GATT Specification Supplement

***Bluetooth*® Document**

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Abstract:

This document contains the definitions for all GATT characteristics and characteristic descriptors, with the exception of those defined in the Bluetooth Core Specification or in Bluetooth service specifications.

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Contents

1 Introduction

This document contains the definitions for all adopted GATT characteristics and characteristic descriptors, with the exception of those defined in the Bluetooth Core Specification [1] or in Bluetooth service specifications.

Note that the terms Reserved for Future Use (RFU) and Prohibited are defined in the specifications that reference characteristics and descriptors defined in this document.

This is not a Bluetooth specification, therefore, the established Bluetooth SIG specification language conventions for use of the words ***shall***, ***shall not***, ***must***, ***should***, ***should not***, ***may***, and ***can*** do not apply to this document.

2 Conventions used in this document

Common default rules for interpretation of characteristics and descriptors are defined in the following subsections. These rules apply unless otherwise explicitly overridden by a specific characteristic or description definition.

2.1 Data Types

The term “data type” in this document refers to the data type definitions in the Bluetooth Core Specification, Volume 1, Part E, Section 2.9 [1].

In addition, the following data type conventions apply:

- The medfloat32 data type is sometimes referred to as an FLOAT in specifications
- The medfloat16 data type is sometimes referred to as an SFLOAT in specifications
- An array of a data type is represented as the data type followed by the array size in brackets (e.g., uint8[4])
- A variable array is represented as a range for the array size (e.g., sint12[0-2])
- A bitfield is represented as an array of the boolean data type (e.g., boolean[8])
- An enumeration is represented as an unsigned integer (e.g., uint8)

2.1.1 Special medfloat32 and medfloat16 values

IEEE 11073-20601 [2] defines a set of five reserved special values for FLOAT and SFLOAT encoding shown in the table below. As specified in Section 2.1, these IEEE 11073-20601 are equivalent to the data types of medfloat32 and medfloat16 respectively.

FLOAT (medfloat32)	SFLOAT (medfloat16)	Meaning
0x007FFFFF	0x07FF	Not a Number (NaN)
0x007FFFFE	0x07FE	Positive Infinity (+inf)
0x00800002	0x0802	Negative Infinity (-inf)
0x00800000	0x0800	Not at this Resolution (NRes)
0x00800001	0x0801	Reserved for Future Use

Table 2.1: Special FLOAT (medfloat32) and SFLOAT (medfloat16) values

2.2 Units

In this document, units are represented using terms of the form org.bluetooth.unit.xxx.yyy, where “xxx” represents a measurable quantity and “yyy” represents the actual unit. An example is org.bluetooth.unit.time.second, where “time” is the measured quantity and “second” is the unit. “yyy” is absent in quantities that have no unit, as in org.bluetooth.unit.unitless. 16-bit UUIDs for these units are found in the Bluetooth SIG Assigned Numbers [4] with an “Allocation type” of “GATT Unit” and an “Allocated for” value of “xxx (yyy)”, for example “frequency (hertz)”.

2.3 Values and represented values

The characteristic or descriptor value associated with a characteristic or descriptor is a raw value that is not self-describing. Each value contains one or more fields. The interpretation of the meaning of the raw value stored in the characteristic or descriptor is defined in the characteristic or descriptor definition.

2.3.1 Interpretation of values

Binary, hexadecimal, and decimal values in this document follow the conventions in Volume 1 Part E Section 2.1 of the Bluetooth Core Specification [1].

Some values in this document are divided into individual bits which each have a definition. Unless explicitly specified, the bit definition represents the meaning when the bit equals 1 (sometimes referred to as True) and the opposite of the meaning when the value is 0 (sometimes referred to as False).

Where a range is given (e.g., 0 to 100, 0–15,) then the range always includes both endpoints unless explicitly stated otherwise.

2.3.2 Scalar values

When a field represents a scalar value, the represented value (R) is related to the raw value (C) by the following equation:

$$R = C * M * 10^{d} * 2^{b}$$

Where:

M = multiplier, positive or negative integer (between -10 and +10)

d = decimal exponent, positive or negative integer

b = binary exponent, positive or negative integer

For example, to represent a length in meters with a resolution of 0.1 meter:

Unit: meter

M = 1, d = -1, b = 0

To represent a duration in seconds with a resolution of 1/256 second:

Unit: second

M = 1, d = 0, b = -8

To represent the number of rotations of a wheel with a resolution of 1/5 rotation:

Unit: unitless

M = 2, d = -1, b = 0

If values are not specified, then M = 1, d = 0, and b = 0.

2.4 Representation of multi-field characteristics or descriptors

The ordering principles in this section apply when a table is used to describe a characteristic or descriptor value that is made up of multiple fields, unless explicitly specified by the characteristic or descriptor definition.

- Fields are not necessarily aligned to octet boundaries.
- Fields in the table are assigned starting with the topmost field in the table and the Least Significant Octet (LSO, octet 0) of the value.

- The Least Significant Bit (LSB, bit number 0) of the topmost field in the table is the LSB of the LSO of the value.
- The LSB of each subsequent field in the table is the bit position after the Most Significant Bit (MSB) of the field above it in the table or, if the previous field ended with the MSB of an octet, the LSB of the next octet of the value.
- Subsequent bits of each field, in order from least to most significant, are assigned to subsequent bits (from LSB to MSB) of the same octet; after the MSB of an octet is used, the next bit is assigned to the LSB of the next octet.
- The MSB of the last field in the table is in the MSO of the value and that determines the number of octets in the value.

When all fields in a table are an integer number of octets, the Size column specifies the size in octets, as shown in the example in Table 2.2.

Field	Data Type	Size (in octets)	Description
Field 1	xxx	2	This field is octet 0 (LSO) and octet 1.
Field 2	xxx	3	This field is octets 2, 3, and 4.
Field 3	xxx	2	This field is octet 5 and octet 6 (MSO).

Table 2.2: Ordering example where all fields are an integer number of octets

When one or more fields in a table are not an integer number of octets, the Size column specifies the size in bits as shown in the example in Table 2.3.

Field	Data Type	Size (in bits)	Description
Field 1	xxx	4	This field is bits 0 to 3 of octet 0 (LSO).
Field 2	xxx	2	This field is bits 4 and 5 in octet 0.
Field 3	xxx	8	Bits 0 and 1 of this field are in bits 6 and 7 of octet 0. Bits 2 to 7 of this field are in bits 0 to 5 of octet 1.
Field 4	xxx	2	This field is bits 6 and 7 of octet 1 (MSO).

Table 2.3: Ordering example where at least one field is not an integer number of octets

If a characteristic or descriptor is composed of multiple fields, all fields are mandatory unless otherwise specified.

All fields in a characteristic or descriptor are little endian unless otherwise stated.

2.5 CRC calculation

If not defined in the service, the CRC is defined using a CRC-CCITT generator polynomial $g(D)=D^{16}+D^{12}+D^{5}+1$ (i.e., 210041 in octal representation) with a seed of 0xFFFF.

The CRC shift register is filled with 1s before calculating the CRC. Octets are fed through the CRC generator least significant bit first.

The most significant parity octet is transmitted first (where the CRC shift register is viewed as shifting from the least significant bit towards the most significant bit). Therefore, the transmission order of the parity octets within the CRC shift register is as follows:

x[8], x[9], …, x[15], x[0], x[1], …, x[7] (last)

where x[15] correspondents to the highest power CRC coefficient and x[0] corresponds to the lowest power coefficient.

The switch is set in position 1 while the data is shifted in. After the last bit has entered the Linear Feedback Shift Register (LFSR), the switch (S) is set in position 2 to access the register contents.

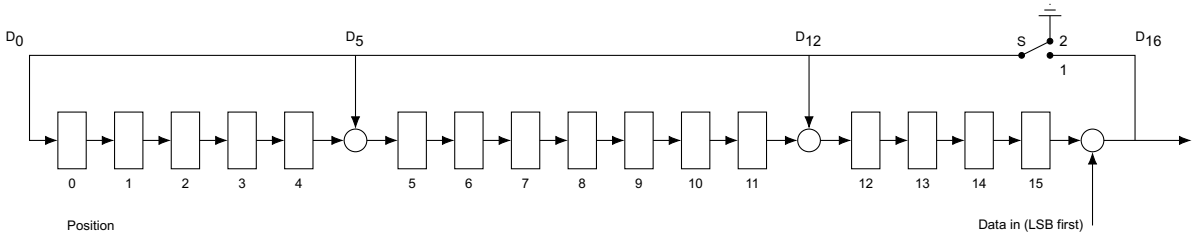

Figure 2.1: LFSR circuit generating the CRC

The computation for a sample with 10 octets of data is the following:

data[0] = 0x3E
data[1] = 0x01
data[2] = 0x02
data[3] = 0x03
data[4] = 0x04
data[5] = 0x05
data[6] = 0x06
data[7] = 0x07
data[8] = 0x08
data[9] = 0x09

→ CRC = 01 2F (LSO … MSO)

Based on little endianness the output of the shift register is 0x2F01 (MSO…LSO).

Note: See also Volume 2, Part B, Section 7.1.2 in [1] for more details. For E2E-CRC the Linear Feedback Shift Register is initially loaded with a seed of 0xFFFF instead of the UAP and the calculation is done in the same way.

3 Characteristics

The characteristics in this section are listed in alphabetical order.

3.1 Acceleration

The Acceleration characteristic is used to represent the acceleration of an object along a given axis as determined by the service.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Acceleration	sint32	4	Base Unit: org.bluetooth.unit.acceleration.metres_per_seconds_-squared Represented values: M = 1, d = -3, b = 0 Unit is meter per second squared with a resolution of 1mm per second squared. A value of 0x7FFFFFFF represents ”value is not known”.

Table 3.1: Structure of the Acceleration characteristic

3.2 Activity Goal

The Activity Goal characteristic is used to represent the goal or target of a user, such as number of steps or total energy expenditure, related to a physical activity session.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Presence Flags	boolean[8]	1	See Section 3.2.1
Total Energy Expenditure	uint16	0 or 2	Base Unit: org.bluetooth.unit.energy.joule Represented values: M = 1, d = 3, b = 0 Unit is joule with a resolution of 1000 J. Present if bit 0 of Presence Flags field is set to 1
Normal Walking Steps	uint24	0 or 3	Unit: org.bluetooth.unit.unitless Present if bit 1 of Presence Flags field is set to 1
Intensity Steps	uint24	0 or 3	Unit: org.bluetooth.unit.unitless Present if bit 2 of Presence Flags field is set to 1
Floor Steps	uint24	0 or 3	Unit: org.bluetooth.unit.unitless Present if bit 3 of Presence Flags field is set to 1
Distance	uint24	0 or 3	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = 1, b = 0 Unit is meter with a resolution of 1 m. Present if bit 4 of Presence Flags field is set to 1
Duration of Normal Walking	uint24	0 or 3	Unit: org.bluetooth.unit.time.second Present if bit 5 of Presence Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Duration of Intensity Walking	uint24	0 or 3	Unit: org.bluetooth.unit.time.second Present if bit 6 of Presence Flags field is set to 1

Table 3.2: Structure of the Activity Goal characteristic

3.2.1 Presence Flags field

The presence of a conditional field of the Activity Goal characteristic is dependent on the Presence Flags field value. When the respective Presence Flags field bit is set to 1, the field is present.

The bits of this field are defined below.

Bit	Definition
0	Total Energy Expenditure Present
1	Normal Walking Steps Present
2	Intensity Steps Present
3	Floor Steps Present
4	Distance Present
5	Duration of Normal Walking Present
6	Duration of Intensity Walking Present
7	Reserved for Future Use

Table 3.3: Presence Flags field

3.3 Aerobic Heart Rate Lower Limit

The Aerobic Heart Rate Lower Limit characteristic is used to represent the desired lower limit of the heart rate, where a user enhances his or her endurance while exercising.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Aerobic Heart Rate Lower Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.4: Structure of the Aerobic Heart Rate Lower Limit characteristic

3.4 Aerobic Heart Rate Upper Limit

The Aerobic Heart Rate Upper Limit characteristic is used to represent the desired upper limit of the heart rate, where a user enhances his or her endurance while exercising.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Aerobic Heart Rate Upper Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.5: Structure of the Aerobic Heart Rate Upper Limit characteristic

3.5 Aerobic Threshold

The Aerobic Threshold characteristic is used to represent the aerobic threshold of a user. Aerobic Threshold and Anaerobic Threshold characteristics together with the Sport Type For Aerobic And Anaerobic Thresholds characteristic describe the metabolic thresholds of the user. The Sport Type For Aerobic And Anaerobic Thresholds characteristic value identifies how the measurement was performed.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Aerobic Threshold	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.6: Structure of the Aerobic Threshold characteristic

3.6 Age

The Age characteristic is used to represent the age of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Age	uint8	1	Unit: org.bluetooth.unit.time.year

Table 3.7: Structure of the Age characteristic

3.7 Alert Category ID

The Alert Category ID characteristic is used to represent predefined categories of alerts and messages.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Category ID	uint8	1	See Section 3.7.1

Table 3.8: Structure of the Alert Category ID characteristic

3.7.1 Category ID field

The values of this field are defined below.

Value	Definition
0	Simple Alert
1	Email
2	News
3	Call
4	Missed Call
5	SMS/MMS
6	Voice Mail
7	Schedule
8	High Prioritized Alert
9	Instant Message
10–250	Reserved for Future Use
251–255	Defined by Service Specification

Table 3.9: Category ID field

3.8 Alert Category ID Bit Mask

The Alert Category ID Bit Mask characteristic is used to represent support for predefined Category IDs.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Category ID Bit Mask	boolean[16]	2	See Section 3.8.1

Table 3.10: Structure of the Alert Category ID Bit Mask characteristic

3.8.1 Category ID Bit Mask field

This field is a bit mask spanning one or more octets. If a bit is set to 0, the associated feature is not supported. If the bit is set to 1, the associated feature is supported.

The following bits are defined for the Category ID Bit Mask field:

Bit	Definition
0	Simple Alert
1	Email
2	News
3	Call
4	Missed Call
5	SMS/MMS

Bit	Definition
6	Voice Mail
7	Schedule
8	High Prioritized Alert
9	Instant Message
10–15	Reserved for Future Use

Table 3.11: Category ID Bit Mask field

3.9 Alert Level

The Alert Level characteristic is used to represent the level of an alert.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Alert Level	uint8	1	0x00: No Alert 0x01: Mild Alert 0x02: High Alert 0x03–0xFF: Reserved for Future Use

Table 3.12: Structure of the Alert Level characteristic

3.10 Alert Notification Control Point

The Alert Notification Control Point characteristic is used to enable device-specific procedures related to alert notification.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Command ID	uint8	1	0: Enable New Incoming Alert Notification 1: Enable Unread Category Status Notification 2: Disable New Incoming Alert Notification 3: Disable Unread Category Status Notification 4: Notify New Incoming Alert immediately 5: Notify Unread Category Status immediately 6–255: Reserved for Future Use
Category ID	struct	1	This field shows the target category to which the command ID applies. Refer to Section 3.7, Alert Category ID characteristic.

Table 3.13: Structure of the Alert Notification Control Point characteristic

3.11 Alert Status

The Alert Status characteristic is used to represent the status of a phone alert.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Alert Status	boolean[8]	1	See Section 3.11.1

Table 3.14: Structure of the Alert Status characteristic

3.11.1 Alert Status field

This field is a bit map of bits that represents alert states of the server device.

The bits of this field are defined below.

Bit	Definition
0	Ringer State 0 = Ringer State not active 1 = Ringer State active
1	Vibrate State 0 = Vibrate State not active 1 = Vibrate State active
2	Display Alert Status 0 = Display Alert Status not active 1 = Display Alert Status active
3–7	Reserved for Future Use

Table 3.15: Alert Status field

3.12 Ammonia Concentration

The Ammonia Concentration characteristic is used to represent a measure of ammonia (NH_3) concentration.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Ammonia Concentration	medfloat16	2	Unit: org.bluetooth.unit.density.kilogram_per_cubic_meter The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.16: Structure of the Ammonia Concentration characteristic

3.13 Anaerobic Heart Rate Lower Limit

The Anaerobic Heart Rate Lower Limit characteristic is used to represent the desired lower limit of the heart rate, where a user enhances his or her anaerobic tolerance while exercising.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Anaerobic Heart Rate Lower Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.17: Structure of the Anaerobic Heart Rate Lower Limit characteristic

3.14 Anaerobic Heart Rate Upper Limit

The Anaerobic Heart Rate Upper Limit characteristic is used to represent the desired upper limit of the heart rate, where a user enhances his or her anaerobic tolerance while exercising.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Anaerobic Heart Rate Upper Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.18: Structure of the Anaerobic Heart Rate Upper Limit characteristic

3.15 Anaerobic Threshold

The Anaerobic Threshold characteristic is used to represent the anaerobic threshold of a user. The Aerobic Threshold and Anaerobic Threshold characteristics together with the Sport Type For Aerobic And Anaerobic Thresholds characteristic describe the metabolic thresholds of the user. The Sport Type For Aerobic And Anaerobic Thresholds characteristic value identifies how the measurement was performed.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Anaerobic Threshold	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.19: Structure of the Anaerobic Threshold characteristic

3.16 Apparent Energy 32

The Apparent Energy 32 characteristic is used to represent the integral of Apparent Power over a time interval.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Apparent Energy 32	uint32	4	Unit is kilovolt ampere hour with resolution of 1 volt ampere hour. Minimum: 0 Maximum: 4294967.293 Represented values: M = 1, d = -3, b = 0 Unit: org.bluetooth.unit.electrical_apparent_energy.kilovolt_ampere_hour A value of 0xFFFFFFFE represents ”value is not valid”. A value of 0xFFFFFFFF represents ”value is not known”.

Table 3.20: Structure of the Apparent Energy 32 characteristic

3.17 Apparent Power

The Apparent Power characteristic is used to represent the product of the quadratic mean values of voltage and current.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Apparent Power	uint24	3	Unit is volt ampere with resolution of 0.1. Minimum: 0 Maximum: 1677721.3 Represented values: M = 1, d = -1, b = 0 Unit: org.bluetooth.unit.electrical_apparent_power.volt_ampere A value of 0xFFFFFE represents ”value is not valid”. A value of 0xFFFFFF represents ”value is not known”.

Table 3.21: Structure of the Apparent Power characteristic

3.18 Apparent Wind Direction

The Apparent Wind Direction characteristic is used to represent the apparent wind direction. The apparent wind direction is the wind experienced by an observer in motion and is the relative direction of the wind in relation to the observer. For example, the apparent wind direction aboard a boat is given in degrees relative to the heading of the boat. The apparent wind direction is reported by the direction from which it appears to originate. For example, an apparent wind coming from a direction that is 45 degrees clockwise relative to the heading of the observer is given as 45 degrees; one that is from a direction 45 degrees anti-clockwise relative to the heading of the observer is given as 315 degrees.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Apparent Wind Direction	uint16	2	Base Unit: org.bluetooth.unit.plane_angle.degree Minimum value: 0 Maximum value: 359.99 Represented values: M = 1, d = -2, b = 0 Unit is degrees with a resolution of 0.01 degrees.

Table 3.22: Structure of the Apparent Wind Direction characteristic

3.19 Apparent Wind Speed

The Apparent Wind Speed characteristic is used to represent the apparent wind speed. The apparent wind speed is the wind experienced by an observer in motion and is the relative speed of the wind in relation to the observer.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Apparent Wind Speed	uint16	2	Base Unit: org.bluetooth.unit.velocity.metres_per_second Represented values: M = 1, d = -2, b = 0 Unit is in meters per second with a resolution of 0.01 m/s.

Table 3.23: Structure of the Apparent Wind Speed characteristic

3.20 Average Current

The Average Current characteristic is used to represent average electric current over a period of time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Electric Current Value	struct	2	Refer to the Electric Current characteristic in Section 3.79.
Sensing Duration	struct	1	Refer to the Time Exponential 8 characteristic in Section 3.229.

Table 3.24: Structure of the Average Current characteristic

3.21 Average Voltage

The Average Voltage characteristic is used to represent average voltage over a period of time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Voltage Value	struct	2	Refer to the Voltage characteristic in Section 3.252.
Sensing Duration	struct	1	Refer to the Time Exponential 8 characteristic in Section 3.229.

Table 3.25: Structure of the Average Voltage characteristic

3.22 Barometric Pressure Trend

The Barometric Pressure Trend characteristic is used to represent the trend observed for barometric pressure.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Barometric Pressure Trend	uint8	1	See Section 3.22.1

Table 3.26: Structure of the Barometric Pressure Trend characteristic

3.22.1 Barometric Pressure Trend field

The values of this field are defined below.

Value	Definition
0	Unknown
1	Continuously falling
2	Continuously rising
3	Falling, then steady
4	Rising, then steady
5	Falling before a lesser rise
6	Falling before a greater rise
7	Rising before a greater fall
8	Rising before a lesser fall
9	Steady
10–255	Reserved for Future Use

Table 3.27: Barometric Pressure Trend field

3.23 Battery Critical Status

The Battery Critical Status characteristic is used to represent that the device will possibly not function as expected due to low energy or service required.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Battery Critical Status	boolean[8]	1	See Section 3.23.1.

Table 3.28: Structure of the Battery Critical Status characteristic

3.23.1 Battery Critical Status field

The values of this field are defined below.

Bit	Definition
0	Critical Power State
1	Immediate Service Required
2–7	RFU

Table 3.29: Battery Critical Status field

3.24 Battery Energy Status

The Battery Energy Status characteristic is used to represent details about the energy status of the battery.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.24.1.
External Source Power	medfloat16	0 or 2	The total power being consumed from an external power source in watts for its Battery Aggregation Group. Base unit: org.bluetooth.unit.power.watt Allowed values are 0 and all positive real numbers. Present if bit 0 of the Flags field is set to 1
Present Voltage	medfloat16	0 or 2	The present terminal voltage of the battery in volts. Base unit: org.bluetooth.unit.electric_potential_difference.volt Allowed values are all real numbers. Present if bit 1 of the Flags field is set to 1
Available Energy	medfloat16	0 or 2	The available energy of the battery in kilowatt-hours in its current charge state. Base unit: org.bluetooth.unit.energy.kilowatt_hour Allowed values are 0 and all positive real numbers. Present if bit 2 of the Flags field is set to 1
Available Battery Capacity	medfloat16	0 or 2	The capacity of the battery in kilowatt-hours at full charge in its current condition. Base unit: org.bluetooth.unit.energy.kilowatt_hour Allowed values are 0 and all positive real numbers. Present if bit 3 of the Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Charge Rate	medfloat16	0 or 2	The energy flowing into the battery in watts. Positive values indicate charging, and negative values indicate discharging. Base unit: org.bluetooth.unit.power.watt Allowed values are all real numbers. Present if bit 4 of the Flags field is set to 1
Available Energy at Last Charge	medfloat16	0 or 2	The available energy of the battery in kilowatt-hours in its last charge state. Base unit: org.bluetooth.unit.energy.kilowatt_hour Allowed values are 0 and all positive real numbers. Present if bit 5 of the Flags field is set to 1

Table 3.30: Structure of the Battery Energy Status characteristic

3.24.1 Flags field

The values of this field are defined below.

Bit	Definition
0	External Source Power Present
1	Present Voltage Present
2	Available Energy Present
3	Available Battery Capacity Present
4	Charge Rate Present
5	Available Energy at Last Charge Present
6–7	RFU

Table 3.31: Flags field

3.25 Battery Health Information

The Battery Health Information characteristic is used to represent the health of a battery.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.25.1.
Cycle Count Designed Lifetime	uint16	0 or 2	Represents the designed number of charge cycles supported by the device where one charge cycle is a discharge equivalent to the capacity of the battery at full charge in its current condition. Unit is unitless with a resolution of 1. Present if bit 0 of the Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Min Designed Operating Temperature	sint8	0 or 1	Represents the minimum designed operating temperature of the battery. Base Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius A raw value of 0x7F represents: Greater than 126. A raw value of 0x80 represents: Less than -127. Present if bit 1 of the Flags field is set to 1
Max Designed Operating Temperature	sint8	0 or 1	Represents the maximum designed operating temperature of the battery. Base Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius A raw value of 0x7F represents: Greater than 126. A raw value of 0x80 represents: Less than -127. Present if bit 1 of the Flags field is set to 1

Table 3.32: Structure of the Battery Health Information characteristic

3.25.1 Flags field

The values of this field are defined below.

Bit	Definition
0	Cycle Count Designed Lifetime Present
1	Min and Max Designed Operating Temperature Present
2–7	RFU

Table 3.33: Flags field

3.26 Battery Health Status

The Battery Health Status characteristic is used to represent several aspects of battery health.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.26.1.
Battery Health Summary	uint8	0 or 1	Represents aggregation of the overall health of the battery where 100% represents new working condition and 0% represents the end of its expected lifetime when replacement is required. The value within this range is determined by the implementation. Unit is percentage with a resolution of 1. Allowed range is 0 to 100. Base unit: org.bluetooth.unit.percentage Present if bit 0 of the Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Cycle Count	uint16	0 or 2	Represents the count value of charge cycles where one charge cycle is a discharge equivalent to the capacity of the battery at full charge in its current condition. Unit is unitless with a resolution of 1. Present if bit 1 of the Flags field is set to 1
Current Temperature	sint8	0 or 1	Represents the current temperature of the battery. Base Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius A raw value of 0x7F represents: Greater than 126. A raw value of 0x80 represents: Less than -127. Present if bit 2 of the Flags field is set to 1
Deep Discharge Count	uint16	0 or 2	Represents the number of times the battery was completely discharged. Unit is unitless with a resolution of 1. Present if bit 3 of the Flags field is set to 1

Table 3.34: Structure of the Battery Health Status characteristic

3.26.1 Flags field

The values of this field are defined below.

Bit	Definition
0	Battery Health Summary Present
1	Cycle Count Present
2	Current Temperature Present
3	Deep Discharge Count Present
4–7	RFU

Table 3.35: Flags field

3.27 Battery Information

The Battery Information characteristic is used to represent the physical characteristics of a battery in the context of the battery's connection in a device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.27.1.
Battery Features	boolean[8]	1	The supported features of the battery. See Section 3.27.2.

Field	Data Type	Size (in octets)	Description
Battery Manufacture Date	uint24	0 or 3	Battery date of manufacture specified as days elapsed since the Epoch (Jan 1, 1970) in the Coordinated Universal Time (UTC) time zone. Refer to the Date UTC characteristic in Section 3.72. Base unit: org.bluetooth.unit.time.day Present if bit 0 of the Flags field is set to 1
Battery Expiration Date	uint24	0 or 3	Battery expiration date specified as days elapsed since the Epoch (Jan 1, 1970) in the Coordinated Universal Time (UTC) time zone. Refer to the Date UTC characteristic in Section 3.72. Base unit: org.bluetooth.unit.time.day Present if bit 1 of the Flags field is set to 1
Battery Designed Capacity	medfloat16	0 or 2	The capacity of the battery in kilowatt-hours at full charge in original (new) condition. Base unit: org.bluetooth.unit.energy.kilowatt_hour Allowed values are all positive real numbers. Present if bit 2 of the Flags field is set to 1
Battery Low Energy	medfloat16	0 or 2	The battery energy value in kilowatt-hours when the battery is low. Base unit: org.bluetooth.unit.energy.kilowatt_hour Allowed values are all positive real numbers. Present if bit 3 of the Flags field is set to 1
Battery Critical Energy	medfloat16	0 or 2	The battery energy value in kilowatt-hours when the battery is critical. Base unit: org.bluetooth.unit.energy.kilowatt_hour Allowed values are all positive real numbers. Present if bit 4 of the Flags field is set to 1
Battery Chemistry	uint8	0 or 1	See Section 3.27.3. Present if bit 5 of the Flags field is set to 1
Nominal Voltage	medfloat16	0 or 2	Nominal voltage of the battery in units of volts. Base unit: org.bluetooth.unit.electric_potential_difference.volt Allowed values are all real numbers. Present if bit 6 of the Flags field is set to 1
Battery Aggregation Group	uint8	0 or 1	Indicates the Battery Aggregation Group to which this instance of the battery service is associated. 0: Not in an aggregation group 1–254: Battery Aggregation Group Number 255: RFU Present if bit 7 of the Flags field is set to 1

Table 3.36: Structure of the Battery Information characteristic

3.27.1 Flags field

The values of this field are defined below.

Bit	Definition
0	Battery Manufacture Date Present
1	Battery Expiration Date Present
2	Battery Designed Capacity Present
3	Battery Low Energy Present
4	Battery Critical Energy Present
5	Battery Chemistry Present
6	Nominal Voltage Present
7	Battery Aggregation Group Present
8–15	RFU

Table 3.37: Flags field

3.27.2 Battery Features field

The values of this field are defined below.

Bit	Definition
0	Battery Replaceable
1	Battery Rechargeable
2–7	RFU

Table 3.38: Battery Features field

3.27.3 Battery Chemistry field

The values of this field are defined below.

Value	Definition
0	Unknown
1	Alkaline (zinc–manganese dioxide)
2	Lead Acid
3	Lithium (lithium-iron disulfide) $LiFeS_2$
4	Lithium (lithium-manganese dioxide) $LiMnO_2$
5	Lithium Ion Li
6	Lithium Polymer
7	Nickel Oxyhydroxide (zinc-manganese dioxide/oxy nickel hydroxide) NiO_x
8	Nickel Cadmium NiCd
9	Nickel-metal Hydride NiMH
10	Silver Oxide (silver-zinc) AgZn

Value	Definition
11	Zinc Chloride
12	Zinc Air
13	Zinc Carbon
14–254	RFU
255	Other

Table 3.39: Battery Chemistry field

3.28 Battery Level

The Battery Level characteristic is used to represent the charge level of a battery.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Battery Level	uint8	1	Base Unit: org.bluetooth.unit.percentage. Allowed range is 0 to 100. 100% represents fully charged; 0% represents fully discharged. All other values are reserved for future use.

