GPS Tracker
Communication Protocol
JM-VL01(GV40)

Revision Record

Author	Date	Version	Review	Approve	Remarks
	2020-4--16	V13			Delete LBS packet Compatible with 2 bytes in some countries mnc
	2020-6-17	V14			Modify the alarm bit 09 to be the moving alarm
	2020-7-1	V15			Add multi-fence alarm and Information transmission packet
	2020-8-12	V16			Add other alarm types
	2021-4-10	V17			Add mileage statistic
	2021-7-14	V18			Add 0x9B
	2021-12-29	V19			Add protocol example

CONTENT

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

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 re-transmission 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.

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 or 2
Protocol Number	1
Information Content	N
Information Serial Number	2
Error Check	2
Stop Bit	2

4.1. Start Bit

Packet length is 1, fixed value in HEX : 0x78 0x78.

Packet length is 2.Fixed value in HEX : 0x79 0x79.

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 information	0x01
Status information (heartbeat package)	0x13
Location packet	0xA0
Multi-fence alarm packet	0xA4
WiFi information collection package	0XC3
Information transmission packet	0x94
Alarm packet	0x95
Command sent by 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

Fixed value in HEX 0x0D 0x0A.

Ⅴ.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(0x01)

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
Login Message Packet(18 Byte)	Start Bit	2
	Packet Length	1
	Protocol Number	1
	Terminal ID	8
	Type identification code	2
	Time zone language	2
	Information Serial Number	2
	Error Check	2
	Stop Bit	2

Example：78 78 11 01 07 52 53 36 78 90 02 42 70 00 32 01 00 05 12 79 0D 0A

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. Type identification code

The type identification code takes up two bytes. The terminal type is judged based on the identification code.

The first three digits of the two bytes represent the model, and the latter one represents the branch of the model.

Type ID 0x80 0x22 ; GV40

5.1.1.6. Time zone & Language

<table>
<tr><td rowspan="10">One and a half bits bit15—bit 4</td><td>15</td><td colspan="2" rowspan="10">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="4">Lower half bit4-bit0</td><td>3</td><td colspan="2">GMT</td></tr>
<tr><td>2</td><td colspan="2">No definition</td></tr>
<tr><td>1</td><td>Language Select Bit</td><td>1</td></tr>
<tr><td>0</td><td>Language Select Bit</td><td>0</td></tr>
</table>

Bit3 0-------Eastern time

1-------Western time

Example: Extended bit: 0x32 0x00 means GMT+8

Calculation method: 8*100=800 converts to HEX: 0X0320

Extended bit: 0x4D 0xD8 means GMT-12:45

Calculation method: 12.45*100=1245 converts to HEX: 0x04 0xDD

Here, to save 4 bytes, calculation result left shifted 4 bits and combined eastern time, western time and language bit.

5.1.1.7. Information Serial Number

For details see Data Packet Format section 4.5.

5.1.1.8. Error Check

For details see Data Packet Format section 4.6.

5.1.1.9. Stop Bit

For details see Data Packet Format section 4.7.

5.1.2. Server Responds the Data Packet

	Description	Bits
Login Message Packet (18 Byte)	Start Bit	2
	Packet Length	1
	Protocol Number	1
	Information Serial Number	2
	Error Check	2
	Stop Bit	2

Example：78 78 05 01 00 05 9F F8 0D 0A

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.

5.2. Heartbeat Packet（0x13）

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

Example：78 78 0A 13 40 04 04 00 01 00 0F DC EE 0D 0A

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 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	100: SOS
	Bit2	1: Charge On
		0: Charge Off
	Bit1	1: ACC high
		0: ACC Low
	Bit0	1: Defense Activated
		0: Defense Deactivated

E.g. 0x44, corresponding binary value is 01000100, which indicates that the status of the terminal is a) oil and electricity connected and b) GPS tracking is on and c) normal without any alarm and d) charge on and e) ACC is low, and f) defense deactivated

5.2.1.5 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

5.2.1.6 GSM Signal Strength Levels

0x00: no signal;

0x01: extremely weak signal;

0x02: very weak signal;

0x03: good signal;

0x04: strong signal..

