Blood Pressure Profile (BLP)

Bluetooth® Test Suite

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## Contents

1 **Scope** ................................................................................................................................. 5

2 **References, Definitions, and Abbreviations** ........................................................................ 6
   2.1 References ............................................................................................................................ 6
   2.2 Definitions ............................................................................................................................. 6
   2.3 Abbreviations ....................................................................................................................... 6

3 **Test Suite Structure (TSS)** ................................................................................................. 7
   3.1 Overview .............................................................................................................................. 7
   3.2 Test Strategy ........................................................................................................................ 7
   3.3 Test Groups .......................................................................................................................... 8
   3.3.1 Discovery of Services and Characteristics ....................................................................... 8
   3.3.2 Features ........................................................................................................................... 8

4 **Test Cases (TC)** ................................................................................................................ 9
   4.1 Introduction .......................................................................................................................... 9
   4.1.1 Test Case Identification Conventions ............................................................................. 9
   4.1.2 Conformance ................................................................................................................... 9
   4.1.3 Pass/Fail Verdict Conventions ....................................................................................... 10
   4.2 Setup Preambles .................................................................................................................. 10
   4.2.1 Set up LE Transport ........................................................................................................ 10
   4.2.2 Set up BR/EDR Transport ............................................................................................... 10
   4.2.3 Collector: Initiate Connection when ready for Indications or Notifications ................... 10
   4.3 Discover Services and Characteristics ............................................................................... 11
   4.3.1 BLP/COL/BPD/BV-01-I [Discover Blood Pressure Service] ........................................... 11
   4.3.2 BLP/COL/BPD/BV-02-I [Discover Device Information Service] .................................... 12
   4.3.3 BLP/SEN/BPD/BV-03-I [Verify Valid BR/EDR Behavior for Blood Pressure Service] ....... 13
   4.3.4 BLP/COL/BPD/BV-04-I [Discover Blood Pressure Measurement Characteristic] ........ 13
   4.3.5 BLP/COL/BPD/BV-05-I [Discover Blood Pressure Measurement – Client Characteristic Configuration Descriptor] ............................................................. 14
   4.3.6 BLP/COL/BPD/BV-06-I [Discover Intermediate Cuff Pressure Characteristic] ............ 15
   4.3.7 BLP/COL/BPD/BV-07-I [Discover Intermediate Cuff Pressure – Client Characteristic Configuration Descriptor] ................................................................. 16
   4.3.8 BLP/COL/BPD/BV-08-I [Discover Blood Pressure Feature Characteristic] ................. 17
   4.3.9 BLP/COL/BPD/BV-09-I [Discover Device Information Service Characteristics] ............ 18
   4.3.10 BLP/COL/BPD/BV-10-I [Read Device Information Service Characteristics] .................. 19
   4.4 Blood Pressure Features ..................................................................................................... 20
   4.4.1 BLP/SEN/BPF/BV-01-I [Blood Pressure Service UUID in AD] ...................................... 20
   4.4.2 BLP/SEN/BPF/BV-02-I [Local Name included in AD or Scan Response] ...................... 20
   4.4.3 BLP/SEN/BPF/BV-03-I [Public Address in AD or Scan Response] ................................. 21
   4.4.4 BLP/SEN/BPF/BV-04-I [Private Random Address in AD or Scan Response] .................. 23
   4.4.5 BLP/SEN/BPF/BV-05-I [Static Random Address in AD or Scan Response] .................... 24
   4.4.6 BLP/SEN/BPF/BV-06-I [No Target Address in AD or Scan Response – Multi-Bond] ....... 25
   4.4.7 BLP/SEN/BPF/BV-07-I [No Target Address in AD or Scan Response – Single-Bond] ...... 27
   4.4.8 BLP/SEN/BPF/BV-08-I [Blood Pressure Service as Primary Service] .............................. 28
   4.4.9 BLP/COL/BPF/BV-09-I [Configure Blood Pressure Measurement Characteristic for Indications] ................................................................. 29
   4.4.10 BLP/COL/BPF/BV-10-I [Receive Blood Pressure Measurement Indications] .............. 30
   4.4.11 BLP/COL/BPF/BV-01-I [Receive Blood Pressure Measurement Indications with reserved flags] ................................................................. 32

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Bluetooth SIG Proprietary

Page 3 of 52
4.4.12 BLP/COL/BPF/BI-02-I [Receive Blood Pressure Measurement Indications with reserved measurement status bits]..................................................................................................................33
4.4.13 BLP/COL/BPF/BI-03-I [Receive Blood Pressure Measurement Indications with additional octets not comprehended]...........................................................................................................34
4.4.15 BLP/COL/BPF/BV-12-I [Configure Intermediate Cuff Pressure Characteristic for Notifications] ............37
4.4.16 BLP/COL/BPF/BV-13-I [Receive Intermediate Cuff Pressure Notifications] ..............................................38
4.4.17 BLP/COL/BPF/BI-04-I [Receive Intermediate Cuff Pressure Notifications with reserved flags] ............39
4.4.18 BLP/COL/BPF/BI-05-I [Receive Intermediate Cuff Pressure Notifications with reserved measurement status bits]..................................................................................................................41
4.4.19 BLP/COL/BPF/BI-06-I [Receive Intermediate Cuff Pressure Notifications with additional octets not comprehended]...........................................................................................................42
4.4.20 BLP/COL/BPF/BV-14-I [Receive multiple Intermediate Cuff Pressure Notifications] ...........................................43
4.4.21 BLP/COL/BPF/BV-15-I [Read Blood Pressure Feature characteristic] ........................................................44
4.4.22 BLP/COL/BPF/BI-07-I [Read Blood Pressure Feature characteristic with reserved value] ....................45
4.4.23 BLP/COL/BPF/BV-16-I [Verify Bond Status on Reconnect] ..........................................................................46

5 Test Case Mapping.............................................................................................................................................48
6 Revision History and Contributors ..................................................................................................................50
1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and Test Cases (TC) to test the Bluetooth Blood Pressure Profile Specification.

The objective of this test suite is to provide a basis for interoperability 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.

[1] Test Strategy and Terminology Overview
[2] Bluetooth Core Specification, v4.0 or later
[3] Blood Pressure Profile Specification v1.0
[4] ICS Proforma for Blood Pressure Profile, BLP.ICS
[5] GAP Test Suite, GAP.TS
[6] SM Test Suite, SM.TS
[7] GATT Test Suite, GATT.TS
[8] Blood Pressure Service Specification v1.0
[9] Device Information Service v1.1
[10] Blood Pressure Service Test Suite, BLS.TS
[11] Blood Pressure Profile Implementation eXtra Information for Test, IXIT

2.2 Definitions

For the purpose of this Bluetooth document, the definitions in [1] and [2] apply.

2.3 Abbreviations

For the purpose of this Bluetooth document, the abbreviations in [1] and [2] apply.
3 Test Suite Structure (TSS)

3.1 Overview

The Blood Profile requires the presence of GAP, SM and GATT. This is illustrated in Figure 3.1.

3.2 Test Strategy

The test objectives are to verify functionality of the Blood Pressure Profile 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 Blood Pressure 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 Blood Pressure Profile test suite contains Valid Behavior (BV) tests complemented with Invalid Behavior (BI) tests where required. The test coverage mirrored in the test suite structure is the result of a process that started with catalogued specification requirements that were logically grouped and assessed for testability enabling coverage in defined test purposes.
The test suite structure is a tree with the first level representing the protocol groups.

- Discovery of Services and Characteristics
- Features

### 3.3 Test Groups
The following test groups have been defined.

#### 3.3.1 Discovery of Services and Characteristics
This group tests IUT discovery of the Blood Pressure Service and characteristics and Device Information Service and characteristics.

