**W200P-4G-CAT1 device TCP protocol**

**The server needs to respond with F0 login packet (with specific response format) and F9 heartbeat packet (no specific response format), otherwise itl.**

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# 

# Overview

This agreement is applicable to Oviphone Communication's W200P 4G CAT1 equipment, which currently supports products such as W200PG.

* Use 32-bit data headers for synchronization and terminal identification;
* Implement verification protection using low-cost verification algorithms;
* Use message identifiers to indicate different messages.
* Unless otherwise specified. All applicable.

**2.Instructions for the use of equipment**

## **2.1 Device Functions and User Instructions**

**General Version**

(1) Power - on:

* Before the first use, please fully charge the device. When the charging reaches the power required for startup, the device will automatically power on. The charging status is indicated by a charging icon, and a full charge is shown as a green icon. Note: Do not check the device signal while charging.
* Manual power - on: Long - press the up button for 10 seconds and then release it. The word "Welcome" will appear on the screen.  
  Note: The device is in the default worn state when powered on. If the heart rate is not detected, a disconnection alarm will be reported.

(2) Power - off:

* + Low - power shutdown: The screen turns off after the "Byebye" message is displayed.
  + Manual power - off: Long - press the button for more than 15 seconds. The "Byebye" message will be displayed on the screen, and then the screen turns off.
  + Downlink instruction shutdown: When a shutdown instruction is sent while the device is powered on, the "Byebye" message will be displayed, and then the screen turns off.  
    Note: The device will not shut down when charging while powered on.

(3) SOS Function:

* + Trigger method: After triggering, the device will not enter hibernation. Long - press the down button for 3 seconds. After the "SOS SEND OK" / "SOS sent successfully" message is displayed, the SOS icon will appear.
  + Cancellation method: In the SOS mode, long - press the down button for 3 seconds. After the "SEND CENCEL" / "SOS cancelled" message is displayed, the SOS icon will disappear.

(4) Signal Status:

* + No signal: The signal on the screen is shown as a horizontal line.
  + Signal available: The signal on the screen is shown as a stepped columnar graph.

(5) Device Hibernation:

* + Trigger condition: If the device does not move for 40 minutes, it will enter the hibernation mode. In this mode, it will not report location and health data, but only send the F9 heartbeat packet to maintain a long - connection.

(6) Ultra - long Standby Mode:

* + Manual change: Switch to "Settings" - "Ultra - long Standby Mode" and click "Enable". The device will switch to the ultra - long standby mode.
  + Remote instruction download: When the "Switch to Ultra - long Standby Mode" instruction is sent, the device will switch to this mode.  
    Effect: There is a yellow bar below the battery icon on the time interface. In this mode, it uses a short - connection. It checks the health and location every 10 minutes. If the health data is normal and the location has not changed, it will report data every 1 hour; otherwise, it will report every 10 minutes.

(7) Device Parameters:

* + Settings - Parameter Interface: There are three pages in total, which can be switched by swiping the screen down.
  + sos(yes): "yes" indicates that the device can trigger the SOS function by pressing the button, and "sos(no)" indicates that it cannot.
  + health(10min): It means the device has enabled the health reporting function, and "10min" indicates the current health data reporting frequency is 10 minutes. "health(no)" means the device has disabled the health reporting function.
  + location(BWG,10min): It indicates that the device has enabled the location reporting function. "BWG" means the location priority is Bluetooth > wifi > gps, and "10min" indicates the current location reporting frequency is 10 minutes. "location(no)" means the device has disabled the location reporting function.
  + fall(medium,1.5m): It means the device has enabled the fall alarm trigger function. "medium" indicates the fall alarm trigger sensitivity is medium, and "1.5m" indicates the fall alarm trigger height is 1.5m. "fall(no)" means the device has disabled the fall alarm trigger function.
  + sedentary(2min): It means the device has enabled the sedentary stay alarm trigger function. "2min" indicates that the device will trigger the sedentary stay alarm if it remains stationary for 2 minutes. "sedentary(no)" means the device has disabled the sedentary stay alarm trigger function.
  + health broadcast(yes): It indicates that the device has enabled the Bluetooth broadcast of health data, and "health broadcast(no)" means it has disabled this function.
  + sleep statistics reporting time: (21:00 - 08:00) indicates that the sleep statistics reporting time is from 21:00 at night to 08:00 the next day.
  + global vibration duration(1.500s): The current device vibration duration is 1.5 seconds.
  + health alarm threshold: For example, heart rate threshold(90,100)BPM means the normal heart rate range is 90 - 100. If the heart rate is outside this range, a health abnormality alarm will be reported. "heart rate threshold(no)" means the heart rate threshold is disabled.
  + allow working hibernation(yes): "yes" indicates that the device has enabled the hibernation function, and "no" indicates it has disabled this function.  
    Note: The hibernation function means that the device will not report data when it is in a disconnected state or has not moved for 40 minutes.
  + network long - connection(yes): "yes" indicates the current device TCP connection mode is a long - connection (always maintaining the connection state and can receive downlink instructions in real - time), and "no" indicates a short - connection (disconnects after reporting data, and the device receives downlink instructions when reporting data).

(8) Vibration:  
When receiving a downlink text message or a health threshold alarm (the screen has a text reminder and vibrates), the vibration duration can be controlled by the downlink (see section 2.3).

## **2.2 Default Reporting Logic of the Device**

**General Version**

(1) Connection - related Reports

* + F0 Request: If the device is in a long - link state, and the server connection and network are normal, it will report once when powered on.
  + F9/F6: Heartbeat packet reporting. The default reporting frequency is once every 4 minutes. (In previous firmware) A heartbeat packet will also be reported after location and health reports.

(2) Location - related Reports

* + gps/wifi/ble beacon: The default reporting frequency is 10 minutes. The default location priority is wifi > gps. Wifi positioning is preferred, and if wifi positioning fails, it will switch to gps positioning.

(3) Alarm - related Reports

* + SOS Alarm(0x02): Actively triggered by the user. The trigger method is described in the previous section.
  + SOS Cancellation(0x02): Actively triggered by the user to cancel. The trigger method is described in the previous section.
  + Shutdown Alarm(0x21): Triggered when the device shuts down actively or due to low power. The trigger method is described in the previous section.
  + Wearing Disconnection Alarm(0x02): The device determines the wearing status according to the health sampling reporting frequency. If the heart rate is detected, a wearing alarm will be reported; if not, a disconnection alarm will be reported.
  + Sedentary Stay Alarm(0x02): By default, it will be reported if the device remains stationary for 15 minutes.
  + Fall Alarm(0x02): Triggered when the device free - falls from a certain height and meets the fall algorithm.
  + Low - Battery Alarm(0x02): Triggered when the current battery level of the device is less than or equal to 0.
  + Abnormal Temperature Alarm(0x16): Reported when the device - detected temperature exceeds 40 degrees Celsius.
  + Health Threshold Alarm(0x2105): By default, no alarm is reported. After the health threshold is sent via downlink, if the health data is out of the threshold range, an alarm will be reported.  
    Note: When the health threshold alarm is reported, the device will vibrate, and the abnormal value will be displayed on the screen.

(4) Health - related Reports

* + Steps, heart rate, body temperature & wrist temperature, blood pressure, blood oxygen(0x32): The default reporting frequency is 10 minutes.
  + Sleep(0xC5): The statistical time period is 21:00 - 08:00. During this period, sleep data will be reported according to the status.

(5) Device Information and Status Reports

* + Software Version and Model(0xBB)/Status Parameters(0xA9): Reported once when the device is powered on.
  + SIM Card ICCID(0xF3): Reported once when the device is powered on.
  + Device Status(0xE9): Reported once when the device is powered on and once when the reporting frequency is changed.
  + Charging Status(0xC3): Reported when charging starts, ends, or is fully charged.

(6) Downlink Feedback

* + Downlink Feedback(0xC0): Reported by the device after receiving a downlink instruction from the server.
  + Message Status Feedback(0x28): After a downlink text message is sent, reported when the device clicks "Accept" or "Reject".

## **2.3 Device Downlink Instructions**

**General Version**

(1) Device Location Reporting Frequency Download(0x17):  
The default reporting frequency is 10 minutes, and the minimum is 1 minute. After the device receives the downlink instruction, it will report data according to the time period and frequency specified in the instruction. Outside the specified time period, it will report according to the default reporting frequency. For example, if the instruction is 00:00 - 18:00 with a 10 - minute location reporting frequency, then outside this period, it will report at the default 2 - minute reporting frequency.

