Version：V1.1
Confidential

Shenzhen Concox Information Technology Co. Ltd

GK309E
Communication Protocol

Important Revision History

Writer	Date	Version	Audit	Approval	Description
	2014/9/13	1.0.			First edition
					1. Add LBS + WIFI information packet (0x2c) 2. Add WTMER, WIFION, WIFIOFF and LJDW control command

Content

1. Communication statute

1.1. Introduction

This document defines instructions about interface protocol on application layer of vehicles GPS tracker and location-based service platform. Related interface protocol only applies in the interaction between the platform and the terminal.

1.2. Compatibility

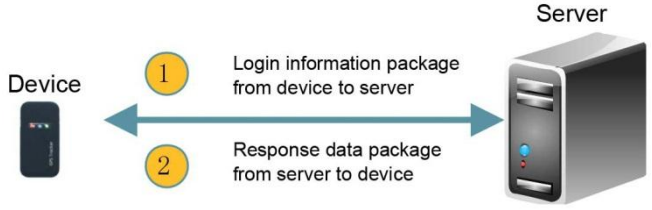
The applicable platform version is GK309.

2. Terms and definitions

Terms/ab.	English meanings
CMPP	China Mobile Peer to Peer
GPS	Global Positioning System
GSM	Global System for Mobile Communication
GPRS	General Packet Radio Service
TCP	Transport Control Protocol
LBS	Location Based Services
IMEI	International Mobile Equipment Identity
MCC	Mobile Country Code
MNC	Mobile Network Code
LAC	Location Area Code
CI	Cell ID
RSSI	Received Signal Strength Indicator
UDP	User Datagram Protocol
SOS	Save Our Ship/Save Our Souls
CRC	Cyclic Redundancy Check
NITZ	Network Identity and Time Zone
GIS	Geographic Information System

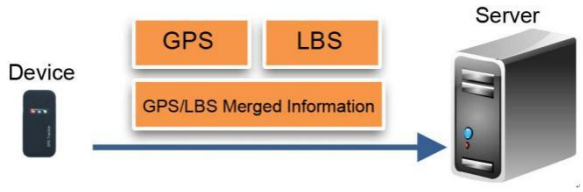
3. Basic rules

1. Terminal will send login information package by default and wait confirmation from the server.

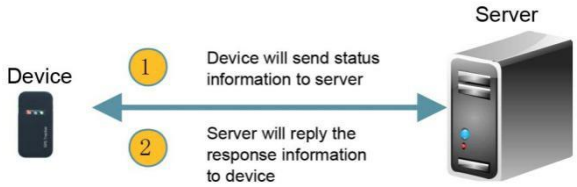


2. After the normal connection is established, the terminal will regularly send GPS, LBS combined

info package or GPS and LBS info package separately to server after changing of the GPS info. Server can set the default sending protocol by command.



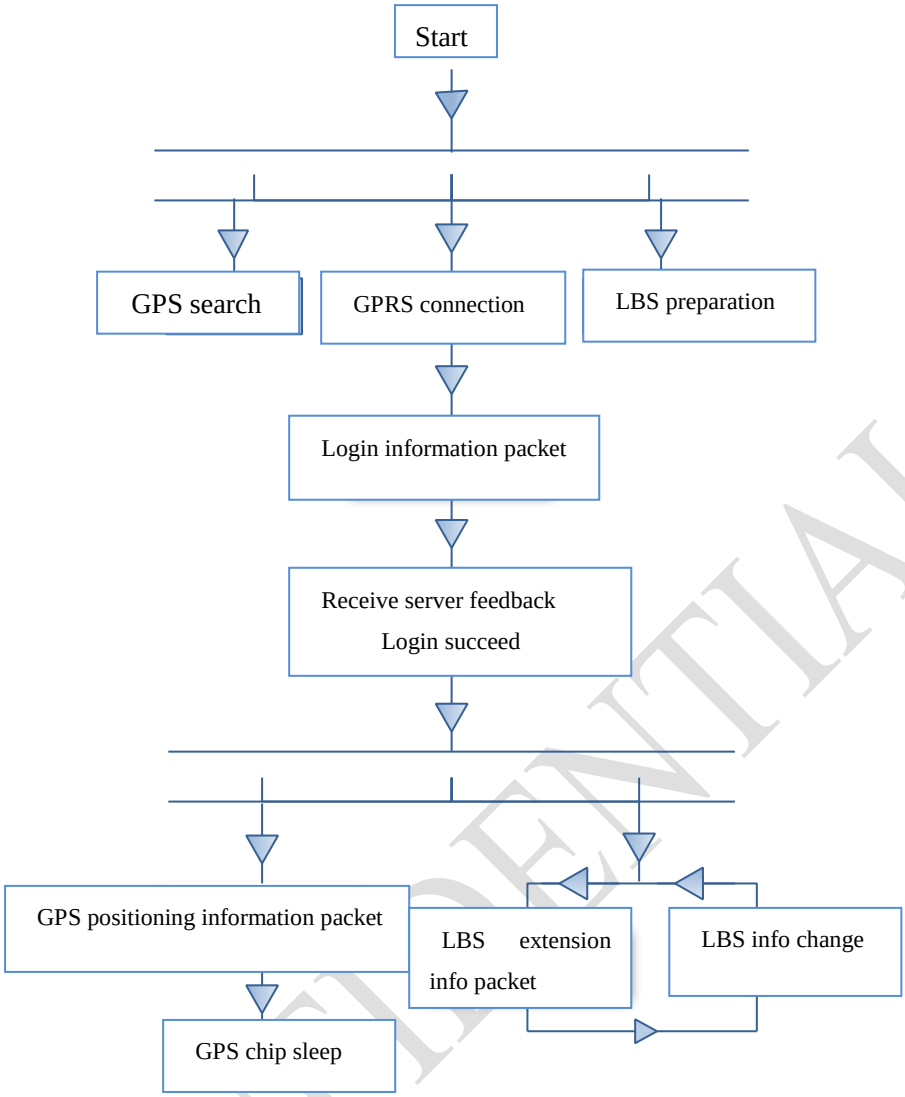
3. To ensure the effectiveness of the connection, the terminal will send state information to server during fixed interval and the server will reply the response information package to confirm.



4. GPRS network connection

GK309 uses TCP to connect with server.

Basic Procedure:



4. Data Package Format

Communication transfer is asynchronous mode in byte. It transfers serial data stream of every uncertain length data package between terminal and server.

Data package length:（10+N）Byte

Format	Length(Byte)
Start Bit	2
Packet Length	1
Protocol Number	1
Information Content	N
Information Serial Number	2
Error Check	2
Stop Bit	2

Note: For GK309, Single byte packet length is mainly used.

Double byte length packet is used when message length exceeds 255 bytes. Data packet length: (11+N) Byte

Format	Length(Byte)
Start Bit	2
Packet Length	2
Protocol Number	1
Information Content	N
Information Serial Number	2
Error Check	2
Stop Bit	2

4.1. Start Bit

Message differentiates the data packet by the start bit.
Single byte length data packet: Fixed value in HEX 0x78 0x78
Double bytes length data packet: Fixed value in HEX 0x79 0x79

4.2. Packet Length

Length = Protocol Number + Information Content + Information Serial Number + Error Check, totally (5+N) Byte, because the Information Content is a variable length field.

4.3. Protocol Number

Refer to different "information content" and correspond to the protocol number.

Type	Value	Switched protocol needed when the content replied by server is in English	Description
Login information packet	0x01		Server response
GPS information packet	0x10		General GPS position upload
Heartbeat, status information packet	0x13		For network maintenance, server must reply.
GPS/LBS/Status merged information packet	0x16(Chinese)	0x96（English response）	GPS alert packet
LBS/Checking location via	0x17(Chinese)	0x97（English response）	LBS immediate

phone number Information packet			positioning
LBS extension information packet	0x18		General LBS position upload
LBS/Status Merged packet	0x19(Chinese)	0x99（English response）	LBS alert packet
GPS/Checking location via phone number information packet	0x1A(Chinese)	0x9A（English response）	GPS immediate positioning
Synchronizations package	0x1F		Time checking
Server Sends Command To Terminal (setting) package	0x80		Control command channel (uplink/downlink)
Server Sends Command To Terminal (checking) package	0x81		Control command (data) uplink channel
Request the latitude and longitude of LBS	0x8B		Obtain latitude, longitude and current time by LBS.
LBS+WIFI information packet	0x2C		

4.4. Information Serial Number

The serial number of the first GPRS data (including status packet and data packet such as GPS, LBS package) sent after booting is '1', and the serial number of data sent later at each time will be automatically added '1'.

5. Information Contents

The specific contents are determined by the protocol numbers corresponding to different applications.

5.1. Login Message Packet (0x01)

5.1.1. **Content**

Format	Content		
	Terminal ID	Type Identifier	Extension Bit
Length	8	2	2

Login Message Package is used to confirm whether the connection is normal and submit terminal ID to server.

There are two types of login message package, one is with the extension bit, and the other is without the extension bit.

5.1.1.1.Terminal ID

The Terminal ID number is 15 bits.
E.g. If the IMEI is 123456789012345, then the Terminal ID will be: 0x01 0x23 0x45 0x67 0x89 0x01 0x23 0x45.

5.1.1.2.Type Identifier

Type Identifier occupied 2 bytes. It can be used for identify terminal type.
E.g. For GK309 LBS version, the Type Identifier will be 0x10 0x04.
E.g. For GK309 GPS version, the Type Identifier will be 0x10 0x05.

