BT04 Communication Protocol

V2.0

1 Broadcast and scan response data format:

1.1 Broadcast data PDU

I) The specific definition of location is as follows (the sequence of PDU parts)

Definition	Meaning
0x02	The data length of type 0x01 is 0x02
0x01	Data type
0x06	Fixed value
Length	The data length of type 0x16 is 0x14
Type description	0x16
Detailed data	See broadcast data format

II) Broadcast data domain sequence (strictly follow the following analysis)

Data Domain	Total length of data	Type	Fixed value	Fixed value	Fixed value	Hardware type	Firmware version	ID	Battery Percentage	Fixed value	Temperature value	Humidity value	Reserve	Reserve	Alarm status
Occupied bytes	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Byte	1 Byte	4 Byte	1 Byte	1 Byte	2 Byte	2 Byte	1 Byte	1 Byte	1 Byte
Data value	0x14	0x16	0xFF	0xCB	0x11	See details below	See details below	See details below	See details below	0x 04	See details below	See details below	0x0	0x0	See details below

A. Hardware type: 2bytes, using hex code

0x3901：BT04

B. Firmware version: 1byte, using hex code

For example:0x25, the firmware version is v25

C. ID: 4bytes, hex code

For example:0x01 23 45 67, ID is 01234567

D. Battery percentage: 1byte,using hex code

For example:0x60, means 96% of the power

E. Temperature value: 2bytes, unit: 0.01 ℃

Bit15	Bit14	Bit13- Bit0
Temperature sensor normal flag bit	Temperature positive and negative sign bit	Temperature value
0:the sensor is normal 1:abnormal sensor	0:positive temperature 1:negative temperature	

For example:

0x8000: indicates that the temperature sensor is abnormal

0x0BD1: means + 30.25 ℃,

0x4BD1: means - 30.25 ℃

F. Humidity value: 2bytes, unit: 0.01%

Bit15	Bit14- Bit0
Normal flag of humidity sensor	Humidity value
0:the sensor is normal 1:abnormal sensor	

For example:

0x8000: indicates that the humidity sensor is abnormal

0x1F40:means 80.0%,

G. Alarm status: 1byte

Bit7	Bit6	Bit5- Bit0
1: low power alarm	1: temperature overrun alarm	reserve
0: the power is normal	0: the temperature does not exceed the limit	

For example:

0x80: low power alarm

0x40: indicates that the temperature exceeds the set alarm threshold

0xC0: low power alarm and the temperature exceeds the set alarm threshold

1.2 Scan response data PDU

I) the specific definition of location is as follows (the sequence of PDU parts)

position	definition	meaning
1	length	Data length of type 0x08 data
2	Type description	0X08
3	Detailed data	See scan response data format

II) sequence of scanning response data fields: (strictly follow the following analysis)

Data field	The length of the type	Type	Equipment name
Occupied bytes	1Byte	1Byte	1--7Bytes
Data value	See details below	0x08	See details below

A Type length: the total length from type to device name.

1.3 Examples of broadcast and scan response data analysis

For example, APP receives the following data:

0x020106 1416FFCB11390125112233441B0408980000000000 050842543034

Analysis:

A. Green part: broadcast data（0x020106 1416FFCB11390125112233441B0408981F400000）

Equipment type: 3901, BT04

Firmware version: 25, firmware version is 25

ID: 11223344, ID: 11223344

Power percentage: 1B, power 27%

Temperature value: 0x0898, temperature value is 22.0 ℃

Humidity value: 0x1F40, humidity value is 80%

Alarm status: 00, no low pressure and over temperature alarm

B. Orange part: scan response data（050842543034）

Device name: 0x42543034, "BT04"

2 Connection protocol

2.1 First service UUID:27763B10-999C-4D6A-9FC4-C7272BE10900

Characteristic UUID correspondence table:

