

tracMo GATT Specification

This document is for tracMo community developers

Advertising Format

tracMo Serial Number

tracMo serial number is a 32-bit integer. Each tracMo number is unique in the world. This is NOT the Bluetooth Device Address.

Advertising Format

Advertising is based on iBeacon format.

0x02,

GAP_ADTYPE_FLAGS,

GAP_ADTYPE_FLAGS_LIMITED | GAP_ADTYPE_FLAGS_BREDR_NOT_SUPPORTED,

0x1A,

GAP_ADTYPE_MANUFACTURER_SPECIFIC,

LO_UINT16(APPLE_COMPANY_ID),

HI_UINT16(APPLE_COMPANY_ID),

0x02,

0x15,

0xec,

0x73,

0x6b,

0x6e,

0x69,

0x6c,

0x62,

0x51,

0x53,

0x54,

0x43,

0x41,

MASK,

```

0xFF,
0x00,
0xe8,
HI_UINT16(IBEACON_MAJOR_NUMBER) : SN bit 24 ~ 31
LO_UINT16(IBEACON_MAJOR_NUMBER) : SN bit 16 ~ 23
HI_UINT16(IBEACON_MINOR_NUMBER) : SN bit 8 ~ 15
LO_UINT16(IBEACON_MINOR_NUMBER) : SN bit 0 ~ 7
Power_Setting // Power Setting or changed when the button is pressed
                // refer to the Power Control section

```

MASK

Mask is not a determined value. Do not use MASK to perform product identification.

Active Scan Response Packet Format

To identify if this is a tracMo device, the following data is used in the active scan advertising response:

```

0x14, // Data Length
GAP_ADTYPE_LOCAL_NAME_COMPLETE,
't',
'r',
'a',
'c',
'M',
'o',
',', // space
BID-Hi, // broadcast ID, 0x00 (no button pressed) or 0xF0 (button pressed)
BID-Lo, //
FID-Hi, // firmware type ID
FID-Lo,
SN, // tracMo serial number in ASCII readable format
SN,
SN,

```

SN,
 SN,
 SN,
 SN,
 SN

All the data above is in ASCII, e.g. “tracMo 00013AD05000” or “tracMo F0013AD05000” if the button has been pressed in the last 30 seconds.

“tracMo “ can be other name if the device is for the co-branding partners, e.g. “CubiTag00013AD05000”.

Active Advertising Data

The advertising data is based on the format of iBeacon. The tracMo serial number is packed in the major/minor number.

HI_UINT16(IBEACON_MAJOR_NUMBER) : SN bit 24 ~ 31

LO_UINT16(IBEACON_MAJOR_NUMBER) : SN bit 16 ~ 23

HI_UINT16(IBEACON_MINOR_NUMBER) : SN bit 8 ~ 15

LO_UINT16(IBEACON_MINOR_NUMBER) : SN bit 0 ~ 7

Button Press in Advertising

When button is pressed, the following two changes happen for the following 30 seconds.

1. BID-Hi in the active scan is changed to 0xF0
2. Power_Setting in the iBeacon format is changed to 0xCA

tracMo UUID Information

tracMo uses 128-bit UUID Format:

```
#define QBLINKS_128BIT_UUID(uuid)      0xec, 0x73, 0x6b, 0x6e, 0x69,  
0x6c, 0x62, 0x51, 0x53, 0x54, 0x43, 0x41, LO_UINT16(uuid),  
HI_UINT16(uuid), 0x00, 0xe8
```

Tone Playing

Total number of music tones may be varied by different firmware versions.

However, the first 5 tones are used at the specific conditions.

Score ID 1: button clicked two or more times and tracMo is not connected

Score ID 2: button clicked two or more times and tracMo is connected

Score ID 3: default tone for the disconnection alert

Score ID 4: indicates there is an error

Score ID 5: low battery indication

Tone Playing Priority

There are priorities to determine if a tone playing can be interrupted. The priority is: QPS Command Playing > Disconnect Alert > button click alert

QPS Command Playing has the highest priority. Once it starts, nothing can interrupt it but the Stop Playing command or wait until the playing is finished. Disconnect/Reconnect does not stop the playing.

Disconnect alert has the second highest priority. Once it starts, the button click tone does not stop it. If the QPS Command Playing is running, the disconnect alert will not play. Reconnect stops the disconnect alert playing.

Playing/Stop Callback

Tone playing (QPS Command 0x30 0x03) will generate the callback when the tone gets played. If this tone playing experiences disconnection/reconnection, this callback is generated again when QPS Callback is subscribed.

