ENTERPRISE ASSET TRACKER (ATEX)

User Guide

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Document Revision

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0.1	April 22, 2021	Obsolete	Maheeka Wijesinghe	Updated guide to only include ATEX, based on T0006940_UG_v0.2
0.2	April 23, 2021	Obsolete	Carter Mudryk	Minor changes
0.3	May 06, 2021	Obsolete	SM	Numerous updates
0.4	June 15, 2021	Obsolete	SM	Removed incorrect ATEX information
0.5	June 16, 2021	Obsolete	SM	Removed dust certification
0.6	January 10, 2022	Obsolete	Carter Mudryk	Updated screw torque value to range.
0.7	January 10, 2022	Obsolete	Carter Mudryk	Added that Tracker is certified forATEX categories 2G and 2D. Corrected EN certification reference numbers.
0.8	January 12, 2022	Obsolete	Carter Mudryk	Removed references to LEDs.
0.9	January 12, 2022	Obsolete	Carter Mudryk	Corrected images to reflect removalof LED holes. Updated temperature for dust certification to 135°C.
1.0	January 2, 2024	Released	SM	Clarified magnet is not included with product but provided on request

Table of Contents

List of Acronyms

ATEX............................ ATmospheres EXplosible
BER.............................. Bit Error Rate
BLE.............................. Bluetooth Low-Energy
CNR............................. Cahiers des charges sur les Normes Radioélectriques (RSS)
DL............................... DownLink
EOS............................. End Of Service
EU............................... European Union
FCC............................. Federal Communications Commission
FW.............................. FirmWare
HW............................. HardWare
IoT.............................. Internet of Things
IP................................ Ingress Protection
ISM............................. Industrial, Scientific, and Medical
LoRa........................... Long-Range
LoRaWAN................... Long-Range Wide-Area Network
LoS............................. Line-of-Sight
LTC............................. Lithium-Thionyl Chloride
MCU........................... MicroController Unit
NA.............................. North America
NS.............................. Network Server
OTA............................ Over The Air
PCB............................ Printed Circuit Board
PCBA.......................... Printed Circuit Board Assembly
Rev............................ Revision
RF.............................. RadioFrequency
RSS............................ Radio Standards Specifications (CNR)
RSSI........................... Received Signal Strength Indicator
Rx.............................. Receive, receiver, etc.
SW............................. SoftWare
TRM........................... Technical Reference Manual
Tx.............................. Transmit, Transmitter, etc.
UG............................. User Guide
UL.............................. UpLink
US.............................. United States
Ver............................ Version

1 Product Description

1.1 Overview

This document is the user manual for the T0007367 *Enterprise Asset Tracker (ATEX)* developed by TEKTELIC Communications Inc. This document includes descriptions of the HW, sensing capabilities, and mechanical enclosure of the Tracker. For the functional operation and SW behaviour of the Tracker, please refer to the TRM document.

The Tracker is a LoRaWAN-capable end-device that supports Tx/Rx in the following frequency bands as specified in the LoRaWAN Regional Parameters v1.0.2: AS923, AU915, EU868, IN865, KR920, RU864, US915. The BLE Rx operates in the 2.4 GHz band according to the BLE 5.0 specifications. The Tracker is ATEX category 2G and 2D certified and has a metal wall-mounting bracket for fixed installation.

The main function of the Enterprise Asset Tracker (ATEX) is to utilize periodic BLE scanning to collect data from nearby BLE peripherals to determine device location.

1.2 External Appearance and Interfacing

The Tracker with mounting bracket is shown in Figure 1-1. The enclosure interfacing is shown in Figure 1-2.

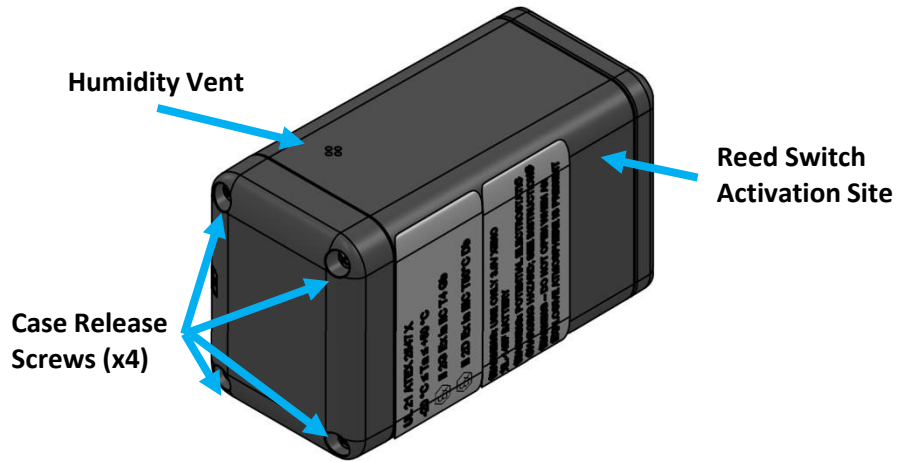**Figure 1-1: ATEX Tracker with Mounting Bracket**

