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empowering wireless

MicroTracker MT-01 (rev.2)

PRODUCT SPECIFICATIONS
SOFTWARE MANUAL FOR VERSION 2.6.5
BASED ON SIERRA WIRELESS OPENAT FIRMWARE R7.45.1

REV 1.7

Revision history

Rev.	Date	Details	Originated by
1.0	21 Nov 2011	First release	Samuel Chereau
1.1	05 Jan 2012	- Edit title - Edit change log for more details - Correct SG132 response format - Correct SG531 serial command format Add firmware version reminder in application update steps - Add details on the build file name	Samuel Chereau
1.2	20 Jan 2012	Added commands 212 and 213	Samuel Chereau
1.3	20 Feb 2012	Update for 2.6.1 - Correct SG213 weekday format - Correct SACK packet format - Certification passed - Default commands and example are now directly on m2mgateway server - Correct SG204 with periodic report	Samuel Chereau
1.4	28 Feb 2012	Added a further step in DOTA process to ensure it works fine with 2.6	Samuel Chereau
1.5	16 Apr 2012	Update for 2.6.2 - CE certification passed	Samuel Chereau
1.6	30 May 2012	Update for 2.6.4 - Add SGEE command - Correct AI values (0-5000mV)	Samuel Chereau
1.7	30 July 2012	Update for 2.6.5 - Add SG107 command - Correct SG132 response with backup values	Samuel Chereau

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Safety precautions

General precautions

- The tracker generates radio frequency (RF) power. When using the tracker care must be taken on safety issues related to RF interference as well as regulations of RF equipment.

- Do not use the tracker in aircraft, hospitals, petrol stations or in places where using GSM products is prohibited.

- Be sure that the tracker will not be interfering with nearby equipment. For example: pacemakers or medical equipment. The antenna of the tracker should be away from computers, office equipment, home appliance, etc.

- Always keep the tracker with minimum safety distance of 26.6cm or more from human body. Do not put the tracker inside metallic box, containers, etc.

Using the tracker in vehicle

- Check for any regulation or law authorizing the use of GSM in vehicle in your country before installing the tracker.

- Install the tracker by qualified personnel. Consult your vehicle dealer for any possible interference of electronic parts by the tracker.

- Be careful when the tracker is powered by the vehicle's main battery. The battery may be drained after extended period.

Protecting your tracker

To ensure error-free usage, please install and operate your tracker with care. Do remember the following:

- Do not expose the tracker to extreme conditions such as high humidity/rain, high temperatures, direct sunlight, caustic/harsh chemicals, dust, or water.

- Do not try to disassemble or modify the tracker. There is no user serviceable part inside and the warranty would be void.

- Do not drop, hit or shake the tracker.

- Do not use the tracker under extreme vibrating condition.

- Do not pull the power supply cable. Please attach or detach it by holding the connector.

- Connect the tracker only according to the instruction manual. Failure to do it will void the warranty.

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Chapter 1

Product specifications

1.1 Physical and mechanical

– Dimensions: 58.6 X 60.0 X 13.0 mm
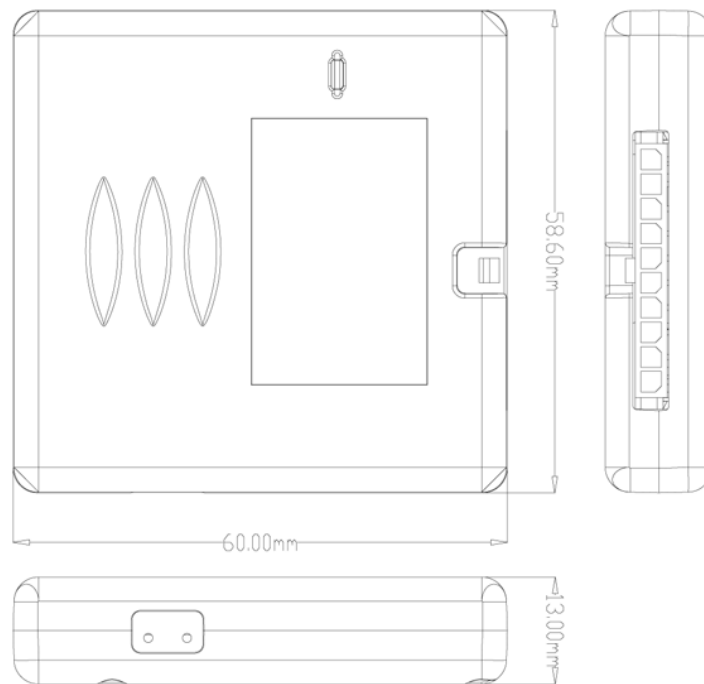
Figure 1.1.1: Drawing

– Weight: 45g

– Case: PC/ABS material UL94V-0 flammability

– Packing method:

  • bulk packaging: protected in poly bags in bulk packing with leaflet
  • individual packaging: protected in poly bag in individual gift box with leaflet
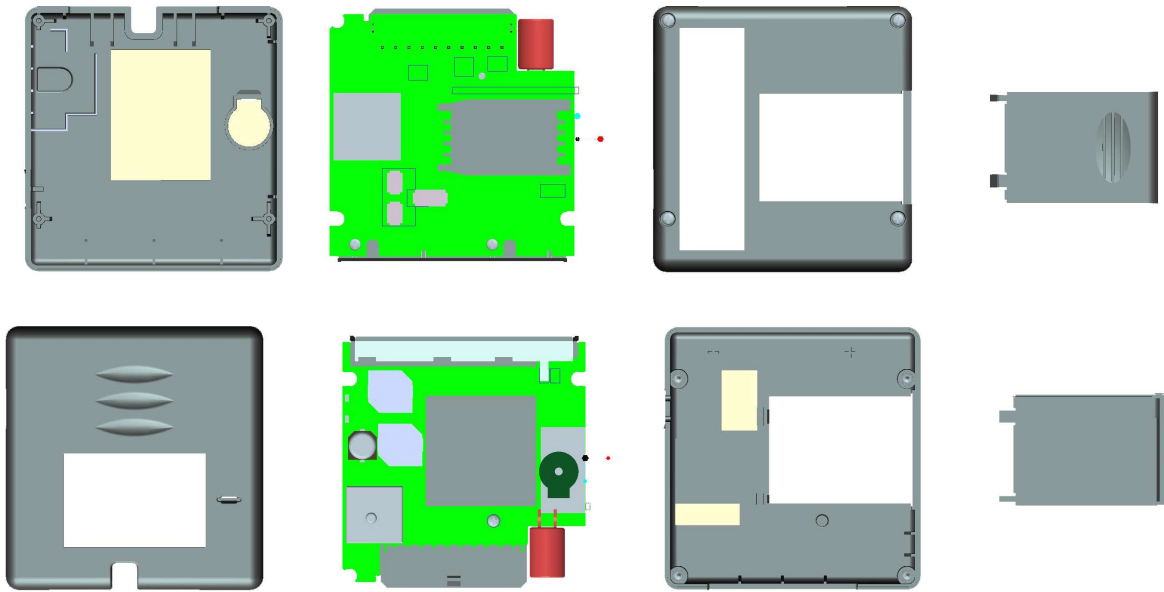
Figure 1.1.2: Exploded views

– Product label:

- IMEI: wireless module IMEI number

- serial Number: SN#MT-01<hardware version (2 digits)><lot number (2 digits)>-<production date (yymmdd)>-<unit number (4 digits)>

Figure 1.1.3: Label

1.2 Environmental

– ETSI compliant: -20 to +55℃

– Operating temperature: -30 to +80℃

– Storage: -40 to +85℃

– Shock & Vibration: SAE J1211 compliant

1.3 Power supply

– Supply voltage range: 6 to 32V DC

– Current consumption during idle: 35mA - typical at 12V DC

– Current consumption during transmission: 78mA - typical at 12V DC

– Current consumption during power saving: 20mA - typical at 12V DC

– Rated current: 650mA (peak value)

1.4 GSM / GPRS

– GSM/GPRS engine: Sierra Wireless branded Wireless Microprocessor, part number - WMP100Rx (approved by AT&T; CE, PTCRB and FCC certified)

– 64Mb memory (6MB flash memory for embedded application; 2MB RAM)

– Frequency band: 850/1900/900/1800MHz

– Built-in GSM antenna: quad band

– SIM card interface: 1.8/3.0V

– SIM card holder: Flip type; SIM card is accessible from outside after removing a plastic lid

1.5 Communication with back-end

– Configuration by SMS or GPRS

– Configuration acknowledgment by SMS

– Communication with back-end (reports, alarms, replies) by SMS, TCP or UDP connection over GPRS

1.6 GPS

– GPS engine: Maestro GPS Receiver A2100-A SiRF StarIV based

– Built-in active antenna with LNA:

Characteristic	Specification
Center Frequency	1575.42±1.023 MHz
Gain	13.5±2 dBic
Polarization	RHCP
Input Voltage	3.0V typ.
Current Consumption	4.2mA typ.

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– GPS Characteristics:

Channels	48, parallel tracking	
Correlators	~ 400,000	
Frequency	L1 (= 1,575 MHz)	
Tracking Sensitivity	-163 dBm	
Horizontal Position Accuracy	Stand alone	< 2.5 m CEP (SA off)
Time To First Fix – TTFF (theoretical minimum values; values in real world may differ)	Obscuration recovery	0.1s
	Hot start	< 1s
	Warm	< 32s
	Cold	< 35s

– Support of Extended Ephemeris download from Maestro Wireless Solutions servers

1.7   Status indicator

– One red color LED indicating GPS position fix:

  1. Off when GPS module is not working.
  2. Blinking lit when GPS is looking for satellite.
  3. Solid lit when GPS has a fix (i.e. location is correct).

– One green color LED indicating GSM registration

  1. Off when MicroTracker is not powered.
  2. Blinking lit when the Cellular network is registering.
  3. Solid lit when Cellular network is registered.

1.8   Electrical interface

– 10-pin connector

– Connection for:

  • Power supply (from vehicle battery)
  • Primary digital output for driving external relay (to cut the ignition key starter)
  • Secondary digital output for driving additional relay or LED, etc...
  • Primary digital input for ignition detection, active between 6 to 32Vdc
  • Secondary digital input (reserved), active between 6 to 32Vdc
  • Analog input for sensor reading, maximum absolute rating 5V, 20mA

– All digital inputs and digital outputs are opto-isolated and all interfaces are ESD protected.

