

HID Service (HIDS)

Bluetooth® Test Suite

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Contents

1	Scope	5
2	References, definitions, and abbreviations	6
2.1	References	6
2.2	Definitions	6
2.3	Acronyms and abbreviations	6
3	Test Suite Structure (TSS)	7
3.1	Overview	7
3.2	Test Strategy	7
3.3	Test groups	8
3.3.1	Service Definition	8
3.3.2	Characteristic Declaration	8
3.3.3	Characteristic Descriptors	8
3.3.4	Characteristic Read	8
3.3.5	Long Characteristic Read	8
3.3.6	Characteristic Write	8
3.3.7	Configure Notification	8
3.3.8	Characteristic Notification	8
3.3.9	Descriptor Read	8
3.3.10	Descriptor Write	9
3.3.11	Service Procedures	9
4	Test cases (TC)	10
4.1	Introduction	10
4.1.1	Test case identification conventions	10
4.1.2	Conformance	10
4.1.3	Pass/Fail verdict conventions	11
4.2	Setup preambles	11
4.2.1	ATT Bearer on LE Transport	11
4.3	Service Definition	11
	HIDS/HD/SD/BV-01-C [Service Definition]	11
4.4	Characteristic Declaration	12
	HIDS/HD/DEC/BV-01-C [Characteristic Declaration – Report Map Characteristic]	12
	HIDS/HD/DEC/BV-02-C [Characteristic Declaration – Report Characteristic]	12
	HIDS/HD/DEC/BV-03-C [Characteristic Declaration – HID Control Point Characteristic]	12
	HIDS/HD/DEC/BV-04-C [Characteristic Declaration – HID Information Characteristic]	12
	HIDS/HD/DEC/BV-05-C [Characteristic Declaration – Protocol Mode Characteristic]	12
	HIDS/HD/DEC/BV-06-C [Characteristic Declaration – Boot Keyboard Input Report]	12
	HIDS/HD/DEC/BV-07-C [Characteristic Declaration – Boot Keyboard Output Report]	12
	HIDS/HD/DEC/BV-08-C [Characteristic Declaration – Boot Mouse Input Report]	12
4.5	Characteristic Descriptors	13
	HIDS/HD/DES/BV-01-C [Client Characteristic Configuration Descriptor of Report Characteristic]	13
	HIDS/HD/DES/BV-02-C [Report Reference Characteristic Descriptor]	13
	HIDS/HD/DES/BV-03-C [External Report Reference Characteristic Descriptor]	13
	HIDS/HD/DES/BV-04-C [Client Characteristic Configuration Descriptor of Boot Keyboard Input Report Characteristic]	13
	HIDS/HD/DES/BV-05-C [Client Characteristic Configuration Descriptor of Boot Mouse Input Report Characteristic]	13
4.6	Characteristic Read	14
	HIDS/HD/CR/BV-01-C [Characteristic Read – Report Characteristic (Feature)]	14



HIDS/HD/CR/BV-02-C [Characteristic Read – Report Characteristic (Input)]	14
HIDS/HD/CR/BV-03-C [Characteristic Read – HID Information]	14
HIDS/HD/CR/BV-04-C [Characteristic Read – Protocol Mode]	14
HIDS/HD/CR/BV-05-C [Characteristic Read – Report Map]	14
HIDS/HD/CR/BV-06-C [Characteristic Read – Boot Keyboard Input Report Characteristic]	14
HIDS/HD/CR/BV-07-C [Characteristic Read – Boot Keyboard Output Report Characteristic]	14
HIDS/HD/CR/BV-08-C [Characteristic Read – Boot Mouse Input Report Characteristic]	14
4.7 Long Characteristic Read	15
HIDS/HD/LCR/BV-01-C [Characteristic Read – Report Map Characteristic]	16
HIDS/HD/LCR/BV-02-C [Characteristic Read – Report Characteristic (Input)]	16
HIDS/HD/LCR/BV-03-C [Characteristic Read – Report Characteristic (Output)]	16
HIDS/HD/LCR/BV-04-C [Characteristic Read – Report Characteristic (Feature)]	16
4.8 Characteristic Notification	16
HIDS/HD/CN/BV-01-C [Characteristic Notification Report (Input)]	17
HIDS/HD/CN/BV-02-C [Characteristic Notification – Boot Keyboard Input Report Characteristic]	17
HIDS/HD/CN/BV-03-C [Characteristic Notification – Boot Mouse Input Report Characteristic]	17
4.9 Characteristic Write	17
HIDS/HD/CW/BV-01-C [Characteristic Write – Report (Input)]	18
HIDS/HD/CW/BV-02-C [Characteristic Write – Report (Output)]	18
HIDS/HD/CW/BV-03-C [Characteristic Write – Report (Feature)]	18
HIDS/HD/CW/BV-04-C [Characteristic Write – Boot Keyboard Input Report Characteristic]	18
HIDS/HD/CW/BV-05-C [Characteristic Write – Boot Keyboard Output Report Characteristic]	18
HIDS/HD/CW/BV-06-C [Characteristic Write – Boot Mouse Input Report Characteristic]	18
4.10 Characteristic Write Without Response	19
HIDS/HD/CW/BV-07-C [Characteristic Write – Report (Output)]	19
HIDS/HD/CW/BV-08-C [Characteristic Write – Protocol Mode (Boot Mode)]	19
HIDS/HD/CW/BV-09-C [Characteristic Write – Protocol Mode (Report Mode)]	19
HIDS/HD/CW/BV-10-C [Characteristic Write – HID Control Point (Suspend)]	19
HIDS/HD/CW/BV-11-C [Characteristic Write – HID Control Point (Exit Suspend)]	19
HIDS/HD/CW/BV-12-C [Characteristic Write – Boot Keyboard Output Report Characteristic]	19
4.11 Descriptors Read	20
HIDS/HD/DR/BV-01-C [Client Characteristic Configuration Descriptor of Report Characteristic]	20
HIDS/HD/DR/BV-02-C [Report Reference Characteristic Descriptor]	20
HIDS/HD/DR/BV-03-C [External Report Reference Characteristic Descriptor]	20
HIDS/HD/DR/BV-04-C [Client Characteristic Configuration Descriptor of Boot Keyboard Input Report Characteristic]	20
HIDS/HD/DR/BV-05-C [Client Characteristic Configuration Descriptor of Boot Mouse Input Report Characteristic]	20
4.12 Descriptors Write	21
HIDS/HD/DW/BV-01-C [Client Characteristic Configuration Descriptor of Report Characteristic]	21
HIDS/HD/DW/BV-02-C [Client Characteristic Configuration Descriptor of Boot Keyboard Input Report Characteristic]	21
HIDS/HD/DW/BV-03-C [Client Characteristic Configuration Descriptor of Boot Mouse Input Report Characteristic]	21
4.13 Service Procedures	22
HIDS/HD/SP/BV-01-C [Notification Behavior of Multiple Input Reports]	22
5 Test case mapping	24
6 Revision history and acknowledgments	26



