



EMBC Beacon Packet Specification



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1. GENERAL DESCRIPTION

The EMBCxx product line supports three key packet types:
Sensor Packet.
ID Data Packet
Alt Beacon Packet

This document provides the definitions and formatting of these packet types.

Unless otherwise noted, all packet types defined are Bluetooth advertising packets and are non-connectable, undirected advertising events (ADV_NONCONN_IND) which follow the GAP specification according to the Bluetooth Specification V4.0, Volume 3, Part C, Section 11.

1.1. ADVERTISING ADDRESS

In all cases a unique advertising address is transmitted as part of the header of the packet.

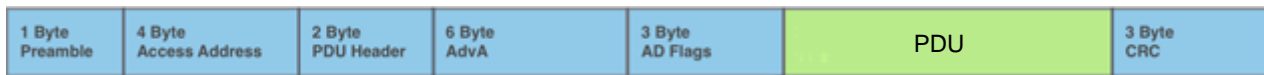
The first 3 octets of the device address are the EM Microelectronic OUI assigned address from the IEEE 802 committee: 0x0CF3EE.

The last 3 octets of the device address are uniquely assigned by EM Microelectronic.

The device address can be modified to any valid device address according to Bluetooth Specification V4.0 Volume 3 Section 1.3.

1.2. PAYLOAD

Each packet type defines a different payload that conforms with the Bluetooth Low Energy standard PDU(ADV_NONCONN_IND) as defined in *Bluetooth Specification Version 4.0, Volume 0, Part B, Section 4.4 Low Energy Core Configuration* or *Section 4.5 Basic Rate and Low Energy Combined Core Configuration*.



2. ID DATA PACKET

2.1. ID DATA PACKET FORMAT

The ID data packet format is described in the following specification: *Proximity Beacon Specification Release R1 Draft D1*, which can be obtained from Apple, Inc.

2.2. ID DATA ID NUMBERS

The following ID numbers are used:

- The EM standard UUID is: 699EBC80-E1F3-11E3-9A0F-0CF3EE3BC012
- The Major ID is a 16-bit unsigned non-zero value uniquely assigned by EM Microelectronic.
- The Minor ID is a 16-bit unsigned non-zero value uniquely assigned by EM Microelectronic.

2.3. ID DATA MEASURED POWER

Measured power as described in *Proximity Beacon Specification Release R1 Draft D1* with iPhone 5S.

3. ALT BEACON PACKET

AltBeacon is an open protocol specification that defines the format and contents of the advertisement message. Complete documentation on the standard and any updates to the standard can be found <http://altbeacon.org/>. Details included below are for reference of the implementation within the EMBCxx family of products and the details and definitions are sourced from the initial release of the AltBeacon specification.

The Alt Beacon Specification is free for any user to implement without royalties or fees and is not linked to any specific vendor or manufacturer. The data within the packet is used to uniquely identify the beacon, the manufacturer and the signal strength of the transmitted packet. The payload conforms with the Bluetooth Low Energy standard PDU(ADV_NONCONN_IND) as defined in *Bluetooth Specification Version 4.0*,

Volume 0, Part B, Section 4.4 Low Energy Core Configuration or Section 4.5 Basic Rate and Low Energy Combined Core Configuration.

3.1. ALT BEACON PACKET FORMAT

The Alt Beacon PDU consists of 28 bytes formatted to provide concise proximity advertising messages for the interchange of information between advertisers and scanners and maintain compliance with Bluetooth Specification v4.0 by utilizing defined advertising PDU and advertising data structures.

The AltBeacon advertisement makes use of the Manufacturer Specific Advertising Data structure as defined in Bluetooth Specification Version 4.0, Volume 3, Part C, Section 2.3 Advertising Channel PDU.

The AltBeacon advertisement is made up of a 1-byte length field, 1-byte type field and two-byte company identifier, as prescribed by the Manufacturer Specific Advertising Data structure format, followed by 24 additional bytes containing the beacon advertisement data.

