	Doc. Title	Author		Page of Pages	
	ST310U OPERATION MANUAL	JH KIM		1 of 74	
	Concerning	Doc. No.	Rev.	Date	
	Features and How to set parameters		1.18	2019/03/25	

Operation Manual

ST310U

Suntech International Ltd.

<i>CONFIDENTIAL DOCUMENT</i>
This document belongs to intellectual property of Suntech International Ltd. and shall neither be copied nor be given to any 3rd parties without prior written consent from the company.
DO NOT MAKE ANY COPIES




	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		2 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

Table of Contents

1. Introduction	5
2. Overview	6
2-1. Operation modes	6
2-2. Reports sent by device.....	6
2-3. Parameter change.....	7
2-4. Features	7
3. Communication string format	9
3-1. Command format	9
3-2. Report format.....	9
4. Configuration	10
4-1. Network parameters	10
4-2. Reporting parameters	12
4-3. Event Parameters	13
4-4. GSM Parameters for SMS Messaging / Phone Calling	16
4-5. Parameters for various features	17
4-6. Voltage control parameters	19
4-7. Motion sensor parameters	20
4-8. Circular geo-fencing parameters.....	21
4-9. Additional Parameters (TCP/UDP Parameters).....	22
4-10. New Parameter Setting.....	25
4-11. Backup Battery Shutdown Parameter	27
5. Reporting to Server.....	29
5-1. Status Report	30
5-1-1. Normal.....	30
5-1-2. Zip.....	31
5-2. Emergency Report.....	34
5-2-1. Normal.....	34
5-2-2. Zip.....	35
5-3. Event Report	38
5-3-1. Normal.....	38
5-3-2. Zip.....	39
5-4. Alert Report.....	42
5-4-1. Normal.....	42
5-4-2. Zip.....	44
5-5. Keep-Alive Report.....	47
5-5-1. Normal.....	47
5-5-2. Zip.....	47
5-6. Status String Reporting via SMS	48
5-6-1. In case of Back-up method	48
5-6-2. In case of Main method	48
5-7. Location query sent via smart phone.....	49
6. Command for general use	50
6-1. Common parts of this command	50
6-2. Requesting Status	50
6-3. Pre-setting.....	50

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		3 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

6-4. ACK of Emergency	52
6-5. Re-setting (Restoring to factory defaults and Rebooting)	52
6-6. Enable1 ('Activating Output 1')	53
6-7. Disable1 ('Inactivating Output1')	53
6-8. Requesting IMSI	54
6-9. Requesting ICCID	54
6-10. Requesting Version	54
6-11. Requesting IMEI	55
7. Command for non-general use	55
7-1. Erase All	55
7-2. Initialize Traveled Distance	56
7-3. Setting Traveled Distance	56
7-4. Initializing Message Number	56
7-5. Setting Hour-Meter	56
7-6. Initialize Circular Geo-fence	57
7-7. Requesting Circular Geo-fence	57
7-8. Requesting Own Phone Number	57
7-9. Setting Own Phone Number	58
7-10. Command to Reboot	58
7-11. Setting ImproveBatteryLife	58
7-12. Request ImproveBatteryLife	59
7-13. Command on How to Restart Anti-Theft 2	59
7-14. Command on How to Set SMS Number for Panic Situation	59
7-15. Requesting SMS Number Used in Panic Situation	59
7-16. Command to Set Google Map Address	60
7-17. Command to Get Google Map Address	60
7-18. Testing Output 1 for 30 seconds.	60
7-19. Testing Output 1 for 60 seconds.	61
7-20. Command to set if increase odometer in parking.	61
7-21. Requesting odometer increasing option	61
7-22. Changing Direction of SMS response	61
7-23. Requesting Direction of SMS response	62
8. Detailed Description on Event Lines and Features	63
8-1. Total 5 pin Event Lines	63
8-1-1. Immobilizer	63
8-1-2. Immobilizer2	64
8-1-3. Alert of Buzzer	65
8-2. Indication with Two (2) LEDs	66
8-2-1. Red LED for GPS	66
8-2-2. Blue LED for GPRS	66
8-3. Power Saving	67
8-4. Backup Battery	68
8-5. Motion Sensor	68
8-6. Protection of Vehicle Battery	69
8-7. Anti-Theft	70
8-8. Storage of Reports un-sent	73
Revisions	74

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		4 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

Disclaimer

We, at Suntech, announce that this document and all other related products (i.e. device, firmware, and software) have been developed by the company, Suntech International Ltd., which is hereinafter referred to as "Suntech". The information in this manual is believed to be accurate and reliable at the time of releasing. We, at Suntech, also assume no responsibility for any damage or loss resulting from the use of this manual, and expressly disclaim any liability or damages for loss of data, loss of use, and property damage of any kind, direct, incidental or consequential, in regard to or arising out of the performance or form of the materials presented herein or in any software program(s) that may accompany this document. When this document is released, it is most compatible with a specified firmware version. Now that the functionalities of the devices are being developed and improved continuously from time to time by Suntech, any alteration on the protocol, the firmware functions, the hardware specifications of the product is subject to change without prior notice.

Copyright


We, at Suntech, notify that Suntech holds all parts of intellectual rights applicable in the copyright laws in all the countries. The information contained in this document cannot be reproduced in any form without prior written consent made by Suntech. Any software programs that might accompany this document can be used only in accordance with any license agreement(s) between the purchaser and Suntech.

Warning

Our customers are required to be aware that connecting the wire inputs can be hazardous to both of the installer and your vehicle's electrical system(s) if not done by an experienced installer. This document assumes you are aware of the inherent dangers of working in installing the device on the vehicle(s) and the machinery.

Document Amendments

Please be advised that, for the firmware version column with specific firmware number, any modification(s) on the comments column should be done on this corresponding firmware version (and the versions thereafter). Please make sure you upgrade the firmware to the specified version before applying any changes made in this protocol.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		5 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

1. Introduction

The ST300 is a vehicle tracking and controlling device. It is designed to collect location data through GPS technology, various vehicle conditions through event lines, and interact remotely with its server by using GSM/GPRS technology.

In order to make the vehicle tracking system work, device should be configured and installed properly on a vehicle whose geographical position and/or state is desired to be remotely monitored and/or controlled.

Following this "Introduction Chapter" (i.e. Chapter 1.), the Operation Manual is organized as below.

- Chapter 2. Overview

This chapter covers fundamental features of the device.

- Chapter 3. Communication string format ('Command' and 'Report')

This chapter gives descriptions on the two (2) formats, Command (all the formats received by device) and Report (sent from the device).

- Chapter 4. Configuration

This chapter gives users explanation on how and what parameters are required to be set in configuring device.

This manual describes setting commands which can be sent with following three options;

- Option 1 : Setting by PC
- Option 2 : Setting by GPRS
- Option 3 : Setting by SMS

Practically special program (named as "SyncTrack") is used for setting. It enables setting much easier and multi-setting possible in PC environments.

- Chapter 5. Reporting to server

This chapter covers when and what reports are sent back to the server by device.

- Chapter 6. Checking/Changing the current settings


This chapter describes how user can check current settings of the device and how user can change the 'pre-defined' parameters.

- Chapter 7. Detailed description on event lines and special features

This chapter gives users detailed information on key features of the device and on how to operate the device if the events occur after configuring the parameters related to such events.

Please note that this 'Operation Manual' is for a standard model. In case specific requirements are incorporated into this manual, such a manual applies only for the case.

For overall operation including installation, in addition to the 'Operation Manual', users should refer to other documents such as Installation Manual, Technical Data Sheet, Firmware OTA (over-the-air) Manual, Buyer Change Guide, Trace Log, Assembly Guide and so on.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		6 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

2. Overview

Main function of device installed on a vehicle is to report vehicle location and status to its monitoring server at pre-defined interval and to deliver command coming from the server for activating any appliance connected to the device.

2-1. Operation modes

The device works in one of the three (3) operation modes below.

- Driving mode:

This mode starts when 'Ignition' of the vehicle is ON.

- Parking mode:

This mode is operational when 'Ignition' is OFF for duration longer than the pre-defined time ('T1').

In parking mode, the device can get into special modes for power saving like 'Sleep mode' and 'Deep sleep mode'. These power saving modes are described in more details in this document.

- Emergency mode:

This mode works either when panic button is ON or when one of any pre-defined events occurs.


2-2. Reports sent by device

There are 8 types of report/ response sent by device to the server as follows:

- Status report (made in string / made in zip),
- Status string report (made in string) sent via SMS
- Emergency report,
- Event report,
- Keep-alive report,
- Alert (**),

*Note (**): In addition to the reports periodically sent to the server as described above, device also sends some alerts. For instance, device sends the server such an alert if the vehicle moves under the parking mode or if the connected Input Line is changed.*

Suntech can also increase this capacity up to a certain level if a customer of the device wants to do so. As soon as the reporting condition for the device is recovered, the device starts sending all those accumulated reports according to the following rule:

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		7 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

- Emergency (the most important) → Command Response → Alert → Status Report → Alive (the lowest priority)

This means that the emergency report is the first one that should be sent right after the GPRS network condition is recovered.

2-3. Parameter change

Parameters which have already been set on the device can be changed via GPRS or via SMS or via RS232 connected with PC if a user needs to do so. Some controlling functions can also be implemented in the same way.

How to change values of the current parameters is described in detail in Chapter 4 of this document.

2-4. Features

Key features of the ST310 device are as follows:

- Power Saving Modes(= Power Down Modes)

- LED Indicators

The LEDs indicate GPRS and GPS status. It is helpful to check what error(s) and why such an error has occurred.

- Event Lines

Device has 1 output line, 2 input lines.

- Upgrading Firmware by Over The Air (Firmware OTA)

In case 'firmware' of the device has an (some) error(s) or needs to be upgraded to provide the user with newly implemented services, the device can upgrade its internal ROM file by over the air (Firmware OTA), remotely via GPRS. The users do not need to visit the vehicle individually to download the new firmware on those vehicles.


How to do OTA is described in detail in the "SunTech_OTA_UA_Protocol" document.

- Parking Lock

Device is able to check if the vehicle moves away from the pre-defined parking boundary or starts moving without having a mode of the ignition on. In case the device recognizes such an unauthorized moving or driving, it sends an emergency report immediately.

- Over speed

Device checks speed of the vehicle and sends to the server an alert if the vehicle runs faster than the pre-defined over-speed threshold values.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		8 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

- Checking Connectivity of GPS Antenna


Device alerts when GPS antenna is disconnected. It is applicable only to the device models which have the external antenna.

- Checking Status of Main Power Source

Device recognizes its connectivity with the main power source (i.e. vehicle's battery) and is able to inform the server about status on whether or not the main power line is disconnected. The device is also able to inform the server about the voltage level status of the main power source and informs the server in case the voltage level of the main power source drops down below the pre-set value. This function is applicable to battery-installed device models only.

- Alerting Battery Error

Device sends an alert when a battery charging error occurs. This function is applicable only to the device models available with back-up battery.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		9 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

3. Communication string format

All the communication messages exchanged between device and its server should be in the form of STRING as described below. Each 'Report' can be compressed in ZIP. Every 'Filed' is separated with semicolon. All the report string triggered by device ends with a mark, '\r' (0x0d).

3-1. Command format

The following format is used when the server sends command message to the device(s) as shown in the below table. The "Value"(or Indicating Mark) and its "Meaning" are described individually.

The parts consisting of 'Fields' are capitalized for naming like:

"HDR" stands for the header, 'DEV_ID' for device' identification number, "VER" for version, Field 1, Field 2, etc.

HDR	DEV_ID	VER	Field 1	Field 2	...	Field n
-----	--------	-----	---------	---------	-----	---------

Field	Value (or Mark)	Meaning
HDR	String	"ST300" + Command type
DEV_ID	9 char.	Device ID
VER	"02"	Protocol Version. This is fixed with "02".
Field 1 ~ n	String	Contents

The 'Device ID' is a unique number that each device should have. It is equal to the last 9 digits of IMEI numbers shown on the back label of the device. Whenever the server sends a command message, it designates a specific device along with the unique identification number of the device as a command receiver. And then, the device recognizes a fact that it has received the command message and responds to the server with a relevant response or a relevant action to be taken. This is how a normal communication is made between the server and its device.

On the other hand, sometimes, a very bad GPRS connection between a device and the server may consequently bring about a bad result that the specified command message would be delivered NOT to the targeted device BUT to other device. In such a situation, the wrong device does not accept the command message because the device ID number of the message does not match the ID number of the wrong device.


However, we might consider a situation in which a command message is delivered to a device via RS232. In such a situation the device accepts the command message even though the device ID number of that command message is NOT its own one.

3-2. Report format

The contents of the following table show what messages and how they are delivered to the server in response to the command that the server has sent to the device(s) by requesting the device(s) to respond with.

HDR	DEV_ID	SW_VER	Field 1	Field 2	...	Field n
-----	--------	--------	---------	---------	-----	---------

Field	Value (or Mark)	Meaning
HDR	String	"ST300" + Report type
DEV_ID	9 char.	Device ID
SW_VER	"001"	Software version that the device has.
Field 1 ~ n	String	Contents

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		10 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

4. Configuration

Before a device starts being operated, its parameters should be set first. This *chapter* shows the string to be sent to device.

There are 3 options of sending string.

Option 1: by using PC

Option 2: by using GSM/GPRS network

Option 3: by messaging via SMS

In practice, configuration can be made more efficiently with 'SyncTrak', i.e. a setting tool provided by Suntech.


Once a device receives a command from the server, it gets back to the server with a relevant response. Device also changes some parameters (if it is required to do so) or takes an action as instructed below as per the command sent by the server.

4-1. Network parameters


The following table shows how and what parameters are required to be set so that the device can be connected with network. As shown in the bottom part of this table, an '<Example>' of '[command]' and '[response]' are made in string respectively when the configuration for the networking is completed.

HDR	DEV_ID	VER	AUTH	APN	USER_ID	USER_PWD	SEVER_IP	SEVER_PORT
B_SEVER_IP	B_SEVER_PORT	SMS_NO	PIN_NO					

Field	Marks	Value	Meaning
HDR	"ST300NTW"		Command type of Header
DEV_ID	9 char.		Device ID
VER	"02"		Protocol Version
AUTH	'0'/'1'/'A'		<u>GPRS authentication</u> 0 : PAP('NO' in 'SyncTrak') 1 : CHAP('YES' in 'SyncTrak') A: Automatic GPRS set. In this case, parameters for APN, USER_ID and USER_PWD field should remain empty.
APN	String		Access Point Name
USER_ID	String		ID for GPRS Access
USER_PWD	String		Password for GPRS Access
SEVER_IP	String		Server IP Address
SEVER_PORT	String		Server Port
B_SEVER_IP	String		IP Address of Backup Server
B_SEVER_PORT	String		Port of Backup Server
SMS_NO	String		Phone number that will receive the SMS report sent by the device. This can be used for backup in the area where GPRS

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		11 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

			condition is not good. Or, it can be used as a main report receiver when IP and Port are unavailable. If it is not used, it should remain empty.
PIN_NO	String		PIN Number to release PIN lock if it is enabled
<p><Example></p> <p>[command] ST300NTW;100850000;02;0;internet;;;111.111.111.111;8600;;;</p> <p>[response] ST300NTW;Res;100850000;010;0;internet;;; 111.111.111.111;8600;;;</p> <p>ST300NTW;Res;100850000;010;A1;tim.br;tim;tim; 111.111.111.111;8600;;;</p> <p><Note>:</p> <p>** If network does not require User ID and Password, these fields should remain empty.</p> <p><u>Automatic Setting for GPRS Network</u></p> <p>If you set the device to 'Automatic GPRS Set', the device will automatically set the parameters for GPRS with the data available on the inserted SIM card.</p> <p>For instance, if Airtel SIM is inserted, the device will set 'AUTH' to '0', 'APN' to 'airtelgprs.com', 'USER_ID and USER_PASS' to empty respectively.</p> <p>And then, the device reports response string after adding real GPRS parameters, if 'Automatic GPRS Set' is selected.</p> <p>DNS</p> <p>Server_IP and B_SERVER_IP field can be filled with direct IP address (for example 111.111.111.111) or domain name (for example, suntechint.com). If this field is written by domain, the device will find real IP address by DNS and sends reports to IP address.</p>			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		12 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

4-2. Reporting parameters


Device responds to the command(s) with the relevant report or response periodically at a time interval or at a travelled distance interval of the vehicle that has already been pre-defined by user. Such are response sent back to the server includes SMS message (if the device user has already configured SMS messaging functionality). The following table shows how to set those parameters.

