Bond Management Service

Bluetooth® Test Specification

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- **Group Prepared by**: BTI
- **Feedback Email**: bti-main@bluetooth.org
- **Abstract**: This document defines test structures and procedures for conformance test of products implementing the Bond Management Service Specification.
## Revision History

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1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and Test Cases (TC) to test the Bond Management Service Specification.

The objective of this test specification 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. For the purpose of this Bluetooth document, the definitions and abbreviations in [1], [2], and [3] apply.

[1] Bluetooth Core Specification, Version 4.0 or later
[4] ICS Proforma for Bond Management Service
[6] Characteristic and Descriptor descriptions are accessible via the Bluetooth SIG Assigned Numbers
[7] GAP Test Specification GAP.TS
[8] LMP Test Specification LMP.TS
[9] Bond Management Service Implementation eXtra Information for Test, IXIT
3 Test Suite Structure (TSS)

3.1 Test Strategy

The test objectives are to verify functionality of the Bond Management Service 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 service specification and to match these to the support of the IUT as described in the ICS Proforma.

The 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 Bond Management Service Test Specification. 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 Bond Management Service 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 and described on Section 3.2.

The interface between the IUT and the Upper Tester may be

- a man-machine interface
- provided by the IUT manufacturer

3.2 Test Groups

3.2.1 Service Definition

Verify the Service definition for LE transport, if supported by the server

Verify the SDP record for the service, if BR/EDR transport is supported by the server

3.2.2 Characteristic Declaration

Verify the presence and content of the characteristic declarations:

- Bond Management Feature characteristic
- Bond Management Control Point characteristic

3.2.3 Characteristic Read

Verify that the Bond Management Feature characteristic can be read

Verify the format and value of the characteristic value
3.2.4 Characteristic Write

Verify Bond Management Control Point characteristic can be written using the GATT feature
Write Characteristic Value
Verify that the Bond Management Control Point characteristic can be written using the GATT feature Characteristic Value Reliable Write if supported by the server

3.2.5 Service Procedures

Verify the operation of procedures defined in the service specification
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 [2]. The convention used here is <spec abbreviation>/<IUT role>/<feat>/<xx>-<nn>-<y>.

Test group abbreviations for “class,” “feature,” “function,” “sub-function” or “capability” (as applicable to this test specification) are defined in Table 4.1.

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Feature identifier</th>
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<tr>
<td>SD</td>
<td>Service Definition</td>
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<td>DEC</td>
<td>Characteristic Declaration</td>
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<td>CR</td>
<td>Characteristic Read</td>
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<tr>
<td>CW</td>
<td>Characteristic Write</td>
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<tr>
<td>CPP</td>
<td>Bond Management Control Point Procedures</td>
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<td></td>
<td>Delete bond of requesting device</td>
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<td></td>
<td>Delete all bonds on server</td>
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<td>Delete all but the active bond on server</td>
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<tr>
<td>CPE</td>
<td>Bond Management Control Point Error Handling</td>
</tr>
</tbody>
</table>

Table 4.1: TC Feature 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 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 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 Specification, 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 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.

4.1.3.1 ATT Bearer on LE Transport
Follow the preamble procedure described in [5] section 4.2.1.2.

4.1.3.2 ATT Bearer on BR/EDR Transport
Follow the preamble procedure described in [5] section 4.2.1.1.

4.1.4 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 specification 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 and in case this occurs, the outcome of the test shall be the Fail Verdict.

4.2 Service Definition

Verify the Service Definition

4.2.1 BMS/SEN/SD/BV-01-C [Service Definition over ATT]

• Test Purpose
  Verify that the IUT has one instantiation of the Bond Management Service either as primary or secondary service.

• Reference
[3] Section 2

- Initial Condition

Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.1.3.1 or Section 4.1.3.2.

- Test Procedure

1. Detect that the IUT exposes a service with UUID equal to «Bond Management Service» by executing the test procedure of GATT test case GATT/SR/GAD/BV-02-C in [5] searching for this UUID if exposed as a primary service or by executing the test procedure of GATT test case GATT/SR/GAD/BV-03-C in [5] for included services.

