

AT Command Guide
Mobile Tracking Device
MTD2000

Revision 12

1 Jun 2010

Revision History

Rev	Date	Author	Description
01	02-Sep-08	CF Chan	Initial release.
02	1-Dec-08	CF Chan	<ol style="list-style-type: none"> 1. Add repeat command, event debug command. 2. Revise standard report format. 3. Revise the setting list in \$SC. 4. Rename \$NR to \$NA since \$NR is used for NMEA. 5. Add the maximum length for IP address.
03	30-Apr-09	CF Chan	<ol style="list-style-type: none"> 1. Added panic button and counter command. 2. Added RS232 interface mode command. 3. Added GPS data flag in the event table. 4. Added host name constraints for TCP/IP address. 5. Revised GSM LED definition to follow MC55i. 6. Revised memory logging to overwrite memory data when memory is full. 7. Revised memory dump to keep the unsent data in the memory. 8. Revised \$EV to support 5 conditions, 10 commands, 250 chars maximum length. 9. Revised the ADC conversion algorithm for external power and battery power. 10. Removed \$NA as heartbeat message is not ready. 11. Removed \$PI as debouncing is done via hardware mean. 12. Removed \$PO as \$OUT will serve the same purpose.
04	08-May-09	CF Chan	<ol style="list-style-type: none"> 1. Revised standard report format to shorten the total length including device ID to less then 90 chars. 2. Removed ';' as the command terminator for commands sent via SMS and TCP channel.
05	12-Jun-09	CF Chan	<ol style="list-style-type: none"> 1. Added \$ACC for harsh acceleration detection. 2. Added \$DEC for harsh deceleration detection. 3. Added \$DB to set the data memory size. 4. Revised the default port configuration to 8 input ports. 5. Revised \$SS command to place individual GSM/GPS module to sleep. 6. Revised ADC reference voltage to 3.3V in \$XE and \$XB command.
06	03-Jul-09	CF Chan	<ol style="list-style-type: none"> 1. Added \$NU to support UDP channel. 2. Added \$CR to support cell ID.
07	20-Jul-09	CF Chan	<ol style="list-style-type: none"> 1. Added \$ND command for DNS server address. 2. Added watchdog timer to prevent firmware lockup. 3. Monitor and reset GSM and GPS module if it stops responding. 4. Terminate command response with carriage return and line feed for TCP channel.

07A	31-Jul-09	CF Chan	<ol style="list-style-type: none"> 1. Revised default data buffer to 300 reports.
08	01-Aug-09	CF Chan	<ol style="list-style-type: none"> 1. Added \$MS and \$MC for mileage counter. 2. Added GPS antenna detection. 3. Added error code 2303 to indicate failure to send report via SMS.
09	16-Sep-09	CF Chan	<ol style="list-style-type: none"> 1. Increase APN length to 40 characters in \$NG command. 2. Increase watchdog timeout to 65 seconds. 3. Revised SMS recipient in \$EI to single SMS number. 4. Revised minimum report interval in \$CR to 5 sec.
10	02-Oct-09	CF Chan	<ol style="list-style-type: none"> 1. Added a System Overview section. 2. Added \$SIM for dual SIM card. 3. Added GSM/GPRS commands pass through. 4. Removed the support of the following characters (text message, report, etc) which are not in the default GSM character set: [\] ^ _ ` { } ~
10A	10-Mar-10	CF Chan	<ol style="list-style-type: none"> 1. Added \$LB for low battery shutdown. 2. Revised interval of data log to 60 sec and above. 3. Revised the maximum length of AT command and event to 120 characters.
11	17-May-10	CF Chan	<ol style="list-style-type: none"> 1. Added \$GF and \$GS for geo fence. 2. Added \$AI and \$AO for analog input and output. 3. Added \$FSD and \$FSO for fail safe output. 4. Added \$MD for motion sensor sensitivity. 5. Added \$DI for driver ID. 6. Added \$OS for over speed detection. 7. Added \$KR for key on reset. 8. Added \$GM for GSM modem. 9. Added \$SU for over the air firmware upgrade. 10. Added \$CV for voice call and silent call. 11. Added \$CA for auto answer incoming call. 12. Added \$CS for MIC gain and speaker volume. 13. Added \$GC and \$GA for dead reckoning calibration. 14. Added \$BC for battery charging control. 15. Added hardware watchdog timer. 16. Added test mode for peripheral test. 17. Support 5000 reports for data logging. 18. Removed \$LB for low battery shutdown. 19. Revised the maximum length of AT command and event to 150 characters.
12	1-Jun-10	Kyle Hor	<ol style="list-style-type: none"> 1. Updated system code 2105 to include possibility that no battery is present. 2. Added precaution not to send \$SR via SMS at less than 10sec interval. 3. Added \$MZ for motion detect calibration and modified calibration mode not to be unique to gyroscope only. 4. \$MD accuracy range and default value changed.

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1 Introduction

This document defines the AT commands used for interfacing between a host application and the MTD2000. The MTD2000 comes with a built-in event driven engine which allow user to define the events for different applications.

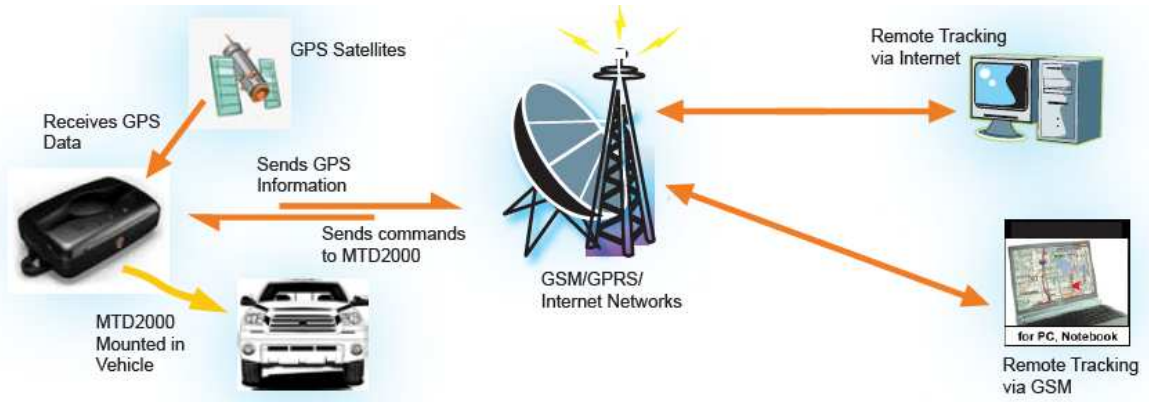
2 Features Summary

MTD2000 supports the following features:

1. LED
 - Red LED for charging indication
 - Green LED for GSM status indication
 - Yellow LED for GPS status indication
2. Configuration
 - Programmable unit ID
 - 5 battery power monitor
 - 5 external power monitor
 - 10 programmable SMS numbers
 - 10 programmable TCP/IP addresses
 - 10 programmable UDP/IP addresses
 - 10 programmable GPRS profiles
 - 10 programmable timers
 - 10 programmable counters
 - 20 geographical fences
 - 20 text messages
 - 20 user defined events
3. Message and Report
 - User defined text message
 - NMEA 0183 report (GLL, GGA, GSA, etc)
 - Standard report (location, IO and system status, etc)
 - Cell ID report (cell ID of serving cell and neighbor cells)
 - Data logging of up to 300 / 5000 standard reports
4. Speed and Mileage
 - Mileage counter
 - Over speed detection
 - Harsh acceleration / deceleration detection
5. Digital IO Port
 - 4 digital input ports
 - 4 programmable digital input / output ports

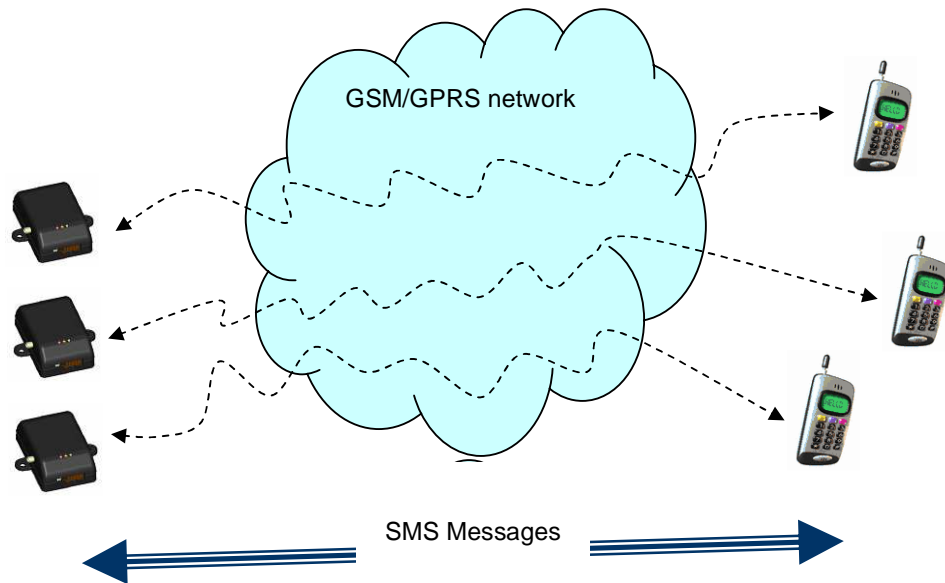
- 1 fail safe output port
6. Analog IO Port
 - 1 analog input port
 - 1 analog output port
 7. Power Monitor
 - Backup battery low power detection
 - External power source low power detection
 8. Data and Configuration
 - Configure device via serial port, SMS and TCP/UDP channel
 - Receive data via serial port, SMS and TCP/UDP channel
 9. Firmware Upgrade
 - Firmware upgrade via serial port
 - Over the air firmware upgrade
 10. General
 - Driver ID
 - Panic button
 - Key on reset
 - Dead reckoning
 - Motion detection with programmable sensitivity
 - Dual SIM cards for SIM fail switchover and border crossing
 - GSM/GPRS command pass through
 - GPS external antenna tamper sensing
 - Support DNS for server PC with dynamic IP address
 - Watchdog timer to prevent unit lockup
 - Low battery shutdown
 - Turn of battery charging when external voltage drops below a designated threshold
 - Function as GSM/GPRS modem

3 System Overview



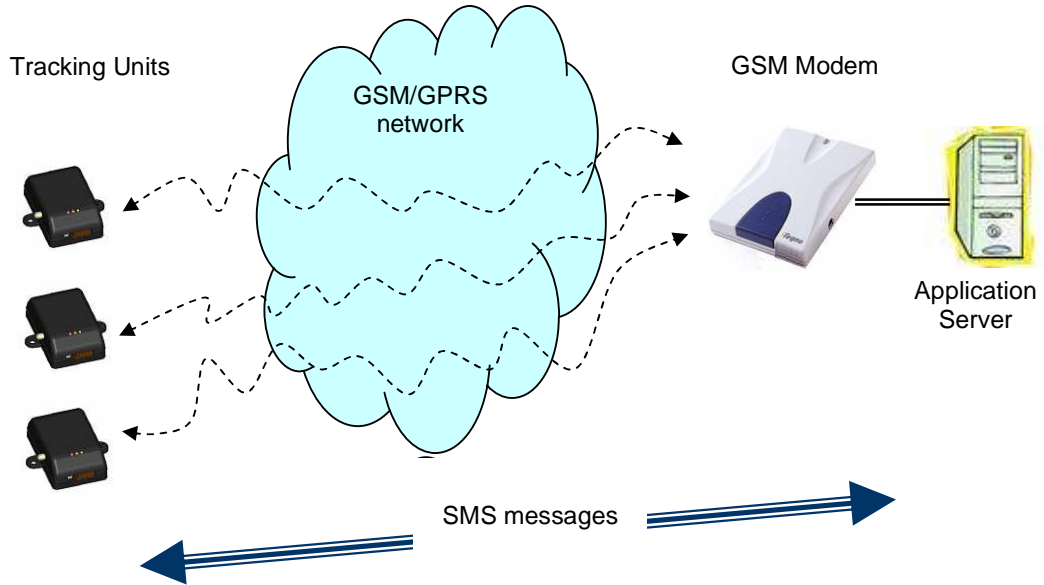
3.1 End-User-Based Reporting (SMS)

The device can be configured to send reports or text messages in SMS to mobile phones as illustrated below:



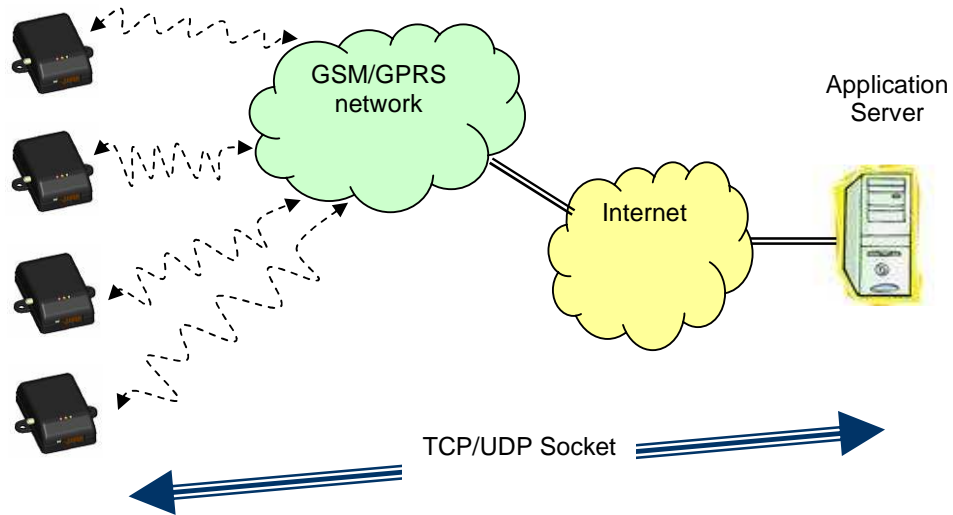
3.2 Server-Based Reporting (SMS)

The device can be configured to send reports in SMS to the server (with GSM Modem) as illustrated below:



3.3 Server-Based Reporting (TCP/UDP Socket)

The device can be configured to send reports via TCP Socket to the server as illustrated below:



4 AT Command Syntax

The MTD AT commands are accessible via serial port, SMS and TCP / UDP channel. The maximum length of AT commands including the overhead is 120 characters. The default settings of serial port are as follows: 115200 bps, 8 data bits, no parity bit, 1 stop bit, hardware flow control. Upon power, the device will send out "MTD2000 READY" to the serial port using the serial port setting.