In bottom part of the table, the following table also shows how and what parameters should be set to utilize functions like:

- 'Angle Report', that is used for displaying the historic path more accurately or saving network cost while the vehicle is driving on straight roads for long time, and
- 'FIFO' or 'LIFO', that should be selected to determine a sequential order if buffer of the device is completely full of reports. For more information, have a look at the description made in the bottom part of the table below.

HDR	DEV_ID	VER	T1	T2	T3	A1	SND_DIST	T4	SMS_T1	SMS_T2	SMS_PACK_NO
-----	--------	-----	----	----	----	----	----------	----	--------	--------	-------------

Field	Marks	Value	Meaning
HDR	"ST300RPT"		Command type
DEV_ID	9 char.		Device ID
VER	"02"		Protocol Version
T1	String	Sec	Interval to be set to send a Status Report in parking mode: Range : 0 ~ 86400 If 0, a report in parking will be sent only one time when vehicle starts being parked.
T2	String	Sec	Interval to be set to send a Status Report in driving mode: Range : 0 ~ 60000 If 0, a report in driving will be sent only one time when vehicle starts driving.
T3	String	Sec	Interval to be set to send a Status Report in emergency mode: Range : 0 ~ 9999 If 0, an emergency report will be sent only one time when an emergency state occurs.
A1	String		Number of attempts to send an emergency report until the device gets acknowledgement from the server: If 0, no Emergency Report will be sent. If 65500, unlimited report until get ACK from Server.
SND_DIST	String	Meter	Distance interval to be set when the device sends a Status Report: Range : 0 ~ 60000 (60km) If 0, a Status Report on traveled distance is disabled. If not 0, a Status Report is sent when traveled distance reaches the predefined SND_DIST.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		13 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

T4	String	Sec	Interval to be set to send a Keep Alive string. Range: 0 ~ 65500
SMS_T1	String	Min	Interval to be set to send a Status Report in parking mode Range: 0 ~ 99999
SMS_T2	String	Min	Interval to be set to send a Status Report in driving mode Range: 0 ~ 99999
SMS_PACK_NO	String		Report No in one SMS message Range: 0 ~ 5

<Example>

[command] ST300RPT;100850000;02;180;120;60;3;0;0;0;0

[response] ST300RPT;Res;100850000;010;180;120;60;3;0;0;0;0

<Note>:

** If a reporting interval is set with a big number, the network may disconnect GPRS connection because GPRS communication does not make a progress for a long time. So, the device may not receive the command via GPRS. "T4" will be used to prevent such a disconnection by sending a short data for short time.


** The 'Keep Alive' report is sent only when the device has no data to be sent for the time of the interval 'T4'.

4-3. Event Parameters


In order to set these parameters properly, read carefully the contents and <Example> along with <Note> described in the bottom inside the table below.

HDR	DEV_ID	VER	IGNITION	T1	T2
IN1_TYPE	IN2_TYPE	IN3_TYPE	IN1_CHAT	IN2_CHAT	IN3_CHAT
OUT1_TYPE	OUT2_TYPE	OUT1_ACTIVE	OUT2_ACTIVE		
PULSE1_NO	PULSE1_ON	PULSE1_OFF	PULSE2_NO	PULSE2_ON	PULSE2_OFF
IN4_TYPE	IN5_TYPE	IN4_CHAT	IN5_CHAT	BAUD	

Field	Marks	Value	Meaning
HDR	"ST300EVT"		Command type
DEV_ID	9 char.		Device ID
VER	"02"		Protocol Version
IGNITION	'0' ~ '3'		Ignition using state: 0 : Not use ignition 1 : Use ignition Line 2 : Virtual ignition(power) 3 : Virtual ignition (motion)
T1	String	Sec	Delay in entering parking mode after ignition goes to OFF
T2	String	Sec	Delay in entering driving mode after ignition goes to ON

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Doc. No. Rev. 1.18	14 of 74 Date 2019/03/25

IN1_TYPE	'0' ~ '15'		0 = Falling Edge 1 = Rising Edge 2 = Both Edge (Falling & Rising) 3 = Panic Button 7 = Anti-Theft Button 11 = Door Sensor 12 = Ignition Line 13 = Disable Immobilizer if it's activated by jammer Detector 15 = Anti-Theft Button 2 Default = '3'.
IN2_TYPE	'0' ~ '15'		0 = Falling Edge 1 = Rising Edge 2 = Both Edge (Falling & Rising) 3 = Panic Button 7 = Anti-Theft Button 11 = Door Sensor 13 = Disable Immobilizer if it's activated by jammer Detector 15 = Anti-Theft Button 2 Default = '2'.
IN3_TYPE			This device does not have INPUT3
IN1_CHAT	String	100ms	Input1 chattering time. Range : 0 ~ 9999 Default = 3 sec. If 0, input1 is not checked.
IN2_CHAT	String	100ms	Input2 chattering time. Range : 0 ~ 9999 Default = 2 sec. If '0', the input2 is not checked.
IN3_CHAT	String	100ms	This device does not have INPUT3
OUT1_TYPE	'0' ~ '9'		0 = GPIO 1 = immobilizer 3 = Pulse 5 = Buzzer 8 = Immobilizer 2 9 = Auto Immobilizer 2
OUT2_TYPE			This device does not have OUTPUT2
OUT1_ACTIVE	'0' or '1'		0 = Open when out1 is active 1 = GND when out1 is active
OUT2_ACTIVE			This device does not have OUTPUT2
PULSE1_NO	String		Pulse number when the out1 type is set to pulse. Range : 0 ~ 9999 If Pulse Number is 9999, pulsing runs permanently.
PULSE1_ON	String	100ms	Active time of Pulse1: Range : 0 ~ 9999 It should be set with an even number.
PULSE1_OFF	String	100ms	Inactive time of Pulse1: Range : 0 ~ 9999 It should be set with an even number.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		15 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

PULSE2_NO			This device does not have OUTPUT2
PULSE2_ON			This device does not have OUTPUT2
PULSE2_OFF			This device does not have OUTPUT2
IN4_TYPE			This device does not have INPUT4
IN5_TYPE			This device does not have INPUT5
IN4_CHAT			This device does not have INPUT4
IN5_CHAT			This device does not have INPUT5
BAUD			This device does not have RS232.

<Example>

[command] ST300EVT;100850000;02;1;60;0;3;2;2;30;20;20;1;0;1;0;0;0;0;0;0;0;0;0

[response] ST300EVT;Res;100850000;010;1;60;0;3;2;2;30;20;20;1;0;1;0;0;0;0;0;0;0;0;0


<Note>:

** If IGNITION is set to '0', the device doesn't check driving or parking state of the vehicle. It always reports status string under parking mode, and cannot support Parking Lock and the Service which enters Sleep or Deep Sleep automatically when the vehicle is parked.

** If IGNITION is set to '2', the device checks driving or parking state of the vehicle with voltage range of vehicle's battery. We named it as 'Virtual Ignition'. Virtual ignition runs when the device installed on a real vehicle and it may need to adjust the voltage range for special vehicle.

** "IGNITION" should be selected to "Not Use Ignition" if "IN1_TYPE" = 12.

** In case of pulse, pulse time may have tolerance about dozens of ms.


	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		17 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

4-5. Parameters for various features

In order to set these various parameters properly, read carefully the contents and <Example> along with <Note> described in the bottom inside the table below. In setting a new device, the 'SyncTrak' will show you detailed explanation on how to set parameters relating to these 'Fields'.

HDR	DEV_ID	VER	PARKING_LOCK	SPEED_LIMIT	PWR_DN	CON_TYPE
ZIP	GROUP_SEND	MP_CHK	ANT_CHK	BAT_CHK	M_SENSOR	CALL
GEO_FENCE	DATA_LOG					

Field	Marks	Value	Meaning
HDR	"ST300SVC"		Command type
DEV_ID	9 char.		Device ID
VER	"02"		Protocol Version
PARKING_LOCK	'0' or '1'		Parking lock enable (1) / disable (0): If 1, the device periodically checks vehicle position under parking status. When the vehicle goes off some boundary or starts moving faster than the predefined velocity, the device reports the Parking Lock Emergency.
SPEED_LIMIT	String	Km/h	Over speed limit: If 0, the device does not check the over-speed. If 1 and if the vehicle runs faster than the over predefined value, the device reports an alert once.
PWR_DN	'0' ~ '2'		Power saving type: 0 : Disabled sleep and deep sleep service 1 : Enabled deep sleep 2 : Enabled sleep
CON_TYPE	'0' or '1'		Connection Type with Server: 0 = KEEP_CON 1 = KEEP_DISCON Detail explanation is below.
ZIP	'0' or '1'		Use Zip Disable (0) / Enable (1)
GROUP_SEND	'0' or '1'		Group Send for stored data: 0 : Disable 1 : Enable. One packet can include up to 5 reports. The 'Group Send' function is explained below.
MP_CHK	'0' or '1'		Checking Main Power Disconnection: Disable (0) / Enable (1)
ANT_CHK	'0' or '1'		GPS Antenna Connection Error Check: Disable (0) / Enable (1)
BAT_CHK	'0' or '1'		Backup Battery Error Check: Disable (0) / Enable (1)

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		18 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

M_SENSOR	'0' ~ '7'		Motion Sensor			
				Motion	Collision	Shock
			0	Disable	Disable	Disable
			1	Enable	Disable	Disable
			2	Disable	Disable	Enable
			3	Enable	Disable	Enable
			4	Disable	Enable	Disable
			5	Enable	Enable	Disable
			6	Disable	Enable	Enable
			7	Enable	Enable	Enable
CALL	'0' or '1'		Support Call with headset: Disable (0) / Enable (1)			
GEO_FENCE	'0' or '1'		Support Geo-fence: Disable (0) / Enable (1)			
DATA_LOG	'0' or '1'		This parameter is not used now. But you can get all the stored data log from the device by using the SyncDown program and Setting cable.			

<Example>

[command] ST300SVC;100850000;02;1;120;0;0;0;0;1;1;1;0;0;0;0

[response] ST300SVC;Res;100850000;010;1;120;0;0;0;0;1;1;1;0;0;0;0

<Note>:

** Function of M_SENSOR can be used with the model that has motion sensor.

If shock or collision detection is enabled and if there is shock or collision on the vehicle, the device sends a report to the server.

** If these parameters are customized for your device, please follow the instructions customized for you instead of using this table.

CON TYPE

1. KEEP_CON: Device always keeps TCP connection and can receive a command via GPRS.
2. KEEP_DISCON: Device maintains TCP connection while the device is sending the data to the server. Within 3 minutes after sending all the data that the device has been keeping, the device disconnects GPRS and TCP connection as there is no data to be sent any more inside the device. In this case, the device cannot receive a command via GPRS.

Group Send


Device stores data if the vehicle is in 'no GPRS area'. And, the vehicle moves to GPRS available area, device starts sending the stored data.

If the 'Group Send option' is enabled, the device sends the server5 reports at one time as one bundle.

The 'Group Send' is useful to speed up sending.

M_Sensor

1. Collision: Device sends an event report when ignition is ON and the vehicle moves.
2. Shock: Device sends an event report when ignition is OFF and the vehicle moves.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		19 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

4-6. Voltage control parameters

In order to set these parameters properly, read carefully the contents and <Example> along with <Note> described in the bottom inside the table below. In setting a new device, the 'SyncTrak' will show you detailed explanation on how to set parameters relating to these 'Fields'.

HDR	DEV_ID	VER	CHR_STOP_THRES_12	CHR_STOP_THRES_24	DECIDE_BAT_24
OPERATION_STOP_THRES_12	OPERATION_STOP_THRES_24	IGNDET_H	IGNDET_L		

Field	Marks	Meaning
HDR	"ST300MBV"	Command type
DEV_ID	9 char.	Device ID
VER	"02"	Protocol Version
CHR_STOP_THRES_12	String	Not used
CHR_STOP_THRES_24	String	Not used
DECIDE_BAT_24	String	Voltage value to check if the vehicle's battery is 12V or 24V.
OPERATION_STOP_THRES_12	String	Voltage value to protect vehicle battery. In case of 12 V vehicle, the device stops operation if car battery voltage gets lower than this value.
OPERATION_STOP_THRES_24	String	Voltage value to protect vehicle. In case of 24 V vehicle, the device stops operation if car battery voltage gets lower than this value.
IGNDET_H	String	In case of virtual ignition, the vehicle can recognize driving state when vehicle power is higher than IGNDET_H. Default = '0'
IGNDET_L	String	In case of virtual ignition, the vehicle can recognize parking state when vehicle power is less than IGNDET_L. Default = '0'


<Example>

[command] ST300MBV;100850000;02;0;22;19;8.00;18.00;0;0

[response]ST300MBV;Res;100850000;122;0;22;19;8.00;18.00;0;0

<Note>

1. IGNDET_H and IGNDET_L are '0', device check parking and driving automatically.
 2. CHR_STOP_THRES_12 and CHR_STOP_THRES_24 parameters are not used in this device.
- Charging is stopped every time when vehicle mode changed to Parking.


	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		20 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

4-7. Motion sensor parameters

In order to set these parameters properly, read carefully the contents and <Example> along with <Note> described in the bottom inside the table below. In setting a new device, the 'SyncTrak' will show you detailed explanation on how to set parameters relating to these 'Fields'.

HDR	DEV_ID	VER	SHOCK_DELAY	MOTION_THRES	SHOCK_THRES
COLL_THRES					

Field	Marks	Value	Meaning
HDR	"ST300MSR"		Command type
DEV_ID	9 char.		Device ID
VER	"02"		Protocol Version
SHOCK_DELAY	String	Sec.	Delay in entering shock detection mode after ignition off 0 – Disable Range : 1 ~ 21600 (5hour) Recommend: 600 (10 min.)
MOTION_THRES	String	Step	Detection level of shock violation. Range : 0.04 ~ 2.0 Recommend : 0.06
SHOCK_THRES	String	Step	Detection level of shock violation. Range : 0.04 ~ 2.0 Recommend : 0.10
COLL_THRES	String	Step	Gravity for collision report. Range : 0.1 ~ 2.0 Recommend : 0.7
<p><Example> [command] ST300MSR;100850000;02;600;0.04;0.04;0.7 [response] ST300MSR;Res;100850000;128;600;0.04;0.04;0.70 <Note> * For the shock level, it is recommended that the user should set to 0.04. If the motion threshold is higher than 0.04, the sensor will be too sensitive to make a proper detection on shock. The setting values of " MOTION_THRES < SHOCK_THRES < COLL_THRES "</p>			


	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		21 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

4-8. Circular geo-fencing parameters

This table shows how a device user can set parameters for circular geo-fencing. In order to set these parameters properly, read carefully the contents and <Example> along with <Note> described in the bottom inside the table below. In setting a new device, the 'SyncTrak' will show you detailed explanation on how to set parameters relating to these 'Fields'.

