Shenzhen Benway Technology Co.,Ltd

GPS Tracker
Communication Protocol

(BW02/BW08/BW09/ET300)

CONFIDENTIAL

Copyright

This document is copyrighted by Shenzhen Benway Technology Co.,Ltd. All rights reserved.

Any unauthorized copy or transmission of the document partially or wholly shall be subject to prosecution.

CONTENT

I. COMMUNICATION PROTOCOL 5

II. TERMS, DEFINITIONS 5

III. BASIC RULES 6

IV. DATA PACKET FORMAT 8

4.1. START BIT 8
4.2. PACKET LENGTH 8
4.3. PROTOCOL NUMBER 8
4.4. INFORMATION CONTENTS 8
4.5. INFORMATION SERIAL NUMBER 8
4.6. ERROR CHECK 8
4.7. STOP BIT 8
v. Details about Data Packet sent by Server to Terminal 9
5.1. LOGIN MESSAGE PACKET 9
5.1.1. Terminal Sending Data Packet to Server 9
5.1.1.1. Start Bit 9
5.1.1.2. Packet Length 9
5.1.1.3. Protocol Number 9
5.1.1.4. Terminal ID 9
5.1.1.5. Information Serial Number 9
5.1.1.6. Error Check 9
5.1.1.7. Stop Bit 9
5.1.2. Server Responds the Data Packet 9
5.1.2.1. Start Bit 10
5.1.2.2. Packet Length 10
5.1.2.3. Protocol Number 10
5.1.2.4. Information Serial Number 10
5.1.2.5. Error Check 10
5.1.2.6. Stop Bit 10
5.1.3. Examples 10
5.2. LOCATION DATA PACKET (COMBINED INFORMATION PACKAGE OF GPS AND LBS) 11
5.2.1. Terminal Sending Location Data Packet to Server 11
5.2.1.1. Start Bit 11
5.2.1.2. Packet Length 11
5.2.1.3. Protocol Number 11
5.2.1.4. Date Time 11
5.2.1.5. Length of GPS information, quantity of positioning satellites 12
5.2.1.6. Latitude 12
5.2.1.7. Longitude 12
5.2.1.8. Speed 12

CONFIDENTIAL

5.2.1.9. Course Status....12
5.2.1.10. MCC....13
5.2.1.11. MNC....14
5.2.1.12. LAC....14
5.2.1.13. Cell ID....14
5.2.1.14. ACC+Input2+ADC....14
5.2.1.15. Information Serial Number....15
5.2.1.16. Error Check....15
5.2.1.17. Stop Bit....15
5.2.2. Examples of Packet Sent from Terminal to Server....15
5.3.ALARM PACKET (GPS, LBS, COMBINED STATUS INFORMATION PACKET)....17
5.3.1. Server Sending Alarm Data Packet to Server....17
5.3.1.1. Start Bit....17
5.3.1.2. Packet Length....17
5.3.1.3. Protocol Number....17
5.3.1.4. Date Time....17
5.3.1.5. Length of GPS information, quantity of positioning satellites....17
5.3.1.6. Latitude....17
5.3.1.7. Longitude....17
5.3.1.8. Speed....17
5.3.1.9. Status and Course....17
5.3.1.10. MCC....18
5.3.1.11. MNC....18
5.3.1.12. LAC....18
5.3.1.13. Cell ID....18
5.3.1.14. Terminal Information....18
5.3.1.15. Voltage Level....18
5.3.1.16. GSM Signal Strength Levels....18
5.3.1.17. Alarm/Language....19
5.3.1.18. Information Serial Number....19
5.3.1.19. Error Check....19
5.3.1.20. Stop Bit....20
5.3.2. Examples....20
5.4.HEARTBEAT PACKET (STATUS INFORMATION PACKET)....21
5.4.1. Terminal Sending Heartbeat Packet to Server....21
5.4.1.1. Start Bit....21
5.4.1.2. Packet Length....21
5.4.1.3. Protocol Number....21
5.4.1.4. Terminal Information....21
5.4.1.5. Voltage Level....22
5.4.1.6. GSM Signal Strength Levels....22
5.4.1.7. Alarm/Language....22
5.4.1.8. Information Serial Number....22
5.4.1.9. Error Check....22

CONFIDENTIAL

5.4.1.10. Stop Bit..... 22
5.4.2. Server Responds the Data Packet.....23
5.4.2.1. Start Bit.....23
5.4.2.2. Packet Length..... 23
5.4.2.3. Protocol Number.....23
5.4.2.4. Information Serial Number.....23
5.4.2.5. Error Check..... 23
5.4.2.6. Stop Bit..... 23
5.4.3. Examples.....23
VI. DATA PACKET SENT FROM SERVER TO TERMINAL(GPRS COMMAND).....24
6.1. PACKET SENT BY SERVER.....24
6.1.1. Start Bit.....24
6.1.2. Packet Length..... 24
6.1.3. Protocol Number.....24
6.1.4. Length of Command.....24
6.1.5. Server Flag Bit.....24
6.1.6. Command Content..... 24
6.1.7. Language.....25
6.1.8. Information Serial Number.....25
6.1.9. Error Check..... 25
6.1.10. Stop Bit..... 25
6.2. PACKET REPLIED BY TERMINAL.....26
6.2.1. Start Bit.....26
6.2.2. Packet Length..... 26
6.2.3. Protocol Number.....26
6.2.4. Length of Command.....26
6.2.5. Server Flag Bit.....26
6.2.6. Command Content..... 26
6.2.7. Language.....26
6.2.8. Information Serial Number.....26
6.2.9. Error Check..... 26
6.2.10. Stop Bit..... 26
6.3. Looking Up Location Information.....27
6.4. Cutting Oil and Electricity..... 27
6.5. Connecting Oil and Electricity.....27
6.6. Address Querying Information Sent by the Server.....27
6.7.GPS, Phone Number Querying Address Information Package (0X1A).....29
6.7.1. Information from Terminal to Server..... 29
6.7.1.1. Start Bit.....29
6.7.1.2. Packet Length..... 29
6.7.1.3. Protocol Number.....29
6.7.1.4. Date Time..... 29
6.7.1.5. Length of GPS information, quantity of positioning satellites..... 29
6.7.1.6. Latitude.....29

CONFIDENTIAL

6.7.1.7. Longitude....29
6.7.1.8. Speed....30
6.7.1.9. Course....30
6.7.1.10. Phone Number....30
6.7.1.11. Language....30
6.7.1.12. Information Serial Number....30
6.7.1.13. Error Check....30
6.7.1.14. Stop Bit....30
6.7.2. Response of Server....30
6.7.2.1. Response package in Chinese....30
6.7.2.2. Response package in English....31

VII. APPENDIX A: CODE FRAGMENT OF THE CRC-ITU LOOKUP TABLE ALGORITHM IMPLEMENTED BASED ON C LANGUAGE....33

VIII. APPENDIX B: A FRAGMENT OF EXAMPLE OF DATA PACKET OF COMMUNICATION PROTOCOL 34

IX. APPENDIX C: COMPLETE FORMAT OF THE INFORMATION PACKAGE....36

CONFIDENTIAL

i. Communication Protocol

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 position terminal.

ii. Terms, Definitions

Terms, Abbreviation	Definition in English	Definition in Chinese
CMPP	China Mobile Peer to Peer	中国移动点对点协议
GPS	Global Positioning System	全球卫星定位系统
GSM	Global System for Mobile Communication	全球移动通信系统
GPRS	General Packet Radio Service	通用无线分组业务
TCP	Transport Control Protocol	传输控制协议
LBS	Location Based Services	辅助定位服务
IMEI	International Mobile Equipment Identity	国际移动设备识别码
MCC	Mobile Country Code	移动用户所属国家代号
MNC	Mobile Network Code	移动网号码
LAC	Location Area Code	位置区码
Cell ID	Cell Tower ID	移动基站
UDP	User Datagram Protocol	用户数据报协议
SOS	Save Our Ship/Save Our Souls	遇难求救信号
CRC	Cyclic Redundancy Check	循环冗余校验
NITZ	Network Identity and Time Zone,	时区
GIS	Geographic Information System	地理信息系统

CONFIDENTIAL

iii. Basic Rules

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.