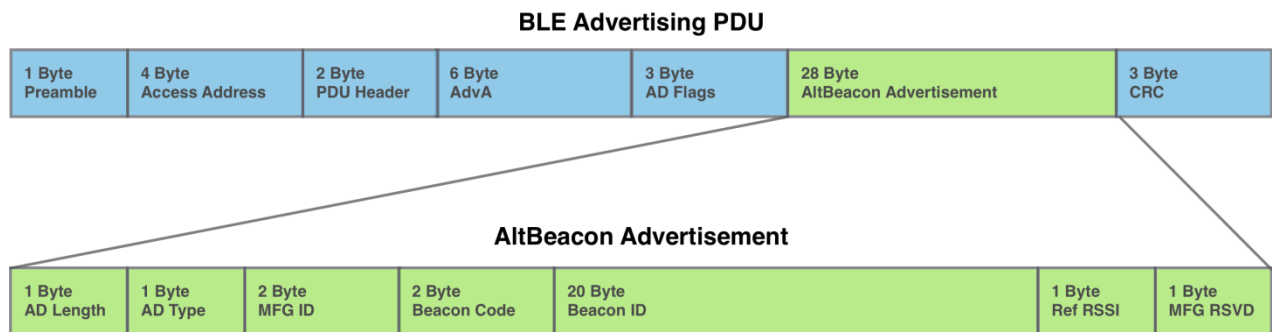


Figure 1: Alt Beacon Data Packet Format

3.2. ADVERTISEMENT LENGTH

This field contains the length of the type and data portion of the Manufacturer Specific advertisement data structure with a fixed definition of 0x1B.

3.3. ADVERTISEMENT TYPE

This field contains the Manufacturer Specific advertising data structure with a fixed definition of 0xFF.

3.4. MANUFACTURE ID

This field contains the beacon device manufacturer's company identifier code. The number is a little endian representation of EM Microelectronic ID manufacturer's company code (90 = 0x005A), as maintained by the Bluetooth SIG assigned numbers database.

3.5. BEACON CODE

This field contains the AltBeacon advertisement code. It is a big endian representation of the fixed value 0xBEAC.

3.6. BEACON ID

This field contains a 20 byte, big endian, unique identifier for the beacon. For EMBCxx products this has been defined using the UUID, Major & Minor ID values used in the for the ID data packet. The 20 byte value is defined as:

UUID(16 byte) + Major ID (2 byte) + Minor ID (2 byte)

As mentioned in the ID packet definition:

- The EM standard UUID is: 699EBC80-E1F3-11E3-9A0F-0CF3EE3BC012
- The Major ID is a 16-bit unsigned non-zero value uniquely assigned by EM Microelectronic.
- The Minor ID is a 16-bit unsigned non-zero value uniquely assigned by EM Microelectronic.

3.7. REFERENCE RSSI

This field contains the average received signal strength at 1m from the advertising beacon in free space. The value is a signed 1-byte value ranging from 0 to -127 in dBm.

3.8. MANUFACTURE RESERVED

This field is reserved for use by the manufacturer to implement special features. The byte can range from 0x00 to 0xFF and the interpretation of the value is evaluated based on the value of the MFG ID. For EMBCxx products

4. SENSOR DATA PACKET CONTENTS

Sensor Packet is a packet definition created by EM Microelectronic for the purpose of transmitting data about the status of the beacon and any connected sensors.

4.1. SENSOR DATA PACKET FORMAT

The Sensor data format is shown in the Figure 2 below and is 37 bytes long. The Advertise Address is in the first few columns and should conform to the BLE Device Address. The rest of the columns comprise the Advertise Data. The Advertise Data consists of the Local Name, Manufacturers ID and Data, each preceded by the length in bytes.