HDR	DEV_ID	VER	GEO_ID	ACTIVE	LAT	LON	RADIUS	IN	OUT
-----	--------	-----	--------	--------	-----	-----	--------	----	-----

Field	Marks	Value	Meaning
HDR	"ST300CGF"		Command type
DEV_ID	9 char.		Device ID
VER	"02"		Protocol Version
GEO_ID	'1' ~ '200'		Geo-fence ID
ACTIVE	'0' or '1'		enable (1) or disable (0)
LAT	String		Central latitude of circular area
LON	String		Central longitude of circular area
RADIUS	String	meter	Radius of circular area Range : 30~65,000
IN	'0' or '1'		Alert that a vehicle enters into the circular area. Enable (1) or disable (0)
OUT	'0' or '1'		Alert that a vehicle goes out from the circular area. Enable (1) or disable (0)
<Example> [command] ST300CGF;100850000;02;1;1;+37.000000;+127.000000;50;1;1 [response] ST300CGF;Res;100850000;010;1;1;+37.000000;+127.000000;50;1;1			


	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		22 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

4-9. Additional Parameters (TCP/UDP Parameters)

In order to set these parameters properly, read carefully the contents and <Example> along with <Note> described in the bottom inside the table below. In setting a new device, the 'Additional Parameter' section available in the 'SyncTrak' program will show you detailed explanation on how to set parameters relating to these 'Fields'.

HDR	DEV_ID	VER	SVR_TYPE	B_SVR_TYPE	UDP_ACK	DEV_PORT	OLD_PROTOCOL
SAT_OUT	SAT_DELAY	SAT_RS232					

Field	Definitions	Unit	Remark			
HDR	“ST300ADP”		Command type			
DEV_ID	9 char.		Device ID			
VER	“02”		Protocol Version			
SVR_TYPE	‘T’ / ‘U’		Server Protocol Type T : TCP U : UDP			
B_SVR_TYPE	‘T’ / ‘U’		Backup Server Protocol Type T : TCP U : UDP			
UDP_ACK	‘0’ ~ ‘3’		‘ACK’ from the server when UDP is used: 0 : No Use 1 : ACK (‘Acknowledgement’ to be made by the server right after receiving a report from the device) when the server receives reports except ‘Alive’ 2 : ACK when the server receives reports except ‘STT (Status) Report ‘and ‘Alive Report’ 3 : ACK when the server receives an ‘emergency report’. ‘Command response ‘doesn’t need ACK.			
DEV_PORT	String		It is a port of the device for receiving commands from the server via UDP. It can be used only when UDP server is used. If ‘0’ or empty, the device would use port 9000. If not zero, the device can receive commands through the port, DEV_PORT.			
OLD_PROTOCOL	‘0’~‘1’		If ‘0’, follow this document about commands and reports. If ‘1’, follow old document of ST215 or ST240 series. (For example, use “SA200” as header and 6digits as unit ID)			
SAT_OUT	String	‘0’ ~‘4’	Output control for satellite modem can detect the situation of no GSM. 0 = Disable 1 ~ 4 = Enable satellite if lost GSM signal.			
			<table><tr><td>SATELLITE</td><td>OUT 1</td><td>OUT 2</td></tr></table>	SATELLITE	OUT 1	OUT 2
SATELLITE	OUT 1	OUT 2				

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Doc. No. Rev. 1.18	23 of 74 Date 2019/03/25

			<table><tr><td>'1'</td><td>X</td><td>X</td></tr><tr><td>'2'</td><td>O</td><td>X</td></tr><tr><td>'3'</td><td>X</td><td>O</td></tr><tr><td>'4'</td><td>O</td><td>O</td></tr></table> <p>Please refer below note, Control of Satellite Modem</p>	'1'	X	X	'2'	O	X	'3'	X	O	'4'	O	O
'1'	X	X													
'2'	O	X													
'3'	X	O													
'4'	O	O													
SAT_DELAY	String	Sec	<p>Delay time to activate the output after losing GSM/GPRS signal.</p> <p>Range : 0 ~ 86400</p> <p>Please refer below note, Control of Satellite Modem</p>												
SAT_RS232	String	'0' or '1'	<p>Send reports through RS232 when SAT_OUT is activated.</p> <p>0 : Disable</p> <p>1 : Enable</p> <p>Caution: This function use only in ST300R.</p> <p>Please refer below note, Control of Satellite Modem</p>												

<example>

[command] ST300ADP;100850000;02;U;T;2;9000;0;0;0;0;**1**;0

[response] ST300ADP;Res;100850000;022;U;T;2;9000;0;0;0;0;**1**;0

<notes>

ACK in case of UDP

UDP is protocol that doesn't check whether the data is transmitted successfully. So, the device checks completion of sending with ACK depending on UDP_ACK type.

ACK is sent by server when the server receives the data.

If the ACK has not been sent for more than 2 minutes after sending, the device recognizes the data has not been reached to the server and sends the data again.

Examples of ACK report are as below.

String Format : **"ST300ACK;100850000"**

Zip Format : **0x15 0x85 0x00 0x00**

Device users are recommended to set ACK_TYPE to '1' to confirm that all the data can be transmitted successfully.

Report Type	UDP_ACK=0	UDP_ACK=1	UDP_ACK=2	UDP_ACK=3
Alive	X	X	X	X
STT	X	O	X	X
Event, Alert, Etc.	X	O	O	X
Emergency	X	O	O	O


<Note>

'O': Necessary

'X': Not necessary


Control of Satellite Modem

SAT_OUT, SAT_DELAY and SAT_RS232 are used for connected satellite modem can communicate with server instead of the device under no GSM/GPRS situation.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		24 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

Operation of the control is as follows.

1. If no GSM/GPRS situation keeps more than SAT_DELAY, the device activates related output depend on SAT_OUT.
2. If SAT_OUT is activated, the satellite modem detects no GSM situation and starts own communication.
3. If SAT_RS232 is enabled, the device sends STT string which has '0' in MSG_TYPE field through RS232. And then it sends all reports except for STT and Alive.
4. If GSM signal is recovered, the device deactivates output line related on SAT_OUT. If SAT_RS232 is enabled, STT string which has '0' in MSG_TYPE field is sent before the deactivation.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		25 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25


4-10. New Parameter Setting

In order to set these parameters properly, read carefully the contents and <Example> along with <Note> described in the bottom inside the table below. In setting a new device, the 'New Parameter Setting' section available in the 'SyncTrak' program will show you detailed explanation on how to set parameters relating to these 'Fields'.


HDR	DEV_ID	VER	ANGLE_RPT	RPT_TYPE	ANTITHFT_CNT1	ANTITHFT_CNT2	JAM_DET
JAM_CHK_DIST	JAM_CHK_TM	VI_ON_THRES	VI_ON_DELAY	VI_ON_PERCENT			
VI_OFF_THRES	VI_OFF_DELAY	VI_OFF_PERCENT	HBM_STT				

- Definition : Set parameters related on report interval.

Field	Definitions	Unit	Remark																
HDR	"ST300NPT"		Command type																
DEV_ID	9 char.		Device ID																
VER	"02"		Protocol Version																
ANGLE_RPT	String	degree	Reporting about the STT Message if the steering angle is greater than ANGLE_RPT: Disable : 0 Enable : 1 to 180 degrees																
RPT_TYPE	String	'0' or '1'	How to set a sequential rule of storing/erasing reports if buffer of the device is full of reports un-sent to the server: 0: FIFO: First in First Out. 1: LIFO: Last In First Out.																
ANTITHFT_CNT1	String	Sec	Delay of Anti-Theft Release: When ignition is on, it starts Anti-Theft emergency state after the user-defined time. Range : 10 to 60000 second																
ANTITHFT_CNT2	String	Sec	Delay of Anti-Theft Alert: When it is Anti-theft emergency state, it sends the emergency report after the user-defined time. Range : 0 to 60000 second																
JAM_DET	String	'0' ~ '3'	GPRS or GPRS+GPS Jamming detection function: 0 = Disable 1 ~ 3 = enabled jamming detection and if detected first, check assist functions and then triggered by JAM_DET mode as follows. <table border="1"> <tr> <th>JAM_DET</th><th>Alert</th><th>Active Immob.</th><th>Active Buzzer</th></tr> <tr> <td>'1'</td><td>O</td><td>X</td><td>X</td></tr> <tr> <td>'2'</td><td>O</td><td>O</td><td>X</td></tr> <tr> <td>'3'</td><td>O</td><td>X</td><td>O</td></tr> </table> X – Inactive, O – Activated if jamming is detected. Immobilizer: You can disable it by command.	JAM_DET	Alert	Active Immob.	Active Buzzer	'1'	O	X	X	'2'	O	O	X	'3'	O	X	O
JAM_DET	Alert	Active Immob.	Active Buzzer																
'1'	O	X	X																
'2'	O	O	X																
'3'	O	X	O																

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Doc. No. Rev. 1.18	26 of 74 Date 2019/03/25

			<p>Buzzer: It is disabled automatically after being released from jamming.</p> <p>Device will send an alert after recovering the GSM network. It takes about 2 minutes or more for the device to complete a jamming detection.</p> <p>Default : 0</p>
JAM_CHK_DIST	'0' ~'60000'	Meter	<p>This is complementary to the detection function of device described above on the GPRS jamming by utilizing a distance value as a parameter when jamming is done.</p> <p>Once jamming on the GPRS network starts being detected, the device will also check the distance between the current location of the vehicle and the First geographical Point ('Fp') where the jamming started being detected.</p> <p>If the distance is greater than JAM_CHK_DIST for a while triggered by JAM_DET mode.</p> <p>If '0', skip this procedure.</p> <p>Default : 500 meters</p>
JAM_CHK_TM	'0' ~ '43200'	Sec.	<p>It is complementary to the function of GPRS jamming detection in an area 'without GPS connectivity' ('No GPS').</p> <p>After detecting jamming first in such a bad GPS connecting area, the device begins to count the 2 time-length factors (<i>A</i> and <i>B</i>) to make a sum ($A + B = C$) if the vehicle moves in the area:</p> <ul style="list-style-type: none"> ● <i>A: time length that needs to complete the jamming detection</i> ● <i>B: time length that the vehicle driver needs to complete driving in the area.</i> <p>If <i>C</i> (the sum) is longer than the length of the jamming detection ('JAM_CHK_TM') the device judges that jamming was done in the area. Please refer to the table for more details.</p> <p>If the has not moved in the area, ignore jamming detection until the jamming detection function is released.</p> <p>If '0', skip this procedure.</p> <p>Default: 300 seconds.</p>
VI_ON_THRES	String	1/255G	<p>Threshold value for Motion Virtual Ignition On</p> <p>Range : 3~30</p> <p>Default : 5</p>
VI_ON_DELAY	String	Sec.	<p>Delay time for Motion Virtual Ignition On</p> <p>Range : 3~999</p> <p>Default : 10</p>
VI_ON_PERCENT	String	%	<p>Percent for Motion Virtual Ignition On.</p>

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		27 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

			Range : 30~100 Default: 70
VI_OFF_THRES	String	1/255G	Threshold value for Motion Virtual Ignition Off Range : 3~30 Default : 5
VI_OFF_DELAY	String	Sec.	Delay time for Motion Virtual Ignition Off Range : 3~999 Default : 10
VI_OFF_PERCENT	String	%	Percent for Motion virtual Ignition Off. Range : 30 ~ 100 Default : 70
HBM_STT	String	0' ~ '2'	Type of report as follows. 0 : Not Increase H_METER/ BCK_VOLT/ MSG_TYPE in "STT" String 1: Increase H_METER/ BCK_VOLT/ MSG_TYPE in "STT" String. 2: Increase H_METER/ BCK_VOLT/ MSG_TYPE in "STT" String and LBS information

<example>

[command] ST300NPT;100850000;02;0;0;0;0;0;500;300;5;10;70;5;10;70;0

[response] ST300NPT;Res;100850000;010; 02;0;0;0;0;0;500;300;5;10;70;5;10;70;0

Jamming detection procedure

JAM_CHK_DIST and & JAM_CHK_TM are complementary to jamming detection to avoid false detection. At least, we recommend that users of our device should utilize the 'JAM_CHK_DIST' for safety purposes. If you use the 2 (two) functions, it can detect the following two cases of jamming:

*Case A: Jamming GPRS only.

Jamming detected ->JAM_CHK_DIST -> JAM_CHK_TM -> Triggered by JAM_DET mode.

*Case B: Jamming GPRS & GPS.

Jamming detected ->JAM_CHK_TM -> Triggered by JAM_DET mode.

JAM_CHK_DIST: if 0, skip this function.

JAM_CHK_TM: if 0, skip this function.


In case all of the complementary functions are disabled, device starts working according to the jamming mode (JAM_DET mode) after detecting the jamming. In this case, a false detection might be made in an area having a weak GSM connectivity or in an area having a strong radio.

4-11. Backup Battery Shutdown Parameter

HDR	DEV_ID	VER	SDN_USE	SDN_THRES
-----	--------	-----	---------	-----------

- Definition : When vehicle battery is disconnected and Backup battery voltage is low, device is turned off.

Field	Definitions	Unit	Remark
HDR	"ST300BAT"		Command type


	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM		28 of 74 Doc. No. Rev. 1.18
				Date 2019/03/25

DEV_ID	9 char.		Device ID
VER	"02"		Protocol Version
SDN_USE	String	'0' or '1'	0 : Doesn't power off the device. 1 : Power off the device when vehicle battery is disconnected and Backup battery voltage is low
SDN_THRES	String	Volts	Threshold of backup battery voltage for power off. Minimum: 3.4 Volts Maximum: 3.8 Volts

<example>

[command] ST300BAT;600850000;02;1;3.5

[response] ST300BAT;Res;600850000;010;1;3.5

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		29 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

5. Reporting to Server


Once a device is configured properly and registered on its server for operation, it sends reports to the server (or sends SMS messages to cellular phone whose number is pre-defined) either in response to the commands made by the server or as per the way how the device has been configured to respond to its server.

This *chapter* shows the strings of each report, so that server could understand the contents. One report can be issued in either of two types, normal string and zip string, both of which are described below.

Also, note that we take an <Example> and make a <Note> in bottom part of each report in this chapter to help the users understand better what contents are included in the report. So, it is highly recommended that users should read the whole parts of the reports very carefully.

Model Identification Table

Model	ID
ST300RI	01
ST340	02
ST340LC(4pin)	03
ST300H	04
ST350	05
ST480	06
ST310U	40

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		30 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25


5-1. Status Report

This report ('Status Report') is sent to the server periodically as defined by user to configure 'status report' if conditions for issuing the report are met. The following two (2) tables show that one reporting can be made in 2 different types such as in 'string' and in 'zip'.