#### 3.3.2 Features
This group tests IUT implementation of Blood Pressure Profile Features.
4 Test Cases (TC)

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>
</tr>
</thead>
<tbody>
<tr>
<td>BLP</td>
<td>Blood Pressure Profile</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identifier Abbreviation</th>
<th>Role Identifier <code>&lt;IUT role&gt;</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>COL</td>
<td>Collector Role</td>
</tr>
<tr>
<td>SEN</td>
<td>Sensor Role</td>
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<table>
<thead>
<tr>
<th>Identifier Abbreviation</th>
<th>Feature Identifier <code>&lt;feat&gt;</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>BLP</td>
<td>Blood Pressure Profile</td>
</tr>
<tr>
<td>BPD</td>
<td>Discovery of Services and Characteristics</td>
</tr>
<tr>
<td>BPF</td>
<td>Features</td>
</tr>
</tbody>
</table>

*Table 4.1: Blood Pressure Profile TC Class Naming Convention*

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 are 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 exists, 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 as 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 Set up LE Transport

Use GATT.TS [7] Preamble [Set up ATT Bearer over LE].

4.2.2 Set up BR/EDR Transport

This procedure is used for negative tests only (see Section 4.3.3).

Use GATT.TS [7] Preamble [Set up ATT Bearer over BR/EDR].

4.2.3 Collector: Initiate Connection when ready for Indications or Notifications

• Preamble Purpose
  This is a setup procedure for the Collector to initiate connection to a Blood Pressure Sensor when it is ready to receive indications or notifications.

• Reference
  [3] 5.2

  [2] GAP 9.3.3, 9.3.4
• Initial Condition

A preamble procedure defined in Section 4.2.1 is used to setup the LE transport and L2CAP channel. The Collector and the Lower Tester (Blood Pressure Sensor) may have bonded following GAP procedures.

The Collector is disconnected.

The Collector has been configured to accept commands from the Upper Tester to request and receive blood pressure measurements.

• Preamble Procedure

1. The Upper Tester commands the Collector IUT to initiate a connection.
2. The Lower Tester sends to the Collector IUT either using:
   - ALT 1: GAP Directed Connectable Mode (send ADV_DIRECT_IND packets)
   or
   - ALT 2: GAP Undirected Connectable Mode (send ADV_IND packets).
3. The Lower Tester waits for responses from the Collector IUT.
4. The Collector IUT sends a CONNECT_REQ and an optionally empty PDU to the Lower Tester.

4.3 Discover Services and Characteristics

The procedures defined in this test group verify IUT discovery of the services and characteristics used by a Blood Pressure Sensor (Lower Tester).

4.3.1 BLP/COL/BPD/BV-01-I [Discover Blood Pressure Service]

• Test Purpose

Verify that an instantiation of the Blood Pressure Service can be detected by the Collector IUT.
• Reference

[3] 4.2.1

• Initial Condition
Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

The Lower Tester has one instantiation of the Blood Pressure Service [8] as a primary service.

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


• Expected Outcome
Pass verdict

An attribute handle range is returned containing the starting handle and the ending handle of one instantiation of a Blood Pressure Service definition.

4.3.2  BLP/COL/BPD/BV-02-I [Discover Device Information Service]

• Test Purpose
Verify that the Device Information Service can be detected by the Collector IUT.

• Reference

[3] 4.2.2

• Initial Condition
Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

The Lower Tester has one instantiation of the Device Information Service [9].

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


• Expected Outcome
  Pass verdict

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

4.3.3 BLP/SEN/BPD/BV-03-I [Verify Valid BR/EDR Behavior for Blood Pressure Service]

• Test Purpose
  Verify that the Blood Pressure Service on a BR/EDR/LE (i.e., dual mode) Blood Pressure Sensor IUT cannot be discovered by a Collector when using a BR/EDR based ATT Bearer.

• Reference
  [3] 2.5

• Initial Condition
  The IUT has one instantiation of the Blood Pressure Service [8] as a primary service.

• Test Procedure
  1. Establish a BR/EDR ATT Bearer connection between the Lower Tester and IUT (see Section 4.2.2).
  2. Execute the procedure included in test BLS/SEN/SD/BV-01-C of [10] over the BR/EDR ATT Bearer to discover the Blood Pressure Service.

• Expected Outcome
  Pass verdict

The Blood Pressure Service is not discovered.

4.3.4 BLP/COL/BPD/BV-04-I [Discover Blood Pressure Measurement Characteristic]

• Test Purpose
  Verify that a Blood Pressure Measurement characteristic can be detected by the Collector IUT.

• Reference
  [3] 4.3.1.1

• Initial Condition
  Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.
The Lower Tester includes one instantiation of the Blood Pressure Service [8] as a primary service including all defined characteristics. This instantiation also contains two «future» characteristics:

- One inserted between the last mandatory characteristic and the first optional characteristic.
- One appended after the last optional characteristic.
- The «future» characteristic is a 16-bit UUID randomly selected from unassigned UUIDs at the time of the test.

The IUT has executed the procedure included in BLP/COL/BPD/BV-01-I [Discover Blood Pressure Service], and has saved the handle range for an instantiation of the Blood Pressure Service. The Blood Pressure Service contains one Blood Pressure Measurement characteristic.

• Test Procedure

The Upper Tester issues a command to the IUT to discover the Blood Pressure Measurement characteristic.

The IUT executes either of the procedures included in GATT.TS [7]:

- Discover All Characteristics of a Service, GATT/CL/GAD/BV-04-C, with the specified handle range for the instantiation of the Blood Pressure Service.

or

- Discover Characteristics by UUID, GATT/CL/GAD/BV-05-C, with the specified handle range for the instantiation of the Blood Pressure Service and UUID set to «Blood Pressure Measurement». In the selected procedure, only one pass is needed with the server database defined in the Initial Condition.

• Expected Outcome

Pass verdict

One attribute handle/value pair is returned containing the UUID «Blood Pressure Measurement» characteristic.

4.3.5 BLP/COL/BPD/BV-05-I [Discover Blood Pressure Measurement – Client Characteristic Configuration Descriptor]

• Test Purpose

Verify that the Collector IUT can discover the Client Characteristic Configuration descriptor of the Blood Pressure Measurement characteristic.

• Reference

[3] 4.3.1.1

• Initial Condition

Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.
The Lower Tester has an instance of the Blood Pressure Service [8] as a primary service and an associated Client Characteristic Configuration descriptor.

The IUT has discovered the handle range of the Blood Pressure Measurement characteristic either by executing BLP/COL/BPD/BV-04-I [Discover Blood Pressure Measurement Characteristic] or by other means.

- **Test Procedure**
  The Upper Tester issues a command to the IUT to Discover All Characteristic Descriptors using the handle range of the Blood Pressure Measurement characteristic.

  The IUT executes one pass of the procedure included in GATT.TS [7] Discover all Characteristic Descriptors, GATT/CL/GAD/BV-06-C, using the specified handle range with the Blood Pressure Measurement characteristic contained in the server database defined in the Initial Condition.

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

  One attribute handle/value pair is returned containing the UUID «Client Characteristic Configuration» descriptor.

4.3.6 BLP/COL/BPD/BV-06-I [Discover Intermediate Cuff Pressure Characteristic]

- **Test Purpose**
  Verify that an Intermediate Cuff Pressure characteristic can be detected by the Collector IUT.

- **Reference**
  [3] 4.3.1.2

- **Initial Condition**
  Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

The Lower Tester has one instantiation of the Blood Pressure Service [8] as a primary service including all defined characteristics. This instantiation also contains two «future» characteristics:

- One inserted between the last mandatory characteristic and the first optional characteristic.
- One appended after the last optional characteristic.
- The «future» characteristic is a 16-bit UUID randomly selected from unassigned UUIDs at the time of the test.

The IUT has executed the procedure included in BLP/COL/BPD/BV-01-I [Discover Blood Pressure Service], and has saved the handle range for the instantiation of the Blood Pressure Service. The Blood Pressure Service contains one Intermediate Cuff Pressure characteristic.
• **Test Procedure**

  The Upper Tester issues a command to the IUT to discover the Intermediate Cuff Pressure characteristic.

  The IUT executes either of the procedure included in GATT.TS [7]

  - Discover All Characteristics of a Service, TP/GAD/CL/BV-04-C, with the specified handle range for the instantiation of the Blood Pressure Service

  or

  - Discover Characteristics by UUID, GATT/CL/GAD/BV-05-C, using the specified handle range for the instantiation of the Blood Pressure Service and UUID set to «Intermediate Cuff Pressure».

