Operation Description

for

ST215series and ST240series

Suntech International Ltd.

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Table Contents

1. Introduction

This document describes features, protocols and detail operation of ST2xx series.

If there is another operation description document for special buyer to customize or model and the contents of the document is different with this, customizing document should be applied for special buyer.

2. Overview

Device consists of GPRS, GPS and event parts.
The main purpose of device reports getting GPS position and other informs of vehicle to server periodically.
Device can control or check connected lines and support additional functions.

2-1. Operation Mode

The device has 3 operation modes, driving, parking and emergency.

** **Driving** : Driving status when ignition is on.
** **Parking** : Parking status that starts if ignition is off during more than T1.
** **Emergency** : Once panic button is On or any other status as per designed.
The device sends emergency reports until A1 times or receiving server acknowledge.

2-2. Report

AVL reports GPS and some information at predefined interval, depending on the current modes.
Also, AVL sends some alerts, for example, movement at the parking condition, changing of connected input line and so on.
Device distinguishes all reports with 6 types, Status report, emergency, event, alert, alive and command response.
Device can store reports when reporting route (For example, GPRS condition) is not successful. Storage capacity is up to 2,000 status reports, 50 emergency reports, 50 alert reports (include event reports) and 1500 bytes as command response. In case of status reports, oldest report is erased and new report is buffered when the buffer is full and new status report enters (FIFO).
When reporting condition is recovered, device starts sending all buffered reports.
Also, this capacity can increase if it is needed.
Each type of reports has priority, and priority is as below.
Emergency → Command Response → Alert → Status Report → Alive (Lowest)
Emergency is the first to be sent after recovering GPRS condition.

2-3. Setting Parameter

Parameters of device can be changed by GPRS or SMS or RS232 with PC/ST50, and some control can be realized also in the same way.
Detail protocols are described in Chapter 4.

2-4. Features

Key features are described here;

- Power Down
Device can process two steps of power-down, Sleep and Deep Sleep, for reducing power consumption when the vehicle is parked.

- LED Indicator
LED indicates GPRS and GPS states. It's helpful to check error cause.

- Events
Device has output and input lines

- Update Firmware by Over The Air (FOTA)
When Firmware of device has some error or has to be changed for a new service to be implemented, device can update internal ROM file by over the air (FOTA), remotely via GPRS. Customers do not need to visit every vehicle to download the new firmware.
Method of FOTA describes at "SunTech_OTA_UA_Protocol" document in detail.

- Parking Lock
Device can check whether the vehicle moves off the preset parking boundary or starts driving without ignition on. In the case that it notes the unauthorized moving or driving, it sends emergency report immediately.

- Over speed
Device can check speed of vehicle and send alert of over-speed to server.

- GPS Antenna Checking
Device can alert when GPS antenna is disconnected.
It's applicable only for models that have external antenna.

- Main Power Checking
The device can recognize the main power and inform to server when main power line is disconnected or main power drops below preset value.
It's applicable only for battery model.

- Battery Error Alert
Device can alert about battery error related on charging.
It's applicable only for battery model.

3. Protocol Construction

All command and reports are string and follows below format.
Every filed is distinguished by semi colon.
All report string from device is ended by '\r' (0x0D).

Command message format (from server to device)

HDR	DEV_ID	VER	Field 1	Field 2	…	Field n

Field	Definitions	Remark
HDR	String	"SA200" + Command type
DEV_ID	6 char.	Device ID of AVL
VER	"02"	Protocol Version. This is fixed with "02".
Field 1 ~ n	String	Contents

Device ID is unique number of each device that consists of 6digits.
If the command has invalid value or DEV_ID of the command that is sent by GPRS or SMS is not matched with DEV_ID of the unit.
Although the command's DEV_ID by RS232 is not matched with unit's DEV_ID, the command can be accepted.
Response of command by RS232 is sent by RS232.

Report message format (from device to server)

HDR	DEV_ID	SW_VER	Field 1	Field 2	…	Field n

Field	Definitions	Remark
HDR	String	"SA200" + Report type
DEV_ID	6 char.	Device ID of AVL
VER	"001"	Software version that the device has.
Field 1 ~ n	String	Contents

4. Commands

When the device is received a command, it responds with response string and changes some parameters or acts related operation.

4-1. Network Parameters Setting

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

● Definition : Set network parameters and PIN number.

Field	Definitions	Unit	Remark
HDR	"SA200NTW"		Command type
DEV_ID	6 char.		Device ID
VER	"02"		Protocol Version
AUTH	'0' /'1'/'A'		GPRS authentication 0 : PAP('NO' in Synctrack) 1 : CHAP('YES' in Synctrack) A : Automatic GPRS set. In this case, parameters in APN, USER_ID and USER_PWD field should be 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		Backup Server IP Address
B_SEVER_PORT	String		Backup Server Port
SMS_NO	String		Phone number what the device sends SMS report to. This can be used for backup in the area that if GPRS condition is not good. Or, it can be used main report method when IP and Port are empty. For no use, it should be empty.
PIN_NO	String		PIN Number to release PIN lock if it is enabled

<example>

[command] SA200NTW;850000;02;0;internet;;;111.111.111.111;8600;;;;

[response] SA200NTW;Res;850000;010;0;internet;;; 111.111.111.111;8600;;;;

SA200NTW;Res;850000;010;**A1;tim.br;tim;tim**; 111.111.111.111;8600;;;;

<notes>

** If network does not require User ID and Password, these fields should be empty.

Automatic GPRS Set

It the device is set to 'Automatic GPRS Set', the device set GPRS parameters automatically depending on inserted SIM.

For example, if Airtel SIM is inserted, the device set AUTH to 0, APN to "aitelgprs.com", USER_ID and USER_PASS to empty.

And the device reports response string after adding real GPRS parameters when automatic GPRS set is selected.

4-2. Report Parameter Setting

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

● Definition : Set parameters related on report interval.

Field	Definitions	Unit	Remark
HDR	"SA200RPT"		Command type
DEV_ID	6 char.		Device ID
VER	"02"		Protocol Version
T1	String	Sec	Interval for sending status report in parking mode Range : 0 ~ 86400 If 0, report in parking will be sent only one time when vehicle starts parking.
T2	String	Sec	Interval for sending status report in driving mode Range : 0 ~ 60000 If 0, report in driving will be sent only one time when vehicle starts driving.
T3	String	Sec	Interval for sending status report in emergency mode Range : 0 ~ 9999 If 0, emergency report will be sent only one time when emergency state occurs.
A1	String		Number of attempts for emergency report until the device gets acknowledge from server If 0, no emergency report will be sent.
SND_DIST	String	Meter	Distance interval for sending status report. Range : 0 ~ 60000 (60km) If 0, status report related on moving distance is disabled. If not 0, stats report is send when traveled distance reaches predefined SND_DIST.
T4	String	Sec	Interval for sending keep alive string
SMS_T1	String	Min	Interval for sending status report in parking mode
SMS_T2	String	Min	Interval for sending status report in driving mode
SMS_PACK_NO	String		Report No in one SMS message

<example>
[command] SA200RPT;850000;02;180;120;60;3;0;0;0;0;0
[response] SA200RPT;Res;850000;010;180;120;60;3;0;0;0;0;0
<notes>
** If report interval is set big number, network may disconnect GPRS connection because GPRS communication is not progressed for a long time. So, unit may not receive command by GPRS. T4 is for protecting against this disconnection by sending short data with short term.
** Alive report can be sent only when the device has no data to send during T4 interval.

4-3. Event Parameter Setting

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	

● Definition : Set parameter related event.

Field	Definitions	Unit	Remark
HDR	"SA200EVT"		Command type
DEV_ID	6 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 for entering idle mode after ignition goes to off
T2	String	Sec	Delay for entering active mode after ignition goes to on
IN1_TYPE	'0' ~ '7'		0 = Falling Edge 1 = Rising Edge 2 = Both Edge (Falling & Rising) 3 = Panic Button 4 = Call1 Button 5 = Call 2 Button 6 = Reserved 7 = Anti-Theft Button **11 = Door Sensor** **13 = Disable Immobilizer if it's activated by jammer detector.** Default = '3'. Only the device that included voice option (audio circuit) can be set to 'Call1 Button' or 'Call2 Button'.
IN2_TYPE	'0' ~ '7'		Same as IN1_TYPE Default = '2' Only the device that included voice option (audio circuit) can be set to 'Call1 Button' or 'Call2 Button'.
IN3_TYPE	'0' ~ '7'		Same as IN1_TYPE Default = '2'
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, input2 is not checked.
IN3_CHAT	String	100ms	Input3 chattering time.

			Default = 2 sec. If 0, input3 is not checked.
OUT1_TYPE	'0' ~ '5'		0 = GPIO 1 = immobilizer 2 = Immobilizer & Auto active Auto active means immobilizer is activated automatically when the vehicle starts parking. 3 = Pulse 4 = LED Out for indicating call status. Refer 7-2-3. 5 = Buzzer
OUT2_TYPE	'0' ~ '5'		Same as OUT1_TYPE
OUT1_ACTIVE	'0' or '1'		0 = Open when out1 is active 1 = GND when out1 is active
OUT2_ACTIVE	'0' or '1'		0 = Open when out2 is active 1 = GND when out2 is active
PULSE1_NO	String		Pulse number when out1 type set to pulse. Range : 0 ~ 9999 If pulse no is 9999, pulsing runs permanently.
PULSE1_ON	String	100ms	Active time of pulse1 Range : 0 ~ 9999 It should be set with even number.
PULSE1_OFF	String	100ms	Inactive time of pulse1 Range : 0 ~ 9999 It should be set with even number.
PULSE2_NO	String		Pulse number when out2 type set to pulse. Range : 0 ~ 9999 Same as PULSE1_NO
PULSE2_ON	String	100ms	Active time of pulse2 Range : 0 ~ 9999 It should be set with even number.
PULSE2_OFF	String	100ms	Inactive time of pulse2 Range : 0 ~ 9999 It should be set with even number.
IN4_TYPE	'0' ~ '7' Or '9'		Case that extra event IN4 can be supported : Same as IN1_TYPE Case that extra event IN4 isn't supported : IN4_TYPE should be '9'. 9 = NoUse
IN5_TYPE	'0' ~ '7' Or '9'		Case that extra event IN4 can be supported : Same as IN1_TYPE Case that extra event IN4 isn't supported : IN4_TYPE should be '9'. 9 = NoUse
IN4_CHAT	String		Chattering time when extra event IN4 is supported. Range : 0 ~ 9999 If 0, input 4 is not checked. When extra event IN4 isn't supported, it should be 0.
IN5_CHAT	String		Chattering time when extra event IN5 is supported. Range : 0 ~ 9999 If 0, input 5 is not checked. When extra event IN5 isn't supported, it should be 0.
BAUD	'0' ~ '4'		It's available when extra events support RS232. Baud-rate

			0 = No use 1 = 4800bps 2 = 9600bps 3 = 19200bps 4 = 38400bps 5 = 115200bps If the device does not support RS232, it should be 0.