Model	Type Identifier
GK301(LBS)	0x10 0x04
GK301(GPS)	0x10 0x05
GK306(LBS)	0x10 0x16
GK306(GPS)	0x10 0x17
GK309(LBS)	0x10 0x1D
GK309(GPS)	0x10 0x1C

5.1.1.3.Extension Bit

	Meaning	
One and a half bytes (bit15—bit4)	15	The time zone value times 100.
	14	
	13	
	12	
	11	
	10	
	9	
	8	
	7	
	6	
	5	
	4	
Low half	3	Eastern/western time zone

byte (bit4-bit0)	2	—	
	1	Language selection bit	1
	0	Language selection bit	0

Note:

Bit3 0------- Eastern time zone

1------- Western time zone

E.g.

If the Extension bit is: 0x32 0x00, it indicates GMT+8:00.

Arithmetic: 8*100=800, convert 800 into hex value, which is 0x0320.

If the Extension bit is: 0x4D 0xD8, it indicates GMT-12:45.

Arithmetic: 12.45*100=1245, convert 1245 into hex value, which is 0X04 0XDD.

Algorithmic method: to combine the time zone value with eastern/western time zone and language selection bit so as to save the bytes.

5.1.2. **Server Response**

The example of the login message packet without extension bit is as below;

Terminal->Server (here the terminal ID is 123456789012345)

	Format	Value
Login message packet without extension bit （20 Byte）	Start Bit	0x78 0x78
	Packet Length	0x0D
	Protocol Number	0x01
	Terminal ID	0x01 0x23 0x45 0x67 0x89 0x01 0x23 0x45
	Identifier	0x10 0x04
	Information Serial Number	0x00 0x01
	CRC verify	0x8C 0xDD
	Stop Bit	0x0D 0x0A

The example of the login message packet with the extension bit is as below:

	Format	Length(Byte)
Login message packet with the extension bit （22 Byte）	Start Bit	0x78 0x78
	Packet Length	0x11
	Protocol Number	0x01
	Terminal ID	0x03 0x53 0x41 0x90 0x30 0x09 0x96 0x21

	Identifier	0x10 0x06
	Extension bit	0x32 0x01
	Information Serial Number	0x00 0x01
	CRC verify	0x37 0x6C
	Stop Bit	0x0D 0x0A

Server-> Terminal (the response protocol number is the same with the one sending by terminal)

Description	Example
Start Bit	0x78 0x78
Packet Length	0x05
Protocol Number	0x01
Serial Number	0x00 0x01
CRC Verify	0xD9 0xDC
Stop Bit	0x0D 0x0A

5.1.3. **Function**

Login message packet will be sent the first time when the terminal connects with the platform, and it is used for platform to recognize different ID.

5.2. GPS Information package（0X10）

Format		Length(Byte)
Information Content	Date and Time	6
	GPS message length, Quantity of GPS satellites	1
	Latitude	4
	Longitude	4
	Speed	1
	Course, Status	2
	Reserved extension bit	2

5.2.1.1.Date and time

Format	Length(Byte)
Year	1
Month	1
Day	1

Hour	1
Minute	1
Second	1

E.g. 2010-03-23 15:50:23

Calculated as follows: 10(Decimal)=0A(Hexadecimal)
3 (Decimal)=03(Hexadecimal)
23(Decimal)=17(Hexadecimal)
15(Decimal)=0F(Hexadecimal)
50(Decimal)=32(Hexadecimal)
23(Decimal)=17(Hexadecimal)

Then the value is: 0x0A 0x03 0x17 0x0F 0x32 0x17

5.2.1.2.GPS info length/ Number of satellites involved in locating

1 byte converts to binary is 8 bit, the first 4 bit means GPS info length, the last 4 bit means number of satellites involved in locating.

Note: The length includes 1 byte occupied by itself.

E.g. 0xCC means GPS information length is 9 bytes, the number of satellite involved in locating is 12.

5.2.1.3.Latitude

Occupy 4 bytes, representing the latitude value. Value ranges from 0 to 162000000, which represents the latitude ranges from 0 °to 90 °.Unit: 1/500 second

Conversion method:

(1) Convert the latitude (degrees, minutes) data from GPS module into a new form which represents the value only in minutes;
(2) Multiply the converted value by 30000, and then transform the result to hexadecimal number

E.g. For 22°32.7658′, (22×60＋32.7658)×30000=40582974,then convert it to hexadecimal number 0x02 0x6B 0x3F 0x3E

5.2.1.4.Longitude

Occupy 4 bytes, representing the longitude value of location data. Number ranges from 0 to 324000000, representing the range form 0 °to 180 °.Unit: 1/500 seconds, Conversion method is the same as latitude's.

5.2.1.5.Speed

Occupy 1 byte, representing the speed of the terminal; ranges from 0 to 255. Unit: kilometer/hour.

5.2.1.6.Status/Course

Occupy 2 bytes; representing the moving direction of the terminal; ranges from 0-360; unit: degree, regards due north as 0 degree; clockwise.

1 byte is composed of eight binary. In the first byte, the first six binary represents status. The last two binary and the whole eight binary in the second byte (10 binary in total) represents course.

BYTE_1	Bit7	—
	Bit6	—
	Bit5	GPS real-time/differential positioning
	Bit4	GPS having been positioning or not
	Bit3	East Longitude, West Longitude
	Bit2	South Latitude, North Latitude
	Bit1	Course
	Bit0	
BYTE_2	Bit7	
	Bit6	
	Bit5	
	Bit4	
	Bit3	
	Bit2	
	Bit1	
	Bit0	

0: south latitude 1: North latitude

0: East longitude 1: West longitude

0: GPS has not located 1: GPS has located

0: Real time GPS 1: Different GPS

Note: The status information in the data packet is the status corresponding to the time bit recorded in the data packet.

E.g. the value is 0x15 0x4C, the corresponding binary is 00010101 01001100,

BYTE_1 Bit7 0

BYTE_1 Bit6 0

BYTE_1 Bit5 0 (real time GPS)

BYTE_1 Bit4 1 (GPS has been positioned)

BYTE_1 Bit3 0 (East Longitude)

BYTE_1 Bit2 1 (North Latitude)

BYTE_1 Bit1 0

BYTE_1 Bit0 1

BYTE_2 Bit7 0
BYTE_2 Bit6 1
BYTE_2 Bit5 0 → Course 332 °(0101001100 in Binary, or 332 in decimal)
BYTE_2 Bit4 0
BYTE_2 Bit3 1
BYTE_2 Bit2 1
BYTE_2 Bit1 0
BYTE_2 Bit0 0 ————

which means GPS tracking is on, real time GPS, location at north latitude, east longitude and the course is 332 °.

5.2.1.7.Reserved bit

Reserved bit as N is 2byte.

One nibble bit15—bit4	15	No definition
	14	
	13	
	12	
	11	
	10	
	9	
	8	
	7	
	6	
	5	
	4	
Low nibble bit4-bit0	3	
	2	
	1	Language selection bit 1
	0	Language selection bit 2

Note:

Language selection bit 0=1 (or 0), language selection bit 1=0, which means the terminal asks platform to reply Chinese location information by SMS.

Language selection bit 0=1, language selection bit 1=1, which means the terminal asks platform to reply English location information by SMS.

E.g. Extension bit value is 0x00 0x00 or 0x00 0x01, that means ask for Chinese location information. Value is 0x00 0x02 means English one.

5.2.2. **Function**

The terminal will upload GPS location after connected with platform and located by GPS.

If the GPS need work for long time, such as SOS active GPS or active GPS on platform, GPS will work for 20mins. At this moment, GPS will upload location data for every 10s by default. If the terminal does not support GPS work for long time, this data package will not be uploaded.

5.2.3 Example

GPS information packet (terminal →server)
78 78 19 10 0E 09 03 0E 0A 26 C5 02 6C 19 96 0C 38 D1 20 00 14 00 00 01 00 1C 10 C6 0D 0A
Server response（server → terminal）:
No need to reply

5.3. Heartbeat Packet（Information Status Packet）（0x13）

Format	Information Content			
	Terminal Information Content	Voltage Level	GSM Signal Strength	Reserved Bit
Length (Byte)	1	1	1	N

5. 3.1 Terminal Information

One byte is consumed defining for various status information of the mobile phone.

Hig-order bit							Low-order bit
7	6	5	4	3	2	1	0

Bit 0	Reserve
Bit 1	Reserve
Bit 2	Reserve
Bit 3-Bit 5	000：Normal 001：Reserve 010：Power On Alarm 011：Low Battery Alarm 100：SOS Alarm 101：Enter geo-fence 110：Exit geo-fence

	111：Power Off Alarm
Bit 6	Reserve
Bit 7	No definition

Note: Status information of the data packet is the status recorded by time position in data packet. This byte in the 0x13 heartbeat packet is meaningless. Alert information uploaded by other protocol.

5.3.2 Voltage Level

The range is 0~6 defining the voltage is from low to high.
0: No Power (shutdown)
1: Extremely Low Battery (not enough for calling or sending text messages, etc.)
2: Very Low Battery (Low Battery Alarm)
3: Low Battery (can be used normally)
4: Medium
5: High
6: Very High

5.3.3 GSM Signal Strength Levels

0x00: no signal;
0x01: extremely weak signal;
0x02: very weak signal;
0x03: good signal;
0x04: strong signal.

5.3.4 Reserved Extension Bit

Reserved bit is 2 bytes and the same as GPS data packet definition.

