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HID SERVICE SPECIFICATION

Abstract:

This service exposes HID reports and other HID data intended for HID Hosts and HID Devices.

Revision History

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Document Terminology

The Bluetooth SIG has adopted Section 13.1 of the IEEE Standards Style Manual, which dictates use of the words ``shall'', ``should'', ``may'', and ``can'' in the development of documentation, as follows:

The word *shall* is used to indicate mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).

The use of the word *must* is deprecated and shall not be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

The use of the word *will* is deprecated and shall not be used when stating mandatory requirements; *will* is only used in statements of fact.

The word *should* is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain course of action is deprecated but not prohibited (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals is *permitted*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

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1 Introduction

The HID Service exposes data and associated formatting for HID Devices and HID Hosts.

1.1 Conformance

If conformance to this service is claimed, all capabilities indicated as mandatory for this Service shall be supported in the specified manner (process-mandatory). This also applies for all optional and conditional capabilities for which support is indicated. All mandatory capabilities, and optional and conditional capabilities for which support is indicated, are subject to verification as part of the *Bluetooth* qualification program.

1.2 Service Dependency

This service is not dependent upon any other services.

1.3 Bluetooth Specification Release Compatibility

This specification is compatible with any *Bluetooth* core specification [3] that includes the Generic Attribute Profile (GATT) specification and the *Bluetooth* Low Energy Controller specification.

1.4 GATT Sub-Procedure Requirements

Requirements in this section represent a minimum set of requirements for a HID Device (GATT Server). Other GATT sub-procedures may be used if supported by both Client and Server.

Table 1.1 below summarizes additional GATT sub-procedure requirements beyond those required by all GATT Servers.

GATT Sub-Procedure	Requirement
Read Long Characteristic Value	M
Write Without Response	M
Write Characteristic Value	M
Notifications	M
Read Characteristic Descriptors	M
Write Characteristic Descriptors	M

Table 1.1: GATT sub-procedure requirements

1.5 Transport Dependencies

This service shall operate over the LE transport only. For BR/EDR, the Bluetooth HID Profile [5] shall be used.

1.6 Error Codes

This service does not define any application error codes that are used in Attribute Protocol.

1.7 Byte Transmission Order

All characteristics used with this service shall be transmitted with the least significant octet first (i.e., little endian). The least significant octet is identified in the characteristic definitions in [4].

2 Service Requirements

2.1 Service Declaration

The service UUID shall be set to ‹‹HID Service››.

The UUID assigned to ‹‹HID Service›› is defined in [4].

2.2 Characteristic Overview

The HID Service is composed of the following characteristics used to provide access to HID data. Unless otherwise specified, only one instance of each characteristic is permitted within a HID Service.

Characteristic Name	Requirement	Mandatory Properties	Optional Properties	Security Permissions
Protocol Mode	C.4	Read / WriteWithoutResponse		None
Report	O			
Report: Input Report Type	C.1	Read/Notify	Write	None
Report: Output Report Type	C.1	Read/Write/Write Without Response		None
Report: Feature Report Type	C.1	Read/Write		None
Report Map	M	Read		None
Boot Keyboard Input Report	C.2	Read/Notify	Write	None
Boot Keyboard Output Report	C.2	Read/Write/Write Without Response		None
Boot Mouse Input Report	C.3	Read/Write		None
HID Information	M	Read		None
HID Control Point	M	WriteWithoutResponse		None
C.1: Mandatory to support at least one Report Type if the Report characteristic is supported C.2: Mandatory for HID Devices operating as keyboards, else excluded. C.3: Mandatory for HID Devices operating as mice, else excluded. C.4: Mandatory for HID Devices supporting Boot Protocol Mode, otherwise optional.				

Table 2.1: HID Service Characteristics

Notes:

- Security Permissions of “None” means that this service does not impose any requirements.
- Profiles utilizing this Service may impose security requirements beyond those defined in Table 2.1 for all characteristics defined in Table 2.1.
- Properties not listed as mandatory (M) or optional (O) are excluded.

