

# Mictrack Communication Protocol

(for MX100)

## V1.0



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## 1. Introduction

(1) This protocol is for MX100 .

(2) Message ID in protocol includes:

a) Messages sending from tracker device to the server

0x0200: Basic information, contains device ID, time stamp, position, cell ID and information of sensors embedded and connected .

0x0900: Additional information, contains the data of external sensors via BLE or wired probe.

0x0001: General query response from tracker device. Tracker device would send 0x0001 message to respond the query commands from the server.

0x0104: General configuration response from tracker device. Tracker device would send 0x0104 message to respond the configuration commands from the server.

b) Messages sending from server to the tracker device

0x8001: General response from server. The server would send 0x8001 message to respond the 0x0200 message from tracker device .

0x8103: Configuration commands from server to the tracker device.

0x8104: Query commands from server to the tracker device.

(3) In addition to the protocol documentation, provides Java, python and C# reference code to accelerate the integration.

Recommend to read this protocol document and illustrate excel together to easy understand the message structure.

## 2. Format Protocol Content

### 2.1 Date Type

Table 1. Data Type

Data type	Description
BYTE	Unsigned single-byte integer type(8 bits)
WORD	Unsigned double-byte integer type(16 bits)
DWORD	Unsigned four bytes integer type(32 bits)
BYTE[n]	n bytes
BCD[n]	8421 code, n bytes
STRING	GBK code, leave blank if no data

### 2.2 Transmission Rule

This protocol uses big-endian mode for transferring WORD and DWORD data. The agreements are as follows:

- BYTE: Transferred as byte streams.

- WORD: Transmit the high 8 bits first, followed by the low 8 bits.
- DWORD: Transmit the highest 8 bits (b31, b24) first, followed by the higher 8 bits (b23, b16), then the lower 8 bits (b15, b8), and finally the lowest 8 bits (b7, b0).

## 2.3 Protocol Message Format

### 2.3.1 Message Structure

The message is consisted of flag, message header, message body payload and checksum. Its structure is shown as the below figure, the following example will follow below color to illustrate the message structure.



Sending from device: Pack the message -- >Calculate and fill the checksum code-- >Transferred meaning-- > Sending;

Receiving from server: Receiving message -- >Transferred meaning and revert -- >Verify the checksum code-- > Parse message ;

**Example:**

The device needs to send a hexadecimal packet with the content of `00000008400002301E5BB4506FABB57003F00000036230731084856`, which is encapsulated as follows:

Add flag, message header and checksum code:

```

7E ----- flag
0200001C8050650805440004 ----- message header
00000008400002301E5BB4506FABB57003F00000036230731084856 ----- message body
41 ----- checksum code
7E ----- flag
    
```

### 2.3.2 Flag

The start/end flag is 0x7E, if there is 0x7E / 0x7D existing in the checksum, message header or message body, it must be transferred, the transferred meaning rules is shown as the below:

```

0x7E <-----> 0x7D 0x02
0x7D <-----> 0x7D 0x01
    
```

Transferred meaning process is described as following:

Example1:

The data "0x7D 0x00 0x00 0x00 0x01" shall be transferred to " 0x7D 0x01 0x00 0x00 0x00 0x01"

Server receive the data from the device "0x7D 0x01 0x00 0x00 0x00 0x01 " shall be restored to "0x7D 0x00 0x00 0x00 0x01"

Example 2:

The data "0x7E 0x00 0x00 0x00 0x01 " shall be transferred to " 0x7D 0x02 0x00 0x00

0x00 0x01”

Server receive the data from the device “0x7D 0x02 0x00 0x00 0x00 0x01” shall be restored to “ 0x7E 0x00 0x00 0x00 0x01”.

### 2.3.3 Message Header

Table 2. Message header

Start byte	Field	Data type	Description
0	Message ID	WORD	-
2	Properties of Message Body	WORD	The properties format refer to the table 3
4	Device ID Number	BCD[6]	last 12 digital number of IMEI of cellular modem
10	Message Sequence Number	WORD	Cycle accumulation from 0 as the sending sequence

Table 3. Message Body Properties

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved	Version	Sub-package	Data encryption mode			Length of message body									

Bit15: Reserved.

Bit14: This bit is reserved as 0 by default;

Bit13: 0 represents no sub-package ; 1 represents there is sub-package messages .

Bit12-10: Data encryption mode:

-- When all three bits are 0, it means the message body is not encrypted.

-- When the tenth bit are 1, it means the message body is encrypted by the RSA algorithm.

Bit9-0: Length of message body.

### 2.3.4 Checksum

Checksum code is calculated via XOR from the start of message header to the last byte before checksum code. The Checksum occupies 1 byte.

*Example:*

*8001000541305150710000B2046F020000*

*The result is 5E.*

## 2.4 Protocol Interaction Process

Device sends message(0x0200) to the server according to the configured reporting interval and then server responds to the device by 0x8001 message.

2. The server can also actively configure and query device parameters as well(more

details refer to 0x8103 and 0x8104), and the device will respond to the platform server after receiving the configuration or query commands.

3. The server needs to reply to every message sent by the device.

4. After the server sends command 8103 to the device, the server needs to check whether the device has received the command sent by the server based on the response from the device.

Table 4. Message Interaction Response

Message sent from tracker device to server		
Message	Description	Server response
0x0001	Device general query response	\
0x0104	Device general configuration response	\
0x0200	Device basic information	0x8001
0x0900	Additional information	0x8001
Message sent from server to tracker device		
Message	Description	Device response
0x8001	Server general response	\
0x8103	Configuration commands	0x0104
0x8104	Query commands	0x0001

### 3. Message Body Data Format

#### 3.1 Device General Query Response (0x0001)

Message ID: 0x0001

Table 5. Device General Query Response Message Body

Start byte	Field	Data type	Description
0	Response sequence number	WORD	The sequence number of the corresponding server message
2	Message ID	WORD	Message ID of the corresponding server message
4	Result	BYTE	<i>0: Success</i> <i>1: Fail</i> <i>2: Wrong message</i>