Table 3.40: Structure of the Battery Level characteristic

3.29 Battery Level Status

The Battery Level Status characteristic is used to represent the power state of a battery, an identifier used to identify the specific battery associated with the data, and the battery level.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.29.1.
Power State	boolean[16]	2	See Section 3.29.2.
Identifier	uint16	0 or 2	Used as an identifier for a service instance. Populated with a valid value from the GATT Bluetooth Namespace Descriptions [4]. Present if bit 0 of the Flags field is set to 1
Battery Level	uint8	0 or 1	Refer to the Battery Level characteristic in Section 3.28. Present if bit 1 of the Flags field is set to 1
Additional Status	boolean[8]	0 or 1	Contains additional status information such as whether or not service is required. See Section 3.29.3. Present if bit 2 of the Flags field is set to 1

Table 3.41: Structure of the Battery Level Status characteristic

3.29.1 Flags field

The values of this field are defined below.

Bit	Definition
0	Identifier Present
1	Battery Level Present
2	Additional Status Present
3–7	RFU

Table 3.42: Flags field

3.29.2 Power State field

The values of this field are defined below.

Bit	Definition
0	Battery Present: 0 = No 1 = Yes
1–2	Wired External Power Source Connected: 0 = No 1 = Yes 2 = Unknown 3 = RFU
3–4	Wireless External Power Source Connected: 0 = No 1 = Yes 2 = Unknown 3 = RFU
5–6	Battery Charge State: 0 = Unknown 1 = Charging 2 = Discharging: Active 3 = Discharging: Inactive
7–8	Battery Charge Level: 0 = Unknown 1 = Good 2 = Low 3 = Critical
9–11	Charging Type: 0 = Unknown or Not Charging 1 = Constant Current 2 = Constant Voltage 3 = Trickle 4 = Float 5–7 = RFU

Bit	Definition
12–14	Charging Fault Reason Bit 12: Battery Bit 13: External Power source Bit 14: Other
15	RFU

Table 3.43: Power State field

3.29.3 Additional Status field

The values of this field are defined below.

Bit	Definition
0–1	Service Required: 0 = False 1 = True 2 = Unknown 3 = RFU
2	Battery Fault: 0 = False or Unknown 1 = Yes
3–7	RFU

Table 3.44: Additional Status field

3.30 Battery Time Status

The Battery Time Status characteristic is used to represent time estimates for discharging and charging.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.30.1.
Time until Discharged	uint24	3	Estimated time in minutes until discharged. Base unit: org.bluetooth.unit.time.minute A value of 0xFFFFFF represents: Unknown A value of 0xFFFFFE represents: Greater than 0xFFFFFD
Time until Discharged on Standby	uint24	0 or 3	Estimated time in minutes until discharged assuming for the remaining time the device is in standby. Base unit: org.bluetooth.unit.time.minute A value of 0xFFFFFF represents: Unknown A value of 0xFFFFFE: represents: Greater than 0xFFFFFD Present if bit 0 of the Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Time until Recharged	uint24	0 or 3	Estimated time in minutes until recharged. Base unit: org.bluetooth.unit.time.minute A value of 0xFFFFFF represents: Unknown A value of 0xFFFFFE represents: Greater than 0xFFFFFD Present if bit 1 of the Flags field is set to 1

Table 3.45: Structure of the Battery Time Status characteristic

3.30.1 Flags field

The values of this field are defined below.

Bit	Definition
0	Time until Discharged on Standby Present
1	Time until Recharged Present
2–7	RFU

Table 3.46: Flags field

3.31 Blood Pressure Feature

The Blood Pressure Feature characteristic is used to represent the supported features of a blood pressure sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Blood Pressure Feature	boolean[16]	2	See Section 3.31.1.

Table 3.47: Structure of the Blood Pressure Feature characteristic

3.31.1 Blood Pressure Feature field

The bits of this field are defined below.

Bit	Definition
0	Body Movement Detection Support 0 = Body Movement Detection feature not supported 1 = Body Movement Detection feature supported
1	Cuff Fit Detection Support 0 = Cuff Fit Detection feature not supported 1 = Cuff Fit Detection feature supported

Bit	Definition
2	Irregular Pulse Detection Support 0 = Irregular Pulse Detection feature not supported 1 = Irregular Pulse Detection feature supported
3	Pulse Rate Range Detection Support 0 = Pulse Rate Range Detection feature not supported 1 = Pulse Rate Range Detection feature supported
4	Measurement Position Detection Support 0 = Measurement Position Detection feature not supported 1 = Measurement Position Detection feature supported
5	Multiple Bond Support 0 = Multiple Bonds not supported 1 = Multiple Bonds supported
6	E2E-CRC Support 0 = E2E-CRC not supported 1 = E2E-CRC supported
7	User Data Service Support 0 = User Data Service not supported 1 = User Data Service supported
8	User Facing Time Support 0 = User Facing Time not supported 1 = User Facing Time supported
9–15	Reserved for Future Use

Table 3.48: Blood Pressure Feature field

3.32 Blood Pressure Measurement

The Blood Pressure Measurement characteristic is used to represent blood pressure measurement data.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.32.1.
Blood Pressure Measurement Compound Value - Systolic (mmHg)	medfloat16	0 or 2	Unit: org.bluetooth.unit.pressure.millimetre_of_mercury Present if bit 0 of Flags field is set to 0
Blood Pressure Measurement Compound Value - Diastolic (mmHg)	medfloat16	0 or 2	Unit: org.bluetooth.unit.pressure.millimetre_of_mercury Present if bit 0 of Flags field is set to 0
Blood Pressure Measurement Compound Value - Mean Arterial Pressure (mmHg)	medfloat16	0 or 2	Unit: org.bluetooth.unit.pressure.millimetre_of_mercury Present if bit 0 of Flags field is set to 0

Field	Data Type	Size (in octets)	Description
Blood Pressure Measurement Compound Value - Systolic (kPa)	medfloat16	0 or 2	Base Unit: org.bluetooth.unit.pressure.pascal; M = 1, d = 3, and b = 0 Present if bit 0 of Flags field is set to 1
Blood Pressure Measurement Compound Value - Diastolic (kPa)	medfloat16	0 or 2	Base Unit: org.bluetooth.unit.pressure.pascal; M = 1, d = 3, and b = 0 Present if bit 0 of Flags field is set to 1
Blood Pressure Measurement Compound Value - Mean Arterial Pressure (kPa)	medfloat16	0 or 2	Base Unit: org.bluetooth.unit.pressure.pascal; M = 1, d = 3, and b = 0 Present if bit 0 of Flags field is set to 1
Time Stamp	struct	0 or 7	Refer to Date Time characteristic in Section 3.71. Present if bit 1 of Flags field is set to 1
Pulse Rate	medfloat16	0 or 2	Unit: org.bluetooth.unit.period.beats_per_minute Present if bit 2 of Flags field is set to 1
User ID	uint8	0 or 1	See Section 3.32.2. Present if bit 3 of Flags field is set to 1
Measurement Status	boolean[16]	0 or 2	See Section 3.32.3. Present if bit 4 of Flags field is set to 1

Table 3.49: Structure of the Blood Pressure Measurement characteristic

3.32.1 Flags field

These flags define which data fields are present in the characteristic value.

The bits of this field are defined below.

Bit	Definition
0	Blood Pressure Units Flag 0 = Blood pressure for Systolic, Diastolic and MAP in units of mmHg 1 = Blood pressure for Systolic, Diastolic and MAP in units of kPa
1	Time Stamp Flag 0 = Time Stamp not present 1 = Time Stamp present
2	Pulse Rate Flag 0 = Pulse Rate not present 1 = Pulse Rate present
3	User ID Flag 0 = User ID not present 1 = User ID present
4	Measurement Status Flag 0 = Measurement Status not present 1 = Measurement Status present

Bit	Definition
5–7	Reserved for Future Use

Table 3.50: Flags field

3.32.2 User ID field

The values of this field are defined below.

Value	Definition
0x00–0xFE	Defined by the service specification
0xFF	Unknown User

Table 3.51: User ID field

3.32.3 Measurement Status field

The bits of this field are defined below.

Bit	Definition
0	Body Movement Detection Flag 0 = No body movement 1 = Body movement detected during measurement
1	Cuff Fit Detection Flag 0 = Cuff fits properly 1 = Cuff too loose
2	Irregular Pulse Detection Flag 0 = No irregular pulse detected 1 = Irregular pulse detected
3–4	Pulse Rate Range Detection Flags 0b00 = Pulse rate is within the range 0b01 = Pulse rate exceeds upper limit 0b10 = Pulse rate is less than lower limit 0b11 = Reserved for Future Use
5	Measurement Position Detection Flag 0 = Proper measurement position 1 = Improper measurement position
6–15	Reserved for Future Use

Table 3.52: Measurement Status field

3.33 Blood Pressure Record

The Blood Pressure Record characteristic is a container that represents a stored value of a blood pressure measurement or of any other characteristic as specified by the service using the characteristic.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Segmentation Header	boolean[8]	1	See Section 3.33.1.
Sequence Number	uint16	2	Contains a sequence number of the record. The sequence number starts at 0 and loops back to 0 after 65536 records (per user). See Section 3.33.2.
UUID	uint16	2	Contains the UUID of the contained characteristic value. See Section 3.33.3.
Recorded Characteristic	Determined by UUID	Variable	Contains a part of or a complete characteristic value. See Section 3.33.4.
E2E-CRC	uint16	0 or 2	Contains the CRC over all the data of a complete single or multi-message record. See Section 3.33.5. The presence of this field is defined by the service using this characteristic.

Table 3.53: Structure of the Blood Pressure Record characteristic

3.33.1 Segmentation Header field

The Segmentation Header field provides information about which segments to concatenate to get a complete Blood Pressure Record value.

The bits of this field are defined below.

Bit	Definition
0	First Segment: the characteristic contains the first segment of a record 0 = False 1 = True
1	Last Segment: The characteristic contains the last segment of a record 0 = False 1 = True
2–7	Rolling Segment Counter: 0 to 63 If the Rolling Segment Counter is equal to 63, it rolls over to 0 when it is next incremented.

Table 3.54: Segmentation Header field

3.33.2 Sequence Number field

The sequence number field contains the sequence number of a record. The sequence number starts at 0 and loops back to 0 after 65536 records and is used to number a sequence of records as defined by the service.

3.33.3 UUID field

The UUID field contains the 16-bit Bluetooth SIG assigned number for a Bluetooth SIG defined characteristic. Supported values are typically constrained by the service. See [4] for the list of SIG Assigned Numbers for GATT characteristic UUIDs.

3.33.4 Recorded Characteristic field

The Recorded Characteristic field contains a partial or a complete characteristic value. The characteristic value is identified by the UUID field. For most UUID values, the definition of the corresponding characteristic value is included in this document.

3.33.5 E2E-CRC field

If the service using the Blood Pressure Record characteristic supports E2E-CRC, the status of the recorded characteristic is secured by a CRC calculated over all fields of all parts of a multi-message record not including the E2E-CRC-field itself. See Section 2.5 for further information about the CRC calculation.

3.34 Body Composition Feature

The Body Composition Feature characteristic is used to represent the supported features of a body composition sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Body Composition Feature	boolean[32]	4	See Section 3.34.1

Table 3.55: Structure of the Body Composition Feature characteristic

3.34.1 Body Composition Feature field

The bits of this field are defined below.

Bit	Definition
0	Time Stamp Supported
1	Multiple Users Supported
2	Basal Metabolism Supported
3	Muscle Percentage Supported
4	Muscle Mass Supported
5	Fat Free Mass Supported
6	Soft Lean Mass Supported
7	Body Water Mass Supported

Bit	Definition
8	Impedance Supported
9	Weight Supported
10	Height Supported
11–14	Weight Measurement Resolution 0b0000 = Not specified 0b0001 = Resolution of 0.5 kg or 1 lb. 0b0010 = Resolution of 0.2 kg or 0.5 lb. 0b0011 = Resolution of 0.1 kg or 0.2 lb. 0b0100 = Resolution of 0.05 kg or 0.1 lb. 0b0101 = Resolution of 0.02 kg or 0.05 lb. 0b0110 = Resolution of 0.01 kg or 0.02 lb. 0b0111 = Resolution of 0.005 kg or 0.01 lb. All other values = Reserved for Future Use
15–17	Height Measurement Resolution 0b000 = Not specified 0b001 = Resolution of 0.01 meter or 1 inch 0b010 = Resolution of 0.005 meter or 0.5 inch 0b011 = Resolution of 0.001 meter or 0.1 inch All other values = Reserved for Future Use
18–31	Reserved for Future Use

Table 3.56: Body Composition Feature field

3.35 Body Composition Measurement

The Body Composition Measurement characteristic is used to represent data related to a body composition measurement.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.35.1
Body Fat Percentage	uint16	2	Base Unit: org.bluetooth.unit.percentage Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a percent
Time Stamp	struct	0 or 7	Refer to the Date Time characteristic in Section 3.71 Present if bit 1 of Flags field is set to 1
User ID	uint8	0 or 1	See Section 3.35.2 Present if bit 2 of Flags field is set to 1
Basal Metabolism	uint16	0 or 2	Base Unit: org.bluetooth.unit.energy.joule Represented values: M = 1, d = 3, b = 0 Unit is kilojoules Present if bit 3 of Flags field is set to 1
Muscle Percentage	uint16	0 or 2	Base Unit: org.bluetooth.unit.percentage Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a percent Present if bit 4 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Muscle Mass	uint16	0 or 2	See Section 3.35.3 Present if bit 5 of Flags field is set to 1
Fat Free Mass	uint16	0 or 2	See Section 3.35.4 Present if bit 6 of Flags field is set to 1
Soft Lean Mass	uint16	0 or 2	See Section 3.35.5 Present if bit 7 of Flags field is set to 1
Body Water Mass	uint16	0 or 2	See Section 3.35.6 Present if bit 8 of Flags field is set to 1
Impedance	uint16	0 or 2	Base Unit: org.bluetooth.unit.electric_resistance.ohm Represented values: M = 1, d = -2, b = 0 Unit is 1/10 of an Ohm Present if bit 9 of Flags field is set to 1
Weight	uint16	0 or 2	See Section 3.35.7 Present if bit 10 of Flags field is set to 1
Height	uint16	0 or 2	See Section 3.35.8 Present if bit 11 of Flags field is set to 1

Table 3.57: Structure of the Body Composition Measurement characteristic

3.35.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Measurement Units: 0 = SI (Weight and Mass in units of kilogram (kg) and Height in units of meter) 1 = Imperial (Weight and Mass in units of pound (lb) and Height in units of inch (in))
1	Time Stamp present
2	User ID present
3	Basal Metabolism present
4	Muscle Percentage present
5	Muscle Mass present
6	Fat Free Mass present
7	Soft Lean Mass present
8	Body Water Mass present
9	Impedance present
10	Weight present
11	Height present
12	Multiple Packet Measurement
13–15	Reserved for Future Use

Table 3.58: Flags field

3.35.2 User ID field

The special value of 0xFF for User ID represents ”unknown user”.

3.35.3 Muscle Mass field

This field is in kilograms with resolution 0.005 if the bit 0 of the Flag field is 0 or in pounds with a resolution of 0.01 if the bit 0 of the Flag field is 1.

3.35.4 Fat Free Mass field

This field is in kilograms with resolution 0.005 if the bit 0 of the Flag field is 0 or in pounds with a resolution of 0.01 if the bit 0 of the Flag field is 1.

3.35.5 Soft Lean Mass field

This field is in kilograms with resolution 0.005 if the bit 0 of the Flag field is 0 or in pounds with a resolution of 0.01 if the bit 0 of the Flag field is 1.

3.35.6 Body Water Mass field

This field is in kilograms with resolution 0.005 if the bit 0 of the Flag field is 0 or in pounds with a resolution of 0.01 if the bit 0 of the Flag field is 1.

3.35.7 Weight field

This field is in kilograms with resolution 0.005 if the bit 0 of the Flag field is 0 or in pounds with a resolution of 0.01 if the bit 0 of the Flag field is 1.

3.35.8 Height field

This field is in meters with a resolution of 0.001 if the bit 0 of the Flag field is 0 or in inches with a resolution of 0.1 if the bit 0 of the Flag field is 1.

3.36 Body Sensor Location

The Body Sensor Location characteristic is used to represent the location of a sensor on a human body.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Body Sensor Location	uint8	1	See Section 3.36.1

Table 3.59: Structure of the Body Sensor Location characteristic

3.36.1 Body Sensor Location field

The values of this field are defined below.

Value	Definition
0x00	Other
0x01	Chest
0x02	Wrist
0x03	Finger
0x04	Hand
0x05	Ear Lobe
0x06	Foot
0x07–0xFF	Reserved for Future Use

Table 3.60: Body Sensor Location field

3.37 Boolean

The Boolean characteristic is used to represent the predefined Boolean values.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Boolean	uint8	1	See Section 3.37.1

Table 3.61: Structure of the Boolean characteristic

3.37.1 Boolean field

The values of this field are defined below.

Value	Definition
0	False
1	True
2–255	Prohibited

Table 3.62: Boolean field

3.38 Caloric Intake

The Caloric Intake characteristic is used to represent the calorie intake per day of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Caloric Intake	uint16	2	Unit: org.bluetooth.unit.energy.kilogram_calorie

Table 3.63: Structure of the Caloric Intake characteristic

3.39 Carbon Monoxide Concentration

The Carbon Monoxide Concentration characteristic is used to represent a measure of carbon monoxide (CO) concentration.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Carbon Monoxide Concentration	medfloat16	2	Unit: org.bluetooth.unit.density.kilogram_per_cubic_meter The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.64: Structure of the Carbon Monoxide Concentration characteristic

3.40 CGM Feature

The CGM Feature characteristic is used to represent the supported features of a continuous glucose monitor (CGM).

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
CGM Feature	boolean[24]	3	See Section 3.40.1
CGM Type-Sample Location	struct	1	See Section 3.40.2
E2E-CRC	uint16	2	CRC calculated over all data except the E2E-CRC field itself. See Section 2.5 for details. If the service containing this characteristic does not support the E2E-CRC, this field typically has a value defined by the service such as 0xFFFF or any other value.

Table 3.65: Structure of the CGM Feature characteristic

3.40.1 CGM Feature field

The bits of this field are defined below.

Bit	Definition
0	Calibration supported
1	Patient High/Low Alerts supported
2	Hypo Alerts supported
3	Hyper Alerts supported
4	Rate of Increase/Decrease Alerts supported
5	Device Specific Alert supported
6	Sensor Malfunction Detection supported
7	Sensor Temperature High-Low Detection supported
8	Sensor Result High-Low Detection supported
9	Low Battery Detection supported
10	Sensor Type Error Detection supported
11	General Device Fault supported
12	E2E-CRC supported
13	Multiple Bond supported
14	Multiple Sessions supported
15	CGM Trend Information supported
16	CGM Quality supported
17–23	Reserved for Future Use

Table 3.66: CGM Feature field

3.40.2 CGM Type-Sample Location field

The structure of this field is defined below.

Field	Data Type	Size (in bits)	Description
Type	uint4	4	Unit: org.bluetooth.unit.unitless See Section 3.40.2.1
Sample Location	uint4	4	Unit: org.bluetooth.unit.unitless See Section 3.40.2.2

Table 3.67: CGM Type-Sample Location field

3.40.2.1 Type field

The values of this field are defined below.

Value	Definition
0x0	Reserved for Future Use
0x1	Capillary Whole blood
0x2	Capillary Plasma
0x3	Venous Whole blood
0x4	Venous Plasma
0x5	Arterial Whole blood
0x6	Arterial Plasma
0x7	Undetermined Whole blood
0x8	Undetermined Plasma
0x9	Interstitial Fluid (ISF)
0xA	Control Solution
0xB–0xF	Reserved for Future Use

Table 3.68: Type field

3.40.2.2 Sample Location field

The values of this field are defined below.

Value	Definition
0x0	Reserved for Future Use
0x1	Finger
0x2	Alternate Site Test (AST)
0x3	Earlobe
0x4	Control solution
0x5	Subcutaneous tissue
0x6–0xE	Reserved for Future Use
0xF	Sample Location value not available

Table 3.69: Sample Location field

3.41 CGM Measurement

The CGM Measurement characteristic is used to represent one or more CGM Measurement Records.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
CGM Measurement Record(s)	struct	variable	A sequence of one or more CGM Measurement Records, concatenated as defined by the service. The structure of a CGM Measurement Record is defined in Section 3.41.1.

Table 3.70: Structure of the CGM Measurement characteristic

3.41.1 CGM Measurement Record

The structure of a CGM Measurement Record is defined below.

Field	Data Type	Size (in octets)	Description
Size	uint8	1	Size of the CGM Measurement Record including this field.
Flags	boolean[8]	1	See Section 3.41.2
CGM Glucose Concentration	medfloat16	2	Glucose concentration. Unit: org.bluetooth.unit.mass_density.milligram_per_decilitre
Time Offset	uint16	2	Minutes since the Session Start Time for the stored glucose concentration value. See Section 3.41.3. Unit: org.bluetooth.unit.time.minute
Sensor Status Annunciation	boolean[8][3]	0 to 3	See Section 3.41.4
CGM Trend Information	medfloat16	0 or 2	Glucose trend rate since previous measurement. Unit: org.bluetooth.unit.milligram_per_decilitre_per_minute Present if bit 0 of Flags field is set to 1
CGM Quality	medfloat16	0 or 2	CGM Quality information in percentage. Unit: org.bluetooth.unit.percentage Present if bit 1 of Flags field is set to 1
E2E-CRC	uint16	0 or 2	CRC calculated over all fields except the E2E-CRC field itself. Present if E2E-CRC Supported bit in CGM Feature characteristic is set to 1

Table 3.71: CGM Measurement Record

3.41.2 Flags field

The bits of this field are defined below.

Bit	Definition
0	CGM Trend Information present
1	CGM Quality present
2	Reserved for Future Use
3	Reserved for Future Use
4	Reserved for Future Use
5	Sensor Status Annunciation field, Warning-Octet present
6	Sensor Status Annunciation field, Cal/Temp-Octet present
7	Sensor Status Annunciation field, Status-Octet present

Table 3.72: Flags field

3.41.3 Time Offset field

The values of this field specify the relative time difference of the single CGM values to the Session Start Time.

Value	Definition
0x0000–0xFFFF	Time offset in minutes since the Session Start Time (see Section 3.43)

Table 3.73: Time Offset field

3.41.4 Sensor Status Annunciation field

The Sensor Status Annunciation field is composed of up to three octets: one for Status, one for Cal/Temp and one for Warning. An octet is only present if one or more bits are set to ”1”. The presence of each annunciation octet is indicated by the corresponding Flags field (see Section 3.41.2). The Sensor Status Annunciation field is present for every CGM Measurement Record to which the status applies.

Field	Data Type	Size (in octets)	Description
Status	boolean[8]	0 or 1	See Section 3.41.4.1 Present if bit 7 of Flags field is set to 1
Cal/Temp	boolean[8]	0 or 1	See Section 3.41.4.2 Present if bit 6 of Flags field is set to 1
Warning	boolean[8]	0 or 1	See Section 3.41.4.3 Present if bit 5 of Flags field is set to 1

Table 3.74: Sensor Status Annunciation field

3.41.4.1 Status field

The bits of this field are defined below.

Bit	Definition
0	Session stopped
1	Device battery low
2	Sensor type incorrect for device
3	Sensor malfunction
4	Device Specific Alert
5	General device fault has occurred in the sensor
6	Reserved for Future Use
7	Reserved for Future Use

Table 3.75: Status field

3.41.4.2 Cal/Temp field

The bits of this field are defined below.

Bit	Definition
8	Time synchronization between sensor and collector required
9	Calibration not allowed
10	Calibration recommended
11	Calibration required
12	Sensor temperature too high for valid test/result at time of measurement
13	Sensor temperature too low for valid test/result at time of measurement
14	Calibration Process Pending
15	Reserved for Future Use

Table 3.76: Cal/Temp field

3.41.4.3 Warning field

The bits of this field are defined below.

Bit	Definition
16	Sensor result lower than the Patient Low level
17	Sensor result higher than the Patient High level
18	Sensor result lower than the Hypo level
19	Sensor result higher than the Hyper level
20	Sensor Rate of Decrease exceeded
21	Sensor Rate of Increase exceeded
22	Sensor result lower than the device can process

Bit	Definition
23	Sensor result higher than the device can process

Table 3.77: Warning field

3.42 CGM Session Run Time

The CGM Session Run Time characteristic is used to represent the expected run time of the continuous glucose monitor (CGM) session.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
CGM Session Run Time	uint16	2	The expected run time of the CGM session in hours. Unit: org.bluetooth.unit.time.hour
E2E-CRC	uint16	0 or 2	CRC calculated over all fields. See Section 2.5 for details. Present if E2E-CRC Supported bit in CGM Feature characteristic is set to 1

Table 3.78: Structure of the CGM Session Run Time characteristic

3.43 CGM Session Start Time

The CGM Session Start Time characteristic is used to represent the time the continuous glucose monitor (CGM) session is started.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Session Start Time	struct	7	Refer to the Date Time characteristic in Section 3.71
Time Zone	uint8	1	Refer to the Time Zone characteristic in Section 3.239
DST Offset	uint8	1	Refer to the DST Offset characteristic in Section 3.77
E2E-CRC	uint16	0 or 2	CRC calculated over all fields. See Section 2.5 for details. Present if E2E-CRC Supported bit in CGM Feature characteristic is set to 1

Table 3.79: Structure of the CGM Session Start Time characteristic

3.44 CGM Specific Ops Control Point

The CGM Specific Ops Control Point characteristic is used to enable procedures related to a continuous glucose monitor (CGM).

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Op Code	uint8	1	See Section 3.44.1
Operand	struct	0 … 17	See Section 3.44.1
E2E-CRC	uint16	0 or 2	CRC calculated over all fields except the E2E-CRC field itself. See Section 2.5 for details. Present if E2E-CRC Supported bit in CGM Feature characteristic is set to 1

Table 3.80: Structure of the CGM Specific Ops Control Point characteristic

3.44.1 Op Code and Operand fields

The values of these fields are defined below.

Op Code Value	Definition	Operand	Operand Data Type	Description
0x00	Reserved for Future Use	N/A	N/A	N/A
0x01	Set CGM Communication Interval	Communication interval in minutes	uint8	The response to this control point is Response Code (Op Code 0x0F).
0x02	Get CGM Communication Interval	N/A	N/A	The normal response to this control point is Op Code 0x03. For error conditions, the response is Response Code. as defined in Section 3.44.2.
0x03	CGM Communication Interval response	Communication Interval in minutes	uint16	This is the normal response to Op Code 0x02.
0x04	Set Glucose Calibration value	Operand as defined below. (See Section 3.44.3)	See Section 3.44.3	The response to this control point is Response Code.
0x05	Get Glucose Calibration Value	Calibration Data Record Number	uint16	The normal response to this control point is Op Code 0x06. For error conditions, the response is Response Code.
0x06	Glucose Calibration Value response	Calibration Data	See Section 3.44.3	This is the normal response to Op Code 0x05.
0x07	Set Patient High Alert Level	Patient High bG value in mg/dL	medfloat16	The response to this control point is Response Code.

Op Code Value	Definition	Operand	Operand Data Type	Description
0x08	Get Patient High Alert Level	N/A	N/A	The normal response to this control point is Op Code 0x09. For error conditions, the response is Response Code.
0x09	Patient High Alert Level Response	Patient High bG value in mg/dL	medfloat16	This is the normal response to Op Code 0x08.
0x0A	Set Patient Low Alert Level	Patient Low bG value in mg/dL	medfloat16	The response to this control point is Response Code.
0x0B	Get Patient Low Alert Level	N/A	N/A	The normal response to this control point is Op Code 0x0C. For error conditions, the response is Response Code.
0x0C	Patient Low Alert Level Response	Patient Low bG value in mg/dL	medfloat16	This is the normal response to Op Code 0x0B.
0x0D	Set Hypo Alert Level	Hypo Alert Level value in mg/dL	medfloat16	The response to this control point is Response Code.
0x0E	Get Hypo Alert Level	N/A	N/A	The normal response to this control point is Op Code 0x0F. For error conditions, the response is Response Code.
0x0F	Hypo Alert Level Response	Hypo Alert Level value in mg/dL	medfloat16	This is the normal response to Op Code 0x0E.
0x10	Set Hyper Alert Level	Hyper Alert Level value in mg/dL	medfloat16	The response to this control point is Response Code.
0x11	Get Hyper Alert Level	N/A	N/A	The normal response to this control point is Op Code 0x12. For error conditions, the response is Response Code.
0x12	Hyper Alert Level Response	Hyper Alert Level value in mg/dL	medfloat16	This is the normal response to Op Code 0x11.
0x13	Set Rate of Decrease Alert Level	Rate of Decrease Alert Level value in mg/dL/min	medfloat16	The response to this control point is Response Code.
0x14	Get Rate of Decrease Alert Level	N/A	N/A	The normal response to this control point is Op Code 0x15. For error conditions, the response is Response Code.
0x15	Rate of Decrease Alert Level Response	Rate of Decrease Alert Level value in mg/dL/min	medfloat16	This is the normal response to Op Code 0x14.

