



TMX09 USER MANUAL

TMX09 User manual

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TMX09 User Manual

1. Preface

This guide provides the user with an overview of the features available on the TMX09 device. In this manual, Platform means ThingsMatrix Service Platform.

2. Introduction

2.1 Overview

TMX09 is a ruggedized remote monitoring and tracking device that supports 2G (GSM/GPRS/EDGE) connectivity and positioning features. It is waterproof (IP67 rating) with ultra-low power consumption for long battery life. It also has built-in sensors including optical, temperature, and an accelerometer (a magnetic sensor is also available as an option).

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°C and +70°C
- Ultra-long battery life
- Ultra-low power consumption: The working current can be less than 15uA when it is in sleep mode, to ensure that the device can work for a long time without replacing the battery
- Compared to similar products available on the market, TMX09 is small and ideal to be easily hidden
- Integrated optical sensor to provide a tamper alert
- IP67 rating
- Supports global connectivity with embedded 2G module

2.2 Specifications

More detailed specifications are as follows:

Table 1 - TMX09 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	81x66x31mm	
	IP Rating	IP67	
	Embedded Sensors	Optical Sensor	
		Accelerometer	
Magnetic Sensor (optional)			
Temperature Sensor			
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°C ~ +70°C	
	Humidity	95%RH	
Antenna/SIM	GPS Antenna	Internal	
	Cellular Antenna	Internal	
	SIM Form Factor	SIM (2FF)	
Certification	FCC	Pending	
	CE	Pending	
	PTCRB	Pending	
Device Management	Data Monitoring	Supported	
	Device Configuration	Supported	
	Firmware Upgrade	Supported	

2.3 Main Features and Use Cases

Table 2 - TMX09 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
Temperature Sensor	Yes if temperature alert is required

2.3.1 Intelligent Tracking

The “Track Now” Mode can be set on the Platform in case of an emergency (e.g. 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. For more details, please refer to **Chapter 3.4.1 Introduction**.

2.3.2 Multiple Wake-up Mechanisms

The TMX09 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 TMX09 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.

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 TMX09 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 TMX09 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.

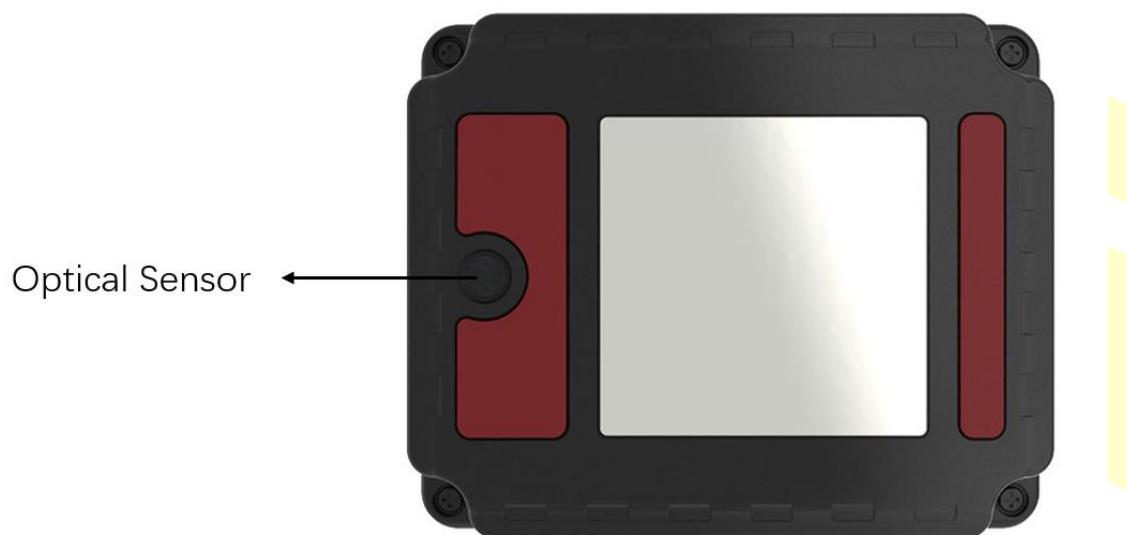
2.3.7 Battery Level Detection

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 TMX09 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 TMX09 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.

