# 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 |

**Copyright**

**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 |
| 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 |

### 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

| One and a half bits bit15—bit 4 | 15 | Time zone value expands 100 | |
| | 14 | | |
| | 13 | | |
| | 12 | | |
| | 11 | | |
| | 10 | | |
| | 9 | | |
| | 8 | | |
| | 7 | | |
| | 6 | | |
| | 5 | | |
| | 4 | | |
| Lower half bit4-bit0 | 3 | GMT | |
| | 2 | No definition | |
| | 1 | Language Select Bit | 1 |
| | 0 | Language Select Bit | 0 |

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 |

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 |
| Information Content — Voltage Level | 1 |
| Information Content — GSM Signal Strength | 1 |
| Information Content — Language/Extended Port Status | 2 |
| Serial Number | 2 |
| Error Check | 2 |
| Stop Bit | 2 |

### 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 |

### 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)

#### 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 |
| | Serial Number | | 2 |
| | Error Check | | 2 |
| | Stop Bit | | 2 |

#### 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 | Course |
| | 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. Information Serial Number

For details see Data Packet Format section 4.5.

### 5.3.1.18. Error Check

For details see Data Packet Format section 4.6.

### 5.3.1.19. Stop Bit

For details see Data Packet Format section 4.7.

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

### 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 |

#### 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 battery alarm |
| | 0x19: external battery low alarm |

### 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

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 |

### 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)

| 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 |

### 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:**

T**he 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 | 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) |
|---|---|---|---|
| | MAC1 | | |
| | 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 |

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 | Mobile Network Code(MNC)(converted to a decimal) |
| | LAC | 2 | Location Area Code (LAC) (converted to a decimal) |
| | Cell ID | 3 | Cell Tower ID(Cell ID)(converted to a decimal) |
| | Terminal Information | 1 | See the following diagram |
| | Voltage Level | 1 | 0x00：No Power (shutdown)<br>0x01：Extremely Low Battery (not enough for calling or sending text messages, etc.)<br>0x02：Very Low Battery (Low Battery Alarm)<br>0x03：Low Battery (can be used normally)<br>0x04：Medium<br>0x05：High<br>0x06：Very High |
| | GSM Signal Strength | 1 | 0x00: no signal;<br>0x01: extremely weak signal;<br>0x02: very weak signal;<br>0x03: good signal;<br>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 |

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<br>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<br>0x02 English<br>0x00 Platform has no need to reply |

## 5.9 Information Transmission Packet

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<br>01~03（custom）<br>04 terminal status synchronization<br>05door status<br>08 self-detection parameters<br>0A iccid<br>0E Upload oil information<br>……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 |

**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 |

## 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) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 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 | Error Check | stop bit |
| 2 | 1 | 1 | 6 | 1 | 4 | 4 | 1 | 2 | N | 2 | 2 | 2 |

| LBS information package (23+N Byte) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Start | Packet leng ng | Prot ocol N | Information Content | | | | | | | | |
| | | | Date Time | LBS Information | | | | Reserved | Infor mat | Error Chec k | stop bit |
| | | | | MCC | MNC | LAC | Cell ID | | | | |

| Bit | th | umber | | | | | extended bit | ion serial number | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 | MCISSS | NCI1 | NCISSS1 | NCI2 | NCISSS2 | NCI3 | NCISSS3 | NCI4 | NCISSS4 | NCI5 | NCISSS5 | NCI6 | NCISSS6 | | | | |
| 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 Bit | Packet length | Protocol Number | Information Content | | | | | | | | | | | | Information serial number | Error Check | stop bit |
| | | | Date Time | GPS Information | | | | | | LBS Information | | | | Reserved and extended | | | |
| | | | | Length of GPS information, quantity of positioning satellites | Latitude | Longitude | Speed | Course, Status | Reserved extended bit | MCC | MNC | LAC | Cell ID | | | | |
| 2 | 1 | 1 | 6 | 1 | 4 | 4 | 1 | 2 | M | 2 | 1 | 2 | 3 | M | 2 | 2 | 2 |

| 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 | Reserved and Extended Bit | | | | |
| | | | | 1 2 3 …… n | | | | | |
| 2 | 1 | 1 | 1 | M | N | 2 | 2 | 2 | |

| terminal responds to the command sent by server (15+M+N Byte) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 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 | 2 | 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 |