HDR	DEV_ID	MODEL	SW_VER	DATE	TIME	CELL	LAT
LON	SPD	CRS	SATT	FIX	DIST	PWR_VOLT	I/O
MODE	MSG_NUM	H_METER	BCK_VOLT	MSG_TYPE	CELL_ID	MCC	MNC
RX_LVL	LAC	TM_ADV					

5-1-1. Normal

Field	Marks	Meaning
HDR	"ST300STT"	Header of Status Report
DEV_ID	9 char.	Device ID
MODEL	2Char	Device Model (According to table model)
SW_VER	String	Software Version Ex: 313F
DATE	8 char.	GPS date (yyyymmdd) Year + Month + Day
TIME	8 char.	GPS time (hh:mm:ss) Hour : Minute : Second
CELL	String	Location Code ID(3 digits hex) + Serving Cell BSIC(2 digits decimal)
LAT	String	Latitude (+/-xx.xxxxxx)
LON	String	Longitude (+/-xxx.xxxxxx)
SPD	String	Speed in km/h This value returns to 0 when it is over than 200,000km (kilo meters).
CRS	String	Course on the ground in degree
SATT	String	Number of satellites
FIX	'1' or '0'	GPS is fixed (1); GPS is not fixed (0)
DIST	String	Traveled distance in meter. Max 999999999
PWR_VOLT	String	Voltage value of the main power
I/O	6 char.	Current I/O status of the inputs and the outputs: Ignition + Input1 + Input 2 + Input 3 + Out1 + Out2 Ignition : '1' (ON), '0' (OFF) Input1 ~ Input3 : '1' (Ground, Shorted), '0' (Opened) Out1 ~ Out2 : '1' (Active), '0' (Inactive)
MODE	1 char.	'1' = Idle mode(Parking) '2' = Active Mode(Driving) '4' = Distance mode '5' = Angle mode
MSG_NUM	4 char.	Message number After "9999" is reported, message number returns to '0000'.
H_METER	String	Driving hour-meter. Max 999999
BCK_VOLT	String	Voltage value of backup battery

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Doc. No. Rev. 1.18	31 of 74 Date 2019/03/25

MSG_TYPE	1 char	Report is real time (1), Report is storage (0)
CELL_ID	String	Information of Cell ID
MCC	String	Information of Mobile Country Code
MNC	String	Information of Mobile Network Code
RX_LVL	String	Information of Rx Level
LAC	String	Information of Location Area Code
TM_ADV	String	Information of Timing Advance

<Example>


ST300STT;100850000;07;301;20170103;01:45:10;01454;+37.479265;+126.887877;000.000;104.38;13;1;0;12.14;000000;1;0001;000000;3.8;1;73;1c2;0;-82;20;1

<Note>

The "H_METER/ BCK_VOLT/ MSG_TYPE" are included in STT only when "HBM_STT" is "1"
 CELL_ID to TM_ADV are included in STT only when "HBM_STT" is "2"

5-1-2. Zip

Field	Marks	Meaning							
STX	0x02	Start of zip data							
PKT_LEN	2 Bytes	Length of zip data, HDR to MSG_TYPE							
HDR	0x10	Header of Status Report							
DEV_ID	5 bytes	Device ID BCD format If the Device ID is 123456789, this field will be filled with 0x12, 0x34, 0x56 0x78 and 0x90.							
MODEL	1byte	Device Model (According to table model)							
SW_VER	2 bytes	<div>Software Version</div> <table><tr><td>Bit 15 ~ Bit 12</td><td>Bit 11 ~ Bit 0</td></tr><tr><td>Version Letter</td><td>Version Number</td></tr></table> Version Letter: 1 ~ 15. Each number means ‘A’ ~ ‘O’. Version Number: 1 ~ 4095. It made by combining Number with Letter. If Version Letter field is filled by '0', it means the software version does not have version letter. Ex: 6139 (313F) 6 = F 139 = 313				Bit 15 ~ Bit 12	Bit 11 ~ Bit 0	Version Letter	Version Number
Bit 15 ~ Bit 12	Bit 11 ~ Bit 0								
Version Letter	Version Number								
DATE_TIME	6 bytes	GPS date & Time (Year + Month + Day + Hour + Minute + Second)							
CELL	3 bytes	Location Code ID (2 bytes) + Serving Cell BSIC (1 byte)							
LAT	4 bytes	1 byte (integer) + 3 bytes (BCD)							
LON	4 bytes	1 byte (integer) + 3bytes (BCD)							
SPD	3 bytes	2 bytes (integer) + 1 byte (BCD)							
CRS	3 bytes	2 bytes (integer) + 1 byte (BCD)							
SATT_FIX	1 byte	<table><tr><td>Bit 7 Fix</td><td>Bit 6 Latitude +/- sign</td><td>Bit 5 Longitude +/- sign</td><td>Bit 4 ~ Bit 0 Satellite's count</td></tr></table>				Bit 7 Fix	Bit 6 Latitude +/- sign	Bit 5 Longitude +/- sign	Bit 4 ~ Bit 0 Satellite's count
Bit 7 Fix	Bit 6 Latitude +/- sign	Bit 5 Longitude +/- sign	Bit 4 ~ Bit 0 Satellite's count						

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		32 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

		+ sign = 0, - sign = 1											
DIST	4 bytes	Traveled distance in meter											
PWR_VOLT	2 bytes	Voltage value of main power 1 byte (integer) + 1 byte (BCD)											
I/O	1 byte	<table border="1"><tr><td>Bit 5 Out 2</td><td>Bit 4 Out1</td><td>Bit 3 Input 3</td><td>Bit 2 Input 2</td><td>Bit 1 Input1</td><td>Bit 0 Ignition</td></tr></table> Ignition : 1 (ON), 0 (OFF) Input1 ~ Input3 : 1 (Ground, Shorted), 0 (Opened) Out1 ~ Out2 : 1 (Active), 0 (Inactive)						Bit 5 Out 2	Bit 4 Out1	Bit 3 Input 3	Bit 2 Input 2	Bit 1 Input1	Bit 0 Ignition
Bit 5 Out 2	Bit 4 Out1	Bit 3 Input 3	Bit 2 Input 2	Bit 1 Input1	Bit 0 Ignition								
MODE	1 byte	1 = Idle (Parking), 2 = Active (Driving), 4 = Distance, 5 = Angle											
MSG_NUM	2 bytes	Message number After 9999, message number returns to 0.											
H_METER	4 bytes	Driving hour-meter											
BCK_VOLT	2 bytes	Voltage value of backup battery 1 byte (integer) + 1 byte (BCD)											
MSG_TYPE	1 byte	Report is real time (1), Report is storage (0)											
CELL_ID	2 bytes	Information of Cell ID											
MCC	2 bytes	Information of Mobile Country Code											
MNC	1 byte	Information of Mobile Network Code											
RX_LVL	2 bytes	Information of Rx Level											
LAC	2 bytes	Information of Location Area Code											
TM_ADV	1 bytes	Information of Timing Advance											
ETX	0x03	End of zip data.											


<Example>

Original String :

ST300STT;100850000;07;301;20170103;01:45:10;01454;+37.479320;+126.887833;000.007;000.00;9;1;0;12.3
6;000000;1;0001;000000;3.8;1;73;1c2;0;-82;20;1

→ Zip Packet

0x02
0x00 0x3c
0x10
0x10 0x08 0x50 0x00 0x00
0x07
0x61 0x39
0x11 0x01 0x03 0x01 0x2d 0x0a
0x00 0x14 0x36
0x25 0x47 0x93 0x20
0x7e 0x88 0x78 0x33
0x00 0x00 0x07
0x00 0x00 0x00
0x89
0x00 0x00 0x00 0x00
0x0c 0x36
0x00 0x00
0x01
0x00 0x01
0x00 0x00 0x00 0x00
0x03 0x08

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM		33 of 74
		Doc. No.	Rev.	Date
			1.18	2019/03/25

0x01
0x00 0x49
0x01 0xc2
0x00
0xff 0xae
0x00 0x14
0x01
0x03


<note>

If you want 'RX_LVL' data back to normal format to use excel. Use this function.

=IF(HEX2DEC(C1)>HEX2DEC("8FFF"), (HEX2DEC("FFFF")-HEX2DEC(C1)+1)*-1, HEX2DEC(C1))

C1 is position of cell, and this cell has 16 bits hexadecimal data.

'Timing Advance' value is last available data. If the device never getting available 'Timing Advance' value, it will be '0'.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		34 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25


5-2. Emergency Report

When an emergency occurs, device sends to the server this 'emergency report' as defined already in the course of configuring device.

HDR	DEV_ID	MODEL	SW_VER	DATE	TIME	CELL	LAT
LON	SPD	CRS	SATT	FIX	DIST	PWR_VOLT	I/O
EMG_ID	H_METER	BCK_VOLT	MSG_TYPE	CELL_ID	MCC	MNC	RX_LVL
LAC	TM_ADV						

5-2-1. Normal


Field	Marks	Meaning
HDR	"ST300EMG"	Header of Emergency Report
DEV_ID	9 char.	Device ID
MODEL	2Char	Device Model (According to table model)
SW_VER	String.	Software Version Ex: 313F
DATE	8 char.	GPS date (yyyymmdd)
TIME	8 char.	GPS time (hh:mm:ss)
CELL	String	Location Code ID(3 digits hex) + Serving Cell BSIC(2 digits decimal)
LAT	String	Latitude (+/-xx.xxxxxx)
LON	String	Longitude (+/-xxx.xxxxxx)
SPD	String	Speed in km/h
CRS	String	Course over ground in degree
SATT	String	Number of satellites
FIX	'1' or '0'	GPS is fixed (1), GPS is not fixed (0)
DIST	String	Traveled distance in m.
PWR_VOLT	String	Voltage value of main power
I/O	6 char.	Current I/O status of inputs and outputs. Ignition + Input1 + Input 2 + Input 3 + Out1 + Out2 Ignition : '1' (ON), '0' (OFF) Input1 ~ Input3 : '1' (Ground, Shorted), '0' (Opened) Out1 ~ Out2 : '1' (Active), '0' (Inactive)
EMG_ID	1 char.	Emergency type: '1' = emergency by panic button '2' = emergency by parking lock '3' = emergency by removing main power. It's only available in model that has a backup battery. '5' = emergency by anti-theft '6' = emergency by anti-theft door '7' = emergency by motion '8' = emergency by anti-theft shock
H_METER	String	Driving hour-meter
BCK_VOLT	String	Voltage value of backup battery
MSG_TYPE	1 char	Report is real time (1), Report is storage (0)
CELL_ID	String	Information of Cell ID
MCC	String	Information of Mobile Country Code
MNC	String	Information of Mobile Network Code

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Doc. No. Rev. 1.18	35 of 74 Date 2019/03/25

RX_LVL	String	Information of Rx Level
LAC	String	Information of Location Area Code
TM_ADV	String	Information of Timing Advance
<p><Example> ST300EMG;100850000;01;010;20081017;07:41:56;00100;+37.478519;+126.886819;000.012;000.00;9;1;0;12.14;001100;1;0;3.8;1;73;1c2;0;-82;20;1</p> <p><Note> Emergency reports are sent A1 times until the unit receives server acknowledge. The "H_METER/ BCK_VOLT/ MSG_TYPE" are included in STT only when "HBM_STT" is "1" CELL_ID to TM_ADV are included in STT only when "HBM_STT" is "2"</p>		

5-2-2. Zip

Field	Marks	Meaning				
STX	0x02	Start of zip data				
PKT_LEN	2 Bytes	Length of zip data, HDR to MSG_TYPE				
HDR	0x11	Header of Emergency Report				
DEV_ID	5 bytes	Device ID BCD format If the Device ID is 123456789, this field will be filled with 0x12, 0x34, 0x56 0x78 and 0x90.				
MODEL	1byte	Device Model (According to table model)				
SW_VER	2 bytes	Software Version <table border="1"><tr><td>Bit 15 ~ Bit 12 Version Letter</td><td>Bit 11 ~ Bit 0 Version Number</td></tr></table> Version Letter: 1 ~ 15. Each number means ‘A’ ~ ‘O’. Version Number: 1 ~ 4095. It made by combining Number with Letter. If Version Letter field is filled by ‘0’, it means the software version does not have version letter. Ex: 6139 (313F) 6 = F 139 = 313	Bit 15 ~ Bit 12 Version Letter	Bit 11 ~ Bit 0 Version Number		
Bit 15 ~ Bit 12 Version Letter	Bit 11 ~ Bit 0 Version Number					
DATE_TIME	6 bytes	GPS date & Time (Year + Month + Day + Hour + Minute + Second)				
CELL	3 bytes	Location Code ID (2 Bytes) + Serving Cell BSIC (1 Byte)				
LAT	4 bytes	1 byte (integer) + 3 bytes (BCD)				
LON	4 bytes	1 byte (integer) + 3bytes (BCD)				
SPD	3 bytes	2 bytes (integer) + 1 byte (BCD)				
CRS	3 bytes	2 bytes (integer) + 1 byte (BCD)				
SATT_FIX	1 byte	<table border="1"><tr><td>Bit 7 Fix</td><td>Bit 6 Latitude +/- sign</td><td>Bit 5 Longitude +/- sign</td><td>Bit 4 ~ Bit 0 Satellite’s count</td></tr></table> + sign = 0, - sign = 1	Bit 7 Fix	Bit 6 Latitude +/- sign	Bit 5 Longitude +/- sign	Bit 4 ~ Bit 0 Satellite’s count
Bit 7 Fix	Bit 6 Latitude +/- sign	Bit 5 Longitude +/- sign	Bit 4 ~ Bit 0 Satellite’s count			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Doc. No. Rev. 1.18	36 of 74 Date 2019/03/25

DIST	4 bytes	Traveled distance in meter											
PWR_VOLT	2bytes	Voltage value of the main power 1 byte (integer) + 1 byte (BCD)											
I/O	1 byte	<table border="1"><tr><td>Bit 5 Out 2</td><td>Bit 4 Out1</td><td>Bit 3 Input 3</td><td>Bit 2 Input 2</td><td>Bit 1 Input1</td><td>Bit 0 Ignition</td></tr></table> Ignition : 1 (ON), 0 (OFF) Input1 ~ Input3 : 1 (Ground, Shorted), 0 (Opened) Out1 ~ Out2 : 1 (Active), 0 (Inactive)						Bit 5 Out 2	Bit 4 Out1	Bit 3 Input 3	Bit 2 Input 2	Bit 1 Input1	Bit 0 Ignition
Bit 5 Out 2	Bit 4 Out1	Bit 3 Input 3	Bit 2 Input 2	Bit 1 Input1	Bit 0 Ignition								
EMG_ID	1 byte	Emergency type: 1 = emergency by panic button 2 = emergency by parking lock 3 = emergency by removing the main power It's only available in model that has a backup battery. 5 = emergency by anti-theft 6 = emergency by anti-theft door 7 = emergency by motion 8 = emergency by anti-theft shock											
H_METER	4bytes	Driving hour-meter											
BCK_VOLT	2bytes	Voltage value of backup battery											
MSG_TYPE	1 char	Report is real time (1), Report is storage (0)											
CELL_ID	2 bytes	Information of Cell ID											
MCC	2 bytes	Information of Mobile Country Code											
MNC	1 byte	Information of Mobile Network Code											
RX_LVL	2 bytes	Information of Rx Level											
LAC	2 bytes	Information of Location Area Code											
TM_ADV	1 bytes	Information of Timing Advance											
ETX	0x03	End of zip data.											


<Example>

Original String :

ST300EMG;100850001;01;302;20181017;07:41:56;2F100;+37.478519;+126.886819;000.007;000.00;9;1;
0;12.14;000000;1;3.8;1;73;1c2;0;-82;20;1

→ Zip Packet


0x02
 0x00 0x3c
 0x11
 0x10 0x08 0x50 0x00 0x00
 0x01
 0x61 0x39
 0x12 0x0a 0x11 0x07 0x29 0x38
 0x02 0xf1 0x00
 0x25 0x47 0x85 0x19
 0x7e 0x88 0x68 0x19
 0x00 0x00 0x07
 0x00 0x00 0x00
 0x89
 0x00 0x00 0x00 0x00
 0x0c 0x14
 0x00 0x00

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		37 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

0x01
 0x03 0x08
 0x01
 0x00 0x49
 0x01 0xc2
 0x00
 0xff 0xae
 0x00 0x14
 0x01
 0x03

<Note>

Emergency reports are sent A1 times until the unit receives server acknowledge.
 The "H_METER/ BCK_VOLT/ MSG_TYPE" is include in emergency report only when "HBM_STT" is "1"
 CELL_ID to TM_ADV are included in STT only when "HBM_STT" is "2"

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Doc. No. Rev. 1.18	38 of 74 Date 2019/03/25


5-3. Event Report

When an emergency occurs, device sends to the server this 'event report' as defined already in the course of configuring the device. The following shows a sample of event report that is sent to the server if 'Input Line' is changed.

