TMX03 USER MANUAL

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1. Preface

This guide provides the user with an overview of the features available on the TMX03 device. In this manual, Platform means ThingsMatrix Service Platform.

2. Introduction

2.1 Overview

TMX03 is a ruggedized remote monitoring and tracking device that supports 2G (GSM/GPRS/EDGE) connectivity and positioning features. It is double-layer waterproof (IP67 rating) with ultra-low power consumption for long battery life. It also has built-in sensors including optical and an accelerometer.

Additional details are as follows:

- Easy installation without wires

- Built-in large-capacity disposable lithium-ion battery. It has an ultra-low self-discharge rate and extremely wide temperature capability. Working temperature range is between -20℃ and +70℃

- Ultra-long battery life

- Ultra-low power consumption

- With special enclosure design, TMX03 is ideal for container tracking applications

- Fitted with a built-in optical sensor, TMX03 can generate a tamper alarm

- IP67 rating

- Supports global connectivity with embedded 2G module

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2.2 Specifications

More detailed specifications are as follows:

Table 1 - TMX03 Specifications

Category	Specification	Description
Cellular Network	GSM	B2/B3/B5/B8
Electrical	Power Supply	Non-Rechargeable Battery
	Battery	8100mAh, 3.6V
		5 years @ 1 report/day
Physical	Size	205x68x27mm
	IP Rating	IP67
	Embedded Sensors	Optical Sensor (optional)
		Accelerometer (optional)
Data Transfer	EDGE	296kbps DL; 236.8kbps UL
	GPRS	107kbps DL; 85.6kbps UL
Location	LBS	Supported
	GPS	Supported
	BeiDou	Supported
	Sensitivity	Cold Start -145dbm
	Accuracy	<15m CEP
Environmental	Temperature	-20℃ to +70℃
	Humidity	95%RH
Antenna/SIM	GPS Antenna	Internal
	Cellular Antenna	Internal
	SIM Form Factor	2FF
Certification	FCC	No
	CE	No
	PTCRB	No
	GCF	No
	RoHS	No
	IC	No
Device Management	Data Monitoring	Supported
	Device Configuration	Supported
	Firmware Upgrade	Supported

2.3 Main Features and Use Cases

Table 2 - TMX03 Features

Supported Features	Configuration on the Platform required?
Intelligent Tracking	Yes
Wake-up Mechanisms	Yes
Position Monitor	No
AGPS	No
LBS	No
Blind Zone Compensation	No
Battery Power Detection	Yes, if battery level alert is required
Optical Sensor	No

2.3.1 Intelligent Tracking

The "Track Now" Mode can be set on the Platform in case of an emergency (i.e., theft) so that the real-time location of the device can be monitored. Upon receiving the tracking command from the Platform, the device switches into "Track Now" Mode. In this mode, the device periodically reports the location information to the platform following the pre-configured reporting interval until a stop tracking command is received.

2.3.2 Multiple Wake-up Mechanisms

The TMX03 supports multiple wake-up mechanisms:

- The user can set a wake-up interval on the Platform to make the device wake up periodically

- The user can modify the schedule of the wake-up times of the device on the Platform to wake-up the device at a fixed time. A device can be configured for up to 4 wake-up time points, which is used for more accurate positioning and for better connection to the server. Please refer to **Chapter 3.7.1 Introduction** for more details

- The wake-up feature must be set and enabled from the Platform

2.3.3 Position Monitor

The Position Monitor feature is enabled by default, which means the TMX03 will report the location information every 24 hours. The information includes: Position fix technology (LBS/GPS), longitude and latitude, Cellular Signal Strength, number of GPS satellites, battery voltage, Cell ID, etc. All the device information reported is displayed on the Platform.

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For further information, please refer to **Assets Management Service - Device List** section in ThingsMatrix Service Platform User Guide.

2.3.4 AGPS

The AGPS enhances the performance of GPS by reducing the time-to-fix and by improving the positioning accuracy, assisted by the carrier signal. The TMX03 uses the GPRS signal to achieve this feature and it is enabled by default.

