



# Industrial Tracker

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Reference Manual

TNIT100-915  
TNIT100-868

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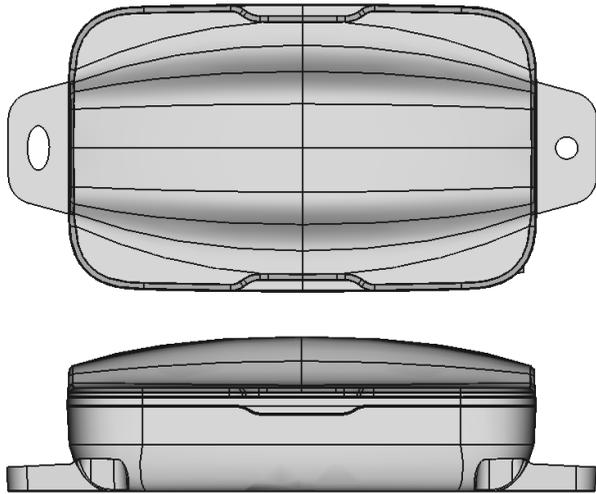
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## 1. Description

The multi-purpose Industrial Tracker is designed for outdoor asset tracking and industrial applications. The design uses replaceable batteries and is designed for multi-year operation. The sensor includes a three-axis accelerometer which is used to optimize different asset tracking applications for response time and battery lifetime. The sensor also includes many unique GPS acquisition and geo-fencing features for optimal battery lifetime and response time. TrackNet provides the sensor, sensor software, and core network management to deliver fully optimized asset tracking solutions.

## 2. Specifications

### 2.1 Mechanical



#### 2.1.1 Sensor

|                         |  |
|-------------------------|--|
| Length x Width x Height | 52mm x 85mm x 27mm                       |
| Weight                  | 45 grams                                 |
| Sensor                  | GNSS, 3D MEMs accelerometer, Hall effect |

### 2.2 Environmental

|             |                  |
|-------------|------------------|
| Temperature | -20°C to +50°C   |
| IP Rating   | IP 66 equivalent |

### 2.3 Radio

|                            |  |
|----------------------------|--|
| Frequency                  | Either 863–870MHz for EU models and 902–928MHz for North America |
| Tx Power                   | +19dBm conducted   |
| Rx Sensitivity (Conducted) | -138dBm  |
| Antenna Gain               | 0dBi Peak, -3dBi Avg   |

### 2.4 Certifications and Conformity

|                   |
|-------------------|
| FCC: 2AMUGTNIT100 |
| IC: 22980-TNIT100 |
| CE                |
| ROHS REACH        |

### 2.5 Power

|                 |                               |
|-----------------|-------------------------------|
| Source          | 3.6V Li-SOCI2 2500mAh battery |
| Maximum Voltage | 3.6V                          |
| Minimum Voltage | 3.1V                          |
| Current         | 170mA max / 5uA minimum       |

### 2.6 User Interface

|      |               |
|------|---------------|
| LEDs | One green LED |
|------|---------------|

### 2.7 Additional Features

|                    |                  |
|--------------------|------------------|
| PCB Temperature    | NTC 100K Ohm     |
| Battery Monitoring | Resistor divider |

## 3. Operation

### 3.1 Shipping Mode

When industrial trackers leave the factory, they are put into shipping mode, where the sensor is hibernating without functionality to prevent radio activity and minimize battery usage. Devices are delivered in this mode. The LED shall be off at all times when in shipping mode and the hall sensor will be ignored. When the device is commanded by a network, the device shall exit shipping mode and enter default mode. There is no method for customers to put the device back into shipping mode.

### 3.2 Transport Mode

The sensor is hibernating without functionality to prevent radio transmissions and to minimize battery usage.

To enter transport mode from default mode, the user shall press and hold a magnet for at least 10 seconds. Upon removal of the magnet, transport mode is activated and a green LED shall flash rapidly for a duration of 3 seconds as an indication to the user.

To exit transport mode, the user shall press and hold a magnet for at least 10 seconds. Upon removal of the magnet, transport mode is deactivated and default mode entered. As an indication to the user, the green LED shall light up for a duration of 3 seconds.

### 3.3 Default Mode

This mode is active when the device is in normal operating mode. Whenever device motion is detected after a period of rest, the green LED shall flash 3 times within 500ms, or once if a low battery condition is detected. Position updates will be sent to the network until the device remains at rest for 30 seconds.

## 4. Messages

LoRaWAN Packets for this device use port 136.

### 4.1 Status

#### 4.1.1 Common Fields

##### **Status[7:0]**

{Fault3, Fault2, LED1, LED0, Fault1, Fault0, BTN1, BTN0}

- Nominally Fault0 indicates no network time available
- Nominally Fault1 indicates loss of primary sensor function
- Nominally Fault2 indicates loss of secondary sensor function
- Nominally Fault3 indicates loss of network connectivity

##### **Battery[7:0]**

LoRaWAN Decode

- 0 => Device is charging or line powered
- 1 to 254 => device level, 1 = minimum and 254 = fully charged
  - Further encode
    - [7:4] = predicted battery life percentage, 15 = New, 0 = Replace
    - [3:0] = BatteryVoltage — 2.5V, in 0.1V steps, So 3.1V = 6
- 255 => Device could not measure battery — possible Fault

Temperature[6:0]

Unsigned Integer (0 to 127) Temperature = value - 32, measurement range -32 to 95°C

For Industrial Tracker devices Fault 3 indicates '1' for no GNSS fix, and '0' for GNSS fix is OK.