(2) Text Message Download(0x28):  
Encoded in GB2312, it can contain up to 40 Chinese characters. Each Chinese character takes up 2 bytes, and each English letter takes up 1 byte.  
The message list - historical messages can store up to 50 messages at most (Note: Firmware without a message list can store up to 20 messages).

(3) Device Location Priority Download(0xCE01):  
The default location priority is wifi > gps.  
If the downloaded location priority is wifi > gps > ble beacon, then if wifi positioning fails, it will switch to gps, and if gps positioning fails, it will switch to ble beacon. When positioning is successful, it will not switch to the next positioning priority for positioning.

(4) Device Health Sampling Frequency Download(0xCE02):  
The default health sampling frequency is 10 minutes, and the minimum is 2 minutes for reporting.

(5) Modify IP and Port Instruction Download(0xC3):  
The default general version points to the Smart Cloud Platform: 118.178.184.219:8825. If you need to change it, you can consult the relevant docking personnel or visit the official website.

(6) Sedentary Stay Alarm Trigger Time Download(0xCC):  
The value range is 2 minutes - 60 minutes. For example, if the trigger time set by downlink is 10 minutes, the device will trigger and report the sedentary stay alarm if it remains stationary for 10 minutes.

(7) Device Shutdown and Restart Download(0x77):  
Note that this instruction can only take effect when the device is powered on and cannot be received after shutdown.

* + Shutdown Download: When this instruction is sent while the device is powered on, the device will shut down and cannot receive downlink instructions after shutdown.
  + Restart Download: When this instruction is sent while the device is powered on, the device will restart.

(8) Drop Sensitivity and Height Download(0xCE15):

* + Sensitivity: It refers to the degree of meeting the fall algorithm and provides 5 setting levels (0 - 4): low - medium - low - medium - medium - high - high.
  + Height: It refers to the height that meets the trigger of the fall alarm and provides 5 setting levels (0 - 4): 0.5m - 1.0m - 1.5m - 2.0m - 2.5m.

(9)Remote OTA issuance (0xA9):

Remote updates consume data and are affected by the network. The SIM card of the device is 30M per month and cannot be updated too many times, otherwise it will cause insufficient data. This feature requires hardware support for remote updates, which was not supported by previous devices

(10) Press the button to turn off the switch command (0xCE16):

The default device can be turned off by pressing a button, but after downstream shutdown, the device cannot be turned off by pressing a button

(11) Control device triggers sleep switch issuance (0xCE18):

Default to on state, the device enters sleep mode after 40 minutes of inactivity, and does not enter sleep mode after downstream shutdown

(12) Fall alarm switch (0xCE07):

The default fall alarm is on, and the device does not report a fall alarm after it is turned off

(13) Press the button to trigger the SOS start switch (0xCE19)

By default, it is in the on state. Long pressing the charging cable button can trigger SOS. After turning it off, long pressing the charging cable button will not trigger reporting SOS

(14) Device Health and Positioning Reporting Switch (0xCE20)

The default health report is enabled, and the default location report is enabled. The location/health enable and disable states can be set separately. After disabling, the device will not report health/location

(15) Long connection short connection mode switching (0xCE22)

The default is a long connection, which can switch between long and short connection commands. After receiving the command, the device will restart and switch to long/short connection. Note that the long connection mode consumes slightly more power than the short connection mode. The default state reports a heartbeat packet every 4 minutes (0xF9)

(16) Health threshold setting (0xCE0300)

Health threshold issuance, downward command. After the device receives it, it issues the normal range of health threshold. Health data outside this range will be reported as an alarm

(17) Equipment vibration setting (0xCE23)

After receiving the down command, the device's vibration duration changes to the down duration, ranging from 0-60 seconds

(18) Report location immediately (0xCE0A)

After receiving the downward command, the device immediately begins to locate and report

(19) Report health immediately (0xCE0B)

After receiving the downward command, the device immediately starts health sampling and reporting

(20) Sleep statistics time period distribution (0x1D)

Different time periods can be issued, such as 13:00-14:00, during which sleep statistics data will be collected and reported

(21) GPS normally open switch (0xCE24):

After being turned on, the internal interface is normally open to collect GPS, which can speed up the GPS positioning time in general environments. However, the power consumption will increase, and it will be turned off by default

# 3.Protocol Data Packet Structure

A basic protocol data packet structure is shown in Figure 1.：



**Figure1**

## 3.1Data Header

Each data packet begins with a 4-byte Header or token (in some response messages, a timestamp is used instead):

Currently, the token for Eurofins devices is fixed as BD BDBDBD

Header: 0xBD 0xBD 0xBD 0xBD

Timestamp: 32 bits, generated by the server

## 3.2 Message ID

MessageId represents the content as described in Chapter 3.

Every time the TCP connection is established, the device side will first report the 0xF0 message, which contains the unique identifier IMEI of the device. The server side needs to record this IMEI as an identifier. Then it will respond with the 0xF1 message. The device side will consider the connection successful only after receiving this response. Otherwise, it will disconnect the link.

## 3.3 Token Generation Mechanism

Currently fixed to BDBDBDBD

## 3.4 Payload

The payload below refers to the effective content of the protocol, excluding the head token and checksum. The length of the content is indicated afterwards.

The data formats used in the payload are shown in the following table:

[U-unsigned; I-signed; X-bitfield; number-bytes occupied]

In the protocol below, little-endian is used for all data types except for ch, u8, i8, and x8.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Short** | **peTypeType** | **Size(Bytes)** | **Min/max** | **Resolution** | **explain** |
| CH | ASCII/ISO 8859.1 | 1 | - | - | char |
| u8 | Unsigned Char | 1 | 0..255 | 1 | unsigned short |
| i8 | Signed Char | 1 | -128..127 | 1 | short |
| x8 | Bitfield | 1 | - | - | bit |
| u16 | Unsigned Short | 2 | 0..65，535 | 1 | unsigned int |
| i16 | Unsigned Short | 2 | -32,768..32,767 | 1 | int |
| x16 | Bitfield | 2 | - | - | （bit）2 |
| u32 | Unsigned Long | 4 | 0..4,294,967,295 | 1 | unsigned long |
| i32 | Signed Long | 4 | -2,147,483,648..2,147,483,647 | 1 | long |
| u64 | Uint64\_t | 8 | 0..18,446,744,073,709,551,616 | 1 | uint64\_t |
| float | float | 4 | -3.44\*10e38..3.4\*10e38 | - | float |

## 3.5 Checksum

The content to be added to the checksum includes the payload, as shown in Figure 1. The algorithm is as follows, where Buffer[N] represents the data to be accumulated.

Ck\_sum = 0

For(i=0; i<N; i++)

{

ck\_sum = ck\_sum + Buffer[i]

ck\_sum = ck\_sum % 0x100

}

ck\_sum = 0xFF – ck\_sum

Return ck\_sum

Where ck\_sum cannot exceed 0xFF, so after each loop, it must be modulo 0x100 and then taken the remainder.

# **4.**messages

## 4.1 Connection related

### 4.1.1 LNK-LIN (0xF0) Request Connection (TCP Only)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | LNK-LIN | | | |
| Description | Terminal requests to log into the terminal server through IMEI number | | | |
| Firmware |  | | | |
| Direction | Terminal => Terminal Server | | | |
| Payload length | 10bytes | | | |
| Message structure | Header | Message ID | Payload | Checksum |
| 0xBD 0xBD 0xBD 0xBD | 0xF0 | See below | CK\_sum |

Payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte Offset | Format | Name | Scale | Unit | Drscription |
| 8 | u64 | IMEI | 1 | - | IMEI number（little-endian） |
| 2 | x16 | version |  | - | Bitfield see below |
|  |  |  |  |  |  |

This request must have a response of 0xF1, otherwise the login will fail.

例：bdbdbdbdf09b51731bc6160300000014 （imei:869465050010011）

BDBDBDBD：4-byte message header

F0：Message ID

9b51731bc6160300：imei number (Little-endian mode)，imei decimal is 869465050010011，In hexadecimal, it is0x000316C6 1B73 519B, Little-endian mode:9b51731bc6160300

0000：version

14：checksum

When TCP creates a new connection, it first reports an F0 request, which includes the IMEI. The server then records this IMEI, and all the data in this connection will be associated with this IMEI.