AdvAddress										AdvData																																		
EM specific adv address (public), from IEEE			beacon specific address from 6819 serial number lower 3 bytes							number of bytes to/including end of complete local name complete local name (18..3)										unique beacon number derived Minor ID (230..35)					end of complete local name	number of user data bytes to follow	manufacturer specific data, company identifier code			Manufacturer ID (low)	Manufacturer ID (high)	Sensor data (high)	Sensor data (low)	Model Number (ASCII, high)		Model Number (ASCII, low)		Battery Voltage(V)	number of packets transmitted (MSB)	number of packets transmitted	number of packets transmitted	number of packets transmitted (LSB)	Event Count (MSB)	Event Count (LSB)
0C	F3	EE	S2	S1	S0	0F	09	45	4D	42	65	61	63	6F	6E	32	33	30	33	35	00	0E	FF	5A	00	SD	SD	MN	MN	BB	PP	PP	PP	PP	EC	EC								

Figure 2: Sensor Data Packet Format

4.2. LOCAL NAME

The local name is made with the zero-terminated ASCII text: "EMBeaconABCDE", where ABCDE is the same as the Minor ID (including leading zeros).

4.3. MANUFACTURERS SPECIFIC DATA

Bluetooth Manufacturers Specific Data (0xFF).

4.4. MANUFACTURERS ID

The Manufacturers ID encoded with the EM Microelectronic ID from the Bluetooth SIG (90 = 0x005A), low byte first.

4.5. SENSOR READING

This field is a sensor reading. The highest nibble represents the sensor type, and the lower 3 nibble represents the sensor data. Sensor types and data format are listed in **Error! Reference source not found.**1 below.

Description	MS-nibble	Data Format
Light	0x0	12-bit unsigned int ie 0-4,095
Firmware Revision	0x1	BCD 4msb.4nsb.4lsb ie 2.5.0
Autocal Results	0x2	BCD 4msb/8lsb ie 7/35



Generic	0x3	12-bit unsigned int
Temperature	0x4	12-bit fixed-point 4 fractional bits 2's compliment le -0.25° C=0xFFC
Pressure	0x5	12-bit unsigned 0hPa=44,330m 300hPa = 9165.2m 1100hPa=-698.4m
Humidity	0x6	12-bit fixed-point 4 fractional bits 2's compliment 0.0-100.0%
Time	0x7	BCD: HH:MM Hour = 1-12 Minute = 0-59
Date	0x8	BCD: MM,-,DD Date: 1-31 Month: 1-12
Magnetic Field	0x9	12-bit fixed-point 4 fractional bits 2's compliment le +/-1300µT
Day	0xA	BCD: A/P,DD,YY 0="am" or 1= "pm"
Acceleration	0xB	12-bit fixed-point 6 fractional bits 2's compliment le +/-16g
Gyro	0xC	12-bit 2's compliment le +/-2000°/sec
Generic	0xD	12-bit unsigned int
Generic	0xE	12-bit unsigned int
Generic	0xF	12-bit unsigned int

4.6. MODEL NUMBER

This field is a model number. The 16-bit field is a 2-digit ASCII encoded value. For example, EMBC02 is encoded as "02" = 0x3032.

4.7. BATTERY VOLTAGE

The battery voltage is stored as a single byte in binary-coded decimal format (BCD) where the 4 most-significant bits are integer and the 4 least-significant bits are the decimal part. For example, 2.8V = 0x28.

4.8. TRANSMITTED PACKETS

The total number of advertisements actually transmitted since the battery was inserted is represented a 32-bit integer, MSB first.

4.9. EVENT COUNTER

This field will be a generic event counter. The highest nibble represents the event type, and the lower 3 nibbles represent the event count. Event types are listed in **Error! Reference source not found.** below.

Description	MS-nibble
Button Press	0x0
Low Battery	0x1
VCO Cal	0x2
Low Temperature	0x3
High Temperature	0x4
Low Pressure	0x5
High Pressure	0x6
Lights On	0x7



Lights Off	0x8
Close Magnet	0x9
Far Magnet	0xA
Any movement	0xB
Tap	0xC
Fall	0xD
Alarm	0xE
Buzzer	0xF

5. CONTACT INFORMATION

Inquiries for lead-times, quotes, orders:

EMDirect@emmicroelectronic.com

6. REFERENCE DOCUMENTS

EM9301 v22 Device specification
EM6819 B300 Device specification
Bluetooth Specification V4.0
Proximity Beacon Specification Release R1 Draft D



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