2.3 Overview of mapping between USB HID and HID Service

This specification maps features from the USB HID Specification [2] onto GATT characteristics and characteristic descriptors, and the GATT sub-procedures used to access them. Figure 2.1 shows the main characteristics used to provide this mapping for HID Devices transferring data whilst operating in Report Protocol Mode (section 2.4.1.1):

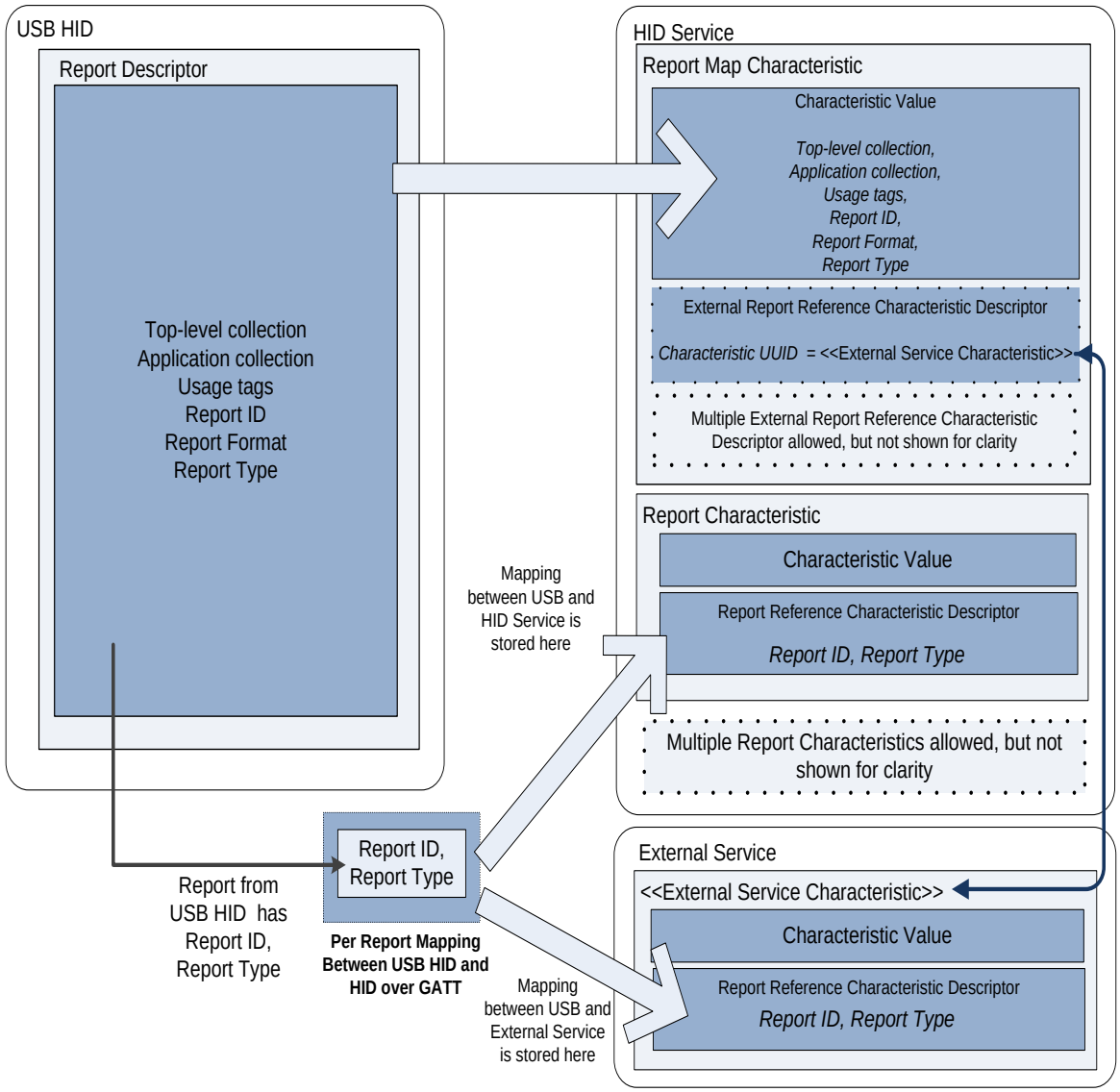

Figure 2.1: Mapping between USB HID features and HID Service characteristics: Report Protocol Mode

The “Report Descriptor” is defined in the USB HID Specification [2] and its contents map to the HID Service *Report Map* characteristic value (section 2.6). The *External Report Reference* characteristic descriptor (section 2.6.3.1) is used to provide further information to the HID Host for non-HID Service characteristics whose values are described in the *Report Map* characteristic value.