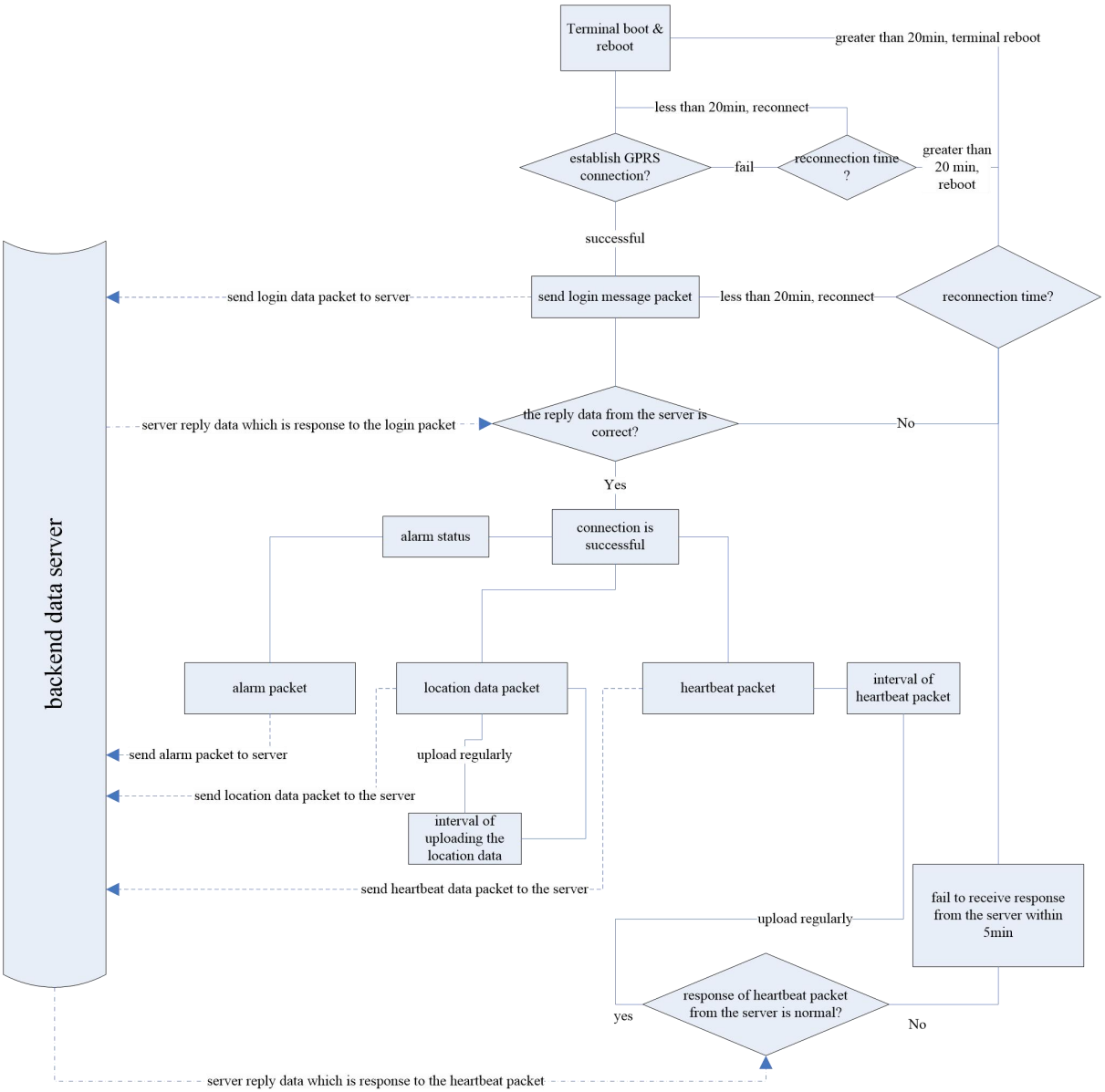
5. In case of the normal connection, the terminal will send a combined information package of GPS and LBS to the server after the GPS information is changed; and the server may set a default protocol for transmission by using commands.

6. To ensure the effectiveness of the connection, the terminal will send status information to the server at regular intervals, and the server will return response data packets to confirm the connection.

7. For the terminal which doesn't register an IMEI number, the server will reply the terminal with a login request response and heartbeat packet response, rather than directly disconnect the connection. (If the connection is directly disconnected or the server doesn't reply to the terminal, it will lead to a continuous reconnected by the terminal and the GPRS traffic will be consumed heavily.

Data Flow Diagram

CONFIDENTIAL


Terminal boot & reboot
greater than 20min, terminal reboot
less than 20min, reconnect
establish GPRS connection?
fail
reconnection time ?
greater than 20 min, reboot
successful
send login data packet to server
send login message packet
less than 20min, reconnect
reconnection time?
backend data server
server reply data which is response to the login packet
the reply data from the server is correct?
No
Yes
alarm status
connection is successful
alarm packet
location data packet
heartbeat packet
interval of heartbeat packet
send alarm packet to server
upload regularly
send location data packet to the server
interval of uploading the location data
send heartbeat data packet to the server
upload regularly
fail to receive response from the server within 5min
response of heartbeat packet from the server is normal?
yes
No
server reply data which is response to the heartbeat packet

iv. Data Packet Format

The communication is transferred asynchronously in bytes.

The total length of packets is (10+N) Bytes.

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

4.1. Start Bit

Fixed value in HEX 0x78 0x78.

4.2. Packet Length

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

4.3. Protocol Number

Type	Value
Login Message	0x01
Location Data	0x12
Status information	0x13
String information	0x15
Alarm data	0x16
GPS, query address information by phone number	0x1A
Command information sent by the server to the terminal	0x80

4.4. Information Contents

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

4.5. Information Serial Number

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'.

4.6. 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.

4.7. Stop Bit

CONFIDENTIAL

Fixed value in HEX 0x0D 0x0A.

Details about Data Packet sent by Server to Terminal

The commonly used information packages sent by the terminal and those sent by the server will be interpreted separately.

5.1. Login Message Packet

5.1.1. Terminal Sending Data Packet to Server

The login message packet is used to be sent to the server with the terminal ID so as to confirm the established connection is normal or not.

	Description	Bits	Example
Login Message Packet(18 Byte)	Start Bit	2	0x78 0x78
	Packet Length	1	0x0D
	Protocol Number	1	0x01
	Terminal ID	8	0x01 0x23 0x45 0x67 0x89 0x01 0x23 0x45
	Information Serial Number	2	0x00 0x01
	Error Check	2	0x8C 0xDD
	Stop Bit	2	0x0D 0x0

CONFIDENTIAL

5.1.1.1. Start Bit

For details see Data Packet Format section 4.1.