<table>
<tr><td colspan="9">Extension Bit 2 bytes</td></tr>
<tr><td>BYTE_1</td><td colspan="8">BYTE_2</td></tr>
<tr><td>0x01-0x0A： Reserve</td><td rowspan="5">Alarm fence series number 3</td><td rowspan="5">Alarm fence series number 2</td><td rowspan="5">Alarm fence series number 1</td><td rowspan="5">Alarm fence series number 0</td><td rowspan="5">No definin</td><td rowspan="5">No definition</td><td rowspan="5">Language selection 1</td><td rowspan="5">Language selection 0</td></tr>
<tr><td>GPS enters dead zone alarm：0x0B</td></tr>
<tr><td>GPS exits dead zone alarm：0x0C</td></tr>
<tr><td>Illegal use alarm（SIM card alarm）： 0x0D</td></tr>
<tr><td>Others： No definition</td></tr>
</table>

					i t i o n			

Description: The high half byte of byte 2 is the fence series number of enter /exit alarm.
These two bytes in the 0x13 heartbeat packet is meaningless. Alert information uploaded by other protocol.

5.3.5 Server Response

The server needs to response after receiving the data packet.

	Format	Length (Byte)
Server response（10 Byte）	Start Bit	2
	Data Bit Length	1
	Protocol Number	1
	Serial Number	2
	Error Check	2
	Stop Bit	2

5.3.6 Function

The terminal starts to upload status information of terminal after connected with platform.
The terminal uploads data package every 5mins by default.

5.3.7 Example

Status packet(terminal→server)：
78 78 0A 13 00 05 00 00 01 00 0A 65 7E 0D 0A
Server reply（server→terminal）：
78 78 05 13 00 0A 57 22 0D 0A

5.4. Combined information packet of GPS, LBS and Status (0X16)

Format	Information Content				
	Da	GPS Information	LBS Information	status Information	Reserve

	te Time														d extension bit
		GPS information length, Quantity of GPS information satellites	Latitude	Longitude	Speed	Course, Status	LBS Length	MCC	MNC	LAC	Cell ID	Terminal Information Content	Voltage Level	GSM Signal Strength	N
Length(Byte)	6	1	4	4	1	2	1	2	1	2	3	1	1	1	2

See above for details of parameters and format. Status information and reserved extension bit is the same as defined in 0x13.

Server needs to respond and send alarm message to parents which includes address when SOS and geo-fence alarm occurs. Then the terminal will forward it to parents as soon as reply received. For other type of alarms, say power off alarm, the server can decide whether to send message or not as it has already sent message to parents in the period of uploading the alarm to server.

5.4.2 Server Response

The terminal asks server for replying Chinese or English address, the replying data packages are different according to extension command.

Replying data packet of Chinese:

	Format		Length (Byte)
Command packet sent from the server to the terminal （15+M Byte）	Start Bit		2
	Packet length		1
	Protocol Number		1
	Information Content	Length of Command	1
		Server Flag Bit	4
		Command content	M
		Reserved extension bit	0
	Information Serial Number		2
	Error Check		2
	Stop Bit		2

Applying Chinese address protocol no.:0X16.

Info content is as below：

	Format	Length (Byte)
Information Content	Length of Command	1
	Server Flag Bit	4
	Command content	M
	Reserved extension bit	0

Command content: ADDRESS&&address content&&phone number##
Chinese address content will be sent as Unicode.

Regarding the foreign countries' addresses information are longer; add data bit into 2 Bytes in case of 1 data is not enough.
Note：
Only the data bit length of address info protocol No. is changed into 2 Bytes.

	Format		Length (Byte)
Command packet sent from the server to the terminal (15+M+N Byte)	Start Bit		2
	Packet length		2
	Protocol Number		1
	Information Content	Length of Command	2
		Server Flag Bit	4
		Command content	M
		Reserved extension bit	0
	Information Serial Number		2
	Error Check		2
	Stop Bit		2

Applying for English address protocol: 0X96

5.4.3 Example

GPS,LBS and status merged packet(terminal→serve)：
78 78 25 16 0e 09 0b 0e
3a 13 c9 02 6c 19 b7 0c
38 d1 41 00 14 7d 09 01
cc 00 28 66 00 0e ee 60
06 04 00 01 01 1d 31 d9
0d 0a

Server reply（server→terminal）:
SOS!广东省深圳市宝安区留仙一路.G4.高新奇工业区<2014-09-11 14:58>
78 78 94 16 8e 00 00 00
01 41 44 44 52 45 53 53
26 26 7d 27 60 25 54 7c
53 eb 00 21 5e 7f 4e 1c
77 01 6d f1 57 33 5e 02
5b 9d 5b 89 53 3a 75 59
4e d9 4e 00 8d ef 00 2e
00 47 00 34 00 2e 79 bb
9a d8 65 b0 59 47 5d e5
4e 1a 53 3a 7e a6 00 37
00 36 7c 73 00 2e 00 3c
00 32 00 30 00 31 00 34
00 2d 00 30 00 39 00 2d
00 31 00 31 00 20 00 31
00 34 00 3a 00 35 00 38
00 3e 26 26 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 23 23 01 1d 35 c0 0d
0a

5.5. LBS, Phone Number Checking Location Info Package (0X17)

5.5.1. Terminal Sending Data Packet to Server

Format			Length (Byte)
Info content	LBS info	MCC	2
		MNC	1
		LAC	2
		Cell ID	3
	Phone Number		21
	Reserved Extension Bit		N(N=2)

Note: “ Phone Number”----parent’s number, used for replying message.
Reserved extension bit N=2, which is as same as the GPS information package.

5.5.2. **Server Response**

The server replies Chinese address or English address based on the extended command, and the response data packet is inconsistent
The response data packet in Chinese is as follow:

	Format		Length (Byte)
Command packet sent from the server to the terminal（15+M+N Byte）	Start Bit		2
	Packet Length		1
	Protocol Number		1
	Information Content	Length of Command	1
		Server Flag Bit	4
		Command content	M
		Reserved extension bit	0
	Information Serial Number		2
	Check Bit		2
	Stop Bit		2

The Protocol Number of request Chinese address response is 0X17.

Info content is as below:

	Format	Length (Byte)
Information Content	Length of command	1
	Server flag bit	4
	Command content	M
	Reserved extension bit	0

Command Content: ADDRESS&&Address Content&&Phone Number##
Chinese address content is sent in UNICODE.

Considering the address or other foreign address in English is generally longer than that in Chinese, one data bit is not enough, so the data bit is occupied in 2 bytes.
Note: only the packet length corresponding to the protocol number of response address information is changed into two bytes.

	Format		Length (Byte)
Command packet sent from the server to	Start Bit		2
	Packet length		2
	Protocol Number		1
	Informa	Length of Command	2

the terminal（17+M Byte）	tion Content	Server Flag Bit	4
		Command content	M
		Reserved extension bit	0
	Information Serial Number		2
	Check Bit		2
	Stop Bit		2

The Protocol Number of request English address response is 0X97.

5.5.3. **Example**

LBS and PHB information packet(terminal→server)：
78 78 24 17 01 CC 00 28 66 00 0E EE 2B 38 36 31 35 30 31 32 35 38 34 31 30 35 00 00 00 00 00 00 00 00 00 01 00 27 B0 CE 0D 0A
server reply(server → terminal)：
Location：广东省.深圳市.宝安区边检路.甲岸科技园附近.同乐出口附近.(N22.575,E113.917)附近
78 78 9A 17 94 00 00 00 01 41 44 44 52 45 53 53 26 26 62 40 59 04 4F 4D 7F 6E 00 3A 5E 7F 4E 1C 77 01 00 2E 6D F1 57 33 5E 02 00 2E 5B 9D 5B 89 53 3A 8F B9 68 C0 8D EF 00 2E 75 32 5C B8 79 D1 62 80 56 ED 96 44 8F D1 00 2E 54 0C 4E 50 51 FA 53 E3 96 44 8F D1 00 2E 00 28 00 4E 00 32 00 32 00 2E 00 35 00 37 00 35 00 2C 00 45 00 31 00 31 00 33 00 2E 00 39 00 31 00 37 00 29 96 44 8F D1 26 26 2B 38 36 31 35 30 31 32 35 38 34 31 30 35 00 00 00 00 00 00 00 23 23 00 27 FD 82 0D 0A

A. Example of Chinese address response information:

7878 //start bit
84 // data length
17 // Response Protocol Number
7E //command length, i.e.: SMS content length
00000001 //serial number sent from server

41444452455353 //ADDRESS
2626 //&& separator
624059044F4D7F6E0028 // Chinese address is sent in UNICODE
004C004200530029003A
5E7F4E1C77015E7F5DDE
5E0282B190FD533AFF17
FF15FF144E6190530028
004E00320033002E0033
00390035002C00450031
00310032002E00390038

0038002996448FD1
2626 //&& separator
3133373130383139313335000000000000000000 //phone number
2323 //## terminator of content
0106 // Serial No.
3825 // Check Bit
0D0A //end bit

B. **Example of English address info replying:**

7878 //start bit
00D1 //data length
97 // Response Protocol Number
00CA //command length; content info length;
00000001 //serial number sent from server
41444452455353 //ADDRESS
2626 //&& separator
0053004F00530028004C // English address is sent in UNICODE
0029003A005300680069
006D0069006E00200046
0061006900720079006C
0061006E006400200057
0065007300740020052
0064002C004800750069
006300680065006E0067
002C004800750069007A
0068006F0075002C0047
00750061006E00670064
006F006E00670028004E
00320033002E00310031
0031002C004500310031
0034002E003400310031
0029004E006500610072
00620079
2626 //&& separator
3132353230313337393037373430353100000000000 //phone number
2323 //## terminator of content
0007 //serial number
72b5 //check bit
0D0A //end bit

5.6. LBS Extension Information package (0X18)

Format		Length (Byte)
Information	Date & Time	6

Content	LBS extension information	MCC	2
		MNC	1
		LAC	2
		CI	3
		RSSI	1
		NLAC①	2
		NCI①	3
		NRSSI①	1
		NLAC②	2
		NCI②	3
		NRSSI②	1
		NLAC③	2
		NCI③	3
		NRSSI③	1
		NLAC④	2
		NCI④	3
		NRSSI④	1
		NLAC⑤	2
		NCI⑤	3
		NRSSI⑤	1
		NLAC⑥	2
		NCI⑥	3
		NRSSI⑥	1
	Reserved extension bit		N

5.6.1. **Date & Time**

The same as section mentioned above.