			3: Not support
--	--	--	----------------

**Example:**

**7E 00 01 00 05 41 30 50 33 98 28 00 01 FFDD810400 00 7E**

7E -----Flag  
 00 01 -----Message ID  
 00 05 -----Message Body Properties  
 41 30 50 33 98 28 -----Device ID  
 00 01 -----Message sequence number  
 FFDD -----Response sequence number  
 8104 -----Response ID  
 00 -----Result  
 00 -----Checksum code  
 7E -----Flag

**3.2 Dada Device Query Response (0x0104)**

Message ID: 0x0104

Table 6. Device Query Response Message Body

Start byte	Field	Data type	Description
0	Response sequence number	WORD	Corresponding to query device parameter message sequence number
2	The total number of response parameters	BYTE	
3	Parameters item list		Refer to table 29

**Example:**

**7E 01 04 00 1B 41 30 50 33 98 28 00 14 FFDE040000F00F01010000F01001010000F01201050000F014011F 8E 7E**

7E -----Flag  
 01 04 ----- Message ID  
 00 1B -----Message Body Properties  
 41 30 50 33 98 28 -----Device ID  
 00 14 -----Message sequence number  
 FFDE -----Response sequence number  
 04 -----Total number of response parameters as below 4 parameters  
 0000F00F -----Parameter\_1 ID  
 01 -----Parameter length  
 01 -----Parameter value

```

0000F010      -----Parameter_2 ID
01            -----Parameter length
01            -----Parameter value
0000F012      -----Parameter_3 ID
01            -----Parameter length
05            -----Parameter value
0000F014      -----Parameter_4 ID
01            -----Parameter length
1F            -----Parameter value
8E            -----Checksum Code
7E            -----Flag

```

### 3.3 Device Basic Information Message (0x0200)

Message ID: 0x0200

0X0200 messages body payload contains 2 parts: location information and extension information . Message structure is shown as follows:

<b>Location information (Table 7)</b>	<b>Extension information (Table 10)</b>
---------------------------------------	---

Table 7. Basic Location Information Data Format

Start byte	Field	Data type	Description
0	Alarm flag	DWORD	Alarm flag definition is shown as Table 8
4	Status	DWORD	Status definition is shown as Table 9
8	Latitude	DWORD	GNSS Latitude value *10 <sup>6</sup> , accurate to 0.000001 degree.
12	Longitude	DWORD	GNSS Longitude value *10 <sup>6</sup> , accurate to 0.000001 degree
16	Altitude	WORD	GNSS Altitude in meters (m)
18	Speed	WORD	1/10km/h
20	Direction	WORD	0~359, north is 0,clockwise
22	Time	BCD[6]	YY-MM-DD-hh-mm-ss (default is GMT+0 time zone)

Table 8. Alarm Flag Definition

Bit	Definition	Description
0	Reserved	



1	Reserved	
2-3	Reserved	
4	Reserved	
5-6	Reserved	
7	Reserved	
8	Reserved	
9-14	Reserved	
15	Reserved	
16	Motion Alarm	0:static 1:movement
17-27	Reserved	
28	Reserved	
29-30	Reserved	
31	Reserved	

Table 9. Status Definition

Bit	Status
0	Reserved
1	0: GNSS position unfix ; 1: GNSS position fix
2	0: North latitude; 1: South latitude
3	0: East longitude; 1: West longitude
4	0: Un-sampled data; 1: Sampled data
5-26	Reserved
27-29	Network modes: 000-Fail to register network; 001-GSM; 010-LTE; 011-CATM; 100-NB-IoT
30	Reserved
31	0: Real-time data; 1: Buffered data

Table 10. Extension Information Data Format

Note: Extension information can be filled/ not filled in 0x0200 payload by AT command AT+REPORTMASK in AT command manual .

Field	Date type	Description
Extension information ID	BYTE	
Extension information length	BYTE	
Extension information		Extension information shown as Table 11

Table 11. Extension Information Definition

Extension information ID	Extension information length	Description
0x01	4	DWORD. Mileage, 1/10km .Table 12.
0x30	1	BYTE. Cellular network signal strength.Table 13
0x31	1	BYTE. Number of GNSS satellites used. Table14
0xF0	$m*(2+2+4+4+1)$	Cell IDs information . Table 15. <i>MCC , 2 bytes</i> <i>MNC , 2 bytes</i> <i>CI , 4 bytes</i> <i>LAC , 4 bytes</i> <i>RSSI , Serving cell signal strength , 1 bytes</i> ("m" represents the number of group of base station Cell IDs, the maximum is 7)
0xF2	n	STRING, Device Firmware version.Table 16
0xF3	$1+m*(6+1+[10]+[2]+[2]+[2]+[2]+[6]+[2]+[2])$	Bluetooth data scanned list. 1: Byte. Field mask bit , configured by command AT+BTMODE in AT command manual. m: Numbers of group of Bluetooth nodes <i>[</i> <i>Mac, 6 bytes</i> <i>RSSI, Bluetooth signal strength. 1 byte</i> <i>Name, 10 bytes</i> <i>FwVer, 2 bytes</i>

		<p><i>Voltage, 2 bytes</i></p> <p><i>Temperature, 2 bytes</i></p> <p><i>Humidity, 2 bytes</i></p> <p><i>Accelerometer(X,Y,Z), 6 bytes</i></p> <p><i>Res1, reserved, 2 bytes</i></p> <p><i>Res2, reserved, 2 bytes</i></p> <p><i>J</i></p> <p>Table 17 .</p> <p>("m" represents the numbers of Bluetooth nodes. If all Bluetooth information is displayed, the maximum is 7 (the actual total length should be less than 255 bytes))</p>
0xF4	$m*(6+1)$	<p>m: Numbers of group of WiFi information</p> <p>[Mac,RSSI]</p> <p>Mac, 6 bytes</p> <p>RSSI, WiFi signal strength, 1 byte</p> <p>Table 19.</p>
0xF6	$1+1+m*([2]+[2]+[2]+[6]+[10]+[2]+[2]+[2])$	<p>Trigger Event Type and Sensor Information.</p> <p>Trigger event type, 1 bytes</p> <p>Sensor data field mask, 1 bytes .</p> <p>[<i>Light, Temperature, Humidity, Accelerometer, Limit, Bar, Res2, Res3</i>]</p> <p>"m" represents numbers of group of sensor information</p> <p>Sensor information:</p> <p>[<i>Light, 2 bytes</i></p> <p><i>Temperature, 2 bytes</i></p> <p><i>Humidity, 2 bytes</i></p> <p><i>Accelerometer, 6 bytes</i></p> <p><i>Limit (Ligh, Tmax, Tmin, Hmax, Hmin), 10 bytes</i></p> <p><i>Bar, air pressure sensor, 2 bytes</i></p> <p><i>Res2, reserved, 2 bytes</i></p> <p><i>Res3, reserved, 2 bytes</i></p> <p><i>J</i></p> <p>Table 20.</p>
0xF7	$4+[1]+[1]$	<p>Battery voltage: 4 bytes;</p> <p>Charge status: 1 byte</p> <p><i>0: invalid;</i></p> <p><i>1: uncharged;</i></p>