5.1.1.2. Packet Length

For details see Data Packet Format section 4.2.

5.1.1.3. Protocol Number

For details see Data Packet Format section 4.3.

5.1.1.4. Terminal ID

The terminal ID applies IMEI number of 15 bits.

Example: if the IMEI is 123456789012345,

the terminal ID is 0x01 0x23 0x45 0x67 0x89 0x01 0x23 0x45.

5.1.1.5. Information Serial Number

For details see Data Packet Format section 4.5.

5.1.1.6. Error Check

For details see Data Packet Format section 4.6.

5.1.1.7. Stop Bit

For details see Data Packet Format section 4.7.

5.1.2. Server Responds the Data Packet

	Description	Bits	Example
Login Message Packet (18	Start Bit	2	0x78 0x78
	Packet Length	1	0x05
	Protocol	1	0x01

Byte)	Number		
	Information Serial Number	2	0x00 0x01
	Error Check	2	0xD9 0xDC
	Stop Bit	2	0x0D 0x0A

The response packet from the server to the terminal: the protocol number in the response packet is identical to the protocol number in the data packet sent by the terminal.

5.1.2.1. Start Bit

For details see Data Packet Format section 4.1.

5.1.2.2. Packet Length

For details see Data Packet Format section 4.2.

5.1.2.3. Protocol Number

For details see Data Packet Format section 4.3.

5.1.2.4. Information Serial Number

For details see Data Packet Format section 4.5.

5.1.2.5. Error Check

For details see Data Packet Format section 4.6.

5.1.2.6. Stop Bit

For details see Data Packet Format section 4.7.

5.1.3. Examples

Examples of the login message packet sent by the terminal to the server and the response packet sent by the server to the terminal are as follows: (in the examples the terminal ID is 123456789012345.

CONFIDENTIAL

Example of data packet sent by the terminal 78 780 0D 01 01 23 45 67 89 01 23 45 00 01 8C DD 0D 0A

Explain

0x78 0x78	0x0D	0x01	0x01 0x23 0x45 0x67 0x89 0x01 0x23 0x45	0x00 0x01	0x8C 0xDD	0x0D 0x0A
Start Bit	Length	Protocol No.	Terminal ID	Serial No.	Error Check	Stop Bit

Example of response packet returned by the server

78 78 05 01 00 01 D9 DC 0D 0A

Explain

0x78 0x78	0x05	0x01	0x00 0x01	0xD9 0xDC	0x0D 0x0A
Start Bit	Length	Protocol No.	Serial No.	Error Check	Start Bit

5.2. Location Data Packet (combined information package of GPS and LBS)

5.2.1. Terminal Sending Location Data Packet to Server

Format			Length(Byte)	Example
Information Content	Start Bit		2	0x78 0x78
	Packet Length		1	0x1F(31) or 0x21(33)
	Protocol Number		1	0x12
	GPS Information	Date Time	6	0x0B 0x08 0x1D 0x11 0x2E 0x10
		Quantity of GPS information satellites	1	0xCF
		Latitude	4	0x02 0x7A 0xC7 0xEB
		Longitude	4	0x0C 0x46 0x58 0x49
		Speed	1	0x00
		Course, Status/ACC AC	2	0x14 0x8F
	LBS Information	MCC	2	0x01 0xCC
		MNC	1	0x00
		LAC	2	0x28 0x7D
		Cell ID	3	0x00 0x1F 0xB8
	ACC+input2+ADC		0 or 2	0x10 0xB6
	Serial Number		2	0x00 0x03
	Error Check		2	0x80 0x81
	Stop Bit		2	0x0D 0x0A

5.2.1.1. Start Bit

For details see Data Packet Format section 4.1.

5.2.1.2. Packet Length

For details see Data Packet Format section 4.2.

5.2.1.3. Protocol Number

For details see Data Packet Format section 4.3.

5.2.1.4. Date 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 15:30:23

Calculated as follows: 10(Decimal)=0A(Hexadecimal)

3 (Decimal)=03(Hexadecimal)

CONFIDENTIAL

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

5.2.1.5. Length of GPS information, quantity of positioning satellites

The field is 1 Byte displayed by two hex digits, wherein the first one is for the length of GPS information and the second one for the number of the satellites join in positioning.

Example: if the value is 0xCB, it means the length of GPS information is 12 and the number of the positioning satellites is 11.

(C = 12Bit Lenght ， B = 11 satellites)

5.2.1.6. Latitude

Four 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 thereof 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: 22º32.7658'=(22X60+32.7658)X30000=40582974, then converted into a hexadecimal number

40582974(Decimal)= 26B3F3E(Hexadecimal)

at last the value is 0x02 0x6B 0x3F 0x3E.

5.2.1.7. Longitude

Four 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 (see section 5.2.1.6).

5.2.1.8. Speed

One byte is consumed, defining the running Speed of GPS. The value ranges from 0x00 to 0xFF indicating a range from 0 to 225km/h.

e.g. 0x00 represents 0 km/h.
0x10 represents 16km/h.
0xFF represents 255 km/h.

5.2.1.9. Course Status

Two bytes are consumed, defining the running direction of GPS. The value ranges from 0° to 360° measured clockwise from north of 0°.

BYTE_1	Bit7	0:ACC OFF 1: ACC ON
	Bit6	0:input2 OFF 1:input2 ON
	Bit5	GPS real-time/differential positioning
	Bit4	1:GPS having been positioning or 0:not
	Bit3	0:East Longitude, 1:West Longitude
	Bit2	0:South Latitude, 1:North Latitude
	Bit1	Course
	Bit0	
BYTE_2	Bit7	
	Bit6	
	Bit5	
	Bit4	
	Bit3	
	Bit2	
	Bit1	
	Bit0	

Note: The status information in the data packet is the status corresponding to the time bit recorded in the data packet.
For example: the value is 0x15 0x4C, the corresponding binary is 00010101 01001100,

BYTE_1 Bit7 0 0:ACC OFF 1: ACC ON
BYTE_1 Bit6 0 0:input2 OFF 1:input2 ON
BYTE_1 Bit5 0 (real time GPS)
BYTE_1 Bit4 1 (GPS has been positioned), if this bit is 0,then Longitude& Latitude is invalid
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°.

5.2.1.10. MCC

The country code to which a mobile user belongs, i.e., Mobile Country Code(MCC).

Example: 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).

Herein the range is 0x0000 ~ 0x03E7.

5.2.1.11. MNC

Mobile Network Code(MNC)

Example: Chinese MNC is 0x00.

5.2.1.12. 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).

5.2.1.13. Cell ID

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

5.2.1.14. ACC+Input2+ADC

Two bytes are combined for defining the ACC(on/off), INPUT2(on/off) and ADC value.

If you do not want those two bytes, then send sms command to device to disable this function, the sms command is :#6666#GT06#2#,then the gps packet is same with GT06 protocol. if you want those two btyes please send : #6666#GT06#3# then gps packet will increase those two bytes.

ADC can be used as voltage detection, oil percentage, temperature detection function, The factory default is voltage detection, You can send a text message to change the purpose of the ADC. the sms command is :

#6666#votselect#0# (0= voltage detection, 1= oil percentage,2= temperature detection)

When BYTE_1 Bit4 is 0 and if "BYTE_1 Bit5" is 0 then ADC value is for voltage, if "BYTE_1 Bit5" is 1 then ADC value is for Fuel Oil percentage. if "BYTE_1 Bit4" is 1 then ADC value is for temperature and BYTE_1 Bit1 is for +/- temperature. The server can judge the packet type based on these bits.