Figure 1-2: External Interfacing (Front View)

1.3   Specifications and Sensing Functions

The Enterprise Asset Tracker (ATEX) specifications are listed in Table 1-1.

Table 1-1: ATEX Enterprise Asset Tracker Specifications.

Parameter	Specification
Environmental Rating	ATEX, IP67
Mounting	Fixed wall mount
Operating Temperature	-20°C to 50°C
Operating Relative Humidity	10% - 100%
Dimensions	66 mm x 32 mm x 44 mm
Weight	51.3 g enclosure + 56.5 g battery = 107.8 g total
Power Source	Battery-powered: 1x C-cell LTC (3.6 V), XENOENERGY XL-145F
Network technology/Frequency band	LoRaWAN EU868 ISM band
Air Interface	LoRa Rx/Tx, BLE Rx
Maximum Tx Power	15 dBm
Sensing Elements	BLE receiver, accelerometer, MCU thermometer, magnetic reed switch, battery gauge
Bluetooth Compatibility	BLE based on Bluetooth 5
LoRa RF Sensitivity	Up to -137 dBm (SF12, 125 kHz BW)
BLE Sensitivity (0.1% BER)	125 kbps: -103 dBm 500 kbps: -98 dBm 2 Mbps: -91 dBm

Parameter	Specification
Accelerometer Sensitivity	Sample rate: 1, 10, 25, 50, 100, 200, 400 Hz Measurement range: ±2, ±4, ±8, ±16 g Precision: 16, 32, 64, 192 mg
Battery Fuel Gauge Features	Measures battery voltage, current, and temperature EOS alert when the capacity is at 5%
Battery Lifetime	2 years

The Enterprise Asset Tracker (ATEX) certifications are listed in Table 1-2.

Table 1-2: ATEX Enterprise Asset Tracker Certifications.

Certification	Specification	Marking
EMC	EN 301 489-1	CE
Ordinary locations	EN 62368-1-2014	CE, IP-67
Explosive locations (ATEX)	EN IEC 60079-0:2018 EN 60079-11-2012	⟨Ex⟩ II 2 G Ex ia IIC T4 Gb ⟨Ex⟩ II 2 D Ex ia IIIC T135°C Db
Temperature		-20 °C ≤ Ta ≤ +50 °C

1.3.1   Bluetooth Low-Energy (BLE) Receiver

The Enterprise Asset Tracker (ATEX) is equipped with a BLE module that is embedded in the MCU. It serves as a BLE central device that periodically searches to discover nearby BLE peripherals. It can be used as a standalone proximity Tracker that can also help at positioning.

The BLE scan can be disabled entirely or enabled at any time. Figure 1-3 shows the BLE scan scheme when the BLE scan is enabled. As shown in the figure, BLE scans are performed periodically. Each scan duration is divided into scan intervals. The BLE scan is performed only in the scan window portion of the scan interval. The ratio of the scan window to the scan interval is the scan duty cycle. In the case of the scan window equalling the scan interval, the scan duty cycle is 100%. This represents a continuous scan over each scan duration. A larger duty cycle will increase the likelihood of receiving more beacon packets at the expense of consuming more power. The scan period, duration, interval, and window are all configurable. For all user configurable device settings, refer to the TRM document for the Tracker.
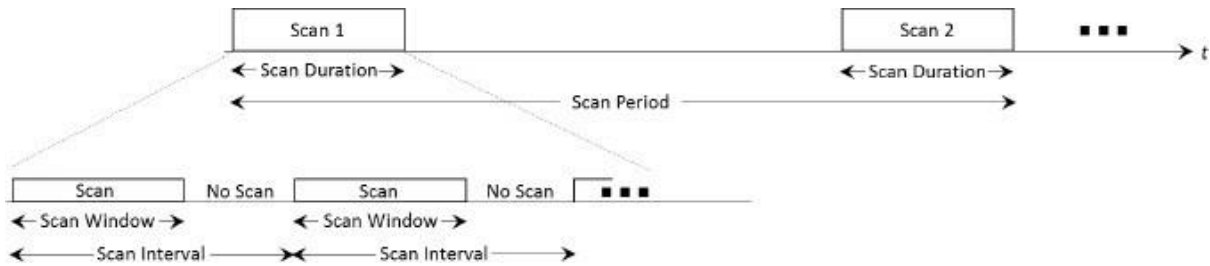
Figure 1-3: The BLE Scan Schematic Procedure.