Op Code Value	Definition	Operand	Operand Data Type	Description
0x16	Set Rate of Increase Alert Level	Rate of Increase Alert Level value in mg/dL/min	medfloat16	The response to this control point is Response Code.
0x17	Get Rate of Increase Alert Level	N/A	N/A	The normal response to this control point is Op Code 0x18. For error conditions, the response is Response Code.
0x18	Rate of Increase Alert Level Response	Rate of Increase Alert Level value in mg/dL/min	medfloat16	This is the normal response to Op Code 0x17.
0x19	Reset Device Specific Alert	N/A	N/A	The response to this control point is Response Code.
0x1A	Start the Session	N/A	N/A	The response to this control point is Response Code.
0x1B	Stop the Session	N/A	N/A	The response to this control point is Response Code.
0x1C	Response Code	Request Op Code, Response Code Value	N/A	See Section 3.44.2.
0x1D–0xFF	Reserved for Future Use	N/A	N/A	N/A

Table 3.81: Op Code and Operand fields

3.44.2 Response Code Values

The Response Code Values associated with the CGM Specific Ops Control Point are defined below.

Response Code Value	Definition	Description
0x00	Reserved For Future Use	N/A
0x01	Success	Normal response for successful operation.
0x02	Op Code not supported	Normal response if unsupported Op Code is received.
0x03	Invalid Operand	Normal response if Operand received does not meet the requirements of the service.
0x04	Procedure not completed	Normal response if unable to complete a procedure for any reason.
0x05	Parameter out of range	Normal response if Operand received does not meet the range requirements

Response Code Value	Definition	Description
0x06–0xFF	Reserved for Future Use	N/A

Table 3.82: Response Code Values

3.44.3 Calibration Value

The Operand which is used for setting and getting the calibration value is defined below.

Field	Data Type	Size (in octets)	Description
Glucose Concentration of Calibration	medfloat16	2	Glucose value of the calibration. Unit: org.bluetooth.unit.mass_density.milligram_per_decilitre
Calibration Time	uint16	2	Minutes since the Session Start Time (see Section 3.43) of the reported Glucose Concentration of Calibration value. Unit: org.bluetooth.unit.time.minute
Calibration Type-Sample Location	uint4[2]	1	Definition and field value are the same as CGM Type-Sample Location as described in the CGM Features characteristic (see Section 3.40.2). Unit: org.bluetooth.unit.unitless
Next Calibration Time	uint16	2	The next calibration measurement time in minutes since the Session Start Time (see Section 3.43). Unit: org.bluetooth.unit.time.minute
Calibration Data Record Number	uint16	2	Sequence number for the stored calibration record. Unit: org.bluetooth.unit.unitless
Calibration Status	boolean[8]	1	The result of the calibration procedure of the sensor. Unit: org.bluetooth.unit.unitless 0: Calibration Data rejected (Calibration failed) 1: Calibration Data out of range 2: Calibration Process Pending 3–7: Reserved for Future Use

Table 3.83: Calibration Value Operand

3.45 CGM Status

The CGM Status characteristic is used to represent the current status of a continuous glucose monitor (CGM) sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Offset	uint16	2	The Time Offset field specifies the time since the Session Start Time (see Section 3.43).

Field	Data Type	Size (in octets)	Description
CGM Status	boolean[24]	3	The structure of this field is identical to the structure of the combined Status fields as defined in Section 3.41.4, but it always consists of three octets regardless of the value.
E2E-CRC	uint16	0 or 2	CRC calculated over all fields except the E2E-CRC field itself. See Section 2.5 for details. Present if E2E-CRC Supported bit in CGM Feature characteristic is set to 1

Table 3.84: Structure of the CGM Status characteristic

3.46 Chromatic Distance from Planckian

The Chromatic Distance from Planckian characteristic is used to represent a distance of a chromaticity coordinate from the Planckian locus in the (u′, 2/3v′) diagram as defined by ANSI standard C78.377-2008 [6].

The distance is positive if the chromaticity coordinate is located above the Planckian locus (i.e., has a higher y value than the Planckian), and negative if it is located below.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Distance from Planckian	sint16	2	Unit is unitless with a resolution of 0.00001. Minimum: -0.05 Maximum: 0.05 Represented values: M = 1, d = -5, b = 0 A value of 0x7FFF represents ”value is not valid”. A value of 0x7FFE represents ”value is not known”. All other values are prohibited.

Table 3.85: Structure of the Chromatic Distance from Planckian characteristic

3.47 Chromaticity Coordinate

The Chromaticity Coordinate characteristic is used to represent an x- or y-coordinate in a color diagram such as the CIE1931 diagram [7].

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Chromaticity Coordinate	uint16	2	Unit is unitless with a resolution of 1/65535 Minimum: 0 Maximum: 1.0 Represented values: M = 1, d = 0, b = -16

Table 3.86: Structure of the Chromaticity Coordinate characteristic

3.48 Chromaticity Coordinates

The Chromaticity Coordinates characteristic is used to represent a chromaticity coordinate.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Chromaticity x-coordinate	struct	2	Refer to the Chromaticity Coordinate characteristic in Section 3.47
Chromaticity y-coordinate	struct	2	Refer to the Chromaticity Coordinate characteristic in Section 3.47

Table 3.87: Structure of the Chromaticity Coordinates characteristic

3.49 Chromaticity in CCT and Duv Values

The Chromaticity in CCT and Duv Values characteristic is used to represent the combination of the Correlated Color Temperature characteristic and the Chromatic Distance From Planckian characteristic.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Correlated Color Temperature	struct	2	Refer to the Correlated Color Temperature characteristic in Section 3.55
Chromaticity Distance from Planckian	struct	2	Refer to the Chromatic Distance From Planckian characteristic in Section 3.46

Table 3.88: Structure of the Chromaticity in CCT and Duv Values characteristic

3.50 Chromaticity Tolerance

The Chromaticity Tolerance characteristic is used to represent the tolerance of a tuple of chromaticity values. This tolerance represents the value of a radius of a circle in the CIE 1976 [8] (u',v') diagram. This tolerance value corresponds to the 3-sigma values of the expected chromaticity deviations.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Chromaticity Tolerance	uint8	1	Unit is unitless with a resolution of 0.0001 Minimum: 0 Maximum: 0.0255 Represented values: M = 1, d = -4, b = 0

Table 3.89: Structure of the Chromaticity Tolerance characteristic

3.51 CIE 13.3-1995 Color Rendering Index

The CIE 13.3-1995 Color Rendering Index characteristic is used to represent a color rendition index value for a color patch as calculated in accordance with the CIE 13.3-1995 standard.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Color Rendering Index	sint8	1	Unit is unitless with a resolution of 1. Minimum: -128 Maximum: 100 Represented values: M = 1, d = 0, b = 0

Table 3.90: Structure of the CIE 13.3-1995 Color Rendering Index characteristic

3.52 CO_2 Concentration

The CO_2 Concentration characteristic is used to represent a measure of carbon dioxide concentration.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
CO_2 Concentration	uint16	2	Unit is parts per million (ppm) with a resolution of 1. Unit: org.bluetooth.unit.ppm Represented values: M = 1, d = 0, b =0 Allowed range is: 0 to 65533. A value of 0xFFFE represents ”value is 65534 or greater”. A value of 0xFFFF represents ”value is not known”.

Table 3.91: Structure of the CO_2 Concentration characteristic

3.53 Coefficient

The Coefficient characteristic is used to represent a general coefficient value.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Coefficient	float32	4	Unit is unitless.

Table 3.92: Structure of the Coefficient characteristic

3.54 Content Control ID

The Content Control ID (CCID) characteristic is used to represent a unique instance of a service that either controls or provides status information on an audio-related feature. Examples of audio-related features include media players and telephone bearers. The value of a CCID characteristic is a unique identifier for each instance of the characteristic on the device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Content Control ID	uint8	1	The ID of the content control service instance containing this characteristic.

Table 3.93: Structure of the Content Control ID characteristic

3.55 Correlated Color Temperature

The Correlated Color Temperature characteristic is used to represent correlated color temperature.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Correlated Color Temperature	uint16	2	Unit is Kelvin with a resolution of 1. Minimum: 800 Maximum: 65534 Unit: org.bluetooth.unit.thermodynamic_temperature.kelvin A value of 0xFFFF represents ”value is not known”.

Table 3.94: Structure of the Correlated Color Temperature characteristic

3.56 Cosine of the Angle

The Cosine of the Angle characteristic represents a value of the cosine of an angle.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Cosine of the Angle	sint8	1	This is a unitless value, expressed as Cos(θ) x 100, with a resolution of 1. Unit: org.bluetooth.unit.unitless Minimum: -100 Maximum: 100 Represented values: M = 1, d = -2, b = 0 A raw value of 0x7F represents ”value is not known”. All other values are prohibited.

Table 3.95: Structure of the Cosine of the Angle characteristic

3.57 Count 16

The Count 16 characteristic is used to represent a general count value.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Count	uint16	2	Unit is unitless with a resolution of 1. Minimum: 0 Maximum: 65534 Represented values: M = 1, d = 0, b = 0 A value of 0xFFFF represents ”value is not known”.

Table 3.96: Structure of the Count 16 characteristic

3.58 Count 24

The Count 24 characteristic is used to represent a general count value.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Count	uint24	3	Unit is unitless with a resolution of 1. Minimum: 0 Maximum: 16777214 Represented values: M = 1, d = 0, b = 0 A value of 0xFFFFFF represents ”value is not known”.

Table 3.97: Structure of the Count 24 characteristic

3.59 Country Code

The Country Code characteristic is used to represent a country or dependent areas in accordance with the ISO 3166-1 Numeric standard [9].

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Country Code	uint16	2	Unit is unitless with a resolution of 1. Minimum: 0 Maximum: 4095 Represented values: M = 1, d = 0, b = 0 A value of 0xFFFF represents ”value is not known”.

Table 3.98: Structure of the Country Code characteristic

3.60 Cross Trainer Data

The Cross Trainer Data characteristic is used to represent data related to cross trainer activity.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[24]	3	See Section 3.60.1

Field	Data Type	Size (in octets)	Description
Instantaneous Speed	uint16	0 or 2	Base Unit: org.bluetooth.unit.velocity.kilometre_per_hour Represented values: M = 1, d = -2, b = 0 Unit is 1/100 of a kilometer per hour Present if bit 0 of Flags field is set to 0
Average Speed	uint16	0 or 2	Base Unit: org.bluetooth.unit.velocity.kilometre_per_hour Represented values: M = 1, d = -2, b = 0 Unit is 1/100 of a kilometer per hour The Average Speed field represents the average speed since the beginning of the training session. Present if bit 1 of Flags field is set to 1
Total Distance	uint24	0 or 3	Unit: org.bluetooth.unit.length.metre The Total Distance field represents the total distance reported by the Server since the beginning of the training session. Present if bit 2 of Flags field is set to 1
Steps Per Minute	uint16	0 or 2	Unit: org.bluetooth.unit.step_per_minute The Step per Minute Rate field represents the average step rate of a user during a period of one minute. Present if bit 3 of Flags field is set to 1
Average Step Rate	uint16	0 or 2	Unit: org.bluetooth.unit.step_per_minute The Average Step Rate field represents the average step rate since the beginning of the training session. Present if bit 3 of Flags field is set to 1
Stride Count	uint16	0 or 2	Base Unit: org.bluetooth.unit.unitless Represented values: M = 1, d = -1, b = 0 Unit is 1/10 A stride is a pair of steps The Stride Count field represents the total number of strides since the beginning of the training session. Present if bit 4 of Flags field is set to 1
Positive Elevation Gain	uint16	0 or 2	Unit: org.bluetooth.unit.length.metre The Positive Elevation Gain field represents the positive elevation gain since the training session has started. Present if bit 5 of Flags field is set to 1
Negative Elevation Gain	uint16	0 or 2	Unit: org.bluetooth.unit.length.metre The Negative Elevation Gain field represents the negative elevation gain since the training session has started. Present if bit 5 of Flags field is set to 1
Inclination	sint16	0 or 2	Base Unit: org.bluetooth.unit.percentage Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a percent The Inclination field represents the current inclination of the Server. A positive value means that the user feels as if they are going uphill and a negative value means that the user feels as if they are going downhill. Present if bit 6 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Ramp Setting	sint16	0 or 2	Base Unit: org.bluetooth.unit.plane_angle.degree Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a degree The Ramp Angle Setting field represents the current setting of the ramp angle of the Server. Present if bit 6 of Flags field is set to 1
Resistance Level	uint8	0 or 1	Base Unit: org.bluetooth.unit.unitless Represented values: M = 1, d = 1, b = 0 Unit is 1 The Resistance Level field represents the value of the current value of the resistance level of the Server. Present if bit 7 of Flags field is set to 1
Instantaneous Power	sint16	0 or 2	Unit: org.bluetooth.unit.power.watt The Instantaneous Power field represents the value of the instantaneous power measured by the Server. Present if bit 8 of Flags field is set to 1
Average Power	sint16	0 or 2	Unit: org.bluetooth.unit.power.watt The Average Power field represents the value of the average power measured by the Server since the beginning of the training session. Present if bit 9 of Flags field is set to 1
Total Energy	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Total Energy field represents the total expended energy of a user since the training session has started. Present if bit 10 of Flags field is set to 1
Energy Per Hour	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Hour field represents the average expended energy of a user during a period of one hour. Present if bit 10 of Flags field is set to 1
Energy Per Minute	uint8	0 or 1	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Minute field represents the average expended energy of a user during a period of one minute. Present if bit 10 of Flags field is set to 1
Heart Rate	uint8	0 or 1	Unit: org.bluetooth.unit.period.beats_per_minute The Heart Rate field represents the current heart rate value of the user (e.g., measured via the contact heart rate or any other means). Present if bit 11 of Flags field is set to 1
Metabolic Equivalent	uint8	0 or 1	Base Unit: org.bluetooth.unit.metabolic_equivalent Represented values: M = 1, d = -1, b = 0 Unit is 1/10 metabolic equivalent The Metabolic Equivalent field represents the metabolic equivalent of the user. Present if bit 12 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Elapsed Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Elapsed Time field represents the elapsed time of a training session since the training session has started. Present if bit 13 of Flags field is set to 1
Remaining Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Remaining Time field represents the remaining time of a training session that has been selected. Present if bit 14 of Flags field is set to 1

Table 3.99: Structure of the Cross Trainer Data characteristic

3.60.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	More Data
1	Average Speed present
2	Total Distance present
3	Step Count present
4	Stride Count present
5	Elevation Gain present
6	Inclination and Ramp Angle Setting present
7	Resistance Level present
8	Instantaneous Power present
9	Average Power present
10	Expended Energy present
11	Heart Rate present
12	Metabolic Equivalent present
13	Elapsed Time present
14	Remaining Time present
15	Movement Direction: 0 = Forward 1 = Backward
16–23	Reserved for Future Use

Table 3.100: Flags field

3.61 CSC Feature

The CSC Feature characteristic is used to represent the supported features of a cycling speed and cadence (CSC) sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
CSC Feature	boolean[16]	2	See Section 3.61.1

Table 3.101: Structure of the CSC Feature characteristic

3.61.1 CSC Feature field

The bits of this field are defined below.

Bit	Definition
0	Wheel Revolution Data Supported
1	Crank Revolution Data Supported
2	Multiple Sensor Locations Supported
3–15	Reserved for Future Use

Table 3.102: CSC Feature field

3.62 CSC Measurement

The CSC Measurement characteristic is used to represent data related to a cycling speed and cadence (CSC) sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.62.1
Wheel Revolution Data	struct	0 or 6	See Section 3.62.2 Present if bit 0 of Flags field is set to 1
Crank Revolution Data	struct	0 or 4	See Section 3.62.3 Present if bit 1 of Flags field is set to 1

Table 3.103: Structure of the CSC Measurement characteristic

3.62.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Wheel Revolution Data Present
1	Crank Revolution Data Present
2–7	Reserved for Future Use

Table 3.104: Flags field

3.62.2 Wheel Revolution Data field

The structure of this field is defined below.

Field	Data Type	Size (in octets)	Description
Cumulative Wheel Revolutions	uint32	4	Unit: org.bluetooth.unitless
Last Wheel Event Time	uint16	2	Base Unit: org.bluetooth.unit.time.second Represented values: M = 1, d = 0, b = -10 Unit is 1/1024th of a second

Table 3.105: Wheel Revolution Data field

3.62.3 Crank Revolution Data field

The structure of this field is defined below.

Field	Data Type	Size (in octets)	Description
Cumulative Crank Revolutions	uint16	2	Unit: org.bluetooth.unitless
Last Crank Event Time	uint16	2	Base Unit: org.bluetooth.unit.time.second Represented values: M = 1, d = 0, b = -10 Unit is 1/1024 second

Table 3.106: Crank Revolution Data field

3.63 Current Time

The Current Time characteristic is used to represent the exact time and the reason for adjustment.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Exact Time 256	struct	9	Refer to the Exact Time 256 characteristic in Section 3.92
Adjust Reason	boolean[8]	1	This field represents reason(s) for adjusting time. 0: Manual Time Update 1: External Reference Time Update 2: Change of Time Zone 3: Change of DST 4–7: Reserved for Future Use

Table 3.107: Structure of the Current Time characteristic

3.64 Cycling Power Control Point

The Cycling Power Control Point characteristic is used to enable device-specific procedures related to a cycling power sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Op Code	uint8	1	See Section 3.64.1
Parameter	struct	0–18	See Section 3.64.1

Table 3.108: Structure of the Cycling Power Control Point characteristic

3.64.1 Op Code and Parameter fields

The values of these fields are defined below.

Op Code Value	Definition	Parameter	Parameter Type	Description
0x00	Reserved for Future Use	N/A	N/A	N/A
0x01	Set Cumulative Value	Cumulative Value (defined per service)	Defined per service	Initiate the procedure to set a cumulative value. The new value is sent as parameter following op code (parameter defined per service). The response to this control point is Op Code 0x20 followed by the appropriate Response Value.
0x02	Update Sensor Location	Sensor Location Value (defined per service)	uint8	Update to the location of the sensor with the value sent as parameter to this op code. The response to this control point is Op Code 0x20 followed by the appropriate Response Value.
0x03	Request Supported Sensor Locations	N/A	N/A	Request a list of supported locations for sensor attachment. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including a list of supported sensor locations in the Response Parameter.

Op Code Value	Definition	Parameter	Parameter Type	Description
0x04	Set Crank Length	Crank Length Value (defined per service)	Defined per service	Initiate the procedure to set the crank length value to Sensor. The new value is sent as a parameter with preceding Op Code 0x04 operand. The response to this control point is Op Code 0x20 followed by the appropriate Response Value.
0x05	Request Crank Length	N/A	N/A	Request the current crank length value set in the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including the value of the crank length in the Response Parameter.
0x06	Set Chain Length	Chain Length Value (defined per service)	Defined per service	Initiate the procedure to set the chain length value to Sensor. The new value is sent as a parameter with preceding Op Code 0x06 operand. The response to this control point is Op Code 0x20 followed by the appropriate Response Value.
0x07	Request Chain Length	N/A	N/A	Request the current chain length value set in the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including the value of the chain length in the Response Parameter.
0x08	Set Chain Weight	Chain Weight Value (defined per service)	Defined per service	Initiate the procedure to set the chain weight value to Sensor. The new value is sent as a parameter with preceding Op Code 0x08 operand. The response to this control point is Op Code 0x20 followed by the appropriate Response Value.

Op Code Value	Definition	Parameter	Parameter Type	Description
0x09	Request Chain Weight	N/A	N/A	Request the current chain weight value set in the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including the value of the chain weight in the Response Parameter.
0x0A	Set Span Length	Span Length Value (defined per service)	Defined per service	Initiate the procedure to set the span length value to Sensor. The new value is sent as a parameter with preceding Op Code 0x0A operand. The response to this control point is Op Code 0x20 followed by the appropriate Response Value.
0x0B	Request Span Length	N/A	N/A	Request the current span length value set in the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including the value of the span length in the Response Parameter.
0x0C	Start Offset Compensation	N/A	N/A	Starts the offset compensation process of the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including the value of the raw force or a raw torque in the Response Parameter (defined per service).
0x0D	Mask Cycling Power Measurement Characteristic Content	Content Mask (defined per service)	Defined per service	Initiate the procedure to set the content of the Cycling Power Measurement characteristic. The response to this control point is Op Code 0x20 followed by the appropriate Response Value.

Op Code Value	Definition	Parameter	Parameter Type	Description
0x0E	Request Sampling Rate	N/A	N/A	Request the sampling rate value set in the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including the value of the sampling rate in the Response Parameter.
0x0F	Request Factory Calibration Date	N/A	N/A	Request the Factory calibration date set in the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including the value of the Factory calibration date in the Response Parameter.
0x10	Start Enhanced Offset Compensation	N/A	N/A	Starts the offset compensation process of the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including the value of the raw force or a raw torque in the Response Parameter and an option for a manufacturer specific value (defined per service).
0x11–0x1F	Reserved for Future Use	N/A	N/A	N/A
0x20	Response Code	Request Op Code, Response Code Value, Response Parameter	N/A	See Section 3.64.2
0x21–0xFF	Reserved for Future Use	N/A	N/A	N/A

Table 3.109: Op Code and Parameter fields

3.64.2 Response Code Values

The Response Code Values associated with the Cycling Power Control Point are defined below.

Response Code Value	Definition	Response Parameter	Description
0x00	Reserved For Future Use	N/A	N/A
0x01	Success	Defined per service	Normal response for successful operation.
0x02	Op Code not supported	N/A	Response if unsupported Op Code is received
0x03	Invalid Operand	N/A	Response if Parameter received does not meet the requirements of the service.
0x04	Operation Failed	Defined per service	Response if the requested procedure failed.
0x05–0xFF	Reserved for Future Use	N/A	N/A

Table 3.110: Response Code Values

3.65 Cycling Power Feature

The Cycling Power Feature characteristic is used to represent the supported features of a cycling power sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Cycling Power Feature	boolean[32]	4	See Section 3.65.1

Table 3.111: Structure of the Cycling Power Feature characteristic

3.65.1 Cycling Power Feature field

The bits of this field are defined below.

Bit	Definition
0	Pedal Power Balance Supported
1	Accumulated Torque Supported
2	Wheel Revolution Data Supported
3	Crank Revolution Data Supported
4	Extreme Magnitudes Supported
5	Extreme Angles Supported
6	Top and Bottom Dead Spot Angles Supported
7	Accumulated Energy Supported
8	Offset Compensation Indicator Supported

Bit	Definition
9	Offset Compensation Supported
10	Cycling Power Measurement Characteristic Content Masking Supported
11	Multiple Sensor Locations Supported
12	Crank Length Adjustment Supported
13	Chain Length Adjustment Supported
14	Chain Weight Adjustment Supported
15	Span Length Adjustment Supported
16	Sensor Measurement Context 0 = Force based 1 = Torque based
17	Instantaneous Measurement Direction Supported
18	Factory Calibration Date Supported
19	Enhanced Offset Compensation Procedure Supported
20–21	Distributed System Support 0b00 = Unspecified (Legacy Sensor) 0b01 = Not for use in a distributed system 0b10 = For use in a distributed system 0b11 = Reserved for Future Use
22–31	Reserved for Future Use

Table 3.112: Cycling Power Feature field

3.66 Cycling Power Measurement

The Cycling Power Measurement characteristic is used to represent data related to a cycling power sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.66.1
Instantaneous Power	sint16	2	Unit: org.bluetooth.unit.power.watt
Pedal Power Balance	uint8	0 or 1	Base Unit: org.bluetooth.unit.percentage Represented values: M = 1, d = 0, b = -1 Unit is 1/2 of a percent Present if bit 0 of Flags field is set to 1
Accumulated Torque	uint16	0 or 2	Base Unit: org.bluetooth.unit.moment_of_force.newton_metre Represented values: M = 1, d = 0, b = -5 Unit is 1/32 Newton meter Present if bit 2 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Wheel Revolution Data	struct	0 or 6	See Section 3.66.2 Present if bit 4 of Flags field is set to 1
Crank Revolution Data	struct	0 or 4	See Section 3.66.3 Present if bit 5 of Flags field is set to 1
Extreme Force Magnitudes	struct	0 or 4	See Section 3.66.4 Present if bit 6 of Flags field is set to 1
Extreme Torque Magnitudes	struct	0 or 4	See Section 3.66.5 Present if bit 7 of Flags field is set to 1
Extreme Angles	struct	0 or 3	See Section 3.66.6 Present if bit 8 of Flags field is set to 1
Top Dead Spot Angle	uint16	0 or 2	See Section 3.66.7 Unit: org.bluetooth.unit.plane_angle.degree Present if bit 9 of Flags field is set to 1
Bottom Dead Spot Angle	uint16	0 or 2	See Section 3.66.7 Unit: org.bluetooth.unit.plane_angle.degree Present if bit 10 of Flags field is set to 1
Accumulated Energy	uint16	0 or 2	Base Unit: org.bluetooth.unit.energy.joule Represented values: M = 1, d = 3, b = 0 Unit is kilojoule Present if bit 11 of Flags field is set to 1

Table 3.113: Structure of the Cycling Power Measurement characteristic

3.66.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Pedal Power Balance Present
1	Pedal Power Balance Reference 0 = Unknown 1 = Left
2	Accumulated Torque Present
3	Accumulated Torque Source 0 = Wheel based 1 = Crank based
4	Wheel Revolution Data Present
5	Crank Revolution Data Present
6	Extreme Force Magnitudes Present
7	Extreme Torque Magnitudes Present
8	Extreme Angles Present
9	Top Dead Spot Angle Present

Bit	Definition
10	Bottom Dead Spot Angle Present
11	Accumulated Energy Present
12	Offset Compensation Indicator 0 = False 1 = True
13–15	Reserved for Future Use

Table 3.114: Flags field

3.66.2 Wheel Revolution Data field

The structure of this field is defined below.

Field	Data Type	Size (in octets)	Description
Cumulative Wheel Revolutions	uint32	4	Unit: org.bluetooth.unit.unitless
Last Wheel Event Time	uint16	2	Base Unit: org.bluetooth.unit.time.second Represented values: M = 1, d = 0, b = -11 Unit is 1/2048 second

Table 3.115: Wheel Revolution Data field

3.66.3 Crank Revolution Data field

The structure of this field is defined below.

Field	Data Type	Size (in octets)	Description
Cumulative Crank Revolutions	uint16	2	Unit: org.bluetooth.unit.unitless
Last Crank Event Time	uint16	2	Base Unit: org.bluetooth.unit.time.second Represented values: M = 1, d = 0, b = -10 Unit is 1/1024 second

Table 3.116: Crank Revolution Data field

3.66.4 Extreme Force Magnitudes field

The structure of this field is defined below.

Field	Data Type	Size (in octets)	Description
Maximum Force Magnitude	sint16	2	Unit: org.bluetooth.unit.force.newton
Minimum Force Magnitude	sint16	2	Unit: org.bluetooth.unit.force.newton

Table 3.117: Extreme Force Magnitudes field

3.66.5 Extreme Torque Magnitudes field

The structure of this field is defined below.

Field	Data Type	Size (in octets)	Description
Maximum Torque Magnitude	sint16	2	Base Unit: org.bluetooth.unit.moment_of_force.newton_metre Represented values: M = 1, d = 0, b = -5 Unit is 1/32 Newton meter
Minimum Torque Magnitude	sint16	2	Base Unit: org.bluetooth.unit.moment_of_force.newton_metre Represented values: M = 1, d = 0, b = -5 Unit is 1/32 Newton meter

Table 3.118: Extreme Torque Magnitudes field

3.66.6 Extreme Angles field

When observed with the front wheel to the right of the pedals, a value of 0 degrees represents the angle when the crank is in the 12 o'clock position and a value of 90 degrees represents the angle, measured clockwise, when the crank points towards the front wheel in the 3 o'clock position. The left crank sensor (if fitted) detects 0 degrees when the crank it is attached to is in the 12 o'clock position, and the right sensor (if fitted) detects 0 degrees when the crank it is attached to is in the 12 o'clock position; thus, there is a constant 180-degree difference between the right crank and the left crank position signals.

When present, both subfields "Extreme Angles - Minimum Angle" and "Extreme Angles - Maximum Angle" are always present as a pair and are concatenated into a uint24 value (3 octets). As an example, if the Maximum Angle is 0xABC and the Minimum Angle is 0x123, the field value is represented as 0x123ABC.

The structure of this field is defined below.

Field	Data Type	Size (in bits)	Description
Maximum Angle	uint12	12	Unit: org.bluetooth.unit.plane_angle.degree
Minimum Angle	uint12	12	Unit: org.bluetooth.unit.plane_angle.degree

Table 3.119: Extreme Angles field

3.66.7 Top and Bottom Dead Spot Angles fields

When observed with the front wheel to the right of the pedals, a value of 0 degrees represents the angle when the crank is in the 12 o'clock position and a value of 90 degrees represents the angle, measured clockwise, when the crank points towards the front wheel in the 3 o'clock position. The left crank sensor (if fitted) detects 0 degrees when the crank it is attached to is in the 12 o'clock position, and the right sensor (if fitted) detects 0 degrees when the crank it is attached to is in the 12 o'clock position; thus, there is a constant 180-degree difference between the right crank and the left crank position signals.