ADC for voltage detection:

voltage value=(10bit ADC value)/10, such as 10bits ADC value= 0001100010 in Binary= 98 in decimal mean 9.8V

ADC for oil percentage:

You can use this ADC for fuel oil detection, Due to the different height of fuel tank and fuel sensor specifications, tracker needs to be set appropriate zero rang value and full range value to detect the precise fuel percentage.

Zero calibration: Send " #6666#oilzero# " to tracker when the fuel tank is empty ,then tracker will adjust zero range automatically and reply "Getting oilzero ok! value=?.?V". you can also send sms command #6666#oilzero#0.1# to define the different voltage value when fuel tank is empty and it will reply "Setting oilzero ok! value=?.?V "

Full calibration: Send " #6666#oilfull# " to tracker when the fuel tank is full ,then tracker will adjust full range automatically and reply "Getting oilfull ok! value=?.?V". you can also send sms command #6666#oilfull#5.1# to define the different voltage value when fuel tank is full and it will reply "Setting oilfull ok! value=?.?V "

#6666#checkoil# is for SMS checking percentage, current voltage, oilzero, oilfull values.

If full calibration is set as 0.0V,then tracker does not give percentage value but ADC voltage value in GPS package.

ADC for temperature detection:

When you set the ADC to the temperature detection function, the device will write the temperature value into the two bytes of "ACC+Input2+ADC". Please parse the temperature value as defined below, if BYTE_1 Bit4 is 1,then ADC(9bits) value is for temperature value and BYTE_1 Bit1=1 for -temperature ,0: for +temperature

#6666#checktemperature# is the sms command for checking temperature value

For example: the value is 0xC3 0x15, the corresponding binary is 1100001100010101, it show ACC is ON,input2 is ON,the adc voltage is:78.9V

BYTE_1 Bit7	1	0: ACC OFF 1: ACC ON
BYTE_1 Bit6	1	0: input2 OFF 1: input2 ON
BYTE_1 Bit5	0	0:10bit ADC is voltage 1: 10bit ADC is percentage; This bit is useful only when BYTE_1 Bit4 is 0
BYTE_1 Bit4	0	0:unused 1: 10bit ADC is Temperature and BYTE_1 Bit1 is for +/- temperature and BYTE_1 Bit5 is unused
BYTE_1 Bit3	0	unused
BYTE_1 Bit2	0	unused
BYTE_1 Bit1	1	if BYTE_1 Bit4 is 1,then this bit:1 for -temperature ,0: for +temperature
BYTE_1 Bit0	1	
BYTE_2 Bit7	0	
BYTE_2 Bit6	0	
BYTE_2 Bit5	0	→ (ADC) (0001100010 in Binary, or 98 in decimal),mean 9.8V if BYTE_1 Bit5=0
BYTE_2 Bit4	1	→ OR (ADC) (0001100010 in Binary, or 98 in decimal),mean 98% if BYTE_1 Bit5=1
BYTE_2 Bit3	0	OR (ADC) (0001100010 in Binary, or 98 in decimal),mean +98°C if BYTE_1 Bit4=1
BYTE_2 Bit2	1	
BYTE_2 Bit1	0	
BYTE_2 Bit0	1	

5.2.1.15. Information Serial Number

For details see Data Packet Format section 4.5.

5.2.1.16. Error Check

For details see Data Packet Format section 4.6.

5.2.1.17. Stop Bit

For details see Data Packet Format section 4.7.

5.2.2. Examples of Packet Sent from Terminal to Server

Example of sending by the terminal

New package, more tow bytes, voltage=4.4V ACC=0, AC=1:

78 78 21 12 00 00 00 08 00 00 c7 00 00 00 00 00 00 00 00 00 44 00 01 cc 00 26 22 00 13 30 40 2c 00 5f db e6 0d 0a

Old package :

78 78 1F 12 0B 08 1D 11 2E 10 CC 02 7A C7 EB 0C 46 58 49 00 14 8F 01 CC 00 28 7D 00 1F B8 00 03 80 81 0D 0A

Explain

0x78 0x78	0x1F	0x12	0x0B 0x08 0x1D 0x11 0x2E 0x10	0xCC	0x02 0x7A 0xC7 0xEB
Start Bit	Packet Length	Protocol No.	Date Time	Quantity of GPS information satellites	Latitude

0x0C 0x46 0x58 0x49	0x00	0x14 0x8F	0x01 0xCC	0x00	0x28 0x7D	0x00 0x1F 0xB8	0x00 0x03

Longitude	Speed	Course Status	MCC	MNC	LAC	Cell ID	Serial No.
0x80 0x81 Error Check	0x0D 0x0A Stop Bit						

5.3. Alarm Packet (GPS, LBS, combined status information packet)

5.3.1. Server Sending Alarm Data Packet to Server

Format			Length (Byte)
3Information Content	Start Bit		2
	Packet Length		1
	Protocol Number		1
	Date Time		6
	GPS Information	Quantity of GPS information satellites	1
		Latitude	4
		Longitude	4
		Speed	1
		Course, Status	2
	LBS Information	LBS Length	1
		MCC	2
		MNC	1
		LAC	2
		Cell ID	3
	status Information	Terminal Information Content	1
		Voltage Level	1
		GSM Signal Strength	1
		Alarm/Language	2
	Serial Number		2
	Error Check		2
	Stop Bit		2

CONFIDENTIAL

Alarm packet is consisted by adding status information to location packet, so does the encoding format of the protocol.

5.3.1.1. Start Bit

For details see Data Packet Format section 4.1.

5.3.1.2. Packet Length

For details see Data Packet Format section 4.2.

5.3.1.3. Protocol Number

For details see Data Packet Format section 4.3.

5.3.1.4. Date Time

For details see Location Data Packet Format section 5.2.1.4.

5.3.1.5. Length of GPS information, quantity of positioning satellites

For details see Location Data Packet Format section 5.2.1.5.

5.3.1.6. Latitude

For details see Location Data Packet Format section 5.2.1.6.

5.3.1.7. Longitude

For details see Location Data Packet Format section 5.2.1.7.

5.3.1.8. Speed

For details see Location Data Packet Format section 5.2.1.8.

5.3.1.9. Status and Course

For details see Location Data Packet Format section 5.2.1.9.

5.3.1.10. MCC

For details see Location Data Packet Format section 5.2.1.10.

5.3.1.11. MNC

For details see Location Data Packet Format section 5.2.1.11.

5.3.1.12. LAC

For details see Location Data Packet Format section 5.2.1.12.

5.3.1.13. Cell ID

For details see Location Data Packet Format section 5.2.1.13.

5.3.1.14. Terminal Information

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

Bit		Code Meaning
BYTE	Bit7	1: oil and electricity disconnected
		0: gas oil and electricity connected
	Bit6	1: GPS tracking is on
		0: GPS tracking is off
	Bit3~ Bit5	XX
		100: SOS
		011: Low Battery Alarm
		010: Power Cut Alarm
		001: Shock Alarm
		000: Normal
	Bit2	1: Charge On
		0: Charge Off
	Bit1	1: ACC high
		0: ACC Low
	Bit0	1: Activated
		0: Deactivated

Example: 0x44, corresponding binary value is 01000100,

indicates that the status of the terminal is: oil and electricity connected, GPS tracking is on, normal without any alarm, charge on, ACC is low, and deactivated.

5.3.1.15. Voltage Level

The arrange 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

Example: 0x02 indicates very low battery and a Low Battery Alarm is sending.

