# GV501LG @Track Protocol PRO Air Interface Definition

## GSM/UMTS/LTE Cat 4/GNSS/OBD Tracker

VERSION 12


*International Telematics Solutions Innovator*

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|---|---|
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# Revision History

| Version | Date | Author | Description of Change |
|---|---|---|---|
| V1 | 2020/12/01 | Hubert.Lee<br>Kerwin.Shen | Initial |
| V2<br>to<br>V5 | 2020/12/10<br>to<br>2021/05/17 | Kerwin Shen | The description of changes based on the old document structure has been removed to reduce the size of the document. |
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# Contents

# Summary

The @Track Air Interface Protocol is a digital communication interface, transmitted via cellular network or SMS, for all communications between the backend server and the terminal The terminal will actively send messages to the backend server according to the configuration. The backend server can also send commands to the terminal (commands to modify the configuration or real-time operation commands, etc.), and then the terminal confirms with an acknowledgement message and executes the command.

The purpose of this document is to describe how to integrate terminals based on the @Track Air Interface Protocol. In addition, this document also introduces how to remotely upgrade the firmware of the terminal. Please refer to *Chapter Device Management* for more information.

In fact, the frames defined by the @Track Air Interface Protocol can be transmitted via other communication interfaces (such as the local serial port) in addition to cellular network or SMS.

## Terms and Abbreviations

In this document, unless otherwise specified, "**terminal**" and "**device**" both refer to terminal device designed by Queclink. In addition, this document also contains the following terms and abbreviations:

| Abbreviations | Description |
|---|---|
| **ACK** | Acknowledgement |
| **AGPS** | Assisted Global Position System |
| **APN** | Access Point Name |
| **ASCII** | American National Standard Code for Information Interchange |
| **BER** | Bit Error Rate |
| **BLE** | Bluetooth Low Energy |
| **CPU** | Central Processing Unit |
| **DTC** | Diagnostic Trouble Code |
| **ECU** | Electronic Control Unit |
| **GNSS** | Global Navigation Satellite System |
| **GPRS** | General Packet Radio Service |
| **GPS** | Global Position System |
| **GSM** | Global System for Mobile Communication |
| **HDOP** | Horizontal Dilution of Precision |
| **HTTP** | HyperText Transfer Protocol |
| **ICCID** | Integrated Circuit Card Identity |
| **IMEI** | International Mobile Equipment Identity |
| **IMSI** | International Mobile Subscriber Identity |
| **IoT** | Internet of Things |
| **IP** | Internet Protocol |
| **LAC** | Location Area Code |
| **LTE** | Long Term Evolution |
| **MCC** | Mobile Country Code |
| **MCU** | Micro Controller Unit |
| **MIL** | Malfunction Indicator Lamp |
| **MNC** | Mobile Network Code |

| | |
|---|---|
| **MQTT** | Message Queuing Telemetry Transport |
| **NTP** | Network Time Protocol |
| **OBD** | On-Board Diagnostics |
| **PID** | Parameter ID |
| **PLMN** | Public Land Mobile Network |
| **RAT** | Radio Access Technology |
| **RSSI** | Received Signal Strength Indicator |
| **RPM** | Revolutions per Minute |
| **SIM** | Subscriber Identity Module |
| **SMS** | Short Message Service |
| **SN** | Serial Number |
| **SSID** | Service Set Identifier |
| **TCP** | Transmission Control Protocol |
| **UDP** | User Datagram Protocol |
| **UMTS** | Universal Mobile Telecommunications System |
| **USIM** | Universal Subscriber Identity Module |
| **UTC** | Coordinated Universal Time |
| **VIN** | Vehicle Identification Number |
| **WAN** | Wide Area Network |
| **Wi-Fi** | Wireless Fidelity |

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# Chapter 1
# Architecture

This chapter introduces the basic architecture of the system composed of backend server and terminals. It contains the following section:

- *System Architecture*
- *Data Stream*
- *Location SMS*
- *Profiles*

## 1.1 System Architecture

The figure below shows the basic architecture of the system composed of backend server and terminals.

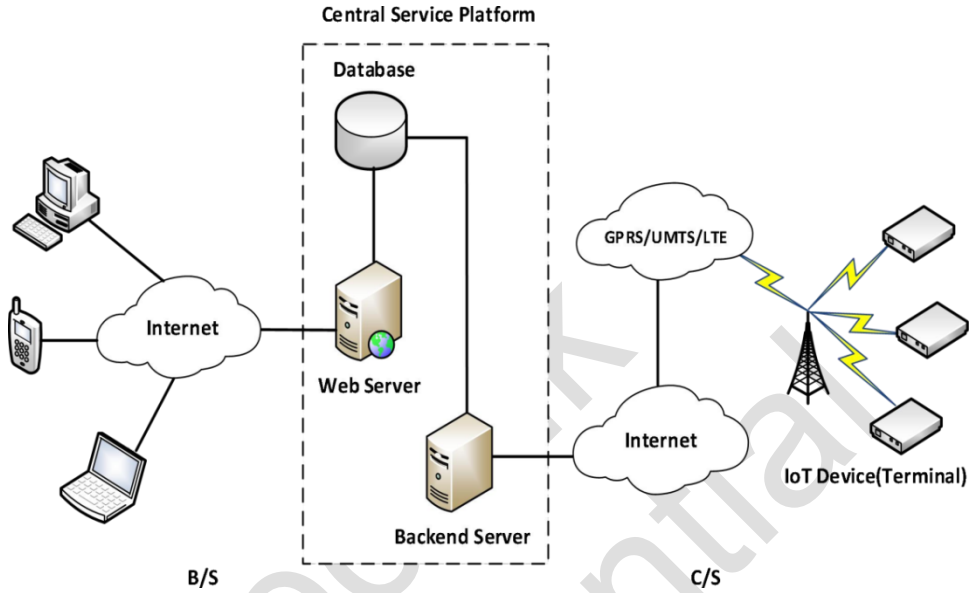


**Figure 1. System Architecture**

The backend server needs to be accessed by multiple terminals and should have at least the following abilities:

- The backend server should be able to access the internet or the local area network where the terminals are located and listen for the connection from the terminals.
- The backend server should be able to support TCP/IP or UDP/IP connection with the terminal. It should be able to receive data from the terminal and send data to the terminal.
- Optional: The backend server should be able to receive and send SMS.

## 1.2 Data Stream

This chapter describes the format of the frames supported by the @Track Air Interface Protocol. It contains the following sections:

- *About data stream*
- *Configuration Comands*
- *Query Commands*
- *Real-time Operation Commands*
- *Acknowledgement*
- *Heartbeat Data*
- *Report*

### 1.2.1 About Data Stream

Data stream includes upstream and downstream.

**Upstream** refers to the data stream transmitted from the terminal device to the backend server via the cellular network, which includes response to the downlink commands and some messages sent actively.

**Downstream** refers to the data stream transmitted from the backend server to the terminal device via the cellular network, which includes some commands for configuring or controlling the terminal, and responses to the uplink message.

The following table describes the frame types of upstream and downstream.

**Table 1. Frame Types of Data Stream**

| Direction | Frame Encoding | Frame Type | Frame Usage |
|---|---|---|---|
| Downstream | ASCII | Configuration Command | The backend server configures the parameters of the terminal. |
| | | Query Command | The backend server queries the current parameters of the terminal. |
| | | Real-time Operation Command | The backend server controls the terminal to perform some operations in real-time. |
| | | SACK | Server Acknowledgement. The terminal sends a 'Report' frame to the backend server, and the server responds with a SACK frame. |
| | | SHBD | Server Heartbeat Data. The terminal sends an 'HBD' frame to the backend server, and the server responds with a SHBD frame. |
| Upstream | ASCII | Query Response | The backend server sends a 'Query Command' frame to the terminal, and the terminal responds with the current parameters. |
| | | ACK | Acknowledgement. The backend server sends a valid 'Configuration Command' frame to the terminal, and the terminal responds with an ACK frame indicating that a valid command has been received. |
| | | NACK | Not Acknowledgement. The backend server sends an unsupported 'Configuration Command' frame to the terminal, and the terminal responds with a NACK frame indicating that an invalid command has been received. |
| | Binary | Report | A message that the terminal actively reports to the backend server. |
| | | HBD | Heartbeat Data. In order to maintain connectivity with the backend server, the terminal periodically sends an HBD frame to the server. |

The following figure is easy to understand the direction of frame transmission between the terminal and the backend server.

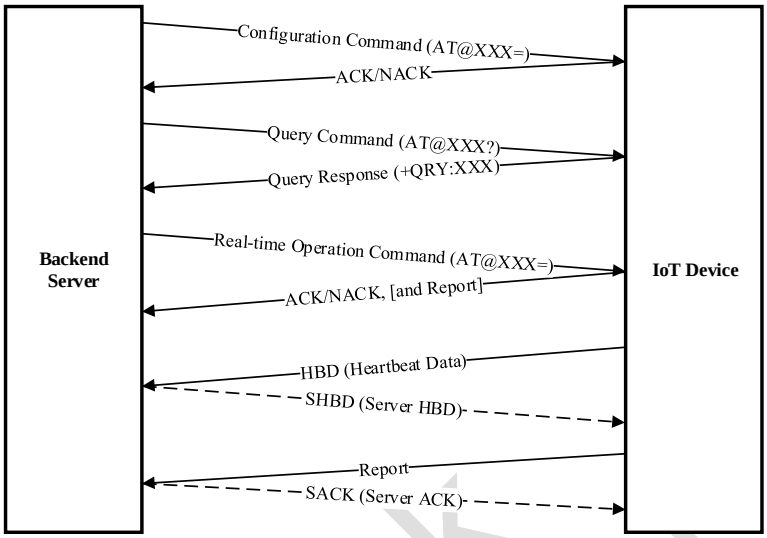


**Figure 2. Direction of Data Stream**

All the upstream and downstream frames end with character "**$**" (i.e. 24H). In ASCII frames consisting of printable ASCII characters, the character "**,**" is used to separate the neighboring parameter characters. And in binary frames, there is no separator between the parameters. Please see below for the detailed descriptions of each frame format.

## 1.2.2 Configuration Commands

Configuration commands are used to modify function configuration and report configuration. It can be function configuration command or the QRC (Queclink Report Configuration) command for the report settings.

### 1.2.2.1 Function Configuration Command

The function configuration command is used to set the working parameters of the terminal.

All configuration commands are encoded using printable ASCII characters, and the character "**,**" is used to separate the neighboring parameter characters, their frame format is:

**Table 2. Frame Format of Function Configuration**

| **Example:**<br>*AT@APN=queclink,,cmnet,,,0,,012F$*<br>*AT@TMA=queclink,0,+32,0,,time.windows.com,123,0387$*<br>*AT@AGPS=queclink,1,1,,,1101$* | | | | |
|---|---|---|---|---|
| **Parts** | **Fields** | **Length (Byte)** | **Range/Format** | **Default** |
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | <=10 | It must only contain Latin letters, numbers. | |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Parameters | N | Check the parameter definition of each command. | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

- **Header**

  3 bytes, ASCII "AT@".

- **Command Word**

  Used to indicate which command to configure. In general, the format and meaning of 'Parameters' corresponding to each command word are different.

  For example, "**APN**" for setting the configuration of AT@APN function, "**TMA**" for setting the configuration of AT@TMA function, and so on.

  Please refer to *Chapter Commands and Reports* for the command words supported by the terminal and the format of 'Parameters' it carries.

- **Leading Symbol**

  1 byte, ASCII "=".

- **Password**

  The password of the terminal device.

  Only the following characters are supported: '0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_', '#'.

  The password can be modified by *AT@CFG* command.

- **Parameters**

  Corresponding to 'Command Word', the content, length and meaning are all determined by 'Command Word'.

  In general, parameters will contain multiple fields, separated by commas. And a field of length 0 is called an **empty field**. Unless otherwise stated, an empty field means that the contents of this field are not changed, that is, the last configured value is left unchanged.

- **Sequence Number**

  The sequence number of the command. It will be included in the ACK or NACK message of the command.

- **Tail**

  1 byte, ASCII "$", immediately after 'Sequence Number'.

  **Note**: 'Header', 'Leading Symbol', and 'Tail' are continuous between the fields adjacent to them, not separated by character ",". This note will not be repeated in below context.

### 1.2.2.2 Report Configuration Command

The QRC configuration command is used to set the composition of terminal report messages.

All configuration commands are encoded using printable ASCII characters, and the character "**,**" is used to separate the neighboring parameter characters, their frame format is:

**Table 3. Frame Format of Report Configuration**

| **Example:** *AT@QRC=queclink,03,,1,1,2\|88,A052$* | | | | |
|---|---|---|---|---|
| **Parts** | **Fields** | **Length (Byte)** | **Range/Format** | **Default** |
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Parameters | N | Check the parameter definition of each command. | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

- **Header**

  3 bytes, ASCII "AT@".

- **Command Word**

  Used to indicate which command to configure.

  It is "**QRC**" for setting report configuration.

- **Leading Symbol**

  1 byte, ASCII "=".

- **Password**

  The password of the terminal device.

  Only the following characters are supported: '0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_', '#'.

  The password can be modified by *AT@CFG* command.

- **Parameters**

  In general, parameters will contain multiple fields, separated by commas. And a field of length 0 is called an **empty field**. Unless otherwise stated, an empty field means that the contents of this field are not changed, that is, the last configured value is left unchanged.

  The **QRC** command is used to set the working parameters of report. The content, length and meaning of the parameters are described in the corresponding report setting commands. Please refer to Section *Report Configuration* for more information.

- **Sequence Number**

  The sequence number of the command. It will be included in the ACK or NACK message of the command.

- **Tail**

  1 byte, ASCII "$", immediately after 'Sequence Number'.

  **Note**: 'Header', 'Leading Symbol', and 'Tail' are continuous between the fields adjacent to them, not separated by character ",". This note will not be repeated in below context.

### 1.2.3 Query Commands

Query commands are used to read back the configuration, can be single query commands for functions or the QRC (Queclink Report Configuration) query command to query the report configurations.

In addition, the terminal also supports the *AT@GTC* command which can obtain the complete configuration file of the terminal.

#### 1.2.3.1 Read Function Configuration

The single query command is used to query the current working parameters of the function.

All query commands are encoded using printable ASCII characters, and the character "**,**" is used to separate the neighboring parameter characters, their frame format is:

**Table 4. Frame Format of Query Function Configuration**

| **Example:**<br>*AT@APN?queclink,,1C06$*<br>*AT@TMA?queclink,,13B7$*<br>*AT@AGPS?queclink,,280F$* | | | | |
|---|---|---|---|---|
| **Parts** | **Fields** | **Length (Byte)** | **Range/Format** | **Default** |
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | <=10 | It must only contain Latin letters, numbers. | |
| | Leading Symbol | 1 | ? | ? |
| | Password | 8-16 | | |
| Parameters | Parameters | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

- **Header**

  3 bytes, ASCII "AT@".

- **Command Word**

  Used to indicate which command to query.

  For example, "**APN**" for querying the configuration of AT@APN function, "**BSS**" for querying the configuration of AT@BSS function, and so on.

- **Leading Symbol**

  1 byte, ASCII "?".

- **Password**

  The password of the terminal device.

- **Parameters**

  0 byte. For Single Query Commands, the length of this field is 0.

- **Sequence Number**

  The sequence number of the command. It will be included in the *Query Response*

message of the command.

- **Tail**

  1 byte, ASCII "$", immediately after 'Sequence Number'.

### 1.2.3.2 Read Report Configuration

The QRC (Queclink Report Configuration) query command is used to query the current working parameters of the report configuration.

All query commands are encoded using printable ASCII characters, and the character "**,**" is used to separate the neighboring parameter characters, their frame format is:

**Table 5. Frame Format of Query Report Configuration**

| **Example:** *AT@QRC?queclink,01,A0E1$* | | | | |
|---|---|---|---|---|
| **Parts** | **Fields** | **Length (Byte)** | **Range/Format** | **Default** |
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | ? | ? |
| | Password | 8-16 | | |
| Parameters | Parameters | 2 | Record ID | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

- **Header**

  3 bytes, ASCII "AT@".

- **Command Word**

  Used to indicate which command to query.

  It is "**QRC**" for reading report configuration.

- **Leading Symbol**

  1 byte, ASCII "?".

- **Password**

  The password of the terminal device.

- **Parameters**

  For the **QRC** command, the length of this field is 2 bytes. And it is a Record ID to indicate which report configuration is to be queried.

  For example, if you want to query the *01H Settings*, fill in "01" to this field.

- **Sequence Number**

  The sequence number of the command. It will be included in the *Query Response* message of the command.

- **Tail**

  1 byte, ASCII "$", immediately after 'Sequence Number'.

### 1.2.3.3 Query Response

When the terminal receives a query command from the backend server, it will use the following frame format to respond with the current parameters of the command to the server. Encode with printable ASCII characters, separate neighboring parameter characters with commas, the complete format of the query response is as follows:

**Table 6. Frame Format of Query Response**

***For examples:***
*+QRY:APN,123456789012345,FE01,6,1,1,1,,cmnet,,,0,,1C06,20210407101530,1234$*
*+QRY:TMA,123456789012345,FE01,6,1,1,1,0,+32,0,,time.windows.com,123,13B7,20210407101540,1235$*
*+QRY:AGPS,123456789012345,FE01,6,1,1,1,1,1,,,280F,20210407101550,1236$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,03,,1,,2|88,A0E1,20210407101553,1237$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 4 | +QRY | +QRY |
| | Leading Symbol | 1 | : | : |
| | Command Word | <=10 | | |
| | IMEI | 15 | | |
| | Device Type | 4 | 0000-FFFF | |
| | Protocol Version | 1-5 | 1-65535 | |
| | Custom Version | 1-3 | 0-255 | 0 |
| | Total Frame | 1-2 | 1-99 | |
| | Current Frame | 1-2 | 1-99 | |
| Parameters | Parameters | N | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Generated Time | 14 | YYYYMMDDhhmmss | |
| | Count Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

- **Header**

  4 bytes, ASCII "+QRY".

- **Leading Symbol**

  1 byte, ASCII ":".

- **Command Word**

  Corresponds to the command word in the query command.

  For example, "APN" for responding the single query command "AT@APN?...".
  For example, "TMA" for responding the single query command "AT@TMA?...".
  For example, "QRC" for responding the QRC query command "AT@QRC?...".

- **IMEI**

  The IMEI of the terminal, for example: "123456789012345".

- **Device Type**

  The device type of terminal. It is "8001" for GV501LG.

- **Protocol Version**

The protocol version number.

For example, "1" means V1, "12" means V12, and "123" means V123.

- **Custom Version**

  This version number is reserved for user customization.

  For example, "1" means V1, "12" means V12, and "123" means V123.

  If the custom version number has not been set, it defaults to "0".

- **Total Frame**

  Total number of query response frame.

- **Current Frame**

  Indicates the current number of query response frame. It counts from 1, and the maximum value is equal to 'Total Frame'.

- **Parameters**

  The current working parameters of the terminal device. Its content is determined by 'Command Word', which is consistent with 'Parameters' in Configuration Command.

- **Sequence Number**

  Corresponds to the sequence number in the query command.

- **Generated Time**

  The local time when the frame was generated, in YYYYMMDDHHMMSS format.

  For example, "20191120135807" indicates November 20,2019,13:58:07.

- **Count Number**

  A self-increasing count number in each QRY frame. It begins from "0000" and increases by 1 for each QRY frame. And it rolls back after "FFFF".

- **Tail**

  1 byte, ASCII "$", immediately after 'Count Number'.

**Note**: Some configuration commands support multiple profiles (please see the Chapter *Profiles* for more information), and when the backend server queries the parameters of these commands, the terminal always responds all parameters of the supported profiles consecutively using the above frame format. For example, for the query command *AT@QRC?queclink,50,0C37$*, its response is:

*+QRY:QRC,123456789012345,FE01,6,1,3,1,50,0,2,,2|88,10,1,600,0,0,0,0C37,20210407101530,1234$*
*+QRY:QRC,123456789012345,FE01,6,1,3,2,50,1,0,,2|88,10,1,300,0,0,0,0C37,20210407101532,1235$*
*+QRY:QRC,123456789012345,FE01,6,1,3,3,50,63,1,,2|88,10,1,60,0,0,0,0C37,20210407101533,1236$*

In addition, when the parameters of multiple profiles are the same, the terminal will use the '|' symbol to link the profile IDs to indicate that they have the same parameters, similar to this:

*AT@QRC?queclink,50,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,50,0|1|63,1,,2|88,10,1,60,0,0,0,0C37,20210407101530,1237$*

### 1.2.4 Real-time Operation Commands

The real-time operation command is used to control the terminal to perform some operations in real time, such as restarting the device, clearing unsent reports, upgrading firmware, and so on.

Related commands are: *AT@RTO*, *AT@UPD*, *AT@UPC*, *AT@GTC*.
To facilitate communication, we usually use the 'RTO' to specifically refer to the AT@RTO command.

These real-time operation commands are encoded using printable ASCII characters, and the character "**,**" is used to separate the neighboring parameter characters, their frame format is:

**Table 7. Frame Format of Real-time Operation**

| Header (AT@) | Command Word | Leading Symbol (=) | Password | Parameters | Sequence Number | Tail ($) |
|---|---|---|---|---|---|---|
| 3 bytes | N bytes | 1 byte | 8-16 bytes | N bytes | 4 bytes | 1 byte |

**Note**: Although query commands are also operated in real-time, since there are many such commands, and their command format is obviously different from 'Configuration Commands' and 'Real-time Operation Commands', so they are classified separately. Please refer to the section *Query Commands*.

### 1.2.5 Acknowledgement

When the backend server sends a configuration command to the terminal, the terminal responds with an ACK or NACK to the server indicating that the device has received the command. The terminal responds with an ACK indicating that a valid (supported) configuration command has been received, and responds with a NACK indicating that an invalid (unsupported) configuration command has been received.

Please note that, the ACK frame simply indicates that the terminal successfully received the configuration command, and does not indicate that the command was executed successfully; the terminal will send a report to inform the backend server of the execution result of the command when necessary.

In order to avoid network attacks, the terminal device will not send a NACK to the backend server after continuously sending **5** NACKs until it receives a valid (supported) command, or after one hour.

The frame formats of ACK and NACK are shown below:

- *ACK*
- *NACK*

#### 1.2.5.1 ACK

The ACK is encoded using printable ASCII characters, and the character "**,**" is used to separate the neighbouring parameter characters, its frame format is:

**Table 8. Frame Format of ACK**

| ***For examples:***<br>*+ACK:APN,123456789012345,FE01,6,1,,012F,20210407101530,1234$*<br>*+ACK:TMA,123456789012345,FE01,6,1,,0378,20210407101530,1235$*<br>*+ACK:AGPS,123456789012345,FE01,6,1,,1101,20210407101530,1236$*<br>*+ACK:QRC,123456789012345,FE01,6,1,03,A052,20210407101530,1237$*<br>*+ACK:RTO,123456789012345,FE01,6,1,01,028A,20210407101530,1238$* | | | | |
|---|---|---|---|---|
| **Parts** | **Fields** | **Length (Byte)** | **Range/Format** | **Default** |
| Head Part | Header | 4 | +ACK | +ACK |
| | Leading Symbol | 1 | : | : |
| | Command Word | <=10 | | |
| | IMEI | 15 | | |
| | Device Type | 4 | 0000-FFFF | |
| | Protocol Version | 1-5 | 1-65535 | |
| | Custom Version | 1-3 | 0-255 | 0 |
| Parameters | Sub Command | N | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Generated Time | 14 | YYYYMMDDhhmmss | |
| | Count Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

- **Header**

  4 bytes, ASCII "+ACK".

- **Leading Symbol**

  1 byte, ASCII ":".

- **Command Word**

  Corresponds to the command word in the configuration command.

- **IMEI**

  The IMEI of the terminal, for example: "123456789012345".

- **Device Type**

  The device type of terminal.

- **Protocol Version**

  The protocol version number.

  For example, "1" means V1, "12" means V12, and "123" means V123.

- **Custom Version**

  This version number is reserved for user customization.

  For example, "1" means V1, "12" means V12, and "123" means V123.

  If the custom version number has not been set, it defaults to "0".

- **Sub Command**

  If the configuration command does not contain a subcommand, the length of this field is 0. Otherwise, the length and value of this field correspond exactly to the subcommand of the configuration command.

  In fact, most configuration commands have no subcommands, and only a few commands such as *AT@RTO* contain subcommands. For details, please see whether the configuration command includes the subcommand field and the meaning of the subcommand (if any).

  Specially, for the *AT@QRC* command, this field refers to the record ID to be set in the command.

- **Sequence Number**

  Corresponds to the sequence number in the configuration command.

- **Generated Time**

  The local time when the frame was generated, in YYYYMMDDHHMMSS format.

  For example, "20191120135807" indicates November 20,2019,13:58:07.

- **Count Number**

  A self-increasing count number in each acknowledgement message. It begins from "0000" and increases by 1 for each acknowledgement message. And it rolls back after "FFFF".

- **Tail**

  1 byte, ASCII "$", immediately after 'Count Number'.

### 1.2.5.2 NACK

The NACK is encoded using printable ASCII characters, and the character "**,**" is used to separate the neighbouring parameter characters, its frame format is:

**Table 9. Frame Format of NACK**

| ***For examples:***<br>*+NACK:APN,123456789012345,FE01,6,1,,0,0128,20210407101610,1234$*<br>*+NACK:AGPS,123456789012345,FE01,6,1,,1,1C80,20210407101611,1235$*<br>*+NACK:RTO,123456789012345,FE01,6,1,01,2,25A8,20210407101612,1236$* | | | | |
|---|---|---|---|---|
| **Parts** | **Fields** | **Length (Byte)** | **Range/Format** | **Default** |
| Head Part | Header | 5 | +NACK | +NACK |
| | Leading Symbol | 1 | : | : |
| | Command Word | <=10 | | |
| | IMEI | 15 | | |
| | Device Type | 4 | 0000-FFFF | |
| | Protocol Version | 1-5 | 1-65535 | |
| | Custom Version | 1-3 | 0-255 | 0 |
| Parameters | Sub Command | N | | |
| | Cause | 1-2 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Generated Time | 14 | YYYYMMDDhhmmss | |
| | Count Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

- **Header**

  5 bytes, ASCII "+NACK".

- **Leading Symbol**

  1 byte, ASCII ":".

- **Command Word**

  Corresponds to the command word in the configuration command.

- **IMEI**

  The IMEI of the terminal, for example: "123456789012345".

- **Device Type**

  The device type of terminal.

- **Protocol Version**

  The protocol version number.

  For example, "1" means V1, "12" means V12, and "123" means V123.

- **Custom Version**

  This version number is reserved for user customization.

  For example, "1" means V1, "12" means V12, and "123" means V123.

  If the custom version number has not been set, it defaults to "0".

✧ **Sub Command**

If the configuration command does not contain a subcommand, the length of this field is 0. Otherwise, the length and value of this field correspond exactly to the subcommand of the configuration command.

In fact, most configuration commands have no subcommands, and only a few commands such as *AT@RTO* contain subcommands. For details, please see whether the configuration command includes the subcommand field and the meaning of the subcommand (if any).

Specially, for the *AT@QRC* command, this field refers to the record ID to be set in the command.

✧ **Cause**

It is used to indicate the specific reason for the NACK to be triggered.

- **0** - The password or parameter is incorrect.
- **1** - The terminal does not support this command.
- **2** - The terminal is not allowed to execute this command now, probably for security reasons.

✧ **Sequence Number**

Corresponds to the sequence number in the configuration command.

✧ **Generated Time**

The local time when the frame was generated, in YYYYMMDDHHMMSS format.

For example, "20191120135807" indicates November 20,2019,13:58:07.

✧ **Count Number**

A self-increasing count number in each acknowledgement message. It begins from "0000" and increases by 1 for each acknowledgement message. And it rolls back after "FFFF".

✧ **Tail**

1 byte, ASCII "$", immediately after 'Count Number'.

### 1.2.6 Heartbeat Data

In order to let the backend server knows whether the terminal device is online when no report is generated, the terminal provides a heartbeat mechanism: the terminal periodically sends a HBD frame to the server, and the server responds with a SHBD frame to the terminal if necessary. The heartbeat feature can be controlled by the *AT@HBD* command.

The frame formats of HBD, SHBD are shown below:

- *HBD*
- *SHBD*

### 1.2.6.1 HBD

If the heartbeat function is enabled. The terminal will send the HBD messages to the backend server at specified intervals.

The HBD is encoded as a binary short report, its frame format is:

**Table 10. Frame Format of HBD**

| ***For examples (Total 23 bytes):*** *2B 10 17 01 23 45 67 89 01 23 45 80 01 07 00 5E 36 2F 5A 10 F2 87 24* | | | | |
|---|---|---|---|---|
| **Parts** | **Fields** | **Length (Byte)** | **Range/Format** | **Default** |
| Head Part | Header | 1 | 2BH | 2BH |
| | 10H | 1 | 10H | 10H |
| | Frame Length | 1 | 18H | 18H |
| | IMEI | 8 | | |
| | Device Type | 2 | | |
| | Protocol Version | 2 | 0001H-FFFFH | |
| | Custom Version | 1 | 00H-FFH | 00H |
| Parameters | Generated Time | 4 | | |
| Tail Part | Count Number | 2 | 0000H-FFFFH | |
| | Check Byte | 1 | 00H-FFH | |
| | Tail | 1 | $ | $ |

- **Header**

  1 byte, ASCII '+' (2BH).

- **10H**

  1 byte. Always 10H.

- **Frame Length**

  The length of this message from 'Header' to 'Tail'.

  For example, 18H represents 24 bytes.

- **IMEI**

  The IMEI of the terminal device.

  For example, 0123456789012345H indicates IMEI "123456789012345".

- **Device Type**

  The device type refers to the terminal model. In general, the device type will not change due to hardware or firmware upgrades.

- **Protocol Version**

  The protocol version number.

  For example, 0001H means V1, 000CH means V12, and 007BH means V123.

- **Custom Version**

  This version number is reserved for user customization.

  For example, 01H means V1, 0CH means V12, and 7BH means V123.

If the custom version number has not been set, it defaults to 00H.

- **Generated Time**

  The time when the record was generated, difference, in seconds, between the current local time and midnight, January 1, 1970.

  For example, 5DB38C80H (i.e., 1572048000) indicates October 26,2019,00:00:00.

- **Count Number**

  A self-increasing count number in each HBD frame, it begins from 0000H and increases by 1 for each HBD frame, and it rolls back after FFFFH.

  **Note**: Once the terminal device reconnects to the backend server (restarted/socket disconnected/PDP disconnected, etc.), the count number always starts from 0000H again.

- **Check Byte**

  This is an 8-bit CRC checksum, it is generated by a CRC algorithm with the properties displayed in *CRC-8 Calculation* below. The CRC covers the content of 'Header' to 'Count Number'.

- **Tail**

  1 byte, 24H (ASCII "$").

### 1.2.6.2 SHBD

If the heartbeat function and the SHBD mode are both enabled, the terminal will wait for the backend server to respond SHBD message after sending HBD message. Once the terminal receives the correct SHBD response message, it means that this heartbeat interaction is successful.

If the terminal does not receive the correct SHBD message from the backend server after sending HBD message, the terminal will try to resend the HBD message. After resending a few times, it still does not receive a correct SHBD, it will reconnect to the backend server and try again. Please check the *Appendix* at the end of the document for more details.

The SHBD is encoded using printable ASCII characters, its frame format is:

**Table 11. Frame Format of SHBD**

| ***For examples (Total 11 bytes):*** *+SHBD:10F2$* | | | |
|---|---|---|---|
| **Fields** | **Length (Byte)** | **Range/Format** | **Default** |
| Header | 5 | +SHBD | +SHBD |
| Leading Symbol | 1 | : | : |
| Count Number | 4 | 0000-FFFF | |
| Tail | 1 | $ | $ |

- **Header**

  5 bytes, ASCII "+SHBD".