The MTD AT command has the prefix of "AT\$" or "at\$" and is not case sensitive in both the command and the parameters.

Note 1:

All settings via MTD AT commands (command with prefix "AT\$") are saved into the flash at the point of entry.

Note 2:

The native GSM/GPRS AT commands (command with prefix "AT+" and "AT^") will be routed to the GSM module for handling and the corresponding response will be sent back to the host via serial port. The GSM/GPRS AT commands are only available via serial port.

4.1 AT Command

Serial Port

The "AT" or "at" prefix must be set at the beginning of each command line. To terminate a command line enter <CR><LF>. Commands are usually followed by a response that includes "<CR><LF><response><CR><LF>". Throughout this document, only the responses are presented, <CR><LF> are omitted intentionally.

Single AT command can be sent to the device via serial port using the following format:

Syntax	Example
<AT\$Command><CR><LF>	AT\$SV

SMS and TCP / UDP Channel

Single AT command can be sent to the device via SMS and TCP / UDP channel using the following format without the "AT" or "at" prefix:

Syntax	Example
<\$Command>	\$SV

--	--

4.2 Write Command

The write command is used to set the parameters in an AT command.

Command	Response
AT\$ABC=<parameter 1>,...,<parameter N>	OK Other responses (if any)

4.3 Query Command

The query command is used to query the current setting of an AT command.

4.3.1 Single Index Command

Single index command is referred to the command that holds only one element (e.g. AT\$PC, port configuration). The following query command is used to query the current setting of a single index AT command.

Command	Response
AT\$ABC?	OK \$ABC: <Parameter 1>,...,<Parameter N>

4.3.2 Multiple Index Command

Multiple index command is referred to the command that holds multiple elements (e.g. AT\$SL, SMS number list).

Query Individual Setting

The following query command is used to query the current setting of an element in a multi index AT command.

Command	Response
AT\$ABC=<Index>	OK \$ABC: <Index>,<Parameter 1>,...,<Parameter N>

Query All Setting

The following query command is used to query the current setting of all the elements in a multi index AT command. The query all setting is not accessible via SMS due to large amount of data.

If the user is trying to query all settings via SMS, the device will send out an unsolicited response to indicate settings retrieval not allowed.

Command	Response
AT\$ABC?	OK \$ABC: 1,<Parameter 1>,...,<Parameter N> ... \$ABC: M,<Parameter 1>,...,<Parameter N>

4.4 Execution Command

The execution command is used to execute an AT command.

Command	Response
AT\$ABC	OK Other responses (if any)

4.5 Command Response

4.5.1 Normal Response

For any command sent to the device, it will respond with either “OK” or “ERROR”. If there is no syntax error in the command and all the parameters are correct, the device will respond with “OK”, followed by the result (if any) after command execution. Otherwise, the device will respond with “ERROR” and will not execute the command.

The command response (e.g. standard report) will be terminated by carriage return and line feed (<CR><LF>) if the channel is serial port or TCP channel (no carriage return and line feed for SMS channel).

Syntax	Example
<CR><LF> OK <CR><LF> Note: Successful response.	OK
<CR><LF> ERROR <CR><LF> Note: Failure response.	ERROR
<CR><LF>\$Command>: <Parameter 1>,...,<Parameter n>	\$SL: 1,"91234567"

<p><CR><LF> Note: Response without device ID.</p>	
<p><CR><LF><\$Command>: <Parameter 1>,...,<Parameter n>; <Device ID><CR><LF> Note: Response with device ID.</p>	<p>\$SL: 1,"91234567";ABC1234D</p>

4.5.2 Unsolicited Response

When the device is unable to execute the command successfully or has status update, it will send out unsolicited response for error and status indication via the selected channels (serial port, SMS or TCP / UDP channel).

The unsolicited response will be terminated by carriage return and line feed (<CR><LF>) if the channel is serial port or TCP channel (no carriage return and line feed for SMS channel).

For example, if the user is trying to establish another TCP / UDP connection without closing the existing TCP / UDP connection first, the device will send out an unsolicited response to indicate network connection not allowed.

Syntax	Example
<p><CR><LF>\$MTD: <System Code><CR><LF></p>	<p>\$MTD: 5201</p>

4.6 Command Interface

The command can be sent to the device via:

1. RS232 Serial Port
2. Over the air via SMS (GSM)
3. Over the air via TCP / UDP channel (GPRS)

Notes:

Only MTD2000 AT commands (command with prefix "AT\$") are allowed in SMS and TCP / UDP channel.

5 System Code

5.1 MTD System Code

	Data Dump
1001	Data dump started
1002	Data dump completed
1003	No logged data in the memory
1004	Data dump not allowed while logging is in progress
	AT Command
2001	Command input buffer is full
2002	Invalid command
2003	Invalid parameter
	General
2101	Memory full for data log
2102	Data dump stopped due to communication link down
2103	Not allow to retrieve all settings via SMS due to large amount of data
2104	Device shutdown due to low battery
2105	Stop battery charging due to low external voltage or no battery connected
2106	Resume battery charging when low external voltage goes up
	Input / Output
2201	Invalid input port
2202	Invalid output port
	Send Report
2301	Network channel is not established to send report
2302	SMS number is not defined to send report
2303	Fail to send report via SMS
	Network Connection
2401	New network connection not allowed until the existing connection is closed
2402	Network disconnection not allowed while data dump is in progress
	OTA Firmware Upgrade
2501	Download complete and upgrade start
2502	Fail to download
2503	Invalid GPRS profile
2504	Invalid FTP URL
2505	Invalid user name
2506	Invalid user password
2507	Invalid image

5.2 GSM System Code

5000	GSM is in sleep mode
5001	GSM bearer connection failed
5002	GSM is not registered
5101	GPRS bearer connection failed

5201	TCP / UDP channel establishment failed
5202	TCP / UDP channel connected
5203	TCP / UDP channel disconnected by remote (via SMS or TCP / UDP channel)
5204	TCP / UDP channel disconnected by local (via serial port or event)

5.3 GPS System Code

6001	GPS is in sleep mode
6002	GPS is not operational
6003	Calibration not supported
6004	Dead reckoning failed
6005	Calibration entry
6006	Calibration exit
6007	Motion Detect failed

6 LED Indication

6.1 Charging LED

Charging status is indicated by a red LED as follows:

1. Red LED On
 - Charging of Li-ion battery is in progress.
2. Red LED Off
 - Charging of Li-ion battery is completed.

6.2 GSM LED

GSM status is indicated by a green LED as follows:

1. Green LED Blinking
 - Fast Blink (600 ms on / 600ms off)
No SIM card inserted or network search in progress.
 - Slow Blink (75 ms on / 3 s off)
Registered to the GSM network.
2. Green LED Off
 - GSM module is in sleep or power down mode.

6.3 GPS LED

GPS status is indicated by a yellow LED as follows:

1. Yellow LED On
 - GPS position is fixed, ready for tracking.
2. Yellow LED Off
 - GPS position is not fixed, not ready for tracking.

7 Basic Command

7.1 Command Mode – AT

This command will prompt the device to return a positive acknowledgement via the command channel, which can be used to check the communication link between the remote host and the device.

Syntax

Command	Response
AT	OK

Parameters

Nil

Example

Command	Response
AT Note: Send this command via serial port to check the corresponding communication link.	OK Note: Send to serial port.
AT Note: Send this command via SMS and check the corresponding communication link.	OK Note: Send to SMS number.
AT Note: Send this command via network channel to check the corresponding communication link.	OK Note: Send to network channel.

7.2 Repeat Last Command – A/

This command will repeat the last valid command of the open session, only the A/ command itself cannot be repeated. If this command is the first one of the open session, the response is OK without any treatment.

Syntax

Command	Response
A/	<repeat last command>

--	--

Parameters

Nil

Example

Command	Response
AT\$SV Note: Query firmware version.	OK \$SV: R0100
A/ Note: Repeat last command.	OK \$SV: R0100

8 System Command

8.1 System Version – AT\$SV

This command will get the firmware version of the device.

Syntax

Command	Response
AT\$SV or AT\$SV? Note: Query setting.	OK \$SV: <Version>

Parameters

Version Firmware version in “RXXYY” format: XX is the major version, YY is the minor version.

Example

Command	Response
AT\$SV Note: Query the firmware version.	OK \$SV: R0100 Note: Firmware version is 1.00.

8.2 System Identity – AT\$SI

This command will set and control the device ID of the device. Device ID can be used to identify and differentiate the device with a unique code (e.g. vehicle number). The device ID is appended at the back of the responses and reports.

Syntax

Command	Response
AT\$SI=<Mode>[,<ID>] Note: Write setting.	OK
AT\$SI? Note: Query setting.	OK \$SI: <Mode>,<ID>

Parameters

- Mode 0 – Disable device ID
 1 – Append device ID to every response and report
 2 – Append device ID to every response and report except NMEA report

Default mode is 0 (Disable device ID).

ID Device ID of up to 10 alphanumeric characters, limited to the following characters list:

0-9 a-z A-Z ! # \$ % & ' () * + - . / : < = > ? @

Default device ID is "0123456789".

Example

Command	Response
AT\$SI=1,"ABC1234D" Note: Set and enable device ID.	OK
AT\$SI? Note: Query device ID.	OK \$SI: 1,"ABC1234D";ABC1234D
AT\$SV Note: Query the firmware version with device ID.	OK \$SV: R0100;ABC1234D

8.3 System Default – AT\$SD

This command will restore factory default settings.

Syntax

Command	Response
AT\$SD=<Mode> Note: Write setting.	OK

Parameters

- Mode 0 – Restore factory default
 1 – Restore factory default except the device ID, port configuration, output port default, SMS number list, TCP / UDP address list, GPRS profile list and DNS server address.

Example

Command	Response
AT\$SD=0 Note: Restore factory default.	OK
AT\$SD=1 Note: Restore factory default except some important user settings.	OK

8.4 System Configuration – AT\$SC

This command will retrieve and send the device settings all at one go via the command channel. This command is not accessible via SMS due to large amount of data.

Note:

If the user is trying to retrieve device settings via SMS, the device will send out an unsolicited response to indicate settings retrieval not allowed.

Syntax

Command	Response
AT\$SC or AT\$SC? Note: Query device setting.	OK \$SV: <...> \$SI: <...> \$SS: <...> \$DB: <...> \$CA: <...> \$CS: <...> \$SIM: <...> \$OS: <...> \$ACC: <...> \$DEC: <...> \$MS: <...> \$MC: <...> \$GA: <...> \$PC: <...> \$PD: <...> \$FSD: <...> \$MD: <...> \$KR: <...> \$BC: <...> \$GM: <...> \$UM: <...> \$EI: <...> \$NC: <...> \$GF: <...> \$XE: <...> \$XB: <...>

	\$FT: <...> \$FC: <...> \$TL: <...> \$SL: <...> \$NT: <...> \$NU: <...> \$NG: <...> \$ND: <...> \$EV: <...>
--	---

Parameters

Nil

Example

Command	Response
AT\$SC Note: Retrieve device settings.	OK \$SV: R0100 \$SI: 0,ABC1234D ... \$EV: 20,"" \$NC: 0

8.5 System Reset – AT\$ST

This command will reset the system or GSM / GPS module.

Syntax

Command	Response
AT\$ST=<Mode> Note: Write setting.	OK

Parameters

- Mode
- 0 – System reset including GSM and GPS module
 - 1 – Reset GSM module only
 - 2 – Reset GPS module only

Example

Command	Response
AT\$ST=0 Note: Reset the system.	OK

AT\$ST=1 Note: Reset the GSM module only.	OK
--	----

8.6 System Sleep – AT\$SS

This command will place the GSM / GPS module into sleep mode. After power is cycled or device is reset, the GSM / GPS module will revert to awake mode.

Syntax

Command	Response
AT\$SS=<Module>[,<Mode>] Note: Write setting.	OK
AT\$SS=<Module> Note: Query setting.	OK \$SS: <Module>,<Mode>

Parameters

- Module 0 – GSM
 1 – GPS
- Mode 0 – Awake
 1 – Sleep

Default is 0 (Awake).

Example

Command	Response
AT\$SS=0,1 Note: Place GSM module into sleep mode.	OK
AT\$SS=0 Note: Query status of GSM module.	OK \$SS: 0,1

8.7 System Upgrade – AT\$SU

User can use this command to upgrade the firmware over the air via a FTP server which hosts the firmware image. The OTA firmware upgrade consists of image download and image upgrade process. After the firmware upgrade, the device will initiate a reset to run in normal mode.