1.9   Service port

– Accessible from outside only after removing a plastic lid

– Serial port at logic 2.8V TTL level (UART) + other electrical test points

– Using external RS232 transceiver for connection to a computer for diagnostic and factory settings, Maestro Wireless Solutions can provide that accessory (See section 2.4 on page 20)

1.10   Functions & features

– Immediate on-request reporting of vehicle status (position, speed, mileage, ignition status, GSM RSSI. . .)

– Periodic reporting of vehicle status (time and/or distance based)

– SMS number screening

– Disable or enable starter motor on-request

– Alert messages for over-speed, geofence crossed, main battery connect/disconnect, ignition on/off, direction change, mileage exceed. . .

– Accept configuration (IP address, port number, APN,. . .) & threshold settings from server

– Over The Air embedded software update

1.11   Power saving design

– The device is able to enter deep sleep mode, driven by digital input (i.e. vehicle ignition signal), to achieve low power consumption. Other reduced power operating modes also available.

1.12   Compliance

– FCC Part 15B, 22H & 24E certification

– PTCRB certification

– CE (R&TTE directive)

– e mark

– ROHS

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Chapter 2

Optional accessories

2.1 Wire harness (MT-CA01)

Figure 2.1.1: Wire harness

2.1.1 Specifications

– 10 pins Molex connector

– ATO Fuse holder with glass fuse on the cable

– Relay socket

– Relay

– Length: 1m

2.1.2 10-pin connector assignment

Number	Name	I/O	Description	Color	Remark
1	BAT+	I	Battery backup power	red	
2	BAT-		Battery backup ground	black	
3	PWR	I	Main power input	red	DC 6-32V
4	GND		Main ground	black	
5	OUT1	O	Output to drive the relay - Disabling the starter	green	250mA max. sink current
6	DIN1	I	Digital input - Use for the ignition sense	white	Active > 6V, max. 32V
7	DIN2	I	Digital input 2	yellow	Active > 6V, max. 32V
8	OUT2	O	Digital output 2	blue	250mA max. sink current
9	ADC+	I	Analog input	purple	max. 5V, 20mA
10	ADC-		Analog input ground reference	black	

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2.1.3 Standard wiring diagram
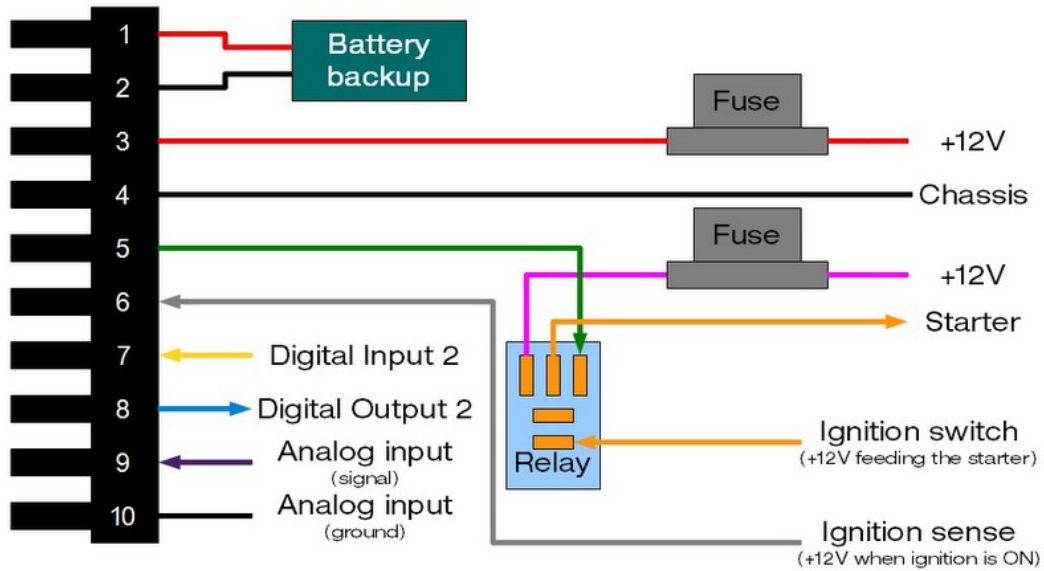
Figure 2.1.2: Simplified wiring diagram

2.2 Relay (MT-OTH01)

CM1-12V Automotive micro-iso relay from NAIS. Rated: 35A, 100000 operations. For more details please refer to NAIS datasheet.

2.3 External back up battery (MT-OTH02)
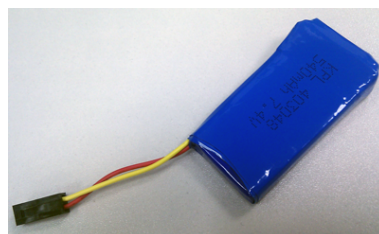
Figure 2.3.1: Battery backup

The back-up battery is designed as an optional add-on module and plugs directly on the wire harness. It embeds its own charging circuit, a two cells Lithium Polymer battery and protection circuits in a single housing.

In case the main power supply becomes unavailable, the MicroTracker will immediately switch to the back-up battery as its power source. An alert can be send to signal the disconnection of the main power source (which can happen in case of vehicle theft).

The battery can stand for around 5 hours of transmission, more than 2 days in power saving mode.

2.3.1   Specifications

- Dimension: 11x32x65.5mm

- Voltage: 7.4V Li-Po battery

- Capacity: 540mAh

- Connector: 2-pin Molex

- Package: fiber glass

- Embedded charge circuit: will requires at least 8 hours of charge

- Operation Temperature Range:

  - Humidity: 60±25%RH
  - Charge: 0~45℃
  - Discharge: -20~60℃

- Storage Temperature Range

  - Humidity: 60±25%RH
  - Less than 1 year: -20~25℃
  - Less than 3 months: -20~40℃
  - 1 Week: -20~60℃

2.3.2   /!\ Warning

The backup battery has been custom made, it includes a protection and charging circuit. Don't try to use any third-party battery on the wire harness connector.

2.3.3   Usage attentions

Storage

- The Li-ion battery pack should be stored in a cool, dry and well-ventilated area, and should be far from fire and high temperature.

- Best storage temperature is between 0 to 25℃. with 60±25% of relative humidity.

Transportation

- Do not mix the battery products with other merchandises.

- Do not immerse the battery products in water or allow it to get wet.

- Do no stack more than 7 batteries.

- The highest temperature in transportation is lower than 65℃.

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Handling

- – Do not expose to, dispose of the battery in fire.

- – Do not put the battery in a charger or equipment with wrong terminals connected.

- – Avoid shorting the battery

- – Avoid excessive physical shock or vibration.

- – Do not disassemble or deform the battery.

- – Do not immerse in water.

- – Do not use the battery mixed with other different make, type, or model batteries.

- – Keep out of the reach of children.

Disposal

Regulations vary for different countries. Dispose in accordance with local regulations.

2.4 Serial Port Adapter (MT-OTH03)
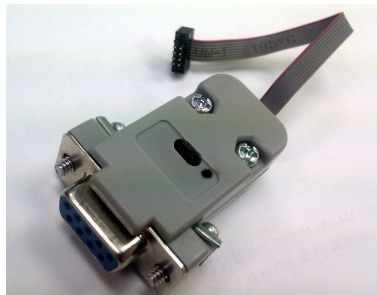
Figure 2.4.1: Serial adapter

The serial port adapter is a RS232 transceiver, a boot mode enabler switch, and a 8-pin UART connector cable in one package. It is used to update, debug and test the MicroTracker using AT commands.

- – Handle with care!

- – Red wire to direct toward the arrow drawn on PCB.

- – Switch to enable boot mode download.

Chapter 3

Do and Do not

3.1 DO

– Plug the wire harness on the fuse box of the car, using the battery 12V or 24V to power the unit.

– Put the MicroTracker under the dash board facing up, to let the GPS see the sky.

– Go to a clear sky view area to first test the MicroTracker, as the GPS might have never got a fix before.

– Setup periodic report when ignition is on, and move the tracker driving the car it is installed in. You will be able to see good report position following your track.

– Always wait for the SMS acknowledgment of each configuration command before sending a new configuration command.

3.2 DO NOT

– Put the MicroTracker facing down. It will adversely affect the GPS signal reception if the antenna is not directed to the sky.

– Restart, reconfigure the unit all the time, if the MicroTracker cannot get a good GPS fix, please wait, first fix can take several minutes.

– Setup heartbeat reports every 30sec, and leave the MicroTracker not moving. If it is the case you will see a constellation of point around your position and that will not reflect the true quality of the GPS receiver. Heartbeat report is here to enable periodic health check report, to ensure the MicroTracker is well connected to the platform and still running well.

– Send all the configurations commands in a row without waiting for the SMS acknowledgment.

– Use the serial connection for anything else than debug or device preparation.

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Chapter 4

Step by Step - Quick Start Guide

4.1 First installation

1. Install the wire harness in the car, follow Section 2.1.3 on page 18 instructions. The minimal setup consists of only connecting the red and black power supply wires. DO NOT connect the Micro Tracker to the wire harness yet.

2. Insert the SIM card in the SIM card holder, ensure that the holder is well closed and slide in lock position before you put back the plastic lid.

3. Note down the IMEI and SIM card phone number for future reference, it will help for configuring the tracker.

4. Plug the tracker on the wire harness.

5. Wait a few seconds, and verify the LED status, C (Cellular) green LED should be solid lit, G (GPS) red LED should be blinking, or solid lit.

    Note: All configuration commands have to be sent to the MicroTracker by SMS.

6. Send configuration command, the first command to be set is the **SG106** to setup the server address, APN, and the phone number to receive the MicroTracker SMS reply. Please refer to Section 5.2.1 on page 28 for details.

7. Setup alert report (Section 5.2.2 on page 35), one which can be checked and set up easily (for testing and evaluation) is the automatic time-based reporting, for example every 60 seconds : **SG208,60,0**

8. Put the tracker under the sky (follow instructions on the tracker casing), verify that the G red LED goes solid. You can now connect to the `m2mgateway.net` website.

9. Please contact Maestro Wireless Solutions to get access credentials for the `m2mgateway.net` website if necessary (provide the IMEI number of the tracker) to obtain login information

10. Connect to the platform using your credentials, and check your reports online.

4.2 Run a test in your car

1. After having checked that you can get heartbeat report with your unit on the `m2mgateway.net` platform, you might want to test all the alert features of the MicroTracker. For that you will have to switch on some alert reporting.

