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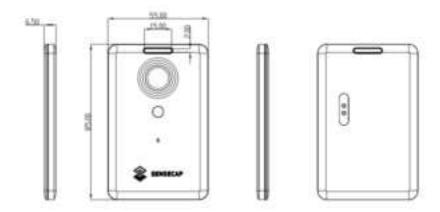


1. Introduction

SenseCAP T1000 is a credit card-sized tracker designed for asset and personal tracking. It utilizes GNSS/Wi-Fi/Bluetooth to provide high accuracy positioning in both outdoor and indoor scenarios.



Dimension:





2. Features

2.1 Hardware Specifications

General Parameters		
Product Model	T1000-A/T1000-B/T1000-C/T1000-D	
Backhaul	LoRaWAN® (v1.0.4 Class A)	
Bluetooth	Bluetooth v5.1, setting via App	
LoRaWAN Channel Plan	IN865/EU868/US915/AU915/AS923/KR920/RU864	
Temperature	Range: -20 to 60°C; Accuracy: ± 1°C (min ±0.5°C, max ±1°C) Resolution: 0.1°C	
Light	0 to 100% (0% is dark, 100% is brightest)	
3-Axis Accelerometer	3-Axis Accelerometer to detect movement	
LED and Buzzer	1xLED and 1x buzzer to indicate status	
Button	1xButton to operate and trigger events (SOS)	
Antenna	Internal (GNSS/LoRa/Wi-Fi/BLE)	
Communication Distance	2 to 5km (depending on gateway antenna, installation, and environments)	
IP Rating	IP65	
Dimensions	85 x 55 x 6.5 mm	
Device Weight	32g	
Operating Temperature	-20°C to +60°C	
Operating Humidity	5% - 95% (No condensation)	
Certification	CE /FCC /TELEC /RoHS /REACH	
Location		
GNSS Constellation	T1000-A/B: GPS/GLONASS/Galileo/BeiDou/QZSS T1000-C/D: GPS/ BeiDou	
GNSS Sensitivity	-145dBm cold start / -160 dBm Tracking	
GNSS Location Accuracy	~1m CEP, GPS, -130dBm	
Wi-Fi Positioning	Passive scanning, uploads the scanned 4 MAC addresses	
Bluetooth Positioning	uploads the scanned 3 best signal MAC addresses of Beacon	
Data Cache	Cache 1000 data when there is no LoRaWAN network	
Battery		
Battey Capacity	Rechargeable lithium battery, 700mAh	
*Battery Life Estimates	4 months on a single charge (uplink every 1 hour, only GNSS data)	
Battery Life Monitoring	Periodic uplink battery level	
Charge Cable (Adapter not included)	USB magnetic charging cable, 1 meter	

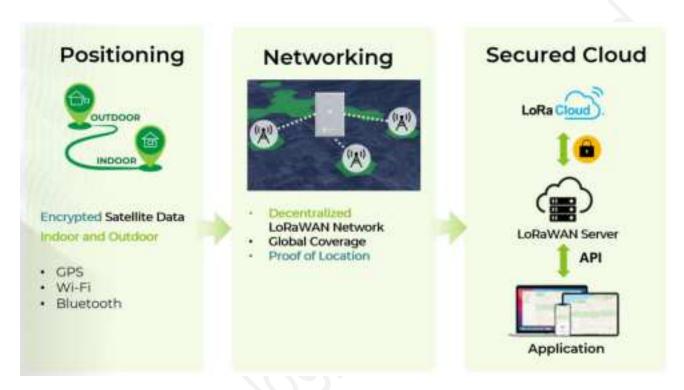




Power Input Voltage	4.7 to 5.5V DC
Charging Temperature Limit	0 to +45°C (Beyond the temperature range, the charge will be limited, and the LED will blink quickly)

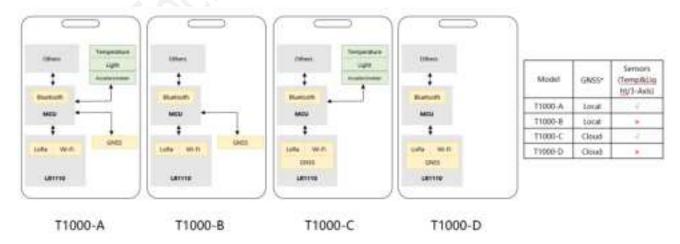
^{*}Battery life depends on temperature, installation, location interval, network coverage and sensor settings.

2.2 Architecture



We offer two different solutions:

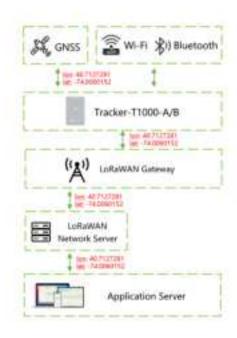
- 1) T1000-A/T1000-B: GNSS data without special encryption.
- 2) T1000-C/T1000-D: GNSS data encrypted via Semetech LoRa Edge, GNSS data needs to be decrypted through LoRa Cloud.



The main chip used in the T1000 is based on <u>Semetech LR1110</u>, LR1110 has built-in GNSS function to obtain encrypted satellite data, which is finally uploaded to the Cloud and parsed by LoRa Cloud.









T1000-A/B: Get Location Locally

T1000-C/D: Get Location via LoRa Cloud

As depicted in the above figure, the entire network comprises multiple components ranging from hardware to software.

2.2.1 Get the GNSS/Wi-Fi/Bluetooth Location

1. GNSS

Location is obtained outdoors via satellite, such as GPS.

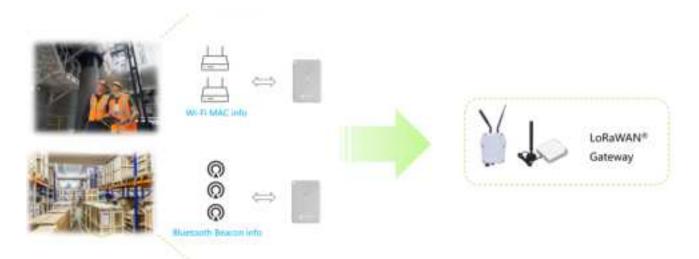


2. Wi-Fi

Use the passive Wi-Fi AP MAC address scanner to obtain the MAC address and RSSI of nearby Wi-Fi and upload it through LoRaWAN. The application server resolves the location according to the global Wi-Fi location service (such as <u>Google Geolocation API</u>) to obtain the final location.







Indoor: Located by Wi-Fi and Bluetooth

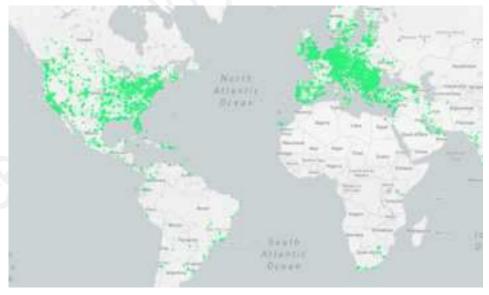
3. Bluetooth

The Tracker T1000 scans the MAC address and RSSI of nearby Bluetooth beacons and uploads them through LoRa. The application server needs to calculate the real geographical location based on the MAC address and signal strength (RSSI) of the Bluetooth beacons.

2.2.2 LoRaWAN Network

There are already many large LoRaWAN network providers around the world whose base stations already fully cover many cities and regions, so the tracker can run on these large LoRaWAN networks.

Such as Helium, The Things Network, Actility, Loriot, Senet, Everynet, KPN etc.



(Helium Network)

If you want to deploy your own private network, you can also purchase a gateway. SenseCAP offers cost-effective indoor and outdoor gateways.

- SenseCAP Outdoor Gateway
- SenseCAP Indoor Gateway





2.2.3 Application

SenseCAP provides the <u>SenseCAP Mate App</u> and <u>SenseCAP Portal</u>, which are mainly used as device settings and basic functions for users to quickly experience the basic functions of the Tracker. We also provide App and platform customization services. Please refer to the last chapter and contact our team.

2.3 Main Function

2.3.1 Work Mode

The Tracker can run different modes in different scenarios.

Work Mode	Description	Scene
Standby Mode	Only heartbeat packets are uploaded, just includes battery info. The location can be obtained using the LoRa downlink command.	If you need to locate the device for a long time and the device can run for a long time before being charged, the cloud platform can issue a location request command to locate the device.
Periodic Mode	Set an interval at which the device periodically uploads location and sensor data.	This mode is recommended for most scenarios.
Event Mode	Adjust the upload interval according to the temperature, light and acceleration sensor of the tracker, including temperature event, light event, motion event, motionless timeout, and shock event.	It can be used in complex scenarios, such as monitoring the transportation of important items. But the power consumption increases a lot.