Note:

1. During the image download process, the device will continue the normal operation.
2. After download complete and during the image upgrade process, the device will enter boot mode and stop the normal operation.
3. Once the image upgrade is completed, the device will reset to run in normal mode.
4. If the FTP URL is invalid, the device will send out an unsolicited response to indicate invalid FTP URL.
5. If the FTP user name is invalid, the device will send out an unsolicited response to indicate invalid FTP user name.
6. If the FTP user password is invalid, the device will send out an unsolicited response to indicate invalid FTP user password.
7. If the device cannot connect to the GPRS gateway via the GPRS profile, the device will send out an unsolicited response to indicate invalid GPRS profile.
8. If the incorrect image is downloaded, the device will send out an unsolicited response to indicate invalid image.
9. If the image download is failed, the device will send out an unsolicited response to indicate download fail.
10. If the image download is completed, the device will send out an unsolicited response to indicate download complete and upgrade start.

Syntax

Command	Response
AT\$SU=<URL>,<User>,<Password>,<GPRS Profile> Note: Perform OTA firmware upgrade.	OK

Parameters

- | | |
|------|---|
| URL | FTP URL of up to 60 alphanumeric characters, limited to the following characters list:

0-9 a-z A-Z ! # \$ % & ' () * + - . / : < = > ? @ |
| User | FTP user name of up to 20 alphanumeric characters, limited to the following characters list: |

0-9 a-z A-Z ! # \$ % & ' () * + - . / : < = > ? @

Password FTP user password of up to 20 alphanumeric characters, limited to the following characters list:

0-9 a-z A-Z ! # \$ % & ' () * + - . / : < = > ? @

GPRS Profile GPRS profile 1 to 10

Example

Command	Response
AT\$SU="ftp://ftp.com.sg/MTD2000-R0240.hex","1234","abcd",1 Note: Perform firmware upgrade over the air.	OK

8.8 System Boot Mode – AT\$SB

This command will place the device into boot mode, which is used by Downloader for firmware upgrade via serial port. After power is cycled or device is reset, the device will remain in boot mode until it is set to normal mode by the Downloader.

Note:
This command is password protected, it is not meant for normal user. It is to be used only by the Downloader for firmware upgrade.

Syntax

Command	Response
AT\$SB=<Password> Note: Enter boot mode with password protection.	OK

Parameters

Password Password to enter boot mode

Example

Command	Response
AT\$SB=#### Note: Place the device into boot mode.	OK

8.9 Error and Status Indication – AT\$EI

This command will send error and status indication as unsolicited response to the selected channel.

Syntax

Command	Response
AT\$EI=<Mode>[,<Recipient>] Note: Write setting.	OK
AT\$EI? Note: Query setting.	OK AT\$EI: <Mode>,<Recipient>

Parameters

Mode 0 – Disable error and status indication
 1 – Enable error and status indication

Default is 1 (enable error and status indication).

Recipient Send error and status indication to single or multiple recipients as follows, default is serial port:

- U – Serial port (UART)
- N – Network channel (TCP / UDP)
- Sx – Single SMS number in decimal (1 to 10)

Example

Command	Response
AT\$EI=1,"U S1" Note: Send error and status indication to serial port and SMS number 1.	OK
AT\$EI=1,"N S1" Note: Send error and status indication to network channel and SMS number 1.	OK

9 SMS Command

9.1 SMS/Call Number List – \$SL

This command allows user to store maximum 10 SMS / Call numbers in the device. The device will receive commands or send data only via the programmed SMS numbers. Similarly, the device will initiate call or accept incoming call only via the programmed call numbers.

Syntax

Command	Response
AT\$SL=<Index>,<SMS Number> Note: Write setting.	OK
AT\$SL=<Index> Note: Query one setting.	OK \$SL: <Index>,<SMS Number>
AT\$SL? Note: Query all settings (not accessible via SMS).	OK \$SL: 1, <SMS Number> ... \$SL: 10, <SMS Number>

Parameters

- Index SMS number 1 to 10
- SMS Number Phone number of up to 20 digits (including '+' sign), default is blank.

Example

Command	Response
AT\$SL=1,"91234567" Note: Store a SMS number.	OK
AT\$SL=1 Note: Query a SMS number.	OK \$SL: 1,"91234567"
AT\$SL? Note: Query all SMS numbers.	OK \$SL: 1,"91234567" \$SL: 2,"" ... \$SL: 10,""

10 Network Command

10.1 TCP/IP Address List – AT\$NT

This command allows user to store maximum 10 TCP/IP server addresses in the device.

Syntax

Command	Response
AT\$NT=<Index>,<IP Address>,<Port> Note: Write setting.	OK
AT\$NT=<Index> Note: Query one setting.	OK \$NT: <Index>,<IP Address>,<Port>
AT\$NT? Note: Query all settings (not accessible via SMS).	OK \$NT: 1,<IP Address>,<Port> ... \$NT: 10,<IP Address>,<Port>

Parameters

Index	TCP server address 1 to 10
IP Address	TCP server IP address in host name or dotted decimal notation, maximum 60 characters. A hostname may contain only the ASCII letters 'a' through 'z' (case-insensitive), the digits '0' through '9', and the hyphen. Hostname labels cannot begin or end with a hyphen. No other symbols, punctuation characters, or blank spaces are permitted. Default is blank
Port	TCP server port number (1 to 65535) Default is 1000

Example

Command	Response
AT\$NT=1,"192.168.123.168",2000 Note: Store a server address.	OK
AT\$NT=2,"www.yahoo.com",80	OK

Note: Store a server address.	
AT\$NT=1 Note: Query a server address.	OK \$NT: 1,"192.168.123.120",2000
AT\$NT? Note: Query all server addresses.	OK \$NT: 1,"192.168.123.120",2000 \$NT: 2,"www.yahoo.com",80 ... \$NT: 10,""

10.2 UDP/IP Address List – AT\$NU

This command allows user to store maximum 10 UDP/IP server addresses in the device.

Syntax

Command	Response
AT\$NU=<Index>,<IP Address>,<Port> Note: Write setting.	OK
AT\$NU=<Index> Note: Query one setting.	OK \$NU: <Index>,<IP Address>,<Port>
AT\$NU? Note: Query all settings (not accessible via SMS).	OK \$NU: 1,<IP Address>,<Port> ... \$NU: 10,<IP Address>,<Port>

Parameters

- Index UDP server address 1 to 10

- IP Address UDP server IP address in host name or dotted decimal notation, maximum 60 characters. A hostname may contain only the ASCII letters 'a' through 'z' (case-insensitive), the digits '0' through '9', and the hyphen. Hostname labels cannot begin or end with a hyphen. No other symbols, punctuation characters, or blank spaces are permitted.

Default is blank

- Port UDP server port number (1 to 65535)

Default is 1000

Example

Command	Response
AT\$NU=1,"192.168.123.168",2000 Note: Store a server address.	OK
AT\$NU=2,"www.yahoo.com",80 Note: Store a server address.	OK
AT\$NU=1 Note: Query a server address.	OK \$NU: 1,"192.168.123.120",2000
AT\$NU? Note: Query all server addresses.	OK \$NU: 1,"192.168.123.120",2000 \$NU: 2,"www.yahoo.com",80 ... \$NU: 10,""

10.3 GPRS Profile List – AT\$NG

This command allows user to store maximum 10 GPRS profiles in the device.

Syntax

Command	Response
AT\$NG=<Index>,<APN>,<User>,<Password> Note: Write setting.	OK
AT\$NG=<Index> Note: Query one setting.	OK \$NG: <Index>,<APN>,<User>,<Password>
AT\$NG? Note: Query all settings (not accessible via SMS).	OK \$NG: 1,<APN>,<User>,<Password> ... \$NG: 10,<APN>,<User>,<Password>

Parameters

- Index GPRS profile 1 to 10
- APN GPRS access point name of up to 40 alphanumeric characters, limited to the following characters list:

0-9 a-z A-Z ! # \$ % & ' () * + - . / : < = > ? @

- Default is blank
- User GPRS user name of up to 20 alphanumeric characters, limited to the following characters list:

0-9 a-z A-Z ! # \$ % & ' () * + - . / : < = > ? @

Default is blank
- Password GRPS user password of up to 20 alphanumeric characters, limited to the following characters list:

0-9 a-z A-Z ! # \$ % & ' () * + - . / : < = > ? @

Default is blank

Example

Command	Response
AT\$NG=1,"internet","1234","abcd" Note: Store a GPRS profile	OK
AT\$NG=1 Note: Query a GPRS profile	OK \$NG: 1,"internet","1234","abcd"
AT\$NG? Note: Query all GPRS profiles	OK \$NG: 1,"internet","1234","abcd" ... \$NG: 10,""

10.4 DNS Server Address – AT\$ND

This command allows user to set the DNS server address to resolve server address name.

Syntax

Command	Response
AT\$ND=<DNS1>[,<DNS2>] Note: Write setting.	OK
AT\$ND? Note: Query setting.	OK \$ND: <DNS1>,<DNS2>

Parameters

- DNS1** Primary DNS server address (IP address in dotted-four-byte format). This value determines whether to use the DNS server addresses dynamically assigned by the network or a specific DNS server address given by the user. "DNS1" = "0.0.0.0" (default) means that the GPRS connection profile uses dynamic DNS assignment. Any other address means that the Primary DNS is manually set. The default value applies automatically if no other address is set.
- DNS2** Secondary DNS server address (IP address in dotted-four-byte format). If "DNS1" = "0.0.0.0" this setting will be ignored. Otherwise this value can be used to manually configure an alternate server for the DNS1. If "DNS1" is not equal "0.0.0.0" and no "DNS2" address is given, then "DNS2"="0.0.0.0" will be assumed automatically.

Example

Command	Response
AT\$ND="165.21.83.88" Note: Set only primary DNS address.	OK
AT\$ND? Note: Query DNS address.	OK \$ND: "165.21.83.88","0.0.0.0"
AT\$ND="165.21.83.88","165.21.100.88" Note: Set primary and secondary DNS address.	OK
AT\$ND? Note: Query DNS address.	OK \$ND: "165.21.83.88","165.21.100.88"

10.5 Network Connection – AT\$NC

This command is used to setup a network connection via GPRS.

Note:

1. If the user is trying to establish a new network connection without closing the existing connection, the device will send out an unsolicited response to indicate network connection not allowed.

2. If the user is trying to close the existing network connection while data dump is in progress, the device will send out an unsolicited response to indicate network disconnection not allowed.
3. If network connection is not successful due to GSM/GPRS network or remote server, the device will send out an unsolicited response to indicate the respective error status. If the network connection is successful, the online flag in the event table will be set.

After connected to network,

- The online flag will remain set if GSM network is down.
- The online flag will be cleared if remote server is down.

Syntax

Command	Response
AT\$NC=<Mode>,<Channel>,<Channel Index>,<GPRS Profile> Note: Write setting.	OK
AT\$NC? Note: Query setting.	OK \$NC: <Mode>,<Channel>,<Channel Index>,<GPRS Profile>

Parameters

- | | | |
|---------------|--|--|
| Mode | | 0 – Disconnect from network (the rest of the fields are not needed)
1 – Connect to network

Default is 0 (Disconnect) |
| Channel | | 0 – TCP channel
1 – UDP channel |
| Channel Index | | Channel address index 1 to 10 |
| GPRS Profile | | GPRS profile 1 to 10 |

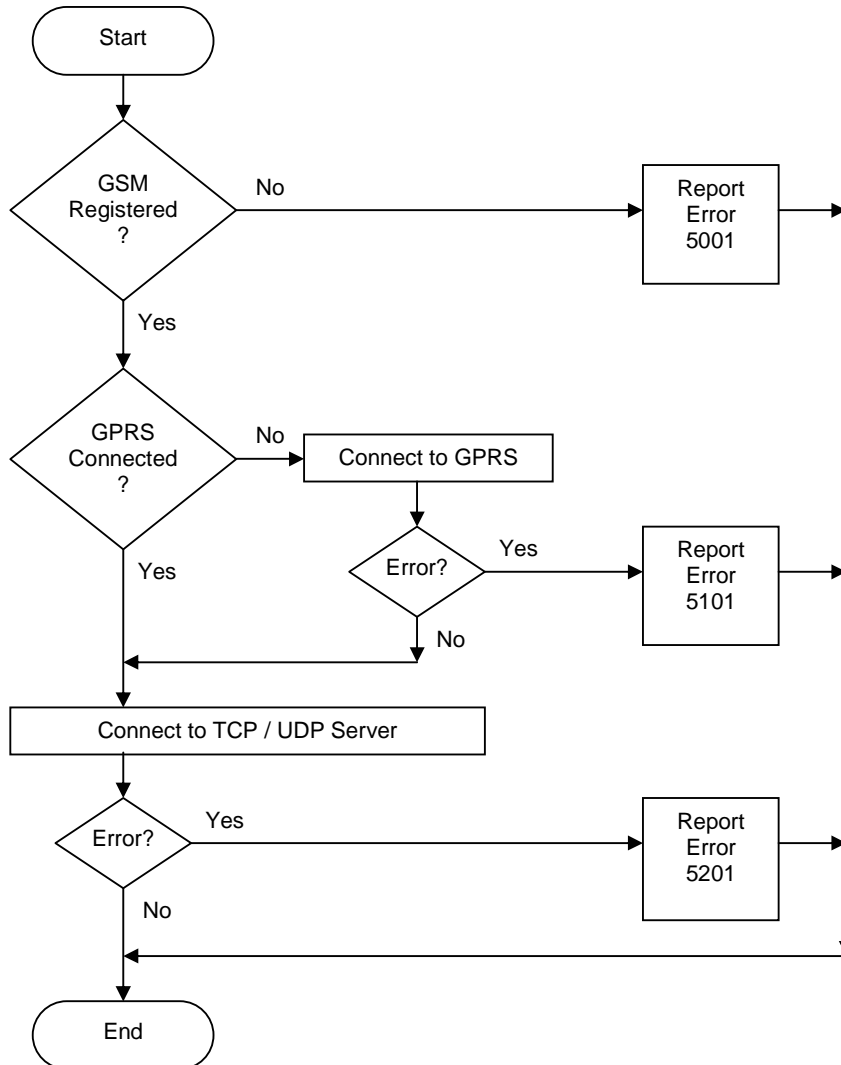
Example

Command	Response
AT\$NT=1,"192.168.123.168",1000 Note: Store a server address.	OK
AT\$NG=1,"internet", "", "" Note: Store a GPRS profile.	OK

AT\$NC=1,0,1,1 Note: Connect to the TCP server.	OK
AT\$NC? Note: Query connection status.	OK \$NC: 1,0,1,1
AT\$NC=0 Note: Disconnect from the TCP server.	OK
AT\$NC? Note: Query connection status.	OK \$NC: 0

TCP / UDP Connection Flow

The device will send out an unsolicited response if the TCP / UDP connection is not successful. For example: \$MTD: 5201.