Data transfers are carried in “Reports” in USB HID; these “Reports” are differentiated by their Report ID and Report Type. The HID Service *Report* characteristic is used to transfer HID Service data. The *Report Reference* characteristic descriptor (section 2.5) is used to provide Report ID and Report Type.

There are three different types of data transfers (Report Types):

1. Input Reports (control data from HID Device to HID Host such as a keypress). Input Reports are normally sent from the HID Device to the HID Host, however there are occasions where a HID Host may set the value of an Input Report on a HID Device.
2. Output Reports (control data from HID Host to HID Device such as an ‘LED on’ signal). Output Reports are normally sent from the HID Host to the HID Device; however there are occasions where a HID Host may read the value of an Output Report back from the HID Device.
3. Feature Reports (configuration or application-specific data in either direction).

The USB HID Specification [2] also defines an operating mode for HID Devices, Boot Protocol Mode, with data transfers of fixed format and length. Since their format and lengths are fixed, they are not required to be included within the Report Descriptor hence they are not defined within the *Report Map* characteristic; separate characteristics are used for Boot Protocol Mode Report data.

Figure 2.2 shows the mapping between USB HID features and the main HID Service characteristics for HID Devices transferring data whilst operating in Boot Protocol Mode:

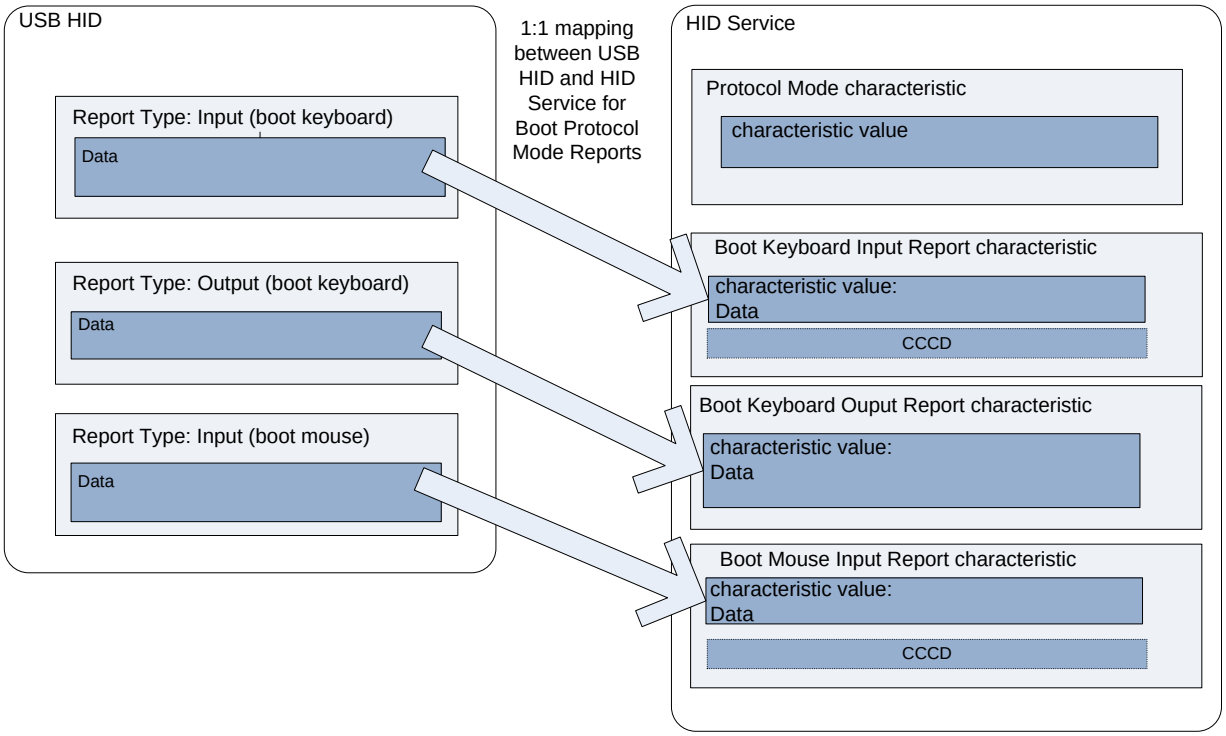

Figure 2.2: Mapping USB HID features and HID Service characteristics: Boot Protocol Mode.