5.6.2. **LBS Information**

5.6.2.1.MCC

The same as mentioned above.

5.6.2.2.MNC

The same as mentioned above.

5.6.2.3.LAC

The same as mentioned above.

5.6.2.4.CI（Cell ID）

Cell ID ranges from 0x000000 to 0xFFFFFF

5.6.2.5.RSSI（Received Signal Strength Indicator）

RSSI ranges from 0x00 to 0xFF. The actual value of signal strength is negative, while its absolute value is uploaded.

5.6.2.6.NLAC1～6

The neighboring location area code, there are six of them.

5.6.2.7.NCI1～6（Neighboring Cell ID）

The neighboring cell ID is one-to-one correspondence with the six neighboring location area code.

5.6.2.8.NRSSI1～6（Near Cell ID Signal Strength）

NRSSI is one-to-one correspondence with the six neighboring location area code.

5.6.3. **Extension byte**

N=2, the same as GPS data.

5.6.4. **Function**

Terminal uploads base extension info packet to server timely and automatically under the circumstances of no GPS or GPS off, realizing positioning (History upload).

5.6.5. **Example**

LBS extension information packet(terminal→server)：

78 78 3B 18 00 00 00 00 00 00 01 CC 00 28 66 00 0E E3 60 28 66 00 0E EE 59 28 66 00 0E ED 5B 28 66 00 0E E4 6B 00 00 00 00 00 FF 00 00 00 00 00 FF 00 00 00 00 00 FF FF 00 01 00 0C 72 A6 0D 0A

Server response(server → terminal)：

78 78 05 18 00 0C 1B B2 0D 0A

No need to reply

5.7. LBS/ Status Info Package（0X19）

5.7.1. Terminal Sending Data Packet to Server

Format			Length (Byte)
Information Content	LBS Information	MCC	2
		MNC	1
		LAC	2
		Cell ID	3
	Status Information	Terminal Information Content	1
		Voltage Level	1
		GSM Signal Strength	1
	Extension bit		N

Extension bit N=2, the same as statue information.

5.7.2. Server response

The server needs to response after receiving the data packet.

See 5.5.2. Response protocol number: Chinese: 0x19; English:0x99.

Note: For platform compatibility, protocol used here could be 0x19 and 0x17. Server uses 0x17.

5.7.3. Example

LBS status packet（terminal→server)：

78 78 12 19 01 CC 00 28 66 00 0E EE 20 05 04 00 01 00 14 50 0C 0D 0A

Server reply（server → terminal）：

SOS call：广东省.深圳市.宝安区边检路.甲岸科技园附近.同乐出口附近.(N22.575,E113.917)附近

78 78 9A 17 94 00 00 00 01 41 44 44 52 45 53 53 26 26 7D 27 60 25 54 7C 53 EB 00 3A 5E 7F 4E 1C 77 01 00 2E 6D F1 57 33 5E 02 00 2E 5B 9D 5B 89 53 3A 8F B9 68 C0 8D EF 00 2E 75 32 5C

B8 79 D1 62 80 56 ED 96 44 8F D1 00 2E 54 0C 4E 50 51 FA 53 E3 96 44 8F D1 00 2E 00 28 00 4E 00 32 00 32 00 2E 00 35 00 37 00 35 00 2C 00 45 00 31 00 31 00 33 00 2E 00 39 00 31 00 37 00 29 96 44 8F D1 26 26 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 23 23 00 14 87 07 0D 0A

5.8. GPS/phone number checking location info package (0X1A)

Format			Length (Byte)
Information Content	Date Time		6
	GPS Information	Length of GPS information, quantity of positioning satellites	1
		Latitude	4
		Longitude	4
		Speed	1
		Course, Status	2
	Phone Number		21
	Reserved extension bit		N

5.8.1. **Server Response**

The server replies Chinese address or English address based on the extended command, and the response data packet is inconsistent

The response data packet in Chinese is as follow:

	Format		Length (Byte)
Command packet sent from the server to the terminal (15+M+N Byte)	Start Bit		2
	Length of data bit		1
	Protocol Number		1
	Information Content	Length of Command	1
		Server Flag Bit	4
		Command content	M
		Reserved extension bit	0
	Information Serial Number		2
	Check Bit		2
	Stop Bit		2

The Protocol Number of request Chinese address response is 0X1A.

Info content is as below:

	Format	Length (Byte)
Information Content	Length of Command	1
	Server Flag Bit	4
	Command content	M
	Reserved extension bit	0

Command Content: ADDRESS&&Address Content&&Phone Number##
Chinese address content is sent in UNICODE.

Considering the address or other foreign address in English is generally longer than that in Chinese, one data bit is not enough, so the data bit is occupied in 2 bytes.
Note: only the length of data bit corresponding to the protocol number of response address information is changed into two bytes.

	Format		Length (Byte)
Command packet sent from the server to the terminal（17+M Byte）	Start Bit		2
	Length of data bit		2
	Protocol Number		1
	Information Content	Length of Command	2
		Server Flag Bit	4
		Command content	M
		Reserved extension bit	0
	Information Serial Number		2
	Check Bit		2
	Stop Bit		2

The Protocol Number of request English address response is 0X9A.

5.8.2. **Example**

GPS PHB packet(terminal→server)：
78 78 2E 1A 0E 09 0B 10 0A 0F C7 02 6C 19 72 0C 38 D0 A2 00 14 D1 2B 38 36 31 33 36 33 32 36 36 38 36 37 37 00 00 00 00 00 00 00 00 01 00 29 4D A0 0D 0A
server reply(server → terminal)：
Precise positioning：广东省深圳市宝安区留仙一路.G4.高新奇工业区约 69 米.
78 78 70 1A 6A 00 00 00 01 41 44 44 52 45 53 53 26 26 7C BE 78 6E 5B 9A 4F 4D FF 1A 5E 7F 4E 1C 77 01 6D F1 57 33 5E 02 5B 9D 5B 89 53 3A 75 59 4E D9 4E 00 8D EF 00 2E 00 47 00 34 00 2E 79 BB 9A D8 65 B0 59 47 5D E5 4E 1A 53 3A 7E A6 00 36 00 39 7C 73 00 2E 26 26 2B 38 36 31 33 36 33 32 36 36 38 36 37 37 00 00 00 00 00 00 00 23 23 00 29 59 B3 0D 0A

5.9. Synchronizations package (0x1F)

	Format	Length

		(Byte)
Information Content	Date and time	6
	Reserved extension bit	2

5.9.1. **Date and time**

Terminal time

5.9.2. **Reserved Extension Bit**

Same as GPS data package

5.9.3. **Server Response**

	Format		Length (Byte)
Command packet sent from the server to the terminal (10+4+N Byte)	Start Bit		2
	Length of data bit		1
	Protocol Number		1
	Information Content	Time (UTC second)	4
		Reserved extension bit	2
	Information Serial Number		2
	Check Bit		2
	Stop Bit		2

Respond protocol number: 0x1F
The time is the UTC seconds shown on server.

5.9.4. **Example**

Time sync information packet（terminal→server）:
78 78 0D 1F 0E 09 0B 10 21 21 00 01 00 04 D0 17 0D 0A
Server reply（server → terminal）:
78 78 0B 1F 54 11 5E 65 00 00 00 04 AD CF 0D 0A

5.10. Data Packet Sent From Server to Terminal (Setting Command 0x80)

Format		Length (Byte)
Information	Length of Command	1
	Server Flag Bit	4

Content	Command content	M
	Reserved extension bit	N

The Protocol Number is 0x80.

The terminal response the command from server，data package format is the same as the command format from server to terminal. The protocol no. is different, using “0x80” or “0x81”. 0x80 is setting command, 0x81 is checking command.

Note: Reserved extension bit N=0;

5.10.1. Command Length

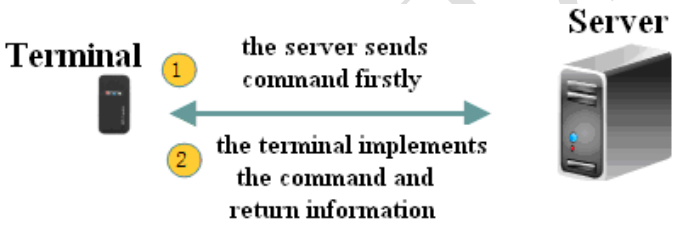
Length= Server flag bit (4) +Comment content (M) + Reserved extension bit (2)

5.10.2. Server Flag Bit

It is reserved to the identification of the server. The binary data received by the terminal is returned without change.