5.3.1.16. GSM Signal Strength Levels

0x00: no signal;
0x01: extremely weak signal;
0x02: very weak signal;
0x03: good signal;
0x04: strong signal.
Example: 0x03 indicates the GSM signal is good.

5.3.1.17. Alarm/Language

0x00 (former bit) 0x01 (latter bit)
former bit: terminal alarm status (suitable for alarm packet and electronic fence project)-our server read this byte as alarm.
latter bit: the current language used in the terminal

former bit	0x00: normal
	0x01: SOS
	0x02: Power Cut Alarm
	0x03: Shock Alarm
	0x04: Fence In Alarm
	0x05: Fence Out Alarm
	0x06: no
	0x09: Move Alarm/位移
	0x0A: no
	0x10: Low battery Alarm
	0x12: Over speed Alarm/超速
	0x20: Light Alarm/见光报警
	0x21:Off Line Alam
latter bit	0x01: Chinese
	0x02: English

Examples:
No Alarm and Language is Chinese: 0x00 0x01
No Alarm and Language is English: 0x00 0x02

To increase the reliability of alarm information, labeling the alarm information repeatedly; in most cases, the alarm information keeps consistent with information of former terminal, while the inconsistencies are as follows:

A. Low Battery Alarm occurred in the information of the terminal
B. Fence in and out Alarm in the Alarm/Language information

5.3.1.18. Information Serial Number

For details see Data Packet Format section 4.5.

5.3.1.19. Error Check

For details see Data Packet Format section 4.6.

5.3.1.20. Stop Bit

For details see Data Packet Format section 4.7.

5.3.2. Examples

Examples of terminal transmission

78 78 25 16 0B 0B 0F 0E 24 1D CF 02 7A C8 87 0C 46 57 E6 00 14 02 09 01 CC 00 28 7D 00 1F 72 65 06 04 01 01 00 36 56 A4 0D 0A

Explain

0x78 0x78	0x25	0x16	0x0B 0x0B 0x0F 0x0E 0x24 x01D	0xCF	0x02 0x7A 0xC8 0x87		
Start Bit	Length	Protocol No.	Date Time	Quantity of GPS information satellites	Latitude		
0x0C 0x46 0x57 0xE6	0x00	0x14 0x02	0x09	0x01 0xCC	0x00	0x28 0x7D	0x00 0x1F 0x72
Longitude	Speed	Course Status	LBS Length	MCC	MNC	LAC	Cell ID
0x65	0x06	0x04	0x01 0x01	0x00 0x36	0x56 0xA4		0x0D 0x0A
Terminal Information Content	Voltage Level	GSM Signal Strength	Alarm/Language	Serial No.	Error Check		Stop Bit

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

CONFIDENTIAL

5.4. Heartbeat Packet (status information packet)

Heartbeat packet is a data packet to maintain the connection between the terminal and the server.

5.4.1. Terminal Sending Heartbeat Packet to Server

Format			Length (Byte)
Information Content	Start Bit		2
	Packet Length		1
	Protocol Number		1
	Status Information	Terminal Information Content	1
		Voltage Level	1
		GSM Signal Strength	1
		Alarm/Language	2
	Serial Number		2
	Error Check		2
	Stop Bit		2

5.4.1.1. Start Bit

For details see Data Packet Format section 4.1.

5.4.1.2. Packet Length

For details see Data Packet Format section 4.2.

5.4.1.3. Protocol Number

For details see Data Packet Format section 4.3.

5.4.1.4. Terminal Information

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

Bit		Code Meaning
BYTE	Bit7	1: oil and electricity disconnected
		0: gas oil and electricity
	Bit6	1: GPS tracking is on
		0: GPS tracking is off
	Bit3~ Bit5	
		100: SOS
		011: Low Battery Alarm
		010: Power Cut Alarm
		001: Shock Alarm
		000: Normal
	Bit2	1: Charge On
		0: Charge Off
	Bit1	1: ACC high
		0: ACC Low
	Bit0	1: Activated----Air Condition ON
		0: Deactivated------AC OFF

Example: 0x44, corresponding binary value is 01000100,

CONFIDENTIAL

indicates that the status of the terminal is: oil and electricity connected, GPS tracking is on, normal without any alarm, charge on, ACC is low, and deactivated.

5.4.1.5. Voltage Level

The arrange 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

Example: 0x02 indicates very low battery and a Low Battery Alarm is sending.

5.4.1.6. GSM Signal Strength Levels

0x00: no signal;

0x01: extremely weak signal;

0x02: very weak signal;

0x03: good signal;

0x04: strong signal.

Example: 0x03 indicates the GSM signal is good.

5.4.1.7. Alarm/Language

0x00 (former bit) 0x01 (latter bit)

former bit: terminal alarm status (suitable for alarm packet and electronic fence project)

latter bit: the current language of the terminal

former bit	0x00: normal
	0x01: SOS
	0x02: Power Cut Alarm
	0x03: Shock Alarm
	0x04: Fence In Alarm
	0x05: Fence Out Alarm
latter bit	0x01: Chinese
	0x02: English

Examples:

No Alarm and Language is Chinese: 0x00 0x01

No Alarm and Language is English: 0x00 0x02

5.4.1.8. Information Serial Number

For details see Data Packet Format section 4.5.

5.4.1.9. Error Check

For details see Data Packet Format section 4.6.

5.4.1.10. Stop Bit

For details see Data Packet Format section 4.7.

CONFIDENTIAL

5.4.2. Server Responds the Data Packet

	Description	Bits	Example
Login Message Packet (18 Byte)	Start Bit	2	0x78 0x78
	Packet Length	1	0x05
	Protocol Number	1	0x013
	Information Serial Number	2	0x00 0x01
	Error Check	2	0xD9 0xDC
	Stop Bit	2	0x0D 0x0A

The response packet from the server to the terminal: the protocol number in the response packet is identical to the protocol number in the data packet sent by the terminal.

5.4.2.1. Start Bit

For details see Data Packet Format section 4.1.

5.4.2.2. Packet Length

For details see Data Packet Format section 4.2.

5.4.2.3. Protocol Number

For details see Data Packet Format section 4.3.

5.4.2.4. Information Serial Number

For details see Data Packet Format section 4.5.

5.4.2.5. Error Check

For details see Data Packet Format section 4.6.

5.4.2.6. Stop Bit

For details see Data Packet Format section 4.7.

CONFIDENTIAL

5.4.3. Examples

Example of data packet sent by the terminal

78 78 0A 13 4B 04 03 00 01 00 11 06 1F 0D 0A

Explain

0x78 0x78	0x0A	0x13	0x4B 0x04 0x03	0x00 0x01	0x00 0x11	0x06 0x1F	0x0D 0x0A
Start Bit	Length	Protocol No.	Information Content	Reserved bit (Language)	Serial No.	Error Check	Stop Bit

Example of response packet returned by the server

78 78 05 13 00 11 F9 70 0D 0A

Explain

0x78 0x78	0x05	0x13	0x00 0x11	0xF9 0x70	0x0D 0x0A
Start Bit	Length	Protocol No.	Serial No.	Error Check	Stop Bit

v. Data Packet Sent From Server to Terminal (gprs command)

6.1. Packet Sent by Server

Format		Length (Byte)
Start Bit		2
Packet length		1
Protocol Number		1
Information Content	Length of Command	1
	Server Flag Bit	4
	Command Content	M
	Language	2--change to 0
Information Serial Number		2
Error Check		2
Stop Bit		2

6.1.1. Start Bit

For details see Data Packet Format section 4.1.