- **Leading Symbol**

  1 byte, ASCII ":".

- **Count Number**

  4 bytes, ASCII, corresponds to the count number in the HBD frame.

  For example, the count number in the HBD frame is 10F2H, here it is ASCII "10F2".

- **Tail**

  1 byte, ASCII "$".

### 1.2.7 Report

Report refers to the frame that the terminal actively generates and sends to the backend server when it reaches certain established conditions. Some conditions can be changed by configuration commands.

In order to reduce the frame size and increase the effective usage rate of the data traffic, all report frames are uniformly encoded in **Binary** frames. And the **big-endian** byte order is used for the transmission of multi-byte data types (int, float, double, etc.). For example, for the integer 305419896 (i.e., 12345678H), the byte 12H will be sent first, and then 34H, 56H,78H.

This section contains the following information about report:

- *Frame Format*
- *Report Priority*
- *BUFFER Report*
- *CRC-8 Calculation*

### 1.2.7.1 Frame Format

In order to facilitate the backend server to parse the report frame, this protocol limits the maximum length of a single report. Usually the maximum length of a report cannot exceed **1460** bytes. When the length of the report is too long, the terminal will automatically split it into multiple reports.

Usually user data is contained in **Record**s, and a report can contain multiple records. The whole frame format of the report is as follows:

**Table 12. Frame Format of Report**

1 byte

| Header (+/-) | 00H | Frame Length | Multi-packet Flag | Reserved | Frame Count & Number | IMEI | Device Type | Protocol Version |
|---|---|---|---|---|---|---|---|---|
| 1 byte | 1 byte | 2 bytes | 1 bit | 7 bits | 0 or 2 bytes | 8 bytes | 2 bytes | 2 bytes |

Reserved Field | One Record

| Custom Version | Reserved Field Length | Reserved Field Data | Record Length | Generated Time | Record ID | Event Code | Data of Record | … | N | C | $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 byte | 1 byte | n bytes | 1 or 2 bytes | 4 bytes | 1 byte | 1 byte | N bytes | N | 2 | 1 | 1 |

**Other Records**, N bytes
**Count Number**, 2 bytes
**Check Byte**, 1 byte
**Tail ($)**, 1 byte

➢ **Binary Report**

***Example (Total 75 bytes):***
***2B 00*** *00 4B* ***00*** *01 23 45 67 89 01 23 45* ***80 01*** *06 01* ***00*** *35* ***5E 36 2F 5A*** *03* ***00*** *02 0B 4D 79 49 6F 54 64 65 76 69 63 65* ***51 0F 09 07 3C 46 FF 01 DB 88 57 5F 17 9D A0 01 7D*** *55 0E 06 04 BC 8A 00 10 00 02 10 00 10 0C 13 03* ***01 23*** *42* ***24***

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 03H | 03H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |

| | | | | |
|---|---|---|---|---|
| Tail | Count Number | 2 | 0000H-FFFFH | |
| | Check Byte | 1 | 00H-FFH | |
| | Tail | 1 | $ | $ |

✧ **Header**

1 byte. ASCII '+' (2BH) or '-' (2DH).

+ Real-time report, which is sent successfully in time.
- BUFFER report, which is not sent successfully in time.

For more information, please see *Report Priority* and *BUFFER Report* below.

✧ **00H**

1 byte. Always 00H. This byte indicates that the frame is a binary long report of uplink message.

✧ **Frame Length**

2 bytes. The length of this message from 'Header' to 'Tail'.

For example, 0136H represents 310 bytes.

✧ **Multi-packet Flag**

1 bit. The highest bit (bit7) of the byte is 'Multi-packet Flag', which is used to indicate whether this report contains the 'Frame Count & Frame Number' field: **0b0** means no, and **0b1** means yes.

✧ **Frame Count & Frame Number**

2 bytes. The first byte means 'Frame Count' and the second byte means 'Frame Number'.

When the length of the message is too long, the terminal will automatically split it into multiple reports for sending. The 'Frame Count' represents the number of reports obtained by dividing the message, and the 'Frame Number' is a numeric to indicate the sequence of the current report.

Please note that the report contains these two bytes only if 'Multi-packet Flag' is **0b1** and not so if it is **0b0**.

✧ **IMEI**

8 bytes. The IMEI of the terminal device.

For example, 0123456789012345H indicates IMEI "123456789012345".

✧ **Device Type**

2 bytes. The device type refers to the terminal model.

In general, the device type will not change due to hardware or firmware upgrades.

✧ **Protocol Version**

2 bytes. The protocol version number.

For example, 0001H means V1, 000CH means V12, and 007BH means V123.

✧ **Custom Version**

1 byte. This version number is reserved for user customization.

For example, 01H means V1, 0CH means V12, and 7BH means V123.

If the custom version number has not been set, it defaults to 00H.

✧ **Reserved Field**

1+n bytes. The reserved field is reserved for extended use. The first byte is **Reserved Field Length**, it indicates the number of bytes occupied by **Reserved Field Data**.

In particular, if 'Reserved Field Length' is 00H, the 'Reserved Field Data' is absent.

✧ **Record**

In a report, user data is always organized into records for transmission. Records are always made up of 'Record Length', 'Generated Time', 'Record ID', 'Event Code' and 'Data of Record' as described below. A report can contain multiple records, but the 'Record ID' of these records must be the same.

- ***Record Length***

  1 or 2 bytes. The number of bytes occupied by the entire record, including 'Record Length' itself. The highest bit of 0 means that 'Record Length' occupies only 1 byte, and the value is represented by the lowest 7 bits; The highest bit of 1 means that 'Record Length' occupies 2 bytes, and the value is represented by the lower 7 bits of the first byte and the second byte. Please see below:

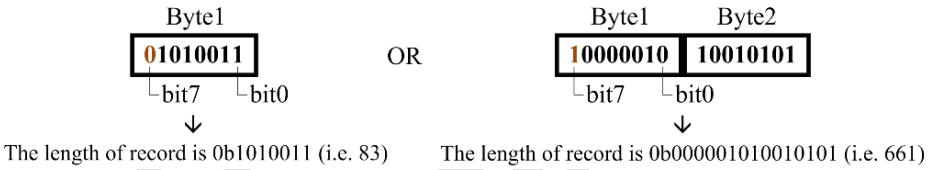


**Figure 3. Format of Record Length**

- ***Generated Time***

  4 bytes. The time when the record was generated, difference, in seconds, between the current local time and midnight, January 1, 1970.

  For example, 5DB38C80H (i.e., 1572048000) indicates October 26,2019,00:00:00.

- ***Record ID***

  1 byte. To identify different event such as Geo-fence event.

  Please refer to *Chapter Record IDs* for the record IDs supported by the terminal.

- ***Event Code***

  1 byte. The specific reason to generate the event, such as entering into a Geo-fence or leaving from a Geo-fence.

  The event code is defined in each record ID, please refer to *Chapter Record IDs* for detailed definition.

- ***Data of Record***

  The specific format of 'Data of Record' is as follows:

**Table 13. Format of Data of Record**

| The first Data ID Unit | The second Data ID Unit |
|---|---|

| Data ID 1 | Data Length 1 | Data Content 1 | Data ID 2 | Data Length 2 | Data Content 2 | … |
|---|---|---|---|---|---|---|
| 1 or 2 bytes | 1 or 2 bytes | N bytes | 1 or 2 bytes | 1 or 2 bytes | N bytes | N |

**Other Data ID units**

The 'Data of Record' consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

✧ **Data ID Unit**

A Data ID unit contains three parts: 'Data ID', 'Data Length', and 'Data Content'.

- ***Data ID***

  This protocol assigns a unique ID to all information that needs to be sent to the backend server. Some information items are closely related to each other and always are transmitted in one piece, they also have a unique ID. These unique IDs are called Data IDs. In other words, a data ID can contain only one piece of indivisible information such as Device Name, or multiple information such as Longitude and Latitude.

  The data ID is represented by 1 or 2 bytes. Same as 'Record Length', the highest bit of 0 means that 'Data ID' occupies only 1 byte, and the value is represented by the lowest 7 bits; The highest bit of 1 means that 'Data ID' occupies 2 bytes, and the value is represented by the lower 7 bits of the first byte and the second byte.

  Please refer to Chapter *Data IDs* for the data IDs supported by the terminal.

- ***Data Length***

  Length of content of Data ID. The actual length of the information represented by the data ID, occupying 1 or 2 bytes. Same as 'Record Length', the highest bit of 0 means that the length occupies only 1 byte, and the value is represented by the lowest 7 bits; The highest bit of 1 means that the length occupies 2 bytes, and the value is represented by the lower 7 bits of the first byte and the second byte.

  Please note that if this field is **00H**, it means that the content of Data ID cannot be obtained, and the 'Data Content' field will be absent.

- ***Data Content***

  The information represented by the data ID, its meaning is determined by 'Data ID', and the length is indicated by 'Data Length'.

  Please refer to *Chapter Data IDs* for the data IDs supported by the terminal.

✧ **Count Number**

2 bytes. A self-increasing count number in each report, it begins from 0000H and increases by 1 for each report, and it rolls back after FFFFH.

The count number is accumulated according to the order in which the reports are sent, not in the order in which the reports are generated. After the terminal is restarted, the count number will not restart from 0000H, but will continue to accumulate based on the count before restarting.

✧ **Check Byte**

1 byte. This is an 8-bit CRC checksum, it is generated by a CRC algorithm with the properties displayed in *CRC-8 Calculation* below. The CRC covers the content of 'Header' to 'Count Number'.

- **Tail**

  1 byte. 24H (ASCII "$").

  In the *Appendix* at the end of the document, how to decode the report frame is described for reference.

### 1.2.7.2 Report Priority

Reports have two priorities: **High** and **Normal**.

**Table 14. Report Priority**

| Type | Priority | Record IDs |
|---|---|---|
| Real-time Reports | High | 01H - Device Startup |
| | | 03H - Connection Starts |
| | | 11H - Device Basic Information |
| | | 12H - Real-time Location |
| | | 22H - Real-time Customization |
| | | 33H - OBD Real-time Diagnostics |
| | | 62H - Wi-Fi Clients |
| | | 74H - Crash Alarm |
| | | E0H - Self-Test Notification |
| | | F1H - UPD Status |
| | | F2H - UPC Status |
| | | F3H - GTC Status |
| | Normal | Others |
| BUFFER Reports | / | / |

The terminal always sends the high-priority report preferentially, regardless of whether its generated time is before or after the normal-priority report. When there are many high-priority reports, they are sent in the order of the generated time.

By default, the normal-priority reports are sent in the order in which they are generated, unless the terminal is set to send real-time reports preferentially. For more information, please see *BUFFER Report* below.

#### 1.2.7.3 BUFFER Report

If there is no cellular network signal around or the signal is weak, the report will not be sent to the backend server in time, and the report will stay in the terminal until the surrounding cellular network signal is strong enough for the report to be sent to the server.

To distinguish between the newly generated report and the report generated earlier, the report that is successfully sent in time is called the real-time report, the report that has not been sent successfully in time is called the BUFFER report. The header of the real-time report is represented by '+' (2BH), and the BUFFER report is represented by '-' (2DH).

By default, the reports are sent in the order in which they are generated, unless the terminal device is set to send real-time reports preferentially in the *AT@RPS* command.

### 1.2.7.4 CRC-8 Calculation

The 8-bit CRC checksum in the report should be calculated according to the properties in the table below.

**Table 15. CRC-8 Calculation Properties**

| Property | Value |
|---|---|
| Name | CRC-8 |
| Width | 8 bits |
| Polynomial | 0x31 ($X^8+X^5+X^4+1$) |
| Initialization | FFH (0xFF) |
| Reflect input | False |
| Reflect output | False |
| Final XOR | 00H (0x00) |
| Example | CRC (2B 01 23 45 67 89 01 23 45 FE 01 06 01 02 01 FF 5D B3 8C 80)<br>= FEH (0xFE) |

Here is a corresponding CRC-8 algorithm routine written in C language:

```
#define CRC_POLYNOMIAL 0x131 // P(x) = x^8 + x^5 + x^4 + 1 = 100110001
unsigned char crc8_calc(unsigned char data[], unsigned int n) {
    unsigned char crc = 0xFF;      // calculated checksum
    unsigned char bit;             // bit mask
    unsigned int i;                // byte counter
    for (i=0; i < n; i++) {
        crc ^= (data[i]);
        for (bit=8; bit > 0; --bit) {
        if (crc & 0x80)
            crc = (crc << 1) ^ CRC_POLYNOMIAL;
        else
            crc = (crc << 1);
        }
    }
    return crc;
}
```

### 1.2.7.5 SACK

If the SACK function is enabled, the terminal will wait for the backend server to respond SACK message after sending a report (binary long report). Once the terminal receives the correct SACK response message, it means that this report has been successfully received by the backend server.

If the terminal does not receive the correct SACK message from the backend server after sending the report, the terminal will try to resend the report. After resending a few times, it still does not receive a correct SACK, it will reconnect to the backend server and try again. Please check the *Appendix* at the end of the document for more details.

The SACK is encoded using printable ASCII characters, its frame format is:

**Table 16. Frame format of SACK**

| ***For examples (Total 11 bytes):*** *+SACK:0058$* | | | |
|---|---|---|---|
| **Fields** | **Length (Byte)** | **Range/Format** | **Default** |
| Header | 5 | +SACK | +SACK |
| Leading Symbol | 1 | : | : |
| Count Number | 4 | 0000-FFFF | |
| Tail | 1 | $ | $ |

- **Header**

  5 bytes, ASCII "+SACK".

- **Leading Symbol**

  1 byte, ASCII ":".

- **Count Number**

  4 bytes, ASCII, corresponds to the count number in the report.

  For example, the count number in the report is 01F7H, here it is ASCII "01F7".

- **Tail**

  1 byte, ASCII "$".

## 1.3 Location SMS

The terminal supports sending SMS with Google Maps Hyperlink (called Location SMS) to mobile phones. The format of Location SMS is as follows:

**Table 17. Format of Location SMS**

| ***Example:***<br>*LBS:123456789012345*<br>*http://maps.google.com/maps?q=22.538503,114.017054*<br>*F1 D2020/10/31T17:20:45 I1 S12.34* | | | | |
|---|---|---|---|---|
| **Parts** | **Fields** | **Length (Byte)** | **Range/Format** | **Default** |
| Fixed Info | SMS Type | <=15 | | |
| | Leading Symbol | 1 | : | : |
| | IMEI | 15 | | |
| | LF | 1 | \n | \n |
| Location | Google Maps Hyperlink | N | | |
| | LF | 1 | \n | \n |
| Parameters | GNSS Fix State | 2 | **F**0, **F**1 | |
| | GNSS UTC Time | 20 | **D**YYYY/MM/DD**T**hh:mm:ss | |
| | Ignition Status | 2 | **I**0, **I**1 | |
| | Speed | 4-6 | **S**XXX.X | |

✧ **SMS Type**

Used to indicate the cause of the Location SMS, which includes the following types:

- ***LBS***
  Location by SMS. When receiving a "**get position**" command from the SMS, the terminal will respond to this type of Location SMS. This feature can be enabled or disabled by the *AT@GMS* command.
- ***IN GEO-i*** *(i means the ID of Geo-fence)*
  When entering a specified Geo-fence, the terminal will send this type of Location SMS to the phone number preset using the *AT@GML* command. This feature can be enabled or disabled by the *AT@GEO* command.
- ***OUT GEO-i*** *(i means the ID of Geo-fence)*
  When exiting a specified Geo-fence, the terminal will send this type of Location SMS to the phone number preset using the *AT@GML* command. This feature can be enabled or disabled by the *AT@GEO* command.

✧ **Leading Symbol**

1 byte, ASCII ":".

✧ **IMEI**

The IMEI of the terminal device.

✧ **LF**

1 byte. Line Feed, ASCII "\n".

✧ **Google Maps Hyperlink**

A Google Maps hyperlink representing the current location.

For example, *http://maps.google.com/maps?q=22.538503,114.017054* represents a position of 22.538503 degrees latitude and 114.017054 degrees longitude.

✧ **Parameters**

The last line contains the following parameters, separated by spaces:

- ***GNSS Fix State***
  Indicates the GNSS fix state. **F1** means fix, **F0** means no fix.
- ***GNSS UTC Time***
  20 bytes, the format is **D**YYYY/MM/DD**T**HH:MM:SS, for example, "D2019/10/26T08:12:00" indicates October 26,2019,08:12:00.
- ***Ignition Status***
  The vehicle's current ignition status, **I1** means ignition on, **I0** means ignition off.
- ***Speed***
  The current speed. Unit: km/h. Format is **S**XXX.X, for example, S38.6 means 38.6 km/h.

## 1.4 Profiles

This chapter introduces the concept, priority and related usage of **profile**. It contains the following sections:

- *About Profile*
- *Profile Related Commands*
- *Supported Profiles*

### 1.4.1 About Profile

In order for the terminal to have appropriate performance in different application scenarios, the terminal supports multiple profiles, and each profile corresponds to an application scenario.

The profiles supported by the terminal are:
*Profile 0 (Default)*,
*Profile 1 (Roaming)*,
*Profile 3 (Off Duty)*,
*Profile 6 (Ignition On)*,
*Profile 7 (Ignition Off)*,
*Profile 11 (Low Power)*,
*Profile 63 (Emergency)*.
Please see below for a more detailed description of each profile.

In different profiles, the terminal can have different behaviors. Here are some examples.

- When the terminal leaves the home network and enters the roaming network area, it will automatically switch to Profile 1 (Roaming), at this time, in order to save the data usage of the roaming network, the terminal may only generate reports but not send to the backend server, and then send these reports when the terminal leaves the roaming network area and returns to the local network area.
- When it is off duty, the terminal will automatically switch to Profile 3 (Off Duty), and in order to protect the privacy of the driver, the generated reports will not contain the actual location information, instead of fixed and false location information.
- When the ignition signal is detected, the terminal will automatically switch to Profile 6 (Ignition On), and a location report will be generated every 1 minute. When the flameout signal is detected, the terminal will switch to Profile 7 (Ignition Off), and automatically adjust to generate a location report every 60 minutes.
- When the power supply is sufficient, the terminal generates a location report every 30 minutes, and when it is in a low power state, in order to save power, it will switch to Profile 11 (Low Power) and automatically adjust to generate a location report every 6 hours.
- When the terminal receives the *AT@RTO* command with the subcommand **92**, the terminal will automatically switch to Profile 63 (Emergency), and always tries to maintain a long connection with the backend server while shortening the interval for generating location reports so that the server can know the location of the terminal in real time.

  These different behaviors of the terminal under different profiles can be realized through the multi-profile command. And the *profile related commands* supported by the terminal are listed below.

  **Note**: Not all configuration commands support multiple profiles, that is, some commands are valid regardless of which profile the terminal is in, such as *AT@CFG* command.

  Sometimes the terminal may be in multiple profiles at the same time, for example,

the terminal is in the area of the roaming network (Profile 1), and the power supply is low (Profile 11). The terminal supports configuring different **priorities** for different profiles to clarify the behavior of the terminal when it is in multiple profiles at the same time: The terminal will work according to the parameters of the higher priority profile.

By default, the lower the value of the profile ID, the lower the priority, that is, Profile 0 (Default) has the lowest priority and Profile 63 (Emergency) has the highest priority. And in particular, the priority of Profile 0 and Profile 63 cannot be changed, while the priority of other profiles can be changed through the *AT@PPS* command.

**Note**: The priority of each profile is different, that is, one profile corresponds to one priority. There will be no different profiles using the same priority.

The parameters of each profile are independent. Changing the parameters of one profile will not affect the parameters of other profiles.

By default, all parameters of all profiles supported by the terminal are the same, and the terminal only enables Profile 0 (Default) and Profile 63 (Emergency), and other profiles are disabled. The *AT@PROFILE* command can enable and disable profiles other than Profile 0 and Profile 63.

The terminal works in Profile 0 (Default) when it is started, and only when the trigger conditions of other profiles are met, the terminal will switch to other profiles. And when the conditions of other profiles disappear, the terminal will switch back to Profile 0 to work.

### 1.4.2 Profile Related Commands

Considering the actual use situation, only a small part of the configuration commands (function configuration commands or report configuration commands) support the profile feature, and we call these commands Profile Related Commands.

The difference between the Profile Related Commands and other commands can be distinguished simply by checking whether the command supports the 'Profile ID' parameter.

The profile related commands supported by the terminal are as follows:

**Table 18. Profile Related Commands**

| No. | Command | Basic Description |
|---|---|---|
| 1 | AT@PROFILE | Profile feature settings |
| 2 | AT@HBD | HBD and SHBD feature settings |
| 3 | AT@QRC | 50H (Fixed Report Information) settings |

### 1.4.3 Supported Profiles

Please see below for a more detailed description of each profile.

#### 1.4.3.1 Profile 0 (Default)

When a terminal is first powered on, it always works in this profile. When the terminal restarts, it will work in the profile before the restart.

The terminal will only switch to other profiles when it is satisfied to switch to other profiles, otherwise it will always work in this profile.

Profile 0 (Default) is the lowest priority profile, and this is unchangeable.

#### 1.4.3.2 Profile 1 (Roaming)

Since the terminal may be often used across regions, in order to reduce the data usage when using a roaming network, the terminal supports appropriately reducing the number of messages sent to the backend server when using a roaming network. This can be achieved by changing the configuration of the Profile 1.

This profile is disabled by default, you can enable it through the *AT@PROFILE* command.

#### 1.4.3.3 Profile 3 (Off Duty)

To protect the privacy of the driver and reduce unnecessary data usage, the terminal supports running with different configuration parameters during off duty. This can be achieved by changing the configuration of the Profile 3.

Fixedly, the reports sent by the terminal during off duty always hide the location information, which means that in all reports, the fields Latitude, Longitude will be filled with **054C5638H**, and the fields PLMN, LAC, Cell ID will be filled with **0**.

**Note**: This feature of hiding location information during off duty is always effective, even if the terminal switches to other profile (except Profile 63).

This profile is disabled by default, you can enable it through the *AT@PROFILE* command, and the working hours can be set in the *AT@OWH* command.

#### 1.4.3.4 Profile 6 (Ignition On)

The terminal supports vehicle ignition detection. When the vehicle is being driven, the location can be updated more quickly. In order to more timely inform the backend server that the location of the terminal, it is necessary to speed up the transmission of location information when vehicle is ignition on. This can be achieved by changing the configuration of the Profile 6.

This profile is disabled by default, you can enable it through the *AT@PROFILE* command.

#### 1.4.3.5 Profile 7 (Ignition Off)

The terminal supports vehicle ignition detection. In order to save power, some reports need to be turned off or reduced when the vehicle is ignition off. This can be achieved by changing the configuration of the Profile 7.

This profile is disabled by default, you can enable it through the *AT@PROFILE* command.

#### 1.4.3.6 Profile 11 (Low Power)

When the external power supply of the terminal is connected and low, in order to extend the working time as much as possible, the terminal supports running with different configuration parameters at this time, which can be achieved by changing the configuration of Profile 11.

This profile is disabled by default, you can enable it through the *AT@PROFILE* command, and the low power threshold can be set in the *AT@EPS* command.

### 1.4.3.7 Profile 63 (Emergency)

In order to allow the user to know the current location and other information of the terminal in a more real-time way when necessary, the terminal supports the Profile 63 (Emergency).

This profile is also called **emergency mode**, and it contains these features:

- When the terminal enters the emergency mode, the GNSS and cellular network are always on, and the terminal will always stay connected to the backend server.
- When the terminal enters the emergency mode, the Outside Working Hours function (see *AT@OWH* command) will also be invalid, the real location of the terminal will be used to generate reports.
- In emergency mode, the terminal always sends real-time reports first (equivalent to 'Report Priority' in the *AT@RPS* command is set to 1).
- In emergency mode, the terminal may send some reports to the backend server more frequently. This can be achieved by changing the configuration of the Profile 63.

  **Note**: This profile is always enabled and has the highest priority, which cannot be changed.

- **How to Enter Profile 63**

  When one of the following conditions is met, the terminal will switch to Profile 63 (Emergency).

  - When the terminal enters or exits the preset Geo-fence. Please refer to the
  - When the terminal receives the *AT@RTO* command with the subcommand **92**.

- **How to Exit Profile 63**

  When the terminal detects that the conditions for entering Profile 63 (Emergency) have disappeared, or the specified duration has elapsed, the terminal will exit Profile 63 and switch to other profiles. For example, the terminal receives a command to end the emergency state from the backend server, leaves the Geo-fence that should not be entered, and so on.

Chapter 2

# Commands and Reports

This chapter introduces all record IDs supported by the terminal. It contains the following sections:

- *Primary Parameters Configuration*
- *General Parameters Configuration*
- *RTO Command*
- *About Report*
- *Record IDs*
- *Report Configuration*
- *Data IDs*

## 2.1 Primary Parameters Configuration

The primary parameters refer to the working parameters that are indispensable for the basic operation of the terminal. Even if the "restore factory settings" operation (see *AT@RTO* command for details) is performed, these parameters will not be changed, and the existing configuration will remain.

The primary parameters can be restored to the factory settings through the "force restore factory settings" command (see *AT@RTO* command for details). Those parameters that were not configured at the factory will be cleared or restored to the default values. This operation may cause the terminal to fail to connect to the backend server, please perform it with caution.

### 2.1.1 Device Connectivity

This Section describes the commands related to the device connectivity and its associated functions.

### 2.1.1.1 ACK (Acknowledgement)

This command is used to configure the ACK and SACK feature. For the frame format of the ACK and SACK, please see Section *Acknowledgement*.

➢ **AT@ACK**

**Example:**
*AT@ACK=queclink,,,0,0,,012F$*
*+ACK:ACK,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@ACK?queclink,,0C37$*
*+QRY:ACK,123456789012345,FE01,6,1,1,1,,,0,0,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | ACK | ACK |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Reserved | 0 | | |
| | ACK Mode | 1 | 0 - 1 | 0 |
| | SACK Mode | 1 | 0 - 2 | 0 |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **ACK Mode**

- **0**-Respond to sender only. The terminal receives the command from which physical path (For example, cellular network, SMS, serial port, etc.), and replies the ACK (or NACK) only from which physical path.
- **1**-Respond to sender and backend server. The terminal receives the command from which physical path (For example, cellular network, SMS, serial port, etc.), and replies the ACK (or NACK) from which physical path. At the same time, if the legal command is not received from the backend server, the terminal will reply an ACK to the server to inform the server that the parameters of terminal may have changed.

✧ **SACK Mode**

- **0**-The backend server does not reply a SACK frame after receiving a report from the terminal.
- **1**-The backend server not only replies a SACK frame after receiving a report from the terminal but also requires the device to check the sequence number in the SACK frame.
- **2**-The backend server replies a SACK frame after receiving a report from the terminal, but does not require the device to check the sequence number in the SACK frame.

### 2.1.1.2 APN (Access Point Name)

This command is used to configure the APN specified by the cellular network operator.

**Note**: In this command, if the parameter field is empty, the current value of this parameter will be cleared.

➢ **AT@APN**

**Example:**
*AT@APN=queclink,,cmnet,,,0,,012F$*
*+ACK:APN,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@APN?queclink,,0C37$*
*+QRY:APN,123456789012345,FE01,6,1,1,1,,cmnet,,,0,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | APN | APN |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | APN | <=39 | It must only contain Latin letters, numbers, hyphen and dot (A-Z a-z 0-9 - .) | |
| | User Name | <=32 | | |
| | Password | <=32 | | |
| | Authentication | 1 | 0-3 | 0 |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **APN**

Access Point Name.

✧ **User Name**

The user name of APN.

✧ **Password**

The password of APN.

✧ **Authentication**

- **0**-None.
- **1**-PAP authentication.
- **2**-CHAP authentication.
- **3**-PAP or CHAP authentication.

### 2.1.1.3 BSS (Backend Server Settings)

This command is used to configure the IP address (or domain name) and port of the backend server, transmission mode, connection mode, etc.

➢ **AT@BSS**

**Example:**
*AT@BSS=queclink,,,192.168.1.10,590,0,0,60,0,,,012F$*
*+ACK:BSS,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@BSS?queclink,,0C37$*
*+QRY:BSS,123456789012345,FE01,6,1,1,1,,,192.168.1.10,590,0,0,60,0,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | BSS | BSS |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Reserved | 0 | | |
| | IP Address/Domain Name | <=128 | | |
| | Port | <=11 | 1-65535 or 1-65535\|1-65535 | 30059 |
| | Transmission Mode | 1 | 0-1 | 0 |
| | Connection Mode | <=2 | 0, 1, 2, 3, 10 | 0 |
| | Stay Time | <=4 | 0-3600 (seconds) | 10 |
| | Connection Time | <=14 | 0 or HHMM\|HHMM\|HHMM. | 0 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **IP Address/Domain Name**

The IPv4/IPv6 address or domain name of the backend server.

✧ **Port**

The port of the backend server and local port of terminal. The format is 'Server Port' or 'Server Port|Local Port'.

If the format of this field is 'Server Port', it means that the port number of backend server is 'Server Port' and the terminal will use the automatically assigned port number for data transmission and reception.

If the format of this field is 'Server Port|Local Port', then 'Server Port' represents the port number of the backend server and 'Local Port' represents the port number of the terminal. The terminal will use the 'Local Port' as the local port for data transmission and reception.

✧ **Transmission Mode**

- **0**-TCP/IP.
- **1**-UDP/IP.

✧ **Connection Mode**

Specify the network connection mode.

- **0**-Automatic.
  The terminal autonomously decides whether to maintain a long connection with the backend server according to its current working status.

  For example, in this mode, the terminal (which supports ignition detection) will try to maintain a long-term connection with the backend server after detecting ignition on or driving, and will connect to the backend server only when it needs to send data after detecting ignition off or stop.

- **1**-Online on demand.
  The terminal connects to the backend server only when it needs to send data; when all the data is successfully sent, the terminal will continue to keep the connection with the server for the time indicated by 'Stay Time', after which the device will cut off the connection; in addition, the terminal will also follow the time indicated by 'Connection Time', connect to the backend server regularly every day and keep at least the time indicated by 'Stay Time'.

- **2**-Always online.
  The terminal always tries and keeps connected to the backend server. At this point, the values of 'Stay Time' and 'Connection Time' are invalid.

- **3**-Online at fixed daily times.
  The terminal will follow the time indicated by 'Connection Time', connect to the backend server regularly every day and keep the connection at least the time indicated by 'Stay Time'.

- **10**-Offline mode.
  The terminal will never connect to the backend server until this mode is changed. If the short message server function is turned off at the same time (see AT@SMS command), the terminal will no longer generate any new reports (the generated reports will not be deleted).

✧ **Stay Time**

The time to stay connected to the backend server.
This field is valid only when 'Connection Mode' is 0, 1 or 3.

In order for the backend server to send commands to the terminal in time when necessary, the terminal will also keep at least the time indicated by 'Stay Time' connection with the backend server when there is no data transmission.

✧ **Connection Time**

The time to connect to the backend server every day. Up to 3 time points can be specified.

This field is valid only when 'Connection Mode' is 0, 1 or 3.

In order for the backend server to send commands to the terminal in time when necessary, the terminal will connect to the server at the time HH:MM every day, and will remain connected for at least the time indicated by 'Stay Time'.

For example, 'Connection Time' is 1015 and the 'Stay Time' is 180, indicating that the terminal is connected to the backend server at 10:15 local time each day and the connection between the terminal and the backend server shall be maintained for at least 3 minutes.

For example, 'Connection Time' is 0200|1000|1800 and the 'Stay Time' is 180, indicating that the terminal is connected to the backend server at 02:00, 10:00 and

18:00 local time each day and the connection between the terminal and the backend server shall be maintained for at least 3 minutes.

In particular, this field equals 0 meaning that the terminal does not periodically connect to the backend server every day.

### 2.1.1.4 HBD (Heartbeat Settings)

This command is used to configure the HBD and SHBD feature. For the frame format of the HBD and SHBD, please see Section *Heartbeat Data*.