2.3.9 Temperature Sensor

The TMX09 has a built-in temperature sensor, which can measure the temperature around the device. The device uploads the location data and real-time temperature, which are displayed on the Platform. The device cannot trigger a temperature alert. Temperature alert (out of range) can only be triggered via the Platform settings.

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

3 Working Modes

3.1 Introduction

The TMX09 has four working modes: Periodic, Storage, Motion and Schedule.

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

3.2 Usage Table

Table 3 - TMX09 Usage

Working Mode	Use Case
Storage	Storage Mode is used when the TMX09 is ready for shipment. It can be stored (like in a warehouse) for long periods of time while saving power.
Motion	Motion Mode is mostly used for fixed location assets (usually kept static). The report interval needs to be set according to the Motion/Static Mode.
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 fixed report interval.

3.3 Parameter Table

Table 4 - TMX09 Parameters

Category	Parameter	Definition	Remark
Working Mode	Mode	Work Mode	Users can select the required working mode through the drop-down box. There are four options: Periodic, Storage, Motion 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.
Motion Static Mode Settings	Report Interval on Motion	Time interval of	Unit: minute. The default value is 60. For example, setting the parameter "Report Interval on

		position information	Motion: 60" will cause the device to report data every 60 minutes in Motion Mode.
	Report Interval on Static	Time interval of position information	<i>Unit: minute. The default value is 720.</i> For example, setting the parameter " Report Interval on Static: 720" will cause the device to report data every 720 minutes in Static Mode.
Schedule Mode Settings	Fixed Wakeup Time 1	Wakeup Time 1	<i>Parameter format: "HH: mm". For example, setup "wakeup_time1" to be 08:00, the device will wake up at 08:00 and report data.</i>
	Fixed Wakeup Time 2	Wakeup Time 2	<i>Parameter format: "HH: mm". For example, setup "wakeup_time2" to be 12:30, the device will wake up at 12:30 and report data.</i>
	Fixed Wakeup Time 3	Wakeup Time 3	<i>Parameter format: "HH: mm". For example, setup "wakeup_time3" to be 16:00, the device will wake up at 16:00 and report data.</i>
	Fixed Wakeup Time 4	Wakeup Time 4	<i>Parameter format: HH: mm; For example, setup "wakeup_time4" to be 20:30, the device will wake up at 20:30 and report data.</i>
	Timezone	Timezone	<i>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.</i>
Firmware Settings	Server	Server	<i>Default: ftp.thingsmatrix.io</i>
	Port	Port	<i>Default: 21</i>
	Version	Version	<i>Default: v1.0</i>

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 Periodic ▼

Default: Periodic

▼ Periodic Mode Settings ⓘ

Report Interval 10

Default: 1440min

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 of time 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:

Configuration

Working Mode Option ⓘ	
Mode Default: Periodic	Storage ▼
Periodic Mode Settings ⓘ	
Storage Mode Settings ⓘ	
Report Interval Default: 10080min	10080

3.6 Motion Mode

3.6.1 Introduction

Motion Mode is used when the reporting interval needs to be changed based on an asset’s mobility or fixed status.

Motion Mode is off by default. If it is on, the report interval is configurable from 5 minutes to 43200 minutes (720 hours).

When the device wakes up in Motion/Static Mode, it will report the data according to the preset reporting interval.

When motion is detected, it wakes up after sleeping for 1 hour (default value). During sleep, the accelerometer (G-sensor) is turned off, and the device cannot be woken up by vibration and/or motion.

When motionless, it wakes up after 12 hours of sleep (the default value). During sleep, the accelerometer (G-sensor) enters the low power consumption mode and continues to detect vibration. In this mode, the device can be woken up by vibration and/or motion.

After being woken up by vibration/motion, if no continuous vibration/motion is detected for more than 4 seconds, the device will go back to sleep.

The priority of Motion/Static Mode is higher than the other two working modes (Clock Mode and Refresh Mode). The user can select a working mode according to the specific use case (refer to **Table 3**).