6.1.2. Packet Length

For details see Data Packet Format section 4.2.

6.1.3. Protocol Number

The Protocol Number of terminal transmission is 0x80.

6.1.4. Length of Command

Server Flag Bit + Length of Command Content

Example: measured in bytes, 0x0A means the content of command occupied ten bytes.

6.1.5. Server Flag Bit

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

6.1.6. Command Content

It is represented in ASC II of string, and the command content is compatible with benway text message command. Such as #0613#CF# the password must be “0613” not “6666” for gprs command.

SIMPLE GPRS COMMAND:

DYD,000000# or DYD# This is for cuting engine

Example:

Server to device: 78 78 15 80 0f 00 53 01 27 44 59 44 2c 30 30 30 30 30 30 23 00 00 d6 7d 0d 0a

Device respond server(0x15package): 78 78 18 15 10 00 53 01 27 44 59 44 3d 53 75 63 63 65 73 73 21 00 02 00 4d 62 5d 0d 0a

HFYD,000000# or HFYD# This is for recovering engine

Server to device: 78 78 16 80 10 00 53 01 50 48 46 59 44 2c 30 30 30 30 30 30 23 00 00 dd 3e 0d 0a

Device respond server: 78 78 19 15 11 00 53 01 50 48 46 59 44 3d 53 75 63 63 65 73 73 21 00 02 00 54 f0 c6 0d 0a

STATUS# This is for checking parameter.

Server to device: 78 78 11 80 0b 00 53 01 75 53 54 41 54 55 53 23 00 00 50 f2 0d 0a

Device respond server: 78 78 e7 15 df 00 53 01 75 31 64 5f 33 30 30 5f 56 35 2e 30 0a 56 65 72 3a 32 30 31 38 2f 30 38 2f 33 30 20 31 33 3a 33 38 0a 49 4d 45 49 3a 38 38 38 38 38 38 38 38 38 38 38 38 38 31 0a 49 50 2d 77 7a 3a 34 35 2e 31 31 32 2e 32 30 34 2e 31 36 30 3a 37 37 30 30 0a 47 50 52 53 3d 31 2c 47 50 53 3d 31 2c 4d 3d 32 2c 47 53 4d 3d 34 2c 4e 65 74 3d 39 2c 54 5a 3d 45 38 2c 4c 42 53 3d 30 2c 52 65 69 73 73 75 65 3d 31 2c 41 6e 67 3d 31 2c 43 5f 61 6c 6d 3d 31 2c 53 5f 61 6c 6d 3d 31 2c 58 69 65 79 69 3d 30 2c 4d 54 3d 31 30 2c 53 54 3d 35 2c 4d 53 3d 31 38 2c 42 61 74 3d 34 2e 32 30 56 2c 56 6f 6c 3d 31 34 2e 30 56 2c 53 6c 70 3d 30 2c 41 43 43 3d 30 2c 41 64 31 3a 2c 41 64 32 3a 00 02 00 5d d4 f3 0d 0a

Also can use all benway standard sms commands ,but the password must be “0613” not “6666” for gprs command:

Server to device: 78 78 13 80 0d 00 02 18 25 23 30 36 31 33 23 63 66 23 00 02 00 00 9a 97 0d 0a

(this mean sever send command by gprs to device :#0613#cf#)

Device respond server: 78 78 18 15 10 00 02 18 25 23 30 36 31 33 23 63 66 23 2d 4f 4b 00 02 00 1e ad 79 0d 0a

6.1.7. Language

A bit indicates the current language used in the terminal. those two bytes

Chinese: 0x00 0x01

English: 0x00 0x02

6.1.8. Information Serial Number

For details see Data Packet Format section 4.5.

6.1.9. Error Check

For details see Data Packet Format section 4.6.

6.1.10. Stop Bit

For details see Data Packet Format section 4.7.

ENTIAL

6.2. Packet Replied by Terminal

Format		Length (Byte)
Start Bit		2
Packet Length		1
Protocol Number		1
Information Content	Length of Command	1
	Server Flag Bit	4
	Command Content	M
	Language	2
Information Serial Number		2
Error Check		2
Stop Bit		2

6.2.1. Start Bit

For details see Data Packet Format section 4.1.

6.2.2. Packet Length

For details see Data Packet Format section 4.2.

6.2.3. Protocol Number

The terminal responds to the command sent by the server. The format of data packet is consistent with “the command sent by the server to the terminal”, but the Protocol Number herein is different and is 0x15.

6.2.4. Length of Command

Server Flag Bit + Length of Command Content

Example: measured in bytes, 0x0A means the content of command occupied ten bytes.

6.2.5. Server Flag Bit

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

6.2.6. Command Content

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

6.2.7. Language

A bit indicates the current language used in the terminal.

Chinese: 0x00 0x01

English: 0x00 0x02

6.2.8. Information Serial Number

For details see Data Packet Format section 4.5.

6.2.9. Error Check

For details see Data Packet Format section 4.6.

6.2.10. Stop Bit

For details see Data Packet Format section 4.7.

6.3. Looking Up Location Information

Function Description: Obtain the command of tracking information. A mobile phone user or a short message server may obtain the tracking information by this command.

In an example, the transmitting and returning strings are converted into ASCII to generate command contents.

Sending by the server
DWXX,000000#
Returned by the terminal
if successful, return
DWXX=Lat:<North/South Latitude>,Lon:<East/West Longitude>,Course:<angle>,Speed:<speed>,DateTime:<time>
if failed, return
DWXX=Command Error!
if tracking unsuccessful, return
DWXX=Lat:,Lon:, Course:,Speed:,DateTime:-:
Example:
DWXX=Lat:N23d5.1708m,Lon: E114d23.6212m,Course:120,Speed:53.02;DateTime:08-09-12 14:52:36
Explain: which means: N23d5.1708m, E114d23.6212m, Course: 120, Speed: 53.02km/h, Date Time: 08-09-12 14:52:36.

6.4. Cutting Oil and Electricity

Function Description: cutting off the vehicle oil-electric control circuit

In an example, the transmitting and returning strings are converted into ASCII to generate command contents.

Sending by the server
DYD,000000#
Returned by the terminal
if successful, return
DYD=Success!
if failed, return
DYD=Unvalued Fix 或 DYD=Speed Limit, Speed 40km/h
Explain: the oil and electricity are not allowed to be disconnect when the GPS tracking is off or the running speed is higher than 20KM/H.

6.5. Connecting Oil and Electricity

Function Description: connecting the vehicle oil-electric control circuit

In an example, the transmitting and returning strings are converted into ASCII to generate command contents.

Sending by the server
HFYD,000000#
Returned by the terminal
if successful, return
HFYD=Success!
if failed, return
HFYD=Fail!

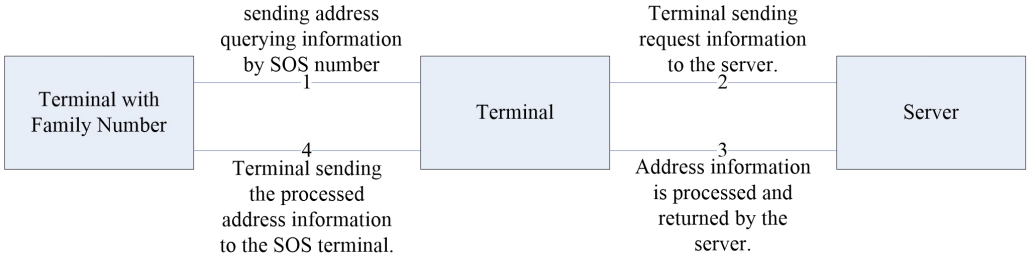
6.6. Address Querying Information Sent by the Server

In an example, the transmitting and returning strings are converted into ASCII to generate command contents.