		<p>2: charging;                  3: full charging;                  4: abnormal;                  Battery level percentage: 1 byte;                  Table 22.</p>
0xF8	1+[8]+[10]+[10]	<p>Device general information .                  Work mode: 1 byte;                  0: Reserved                  1: Reserved                  2: Tracking mode+Trigger mode                  3: Reserved                  4: Periodic mode+Trigger mode . Default mode.                  IMEI: 8 bytes (BCD)                  ICCID: 10 bytes (BCD)                  Device Part Number : 10 bytes (STRING),                  For example: GM100LA-CC                  Table 23.</p>
0xF9	2+[4]+[4]+[2]+[6]+[4]+[4]+[2] +[2]+[2]+[2]	<p>Auxiliary information                  Assistant information field mask , 2 bytes.                  Mask Bit 0-15 identified as [GNSS position age,                  Acc on time,HDOP,reserved,Sample and Report                  Time ,ExtTemp Res1,...,Res10]                  GNSS position age: 4 bytes; Reserved                  Duration of Acc on: 4 bytes; Reserved ;                  HDOP: 2 bytes;                  GNSS time: 6 bytes ; Reserved                  Sampling interval:4 bytes;                  Report interval:4 bytes;                  Sensor Type:2 bytes;                  ExtTemp :2 bytes; External temperature probe .                  ExtTempMax:2 bytes;                  ExtTempMin:2 bytes;                  Table 24.</p>

Table 12. Mileage Data Format

Starting byte	Field	Date type	Description
---------------	-------	-----------	-------------

0	Mileage	DWORD	Mileage, 1/10km
---	---------	-------	-----------------

Table 13. Cellular Network Signal Strength Data Format

Starting byte	Field	Date type	Description
0	Wireless Communication Network Signal Strength	BYTE	Servicing Cell Signal Strength (CSQ)

Table 14. Number of GNSS positioning satellites Used Data Format

Starting byte	Field	Date type	Description
0	Number of GNSS positioning satellites	BYTE	Number of GNSS positioning satellites used

Table 15. Base Station Data Format

Starting byte	Field	Date type	Description
0	MCC	WORD	Mobile Country Code(MCC)
2	MNC	WORD	Mobile Network Code(MNC)
4	CI	DWORD	Cell Tower ID(CI)
8	LAC	WORD	Location Area Code(LAC)
12	RSSI	BYTE	Serving cell Signal Strength Indicator (RSSI)
.....			When there are multiple base stations, MCC-RSSI is connected to a group of base station information in sequence

Table 16. Device Firmware Version Data Format

Starting byte	Field	Date type	Description
0	Software Firmware Version	STRING	String ACSII

Table 17. Bluetooth Data Scanned List Format

Starting byte	Field	Date type	Description
0	Field Mask	BYTE	Bit0-7 [Name,FwVer,Voltage,Temperature,Humidity,Accelerometer,Res1,Res2] AT command AT+BTMODE is used to configure this

			mask .
			Table 18
2	Mac	BYTE[6]	Bluetooth Mac address
8	RSSI	BYTE	The strength of the received signal
9	Name	STRING	10 bytes, Bluetooth name
19	FwVer	BCD[2]	Bluetooth version
21	Voltage	WORD	Voltage
23	Temperature	WORD	Temperature
25	Humidity	WORD	Humidity
27	Accelerometer(X,Y,Z)	STRING	Values of the three axes of accelerometer
33	Res1	WORD	Reserved
35	Res2	WORD	Reserved
.....			When there are multiple Bluetooths, the Mac-Res2 connects to a set of Bluetooth information in sequence.

Note: The data length display of the Bluetooth list is mainly based on the actual display information of the mask, and the format in the table above displayed all the mask.

Table 18. Status Bit Definition

Bit	Definition	Status
Bit 0	Name	0: No Display. 1: Display
Bit 1	FwVer	0: No Display. 1: Display
Bit 2	Voltage	0: No Display. 1: Display
Bit 3	Temperature	0: No Display. 1: Display
Bit 4	Humidity	0: No Display. 1: Display
Bit 5	Accelerometer	0: No Display. 1: Display
Bit 6	Res1	0: No Display. 1: Display
Bit 7	Res2	0: No Display. 1: Display

Table 19. WiFi List Data Format

Starting byte	Field	Date type	Description
0	Mac	BYTE[6]	WiFi MAC Address
6	RSSI	BYTE	Strength of the received signal

Table 20. Trigger Event Type and Sensor Information Data Format

Starting byte	Field	Date type	Description
0	Data Type	BYTE	<p>0: Periodic sampling</p> <p>1: Low battery trigger event</p> <p>2: Motion trigger event</p> <p>3: Shock trigger event</p> <p>4: Light trigger event</p> <p>5: Over temperature and humidity trigger</p> <p>6: Over temperature trigger</p> <p>7: Over humidity trigger</p> <p>8: Reserved</p> <p>9: Bluetooth sensor connection trigger</p> <p>10: Entry flight mode</p> <p>11: Flight sampling</p> <p>12: Exit flight mode</p> <p>13: Over temperature in external probe</p> <p>14-74: Reserved</p> <p>75: OTA Firmware upgrade start</p> <p>76: OTA Firmware upgrade succeed</p> <p>77: OTA Firmware upgrade failed</p>
1	Sensor field mask	BYTE	<p>Field masks Bit0-7 are identified respectively [Light, Temperature, Humidity, Accelerometer, Threshold, Bar, Res2, Res3]</p> <p>AT command AT+SENSORMASK is used to configure this mask</p> <p>The status bits are defined in Table 21.</p>
2	Light	WORD	mV
4	Temperature	WORD	1/10 °C
6	Humidity	WORD	1/10 %RH
8	Accelerometer	STRING	STRING Six bytes. Each two bytes indicates a parameter value. The value of the Acc_X, Acc_Y, and Acc_Z three-axis .
14	Threshold	STRING	10 bytes, each two bytes represents threshold, (Ligh, Tmax, Tmin, Hmax, Hmin device parameter

			threshold)
24	Bar	WORD	2 bytes,Air pressure, hPa
26	Res2	WORD	Reserved
28	Res3	WORD	Reserved