3.67 Cycling Power Vector

The Cycling Power Vector characteristic is used to represent power vector data related to a cycling power sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.67.1
Crank Revolution Data	struct	0 or 4	See Section 3.67.2 Present if bit 0 of Flags field is set to 1
First Crank Measurement Angle	uint16	0 or 2	See Section 3.67.3 Unit: org.bluetooth.unit.plane_angle.degree Present if bit 1 of Flags field is set to 1
Instantaneous Force Magnitude Array	sint16 [0–9]	0–18	Unit: org.bluetooth.unit.force.newton Present if bit 2 of Flags field is set to 1
Instantaneous Torque Magnitude Array	sint16 [0–9]	0–18	Base Unit: org.bluetooth.unit.moment_of_force.newton_metre Represented values: M = 1, d = 0, b = -5 Unit is 1/32 Newton meter Present if bit 3 of Flags field is set to 1

Table 3.120: Structure of the Cycling Power Vector characteristic

3.67.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Crank Revolution Data Present
1	First Crank Measurement Angle Present
2	Instantaneous Force Magnitude Array Present
3	Instantaneous Torque Magnitude Array Present
4–5	Instantaneous Measurement Direction 0b00 = Unknown 0b01 = Tangential Component 0b10 = Radial Component 0b11 = Lateral Component

Bit	Definition
6–7	Reserved for Future Use

Table 3.121: Flags field

3.67.2 Crank Revolution Data field

The structure of this field is defined below.

Field	Data Type	Size (in octets)	Description
Cumulative Crank Revolutions	uint16	2	Unit: org.bluetooth.unit.unitless
Last Crank Event Time	uint16	2	Base Unit: org.bluetooth.unit.time.second Represented values: M = 1, d = 0, b = -10 Unit is 1/1024 second

Table 3.122: Crank Revolution Data field

3.67.3 First Crank Measurement Angle field

When observed with the front wheel to the right of the pedals, a value of 0 degrees represents the angle when the crank is in the 12 o'clock position and a value of 90 degrees represents the angle, measured clockwise, when the crank points towards the front wheel in a 3 o'clock position. The left crank sensor (if fitted) detects the 0° when the crank it is attached to is in the 12 o'clock position and the right sensor (if fitted) detects the 0° when the crank it is attached to is in its 12 o'clock position; thus, there is a constant 180° difference between the right crank and the left crank position signals.

3.68 Database Change Increment

The Database Change Increment characteristic is used to represent a count of the changes made to a set of related characteristic(s) as defined by the containing service. It is used to determine the need to synchronize this set between a Server and a Client.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Database Change Increment	uint32	4	Unit: org.bluetooth.unit.unitless The Database Change Increment is a unitless integer value.

Table 3.123: Structure of the Database Change Increment characteristic

3.69 Date of Birth

The Date of Birth characteristic is used to represent the date of birth of a user as defined by the Gregorian calendar.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Year	uint16	2	Unit: org.bluetooth.unit.time.year The Year is an integer value. Minimum value: 1582 Maximum value: 9999 In addition to the above range, a special value is defined: 0 = Year is not known
Month	uint8	1	See Section 3.69.1.
Day	uint8	1	Unit: org.bluetooth.unit.time.day The Day is an integer value. Minimum value: 1 Maximum value: 31 In addition to the above range, a special value is defined: 0 = Day of Month is not known

Table 3.124: Structure of the Date of Birth characteristic

3.69.1 Month field

The values of this field are defined below.

Value	Definition
0	Month is not known
1	January
2	February
3	March
4	April
5	May
6	June
7	July
8	August
9	September
10	October
11	November
12	December
13–255	Reserved for Future Use

Table 3.125: Month field

3.70 Date of Threshold Assessment

The Date of Threshold Assessment characteristic is used to represent the date of threshold assessment of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Year	uint16	2	Year as defined by the Gregorian calendar. Unit; org.bluetooth.unit.time.year The Year is an integer value. Minimum value: 1582 Maximum value: 9999 In addition to the above range, a special value is defined: 0 = Year is not known
Month	uint8	1	See Section 3.70.1.
Day	uint8	1	Unit: org.bluetooth.unit.time.day The Day is an integer value. Minimum value: 1 Maximum value: 31 In addition to the above range, a special value is defined: 0 = Day of Month is not known

Table 3.126: Structure of the Date of Threshold Assessment characteristic

3.70.1 Month field

The values of this field are defined below.

Value	Definition
0	Month is not known
1	January
2	February
3	March
4	April
5	May
6	June
7	July
8	August
9	September
10	October
11	November
12	December
13–255	Reserved for Future Use

Table 3.127: Month field

3.71 Date Time

The Date Time characteristic is used to represent date and time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Year	uint16	2	Year as defined by the Gregorian calendar. Valid range 1582 to 9999. A value of 0 means that the year is not known. All other values are Reserved for Future Use.
Month	uint8	1	Month of the year as defined by the Gregorian calendar. Valid range 1 (January) to 12 (December). A value of 0 means that the month is not known. All other values are Reserved for Future Use.
Day	uint8	1	Day of the month as defined by the Gregorian calendar. Valid range 1 to 31. A value of 0 means that the day of month is not known. All other values are Reserved for Future Use.
Hours	uint8	1	Number of hours past midnight. Valid range 0 to 23. All other values are Reserved for Future Use.
Minutes	uint8	1	Number of minutes since the start of the hour. Valid range 0 to 59. All other values are Reserved for Future Use.
Seconds	uint8	1	Number of seconds since the start of the minute. Valid range 0 to 59. All other values are Reserved for Future Use.

Table 3.128: Structure of the Date Time characteristic

3.72 Date UTC

The Date UTC characteristic is used to represent the date as days elapsed since the Epoch (Jan 1, 1970) in the Coordinated Universal Time (UTC) time zone.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Date	uint24	3	Unit is a day with a resolution of 1. Minimum: 1 Maximum: 16777214 Represented values: M = 1, d = 0, b = 0 Unit: org.bluetooth.unit.time.day A value of 0x000000 represents ”value is not known”.

Table 3.129: Structure of the Date UTC characteristic

3.73 Day Date Time

The Day Date Time characteristic is used to represent weekday, date, and time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Date Time	struct	7	Refer to the Date Time characteristic in Section 3.71
Day of Week	struct	1	Refer to the Day of Week characteristic in Section 3.74

Table 3.130: Structure of the Day Date Time characteristic

3.74 Day of Week

The Day of Week characteristic is used to represent the day within a seven-day week as specified in ISO 8601 [10].

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Day of Week	uint8	1	0: Unknown 1: Monday 2: Tuesday 3: Wednesday 4: Thursday 5: Friday 6: Saturday 7: Sunday 8–255: Reserved for Future Use

Table 3.131: Structure of the Day of Week characteristic

3.75 Device Wearing Position

The Device Wearing Position characteristic is used to represent the position where a user is wearing the device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Device Wearing Position	uint8	1	See Section 3.75.1

Table 3.132: Structure of the Device Wearing Position characteristic

3.75.1 Device Wearing Position field

The values of this field are defined below.

Value	Definition
0x00	Other
0x01	Head
0x02	Head_Ear

Value	Definition
0x03	Head_Ear_Right
0x04	Head_Ear_Left
0x05	Head_Neck
0x06	Trunk
0x07	Trunk_Pelvis
0x08	Trunk_Pelvis_Right
0x09	Trunk_Pelvis_Left
0x0A	Trunk_Thorax
0x0B	Trunk_Thorax_Right
0x0C	Trunk_Thorax_Left
0x0D	Trunk_Back
0x0E	UpperExtremity
0x0F	UpperExtremity_Right
0x10	UpperExtremity_Left
0x11	UpperExtremity_Wrist
0x12	UpperExtremity_Wrist_Right
0x13	UpperExtremity_Wrist_Left
0x14	UpperExtremity_Finger
0x15	UpperExtremity_Finger_Right
0x16	UpperExtremity_Finger_Left
0x17	UpperExtremity_Hand
0x18	UpperExtremity_Hand_Right
0x19	UpperExtremity_Hand_Left
0x1A	LowerExtremity
0x1B	LowerExtremity_Right
0x1C	LowerExtremity_Left
0x1D	LowerExtremity_Ankle
0x1E	LowerExtremity_Ankle_Right
0x1F	LowerExtremity_Ankle_Left
0x20	LowerExtremity_Foot
0x21	LowerExtremity_Foot_Right
0x22	LowerExtremity_Foot_Left
0x23	Pants_Pocket
0x24	Pants_Pocket_Right

Value	Definition
0x25	Pants_Pocket_Left
0x26	Chest_Pocket
0x27	Chest_Pocket_Right
0x28	Chest_Pocket_Left
0x29–0xFF	Reserved for Future Use

Table 3.133: Device Wearing Position field

3.76 Dew Point

The Dew Point characteristic is used to represent the dew point.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Dew Point	sint8	1	Base Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius Represented values: M = 1, d = 0, b = 0 Unit is in degrees Celsius with a resolution of 1 degree Celsius.

Table 3.134: Structure of the Dew Point characteristic

3.77 DST Offset

The DST Offset characteristic is used to represent daylight saving time information associated with time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
DST Offset	uint8	1	0: Standard Time 2: Half an hour Daylight Time (+ 0.5h) 4: Daylight Time (+ 1h) 8: Double Daylight Time (+ 2h) 255: DST offset unknown All other values: Reserved for Future Use

Table 3.135: Structure of the DST Offset characteristic

3.78 Elapsed Time

The Elapsed Time characteristic is used to represent the current time of a clock or tick counter at the time an event occurred. The Time Value allows easy calculation of time differences and easy comparison of times. The characteristic is a fixed-size structure that provides sufficient information to interpret the reported time in many contexts.

The flags determine if the Time Value represents a tick counter, UTC time or local time. The following formula gives the relation between local time and UTC time:

*Local time = UTC time + TZ/DST Offset * 15 minutes*

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.78.1.
Time Value	uint48	6	The actual time value in the resolution as defined by the flags. The Time Value field contains a counter of the number of time units as determined by the time resolution of the clock. The starting point of the timeline is 2000-01-01 00:00:00 when reporting a time of day or is implementation-dependent for a tick counter.
Time Sync Source Type	uint8	1	The type of time source used for synchronization. See Section 3.235 for the supported values. This field has no meaning for a tick counter.
TZ/DST Offset	sint8	1	Combined TZ/DST offset from UTC in 15-minute units. This field has no meaning for a tick counter and is relevant only when the TZ/DST offset used flag is set.

Table 3.136: Structure of the Elapsed Time characteristic

3.78.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Time is a tick counter 0 = Time Value reports a time of day 1 = Time Value reports a counter (also known as ”relative time”)
1	Time is UTC 0 = Time Value reports local time 1 = Time Value reports UTC This field has no meaning for a tick counter.
2-3	Time resolution 00 = 1 second 01 = 100 milliseconds 10 = 1 millisecond 11 = 100 microseconds
4	TZ/DST offset is used 0 = TZ/DST offset is not used 1 = TZ/DST offset is used This field has no meaning for a tick counter.

Bit	Definition
5	Time stamp is from the current timeline 0 = Time stamp is not from the current timeline 1 = Time stamp is from the current timeline This bit indicates if the time comes from the current timeline as reported by the clock that is used for keeping track of time.
6-7	Reserved for Future Use

Table 3.137: Flags field

3.79 Electric Current

The Electric Current characteristic is used to represent an electric current.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Current	uint16	2	Unit is ampere with a resolution of 0.01. Minimum: 0 Maximum: 655.34 Represented values: M = 1, d = -2, b = 0 Unit: org.bluetooth.unit.electric_current.ampere A value of 0xFFFF represents ”value is not known”.

Table 3.138: Structure of the Electric Current characteristic

3.80 Electric Current Range

The Electric Current Range characteristic is used to represent a range of electric current values.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Electric Current Value	struct	2	Refer to the Electric Current characteristic in Section 3.79
Maximum Electric Current Value	struct	2	Refer to the Electric Current characteristic in Section 3.79

Table 3.139: Structure of the Electric Current Range characteristic

3.81 Electric Current Specification

The Electric Current Specification characteristic is used to represent a specification of an electric current value.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Electric Current Value	struct	2	Refer to the Electric Current characteristic in Section 3.79
Typical Electric Current Value	struct	2	Refer to the Electric Current characteristic in Section 3.79
Maximum Electric Current Value	struct	2	Refer to the Electric Current characteristic in Section 3.79

Table 3.140: Structure of the Electric Current Specification characteristic

3.82 Electric Current Statistics

The Electric Current Statistics characteristic is used to represent a set of statistical electric current values.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Average Electric Current Value	struct	2	Refer to the Electric Current characteristic in Section 3.79
Standard Deviation Electric Current Value	struct	2	Refer to the Electric Current characteristic in Section 3.79
Minimum Electric Current Value	struct	2	Refer to the Electric Current characteristic in Section 3.79
Maximum Electric Current Value	struct	2	Refer to the Electric Current characteristic in Section 3.79
Sensing Duration	struct	1	Refer to the Time Exponential 8 characteristic in Section 3.229

Table 3.141: Structure of the Electric Current Statistics characteristic

3.83 Elevation

The Elevation characteristic is used to represent the elevation. The elevation is relative to sea level unless otherwise specified in the service.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Elevation	sint24	3	Base Unit: org.bluetooth.unit.length.meter Represented values: M = 1, d = -2, b = 0 Unit is in meters with a resolution of 0.01 m.

Table 3.142: Structure of the Elevation characteristic

3.84 Email Address

The Email Address characteristic is used to represent the email address of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Email Address	utf8s	variable	UTF-8 string

Table 3.143: Structure of the Email Address characteristic

3.85 Energy

The Energy characteristic is used to represent a measure of energy.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Energy	uint24	3	Unit is kilowatt-hour with a resolution of 1. Minimum: 0 Maximum: 16777214 Represented values: M = 1, d = 0, b = 0 Unit: org.bluetooth.unit.energy.kilowatt_hour A value of 0xFFFFFF represents ”value is not known”.

Table 3.144: Structure of the Energy characteristic

3.86 Energy 32

The Energy 32 characteristic is used to represent a measure of energy.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Energy 32	uint32	4	Unit is kilowatt-hour with a resolution of 1 Watt–hour. Minimum: 0 Maximum: 4294967.293 Represented values: M = 1, d = -3, b = 0 Unit: org.bluetooth.unit.energy.kilowatt_hour A value of 0xFFFFFFFE represents ”value is not valid”. A value of 0xFFFFFFFF represents ”value is not known”.

Table 3.145: Structure of the Energy 32 characteristic

3.87 Energy in a Period of Day

The Energy in a Period of Day characteristic is used to represent energy use in a period of a day.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Energy Value	struct	3	Refer to the Energy characteristic in Section 3.85

Field	Data Type	Size (in octets)	Description
Start Time	struct	1	Refer to the Time Decihour 8 characteristic in Section 3.228
End Time	struct	1	Refer to the Time Decihour 8 characteristic in Section 3.228

Table 3.146: Structure of the Energy in a Period of Day characteristic

3.88 Enhanced Blood Pressure Measurement

The Enhanced Blood Pressure Measurement characteristic is used to represent data related to a blood pressure measurement that includes a UTC time stamp and a user facing time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.88.1.
Blood Pressure Measurement Compound Value (mmHg)	struct	0 or 6	See Section 3.88.2. Present if bit 0 of Flags field is set to 0
Blood Pressure Measurement Compound Value (kPa)	struct	0 or 6	See Section 3.88.3. Present if bit 0 of Flags field is set to 1
Time Stamp	uint32	0 or 4	Unit: Seconds, since Epoch Start See Section 3.88.4. Present if bit 1 of Flags field is set to 1
Pulse Rate	medfloat16	0 or 2	Unit: org.bluetooth.unit.period.beats_per_minute Present if bit 2 of Flags field is set to 1
User ID	uint8	0 or 1	See Section 3.32.2. Present if bit 3 of Flags field is set to 1
Measurement Status	boolean[16]	0 or 2	See Section 3.32.3. Present if bit 4 of Flags field is set to 1
User Facing Time	uint32	0 or 4	Unit: Seconds, since Epoch Start See Section 3.88.5. Present if bit 5 of Flags field is set to 1

Table 3.147: Structure of the Enhanced Blood Pressure Measurement characteristic

3.88.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Blood Pressure Measurement Units Flag 0 = Blood pressure for Systolic, Diastolic and MAP in units of mmHg 1 = Blood pressure for Systolic, Diastolic and MAP in units of kPa
1	Time Stamp Flag 0 = Time Stamp not present 1 = Time Stamp present
2	Pulse Rate Flag 0 = Pulse Rate not present 1 = Pulse Rate present
3	User ID Flag 0 = User ID not present 1 = User ID present
4	Measurement Status Flag 0 = Measurement Status not present 1 = Measurement Status present
5	User Facing Time Flag 0 = User Facing Time not present 1 = User Facing Time present
6	Epoch Start 2000 Flag 0 = Epoch start is January 1, 1900 (00:00:00) 1 = Epoch start is January 1, 2000 (00:00:00)
7	Reserved for Future Use

Table 3.148: Flags field

3.88.2 Blood Pressure Measurement Compound Value (mmHg) field

The structure of this field is defined below.

Field	Data Type	Size (in octets)	Description
Systolic (mmHg)	medfloat16	2	Unit: org.bluetooth.unit.pressure.millimetre_of_mercury
Diastolic (mmHg)	medfloat16	2	Unit: org.bluetooth.unit.pressure.millimetre_of_mercury
Mean Arterial Pressure (mmHg)	medfloat16	2	Unit: org.bluetooth.unit.pressure.millimetre_of_mercury

Table 3.149: Blood Pressure Measurement Compound Value (mmHg) field

3.88.3 Blood Pressure Measurement Compound Value (kPa) field

The structure of this field is defined below.

Field	Data Type	Size (in octets)	Description
Systolic (kPa)	medfloat16	2	Base Unit: org.bluetooth.unit.pressure.pascal; M = 1, d = 3, and b = 0
Diastolic (kPa)	medfloat16	2	Base Unit: org.bluetooth.unit.pressure.pascal; M = 1, d = 3, and b = 0
Mean Arterial Pressure (kPa)	medfloat16	2	Base Unit: org.bluetooth.unit.pressure.pascal; M = 1, d = 3, and b = 0

Table 3.150: Blood Pressure Measurement Compound Value (kPa) field

3.88.4 Time Stamp field

This field represents the Sensor time in seconds since the epoch start time. The epoch start is on January 1 of 1900, or 2000 at 00:00:00, depending on the value of the Epoch Start 2000 Flag.

When both the Time Stamp field and the User Facing Time field are present, the Time Stamp field represents the base time (possibly UTC aligned) and does not take into account time zone, DST adjustments or manual adjustments of the time displayed to a user.

3.88.5 User Facing Time field

This field represents the user facing time in seconds since the epoch start time. The epoch start is on January 1 of 1900, or 2000 at 00:00:00, depending on the value of the Epoch Start 2000 Flag.

User facing time takes into account time zone, DST adjustments and manual adjustments of the time displayed to a user.

3.89 Enhanced Intermediate Cuff Pressure

The Enhanced Intermediate Cuff Pressure characteristic is used to represent enhanced intermediate Cuff Pressure values for display purposes while a measurement is in progress and includes a UTC time stamp and a user facing time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.89.1.
Intermediate Cuff Pressure Value	medfloat16	2	Unit: org.bluetooth.unit.pressure.millimetre_of_mercury or Base Unit: org.bluetooth.unit.pressure.pascal; M = 1, d = 3, and b = 0 If bit 0 of the Flags field is set to 0, units are mmHG, else units are kPa.
Time Stamp	uint32	0 or 4	Unit: Seconds since Epoch Start See Section 3.88.4. Present if bit 1 of Flags field is set to 1
Pulse Rate	medfloat16	0 or 2	Unit: org.bluetooth.unit.period.beats_per_minute Present if bit 2 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
User ID	uint8	0 or 1	See Section 3.32.2. Present if bit 3 of Flags field is set to 1
Measurement Status	boolean[16]	0 or 2	See Section 3.32.3. Present if bit 4 of Flags field is set to 1
User Facing Time	uint32	0 or 4	Unit: Seconds since Epoch Start See Section 3.88.5. Present if bit 5 of Flags field is set to 1

Table 3.151: Structure of the Enhanced Intermediate Cuff Pressure characteristic

3.89.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Intermediate Cuff Pressure Measurement Units Flag 0 = Intermediate Cuff Pressure in units of mmHg 1 = Intermediate Cuff Pressure in units of kPa
1	Time Stamp Flag 0 = Time Stamp not present 1 = Time Stamp present
2	Pulse Rate Flag 0 = Pulse Rate not present 1 = Pulse Rate present
3	User ID Flag 0 = User ID not present 1 = User ID present
4	Measurement Status Flag 0 = Measurement Status not present 1 = Measurement Status present
5	User Facing Time Flag 0 = User Facing Time not present 1 = User Facing Time present
6	Epoch Start 2000 Flag 0 = Epoch start is January 1, 1900 (00:00:00) 1 = Epoch start is January 1, 2000 (00:00:00)
7	Reserved for Future Use

Table 3.152: Flags field

3.90 Estimated Service Date

The Estimated Service Date characteristic is used to represent the estimated date when replacement or servicing is required.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Estimated Service Date	uint24	3	Estimated service date specified as days elapsed since the Epoch (Jan 1, 1970) in the Coordinated Universal Time (UTC) time zone. Refer to the Date UTC characteristic in Section 3.72. Base unit: org.bluetooth.unit.time.day

Table 3.153: Structure of the Estimated Service Date characteristic

3.91 Event Statistics

The Event Statistics characteristic is used to represent statistical values of events.

The structure of this characteristic is defined below

Field	Data Type	Size (in octets)	Description
Number of Events	struct	2	Refer to the Count 16 characteristic in Section 3.57
Average Event Duration	struct	2	Refer to the Time Second 16 characteristic in Section 3.233
Time Elapsed Since Last Event	struct	1	Refer to the Time Exponential 8 characteristic in Section 3.229
Sensing Duration	struct	1	Refer to the Time Exponential 8 characteristic in Section 3.229

Table 3.154: Structure of the Event Statistics characteristic

3.92 Exact Time 256

The Exact Time 256 characteristic is used to represent the day, date, and time, including fractions of seconds.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Day Date Time	struct	8	Refer to the Day Date Time characteristic in Section 3.73.
Fractions256	uint8	1	The number of 1/256 fractions of a second. Valid range 0–255.

Table 3.155: Structure of the Exact Time 256 characteristic

3.93 Fat Burn Heart Rate Lower Limit

The Fat Burn Heart Rate Lower Limit characteristic is used to represent the desired lower limit of the heart rate, where a user maximizes the fat burn while exercising.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Fat Burn Heart Rate Lower Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.156: Structure of the Fat Burn Heart Rate Lower Limit characteristic

3.94 Fat Burn Heart Rate Upper Limit

The Fat Burn Heart Rate Upper Limit characteristic is used to represent the desired upper limit of the heart rate, where a user maximizes the fat burn while exercising.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Fat Burn Heart Rate Upper Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.157: Structure of the Fat Burn Heart Rate Upper Limit characteristic

3.95 Firmware Revision String

The Firmware Revision String characteristic is used to represent the revision of the firmware within the device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Firmware Revision	utf8s	variable	UTF-8 string

Table 3.158: Structure of the Firmware Revision String characteristic

3.96 First Name

The First Name characteristic is used to represent the first name of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
First Name	utf8s	variable	UTF-8 string

Table 3.159: Structure of the First Name characteristic

3.97 Five Zone Heart Rate Limits

The Five Zone Heart Rate Limits characteristic is used to represent the limits between the heart rate zones for the five-zone heart rate definition (Maximum, Hard, Moderate, Light, and Very Light) of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Five Zone Heart Rate Limits - Very Light / Light Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute
Five Zone Heart Rate Limits - Light / Moderate Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute
Five Zone Heart Rate Limits - Moderate / Hard Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute
Five Zone Heart Rate Limits - Hard / Maximum Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.160: Structure of the Five Zone Heart Rate Limits characteristic

3.98 Fixed String 8

The Fixed String 8 characteristic is used to represent a variable-length UTF-8 string with a maximum length of 8 octets, see Volume 1, Part E, Section 2.9.3 in [1].

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Fixed String	utf8s{8}	8	UTF-8 string

Table 3.161: Structure of the Fixed String 8 characteristic

3.99 Fixed String 16

The Fixed String 16 characteristic is used to represent a variable-length UTF-8 string with a maximum length of 16 octets, see Volume 1, Part E, Section 2.9.3 in [1].

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Fixed String	utf8s{16}	16	UTF-8 string

Table 3.162: Structure of the Fixed String 16 characteristic

3.100 Fixed String 24

The Fixed String 24 characteristic is used to represent a variable-length UTF-8 string with a maximum length of 24 octets, see Volume 1, Part E, Section 2.9.3 in [1].

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Fixed String	utf8s{24}	24	UTF-8 string

Table 3.163: Structure of the Fixed String 24 characteristic

3.101 Fixed String 36

The Fixed String 36 characteristic is used to represent a variable-length UTF-8 string with a maximum length of 36 octets, see Volume 1, Part E, Section 2.9.3 in [1].

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Fixed String	utf8s{36}	36	UTF-8 string

Table 3.164: Structure of the Fixed String 36 characteristic

3.102 Fixed String 64

The Fixed String 64 characteristic is used to represent a variable-length UTF-8 string with a maximum length of 64 octets, see Volume 1, Part E, Section 2.9.3 in [1].

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Fixed String 64	utf8s{64}	64	UTF-8 string

Table 3.165: Structure of the Fixed String 64 characteristic

3.103 Force

The Force characteristic is used to represent the force being applied to an object along a given axis.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Force	sint32	4	Base Unit: org.bluetooth.unit.force.newton Represented values: M = 1, d = -3, b = 0 Unit is Newton with a resolution of 1/1000 N (1 mN). A value of 0x7FFFFFFF represents ”value is not known”.

Table 3.166: Structure of the Force characteristic

3.104 Four Zone Heart Rate Limits

The Four Zone Heart Rate Limits characteristic is used to represent the limits between the heart rate zones for the four-zone heart rate definition (Maximum, Hard, Moderate, and Light) of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Four Zone Heart Rate Limits - Light / Moderate Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute
Four Zone Heart Rate Limits - Moderate / Hard Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute
Four Zone Heart Rate Limits - Hard / Maximum Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.167: Structure of the Four Zone Heart Rate Limits characteristic

3.105 Gender

The Gender characteristic is used to represent the gender of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Gender	uint8	1	0: Male 1: Female 2: Unspecified 3–255: Reserved for Future Use

Table 3.168: Structure of the Gender characteristic

3.106 Generic Level

The Generic Level characteristic is used to represent a general level value of a setting of a device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Generic Level	uint16	2	Unit is unitless with a resolution of 1. Minimum: 0 Maximum: 65535 Represented values: M = 1, d = 0, b = 0

Table 3.169: Structure of the Generic Level characteristic

3.107 Global Trade Item Number

The Global Trade Item Number characteristic is used to represent an identifier as defined by GS1 [5], with up to 14 digits.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Global Trade Item Number	uint48	6	An identifier for trade items, defined by GS1 [5].

Table 3.170: Structure of the Global Trade Item Number characteristic

3.108 Glucose Feature

The Glucose Feature characteristic is used to represent the supported features of a glucose sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Glucose Feature	boolean[16]	2	See Section 3.108.1

Table 3.171: Structure of the Glucose Feature characteristic

3.108.1 Glucose Feature field

The bits of this field are defined below.

Bit	Definition
0	Low Battery Detection During Measurement support bit: 0 = Low Battery Detection During Measurement feature not supported 1 = Low Battery Detection During Measurement feature supported
1	Sensor Malfunction Detection support bit: 0 = Sensor Malfunction Detection feature not supported 1 = Sensor Malfunction Detection feature supported
2	Sensor Sample Size support bit: 0 = Sensor Sample Size feature not supported 1 = Sensor Sample Size feature supported
3	Sensor Strip Insertion Error Detection support bit: 0 = Sensor Strip Insertion Error Detection feature not supported 1 = Sensor Strip Insertion Error Detection feature supported
4	Sensor Strip Type Error Detection support bit: 0 = Sensor Strip Type Error Detection not supported 1 = Sensor Strip Type Error Detection supported
5	Sensor Result High-Low Detection support bit: 0 = Sensor Result High-Low Detection not supported 1 = Sensor Result High-Low Detection supported
6	Sensor Temperature High-Low Detection support bit: 0 = Sensor Temperature High-Low Detection not supported 1 = Sensor Temperature High-Low Detection supported
7	Sensor Read Interrupt Detection support bit: 0 = Sensor Read Interrupt Detection not supported 1 = Sensor Read Interrupt Detection supported

Bit	Definition
8	General Device Fault support bit: 0 = General Device Fault not supported 1 = General Device Fault supported
9	Time Fault support bit: 0 = Time Fault not supported 1 = Time Fault supported
10	Multiple Bond support bit: 0 = Multiple Bonds not supported 1 = Multiple Bonds supported
11–15	Reserved for Future Use

Table 3.172: Glucose Feature field

3.109 Glucose Measurement

The Glucose Measurement characteristic is used to represent data related to a glucose measurement record.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.109.1
Sequence Number	uint16	2	Contains a sequence number of the record. It is used to number a sequence of measurements as defined by the service.
Base Time	struct	7	Refer to Date Time characteristic in Section 3.71
Time Offset	int16	0 or 2	Specifies the time difference from the value of the Base Time field. See Section 3.109.2 unit: org.bluetooth.unit.time.minute Present if bit 0 of Flags field is set to 1
Glucose Concentration	medfloat16	0 or 2	If bit 2 of Flags field is set to 0, unit: org.bluetooth.unit.mass_density.kilogram_per_liter If bit 2 of Flags field is set to 1, unit: org.bluetooth.unit.mass_density.mole_per_litre Present if bit 1 of Flags field is set to 1
Type-Sample Location	struct	0 or 1	See Section 3.109.3 Present if bit 1 of Flags field is set to 1
Sensor Status Annunciation	boolean[16]	0 or 2	See Section 3.109.4 Present if bit 3 of Flags field is set to 1

Table 3.173: Structure of the Glucose Measurement characteristic

3.109.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Time Offset Flag: 0 = Time Offset field not present 1 = Time Offset field present
1	Glucose Concentration and Type-Sample Location Flag: 0 = Glucose Concentration and Type-Sample Location fields not present 1 = Glucose Concentration and Type-Sample Location fields present
2	Glucose Units Flag: 0 = Glucose concentration in units of mg/dL 1 = Glucose concentration in units of mmol/L
3	Sensor Status Annunciation Flag: 0 = Sensor Status Annunciation field not present 1 = Sensor Status Annunciation field present
4	Context Information Flag: 0 = This record does not include context information 1 = This record includes context information
5–7	Reserved for Future Use

Table 3.174: Flags field

3.109.2 Time Offset field

The values of this field are defined below

Value	Definition
0x0000–0xFFFF	Time offset in minutes

Table 3.175: Time Offset field

3.109.3 Type-Sample Location field

The structure of this field is defined below.