11 Text Message Command

11.1 Text Message List – AT\$TL

This command allows user to store maximum 20 text messages in the device.

Syntax

Command	Response
AT\$TL=<Index>,<Message> Note: Write setting.	OK
AT\$TL=<Index> Note: Query one setting.	OK \$TL: <Index>,<Message>
AT\$TL? Note: Query all settings (not accessible via SMS).	OK \$TL: 1,<Message> ... \$TL: 20,<Message>

Parameters

- Index Text message 1 to 20
- Message Text message of up to 40 alphanumeric characters, limited to the following characters list:

0-9 a-z A-Z ! # \$ % & ' () * + - . / : < = > ? @

 Default is blank

Example

Command	Response
AT\$TL=1,"Car Alarm!" Note: Store a text message.	OK
AT\$TL=1 Note: Query a text message.	OK AT\$TL=1,"Car Alarm!"
AT\$TL? Note: Query setting of all text messages.	OK \$TL: 1,"Car Alarm!" \$TL: 2,"" ... \$TL: 20,""

--	--

11.2 Text Message – AT\$TM

This command will send a pre-programmed text message via the selected channels.

Note:

1. If the user is trying to send a text message via inactive network channel, the device will send out an unsolicited response to indicate inactive network channel.
2. If the user is trying to send a text message to a SMS number which is not defined, the device will send out an unsolicited response to indicate undefined SMS number.

Syntax

Command	Response
AT\$TM=<Index>,<Recipient> Note: Execute command.	OK

Parameters

- Index Text message 1 to 20
- Recipient Send a text message to single or multiple recipients as follows:
 - U – Serial port (UART)
 - N – Network channel (TCP / UDP)
 - Sx or Mx – Single SMS number in decimal (1 to 10)
 - Multiple SMS numbers in hexadecimal (001 to 3FF)

Bit presentation for multiple SMS numbers:

Bit #	9	8	7	6	5	4	3	2	1	0
SMS #	10	9	8	7	6	5	4	3	2	1

Example

Command	Response
AT\$TM=1,"U" Note: Send a text message via serial port.	OK Car Alarm!
AT\$TM=1,"N S1" Note: Send a text message via network channel	OK Car Alarm!

and SMS number 1.	
AT\$TM=1,"N M003" Note: Send a text message via network channel, SMS number 1 and 2.	OK Car Alarm!

12 Location Report Command

12.1 Standard Report – AT\$SR

This command will send one or more standard reports via the selected channels.

Note:

1. If the device is unable to acquire position, the last valid position will be sent with status indicator marked as invalid. The device will start afresh and will not keep the last valid position if power is cycled. In the case of no valid position at all, all the GPS data fields (date, time, latitude, longitude, speed, heading) will be set to 0.
2. If the user is trying to send standard report while the GPS is in sleep mode, the device will send out an unsolicited response to indicate GPS sleep.
3. If the user is trying to send standard report while the GPS is not operational, the device will send out an unsolicited response to indicate GPS not operational.
4. If the user is trying to send standard report via inactive network channel, the device will send out an unsolicited response to indicate inactive network channel.
5. If the user is trying to send standard report to a SMS number which is not defined, the device will send out an unsolicited response to indicate undefined SMS number.
6. Once maximum reports (set in \$DB command) are logged, the device will overwrite the report data in the memory in FIFO order, at the same time, it will send out an unsolicited response to indicate memory full.
7. Note that excessive data log (e.g. data log and dump every min) may result in overwritten data flash beyond the life cycle.
8. Note that it is not recommended to send \$SR via SMS at less than 10sec interval.

Syntax

Command	Response
AT\$SR=<Prefix>,<Recipient>[,<Interval>,<Cycle>] Note: Send multiple reports.	OK <Standard Report> ... <Standard Report>

AT\$SR=<Prefix>,<Recipient> Note: Send one report.	OK <Standard Report>
AT\$SR Note: Stop sending report.	OK

Parameters

Prefix ASCII text of up to 10 alphanumeric characters, limited to the following characters list:

0-9 a-z A-Z ! # \$ % & ' () * + - . / : < = > ? @

Recipient Send report to single or multiple recipients as follows:

- D – Log data into memory
- U – Serial port (UART)
- N – Network channel (TCP / UDP)
- Sx or Mx – Single SMS number in decimal (1 to 10)
- Multiple SMS numbers in hexadecimal (001 to 3FF)

Bit presentation for multiple SMS numbers:

Bit #	9	8	7	6	5	4	3	2	1	0
SMS #	10	9	8	7	6	5	4	3	2	1

Interval Interval between reports in second:

- Internal Memory – 60 to 65000 sec
- SMS Channel – 5 to 65000 sec
- Other Channel – 1 to 65000 sec

Cycle Number of reports to be sent (1 to 65000 reports, 0 is non-stop sending)

Example

Command	Response
AT\$SR="Location","D" Note: Log one report into memory.	OK
AT\$SR="Location","U" Note: Send one report via serial port.	OK <Standard Report>
AT\$SR="Location","N S1" Note: Send one report via network channel and SMS number 1.	OK <Standard Report>

<p>AT\$SR="Location","N M003",300,100 Note: Send 100 reports with interval 5 min via network channel, SMS number 1 and 2.</p>	<p>OK <Standard Report> ... <Standard Report></p>
---	---

Standard Report Format

Syntax

\$SR:<Prefix>,<Status><Date><Time><Location><Speed><Heading><System><Ports>

Parameters

Field	Identifier	Description
Prefix		User defined short-text prefix for the report. Up to 10 alphanumeric characters.
Status	V	<v> 0 = invalid location data 1 = valid location data
Date	D	<ddmmyy> dd:day, mm:month, yy:year
Time	T	<hhmmss> hh:hour, mm:minute, ss:second
Location - Latitude - Longitude	L	<Aaa.bbbbbb><Brrr.hhhhhh> <Aaa.bbbbbb> A: '+' = North, '-' = South aa.bbbbbb degree <Brrr.hhhhhh> B: '+' = East, '-' = West rrr.hhhhhh degree
Speed	S	<nnn.mmm> nnn.mmm km/h 000.000 – 300.000 km/h
Heading	H	<nnn.mmm> nnn.mmm degree 000.000 – 359.999 degree
System	W	<aa> aa = 00 to FF Bit 0: GSM Registered Bit 1: GPRS Registered Bit 2: GPRS Connected Bit 3: Active TCP / UDP Session

Port	P	<bb> bb = 00 to FF Bit 0 to 7: Port #1 (LSB) to #8 (MSB)
------	---	--

Example 1: Valid GPS data

`$$SR:Location,V1D061208T143500L+01.225296+103.521991S067.231H403.412W0FP03`

Example 2: No valid GPS data, use last valid position

`$$SR:Location,V0D061208T143500L+01.225296+103.521991S067.231H403.412W0FP03`

Example 3: No valid GPS data since startup

`$$SR:Location,V0D000000T000000L+00.000000+000.000000S000.000H000.000W0FP03`

12.2 NMEA Report – AT\$NR

This command will send one or more NMEA reports via the selected channels.

Note:

1. If GPS is in sleep mode, the device will send out the requested NMEA type without data.
2. If the user is trying to send NMEA report while the GPS is in sleep mode, the device will send out an unsolicited response to indicate GPS sleep.
3. If the user is trying to send NMEA report while the GPS is not operational, the device will send out an unsolicited response to indicate GPS not operational.
4. If the user is trying to send NMEA report via inactive network channel, the device will send out an unsolicited response to indicate inactive network channel.
5. If the user is trying to send NMEA report to a SMS number which is not defined, the device will send out an unsolicited response to indicate undefined SMS number.

Syntax

Command	Response
AT\$NR=<Type>,<Recipient>[,<Interval>,<Cycle>] Note: Send multiple reports.	OK <NMEA Report> ... <NMEA Report>
AT\$NR=<Type>,<Recipient> Note: Send one report.	OK <NMEA Report>
AT\$NR Note: Stop sending report.	OK

Parameters

Type NMEA report type as follows:

- 0 - \$GPGLL
- 1 - \$GPGGA
- 2 - \$GPGSA
- 3 - \$GPGSV
- 4 - \$GPVTG
- 5 - \$GPRMC
- 6 - \$GPZDA

Recipient Send report to single or multiple recipients as follows:

- U – Serial port (UART)
- N – Network channel (TCP / UDP)
- Sx or Mx – Single SMS number in decimal (1 to 10)
Multiple SMS numbers in hexadecimal (001 to 3FF)

Bit presentation for multiple SMS numbers:

Bit #	9	8	7	6	5	4	3	2	1	0
SMS #	10	9	8	7	6	5	4	3	2	1

Interval Interval between reports in second:

- SMS Channel – 5 to 65000 sec
- Other Channel – 1 to 65000 sec

Cycle Number of reports to be sent (1 to 65000 reports, 0 is non-stop sending)

Example

Command	Response
AT\$NR=0,"U" Note: Send one report via serial port.	OK <NMEA Report>
AT\$NR=0,"N S1" Note: Send one report via network channel and SMS number 1.	OK <NMEA Report>
AT\$NR=0,"N M003",300,100 Note: Send 100 reports with interval 5 min via network channel, SMS number 1 and 2.	OK <NMEA Report> ... <NMEA Report>
AT\$NR=0,"U" Note: Send one GLL report via serial port while GPS is in sleep mode.	OK \$GPGLL Note: Send only the NMEA type in sleep mode.

12.3 Cell ID Report – AT\$CR

This command will send one or more Cell ID reports via the selected channels.

Note:

1. If GSM is in sleep mode, the device will send out \$CR without data.
2. If the user is trying to send Cell ID report while the GSM is in sleep mode, the device will send out an unsolicited response to indicate GSM sleep.
3. If the user is trying to send Cell ID report while the GSM is not registered, the device will send out an unsolicited response to indicate GSM not registered.
4. If the user is trying to send Cell ID report via inactive network channel, the device will send out an unsolicited response to indicate inactive network channel.
5. If the user is trying to send Cell ID report to a SMS number which is not defined, the device will send out an unsolicited response to indicate undefined SMS number.
6. If any field in the cell ID information is not available, it will be marked as ‘.’.

Syntax

Command	Response
AT\$CR=<Recipient>[,<Interval>,<Cycle>] Note: Send multiple reports.	OK <Cell ID Report> ... <Cell ID Report>
AT\$CR=<Recipient> Note: Send one report.	OK <Cell ID Report>
AT\$CR Note: Stop sending report.	OK

Parameters

Recipient Send report to single or multiple recipients as follows:

- U – Serial port (UART)
- N – Network channel (TCP / UDP)
- Sx or Mx – Single SMS number in decimal (1 to 10)
- Multiple SMS numbers in hexadecimal (001 to 3FF)

Bit presentation for multiple SMS numbers:

Bit #	9	8	7	6	5	4	3	2	1	0
SMS #	10	9	8	7	6	5	4	3	2	1

Interval Interval between reports in second (5 to 65000 sec)

Cycle Number of reports to be sent (1 to 65000 reports, 0 is non-stop sending)

Example

Command	Response
AT\$CR="U" Note: Send one report via serial port.	OK <Cell ID Report>
AT\$CR="N S1" Note: Send one report via network channel and SMS number 1.	OK <Cell ID Report>
AT\$CR="N M003",300,100 Note: Send 100 reports with interval 5 min via network channel, SMS number 1 and 2.	OK <Cell ID Report> ... <Cell ID Report>
AT\$CR="U" Note: Send one report via serial port while GSM is in sleep mode.	OK \$CR Note: Send only the report type in sleep mode.

Cell ID Report Format

Syntax

\$CR: <Serving Cell><Neighbor Cells><Timing Advance>

Parameters

Field	Description
Serving Cell	Cell ID (2 bytes or 4 hexadecimal digits), e.g. 4EAF Received signal level in dBm (1 byte), e.g. 55 which is -55 dBm
Neighbor Cells	List of neighbor cells from strongest to weaker signal: Cell ID 1 (2 bytes), strongest signal Received signal level in dBm (1 byte) ... Cell ID 6 (2 bytes), weakest signal Received signal level in dBm (1 byte)
Timing Advance	Timing advance for the serving cell (1 byte)

Example 1: Information of all cells available

\$CR:0103,50,0104,84,0105,90,0106,91,0107,96,0108,96,0109,100,1

Example 2: Information of last two neighbor cells not available

\$CR:0103,50,0104,84,0105,90,0106,91,0107,96,,,,,1

13 Data Log Command

13.1 Data Buffer – AT\$DB

This command will set the data memory size to store reports.

Note:

While data logging is in progress, changing the data buffer will clear the logged data in the memory.