The GPS data is displayed on the Platform. Please refer to **Assets Management Service - Device List** section in ThingsMatrix Service Platform User Guide to get additional information.

2.3.5 LBS

The LBS provides the location information by utilizing the carrier network signal. It is enabled when the TMX03 does not have GPS location information. Please note that LBS is largely dependent on distance to surrounding network cell sites, which could be up to a few miles away in worst case scenarios. It is not as accurate as GPS.

This feature is enabled by default. The LBS data is displayed on the Platform. Please refer to **Assets Management Service - Device List** section in ThingsMatrix Service Platform User Guide to get further information.

2.3.6 Blind Zone Compensation

In sleep mode, when the device enters a GPRS blind zone (limited or no cellular coverage), it will store the collected data according to the preconfigured reporting frequency and will upload this data to the Platform once the GPRS signal is recovered. The maximum number of blind zone compensation data reports is 16.

This feature is enabled by default on the Platform.

2.3.7 Battery Level Detection

The device will upload the battery level status together with the location coordinates. The battery level will be displayed on the Platform.

The device, by default, reports power information without any additional configuration on the Platform. The battery level information is displayed on the Platform. Please refer to **Assets Management Service - Device List** section in ThingsMatrix Service Platform User Guide to get further details. If the user requires battery level alert, it can be enabled by configuring a policy on the Platform. Please refer to **Data Management Service - Policy** section in ThingsMatrix Service Platform User Guide.

2.3.8 Optical Sensor
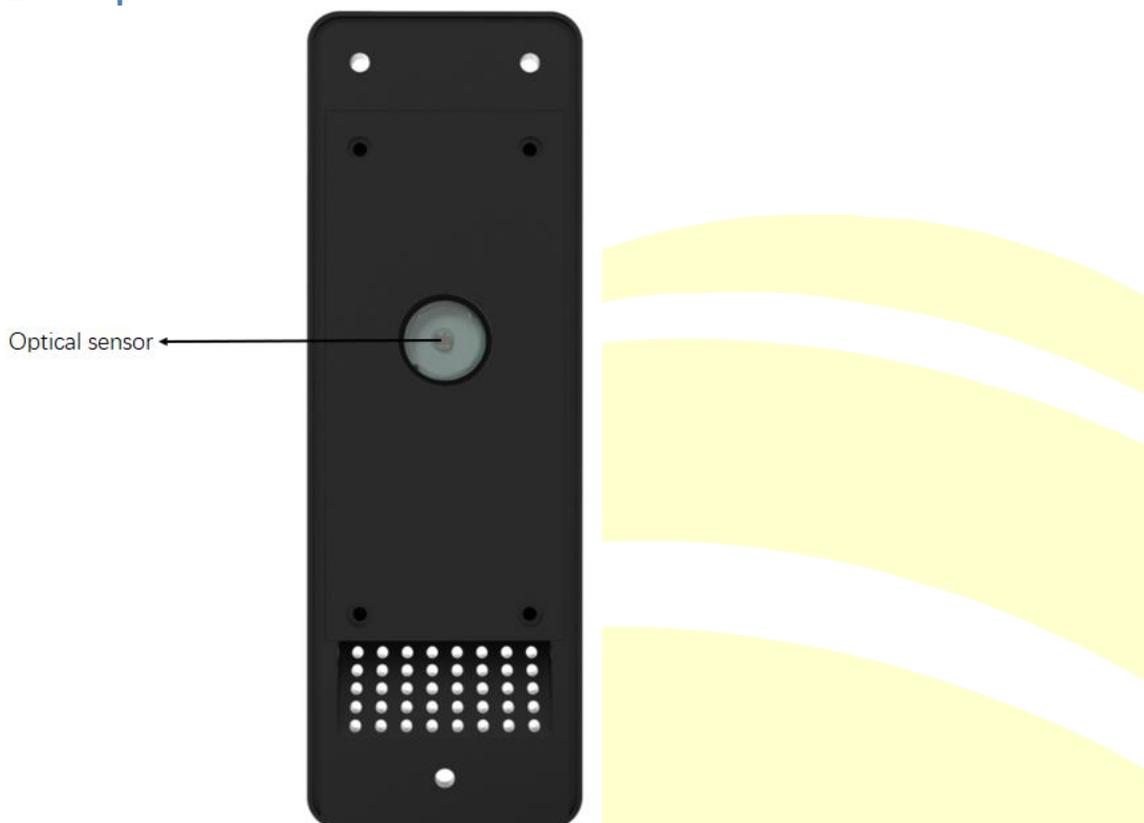
The TMX03 has a built-in optical sensor. When the device is removed after installation and the sensor is exposed to light, it will be activated immediately and the TMX03 will send a "DEVICE_REMOVED" alarm message to the Platform, together with the current location data.