5.10.3. Command Content

It is represented in ASC II of string, and the command content is compatible with text message command.



5.10.3.1. Activate GPS online

(1) Without parameters setting

SMS command format:

GPSON#

Function description: Start GPS locating function

Returned SMS:

If successful, return: GPSON=Success!

If failed, return: GPSON=Fail!

Example：

Server sends command to activate GPS online (server → Terminal)：

78 78 10 80 0A 00 42 28 60 47 50 53 4F 4E 23 00 00 B4 3C 0D 0A

(Terminal→server)：OK!GPSON

78 78 17 81 12 00 42 28 60 4F 4B 21 47 50 53 20 4F 4E 21 00 00 00 02 00 11 A7 6B 0D 0A

Note：Terminal uses 0x81 to reply results.

(2) With Parameters settings

SMS command format:

GPSON,T#

Function description: Start GPS locating function in T minutes. (T ranges from 5 to 300)

5.10.3.2. Set Family numbers online

SMS command format:

Add numbers:

FN&&A&&name 1&&number1&&name 2&&number 2&&name 3&&number 3&&name 4&& number 4##

Note: the maximum length of the names is 6 letters. Names are shown in Unicode. Other characters will be shown in ASCII. "&&" can not to be omitted.

Delete numbers:

FN&&D&&serial number 1&&serial number 2&& serial number 3&&serial number 4##

OR

FN&&D&&number##

Returned SMS:

If successful, return: FN=Success!

If failed, return: FN=Fail!

E.g.

FN&&A&&familynumber1&&13790774051&&zhangsan&&13790774051&&lisi&&13790774051&&wangwu&&13790774051##

FN&&A&&&&&&zhangsan&&13785421542&&&&&&&&&## (Add the second number without adding other numbers)

FN&&D&&1&&3##（Delete the first and third numbers and names）

FN&&D&&132487346727##（delete 132487346727 and corresponding name）

5.10.3.3. Set White List Numbers

SMS command format:

Add numbers: The server will upload all 15 numbers and every time it will cover the previous settings.

WN&&A&&Name 1&&Number 1&&Name 2&&Number 2&&Name 3&&Number 3&&Name 4&&Number 4……Name 15&&Number 15##

Note: the maximum length of the names is 6 letters. Names are shown in Unicode. Other characters

will be shown in ASCII. “&&” can not to be omitted.

Delete numbers: The platform may not support the delete command. This action can be performed by adding numbers.
OR
WN&&D&&serial number 1&&serial number 2&& serial number 3&&serial number 4##
Or WN&&D&&phone number##
Note: Multiple corresponding phone numbers and names can be deleted by serial number deletion. Only one phone number will be deleted if deletion is down by phone number.

Function：Set white list numbers

Return SMS:
If successful, return: WN=Success!
If failed, return: WN=Fail!
e.g.
WN&&A&&familynumber1&&13790774051&&zhangsan&&13790774051&&lisi&&13790774051&&wangwu&&13790774051## to set 15 family phone numbers (4 is valid while 11 are null). Character strings in command like zhangsan are Unicode.

WN&&A&&&&&&zhangsan&&13785421542&&&&&&&&&## (add the second family number; others are null.)

WN&&D&&1&&3##: delete the first and third number.
WN&&D&&132487346727## : delete the number 132487346727.
Note: If the White List number too long (over 255 bytes), command length and package length need to be filled by 0xFF for terminal to analyze.

5.10.3.4. Set SOS numbers online

Add number:
SOS, A, Number 1, Number 2, Number 3, Number 4#
e.g.
SOS,A,13790774051,13790774051,13790774051,13790774051#
Delete number:
SOS,D，series number 1，series number 2，series number 3#
or SOS,D,phone number#

Returned SMS:
If successful, return：SOS=Success!
If failed, return：SOS=Fail!
e.g.
SOS ,A,13790774051,13553442881,13556286698,13525449308#（add 3 numbers at one time）
SOS,A,13790774051,, #（add the first SOS number, delete the second and third number）

SOS,A, ,13553442881, #（add the second SOS number; delete the first and third number）
SOS,D,1#（delete the first SOS number）
SOS, D,1,3#（delete the first and the other three SOS numbers）
SOS,A,13790774051, 13553442881#(delete 13790774051 and 13553442881)

5.10.3.5. Set Silent Mode and GPS working hours online

(1) Send SMS command (for parents):
PERIOD,M,N,D,S1,S2,S3,S4,S5,S6,S7,S8#
M=0 silent mode hours; M=1 GPS working hours;
N=0 OFF; N=1 ON (only works for silent mode)
D=0 school days; D=1 Saturday; D=2 Sunday
S1,S2,S3……,S8 means time period. Format: HH:MM-HH:MM
e.g.
PERIOD,0,1,0,08:30-09:15,,10:15-11:00,,13:30-14:15,,,# (means to set silent mode period on the first, third and the fifth time period of the weekday. Other period will be not be silent mode.)
PERIOD,1,1,1,08:30-09:15,,10:15-11:00,,13:30-14:15,,,# (means to set GPS working hours on the first, third and fifth time period of the weekend. Other period will not be working.)

(2) GPRS command format (platform):
PERIOD,M,N,S1,S2,S3,S4,S5,S6,S7,S8;S1,S2,S3,S4,S5,S6,S7,S8;S1,S2,S3,S4,S5,S6,S7,S8#
OR
PERIOD|M|N|S1|S2|S3|S4|S5|S6|S7|S8]S1|S2|S3|S4|S5|S6|S7|S8]S1|S2|S3|S4|S5|S6|S7|S8}
M=0 silent mode; M=1, GPS working period
N=0 OFF; N=1 ON (only works for silent mode)
S1,S2,S3……,S8 means time period. Format: HMHM (length is 4 bytes)
e.g. If S1 is 10:30-11:30, then the content in decimal is 10301130; in hexadecimal will be 0x0a0x1e0x0b0x1e).
Note: If set weekday and weekend at the same time, use "]" to separate weekday and weekend. The three S1 means the first period of first period of weekday, Saturday and Sunday.
Returned SMS:
If successful, return: TIME=Success!
If failed, return: TIME=Fail!

e.g.
TIME|0|1|08300915||10151100||13301415|||]07000730|08300915|09301020|13301415|14301450|15001530|16001630|17101800]07100720|08200935|09401040|13401445|14401455|15101520|16101640|17301800} (means turning on silent mode, works for the first, third and the fifth time period; and the first to eighth time period on Saturday and Sunday. Those time period that separate by ||means they are not in silent mode.)

5.10.3.6. Parameters Settings Controlled by Terminal

Command	Function	Parameters
GTIMER	turn on/off GPS timing and positioning	See command list
TIMER	LBS/GPS Data transmission interval	
PWRLIMIT	Power off limitation	
RING Or SETRING	ringtone setting	
CALLMODE	incoming calls reminder mode switch	
SIMALM	SIM card changing alarm setting	
BATALM	Low battery alarm	
PWRONALM	power on reminder	
PWROFFALM	Power off warning	
BLINDALM	Enter/exit GPS blind area remind	
SOSALM	SOS alarm	
RINGVOL	Ringtone volume	
CALLVOL	Call volume	
FACTORY	Restore to factory	
WTIMER	Turn on/off WIFI timing and positioning	
WIFION	Open WIFI	
WIFIOFF	Turn off WIFI	
LJDW	Immediate positioning	

Terminal reply description: Through 0x81, server will return execution results to server in character strings. If parameters set successfully, the return format will be:
OK#command# xxxxx
OK=success, command=parameters set, xxxxx= Execution result description

e.g 1: Set 3# as ringtone
[Server -> Terminal] sending：
78 78 16 80 0E 00 42 47 42 53 45 54 52 49 4E 47 2C 33 23 00 01 00 00 49 FB 0D 0A
[Terminal -> Server] uploading：
78 78 1C 81 17 00 42 47 42 4F 4B 23 52 49 4E 47 23 20 52 49 4E 47 3A 33 00 00 00 02 00 7C 22 F2 0D 0A

e.g 2： Power off limitation

[Server - Terminal] sending：
78 78 18 80 10 00 42 47 47 50 57 52 4C 49 4D 49 54 2C 4F 4E 23 00 01 00 00 FE F7 0D 0A

[Terminal->Server] uploading：
78 78 26 81 21 00 42 47 47 4F 4B 23 50 57 52 4C 49 4D 49 54 23 20 50 57 52 20 4C 69 6D 69 74 3A 4F 4E 00 00 00 02 00 7D 62 8C 0D 0A

5.10.5 Reserved Extension Bit

N=0.

5.11. Command Sent from Server to Terminal (Setting Command 0X81)

Format 1: Adopted when reply content is less than 255 bytes (white list commend is excluded. See above white list example)

Format	Start Bit	Packet length	Protocol Number	Information Content	Information Serial Number	Error Check	Stop Bit
Length (Byte)	2(0x78 0x78)	1	1	N	2	2	2

Format	Information Content			
	Length of Command	Server Flag Bit	Command content	Reserved extension bit
Length (Byte)	1	4	M	N（2）

Format 2: Adopted when reply content is longer than 255 bytes

Format	Start Bit	Packet length	Protocol Number	Information Content	Information Serial Number	Error Check	Stop Bit
Length (Byte)	2(0x79 0x79)	2	1	N	2	2	2

Format	Information Content			
	Length of Command	Server Flag Bit	Command content	Reserved extension bit
Length	2	4	M	N（2）

(Byte)				

Note: Reserved bit (1): not used yet
Reserved bit (2): Coding mode for command content: 1=UNICODE 2=ASCII

5.11.1. Content Information

It is written in ASCII code. It is used to sync the server with the terminal.

