HID Over GATT Profile (HOGP)

Abstract:
This document defines test structures and procedures for conformance test of devices implementing the Bluetooth HID over GATT Profile (HOGP) Test Suite.
## Revision History

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<tr>
<td>D09r01</td>
<td>2011-09-25</td>
<td>Initial draft</td>
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<td>1.0.4r00</td>
<td>2015-10-02</td>
<td>TSE 6653: Added cross-reference to HIDS.TS in HOGP (1/1 AND 4/7) in TCMT; revised HOGP (1/3 AND 12/6) and HOGP (1/3 AND 12/12) items in TCMT. TSE 6487: Removed requirement to support reading Report characteristic value for Input, Output, and Feature reports; renamed Input Report variant, and deleted Output and Feature report duplicates in TCMT.</td>
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5 Test Case Mapping
1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and Test Cases (TC) to test the Bluetooth HID over GATT Profile Specification.

The objective of this test suite is to provide a basis for interoperability tests for Bluetooth devices giving a high probability of air interface interoperability between different manufacturers’ Bluetooth devices.
2 References, Definitions, and Abbreviations

2.1 References

This Bluetooth document incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. Additional definitions and abbreviations can be found in [4].

[1] Bluetooth Test Strategy and Terminology Overview
[2] Specification of the Bluetooth System, version 4.0 or later
[3] ICS Proforma for HID Over GATT Profile v1.0
[4] HID over GATT Profile Specification v1.0
[5] GAP Test Suite, GAP.TS
[6] GATT Test Suite, GATT.TS
[7] SM Test Suite, SM.TS
[8] HID Service Specification v1.0
[9] Battery Service Specification v1.0
[10] Device Information Service v1.1
[12] Scan Parameters Profile Specification v1.0
[13] SCPP Test Suite, SCPP.TS
[14] HIDS Test Suite, HIDS.TS
[15] HID Over GATT Profile Implementation eXtra Information for Test, IXIT
3 Test Suite Structure (TSS)

3.1 Overview

The HID over GATT Profile is a client of GAP and GATT. This is illustrated in Figure 3.1.

Figure 3.1: HID over GATT Profile Test Model

3.2 Test Strategy

The test objectives are to verify functionality of HID over GATT within a Bluetooth Host and enable interoperability between Bluetooth Hosts on different devices. The testing approach is to cover mandatory and optional requirements in the profile specification and to match these to the support of the IUT as described in the ICS Proforma.

The basis for the test approach is the general concepts and conformance testing principles defined in ISO/IEC 9646-1 and ISO/IEC 9646-2; both are part of the OSI Conformance Testing Methodology and Framework (CTMF).

The conformance test equipment shall provide an implementation of the Radio Controller and the parts of the Host needed to perform the test cases defined in the HID over GATT Profile Test Suite. 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, an MMI, or another interface supported by the IUT.

The HID over GATT 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 cases.

The test suite structure is a tree with the first level representing the protocol groups.

- Discovery of HID over GATT Profile Services
- Discovery of HID over GATT Profile Characteristics and Characteristic Descriptors.
• Discovery of HID over GATT Profile Related Services.
• HID over GATT Profile Features as follows:
  - Read
  - Write
  - Configuration
  - Notification
3.2.1 HID over GATT Profile HID Host Testing Configuration

The following configuration is recommended for testing HID over GATT Profile HID Host IUT:

![Diagram showing HID over GATT Profile HID Host Testing Configuration]

The sample database of Characteristics used by the Lower Tester is specified in each test case. All HID over GATT Profile HID Host test cases, which use a configuration as shown in Figure 3.2, contain test procedure descriptions and expected results. These in turn use example message syntax between the Upper tester and the IUT. Those example messages are generic; there is no normative specification for these messages. The normative specifications are the functional descriptions for the test procedures and the expected results.

In Test Cases where more than one alternative method of performing the Test Case exists, a HID Host IUT shall perform the Test Case once for each supported alternative method.
3.2.2 HID over GATT Profile HID Device Testing Configuration

The following configuration is recommended for testing HID over GATT Profile HID Device IUT:

In Test Cases where more than one alternative method of performing the Test Case exists, a HID Device IUT shall perform the Test Case once for each supported alternative method.
3.3  Test Groups

The following test groups have been defined:

3.3.1  Discovery of Services

This group tests IUT discovery of the HID Service, the Battery Service, the Device information Service and the Scan parameters Service.

3.3.2  Related Services Discovery

The group tests IUT discovery of services with a relationship to HID Service.

3.3.3  Discovery of Characteristics and Characteristic Descriptors

This group tests IUT discovery of HID Service Characteristics and Characteristic Descriptors, Related Service Characteristics and Characteristic Descriptors, Battery Service Characteristics and Characteristic Descriptors and Device Information Service Characteristics.

3.3.4  Read Features

This group tests IUT implementation of the HID over GATT Profile Read Features.

3.3.5  Write Features

This group tests IUT implementation of the HID over GATT Profile Write Features.

3.3.6  Configuration Features

This group tests IUT implementation of the HID over GATT Profile Configuration Features.

3.3.7  Notification Features

This group tests IUT implementation of the HID over GATT Profile Notification Features.
4 Test Cases

4.1 Introduction

4.1.1 Test Case Identification Conventions

Test cases shall be 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>`. Bolded ID parts shall appear in the order prescribed. Non-bolded ID parts (if applicable) shall appear between the bolded parts. The order of the non-bolded parts may vary from test suite to test suite, but shall be consistent within each individual test suite.

<table>
<thead>
<tr>
<th>Identifier Abbreviation</th>
<th>Spec Identifier <code>&lt;spec abbreviation&gt;</code></th>
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<tbody>
<tr>
<td>HOGP</td>
<td>HID over GATT Profile</td>
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<table>
<thead>
<tr>
<th>Identifier Abbreviation</th>
<th>Role Identifier <code>&lt;IUT role&gt;</code></th>
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<td>RH</td>
<td>HID over GATT Profile Report Host Role</td>
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<tr>
<td>BH</td>
<td>HID over GATT Profile Boot Host Role</td>
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<tr>
<td>HD</td>
<td>HID over GATT Profile HID Device Role</td>
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<tr>
<th>Identifier Abbreviation</th>
<th>Class Identifier <code>&lt;class&gt;</code></th>
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<td>HGDS</td>
<td>HID over GATT Profile Discovery of Services</td>
</tr>
<tr>
<td>HGDR</td>
<td>HID over GATT Profile Related Services Discovery</td>
</tr>
<tr>
<td>HGDC</td>
<td>HID over GATT Profile Discovery of Characteristics and Characteristic Descriptors</td>
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<td>HGRF</td>
<td>HID over GATT Profile Read Features</td>
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<td>HGWF</td>
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<td>HGCF</td>
<td>HID over GATT Profile Configuration Features</td>
</tr>
<tr>
<td>HGNF</td>
<td>HID over GATT Profile Notification Features</td>
</tr>
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Figure 4.1: HID Over GATT Profile TC Class Naming Convention

Note: The term HID Host is used throughout this document to refer to a GATT Client which implements the HID over GATT Profile; there are two variations of the HID Host Role; the Report Host and the Boot Host. Where Report Host is used, it refers only the Report Host Role as defined in the HID over GATT Profile. Where Boot Host is used, it refers only to the Boot Host Role as defined in the HID over GATT Profile. Where HID Host is used, it refers equally to either the Report Host Role or the Boot Host Role.

4.1.2 Conformance

When conformance is claimed, all capabilities indicated as mandatory for this Specification 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.

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 that is not excluded by the Specification, OR
- that capabilities enabled by the implementations are sustained over durations expected by the use case, OR
- that the implementation gracefully handles any quantity of data expected by the use case, OR
- that the implementation gracefully rejects any attempt to exercise capabilities which were declared as not supported. Graceful rejection means that the implementation demonstrates uninterrupted conformance to the specification immediately after rejecting such attempts without any need to be externally reset or adjusted, OR
- that in cases where more than one valid interpretation of the Specification exist, the implementation complies with at least one interpretation and gracefully handles other interpretations OR
- that the implementation is immune to attempted security exploits

A single execution of each of the required tests is required in order to constitute a pass verdict. However, it is noted that in order 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 Generator, 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 errata request such that the issue may be addressed.

4.1.3 Pass/Fail Verdict Conventions

Each test case has an Expected Outcome section, which outlines all the detailed pass criteria conditions that shall be met by the IUT to merit a Pass Verdict.

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 one of the pass criteria conditions cannot be met. If this occurs the outcome of the test shall be the 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 [6] section 4.2.1.2.

4.2.2 HID Device: Initiate Undirected Connectable mode before Notification

This is a setup procedure for the HID Device to enter the Undirected Connectable mode and accept connection from a HID Host.

- Reference
  
  [4] Section 5.1
  
  [2] GAP 9.3.4

- Initial Condition

A preamble procedure defined in paragraph 4.2.1 is used to setup the LE transport and L2CAP channel. The HID Device (IUT) and the Lower Tester (HID Host) have bonded following GAP procedures.

The HID Device is disconnected.

The HID Device has been configured to accept commands from the Upper Tester to generate HID Reports.

- Preamble Procedure

1. The Lower Tester waits for the IUT to send ADV_IND packets (GAP Undirected Connectable Mode).
2. After receipt of either advertising packet, the Lower Tester sends CONNECT_REQ and an empty packet to the HID Device IUT.
4.2.3 HID Host: Initiate Connection when ready to receive Notifications

This is a setup procedure for the HID Host to initiate connection to a HID Device.

- Reference
  [4] Section 5.2
  [2] GAP 9.3.4

- Initial Condition
  A preamble procedure defined in paragraph 4.2.1 is used to setup the LE transport and L2CAP channel. The HID Host (IUT) and the Lower Tester (HID Device) have bonded following GAP procedures.

  The HID Host is disconnected.

  The HID Host has been configured to accept commands from the Upper Tester to request and receive Reports.

- Preamble Procedure
  1. The Upper Tester commands the HID Host IUT to initiate a connection.
  2. The Lower Tester sends ADV_IND packets (GAP Undirected Connectable Mode) to the HID Host IUT.
  3. The Lower Tester waits for responses from the HID Host IUT.
  4. The HID Host IUT sends a CONNECT_REQ and an empty packet to the Lower Tester.
No L2CAP connection exists over LE Transport

Upper Tester command to
Initiate a connection

ADV_IND

CONNECT_REQ

Empty Packet
4.3 Discovery of Services

The procedures defined in this test group verify IUT discovery of the services defined in the HID over GATT Profile Specification [4] by a HID Host IUT and from a HID Device IUT.

4.3.1 [Discover HID Services]

- Test Case ID(s)
  
  **HOGP/RH/HGDS/BV-01-I**
  
  **HOGP/BH/HGDS/BV-01-I**

- Test Purpose
  Verify that all HID Services can be discovered by a HID Host IUT.

- Reference
  [4] 4.3.1, 4.5.1

- Initial Condition
  
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has one or more instances of the HID Service [8] with the Attribute Type set to «Primary Service» in the service declaration.

- Test Procedure
  
  The Upper Tester issues a command to the IUT to discover primary services. There are two alternatives:

  1. Execute the procedure included in GATT.TS [6] Discover All Primary Services, GATT/CL/GAD/BV-01-C once, with the database specified in [8].
2. Execute the procedure included in GATT.TS [6] Discover Primary Services by Service UUID, GATT/CL/GAD/BV-02-C once, with the service UUID set to «HID Service», with the database specified in [8].

• Expected Outcome
  Pass verdict

  At least one attribute handle range is returned, containing the starting handle and the ending handle of all HID Service definitions.

4.3.2 [Discover Battery Service]

• Test Case ID(s)
  HOGP/RH/HGDS/BV-02-I
  HOGP/BH/HGDS/BV-02-I

• Test Purpose
  Verify that the Battery Service can be discovered by a HID Host IUT.

• Reference
4.5.3

**Initial Condition**

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has one instance of the Battery Service [9] with the Attribute Type set to «Primary Service» in the service declaration.

**Test Procedure**

The Upper Tester issues a command to the IUT to discover primary services. There are two alternatives:

1. Execute the procedure included in GATT.TS [6] Discover All Primary Services, GATT/CL/GAD/BV-01-C once, with the database specified in [9].

2. Execute the procedure included in GATT.TS [6] Discover Primary Services by Service UUID, GATT/CL/GAD/BV-02-C once, with the service UUID set to «Battery Service», with the database specified in [8] and [9].
• Expected Outcome

Pass verdict

At least one attribute handle range is returned, containing the starting handles and the ending handles of the Battery Service definition.

4.3.3 [Discover Device Information Service]

• Test Case ID(s)

HOGP/RH/HGDS/BV-03-I
HOGP/BH/HGDS/BV-03-I

• Test Purpose

Verify that the Device Information Service can be discovered by a HID Host IUT.

• Reference:

[4] 4.5.2

• Initial Condition

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has a single instance of the Device Information Service [10] with the Attribute Type set to «Primary Service» in the service declaration.

• Test Procedure

The Upper Tester issues a command to the IUT to discover primary services. There are two alternatives:
1. Execute the procedure included in GATT.TS [6] Discover All Primary Services, GATT/CL/GAD/BV-01-C once, with the database specified in [10].

2. Execute the procedure included in GATT.TS [6] Discover Primary Services by Service UUID, GATT/CL/GAD/BV-02-C once, with the service UUID set to «Device Information Service», with the database specified in [10].

• Expected Outcome

   Pass verdict

   One attribute handle range is returned, containing the starting handle and the ending handle of the Device Information Service definition.

4.3.4 HOGP/HD/HGDS/BV-01-I [Discover All HID over GATT Profile Services]

• Test Purpose

   Verify that all HID Services, the Battery Service, the Device Information Service and, if applicable, the Scan Parameters Service can be discovered from a HID Device IUT.
• Reference
[4] 3

• Initial Condition
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The IUT has in its database one or more instances of the HID Service [8] and one or more instances of the Battery Service [9], the Device Information Service [10] and, if applicable, the Scan Parameters Service [11].

The Upper Tester has access to the IUT database structure.

• Test Procedure
1. The Lower Tester sends an initial ATT_Read_By_Group_Type_Request (Starting handle=0x0001, Ending handle=0xFFFF, UUID = «Primary Service») to the IUT.
2. If the IUT returns an ATT_Read_By_Group_Type_Response, the Lower Tester sends another ATT_Read_By_Group_Type_Request (next starting handle, Ending handle=0xFFFF, UUID = «Primary Service») to the IUT.
3. Repeat sending ATT_Read_By_Group_Type_Requests until the IUT returns an ATT_Error_Response indicating AttributeNotFound, or the IUT returns an ATT_Read_By_Group_Type_Response containing handle 0xFFFF.

• Expected Outcome
Pass verdict

For each ATT_Read_By_Group_Type_Request, the IUT sends a correctly formatted ATT_Read_By_Group_Type_Response to the Lower Tester or an ATT_Error_Response if there is no handle/UUID pair matching the request.
The IUT reports one or more service UUID’s for the HID Service, and a single service UUID for each of the Battery Service, Device Information Service and, if applicable, Scan Parameters Service. All service UUID’s match the values known to be in the HID Device database.

4.3.5 HOGP/HD/HGDS/BV-02-I [Discover All HID over GATT Profile Services]

- Test Purpose
  Verify that all HID Services, the Battery Service, the Device Information Service and, if applicable, the Scan Parameters Service can be discovered from a HID Device IUT.