<example>
[command] SA200EVT;850000;02;1;60;0;3;2;2;30;20;20;1;0;1;0;0;0;0;0;0;0;0;0;0;0
[response] SA200EVT;Res;850000;010;1;60;0;3;2;2;30;20;20;1;0;1;0;0;0;0;0;0;0;0;0;0;0
<notes>
** If IGNITION is set to '0', device doesn't check driving or parking state of the vehicle. It reports status string with idle mode always, and cannot support parking lock and the service that 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 can operate when the device installed into real vehicle and it may be need adjustment of voltage range for special vehicle. For setting method, please refer 6.3.
** In case of pulse, pulse time may have tolerance about dozens of ms.
** Immobilizer, LED Blink line and Buzzer type cannot set both OUT1 and OUT2 simultaneously.
** In case that a event is set to "door sensor", active state means door is opened.

In case of 4 or 5 Line Event Model :

Type of no supported event line is fixed to "No Use".
Below table is for example of 4 line event model.

Field	Definitions	Unit	Remark
HDR	"SA200EVT"		Command type
DEV_ID	6 char.		Device ID
VER	"02"		Protocol Version
IGNITION	'0' ~ '2'		Ignition using state 0 : Not use ignition 1 : Use ignition Line 2 : Virtual ignition(power) 3 : Virtual ignition (motion)
T1	String	Sec	Delay for entering idle mode after ignition goes to off
T2	String	Sec	Delay for entering active mode after ignition goes to on
IN1_TYPE	'0' ~ '5'		0 = Falling Edge 1 = Rising Edge 2 = Both Edge (Falling & Rising) 3 = Panic Button 4 = Call1 Button 5 = Call 2 Button 6 = Reserved 7 = Anti-Theft Button **11 = Door Sensor** **13 = Disable Immobilizer if it's activated by jammer detector.** Default = '3'. Only the device that included voice option (audio circuit) can be set to 'Call1 Button' or 'Call2 Button'.
IN2_TYPE	'9'		**9 = No Use**

IN3_TYPE	'9'		**9 = No Use**
IN1_CHAT	String	100ms	Input1 chattering time. Range : 0 ~ 9999 Default = 3 sec. If 0, input1 is not checked.
IN2_CHAT	'0'		
IN3_CHAT	'0'		
OUT1_TYPE	'7'		**7 = No Use**
OUT2_TYPE	'7'		**7 = No Use**
OUT1_ACTIVE	'0' or '1'		
OUT2_ACTIVE	'0' or '1'		
PULSE1_NO	'0'		
PULSE1_ON	'0'		
PULSE1_OFF	'0'		
PULSE2_NO	'0'		
PULSE2_ON	'0'		
PULSE2_OFF	'0'		
IN4_TYPE	'9'		**9 = No Use**
IN5_TYPE	'9'		**9 = No Use**
IN4_CHAT	'0'		
IN5_CHAT	'0'		
BAUD	'0'		0 = No use

<example>
[command] SA200EVT;850000;02;1;60;0;3;2;2;30;20;20;1;0;1;0;0;0;0;0;0;0;0;0;0;0;0
[response] SA200EVT;Res;850000;010;1;60;0;3;8;8;30;0;0;6;6;1;0;0;0;0;0;0;8;8;0;0;0
<notes>
**** In case of event 4 line model, IN2_TYPE, IN3_TYPE, IN4_TYPE, IN5_TYPE, OUT1_TYPE and OUT2_TYPE should be 'No Use'.**
Type and chat time of non used event lines are set to 'No Use' and '0' automatically although these filed of command is set to other value.

4-4. GSM Parameter Setting

HDR	DEV_ID	VER	SMS_LOCK	SMS_MT1	SMS_MT2	SMS_MT3
SMS_MT4	IN_CALL_LOCK	CALL_MT1	CALL_MT2	CALL_MT3	CALL_MT4	CALL_MT5
CALL_MO1	CALL_MO2					

● Definition : Set parameters related SMS or Call.

Field	Definitions	Unit	Remark
HDR	"SA200GSM"		Command type
DEV_ID	6 char.		Device ID
VER	"02"		Protocol Version
SMS_LOCK	'0' or '1'		Lock of Receiving Commands by SMS Disable (0) / Enable (1) If enabled, only commands that receives from SMS_MT1 ~ MT3 number can be accepted.
SMS_MT1	String	Up to 20 char.	Phone number for SMS commands
SMS_MT2	String	Up to 20 char.	Phone number for SMS commands
SMS_MT3	String	Up to 20 char.	Phone number for SMS commands
SMS_MT4	String	Up to 20 char.	Phone number for SMS commands
IN_CALL_LOCK	'0' or '1'		Lock of Incoming Call Disable (0) / Enable (1) If enabled, only call from CALL_MT1 ~ MT5 number can be accepted.
CALL_MT1	String	Up to 20 char.	Phone number for call
CALL_MT2	String	Up to 20 char.	Phone number for call
CALL_MT3	String	Up to 20 char.	Phone number for call
CALL_MT4	String	Up to 20 char.	Phone number for call
CALL_MT5	String	Up to 20 char.	Phone number for call
CALL_MO1	String	Up to 20 char.	Phone number for outgoing call from device
CALL_MO2	String	Up to 20 char.	Phone number for outgoing call from device

<example>
[command] SA200GSM;850000;02;0;;;;;0;;;;;;;
[response] SA200GSM;Res;850000;010;0;;;;;0;;;;;;;
<notes>
** When SMS or Call numbers are not set, that field should be empty.

4-5. Service Parameter Setting

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					

● Definition : Set parameters related report.

Field	Definitions	Unit	Remark
HDR	"SA200SVC"		Command type
DEV_ID	6 char.		Device ID
VER	"02"		Protocol Version
PARKING_LOCK	'0' or '1'		Parking lock enable (1) / disable (0) If 1, the device checks vehicle position in parking periodically. When the vehicle goes off some boundary or starts moving over some velocity, the device reports parking lock emergency.
SPEED_LIMIT	String	Km/h	Over speed limit If 0, the device does not check over speed. If 1 and the vehicle runes over predefined value, device reports speed alerts 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' ~ '2'		Connection Type with Server 0 = KEEP_CON 1 = KEEP_DISCON 2 = KEEP_NOP 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. Group send is explained below.
MP_CHK	'0' or '1'		Main Power Disconnection Check 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)
M_SENSOR	'0' ~'4'		Motion Sensor
CALL	'0' or '1'		Support Call with headset Disable (0) / Enable (1)

	Motion	Collision	Shock
0	Disable	Disable	Disable
1	Enable	Disable	Disable
2	Enable	Enable	Disable
3	Enable	Disable	Enable
4	Enable	Enable	Enable

GEO_FENCE	'0' or '1'		Support Geo-fence Disable (0) / Enable (1)
DAT_LOG	'0' or '1'		Log out with RS232 0 = No Use 1 = Enable getting saved log data by RS232

<example>
[command] SA200SVC;850000;02;1;120;0;0;0;0;1;1;1;0;0;0;0
[response] SA200SVC;Res;850000;010;1;120;0;0;0;0;1;1;1;0;0;0;0
<notes>
** Function of M_SEMSOR can be used with the model that has motion sensor.
If shock or collision detection is enabled, device will report to server when gets any shock or collision.
** If this parameter has been customized, This table should be disregarded and you should follow customized operation document.

CON_TYPE

1. KEEP_CON : The device keeps TCP connection always and can receives a command by GPRS.
2. KEEP_DISCON : The device connects TCP connection when the data is sent. After sending, the device disconnects GPRS and TCP connection if it estimates there is no data for sending within 3minutes. In this case, it cannot receive a command by GPRS.
3. KEEP_NOP : The device doesn't send any report after be installed. When the device enters emergency mode or receive 'Start Report' command by SMS or RS232, it starts report depending on report parameters. It may be used for saving GPRS fee. Current version cannot support this option.

Group Send
The device stores data if the vehicle is in no GPRS area. And, the vehicle moves to GPRS available area, device starts sending stored data.
If group send option is enabled, the device makes 5 reports to one bundle and send these 5 reports at one time. Group send is useful to speed up sending.

M_Sensor

1. Collision: The device sending a event when ignition is ON and have a motion.
2. Shock: The device sending a event when ignition is OFF and have a motion.

4-6. Additional Parameters

HDR	DEV_ID	VER	SVR_TYPE	B_SVR_TYPE	UDP_ACK	DEV_PORT

● Definition : Setting additional parameter requested.

Field	Definitions	Unit	Remark
HDR	"SA200ADP"		Command type
DEV_ID	6 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 Server when UPD is used. 0 : No use

			1 : ACK when the server receives reports except alive. 2 : ACK when the server receives reports except STT and alive report. 3 : ACK when the server receives emergency report. Command response doesn't need ACK.
DEV_PORT	String		Device's port for receiving command from UDP server. 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 with port DEV_PORT.**
Reserved	'0'		
Reserved	'0'		
Reserved	'0'		
Reserved	'0'		
Reserved	'0'		
Reserved	'0'		

<example>
[command] SA200ADP;850000;02;U;T;2;9000;0;0;0;0;0;0
[response] SA200ADP;Res;850000;022;U;T;2;9000;0;0;0;0;0;0
<notes>
This command can be applied from software version 22.

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 data is received.

If the ACK is not sent during more than 2 minutes after sending, the device recognizes the data was not reached to server and sends the data again.

Examples of ACK report are as below.

String Format : "**SA200ACK**;850000"

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

It is recommended ACK_TYPE is set to '1' to confirm all data can be transmitted safely.

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

4-7. Set Parameters of Main Voltage

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		

● Definition : Set some value of main voltage.