In an example, the transmitting and returning strings are converted into ASCII to generate command contents.
ADDRESS, Address Content, Phone Number

Note: The address content in Chinese is sent in UNICODE.

6.7. GPS, Phone Number Querying Address Information Package (0X1A)



6.7.1. Information from Terminal to Server

The information is received by the terminal.

The format is basically same to the format mentioned as GPS information content, and the different is that phone number for querying address is added here.

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

6.7.1.1. Start Bit

For details see Data Packet Format section 4.1.

6.7.1.2. Packet Length

For details see Data Packet Format section 4.2.

Example: measured in bytes, 0x2E means the content of command occupied 46 bytes.

6.7.1.3. Protocol Number

0x1A is utilized.

6.7.1.4. Date Time

For details see Location Data Packet Format section 5.2.1.4.

6.7.1.5. Length of GPS information, quantity of positioning satellites

For details see Location Data Packet Format section 5.2.1.5.

6.7.1.6. Latitude

For details see Location Data Packet Format section 5.2.1.6.

6.7.1.7. Longitude

For details see Location Data Packet Format section 5.2.1.7.

CONFIDENTIAL

6.7.1.8. Speed

For details see Location Data Packet Format section 5.2.1.8.

6.7.1.9. Course

For details see Location Data Packet Format section 5.2.1.9.

6.7.1.10. Phone Number

The SOS phone number used for requesting address query, which is converted by ASCII and 0 is added at the right side if less than 21 bits.

6.7.1.11. Language

A bit indicates the current language used in the terminal.

Chinese: 0x00 0x01

English: 0x00 0x02

6.7.1.12. Information Serial Number

For details see Data Packet Format section 4.5.

6.7.1.13. Error Check

For details see Data Packet Format section 4.6.

6.7.1.14. Stop Bit

For details see Data Packet Format section 4.7.

6.7.2. Response of Server

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

6.7.2.1. Response package in Chinese or other language

The response data packet in Chinese is as follow:

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	ADDRESS	7
			&&	2
			Address Content	M
			&&	2
			Phone Number	21
			##	2
	Information Serial Number			2
	Check Bit			2
	Stop Bit			2

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

Command Content: ADDRESS&&Address Content&&Phone Number## (ADDRESS, &&, ## are fixed strings)

Chinese address content is sent in UNICODE.

Example of Chinese address response information:

7878 //Start Bit
84 //Data Length
17 //Response Protocol Number
7E //Length of Command, i.e., length of the information of the transmitted content
00000001 //Server Flag Bit
41444452455353 //ADDRESS
2626 //&& Separator
624059044F4D7F6E0028 //Chinese address is sent in UNICODE
004C004200530029003A
5E7F4E1C77015E7F5DDE
5E0282B190FD533AFF17
FF15FF144E6190530028
004E00320033002E0033
00390035002C00450031
00310032002E00390038
0038002996448FD1
2626 //&&Separator
3133373130383139313335000000000000000000000 //Phone Number
2323 //## terminator of content
0106 //Serial No.
3825 //Check Bit
0D0A //Stop Bit

6.7.2.2. Response package in English

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.

<table>
<tr><td rowspan="12">Command packet sent from the server to the terminal (15+M+N Byte)</td><td colspan="3">Start Bit</td><td>2</td></tr>
<tr><td colspan="3">Length of data bit</td><td>2</td></tr>
<tr><td colspan="3">Protocol Number</td><td>1</td></tr>
<tr><td rowspan="8">Information Content</td><td colspan="2">Length of Command</td><td>2</td></tr>
<tr><td colspan="2">Server Flag Bit</td><td>4</td></tr>
<tr><td rowspan="6">Command Content</td><td>ADDRESS</td><td>7</td></tr>
<tr><td>&&</td><td>2</td></tr>
<tr><td>Address Content</td><td>M</td></tr>
<tr><td>&&</td><td>2</td></tr>
<tr><td>Phone Number</td><td>21</td></tr>
<tr><td>##</td><td>2</td></tr>
<tr><td colspan="3">Information Serial Number</td><td>2</td></tr>
<tr><td colspan="3">Check Bit</td><td>2</td></tr>
<tr><td colspan="3">Stop Bit</td><td>2</td></tr>
</table>

CONFIDENTIAL

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

Command Content: ADDRESS&&Address Content&&Phone Number##(ADDRESS, &&, ## are fixed strings)

Example of English address response information:

7878 //Start Bit
00D1 //Data Length
97 //Response Protocol Number
00CA //Length of Command, i.e., length of the information of the transmitted content
00000001 //Server Flag Bit
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
313235323031333739303737343035310000000000 //Phone Number
2323 //## terminator of content
0007 // Serial No.
72b5 //Check Bit
0D0A //Stop Bit