- Reference
  [4] 3

- Initial Condition
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The IUT has in its database two instances of the HID Service [8] and one or more instances of the Battery Service [9], and a single instance of the Device Information Service [10] and, if applicable, the Scan Parameters Service [11].

  The Upper Tester has access to the IUT database structure.

- Test Procedure
  Execute the procedure included in GATT.TS [6] Discover Primary Services by Service UUID, GATT/SR/GAD/BV-02-C once, with the database specified in initial condition, that is:

  The Lower Tester sends an ATT_Find_By_Type_Value_Requests (starting handle, ending handle) to the IUT, with type set to «Primary Service» and Value set to a particular UUID, until all Primary Services with a matching service UUID are found, and the IUT returns an ATT_Error_Response with the error code AttributeNotFound.
4.4 Discovery of Related Services

The procedures in this Test Group verify that discovery of services with a relationship to the HID Service can be discovered by a Report Host IUT.

4.4.1 HOGP/RH/HGDR/BV-01-I [Find Included Services]

- **Test Purpose**
  
  Verify that any services included using the «Include» definition can be discovered by a Report Host IUT.

- **Reference**
  
  [4] 3.1.1

- **Initial Condition**
  
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.
The Lower Tester has a single instance of the HID Service [8], that instance includes, using the «Include» definition, a non-HID Service instance.

The IUT has executed HOGP/RH/HGDS/BV-01-I and has saved the handle range for an instance of the HID Service. That instance contains one included service.

- Test Procedure

The Upper Tester issues a command to find included services, specifying the starting and ending handles of the service definition returned after running HOGP/RH/HGDS/BV-01-I above.

The IUT sends ATT_Read_By_Type_Requests commands to the Lower Tester, with Attribute Type = «Include». The first request will contain the starting and ending handles of the specified service.

For subsequent requests the starting handle is set to one greater than the last attribute handle in the ATT_Read_By_Type_Response.

The test will continue until the Included Services of the HID service is found.

- Expected Outcome

Pass verdict

The IUT sends ATT_Read_By_Type_Requests to the Lower Tester until all include service declarations in the specified handle range are returned.
The IUT receives `ATT_Read_By_Type_Responses` and reports the attribute handle/UUID pairs of all included services returned to the Upper Tester.

The values reported by the IUT match the values in the Lower Tester database.

### 4.5 Discovery of Characteristics and Characteristic Descriptors

The procedures defined in this Test Group verify discovery of the Characteristics and Characteristic Descriptors defined in the HID Service Specification [8], the Battery Service Specification [9] and the Device Information Service Specification [10] by a HID Host IUT, a Report Host IUT and a Boot Host IUT.

#### 4.5.1 HOGP/RH/HGDC/BV-01-I [Discover Report Map Characteristics]

- **Test Purpose**
  
  Verify that all Report Map characteristics can be discovered by a Report Host IUT.

- **Reference**
  
  [4] 4.6.1.1

- **Initial Condition**
  
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1. The IUT and Lower Tester have bonded following GAP procedures. The Lower Tester has two instances of the HID Service [8].

  The IUT has executed HOGP/RH/HGDS/BV-01-I and has saved the handle range for all instances of the HID Service available in the Lower Tester. Each instance contains one and only one instance of the Report Map characteristic.

- **Test Procedure**
  
  The Upper Tester issues a command to the IUT to discover characteristics using the handle ranges returned after running HOGP/RH/HGDS/BV-01-I above. There are two alternatives:

  1. Execute the procedure included in GATT.TS [6] *Discover All Characteristics of a Service*, GATT/CL/GAD/BV-04-C once for each HID Service instance, with the handle ranges specified in initial conditions.
2. Execute the procedure included in GATT.TS [6] Discover Characteristics by UUID, GATT/CL/GAD/BV-05-C once for each HID Service instance, with the characteristic UUID set to «Report Map», with the database specified in [8].
• Expected Outcome

**Pass verdict**

The IUT sends a correctly formatted `ATT_Read_By_Type_Request` to the Lower Tester once for each instance of the HID Service.

The IUT receives all `ATT_Read_By_Type_Responses` from the Lower Tester and reports each attribute handle-value pair for each instance of the Report Map characteristic discovered to the Upper Tester.

Each attribute handle-value pair returned matches a Report Map characteristic declaration implemented in the Lower Tester.

### 4.5.2 HOGP/RH/HGDC/BV-02-I [Discover External Report Reference Characteristic Descriptors for Report Map Characteristics]

• **Test Purpose**

Verify that all External Report Reference characteristic descriptors for the Report Map characteristic can be discovered by a Report Host IUT.

• **Reference**

[4] 4.6.1.1

• **Initial Condition**
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8].

The IUT has executed HOGP/RH/HGDS/BV-01-I and has saved the handle range for each instance of the HID Service available in the Lower Tester.

- **Test Procedure**
  
The Upper Tester issues a command to the IUT to Discover All Characteristic Descriptors using the handle ranges returned after running HOGP/RH/HGDS/BV-01-I above.

  The IUT executes one or more passes of the procedure included in GATT.TS [6] Discover all Characteristic Descriptors, GATT/CL/GAD/BV-06-C using the handle ranges specified in initial conditions.

  ![Diagram of ATT Bearer established over LE transport with ATT_Find_Information_RESPONSE, ATT_Find_Information_REQUEST, DiscDescriptors, GATT_DiscDescriptors, Command_Complete, ALT 1: last handle != end handle, ALT 2: last handle = end handle, ALT 3: No remaining characteristics]

- **Expected Outcome**
  
  **Pass verdict**

  The IUT sends ATT_Find_Information_Requests to the Lower Tester until all External Report Reference characteristic descriptors are found.

  The IUT receives all ATT_Find_Information_Responses from the Lower Tester and reports all received attribute handle/UUID pairs for each discovered External Report Reference characteristic descriptor discovered to the Upper Tester.
All attribute handle/UUID pairs are returned with UUID = «External Report Reference» and matching attribute handle for each External Report Reference characteristic descriptor implemented in the Lower Tester.

4.5.3 HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics]

- Test Purpose
  Verify that all Report characteristic can be discovered by a Report Host IUT.

- Reference
  [4] 4.6.1.2

- Initial Condition
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8].

  The IUT has executed HOGP/RH/HGDS/BV-01-I and has saved the handle range for each instance of the HID Service available in the Lower Tester. Each instance contains one or more instances of the Report characteristic.

- Test Procedure
  The Upper Tester issues a command to the IUT to discover characteristics using the handle ranges returned after running HOGP/RH/HGDS/BV-01-I above. There are two alternatives:

  1. Execute the procedure included in GATT.TS [6] Discover All Characteristics of a Service, GATT/CL/GAD/BV-04-C once for each HID Service instance, with the handle ranges specified in initial conditions.
2. Execute the procedure included in GATT.TS [6] Discover Characteristics by UUID, GATT/CL/GAD/BV-05-C once for each HID Service instance, with the characteristic UUID set to «Report» with the database specified in [8].
• **Expected Outcome**

**Pass verdict**

The IUT sends correctly formatted `ATT_Read_By_Type_Requests` to the Lower Tester.

The IUT receives the `ATT_Read_By_Type_Responses` from the Lower Tester and reports the attribute handle-value pair for each discovered Report characteristic discovered to the Upper Tester.

Each attribute handle-value pair returned matches a Report characteristic attribute handle-value pair implemented in the Lower Tester.

### 4.5.4 HOGP/RH/HGDC/BV-04-I [Discover Report Characteristic Client Characteristic Configuration Descriptors]

• **Test Purpose**

Verify that the Client Characteristic Configuration characteristic descriptors for all Report characteristics can be discovered by a Report Host IUT.

• **Reference**

[4] 4.6.1.2

• **Initial Condition**

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.
The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8].

The IUT has executed HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] and has saved the handle range for each instance of the HID Service and the handles for each instance of the Report characteristic available in the Lower Tester. At least one HID Service instance has at least one instance of the Report characteristic, and each instance of the Report characteristic may have one and only one Client Characteristic Configuration Descriptor.

- **Test Procedure**

  The Upper Tester issues a command to the IUT to Discover All Characteristic Descriptors using the handle ranges returned after running HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] above.

  The IUT executes one pass of the procedure included in GATT.TS [6] *Discover all Characteristic Descriptors*, GATT/CL/GAD/BV-06-C, for each instance of the Report characteristic, using the handle ranges specified in initial conditions.

- **Expected Outcome**

  **Pass verdict**

  The IUT sends *ATT_Find_Information_Requests* to the Lower Tester until all Client Characteristic Configuration Descriptors of all Report characteristics are found.

  All attribute handle/UUID pairs are returned with UUID = «Client Characteristic Configuration» and matching attribute handle for each Client Characteristic Configuration characteristic descriptor of each Report characteristic implemented in the Lower Tester.
4.5.5 HOGP/RH/HGDC/BV-05-I [Discover Report Characteristic Report Reference Characteristic Descriptors]

- **Test Purpose**
  Verify that all Report Reference characteristic descriptors for all Report characteristics can be discovered by a Report Host IUT.

- **Reference**
  [4] 4.6.1.2

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.
  The IUT and Lower Tester have bonded following GAP procedures.
  The Lower Tester has two instances of the HID Service [8].
  The IUT has executed HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] and has saved the handle range for each instance of the HID Service and each instance of the Report characteristic available in the Lower Tester. At least one HID Service instance has at least one instance of the Report characteristic, and each instance of the Report characteristic has one and only one Report Reference characteristic descriptor. Each Report Reference characteristic descriptor contains a Report ID and Report Type field.

- **Test Procedure**
  The Upper Tester issues a command to the IUT to Discover All Characteristic Descriptors using the handle ranges returned after running HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] above.
  The IUT executes one pass of the procedure included in GATT.TS [6] Discover all Characteristic Descriptors, GATT/CL/GAD/BV-06-C, for each instance of the Report characteristic, using the handle ranges specified in initial conditions.
• Expected Outcome

**Pass verdict**

The IUT sends `ATT_Find_Information_Requests` to the Lower Tester until all Report Reference characteristic descriptors of all Report characteristics are found.

All attribute handle/UUID pairs are returned with UUID = «Report Reference» and matching attribute handle for each Report Reference characteristic descriptor of each Report characteristic implemented in the Lower Tester.

The Report ID and Report Type values in each Report Reference characteristic descriptor match the values implemented in the Lower Tester.

### 4.5.6 HOGP/RH/HGDC/BV-06-I [Discover HID Information Characteristics]

• **Test Purpose**

Verify that all HID Information characteristics can be discovered by a Report Host IUT.

• **Reference**

[4] 4.6.1.4

• **Initial Condition**

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.
The Lower Tester has two instances of the HID Service [8].

The IUT has executed HOGP/RH/HGDS/BV-01-I and has saved the handle ranges for each instance of the HID Service available in the Lower Tester. Each instance contains one and only one instance of the HID Information characteristic.

- **Test Procedure**

  The Upper Tester issues a command to the IUT to discover characteristics using the handle ranges returned after running HOGP/RH/HGDS/BV-01-I. There are two alternatives:

  1. Execute the procedure included in GATT.TS [6] Discover All Characteristics of a Service, GATT/CL/GAD/BV-04-C once for each HID Service instance, with the handle ranges specified in initial conditions.

  2. Execute the procedure included in GATT.TS [6] Discover Characteristics by UUID, GATT/CL/GAD/BV-05-C once for each HID Service instance, with the characteristic UUID set to «HID Information», with the database specified in [8].
• **Expected Outcome**

**Pass verdict**

The IUT sends correctly formatted `ATT_Read_By_Type_Requests` to the Lower Tester.

The IUT receives the `ATT_Read_By_Type_Responses` from the Lower Tester and reports the attribute handle-value pair for each HID Information characteristic discovered to the Upper Tester.

Each attribute handle-value pair returned matches a HID Information characteristic attribute handle-value pair implemented in the Lower Tester.

4.5.7 **HOGP/RH/HGDC/BV-07-I [Discover HID Control Point Characteristics]**

• **Test Purpose**

Verify that all HID Control Point characteristics can be discovered by a Report Host IUT.

• **Reference**

[4] 4.6.1.3

• **Initial Condition**

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8].
The IUT has executed HOGP/RH/HGDS/BV-01-I and has saved the handle range for each instance of the HID Service available in the Lower Tester. Each instance contains one and only one instance of the HID Control Point characteristic.

- **Test Procedure**

The Upper Tester issues a command to the IUT to discover characteristics using the handle ranges returned after running HOGP/RH/HGDS/BV-01-I above. There are two alternatives:

1. Execute the procedure included in GATT.TS [6] *Discover All Characteristics of a Service*, GATT/CL/GAD/BV-04-C once for each HID Service instance, with the handle ranges specified in initial conditions.

2. Execute the procedure included in GATT.TS [6] *Discover Characteristics by UUID*, GATT/CL/GAD/BV-05-C once for each HID Service instance, with the characteristic UUID set to «HID Control Point», with the database specified in [8].
• Expected Outcome

Pass verdict

The IUT sends correctly formatted ATT_Read_By_Type_Requests to the Lower Tester.

The IUT receives the ATT_Read_By_Type_Responses from the Lower Tester and reports the attribute handle-value pairs for each HID Control Point characteristic discovered to the Upper Tester.

Each attribute handle-value pair returned matches a HID Control Point characteristic attribute handle-value pair implemented in the Lower Tester.

4.5.8 [Discover Protocol Mode Characteristics]

• Test Case ID(s)

HOGP/RH/HGDC/BV-08-I

HOGP/BH/HGDC/BV-08-I

• Test Purpose

Verify that all Protocol Mode characteristics can be discovered by a HID Host IUT.

• Reference

[4] 4.6.1.5

• Initial Condition
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8].

The IUT has executed either HOGP/RH/HGDS/BV-01-I or HOGP/BH/HGDS/BV-01-I and has saved the handle range for each instance of the HID Service available in the Lower Tester. Each instance contains one and only one instance of the Protocol Mode characteristic.

- Test Procedure

The Upper Tester issues a command to the IUT to discover characteristics using the handle ranges returned after running either HOGP/RH/HGDS/BV-01-I or HOGP/BH/HGDS/BV-01-I above. There are two alternatives:

1. Execute the procedure included in GATT.TS [6] Discover All Characteristics of a Service, GATT/CL/GAD/BV-04-C once for each HID Service instance, with the handle ranges specified in initial conditions.

2. Execute the procedure included in GATT.TS [6] Discover Characteristics by UUID, GATT/CL/GAD/BV-05-C once for each HID Service instance, with the characteristic UUID set to «Protocol Mode», with the database specified in [8].
4.5.9 HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic]

- **Test Purpose**
  Verify that the HID Boot Keyboard Input Report characteristic can be discovered by a Boot Host IUT.

- **Reference**
  [4] 4.4.1.2

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.
The Lower Tester has two instances of the HID Service [8].

The IUT has executed HOGP/BH/HGDS/BV-01-I and has saved the handle ranges for each instance of the HID Service available in the Lower Tester. One instance of the HID Service contains one and only one instance of the HID Boot Keyboard Input Report characteristic.

- Test Procedure

The Upper Tester issues a command to the IUT to discover characteristics. There are two alternatives:

1. Execute the procedure included in GATT.TS [6] Discover All Characteristics of a Service, GATT/CL/GAD/BV-04-C once for each HID Service instance, with the handle ranges specified in initial conditions.