Field	Definitions	Remark
HDR	"SA200MBV"	Command type
DEV_ID	6 char.	Device ID
VER	"02"	Protocol Version
CHR_STOP_THRES_12	String	Voltage value to stop backup battery charging in 12V vehicle.
CHR_STOP_THRES_24	String	Voltage value to stop backup battery charging in 24V vehicle.
DECIDE_BAT_24	String	Voltage value to check whether the vehicle's battery is 12V or 24V.
OPERATION_STOP_THRES_12	String	Voltage value to protect vehicle battery. The device operation stops if car battery voltage is lower than this value in vehicle that has 12V power.
OPERATION_STOP_THRES_24	String	Voltage value to protect vehicle. The device operation stops if car battery voltage is lower than this value in vehicle that has 24V power.
IGNDET_H	String	In case of virtual ignition, the vehicle can recognize driving state when vehicle power is more 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] SA200MBV;850000;02;10.5;22;19;8.00;18.00;0;0 [response] SA200MBV;Res;850000;122;10.5;22;19;8.00;18.00;0;0 **<note>** IGNDET_H and IGNDET_L are '0', device check parking and driving automatically.		

4-8. Set Parameters of Motion Sensor

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		

● Definition : Set motion sensor parameters

Field	Definitions	Unit	Remark
HDR	"SA200MSR"		Command type
DEV_ID	6 char.		Device ID
VER	"02"		Protocol Version
SHOCK_DELAY	String	Sec.	Delay for 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 : **0.04**
SHOCK_THRES	String	Step	Detection level of shock violation. Range : 0.04 ~ 2.0 Recommend : **0.04**
COLL_THRES	String	Step	Gravity for collision report. Range : 0.1 ~ 2.0 Recommend : 0.7
<example> [command] SA200MSR;850000;02;600;0.04;0.04;0.7 [response] SA200MSR;Res;850000;122;600;0.04;0.04;0.7 <notes> * For the shock level, we recommend it to set to 0.04. if it's over than 0.04, the sensor will be more insensitive as it for shock detection.			

4-9. Circular Geo-fence Setting

HDR	DEV_ID	VER	GEO_ID	ACTIVE	LAT	LON	RADIUS	IN	OUT	IN_ACT	OUT_ACT

● Definition : Set ID, position and enable state of circular geo-fence.

Field	Definitions	Unit	Remark
HDR	"SA200CGF"		Command type
DEV_ID	6 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] SA200CGF;850000;02;1;1;+37.000000;+127.000000;50;1;1
[response] SA200CGF;Res;850000;010;1;1;+37.000000;+127.000000;50;1;1
Observation
If sending only "HDR/DEV_ID/VER/GEO_ID_ACTIVATE/LAT/LON/RADIUS/IN/OUT" the device automatically setting the "IN_ACT" and "OUT_ACT" to "0".

4-10. New Parameter Setting

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_OFF_THRES	VI_OFF_DELAY		
HBM_STT							

● Definition : Set parameters related on report interval.

Field	Definitions	Unit	Remark
HDR	"SA200NPT"		Command type
DEV_ID	6 char.		Device ID
VER	"02"		Protocol Version
ANGLE_RPT	String	'0'- '179'	Report If forwarding angle is over than specific value Disable : '0' Enable : '1' ~ '179' degree.
RPT_TYPE	String	'0' or '1'	Type of report as follows. 0 : Reported sequential. 1 : Reported recently data first.

			Caution : This feature may not be able to support for some customer.
ANTITHFT_CNT1	String	Sec	Delay of Anti-Theft Release When ignition is on, It starts Anti-Theft emergency state after this time.
ANTITHFT_CNT2	String	Sec	Delay of Anti-Theft Alert When it is Anti_theft emergency state, It sends the emergency report after this time.
JAM_DET	String	'0' ~'4	GPRS or GPRS+GPS Jamming detection function. 0 = Disable 1 ~ 4 = enabled jamming detection and if detected first, check assist functions and then triggered byJAM_DET mode as follows. JAM_DET / Alert / Active Immob. / Active Buzzer '1' / O / X / X '2' / O / O / X '3' / O / X / O '4' / O / O / O X – Inactive, O – Activated if jammer detected. Immobilizer : you can disable by command Buzzer : it's disabled automatically after released from jamming. It's send an alert after recovery the GSM network. To detection, it's take about 2 minutes or more. Default : 0
JAM_CHK_DIST	'0' ~'60000'	Meter	Assist function of GPRS jamming detection for distance. After detected it with GPS first (Fp), it's always check distance between current location and Fp through GPS information. If it's greater than JAM_CHK_DIST for a while, triggered by JAM_DET mode. If 0, skip this procedure. Default : 500 meter
JAM_CHK_TM	'0' ~ '43200'	Sec.	Assist function of GPRS jamming detection for no GPS. After detected jamming first and no GPS, start count time and check any movement of vehicle for a while until over than JAM_CHK_TM with NO GPS. If over, triggered by JAM_DET mode (refer to table). If there's no moving, **ignore jamming detection until release jamming**. If 0, skip this procedure. Default : 300 secs.
VI_ON_THRES	String	1/255G	Threshold value for Motion Virtual Ignition On Range : 3~50 Default : 5
VI_ON_DELAY	String	Sec.	Delay time for Motion Virtual Ignition On Range : 3~999 Default : 10
VI_ON_PERCENT	String	%	Percent for Motion Virtual Ignition On.

			Range : 30~100 Default: 70
VI_OFF_THRES	String	1/255G	Threshold value for Motion Virtual Ignition Off Range : 3~50 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' or '1'	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.

<example>
[command] SA200NPT;850000;02;0;0;0;0;0;500;300;5;10;70;5;10;70;0
[response] SA200NPT;Res;850000;010; 02;0;0;0;0;0;500;300;5;10;70;5;10;70;0

Jamming detection procedure

JAM_CHK_DIST & JAM_CHK_TM are assist for jamming detection to avoid false detection.
At least, we recommend use JAM_CHK_DIST for safety.
If you use two assist functions, it can detect two case of jamming as follows.

*Case of jamming GPRS only.
Jamming detected -> JAM_CHK_DIST -> JAM_CHK_TM -> Triggered by JAM_DET mode.
*Case of 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.

If disable all of assist functions, just triggered by HAM_DET mode after detected jamming.
In this case, it's possible to false detection in weak GSM or strong radio area.

4-11. Control Command

HDR	DEV_ID	VER	CMD_ID

● Definition : Controls some functions.

Field	Definitions	Unit	Remark
HDR	"SA200CMD"		Command type
DEV_ID	6 char.		Device ID
VER	'01'		Protocol Version
CMD_ID	String		Control command content

Caution : If it's not correct the Unit ID, ignored.

4-11-1. Status Request

● Definition : Location poll, request of the status report.

Field	Definitions	Unit	Remark
CMD_ID	"StatusReq"		Status request If received, the device sends status string instantly.
<example> **<example>** [command] SA200CMD;850000;02;StatusReq [response] SA200STT;850000;010;20090724;07:12:16;00129;+37.479995;+126.885815;000.029;000.00;7;1;0;15.33;100000;2;0002			

4-11-2. Reset

● Definition : Reset all of parameters.

Field	Definitions	Unit	Remark
CMD_ID	"Reset"		Reset Initialize all parameters with factory value and reboot the device.
<example> [command] SA200CMD;850000;02;Reset [response] SA200CMD;Res;850000;010;Reset			

4-11-3. Preset

● Definition : Reset all of parameters.

Field	Definitions	Unit	Remark
CMD_ID	"Preset"		Report parameter setting values and current device status. Response includes network, report, event, GSM and service parameters. It includes status of device, also.

<example>
[command] SA200CMD;850000;02;Preset
[response] SA200CMD;Res;850000;010;Preset;
NTW;0;internet;;;111.111.111.111;8600;;;;1234;
RPT;60;180;120;60;3;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;0;0;0;
GSM;0;;;;;0;;;;;;;;;
SVC;1;120;0;0;0;0;1;1;1;0;0;0;0
DEV;0;0;0;0
[response] event 4 line model
NTW;0;internet;;;111.111.111.111;8600;;;;1234;
RPT;60;180;120;60;3;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;0;0;0;
GSM;0;;;;;0;;;;;;;;;
SVC;1;120;0;0;0;0;1;1;1;0;0;0;0
DEV;0;0;0;0

<notes>
** After power on, device sends response string of preset once.
** DEV filed informs current status of 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.

Field	Definitions	Unit	Remark
CMD_ID	“PresetA”		Report all parameters including additional parameter.

<example>
[command] SA200CMD;850000;02;PresetA
[response] SA200CMD;Res;850000;010;PresetA;
NTW;0;internet;;;111.111.111.111;8600;;;;1234;
RPT;60;180;120;60;3;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;0;0;0;
GSM;0;;;;;0;;;;;;;;;
SVC;1;120;0;0;0;0;1;1;1;0;0;0;0;
ADP;U;T;2;9000;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;850000;02;0;0;0;0;0;500;300;5;10;5;10;
DEV;0;0;0;0;0;0;0;0

<notes>
**** This command can be applied from software version 22.**
** DEV filed informs current status of 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.

TRACKING	Anti-Theft	Reserved	Reserved
0 = Stop Tracking 1 = Start Tracking	0 = Disable 1 = Enable		

4-11-4. ACK of Emergency

● Definition : Stop emergency report.

Field	Definitions	Unit	Remark
CMD_ID	"AckEmerg"		Acknowledgement of emergency report. The device will stop emergency reports if it is in emergency state.
<example> [command] SA200CMD;850000;02;AckEmerg [response] SA200CMD;Res;850000;010;AckEmerg			

4-11-5. Enable1

● Definition : Active Output1.

Field	Definitions	Unit	Remark
CMD_ID	"Enable1"		Enable Output1
<example> [command] SA200CMD;850000;02;Enable1 [response] SA200CMD;Res;850000;010;Enable1 **[response] SA200CMD;Res;850000;010;Enable1NoUse (in case that IN type is set to 'No Use').** **<notes>** ** Output1 line goes to active status. ** If OUT1 set with immobilizer, output1 line goes to active status gradually with pulse in driving mode. ** If OUT1 set with pulse type, output1 line generates pulse and returns inactive state after pulsing out automatically.			

4-11-6. Disable1

● Definition : Inactive Output1.

Field	Definitions	Unit	Remark
CMD_ID	"Disable1"		Disable Output1
<example> [command] SA200CMD;850000;02;Disable1 [response] SA200CMD;Res;850000;010;Disable1 **[response] SA200CMD;Res;850000;010;Disable1NoUse (in case that IN type is set to 'No Use').** **<notes>** ** Output1 line goes to inactive status.			

4-11-7. Enable2

● Definition : Active Output2.

Field	Definitions	Unit	Remark
CMD_ID	"Enable2"		Enable Output2

<example>
[command] SA200CMD;850000;02;Enable2
[response] SA200CMD;Res;850000;010;Enable2
[response] SA200CMD;Res;850000;010;Enable2NoUse (in case that IN type is set to 'No Use').
<notes>
** Output2 line goes to active status.
** If OUT2 set to immobilizer, output2 line goes to active status gradually with pulse in driving mode.
** If OUT2 set to pulse type, output2 line generates pulse and returns inactive state after pulsing out automatically.