### 4.1.2 LNK-RPL(0xF1) Connection Reply (TCP only) - Important

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | LNK-RPL | | | |
| Description |  | | | |
| Firmware |  | | | |
| Direction | Terminal <= Terminal Server | | | |
| Payload length | 4 bytes | | | |
| Message structure | Header | Message ID | Payload | Checksum |
| Timestamp(unix) | 0xF1 | See below | CK\_sum |

Payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte Offset | Format | Name | Scale | Unit | Drscription |
| 4 | u32 | Token | 1 | - | Token:BDBDBDBD |

eg：28D4DE55F1BDBDBDBDEB

The response must be replied on the current channel. The first 4 bytes are the timestamp, and the device side synchronizes the time based on this, so it must be the correct timestamp value in little-endian mode. The reply is sent byte by byte, for example, BD counts as one byte.

The timestamp refers to the number of seconds or milliseconds from the current time to 1970-1-1 0:00. Milliseconds are easier to convert in Java. Our protocol uses seconds, so it's a long integer. We use little-endian preference, so it becomes the following format: 28D4DE55 --> 55 DE D4 28 is the actual value, and then this value is converted to a long integer. Adding this value to 1970-1-1 0:00 gives the current time.

Example: Timestamp = 07FD8860 real value 6088FD07 = 1619590407 seconds. This is 1619590407 seconds from 1970-01-01 00:00:00, which is the time reported by the device: 2021/4/28 6:13:27.

### 4.1.3New heartbeat packet protocol (0xF9) - Important

After the terminal connects to the server, it uploads a heartbeat packet to the server at fixed intervals.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HTB\_UPL | | | |
| Decription | heartbeat packet | | | |
| Firmware | -/- | | | |
| Payload Length | 15 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xF9 | 见下方定义 | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 1 | U8 | Bat\_type |  |  | Battery Type  0: 4-level  1: 5-level  2: Percentage  3: Voltage |
| 2 | u16 | Bat\_volt |  | -/- | Battery Level  If Bat\_type is 0:  The battery level ranges from 0 to 3  (0 for 25%, 3 for 100%)  If Bat\_type is 1:  The battery level ranges from 0 to 4  (0 for 20%, 4 for 100%)  If Bat\_type is 2:  The battery level ranges from 0 to 100 |
| 1 | U8 | Signal\_type |  |  | Signal Type  0: Percentage  1: 5-level  2: CSQ value |
| 2 | I16 | Signal\_strength |  |  | Signal\_strength |
| 1 | U8 | Other\_type |  |  | Extension Type  0: Full Step Count  1: Incremental Step Count  2: Vibration |
| 4 | U32 | Num |  |  | Extended value |
| 4 | U32 | Timestamp | -/- | -/- | Utc Timestamp |

Heartbeat packets must be replied to, The device will consider the connection still exists as long as it receives a reply.

Reply example (can be fixed reply to this): BDBDBDBDF301

### 4.1.4Heartbeat protocol (0xF6) (used in previous devices, will not coexist with F9)

After the terminal connects to the server, it will upload a heartbeat packet to the server at regular intervals. The later versions will also include a timestamp.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HTB\_UPL | | | |
| Decription | heartbeat packet | | | |
| Firmware | -/- | | | |
| Payload Length | 11 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xF6 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 2 | U16 | Bat\_volt |  | -/- | The number of battery power bars. |
| 4 | U32 | Step\_num |  |  | Step count data |
| 1 | U8 | Signal\_strength |  |  | Signal strength |
| 4 | U32 | Timestamp |  |  | timestamp (a timestamp will be added at the end when making up for missing data) |

eg：BDBDBDBDF6030000000000509C75FE6350

Bat\_volt=0 represents the battery percentage is 10%

Bat\_volt=1 represents the battery percentage is 30%

Bat\_volt=2 represents the battery percentage is 60%

Bat\_volt=3 represents the battery percentage is 100%

## 4.2 Positioning related reporting

### 4.2.1GPS/BDS Position Reporting: Location Data Reporting (0x03)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_UPL\_GPS | | | |
| Decription | 回馈GPS/BDS定位数据 | | | |
| Firmware | -/- | | | |
| Payload Length | 23 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0x03 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 8 | Double | lon |  | -/- | longitude |
| 8 | Double | lat |  |  | latitude |
| 1 | U8 | north\_south |  |  | /\*N or S\*/ |
| 1 | U8 | east\_west |  |  | /\*E or W\*/ |
| 1 | U8 | status |  |  | /\*A or V\*/ |
| 4 | U32 | Timestamp |  |  | Timestamp |

Example： BDBDBDBD03000000C0424C5E4000000000A5DC3C404E4541E62C616078

Lon: 000000C0424C5E40Lat: 00000000A5DC3C40 4E –N 45-E 41-A Time E62C6160

Lon:121.191574Lat: 28.861893

Status = A indicates that the information content is accurate. It can be resolved to V and can be abandoned.

Example of GPS parsing (JAVA)：

DBDBDBDB037d9f84ac81815c40e766926b1d8936404e4541749d695f0b

//DBDBDBDB03 7d9f84ac81815c40 e766926b1d893640 4e 45 41 749d695f 0b

public static void main(String[] args){

//eg:7d9f84ac81815c40 -->405c8181ac849f7d

Double.longBitsToDouble(Long.parseLong("405c8181ac849f7d",16))); //114.02353966666665

//message e766926b1d893640 actual value 4036891d6b9266e7

Double.longBitsToDouble(Long.parseLong("4036891d6b9266e7", 16))) ;//22.535605166666667

HexToStr(data.Substring(“4e”)); //N

HexToStr(data.Substring(“45”));//E

HexToStr(data.Substring(“41”));//AA represents data "OK", V represents a warning

//Message 749d695f actual value 5f699d74

Date date=new Date();

date.setTime(Long.parseLong(“5f699d74",16)\*1000);

SimpleDateFormatsdf = new SimpleDateFormat("yyyyMMddHHmmss");

System.out.println(sdf.format(date)); //2020-09-22 14:45:08

### 4.2.2 Upload of Wi-Fi and base station information (0xA4 improved version)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | EXT-CIU | | | |
| Description | Cell information upload.Upload cell tower information for terminal server to compute location. | | | |
| Firmware |  | | | |
| Direction | Terminal -> Terminal Server | | | |
| Payload length |  | | | |
| Message structure | Header | Message ID | Payload | Checksum |
| Token | 0xA4 | See below | CK\_sum |

Payload contents:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Byte Offset** | **Format** | | **Name** | | **Scale** | | | **Unit** | | **Description** |
| 4 | U32 | | UtcTime | |  | | |  | | Search Time |
| 1 | u8 | | Cell\_cnt | | 1 | | | - | | Number of cell info payload.Valid value:1~7 |
| 2 | u16 | | Cell[0].MCC | | - | | | - | | mobile country code of cell[0] |
| 2 | u16 | | Cell[0].MNC | | - | | | - | | mobile network code of cell[0] |
| 2 | u16 | | Cell[0].LAC | | - | | | - | | Location area code of cell[0] |
| 4 | U32 | | Cell[0].CELL\_ID | | - | | | - | | Cell id of cell[0] |
| 2 | i16 | | Cell[0].RSSI | | - | | | dbm | | RSSI in dbm of cell[0] |
| … |  | |  | |  | | |  | |  |
| 2 | u16 | | Cell[cell\_cnt-1].LAC | | - | | | - | | Location area code of cell[[cell\_cnt-1] |
| 4 | U32 | | Cell[cell\_cnt-1].CELL\_ID | | - | | | - | | Cell id of cell[[cell\_cnt-1] |
| 2 | I16 | | Cell[cell\_cnt-1].RSSI | | - | | | dbm | | RSSI in dbm of cell[[cell\_cnt-1] |
| 1 | U8 | | Wifi\_cnt | |  | | |  | | Number 0f wifi |
| 1 | U8 | | Wifi[0].bssid[0] | |  | | |  | |  |
| 1 | U8 | | Wifi[0].bssid[1] | |  | | |  | |  |
| 1 | U8 | | Wifi[0].bssid[2] | |  | | |  | |  |
| 1 | U8 | | Wifi[0].bssid[3] | |  | | |  | |  |
| 1 | U8 | | Wifi[0].bssid[4] | |  | | |  | |  |
| 1 | U8 | | Wifi[0].bssid[5] | |  | | |  | |  |
| 4 | I32 | | Wifi[0].rssi | |  | | |  | |  |
|  |  | |  | |  | | |  | |  |
| 1 | U8 | | Wifi[Wifi\_cnt-1].bssid[0] | |  | | |  | |  |
| 1 | U8 | | Wifi[Wifi\_cnt-1].bssid[1] | |  | | |  | |  |
| 1 | U8 | | Wifi[Wifi\_cnt-1].bssid[2] | |  | | |  | |  |
| 1 | U8 | | Wifi[Wifi\_cnt-1].bssid[3] | |  | | |  | |  |
| 1 | U8 | | Wifi[Wifi\_cnt-1].bssid[4] | |  | | |  | |  |
| 1 | U8 | | Wifi[Wifi\_cnt].bssid[5] | |  | | |  | |  |
| 4 | | I32 | | Wifi[wifi\_cnt].rssi | |  |  | |  | |

Note: A total of 7 base station information will be provided, including the serving cell and the adjacent 6 cells.