  In the selected procedure, only one pass is needed with the server database defined in the Initial Condition.

• **Expected Outcome**

  **Pass verdict**

  One attribute handle/value pair is returned containing the UUID «Intermediate Cuff Pressure» characteristic.

---

4.3.7  **BLP/COL/BPD/BV-07-I [Discover Intermediate Cuff Pressure – Client Characteristic Configuration Descriptor]**

• **Test Purpose**

  Verify that the Collector IUT can discover the Client Characteristic Configuration descriptor of the Intermediate Cuff Pressure characteristic.

• **Reference**

  [3] 4.3.1.2

• **Initial Condition**

  Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

  The Lower Tester has one instantiation of the Blood Pressure Service [8] as a primary service and an associated Client Characteristic Configuration descriptor.

  The IUT has discovered the handle range of the Intermediate Cuff Pressure characteristic either by executing the procedure included in **BLP/COL/BPD/BV-06-I [Discover Intermediate Cuff Pressure Characteristic]** or by other means.

• **Test Procedure**

  The Upper Tester issues a command to the IUT to Discover All Characteristic Descriptors using the handle range of the Intermediate Cuff Pressure characteristic.
The IUT executes one pass of the procedure included in GATT.TS [7] Discover all Characteristic Descriptors, GATT/CL/GAD/BV-06-C, using the specified handle range with the Intermediate Cuff Pressure characteristic contained in the server database defined in the Initial Condition.

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

  One attribute handle/value pair is returned containing the UUID «Client Characteristic Configuration» descriptor.

**4.3.8 BLP/COL/BPD/BV-08-I [Discover Blood Pressure Feature Characteristic]**

- **Test Purpose**

  Verify that a Blood Pressure Feature characteristic can be detected by the Collector IUT.

- **Reference**

  [3] 4.3.1.3

- **Initial Condition**

  Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

  The Lower Tester has one instantiation of the Blood Pressure Service [8] as a primary service including all defined characteristics. This instantiation also contains two «future» characteristics:

  - One inserted between the last mandatory characteristic and the first optional characteristic.
  - One appended after the last optional characteristic.
  - The «future» characteristic is a 16-bit UUID randomly selected from unassigned UUIDs at the time of the test.

  The IUT has executed the procedure included in BLP/COL/BPD/BV-01-I [Discover Blood Pressure Service], and has saved the handle range for the Blood Pressure Service. The Blood Pressure Service contains one Blood Pressure Feature characteristic.

- **Test Procedure**

  The Upper Tester issues a command to the IUT to discover the Blood Pressure Feature characteristic.

  The IUT executes either of the procedures included in GATT.TS [7]:

  - Discover All Characteristics of a Service, TP/GAD/CL/BV-04-C, with the specified handle range for the instantiation of the Blood Pressure Service

  or

  - Discover Characteristics by UUID, GATT/CL/GAD/BV-05-C, using the specified handle range for the instantiation of the Blood Pressure Service and UUID set to «Blood Pressure Feature».
In the selected procedure, only one pass is needed with the server database defined in the Initial Condition.

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

  One attribute handle/value pair is returned containing the UUID «Blood Pressure Feature characteristic».

4.3.9 BLP/COL/BPD/BV-09-I [Discover Device Information Service Characteristics]

- **Test Purpose**
  Verify that a Collector IUT can discover all characteristics of a Device Information Service supported by the IUT.

- **Reference**
  [3] 4.3.2

- **Initial Condition**
  Via IXIT [11] the IUT manufacturer specifies all characteristics of the Device Information Service supported by the IUT.

  Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

  The Lower Tester includes one instantiation of the Device Information Service including all defined characteristics. This instantiation also contains two «future» characteristics:

  - One inserted before the first characteristic defined in [9].
  - One appended after the last characteristic defined in [9].
  - The «future» characteristic is a 16-bit UUID randomly selected from unassigned UUIDs at the time of the test.

  The IUT has executed the procedure included in BLP/COL/BPD/BV-02-I [Discover Device Information Service], and has saved the handle range for the instantiation of the Device Information Service contained in the Lower Tester. The Device Information Service contains one or more characteristics.

- **Test Procedure**
  The Upper Tester issues a command to the IUT to discover all characteristics of the Device Information Service supported by the IUT. There are two alternatives:

  1. The IUT executes the procedure included in GATT.TS [7] Discover All Characteristics of a Service, GATT/CL/GAD/BV-04-C, using the specified handle range, with the Lower Tester instantiating the database specified in the Initial Condition.
  2. The IUT executes the procedure included in GATT.TS [7] Discover Characteristics by UUID, GATT/CL/GAD/BV-05-C several times, using each of the UUIDs for the characteristics of the
Device Information Service supported by the IUT, with the Lower Tester instantiating the database specified in the Initial Condition.

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

  For each characteristic supported by the IUT contained in the Lower Tester’s instantiation of the Device Information Service, the IUT shall report an attribute handle/value pair for each characteristic specified in the IXIT [11] to the Upper Tester.

### 4.3.10 BLP/COL/BPD/BV-10-I [Read Device Information Service Characteristics]

- **Test Purpose**
  
  Verify that the Collector IUT can read all characteristics of a Device Information Service supported by the IUT.

- **Reference**
  
  [3] 3.2, 4.3.2

- **Initial Condition**
  
  Via IXIT [11] the IUT manufacturer specifies all characteristics of the Device Information Service supported by the IUT.

  Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

  The Lower Tester includes one instantiation of the Device Information Service [9] including all defined characteristics.

  The IUT has previously executed the procedure included in BLP/COL/BPD/BV-09-I [Discover Device Information Service Characteristics], so it has the handle/value pairs for all characteristics of the Device Information Services supported by the IUT.

- **Test Procedure**
  
  This test shall be run twice and a disconnection may occur between the two tests. In the first pass, the string shall include only character values in the ASCII printable range. In the second pass, the string shall include character values outside the ASCII printable range.

  The Upper Tester issues a command to the IUT to read all characteristics of the Device Information Service supported by the IUT.

  For each characteristic of the Device Information Service supported by the IUT, the IUT shall execute the procedure included in GATT.TS [7] GATT/CL/GAR/BV-01-C [Read Characteristic Value – by client].
• Expected Outcome
  Pass verdict

  For each characteristic contained in the Lower Tester’s instantiation of the Device Information Service supported by the IUT, the IUT shall report the characteristic value for all characteristics specified in the IXIT [11] to the Upper Tester, including any printable or non-printable ASCII values.

4.4 Blood Pressure Features

The procedures defined in this test group verify Blood Pressure Sensor IUT implementation of the Features defined in the Blood Pressure Profile Specification [3] by a Blood Pressure Sensor IUT, and usage of the same features by a Collector IUT.

4.4.1 BLP/SEN/BPF/BV-01-I [Blood Pressure Service UUID in AD]

• Test Purpose
  Verify that the Blood Pressure Service UUID is included in AD (Advertising Data) from the Blood Pressure Sensor IUT when in GAP Discoverable Mode.

• Reference
  [3] 3.1.1

• Initial Condition
  The IUT is induced to enter a GAP discoverable mode and generate Advertising Packets.

• Test Procedure
  The Lower Tester listens for Advertising Packets from the IUT.

• Expected Outcome
  Pass verdict

  At least one received Advertising Packet contains the defined Service UUID for «Blood Pressure Service».

4.4.2 BLP/SEN/BPF/BV-02-I [Local Name included in AD or Scan Response]

• Test Purpose
  Verify that the Local Name is included in AD (Advertising Data) or Scan Response data from the Blood Pressure Sensor IUT.

• Reference
  [3] 3.1.2

• Initial Condition
  The IUT is induced to enter a GAP connectable mode and generate Advertising Packets.
• Test Procedure
The Lower Tester listens for Advertising Packets from the IUT. When the Lower Tester receives an Advertising Packet from the IUT, it sends a Scan Request to the IUT. Then the Lower Tester listens for a Scan Response from the IUT.

• Expected Outcome
Pass verdict
The IUT sends an Advertising packet and a Scan Response packet.
The IUT includes the Local Name in either the Advertising packet or Scan Response packet.