2.3.2 Sensor Description

You can choose whether to use these sensors:

- 1) Turn off all sensors, but you can also choose a version without sensor to reduce costs.
- 2) Only the temperature and light sensors are enabled to monitor data periodically with low power consumption.
- 3) When temperature, illumination and accelerometer are used as trigger conditions, the sensor will always be powered, and the device consumes a lot of power.





Sensor	Description
Temperature	This is an onboard independent temperature sensor with an accuracy of ±0.5~1°C . It should be noted that there may be some temperature measurement delay here, because it is separated from the shell.
Light	The light sensor is not the actual lumen value monitored, but a percentage of the light from dark to amount. Mainly can be used for anti-demolition monitoring and some light sensitive monitoring.
3-Axis Accelerometer	By setting the value of acceleration, motion event and shock event are triggered.

2.3.3 Data Cache

The device can cache data, which can be enabled through Bluetooth configuration by opening "GNSS Data Cache". The device uploads confirmation packets. When the LoRaWAN signal coverage is weak or there is no network coverage, the device cannot receive an ack when uploading data. In this case, the data will be saved and entered the next cycle. When the device successfully uploads data at some point, it will send offline data. The maximum number of data that can be cached is 1000.





3. How to Operate the Button

Actions	Description	LED Status	Buzzer
Press button and hold for 3 seconds	If the tracker is powered off, press and hold the button for 3 seconds to turn it on. The Bluetooth pairing will be activated automatically, and the user can use the app to scan and connect.	The LED flashes once a second.	Melody of rise
	If the device is powered on, press and hold the button for 3 seconds to activate Bluetooth pairing.	The LED flashes once a second.	None
Press button and hold for 9 seconds	Power off.	None	Melody of descent
Join LoRa network	After exiting the Bluetooth settings, try to join the LoRaWAN network.	The breathing light flashes when trying to access the network, and flashes quickly if the network is successfully joined	A quick and cheerful melody when the network is successfully joined
Press once	Get location/sensor data, upload data, and trigger the "Press once" event immediately.	The LED is bright for 2 seconds	A sound will beep when the data is uploaded successfully.
	If Bluetooth pairing is turned on, press once can be turned off Bluetooth.	The LED will off	None
C6660	If the SOS is set to single-shot mode, double-clicking the button will activate the single-shot SOS mode and upload the location/sensor data and SOS events once.	Twinkle with the sound	3 seconds of alarm sound
Press twice continuously	If the SOS is set to continuous mode, double-click the button to activate the continuous SOS mode. The location, sensor data, and SOS events will be uploaded once every minute, and the mode will automatically end after 30 times.	Twinkle with the sound	A constant alarm sound







Double-click twice to exit SOS mode	None	None
-------------------------------------	------	------

- 1. Power off is recommended when not deployed.
- 2. When first turned on, it is recommended to go to outdoors, and the GPS needs to update the time via satellite.
- 2. If the frequency band does not match the gateway frequency, the tracker cannot join the network.





4. How to Configure via Bluetooth

4.1 Download SenseCAP Mate App

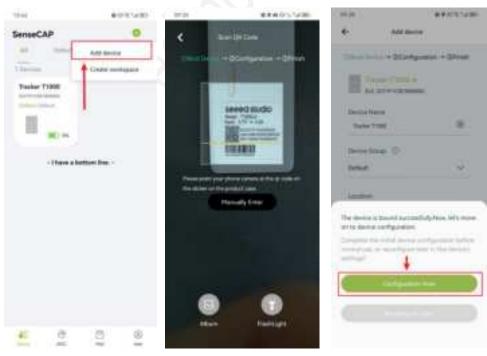
As a tool, SenseCAP Mate App is used to config LoRa parameters, interval, bind devices to your account and check device basic information. You can download App from https://install.appcenter.ms/orgs/seeed/apps/sensecap-mate/distribution_groups/public

- 1) For iOS, please search for "SenseCAP Mate" in the App Store and download it.
- 2) For Android, please search for "SenseCAP Mate" in the Google Store and download it.



4.2 Quick Start with SenseCAP Server

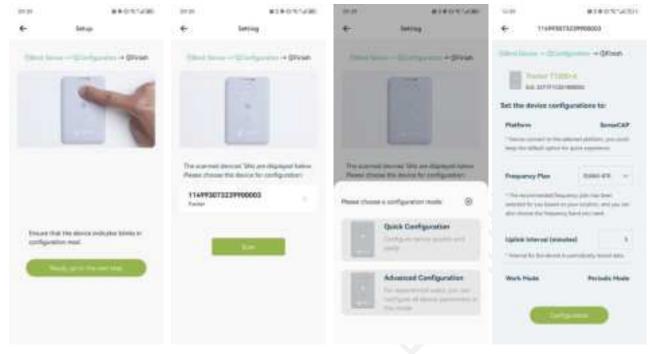
1) Add Device via scanning QR code.







2) Press the tracker's button for 3 seconds, and select device by SN. For quick start, you can select quick config the basic parameters, if you want to set more parameters, please select "Advanced Configuration".



- 3) Select the frequency, it is same to your gateway. Set the Uplink interval, work mode default is "Periodic Mode", you can set other mode via "Device Bluetooth Configuration" on "User" page.
- 4) Tracker will try to join LoRaWAN network, the breathing light flashes when trying to join the network, and flashes quickly if the network is successfully joined with a quick and cheerful melody.

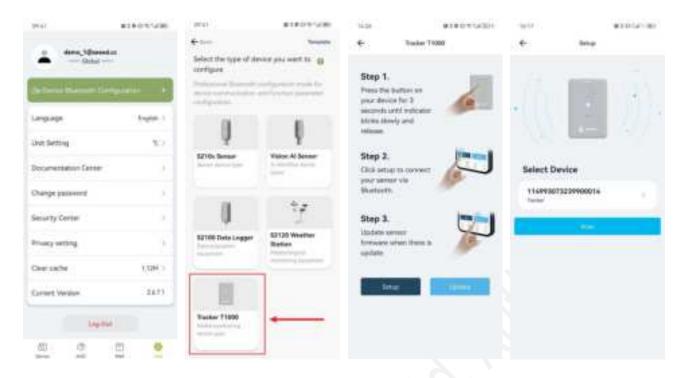
4.3 Setting the Tracker Parameters through the App

4.3.1 Bluetooth Pairing

- 1) Press button and hold for 3 seconds to turn it on, then turn on the Bluetooth pairing automatically, user can use the app to scan and connect.
- 2) Open the App and click the "Tracker T1000". Select the "Setup" to config the tracker.
- 3) Select the device by S/N (S/N is on the label of the device). Then, the basic information of the sensor will be displayed after entering.



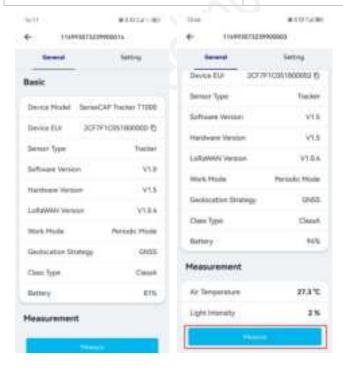




4.3.2 Test the Sensor

Click the "Measure", it will read the sensor value:

Temperature	Range: -20 to 60° C; Accuracy: \pm 1°C(min 0.5° C, max 1°C); Resolution: 0.1° C
Light	0 to 100%, (0% is dark, 100% is brightest)





4.3.3 Set the LoRa Parameters

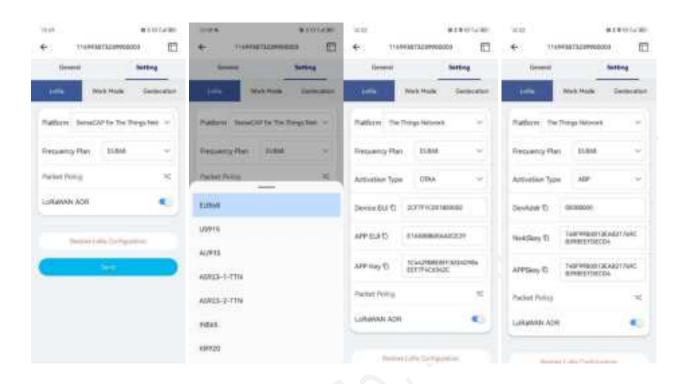
Trackers are manufactured to support universal frequency plan from 863MHz ~928MHz in one SKU. Every single device can support 7 frequency plans.