Note: The length of sensor information is mainly displayed based on the actual mask configuration . and the format in the table above displayed all the mask.

Table 21. Status Bit Definition

Bit	Definition	Status
Bit 0	Light	0: No Display. 1: Display
Bit 1	Temperature	0: No Display. 1: Display
Bit 2	Humidity	0: No Display. 1: Display
Bit 3	Accelerometer	0: No Display. 1: Display
Bit 4	Limit	0: No Display. 1: Display
Bit 5	Bar	0: No Display. 1: Display
Bit 6	Res2	0: No Display. 1: Display
Bit 7	Res3	0: No Display. 1: Display

Table 22. Battery Information Data format

Starting byte	Field	Date type	Description
0	Battery voltage	DWORD	mV
4	Charging state	BYTE	0 invalid 1 Uncharged 2 Charging 3 Full 4 Exceptions
5	Battery percentage	BYTE	Percentage

Table 23. Device Information Data format

Starting byte	Field	Date type	Description
0	Working Mode	BYTE	Working Mode: 1 byte



			<i>0: Reserved</i> <i>1: Reserved</i> <i>2: Tracking mode+Trigger mode</i> <i>3: Reserved</i> <i>4: Periodic mode+Trigger mode</i>
1	IMEI	BCD[8]	Device IMEI
9	ICCID	BCD[10]	ICCID
19	Device Part Number	STRING	10 bytes, part number

Table 24. Device Information Data format

Starting byte	Field	Date type	Description
0	Auxiliary Information Mask	WORD	Mask Bit0-15 identified separately <i>[GNSS age,</i> <i>Acc on time,</i> <i>HDOP,</i> <i>GNSS TIME ,</i> <i>Sampling interval,</i> <i>Report interval ,</i> <i>External temperature probe,</i> <i>Res1,...,Res10]</i>  AT command AT+ASSISTMASK is used to configure this mask.  The bits status are defined in Table 25
2	GNSS age	DWORD	GNSS age, Reserved
6	ACC on time	DWORD	ACC on time , Reserved
10	HDOP	WORD	HDOP
12	GNSS Time	BCD[6]	GNSS TIME YY-MM-DD-hh-mm-ss ( The default time zone is GMT+0)
	Reserved	None	
18	Sampling interval	DWORD	Sampling interval
24	Report interval	DWORD	Report interval

30	Sensor Type	WORD	BIT0:External temperature probe BIT1-BIT15:reserved
32	ExtTemp	WORD	external temperature sensors,1/10°C
34	ExtTempMax	WORD	Upper alarm limit of the external temperature sensor
36	ExtTempMin	WORD	Lower alarm limit for external temperature sensor
.....			

Table 25. Status Bit Definition

Bit	Definition	Status
Bit 0	GNSS age	0: No Display. 1: Display
Bit 1	ACC on time	0: No Display. 1: Display
Bit 2	HDOP	0: No Display. 1: Display
Bit 3	GNSS Time	0: No Display. 1: Display
Bit 4	Reserved	0: No Display. 1: Display
Bit 5	Sampling and Report Interval	0: No Display. 1: Display
Bit 6	External Temperature Sensor	0: No Display. 1: Display
Bit 7-Bit13	Reserved	0: No Display. 1: Display

Table 26. Sensor Type Definition

Bit	Definition	Status
Bit 0	External temperature sensor	0: No Display. 1: Display
Bit 1-Bit15	Reserved	0: No Display. 1: Display

**Example**

**7E020000CC4130515296090001000000001000001000000000000000000000000000000000230**  
**731012858010400000000300116310100F01A01CC0000085118AA0000550BA201CC00000**  
**85118AE0000550B93F231414F56585F474C3130302D4C415F48322E305F4547393135554**  
**C4141425230324130334D30385F56322E302E373A763135F618001F09EB015E01FC0050**  
**0060042005DC002800000032000AF70600000E480234F81D020865413051529609898604**  
**A6102181622843474C3130302D4C410000F912000F000000000000000000000000000000**  
**04E7E**

7E -----Flag  
 0200 -----Message ID  
 00CC -----Message Body Properties  
 413051529609 -----Device ID  
 0001 -----Message sequence number  
 00000000 -----Alarm sign  
 10000010 -----Status  
 00000000 -----Latitude  
 00000000 -----Longitude  
 0000 -----Altitude  
 0000 -----Speed  
 0000 -----Direction  
 230731012858 -----Time  
 01 04 00000000 -----Mileage  
 30 01 16 -----Wireless network signal strength  
 31 01 00 -----Number of GNSS positioning satellites  
 F0 1A 01CC0000085118AA0000550BA201CC0000085118AE0000550B93 -----Base  
 station information  
 F231414F56585F474C3130302D4C415F48322E305F4547393135554C4141425230324  
 130334D30385F56322E30 2E373A763135 -----Firmware version  
 -----Bluetooth list  
 -----WiFi list  
 F6 18 001F09EB015E01FC00500060042005DC002800000032000A -----Trigger event  
 type and sensor information  
 F7 06 00000E480234 -----Battery information  
 F8 1D  
 020865413051529609898604A6102181622843474C3130302D4C410000-----Device  
 information  
 F9 12 000F00000000000000000000000000000000 -----Auxiliary information  
 4E -----Checksum Code  
 7E -----Flag

### 3.4 Server General Response (0x8001)

Message ID:0x8001

Table 27. Server General Response Message Body.