4-11-8. Disable2

● Definition : Inactive Output2.

Field	Definitions	Unit	Remark
CMD_ID	'Disable2'		Disable Output2

<example>
[command] SA200CMD;850000;02;Disable2
[response] SA200CMD;Res;850000;010;Disable2
[response] SA200CMD;Res;850000;010;Disable2NoUse (in case that IN type is set to 'No Use').
<notes>
** Output2 line goes to inactive status.

4-11-9. Request IMSI

● Definition : Request the unique SIM ID.

Field	Definitions	Unit	Remark
CMD_ID	"ReqIMSI"		Request IMSI (unique SIM ID) If received, device sends IMSI of using SIM.

<example>
[command] SA200CMD;850000;02;ReqIMSI
[response] SA200CMD;Res;850000;010;ReqIMSI;724031111553779

4-11-10. Request ICCID

● Definition : Request the ICCID.

Field	Definitions	Unit	Remark
CMD_ID	"ReqICCID"		Request ICCID (sequence number that is displayed on SIM) If received, device sends ICCID of using SIM.

<example>
[command] SA200CMD;850000;02;ReqICCID
[response] SA200CMD;Res;850000;010;ReqICCID; 89550230000084256668

4-11-11. ReqVer

● Definition : Request software version.

Field	Definitions	Unit	Remark
CMD_ID	"ReqVer"		Request device version Device reports Model, Buyer, Protocol and S/W release version.

<example>
[command] SA200CMD;850000;02;ReqVer
[response] SA200CMD;Res;850000;010;ReqVer;SA200E_SAMPLE_STBASE_001

4-11-12. Erase All

● Definition : Erase all of data in buffer.

Field	Definitions	Unit	Remark
CMD_ID	"EraseAll"		Erase saved all reports and disable outputs. This is needed to initialize just before device is delivered to a customer.

<example>
[command] SA200CMD;850000;02;EraseAll
[response] SA200CMD;Res;850000;010;EraseAll

4-11-13. Setting Traveled Distance

● Definition : Setting the travel distance.

Field	Definitions	Unit	Remark
CMD_ID	"SetOdometer="	meter	Setting odometer .

<example>
[command] SA200CMD;850000;02;SetOdometer=999999999
[response] SA200CMD;Res;850000;010;SetOdometer=999999999

4-11-14. Initialize Message Number

● Definition : Initialize the message sequence number.

Field	Definitions	Unit	Remark
CMD_ID	"InitMsgNo"		Set message number to 0.
<example> [command] SA200CMD;850000;02;InitMsgNo [response] SA200CMD;Res;850000;010;InitMsgNo			

4-11-15. Setting Hour-Meter

Field	Definitions	Unit	Remark
CMD_ID	"SetHMeter="	minute	Setting hour-meter
<example> [command] SA200CMD;850000;02;SetHmeter=999999 [response] SA200CMD;Res;850000;010;SetHmeter=999999			

4-11-16. Request Circular Geo-fence

● Definition : Request all of geo-fence parameters.

Field	Definitions	Unit	Remark
CMD_ID	"ReqCircleGeo"		Report enabled circular geo-fences. Response consists of continuous field (0 or 1) and each geo-fence inform.
<example> [command] SA200CMD;850000;02;ReqCircleGeo [response] Case that unit has 3 geo-fences : SA200CMD;Res;850000;010;CircleGeoReq;001;**1**;1;1;+37.000000;+127.000000; 2000;1;1 SA200CMD;Res;850000;010;CircleGeoReq;001;**1**;2;1;+37.100000;+ 127.100000;2000;1;0 SA200CMD;Res;850000;010;CircleGeoReq;001;**0**;3;1;+37.200000;+127.200000;2000;1;1 Case that unit has no geo-fence. SA200CMD;Res;850000;CircleGeoReq;NoData **<notes>** ** Continuous field of above response string represents bold and red.			

4-11-17. Request Own Phone Number

● Definition : Request phone number.

Field	Definitions	Unit	Remark
CMD_ID	"ReqOwnNo"		Request own phone number

<example>
[command] SA200CMD;850000;02;ReqOwnNo
[response] SA200CMD;Res;850000;010;ReqOwnNo;82220275656
<notes>
** If no SIM or during power on process, own phone number cannot read.
The device reports with “NotReady”
** If own number field in SIM is empty, device reports with “NoData”.

4-11-18. Set Own Phone Number

● Definition : Set phone number.

Field	Definitions	Unit	Remark
CMD_ID	“SetOwnNo”		Set own phone number. This command is followed by “=” and own number.

<example>
[command] SA200CMD;850000;02;SetOwnNo=21140108
[response] SA200CMD;Res;850000;010;SetOwnNo=21140108
<notes>
** If no SIM or during power on process, own phone number cannot set.
The device reports with “NotReady”

4-11-19. Request Volume Level in Call

● Definition : Request volume level for voice call.

Field	Definitions	Unit	Remark
CMD_ID	“ReqVol”		Request volume

<example>
[command] SA200CMD;850000;02;ReqVol
[response] SA200CMD;Res;850000;010;ReqVol;200
<notes>
** It’s available only for the model that can support voice call.

4-11-20. Set Volume Level in Call

● Definition : Set volume level for voice call.

Field	Definitions	Unit	Remark
CMD_ID	“SetVol”		Set volume level in call. It is followed by “=” and volume number(0~255).

<example>
[command] SA200CMD;850000;02;SetVol=200
[response] SA200CMD;Res;850000;010;SetVol=200
<notes>
** It’s available only for the model that can support voice call.

4-11-21. Reboot

● Definition : reboot unit.

Field	Definitions	Unit	Remark
CMD_ID	"Reboot"		Reboot device.
<example> [command] SA200CMD;850000;02;Reboot [response] SA200CMD;Res;850000;010;Reboot			

4-11-22. Enable Server Lock

● Definition : Location poll, request of the status report.

Field	Definitions	Unit	Remark
HDR	"EnableSvrLock"		Enable Server Lock
<example> [command] SA200CMD;850000;02;EnableSvrLock [response] SA200CMD;Res;850000;010;EnableSvrLock Note. 1. EnableSvrLock command is available only when command is sent by GPRS. 2. Once Server Lock is Enabled, it is LOCKED if server receives any report. 3. If Server is LOCKED, you can change IP and port(including backup server) only by GPRS. The other parameters are configurable by SyncTrak, GPRS or SMS. 4. In order to Disable Server Lock, you have to use PC program(ServerLock) with USB Dongle.			

4-11-23. Disable Server Lock

● Definition : Location poll, request of the status report.

Field	Definitions	Unit	Remark
HDR	"DisableSvrLock"		Disable Server Lock
<example> [command] SA200CMD;850000;02;DisableSvrLock [response] SA200CMD;Res;850000;010;DisableSvrLock Note. 1. DisableSvrLock command is available only when command is sent by GPRS. 2. This command is to disable server locked state.			

4-12. Transferring Data to External RS232 Device

HDR	DEV_ID	VER	LEN	DATA	CHK_SUM

● Definition : If the device receives this command, it transfers the data to connected RS232's device.

Field	Definitions	Unit	Remark
HDR	"SA200DEX"		Command type
DEV_ID	6 char.		Device ID
VER	"02"		Protocol Version
LEN			Length of data
DATA			Up to 500bytes
CHK_SUM			8bit Checksum

<example>
[command] SA200DEX;850000;02;6;012345;2F
[response] SA200DEX;Res;850000;010;25;012345;2F

<note>
CHK_SUM is string converted from lower 8 bit of the summation of DATA field.
In case of above example.
Value of '0' character in DATA field is equal to 0x30 in hex system, and '1' is equal to 0x31 in hex system.
In this case, summation of DATA will be 0x12F (0x30+0x31+0x32+0x33+0x34+0x35), and CHK_SUM string will be "2F'.
And, whole string from server will be "SA200DEX;850000;02;6;012345;2F".

If DATA field includes 0x00 or 0x01, server should convert and send as below.
Original Data : 0x30 0x31 **0x00** 0x32 **0x01**
Conversion : 0x30 0x31 0x01 0x10 0x32 **0x01 0x11**

4-12-1 Status Request for External RS232 device

HDR	DEV_ID	VER	LEN	DATA	CHK_SUM

● Definition : Location poll, request of the status report external device through RS232

Field	Definitions	Unit	Remark
CMD_ID	"SttReq"		Status request If received, the device sends status string instantly.

<example>
[command] SttReq
[response] SA200STT;850000;010;20090724;07:12:16;00129;+37.479995;+126.885815;000.029;000.00;7;1;0;15.33;100000;2;0002

4-12-2 Control Command

HDR	DEV_ID	VER	CMD_ID

● Definition : Controls some functions.

Field	Definitions	Unit	Remark
HDR	"SA200CMD"		Command type
DEV_ID	6 char.		Device ID
VER	'01'		Protocol Version
CMD_ID	String		Control command content

OBSERVATION : All command it's possible send for RS232 and the device response by RS232.

Reports

5-1. Status Report

HDR	DEV_ID	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				

● Definition : String that device reports periodically.

5-1-1. String

Field	Definitions	Remark
HDR	"SA200STT"	Status report header
DEV_ID	6 char.	Device ID
SW_VER	3 char.	Software Release Version
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.
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 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)

MODE	1 char.	'1' = Idle mode (Parking) '2' = Active Mode (Driving)
MSG_NUM	4 char.	Message number After "9999" is reported, message number returns to "0000".
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)
<example> SA200STT;850000;010;20081017;07:41:56;00100;+37.478519;+126.886819;000.012;000.00;9;1;0;15.30;001100;1;0072;0;4.5;1 Observation The" H_METER/ BCK_VOLT/ MSG_TYPE" is include in STT only "HBM_STT"is "1"		

5-1-2. Zip

Field	Definitions	Remark
HDR	0x10	Status report header
DEV_ID	3 bytes	Device ID BCD format If device ID is 123456, this field is full with 0x12, 0x34 and 0x36.
SW_VER	1 byte	Software Version
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	Bit 7: Fix; Bit 6: Latitude +/- sign; Bit 5: Longitude +/- sign; Bit 4 ~ Bit 0: Satellite's count + sign = 0, - sign = 1
DIST	4 byte	Traveled distance in meter
PWR_VOLT	2 bytes	Voltage value of main power 1 byte (integer) + 1 byte (BCD)
I/O	1 byte	Bit 5: Out 2; Bit 4: Out1; Bit 3: Input 3; Bit 2: Input 2; Bit 1: Input1; Bit 0: Ignition Ignition : 1 (ON), 0 (OFF) Input1 ~ Input3 : 1 (Ground, Shorted), 0 (Opened) Out1 ~ Out2 : 1 (Active), 0 (Inactive)
MODE	1 byte	1 = Idle (Parking), 2 = Active (Driving)
MSG_NUM	2 bytes	Message number After 9999, message number returns to 0.
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)

<example>
Original String :
SA200STT;850000;010;20081017;07:41:56;2F100;+37.478519;+126.886819;032.012;000.00;9;1;500;15.30;001100;1;0072
➔ Zip Packet
0x10 0x85 0x00 0x00 0x02
0x08 0x0a 0x11 0x07 0x29 0x38
0x02 0xF1 0x00
0x25 0x47 0x85 0x19 0x7e 0x88 0x68 0x19
0x00 0x20 0x01
0x00 0x00 0x00
0x89
0x00 0x00 0x01 0xF4
0x0F 0x30
0x0c
0x01
0x00 0x48

5-2. Emergency Report

HDR	DEV_ID	SW_VER	DATE	TIME	CELL	LAT	LON	SPD	CRS	SATT	FIX
DIST	PWR_VOLT	I/O	EMG_ID	H_METER	BCK_VOLT	MSG_TYPE					

● Definition : String that is sent when emergency occurs.