Message ID:A4

BDBDBDBDA468984C5F01CC010000C21871F543009E00078CBEBE1A8162C6FFFFFFC061180AF42AC1FFFFFF200BC726E000B6FFFFFFA8154DF6517EB2FFFFFFE005C5B1F824CCFFFFFFE8FCAFA02663AFFFFFFF6409805B2B9CAEFFFFFF94

To finally obtain the latitude and longitude data, please refer to the relevant explanation in Section 4.4 of the "Explanation of WiFi positioning regarding protocol parsing for A3, A2, and A4"And amap wifi positioning protocol（It is currently only available in the Chinese version）



### 4.2.3 Bluetooth positioning information(LBE Location)（MsgId=0xD6）

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HTB\_UPL | | | |
| Decription | LBE Location | | | |
| Firmware | -/- | | | |
| Payload Length | 1 bytes +n | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xD6 | See below | checksum |

Payload:

|  |  |  |  |
| --- | --- | --- | --- |
| Format | Name | Scale | Description |
| U8 | Type | 1 | Currently fixed to0 (Fix value 0) |
| U8 | Total\_groups | 1 | Total number of assemblies, there may be multiple sets of information, and each set may contain multiple items.  ibeacon (The total number of groups, there may be multiple groups of information, and there may be multiple ibeacons in each group) |
| Int32 | Utc | 4 | Utctimestamp (the UTC timestamp of the first group) |
| U8 | Total\_PackCount | 1 | Total number of packages at the current time: (the ibeacon’s count of the first group) |
| U16 | Major0 | 2 | Major |
| U16 | Minor0 | 2 | Minor |
| S8 | Rssi0 | 1 | Rssi |
| U16 | MajorN | 2 | Major |
| U16 | MinorN | 2 | Minor |
| S8 | RssiN] | 1 | Rssi |
| Int32 | Utc | 4 | Utc timestamp (UTC timestamp of the second group) |
| U8 | Total\_PackCount | 1 | Total number of packages at the current time (the ibeacon’s count of current group) |
| U16 | Major0 | 2 | Major |
| U16 | Minor0 | 2 | Minor |
| S8 | Rssi0 | 1 | Rssi |
| U16 | MajorN | 2 | Major |
| U16 | MinorN | 2 | Minor |
| S8 | RssiN] | 1 | Rssi |

Example：

bdbdbdbdd60001be20315f0443271794ac43273094aa4327b956a54327fe94a56a

**bdbdbdbd - header**

**d6 - msgID**

**00 - type**

**01 -- Only one set of iBeacon data（total groups of beacons data :1）**

be20315f -- The first group’s timestamp: 0x5f3120be=1597055166

There are 4 beacon information in the first group.4327 --- major : 0x2743 = 10051

1794--- minor: 0x9417 = 37911

ac--- rssi: 0xac = -84

4327 --- major: 0x2743 = 10051

3094--- minor:0x9430 = 37936

aa--- rssi:-86

4327 --- major: 0x2743 = 10051

b956--- minor:0x56b9 = 22201

a5--- rssi:-91

4327 --- major: 0x2743 = 10051

fe94--- minor:0x94fe=38142

a5--- rssi:-91

6a --checksum

**4.3：Alarm related reporting**

### 4.3.1Alarm data upload (0x02)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | LNK-WRN | | | |
| Description | Terminal uploads its warnings to terminal server. | | | |
| Firmware |  | | | |
| Direction | Terminal => Terminal Server | | | |
| Payload length | 6 bytes | | | |
| Message structure | Header | Message ID | Payload | Checksum |
| Token | 0x02 | See below | CK\_sum |

Payload contents

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Byte Offset | Format | | Name | Scale | Unit | Drscription |
| 2 | x16 | | Upl\_warn | - | - | Bitfield see below(Little-endian) |
| 4 | | U32 | Timestamp |  |  | Timestamp (timestamp will be added afterwards for supplementary upload) |
|  |  | |  |  |  |  |

Bitfield WRN:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 15 |  |  |  |  |  |  |  |  |  |  | 4 |  |  | 1 | 0 |

Below is the corresponding definition table for when the bit is 1 and the current alarm. Multiple alarms may also be present simultaneously.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| bit | Name | Description | Code | 调整后的16进制 | 十进制 |
| 15 | Gas alarm（- special equipment support） | Gas alarm（- special equipment support） | 0 | 8000 |  |
| 14 | Drop the alarm | Drop the alarm | 1 | 4000 | 4\*4096=16384 |
| 13 | Fence alarm（- special equipment support） | Fence alarm (away from the beacon) （- special equipment support）） | 2 | 2000 | 2\*4096=8192 |
| 12 | Strap damage（- special equipment support） | Strap damage（- special equipment support） | 3 | 1000 | 1\*4096=4096 |
| 11 | Lock open（- special equipment support） | Lock open（- special equipment support） | 4 | 0800 | 8\*256=2048 |
| 10 | Approaching beacon point (125K) （- special equipment support） | Approaching beacon point (125K) （- special equipment support） | 5 | 0400 | 4\*256=1024 |
| 9 | Release key  （- special equipment support） |  | 6 | 0200 | 2\*256=512 |
| 8 | Wearing device | Wearing device | 7 | 0100 | 1\*256=256 |
| 7 | Cancel SOS | Cancel SOS | 8 | 0080 | 8\*16=128 |
| 6 | Vibration alarm（- special equipment support） | Vibration alarm（- special equipment support） | 9 | 0040 | 4\*16=64 |
| 5 | Sedentary alarm | Sedentary alarm | 10 | 0020 | 2\*16=32 |
| 4 | Remove device | Remove device | 11 | 0010 | 1\*16=16 |
| 3 | Open box alarm（- special equipment support） | Open box alarm（- special equipment support） | 12 | 0008 | 8 |
| 2 | Shutdown | Shutdown | 13 | 0004 | 4 |
| 1 | SOS |  | 14 | 0002 | 2 |
| 0 | Low Battery | Low Battery | 15 | 0001 | 1 |

BDBDBDBD02020007FD8860E7 true value 0002—0000 0000 0000 0010 SOS alarm

Timestamp = 07FD8860 is equal to 6088FD07 = 1619590407. This represents the time when 1619590407 seconds have elapsed since 1970-01-01 00:00:00. This corresponds to the device reporting the time as 2021/4/28 6:13:27.

Alarm 02 and each independent, the status of the corresponding bit is not associated in the context of non-related alarms, only the current bit alarm with a value of 1 is processed, and the corresponding processing is performed.