   ATT_Bearer established over LE transport. HOGP/BH/HGDS/BV-01-I has been executed.
   ![Diagram]

   ATT_Read_By_Type_Request
   (Code = 0x08, 1st Handle, end Handle, Type=, <<Characteristic>>)
   ATT_Read_By_Type_Resp.
   (Code = 0x09, Length, Sets of handle-value pairs)

   DiscServiceChar
   (service handle range)

   ATT_Read_By_Type_Request
   (Code = 0x08, 1st Handle, end Handle, Type=, <<Characteristic>>)
   ATT_Read_By_Type_Resp.
   (Code = 0x09, Length, Sets of handle-value pairs)

   DiscServiceChar
   (handle/characteristic list)

   ATT_Read_By_Type_Request
   (Code = 0x08, 1st Handle, end Handle, Type=, <<Characteristic>>)
   ATT_Read_By_Type_Resp.
   (Code = 0x09, Length, Sets of handle-value pairs)

   DiscServiceChar
   (service handle range)

   ATT_Read_By_Type_Request
   (Code = 0x08, 1st Handle, end Handle, Type=, <<Characteristic>>)
   ATT_Read_By_Type_Resp.
   (Code = 0x09, Length, Sets of handle-value pairs)

2. Execute the procedure included in GATT.TS [6] Discover Characteristics by UUID, GATT/CL/GAD/BV-05-C once for each HID Service instance, with the characteristic UUID set to «Boot Keyboard Input Report», with the database specified in [8].
• Expected Outcome

**Pass verdict**
The IUT sends a correctly formatted `ATT_Read_By_Type_Request` to the Lower Tester.

The IUT receives the `ATT_Read_By_Type_Response` from the Lower Tester.

One attribute handle-value pair is returned and matches the Boot Keyboard Input Report characteristic attribute handle-value pair implemented in the Lower Tester.

4.5.10 HOGP/BH/HGDC/BV-10-I [Discover Boot Keyboard Input Report Client Characteristic Configuration Descriptor]

• Test Purpose
Verify that the Client Characteristic Configuration characteristic descriptors for the Boot Keyboard Input Report characteristic can be discovered by a Boot Host IUT.

• Reference

• Initial Condition
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.
The Lower Tester has two instances of the HID Service [8]. One HID Service instance has one and only instance of the Boot Keyboard Input Report characteristic, and the instance of the Boot Keyboard Input Report characteristic has one and only one Client Characteristic Configuration Descriptor.

The IUT may have executed HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic] and saved the handle ranges for the instance of the Boot Keyboard Input Report characteristic available in the Lower Tester.

If the IUT has not executed HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic], it must have executed HOGP/BH/HGRF/BV-13-I [Read Boot Keyboard Input Report Characteristic] and saved the handle range for the instance of the Boot Keyboard Input Report characteristic available in the Lower Tester.

- **Test Procedure**

  The Upper Tester issues a command to the IUT to Discover All Characteristic Descriptors using the handle range returned after running HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic] or HOGP/BH/HGRF/BV-13-I [Read Boot Keyboard Input Report Characteristic] above.

  The IUT executes one pass of the procedure included in GATT.TS [6] Discover all Characteristic Descriptors, GATT/CL/GAD/BV-06-C for the instance of the Boot Keyboard Input Report characteristic, using the handle range specified in initial conditions.

  ![Diagram of ATT Find Information Request/Response procedure](image)

  - **Expected Outcome**

    **Pass verdict**

    The IUT sends ATT _Find Information Requests _to the Lower Tester until the Client Characteristic Configuration Descriptor of the Boot Keyboard Input Report characteristics is found.
One attribute handle/UUID pair is returned with UUID = «Client Characteristic Configuration» and matching attribute handle for each Client Characteristic Configuration characteristic descriptor of the Boot Keyboard Input Report characteristic implemented in the Lower Tester.

### 4.5.11 HOGP/BH/HGDC/BV-11-I [Discover Boot Keyboard Output Report Characteristic]

- **Test Purpose**
  Verify that the Boot Keyboard Output Report characteristic can be discovered by a Boot Host IUT.

- **Reference**
  [4] 4.4.1.3

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. One instance of the HID Service contains one and only one instance of the HID Boot Keyboard Output Report characteristic.

  The IUT has executed HOGP/BH/HGDS/BV-01-I and has saved the handle ranges for each instance of the HID Service available in the Lower Tester.

- **Test Procedure**
  The Upper Tester issues a command to the IUT to discover characteristics. There are two alternatives:

  1. Execute the procedure included in GATT.TS [6] *Discover All Characteristics of a Service*, GATT/CL/GAD/BV-04-C once for each HID Service instance, with the handle ranges specified in initial conditions.

- **Expected Outcome**
Pass verdict

The IUT sends a correctly formatted ATT_Read_By_Type_Request to the Lower Tester.

The IUT receives the ATT_Read_By_Type_Response from the Lower Tester.

One attribute handle-value pair is returned and matches the Boot Keyboard Output Report characteristic attribute handle-value pair implemented in the Lower Tester.

4.5.12 HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic]

- **Test Purpose**
  Verify that the Boot Mouse Input Report characteristic can be discovered by a Boot Host IUT.

- **Reference**
  [4] 4.4.1.4

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8].

  The IUT has executed HOGP/BH/HGDS/BV-01-I and has saved the handle ranges for each instance of the HID Service available in the Lower Tester. One instance of the HID Service contains one instance of the HID Boot Mouse Input Report characteristic.

- **Test Procedure**
  The Upper Tester issues a command to the IUT to discover characteristics. There are two alternatives:

  1. Execute the procedure included in GATT.TS [6] Discover All Characteristics of a Service, GATT/CL/GAD/BV-04-C once for each HID Service instance, with the handle ranges specified in initial conditions.
2. Execute the procedure included in GATT.TS [6] Discover Characteristics by UUID, GATT/CL/GAD/BV-05-C once for each HID Service instance, with the characteristic UUID set to «Boot Mouse Input Report», with the database specified in [8].

- **Expected Outcome**
Pass verdict

The IUT sends a correctly formatted `ATT_Read_By_Type_Request` to the Lower Tester.

The IUT receives the `ATT_Read_By_Type_Response` from the Lower Tester.

One attribute handle-value pair is returned and matches the Boot Mouse Input Report characteristic attribute handle-value pair implemented in the Lower Tester.

4.5.13 HOGP/BH/HGDC/BV-13-I [Discover Boot Mouse Input Report Client Characteristic Configuration Descriptor]

- Test Purpose
  Verify that the Client Characteristic Configuration characteristic descriptor for the Boot Mouse Input Report characteristic can be discovered by a Boot Host IUT.

- Reference
  [4] 4.4.1.4

- Initial Condition
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. One HID Service instance has one instance of the Boot Mouse Input Report characteristic, and the instance of the Boot Mouse Input Report characteristic has one Client Characteristic Configuration Descriptor.

  The IUT may have executed HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic] and saved the handle range for the instance of the Boot Mouse Input Report characteristic available in the Lower Tester.

  If the IUT has not executed HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic], it must have executed HOGP/BH/HGDC/BV-16-I and saved the handle range for the instance of the Boot Mouse Input Report characteristic available in the Lower Tester.

- Test Procedure
  The Upper Tester issues a command to the IUT to Discover All Characteristic Descriptors using the handle range returned after running HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic] or HOGP/BH/HGDC/BV-16-I above.

  The IUT executes one pass of the procedure included in GATT.TS [6] Discover all Characteristic Descriptors, GATT/CL/GAD/BV-06-C for each HID Service instance, using the handle range specified in initial conditions.
• Expected Outcome

**Pass verdict**

The IUT sends `ATT_Find_Information_Requests` to the Lower Tester until the Client Characteristic Configuration Descriptor of the Boot Mouse Input Report characteristics is found.

One attribute handle/UUID pair is returned with UUID = «Client Characteristic Configuration» and matching attribute handle for the Client Characteristic Configuration characteristic descriptor of the Boot Mouse Input Report characteristic implemented in the Lower Tester.

### 4.5.14 [Discover Battery Level Characteristics]

- **Test Case ID(s)**

  **HOGP/RH/HGDC/BV-14-I**
  **HOGP/BH/HGDC/BV-14-I**

- **Test Purpose**

  Verify that all Battery Level characteristics can be discovered by a HID Host IUT.

- **Reference**

  [4] 4.4.3.1, 4.6.3.1

- **Initial Condition**

  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.
The Lower Tester has two instances of the Battery Service [9].

The IUT has executed either HOGP/RH/HGDS/BV-02-I or HOGP/BH/HGDS/BV-02-I and has saved the handle range for all instances of the Battery Service available in the Lower Tester. Each instance contains a single instance of the Battery Level characteristic.

- **Test Procedure**

  The Upper Tester issues a command to the IUT to discover characteristics. There are two alternatives:

  1. Execute the procedure included in GATT.TS [6] *Discover All Characteristics of a Service*, GATT/CL/GAD/BV-04-C once, with the handle range specified in initial conditions.

     ![Diagram 1](image1.png)

     - **ATT Bearer established over LE transport**
     - Either HOGP/RH/HGDS/BV-02-I or HOGP/BH/HGDS/BV-02-I has been executed.
     - **ATT_Read_By_Type_Request**
       
       (Code = 0x08, 1st Handle, end Handle, Type=, <<Characteristic>>)
     - **ATT_Read_By_Type_Res.**
       
       (Code = 0x09, Length, Sets of handle-value pairs)

  2. Execute the procedure included in GATT.TS [6] *Discover Characteristics by UUID*, GATT/CL/GAD/BV-05-C once, with the characteristic UUID set to «Battery Level», with the handle range specified in initial conditions.

     ![Diagram 2](image2.png)

     - **ATT Bearer established over LE transport**
     - Either HOGP/RH/HGDS/BV-02-I or HOGP/BH/HGDS/BV-02-I has been executed.
     - **ATT_Read_By_Type_Request**
       
       (Code = 0x08, 1st Handle, end Handle, Type=, <<Characteristic>>)
     - **ATT_Read_By_Type_Res.**
       
       (Code = 0x09, Length, Sets of handle-value pairs)

- **Expected Outcome**
Pass verdict

The IUT sends a correctly formatted `ATT_Read_By_Type_Request` to the Lower Tester.

The IUT receives the `ATT_Read_By_Type_Response` from the Lower Tester.

The attribute handle-UUID pair returned matches the Battery Level characteristic attribute handle-UUID pair implemented in the Lower Tester.

4.5.15 [Discover Battery Level Client Characteristic Configuration Descriptors]

- Test Case ID(s)
  
  **HOGP/RH/HGDC/BV-15-I**
  
  **HOGP/BH/HGDC/BV-15-I**

- Test Purpose

  Verify that the Client Characteristic Configuration characteristic descriptors for all Battery Level characteristics can be discovered by a HID Host IUT.

- Reference

  [4] 4.4.3.1, 4.6.3.1

- Initial Condition

  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the Battery Service [9].

  The IUT may have executed either `HOGP/RH/HGDS/BV-02-I` or `HOGP/BH/HGDS/BV-02-I` and saved the handle range for each instance of the Battery Service available in the Lower Tester.

  If the IUT has not executed neither `HOGP/RH/HGDS/BV-02-I` nor `HOGP/BH/HGDS/BV-02-I`, it must have executed either `HOGP/RH/HGRF/BV-10-I` or `HOGP/BH/HGRF/BV-10-I` and saved the handle ranges for all Battery Level characteristics.

- Test Procedure

  The Upper Tester issues a command to the IUT to Discover All Characteristic Descriptors using the handle ranges returned after executing either `HOGP/RH/HGDS/BV-02-I` or `HOGP/BH/HGDS/BV-02-I` or either `HOGP/RH/HGRF/BV-10-I` or `HOGP/BH/HGRF/BV-10-I` above.

  The IUT executes one pass of the procedure included in GATT.TS [6] Discover all Characteristic Descriptors, GATT/CL/GAD/BV-06-C using the handle range specified in initial conditions.
• Expected Outcome

Pass verdict

One attribute handle/UUID pair is returned with UUID = "Client Characteristic Configuration" and a matching attribute handle for the Client Characteristic Configuration characteristic descriptor of each of the Battery Level characteristics implemented in the Lower Tester.

4.5.16 [Discover PnP ID Characteristic]

• Test Case ID(s)

HOGP/RH/HGDC/BV-16-I

HOGP/BH/HGDC/BV-16-I

• Test Purpose

Verify that the PnP ID characteristic can be discovered by a HID Host IUT.

• Reference

[4] 4.5.2, 4.6.2.1

• Initial Condition

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has a single instance of the Device Information Service [10].
The IUT has executed either HOGP/RH/HGDS/BV-03-I or HOGP/BH/HGDS/BV-03-I and has saved the handle range for the instance of the Device Information Service available in the Lower Tester. That instance contains a single instance of the PnP ID characteristic.

• Test Procedure

The Upper Tester issues a command to the IUT to discover characteristics using the handle range returned after running either HOGP/RH/HGDS/BV-03-I or HOGP/BH/HGDS/BV-03-I above. There are two alternatives:


• Expected Outcome

Pass verdict

The IUT sends a correctly formatted ATT_Read_By_Type_Request to the Lower Tester.
The IUT receives the `ATT_Read_By_Type_Response` from the Lower Tester and reports the attribute handle-value-pair for each Device Information characteristic discovered to the Upper Tester, including one and only one attribute handle-UUID pair that matches the PnP ID characteristic attribute handle-UUID pair implemented in the Lower Tester.

### 4.6 Read Features

The procedures defined in this test group verify IUT implementation of the Read Features defined in the HID over GATT Profile Specification [4] by a HID Host IUT, a Report Host IUT, and a Boot Host IUT.

#### 4.6.1 HOGP/RH/HGFR/BV-01-I [Read Report Map Characteristics]

- **Test Purpose**
  
  Verify that all Report Map characteristics can be read by a Report Host IUT.

- **Reference**
  

- **Initial Condition**
  
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  ATT_MTU has been exchanged between the IUT and Lower Tester.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. Each instance contains a single instance of the Report Map characteristic.

  The IUT has executed HOGP/RH/HGDC/BV-01-I [Discover Report Map Characteristics] and has saved the attribute handle for each instance of the Report Map characteristic available in the Lower Tester.

- **Test Procedure**
  
  The Upper Tester issues a command to the IUT to read characteristics. There are two alternatives:

  1. If the length of the Report Map characteristic value is less than ATT_MTU, execute the procedure included in GATT.TS [6] `Read Characteristic Value`, GATT/CL/GAR/BV-01-C once for each HID Service instance, with the handles specified in initial conditions.
ATT Bearer established over LE transport.
HOGP/RH/HGDC/BV-01-I has been executed.
ATT_MTU has been exchanged between IUT and Lower Tester.

ATT_Read_Request
(Code = 0x0A, Handle)

ATT_Read_Response.
(Code = 0x0B, value)

ATT_Bearer established over LE transport.
HOGP/RH/HGDC/BV-01-I has been executed.
ATT_MTU has been exchanged between the IUT and Lower Tester.

ATT_Bearer established over LE transport.
HOGP/RH/HGDC/BV-01-I has been executed.
ATT_MTU has been exchanged between the IUT and Lower Tester.

2. If the length of the Report Map characteristic value is greater than ATT_MTU, execute the
once for each HID Service instance, with the handle specified in initial conditions.

Read 1st Blob
ATT_Read_Blob_Request
(Code = 0x0C, handle, Offset = 0x0000)

ATT_Read_Blob_Response

Read Next Blob
ATT_Read_Blob_Request
(Code = 0x0C, handle, Offset = last+Nx(ATT_MTU-1))

ATT_Read_Blob_Response
(Code = 0x0D, part attribute value)

ATT_Error_Response
(Code = 0x01, 0x0C, handle, Error Code = 0x07)

ALT 1: full size blob

ALT 2: smaller size (last) blob

ALT 3: no blob

Expected Outcome

Pass verdict

The IUT sends correctly formatted ATT_Read_Blob_Request commands to the Lower Tester
containing the handle value specified by the Upper Tester.