➢ **AT@HBD**

**Example:**

*AT@HBD=queclink,0,,1,10,,0,,012F$*
*+ACK:HBD,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@HBD?queclink,,0C37$*
*+QRY:HBD,123456789012345,FE01,6,1,7,1,**0**,,1,10,,0,,0C37,20210407101530,1234$*
*+QRY:HBD,123456789012345,FE01,6,1,7,2,**1**,,0,10,,0,,0C37,20210407101530,1235$*
*+QRY:HBD,123456789012345,FE01,6,1,7,3,**3**,,0,10,,0,,0C37,20210407101530,1235$*
*+QRY:HBD,123456789012345,FE01,6,1,7,4,**6**,,0,10,,0,,0C37,20210407101530,1235$*
*+QRY:HBD,123456789012345,FE01,6,1,7,5,**7**,,0,10,,0,,0C37,20210407101530,1235$*
*+QRY:HBD,123456789012345,FE01,6,1,7,6,**11**,,0,10,,0,,0C37,20210407101530,1235$*
*+QRY:HBD,123456789012345,FE01,6,1,7,7,**63**,,0,10,,0,,0C37,20210407101530,1235$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | HBD | HBD |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Profile ID | | All supported profiles | |
| | Reserved | 0 | | |
| | Heartbeat Mode | 1 | 0-2 | 0 |
| | Heartbeat Interval | <=2 | 3-99 (minutes) | 10 |
| | Reserved | 0 | | |
| | SHBD Mode | 1 | 0-1 | 0 |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Profile ID**

Specify the associated profile ID. Please refer to the *AT@PROFILE* command for valid values.

✧ **Heartbeat Mode**

- **0**-Disable. The terminal does not send the HBD frame to the backend server.
- **1**-Enable (periodic). The terminal will periodically send the HBD frame to the backend server according to 'Heartbeat Interval'.
- **2**-Enable (aperiodic). Only when the terminal has not sent any information to the backend server within the time indicated by 'Heartbeat Interval', the terminal will send the HBD frame to the server.

✧ **Heartbeat Interval**

The interval for the terminal to send the HBD frame to the backend server.

✧ **SHBD Mode**

- **0**-Disable. The backend server has no need to reply the SHBD frame after receiving the HBD frame from the terminal.
- **1**-Enable. The backend server needs to reply the SHBD frame after receiving

the HBD frame from the terminal, and the terminal will diagnose its connection status with the backend server according to the SHBD frame.

### 2.1.1.5 NET (Network Connection)

This command is used to configure the network connection method between the terminal and the backend server.

➢ **AT@NET**

**Example:**
*AT@NET=queclink,,0,,,,1,,012F$*
*+ACK:NET,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@NET?queclink,,0C37$*
*+QRY:NET,123456789012345,FE01,6,1,1,1,,0,,,,1,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | NET | NET |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | RAT Selection | 1 | 0, 2, 3, 4 | 0 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Manual Network Register | 1 | 0-1 | 0 |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **RAT Selection**

This field is used to specify the RAT (Radio Access Technology) allowed to be searched.

Use numbers to indicate the corresponding RATs. In particular, setting this field to **0** indicates that the terminal will automatically search for all supported RATs. And the definition is as follows:

| RAT | ID |
|---|---|
| GSM | 2 |
| UMTS | 3 |
| LTE | 4 |

For example, "4" means that the terminal will search LTE only.

The terminal supports the following options:

- **0** – Auto.
- **2** – GSM only.
- **3** – UMTS only.
- **4** – LTE only.

✧ **Manual Network Register**

This field is used to specify whether to enable manually register the network.

- **0**-Disable manually register the network.
- **1**-Enable manually register the network.

**Note**: If this function is enabled (value 1), the terminal filters the telecom operators according to the rules specified by the *AT@TOF* command (Mode is not 0), otherwise it will automatically search for all operators.

### 2.1.1.6 QSS (Quick Start Settings)

The Quick Start Settings command allow the user to set the basic connectivity configuration with one single command.

- **AT@QSS**

**Example:**
*AT@QSS=queclink,,cmnet,,,0,,0,,0,,192.168.1.1,590,0,0,10,0200,012F$*
*+ACK:QSS,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@QSS?queclink,,0C37$*
*+QRY:QSS,123456789012345,FE01,6,1,1,1,,cmnet,,,0,,0,,0,,192.168.1.1,590,0,0,10,0200,0C37*
*,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QSS | QSS |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | APN | <=39 | It must only contain Latin letters, numbers, hyphen and dot (A-Z a-z 0-9 - .) | |
| | APN User Name | <=32 | | |
| | APN Password | <=32 | | |
| | APN Authentication | 1 | 0-3 | 0 |
| | Reserved | 0 | | |
| | RAT Selection | 1 or N | One or more RATs. | 0 |
| | Reserved | 0 | | |
| | Manual Network Register | 1 | 0-1 | 0 |
| | Reserved | 0 | | |
| | IP Address/Domain Name | <=128 | | |
| | Port | <=11 | 1-65535 or 1-65535\|1-65535 | 30059 |
| | Transmission Mode | 1 | 0-1 | 0 |
| | Connection Mode | <=2 | 0, 1, 2, 3, 10 | 0 |
| | Stay Time | <=4 | 0-3600 (seconds) | 10 |
| | Connection Time | <=14 | 0 or HHMM\|HHMM\|HHMM. | 0 |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

- **APN**

  Access Point Name.

- **APN User Name**

  The user name of APN.

- **APN Password**

  The password of APN.

- **APN Authentication**

  - **0**-None.
  - **1**-PAP authentication.

- **2**-CHAP authentication.
- **3**-PAP or CHAP authentication.

✧ **RAT Selection**

This field is used to specify the RAT (Radio Access Technology) allowed to be searched.

Please refer to the *AT@NET* command.

✧ **LTE RAT**

This field is used to specify which network category to be searched under LTE RAT. It is only valid when LTE is included in the RAT specified by 'RAT Selection'.

Please refer to the *AT@NET* command.

✧ **Manual Network Register**

This field is used to specify whether to enable manually register the network.

Please refer to the *AT@NET* command.

✧ **IP Address/Domain Name**

The IPv4/IPv6 address or domain name of the backend server.

✧ **Port**

The port of the backend server and local port of terminal. The format is 'Server Port' or 'Server Port|Local Port'.

If the format of this field is 'Server Port', it means that the port number of backend server is 'Server Port' and the terminal will use the automatically assigned port number for data transmission and reception.

If the format of this field is 'Server Port|Local Port', then 'Server Port' represents the port number of the backend server and 'Local Port' represents the port number of the terminal. The terminal will use the 'Local Port' as the local port for data transmission and reception.

✧ **Transmission Mode**

- **0**-TCP/IP.
- **1**-UDP/IP.

✧ **Connection Mode**

Specify the network connection mode.

Please refer to the *AT@BSS* command.

✧ **Stay Time**

The time to stay connected to the backend server.
This field is valid only when 'Connection Mode' is 0, 1 or 3.

In order for the backend server to send commands to the terminal in time when necessary, the terminal will also keep at least the time indicated by 'Stay Time' connection with the backend server when there is no data transmission.

✧ **Connection Time**

The time to connect to the backend server every day. Up to 3 time points can be specified.

This field is valid only when 'Connection Mode' is 0, 1 or 3.

In order for the backend server to send commands to the terminal in time when necessary, the terminal will connect to the server at the time HH:MM every day, and will remain connected for at least the time indicated by 'Stay Time'.

For example, 'Connection Time' is 1015 and the 'Stay Time' is 180, indicating that the terminal is connected to the backend server at 10:15 local time each day and the connection between the terminal and the backend server shall be maintained for at least 3 minutes.

For example, 'Connection Time' is 0200|1000|1800 and the 'Stay Time' is 180, indicating that the terminal is connected to the backend server at 02:00, 10:00 and 18:00 local time each day and the connection between the terminal and the backend server shall be maintained for at least 3 minutes.

In particular, this field equals 0 meaning that the terminal does not periodically connect to the backend server every day.

### 2.1.1.7 SMS (Short Message Server Settings)

This command is used to configure the SMS server function of the terminal.

➢ **AT@SMS**

**Example:**
*AT@SMS=queclink,,,0,,,,,012F$*
*+ACK:SMS,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@SMS?queclink,,0C37$*
*+QRY:SMS,123456789012345,FE01,6,1,1,1,,,0,,,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | SMS | SMS |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Reserved | 0 | | |
| | SMS Mode | 1 | 0, 1, 2, 5 | 0 |
| | SMS Gateway Number | <=20 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **SMS Mode**

The working mode of SMS server function.

- **0**-Disable. SMS will not be used for data transmission.
- **1**-Enabled and Alternative. The terminal will first attempt to send data to the backend server using wireless network, and then try to send them over SMS if it fails.
- **2**-Enabled and Preferred. The terminal will first attempt to send data to the backend server using SMS, and then try to send them over the wireless network if it fails.
- **5**-Force on SMS mode. Only SMS is used for data transmission. In this mode, the network backend server function (configured by the *AT@BSS* command) will be invalid, that is, the terminal does not connect to the network backend server.

✧ **SMS Gateway Number**

The gateway number of SMS. If it is an international number, remember to add "+" and the area code. Note that this field will be ignored when the 'SMS Mode' is 0.

### 2.1.1.8 TOF (Telecom Operators Filtering)

This command is used to customize the telecom operators filtering.

➢ **AT@TOF**

**Example:**
*AT@TOF=queclink,1,46001|46003,,,,012F$*
*+ACK:TOF,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@TOF?queclink,,0C37$*
*+QRY:TOF,123456789012345,FE01,6,1,1,1,1,46001|46003,,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | TOF | TOF |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Mode | 1 | 0-4 | 0 |
| | PLMN White List | N | PLMN1\|PLMN2\|PLMN3… | |
| | PLMN Black List | N | PLMN1\|PLMN2\|PLMN3… | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

Specify the working mode of filtering the telecom operators.

- **0**-Disable. Allow the terminal to register to any cellular network.
- **1**-White list only. The terminal is only allowed to register to the cellular network of the telecom operators which in the white list.
- **2**-White list first. The terminal is allowed to register to any cellular network, but the telecom operators in the white list are preferred.
- **3**-Black list only. The terminal is only allowed to register to the cellular network of the telecom operators which are not in the black list.
- **4**-Both white list and black list. The order of terminal filtering telecom operators is: 'PLMN White List', 'PLMN Black List', others.

✧ **PLMN White List**

Specify the PLMN(s) as telecom operators white list. The terminal supports setting up to 10 operators (i.e. PLMN). The characters "|" are used to connect each PLMN. Each PLMN is represented by 5 or 6 digits, the first three digits represent MCC, and the remaining digits represent MNC.

For example, "46000" means PLMN 46000, and "46000|46001" means PLMN 46000 and PLMN 46001.

In particular, "MCCFF" type code is used to identify telecom operators across a whole country. For example, "460FF" covers the telecom operators all across China.

✧ **PLMN Black List**

Specify the PLMN(s) as telecom operators black list. The terminal supports setting up to 10 operators (i.e, PLMN). The characters "|" are used to connect each PLMN.

Each PLMN is represented by 5 or 6 digits, the first three digits represent MCC, and the remaining digits represent MNC.

For example, "46000" means PLMN 46000, and "46000|46001" means PLMN 46000 and PLMN 46001.

In particular, "MCCFF" type code is used to identify telecom operators across a whole country. For example, "460FF" covers the telecom operators all across China.

### 2.1.2 Device Configuration

This Section describes some configuration commands related to the device itself.

### 2.1.2.1 CFG (Global Device Configuration)

This command is used to configure the key properties (such as Password) of the terminal.

➢ **AT@CFG**

**Example:**
*AT@CFG=queclink,queclink123,MyDevice,,,,012F$*
*+ACK:CFG,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@CFG?queclink123,,0C37$*
*+QRY:CFG,123456789012345,FE01,6,1,1,1,,MyDevice,,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | CFG | CFG |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | New Password | 0 or 8-16 | It must only contain Latin letters, numbers, hyphen, underscore and number sign (A-Z a-z 0-9 - _ #). | gv501lg# |
| | Device Name | 0 or 4-16 | It must only contain Latin letters, numbers, hyphen and underscore (A-Z a-z 0-9 - _). | GV501LG |
| | Modem Power Management | 1 | 0-1 | 0 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **New Password**

Change the current password with a new one. If this field is empty, it means no need to change the password.

✧ **Device Name**

The name of the terminal device. If this field is empty, it means no need to change the device name.

✧ **Modem Power Management**

Used to specify whether the device is allowed to shut down the module modem when there is no data traffic task.

- **0**-Modem will not shut down.
- **1**-Modem shuts down.

### 2.1.2.2 PIN (Unlock SIM PIN)

This command is used to unlock the SIM PIN automatically.

➢ **AT@PIN**

**Example:**
*AT@PIN=queclink,1,300590,,,012F$*
*+ACK:PIN,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@PIN?queclink,,0C37$*
*+QRY:PIN,123456789012345,FE01,6,1,1,1,1,300590,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | PIN | PIN |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Mode | 1 | 0-1 | 0 |
| | PIN | 4-8 | It must contain only numbers (0-9). | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

- **0**-Disable. Do not unlock PIN automatically.
- **1**-Enable. If the terminal detects that the SIM card is locked with a PIN, the terminal will use 'PIN' to unlock it automatically.

✧ **PIN**

The PIN code which is used to unlock the SIM card. Please note that, if this field is empty, the PIN code saved in the terminal will be cleared.

### 2.1.2.3 TMA (Time Adjustment)

This command is used to help the terminal calibrate the local time. The terminal always automatically performs time synchronization via the GNSS chip, the cellular network base station, or the NTP server.
The terminal can automatically obtain UTC time from the base station, NTP server or GNSS, and then use the 'Time Zone' and 'Daylight Saving' parameters to calculate the local time.

**Note**: The subcommand **98** of the *AT@RTO* command can be used to calibrate the UTC time of the terminal in real time.

➢ **AT@TMA**

**Example:**
*AT@TMA=queclink,,+32,0,,time.windows.com,123,012F$*
*+ACK:TMA,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@TMA?queclink,,0C37$*
*+QRY:TMA,123456789012345,FE01,6,1,1,1,,+32,0,,time.windows.com,123,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | TMA | TMA |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Time Zone | <=3 | -48 to +48 (*15 minutes) | 0 |
| | Daylight Saving | 1 | 0-1 | 0 |
| | Reserved | 0 | | |
| | NTP Server IP or Domain Name | <=64 | | time.windows.com |
| | NTP Server Port | <=5 | 0-65535 | 123 |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Time Zone**

Time zone, a signed integer, indicates the difference, expressed in quarters of an hour, between the local time (excluding daylight saving time) and UTC.

For example, the value of this field is "+32", which means UTC+08:00.
For example, the value of this field is "-8", which means UTC-02:00.
For example, the value of this field is "-10", which means UTC-02:30.

✧ **Daylight Saving**

- **0**-Disable. There is no need to add 1 hour to local time.
- **1**-Enable. The local time needs to be added by 1 hour.

✧ **NTP Server IP or Domain Name**

The IP or domain name of the NTP server. The terminal will only try to access the NTP server when it cannot obtain the UTC time via the GNSS chip and the base station, and access it at most once within 24 hours.

✧ **NTP Server Port**

The port of the NTP server.

## 2.2 General Parameters Configuration

The parameters described in this section are related to the working method of the terminal, thresholds, etc., they can be restored to the factory default through the "restore factory settings" command (see *AT@RTO* command for details), and they are usually not directly related to the generation and transmission of the reports (see the Section *Report Configuration* for more information).

Please see below for the configuration commands of the working parameters.

### 2.2.1 Profiles Configuration

This Section describes the commands related to the configuration of the profiles and its associated functions.

### 2.2.1.1 PROFILE (Profile Settings)

This command is used to set the working mode for the specified profile.

Please refer to the *AT@PPS* command for profile priority configuration.

➢ **AT@PROFILE**

**Example:**
*AT@PROFILE=queclink,3,0,,,,012F$*
*+ACK:PROFILE,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@PROFILE?queclink,,0C37$*
*+QRY:PROFILE,123456789012345,FE01,6,1,7,1,**0**,1,,,,0C37,20210407101530,1234$*
*+QRY:PROFILE,123456789012345,FE01,6,1,7,2,**1**,2,,,,0C37,20210407101530,1235$*
*+QRY:PROFILE,123456789012345,FE01,6,1,7,3,**3**,0,,,,0C37,20210407101530,1236$*
*+QRY:PROFILE,123456789012345,FE01,6,1,7,4,**6**,1,,,,0C37,20210407101530,1234$*
*+QRY:PROFILE,123456789012345,FE01,6,1,7,5,**7**,1,,,,0C37,20210407101530,1234$*
*+QRY:PROFILE,123456789012345,FE01,6,1,7,6,**11**,1,,,,0C37,20210407101530,1234$*
*+QRY:PROFILE,123456789012345,FE01,6,1,7,7,**63**,1,,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 7 | PROFILE | PROFILE |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Profile ID | | All supported profiles | |
| | Mode | 1 | 0-2 | 0 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Profile ID**

Specify which profile ID will be configured. For example, "1" means Profile 1 (Roaming). In particular, this field is **empty** to indicate that all profiles are configured. And connecting multiple profile IDs with the '|' symbol means that the same configuration is applied to multiple Profiles.

This information about the 'Profile ID' field in the configuration command will not be repeated below.

Please see Chapter *Profiles* for more information.

✧ **Mode**

The working mode of the specified profile.

- **0**-Disable. The terminal will never switch to this profile.
- **1**-Normal. The terminal will normally generate records or reports according to the configuration of this profile, and send these reports to the backend server in time.
- **2**-High Priority Only. The terminal will normally generate records or reports according to the configuration of this profile, but only high priority reports will be sent to the backend server until the terminal leaves this profile. For the high priority reports, please refer to the '*Report Priority*'.

**Note**: For Profile 0 (Default) and Profile 63 (Emergency), always work in **Mode 1** (Normal). This cannot be changed.

### 2.2.1.2 PPS (Profile Priority Settings)

This command is specially used to adjust the priority of the profiles.

By default, the lower the value of the profile ID, the lower the priority, that is, *Profile 0* (Default) has the lowest priority and *Profile 63* (Emergency) has the highest priority. And in particular, the priority of Profile 0 and Profile 63 cannot be changed, while the priority of other profiles can be changed through this command.

➢ **AT@PPS**

**Example:**
*AT@PPS=queclink,0<1<3<10<12<16<13<63,,,012F$*
*+ACK:PPS,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@PPS?queclink,,0C37$*
*+QRY:PPS,123456789012345,FE01,6,1,1,1,0<1<3<10<12<16<13<63,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | PPS | PPS |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Profile IDs | 1 or N | 0<X1<X2<X3… | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Profile IDs**

Configure the priority of the specified profile IDs.

Use the '<' symbol to connect specified profile IDs, the priority of the profile ID on the right side of the symbol is higher than the one on the left. Since Profile 0 is always the lowest priority, 0 can only appear on the far left. In particular, if you want to set the priority of one certain profile ID to be greater than 0 but less than other IDs, you can omit "0<" and just fill in its ID.

For example, if this field is set to "0<10<1<3<6", it means that the priority is sorted from low to high, in order 0, 10, 1, 3, 6, and then other IDs.

For example, if this field is set to "12", it means that the priority is sorted from low to high, in order is 0, 12, and then other IDs.

For another example, assuming that the current priority order is 0,1,3,10,7,6,63 in the terminal, and if "10<1<6" is set, then the priority order will become 0,3,10,1,6,7,63. Please check the table below to known the changing process:

| Step | Step Description | Process |
|---|---|---|
| 1 | Current priority order | 0,**1**,3,**10**,7,**6**,63 |
| 2 | Received a specific order | 10<1<6 |
| 3 | Split into two sorts | "0,3,**10**,7,63" and "**10**,1,6" |
| 4 | Merge into a final new sort | 0,3,**10**,**1**,**6**,7,63 |

**Note**: The focus of all the above examples is to describe the usage of this parameter,

please do not care whether the profile IDs used in the examples exist in the document.

### 2.2.1.3 RPS (Report Priority Settings)

This command is used to set the priority of report.

➢ **AT@RPS**

**Example:**
*AT@RPS=queclink,,0,100,,,012F$*
*+ACK:RPS,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@RPS?queclink,,0C37$*
*+QRY:RPS,123456789012345,FE01,6,1,1,1,,0,100,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | RPS | RPS |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Report Priority | 1 | 0-2 | 0 |
| | Number of BUFFER Reports | <=3 | 9-999 | 100 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Report Priority**

- **0**-BUFFER report first. The terminal device always sends reports according to the order in which they were generated. Reports generated earlier are sent first.
- **1**-Real-time reports first. The terminal will send the real-time reports first, and then send the history reports.
- **2**-Automatic. When the number of BUFFER reports reaches the value set by 'Number of BUFFER Reports', the terminal will work in the mode 1 (Real-time reports first), otherwise it will work in the mode 0 (BUFFER reports first).

About the BUFFER report and real-time report, please see *BUFFER Report* for more information.

**Note**: In emergency mode (*Profile 63*), the terminal always sends real-time reports first (equivalent to setting 'Report Priority' to 1).

✧ **Number of BUFFER Reports**

The threshold of the number of BUFFER reports. This field is valid only when 'Report Priority' is 2 (Automatic).

### 2.2.2 Alarm Settings

This Section describes the commands related to the alarm functions.

### 2.2.2.1 APF (Auto Parking-fence)

This command is used to control the Parking-fence function.

The Parking-fence refers to a virtual circular geographical fence that automatically generated when parking. When the vehicle is ignition off, the terminal will automatically set a Parking-fence with the current location as the center. The terminal will only scan whether it exits this Parking-fence. This Parking-fence will be canceled after the terminal exits the zone.

The *18H report* could be generated and sent to backend server when the Paring-fence is generated or canceled.

In addition, the status of the Parking-fence (*Data 105*) can be inquired in real time by the subcommand **0** of the *AT@RTO* command.

➢ **AT@APF**

**Example:**
*AT@APF=queclink,,1,,500,,,012F$*
*+ACK:APF,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@APF?queclink,,0C37$*
*+QRY:APF,123456789012345,FE01,6,1,1,1,,1,,500,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | APF | APF |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Mode | 1 | 0-2 | 0 |
| | Reserved | 0 | | |
| | Radius | <=6 | 100-100000 (meters) | 100 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

Access Point Name.

- **0**-Disable. Disable the Parking-fence function.
- **1**-Enable (Automatically triggered **always**). In this mode, every time the vehicle is ignition off, if there is no Parking-fence that has been generated, the terminal will automatically generate a new Parking-fence.
- **2**-Enable (Automatically triggered **once**). After receiving the AT@APF command with this mode, the terminal will generate a new Parking-fence after the vehicle is ignition off (even if it has been generated before); when the vehicle leaves this fence, the terminal will no longer generate a new Parking-fence until it receives a new AT@APF command.

✧ **Radius**

The radius of the circular Parking-fence region.

### 2.2.2.2 DOG (Protocol Watchdog)

This command is used to restart the terminal periodically, which may help prevent the device from staying in malfunctioning state for a long time.

**Note**: For security consideration, if the terminal can obtain the speed and the speed is greater than 0.3 km/h, the device will not restart immediately even if the predetermined time reaches. The device will continue to monitor the speed value within 3 hours, until the speed drops below 0.3 km/h. If the speed does not drop below 0.3 km/h within 3 hours, the system will not restart on the same day, but try to restart at the same time the next day, and so on until the restart is completed.

➢ **AT@DOG**

**Example:**
*AT@DOG=queclink,1,,7,0300,,,012F$*
*+ACK:DOG,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@DOG?queclink,,0C37$*
*+QRY:DOG,123456789012345,FE01,6,1,1,1,1,,7,0300,,,0C37,20210407101530,1234$.*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | DOG | DOG |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Mode | 1 | 0-1 | 0 |
| | Reserved | 0 | | |
| | Interval | <=2 | 1-30 (days) | 7 |
| | Time | 4 | HHMM | 0300 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

- **0**-Disable, the terminal does not restart periodically.
- **1**-Enable, the terminal will automatically restart periodically according to the following parameters.

✧ **Interval**

The interval to restart the terminal.

✧ **Time**

At what time to perform the restart operation when 'Interval' (unit is day) is met.

For example, 'Interval' is 7, 'Time' is 0300, which means that every 7 days, and the terminal will restart at 03:00:00 in the morning.

### 2.2.2.3 EPS (External Power Supply)

This command is used to configure the alarm threshold of the external power supply of the terminal.

When the external power is connected and the external power voltage is below the limit value (specified by 'Low Voltage Threshold'), the terminal will be in the state of low external voltage. In this state, the terminal will enter *Profile 11 (Low Power)* and trigger an external low voltage alarm (refer to *23H report*).

➢ **AT@EPS**

**Example:**
*AT@EPS=queclink,,12000,60,,,012F$*
*+ACK:EPS,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@EPS?queclink,,0C37$*
*+QRY:EPS,123456789012345,FE01,6,1,1,1,,12000,60,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | EPS | EPS |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Low Voltage Threshold | <=5 | 0 or11000-16000 (mV) | 0 |
| | Low Voltage Debounce Time | <=4 | 5-3600 (seconds) | 5 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Low Voltage Threshold**

Specify the low power threshold. When the voltage of external power is below this value longer than 'Low Voltage Debounce Time', the terminal will be in the state of low external voltage. If it is set to 0, this function is disabled.

✧ **Low Voltage Debounce Time**

The debounce time for checking the 'Low Voltage Threshold'.

### 2.2.2.4 GEO (Geo-fence Settings)

This command is used to set the area of Geo-fence (a virtual geographical fence) and its scanning method. The format and meaning of the parameters of this command are as follows:

➢ **AT@GEO**

**Example:**

*AT@GEO=queclink,1,3,,,60,500,1,116.405419|39.916706,012F$*
*+ACK:GEO,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@GEO?queclink,,0C37$*
*+QRY:GEO,123456789012345,FE01,6,1,20,1,1,3,,,60,100,1,116.405419|39.916706,0C37,20210407101530,1234$*
*+QRY:GEO,123456789012345,FE01,6,1,20,2,2,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1235$*
*+QRY:GEO,123456789012345,FE01,6,1,20,3,3,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1236$*
*+QRY:GEO,123456789012345,FE01,6,1,20,4,4,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1237$*
*+QRY:GEO,123456789012345,FE01,6,1,20,5,5,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1238$*
*+QRY:GEO,123456789012345,FE01,6,1,20,6,6,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1239$*
*+QRY:GEO,123456789012345,FE01,6,1,20,7,7,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,123A$*
*+QRY:GEO,123456789012345,FE01,6,1,20,8,8,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,123B$*
*+QRY:GEO,123456789012345,FE01,6,1,20,9,9,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,123C$*
*+QRY:GEO,123456789012345,FE01,6,1,20,10,10,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,123D$*
*+QRY:GEO,123456789012345,FE01,6,1,20,11,11,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,123E$*
*+QRY:GEO,123456789012345,FE01,6,1,20,12,12,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,123F$*
*+QRY:GEO,123456789012345,FE01,6,1,20,13,13,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1240$*
*+QRY:GEO,123456789012345,FE01,6,1,20,14,14,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1241$*
*+QRY:GEO,123456789012345,FE01,6,1,20,15,15,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1242$*
*+QRY:GEO,123456789012345,FE01,6,1,20,16,16,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1243$*
*+QRY:GEO,123456789012345,FE01,6,1,20,17,17,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1244$*
*+QRY:GEO,123456789012345,FE01,6,1,20,18,18,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1245$*
*+QRY:GEO,123456789012345,FE01,6,1,20,19,19,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1246$*
*+QRY:GEO,123456789012345,FE01,6,1,20,20,20,0,,,60,100,1,0.000000|0.000000,0C37,20210407101530,1247$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | GEO | GEO |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | GEO ID | <=2 | 1-20 | |
| | Mode | 1 | 0-3 | 0 |
| | Emergency Enable | 1 | 0-1 | 0 |
| | Location SMS Enable | 1 | 0-1 | 0 |
| | Check Interval | <=5 | 5-86400 (seconds) | 60 |
| | Radius | <=6 | 100-100000 (meters) | 100 |
| | Point Number | <=2 | 1-10 | 1 |
| | Longitude\|Latitude | | One or more points | 0.000000\|0.000000 |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **GEO ID**

Which Geo-fence to configure.

✧ **Mode**

- **0**-Disable. Disable the Geo-fence of specified 'GEO ID'.
- **1**-Entering the zone. The terminal will only scan whether it enters this Geo-fence.
- **2**-Exiting the zone. The terminal will only scan whether it exits this Geo-fence.
- **3**-Both entering and exiting. The terminal will scan whether it enters or exits this Geo-fence.

When this 'Mode' is not equal to 0, the terminal will generate *17H report* or record according to the *17H Settings* command.

✧ **Emergency Enable**

Whether to automatically enter and exit emergency mode (Profile 63) according to 'Mode'.

- **0**-Disable. This Geo-fence will not trigger emergency mode.
- **1**-Enable. For Mode 1 (Entering the zone) and Mode 3 (Both entering and exiting), when the terminal enters the Geo-fence, the terminal will switch to emergency mode, and when it exits the Geo-fence, it will also exit emergency mode. And for Mode 2 (Exiting the zone), when the terminal exits the Geo-fence, the terminal will switch to emergency mode, and when it enters the Geo-fence, it will exit emergency mode.

✧ **Location SMS Enable**

Specify whether needs to send the Location SMS when the GEO event is detected. If this function is enabled, the Location SMS will be sent to the phone list in *AT@GML* command when the GEO event is detected.

- **0**-Disable.
- **1**-Enable.

✧ **Check Interval**

The checking interval for the Geo-fence event. When multiple Geo-fences are

enabled, the terminal will pick the minimum value from these 'Check Interval' values as their detection interval. For power consumption reasons, the terminal will turn off GNSS without affecting the application, in which case the terminal will temporarily stop detecting Geo-fence events until this interval is reached.

✧ **Radius**

The radius of the circular Geo-fence region. This field is only valid when 'Point Number' is 1.

✧ **Point Number**

The number of location points that make up this Geo-fence.

When this field is **1**, it means that this is a circular Geo-fence. At this time, the terminal will use 'Longitude|Latitude' as the center and 'Radius' as the radius to form a circular Geo-fence.

When this field is **2**, it means that this is a rectangular Geo-fence, followed by the first 'Longitude|Latitude' is the position of the upper-left corner of the rectangle, and the second 'Longitude| Latitude' is the position of the lower-right corner of the rectangle.

When this field is greater than 2, the terminal will line up in the following order of location points indicated by 'Longitude| Latitude' to form a polygon Geo-fence.

✧ **Longitude|Latitude**

The location information. Each location point is composed of longitude and latitude, and the two are connected by vertical bar ('|'). Please note that if there are multiple location points, use commas to separate the location points.

For **longitude**, the data format is -xxx.xxxxxx or xxx.xxxxxx, and the value range is from -180.000000 to 180.000000. The unit is degree. West longitude is defined as negative starting with "-" and east longitude is defined as positive without "+".

For **latitude**, the data format is -xx.xxxxxx or xx.xxxxxx, and the value range is from -90.000000 to 90.000000. The unit is degree. South latitude is defined as negative starting with "-" and north latitude is defined as positive without "+".

### 2.2.3 Driving Monitoring Settings

This Section describes the monitoring and detection functions related to driving behavior supported by the terminal.

### 2.2.3.1 CRASH (Crash Detection)

This command is used to configure the parameters for crash detection. When the detection condition is met (the current acceleration in a direction is beyond the configured threshold), the device will send a crash alarm *74H report* and data packets *75H report* and *76H report* to the backend server.

Note: The default accelerometer recording is 100Hz and the fastest GNSS recording is 1 Hz.