All BLE peripheral devices are discoverable during BLE scans. At the end of each scan duration, up to n discovered BLE devices with the strongest RSSIs are reported over LoRaWAN. The value n is user configurable. If no devices are found, an empty list is uplinked. Over each scan duration, a BLE device beacon may be observed (discovered) more than once. The Trackers do not support BLE Tx advertising.

The Enterprise Asset Tracker (ATEX) support BLE of Bluetooth 5.0. The BLE scan is performed in the passive mode only, meaning that the Tracker listens to surrounding beacons, but does not transmit to them to request additional information.

NOTE: The BLE scan is exclusive to LoRa radio transmission; i.e. they do not overlap. If any reporting becomes due at the same time of a BLE scan, the reporting will be done after the BLE scan is complete.

1.3.2 Magnetic Reed Switch

The Enterprise Asset Tracker (ATEX) is equipped with an internal magnet actuated reed switch. Since the Tracker has a water-tight IP67 enclosure, there is no ability to have battery pull-tabs or reset button pinholes. The reed switch therefore addressthe following purposes:

1. To wake the device from sleep (the Trackers are shipped in a state of deep sleep).
2. To put the device to sleep.
3. To reset the device (since the Trackers do not have a reset button).
4. To force an UL.

A magnet for this purpose is available upon request. The position on the exterior of the enclosure on which the magnet must be placed to activate the reed switch is shown in Figure 1-2.

For more information on how to wake the device from sleep, refer to Section 2.4. For more information on how to use the reed switch for the other purposes, refer to the specific TRM document for the Tracker.

1.3.3 Accelerometer Transducer

The Enterprise Asset Tracker (ATEX) supports motion sensing through an integrated 3-axis accelerometer which can optionally be disabled. The main role of the accelerometer in the is to detect motion that can indicate a change of the Tracker's status from stillness to mobility, or vice versa.

The accelerometer can also be polled periodically for its output acceleration vector for applications in which the Tracker's orientation is of interest.

2   Installation

2.1   Included Product and Installation Material

The following items are shipped with each Tracker:

- 1x Tracker inside an enclosure with 3.6 V C-cell LTC battery installed.
- 1x corresponding Tracker Quick Start Guide.
- 1x mounting bracket.

2.2   Safety Precautions

WARNING – DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT.

WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD, SEE INSTRUCTIONS.

WARNING – USE ONLY 3.6 V XENO XL-145F BATTERY.

The following safety precautions should be observed when using the Enterprise Asset Tracker (ATEX):

- The Enterprise Asset Tracker (ATEX) is intended for fixed installation according to the mounting instructions provided in this guide. The Tracker shall not be used as a portable device.
- All installation practices must be in accordance with the local and national electrical and building codes.
- Follow all instructions for sensor mounting (Section 2.5.1) and battery replacement (Section 2.6.1).
- Under certain extreme conditions, the non-metallic enclosure of this equipment may generate an ignition-capable level of electrostatic charge. One or more of the following techniques may be used to minimize the risk of ignition due to electrostatic discharge:
    - Clean the sensor only with a damp cloth.
    - Protect the sensor from continuous direct airflow.
    - Control the humidity of the environment to minimize the potential for static discharge.
    - Mount the sensor to a grounded structure.
    - Touch the sensor only when the atmosphere is known to be non-hazardous.
- The Tracker contains a Lithium Thionyl Chloride battery. When used correctly, lithium batteries provide a safe and dependable source of power. However, if they are misused or

abused, leakage, venting, explosion, and/or fire can occur. The following are recommended safety precautions for battery usage.

- Keep batteries out of the reach of children.
- Do not insert batteries in reverse.
- Do not short-circuit batteries.
- Do not charge batteries.
- Do not force discharge batteries.
- Do not mix batteries.