Syntax

Command	Response
AT\$DB=<Memory> Note: Write setting.	OK
AT\$DB? Note: Query setting.	\$DB: <Memory>

Parameters

- Memory 0 – Data memory of 5000 reports
- 1 – Data memory of 300 reports

Default is 1 (300 reports)

Example

Command	Response
AT\$DB=1 Note: Select data memory of 300 reports.	OK
AT\$DB? Note: Query current setting.	OK \$DB: 1

13.2 Data Dump – AT\$DD

This command will dump the logged data in the memory via the selected channel. The logged data is not allowed to dump via SMS channel due to large amount of data.

Note:

1. The data dump is allowed only if data logging is stopped first. If data dump is initiated while logging is in progress, the device will send an unsolicited response to indicate data dump not allowed.
2. Before data dump is started, the device will first send out an unsolicited response via the selected channel to indicate data dump start.
3. The device will dump all the reports one at a time in FIFO order. If data dump is stopped before dump completion, the remaining reports will be cleared from the memory.
4. At the end of the data dump, it will send out another unsolicited response to indicate data dump completed.
5. If the connection between the remote host and the device is down while data dump is in progress, the device will stop the data dump (and clear the remaining logged data) and send an unsolicited response to indicate data dump stopped due to communication link down.

Syntax

Command	Response
AT\$DD=<Mode> Note: Write setting.	OK

Parameters

- Mode
- 0 – Stop data dump and clear remaining data
 - 1 – Dump data via serial port
 - 2 – Dump data via TCP / UDP channel

Example

Command	Response
AT\$DD=1 Note: Dump data via serial port.	OK <Logged Data> ... <Logged Data>
AT\$DD=0 Note: Stop dumping data.	OK

13.3 Data Clear – AT\$DC

This command will clear the logged data in the device memory.

Syntax

Command	Response
AT\$DC Note: Execute command.	OK

Parameters

Nil

Example

Command	Response
AT\$DC Note: Remove logged data.	OK

14 Call Command

14.1 Originate Call – AT\$CV

This command is used to initiate a voice call (normal or silent call). For normal call, the device will start the two-way call session after call is connected. For silent call, the device will start one-way call session by turning on the MIC and mute the speaker (no ring back tone, no voice heard from the called party).

Note:

1. User can use event to trigger a call (e.g. press panic button or other means). Once the call is initiated, the panic button is used to end the call. Thus pressing panic button during call in progress will not trigger the event but end the call.
2. If the panic button is pressed while normal call is being established or in the midst of active normal call, the device will end the call.
3. If the panic button is pressed while silent call is being established or in the midst of active silent call, the device will not end the call. Only the called part (far end) can end the silent call.
4. If the user is trying make call to a SMS number which is not defined, the device will send out an unsolicited response to indicate undefined SMS number.

Syntax

Command	Response
AT\$CV=<Index>,<Type> Note: Write setting.	OK

Parameters

- Index Call number index 1 to 10 (corresponding to the SMS number in \$SL)
- Type Call type (0 – normal call, 1 – silent call)

Example

Command	Response
AT\$CV=1,0 Note: Initiate a normal call.	OK

AT\$CV=1,1 Note: Initiate a silent call.	OK
---	----

14.2 Auto Answer – AT\$CA

This command will enable / disable auto answer incoming call. If auto answer is enabled, the device will auto answer incoming call provided the call is in the SMS number list, otherwise, it will reject the call. If auto answer is disabled, the device will reject incoming call.

Note:

If the incoming call number is not in the SMS number list, the device will send out an unsolicited response to indicate undefined SMS number.

Syntax

Command	Response
AT\$CA=<Mode> Note: Write setting.	OK
AT\$CA? Note: Query setting.	OK \$CA: <Mode>

Parameters

- Mode 0 – Reject incoming call
- 1 – Auto answer incoming call

- Default is 0 (reject incoming call)

Example

Command	Response
AT\$CA=1 Note: Enable auto answer.	OK
AT\$CA? Note: Query call answer setting.	OK \$CA: 1

14.3 Speaker Volume and MIC Gain – AT\$CS

This command is used to set the speaker volume and MIC gain for voice call.

Note:

1. The device will turn off the speaker when call is not established and after the call is ended.
2. The device supports both internal and external MIC in which higher gain will be set for external MIC.
3. The device supports both internal and external speaker in which higher volume will be set for external speaker.
4. The device will assume external speaker is used when external MIC is detected. If external MIC is inserted, the device will switch to external MIC automatically and up the MIC gain and speaker volume accordingly.

Syntax

Command	Response
AT\$CS=<Speaker>,<MIC> Note: Write setting.	OK
AT\$CS? Note: Query setting.	OK \$CS: <Speaker>,<MIC>

Parameters

- Speaker Speaker volume (0 – Low, 1 – Mid, 2 – High), default is 1
- MIC MIC gain (0 – Low, 1 – Mid, 2 – High), default is 1

Example

Command	Response
AT\$CS=2,2 Note: Set speaker and MIC to high level.	OK
AT\$CS? Note: Query speaker and MIC setting.	OK \$CS: 2,2

15 Geo Fence Command

15.1 Geo Fence – AT\$GF

This command allows user to set maximum 20 geographical fences. When the device enters (exits) the geo fence, the respective geo fence flag in the event table will be set (cleared).

Syntax

Command	Response
AT\$GF=<Index>,<Mode>[,<Latitude>,<Longitude>,<Radius>] Note: Write setting.	OK
AT\$GF=<Index> Note: Query one setting.	OK \$GF: <Index>,<Mode>,<Latitude>,<Longitude>,<Radius>
AT\$GF? Note: Query all settings (not accessible via SMS).	OK \$GF: 1,<...> ... \$GF: 20,<...>

Parameters

- | | |
|-------|-------------------|
| Index | Geo fence 1 to 20 |
|-------|-------------------|
- | | |
|------|--|
| Mode | 0 – Disable
1 – Enable

Default is 0 (Disable). |
|------|--|
- | | |
|----------|---|
| Latitude | Format of latitude is as follows: <Aaa.bbbbbb>

A: '+' = North, '-' = South
aa.bbbbbb degree

Default is +00.000000. |
|----------|---|
- | | |
|-----------|---|
| Longitude | Format of longitude is as follows: <Brrr.hhhhhh>

B: '+' = East, '-' = West
rrr.hhhhhh degree

Default is +000.000000. |
|-----------|---|

Radius Radius of the geo fence (0.1 – 100.0 km)
 Default is 0.1 km

Example

Command	Response
AT\$GF=1,1,+89.121432,-103.242351,0.1 Note: Set geo fence 1.	OK
AT\$GF=1,0 Note: Disable geo fence 1.	OK
AT\$GF=1,1 Note: Enable geo fence 1.	OK
AT\$GF=1 Note: Query geo fence 1 setting.	OK \$GF: 1,1,+89.121432,-103.242351,0.1
AT\$GF? Note: Query setting of geo fences.	OK \$GF: 1, 1,+89.121432,-103.242351,0.1 ... \$GF: 20,0,0,0

15.2 Geo Fence Status – AT\$GS

This command allows user to query the current status of all geo fences.

Syntax

Command	Response
AT\$GS or AT\$GS? Note: Query geo fences status.	OK \$GS: <Status>

Parameters

Status Current status of all geo fences in hexadecimal value (00000 to FFFFF) with LSB and MSB as geo fence 1 and 20 respectively:
 0 – exit geo fence
 1 – enter geo fence
 Default is 0 for those disabled geo fences.

Bit presentation for geo fences:

Bit #	19	18	17	...	2	1	0
Geo Fence #	20	19	18	...	3	2	1

Example

Command	Response
AT\$GS Note: Query status of all geo fences.	OK \$GS: 00001 Note: Enter geo fence 1, exit the rest of geo fences (00001 = 0000 0000 0000 0000 0001).

16 Speed and Mileage Command

16.1 Over Speed Detection – AT\$OS

This command will set the speed threshold for over speed detection. When the speed exceeds the high speed threshold, the over speed flag in the event table will be set. When the speed falls below the normal speed threshold, the over speed flag in the event table will be cleared.

Note:
The device will return ERROR if user sets the high speed threshold equal or less than the normal speed threshold.

Syntax

Command	Response
AT\$OS=<Mode>[,<High Speed>,<Normal Speed>] Note: Write setting.	OK
AT\$OS? Note: Query setting.	OK \$OS: <Mode>,<High Speed>,<Normal Speed>

Parameters

- Mode
 - 0 – Disable
 - 1 – Enable

Default is 0 (Disable)
- High Speed

High speed threshold in km/h (10 to 300 km/h) to trigger high speed alert condition. Default is 100 km/h.
- Normal Speed

Normal speed threshold in km/h (10 to 250 km/h) to clear high speed alert condition. Default is 60 km/h.

Example

Command	Response
AT\$OS=1,110,50 Note: Set speed threshold.	OK
AT\$OS? Note: Query high speed setting.	OK \$OS: 1,110,50

16.2 Harsh Acceleration – AT\$ACC

This command will set the speed change threshold for harsh accelerating detection, which can only occur at speed above 40 km/h. When the desired speed change is detected, the acceleration flag in the event table will be set.

Syntax

Command	Response
AT\$ACC=<Mode>[,<Speed Change>,<Duration>] Note: Write setting.	OK
AT\$ACC? Note: Query setting.	OK \$ACC: <Mode>,<Speed Change>,<Duration>

Parameters

- Mode 0 – Disable
 1 – Enable

 Default is 0 (Disable)
- Speed Change Sudden increase in speed in km/h (10 to 40 km/h) caused by harsh accelerating. Default is 20 km/h.
- Duration Duration in second for speed change to take place (1 to 5 sec). Default is 3 sec.

Example

Command	Response
AT\$ACC=1,12,3 Note: Set speed change threshold.	OK
AT\$ACC? Note: Query current setting.	OK \$ACC: 1,12,3

16.3 Harsh Deceleration – AT\$DEC

This command will set the speed change threshold for harsh breaking detection, which can only occur at speed above 40 km/h. When the desired speed change is detected, the deceleration flag in the event table will be set.

Syntax

Command	Response
AT\$DEC=<Mode>[,<Speed Change>,<Duration>] Note: Write setting.	OK
AT\$DEC? Note: Query setting.	OK \$DEC: <Mode>,<Speed Change>,<Duration>

Parameters

- Mode
 - 0 – Disable
 - 1 – Enable

Default is 0 (Disable)
- Speed Change

Sudden drop in speed in km/h (10 to 40 km/h) caused by harsh breaking. Default is 20 km/h.
- Duration

Duration in second for speed change to take place (1 to 5 sec). Default is 3 sec.

Example

Command	Response
AT\$DEC=1,12,3 Note: Set speed change threshold.	OK
AT\$DEC? Note: Query current setting.	OK \$DEC: 1,12,3

16.4 Mileage Setting – AT\$MS

This command allows user to set the initial odometer reading. The device will counts pulses and increase the odometer reading whenever a predefined pulses that equivalent to 1 km is reached.

Note:
The mileage counter will configure analog input as digital input for pulse counting. Thus mileage counter and analog input are mutual exclusive and cannot be used at the same time.

Syntax

Command	Response
AT\$MS=<Mode>[,<Initial>,<Pulse>]	OK

Note: Write setting.	
AT\$MS? Note: Query setting.	\$MS: <Mode>,<Initial>,<Pulse>

Parameters

- Mode 0 – Disable mileage counter (pulse counting)
 1 – Enable mileage counter (pulse counting)

 Default is 0 (Disable)
- Initial Initial odometer reading in km (0 to 800,000 km)

 Default is 0 km.
- Pulse Number of pulses that equivalent to 1 km (100 to 5000 pulses)

 Default is 100 pulses.

Example

Command	Response
AT\$MS=1,10,200 Note: Set odometer reading.	OK
AT\$MS? Note: Query odometer setting.	\$MS: 1,10,200

16.5 Mileage Counter – AT\$MC

This command allows user to set odometer threshold for monitoring. When the odometer reading is equal to the preset threshold, the mileage counter flag in the event table will be set.

Note:
The current odometer reading is saved and will not be reset when the power of the device is cycled.

Syntax

Command	Response
AT\$MC=<Mode>[,<Threshold>] Note: Write setting.	OK

<p>AT\$MC? Note: Query setting and current odometer reading.</p>	<p>\$MC: <Mode>,<Threshold>,<Current></p>
---	---

Parameters

Mode 0 – Disable
 1 – Enable

Default is 0 (Disable)

Threshold Odometer threshold in km (1 to 800,000 km)

Default is 1 km.

Current Current odometer reading in km (0 to 800,000 km)

Example

Command	Response
<p>AT\$MC=1,200 Note: Set odometer threshold.</p>	<p>OK</p>
<p>AT\$MC? Note: Query setting and current odometer reading.</p>	<p>\$MC: 1,200,50</p>

17 Dead Reckoning

17.1 Gyro Calibration – AT\$GC

For every device installation on vehicle, the gyro needs to be calibrated for dead reckoning. This command allows user to instruct the device to start gyro calibration during the calibration mode. The calibration process is as follows:

- Long press the reset button for 3 sec to enter calibration mode.
- Put the vehicle to forward gear.
- Send this command to the device to start the calibration. The device will take less than one min for calibration and return an unsolicited response to indicate calibration result.

Note:

1. When the reset button is long pressed for 3 seconds, the device will enter calibration mode and send out an unsolicited response to indicate calibration entry.
2. Once the gyro is calibrated (by \$GC command) or 5 min is due, the device will return to normal mode and send out an unsolicited response to indicate calibration exit. This command (\$GC) has no effect during normal mode.
3. When the reset button of device without dead reckoning or motion detect is long pressed for 3 sec, it will send out an unsolicited response to indicate calibration is not supported.
4. During normal operation, if the dead reckoning fails to work, the device will send out an unsolicited response to indicate dead reckoning failed.

