# EasyReach Solutions Pvt. Ltd.

# BLE iBeacon Configuration & User Guide

**Device Type:** BLE iBeacon Device
**Application:** nRF Connect
**Company:** EasyReach Solutions Pvt. Ltd.

## 1. Introduction

This document explains the BLE iBeacon payload structure, configuration process, and supported BLE commands used for device setup and testing.

The guide is intended for:

- BLE device testing
- Production configuration
- UUID/Major/Minor setup
- Advertising interval configuration
- Transmission power configuration

## 2. Initial Checkpoints

Before starting the configuration process, ensure the following:

- BLE Device is powered ON
- Android mobile phone is available
- Bluetooth is enabled
- Location Services are enabled
- Device Name or MAC Address is available

## 3. Mobile Application Installation

Install the following application from Google Play Store:

 **nRF Connect**

This application is used for:

- BLE scanning
- Device connection

*Figure 1 NRF Connect*

- Reading configuration
- Writing BLE commands

---

## 4. BLE iBeacon Payload Structure

The iBeacon payload is **30 bytes** long and consists of:

1. Fixed Header Data
2. Configurable Beacon Data
3. Fixed RSSI Data

---

### Example Payload

0x0201061AFF4C000215F9428FD9A3344FB28344A99C6C606CE60064000530

---

## 5. Payload Layout

| Index | Value | Description |
|---|---|---|
| **0** | 0x02 | Length of Flags field |
| **1** | 0x01 | Flags type |
| **2** | 0x06 | LE General Discoverable |
| **3** | 0x1A | Manufacturer Specific Data Length |
| **4** | 0xFF | Manufacturer Specific Data Type |
| **5** | 0x4C | Apple Company ID (MSB) |
| **6** | 0x00 | Apple Company ID (LSB) |
| **7** | 0x02 | iBeacon Type |
| **8** | 0x15 | iBeacon Payload Length |
| **9–24** | — | UUID |
| **25–26** | — | Major Number |
| **27–28** | — | Minor Number |
| **29** | 0x30 | RSSI at 1 Meter |

---

## 6. Fixed and Editable Bytes

### Fixed Bytes

- Bytes 0–8
- Byte 29

### Editable Bytes

- Bytes 9–28

Editable fields include:

- UUID
- Major
- Minor

---

## 7. Connecting to the Device

### Step 1 — Open nRF Connect

Launch the **nRF Connect** application.

---

### Step 2 — Configure Scan Filter

Set the following filter values:

| Parameter | Value |
|---|---|
| **Type** | Any |
| **Exclude** | None |
| **RSSI** | -100 dBm |

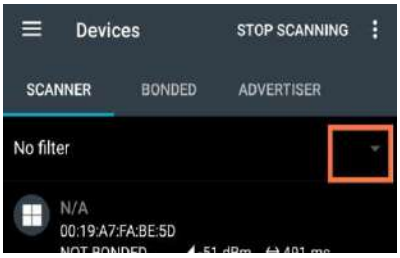



*Figure 2 Filter*

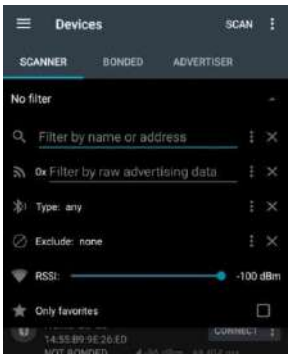



*Figure 3 Filter Settings*

### Step 3 — Search Device

1. Enter the Device Name or MAC ID
2. Click **Scan**
3. Select the device from discovered devices
4. Click **Connect**

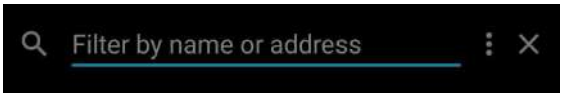



*Figure 4 Enter Device Name*

## 8. Password Authentication

- After successful connection:

