



GUARDIAN™
So You Never Lose It

Engineering & Design **Technical Brief**

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F O U N D E R S

Fenwick How · Colton Stagg

10+ FT RADIUS

01 Executive Overview

Guardian is a self-contained, infrastructure-independent bilateral proximity alert device. No phone. No Bluetooth. No network. Protection that works when everything else doesn't

“Guardian is not a tracker. It is a prevention platform designed to help ensure important things never become lost in the first place.”

Guardian is a bilateral proximity alert device designed to prevent item loss in real time, without reliance on any external infrastructure. There is no Bluetooth, no Wi-Fi, no cellular network, and no paired smartphone required. Guardian operates as a completely self-contained, always-on system.

This document provides the engineering and industrial design team with the complete product vision, functional requirements, device architecture, and design guidance needed to begin prototyping and design development.

Product Mission

Build the most reliable proximity prevention device on the market — one that works when everything else fails. **Guardian’s core value proposition is infrastructure independence:** the device must function in environments where phones are dead, Bluetooth is unavailable, and networks are absent.

Competitive Differentiation

Capability	Guardian	Tile / AirTag / Competitors
Phone Required	No	Yes
Bluetooth Dependency	None	Core requirement
Wi-Fi / Cellular Needed	No	Yes (for extended tracking)
Works Without Any Network	Yes — always	No — never
Bilateral Alert System	Both devices alert	Only one side alerts
Infrastructure Independence	0%	100%

02 Product Vision & Design Direction

Guardian should feel like a premium, purposeful tool. Minimal. Confident. Tactile. Every design decision should reinforce a single message: this device is easy to use and built to be relied upon.

Brand Identity

Attribute	Detail
Product Name	Guardian™
Tagline	So You Never Lose It
Founders	Fenwick How · Colton Stagg
Entity	TBD
Primary Blue	#02AFFD — Guardian Blue (sampled from logo)
Primary Gray	#808080 — Guardian Gray (sampled from wordmark)
Design Language	Minimal, premium, geometric — clean form, considered materiality

Industrial Design Goals

- Small enough to attach to a keychain, bag, pet collar, equipment, vehicle keys, luggage, or everyday carry item without adding noticeable bulk
- Durable and lightweight construction suitable for daily use across consumer, commercial, industrial, and outdoor environments
- Flexible form factor and attachment options to support multiple use cases, including personal belongings, pets, apparel, uniforms, safety gear, tools, equipment, and specialty applications
- Designed to support future licensing, white-label, co-branding, and OEM integration opportunities across multiple industries
- Form factor and aesthetics should allow seamless integration into clothing, footwear, backpacks, wearable accessories, uniforms, sporting goods, and branded merchandise
- The LED ring serves as the primary user interface (when applicable); placement, diffusion quality, visibility, and intuitive communication are critical design elements
- No screens, minimal or no buttons, and no unnecessary moving parts to maximize reliability and simplicity
- Water-resistant construction incorporated wherever feasible within target cost objectives
- Battery architecture optimized for long operating life with minimal user maintenance
- Technology-agnostic platform capable of supporting multiple location and proximity technologies as they evolve
- Designed for scalable manufacturing and cost-effective production at consumer and commercial volumes
- Form should communicate “Guardian” rather than “Tracker” — protective, helpful, and reassuring rather than surveillant

- Product experience should emphasize prevention and peace of mind: helping users avoid losing valuable items rather than helping them find items after loss
- Visual identity and industrial design should be distinctive, recognizable, and adaptable across a family of future Guardian products

Packaging Vision

Two packaging directions are in development. Industrial design should consider how the device presents inside premium retail packaging:

Direction	Description	Est. Unit Cost
The Vault Box	Matte black exterior · Blue foil stamp · Magnetic lift lid · Circular window revealing device	\$1.80–\$2.20
The Reveal Sleeve	White matte outer sleeve · Black inner tray · Architectural reveal on unboxing	\$1.80–\$2.20

03 How Guardian Works

3.1 Core Operating Principle

Guardian operates as a paired proximity detection system. Two devices are bonded during setup and continuously communicate via a proprietary short-range RF protocol — no external infrastructure required. When devices move beyond a defined proximity threshold, both units trigger simultaneous bilateral alerts, warning the user before an item is lost rather than after.

3.2 Device Pairing & Setup Flow

The setup flow is designed to be frictionless and infrastructure-independent:

1. Users initiate bonding handshake by setting devices in pairing mode
2. User places two Guardian devices in desired proximity and sets distance to alert
3. Bond confirmed via synchronized LED state change (white → green → blue)
4. System is active and monitoring immediately — no app download, no account required

No phone. No app. No account. Guardian is ready the moment the bond is confirmed.