2. Verify the returned start and end handle and the type of service.

- Expected Outcome

Pass verdict

One attribute handle range is returned either as a primary service or a secondary service containing the starting handle and the ending handle of the «Bond Management Service» definition.

4.2.2 BMS/SEN/SD/BV-02-C [SDP Record]

- Test Purpose

Verify the SDP Record for the Bond Management Service. This test case only applies when using the BR/EDR transport.

- Reference

[3] Section 2

- Initial Condition

An ACL connection over BR/EDR is established between the Lower Tester and IUT.

- Test Procedure

1. Detect that the IUT exposes a service with UUID equal to «Bond Management Service» via SDP by executing the test procedure of GATT test case GATT/SR/GAD/BV-07-C in [5] searching for this UUID.

2. Verify the returned start and end handle and the type of service.

- Expected Outcome

Pass verdict
The SDP record for the service is found.
All attributes, which are mandatory for the service, are present in the SDP record.
The values of all attributes in the SDP record meet the requirements of the service.
The GATT Start Handle and GATT End Handle parameters in the SDP record match the start handle and end handle of the service.

4.3 Characteristic Declaration

- Test Purpose

This test group contains test cases to verify that the characteristic property field of the characteristic declaration meets the requirements of the service. The verification is performed one property at a time, as enumerated in the test cases in Table 4.2, using this generic test procedure.

- Reference

Section 3 in [3].

- Initial Condition

The handle range of the service has been previously discovered by the Lower Tester in test case BMS/SEN/SD/BV-01-C [Service Definition over ATT], or BMS/SEN/SD/BV-02-C [SDP Record].

Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.1.3.1 if using LE Transport or Section 4.1.3.2 if using a BR/EDR Transport.

- Test Procedure

The following test procedure applies to the test cases listed in Table 4.2:

1. Discover all characteristics of the service by executing the test procedure of GATT test case GATT/SR/GAD/BV-04-C or GATT/SR/GAD/BV-05-C in [5].

2. For a discovered characteristic that is listed in Table 4.2, verify the characteristic properties field of the characteristic declaration meets the requirements of the service.

- Expected Outcome

The following pass verdict applies to the test cases listed in Table 4.2:

Pass verdict

Each characteristic is discovered and the corresponding characteristic properties field of the characteristic declaration meets the requirements of the service [3].
<table>
<thead>
<tr>
<th>Test Case</th>
<th>Characteristic Properties Value (Requirements)</th>
<th>Characteristic Extended Properties Value (Requirements)</th>
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<td>4.3.1 BMS/SEN/DEC/BV-01-C [Characteristic Declarations – Bond Management Feature]</td>
<td>0x02 ([3] Table 3.1)</td>
<td>N/A</td>
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<td>4.3.2 BMS/SEN/DEC/BV-02-C [Characteristic Declarations – Bond Management Control Point]</td>
<td>0x08 OR 0x88 ([3] Table 3.1)</td>
<td>N/A</td>
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<td>4.3.3 BMS/SEN/DEC/BV-03-C [Characteristic Declarations – Bond Management Control Point, Reliable Write]</td>
<td>0x88 ([3] Table 3.1)</td>
<td>0x01 ([3] Table 3.1)</td>
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</tbody>
</table>

Table 4.2: Characteristic Declaration Test Cases

4.4 Characteristic Read

- Test Purpose

  This test group contains test cases to read and verify that the characteristic values required by the service are compliant. The verification is done one value at a time, as enumerated in the test cases in Table 4.3, using this generic test procedure.

- Reference

  [3] 3.2

- Initial Condition

  The handle of each characteristic value referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.

  If the IUT requires a bond, then perform a bonding procedure.

  Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.1.3.1 if using an LE transport or Section 4.1.3.2 if using a BR/EDR transport.

  If the attribute permissions for the characteristic set by the IUT has specific authentication requirements or authorization requirements, the established connection should meet these requirements.

- Test Procedure

  The following test procedure applies to the test cases listed in Table 4.3.
1. Read the characteristic value by executing the test procedure of GATT test case GATT/SR/GAR/BV-01-C in [5].