1. Click on **Unknown Service**.

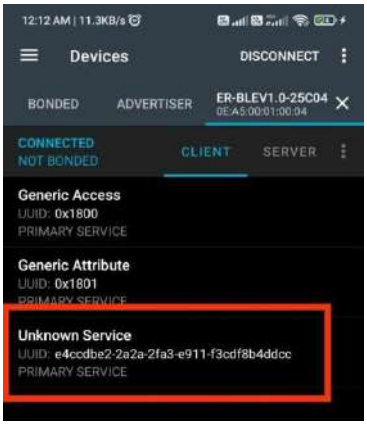



*Figure 5 Unknown Service*

2. Click the **downward-facing arrow** (3 arrows down symbol).

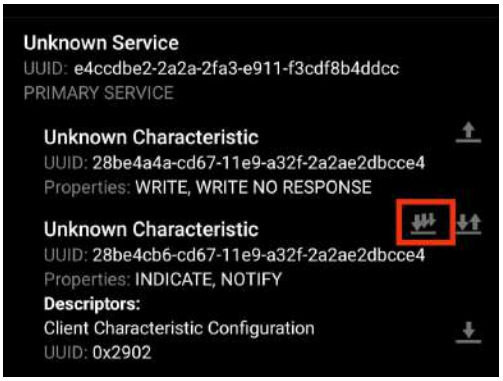



*Figure 7 Before*

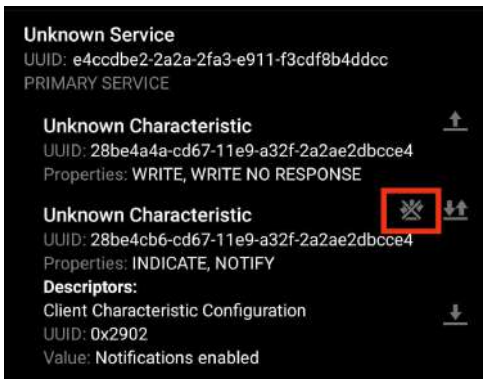



*Figure 6 After*

3. Click on the **Upward Arrow** symbol.

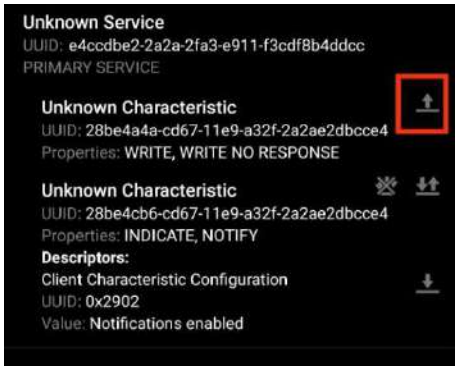



*Figure 8 Upload*

4. Set the **Data format** to **Text (UTF-8)**.

   - Select Text(UTF-8 from dropdown )

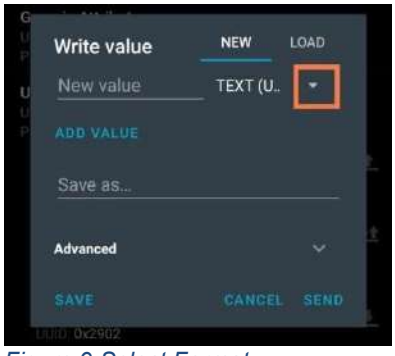



*Figure 9 Select Format*

5. Enter the **Password (New Value)**:
   - Password → 1234

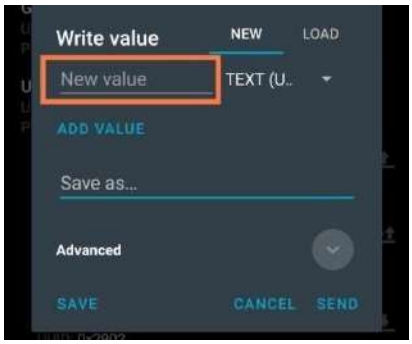



*Figure 10 Password*

6. Click **Send**.

---

### Important Authentication Notes

- Password must be entered within **30 seconds**
- If timeout occurs:
  - Device disconnects automatically
  - Reconnection is required

---

## 9. Steps to Send Any Command Using nRF Connect

After successful password authentication, follow the below steps to send any Read or Write command to the BLE device.

### Step 1 — Open Unknown Service

- After connecting and entering the password successfully:
  - Locate and open the **Unknown Service**
  - This is the custom BLE service used for EasyReach BLE communication
  - Click the **downward-facing arrow** (3 arrows down symbol).

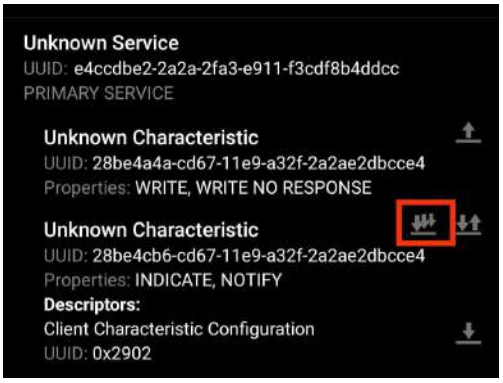



*Figure 11 Before*

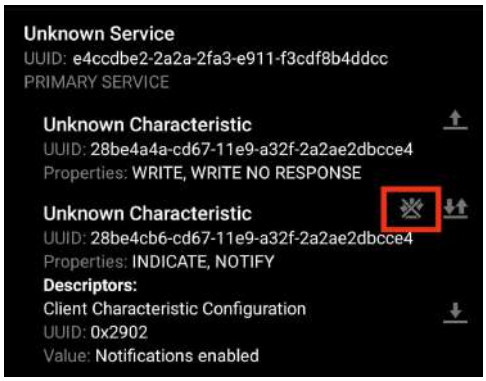



*Figure 12 After*

Step 2 — Open Write Characteristic

- Click on the **Upward Arrow (⬆□)** icon
- This option is generally named: Unknown Characteristic
  - Write
  - Send New Value
  - Upload