Syntax

Command	Response
AT\$GC Note: Execute command.	OK

Parameters

Nil

Example

Command	Response
AT\$GC	OK

Note: Start gyro calibration.	
-------------------------------	--

17.2 Dead Reckoning Calibration Accuracy – AT\$GA

This command allows user to find out the accuracy of speed tick and gyro calibration. The device will return 0% if it does not support dead reckoning.

Note:

For the device without dead reckoning, it will send out unsolicited response to indicate dead reckoning not supported.

Syntax

Command	Response
AT\$GA or AT\$GA? Note: Query setting.	OK \$GA: <Speed>,<Gyro>

Parameters

- Speed Speed tick calibration accuracy in terms of percentage (0 to 100%)
- Gyro Gyro calibration accuracy in terms of percentage (0 to 100%)

Example

Command	Response
AT\$GA? Note: Query dead reckoning calibration accuracy (with dead reckoning).	OK \$GA: 80,90
AT\$GA? Note: Query dead reckoning calibration accuracy (without dead reckoning).	OK \$GA: 0,0

18 Digital IO Command

18.1 Port Configuration – AT\$PC

This command will set the four programmable digital IO ports to either input or output port. There are total 8 IO ports in which port 1 to 4 are input port and port 5 to 8 are programmable IO port which can be configured as either input or output port.

Note:

1. Port 3 cannot be used if driver ID option is hardware configured in factory.
2. Port 4 is typically used to connect to the ignition switch as it comes with a key on reset feature, which allows the hardware reset button to take effect only if ignition is switched on.

Syntax

Command	Response
AT\$PC=<Configuration> Note: Write setting.	OK
AT\$PC? Note: Query setting.	OK \$PC: <Configuration>

Parameters

Configuration Port configuration in hexadecimal (00 to FF) with LSB and MSB as port 1 and port 8 respectively, only port 5 to 8 are effective.

- 0 – Output port
- 1 – Input port

Default port configuration is as follows: port 1 to 8 are input port.

Bit presentation for ports:

Bit #	7	6	5	4	3	2	1	0
Port #	8	7	6	5	4	3	2	1

Example

Command	Response
AT\$PC=3F Note: Set port 7 and 8 to output port and the rest to input ports.	OK
AT\$PC? Note: Query port configuration.	OK \$PC: 3F

18.2 Output Port Default – AT\$PD

This command will set the default value of output ports upon power. It is recommended to set the output port to LOW for power saving if the output port is not used.

Note:

1. If the output port is used as current source, the current direction is from device to the load when output is set to HIGH (activate output). In this case, set the output to LOW will deactivate the output.
2. If the output port is used as current sink, the current direction is from load to the device when output is set to LOW (activate output). In this case, set the output to HIGH will deactivate the output.

Syntax

Command	Response
AT\$PD=<Value> Note: Write setting.	OK
AT\$PD? Note: Query setting.	OK \$PD: <Value>

Parameters

Value Output port default value in hexadecimal (00 to FF) with LSB and MSB as port 1 and port 8 respectively, only output ports are effective. Default is 0 (LOW).

- 0 – LOW
- 1 – HIGH

Port 1 to 4 are input ports, port 5 to 8 can be input or output port depending on the port configuration.

Bit presentation for ports:

Bit #	7	6	5	4	3	2	1	0
Port #	8	7	6	5	4	3	2	1

Example

Command	Response
AT\$PC? Note: Query port configuration.	OK \$PC: 0F
AT\$PD=30 Note: Set default value of output port 5 and 6 to HIGH, output port 7 and 8 to LOW.	OK
AT\$PD? Note: Query default value of output ports.	OK \$PD: 30

18.3 Port Status – AT\$PS

This command will return the current value of both input and output ports.

Syntax

Command	Response
AT\$PS or AT\$PS? Note: Query setting.	OK \$PS: <Status>

Parameters

Status Port status in hexadecimal (00 to FF) with LSB and MSB as port 1 and port 8 respectively.

0 – LOW
1 – HIGH

Bit presentation for ports:

Bit #	7	6	5	4	3	2	1	0
Port #	8	7	6	5	4	3	2	1

Example

Command	Response
AT\$PC? Note: Query port configuration.	OK \$PC: 0F

AT\$PS Note: Query port status.	OK \$PS: F0 Note: Input port 1 to 4 are LOW, output port 5 to 8 are HIGH.
------------------------------------	---

18.4 Input Port – AT\$IN

This command will get the status of a user specified input port.

Note:
If the user is trying to read an output port, the device will send out an unsolicited response to indicate invalid input port.

Syntax

Command	Response
AT\$IN=<Index> Note: Get input port status.	OK \$IN: <Index>,<Status>

Parameters

- Index Port 1 to 8, only input ports are effective (port 1 to 4 are input port, port 5 to 8 can be input or output port depending on the port configuration)
- Status 0 – LOW
 1 – HIGH

Example

Command	Response
AT\$PC? Note: Query port configuration.	OK \$PC: 0F
AT\$IN=1 Note: Get status of input port 1.	OK \$IN: 1,1

18.5 Output Port – AT\$OUT

This command will set a user specified output port to either HIGH or LOW.

Note:

1. If the output port is used as current source, the current direction is from device to the load when output is set to HIGH (activate output). In this case, set the output to LOW will deactivate the output.
2. If the output port is used as current sink, the current direction is from load to the device when output is set to LOW (activate output). In this case, set the output to HIGH will deactivate the output.
3. If the user is trying to set an input port, the device will send out an unsolicited response to indicate invalid output port.

Syntax

Command	Response
AT\$OUT=<Index>,<Value> Note: Write setting.	OK

Parameters

Index	Port 1 to 8, only output ports are effective (port 1 to 4 are input port, port 5 to 8 are depending on the port configuration)
Value	0 – LOW 1 – HIGH

Example

Command	Response
AT\$PC? Note: Query port configuration.	OK \$PC: 0F
AT\$OUT=5,1 Note: Set output port 5 to HIGH.	OK
AT\$OUT=8,1 Note: Set output port 8 to HIGH.	OK
AT\$PS Note: Query port status.	\$PS: 90

19 Analog IO Command

19.1 Analog Input Port – AT\$AI

This command allows user to set analog input thresholds for monitoring, which is in term of digital value. When the analog input level is equal or higher than the preset threshold, the analog input status flag in the event table will be set.

The ADC reference voltage is 3.3 volts. The external power level is reduced by ten times before connecting to the ADC channel.

For the conversion from digital value to actual voltage, refer to “ADC Conversion Formula” below. The factor value for external power level is 31. For example, the voltage of 12 V is corresponding to digital value of 372.

ADC Conversion Formula

Analog Input Level = (Digital Value / Factor) volts

Syntax

Command	Response
AT\$AI=<Mode>[,<Threshold>] Note: Write setting.	OK
AT\$AI? Note: Query setting and current analog input level.	\$AI: <Mode>,<Threshold>,<Current>

Parameters

- Mode 0 – Disable
 1 – Enable

 Default is 0 (Disable)
- Threshold Analog input threshold in digital value (0 to 1023 units)

 Default is 0 units
- Current Current analog input level in digital value (0 to 1023 units)

Example

Command	Response
AT\$AI=1,372 Note: Set analog input threshold.	OK
AT\$AI? Note: Query setting and current analog input level.	\$AI: 1,372,300

19.2 Analog Output Port – AT\$AO

This command allows user to set the analog output maximum capped at the external power level.

Syntax

Command	Response
AT\$AO=<Value> Note: Write setting.	OK
AT\$AO? Note: Query setting.	\$AO: <Value>

Parameters

Value Analog output value in terms of percentage (0 to 100%) of the external power level

Default is 0%

Example

Command	Response
AT\$AO=50 Note: Set analog output to 50% of the external power (e.g. 6V if external power is 12V).	OK
AT\$AO? Note: Query setting.	\$AO: 50

20 Fail Safe Output Command

20.1 Fail Safe Output Default – AT\$FSD

This command will set the default value of fail safe output port upon power up. It is recommended to set the output port to LOW for power saving if the output port is not used.

Note:

1. If the fail safe output port is used as current source, the current direction is from device to the load when output is set to LOW (activate output). In this case, set the output to HIGH will deactivate the output.
2. If the fail safe output port is used as current sink, the current direction is from load to the device when output is set to HIGH (activate output). In this case, set the output to LOW will deactivate the output.

Syntax

Command	Response
AT\$FSD=<Value> Note: Write setting.	OK
AT\$FSD? Note: Query setting.	OK \$FSD: <Value>

Parameters

Value Fail safe output port default value, default is 0 (LOW).

- 0 – LOW
- 1 – HIGH

Example

Command	Response
AT\$FSD=1 Note: Set default value of fail safe output port to HIGH.	OK
AT\$FSD? Note: Query default value of fail safe output port.	OK \$FSD: 1

20.2 Fail Safe Output – AT\$FSO

This command will set the fail safe output port to either HIGH or LOW.

Note:

1. If the fail safe output port is used as current source, the current direction is from device to the load when output is set to HIGH. In this case, set the output to LOW will deactivate output.
2. If the fail safe output port is used as current sink, the current direction is from load to the device when output is set to LOW. In this case, set the output to HIGH will deactivate the output.

Syntax

Command	Response
AT\$FSO=<Value> Note: Write setting.	OK
AT\$FSO? Note: Query setting.	OK AT\$FSO: <Value>

Parameters

Value 0 – LOW
 1 – HIGH

Example

Command	Response
AT\$FSO=1 Note: Set fail safe output port to HIGH.	OK
AT\$FSO? Note: Query fail safe output port setting.	OK \$FSO: 1

21 Peripherals Command

21.1 Driver ID – AT\$DI

This command will return the driver ID of the driver ID Tag connected to the device. When this command is initiated, the device will poll for valid driver ID for 5 sec and return the driver ID right away if valid driver ID is read in 5 sec.

Note:

1. The device will return “0000000000000000” after 5 sec when no driver ID Tag is connected.
2. The device will return “FFFFFFFFFFFFFFFF” after 5 sec when there is error in reading the driver ID Tag.

Syntax

Command	Response
AT\$DI or AT\$DI? Note: Query setting.	OK \$DI: <Driver ID>

Parameters

Driver ID Driver ID of 8 bytes in hex values.

Example

Command	Response
AT\$DI? Note: Query peripheral driver ID.	OK \$DI: "1234567890123456"

21.2 Dual SIM – AT\$SIM

This command allows user to select one of the SIM cards for registration or set the dual SIM setting to auto switch mode for border crossing.

Note:

For border crossing, user can place two SIM cards (e.g. SIM 1 for home country, SIM 2 for foreign country) into the device and set the dual SIM setting to auto switch mode. The device will switch over to SIM 2 when crossing from home to foreign country and vice-versa.

Syntax

Command	Response
AT\$SIM=<Mode> Note: Write setting.	OK
AT\$SIM? Note: Query setting.	\$SIM: <Mode>

Parameters

- Mode
- 0 – Auto switch to another SIM when roaming take place or current network connection is down (GSM/GPRS down or TCP/UDP connection down)
 - 1 – Select SIM1 for GSM registration (default setting)
 - 2 – Select SIM2 for GSM registration

Example

Command	Response
AT\$SIM=0 Note: Switch over to another SIM when roaming takes place or current network connection is down.	OK
AT\$SIM=2 Note: Select SIM2 for GSM registration.	OK

21.3 Panic Button – AT\$PB

This command will get the status of the panic button.

Syntax

Command	Response
AT\$PB or AT\$PB? Note: Get panic button status.	OK \$PB: <Status>

Parameters

Status 0 – LOW (button release)
 1 – HIGH (button press)

Example

Command	Response
AT\$PB Note: Get status of panic button.	OK \$PB: 1

21.4 Key On Reset – AT\$KR

This command will turn on / off the key on reset feature. Once this feature is turned on, the hardware reset button will take effect only when the digital input port 4 is set to HIGH (normally connected to ignition switch).

Syntax

Command	Response
AT\$KR=<Value> Note: Write setting.	OK
AT\$KR? Note: Query setting.	OK AT\$KR: <Value>

Parameters

Value 0 – Disable key on reset
 1 – Enable key on reset

Default is 0 (disable key on reset)

Example

Command	Response
AT\$KR=1 Note: Enable key on reset.	OK
AT\$KR? Note: Query setting.	OK \$KR: 1

21.5 Battery Charging – AT\$BC

This command allows user to turn off battery charging when the external power falls below a preset threshold.

Note:

1. With battery charging disabled, when the external power falls below a preset threshold, the device will send out an unsolicited response to indicate stop battery charging.
2. With battery charging disabled, when the external power goes above the preset threshold, the device will send out an unsolicited response to indicate resume battery charging.

Syntax

Command	Response
AT\$BC=<Mode>[,<Threshold>] Note: Write setting.	OK
AT\$BC? Note: Query setting.	OK AT\$BC: <Mode>,<Threshold>

Parameters

Mode 0 – Turn off battery charging when external power drops below a preset threshold

 1 – Always turn on battery charging

 Default is 1

Threshold External power threshold (9 to 12 V) for 12 V power source, default is 10 V.

 For 24 V power source, the threshold range (9 to 12 V) are corresponding to (18 to 24 V) and the default is 20 V.

Example

Command	Response
AT\$BC=0,9 Note: Disable battery charging when the external power drops below 9 V.	OK
AT\$BC?	OK

Note: Query setting.	\$BC: 0,9
----------------------	-----------

21.6 Motion Detection Calibration – AT\$MZ

For every device installation on vehicle, the motion detection needs to be calibrated to zero for sensitive detection of motion / acceleration. This command allows user to instruct the device to start the motion detection calibration during calibration mode. The calibration process is as follows:

- Long press the reset button for 3 sec to enter calibration mode.
- Send this command to the device to start the calibration. The device will take less than one min for calibration and return a unsolicited response to indicate calibration result.