2.4 Protocol Mode Characteristic

The *Protocol* Mode characteristic is used to expose the current protocol mode of the HID Service with which it is associated, or to set the desired protocol mode of the HID Service.

Only a single instance of this characteristic shall exist as part of the HID Service.

2.4.1 Protocol Mode Characteristic Behavior

The *Protocol Mode* characteristic contains the current protocol mode of the HID Service.

The *Protocol Mode* characteristic value can be read using either the GATT Read Characteristic Value or *Read Using Characteristic UUID* sub-procedures and is written using the GATT *Write Without Response* sub-procedure.

2.4.1.1 Protocol Mode Characteristic Value

The *Protocol Mode* characteristic value can have the values shown in Table 2.2 representing the current Protocol Mode of the HID Service.

Value	Protocol Mode	Comments
0x00	Boot Protocol Mode	A HID Service shall only enter Boot Protocol Mode after this value has been written.
0x01	Report Protocol Mode	Default Protocol Mode of all HID Devices.
0x02 – 0xFF	N/A	Reserved for Future Use.

Table 2.2: Protocol Mode characteristic value

The *Protocol Mode* characteristic value shall be reset to the default value following connection establishment.

A write to the *Protocol Mode* characteristic is analogous to sending the “Set Protocol” request defined in the USB HID Specification [2].

A read of the *Protocol Mode* characteristic is analogous to sending the “Get Protocol” request defined in the USB HID Specification [2].

2.5 Report Characteristic

Table 2.3 shows the *Report* characteristic declaration

Attribute Handle	Attribute Type	Attribute Value			Attribute Permissions
0xNNNN	0xuuuu – UUID for ‹‹Characteristic››	Characteristic Properties	Characteristic Value Attribute Handle	Characteristic UUID for ‹‹Report››	Read Only, No Authentication, No Authorization

Table 2.3: Report characteristic declaration

The characteristic properties of the *Report* characteristic are dependent on the Report Type the data contained in the characteristic value refers to, and are shown in Table 2.4:

Report Type	Requirement	Read	Write	Write Without Response	Notify
Input Report	C.1	M	O	X	M
Output Report	C.1	M	M	M	X
Feature Report	C.1	M	M	X	X
C.1: Mandatory to support at least one Report Type if the Report characteristic is supported.					

Table 2.4: Report characteristic properties

Requirements marked with ‘M’ are mandatory, ‘O’ are optional and ‘X’ are excluded (not permitted).

2.5.1 Report Characteristic Behavior

The *Report* characteristic is used to exchange data between a HID Device and a HID Host.

Note: The USB HID Specification [2] defines a Control endpoint and an Interrupt endpoint. Low-latency data transfers are carried via the Interrupt endpoint and less time-critical requests/responses are carried via the Control endpoint. A single fixed L2CAP channel exists for GATT, thus different GATT characteristic properties are used to map different functions, as shown in Table 2.5:

Report Type	Read	Write	Write Without Response	Notify
Input Report	Get_Report (Input) (§ 7.2.1 [2])	Set_Report (Output) (§ 7.2.2 [2])		Data Input (§ 4.4 [2])
Output Report	Get_Report (Output) (§ 7.2.1 [2])	Set_Report (Output) (§ 7.2.2 [2])	Data Output (§ 4.4 [2])	
Feature Report	Get_Report (Feature) (§ 7.2.1 [2])	Set_Report (Feature) (§ 7.2.2 [2])		

Table 2.5: Function mapping between USB HID and HID Service Report characteristic properties

The GATT *Read Characteristic Value* or *Read Long Characteristic Value* sub-procedures are used to read a Report characteristic containing Input Report data. This procedure maps to a Get_Report (Input) request in USB HID [2].

The GATT *Write Characteristic Value* sub-procedure is used to write to a *Report* characteristic containing Input Report data. This procedure maps to a Set_Report (Input) request in USB HID [2].

For all *Report* characteristics containing Input Report data, a *Client Characteristic Configuration* descriptor shall exist and, if the *Client Characteristic Configuration* descriptor is configured for notifications, the HID Device shall notify the HID Host when the characteristic value changes, using the GATT *Notification* sub-procedure. This procedure maps to Data Input in USB HID [2].