➢ **AT@CRASH**

**Example:**
*AT@CRASH=queclink,,1,100,14,1,8,7,1,1,1,2,012F$*
*+ACK:CRASH,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@CRASH?queclink,,0C37$*
*+QRY:CRASH,123456789012345,FE01,6,1,1,1,,1,100,14,1,8,7,1,1,1,2,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 5 | CRASH | CRASH |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Mode | 1 | 0-2 | 0 |
| | Sensor Frequency | <=3 | 100, 200, 400 (Hz) | 100 |
| | Crash Threshold | <=3 | 6-160 (*100 mg) | 14 |
| | Record Sensor Data | 1 | 0, 1, 2 | 1 |
| | Sensor Time Before Crash | 1 | 1-8 (*0.5 seconds) | 8 |
| | Sensor Time After Crash | 1 | 1-8 (*0.5 seconds) | 7 |
| | Record GNSS Data | 1 | 0-2 | 1 |
| | GNSS 0.2Hz Samples Before Crash | 1 | 0-2 (*10) | 1 |
| | GNSS 1Hz Samples Before Crash | 1 | 0-2 (*10) | 1 |
| | GNSS 1Hz Samples After Crash | 1 | 0-2 (*10) | 2 |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

- **0**-Disable this function.
- **1**-Enable only when ignition on.
- **2**-Enable always.

**Note**: For Mode 2, the power consumption of the terminal will increase. In addition, if the crash event occurs when the terminal is sleeping, the terminal may not be able to provide complete data before the crash to the server.

✧ **Sensor Frequency**

Specifies the sampling frequency of the sensor.

✧ **Crash Threshold**

The threshold for crash threshold. The smaller the value, the easier it is to trigger a crash event.

✧ **Record Sensor Data**

Specifies whether need to record sensor data.

- **0**-None. In this mode, the terminal will not record the sensor data for crash, and the *75H report* will not be generated.
- **1**-Acceleration data. The terminal will record acceleration data for crash.
- **2**-Acceleration data and gyroscope data. The terminal will record acceleration data and gyroscope data for crash.

✧ **Sensor Time Before Crash**

How many seconds of sensor data before the climax of a crash event. The unit is 0.5 second. If the 'Record Sensor Data' is set to 0, then this parameter is invalid.

✧ **Sensor Time After Crash**

How many seconds of sensor data after the climax of a crash event. The unit is 0.5 second. If the 'Record Sensor Data' is set to 0, then this parameter is invalid.

✧ **Record GNSS Data**

Specifies whether need to record GNSS data.

- **0**-None. In this mode, the terminal will not record the GNSS data for crash, and the *76H report* will not be generated.
- **1**-Mini Location. The terminal will record GNSS data in *Data 81* format.
- **2**-Full Location. The terminal will record GNSS data in *Data 82* format.

✧ **GNSS 0.2Hz Samples Before Crash**

How many pieces of 0.2Hz GNSS data before the climax of a crash event. If the 'Record GNSS Data' is set to 0, then this parameter is invalid.

✧ **GNSS 1Hz Samples Before Crash**

How many pieces of 1Hz GNSS data before the climax of a crash event. If the 'Record GNSS Data' is set to 0, then this parameter is invalid.

✧ **GNSS 1Hz Samples After Crash**

How many pieces of 1Hz GNSS data after the climax of a crash event. If the 'Record GNSS Data' is set to 0, then this parameter is invalid.

### 2.2.3.2 GSENSOR (G-Sensor Motion Detection)

This command is used to configure the motion detection parameters of the G-sensor (Accelerometer).

➢ **AT@GSENSOR**

**Example:**
*AT@GSENSOR=queclink,,3,300,30,,,012F$*
*+ACK:GSENSOR,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@GSENSOR?queclink,,0C37$*
*+QRY:GSENSOR,123456789012345,FE01,6,1,1,1,,3,300,30,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 7 | GSENSOR | GSENSOR |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Motion Sensitivity | 1 | 1-5 | 3 |
| | Motion Duration | <=5 | 100-99999 (ms) | 300 |
| | Motionless Duration | <=3 | 1-999 (seconds) | 30 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Motion Sensitivity**

The sensitivity level for the motion sensor to determine whether the terminal is in movement status. The smaller the value, the easier it is for the terminal to detect movement.

✧ **Motion Duration**

A time parameter to determine whether the terminal enters movement status. If the motion sensor detects that the device has been moving for a period of time specified by 'Motion Duration', the device will be considered to be in movement status.

✧ **Motionless Duration**

A time parameter to determine whether the terminal enters motionless status. If the motion sensor detects that the device has been motionless for a period of time specified by 'Motionless Duration', the device will be considered to be in motionless status.

### 2.2.3.3 HBM (Harsh Behavior Monitoring)

This command is used to monitor the harsh behavior of the driver. This function works while driving. The terminal will generate and send the *72H report* to backend server when the harsh behavior event is detected.

The terminal supports the following harsh behavior detection:

- Harsh acceleration.
- Harsh deceleration.
- Harsh cornering.

If terminal detected 2 or more than 2 times of the same harsh driving behavior within 10 seconds, except the first one, the others will be ignored.

➢ **AT@HBM**

**Example:**
*AT@HBM=queclink,,1,30,50,35,50,40,50,,,012F$*
*+ACK:HBM,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@HBM?queclink,,0C37$*
*+QRY:HBM,123456789012345,FE01,6,1,1,1,,1,30,50,30,50,40,50,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | HBM | HBM |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Mode | 1 | 0-1 | 0 |
| | Acceleration Threshold | <=3 | 10-150 (*10 mg) | 30 |
| | Acceleration Duration | <=2 | 10-50 (*10 ms) | 50 |
| | Deceleration Threshold | <=3 | 10-150 (*10 mg) | 35 |
| | Deceleration Duration | <=2 | 10-50 (*10 ms) | 50 |
| | Cornering Threshold | <=3 | 10-150 (*10 mg) | 40 |
| | Cornering Duration | <=2 | 10-50 (*10 ms) | 50 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

- **0**-Disable this function.
- **1**-Enable this function.

✧ **Acceleration Threshold**

The threshold for harsh acceleration.

✧ **Acceleration Duration**

The duration used to confirm a harsh acceleration event. The acceleration of the driving direction is greater than or equal to the 'Acceleration Threshold' and keeps the duration up to this value, a harsh acceleration is detected.

✧ **Deceleration Threshold**

The threshold for harsh deceleration.

- **Deceleration Duration**

  The duration is used to confirm a harsh deceleration event. The deceleration of the driving direction is greater than or equal to the 'Deceleration Threshold' and keeps the duration up to this value, a harsh deceleration is detected.

- **Cornering Threshold**

  The threshold for harsh cornering.

- **Cornering Duration**

  The duration is used to confirm a harsh cornering event. The acceleration for cornering is greater than or equal to the 'Cornering Threshold' and keeps the duration up to this value, a harsh cornering is detected.

### 2.2.3.4 HMC (Hour Meter Count)

The HMC is used to count the accumulated ignition time of the vehicle, which can be understood as the accumulated working time of the vehicle.

➢ **AT@HMC**

**Example:**
*AT@HMC=queclink,,0,,012F$*
*+ACK:HMC,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@HMC?queclink,,0C37$*
*+QRY:HMC,123456789012345,FE01,6,1,1,1,,0,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | HMC | HMC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Initial Hour Meter Count | <=8 | 0-16777215 (minutes) | 0 |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Initial Hour Meter Count**

The initial value for calculating the total hour meter count.

### 2.2.3.5 IDLE (Idling Detection)

This command is used to detect the engine excessive idling (vehicle stays stationary while ignition on). It relates to *54H report*.

➢ **AT@IDLE**

**Example:**
*AT@IDLE=queclink,,1,2,2,1,,012F$*
*+ACK:IDLE,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@IDLE?queclink,,0C37$*
*+QRY:IDLE,123456789012345,FE01,6,1,1,1,,1,2,2,1,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 4 | IDLE | IDLE |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Mode | 1 | 0-1 | 0 |
| | Time to Stationary | <=2 | 1-30 (minutes) | 2 |
| | Time to Movement | 1 | 1-5 (minutes) | 1 |
| | Time to Ignition Off | 1 | 0 or 1-5 (minutes) | 1 |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

- **0**-Disable this function.
- **1**-Enable this function.

✧ **Time to Stationary**

If it is detected that the vehicle is stationary with ignition on for the period of time specified by this parameter, it is considered to be in idling status.

✧ **Time to Movement**

If the vehicle moves again is detected and the status is maintained for the period of time specified by this parameter, the vehicle is considered to exit idling status.

✧ **Time to Ignition Off**

If the vehicle ignition off is detected and the status is maintained for the period of time specified by this parameter, the vehicle is considered to leave idling status. 0 means that as long as the vehicle ignition off is detected, the vehicle is considered to exit idling status.

### 2.2.3.6 ODO (Odometer Settings)

This command is used to set the parameters related to the odometer function.

The terminal will obtain the mileage information of the vehicle to calculate the mileage.

➢ **AT@ODO**

**Example:**
*AT@ODO=queclink,,0,,012F$*
*+ACK:ODO,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@ODO?queclink,,0C37$*
*+QRY:ODO,123456789012345,FE01,6,1,1,1,,0,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | ODO | ODO |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Initial Mileage | <=10 | 0-4294967295 (meters) | 0 |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Initial Mileage**

The initial value for calculating the total mileage.

### 2.2.3.7 OSPD (Overspeed Alarm)

This command is used to set the overspeed detection function. It supports 1 to 4 level thresholds. You can enable only one level or multi-level thresholds. The speed threshold is set to 0, which means that this level of overspeed detection is disabled.

Please follow the order of 1 to 4 to enable multi-level overspeed detection. That is, these 4 speed thresholds should not be used across levels. For example, setting of 'Speed Threshold 1' is 50, 'Speed Threshold 2' is 0, 'Speed Threshold 3' is 90 and 'Speed Threshold 4' is 110" is not allowed, because if the 'Speed Threshold 2' is 0, then 'Speed Threshold 3' and 'Speed Threshold 4' should also be 0, and so on.

In addition, when enabling multi-level overspeed detection, the high-level speed threshold must always be greater than the low-level speed threshold, that is: 'Speed Threshold 1' < 'Speed Threshold 2' < 'Speed Threshold 3' < 'Speed Threshold 4'.

You can obtain overspeed information in real time by enabling the *14H report*, and also can obtain statistical information such as the maximum speed after the overspeed is over by enabling the *15H report*.

➢ **AT@OSPD**

**Example:**
*AT@OSPD=queclink,,50,30,70,30,90,20,110,10,30,012F$*
*+ACK:OSPD,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@OSPD?queclink,,0C37$*
*+QRY:OSPD,123456789012345,FE01,6,1,1,1,,50,30,70,30,90,20,110,10,30,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 4 | OSPD | OSPD |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Speed Threshold 1 | <=3 | 0-400 (km/h) | 50 |
| | Duration 1 | <=4 | 0-3600 (seconds) | 30 |
| | Speed Threshold 2 | <=3 | 0-400 (km/h) | 70 |
| | Duration 2 | <=4 | 0-3600 (seconds) | 30 |
| | Speed Threshold 3 | <=3 | 0-400 (km/h) | 90 |
| | Duration 3 | <=4 | 0-3600 (seconds) | 30 |
| | Speed Threshold 4 | <=3 | 0-400 (km/h) | 110 |
| | Duration 4 | <=4 | 0-3600 (seconds) | 30 |
| | Exit Alarm Validity | <=4 | 0-3600 (seconds) | 30 |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Speed Threshold 1**

The threshold for first level overspeed alarm. If the current speed of vehicle exceeds the value set by 'Speed Threshold 1' and is maintained for a period of time defined by 'Duration 1', the overspeed alarm (Overspeed Alarm 1) will be triggered. If set to

0, it means that this threshold is disabled.

- **Duration 1**

  The duration for first level overspeed alarm.

- **Speed Threshold 2**

  The threshold for second level overspeed alarm. If the current speed of vehicle exceeds the value set by 'Speed Threshold 2' and is maintained for a period of time defined by 'Duration 2', the overspeed alarm (Overspeed Alarm 2) will be triggered. If set to 0, it means that this threshold is disabled.

- **Duration 2**

  The duration for second level overspeed alarm.

- **Speed Threshold 3**

  The threshold for third level overspeed alarm. If the current speed of vehicle exceeds the value set by 'Speed Threshold 3' and is maintained for a period of time defined by 'Duration 3', the overspeed alarm (Overspeed Alarm 3) will be triggered. If set to 0, it means that this threshold is disabled.

- **Duration 3**

  The duration for third level overspeed alarm.

- **Speed Threshold 4**

  The threshold for fourth level overspeed alarm. If the current speed of vehicle exceeds the value set by 'Speed Threshold 4' and is maintained for a period of time defined by 'Duration 4', the overspeed alarm (Overspeed Alarm 4) will be triggered. If set to 0, it means that this threshold is disabled.

- **Duration 4**

  The duration for fourth level overspeed alarm.

- **Exit Alarm Validity**

  When the terminal is in alarm state, if the terminal detects that the speed below all thresholds and the duration reaches this value, the terminal will exit alarm state.

### 2.2.3.8 OWH (Outside Working Hours)

This command is used to define the working hours for the terminal.

Please refer to *Profile 3 (Off Duty)* for more information.

➢ **AT@OWH**

**Example:**
*AT@OWH=queclink,,3E,0900,1200,1300,1800,,,012F$*
*+ACK:OWH,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@OWH?queclink,,0C37$*
*+QRY:OWH,123456789012345,FE01,6,1,1,1,,3E,0900,1200,1300,1800,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | OWH | OWH |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Mode | 1 | 0, 1 | 0 |
| | Day of Work | <=2 | 0-7F | 3E |
| | Working Hours Start 1 | 4 | HHMM | 0900 |
| | Working Hours End 1 | 4 | HHMM | 1200 |
| | Working Hours Start 2 | 4 | HHMM | 1300 |
| | Working Hours End 2 | 4 | HHMM | 1800 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

It specifies the working mode.

- **0**-Disable.
- **1**-Automatic. In this mode, location information will be hidden under the following condition: the device works at outside the working hours.

✧ **Day of Work**

It specifies the working days in a week in a bitwise manner.

- **bit0**-Sunday
- **bit1**-Monday
- **bit2**-Tuesday
- **bit3**-Wednesday
- **bit4**-Thursday
- **bit5**-Friday
- **bit6**-Saturday
- **bit7**-Invalid bit, always set to 0.

For each bit, 0 means "off day", and 1 means "working day".

✧ **Working Hours Start 1**

Specify the start time of the first working period in a day.

✧ **Working Hours End 1**

Specify the end time of the first working period in a day.

For example, 'Working Hours Start 1' is "0900" and 'Working Hours End 1' is "1200", which means the working hours are from 9 to 12 o'clock.

**Note**: The 'Working Hours Start 1' must not be greater than 'Working Hours End 1'. If the 'Working Hours Start 1' is equal to 'Working Hours End 1', that means the whole day (i.e., 24 hours).

✧ **Working Hours Start 2**

Specify the start time of the second working period in a day.

✧ **Working Hours End 2**

Specify the end time of the second working period in a day.

For example, 'Working Hours Start 2' is "1300" and 'Working Hours End 2' is "1800", which means the working hours are from 13 to 18 o'clock.

**Note**: The 'Working Hours Start 2' can be equal to 'Working Hours Start 1', and 'Working Hours End 2' can be equal to 'Working Hours End 1'.

### 2.2.3.9 TOW (Tow Alarm Detection)

This command is used to configure the tow alarm parameters. When the tow alarm event is detected, the terminal will generate and send the *13H report* to the backend server.

The judgment of towing events depends on the motion detection. For the motion detection, please refer to the *AT@GSENSOR* command.

➢ **AT@TOW**

**Example:**
*AT@TOW=queclink,,1,1,10,,,,,012F$*
*+ACK:TOW,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@TOW?queclink,,0C37$*
*+QRY:TOW,123456789012345,FE01,6,1,1,1,,1,1,10,,,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | TOW | TOW |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Mode | 1 | 0-1 | 0 |
| | Fake Tow Delay | <=2 | 0-10 (minutes) | 1 |
| | GNSS Lost to Tow | <=2 | 5-15 (minutes) | 10 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

Enable/disable tow alarm detection.

- **0**-Disable the tow alarm.
- **1**-Enable the tow alarm.

✧ **Fake Tow Delay**

A time parameter to measure whether the terminal is in fake tow state. In the engine off state, if the terminal detects the motion status lasts for 'Fake Tow Delay' minutes, it is considered to be a fake tow state.

✧ **GNSS Lost to Tow**

A time parameter to measure whether the device is considered being towed when GNSS lost during the terminal is in fake tow state.

In fake tow state, the terminal will further confirm whether it is a real tow according to the GNSS positioning information. In this process, if the GNSS lost signal for 'GNSS Lost to Tow' minutes, it is also considered to be a real tow.

### 2.2.4 OBD and CAN Applications

This Section describes the functions and commands related to OBD and CAN communication.

### 2.2.4.1 OBD (OBD Settings)

This command is used to set the parameters related to the OBD (On Board Diagnostics) function.

➢ **AT@OBD**

**Example:**
*AT@OBD=queclink,,,0,45,,,,,012F$*
*+ACK:OBD,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@OBD?queclink,,0C37$*
*+QRY:OBD,123456789012345,FE01,6,1,1,1,,,0,45,,,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | OBD | OBD |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Ignition Detection Mode | 1 | 0, 1, 2 | 0 |
| | Ignition Detection Voltage | <=2 | 30 - 80 (*10 mV) | 45 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Ignition Detection Mode**

It specifies the working mode of ignition detection.

- **0**-Gasoline Vehicle.
- **1**-Hybrid Power Vehicle.
- **2**-Voltage Ripple.

✧ **Ignition Detection Voltage**

This parameter is used for ignition detection.

### 2.2.5 Other Settings

This Section describes other functions and commands besides the known classification.

### 2.2.5.1 AGPS (Assisted GPS)

This command is used to control the AGPS function. Enabling AGPS can obtain location information faster.

➢ **AT@AGPS**

**Example:**
*AT@AGPS=queclink,1,1,,,012F$*
*+ACK:AGPS,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@AGPS?queclink,,0C37$*
*+QRY:AGPS,123456789012345,FE01,6,1,1,1,1,1,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 4 | AGPS | AGPS |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Mode | 1 | 0-1 | 0 |
| | Update Interval | <=2 | 1-10 (*3 days) | 1 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

- **0**-Disable the AGPS function.
- **1**-Enable. The terminal device will periodically download the GPS assistance data according to 'Update Interval' and load them into the GNSS chip.

✧ **Update Interval**

The interval at which the terminal automatically downloads positioning assistance data. The smaller the interval, the more helpful the positioning, but the more wireless data traffic is consumed.

### 2.2.5.2 GML (Google Maps Hyperlink Phone List)

This command is used to configure the mobile phone list for receiving the *Location SMS*. Please note that this phone list is only used to receive Location SMS sent by the terminal and is not equivalent to a phone whitelist. The commands related to this Google Maps hyperlink phone list are *AT@GEO* etc.

➢ **AT@GML**

**Example:**
*AT@GML=queclink,1,+8618888888888|+8612345678,012F$*
*+ACK:GML,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@GML?queclink,,0C37$*
*+QRY:GML,123456789012345,FE01,6,1,1,1,,+8618888888888|+861234567,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | GML | GML |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Action | 1 | 0-2 | |
| | Phone Number List | | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Action**

- **0**-Append the phone numbers carried in the 'Phone Number List' field to the terminal.
- **1**-Replace the phone numbers in the terminal with the phone numbers carried by the 'Phone Number List' field.
- **2**-Clear the phone numbers carried in the 'Phone Number List' field from the terminal. If the phone numbers to be deleted is not specified (that is, the 'Phone Number List' parameter is empty), the terminal will clear all phone numbers.

In particular, it will be 1 when reading this field.

✧ **Phone Number List**

Specify the phone number(s). The terminal supports setting up to 20 phone numbers. The characters "|" are used to connect each phone number. If a phone number is an international number, remember to add "+" and the area code.

For example, "+8618888888888" means one phone number +8618888888888, and "+8618888888888|+8612345678" means two phone numbers, +8618888888888 and +8612345678.

### 2.2.5.3 GMS (Google Maps Hyperlink for SMS)

This command is used to set the function of the terminal sending Location SMS to respond the request SMS, that is, when the terminal receives a "**get position**" SMS, it will respond the Location SMS to the phone.

Please refer to the Section *Location SMS* for more information.

➢ **AT@GMS**

**Example:**
*AT@GMS=queclink,1,0,,,012F$*
*+ACK:GMS,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@GMS?queclink,,0C37$*
*+QRY:GMS,123456789012345,FE01,6,1,1,1,1,0,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | GMS | GMS |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Mode | 1 | 0-1 | 0 |
| | Location Request Number Limit | 1 | 0-1 | 0 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

- **0**-Disable this function.
- **1**-Enable this function.

✧ **Location Request Number Limit**

- **0**-No limit. No matter from which number the short message is received, it will be processed.
- **1**-White list only. Only if the received short message comes from the mobile phone white list (please see *AT@PWL* command), it will be processed.

### 2.2.5.4 PWL (Phone White List)

This command is used to configure the mobile phone whitelist.

Please refer to the related commands (*AT@GMS*) to know how to use this whitelist.

➢ **AT@PWL**

**Example:**
*AT@PWL=queclink,1,+8618888888888|+8612345678,012F$*
*+ACK:PWL,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@PWL?queclink,,0C37$*
*+QRY:PWL,123456789012345,FE01,6,1,1,1,,+861888888888|+8612345678,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | PWL | PWL |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Action | 1 | 0-2 | |
| | Phone Number List | | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Action**

- **0**- Append the phone numbers carried in the 'Phone Number List' field to the terminal.
- **1**-Replace the phone numbers in the terminal with the phone numbers carried by the 'Phone Number List' field.
- **2**-Clear the phone numbers carried in the 'Phone Number List' field from the terminal. If the phone numbers to be deleted is not specified (that is, the 'Phone Number List' parameter is empty), the terminal will clear all phone numbers.

In particular, it will be 1 when reading this field.

✧ **Phone Number List**

Specify the phone number(s). The terminal supports setting up to 20 phone numbers. The characters "|" are used to connect each phone number. If a phone number is an international number, remember to add "+" and the area code.

For example, "+8618888888888" means one phone number +8618888888888, and "+8618888888888|+8612345678" means two phone numbers: +8618888888888 and +8612345678.

### 2.2.5.5 WIFI (Wi-Fi Settings)

This command is used to configure the Wi-Fi function.

**Note**: In the case of ignition on, the terminal will automatically turn on Wi-Fi. In the case of ignition off, if there is no Wi-Fi client, the terminal will turn off the Wi-Fi immediately, otherwise it will turn off the Wi-Fi 10 minutes later.

➢ **AT@WIFI**

**Example:**
*AT@WIFI=queclink,1,,queclink,12345678,4,3,,,,,012F$*
*+ACK:WIFI,123456789012345,FE01,6,1,,012F,20210407101530,1234$*
*AT@WIFI?queclink,,0C37$*
*+QRY:WIFI,123456789012345,FE01,6,1,1,1,1,,queclink,12345678,4,3,,,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 4 | WIFI | WIFI |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Mode | 1 | 0-1 | 0 |
| | Reserved | 0 | | |
| | SSID | <=32 | It must contain only Latin letters, numbers, hyphen and underscore. (A-Z a-z 0-9 - _ ). | |
| | Password | 8-32 | It must contain only Latin letters, numbers, hyphen and underscore. (A-Z a-z 0-9 - _ ) | |
| | Authorization Type | 1 | 1, 3, 4, 5 | 4 |
| | Encryption Mode | 1 | 0, 2, 3, 4 | 3 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

Specify the supported vehicle model.

- **0**-Disable Wi-Fi function.
- **1**-Enable Wi-Fi function. Only when the Wi-Fi function is enabled, other parameters will take effect.

✧ **SSID**

This field is used to set a new SSID string. If it is empty, it means no need to change the SSID.

✧ **Password**

This field is used to set a new password string. At least 8 bytes in length.

✧ **Authorization Type**

A numeral to indicate the authorization type.

- **1**-Open.
- **3**-WPA.
- **4**-WPA2.
- **5**-WPA/WPA2.

✧ **Encryption Mode**

A numeral to indicate the encryption mode.

- **0**-No encryption.
- **2**-TKIP.
- **3**-AES.
- **4**-TKIP-AES.

## 2.3 RTO Command

The real-time operation command (AT@RTO) is used to control the terminal to perform some operations in real time, such as restarting the device, clearing unsent reports, and so on. For those subcommands used to query data (such as subcommand 0, 1, 8, etc.), the total time for the terminal to perform a query operation will not exceed 150 seconds.

For the frame format of the AT@RTO command, please refer to the section *Realtime_Operation_Commands*, the following is the definition of 'Parameters' in the command:

➢ **AT@RTO**

**Example:**
*AT@RTO=queclink,14,,,,,1718$*
*+ACK:RTO,123456789012345,FE01,6,1,14,1718,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | RTO | RTO |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Sub Command | 1 or 2 | 0-99 | |
| | Parameters | | | |
| | Expire UTC Time | 0 or 14 | YYYYMMDDhhmmss | |
| | Commands for Restore | N | CMD1\|CMD2\|CMD3… | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Sub Command**

A numeral to indicate the sub command to be executed.

- **0**-Request the terminal to report the specified information (***22H report***). For this subcommand, the 'Parameters' is used to specify Data IDs that will be queried.
- **1**-Request the terminal to report its current position (*12H report*).
- **3**-Reboot the terminal remotely.
- **8**-Request the terminal to report its basic information (*11H report*).
- **14**-Delete all reports stored in the terminal.
- **32**-Request the terminal to report OBD Real Time Diagnostics information (*33H report*).
- **62**-Request the terminal device to report the Wi-Fi clients' information (*62H report*).
- **90**-Stop connecting to the backend server for a period of time indicated by 'Parameters'. During this time, the terminal's performance is the same as setting 'Connection Mode' in the *AT@BSS* command to 10 (offline mode); and after the time expires, the terminal device will automatically return to its current working status.
- **91**-Immediately expire the time set by the subcommand 90 to stop connecting to the backend server, and make the terminal return to working status. If no

subcommand 90 has been issued before, this command does nothing.

- **92**-Enter emergency mode (*Profile 63*) for a period of time indicated by 'Parameters'. After the time expires, the terminal will automatically return to its current working status.
- **93**-Immediately expire the time set by the subcommand 92 to enter emergency mode, and make the terminal return to previous profile. And even if no subcommand 92 has been issued before, as long as the terminal is working in *Profile 63*, this command will still cause it to return to the previous profile.
- **94**-Restore factory settings, that is, reset all parameters (excluding the primary parameters described in the section *Primary Parameters Configuration*) to the factory defaults.
  **Note**: The terminal will restart after this command is completed.
- **95**-Force restore factory settings, that is, reset all parameters of all commands contained in the 'Commands for Restore' field (can include commands for primary parameters described in section *Primary Parameters Configuration*).
  **Note**: This subcommand may be dangerous. Please ensure the correctness of the command and be responsible for the execution results of the command. This command may cause the terminal device to restart.
- **98**-UTC time calibration. For this subcommand, the 'Parameters' is used to specify a UTC time.
- **99**-Self-Test. Used to trigger terminal self-test, and the terminal will report the self-test result via *E0H report*.

✧ **Parameters**

The parameters of 'Sub Command'. Its length and content are determined by 'Sub Command'. For 'Sub Command' that does not need to carry parameters, the length of this field is 0.

For the following 'Sub Command', the meaning of this field is as follows:

- ***Sub Command 0***

| | |
|---|---|
| Length | 1 or N bytes |
| Format | ID1\|ID2\|ID3… |
| Description | The Data IDs will be queried and contained in the 22H report. It is allowed to specify one or more Data IDs. Separate multiple Data IDs with '\|'.<br>For example, "86" means Data 86 (Surrounding Cells).<br>For example, "88\|89" means Data 88 (SIM Card) and Data 89 (GSV).<br>**Note**: For subcommand 0, the Data ID must be specified (i.e, it cannot be empty), otherwise the command is invalid. |

- ***Sub Command 90***

| | |
|---|---|
| Length | <=3 bytes |
| Range | 1-720 (hours) |
| Description | During this time (in hours), the terminal will stop connecting to the backend server. |

- ***Sub Command 92***

| | |
|---|---|
| Length | <=4 bytes |
| Range | 0 or 3-1440 (minutes) |
| Description | During this time (in minutes), the terminal will work in Profile 63 (Emergency). In particular, this field is 0 or empty to indicate |

that the terminal will not automatically exit the emergency mode until it receives a AT@RTO command with 'Sub Command' being 93.

- ***Sub Command 98***

| | |
|---|---|
| Length | 14 bytes |
| Format | YYYYMMDDhhmmss |
| Description | Specify a UTC time for time calibration. This value is only valid when the terminal cannot obtain the UTC time automatically. For example, "20191120135807" indicates November 20, 2019, 13: 58:07. |

✧ **Expire UTC Time**

The deadline for receiving this command, in UTC time, for example, "20191120135807" indicates November 20, 2019, 13: 58:07.

If this field is not empty, this AT@RTO command will only be valid before the time indicated by this field.

If the terminal receives a AT@RTO command after this time, the command will not be executed and the terminal will reply a NACK frame to the backend server.

✧ **Commands for Restore**

Only valid when 'Sub Command' is 95. It indicates the commands that need to be restored to the factory default.

For example, this field is "APN|DOG|QRC", which indicates that all parameters in the AT@APN, AT@DOG, AT@QRC commands need to be restored.

**Note**: The inclusion of "QRC" in this field means restoring the configuration of all reports supported by the terminal to the factory defaults.

## 2.4 About Report

Broadly speaking, the 'Report' refers to the general name of the message generated by the terminal and reported to the backend server. Messages encoded in ASCII format are '+ACK', '+NACK' and '+QRY', and messages encoded in binary format include '+HBD' and 'Binary Report'.

Since the 'Binary Report' is composed of Record(s) and the included Data ID(s) can be flexibly configured, the number of its parameters is variable. The complete frame format of the report is described in Section *Report.*

The following sections are all related to Binary Repots:

- *Record IDs*
- *Report Configuration*
- *Data IDs*

## 2.5 Record IDs

Please see below for a more detailed description of each record ID.

### 2.5.1 01H (Device Startup)

After the terminal startup, this is always the first message sent to the backend server after it is powered on or reset. And it is a high priority report.

➢ **01H Report**

***For examples (Total 141 bytes):***
*2B 00 00 8D 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 76 5E 36 2F 5A* ***01 00 02 0B 4D 79 49 6F 54 64 65 76 69 63 65 04 0F 4D 50 30 39 39 32 31 44 38 30 30 30 31 33 33 16 02 00 0C 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C 55 0E 06 04 BC 8A 00 10 00 02 10 00 10 0C 13 03 58 12 01 23 45 67 89 01 23 45 01 23 45 67 89 01 23 45 67 89 5A 09 00 00 02 01 00 02 05 01 03 13 04 5F 17 9D A0*** *01 23 8C 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 01H | 01H |
| | Event Code | | 1 | 00H, 01H, 02H | |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

- **00**H-Normal.
- **01**H-Restart periodically. Please refer to the *AT@DOG* command for details.
- **02**H-The terminal receives a *AT@RTO* command with a subcommand **3**.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *01H Settings* of the *AT@QRC* command.

| | |
|---|---|
| *Data 2* | Device Name |
| *Data 4* | Device Serial Number |
| *Data 22* | Report Count |
| *Data 82* | Full Location |
| *Data 85* | Registered Cell |
| *Data 88* | SIM Card |
| *Data 90* | Versions |
| *Data 19* | Triggered Time (means Startup Time). The local time when the terminal is powered on. |

### 2.5.2 03H (Connection Starts)

When the terminal is connected to the backend server, this message is always sent to the backend server first when the device has just connected to the server.

**Note**: When the terminal is connected to the backend server for the first time after power-on or reset, the terminal will send a 'Device Startup' report instead of this 'Connection Starts' report.

