

# **TT8850 Message Decodification**

Revision 1.1  
08/06/2014  
SkyPatrol LLC

## Index

Index.....	2
<i>General Message Structure:</i> .....	3
Position and Event Report in HEX Format: .....	3
Locate command: .....	6
<i>Lat/Long Conversion:</i> .....	8
<i>Geofence:</i> .....	8
Setup Geofence .....	8
<i>ACK Messages:</i> .....	10
Server Acknowledgement.....	10
<i>Getting Firmware Version:</i> .....	10
Firmware Acquisition .....	11

## General Message Structure:

The Header of the TT8850 message reports in hexadecimal format is 2 bytes long and always start with 0x0005.

### Position and Event Report in HEX Format:

The following table gives the structure event reports in HEX format.

We will use a combination of **<Message Type>** and **<Report ID/Status>** to determine the event code of the report.

Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0005
Report item Mask	2	0x0000-0x007F	
SACK enable	1	0 1	
Message type	1	1 – 22	
Protocol version	3	XX0000 – XXXFFF	
Unique ID	15	IMEI	
Device name	10		
Report ID/Status	1	0 – 4 0x21 0x22 0x41 0x42	
Number	1	1	
GPS accuracy	1	0 1 – 50	
Speed	2	0.0 – 999.9km/h	
Azimuth	2	0 – 359	
Altitude	3	±XXXXX.X m	
Longitude	4	±XXX.XXXXXX	
Latitude	4	±XX.XXXXXX	
GPS UTC time	6	YYMMDDHHMMSS	
MCC	2	0XXX	
MNC	2	0XXX	
LAC	2	XXXX	
Cell ID	2	XXXX	
Battery percentage	1	0-100	
Send time	6	YYMMDDHHMMSS	
Sequence number	2	0000 – FFFF	

- ✧ **<Message header>**: A numeric to indicate this message is a message in HEX format. It is always 0x0005 for HEX format.
- ✧ **<Report items mask>**: It is same as the parameter **<Report items mask>** in the command AT+GTCFG to indicate which fields are discarded in the following structure of the message. If some bit is 0, the corresponding field will be discarded.
  - Bit0(0001): <speed>
  - Bit1(0002): <azimuth>
  - Bit2(0004): <altitude>

- Bit3(0008): GSM LAI and CI, including <mcc>, <mnc>, <lac>, <cellid> and the <reserved1> parameter "00"
- Bit4(0010): <send time>
- Bit5(0020): <Device name>
- Bit6(0040): <Protocol version>
- ✧ **<SACK enable>**: A numeric to indicate whether the backend server should reply SACK message to the device.
    - 0: the backend server does not reply SACK message after receiving a message from the device, including response for the heartbeat message.
    - 1: the backend server should reply SACK message after receiving a message from the device, including response for the heartbeat message.
  - ✧ **<Message type>**: A numeric to indicate the type of the message.
    - 0x01**: Report by scheduled time or scheduled distance or scheduled mileage. Please refer to the command AT+GTFRI.
    - 0x02**: Report for into Geo-Fence. Please refer to the command AT+GTGEO.
    - 0x03**: Speed alarm report. Please refer to the command AT+GTSPD.
    - 0x04**: SOS alarm report which is generated by long press the function key. Please refer to the parameter <Function key mode> in the command AT+GTFKS.
    - 0x05**: Real time location. Please refer to the sub command 1 in the command AT+GTRTO (Locate command).
    - 0x06**: The first location after power on.
    - 0x07**: Location report when movement state changes.
    - 0x08**: Location by call request
    - 0x09**: Location as the centre of the Geo-Fence 0.
    - 0x0A**: Power on report.
    - 0x0B**: Power off report.
    - 0x0C**: Report for connecting external power supply.
    - 0x0D**: Report for the removing external power supply.
    - 0x0E**: Battery low report.
    - 0x0F**: Report for charging started.
    - 0x10**: Report for charging stopped.
    - 0x11**: Report for the device state changed, including motion state and ignition state.
    - 0x12**: GPS antenna indication.
    - 0x13**: PDP connection reset report.
    - 0x14**: Report for out from Geo-Fence. Please refer to the command AT+GTGEO.
    - 0x15**: Report for switching on Geo-Fence 0.
    - 0x16**: Report for switching off Geo-Fence 0.
  - ✧ **<Report ID/Status>**: It has different meaning in different <Message Type>.
    - For **0x02** and **0x14** and **0x15** and **0x16**, it is the ID of the Geo-Fence.
    - For **0x12**, it indicates which GPS antenna is being used.
      - 0: the device is using the internal GPS antenna.
      - 1: the device is using the external GPS antenna.
    - For **other messages**, it means the current state of the device,
      - 0x21**: The device attached vehicle is ignition on and motionless.
      - 0x22**: The device attached vehicle is ignition on and moving.
      - 0x41**: The device is motionless without ignition on.
      - 0x42**: The device is moving without ignition on.
  - ✧ **<Number>**: Number of points in one report message. It is always 1.
  - ✧ **<GPS accuracy>**: The HDOP defined in NMEA0183. The range of value is 1 – 50. The smaller the value, the higher the precision. Different from NMEA0183, 0 here means no fix, while GPS