2. Do so using SG211 command (Section 5.2.2 on page 36), for example:
   SG211,10,1,14400,1,0,40,40,10,0,600,1,28800,1,600,1,TEST#1,

3. Setup the ignition as required (Section 5.2.1 on page 28), for example, if you plug the white wire on the car starter: **SG104,1**

4. Go for a ride outside, check when you first go out that the G red led is solid, and have a safe trip.

5. Back on the website, log on the `m2mgateway.net` platform, and check your trip on the map.

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Chapter 5

Software Manual

5.1   Introduction

5.1.1   Overview

This chapter defines:

- – The syntax of the commands to set the unit, the corresponding responses and the data format of reports.
- – The list of commands alerts and reports.
- – Explanations of the software algorithms.
- – Step by step instructions for OTA software update.

5.1.2   Which build ?

Software version: 2.6.4

Filename: MT02_V264_R7451_WMP100_310512.dwl

Filename format: <Product_Application version_Firmware version_Module_Date>.dwl

5.1.3   Behavior

- – When connection mode is 24x7 the tracker will send keep alive packet regularly to the server. Keep alive packet format is **@<IMEI>!**, server has to acknowledge the packet received by sending **@<IMEI>,OK!**.
- – If GPRS is not available, if TCP link is broken:
  - • MicroTracker will retries TCP connection to server up to 5 times.
  - • if failed will retries GPRS registration up to 5 times.
  - • if failed MicroTracker will reboot (It should take a minimum of 20min).
- – If no acknowledgment is received from server (in 24x7 mode) the MicroTracker may reboot to ensure it is not lock up.
- – If DOTA failed, MicroTracker will recover on its old application and restart as previously setup.
- – After sending the following commands MicroTracker will reboot after 5sec, if no backup data are needed to be sent:
  - • SG102
  - • SG103

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- SG106

- SG105

- SG211

- SG501

- SG502

- After configuring the MicroTracker please reboot it to ensure that the settings are saved and reloaded properly in the application.

- Size of packet sent over GPRS:

  - TCP open/close: 60bytes.

  - TCP packet (report or keep alive): 204bytes.

  - UDP packet: 192 bytes.

- Raw report size is 150bytes.

5.1.4   Acronym use in this document

<ID> will always refer to the IMEI number of the unit. It is used in all reports.

5.2   Server originated commands

5.2.1   Configuration commands

SG101: Set server SMS number

Command (TCP24x7 or SMS): SG101,<SVN>

Serial command: AT+SG101=<SVN>

Response: @<ID>,101,<SVN>!

- Where <SVN> is server's SMS number with ISD code; maximum 24 digits in this number are allowed.

It is recommended that this is the first command to send when setting up the unit (although it can be replaced by the more versatile SG106).

After the unit receives a valid number inside this command, this number will be stored in the non-volatile Flash memory. The unit will then accept SMS originated from any number and will report to <SVN>.

If the <SVN> field is not filled, the unit will not handle SMS.

Example: Need to configure SMS reply number +85253988578.

Command: SG101,+85253988578

Response: @352238020015913,101,+85253988578!

SG102: Set user name, password, APN

Command (TCP24x7 or SMS): SG102,<UN>,<PW>,<APN>

Serial command: AT+SG102=<UN>,<PW>,<APN>

Response: @<ID>,102,<UN>,<PW>,<APN>!

- – Where <UN> is GPRS user name (max. 29 characters).
- – Where <PW> is GPRS password (max. 29 characters).
- – Where <APN> is the Access Point Name (max. 79 characters).

GPRS will be activated only if APN is correctly set. In some case, password and user name are necessary. All of these are provided by the network operator. Upon receiving this command, the settings are stored in flash memory and the unit will reboot once.

Example: User name & password are not required. The APN is "internet".

Command: SG102,,,internet

Response: @352238020015913,102,,,internet!

SG103: Set port, IP address and protocol

Command (TCP24x7 or SMS): SG103,<PORT>,<IPA>,<UT>,<CONNECTION_MODE>

Serial command: AT+SG103=<PORT>,<IPA>,<UT>,<CONNECTION_MODE>

Response: @<ID>,103,<PORT>,<IPA>,<UT>,<CONNECTION_MODE>!

- – Where <PORT> is a port number between 0 to 65535.
- – Where <IPA> is the server's IP address or DNS (max. 79 characters).
- – Where <UT> is the communication protocol:
  - • <UT> = 1 for TCP.
  - • <UT> = 2 for UDP.
  - • <UT> = 3 for UDP with acknowledge.
  - • <UT> = 4 for SMS.
- – Where <CONNECTION_MODE> is the mode of connection over GPRS:
  - • <CONNECTION_MODE> = 0 for connection on demand.
  - • <CONNECTION_MODE> = 1 for 24x7 connection with GPRS commands activated. When connection mode is 24x7 the tracker will send keep alive packet regularly to the server. Keep alive packet format is **@<IMEI>!**, server has to acknowledge the packet received by sending **@<IMEI>,OK!**.

These are the settings of the back-end server. It is necessary to change them when you decide to use your own back-end server instead of the `m2mgateway.net` evaluation page. These settings are automatically stored in flash memory.

Example: Need to configure TCP server for report on port 60000.

Command: SG103,6000,61.93.240.149,1,0

Response: @352238020015913,103,60000,61.93.240.149,1,0!

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SG104: Select wired ignition or virtual ignition types

Command (TCP24x7 or SMS): SG104,<IG_TYPE>

Serial command: AT+SG104=<IG_TYPE>

Response: @<ID>,104,<IG_TYPE>!

- Where <IG_TYPE> is the choice of ignition type:
  - 1 = Wired ignition.
  - 2 = Virtual ignition (measure car battery voltage).
  - 3 = Virtual ignition (unit in motion detected by GPS speed).

Virtual ignition is a mechanism employed for detecting that the vehicle's motor is turned off if you can not sense the ignition signal directly. Battery voltage based virtual ignition is divided into three profiles called segments (<10V: backup battery; 10-18V: car; >18V: truck). During power up, the unit will check the voltage level and choose the good segment. Voltage threshold for car is set to 13.8V and for truck is set to 25.5V. If you want to change the threshold level, use the SG555 command.

Default setting: <IG_TYPE> = 1.

Example: You are using wired ignition (no virtual ignition).

Command: SG104,1

Response: @352238020015913,104,1!

SG105: Set FTP directory & FTP server login for DOTA

Command (TCP24x7 or SMS): SG105,<DIR>,<FTPUN>,<FTPPW>,<FTPIPA>

Serial command: AT+SG105=<DIR>,<FTPUN>,<FTPPW>,<FTPIPA>

Response: @<ID>,105,<DIR>,<FTPUN>,<FTPPW>,<FTPIPA>!

- Where <DIR> is the directory where the FTP server keeps the file for DOTA.
- Where <FTPUN> is FTP server's login user name (max. 29 characters).
- Where <FTPPW> is FTP server's login password (max. 29 characters).
- Where <FTPIPA> is FTP server's IP address or DNS (max. 79 characters).

Example: Need to configure FTP server for DOTA update, in the directory /mt-02/ on m2mgateway.net.

Command: SG105,/mt-02/,maestro,dota,ftp.m2mgateway.net

Response: @352238020015913,105,/mt-02/,maestro,dota,ftp.m2mgateway.net!

SG106: Set port, IP address, user name, password, APN, SMS number, and protocol

Command (TCP24x7 or SMS): SG106,<PORT>,<IPA>,<UN>,<PW>,<APN>,<SVN>,<UT>,<CONNECTION_MODE>

Serial command: AT+SG106=<PORT>,<IPA>,<UN>,<PW>,<APN>,<SVN>,<UT>,<CONNECTION_MODE>

Response: @<ID>,106,<PORT>,<IPA>,<UN>,<PW>,<APN>,<SVN>,<UT>,<CONNECTION_MODE>!

- – Where <PORT> is port number between 0 to 65535.

- – Where <IPA> is server's IP address (max. 79 characters).

- – Where <UN> is user name (max. 29 characters).

- – Where <PW> is password (max. 29 characters).

- – Where <APN> is Access Point Name (max. 79 characters).

- – Where <SVN> is server's SMS number with ISD code (max. 24 digits).

- – Where <UT> is choice of protocol:

    - • <UT> = 1 for TCP.
    - • <UT> = 2 for UDP.
    - • <UT> = 3 for UDP with acknowledge.
    - • <UT> = 4 for SMS.

- – Where <CONNECTION_MODE> is the mode of connection over GPRS:

    - • <CONNECTION_MODE> = 0 for connection on demand.
    - • <CONNECTION_MODE> = 1 for 24x7 connection with GPRS commands activated. When connection mode is 24x7 the tracker will send keep alive packet regularly to the server. Keep alive packet format is **@<IMEI>!**, server has to acknowledge the packet received by sending **@<IMEI>,OK!**.

This command is to setup all the basic setup in one; it uses same parameters as the aforementioned ones.

Example: Need to configure TCP server for report & SMS reply number & APN.

Command: SG106,60000,61.93.240.149,,,internet,+85253988578,1,0

Response: @352238020015913,106,60000,61.93.240.149,,,internet,+85253988578,1,0!

SG107: Set port, IP address, for backup server connection

Command (TCP24x7 or SMS): SG107,<BACK_PORT>,<BACK_IPA>

Serial command: AT+SG107=<BACK_PORT>,<BACK_IPA>

Response: @<ID>,107,<BACK_PORT>,<BACK_IPA>!

- – Where <BACK_PORT> is port number between 0 to 65535.

- – Where <BACK_IPA> is server's IP address (max. 79 characters).

This command is to setup connection information of the backup server. MicroTracker will connect to backup server if primary link fails.

Example: Configure backup server on demo.maestro-wireless.com

Command: SG107,60000,61.93.240.149

Response: @352238020015913,107,60000,61.93.240.149!

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SG131: Query device firmware revision

Command (TCP24x7 or SMS): SG131

Serial command: AT+SG131

Response: @<ID>,131,<AFW>,<PF>!

- – Where <AFW> is the version number of the application firmware.

- – Where <PF> is the profile name.

Example:

Command: SG131

Response: @352238020015913,131,280212Ver2.61,M2MGTW!

SG132: Query connection settings

Command (TCP24x7 or SMS): SG132

Serial command: AT+SG132

Response: @<ID>,132,<IPA>,<PORT>,<CONNECTION_MODE>,<UN>,<PW>,<APN>,<SVN>,<BACK_IPA>, <BACK_PORT>,<UT>!

- – Where <IPA> is the server's IP address.

- – Where <PORT> is the server's port number.

- – Where <CONNECTION_MODE> is the mode of connection over GPRS:

  - • <CONNECTION_MODE> = 0 for connection on demand.
  - • <CONNECTION_MODE> = 1 for 24x7 connection with GPRS commands activated. When connection mode is 24x7 the tracker will send keep alive packet regularly to the server. Keep alive packet format is **@<IMEI>!**, server has to acknowledge the packet received by sending **@<IMEI>,OK!**.