Characteristic UUID	Length (bytes)	attribute	Characterist
0x27763B11-999C-4D6A-9FC4-C7272BE10900	4	Read、Write	Device ID
0x27763B12-999C-4D6A-9FC4-C7272BE10900	2	Read、Write	Broadcast interval
0x27763B13-999C-4D6A-9FC4-C7272BE10900	6	Read、Write	password
0x27763B14-999C-4D6A-9FC4-C7272BE10900	1	Read、Write	Transmitting power
0x27763B15-999C-4D6A-9FC4-C7272BE10900	4	Read、Write	Acquisition interval of temperature and humidity sensor
0x27763B16-999C-4D6A-9FC4-C7272BE10900	4	Read、Write	Storage interval
0x27763B17-999C-4D6A-9FC4-C7272BE10900	1	Read、Write	Storage overlay
0x27763B18-999C-4D6A-9FC4-C7272BE10900	2	Read	Number of stored data
0x27763B19-999C-4D6A-9FC4-C7272BE10900	2	Read、Write	Alarm parameter setting
0x27763B20-999C-4D6A-9FC4-C7272BE10900	6	Read、Write	UTC time setting
0x27763B21-999C-4D6A-9FC4-C7272BE10900	2	Notify	Synchronous data switch
0x27763B22-999C-4D6A-9FC4-C7272BE10900	1	Read、Write	Start or end of travel
0x27763B23-999C-4D6A-9FC4-C7272BE10900	3	Read	Model and version
0x27763B27-999C-4D6A-9FC4-C7272BE10900	20	Read、Write	Reserved storage 1
0x27763B28-999C-4D6A-9FC4-C7272BE10900	20	Read、Write	Reserved storage 2
0x27763B29-999C-4D6A-9FC4-C7272BE10900	20	Read、Write	Reserved storage 3
0x27763B2A-999C-4D6A-9FC4-C7272BE10900	20	Read、Write	Reserved storage 4
0x27763B2B-999C-4D6A-9FC4-C7272BE10900	16	Read、Write	Reserved storage 5
0x27763B31-999C-4D6A-9FC4-C7272BE10900	9	Read、Write	Synchronous data mode
0x27763B40-999C-4D6A-9FC4-C7272BE10900	8	Read、Write	Equipment name

Attentions:

Unless otherwise specified, they are all in small end mode, that is, the low byte is sent first

A. Device ID

For example:

a. App receives data 0x01 02 03 49: ID is 01020349

B. Broadcast interval: unit is 1ms, range [100,10000]

For example:

a. If app receives data 0xD0 07, the broadcast interval is 2000ms

b. Set the broadcast interval to 1000ms, APP send data: 0xE8 03

C. Password: The range is from 0x00 to 0x09

For example:

a. App receives data 0x01 02 03 04 05 06: then the password is 123456

b. Set the password to 012345, APP sends data 0x00 01 02 03 05

D. Transmitting power

App sends data (hex)	Corresponding transmitting power
0	4dBm
1	0dBm
2	-4dBm
3	-8dBm
4	-12dBm
5	-16dBm
7	-30dBm

For example:

a. App receives data 0x01: then the transmit power is 0dbm

b. Set the transmit power as - 4dbm, APP send data: 0x02

E. Temperature and humidity collection interval: The unit is 1s and the range is [1,100000]

For example:

a. When app receives data 0x05 00 00 00, the temperature and humidity collection interval is 5s

b. Set the temperature and humidity collection interval as 5S, APP send data: 0x05 00 00 00

F. Storage interval: The unit is 1s and the range is [10,3600]

The first to second byte: the normal storage interval

The 3rd to 4th byte: the storage interval under alarm condition

For example:

a. App receives data 0x00 78000A (read and parse with high byte first mode): then the temperature does not exceed the set threshold, and the storage interval is 120s

When the temperature exceeds the threshold, the storage interval is 10s

b. To set the storage interval as 60 seconds when the temperature does not exceed the set threshold, and 30s when the temperature exceeds the threshold. App sends data: 0x3c 00 1E 00

G. Storage data coverage: Reserved, (internal use, customer can't operate)

H. Number of stored data

For example:

a. If the data received by app is 0x0A 00, there are 10 pieces of historical data in the device.