Only if the tone playing callback is generated, tone stop callback will be generated when the tone playing is finished.

Disconnect Alert

Disconnect alert is a per-session setup. Each setting is valid only for the current connection session. Once the connection is lost, the next session requires its own disconnect alert configuration again.

If [PENDING] is not ZERO, the alert playing is postponed for [PENDING] seconds. If the connection is restored in [PENDING] seconds, it will not trigger the disconnect alert. This is to avoid a possible RF boundary situation. The reconnected session still needs its own disconnect alert setup.

Recommended Temple of Tones

Score 0x01	0x87	// button pressed and no connected
Score 0x02	0x87	// button pressed and connected
Score 0x03	0x87	// disconnect alert
Score 0x04	0x78	// error
Score 0x05	0x87	// low battery
Score 0x06	0x84	// major tom
Score 0x0D	0x9A	// Do not move
Score 0x0E	0x87	// one-click sound (connected, unsubscribed)
Score 0x14	0x87	// one-click sound (unconnected)

Power Control

The standard output power is 0 dbm by the default. Due to the security reason, **the power setting can be changed only through the QPS Security Command**. For CC2640R2F, only the following values (to represent the output dbm) are used in the configuration and call back:

05, 04, 03, 02, 01, 00, -3 (0xFD), -6 (0xFA), -9 (0xF7), -12 (0xF4), -15 (0xF1), -18 (0xEE), -21 (0xEB)

Callback 0x1F 0x06 [PowerSetting] is sent back when power setting is changed. Byte 3 of configuration also indicates the value of the current power setting.

When the power is changed, the Power_Setting in iBeacon is also changed. The value is 0xC0 + configured power value. For example, 0xC0 is 0 dbm, 0xC5 is 5 dbm, and 0xAB is -21 dbm.

When the power setting is changed, **the new setting takes effective after the device is disconnected**. It does not change immediately while the device remains connected.

Power Setting is a NVRAM level of configuration. The latest setting is retained even during a battery change. **When the device is assigned or unassigned, the power setting is automatically restored to 0 dbm.**

tracMo Configuration Retrieve

QPS Command 0x06 0x0F retrieves the tracMo configuration. The configuration is 16 bytes long.

Byte 0: Identification, must be 0x18, otherwise, it is an error

Byte 1: device assignment

Byte 2: Reserved

Byte 3: power setting (refer to the power control section)

Byte 4 ~ Byte 15: Reserved

tracMo Production Profile

There are 10 bytes of the hardware profile. Any value of 0x00 or 0xFF indicates not used or reserved. Value of 0xFE indicates negative.

Byte 0: Flash Installation. 0xFE not installed, 0x01 installed

Byte 1: Motion Sensor. 0xFE not installed, or the motion sensor type code

Byte 2: Not Used

Byte 3: Reserved

Byte 4 ~ Byte 7: Reserved

Byte 8: Flash Manufacturer ID

Byte 9: Flash Device ID

Note: The value of Flash manufacturer ID and Device ID has a meaning only when there is a flash installed.

Series of QPS Commands

Multiple QPS commands can be concatenated into a single QPS commands series.

The format is:

0x00 [LEN1] [CMD1] [LEN2] [CMD2]...

For example:

0x00 0x03 0x2F 0x1F 0x05 0x05 0x30 0x06 0x0A 0x87 0x00

The above QPS command is combined with

0x2F 0x1F 0x05 and 0x30 0x06 0x0A 0x87 0x00

A few restrictions are applied:

- Do not exceed to max length of 18 bytes

- Do not place any command that may disconnect the connection or restart the device in the series

Version Label Rules

The version label of G3 is labeled based on the following rule:

Series.Major.Minor.Build

Where:

Series	3: G3 Hardware without Long-Range Mode 4: G3 Hardware with Long-Range Mode 5: G3 Hardware Mesh Station
Major	Version of Bluetooth Stack
Minor	Version of Application Layer
Build	Firmware Build Sequence Number

Primary Service and Characteristics

Primary Service:

QPS (Qblinks Peripheral Service) , App plays GATT Client role:
QBLINKS_128BIT_UUID (0x8802)

Characteristics:

Command Characteristics:

UUID: QBLINKS_128BIT_UUID (0x9A01)

Property: Write-Only (allow Write with/without Response)

Length: Max 18 bytes

Data Structure: (Network Byte Order)

CMD DATA...