Note:

1. When the reset button is long pressed for 3 seconds, the device will enter calibration mode and send out an unsolicited response to indicate calibration entry.
2. Once the motion detect is calibrated (by \$MZ command) or 5 min is due, the device will return to normal mode and send out an unsolicited response to indicate calibration exit. This command (\$MZ) has no effect during normal mode.
3. When the reset button of device without dead reckoning or G-sensor (motion detect) is long pressed for 3 sec, it will send out an unsolicited response to indicate calibration is not supported.
4. During normal operation, if the G-sensor (motion detect) fails to work, the device will send out an unsolicited response to indicate G-sensor failed.

Syntax

Command	Response
AT\$MZ Note: Execute command.	OK Followed by x, y, z calibrated values upon completion.

Parameters

Nil

Example

Command	Response
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AT\$MZ Note: Start motion detect calibration. Upon completion of calibration	OK \$MZ: <X, Y, Z>
--	---------------------------

21.7 Motion Detection Sensitivity – AT\$MD

This command allows user to set the sensitivity of the motion sensor for motion detection.

Syntax

Command	Response
AT\$MD=<Sensitivity> Note: Write setting.	OK
AT\$MD? Note: Query setting.	OK \$MD: <Sensitivity>

Parameters

Sensitivity Sensitivity of the motion Sensor, ranged from 7 to 255. Default sensitivity is 200.

Note:
Range 0 to 6 is too sensitive for MTD application on vehicle and is disabled.
To turn off Motion Detection, set sensitivity value to maximum, i.e. 255.

Example

Command	Response
AT\$MD=50 Note: Set sensitivity of motion sensor.	OK
\$MD? Note: Query motion sensor setting.	OK \$MD: 50

21.8 GSM Modem – AT\$GM

This command will set the device as GSM modem. In GSM modem mode, the device will not accept MTD2000 commands and will stop executing events. The user can press the panic button to place the device back to GPS tracker mode, the device will reset and resume the event execution.

Note:

1. Cycle power or reset the device while it is in GSM modem mode, it will remain in GSM modem mode and display “MTD2000 READY (GSM Modem)” via serial port.
2. This command is only valid via serial port. If user issues this command via SMS or TCP/UDP channel, the device will return ERROR.

Syntax

Command	Response
AT\$GM Note: Write setting.	OK

Parameters

Nil

Example

Command	Response
AT\$GM Note: Set the device as GSM modem.	OK

21.9 UART Control – AT\$UM

This command will enable / disable RS232 interface (UART) to further conserve power. After power is cycled or device is soft reset, the device will re-activate RS232 interface.

Syntax

Command	Response
AT\$UM=<Mode> Note: Write setting.	OK
AT\$UM? Note: Query setting.	OK \$UM: <Mode>

Parameters

Mode 0 – Disable
 1 – Enable

Default is 1 (Enable).

Example

Command	Response
AT\$UM=0 Note: Disable RS232 interface.	OK
\$UM? Note: Query RS232 interface status via SMS or TCP / UDP channel.	OK \$UM: 0
\$UM=1 Note: Enable RS232 interface via SMS or TCP channel.	OK

22 Power Status Command

22.1 External Power Status – AT\$XE

This command allows user to set maximum 5 external power thresholds for monitoring, which is in term of digital value. When the external power level is equal or higher than the preset threshold, the respective external power status flag in the event table will be set.

The ADC reference voltage is 3.3 volts. The external power level is reduced by ten times before connecting to the ADC channel.

For the conversion from digital value to actual voltage, refer to “ADC Conversion Formula” below. The factor value for external power level is 29. For example, the voltage of 12 V is corresponding to digital value of 348.

ADC Conversion Formula

External Power Level = (Digital Value / Factor) volts

Syntax

Command	Response
AT\$XE=<Index>,<Mode>[,<Threshold>] Note: Write setting.	OK
AT\$XE=<Index> Note: Query one setting and current external power level.	\$XE: <Index>,<Mode>,<Threshold>,<Current>
AT\$XE? Note: Query all settings (not accessible via SMS).	OK \$XE: 1, <Mode>,<Threshold> ... \$XE: 5, <Mode>,<Threshold>

Parameters

- Index External power status 1 to 5
- Mode 0 – Disable
 1 – Enable
- Default is 0 (Disable)

Threshold External power threshold in digital value (0 to 1023 units)
 Default is 0 units

Current Current external power level in digital value (0 to 1023 units)

Example

Command	Response
AT\$XE=1,1,200 Note: Set an external power threshold.	OK
AT\$XE=1 Note: Query setting and current external power level.	\$XE: 1,1,200,250
AT\$XE=2 Note: Query setting and current external power level.	\$XE: 1,0,0,250
AT\$XE? Note: Query all settings.	OK \$XE: 1,1,200 \$XE: 2,0,0 ... \$XE: 5,0,0

22.2 Battery Power Status – AT\$XB

This command allows user to set maximum 5 battery power thresholds for monitoring, which is in term of digital value. When the battery power level is equal or higher than the preset threshold, the respective battery power status flag in the event table will be set.

The ADC reference voltage is 3.3 volts. The battery power level is reduced by half before connecting to the ADC channel.

For the conversion from digital value to actual voltage, refer to “ADC Conversion Formula” below. The factor value for battery power level is 155. For example, the voltage of 3.3 V is corresponding to digital value of 512.

ADC Conversion Formula

Battery Power Level = (Digital Value / Factor) volts

Syntax

Command	Response
---------	----------

AT\$XB=<Index>,<Mode>[,<Threshold>] Note: Write setting.	OK
AT\$XB=<Index> Note: Query one setting and current battery power level.	\$XB: <Index>,<Mode>,<Threshold>,<Current>
AT\$XB? Note: Query all settings (not accessible via SMS).	OK \$XB: 1, <Mode>,<Threshold> ... \$XB: 5, <Mode>,<Threshold>

Parameters

- Index Battery power status 1 to 5
- Mode 0 – Disable
 1 – Enable

 Default is 0 (Disable)
- Threshold Battery power threshold in digital value (0 to 1023 units)

 Default is 0 units
- Current Current battery power level in digital value (0 to 1023 units)

Example

Command	Response
AT\$XB=1,1,200 Note: Set a battery voltage threshold.	OK
AT\$XB=1 Note: Query one setting and current battery power level.	\$XB: 1,1,200,250
AT\$XB=2 Note: Query one setting and current battery power level.	\$XB: 1,0,0,250
AT\$XB? Note: Query all settings.	OK \$XB: 1,1,200 \$XB: 2,0,0 ... \$XB: 5,0,0

23 Timer and Counter Command

23.1 Timer – AT\$FT

This command allows user to set maximum 10 timers. When the timer is expired, the respective timer flag in the event table will be set.

Note:

1. When timer is disabled, the current tick will be paused.
2. When timer is enabled, the current tick will resume from its last paused tick. In the case of once timer, it will not resume running if the current tick is equal to the user specified interval.
3. When timer is disabled, reset the timer will set the current tick to 0.
4. When timer is enabled, reset the timer will set the current tick to 0 and then start running again.
5. The current tick will not be saved and will be reset to 0 when power is cycled or device is reset.
6. After power is cycled or device is reset, the timer will start to run if it is enabled.

Syntax

Command	Response
AT\$FT=<Index>,<Mode>[,<Interval>,<Cyclic>] Note: Write setting.	OK
AT\$FT=<Index> Note: Query one setting and current tick.	OK \$FT: <Index>,<Mode>,<Interval>,<Cyclic>,<Current>
AT\$FT? Note: Query all settings (not accessible via SMS).	OK \$FT: 1,<...> ... \$FT: 10,<...>

Parameters

- Index Timer 1 to 10
- Mode 0 – Disable

- 1 – Enable
- 2 – Reset

Default is 0 (Disable).

Note: Mode = 2 is only valid with AT\$FT=<Index>,<Mode>

Interval Timer interval in second (1 to 65000 seconds)

Default is 1

- Cyclic 0 – Once timer
 1 – Cyclic timer

Default is 0 (Once timer)

Current Current timer tick in second

Example

Command	Response
AT\$FT=1,1,10,0 Note: Start timer 1 of interval 10 seconds.	OK
AT\$FT=1 Note: Query timer 1 setting and current tick.	OK \$FT: 1,1,10,0,3
AT\$FT=1,2 Note: Reset timer 1 and start to run from beginning.	OK
AT\$FT=1,0 Note: Pause timer 1.	OK
AT\$FT=1 Note: Query timer 1 setting and current tick.	OK \$FT: 1,0,10,0,5
AT\$FT? Note: Query setting of all timers (without current tick).	OK \$FT: 1,1,10,0 ... \$FT: 10,0,0,0

23.2 Counter – AT\$FC

This command allows user to set maximum 10 counters. When the current counter value reaches the user defined counter value, the respective counter flag in the event table will be set.

Note:

1. The current counter value starts with 0.
2. The current counter value will not decrement further once it reaches 0.
3. The current counter value will not increment further once it reaches the user defined counter value.
4. The current counter value will not increment / decrement if the counter is disabled.
5. The current counter value is saved and will not be reset when the power of the device is cycled.
6. Note that excessive use of counter (e.g. frequent increment / decrement counter value) may result in overwritten data flash beyond the life cycle.

Syntax

Command	Response
AT\$FC=<Index>,<Mode>[,<Counter>] Note: Write setting.	OK
AT\$FC=<Index> Note: Query one setting and current counter value.	OK \$FC: <Index>,<Mode>,<Counter>,<Current>
AT\$FC? Note: Query all settings (not accessible via SMS).	OK \$FC: 1,<...> ... \$FC: 10,<...>

Parameters

- Index Counter 1 to 10
- Mode 0 – Disable
 1 – Enable
 2 – Reset to 0 count
 3 – Increment one count
 4 – Decrement one count

Default is 0 (Disable)

Note: Mode = 2, 3 or 4 are only valid with AT\$FC=<Index>,<Mode>

Counter User defined counter value (1 to 65000)

Default is 1

Current Current counter value

Example

Command	Response
AT\$FC=1,1,10 Note: Start counter 1 of user defined counter value 10.	OK
AT\$FC=1,3 Note: Increment counter 1.	OK
AT\$FC=1 Note: Query counter 1 setting and current counter value.	OK \$FC: 1,1,10,1
AT\$FC? Note: Query all settings (without current counter value).	OK \$FC: 1,1,10,1 ... \$FC: 10,0,0,0

24 Event Command

24.1 Event Table

The event flags are used as conditions to trigger event.

Function	Flag	Value		Remarks
GSM Sleep	G1	1 (GSM sleep)	0 (GSM awake)	
GSM Registered	G2	1 (GSM registered)	0 (GSM not registered)	
GPRS Registered	G3	1 (GPRS registered)	0 (GPRS not registered)	
GPRS Connected	G4	1 (GPRS connected)	0 (GPRS not connected)	
GPS Sleep	L1	1 (GPS sleep)	0 (GPS awake)	
GPS Data	L2	1 (valid GPS fix)	0 (invalid GPS fix)	
GPS Operational	L3	1 (GPS functioning)	0 (GPS not functioning)	
GPS Antenna	L4	1 (antenna disconnected)	0 (antenna connected)	GPS external antenna
Online Flag	N1	1 (network connected)	0 (network disconnected)	
Geo Fence	Z1 to Z20	1 (enter zone)	0 (exit zone)	
Digital Input	P1 to P8	1 (high)	0 (low)	
External Power	E1 to E5	1 (>= preset threshold)	0 (< preset threshold)	
Battery Power	B1 to B5	1 (>= preset threshold)	0 (< preset threshold)	
Timer	T1 to T10	1 (timer expire)	0 (timer not expire)	
Counter	C1 to C10	1 (= preset count)	0 (< preset count)	
Harsh Acceleration	H1	1 (>= speed change)	0 (< speed change)	
Harsh Deceleration	H2	1 (>= speed change)	0 (< speed change)	
Mileage Counter	H3	1 (= preset threshold)	0 (not used)	
Over Speed Detection	H4	1 (>= high speed threshold)	0 (<= normal speed threshold)	
Dual SIM	R1	1 (SIM 2 active)	0 (SIM 1 active)	
Panic Button	R2	1 (button press)	0 (button release)	
Analog Input	R3	1 (>= preset threshold)	0 (< preset threshold)	
Motion Detection	R4	1 (motion detected)	0 (no motion)	

24.2 Event – \$EV

This command allows user to set up maximum 20 events for user application. Event is used to define certain conditions (using event flags) and trigger the predefined commands when the conditions are met. The maximum length of event including the overhead is 150 characters.

Note:

1. Multiple conditions of up to 5 are supported.
2. Multiple commands of up to 10 are supported (use vertical bar character '|' as a separator).
3. The event will be triggered when the condition changes state and become true again.
4. The events will be saved in the flash and will execute after power is cycled (or reset).
5. The event will be triggered right away when the condition is met after power is cycled (or reset).