I. Alarm parameter setting: The unit is 1 ℃, the range is [- 20,60], and the negative number is expressed in the form of complement

First byte: low temperature alarm threshold

Second byte: high temperature alarm threshold

For example:

a. App receives data 0xF6 05: then the low temperature alarm threshold is: - 10 ℃

High temperature alarm threshold: 5 ℃

b. Set low temperature alarm threshold to - 10 ℃, high temperature alarm threshold to 20 ℃, APP send data: 0xF6, 0x14

J. UTC time setting: Time with UTC + 0

First byte: year (actual year - 2000)

Second byte: month

The third byte: days

The fourth byte: hour

The fifth byte: minutes

The sixth byte: seconds

For example:

a. App receives data 0x15 01 1A 08 05 00, then the device time is: 08:05:00, January 16, 2021

b. Set the device time to 18:20:30 on October 3, 2016, APP send data: 0x100A 03 12 14 1E

K. Synchronous data switch: Used to start the transmission of historical data

Start Notfiy according to Bluetooth API

L. Record start or end:

App sends or reads data (HEX)	Record status (APP writes data)	Record status (APP reads data)
0	stop recording	Record stop
1	Start record	On record

For example:

a. App receives data 0x00: the device is in "unrecorded data state"

b. App receives data 0x01: the device is in "record data state"

c. Start device record, APP send data: 0x01

d. Stop device recording, APP send data: 0x00

Notes:

If the record status changes from "not recorded" to "being recorded", all the historical data inside the device will be cleared;

When the record status is "being recorded", APP sends 0x01 to clear all the historical data inside the device;

M. Model and version:

1st to 2nd byte: device type

The third byte: firmware version

For example:

a. App receives data 0x39 01 25: then the device type is BT04 and the firmware version number is V25

N. Reserved storage (1-4): Reserved data storage (customers can store their own data and define their own data format)

O. Reserved storage (5): Reserved data storage (customers can store their own data and define their own data format)

P. Equipment name:

The first byte: the total length of the device name

Byte 2 --- byte 8: device name

For example:

a. App receives data 0x04 42 54 30 34: then the device name is "BT04"

b. Set the device name as "bt04", APP send data: 0x04 (device name length) 42 54 30 34

c. Set the device name as "bt04rtt", APP send data: 0x07 (device name length) 42 54 30 34 72 74

Q. Synchronous data mode: Used to set the way to extract historical data (high byte first mode)

Write this eigenvalue format:

Start time stamp of historical data to be read (4bytes) + end time stamp of historical data to be read (4bytes) + read data mode (1byte)

a. Read data mode:

0x00: slow mode

0x01: fast mode

b. Start time stamp of historical data to be read or end time stamp of historical data to be read:

0x00: read all historical data

Other values: historical data at the specified time

Read this eigenvalue format:

Starting time stamp of historical data (4bytes) + ending time stamp of historical data (4bytes) + reservation (1byte)

For example:

a. App receives data 0x600 0F CC 00 60 10 58 A0 00;:

The first data time of historical data is: 08:00:00, January 26, 2021

The last data time of historical data is: 18:00:00, January 26, 2021

b. Use fast mode to extract all historical data, APP send data: 0x00 00 00 00 00 00 00 00 01;

c. Use slow mode to extract all historical data, APP sends data: 0x00 00 00 00 00 00 00 00 00;

d. Fast mode is adopted to read the data from 08:00 on January 26, 2021 to 18:00 on January 26, 2021.

App sends data: 0x600F CC 00 60 10 58 A0 01;

e. Use slow mode to read the data from 08:00:00 on January 26, 2021 to 18:00:00 on January 26, 2021.

App sends data: 0x600F CC 00 60 10 58 A0 00;

2.2 The second service UUID: 29ACF120-E3CE-49D0-8D99-ABEC4E713D7F

(internal debugging, not operational)

3 Examples of steps for configuring devices and reading historical data

3.1 Configuration steps

A. Connecting equipment;

B. Under the password characteristic value (i.e. 0x27763B13-999C-4D6A-9FC4-C7272BE10900), APP sends the correct password (after password verification fails, configure or other operations may cause the device to be disconnected);

C. After the password verification is successful, send the configuration data on the features to be configured;

3.2 Slow read all historical data protocol and steps

I) Historical data protocol:

A

1）The format of synchronization start and end data is as follows (set to slow select time mode to have these two packets of data)

Start character (1bytes) + number of data (2 bytes) + end character (1bytes)