Starting byte	Field	Date type	Description
---------------	-------	-----------	-------------

0	Response sequence number	WORD	Sequence number of the corresponding device message
2	Message ID	WORD	ID of the corresponding device message
4	Result	BYTE	0: Success; 1: Fail; 2: Wrong message; 3: Not support; 4: Alarm Confirmed ;

**Example:**

7E 80 01 00 05 59 30 54 49 18 15 00 01 0001020000 FF 7E

7E -----Flag  
80 01 -----Message ID  
00 05 -----Message body Properties  
59 30 54 49 18 15 ----- Device ID  
00 01 -----Message sequence number  
0001 -----Response sequence number  
0200 -----Message ID  
00 -----Result  
FF -----Checksum Code  
7E -----Flag

**3.5 Configuration Commands Parameters(0x8103)**

Message ID:0x8103

Table 28. Configuration Commands Parameters Message Body

Starting byte	Field	Date type	Description
0	Total number of parameters	BYTE	
1	Parameters list		Shown as Table 29

Table 29. Parameters List Format

Starting byte	Field	Date type
Parameters ID	DWORD	The definition and description of parameters ID shown as Table 30
Parameters length	BYTE	Parameters list shown as Table 30
Parameters value		

Table 30. Parameters List

Parameters ID	Data type	Description
0x0001	DWORD	Reserved
0x0010	STRING	Reserved
0x0011	STRING	APN username
0x0012	STRING	APN password
0x0013	STRING	Main server IP or domain name
0x0017	STRING	Backup server IP or domain name
0x0018	DWORD	Main server TCP or UDP port
0xF000	STRING	Device ID; Default maximum 12-bit BCD code
0xF004	STRING	NTP server address, support domain name and IP
0xF005	DWORD	NTP server port
0xF006	BYTE	Timezone [-12, 12]
0xF007	BYTE	Protocol type
0xF009	BYTE	Protocol encryption [0: NULL; 1: RSA; 2: AES; 3: XTEA]
0xF00A	BYTE	Position Galaxy [0: GPS+BD; 1: GPS+GL0; 2: GPS+GAL]
0xF00B	BYTE	WIFI enable [0: off; 1: on]
0xF00C	BYTE	WIFI work mode [0: AP; 1: STA]*
0xF00D	BYTE	The max AP of WIFI
0xF00E	WORD	WiFi single scan time, the unit is second
0xF00F	BYTE	BT enable [0: off; 1: on]
0xF010	BYTE	BT work mode [0:Host; 1:Slave]
0xF011	BYTE	Maximum number nodes of BT

0xF012	BYTE	Scan timeout of BlueTooth sensors, the unit is minute
0xF013	WORD	BlueTooth single scan time, the unit is second
0xF014	BYTE	BlueTooth sensor report mask
0xF017	BYTE	Communication protocol [0: TCP; 1: UDP; 2: MQTT]
0xF018	DWORD	Report mask
0xF019	BYTE	Accelerometer enable [0: Disable ; 1: Enable ]
0xF01A	BYTE	Accelerometer sensitivity [0-255]
0xF01B	BYTE	Accelerometer range [0: ±2g; 1: ±4g; 2: ±8g; 3:±16g]
0xF01C	WORD	Accelerometer motion times
0xF01D	DWORD	Accelerometer motion duration , the unit is second
0xF01E	DWORD	Accelerometer trigger event interval, the unit is second
0xF01F	BYTE	Accelerometer report mask
0xF020	BYTE	Light sensor enable [0: disable; 1: enable]
0xF021	WORD	Light sensor threshold
0xF022	DWORD	Light trigger event interval, the unit is second
0xF023	BYTE	Temperature & humidity enable [0: disable; 1: enable]
0xF024	WORD	Upper temperature limit
0xF025	WORD	Lower temperature limit
0xF026	WORD	Upper humidity limit
0xF027	WORD	Lower humidity limit
0xF028	DWORD	Temperature & humidity trigger event interval, the unit is second
0xF029	BYTE	GNSS enable [0: disable ; 1: enable ]
0xF02A	BYTE	Device working mode

0xF02B	DWORD	Backup server port, TCP or UDP port
0xF02C	BYTE	Buffer enable
0xF02D	BYTE	Server Acknowledge enable
0xF02E	DWORD	Reporting interval
0xF02F	DWORD	Sampling interval
0xF030	STRING	AT command transparent transmission

**Example:**

**7E 81 03 00 2C 59 30 54 48 06 44 FF EB**

**060000F02301010000F0240200280000F0250200000000F028040000001E0000F0260200320000F02702 000A 8A 7E**

**7E** -----Flag  
**81 03** -----Message ID  
**00 2C** -----Message body Properties  
**59 30 54 48 06 44** -----Device ID  
**FF EB** -----Message sequence number  
**06** -----Total Parameter  
**0000F023** -----Parameter\_1 ID  
**01** -----Parameter Length  
**01** -----Parameter Value  
**0000F024** -----Parameter\_2 ID  
**02** -----Parameter Length  
**0028** -----Parameter Value  
**0000F025** -----Parameter\_3 ID  
**02** -----Parameter Length  
**0000** -----Parameter Value  
**0000F028** -----Parameter\_4 ID  
**04** -----Parameter Length  
**0000001E** -----Parameter Value  
**0000F026** -----Parameter\_5 ID  
**02** -----Parameter Length  
**0032** -----Parameter Value  
**0000F027** -----Parameter\_6 ID  
**02** -----Parameter Length

000A -----Parameter Value  
 8A -----Checksum Code  
 7E -----Flag

### 3.6 Query Command Parameters(0x8104)

Message ID:0x8104

Query the device parameters message body is empty.

