RUGGEDIZED HARDWARE & SYSTEM SPECIFICATION

Waterproof GPS Tracking System

All-Weather IP-Rated GNSS Telemetry Unit for Marine, Outdoor Fleet, Construction & Exposed Asset Monitoring

Model / SKU: *[Model #]*	**Document Rev:** *[Rev 1.0]*	**Date:** *[YYYY-MM-DD]*

1. System Overview

The Waterproof GPS Tracking System is an industrial-grade, weather-sealed GNSS positioning and telemetry platform engineered for continuous outdoor exposure, high-pressure washdowns, and temporary water immersion. Designed for marine vessels, motorcycles, off-road equipment, refrigerated trailers, and exposed remote assets, the system pairs a ruggedized IP-rated hardware unit with a real-time cloud tracking portal and automated alerting engine.

2. Key Functional & Environmental Capabilities

- **Hermetically Sealed Enclosure:** Ultrasonic-welded polycarbonate/ABS housing with silicone perimeter gaskets and sealed connectors to prevent water, salt-spray, mud, and dust ingress.
- **High-Sensitivity Multi-GNSS Tracking:** Simultaneous multi-constellation satellite reception with internal high-gain ceramic patch antenna for rapid cold/hot fixes in harsh environments.
- **Flexible Power & Backup Architecture:** Supports wide-range external DC power (*[e.g., 9V–36V / 9V–90V]*) with an internal backup battery or standalone high-capacity self-powered operation.
- **Offline Dead-Zone Buffering:** Stores thousands of timestamped coordinates in internal flash memory during cellular outages and automatically uploads queued logs upon reconnection.
- **Remote Fleet & Asset Platform:** Live map tracking, historical route playback, multi-zone geo-fencing, engine/ignition telemetry, and instant push/SMS/email alerts.

3. Hardware & Environmental Specifications

Parameter	Specification / Rating
Ingress Protection Rating	*[IP67 (1 m immersion for 30 min) / IP68 / IP69K high-pressure washdown]*
GNSS / Positioning Engine	Multi-constellation GNSS (GPS / GLONASS / BeiDou / Galileo / QZSS); SBAS & A-GPS support
Positioning Accuracy	Horizontal: *[< 2.5 m CEP open sky]*; Velocity: *[< 0.1 m/s]*
Cellular Connectivity	*[4G LTE Cat-1 / Cat-M1 / NB-IoT with 2G GSM fallback — specify regional bands]*
SIM & Antenna Interface	Internal sealed Nano-SIM (4FF) or soldered industrial eSIM; internal GNSS & cellular antennas

Parameter	Specification / Rating
Power Input & Backup Battery	*[Hardwired 9V–36V DC + 500 mAh Li-Po backup OR Internal 6,000–10,000 mAh rechargeable pack]*
I/O & Interface Wiring	*[Waterproof pigtail / Deutsch connector: ACC ignition detect, relay cut-off, 1× Digital Input, 1-Wire]*
Motion & Environmental Sensors	3-axis accelerometer (towing, harsh driving, impact detection); optional external waterproof temp probe
Offline Data Storage	Internal non-volatile flash memory (*[e.g., 10,000 – 50,000 waypoints]*)
Operating Temperature & Humidity	*[-30 °C to +75 °C]* operating; up to 100% condensing humidity (submersible rated)
Enclosure Material & Mounting	UV-stabilized, impact-resistant PC/ABS housing; *[screw flanges / heavy-duty magnet / zip-tie slots]*
Dimensions & Weight	*[L × W × H mm]*; Weight: *[g]*
Certifications	*[CE / FCC / RoHS / E-Mark (ECE R10) / IEC 60529 IP-test certified]*

4. System Telemetry, Protocols & Automated Alerts

Feature / Function	Operational Specification
Reporting Modes	Time-based (e.g., 5 s – 60 s active), distance-based, heading-change cornering, and deep-sleep scheduled heartbeat.
Communication Protocols	TCP / UDP / MQTT over TLS encryption; OTA (Over-The-Air) firmware and configuration updates.
Security & Tamper Alerts	External power disconnect alarm, unauthorized towing/vibration alert, enclosure tamper, and remote immobilizer control.
Geo-Fence & Route Monitoring	Polygon and circular zone entry/exit alerts, overspeed warnings, idling duration, and route deviation notifications.

> **Waterproofing & Installation Guidance:** Ensure all cable glands, SIM compartment covers, and waterproof connectors are properly torqued and seated before outdoor or marine deployment. Populate bracketed fields (*[...]*) with exact SKU hardware ratings prior to final release.