- accuracy between 0 and 1 is set to 1.
- ✧ **<Speed>**: The speed from GPS.
  - ✧ **<Azimuth>**: The azimuth from GPS.
  - ✧ **<Altitude>**: The height above sea level from GPS.
  - ✧ **<Longitude>**: The longitude of the current position. The format is “(-)xxx.xxxxx” and the value range is from “-180.000000” to “180.000000”. The unit is degree. West longitude is defined as negative starting with minus “-” and east longitude is defined as positive without “+”.
  - ✧ **<Latitude>**: The latitude of the current position. The format is “(-)xx.xxxxx” and the value range is from “-90.000000” to “90.000000”. The unit is degree. South Latitude is defined as negative starting with minus “-” and north Latitude is defined as positive without “+”.
  - ✧ **<GPS UTC time>**: UTC time from GPS.
  - ✧ **<MCC>**: Mobile country code. It is 3 digits in length and ranges from 000-999.
  - ✧ **<MNC>**: Mobile network code. It is 3 digits in length and ranges from 000-999.
  - ✧ **<LAC>**: Location area code in hex format.
  - ✧ **<Cell ID>**: Cell ID in hex format.
  - ✧ **<Battery Percentage>**: The current volume of the battery in percentage.

**Example:**

```
00 05 00 5F 00 04 02 01 03 38 36 37 38 34 34 30 30 31 36 33 39 39 32 34 42 01 01 00 01 00 00 00 00 F3 FB
36 3A 10 01 89 B5 A8 0E 08 07 14 00 35 03 10 02 60 B7 7B 37 F2 64 0E 08 07 14 00 36 2B 67
```

	Parameter	Value	Meaning
1	HEADER	00 05	Header of message report.
2	Report Item Mask	00 5F	Mask of the report 00 5F = 01011111 – Bit 5 is 0, so the report won't include <Device Name>
3	Need ACK	00	00: No ACK required 01: ACK required
4	Message Type	04	Type of event that generated the report, in this case is a SOS event.
5	Protocol Version	02 01 03	
6	Device ID	38 36 37 38 34 34 30 30 31 36 33 39 39 32 34	Device unique ID (IMEI: 867844001639924)
7	Report ID/Status	42	It has different meaning in different report. <ul style="list-style-type: none"> <li>● For Message Type: 0X02 and 0X14 and 0X15 and 0X16, it is the ID of the Geo-Fence.</li> <li>● For Message Type: 0x12, it indicates which GPS antenna is being used. 0x00: the device is using the internal GPS antenna. 0x01: the device is using the external GPS antenna.</li> <li>● For other Message Types, it means the current state of the device, 0x21: The device attached vehicle is ignition on and motionless. 0x22: The device attached vehicle is ignition on and moving. 0x41: The device is motionless without ignition on. 0x42: The device is moving without ignition on.</li> </ul>

