LTE Cat - M1 Tracker(D)
ATD521 User Guide

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1 Preface 4
1.1 Purpose 4
1.2 Glossary 4
2 Installation 4
2.1 Before installation 4
2.1.1 Unpacking and accessory checking 4
2.1.2 Activate the Device 6
2.1.3 Device Configuration 7
2.2 Installation 8
3 Function 9
3.1 Periodic Sensor Scanning 9
3.1.1 Sensors 9
3.1.2 GNSS/GPS Location and WIFI Scanning 9
3.1.3 Coarse Location Data 9
3.1.4 Data Report Format 9
3.2 Button Press Driven Scanning 10
3.2.1 Double-Button Press 10
3.2.2 Long Button Press for Entry into Active Operation 10
3.3 Configuration 10
3.3.1 monitorPeriod 10
3.3.2 commSynchPeriod 10
3.3.3 opMode 11

3.3.4 reportBuffReset 11
3.3.5 alarms 11
3.3.6 motion & nomotion 12
3.4 LED Indicators 12
3.4.1 Active Mode 12
3.4.2 Set Up Mode 13
3.4.3 FOTA (F/W Over-The-Air Update) 13
4 Historical Data 14
4.1 Historical Data 14
5 H/W Interfaces 14
FCC Statement 15

Version	Date	Comments
1.0.0	8/2/2022	Initial Version
1.0.1	8/22/2022	Update some details
1.0.2	9/6/2022	Update label & package & FCC Statement
1.0.3	9/20/2022	Simplify some items
1.0.4	11/16/2022	Add product name as per FCC agency request

1 Preface

1.1 Purpose

Describe the installation and use of the Mobilogix ATD521 asset tracker.

1.2 Glossary

LKL: **L**ast **K**nown **L**ocation

NCL: **N**etwork **C**onnection **L**ost

MQTT: **M**essage **Q**ueue **T**elemetry **T**ransport

QoS: **Q**uality **o**f **S**ervice

2 Installation

2.1 Before installation

2.1.1 Unpacking and accessory checking

On very first use, verify that the device's SN, IMEI listed on the box's label matches what is printed on the back of device.

Figure 2.1 - Device Label

- **Accessory**

Here is the component list:

1. ATD521
2. Package
3. USB to Type-C cable
4. 5V/2A DC Charger

Figure 2.2 Device

2.1.2 Activate the Device

The device is placed into “Set Up” mode at production. This is a low power mode where the device is dormant and requires user action to active. To determine whether the device is Active or in “Set Up” mode, pressing the device’s button down momentarily for one second or less. If the LED2 blinks once, the device is activated. If the LED2 blinks twice, the device is in “Set Up” mode, and will needs to be put into an active (Long press the button for more than 3 seconds).

Figure 2.3 Button

2.1.3 Device Configuration

There are two ways to config the device: UART and over the backend.

Key items

The APN, MQTT server URL (and Port) and cell RAT need to be configured first. Otherwise, the device cannot establish a connection.

RAT selection options

- 0: 2G only
- 1: 2G + NB (NB – narrowband is not supported)
- 2: 2G + NB + M1 (NB – narrowband is not supported)
- 3: 2G + M1
- 4: NB only (not supported)
- 5: NB + M1 (NB is not supported)
- 6: M1 only

2.2 Installation

Figure 2.4 Example location

3 Function

3.1 Periodic Sensor Scanning

Sensor sampling and a report is performed once every monitorPeriod and reported to the server once every commSynchPeriod. Refer to the referenced Data Model for further details. Note that the device internally treats rounds the monitorPeriod and commSynchPeriod down to the nearest minute. For example, if either are configured to 239 seconds (3 minutes, 59 seconds), the resultant configuration value will be set to 180 seconds (3 minutes).

3.1.1 Sensors

1. Temperature: -20 deg. C to +80 deg. C (operational limits of the device)
2. Humidity: 0 to 100% relative humidity
3. Accelerometer g-force, x, y, z axes: -16.0000 to +16.0000 g-force
4. Tilt Angle x, y, z: 0 to 90 degrees of tilt relative to the vertical
5. Light: 0.01 to 64k lux.
6. Pressure: 260 to 1260 hPa.
7. Temperature Probe (one wire temperature): -20 deg. C to +80 deg. C (operational limits of the device)

3.1.2 GNSS/GPS Location and WIFI Scanning

GNSS/GPS is scanned with each sensor report to get the device's location. If a GNSS/GPS fix cannot be achieved, WIFI is scanned for access point data for use with WIFI LAAS.

3.1.2.1 GPS/GNSS Data

Latitude, Longitude, Speed (m/s), Bearing (deg), Altitude (m), Accuracy (m)

3.1.3 Coarse Location Data

Connected cell tower and neighboring cell tower data are included with every sensor report.
Cell Id, MNC, MCC, LAC, TAC, Operator ID, Signal Strength, RAT, Neighbor Cell tower Data

3.1.4 Data Report Format

Refer to the data model for further details.

3.2 Button Press Driven Scanning

Button presses can result in the device publishing a sensor report to the server. The format and content of the sensor report is the same as that with periodic reporting, except the indicated type of message will differ (periodic: “per”, button press “btn”, Active Mode Entry: “norm”, Setup Mode Entry: “stp”).

3.2.1 Double-Button Press

Pressing the button twice quickly results in a dedicated (“btn”) sensor report published to the MQTT server. Note that the device will not recognize more than one double-button press every 3 minutes.