Note: Notification of characteristic values can contain at most [ATT_MTU-3] bytes of data by definition (see [3], Volume 3, Part F, Section 3.4.7.1). Data beyond [ATT_MTU-3] bytes long is not included in a notification, and must instead be read using the GATT *Read Long Characteristic Value* sub-procedure. The possibility that data to be notified in a Report characteristic value could change before the HID Host completed an outstanding *Read Long Characteristic Value* sub-procedure, and therefore be lost, exists. For this reason it is strongly recommended that HID Devices support an ATT_MTU large enough to transfer their largest possible *Report* characteristic value in a single transaction.

No *Client Characteristic Configuration* descriptor shall exist for a *Report* characteristic containing Output Report data or Feature Report data.

The GATT *Read Characteristic Value* or *Read Long Characteristic Value* sub-procedures are used to read a Report characteristic containing Output Report data. This procedure maps to a Get_Report (Output) request in USB HID [2].

The GATT *Write Characteristic Value* sub-procedure is used to write to a *Report* characteristic containing Output Report data. This procedure maps to a Set_Report (Output) request in USB HID [2]. The GATT *Write Without Response* sub-procedure is also used to write to a Report characteristic containing Output Report data, and this procedure maps to Data Output in USB HID [2].

The GATT *Read Characteristic Value* or *Read Long Characteristic Value* sub-procedures are used to read a Report characteristic containing Feature Report data. This procedure maps to a Get_Report (Feature) request in USB HID [2].

The GATT *Write Characteristic Value* sub-procedure is used to write to a Report characteristic containing Feature Report data. This procedure maps to a Set_Report (Feature) request in USB HID [2].

2.5.2 Report Characteristic Value

The *Report* characteristic value contains Input Report, Output Report, or Feature Report data to be transferred between the HID Device and HID Host.

2.5.3 Report Characteristic Descriptors

2.5.3.1 Client Characteristic Configuration Descriptor

A *Client Characteristic Configuration* descriptor shall be included in each Report characteristic definition where the data contained in the *Report* characteristic value refers to an Input Report.

2.5.3.2 Report Reference Characteristic Descriptor

The *Report Reference* characteristic descriptor is used to provide the Report ID and Report Type for the *Report* characteristic value.

Table 2.6 shows the declaration of the *Report Reference* characteristic descriptor.

Attribute Handle	Attribute Type	Attribute Value	Attribute Permissions
0xNNNN	0xuuuu – 16 bit *Bluetooth* UUID for ‹‹Report Reference››	Report Reference	Read only, No Authentication, No Authorization

Table 2.6: Report Reference characteristic descriptor declaration

Table 2.7 shows the definition of the *Report Reference* characteristic descriptor Attribute Value field:

Name	Size	Value
Report ID	1 octet	0x00 – 0xFF
Report Type	1 octet	0x00: Reserved. Shall not be used 0x01: Input Report 0x02: Output Report 0x03: Feature Report 0x040xFF: Reserved for Future Use.

Table 2.7: Report Reference attributes value

The *Report Type* shall be set to indicate the type of *Report* characteristic value and set to the appropriate value defined in Table 2.7 for Input, Output, or Feature Report.

Report ID shall be nonzero in a *Report Reference* characteristic descriptor where there is more than one instance of the *Report* characteristic for any given Report Type.

HID Devices shall have a *Report Reference* characteristic descriptor in each *Report* characteristic definition for Report Protocol Mode.

2.6 Report Map Characteristic

The *Report Map* characteristic is used to define formatting information for Input Report, Output Report, and Feature Report data transferred between a HID Device and HID Host. It also contains information on how this data can be used regarding physical aspects of the device (i.e., that the device functions as a keyboard, for example, or has multiple functions such as a keyboard and volume controls).

Only a single instance of this characteristic shall exist as part of a HID Service.

2.6.1 Report Map Characteristic Behavior

The GATT *Read Characteristic Value* or *Read Long Characteristic Values* sub-procedures are used to read the *Report Map* characteristic value.

The length of the *Report Map* characteristic value is limited to 512 octets.

2.6.2 Report Map Characteristic Value

Per section 2.3, the *Report Map* characteristic value contains formatting and other information for Input Report, Output Report and Feature Report data transferred between a HID Device and HID Host.