**Note:** If there is no GNSS fix, the Lat and Lon fields contain the last values reported by the GNSS receiver. If there has never been a GNSS fix acquired, the values may both be 0.

#### 4.1.2 Triggers

Packet Triggers: 60 minute inactivity, movement, button press, position update every 15 seconds while moving and GNSS has a 2D fix, update every 2 minutes while moving and GNSS does not have a 2D fix.

### 4.1.3 Payload

|                |          |
|----------------|----------|
| Port           | 136      |
| Payload Length | 11 bytes |

| Byte  | 1      | 2       | 3    | 4   | 5 | 6 | 7   | 8 | 9 | 10 | 11 |
|-------|--------|---------|------|-----|---|---|-----|---|---|----|----|
| Field | Status | Battery | Temp | Lat |   |   | Lon |   |   |    |    |

|         |  |
|---------|--|
| Status  | <b>Sensor status</b><br>Bit [3] 1 – no GNSS fix, 0 – GNSS fix OK<br>Bits [7:4] See common status format above  |
| Battery | <b>Battery level</b><br>Bits [3:0] unsigned value v, range 1 – 14;<br>battery voltage in V = $(25 + v) \div 10$ .<br>Bits [7:4] unsigned value K, range 0 – 15;<br>remaining battery capacity in % = $100 \times (K \div 15)$ .  |
| Temp    | <b>Temperature as measured by on-board NTC</b><br>Bits [6:0] unsigned value $\tau$ , range 0 – 127;<br>temperature in $^{\circ}\text{C} = \tau - 32$ .<br>Bit [7] RFU  |
| Lat     | <b>Latitude as last reported by GNSS receiver</b><br>Bits [27:0] signed value $\varphi$ , range -90,000,000 – 90,000,000;<br>WGS84 latitude in $^{\circ} = \varphi \div 1,000,000$ .<br>Bit [31:28] RFU  |
| Lon     | <b>Longitude and position accuracy estimate as last reported by GNSS receiver</b><br>Bits [28:0] signed value $\lambda$ , range -179,999,999 – 180,000,000;<br>WGS84 longitude in $^{\circ} = \lambda \div 1,000,000$ .<br>Bits [31:29] unsigned value $\alpha$ , range 0-7;<br>position accuracy estimate in m = $2^{\alpha+2}$ (max).<br>The value 7 represents an accuracy estimate of worse than 256m. |

**Note:** If there is no GNSS fix (see sensor status), the Lat and Lon fields contain the last values reported by the GNSS receiver. If there has never been a GNSS fix acquired, the values may both be 0.

## 5. Command

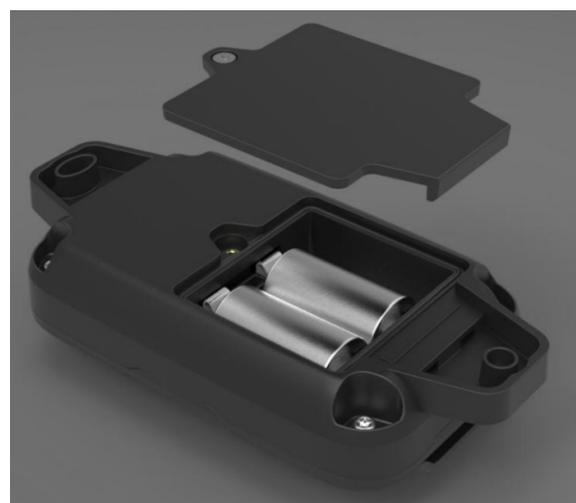
RESERVED.

## 6. Battery Replacement

Use ER14250 or equivalent.

Remove screw and replace both batteries.

Do not mix old and new batteries.



This device complies with Part 15 of the FCC Rules and license-exempt RSS Standards of Industry Canada. 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. For the full FCC/IC Compliance Statements and EU declaration of conformity, visit [www.tabs.io/legal](http://www.tabs.io/legal).

#### Federal Communication Commission Interference Statement

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 a residential 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:

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

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

#### IMPORTANT NOTE

"To comply with FCC and Industry Canada RF radiation exposure limits for general population, the antenna(s) Used for this transmitter must be installed such that a minimum separation distance of 20cm is maintained Between the radiator (antenna) and all persons at all times and must not be co-located or operating in conjunction with any other antenna or transmitter."

#### Industry Canada statement

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie 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'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

#### RF Radiation Hazard Warning

To ensure compliance with FCC and Industry Canada RF exposure requirements, this device must be installed in a location where the antennas of the device will have a minimum distance of at least 20 cm from all persons. Using higher gain antennas and types of antennas not certified for use with this product is not allowed. The device shall not be co-located with another transmitter.

Installez l'appareil en veillant à conserver une distance d'au moins 20 cm entre les éléments rayonnants et les personnes. Cet avertissement de sécurité est conforme aux limites d'exposition définies par la norme CNR-102 at relative aux fréquences radio.