*Figure 13 Write Command*

## Step 3 — Select Data Format

Choose the proper format before sending commands:

| Command Type | Format |
|---|---|
| Text Commands | Text (UTF-8) |
| HEX Commands | BYTE ARRAY |

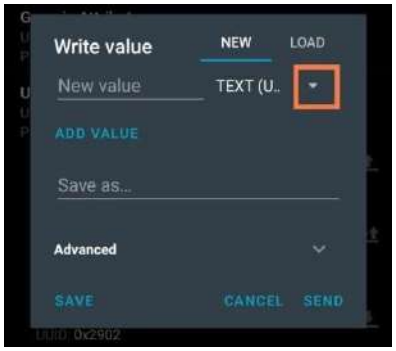
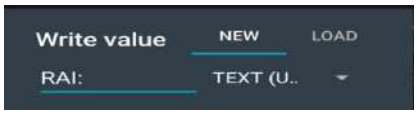



*Figure 14 Select Data Format*

---

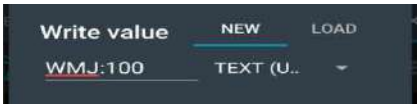
## Step 4 — Enter Command

Type the required command in the input field.




### Example — Read Command

RAI:




### Example — Write Command

WMJ:100

### Example — HEX Command

4341493A0003E8

---

## Step 5 — Send Command

- Click on **Send**
- Wait for the response from the device

---

# Important Notes

- Ensure the correct data format is selected before sending commands
- HEX commands must not contain spaces
- Keep the mobile phone near the BLE device during communication
- Incorrect command format may result in no response from the device

---

## Supported Commands

| Command | Description |
|---|---|
| **RSU** | Read UUID |
| **RMJ** | Read Major |
| **RMN** | Read Minor |
| **RAI** | Read Advertisement Interval |
| **RTP** | Read Transmission Power |
| **RPS** | Read Password |
| **WSU** | Update UUID |
| **WMJ** | Update Major |
| **WMN** | Update Minor |
| **CAI** | Change Advertisement Interval |
| **CTP** | Change Transmission Power |
| **CPS** | Change Password |

---

# 10. Read Commands

### Data Format

- Text (UTF-8)

### Examples

RSU:
RMJ:
RMN:
RAI:
RTP:
RPS:

These commands return the current configuration values.

---

# 11. Write Commands

Write commands are divided into:

1. Text Commands
2. HEX Commands

---

# 11.1 Text Write Commands

### Update UUID

WSU:12345678123456781234567812345678

### Notes

- UUID must be 16 bytes
- Enter 32 hexadecimal characters
- Do not use spaces or hyphens

---

### Update Major Number

WMJ:100

### Notes

- Valid Range: 0 to 65535

---

### Update Minor Number

WMN:200

### Notes

- Valid Range: 0 to 65535

---

### Change Password

CPS:1234567890

### Notes

- Password length must be exactly 10 digits
- Only numeric values are supported

---

## 11.2 HEX Write Commands

HEX commands must be sent using HEX mode.

---

# 12. Advertisement Interval Configuration

## Command Format

CAI:<interval>

## Advertisement Interval Table

| Interval | HEX Value | Final HEX Command |
|---|---|---|
| **1000 ms** | 03E8 | 4341493A0003E8 |
| **1500 ms** | 05DC | 4341493A0005DC |
| **2000 ms** | 07D0 | 4341493A0007D0 |
| **3000 ms** | 0BB8 | 4341493A000BB8 |
| **4000 ms** | 0FA0 | 4341493A000FA0 |

---

# 13. Transmission Power Configuration

## Command Format

CTP :<value>

## TX Power Table

| TX Power | HEX Value | Final HEX Command |
|---|---|---|
| **0 dBm** | 19 | 4354503A19 |
| **1 dBm** | 32 | 4354503A37 |
| **2 dBm** | 4B | 4354503A5B |
| **3 dBm** | 64 | 4354503A7F |

---

# 14. HEX Command Sending Rules

When sending HEX commands:

- Use HEX mode in nRF Connect
- Do not add spaces
- Send continuous HEX values

## Example

Instead of:

54 53 3A 07 E9 02 14

Send:

54533A07E90214

---

## 15. Important Notes & Best Practices

- Keep fixed payload bytes unchanged
- Enter commands exactly as specified
- Disconnect and reconnect after configuration changes
- Keep mobile device close during BLE communication
- Double-check HEX formatting before sending commands

---

## 16. Example Configuration Commands

WSU:12345678123456781234567812345678
WMJ:100
WMN:200
CAI:0003E8
CTP:19
CPS:1234567890

---

## 17. Company Information

**EasyReach Solutions Pvt. Ltd.**

BLE Device Configuration & Testing Guide

Pune
2nd Floor, CASP Bhavan, Baner Pashan Link Road, Pune, 411021

sales@easyreach.co.in