2. Verify the characteristic value meets the requirements of the service.

   • Expected Outcome

   The following pass verdict applies to the test cases listed in Table 4.3:

   **Pass verdict**

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

**Characteristic Read Value Test Cases**

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Value (Requirements)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4.1 BMS/SEN/CR/BV-01-C [Characteristic Read – Bond Management Feature]</td>
<td>Defined in [6]. Special care goes to the RFU bits, which shall be zero.</td>
</tr>
</tbody>
</table>

*Table 4.3: Characteristic Read Value Test Cases*

**4.5 Characteristic Write**

   • Test Purpose

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

   • Reference

   [3] 3.1.1, 3.1.2

   • Initial Condition

   The handle of each characteristic value referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.

   If the IUT requires a bond, then perform a bonding procedure.

   Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1 if using an LE transport or Section 4.2.2 if using a BR/EDR transport. If the attribute permissions for the characteristic set by the IUT has specific authentication requirements or authorization requirements, the established connection should meet these:

   • Test Procedure
The following test procedure applies to the test cases listed in Table 4.4, if transport is supported

1. Write the characteristic value by executing the test procedure of GATT test case GATT/SR/GAW/BV-03-C in [5].

2. Verify the characteristic value meets the requirements of the service.

• Expected Outcome

The following pass verdict applies to the test cases listed in Table 4.4:

Pass verdict

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

### Characteristic Write Value Test Cases

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Value (Requirements)</th>
<th>Supported Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5.1 BMS/SEN/CW/BV-01-C [Characteristic Write – Bond Management Control Point, BR/EDR]</td>
<td>Defined in [6].</td>
<td>BR/EDR</td>
</tr>
<tr>
<td>4.5.2 BMS/SEN/CW/BV-02-C [Characteristic Write – Bond Management Control Point, LE]</td>
<td>Defined in [6].</td>
<td>LE</td>
</tr>
</tbody>
</table>

Table 4.4: Characteristic Write Value Test Cases

### 4.6 Characteristic Write – Reliable Write

• Test Purpose

Verify the IUT supports Reliable Write procedure.

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

• Reference

[3] 3.1.1, 3.1.2

• Initial Condition
The handle of each characteristic value referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.

If the IUT requires a bond, then perform a bonding procedure.

Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1 if using an LE transport or Section 4.2.2 if using a BR/EDR transport.

If the attribute permissions for the characteristic set by the IUT has specific authentication requirements or authorization requirements, the established connection should meet these.

- **Test Procedure**

  The following test procedure applies to the test cases listed in Table 4.5, if transport is supported

  1. Write the characteristic value by executing the test procedure of GATT test case GATT/SR/GAW/BV-06-C in [5].

  2. Verify the characteristic value meets the requirements of the service.

- **Expected Outcome**

  The following pass verdict applies to the test cases listed in Table 4.5:

  **Pass verdict**

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

### Characteristic Reliable Write Test Cases

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Value (Requirements)</th>
<th>Supported Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.6.1 BMS/SEN/CW/BV-03-C [Characteristic Write – Bond Management Control Point, Reliable Write, BR/EDR]</td>
<td>Defined in [6].</td>
<td>BR/EDR</td>
</tr>
<tr>
<td>4.6.2 BMS/SEN/CW/BV-04-C [Characteristic Write – Bond Management Control Point, Reliable Write, LE]</td>
<td>Defined in [6].</td>
<td>LE</td>
</tr>
</tbody>
</table>

*Table 4.5: Characteristic Reliable Write Test Cases*
4.7 Service Procedures – User Control Point

This test group contains test cases to verify compliant operation when the Lower Tester uses Bond Management Control Point procedures.

4.7.1 Delete Bond of Requesting Device Procedures

- Test Purpose

This test subgroup contains test cases to verify the ‘Delete Bond of requesting device’ procedure of the service. The verification is done on one transport at a time, as enumerated in the test cases in Table 4.6, using this generic test procedure.

- Reference

[3] Section 3.1.1

- Initial Condition

The handle of Bond Management Control Point has been discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.

If Authorization is required, the Authorization Code of the IUT shall be known, see IXIT [9].

Perform a bonding procedure with IUT.

Establish an ATT Bearer connection between the Lower Tester and IUT on transport defined in Table 4.6. See Section 4.2.1 if using an LE transport or Section 4.2.2 if using a BR/EDR transport.