### 4.3.2 Alarm data upload(0x21) (supplement to 0x02)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | LNK-WRN | | | |
| Description | Terminal uploads its warnings to terminal server. | | | |
| Firmware |  | | | |
| Direction | Terminal => Terminal Server | | | |
| Payload length | 8 bytes | | | |
| Message structure | Header | Message ID | Payload | Checksum |
| Token | 0x21 | See below | CK\_sum |

Payload contents

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Byte Offset | Format | | Name | | Scale | Unit | Drscription | |
| 2 | U16 | | type | |  |  | Type of alarm | |
| 4 | U32 | | Upl\_warn | | - | - | Bitfield see below(Small end priority) | |
| 4 | U32 | Timestamp | |  | |  | | Timestamp (timestamp will be added afterwards for supplementary upload) |
|  |  | |  | |  |  |  | |

Alarm type =1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 2 | Device is charging and powered off (firmware functionality support required) |  | 29 | 0004 | 4 |
| 1 | Device low on power, powered off (firmware functionality support required) |  | 30 | 0002 | 2 |
| 0 | Device powered off manually (firmware functionality support required) |  | 31 | 0001 | 1 |

BDBDBDBD21010001000000ECFFBE65DA

Alarm type =5---健康阈值报警（手表端）

|  |  |  |  |
| --- | --- | --- | --- |
| Format | Name | Unit | Decription |
| U16 | Type | 2 | 固定为0x05 |
| U32 | UTC | 4 | UTC时间戳 |
| U16 | Content Len | 2 | 报警内容长度 |
| U8 | Health Warn Type1 | 1 | 健康阈值报警类型：  0x01心率，0x02收缩压（SBP）  0x03舒张压（DBP），0x04血氧  0x05温度 |
| U8 | Type1 | 1 | 01小于，02大于 |
| I16 | Health Value1 | 2 | 健康结果数值 |
|  |  | 。。。。 |  |

**示例：**

设备端检测到心率（97）、温度（37.6）处于阈值以外的范围：

bdbdbdbd 21 05008d013b670600 01016100 05027801 ff

BDBDBDBD210500 8BCC6C67 0400 01 02 4100 73

### 4.3.3upload alarm information（0x16）

Special Note: This is a supplement to 0x02. The original 0x02 is limited by the number of digits and cannot represent these combinations of alarms.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_NB\_SOS | | | |
| Decription | Upload SOS information, including temperature and heart rate alarms. | | | |
| Firmware | -/- | | | |
| Payload Length | 7+4 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0x16 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 1 | U8 | Type | -/- | -/- | Alarm types (  0: heart rate alarm  1:temperature alarm) |
| 2 | U16 | Heart | -/- | -/- | heart rate |
| 2 | U16 | temperature | -/- | -/- | temperature |
| 2 | U16 | Pa | -/- | -/- | pressure |
| 4 | 4\*U8 or U32 | expand | -/- | -/- | 4-byte extension for other sensors. |

Currently, the last four bytes of the isolated wristband are used as a timestamp.

**4.4 Equipment information and status reporting**

### 4.4.1Status parameter reporting (MSGID=0xA9) - no need for parsing

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HRD\_DATA | | | |
| Decription | Terminal => Server | | | |
| Firmware | -/- | | | |
| Payload Length | 6 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xA9 | See below | CK\_sum |

1. payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 1 | u8 | TypeCnt | -/- | -/- | Type number |
|  |  |  |  |  | (Reserved 00） |
| 1 | u8 | Type | -/- | -/- | Type 1 |
| 1 | U8 | NameLen | -/- | -/- | Type1 length |
| n | N\*u8 | Name | -/- | -/- | name |
| 1 | u8 | Type | -/- | -/- | Type 2 |
| 1 | U8 | NameLen | -/- | -/- | Type 2 length |
| n | N\*u8 | Name | -/- | -/- | name |
|  |  |  |  |  |  |

Report one message upon startup

Type specified screen system (MCU module sensor wifi screen Bluetooth)

Code MCU 00 module 01 sensor 02 sequentially expands

Name lengthBDBDBDBDA9 01 00 00---mcu

125732303050475F4534322E57472E4D4C3238C8

### 4.4.2 Upload of software version and model（0XBB）- no need for parsing

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_VERSION\_DATA | | | |
| Decription | Upload of software version and model，Terminal=>Terminal Server | | | |
| Firmware | -/- | | | |
| Payload Length | 2+N bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xBB | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 1 | UINT8 | Version\_len | Required | / | The length of the software version number |
| N | S8[n] |  | Required |  | Software Version Number |
| 1 | UINT8 | Model\_len | Optional |  | Model length |
| N | S8[n] |  | Optional |  | Model Number |
| expandable |  |  |  |  | expandable |
|  |  |  |  |  |  |

Note: Previous firmware version used, now do reserved

### 4.4.3 ICCID upload of SIM card (0xF3)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Message | | | LNK-LIN | | | | | | |
| Description | | | The terminal reports iccid to the server .when it logs on first | | | | | | |
| Firmware | | |  | | | | | | |
| Direction | | | Terminal => Terminal Server | | | | | | |
| Payload length | | | 10bytes | | | | | | |
| Message structure | | | Header | | | Message ID | | Payload | Checksum |
| 0xBD 0xBD0xBD0xBD | | | 0xF3 | | See below | CK\_sum |
| Byte Offset | Format | Name | | Scale | Unit | | Drscription | | | |
| 10 | 10\*U8 | ICCID | | 1 | - | | ICCID number | | | |

iccid:89861118236001639994

message :BDBDBDBDF389861118236001639994CC

Note:Start up and report

### 4.4.4Device charging status upload (0xC3)--Special version to use

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HRD\_DATA | | | |
| Decription | Device charging status upload ，Terminal=>Terminal Server | | | |
| Firmware | -/- | | | |
| Payload Length | 5 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xC3 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 0 | U8 | Status | / | / | 0start，  1end，  2 fully charged |
| 1 | U32 | Timestamp |  |  | Timestamp |

Eg:

BDBDBDBDC301DB4D2F668A The device is charged at the end

BDBDBDBDC300DB4D2F668A The device starts charging

BDBDBDBDC302DB4D2F668A The equipment is fully charged

### 4.4.5Device Status (0 xE 9)

After the terminal is connected to the server, report a startup, and report one when the frequency changes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HTB\_UPL | | | |
| Decription | device status | | | |
| Firmware | -/- | | | |
| Payload Length | 15 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xE9 | See below | CK\_sum |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |

Payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 |  |  |  |  | default--00 |
| 2 |  |  |  |  | The length of the post |
| 1 |  |  |  |  | Location reporting frequency 00- - -Default is unmodified 01- - -Down time period: only report the reporting frequency of the current time period |
| 2 |  |  |  |  | frequency 00 Minutes For example: 0A00- -10 minutes 1 hour- -> 60 min |
| 1 |  |  |  |  | Health reporting frequency 00- - -Default is unmodified 01- - -Down time period: only report the reporting frequency of the current time period |
| 2 |  |  |  |  | frequency 00 Minutes For example: 0A00- -10 minutes 1 hour- -> 60 min |

**4.5 Downstream feedback report**

### 4.5.1Downlink feedback(MSGID=0xC0)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HRD\_DATA | | | |
| Decription | Terminal =>Server | | | |
| Firmware | -/- | | | |
| Payload Length | 1 +n bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xC0 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 1 | U8 | length | -/- |  | Message ID length |
| N | n\*U8 | type | -/- |  | N Message ID |
|  |  |  |  |  |  |

This command is used for the feedback of downlink commands, returning the Message ID received earlier (multiple Message ID can be returned collectively).

### 4.5.2Message status reporting(MSGID=0x28)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HRD\_DATA | | | |
| Decription | Terminal =>Server | | | |
| Firmware | -/- | | | |
| Payload Length | 1 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0x28 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bytes | Format | Name | Scale | Unit | Decription |
| 4 | U32 | timestamp | -/- | -/- | Time stamp |
| 1 | U8 | type | -/- | -/- | Type (corresponding to 0X28 downlink), currently 0x03 |
| 1 | U8 | status | -/- | -/- | Message status  0x01: 已确认，  0x02: 已拒绝 |
| 4 | U32 | serial number | -/- | -/- | (corresponding to 0X28 downlink) |
|  |  |  |  |  |  |

## 4.6Health related reports

### 4.6.1Health Data (MSGID = 0 x 32)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. Message | MSG\_HRD\_DATA | | | |
| Decription | Heart rate data upload，Terminal=>Terminal Server | | | |
| Firmware | -/- | | | |
| Payload Length | 8+3n bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0x32 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 1 | U8 | Type |  |  | 00 |
| 4 | U32 | Timestamp |  |  | Time stamp |
| 2 | U16 | contentLength |  |  | the total length of the following content |
| 1 | U8 | ID |  |  | ID (Type (5) + Reported Value Length (3)) |
| 2 | U16 | Val1 |  |  | Reported value of ID |
|  |  |  |  |  |  |
| 1 | U8 | ID |  |  | ID (Type (5) + Reported Value Length (3)) |
| 2 | U16 | Val1 |  |  | Reported value of IDn |

BDBDBDBD32 00 7A 89 0F 60 06 00 0A 32 10 12 04 00 03

The timestamp in the protocol is 7A 89 0F 60, type 00 mixed type single data reported content full length 06 00.

The ID is 0A, where 0A corresponds to 00001010 00001 010 (the first 5 bits are 01, and the following represent a reported length of 2 bytes). The last 2 digits behind the step count represent the number of steps.