4.4.3 BLP/SEN/BPF/BV-03-I [Public Address in AD or Scan Response]
• Test Purpose
Verify that a Blood Pressure Sensor that supports multiple bonds and supports a Target Address AD Type includes the Public Client address in the Public Target Address AD Type in Advertising or Scan Response data and the Multiple Bond Support bit is properly set.

• Reference
[3] 3.1.4, 5.1.5

• Initial Condition
The Lower Tester has previously bonded to the IUT using a public address.
The IUT is induced to enter a GAP connectable mode and generate Advertising Packets.
• Test Procedure

The Lower Tester listens for Advertising Packets from the IUT. When the Lower Tester receives an Advertising Packet from the IUT, the Lower Tester sends a Scan Request to the IUT. Then the Lower Tester listens for a Scan Response from the IUT.

Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

The Lower Tester executes the procedure included in BLP/COL/BPD/BV-01-I [Discover Blood Pressure Service], and saves the handle range for the Blood Pressure Service.

Send a request from the Lower Tester to IUT to read a Blood Pressure Feature characteristic.

• Expected Outcome

Pass verdict

The value of the Multiple Bond Support bit of the Blood Pressure Feature characteristic is set to 1.

The IUT includes a Target Address in either the Advertising packet or Scan Response packet or both.

The Target Address is a Public Address and six octets in length.
4.4.4 BLP/SEN/BPF/BV-04-I [Private Random Address in AD or Scan Response]

- Test Purpose
  Verify that a Blood Pressure Sensor that supports multiple bonds and supports a Target Address AD Type includes the Private Random Client address in the Random Target Address AD Type in Advertising or Scan Response data and the Multiple Bond Support bit is properly set.

- Reference
  [3] 3.1.4, 5.1.5

- Initial Condition
  The Lower Tester has previously bonded to the IUT using a private random address.

  The IUT is induced to enter a GAP connectable mode and generate Advertising Packets.

- Test Procedure
  The Lower Tester listens for Advertising Packets from the IUT. When the Lower Tester receives an Advertising Packet from the IUT, the Lower Tester sends a Scan Request to the IUT. Then the Lower Tester listens for a Scan Response from the IUT.

  Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

  The Lower Tester executes the procedure included in BLP/COL/BPD/BV-01-I [Discover Blood Pressure Service], and saves the handle range for the Blood Pressure Service.

  Send a request from the Lower Tester to IUT to read a Blood Pressure Feature characteristic.

---

Lower Tester has bonded to the IUT using a private address. IUT is disconnected.

Advertising Packet
(Target Address may be included)

Scan Request

Scan Response
(Target Address may be included)

Lower Tester connects to the IUT.

ATT_Read_Request
(Code = 0x0A,
Handle of Blood Pressure Feature)

ATT_Read_Response
(Code = 0x0B,
Blood Pressure Feature value)
• Expected Outcome
  
Pass verdict

The value of the Multiple Bond Support bit of the Blood Pressure Feature characteristic is set to 1.

The IUT includes a Target Address in either the Advertising packet or Scan Response packet or both.

The Target Address is a Private Random Address and six octets in length.

4.4.5  BLP/SEN/BPF/BV-05-I [Static Random Address in AD or Scan Response]

• Test Purpose
  
Verify that a Blood Pressure Sensor that supports multiple bonds and supports a Target Address AD Type includes the Static Random Client address in the Random Target Address AD Type in Advertising or Scan Response data and the Multiple Bond Support bit is properly set.

• Reference
  
[3] 3.1.4, 5.1.5

• Initial Condition
  
The Lower Tester has previously bonded to the IUT using a static random address.

The IUT is induced to enter a GAP connectable mode and generate Advertising Packets.

• Test Procedure
  
The Lower Tester listens for Advertising Packets from the IUT. When the Lower Tester receives an Advertising Packet from the IUT, the Lower Tester sends a Scan Request to the IUT. Then the Lower Tester listens for a Scan Response from the IUT.

Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

The Lower Tester executes the procedure included in BLP/COL/BPD/BV-01-I [Discover Blood Pressure Service], and saves the handle range for the Blood Pressure Service.

Send a request from the Lower Tester to IUT to read a Blood Pressure Feature characteristic.
• Expected Outcome

**Pass verdict**

The value of the Multiple Bond Support bit of the Blood Pressure Feature characteristic is set to 1.

The IUT includes a Target Address in either the Advertising packet or Scan Response packet or both.

The Target Address is a Static Random Address and six octets in length.

### 4.4.6 BLP/SEN/BPF/BV-06-I [No Target Address in AD or Scan Response – Multi-Bond]

• Test Purpose

Verify that a Blood Pressure Sensor that supports multiple bonds and does not claim to support a Target Address AD Type does not include the Client address in a Target Address AD Type in Advertising or Scan Response data and the Multiple Bond Support bit is properly set.

• Reference

[3] 3.1.4, 5.1.5

• Initial Condition

The Lower Tester has previously bonded to the IUT.

The IUT is induced to enter a GAP connectable mode and generate Advertising Packets.
• Test Procedure

The Lower Tester listens for Advertising Packets from the IUT. When the Lower Tester receives an Advertising Packet from the IUT, the Lower Tester sends a Scan Request to the IUT. Then the Lower Tester listens for a Scan Response from the IUT.

Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

The Lower Tester executes the procedure included in BLP/COL/BPD/BV-01-I [Discover Blood Pressure Service], and saves the handle range for the Blood Pressure Service.

Send a request from the Lower Tester to IUT to read a Blood Pressure Feature characteristic.

• Expected Outcome

Pass verdict

The value of the Multiple Bond Support bit of the Blood Pressure Feature characteristic is set to 1.

The IUT does not include the Client address in either the Advertising packet or in a Scan Response packet.
4.4.7 BLP/SEN/BPF/BV-07-I [No Target Address in AD or Scan Response – Single-Bond]

- Test Purpose
  Verify that a Blood Pressure Sensor that does not support multiple bonds and does not claim to support a Target Address AD Type does not include the Client address in a Target Address AD Type in Advertising or Scan Response data and the Multiple Bond Support bit is properly set.

- Reference
  [3] 3.1.4

- Initial Condition
  The Lower Tester has previously bonded to the IUT.

  The IUT is induced to enter a GAP connectable mode and generate Advertising Packets.

- Test Procedure
  The Lower Tester listens for Advertising Packets from the IUT. When the Lower Tester receives an Advertising Packet from the IUT, the Lower Tester sends a Scan Request to the IUT. Then the Lower Tester listens for a Scan Response from the IUT.

  Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

  The Lower Tester executes the procedure included in BLP/COL/BPD/BV-01-I [Discover Blood Pressure Service], and saves the handle range for the Blood Pressure Service.

  Send a request from the Lower Tester to IUT to read a Blood Pressure Feature characteristic.
Lower Tester has bonded to the IUT. IUT is disconnected.

Advertising Packet
(No Target Address included)
Scan_Request
Scan_Response
(No Target Address included)

Lower Tester connects to the IUT.

ATT_Read_Request
(Code = 0x0A,
Handle of Blood Pressure Feature)
ATT_Read_Response
(Code = 0x0B,
Blood Pressure Feature value)

• Expected Outcome

Pass verdict

The value of the Multiple Bond Support bit of the Blood Pressure Feature characteristic is set to 0.

The IUT does not include the Client address in either the Advertising packet or in a Scan Response packet.

4.4.8 BLP/SEN/BPF/BV-08-I [Blood Pressure Service as Primary Service]

• Test Purpose

Verify that a Blood Pressure Service is instantiated as a primary service.

• Reference

[3] 3

• Initial Condition

Run the preamble procedure to enable the Collector to initiate connection to a Blood Pressure Sensor included in Section 4.2.3.

• Test Procedure

1. Discover primary services by service UUID by executing the test procedure of GATT.TS [7] GATT/SR/GAD/BV-02-C with the service UUID set to «Blood Pressure Service».

2. Verify one attribute handle range is returned, containing the starting handle and the ending handle of the service definition.
3. Verify that the Blood Pressure Service is defined as a primary service.

- Expected Outcome

  Pass verdict

  The IUT has one instantiation of the Blood Pressure Service.

  The Blood Pressure Service is a primary service.