If the attribute permissions for the characteristic set by the IUT have specific authentication requirements, the established connection should meet these requirements.

- Test Procedure

The following test procedure applies to the test cases listed in Table 4.6.

1. The Lower Tester writes the corresponding OpCode defined in Table 4.6 to the Bond Management Control Point. If Authorization is required, the OpCode is followed by the operand containing the Authorization Code.

2. The IUT sends a Write Response to acknowledge the procedure is successfully completed.

3. The Lower Tester shall terminate the ATT Bearer connection.

4. The IUT shall delete the requested bond information of the Lower Tester.

5. Establish a connection between the Lower Tester and IUT on transport defined in Table 4.6. See

   a. Section 4.2.1 if using an LE transport or

   b. Section 4.2.2 if using a BR/EDR transport.
6. Run test depending on transport:
   a. For LE-Transport:
      - The Lower Tester challenges the bond by (re)-encrypting the link with the distributed LTK.
      - The IUT responds “PIN or Key Missing” to the encryption request.
   
   b. For BR/EDR Transport:
      The Lower Tester will challenge the bond by executing the TP/AUT/BV-01-C in the LMP specification \[8\].

   • Expected Outcome
   
   The following pass verdict applies to the test cases listed in Table 4.6:

   Pass verdict
   The (re)connection from step 5 requires a new pairing procedure to reauthenticate (encrypt) the link.
Delete bond of requesting device Test Cases

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.7.1.1</td>
<td>BR/EDR and LE 0x01 ([3] Table 3.1)</td>
<td>BR/EDR</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.1.2</td>
<td>BR/EDR and LE 0x01 ([3] Table 3.1)</td>
<td>LE</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.1.3</td>
<td>BR/EDR 0x02 ([3] Table 3.1)</td>
<td>BR/EDR</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.1.4</td>
<td>LE 0x03 ([3] Table 3.1)</td>
<td>LE</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.1.5</td>
<td>BR/EDR and LE 0x01 ([3] Table 3.1)</td>
<td>BR/EDR</td>
<td>Required</td>
</tr>
<tr>
<td>4.7.1.6</td>
<td>BR/EDR and LE 0x01 ([3] Table 3.1)</td>
<td>LE</td>
<td>Required</td>
</tr>
<tr>
<td>4.7.1.7</td>
<td>BR/EDR 0x02 ([3] Table 3.1)</td>
<td>BR/EDR</td>
<td>Required</td>
</tr>
<tr>
<td>4.7.1.8</td>
<td>LE 0x03 ([3] Table 3.1)</td>
<td>LE</td>
<td>Required</td>
</tr>
</tbody>
</table>

Table 4.6: Delete bond of requesting device test cases

4.7.2 Delete all bonds on server procedures

- Test Purpose

This test subgroup contains test cases to verify the ‘Delete all Bonds on Server’ procedure of the service. The verification is done on one transport at a time, as enumerated in the test cases in Table 4.7, using this generic test procedure.
• Reference

[3] 3.1.1

• Initial Condition

The Lower Tester uses two different Addresses (A & B). The handle of Bond Management Control Point has been discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.

If authorization is required, the Authorization Code of the IUT shall be known, see IXIT [9].

The Lower Tester is bonded with the IUT using Address A and Address B.

Establish an ATT Bearer connection between the Lower Tester, using Address A and the IUT on the transport defined in Table 4.7. See Section 4.2.1 if using an LE transport or Section 4.2.2 if using a BR/EDR transport.

If the attribute permissions for the characteristic set by the IUT have specific authentication requirements, the established connection should meet these.

• Test Procedure

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

1. The Lower Tester writes the corresponding Op Code defined in Table 4.7 to the Bond Management Control Point. If Authorization is required, the Op Code is followed by the operand containing the Authorization Code.

2. The IUT sends a Write Response with success to acknowledge the procedure is successfully completed.

3. The Lower Tester shall terminate the ATT Bearer connection.

4. The IUT shall delete all bond information of the Lower Tester, both for Address A and Address B.

5. Establish a connection between the Lower Tester and IUT on transport defined in Table 4.7, using Address A. See
   a. Section 4.2.1 if using an LE transport or
   b. Section 4.2.2 if using a BR/EDR transport.