HDR	DEV_ID	MODEL	SW_VER	DATE	TIME	CELL	LAT
LON	SPD	CRS	SATT	FIX	DIST	PWR_VOLT	I/O
EVT_ID	H_METER	BCK_VOLT	MSG_TYPE	CELL_ID	MCC	MNC	RX_LVL
LAC	TM_ADV						

5-3-1. Normal

Field	Marks	Meaning
HDR	"ST300EVT"	Event report header
DEV_ID	9 char.	Device ID
MODEL	2Char	Device Model (According to table model)
SW_VER	String.	Software Version Ex: 313F
DATE	8 char.	GPS date (yyyymmdd)
TIME	8 char.	GPS time (hh:mm:ss)
CELL	String	Location Code ID(3 digits hex) + Serving Cell BSIC(2 digits decimal)
LAT	String	Latitude (+/-xx.xxxxxx)
LON	String	Longitude (+/-xxx.xxxxxx)
SPD	String	Speed in km/h
CRS	String	Course over ground in degree
SATT	String	Number of satellites
FIX	'1' or '0'	GPS is fixed (1), GPS is not fixed (0)
DIST	String	Traveled distance in meter
PWR_VOLT	String	Voltage value of the main power
I/O	6 char.	Current I/O status of inputs and outputs. Ignition + Input1 + Input 2 + Input 3 + Out1 + Out2 Ignition : '1' (ON), '0' (OFF) Input1 ~ Input3 : '1' (Ground, Shorted), '0' (Opened) Out1 ~ Out2 : '1' (Active), '0' (Inactive)
EVT_ID	1 char.	Event type: 1 = Input1 goes to ground state. 2 = Input1 goes to open state. 3 = Input2 goes to ground state. 4 = Input2 goes to open state.
H_METER	String	Driving hour-meter
BCK_VOLT	String	Voltage value of backup battery
MSG_TYPE	1 char	Report is real time (1), Report is storage (0)
CELL_ID	String	Information of Cell ID
MCC	String	Information of Mobile Country Code
MNC	String	Information of Mobile Network Code
RX_LVL	String	Information of Rx Level
LAC	String	Information of Location Area Code
TM_ADV	String	Information of Timing Advance

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Rev. 1.18	39 of 74 Date 2019/03/25

<Example>


ST300EVT;100850001;01;010;20081017;07:41:56;00100;+37.478519;+126.886819;000.012;000.00;9;1;0;12.14;000000;3;1;0;3.8;1;73;1c2;0;-82;20;1

<Note>

The "H_METER/ BCK_VOLT/ MSG_TYPE" is include in event report only when "HBM_STT" is "1"
 CELL_ID to TM_ADV are included in STT only when "HBM_STT" is "2"

5-3-2. Zip

Field	Marks	Meaning											
STX	0x02	Start of zip data											
PKT_LEN	2 Bytes	Length of zip data, HDR to MSG_TYPE											
HDR	0x12	Header of Event Report											
DEV_ID	5 bytes	Device ID BCD format If the Device ID is 123456789, this field will be filled with 0x12, 0x34, 0x56 0x78 and 0x90.											
MODEL	1byte	Device Model (According to table model)											
SW_VER	2 bytes	<div>Software Version</div> <table><tr><td colspan="2">Bit 15 ~ Bit 12</td><td colspan="2">Bit 11 ~ Bit 0</td></tr><tr><td colspan="2">Version Letter</td><td colspan="2">Version Number</td></tr></table> <div>Version Letter: 1 ~ 15. Each number means ‘A’ ~ ‘O’. Version Number: 1 ~ 4095. It made by combining Number with Letter. If Version Letter field is filled by ‘0’, it means the software version does not have version letter.</div> <div>Ex: 6139 (313F) 6 = F 139 = 313</div>				Bit 15 ~ Bit 12		Bit 11 ~ Bit 0		Version Letter		Version Number	
Bit 15 ~ Bit 12		Bit 11 ~ Bit 0											
Version Letter		Version Number											
DATE_TIME	6 bytes	GPS date & Time (Year + Month + Day + Hour + Minute + Second)											
CELL	3 bytes	Location Code ID (2 Bytes) + Serving Cell BSIC (1 Byte)											
LAT	4 bytes	1 byte (integer) + 3 bytes (BCD)											
LON	4 bytes	1 byte (integer) + 3bytes (BCD)											
SPD	3 bytes	2 bytes (integer) + 1 byte (BCD)											
CRS	3 bytes	2 bytes (integer) + 1 byte (BCD)											
SATT_FIX	1 byte	<table><tr><td>Bit 7 Fix</td><td>Bit 6 Latitude +/- sign</td><td>Bit 5 Longitude +/- sign</td><td>Bit 4 ~ Bit 0 Satellite’s count</td></tr></table> + sign = 0, - sign = 1				Bit 7 Fix	Bit 6 Latitude +/- sign	Bit 5 Longitude +/- sign	Bit 4 ~ Bit 0 Satellite’s count				
Bit 7 Fix	Bit 6 Latitude +/- sign	Bit 5 Longitude +/- sign	Bit 4 ~ Bit 0 Satellite’s count										
DIST	4 bytes	Traveled distance in meter											
PWR_VOLT	2bytes	Voltage value of the main power 1 byte (integer) + 1 byte (BCD)											
I/O	1 byte												

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Doc. No. Rev. 1.18	40 of 74 Date 2019/03/25

		<table><tr><td>Bit 5 Out 2</td><td>Bit 4 Out1</td><td>Bit 3 Input 3</td><td>Bit 2 Input 2</td><td>Bit 1 Input1</td><td>Bit 0 Ignition</td></tr></table> Ignition : 1 (ON), 0 (OFF) Input1 ~ Input3 : 1 (Ground, Shorted), 0 (Opened) Out1 ~ Out2 : 1 (Active), 0 (Inactive)	Bit 5 Out 2	Bit 4 Out1	Bit 3 Input 3	Bit 2 Input 2	Bit 1 Input1	Bit 0 Ignition
Bit 5 Out 2	Bit 4 Out1	Bit 3 Input 3	Bit 2 Input 2	Bit 1 Input1	Bit 0 Ignition			
EVT_ID	1 char.	Event type: 1 = Input1 goes to ground state. 2 = Input1 goes to open state. 3 = Input2 goes to ground state. 4 = Input2 goes to open state.						
H_METER	4bytes	Driving hour-meter						
BCK_VOLT	2bytes	Voltage value of backup battery						
MSG_TYPE	1 char	Report is real time (1), Report is storage (0)						
CELL_ID	2 bytes	Information of Cell ID						
MCC	2 bytes	Information of Mobile Country Code						
MNC	1 byte	Information of Mobile Network Code						
RX_LVL	2 bytes	Information of Rx Level						
LAC	2 bytes	Information of Location Area Code						
TM_ADV	1 bytes	Information of Timing Advance						
ETX	0x03	End of zip data.						

<Example>

Original String :


ST300EVT;100850000;01;302;20181017;07:41:56;2F100;+37.478519;+126.886819;000.007;000.00;9;1;0;12.14;000000;1;0;3.8;1;73;1c2;0;-82;20;1

→ Zip Packet

```

0x02
0x00 0x3c
0x12
0x10 0x08 0x50 0x00 0x00
0x01
0x61 0x39
0x14 0x0a 0x11 0x07 0x29 0x38
0x02 0xF1 0x00
0x25 0x47 0x85 0x19
0x7e 0x88 0x68 0x19
0x00 0x00 0x07
0x00 0x00 0x00
0x89
0x00 0x00 0x00 0x00
0x0c 0x14
0x00 0x00
0x01
0x00
0x03 0x08
0x01
0x00 0x49
0x01 0xc2
0x00
0xff 0xae
0x00 0x14


```


	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		41 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

0x01
0x03

<Note>

The "H_METER/ BCK_VOLT/ MSG_TYPE" is include in event report only when "HBM_STT "is "1"
CELL_ID to TM_ADV are included in STT only when "HBM_STT" is "2"

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		42 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

5-4. Alert Report


Device sends 'Alert' to the server as defined by user in the course of setting the relevant parameters. Most of cases that requiring an alert to be issued means that the vehicle or asset or its driver is in danger or is almost in danger that should be notified by device to the server and/or the cellular phone (If communication via SMS has been configured) for warning.

Have a close look at the fields from the following table for more information on when and what alerts are triggered. An <Example> of alerting and <Note> are also described in the bottom part of the table below.


HDR	DEV_ID	MODEL	SW_VER	DATE	TIME	CELL	LAT
LON	SPD	CRS	SATT	FIX	DIST	PWR_VOLT	I/O
ALERT_ID	H_METER	BCK_VOLT	MSG_TYPE	CELL_ID	MCC	MNC	RX_LVL
LAC	TM_ADV						

5-4-1. Normal

Field	Marks	Meaning
HDR	"ST300ALT"	Alert report header
DEV_ID	9 char.	Device ID
MODEL	2Char	Device Model (According to table model)
SW_VER	String.	Software Version Ex: 313F
DATE	8 char.	GPS date (yyyymmdd)
TIME	8 char.	GPS time (hh:mm:ss)
CELL	String	Location Code ID(3 digits hex) + Serving Cell BSIC(2 digits decimal)
LAT	String	Latitude (+/-xx.xxxxxx)
LON	String	Longitude (+/-xxx.xxxxxx)
SPD	String	Speed in km/h
CRS	String	Course over ground in degree
SATT	String	Number of satellites
FIX	'1' or '0'	GPS is fixed (1); GPS is not fixed (0)
DIST	String	Traveled distance in m.
PWR_VOLT	String	Voltage value of main power
I/O	6 char.	Current I/O status of inputs and outputs. Ignition + Input1 + Input 2 + Input 3 + Out1 + Out2 Ignition : '1' (ON), '0' (OFF) Input1 ~ Input3 : '1' (Ground, Shorted), '0' (Opened) Out1 ~ Out2 : '1' (Active), '0' (Inactive)
ALERT_ID	1 char.	Alert type 1 = Start driving faster than SPEED_LIMIT 2 = Ended over-speed condition 5 = The vehicle exited the geo-fenced area that has the following ID. (5001 ~ 5200) 6 = The vehicle entered the geo- fenced area that has the following ID. (5001 ~ 5200) 9 = Enter the Deep Sleep Mode 10 = Exit from the Deep Sleep Mode 13 = Backup battery error 14 = Vehicle battery goes down to a very low level. Refer to "8-6. Protection of Vehicle Battery"


	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		43 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

		15 = shocked 16 = Collision has occurred to the vehicle. 40=Connected with the Main Power source 41=Disconnected with the Main Power source 44=Connected with the Back-up Battery 45=Disconnected with the Back-up Battery 50 = Jamming detected
H_METER	String	Driving hour-meter
BCK_VOLT	String	Voltage value of backup battery
MSG_TYPE	1 char	Report is real time (1), Report is storage (0)
CELL_ID	String	Information of Cell ID
MCC	String	Information of Mobile Country Code
MNC	String	Information of Mobile Network Code
RX_LVL	String	Information of Rx Level
LAC	String	Information of Location Area Code
TM_ADV	String	Information of Timing Advance
<p><Example> ST300ALT;100850001;01;302;20181017;07:41:56;2F100;+37.478519;+126.886819;000.007;000.00;9;1;0;12.14;000000;1;0;3.8;1;73;1c2;0;-82;20;1</p> <p><Note></p> <p>ALERT_ID 13 may be reported if the Back-up Battery cannot be charged or cannot be supported for long time enough in case the Main Power source (vehicle's battery) is disconnected.</p> <p>The "H_METER/ BCK_VOLT/ MSG_TYPE" is include in alert report only when "HBM_STT" is "1" CELL_ID to TM_ADV are included in STT only when "HBM_STT" is "2"</p> <p>ALERT TYPE 1 and 2 can be reported to server only when main power is connected.</p>		

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Doc. No. Rev. 1.18	44 of 74 Date 2019/03/25

5-4-2. Zip

Field	Marks	Meaning							
STX	0x02	Start of zip data							
PKT_LEN	2 Bytes	Length of zip data, HDR to MSG_TYPE							
HDR	0x13	Header of Alert Report							
DEV_ID	5 bytes	Device ID BCD format If the Device ID is 123456789, this field will be filled with 0x12, 0x34, 0x56 0x78 and 0x90.							
MODEL	1byte	Device Model (According to table model)							
SW_VER	2 bytes	<div>Software Version</div> <table><tr><td>Bit 15 ~ Bit 12</td><td>Bit 11 ~ Bit 0</td></tr><tr><td>Version Letter</td><td>Version Number</td></tr></table> Version Letter: 1 ~ 15. Each number means ‘A’ ~ ‘O’. Version Number: 1 ~ 4095. It made by combining Number with Letter. If Version Letter field is filled by ‘0’, it means the software version does not have version letter. Ex: 6139 (313F) 6 = F 139 = 313		Bit 15 ~ Bit 12	Bit 11 ~ Bit 0	Version Letter	Version Number		
Bit 15 ~ Bit 12	Bit 11 ~ Bit 0								
Version Letter	Version Number								
DATE_TIME	6 bytes	GPS date & Time (Year + Month + Day + Hour + Minute + Second)							
CELL	3 bytes	Location Code ID (2 Bytes) + Serving Cell BSIC (1 Byte)							
LAT	4 bytes	1 byte (integer) + 3 bytes (BCD)							
LON	4 bytes	1 byte (integer) + 3bytes (BCD)							
SPD	3 bytes	2 bytes (integer) + 1 byte (BCD)							
CRS	3 bytes	2 bytes (integer) + 1 byte (BCD)							
SATT_FIX	1 byte	<table><tr><td>Bit 7 Fix</td><td>Bit 6 Latitude +/- sign</td><td>Bit 5 Longitude +/- sign</td><td colspan="2">Bit 4 ~ Bit 0 Satellite’s count</td></tr></table> + sign = 0, - sign = 1		Bit 7 Fix	Bit 6 Latitude +/- sign	Bit 5 Longitude +/- sign	Bit 4 ~ Bit 0 Satellite’s count		
Bit 7 Fix	Bit 6 Latitude +/- sign	Bit 5 Longitude +/- sign	Bit 4 ~ Bit 0 Satellite’s count						
DIST	4 bytes	Traveled distance in meter							
PWR_VOLT	2bytes	Voltage value of main power 1 byte (integer) + 1 byte (BCD)							
I/O	1 byte	<table><tr><td>Bit 5 Out 2</td><td>Bit 4 Out1</td><td>Bit 3 Input 3</td><td>Bit 2 Input 2</td><td>Bit 1 Input1</td><td>Bit 0 Ignition</td></tr></table> Ignition : 1 (ON), 0 (OFF) Input1 ~ Input3 : 1 (Ground, Shorted), 0 (Opened) Out1 ~ Out2 : 1 (Active), 0 (Inactive)		Bit 5 Out 2	Bit 4 Out1	Bit 3 Input 3	Bit 2 Input 2	Bit 1 Input1	Bit 0 Ignition
Bit 5 Out 2	Bit 4 Out1	Bit 3 Input 3	Bit 2 Input 2	Bit 1 Input1	Bit 0 Ignition				
ALERT_ID	1 char.	Alert type 0x01 ~ 0x32							
H_METER	4bytes	Driving hour-meter							
BCK_VOLT	2bytes	Voltage value of backup battery							
MSG_TYPE	1 char	Report is real time (1), Report is storage (0)							

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Doc. No. Rev. 1.18	45 of 74 Date 2019/03/25

CELL_ID	2 bytes	Information of Cell ID
MCC	2 bytes	Information of Mobile Country Code
MNC	1 byte	Information of Mobile Network Code
RX_LVL	2 bytes	Information of Rx Level
LAC	2 bytes	Information of Location Area Code
TM_ADV	1 bytes	Information of Timing Advance
ETX	0x03	End of zip data.