When the double-button is pressed, the LEDs will illuminate and when the LED1 Green stops flashing and illuminates solid, the device has published the message to the server.

3.2.2 Long Button Press for Entry into Active Operation

Pressing the button continuously for 3 seconds or longer results in the device transitioning to/from Setup Mode and Active Operation.

3.2.2.1 Active Mode Entry

The device publishes a dedicated (“norm”) sensor report to the MQTT server when the device initially enters Active Mode (from Setup Mode via a long button press) or when the device boots up for the first time.

3.2.2.2 Setup Mode Entry

The device publishes a dedicated (“stp”) sensor report to the MQTT server before the device enters Setup Mode (from Active Mode).

3.3 Configuration

3.3.1 monitorPeriod

The monitorPeriod controls the number of sensor reports made per time period. Its units are programmed in seconds, but are internally rounded down to the nearest minute internally by the device (e.g. 239 seconds is treated as 180 seconds, or 3 minutes).

Range: 180 seconds to 15,552,000 seconds. Recommended not setting to values longer than 24 hours or 86400 seconds.

3.3.2 commSynchPeriod

The commSynchPeriod controls the number of times all collected sensor reports are published per time period. Its units are programmed in seconds, but are internally rounded down to the nearest minute internally by the device (e.g. 239 seconds is treated as 180 seconds, or 3 minutes).

Range: 180 seconds to 15,552,000 seconds. Recommended not setting to values longer than 24 hours or 86400 seconds. The commSynchPeriod should not be programmed to be less than the monitorPeriod and should not be programmed to be more than 12 x the monitorPeriod

3.3.3 opMode

The opMode is used to command the device into Setup Mode.

Values: 1: Keep device in Active operation. 0: Place device into Setup Mode

3.3.4 reportBuffReset

The reportBuffReset is used to command the device reset its 'history' buffer of sensor reports collected while the device has been offline from the network.

Values: 1: Reset the history buffer.

3.3.5 alarms

Please refer to the data model to config below alarms:

lowBatt: low battery alarm

tempAlarm: temperature overflow/underflow alarm

humiAlarm: humidity overflow/underflow alarm

liteAlarm: lite overflow/underflow alarm

owtAlarm: one wire temperature overflow/underflow alarm

shockAlarm: shock alarm

tiltAlarm: tilt alarm

reportType: motion-based periodic reporting enable/disable

owtDisc: plug out one wire sensor

Motion: motion monmotion config

3.3.6 motion & nomotion

Reporting type is like this:

"tripStrt": Trigger motion status during nomotion period

"Movg": Trigger motion status during motion period

"TripStp": Trigger nomotion status during motion period

"stnry": Trigger nomotion status during nomtion period

3.4 LED Indicators

3.4.1 Active Mode

During active operation, the LEDs are normally off, and will illuminate for at least 30 seconds when the button is pressed.

LED	Off	ON (solid, no blinking)	2 flash/sec (Slow)	1 flash/sec (Very Slow)	4 flash/sec (Fast)
LED1_RED	sleep			battery <=20%	server connection error
LED1_GREEN	sleep	connecting to server	sending data	connected to server (idle, no send data)	FOTA download in progress
LED1_YELLOW	sleep/network disconnected	modem on - not connected to network	registering to network	registered to network (no server connection)	network connection error
LED2_RED	flashing once every 3 seconds when charging or sleep when discharging			battery <= 20%	critical error
LED2_GREEN	flashing once every 3 seconds when charging or sleep			20%<&<60%	FOTA download in progress

	when discharging				
LED2_YELLOW	flashing once every 3 seconds when charging or sleep when discharging			>=60%	GNSS failure

Table 3.4.1

3.4.2 Set Up Mode

LED	Short Press	Double Press	Long Press
LED1_RED	off	off	Long Press Button Detect - Blink Twice - Reboot to Normal Mode
LED1_GREEN	off	off	
LED1_YELLOW	off	off	
LED2_RED	<=20% blink twice	reserved for future use	Long Press Button Detect - Blink Twice - Reboot to Normal Mode
LED2_GREEN	>=60% blink twice	reserved for future use	
LED2_YELLOW	20%<&<60% blink twice	reserved for future use	

Table 3.4.2

3.4.3 FOTA (F/W Over-The-Air Update)

While FOTA is active, the device is actively receiving a F/W image. During this time, all LEDs will blink at approximately a 5Hz rate. As the FOTA is about to complete, the LEDs may illuminate **steady for approximately one minute.** This is normal.

4 Historical Data

4.1 Historical Data

The device retains up to 600 'historical' sensor reports if the device cannot establish a network connection. Once the 600 reports limit is reached, the list will be reset. Once the device be able to attach to the network and MQTT server, it will publish all historical data.

5 H/W Interfaces

Figure 5.1 PCBA board

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one 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.

FCC Radiation Exposure Statement

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of the FCC RF Rules. This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and consider removing the no-collocation statement.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

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

Caution!

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

Canada Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

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

L’émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d’Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes :
1) L’appareil ne doit pas produire de brouillage;
2) L’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.
Le dispositif rencontre l'exemption des limites courantes d'évaluation dans la section 2.5 de RSS 102 et la conformité à l'exposition de RSS-102 rf, utilisateurs peut obtenir l'information canadienne sur l'exposition et la conformité de rf.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur. Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.