Note: The first request may be an ATT_Read_Request; in that case the Lower Tester shall reply with
an ATT_Read_Response, and, if the characteristic value length is greater than ATT_MTU, IUT shall
detect that the characteristic value is long, and continue with ATT_Read_Blob_Requests.
The \textit{ATT\_Read\_Blob\_Request} specifies the handle of the characteristic value to be read and the offset value of the first octet to be read. The offset for the first request is 0x0000; subsequent offset values are sequential values of N\times(\text{ATT\_MTU}-1). The IUT shall detect the end of the long characteristic value in either of two ways:

- ALT2: Detect the size of the last part attribute value is less than [ATT\_MTU-1].
- ALT3: Detect an error response of Invalid Offset, indicating that it has read the complete characteristic value.

The complete Report Map characteristic value reported to the Upper Tester matches the value implemented in the Lower Tester.

\subsection*{4.6.2 HOGP/RH/HGRF/BV-02-I [Read External Report Reference Characteristic Descriptors for Report Map Characteristics]}

\begin{itemize}
  \item Test Purpose
  \begin{itemize}
    \item Verify that all External Report Reference characteristic descriptors for all Report Map characteristics can be read by a Report Host IUT.
  \end{itemize}
  \item Reference
  \begin{itemize}
    \item [4] 4.7
    \item [8] 2.6.3.1
  \end{itemize}
  \item Initial Condition
  \begin{itemize}
    \item Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.
  \end{itemize}
  \begin{itemize}
    \item The IUT and Lower Tester have bonded following GAP procedures.
  \end{itemize}
  \begin{itemize}
    \item The Lower Tester has two instances of the HID Service \cite{8} and one non-HID Service instance with a characteristic whose value is described within the Report Map characteristic value. Each HID Service instance contains a single instance of the Report Map characteristic. One instance of the Report Map characteristic descriptor contains one instance of the External Report Reference characteristic descriptor. Each characteristic UUID contained within the External Report Reference characteristic descriptors matches a non-HID Service characteristic UUID.
  \end{itemize}
  \begin{itemize}
    \item The IUT has executed \textbf{HOGP/RH/HGDC/BV-01-I [Discover Report Map Characteristics]} and has saved the attribute handle for each instance of the Report Map characteristic available in the Lower Tester.
  \end{itemize}
  \begin{itemize}
    \item The IUT has executed \textbf{HOGP/RH/HGDC/BV-02-I [Discover External Report Reference Characteristic Descriptors for Report Map Characteristics]} and has saved the attribute handle for each instance of the External Report Reference characteristic descriptor available in the Lower Tester.
  \end{itemize}
  \item Test Procedure
  \begin{itemize}
    \item The Upper Tester issues a command to the IUT to read characteristic descriptors.
  \end{itemize}
\end{itemize}

The IUT sends correctly formatted ATT_Read_Request commands to the Lower Tester containing the handle values specified by the Upper Tester.

The IUT receives correctly formatted ATT_Read_Responses to the Upper Tester for each instance of the External Report Reference characteristic descriptor.

The complete characteristic descriptors reported to the Upper Tester match the values implemented in the Lower Tester.

4.6.3 HOGP/RH/HGRF/BV-03-I [Read Report Characteristics – Input Report]

- Test Purpose
  Verify that all Report characteristics with a Report Type of Input Report can be read by a Report Host IUT.

- Reference
  [4] 4.8
  [8] 2.5.2

- Initial Condition
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  ATT_MTU has been exchanged between the IUT and Lower Tester
The IUT and Lower Tester have bonded following GAP procedures.


The IUT has executed HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] and has saved the attribute handle for each instance of the Report characteristic available in the Lower Tester.

The IUT has executed HOGP/RH/HGDC/BV-05-I [Discover Report Characteristic Report Reference Characteristic Descriptors] and has saved the attribute handle for each instance of the Report Reference characteristic descriptor available in the Lower Tester.

- Test Procedure

The Upper Tester issues a command to the IUT to read characteristics. There are two alternatives:

1. If the length of the Report characteristic value is less than ATT_MTU, execute the procedure included in GATT.TS [6] Read Characteristic Value, GATT/CL/GAR/BV-01-C once for each Report characteristic, with the handle for the Report characteristic specified in initial conditions.

If the length of the Report characteristic value is greater than ATT_MTU, execute the procedure included in GATT.TS [6] Read Long Characteristic Value, GATT/CL/GAR/BV-04-C once for each Report characteristic, with the handle for the Report characteristic specified in initial conditions.
• Expected Outcome

Pass verdict

The IUT sends correctly formatted ATT_Read_Blob_Request commands to the Lower Tester containing the handle specified by the Upper Tester.

Note: The first request may be an ATT_Read_Request; in that case the Lower Tester shall reply with an ATT_Read_Response, and, if the characteristic value length is greater than ATT_MTU, IUT shall detect that the characteristic value is long, and continue with ATT_Read_Blob_Requests.

The ATT_Read_Blob_Request specifies the handle of the characteristic value to be read and the offset value of the first octet to be read. The offset for the first request is 0x0000; subsequent offset values are sequential values of Nx(ATT_MTU-1). The IUT shall detect the end of the long characteristic value in either of two ways:

- ALT2: Detect the size of the last part attribute value is less than [ATT_MTU-1].
- ALT3: Detect an error response of Invalid Offset, indicating that it has read the complete characteristic value.

Each complete Report characteristic value reported to the Upper Tester matches the value implemented in the Lower Tester.

- Test Purpose
  Verify that all Report Reference characteristic descriptors for all Report characteristics of Report Type: Input Report can be read by a Report Host IUT.

- Reference
  [4] 4.8
  [8] 2.5.3.2

- Initial Condition
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.
  The IUT and Lower Tester have bonded following GAP procedures.
  The IUT has executed HOGP/RH/HGRF/BV-03-I [Read Report Characteristics – Input Report] and has saved the attribute handle for each instance of the Report characteristic and each instance of the Report Reference characteristic descriptor available in the Lower Tester.

- Test Procedure
  The Upper Tester issues a command to the IUT to read characteristic descriptors.
ATT Bearer established over LE transport.
HOGP/RH/HGRF/BV-03-I has been executed.
IUT has a valid handle for an attribute in the Lower Tester.

**Expected Outcome**

**Pass verdict**

The IUT sends correctly formatted `ATT_Read_Request` commands to the Lower Tester containing the handle values specified by the Upper Tester.

The IUT receives correctly formatted `ATT_Read_Response` to the Upper Tester for each instance of the Report Reference characteristic descriptor.

The Report Type field of each Report Reference characteristic descriptor reported to the Upper Tester matches the value for Report Type=Input Report, and matches the values implemented in the Lower Tester.

### 4.6.5 HOGP/RH/HGRF/BV-05-I [Read Client Characteristic Configuration Descriptors for Report Characteristics – Input Report]

**Test Purpose**

Verify that all Client Characteristic Configuration characteristic descriptors for all Report characteristics of Report Type: Input Report can be read by a Report Host IUT.

**Reference**

[4] 4.8

[8] 2.5.3.1

**Initial Condition**

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.
The Lower Tester has two instances of the HID Service [8]. Each HID Service instance contains one instance of the Report characteristic. Each instance of the Report characteristic contains one and only one instance of the Client Characteristic Configuration characteristic descriptor.

The IUT has executed HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] and has saved the attribute handle for each instance of the Report characteristic available in the Lower Tester.

The IUT has executed HOGP/RH/HGDC/BV-04-I [Discover Report Characteristic Client Configuration Descriptors] and has saved the attribute handle for each instance of the Client Characteristic Configuration characteristic descriptor for the Report characteristics available in the Lower Tester.

The IUT has executed HOGP/RH/HGDC/BV-05-I [Discover Report Characteristic Report Reference Descriptors] and has saved the attribute handle for each instance of the Report Reference characteristic descriptor where the Report Type defined in the Report Reference characteristic descriptor is an Input Report available in the Lower Tester.

• Test Procedure

The Upper Tester issues a command to the IUT to read characteristic descriptors.


• Expected Outcome

Pass verdict

The IUT sends correctly formatted ATT_Read_Request commands to the Lower Tester containing the attribute handle values specified by the Upper Tester.

The IUT receives correctly formatted ATT_Read_Reponses to the Upper Tester for each instance of the Client Characteristic Configuration characteristic descriptor.
The attribute value field of each Client Characteristic Configuration characteristic descriptor reported to the Upper Tester matches the values implemented in the Lower Tester.


- **Test Purpose**
  Verify that all Report characteristics with a Report Type of Output Report can be read by a Report Host IUT.

- **Reference**
  [4] 4.8
  [8] 2.5.2

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.
  
  ATT_MTU has been exchanged between the IUT and Lower Tester.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. At least one HID Service instance contains at least one instance of the Report characteristic with a single instance of the Report Reference characteristic descriptor. The HID Report is an Output Report as described via the Report Reference characteristic descriptor.

  The IUT has executed HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] and has saved the attribute handle for each instance of the Report characteristic available in the Lower Tester.

  The IUT has executed HOGP/RH/HGDC/BV-04-I [Discover Report Characteristic Client Characteristic Configuration Descriptors] and has saved the attribute handle for each instance of the Report Reference characteristic descriptor available in the Lower Tester.

- **Test Procedure**
  The Upper Tester issues a command to the IUT to read characteristics. There are two alternatives:

  1. If the length of the HID Report characteristic value is less than ATT_MTU, execute the procedure included in GATT.TS [6] Read Characteristic Value, GATT/CL/GAR/BV-01-C once for each Report characteristic, with the handles for the Report characteristic specified in initial conditions.
2. If the length of the HID Report characteristic value is greater than ATT_MTU, execute the procedure included in GATT.TS [6] Read Long Characteristic Value, GATT/CL/GAR/BV-04-C once for each Report characteristic, with the handle for the Report characteristic specified in initial conditions.

• Expected Outcome
Pass verdict
The IUT sends correctly formatted ATT_Read_Blob_Request commands to the Lower Tester containing the handle specified by the Upper Tester.

Note: The first request may be an ATT_Read_Request; in that case the Lower Tester shall reply with an ATT_Read_Response, and, if the characteristic value length is greater than ATT_MTU, IUT shall detect that the characteristic value is long, and continue with ATT_Read_Blob_Requests.

The ATT_Read_Blob_Request specifies the handle of the characteristic value to be read and the offset value of the first octet to be read. The offset for the first request is 0x0000; subsequent offset values are sequential values of Nx(ATT_MTU-1). The IUT shall detect the end of the long characteristic value in either of two ways:

- ALT2: Detect the size of the last part attribute value is less than [ATT_MTU-1].
- ALT3: Detect an error response of Invalid Offset, indicating that it has read the complete characteristic value.

Each complete Report characteristic value reported to the Upper Tester matches the value implemented in the Lower Tester.


- Test Purpose
  Verify that all Report Reference characteristic descriptors for all Report characteristics of Report Type: Output Report can be read by a Report Host IUT.

- Reference
  [4] 4.8
  [8] 2.5.3.2

- Initial Condition
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.


The IUT has executed HOGP/RH/HGRF/BV-19-I [Read Report Characteristics – Output Report] and has saved the attribute handle for each instance of the Report characteristic and each instance of the Report Reference characteristic descriptor available in the Lower Tester.

- Test Procedure
  The Upper Tester issues a command to the IUT to read characteristic descriptors.

**Expected Outcome**

**Pass verdict**

The IUT sends correctly formatted ATT_Read_Request commands to the Lower Tester containing the handle values specified by the Upper Tester.

The IUT receives correctly formatted ATT_Read_Responses to the Upper Tester for each instance of the Report Reference characteristic descriptor.

The Report Type field of each Report Reference characteristic descriptor reported to the Upper Tester matches the value for Report Type= Output Report, and matches the values implemented in the Lower Tester.

### 4.6.8 HOGP/RH/HGRF/BV-07-I [Read Report Characteristics – Feature Report]

**Test Purpose**

Verify that all Report characteristics with a Report Type of Feature Report can be read by a Report Host IUT.

**Reference**

[4] 4.8

[8] 2.5.2

**Initial Condition**

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.
ATT_MTU has been exchanged between the IUT and Lower Tester.

The IUT and Lower Tester have bonded following GAP procedures.


The IUT has executed HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] and has saved the attribute handle for each instance of the Report characteristic available in the Lower Tester.

The IUT has executed HOGP/RH/HGDC/BV-04-I [Discover Report Characteristic Client Characteristic Configuration Descriptors] and has saved the attribute handle for each instance of the Report Reference characteristic descriptor available in the Lower Tester.

- **Test Procedure**

  The Upper Tester issues a command to the IUT to read characteristics. There are two alternatives:

  1. If the length of the HID Report characteristic value is less than ATT_MTU, execute the procedure included in GATT.TS [6] Read Characteristic Value, GATT/CL/GAR/BV-01-C once for each Report characteristic, with the handle for the Report characteristic specified in initial conditions.

  2. If the length of the HID Report characteristic value is greater than ATT_MTU, execute the procedure included in GATT.TS [6] Read Long Characteristic Value, GATT/CL/GAR/BV-04-C once for each Report characteristic, with the handle for the Report characteristic specified in initial conditions.
• Expected Outcome

Pass verdict

The IUT sends correctly formatted ATT_Read_Blob_Request commands to the Lower Tester containing the handle specified by the Upper Tester.

Note: The first request may be an ATT_Read_Request; in that case the Lower Tester shall reply with an ATT_Read_Response, and if the characteristic value length is greater than ATT_MTU, the IUT shall detect that the characteristic value is long, and continue with ATT_Read_Blob_Requests.

The ATT_Read_Blob_Request specifies the handle of the characteristic value to be read and the offset value of the first octet to be read. The offset for the first request is 0x0000; subsequent offset values are sequential values of Nx(ATT_MTU - 1). The IUT shall detect the end of the long characteristic value in either of two ways:

- ALT2: Detect the size of the last part attribute value is less than [ATT_MTU - 1].
- ALT3: Detect an error response of Invalid Offset, indicating that it has read the complete characteristic value.

Each complete Report characteristic value reported to the Upper Tester matches the value implemented in the Lower Tester.

- **Test Purpose**
  Verify that all Report Reference characteristic descriptors for all Report characteristics of Report Type: Feature Report can be read by a Report Host IUT.

- **Reference**
  [4] 4.8
  [8] 2.5.3.2

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.


  The IUT has executed HOGP/RH/HGRF/BV-07-I [Read Report Characteristics – Feature Report] and has saved the attribute handle for each instance of the Report characteristic and each instance of the Report Reference characteristic descriptor available in the Lower Tester.

- **Test Procedure**
  The Upper Tester issues a command to the IUT to read characteristic descriptors.

ATT Bearer established over LE transport.
HOGP/RH/HGRF/RH/BV-07-I has been executed.
IUT has a valid handle for an attribute in the Lower Tester.

- Expected Outcome

Pass verdict

The IUT sends correctly formatted `ATT_Read_Request` commands to the Lower Tester containing the handle values specified by the Upper Tester.

The IUT receives correctly formatted `ATT_Read_Responses` to the Upper Tester for each instance of the Report Reference characteristic descriptor.

The Report Type field of each Report Reference characteristic descriptor reported to the Upper Tester matches the value for Report Type= Feature Report, and matches the values implemented in the Lower Tester.