5.2.1.7 Language/Extended Port Status

0x00(former) 0x01(later)
former: device extended port status
later: device language bit

former	
later	0x01 Chinese 0x02 English

5.2.1.8 Information Serial Number

For details see Data Packet Format section 4.5

5.2.1.9 Error Check

For details see Data Packet Format section 4.6

5.2.1.10 Stop Bit

For details see Data Packet Format section 4.7

5.2.1.11 Server responding heartbeat data packet to terminal

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

Example：78 78 05 13 01 00 E1 A0 0D 0A

5.2.1.12 Start Bit

For details see Data Packet Format section 4.1

5.2.1.13 Packet Length

For details see Data Packet Format section 4.2

5.2.1.14 Protocol Number

For details see Data Packet Format section 4.3.

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

5.2.1.18 Example

78780513000F008F0D0A

5.3. Location Data Packet (combined information package of GPS and LBS)(0XA0)

5.3.1. Terminal Sending Location Data Packet to Server

Format			Length(Byte)
Information Content	Start Bit		2
	Packet Length		1
	Protocol Number		1
	GPS Information	Date Time	6
		Quantity of GPS information satellites	1
		Latitude	4
		Longitude	4
		Speed	1
		Course, Status	2
	LBS Information	MCC	2
		MNC	1or 2
		LAC	4
		Cell ID	8
	ACC		1
	Data upload mode		1
	GPS real-time reupload		1
	Mileage		4
	Serial Number		2
	Error Check		2
	Stop Bit		2

Example：78 78 29 a0 15 06 16 01 0f 1a cf 03 c8 13 6c 0c 31 ad e0 28 15 64 01 cc 00 00 00 39 13 00 00 00 00 03 d1 aa 0c 01 00 00 00 bb 88 d6 0d 0a

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

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)
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

5.3.1.5. 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)

5.3.1.6. 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.

5.3.1.7. 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).

5.3.1.8. 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.

5.3.1.9. 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
	Bit6	0
	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	

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
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°.

5.3.1.10. 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.

5.3.1.11. MNC

Mobile Network Code(MNC)

Note: To make it compatible for the condition that the MNC is two bits in some countries, the update protocol use the MCC highest bit to identify the MNC length, when the MCC highest bit is 1, the MNC length are 2 bits, the Bit 15 of old devices in the past is 0, the new devices is 1.

MCC detailed explanation:

Byte		Code means
Bytes	Bit15	1:MNC length is 2 0:MNC length is 1
	Bit0-Bit14	MCC information

Example: Chinese MNC is 0x00.

5.3.1.12. 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).

5.3.1.13. Cell ID

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

5.3.1.14. ACC

ACC status: ACC low is 00 and ACC high is 01

5.3.1.15. Data upload mode

GPS data upload type

0x00 upload in fixed time interval

0x01 upload based on fixed distance

0x02 inflection data upload

0x03 ACC status change data upload

0x04 The last valid data is uploaded when the device changes from motion to static state

0x05 The last valid data is uploaded when the network is disconnected .
0x06 upload GPS data when Ephemeris updated
0x07 Press button to upload
0x08 upload when device power on
0x09 Upload LBS data after power on

5.3.1.16. GPS data upload

GPS data re-upload in real-time
0x00 re-upload in real-time
0x01 re-upload

5.3.1.17. Mileage statistics

When the device opens the mileage statistics function, the positioning package needs to upload the mileage statistics, unit:M

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.

5.4. Alarm Packet (Combined information packet of GPS, LBS and Status)(0x95)

5.4.1. Server Sending Alarm Data Packet to Server

Format			Length (Byte)
Information Content	Start Bit		2
	Packet Length		1
	Protocol Number		1
	Date Time		6
	GPS information	Latitude	4
		Longitude	4
		Course, Status	2
	Alarm Information	Alarm type	1
		Alarm value	N
	Serial Number		2
	Error Check		2
	Stop Bit		2

Example: 78 78 16 95 15 0C 1D 05 37 06 02 7A C7 51 0C 46 57 B4 14 00 03 00 2D 63 0B 0D 0A

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. Date Time

For details see Location Data Packet Format section 5.3.1.4.

5.4.1.5. Latitude

For details see Location Data Packet Format section 5.3.1.6.

5.4.1.6. Longitude

For details see Location Data Packet Format section 5.3.1.7.

5.4.1.7. Status and Course

For details see Location Data Packet Format section 5.3.1.9.