<Example>

Original String :

ST300ALT;100850001;01;302;20181017;07:41:56;2F100;+37.478519;+126.886819;000.007;000.00;9;1;0;12.14;000000;1;0;3.8;1;73;1c2;0;-82;20;1

→ Zip Packet

```


0x02
0x00 0x3c
0x13
0x10 0x08 0x50 0x00 0x00
0x01
0x61 0x39
0x14 0x0a 0x11 0x07 0x29 0x38
0x02 0xf1 0x00
0x25 0x47 0x85 0x19
0x7e 0x88 0x68 0x19
0x00 0x00 0x07
0x00 0x00 0x00
0x89
0x00 0x00 0x00 0x00
0x0c 0x14
0x00 0x00
0x01
0x00
0x03 0x08
0x01
0x00 0x49
0x01 0xc2
0x00
0xff 0xae
0x00 0x14
0x01
0x03


```

<Note>

ALERT_ID 13 may be reported if the Back-up Battery cannot be charged or cannot be supported for long time enough in case the Main Power source (vehicle's battery) is disconnected.

The "H_METER/ BCK_VOLT/ MSG_TYPE" is include in alert report only when "HBM_STT" is "1"
CELL_ID to TM_ADV are included in STT only when "HBM_STT" is "2"

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		46 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		47 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

5-5. Keep-Alive Report

A typical GSM/GPRS service provider in any countries has its own corporate policy restricting connection time of device with the GSM/GPRS networks only at an interval if device does not communicate with its server for a long time, which is 1 hour, for instance. The time length varies depending upon such service provider. Please check it by asking your GSM/GPRS service provider this question in your country.

In a casethat there has not been any communication between device and server for such a time period, the GSM/GPRS service provider would not provide GSM/GPRS service for the device temporarily. To avoid such a case, device sends the server this 'Keep-Alive' Report at an interval, 'T4' ('Keep-Alive' interval named in 'SyncTrak' and in this document), which is shorter than the 60 minutes. User of the device may adjust the value of 'T4' as desired.

This Report is intended to mean that the device is still alive and ready for any possible communications with the server for that long time ('T4') even though the device does not interact temporarily with the server.


5-5-1. Normal

HDR	DEV_ID
-----	--------

Field	Marks	Meaning
HDR	"ST300ALV"	Header of Alive report
DEV_ID	9 char.	Device ID
<Example> ST300ALV;100850000		

5-5-2. Zip

Field	Marks	Meaning
STX	0x02	Start of zip data
PKT_LEN	2 Bytes	Length of zip data, HDR to DEV_ID
HDR	0x14	Alive Report header (1 byte)
DEV_ID	5 bytes	Device ID BCD format
ETX	0x03	End of zip data
<Example> 0x02 0x00 0x06 0x14 0x10 0x08 0x50 0x00 0x00 0x03		

	Doc. Title	Author		Page of Pages	
	ST310U OPERATION MANUAL	JH KIM		48 of 74	
	Concerning	Doc. No.		Rev.	Date
	Features and How to set parameters			1.18	2019/03/25

5-6. Status String Reporting via SMS

5-6-1. In case of Back-up method

In case device is located in an area where it has good connectivity with GSM and without having good connectivity with GPRS, it sends a string type report to its server. However, as soon as the bad connectivity between GPRS and device gets back to normal, the device will try to send the reports to the server.


HDR	DEV_ID	MODEL	SW_VER	DATE1	TIME1	CELL1	LAT1	LON1	SPD1	CRS1
SATT1	FIX1	DIST1		PER_VOLT1	I/O1	MODE1				
DATE2	TIME2	CELL2		LAT2	LON2	SPD2	CRS2	SATT2	FIX2	DIST2
PER_VOLT2	I/O2	MODE2								

Note): 'STT String 'sent via SMS does not include the 'message number field'.

5-6-2. In case of Main method

Device sends to its server 'status string' via SMS when it can be connected with the server only via SMS without being connected with GPRS.

Refer to 5-1. Status Report

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		49 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

5-7. Location query sent via smart phone

If you are a smart phone user, you can use it to easily find the current location on the google map

Just send one of the following messages by your smart phone:

“Where are you”, “whereareyou”, “Where r u”, “whereru”

And, then the google map will be responding to you by sending the address on your smart phone. You can see the current location of the device just by opening the message containing that address on the web browser.


In order to enable device to accept your SMS message, you have to add your smart phone number to one of the 4 optional numbers such as SMS_MT1 to SMS_MT4 or disable SMS_LOCK.

Refer to *Chapter 4.4* of this Manual, “GSM Parameter Setting” for more details.

Before you start using this function, you should get to know the URL (server address) of the Google map first.

You can have more information about how to get the server address of the Google map in section “Command to Get Google Map Address” of this document.

You can also get more information about how to set the server address of the Google map in section “Command to Set Google Map Address” of this document.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		50 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

6. Command for general use

After device is configured, user may need to check/query values of the parameters if he/she wants to change those values. This chapter shows user how to change the parameters' values that have been set already.

6-1. Common parts of this command

HDR	DEV_ID	VER	CMD_ID
-----	--------	-----	--------

Field	Marks	Value	Meaning
HDR	"ST300CMD"		Command type
DEV_ID	9 char.		Device ID
VER	'02'		Protocol Version
CMD_ID	String		

**Caution: If 'Device ID' is not correct, this command will be ignored by the device.

6-2. Requesting Status


Once this command is made, some interactions will be made between the server and the device as described in the 'Meaning' section of the table below.

Field	Mark	Value	Meaning
CMD_ID	"StatusReq"		<u>Requesting Status of the device.</u> If device receives this 'Request' command from the server, it sends the Status string to the server promptly.
<Example> [command] ST300CMD;100850000;02;StatusReq [response] ST300STT;100850000;07;301;20060908;14:43:21;01454;+37.124975;+127.091003;000.000;158.53;10;1;0;12.11;000000;1;0493			

6-3. Pre-setting

Once this command is made, some interactions will be made between the server and the device as described in the 'Meaning' section of the table below.

Field	Mark	Value	Meaning
CMD_ID	"Preset"		<u>Report parameters' setting values and current device status</u> Response includes network, report, event, GSM and Service parameters included in 'SyncTrak'. It includes status of device as well.
<Example> [command] ST300CMD;100850000;02;Preset [response] ST300CMD;Res;100850000;010;Preset; NTW;0;internet;;;111.111.111.111;8600;;;1234; RPT;60;180;120;60;3;0;0;;;			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		51 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

EVT;1;60;0;3;2;2;30;20;20;1;1;1;0;0;0;0;0;0;0;0;0;0;0;
GSM;0;
SVC;1;120;0;0;0;0;0;1;1;1;0;0;0;0;
DEV;0;0;0;0

[response] Model – Event 4 Line

NTW;0;internet;;;111.111.111.111;8600;;;1234;
RPT;60;180;120;60;3;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;
EVT;1;60;0;3;8;8;30;0;0;6;6;1;0;0;0;0;0;0;0;0;0;0;
GSM;0;
SVC;1;120;0;0;0;0;0;1;1;1;0;0;0;0;
DEV;0;0;0;0

<Note>

** After power is on, the device sends to the server response string of the 'Preset' once.

** The 'DEVFiled' informs the device of the current status as below.

OUT1	OUT2	PWR_DN	BAT_CON
0 = Disable 1 = Enable	0 = Disable 1 = Enable	0 = Normal 1 = Sleep 2 = Deep sleep	0 = Backup battery is disconnected. 1 = Backup battery is connected.

Field	Mark	Value	Meaning
CMD_ID	"PresetA"		Report all the parameters including additional parameter.

<Example>

[command] ST300CMD;100850000;02;Preset A


[response] ST300CMD;Res;100850000;010;PresetA;
NTW;0;internet;;;111.111.111.111;8600;;;1234;
RPT;60;180;120;60;3;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;
EVT;1;60;0;3;2;2;30;20;20;1;1;1;0;0;0;0;0;0;0;0;0;0;
GSM;0;
SVC;1;120;0;0;0;0;0;1;1;1;0;0;0;0;
ADP;U;T;2;9000;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;
MSR;10;0.10;0.10;0.70;
MBV;9.43;21.07;17.07;8.00;18.00;0.00;0.00;
NPT;02;0;0;0;0;0;500;300;5;10;5;10;
DEV;0;

<Note>

** 'DEV Filed' informs the server about the current status of the device as below.

OUT1	OUT2	PWR_DN	BAT_CON
0 = Disable 1 = Enable	0 = Disable 1 = Enable	0 = Normal 1 = Sleep 2 = Deep sleep	0 = Backup battery is disconnected. 1 = Backup battery is connected.

Reserved	Anti-Theft	Reserved	Reserved
	0 = Disable 1 = Enable		

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		52 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

6-4. ACK of Emergency


Once this command is made by the server, the device will stop reporting about the occurrence of emergency. More details are described in the '*Meaning*' section of the table below.

Field	Mark	Value	Meaning
CMD_ID	"AckEmerg"		<u>'Acknowledge' of emergency report</u> The server sends device this command as a response to inform the device that the server has completed receiving all the 'emergency reports'. And then, the device will stop sending Emergency reports if it is in emergency state.
<Example> [command] ST300CMD;100850000;02;AckEmerg [response] ST300CMD;Res;100850000;010;AckEmerg			

6-5. Re-setting (Restoring to factory defaults and Rebooting)

Once this command is made, some interactions will be made between the server and the device as described in the '*Meaning*' section of the table below.

Field	Mark	Value	Meaning
CMD_ID	"Reset"		<u>Re-setting the current parameters' values</u> This command is used to initialize all the parameters with the values set in the factory of the devices and to reboot the device.
<Example> [command] ST300CMD;100850000;02;Reset [response] ST300CMD;Res;100850000;010;Reset			


	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		53 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

6-6. Enable1 ('Activating Output 1')

Field	Mark	Value	Meaning
CMD_ID	"Enable1"		Enable Output1
<p><Example> [command] ST300CMD;100850000;02;Enable1 [response] ST300CMD;Res;100850000;010;Enable1 [response] ST300CMD;Res;100850000;010;Enable1NoUse (in case that IN type is set to 'No Use').</p> <p><Note> ** Output1 line goes to active status. ** If OUT1 is set with immobilizer, output1 line goes to the Active Status gradually with pulse in driving mode. ** If OUT1 is set with pulse type, output1 line generates pulse and automatically returns to the Inactive State after pulsing out.</p>			

6-7. Disable1 ('Inactivating Output1')

Field	Mark	Value	Meaning
CMD_ID	"Disable1"		Disable Output1
<p><Example> [command] ST300CMD;100850000;02;Disable1 [response] ST300CMD;Res;100850000;010;Disable1 [response] ST300CMD;Res;100850000;010;Disable1NoUse (in case that IN type is set to 'No Use').</p> <p><Note> ** Output1 line goes to the Inactive Status.</p>			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		54 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

6-8. Requesting IMSI

Once this command is made, some interactions will be made between the server and the device as described in the 'Meaning' section of the table as below.

Field	Mark	Value	Meaning
CMD_ID	"ReqIMSI"		The server sends the device this command requesting IMSI (International Mobile Subscriber Identity) if the server wants to receive IMSI from the device.) If the device receives the command from the server, it sends the IMSI to the server.
<Example> [command] ST300CMD;100850000;02;ReqIMSI [response] ST300CMD;Res;100850000;010;ReqIMSI;724031111553779			

6-9. Requesting ICCID


Once this command is made, some interactions will be made between the server and the device as described in the 'Meaning' section of the table as below.

Field	Mark	Value	Meaning
CMD_ID	"ReqICCID"		<ul style="list-style-type: none"> How to request ICCID (Integrated Circuit Card Identifier), which is a sequence number that is displayed on SIM If device receives this command, it sends the server ICCID.
<Example> [command] ST300CMD;100850000;02;ReqICCID [response] ST300CMD;Res;100850000;010;ReqICCID;89550230000084256668			

6-10. Requesting Version

Once this command is made, some interactions will be made between the server and the device as described in the 'Meaning' section of the table as below.

Field	Mark	Value	Meaning
CMD_ID	"ReqVer"		<u>Requesting version of the device</u> If the device receives this command, it reports to the server about: Model, Buyer, Protocol and Software(S/W) release version.
<Example> [command] ST300CMD;100850000;02;ReqVer [response] ST300CMD;Res;100850000;301;ReqVer;ST310_SUNTECHBR_STADV_301			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		55 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

6-11. Requesting IMEI

Field	Mark	Value	Meaning
CMD_ID	"ReqIMEI"		<u>Requesting IMEI of the device</u> If the device receives this command, it reports IMEI to the server.
<Example> [command] ST300CMD;100850000;02;ReqIMEI [response] ST300CMD;Res;100850000;301;ReqIMEI;356430073101123			

7. Command for non-general use

Description on each factor necessary to make types of these commands is shown in this Chapter.

HDR	DEV_ID	VER	CMD_ID
-----	--------	-----	--------

Field	Marks	Value	Meaning
HDR	"ST300CMD"		Command type
DEV_ID	9 char.		Device ID
VER	'01'		Protocol Version
CMD_ID	String		Control command content

Commands are classified into two groups such as:


- "Commands for General Use", which have already been explained in the previous chapter, Chapter 8,
- "Commands for Non-general Use".

The latter commands are described here as below.

7-1. Erase All

This command is used if you want to erase all the saved reports and disable the outputs.

Field	Mark	Value	Meaning
CMD_ID	"EraseAll"		This command is used if you want to erase all the saved reports and disable the outputs. This command is needed to initialize the device which is to be delivered to a new customer.
<Example> [command] ST300CMD;100850000;02;EraseAll [response] ST300CMD;Res;100850000;010;EraseAll			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		56 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

7-2. Initialize Traveled Distance

- Definition : Initialize the travel distance.

Field	Definitions	Unit	Remark
CMD_ID	"InitDist"	meter	Set odometer to 0.
<example> [command] ST300CMD;600850000;02;InitDist [response] ST300CMD;Res;600850000;262;InitDist			

7-3. Setting Traveled Distance

This command is used if you want to set the travelled distance.

Field	Mark	Value	Meaning
CMD_ID	"SetOdometer="	meter	Setting odometer.
<Example> [command] ST300CMD;100850000;02;SetOdometer=999999999 [response] ST300CMD;Res;100850000;010;SetOdometer=999999999			

7-4. Initializing Message Number


This command is used if you want to initialize sequence number of the message.

Field	Mark	Value	Meaning
CMD_ID	"InitMsgNo"		Set message number to 0.
<Example> [command] ST300CMD;100850000;02;InitMsgNo [response] ST300CMD;Res;100850000;010;InitMsgNo			

7-5. Setting Hour-Meter

This command is used if you want to set the travelled time period.

Field	Mark	Value	Meaning
CMD_ID	"SetHMeter="	minute	What to set the travelled time period.
<Example> [command] ST300CMD;100850000;02;SetHMeter=999999 [response] ST300CMD;Res;100850000;010;SetHmeter=999999 Max value is '999999'			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		57 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

7-6. Initialize Circular Geo-fence

- Definition : Request all of geo-fence parameters.

Field	Definitions	Unit	Remark
CMD_ID	"InitCircleGeo"		Clear circular geo-fences.
<example> [command] ST300CMD;600850000;02;InitCircleGeo [response] ST300CMD;Res;600850000;262;InitCircleGeo			

7-7. Requesting Circular Geo-fence


This command is used if the device is required to report to the server with all of the geo-fence parameters that are pre-set.