- – Where <UN> is user name.

- – Where <PW> is password.

- – Where <APN> is access point name (APN).

- – Where <SVN> is server's SMS number.

- – Where <BACK_IPA> is the backup server's IP address.

- – Where <BACK_PORT> is the backup server's port number.

- – Where <UT> is choice of protocol:

  - • <UT> = 1 for TCP.
  - • <UT> = 2 for UDP.
  - • <UT> = 3 for UDP with acknowledge.
  - • <UT> = 4 for SMS.

Upon receiving this command, the unit will reply the current value of the parameters.

Example:

Command: SG132

Response: @352238020015913,132,60000,61.93.240.149,,,internet,+85253988578,1,60000,61.93.240.149,0!

SG133: Query FTP settings

Command (TCP24x7 or SMS): SG133

Serial command: AT+SG133

Response: @<ID>,133,<DIR>,<UN2>,<PW2>,<IPA2>!

– Where <DIR> is the directory where the FTP server keeps the file for DOTA.

– Where <UN2> is FTP server's login user name.

– Where <PW2> is FTP server's login password.

– Where <IPA2> is FTP server's IP address.

Example:

Command: SG133

Response: @352238020015913,133,/mt-02/,maestro,dota,61.93.240.149!

5.2.2 Commands for setting interval/threshold of report/alert

SG201: Set ignition ON periodic location reporting & alert

Command (TCP24x7 or SMS): SG201,<INT_ON>,<ALT_ON>

Serial command: AT+SG201=<INT_ON>,<ALT_ON>

Response: @<ID>,201,<INT_ON>,<ALT_ON>!

– Where <INT_ON> is the interval in **seconds** between each successive location reporting when ignition is ON. If it is set to any value **between 10 and 65000 with increment of 10**, then periodic location reporting will be enabled with reporting interval as the value set. If value set to 0, then periodic location reporting will be disabled.

For the format of this periodic location reporting, please refer to event number 702 (wired ignition) and 703 (virtual ignition) described in chapter 6.

– Where <ALT_ON> is to enable / disable alert message, which is triggered by an ignition ON:

  • 0 = disable.

  • 1 = enable.

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For the format of this alert message, please refer to event number 611 (wired ignition) and 612 (virtual ignition) described in chapter 6.

Default setting: <INT_ON> = 0, <ALT_ON> = 0

Example: Set alert of Ignition ON and report every minute.

Command: SG201,60,1

Response: @352238020015913,201,60,1!

SG202: Set ignition OFF periodic location reporting & alert

Command (TCP24x7 or SMS): SG202,<INT_OFF>,<ALT_OFF>

Serial command: AT+SG202=<INT_OFF>,<ALT_OFF>

Response: @<ID>,202,<INT_OFF>,<ALT_OFF>!

- Where <INT_OFF> is the interval in **seconds** between each successive location reporting when ignition is OFF. If it is set to any value between **10 and 65000 with increment of 10**, then periodic location reporting will be enabled with reporting interval as the value set. If value set to 0, then periodic location reporting will be disabled.

For the format of this periodic location reporting, please refer to event number 705 (wired ignition) and 706 (virtual ignition) described in chapter 6.

- Where <ALT_OFF> is to enable / disable alert message which is triggered by an ignition OFF:

  - 0 = disable.
  - 1 = enable.

For the format of this alert message, please refer to event number 614 (wired ignition) and 615 (virtual ignition) described in chapter 6.

Default setting: <INT_OFF> = 0, <ALT_OFF> = 0

Example: Set alert of Ignition OFF and report every hour

Command: SG202,3600,1

Response: @352238020015913,202,3600,1!

SG203: Set direction change threshold

Command (TCP24x7 or SMS): SG203,<TH_DC>

Serial command: AT+SG203=<TH_DC>

Response: @<ID>,203,<TH_DC>!

- Where <TH_DC> is the threshold of direction change in **degree** if exceeded will trigger an alert message. The value is to be set **between 10 and 180 with increment of 5**. If value set to 0, then this alert message will be disabled.

For the format of this alert message, please refer to event number 605 described in chapter 6.

This feature will function only if the GPS signal is available and the unit is in motion.

Default setting: <TH_DC> = 0

Example: Set alert report of 90 degrees threshold.

Command: SG203,90

Response: @352238020015913,203,90!

SG204: Set speed threshold

Command (TCP24x7 or SMS): SG204,<TH_SP>,<ON_PER>

Serial command: AT+SG204=<TH_SP>,<ON_PER>

Response: @<ID>,204,<TH_SP>,<ON_PER>!

- – Where <TH_SP> is the threshold of speed in **mph** if exceeded more than 15 seconds will trigger an alert message. The event will be reset when speed is 15mph below the threshold. The value is to be set **between 20 and 150 with increment of 5**. If value set to 0, then this alert message will be disabled.

- – Where <ON_PER> is the 10 seconds periodic report when speed threshold is reached:

    - 1 to activate the 10 seconds periodic report.
    - 0 to deactivate the 10 seconds periodic report.

For the format of this alert message, please refer to event number 606 and 708 described in chapter 6.

This feature will function only if the GPS signal is available.

Default setting: <TH_SP> = 0, <ON_PER> = 0

Example: Set alert report of 75 mph threshold and no periodic report.

Command: SG204,75,0

Response: @352238020015913,204,75,0!

SG205: Set Mileage Threshold

Command (TCP24x7 or SMS): SG205,<TH_MI>

Serial command: AT+SG205=<TH_MI>

Response: @<ID>,205,<TH_MI>!

- – Where <TH_MI> is the threshold of distance travel in **miles** if exceeded will trigger an alert message. The value is to be set **between 10 and 65000 with increment of 5**. If value set to 0, then this alert message will be disabled. An alert is when multiple of the set threshold is reached. When the mileage accumulates up to 65000, it goes back to zero, at this point, an alert is sent also. This alert can be used for distance-based reporting.

For the format of this alert message, please refer to event number 607 described in chapter 6.

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Default setting: <TH_MI> = 0

Example: Set alert report of 600 miles threshold.

Command: SG205,600

Response: @352238020015913,205,600!

SG206: Set low battery detection

Command (TCP24x7 or SMS): SG206,<TH_BAT>,<PS>

Serial command: AT+SG206=<TH_BAT>,<PS>

Response: @<ID>,206,<TH_BAT>,<PS>!

- Where <TH_BAT> is main battery voltage threshold, in volt.

- Where <PS> is the MicroTracker power saving mode. Please refer to the Annex 7.3 on page 59 for more details on power saving.

For the format of this alert message, please refer to event number 608 described in chapter 6.

Default setting: <TH_BAT> = 0, <PS> = 0

Example: Set low battery detection to 10V and power saving mode on.

Command: SG206,10,1

Response: @352238020015913,206,10,1!

SG207: Set battery disconnect detection

Command (TCP24x7 or SMS): SG207,<INT_MB>,<ALT_MB>

Serial command: AT+SG207=<INT_MB>,<ALT_MB>

Response: @<ID>,207,<INT_MB>,<ALT_MB>!

- Where <INT_MB> is the periodic report interval in **seconds**. If it is set to any value between **10 and 65000 with increment of 10**, then periodic location reporting will be enabled with reporting interval as the value set. If value set to 0, then periodic location reporting will be disabled.

- Where <ALT_MB> is to enable/disable alert message which is triggered by battery disjunction.

For the format of this alert message, please refer to event number 609 (battery disconnected) and 610 (battery reconnected) described in chapter 6. For the format of the periodic report, please refer to event number 707 described in chapter 6.

Default setting: <INT_MB> = 0, <ALT_MB> = 0

Example: Set battery disconnection alert and report every 15min.

Command: SG207,900,1

Response: @352238020015913,207,900,1!

SG208: Set Heartbeat reporting / Power up alert

Command (TCP24x7 or SMS): SG208,<INT_HB>,<ALT_PU>

Serial command: AT+SG208=<INT_HB>,<ALT_PU>

Response: @<ID>,208,<INT_HB>,<ALT_PU>!

- Where <INT_HB> is the interval in **seconds** between each successive heartbeat location reporting. If it is set to any value **between 10 and 65000 with increment of 10**, then heartbeat location reporting will be enabled with reporting interval as the value set. If value set to 0, then periodic location reporting will be disabled. For the format of this periodic location reporting, please refer to event number 701 described in chapter 6.

- Where <ALT_PU> is to enable / disable alert message which is triggered by a power-up:

  - 0 = disable.
  - 1 = enable.

For the format of this alert message, please refer to event number 601 described in chapter 6.

Default setting: <INT_HB> = 0, <ALT_PU> = 0

Example: Set power up alert and heartbeat every hour.

Command: SG208,3600,1

Response: @352238020015913,208,3600,1!

SG209: Set idle alert period

Command (TCP24x7 or SMS): SG209,<IDT>

Serial command: AT+SG209=<IDT>

Response: @<ID>,209,<IDT>!

Idle means your car engine is running and your car is not moving.

- Where <IDT> is the threshold idle time in **seconds**, if exceeded will trigger an alert message. The value is to be set **between 10 and 65000 with increment of 10**. If value set to 0, then this alert message will be disabled.

For the format of this alert message, please refer to event number 616 described in chapter 6.

This feature will function only when ignition type is set at 1 (no virtual ignition) This feature will function only if the GPS signal is available.

Default setting: <IDT> = 0

Example: Set idle time report to 30min.

Command: SG209,1800

Response: @352238020015913,209,1800!

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SG210: Set tow alert

Command (TCP24x7 or SMS): SG210,<TOW>

Serial command: AT+SG210=<TOW>

Response: @<ID>,210,<TOW>!

Tow means your car engine is not running, but your car is moving.

– Where <TOW> is for controlling the detection of tow:

  • 0 = disable tow alert.
  • 1 = enable tow alert.

For the format of this alert message, please refer to event number 617 (tow detected) and 618 (tow stopped) described in chapter 6.

This feature will function only when ignition type is set at 1 This feature will function only if the GPS signal is available.

Default setting: <TW> = 0

Example: Set tow alert.

Command: SG210,1

Response: @352238020015913,210,1!

SG211: Sets commands from SG201 to SG210 in one, with profile name

Command (TCP24x7 or SMS):
SG211,<INT_ON>,<ALT_ON>,<INT_OFF>,<ALT_OFF>,<TH_DC>,<TH_SP>,<TH_MI>,<TH_BAT>,
<PS>,<INT_MB>,<ALT_MB>,<INT_HB>,<ALT_PU>,<IDT>,<TOW>,<PF>,

Response: @<ID>,211,<INT_ON>,<ALT_ON>,<INT_OFF>,<ALT_OFF>,<TH_DC>,<TH_SP>,<TH_MI>,
<TH_BAT>,<PS>,<INT_MB>,<ALT_MB>,<INT_HB>,<ALT_PU>,<IDT>,<TOW>,<PF>,!