4.6.10 HOGP/RH/HGRF/BV-09-I [Read HID Information Characteristics]

- Test Purpose

Verify that all HID Information characteristics can be read by a Report Host IUT.

- Reference

[4] 4.10

[8] 2.10

- Initial Condition

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. Each instance contains a single instance of the HID Information characteristic.
The IUT has executed HOGP/RH/HGDC/BV-06-I [Discover HID Information Characteristics] and has saved the attribute handle for each instance of the HID Information characteristic available in the Lower Tester.

- **Test Procedure**

  The Upper Tester issues a command to the IUT to read characteristics.

  Execute the procedure included in GATT.TS [6] Read Characteristic Value, GATT/CL/GAR/BV-01-C once for each HID Information instance, with the handles specified in initial conditions.

    - **Expected Outcome**

      **Pass verdict**

      The IUT sends correctly formatted ATT_Read_Requests to the Lower Tester, containing the attribute handle values specified by the Upper Tester.

      The IUT receives correctly formatted ATT_Read_Responses from the Lower Tester containing the values of all HID Information characteristics.

      Each complete HID Information characteristic value reported to the Upper Tester matches the values implemented in the Lower Tester for the bcdHID, bCountryCode and Flags fields.

**4.6.11 [Read Battery Level Characteristic]**

- **Test Case ID(s)**

  HOGP/RH/HGRF/BV-10-I

  HOGP/BH/HGRF/BV-10-I

- **Test Purpose**

  Verify that the Battery Level characteristic can be read by a HID Host IUT.

- **Reference**
• **Initial Condition**

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The Lower Tester has a single instance of the Battery Service [9]. That instance contains a single instance of the Battery Level characteristic.

The IUT may have executed either **HOGP/RH/HGDC/BV-14-I** or **HOGP/BH/HGDC/BV-14-I** and saved the attribute handle for the instance of the Battery Level characteristic available in the Lower Tester.

• **Test Procedure**

The Upper Tester issues a command to the IUT to read characteristics, there are two alternatives:

1. Execute the procedure included in GATT.TS [6] *Read Characteristic Value*, GATT/CL/GAR/BV-01-C once, with the handle returned after running either **HOGP/RH/HGDC/BV-14-I** or **HOGP/BH/HGDC/BV-14-I** above.

2. Execute the procedure included in GATT.TS [6] *Read Using Characteristic UUID*, GATT/CL/GAR/BV-03-C once, with the characteristic UUID set to «Battery Level».
ATT Bearer established over LE transport. ATT_MTU has been exchanged between IUT and Lower Tester.

**Expected Outcome**

**Pass verdict**

1. The IUT sends a correctly formatted `ATT_Read_Request` to the Lower Tester, containing the handle value specified by the Upper Tester. The IUT receives the `ATT_Read_Response` sent by the Lower Tester and sends the received response to the Upper Tester. The Battery Level characteristic value reported to the Upper Tester matches the value implemented in the Lower Tester.

2. The IUT sends a correctly formatted `ATT_Read_By_Type_Request` to the Lower Tester, containing the characteristic UUID for the Battery Level characteristic. The IUT receives the `ATT_Read_By_Type_Response` sent by the Lower Tester and sends the received response to the Upper Tester. The Battery Level characteristic value reported to the Upper Tester matches the value implemented in the Lower Tester.

**4.6.12 [Read Client Characteristic Configuration Descriptor for Battery Level Characteristic]**

- **Test Case ID(s)**
  
  **HOGP/RH/HGRF/BV-11-I**
  
  **HOGP/BH/HGRF/BV-11-I**

- **Test Purpose**
  
  Verify that the Client Characteristic Configuration characteristic descriptor for the Battery Level characteristic can be read by a HID Host IUT.

- **Reference**
  
  [4] 4.4.3, 4.15

  [9] 3.1.2.1

- **Initial Condition**
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The Lower Tester has a single instance of the Battery Service [9]. That instance contains a single instance of the Battery Level characteristic and a single instance of the Client Characteristic Configuration characteristic descriptor for the Battery Level characteristic.

The IUT has executed either HOGP/RH/HGDC/BV-15-I or HOGP/BH/HGDC/BV-15-I and has saved the attribute handle for the instance of the Client Characteristic Configuration characteristic descriptor for the Battery Level characteristic available in the Lower Tester.

- Test Procedure
  
  The Upper Tester issues a command to the IUT to read characteristics.


  ATT_Read_Request (Code = 0x0A, descriptor handle)
  ATT_Read_Response (Code = 0x0B, descriptor value)

- Expected Outcome
  
  Pass verdict

  The IUT sends a correctly formatted ATT_Read_Request to the Lower Tester, containing the handle value specified by the Upper Tester.

  The IUT receives the ATT_Read_Response from the Lower Tester and sends the received response to the Upper Tester.

  The value of the Client Characteristic Configuration characteristic descriptor for the Battery Level characteristic reported to the Upper Tester matches the value implemented in the Lower Tester.
4.6.13 [Read PnP ID Characteristic]

- Test Case ID(s)
  
  HOGP/RH/HGDF/BV-12-I
  
  HOGP/BH/HGDF/BV-12-I

- Test Purpose
  
  Verify that the PnP ID characteristic can be read by a HID Host IUT.

- Reference
  
  [4] 4.16
  
  [10] 3.9

- Initial Condition
  
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has a single instance of the Device Information Service [9]. That instance contains a single instance of the PnP ID characteristic.

  The IUT may have executed either HOGP/RH/HGDC/BV-16-I or HOGP/BH/HGDC/BV-16-I and saved the attribute handle for the instance of the PnP ID characteristic available in the Lower Tester.

- Test Procedure
  
  The Upper Tester issues a command to the IUT to read characteristics, there are two alternatives:

  1. Execute the procedure included in GATT.TS [6] Read Characteristic Value, GATT/CL/GAR/BV-01-C once, with the handle returned after running either HOGP/RH/HGDC/BV-16-I or HOGP/BH/HGDC/BV-16-I above.
2. Execute the procedure included in GATT.TS [6] Read Using Characteristic UUID, GATT/CL/GAR/BV-03-C once, with the characteristic UUID set to «PnP ID».

- Expected Outcome

Pass verdict

1. The IUT sends a correctly formatted ATT_Read_Request to the Lower Tester, containing the handle value specified by the Upper Tester. The IUT receives a correctly formatted ATT_Read_Response from the Lower Tester and reports the characteristic value of the PnP ID characteristic.

2. The IUT sends a correctly formatted ATT_Read_By_Type_Request to the Lower Tester, containing the characteristic UUID for the PnP ID characteristic. The IUT receives the ATT_Read_By_Type_Response sent by the Lower Tester and sends the received response to the Upper Tester. The PnP ID characteristic value reported to the Upper Tester matches the value implemented in the Lower Tester for the Vendor ID Source, Vendor ID, Product ID and Product Version fields.

4.6.14 HOGP/BH/HGRF/BV-13-I [Read Boot Keyboard Input Report Characteristic]

- Test Purpose
Verify that the Boot Keyboard Input Report characteristic can be read by a Boot Host IUT.

- Reference
  
  
  [8] 2.7.1

- Initial Condition
  
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The IUT has two instances of the HID Service [8]. One instance contains one and only one instance of the Boot Keyboard Input Report characteristic.

  The IUT may have executed HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic] and saved the attribute handle range for each HID Service instance, and the attribute handle for the instance of the Boot Keyboard Input Report characteristic available in the Lower Tester.

  If the IUT has not executed HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic], the IUT must have executed HOGP/BH/HGDS/BV-01-I and saved the handle range for each instance of the HID Service available in the Lower Tester.

- Test Procedure
  
  The Upper Tester issues a command to the IUT to read characteristics. There are two alternatives:

  1. If the IUT has executed HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic], execute the procedure included in GATT.TS [6] Read Characteristic Value, GATT/CL/GAR/BV-01-C once for each HID Service instance, with the handle specified in initial conditions.

  2. If the IUT has not executed HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic], execute the procedure included in GATT.TS [6] Read Using Characteristic UUID,
GATT/CL/GAR/BV-03-C once for each HID Service instance, with the characteristic UUID set to «Boot Keyboard Input Report», with the HID Service handle range specified in initial conditions.

- Expected Outcome
  
  **Pass verdict**

  1. The IUT sends a correctly formatted `ATT_Read_Request` to the Lower Tester and receives a correctly formatted `ATT_Read_Response`, and sends the response to the Upper Tester.

  Or:

  2. The IUT sends correctly formatted `ATT_Read_By_Type_Requests` to the Lower Tester and receives the `ATT_Read_By_Type_Responses` sent by the Lower Tester and sends the responses to the Upper Tester.

  The Boot Keyboard Input Report characteristic value returned matches the Boot Keyboard Input Report characteristic value implemented in the Lower Tester.

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### 4.6.15 HOGP/BH/HGRF/BV-14-I [Read Client Characteristic Configuration Descriptors for Boot Keyboard Input Report Characteristics]

- **Test Purpose**

  Verify that each Client Characteristic Configuration characteristic descriptor for the Boot Keyboard Input Report characteristic can be read by a Boot Host IUT.

- **Reference**


  [8] 2.7.3.1

- **Initial Condition**

  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.
The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. One instance of the HID Service has an instance of the Boot Keyboard Input Report characteristic and the instance of the Boot Keyboard Input Report characteristic has one and only one instance of the Client Characteristic Configuration Descriptor.

The IUT may have executed HOGP/BH/HGDC/BV-10-I [Discover Boot Keyboard Input Report Client Characteristic Configuration Descriptor] and saved the attribute handle for the instance of the Client Characteristic Configuration Descriptor for each Boot Keyboard Input Report characteristic available in the Lower Tester.

If the IUT has not executed HOGP/BH/HGDC/BV-10-I [Discover Boot Keyboard Input Report Client Characteristic Configuration Descriptor], it must have executed HOGP/BH/HGRF/BV-13-I [Read Boot Keyboard Input Report Characteristic] and saved the attribute handle for the instance of the Boot Keyboard Input Report characteristic available in the Lower Tester.

- Test Procedure

The Upper Tester issues a command to the IUT to read characteristic descriptors.

Execute the procedure included in GATT.TS [6] Read Characteristic Descriptors, GATT/CL/GAR/BV-01-C once for the instance of the Boot Keyboard Input Report characteristic, with the handle specified in initial conditions.

• Expected Outcome

**Pass verdict**

The IUT sends a correctly formatted ATT_Read_Request to the Lower Tester, containing the handle value specified by the Upper Tester.

The IUT receives the ATT_Read_Response from the Lower Tester and sends the received response to the Upper Tester.
The value of the Client Characteristic Configuration characteristic descriptor for the Boot Keyboard Input Report characteristic reported to the Upper Tester matches the value implemented in the Lower Tester.

### 4.6.16 HOGP/BH/HGRF/BV-15-I [Read Boot Keyboard Output Report Characteristic]

- **Test Purpose**
  Verify that the Boot Keyboard Output Report characteristic can be read by a Boot Host IUT.

- **Reference**
  [8] 2.8.1

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. One instance contains one and only one instance of the Boot Keyboard Output Report characteristic.

  The IUT may have executed HOGP/BH/HGDC/BV-11-I [Discover Boot Keyboard Output Report Characteristic] and saved the attribute handle range for each HID Service instance, and the attribute handle for the instance of the Boot Keyboard Output Report characteristic available in the Lower Tester.

  If the IUT has not executed HOGP/BH/HGDC/BV-11-I [Discover Boot Keyboard Output Report Characteristic], the IUT must have executed HOGP/BH/HGDS/BV-01-I and saved the handle range for each instance of the HID Service available in the Lower Tester.

- **Test Procedure**
  The Upper Tester issues a command to the IUT to read characteristics. There are two alternatives:

  1. If the IUT has executed HOGP/BH/HGDC/BV-11-I [Discover Boot Keyboard Output Report Characteristic], execute the procedure included in GATT.TS [6] *Read Characteristic Value*, GATT/CL/GAR/BV-01-C once for the Boot Keyboard Output Report instance, with the handle specified in initial conditions.
2. Execute the procedure included in GATT.TS [6] Read Using Characteristic UUID, GATT/CL/GAR/BV-03-C once for each HID Service instance, with the characteristic UUID set to «Boot Keyboard Output Report», with the HID Service handle range specified in initial conditions.

• Expected Outcome

Pass verdict

1. The IUT sends a correctly formatted ATT_Read_Request to the Lower Tester and receives correctly formatted ATT_Read_Response, and sends the response to the Upper Tester. Or:
2. The IUT sends correctly formatted ATT_Read_By_Type_Request to the Lower Tester and receives the ATT_Read_By_Type_Responses sent by the Lower Tester and sends the responses to the Upper Tester.

The Boot Keyboard Output Report characteristic values returned matches the Boot Keyboard Output Report characteristic values implemented in the Lower Tester.

4.6.17 HOGP/BH/HGRF/BV-16-I [Read Boot Mouse Input Report Characteristic]

• Test Purpose
Verify that the Boot Mouse Input Report characteristic can be read by a Boot Host IUT.

- Reference
  

- [8] 2.7.1

- Initial Condition

  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. One instance contains one instance of the Boot Mouse Input Report characteristic.

  The IUT may have executed HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic] and saved the attribute handle range for each HID Service instance, and the attribute handle for the instance of the Boot Mouse Input Report characteristic available in the Lower Tester.

  If the IUT has not executed HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic], the IUT must have executed HOGP/BH/HGDS/BV-01-I and saved the handle range for each instance of the HID Service available in the Lower Tester.

- Test Procedure

  The Upper Tester issues a command to the IUT to read characteristics. There are two alternatives:

  1. If the IUT has executed HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic], execute the procedure included in GATT.TS [6] Read Characteristic Value, GATT/CL/GAR/BV-01-C once for the Boot Mouse Input Report instance, with the handle specified in initial conditions.

  2. If the IUT has not executed HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic], execute the procedure included in GATT.TS [6] Read Using Characteristic UUID,
GATT/CL/GAR/BV-03-C once for each HID Service instance, with the characteristic UUID set to «Boot Mouse Input Report», with the HID Service handle range specified in initial conditions.

ATT Bearer established over LE transport. HOGP/BH/HGDS/BV-01-I has been executed.

- Expected Outcome

**Pass verdict**

1. The IUT sends a correctly formatted `ATT_Read_Request` to the Lower Tester and receives a correctly formatted `ATT_Read_Response`, sent by the Lower Tester and sends the response to the Upper Tester.

Or:

2. The IUT sends correctly formatted `ATT_Read_By_Type_Requests` to the Lower Tester and receives the `ATT_Read_By_Type_Responses` sent by the Lower Tester and sends the responses to the Upper Tester.

The Boot Mouse Input Report characteristic value returned matches the Boot Mouse Input Report characteristic value implemented in the Lower Tester.

### 4.6.18 HOGP/BH/HGFR/BV-17-I [Read Client Characteristic Configuration Descriptor for Boot Mouse Input Report Characteristic]

- **Test Purpose**

  Verify that the Client Characteristic Configuration characteristic descriptor for the Boot Mouse Input Report characteristic can be read by a Boot Host IUT.

- **Reference**


  [8] 2.7.3.1

- **Initial Condition**
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. One instance of the HID Service has an instance of the Boot Mouse Input Report characteristic and the instance of the Boot Mouse Input Report characteristic has one and only one instance of the Client Characteristic Configuration Descriptor.