Parameters	Description	
		Default platform.
	SenseCAP for The Things Network	It must be used with SenseCAP Gateway. SenseCAP builds a proprietary TTN server that enables sensors to be used out of the box when paired with an SenseCAP gateway. SenseCAP Outdoor Gateway
		SenseCAP Indoor Gateway
Platform	SenseCAP for Helium	When there is the Helium network coverage, data can upload via Helium. Devices run on a private Helium console of SenseCAP. Users do not need to create devices on Helium console, out of the box with SenseCAP Mate App and Portal.
	(0))	Helium coverage: https://explorer.helium.com/
	Helium	Connect device to your public Helium console.
	The Things Network	Connect device to your TTN(TTS) server.
	Other Platform	Other LoRaWAN Network Server.
Frequency Plan	EU868 / US915 / AU915 / KR920 / IN865 / AS923-1 / AS923-2 / AS923-3 / AS923-4	Default EU868
Packet Policy	1C	LoRaWAN use confirm packet.
LoRaWAN ADR	Default open.	LoRaWAN parameters, default open is recommended.
Restore LoRa Configuration	When "Platform" switches back to SenseCAP from another platform, LoRa parameters (EUI/App EUI/ App Key etc.)	You can use this function when you need to restore LoRa parameters to factory defaults.





need to be restored.



4.3.4 Explanation of Frequency Plan and EUI

The sensor supports two network access modes, OTAA by default.

Parameter	Description
OTAA (default)	Over The Air Activation, it joins the network through Device EUI, App EUI, and App Key.
ABP	Activation By Personalization, it joins the network through DevAddr, NwkSkey, and AppSkey.

The device uses OTAA to join the LoRaWAN network by default. So, it can set the device EUI, App EUI and App Key.

Parameter	Туре
Device EUI	16, hexadecimal from 0 ~ F
App EUI	16, hexadecimal from 0 ~ F
App Key	32, hexadecimal from 0 ~ F





Frequency	Common Name	Sub-band
EU863-870	EU868	
US902-928	US915	Sub band from 1 to 8 (default sub-band 2)
AU915-928	AU915	Sub band from 1 to 8 (default sub-band 2)
KR920-923	KR920	
IN865-867	IN865	
	AS923-1	1/0,
AC000	AS923-2	Executed by the feet Helium
AS923	AS923-3	Frequency plan for Helium
	AS923-4	1,40,-
RU864-867	RU864	

⚠Note1:

Different countries and LoRaWAN network servers use different frequency plans.

For Helium network, please refer to:

https://docs.helium.com/lorawan-on-helium/frequency-plans

For The Things Network, please refer to:

https://www.thethingsnetwork.org/docs/lorawan/frequency-plans/



- 1) When using the SenseCAP platform, the EUI, APP EUI and APP Key are fixed and are the same as the sensor label.
- 2) When the sensor is selected to be used with a public platform such as Helium or TTN, the EUI will not change, and the sensor will generate a new fixed App EUI and App Key for network access.
- 3) To obtain EUI information in batches, please contact our sales team.



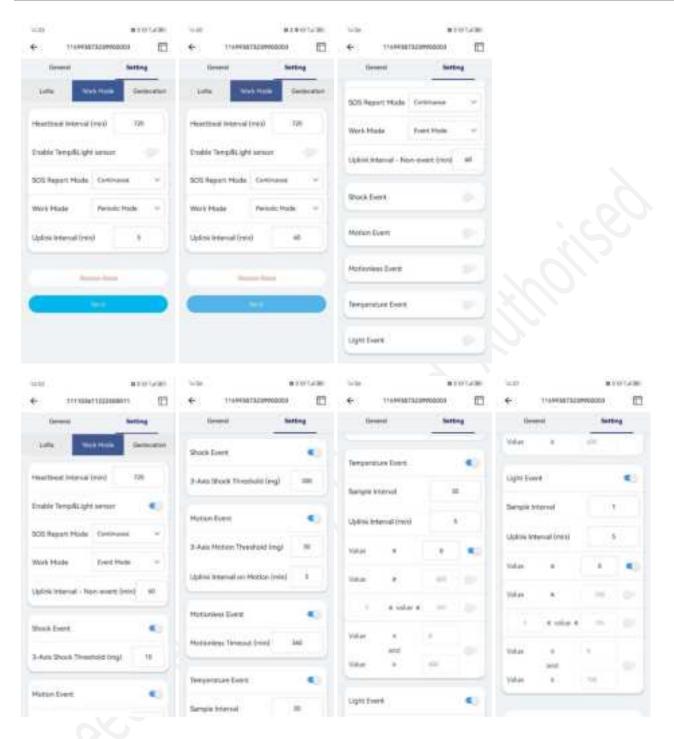


4.3.5 Setting the Work Mode

Parameters	Description		
Heartbeat Interval	If the tracker does not upload any data for a certain period of time, the heartbeat packet will be triggered.	Default 720 minutes.	
Enable Temp&Light	If this switch is turned on, temperature and light will be collected and uploaded, but it will increase power consumption.	Off by default.	
	Single	If SOS is set to single mode, double- clicking the button will enable the single-shot SOS mode and upload the location/sensor data and SOS events once	
SOS Report Mode	Continuous	Default use continuous. If SOS is set to continuous mode, double-click the button to open the continuous mode of SOS, and upload location, sensor data and SOS events once in 1 minute, and automatically end after 30 times	
	Standby Mode	The device goes to sleep and uploads heartbeat according to heartbeat interval.	
Work Mode	Periodic Mode	Location and sensor data are uploaded according to the upload interval.	
0880	Event Mode	Set threshold trigger conditions according to measured values such as temperature, light, and movement, and adjust the upload interval after trigger.	
Uplink Interval (min) – Periodic Mode Periodically locate and upload data.		Default 60 minutes. The higher the frequency, the higher the power consumption.	
Restore Settings All Restore all configuration parameters to factory Settings, includes LoRa, Work Mode and Geolocation.			







Event Mode	Description					
Uplink Interval – Non-event (min)	This is the upload interval when no events are triggered.	Default 60 minutes. Range: 1~10080 min.				
Shock Event	When the shock event is enabled, the shock of the tracker will trigger a data report, including the vibration event, location, and sensor data.	Off by default.				





	3-Axis Motion Threshold (mg)	Default is 300. When the acceleration exceeds 300mg, the shock event is triggered.		
	When the acceleration exceeds the set value, the device starts to move, and when there is no movement for 2 minutes, the device movement stops. Set the upload interval according to the start movement and stop movement.	Off by default.		
Motion Event	3-Axis Motion Threshold (mg)	Default is 30. When the acceleration exceeds 30mg, determine that the device is in motion, When it is 2 minutes below this value, determine that the device is in motionless.		
	Uplink Interval on Motion(min)	Set the upload interval for the current state when the device is in motion.		
Motionless Event	When the device is stationary in a location for more than a certain amount of time, a stationary timeout event is triggered.			
	Motionless Timeout(min)	Default is 360 minutes.		
	If the temperature event is enabled, you can set the upload interval based on the temperature.	For example, Uplink Interval=10, Value ≥ 30, if the temperature is higher than 30 ° C, device will upload the location at 10 minutes interval.		
		Default 30 seconds.		
Temperature Event	Sample Interval (s)	The temperature is detected every 30 seconds. When the threshold is triggered, upload location and sensor data.		
	Uplink Interval (min)	When the temperature exceeds the threshold, the location and sensor data are uploaded according to this interval.		
	Value Rule	One of the four threshold rules can be set.		
Light Event	If the light event is enabled, you can set the upload interval based on the temperature.	For example, Uplink Interval=10, Value ≥ 30, if the temperature is higher than 30 %, device will upload		





	the location at 10 minutes interval.		
Uplink Interval (min)	When the light exceeds the threshold, the location and sensor data are uploaded according to this interval.		
Value Rule	One of the four threshold rules can be set.		

4.3.6 Configuring Geolocation Settings

The tracker supports positioning via GNSS, Wi-Fi, and Bluetooth.

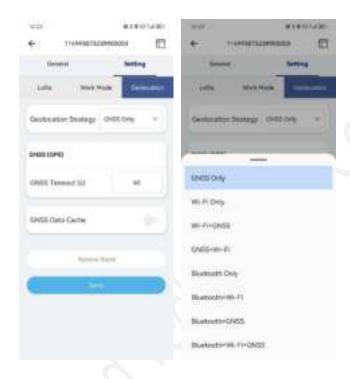
- GNSS: The longitude and latitude can be directly obtained through GPS and other satellite positioning, then upload data via LoRa.
- Wi-Fi: Passive scanning, uploads the scanned 4 MAC addresses via LoRa.
- BLE: Uploads the scanned 3 best signal MAC addresses of Beacon via LoRa.

Geolocation	Description		
	Only GNSS	Default use GNSS. Only GNSS is used for position.	
	Only Wi-Fi	Only Wi-Fi scans are used for position.	
Geolocation Strategy	Wi-Fi+GNSS	Use Wi-Fi before GNSS. If Wi-F fails, then use GNSS in one geolocation cycle.	
	GNSS + Wi-Fi	Use GNSS before Wi-Fi. If GNSS fails, then use Wi-Fi in one geolocation cycle.	
	Only Bluetooth	Only Bluetooth scans are used for position.	
	Bluetooth + Wi-Fi	Use Bluetooth before Wi-Fi. If Bluetooth fails, then use Wi-Fi in one geolocation cycle.	
	Bluetooth + GNSS	Use Bluetooth before GNSS. If Bluetooth fails, then use GNSS in one geolocation cycle.	





