

# tracMo GATT Specification

This document is for tracMo Community Developers (2019-APR-24)

## 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, // or 0x1B if BTN is used

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,

Xn,

```

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
BTN           // Button Tracking Number only used when device is clicked

```

## Xn

This is a random value.

## 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 three things happen for the following 30 seconds.

1. BID-Hi in the active scan response is changed to 0xF0
2. Power\_Setting in the iBeacon format is changed to 0xCA

### BTN – Button Tracking Number

BTN is used with the tracMo station. When tracMo is clicked, BTN is added in the iBeacon advertising format. When tracMo station receives the BTN, it will relay the click to the Cloud. Each click increases the sequence number. tracMo station captures the BTN only when the sequence number is changed. Please note, zero is not a valid BTN. The format of the BTN:

Bit 6, Bit7: Click Count

Bit 0 ~ Bit 5: Sequence Number

## 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
```

## Tracmo Bluetooth Company Identifier

Tracmo, Inc, Bluetooth Company Identifier = 0x05F7

## 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)

## 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: current device assignment mode

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 production profile, including hardware and brand type information. 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: Brand Information.

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.

## Device Assignment Mode

There are different modes that can be used when the device is assigned. The assignment command is

0x2F 0x21 NN

where NN = Bit Mask Value

Bit-0: Must be 1 for the assignment operation

This bit must be 1, otherwise this action is voided.

Bit-1: Must be 0

Bit-2: Frequent Advertising Mode

Advertising Policy – Frequent Advertising Mode is ON.

Bit-3: Frequent Advertising Plus Motion Advertising Mode

Advertising Policy – Frequent Advertising plus Motion is ON. This mode has to be combined with Frequency Advertising Mode. If only Bit-3 is 1 but Bit-2, Bit-2 will be set to 1 automatically. The callback notification will show the Bit-2 is 1.

Bit-4: No iBeacon Advertising Mode

Advertising Policy – no iBeacon is used in the regular advertising periods.

Once the device is assigned, the mode cannot be changed. You need to use tracMo app to deactivate the device to restore the mode to the unassigned mode.

## 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

## 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]: Enable Motion Detection with 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 unless Frequent  
Adv Mode is used, the sensitivity is set to 1, which is the most  
sensitive.

**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 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 NN: Set this device assigned**

NN = Bit Mask Value

Bit-0: Must be 1 for the assignment operation

Bit-1: Must be 0

Bit-2: Frequent Advertising Mode

Bit-3: Frequent Advertising Plus Motion Advertising Mode

Bit-4: No iBeacon Advertising Mode

#### **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: [Obsolete command]**

**0x06 0x09:** [Obsolete command]  
**0x06 0x0A:** [Obsolete command]  
**0x06 0x0B:** [Obsolete command]  
**0x06 0x0C: Connection Parameters**  
**0x06 0x0D:** [Obsolete command]  
**0x06 0x0E:** [Obsolete command]  
**0x06 0x0F: tracMo configuration**  
**0x06 0x10: tracMo production profile**  
**0x06 0x11: tracMo SN (Major/Minor)**  
**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]

**0x01 0x00:**

**Periodic Callback. Generated every 15 minutes since the state is changed to connected**

**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 0x1F 0xFF: Motion Sensor Failed**

**0x1F 0x2F 0x21 NN: Device assignment acknowledgement, NN is the assignment mode**

**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 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 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)**

tracMo SN (Tracker ID). If a server-allocated one is used, the allocated one is returned.

**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