1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and test cases to test the implementation of the Bluetooth HID Service Specification with the objective to provide a high probability of air interface interoperability between the tested implementation and other manufacturers' Bluetooth devices.

2 References, definitions, and abbreviations

2.1 References

This document incorporates provisions from other publications by dated or undated reference. These references are cited at the appropriate places in the text, and the publications are listed hereafter.

- [1] Test Strategy and Terminology Overview
- [2] Specification of the Bluetooth System, Version 4.0 or later
- [3] HID Service Specification, Version 1.0
- [4] ICS Proforma for HID Service 1.0
- [5] GATT Test Suite, GATT.TS
- [6] GAP Test Suite, GAP.TS
- [7] Characteristic and Descriptor descriptions are accessible via the [Bluetooth SIG GATT characteristic web pages](#).

2.2 Definitions

In this Bluetooth document, the definitions in [1] and [2] apply.

2.3 Acronyms and abbreviations

In this Bluetooth document, the definitions, acronyms, and abbreviations in [1] and [2] apply.

3 Test Suite Structure (TSS)

3.1 Overview

The HID Service requires the presence of GAP, SM, and GATT. This is illustrated in [Figure 3.1](#).

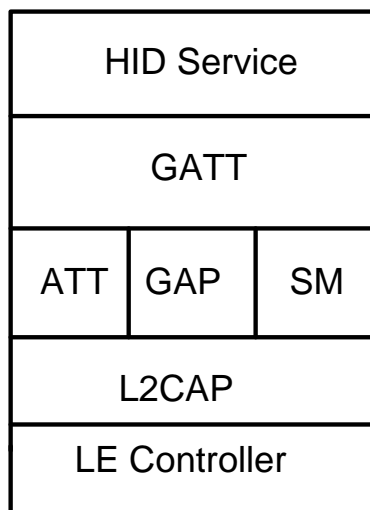


Figure 3.1: HID Service test model

3.2 Test Strategy

The test objectives are to verify functionality of the HID Service within a Bluetooth Host and enable interoperability between Bluetooth Hosts on different devices. The testing approach covers mandatory and optional requirements in the specification and matches these to the support of the IUT as described in the ICS. Any defined test herein is applicable to the IUT if the ICS logical expression defined in the Test Case Mapping Table (TCMT) evaluates to true.

The test equipment provides an implementation of the Radio Controller and the parts of the Host needed to perform the test cases defined in this Test Suite. A Lower Tester acts as the IUT's peer device and interacts with the IUT over-the-air interface. The configuration, including the IUT, needs to implement similar capabilities to communicate with the test equipment. For some test cases, it is necessary to stimulate the IUT from an Upper Tester. In practice, this could be implemented as a special test interface, a Man Machine Interface (MMI), or another interface supported by the IUT.

This Test Suite contains Valid Behavior (BV) tests complemented with Invalid Behavior (BI) tests where required. The test coverage mirrored in the Test Suite Structure is the result of a process that started with catalogued specification requirements that were logically grouped and assessed for testability enabling coverage in defined test purposes.

The Test Suite Structure is a tree with the first level representing the protocol groups.

- Service definition
- Characteristic declaration
- Characteristic descriptors
- Characteristic read
- Long Characteristic Read

- Characteristic write
- Configure notification
- Characteristic notification
- Descriptors Read
- Descriptors Write
- Service procedures

The interface between the IUT and the Upper Tester may be:

- A man-machine interface
- Provided by the IUT manufacturer

3.3 Test groups

The following test groups have been defined.

3.3.1 Service Definition

Verify the existence of defined service.

3.3.2 Characteristic Declaration

Verify the presence and contents of characteristic declarations.

3.3.3 Characteristic Descriptors

Verify the presence and contents of characteristic descriptors.

3.3.4 Characteristic Read

Verify that characteristics that support reading can be read. Verify the formatting and value of characteristic values.

3.3.5 Long Characteristic Read

Verify that characteristics that support long characteristic reading can be read. Verify the formatting and value of characteristic values.

3.3.6 Characteristic Write

Verify that characteristics which support writing can be written.

3.3.7 Configure Notification

Verify that characteristics can be configured for notification.

3.3.8 Characteristic Notification

Verify that characteristics which support notification can be notified.

3.3.9 Descriptor Read

Verify that values descriptors can be read.



3.3.10 Descriptor Write

Verify that descriptors values can be written.

3.3.11 Service Procedures

Verify the operation of additional procedures defined in the Service specification.

4 Test cases (TC)

4.1 Introduction

4.1.1 Test case identification conventions

Test cases are assigned unique identifiers per the conventions in [1]. The convention used here is:

<spec abbreviation>/<IUT role>/<class>/<feat>/<func>/<subfunc>/<cap>/<xx>-<nn>-<y>.