	Bluetooth + Wi-Fi + GNSS	Use Bluetooth, Wi-Fi and GNSS for positioning in turn (switch to the next type of positioning after one type of positioning fails)
GNSS Timeout	The maximum time to spend waiting for the GNSS to get a coarse position fix	Default is 60s. It is not recommended to modify, the longer of the time, the bigger of power consumption.
GNSS Data Cache	When it is not possible to upload data through LoRa, the data is saved locally and uploaded when the LoRa signal is recovered.	Off by default.



4.3.7 Sending and Exiting Bluetooth Pairing

After all parameters are configured, click "Send".

If no parameter needs to be modified, exit Bluetooth configuration, and return to the home page. At this point, the device initiates a LoRa network access request.



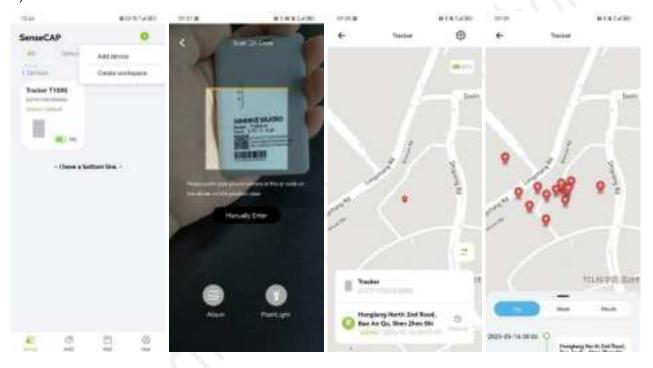




5. Binding the Device and Checking the Data

5.1 Check Data via App

- 1) When exiting the Bluetooth configuration, the device will begin to join the LoRaWAN network. The LED will breathe flash while attempting to join the network. If the network is joined successfully, the LED will flash quickly, and the buzzer will emit a cheerful melody.
- 2) Scan the QR code and bind the device using the SenseCAP Mate App.
- 3) Check the Location on the APP.



5.2 Check Data via SenseCAP Portal

The main function of the SenseCAP Portal is to manage SenseCAP devices and store data. It is built on Azure, a secure and reliable cloud service from Microsoft. Users can apply for an account and bind all devices to this account. The SenseCAP Portal provides a web portal and API. The web portal includes Dashboard, Device Management, Data Management, and Access Key Management. The API is open to users for further development.

- Dashboard: Including Device Overview, Announcement, Scene Data, and Data Chart, etc.
- Device Management: Manage SenseCAP devices.





- Data Management: Manage data, including Data Table and Graph section, providing methods to search for data.
- **Subaccount System:** Register subaccounts with different permissions.
- Access Key Management: Manage Access Key (to access API service), including Key Create, Key Update, and Key Check.



5.2.1 Create Account and Query Data

Portal Website: http://sensecap.seeed.cc

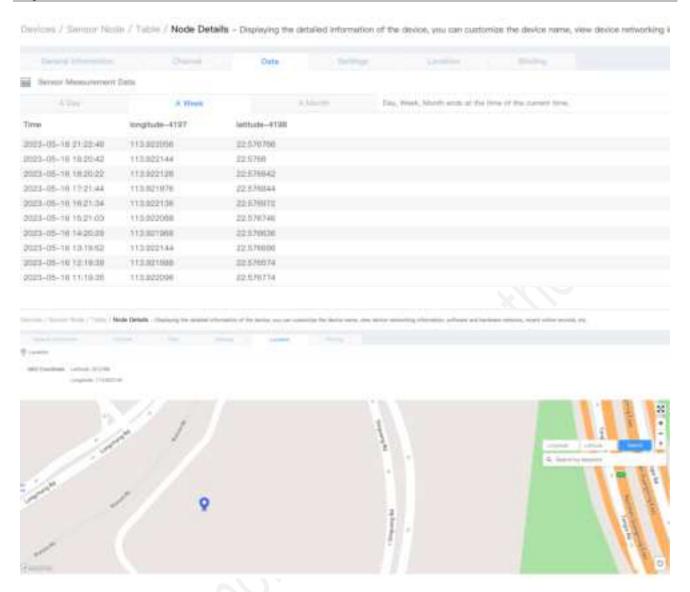
If you have created an account through the APP, you can log in directly.

- 1) Select register account, enter email information, and click "register", the registered email will be sent to the user's mailbox.
- 2) Open the "SenseCAP..."Email, click the jump link, fill in the relevant information, and complete the registration.
- 3) Return to the login interface and complete the login.



SenseCAP Portal User Guide: https://sensecap-docs.seeed.cc/quickstart.html





5.2.2 API Instruction

SenseCAP API is for users to manage IoT devices and data. It includes 3 types of API methods: HTTP protocol, MQTT protocol, and Websocket protocol.

With HTTP API, users can manage LoRa devices, to get raw data or historical data.

With MQTT API, users can subscribe to the sensor's real-time measurement data through the MQTT protocol.

With Websocket API, users can get real-time measurement data of sensors through Websocket protocol.

Please refer to this link for API User Guide: https://sensecap-docs.seeed.cc/





6. Payload Decoder

6.1 Decoder Code

The Things Network (TTN/TTS) payload decoding script:

https://github.com/Seeed-Solution/TTN-Payload-Decoder/blob/master/SenseCAP LoRaWAN V4 Decoder For TTN.js

Helium decoder:

https://github.com/Seeed-Solution/TTN-Payload-Decoder/blob/master/SenseCAP LoRaWAN V4 Decoder For Helium.js

6.2 Uplink Packet Parsing

The Tracker data protocol provides different packets to correspond to different information, and the number of bytes of each packet may vary. The structure of the frame is shown in the image below. The frame content is sent in big-endian byte order.

Data ID	Data Value	
1 byte	50 bytes (Max)	

Data ID: Function number.

Data Value: Position, sensor data and other information.





6.2.1 Device Status Packet - Event Mode 0x01

The Device Status Packet is uploaded when join LoRaWAN network. The Device Status packet has two packet formats in different working modes:

- 1) Event Mode, ID=0x01
- 2) Periodic Mode, ID= 0x02

Device Status Packet - Event Mode: 0x01

0x01	Byte2	Byte3~4	Byte5~6	Byte7	Byte8	Byte9~10	Byte11~12
ID	Battery level	Software version	Hardware version	Work mode	Positioning strategy	Heartbeat interval	Uplink interval

Byte13~14	Byte15	Byte16	Byte17	Byte18~19	Byte20~21
Event mode uplink interval	Temp&light switch	SOS mode	Enable motion event	3-axis motion threshold	Motion start interval

Byte22	Byte23~24	Byte25	Byte26~27	Byte28	Byte29~30
Enable motionless event	Motionless timeout	Enable shock event	3-axis shock threshold	Enable temperature event	Temperature event uplink interval

Byte31~32	Byte33~34	Byte35~36	Byte37	Byte38	Byte39~40
Temperature sample interval	Temperature threshold max	Temperature threshold min	Temperature warning type	Enable light event	Light event uplink interval

Byte41~42	Byte43~44	Byte45~46	Byte47
Light sample interval	Light threshold max	Light threshold min	Light warning type

The raw payload:

4<mark>0000</mark>00





Byte	Value	Туре	Raw Data	Description
1	Frame ID	uint8	01	01 is the packet ID.
2	Battery level	uint8	53	is 0x53 = 83(DEC) The battery level is 83%
3~4	Software version	uint16	0105	0105 is $0x0105 == v1.5The software version is v1.5$
5~6	Hardware version	uint16	0105	0105 is 0x0105 == v1.5 The hardware version is v1.5
7	Work mode	uint8	02	02 is 0x02, means the device use "Event mode".00: Standby mode01: Periodic mode02: Event mode
8	Positioning strategy	uint8	07	is 0x07, means the device use Bluetooth + Wi-Fi + GNSS positioning strategy. 00: Only GNSS 01: Only Wi-Fi 02: Wi-Fi+GNSS 03: GNSS + Wi-Fi 04: Only Bluetooth 05: Bluetooth + Wi-Fi 06: Bluetooth + GNSS 07: Bluetooth + Wi-Fi + GNSS
9~10	Heartbeat interval	uint16	001e	001e is 0x001E = 30(DEC), the heartbeat interval is 30 minutes.
11~12	Uplink Interval	uint16	0005	$\frac{0005}{0005}$ is $0x0005 = 5(DEC)$, the uplink interval is 5 minutes.
13~14	Event mode uplink interval	uint16	0005	0005 is 0x0005 = 5(DEC), the event mode uplink interval is 5 minutes.
15	Temp&light switch	uint8	01	means open the temperature and light sensor. 00: Close the temperature and light sensor. 01: Open the temperature and light sensor.