Field	Data Type	Size (in bits)	Description
Type	uint4	4	Unit: org.bluetooth.unit.unitless See Section 3.109.3.1
Sample Location	uint4	4	Unit: org.bluetooth.unit.unitless See Section 3.109.3.2

Table 3.176: Type-Sample Location field

3.109.3.1 Type field

The values of this field are defined below.

Value	Definition
0x0	Reserved for Future Use
0x1	Capillary Whole blood
0x2	Capillary Plasma
0x3	Venous Whole blood
0x4	Venous Plasma
0x5	Arterial Whole blood
0x6	Arterial Plasma
0x7	Undetermined Whole blood
0x8	Undetermined Plasma
0x9	Interstitial Fluid (ISF)
0xA	Control Solution
0xB–0xF	Reserved for Future Use

Table 3.177: Type field

3.109.3.2 Sample Location field

The values of this field are defined below

Value	Definition
0x0	Reserved for Future Use
0x1	Finger
0x2	Alternate Site Test (AST)
0x3	Earlobe
0x4	Control solution
0x5–0xE	Reserved for Future Use
0xF	Sample Location value not available

Table 3.178: Sample Location field

3.109.4 Sensor Status Annunciation field

The bits of this field are defined below.

Bit	Definition
0	Device battery low: 0 = The battery was not low at the time of measurement. 1 = The battery was low at the time of measurement.
1	Sensor malfunction: 0 = The sensor was not malfunctioning or faulting at the time of measurement. 1 = The sensor was malfunctioning or faulting at the time of measurement.

Bit	Definition
2	Sample size insufficient: 0 = There was enough blood or control solution on the strip during the measurement. 1 = There was not enough blood or control solution on the strip during the measurement.
3	Strip insertion error: 0 = The strip was inserted correctly. 1 = The strip was not inserted correctly.
4	Strip type incorrect: 0 = The strip was the right type for the device. 1 = The strip was not the right type for the device.
5	Sensor result too high: 0 = The reading or value was not higher than the device can process. 1 = The reading or value was higher than the device can process.
6	Sensor result too low: 0 = The reading or value was not lower than the device can process. 1 = The reading or value was lower than the device can process.
7	Sensor temperature too high: 0 = The ambient temperature was not too high for a valid test/result at the time of measurement. 1 = The ambient temperature was too high for a valid test/result at the time of measurement.
8	Sensor temperature too low: 0 = The ambient temperature was not too low for a valid test/result at the time of measurement. 1 = The ambient temperature was too low for a valid test/result at the time of measurement.
9	Sensor read interrupted: 0 = The reading was not interrupted and the strip was not pulled too soon during the measurement. 1 = The reading was interrupted or the strip was pulled too soon during the measurement.
10	General device fault: 0 = A general device fault has not occurred in the sensor device. 1 = A general device fault has occurred in the sensor device.
11	Time fault: 0 = A time fault has not occurred in the sensor device. 1 = A time fault has occurred in the sensor device and the time is inaccurate.
12–15	Reserved for Future Use

Table 3.179: Sensor Status Annunciation field

3.110 Glucose Measurement Context

The Glucose Measurement Context characteristic is used to represent context information associated with a glucose measurement record.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.110.1
Sequence Number	uint16	2	Contains the sequence number of the corresponding Glucose Measurement as defined by the service.
Extended Flags	boolean[8]	0 or 1	See Section 3.110.2 Present if bit 7 of Flags field is set to 1
Carbohydrate ID	uint8	0 or 1	See Section 3.110.3 Present if bit 0 of Flags field is set to 1
Carbohydrate	medfloat16	0 or 2	Unit: org.bluetooth.unit.mass.kilogram Present if bit 0 of Flags field is set to 1
Meal	uint8	0 or 1	See Section 3.110.4 Present if bit 1 of Flags field is set to 1
Tester-Health	struct	0 or 1	See Section 3.110.5 Present if bit 2 of Flags field is set to 1
Exercise Duration	uint16	0 or 2	See Section 3.110.6 Unit: org.bluetooth.unit.time.second Present if bit 3 of Flags field is set to 1
Exercise Intensity	uint8	0 or 1	Unit: org.bluetooth.unit.percentage Present if bit 3 of Flags field is set to 1
Medication ID	uint8	0 or 1	See Section 3.110.7 Present if bit 4 of Flags field is set to 1
Medication	medfloat16	0 or 2	If bit 5 of Flags field is set to 0, Unit: org.bluetooth.unit.mass.kilogram If bit 5 of Flags field is set to 1, Unit: org.bluetooth.unit.volume.litre Present if bit 4 of Flags field is set to 1
HbA1c	medfloat16	0 or 2	Unit: org.bluetooth.unit.percentage Present if bit 6 of Flags field is set to 1

Table 3.180: Structure of the Glucose Measurement Context characteristic

3.110.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Carbohydrates Flag: 0 = Carbohydrate ID and Carbohydrate fields not present 1 = Carbohydrate ID and Carbohydrate fields present
1	Meal Flag: 0 = Meal field not present 1 = Meal field present
2	Tester-Health Flag: 0 = Tester-Health field not present 1 = Tester-Health field present

Bit	Definition
3	Exercise Flag: 0 = Exercise Duration and Exercise Intensity fields not present 1 = Exercise Duration and Exercise Intensity fields present
4	Medication Flag: 0 = Medication ID and Medication fields not present 1 = Medication ID and Medication fields present
5	Medication Units Flag: 0 = Medication value in units of milligrams 1 = Medication value in units of milliliters
6	HbA1c Flag: 0 = HbA1c field not present 1 = HbA1c field present
7	Extended Flags: 0 = Extended Flags field not present 1 = Extended Flags field present

Table 3.181: Flags field

3.110.2 Extended Flags field

The bits of this field are defined below.

Bit	Definition
0–7	Reserved for Future Use

Table 3.182: Extended Flags field

3.110.3 Carbohydrate ID field

The values of this field are defined below.

Value	Definition
0x00	Reserved for Future Use
0x01	Breakfast
0x02	Lunch
0x03	Dinner
0x04	Snack
0x05	Drink
0x06	Supper
0x07	Brunch
0x08–0xFF	Reserved for Future Use

Table 3.183: Carbohydrate ID field

3.110.4 Meal field

The values of this field are defined below.

Value	Definition
0x00	Reserved for Future Use
0x01	Preprandial (before meal)
0x02	Postprandial (after meal)
0x03	Fasting
0x04	Casual (snacks, drinks, etc.)
0x05	Bedtime
0x06–0xFF	Reserved for Future Use

Table 3.184: Meal field

3.110.5 Tester-Health field

The structure of this field is defined below.

Field	Data Type	Size (in bits)	Description
Tester	uint4	4	Unit: org.bluetooth.unit.unitless See Section 3.110.5.1
Health	uint4	4	Unit: org.bluetooth.unit.unitless See Section 3.110.5.2

Table 3.185: Tester-Health field

3.110.5.1 Tester field

The values of this field are defined below.

Value	Definition
0x0	Reserved for Future Use
0x1	Self
0x2	Health Care Professional
0x3	Lab test
0x4–0xE	Reserved for Future Use
0xF	Tester value not available

Table 3.186: Tester field

3.110.5.2 Health field

The values of this field are defined below.

Value	Definition
0x0	Reserved for Future Use
0x1	Minor health issues
0x2	Major health issues
0x3	During menses
0x4	Under stress
0x5	No health issues
0x6–0xE	Reserved for Future Use
0xF	Health value not available

Table 3.187: Health field

3.110.6 Exercise Duration field

The values of this field are defined below.

Value	Definition
0x0000–0xFFFE	Exercise Duration in seconds
0xFFFF	Overrun

Table 3.188: Exercise Duration field

3.110.7 Medication ID field

The values of this field are defined below.

Value	Definition
0x00	Reserved for Future Use
0x01	Rapid acting insulin
0x02	Short acting insulin
0x03	Intermediate acting insulin
0x04	Long acting insulin
0x05	Pre-mixed insulin
0x06–0xFF	Reserved for Future Use

Table 3.189: Medication ID field

3.111 Gust Factor

The Gust Factor characteristic is used to represent the gust factor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Gust Factor	uint8	1	Base Unit: org.bluetooth.unit.unitless Represented values: M = 1, d = -1, b = 0 The factor has a fixed-point representation, where the actual factor is (attribute value * 0.1).

Table 3.190: Structure of the Gust Factor characteristic

3.112 Handedness

The Handedness characteristic is used to represent the handedness of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Handedness	uint8	1	See Section 3.112.1.

Table 3.191: Structure of the Handedness characteristic

3.112.1 Handedness field

The values of this field are defined below.

Value	Definition
0x00	Left handed
0x01	Right handed
0x02	Ambidextrous
0x03	Unspecified
0x04–0xFF	Reserved for Future Use

Table 3.192: Handedness field

3.113 Hardware Revision String

The Hardware Revision String characteristic is used to represent the hardware revision for the hardware within the device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Hardware Revision	utf8s	variable	UTF-8 string

Table 3.193: Structure of the Hardware Revision String characteristic

3.114 Heart Rate Control Point

The Heart Rate Control Point characteristic is used to enable device-specific procedures related to a heart rate sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Heart Rate Control Point	uint8	1	See Section 3.114.1

Table 3.194: Structure of the Heart Rate Control Point characteristic

3.114.1 Heart Rate Control Point field

The values of this field are defined below.

Value	Definition
0x00	Reserved for Future Use
0x01	Reset Energy Expended Resets the value of the Energy Expended field in the Heart Rate Measurement characteristic to 0
0x02–0xFF	Reserved for Future Use

Table 3.195: Heart Rate Control Point field

3.115 Heart Rate Max

The Heart Rate Max characteristic is used to represent the maximum heart rate of a user which the user intends not to exceed.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Heart Rate Max	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.196: Structure of the Heart Rate Max characteristic

3.116 Heart Rate Measurement

The Heart Rate Measurement characteristic is used to represent data related to a heart rate measurement.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.116.1

Field	Data Type	Size (in octets)	Description
Heart Rate Measurement Value (8 bit resolution)	uint8	0 or 1	Unit: org.bluetooth.unit.period.beats_per_minute Present if bit 0 of Flags field is set to 0
Heart Rate Measurement Value (16 bit resolution)	uint16	0 or 2	Unit: org.bluetooth.unit.period.beats_per_minute Present if bit 0 of Flags field is set to 1
Energy Expended	uint16	0 or 2	Unit: org.bluetooth.unit.energy.joule Present if bit 3 of Flags field is set to 1
RR-interval	uint16[n]	0 or n*2	See Section 3.116.2 Present if bit 4 of Flags field is set to 1

Table 3.197: Structure of the Heart Rate Measurement characteristic

3.116.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Heart Rate Value Format: 0 = Heart Rate Value Format is set to uint8 1 = Heart Rate Value Format is set to uint16
1	Sensor Contact detected
2	Sensor Contact Supported
3	Energy Expended present
4	RR-Interval present
5–7	Reserved for Future Use

Table 3.198: Flags field

3.116.2 RR-Interval field

The RR-Interval value represents the time between two R-Wave detections. Each RR-Interval value is represented by a uint16 with 1/1024 second as the unit. Because it is possible to measure several RR-Intervals between transmissions of the Heart Rate Measurement characteristic, multiple RR-Interval sub-fields can be present in the characteristic. The number of RR-Interval sub-fields present is determined by a combination of the overall length of the characteristic and whether or not the characteristic contains the Energy Expended field.

Where there are multiple RR-Interval values transmitted in the Heart Rate Measurement characteristic, the structure of this field is defined below.

RR-Interval Field	Description
RR-Interval Value 0	Oldest RR-Interval value
RR-Interval Value 1	
RR-Interval Value 2	
…	
RR-Interval Value n	Newest RR-Interval value

Table 3.199: RR-Interval field

3.117 Heat Index

The Heat Index characteristic is used to represent the heat index.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Heat Index	sint8	1	Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius

Table 3.200: Structure of the Heat Index characteristic

3.118 Height

The Height characteristic is used to represent the height of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Height	uint16	2	Base Unit: org.bluetooth.unit.length.meter Represented values: M = 1, d = -2, b = 0 Unit is 0.01 meter.

Table 3.201: Structure of the Height characteristic

3.119 High Intensity Exercise Threshold

The High Intensity Exercise Threshold characteristic is used to represent the high intensity exercise threshold of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Field Selector	uint8	1	See Section 3.119.1
Threshold as Energy Expenditure per Hour	uint16	0 or 2	Base Unit: org.bluetooth.unit.energy.joule Represented values: M = 1, d = 3, b = 0 Unit is joule with a resolution of 1000 joules Present if value of Field Selector field is 1

Field	Data Type	Size (in octets)	Description
Threshold as Metabolic Equivalent	uint8	0 or 1	Base Unit: org.bluetooth.unit.metabolic_equivalent Represented values: M = 1, d = -1, b = 0 Unit is MET with a resolution of 0.1 MET (i.e., kcal/kg/hour) Present if value of Field Selector field is 2
Threshold as Percentage of Maximum Heart Rate	uint8	0 or 1	Unit: org.bluetooth.unit.percentage Present if value of Field Selector field is 3
Threshold as Heart Rate	uint8	0 or 1	Unit: org.bluetooth.unit.period.beats_per_minute Present if value of Field Selector field is 4

Table 3.202: Structure of the High Intensity Exercise Threshold characteristic

3.119.1 Field Selector field

The Field Selector field determines the High Intensity Exercise Threshold characteristic field selected to express the high intensity threshold. The selected field is present in the High Intensity Exercise Threshold characteristic, whereas the remaining fields are not present.

The values of this field are defined below.

Value	Definition
0	No field is selected
1	The Threshold as Energy Expenditure per Hour field is selected
2	The Threshold as Metabolic Equivalent field is selected
3	The Threshold as Percentage of Maximum Heart Rate field is selected
4	The Threshold as Heart Rate field is selected
5–255	Reserved for Future Use

Table 3.203: Field Selector field

3.120 High Resolution Height

The High Resolution Height characteristic is used to represent the height of a user and is used when a resolution of 0.1 mm is required.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Height	uint16	2	Base Unit: org.bluetooth.unit.length.meter Represented values: M = 1, d = -4, b = 0 Unit is meter with 0.0001 m (e.g., 0.1 mm)

Table 3.204: Structure of the High Resolution Height characteristic

3.121 High Temperature

The High Temperature characteristic is used to represent a temperature within a wide range of possible temperatures.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
High Temperature	sint16	2	Unit is degree Celsius with a resolution of 0.5. Minimum value: -273 Maximum value: 16383.5 Represented values: M = 1, d = 0, b = -1 Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius A value of 0x8001 represents ”value is not valid”. A value of 0x8000 represents ”value is not known”. All other values are prohibited.

Table 3.205: Structure of the High Temperature characteristic

3.122 High Voltage

The High Voltage characteristic is used to represent a measure of positive electric potential difference.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
High Voltage	uint24	3	Unit is volt with a resolution of 1/64V. Minimum: 0.0 Maximum: 262143.97 Represented values: M = 1, d = 0, b = 6 Unit: org.bluetooth.unit.electric_potential_difference.volt A value of 0xFFFFFF represents ”value is not known”.

Table 3.206: Structure of the High Voltage characteristic

3.123 Hip Circumference

The Hip Circumference characteristic is used to represent the hip circumference measurement of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Hip Circumference	uint16	2	Base Unit: org.bluetooth.unit.length.meter Represented values: M = 1, d = -2, b = 0 Unit is 0.01 meter.

Table 3.207: Structure of the Hip Circumference characteristic

3.124 Humidity

The Humidity characteristic is used to represent the humidity.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Humidity	uint16	2	Base Unit: org.bluetooth.unit.percentage Represented values: M = 1, d = -2, b = 0 Unit is in percent with a resolution of 0.01 percent. Allowed range is: 0.00 to 100.00 A value of 0xFFFF represents ”value is not known”. All other values are prohibited.

Table 3.208: Structure of the Humidity characteristic

3.125 IEEE 11073-20601 Regulatory Certification Data List

The IEEE 11073-20601 Regulatory Certification Data List characteristic is used to represent regulatory and certification information for a product in a list defined in IEEE 11073-20601 [2].

The content of this characteristic is determined by the authorizing organization that provides certifications.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
IEEE 11073-20601 Regulatory Certification Data List	struct	variable	Refer to 11073-20601 [2] or Continua Design Guidelines [3] for more information on the format of this list

Table 3.209: Structure of the IEEE 11073-20601 Regulatory Certification Data List characteristic

3.126 Illuminance

The Illuminance characteristic is used to represent a measure of illuminance.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Illuminance	uint24	3	Unit is lux with a resolution of 0.01. Minimum: 0 Maximum: 167772.14 Represented values: M = 1, d = -2, b = 0 Unit: org.bluetooth.unit.illuminance.lux A value of 0xFFFFFF represents ”value is not known”. All other values are Prohibited.

Table 3.210: Structure of the Illuminance characteristic

3.127 Indoor Bike Data

The Indoor Bike Data characteristic is used to represent data related to the use of an indoor bike.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.127.1
Instantaneous Speed	uint16	0 or 2	Base Unit: org.bluetooth.unit.velocity.kilometre_per_hour Represented values: M = 1, d = -2, b = 0 Unit is 1/100 of a kilometer per hour The Instantaneous Speed field represents the instantaneous speed of the user. Present if bit 0 of Flags field is set to 0
Average Speed	uint16	0 or 2	Base Unit: org.bluetooth.unit.velocity.kilometre_per_hour Represented values: M = 1, d = -2, b = 0 Unit is 1/100 of a kilometer per hour The Average Speed field represents the average speed since the beginning of the training session. Present if bit 1 of Flags field is set to 1
Instantaneous Cadence	uint16	0 or 2	Base Unit: org.bluetooth.unit.angular_-velocity.revolution_per_minute Represented values: M = 1, d = 0, b = -1 Unit is 1/2 of a revolution per minute The Instantaneous Cadence field represents the instantaneous cadence of the user. Present if bit 2 of Flags field is set to 1
Average Cadence	uint16	0 or 2	Base Unit: org.bluetooth.unit.angular_-velocity.revolution_per_minute Represented values: M = 1, d = 0, b = -1 Unit is 1/2 of a revolution per minute The Average Speed field represents the average cadence since the beginning of the training session. Present if bit 3 of Flags field is set to 1
Total Distance	uint24	0 or 3	Unit: org.bluetooth.unit.length.metre The Total Distance field represents the total distance reported by the Server since the beginning of the training session. Present if bit 4 of Flags field is set to 1
Resistance Level	uint8	0 or 1	Base Unit: org.bluetooth.unit.unitless Represented values: M = 1, d = 1, b = 0 Unit is 1 The Resistance Level field represents the value of the current value of the resistance level of the Server. Present if bit 5 of Flags field is set to 1
Instantaneous Power	sint16	0 or 2	Unit: org.bluetooth.unit.power.watt The Instantaneous Power field represents the value of the instantaneous power measured by the Server. Present if bit 6 of Flags field is set to 1
Average Power	sint16	0 or 2	Unit: org.bluetooth.unit.power.watt The Average Power field represents the value of the average power measured by the Server since the beginning of the training session. Present if bit 7 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Total Energy	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Total Energy field represents the total expended energy of a user since the training session has started. Present if bit 8 of Flags field is set to 1
Energy Per Hour	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Hour field represents the average expended energy of a user during a period of one hour. Present if bit 8 of Flags field is set to 1
Energy Per Minute	uint8	0 or 1	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Minute field represents the average expended energy of a user during a period of one minute. Present if bit 8 of Flags field is set to 1
Heart Rate	uint8	0 or 1	Unit: org.bluetooth.unit.period.beats_per_minute The Heart Rate field represents the current heart rate value of the user (e.g., measured via the contact heart rate or any other means). Present if bit 9 of Flags field is set to 1
Metabolic Equivalent	uint8	0 or 1	Base Unit: org.bluetooth.unit.metabolic_equivalent Represented values: M = 1, d = -1, b = 0 Unit is 1/10 metabolic equivalent The Metabolic Equivalent field represents the metabolic equivalent of the user. Present if bit 10 of Flags field is set to 1
Elapsed Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Elapsed Time field represents the elapsed time of a training session since the training session has started. Present if bit 11 of Flags field is set to 1
Remaining Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Remaining Time field represents the remaining time of a selected training session. Present if bit 12 of Flags field is set to 1

Table 3.211: Structure of the Indoor Bike Data characteristic

3.127.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	More Data
1	Average Speed present
2	Instantaneous Cadence present
3	Average Cadence present
4	Total Distance present

Bit	Definition
5	Resistance Level present
6	Instantaneous Power present
7	Average Power present
8	Expended Energy present
9	Heart Rate present
10	Metabolic Equivalent present
11	Elapsed Time present
12	Remaining Time present
13–15	Reserved for Future Use

Table 3.212: Flags field

3.128 Intermediate Cuff Pressure

The Intermediate Cuff Pressure characteristic is used to send intermediate Cuff Pressure values to a device for display purposes while a measurement is in progress. The Intermediate Cuff Pressure characteristic has the same format as the Blood Pressure Measurement characteristic in Section 3.32. However, due to a different context, the Blood Pressure Measurement Compound Value field is used for the Intermediate Cuff Pressure Compound Value field and the Systolic sub-field is used for the Current Cuff Pressure sub-field. The Diastolic and Mean Arterial Pressure fields are unused.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.128.1.
Intermediate Cuff Pressure Compound Value - Current Cuff Pressure (mmHg)	medfloat16	0 or 2	Unit: org.bluetooth.unit.pressure.millimetre_of_mercury Present if bit 0 of Flags field is set to 0
Intermediate Cuff Pressure Compound Value - Current Cuff Pressure (kPa)	medfloat16	0 or 2	Base Unit: org.bluetooth.unit.pressure.pascal; M = 1, d = 3, and b = 0 Present if bit 0 of Flags field is set to 1
Intermediate Cuff Pressure Compound Value - Diastolic (unused)	medfloat16	2	This subfield is not used and is set to the special value NaN.
Intermediate Cuff Pressure Compound Value - Mean Arterial Pressure (unused)	medfloat16	2	This subfield is not used and is set to the special value NaN.

Field	Data Type	Size (in octets)	Description
Time Stamp	struct	0 or 7	Refer to Date Time characteristic in Section 3.71 Present if bit 1 of Flags field is set to 1
Pulse Rate	medfloat16	0 or 2	Unit: org.bluetooth.unit.period.beats_per_minute Present if bit 2 of Flags field is set to 1
User ID	uint8	0 or 1	See Section 3.128.2. Present if bit 3 of Flags field is set to 1
Measurement Status	boolean[16]	0 or 2	See Section 3.128.3. Present if bit 4 of Flags field is set to 1

Table 3.213: Structure of the Intermediate Cuff Pressure characteristic

3.128.1 Flags field

These flags define which data fields are present in the characteristic value.

The bits of this field are defined below.

Bit	Definition
0	Intermediate Cuff Pressure Units Flag 0 = Intermediate Cuff pressure for Systolic, Diastolic and MAP in units of mmHg 1 = Intermediate Cuff pressure for Systolic, Diastolic and MAP in units of kPa
1	Time Stamp Flag 0 = Time Stamp not present 1 = Time Stamp present
2	Pulse Rate Flag 0 = Pulse Rate not present 1 = Pulse Rate present
3	User ID Flag 0 = User ID not present 1 = User ID present
4	Measurement Status Flag 0 = Measurement Status not present 1 = Measurement Status present
5–7	Reserved for Future Use

Table 3.214: Flags field

3.128.2 User ID field

The values of this field are defined below.

Value	Definition
0x00–0xFE	Defined by the service specification
0xFF	Unknown User

Table 3.215: User ID field

3.128.3 Measurement Status field

The bits of this field are defined below.

Bit	Definition
0	Body Movement Detection Flag 0 = No body movement 1 = Body movement detected during measurement
1	Cuff Fit Detection Flag 0 = Cuff fits properly 1 = Cuff too loose
2	Irregular Pulse Detection Flag 0 = No irregular pulse detected 1 = Irregular pulse detected
3–4	Pulse Rate Range Detection Flags 0b00 = Pulse rate is within the range 0b01 = Pulse rate exceeds upper limit 0b10 = Pulse rate is less than lower limit 0b11 = Reserved for Future Use
5	Measurement Position Detection Flag 0 = Proper measurement position 1 = Improper measurement position
6–15	Reserved for Future Use

Table 3.216: Measurement Status field

3.129 Intermediate Temperature

The Intermediate Temperature characteristic is used to send intermediate temperature values to a device for display purposes while a measurement is in progress. The Intermediate Temperature characteristic has the same format as the Temperature Measurement characteristic in Section 3.222 except that, due to a different context, the Measurement Value field is referred to as the Intermediate Temperature field.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.129.1.
Intermediate Temperature (Celsius)	medfloat32	0 or 4	This field contains a measurement value. Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius. Present if bit 0 of Flags field is set to 0

Field	Data Type	Size (in octets)	Description
Intermediate Temperature (Fahrenheit)	medfloat32	0 or 4	This field contains a measurement value. Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_fahrenheit. Present if bit 0 of Flags field is set to 1
Time Stamp	struct	0 or 7	Refer to Date Time characteristic in Section 3.71. Present if bit 1 of Flags field is set to 1
Temperature Type	uint8	0 or 1	The format of this field is the same as the format of the Temperature Type characteristic in Section 3.225. Present if bit 2 of Flags field is set to 1

Table 3.217: Structure of the Intermediate Temperature characteristic

3.129.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Temperature Units Flag 0 = Intermediate Temperature in units of Celsius 1 = Intermediate Temperature in units of Fahrenheit
1	Time Stamp Flag 0 = Time Stamp field not present 1 = Time Stamp field present
2	Temperature Type Flag 0 = Temperature Type field not present 1 = Temperature Type field present
3–7	Reserved for Future Use

Table 3.218: Flags field

3.130 Irradiance

The Irradiance characteristic is used to represent the irradiance, the radiant flux received by a surface per unit area.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Irradiance	uint16	2	Base Unit: org.bluetooth.unit.irradiance.watt_per_square_metre Represented values: M = 1, d = -1, b = 0 Unit is in watt per square meter with a resolution of 0.1 W/m^2.

Table 3.219: Structure of the Irradiance characteristic

3.131 Language

The Language characteristic is used to represent the preferred language of a user.

The Language definition is based on ISO 639-1 [11].

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Language	utf8s	variable	UTF-8 string

Table 3.220: Structure of the Language characteristic

3.132 Last Name

The Last Name characteristic is used to represent the last name of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Last Name	utf8s	variable	UTF-8 string

Table 3.221: Structure of the Last Name characteristic

3.133 Length

The Length characteristic is used to represent the measured dimension of an object along a given axis.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Length	uint32	4	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = - 7, b = 0 Unit is meters with a resolution of 1/10000000 m (100 nm). A value of 0xFFFFFFFF represents ”value is not known”.

Table 3.222: Structure of the Length characteristic

3.134 Light Distribution

The Light Distribution characteristic is used to represent the projected pattern of outdoor light that a fixture disperses onto a surface. This type of lighting is used in the middle of a pathway and is great for narrow pathways. Type II is commonly used on larger walkways and in roadway lighting because it is good for a larger but still narrow areas. This type is often used on side streets or jogging paths. Type III is very commonly used in roadway lighting, because it gives a bit more coverage further from the point source outward. Type III lighting needs to be placed to the side of the area, allowing the light to project outward and fill the area. Type IV light distribution produces a semicircular light that is intended to be used on the sides of buildings and walls. This type also does a great job lighting up a parking area perimeter.

Type V, the widest distribution pattern, is excellent for illuminating the inside portions of a parking lot, or for a 4-way intersection.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Light Distribution	uint8	1	See Section 3.134.1

Table 3.223: Structure of the Light Distribution characteristic

3.134.1 Light Distribution field

The values of this field are defined below.

Value	Definition
0x00	Type not specified
0x01	Type I
0x02	Type II
0x03	Type III
0x04	Type IV
0x05	Type V
All other values	Reserved for Future Use.

Table 3.224: Light Distribution field

3.135 Light Output

The Light Output characteristic is used to represent a measure of the total quantity of visible light emitted by a source per unit of time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Light Output	uint24	3	Unit is Lumen with resolution of 1. Minimum is 0 Maximum 16777213 Represented values: M = 1, d = 0, b = 0 Unit: org.bluetooth.unit.illuminance.lumen A value of 0xFFFFFE represents ”value is not valid”. A value of 0xFFFFFF represents ”value is not known”.