– Where <INT_ON> & <ALT_ON> are ignition ON reporting & alert settings.

– Where <INT_OFF> & <ALT_OFF> are ignition OFF reporting & alert settings.

– Where <TH_DC> is threshold of direction change.

– Where <TH_SP> is threshold of speed.

– Where <TH_MI> is threshold of mileage.

– Where <TH_BAT> is threshold of battery disconnected.

– Where <PS> is the power saving mode of GPS.

– Where <INT_MB> is the interval of battery disjunction.

– Where <ALT_MB> is the alert of battery disjunction.

– Where <INT_HB> is the interval of heartbeat location reporting.

- Where <ALT_PU> is to enable/disable Power Up alert.

- Where <IDT> is the threshold idle time.

- Where <TOW> is for controlling the detection of tow.

- Where <PF> is the profile name (max. 10 char).

Upon receiving this command, the settings are stored in Flash memory and the unit will reboot once.

Example: Set all alerts ON, periodic report OFF and name this profile FIRSTSET.

Command: SG211,0,1,0,1,0,0,0,0,0,1,0,1,0,1,0,0,FIRSTSET,

Response: @352238020015913,211,0,1,0,1,0,0,0,0,0,1,0,1,0,1,0,0,FIRSTSET,!

SG212: Alert at a specific time of the day

Command (TCP24x7 or SMS): SG212,<TIMEZONE>,<ALT_TIME>

Serial command: AT+SG212=<TIMEZONE>,<ALT_TIME>

Response: @<ID>,212,<TIMEZONE>,<ALT_TIME>!

An alert will be sent everyday at a specific time.

- Where <TIMEZONE> specifies the UTC timezone from -12:00 to +12:00 in 24h format +/-HH:MM.

- Where <ALT_TIME> is the time of the day in 24h format +/-HH:MM.

For the format of this alert message, please refer to event number 624 described in chapter 6.

Default: <TIMEZONE> = +00:00 , <ALT_TIME> = FF:FF

Example: Set an alert at 9AM in Hong Kong (UTC+8).

Command: SG212,+08:00,09:00

Response: @352238020015913,212,+08:00,09:00!

SG213: Alert when engine start outside working hours & possibility to cut the starter key.

Command (TCP24x7 or SMS):
SG213,<TIMEZONE>,<ALT_START>,<ALT_END>,<IG_CUT>,<WEEKDAYS>

Serial command: AT+SG213=<TIMEZONE>,<ALT_START>,<ALT_END>,<IG_CUT>,<WEEKDAYS>

Response: @<ID>,212,<TIMEZONE>,<ALT_START>,<ALT_END>,<IG_CUT>,<WEEKDAYS>!

An alert will be sent if ignition on is detected outside of working hours. Working hours defined by <ALT_START> and <ALT_END> time on days specified by <WEEKDAYS>. There is possibility to cut the relay outside the working hour period.

- Where <TIMEZONE> specifies the UTC timezone for -12:00 to +12:00 in 24h format +/-HH:MM.

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- Where <ALT_START> & <ALT_END> is the time in 24h format HH:MM.

- Where <IG_CUT> cut the starter outside of <ALT_START> & <ALT_END> times:

  - 1 to cut the starter (relay open),
  - 0 does nothing (relay close).

- Where <WEEKDAYS> is the days of the week coded on 8 binary bit,

  - MSB is always 0, Monday is the LSB on 8bits,
  - 1 is selected, 0 is not,
  - Example of a full week: 0111 1111,
  - Example of Monday only: 0000 0001.

For the format of this alert message, please refer to event number 625 described in chapter 6.

Example: Switch relay to open during Hong Kong night time (UTC+8), from 9PM to 6AM, from Monday to Friday.

Command: SG213,+08:00,06:00,21:00,1,00011111

Response: @352238020015913,213,+08:00,06:00,21:00,1,00011111!

SG231: Query current interval, alert and threshold settings

Command (TCP24x7 or SMS): SG231

Serial command: AT+SG231

Response: @<ID>,231,<INT_ON>,<ALT_ON>,<INT_OFF>,<ALT_OFF>,<TH_DC>,<TH_SP>,<TH_MI>, <TH_BAT>,<PS>,<INT_MB>,<ALT_MB>,<INT_HB>,<ALT_PU>,<BZ>,<IG_TYPE>,<IDT>,<TOW>,<PF>!

- Where <INT_ON> & <ALT_ON> are ignition ON reporting & alert settings.

- Where <INT_OFF> & <ALT_OFF> are ignition OFF reporting & alert settings.

- Where <TH_DC> is threshold of direction change.

- Where <TH_SP> is threshold of speed.

- Where <TH_MI> is threshold of mileage.

- Where <TH_BAT> is threshold of battery disconnected.

- Where <PS> is the power saving mode of GPS.

- Where <INT_MB> is the interval of battery disjunction.

- Where <ALT_MB> is the alert of battery disjunction.

- Where <INT_HB> is the interval of heartbeat location reporting.

- Where <ALT_PU> is to enable/disable Power Up alert.

- Where <BZ> is to enable/disable buzzer.

- Where <IG_TYPE> is the choice of ignition type.

- Where <IDT> is the threshold idle time.

- – Where <TOW> is for controlling the detection of tow.
- – Where <PF> is the profile name.

Example:

Command: SG231

Response: @352238020015913,231,0,0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,FGT!

5.2.3 Commands for setting up geofence

SG301: Add rectangular geofence to device memory

Command (TCP24x7 or SMS): SG301,<IDX>,<MODE>,<TL_LAT>,<TL_LON>,<BR_LAT>,<BR_LON>

Serial command: AT+SG301=<IDX>,<MODE>,<TL_LAT>,<TL_LON>,<BR_LAT>,<BR_LON>

Response: @<ID>,301,<IDX>,<MODE>,<TL_LAT>,<TL_LON>,<BR_LAT>,<BR_LON>!

- – Where <IDX> is the index number 0 to 9 assigned to each geofence.
- – Where <MODE> is mode:
  - • 0 = disable geofence.
  - • 1 = trigger alert message when the unit moves out of geofence.
  - • 2 = trigger alert message when the unit moves into geofence.
  - • 3 = trigger alert message when the unit either moves in or out of geofence.
- – Where <TL_LAT> is the latitude of the top left corner (max 8 char, 0.00000).
- – Where <TL_LON> is the longitude of the top left corner (max 8 char, 0.00000).
- – Where <BR_LAT> is the latitude of the bottom right corner (max 8 char, 0.00000).
- – Where <BR_LON> is the longitude of the bottom right corner (max 8 char, 0.00000).

For the format of this alert message, please refer to event number 602 described in chapter 6.

The unit executes the cross-fence checking only if GPS signal is available.

Example: Rectangular geofence index 0 which trigger alert in or out with top left corner 45.5,85.1 and bottom right corner 27.1,105.6.

Command: SG301,0,3,45.5,85.1,27.1,105.6

Response: @352238020015913,301,0,3,45.5,85.1,27.1,105.6!

SG302: Set Circular region

Command (TCP24x7 or SMS): SG302,<IDX>,<MODE>,<C_LAT>,<C_LON>,<RA>

Serial command: AT+SG302=<IDX>,<MODE>,<C_LAT>,<C_LON>,<RA>

Response: @<ID>,302,<IDX>,<MODE>,<C_LAT>,<C_LON>,<RA>!

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- Where <IDX> is the index number 0 to 9 assigned to each geofence.
- Where <MODE> is mode:
  - 0 = disable geofence.
  - 1 = trigger alert message when the unit moves out of geofence.
  - 2 = trigger alert message when the unit moves into geofence.
  - 3 = trigger alert message when the unit either moves in or out of geofence.
- Where <C_LAT> is the latitude of center (max 8 char, 0.00000).
- Where <C_LON> is the longitude of center (max 8 char, 0.00000).
- Where <RA> is the radius (unit meter, minimum 40m, maximum 100km).

For the format of this alert message, please refer to event number 603 described in chapter 6.

The unit executes the cross-fence checking only if GPS signal is available.

Example: Circular geofence index 4 which trigger alert in with center 45.5,85.1 and 500m radius.

Command: SG302,4,2,45.5,85.1,500

Response: @352238020015913,302,4,2,45.5,85.1,500!

SG303: Set Polygon region

Command (TCP24x7 or SMS): SG303,<IDX>,<MODE>,<D_LAT1>,<D_LON1>,<D_LAT2>,<D_LON2>, <D_LAT3>,<D_LON3>,...,<D_LAT8>,<D_LON8>

Serial command: AT+SG303=<IDX>,<MODE>,<D_LAT1>,<D_LON1>,<D_LAT2>,<D_LON2>,<D_LAT3>, <D_LON3>,...,<D_LAT8>,<D_LON8>

Response: @<ID>,303,<IDX>,<MODE>!

- Where <IDX> is the index number 0 to 9 assigned to each geofence.
- Where <MODE> is mode:
  - 0 = disable geofence.
  - 1 = trigger alert message when the unit moves out of geofence.
  - 2 = trigger alert message when the unit moves into geofence.
  - 3 = trigger alert message when the unit either moves in or out of geofence.
- Where <D_LAT1> is the latitude of location dot 1 (max 8 char, 0.00000).
- Where <D_LON1> is the longitude of location dot 1 (max 8 char, 0.00000).

Note: maximum of 8 location points, please follow the order of drawing polygons, set the D_LATn and D_LONn.

For the format of this alert message, please refer to event number 604 described in chapter 6.

The unit executes the cross-fence checking only if GPS signal is available.

Example: Polygonal geofence index 6 which trigger alert out with points: 33,106; 23,118; 28,96.

Command: SG303,6,1,33,106,23,118,28,96

Response: @352238020015913,303,6,1,33,106,23,118,28,96!

SG331: Query geofence settings

Command (TCP24x7 or SMS): SG331,<IDX>

Serial command: AT+SG331=<IDX>

Response: @<ID>,331,<IDX>,<MODE>,<TL_LAT>,<TL_LON>,<BR_LAT>,<BR_LON>!

- Where <IDX> is the index number 0 to 9 assigned to each geofence.

- Where <MODE> is mode:

  - 0 = disable geofence.
  - 1 = trigger alert message when the unit moves out of geofence.
  - 2 = trigger alert message when the unit moves into geofence.
  - 3= trigger alert message when the unit either moves in or out of geofence.

- Where <TL_LAT> is the Latitude of the Top Left corner.

