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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 XXXXXXXXX is the serial number of the device.

2. Device Services and Characteristics

2.1 Battery Service

Battery Service (BAS) : 0x180F				
Characteristics	Description	Address	Types	Permissions
Battery Level	Battery level in percentage from 0% to 100%. It is represented on a uint8 from 0 to 100.	0x2A19	uint8	uint8

2.2 Heart Rate Service

Heart Rate Service (HRS) : 0x180D				
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	Read
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): 0x180A				
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 Hexoskin Proprietary Service

Data Service : 0x1DA084FD-E765-4BBA-AE78-EC747D0DABFA				
Characteristics	Description	Address	Types	Permissions
N/A	N/A	N/A	N/A	N/A

2.5 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	0x9bc730c3-8cc0-4d87-85bc-573d6304403c	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: 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 $234/32 \text{ s} = 7.3125 \text{ s}$

2.6 Accelerometer Service

Status Service : 0xBDC750C7-2649-4FA8-ABE8-FBF25038CDA3				
Characteristics	Description	Address	Types	Permissions
Accelerometer Measurement	Step count (if present), activity (if present), and cadence (if present)	0x75246A26-237A-4863-ACA6-09B639344F43	uint8 array	Notify

(Design similar to Heart Rate Service)

Accelerometer Measurement Values formatting:

LSB		MSB
Flags [1B] : mandatory	Step Count Value [2B] : Optional	Activity Value [2B] : Optional
Flags [1B] : mandatory	Cadence Value [2B] : Optional	Cadence Value [2B] : Optional

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Accelerometer Measurement Flags should be as follow:

- 0: Step Count present bit (0: not present, 1: present)
- 1: Activity present bit (0: not present, 1: present)
- 2: Cadence present bit (0: not present, 1: present)
- (3:7): Reserved / Sensor Quality

Note: Activity value is represented in 1/256 g. The principle is similar to the RR intervals from the Heart Rate Service.

- e.g. For a activity value of 0x00EA, we read a activity of 234/256 g = 0.9140625 g

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

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