16	SOS mode	uint8	00	means use SOS single mode.use SOS single mode.use SOS continuous mode.
17	Enable motion event	uint8	00	means disable Event mode. 00: disable Event mode. 01: enable Event mode.
18~19	3-Axis motion threshold	uint16	001e	Onle is 0x001E=30(DEC) mg When the acceleration exceeds 30mg, determine that the device is in motion, when it is 2 minutes below this value, determine that the device is in motionless.
20~21	Motion start interval	uint16	0005	on motion, the interval is 5 minutes. 0005 is $0x0005 = 5(DEC)$, when device is $0x0005 = 5(DEC)$, when device is
22	Enable motionless event	uint8	00	00 means disable motionless event.00: disable motionless event.01: enable motionless event.
23~24	Motionless timeout	uint16	0168	0168 is 0x0168 = 360(DEC), when the device is stationary in a location for more than 360 minutes, a motionless timeout event is triggered.
25	Enable shock event	uint8	01	means enable shock event. 00: disable shock event. 01: enable shock event.
26~27	3-Axis shock threshold	uint16	012c	012c is 0x012C=300(DEC) mg When the acceleration exceeds 300mg, the shock event is triggered.
28	Enable temperature event	uint8	00	means enable shock event. 00: disable shock event. 01: enable shock event.
29~30	Temperature event uplink interval	uint16	0005	is 0x0005 = 5(DEC), when the temperature exceeds the threshold, the location and sensor data will upload every 5 minutes.
31~32	Temperature sample interval	uint16	001e	Onle is 0x001E=30(DEC) seconds The temperature is detected every 30 seconds. When the threshold is triggered,





				upload location and sensor data.
33~34	Temperature threshold max	int16	0258	0258 is 0x0258 = 600(DEC), Maximum threshold =600/10=60.0 °C
35~36	Temperature threshold min	int16	0000	0000 is $0x0000 = 0(DEC)$, Minimum threshold= $0/10=0.0$ °C
37	Temperature threshold rule	uint8	00	means when temperature ≤ min threshold, device will upload location and temperature event. 00: temp ≤ min threshold 01: temp ≥ max threshold 02: temp ≤ min threshold and temp ≥ max threshold 03: min threshold ≤ temp ≤ max threshold
38	Enable light event	uint8	00	means disable light event.disable light event.enable light event.
39~40	Light event uplink interval	uint16	0005	0005 is 0x0005 = 5(DEC), when the light exceeds the threshold, the location and sensor data will upload every 5 minutes.
41~42	Light sample interval	uint16	0001	0001 is 0x0001=1(DEC) seconds The temperature is detected every 1 seconds. When the threshold is triggered, upload location and sensor data.
43~44	Light threshold max	uint16	0064	0064 is 0x0064 = 100(DEC) % Maximum threshold =100%
45~46	Light threshold min	uint16	0000	0000 is 0x0000 = 0(DEC) % Minimum threshold=0%
47	Light warning type	uint8	00	means when light ≤ min threshold, device will upload location and light event. 00: light ≤ min threshold 01: light ≥ max threshold 02: light ≤ min threshold and light ≥ max threshold 03: min threshold ≤ light ≤ max threshold





6.2.2 Device Status Packet -Periodic Mode 0x02

The Device Status package is uploaded when join LoRaWAN network. The Device Status packet has two packet formats in different working modes:

- 1) Event Mode, ID=0x01
- 2) Periodic Mode, ID= 0x02

Device Status Packet -Periodic Mode: 0x02

0x02	Byte2	Byte3~4	Byte5~6	Byte7	Byte8	Byte9~10	Byte11~12
ID	battery	software	hardware	work	positioning	heartbeat	uplink
	level	version	version	mode	strategy	interval	Interval

Byte13~14	Byte15	Byte16
event mode uplink interval	temp&light switch	SOS mode

The raw payload:

025601050105010002d0003c003c0000

Byte	Value	Туре	Raw Data	Description
1	Frame ID	uint8	02	02 is the packet ID.
2	Battery level	uint8	<u>56</u>	56 is 0x56 = 86(DEC) The battery level is 86%
3~4	Software version	uint16	0105	0105 is $0x0105 == v1.5The software version is v1.5$
5~6	Hardware version	uint16	0105	0105 is 0x0105 == v1.5 The hardware version is v1.5
7	Work mode	uint8	01	01 is 0x01, means the device use "Periodic mode".00: Standby mode01: Periodic mode02: Event mode
8	Positioning	uint8	00	00 is 0x01, means the device use "GNSS



	strategy			only" positioning strategy.
				00: Only GNSS
				01: Only Wi-Fi
				02: Wi-Fi+GNSS
				03: GNSS + Wi-Fi
				04: Only Bluetooth
				05: Bluetooth + Wi-Fi
				06: Bluetooth + GNSS
				07: Bluetooth + Wi-Fi + GNSS
9~10	Heartbeat interval	uint16	02d0	02d0 is 0x02D0 = 720(DEC) minutes, the heartbeat interval is 720 minutes.
11~12	Uplink Interval	uint16	003c	003c is $0x003C = 60(DEC)$ minutes, the uplink interval is 60 minutes.
13~14	Event mode uplink interval	uint16	003c	003c is 0x003C = 60(DEC), the event mode uplink interval is 60 minutes.
	Temp&light			00 means open the temperature and light sensor.
15	switch	uint8	00	00: Close the temperature and light sensor.
				01: Open the temperature and light sensor.
				00 means use SOS single mode.
16	SOS mode	uint8	00	00: use SOS single mode.
				01: use SOS continuous mode.

6.2.3 Heartbeat Packet -0x05

If no data is uploaded within one heartbeat interval, the device uploads the heartbeat packet.

0x05	Byte2	Byte3	Byte4	Byte5
ID	battery level	work mode	positioning strategy	SOS mode

The raw payload:

05<mark>64</mark>0100<mark>01</mark>





Byte	Value	Туре	Raw Data	Description
1	Frame ID	uint8	<mark>05</mark>	05 is the packet ID.
2	Battery level	uint8	64	64 is 0x64 = 100(DEC) The battery level is 100%
3	Work mode	uint8	01	01 is 0x01, means the device use "Periodic mode".00: Standby mode01: Periodic mode02: Event mode
4	Positioning strategy	uint8	00	oo is 0x01, means the device use "GNSS only" positioning strategy. 00: Only GNSS 01: Only Wi-Fi 02: Wi-Fi+GNSS 03: GNSS + Wi-Fi 04: Only Bluetooth 05: Bluetooth + Wi-Fi 06: Bluetooth + GNSS 07: Bluetooth + Wi-Fi + GNSS
5	SOS mode	uint8	00	means use SOS single mode.use SOS single mode.use SOS continuous mode.

6.2.4 GNSS Location and Sensor Packet-0x06

ID 0x06 is used to upload GNSS location, sensor data and battery.

0x06	Byte2~4	Byte5	Byte6~9	Byte10~13	Byte14~17
ID	event status	motion segment number	UTC time	longitude	latitude

Byte18~19	Byte20~21	Byte22





The raw payload:

06000008<mark>00</mark>6462248d<mark>06ca5028</mark>01587ec6<mark>00fe</mark>0000<mark>57</mark>

Byte	Value	Туре	Raw Data	Description	
1	Frame ID	uint8	06	06 is the packet ID.	
				000008 is 0x000008, 0x00000XX is reand 0x08 is the event status. This byte bits, each representing an event.	
				Bit1: Start moving event.	
				Bit2: End movement event.	
				Bit3: Motionless event.	
				Bit4: Shock event.	
				Bit5: Temperature event.	
				Bit6: Light event.	
				Bit7: SOS event.	
				Bit8: Press once event.	
2~4	event status	uint24	000008		
				Convert to hexadecimal:	
				0x000000: no event	
				0x000001: Start moving event.	
				0x000002: End movement event.	
				0x000004: Motionless event.	
				0x000008: Shock event.	
				0x000010: Temperature event.	
	0//			0x000020: Light event.	
	000			0x000040: SOS event.	
				0x000080: Press once event.	
	NA. P			00 is $0x00 == 0$.	
5	Motion segment number	uint8	00	When the motion begins, the count incre by 1. Record that this is a movement.	ases
6~9	UTC time	uint32	6462248d	6462248d is 0x6462248D = 1684153485(DEC) seconds.	
				Convert it to Beijing Time: 2023	3-05-15





				20:24:45
10~13	Longitude	int32	06ca5028	06ca5028 is 0x06CA5028 = 113922088(DEC), the longitude= 113922088/1000000=113.922088
14~17	Latitude	int32	01587ec6	01587ec6 is 0x01587EC6 = 22576838(DEC), the Latitude = 22576838/1000000=22.576838
18~19	Temperature	int16	00fe	00fe is $0x00FE = 254(DEC)$, temperature= $254/10=25.4$ °C
20~21	Light	uint16	0000	0000 is $0x0000 = 0(DEC)$ minutes, the light=0=0%
22	Battery level	uint8	57	57 is 0x57 = 87(DEC)The battery level is 87%

6.2.5 Wi-Fi Location and Sensor Packet-0x07

ID 0x07 is used to upload Wi-Fi Mac addresses, sensor data and battery.