- Where <TL_LON> is the Longitude of the Top Left corner.

- Where <BR_LAT> is the Latitude of the Bottom Right corner.

- Where <BR_LON> is the Longitude of the Bottom Right corner.

Example: Query geofence index 4

Command: SG331,4

Response: @352238020015913,331,4,2,45.50000,85.10000,500!

SG351: Delete all geofences

Command (TCP24x7 or SMS): SG351

Serial command: AT+SG351

Response: @<ID>,351!

This will disable all geofence.

Example: Delete all the geofence in memory.

Command: SG351

Response: @352238020015913,351!

5.2.4   SMS number screening

You can enable SMS number screening to allow up to three numbers to send command to the unit. The main server SMS number will always be allowed to send command.

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SG401,1: Set SMS number and enable screening

Command (TCP24x7 or SMS): SG401,1,<SSN1>,<SSN2>,<SSN3>

Serial command: AT+SG401=1,<SSN1>,<SSN2>,<SSN3>

Response: @<ID>,401,1,<SSN1>,<SSN2>,<SSN3>!

– Where SSN is the phone number allow to send SMS to the unit.

Note: SSN1, SSN2, SSN3 are optional, that means you can type "SG401,1,,xxx," to change only the second number.
Note: If no change the <SSN>, you can use the "SG401,1,," to just enable it.

Example: Set SMS number screening +85253988578

Command: SG401,1,+85253988578,,

Response: @352238020015913,401,1,+85253988578,*,*!

SG401,2: Query SMS number screening list

Command (TCP24x7 or SMS): SG401,2

Serial command: AT+SG401=2

Response: @<ID>,401,2,<SSN1>,<SSN2>,<SSN3>!

Example: Query SMS number screening.

Command: SG401,2

Response: @352238020015913,401,2,+85253988578,*,*!

SG401,3: Remove the SMS number screening list

Command (TCP24x7 or SMS): SG401,3

Serial command: AT+SG401=3

Response: @<ID>,401,3!

Example: Remove SMS number screening list.

Command: SG401,3

Response: @352238020015913,401,3!

SG401,0: Disable screening

Command (TCP24x7 or SMS): SG401,0

Serial command: AT+SG401=0

Response: @<ID>,401,0!

Example: Disable SMS number screening.

Command: SG401,0

Response: @352238020015913,401,0!

5.2.5   General actions commands

SG501: Reset the tracker

Command (TCP24x7 or SMS): SG501

Serial command: AT+SG501

Response: @<ID>,501!

This will reset the entire tracker and revert back to all non-volatile parameters.

Example: One shot reboot.

Command: SG501

Response: @352238020015913,501!

SG502: Erase entire non-volatile memory

Command (TCP24x7 or SMS): SG502

Serial command: AT+SG502

Response: @<ID>,502!

This will erase all the non-volatile parameters saved in flash memory, including diagnostics values.

/!\ **Caution: This command force all the settings to factory default. The unit will then reboot once.**

Example: One shot reset and restore to factory configuration.

Command: SG502

Response: @352238020015913,502!

SG503: Update Firmware

Command (TCP24x7 or SMS): SG503,<FILE>

Response to indicate update start: @<ID>,503,1,<FILE>!

Response to confirm completion: @<ID>,503,2,<VER>,<PF>!

Response to inform of a download error: @<ID>,503,2,DOTA ERROR!

- – Where <FILE> is the file name.
- – Where <VER> is the firmware version.
- – Where <PF> is profile name.

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Example: Launch DOTA update.

Command: SG503,dotav261.dwl

Response: @352238020015913,503,1,dotav261.dwl!

Response after reboot on new version: @352238020015913,503,2,240512v2.6.3,M2MGTW!

SG531: Read and report vehicle position immediately

Command (TCP/UDP or SMS): SG531,<RSP>

Serial command: AT+SG531=0

Response: @<ID>,531,<PF>,<GPS>,<BV>,<RSSI>,<STARTER>,<IGNIT>,<D>,<T>, <LT>,<LN>,<AL>,<SP>,<DIR>, <SAT>,<HDOP>,<MI>!

- Where <RSP> is the means by which the response will be sent.

    - 0 = Serial port command
    - 1 = TCP/UDP/UDPwACK as configured.
    - 2 = SMS.

- Where <D> is the date (10 characters YYYY/MM/DD).

- Where <T> is the time (8 characters HH:MM:SS).

- Where <LT> is the latitude.

- Where <LN> is the longitude.

- Where <AL> is the altitude.

- Where <SP> is the speed (mph).

- Where <DIR> is the heading direction in degree.

- Where <SAT> is the number of satellites used for position fix.

- Where <HDOP> is the HDOP GPS accuracy value.

- Where <BV> is battery voltage.

- Where <GPS> is GPS status.

- Where <STARTER> is starter status.

    - 0 = Starter key is enabled.
    - 1 = Starter key is disabled.

- Where <RSSI> is the GSM signal strength.

- Where <MI> is the Mileage reading.

- Where <IG> is the Ignition status.

Example: One shot request position by SMS.

Command: SG531,2

Response: @352238020015913,531,M2MGTW,1,13.4,23,0,1,11/08/22,02:24:49,22.58552,145.4589,100,20.5, 25.5,5,1.5,104.25!

SG532: Query diagnostics values

Command (TCP24x7 or SMS): SG532,<CLEAR>

Serial command: AT+SG532=<CLEAR>

Response: @<ID>,532,<GSM>,<GPRS>,<PDP>,<HO>,<PU>,<R>,<%GPS>,<%GPSQ>,<%GPRS>, <DBO>,<ABI>,<DBI>,<SO>,<SI>,<SS>,<MAX_ACC>,MIN_ACC>,<MAX_SP>,<CARRIER_ID>,<TOWER_ID>!

- Where <CLEAR> is 1 to reset the values, 0 to do nothing.

- Where <GSM> is registration state:

  - 0 = no registration.
  - 1 = home.
  - 2 = search.
  - 3 = denied.
  - 4 = unknown.
  - 5 = roaming.

  Note: for SMS response GSM registration is required, so only states 1 and 5 will appeared.

- Where <GPRS> is GPRS registration state.

- Where <PDP> is GPRS PDP state.

- Where <HO> is the number of hours the unit was on, since last clear.

- Where <PU> is the number of power up, since last clear.

- Where <R> is the number of reset, since last clear.

- Where <%GPS> is percentage of GPS lost, since last clear.

- Where <%GPSQ> is the percentage of GPS with no good fix, since last clear.

- Where <%GSM> is the percentage of GSM lost, since last clear.

- Where <%GPRS> is the percentage of GPRS lost, since last clear.

- Where <DBO> is the number of data sent (in bytes), since last clear.

- Where <ABI> is the number of bytes sent as ACK, since last clear.

- Where <DBI> is the number of bytes receive for DOTA, since last clear.

- Where <SO> is the number of SMS sent, since last clear.

- Where <SI> is the number of SMS received, since last clear.

- Where <SS> is the number of SMS received and ignored, since last clear.

- Where <MAX_ACC> is the maximum acceleration the unit had, since last clear.

- Where <MIN_ACC> is the maximum deceleration the unit had since last clear.

- Where <MAX_SP> is the maximum speed the unit had since last clear.

- Where <CARRIER_ID> is the ID of the GSM carrier.

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- Where <TOWER_ID> is the ID of the GSM tower cell the unit is connected to.

Example: One shot query diagnostics values.

Command: SG532,0

Response: @352238020015913,532,1,0,1,a,1,1,1,0,0,139,0,0,c,12,0,0,0,0,45406,cc30!

SG533: Check GPS and Communication status

Command (TCP24x7 or SMS): SG533

Serial command: AT+SG533

Response: @<ID>,533,GPS:<x>,BE:<x>,SC:<x>,FC:<x>!

- Where GPS is the GPS state.

- Where BE is GPRS state.

- Where SC is the TCP connect state.

- Where FC is the FTP connect state during DOTA operation.

- Where <x> is the state of respective functions:

  - 0 = Inactive.
  - 1 = Active.

Please note that in Connect To Send mode <BE> and <SC> will be 0 most of the times.

Example: One shot check of GSM and communication status.

Command: SG533

Response: @352238020015913,533,GPS:1,BE:1,SC:0,FC:0!

SG551: Sets output for external starter relay

Command (TCP24x7 or SMS): SG551,<RELAY>,<RSP>

Serial command: AT+SG551=<RELAY>,<RSP>

Response: @<ID>,551,<D>,<T>,<LT>,<LN>,<AL>,<SP>,<DIR>,<SAT>,<HDOP>,<BV>, <GPS>,<STARTER>, <RSSI>,<MI>,<IG>!

- Where is <RELAY> status:

  - 0 = relay opened, starter key is disabled (<STARTER> = 1).
  - 1 = relay closed, starter key is working (<STARTER> = 0).

- Where <RSP> is the means by which the response will be sent:

  - 1 = TCP/UDP/UDPwACK.
  - 2 = SMS.

- Where <BV> is battery voltage.

- Where <GPS> is GPS status.

- Where <RSSI> is the GSM signal strength.

- Where <MI> is the mileage reading.

- Where <IG> is the ignition status.

Upon receiving SG551 commands, if the unit is registered to GSM network, then the starter will be disabled. But if the unit loses GSM registration at this moment, the starter will not be disabled until GSM registration is recovered.

Default setting: <RELAY> = 1 meaning that the starter key is enabled.

Example: One shot set output for starter relay.

Command: SG551,1,2

Response: @352238020015913,551,11/07/06,02:59:53,0.00000,0.00000,0,0,0,0,99,12,0,1,99,0.000,0!

SG552: Set Buzzer pattern

Command (TCP24x7 or SMS): SG552,<BZ>

Serial command: AT+SG552=<BZ>

Response: @<ID>,552,<BZ>!

When activated buzzer will ring during for 1min after ignition is detected.

- Where <BZ> is for controlling the buzzer on/off and the sound pattern:

    - 0 = disable.
    - 1 = pattern#1 (100Hz for 3 seconds & 1000Hz for 2 seconds alternating).
    - 2 = pattern#2 (550Hz for 3 seconds & 1000Hz for 2 seconds alternating).

Default setting: <BZ> = 0

Example: One shot set buzzer pattern 2 ON.

Command: SG552,2

Response: @352238020015913,552,2!

SG553: Initialize / set Odometer

Command (TCP24x7 or SMS): SG553,<ODO>

Serial command: AT+SG553=<ODO>

Response: @<ID>,553,<ODO>!

- Where <ODO> is the between 0 and 65,000 in miles in increment of 1.