vi. 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
}
```

ORIGINAL

vii. Appendix B: a fragment of example of data packet of communication protocol

The following data displayed in hexadecimal are intercepted from the communication between a terminal and a server, wherein transmission means sending by the terminal and reception means returned from the server:

Login packet:

transmission: 78 78 0D 01 03 53 41 35 32 15 03 62 00 02 2D 06 0D 0A

reception: 78 78 05 01 00 02 EB 47 0D 0A

GPS data packet (06 means adopting combined information package of GPS and LBS):

transmission: 78 78 1F 12 0B 08 1D 11 2E 10 CF 02 7A C7 EB 0C 46 58 49 00 14 8F 01 CC 00 28 7D 00 1F B8 00 03 80 81 0D 0A

Status packet:

transmission: 78 78 0A 13 44 01 04 00 01 00 05 08 45 0D 0A

reception: 78 78 05 13 00 05 AF D5 0D 0A

disconnect oil and electricity online:

reception: 78 78 15 80 0F 00 01 A9 58 44 59 44 2C 30 30 30 30 30 30 23 00 A0 DC F1 0D 0A

transmission: 78 78 18 15 10 00 01 A9 58 44 59 44 3D 53 75 63 63 65 73 73 21 00 02 00 18 91 77 0D 0A

the server sending DYD,000000#

reply: DYD=Success!

Command sent during disconnection of oil and electricity:

reception: 78 78 15 80 0F 00 01 A9 61 44 59 44 2C 30 30 30 30 30 30 23 00 A0 3E 10 0D 0A

transmission: 78 78 53 15 4B 00 01 A9 61 41 6C 72 65 61 64 79 20 69 6E 20 74 68 65 20 73 74 61 74 65 20 6F 66 20 66 75 65 6C 20 73 75 70 70 6C 79 20 63 75 74 20 6F 66 66 2C 74 68 65 20 63 6F 6D 6D 61 6E 64 20 69 73 20 6E 6F 74 20 72 75 6E 6E 69 6E 67 21 00 02 00 1C F3 0D 0D 0A

the server sending DYD,000000#

reply: Already in the state of fuel supply cut off,the command is not running!

Connect oil and electricity online:

reception: 78 78 16 80 10 00 01 A9 63 48 46 59 44 2C 30 30 30 30 30 30 23 00 A0 7B DC 0D 0A

transmission: 78 78 19 15 11 00 01 A9 63 48 46 59 44 3D 53 75 63 63 65 73 73 21 00 02 00 1E F8 93 0D 0A

the server sending: HFYD,000000#

reply: HFYD=Success!

Command sent during connection of oil and electricity:

reception: 78 78 16 80 10 00 01 A9 64 48 46 59 44 2C 30 30 30 30 30 30 23 00 A0 8B 1B 0D 0A

transmission: 78 78 55 15 4D 00 01 A9 64 41 6C 72 65 61 64 79 20 69 6E 20 74 68 65 20 73 74 61 74 65 20 6F 66 20 66 75 65 6C 20 73 75 70 70 6C 79 20 74 6F 20 72 65 73 75 6D 65 2C 74 68 65 20 63 6F 6D 6D 61 6E 64 20 69 73 20 6E 6F 74 20 72 75 6E 6E 69 6E 67 21 00 02 00 1F DB BF 0D 0A

the server sending: HFYD,000000#

reply: Already in the state of fuel supply to resume,the command is not running!

Querying address information online:

reception: 78 78 16 80 10 00 01 A9 67 44 57 58 58 2C 30 30 30 30 30 30 23 00 A0 06 2D 0D 0A

transmission: 78 78 64 15 5C 00 01 A9 67 44 57 58 58 3D 4C 61 74 3A 4E 32 33 2E 31 31 31 36 38 32 2C 4C 6F 6E 3A 45 31 31 34 2E 34 30 39 32 31 37 2C 43 6F 75 72 73 65 3A 30 2E 30 30 2C 53 70 65 65 64 3A 30 2E 33 35 31 38 2C 44 61 74 65 54 69 6D 65 3A 31 31 2D 31 31 2D 31 35 20 20 31 31 3A 35 33 3A 34 33 00 02 00 23 07 AE 0D 0A

content sent by the terminal: DWXX=Lat:N23.111682,Lon:E114.409217,Course:0.00,Speed:0.3518,DateTime:11-11-15 11:53:43

the terminal obtains address information from the server:

Chinese:

CONFIDENTIAL

transmission: 78 78 2E 1A 0B 0B 0F 0E 21 17 CF 02 7A C8 87 0C 46 57 E3 00 14 02 36 36 33 36 36 00 03 00 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 00 34 AD E9 0D 0A

reception: 78 78 94 17 8E 00 00 00 01 41 44 44 52 45 53 53 26 26 4F 4D 7F 6E 00 3A 5E 7F 4E 1C 77 01 60 E0 5D DE 5E 02 4E 91 5C 71 89 7F 8D EF 00 2E 65 87 53 4E 4E 00 8D EF 00 2E 79 BB 60 E0 5D DE 5B 89 4F 17 4F 1A 8B A1 5E 08 4E 8B 52 A1 62 40 7E A6 00 33 00 32 7C 73 00 2E 79 BB 60 E0 5D DE 5E 02 59 16 55 46 62 95 8D 44 67 0D 52 A1 4E 2D 5F C3 7E A6 00 33 00 32 7C 73 00 2E 26 26 36 36 33 36 36 00 03 00 04 00 00 00 00 00 00 00 00 00 00 00 00 23 23 00 01 E4 2A 0D 0A

The content sent by the server is: Locating: Wenhua Rd. 1, Huizhou, Guangdong, about 32 meters from Huizhou Anzhong Accounting Firm, about 32 meters from Huizhou Foreign Investment Service Center.
Mobile Phone Number is 66366.

English:

transmission: 78 78 2E 1A 0B 0B 0F 0E 1E 08 CF 02 7A C8 A2 0C 46 57 D7 00 14 02 36 36 33 36 36 00 03 00 04 00 00 00 00 00 00 00 00 00 00 00 00 00 02 00 32 04 3A 0D 0A

reception: 78 78 00 E9 97 00 E2 00 00 00 01 41 44 44 52 45 53 53 26 26 00 50 00 72 00 65 00 63 00 69 00 73 00 65 00 6C 00 79 00 20 00 4C 00 6F 00 63 00 61 00 74 00 69 00 6E 00 67 00 3A 00 31 00 30 53 F7 00 20 00 59 00 75 00 6E 00 73 00 68 00 61 00 6E 00 20 00 57 00 65 00 73 00 74 00 20 00 52 00 64 00 2C 00 48 00 75 00 69 00 63 00 68 00 65 00 6E 00 67 00 2C 00 48 00 75 00 69 00 7A 00 68 00 6F 00 75 00 2C 00 47 00 75 00 61 00 6E 00 67 00 64 00 6F 00 6E 00 67 00 2C 00 35 00 31 00 36 00 30 00 30 00 33 00 28 00 4E 00 32 00 33 00 2E 00 31 00 31 00 31 00 37 00 37 00 2C 00 45 00 31 00 31 00 34 00 2E 00 34 00 30 00 39 00 32 00 32 00 29 26 26 36 36 33 36 36 00 03 00 04 00 00 00 00 00 00 00 00 00 00 00 00 23 23 00 01 AF 4D 0D 0A

The content sent by the server is: Precisely Locating:10 号 Yunshan West Rd,Huicheng,Huizhou,Guangdong,516003(N23.11177,E114.40922)
Mobile Phone Number is 66366.

Process of Alarm packet:

Short message in Chinese:

transmission: 78 78 25 16 0B 0B 0F 0E 24 1D CF 02 7A C8 87 0C 46 57 E6 00 14 02 09 01 CC 00 28 7D 00 1F 72 65 06 04 01 01 00 36 56 A4 0D 0A

reception: 78 78 05 16 00 36 95 70 0D 0A

reception: 78 78 BE 17 B8 00 00 00 01 41 4C 41 52 4D 53 4D 53 26 26 7D 27 60 25 54 7C 53 EB 00 3A 5E 7F 4E 1C 77 01 60 E0 5D DE 5E 02 4E 91 5C 71 89 7F 8D EF 00 2E 65 87 53 4E 4E 00 8D EF 00 2E 79 BB 4E 2D 88 4C 00 41 00 54 00 4D 7E A6 00 33 00 31 7C 73 00 2E 79 BB 4E 2D 88 4C 6C 5F 53 17 65 2F 88 4C 7E A6 00 33 00 31 7C 73 00 2E 00 2C 00 31 00 31 00 2D 00 31 00 31 00 2D 00 31 00 35 00 20 00 31 00 34 00 3A 00 33 00 36 00 3A 00 32 00 39 26 26 30 30 30

viii. Appendix C: Complete Format of the 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	Check Bit	Stop Bit
2	1	1	8	2	2	2

GPS Information Package (26+N Byte)												
			Information Content									
				GPS 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	Information serial number	check bit	stop bit
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	check bit	stop bit
2	1	1	6	2	1	2	3	N	2	2	2

LBS complete information package (42+N Byte)																										
			Information Content																							
				LBS Information																						
Start Bit	Packet length	Protocol Number	Date Time	MCC	MNC	LAC	MCI	MCISS	NCI1	NCISS1	NCI2	NCISS2	NCI3	NCISS3	NCI4	NCISS4	NCI5	NCISS5	NCI6	NCISS6	Reserved extended bit	Information serial number	check bit	stop bit			
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	check bit	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				Information Serial Number		
Start Bi	Packet Length	Protocol Number	Terminal Information Content	Voltage Level	GSM Signal Strength Level	Reserved and Extended Bit (language)		Check Bit	Stop Bit

CONFIDENTIAL

t									
2	1	1	1	1	1	2	2	2	2

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

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