5.4.1.8. Alarm type

Byte 1	0x01:SOS
	0x02: Power cut alarm
	0x03: Vibration alarm
	0x04:Enter fence alarm
	0x05:Exit fence alarm
	0x06: Over speed alarm
	0x09: Moving alarm

	0x0A: Enter GPS dead zone alarm
	0x0B: Exit GPS dead zone alarm
	0x0E Low external battery alarm
	0x19: Low internal battery alarm
	0XFE: ACC ON Alarm
	0XFF: ACC OFF Alaram
	0x29: Harsh acceletation alarm
	0x30: Harsh braking alarm
	0x4C: Sharp turn alarm
	0x47: Fatigue driving alarm
	0x2C: Sharp Crash alarm
	0x2A: Sharp Left Turn alarm
	0x2B: Sharp Right Turn alarm
	0x66: ADC value alarm
	0x53: Oil steal alarm
	0x67:Login alarm(RFID)
	0x68: Log out alarm(RFID)

5.4.1.9. Alarm Value

Byte N	When the alarm type is 0x06, the alarm value is the speed, km/hour, (Byte N is a 2-byte Byte, short table)

5.5. Online Command(0x80)

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

5.5.1. Control command sent by server

Format		Length (Byte)
Start Bit		2
Packet Length		1
Protocol Number		1
Info content	Length of Command	1

	Server Flag Bit	4
	Command Content	M
	Language	2
Serial Number		2
Error Check		2
Stop Bit		2

Example: 78 78 20 80 18 00 00 00 00 53 4f 53 2c 41 2c 2c 2c 31 35 38 32 31 34 39 31 36 32 32 23 00 01 15 06 2e 81 0d 0a

5.5.1.1. Start Bit

For details see Data Packet Format section 4.1.

5.5.1.2. Packet Length

For details see Data Packet Format section 4.2

5.5.1.3. Protocol Number

0x80.

5.5.1.4. Command length

Server flag bit + command content length + language

5.5.1.5. Server Flag Bit

Leave for server identification. Terminal receives the original data in Binary in response packet

5.5.1.6. Command content

Character string replied in ASCII coding.

5.5.1.7. Language

Language bit of the terminal.
Chinese: 0x00 0x01
English: 0x00 0x02

5.5.1.8. Information Serial Number

For details see Data Packet Format section 4.5

5.5.1.9. Error Check

For details see Data Packet Format section 4.6

5.5.1.10. Stop Bit

For details see Data Packet Format section 4.7

5.6. Data returned by terminal (terminal response)(0x21)

Format		Length (Byte)
Start Bit		2
Length of data bit		2
Protocol Number		1
	Server Flag Bit	4
	Content code	1
	Command content	M
Information Serial Number		2
Check Bit		2
Stop Bit		2

Example: 79 79 00 9D 21 00 00 00 00 01 42 61 74 74 65 72 79 3A 34 2E 31 36 56 2C 4E 4F 52 4D 41 4C 3B 20 47 50 52 53 3A 4C 69 6E 6B 20 55 70 3B 20 47 53 4D 20 53 69 67 6E 61 6C 20 4C 65 76 65 6C 3A 53 74 72 6F 6E 67 3B 20 47 50 53 3A 53 65 61 72 63 68 69 6E 67 20 73 61 74 65 6C 6C 69 74 65 2C 20 53 56 53 20 55 73 65 64 20 69 6E 20 66 69 78 3A 30 28 30 29 2C 20 47 50 53 20 53 69 67 6E 61 6C 20 4C 65 76 65 6C 3A 3B 20 41 43 43 3A 4F 46 46 3B 20 44 65 66 65 6E 73 65 3A 4F 46 46 00 2E 26 DF 0D 0A

5.6.1 Start Bit

For details see Data Packet Format section 4.1.

5.6.2 Packet Length

For details see Data Packet Format section 4.2

5.6.3 Protocol Number

0x21.