Identifier Abbreviation	Spec Identifier <spec abbreviation>
HIDS	HID Service
Identifier Abbreviation	Role Identifier <IUT role>
HD	HID Device role
Identifier Abbreviation	Feature Identifier <feat>
CN	Characteristic Notification
CR	Characteristic Read
CW	Characteristic Write
DEC	Characteristic Declaration
DES	Characteristic Descriptors
DR	Descriptors Read
DW	Descriptors Write
LCR	Long Characteristic Read
SD	Service Definition
SP	Service Procedures

Table 4.1: HID Service TC feature naming conventions

4.1.2 Conformance

When conformance is claimed for a particular specification, all capabilities are to be supported in the specified manner. The mandated tests from this Test Suite depend on the capabilities to which conformance is claimed.

The Bluetooth Qualification Program may employ tests to verify implementation robustness. The level of implementation robustness that is verified varies from one specification to another and may be revised for cause based on interoperability issues found in the market.

Such tests may verify:

- That claimed capabilities may be used in any order and any number of repetitions not excluded by the specification
- That capabilities enabled by the implementations are sustained over durations expected by the use case
- That the implementation gracefully handles any quantity of data expected by the use case
- That in cases where more than one valid interpretation of the specification exists, the implementation complies with at least one interpretation and gracefully handles other interpretations
- That the implementation is immune to attempted security exploits

A single execution of each of the required tests is required to constitute a Pass verdict. However, it is noted that to provide a foundation for interoperability, it is necessary that a qualified implementation consistently and repeatedly pass any of the applicable tests.

In any case, where a member finds an issue with the test plan generated by Launch Studio, with the test case as described in the Test Suite, or with the test system utilized, the member is required to notify the responsible party via an erratum request such that the issue may be addressed.

4.1.3 Pass/Fail verdict conventions

Each test case has an Expected Outcome section. The IUT is granted the Pass verdict when all the detailed pass criteria conditions within the Expected Outcome section are met.

The convention in this Test Suite is that, unless there is a specific set of fail conditions outlined in the test case, the IUT fails the test case as soon as one of the pass criteria conditions cannot be met. If this occurs, the outcome of the test is a Fail verdict.

4.2 Setup preambles

The procedures defined in this section are provided for information, as they are used by test equipment in achieving the initial conditions in certain tests.

4.2.1 ATT Bearer on LE Transport

Follow the preamble procedure described in [5] Section 4.2.1.2.

4.3 Service Definition

Verify the service definition.

HIDS/HD/SD/BV-01-C [Service Definition]

- Test Purpose

Verify that the IUT has one or more instantiations of the HID service as a primary service.
- Reference

[3] 2.1
- Initial Condition
 - Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1.
- Test Procedure
 1. Discover primary service-by-service UUID by executing the test procedure of GATT test case GATT/SR/GAD/BV-01-C [Discover All Primary Services] or GATT/SR/GAD/BV-02-C [Discover Primary Services by Service UUID - from server] in [5] with the service UUID set to "HID Service".
 2. Verify that at least one attribute handle range is returned, containing the starting handle and the ending handle of each HID service definition.
- Expected Outcome

Pass verdict

At least one attribute handle range is returned, containing the starting handle and the ending handle of each HID service definition.

4.4 Characteristic Declaration

- Test Purpose

This test group contains test cases to verify that the characteristic properties bit field of the *Attribute Value* field of the characteristic declaration meets the requirements of the service. The verification is performed one property at a time, as enumerated in the test cases in [Table 4.2](#), using this generic test procedure.

- Reference

[\[3\]](#) 2.2

- Initial Condition

- The handle range of each instance of the HID service has been previously discovered by the Lower Tester in test case [HIDS/HD/SD/BV-01-C \[Service Definition\]](#).
- Establish an ATT Bearer connection between the Lower Tester and IUT as described in [Section 4.2.1](#).

- Test Case Configuration

Test Case	Requirements
HIDS/HD/DEC/BV-01-C [Characteristic Declaration – Report Map Characteristic]	[3] Table 2-1, 2.5.1 [7] Human Interface Device service
HIDS/HD/DEC/BV-02-C [Characteristic Declaration – Report Characteristic]	[3] Table 2-1, 2.6.1 [7] Human Interface Device service
HIDS/HD/DEC/BV-03-C [Characteristic Declaration – HID Control Point Characteristic]	[3] Table 2-1, 2.8.1 [7] Human Interface Device service
HIDS/HD/DEC/BV-04-C [Characteristic Declaration – HID Information Characteristic]	[3] Table 2-1, 2.7.1 [7] Human Interface Device service
HIDS/HD/DEC/BV-05-C [Characteristic Declaration – Protocol Mode Characteristic]	[3] Table 2-1, 2.3.1 [7] Human Interface Device service
HIDS/HD/DEC/BV-06-C [Characteristic Declaration – Boot Keyboard Input Report]	[3] Table 2-1, 2.7.1 [7] Human Interface Device service
HIDS/HD/DEC/BV-07-C [Characteristic Declaration – Boot Keyboard Output Report]	[3] Table 2-1, 2.8.1 [7] Human Interface Device service
HIDS/HD/DEC/BV-08-C [Characteristic Declaration – Boot Mouse Input Report]	[3] Table 2-1, 2.9.1 [7] Human Interface Device service

Table 4.2: Characteristic Declaration test cases

- Test Procedure

The following test procedure applies to the test cases listed in [Table 4.2](#):

1. Discover all characteristics of the service by executing the test procedure of GATT test case [GATT/SR/GAD/BV-04-C \[Discover All Characteristics of a Service - from server\]](#) or [GATT/SR/GAD/BV-05-C \[Discover Characteristics by UUID - from server\]](#) referred in [\[5\]](#).
2. For a discovered characteristic that is listed in [Table 4.2](#), verify that the characteristic properties bit field of the Attribute Value field of the characteristic declaration meets the requirements of the service.
3. Repeat steps 1–2 for each instance of the service.

- Expected Outcome

The following pass and fail verdicts apply to the test cases listed in [Table 4.2](#):

Pass verdict

The characteristic is discovered and the characteristic properties bit field of the *Attribute Value* field of the characteristic declaration meets the requirements of the service.