5.11.1.1. Sync Family Numbers

Format: **SEEFN#**
Returned SMS: **SEEFN&&Name 1&&Number 1&&Name 2&& Number 2&& Name 3&& Number 3&& Name 4&& Number4##**
Names will be shown in Unicode while others will be shown in ASCII.
E.g. SEEFN&&&&&&zhangsan&&13785421543&&&&&&&&&##

5.11.1.2. Sync SOS Numbers

Format: **SEESOS#**
Returned SMS: **SEESOS: Number 1,Number 2, Number3#**
E.g. SEESOS:18734356421,18656425588,13888888888#
SEESOS:18734356421,,13888888888#

5.11.1.3. Sync silent mode and GPS working period

See as 5.17.3.5

5.11.1.4. Sync Control Parameters

Format: **CTRLPARAMS#**
Returned SMS: **CTRALPARAM: Control group 1,Control group 2, …Control group n#**

Control Group List

Parameters	**Function**	**Explanation**
GTIMER	GPS locating time	See command list
TIMER	LBS/GPS data upload interval	
PWRLIMIT	Power off limited	
RING	Ringtone setting	

CALLMODE	Call reminder	
SIMALM	SIM card change alarm	
BATALM	Low power alarm	
PWROFFALM	Power off alarm	
PWRONALM	Power on alarm	
BLINDALM	Enter/exit GPS blind area alarm	
SOSALM	SOS alarm	
RINGVOL	Ringtone volume	
CALLVOL	Call volume	

5.11.1.5. Sync Geo-fence Data

Format: **ALLGFENCES#**

Returned SMS: **ALLGFENCES: First Fence content, Second Fence content,……Fifth Fence content#**

Fence n content format:

1. Round：fence number, on-off state（1）, fence shape（0）, latitude（0: northern latitude 1: southern latitude），longitude（0:east longitude 1:west longitude), center latitude, center longitude, radius（m）, alarm triggering（1:IN 2:OUT 3:IN&OUT）, alarm upload（0:gprs 1: SMS &GPRS）
2. Rectangle：fence number, on-off state（1）, fence shape（1）, latitude（same as above）,longitude（same as above), upper left latitude, upper left longitude, lower right corner latitude, lower right corner longitude, alarm triggering（same as above）, alarm upload（same as above）#
3. Fence OFF: fence number, on-off state (0)

5.11.1.6. Sync White List Data

Format: **ALLWHITEBOOK#**

Returned SMS: **ALLWHITEBOOK:Name 1, Number 1, Name 2, Number 2,……Name N, Number N;#**

Note: Names will be written in UNICODE.

E.g.

For **WHITE:FATHER,8826267; mother,13312341234;#**

The actual data frame will be :

78 78 57 81 52 00 00 00 00 57 00 48 00 49 00 54
00 45 00 3a 00 36 72 b2 4e 2c 00 38 00 38 00 32
00 36 00 32 00 36 00 37 00 3b 00 6d 00 6f 00 74
00 68 00 65 00 72 00 2c 00 31 00 33 00 33 00 31
00 32 00 33 00 34 00 31 00 32 00 33 00 34 00 3b
00 23 00 00 00 00 01 00 0d 4a 5a 0d 0a

5.12. Server Send Command To Terminal (Leave Messages 0x82)

Server sends massage to terminal by the 0x82 protocol. Message can be broadcasted.

Format		Length (Byte)
Information Content	Length of Command	1
	Server Flag Bit	4
	Command content	M
	Reserved extension bit	2

Note: Command content is in UNICODE
Reserved bit (1): not used yet
Reserved bit (2): Coding mode for command content: 1=UNICODE 2=ASCII

5.13. LBS Base Station Address Request Packet (0x8B)

5.13.1. Function

IT requests current latitude, longitude and time and is the datum point for terminal network checking and AGPS running.

Format			Length (Byte)	Examples
Information Content	Start Bit		2	0x78 0x78
	Packet Length		1	0x0D
	Protocol Number		1	0x8B
	LBS Information	MCC	2	0x01 0xCC
		MNC	1	0x00
		LAC	2	0x26 0x6A
		CELL ID	3	0x00 0x1D 0xF1
	Serial Number		2	0x00 0x03
	Error Check		2	0x80 0x81
	Stop Bit		2	0x0D 0x0A

5.13.1.1. Start Bit

For details see Data Packet Format section 4.

5.13.1.2. Packet Length

For details see Data Packet Format section 4.

5.13.1.3. Protocol Number

For details see Data Packet Format section 4.

5.13.1.4. MCC

The country code to which a mobile user belongs, i.e., Mobile Country Code (MCC).
E.g. Chinese MCC is 460 in decimal, or 0x01 0xCC in Hex (that is, a decimal value of 460 converting into a hexadecimal value, and 0 is added at the left side because the converted hexadecimal value is less than four digits).

5.13.1.5. MNC

Mobile Network Code (MNC)
E.g. Chinese MNC is 0x00.

5.13.1.6. LAC

Location Area Code (LAC) included in LAI consists of two bytes and is encoded in hexadecimal. The available range is 0x0001-0xFFFE, and the code group 0x0000 and 0xFFFF cannot be used. (See GSM specification 03.03, 04.08 and 11.11).

5.13.1.7. Cell ID

Cell Tower ID (Cell ID) with value ranges from 0x000000 to 0xFFFFFF.

5.13.1.8. Information Serial Number

For details see Data Packet Format section 4.

5.13.1.9. Error Check

For details see Data Packet Format section 4.6

5.13.1.10. Stop Bit

For details see Data Packet Format section 4.

5.13.2. **Server Response**

LBS Address Report（Time Checking Included）

Format			Length (Byte)	Example
Information Content	Start Bit		2	0x78 0x78
	Packet Length		1	0x16
	Protocol Number		1	0x8B
	Date and Time（UTC)		6	0x0e 0x06 0x05 0x00 0x37 0x13
	Location	Latitude	4	0x02 0x6c 0x10 0x02
		Longitude	4	0x0c 0x38 0xd3 0x52
	Time Zone		2	0x32 0x00
	West Longitude/East Longitude/Northern latitude/Southern Latitude		1	0x10
	Information Serial Number		2	0x00 0x0a
	Error Check		2	0x2b 0xdd
	Stop Bit			0x0D 0x0A

5.13.2.1. Start Bit

For details see Data Packet Format section 4.

5.13.2.2. Packet Length

For details see Data Packet Format section 4.

5.13.2.3. Protocol Number

For details see Data Packet Format section 4.

5.13.2.4. Date and Time

Format	Length(Byte)	Example
Year	1	0x0A
Month	1	0x03
Day	1	0x17
Hour	1	0x0F
Minute	1	0x32
Second	1	0x17

Example: 2010-03-23 15:50:23
Calculated as follows: 10(Decimal)=0A(Hexadecimal)
3 (Decimal)=03(Hexadecimal)
23(Decimal)=17(Hexadecimal)
15(Decimal)=0F(Hexadecimal)
50(Decimal)=32(Hexadecimal)
23(Decimal)=17(Hexadecimal)
Then the value is: 0x0A 0x03 0x17 0x0F 0x32 0x17

5.13.2.5. Latitude

4 bytes are consumed, defining the latitude value of location data. The range of the value is 0-162000000, indicating a range of 0 °-90 °. The conversion method is as follow:
Converting the value of latitude and longitude output by GPS module into a decimal based on minute; multiplying the converted decimal by 30000; and converting the multiplied result into hexadecimal
Example: 22°32.7658'= (22X60+32.7658) X30000=40582974, then converted into a hexadecimal number
40582974(Decimal)=26B3F3E(Hexadecimal)
At last the value is 0x02 0x6B 0x3F 0x3E.

5.13.2.6. Longitude

4 bytes are consumed, defining the longitude value of location data. The range of the value is 0-324000000, indicating a range of 0 °-180 °.
The conversion method herein is same to the method mentioned in Latitude.

5.13.2.7. Time Zone

<table>
<tr><td rowspan="12">One and a half bits
bit15—bit4</td><td>15</td><td colspan="2" rowspan="12">Time zone value expands 100</td></tr>
<tr><td>14</td></tr>
<tr><td>13</td></tr>
<tr><td>12</td></tr>
<tr><td>11</td></tr>
<tr><td>10</td></tr>
<tr><td>9</td></tr>
<tr><td>8</td></tr>
<tr><td>7</td></tr>
<tr><td>6</td></tr>
<tr><td>5</td></tr>
<tr><td>4</td></tr>
<tr><td rowspan="5">Last nibble
bit4-bit0</td><td rowspan="2">3</td><td>GMT+</td><td>0</td></tr>
<tr><td>GMT-</td><td>1</td></tr>
<tr><td>2</td><td colspan="2">No definition</td></tr>
<tr><td>1</td><td>Language choice bit</td><td>1</td></tr>
<tr><td>0</td><td>Language choice bit</td><td>0</td></tr>
</table>

5.13.2.8. West /East Latitude & Northern /Southern Longitude

First nibble is latitude identification
0 for south, 1 for north
Last nibble is longitude identification
0 for east, 1 for west
e.g: 0x01 for southern latitude and western longitude

5.13.2.9. Information Serial Number

For details see Data Packet Format section 4.