Information relevant to the "DEVICE_REMOVED" alarm is displayed on the Platform (including alert icon, alert record, etc.). Please refer to **Assets Management Service - Device List** section in ThingsMatrix Service Platform User Guide to get more details.

3 Working Modes

3.1 Introduction

The TMX03 has three working modes: Periodic, Storage and Schedule.

User can select the working mode according to a specific use scenario (refer to **Table 3**).

3.2 Usage Table

Table 3 - TMX03 Usage

Working Mode	Use Case
Storage	Storage Mode is used when the TMX03 is ready for shipment. It can be stored (like in a warehouse) for long periods of time while saving power.
Schedule	No specific use scenario. Schedule Mode can be used when the user needs the device to wake up and report data at one or more wake-up time points (up to 4).
Periodic	Periodic means the device will report the data according to a fixed report interval.

3.3 Parameter Table

Table 4 - TMX03 Parameters

Category	Parameter	Definition	Remark
Working Mode	Mode	Work Mode	*Users can select the required working mode through the drop-down box.* *There are three options: Periodic, Storage and Schedule.* For example, selecting the "Periodic" option will cause the device to activate the "Periodic" mode.
Periodic Mode Settings	Report Interval	Time interval for position information	*Unit: minute. The default value is 1440.* For example, setting the parameter "Report Interval: 300" will cause the device to report data every 300 minutes when the device works continuously.
Storage Mode Settings	Report Interval	Time interval of position information	*Unit: minute. The default value is 10080.* For example, setting the parameter "Report Interval: 300" will cause the device to report data every 300 minutes.
Schedule Mode Settings	Fixed Wakeup Time 1	Wakeup Time 1	*Parameter format: "HH: mm". For example, setup "wakeup_time1" to be 08:00, the device will wake up at 08:00 and report data.*
	Fixed Wakeup Time 2	Wakeup Time 2	*Parameter format: "HH: mm". For example, setup "wakeup_time2" to be 12:30, the device will wake up at 12:30 and report data.*
	Fixed Wakeup Time 3	Wakeup Time 3	*Parameter format: "HH: mm". For example, setup "wakeup_time3" to be 16:00, the device will wake up at 16:00 and report data.*
	Fixed Wakeup Time 4	Wakeup Time 4	*Parameter format: HH: mm; For example, setup "wakeup_time4" to be 20:30, the device will wake up at 20:30 and report data.*
	Timezone	Timezone	*Set the time zone according to the current device location. For example, set parameter "time zone: UTC +08:00", which means the device is in the time zone of UTC +08:00.*
Firmware Settings	Server	Server	*Default: ftp.thingsmatrix.io*
	Port	Port	*Default: 21*
	Version	Version	*Default: v1.0*

3.4 Periodic Mode

3.4.1 Introduction

In Periodic Mode the device can only report data in fixed intervals. It can be used if there are no specific requirements.