Start character: 0x2A(start package) 0x24 (end package)

Number of data: the number of data sent by the synchronization device (high byte first)

Terminator: 0x23

2）The data format is as follows:

Temperature and humidity data (7bytes * n) + packet serial number (2bytes) + check sum (1byte), where d-1: temperature and humidity data, where n = [1,2], temperature and humidity data protocol is shown in the table below

Value（56bit）			
32bit	7bit	11bit	6bit
Time (the time stamp is expressed in high byte first mode)	humidity	temperature	reserve
Valid values 0 --- 2 ^ 32	Unit: 1% Effective value [0100]	Unit: 0.1 ℃ **Example:**When the value is greater than or equal to 1250, when the value is 1848, it means 1848-2048 = - 200, which means - 20.0 ℃ **Example :** When the value is less than 1250. When the value is 103, it means 10.3 ℃	

D-2: package serial number: [1,8192]

D-3: check sum: check sum from temperature and humidity data to package serial number

II) Steps to read historical data

A. Connecting equipment;

B. Under the password characteristic value (i.e. 0x27763B13-999C-4D6A-9FC4-C7272BE10900), APP sends the correct password (after the password verification is unsuccessful, to configure the setting will cause the device to be disconnected);

C. Read the characteristic value of the number of data to get the number of data

D. If the number of data is not zero, under the characteristic value of synchronous data switch (i.e. 0x27763B21-999C-4d6A-9FC4-C7272BE10900), start notify to get the historical data;

E. Analyze the historical data according to the data protocol;

For example:

The password of the device is 000000 and the number of stored data is 5. The steps to read all historical data are as follows:

a. Under the password characteristic value (i.e. 0x27763B13-999C-4D6A-9FC4-c7272BE10900), APP sends the password: 0x00 00 00 00 00 00

b. Password verification is successful. Read the number of data in the characteristic value (0x27763B18-999C-4d6A-9FC4-C7272BE10900)

App receives device data as: 0x07 00 (the device has 5 pieces of historical data)

c. Start the synchronous data switch (i.e. 0x27763B21-999C-4D6A-9FC4-C7272BE10900) to obtain all historical data,

App receives the first packet of data (temperature and humidity packet): 0x5F FF 51 C6 A0 25 C0 5F FF 52 3E A1 E5 C0 00 01 2F

The first temperature and humidity data: 2021-01-13 20:02:14 15.1 ℃ 80%

0xA025C0 Move 6 bit to the right to get 0x28097. Then, the temperature = (0x28097 & 0x007FF = 0x97= 151 , the temperature is 15.1 ℃

0xA0 Move 1 bit to the right to get 0x50 = 80, that is, the humidity is 80%

The second temperature and humidity data: 2021-01-13 20:04:14 - 10.5 ℃ 80%

0xA1E5C0 move 6 bit to the right to get ox28797, then the temperature = (0x28797 & 0x007ff) = 0x797 =1943, because 1943 is greater than 1250, the temperature is 1943-2048 - 105, that is - 10.5 ℃

0xA1 Move 1 bit to the right to get 0x50 = 80, that is, the humidity is 80%

App receives the second packet of data (temperature and humidity packet): 0x5F FF 52 B6 A0 25 C0 5F FF 53 2E A0 25 C0 00 02 51

The third temperature and humidity data: 2021-01-13 20:06:14 15.1 ℃ 80%

The fourth temperature and humidity data: 2021-01-13 20:08:14 15.1 ℃ 80%

App receives the third packet of data (temperature and humidity packet): 0x5F FF 53 A6 A0 25 C0 00 03 DF

Article 5 temperature and humidity data: 2021-01-13 20:10:14 15.1 ℃ 80%

3.3 Steps to quickly read all historical data

I) Historical data protocol:

The extracted data mode (synchronous data mode feature) is set as fast mode, and the protocol is as follows:

The data protocol is as follows: (the data length is determined according to the Bluetooth return length)