5.13.2.10. Error Check

For details see Data Packet Format section 4.6

5.13.2.11. Stop Bit

For details see Data Packet Format section 4.

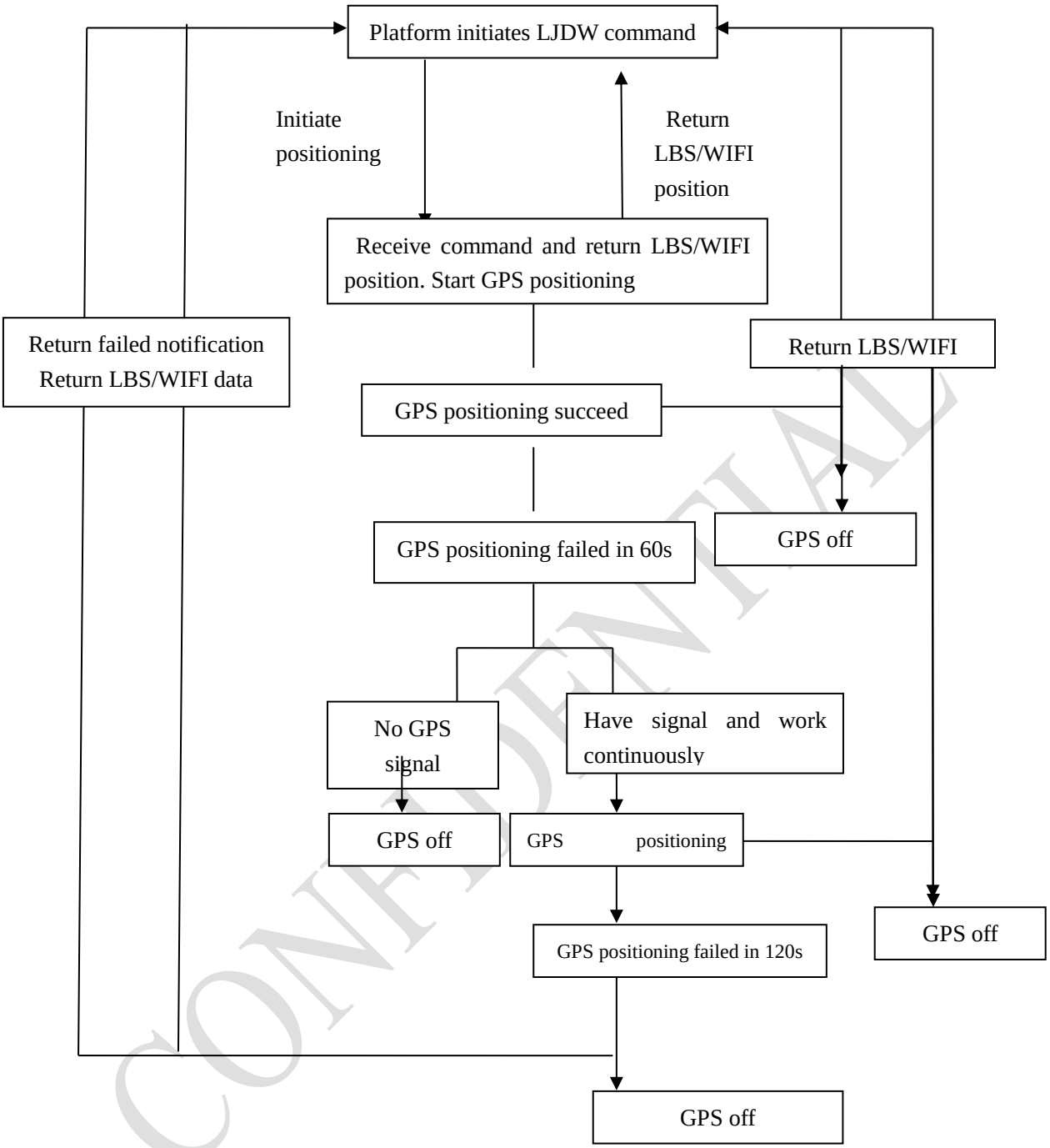
5.14. . LBS + WIFI Information Packet (0x2C)

Format		Length (Byte)	
Start Bit		2	0x78 0x78
Packet length		1	Length = Protocol Number + Information Content + Information Serial Number + Error Check
Protocol Number		1	0x2C
Information Content	Date Time （UTC）	6	year（1byte）month（1byte） day（1byte） hour （1byte）minute（1byte）second（1byte） (convert to decimal)
	MCC	2	Mobile Country Code
	MNC	1	Mobile Network Code(MNC)
	LAC	2	Mobile Network Code(MNC)
	CI	3	Cell Tower ID(Cell ID)
	RSSI	1	Signal strength: value ranges from 0x00～0xFF; 0x00 for weakest signal and 0xFF for strongest signal
	NLAC1	2	Same as LAC
	NCI1	3	Same as CI
	NRSSI1	1	Same as RSSI
	NLAC2	2	Same as LAC
	NCI2	3	Same as CI
	NRSSI2	1	Same as RSSI
	NLAC3	2	Same as LAC
	NCI3	3	Same as CI
	NRSSI3	1	Same as RSSI
	NLAC4	2	Same as LAC
	NCI4	3	Same as CI
	NRSSI4	1	Same as RSSI
	NLAC5	2	Same as LAC
	NCI5	3	Same as CI
	NRSSI5	1	Same as RSSI
	NLAC6	2	Same as LAC
	NCI6	3	Same as CI
	NRSSI6	1	Same as RSSI
	Time leads	1	Value=the actual arrival time of MS signal to the base staion－arrival time of MS signal to the base station (distance from MS to base is 0)
	WIFI Quantity	1	Confirm the transmitted WIFI quantity. 0 means no WIFI detected.

	WIFI MAC1	6	the WIFI MAC of signal 1（transmit according to the searched WIFI quantity. E.g: N WIFI searched, the transmit N）
	WIFI strength 1	1	WIFI strength of signal 1
	WIFI MAC2	6	Same as above
	WIFI strength 2	1	Same as above
	…		…
Information Serial Number		2	The serial number of the first GPRS data (including status packet and data packet such as GPS, LBS) sent after booting is '1', and the serial number of data sent later at each time will be automatically added '1'.
Error Check		2	The check codes of data in the structure of the protocol, from the Packet Length to the Information Serial Number (including "Packet Length" and "Information Serial Number") , are values of CRC-ITU.
Stop Bit		2	Fixed value in HEX 0x0D 0x0A

5.15. . Command for Platform Immediate Locating（LJDW）

LJDW flow chart



1. Protocol interaction
   1）To start immediate positioning, platform sends online command to terminal by protocol 0x80.
   Command format: LJDW#
   See 5.10 for detail.
   2）Terminal uploads LBS/WIFI combined packet (0x2c) and turns on GPS when receive the command.
   3）If GPS positioning succeed, terminal uploads GPS info packet (0x10). See the

5.2 for details.

4）If GPS positioning failed, terminal uploads LBS/WIFI combined packet (0x2c) first, then uploads ACSII notification (e.g: GPS=TIMEOUT, xxxxxx) by 0x81 general upload channel.

2. Platform stops and wait for accurate location in the following situations:
   1）Receive GPS information packet
   2）Get “GPS=TIMEOUT” notification sent by 0x81 upload channel.

5.16. Instruction about login data package and status package

1. If a GPRS connection is established successfully, the terminal will send a first login message packet to the server and, within five seconds, if the terminal receives a data packet responded by the server, the connection is considered to be a normal connection. The terminal will begin to send location information (i.e., GPS, LBS information package). A status information package will be sent by the terminal after three minutes to regularly confirm the connection.

2. If the GPRS connection is established unsuccessfully, the terminal will not be able to send the login message packet. The terminal will start schedule reboot in twenty minutes if the GPRS connection is failed three times. Within twenty minutes, if the terminal successfully connects to the server and receives the data packet from the server as the server’s response to the login message packet sent by the terminal, the schedule reboot will be off and the terminal will not be rebooted; otherwise, the terminal will be rebooted automatically in twenty minutes.

3. After receiving the login message packet, the server will return a response data packet. If the terminal doesn’t receive packet from the server within five seconds after sending the login message packet or the status information package, the current connection is regarded as an abnormal connection. The terminal will start a retransmission function for GPS tracking data, which will cause the terminal to disconnect the current GPRS connection, rebuild a new GPRS connection and send a login message packet again.

4. If the connection is regarded to be abnormal, and the data packet as a response from the server is failed to be received three times after a connection is established and a login message packet or status information package is sent, the terminal will start schedule reboot and the scheduled time is ten minutes. Within ten minutes, if the terminal successfully connects to the server and receives the data packet responded by the server, the schedule reboot will be off and the terminal will not be rebooted; otherwise, the terminal will be rebooted automatically in ten minutes.

5. Server will not return data package to terminal which has not been registered. The connection

will be ended directly.

6. When SIM card is not inserted, the GRPS connection will not be activated, and the terminal will not restart automatically.

7. When SIM cars is inserted while the GPRS connection is not on, the terminal will restart automatically after 20 minutes.

6. Error Check

A check code may be used by the terminal or the server to distinguish whether the received information is error or not. To prevent errors occur during data transmission, error check is added to against data misoperation, so as to increase the security and efficiency of the system. The check code is generated by the CRC-ITU checking method.
The check codes of data in the structure of the protocol, from the Packet Length to the Information Serial Number (including "Packet Length" and "Information Serial Number") , are values of CRC-ITU.
CRC error occur when the received information is calculated, the receiver will ignore and discard the data packet.