4.5 Characteristic Descriptors

- Test Purpose

This test group contains test cases to verify that the characteristic descriptors meet the requirements of the service. The verification is done one descriptor at a time, as enumerated in the test cases in [Table 4.3](#).

- Reference

[3] 2.5.3, 2.6.3, 2.7.3, 2.9.3

- Initial Condition

- The handle range of each characteristic referenced in the test cases that follow has been previously discovered by the Lower Tester during the test procedure in [Section 4.4](#) or is known to the Lower Tester by other means.
- Establish an ATT Bearer connection between the Lower Tester and IUT as described in [Section 4.2.1](#).

- Test Case Configuration

Test Case	Requirements
HIDS/HD/DES/BV-01-C [Client Characteristic Configuration Descriptor of Report Characteristic]	[3] 2.5.3.1 [7] Human Interface Device service
HIDS/HD/DES/BV-02-C [Report Reference Characteristic Descriptor]	[3] 2.5.3.2 [7] Human Interface Device service
HIDS/HD/DES/BV-03-C [External Report Reference Characteristic Descriptor]	[3] 2.6.3.1 [7] Human Interface Device service
HIDS/HD/DES/BV-04-C [Client Characteristic Configuration Descriptor of Boot Keyboard Input Report Characteristic]	[3] 2.7.3.1 [7] Human Interface Device service
HIDS/HD/DES/BV-05-C [Client Characteristic Configuration Descriptor of Boot Mouse Input Report Characteristic]	[3] 2.9.3.1 [7] Human Interface Device service

Table 4.3: Characteristic Descriptor test cases

- Test Procedure

The following test procedure applies to the test cases listed in [Table 4.3](#):

- Discover all characteristic descriptors of the characteristic by executing the test procedure of GATT test case [GATT/SR/GAD/BV-06-C \[Discover All Characteristic Descriptors - from server\]](#) in [5] using the handle range of the characteristic. The IUT returns one or more handle-UUID pairs.
- Verify that the value of the characteristic descriptor meets the requirements of the service.
- Repeat steps 1–2 for each handle-UUID pair.
- Repeat steps 1–3 for each instance of the characteristic and service.



- Expected Outcome

The following pass and fail verdicts apply to the test cases listed in [Table 4.3](#):

Pass verdict

The characteristic descriptor is discovered, the characteristic descriptor is read, and the value of the characteristic descriptor meets the requirements of the service.

4.6 Characteristic Read

- Test Purpose

This test group contains test cases to read and verify that the characteristic values required by the service are compliant with the specification. The verification is done one value at a time, as enumerated in the test cases in [Table 4.4](#), using this generic test procedure.

- Reference

[\[3\]](#) 2.5.3, 2.6.3, 2.7.3, 2.9.3

- Initial Condition

- The handle of each characteristic value referenced in the test cases that follow has been previously discovered by the Lower Tester during the test procedure in [Section 4.4](#) or is known to the Lower Tester by other means.
- Establish an ATT Bearer connection between the Lower Tester and IUT as described in [Section 4.2.1](#).
- If IUT permissions for the characteristic require a specific security mode or security level, establish a connection meeting those requirements.

- Test Case Configuration

Test Case	Requirements
HIDS/HD/CR/BV-01-C [Characteristic Read – Report Characteristic (Feature)]	[3] Table 2-1, 2.5.1 [7] Human Interface Device service
HIDS/HD/CR/BV-02-C [Characteristic Read – Report Characteristic (Input)]	[3] Table 2-1, 2.5.1 [7] Human Interface Device service
HIDS/HD/CR/BV-03-C [Characteristic Read – HID Information]	[3] Table 2-1, 2.8.1 [7] Human Interface Device service
HIDS/HD/CR/BV-04-C [Characteristic Read – Protocol Mode]	[3] Table 2-1, 2.4.1 [7] Human Interface Device service
HIDS/HD/CR/BV-05-C [Characteristic Read – Report Map]	[3] Table 2-1, 2.6.1 [7] Human Interface Device service
HIDS/HD/CR/BV-06-C [Characteristic Read – Boot Keyboard Input Report Characteristic]	[3] Table 2-1, 2.7.1 [7] Human Interface Device service
HIDS/HD/CR/BV-07-C [Characteristic Read – Boot Keyboard Output Report Characteristic]	[3] Table 2-1, 2.8.1 [7] Human Interface Device service
HIDS/HD/CR/BV-08-C [Characteristic Read – Boot Mouse Input Report Characteristic]	[3] Table 2-1, 2.9.1 [7] Human Interface Device service

Table 4.4: Characteristic Read Value test cases

- Test Procedure

The following test procedure applies to the test cases listed in [Table 4.4](#):

1. For Protocol Mode, Boot Keyboard Input Report Characteristic, Boot Mouse Input Report Characteristic and Boot Keyboard Output Report Characteristic, read the characteristic value by executing the test procedure of GATT test case GATT/SR/GAR/BV-01-C [Read Characteristic Value] or GATT/SR/GAR/BV-03-C [Read using Characteristic UUID]
2. Verify that the characteristic value meets the requirements of the service.
3. For the rest of the characteristics, read the characteristic value by executing the test procedure of GATT test case GATT/SR/GAR/BV-01-C [Read Characteristic Value - from server] in [\[5\]](#).
4. Verify that the characteristic value meets the requirements of the service.
5. Repeat steps 1–2 for each instance of the characteristic and service.

- Expected Outcome

The following pass and fail verdicts apply to the test cases listed in [Table 4.4](#):

Pass verdict

The characteristic is successfully read and the characteristic value meets the requirements of the service.

4.7 Long Characteristic Read

- Test Purpose

This test group contains test cases to read and verify that the long characteristic values required by the service are compliant with the specification. The verification is done one value at a time, as enumerated in the test cases in [Table 4.5](#), using this generic test procedure.

- Reference

[\[3\]](#) 2.5, 2.6

- Initial Condition

- The handle of each characteristic value referenced in the test cases that follow has been previously discovered by the Lower Tester during the test procedure in [Section 4.4](#) or is known to the Lower Tester by other means.
- Establish an ATT Bearer connection between the Lower Tester and IUT as described in [Section 4.2.1](#).
- If IUT permissions for the characteristic require a specific security mode or security level, establish a connection meeting those requirements.