5.6.4 Server flag bit

Leave for server identification. Terminal receives the original data in Binary in response packet

5.6.5 Content code

0x01 ASCⅡ coding
0x02 UTF16-BE coding

5.6.6 Content

Data to be sent

5.6.7 Information Serial Number

For details see Data Packet Format section 4.5

5.6.8 Error Check

For details see Data Packet Format section 4.6

5.6.9 Stop Bit

For details see Data Packet Format section 4.7

5.7 WIFI information collection package (0XC3)

Description of the WIFI packet:

The data packet for transmitting the WIFI received by the terminal , and collecting the WIFI location data ;

a) The terminal sends a WiFi information collection package.

	length	Detailed
Start bit	2	0x78 0x78
Packet length	1	Length = protocol number + information content + information serial number + error check
Protocol number	1	0xC3

information	GPS information	Date and time (UTC)	6	Year (1 byte) month (1 byte) day (1 byte) (1 byte) minute (1 byte) second (1 byte) (converted to decimal)
		GPS information satellite number	1	Reference (0XA0) GPS positioning data packet;
		latitude	4	Reference (0XA0) GPS positioning data packet;
		longitude	4	Reference (0XA0) GPS positioning data packet;
		Heading, state	2	Reference (0XA0) GPS positioning data packet;
	WIFI information	Number of W iFi	1	Used to determine the number of WIFIs transmitted in the packet, 0 is not detected WIFI
		WIFI MAC1	6	The received signal 1WIFI MAC (based on the actual number of WIFIs searched, such as searching for one transmission, searching for multiple transmissions, if the transmission is not found to be 0)
		WIFI intensity 1	1	Signal 1WIFI signal strength
		WIFI MAC2	6	Ibid.
		WIFI intensity 2	1	Ibid.
		....		....
Information serial number			2	After booting, each time the data serial number is sent, it is automatically incremented by 1.

Error check	2	The CRC-ITU value of "packet length" to "information sequence number". If the receiver receives a message with a CRC error, it ignores it and discards the packet (see Appendix 1 for the algorithm).
Stop bit	2	Fixed value, unified to 0x0D 0x0A

Example: 78 78 80 C3 15 0C 1D 07 2C 16 C6 02 7A C7 ED 0C 46 57 FB 14 00 0F DC FE 18 18 89 48 1D 82 F4 8D 13 09 04 34 FC 3D 93 B8 27 41 3C F4 83 CD 4D F5 0E 3D 30 FC 68 4B 8A 18 3D 40 45 DA 06 D8 24 40 FC D7 33 A5 97 48 42 80 89 17 D6 CE B6 43 6C 59 40 43 10 FA 47 B2 5C DA C4 D6 4F 47 54 75 95 8C 10 E0 48 54 75 95 0C 5C 0C 48 BC 67 1C 41 16 96 49 6A 35 5B 66 49 C5 4A C4 B8 B4 8F DE E0 4A 00 12 B4 ED 0D 0A

The GPS information analysis is the same as the 0XA0 GPS positioning package, and the WIFI information packet can transmit multiple sets of WIFI addresses;

5.8 Alarm packet (Multiple fences)

		Length	Description
Start Bit		2	0x78 0x78
Packet Length		1	Length = Protocol Number + Information Content + Information Serial Number + Error Check
Protocol Number		1	0XA4（UTC）
Information Content	Date Time	6	Year（1byte）Month（1byte）Day（1byte）Hour（1byte）Min（1byte）Second（1byte）（converted to a decimal）(Date Time)
	Quantity of GPS information satellites	1	The first character is GPS information length，The second character is positioning satellite number（converted to a decimal）
	Latitude	4	Convert to a decimal and divide 1800000
	Longitude	4	Convert to a decimal and divide 1800000
	Speed	1	Convert to a decimal
	Course, Status	2	Convert to binary number of 16 bits and calculate by bits (see the following diagram)（same as GPS packet, see GPS packet for details）
	LBS length	1	LBS length in total (LBS Length+ MCC+ MNC+LAC+ Cell ID=9) parse is not mandatory, can be skipped
	MCC	2	Mobile Country Code(MCC) (converted to a decimal)
	MNC	1/2	Mobile Network Code(MNC)(converted to a decimal)

	LAC	4	Location Area Code (LAC) (converted to a decimal)
	Cell ID	8	Cell Tower ID(Cell ID)(converted to a decimal)
	Terminal Information	1	See the following diagram
	Voltage Level	1	0x00： No Power (shutdown) 0x01： Extremely Low Battery (not enough for calling or sending text messages, etc.) 0x02： Very Low Battery (Low Battery Alarm) 0x03： Low Battery (can be used normally) 0x04： Medium 0x05： High 0x06： Very High
	GSM Signal Strength	1	0x00: no signal; 0x01: extremely weak signal; 0x02: very weak signal; 0x03: good signal; 0x04: strong signal.
	Alarm/Language	2	See the following diagram
	Fence Number	1	Valid bit for fence alarm.1 for fence 1, 2 for fence 2…… FF is invalid.
Serial Number		2	Serial number of data sent later at each time will be automatically added ‘1’.
Error Check		2	Error check (From “Packet Length” to“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. (See Appendix 1)
Stop Bit		2	Fixed value:0x0D 0x0A