0x07	Byte2~4	Byte5	Byte6~9	Byte10~15	Byte16
ID	event status	motion segment number	UTC time	MAC address	The RSSI of MAC address 1, int8

Byte17~22	Byte23	Byte24~29	Byte30	Byte31~36	Byte37
MAC address 2	The RSSI of MAC address 2, int8	MAC address 3	The RSSI of MAC address 3, int8	MAC address 4	The RSSI of MAC address 4, int8

Byte38~39	Byte40~41	Byte42
Temperature	Light	battery level

The raw payload:

070000080064622472487397162234bb3ccd5798fd2ebc74cf002f3ad0a9ec26ca022958b900fe000057

Byte	Value	Туре	Raw Data	Description
1	Frame ID	uint8	07	07 is the packet ID.





				000008 is 0x000008, 0x0000XX is reserved
				and 0x08 is the event status. This byte has 8 bits, each representing an event.
				Bit1: Start moving event.
				Bit2: End movement event.
				Bit3: Motionless event.
				Bit4: Shock event.
				Bit5: Temperature event.
				Bit6: Light event.
				Bit7: SOS event.
				Bit8: Press once event.
2~4	event status	uint24	800000	H/O
				Convert to hexadecimal:
				0x000000: no event
				0x000001: Start moving event.
				0x000002: End movement event.
				0x000004: Motionless event.
			60	0x000008: Shock event.
				0x000010: Temperature event.
				0x000020: Light event.
				0x000040: SOS event.
			(0,2)	0x000080: Press once event.
	Matical comment			00 is $0x00 == 0$.
5	Motion segment number	uint8	00	When the motion begins, the count increases by 1. Record that this is a movement.
		9		$\frac{64622472}{(DEC)} \text{ is } 0x64622472 = 1684153458$
6~9	UTC time	uint32	64622472	(DEC) seconds.
	000			Convert it to Beijing Time: 2023-05-15 20:24:18
10.15	MAC addr d		4070074 00004	487397162234
10~15	MAC address 1		487397162234	the MAC address (HEX)= 48:73:97:16:22:34
16	The RSSI of	int8	bb	bb is 0xBB = -69(DEC), the type is int8
10	MAC address 1	II ILO		the RSSI = -69
17~22	MAC address 2		3ccd5798fd2e	3ccd5798fd2e
				the MAC address (HEX)=



				3C:CD:57:98:FD:2E
23	The RSSI of MAC address 2	int8	bc	bc is 0xBC = -68(DEC), the type is int8 the RSSI = -68
24~29	MAC address 3		74cf002f3ad0	T4cf002f3ad0 the MAC address (HEX)= 74:CF:00:2F:3A:D0
30	The RSSI of MAC address 3	int8	<mark>a9</mark>	a9 is $0xA9 = -87(DEC)$, the type is int8 the RSSI = -87
31~36	MAC address 4		ec26ca022958	ec26ca022958 the MAC address (HEX)= EC:26:CA:02:29:58
37	The RSSI of MAC address 4	int8	<mark>b9</mark>	$\frac{99}{1}$ is $0xA9 = -71(DEC)$, the type is int8 the RSSI = -71
38~39	Temperature	int16	00fe	00fe is 0x00FE = 254(DEC), temperature=254/10=25.4°C
40~41	Light	uint16	0000	0000 is $0x0000 = 0(DEC)$ minutes, the light=0=0%
42	battery level	uint8	57	57 is 0x57 = 87(DEC) The battery level is 87%

6.2.6 Bluetooth Location and Sensor Packet-0x08

ID 0x08 is used to upload Bluetooth Beacon MAC addresses, sensor data and battery.

0x08	Byte2~4	Byte5		Byte6~9	Byte10~15	Byte16
ID	event status	motion number	segment	UTC time	MAC address	The RSSI of MAC address 1, int8

Byte17~22	Byte23	Byte24~29	Byte30	Byte31~32	Byte33~34	Byte 35
MAC address 2	The RSSI of MAC address 2, int8	MAC address 3	The RSSI of MAC address 3, int8	Temperature	light	battery level





The raw payload:

0800000800646225bb5162d2c1b9d3ca1b5bd2afeae5c0d0e2d70529e8c900fa000057

Byte	Value	Туре	Raw Data	Description
1	Frame ID	uint8	08	08 is the packet ID.
				000008 is 0x000008, 0x0000XX is reserved and 0x08 is the event status. This byte has 8 bits, each representing an event.
				Bit1: Start moving event.
				Bit2: End movement event.
				Bit3: Motionless event.
				Bit4: Shock event.
				Bit5: Temperature event.
				Bit6: Light event.
				Bit7: SOS event.
				Bit8: Press once event.
2~4	event status	uint24	800000	
				Convert to hexadecimal:
				0x000000: no event
				0x000001: Start moving event.
				0x000002: End movement event.
				0x000004: Motionless event.
				0x000008: Shock event.
				0x000010: Temperature event.
				0x000020: Light event.
				0x000040: SOS event.
				0x000080: Press once event.
	Mation comme			00 is $0x00 == 0$.
5	Motion segment number	uint8	00	When the motion begins, the count increases by 1. Record that this is a movement.
				646225bb is 0x646225BB = 1684153787 (DEC) seconds.
6~9	UTC time	uint32	646225bb	Convert it to Beijing Time: 2023-05-15 20:29:47
				5162d2c1b9d3
10~15	MAC address 1		5162d2c1b9d3	the MAC address (HEX)=51:62:D2:C1:B9:D3



16	The RSSI of MAC address 1	int8	c0	c0 is $0xC0 = -64(DEC)$, the type is int8 the RSSI = -64
17~22	MAC address 2		1b5bd2afeae5	the MAC address (HEX)= 1B:5B:D2:AF:EA:E5
23	The RSSI of MAC address 2	int8	bc	bc is $0xBC = -68(DEC)$, the type is int8 the RSSI = -68
24~29	MAC address 3		d0e2d70529e8	d0e2d70529e8 the MAC address (HEX)= D0:E2:D7:05:29:E8
30	The RSSI of MAC address 3	int8	<mark>c9</mark>	c9 is $0xC9 = -55(DEC)$, the type is int8 the RSSI = -55
31~32	Temperature	int16	00fa	00fa is 0x00FA = 250(DEC), temperature=254/10=25.0 °C
33~34	Light	uint16	0000	0000 is $0x0000 = 0(DEC)$ minutes, the light=0=0%
35	battery level	uint8	57	57 is 0x57 = 87(DEC) The battery level is 87%

6.2.7 GNSS Location Only Packet-0x09

When the sensor is turned off, the device does not upload the sensor measurement value. Only the location data is uploaded.

0x09	Byte2~4	Byte5	Byte6~9	Byte10~13	Byte14~17	Byte18
ID	event status	motion segment number	UTC time	longitude	latitude	battery level

The raw payload:

09000000<mark>00</mark>64631868<mark>06ca5068</mark>01587e4c<mark>56</mark>

Byte	Value	Туре	Raw Data	Description
1	Frame ID	uint8	09	09 is the packet ID.