Table 3.225: Structure of the Light Output characteristic

3.136 Light Source Type

The Light Source Type characteristic is used to represent the means by which a luminaire generates light.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Light Source Type	uint8	1	See Section 3.136.1

Table 3.226: Structure of the Light Source Type characteristic

3.136.1 Light Source Type field

The values of this field are defined below.

Value	Definition
0x00	Type not specified
0x01	Low pressure fluorescent
0x02	High intensity discharge (HID)
0x03	Low voltage halogen
0x04	Incandescent
0x05	Light emitting diode (LED)
0x06	Organic light emitting diode (OLED)
0xFD	Other than listed above
0xFE	No light source
0xFF	Multiple light source types
All other values	Reserved for Future Use.

Table 3.227: Light Source Type field

3.137 Linear Position

The Linear Position characteristic is used to represent the linear position of an object along a given axis and referencing to the device-specific zero point.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Linear Position	sint32	4	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = - 7, b = 0 Unit is meter with a resolution of 1/10000000 m (100 nm). A value of 0x7FFFFFFF represents ”value is not known”.

Table 3.228: Structure of the Linear Position characteristic

3.138 LN Control Point

The LN Control Point characteristic is used to enable device-specific procedures related to the exchange of location and navigation (LN) information.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Op Code	uint8	1	See Section 3.138.1
Parameter	struct	0–18	See Section 3.138.1

Table 3.229: Structure of the LN Control Point characteristic

3.138.1 Op Code and Parameter fields

The values of these fields are defined below.

Op Code Value	Definition	Parameter	Parameter Type	Description
0x00	Reserved for Future Use	N/A	N/A	N/A
0x01	Set Cumulative Value	Cumulative value as defined per service	Defined per service	Initiate the procedure to reset a cumulative value. The new value is sent as a parameter following op code The response to this control point is Op Code 0x20 followed by the appropriate Response Value.
0x02	Mask Location and Speed Characteristic Content	Content Mask as defined per service	Defined per service	Initiate the procedure to set the content of Location and Speed characteristic The response to this control point is Op Code 0x20 followed by the appropriate Response Value.
0x03	Navigation Control	Defined per service	Defined per service	Update to the location of the sensor with the value sent as parameter to this op code.
0x04	Request Number of Routes	N/A	N/A	Initiate the procedure to request the number of routes stored into the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including the number of routes in the Response Parameter.

Op Code Value	Definition	Parameter	Parameter Type	Description
0x05	Request Name of Route	Defined per service	Defined per service	Initiate the procedure to request the name of wanted route stored into the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value, including the name of the route in the Response Parameter.
0x06	Select Route	Defined per service	Defined per service	Initiate the procedure to select certain route to be used for navigation performed by the Sensor. The response to this control point is Op Code 0x20 followed by the appropriate Response Value.
0x07	Set Fix Rate	Defined per service	Defined per service	Initiate the procedure to set the Sensor fix rate. The response to this control point is Op Code 0x20 followed by the appropriate Response Value.
0x08	Set Elevation	Defined per service	Defined per service	Initiate the procedure to set the elevation value of the sensor (usually this procedure needed if barometric air pressure is used for elevation calculation and elevation needs calibration). The response to this control point is Op Code 0x20 followed by the appropriate Response Value.
0x09–0x1F	Reserved for Future Use	N/A	N/A	N/A
0x20	Response Code	Request Op Code, Response Code Value	N/A	See Section 3.138.2
0x21–0xFF	Reserved for Future Use	N/A	N/A	N/A

Table 3.230: Op Code and Parameter fields

3.138.2 Response Code Values

The Response Code Values associated with the LN Control Point are defined below.

Response Code Value	Definition	Response Parameter	Description
0x00	Reserved for Future Use	N/A	N/A
0x01	Success	Defined per service	Response for successful operation.
0x02	Op Code not supported	N/A	Response if unsupported Op Code is received
0x03	Invalid Operand	N/A	Response if Parameter received does not meet the requirements of the service.
0x04	Operation Failed	N/A	Response if the requested procedure failed.
0x05–0xFF	Reserved for Future Use		N/A

Table 3.231: Response Code Values

3.139 LN Feature

The LN Feature characteristic is used to represent the supported features of a location and navigation (LN) sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
LN Feature	boolean[32]	4	See Section 3.139.1

Table 3.232: Structure of the LN Feature characteristic

3.139.1 LN Feature field

The bits of this field are defined below.

Bit	Definition
0	Instantaneous Speed Supported
1	Total Distance Supported
2	Location Supported
3	Elevation Supported
4	Heading Supported
5	Rolling Time Supported
6	UTC Time Supported
7	Remaining Distance Supported
8	Remaining Vertical Distance Supported
9	Estimated Time of Arrival Supported

Bit	Definition
10	Number of Beacons in Solution Supported
11	Number of Beacons in View Supported
12	Time to First Fix Supported
13	Estimated Horizontal Position Error Supported
14	Estimated Vertical Position Error Supported
15	Horizontal Dilution of Precision Supported
16	Vertical Dilution of Precision Supported
17	Location and Speed Characteristic Content Masking Supported
18	Fix Rate Setting Supported
19	Elevation Setting Supported
20	Position Status Supported
21–31	Reserved for Future Use

Table 3.233: LN Feature field

3.140 Local Time Information

The Local Time Information characteristic is used to represent the relation (offset) between local time and UTC. It contains time zone and Daylight Savings Time (DST) offset information.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Zone	struct	1	Refer to Time Zone characteristic in Section 3.239
DST Offset	struct	1	Refer to DST Offset characteristic in Section 3.77

Table 3.234: Structure of the Local Time Information characteristic

3.141 Location and Speed

The Location and Speed characteristic is used to represent data related to a location and speed sensor. Note that it is possible for this characteristic to exceed the default LE ATT_MTU size.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.141.1
Instantaneous Speed	uint16	0 or 2	Base Unit: org.bluetooth.unit.velocity.metres_per_second Represented values: M = 1, d = -2, b = 0 Unit is 1/100 of a m/s Present if bit 0 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Total Distance	uint24	0 or 3	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -1, b = 0 Unit is 1/10 m Present if bit 1 of Flags field is set to 1
Location - Latitude	sint32	0 or 4	Base Unit: org.bluetooth.unit.plane_angle.degree Represented values: M = 1, d = -7, b = 0 Unit is $1*10^{-7}$ degrees Present if bit 2 of Flags field is set to 1
Location - Longitude	sint32	0 or 4	Base Unit: org.bluetooth.unit.plane_angle.degree Represented values: M = 1, d = -7, b = 0 Unit is $1*10^{-7}$ degrees Present if bit 2 of Flags field is set to 1
Elevation	sint24	0 or 3	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -2, b = 0 Unit is 1/100 m Present if bit 3 of Flags field is set to 1
Heading	uint16	0 or 2	Base Unit: org.bluetooth.unit.plane_angle.degree Represented values: M = 1, d = -2, b = 0 Unit is $1*10^{-2}$ degrees Present if bit 4 of Flags field is set to 1
Rolling Time	uint8	0 or 1	Unit: org.bluetooth.unit.time.second Present if bit 5 of Flags field is set to 1
UTC Time	struct	0 or 7	Refer to Date Time characteristic in Section 3.71. Present if bit 6 of Flags field is set to 1

Table 3.235: Structure of the Location and Speed characteristic

3.141.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Instantaneous Speed Present
1	Total Distance Present
2	Location Present
3	Elevation Present
4	Heading Present
5	Rolling Time Present
6	UTC Time Present
7–8	Position Status: 0b00 = No Position 0b01 = Position Ok 0b10 = Estimated Position 0b11 = Last Known Position

Bit	Definition
9	Speed and Distance format: 0 = 2D 1 = 3D
10–11	Elevation Source: 0b00 = Positioning System 0b01 = Barometric Air Pressure 0b10 = Database Service (or similar) 0b11 = Other
12	Heading Source 0 = Heading based on movement 1 = Heading based on magnetic compass
13–15	Reserved for Future Use

Table 3.236: Flags field

3.142 Luminous Efficacy

The Luminous Efficacy characteristic is used to represent a measure of luminous efficacy.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Luminous Efficacy	uint16	2	Unit is lumen per watt with a resolution of 0.1. Minimum: 0 Maximum: 1800 Represented values: M = 1, d = -1, b = 0 Unit: org.bluetooth.unit.luminous_efficacy.lumen_per_watt A value of 0xFFFF represents ”value is not known”. All other values are Prohibited.

Table 3.237: Structure of the Luminous Efficacy characteristic

3.143 Luminous Energy

The Luminous Energy characteristic is used to represent a measure of luminous energy.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Luminous Energy	uint24	3	Unit is lumen hour with a resolution of 1000. Minimum: 0 Maximum: 16777214000 Represented values: M = 1, d = 3, b = 0 Unit: org.bluetooth.unit.luminous_energy.lumen_per_hour A value of 0xFFFFFF represents ”value is not known”. All other values are Prohibited.

Table 3.238: Structure of the Luminous Energy characteristic

3.144 Luminous Exposure

The Luminous Exposure characteristic is used to represent a measure of luminous exposure.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Luminous Exposure	uint24	3	Unit is lux hour with a resolution of 1000. Minimum: 0 Maximum: 16777214000 Represented values: M = 1, d = 3, b = 0 Unit: org.bluetooth.unit.luminous_exposure.lux_hour A value of 0xFFFFFF represents ”value is not known”. All other values are Prohibited.

Table 3.239: Structure of the Luminous Exposure characteristic

3.145 Luminous Flux

The Luminous Flux characteristic is used to represent a measure of luminous flux.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Luminous Flux	uint16	2	Unit is lumen with a resolution of 1 Minimum: 0 Maximum: 65534 Represented values: M = 1, d = 0, b = 0 Unit: org.bluetooth.unit.luminous_flux.lumen A value of 0xFFFF represents ”value is not known”. All other values are Prohibited.

Table 3.240: Structure of the Luminous Flux characteristic

3.146 Luminous Flux Range

The Luminous Flux Range characteristic is used to represent a luminous flux range.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Luminous Flux	struct	2	Refer to Luminous Flux characteristic in Section 3.145
Maximum Luminous Flux	struct	2	Refer to Luminous Flux characteristic in Section 3.145

Table 3.241: Structure of the Luminous Flux Range characteristic

3.147 Luminous Intensity

The Luminous Intensity characteristic is used to represent the luminous intensity of a beam of light.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Luminous Intensity	uint16	2	Unit is candela with a resolution of 1. Minimum: 0 Maximum: 65534 Represented values: M = 1, d = 0, b = 0 Unit: org.bluetooth.unit.luminous_intensity.candela A value of 0xFFFF represents ”value is not known”. All other values are Prohibited.

Table 3.242: Structure of the Luminous Intensity characteristic

3.148 Magnetic Declination

The Magnetic Declination characteristic is used to represent the magnetic declination. The magnetic declination is the angle on the horizontal plane between the direction of True North (geographic) and the direction of Magnetic North, measured clockwise from True North to Magnetic North.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Magnetic Declination	uint16	2	Base Unit: org.bluetooth.unit.plane_angle.degree. Minimum value: 0 Maximum value: 359.99 Represented values: M = 1, d = -2, b = 0 Unit is degrees with a resolution of 0.01 degrees.

Table 3.243: Structure of the Magnetic Declination characteristic

3.149 Magnetic Flux Density - 2D

The Magnetic Flux Density - 2D characteristic is used to represent measurements of magnetic flux density for two orthogonal axes: X and Y. Note that 1 x 10^{-7} Tesla equals 0.001 Gauss.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
X-Axis	sint16	2	Base Unit: org.bluetooth.unit.magnetic_flux_density.tesla Represented values: M = 1, d = -7, b = 0 Unit is 10^{-7} Tesla.
Y-Axis	sint16	2	Base Unit: org.bluetooth.unit.magnetic_flux_density.tesla Represented values: M = 1, d = -7, b = 0 Unit is 10^{-7} Tesla.

Table 3.244: Structure of the Magnetic Flux Density - 2D characteristic

3.150 Magnetic Flux Density - 3D

The Magnetic Flux Density - 3D characteristic is used to represent measurements of magnetic flux density for three orthogonal axes: X, Y, and Z. Note that 1 x 10^{-7} Tesla equals 0.001 Gauss.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
X-Axis	sint16	2	Base Unit: org.bluetooth.unit.magnetic_flux_density.tesla Represented values: M = 1, d = -7, b = 0 Unit is 10^{-7} Tesla.
Y-Axis	sint16	2	Base Unit: org.bluetooth.unit.magnetic_flux_density.tesla Represented values: M = 1, d = -7, b = 0 Unit is 10^{-7} Tesla.
Z-Axis	sint16	2	Base Unit: org.bluetooth.unit.magnetic_flux_density.tesla Represented values: M = 1, d = -7, b = 0 Unit is 10^{-7} Tesla.

Table 3.245: Structure of the Magnetic Flux Density - 3D characteristic

3.151 Manufacturer Name String

The Manufacturer Name String characteristic is used to represent the name of the manufacturer of the device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Manufacturer Name	utf8s	variable	UTF-8 string

Table 3.246: Structure of the Manufacturer Name String characteristic

3.152 Mass Flow

The Mass Flow characteristic is used to represent a flow of mass.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Mass Flow	uint16	2	Unit is gram/second with a resolution of 1. Minimum: 0 Maximum: 65534 Represented values: M = 1, d = 0, b = 0 Unit: org.bluetooth.unit.mass_flow.gram_per_second A value of 0xFFFF represents ”value is not known”. All other values are Prohibited.

Table 3.247: Structure of the Mass Flow characteristic

3.153 Maximum Recommended Heart Rate

The Maximum Recommended Heart Rate characteristic is used to represent the maximum recommended heart rate of a user. Maximum recommended heart rate is a threshold that is intended to be set to

limit exertion. The maximum recommended heart rate is less than or equal to the maximum heart rate recommended for a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Maximum Recommended Heart Rate	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.248: Structure of the Maximum Recommended Heart Rate characteristic

3.154 Measurement Interval

The Measurement Interval characteristic is used to represent the time between measurements.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Measurement Interval	uint16	2	See Section 3.154.1.

Table 3.249: Structure of the Measurement Interval characteristic

3.154.1 Measurement Interval field

The values of this field are defined below.

Value	Definition
0	No periodic measurement
1–65535	Duration of measurement interval. 65535 seconds is equal to 18 hours, 12 minutes, and 15 seconds. Unit: org.bluetooth.unit.time.second

Table 3.250: Measurement Interval field

3.155 Methane Concentration

The Methane Concentration characteristic is used to represent a measure of methane (CH_4) concentration.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Methane Concentration	medfloat16	2	Unit: org.bluetooth.unit.concentration.parts_per_billion The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.251: Structure of the Methane Concentration characteristic

3.156 Middle Name

The Middle Name characteristic is used to represent the middle name of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Middle Name	utf8s	variable	UTF-8 string

Table 3.252: Structure of the Middle Name characteristic

3.157 Model Number String

The Model Number String characteristic is used to represent the model number assigned by the device vendor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Model Number	utf8s	variable	UTF-8 string

Table 3.253: Structure of the Model Number String characteristic

3.158 Navigation

The Navigation characteristic is used to represent data related to a navigation sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.158.1
Bearing	uint16	2	Base Unit: org.bluetooth.unit.plane_angle.degree Represented values: M = 1, d = -2, b = 0 Unit is $1*10^{-2}$ degrees

Field	Data Type	Size (in octets)	Description
Heading	uint16	2	Base Unit: org.bluetooth.unit.plane_angle.degree Represented values: M = 1, d = -2, b = 0 Unit is $1*10^{-2}$ degrees
Remaining Distance	uint24	0 or 3	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -1, b = 0 Unit is 1/10 m Present if bit 0 of Flags field is set to 1
Remaining Vertical Distance	sint24	0 or 3	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -2, b = 0 Unit is 1/100 m Present if bit 1 of Flags field is set to 1
Estimated Time of Arrival	struct	0 or 7	Refer to Date Time characteristic in Section 3.71. Present if bit 2 of Flags field is set to 1

Table 3.254: Structure of the Navigation characteristic

3.158.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Remaining Distance Present
1	Remaining Vertical Distance Present
2	Estimated Time of Arrival Present
3–4	Position Status: 0b00 = No Position 0b01 = Position Ok 0b10 = Estimated Position 0b11 = Last Known Position
5	Heading Source 0 = Heading based on movement 1 = Heading based on magnetic compass
6	Navigation Indicator Type 0 = To Waypoint 1 = To Destination
7	Waypoint Reached 0 = False 1 = True
8	Destination Reached 0 = False 1 = True
9–15	Reserved for Future Use

Table 3.255: Flags field

3.159 New Alert

The New Alert characteristic is used to represent the category of the alert, how many new alerts of that category have occurred in a device and brief text information for the last alert.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Category ID	struct	1	Refer to Alert Category ID characteristic in Section 3.7
Number of New Alert	uint8	1	This field provides the number of new alerts in the server ranging from 0 to 255.
Text String Information	utf8s	variable 0–18	This field provides brief text information for the last alert. See Section 3.159.1

Table 3.256: Structure of the New Alert characteristic

3.159.1 Text String Information field

The values of this field are defined below.

Category	Recommended Description
Simple Alert	The title of the alert
Email	Sender name
News	Title of the news feed
Call	Caller name or caller ID
Missed Call	Caller name or caller ID
SMS	Sender name or caller ID
Voice Mail	Sender name or caller ID
Schedule	Title of the schedule
High Prioritized Alert	Title of the alert
Instant Messaging	Sender name

Table 3.257: Text String Information field

3.160 Nitrogen Dioxide Concentration

The Nitrogen Dioxide Concentration characteristic is used to represent a measure of nitrogen dioxide (NO_2) concentration.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Nitrogen Dioxide Concentration	medfloat16	2	Unit: org.bluetooth.unit.density.kilogram_per_cubic_meter The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.258: Structure of the Nitrogen Dioxide Concentration characteristic

3.161 Noise

The Noise characteristic is used to represent a measure of sound pressure level.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Noise	uint8	1	Unit is decibel with a resolution of 1. Unit: org.bluetooth.unit.sound_pressure.decibel_spl Allowed range is: 0 to 253. A value of 0xFE represents 'value is 254 or greater'. A value of 0xFF represents "value is not known".

Table 3.259: Structure of the Noise characteristic

3.162 Non-Methane Volatile Organic Compounds Concentration

The Non-Methane Volatile Organic Compounds Concentration characteristic is used to represent a measure of non-methane volatile organic compounds (NMVOCs) concentration.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Non-Methane Volatile Organic Compounds Concentration	medfloat16	2	Base Unit: org.bluetooth.unit.density.kilogram_per_cubic_meter The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.260: Structure of the Non-Methane Volatile Organic Compounds Concentration characteristic

3.163 Object First-Created

The Object First-Created characteristic is used to represent the date and time when the associated object's contents were first created.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Object First Created	struct	7	Refer to Date Time characteristic in Section 3.71.

Table 3.261: Structure of the Object First-Created characteristic

3.164 Object ID

The Object ID characteristic is used to represent an object ID for the associated object.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Object ID	uint48	6	Locally unique object identifier. Values are defined per service.

Table 3.262: Structure of the Object ID characteristic

3.165 Object Last-Modified

The Object Last-Modified characteristic is used to represent the date and time when the associated object's contents were last modified.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Object Last Modified	struct	7	Refer to Date Time characteristic in Section 3.71.

Table 3.263: Structure of the Object Last-Modified characteristic

3.166 Object Name

The Object Name characteristic is used to represent the name of the associated object.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Object Name	utf8s	0–120	UTF-8 string

Table 3.264: Structure of the Object Name characteristic

3.167 Object Type

The Object Type characteristic is used to represent the type of the associated object, representing this with a UUID. The Object Type characteristic has two possible lengths, depending on whether the UUID conveyed is a 16-bit or 128-bit UUID.

The term gatt_uuid is not a defined Data Type but is either a 16-bit UUID using the uint16 Data Type or a 128-bit UUID using the uint128 Data Type.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Object Type	gatt_uuid	2 or 16	Object Type UUIDs that use the 16-bit format are defined in the Bluetooth SIG Assigned Numbers [4]. Object Type UUIDs that use the 128-bit format are proprietary UUIDs.

Table 3.265: Structure of the Object Type characteristic

3.168 Ozone Concentration

The Ozone Concentration characteristic is used to represent a measure of ozone (O_3) concentration.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Ozone Concentration	medfloat16	2	Base Unit: org.bluetooth.unit.density.kilogram_per_cubic_meter The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.266: Structure of the Ozone Concentration characteristic

3.169 Particulate Matter - PM1 Concentration

The Particulate Matter - PM1 Concentration characteristic is used to represent a measure of concentration of particulate matter less than 1 micrometer in diameter.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Particulate Matter - PM1 Concentration	medfloat16	2	Base Unit: org.bluetooth.unit.density.kilogram_per_cubic_meter The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.267: Structure of the Particulate Matter - PM1 Concentration characteristic

3.170 Particulate Matter - PM2.5 Concentration

The Particulate Matter - PM2.5 Concentration characteristic is used to represent a measure of concentration of particulate matter less than 2.5 micrometers in diameter.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Particulate Matter - PM2.5 Concentration	medfloat16	2	Unit: org.bluetooth.unit.density.kilogram_per_cubic_meter The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.268: Structure of the Particulate Matter - PM2.5 Concentration characteristic

3.171 Particulate Matter - PM10 Concentration

The Particulate Matter - PM10 Concentration characteristic is used to represent a measure of concentration of particulate matter less than 10 micrometers in diameter.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Particulate Matter - PM10 Concentration	medfloat16	2	Unit: org.bluetooth.unit.density.kilogram_per_cubic_meter The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.269: Structure of the Particulate Matter - PM10 Concentration characteristic

3.172 Perceived Lightness

The Perceived Lightness characteristic is used to represent the perceived lightness of a light.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Perceived Lightness	uint16	2	Unit is unitless with a resolution of 1. Minimum: 0 Maximum: 65535 Represented values: M = 1, d = 0, b = 0

Table 3.270: Structure of the Perceived Lightness characteristic

3.173 Percentage 8

The Percentage 8 characteristic is used to represent a percentage.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Percentage 8	uint8	1	Unit is a percentage with a resolution of 0.5. Minimum: 0 Maximum: 100 Represented values: M = 1, d = 0, b = -1 Unit: org.bluetooth.unit.percentage A value of 0xFF represents ”value is not known”. All other values are Prohibited.

Table 3.271: Structure of the Percentage 8 characteristic

3.174 Percentage 8 Steps

The Percentage 8 Steps characteristic is used to represent a number of steps between 0% and 100% when configuring a Percentage 8 characteristic value (see Section 3.173).

For example:

- A value of 1 represents one step: 0% to 100% in one 100% step.
- A value of 5 represents five steps: 0% to 100% in five 20% steps.
- A value of 200 represents 200 steps: 0% to 100% in 200 0.5% steps.

Field	Data Type	Size (in octets)	Description
Percentage 8 Steps	uint8	1	Unit is the number of steps from the minimum to the maximum value. Minimum: 1 Maximum: 200 Represented values: M = 1, d = 0, b = 0 Unit: org.bluetooth.unit.unitless A value of 0xFF represents ”value is not known”. All other values are Prohibited.

Table 3.272: Structure of the Percentage 8 Steps characteristic

3.175 PnP ID

The PnP ID characteristic is used to represent a set of values that are used to create a device ID value that is unique for this device. These values are used to identify all devices of a given type/model/version using numbers.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Vendor ID Source	uint8	1	See Section 3.175.1
Vendor ID	uint16	2	Identifies the product vendor from the namespace in the Vendor ID Source
Product ID	uint16	2	Manufacturer managed identifier for this product
Product Version	uint16	2	Manufacturer managed version for this product

Table 3.273: Structure of the PnP ID characteristic

3.175.1 Vendor ID Source field

The values of this field are defined below.

Value	Definition
0	Reserved for Future Use
1	Assigned Company Identifier value from the Bluetooth SIG Assigned Numbers [4]
2	USB Implementer's Forum assigned Vendor ID value
3–255	Reserved for Future Use

Table 3.274: Vendor ID Source field

3.176 Pollen Concentration

The Pollen Concentration characteristic is used to represent the pollen count.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Pollen Concentration	uint24	3	Unit: org.bluetooth.unit.concentration.count_per_cubic_metre

Table 3.275: Structure of the Pollen Concentration characteristic

3.177 Position Quality

The Position Quality characteristic is used to represent data related to the quality of a position measurement.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.177.1
Number of Beacons in Solution	uint8	0 or 1	Unit: org.bluetooth.unit.unitless Present if bit 0 of Flags field is set to 1
Number of Beacons in View	uint8	0 or 1	Unit: org.bluetooth.unit.unitless Present if bit 1 of Flags field is set to 1
Time to First Fix	uint16	0 or 2	Base Unit: org.bluetooth.unit.time.second Represented values: M = 1, d = -1, b = 0 Unit is 1/10 seconds Present if bit 2 of Flags field is set to 1
EHPE	uint32	0 or 4	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -2, b = 0 Unit is 1/100 m Present if bit 3 of Flags field is set to 1
EVPE	uint32	0 or 4	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -2, b = 0 Unit is 1/100 m Present if bit 4 of Flags field is set to 1
HDOP	uint8	0 or 1	Base Unit: org.bluetooth.unit.unitless Represented values: M = 2, d = -1, b = 0 Present if bit 5 of Flags field is set to 1
VDOP	uint8	0 or 1	Base Unit: org.bluetooth.unit.unitless Represented values: M = 2, d = -1, b = 0 Present if bit 6 of Flags field is set to 1

Table 3.276: Structure of the Position Quality characteristic

3.177.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Number of Beacons in Solution Present
1	Number of Beacons in View Present
2	Time to First Fix Present
3	EHPE Present
4	EVPE Present
5	HDOP Present
6	VDOP Present
7–8	Position Status: 0b00 = No Position 0b01 = Position Ok 0b10 = Estimated Position 0b11 = Last Known Position

Bit	Definition
9–15	Reserved for Future Use

Table 3.277: Flags field

3.178 Power

The Power characteristic is used to represent a measure of power.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Power	uint24	3	Unit is watt with a resolution of 0.1. Minimum: 0 Maximum: 1677721.3 Represented values: M = 1, d = -1, b = 0 Unit: org.bluetooth.unit.power.watt A value of 0xFFFFFE represents ”value is not valid”. A value of 0xFFFFFF represents ”value is not known”.

Table 3.278: Structure of the Power characteristic

3.179 Power Specification

The Power Specification characteristic is used to represent a specification of power values.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Power Value	struct	3	Refer to Power characteristic in Section 3.178
Typical Power Value	struct	3	Refer to Power characteristic in Section 3.178
Maximum Power Value	struct	3	Refer to Power characteristic in Section 3.178

Table 3.279: Structure of the Power Specification characteristic

3.180 Preferred Units

The Preferred Units characteristic is the list of units the user prefers.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Units	uint16 [1-256]	2–512	See Section 3.180.1.

Table 3.280: Structure of the Preferred Units characteristic

3.180.1 Units field

This field is an array of 16-bit UUIDs from the available units defined in the Bluetooth SIG Assigned Numbers [4].

If there are multiple entries for the same physical quantity in the array, the order of the units defines the preference (the first unit is the most preferred; the last unit is the least preferred).

3.181 Pressure

The Pressure characteristic is used to represent pressure.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Pressure	uint32	4	Base Unit: org.bluetooth.unit.pressure.pascal Represented values: M = 1, d = -1, b = 0 Unit is Pascals with a resolution of 0.1 Pa

Table 3.281: Structure of the Pressure characteristic

3.182 Rainfall

The Rainfall characteristic is used to represent the amount of rain that has fallen.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Rainfall	uint16	2	Base Unit: org.bluetooth.unit.length.meter Represented values: M = 1, d = -3, b = 0 Unit is meters with a resolution of 1mm

Table 3.282: Structure of the Rainfall characteristic

3.183 Record Access Control Point

The Record Access Control Point is used to enable service-specific procedures for management of a set of data records.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Op Code	uint8	1	See Section 3.183.1
Operator	uint8	1	See Section 3.183.1 and Section 3.183.2
Operand	struct	0-18	See Section 3.183.1, Section 3.183.2, and Section 3.183.3

Table 3.283: Structure of the Record Access Control Point characteristic

3.183.1 Op Code field

The Op Code values and associated Operator and Operand values are defined below.

Op Code Value	Definition	Operator	Operand	Description
0x00	Reserved for Future Use	N/A	N/A	N/A
0x01	Report stored records	Value from Operator table	Filter parameters (as appropriate to Operator and Service)	Following record transmission, the response to this control point is Op Code 0x06.
0x02	Delete stored records	Value from Operator table	Filter parameters (as appropriate to Operator and Service)	The response to this control point is Op Code 0x06.
0x03	Abort operation	Null	Not included	The response to this control point is Op Code 0x06.
0x04	Report number of stored records	Value from Operator table	Filter parameters (as appropriate to Operator and Service)	The normal response to this control point is Op Code 0x05. For error conditions, the response is Op Code 0x06.
0x05	Number of stored records response	Null	Number of Records (Field size defined by Service)	This is the normal response to Op Code 0x04. For error conditions, the response is Op Code 0x06.
0x06	Response Code	Null	Request Op Code followed by Response Code Value	Response to Op Codes when there is no response parameter; also used for error responses for all Op Codes (see Section 3.183.4).
0x07	Combined Report	Value from Operator table	Filter parameters (as appropriate to Operator and Service)	Following record transmission, the normal response to this control point is Op Code 0x08. For error conditions, the response is Op Code 0x06.
0x08	Combined Report Response	Null	Number of Records (Field size defined by Service)	This is the normal response to Op Code 0x07.
0x09-0xFF	Reserved for Future Use	N/A	N/A	N/A

Table 3.284: Record Access Control Point Op Code Values

3.183.2 Operator field

The values of this field are defined below.