- Test Case Configuration

Test Case	Requirements
HIDS/HD/LCR/BV-01-C [Characteristic Read – Report Map Characteristic]	[3] 2.6.1 [7] Human Interface Device service
HIDS/HD/LCR/BV-02-C [Characteristic Read – Report Characteristic (Input)]	[3] 2.5.1 [7] Human Interface Device service
HIDS/HD/LCR/BV-03-C [Characteristic Read – Report Characteristic (Output)]	[3] 2.5.1 [7] Human Interface Device service
HIDS/HD/LCR/BV-04-C [Characteristic Read – Report Characteristic (Feature)]	[3] 2.5.1 [7] Human Interface Device service

Table 4.5: Long Characteristic Read Value test cases

- Test Procedure

The following test procedure applies to the test cases listed in [Table 4.5](#):

1. Read the characteristic value by executing the test procedure of GATT test case GATT/SR/GAR/BV-04-C [Read Long Characteristic Value - from server] in [\[5\]](#).
2. Verify that the characteristic value meets the requirements of the service.
3. Repeat steps 1–2 for each instance of the characteristic and service.

- Expected Outcome

The following pass and fail verdicts apply to the test cases listed in [Table 4.5](#):

Pass verdict

The characteristic is successfully read and the characteristic value meets the requirements of the service.

- Notes

The ATT_Error_Responses “Request Not Supported” or “Attribute Not Long” is acceptable outcomes in response to step 1.

4.8 Characteristic Notification

- Test Purpose

This test group contains test cases to verify responses to enabling and disabling characteristic notifications and compliant operation when the IUT sends notifications of characteristic values. The verification is done one value at a time, as enumerated in the test cases in [Table 4.6](#), using this generic test procedure.

Verify that the IUT sends notifications of characteristic values.

- Reference

[\[3\]](#) 2.5.3, 2.6.3, 2.7.3, 2.9.3

- Initial Condition

- The handle of each characteristic value referenced in the test cases that follow has been previously discovered by the Lower Tester during the test procedure in [Section 4.4](#) or is known to the Lower Tester by other means.

- The handle of the client characteristic configuration descriptor of each characteristic referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in Section 4.5 or is known to the Lower Tester by other means.
 - If the IUT requires a bonding procedure, then perform a bonding procedure.
 - Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1.
 - If IUT permissions for the characteristic descriptor require a specific security mode or security level, establish a connection meeting those requirements.
 - For test cases involving the Boot Keyboard Input Report, and/or the Boot Mouse Input Report characteristics, the Lower Tester writes the value 0x00 to the Protocol Mode characteristic to configure the HID Device in Boot Protocol Mode.
- Test Case Configuration

Test Case	Requirements
HIDS/HD/CN/BV-01-C [Characteristic Notification Report (Input)]	[3] 2.5.1 [7] Human Interface Device service
HIDS/HD/CN/BV-02-C [Characteristic Notification – Boot Keyboard Input Report Characteristic]	[3] 2.7.1 [7] Human Interface Device service
HIDS/HD/CN/BV-03-C [Characteristic Notification – Boot Mouse Input Report Characteristic]	[3] 2.9.1 [7] Human Interface Device service

Table 4.6: Characteristic Notification Value test cases

- Test Procedure

The following test procedure applies to the test cases listed in [Table 4.6](#):

1. Disable notification by writing value 0x0000 to the client characteristic configuration descriptor of the characteristic.
2. Enable notification by writing value 0x0001 to the client characteristic configuration descriptor of the characteristic.
3. Perform an action on the IUT that will induce it to send a notification of the characteristic.
4. The Lower Tester receives an *ATT_Handle_Value_Notification* from the IUT containing the characteristic handle and value.
5. Verify that the characteristic value meets the requirements of the service.

- Expected Outcome

The following pass and fail verdicts apply to the test cases listed in [Table 4.6](#):

Pass verdict

The characteristic is successfully notified and the characteristic value meets the requirements of the service.

4.9 Characteristic Write

- Test Purpose

This test group contains test cases to write to characteristic values and verify that the values written by the service are compliant with specification. The verification is done one value at a time, as enumerated in the test cases in [Table 4.7](#), using this generic test procedure.



- Reference

[3] 2.5, 2.6, 2.7, 2.9

- Initial Condition

- The handle of each characteristic value referenced in the test cases that follow has been previously discovered by the Lower Tester during the test procedure in Section 4.4 or is known to the Lower Tester by other means.
- If the IUT requires a bonding procedure then perform a bonding procedure.
- Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1.
- If IUT permissions for the characteristic descriptor require a specific security mode or security level, establish a connection meeting those requirements.
- For test cases involving the Boot Keyboard Input Report, and/or the Boot Mouse Input Report characteristics, the Lower Tester writes the value 0x00 to the Protocol Mode characteristic to configure the HID Device in Boot Protocol Mode.

- Test Case Configuration

Test Case	Requirements
HIDS/HD/CW/BV-01-C [Characteristic Write – Report (Input)]	[3] Table 2-1, 2.5.1 [7] Human Interface Device service
HIDS/HD/CW/BV-02-C [Characteristic Write – Report (Output)]	[3] Table 2-1, 2.5.1 [7] Human Interface Device service
HIDS/HD/CW/BV-03-C [Characteristic Write – Report (Feature)]	[3] Table 2-1, 2.5.1 [7] Human Interface Device service
HIDS/HD/CW/BV-04-C [Characteristic Write – Boot Keyboard Input Report Characteristic]	[3] Table 2-1, 2.7.1 [7] Human Interface Device service
HIDS/HD/CW/BV-05-C [Characteristic Write – Boot Keyboard Output Report Characteristic]	[3] Table 2-1, 2.7.1 [7] Human Interface Device service
HIDS/HD/CW/BV-06-C [Characteristic Write – Boot Mouse Input Report Characteristic]	[3] Table 2-1, 2.7.1 [7] Human Interface Device service

Table 4.7: Characteristic Write test cases

- Test Procedure

The following test procedure applies to the test cases listed in Table 4.7:

1. Select a value that is valid for the characteristic. Write the characteristic value by executing the test procedure of GATT test case GATT/SR/GAW/BV-03-C [Write Characteristic Value - to Server] in [5].
2. Verify that the characteristic value is successfully written.