3.4.2 Configuration Example

If the device is required to wake up every 10 minutes, Periodic Mode can be configured as follows:

Configuration

	Working Mode Option ⓘ	
	Mode Default: Periodic	Periodic ∨

	Periodic Mode Settings ⓘ	
	Report Interval Default: 1440min	10

3.5 Storage Mode

3.5.1 Introduction

Storage Mode can be used when the user needs to prepare the device for shipment. The device may be placed in a warehouse or similar "storage" location for an extended period and using the Storage Mode will help extend battery life. For example, if the user sets the report interval to a month, Storage Mode can be activated.

Storage Mode is off by default.

3.5.2 Configuration Example

If the device is required to report data every 10080 minutes, Storage Mode can be configured as follows:

3.6 Schedule Mode

3.6.1 Introduction

Schedule Mode can be used when the user requires the device to wake up and report data at one or more preset wake-up times (up to 4).

Schedule Mode is off by default.

The time zone is UTC +00:00 (unit: minute) by default, which can be changed via serial port, SMS, or on the Platform.

In Clock Mode, the wake-up time presets of the device can be modified. The user can configure up to 4 wake-up time points (the interval between each alarm clock cannot be less than 5 minutes) to improve position accuracy and connectivity with the server.

The user can select a working mode according to their specific use case (refer to **Table 3**).

3.6.2 Configuration Example

If the device is required to report data at 08:00, 12:30, 16:00 and 20:30 respectively, the user can set the device to Clock Mode (for this example, the device is in the time zone of UTC +08:00). The parameters can be configured as follows:

4 Device Data Fields

The IoT Gateway parses the data fields from the device's communication protocol and converts it to a JSON-formatted data payload. The user can view the data fields in the device's Status and Statistics tabs on the Platform or via the API. The data fields supported by the device are listed in the table below.

Table 5 - TMX03 Data Field Definitions

Field	Definition	Description
time	Time	It shows the data generated time.
lat	Latitude	It shows the latitude of the device.
lng	Longitude	It shows the longitude of the device.
sn	Serial Number	Each device will have one unique serial number for identification.
iccid	SIM ICCID	It shows the SIM ICCID.
speed	Speed	It shows the speed of the device.
battery	Battery	It shows the remaining power of the battery as a percentage.
ipAddress	IP Address	It shows the IP Address of the connection.
gpsSpeed	GPS Speed	It shows the speed reported by the GPS.

direction	Direction	It shows the direction of the device. North begins at zero degrees clockwise.
net	Network Type	It shows Mobile Network Type.
mcc	Country Code	It shows Mobile Network Country Code.
mnc	Country Code	It shows Mobile Network Country Code.
lac	Area Code	It shows Mobile Network Area Code.
cellId	Cell ID	It shows Mobile Network Cell ID.
signalStrength	Signal Strength (dBm)	It shows Cell Signal Strength.
gpsSatelliteNum	GPS Satellite Number	It shows the number of Satellites in the GPS constellation.
gpsLocating	Location Mode	It shows the Location Mode: GPS or LBS.

5 Troubleshooting

This section provides information to help the user troubleshoot general issues with the device.

5.1 Inaccurate positioning of LBS

- Problem

  – Wrong location shown in map

- Possible cause

  – The carrier network cell tower that the device is attached to is too far

- Solution

  – Move the device around so it can acquire a GPS signal

5.2 The device is offline

- Problem

  – The device is shown as being offline

- Possible cause

  – The SIM card does not have an active subscription

  – The SIM card is inserted incorrectly

  – The device is asleep

- Solution

  – Replace the SIM card

  – Correct the SIM card installation

– Expose optical sensor to light or turn the power off and on to wake the device up

5.3 Unable to boot

• Problem

– The indicator light is off when the device gets powered up

• Possible cause

– Power switch is in the OFF position

– Battery is depleted

• Solution

– Slide the power switch to the ON position

– Replace the battery

5.4 No optical sensor alert

• Problem

– The optical sensor is exposed to light but there is no LED activity and no alarm

• Possible cause

– The light intensity is too weak

• Solution

– Move the device to a position with more light

6 Installation Instructions

The device external appearance is as follows:

6.1 Get Started

To use the device, the user needs to open the top cover, insert the SIM card correctly, turn the power on, and install the device in place.