Operator Value	Definition	Operand Notes
0x00	Null	Varies by Op Code
0x01	All records	No Operand used
0x02	Less than or equal to	Operand contains at least a maximum value
0x03	Greater than or equal to	Operand contains at least a minimum value
0x04	Within range of (inclusive)	Operand contains at least a minimum value, maximum value pair
0x05	First record (i.e., oldest record)	No Operand used
0x06	Last record (i.e., most recent record)	No Operand used
0x07-0xFF	Reserved for Future Use	N/A

Table 3.285: Record Access Control Point Operator Values

3.183.3 Operand field

The format and content of the Operand field is defined by the service using the Record Access Control Point.

3.183.4 Response Code Values

The Response Code Values associated with Op Code 0x06 are defined below.

Response Code Value	Definition	Description
0x00	Reserved for Future Use	N/A
0x01	Success	Normal response for successful operation.
0x02	Op Code not supported	Error response if unsupported Op Code is received.
0x03	Invalid Operator	Error response if Operator received does not meet the requirements of the service (e.g., Null was expected).
0x04	Operator not supported	Error response if unsupported Operator is received.
0x05	Invalid Operand	Error response if Operand received does not meet the requirements of the service.
0x06	No records found	Error response if a request for reporting records resulted in no records meeting the criteria. When using Op Code 0x04 (Report number of stored records), Op Code 0x05 (Number of stored records response) is used with 0 as the Operand to report that zero records are found.

Response Code Value	Definition	Description
0x07	Abort unsuccessful	Error response if request for Abort is unsuccessful.
0x08	Procedure not completed	Error response if procedure cannot be completed for any reason.
0x09	Operand not supported	Error response if unsupported Operand is received.
0x0A	Server Busy	Error response if the server cannot process a requested function because it is busy.
0x0B-0xFF	Reserved for Future Use	N/A

Table 3.286: Response Code Values

3.184 Reference Time Information

The Reference Time Information characteristic is used to represent information about the reference time source.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Source	struct	1	Refer to Time Source characteristic in Section 3.235
Time Accuracy	struct	1	Refer to Time Accuracy characteristic in Section 3.227
Days Since Update	uint8	1	Number of days portion of the time span since the last update from the reference. Valid range is 0 to 254 days A value of 255 is used when the time span is greater than or equal to 255 days
Hours Since Update	uint8	1	Number of hours portion of the time span since the last update from the reference. Valid range is 0 to 23 hours A value of 255 is used when the time span is greater than or equal to 255 days

Table 3.287: Structure of the Reference Time Information characteristic

3.185 Relative Runtime in a Correlated Color Temperature Range

The Relative Runtime in a Correlated Color Temperature Range characteristic is used to represent a relative runtime in a correlated color temperature range.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Relative Runtime	struct	1	Refer to Percentage 8 characteristic in Section 3.173

Field	Data Type	Size (in octets)	Description
Minimum Correlated Color Temperature	uint16	2	Refer to Correlated Color Temperature characteristic in Section 3.55
Maximum Correlated Color Temperature	uint16	2	Refer to Correlated Color Temperature characteristic in Section 3.55

Table 3.288: Structure of the Relative Runtime in a Correlated Color Temperature Range characteristic

3.186 Relative Runtime in a Current Range

The Relative Runtime in a Current Range characteristic is used to represent a relative value in an electric current range.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Relative Runtime Value	struct	1	Refer to Percentage 8 characteristic in Section 3.173
Minimum Current	struct	2	Refer to Electric Current characteristic in Section 3.79
Maximum Current	struct	2	Refer to Electric Current characteristic in Section 3.79

Table 3.289: Structure of the Relative Runtime in a Current Range characteristic

3.187 Relative Runtime in a Generic Level Range

The Relative Runtime in a Generic Level Range characteristic is used to represent a runtime in a generic level range.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Relative Value	struct	1	Refer to Percentage 8 characteristic in Section 3.173
Minimum Generic Level	struct	2	Refer to Generic Level characteristic in Section 3.106
Maximum Generic Level	struct	2	Refer to Generic Level characteristic in Section 3.106

Table 3.290: Structure of the Relative Runtime in a Generic Level Range characteristic

3.188 Relative Value in a Period of Day

The Relative Value in a Period of Day characteristic is used to represent the combination of the Percentage 8 characteristic and two instances of the Time Decihour 8 characteristic.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Relative Value	struct	1	Refer to Percentage 8 characteristic in Section 3.173
Start Time	struct	1	Refer to Time Decihour 8 characteristic in Section 3.228
End Time	struct	1	Refer to Time Decihour 8 characteristic in Section 3.228

Table 3.291: Structure of the Relative Value in a Period of Day characteristic

3.189 Relative Value in a Temperature Range

The Relative Value in a Temperature Range characteristic is used to represent the combination of the Percentage 8 characteristic and two instances of the Temperature characteristic.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Relative Value	struct	1	Refer to Percentage 8 characteristic in Section 3.173
Minimum Temperature Value	struct	2	Refer to Temperature characteristic in Section 3.218
Maximum Temperature Value	struct	2	Refer to Temperature characteristic in Section 3.218

Table 3.292: Structure of the Relative Value in a Temperature Range characteristic

3.190 Relative Value in a Voltage Range

The Relative Value in a Voltage Range characteristic is used to represent a relative value in a voltage range.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Relative Value	struct	1	Refer to Percentage 8 characteristic in Section 3.173
Minimum Voltage	struct	2	Refer to Voltage characteristic in Section 3.252
Maximum Voltage	struct	2	Refer to Voltage characteristic in Section 3.252

Table 3.293: Structure of the Relative Value in a Voltage Range characteristic

3.191 Relative Value in an Illuminance Range

The Relative Value in an Illuminance Range characteristic is used to represent a relative value in an illuminance range.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Relative Value	struct	1	Refer to Percentage 8 characteristic in Section 3.173
Minimum Illuminance	struct	3	Refer to Illuminance characteristic in Section 3.126
Maximum Illuminance	struct	3	Refer to Illuminance characteristic in Section 3.126

Table 3.294: Structure of the Relative Value in an Illuminance Range characteristic

3.192 Resting Heart Rate

The Resting Heart Rate characteristic is used to represent the resting heart rate of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Resting Heart Rate	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.295: Structure of the Resting Heart Rate characteristic

3.193 Ringer Control Point

The Ringer Control Point characteristic is used to enable device-specific procedures for a ringer in a phone.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Ringer Control Point	uint8	1	1: Silent Mode 2: Mute Once 3: Cancel Silent Mode All other values: Reserved for Future Use

Table 3.296: Structure of the Ringer Control Point characteristic

3.194 Ringer Setting

The Ringer Setting characteristic is used to represent the setting of the ringer.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Ringer Setting	uint8	1	0: Ringer Silent 1: Ringer Normal 2–255: Reserved for Future Use

Table 3.297: Structure of the Ringer Setting characteristic

3.195 Rotational Speed

The Rotational Speed characteristic is used to represent the rotational speed of an object rotating around a device-specific axis.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Rotational Speed	sint32	4	Base Unit: org.bluetooth.unit.rotational_speed.revolutions_per_-minute Represented values: M = 1, d = 0, b = 0 Unit is revolutions per minute (RPM) with a resolution of 1 RPM. Negative values indicate counter-clockwise rotation. Positive values indicate clockwise rotation. A value of 0x7FFFFFFF represents ”value is not known”.

Table 3.298: Structure of the Rotational Speed characteristic

3.196 Rower Data

The Rower Data characteristic is used to represent data related to a rowing device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.196.1
Stroke Rate	uint8	0 or 1	Base Unit: org.bluetooth.unit.stroke_per_minute Represented values: M = 1, d = 0, b = -1 Unit is 1/2 of a stroke per minute The Stroke Rate field represents the instantaneous stroke rate measured by the Server. Present if bit 0 of Flags field is set to 0
Stroke Count	uint16	0 or 2	Unit: org.bluetooth.unit.unitless The Stroke Count field represents the total number of strokes since the beginning of the training session. Present if bit 0 of Flags field is set to 0
Average Stroke Rate	uint8	0 or 1	Base Unit: org.bluetooth.unit.stroke_per_minute Represented values: M = 1, d = 0, b = -1 Unit is 1/2 of a stroke per minute The Average Stroke Rate field represents the average speed since the beginning of the training session Present if bit 1 of Flags field is set to 1
Total Distance	uint24	0 or 3	Unit: org.bluetooth.unit.length.metre The Total Distance field represents the total distance reported by the Server since the beginning of the training session. Present if bit 2 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Instantaneous Pace (Time per 500 meters)	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Instantaneous Pace field represents the value of the pace (time per 500 meters) of the user while exercising. Present if bit 3 of Flags field is set to 1
Average Pace (Time per 500 meters)	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Average Pace field represents the value of the average pace (time per 500 meters) since the beginning of the training session. Present if bit 4 of Flags field is set to 1
Instantaneous Power	sint16	0 or 2	Unit: org.bluetooth.unit.power.watt The Instantaneous Power field represents the value of the instantaneous power measured by the Server. Present if bit 5 of Flags field is set to 1
Average Power	sint16	0 or 2	Unit: org.bluetooth.unit.power.watt The Average Power field represents the value of the average power measured by the Server since the beginning of the training session. Present if bit 6 of Flags field is set to 1
Resistance Level	uint8	0 or 1	Base Unit: org.bluetooth.unit.unitless Represented values: M = 1, d = 1, b = 0 Unit is 1 The Resistance Level field represents the value of the current value of the resistance level of the Server. Present if bit 7 of Flags field is set to 1
Total Energy	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Total Energy field represents the total expended energy of a user since the training session has started. Present if bit 8 of Flags field is set to 1
Energy Per Hour	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Hour field represents the average expended energy of a user during a period of one hour. Present if bit 8 of Flags field is set to 1
Energy Per Minute	uint8	0 or 1	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Minute field represents the average expended energy of a user during a period of one minute. Present if bit 8 of Flags field is set to 1
Heart Rate	uint8	0 or 1	Unit: org.bluetooth.unit.period.beats_per_minute The Heart Rate field represents the current heart rate value of the user (e.g., measured via the contact heart rate or any other means). Present if bit 9 of Flags field is set to 1
Metabolic Equivalent	uint8	0 or 1	Base Unit: org.bluetooth.unit.metabolic_equivalent Represented values: M = 1, d = -1, b = 0 Unit is 1/10 metabolic equivalent The Metabolic Equivalent field represents the metabolic equivalent of the user. Present if bit 10 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Elapsed Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Elapsed Time field represents the elapsed time of a training session since the training session has started. Present if bit 11 of Flags field is set to 1
Remaining Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Remaining Time field represents the remaining time of a selected training session. Present if bit 12 of Flags field is set to 1

Table 3.299: Structure of the Rower Data characteristic

3.196.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	More Data
1	Average Stroke rate present
2	Total Distance present
3	Instantaneous Pace present
4	Average Pace present
5	Instantaneous Power present
6	Average Power present
7	Resistance Level present
8	Expended Energy present
9	Heart Rate present
10	Metabolic Equivalent present
11	Elapsed Time present
12	Remaining Time present
13–15	Reserved for Future Use

Table 3.300: Flags field

3.197 RSC Feature

The RSC Feature characteristic is used to represent the supported features of a running speed and cadence (RSC) sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
RSC Feature	boolean[16]	2	See Section 3.197.1

Table 3.301: Structure of the RSC Feature characteristic

3.197.1 RSC Feature field

The bits of this field are defined below.

Bit	Definition
0	Instantaneous Stride Length Measurement Supported
1	Total Distance Measurement Supported
2	Walking or Running Status Supported
3	Calibration Procedure Supported
4	Multiple Sensor Locations Supported
5–15	Reserved for Future Use

Table 3.302: RSC Feature field

3.198 RSC Measurement

The RSC Measurement characteristic is used to represent data related to a running speed and cadence (RSC) measurement.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.198.1
Instantaneous Speed	uint16	2	Base Unit: org.bluetooth.unit.velocity.metres_per_second Represented values: M = 1, d = 0, b = -8 Unit is 1/256th of a m/s
Instantaneous Cadence	uint8	1	Unit is 1/min
Instantaneous Stride Length	uint16	0 or 2	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -2, b = 0 Unit is Centimeter Present if bit 0 of Flags field is set to 1
Total Distance	uint32	0 or 4	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -1, b = 0 Unit is 1/10 m Present if bit 1 of Flags field is set to 1

Table 3.303: Structure of the RSC Measurement characteristic

3.198.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Instantaneous Stride Length Present
1	Total Distance Present
2	Walking or Running Status: 0 = Walking 1 = Running
3–7	Reserved for Future Use

Table 3.304: Flags field

3.199 SC Control Point

The SC Control Point characteristic is used to enable device-specific procedures related to a speed and cadence (SC) sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Op Code	uint8	1	See Section 3.199.1
Parameter	struct	0–18	See Section 3.199.1

Table 3.305: Structure of the SC Control Point characteristic

3.199.1 Op Code and Parameter fields

The values of these fields are defined below.

Op Code Value	Definition	Parameter	Parameter Type	Description
0x00	Reserved for Future Use	N/A	N/A	N/A
0x01	Set Cumulative Value	Cumulative Value as defined per service	Defined per service	Initiate the procedure to set a cumulative value. The new value is sent as parameter following op code (parameter defined per service). The response to this control point is Op Code 0x10 followed by the appropriate Response Value.

Op Code Value	Definition	Parameter	Parameter Type	Description
0x02	Start Sensor Calibration	N/A	N/A	Starts the calibration of the sensor. The response to this control point is Op Code 0x10 followed by the appropriate Response Value.
0x03	Update Sensor Location	Sensor Location Value (See Section 3.201.1)	uint8	Update to the location of the sensor with the value sent as parameter to this op code. The response to this control point is Op Code 0x10 followed by the appropriate Response Value.
0x04	Request Supported Sensor Locations	N/A	N/A	Request a list of supported locations for sensor attachment. The response to this control point is Op Code 0x10 followed by the appropriate Response Value, including a list of supported sensor locations (See Section 3.201) in the Response Parameter.
0x05–0x0F	Reserved for Future Use	N/A	N/A	N/A
0x10	Response Code	Request Op Code, Response Code Value	N/A	See Section 3.199.2
0x11–0xFF	Reserved for Future Use	N/A	N/A	N/A

Table 3.306: Op Code and Parameter fields

3.199.2 Response Code Values

The Response Code Values associated with the SC Control Point are defined below.

Response Code Value	Definition	Response Parameter	Description
0x00	Reserved For Future Use	N/A	N/A
0x01	Success	Defined per service	Normal response for successful operation.
0x02	Op Code not supported	N/A	Response if unsupported Op Code is received

Response Code Value	Definition	Response Parameter	Description
0x03	Invalid Operand	N/A	Response if Parameter received does not meet the requirements of the service.
0x04	Operation Failed	N/A	Response if the requested procedure failed.
0x05–0xFF	Reserved for Future Use	N/A	N/A

Table 3.307: Response Code Values

3.200 Sedentary Interval Notification

The Sedentary Interval Notification characteristic is used to represent the sedentary interval notification of a user. The sedentary interval notification is the sedentary time interval after which a user wants to be notified.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Sedentary Interval Notification	uint16	2	Unit: org.bluetooth.unit.time.second See Section 3.200.1

Table 3.308: Structure of the Sedentary Interval Notification characteristic

3.200.1 Sedentary Interval Notification field

A value of 0x0000 in the Sedentary Interval Notification field represents that the user does not want to be notified about sedentary intervals.

3.201 Sensor Location

The Sensor Location characteristic is used to represent the location of the sensor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Sensor Location	uint8	1	See Section 3.201.1

Table 3.309: Structure of the Sensor Location characteristic

3.201.1 Sensor Location field

The values of this field are defined below.

Value	Definition
0	Other
1	Top of shoe
2	In shoe
3	Hip
4	Front Wheel
5	Left Crank
6	Right Crank
7	Left Pedal
8	Right Pedal
9	Front Hub
10	Rear Dropout
11	Chainstay
12	Rear Wheel
13	Rear Hub
14	Chest
15	Spider
16	Chain Ring
17–255	Reserved for Future Use

Table 3.310: Sensor Location field

3.202 Serial Number String

The Serial Number String characteristic is used to represent the serial number for a device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Serial Number	utf8s	variable	UTF-8 string

Table 3.311: Structure of the Serial Number String characteristic

3.203 Software Revision String

The Software Revision String characteristic is used to represent the revision of the software within the device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Software Revision	utf8s	variable	UTF-8 string

Table 3.312: Structure of the Software Revision String characteristic

3.204 Sport Type for Aerobic and Anaerobic Thresholds

The Sport Type for Aerobic and Anaerobic Thresholds characteristic is used to represent the sport type applicable to aerobic and anaerobic thresholds for a user. The value identifies how the measurement(s) were performed. The Aerobic Threshold and Anaerobic Threshold characteristics together with the Sport Type For Aerobic And Anaerobic Thresholds characteristic describe the metabolic thresholds of the user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Sport Type for Aerobic and Anaerobic Thresholds	uint8	1	See Section 3.204.1.

Table 3.313: Structure of the Sport Type for Aerobic and Anaerobic Thresholds characteristic

3.204.1 Sport Type for Aerobic and Anaerobic Thresholds field

The values of this field are defined below.

Value	Definition
0	Unspecified
1	Running (Treadmill)
2	Cycling (Ergometer)
3	Rowing (Ergometer)
4	Cross Training (Elliptical)
5	Climbing
6	Skiing
7	Skating
8	Arm exercising
9	Lower body exercising
10	Upper body exercising
11	Whole body exercising
12–255	Reserved for Future Use

Table 3.314: Sport Type for Aerobic and Anaerobic Thresholds field

3.205 Stair Climber Data

The Stair Climber Data characteristic is used to represent data related to a stair climber device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.205.1
Floors	uint16	0 or 2	Unit: org.bluetooth.unit.unitless The Floors field represents the total number of floors counted by the Server since the beginning of the training session. Present if bit 0 of Flags field is set to 0
Steps Per Minute	uint16	0 or 2	Unit: org.bluetooth.unit.step_per_minute The Step per Minute Rate field represents the average step rate of a user during a period of one minute. Present if bit 1 of Flags field is set to 1
Average Step Rate	uint16	0 or 2	Unit: org.bluetooth.unit.step_per_minute The Average Step Rate field represents the average step rate since the beginning of the training session. Present if bit 2 of Flags field is set to 1
Positive Elevation Gain	uint16	0 or 2	Unit: org.bluetooth.unit.length.metre The Positive Elevation Gain field represents the positive elevation gain since the beginning of the training session. Present if bit 3 of Flags field is set to 1
Stride Count	uint16	0 or 2	Unit: org.bluetooth.unit.unitless A stride is a pair of steps. The Stride Count field represents the total number of strides since the beginning of the training session. Present if bit 4 of Flags field is set to 1
Total Energy	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Total Energy field represents the total expended energy of a user since the training session has started. Present if bit 5 of Flags field is set to 1
Energy Per Hour	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Hour field represents the average expended energy of a user during a period of one hour. Present if bit 5 of Flags field is set to 1
Energy Per Minute	uint8	0 or 1	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Minute field represents the average expended energy of a user during a period of one minute. Present if bit 5 of Flags field is set to 1
Heart Rate	uint8	0 or 1	Unit: org.bluetooth.unit.period.beats_per_minute The Heart Rate field represents the current heart rate value of the user (e.g., measured via the contact heart rate or any other means). Present if bit 6 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Metabolic Equivalent	uint8	0 or 1	Base Unit: org.bluetooth.unit.metabolic_equivalent Represented values: M = 1, d = -1, b = 0 Unit is 1/10 metabolic equivalent The Metabolic Equivalent field represents the metabolic equivalent of the user. Present if bit 7 of Flags field is set to 1
Elapsed Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Elapsed Time field represents the elapsed time of a training session since the training session has started. Present if bit 8 of Flags field is set to 1
Remaining Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Remaining Time field represents the remaining time of a training session that has been selected. Present if bit 9 of Flags field is set to 1

Table 3.315: Structure of the Stair Climber Data characteristic

3.205.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	More Data
1	Steps Per Minute present
2	Average Step Rate present
3	Positive Elevation Gain present
4	Stride Count present
5	Expended Energy present
6	Heart Rate present
7	Metabolic Equivalent present
8	Elapsed Time present
9	Remaining Time present
10–15	Reserved for Future Use

Table 3.316: Flags field

3.206 Step Climber Data

The Step Climber Data characteristic is used to represent data related to a step climber device.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.206.1
Floors	uint16	0 or 2	Unit: org.bluetooth.unit.unitless The Floors field represents the total number of floors counted by the Server since the beginning of the training session. Present if bit 0 of Flags field is set to 0
Step Count	uint16	0 or 2	Unit: org.bluetooth.unit.unitless The Step Count field represents the total number of steps counted by the Server since the beginning of the training session Present if bit 0 of Flags field is set to 0
Steps Per Minute	uint16	0 or 2	Unit: org.bluetooth.unit.step_per_minute The Step per Minute Rate field represents the average step rate of a user during a period of one minute. Present if bit 1 of Flags field is set to 1
Average Step Rate	uint16	0 or 2	Unit: org.bluetooth.unit.step_per_minute The Average Step Rate field represents the average step rate since the beginning of the training session. Present if bit 2 of Flags field is set to 1
Positive Elevation Gain	uint16	0 or 2	Unit: org.bluetooth.unit.length.metre The Positive Elevation Gain field represents the positive elevation gain since the beginning of the training session. Present if bit 3 of Flags field is set to 1
Total Energy	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Total Energy field represents the total expended energy of a user since the training session has started. Present if bit 4 of Flags field is set to 1
Energy Per Hour	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Hour field represents the average expended energy of a user during a period of one hour. Present if bit 4 of Flags field is set to 1
Energy Per Minute	uint8	0 or 1	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Minute field represents the average expended energy of a user during a period of one minute. Present if bit 4 of Flags field is set to 1
Heart Rate	uint8	0 or 1	Unit: org.bluetooth.unit.period.beats_per_minute The Heart Rate field represents the current heart rate value of the user (e.g., measured via the contact heart rate or any other means). Present if bit 5 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Metabolic Equivalent	uint8	0 or 1	Base Unit: org.bluetooth.unit.metabolic_equivalent Represented values: M = 1, d = -1, b = 0 Unit is 1/10 metabolic equivalent The Metabolic Equivalent field represents the metabolic equivalent of the user. Present if bit 6 of Flags field is set to 1
Elapsed Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Elapsed Time field represents the elapsed time of a training session since the training session has started. Present if bit 7 of Flags field is set to 1
Remaining Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Remaining Time field represents the remaining time of a selected training session. Present if bit 8 of Flags field is set to 1

Table 3.317: Structure of the Step Climber Data characteristic

3.206.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	More Data
1	Steps Per Minute present
2	Average Step Rate present
3	Positive Elevation Gain present
4	Expended Energy present
5	Heart Rate present:
6	Metabolic Equivalent present
7	Elapsed Time present
8	Remaining Time present
9–15	Reserved for Future Use

Table 3.318: Flags field

3.207 Stride Length

The Stride Length characteristic is used to represent the stride length of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Stride Length	uint16	2	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -3, b = 0 Unit is meter with a resolution of 0.001 m (e.g., 1 mm)

Table 3.319: Structure of the Stride Length characteristic

3.208 Sulfur Dioxide Concentration

The Sulfur Dioxide Concentration characteristic is used to represent a measure of sulfur dioxide (SO_2) concentration.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Sulfur Dioxide Concentration	medfloat16	2	Base Unit: org.bluetooth.unit.density.kilogram_per_cubic_meter The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.320: Structure of the Sulfur Dioxide Concentration characteristic

3.209 Sulfur Hexafluoride Concentration

The Sulfur Hexafluoride Concentration characteristic is used to represent a measure of sulfur hexafluoride (SF_6) concentration.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Sulfur Hexafluoride Concentration	medfloat16	2	Base Unit: org.bluetooth.unit.density.kilogram_per_cubic_meter The special value NRes is used to report a value outside the available range and resolution, possibly resulting from an overflow or underflow situation. The special value NaN is used to report an invalid result from a computation step or to indicate missing data due to the hardware's inability to provide a valid measurement, perhaps from sensor perturbation.

Table 3.321: Structure of the Sulfur Hexafluoride Concentration characteristic

3.210 Supported Heart Rate Range

The Supported Heart Rate Range characteristic is used to represent the heart rate range supported by a fitness machine.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Heart Rate	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute
Maximum Heart Rate	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute
Minimum Increment	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.322: Structure of the Supported Heart Rate Range characteristic

3.211 Supported Inclination Range

The Supported Inclination Range characteristic is used to represent the inclination range supported by a fitness machine.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Inclination	sint16	2	Base Unit: org.bluetooth.unit.percentage Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a percent
Maximum Inclination	sint16	2	Base Unit: org.bluetooth.unit.percentage Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a percent
Minimum Increment	uint16	2	Base Unit: org.bluetooth.unit.percentage Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a percent

Table 3.323: Structure of the Supported Inclination Range characteristic

3.212 Supported New Alert Category

The Supported New Alert Category characteristic is used to represent the category that the server supports for a new alert.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Category ID Bit Mask	struct	1 or 2	Refer to Alert Category ID Bit Mask characteristic in Section 3.8

Table 3.324: Structure of the Supported New Alert Category characteristic

3.213 Supported Power Range

The Supported Power Range characteristic is used to represent the power range supported by a fitness machine.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Power	sint16	2	Unit: org.bluetooth.unit.power.watt
Maximum Power	sint16	2	Unit: org.bluetooth.unit.power.watt
Minimum Increment	uint16	2	Unit: org.bluetooth.unit.power.watt

Table 3.325: Structure of the Supported Power Range characteristic

3.214 Supported Resistance Level Range

The Supported Resistance Level Range characteristic is used to represent the resistance level range supported by a fitness machine.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Resistance Level	uint8	1	Base Unit: org.bluetooth.unit.unitless Represented values: M = 1, d = 1, b = 0 Unit is 1
Maximum Resistance Level	uint8	1	Base Unit: org.bluetooth.unit.unitless Represented values: M = 1, d = 1, b = 0 Unit is 1
Minimum Increment	uint8	1	Base Unit: org.bluetooth.unit.unitless Represented values: M = 1, d = 1, b = 0 Unit is 1

Table 3.326: Structure of the Supported Resistance Level Range characteristic

3.215 Supported Speed Range

The Supported Speed Range characteristic is used to represent the speed range supported by a fitness machine.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Speed	uint16	2	Base Unit: org.bluetooth.unit.velocity.kilometre_per_hour Represented values: M = 1, d = -2, b = 0 Unit is 1/100 of a kilometer per hour
Maximum Speed	uint16	2	Base Unit: org.bluetooth.unit.velocity.kilometre_per_hour Represented values: M = 1, d = -2, b = 0 Unit is 1/100 of a kilometer per hour
Minimum Increment	uint16	2	Base Unit: org.bluetooth.unit.velocity.kilometre_per_hour Represented values: M = 1, d = -2, b = 0 Unit is 1/100 of a kilometer per hour

Table 3.327: Structure of the Supported Speed Range characteristic

3.216 Supported Unread Alert Category

The Supported Unread Alert Category characteristic is used to represent the category that the server supports for an unread alert.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Category ID Bit Mask	struct	1 or 2	Refer to Alert Category ID Bit Mask characteristic in Section 3.8

Table 3.328: Structure of the Supported Unread Alert Category characteristic

3.217 System ID

The System ID characteristic is used to represent an extended unique identifier (EUI) of the system implementing the service that contains this characteristic.

This 64-bit structure is an EUI-64 which consists of an Organizationally Unique Identifier (OUI) concatenated with a manufacturer-defined identifier. The OUI is issued by the IEEE Registration Authority (RA) [12] and should be used in accordance with the guidelines in [13]. Supported lengths for IEEE-issued OUIs include 24 and 36 bits. In those cases, the remaining least significant 40 or 28 bits are manufacturer assigned.

A Bluetooth Device Address is an EUI-48, is 48 bits in length, and can be based on an OUI as well, but this is not required. See Core Spec, volume 2, part B, section 1.2. Historically an EUI-48 could be mapped to an EUI-64 by inserting either the value 0xFFFE or the value 0xFF-FF in the middle of the 6-octet EUI-48. This mapping is deprecated.

Note that the order of transmission of the EUI-64 octets in a Characteristic is LSO-MSO and also the bit order is little endian. In the System ID characteristic the uint64 starts with the manufacturer-defined identifier, whereas the representation of an EUI-64 in the IEEE-RA guidelines is MSO-LSO, starts with the OUI, and uses the big endian bit order.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
EUI-64	uint64	64	An EUI-64 assigned according to the guidelines of the IEEE-RA.

Table 3.329: Structure of the System ID characteristic

3.218 Temperature

The Temperature characteristic is used to represent a temperature.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Temperature	sint16	2	Base Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius Represented values: M = 1, d = -2, b = 0 Unit is degrees Celsius with a resolution of 0.01 degrees Celsius. Allowed range is: -273.15 to 327.67. A value of 0x8000 represents ”value is not known”. All other values are prohibited.