- Do not leave discharged batteries in equipment.
- Do not overheat batteries.
- Do not dispose of batteries in fire.
- Do not expose batteries to water.
- Store unused batteries in their original packaging away from metal objects.

2.3   Unpacking and Inspection

The following should be considered during the unpacking of a new Tracker.

1. Inspect the shipping carton and report any significant damage to TEKTELIC.

2. Unpacking should be conducted in a clean and dry location. Unpacking of the Enterprise Asset Tracker- ATEX Tracker (T0007367) must be done in a non-explosive environment.

3. Do not discard the shipping box or inserts as they will be required if a unit is returned for repair or re-configuration.

2.4   Commissioning and Activation

Each Tracker has a set of commissioning information that must be entered into the network server in order for the Tracker to be able to join the network and begin normal operation once activated. For instructions on how to do this please refer to the Network Server Quick Start Guide (available online in the *Knowledge Base*).

The Tracker is shipped in a secured enclosure with the battery preinstalled. The device is shipped in a state of deep sleep. A magnet can be used to wake the Tracker from sleep by applying the magnetic activation pattern at the location specified on the device in Figure 1-2. The magnetic pattern is illustrated in Figure 2-1. A "magnet presence" is achieved by attaching the magnet to the enclosure at the magnet symbol. A "magnet absence" is achieved by taking the magnet away from the enclosure. Figure 2-1 shows that the pattern involves sustaining a "magnet presence" continuously for at least 3 s but less than 10 s.
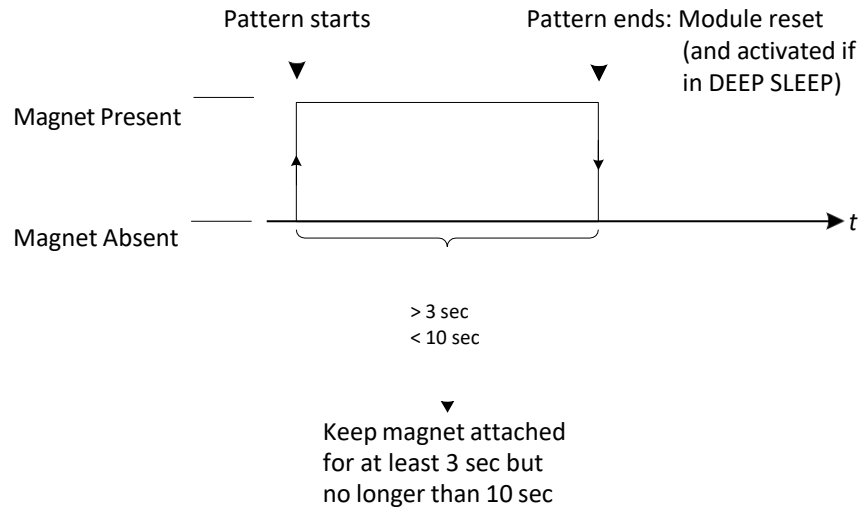
Pattern starts   Pattern ends: Module reset
(and activated if
in DEEP SLEEP)

Magnet Present

Magnet Absent   *t*

> 3 sec
< 10 sec

Keep magnet attached
for at least 3 sec but
no longer than 10 sec

Figure 2-1: The C-Cell Tracker Variant Magnetic Activation Pattern

Once activated, the Tracker will automatically begin the join process. To turn the Tracker off, the battery must be removed. To reset the device without taking the battery out, see Section 3.4 for a description of the reset function.

2.5 Mounting

2.5.1 Mounting Procedure for ATEX Enterprise Asset Tracker

1. The mounting bracket needs to be secured to a wall or another solid surface by using an adhesive, or four mounting screws (see Figure 2-2).

Figure 2-2: Securing the Mounting Bracket to a Surface

2. After the bracket has been secured, the Tracker can be mounted to the bracket via the mounting feature on the main body of the Tracker (see Figure 2-3). Slide the bottom hook of the mounting bracket into the mounting feature until it is fully inserted.

Figure 2-3: Attaching the Tracker to the Mounting Bracket

3. Secure the Tracker in place using a fifth screw inserted through both holes on the top side of the bracket as shown in Figure 2-4, clamp the top flange of the bracket until it is flush with the top surface of the Tracker.

Figure 2-4: Securing the Tracker in the Mounting Bracket with a Fifth Screw

2.6 Battery Replacement

2.6.1 Battery Replacement Procedure for ATEX Enterprise Asset Tracker

WARNING – DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT.

WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD, SEE INSTRUCTIONS.

WARNING – USE ONLY 3.6 V XENO XL-145F BATTERY.

The battery cover is marked with a battery symbol and uses Phillips Head H1 screws. This is the cover that needs to be removed to replace the battery, DO NOT REMOVE the feature cover on the opposite side which is marked by a magnet symbol and uses Torx Head screws.

1. Before taking any other steps to replace the battery, bring the Tracker to a non-hazardous atmosphere location.

2. In a non-hazardous location, remove the battery cover by unscrewing the 4x Phillips head screws using a size #1 Phillips head screwdriver as shown in Figure 2-5.

Figure 2-5: Removing the Battery Cover Screws

3. Remove the used battery, and replace it **ONLY** with a new 3.6V XENO XL-145F battery. When inserting the new battery, insert the negative terminal end into the Tracker first. The battery contacts are marked with their proper polarities (see Figure 2-6), with the positive terminal marked with a plus-sign (**+**), and the negative with a minus-sign (**-**).
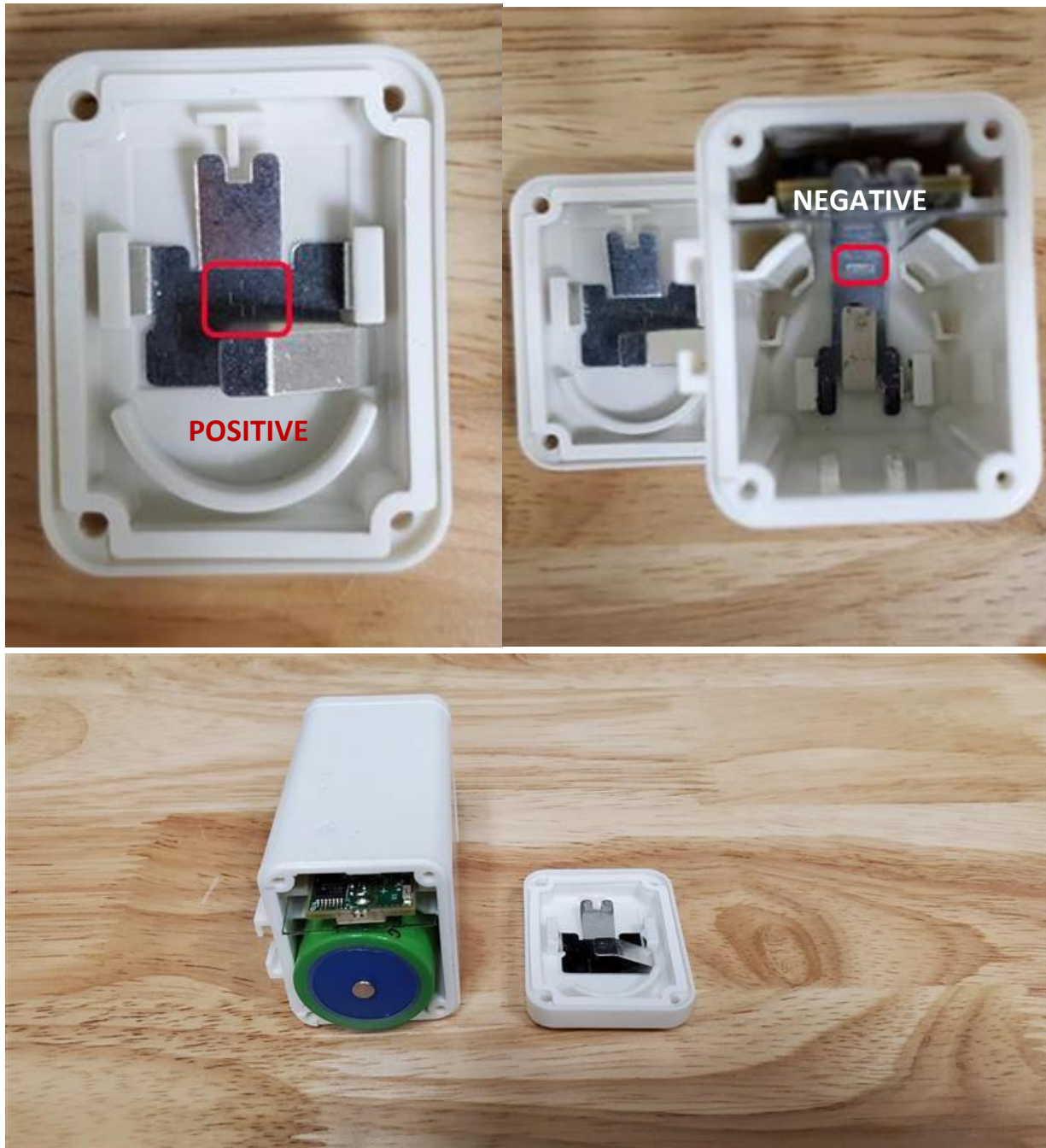
Figure 2-6: Battery Polarity Markers and Insertion