4.4.9 BLP/COL/BPF/BV-09-I [Configure Blood Pressure Measurement Characteristic for Indications]

- Test Purpose

  Verify that the Collector IUT can configure a Blood Pressure Sensor (Lower Tester) to Indicate Blood Pressure measurements.

- Reference

  [3] 4.4

- Initial Condition

  A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

  The IUT has executed the procedure included in BLP/COL/BPD/BV-05-I [Discover Blood Pressure Measurement – Client Characteristic Configuration Descriptor], which returns the handle of a Client Characteristic Configuration Descriptor for a Blood Pressure Measurement characteristic contained in the Lower Tester.

- Test Procedure

  The Upper Tester sends a command to the IUT to configure to receive Blood Pressure measurements.
• Expected Outcome

Pass verdict

IUT sends a correctly formatted ATT_Write_Request (0x12) to the Lower Tester, with the handle set to that of the Client Characteristic Configuration Descriptor for a Blood Pressure Measurement characteristic, and the value set to «indication».

4.4.10 BLP/COL/BPF/BV-10-I [Receive Blood Pressure Measurement Indications]

• Test Purpose

Verify that the Collector IUT can receive indication of the Blood Pressure Measurement Characteristic value from a Blood Pressure Sensor for various field configurations.

• Reference

[3] 4.4

• Initial Condition

A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

The IUT is configured to expect Blood Pressure Measurement Indication, after executing the procedure included in BLP/COL/BPF/BV-09-I [Configure Blood Pressure Measurement Characteristic for Indications].

The IUT knows the handle of the Blood Pressure Measurement characteristic.

• Test Procedure

The Lower Tester sends an ATT_Handle_Value_Indication containing a Blood Pressure Measurement characteristic value to the IUT.
This test shall be run for each value of each bit shown in Table 4.2:

<table>
<thead>
<tr>
<th>Flag Field</th>
<th>Value</th>
<th>Pass Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>bit 0</td>
<td>0</td>
<td>Blood pressure for Systolic, Diastolic and MAP is in units of mmHg</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Blood pressure for Systolic, Diastolic and MAP is in units of kPa</td>
</tr>
<tr>
<td>bit 1</td>
<td>0</td>
<td>Time Stamp field is not present</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Time Stamp field is present</td>
</tr>
<tr>
<td>bit 2</td>
<td>0</td>
<td>Pulse Rate field not present</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Pulse Rate field present</td>
</tr>
<tr>
<td>bit 3</td>
<td>0</td>
<td>User ID field not present</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>User ID field present</td>
</tr>
<tr>
<td>bit 4</td>
<td>0</td>
<td>Measurement Status field is not present</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Measurement Status field is present</td>
</tr>
</tbody>
</table>

Table 4.2: Pass Criteria for Characteristics

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

  IUT sends a correctly formatted ATT_Handle_Value_Confirmation (0x1E) to the Lower Tester. IUT reports the received Blood Pressure measurement values in expected combinations to the Upper
Tester using the pass criteria in the table above. Note that an IUT may send the ATT_Handle_Value_Confirmation before or after it reports the received Blood Pressure Measurement to the Upper Tester.

4.4.11 BLP/COL/BPF/BI-01-I [Receive Blood Pressure Measurement Indications with reserved flags]

• Test Purpose

Verify that the Collector IUT can receive indication of the Blood Pressure Measurement Characteristic value from a Blood Pressure Sensor in the presence of reserved flags.

• Reference

[3] 4.4

• Initial Condition

A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

The IUT is configured to expect Blood Pressure Measurement Indication, after executing the procedure included in BLP/COL/BPF/BV-09-I [Configure Blood Pressure Measurement Characteristic for Indications].

The IUT knows the handle of the Blood Pressure Measurement characteristic.

• Test Procedure

The Lower Tester sends an ATT_Handle_Value_Indication containing a Blood Pressure Measurement characteristic value to the IUT.

There are many combinations of reserved flag settings. For this test use Flags = 0xFF (all 1s). Also, include valid uses of the other flags: Blood Pressure in kilo Pascals, time stamp, pulse rate, user id and measurement status. Any valid values for time stamp, pulse rate, user id and measurement status may be sent by the Lower Tester.
• Expected Outcome

Pass verdict

IUT sends a correctly formatted ATT_Handle_Value_Confirmation (0x1E) to the Lower Tester.

IUT reports the received Blood Pressure measurement to the Upper Tester, e.g., BLP_Indication (kilo Pascal Blood Pressure Measurement value, time stamp, pulse rate, user id and measurement status) optionally including the reserved bits of the Flags field. The reported field values match the ones sent by the Lower Tester.

4.4.12 BLP/COL/BPF/BI-02-I [Receive Blood Pressure Measurement Indications with reserved measurement status bits]

• Test Purpose

Verify that the Collector IUT can receive indication of the Blood Pressure Measurement Characteristic value from a Blood Pressure Sensor including reserved bits of the measurement status field.

• Reference

[3] 4.4

• Initial Condition

A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

The IUT is configured to expect Blood Pressure Measurement Indication, after executing the procedure included in BLP/COL/BPF/BV-09-I [Configure Blood Pressure Measurement Characteristic for Indications].

The IUT knows the handle of the Blood Pressure Measurement characteristic.
• Test Procedure

The Lower Tester sends an ATT_Handle_Value_Indication to the IUT containing a Blood Pressure Measurement characteristic value. That value shall contain:

flags = 0x12, valid mmHg Blood Pressure, valid time stamp, reserved measurement status bits (e.g. 0xFFFF).

IUT configured to expect Blood Pressure Measurement Characteristic Indication.

ATT_Handle_Value_Indication
(Code = 0x1D, BPM handle,
BPM in mmHg, valid time stamp,
valid and reserved measurement status flags)

BLP_Indication
(BP in mmHg, time stamp, valid
and optionally reserved measurement status flags)

• Expected Outcome

Pass verdict

IUT sends a correctly formatted ATT_Handle_Value_Confirmation (0x1E) to the Lower Tester.

IUT reports the received Blood Pressure measurement to the Upper Tester, e.g., BLP_Indication (Blood Pressure value in mmHg, time stamp, valid and optionally reserved measurement status bits). The reported field values match the ones sent by the Lower Tester.

4.4.13 BLP/COL/BPF/BI-03-I [Receive Blood Pressure Measurement Indications with additional octets not comprehended]

• Test Purpose

Verify that the Collector IUT can receive indication of the Blood Pressure Measurement Characteristic value from a Blood Pressure Sensor including additional octets not comprehended by the Collector.

• Reference

[3] 4.4

• Initial Condition

A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.
The IUT is configured to expect Blood Pressure Measurement Indication, after executing the procedure included in BLP/COL/BPF/BV-09-I [Configure Blood Pressure Measurement Characteristic for Indications].

The IUT knows the handle of the Blood Pressure Measurement characteristic.

- **Test Procedure**

  The Lower Tester sends an ATT_Handle_Value_Indication to the IUT containing a Blood Pressure Measurement characteristic value. That value shall contain:

  flags = 0x7E, valid mm Hg Blood Pressure, valid time stamp, valid pulse rate, valid user id and valid measurement status, two reserved Flags bits set, and at least two additional octets not comprehended by the Collector. The total number of octets shall not exceed the maximum MTU size.

  ATT_Handle_Value_Indication (Code = 0x1D, BPM handle, valid and reserved Flags, BP in mmHg, time stamp, pulse rate, user id, measurement status, optionally additional octets)

  ATT_Handle_Value_Confirmation (Code = 0x1E)

- **Expected Outcome**

  **Pass verdict**

  IUT sends a correctly formatted ATT_Handle_Value_Confirmation (0x1E) to the Lower Tester.

  IUT reports the received Blood Pressure measurement to the Upper Tester, e.g., BLP_Indication (mm Hg Blood Pressure value, time stamp, pulse rate, user id, measurement status, valid and optionally reserved Flags, optionally additional octets). The reported field values match the ones sent by the Lower Tester.