The ID codes are as follows (the protocol defines the high 5 bits of the ID):

01 Step count

02 Heart rate

03 Body temperature

04 Wrist temperature

05 Blood sugar

06 Diastolic pressure

07 Systolic pressure

08 Blood oxygen

10 Number of sit-ups

11 Running pace and distance

12 Skipping speed and count

Eg1:

BDBDBDBD3200B3C4F2630F000A1E00114B314A39711A4A0122bc00416212

B3C4F263: 63f2c4b3(Hexadecimal timestamp)

0F00 :Total length excluding the last byte (checksum)

0A1E00：0x0A=00001 010. The first five bits are 00001, representing the data ID for step counting (0x01). The last three bits are 010, indicating that the length of the step count data is 2 bytes. 0x001E represents step count data, totaling 30 steps.

114B：0x11=00010001. The first five bits are 00010, representing the data ID for heart rate (0x02). The last three bits are 001, indicating that the length of the heart rate data is 1 byte. 0x4B represents the heart rate data, with a heart rate of 75.

314A：0x31=00110001. The first five bits are 00110, representing the data ID for diastolic blood pressure (0x06). The last three bits are 001, indicating that the length of the diastolic blood pressure data is 1 byte. 0x4A represents the diastolic blood pressure data, which is 74.

3971：0x39=00111 001. The first five bits are 00111, representing the data ID for systolic blood pressure (0x07). The last three bits are 001, indicating that the length of the systolic blood pressure data is 1 byte. 0x71 represents the systolic blood pressure data, which is 113.

1A4A01：0x1A=00011 010. The first five bits are 00011, representing the data ID for temperature (0x03). The last three bits are 010, indicating that the length of the temperature data is 2 bytes. 0x014A represents the temperature data, which is 330.

22BC00 ：0x22=00100 010. The first five bits are 00100, representing the data ID for wrist temperature (0x04). The last three bits are 010, indicating that the length of the wrist temperature data is 2 bytes. 0x00BC represents the wrist temperature data, which is 188.

4162：0x41=01000001 The first five bits are 01000, code data id blood oxygen (0x08), the last three bits 001, represents the blood oxygen data length of 1 byte, 0x62 is blood oxygen data, 98

### 4.6.2Upload of device sleep analysis data (0xC5)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HTB\_UPL | | | |
| Decription | AnalyseSlepp Data；Report time: 21:00-08:00 | | | |
| Firmware | -/- | | | |
| Payload Length | 14 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xC5 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 4 | Int32 | DateTime |  | -/- | Upload UTC start time |
| 4 | Int32 | DateTime |  |  | Upload UTC end time |
| 2 | Int16 | Sleepminute |  |  | Upload minutes of sleep time |
| 4 | Int32 | Type |  |  | Upload type, 1 for deep sleep, 2 for light sleep, 3 for awake duration |
|  |  |  |  |  |  |

BDBDBDBDC5AC338860693B8860210001000000D1

It indicates 1 for deep sleep, start time 2021/4/27 23:54:20, end time 2021/4/28 0:27:21, duration 33 minutes.

### 4.6.3Multiple Temperature Upload (0XBA)

**---Previously used by the device, the current health data is 0x32**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_TEMP\_DATA | | | |
| Decription | Multiple Temperature Upload ，Terminal=>Terminal Server | | | |
| Firmware | -/- | | | |
| Payload Length | 12 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xBA | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte size | Format | Name | Scale | Unit | Decription |
| 1 | U8 | Timestamp identifier | Required |  | 00 - with timestamp; 01 - without timestamp |
| 4 | Int32 | Timestamp | Optional |  | If the timestamp identifier is 01, this field is not required |
| 1 | U8 | Temperature type | Required |  | 1: Indicates the upload of body surface temperature and body temperature  2: Indicates the upload of body surface temperature, body temperature, and ambient temperature |
| 2 | S16 | Body surface temperature | Optional |  | Body surface temperature with one decimal point (×10), reported value is an integer. Whether this field is present depends on the temperature type. |
| 2 | S16 | Body temperature | Optional |  | Body temperature with one decimal point (×10), reported value is an integer. Whether this field is present depends on the temperature type. |
| 2 | S16 | Ambient temperature | Optional | / | Ambient temperature with one decimal point (×10), reported value is an integer. Whether this field is present depends on the temperature type. |

### 4.6.4 Upload of device blood oxygen data(0xC6)

**---Previously used by the device, the current health data is 0x32**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HTB\_UPL | | | |
| Decription | Uuid | | | |
| Firmware | -/- | | | |
| Payload Length | 6 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xC6 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 2 | I16 | BloodOxygen |  | -/- | Upload blood oxygen |
| 4 | U32 | Timestamp |  |  | timestamp (a timestamp will be added at the end when making up for missing data) |

### 4.6.5Upload heart rate and blood pressure.(0xC2)

**---Previously used by the device, the current health data is 0x32**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_BP\_UPL | | | |
| Decription | Upload heart rate and blood pressure | | | |
| Firmware | -/- | | | |
| Payload Length | 10 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xC2 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 2 | U16 | bp\_high | - | - | Systolic pressure：2byte |
| 2 | U16 | bp\_low | - | - | Diastolic pressure：2byte |
| 2 | U16 | Bp\_heart | - | - | heart rate：2byte |
| 4 | U32 | Timestamp |  |  | timestamp (a timestamp will be added at the end when making up for missing data) |
|  |  |  |  |  |  |

BDBDBDBDC275004D004A007A890F60CB

Systolic pressure 00 75 =117 Diastolic pressure 00 4D = 77 heart rate 00 4A =66

# **5.Setting**

## 5.1Downlink

### 5.1.1Set periodic upload（0x17）

The platform sets 1-4 time slots to send to the terminal. After the terminal receives the data, it uploads the data within the specified time slot.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_NB\_SLT | | | |
| Decription | downlink | | | |
| Firmware | -/- | | | |
| Payload Length | 28 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0x17 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Byte offset** | **Format** | **Name** | **Scale** | **Unit** | **Decription** |  |
| 1 | u8 | enable | -/- | -/- | Enabled? | Time Slot 1 |
| 1 | U16 | Interval |  |  | Time interval (minutes) |
| 1 | u8 | time\_start\_h |  |  | -h |
| 1 | u8 | time\_start\_m |  |  | -m |
| 1 | u8 | time\_end\_h |  |  | -h |
| 1 | u8 | time\_end\_m |  |  | -m |
| 1 | u8 | enable | -/- | -/- | Enabled? | Time Slot 2 |
| 1 | U16 | Interval |  |  | Time interval (minutes) |
| 1 | u8 | time\_start\_h |  |  | -h |
| 1 | u8 | time\_start\_m |  |  | -m |
| 1 | u8 | time\_end\_h |  |  | -h |
| 1 | u8 | time\_end\_m |  |  | -m |
| 1 | u8 | enable | -/- | -/- | Enabled? | Time Slot 3 |
| 1 | U16 | Interval |  |  | Time interval (minutes) |
| 1 | u8 | time\_start\_h |  |  | -h |
| 1 | u8 | time\_start\_m |  |  | -m |
| 1 | u8 | time\_end\_h |  |  | -h |
| 1 | u8 | time\_end\_m |  |  | -n |
| 1 | u8 | enable | -/- | -/- | Enabled? | Time Slot 4 |
| 1 | U16 | Interval |  |  | Time interval (minutes) |
| 1 | u8 | time\_start\_h |  |  | -h |
| 1 | u8 | time\_start\_m |  |  | -m |
| 1 | u8 | time\_end\_h |  |  | -h |
| 1 | u8 | time\_end\_m |  |  | -m |

Example：

bd bd bd bd 17 01 03 00 00 00 13 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 dd

From 0:00 to 19:00, location is updated every 3 minutes.

BDBDBDBD17010A000000173B00000000000000000000000000000000000000000097

From 0:00 to 23:59, location is updated every 10 minutes.