Example: 78 78 2E A4 15 0C 1D 03 07 0C CF 02 7A DA 76 0C 46 54 2E 46 14 87 10 81 CC 00 01 00 00 A5 A6 00 00 00 00 04 59 9C 8D 46 05 03 04 02 14 00 2A F1 1E 0D 0A

i. Note: To make it compatible for the condition that the MNC is two bits in some countries, the update protocol use the MCC highest bit to identify the MNC length, when the MCC highest bit is 1, the MNC length are 2 bits, the Bit 15 of old devices in the past is 0, the new devices is 1.

MCC detailed explanation:

Byte		Code means
Bytes	Bit15	1:MNC length is 2 0:MNC length is 1
	Bit0-Bit14	MCC information

ii. Terminal Information

Bit		Code Meaning
BYTE	Bit7	1:Oil and electricity disconnected
		0: Oil and electricity connected
	Bit6	1: GPS tracking is on
		0: GPS tracking is off
	Bit3～Bit5	100: SOS
		011: Low Battery Alarm
		010: Power Cut Alarm
		001:Vibration Alarm
		000: Normal
	Bit2	1: Charging
		0: Not Charge
	Bit1	1: ACC high
		0: ACC Low
	Bit0	1: Defense Activated
		0: Defense Deactivated

iii. Alarm language

Byte 1	0x00：normal
	0x01：SOS
	0x02：Power cut alarm
	0x03: Vibration alarm
	0x04:Enter fence alarm
	0x05:Exit fence alarm
	0x06 Over speed alarm
	0x09 Displacement alarm
	0x0A Enter GPS dead zone alarm
	0x0BExit GPS dead zone alarm
	0x0C Power on alarm
	0x0D GPS First fix notice
	0x0E Low battery alarm
	0x0F Low battery protection alarm
	0x10 SIM change notice
	0x11 Power off alarm
	0x12 Airplane mode alarm
	0x13 Disassemble alarm
	0x14 Door alarm

	0x15 Low battery and shutdown alarm
	0x16 Sound control alarm
	0x17 Pseudo base-station alarm
	0x18 Open cover alarm
	0x19 Internal low Battery Alarm
	0x20 Sleep mode alarm
	0x24 Insert charger alarm
	0x28 Offline pre- alarm
	0x32 Pull alarm
Byte 2	0x01 Chinese 0x02 English 0x00 Platform has no need to reply

5.9 Information Transmission Packet(0x94)

Description：

- Terminal transmits all types of non-position data.

5.9.1 Information transmission packet sent by terminal

		Length	Description
Start Bit		2	0x79 0x79
Length of packet		2	Length = Protocol Number + Information Content + Information Serial Number + Error Check
Protocol Number		1	0x94
Information Content	Information Type（Sub-protocol Number）	1	00 External power voltage 01~03（custom） 04 terminal status synchronization 05door status 08 self-detection parameters 0A iccid 0E Upload oil information ……to add
	Data Content	N	Different information type results in different transmission content. See the following for details.
Information Serial Number		2	Serial number of data sent later at each time will be automatically added ‘1’.
Check Bit		2	Error check (From “Packet Length” to“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. (See Appendix 1)
Stop Bit		2	Fixed value:0x0D0x0A

Example: 79 79 00 7F 94 04 41 4C 4D 31 3D 43 34 3B 41 4C 4D 32 3D 43 43 3B 41 4C 4D 33 3D 34 43 3B 53 54 41 31 3D 43 30 3B 44 59 44 3D 30 31 3B 53 4F 53 3D 2C 2C 3B 43 45 4E 54 45 52 3D 3B 46 45 4E 43 45 3D 46 65 6E 63 65 2C 4F 4E 2C 30 2C 32 33 2E 31 31 31 38 30 39 2C 31 31 34 2E 34 30 39 32 36 34 2C 34 30 30 2C 49 4E 20 6F 72 20 4F 55 54 2C 30 3B 4D 49 46 49 3D 4D 49 46 49 2C 4F 46 46 00 0A 06 1E 0D 0A