The IUT may have executed HOGP/BH/HGDC/BV-13-I [Discover Boot Mouse Input Report Client Characteristic Configuration Descriptor] and saved the attribute handle for the Client Characteristic Configuration Descriptor for the instance of the Boot Mouse Input Report characteristic available in the Lower Tester.

If the IUT has not executed HOGP/BH/HGDC/BV-13-I [Discover Boot Mouse Input Report Client Characteristic Configuration Descriptor], it must have executed HOGP/BH/HGRF/BV-16-I [Read Boot Mouse Input Report Characteristic] and saved the attribute handle for the instance of the Boot Mouse Input Report characteristic available in the Lower Tester.

• Test Procedure

The Upper Tester issues a command to the IUT to read characteristic descriptors.

Execute the procedure included in GATT.TS [6] Read Characteristic Descriptors, GATT/CL/GAR/BV-01-C once for the instance of the Boot Mouse Input Report, with the handle specified in initial conditions.

• Expected Outcome

Pass verdict

The IUT sends a correctly formatted ATT_Read_Request to the Lower Tester, containing the handle value specified by the Upper Tester.
The IUT receives the **ATT_Read_Response** from the Lower Tester and sends the received response to the Upper Tester.

The value of the Client Characteristic Configuration characteristic descriptor for the Boot Mouse Input Report characteristic reported to the Upper Tester matches the value implemented in the Lower Tester.

### 4.6.19 [Read Protocol Mode Characteristics (Get Protocol Mode Command)]

- **Test Case ID(s)**
  - HOGP/RH/HGRF/BV-18-I
  - HOGP/BH/HGRF/BV-18-I

- **Test Purpose**
  Verify that all Protocol Mode characteristics can be read by a HID Host IUT.

- **Reference**
  - [4] 4.11
  - [8] 2.4.1

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. Each instance contains a single instance of the Protocol Mode characteristic

The Report Host IUT has executed either HOGP/RH/HGDC/BV-08-I or HOGP/BH/HGDC/BV-08-I and has saved the attribute handle for each instance of the Protocol Mode characteristic available in the Lower Tester. The Boot Host IUT may have executed either HOGP/RH/HGDC/BV-08-I or HOGP/BH/HGDC/BV-08-I and saved the attribute handle for each instance of the Protocol Mode characteristic available in the Lower Tester.

If the Boot Host IUT has not executed neither HOGP/RH/HGDC/BV-08-I nor HOGP/BH/HGDC/BV-08-I, it must have executed either HOGP/RH/HGDS/BV-01-I or HOGP/BH/HGDS/BV-01-I and have saved the handle range for all HID Service instances available in the Lower Tester.

- **Test Procedure**
  The Upper Tester issues a command to the IUT to read characteristics, there are two alternatives:

  1. Execute the procedure included in GATT.TS [6] *Read Characteristic Value*, GATT/CL/GAR/BV-01-C once for each instance of the Protocol Mode characteristic, with the handles specified in initial conditions.
2. If the Boot Host IUT has not executed HOGP/RH/HGDC/BV-08-I nor HOGP/BH/HGDC/BV-08-I, execute the procedure included in GATT.TS [6] Read Using Characteristic UUID, GATT/CL/GAR/BV-03-C once for each HID Service instance, with the characteristic UUID set to «Protocol Mode», with the HID Service handle ranges saved after running either HOGP/RH/HGDS/BV-01-I or HOGP/BH/HGDS/BV-01-I as specified in initial conditions.

• Expected Outcome

Pass verdict

1. The IUT sends correctly formatted ATT_Read_Requests to the Lower Tester, containing the attribute handle values specified by the Upper Tester and receives correctly formatted ATT_Read_Responses from the Lower Tester containing the values of all Protocol Mode characteristics. The IUT reports all received Protocol Mode characteristic values to the Upper Tester.

Or:

2. The Boot Host IUT sends correctly formatted ATT_Read_By_Type_Requests to the Lower Tester containing the characteristic UUID values specified by the Upper Tester and receives correctly formatted ATT_Read_By_Type_Responses containing the values of all Protocol Mode
characteristics. The IUT reports all received Protocol Mode characteristic values to the Upper Tester.

Each complete Protocol Mode characteristic value reported to the Upper Tester matches the values implemented in the Lower Tester for the Protocol Mode field.

4.7 Write Features
The procedures defined in this test group verify IUT implementation of the Write Features defined in the HID over GATT Profile Specification [4] by a HID Host IUT, a Report Host IUT and a Boot Host IUT.


• Test Purpose
Verify that all Report characteristics with a Report Type of Input Report can be written by a Report Host IUT.

• Reference
[4] 4.8
[8] 2.5.1

• Initial Condition
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. Each instance of the HID Service contains at least one instance of the Report characteristic and a single instance of the Report Reference characteristic descriptor within each Report characteristic definition. Each Report Reference characteristic descriptor has the Report Type value field set to the value for Input Report as defined in the HID Service.

The IUT has executed HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] and saved the attribute handles for all Report characteristics available in the Lower Tester. The IUT has also executed HOGP/RH/HGDC/BV-05-I [Discover Report Characteristic Report Reference Characteristic Descriptors] and has saved the attribute handles for all Report Reference characteristic descriptors available in the Lower Tester whose Report Type field is set to the value for Input Report.

The contents of the Input Report Data have been declared via IXIT and whose length is small enough to fit in a single transaction (i.e., <= [ATT_MTU-3]).

• Test Procedure
The Upper Tester issues a command to the IUT to write characteristics.

Execute the procedure in GATT.TS [6] Write Characteristic Value, GATT/CL/GAW/BV-03-C, once for each Report characteristic of Input Report Type with the handles specified in initial conditions and the value declared for Input Report contents via IXIT.
4.7.2 HOGP/RH/HGWF/BV-02-I [Write Report Characteristics – Output Report]

- Test Purpose
  Verify that all Report characteristics with a Report Type of Output Report can be written by a Report Host IUT.

- Reference
  [4] 4.8
  [8] 2.5.1

- Initial Condition
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. Each instance of the HID Service contains at least one instance of the Report characteristic and a single instance of the Report Reference characteristic descriptor within each Report characteristic definition. Each Report
Reference characteristic descriptor has the Report Type value field set to the value for Output Report as defined in the HID Service.

The IUT has executed HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] and saved the attribute handles for all Report characteristics available in the Lower Tester. The IUT has also executed HOGP/RH/HGDC/BV-05-I [Discover Report Characteristic Report Reference Characteristic Descriptors] and has saved the attribute handles for all Report Reference characteristic descriptors available in the Lower Tester whose Report Type field is set to the value for Output Report.

The contents of all Output Report Data have been declared via IXIT and whose length is small enough to fit in a single transaction (i.e., <= [ATT_MTU-3]).

- Test Procedure
  The Upper Tester issues a command to the IUT to write characteristics.
  There are two alternatives:
  
  1. Execute the procedure in GATT.TS [6] Write Characteristic Value, GATT/CL/GAW/BV-03-C, once for each Report characteristic of Output Report Type, with the handles specified in initial conditions and the value declared for Output Report contents via IXIT.
  
  Or
  
Alternative 2: Upper Tester Sends WriteRequest – ATT_Write_Command

- Expected Outcome
  
  **Pass verdict**

  The IUT sends correctly formatted write requests (either `ATT_Write_Requests` or `ATT_Write_Commands`) to the Lower Tester using the handles specified by the Upper Tester and the values declared via IXIT for Output Report Data.

  The Lower Tester confirms the written Report characteristic values match the values sent to the IUT by the Upper Tester.

### 4.7.3 HOGP/RH/HGWF/BV-04-I [Write Report Characteristics – Feature Report]

- Test Purpose
  
  Verify that all Report characteristics with a Report Type of Feature Report can be written by a Report Host IUT.

- Reference
  
  [4] 4.8
  
  [8] 2.5.1

- Initial Condition
  
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. Each instance of the HID Service contains one instance of the Report characteristic and a single instance of the Report Reference characteristic descriptor within each Report characteristic definition. Each Report Reference
characteristic descriptor has the Report Type value field set to the value for Feature Report as defined in the HID Service.

The IUT has executed HOGP/RH/HGDC/BV-03-I [Discover Report Characteristics] and saved the attribute handles for all Report characteristics available in the Lower Tester. The IUT has also executed HOGP/RH/HGDC/BV-05-I [Discover Report Characteristic Report Reference Characteristic Descriptors] and has saved the attribute handles for all Report Reference characteristic descriptors available in the Lower Tester whose Report Type field is set to the value for Feature Report.

The contents of the Feature Report Data have been declared via IXIT and whose length is small enough to fit in a single transaction (i.e. \( \leq \text{[ATT_MTU-3]} \)).

- **Test Procedure**
  The Upper Tester issues a command to the IUT to write characteristics.

  Execute the procedure in GATT.TS [6] *Write Characteristic Value*, GATT/CL/GAW/BV-03-C, once for each Report characteristic of Feature Report Type with the handles specified in initial conditions and the value declared for Feature Report contents via IXIT.

  - **Expected Outcome**
    **Pass verdict**

    The IUT sends correctly formatted *ATT_Write_Requests* to the Lower Tester using the attribute handle specified by the Upper Tester and the values declared for Feature Report Data.

    The Lower Tester confirms the written Report characteristic values match the values sent to the IUT by the Upper Tester.

4.7.4 HOGP/RH/HGWF/BV-05-I [Write HID Control Point Characteristics – Suspend]

- **Test Purpose**
Verify that all HID Control Point characteristics can be written with the Suspend command by a Report Host IUT.

• Reference
  [4] 4.9
  [8] 2.11.2

• Initial Condition
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.
  The IUT and Lower Tester have bonded following GAP procedures.
  The Lower Tester has two instances of the HID Service [8]. Each HID Service instance contains a single instance of the HID Control Point characteristic.
  The IUT has executed HOGP/RH/HGDC/BV-07-I [Discover HID Control Point Characteristics] and has saved the attribute handle of all HID Control Point characteristics available in the Lower Tester.

• Test Procedure
  The Upper Tester commands the IUT to write.
  Execute the procedure in GATT.TS [6] Write Without Response, GATT/CL/GAW/BV-01-C, once for each HID Service instance, using the handles returned after running HOGP/RH/HGDC/BV-07-I [Discover HID Control Point Characteristics], and the value 0x0000 which corresponds to the Suspend command.

• Expected Outcome
  Pass verdict
  The IUT sends correctly formatted ATT_Write_Commands to the Lower Tester using the handles specified by the Upper Tester and the value 0x0000 which corresponds to the Suspend command.
The Lower Tester confirms all HID Control Point characteristic values are written and the values match the values sent by the Upper Tester to the IUT.

4.7.5 HOGP/RH/HGWF/BV-06-I [Write HID Control Point Characteristics – Exit Suspend]

• Test Purpose
Verify that all HID Control Point characteristics can be written with the Exit Suspend command by a Report Host IUT.

• Reference
[4] 4.9
[8] 2.11.2

• Initial Condition
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The Lower Tester has two instances of the HID Service [8]. Each instance contains a single instance of the HID Control Point characteristic.

The IUT has executed HOGP/RH/HGDC/BV-07-I [Discover HID Control Point Characteristics] and has saved the attribute handles of all HID Control Point characteristics available in the Lower Tester.

• Test Procedure
The Upper Tester commands the IUT to write characteristics.

Execute the procedure in GATT.TS [6] Write Without Response, GATT/CL/GAW/BV-01-C, once for each instance of the HID Service, with the handles using the handles returned after running HOGP/RH/HGDC/BV-07-I [Discover HID Control Point Characteristics], and the value for the Exit Suspend command (0x0001).
ATT Bearer established over LE transport. HOGP/RH/HGDC/BV-07-I has been executed.

WriteRequest
(handle, value)

ATT_Write_Command
(Code = 0x52, Handle of HID Control Point, Value=0x0001 (EXIT_SUSPEND))

• Expected Outcome

Pass verdict

The IUT sends correctly formatted ATT_Write_Commands to the Lower Tester using the handles specified by the Upper Tester and the value 0x0001 which corresponds to the Exit Suspend command.

The Lower Tester confirms all HID Control Point characteristic values are written and the values match the values sent by the Upper Tester to the IUT.


• Test Purpose

Verify that all Protocol Mode characteristics can be written with the Set Protocol command (Set Report Protocol Mode) by a Report Host IUT.

• Reference

[4] 4.11

[8] 2.4.1

• Initial Condition

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. Each HID Service instance contains a single instance of the Protocol Mode characteristic.

The Report Host IUT has executed HOGP/RH/HGDC/BV-08-I and has saved the attribute handle of all Protocol Mode characteristics available in the Lower Tester.
Test Procedure

The Upper Tester commands the IUT to write characteristics using the handles returned after running HOGP/RH/HGDC/BV-08-I and the value 0x0001.

Execute the procedure in GATT.TS [6] Write Without Response, GATT/CL/GAW/BV-01-C, once for each HID Service instance, with the handles specified in initial conditions, and the value 0x0001 which corresponds to the Set Protocol (Set Report Protocol Mode) command.

- Expected Outcome
  Pass verdict

The IUT sends correctly formatted ATT_Write_Commands to the Lower Tester using the handles specified by the Upper Tester and the value 0x0001 which corresponds to the Set Protocol (Set Report Protocol Mode) command.

The Lower Tester confirms all Protocol Mode characteristic values are written and the values match the values sent by the Upper Tester to the IUT.


- Test Purpose
  Verify that all Protocol Mode characteristics for HID Services supporting Boot Protocol Mode can be written with the Set Protocol command (Set Boot Protocol Mode) by a Boot Host IUT.

- Reference
  [4] 4.11
  [8] 2.4.1

- Initial Condition
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. Each HID Service instance contains a single instance of the Protocol Mode characteristic.

The IUT may have executed \textsf{HOGP/BH/HGDC/BV-08-I} and saved the attribute handle of all Protocol Mode characteristics available in the Lower Tester.

If the IUT has not executed \textsf{HOGP/BH/HGDC/BV-08-I}, it must have executed \textsf{HOGP/BH/HGRF/BV-18-I} and saved the handles for all instances of the Protocol Mode characteristic available in the Lower Tester.

**Test Procedure**

The Upper Tester commands the IUT to write characteristics, there are two alternatives:

1. If the IUT has executed \textsf{HOGP/BH/HGDC/BV-08-I}, execute the procedure in GATT.TS [6] \textit{Write Without Response}, GATT/CL/GAW/BV-01-C, once for each instance of the Protocol Mode characteristic using the handles returned after running \textsf{HOGP/BH/HGDC/BV-08-I}, and using the value 0x0000 which corresponds to the Set Protocol (Set Boot Protocol Mode) command.

2. If the IUT has executed \textsf{HOGP/BH/HGRF/BV-18-I}, execute the procedure in GATT.TS [6] \textit{Write Without Response}, GATT/CL/GAW/BV-01-C once for each instance of the Protocol Mode characteristic, with the Protocol Mode handles saved after running \textsf{HOGP/BH/HGRF/BV-18-I} as specified in initial conditions, and the value 0x0000 which corresponds to the Set Protocol (Set Boot Protocol Mode) command.
ATT Bearer established over LE transport.
HOGP/BH/HGRF/BV-18-I has been executed.

Expected Outcome
Pass verdict

The IUT sends correctly formatted Att_Wri die Commands to the Lower Tester using the handles specified by the Upper Tester and the value 0x0000 which corresponds to the Set Protocol (Set Boot Protocol Mode) command.

The Lower Tester confirms all Protocol Mode characteristic values are written and the values match the values sent by the Upper Tester to the IUT.