5-2-1. String

Field	Definitions	Remark
HDR	"SA200EMG"	Emergency report header
DEV_ID	6 char.	Device ID
SW_VER	3 char.	Software Version
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
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)

<example>
SA200EMG;850000;010;20081017;07:41:56;00100;+37.478519;+126.886819;000.012;000.00;9;1;0;15.30;001100;1
<notes>
Emergency reports are sent A1 times until the unit receives server acknowledge.

Observation
The" H_METER/ BCK_VOLT/ MSG_TYPE" is include in STT only "HBM_STT"is "1"

5-2-2. Zip

Field	Definitions	Remark
HDR	0x11	Emergency report header
DEV_ID	3 bytes	Device ID BCD format If device ID is 123456, this field is full with 0x12, 0x34 and 0x36.
SW_VER	1 byte	Software Version
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	Bit 7: Fix; Bit 6: Latitude +/- sign; Bit 5: Longitude +/- sign; Bit 4 ~ Bit 0: Satellite's count + sign = 0, - sign = 1
DIST	4 byte	Traveled distance in meter
PWR_VOLT	2 bytes	Voltage value of main power 1 byte (integer) + 1 byte (BCD)
I/O	1 byte	Bit 5: Out 2; Bit 4: Out1; Bit 3: Input 3; Bit 2: Input 2; Bit 1: Input1; Bit 0: Ignition Ignition : 1 (ON), 0 (OFF) Input1 ~ Input3 : 1 (Ground, Shorted), 0 (Opened) Out1 ~ Out2 : 1 (Active), 0 (Inactive)
EMG_ID	1 byte	Emergency type 1 = emergency by panic button 2 = emergency by parking lock 3 = emergency by removing main power 5 = emergency by anti-theft
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)

<example>

Original String :

SA200EMG;850000;010;20081017;07:41:56;2F100;+37.478519;+126.886819;032.012;000.00;9;1;0;15.30;001100;1

➔ Zip Packet

0x11 0x85 0x00 0x00 0x0A
0x08 0x0a 0x11 0x07 0x29 0x38
0x02 0xF1 0x00
0x25 0x47 0x85 0x19 0x7e 0x88 0x68 0x19
0x00 0x20 0x01
0x00 0x00 0x00
0x89
0x00 0x00 0x00 0x00
0x0F 0x30
0x0c
0x01

5-3. Event Report

HDR	DEV_ID	SW_VER	DATE	TIME	CELL	LAT	LON	SPD	CRS	SATT	FIX
DIST	PWR_VOLT	I/O	EVT_ID	H_METER	BCK_VOLT	MSG_TYPE					

● Definition : String that is sent when input line is changed.

5-3-1. String

Field	Definitions	Remark
HDR	"SA200EVT"	Event report header
DEV_ID	6 char.	Device ID
SW_VER	3 char.	Software Version
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)
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. 5 = Input3 goes to ground state. 6 = Input3 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)
<example> SA200EVT;850000;010;20081017;07:41:56;00100;+37.478519;+126.886819;000.012;000.00;9;1;0;15.30;001100;3 Observation The" H_METER/ BCK_VOLT/ MSG_TYPE" is include in STT only "HBM_STT"is "1"		

5-3-2. Zip

Field	Definitions	Remark
HDR	0x12	Event report header
DEV_ID	3 bytes	Device ID BCD format If device ID is 123456, this field is full with 0x12, 0x34 and 0x36.
SW_VER	1 byte	Software Version
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	Bit 7: Fix; Bit 6: Latitude +/- sign; Bit 5: Longitude +/- sign; Bit 4 ~ Bit 0: Satellite's count + sign = 0, - sign = 1
DIST	4 byte	Traveled distance in meter
PWR_VOLT	2 bytes	Voltage value of main power 1 byte (integer) + 1 byte (BCD)
I/O	1 byte	Bit 5: Out 2; Bit 4: Out1; Bit 3: Input 3; Bit 2: Input 2; Bit 1: Input1; Bit 0: Ignition 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 = Input2 goes to open state. 3 = Input2 goes to ground state. 4 = Input2 goes to open state. 5 = Input3 goes to ground state. 6 = Input3 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)

<example>
Original String :
SA200EVT;850000;010;20081017;07:41:56;2F100;+37.478519;+126.886819;032.012;000.00;9;1;0;15.30;001100;1
➔ Zip Packet
0x12 0x85 0x00 0x00 0x0A
0x08 0x0a 0x11 0x07 0x29 0x38
0x02 0xF1 0x00
0x25 0x47 0x85 0x19 0x7e 0x88 0x68 0x19
0x00 0x20 0x01
0x00 0x00 0x00
0x89
0x00 0x00 0x00 0x00
0x0F 0x30
0x0c
0x01

5-4. Alert Report

HDR	DEV_ID	SW_VER	DATE	TIME	CELL	LAT	LON	SPD	CRS	SATT	FIX
DIST	PWR_VOLT	I/O	ALERT_ID	H_METER	BCK_VOLT			MSG_TYPE			

● Definition : String that is sent when some special condition is occurred.

5-4-1. String

Field	Definitions	Remark
HDR	"SA200ALT"	Alert report header
DEV_ID	6 char.	Device ID
SW_VER	3 char.	Software Version
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 3 = Disconnected GPS antenna 4 = Reconnected GPS antenna after disconnected 5 = The vehicle went out from the geo-fence that has following ID. 6 = The vehicle entered into the geo- fence that has following ID. 8 = Shorted GPS antenna. This alert may not support depend on GPS chipset model. 9 = Enter to deep sleep mode 10 = Exit from deep sleep mode 13 = Backup battery error 14 = Vehicle battery goes down to so low level. Refer 7.6 15 = shocked 16 = occurred some collision 18 = Deviate from predefined route 19 = Enter into predefined route 40 = Connected main power 41 = Disconected main power 44 = Connected Backup battery 45 = Disconnected Backup 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)

<example>
SA200ALT;850000;010;20081017;07:41:56;00100;+37.478519;+126.886819;000.012;000.00;9;1;0;15.30;001100;3

<note>
ALERT_ID 3, 4, and 8 are applicable in the device that have external GPS antenna.
ALERT_ID 13 may be reported if backup battery cannot be charged or cannot support during enough time when main power (vehicle battery) is disconnected.
Observation
The" H_METER/ BCK_VOLT/ MSG_TYPE" is include in STT only "HBM_STT"is "1"

5-4-2. Zip

Field	Definitions	Remark
HDR	0x13	Alert report header
DEV_ID	3 bytes	Device ID BCD format If device ID is 123456, this field is full with 0x12, 0x34 and 0x36.
SW_VER	1 byte	Software Version
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	Bit 7: Fix; Bit 6: Latitude; Bit 5: Longitude; Bit 4 ~ Bit 0: Satellite's count

		+/- sign | +/- sign + sign = 0, - sign = 1
DIST	4 byte	Traveled distance in meter
PWR_VOLT	2 bytes	Voltage value of main power 1 byte (integer) + 1 byte (BCD)
I/O	1 byte	Bit 5 Out 2 | Bit 4 Out1 | Bit 3 Input 3 | Bit 2 Input 2 | Bit 1 Input1 | Bit 0 Ignition Ignition : 1 (ON), 0 (OFF) Input1 ~ Input3 : 1 (Ground, Shorted), 0 (Opened) Out1 ~ Out2 : 1 (Active), 0 (Inactive)
ALERT_ID	1 char.	Alert type 0x01 ~ 0x13
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)

<example>
Original String :
SA200ALT;850000;010;20081017;07:41:56;2F100;+37.478519;+126.886819;032.012;000.00;9;1;0;15.30;001100;501
➔ Zip Packet
0x13 0x85 0x00 0x00 0x0A
0x08 0x0a 0x11 0x07 0x29 0x38
0x02 0xF1 0x00
0x25 0x47 0x85 0x19 0x7e 0x88 0x68 0x19
0x00 0x20 0x01 0x00 0x00 0x00 0x89 0x00 0x00 0x00 0x00 0x0F 0x30 0x0c
0x05 0x01

5-5. Alive Report

HDR	DEV_ID

● Definition : Alive report that is sent when no data is sent to server during more than T4 (alive interval).

5-5-1. String

Field	Definitions	Remark
HDR	"SA200ALV"	Alive report header
DEV_ID	6 char.	Device ID

<example>
SA200ALV;850000

5-5-2. Zip

HDR	DEV_ID

Field	Definitions	Remark
HDR	0x14	Alive Report header (1 byte)
DEV_ID	3 bytes	Device ID BCD format
<example> 0x14 0x85 0x00 0x00		

5-6 Data Report from External RS232 device

HDR	DEV_ID	SW_VER	DATE	TIME	CELL	LAT	LON	SPD	CRS	SATT	FIX
DIST	PWR_VOLT	I/O	LEN	DATA	H_METER	BCK_VOLT	MSG_TYPE				

● Definition : String that is sent when the device receives data from external RS232 device.