### 5.1.2Message Send（MSGID=0X28）

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HRD\_DATA | | | |
| Decription | Server =>Terminal downlink | | | |
| Firmware | -/- | | | |
| Payload Length | 7+n bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0x28 | See below | CK\_sum |

payload contents

|  |  |  |  |
| --- | --- | --- | --- |
| Byte size | Format | Name | Decription |
| 1 | U8 | type | (Message type, if it is downlink information, the fixed value is 03) |
| 4 | Uint32 | seqID | Information id, uniqueness |
| 1 | U8 | CONTENT LEN | Contect Length |
| N | N | CONTENT | content, Chinese is GB2312 code, English is ascii code |
|  |  |  |  |
|  |  |  |  |

Example：bd bd bd bd 28 03 03 00 00 00 0b 68 65 6c 6c 6f 2c 77 6f 72 6c 64dd

Type: 03

seqId:03 00 00 00

CONTENT LEN: 0b (10)

CONTENT :68 65 6c 6c 6f 2c 77 6f 72 6c 64 ( hello,world)

### 5.1.3Setting（0XCE）---See detailed instructions-Important Downside

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HRD\_DATA | | | |
| Decription | setting，Server => Terminal downlink | | | |
| Firmware | -/- | | | |
| Payload Length | 4+n bytes | | | |
| Message structure | Header | Message ID | Payload | Checksum |
| token | 0xCE | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 0 | u8 | Type | -/- | -/- | Type see below |
| 1 | u8 | Valid | -/- | -/- | Temporary valid, always valid |
| 2 | U16 | Len | -/- | -/- | Length of the following instruction |
| 4 | n |  | -/- | -/- | Main text |
|  |  |  |  |  |  |

Type 01 Positioning 02 health 03 Alarm (not reserved yet) 04 Local storage (not reserved yet)

05Bluetooth radio switch 06Position and health data reporting switch 07 Fall alarm switch 08 Stay alarm switch, expandable at the back

Valid 00 Always valid 01 Effective this time 02 Off

Length Length of the following instruction

Main text:

Type

01 Positioning function The main text can only be the basic class 01 - gps 02 - wifi 03 - Bluetooth beacon 04 - LBS base station 05 - 125k and later expanded basic class The main text can be a combination of 01 or 010204;

Such as 010203 means using gps wifi Bluetooth beacon;

Example: wifi positioning priority (wifi> Bluetooth> gps): BDBDBDBDCE0100030002030133

gps positioning priority (gps> wifi> Bluetooth): BDBDBDBDCE0100030001020333

Bluetooth positioning priority (Bluetooth beacon deployment required, Bluetooth> wifi> gps): BDBDBDBDCE0100030003020133,

Analysis example: wifi positioning priority (wifi> Bluetooth> gps): BDBDBDBD CE 01 00 0300 020301 33

Type: 01; Valid: 00; length: 0300; type: 020301; checksum: 33

02 Health such as step counting, blood pressure and other text first byte 00-all (01 step counting 02 heart rate 03 temperature 04 sleep 05 blood pressure 06 Blood glucose 07 Blood oxygen- -temporarily not supported)

Subbyte time interval, third byte, interval unit 00 minutes 01 hours

The third byte continues this state

Eg:BDBDBDBDCE 02 00 0300 00 0500 33

Type:02； Valid:00；length:0300;The first byte:00; Secondary bytes：0500；checksum:33

03 The local alarm function can set heart rate alarm, and the blood pressure alarm falls off. which can be expanded after falling (type definition to be added) - -reserved for no

04 Local storage function (reserved) Keep those data in time-reserved temporarily

05 Bluetooth radio switch

00---open eg:BDBDBDBDCE0500000093

02---close eg:BDBDBDBDCE0502000093

06 Position and health data reporting switch

00---open (The closure situation will be reported immediately after it is issued) eg:BDBDBDBDCE0600000093

02---close eg:BDBDBDBDCE0602000093

07 Fall alarm switch

00---open eg:BDBDBDBDCE0700000093

02---close eg:BDBDBDBDCE0702000093

08 Stay alarm switch

00---open eg:BDBDBDBDCE0800000093

02---close eg:BDBDBDBDCE0802000093

10 Report the location information immediately

01--- An effective eg:BDBDBDBDCE0A01000093

11 Report the health data immediately

01---An effective eg:BDBDBDBDCE0B01000093

13 Report the version number data immediately

01--An effective eg:BDBDBDBDCE0D01000093

16 Downlink whether it can be used to shut down the key

00---open eg:BDBDBDBDCE1600000093

02---close eg:BDBDBDBDCE1602000093

18 Sleep function switch

00---open，After at rest for a period of time, they go into hibernation and do not work eg:BDBDBDBDCE1800000093

02---close Ststate or charging state, also work normally eg:BDBDBDBDCE1802000093

19 Key triggers the soss alarm switch

00---open eg:BDBDBDBDCE1900000093

02---close eg:BDBDBDBDCE1902000093

20: Report data switch- -set up separately

Body length: 2 bytes

body：0x00（Positioning data reporting） +switch（0x00:open，0x02:close）

0x01 (Health data reporting）+switch（0x00:open，0x02:close）

Eg：

BDBDBDBDCE20000200000093 Location data report is open 0，0 open 0，2 close BDBDBDBDCE20000200010093 Health data reporting is open 1，0 open 1，2 close

BDBDBDBDCE20000200010293 Health data reporting is closed

22 Long and short connection mode switch

00---Long connection mode, the default is the long connection eg:BDBDBDBDCE2200000093

02---Short connection mode

eg:BDBDBDBDCE2202000093

24 GPS normally open switch (power consumption will be high when turned on downstream, note: GPS normally open refers to the internal interface being normally open to collect GPS, which can speed up GPS positioning time in general environments)

00---open eg:BDBDBDBDCE2400000093

02---close，Default is closed eg:BDBDBDBDCE2402000093

### 5.1.4 Domain Name Setting (0xC3) (TCP specific)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_SET\_DOMAIN | | | |
| Decription | Domain name settings downstream | | | |
| Firmware | -/- | | | |
| Payload Length | 52 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0XC3 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 1 | U8 | Type |  |  | Type of issuance |
| 2 | U16 | Port |  |  | Port number (2 bytes) |
| 1 | U8 | Length |  |  | Length |
| N | U8 | Domainname |  |  | Type=1 IPv4 specific  Type 2 IPV6 specific (ASCII encoding) - not currently supported  Type=3 domain specific  (ASCII encoding) |

explain：type =1 4byte 0F:12:34:4A

type=2 IPv6

Eg：BDBDBDBDC302792204 33

BDBDBDBD C3 01 7922 04 76B2B8DB 33

01 type=1 ipv4

1. --Turn the big end--2279 --》Convert to decimal port：8825

76B2B8DB --》Convert to decima 118.178.184.219

33 checksum

### 5.1.5 Issuance of dwell alarm trigger time（MSGID=0XCC）

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HRD\_DATA | | | |
| Decription | Issuance of dwell alarm trigger time，Server => Terminal | | | |
| Firmware | -/- | | | |
| Payload Length | 4+n bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xCC | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 0 | U8 | minute | -/- | -/- | The duration of the stay alarm (unit: minutes; value range 2-60), during which no activity will trigger the stay alarm |

Example：

bd bd bd bd cc 05 dd

05 -- 0x05 Report a stop alarm for 5 consecutive minutes of inactivity on the watch (when the watch is worn)

### 5.1.6 Shutdown and restart (0x77)

(issued when the device is turned on, this command is invalid when the device is turned off)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_CFG\_PWR | | | |
| Decription | Shutdown and restart （issued when the device is turned on, this command is invalid when the device is turned off） | | | |
| Firmware | -/- | | | |
| Payload Length | 1 bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0x77 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 1 | u8 | enable | -/- |  | 1shut down |
| 1 | u8 | enable | -/- |  | 0 restart |

Eg：

restart："BDBDBDBD770193"

shut down："BDBDBDBD770093"

**5.1.7 Drop-off sensitivity setting（0xCE15）**

Sensitivity default: medium-high, 0.5m

|  |  |  |
| --- | --- | --- |
| Message | MSG\_CFG\_DATA | |
| Description | Server=>Terminal | |
| Message structure | Hearer | Message ID |
| Token | 0xCE |

|  |  |  |  |
| --- | --- | --- | --- |
| Format | Name | Unit | Decription |
| U8 | Type | 1 | Type=0x15 |
| U8 | Valid | 1 | Default 0 can be, no effect |
| U16 | Len | 2 | contention length |
| U8 | Param Type | 1 | parameter type: 0x00: sensitivity, 0x01: height |
| U8 | Param Level | 1 | 5 grades (0-4) |