4.7.8 HOGP/BH/HGWF/BV-09-I [Write Boot Keyboard Input Report Characteristic]

Test Purpose
Verify that the Boot Keyboard Input Report characteristic can be written by a Boot Host IUT.

Reference
[8] 2.7.1

Initial Condition
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. One instance of the HID Service contains one instance of the Boot Keyboard Input Report characteristic

The IUT may have executed HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic] and saved the attribute handle for the Boot Keyboard Input Report characteristic available in the Lower Tester.
If the IUT has not executed HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic], it must have executed HOGP/BH/HGRF/BV-13-I [Read Boot Keyboard Input Report Characteristic] and saved the attribute handle for the instance of the Boot Keyboard Input Report characteristic available in the Lower Tester.

- **Test Procedure**

  The Upper Tester issues a command to the IUT to write characteristics using the attribute handle returned after running HOGP/BH/HGDC/BV-09-I [Discover Boot Keyboard Input Report Characteristic] or HOGP/BH/HGRF/BV-13-I [Read Boot Keyboard Input Report Characteristic] above.


  **Expected Outcome**

  **Pass verdict**

  The IUT sends a correctly formatted ATT_Write_Request to the Lower Tester using the attribute handle specified by the Upper Tester.

  The Lower Tester confirms the written Boot Keyboard Input Report characteristic value matches the value sent to the IUT by the Upper Tester.

**4.7.9 HOGP/BH/HGWF/BV-10-I [Write Boot Keyboard Output Report Characteristic]**

- **Test Purpose**

  Verify that the Boot Keyboard Output Report characteristic can be written by a Boot Host IUT.

- **Reference**

[8] 2.8.1

- **Initial Condition**

  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. One instance of the HID Service contains one instance of the Boot Keyboard Output Report characteristic.

  The IUT may have executed HOGP/BH/HGDC/BV-11-I [Discover Boot Keyboard Output Report Characteristic] and saved the attribute handle for the Boot Keyboard Output Report characteristic available in the Lower Tester.

  If the IUT has not executed HOGP/BH/HGDC/BV-11-I [Discover Boot Keyboard Output Report Characteristic], it must have executed HOGP/BH/HGRF/BV-15-I [Read Boot Keyboard Output Report Characteristic] and saved the attribute handle for the instance of the Boot Keyboard Output Report characteristic available in the Lower Tester.

- **Test Procedure**


- **Expected Outcome**

  Pass verdict
The IUT sends a correctly formatted `ATT_Write_Request` to the Lower Tester using the attribute handles specified by the Upper Tester.

The Lower Tester confirms the written Boot Keyboard Output Report characteristic value matches the value sent to the IUT by the Upper Tester.

### 4.7.10 HOGP/BH/HGWF/BV-11-I [Write Boot Mouse Input Report Characteristic]

- **Test Purpose**
  Verify that the Boot Mouse Input Report characteristic can be written by a Boot Host IUT.

- **Reference**
  [8] 2.9.1

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. One instance of the HID Service contains one instance of the Boot Mouse Input Report characteristic.

  The IUT may have executed HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic] and saved the attribute handle for the Boot Mouse Input Report characteristics available in the Lower Tester.

  If the IUT has not executed HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic], it must have executed HOGP/BH/HGRF/BV-16-I [Read Boot Mouse Input Report Characteristic] and saved the attribute handle for the instance of the Boot Keyboard Mouse Report characteristic available in the Lower Tester.

- **Test Procedure**
  The Upper Tester issues a command to the IUT to write characteristics using the attribute handle returned after running HOGP/BH/HGDC/BV-12-I [Discover Boot Mouse Input Report Characteristic] or HOGP/BH/HGRF/BV-16-I [Read Boot Mouse Input Report Characteristic] above.

  Execute the procedure in `GATT.TS` [6] *Write Characteristic Value*, GATT/CL/GAW/BV-03-C, once for the instance of the Boot Mouse Input Report characteristic with the attribute handle specified in initial conditions.
• Expected Outcome

Pass verdict

The IUT sends a correctly formatted `ATT_Write_Request` to the Lower Tester using the attribute handle specified by the Upper Tester.

The Lower Tester confirms the written Boot Keyboard Input Report characteristic value matches the value sent to the IUT by the Upper Tester.

### 4.8 Configuration Features

The procedures defined in this test group verify IUT implementation of the Configuration Features defined in the HID over GATT Profile Specification [4] by a Report Host IUT or a Boot Host IUT.

#### 4.8.1 HOGP/RH/HGCF/BV-01-I [Report Characteristic – Input Reports – enable notifications (write with 0x0001)]

• Test Purpose

Verify that all Client Characteristic Configuration characteristic descriptors for all Report characteristics of Report Type: Input Report can be written with the value 0x0001 by a Report Host IUT.

• Reference

[4] 4.8

[8] 2.5.3.1

• Initial Condition

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.
The Lower Tester has two instances of the HID Service [8]. Each instance of the HID Service contains at least one instance of the Report characteristic with one and only one instance of the Client Characteristic Configuration characteristic descriptor.

The IUT has executed HOGP/RH/HGDC/BV-04-I [Discover Report Characteristic Client Characteristic Configuration Descriptors] and saved the attribute handle for the Client Characteristic Configuration characteristic descriptor for each instance of the Report characteristic available in the Lower Tester.

• Test Procedure

The Upper Tester commands the IUT to enable notifications for each Report characteristic using the handles returned after running HOGP/RH/HGDC/BV-04-I [Discover Report Characteristic Client Characteristic Configuration Descriptors].

The IUT sends an ATT_Write_Request with the value 0x0001 to the Lower Tester to each of the handles specified in initial conditions.

• Expected Outcome

Pass verdict

The IUT sends correctly formatted ATT_Write_Requests to the Lower Tester using the handles specified by the Upper Tester and the value 0x0001.

The IUT receives a correctly formatted ATT_Write_Response from the Lower Tester and sends the WriteResponse to the Upper Tester.

4.8.2 HOGP/RH/HGCF/BV-02-I [Report Characteristic – Input Reports – disable notifications (write with 0x0000)]

• Test Purpose
Verify that all Client Characteristic Configuration characteristic descriptors for all Report characteristics of Report Type: Input Report can be written with the value 0x0000 by a Report Host IUT.

• Reference

[4] 4.8

[8] 2.5.3.1

• Initial Condition

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. Each instance of the HID Service contains at least one instance of the Report characteristic with one and only one instance of the Client Characteristic Configuration characteristic descriptor.

The IUT has executed HOGP/RH/HGDC/BV-04-I [Discover Report Characteristic Client Characteristic Configuration Descriptors] and saved the attribute handle for the Client Characteristic Configuration characteristic descriptor for each instance of the Report characteristic available in the Lower Tester.

The Upper Tester commands the IUT to enable notifications for each Report characteristic using the handles returned after running HOGP/RH/HGDC/BV-04-I [Discover Report Characteristic Client Characteristic Configuration Descriptors]. The IUT sends an ATT_Write_Request with the value 0x0001 to the Lower Tester to each of the handles specified in initial conditions as in HOGP/RH/HGCF/BV-01-I [Report Characteristic – Input Reports – enable notifications (write with 0x0001)].

• Test Procedure

1. The Upper Tester commands the IUT to disable notifications for each Report characteristic using the handles returned after running HOGP/RH/HGDC/BV-04-I [Discover Report Characteristic Client Characteristic Configuration Descriptors].
2. The IUT sends an ATT_Write_Request with the value 0x0000 to the Lower Tester to each of the handles specified in initial conditions.
• Expected Outcome

Pass verdict

The IUT sends correctly formatted \textit{ATT\_Write\_Requests} to the Lower Tester using the handles specified by the Upper Tester. The IUT successfully disables notification by writing the value 0x0000 to the Client Characteristic Configuration characteristic descriptors for all Report characteristics of Report Type: Input Report.

The IUT receives a correctly formatted \textit{ATT\_Write\_Response} from the Lower Tester and sends the \textit{WriteResponse} to the Upper Tester.

4.8.3 HOGP/BH/HGCF/BV-03-I [Boot Keyboard Input Report Characteristic – enable notifications (write with 0x0001)]

• Test Purpose

Verify that the Client Characteristic Configuration characteristic descriptor for the Boot Keyboard Input Report characteristic can be written with the value 0x0001 by a Boot Host IUT.

• Reference


[8] 2.7.3.1

• Initial Condition

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.
The Lower Tester has two instances of the HID Service [8]. One instance of the HID Service contains one instance of the Boot Keyboard Input Report characteristic with one instance of the Client Characteristic Configuration characteristic descriptor.

The IUT may have executed HOGP/BH/HGDC/BV-10-I [Discover Boot Keyboard Input Report Client Characteristic Configuration Descriptor] and saved the attribute handle for the Client Characteristic Configuration characteristic descriptor for the instance of the Boot Keyboard Input Report characteristic available in the Lower Tester.

If the IUT has not executed HOGP/BH/HGDC/BV-10-I [Discover Boot Keyboard Input Report Client Characteristic Configuration Descriptor] it must have executed HOGP/BH/HGRF/BV-14-I [Read Client Characteristic Configuration Descriptors for Boot Keyboard Input Report Characteristics] and saved the attribute handle for the Client Characteristic Configuration characteristic descriptors for the instance of the Boot Keyboard Input Report characteristic available in the Lower Tester.

- **Test Procedure**

  The Upper Tester commands the IUT to enable notifications for each Report characteristic using the handle returned after running HOGP/BH/HGDC/BV-10-I [Discover Boot Keyboard Input Report Client Characteristic Configuration Descriptor] or HOGP/BH/HGRF/BV-14-I [Read Client Characteristic Configuration Descriptors for Boot Keyboard Input Report Characteristics] above.

  The IUT sends an *ATT_Write_Request* with the value 0x0001 to the Lower Tester of the handle specified in initial conditions.

  - **Expected Outcome**

    *Pass verdict*

    The IUT sends a correctly formatted *ATT_Write_Request* to the Lower Tester using the handle specified by the Upper Tester and the value 0x0001.

    The IUT receives a correctly formatted *ATT_Write_Response* from the Lower Tester and sends the WriteResponse to the Upper Tester.
4.8.4 HOGP/BH/HGCF/BV-04-I [Boot Keyboard Input Report Characteristic – disable notifications (write with 0x0000)]

• Test Purpose
Verify that the Client Characteristic Configuration characteristic descriptor for the Boot Keyboard Input Report characteristic can be written with the value 0x0000 by a Boot Host IUT.

• Reference
[8] 2.7.3.1

• Initial Condition
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. One instance of the HID Service contains one instance of the Boot Keyboard Input Report characteristic with one instance of the Client Characteristic Configuration characteristic descriptor.

The IUT may have executed HOGP/BH/HGDC/BV-10-I [Discover Boot Keyboard Input Report Client Characteristic Configuration Descriptor] and saved the attribute handle for the Client Characteristic Configuration characteristic descriptor for the instance of the Boot Keyboard Input Report characteristic available in the Lower Tester.

If the IUT has not executed HOGP/BH/HGDC/BV-10-I [Discover Boot Keyboard Input Report Client Characteristic Configuration Descriptor] it must have executed HOGP/BH/HGRF/BV-14-I [Read Client Characteristic Configuration Descriptors for Boot Keyboard Input Report Characteristics] and saved the attribute handle for the Client Characteristic Configuration characteristic descriptors for the instance of the Boot Keyboard Input Report characteristic available in the Lower Tester.

• Test Procedure
The Upper Tester commands the IUT to enable notifications for each Report characteristic using the handle returned after running HOGP/BH/HGDC/BV-10-I [Discover Boot Keyboard Input Report Client Characteristic Configuration Descriptor] or HOGP/BH/HGRF/BV-14-I [Read Client Characteristic Configuration Descriptors for Boot Keyboard Input Report Characteristics] above.

The IUT sends an ATT_Write_Request with the value 0x0000 to the Lower Tester to the handles specified in initial conditions.
• Expected Outcome

Pass verdict

The IUT sends a correctly formatted `ATT_Write_Request` to the Lower Tester using the handles specified by the Upper Tester and the value 0x0000.

The IUT receives a correctly formatted `ATT_Write_Response` from the Lower Tester and sends the `WriteResponse` to the Upper Tester.

### 4.8.5 HOGP/BH/HGCF/BV-05-I [Boot Mouse Input Report Characteristic – enable notifications (write with 0x0001)]

• Test Purpose

Verify that all Client Characteristic Configuration characteristic descriptors for the Boot Mouse Input Report characteristic can be written with the value 0x0001 by a Boot Host IUT.

• Reference


[8] 2.9.3.1

• Initial Condition

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. One instance of the HID Service contains one instance of the Boot Mouse Input Report characteristic with one instance of the Client Characteristic Configuration characteristic descriptor.
The IUT may have executed HOGP/BH/HGDC/BV-13-I [Discover Boot Mouse Input Report Client Characteristic Configuration Descriptor] and saved the attribute handles for the Client Characteristic Configuration descriptor for the instance of the Boot Mouse Input Report characteristic available in the Lower Tester.

If the IUT has not executed HOGP/BH/HGDC/BV-13-I [Discover Boot Mouse Input Report Client Characteristic Configuration Descriptor] it must have executed HOGP/BH/HGRF/BV-17-I [Read Client Characteristic Configuration Descriptor for Boot Mouse Input Report Characteristic] and saved the attribute handle for the Client Characteristic Configuration characteristic descriptor for the instance of the Boot Mouse Input Report characteristic available in the Lower Tester.

- **Test Procedure**

The Upper Tester commands the IUT to enable notifications for each Report characteristic using the handles returned after running HOGP/BH/HGDC/BV-13-I [Discover Boot Mouse Input Report Client Characteristic Configuration Descriptor] or HOGP/BH/HGRF/BV-17-I [Read Client Characteristic Configuration Descriptor for Boot Mouse Input Report Characteristic] above.

The IUT sends an ATT Write Request with the value 0x0001 to the Lower Tester to the handle specified in initial conditions.

![Diagram of ATT Write Request and Response]

- **Expected Outcome**

  **Pass verdict**

  The IUT sends a correctly formatted ATT Write Request to the Lower Tester using the handles specified by the Upper Tester and the value 0x0001.

  The IUT receives a correctly formatted ATT Write Response from the Lower Tester and sends the WriteResponse to the Upper Tester.

4.8.6 HOGP/BH/HGCF/BV-06-I [Boot Mouse Input Report Characteristic – disable notifications (write with 0x0000)]

- **Test Purpose**
Verify that the Client Characteristic Configuration characteristic descriptor for the Boot Mouse Input Report characteristic can be written with the value 0x0000 by a Boot Host IUT.

- **Reference**
  
  
  [8] 2.9.3.1  

- **Initial Condition**

  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. One instance of the HID Service contains one instance of the Boot Mouse Input Report characteristic with one instance of the Client Characteristic Configuration characteristic descriptor.

  The IUT may have executed HOGP/BH/HGDC/BV-13-I [Discover Boot Mouse Input Report Client Characteristic Configuration Descriptor] and saved the attribute handle for the Client Characteristic Configuration characteristic descriptor for the instance of the Boot Mouse Input Report characteristic available in the Lower Tester.

  If the IUT has not executed HOGP/BH/HGDC/BV-13-I [Discover Boot Mouse Input Report Client Characteristic Configuration Descriptor] it must have executed HOGP/BH/HGRF/BV-17-I [Read Client Characteristic Configuration Descriptor for Boot Mouse Input Report Characteristic] and saved the attribute handles for the Client Characteristic Configuration characteristic descriptors for the instance of the Boot Mouse Input Report characteristic available in the Lower Tester.