4.4.14 BLP/COL/BPF/BV-11-I [Receive multiple Blood Pressure Measurement Indications]

- **Test Purpose**

  Verify that the Collector IUT can receive a series of Blood Pressure Measurement characteristic indications.
• Reference

[3] 4.4

• Initial Condition

A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

The IUT is configured to expect Blood Pressure Measurement Indication, after executing the procedure included in BLP/COL/BPF/BV-09-I [Configure Blood Pressure Measurement Characteristic for Indications].

The IUT knows the handle of the Blood Pressure Measurement characteristic.

• Test Procedure

The Lower Tester sends multiple (e.g., two or more) ATT_Handle_Value_Indications to the IUT; each contains a Blood Pressure Measurement characteristic value in mm Hg with a time stamp, pulse rate, user id, and measurement status.

• Expected Outcome

Pass verdict

For each ATT_Handle_Value_Indication sent to the IUT:

- The IUT sends a correctly formatted ATT_Handle_Value_Confirmation (0x1E) to the Lower Tester.

- The IUT reports all of the received mm Hg Blood Pressure measurement values to the Upper Tester, e.g., BLP_Indication (Blood Pressure value, time stamp, pulse rate, user id and measurement status) as specified in the flags field. The reported field values match the ones sent by the Lower Tester.
4.4.15 BLP/COL/BPD/BV-12-I [Configure Intermediate Cuff Pressure Characteristic for Notifications]

- **Test Purpose**
  Verify that the Collector IUT can configure a Blood Pressure Sensor (Lower Tester) to Notify Intermediate Cuff Pressure characteristics.

- **Reference**
  [3] 4.5

- **Initial Condition**
  A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

The IUT has executed the procedure included in BLP/COL/BPD/BV-07-I [Discover Intermediate Cuff Pressure – Client Characteristic Configuration Descriptor], which returns the handle of a Client Characteristic Configuration Descriptor for an Intermediate Cuff Pressure characteristic contained in the Lower Tester.

- **Test Procedure**
  The Upper Tester sends a command to the IUT to configure to receive Intermediate Cuff Pressure characteristic notifications.
• Expected Outcome
  
  Pass verdict

  IUT sends a correctly formatted ATT_Write_Request (0x12) to the Lower Tester, with the handle set to that of the Client Characteristic Configuration Descriptor for an Intermediate Cuff Pressure characteristic, and the value set to «notification».

4.4.16 BLP/COL/BPF/BV-13-I [Receive Intermediate Cuff Pressure Notifications]

• Test Purpose
  
  Verify that the Collector IUT can receive notifications of the Intermediate Cuff Pressure Characteristic for various field configurations.

• Reference
  
  [3] 4.5

• Initial Condition
  
  A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

  The IUT has executed the procedure included in BLP/COL/BPF/BV-12-I [Configure Intermediate Cuff Pressure Characteristic for Notifications], which configures it to expect Intermediate Cuff Pressure Notification.

  The IUT knows the handle of the Intermediate Cuff Pressure characteristic.

• Test Procedure
  
  The Lower Tester sends an ATT_Handle_Value_Notification containing an Intermediate Cuff Pressure characteristic value to the IUT.

  This test shall be run for each value of each bit shown in the following table:

<table>
<thead>
<tr>
<th>Flag Field</th>
<th>Value</th>
<th>Pass Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(Reported in Intermediate Cuff Pressure Measurement characteristic)</td>
</tr>
<tr>
<td>bit 0</td>
<td>0</td>
<td>Intermediate Cuff Pressure in units of mmHg</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Intermediate Cuff Pressure in units of kPa</td>
</tr>
<tr>
<td>bit 1</td>
<td>0</td>
<td>Time Stamp field is not present</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Time Stamp field is present</td>
</tr>
<tr>
<td>bit 2</td>
<td>0</td>
<td>Pulse Rate field not present</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Pulse Rate field present</td>
</tr>
<tr>
<td>Flag Field</td>
<td>Value</td>
<td>Pass Criteria</td>
</tr>
<tr>
<td>------------</td>
<td>-------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Reported in Intermediate Cuff Pressure Measurement characteristic)</td>
</tr>
<tr>
<td>bit 3</td>
<td>0</td>
<td>User ID field not present</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>User ID field present</td>
</tr>
<tr>
<td>bit 4</td>
<td>0</td>
<td>Measurement Status field is not present</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Measurement Status field is present</td>
</tr>
</tbody>
</table>

**Expected Outcome**

**Pass verdict**

IUT sends notifications of Intermediate Cuff Pressure measurement values in expected combinations to the Upper Tester using the pass criteria in the table above.

Verify that the two unused fields in Intermediate Cuff Pressure Value field are set to special value NaN (0x07FF) in all cases.

The reported field values and units match the ones sent by the Lower Tester.

**4.4.17 BLP/COL/BPF/BI-04-I [Receive Intermediate Cuff Pressure Notifications with reserved flags]**

**Test Purpose**

Verify that the Collector IUT can receive notifications of the Intermediate Cuff Pressure Characteristic from a Blood Pressure Sensor including reserved flags.
• Reference

[3] 4.5

• Initial Condition

A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

The IUT has executed the procedure included in BLP/COL/BPF/BV-12-I [Configure Intermediate Cuff Pressure Characteristic for Notifications], which configures it to expect Intermediate Cuff Pressure Notification.

The IUT knows the handle of the Intermediate Cuff Pressure characteristic.

• Test Procedure

The Lower Tester sends an ATT_Handle_Value_Notification containing an Intermediate Cuff Pressure characteristic value to the IUT. There are many combinations of reserved flag settings. For this test use Flags = 0xF0 (Blood Pressure in mm Hg, no Time Stamp, no Pulse Rate, no User ID, Measurement Status). Any valid values for the Measurement Status field may be sent by the Lower Tester.

![Diagram](Diagram.png)

ATT_Handle_Value_Notification
(Code = 0x1B, Intermediate CP handle, valid and reserved Flags, Intermediate CP mmHg, measurement status)

BLP_Notification
(Valid and optionally reserved Flags, Intermediate CP mmHg, measurement status)

• Expected Outcome

Pass verdict

IUT reports the received mm Hg Blood Pressure value to the Upper Tester, e.g., BLP_Notification (Intermediate Cuff Pressure). The reported field values match the ones sent by the Lower Tester optionally including the reserved bits of the Flags field.
4.4.18 BLP/COL/BPF/BI-05-I [Receive Intermediate Cuff Pressure Notifications with reserved measurement status bits]

- **Test Purpose**
  Verify that the Collector IUT can receive notifications of the Intermediate Cuff Pressure Characteristic from a Blood Pressure Sensor including reserved bits of the measurement status field.

- **Reference**
  [3] 4.5

- **Initial Condition**
  A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

  The IUT has executed the procedure included in BLP/COL/BPF/BV-12-I [Configure Intermediate Cuff Pressure Characteristic for Notifications], which configures it to expect Intermediate Cuff Pressure Notification.

  The IUT knows the handle of the Intermediate Cuff Pressure characteristic.

- **Test Procedure**
  The Lower Tester sends an ATT_Handle_Value_Notification containing an Intermediate Cuff Pressure characteristic value. That value shall contain:

  `flags = 0x10, valid mm Hg Blood Pressure, measurement status bits (e.g. 0xFFFF)`
• Expected Outcome
  Pass verdict

IUT reports the received mm Hg Blood Pressure value to the Upper Tester, e.g., BLP_Notification (Intermediate Cuff Pressure in mmHg, valid and optionally reserved measurement status bits). The reported field values match the ones sent by the Lower Tester.

4.4.19 BLP/COL/BPF/BI-06-I [Receive Intermediate Cuff Pressure Notifications with additional octets not comprehended]

• Test Purpose
  Verify that the Collector IUT can receive notifications of the Intermediate Cuff Pressure Characteristic from a Blood Pressure Sensor including additional octets not comprehended.

• Reference
  [3] 4.5

• Initial Condition
  A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

  The IUT has executed the procedure included in BLP/COL/BPF/BV-12-I [Configure Intermediate Cuff Pressure Characteristic for Notifications], which configures it to expect Intermediate Cuff Pressure Notification.

  The IUT knows the handle of the Intermediate Cuff Pressure characteristic.