Transmitted information content

When the type is 0E,the bit transmit upload oil information, multiple types of data are mixed and uploaded, the format (type+data)*n, the data format is determined by the type==0 oily

type	1	00:oil sensor
path	1	address
value	2	Oil sensor value
unit	1	unit：1:height，2:percentage,3: Voltage value

5.10 External device transfer protocol (0x9B)

5.10.1 Device send transparent data to server

		Length	Description
Start Bit		2	0x79 0x79
Length of data bit		2	Length = Protocol Number + Information Content + Information Serial Number + Error Check
Protocol Number		1	0x9B
Information Content	Module type code	1	03
	Transparent content	N	
Information Serial Number		2	Serial number of data sent later at each time will be automatically added ‘1’.
Check Bit		2	Error check (From “Packet Length” to“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. (See Appendix 1)
Stop Bit		2	Fixed value:0x0D0x0A

Example：79 79 00 14 9B 03 02 31 42 30 30 31 33 46 37 37 37 38 38 03 00 0B E8 E9 0D 0A

5.10.2 Server Response transfer data Packet

	Length	Description
Start Bit	2	0x79 0x79
Length of data bit	2	Length = Protocol Number + Information

			Content + Information Serial Number + Error Check
Protocol Number		1	0x9B
Information Content	Module type code	1	02
	Transparent content	N	01：Identify successful 00：fail
Information Serial Number		2	Serial number of data sent later at each time will be automatically added '1'.
Check Bit		2	Error check (From "Packet Length" to"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. (See Appendix 1)
Stop Bit		2	Fixed value:0x0D0x0A

Example：79 79 00 07 9B 02 01 00 1E 73 0D 0D 0A

6.0 Attached A CRC-ITU lookup table algorithm C language code fragment

CRC-ITU lookup table algorithm C language code fragment

```
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 for a given length of data.

U16 GetCrc16(const U8* pData, int nLength)

{

U16 fcs = 0xffff; // Initialize

While(nLength>0){

Fcs = (fcs >> 8) ^ crctab16[(fcs ^ *pData) & 0xff];

nLength--;

pData++;

}

Return ~fcs; // reverse

}
```

5.9. Appendix B: Complete Format of Information Package

1. 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 Nu	Information Content									
			Date Time	GPS Information						Reserved extended bit	Information serial number	Error Check	stop bit
				Length of GPS information, quantity of positioning satellites	Latitude	Longitude	Speed	Course, Status				

		mber										
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)								
Start	Packet	Protocol	Information Content				Information	Error	stop
			Da	GPS Information	LBS Information	Rese			

Start Bit	Packet Length	Protocol Number	Information Content				Information Serial Number	Error Check	Stop Bit
			Terminal Information Content	Voltage Level	GSM Signal Strength Level	Reserved and Extended Bit (language)			
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	Error Check	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	Error Check	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	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

B. Packet sent by the server to the terminal

The response of the server after receiving the status packet sent by the terminal (10 Byte)					
Start bit	Packet length	Protocol number	Information serial number	Check Digit	Stop bit
2	1	1	2	2	2

The instruction packet sent by the server to the terminal (15+M+N Byte)									
Start bit	Packet length	Protocol number	information				Information serial number	Check Digit	Stop bit
			Instruction length	Server flag	Instruction content	Reserved extension bit			
2	1	1	1	4	M	N	2	2	2

Appendix I

Types of	value
Login information	0x01
~~Positioning data~~	~~0x12~~
Positioning data (UTC)	0xA0
Status information (heartbeat package)	0x13
~~String information~~	~~0x15~~
LBS Multi-Base Station Packet (UTC)	0x28
String information	0x21
~~Alarm data~~ (local time) (single fence)	~~0x16~~
Alarm data	0x95
~~GPS, phone number query address information~~	~~0x1A~~
GPS, telephone number inquiry address information (UTC)	0x2A
The server sends instruction information to the terminal.	0x80

Network time	8A
~~LBS latitude and longitude request~~	~~8B~~
~~OBD package~~	~~8C~~
OBD package (260)	8E
OBD Control Package (260)	8F