- **Test Procedure**

  The Upper Tester commands the IUT to enable notifications for each Report characteristic using the handle returned after running HOGP/BH/HGDC/BV-13-I [Discover Boot Mouse Input Report Client Characteristic Configuration Descriptor] or HOGP/BH/HGRF/BV-17-I [Read Client Characteristic Configuration Descriptor for Boot Mouse Input Report Characteristic] above.

  The IUT sends an *ATT_Write_Request* with the value 0x0000 to the Lower Tester to the handle specified in initial conditions.
ATT Write Request
(Code = 0x12, Handle of Boot Mouse Input Report Client Characteristic Configuration, 0x0000)

ATT Write Response
(Code = 0x13)

WriteRequest
(handle, new value)

WriteResponse

• Expected Outcome

Pass verdict

The IUT sends a correctly formatted ATT_Write_Request to the Lower Tester using the handle specified by the Upper Tester and the value 0x0000.

The IUT receives a correctly formatted ATT_Write_Response from the Lower Tester and sends the WriteResponse to the Upper Tester.

4.9 Notification Features

The procedures defined in this test group verify IUT implementation of the Notification Features defined in the HID over GATT Profile Specification [4] by a Report Host IUT and a Boot Host IUT.

4.9.1 HOGP/RH/HGNF/BV-01-I [Report Characteristic Configuration, receive notifications]

• Test Purpose

Verify that, when the Client Characteristic Configuration characteristic descriptor is configured for notification, a Report Host IUT can successfully receive notifications for Report characteristics.

• Reference

[4] 4.8

[8] 2.5.3.1

• Initial Condition

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.
The Lower Tester has two instances of the HID Service [8]. Each HID Service instance contains one instance of the Report characteristic of Report Type: Input Report with a single instance of the Client Characteristic Configuration characteristic descriptor.

The IUT has executed HOGP/RH/HGCF/BV-01-I [Report Characteristic – Input Reports – enable notifications (write with 0x0001)] to configure all Report characteristics of Report Type: Input Report available in the Lower Tester for notifications.

• Test Procedure
The Lower Tester sends \textit{ATT\_Handle\_Value\_Notifications} containing the characteristic values for all instances of the Report characteristic of Report Type: Input Report to the IUT.

• Expected Outcome
Pass verdict
The IUT reports all received Report characteristic values to the Upper Tester.
The reported values for the Report characteristics match the ones sent by the Lower Tester.

4.9.2 HOGP/BH/HGNF/BV-02-I [Boot Keyboard Input Report Characteristic Configuration, receive notifications]

• Test Purpose
Verify that, when the Client Characteristic Configuration characteristic descriptor is configured for notification, a Boot Host IUT can successfully receive notifications for the Boot Keyboard Input Report characteristic.

• Reference
[8] 2.7.3.1

• Initial Condition
Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. One HID Service instance contains a single instance of the Boot Keyboard Input Report characteristic with a single instance of the Client Characteristic Configuration characteristic descriptor.

The IUT has executed HOGP/BH/HGCF/BV-03-I [Boot Keyboard Input Report Characteristic – enable notifications (write with 0x0001)] to configure the Boot Keyboard Input Report characteristic for notifications available in the Lower Tester.

• Test Procedure

The Lower Tester sends ATT_Handle_Value_Notifications containing the characteristic values for the Boot Keyboard Input Report characteristic to the IUT.

• Expected Outcome

Pass verdict

The IUT reports the received Boot Keyboard Input Report characteristic value to the Upper Tester.

The reported values for the Boot Keyboard Input Report characteristic match the one sent by the Lower Tester.

4.9.3 HOGP/BH/HGNF/BV-03-I [Boot Mouse Input Report Characteristic Configuration, receive notifications]

• Test Purpose

Verify that, when the Client Characteristic Configuration characteristic descriptor is configured for notification, a Boot Host IUT can successfully receive notifications for the Boot Mouse Input Report characteristic.
• Reference


[8] 2.9.3.1

• Initial Condition

Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

The IUT and Lower Tester have bonded following GAP procedures.

The Lower Tester has two instances of the HID Service [8]. One HID Service instance contains a single instance of the Boot Mouse Input Report characteristic with a single instance of the Client Characteristic Configuration characteristic descriptor.

The IUT has executed HOGP/BH/HGCF/BV-05-I [Boot Mouse Input Report Characteristic – enable notifications (write with 0x0001)] to configure the Boot Mouse Input Report characteristic available in the Lower Tester for notifications.

• Test Procedure

The Lower Tester sends ATT_Handle_Value_Notifications containing the characteristic values for the Boot Mouse Input Report characteristic to the IUT.

• Expected Outcome

Pass verdict

The IUT reports the received Boot Mouse Input Report characteristic value to the Upper Tester.

The reported value for the Boot Mouse Input Report characteristic matches the one sent by the Lower Tester.
4.9.4 HOGP/BH/HGNF/BI-01-I [Report Characteristic Configuration, ignore notifications, Boot Host]

- **Test Purpose**
  Verify that, when the Client Characteristic Configuration characteristic descriptor is configured for notification, a Boot Host IUT will ignore all notifications for Report characteristics.

- **Reference**
  - [4] 4.8
  - [8] 2.5.3.1

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.

  The IUT and Lower Tester have bonded following GAP procedures.

  The Lower Tester has two instances of the HID Service [8]. Each HID Service instance contains one instance of the Report characteristic of Report Type: Input Report, each with a single instance of the Client Characteristic Configuration characteristic descriptor.

  The Lower Tester has configured all Report characteristics of Report Type: Input Report for notifications.

- **Test Procedure**
  The Lower Tester sends `ATT_Handle_Value_Notification` containing the characteristic values for all instances of the Report characteristic of Report Type: Input Report to the IUT.

- **Expected Outcome**
  **Pass verdict**

  The IUT ignores all received Report characteristic values from the Lower Tester and reports no values to the Upper Tester.
4.9.5 HOGP/RH/HGNF/BI-01-I [Boot Keyboard Input Report Characteristic Configuration, ignore notifications, Report Host]

- **Test Purpose**
  Verify that, when the Client Characteristic Configuration characteristic descriptor is configured for notification, a Report Host IUT will ignore notifications for the Boot Keyboard Input Report characteristic.

- **Reference**
  [8] 2.7.3.1

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.
  The IUT and Lower Tester have bonded following GAP procedures.
  The Lower Tester has two instances of the HID Service [8]. One HID Service instance contains a single instance of the Boot Keyboard Input Report characteristic with a single instance of the Client Characteristic Configuration characteristic descriptor.
  The Lower Tester has configured the instance of the Boot Keyboard Input Report characteristic for notifications.

- **Test Procedure**
  The Lower Tester sends `ATT_Handle_Value_Notification` containing the characteristic value for the Boot Keyboard Input Report characteristic to the IUT.

- **Expected Outcome**
  Pass verdict
The IUT ignores the received Boot Keyboard Input Report characteristic value and reports no value to the Upper Tester.

4.9.6 HOGP/RH/HGNF/BI-02-I [Boot Mouse Input Report Characteristic Configuration, ignore notifications, Report Host]

- **Test Purpose**
  Verify that, when the Client Characteristic Configuration characteristic descriptor is configured for notification, a Report Host IUT will ignore notifications for the Boot Mouse Input Report characteristic.

- **Reference**
  [8] 2.9.3.1

- **Initial Condition**
  Establish an ATT Bearer connection between the Lower Tester and the IUT as defined in Section 4.2.1.
  The IUT and Lower Tester have bonded following GAP procedures.
  The Lower Tester has two instances of the HID Service [8]. One HID Service instance contains a single instance of the Boot Keyboard Input Report characteristic with a single instance of the Client Characteristic Configuration characteristic descriptor.
  The Lower Tester has configured the instance of the Boot Mouse Input Report characteristic for notifications.

- **Test Procedure**
  The Lower Tester sends `ATT_Handle_Value_Notification` containing the characteristic value for the Boot Mouse Input Report characteristic to the IUT.

- **Expected Outcome**
Pass verdict

The IUT ignores the received Boot Mouse Input Report characteristic value and reports no value to the Upper Tester.
5 Test Case Mapping

The Test Case Mapping Table (TCMT) maps test cases to specific capabilities in the ICS. Profiles, protocols and services may define multiple roles, and it is possible that a product may implement more than one role. The product shall be tested in all roles for which support is declared in the ICS document.

The columns for the TCMT are defined as follows:

**Item:** contains an y/x reference, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS Proforma for HID Over GATT Profile (HOGP) [4]. If the item is defined with Protocol, Profile or Service abbreviation before y/x, the table and feature number referenced are defined in the abbreviated ICS proforma document.

**Feature:** recommended to be the primary feature defined in the ICS being tested or may be the test case name.

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

**Test Case Applicable:** may be used to note if a test is required based on the supported features.

For purpose and structure of the ICS/IXIT proforma and instructions for completing the ICS/IXIT proforma refer to the Bluetooth ICS and IXIT proforma document.

<table>
<thead>
<tr>
<th>Item</th>
<th>Feature</th>
<th>Test cases(s)</th>
<th>Test Case Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOGP (1/2 AND 9/1)</td>
<td>Discover HID Services</td>
<td>HOGP/RH/HGDS/BV-01-I</td>
<td></td>
</tr>
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<td>Discover HID Services</td>
<td>HOGP/BH/HGDS/BV-01-I</td>
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<td>HOGP/RH/HGDS/BV-02-I</td>
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<td>Discover Scan Parameters Service</td>
<td>SCPPT.S:SCP/CL/SPDS/BV-01-I</td>
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<td>HOGP 1/1 AND (3/1 AND 3/3 AND 3/4)</td>
<td>Implements HID over GATT Profile, HID Device role</td>
<td>HOGP/HGDS/BV-01-I</td>
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<td>HOGP 1/1 AND (3/1 AND 3/2 AND 3/3 AND 3/4)</td>
<td>Implements HID over GATT Profile, HID Device role – multiple service instances</td>
<td>HOGP/HGDS/BV-02-I</td>
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<td>Feature</td>
<td>Test cases(s)</td>
<td>Test Case Applicable</td>
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<td>HOGP (1/2 AND 9/5)</td>
<td>Discover Report Map Characteristics for HID Services</td>
<td>HOGP/RH/HGDC/BV-01-I</td>
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<td>HOGP/RH/HGDC/BV-06-I</td>
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<td>Discover HID Control Point Characteristics for HID Services</td>
<td>HOGP/RH/HGDC/BV-07-I</td>
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<td>HOGP (1/2 AND 9/12)</td>
<td>Discover Protocol Mode characteristics for HID Services</td>
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<td>Discover Protocol Mode characteristics for HID Services</td>
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<td>Discover Battery Level Characteristic for Battery Service</td>
<td>HOGP/RH/HGDC/BV-14-I</td>
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<td>Discover Client Characteristic Configuration Descriptor for Battery Level</td>
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<td>HOGP (1/3 AND 10/5 AND (GATT 3/5 OR 3/6))</td>
<td>Discover Boot Keyboard Input Report Characteristics for HID Services</td>
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<td>Discover Client Characteristic Configuration Descriptors for Boot Keyboard Input Report</td>
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<td>Discover Boot Keyboard Output Report Characteristics for HID Services</td>
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<td>Discover Boot Mouse Input Report Characteristics for HID Services</td>
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<td>Discover Client Characteristic Configuration Descriptors for Boot Mouse Input Report</td>
<td>HOGP/BH/HGDC/BV-13-I</td>
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<td>HOGP/RH/HGRF/BV-01-I</td>
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<td>Read External Report Reference Characteristic Descriptors for Report Map</td>
<td>HOGP/RH/HGRF/BV-02-I</td>
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<td>Read External Report Reference Characteristic Descriptors for Report Map Characteristic – from HID Device</td>
<td>HIDS/HD/DR/BV-03-C HIDS/HD/DES/BV-03-C</td>
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<td>HOGP (1/3 AND 12/15)</td>
<td>Read Battery Level Characteristic</td>
<td>HOGP/BH/HGRF/BV-10-I</td>
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<td>Read Client Characteristic Configuration Descriptor for Battery Level Characteristic</td>
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<td>HOGP (1/3 AND 12/16)</td>
<td>Read Client Characteristic Configuration Descriptor for Battery Level Characteristic</td>
<td>HOGP/BH/HGRF/BV-11-I</td>
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<td>HOGP (1/2 AND 11/23)</td>
<td>Read PnP ID Characteristic</td>
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<td>Read Boot Keyboard Input Report Characteristics</td>
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<td>HOGP (1/3 AND 12/3 AND 12/11)</td>
<td>Read Client Characteristic Configuration Descriptors for Boot Keyboard Input Report Characteristics</td>
<td>HOGP/BH/HGRF/BV-14-I</td>
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<td>HOGP (1/3 AND 12/9)</td>
<td>Read Boot Mouse Input Report Characteristics</td>
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<td>HOGP (1/3 AND 12/9 AND 12/11)</td>
<td>Read Client Characteristic Configuration Descriptors for Boot Mouse Input Report Characteristics</td>
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<td>Read Protocol Mode Characteristics (Get Protocol Mode Command)</td>
<td>HOGP/BH/HGRF/BV-18-I</td>
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<td>HOGP (1/2 AND 11/16)</td>
<td>Write HID Control Point Characteristics: Exit Suspend</td>
<td>HOGP/RH/HGWF/BV-06-I</td>
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<td>HOGP (1/3 AND 12/2)</td>
<td>Write Protocol Mode Characteristics: Set Boot Protocol</td>
<td>HOGP/BH/HGWF/BV-08-I</td>
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<td>HOGP (1/3 AND 12/4)</td>
<td>Write Boot Keyboard Input Report Characteristics</td>
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<td>HOGP (1/3 AND 12/10)</td>
<td>Write Boot Mouse Input Report Characteristics</td>
<td>HOGP/BH/HGWF/BV-11-I</td>
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<td>HOGP (1/3 AND 12/6)</td>
<td>Boot Keyboard Input Report Characteristic: Enable Notifications</td>
<td>HOGP/BH/HGCF/BV-03-I</td>
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<td>HOGP (1/3 AND 12/6a)</td>
<td>Boot Keyboard Input Report Characteristic: Disable Notifications</td>
<td>HOGP/BH/HGCF/BV-04-I</td>
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<td>Boot Mouse Input Report Characteristic: Enable Notifications</td>
<td>HOGP/BH/HGCF/BV-05-I</td>
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<tr>
<td>HOGP (1/3 AND 12/12a)</td>
<td>Boot Mouse Input Report Characteristic: Disable Notifications</td>
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<td>Boot Keyboard Input Report Characteristic: Receive Notifications</td>
<td>HOGP/BH/HGNF/BV-02-I</td>
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<td>HOGP (1/3 AND 12/13)</td>
<td>Boot Mouse Input Report Characteristic: Receive Notifications</td>
<td>HOGP/BH/HGNF/BV-03-I</td>
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<tr>
<td>HOGP (1/3)</td>
<td>Boot Host: Ignore Report Notifications</td>
<td>HOGP/BH/HGNF/BI-01-I</td>
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<td>Test cases(s)</td>
<td>Test Case Applicable</td>
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<td>Report Host: Ignore Boot Keyboard Input Report Notifications</td>
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<td>Report Host: Ignore Boot Mouse Input Report Notifications</td>
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<td>HOGP (1/2 AND 13/5)</td>
<td>Find Included Services</td>
<td>HOGP/RH/HGDR/BV-01-I</td>
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*Table 5.1: Test Case Mapping*