8	Number	01	Number of points in one report message. It is always 1.
9	GPS Accuracy	01	0x00 = Invalid or last know position 0x01 – 0x50 = HDOP
10	Speed	00 01	The speed from GPS (0.0 – 999.9km/h) 0x00 0x01 = 0.1 Km/h Note: Only one decimal place
11	Azimuth	00 00	The azimuth from GPS.
12	Altitude	00 00 F3	The height above sea level from GPS(XX.X) 0x00 0x00 0xF3 = 24.3m
13	Longitude	FB 36 3A 10	The Longitude of the current position. Since Long is > 7F FF FF FF, the latitude is negative and it must be subtracted from FF FF FF FF FF FF FF FF - FB 36 3A 10 = 04 C9 C5 EF (4C9C5EF)h = (80332271)d 80332271 = dd.mmmmmm = (-)80.332271
14	Latitude	01 89 B5 A8	The Latitude of the current position. Since Lat is <= 7F FF FF FF, the latitude is positive (189B5A8)h = (25802152)d 25802152 = dd.mmmmmm = 25.802152
15	UTC Time	0E 08 07 14 00 35	UTC time from GPS (YYMMDDHHMMSS). 0x0E 0x08 0x07 0x14 0x00 0x35 = 14 08 07 20 00 53 (14/08/07-20:00:53)
16	MCC	03 10	Mobile country code. It is 3 digits in length and ranges from 000-999.
17	MNC	02 60	Mobile network code. It is 3 digits in length and ranges from 000-999.
18	LAC	B7 F2	Location area code
19	CELL ID	37 F2	Cell ID.
20	Battery Percentage	64	The current volume of the battery in percentage. 0x64 = 100%
21	Send Time	0E 08 07 14 00 36	The time the message was sent (YYMMDDHHMMSS). 0x0E 0x08 0x07 0x14 0x00 0x36 = 14 08 07 20 00 54 (14/08/07-20:00:54)
22	Sequence Number	2B 67	Sequence number from 0x0000 to 0xFFFF.

**Note:** We will use < Message Type > and < Report ID/Status > to get the event code of the report, in the example above < Message Type > is 0x04 and < Report ID/Status > is 0x42, this means it the event code is “434” (Convert the values 0x04h and 0x42h to decimal and combine them) and it’s a “SOS in Motion” report.

## Locate command:

Use the following command to request the device to immediately report its current position.

**AT+GTRTO=TT8850,1,,,,,0000\$**

Device will first reply an Acknowledge message for the command; this means the device received the command correctly.

Example:

**+ACK:GTRTO,020103,867844001639924,,0,RTL,0000,20140807210308,2B7B\$**

Then it will report an event report message in Hex format with < Message Type > code of 0x05

Example: **00 05 00 5F 00 05 02 01 03 38 36 37 38 34 34 30 30 31 36 33 39 39 32 34 41 01 01 00 00 00 00 00 00 C7 FB 36 3A 07 01 89 B5 B9 0E 08 07 15 12 1F 03 10 02 60 B7 7B 37 F2 64 0E 08 07 15 12 20 2B 8E**

(See section “Position and Event report in HEX format” for more details on this type of report)

Format of the acknowledgement message of **AT+GTRTO** command:

