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## 1. Purpose

This document presents the current Bluetooth Low Energy (BLE) specification for the HxSmart module. The HxSmart device is a BLE device that acts as a peripheral server. The device is seen by a central client device with the following name structure: HX-XXXXXXXX. Where XXXXXXXX is the serial number of the device.

## 2. Device Services and Characteristics

### 2.1 Battery Service

| Characteristics | Description  | Address | Types | Permissions    |
|-----------------|--|---------|-------|----------------|
| Battery Level   | Battery level in percentage from 0% to 100%. It is represented to a uint8 from 0 to 100. | 0X2A19  | uint8 | Read<br>Notify |

### 2.2 Heart Rate Service

| Characteristics          | Description   | Address | Types  | Permissions |
|--------------------------|---|---------|--------|-------------|
| Heart Rate Measurement   | Heart rate value on 8 bit with RR-interval values if present. | 0x2A37  | uint32 | Notify      |
| Body Sensor Location     | Sensor location: Chest  | 0x2A38  | uint8  | Notify      |
| Heart Rate Control Point | Reset energy expended   | 0x2A39  | uint8  | Write       |

Note : RR intervals are represented in 1/1024 s. One heart rate packet could contain more than one RR interval value.

### 2.3 Device Information Service

| Device Information Service (DIS): 0x108A |                            |         |              |             |
|--|----------------------------|---------|--------------|-------------|
| Characteristics                          | Description                | Address | Types        | Permissions |
| Hardware Revision                        | Assembly hardware revision | 0x2A27  | UTF-8 String | Read        |
| Serial Number                            | Device serial number       | 0x2A25  | UTF-8 String | Read        |
| Model Number                             | Device model number        | 0x2A24  | UTF-8 String | Read        |
| Manufacturer Name                        | Manufacturer name          | 0x2A29  | UTF-8 String | Read        |
| Firmware Revision                        | Device firmware revision   | 0x2A26  | UTF-8 String | Read        |
| Software Revision                        | BLE stack revision         | 0x2A28  | UTF-8 String | Read        |

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## 2.4 Respiration Service

| Status Service : 0x3b55c581-bc19-48f0-bd8c-b522796f8e24 |   |                                       |             |             |
|---|---|---------------------------------------|-------------|-------------|
| Characteristics   | Description   | Address                               | Types       | Permissions |
| Respiration Rate Measurement                            | Respiration Rate value with inspiration/expiration detection value if present | 0x9bc730c3-8cc0-4d87-85bc573d6304403c | uint8 array | Notify      |

(Design similar to Heart Rate Service)

### Respiration Rate Measurement value formatting:

| LSB                    | MSB  |
|------------------------|--|
| Flags [1B] : mandatory | Respiration Rate Value [1B or 2B] : Mandatory    |
|                        | Inspiration/Expiration Value [n x 2B] : Optional |

### Respiration Rate Measurement Flags should be as follow:

- 0: Respiration Format bit (0: 8 bits, 1:16 bits)
- 1: Inspiration/Expiration interval bit (0:not present, 1: present)
- 2: First data type present (0: Inspiration, 1: Expiration)
- (3:7): Reserved / Sensor Quality

Note: Inspiration and expiration values are time intervals since the last Insp/Exp event, and are represented in 1/32 s. The principle is similar to the RR intervals from the Heart Rate Service

e.g. For a inspiration value of 0x00EA, we read a inspiration of  $234/32 \text{ s} = 7.3125 \text{ s}$

## 3. Peripheral Preferred Connection Parameters

These parameters are currently static.

Connection Interval

- Minimum : 30mS
- Maximum : 50mS

Slave Latency

- 0

Connection Supervision Timeout

- 300 mS

## 4. Advertisement Settings, Security Settings and Bonding Procedure

### 4.1 Advertisement Settings

Discovery mode

- General

Advertising Type

- Connectable undirected advertising

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## 4.1 Battery Service

### Filter Policy

- Scan Request : Any
- Connect Request : Any

### Advertising channel

- Channel 37, 38 and 39

### Fast Advertising interval

- Minimum : 20mS
- Maximum : 100mS
- Timeout : 60 000mS

### Slow Advertising interval

- Minimum : 1022.5mS
- Maximum : 1285mS
- Timeout : 120 000mS

## 4.2 Security Settings

### Security Mode

- Mode 1

### Security Level

- Unauthenticated pairing with encryption

### I/O capabilities

- No Input, No Output

### Bonding Requirement

- Yes

### Encryption Key Size

- 16 Bytes