3.6.2 Configuration Example

If the device needs to report data once every 5 minutes while in motion and once every 10 minutes otherwise, the user can turn on Motion Mode and set the following parameters:

Configuration

Working Mode Option ⓘ	
Mode Default: Periodic	Motion ▼
Periodic Mode Settings ⓘ	
Storage Mode Settings ⓘ	
Motion Static Mode Settings ⓘ	
Report Interval on Motion Default: 60min	5
Report Interval on Static Default: 720min	10

3.7 Schedule Mode

3.7.1 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), in order to improve position accuracy and connectivity with the server. The device cannot be woken up by vibration/motion in Clock Mode.

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

3.7.2 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:

Configuration

Working Mode Option ⓘ	
Mode Default: Periodic	Schedule ▼
> Periodic Mode Settings ⓘ	
> Storage Mode Settings ⓘ	
> Motion Static Mode Settings ⓘ	
▼ Schedule Mode Settings ⓘ	
Fixed Wakeup Time 1 Default:	08:00 ⓘ
Fixed Wakeup Time 2 Default:	12:30 ⓘ
Fixed Wakeup Time 3 Default:	16:00 ⓘ
Fixed Wakeup Time 4 Default:	20:30 ⓘ
Timezone Default: UTC +00:00	UTC +08:00 ▼

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 - TMX09 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 (km/h)	It shows the speed of the device.
battery	Battery (%)	It shows the remaining power of the battery as a percentage.
voltage	Battery Voltage (V)	It shows the voltage of the battery.
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	Network Code	It shows Mobile Network 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.
elapsedTime	Elapsed Time	It shows the device system's running time.
gpsLocating	Location Mode	It shows the Location Mode: GPS or LBS.
temperature	Temperature	It shows the sensor's temperature reading.
humidity	Humidity	It shows the sensor's humidity reading.

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

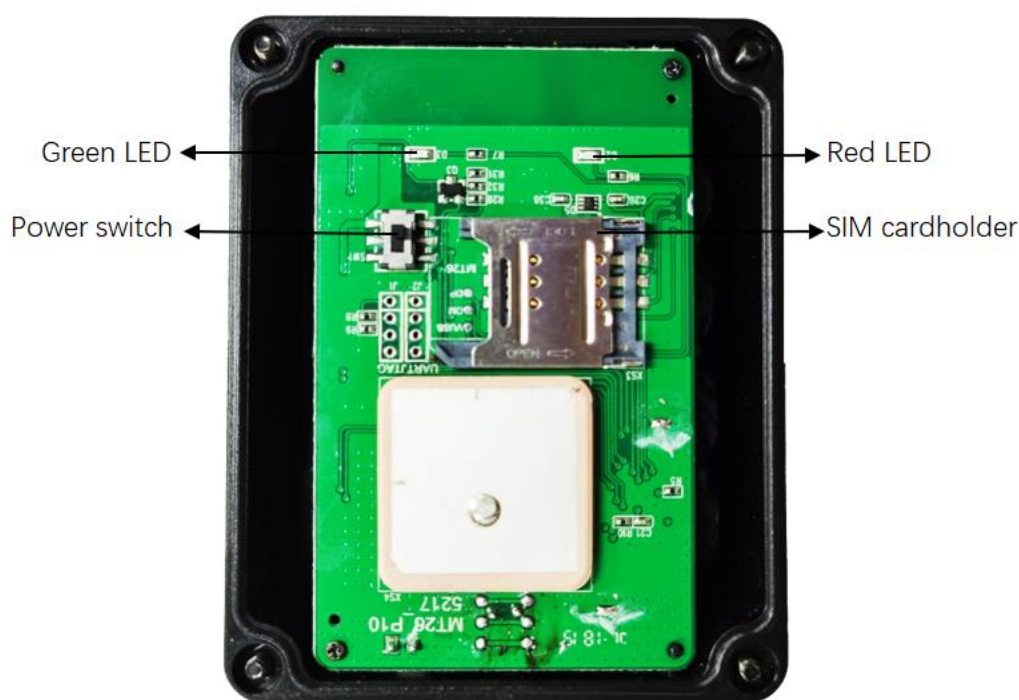
Solid On: GPS location

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.