**Example:**

7E 81 04 00 00 59 30 54 48 06 44 FF F9 B4 7E  
 7E -----Flag  
 81 04 -----Message ID  
 00 00 -----Message Body Properties  
 59 30 54 48 06 44 -----Device ID  
 FF F9 -----Message sequence number  
 B4 -----Checksum Code  
 7E -----Flag

### 3.7 Additional Information (0x0900)

Message ID:0x0900

Table 31. Basic Location Information Data Format

Start byte	Field	Data type	Description
0	Data Transparent Transmission Type	BYTE	0x53: Bluetooth transparent data . Table 32 0x54:Sensor log transparent data . Table 34
1	Status	DWORD	Status definition is shown as Table 9
5	Latitude	DWORD	Latitude value *10 <sup>6</sup> , accurate to 0.000001 degree
9	Longitude	DWORD	Longitude value *10 <sup>6</sup> , accurate to 0.000001 degree
13	Altitude	WORD	Altitude in meters (m)
15	Speed	WORD	1/10km/h
17	Direction	WORD	0~359, north is 0,clockwise
19	Time	BCD[6]	YY-MM-DD-hh-mm-ss (default is GMT+0 time zone)
25	Transparent Transmission Data	STRING	ASCII code,length less than 850 bytes;



Table 32. 0x53 Bluetooth transmission data format

Start byte	Field	Data type	Description
0	BlePoeCnt	BYTE	Total number of Bluetooth nodes
1	PoeData	STRING	Bluetooth node data (cannot exceed 849 bytes, if exceeded subcontracted) Table 33

Table 33. PoeData data format

Start byte	Field	Data type	Description
0	BleIndex	BYTE	Bluetooth node index, increasing from 0, up to BlePoeCnt-1
1	BleMacAddr	BYTE[6]	The Bluetooth Mac address
7	BleRssi	BYTE	Bluetooth signal strength (signed number)
8	DataLen	BYTE	Bluetooth node transmission data length
9	Data	STRING	Bluetooth nodes transmit data up to 31 bytes.

**Example: (in this example, assuming that the total length of the transmission data exceeds 850 bytes, the transmission data is sent into two 0900 packets)**

```
7E0900007A413050338598004B530000001000000000000000000000000000000000230626
0457470700AABBCC001122BD0B043F0464014864034A003E01AABBCC011122BD08052
F04641200010302AABBCC201122BD05012F04640103AABBCC031122BD06022F046448
6404AABBCC401122BD06032F04641C04767E
```

```
7E09000051413050338598004C530000001000000000000000000000000000000000230626
0457470705AABBCC051122BD0B042F0464014864034A003E06AABBCC001122BD0B04
2F0464014864034A003E4E7E
```

```
7E          -----Flag
0900       -----Message ID
007A       -----Message Body Properties
413050338598 -----Device ID
004B       -----Message sequence number
53         -----Transparent Transmission Type
00000010  -----Status
00000000  -----Latitude
00000000  -----Longitude
```

0000	-----Altitude
0000	-----Speed
0000	-----Direction
230626045747	-----Time
07	-----Total number of Bluetooth nodes
00	-----Bluetooth node index
AABBCC001122	-----Bluetooth node index
BD	-----Bluetooth signal strength
0B	-----Bluetooth node transmission data length
043F0464014864034A003E	-----Bluetooth nodes transmit data
01	-----Bluetooth node index
AABBCC011122	-----Bluetooth node index
BD	-----Bluetooth signal strength
08	-----Bluetooth node transmission data length
052F046412000103	-----Bluetooth nodes transmit data
02	-----Bluetooth node index
AABBCC201122	-----Bluetooth node index
BD	-----Bluetooth signal strength
05	-----Bluetooth node transmission data length
012F046401	-----Bluetooth nodes transmit data
03	-----Bluetooth node index
AABBCC031122	-----Bluetooth node index
BD	-----Bluetooth signal strength
06	-----Bluetooth node transmission data length
022F04644864	-----Bluetooth nodes transmit data
04	-----Bluetooth node index
AABBCC401122	-----Bluetooth node index
BD	-----Bluetooth signal strength
06	-----Bluetooth node transmission data length
032F04641C04	-----Bluetooth nodes transmit data
76	-----Checksum Code
7E	-----Flag
7E	-----Flag
0900	-----Message ID
0051	-----Message Body Properties
413050338598	-----Device ID
004C	-----Message sequence number
53	-----Transparent Transmission Type

```

00000010      -----Status
00000000      -----Latitude
00000000      -----Longitude
0000          -----Altitude
0000          -----Speed
0000          -----Direction
230626045747  -----Time
07            -----Total number of Bluetooth nodes
05            -----Bluetooth node index
AABBCC051122  -----Bluetooth node index
BD            -----Bluetooth signal strength
0B            -----Bluetooth node transmission data length
042F0464014864034A003E  -----Bluetooth nodes transmit data
06            -----Bluetooth node index
AABBCC001122  -----Bluetooth node index
BD            -----Bluetooth signal strength
0B            -----Bluetooth node transmission data length
042F0464014864034A003E  -----Bluetooth nodes transmit data
4E            -----Checksum Code
7E            -----Flag

```

0900 transmission data is composed of multiple Sensor Log nodes, and the data structure of each node is shown in the table below.

Table 34. 0x54 Sensor log Transmission data format

Start byte	Field	Data type	Description	Note
0	Mask	WORD	Sensor log mask	Convert Hex values to BIN values sorted from right to left as: <i>BIT 0: Light</i> <i>BIT 1: Built-in temperature and humidity</i> <i>BIT 2: External temperature</i> <i>BIT 3: Acceleration</i> <i>BIT 4: Air Pressure</i> <i>BIT5~BIT 7: Reserve</i>
1	Time	BYTE[6]	Sample time	BCD format YY-MM-DD-hh-mm-ss (the time zone of this time is the time zone of the device)

7	Light	WORD	light	mV
9	Board Temperature	WORD	Built-in temperature	1/10 °C
11	Board Humidity	WORD	Built-in humidity	1/10 %RH
13	Ext Temp	WORD	External temperature	1/10 °C
15	Acceleration	BYTE[6]	Acceleration X [2] + Y [2] + Z [2]	Each two bytes represents a parameter value, Acc _ X, Acc _ Y, Acc _ Z triaxial sensor ,unit is mg
21	Air Pressure	WORD	Air Pressure	unit is hPa

**Example**

7E09000049487060054219000E54100240112034640001F2401120345210C4100F4011C00F3FFE80008004003FE001F2401120345510C4100F4011C00F3FFF000800A003FEB67E