7. Stop Bit

Fixed value in HEX 0x0D 0x0A

8. Appendix A: code fragment of the CRC-ITU lookup table algorithm implemented based on C language

Code fragment of the CRC-ITU lookup table algorithm implemented based on C language is as follow:

```
static const U16 crctab16[] =
{
    0X0000, 0X1189, 0X2312, 0X329B, 0X4624, 0X57AD, 0X6536, 0X74BF,
    0X8C48, 0X9DC1, 0XAF5A, 0XBED3, 0XCA6C, 0XDBE5, 0XE97E, 0XF8F7,
    0X1081, 0X0108, 0X3393, 0X221A, 0X56A5, 0X472C, 0X75B7, 0X643E,
    0X9CC9, 0X8D40, 0XBFDB, 0XAE52, 0XDAED, 0XCB64, 0XF9FF, 0XE876,
    0X2102, 0X308B, 0X0210, 0X1399, 0X6726, 0X76AF, 0X4434, 0X55BD,
    0XAD4A, 0XBCC3, 0X8E58, 0X9FD1, 0XEB6E, 0XFAE7, 0XC87C, 0XD9F5,
    0X3183, 0X200A, 0X1291, 0X0318, 0X77A7, 0X662E, 0X54B5, 0X453C,
    0XBDCB, 0XAC42, 0X9ED9, 0X8F50, 0XFBEF, 0XEA66, 0XD8FD, 0XC974,
```

```
    0X4204, 0X538D, 0X6116, 0X709F, 0X0420, 0X15A9, 0X2732, 0X36BB,
    0XCE4C, 0XDFC5, 0XED5E, 0XFCD7, 0X8868, 0X99E1, 0XAB7A, 0XBAF3,
    0X5285, 0X430C, 0X7197, 0X601E, 0X14A1, 0X0528, 0X37B3, 0X263A,
    0XDECD, 0XCF44, 0XFDDF, 0XEC56, 0X98E9, 0X8960, 0XBBFB, 0XAA72,
    0X6306, 0X728F, 0X4014, 0X519D, 0X2522, 0X34AB, 0X0630, 0X17B9,
    0XEF4E, 0XFEC7, 0XCC5C, 0XDDD5, 0XA96A, 0XB8E3, 0X8A78, 0X9BF1,
    0X7387, 0X620E, 0X5095, 0X411C, 0X35A3, 0X242A, 0X16B1, 0X0738,
    0XFFCF, 0XEE46, 0XDCDD, 0XCD54, 0XB9EB, 0XA862, 0X9AF9, 0X8B70,
    0X8408, 0X9581, 0XA71A, 0XB693, 0XC22C, 0XD3A5, 0XE13E, 0XF0B7,
    0X0840, 0X19C9, 0X2B52, 0X3ADB, 0X4E64, 0X5FED, 0X6D76, 0X7CFF,
    0X9489, 0X8500, 0XB79B, 0XA612, 0XD2AD, 0XC324, 0XF1BF, 0XE036,
    0X18C1, 0X0948, 0X3BD3, 0X2A5A, 0X5EE5, 0X4F6C, 0X7DF7, 0X6C7E,
    0XA50A, 0XB483, 0X8618, 0X9791, 0XE32E, 0XF2A7, 0XC03C, 0XD1B5,
    0X2942, 0X38CB, 0X0A50, 0X1BD9, 0X6F66, 0X7EEF, 0X4C74, 0X5DFD,
    0XB58B, 0XA402, 0X9699, 0X8710, 0XF3AF, 0XE226, 0XD0BD, 0XC134,
    0X39C3, 0X284A, 0X1AD1, 0X0B58, 0X7FE7, 0X6E6E, 0X5CF5, 0X4D7C,
    0XC60C, 0XD785, 0XE51E, 0XF497, 0X8028, 0X91A1, 0XA33A, 0XB2B3,
    0X4A44, 0X5BCD, 0X6956, 0X78DF, 0X0C60, 0X1DE9, 0X2F72, 0X3EFB,
    0XD68D, 0XC704, 0XF59F, 0XE416, 0X90A9, 0X8120, 0XB3BB, 0XA232,
    0X5AC5, 0X4B4C, 0X79D7, 0X685E, 0X1CE1, 0X0D68, 0X3FF3, 0X2E7A,
    0XE70E, 0XF687, 0XC41C, 0XD595, 0XA12A, 0XB0A3, 0X8238, 0X93B1,
    0X6B46, 0X7ACF, 0X4854, 0X59DD, 0X2D62, 0X3CEB, 0X0E70, 0X1FF9,
    0XF78F, 0XE606, 0XD49D, 0XC514, 0XB1AB, 0XA022, 0X92B9, 0X8330,
    0X7BC7, 0X6A4E, 0X58D5, 0X495C, 0X3DE3, 0X2C6A, 0X1EF1, 0X0F78,
};

//  calculate the 16-bit CRC of data with predetermined length.
U16 GetCrc16(const U8* pData, int nLength)
{
    U16  fcs  =  0xffff;            //  initialization
    while(nLength>0){
        fcs = (fcs >> 8) ^ crctab16[(fcs ^ *pData) & 0xff];
        nLength--;
        pData++;
    }
    return  ~fcs;           //  negated
}
```

9. Appendix B: Complete Format of Information Package

A. data packet sent by the terminal to the server

Login Message Packet (18 Byte)						
Start Bit	Packet length	Protocol Number	Terminal ID	Information Serial Number	Error Check	Stop Bit
2	1	1	8	2	2	2

GPS Information Package (26+N Byte)												
Start Bit	Packet length	Protocol Numb	Information Content							Information serial number	Error Check	stop bit
			Date Time	GPS Information					Reserved extended bit			
				Length of GPS information, quantity of positioning satellites	Latitude	Longitude	Sped	Course, Status				

		er										
2	1	1	6	1	4	4	1	2	N	2	2	2

LBS information package (23+N Byte)											
			Information Content								
				LBS Information							
Start Bit	Packet length	Protocol Number	Date Time	MCC	MNC	LAC	Cell ID	Reserved extended bit	Information serial number	Error Check	stop bit
2	1	1	6	2	1	2	3	N	2	2	2

LBS complete information package (42+N Byte)																								
Start Bit	Packet length	Protocol Number	Information Content																			Information serial number	Error Check	stop bit
			Date Time	LBS Information																		Reserved extended bit			
				MCC	MNC	LAC	MCI	MCISS	NCI1	NCISS1	NCI2	NCISS2	NCI3	NCISS3	NCI4	NCISS4	NCI5	NCISS5	NCI6	NCISS6					
2	1	1	6	2	1	2	2	1	2	1	2	1	2	1	2	1	2	1	2	1	N	2	2	2

GPS、LBS information package (34+M+N Byte)																	
			Information Content														
				GPS Information						LBS Information							
Start Bit	Packet length	Protocol Number	Date Time	Length of GPS information, quantity of positioning satellites	Latitude	Longitude	Speed	Course, Status	Reserved extended bit	MCC	MNC	LAC	Cell ID	Reserved and extended	Information serial number	Error Check	stop bit
2	1	1	6	1	4	4	1	2	M	2	1	2	3	M	2	2	2

Status Packet(13+N Byte)									
			Information Content						
Start Bit	Packet Length	Protocol Number	Terminal Information Content	Voltage Level	GSM Signal Strength Level	Reserved and Extended Bit (language)	Information Serial Number	Error Check	Stop Bit
2	1	1	1	1	1	2	2	2	2

SNR information of satellite (11+M+N Byte)								
			Information Content					
Start Bit	Packet Length	Protocol Number	Quantity of positioning satellites	SNR of Satellite	Reserved and Extended Bit	Information Serial Number	Error Check	Stop Bit
				1 2 3 …… n				
2	1	1	1	M	N	2	2	2

terminal responds to the command sent by server (15+M+N Byte)									
			String Content						
Start Bit	Packet Length	Protocol Number	Length of Command	Server Flag Bit	Command Content	Reserved and Extended Bit (language)	Information Serial Number	Error Check	Stop Bit
2	1	1	1	4	M	2	2	2	2

GPS, LBS, Status Information Package (40+M+N+L Byte)																						
Start Bit	Packet Length	Protocol Number	Information Content															Reserved and Extended Bit (language)	Information Serial Number	Error Check	Stop Bit
			Date Time	GPS Information						LBS Information						Status Information						
				Length of GPS information, quantity of positioning satellites	Latitude	Longitude	Speed	Course, Status	Reserved and Extended Bit	LBS Length	MCC	MNC	LAC	Cell ID	Reserved and Extended Bit	Terminal Information Content	Voltage Level	GSM Signal Strength Level				
2	1	1	6	1	4	4	1	2	M	1	2	1	2	3	N	1	1	1	2	2	2	2

B. Data Packet Sent by Server to Terminal

Response of Server after receiving Status Packet from Terminal (10 Bytes)					
Start Bit	Packet Length	Protocol Number	Information Serial Number	Error Check	Stop Bit
2	1	1	2	2	2

Command Packet Sent by Server to Terminal (15+M+N Byte)									
Start Bit	Packet Length	Protocol Number	Information Content				Information Serial Number	Error Check	Stop Bit
			Length of Command	Server Flag Bit	Command Content	Reserved extended bit			
2	1	1	1	4	M	N	2	2	2