**Note:** Each field is separated by comma ( , ) and is always in ASCII.

➤ **+ACK:GTRTO,**

Example:			
<b>+ACK:GTRTO,020103,867844001639924,,0,RTL,0005,20140807210308,2B7B\$</b>			
Parameter	Length (byte)	Range/Format	Default
Header	10	<b>+ACK:GTRTO</b>	+ACK:GTRTO
Protocol version	6	XX0000 – XXFFFF, X∈{'A'-'Z','0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Sub command	<=6	Sub command string	RTL
Serial number	4	0000 – FFFF	0000
Send time	14	YYYYMMDDHHMMSS	
Sequence number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ <Protocol version>: The combination of the device type and the version number of the applied protocol. The first two characters ‘XX’ indicate the device type. ‘02’ represents TT8850. The middle two characters are the main version number and the last two characters are the minimum version number. Both the main version and the minimum version are hex digital. For example, ‘020A’ means version 2.10.
- ✧ <Unique ID>: ID of the device, use the IMEI of the current SIM card inside the terminal.
- ✧ <Device name>: Please refer to the parameter <Device name> in the command **AT+GTCFG**.
- ✧ <Command response>: A numeric to indicate whether the command is executed
  - 0: Command executed successfully
  - 1: Error in command
- ✧ <Sub command>: A numeric to indicate the sub command to execute.
  - 0 (**GPS**): Request GPS related information, including setting of <GPS on need>, <Report items mask>, <Report mask> of fixed report, GPS antenna type, GPS antenna status and the last known time of successful GPS fixing.
  - 1 (**RTL**): Request the device to report its current position (Locate Now).
  - 2 (**READ**): Request the device to report its entire configuration.
  - 3 (**REBOOT**): Reboot the device remotely.
  - 4 (**RESET**): Reset all parameters to factory default except parameter of **AT+GTBSI**, **AT+GTSRI**.
  - 5 (**PWROFF**): Power off the device remotely.
  - 6 (**CID**): Request the device to report the ICCID of the installed SIM card.
  - 7 (**CSQ**): Request the device to report the current GSM signal level.
  - 8 (**VER**): Request the device to report version information including the device type, the firmware version and the hardware version.
  - 9 (**BAT**): Request the device to report power supply related information including the external power supply status, current voltage of the battery, the battery charging status and the working mode of LED.

- A (**TMZ**): Request the device to report the time zone setting.
- B: (**INF**): Read the device information report function. The corresponding information will be reported via the message GTINF.
- C: (**GGL**): Get a message with google map hyperlink of the current position. And the message with google map hyperlink will be sent to the original place where the command is from.
- D: (**NCS**): Request the device to report network connection status
- E: (**FAC**): Reset all parameters to factory default, include the values setup with AT+GTSRI command.
- F: (**LOC**): Request the device to fix and then report the current position (GTRTL) to the server defined.

## **Lat/Long Conversion:**

If Lat or Long is > 7F FF FF FF, then it has a negative degree

### **Part 1: Positive Coordinate (Latitude Example)**

Lat: **(01 89 B5 B9)H**

Since Lat is <= 7F FF FF FF, the latitude is positive

**Step 1** – Convert to decimal: dd.mmmmmm

**Lat\_decimal**= 25802169

**Step 2** – Divide by 1000000 to get the minutes. The remaining digits to the left are the degrees.

**dd**= 25

**mmmmmm**= 0.802169

**Step 3** –Add dd + mmmmmm to get the full Latitude degrees:

**Lat\_full**= **dd+ mm.mmmm**

25.802169

### **Part 2: Negative Coordinate (Longitude Example)**

Long: **(FB 36 3A 07)H**

Since Long is > 7F FF FF FF, the latitude is negative

**Step 1** – 2's complement

**Long\_comp** = (FF FF FF FF)H –Long

**Long\_comp** = (FF FF FF FF)H –(FB 36 3A 07)H= (04 C9 C5 F8)H

**Step 2** – Convert to decimal: dd.mmmmmm

**Long\_decimal**= 80332280

**Step 3** – Divide by 1000000 to get the minutes. The remaining digits to the left are the degrees.

**dd**= 80

**mm.mmmm**= 0.33228

**Step 4**– Add dd + mmmmmm to get the full Longitude degrees, and put a negative sign:

**Long\_full**= **dd+ mm.mmmm/60**

80 + 0.33228= (-)80.33228

## **Geofence:**

### **Setup Geofence**

The TT8850 device supports 5 circular device based Geofences



**Out Command:**

AT+GTGEO=TT8850,<INDEX>,<MODE>,<LONGITUDE>,<LATITUDE>,<RADIUS>,<CHECK\_INTERVAL>,,,,,0000\$

The command **AT+GTGEO** is used to configure the parameters of Geo-Fence. Geo-Fence is a virtual perimeter on a geographic area using a location-based service, so that when the geofencing terminal enters or exits the area a notification is generated. The notification can contain information about the location of the terminal and may be sent to the backend server.