Field	Mark	Value	Meaning
CMD_ID	"ReqCircleGeo"		<ul style="list-style-type: none"> • Report the enabled circular geo-fences • Response consists of continuous field (0 or 1) and information about all the geo-fences including the first geo-fence up to the last one whose last digit is 1 (One).
<Example> [command] ST300CMD;100850000;02;ReqCircleGeo [response] Case that unit has 3 geo-fences : ST300CMD;Res;205310317;301;ReqCircleGeo; 1 ;1;1;37.478809;126.887890;191;1;1 ST300CMD;Res;205310317;301;ReqCircleGeo; 1 ;2;1;37.566190;126.977330;177;1;1 ST300CMD;Res;205310317;301;ReqCircleGeo; 0 ;3;1;37.565654;126.966462;267;0;1 Case that unit has no geo-fence. ST300CMD;Res;205310317;301;ReqCircleGeo;NoData <Notes> ** Continuous field of above response string represents bold.			

7-8. Requesting Own Phone Number

Once this command is made, some interactions will be made between the server and the device as described in the 'Meaning' section of the table as below.

Field	Mark	Value	Meaning
CMD_ID	"ReqOwnNo"		Requesting own phone number
<Example> [command] ST300CMD;100850000;02;ReqOwnNo [response] ST300CMD;Res;100850000;010;ReqOwnNo;82220275656 <Notes>			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		58 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

** When the device has no SIM or is under power-on process, the own phone number cannot be read.
The device reports with "NotReady"

** If the own number field in SIM is empty, the device reports with "NoData".

7-9. Setting Own Phone Number

Once this command is made, some interactions will be made between the server and the device as described in the 'Meaning' section of the table as below.

Field	Mark	Value	Meaning
CMD_ID	"SetOwnNo"		<ul style="list-style-type: none"> How to set the own phone number This command is followed by "=" and own number.
<Example> [command] ST300CMD;100850000;02;SetOwnNo=21140108 [response] ST300CMD;Res;100850000;010;SetOwnNo=21140108 <Notes> ** When the device has no SIM or is under power-on process, the own phone number cannot be set. The device reports with "NotReady"			

7-10. Command to Reboot


This command is made by the server to the device which needs to be reboot.

Field	Mark	Value	Meaning
CMD_ID	"Reboot"		Reboot device.
<Example> [command] ST300CMD;100850000;02;Reboot [response] ST300CMD;Res;100850000;010;Reboot			

7-11. Setting ImproveBatteryLife

- Definition : Setting Improve Battery Life.

Field	Definitions	Unit	Remark
CMD_ID	"ImproveBatteryLife"		0 = Disable ImproveBatteryLife 1 = Enable ImproveBatteryLife
<example> [command] ST300CMD; 600850000;02;ImproveBatteryLife=0 [response] ST300CMD;Res; 600850000;010;ImproveBatteryLife=0;OK			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		59 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

7-12. Request ImproveBatteryLife

- Definition : Request Improve Battery Life.

Field	Definitions	Unit	Remark
CMD_ID	"ReqBattLife"		Request Improve Battery Life
<example> [command] ST300CMD;600850000;02;ReqBattLife [response] ST300CMD;Res;600850000;534;ReqBattLife;1			

7-13. Command on How to Restart Anti-Theft 2

Field	Definitions	Unit	Remark
CMD_ID	"RestartAntiTheft2"		Restart anti-theft after anti-theft disabled by press of panic button in case of 'Anti-theft 2'.
<Example> [command] ST300CMD;600850000;02;RestartAntiTheft2 [response] ST300CMD;Res;600850000;010; RestartAntiTheft2 <Note> This command is only for 'Anti-theft 2' mode.			

7-14. Command on How to Set SMS Number for Panic Situation


This table shows us how to set the SMS number to be used when the panic button is pressed.

Field	Mark	Value	Meaning
CMD_ID	"SetSMSNoOfPanic"		How to set the SMS number where the location information (i.e. the location link address) will be delivered through SMS when the panic button is pressed.
<Example> [command] ST300CMD;100850000;02;SetSMSNoOfPanic=01988888888 [response] ST300CMD;Res;100850000;010;SetSMSNoOfPanic=01988888888			

7-15. Requesting SMS Number Used in Panic Situation

This table shows us how to get the SMS number when the panic button is pressed.

Field	Mark	Value	Meaning
CMD_ID	"ReqSMSNoOfPanic"		Requesting SMS number where the location link address is sent when the panic button is pressed.
<Example> [command] ST300CMD;100850000;02;ReqSMSNoOfPanic [response] ST300CMD;Res;100850000;010;ReqSMSNoOfPanic;NoData			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		60 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

7-16. Command to Set Google Map Address

In a case that you use a smart phone operating a function of "Where Are You", you can use the server of the Google as set below *in italic bold letters*, "Google map address". The users of the Google map should check what the right map address of the Google is and that the right address should be set. The Google map address needs to be checked. If the Google map address is not right, this function ("Where Are You") cannot be used.

Field	Mark	Value	Meaning
CMD_ID	"SetGoogleMap"		Set location link address format (Google map address). This command is either followed by "=" or inserted inside the address.
<Example> [command] ST300CMD;100850000;02;SetGoogleMap= http://maps.google.com/maps?q= [response] ST300CMD;Res;100850000;010; SetGoogleMap= http://maps.google.com/maps?q= [command] ST300CMD;100850000;02;SetGoogleMap= http://maps.google.com/[Lon],[Lat]/maps?q [response] ST300CMD;Res;100850000;010;SetGoogleMap= http://maps.google.com/[Lon],[Lat]/maps?q <Note> The max of input string is 96 characters.			

7-17. Command to Get Google Map Address


In case this command is made, the pre-set existing Google Map address will be known.
Get Google Map Address.

Field	Mark	Value	Meaning
CMD_ID	"ReqGoogleMap"		Request the Google Map Address. This command is followed by "=" and Google Map Address.
<Example> [command] ST300CMD;100850000;02;ReqGoogleMap [response] ST300CMD;Res;100850000;010;ReqGoogleMap; http://maps.google.com/maps?q=			

7-18. Testing Output 1 for 30 seconds.

This table shows you how to test the output (i.e. Output1) for 30 seconds.

Field	Mark	Value	Meaning
CMD_ID	"ReqShortTest"		Request the device to activate output to do testing for 30 seconds.
<example> [command] ST300CMD;100850000;02;ReqShortTest [response] ST300CMD;Res;100850000;259;ReqShortTest Output 1 will be activated for 30 seconds for the testing. In 30 seconds, output 1 will be deactivated.			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		61 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

7-19. Testing Output 1 for 60 seconds.

This table shows you how to test the output (i.e. Output1) for 60 seconds.

Field	Mark	Value	Meaning
CMD_ID	"ReqTest"		Request the device to activate output to do testing for 60 seconds.
<example> [command] ST300CMD;100850000;02;ReqTest [response] ST300CMD;Res;100850000;259;ReqTest Output 1 will be activated for 60 seconds for the testing. In 60 seconds, output 1 will be deactivated.			

7-20. Command to set if increase odometer in parking.

This table shows you how to set if increase odometer in parking.

Field	Mark	Value	Meaning
CMD_ID	"SetOdoIgn"		0: Device increase odometer regardless of ignition status. 1: Device does not increase odometer if ignition is turned off.
<example> [command] ST300CMD;100850000;02;SetOdoIgn=1 [response] ST300CMD;Res;100850000;311;SetOdoIgn=1 This setting is meaningful only when "Ignition by Line" or "Ignition by Power" is selected.			


7-21. Requesting odometer increasing option

This table shows you how to set if increase odometer in parking.

Field	Mark	Value	Meaning
CMD_ID	"ReqOdoIgn"		
<example> [command] ST300CMD;100850000;02;ReqOdoIgn [response] ST300CMD;Res;100850000;311;ReqOdoIgn=1 This setting is meaningful only when "Ignition by Line" or "Ignition by Power" is selected.			

7-22. Changing Direction of SMS response


Field	Mark	Value	Meaning
CMD_ID	"SetSmsResDir"	0 ~ 2	<u>Change direction of SMS response</u> When a command is transmitted by SMS, device send its response by SMS, GPRS or both.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		62 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

			0: Response is sent by SMS 1: Response is sent by GPRS 2: Response is sent by both SMS and GPRS
<Example> [command] ST300CMD;100850000;02;SetSmsResDir=0 [response] ST300CMD;Res;100850000;301;SetSmsResDir=0			

7-23. Requesting Direction of SMS response

Field	Mark	Value	Meaning
CMD_ID	"ReqSmsResDir"	0 ~ 2	<u>Requesting direction of SMS response</u> If the device receives this command, it reports direction of SMS response 0: SMS responses are sent through SMS only. 1: SMS responses are sent through GPRS only. 2: SMS responses are sent through both SMS and GPRS.
<Example> [command] ST300CMD;100850000;02;ReqSmsResDir [response] ST300CMD;Res;100850000;301; ReqSmsResDir;0			

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		63 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

8. Detailed Description on Event Lines and Features

8-1. Total 5 pin Event Lines

Red	Car battery (Main power 8V ~ 40V)	FIX wire
BLK	Ground	FIX wire
WHT	Input 1 (Digital input or Ignition)	FIX wire
ORG	Output 1	FIX wire
YEL	Input 2 (Digital input)	Fix wire

The Input lines were designed to endure up to 50V. The Output lines can endure up to 30V.

8-1-1. Immobilizer

If Output type is set to 'Immobilizer' or 'Immobilizer & Auto Active' and you connect this line to immobilize the vehicle, the Output line can use the immobilizer.

When the device recognizes the command to activate the immobilizer output, one of the 2 options ('Active' or 'Inactive') will be selected. Which activation you choose will depend on what mode the vehicle is in a parking mode or in a driving mode.

In case of driving, the immobilizer activation is made in a way of progressive blocking as shown the following blinking diagram:




The active time of the immobilizer is increased by 90ms each 4s. Three (3) minutes later, the immobilizer starts being activated and will be activated continuously.

However, in case of parking as soon as the vehicle is parked, the immobilizer is activated normally-

In a case that the Output type is set to 'Immobilizer & Auto active', the output is activated automatically as long as the vehicle is parked. In such a case the Output is also activated as long as the vehicle starts being in a driving mode.

If the device receives a command to activate the immobilizer output, the output is always activated regardless to a mode type (either parking mode or driving mode).

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		64 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

8-1-2. Immobilizer2

If output type is set to 'Immobilizer2'(or 'Immobilizer2 & Auto Active'), the way how 'Immobilizer2'(or 'Immobilizer2 & Auto Active') functions is same as the way how '9-1-1. Immobilizer' functions.

The active time of the 'Immobilizer2'(or 'Immobilizer2 & Auto Active') is increased by 90ms every 2.5 seconds.


One(1) minute later, the immobilizer starts being activated and will be activated continuously.

<NOTE> When you use the IMMOBILIZER please check the following conditions.

The combination of the order to use the IMMOBILIZER with the OUTPUTx

		Connect the power of the Device to constant power of the vehicle		If not connected to the constant power of the vehicle,	
OUTPUTx Type	OUTPUT LINE	OUTPUT ACIVE		OUTPUT ACIVE	
		0	1	0	1
Immobilizer, Immobilizer Auto, Immobilizer 2, Immobilizer Auto 2	1 / 2	O	O	O	X
	3 / 4 (If available)	O	X	O	X

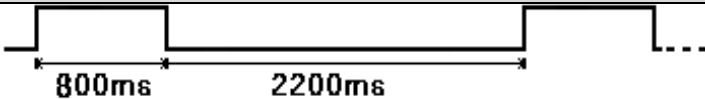

O : Available , X : Not available / OUTPUT ACTIVE : 0(OPEN) , 1(GND)

	Doc. Title	Author		Page of Pages	
	ST310U OPERATION MANUAL	JH KIM		65 of 74	
	Concerning	Doc. No.	Rev.	Date	
	Features and How to set parameters		1.18	2019/03/25	

8-1-3. Alert of Buzzer

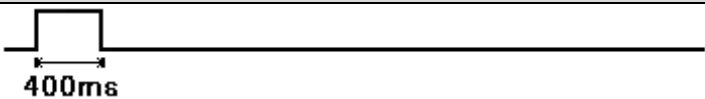
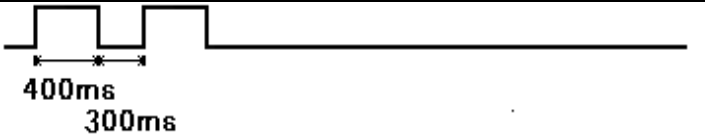
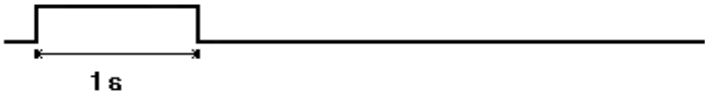

In a case that the Output type is set to 'Buzzer', the buzzer alerts. The following table shows such cases:


8-1-2-1. Related with over-speed

Condition	Alert Pulse	Meaning
Over-speed (Out = Buzzer)		When vehicle's speed exceeds the over-speed value.
Over-speed (Out = NRT_Buzzer)		When vehicle's speed exceeds the over-speed value.
Stop buzzer		When the vehicle's speed is maintained under (over-speed value – 5km/h) for 10 seconds.

8-1-2-2. Related with Anti-theft

In case one of any input ports is set to "Anti-Theft".




Condition	Alert Pulse	Meaning
Enable		This size of Alert pulse is generated if you enable this function by pressing the anti-theft button for 10 seconds.
Disable		This type of Alert pulse is generated if you disable this function by pressing anti-theft button for 10 seconds.
Lock Alert		When it starts to be in a locking mode. (anti-theft function is enabled and 20 seconds later after beginning to park vehicle.
Emergency		

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		66 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25



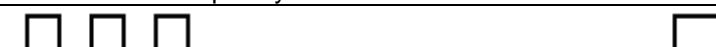

8-2. Indication with Two (2) LEDs


Blue LED indicates GPS status and red LED indicates GPRS status while the device is not processing call.

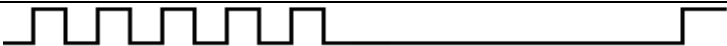

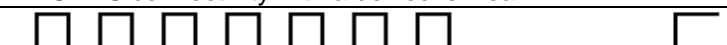
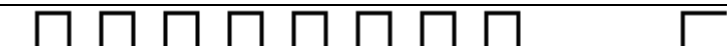
8-2-1. Red LED for GPS

GPS	Blink Count	Meaning
Normal	1	
No Fix	2	 <Probable Situations> <ol style="list-style-type: none"> 1. If power is on, GPS chipset tries to find position for some minutes. 2. If device has weak connectivity with GPS network or if it has no GPS signal position 3. If GPS connectivity with a device is weak
GPS Chipset Error GPS Antenna Error	4	 <Probable Situations> <ol style="list-style-type: none"> 1. If GPS antenna is disconnected. 2. If GPS antenna or socket of GPS antenna is broken. 3. If device is broken.

8-2-2. Blue LED for GPRS

GPRS	Blink Count	Meaning
Normal	1	
Server Com. Error	2	 < Probable Situations > <ol style="list-style-type: none"> 1. If the server or network parameter is wrong. 2. If the server is closed. 3. If there is a temporary network barrier
GPRS Com. Error	3	 <Probable Situations > <ol style="list-style-type: none"> 1. If network parameter is wrong. 2. If SIM is blocked and it is impossible to use GPRS session 3. If there is a temporary network barrier 4. If device receives weak GPRS signal 5. If GPRS connectivity with a device is weak
No Network	4	 < Probable Causes>

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		67 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

		1. If GPRS antenna is disconnected 2. If GPRS antenna or socket of GPRS antenna is broken 3. If the device is broken
SIM PIN Locked	5	 <Probable Situation > 1. If SIM PIN is enabled.
Cannot Attach NW	6	 < Probable Situations> 1. If device receives weak GPRS signal 2.If GPRS connectivity with a device is weak
No SIM	7	 < Probable Situations > 1. If there is no SIM or if SIM is not inserted properly 2. If SIM or SIM socket is broken.
PUK Locked	8	 < Probable Situations > 1. PUK or PUK2 is locked

8-3. Power Saving

The device can save power consumption of the battery by using one of two modes such as Sleep Mode, Deep Sleep Mode. If PWR_DN is set with '1' or '2' and report interval in parking mode is made every 10 minutes or longer than 10 minutes to enable the devices to process power down while the vehicle is in parking situation.