- Expected Outcome

The following pass and fail verdicts apply to the test cases listed in Table 4.7:

Pass verdict

The characteristic value is successfully written.



4.10 Characteristic Write Without Response

- Test Purpose

This test group contains test cases to write without response to characteristic values and verify that the values written by the service are compliant with specification. The verification is done one value at a time, as enumerated in the test cases in [Table 4.8](#), using this generic test procedure.

- Reference

[\[3\]](#) 2.10, 2.11

- Initial Condition

- The handle of each characteristic value referenced in the test cases that follow has been previously discovered by the Lower Tester during the test procedure in [Section 4.4](#) or is known to the Lower Tester by other means.
- If the IUT requires a bonding procedure then perform a bonding procedure.
- Establish an ATT Bearer connection between the Lower Tester and IUT as described in [Section 4.2.1](#).
- If IUT permissions for the characteristic descriptor require a specific security mode or security level, establish a connection meeting those requirements.
- For test cases involving the Boot Keyboard Input Report, and/or the Boot Mouse Input Report characteristics, the Lower Tester writes the value 0x00 to the Protocol Mode characteristic to configure the HID Device in Boot Protocol Mode.

- Test Case Configuration

Test Case	Requirements
HIDS/HD/CW/BV-07-C [Characteristic Write – Report (Output)]	[3] Table 2-1, 2.5.1 [7] Human Interface Device service
HIDS/HD/CW/BV-08-C [Characteristic Write – Protocol Mode (Boot Mode)]	[3] Table 2-1, 2.4.1 [7] Human Interface Device service
HIDS/HD/CW/BV-09-C [Characteristic Write – Protocol Mode (Report Mode)]	[3] Table 2-1, 2.4.1 [7] Human Interface Device service
HIDS/HD/CW/BV-10-C [Characteristic Write – HID Control Point (Suspend)]	[3] Table 2-1, 2.9.1 [7] Human Interface Device service
HIDS/HD/CW/BV-11-C [Characteristic Write – HID Control Point (Exit Suspend)]	[3] Table 2-1, 2.9.1 [7] Human Interface Device service
HIDS/HD/CW/BV-12-C [Characteristic Write – Boot Keyboard Output Report Characteristic]	[3] Table 2-1, 2.9.1 [7] Human Interface Device service

Table 4.8: Characteristic Write Without Response test cases

- Test Procedure

The following test procedure applies to the test cases listed in [Table 4.8](#):

1. Select a value that is valid for the characteristic. Write the characteristic value by executing the test procedure of GATT test case GATT/SR/GAW/BV-01-C [Write Without Response - to server] in [\[5\]](#).
2. Verify that the characteristic value is successfully written.

- Expected Outcome

The following pass and fail verdicts apply to the test cases listed in [Table 4.8](#):

Pass verdict

The characteristic value is successfully written.

4.11 Descriptors Read

- Test Purpose

This test group contains test cases to read and verify that the descriptor values required by the service are compliant with the specification. The verification is done one value at a time, as enumerated in the test cases in [Table 4.9](#), using this generic test procedure.

- Reference

[3] 2.5.3, 2.6.3, 2.7.3, 2.9.3

- Initial Condition

- The handle of each descriptor referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in [Section 4.5](#) or is known to the Lower Tester by other means.
- Establish an ATT Bearer connection between the Lower Tester and IUT as described in [Section 4.2.1](#).
- If IUT permissions for the characteristic descriptor require a specific security mode or security level, establish a connection meeting those requirements.
- For test cases involving the Boot Keyboard Input Report, and/or the Boot Mouse Input Report characteristics, the Lower Tester writes the value 0x00 to the Protocol Mode characteristic to configure the HID Device in Boot Protocol Mode.

- Test Case Configuration

Test Case	Requirements
HIDS/HD/DR/BV-01-C [Client Characteristic Configuration Descriptor of Report Characteristic]	[3] 2.5.3.1 [7] Human Interface Device service
HIDS/HD/DR/BV-02-C [Report Reference Characteristic Descriptor]	[3] 2.5.3.2 [7] Human Interface Device service
HIDS/HD/DR/BV-03-C [External Report Reference Characteristic Descriptor]	[3] 2.6.3.1 [7] Human Interface Device service
HIDS/HD/DR/BV-04-C [Client Characteristic Configuration Descriptor of Boot Keyboard Input Report Characteristic]	[3] 2.7.3.1 [7] Human Interface Device service
HIDS/HD/DR/BV-05-C [Client Characteristic Configuration Descriptor of Boot Mouse Input Report Characteristic]	[3] 2.9.3.1 [7] Human Interface Device service

Table 4.9: Descriptor Read Value test cases

- Test Procedure

The following test procedure applies to the test cases listed in [Table 4.9](#):

1. Read the descriptor value by executing the test procedure of GATT test case GATT/SR/GAR/BV-06-C [Read Characteristic Descriptors – from server] in [\[5\]](#).



2. Verify that the descriptor value meets the requirements of the service.
3. Repeat steps 1–2 for each instance of the descriptor.

- Expected Outcome

The following pass and fail verdicts apply to the test cases listed in [Table 4.9](#):

Pass verdict

The descriptor is successfully read and the descriptor value meets the requirements of the service.

4.12 Descriptors Write

- Test Purpose

This test group contains test cases to write and verify that the descriptors behavior required by the service is compliant with the specification. The verification is done one value at a time, as enumerated in the test cases in [Table 4.10](#), using this generic test procedure.