0x00 [LEN] [CMD] ...: Series of QPS commands

Please refer to the section of Series of QPS Commands

0x2F 0x03 0x00: Restart Device

0x2F 0x06 0x00: Disconnect and No Re-advertising

Note: This command applies on only the unassigned device

0x2F 0x07 0x00: Disconnect but Remain Advertising

0x2F 0x08 0x01: Enable Connected Advertising

0x2F 0x08 0x00: Disable Connected Advertising

0x2F 0x1F [SEN]: Set Motion Sensor Sensitivity

[SEN] = 1 to 10. Sensitivity = [SEN] x 0.0625g. By the default,
[SEN] = 8, which is 0.5g. This value is per connection setting.

Disconnection will restart the sensitivity to 8.

0x2F 0x1F 0x00: Clear Motion Sensor Detection

By the default, the triggered motion detection is on hold for 1
minute. No further detection will be triggered again in a minute.

This command can restart the motion detection manually.

0x2F 0x1F 0xFF: Force Motion Sensor Detection

Enable a one-time motion detection/clear, even the device is unassigned.

0x2F 0x1F 0xFE: Motion Sensor Factory Self-Test Initialization

This is for the factory QA use ONLY. Issue this command to setup a motion sensor self-test.

0x2F 0x1F 0xFD: Motion Sensor Factory Self-Test Completion

This is for the factory QA use ONLY. After Motion Sensor Self-Test command is issued, this command checks the result. If the motion sensor works correctly, a motion detection callback is generated.

0x2F 0x20 [INT-MIN] [INT-MAX] [LAT] [TO]: Connection Parameters Update Request

INT-MIN = Min Connection Interval (2 bytes in little endian)

INT-MAX = Max Connection Interval (2 bytes in little endian)

LAT = Slave Latency (1 byte)

TO = Supervision Timeout (2 bytes in little endian)

Note: Once this command is sent, the leveling connection parameter update will stop. Disconnecting but remain advertising action may be needed.

0x2F 0x21 0x01: Set this device assigned

Note: Only Security SR command can unassign a device

0x2F 0x23 0x00: Do not enable Long-Range Mode

This command needs to be sent when the device is connected before the device enters Long-Range mode for every reconnection. Once the device enters Long-Range mode, disconnect/reconnect is needed to restart the process. Note, it

takes about 20 seconds for a device to enter Long-Range mode since it is connected.

0x30 0x03 [SCORE-ID] [TEMPO-BPM] [REPEATMORE]: Play SCORE-ID for (REPEATMORE + 1) times with the speed TEMPO-BPM

This command initiates the TONE PLAYING START/STOP callbacks.

0x30 0x04: Stop Playing

0x30 0x05 [SCORE-ID] [TEMPO-BPM] [REPEATMORE] [PENDING]:

Set the Disconnection Alert for this connection

PENDING = If the connection is not restored in [PENDING] seconds, start the alert. 0 to start immediately.

This setting is valid for only single connection. It does not last to the next reconnection.

0x30 0x05 0x00: Unset the Disconnection Alert

0x30 0x06 [SCORE-ID] [TEMPO-BPM] [REPEATMORE]: Set the Motion Alert for this connection

This setting is valid for only single connection. It does not last to the next reconnection.

0x30 0x06 0x00: Unset the Motion Alert

0x30 0x07: Set button-stoppable tone playing

Once this command is set, the tone playing can be stopped by any button click and NO button callback is sent back while the tone is playing. This is an un-reversible one-time setting. Once it is set, only the finish of the next tone playing can restore the flag.

[Inquiry Commands, Result will be send back through Callback Characteristics with Type 0x06]

0x06 0x03: Manufacturer Information

0x06 0x04: Bluetooth Device Address

0x06 0x05: Model Information

0x06 0x06: Hardware Version
0x06 0x07: Firmware Version
0x06 0x08: FCC Information
0x06 0x09: IC Information
0x06 0x0A: NCC Information
0x06 0x0B: [for Qmote app compatibility purpose only]
0x06 0x0C: Connection Parameters
0x06 0x0D: JRF Information
0x06 0x0E: [Obsolete command]
0x06 0x0F: tracMo configuration
0x06 0x10: tracMo production profile
0x06 0x11: tracMo Serial Number
0x06 0x12: peripheral diagnostics

Callback Characteristics

UUID: QBLINKS_128BUT_UUID (0x9A02)

Property: Notifiable/Read-Only

Length: 2 bytes or Variable

Data Structure: (Network Byte Order, the first byte is the type code)

[Event Notifications]

0x1F 0x01: Reserved for synchronization commands

0x1F 0x05 [...]: OAD status, refer to OAD specifications document

0x1F 0x06 [Power_Setting]: confirm the power output change

Refer to the Power Control section. If the power change due to device assignment/unassignment, no callback is sent back

0x1F 0x08: Motion detected

Motion detection can be triggered only once a minute. Please note, motion sensor is enabled only when the device is assigned.