The user can open the top cover by removing the 4 screws in the corners using a Philips screwdriver. There are two LED indicators under the cover: the **green** LED shows the GPS status, and the **red** LED shows the cellular connectivity status.

Please review the following diagram for the different LED combinations.

Terminology:

Fast blinking: The indicator light flashes 2-3 times in 1s.

Slow blinking: The indicator light flashes one times in 5s.

GPS green LED

Off: No location
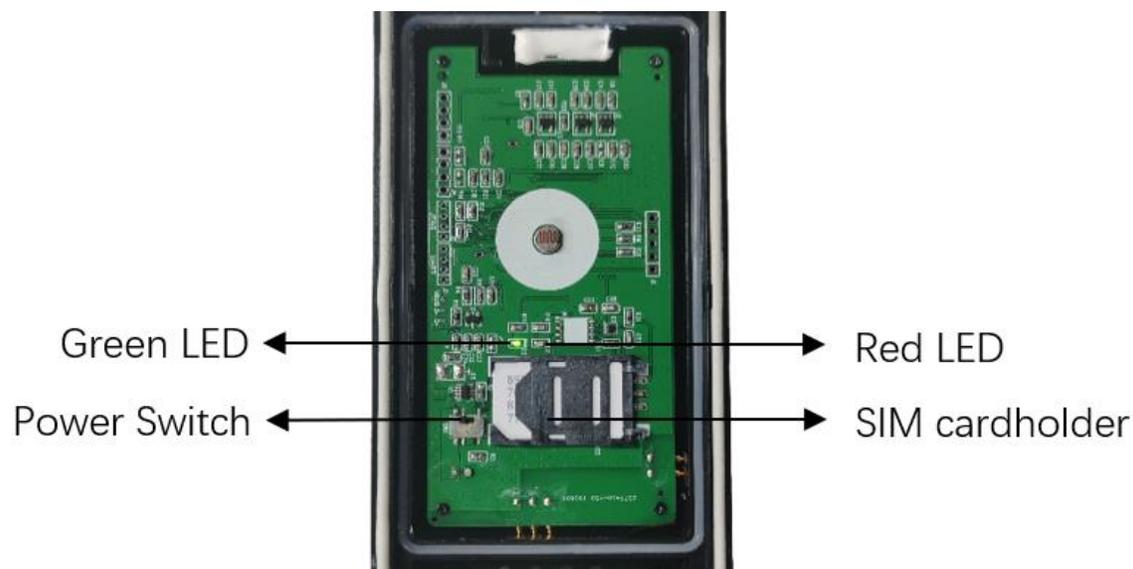
1s On, 1s Off: LBS location

Solid On: GPS location

GPRS red LED

Fast blinking: GPRS connecting

Slow blinking: GPRS connected

Solid On: Module error

6.2 SIM Card Installation

Open the SIM card holder cover, insert the SIM card into the SIM card holder.

Ensure that the SIM card is properly placed.

Close the SIM card cover.

Please take note of the ICCID on the SIM card and make sure that the SIM card has an active subscription for the required cellular network.

6.3 Device Power Up

After the SIM card is installed, move the power switch to the ON position (Please refer to the picture of chapter 6.1, move the power switch to the left). When the **red** LED starts blinking, the device is powered on.

Verify that the **red** LED starts blinking slowly. It may take up to 3 minutes.

6.4 Device Installation

Close the top cover after the device is powered up.

Peel one side of the supplied 3M double sided tape and place it on the bottom of the device (optical sensor side), making sure not to cover the sensor.

Select a place where the device will be installed. Peel the other side of the tape and place it over a clean flat surface pressing down firmly.

If the device is removed, the optical sensor will be activated immediately. The Platform will display a "DEVICE_REMOVED" alarm along with the current location data.

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