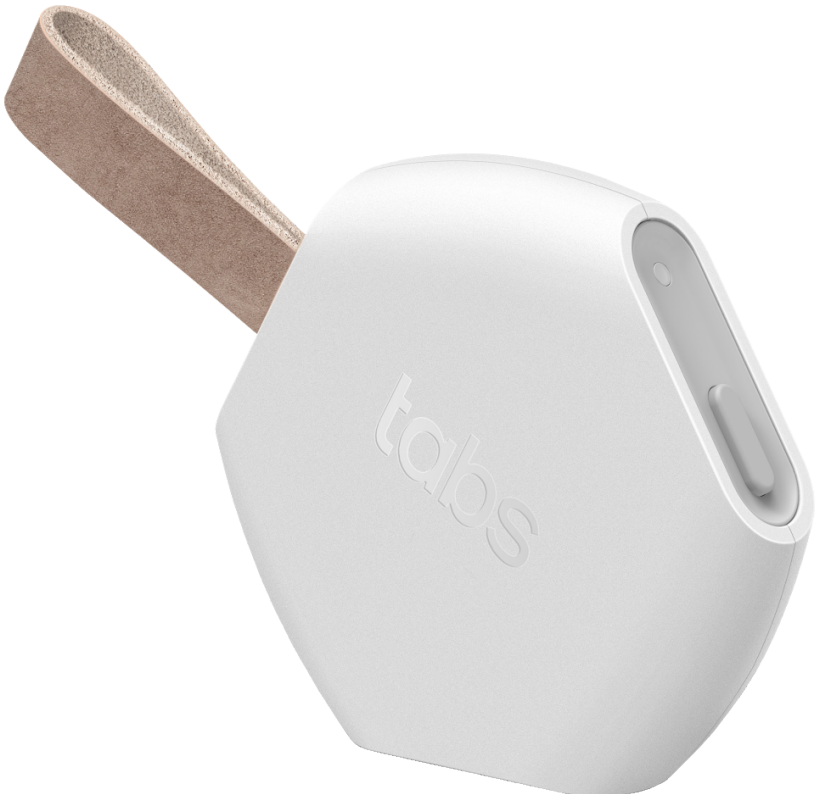
BROWAN




# Object Locator

## Reference Manual

TBOL100-915
TBOL100-868

Model Name: TBOL100

DOC ver.: BQW_02_0021.002

# Table of Contents



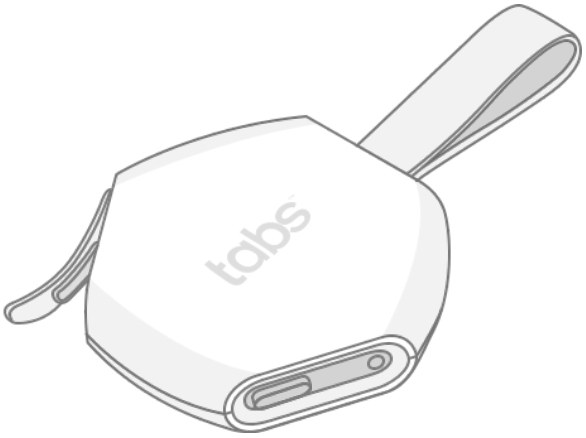
# 1. Description

The Tabs Object Locator utilizes LoRaWAN connectivity to communicate the location of the device. The intended use is to attach the sensor to an object like a backpack or a purse to be able to remotely know its location.

The sensor is composed of a GNSS receive,  a push button, an LED indicator, and a USB-C connector. The device contains a LiPo battery that can be recharged through the USB-C  connector.