2.6.3 Report Map Characteristic Descriptors

2.6.3.1 External Report Reference Characteristic Descriptor

The *External Report Reference* characteristic descriptor allows a HID Host to map information from the *Report Map* characteristic value for Input Report, Output Report or Feature Report data to the Characteristic UUID of external service characteristics used to transfer the associated data.

Table 2.8 shows the declaration of the *External Report Reference* characteristic descriptor.

Attribute Handle	Attribute Type	Attribute Value	Attribute Permissions
0xNNNN	0xuuuu – 16 bit *Bluetooth* UUID for ‹‹External Report Reference››	External Report Reference	Read only, No Authentication, No Authorization

Table 2.8: External Report Reference characteristic descriptor declaration

Table 2.9 shows the definition of the *External Report Reference* characteristic descriptor *Attribute Value* field:

Field	Size	Value
Characteristic UUID	2 octets	Characteristic UUID for externally referenced characteristic

Table 2.9: External Report Reference characteristic attribute value

The *Characteristic UUID* field is used to identify characteristics within external services that the HID Device uses to send the data to the HID host.

2.7 Boot Keyboard Input Report Characteristic

Note: A HID Device operating in Boot Protocol Mode as a keyboard is referred to as a “boot keyboard.”

Table 2.10 shows the *Boot Keyboard Input Report* characteristic declaration.

Attribute Handle	Attribute Type	Attribute Value			Attribute Permissions
0xNNNN	0xuuuu – UUID for ‹‹Characteristic››	Characteristic Properties	Characteristic Value Attribute Handle	Characteristic UUID for ‹‹Boot Keyboard Input Report››	Read Only, No Authentication, No Authorization

Table 2.10: Boot Keyboard Input Report characteristic declaration

The *Input Boot Keyboard Report* characteristic is used to transfer fixed format and length Input Report data between a HID Host operating in Boot Protocol Mode and a HID Service corresponding to a boot keyboard.

Table 2.11 shows the characteristic properties of the Boot Keyboard Input Report characteristic.

Report Type	Read	Write	Write Without Response	Notify
Input Report	M	O	X	M

Table 2.11: Boot Keyboard Input Report characteristic properties

A single instance of this characteristic shall exist within a HID Service for a boot keyboard.

2.7.1 Boot Keyboard Input Report Characteristic Behavior

The *Boot Keyboard Input Report* characteristic value can be read using the GATT *Read using Characteristic UUID* or *Read Characteristic Value* sub-procedures, written using the GATT *Write Characteristic Value* sub-procedure, and notified using the GATT *Notification* sub-procedure.

2.7.2 Boot Keyboard Input Report Characteristic Value

The *Boot Keyboard Input Report* characteristic value is an array of octets whose meaning is defined in the USB HID Usage Tables [1].

2.7.3 Boot Keyboard Input Report Characteristic Descriptors

2.7.3.1 Client Characteristic Configuration Descriptor

A *Client Characteristic Configuration* descriptor shall exist for the Boot Keyboard Input *Report* characteristic and, if configured for notifications, the *Boot Keyboard Input Report* characteristic value shall send notifications to the HID Host when the characteristic value changes.

2.8 Boot Keyboard Output Report Characteristic

Note: A HID Device operating in Boot Protocol Mode as a keyboard is referred to as a “boot keyboard.”

Table 2.12 shows the *Boot Keyboard Output Report* characteristic declaration.

Attribute Handle	Attribute Type	Attribute Value			Attribute Permissions
0xNNNN	0xuuuu – UUID for ‹‹Characteristic››	Characteristic Properties	Characteristic Value Attribute Handle	Characteristic UUID for ‹‹Boot Keyboard Output Report››	Read Only, No Authentication, No Authorization

Table 2.12: Boot Keyboard Output Report characteristic declaration

The *Boot Keyboard Output Report* characteristic is used to transfer fixed format and length Output Report data between a HID Host operating in Boot Protocol Mode and a HID Service corresponding to a boot keyboard.

Table 2.13 shows the characteristic properties of the *Boot Keyboard Output Report* characteristic.

Report Type	Read	Write	Write Without Response	Notify
OutputReport	M	M	M	X

Table 2.13: Boot Keyboard Output Report characteristic properties

A single instance of this characteristic shall exist within a HID Service definition for a boot keyboard.