0x1F 0x2F 0x03 0xFF: Unexpected Connection Parameters

When this callback is sent, connection parameters are in a high-power consumption mode under regular operation.

0x1F 0x2F 0x03 0x00: Unexpected Connection Parameters OAD

When this callback is sent, connection parameters are in a high-power consumption mode when OAD is unlocked.

0x1F 0x2F 0x1F 0xFF: Motion Sensor Failed

0x1F 0x2F 0x21 0x01: Device assignment acknowledged

0x1F 0x2F 0x21 0x00: Device un-assignment acknowledged

0x1F 0x2F 0x22 [N]: Emergency Button Configured

0x1F 0x2F 0x22 0x00: Emergency Button disabled

0x1F 0x2F 0x23 0x00: Long-Range Mode not supported or mode change failed

0x1F 0x2F 0x23 0x01: Long-Range Mode enabled

0x1F 0x30 0x03 [SCORE-ID]: Tone Playing Starts

0x1F 0x30 0x04: Tone Playing Finished

[Return of the Inquiry Commands]

0x06 0x03 [Manufacturer Info in ASCII]

0x06 0x04 [Bluetooth Device Address in ASCII]

0x06 0x05 [Model Info in ASCII]

0x06 0x06 [Hardware Version in ASCII]

0x06 0x07 [Firmware Version in ASCII]

0x06 0x08 [FCC Info in ASCII]

0x06 0x09 [IC Info in ASCII]

0x06 0x0A [NCC Info in ASCII]

0x06 0x0B 0 0

[for Qmote app compatibility purpose only]

0x06 0x0C [INT] [LAT] [TO]

INT = Connection Interval (2 bytes in little endian)

LAT = Slave Latency (1 byte)

TO = Supervision Timeout (2 bytes in little endian)

0x06 0x0D [JRF Info in ASCII]

0x06 0x0E [Number of Built-in Songs] (1 byte)

0x06 0x0F [tracMo configurations] (16 bytes)

0x06 0x10 [tracMo production profile] (10 bytes)

0x06 0x11 [tracMo Serial Number in ASCII] (8 bytes)

0x06 0x12 [tracMo diagnostics] (10 bytes)

[diag][RND][C.Num][C.Time][A1.Time][A2.Time]

[diag] (1 byte)

Bit 0: External Flash (1:OK, 0: failed or not exist)

Bit 1: Motion Sensor (1:OK, 0: failed or not exist)

Bit 2: Bluetooth 5 Long Range Mode (1: LR ready, 0: No LR)

Bit 3: SCLK_LF Source (1: abnormal, 0: external)

Bit 4: SCLK_LF Loss (1: loss, 0: normal)

Bit 5 ~ Bit 7: Reserved

[RND] (1 byte)

Random number assigned only once on each boot up

[C.Num] (2 bytes in little endian)

Statistics: Number of connections since boot up

[C.Time] (2 bytes in little endian)

Statistics: Total time of connection since boot up in quarter-hour

[A1.Time] (2 bytes in little endian)

Statistics: Total time of high power advertising since boot up in quarter-hour

[A2.Time] (2 bytes in little endian)

Statistics: Total time of low power advertising since boot up in quarter-hour

Button Characteristics

UUID: QBLINKS_128BIT_UUID (0x9A03)

Property: Notifiable

Length: 1 Byte

Data Structure: **[Button Accumulation Code]**

Note: There is no Code 0 as the button release in tracMo

Revision History

V1.0/2017-May-03

Init Version

V1.1/2017-July-04

Added OAD commands

V1.2/2017-Aug-18

Changed hardware profile

V1.4/2017-Sep-19

Added EBTN, Tone Playing feedback and motion control features

V1.5/2017-Sep-25

Added Bluetooth 5 Long Range Mode in the diagnostics info

V1.6/2017-Dec-28

Security fixes include: only unassigned device can be shutdown and only security SR command can unassign a device

V1.7/2018-Mar-19

Added Power Control

V1.8/2018-Mar-14

Added XOSC_LF Status

V1.9/2018-May-25

Changed Hardware Profile to Production Profile to include Branding Info

V1.10/2018-Dec-24

Revised based on the development specification V1.14