				D00000 is 0x000008, 0x0000XX is reserved and 0x08 is the event status. This byte has 8 bits, each representing an event. Bit1: Start moving event. Bit2: End movement event. Bit3: Motionless event. Bit4: Shock event. Bit5: Temperature event. Bit6: Light event. Bit7: SOS event.
2~4	event status	uint24	000000	Bit8: Press once event.
<u>-</u> -	overil sialus	unit24	500000	
				Convert to hexadecimal:
				0x000000: no event
				0x000001: Start moving event.
				0x000002: End movement event.
				0x000004: Motionless event.
				0x000008: Shock event.
				0x000010: Temperature event.
				0x000020: Light event.
				0x000040: SOS event.
				0x000080: Press once event.
	Motion			00 is $0x00 == 0$.
5	segment number	uint8	00	When the motion begins, the count increases by 1. Record that this is a movement.
				64631868 is 0x64631868 = 1684215912
6~9	UTC time	uint32	64631868	(DEC) seconds.
	0/7			Convert it to Beijing Time: 2023-05-16 13:45:12
10~13	Longitude	int32	06ca5068	06ca5068 is 0x06CA5068 = 113922152 (DEC), the longitude= 113922152/1000000=113.922152
14~17	Latitude	int32	01587e4c	01587e4c is 0x01587E4C = 22576716 (DEC), the Latitude = 22576716/1000000=22.576716
				56 is 0x56 = 86(DEC)



6.2.8 Wi-Fi Location Only Packet-0x0A

0x0A	Byte2~4	Byte5	Byte6~9	Byte10~15	Byte16
ID	event status	motion segment number	UTC time	MAC address	The RSSI of MAC address 1, int8

Byte17~22	Byte23	Byte24~29	Byte30	Byte31~36	Byte37	Byte38
MAC address 2	The RSSI of MAC address 2, int8	MAC address 3	The RSSI of MAC address 3, int8	MAC address 4	The RSSI of MAC address 4, int8	battery level

The raw payload:

<mark>0A</mark>000008<mark>00</mark>64622472<mark>487</mark>

Byte	Value	Туре	Raw Data	Description
1	Frame ID	uint8	<mark>0A</mark>	OA is the packet ID.
2~4	event status	uint32	000008	000008 is 0x000008, 0x00000XX is reserved and 0x08 is the event status. This byte has 8 bits, each representing an event. Bit1: Start moving event. Bit2: End movement event. Bit3: Motionless event. Bit4: Shock event. Bit5: Temperature event. Bit6: Light event. Bit7: SOS event. Bit8: Press once event. Convert to hexadecimal: 0x000000: no event 0x000001: Start moving event.



				0x000002: End movement event.	
				0x000004: Motionless event.	
				0x000008: Shock event.	
				0x000010: Temperature event.	
				0x000020: Light event.	
				0x000040: SOS event.	
				0x000080: Press once event.	
				0x000000.1 Tess office event.	
	Motion			00 is $0x00 == 0$.	
5	segment number	uint8	00	When the motion begins, the count increases by 1. Record that this is a movement.	
				64622472 is $0x64622472 = 1684153458$ (DEC) seconds.	
6~9	UTC time	uint32	64622472	Convert it to Beijing Time: 2023-05-15 20:24:18	
				487397162234	
10~15	MAC address		487397162234	the MAC address (HEX)= 48:73:97:16:22:34	
16	The RSSI of MAC address	int8	bb	bb is 0xBB = -69(DEC), the type is int8 the RSSI = -69	
17~22	MAC address 2	- 6	3ccd5798fd2e	3ccd5798fd2e the MAC address (HEX)= 3C:CD:57:98:FD:2E	
23	The RSSI of MAC address 2	int8	bc	bc is $0xBC = -68(DEC)$, the type is int8 the RSSI = -68	
24~29	MAC address		74cf002f3ad0	74cf002f3ad0 the MAC address (HEX)= 74:CF:00:2F:3A:D0	
30	The RSSI of MAC address	int8	<mark>a9</mark>	a9 is 0xA9 = -87(DEC), the type is int8	
	3			the RSSI = -87	
31~36	MAC address		ec26ca022958	ec26ca022958 the MAC address (HEX)= EC:26:CA:02:29:58	
37	The RSSI of MAC address	int8	<mark>b9</mark>	b9 is $0xA9 = -71(DEC)$, the type is int8	





	4, int8			the RSSI = -71
38	battery level	uint8	57	57 is 0x57 = 87(DEC) The battery level is 87%

6.2.9 Bluetooth Location Only Packet-0x0B

0x0B	Byte2~4	Byte5	Byte6~9	Byte10~15	Byte16
ID	event status	motion segment number	UTC time	MAC address	The RSSI of MAC address 1, int8

Byte17~22	Byte23	Byte24~29	Byte30	Byte31
MAC address 2	The RSSI of MAC address 2, int8		The RSSI of MAC address 3, int8	battery level

The raw payload:

<mark>0B</mark>000008<mark>00</mark>646225bb<mark>5</mark>

Byte	Value	Туре	Raw Data	Description
1	Frame ID	uint8	0B	OB is the packet ID.
2~4	event status	uint24	800000	O00008 is 0x000008, 0x00000XX is reserved and 0x08 is the event status. This byte has 8 bits, each representing an event. Bit1: Start moving event. Bit2: End movement event. Bit3: Motionless event. Bit4: Shock event. Bit5: Temperature event. Bit6: Light event. Bit7: SOS event. Bit8: Press once event.





				Convert to hexadecimal:	
				0x000000: no event	
				0x000001: Start moving event.	
				0x000002: End movement event.	
				0x000004: Motionless event.	
				0x000004: Wictionless event.	
				0x000010: Temperature event.	
				0x000020: Light event.	
				0x000040: SOS event.	
				0x000080: Press once event.	
	Motion			00 is $0x00 == 0$.	
5	segment number	uint8	00	When the motion begins, the count increases	
	number			by 1. Record that this is a movement.	
				646225bb is 0x646225BB = 1684153787	
6~9	UTC time	uint32	646225bb	(DEC) seconds.	
				Convert it to Beijing Time: 2023-05-15 20:29:47	
				20.20.47	
10~15	MAC address		5162d2c1b9d3	5162d2c1b9d3	
	1			the MAC address (HEX)=51:62:D2:C1:B9:D3	
	The RSSI of			0 is $0 \times C0 = -64(DEC)$, the type is int8	
16	MAC address 1, int8	int8	c0	the RSSI = -64	
	I, IIILO			ule ricor = 04	
	MAC address			1b5bd2afeae5	
17~22	2		1b5bd2afeae5	the MAC address (HEX)=	
				1B:5B:D2:AF:EA:E5	
	The RSSI of			bc is $0xBC = -68(DEC)$, the type is int8	
23	MAC address 2, int8	int8	b <mark>c</mark>	the RSSI = -68	
	-,				
04.55	MAC address		10.0170500	d0e2d70529e8	
24~29	3		d0e2d70529e8	the MAC address (HEX)= D0:E2:D7:05:29:E8	
				DU.LZ.D1.00.20.L0	
30	The RSSI of MAC address	intQ	<mark>c9</mark>	c9 is $0xC9 = -55(DEC)$, the type is int8	
30	3, int8	int8	<mark>63</mark>	the RSSI = -55	
				: 0.457 07(DEO)	
31	battery level	uint8	57	57 is $0x57 = 87(DEC)$	
				The battery level is 87%	



6.2.10 Positioning Timeout and Error Code Packet-0x0D

When the device cannot locate due to poor GNSS/ Wi-Fi/Bluetooth signal, the positioning timeout packet is uploaded.

The raw payload:

0D00000000

Byte	Value	Туре	Raw Data	Description
1	Frame ID	uint8	0D	OD is the packet ID.
2~4	Error code	uint32	0000000	00000000 is 0x00000000 0x00000000: The GNSS scan timed out and failed to obtain the location. 0x00000001: The Wi-Fi scan timed out and failed to obtain the location. 0x00000002: The Wi-Fi + GNSS scan timed out and failed to obtain the location. 0x00000003: The GNSS + Wi-Fi scan timed out and failed to obtain the location. 0x00000004: The Bluetooth scan timed out and failed to obtain the location. 0x00000005: The Bluetooth + Wi-Fi scan timed out and failed to obtain the location. 0x00000006: The Bluetooth + GNSS scan timed out and failed to obtain the location. 0x00000007: The Bluetooth + Wi-Fi + GNSS scan timed out and failed to obtain the location.

6.3 Downlink Packet, FPort=5

The tracker supports LoRaWAN to downlink some commands to adjust parameters. If the device is hibernated, the downlink command takes effect the next time the device wakes up to upload data.

Note: FPort=5





6.3.1 Setting the SOS Mode -0x80

0x80	Byte2
	SOS mode
ID	0: single mode
	1: continuous mode

8001: set SOS to single mode. 8002: set SOS to continuous mode.

6.3.2 Setting the Uplink Interval -0x81

0x81	Byte2~3	Byte4~5	Byte6~7
ID	Heartbeat uplink interval 00: Keep current configuration Unit: minutes	Periodic mode uplink interval 00: Keep current configuration Unit: minutes	Event mode uplink interval 00: Keep current configuration Unit: minutes

Example: set the periodic mode interval to 30 minutes

Command: 81001E00

6.3.3 Open the buzzer -0x82

After sending this command, a buzzer alarm tone will be turned on after the device wakes up and will continue to sound for 1 minute.