• Test Procedure
  The Lower Tester sends an ATT_Handle_Value_Notification containing an Intermediate Cuff Pressure characteristic value to the IUT. That value shall contain:

  flags = 0x70, valid mm Hg Blood Pressure, valid measurement status, two reserved Flags bits set, and at least two additional octets not comprehended by the Collector. The total number of octets shall not exceed the maximum MTU size.
Expected Outcome

Pass verdict

IUT reports the received mm Hg Blood Pressure value to the Upper Tester, e.g., BLP_Notification (Intermediate Cuff Pressure, valid measurement status, valid and optionally reserved Flags, optionally additional octets). The reported field values match the ones sent by the Lower Tester.

4.4.20 BLP/COL/BPF/BV-14-I [Receive multiple Intermediate Cuff Pressure Notifications]

Test Purpose

Verify that the Collector IUT can receive multiple Intermediate Cuff Pressure notifications followed by a Blood Pressure Measurement indication.

Reference

[3] 4.4, 4.5

Initial Condition

A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

The Lower Tester is configured to enable Blood Pressure Measurement Indication, by executing the procedure included in BLP/COL/BPF/BV-09-I [Configure Blood Pressure Measurement Characteristic for Indications].

The Lower Tester is configured to enable Intermediate Cuff Pressure Notification, by executing the procedure included in BLP/COL/BPF/BV-12-I [Configure Intermediate Cuff Pressure Characteristic for Notifications].

The IUT knows the handle of the Blood Pressure Measurement characteristic.
The IUT knows the handle of the Intermediate Cuff Pressure characteristic.

- **Test Procedure**
  The Lower Tester sends two or more ATT_Handle_Value_Notifications to the IUT; each contains the Intermediate Cuff Pressure characteristic value in mm Hg.

  The Lower Tester sends an ATT_Handle_Value_Indication to the IUT; containing a Blood Pressure Measurement characteristic value in mm Hg with a time stamp and a measurement status field.

- **Expected Outcome**
  Pass verdict

  For each ATT_Handle_Value_Notification sent to the IUT:
  - The IUT reports the received mm Hg Blood Pressure value to the Upper Tester. The reported field values match the ones sent by the Lower Tester.

  For the ATT_Handle_Value_Indication sent to the IUT:
  - The IUT sends a correctly formatted ATT_Handle_Value_Confirmation (0x1E) to the Lower Tester.
  - The IUT reports the received mm Hg Blood Pressure values to the Upper Tester, e.g., BLP_Indication (Blood Pressure value, measurement status) as specified in the flags field. The reported field values match the ones sent by the Lower Tester.

4.4.21 BLP/COL/BPF/BV-15-I [Read Blood Pressure Feature characteristic]

- **Test Purpose**
  Verify that the Collector IUT can read the Blood Pressure Feature characteristic from a Blood Pressure Sensor.

- **Reference**
  [3] 4.6

- **Initial Condition**
  A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

  The Upper Tester knows the handle of a Blood Pressure Feature characteristic contained in the Lower Tester.

- **Test Procedure**
  Send a command from the Upper Tester to request the IUT to read a Blood Pressure Feature characteristic from the Lower Tester e.g. BLP_ReadRequest (handle).

  After receipt of the expected result by the Lower Tester, send an ATT_Read_Response (0x0B) from the Lower Tester to the IUT.
Blood Pressure Profile (BLP) / Test Suite

• Expected Outcome

Pass verdict

The IUT sends a correctly formatted ATT_Read_Request (0x0A) to the Lower Tester, containing the handle specified by the Upper Tester.

The IUT receives the response from the Lower Tester and sends the BLP_ReadResponse containing the correct Blood Pressure Feature value to the Upper Tester.

4.4.22 BLP/COL/BPF/BI-07-I [Read Blood Pressure Feature characteristic with reserved value]

• Test Purpose

Verify that the Collector IUT can read the Blood Pressure Feature characteristic from a Blood Pressure Sensor and ignore reserved values.

• Reference

[3] 4.6

• Initial Condition

A preamble procedure defined in Section 4.2.3 is used to setup the LE transport and L2CAP channel and to initiate connection to a Blood Pressure Sensor.

The Upper Tester knows the handle of a Blood Pressure Feature characteristic contained in the Lower Tester.

• Test Procedure

Send a command from the Upper Tester to request the IUT to read a Blood Pressure Feature characteristic from the Lower Tester e.g., BLP_ReadRequest (handle).

After receipt of the expected result by the Lower Tester from the IUT, send an ATT_Read_Response (0x0B) from the Lower Tester to the IUT containing a reserved value e.g., 0xFFFF.
• Expected Outcome

Pass verdict

The IUT sends a correctly formatted ATT_Read_Request (0x0A) to the Lower Tester, containing the handle specified by the Upper Tester.

The IUT receives the response from the Lower Tester and ignores the reserved bits.

The IUT reports the non-reserved values and optionally reports the reserved values to the Upper Tester.

4.4.23 BLP/COL/BPF/BV-16-I [Verify Bond Status on Reconnect]

• Test Purpose

Verify that the Collector IUT starts encryption with a bonded Blood Pressure Sensor on reconnection.

• Reference

[3] 5.2.2

• Initial Condition

The IUT and the Lower Tester are bonded.

The IUT has configured the Lower Tester to enable indications or notifications on one or more of the characteristics of the Lower Tester’s Blood Pressure Service.

No connection is established between the IUT and Lower Tester.

• Test Procedure

1. The Lower Tester begins advertising using a GAP connectable mode.
2. The IUT establishes a connection to the Lower Tester.
3. The Lower Tester does not send any indications or notifications to IUT.
4. The IUT starts encryption when the connection is established.
• Expected Outcome

**Pass verdict**

The IUT starts encryption when the connection is established.
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 Blood Pressure Profile (BLP) [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.

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 case(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLP 3/1</td>
<td>Blood Pressure Service as a Primary Service</td>
<td>BLP/SEN/BPF/BV-08-I</td>
</tr>
<tr>
<td>BLP 3/2</td>
<td>Include Blood Pressure Service UUID in AD in GAP Discoverable Mode</td>
<td>BLP/SEN/BPF/BV-01-I</td>
</tr>
<tr>
<td>BLP 3/3</td>
<td>Include Local Name in AD or Scan Response</td>
<td>BLP/SEN/BPF/BV-02-I</td>
</tr>
</tbody>
</table>
| BLP 3/4 AND BLP 3/6 | Target Address (Public, Static Random, or Private Random) in AD or Scan Response | BLP/SEN/BPF/BV-03-I
<p>|                    |                                                                         | BLP/SEN/BPF/BV-04-I    |
|                    |                                                                         | BLP/SEN/BPF/BV-05-I    |
| BLP 1/1 AND BLP 3/6 AND NOT BLP 3/4 | No Target Address in AD or Scan Response – Multi-Bond | BLP/SEN/BPF/BV-06-I |
| BLP 1/1 AND (BLP 3/7) AND NOT BLP 3/4 | No Target Address in AD or Scan Response – Single Bond | BLP/SEN/BPF/BV-07-I |
| BLP 1/1 AND GAP 0/3 | Blood Pressure Sensor support for BR/EDR/LE (dual mode)                | BLP/SEN/BPD/BV-03-I    |
| BLP 8/1             | Discover Blood Pressure Service                                        | BLP/COL/BPD/BV-01-I    |
| BLP 8/2             | Discover Blood Pressure Measurement characteristic                     | BLP/COL/BPD/BV-04-I    |
| BLP 8/3             | Discover Blood Pressure Measurement – Client Characteristic Configuration Descriptor | BLP/COL/BPD/BV-05-I |</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>Feature</th>
<th>Test case(s)</th>
</tr>
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<tbody>
<tr>
<td>BLP 8/4</td>
<td>Discover Intermediate Cuff Pressure characteristic</td>
<td>BLP/COL/BPD/BV-06-I</td>
</tr>
<tr>
<td>BLP 8/5</td>
<td>Discover Intermediate Cuff Pressure – Client Characteristic Configuration Descriptor</td>
<td>BLP/COL/BPD/BV-07-I</td>
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<tr>
<td>BLP 8/6</td>
<td>Discover Blood Pressure Feature characteristic</td>
<td>BLP/COL/BPD/BV-08-I</td>
</tr>
<tr>
<td>BLP 9/1</td>
<td>Configure Blood Pressure Measurement characteristic for Indications</td>
<td>BLP/COL/BPF/BV-09-I</td>
</tr>
<tr>
<td>BLP 9/2</td>
<td>Receive Blood Pressure Measurement characteristic Indications</td>
<td>BLP/COL/BPF/BV-10-I, BLP/COL/BPF/BI-01-I, BLP/COL/BPF/BI-03-I</td>
</tr>
<tr>
<td>BLP 9/3</td>
<td>Receive multiple Blood Pressure Measurement characteristic Indications</td>
<td>BLP/COL/BPF/BV-11-I</td>
</tr>
<tr>
<td>BLP 9/2 AND</td>
<td>Receive Blood Pressure Measurement characteristic with Measurement Status Field</td>
<td>BLP/COL/BPF/BI-02-I</td>
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<tr>
<td>BLP 9/7</td>
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<tr>
<td>BLP 9/8</td>
<td>Configure Intermediate Cuff Pressure characteristic for Notifications</td>
<td>BLP/COL/BPF/BV-12-I</td>
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<tr>
<td>(BLP 9/4 OR BLP 9/7)</td>
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<td></td>
</tr>
<tr>
<td>BLP 9/7 AND</td>
<td>Receive Intermediate Cuff Pressure characteristic with Measurement Status Field</td>
<td>BLP/COL/BPF/BI-05-I</td>
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<tr>
<td>BLP 9/9</td>
<td></td>
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<tr>
<td>BLP 9/10</td>
<td>Read Blood Pressure Feature characteristic</td>
<td>BLP/COL/BPF/BV-15-I, BLP/COL/BPF/BI-07-I</td>
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<tr>
<td>BLP 9/11</td>
<td>Verify Bond Status on Reconnection</td>
<td>BLP/COL/BPF/BV-16-I</td>
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<td>BLP 10/1</td>
<td>Discover Device Information Service</td>
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<td>BLP 10/4</td>
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Table 5.1: Test Case Mapping
# 6 Revision History and Contributors