- Reference

[\[3\]](#) 2.5.3, 2.6.3, 2.7.3, 2.9.3

- Initial Condition

- The handle of each descriptor referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in [Section 4.5](#) or is known to the Lower Tester by other means.
- Establish an ATT Bearer connection between the Lower Tester and IUT as described in [Section 4.2.1](#).
- If IUT permissions for the characteristic descriptor require a specific security mode or security level, establish a connection meeting those requirements.
- For test cases involving the Boot Keyboard Input Report, and/or the Boot Mouse Input Report characteristics, the Lower Tester writes the value 0x00 to the Protocol Mode characteristic to configure the HID Device in Boot Protocol Mode.

- Test Case Configuration

Test Case	Requirements
HIDS/HD/DW/BV-01-C [Client Characteristic Configuration Descriptor of Report Characteristic]	[3] 2.5.3.1 [7] Human Interface Device service
HIDS/HD/DW/BV-02-C [Client Characteristic Configuration Descriptor of Boot Keyboard Input Report Characteristic]	[3] 2.7.3.1 [7] Human Interface Device service
HIDS/HD/DW/BV-03-C [Client Characteristic Configuration Descriptor of Boot Mouse Input Report Characteristic]	[3] 2.9.3.1 [7] Human Interface Device service

Table 4.10: Descriptor Write Value test cases

- Test Procedure

The following test procedure applies to the test cases listed in [Table 4.10](#):

1. Write the descriptor value by executing the test procedure of GATT test case GATT/SR/GAW/BV-08-C [Write Characteristic Descriptors – from server] in [\[5\]](#).
2. Verify that the descriptor behavior meets the requirements of the service.
3. Repeat steps 1–2 for each instance of the descriptor.



- Expected Outcome

The following pass and fail verdicts apply to the test cases listed in [Table 4.10](#):

Pass verdict

The descriptor value is successfully written, and the descriptor behavior meets the requirements of the service.

4.13 Service Procedures

This test group contains test cases to verify all expected features and behavior of the service and to ensure it is compliant with specification.

HIDS/HD/SP/BV-01-C [Notification Behavior of Multiple Input Reports]

- Test Purpose

Verify that the IUT can send input reports once it has been configured to do so.

- Reference

[\[3\]](#) 2.5.1

- Initial Condition

- The Report Characteristic is configured for notification.
- If the IUT requires a bonding procedure, then perform a bonding procedure.
- Establish an ATT Bearer connection between the Lower Tester and IUT as described in [Section 4.2.1](#).
- If IUT permissions for the Report characteristic require a specific security mode or security level, establish a connection meeting those requirements.

- Test Procedure

1. Perform an action on the IUT that will induce it to send notifications of the Report Characteristic of type Input Report.
2. A connection is established between the Lower Tester and IUT meeting the security requirements of the IUT, if not already done so prior to step 1.
3. The Lower Tester receives an *ATT_Handle_Value_Notification* from the IUT containing the Report Characteristic handle and value.
4. Verify that the characteristic value meets the requirements of the service.
5. Repeat steps 3–4 for each received notification until the IUT stops sending notifications.
6. The Lower Tester configures the Report characteristic to disable notifications.
7. Repeat steps 1–2 with notifications disabled.
8. Verify that the Tester does not receive an *ATT_Handle_Value_Notification* from the IUT containing the Report Characteristic.

- Expected Outcome

Pass verdict

The IUT sends a notification of the correct Input Report characteristic, upon reconnection.

The value of the Input Report characteristic meets the requirements of the service.

The IUT sends one or more notifications of the Report characteristic when the appropriate Reports have been set for notification.



The value of the characteristic meets the requirements of the service.

The IUT stops sending notifications of the Report characteristic after the Lower Tester configures the characteristic to disable notifications.

5 Test case mapping

The Test Case Mapping Table (TCMT) maps test cases to specific requirements in the ICS. The IUT is tested in all roles for which support is declared in the ICS document.

The columns for the TCMT are defined as follows:

Item: Contains a logical expression based on specific entries from the associated ICS document. Contains a logical expression (using the operators AND, OR, NOT as needed) based on specific entries from the applicable ICS document(s). The entries are in the form of y/x references, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS document for HID Service [4].

Feature: A brief, informal description of the feature being tested.

Test Case(s): The applicable test case identifiers are required for Bluetooth Qualification if the corresponding y/x references defined in the Item column are supported.

For the purpose and structure of the ICS/IXIT, refer to [1].

Item	Feature	Test Case(s)
HIDS 2/1	Service Discovery - HID Service	HIDS/HD/SD/BV-01-C
HIDS 2/5	Protocol Mode Characteristic	HIDS/HD/DEC/BV-05-C HIDS/HD/CR/BV-04-C HIDS/HD/CW/BV-08-C HIDS/HD/CW/BV-09-C
HIDS 2/11	Report Map Characteristic	HIDS/HD/DEC/BV-01-C HIDS/HD/CR/BV-05-C HIDS/HD/LCR/BV-01-C
HIDS 2/2 AND HIDS 2/6	Boot Keyboard Input Report Characteristic	HIDS/HD/DEC/BV-06-C HIDS/HD/DES/BV-04-C HIDS/HD/CR/BV-06-C HIDS/HD/CN/BV-02-C HIDS/HD/DR/BV-04-C HIDS/HD/DW/BV-02-C
HIDS 2/2 AND HIDS 2/6 AND HIDS 2/7	Boot Keyboard Input Report Characteristic - Write	HIDS/HD/CW/BV-04-C
HIDS 2/2 AND HIDS 2/8	Boot Keyboard Output Report Characteristic	HIDS/HD/DEC/BV-07-C HIDS/HD/CW/BV-05-C HIDS/HD/CR/BV-07-C HIDS/HD/CW/BV-12-C
HIDS 2/3 AND HIDS 2/9	Boot Mouse Input Report Characteristic	HIDS/HD/DEC/BV-08-C HIDS/HD/DES/BV-05-C HIDS/HD/CR/BV-08-C HIDS/HD/CN/BV-03-C HIDS/HD/DR/BV-05-C HIDS/HD/DW/BV-03-C
HIDS 2/3 AND HIDS 2/9 AND HIDS 2/10	Boot Mouse Input Report Characteristic – Write	HIDS/HD/CW/BV-06-C
HIDS 2/11a	External Report Reference Characteristic Descriptor for Report Map Characteristic	HIDS/HD/DR/BV-03-C HIDS/HD/DES/BV-03-C