5-6-1. String

Field	Definitions	Remark
HDR	"SA200UEX"	External Device's Data report header
DEV_ID	6 char.	Device ID
SW_VER	3 char.	Software Version
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 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)
LEN	String	Length of Data
DATA		Data from external RS232 device Up to 500 bytes
CHK_SUM	String	8bit Checksum, Refer to 4.8
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)

<example>
SA200UEX;850000;010;20081017;07:41:56;2F100;+37.478519;+126.886819;000.012;000.00;9;1;0;15.30;0011
00;25;Welcome to Suntech World!;12

Observation
The" H_METER/ BCK_VOLT/ MSG_TYPE" is include in STT only "HBM_STT"is "1"

5-6-2. Zip

Field	Definitions	Remark
HDR	0x16	External Device's Data report header
DEV_ID	3 bytes	Device ID BCD format If device ID is 123456, this field is full with 0x12, 0x34 and 0x36.
SW_VER	1 byte	Software Version
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	Bit 7: Fix; Bit 6: Latitude +/- sign; Bit 5: Longitude +/- sign; Bit 4 ~ Bit 0: Satellite's count + 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	Bit 5: Out 2; Bit 4: Out1; Bit 3: Input 3; Bit 2: Input 2; Bit 1: Input1; Bit 0: Ignition Ignition : 1 (ON), 0 (OFF) Input1 ~ Input3 : 1 (Ground, Shorted), 0 (Opened) Out1 ~ Out2 : 1 (Active), 0 (Inactive)
LEN	2 bytes	Length of Data
DATA		Data from external RS232 device Up to 500 bytes
CHK_SUM	1 byte	8bit Checksum, Refer to 4.8
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)

<example>
Original String :
SA200UEX;850000;010;20081017;07:41:56;2F100;+37.478519;+126.886819;032.012;000.00;9;1;500;15.30;00
1100;25;Welcome to Suntech World!
➔ Zip Packet
0x16 0x85 0x00 0x00 0x0A
0x08 0x0a 0x11 0x07 0x29 0x38
0x02 0xF1 0x00

0x25 0x47 0x85 0x19 0x7e 0x88 0x68 0x19
0x00 0x20 0x01 0x00 0x00 0x00
0x89
0x00 0x00 0x01 0xF4 0x0F 0x30 0x0c
0x00 0x19
0x57 0x65 0x6C 0x63 0x6F 0x6D 0x65 0x20 0x74 0x6F 0x20 0x53 0x75 0x6E 0x74 0x65 0x63 0x68 0x20
0x57 0x6F 0x72 0x6C 0x64 0x21
0x12

5-7. Status String Report by SMS

5-7-1. In case of Backup method

● Definition : Status String by SMS when the vehicle is in no GPRS but available GSM.

HDR	DEV_ID	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 by SMS doesn't include message number field.

5-7-2. In case of Main method

● Definition : Status String by SMS when the device reports only by SMS and does not use GPRS.

HDR	DEV_ID	SW_VER	DATE1	TIME1	CELL1	LAT1	LON1	SPD1	CRS1
SATT1	FIX1	DIST1	PER_VOLT1	I/O1	MODE1	MSG_NO1			
DATE2	TIME2	CELL2	LAT2	LON2	SPD2	CRS2	SATT2	FIX2	DIST2
PER_VOLT2	I/O2	MODE2	MSG_NO2						

...

6. Engineering Commands

Engineering commands is for test or delivery.
It should not be opened to customer side.

6-1. Shutdown

● Definition : Command to shut down.

Command	$SHTDN<enter>
Response	OK (successful) NO SIM (Error : No SIM is inserted) ERROR : Plug out the Main Power ! (Error : Main power is connected).

<notes>
This commands must be sent only by RS232.
Shutdown command is for saving battery power during delivery or stock.
It's available for model that has a backup battery.
For sending this, below steps are followed.

1. Insert SIM and connect main power (12V or 24V) and battery.
2. Disconnect main power.
3. Send "$SHTDN" command after 3 seconds.

After entering to storage mode, the device cannot operate until main power is connected.
Battery charged about 30% can endure 2 months with shutdown mode.

6-2. Stop Shutdown

● Definition : Command to exit shutdown.

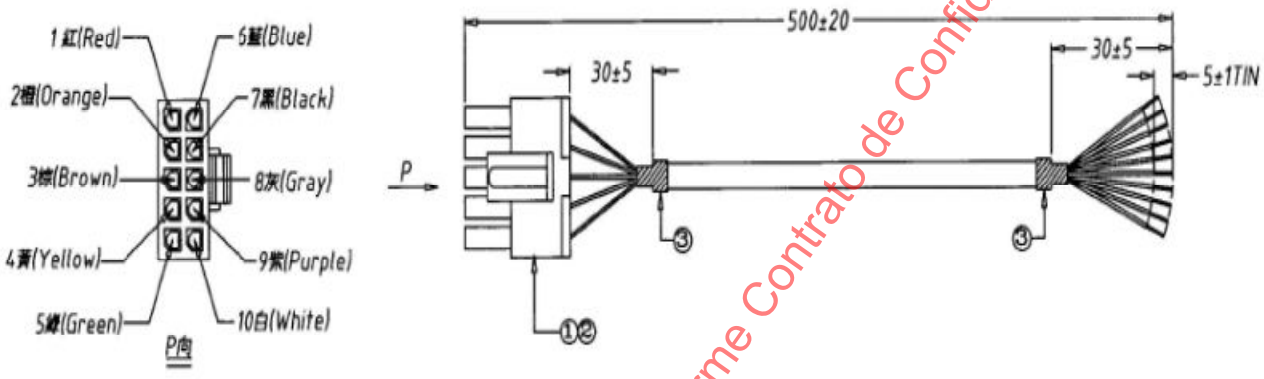
Command	$SHTRST<enter>
Response	OK

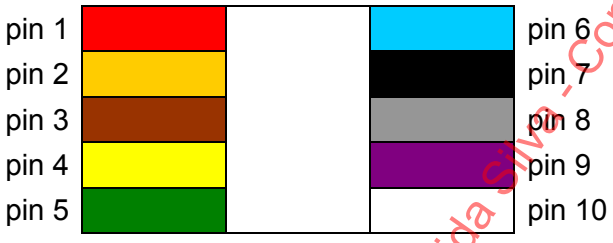
<notes>
This commands must be sent only by RS232.
This command can recognized only when the device does not complete steps for entering storage mode yet.

7. Detail Description of Features

7-1. Event Lines

ST210 has 10pin cable as below picture for events, communication, power and ground line.





	pin 1	Car battery (Main power 8V ~ 30V)	**Fixed**
	pin 2	Output 1	**Fixed**
	pin 3	Output 2	**Fixed**
	pin 4	Input 2	**Fixed**
	pin 5	Input 3	**Fixed**
	pin 6	Ignition	**Fixed**
	pin 7	GND	**Fixed**
	pin 8	TX for ST215R	**Fixed**
	pin 9	RX for ST215R	**Fixed**
	pin 10	Input 1	**Fixed**

Input lines are designed to endure up to 50V and Output lines can endure up to 30V.

7-1-1. 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 immobilizer.

When the device received command to activate the immobilizer output, immobilizer activation is different depending on parking or driving,

In case of driving, immobilizer activation behaves progressive blocking as below blinking diagram.

The active time of the immobilizer increases 90ms each 4s. After 3minutes, immobilizer is activated continuously.

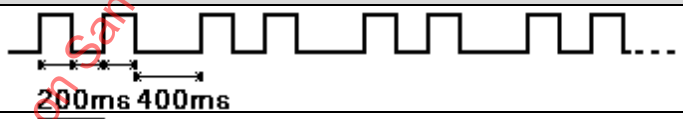
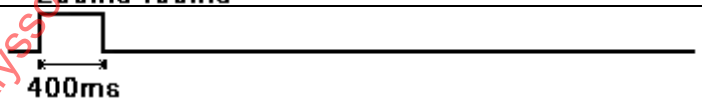
Otherwise, in case of parking, immobilization acts rightly.

If Output type is set to 'Immobilizer & Auto active', the output activates automatically when the vehicle is parked and deactivates when the vehicle starts driving. If the device has received the command of activating immobilizer output, the output activates always regardless parking or driving.

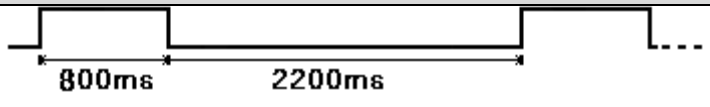
7-1-2. Alert of Buzzer

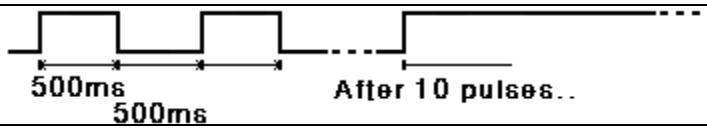
If Output type is set to 'Buzzer', buzzer alerts at below cases.

Voice Model

Condition	Alert Pulse	Remarks
Incoming Call		When the call is coming.
Outgoing Call Error		When outgoing call is failed.

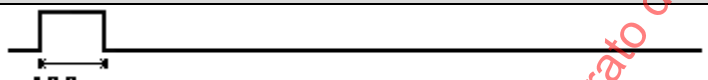
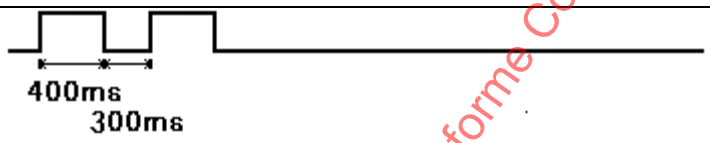
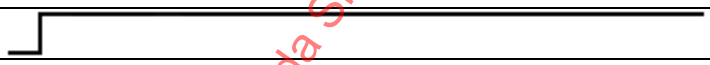
Related over-speed

Condition	Alert Pulse	Remarks
Over speed (Out = Buzzer)		When vehicle's speed exceeds than over speed value.

Over speed (Out = NRT_Buzzer)		When vehicle's speed exceeds than over speed value.
Stop buzzer		When the vehicle's speed is under (pver speed value – 5km/h) during 10 seconds.

Related on anti-theft

In case that any input port is set to "Anti-Theft".

Condition	Alert Pulse	Remarks
Enable		When enabled by pressing anti-theft button during 10 seconds.
Disable		When disabled by pressing anti-theft button during 10 seconds.
Lock Alert		When starts locking mode. (anti-theft is enabled and it passed 20 seconds after parking starts.
Emergency		

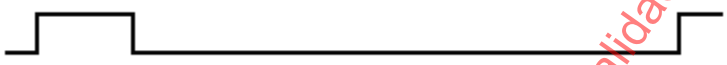
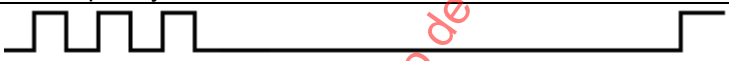
7-2. Indication with Two LED

Green LED indicates GPS status and red LED indicates GPRS status if the device is not processing call.