2.8.1 Boot Keyboard Output Report Characteristic Behavior

The *Boot Keyboard Output Report* characteristic value can be written using the GATT *Write Characteristic Value* or *Write Without Response* sub-procedures and read using either the GATT *Read using Characteristic UUID* or *GATT Read Characteristic Value* sub-procedures.

2.8.2 Boot Keyboard Output Report Characteristic Value

The *Boot Keyboard Output Report* characteristic value is an array of octets whose meaning is defined in the USB HID Usage Tables [1].

2.9 Boot Mouse Input Report Characteristic

Note: A HID Device operating in Boot Protocol Mode as a mouse is referred to as a “boot mouse.”

Table 2.14 shows the Boot Mouse Input Report characteristic declaration.

Attribute Handle	Attribute Type	Attribute Value			Attribute Permissions
0xNNNN	0xuuuu – UUID for ‹‹Characteristic››	Characteristic Properties	Characteristic Value Attribute Handle	Characteristic UUID for ‹‹Boot Mouse Input Report››	Read Only, No Authentication, No Authorization

Table 2.14: Boot Mouse Input Report characteristic declaration

The *Boot Mouse Input Report* characteristic is used to transfer fixed format and length Input Report data between a HID Host operating in Boot Protocol Mode and a HID Service corresponding to a boot mouse.

Table 2.15 shows the characteristic properties of the *Boot Mouse Input Report* characteristic.

Report Type	Read	Write	Write Without Response	Notify
Input Report	M	O	X	M

Table 2.15: Boot Mouse Input Report Characteristic properties

A single instance of this characteristic shall exist within a HID Service definition for a boot mouse.

2.9.1 Boot Mouse Input Report Characteristic Behavior

The *Boot Mouse Input Report* characteristic value can be read using the GATT *Read using Characteristic UUID* or *Read Characteristic Value* sub-procedures, written using the GATT *Write Characteristic Value* sub-procedure, and notified using the GATT *Notification* sub-procedure.

2.9.2 Boot Mouse Input Report Characteristic Value

The *Boot Mouse Input Report* characteristic value is an array of octets whose meaning is defined in the USB HID Usage Tables [1].

2.9.3 Boot Keyboard Input Report Characteristic Descriptors

2.9.3.1 Client Characteristic Configuration Descriptor

A *Client Characteristic Configuration* descriptor shall exist for the *Boot Mouse Input Report* characteristic and, if configured for notifications, the *Boot Mouse Input Report* characteristic value shall send notifications to the HID Host when the characteristic value changes.

2.10 HID Information Characteristic

The *HID Information* characteristic is used to hold a set of values known as the HID Device's HID Attributes.

Only a single instance of this characteristic shall exist as part of the HID Service.

2.10.1 HID Information Characteristic Behavior

The GATT *Read Characteristic Value* sub-procedure is used to read the HID Information characteristic value from the HID Device.

2.10.2 HID Information Characteristic Value

The *HID Information* characteristic value contains a set of values which correspond to the HID Device's HID Attributes. The *HID Information* characteristic value is static and may be cached for the lifetime of a bond between the HID Device and the HID Host.

Table 2.16 shows the layout of the *HID Information* characteristic value field.

HID Attribute	Size	Description	Reference
bcdHID	2 octets	16-bit unsigned integer representing version number of base USB HID Specification implemented by HID Device	§ 6.1.1 [2]
bCountryCode	1 octet	8-bit integer identifying country HID Device hardware is localized for. Most hardware is not localized (value 0x00)	§ 6.2.1 [2]
Flags	1 octet	Bit 0: RemoteWake - Boolean value indicating whether HID Device is capable of sending a wake-signal to a HID Host. 0bXXXXXXX0 = FALSE 0bXXXXXXX1 = TRUE	§ 7.11.10 [5]
		Bit 1: NormallyConnectable - Boolean value indicating whether HID Device will be advertising when bonded but not connected. 0bXXXXXX0X = FALSE 0xXXXXXX1X = TRUE	§ 7.11.14 [5]

Table 2.16: HID Information characteristic value field

2.11 HID Control Point Characteristic

The *HID Control Point* characteristic is a control-point attribute that defines the following HID Commands when written:

- Suspend (§7.4.2, *Bluetooth* HID Profile Specification [5])
- Exit Suspend (§7.4.2, *Bluetooth* HID Profile Specification [5])

Only a single instance of this characteristic shall exist as part of the HID Service.