- 7E -----Flag
- 0900 -----Message ID
- 0049 -----Message Body Properties
- 487060054219 -----Device ID
- 000E -----Message sequence number
- 54 -----Transparent Transmission Type
- 10000000 -----Status
- 00000000 -----Latitude
- 00000000 -----Longitude
- 0000 -----Altitude
- 0000 -----Speed
- 0000 -----Direction
- 240112034640 -----Time
- 00 1F -----Sensor log mask
- 240112034521 -----Sample Time
- 0C41 -----light
- 00F4 011C -----Built-in temperature and humidity (00F4-built-in temperature 011C-built-in humidity)
- 00F3 -----External temperature
- FFE8 0008 0040 -----Acceleration (FFE8 -- Acc \_ X 0008 ---, Acc \_ Y 0040 ---, Acc \_ Z )
- 03FE ----- Air pressure

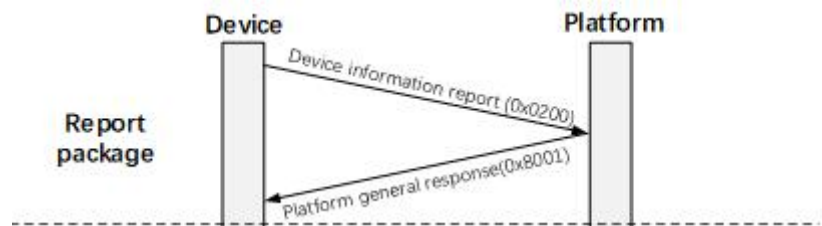
<i>00 1F</i>	<i>-----Sensor log mask</i>
<i>240112034551</i>	<i>-----Sample Time</i>
<i>0C41</i>	<i>-----light</i>
<i>00F4 011C</i>	<i>-----Built-in temperature and humidity (00F4-built-in temperature</i>
<i>011C-built-in</i>	<i>humidity)</i>
<i>00F3</i>	<i>-----External temperature</i>
<i>FFE0 0008 00A0</i>	<i>-----Acceleration (FFE0 -- Acc_X 0008 ---, Acc_Y 00A0 ---, Acc_Z)</i>
<i>03FE</i>	<i>----- Air pressure</i>
<b>B6</b>	<b>-----Checksum Code</b>
<b>7E</b>	<b>-----Flag</b>

## 4. Example of Message Data Interaction

### 4.1 Report the Packet

The devices report location and expansion information to the platform at the configured interval. This packet is also reported when the device detects the trigger event. The interval for reporting data packets can be configured remotely by the platform.

Example for reporting Data packets:



[Device→Platform]:

Example of data packet sent by the device:

```

7E 02 00 00 42 14 50 60 00 05 26 00 09 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 22 12 29 08 42 35 F0 0C 01 CC 00 00 00 6C 6D 00 00 55 0B 2F F6 0E 04 0F
0A 8F 00 FE 01 18 02 D8 FD A8 00 48 F7 06 00 00 10 0E 02 61 B3 7E
  
```

- 7E** --Flag
- 0200** --Message ID
- 0042** --Properties of Message Body
- 145060000526** --Device Number
- 0009** --Message Sequence Number
- 00000000** --Alarm Flag
- 00000000** --Status Flag
- 00000000** --Latitude
- 00000000** --Longitude
- 0000** --Altitude
- 0000** --Speed

**0000** --Direction

**221229084235** --Time

**F0 0C 01CC0000006C6D0000550B2F** --Base Station

Information(MCC:01CC,MNC:00,CI:00006C6D,LAC:0000550B,RSSI:2F)

**F6 0E 040F0A8F00FE011802D8FDA80048** --Trigger Type and Sensors

Information(04(Data type) 0F(Mask) 0A8F(Light) 00FE(Temperature) 0118(Humidity) 02D8FDA80048(Accelerometer) )

**F7 06 0000100E0261** --Battery Information

**B3** --Checksum Code

**7E** --Flag

[Platform→Device]:

Example of data packet sent by the platform:

7E 80 01 00 05 14 50 60 00 05 26 00 01 00 09 02 00 00 89 7E

**7E** --Flag

**8001** --Message ID

**0005** --Properties of Message Body

**145060000526** --Device Number

**0001** --Message Sequence Number

**0009020000** --Response message body89 --Checksum Code

7E --Flag

Example for reporting data packets:

[Device→Platform]:

Example of data packet sent by the device:

7E020000421450600005260004000000000000010000000000000000000000000000000000000002212

28135548F00C01CC0000006C6D0000550B2EF60E000F000000F7011A0038FFC80300F70

60000100903649D7E

**7E** --Flag

**0200** --Message ID

**0042** --Properties of Message Body

**145060000526** --Device Number

**0004** --Message Sequence Number

**00000000** --Alarm Flag

**00000010** --Status Flag

**00000000** --Latitude

**00000000** --Longitude

**0000** --Altitude

**0000** --Speed

**0000** --Direction

**221228135548** --Time

**F0 0C 01CC0000006C6D0000550B2E** --Base Station

Information(MCC:01CC,MNC:00,CI:00006C6D,LAC:0000550B,RSSI:2E)

**F6 0E 000F00000F7011A0038FFC80300** --Trigger Type and Sensors

Information(00(Data type) 0F(Mask) 0000(Light) 00F7(Temperature) 011A(Humidity)  
0038FFC80300(Accelerometer) )

**F7 06 000010090364** --Battery Information

**9D** --Checksum Code

**7E** --Flag

[Platform→Device]:

Example of data packet sent by the device:

7E8001000514506000052600010004020000847E

**7E** --Flag

**8001** --Message ID

**0005** --Properties of Message Body

**145060000526** --Device Number

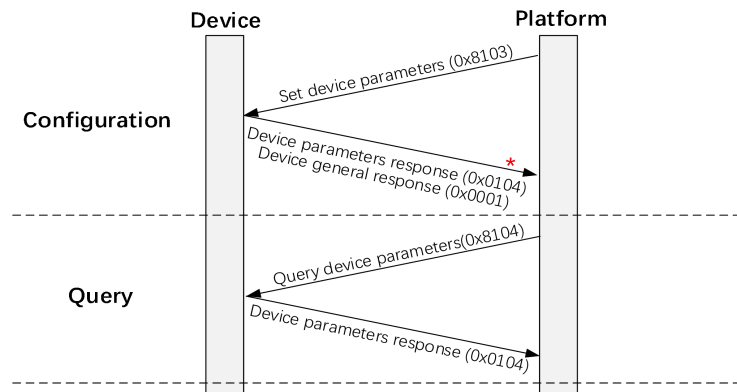
**0001** --Message Sequence Number

**0004020000** --Response message body84 --Checksum Code

**7E** --Flag

## 4.2 Platform remote configuration and query

The platform can also proactively configure and query the device parameters. When the platform uses remote configuration, devices reply all parameter packets (0x0104) by default for platform verification, or devices can be configured to reply general response packets (0x0001). The platform can send a query package (0x8104) to obtain device parameter information.