4. Check that the gasket is undamaged and properly seated on and adhered to the battery cover. It should look similar to Figure 2-7.
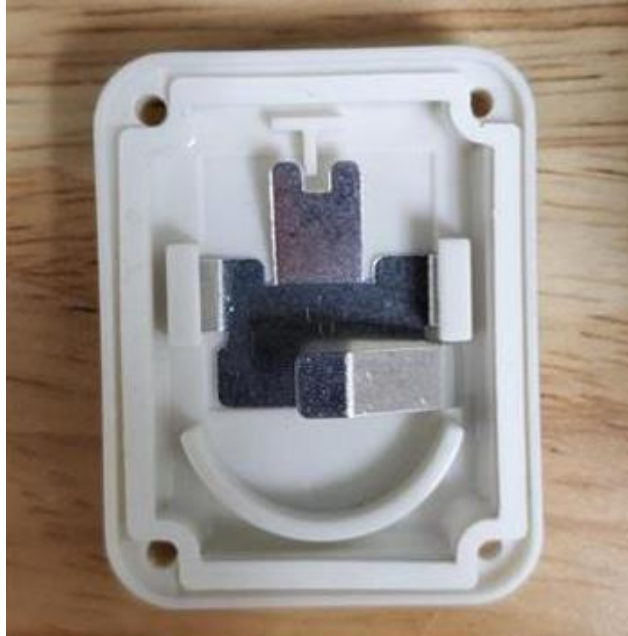
Figure 2-7: Proper Gasket Appearance

5. Before reattaching the battery cover, ensure the proper orientation of the cover by placing the battery symbol next to the mounting feature. You can also ensure proper orientation by closing it with the semi-circular rib against the battery, and the T-shaped rib against the PCBA (see Figure 2-8).

Figure 2-8: Proper Replacement Orientation of the Battery Cover

6. Reassemble the cover to the chassis by using the 4x #1 size Phillips head screws, using a #1 size screwdriver and tighten to between 0.26-0.29 Nm torque.

3 Configuration and Operation

3.1 Configuration

The Tracker support a full range of OTA configuration options. Specific technical details are available in the corresponding TRM document. All configuration commands need to be sent OTA during the Tracker's DL Rx windows.

3.2 Default Configuration

Table 3-1 lists the default reporting behaviour for each functional grouping of the Enterprise Asset Tracker compared to the remaining Tracker variants. Reporting behaviour can be changed from default through OTA DL commands.

Table 3-1: Default Reporting Intervals

Reported Data	Reporting Interval
Battery Voltage	24 hours
Discovered BLE devices	1 hour
Acceleration Vector	Disabled
MCU Temperature	Disabled

3.3 Reset Function

For the Enterprise Asset Tracker, the reset is triggered by applying the magnetic pattern as shown in Figure 2-1. While this pattern causes the Tracker to wake from deep sleep before activation, during normal operation this pattern causes a reset.

NOTE: Shutting down or resetting the Tracker will cause all unsaved user configurations to be lost. Save the desired configuration to the Tracker flash before powering off or resetting.

4 Compliance Statements

Federal Communications Commission:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

To comply with FCC exposure limits for general population / uncontrolled exposure, this device should be installed at a distance of 20 cm from all persons and must not be co-located or operating in conjunction with any other transmitter.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in an industrial installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Innovation, Science and Economic Development Canada (Industry Canada):

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

i.   This device may not cause interference, and

ii. This device must accept any interference, including interference that may cause undesired operation of the device.

This device should be installed and operated with minimum distance 0.2 m from human body.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) L'appareil ne doit pas produire de brouillage.

(2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet appareil doit être installé et utilise à une distance minimale de 0.2 m du corps humain.

California Proposition 65:

WARNING: This product can expose you to chemicals including lead, nickel, and carbon black, which are known to the State of California to cause cancer, birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.