0x82	Byte2
ID	Open the buzzer. 00: close 01: open

8200: close the buzzer 8201: open the buzzer





6.3.4 Setting the Work Mode -0x83

Byte2
Open the buzzer.
00: standby mode
01: periodic mode
02: event mode

8300: set work mode to standby mode 8301: set work mode to periodic mode 8302: set work mode to event mode

6.3.5 Setting the Work Mode -0x84

0x84	Byte2	Byte3~4	Byte5~6	Byte7	Byte8~9
ID	enable motion event	3-Axis motion threshold	motion start interval	enable motionless event	motionless timeout

Byte10	Byte11~12	Byte13	Byte14~15	Byte16~17	Byte18~19
enable shock event	3-Axis shock threshold	enable temperature event	temperature event uplink interval	temperature sample interval	temperature threshold max

Byte20~21	Byte22	Byte23	Byte24~25	Byte26~27	Byte28~29
Temperature threshold min	Temperature warning type	Enable light event	light event uplink interval	light sample interval	light threshold max

Byte30~31	Byte32
light threshold min	light warning type

The command:

<mark>84</mark>00<mark>001e</mark>0005<mark>00</mark>0168<mark>01</mark>012c<mark>00</mark>0005<mark>001e</mark>0258<mark>0000</mark>00<mark>00</mark>0005<mark>0001</mark>0064<mark>0000</mark>00





Byte	Value	Туре	Raw Data	Description
1	Frame ID	uint8	84	84 is the packet ID.
				00 means disable Event mode.
2	Enable motion event	uint8	00	00: disable Event mode.
	Ovon			01: enable Event mode.
				001e is 0x001E=30(DEC) mg
3~4	3-Axis motion threshold	uint16	001e	When the acceleration exceeds 30mg, determine that the device is in motion, when it is 2 minutes below this value, determine that the device is in motionless.
5~6	Motion start interval	uint16	0005	0005 is $0x0005 = 5(DEC)$, when device is on motion, the interval is 5 minutes.
	Frable			00 means disable motionless event.
7	Enable motionless	uint8	00	00: disable motionless event.
	event			01: enable motionless event.
8~9	Motionless timeout	uint16	0168	0168 is 0x0168 = 360(DEC), when the device is stationary in a location for more than 360 minutes, a motionless timeout event is triggered.
				01 means enable shock event.
10	Enable shock event	uint8	01	00: disable shock event.
	CVOIN			01: enable shock event.
				012c is 0x012C=300(DEC) mg
11~12	3-Axis shock threshold	uint16	012c	When the acceleration exceeds 300mg, the shock event is triggered.
	Enable	,		00 means enable shock event.
13	temperature	uint8	00	00: disable shock event.
	event			01: enable shock event.
14~15	Temperature event uplink interval	uint16	0005	0005 is 0x0005 = 5(DEC), when the temperature exceeds the threshold, the location and sensor data will upload every 5 minutes.
				001e is 0x001E=30(DEC) seconds
16~17	Temperature sample interval	uint16	001e	The temperature is detected every 30 seconds. When the threshold is triggered, upload location and sensor data.





18~19	Temperature threshold max	int16	0258	0258 is 0x0258 = 600(DEC), Maximum threshold =600/10=60.0 °C
20~21	Temperature threshold min	int16	0000	0000 is $0x0000 = 0(DEC)$, Minimum threshold=0/10=0.0 °C
22	Temperature threshold rule	uint8	00	means when temperature ≤ min threshold, device will upload location and temperature event. 00: temp ≤ min threshold 01: temp ≥ max threshold 02: temp ≤ min threshold and temp ≥ max threshold 03: min threshold ≤ temp ≤ max threshold
23	Enable light event	uint8	00	means disable light event.disable light event.enable light event.
24~25	Light event uplink interval	uint16	0005	one is $0 \times 0005 = 5$ (DEC), when the light exceeds the threshold, the location and sensor data will upload every 5 minutes.
26~27	Light sample interval	uint16	0001	O001 is 0x0001=1(DEC) seconds The temperature is detected every 1 seconds. When the threshold is triggered, upload location and sensor data.
28~29	Light threshold max	uint16	0064	0064 is 0x0064 = 100(DEC) % Maximum threshold =100%
30~31	Light threshold min	uint16	0000	0000 is 0x0000 = 0(DEC) % Minimum threshold=0%
32	Light warning type	uint8	OO	means when light ≤ min threshold, device will upload location and light event. 00: light ≤ min threshold 01: light ≥ max threshold 02: light ≤ min threshold and light ≥ max threshold 03: min threshold ≤ light ≤ max threshold



6.3.6 Request Location -0x85

The request tracker initiates location and uploads based on the current configuration. It is usually used in standby mode.

0x85 ID

Example:

85: request location.

6.3.7 Setting Positioning strategy -0x86

0x86	Byte2
	Positioning strategy
	00: Only GNSS
	01: Only Wi-Fi
	02: Wi-Fi+GNSS
ID	03: GNSS + Wi-Fi
	04: Only Bluetooth
	05: Bluetooth + Wi-Fi
	06: Bluetooth + GNSS
	07: Bluetooth + Wi-Fi + GNSS

Example:

8600: Set the positioning strategy to "Only GNSS".

6.3.8 Request Event Parameters -0x87

0x87

Example:

85: request event parameters.





6.3.9 Request Device Status Packet -0x88

0x88

ID

Example:

88: request Device Status packet(0x01 or 0x02).

6.3.10 Reboot Device -0x89

0x89

ID

Example:

89: After the command is sent, the device reboots and join the network again. Please use this command with caution.

6.3.11 Enable Temperature and Light Sensor -0x8C

Enable data collection and upload for the temperature and light sensor.

0x83	Byte2
ID	Open the temperature and light sensor. 00: Close the temperature and light sensor.
	01: Open the temperature and light sensor.

Example:

8300: Close the temperature and light sensor. 8301: Open the temperature and light sensor.

6.3.12 Enable SOS Alarm -0x8D

Enable SOS continuous mode, upload positioning quickly, once every minute, stop after 30 consecutive times, accompanied by sound and light alarm.





Turn off SOS by closing the command or by double clicking the key.

0x8D	Byte2
ID	Open the SOS. 00: Close.
	01: Open.

Example:

8D00: Close the SOS alarm. 8D01: Open the SOS alarm.





7. FAQ

7.1 Location Issues

7.1.1 Why is there no GPS location data

- The tracker is indoor. Check whether the device is indoors. If the device is indoors, the GPS location times out. In this case, the location transmission status is uploaded, and the location cannot be obtained. GNSS positioning needs to be used outdoors.
- 2) The installation position of the device affects antenna positioning. When installing the antenna, do not block the position of the antenna.



7.1.2 Why is Wi-Fi or Bluetooth location not displayed on the App map?

- 1) Wi-Fi location requires the use of a third-party map parsing service, which requires users to invoke the interface for parsing. Currently, Mate App only supports GNSS positioning display.
- 2) Bluetooth positioning needs to determine the location according to the location of the beacon and needs to cooperate with the beacon.

7.2 Battery Issues

7.2.1 Battery Life

Battery life depends on a variety of factors such as uplink interval, whether the sensor is turned on and used, LoRa transmission distance, operating temperature, etc. Therefore, we use the typical working environment(25°C) to predict the battery life, for reference only, and the final life is subject to the actual test.

Please download the excel:

https://files.seeedstudio.com/products/SenseCAP/SenseCAP Tracker/Trcaker Battery Life Calculation T1000 AB.xlsx





7.2.2 Why can't I charge the battery?

Charging	The LED will flash once every 3 seconds.	
Fully charged	The LED will stay always on.	
Charging anomaly	When the device is charged below 0 ° C or above 45 ° C, the device will enter the charge protection state and cannot be charged. The LED will flash rapidly.	





8.FCC

FCC regulatory conformance:

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.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: 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 or more 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

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

RF Exposure

The SAR limit adopted by FCC is 1.6 W/kg averaged over one gram of tissue. The highest SAR value reported to the FCC for this device type complies with this limit. The highest SAR value reported to the FCC for this device type when using in portable exposure conditions is 0.91W/kg.





9. CE

Declaration of Conformity

Hereby, Seeed Technology Co., Ltd. declares that the radio equipment type T1000-A, T1000-B, T1000-C, T1000-D of SenseCAP Card Tracker is in compliance with Directive 2014/53/EU and this product is allowed to be used in all EU member states. The full text of the EU declaration of conformity is available at the following internet address: www.seeedstudio.com

Manufacturer information:

Company name: Seeed Technology Co., Ltd.

Address: 9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District,

Shenzhen 518055, China

Operation frequency (Max power) Bluetooth: 2402-2480 (7.5dBm) Lora: 863MHz-870MHz (13.9dBm)

RF exposure statement

For the countries that adopt the SAR limit of 2.0 W/kg over 10 grams of tissue. The device complies with RF specifications when used at a distance of 0.0 cm from your body. The highest reported SAR value: body SAR: 0.321W/kg





10. Document Version

Version	Date	Description	Editor
V1.0	5/18/2023	First edition	Jenkin Lu
V1.1	6/30/2023	Modify some description.	Jenkin Lu