# 2. Specifications

## 2.1 Mechanical




### 2.1.1 Sensor

| | |
|---|---|
| Length x Width x Height | 50mm x 13mm x 50mm |
| Weight | 28 grams |
| Sensor | GNSS, 3D MEMs accelerometer, Push Button |

## 2.2 Environmental

| | |
|---|---|
| Temperature | 0°C to +50°C |
| IP Rating | IP 64 equivalent |

## 2.3 Radio

| | |
|---|---|
| Frequency | • 863–870MHz for EU<br>• 902–928MHz for North America |
| Tx Power | +19dBm conducted |
| Rx Sensitivity | -140dBm conducted |
| Antenna Gain | -5dBi Peak, -8dBi Avg |

## 2.4 Certifications and Conformity

| |
|---|
| FCC ID: 2AMUGTBOL100 |
| IC: 22980-TBOL100 |
| CE |
| ROHS REACH |

## 2.5 Power

| | |
|---|---|
| Source | 4.2V LiPo 540mAh battery |
| Maximum Voltage | 4.2V |
| Minimum Voltage | 3.6V |
| 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 Transport Mode

The sensor is hibernating without functionality to prevent radio transmissions and to minimize battery usage.
To enter flight mode from default mode, the user shall press and hold any button for at least 10 seconds. Upon the release of the button, flight mode is activated and the green LED shall flash rapidly for a duration of 3 seconds as an indication to the user.
To exit flight mode, the user shall press and hold any button for at least 10 seconds.
Upon the release of the button, flight 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.

## 3.2 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.

After a button is pressed, the green LED shall turn on for at most 50ms, after which uplink transmission is scheduled. After the uplink transmission is complete – but before any down-link windows are opened – the green LED shall turn on for 500ms.

## 3.3 Charging Indication

These indications do not constitute an operating mode by themselves, but may be active whenever there are no other ongoing indications as defined by the flight and default operating modes. When the device is connected to a powered charger, and the battery is charging, (1)the green LED shall be on continuously .(2)the sensor will send NULL payload with FPort 8 every 5 minutes.

# 4. Messages

LoRaWAN Packets for this device use port 136.

## 4.1 Status

### 4.1.1 Triggers

Packet Triggers:
1.The sensor will update status around 5 hours 30 minutes  if the sensor is in stationary mode.
2.The sensor is in moving mode:
2.1 The sensor will update status around 15 seconds if the status bit[3] is GNSS fix OK.
2.1 The sensor will update status around 2 minutes if the status bit[3] is no GNSS fix OK.
3.Press button to trigger event.

*Note: The sensor will uplink if it changes status from stationary mode to moving mode.

### 4.1.2 Payload

| | |
|---|---|
| Port | 136 |
| Payload length | 11 bytes |

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

| | |
|---|---|
| **Status** | **Sensors status**<br>Bit[0] 1 - button trigger event, 0 - no button trigger event<br>Bit[1:2] RFU<br>Bit [3] 1 – no GNSS fix, 0 – GNSS fix OK<br>Bit[7:4] RFU |
| **Battery** | **Battery level**<br>Bits [3:0] unsigned value v, range 1 – 14;<br>battery voltage in V = (25 + v) ÷ 10.<br>Bits [7:4] unsigned value κ, range 0 – 15;<br>remaining battery capacity in % = 100 × (κ ÷ 15). |
| **Temp** | **Temperature as measured by on-board NTC**<br>Bits [6:0] unsigned value τ, range 0 – 127;<br>temperature in °C = τ - 32.<br>Bit [7] RFU |
| **Lat** | **Latitude as last reported by GNSS receiver**<br>Bits [27:0] signed value φ, range -90,000,000 – 90,000,000;<br>WGS84 latitude in ° = φ ÷ 1,000,000.<br>*Note: little-endian format.<br>Bits [31:28] RFU |
| **Long** | **Longitude and position accuracy estimate as last reported by GNSS receiver**<br>Bits [28:0] signed value λ, range -179,999,999 – 180,000,000;<br>WGS84 longitude in ° = λ÷ 1,000,000.<br>Bits [31:29] unsigned value α, 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.<br>*Note: little-endian format. |

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. Messages

RESERVED.