<table>
<tr><td>Data type (3bit)</td><td>Data serial number (13bit)</td><td colspan="3">Data (0 -- 18bytes)</td></tr>
<tr><td rowspan="3">0(all temperature data Temp_Packet）</td><td rowspan="3">0---8192</td><td colspan="3">Historical data of 3bytes * n (n is 1-6)</td></tr>
<tr><td>7bit</td><td>11bit</td><td>6bit</td></tr>
<tr><td>humidity</td><td>temperature</td><td>reserve</td></tr>
<tr><td></td><td></td><td>Unit: 1%
Valid values 0-100</td><td>Unit: 0.1 ℃
Example: When the value is greater than or equal to 1250, when the value is 1848, it means 1848-2048= -200, which means - 20.0 ℃
Example: When the value is less than 1250. When the value is 103, it means 10.3 ℃</td><td></td></tr>
<tr><td rowspan="2">1(start time + time interval + data) /Mid_Packet）</td><td rowspan="2">0---8192</td><td>Start time</td><td>With the next historical data interval, the high byte first mode is adopted</td><td>historical data</td></tr>
<tr><td>4bytes (time stamp representation, high byte first mode)</td><td>4Bytes</td><td>3bytes * n (n is 1 -- 3)</td></tr>
<tr><td rowspan="2">2 (synchronous start packet) /Start_Packet)</td><td rowspan="2">0---8192</td><td colspan="3">The number of historical data has been recorded, using high byte first mode</td></tr>
<tr><td colspan="3">2Bytes</td></tr>
<tr><td rowspan="2">3 (synchronous end package) /Stop_Packet）</td><td rowspan="2">0---8192</td><td colspan="2">The actual number of uploaded historical data is in high byte first mode</td><td>Send packets (number of packets from the beginning to the end, in high byte first mode)</td></tr>
<tr><td colspan="2">2Bytes</td><td>2Bytes</td></tr>
<tr><td>4--7(reserved)</td><td></td><td colspan="3"></td></tr>
</table>

II) Steps to read historical data

A. Connecting equipment;

B. Under the password characteristic value (i.e. 0x27763B13-999C-4D6A-9FC4-C7272BE10900), APP sends the correct password (after the password verification is unsuccessful, configure

The setting will cause the device to be disconnected);

C. In synchronous data mode (i.e. 0x27763B31-999C-4D6A-9FC4-c7272BE10900), APP sends data: 0x00 00 00 00 00 00 00 00 01;

D. Under the characteristic value of synchronous data switch (i.e. 0x27763B21-999C-4D6A-9FC4-C7272BE10900), start notify;

For example:

The password of the device is 000000 and the number of stored data is 7. The steps to read all historical data are as follows:

a . Under the password characteristic value (i.e. 0x27763B13-999C-4D6A-9FC4-C7272BE10900), APP sends the password: 0x00 00 00 00 00 00

b. Password verification is successful. Read the number of data in the characteristic value (0x27763B18-999C-4D6A-9FC4-C7272BE10900)

App receives device data as: 0x07 00 (the device has 7 pieces of historical data)

c. Set the fast read data mode. Under the characteristic value of synchronous data mode (i.e. 0x27763B31-999c-4D6A-9FC4-c7272BE10900), APP sends:0x00 00 00 00 00 00 00 00 01

d. Start the synchronous data switch (i.e. 0x27763B21-999C-4D6A-9FC4-C7272BE10900) to obtain all historical data,D-1: app receives the first packet of data (start_Packet)：0x40 01 00 07

1) Packet type judgment: after moving 5 bits to the right of 0x40, get 0x02, that is start_Packet；

2) Data sequence number judgment: (0x4001 & 0x1FFF) = 0x0001, data sequence number is 1

3) Number of historical data to be sent: 0x00 07 = 7

D-2: app receives the second packet of data (MID_Pakcet)：0x20 02 5F FF 51 C6 00 00 00 78 A0 25 C0 A0 25 C0 A0 25 C0

1) Judgment of packet type: after moving 5 bits to the right of 0x20, get 0x01, that is mid_Pakcet；

2) Data sequence number judgment: (0x2002 & 0x1FFF) = 0x0002, data sequence number is 2

3) Judging the starting time of data: 0x5FFF 51 C6 is 2021-01-13 20:02:14

4) Direct time interval judgment of two data: 0x0078 = 120, that is, the interval between two data is 120 seconds

5) The first temperature data: 2021-01-13 20:02:14 15.1 ℃ 80% (temperature according to temp_Data protocol format in packet analysis)

0xA025C0 move 6 bit to the right to get 0x28097, then the temperature = (0x28097 & 0x007FF) = 0x97=151 The temperature is 15.1 ℃

0xA0 Move 1 bit to the right to get 0x50 = 80, that is, the humidity is **80%** .