However, there are some restrictions in processing power down:

- If an emergency situation occurs, device cannot process power down for 30 minutes due to safety issue.
- When GPS signal is not fixed, the device can start to process power down after trying to fix for 5 minutes.
- If communication with the server fails continuously, the device processes Deep Sleep after trying to make communications for 8 minutes.
- While the device is charging the backup battery, it cannot process Deep Sleep.

Device turns off LED and sends a status report and a related alert before entering the power-down functionality.


The device terminates power down either when ignition is ON or when an event or an emergency occurs. In such cases, the device sends related alert and status string, instead.

- Sleep

Device turns off only GPS part and GPRS part enters Sleep. Even for time of Sleep, all communication with the server works normally and the device can receive SMS or call always. Average of Sleep current is lower than 10mA and this current may be increased under weak GPRS condition.

- Deep Sleep

Device turns off GPS and GPRS part. For time of Sleep, all communication with the server is impossible and it cannot receive any SMS messages or any calls, either. Device turns on GPRS session every max. 30 minutes.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		68 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

However, the device can receive SMS or call while it is in Deep Sleep. Average current during Deep Sleep mode is around 5mA (non-battery version).

8-4. Backup Battery

The device has a back-up battery in order to be prepared for any emergency cases when the main power source is removed or sabotaged. When the vehicle is stolen and power of device is removed, the back-up battery starts working as a replacement power source for the main power source (the vehicle's battery).

Back-up battery at full charge on good GPRS network condition at a reporting interval value of every 3 minutes, the device can work for 6 hours at least.

The device was designed to keep back-up battery staying as effective as possible all the time. Charging the back-up battery starts if voltage of the back-up battery goes below 4.2V. In a parking mode, charging the back-up battery is hold when the main power source gets consumed down to 90% of the normal voltage level.

The charging algorithm for the back-up battery has a protection against over-voltage, abnormal charging current and high temperature.

In addition, the device alerts about battery error if the back-up battery cannot be charged.

8-5. Motion Sensor

<About How to activate Motion Sensor>

- Ignition ON (Driving)

The sensor mode goes to collision detection mode. So, if the vehicle has a car accident, the accident may bring about a big impact of which value is higher than that of the specified collision threshold (COLL_THRES). In this case the device will be reporting a collision message to the server.

After a collision is made against the vehicle, the sensor will be disabled for a while (30 seconds) so as to avoid sending to the server the same message as the first one repeatedly.


- Ignition OFF (Parking)

'Ignition Off' situation means that the vehicle is in state of parking and that the sensor goes to 'parking mode' (shock or movement detection mode).

In this situation, if there is a shock made on the vehicle by somebody, the device will report a shock message to the server. The device will also exit from the power down mode if the device has been in power down mode.

In case of movement, the device will exit from the mode of power down to check functionality of 'Parking Lock' from the power down mode without reporting to the server.

After triggering an event such as a shock or a movement, the sensor will be disabled for a while (for 30 seconds) so as to avoid sending to the server the same message as the first one repeatedly.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		69 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

<About Threshold>

- Collision Threshold

Our recommendation is 0.7 but it is only for reference value obtained from our field testing made on real vehicles (nearby gear). The value may vary in a real situation depending upon driving manner or condition of road. So, you need to check this value.

- Shock Threshold

Our recommendation is 0.04 but it is only for reference value obtained from our field testing made on real vehicles (nearby gear). Motion sensor is installed on an inside part of the vehicle's body to measure sensitivity value(s) created by vibration and shock impact given to the vehicle. Value of this sensitivity varies because it depends on what body part of the vehicle the motion sensor is installed.

Shock Threshold is also used for checking movement of vehicle. So, the device may not be able to recognize if a shock threshold value is too high. You need to consider these kinds of factors measurable under realistic environment when you also adjust the values.

State	Detection			Exit from Power down			Reporting about:		
	Motion	Shock	Collision	Motion	Shock	Collision	Motion	Shock	Collision
Parking	ON	Enable	X	Exit	Exit	Exit	X	Enable	X
Driving	OFF	OFF	Enable	X	X	X	X	X	Enable

<Note>:

- ON : activation
- OFF : Deactivation
- Enable : Enable or Disable by setting
- X: Please, do not care.


For setting method, please refer "4-7. Motion Sensor Parameter Settings".

[Caution] : Basically, the device checks any motions in parking mode (Ignition Off). It does not care about the enable flags such as COLL_EN or SHOCK_EN. This means that, if the device senses any motion (movement) created in the power down mode, it will exit from the power down mode as if a creature would wake up from sleeping suddenly. So, if you want to check the power down mode to save power consumption of the backup battery, DO NOT give any impacts to the vehicle.

8-6. Protection of Vehicle Battery

For a period of duration that the vehicle has been in a parking mode for a long time by consuming vehicle's battery down to a very low level, the device starts entering the Deep Sleep Mode automatically. This situation happens because the device intends to prevent vehicle's battery from wasting power. In this case, the device alerts with ALERT_ID 14 before entering the deep sleep mode, and exits from the deep sleep mode either when ignition line goes to 'ON' or until the voltage level is increased sufficiently.

The vehicle's battery level for protection can be changed by making a Command; '\$SetMVolt'.

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		70 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

8-7. Anti-Theft

Anti-theft function available at the device is used to protect the vehicle from a risk of potential thefts by utilizing buzzer, immobilizer and alerting to the server.

In order to use the function related with the anti-theft, the following basic conditions should be satisfied:

[Basic Conditions]

1. IGNITION of event parameter should not be set to "0" (No Use).
2. One input should be set to "**Anti-theft**" type.

If one output event is set to immobilizer or buzzer, immobilizer or buzzer can be activated automatically when emergency related with anti-theft occurs.

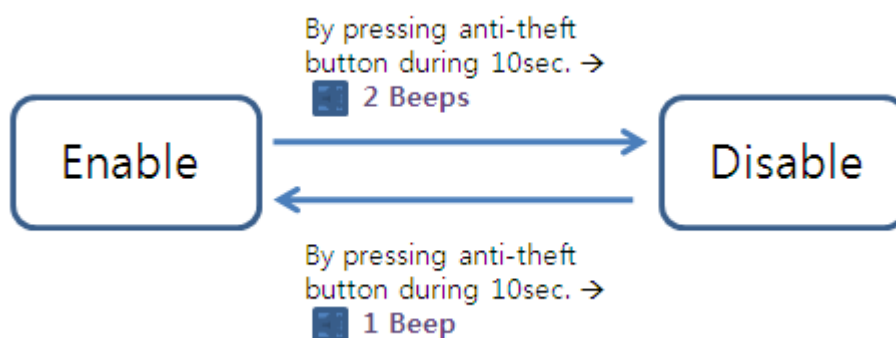
Activation/Deactivation


When the input is set to "Anti-theft" by command, anti-theft is enabled by default at first. Activation/deactivation state of anti-theft can be checked by "PresetA" command.

Case of 'Anti-Theft'

In a case that anti-theft button type is "Anti-theft" and that the **device has a buzzer**, the anti-theft function can be activated or deactivated by pressing anti-theft button for more than 10seconds.
If anti-theft button is pressed for 10 seconds in activation mode of anti-theft, anti-theft gets disabled by making the buzzer beep two times.

On the other hand, if anti-theft button is pressed as being disabled, anti-theft gets enabled by making the buzzer beep **just** one time.



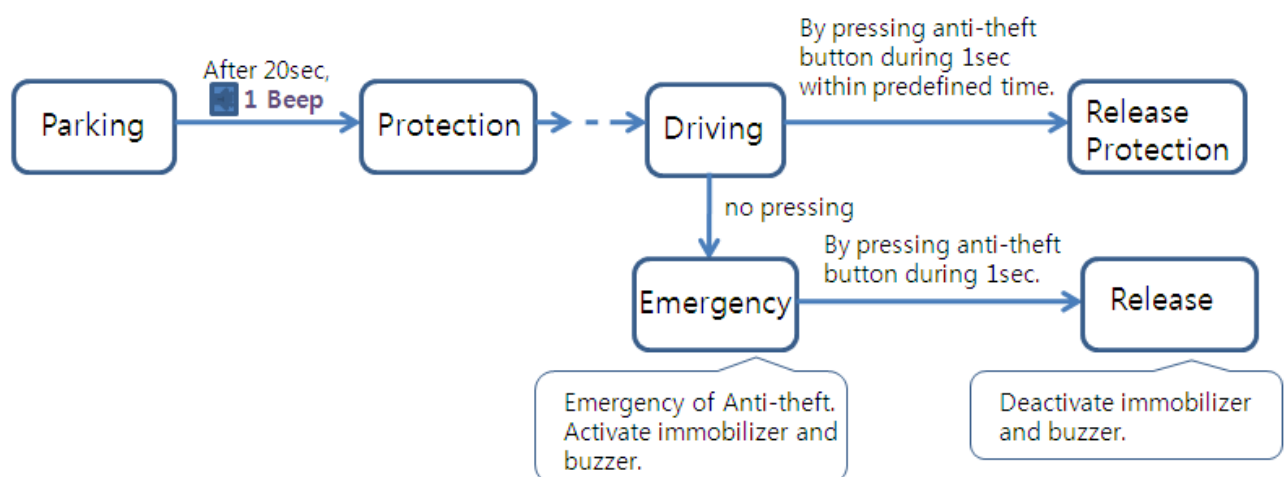
	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		71 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

Anti-theft without Door Sensor

The anti-theft system in a vehicle without door sensor can be operated. The followings show you how it works:


1. About when the anti-theft system starts working? → There are 2 different types of the start timing of the anti-theft function as described below:

If your device has been configured with the “Anti-theft Button”, twenty (20) seconds later after the vehicle is parked (ignition goes to off), the protection function starts working by making a beep just one time.
2. After driving is started (ignition goes to on) in state of vehicle protection, the driver should press the anti-theft button within the pre-defined time period of “Delay of Anti-theft Release” described in the “New Parameter.”
3. If the button is pressed for 1 second within this time period, the protection function is released. If the driver has not pressed the button within this time period, anti-theft emergency of the device starts working immediately.
4. In emergency, the buzzer and the immobilizer are activated if they are connected properly. After the preset time of “Delay of Anti Theft Alert”, the device sends emergency report about anti-theft occurring.
5. However, you can stop such an emergency functioning of the device if you were not expecting such an emergency. The followings are two (2) alternatives on how to stop functioning the Emergency:
 - Alt. 1. By pressing anti-theft button for 1 second, the emergency situation can be stopped immediately.
 - Alt. 2. As soon as all the immobilizer and the buzzer start getting deactivated by commands of the “Disable Output”, the emergency situation will be over.

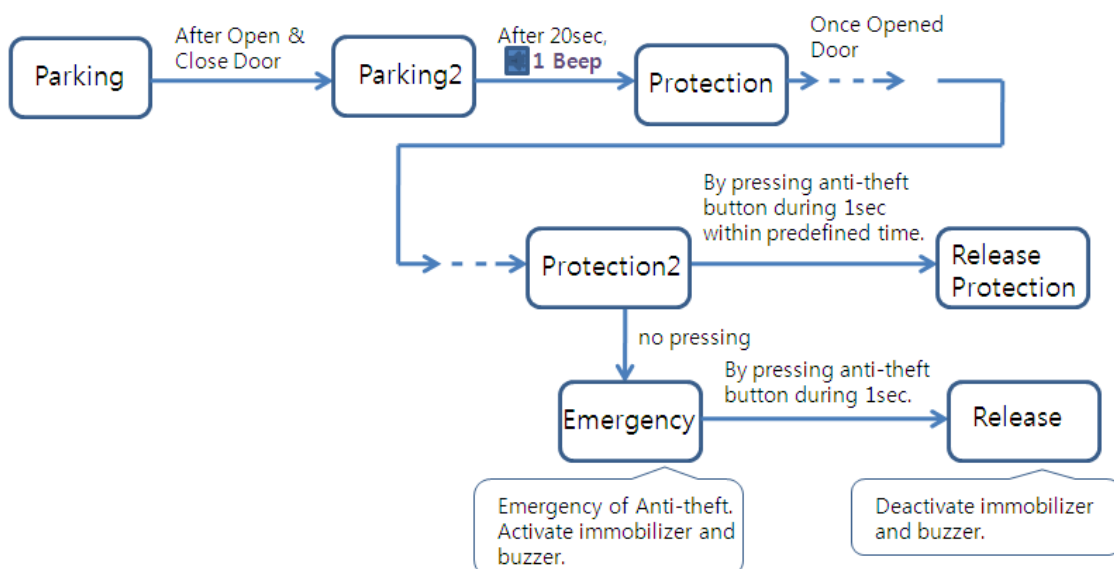



Anti-Theft with Door Sensor

The anti-theft system in a vehicle having door sensor can be operated. The followings show you how it works:

	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL Concerning Features and How to set parameters	JH KIM	Rev. 1.18	72 of 74 Date 2019/03/25

- About when the anti-theft system starts working? → There are 2 different types of the start timing of the anti-theft function as described below:
 - Under an assumption that your device has been configured with the “Anti-theft Button”, twenty (20) seconds later after the driver parks the vehicle (ignition goes to off), opens and closes the door, the protection function starts working by making a beep just one time.
 - Under an assumption that your device has been configured with the “Anti-theft Button2”, twenty (20) seconds later after the driver parks the vehicle (ignition goes to off), opens and closes the door, the protection function starts working silently.
- After the door is opened and closed in state of vehicle protection, the driver should press the anti-theft button within the pre-defined time period of “Delay of Anti-theft Release” described in the “New Parameter.
- If the button is pressed for 1 second within this time period, the protection function is released. If the driver has not pressed the button within this time period, anti-theft emergency of the device starts working immediately.
- In emergency, the buzzer and the immobilizer are activated if they are connected properly. After the preset time of “Delay of Anti Theft Alert”, the device sends emergency report about anti-theft occurring.
- However, you can stop such an emergency functioning of the device if you were not expecting such an emergency. The followings are two (2) alternatives on how to stop functioning the Emergency:
 - Alt. 1. By pressing anti-theft button for 1 second, the emergency situation can be stopped immediately.
 - Alt. 2. As soon as all the immobilizer and the buzzer start getting deactivated by commands of the “Disable Output”, the emergency situation will be over.



	Doc. Title	Author		Page of Pages
	ST310U OPERATION MANUAL	JH KIM		73 of 74
	Concerning	Doc. No.	Rev.	Date
	Features and How to set parameters		1.18	2019/03/25

8-8. Storage of Reports un-sent

Device has maximum storage capacity of the un-sent reports in such cases as follows:

- 1,000 status reports (**),
- 50 emergency reports,
- 50 alert reports (including event reports), and
- 1500 bytes for the response that the command has required the device to respond with as command response

Note (**):

Due to bad report-routing environment, device could not make a real-time based reporting. For example, the reporting router does neither run properly, is nor connected properly. In such a situation there might be a report which has consequently failed to arrive in the server successfully after making several attempts to send the report to the server. In that case, the device stores such a report for a while until such environment (e.g. GPRS network) gets back to normal to enable the device to try to send the report to the server again.

When 'status reports' start being accumulated, max 1000 reports can be hold in the buffer storage of the device. If those 'status reports' are triggered out to the server, the oldest report is erased first and a new report is buffered if the buffer is completely full of those reports. And then, a new status report enters (FIFO: First In First Out as a sequential system).