7-2-1. RED LED for GPS

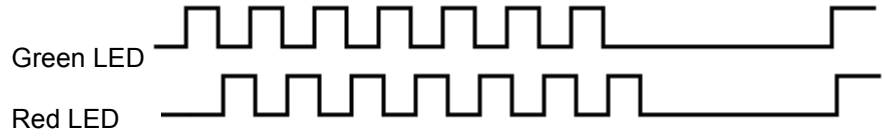
GPS	Blink Count	Remarks
Normal	1	
No Fix	2	 **<Possible Cause>** 1. If power on, GPS chipset is trying to find position during some minutes. 2. GPS antenna lays on weak or no GPS signal position 3. GPS antenna connection is not firm.
GPS Chipset Error GPS Antenna Error	4	 **<Possible Cause>** 1. GPS antenna is disconnected. 2. GPS antenna or socket of GPS antenna is broken. 3. Unit is broken.

7-2-2. BLUE LED for GPRS

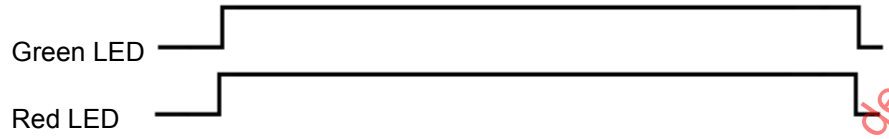
GPRS	Blink Count	Remarks
Normal	1	
Server Com. Error	2	 **<Possible Cause>** 1. Server or network parameter is wrong. 2. Server is closed. 3. Temporary network barrier
GPRS Com. Error	3	 **<Possible Cause>** 1. Network parameter is wrong. 2. SIM is blocked about GPRS using. 3. Temporary network barrier 4. Weak GPRS signal 5. GPRS antenna connection is not firm.
No Network	4	 **<Possible Cause>** 1. GPRS antenna is disconnected. 2. GPRS antenna or socket of GPRS antenna is broken. 3. Device is broken.
SIM PIN Locked	5	 **<Possible Cause>** 1. SIM PIN is enabled.
Cannot Attach NW	6	 **<Possible Cause>** 1. Weak GPRS signal. 2. GPRS antenna connection is not firm.
No SIM	7	 **<Possible Cause>** 1. There is no SIM or SIM is not inserted properly. 2. SIM or SIM socket is broken.

7-2-3. Call LED

- Incoming Call



- During Call



7-3. Power Down

The device can reduce current with two methods, sleep and deep sleep.
If PWR_DN of service setting is set with '1' or '2' and report interval in parking is 10 minutes or more than 10 minutes, the devices can process power down in parking.
There are some restrictions of processing power down.

- If emergency is occurred, device cannot process power down during 30 minutes for safety.
- When GPS signal is not fixed, device process power down after trying to fix during 5 minutes.
- If communication with server is failed continuously, device processes deep sleep after trying communication during 8 minutes.
- During charging backup battery, device cannot process deep sleep.

Device turns off led and sends status report and related alert before entering power down.
The device ends power down when ignition is ON or any events or emergency is occurred, and then it sends related alert and status string.

- Sleep
Device turns off only GPS part and GPRS part enters to sleep.
In sleep, all communication with server works normally and can receive SMS or call always.
Average of sleep current is under 10mA and this current may be increased in weak GPRS condition.

- Deep Sleep
Device turns off GPS and GPRS part.
In deep sleep, all communication with server is disconnected and cannot receive SMS or call too.
Device turns on GPRS part every max. 30 minutes, the device can SMS or call in this time.
Average of deep sleep current is around 5mA (non-battery version).

7-4. Backup Battery

The device has a backup battery in order to be prepared for the emergency case when main power is removed.
When the vehicle is stolen and power of device is removed, it becomes effective.
Backup battery at full charged, report interval set with 3 minutes and vehicle staying in good GPRS condition, device can work for 6 hours at least.

Device is designed to keep backup battery staying most effective always.
Charging starts if voltage of battery goes below 4,2V.
In parking, charging is hold when main power goes under 90% of normal.
Charging algorithm has protection about over voltage, abnormal charging current and temperature.

Device can alert battery error if battery cannot charge also.

7-5. Motion Sensor

<Action of Sensor>

- Ignition ON (Driving)

The sensor mode goes to collision detection mode. So, if there's accident such as impact which is over specified threshold of collision (COLL_THRES), it will be report a collision message to server.
After generated a collision, the sensor will be disabled for a while (30 second) so as to avoid frequently occurrence.

- Ignition OFF (Parking)

The sensor mode goes to parking mode (shock or movement detection mode).
If there's a shock by whom, AVL will report a shock message to the server and exit from the power down mode if in power down mode.
In case of movement, the AVL will be exit to check parking lock from power down mode (in power down mode) but not reports to the server.
After generating event such as a shock or a movement, the sensor will be disabled for a while (30 seconds) so as to avoid frequently occurrence.

<About threshold>

- Collision Threshold

Our recommendation is 0.7 but it's only for reference value from our field test by car (nearby gear).
It's related driver manner or condition of load. So you need to check this value.

- Shock Threshold

Our recommendation is 0.04 but it's only for reference value from our field test by car (nearby gear).
It's related with install position of car's body.
Because of the motion sensor only get the vibration through car's body and it is depend on install place.
Shock Threshold be used for checking movement vehicle also. So, the device may not recognize if shock threshold value is so big.
When you adjust this value, check movement and shock operation with new value.

State	Detection			Exit from Power down			Report		
	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

ON : activation, OFF : Deactivation.
Enable : Enable or Disable by setting.
X : don't care.

For setting method, please refer 6.5.

CAUTION : Basically, the device is check any motion in parking mode(ignition off) and don't care about the enable flags such as COLL_EN or SHOCK_EN.
That means, if the AVL get any motion (movement) in power down mode, it will be exit from the power down mode.
So if you want to check power down mode for power consumption, DO NOT give any impact.

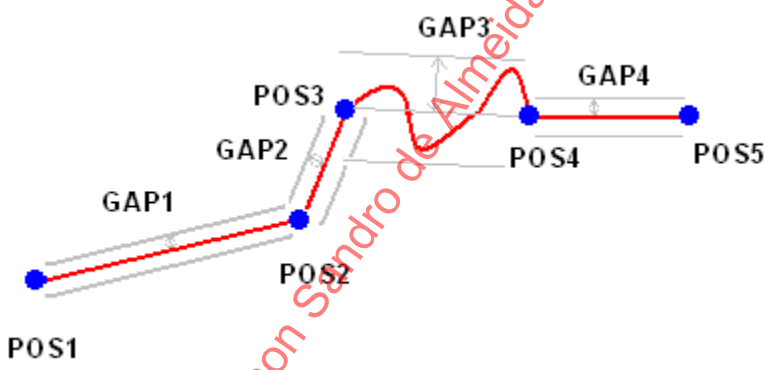
7-6. Protection of Vehicle Battery

When the vehicle has been parked for a long time and vehicle's battery goes to too low level, ST210 enters deep sleep mode automatically to protect from whole discharging of vehicle's battery by saving ST210's current.
In this case, ST210 alerts with ALERT_ID 14 before entering deep sleep mode, and exits from deep sleep mode when ignition line goes to on or voltage level increases.

The vehicle's battery level for protection can be changed by engineering command, '$SetMVolt'.

7-7. Route Deviation

Route deviation is for checking moving track of the vehicle with predefined route.
It is useful the company orders the driver to drive along safe road or not to get out of delivery road.
Below picture is the example of predefined route.



[Sample Route]

<Settings>

Route Setting
For above sample route, setting commands are as below.
SA200STR;xxxxxx;02;1;Latitude of POS1;Longitude of POS1;GAP1;Latitude of POS2;Longitude of POS2;GAP2;Latitude of POS3;Longitude of POS3;GAP3;Latitude of POS4;Longitude of POS4;GAP4;Latitude of POS5;Logitude of POS5;**0**

If number of positions exceeds 10 points, the command should be divided with 10 points.
For example,

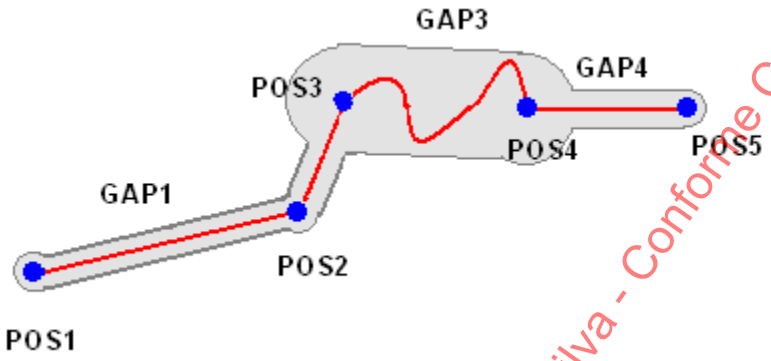
SA200STR;xxxxxx;02;1;Latitude of POS1;Longitude of POS2;GAP1;…..;Latitude of POS10;Longitude of POS10;GAP10
SA200STR;xxxxxx;02;11;Latitude of POS11;Longitude of POS11;GAP11;….

Last field of Gap should be 0 and position can support up to 500.

Start
For start checking route, below command should be sent.
SA200CTR;xxxxxx;02;1

<Operation>

If Route deviation is enabled, the device checks whether the vehicle is moving along predefined route.
In case of sample, the device perceives that the vehicle is moving along predefine route if the vehicle is inside of gray range.



When the vehicle gets out of the route or re-enters to the route, the device alerts with alert ID 18 and 19 to server.

7-8. Anti-Theft

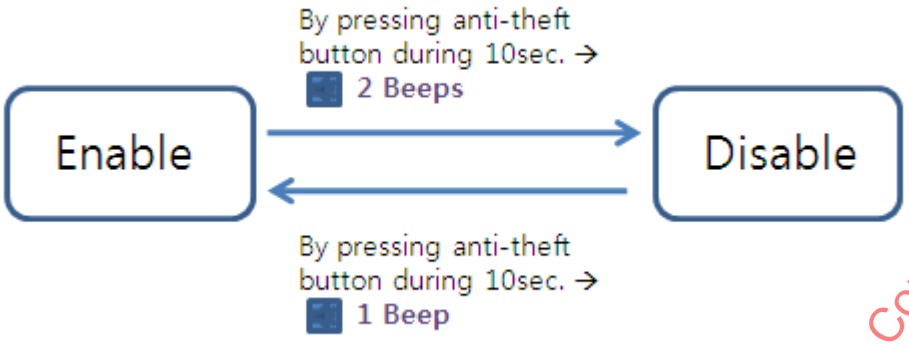
Anti-Theft is for protecting the vehicle against theft by buzzer, immobilizer and alerting to server. immobilizer automatically or activating buzzer.