Format

AT\$EV=<Index>,<Mode>,<Operator>,"<Condition 1> <Condition 2> ... <Condition N>",<Command 1>|<Command 2>|...|<Command M>

Syntax

Command	Response
<p>AT\$EV=<Index>,<Mode>[,<Operator>,<Conditions>,<Commands>] Note: Write setting.</p>	OK
<p>AT\$EV=<Index> Note: Query one setting (not accessible via SMS).</p>	OK AT\$EV: <Index>,<Mode>,<Operator>,<Conditions>,<Commands>
<p>AT\$EV? Note: Query all settings (not accessible via SMS).</p>	OK AT\$EV: 1,<...> ... AT\$EV: 20,<...>

Parameters

Index Event 1 to 20

- Mode 0 – Disable
 1 – Enable

 Default is 0 (Disable)
- Operator 0 – Logical AND operation in the condition
 1 – Logical OR operation in the condition
- Conditions Specify up to 5 conditions using event flags
- Commands Specify up to 10 commands to be triggered when conditions are met

Example:

Command	Response
Refer to example 1 for event with AND condition.	OK
Refer to example 2 for event with OR condition.	OK
AT\$EV=1 Note: Query an event.	OK AT\$EV: 1,1,0,"P1=1 P3=1", \$SR="Alarm!","S1" \$NR=0,"N"
AT\$EV? Note: Query setting of all events	OK AT\$EV: 1,1,0,"P1=1 P3=1", \$SR="Alarm!","S1" \$NR=0,"N" AT\$EV: 2,1,1,"E1=0 B1=0", \$OUT=1,1 \$TM=1,"S1" ... AT\$EV: 20,""

Example 1: Event with AND Condition

When the following conditions are met, send out one standard report via SMS and one NMEA report via TCP / UDP channel.

Condition:

Port #1 is HIGH **AND** Port #3 is HIGH

Event:

AT\$EV=1,1,0,"P1=1 P3=1", \$SR="Alarm!","S1"|\$NR=0,"N"

Example 2: Event with OR Condition

When any of following conditions is met, turn on output port and send out a text message via SMS.

Condition:

External **OR** Battery power level drops below preset threshold

Event:

AT\$EV=2,1,1,"E1=0 B1=0", \$OUT=1,1|\$TM=1,"S1"

25 Miscellaneous Functions

25.1 GSM Monitoring

The firmware will monitor the GSM module every 4 minutes to check if the GSM module is alive. It will shorten the monitoring interval to every minute if there is no response from the GSM module, and reset the GSM module and clear the GSM register flag in the event table if there is no response after three consecutive attempts with one minute interval. It will repeat the above cycle and set the GSM register flag once there is response from the GSM module.

If dual SIM auto switching is enabled, the firmware will switch over to another SIM card when GSM module has no response.

The firmware will monitor the GSM module every 4 minutes to check if roaming occurs. If dual SIM auto switching is enabled, the firmware will switch over to another SIM when roaming takes place.

25.2 GPS Monitoring

The firmware will monitor the GPS module every 10 seconds to check if the GPS module is alive. It will reset the GPS module and clear the GPS operational flag in the event table if there is no response from the GPS module after three consecutive checks. Thereafter, the firmware will monitor the GPS module every 2 minutes and will set the GPS operational flag if the response is resumed.

25.3 GPS Antenna Detection

The firmware will monitor the GPS external antenna to check for disconnection. When the GPS external antenna is disconnected from the device, the firmware will set the GPS antenna flag in the event table. When the GPS external antenna is connected to the device, the firmware will clear the GPS antenna flag.

25.4 Low Battery Shutdown

When the battery voltage drops below 3 V, the device will shutdown and send out an unsolicited response to indicate device shutdown. The device will reset and resume normal operation when the battery voltage goes above 3.6 V (e.g. apply external power source).

25.5 Watchdog Timer

The device provides watchdog function to prevent firmware lockup. If any function in the firmware is lockup for a period of time (65 sec for software watchdog timer / 90 sec for hardware watchdog timer), the watchdog timer will kick in to reset the device.

25.6 Firmware Upgrade

The firmware of the device can be upgraded over the air using the \$SU command or via the serial port using the Downloader on PC.

25.7 Test Mode

The device provides a test mode for peripherals test in factory. The device will enter test mode when panic button is pressed and hold for 2 sec upon power up. Upon entering test mode (around 10 sec from power up), the device will display “MTD2000 Test Mode”. User may press the RESET button to exit test mode. In test mode, the GSM module will always turn on and will not enter cyclic mode.

26 Appendix

26.1 NMEA Messages

26.1.1 GLL – Geographic Position (Latitude / Longitude)

It is for showing latitude and longitude, UTC time of fix and status.

Syntax:

\$GPGLL,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,hhmmss.dd,S,M*hh<CR><LF>

xxmm.dddd	Latitude xx = degrees mm = minutes dddd = decimal part of minutes
<N S>	Either character N or character S, N = North, S = South)
yyymm.dddd	Longitude yyy = degrees mm = minutes dddd = decimal part of minutes
<E W>	Either character E or character W, E = East, W = West
hhmmss.dd	UTC time hh = hours mm = minutes ss = seconds dd = decimal part of seconds
S	Status indicator A = valid V = invalid
M	Mode indicator A=autonomous GNSS fix D=differential GNSS fix E=estimated/dead reckoning fix N=no fix

Example:

```
$GPGLL,6016.3073,N,02458.3817,E,090110.10,A,A*61
```

Remarks:“*61” is the checksum of the example message and is calculated as described in page 13 of NMEA 3.0.

26.1.2 GGA – Global Positioning System Fix Data

It is to show the time, position and fix related data for a GPS receiver.

Syntax:

\$GPGGA,hhmmss.dd,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,v,ss,d.d,h.h,M,g,
g,M,a,a,xxxx*hh<CR><LF>

Hhmmss.dd	UTC time hh = hours mm = minutes ss = seconds dd = decimal part of seconds
xxmm.dddd	Latitude xx = degrees mm = minutes dddd = decimal part of minutes
<N S>	Either character N or character S, (N = North, S = South)
yyymm.dddd	Longitude yyy = degrees mm = minutes dddd = decimal part of minutes
<E W>	Either character E or character W, E = East, W = West
V	Fix valid indicator 0 = Fix not valid 1 = Fix valid
Ss	Number of satellites used in position fix, 00-12. Fixed length
d.d	HDOP – Horizontal Dilution Of Precision
h.h	Altitude (mean-sea-level, geoid)
M	NULL (missing)
g.g	NULL (missing)
M	NULL (missing)
a.a	NULL (missing)
Xxxx	NULL (missing)

Example:

\$GPGGA,084053.39,6016.3051,N,02458.3735,E,0,00,0.0,46.6,M,18.2,M,,*5D
--

26.1.3 GSA – DOP and Active Satellites

It is to show the GPS receivers' operating mode, satellites used in the navigation solution reported by the GGA sentence, and DOP values.

Syntax:

\$GPGSA,a,b,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,p,p,h,h,v.v*hh<CR><LF>

a	Mode: M = Manual, forced to operate in 2D or 3D mode.
---	--

	A = Automatic, allowed to automatically switch 2D/3D
b	Mode: 1 = Fix not available, 2 = 2D, 3 = 3D
xx	ID (PRN) numbers of GPS satellites used in solution
p.p	PDOP
h.h	HDOP
v.v	VDOP

Example:

```
$GPGSA,A,3,06,10,15,16,21,25,30,,,,,2.1,1.2,1.8*38
```

26.1.4 GSV – Satellites in View

It shows the number of satellites in view, satellite ID (PRN) numbers, elevation, azimuth, and SNR value. The satellites are in PRN number order.

Before a position fix is acquired the information contains only the SNR (Signal to Noise Ratio) value. After a fix is acquired, the elevation and azimuth angles will be added. Note that there can be also “theoretical” satellites in the GSV message. These are satellites of which the angles (elevation, azimuth) are known but for some reasons, e.g. due to an obstruction, have not been found by the GPS receiver. The SNR value for these satellites is therefore zero.

Syntax:

```
$GPGSV,n,m,ss,xx,ee,aaa,cn,,,,,,,,,xx,ee,aaa,cn*hh<CR><LF>
```

n	Total number of messages, 1 to 9
m	Message number, 1 to 9
ss	Total number of satellites in view
xx	Satellite ID (PRN) number
ee	Satellite elevation, degrees 90 max
aaa	Satellite azimuth, degrees True, 000 to 359
cn	SNR (C/No) 00-99 dB-Hz. zero when not tracking

Examples:

```
$GPGSV,4,1,14,03,66,207,50,08,09,322,44,11,01,266,42,14,00,155,00*79
$GPGSV,4,2,14,15,41,088,48,17,21,083,44,18,57,087,51,21,57,173,50*78
$GPGSV,4,3,14,22,05,203,00,23,52,074,49,26,17,028,44,27,00,300,00*79
$GPGSV,4,4,14,28,32,243,00,31,48,286,00*70
```

26.1.5 VTG – Course Over Ground and Ground Speed

It is to show the course and speed

Syntax:

\$GPVTG,h.h,T,m.m,M,s.s,N,s.s,K,M*hh<CR><LF>

h.h	Heading
T	Degrees (heading units).
m.m	Magnetic heading. Currently NULL (missing).
M	Degrees. Magnetic heading units. Currently NULL (missing)
s.s	Speed, knots.
N	Knots (Speed unit)
s.s	Speed, km/h
K	km/h (Speed units)
M	Mode indicator A=autonomous GNSS fix D=differential GNSS fix E=estimated/dead reckoning fix N=no fix

Example:

\$GPVTG,202.60,T,,0.38,N,0.7,K,A*0D

26.1.6 RMC – Recommended Minimum Specific GNSS Data

It is to show the time, date, position, course and speed data.

Syntax:

\$GPRMC,hhmmss.dd,S,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,s.s,h.h,ddmmyy,d.d, <E|W>,M*hh<CR><LF>

hhmmss.dd	UTC time hh = hours mm = minutes ss = seconds dd = decimal part of seconds
S	Status indicator A = valid V = invalid
xxmm.dddd	Latitude xx = degrees mm = minutes dddd = decimal part of minutes
<N S>	Either character N or character S, (N = North, S = South)
yyymm.dddd	Longitude yyy = degrees

	mm = minutes dddd = decimal part of minutes
<E W>	Either character E or character W, E = East, W = West
s.s	Speed, knots
h.h	Heading
ddmmyy	Date dd = date mm = month yy = year
d.d	Magnetic variation
<E W>	Declination. Either character E or character W, E = East, W = West
M	Mode indicator A=autonomous GNSS fix D=differential GNSS fix E=estimated/dead reckoning fix N=no fix

Example:

\$GPRMC,134829.486,A,1126.6639,S,11133.3299,W,58.31,309.62,110200,,,A*14
--

26.1.7 ZDA – Time and Date

Outputs the current UTC time and date. Unlike other messages, the time output by this message is bound to GPS Receiver’s internal real-time clock (RTC) and thus it is updated even when navigation fix is unavailable. The RTC time is maintained also while the module is in sleep mode.

Note:

- The time output in ZDA message slightly differs from the time output by other messages because the time reference of the ZDA message is set to the very instant of outputting the message, whereas the time output on other messages is the moment of the navigation fix.
- As the ZDA time is set to output time of the message, this time is closer to the real time and may be used as a somewhat accurate time reference if the latency of the system-specific serial port transmission is compensated (usually about deterministic). Time precision of approx. 1/100th of a second can be achieved by this method.

Syntax:

\$GPZDA,hhmmss.dd,dd,mm,yyyy,xx,yy*hh

hhmmss.dd	UTC time in hours, minutes, seconds and fractions of a second
dd	UTC day of month
mm	UTC month
yyyy	UTC year

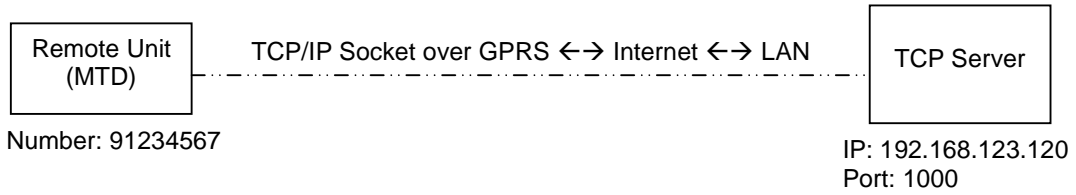
xx	Local zone hours. Not implemented, output always 00
yy	Local zone minutes. Not implemented, output always 00

Example:

The following message corresponds to UTC time 06:17:24.46 on 17-Apr-2003.

\$GPZDA,061724.46,17,04,2003,00,00*61

26.2 TCP Connection Setup



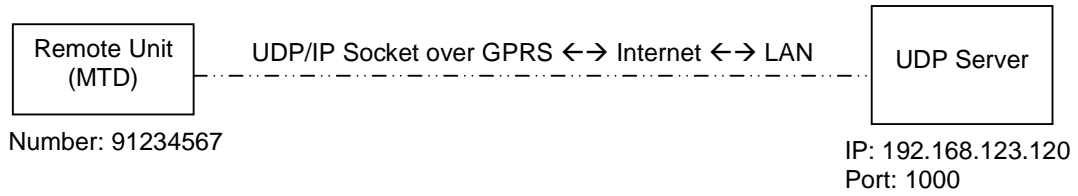
26.2.1 Connecting from MTD to TCP Server

Steps	Procedures
1	In MTD, set the server IP address and Port: AT\$NT=1,"192.168.123.120",1000
2	In MTD, set GPRS Profile: AT\$NG=1,"internet", "", ""
3	In MTD, start TCP connection: AT\$NC=1,0,1,1

26.2.2 Disconnecting TCP Server from MTD

Steps	Procedures
1	In MTD, end the TCP connection by: AT\$NC=0

26.3 UDP Connection Setup



26.3.1 Connecting from MTD to UDP Server

Steps	Procedures
1	In MTD, set the server IP address and Port: AT\$NT=1,"192.168.123.120",1000
2	In MTD, set GPRS Profile: AT\$NG=1,"internet","", ""
3	In MTD, start UDP connection: AT\$NC=1,1,1,1

26.3.2 Disconnecting UDP Server from MTD

Steps	Procedures
1	In MTD, end the UDP connection by: AT\$NC=0