➢ **03H Report**

***For examples (Total 76 bytes):***
*2B 00 00 4C 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 35 5E 36 2F 5A* ***03 00 02 0B 4D 79 49 6F 54 64 65 76 69 63 65 51 0F 09 07 3C 46 FF 01 DB 88 57 5F 17 9D A0 01 7D 55 0E 06 04 BC 8A 00 10 00 02 10 00 10 0C 13 03*** *01 23 23 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 03H | 03H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *03H Settings* of the *AT@QRC* command.

| | |
|---|---|
| *Data 2* | Device Name. |
| *Data 81* | Mini Location. |
| *Data 85* | Registered Cell. |

### 2.5.3 11H (Device Basic Information)

When the terminal receives a valid *AT@RTO* command with a subcommand of **8**, it will respond to this message to the backend server.

➢ **11H Report**

***For examples (Total 95 bytes):***
*2B 00 00 5F 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 48 5E 36 2F 5A* ***11 00 02 0B 4D 79 49 6F 54 64 65 76 69 63 65 04 0F 4D 50 30 39 39 32 31 44 38 30 30 30 31 33 33 16 02 00 0C 58 12 01 23 45 67 89 01 23 45 01 23 45 67 89 01 23 45 67 89 5A 09 00 00 02 01 00 02 05 01 03*** *01 23 BD 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 11H | 11H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *11H Settings* of the *AT@QRC* command.

*Data 2* Device Name.
*Data 4* Device Serial Number.
*Data 22* Report Count.

*Data 88* SIM Card.
*Data 90* Versions.

## 2.5.4 12H (Real-time Location)

When the terminal receives a valid *AT@RTO* command with a subcommand of **1**, it will respond to this message to the backend server.

➢ **12H Report**

***For examples (Total 70 bytes):***
*2B 00 00 46 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 2F 5E 36 2F 5A* ***12 00 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C 55 0E 06 04 BC 8A 00 10 00 02 10 00 10 0C 13 03*** *01 23 F7 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 12H | 12H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *12H Settings* of the *AT@QRC* command.

*Data 82* Full Location.
*Data 85* Registered Cell.

## 2.5.5 13H (Tow Information)

This message is used to report tow alarm information. About the tow alarm event detection, please see the *AT@TOW* command.

Sometimes, the vehicle is being shaken instead of being towed, such as the truck is loading or unloading, etc. To avoid misreporting the towing event, the terminal defines the situation as 'Fake Tow' when the vehicle is being shaken and not fully sure that it is being towed.

➢ **13H Report**

***For examples (Total 77 bytes):***
*2B 00 00 4D 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 36 5E 36 2F 5A* ***13 00 60 05 00 00 00 00 00 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C 55 0E 06 04 BC 8A 00 10 00 02 10 00 10 0C 13 03*** *01 23 0C 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 13H | 13H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *13H Settings* of the *AT@QRC* command.

| | |
|---|---|
| *Data 96* | Tow Mileage. |
| *Data 82* | Full Location. |
| *Data 85* | Registered Cell. |

## 2.5.6 14H (Overspeed Alarm)

This message is used to report overspeed alarm information. About the overspeed alarm function, please see the *AT@OSPD* command. For the settings of this message, please refer to the *14H Settings* command.

➢ **14H Report**

***For examples (Total 64 bytes):***
*2B 00 00 40 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 29 5E 36 2F 5A* ***14 00 13 04 5F 17 9D A0 0C 02 01 7D 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C*** *01 23 A4 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 14H | 14H |
| | Event Code | | 1 | 00H, 01H, 02H, 03H,04H | |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

- **00**H-The terminal completely exits overspeed alarm state.
- **01**H-Overspeed Alarm 1.
- **02**H-Overspeed Alarm 2.
- **03**H-Overspeed Alarm 3.
- **04**H-Overspeed Alarm 4.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *14H Settings* of the *AT@QRC* command.

| | |
|---|---|
| *Data 19* | Triggered Time. The time when the event is detected. |
| *Data 12* | Current Speed. |
| *Data 82* | Full Location. |

## 2.5.7 15H (Overspeed Statistics)

This message is used to report overspeed statistics information when the terminal exits the alarm state. About the overspeed alarm function, please see the *AT@OSPD* command. For the settings of this message, please refer to the *15H Settings* command.

➢ **15H Report**

***For examples (Total 53 bytes):***
*2B 00 00 35 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 1E 5E 36 2F 5A* ***15 00 5F 15 09 07 3C 46 FF 01 DB 88 57 5F 17 9D A0 01 7D 00 12 02 58 05 DC*** *01 23 F6 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 15H | 15H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *15H Settings* of the *AT@QRC* command.

*Data 95* Overspeed Information.

## 2.5.8 17H (GEO Information)

When the terminal detects entering or exiting Geo-fence according to the settings of the *AT@GEO* command, it will use this message to report to the backend server.

➢ **17H Report**

***For examples (Total 58 bytes):***
*2B 00 00 3A 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 23 5E 36 2F 5A* ***17 01 5C 02 01 00 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C*** *01 23 66 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 17H | 17H |
| | Event Code | | 1 | 01H, 02H | |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

- **01**H-The terminal enters the Geo-fence area.
- **02**H-The terminal exits the Geo-fence area.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *17H Settings* of the *AT@QRC* command.

*Data 92* GEO Status.
*Data 82* Full Location.

## 2.5.9 18H (Parking-fence Information)

When the terminal is generating or canceling the Parking-fence according to the settings of the *AT@APF* command, it will use this message to report to the backend server.

➢ **18H Report**

***For examples (Total 54 bytes):***
*2B 00 00 36 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 1F 5E 36 2F 5A* ***18 01 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C*** *01 23 1D 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 18H | 18H |
| | Event Code | | 1 | 01H, 02H | |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

- **01**H-The terminal generates the Parking-fence.
- **02**H-The terminal exits the zone and cancels the Parking-fence.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *18H Settings* of the *AT@QRC* command.

*Data 82* Full Location, the current location of the terminal.

## 2.5.10 22H (Real-time Customization)

This message is a real-time custom report. There is no corresponding report setting command for this report. When the terminal receives the *AT@RTO* command with subcommand **0**, it will query the specified data information, and then send a 22H report containing the data information to the backend server.

➢ **22H Report**

***For examples (Total 63 bytes):***
*2B 00 00 3F 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 28 5E 36 2F 5A* ***22 00 02 0B 4D 79 49 6F 54 64 65 76 69 63 65 58 12 01 23 45 67 89 01 23 45 01 23 45 67 89 01 23 45 67 89*** *01 23 2A 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 22H | 22H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report does not contain any data. And the data content of this report is specified in real-time by the 'Parameters' in *AT@RTO* command (with subcommand **0**).

## 2.5.11 23H (External Power Information)

This message is used to report the external power information of terminal.

➢ **23H Report**

| ***For examples (Total 35 bytes):*** *2B 00 00 23 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 0C 5E 36 2F 5A* ***23 00 57 03 01 2E E0*** *01 23 A5 24* | | | | | |
|---|---|---|---|---|---|
| **Segments** | **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 23H | 23H |
| | Event Code | | 1 | 00H, 01H | |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

- **00**H-The external power voltage returns to normal.
- **01**H-The external power voltage is low (please see the *AT@EPS* command).

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *23H Settings* of the *AT@QRC* command.

*Data 87* External Power Voltage.

## 2.5.12 30H (Ignition On)

This message will be sent to the backend server when the vehicle is ignition on.

➢ **30H Report**

***For examples (Total 63 bytes):***
*2B 00 00 3F 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 28 5E 36 2F 5A* ***30 00 13 04 5F 17 9D A0 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C 1B 01 00*** *01 23 D2 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 30H | 30H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *30H Settings* of the *AT@QRC* command.

*Data 19* Triggered Time (Means ignition on time). The time when the vehicle is ignition on.
*Data 82* Full Location.
*Data 27* Ignition Status.

## 2.5.13 31H (Ignition Off)

This message will be sent to the backend server when the vehicle is ignition off.

➢ **31H Report**

***For examples (Total 63 bytes):***
*2B 00 00 3F 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 28 5E 36 2F 5A* ***31 00 13 04 5F 17 9D A0 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C 1B 01 00*** *01 23 CD 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 31H | 31H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *31H Settings* of the *AT@QRC* command.

*Data 19* Triggered Time (Means ignition off time). The time when the vehicle is ignition off.
*Data 82* Full Location.
*Data 27* Ignition Status.

## 2.5.14 32H (OBD Alarm)

This message will be sent to the backend server when the fault status of vehicle changes.

➢ **32H Report**

***For examples (Total 95 bytes):***
*2B 00 00 5F 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 48 5E 36 2F 5A* ***32 00 3C 11 4C 46 50 4D 34 41 43 50 31 42 31 41 30 38 39 35 33 51 0F 09 07 3C 46 FF 01 DB 88 57 5F 17 9D A0 01 7D 1B 01 00 57 03 01 2E E0 6E 13 00 00 03 FF 01 2C 03 84 00 6E 00 00 00 00 00 00 32 3C 4B*** *01 23 0F 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 32H | 32H |
| | Event Code | | 1 | 00H, 01H | |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

- **00**H-The vehicle is completely fault-free now.
- **01**H-The vehicle is malfunctioning now.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *32H Settings* of the *AT@QRC* command.

*Data 60* VIN.
*Data 81* Mini Location.

| | |
|---|---|
| *Data 27* | Ignition Status. |
| *Data 87* | External Power Voltage (Means OBD Power Voltage). The voltage from the vehicle obtained via the OBD interface. |
| *Data 110* | OBD PIDs. |

## 2.5.15 33H (OBD Real-time Diagnostics)

When the terminal receives a valid *AT@RTO* command with a subcommand of **32**, it will respond this message to the backend server.

➢ **33H Report**

***For examples (Total 101 bytes):***
*2B 00 00 65 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 4E 5E 36 2F 5A* ***33 00 3C 11 4C 46 50 4D 34 41 43 50 31 42 31 41 30 38 39 35 33 51 0F 09 07 3C 46 FF 01 DB 88 57 5F 17 9D A0 01 7D 1B 01 00 57 03 01 2E E0 1F 04 00 09 00 B0 6E 13 00 00 03 FF 01 2C 03 84 00 6E 00 00 00 00 00 00 32 3C 4B*** *01 23 12 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 33H | 33H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *33H Settings* of the *AT@QRC* command.

*Data 60* VIN.
*Data 81* Mini Location.
*Data 27* Ignition Status.

| | |
|---|---|
| *Data 87* | External Power Voltage (Means OBD Power Voltage). The voltage from the vehicle obtained via the OBD interface. |
| *Data 31* | Total Mileage. The total mileage of the vehicle. |
| *Data 110* | OBD PIDs. |

## 2.5.16 50H (Fixed Report Information)

This message is used to report the location information of the terminal to the backend server, and it will be generated and sent according to the *50H Settings* command.

**Note**: In particular, when the following happens, this message will stop being sent and the terminal will use another message to report the location to the backend server:

- When the vehicle is towed, the terminal sends *13H report* to the server.

➢ **50H Report**

***For examples (Total 54 bytes):***
*2B 00 00 36 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 1F 5E 36 2F 5A* ***50 00 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C*** *01 23 20 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 50H | 50H |
| | Event Code | | 1 | 00H, 01H, 02H, 03H | |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

- **00**H-Report at a fixed time.
- **01**H-Report at a fixed distance.
- **02**H-Report at a fixed mileage.
- **03**H-Report at a corner.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts:

Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *50H Settings* of the *AT@QRC* command.

*Data 82* Full Location.

## 2.5.17 54H (Idling Information)

This message will be generated and sent to the backend server according to the configuration of the *AT@IDLE* command.

➢ **54H Report**

***For examples (Total 37 bytes):***
*2B 00 00 25 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 0E 5E 36 2F 5A* ***54 00 62 05 01 00 00 00 B4*** *01 23 F3 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 54H | 54H |
| | Event Code | | 1 | 00H, 01H, 02H | |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

- **00**H-The vehicle enters into idling status.
- **01**H-The vehicle leaves idling status.
- **02**H-The vehicle is in idling status.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *54H Settings* of the *AT@QRC* command.

*Data 98* Idling Status.

## 2.5.18 62H (Wi-Fi Clients)

When the terminal device receives a valid *AT@RTO* command with a subcommand of **62**, it will respond to this message to the backend server.

➢ **62H Report**

| ***For examples (Total 33 bytes):*** *2B 00 00 21 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 0A 5E 36 2F 5A* ***62 00 4D 01 02*** *01 23 ED 24* | | | | | |
|---|---|---|---|---|---|
| **Segments** | **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 62H | 62H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *62H Settings* of the *AT@QRC* command.

*Data 77* Wi-Fi Clients Number

## 2.5.19 72H (Harsh Behavior Alarm)

This message is used to report the harsh behavior alarm to backend server. About the harsh behavior alarm detection, please see the *AT@HBM* command.

➢ **72H Report**

***For examples (Total 66 bytes):***
*2B 00 00 42 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 2B 5E 36 2F 5A* ***72 01 80 8C 09 01 02 58 00 00 00 00 00 00 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C*** *01 23 C5 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 72H | 72H |
| | Event Code | | 1 | 01H, 02H, 03H | |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

- **01**H-Harsh acceleration event is detected.
- **02**H-Harsh deceleration event is detected.
- **03**H-Harsh cornering event is detected.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *72H Settings* of the *AT@QRC* command.

*Data 140* Harsh Behavior Information.
*Data 82* Full Location.

## 2.5.20 74H (Crash Alarm)

This message can be sent to the backend server when the crash event is detected. About the crash detection, please see the *AT@CRASH* command.

➢ **74H Report**

***For examples (Total 60 bytes):***
*2B 00 00 3C 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 25 5E 36 2F 5A* ***74 00 80 8E 03 00 06 40 52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C*** *01 23 A7 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 74H | 74H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *74H Settings* of the *AT@QRC* command.

*Data 142* Crash Information.
*Data 82* Full Location.

## 2.5.21 75H (Crash Sensor Data Packet)

This message can be sent to the backend server when the crash event is detected. About the crash detection, please see the *AT@CRASH* command.

**Note**: When the length of the message is too long, it needs to be sent in multiple frames.

➢ **75H Report**

***For examples (Total 341 bytes):***

*2B 00 01 55 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 81 3E 5E 36 2F 5A* ***75 00 80 8F 81 32 00 00 33 FF 01 2C 00 02 00 B7 08 5E 00 04 00 02 00 02 FF F5 00 B9 08 60 00 02 00 00 00 00 FF FD 00 C4 08 65 00 04 00 00 00 00 FF FA 00 B3 08 69 00 03 00 02 00 00 FF F6 00 B3 08 63 00 04 00 03 00 00 00 00 00 C3 08 4E 00 02 00 04 00 00 00 07 00 BE 08 55 00 04 00 02 00 01 00 02 00 BC 08 61 00 05 00 00 00 02 00 03 00 BE 08 60 00 03 FF FE 00 01 FF FE 00 BB 08 60 00 04 00 01 00 00 FF F4 00 BD 08 5B 00 01 FF FF 00 00 FF F3 00 B6 08 5E 00 02 00 00 00 00 FF F2 00 B6 08 56 00 01 00 01 00 00 FF F9 00 C1 08 66 00 01 00 00 00 01 00 00 00 C1 08 5E 00 02 00 03 00 00 FF F9 00 C0 08 5F 00 04 00 01 00 01 00 05 00 C3 08 61 00 00 00 00 00 00 00 06 00 B9 08 60 00 05 00 01 00 00 FF FA 00 BF 08 68 00 02 FF FF FF FF FF F7 00 BA 08 66 00 04 00 01 FF FE FF FF 00 BE 08 5E 00 02 00 00 00 00 FF FC 00 BE 08 66 00 03 00 01 00 02 FF F7 00 B8 08 5E 00 00 00 04 00 03 FF FE 00 C5 08 5E FF FE 00 04 00 02 00 03 00 BE 08 60 FF FF 00 03 00 02*** *01 23 1B 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 75H | 75H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

This report contains only the data IDs listed below:

*Data 143* Crash Sensor Data.

## 2.5.22 76H (Crash GNSS Data Packet)

This message can be sent to the backend server when the crash event is detected. About the crash detection, please see the *AT@CRASH* command.

**Note**: When the length of the message is too long, it needs to be sent in multiple frames.

➢ **76H Report**

***For examples (Total 189 bytes):***

*2B 00 00 BD 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 80 A6 5E 36 2F 5A* ***76 00 80 90 80 9A 00 20 00 0A 09 07 3C 46 FF 01 DB 88 57 5E 36 2F 50 00 06 09 07 3C 46 FF 01 DB 88 58 5E 36 2F 51 00 06 09 07 3C 46 FF 01 DB 88 59 5E 36 2F 52 00 06 09 07 3C 46 FF 01 DB 88 5A 5E 36 2F 53 00 06 09 07 3C 46 FF 01 DB 88 5B 5E 36 2F 54 00 06 09 07 3C 46 FF 01 DB 88 5C 5E 36 2F 55 00 06 09 07 3C 46 FF 01 DB 88 5D 5E 36 2F 56 00 06 09 07 3C 46 FF 01 DB 88 5E 5E 36 2F 57 00 06 09 07 3C 46 FF 01 DB 88 5F 5E 36 2F 58 00 06 09 07 3C 46 FF 01 DB 88 60 5E 36 2F 59 00 06*** *01 23 99 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | 76H | 76H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

This report contains only the data IDs listed below:

*Data 144* Crash GNSS Data.

## 2.5.23 E0H (Self-Test Notification)

The terminal generates and sends the message in the following cases:

(1) When the terminal executes the subcommand **99** of *AT@RTO* command from the backend server, the terminal will send a resulting report to the backend server.

(2) When the subcommand **99** of *AT@RTO* command is initiated by other channels (not backend server), the terminal will respond with a resulting report to the initiator after executing the command, and the terminal will also send the resulting report to the backend server.

(3) If the terminal does not receive the subcommand **99** of the *AT@RTO* command, but the terminal detects an abnormal component, the terminal will send a notification report to the backend server.

➢ **E0H Report**

***For examples (Total 40 bytes):***
*2B 00 00 28 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 11 5E 36 2F 5A* ***E0 00 78 08 5D B3 8C 80 00 00 00 00*** *01 23 B5 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | E0H | E0H |
| | Event Code | | 1 | 00H, 01H | |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**
- **00**H-Normal.
- **01**H-Abnormal.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below, which can be changed by the sub-command *E0H Settings* of the *AT@QRC* command.

*Data 120* Self-Test Status.

## 2.6 Report Configuration

The configuration command of report is used to set parameters associated with report's generation and transmission, such as sending mode, sending interval, and so on. These configuration commands of reports are collectively called "**QRC**" (Queclink Report Configuration) commands. The complete frame format of the QRC command is described in Section *Configuration Command*. Here only contains the definitions of 'Parameters', and the fields in the 'Parameters' are separated by character ",".

The QRC Command is the command used to configure ALL the reports from the device. For each report you will use the same header (QRC) with specific values for each report.

The main QRC structure is like follows:

**Table 19. Frame Format of QRC Command**

| Header | Password | Record ID, Other Parameters… | Sequence Number | Tail |
|---|---|---|---|---|
| AT@QRC= | 8-16 bytes | 2+N bytes | 4 bytes | $ |

**Note**: For a detailed structure of each report please check the individual report Settings.

### 2.6.1 01H Settings (Device Startup)

This command is used to control *01H report*.

➢ **AT@QRC (01H)**

**Example:**
*AT@QRC=queclink,01,,1,,,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,01,012F,20210407101530,1234$*
*AT@QRC?queclink,01,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,01,,1,,2|3|4|22|82|85|88|90|19,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 01 | 01 |
| | Reserved | 0 | | |
| | Mode | <=2 | 0, 1, 11, 12 | 1 |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "01" here.

✧ **Mode**

- **0**-Disable. The terminal no longer generates and sends the *01H report*.
- **1**-Enable Report. The terminal generates and sends the *01H report*. If the location information needs to be included, the terminal directly uses the currently existing location information (even if the location information has expired).
- **11**-Enable Report (Location first). The terminal generates and sends the report, if the location information has expired, wait for real-time positioning before generating. If waiting for the real-time positioning timeout, the last valid position information will be used.
- **12**-Enable Report (Event first). In order to report the event in time, the terminal immediately generates and sends a report. If the location information contained in this sent report has expired, the terminal will wait for real-time positioning, then generate and send one more report (**Note**: To distinguish between the two reports, the highest bit of the event code for the appended report is set to 1, i.e. plus **80H**).

**Note:** For **Mode 11** and **Mode 12**, if the report does not need to carry location information, these two modes are equivalent to **Mode 1**.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data

IDs' field.

- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 01H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.2 03H Settings (Connection Starts)

This command is used to configure the generation and content of *03H report*.

➢ **AT@QRC (03H)**

**Example:**
*AT@QRC=queclink,03,,1,,,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,03,012F,20210407101530,1234$*
*AT@QRC?queclink,03,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,03,,1,,2|3|80|85,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 03 | 03 |
| | Reserved | 0 | | |
| | Mode | <=2 | 0, 1, 11, 12 | 1 |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "03" here.

✧ **Mode**

- **0**-Disable. The terminal no longer generates and sends the *03H report*.
- **1**-Enable Report. The terminal generates and sends the *03H report*. If the location information needs to be included, the terminal directly uses the currently existing location information (even if the location information has expired).
- **11**-Enable Report (Location first). The terminal generates and sends the report, if the location information has expired, wait for real-time positioning before generating. If waiting for the real-time positioning timeout, the last valid position information will be used.
- **12**-Enable Report (Event first). In order to report the event in time, the terminal immediately generates and sends a report. If the location information contained in this sent report has expired, the terminal will wait for real-time positioning, then generate and send one more report (**Note**: To distinguish between the two reports, the highest bit of the event code for the appended report is set to 1, i.e. plus **80H**).

**Note:** For **Mode 11** and **Mode 12**, if the report does not need to carry location information, these two modes are equivalent to **Mode 1**.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.

- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 03H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

### 2.6.3 11H Settings (Device Basic Information)

This command is used to configure the generation and content of *11H report*.

➢ **AT@QRC (11H)**

**Example:**
*AT@QRC=queclink,11,,,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,11,012F,20210407101530,1234$*
*AT@QRC?queclink,11,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,11,,,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 11 | 11 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "11" here.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 11H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.4 12H Settings (Real-time Location)

This command is used to configure the generation and content of *12H report*.

➢ **AT@QRC (12H)**

**Example:**
*AT@QRC=queclink,12,,,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,12,012F,20210407101530,1234$*
*AT@QRC?queclink,12,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,12,,,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 12 | 12 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "12" here.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 12H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.5 13H Settings (Tow Information)

This command is used to configure the generation and content of *13H report*. Please see *AT@TOW* command for more information.

➢ **AT@QRC (13H)**

**Example:**
*AT@QRC=queclink,13,,1,,,10,10,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,13,012F,20210407101530,1234$*
*AT@QRC?queclink,13,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,13,,1,,88,10,10,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 13 | 13 |
| | Reserved | 0 | | |
| | Mode | <=2 | 0, 1, 3, 31 | 1 |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| | Record Count | <=2 | 2-99 | 10 |
| | Time Interval | <=5 | 30-86400 (seconds) | 300 |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "13" here.

✧ **Mode**

- **0**-Disable. The terminal no longer generates and sends the *13H report*.
- **1**-Enable Report. The terminal generates and sends the *13H report*. If the location information needs to be included, the terminal directly uses the currently existing location information (even if the location information has expired).
- **3**-Enable Batch Record. The terminal will generate records according to the time interval indicated by the 'Time Interval' field. And when the number of records reaches the number indicated by the 'Record Count' field, the terminal will pack these records into a *13H report* and send it to the backend server.
- **31**-Enable Batch Record (Location first). The difference between this mode and Mode 3 (Enable Batch Record) is that it waits for real-time positioning information. That is, if the location information has expired, wait for real-time positioning before generating. If waiting for the real-time positioning timeout, the last valid position information will be used.

**Note:** For **Mode 31**, if the record does not need to carry location information, this mode is equivalent to **Mode 3.**

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.

- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 13H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

✧ **Record Count**

When the terminal generates the number of records indicated by this field, it sends them to the backend server in batches. This field is only valid for **Mode 3** and **Mode 31.**

✧ **Time Interval**

The terminal will periodically generate a *13H report* or record according to this interval when the vehicle is being towed.

## 2.6.6 14H Settings (Overspeed Alarm)

This command is used to configure the generation and content of *14H report*. The related function command is *AT@OSPD*.

In the case this message function is enabled ('Mode' is not 0), the corresponding *14H report* will be generated when the terminal detects an enter/exit alarm state event or an alarm level switch event.

➢ **AT@QRC (14H)**

**Example:**
*AT@QRC=queclink,14,,1,1,2|88,0,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,14,012F,20210407101530,1234$*
*AT@QRC?queclink,14,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,14,,1,,2|88,0,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 14 | 14 |
| | Reserved | 0 | | |
| | Mode | <=2 | 0, 1, 11, 12 | 1 |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| | Time Interval | <=4 | 0 or 30-3600 (seconds) | 0 |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "14" here.

✧ **Mode**

- **0**-Disable. The terminal no longer generates and sends the *14H report*.
- **1**-Enable Report. The terminal generates and sends the *14H report*. If the location information needs to be included, the terminal directly uses the currently existing location information (even if the location information has expired).
- **11**-Enable Report (Location first). The terminal generates and sends the report, if the location information has expired, wait for real-time positioning before generating. If waiting for the real-time positioning timeout, the last valid position information will be used.
- **12**-Enable Report (Event first). In order to report the event in time, the terminal immediately generates and sends a report. If the location information contained in this sent report has expired, the terminal will wait for real-time positioning, then generate and send one more report (**Note**: To distinguish between the two reports, the highest bit of the event code for the appended report is set to 1, i.e. plus **80H**).

**Note:** For **Mode 11** and **Mode 12**, if the report does not need to carry location information, these two modes are equivalent to **Mode 1**.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 14H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

✧ **Time Interval**

The terminal will periodically generate a 14H record according to this interval when in overspeed alarm state (no matter what the alarm level is). If set to 0, it means that 14H records do not need to be generated periodically when in the overspeed alarm state.

## 2.6.7 15H Settings (Overspeed Statistics)

This command is used to configure the generation and content of *15H report*. The related function command is *AT@OSPD*.

When this message is enabled ('Mode' is not 0), the corresponding *15H report* will be generated when the terminal completely exits the alarm state.

➢ **AT@QRC (15H)**

**Example:**
*AT@QRC=queclink,15,,1,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,15,012F,20210407101530,1234$*
*AT@QRC?queclink,15,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,15,,1,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 15 | 15 |
| | Reserved | 0 | | |
| | Mode | <=2 | 0, 1 | 1 |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "15" here.

✧ **Mode**

- **0**-Disable. The terminal no longer generates and sends the *15H report*.
- **1**-Enable Report. The terminal generates and sends the *15H report*. If the location information needs to be included, the terminal directly uses the currently existing location information (even if the location information has expired).

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 15H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.8 17H Settings (GEO Information)

This command is used to control *17H report*. Please see *AT@GEO* command for more information.

➢ **AT@QRC (17H)**

**Example:**
*AT@QRC=queclink,17,,,1,2|88,0,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,17,012F,20210407101530,1234$*
*AT@QRC?queclink,17,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,17,,,1,2|88,0,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 17 | 17 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| | Ignore Event When Geo-fence Initialed | 1 | 0-1 | 0 |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "17" here.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 17H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

✧ **Ignore Event When Geo-fence Initialed**

- **0**-Not ignore. An event is detected when the Geo-fence is initialized, the terminal does not ignore this event and will generate a *17H report*
- **1**-Ignore. An event is detected when the Geo-fence is initialized, the terminal ignores this event and will not generate a *17H report*.

In other words, in mode 0 (Not ignore), when the terminal receives the *AT@GEO* command to enable Geo-fence detection, and if the current location meets the

detection condition, the terminal will immediately generate a *17H report*, while mode 1 (Ignore) will not.

## 2.6.9 18H Settings (Parking-fence Information)

This command is used to control *18H report*. Please see *AT@APF* command for more information.

➢ **AT@QRC (18H)**

**Example:**
*AT@QRC=queclink,18,,,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,18,012F,20210407101530,1234$*
*AT@QRC?queclink,18,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,18,,,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 18 | 18 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "18" here.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 18H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.10 23H Settings (External Power Information)

This command is used to configure the generation and content of *23H report*.

➢ **AT@QRC (23H)**

**Example:**
*AT@QRC=queclink,23,,1,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,23,012F,20210407101530,1234$*
*AT@QRC?queclink,23,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,23,,1,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 23 | 23 |
| | Reserved | 0 | | |
| | Mode | <=2 | 0, 1 | 1 |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "23" here.

✧ **Mode**

- **0**-Disable. The terminal no longer generates and sends the *23H report*.
- **1**-Enable Report. The terminal generates and sends the *23H report*. If the location information needs to be included, the terminal directly uses the currently existing location information (even if the location information has expired).

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 23H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.11 30H Settings (Ignition On)

This command is used to control *30H report*.

➢ **AT@QRC (30H)**

**Example:**
*AT@QRC=queclink,30,,1,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,30,012F,20210407101530,1234$*
*AT@QRC?queclink,30,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,30,,1,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 30 | 30 |
| | Reserved | 0 | | |
| | Mode | <=2 | 1, 11, 12 | 1 |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "30" here.

✧ **Mode**

- **1**-Enable Report. The terminal generates and sends the *30H report*. If the location information needs to be included, the terminal directly uses the currently existing location information (even if the location information has expired).
- **11**-Enable Report (Location first). The terminal generates and sends the report, if the location information has expired, wait for real-time positioning before generating. If waiting for the real-time positioning timeout, the last valid position information will be used.
- **12**-Enable Report (Event first). In order to report the event in time, the terminal immediately generates and sends a report. If the location information contained in this sent report has expired, the terminal will wait for real-time positioning, then generate and send one more report (**Note**: To distinguish between the two reports, the highest bit of the event code for the appended report is set to 1, i.e. plus **80H**).

**Note:** For **Mode 11** and **Mode 12**, if the report does not need to carry location information, these two modes are equivalent to **Mode 1**.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 30H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.12 31H Settings (Ignition Off)

This command is used to control *31H report*.

➢ **AT@QRC (31H)**

**Example:**
*AT@QRC=queclink,31,,1,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,31,012,20210407101530,1234F$*
*AT@QRC?queclink,31,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,31,,1,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 31 | 31 |
| | Reserved | 0 | | |
| | Mode | <=2 | 1, 11, 12 | 1 |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "31" here.

✧ **Mode**

- **1**-Enable Report. The terminal generates and sends the *31H report*. If the location information needs to be included, the terminal directly uses the currently existing location information (even if the location information has expired).
- **11**-Enable Report (Location first). The terminal generates and sends the report, if the location information has expired, wait for real-time positioning before generating. If waiting for the real-time positioning timeout, the last valid position information will be used.
- **12**-Enable Report (Event first). In order to report the event in time, the terminal immediately generates and sends a report. If the location information contained in this sent report has expired, the terminal will wait for real-time positioning, then generate and send one more report (**Note**: To distinguish between the two reports, the highest bit of the event code for the appended report is set to 1, i.e. plus **80H**).

**Note:** For **Mode 11** and **Mode 12**, if the report does not need to carry location information, these two modes are equivalent to **Mode 1**.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 31H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.13 32H Settings (OBD Alarm)

This command is used to control *32H report*.

➢ **AT@QRC (32H)**

**Example:**
*AT@QRC=queclink,32,,,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,32,012F,20210407101530,1234$*
*AT@QRC?queclink,32,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,32,,,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 32 | 32 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "32" here.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 32H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.14 33H Settings (OBD Real-time Diagnostics)

This command is used to control *33H report*.

➢ **AT@QRC (33H)**

**Example:**
*AT@QRC=queclink,33,,,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,33,012F,20210407101530,1234$*
*AT@QRC?queclink,33,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,33,,,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 33 | 33 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "33" here.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 33H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.15 50H Settings (Fixed Report Information)

This command is used to control *50H report*.