6) The second temperature data: 2021-01-13 20:04:14 15.1 ℃ **80% .**

0xA025C0: Move 6 bit to the right to get 0x28097, then, the temperature = (0x28097 & 0x007FF) = 0x97= 151 .The temperature is 15.1 ℃

0xA0 : Move 1 bit to the right to get 0x50 = 80, that is, the humidity is **80%.**

7） The third temperature data: 2021-01-13 20:06:14 15.1 ℃ **80%.**

0xA250C0 :Move 6 bit to the right to get 0x28097 .Then, the temperature = (0x28097 & 0x007FF) = 0x97= 151. The temperature is 15.1 ℃

0xA0 Move 1 bit to the right to get 0x50 = 80, that is, the humidity is **80%.**

d-3: APP receives the third packet of data (Temp)_Packet)：0x00 03 A0 25 C0 A1 E5 C0

1) Judgment of packet type: after moving 5 bits of 0x00 to the right, get 0x00, that is, temp_Packet；

2) Data sequence number judgment: (0x2002 & 0x1fff) = 0x0003, data sequence number is 3

3) The fourth temperature data: 2021-01-13 20:08:14 15.1 ℃ **80%.**

0xA025C0: Move 6 bit to the right to get 0x28097.Then the temperature = (0x28097 & 0x007FF) = 0x97=

151 . The temperature is 15.1 ℃

0xA0 Move 1 bit to the right to get 0x50 = 80, that is, the humidity is **80%.**

4) The fifth temperature data: 2021-01-13 20:10:14 - 10.5 ℃ **80%.**

oxA1E5C0: Move 6 bits to the right to get 0x28797. Then the temperature = (0x28797 & 0x007FF) = 0x797 =1943, because 1943 is greater than 1250, the temperature is 1943-2048 - 105, that is - 10.5 ℃

Move 1 bit of 0xa1 to the right, and get 0x50 = 80, that is, the humidity is **80%.**

d-4: APP receives the fourth packet of data (MID)_Pakcet)：0x20 04 5F FF 53 C4 00 00 00 0A **A0** 25 C0 **A0** 25 C0

1) Judgment of pcket type: after moving 5 bits to the right of 0x20, get 0x01, that is mid_Packet；

2) Data sequence number judgment: (0x2002 & 0x1FFF) = 0x0004, data sequence number is 4

3) Judging the starting time of data: 0x5f FF 53 C4 is 2021-01-13 20:10:44

4) Direct time interval judgment of two data: 0x00 00 00 0A = 10, that is, the interval between two data is 10 seconds

5) The sixth temperature data: 2021-01-13 20:10:44 15.1 ℃ **80%.**

0xA025C0: Move 6 bit to the right to get 0x28097. Then the temperature = (0x28097 & 0x007FF) = 0x97= 151. The temperature is 15.1 ℃

0xA0 Move 1 bit to the right to get 0x50 = 80, that is, the humidity is **80%.**

6) Article 7 temperature data: 2021-01-13 20:10:54 15.1 ℃ **80%.**

0xA025C0: Move 6 bit to the right to get ox28097 . Then the temperature = (0x28097 & 0x007FF) = 0x97= 151 . The temperature is 15.1 ℃

0xA0 : Move 1 bit to the right to get 0x50 = 80, that is, the humidity is **80%.**

d-4: APP receives the fifth packet data (stop)_Packet)：0x60 05 00 07 00 05

1) Judgment of packet type: after moving 5 bits to the right of 0x60, get 0x03, that is stop_Packet；

2) Data sequence number judgment: (0x6001 & 0x1FFF) = 0x0005, data sequence number is 5

3) Number of historical data sent: 0x00 07 = 7

4) Number of packets sent: 0x00 05 = 5 packets