## Revision History

<table>
<thead>
<tr>
<th>Revision History</th>
<th>Date</th>
<th>Comments</th>
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<tbody>
<tr>
<td>D09R01</td>
<td>2011-04-09</td>
<td>Initial draft based on HTP.TS D10R07. Version used for IOP.</td>
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<tr>
<td>D09R02</td>
<td>2011-08-28</td>
<td>Updated during MED WG IOP. Incorporated relevant changes from recent HRP.TS and HTP.TS changes since April 9. Updated to align with BLP D09r04. Incorporated feedback from MED WG reviews.</td>
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<tr>
<td>D09R03</td>
<td>2011-09-10</td>
<td>Accepted all changes. Submitted for BTI review. Incorporated feedback from BTI.</td>
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<tr>
<td>D09R04</td>
<td>2011-09-10</td>
<td>Accepted all changes. Version used at IOP.</td>
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<tr>
<td>D1.0.0r1</td>
<td>2011-09-29</td>
<td>Updated for BTI review. Changes resulting from primary service declaration. Added test case BLP/SEN/BPF/BV-04-I (legacy ID: TP/BPF/BP/BV-04-I)</td>
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<tr>
<td>D1.0.0r2</td>
<td>2011-10-10</td>
<td>Incorporated feedback from BTI. Added IXIT reference. Enhanced test case BLP/SEN/BPF/BV-03-I (legacy ID: TP/BPF/BP/BV-03-I) to better test the relationship between the multiple bond support bit and target address. Updated TCMT.</td>
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<tr>
<td>D1.0.0r3</td>
<td>2011-10-10</td>
<td>Accepted all changes.</td>
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<tr>
<td>D1.0.0r4</td>
<td>2011-10-15</td>
<td>Split BLP/SEN/BPF/BV-03-I (legacy ID: TP/BPF/BP/BV-03-I) into 4 test cases. Fixed typos in two diagrams. Fixed error in TCMT and updated numbers resulting from additional test cases.</td>
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<tr>
<td>D1.0.0r5</td>
<td>2011-10-17</td>
<td>Split ‘private’ test case into Static Random and Private Random test cases.</td>
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<tr>
<td>D1.0.0r6</td>
<td>2011-10-19</td>
<td>Fixed typo in 4.4.4.</td>
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<tr>
<td>1.0.0</td>
<td>2011-10-25</td>
<td>Adopted by the I SIG Board of Directors</td>
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<td>1.0.1</td>
<td></td>
<td>Prepare for Publication</td>
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<td>1.0.2r2</td>
<td>2013-05-10</td>
<td>Removed an incorrectly added &quot;0&quot; in BLP/COL/BPF/BV-12-I (legacy ID: TP/BPF/CO/BV-12-I) that was referenced in BLP/COL/BPF/BI-05-I (legacy ID: TP/BPF/CO/BI-05-I)</td>
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<td>1.0.2</td>
<td>2013-07-02</td>
<td>Prepare for Publication</td>
</tr>
<tr>
<td>1.0.3r01</td>
<td>2013-09-30</td>
<td>TSE 5296: Updated first sentence of test procedure of BLP/COL/BPD/BV-10-I (legacy ID: TP/BPD/CO/BV-10-I) to add, &quot;and a disconnection may occur between the two tests&quot; for clarification.</td>
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<td>1.0.3</td>
<td>2013-12-03</td>
<td>Prepare for Publication</td>
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<td>1.0.4r00</td>
<td>2015-05-10</td>
<td>TSE 6225: Updated mapping for BLP/SEN/BPF/BV-06-I and 07-I (legacy ID: TP/BPF/BP/BV-06-I and 07-I); editorial fixes throughout TCMT.</td>
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<td>1.0.4r01</td>
<td>2015-05-27</td>
<td>Added Section 4.1.3 on Verdict Conventions. Deleted non-specific Fail verdicts throughout document.</td>
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<td>1.0.4</td>
<td>2015-07-14</td>
<td>Prepared for TCRL 2015-1 publication</td>
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<tr>
<td>1.0.5r00</td>
<td>2016-05-19</td>
<td>Converted to new Test Case ID conventions as defined in TSTO v4.1.</td>
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<td>1.0.5r01</td>
<td>2016-06-16</td>
<td>Test Spec Template Conversion</td>
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<tr>
<td>1.0.5</td>
<td>2016-07-13</td>
<td>Prepared for TCRL 2016-1 publication.</td>
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| 1.0.6r00-01      | 2018-03-20 – 2018-04-13 | TSE 10480 (rating 1): Made editorial changes to tables for BLP/COL/BPF/BV-10-I and 13-I.  
TSE 10541 (rating 1): Corrected typos in test cases BLP/COL/BPF/BV-14-I and BV-10-I; BLP/COL/BPF/BI-01-I, BI-02-I, and BI-03-I.  
TSE 10542 (rating 1): Removed the requirement for reporting the maximum number of Blood Pressure measurements via IXIT in the BLP/COL/BPF/BV-11-I Initial Condition and Test Procedure. |
| 1.0.6            | 2018-06-27  | Approved by BTI. Prepared for TCRL 2018-1 publication.                                                                                                                                                  |
## Revision History

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<tr>
<td>1.0.7r00</td>
<td>2018-10-02</td>
<td>TSE 11007 (rating 3): Updated mapping for BLP/COL/BPF/BV-13-I – 14-I, BLP/COL/BPF/BV-04-I &amp; 06-I.</td>
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<tr>
<td>1.0.1.0</td>
<td>2018-11-09</td>
<td>Updated version number from 1.0.7 to 1.0.1.0 to align with adoption of the specification 1.0.10</td>
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<td>1.0.1.0</td>
<td>2018-11-21</td>
<td>Approved by BTI. Prepared for TCRL 2018-2 publication.</td>
</tr>
<tr>
<td>1.0.1.1</td>
<td>2019-07-29</td>
<td>Approved by BTI. Prepared for TCRL 2019-1 publication.</td>
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<thead>
<tr>
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<td>Jason Hillyard</td>
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