2.11.1 HID Control Point Characteristic Behavior

The GATT *Write Without Response* sub-procedure is used to write to the *HID Control Point* characteristic.

2.11.2 HID Control Point Characteristic Value

The *HID Control Point* characteristic value contains an enumeration of values as shown in Table 2.17.

Value	Command	Description
0x00	Suspend	Informs HID Device that HID Host is entering the Suspend State as defined in (§7.4.2, *Bluetooth* HID Profile Specification [5])
0x01	Exit Suspend	Informs HID Device that HID Host is exiting the Suspend State as defined in (§7.4.2, *Bluetooth* HID Profile Specification [5])
0x02 – 0xFF	N/A	Reserved for Future Use.

Table 2.17: HID Information characteristic value field

There are no response codes defined for the Suspend and Exit Suspend commands.

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5 Acronyms and Abbreviations

Acronyms and Abbreviations	Meaning
BR/EDR	Basic Rate / Enhanced Data Rate
GAP	Generic Access Profile
GATT	Generic Attribute Profile
HID	Human Interface Device
LE	Low Energy
UUID	Universally Unique Identifier
USB	Universal Serial Bus

Table 5.1: Acronyms and Abbreviations

6 References

[1] USB HID Usage Tables, Version 1.12 (www.usb.org)
[2] USB Device Class Definition for Human Interface Devices (USB HID Specification), Version 1.11 (www.usb.org)
[3] *Bluetooth* Core Specification version 4.0 or later
[4] Characteristic and Descriptor descriptions are accessible via the Bluetooth SIG Assigned Numbers.
[5] *Bluetooth* HID Profile Specification 1.0

7 Appendix A: Example GATT Database

Table 7.1 shows a sample GATT database.

Attribute Handle	Attribute Type	Type Note	Attribute Value
0x0100	«Primary Service»	Declaration	«HID Service»
0x0101	«Include»	Declaration	“Battery Service”
0x0102	«Characteristic»	Declaration	r, «HID Information»
0x0103	«HID Information»	Value	(HID Attributes)
~~0x0104~~	~~«Characteristic»~~	~~Declaration~~	~~rwn, «Boot Keyboard Input Report»~~
~~0x0105~~	~~«Boot Keyboard Input Report»~~	~~Value~~	~~(boot keyboard input values)~~
~~0x0106~~	~~«Client Characteristic Configuration Descriptor»~~	~~Descriptor~~	~~0x0000~~
~~0x0107~~	~~«Characteristic»~~	~~Declaration~~	~~rwwrw, «Boot Keyboard Output Report»~~
~~0x0108~~	~~«Boot Keyboard Output Report»~~	Value	(boot keyboard output values)
0x0109	«Characteristic»	Declaration	r, «Report Map»
0x010A	«Report Map»	Value	HID Report Descriptor for this Device
0x010B	«External Report Reference»	Descriptor	r, «Battery Level»
0x0120	«Characteristic»	Declaration	rwn, 0x0121, «Report»
0x0121	«Report»	Value	(report protocol keyboard)
0x0122	«Client Characteristic Configuration Descriptor»	Descriptor	0x0000
0x0123	«Report Reference»	Descriptor	0x02, Input
0x0128	«Characteristic»	Declaration	rwwrw 0x0129, «Report»
0x0129	«Report»	Value	Keyboard LED bitmap
0x0130	«Report Reference»	Descriptor	0x01, Output
0x0131	«Characteristic»	Declaration	rw, 0x0132, «Report»
0x0132	«Report»	Value	(data)
0x0133	«Report Reference»	Descriptor	0x01, Feature
0x0134	«Characteristic»	Declaration	wwr, 0x0135, «HID Control Point»
0x0135	«HID Control Point»	Value	(mode)
0x0138	«Characteristic»	Declaration	rwwr, «Protocol Mode»
0x0139	«Protocol Mode»	Value	(current protocol mode)
0x0140	«Primary Service»	Declaration	«Battery Service»
0x0141	«Characteristic»	Declaration	rn, 0x0142, «Battery Level»
0x0142	«Battery Level»	Value	(level)
0x0143	«Report Reference»	Descriptor	0x03, Input

Table 7.1: A GATT database