Example for querying device parameters after delivering the device report interval:

[Platform→Device]:

Example of data packet sent by the platform:

7E 81 03 00 16 14 50 60 00 05 26 FF DD 01 00 00 F0 30 10 41 54 2B 54 49 4D 45 47 41 50  
3D 30 2C 36 30 30 0A 7E

**7E** --Flag

**8103** --Message ID

**0016** --Properties of Message Body

**145060000526** --Device Number

**FFDD** --Message Sequence Number  
**010000F0301041542B54494D454741503D302C363030** --Response message body0A  
 --Checksum Code

**7E** --Flag

[Device→Platform]:

Example of data packet sent by the device:

7E 01 04 00 25 14 50 60 00 05 26 00 04 FF DD 01 00 00 F0 30 1D 2B 54 49 4D 45 47 41 50  
 3A 72 65 70 6F 72 74 2C 36 30 30 0D 0A 0D 0A 4F 4B 0D 0A 0D 0A 9F 7E

**7E** --Flag

**0104** --Message ID

**0025** --Properties of Message Body

**145060000526** --Device Number

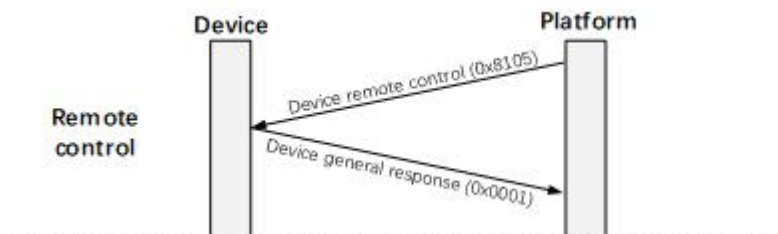
**0004** --Message Sequence Number

**FFDD010000F0301D2B54494D454741503A7265706F72742C3630300D0A0D0A4F4B0  
 D0A0D0A** --Response message body9F --Checksum Code

**7E** --Flag

### 4.3 Platform Remote Control

The platform can actively control the device. The platform uses remote control equipment for reset and OTA upgrade.



OTA upgrade instructions for example:

[Platform→Device]:

Example of data packet sent by the platform:

7E 81 05 00 A6 14 50 60 00 05 26 FF DD 20 30 3B 30 3B 41 4F 56 58 5F 47 58 31 30 30 2D  
 58 58 5F 48 32 2E 30 5F 56 32 2E 30 2E 32 5F 76 30 37 2E 62 69 6E 3B 31 3B 68 74 74 70  
 3A 2F 2F 34 37 2E 31 32 32 2E 30 2E 31 39 31 3A 38 30 38 30 2F 66 69 6C 65 2F 46 69 72  
 6D 77 61 72 65 5F 4A 74 38 30 38 5F 41 4F 56 58 2F 32 30 32 32 31 32 30 36 2F 41 4F 56 58  
 5F 47 58 31 30 30 2D 58 58 5F 48 32 2E 30 5F 56 32 2E 30 2E 32 5F 76 30 37 2E 62 69 6E  
 3B 34 33 39 30 61 32 37 66 33 64 39 34 30 62 33 33 66 65 31 64 31 62 35 66 37 64 62 65 35  
 37 36 30 1C 7E

**7E** --Flag

**8105** --Message ID

**00A6** --Properties of Message Body



**145060000526** --Device Number  
**FFDD** --Message Sequence Number  
**20303B303B414F56585F47583130302D58585F48322E305F56322E302E325F7630372E62696E3B313B687474703A2F2F34372E3132322E302E3139313A383038302F66696C652F4669726D776172655F4A743830385F414F56582F32303232313230362F414F56585F47583130302D58585F48322E305F56322E302E325F7630372E62696E3B3433393061323766336439343062333366653164316235663764626535373630** --Response message body1C  
 --Checksum Code  
**7E** --Flag

[Device→Platform]:

Example of data packet sent by the device:

7E 00 01 00 05 14 50 60 00 05 26 00 07 FF DD 81 03 00 A4 7E

**7E** --Flag  
**0001** --Message ID  
**0005** --Properties of Message Body  
**145060000526** --Device Number  
**0007** --Message Sequence Number  
**FFDD810300** --Response message bodyA4 --Checksum Code  
**7E** -Flag

Example of AT pass-through instruction:

[Device→Platform]:

Example of data packet sent by the device:

7E 09 00 00 40 41 30 50 73 23 78 00 05 52 00 00 00 12 01 E5 BB 63 06 FA BC 40 00 44 00 00 00 00 22 12 29 17 36 45 01 D0 6D 76 0C 21 F7 BA 02 01 06 03 03 AA FE 11 16 AA FE 20 00 0D 68 12 80 00 02 44 F9 00 07 90 8B 00 00 00 00 00 00 DC 7E

**7E** --Flag  
**0001** --Message ID  
**0005** --Properties of Message Body  
**145060000526** --Device Number  
**0007** --Message Sequence Number  
**FFDD810300** --Response message bodyA4 --Checksum Code  
**7E** --Flag

(End of this document)



**Shenzhen Mictrack Electronics Co.,Ltd.**

**Add:** 706, Union Building, Donghuan 1st Road, Longhua District, Shenzhen, China 518109

**Tel:** +86-755-28198746

**Web:** [www.mictrack.com](http://www.mictrack.com)

**Email:** [info@mictrack.com](mailto:info@mictrack.com)