For using function related on anti-theft, below condition should be satisfied at first.
[Basic Condition]
1. IGNITION of event parameter should not be set to “0” (No Use).
2. One input should be set to **“Anti-theft”** button type.
3. One output should be set to “Buzzer”.

Depending on setting of immobilizer, immobilizer can be activated automatically when emergency related on anti-theft occurs.

Activation/Deactivation

Anti-theft function can be activated or deactivated by pressing anti-theft button during more than 10seconds by driver.
If anti-theft button is pressed during 10 seconds when anti-theft is enabled, anti-theft is disabled with two buzzer beeps. And opposite, if anti-theft button is pressed as being disabled, anti-theft is enabled with one buzzer beep.

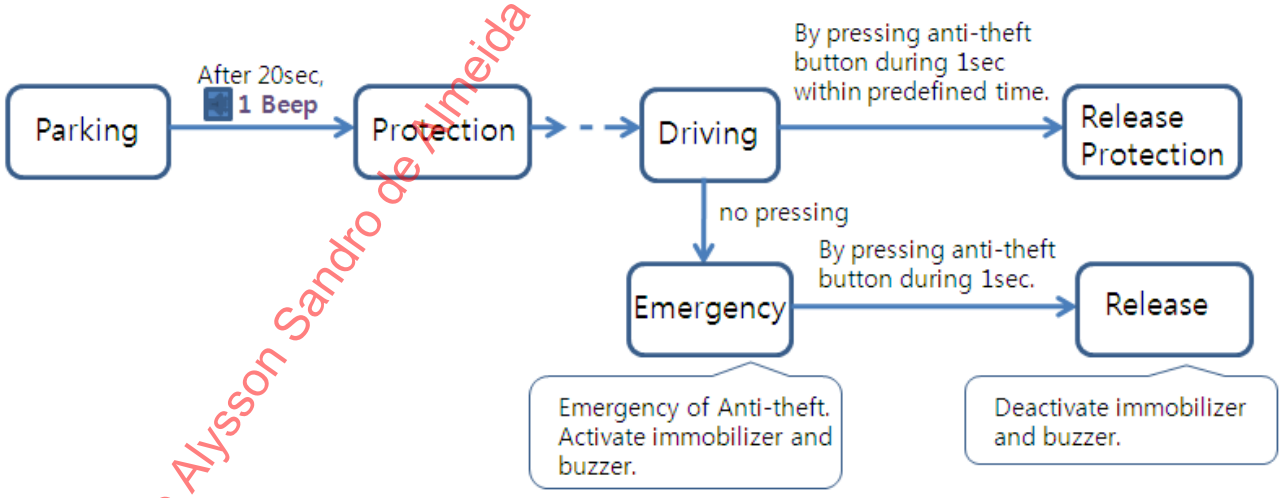


At first time that a input is set to “Anti-theft” by command, anti-theft is enabled by default.
Enable/disable state of anti-theft can be checked by “PresetA” command.

Anti-theft without Door Sensor

This is anti-theft operation when there is no door sensor.

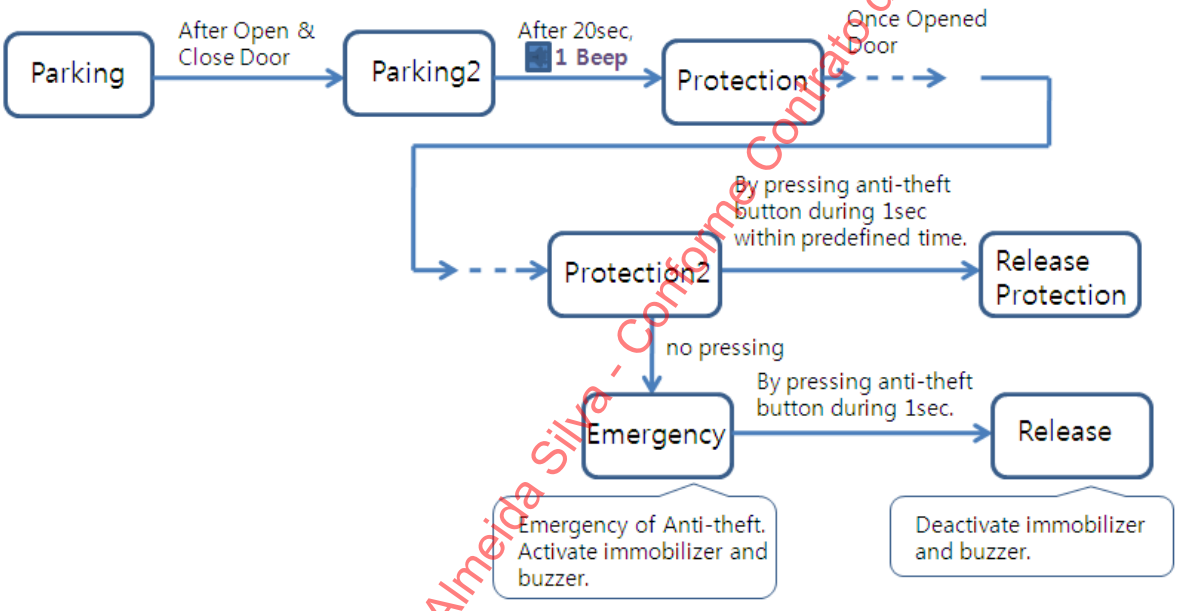
1. After 20 seconds from vehicle is parked (ignition goes to off), protection starts with one beep.
2. When driving starts (ignition goes to on) in protection mode, the device waits pressing of anti-theft button during predefined time of new parameter (“Delay of Anti Theft Emergency”).
3. If the button is pressed during 1 second within this time, protection is released. If there is no pressing within this time, the device starts anti-theft emergency.
4. On emergency, buzzer is activated and immobilizer might be activated if it is connected. And, after “Delay of Anti Theft Report”, the device sends emergency report for anti-theft. By pressing anti-theft button during 1 second, the emergency situation can be stopped rightly.



Anti-Theft with Door Sensor

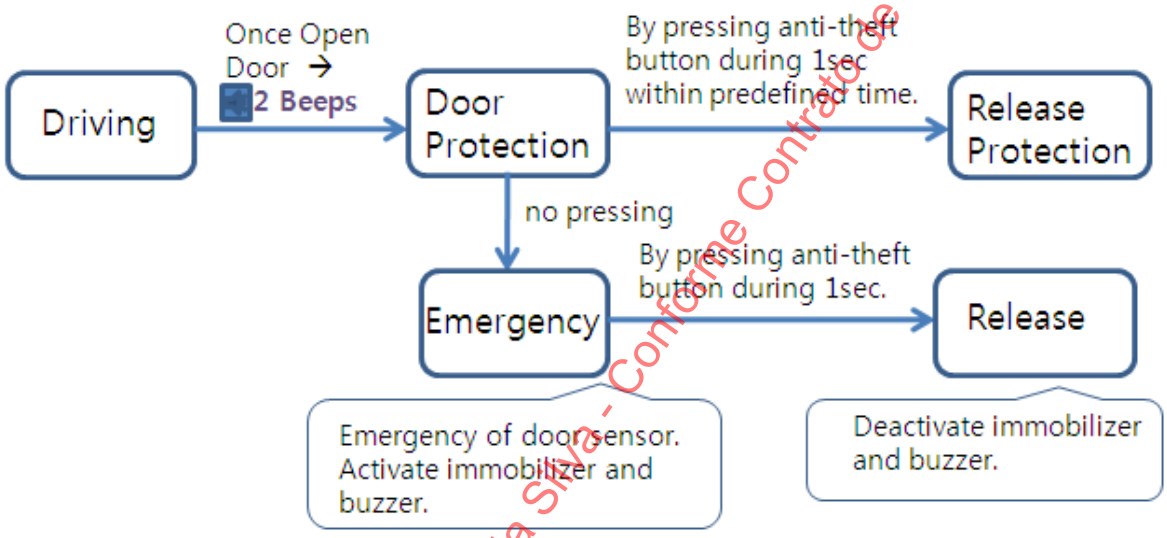
This is anti-theft operation when one input is set to door sensor.

1. After 20 seconds when Ignition goes to off and door is opened and closed, the device start protecting against theft with one beep. This situation means the driver parked the vehicle and went out.
2. Once the driver opens the door on this protection, he should press anti-theft button during 1 second within predefined time of new parameter ("Delay of Anti Theft Emergency"). Otherwise anti-theft emergency is started.
3. On emergency, buzzer is activated and immobilizer might be activated if it is connected. And, after "Delay of Anti Theft Report", the device sends emergency report for anti-theft. By pressing anti-theft button during 1 second, the emergency situation can be stopped rightly.



Door Protection

Door protection is operated when one input is set to “Door Sensor”.
This function is for protecting unsafe act, opening door on driving.
If ignition goes to on with the door being opened, the device beeps two times for note.
Once this situation is occurred, the driver should close the door and press anti-theft button during 1 second within predefined time of new parameter (“Delay of Anti Theft Emergency”).
Otherwise, the device starts door sensor emergency and activates buzzer. Also, it activates immobilizer if it is connected. After there is no pressing anti-theft button during “Delay of Anti Theft Report” time, the device sends door sensor emergency report. By pressing anti-theft button shortly (1 second), the emergency can be stopped and immobilizer and buzzer can be deactivated.



Motion Checking on Anti-theft Protection

Motion check on parking can be operated when below conditions are satisfied.
M_SENSOR of service parameter should not be set to “0” (Disable).
IGNITION of event parameter should not be set to “No Use” or “Virtual by Motion”.

When protection against anti-theft starts (with/without door sensor), motion checking is started also.
On protection mode, if movement has checked during more than 30 seconds, the device starts movement emergency and sends related emergency report and activates immobilizer and buzzer if they are connected. By pressing anti-theft button shortly (1 second), the emergency can be stopped and immobilizer and buzzer can be deactivated.

REVISIONS

Rev.	Date	Changes	Author
Rev. 1.00	2012-12-05	Construct Protocol	Ronaldo
Rev. 1.01	2012-12-13	Changed Motion Setting, Main Voltage Setting Command	KJH
Rev. 1.02	2012-12-17	General review and changed some details	Ronaldo
Rev. 1.03	2013-02-05	Included ST240	Ronaldo