➢ **AT@QRC (50H)**

**Example:**

*AT@QRC=queclink,50,0,1,1,2|82|88,10,,600,0,0,0,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,50,012F,20210407101530,1234$*
*AT@QRC?queclink,50,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,7,1,50,**0**,1,,2|82|88,10,,600,0,0,0,0C37,20210407101530,1234$*
*+QRY:QRC,123456789012345,FE01,6,1,7,2,50,**1**,1,,82,10,,600,0,0,0,0C37,20210407101530,1235$*
*+QRY:QRC,123456789012345,FE01,6,1,7,3,50,**3**,1,,82,10,,600,0,0,0,0C37,20210407101530,1235$*
*+QRY:QRC,123456789012345,FE01,6,1,7,4,50,**6**,1,,82,10,,600,0,0,0,0C37,20210407101530,1235$*
*+QRY:QRC,123456789012345,FE01,6,1,7,5,50,**7**,1,,82,10,,600,0,0,0,0C37,20210407101530,1235$*
*+QRY:QRC,123456789012345,FE01,6,1,7,6,50,**11**,1,,82,10,,600,0,0,0,0C37,20210407101530,1235$*
*+QRY:QRC,123456789012345,FE01,6,1,7,7,50,**63**,1,,82,10,,600,0,0,0,0C37,20210407101530,1235$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 50 | 50 |
| | Profile ID | | All supported profiles | |
| | Mode | <=2 | 0, 1, 3, 31 | 1 |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| | Record Count | <=2 | 2-99 | 10 |
| | Reserved | 0 | | |
| | Time Interval | <=5 | 0 or 10-86400 (seconds) | 600 |
| | Distance Interval | <=5 | 0 or 100-10000 (meters) | 0 |
| | Mileage Interval | <=5 | 0 or 200-10000 (meters) | 0 |
| | Corner Value | <=3 | 0 or 10-180 (degrees) | 0 |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "50" here.

✧ **Mode**

- **0**-Disable. The terminal no longer generates and sends the *50H report*.
- **1**-Enable Report. The terminal generates and sends the *50H report*. If the location information needs to be included, the terminal will turn on the power supply of the GNSS chip in advance to ensure that the location information is real-time.

- **3**-Enable Batch Record. The terminal will generate records according to the parameters below. And when the number of records reaches the number indicated by the 'Record Count' field, the terminal will send these records to the backend server via *50H report*.
- **31**-Enable Batch Record (Location first). The difference between this mode and Mode 3 (Enable Batch Record) is that it waits for real-time positioning information. That is, if the location information has expired, wait for real-time positioning before generating. If waiting for the real-time positioning timeout, the last valid position information will be used.

**Note:** For **Mode 31**, if the record does not need to carry location information, this mode is equivalent to **Mode 3.**

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 50H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

✧ **Record Count**

When the terminal generates the number of records indicated by this field, it sends them to the backend server in batches. This field is only valid for **Mode 3** and **Mode 31**.

**Note**: When any of the following conditions are met, even if the number of generated record is insufficient, the terminal will still send them to the backend server:

(1) When 'Mode' changes from non-zero (Enable) to zero (Disable).
(2) When the terminal switches to *Profile 63* (Emergency).
(3) When the *Profile 3* (Off Duty) is enabled and the terminal switches from duty hours to off duty hours.

✧ **Time Interval**

The terminal will periodically generate a 50H record according to this interval. And a value of 0 in this field means that no records will be generated at this interval.

✧ **Distance Interval**

'Distance' is the straight distance between two location points. The terminal will generate a 50H record according to this distance interval. And a value of 0 in this field means that no records will be generated at this interval.

✧ **Mileage Interval**

The terminal will generate a 50H record according to this mileage interval when the vehicle is driving. And a value of 0 in this field means that no records will be

generated at this interval.

- **Corner Value**

  If the absolute value of the difference of the azimuth between two positions is greater than or equal to the value of 'Corner Value', the terminal will generate a 50H record. And a value of 0 in this field means that no records will be generated at this corner value.

## 2.6.16 54H Settings (Idling Information)

This command is used to control *54H report*. The related function command is *AT@IDLE*.

➢ **AT@QRC (54H)**

**Example:**
*AT@QRC=queclink,54,,1,,,1,1,60,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,54,012F,20210407101530,1234$*
*AT@QRC?queclink,54,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,54,,1,,54,1,1,60,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 54 | 54 |
| | Reserved | 0 | | |
| | Mode | <=2 | 0, 1, 11, 12 | 1 |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| | Enter Idling Report | 1 | 0-1 | 0 |
| | Leave Idling Report | 1 | 0-1 | 0 |
| | Time Interval | <=4 | 0 or 10-3600 (seconds) | 0 |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "54" here.

✧ **Mode**

- **0**-Disable. The terminal no longer generates and sends the *54H report*.
- **1**-Enable Report. The terminal generates and sends the *54H report*. If the location information needs to be included, the terminal directly uses the currently existing location information (even if the location information has expired).
- **11**-Enable Report (Location first). The terminal generates and sends the report, if the location information has expired, wait for real-time positioning before generating. If waiting for the real-time positioning timeout, the last valid position information will be used.
- **12**-Enable Report (Event first). In order to report the event in time, the terminal immediately generates and sends a report. If the location information contained in this sent report has expired, the terminal will wait for real-time positioning, then generate and send one more report (**Note**: To distinguish between the two reports, the highest bit of the event code for the appended report is set to 1, i.e. plus **80H**).

**Note:** For **Mode 11** and **Mode 12**, if the report does not need to carry location information, these two modes are equivalent to **Mode 1**.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data

IDs' field will be ignored.

- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 54H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

✧ **Enter Idling Report**

Specify whether to generate a 54H record with event code 00H when the vehicle enters into idling status.

- **0**-No need. Record 54H with event code 00H will not be generated.
- **1**-Need. Record 54H with event code 00H will be generated.

✧ **Leave Idling Report**

Specify whether to generate a 54H record with event code 01H when the vehicle leaves idling status.

- **0**-No need. Record 54H with event code 01H will not be generated.
- **1**-Need. Record 54H with event code 01H will be generated.

✧ **Time Interval**

The terminal will periodically generate a 54H record with event code 02H according to this interval when the vehicle is in idling status. And a value of 0 in this field means that no records will be generated at this interval.

## 2.6.17 62H Settings (Wi-Fi Clients)

This command is used to control *62H report*. The related function command is *AT@WIFI*.

➢ **AT@QRC (62H)**

**Example:**
*AT@QRC=queclink,62,,,0,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,62,012F,20210407101530,1234$*
*AT@QRC?queclink,62,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,62,,,,2|77|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 62 | 62 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "62" here.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 62H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.18 72H Settings (Harsh Behavior Alarm)

This command is used to configure the generation and content of *72H report*. The related function command is *AT@HBM*.

➢ **AT@QRC (72H)**

**Example:**
*AT@QRC=queclink,72,,,,,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,72,012F,20210407101530,1234$*
*AT@QRC?queclink,72,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,72,,,,,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 72 | 72 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "72" here.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 72H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.19 74H Settings (Crash Alarm)

This command is used to configure the generation and content of *74H report*.

➢ **AT@QRC (74H)**

**Example:**
*AT@QRC=queclink,74,,,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,74,012F,20210407101530,1234$*
*AT@QRC?queclink,74,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,74,,,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | 74 | 74 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "74" here.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the 74H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.6.20 E0H Settings (Self-Test Notification)

This command is used to configure the generation and content of *E0H report*.

➢ **AT@QRC (E0H)**

**Example:**
*AT@QRC=queclink,E0,,,1,2|88,012F$*
*+ACK:QRC,123456789012345,FE01,6,1,E0,012F,20210407101530,1234$*
*AT@QRC?queclink,E0,0C37$*
*+QRY:QRC,123456789012345,FE01,6,1,1,1,E0,,,,2|88,0C37,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | QRC | QRC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Record ID | 2 | E0 | E0 |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Action | 1 | 0-2 | |
| | Data IDs | N | ID1\|ID2\|ID3… | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Record ID**

Which report to configure. Always "E0" here.

✧ **Action**

- **Empty**-No change the data IDs in the terminal. If this field is empty, the 'Data IDs' field will be ignored.
- **0**-Append the data IDs carried in the 'Data IDs' field to the terminal.
- **1**-Replace the data IDs in the terminal with the data IDs carried by the 'Data IDs' field.
- **2**-Clear the data IDs carried in the 'Data IDs' field from the terminal.

In particular, it will be 1 when reading this field.

✧ **Data IDs**

The data IDs contained in the E0H record. The characters "|" are used to connect each data ID.

For example, "2|88" means Data 2 (Device Name) and Data 88 (SIM Card).

## 2.7 Data IDs

This chapter introduces the data IDs supported by the terminal and their formats. It contains the following sections:

- *Single Data*
- *Combined Data*

### 2.7.1 Single Data

The single data refers to the independent, indivisible information that needs to be sent to the backend server. Note that if the data ID is greater than 127, the hexadecimal format ID in the report occupies two bytes. See below for the single data supported by the terminal.

#### 2.7.1.1 Data 1 (Profile ID)

| ***For examples (Total 3 bytes):***<br>*01 01 00* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 01H | 01H |
| Data Length | | 1 | 00H or 01H | |
| Data Content | Profile ID | 1 | | |

✧ **Profile ID**

Used to indicate the profile the terminal was in when the record or report was generated.

For example, 3FH means the Profile 63. For more information, please see the Chapter *Profiles*.

#### 2.7.1.2 Data 2 (Device Name)

| ***For examples (Total 13 bytes):***<br>*02 0B 4D 79 49 6F 54 64 65 76 69 63 65* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 02H | 02H |
| Data Length | | 1 | 00H or 04H-10H | |
| Data Content | Device Name | 4-16 | | |

✧ **Device Name**

The name of the terminal device. It is defined in the *AT@CFG* command.

For example, "MyIoTdevice" is represented by 4D 79 49 6F 54 64 65 76 69 63 65.

#### 2.7.1.3 Data 4 (Device Serial Number)

| ***For examples (Total 17 bytes):***<br>*04 0F 4D 50 30 39 39 32 31 44 38 30 30 30 31 33 33* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 04H | 04H |
| Data Length | | 1 | 00H or 00H-14H | |
| Data Content | Device Serial Number | 0-20 | | |

✧ **Device Serial Number**

The unique serial number of the terminal device.

For example, "MP09921D8000133" is represented by 4D 50 30 39 39 32 31 44 38 30 30 30 31 33 33.

#### 2.7.1.4 Data 12 (Speed)

| ***For examples (Total 4 bytes):***<br>*0C 02 01 7D* | | | |
|---|---|---|---|
| **Fields** | **Length (Byte)** | **Range/Format** | **Default** |

| | | | | |
|---|---|---|---|---|
| Data ID | | 1 | 0AH | 0CH |
| Data Length | | 1 | 00H or 02H | |
| Data Content | Speed | 2 | 0000H-FFFFH (*0.1 km/h) | |

✧ **Speed**

The speed is obtained from the vehicle. Speed over ground, expressed as a 16-bit unsigned integer and the unit is 0.1 km/h.

For example, 017DH (i.e., 381) means speed 38.1 km/h.

**Note**: This data ID may have different meanings in different reports or records. Please refer to the corresponding record ID for the specific meaning. If there is no clear description, it indicates the speed when the report or record was generated.

### 2.7.1.5 Data 19 (Triggered Time)

***For examples (Total 6 bytes):***
*13 04 5D B3 8C 80*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 13H | 13H |
| Data Length | | 1 | 00H or 04H | |
| Data Content | Triggered Time | 4 | Difference, in seconds, between the current local time and midnight, January 1, 1970. | |

✧ **Triggered Time**

Used to record the time when the event occurred.

For example, 5DD52EFAH (i.e., 1574252282) indicates November 20, 2019, 12:18:02, and 5DB38C80H (i.e., 1572048000) indicates October 26, 2019, 00:00:00.

**Note**: This data ID may have different meanings in different reports or records. Please refer to the corresponding record ID for the specific meaning. If there is no clear description, it indicates when the report or record was generated.

### 2.7.1.6 Data 22 (Report Count)

***For examples (Total 4 bytes):***
*16 02 00 0C*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 16H | 16H |
| Data Length | | 1 | 00H or 02H | |
| Data Content | Report Count | 2 | 0000H-FFFFH | |

✧ **Report Count**

The number of reports stored in the terminal that were not sent to the backend server. Expressed as a 16-bit unsigned integer.

### 2.7.1.7 Data 23 (Motion Status)

***For examples (Total 3 bytes):***

| *17 01 00* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 17H | 17H |
| Data Length | | 1 | 00H or 01H | |
| Data Content | Motion Status | 1 | 00H, 01H, 02H | |

✧ **Motion Status**

The current motion status of the terminal.

- **00**H-The terminal is motionless now.
- **01**H-The terminal is being moved now.
- **02**H-Unknown.

### 2.7.1.8 Data 26 (Tow Status)

| ***For examples (Total 3 bytes):*** *1A 01 00* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 1AH | 1AH |
| Data Length | | 1 | 00H or 01H | |
| Data Content | Tow Status | 1 | 00H, 01H, 02H | |

✧ **Tow Status**

The vehicle's current tow status.

- **00**H-The vehicle is not being towed now.
- **01**H-Fake Tow. The vehicle is ignition off and it is likely to be being towed now.
- **02**H-Tow. The vehicle is being towed now.

### 2.7.1.9 Data 27 (Ignition Status)

| ***For examples (Total 3 bytes):*** *1B 01 00* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 1BH | 1BH |
| Data Length | | 1 | 00H or 01H | |
| Data Content | Ignition Status | 1 | 00H, 01H, 02H | |

✧ **Tow Status**

The vehicle's current ignition status.

- **00**H-The vehicle is ignition off now.
- **01**H-The vehicle is ignition on now.
- **02**H-Unknown. The terminal is checking whether the vehicle is on or off.

### 2.7.1.10 Data 31 (Total Mileage)

| ***For examples (Total 6 bytes):*** *1F 04 00 09 00 B0* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |

| | | | | |
|---|---|---|---|---|
| Data ID | | 1 | 1FH | 1FH |
| Data Length | | 1 | 00H or 04H | |
| Data Content | Total Mileage | 4 | 00000000H-FFFFFFFFH (meters) | |

✧ **Total Mileage**

Total mileage. Expressed as a 32-bit unsigned integer and the unit is meter.

This value can be cleared and re-accumulated when the 'Initial Mileage' field in *AT@ODO* command is reconfigured.

For example, 000900B0H indicates 590000 meters, and 80000012H indicates 2147483666 meters.

### 2.7.1.11 Data 32 (Current Mileage)

***For examples (Total 6 bytes):***
*20 04 00 01 4C 08*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 20H | 20H |
| Data Length | | 1 | 00H or 04H | |
| Data Content | Current Mileage | 4 | 00000000H-FFFFFFFFH (meters) | |

✧ **Current Mileage**

The accumulated mileage of vehicle since latest ignition on. Expressed as a 32-bit unsigned integer and the unit is meter.

### 2.7.1.12 Data 34 (Total Hour Meter Count)

***For examples (Total 6 bytes):***
*22 04 00 04 65 00*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 22H | 22H |
| Data Length | | 1 | 00H or 04H | |
| Data Content | Total Hour Meter Count | 4 | 00000000H-FFFFFFFFH (seconds) | |

✧ **Total Hour Meter Count**

The accumulated ignition time of the vehicle. When the vehicle is of ignition off, the accumulation is suspended, and when the vehicle is of ignition on, the accumulation continues. Expressed as a 32-bit unsigned integer and the unit is second.

This total value is cleared and re-accumulated when the 'Initial Hour Meter Count' field in the *AT@HMC* command is reconfigured.

### 2.7.1.13 Data 35 (Current Hour Meter Count)

***For examples (Total 6 bytes):***
*23 04 00 00 0E 10*

| Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|
| Data ID | 1 | 23H | 23H |

| | | | | |
|---|---|---|---|---|
| Data Length | | 1 | 00H or 04H | |
| Data Content | Current Hour Meter Count | 4 | 00000000H-FFFFFFFFH (seconds) | |

✧ **Current Hour Meter Count**

The accumulated time from latest ignition on till ignition off. Expressed as a 32-bit unsigned integer and the unit is second.

### 2.7.1.14 Data 60 (VIN)

***For examples (Total 19 bytes):***
*3C 11 4C 46 50 4D 34 41 43 50 31 42 31 41 30 38 39 35 33*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 3CH | 3CH |
| Data Length | | 1 | 00H or 11H | |
| Data Content | VIN | 17 | The supported character sets are '0'-'9' and 'A'-'Z' (except 'I', 'O', 'Q'), that is, 30H-39H and 41H-5AH (Except 49H, 4FH, 51H). | |

✧ **VIN**

Vehicle Identification Number. In particular, ALL 00H means that the terminal cannot obtain this data currently.

For example, "LFPM4ACP1B1A08953" is represented by 4C 46 50 4D 34 41 43 50 31 42 31 41 30 38 39 35 33.

### 2.7.1.15 Data 61 (Average Fuel Consumption)

***For examples (Total 4 bytes):***
*3D 02 00 5C*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 3DH | 3DH |
| Data Length | | 1 | 00H or 02H | |
| Data Content | Average Fuel Consumption | 2 | 0000H-FFFFH (*0.1 L/100km) | |

✧ **Average Fuel Consumption**

The average fuel consumption of vehicle since latest ignition on. Expressed as a 16-bit unsigned integer and the unit is 0.1L/100km. In particular, FFFFH means that the terminal cannot obtain this data currently.

For example, 005CH (i.e., 92) means 9.2 L/100km.

### 2.7.1.16 Data 62 (Trip Fuel Consumption)

***For examples (Total 4 bytes):***
*3E 02 00 5C*

| Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|
| Data ID | 1 | 3EH | 3EH |
| Data Length | 1 | 00H or 02H | |

| | | | | |
|---|---|---|---|---|
| Data Content | Trip Fuel Consumption | 2 | 0000H-FFFFH (*0.1 L) | |

✧ **Trip Fuel Consumption**

The fuel consumption of vehicle since latest ignition on. Expressed as a 16-bit unsigned integer and the unit is 0.1L. In particular, FFFFH means that the terminal cannot obtain this data currently.

For example, 005CH (i.e., 92) means 9.2 L.

### 2.7.1.17 Data 65 (Engine Coolant Temperature)

***For examples (Total 4 bytes):***
*41 02 00 5A*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 41H | 41H |
| Data Length | | 1 | 00H or 02H | |
| Data Content | Engine Coolant Temperature | 2 | 0000H-FFFFH (℃) | |

✧ **Engine Coolant Temperature**

The engine coolant temperature. Expressed as a 16-bit signed integer and the unit is degrees Celsius. In particular, FFFFH means that the terminal cannot obtain this data currently.

For example, FFF6H means -10 degrees Celsius, and 005AH means 90 degrees Celsius.

### 2.7.1.18 Data 68 (Absolute Throttle Position)

***For examples (Total 3 bytes):***
*44 01 0F*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 44H | 44H |
| Data Length | | 1 | 00H or 01H | |
| Data Content | Absolute Throttle Position | 1 | 00H-FFH (*1%) | |

✧ **Absolute Throttle Position**

Absolute throttle position (not "relative" or "learned" throttle position). It indicates a percentage value of the throttle position sensor. In particular, FFH means that the terminal cannot obtain this data currently.

For example, 0FH means 15%.

### 2.7.1.19 Data 70 (Engine RPM)

***For examples (Total 4 bytes):***
*46 02 00 7D*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 46H | 46H |
| Data Length | | 1 | 00H or 02H | |
| Data Content | Engine RPM | 2 | 0000H-FFFFH (rpm) | |

✧ **Engine RPM**

Revolutions per minute (RPM) of the engine. Expressed as a 16-bit unsigned integer and the unit is rpm. In particular, FFFFH means that the terminal cannot obtain this data currently.

For example, 007DH means 125 rpm.

### 2.7.1.20 Data 71 (Engine Load)

| ***For examples (Total 3 bytes):*** *47 01 3C* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 47H | 47H |
| Data Length | | 1 | 00H or 01H | |
| Data Content | Engine Load | 1 | 00H-FFH (*1%) | |

✧ **Engine Load**

Calculated load value. Percent of maximum available engine torque. In particular, FFH means that the terminal cannot obtain this data currently.

For example, 3CH means 60%.

### 2.7.1.21 Data 75 (MIL Status)

| ***For examples (Total 3 bytes):*** *4B 01 00* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 4BH | 4BH |
| Data Length | | 1 | 00H or 01H | |
| Data Content | MIL Status | 1 | 00H, 01H, 02H | |

✧ **MIL Status**

Malfunction Indicator Lamp (MIL) Status.

- **00**H-MIL OFF.
- **01**H-MIL ON.
- **02H**-Unknown.

### 2.7.1.22 Data 77 (Wi-Fi Clients Count)

| ***For examples (Total 3 bytes):*** *4D 01 02* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 4DH | 4DH |
| Data Length | | 1 | 00H or 01H | |
| Data Content | Wi-Fi Clients Count | 1 | 00H-FFH | |

✧ **Wi-Fi Clients Count**

Number of clients connected to Wi-Fi. Expressed as an 8-bit unsigned integer. In particular, FFH means that the terminal cannot obtain this data currently.

### 2.7.2 Combined Data

The combined data refers to multiple closely related information, which will always be sent to the backend server at the same time. Note that if the data ID is greater than 127, the hexadecimal format ID in the report occupies two bytes. See below for the combined data supported by the terminal.

### 2.7.2.1 Data 81 (Mini Location)

The mini location information, only provides 6 parts information of fix state, fix mode, longitude, latitude, UTC time and speed.

**Note**: All bytes are 00H, which means that the terminal has never obtained valid location information.

***For examples (Total 17 bytes):***
*51 0F 09 07 3C 46 FF 01 DB 88 57 5F 17 9D A0 01 7D*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 51H | 51H |
| Data Length | | 1 | 00H or 0FH | |
| Data Content | Fix State & Fix Mode | 1 | | |
| | Longitude | 4 | | |
| | Latitude | 4 | | |
| | UTC Time | 4 | | |
| | Speed | 2 | 0000H-FFFFH (*0.1 km/h) | |

✧ **Fix State & Fix Mode**

The upper 4 bits (bit7 to bit4) are reserved, the next 2 bits (bit3 to bit2) represent the fix state, and the lowest 2 bits (bit1 to bit0) represent the fix mode. Details are as follows.

- ***Reserved (Bit7 to Bit4)***
  Reserved bits, set to **0b0000** by default.
- ***Fix State (Bit3 to Bit2)***

  **0b00**-Off. GNSS is not working at the moment. In this case, the 'longitude', 'latitude', 'speed'(if any), 'UTC time'(if any) etc. are the same as the last valid positioning.

  **0b01**-No fix. GNSS worked but could not get the position. In this case, the 'longitude', 'latitude', 'speed'(if any), 'UTC time'(if any) etc. are the same as the last valid positioning.

  **0b10**-Fix. GNSS worked and got the accurate location. The values of all fields are reliable to use.
- ***Fix Mode (Bit1 to Bit0)***

  **0b00**-2D GNSS fix.

  **0b01**-3D GNSS fix.

✧ **Longitude**

The longitude is converted to an integer with 6 implicit decimals and this integer is reported in HEX format; if its value is negative, it is represented in 2's complement format. For the converted longitude, a positive number indicates the east longitude and a negative number indicates the west longitude.

For example, 073C46FFH (i.e., 121390847) means longitude 121.390847 degrees, and F920A8E1H (i.e., -115300127) means longitude -115.300127 degrees.

✧ **Latitude**

The latitude is converted to an integer with 6 implicit decimals and this integer is reported in HEX format; if its value is negative, it is represented in 2's complement format. For the converted latitude, a positive number indicates the north latitude and a negative number indicates the south latitude.

For example, 01DB8857H (i.e., 31164503) means latitude 31.164503 degrees, and FF2DC096H (i.e., -13778794) means latitude -13.778794 degrees.

✧ **UTC Time**

The UTC time obtained from the GNSS chip, difference, in seconds, between the current time and midnight, January 1, 1970.

For example, 5DD52EFAH (i.e., 1574252282) means November 20, 2019, 20:18:02.

✧ **Speed**

The speed is obtained from the GNSS chip. Speed over ground, expressed as a 16-bit unsigned integer and the unit is 0.1 km/h.

For example, 017DH (i.e., 381) means speed 38.1 km/h.

### 2.7.2.2 Data 82 (Full Location)

The full location information, provides following information: fix state, fix mode, longitude, latitude, UTC time, speed, HDOP, azimuth, altitude, satellite count.

**Note**: All bytes are 00H, which means that the terminal has never obtained valid location information.

| ***For examples (Total 24 bytes):*** *52 16 09 F9 20 A8 E1 FF 2D C0 96 5F 17 9D A0 01 7D 0A 00 25 00 01 B3 0C* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 52H | 52H |
| Data Length | | 1 | 00H or 16H | |
| Data Content | Fix State & Fix Mode | 1 | | |
| | Longitude | 4 | | |
| | Latitude | 4 | | |
| | UTC Time | 4 | | |
| | Speed | 2 | 0000H-FFFFH (*0.1 km/h) | |
| | HDOP | 1 | | |
| | Azimuth | 2 | 0000H-0167H (degrees) | |
| | Altitude | 3 | 000000H-FFFFFFH (*0.1 meters) | |
| | Satellite Count | 1 | | |

- **Fix State & Fix Mode**

  Please refer to 'Fix State & Fix Mode' in *Mini Location*.

- **Longitude**

  Please refer to 'Longitude' in *Mini Location*.

- **Latitude**

  Please refer to 'Latitude' in *Mini Location*s.

- **UTC Time**

  Please refer to 'UTC Time' in *Mini Location*.

- **Speed**

  Please refer to 'Speed' in *Mini Location*.

- **HDOP**

  Horizontal Dilution of Precision. It is converted to an integer with 1 implicit decimal and this integer is reported in HEX format.

  For example, 0AH (i.e., 10) means HDOP 1.0, 1CH (i.e., 28) means HDOP 2.8. And FFH (i.e., 255) means HDOP 25.5 or more.

- **Azimuth**

  Azimuth is the angle a line makes with a meridian, measured clockwise from north.

  For example, 0025H (i.e., 37) means azimuth 37 degrees.

- **Altitude**

  The altitude is converted to an integer with 1 implicit decimal and this integer is

reported in HEX format; if its value is negative, it is represented in 2's complement format.

For example, 0001B3H (i.e., 435) means altitude 43.5 meters.

✧ **Satellite Count**

The number of satellites in view.

For example, 0CH means 12 satellites.

### 2.7.2.3 Data 85 (Registered Cell)

The current network registration information.

In particular, ALL 00H means that the terminal cannot obtain these data currently.

| ***For examples (Total 16 bytes):***<br>*55 0E 06 04 BC 8A 00 10 00 02 10 00 10 0C 13 03* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 55H | 55H |
| Data Length | | 1 | 00H or 0EH | |
| Data Content | PLMN | 4 | | |
| | LAC | 2 | 0000H-FFFFH | |
| | Cell ID | 4 | 00000000H-0FFFFFFFH | |
| | Access Technology & Roaming | 1 | | |
| | Band | 1 | | |
| | CSQ RSSI | 1 | 00H-1FH, 63H | |
| | Bit Error Rate | 1 | 00H-07H, 63H | |

✧ **PLMN**

Public Land Mobile Network, composed by MCC (Mobile Country Code) and MNC (Mobile Network Code).

The first byte (the highest byte) represents the length of the PLMN, and the next 3 bytes are the hexadecimal expression of the PLMN converted to an integer.

For example, 0500B3B1H means PLMN "46001", and 0604BC8AH means PLMN "310410".

✧ **LAC**

Location Area Code in hexadecimal format.

✧ **Cell ID**

Cell ID in hexadecimal format.

✧ **Access Technology & Roaming**

The upper 1 bit represents roaming status and the lower 7 bits represent access technology.

- ***Roaming (Bit7)***

  **0b0**-Registered to the home network.
  **0b1**-Registered to a roaming network.

- ***Access Technology (Bit6 to Bit0)***

  **0b0000000**-GSM
  **0b0000001**-UMTS
  **0b0001000**-LTE Cat-4

✧ **Band**

If the value of 'Access Technology' is **GSM** or **UMTS**, the meaning of this field is as follows:

**00**H-800MHz
**01**H-850MHz
**02**H-900MHz
**03**H-1800MHz
**04**H-1900MHz
**05**H-2100MHz

If the value of 'Access Technology' means "LTE X", this field indicates the LTE Band. For example, 05H indicates Band5, 0CH indicates Band12, and 14H indicates Band20.

✧ **CSQ RSSI**

The received signal strength:

**Table 20. CSQ RSSI**

| CSQ RSSI | Signal Strength (dBm) |
|---|---|
| 00H (0) | -113 or less |
| 01H (1) | -111 |
| 02H to 1EH (2 to 30) | -109 to -53 |
| 1FH (31) | -51 or greater |
| 63H (99) | Not known or not detectable |

✧ **Bit Error Rate**

Channel bit error rate (in percent). In particular, 63H (i.e. 99) means "Not known or not detectable".

### 2.7.2.4 Data 87 (External Power Voltage)

The basic information of the external power supply.

| ***For examples (Total 5 bytes):*** *57 03 01 2E E0* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 57H | 57H |
| Data Length | | 1 | 00H or 03H | |
| Data Content | Connection Status | 1 | 00H-01H | |
| | Voltage | 2 | 0000H-FFFFH (mV) | |

✧ **Connection Status**

Whether the external power supply is connected.

- **00**H-Not connected.
- **01**H-Connected.

✧ **Voltage**

The external power supply voltage of the terminal device. Expressed as a 16-bit unsigned integer and the unit is mV. This field is only valid when Connection Status is 01H (Connected).

### 2.7.2.5 Data 88 (SIM Card)

The information of SIM card in the terminal.

| ***For examples (Total 20 bytes):*** *58 12 01 23 45 67 89 01 23 45 01 23 45 67 89 01 23 45 67 89* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 58H | 58H |
| Data Length | | 1 | 00H or 12H | |
| Data Content | IMSI | 8 | | |
| | ICCID | 10 | | |

✧ **IMSI**

International Mobile Subscriber Identity. In particular, ALL 00H means that the terminal cannot obtain these data currently.

For example, 0123456789012345H indicates IMSI "123456789012345".

✧ **ICCID**

Integrated Circuit Card Identity. In particular, ALL 00H means that the terminal cannot obtain these data currently.

For example, 01234567890123456789H indicates ICCID "0123456789012345678 9".

### 2.7.2.6 Data 89 (GSV)

The information of GSV (GNSS Satellites in View).

Each SV occupies 6 bytes, including 'GNSS ID', 'SV ID', 'Signal Strength', 'Elevation' and 'Azimuth'.

***For examples (Total 21 bytes):***
*59 13 03 03 02 24 11 00 37 03 05 30 45 01 02 03 06 28 18 00 9A*

| Fields | | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Data ID | | | 1 | 59H | 59H |
| Data Length | | | 1 or 2 | 00H or 01H-7FH or 8085H-8181H | |
| Data Content | Number | | 1 | 00H-15H or 16H-40H | |
| | The first SV | GNSS ID | 1 | 00H, 02H, 03H, 06H | |
| | | SV ID | 1 | 00H-FFH | |
| | | Signal Strength | 1 | 00H-63H (dBHz) | |
| | | Elevation | 1 | 00H-5AH (degrees) | |
| | | Azimuth | 2 | 00000H-0167H (degrees) | |
| | … | | | | |

✧ **Number**

Indicates how many satellites the following data comes from. If the value of this field is 00H, no other data is included (such as 'GNSS ID', 'SV ID', 'Signal Strength', 'Elevation', 'Azimuth', etc.).

✧ **GNSS ID**

GNSS ID indicates the GNSS type.