Table 3.330: Structure of the Temperature characteristic

3.219 Temperature 8

The Temperature 8 characteristic is used to represent a measure of temperature with a limited range.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Temperature 8	sint8	1	Unit is degree Celsius with a resolution of 0.5. Minimum: -64.0 Maximum: 63.0 Represented values: M = 1, d = 0, b = -1 Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius A value of 0x7F represents ”value is not known”.

Table 3.331: Structure of the Temperature 8 characteristic

3.220 Temperature 8 in a Period of Day

The Temperature 8 in a Period of Day characteristic is used to represent a temperature setting over a period of time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Temperature	struct	1	Refer to Temperature 8 characteristic in Section 3.219
Start Time	struct	1	Refer to Time Decihour 8 characteristic in Section 3.228
End Time	struct	1	Refer to Time Decihour 8 characteristic in Section 3.228

Table 3.332: Structure of the Temperature 8 in a Period of Day characteristic

3.221 Temperature 8 Statistics

The Temperature 8 Statistics characteristic is used to represent temperature statistics over a period of time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Average	struct	1	Refer to Temperature 8 characteristic in Section 3.219
Standard Deviation Value	struct	1	Refer to Temperature 8 characteristic in Section 3.219
Minimum Value	struct	1	Refer to Temperature 8 characteristic in Section 3.219
Maximum Value	struct	1	Refer to Temperature 8 characteristic in Section 3.219
Sensing Duration	struct	1	Refer to Time Exponential 8 characteristic in Section 3.229

Table 3.333: Structure of the Temperature 8 Statistics characteristic

3.222 Temperature Measurement

The Temperature Measurement characteristic is used to represent data related to a temperature measurement.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.222.1.
Temperature Measurement Value (Celsius)	medfloat32	0 or 4	This field contains a measurement value. Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius. Present if bit 0 of Flags field is set to 0
Temperature Measurement Value (Fahrenheit)	medfloat32	0 or 4	This field contains a measurement value. Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_fahrenheit. Present if bit 0 of Flags field is set to 1
Time Stamp	struct	0 or 7	Refer to Date Time characteristic in Section 3.71. Present if bit 1 of Flags field is set to 1
Temperature Type	uint8	0 or 1	The format of this field is the same as the format of the Temperature Type characteristic in Section 3.225. Present if bit 2 of Flags field is set to 1

Table 3.334: Structure of the Temperature Measurement characteristic

3.222.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Temperature Units Flag 0 = Temperature Measurement Value in units of Celsius 1 = Temperature Measurement Value in units of Fahrenheit

Bit	Definition
1	Time Stamp Flag 0 = Time Stamp field not present 1 = Time Stamp field present
2	Temperature Type Flag 0 = Temperature Type field not present 1 = Temperature Type field present
3–7	Reserved for Future Use

Table 3.335: Flags field

3.223 Temperature Range

The Temperature Range characteristic is used to represent a temperature range.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Temperature	struct	2	Refer to Temperature characteristic in Section 3.218
Maximum Temperature	struct	2	Refer to Temperature characteristic in Section 3.218

Table 3.336: Structure of the Temperature Range characteristic

3.224 Temperature Statistics

The Temperature Statistics characteristic is used to represent temperature statistics over a period of time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Average Temperature	struct	2	Refer to Temperature characteristic in Section 3.218
Standard Deviation Temperature	struct	2	Refer to Temperature characteristic in Section 3.218
Minimum Temperature	struct	2	Refer to Temperature characteristic in Section 3.218
Maximum Temperature	struct	2	Refer to Temperature characteristic in Section 3.218
Sensing Duration	struct	1	Refer to Time Exponential 8 characteristic in Section 3.229

Table 3.337: Structure of the Temperature Statistics characteristic

3.225 Temperature Type

The Temperature Type characteristic is used to represent the location of a temperature measurement. These values correspond to the Temperature Type descriptions used in IEEE 11073-10408-2008 [14].

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Temperature Type Description	uint8	1	See **??**.

Table 3.338: Structure of the Temperature Type characteristic

3.225.1 Temperature Type Description field

The values of this field are defined below.

Value	Definition
0	Reserved for Future Use
1	Armpit
2	Body (general)
3	Ear (usually earlobe)
4	Finger
5	Gastrointestinal Tract
6	Mouth
7	Rectum
8	Toe
9	Tympanum (ear drum)
10–255	Reserved for Future Use

Table 3.339: Temperature Type Description field

3.226 Three Zone Heart Rate Limits

The Three Zone Heart Rate Limits characteristic is used to represent the limits between the heart rate zones for the three-zone heart rate definition (Hard, Moderate, and Light) of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Three Zone Heart Rate Limits - Light (Fat burn) / Moderate (Aerobic) Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute
Three Zone Heart Rate Limits - Moderate (Aerobic) / Hard (Anaerobic) Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.340: Structure of the Three Zone Heart Rate Limits characteristic

3.227 Time Accuracy

The Time Accuracy characteristic is used to represent the accuracy (drift) of time information compared to a reference time source.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Accuracy	uint8	1	Base Unit: org.bluetooth.unit.time.second Represented values: M = 1, d = 0, b = -3 This field represents accuracy (drift) of time information in steps of 1/8 of a second (125ms) compared to a reference time source. Valid range from 0 to 253 (0s to 31.625s). A value of 254 means drift is larger than 31.625s. A value of 255 means drift is unknown.

Table 3.341: Structure of the Time Accuracy characteristic

3.228 Time Decihour 8

The Time Decihour 8 characteristic is used to represent a period of time in tenths of an hour.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Decihour 8	uint8	1	Unit is hour with a resolution of 0.1. Minimum: 0.0 Maximum: 23.9 Represented values: M = 1, d = -1, b = 0 Unit: org.bluetooth.unit.time.hour A value of 0xFF represents ”value is not known”. All other values are Prohibited.

Table 3.342: Structure of the Time Decihour 8 characteristic

3.229 Time Exponential 8

The Time Exponential 8 characteristic is used to represent a measure of a period of time in seconds.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Exponential 8	uint8	1	The time duration is given by the value 1.1^{N-64} in seconds, with N being the raw 8-bit value. Minimum: 0.0 Maximum: 66560641 Unit: org.bluetooth.unit.time.second A raw value of 0x00 represents 0 seconds. A raw value of 0xFE represents the total life of the device. A raw value of 0xFF represents ”value is not known”.

Table 3.343: Structure of the Time Exponential 8 characteristic

3.230 Time Hour 24

The Time Hour 24 characteristic is used to represent a period of time in hours.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Hour 24	uint24	3	Unit is hour with a resolution of 1. Minimum: 0 Maximum: 16777214 Unit: org.bluetooth.unit.time.hour A value of 0xFFFFFF represents ”value is not known”.

Table 3.344: Structure of the Time Hour 24 characteristic

3.231 Time Millisecond 24

The Time Millisecond 24 characteristic is used to represent a period of time with a resolution of 1 millisecond.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Millisecond 24	uint24	3	Unit is second with a resolution of 0.001. Minimum: 0 Maximum: 16777.214 Represented values: M = 1, d = -3, b = 0 Unit: org.bluetooth.unit.time.second A value of 0xFFFFFF represents ”value is not known”.

Table 3.345: Structure of the Time Millisecond 24 characteristic

3.232 Time Second 8

The Time Second 8 characteristic is used to represent a period of time with a unit of 1 second.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Second 8	uint8	1	Unit is second with a resolution of 1. Minimum: 0 Maximum: 254 Unit: org.bluetooth.unit.time.second A value of 0xFF represents ”value is not known”.

Table 3.346: Structure of the Time Second 8 characteristic

3.233 Time Second 16

The Time Second 16 characteristic is used to represent a period of time with a unit of 1 second.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Second 16	uint16	2	Unit is second with a resolution of 1. Minimum: 0 Maximum: 65534 Unit: org.bluetooth.unit.time.second A value of 0xFFFF represents ”value is not known”.

Table 3.347: Structure of the Time Second 16 characteristic

3.234 Time Second 32

The Time Second 32 characteristic is used to represent a period of time with a unit of 1 second.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Second 32	uint32	4	Unit is second with a resolution of 1. Minimum: 0 Maximum: 4294967294 Represented values: M = 1, d = 0, b = 0 Unit: org.bluetooth.unit.time.second A value of 0xFFFFFFFF represents ”value is not known”.

Table 3.348: Structure of the Time Second 32 characteristic

3.235 Time Source

The Time Source characteristic is used to represent the type of time source that is used for reference time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Source	uint8	1	See Section 3.235.1.

Table 3.349: Structure of the Time Source characteristic

3.235.1 Time Source values

The values of this field are defined below.

Value	Definition	Description
0	Unknown	A time source not listed in the following categories or an otherwise unknown time source
1	Network Time Protocol	Any version of the (Simple) Network Time Protocol
2	GPS	A time source based on GPS information (GPS, Galileo, GLONASS, BeiDou, or similar)
3	Radio Time Signal	(Atomic) Clock synchronized through RF (in most cases the same as Time Source value 5 - Atomic Clock)
4	Manual	A manually set time, by 'eyeball and wristwatch'
5	Atomic Clock	Atomic Clock (synchronized through RF) (legacy, in most cases the same as Time Source value 3 - Radio Time Signal)
6	Cellular Network	A mobile network clock (GSM, CDMA, 4G, or similar)
7	Not Synchronized	The clock is not synchronized
8-255	Reserved for Future Use	-

Table 3.350: Time Source field

3.236 Time Update Control Point

The Time Update Control Point characteristic is used to enable device-specific procedures related to a time server.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Update Control Point	uint8	1	1: Get Reference Update 2: Cancel Reference Update All other values: Reserved for Future Use

Table 3.351: Structure of the Time Update Control Point characteristic

3.237 Time Update State

The Time Update State characteristic is used to represent the status of the time update process and the result of the last update in a time server.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Current State	uint8	1	0: Idle 1: Update Pending 2–255: Reserved for Future Use
Result	uint8	1	0: Successful 1: Cancelled 2: No connection to reference 3: Reference responded with an error 4: Timeout 5: Update not attempted after reset 6–255: Reserved for Future Use

Table 3.352: Structure of the Time Update State characteristic

3.238 Time with DST

The Time with DST characteristic is used to represent information about a DST change event.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Date Time	struct	7	Refer to Date Time characteristic in Section 3.71
DST Offset	struct	1	Refer to DST Offset characteristic in Section 3.77

Table 3.353: Structure of the Time with DST characteristic

3.239 Time Zone

The Time Zone characteristic is used to represent the time difference in 15-minute increments between local standard time and UTC.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Time Zone	sint8	1	This field represents the offset from UTC in number of 15-minute increments. Valid range from -48 to +56. A value of -128 means that the time zone offset is not known. All other values are Reserved for Future Use. The offset defined in this characteristic is constant regardless of whether daylight savings is in effect.

Table 3.354: Structure of the Time Zone characteristic

3.240 Torque

The Torque characteristic is used to represent the measured magnitude of torque (or moment of force) around a device-specific axis.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Torque	sint32	4	Base Unit: org.bluetooth.unit.moment_of_force.newton_metre Represented values: M = 1, d = - 2, b = 0 Unit is Newton meters with a resolution of 0.01 Nm. Torque is positive when the force is applied in the clockwise direction around the given axis. A value of 0x7FFFFFFF represents ”value is not known”.

Table 3.355: Structure of the Torque characteristic

3.241 Treadmill Data

The Treadmill Data characteristic is used to represent data related to a treadmill.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[16]	2	See Section 3.241.1
Instantaneous Speed	uint16	0 or 2	Base Unit: org.bluetooth.unit.velocity.kilometre_per_hour Represented values: M = 1, d = -2, b = 0 Unit is 1/100 of a kilometer per hour The Instantaneous Speed field represents the instantaneous speed of the belt of the treadmill. Present if bit 0 of Flags field is set to 0
Average Speed	uint16	0 or 2	Base Unit: org.bluetooth.unit.velocity.kilometre_per_hour Represented values: M = 1, d = -2, b = 0 Unit is 1/100 of a kilometer per hour The Average Speed field represents the average speed since the beginning of the training session. Present if bit 1 of Flags field is set to 1
Total Distance	uint24	0 or 3	Unit: org.bluetooth.unit.length.metre The Total Distance field represents the total distance reported by the Server since the beginning of the training session. Present if bit 2 of Flags field is set to 1
Inclination	sint16	0 or 2	Base Unit: org.bluetooth.unit.percentage Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a percent The Inclination field represents the current inclination of the Server. A positive value means that the user feels as if they are going uphill and a negative value means that the user feels as if they are going downhill. Present if bit 3 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Ramp Angle Setting	sint16	0 or 2	Base Unit: org.bluetooth.unit.plane_angle.degree Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a degree The Ramp Angle Setting field represents the current setting of the ramp angle of the Server. Present if bit 3 of Flags field is set to 1
Positive Elevation Gain	uint16	0 or 2	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a meter The Positive Elevation Gain field represents the positive elevation gain since the training session has started. Present if bit 4 of Flags field is set to 1
Negative Elevation Gain	uint16	0 or 2	Base Unit: org.bluetooth.unit.length.metre Represented values: M = 1, d = -1, b = 0 Unit is 1/10 of a meter The Negative Elevation Gain field represents the negative elevation gain since the training session has started. Present if bit 4 of Flags field is set to 1
Instantaneous Pace (Time per 500 meters)	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Instantaneous Pace field represents the instantaneous pace of a user while exercising. This value is directly related to the instantaneous speed of the treadmill but is presented with different units. Present if bit 5 of Flags field is set to 1
Average Pace (Time per 500 meters)	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Average Pace field represents the average pace of a user since the beginning of the training session. This value is directly related to the average speed of the treadmill but is presented with different units. Present if bit 6 of Flags field is set to 1
Total Energy	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Total Energy field represents the total expended energy of a user since the training session has started. Present if bit 7 of Flags field is set to 1
Energy Per Hour	uint16	0 or 2	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Hour field represents the average expended energy of a user during a period of one hour. Present if bit 7 of Flags field is set to 1
Energy Per Minute	uint8	0 or 1	Unit: org.bluetooth.unit.energy.kilogram_calorie The Energy per Minute field represents the average expended energy of a user during a period of one minute. Present if bit 7 of Flags field is set to 1

Field	Data Type	Size (in octets)	Description
Heart Rate	uint8	0 or 1	Unit: org.bluetooth.unit.period.beats_per_minute The Heart Rate field represents the current heart rate value of the user (e.g., measured via the contact heart rate or any other means). Present if bit 8 of Flags field is set to 1
Metabolic Equivalent	uint8	0 or 1	Unit: org.bluetooth.unit.metabolic_equivalent The Metabolic Equivalent field represents the metabolic equivalent of the user. Present if bit 9 of Flags field is set to 1
Elapsed Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Elapsed Time field represents the elapsed time of a training session since the training session has started. Present if bit 10 of Flags field is set to 1
Remaining Time	uint16	0 or 2	Unit: org.bluetooth.unit.time.second The Remaining Time field represents the remaining time of a training session that has been selected. Present if bit 11 of Flags field is set to 1
Force On Belt	sint16	0 or 2	Unit: org.bluetooth.unit.force.newton The Force on Belt field represents the force being applied to the treadmill belt by the user's steps. A positive value means that the user is accelerating the belt and a negative value means that the user is slowing down the belt Present if bit 12 of Flags field is set to 1
Power Output	sint16	0 or 2	Unit: org.bluetooth.unit.power.watt The Power Output field represents the power being applied to the treadmill by the user's steps. A positive value means that the user is accelerating the belt and a negative value means that the user is slowing down the belt. Present if bit 12 of Flags field is set to 1

Table 3.356: Structure of the Treadmill Data characteristic

3.241.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	More Data
1	Average Speed present
2	Total Distance present
3	Inclination and Ramp Angle Setting present
4	Elevation Gain present
5	Instantaneous Pace present

Bit	Definition
6	Average Pace present
7	Expended Energy present
8	Heart Rate present
9	Metabolic Equivalent present
10	Elapsed Time present
11	Remaining Time present
12	Force On Belt and Power Output present
13–15	Reserved for Future Use

Table 3.357: Flags field

3.242 True Wind Direction

The True Wind Direction characteristic is used to represent the true wind direction. Wind direction is reported by the direction from which it originates and is an angle measured clockwise relative to Geographic North. For example, a wind coming from the north is given as 0 degrees, a wind coming from the south is given as 180 degrees, a wind coming from the east is given as 90 degrees, and a wind coming from the west is given as 270 degrees.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
True Wind Direction	uint16	2	Base Unit: org.bluetooth.unit.plane_angle.degree Minimum value: 0 Maximum value: 359.99 Represented values: M = 1, d = -2, b = 0 Unit is degrees with a resolution of 0.01 degrees.

Table 3.358: Structure of the True Wind Direction characteristic

3.243 True Wind Speed

The True Wind Speed characteristic is used to represent the true wind speed.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
True Wind Speed	uint16	2	Base Unit: org.bluetooth.unit.velocity.metres_per_second Represented values: M = 1, d = -2, b = 0 Unit is in meters per second with a resolution of 0.01 m/s.

Table 3.359: Structure of the True Wind Speed characteristic

3.244 Two Zone Heart Rate Limits

The Two Zone Heart Rate Limits characteristic is used to represent the heart rate limit between the heart rate zones for the two-zone heart rate definition (Fitness and Fat Burn) of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Two Zone Heart Rate Limit - Fat Burn / Fitness Limit	uint8	1	Unit: org.bluetooth.unit.period.beats_per_minute

Table 3.360: Structure of the Two Zone Heart Rate Limits characteristic

3.245 Tx Power Level

The Tx Power Level characteristic is used to represent the current radiated transmit power level.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Tx Power	sint8	1	Base Unit: org.bluetooth.unit.logarithmic_radio_quantity.decibel Allowed range is -100 to 20. All other values are reserved for future use.

Table 3.361: Structure of the Tx Power Level characteristic

3.246 UDI for Medical Devices

This characteristic is used to represent a unique identification assigned to a medical device and the controlling and assigning bodies.

A Unique Device Identifier (UDI) is a string that is used to label a medical product in a pre-defined way as defined by a regional authority such as the US FDA. A UDI is linked to a registration of product information in a database and tracks a device in case of medical issues linked to using the device. A UDI consists of a Device Information (DI) part that identifies the device type and a Production Information (PI) part that identifies a specific device instance by the device's production date, serial number, and similar attributes. The UDI for Medical Devices characteristic contains the full UDI or at least the DI part (see [15] for more information).

The UDI Issuer and the UDI Authority fields contain international Object Identifiers (OIDs) as defined by ITU-T [16] and ISO/IEC [17]. For example, the OID for the US FDA is 2.16.840.1.113883.3.24. Details on an OID are retrievable via directories such as http://www.oid-info.com/.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	Flags reflecting the presence of fields (see Section 3.246.1).

Field	Data Type	Size (in octets)	Description
UDI Label	utf8s	variable	String value matching the UDI in human readable form as assigned to the product by a recognized UDI Issuer. Zero-terminated. Present if bit 0 of Flags field is set to 1
UDI Device Identifier	utf8s	variable	A fixed portion of a UDI that identifies the labeler and the specific version or model of a device. Zero-terminated. Present if bit 1 of Flags field is set to 1
UDI Issuer	utf8s	variable	OID representing the UDI Issuing Organization, such as GS1. Zero-terminated. Present if bit 2 of Flags field is set to 1
UDI Authority	utf8s	variable	OID representing the regional UDI Authority, such as the US FDA. Zero-terminated. Present if bit 3 of Flags field is set to 1

Table 3.362: Structure of the UDI for Medical Devices characteristic

3.246.1 Flags field

The Flags field contains the flags as defined below.

Bit	Definition
0	UDI Label is present
1	UDI Device Identifier is present
2	UDI Issuer is present
3	UDI Authority is present
4–7	RFU

Table 3.363: Flags field

3.247 Unread Alert Status

The Unread Alert Status characteristic is used to represent the number of unread alerts in the specific category.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Category ID	struct	1	Refer to Alert Category ID characteristic in Section 3.7
Unread Count	uint8	1	This field provides the number of unread alerts in the server. The range is 0–254. The value of 255 means that there are more than 254 unread alerts in the server.

Table 3.364: Structure of the Unread Alert Status characteristic

3.248 User Index

The User Index characteristic is used to represent the index of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
User Index	uint8	1	See Section 3.248.1.

Table 3.365: Structure of the User Index characteristic

3.248.1 User Index field

The values of this field are defined below.

Value	Definition
0–254	Index of the current user.
255	Unknown User

Table 3.366: User Index field

3.249 UV Index

The UV Index characteristic is used to represent the UV Index.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
UV Index	uint8	1	Unit: org.bluetooth.unit.unitless

Table 3.367: Structure of the UV Index characteristic

3.250 VO2 Max

The VO2 Max characteristic is used to represent the maximal oxygen uptake of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
VO2 Max	uint8	1	Unit: org.bluetooth.unit.transfer_rate.milliliter_per_-kilogram_per_minute

Table 3.368: Structure of the VO2 Max characteristic

3.251 VOC Concentration

The VOC Concentration characteristic is used to represent a measure of volatile organic compounds concentration.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
VOC Concentration	uint16	2	Unit is parts per billion (ppb) with a resolution of 1. Unit: org.bluetooth.unit.ppb Represented values: M = 1, d = 0, b =0 Allowed range is: 0 to 65533. A value of 0xFFFE represents ”value is 65534 or greater”. A value of 0xFFFF represents ”value is not known”.

Table 3.369: Structure of the VOC Concentration characteristic

3.252 Voltage

The Voltage characteristic is used to represent a measure of positive electric potential difference.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Voltage Value	uint16	2	Unit is volt with a resolution of 1/64V. Minimum: 0.0 Maximum: 1022.0 Represented values: M = 1, d = 0, b = -6 Unit: org.bluetooth.unit.electric_potential_difference.volt A value of 0xFFFF represents ”value is not known”. The minimum representable value represents the minimum value or lower, the maximum representable value represents the maximum value or higher.

Table 3.370: Structure of the Voltage characteristic

3.253 Voltage Frequency

The Voltage Frequency characteristic is used to represent power supply voltage frequency.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Voltage Frequency	uint16	2	Unit is hertz with resolution of 1. Minimum: 1 Maximum: 65533 Represented values: M = 1, d = 0, b = 0 Unit: org.bluetooth.unit.hertz A value of 0 represents DC power supply. A value of 0xFFFE represents ”value is not valid”. A value of 0xFFFF represents ”value is not known”.

Table 3.371: Structure of the Voltage Frequency characteristic

3.254 Voltage Specification

The Voltage Specification characteristic is used to represent a specification of voltage values.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Minimum Voltage Value	struct	2	Refer to Voltage characteristic in Section 3.252
Typical Voltage Value	struct	2	Refer to Voltage characteristic in Section 3.252
Maximum Voltage Value	struct	2	Refer to Voltage characteristic in Section 3.252

Table 3.372: Structure of the Voltage Specification characteristic

3.255 Voltage Statistics

The Voltage Statistics characteristic is used to represent a set of statistical voltage values over a period of time.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Average Voltage Value	struct	2	Refer to Voltage characteristic in Section 3.252
Standard Deviation Voltage Value	struct	2	Refer to Voltage characteristic in Section 3.252
Minimum Voltage Value	struct	2	Refer to Voltage characteristic in Section 3.252
Maximum Voltage Value	struct	2	Refer to Voltage characteristic in Section 3.252
Sensing Duration	struct	1	Refer to Time Exponential 8 characteristic in Section 3.229

Table 3.373: Structure of the Voltage Statistics characteristic

3.256 Volume Flow

The Volume Flow characteristic is used to represent a flow of a general volume such as a volume of material or gas.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Volume Flow	uint16	2	Unit is liter/second with a resolution of 0.001 (1 milliliter). Minimum: 0 Maximum: 65534 Represented values: M = 1, d = -3, b = 0 Unit: org.bluetooth.unit.volume_flow.litre_per_second A value of 0xFFFF represents ”value is not known”. All other values are Prohibited.

Table 3.374: Structure of the Volume Flow characteristic

3.257 Waist Circumference

The Waist Circumference characteristic is used to represent the waist measurement of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Waist Circumference	uint16	2	Base Unit: org.bluetooth.unit.length.meter Represented values: M = 1, d = -2, b = 0 Unit is 0.01 meter.

Table 3.375: Structure of the Waist Circumference characteristic

3.258 Weight

The Weight characteristic is used to represent the weight of a user.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Weight	uint16	2	Base Unit: org.bluetooth.unit.mass.kilogram Represented values: M = 5, d = -3, b = 0 Unit is 0.005 kilogram.

Table 3.376: Structure of the Weight characteristic

3.259 Weight Measurement

The Weight Measurement characteristic is used to represent data related to a weight measurement.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Flags	boolean[8]	1	See Section 3.259.1
Weight	uint16	2	This field is in kilograms with resolution 0.005 if the bit 0 of the Flag field is 0 or in pounds with a resolution of 0.01 if the bit 0 of the Flag field is 1.

Field	Data Type	Size (in octets)	Description
Time Stamp	struct	0 or 7	Refer to Date Time characteristic in Section 3.71 Present if bit 1 of Flags field is set to 1
User ID	uint8	0 or 1	The special value of 0xFF for User ID represents ”unknown user”. Present if bit 2 of Flags field is set to 1
BMI	uint16	0 or 2	Unit is 0.1 kg/m2 or org.bluetooth.unit.kilogram_per_square_metre Represented values: M = 1, d = -1, b = 0. Present if bit 3 of Flags field is set to 1
Height	uint16	0 or 2	This field is in meters with a resolution of 0.001 if the bit 0 of the Flag field is 0 or in inches with a resolution of 0.1 if the bit 0 of the Flag field is 1. Present if bit 3 of Flags field is set to 1

Table 3.377: Structure of the Weight Measurement characteristic

3.259.1 Flags field

The bits of this field are defined below.

Bit	Definition
0	Measurement Units: 0 = SI (Weight and Mass in units of kilogram (kg) and Height in units of meter) 1 = Imperial (Weight and Mass in units of pound (lb) and Height in units of inch (in))
1	Time Stamp present
2	User ID present
3	BMI and Height present
4–7	Reserved for Future Use

Table 3.378: Flags field

3.260 Weight Scale Feature

The Weight Scale Feature characteristic is used to represent the supported features of a weight scale.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Weight Scale Feature	boolean[32]	4	See Section 3.260.1

Table 3.379: Structure of the Weight Scale Feature characteristic

3.260.1 Weight Scale Feature field

The bits of this field are defined below.

Bit	Definition
0	Time Stamp Supported
1	Multiple Users Supported
2	BMI Supported
3–6	Weight Measurement Resolution 0b0000 = Not specified 0b0001 = Resolution of 0.5 kg or 1 lb 0b0010 = Resolution of 0.2 kg or 0.5 lb 0b0011 = Resolution of 0.1 kg or 0.2 lb 0b0100 = Resolution of 0.05 kg or 0.1 lb 0b0101 = Resolution of 0.02 kg or 0.05 lb 0b0110 = Resolution of 0.01 kg or 0.02 lb 0b0111 = Resolution of 0.005 kg or 0.01 lb 0b1000–0b1111 = Reserved for Future Use
7–9	Height Measurement Resolution 0b000 = Not specified 0b001 = Resolution of 0.01 meter or 1 inch 0b010 = Resolution of 0.005 meter or 0.5 inch 0b011 = Resolution of 0.001 meter or 0.1 inch 0b100–0b111 = Reserved for Future Use
10–31	Reserved for Future Use

Table 3.380: Weight Scale Feature field

3.261 Wind Chill

The Wind Chill characteristic is used to represent the wind chill factor.

The structure of this characteristic is defined below.

Field	Data Type	Size (in octets)	Description
Wind Chill	sint8	1	Unit: org.bluetooth.unit.thermodynamic_-temperature.degree_celsius

Table 3.381: Structure of the Wind Chill characteristic

4 Descriptors

The descriptors in this section are listed in alphabetical order.

4.1 Valid Range

The Valid Range descriptor is used to represent the range of a single-field characteristic that it describes. It contains two fields that define the upper and lower bounds of a range.

The data type and units for lower inclusive value and the upper inclusive value are identical to the data type, units, and represented values (i.e., M, d, b as described in Section 2.3.2) of the characteristic for which it is used.

The structure of this descriptor is defined below.

Field	Data Type	Size (in octets)	Description
Lower Inclusive Value	Same as characteristic it is attached to	Same as characteristic it is attached to	The lower bound is the same format as the characteristic the descriptor describes.
Upper Inclusive Value	Same as characteristic it is attached to	Same as characteristic it is attached to	The upper bound is the same format as the characteristic the descriptor describes.

Table 4.1: Structure of the Valid Range descriptor

Examples:

If used with the Measurement Interval characteristic, the Valid Range descriptor would have a Data Type of uint16 and units of seconds. If the valid range has a Minimum Value of 10 minutes (600 seconds) and a Maximum Value of 2 hours (7200 seconds), the value of the Valid Range descriptor would be expressed as 0x58 0x02 0x20 0x1C.

If a characteristic has a Data Type of uint4, a multiplier of 1 (i.e., M = 1, d = 0 and b = 0), and a Valid Range from 2 to 13, the value of the Valid Range descriptor would be expressed as 0x02 0x0D.

If a characteristic has a Data Type of sint16, a multiplier of 0.1 (i.e., M = 1, d = -1 and b = 0), and a Valid Range from -40 to +85, the value of the Valid Range descriptor would be expressed as 0x70 0xFE 0x52 0x03.

5 References

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