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This command is to set the odometer to a value from 0 to 65,000 miles.

Default setting: <ODO> = 0

Example: On installation set the odometer to 600 miles.

Command: SG553,600

Response: @352238020015913,553,600!

SG554: Activate A-GPS Position Aiding

Command (TCP24x7 or SMS): SG554,<AGPS>

Serial command: AT+SG554=<AGPS>

Response: @<ID>,554!

- Where <AGPS> is the A-GPS status:
    - 0 = A-GPS disabled.
    - 1 = A-GPS enabled.

Assisted-GPS enhance the GPS performance to achieve speedy position fix and accuracy.

/!\ **Warning:** Turning on A-GPS will increase the GPRS data traffic, one SGEE file download requires data traffic of approximately 10KB every day.

Default setting: <AGPS> = 1

Example: Activated A-GPS.

Command: SG554,1

Response: @352238020015913,554,1!

SG555: Change the voltage detection level for the virtual ignition

Command (TCP24x7 or SMS): SG555,<MODE>,<BVC>,<BVT>

Serial command: AT+SG555=<MODE>,<BVC>,<BVT>

Response: @<ID>,555,<MODE>,<BVC>,<BVT>!

- Where <MODE> is:
    - 0 = Read the values.
    - 1 = Set new values.
- Where <BVC> times 16 is the voltage level for Car battery in mV.
- Where <BVT> times 16 is the voltage level for Truck battery in mV.

Default setting: <BVC> = 862*16 = 13792 $\approx$ 13.8V, <BVT> = 1593*16 = 25488 $\approx$ 25.5V

Example: Change the voltage detection level for the virtual ignition to 13.8V and 25.5V.

Command: SG555,1,862,1593

Response: @352238020015913,555,1,862,1593!

SG556: Control digital output 2

Command (TCP24x7 or SMS): SG556,<state>

Serial command: AT+SG556=<DO2>

Response: @<ID>,556,<DO2>!

  – Where <DO2> is the output state:

  • 1 is output High.
  • 0 is output Low.

Default setting: <DO2> = 0

Example: Switch the digital output 2 to High.

Send: SG556,1

Response: @352238020015913,556,1!

SG557: Read the Analog input

Command (TCP24x7 or SMS): SG557

Serial command: AT+SG557=<AI value>

Response: @<ID>,557,<AI value>!

  Note: Analog input voltage max is 5V.

  – Where <AI value> is from 0-5000 equals 0-5V.

Example: Read the analog input.

Send: SG557

Response: @352238020015913,557,1500!

SG558: Set analog input alert report under/over value

Command (TCP24x7 or SMS): SG558,<AI_L>,<AI_H>

Serial command: AT+SG558=<AI_L>,<AI_H>

Response: @<ID>,558,<AI_L>,<AI_H>!

  Note: Analog input value is 0-5000 equals 0-5V.

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- – Where <AI_L> is the analog input value that will trigger alert 619 if voltage goes under.
- – Where <AI_H> is the analog input value that will trigger alert 620 if voltage goes over.

When the analog input value will come back in the normal range, alert 621 will be triggered.

Default setting: <AI_L> = 0 & <AI_H> = 0

Example: Setup an alert report when analog input goes over 3.50V.

Send: SG558,0,3500

Response: @352238020015913,558,0,3500!

SG559: Read the Digital input 2 status

Command (TCP24x7 or SMS): SG559

Serial command: AT+SG559=<DI state>

Response: @<ID>,559,<DI state>!

- – Where <DI state> is:
    - 1 for High.
    - 0 for Low.

Example: Read the digital input 2 state.

Send: SG559

Response: @352238020015913,559,1!

SG560: Activate digital input alert report

Command (TCP24x7 or SMS): SG560,<DI2_AL>

Serial command: AT+SG560=<DI2_AL>

Response: @<ID>,560,<DI2_AL>!

   Note: Digital input is active when over 6V, maximum input voltage is 32V.

- – Where <DI2_AL> is 1 to activate the alerts report, or 0 to disable alert.
    - If <DI2_AL> is activated, and voltage goes over 6V it will trigger alert report 622.
    - If <DI2_AL> is activated, and voltage goes under 6V it will trigger alert report 623.

Default setting: <DI2_AL> = 0

Example: Activate digital input alert report.

Send: SG560,1

Response: @352238020015913,560,1!

Chapter 6

Event-triggered Periodic Reporting & Alert Message

Both periodic reporting & alert messages are sent through TCP or through UDP by the unit to the server when a defined event is triggered.

This chapter describes the syntax of the alert and periodic reporting (Report type syntax #1) and the geofence alert message (syntax #2). As well as the special UDP with ACK format and behavior (syntax #3).

6.1   Meaning of Syntax Fields

- <ID> IMEI number of the unit (varchar(15))
- <PF> the profile name (varchar(32))
- <GPS> GPS status (boolean)
- <BV> battery voltage (float)
- <RSSI> GSM signal strength (integer)
- <STARTER> starter status (boolean)
- <IGNIT> ignition mode (boolean)
- <D> date (date YY/MM/DD)
- <T> time (time HH:MM:SS)
- <LT> latitude (double)
- <LN> longitude (double)
- <AL> altitude in meters (float)
- <SP> speed in mph (float)
- <DIR> direction in degree (float)
- <SAT> number of satellites used position fix (integer)
- <HDOP> GPS position accuracy indication (float)
- <MI> mileage reading (float)
- <ANA> is the analog input reading (integer) 0-5000mV
- <GF_ID> (integer)

    - First digit = the index number 0 to 9 of the geofence
    - Second digit = 1 or 2 (1 means out of fence violation; 2 means inside the fence violation)

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6.2 Syntax #1: TCP/UDP/SMS

General Reports:
@<ID>,<MSG#>,<PF>,<GPS>,<BV>,<RSSI>,<STARTER>,<IGNIT>,<D>,<T>,<LT>,<LN>,<AL>,<SP>,<DIR>,
<SAT>,<HDOP>,<MI>,<ANA>!

Event number (MSG#)	Description	Details
531	Location report on demand (command SG531)	Alert send directly after reception, send position if good fix, if no GPS send last know position
551	External starter relay status change (command SG551)	same as 531
701	Periodic reporting heartbeat while powered	On each timer, send position if good fix, if no GPS send last know position
702	Periodic reporting with wired ignition ON	When DI1 is High, same as 701
703	Periodic reporting while virtual ignition ON	When supply voltage is > BVC, same as 701
704	Periodic reporting while GPS ignition ON	When GPS position is moving, same as 701
705	Periodic reporting with wired ignition OFF	When DI1 is Low, same as 701
706	Periodic reporting while virtual ignition OFF	When supply voltage is < BVC - 0.8V, same as 701
707	Periodic reporting while battery is disconnected	When main input voltage < 9V, same as 701
708	Periodic reporting when speed threshold exceeded	When speed is > TH_SP, every 10sec, same as 701
601	Alert message when power up/reset	When unit power cycle happen, send report (has 1min delay)
605	Alert message when direction change threshold exceeded	When direction between two position change > TH_DC, same as 531
606	Alert message when speed threshold exceeded	When speed > TH_SP, same as 531
607	Alert message when mileage threshold exceeded / reach 65000 miles	When mileage > TH_MI or 65000 miles, same as 531
608	Alert message when battery Voltage below threshold	When main input voltage < TH_BAT, same as 531 (max. 5min delay)
609	Alert message when battery disconnected	When main input voltage < 9V, same as 531 (max. 5min delay)
610	Alert message when battery re-connected	When main input back on 12V or more, same as 531
611	Alert message when wired ignition ON detected	When DI1 is High, same as 531
612	Alert message when virtual ignition ON detected	When supply voltage is > BVC, same as 531
613	Alert message when GPS ignition ON detected	When GPS position is moving, same as 531
614	Alert message when wired ignition OFF detected	When DI1 is Low, same as 531
615	Alert message when virtual ignition OFF detected	When supply voltage is < BVC - 0.8V, same as 531
616	Alert message when idle period threshold exceeded	When ignition is on, and position not moving for time > IDT, same as 531
617	Alert message when towing detected	When GPS speed > 5mph, same as 531
618	Alert message when towing stopped	After 617, when speed < 5mph, same as 531
619	Alert message when analog input over limit is breached	When AI1 > AI_H, same as 531
620	Alert message when analog input go back to normal range	After 619 or 621 and AI_L < AI1 < AI_H, same as 531

Event number (MSG#)	Description	Details
621	Alert message when analog input under limit is breached	When AI1 < AI_L, same as 531
622	Alert message when digital input 2 is going High	When DI2 goes from > 6V to < 32V, same as 531
623	Alert message when digital input 2 is going Low	When DI2 goes from 0V to < 6V, same as 531
624	Alert message when the specific time is passed	When <time> reached, same as 531
625	Alert message when ignition ON detected outside of working hours	When DI1 is High or supply voltage is > BVC, in between <start> and <stop> time, same as 531

6.3   Syntax #2: TCP/UDP/SMS – Geofence reports

@<ID>,<MSG#>,<PF>,<GPS>,<BV>,<RSSI>,<STARTER>,<IGNIT>,<D>,<T>,<LT>,<LN>,<AL>,<SP>,<DIR>, <SAT>,<HDOP>,<MI>,<ANA>,<GF_ID>!

Event number (MSG#)	Description
602	Alert message when rectangular geofence crossing is detected
603	Alert message when circular geofence crossing is detected
604	Alert message when polygonal geofence crossing is detected

6.4   Syntax #3: UDPwACK

General report:
@<ID>,<MSG#>,<PF>,<GPS>,<BV>,<RSSI>,<STARTER>,<IGNIT>,<D>,<T>,<LT>,<LN>,<AL>,<SP>,<DIR>, <SAT>,<HDOP>,<MI>,<ANA>,<SEQ>!

Geofence report:
@<ID>,<MSG#>,<PF>,<GPS>,<BV>,<RSSI>,<STARTER>,<IGNIT>,<D>,<T>,<LT>,<LN>,<AL>,<SP>,<DIR>, <SAT>,<HDOP>,<MI>,<ANA>,<GF_ID>,<SEQ>!

  – Where <SEQ> is the sequence number (0 to 255, incremented on each successful UDP acknowledgment from the server) assigned by the unit if UDP with acknowledge mode is enabled.