1. Sensitivity: refers to the degree of satisfying the drop algorithm, providing 5 setting levels (0-4): low-medium-low (lower) -medium-medium-high (higher) -high.
2. Height: refers to the height that triggers the drop alarm, providing 5 setting levels (0-4):0.5m-1.0m-1.5m-2.0m-2.5m. If the height is set to "1.5m", the device should need at least 1.5m to trigger the drop prediction alarm. instance: Set the sensitivity to "Medium to Low": bdbdbdbdce150002000001ff Set the height to "1.5m": bdbdbdbdce150002000102ff

Note: This setting is only available for the latest general version firmware

**5.1.8 Remote OTA upgrade issued（0xA9）**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Message | MSG\_HRD\_DATA | | | |
| Decription | Terminal => Server | | | |
| Firmware | -/- | | | |
| Payload Length | N bytes | | | |
| Message structure | Hearer | Message ID | Payload | Checksum |
| token | 0xA9 | See below | CK\_sum |

payload contents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte offset | Format | Name | Scale | Unit | Decription |
| 1 | u8 | TypeCnt | -/- | -/- | Type number |
|  |  |  |  |  | 00 |
| 1 | u8 | Type | -/- | -/- | Type 1 The 00- -mcu firmware |
| 1 | U8 | PathLen | -/- | -/- | Path 1 length |
| n | N\*u8 | Path | -/- | -/- | path |
| 2 | U16 | PackageSize |  |  | File pack size Fixed to 0,000 |
|  | -- |  | -/- | -/- | -- |
| 1 | u8 | Type | -/- | -/- | type n The 00- -mcu firmware |
| 1 | U8 | PathLen | -/- | -/- | Path n length |
| n | N\*u8 | Path | -/- | -/- | path |
| 2 | U16 | PackageSize |  |  | File pack size Fixed to 0,000 |
|  | - | --- | -- | -- | -- |

Note: Remote update consumes traffic, and is affected by the network, the device sim card is 30M per month, can not be updated too many times, otherwise it will cause insufficient traffic

Such as: path: http://tools.aiday.com.cn/File/MCU/W200PG/W200PG\_E42.BWGHOL25.bin (need server support http download)

Turn 16 is: 0041687474703A2F2F746F6F6C732E61696461792E636F6D2E636E2F46696C652F4D43552F5732303050472F5732303050475F4534322E425747484F4C32352E62696E0000

Issue example: After the update is successful, the device will restart and reconnect the server to report the version number change

BDBDBDBDA902000041687474703A2F2F746F6F6C732E61696461792E636F6D2E636E2F46696C652F4D43552F5732303050472F5732303050475F4534322E425747484F4C32352E62696E00000A

BDBDBDBDA9

01 --Type number

00 --default 00

00 ---firmware mcu

41 -----path length

687474703A2F2F746F6F6C732E61696461792E636F6D2E636E2F46696C652F4D43552F5732303050472F5732303050475F4534322E425747484F4C32352E62696E ---File download path

0000 ---default 0000

0A ---checksum

**5.1.9 Sleep statistics time period was set up（MSGID = 0X1D）**

|  |  |  |
| --- | --- | --- |
| Description | Server=>Terminal | |
| Message structure | Hearer | Message ID |
| Token | 0x1D |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Format | Name | Unit | Decription |  |
| U8 | Enable | 1 | Is the effective time period 1  01 Effective 00 Invalid | Time period 1 |
| U8 | Time\_Start\_Hour | 1 | Starting time point-hours (00-23) |
| U8 | Time\_Start\_Minute | 1 | Starting time point-minutes (00-59) |
| U8 | Time\_End\_Hour | 1 | End time point-hour (00-23) |
| U8 | Time\_End\_Minute | 1 | End time point-minutes (00-59) |
| U8 | Enable | 1 | Is the effective time period 2  01 Effective 00 Invalid | Time period 2 |
| U8 | Time\_Start\_Hour | 1 | Starting time point-hours (00-23) |
| U8 | Time\_Start\_Minute | 1 | Starting time point-minutes (00-59) |
| U8 | Time\_End\_Hour | 1 | End time point-hour (00-23) |
| U8 | Time\_End\_Minute | 1 | End time point-minutes (00-59) |
| U8 | Enable | 1 | Is the effective time period3  01 Effective 00 Invalid | Time period 3 |
| U8 | Time\_Start\_Hour | 1 | Starting time point-hours (00-23) |
| U8 | Time\_Start\_Minute | 1 | Starting time point-minutes (00-59) |
| U8 | Time\_End\_Hour | 1 | End time point-hour (00-23) |
| U8 | Time\_End\_Minute | 1 | End time point-minutes (00-59) |
| U8 | Enable | 1 | Is the effective time period 4  01 Effective 00 Invalid | Time period 4 |
| U8 | Time\_Start\_Hour | 1 | Starting time point-hours (00-23) |
| U8 | Time\_Start\_Minute | 1 | Starting time point-minutes (00-59) |
| U8 | Time\_End\_Hour | 1 | End time point-hour (00-23) |
| U8 | Time\_End\_Minute | 1 | End time point-minutes (00-59) |

eg: Set the 2 time periods as 13:00-15:00 and 22:30-08:00:

bdbdbdbd 1d 010d000f00 01161e0800 0000000000 0000000000 ff

After distribution, the sleep analysis data will be reported within the set period, up to 4 periods, without setting. The default reporting time is 21:00 the previous day to 08:00 the next day

**5.1.10 Hardware Settings（0XCE23）**

|  |  |  |
| --- | --- | --- |
| Description | Server=>Terminal | |
| Message structure | Hearer | Message ID |
| Token | 0xCE |

Valid：00--good through

|  |  |  |  |
| --- | --- | --- | --- |
| Format | Name | Unit | Decription |
| U8 | Type | 1 | 0x23 |
| U8 | Valid | 1 | 0x00 |
| U16 | Cfg Len | 2 | command length |
| U8 | Motor Type | 1 | Settings type: 1. Shock duration is-0x00 |
| U32 | Value | 4 | Set content: 1. Shof duration (in milliseconds, range 0-60 seconds) |

Set the default global vibration time of the device to 1.5 seconds (1500 ms):

bdbdbdbd ce 23000500 00dc050000 ff

**5.1.11 Equipment alarm setting（0XCE03）**

|  |  |  |
| --- | --- | --- |
| Description | Server=>Terminal | |
| Message structure | Hearer | Message ID |
| Token | 0xCE |

Valid：00--good through

|  |  |  |  |
| --- | --- | --- | --- |
| Format | Name | Unit | Decription |
| U8 | Type | 1 | 0x03 |
| U8 | Valid | 1 | 0x00 |
| U16 | Cfg Len | 2 | command length |
| U8\*N | [Bit7] Enable  [Bit6 - 0] Threshold Type | 1\*N | Whether [Bit 7] enables the threshold detection of this type  [Bit 6-0] Set the threshold type:  0x01 Heart rate, 0x02 SBP (SBP)  0x03 diastolic blood pressure (DBP), 0x04 blood oxygen  0x05 Temperature (threshold in \* 10, say 37.3,373) |
| I16\*N | Threshold Min | 2\*N | Lower Threshold (only when threshold detection is enabled) |
| I16\*N | Threshold Max | 2\*N | Upper threshold limit (only when threshold detection is enabled) |

Example: The default is off, and the threshold is in the normal range, where the device reports an alarm

Range of heart rate threshold (20-200), blood pressure systolic pressure (20-100), blood pressure diastolic pressure (20-100), blood oxygen threshold (80-100), and temperature threshold (160-600)

At the same time, multiple health thresholds were set, 1. Heart rate [60,120], 2. Close the blood oxygen threshold detection, 3. Temperature [36.0,37.3]:

bdbdbdbd ce 03000b00 813c007800 04 8568017501 ff

03 type

00 Fixed value

0b00 turn small end priority 000b after the command message section length (excluding checksum) 11 bytes

81 10000001 bit7:1- - -turn on open state bit6-0:000001- -> 0x01 heart rate

The 3C00 turn-to-small end was preferred 003C- -> 60 with a lower heart rate threshold of 60

The 7800 rpm end was preferred 0078- -> 120 with an upper heart rate threshold of 120

04 00000100 bit7:0- - -off, closed state does not follow threshold bit6-0:0000100- -> 0x04 blood oxygen

85 10000101 bit7:1- - -open state bit6-0:0000101- -> 0x05 temperature

6801 Priority 0168- -> 360 (actual temperature \* 10) Lower temperature threshold is 36.0

7501 Priority 0175- -> 373 (actual temperature \* 10) Upper temperature threshold is 37.3

ff checksum