Item	Feature	Test Case(s)
HIDS 2/12	Report Characteristic	HIDS/HD/DEC/BV-02-C HIDS/HD/DES/BV-02-C HIDS/HD/DR/BV-02-C
HIDS 2/12 AND HIDS 2/13	Report Characteristic –: Report Type: Input Report	HIDS/HD/CR/BV-02-C HIDS/HD/LCR/BV-02-C HIDS/HD/CN/BV-01-C HIDS/HD/DES/BV-01-C HIDS/HD/DR/BV-01-C HIDS/HD/DW/BV-01-C HIDS/HD/SP/BV-01-C
HIDS 2/13 AND HIDS 2/14	Report Type: Input Report – Write	HIDS/HD/CW/BV-01-C
HIDS 2/12 AND HIDS 2/15	Report Characteristic – Report Reference Characteristic Descriptor Report Type: Output Report	HIDS/HD/LCR/BV-03-C HIDS/HD/CW/BV-02-C HIDS/HD/CW/BV-07-C
HIDS 2/12 AND HIDS 2/16	Report Characteristic – Report Reference Characteristic Descriptor Report Type: Feature Report	HIDS/HD/CR/BV-01-C HIDS/HD/LCR/BV-04-C HIDS/HD/CW/BV-03-C
HIDS 2/17	HID Control Point Characteristic	HIDS/HD/DEC/BV-03-C HIDS/HD/CW/BV-10-C HIDS/HD/CW/BV-11-C
HIDS 2/18	HID Information Characteristic	HIDS/HD/DEC/BV-04-C HIDS/HD/CR/BV-03-C

Table 5.1: Test case mapping

6 Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	1.0.0	2011-12-27	Adopted by the Bluetooth SIG Board of Directors
	1.0.1r0	2012-05-18	TSE 4788: HIDS/HD/DES/BV-03-C (legacy ID: TP/DES/BV-03-C): Remove from TCMT
1	1.0.1	2012-07-24	Prepare for publication.
	1.0.2r1	2013-05-24	TSE 5145: Updated initial condition of boot mode test cases to include, "For Test Cases involving the Boot Keyboard Input Report, and/or the Boot Mouse Input Report characteristics, the Tester shall write the value 0x00 to the Protocol Mode characteristic to configure the HID Device in Boot Protocol Mode." Affects HIDS/HD/CON/BV-02-C, HID/HD/CON/BV-03-C, HIDS/HD/CN/BV-02-C, HIDS/HD/CN/BV-03-C, HIDS/HD/CW/BV-04-C, HIDS/HD/CW/BV-05-C, HIDS/HD/CW/BV-06-C, HIDS/HD/CW/BV-12-C, HIDS/HD/DR/BV-04-C, HIDS/HD/DR/BV-05-C, HIDS/HD/DW/BV-02-C and HIDS/HD/DW/BV-03-C (legacy IDs: TP/CON/BV-02-C, TP/CON/BV-03-C, TP/CN/BV-02-C, TP/CN/BV-03-C, TP/CW/BV-04-C, TP/CW/BV-05-C, TP/CW/BV-06-C, TP/CW/BV-12-C, TP/DR/BV-04-C, TP/DR/BV-05-C, TP/DW/BV-02-C and TP/DW/BV-03-C).
2	1.0.2	2013-07-02	Prepare for Publication
	1.0.3r00	2016-02-16	TSE 6839: Test case reference corrected. Changed "TP/GAW/SR/BV-01-C" to "TP/GAW/SR/BV-03-C." (GATT/SR/GAW/BV-03-C after ID conversion) NOTE: Edits for TSE 6839 also include TSE 6928. TSE 6839 and 6928 are essentially duplicates.
	1.0.3r01	2016-04-13	Converted to new Test Case ID conventions as defined in TSTO v4.1. Deleted Fail verdicts with no content other than "Otherwise."
	1.0.3r02	2016-04-14	Reviewed by Alicia Courtney. Converted to current document template. Additional editorial changes.
	1.0.3r03	2016-06-24	Corrected role abbreviations to match the roles declared in the ICS.
3	1.0.3	2016-07-13	Prepared for TCRL 2016-1 publication.
	1.0.3 edition 2r00	2018-11-29	Editorial changes only. Template updated. Revision History and contributors moved to the end of the document.
	1.0.3 edition 2	2019-12-12	Updated copyright page and confidentiality markings to support new Documentation Marking Requirements, performed minor formatting updates, and accepted all tracked changes to prepare for edition 2 publication.

Publication Number	Revision Number	Date	Comments
	p4r00–r01	2021-08-11 – 2021-11-29	TSE 17130 (rating 2): Removed Configure Notification test cases HIDS/HD/CON/BV-01-C – -03-C. Revised the test purpose, initial condition, and test procedure of the characteristic notification tests to correct for the missing enable notifications configuration step and to remove the dependencies on the Configure Notification section to remove the redundancy in HIDS/HD/CN/BV-01-C – -03-C, which already implicitly contain the configuration steps. Performed template-related editorials. Assigned publication number 3 to previous v1.0.3. Updated and the introduction text before the TCMT to align with the template. Updated copyright page to align with v2 of the DNMD. Minor editorials in the TCMT from the consistency checker.
4	p4	2022-01-25	Approved by BTI on 2022-01-06. Prepared for TCRL 2021-2 publication.
	p5r00–r01	2022-09-22 – 2022-12-12	TSE 18204 (rating 3): Added HIDS/HD/DR/BV-03-C and HIDS/HD/DES/BV-03-C to the TCMT. Performed additional template-related formatting fixes.
5	p5	2023-02-07	Approved by BTI on 2022-12-28. Prepared for TCRL 2022-2 publication.

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