The format of the UDP acknowledgment from the server: **UDP_ACK,<SEQ>**

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Chapter 7

Annex

7.1 Change log

7.1.1 Application V2.5: (Firmware R7.45) (August 2011)

– QA version, unvalidated, and known to be unstable

7.1.2 Application V2.6: (Firmware R7.4a) (December 2011)

– First release with state machine

7.1.3 Application V2.6.1: (Firmware R7.4a) (February 2012)

– Bug fixes:

- bug on the NMEA parsing that was causing the unit to reboot.
- command 212 and 213 format on serial port command.
- speed value to be in miles.
- odometer calculation is more accurate, and filters has been added to avoid drift.
- leap year calculation.
- garbage data in report.
- some GPRS commands.
- SG551 command and output default value (ticking when rebooting is removed).
- command 206 and 211 to accept decimal value of <BV>.
- some fixes in 24*7 GPRS mode.
- idling alerts behavior.
- initialization of some parameters.

– Ignition input debounce as been increased to 10s.

– Edit command SG204 to accept a 10sec periodic report when overspeeding. (SG204,<TH_SP>,1).

– Application now check AT+WMBS=7 is well activated.

– Number of retries in case of connection failure has been increased to prolong reboot period.

– Default profile updated to fit demo.maestro-wireless.com configuration. (or custom customer profile).

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7.1.4 Application V2.6.2: (Firmware R7.45.1) (April 2012)

– Bug fixes:

- dota command was not triggered, and reporting well in some cases, when sent over GPRS.
- ignition flag was reverse in alert report 611 & 614.
- corrected issues with SMS reporting on some operator.

– GPRS lockup issues due to previous firmware has led to a firmware upgrade, now R7.45.1.

– Add a watchdog on GPS value to prevent any lockup due to a known SiRF bug.

– Reset time reduce to approximately 10mins in case of GPRS problem.

– Microtracker RTC is updated on good GPS fix.

– RTC date & time added in report with no GPS fix.

7.1.5 Application V2.6.4: (Firmware R7.45.1) (May 2012)

– Bug fixes:

- direction value
- bearer reboot on some network when 601 was activated
- 401 command
- some alert reporting on SMS were missing

– Improved power saving to handle W32K mode

– Improved GPS filter to reduce drift and false alert report (616, 617, 618)

– Correct AGPS SGEE download on boot (activated by default)

7.1.6 Application V2.6.5: (Firmware R7.45.1) (July 2012)

– Bug fixes:

- Cleared the time checking bug for GPS module getting stuck. (Known issue on 4.0.5 SiRFStarIV firmware)
- Resolved a bug in power saving mode, which caused exception if reporting frequency was less than 5 min.
- Resolved a bug in polygonal geofencing.

– Delayed power up alert to have correct values of ignition and starter in the report.

– Changed lost fix condition to update last known position, with RTC time.

– Sync RTC every hour with GPS time.

– Implemented GPS filtering on changing lat/long and speed values as well, to avoid too much drift and false position reporting.

– In case GPS fix is not good, last known position and speed will be reported.

7.2 Application update

7.2.1 By serial port

Condition

– Make sure the Sierra Wireless firmware version is correct (Command ATI3), please refer to the Change log for more details Chapter 7.1 on page 55.

– Maestro has provided you a file to update the MicroTracker under that firmware version make sure it is correct, refer to the file name format in section 5.1.2 on page 25.

– The serial port is accessible after removing the lid covering the SIM card holder.

– Maestro Wireless has given you a serial port adapter that will be hooked up to the MicroTracker.

Procedure

1. Load the .dwl file of the desired version into designated directory.

2. Launch the HyperTerminal program on a PC running Windows XP, or with HyperTerminal software.

3. Configure the right COM port number, Baud rate = 115200, Character Framing = 8N1, with hardware flow control.

4. Send command AT to check if OK response.

5. Send AT+WOPEN=0 to stop the software execution. It should reply OK.

6. Send command AT+WDWL to activate download mode. It should reply +WDWL:0.

7. Pull-down menu: Transfer -> Send.

8. Browse the directory and select the .dwl file.

9. Select Xmodem protocol.

10. Push SEND button. Download begins.

11. After download finishes, send AT+CFUN=1 command to reset the unit.

12. Send AT+WOPEN=1 to start the software execution. It should reply OK.

13. Application will boot and reply "init ok" when completed.

7.2.2 DOTA process

Condition

– A valid SIM Card is placed into the device and device can register to GSM network.

– Device can use GPRS provided by the network.

– Make sure GSM network is stable.

– Make sure FTP server is stable and accessible.

– Make sure power supply is stable.

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- DOTA will work only on the same Sierra Wireless firmware version, make sure it is the case, please refer to the Change log for more details Chapter 7.1 on page 55.

- Maestro has provided you a file to update the MicroTracker under that firmware version make sure it is correct, refer to the file name format in section 5.1.2 on page 25. Or given you the file name on Maestro Wireless FTP server.

Procedure

1. Plug your tracker with the SIM card inserted. Verify the SIM card phone number and APN.

2. Use your mobile phone to send the configuration command by SMS.

3. It is better to clear the tracker report has the DOTA needs TCP connection to retrieves the file. And will not works if tracker is sending reports.

4. Follow this process:

   (a) If the APN has not been configured before, send the following command:
   SG106,60000,61.93.240.149,<APNUSER>,<APNPASS>,<APN>,<REPLYPHONENUMBER>,1,0

   (b) Always wait for the SG106 SMS reply as it is the most important command.

   (c) Send FTP configuration command: **SG105,/mt-02/,maestro,dota,61.93.240.149**

   (d) Wait for the SG105 SMS reply.

   (e) Activate power up alert command[1]: **SG208,0,1**

   (f) Wait for the SG208 SMS reply.

   (g) Send Reset command to ensure the configuration is saved in flash properly: **SG501**

   (h) Wait for the SG501 SMS reply.

   (i) Send the Launch DOTA command: **SG503,dotav264.dwl**

   (j) You will receive a Launch DOTA acknowledgment as SG503,1 SMS reply.

   (k) When DOTA is completed (around 5min later) you will received a SG503,2 SMS reply with the new version name: **@<IMEI>,503,2,310512v2.64,<PF>!** The device will auto reset after finishing downloading and upgrading the firmware.[2]

   (l) Now you are all set to enjoy the features of the V2.6.2.

Costing of DOTA operation

- Time consumption: Time for DOTA depends on network condition and file size. Usually it is completed in 60-120 sec.

- GPRS consumption: GPRS data depends on DOTA files size. Usually the size is between 350k-500k Bytes.

Possible reason of unsuccessful DOTA

- DOTA Server is closed.

- DOTA Server is blocked by firewall.

- Connection to DOTA Server is too slow or unstable.

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[1]It appears sometimes that DOTA hangs on v2.6 because no reporting are set.

[2]If the tracker after ~10min doesn't reply please check the version via SG131 command, sometimes the V2.6 doesn't reply correctly after updating.

- Network provider does not offer GPRS service.

- GSM network signal is unstable.

Note: If DOTA is unsuccessful, the operation will be aborted and device continues to operate with the old firmware version.

7.3 Power saving mode behavior

7.3.1 Functional Description

The MicroTracker has an auto power saving mode. If you want to enable this function, you need to send **SG206,,1** command. When activated the application will monitor the car ignition switch and the power supply.

7.3.2 How it works ?

- Ignition on and battery less than 9V - Normal operation:

  - It will switch to connect to send mode irrespectively of the mode set. And allow one GPRS command at a time.

- Ignition off - Sleep mode:

  - It will switch to connect to send mode irrespectively of the mode set. And allow one GPRS command at a time.
  - GPS led is switch off.
  - GSM module is in deep sleep, will wake up only on periodic timer to get a fix and send alert. While in deep sleep AI, DO, control are disabled, GPRS is off, SMS are still available.

7.4 Reports example for parser development

Location report on demand (command SG531) - 531:
@123451234512345,531,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160.0,8,1,20!

External starter relay status change (command SG551) - 551:
@123451234512345,551,M2MGTW,1,12.5,30,1,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160.0,8,1,20!

Periodic reporting heartbeat while powered - 701:
@123451234512345,701,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160.0,8,1,20!

Periodic reporting with wired ignition ON - 702:
@123451234512345,702,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,25.12,160.0,8,1,25!

Periodic reporting while virtual ignition ON - 703:
@123451234512345,703,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,25.12,160.0,8,1,25!

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Periodic reporting while GPS ignition ON - 704:
@123451234512345,704,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,25.12,160.0,8,1,25!

Periodic reporting with wired ignition OFF - 705:
@123451234512345,705,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160.0,8,1,25!

Periodic reporting while virtual ignition OFF - 706:
@123451234512345,706,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160.0,8,1,25!

Periodic reporting while battery is disconnected - 707:
@123451234512345,707,M2MGTW,1,7.4,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160.0,8,1,25!

Periodic reporting when speed threshold exceeded - 708:
@123451234512345,607,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,81.0,160.0,8,1,25!

Alert message when power up/reset - 601:
@123451234512345,601,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160.0,8,1,25!

Alert message when rectangular geofence crossing is detected - 602:
@123451234512345,602,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,25.12,160.0,8,1,25,02!

Alert message when circular geofence crossing is detected - 603:
@123451234512345,603,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,25.12,160.0,8,1,25,12!

Alert message when polygonal geofence crossing is detected - 604:
@123451234512345,604,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,25.12,160.0,8,1,25,23!

Alert message when direction change threshold exceeded - 605:
@123451234512345,605,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,25.0,20,8,1,25!

Alert message when speed threshold exceeded - 606:
@123451234512345,606,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,87.0,160,8,1,25!

Alert message when mileage threshold exceeded / reach 65000 miles - 607:
@123451234512345,607,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,50.0,160,8,1,500!

Alert message when battery Voltage below threshold - 608:
@123451234512345,608,M2MGTW,1,10.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when battery disconnected - 609:
@123451234512345,609,M2MGTW,1,7.4,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when battery re-connected - 610:
@123451234512345,610,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when wired ignition ON detected - 611:
@123451234512345,611,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when virtual ignition ON detected - 612:
@123451234512345,612,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when GPS ignition ON detected - 613:
@123451234512345,613,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,5.0,160,8,1,25!

Alert message when wired ignition OFF detected - 614:
@123451234512345,614,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when virtual ignition OFF detected - 615:
@123451234512345,615,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when idle period threshold exceeded - 616:
@123451234512345,616,M2MGTW,1,14.7,30,0,1,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when towing detected - 617:
@123451234512345,617,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,20.0,160,8,1,25!

Alert message when towing stopped - 618:
@123451234512345,618,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when analog input over limit is breached - 619:
@123451234512345,619,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when analog input go back to normal range - 620:
@123451234512345,620,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

Alert message when analog input under limit is breached - 621:
@123451234512345,621,M2MGTW,1,12.5,30,0,0,11/10/10,09:09:09,22.222222,114.141414,45.6,0.0,160,8,1,25!

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