3.3 Proximity Detection & Alert Logic

Guardian’s alert system is bilateral — both devices in a bonded pair alert simultaneously when the proximity threshold is exceeded. This is a critical architectural distinction from all competitors, which only alert the user’s phone.

Device Role	Behavior on Alert
Device A — carried by user	Alerts the user that Device B (on the item) is moving out of safe range
Device B — on the item	Alerts anyone nearby that the item is separating from its owner

- Alert type: Haptic feedback + audible tone + LED state change
- Alert threshold: To be defined during prototyping — initial target 10–30 feet open air
- Latency target: Both devices alert within 500ms of threshold breach

3.4 Multi-Device Architecture

Guardian is designed to support multi-device networks. A single user may bond multiple units to protect multiple items. The communication protocol and device addressing scheme should support this from day one, even if initial SKUs ship as single pairs.

- Unique device IDs assigned at manufacture or during bonding
- Network topology: star or mesh — TBD by RF team based on power and cost constraints
- Bonding is exclusive but re-bondable (a device can be re-paired to a new partner)

04 LED Ring State System

The LED ring is Guardian’s primary and only user interface. It must communicate device state immediately, without supplementary text or UI, across all lighting conditions. Four states are defined. Industrial design must ensure clean, uniform diffusion across all four colors.

State	LED Color	Meaning	Design Note
Standby / Connected	White	Bonded and within safe proximity range	Soft ambient glow — always-on, low power
Alert / Separation	Red	Threshold exceeded — item moving away	High-visibility pulse or strobe — urgent
Pairing / Setup	Green	Device is in bonding/pairing mode	High-visibility pulse or strobe — pairing
Bonded / Confirmed	Guardian Blue	Bond successfully established	Brand blue — mirrors the logo dot motif



LED Implementation Requirements

- Full 360° uniform light distribution — no hotspots or dead zones
- Legible in direct sunlight (minimum brightness TBD from photometric testing)
- Low standby power draw — white state is on continuously in normal operation
- Blue pairing state should match brand blue (#02AFFD) as closely as LED technology permits
- Red must read as distinctly urgent and be distinguishable from white standby at a glance
- Transition animations (pulse, fade, strobe) configurable in firmware for tuning post-production

05 Technical Requirements

5.1 Communication Protocol

The RF communication layer is the most critical technical component of Guardian. It must be robust, power-efficient, and entirely independent of any external standard or network.

- Frequency band: TBD — 2.4 GHz, sub-GHz, or proprietary FHSS are candidate approaches
- Range target: 10–30 meters open air — to be validated during prototyping
- Latency: < 500ms from threshold breach to alert onset on both devices
- Interference resilience: Must perform reliably in RF-dense environments (airports, offices, transit hubs)
- No external protocol dependency: Must not rely on Bluetooth, Wi-Fi, or cellular stacks
- Power efficiency: Always-on communication must support multi-month battery life

5.2 Power System

Parameter	Target	Notes
Battery Type	Rechargeable Li-ion or coin cell	TBD based on form factor — rechargeable strongly preferred
Standby Battery Life	6+ months	White LED on, RF listening, no alerts
Alert Mode Power	Acceptable burst increase	Red LED + haptic + tone — burst, not sustained
Charging Interface	USB-C preferred	Magnetic pogo-pin acceptable for waterproof variants
Low Battery Indication	LED state or pattern	Leverage LED ring — no separate indicator

5.3 Physical & Environmental Specifications

Parameter	Requirement
Dimensions	Target $\leq 38\text{mm}$ diameter, $\leq 8\text{mm}$ thickness. Final TBD.
Weight	Target < 15g including battery
Attachment	Keychain loop / lanyard hole required. Adhesive mount optional.

Parameter	Requirement
Ingress Protection	IPX4 minimum. IPX7 preferred if cost-feasible.
Operating Temp	-10°C to 60°C
Drop Resistance	1.0m onto hard surface, no functional damage
Housing Material	Durable polymer or anodized aluminum — premium feel required

Future Integration & Embedded Deployment Considerations

Parameter	Requirement
Modular Architecture	Internal electronics and antenna assembly should support future integration into custom housings and third-party products.
Apparel Integration	Form factor should support future embedding into jackets, uniforms, footwear, backpacks, purses, wallets, belts, and wearable accessories.
OEM Integration	Electronics package should be adaptable for OEM licensing opportunities with consumer brands, safety equipment manufacturers, pet product companies, and industrial suppliers.
Flexible Mounting	Design should support future sew-in, snap-in, adhesive, molded-in, magnetic, and concealed installation methods.
Antenna Performance	RF performance must remain effective when installed near fabrics, leather, plastics, composites, and common accessory materials.
Environmental Isolation	Future embedded versions should maintain water resistance and durability when integrated into textiles and soft goods.
Serviceability	Battery replacement and maintenance strategy should be considered for both standalone and embedded product variants.
Miniaturization Roadmap	Electronics architecture should support future reduced-size versions for jewelry, pet collars, children’s products, and premium accessories.
Brand Licensing Readiness	Mechanical and electrical design should enable white-label and co-branded deployments without requiring fundamental redesign.