- **00**H-GPS.
- **02H**-Galileo.
- **03H**-BeiDou.
- **06H**-GLONASS.

✧ **SV ID**

Satellite Vehicle ID.

✧ **Signal Strength**

Signal strength (C/N0). In particular, FFH means invalid value.

✧ **Elevation**

Elevation. In particular, FFH means invalid value.

✧ **Azimuth**

Azimuth. In particular, FFFFH means invalid value.

### 2.7.2.7 Data 90 (Versions)

Information about the hardware and firmware versions supported by the terminal.

**Note**: In particular, the length of this data ID is uncertain and variable, which is closely related to the 'Version Mask' field, and the mask can also reflect the meaning of "version information supported by the terminal".

***For examples (Total 11 bytes):***
*5A 09 00 00 02 01 00 02 05 01 03*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 5AH | 5AH |
| Data Length | | 1 | 00H or 09H-7FH | |
| Data Content | Version Mask | 1 | 00H-FFH | |
| | Bootloader Version | 3 | RRAAVV | |
| | Firmware Version | 3 | RRAAVV | |
| | Hardware Version | 2 | RRVV | |
| | Modem Firmware Version | N | | |
| | OBD Firmware Version | N | | |

✧ **Version Mask**

The version mask is used to indicate whether this data ID contains the following version fields. A bit value of 1 means that the corresponding version field is included, otherwise it means that the corresponding version field is not included. The version fields corresponding to the bits are as follows:

- **Bit0**-'Modem Firmware Version'.
- **Bit3**-'OBD Firmware Version'.
- **Other bits**-Reserved, set to 0 by default.

✧ **Bootloader Version**

The bootloader version of the terminal's CPU.

For example, 000201H indicates version "R00A02V01".

✧ **Firmware Version**

The firmware (application) version of the terminal's CPU.

For example, 000205H indicates version "R00A02V05".

✧ **Hardware Version**

The hardware version of the terminal.

For example, 0103H indicates version "1.03", and 010AH indicates version "1.10".

✧ **Modem Firmware Version**

The firmware version of cellular network module in the terminal. The first byte indicates its length, and the version starts from the second byte.

For example, "BG96MAR04A04M1G" is represented by 0F 42 47 39 36 4D 41 52 30 34 41 30 34 4D 31 47, total 16 bytes, version occupies 15 bytes.

**Note**: The presence of this field depends on whether bit0 of 'Version Mask' is 1.

✧ **OBD Firmware Version**

The firmware version of the OBD chip in the terminal. The first byte indicates its length, and the version starts from the second byte.

For example, "OU015" is represented by 05 4F 55 30 31 35, total 6 bytes, version occupies 5 bytes.

**Note**: The presence of this field depends on whether bit3 of 'Version Mask' is 1.

### 2.7.2.8 Data 92 (GEO Status)

The status of the Geo-fence ID that triggered the event.

**Note**: If this data is not included in the *17H* report, it will indicate the GEO status of the previously triggered Geo-fence event.

***For examples (Total 4 bytes):***
*5C 02 01 00*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 5CH | 5CH |
| Data Length | | 1 | 00H or 02H | |
| Data Content | GEO ID | 1 | 01H-14H | |
| | GEO Status | 1 | 00H, 01H | |

✧ **GEO ID**

The ID of Geo-fence. Refer to the 'GEO ID' of *AT@GEO* command.

✧ **GEO Status**

The current status of Geo-fence.

- **00H**-The terminal is inside of Geo-fence now.
- **01H**-The terminal is outside of Geo-fence now.

### 2.7.2.9 Data 93 (All GEO Status)

The current status of all enabled Geo-fences.

Each GEO occupies 2 bytes, including GEO ID and GEO Status.

***For examples (Total 5 bytes):***
*5D 03 01 01 00*

| Fields | | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Data ID | | | 1 | 5DH | 5DH |
| Data Length | | | 1 | 00H or 01H-29H | |
| Data Content | Number | | 1 | 00H-14H | |
| | The first GEO | GEO ID | 1 | 01H-14H | |
| | | GEO Status | 1 | 00H, 01H, 02H | |
| | … | | | | |

✧ **Number**

Indicates how many Geo-fences the following data comes from. If the value of this field is 00H, no other fields are included.

✧ **GEO ID**

The ID of Geo-fence. Refer to the 'GEO ID' of *AT@GEO* command.

✧ **GEO Status**

The current status of Geo-fence.

- **00H**-The terminal is inside of Geo-fence now.
- **01H**-The terminal is outside of Geo-fence now.
- **02H**-Unknown. The terminal is scanning the Geo-fencing status now.

### 2.7.2.10 Data 95 (Overspeed Information)

The last overspeed information of vehicle.

All 00H means that no overspeed has occurred since the terminal was started.

Please refer to *AT@OSPD* command for more information.

***For examples (Total 23 bytes):***
*5F 15 09 07 3C 46 FF 01 DB 88 57 5F 17 9D A0 01 7D 00 12 02 58 05 DC*

| Fields | | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Data ID | | | 1 | 5FH | 5FH |
| Data Length | | | 1 | 00H or 15H | |
| Data Content | Location | Fix State & Fix Mode | 1 | | |
| | | Longitude | 4 | | |
| | | Latitude | 4 | | |
| | | UTC Time | 4 | | |
| | | Speed | 2 | | |
| | Overspeed Time | | 2 | 0000H-FFFFH (seconds) | |
| | Overspeed Mileage | | 2 | 0000H-FFFFH (*10 meters) | |
| | Max Speed | | 2 | 0000H-FFFFH (*0.1 km/h) | |

- **Location**

  The location where vehicle started to overspeed.

  The data format is the same as *Data 81 (Mini Location)*.

- **Overspeed Time**

  The accumulated overspeed driving time of vehicle. Expressed as a 16-bit unsigned integer and the unit is seconds.

- **Overspeed Mileage**

  The accumulated overspeed driving mileage of vehicle. Expressed as a 16-bit unsigned integer and the unit is 10 meters.

- **Max Speed**

  The maximum speed of vehicle during overspeed. Expressed as a 16-bit unsigned integer and the unit is 0.1 km/h.

  For example, 017DH (i.e., 381) means speed 38.1 km/h.

### 2.7.2.11 Data 96 (Tow Mileage)

The tow status and tow mileage.

| ***For examples (Total 7 bytes):*** *60 05 00 00 00 00 00* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 60H | 60H |
| Data Length | | 1 | 00H or 05H | |
| Data Content | Tow Status | 1 | 00H, 01H, 02H | |
| | Tow Mileage | 4 | 00000000H-FFFFFFFFH (meters) | |

✧ **Tow Status**

The vehicle's current tow status.

- **00H**-The vehicle is not being towed now.
- **01H**-Fake Tow. The vehicle is ignition off and it is likely to be being towed now.
- **02H**-Tow. The vehicle is being towed now.

✧ **Tow Mileage**

Tow Mileage. The accumulated mileage from the beginning of the vehicle to be towed to the present or stopped. Expressed as a 32-bit unsigned integer and the unit is meter.

If the current Tow Status is 00H (not being towed), it means the most recent total towed mileage.

### 2.7.2.12 Data 98 (Idling Status)

Idling status means that the vehicle is ignition on but not driving.

Please refer to *AT@IDLE* command for more information.

***For examples (Total 7 bytes):***
*62 05 01 00 00 00 B4*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 62H | 62H |
| Data Length | | 1 | 00H or 05H | |
| Data Content | Idling Status | 1 | 00H, 01H, 02H | |
| | Idling Duration | 4 | 00000000H-FFFFFFFFH (seconds) | |

✧ **Idling Status**

The vehicle's current idling status.

- **00H**-The vehicle is not idling.
- **01H**-The vehicle is idling.
- **02H**-Unknown.

✧ **Idling Duration**

Duration of idling status. Expressed as a 32-bit unsigned integer and the unit is second.

Each time the vehicle enters the idling status, it is cleared and then recalculated.

### 2.7.2.13 Data 101 (Upgrade Information)

The upgrade information is used for reporting upgrade status. Please check *F1H report* for more information.

***For examples (Total 9 bytes):***
*65 07 01 00 01 00 00 00 00*

***For examples (Total 9 bytes):***
*65 07 02 00 01 00 00 00 00*

***For examples (Total 9 bytes):***
*65 07 03 00 01 00 00 00 00*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 65H | 65H |
| Data Length | | 1 | 00H or 07H | |
| Data Content | Code | 1 | 01H-08H | |
| | Sub Code | 1 | 00H-FFH | |
| | Update Type | 1 | | |
| | Reserved | 4 | 00000000H | 00000000H |

✧ **Code**

Indicates the status of updating.

- **01H**-Start to download. The terminal successfully connected to the file server and started to download the upgrade file.
- **02H**-Start to update. The terminal has successfully downloaded the upgrade file from the file server and started to perform the update.
- **03H**-Success to update.
- **04H**-Refused. The terminal refuses to execute the upgrade command.
- **05H**-Canceled. The upgrade command was cancelled by the user.
- **06H**-Failed to connect. The terminal cannot connect to the file server.
- **07H**-Failed to download. The terminal cannot download the upgrade file from the file server.
- **08H**-Fail to update.

✧ **Sub Code**

Supplementary notes on the status of updating.

- **00H**-Normal.
- **12H**-The vehicle is ignition on.
- **14H**-Failed to communicate with the module.
- **20H**-No network connection.
- **21H**-Can't connect to the specific URL.
- **30H**-File not found. There is no such file on the server.
- **31H**-File CRC error. The CRC check of the downloaded file failed.
- **32H**-File type error. The file type does not match.
- **33H**-File size error. The file size does not match.
- **34H**-Incompatible version. Update to this version is not allowed.
- **F0H**-Operation is in progress.

- **FFH**-Unknown.

✧ **Update Type**

Indicates the type of firmware being updated, corresponding to the 'Update Type' in the *AT@UPD* command.

### 2.7.2.14 Data 102 (Update Configuration)

The update information is used for reporting configuration update process. Please check *F2H Report* for more information.

***For examples (Total 9 bytes):***
*66 07 01 00 00 00 00 00 00*

***For examples (Total 9 bytes):***
*66 07 02 00 00 00 00 00 00*

***For examples (Total 9 bytes):***
*66 07 03 00 00 00 00 00 00*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 66H | 66H |
| Data Length | | 1 | 00H or 07H | |
| Data Content | Code | 1 | 01H-08H | |
| | Sub Code | 1 | 00H-FFH | |
| | Reserved | 5 | 0000000000H | 0000000000H |

✧ **Code**

Indicates the status of updating.

- **01H**-Start to download. The terminal successfully connected to the file server and started to download the configuration file.
- **02H**-Start to update. The terminal has successfully downloaded the configuration file from the file server and started to perform the update.
- **03H**-Success to update.
- **04H**-Refused. The terminal refuses to execute the configuration update command.
- **06H**-Failed to connect. The terminal cannot connect to the file server.
- **07H**-Failed to download. The terminal cannot download the configuration file from the file server.
- **08H**-Fail to update.

✧ **Sub Code**

Supplementary notes on the status of updating.

- **00H**-Normal.
- **12H**-The vehicle is ignition on.
- **14H**-Failed to communicate with the module.
- **20H**-No network connection.
- **21H**-Can't connect to the specific URL.
- **30H**-File not found. There is no such file on the server.
- **31H**-File CRC error. The CRC check of the downloaded file failed.
- **32H**-File type error. The file type does not match.
- **33H**-File size error. The file size does not match.
- **34H**-Incompatible version. Update to this version is not allowed.
- **F0H**-Operation is in progress.
- **FFH**-Unknown.

### 2.7.2.15 Data 103 (Get Configuration)

This combined data is used for reporting the process of getting configuration. Please check *F3H Report* for more information.

***For examples (Total 9 bytes):***
*67 07 01 00 00 00 00 00 00*

***For examples (Total 75 bytes):***
*67 49 02 00 00 00 00 00 00 68 74 74 70 3A 2F 2F 31 39 32 2E 31 36 38 2E 31 2E 33 30 30 3A 35 39 30 2F 47 56 35 30 31 4C 47 2F 43 6F 6E 66 69 67 2F 47 56 35 30 31 4C 47 5F 32 30 32 30 30 39 30 31 31 30 32 34 31 31 2E 63 66 67*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 67H | 67H |
| Data Length | | 1 or 2 | 00H or 07H-7FH or 8080H-80FFH | |
| Data Content | Code | 1 | 01H-07H | |
| | Sub Code | 1 | 00H-FFH | |
| | Reserved | 5 | 0000000000H | 0000000000H |
| | File URL | N | | |

✧ **Code**

Indicates the status of processing.

- **01H**-Start to upload. The terminal successfully connected to the file server and started to upload the configuration file.
- **02H**-Success to upload. The terminal has successfully uploaded the configuration file.
- **04H**-Refused. The terminal refuses to execute the configuration upload command.
- **06H**-Failed to connect. The terminal cannot connect to the file server.
- **07H**-Failed to upload. The terminal cannot upload the configuration file to the file server.

✧ **Sub Code**

Supplementary notes on the status of processing.

- **00H**-Normal.
- **20H**-No network connection.
- **21H**-Can't connect to the specific URL.
- **F0H**-Operation is in progress.
- **FFH**-Unknown.

✧ **File URL**

It specifies the URL of the uploaded configuration file. The content of this field is to append "/FileName" (file name of uploaded file) after 'Upload Directory' (which in *AT@GTC* command).

**Note**: This field is only be included when the 'Mode' is 2 (which in *AT@GTC* command) and the 'Code' is 02H.

### 2.7.2.16 Data 105 (Parking-fence Status)

This combined data is some status information about Parking-fence.

Please refer to the *AT@APF* command for more information.

| ***For examples (Total 16 bytes):*** *69 0E 01 01 00 00 0B B8 F9 20 A8 E1 FF 2D C0 96* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 1 | 69H | 69H |
| Data Length | | 1 | 00H or 0EH | |
| Data Content | Mode | 1 | 00H, 01H, 02H | |
| | Status | 1 | 00H, 01H, 02H | |
| | Radius | 4 | 00000064H-000186A0H (meters) | |
| | Longitude | 4 | | |
| | Latitude | 4 | | |

✧ **Mode**

Indicates the working mode of Parking-fence function. Corresponds to the 'Mode' parameter of the *AT@APF* command.

- **00H**-Disable.
- **01H**-Enable (Automatically triggered always).
- **02H**-Enable (Automatically triggered once).

✧ **Status**

Indicates the current status of the Parking-fence.

- **00H**-No Parking-fence is generated.
- **01H**-The Parking-fence is generated (the vehicle is inside).
- **02H**-The Parking-fence is canceled (the vehicle is outside).

✧ **Radius**

The radius of the circular Parking-fence region. The value is configured by the 'Radius' parameter of the *AT@APF* command.

Expressed as a 32-bit unsigned integer and the unit is meter.

✧ **Longitude**

Indicates the longitude of the center of the circular Parking-fence region.

Please refer to 'Longitude' in *Mini Location*.

✧ **Latitude**

Indicates the latitude of the center of the circular Parking-fence region.

Please refer to 'Latitude' in *Mini Location*.

### 2.7.2.17 Data 110 (OBD PIDs)

OBD Parameters. Parameter ID defined by SAE J1979.

**Note**: In particular, the length of this data ID is uncertain and variable, which is closely related to the 'PID Mask' field, and the mask can also reflect the meaning of "PIDs supported by the terminal".

***For examples (Total 21 bytes):***
*6E 13 00 00 03 FF 01 2C 03 84 00 6E 00 00 00 00 00 00 32 3C 4B*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 6EH | 6EH |
| Data Length | | 1 | 00H-7FH | |
| Data Content | PID Mask | 4 | 00000000H-FFFFFFFFH | |
| | Engine RPM | 2 | 0000H-3FFFH (rpm) | |
| | Speed | 2 | 0000H-FFFFH (*0.1 km/h) | |
| | Engine Coolant Temperature | 2 | FFD8H-00D7H (℃) | |
| | DTCs Cleared Distance | 2 | 0000H-FFFFH (km) | |
| | MIL Activated Distance | 2 | 0000H-FFFFH (km) | |
| | MIL Status | 1 | 00H, 01H | |
| | Number of DTCs & DTCs | 1+2*N | | |
| | Absolute Throttle Position | 1 | 00H-64H (*1%) | |
| | Engine Load | 1 | 00H-64H (*1%) | |
| | Fuel Level Input | 1 | 00H-64H (*1%) | |

✧ **PID Mask**

The PID mask is used to indicate whether this data ID contains the following data fields. A bit value of 1 means that the corresponding data field is included, otherwise it means that the corresponding data field is not included. The data fields corresponding to the bits are as follows:

- **Bit0**-'Engine RPM'.
- **Bit1**-'Vehicle Speed'.
- **Bit2**-'Engine Coolant Temperature'.
- **Bit3**-'DTCs Cleared Distance'.
- **Bit4**-'MIL Activated Distance'.
- **Bit5**-'MIL Status'.
- **Bit6**-'Number of DTCs & DTCs'.
- **Bit7**-'Absolute Throttle Position'.
- **Bit8**-'Engine Load'.
- **Bit9**-'Fuel Level Input'.
- **Other bits**-Reserved, set to 0 by default.

✧ **Engine RPM**

Revolutions per minute (RPM) of the engine.

Expressed as a 16-bit unsigned integer and the unit is rpm.

✧ **Speed**

Speed over ground, which is vehicle road speed.

Expressed as a 16-bit unsigned integer and the unit is 0.1 km/h.

For example, 017DH (i.e., 381) means speed 38.1 km/h.

- **Engine Coolant Temperature**

  The engine coolant temperature.

  Expressed as a 16-bit signed integer and the unit is degrees Celsius.

  For example, FFF6H means -10 degrees Celsius, and 005AH means 90 degrees Celsius.

- **DTCs Cleared Distance**

  Distance traveled since DTCs are cleared.

  Expressed as a 16-bit unsigned integer and the unit is km.

- **MIL Activated Distance**

  Distance traveled while MIL is activated.

  Expressed as a 16-bit unsigned integer and the unit is km.

- **MIL Status**

  Malfunction Indicator Lamp (MIL) Status.

  - **00H**-MIL OFF.
  - **01H**-MIL ON.

- **Number of DTCs & DTCs**

  The first byte is the number of DTCs, and the other bytes represent DTCs.

  If the first byte is equal to 00H, it means that the vehicle does not have any DTCs, and the length of this field is 1 byte.

  If the first byte is greater than 0, it means that the vehicle is malfunctioned, and the next 2*N bytes are specific diagnostic trouble codes. Each DTC occupies 2 bytes.

  For example, 010008H indicates powertrain system DTC P0008, and 01C019H indicates network communication DTC U0019. For details of DTC, please refer to SAE J2012.

- **Absolute Throttle Position**

  Absolute throttle position (not "relative" or "learned" throttle position). It indicates a percentage value of the throttle position sensor.

- **Engine Load**

  Calculated load value. Percent of maximum available engine torque.

- **Fuel Level Input**

  FLI shall indicate nominal fuel tank liquid fill capacity as a percent of maximum.

### 2.7.2.18 Data 120 (Self-Test Status)

After the terminal performs self-test, the data information will be updated. The terminal will automatically perform a self-test every time it is powered on or restarted. The terminal also performs self-test when the terminal receives the subcommand 99 of *AT@RTO* command.
Please check *E0H report* for more information.

***For examples (Total 10 bytes):***
*78 08 5D B3 8C 80 00 00 00 00*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 1 | 78H | 78H |
| Data Length | | 1 | 00H or 08H | |
| Data Content | Time | 4 | | |
| | Connectivity | 4 | 00000000H-FFFFFFFFH | |

✧ **Time**

Record the moment the data is updated. Difference, in seconds, between the current local time and midnight, January 1, 1970.

For example, 5DD52EFAH (i.e., 1574252282) indicates November 20, 2019, 12:18:02, and 5DB38C80H (i.e., 1572048000) indicates October 26, 2019, 00:00:00.

✧ **Connectivity**

Used to indicate the connectivity of the corresponding component.

Different bits correspond to different components. A bit value of 1 means that the connectivity of the corresponding component is abnormal, otherwise it means that the connectivity of the corresponding component is normal. The components corresponding to the bits are as follows:

- **Bit0**-MCU.
- **Bit1**-Modem.
- **Bit2**-Reading IMEI.
- **Bit3**-SIM/eSIM.
- **Bit4**-GNSS.
- **Bit5**-G-Sensor.
- **Bit6**-External Flash.
- **Bit11**-Reading external power voltage.
- **Bit13**-OBD.
- **Other bits**-Reserved, set to 0 by default.

### 2.7.2.19 Data 140 (Harsh Behavior Information)

Identifies the information for harsh behavior event.

| ***For examples (Total 12 bytes):*** *80 8C 09 01 02 58 00 00 00 00 00 00* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 2 | 808CH | 808CH |
| Data Length | | 1 | 00H or 09H | |
| Data Content | Type | 1 | 00H, 01H, 02H, 03H, FFH | |
| | Maximum Acceleration | 2 | 0000H-FFFFH (mg) | |
| | Reserved | 6 | | All 00H |

✧ **Type**

Indicates which type of harsh behavior event occurred.

- **00H**-Normal.
- **01H**-Harsh acceleration.
- **02H**-Harsh deceleration.
- **03H**-Harsh cornering.
- **FFH**-Unknown.

✧ **Maximum Acceleration**

The maximum acceleration while the harsh behavior event occurred.

Expressed as a 16-bit signed integer and the unit is mg. In particular, 8000H means that the terminal cannot obtain this data currently.

For example, 0123H (i.e., 291) means 291 mg.

### 2.7.2.20 Data 142 (Crash Information)

Identifies the information of crash event.

| ***For examples (Total 6 bytes):*** *80 8E 03 00 06 40* | | | | |
|---|---|---|---|---|
| **Fields** | | **Length (Byte)** | **Range/Format** | **Default** |
| Data ID | | 2 | 808EH | 808EH |
| Data Length | | 1 | 00H or 03H | |
| Data Content | Crash ID | 1 | 00H-FFH | |
| | Peak Acceleration | 2 | 0000H-FFFFH (mg) | |

✧ **Crash ID**

When the terminal detects a crash event, it will automatically assign a crash ID.

The ID is convenient to distinguish multiple adjacent crash events. It rolls from 00H to FFH.

✧ **Peak Acceleration**

The maximum acceleration value when the crash incident occurred.

Expressed as a 16-bit signed integer and the unit is mg.

### 2.7.2.21 Data 143 (Crash Sensor Data)

Packets the acceleration/gyroscope data when the crash event is detected.

**Note**: This data is only used for *75H report*.

***For examples (Total 310 bytes):***

*80 8F 81 32 00 00 33 FF 01 2C 00 02 00 B7 08 5E 00 04 00 02 00 02 FF F5 00 B9 08 60 00 02 00 00 00 00 FF FD 00 C4 08 65 00 04 00 00 00 00 FF FA 00 B3 08 69 00 03 00 02 00 00 FF F6 00 B3 08 63 00 04 00 03 00 00 00 00 00 C3 08 4E 00 02 00 04 00 00 00 07 00 BE 08 55 00 04 00 02 00 01 00 02 00 BC 08 61 00 05 00 00 00 02 00 03 00 BE 08 60 00 03 FF FE 00 01 FF FE 00 BB 08 60 00 04 00 01 00 00 FF F4 00 BD 08 5B 00 01 FF FF 00 00 FF F3 00 B6 08 5E 00 02 00 00 00 00 FF F2 00 B6 08 56 00 01 00 01 00 00 FF F9 00 C1 08 66 00 01 00 00 00 01 00 00 00 C1 08 5E 00 02 00 03 00 00 FF F9 00 C0 08 5F 00 04 00 01 00 01 00 05 00 C3 08 61 00 00 00 00 00 00 00 06 00 B9 08 60 00 05 00 01 00 00 FF FA 00 BF 08 68 00 02 FF FF FF FF FF F7 00 BA 08 66 00 04 00 01 FF FE FF FF 00 BE 08 5E 00 02 00 00 00 00 FF FC 00 BE 08 66 00 03 00 01 00 02 FF F7 00 B8 08 5E 00 00 00 04 00 03 FF FE 00 C5 08 5E FF FE 00 04 00 02 00 03 00 BE 08 60 FF FF 00 03 00 02*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 2 | 808FH | 808FH |
| Data Length | | 1 or 2 | 00H-7FH or 8080H-84B6H | |
| Data Content | Crash ID | 1 | 00H-FFH | |
| | Data Type | 1 | | |
| | Acceleration Parameter | 1 | | |
| | Gyroscope Parameter | 1 | | |
| | Length | 2 | 0000H-04B0H | |
| | Data | N | | |

✧ **Crash ID**

When the terminal detects a crash event, it will automatically assign a crash ID.

The ID is convenient to distinguish multiple adjacent crash events. It rolls from 00H to FFH.

✧ **Data Type**

The highest bit (bit7) represents the type of data recorded, the upper 3 bits (bit 6 to bit 4) are reserved, the next 3 bits (bit3 to bit1) represent the data sampling frequency, and the lowest bit (bit0) indicates the time of the data.

Details are as follows:

- ***Type (Bit7)***

  **0b0**-Acceleration data.
  **0b1**-Acceleration data and gyroscope data.

- ***Reserved (Bit6 to Bit4)***

  Reserved bits, set to **0b000** by default.

- ***Sensor Frequency (Bit3 to Bit1)***

  Indicates the sampling frequency of sensor data.

  **0b000**-100Hz.
  **0b001**-200Hz.

**0b010**-400Hz.
**Others**-Reserved.

- ***Time Point (Bit0)***

  **0b0**-The data is recorded before crash.
  **0b1**- The data is recorded after crash.

✧ **Acceleration Parameter**

The upper 4 bits represent the acceleration range, and the lower 4 bits represent the acceleration resolution. In particular, FFH means the terminal cannot obtain this information.

- ***Range (Bit7 to Bit4)***

  **0b0000**-±2g.
  **0b0001**-±4g.
  **0b0010**-±8g.
  **0b0011**-±16g.
  **Others**-Reserved.

- ***Resolution (Bit3 to Bit0)***

  **0b0000**-0.98 mg/LSB.
  **0b0001**-1.95 mg/LSB.
  **0b0010**-3.91 mg/LSB.
  **0b0011**-7.81 mg/LSB.
  **0b0100**-0.06 mg/LSB.
  **0b0101**-0.12 mg/LSB.
  **0b0110**-0.24 mg/LSB.
  **0b0111**-0.49 mg/LSB.
  **Others**-Reserved.

✧ **Gyroscope Parameter**

The upper 4 bits represent the gyroscope range, and the lower 4 bits represent the gyroscope resolution. In particular, FFH means the terminal cannot obtain this information.

- ***Range (Bit7 to Bit4)***

  **0b0000**-±125°/s.
  **0b0001**-±250°/s.
  **0b0010**-±500°/s.
  **0b0011**-±1000°/s.
  **0b0100**-±2000°/s.
  **Others**-Reserved.

- ***Resolution (Bit3 to Bit0)***

  **0b0000**-3.8 m°/s /LSB.
  **0b0001**-7.6 m°/s /LSB.
  **0b0010**-15.3 m°/s /LSB.
  **0b0011**-30.5 m°/s /LSB.
  **0b0100**-61.0 m°/s /LSB.
  **Others**-Reserved.

✧ **Length**

Indicates the total number of bytes in the 'Data' field.

If the value is 0, the 'Data' field is absent.

✧ **Data**

This field consists of one or more sets of sensor raw data.

If the highest bit of 'Data Type' is 0, then each set of sensor data is 3-axis data, if the highest bit of 'Data Type' is 1, then each set of sensor data is 6-axis data.

For acceleration data, each data is a 16-bit signed integer (2 bytes). The acceleration resolution can be known from the 'Acceleration Parameter'. For example, if the resolution is 0.49 mg/LSB and the 16-bit signed integer is 0123H (i.e. 291), then the corresponding acceleration can be calculated to be 142.59 mg (291*0.49=142.59).

For gyroscope data, each data is a 16-bit signed integer (2 bytes). The gyroscope resolution can be known from the 'Gyroscope Parameter'. For example, if the resolution is 61.0 m°/s /LSB and the 16-bit signed integer is 0123H (i.e. 291), then the corresponding angular rate can be calculated to be 17.751 °/s (291*61=17751).

The definition of a set of 3-axis/6-axis data is as follow:

➢ ***A Set of 3-axis Data***

Length 6 bytes

Description The 6 bytes represent 3-axis (X/Y/Z) acceleration data. The order is as follows:

- ***X-axis Acceleration****: 2 bytes. It is a 16-bit signed integer.*
- ***Y-axis Acceleration****: 2 bytes. It is a 16-bit signed integer.*
- ***Z-axis Acceleration****: 2 bytes. It is a 16-bit signed integer.*

For example, 0123F1003012H means that X-axis acceleration data is 291 (0123H), Y-axis acceleration data is -3840 (F100H) and Z-axis acceleration data is 12306 (3012H).

➢ ***A Set of 6-axis Data***

Length 12 bytes

Description The first 6 bytes represent 3-axis (X/Y/Z) acceleration data, and the last 6 bytes represent 3-axis (X/Y/Z) gyroscope data. The order is as follows:

- ***X-axis Acceleration****: 2 bytes. It is a 16-bit signed integer.*
- ***Y-axis Acceleration****: 2 bytes. It is a 16-bit signed integer.*
- ***Z-axis Acceleration****: 2 bytes. It is a 16-bit signed integer.*
- ***X-axis Gyroscope****: 2 bytes. It is a 16-bit signed integer.*
- ***Y-axis Gyroscope****: 2 bytes. It is a 16-bit signed integer.*
- ***Z-axis Gyroscope****: 2 bytes. It is a 16-bit signed integer.*

For example, 0123F1003012A0010052FF12H means that X-axis acceleration data is 291 (0123H), Y-axis acceleration data is -3840 (F100H) and Z-axis acceleration data is 12306 (3012H), X-axis gyroscope data is -24575 (A001H), Y-axis gyroscope data is 82 (0052H), Z-axis gyroscope data is -238 (FF12H).

### 2.7.2.22 Data 144 (Crash GNSS Data)

Packets the GNSS data when the crash event is detected.

**Note**: This data is only used for *76H report*.

***For examples (Total 158 bytes):***
*80 90 80 9A 00 20 00 0A 09 07 3C 46 FF 01 DB 88 57 5E 36 2F 50 00 06 09 07 3C 46 FF 01 DB 88 58 5E 36 2F 51 00 06 09 07 3C 46 FF 01 DB 88 59 5E 36 2F 52 00 06 09 07 3C 46 FF 01 DB 88 5A 5E 36 2F 53 00 06 09 07 3C 46 FF 01 DB 88 5B 5E 36 2F 54 00 06 09 07 3C 46 FF 01 DB 88 5C 5E 36 2F 55 00 06 09 07 3C 46 FF 01 DB 88 5D 5E 36 2F 56 00 06 09 07 3C 46 FF 01 DB 88 5E 5E 36 2F 57 00 06 09 07 3C 46 FF 01 DB 88 5F 5E 36 2F 58 00 06 09 07 3C 46 FF 01 DB 88 60 5E 36 2F 59 00 06*

| Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Data ID | | 2 | 8090H | 8090H |
| Data Length | | 1 or 2 | 00H-7FH or 8080H-84A8H | |
| Data Content | Crash ID | 1 | 00H-FFH | |
| | Data Type | 1 | | |
| | Samples of 0.2Hz GNSS Data | 1 | 00H-FFH | |
| | Samples of 1Hz GNSS Data | 1 | 00H-FFH | |
| | 0.2Hz GNSS Data | m | | |
| | 1Hz GNSS Data | n | | |

✧ **Crash ID**

When the terminal detects a crash event, it will automatically assign a crash ID.

The ID is convenient to distinguish multiple adjacent crash events. It rolls from 00H to FFH.

✧ **Data Type**

Indicates the unit data type and the time point of recorded data, and so on.