➤ **AT+GTGEO=**

Example:			
<b>AT+GTGEO=TT8850,0,3,101.412248,21.187891,1000,600,,,,,0008\$</b>			
Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
GEO ID	1	0 – 4	
Mode	1	0 – 3	0
Longitude	<=11	(-)xxx.xxxxxx	
Latitude	<=10	(-)xx.xxxxxx	
Radius	<=7	50 – 6000000m	50
Check interval	<=5	0 30 – 86400sec	0
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ <GEO ID>: A numeric to identify the Geo-Fence.
- ✧ <Mode>: A numeric which indicates when to report the notification to the backend server based on the following:
  - 0: Disable the Geo-Fence on the specified GEO ID.
  - 1: Reports when enters the Geo-Fence.
  - 2: Reports when leaves the Geo-Fence.
  - 3: Reports when enters or leaves the Geo-Fence.
- ✧ <Longitude>: The longitude of a point which is defined as the center of the Geo-Fence circular region. The format is "(-)xxx.xxxxxx" and the value range is from "-180.000000" to "180.000000". The unit is degree. West longitude is defined as negative starting with minus "-" and east longitude is defined as positive without "+".
- ✧ <Latitude>: The latitude of a point which is defined as the centre of the Geo-Fence circular region. The format is "(-)xx.xxxxxx" and the value range is from "-90.000000" to "90.000000". The unit is degree. South Latitude is defined as negative starting with minus "-" and north Latitude is defined as positive without "+".
- ✧ <Radius>: The radius of the Geo-Fence circular region. The value range is (50-6000000) and the unit is meter.
- ✧ <Check interval>: The interval of GPS checking for the Geo-Fence alarm.

**Note:**

If the parameter <Check interval> is set as 0, <Mode> will be set as 0 automatically (To Geo-Fence 0,

<Mode> will be restored at first and it could be used later when switch on Geo-Fence 0 via Function Key), because the terminal doesn't know when to check Geo-Fence if the parameter <Check interval> is 0.

The acknowledgement message of **AT+GTGEO** command:

➤ **+ACK:GTGEO,**

Example:			
<b>+ACK:GTGEO,020100,135790246811220,,0,0,0008,20100310172830,11F0\$</b>			
Parameter	Length (byte)	Range/Format	Default
Header	10	+ACK:GTGEO	+ACK:GTGEO
Protocol version	6	XX0000 – XXFFFF, X∈{'A'-'Z','0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
GEO ID	1	0 – 4	
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

## **ACK Messages:**

### **Server Acknowledgement**

If server acknowledgement is enabled by AT+GTQSS or AT+GTSRI command, the backend server should reply to the device whenever it receives a message from the device.

➤ **+SACK:**

Example:			
<b>+SACK:11F0\$</b>			
Parameter	Length (byte)	Range/Format	Default
Messaeg header	6	+SACK:	+SACK:
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

✧ <Count number>: The backend server uses the <Count number> extracted from the received message as the <Count number> in the server acknowledgement.

## **Getting Firmware Version:**

## Firmware Acquisition

Below is the command to send to the TT8850 to receive the current firmware version in the device.

### Out Command:

```
AT+GTRTO=TT8850,8,,,,,0000$
```

### Response:

The device will respond with two messages.

- 1) Firstly, it will respond with an Acknowledge message. This message only indicates that it received the command.

#### Example:

```
+ACK:GTRTO,020102,867844000023419,,0,VER,0000,20120711214146,0003$
```

- 2) Secondly, it will report the GTVER message which contains the device firmware version, as shown in the example below.

#### Example:

```
<0x0004>,005F,0,GTVER,020100,135790246811220,,TT8850,0100,0101,20100214093254,11F0$
```

- **GTVER:** The report for real time operation VER

Example: \<0\4,005F,0,GTVER,020100,135790246811220,,TT8850,0100,0101,20100214093254,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTVER	
Protocol version	6	XX0000 – XXFFFF, X∈{'A'-'Z','0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Device type	10	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
Firmware version	4	0000 – FFFF	
Hardware version	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ *<Device type>*: A string represents the type of the device.
- ✧ *<Firmware version>*: The firmware version. The first two characters point out the main version and the last two characters point out the subsidiary version. For example: 010A means the version 1.10
- ✧ *<Hardware version>*: The hardware version. The first two characters point out the main version and the last two characters point out the subsidiary version. For example: 010A means the version 1.10