5.4 Alert System Specifications

Alert Type	Specification
Audible Tone	Minimum 85 dB at 10cm. Audible in moderate ambient noise.
Haptic Vibration	Perceptible through a pocket or bag. Linear resonant actuator preferred.
LED Alert State	Red — pulsing or strobing pattern. See Section 04.
Alert Persistence	Repeats until proximity is restored or manually dismissed.
False Positive Rate	Minimize — threshold tuning and signal smoothing required in firmware.

06 Engineering Reference

6.1 Existing Engineering Drawing

An engineering drawing exists for the current device concept. Engineering and design should reference this as the baseline for form factor geometry, LED ring placement, and internal component layout. Evolve from it as component selection and manufacturing feedback are incorporated — do not treat it as locked.

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6.2 Key Engineering Challenges & Risk Areas

Risk Area	Description	Priority
RF Protocol Design	Custom protocol required for infrastructure independence at low power and adequate range <i>Use a pre-certified 915 MHz FHSS module?</i>	Critical
Power Budget	Always-on RF + always-on LED in miniaturized form — battery life targets are aggressive	Critical
Bilateral Synchronization	Both devices must respond within latency target of each other on every alert event	High
Multi-Device Addressing	Protocol must scale to multiple bonded pairs without cross-triggering or interference	High
Miniaturization vs. Durability	Premium feel + drop resistance + IPX rating in a sub-15g device	High

6.3 Firmware Requirements

- Embedded firmware on low-power MCU (e.g. ARM Cortex-M0+ or equivalent)
- State machine: standby, pairing, bonded-active, alert, low-battery, charging
- RF protocol stack: bonding, keep-alive polling, threshold detection, alert trigger
- LED animation controller: color, pattern (solid, pulse, strobe, fade), brightness
- Power management: sleep/wake cycles, alert burst mode, low-battery detection
- OTA update capability: preferred but not required for v1.0

07 SKU & Retail Strategy

Guardian will launch across three retail SKUs. Engineering and design should ensure the core device architecture supports all three configurations with minimal hardware change.

SKU	Contents	Retail Price	Notes
Entry	1 Guardian pair (2 units)	\$19.99	Entry price point — single pair, standard packaging
Standard	1 Guardian pair + accessories	\$24.99	Keychain hardware, lanyard, or mounting accessories included
Bundle	2 Guardian pairs (4 units total)	\$34.99	Family / multi-item bundle — demonstrates multi-device capability

Device BOM targets should be developed with retail margin in mind at the price points above. Packaging unit cost target: \$1.80–\$2.20 per unit at volume.

08 Requested Deliverables

Phase 1 — Discovery & Feasibility (Weeks 1–4)

5. RF protocol recommendation: Propose frequency band, protocol approach, and component candidates. Include power budget estimate and range validation plan.
6. Form factor exploration: 3–5 concept directions in sketch/CAD. Explore attachment methods, LED ring integration, and housing language. Baseline from DM-40-001.
7. High-level BOM estimate: Component list with estimated costs at prototype volume and 100K+ unit volume.
8. Risk register: Top 5 technical risks with proposed mitigation strategies.

Phase 2 — Prototype Development (Weeks 5–12)

9. Functional alpha prototype: Working RF communication between two devices, bilateral alert system, LED ring with all four states operational.
10. Form prototype: 3D printed or CNC housing in target form factor. LED ring diffusion validation.
11. Power characterization: Measured standby current draw, alert burst draw, and projected battery life against target.
12. Alert system validation: Audible tone, haptic, and LED alert confirmed at spec.

Phase 3 — Design Refinement (Weeks 12–20)

13. EVT builds: Integrated hardware/firmware prototype for functional and environmental testing.
14. Industrial design final direction: Housing material, finish, color, LED ring treatment, and attachment hardware finalized.
15. Packaging prototype: Physical mockup of selected direction aligned with device design.
16. Compliance planning: CE/FCC/RoHS assessment and certification roadmap.

09 Points of Contact & Closing

Founders & Product Owners

Name	Role	Authority
Fenwick How	Co-Founder	All design approvals, product direction, investor communications
Colton Stagg	Co-Founder	All design approvals, product direction, investor communications

All engineering and design questions, decisions, and design locks must be routed through the founders before confirmation. No external commitments on behalf of Guardian without written founder authorization.

Design Philosophy

Guardian is not a tracking device. It is a prevention device. The language of every design decision — form, material, LED state, alert behavior, packaging — must reinforce that Guardian acts before loss happens, not after. This distinction is commercially and philosophically central to the product and must be legible in how it looks, feels, and behaves

Confidentiality & NDA

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