Details are as follows:

- ***Reserved (Bit7)***

  Reserved bit, set to **0b0** by default.

- ***Unit Data (Bit6 to Bit4)***

  **0b010**-Mini Location. Please refer to the *Data 81*.
  **0b011**-Full Location. Please refer to the *Data 82*.
  **Others**-Reserved.

- ***Reserved (Bit3 to Bit1)***

  Reserved bits, set to **0b000** by default.

- ***Time Point (Bit0)***

  **0b0**-The data is recorded before crash.
  **0b1**-The data is recorded after crash.

✧ **Samples of 0.2Hz GNSS Data**

Indicates the total number of unit data contained in the '0.2Hz GNSS Data' field.

If the value is 0, the '0.2Hz GNSS Data' field is absent.

✧ **Samples of 1Hz GNSS Data**

Indicates the total number of unit data contained in the '1Hz GNSS Data' field.

If the value is 0, the '1Hz GNSS Data' field is absent.

✧ **0.2Hz GNSS Data**

GNSS data sampled at 0.2Hz (i.e. a set of unit data every 5 seconds).

This field consists of one or more sets of unit data. The unit data is indicated by 'Data Type'.

✧ **1Hz GNSS Data**

GNSS data sampled at 1Hz (i.e. a set of unit data every 1 second).

This field consists of one or more sets of unit data. The unit data is indicated by 'Data Type'.

The unit data of "0.2Hz GNSS Data" or "1Hz GNSS Data" is defined as follows:

➢ ***Unit Data is 'Mini Location' (0b010)***

Each unit data occupies 15 bytes. Please refer to the *Data 81*.

| Fields | | Length (Byte) |
|---|---|---|
| GNSS Data | Fix State & Fix Mode | 1 |
| | Longitude | 4 |
| | Latitude | 4 |
| | UTC Time | 4 |
| | Speed | 2 |

➢ ***Unit Data is 'Full Location' (0b011)***

Each unit data occupies 22 bytes. Please refer to the *Data 82*.

| Fields | | Length (Byte) |
|---|---|---|
| GNSS Data | Fix State & Fix Mode | 1 |
| | Longitude | 4 |
| | Latitude | 4 |
| | UTC Time | 4 |
| | Speed | 2 |
| | HDOP | 1 |
| | Azimuth | 2 |
| | Altitude | 3 |
| | Satellite Count | 1 |

Chapter 3

# Device Management

This chapter introduces how the backend server can remotely upgrade terminal firmware and configuration file based on HTTP protocol. It contains the following sections:

- *About Updating*
- *Firmware Over the Air Upgrade*
- *Update Configurations*
- *Get Configurations*

## 3.1 About Updating

This chapter focuses on features such as firmware upgrade, configuration update and configuration obtaining. User can complete these services remotely without bringing device to the service center. Thus, the service provider of terminal can conveniently promote new features or carry out debugging for the end users to improve the customer experience.

During the firmware or configuration update, three devices are involved:

- The terminal: GV501LG whose firmware or configuration is to be updated.
- The backend server: the server which remotely controls the terminal and receives report from the terminal.
- The file server: a server that supports the HTTP protocol and is used to store the packages of the update. It can be hosted on the same machine with the backend server.

In addition, this document describes the process of the firmware update and the necessary message exchanged during the update while not covering the information below:

- The time and the method that the backend server initiates the update.
- The deployment method of the update package.
- How to set up a file server.
- The communication between the backend server and the file server.

Please see below for details of the update commands and reports.

## 3.2 Firmware Over The Air Upgrade

This section describes the command and report for remote upgrade, as well as the upgrade process. It contains the following subsections:

- *UPD Command*
- *F1H Report*
- *Update Process*

### 3.2.1 UPD (Upgrade Firmware)

This command is used to update the firmware of terminal via network.

**Note**: Download files over HTTP. After the terminal fails to connect to the server (which specified by 'Download URL'), a gradual delay retry strategy will be adopted.

➢ **AT@UPD**

**Example:**
*AT@UPD=queclink,0,1,,,10,http://218.17.46.11:979/GV501LG/deltabin/GV501LG_R00A01V02.enc,,,,,1234$*
*+ACK:UPD,123456789012345,FE01,6,1,0,1234,20210407101530,1234$*
*+NACK:UPD,123456789012345,FE01,6,1,0,0,1234,20210407101530,1234$*
*AT@UPD=queclink,1,,,,,,,,,0125$*
*+ACK:UPD,123456789012345,FE01,6,1,1,0125,20210407101530,1234$*
*+NACK:UPD,123456789012345,FE01,6,1,1,2,0125,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | UPD | UPD |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Sub Command | 1 | 0-1 | |
| | Update Type | <=2 | 1, 4, 6 | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Download Timeout | <=2 | 10-30 (minutes) | 10 |
| | Download URL | <=150 | A valid HTTP URL. | |
| | Authentication Username | <=6 | It must only contain Latin letters, numbers (A-Z a-z 0-9). | |
| | Authentication Password | <=6 | It must only contain Latin letters, numbers (A-Z a-z 0-9). | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Sub Command**

A numeral to indicate the sub command to be executed.

- **0**-Start the firmware update.
- **1**-Stop the firmware update.

**Note**: If this field is 1, the other fields below can be empty.

✧ **Update Type**

The type of the firmware to be updated.

- **1**-MCU firmware.
- **4**-OBD firmware.

- **6**-Modem firmware.

✧ **Download Timeout**

If downloading is not finished within this time, it will be regarded that the downloading failed.

✧ **Download URL**

It specifies the URL to download the package.

✧ **Authentication Username**

If the server (that corresponding to URL) uses authentication, the username is specified here.

✧ **Authentication Password**

If the server (that corresponding to URL) uses authentication, the password is specified here.

### 3.2.2 F1H (UPD Status)

During the firmware update process, the device reports its status including the update confirmation information, package downloading information and firmware update information to the backend server via this message at different phases.

➢ **F1H Report**

***For examples (Total 39 bytes):***
*2B 00 00 27 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 10 5E 36 2F 5A* ***F1 00 65 07 01 00 01 00 00 00 00*** *01 23 84 24*

***For examples (Total 39 bytes):***
*2B 00 00 27 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 10 5E 36 2F 5A* ***F1 00 65 07 02 00 01 00 00 00 00*** *01 23 6A 24*

***For examples (Total 39 bytes):***
*2B 00 00 27 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 10 5E 36 2F 5A* ***F1 00 65 07 03 00 01 00 00 00 00*** *01 23 DF 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | F1H | F1H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below:

*Data 101* Upgrade Information.

### 3.2.3 Update Process

The firmware update process includes four steps: start the update, check security, download the update package and perform the update.

Here is a flowchart of successful update:

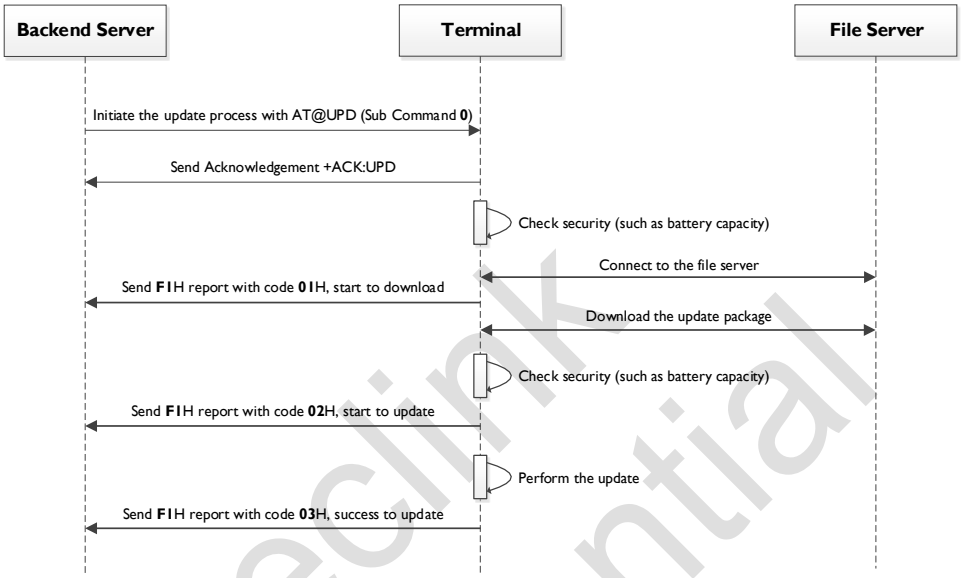


**Figure 4. Flowchart of Successful Update**

Please see below for more detailed information for each update step.

#### 3.2.3.1 Start the Update

The backend server sends the AT@UPD (sub-command 0) command to the terminal to initiate the update process. Along with this command, necessary information is sent to the terminal to start the update process.

Backend server decides when and how to initiate the firmware update process of all the terminals it controls. As the response message receiver and the controller, the backend server has all the information (including the current firmware version of the terminal, the version of the latest available firmware and the location of the proper update packages) it needs to start an update process.

#### 3.2.3.2 Check Security

After receiving the valid AT@UPD (sub-command 0) command, the terminal will first check the security of the system (such as whether the vehicle is driving). If the terminal is not currently in a secure environment, it will send a *F1H report* (code 04H) to inform the backend server that the update process is to be aborted. If the current terminal is in a state that allows the update, the terminal will connect to the file server. If the connection successful, the terminal will send a *F1H report* (code 01H) to the backend server and then start to download the update package.

#### 3.2.3.3 Download the Update Package

If the terminal downloading the update package failed, it will retry until it

succeeds or times out. If the downloading is successful, the terminal will check the downloaded file, after confirming that the file is right, the terminal will send a *F1H report* (code 02H) to the backend server and the update process proceeds to the next step.

Before downloading the package, the user can send the *AT@UPD* (sub-command 1) command to cancel current update process. This is the only chance to abort the upgrading during the update process. Once the terminal starts to download the update package, the update process cannot be cancelled.

#### 3.2.3.4 Perform the Update

After downloading the package successfully, the terminal will check the system security again. If the terminal is not currently in a secure environment, the terminal will send a *F1H report* (code 08H) to inform the backend server that the update process is to be aborted. Otherwise, the terminal will start updating. After the update, whether successful or not, the terminal will reboot automatically. After that, it will send a *F1H report* (if successful, the code is 03H) with update information to the backend server and work as usual.

## 3.3 Update Configurations

This section describes how to use the AT@UPC command to update the entire configuration file of the terminal. The terminal downloads the configuration file through the GET request of HTTP protocol. The configuration file loaded to the terminal can contain all supported configuration commands, or only a few configuration commands that need to be changed.

The process of updating the configuration file is similar to that of upgrading the firmware. Please refer to the Section *Update Process* for more information.

**Note**: The terminal always verifies that all the configuration commands in the configuration file are valid before updating. As long as the configuration file contains an invalid command (unsupported or invalid parameters), the terminal will not perform any updates.

This section contains the following subsections:

- *Configuration File Format*
- *UPC Command*
- *F2H Report*

### 3.3.1 Configuration File Format

The terminal supports configuration files in JSON format.

The configuration file in JSON format includes CRC check and file generation time (UTC time, can be used as a configuration version), and it can only be exported by the **Manage Tool** running on the computer provided by Queclink.

**Note**: When the device generates the configuration file, the password will be masked for security reasons.

The configuration file in JSON format looks like this:

```
{
    "ConfigGenerationTime": "20210601101030",
    "CustomVersion": 0,
    "ConfigurationCommands": {
        "ACK": "AT@ACK=*,,,0,0,,FFFF$",
        "AGPS": "AT@AGPS=*,1,1,,,FFFF$",
        "APN": "AT@APN=*,,cmnet,,,0,,FFFF$",
        "CFG": "AT@CFG=*,,MyDevice,,,,FFFF$",
        "NET": "AT@NET=*,,0,0,,,1,,FFFF$",
        "PROFILE": [
            "AT@PROFILE=*,0,1,,,,FFFF$",
            "AT@PROFILE=*,1,2,,,,FFFF$",
            "AT@PROFILE=*,63,1,,,,FFFF$"
        ],
        "TMA": "AT@TMA=*,,+32,0,,time.windows.com,123,FFFF$",
        "QRC": {
            "01H": "AT@QRC=*,01,,1,,,FFFF$",
            "03H": "AT@QRC=*,03,,1,,,FFFF$",
            "50H": [
                "AT@QRC=*,50,0,1,0,,,,600,,,,FFFF$",
                "AT@QRC=*,50,1,1,,,10,0,600,0,0,0,FFFF$",
                "AT@QRC=*,50,63,1,,,10,0,600,0,0,0,FFFF$"
            ],
            "E0H": "AT@QRC=*,E0,,,1,2|88,FFFF$"
        }
    },
    "CRC": "5EEB"
}
```

### 3.3.2 UPC (Update Configurations)

This command is used to start updating the configuration file of the terminal.

➢ **AT@UPC**

**Example:**
*AT@UPC=queclink,,10,http://218.17.46.11:979/GV501LG/deltabin/GV501LG_Config_V01.txt,,,,,,,1234$*
*+ACK:UPC,123456789012345,FE01,6,1,,1234,20210407101530,1234$*
*+NACK:UPC,123456789012345,FE01,6,1,,0,1234,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | UPC | UPC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Reserved | 0 | | |
| | Download Timeout | <=2 | 10-30 (minutes) | 10 |
| | Download URL | <=150 | A valid HTTP URL | |
| | Authentication Username | <=6 | It must only contain Latin letters, numbers (A-Z a-z 0-9). | |
| | Authentication Password | <=6 | It must only contain Latin letters, numbers (A-Z a-z 0-9). | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Download Timeout**

If downloading is not finished within this time, it will be regarded that the downloading failed.

✧ **Download URL**

It specifies the URL to download the package.

✧ **Authentication Username**

If the server (that corresponding to URL) uses authentication, the username is specified here.

✧ **Authentication Password**

If the server (that corresponding to URL) uses authentication, the password is specified here.

### 3.3.3 F2H (UPC Status)

During the process of updating configuration, the device reports its status including the update confirmation information, package downloading information and configuration update information to the backend server via this message at different phases.

➢ **F2H Report**

***For examples (Total 39 bytes):***
*2B 00 00 27 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 10 5E 36 2F 5A* ***F2 00 66 07 01 00 00 00 00 00 00*** *01 23 02 24*

***For examples (Total 39 bytes):***
*2B 00 00 27 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 10 5E 36 2F 5A* ***F2 00 66 07 02 00 00 00 00 00 00*** *01 23 EC 24*

***For examples (Total 39 bytes):***
*2B 00 00 27 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 10 5E 36 2F 5A* ***F2 00 66 07 03 00 00 00 00 00 00*** *01 23 59 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | F2H | F2H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.

By default, this report contains only the data IDs listed below:

*Data 102* Update Configuration.

## 3.4 Get Configurations

This section describes how to use the AT@GTC command to obtain the entire configuration file of the terminal.

The terminal has three ways to output the configuration file: print the configuration file through the serial port, send the query response messages to backend server, upload the configuration file through the POST request of HTTP protocol.

The process of uploading the configuration file is similar to that of upgrading the firmware. Please refer to the Section *Update Process* for more information.

This section contains the following subsections:

- *GTC Command*
- *F3H Report*

### 3.4.1 GTC (Get Configurations)

This command is used to get all configurations of the terminal.

There are two sets of configurations in the terminal device, the factory configurations and the current configurations:

- When production, the factory configurations will be written to the terminal as the default current configurations.
- The current configurations used by the device, and parameters can be modified by configuration commands.
- When the terminal receives a subcommand **94** or **95** of the *AT@RTO* command, the relevant parameters of the current configurations will be changed to the same as the factory configurations.

➢ **AT@GTC**

**Example:**
*AT@GTC=queclink,2,,3,http://218.17.46.11:964/GV501LG/Config,,,,,1234$*
*+ACK:GTC,123456789012345,FE01,6,1,,1234,20210407101530,1234$*
*+NACK:GTC,123456789012345,FE01,6,1,,0,1234,20210407101530,1234$*

| Parts | Fields | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|
| Head Part | Header | 3 | AT@ | AT@ |
| | Command Word | 3 | GTC | GTC |
| | Leading Symbol | 1 | = | = |
| | Password | 8-16 | | |
| Parameters | Mode | 1 | 0-2 | |
| | Type | 0 or 1 | | |
| | Upload Timeout | <=2 | 3-10 (minutes) | 3 |
| | Upload Directory | <=150 | A valid HTTP URL. | |
| | Authentication Username | <=6 | It must only contain Latin letters, numbers (A-Z a-z 0-9). | |
| | Authentication Password | <=6 | It must only contain Latin letters, numbers (A-Z a-z 0-9). | |
| | Reserved | 0 | | |
| | Reserved | 0 | | |
| Tail Part | Sequence Number | 4 | 0000-FFFF | |
| | Tail | 1 | $ | $ |

✧ **Mode**

A numeral to specify how to get the configurations.

- **0**-Print out file. Print the configuration file directly from the serial port.
- **1**-Send query responses. Send all query responses to backend server.
- **2**-Upload file. Upload the file to the directory which is specified by 'Upload Directory' via HTTP POST.

✧ **Type**

It specifies which set of configurations will be obtained.

- **Empty**-Current configurations.
- **1**-Factory configurations.

- **Upload Timeout**

  If uploading is not finished within this time, it will be regarded that the uploading failed.

  **Note**: This parameter is only valid for Mode 2.

- **Upload Directory**

  It specifies the directory to upload the configuration file.

  **Note**: This parameter is only valid for Mode 2. For Mode 2, this field must be filled with a valid directory, and it is not allowed to be empty.

- **Authentication Username**

  If the server (which is specified by 'Upload Directory') uses authentication, the username is specified here.

  **Note:** This parameter is only valid for Mode 2.

- **Authentication Password**

  If the server (which is specified by 'Upload Directory') uses authentication, the password is specified here.

  **Note:** This parameter is only valid for Mode 2.

## 3.4.2 F3H (GTC Status)

During performing the process of getting configuration, the *F3H Report* will be sent to backend server to inform the performing status.

➢ **F3H Report**

***For examples (Total 39 bytes):***
*2B 00 00 27 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 10 5E 36 2F 5A* ***F3 00 67 07 01 00 00 00 00 00 00*** *01 23 C8 24*

***For examples (Total 105 bytes):***
*2B 00 00 69 00 01 23 45 67 89 01 23 45 80 01 00 06 01 00 52 5E 36 2F 5A* ***F3 00 67 49 02 00 00 00 00 00 00 68 74 74 70 3A 2F 2F 31 39 32 2E 31 36 38 2E 31 2E 33 30 30 3A 35 39 30 2F 47 56 35 30 31 4C 47 2F 43 6F 6E 66 69 67 2F 47 56 35 30 31 4C 47 5F 32 30 32 30 30 39 30 31 31 30 32 34 31 31 2E 63 66 67*** *01 23 C7 24*

| Segments | Fields | | Length (Byte) | Range/Format | Default |
|---|---|---|---|---|---|
| Fixed Header | Header | | 1 | 2BH or 2DH | 2BH |
| | 00H | | 1 | 00H | 00H |
| | Frame Length | | 2 | | |
| | Multi-packet Flag & Reserved | | 1 | 00H or 80H | |
| | Frame Count & Frame Number | | 0 or 2 | | |
| | IMEI | | 8 | | |
| | Device Type | | 2 | | |
| | Protocol Version | | 2 | 0001H-FFFFH | |
| | Custom Version | | 1 | 00H-FFH | 00H |
| Reserved Field | Reserved Field Length | | 1 | 00H-FFH | 00H |
| | Reserved Field Data | | N | | |
| Records | Record Length | | 1 or 2 | 00H-7FH or 8080H-FFFFH | |
| | Generated Time | | 4 | | |
| | Record ID | | 1 | F3H | F3H |
| | Event Code | | 1 | 00H | 00H |
| | Data of Record | Data ID | 1 or 2 | | |
| | | Data Length | 1 or 2 | | |
| | | Data Content | N | | |
| | | … | | | |
| | … | | | | |
| Tail | Count Number | | 2 | 0000H-FFFFH | |
| | Check Byte | | 1 | 00H-FFH | |
| | Tail | | 1 | $ | $ |

✧ **Event Code**

Always **00**H.

✧ **Data of Record**

It consists of one or more Data ID units, and each Data ID unit contains three parts: Data ID, Data Length, and Data Content.
By default, this report contains only the data IDs listed below:
*Data 103* Get Configuration.

# Appendix (Strategy)

In order to help users to understand more about the behavior of the terminal, this chapter introduces some strategies implemented by the terminal. In addition, it also introduces some other information that may be necessary to know. It contains the following sections:

- *GNSS On/Off Control*
- *SACK/SHBD Mechanism*
- *An Example of Report Frame*

# GNSS On/Off Control

The terminal will automatically control the on and off of the power supply of the GNSS chip according to the parameters of the configuration commands related to the location information and the working status detected by the terminal.

When the terminal detects the ignition of the vehicle, in order to obtain the location information of the vehicle in time, the terminal will turn on the power supply of the GNSS chip and not turn it off; When the terminal detects that the vehicle is ignition off, the terminal will only turn on the power supply of the GNSS chip when necessary, otherwise it will always be turned off to save power. "when necessary" means when the terminal needs to obtain current location information according to the configuration parameters.

In order to reduce power consumption, it is recommended that users no longer obtain location information or lengthen the period of obtaining location information after the vehicle is ignition off. This can be achieved by changing the parameters of Profile 7 (Ignition Off).

# SACK/SHBD Mechanism

If the SACK function is enabled, the terminal will perform a special mechanism:

(1) Terminal will wait for the backend server to respond SACK message after sending a report (binary long report). The maximum timeout for each waiting is 60 seconds.

(2) Once the terminal receives the correct SACK response message, it means that this report has been successfully received by the backend server. The terminal will end the sending process of this report.

(3) If the terminal does not receive the correct SACK message within the waiting time from the backend server, the terminal will try to resend the report. After resending 2 times (i.e., sent a total of 3 times), it still does not receive a correct SACK, it will reconnect to the backend server.

The flowchart is shown below:

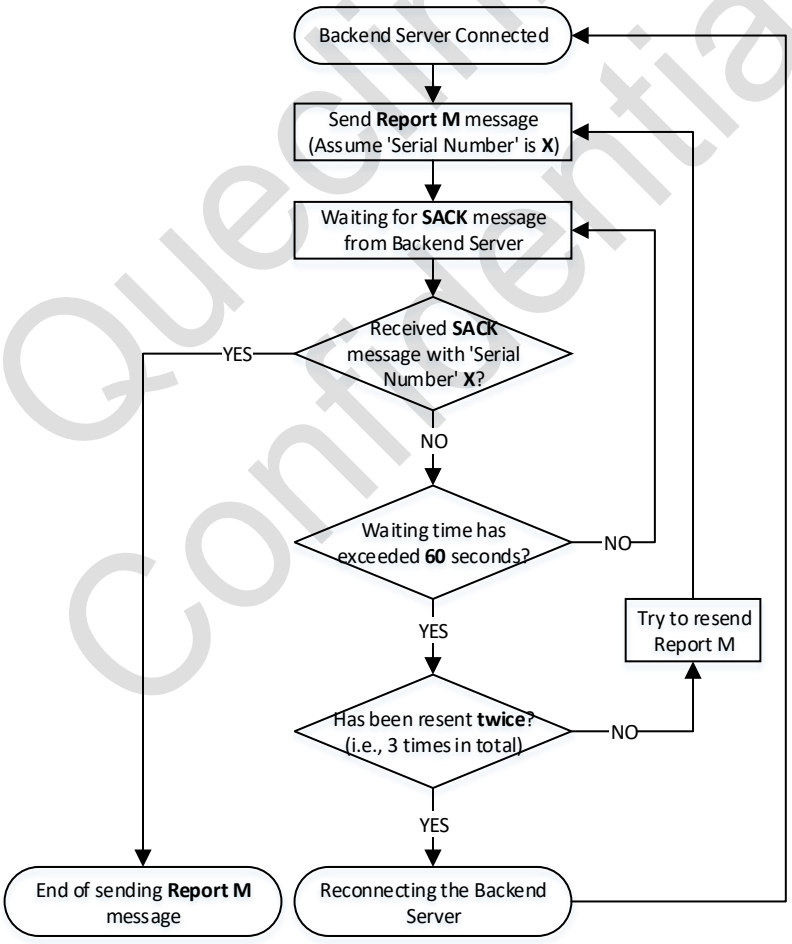


**Figure 5. Flowchart of SACK Mechanism**

If the SHBD function is enabled, the terminal will perform a special mechanism (similar to SACK mechanism):

(1) Terminal will wait for the backend server to respond SHBD message after sending HBD message. The maximum timeout for each waiting is 60 seconds.

(2) Once the terminal receives the correct SHBD response message, it means that this heartbeat interaction is successful.

(3) If the terminal does not receive the correct SHBD message within the waiting time from the backend server, the terminal will try to resend the HBD message. After resending 2 times (i.e., sent a total of 3 times), it still does not receive a correct SHBD, it will reconnect to the backend server.

The flowchart is shown below:

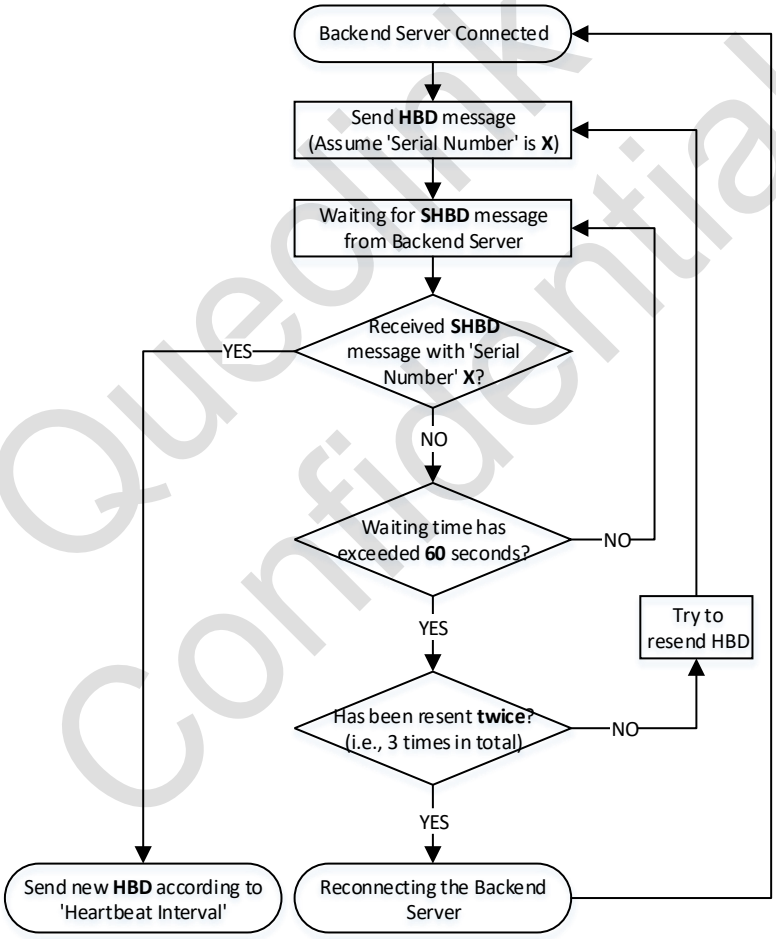


**Figure 6. Flowchart of SHBD Mechanism**

# An Example of Report Frame

This section uses a specific report frame (it is a binary long report) as an example to describe a step of decoding the report frame, for reference only:

(1) Each frame can be simply seen as consisting of four segments: Fixed Header Segment, Reserved segment, Records Segment, and Tail Segment.

| Fixed Header Segment | Reserved Segment | Records Segment | Tail Segment |
|---|---|---|---|
| 18 or 20 bytes | >=1 byte | N bytes | 4 bytes |

The Fixed Header Segment contains content from 'Header' to 'Custom Version'.
The Reserved Segment contains content 'Reserved Field Length' and 'Reserved Field Data'.
The Tail Segment consists of 'Count Number', 'Check Byte' and 'Tail'.
The Records Segment is between the Reserved Segment and the Tail segment, it contains all records.

(2) First of all, the 'Frame Length' can be obtained from the Fixed Header Segment, and you can find the end of the frame according to the 'Frame Length'. By checking the 'Check Byte' of the Tail Segment to judge whether the frame is a correct message frame.

(3) Since the length of the Fixed Header Segment is fixed, we can easily find the Reserved Segment, and then the Records Segment can be addressed according to the 'Reserved Field Length' in the Reserved Segment.

(4) The Records Segment is composed of one or more Records, and the format of each Record is uniform, and all data is obtained by further parsing these Records.

**Table 21. An Example of Decoding a Report**

| |
|---|
| **2B 00** 00 4C **00** 01 23 45 67 89 01 23 45 **80 01** 00 06 01 **00** 35 **5E 36 2F 5A** 03 **00** 02 0B 4D 79 49 6F 54 64 65 76 69 63 65 **51 0F 09 07 3C 46 FF 01 DB 88 57 5F 17 9D A0 01 7D** 55 0E 06 04 BC 8A 00 10 00 02 10 00 10 0C 13 03 **01 23** 23 **24** |
| ***Total 76 bytes***<br>**2B** - Header '+'.<br>**00** - Always be 00H.<br>00 4C - Frame Length, 004CH (76) bytes.<br>**00** - 0b**0**0000000, Multi-packet Flag is 0b0, indicating that there is no 'Frame Count & Number' field in this report.<br>01 23 45 67 89 01 23 45 - IMEI, "123456789012345".<br>**80 01** - Device Type, "8001".<br>00 06 - Protocol Version, V6.<br>01 - Custom Version, V1.<br>**00** - Reserved Field Length. Set to 0 by default.<br>***Content of Record 03H:***<br>35 - Record Length, this record has 35H (53) bytes. (Note: 35H=0b**0**0110101, the highest bit is 0 means that 'Record Length' field occupies only 1 byte).<br>**5E 36 2F 5A** - Generated Time of this record. Timestamp 1580609370.<br>03 - Record ID, 03H.<br>**00** - Event Code, 00H.<br>***Content of Data 02 (Device Name):***<br>02 - Data ID, 02H (2), Device Name. (Note: 02H=0b**0**0000010, the highest bit is 0 |

means that 'Data ID' field occupies only 1 byte).
0B - Length of content of Data 2, 0BH (11) bytes. (Note: 0BH=0b**0**0001011, the highest bit is 0 means that this length field occupies only 1 byte).
4D 79 49 6F 54 64 65 76 69 63 65 - Device Name, "MyIoTdevice".
***Content of Data 81 (Mini Location):***
**51** - Data ID, 51H (81), Mini Location.
**0F** - Length of content of Data 81, 0FH (15) bytes.
**09** - 0b0000**10**01, Fix State is 0b10 (Fix), and Fix Mode is 0b01 (3D GNSS fix).
**07 3C 46 FF** - Longitude, 073C46FFH (i.e., 121390847) means east longitude 121.390847 degrees.
**01 DB 88 57** - Latitude, 01DB8857H (i.e., 31164503) means north latitude 31.164503 degrees.
**5F 17 9D A0** - UTC Time. Timestamp 1595383200.
**01 7D** - Speed. 017DH (i.e., 381) means speed 38.1 km/h.
***Content of Data 85 (Registered Cell):***
55 - Data ID, 55H (85), Registered Cell.
0E - Length of content of Data 85, 0EH (14) bytes.
06 04 BC 8A - PLMN is "310410".
00 10 - LAC is "16".
00 02 10 00 - Cell ID, 00021000H (135168).
10 - Access Technology & Roaming, 0b**0**0010000, roaming status is home network (0b0) and access technology is LTE Cat-M1 (0b0010000=10H).
0C - Band, 0CH (12).
13 - CSQ RSSI, 13H (19).
03 - Bit Error Rate, 3% (03H).
**01 23** - Count Number, 0123H (291).
23 - Check Byte, Calculated by *CRC-8 Calculation*.
**24** - Tail, "$".