6. Run test depending on transport:
   a. For LE-Transport:
      • The Lower Tester challenges the bond by (re)-encrypting the link with the distributed LTK.
      • The IUT responds “PIN or Key Missing” to the encryption request.
b. **For BR/EDR Transport:**
   - The Lower Tester sends an LMP\_au\_rand PDU with the challenge random number.
   - The IUT responds LMP\_not accepted, reason “PIN or Key Missing” to the LMP\_au\_rand PDU.

7. The Lower Tester shall terminate the ATT Bearer connection.

8. Establish a connection between the Lower Tester and IUT on transport defined in Table 4.7, using Address B. See
   a. Section 4.2.1 if using an LE transport or
   b. Section 4.2.2 if using a BR/EDR transport

9. Run test depending on transport:
   a. **For LE-Transport:**
      - The Lower Tester challenges the bond by (re)-encrypting the link with the distributed LTK.
      - The IUT responds “PIN or Key Missing” to the encryption request.
   b. **For BR/EDR Transport:**
      - The Lower Tester sends an LMP\_au\_rand PDU with the challenge random number.
      - The IUT responds LMP\_not accepted, reason “PIN or Key Missing” to the LMP\_au\_rand PDU.

- Expected Outcome

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

  **Pass verdict**

  The (re)connection from step 5 and step 8 each require a new pairing procedure to reauthenticate (encrypt) the link.
Delete all bonds on server Test Cases

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.7.2.1   BMS/SEN/CPP/BV-09-C [Delete all bonds on server, BR/EDR/LE, using BR/EDR transport]</td>
<td>BR/EDR and LE 0x04 ([3] Table 3.3)</td>
<td>BR/EDR</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.2.2   BMS/SEN/CPP/BV-10-C [Delete all bonds on server, BR/EDR/LE, using LE transport]</td>
<td>BR/EDR and LE 0x04 ([3] Table 3.3)</td>
<td>LE</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.2.3   BMS/SEN/CPP/BV-11-C [Delete all bonds on server, BR/EDR]</td>
<td>BR/EDR 0x05 ([3] Table 3.3)</td>
<td>BR/EDR</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.2.4   BMS/SEN/CPP/BV-12-C [Delete all bonds on server, LE]</td>
<td>LE 0x06 ([3] Table 3.3)</td>
<td>LE</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.2.5   BMS/SEN/CPP/BV-13-C [Delete all bonds on server, BR/EDR/LE, using BR/EDR transport and authorization code]</td>
<td>BR/EDR and LE 0x04 ([3] Table 3.3)</td>
<td>BR/EDR</td>
<td>Required</td>
</tr>
<tr>
<td>4.7.2.6   BMS/SEN/CPP/BV-14-C [Delete all bonds on server, BR/EDR/LE, using LE transport and authorization code]</td>
<td>BR/EDR and LE 0x04 ([3] Table 3.3)</td>
<td>LE</td>
<td>Required</td>
</tr>
<tr>
<td>4.7.2.7   BMS/SEN/CPP/BV-15-C [Delete all bonds on server, BR/EDR, with authorization code]</td>
<td>BR/EDR 0x05 ([3] Table 3.3)</td>
<td>BR/EDR</td>
<td>Required</td>
</tr>
<tr>
<td>4.7.2.8   BMS/SEN/CPP/BV-16-C [Delete all bonds on server, LE, with authorization code]</td>
<td>LE 0x06 ([3] Table 3.3)</td>
<td>LE</td>
<td>Required</td>
</tr>
</tbody>
</table>

Table 4.7: Delete all bonds on server test cases

4.7.3 Delete all but active bond on server procedures

- Test Purpose

This test subgroup contains test cases to verify the ‘Delete all but active bond on Server’ procedure of the service. The verification is done on one transport at a time, as enumerated in the test cases in Table 4.8, using this generic test procedure.

- Reference
[3] 3.1.1

• Initial Condition

The Lower Tester uses two different Addresses (A & B). The handle of Bond Management Control Point has been discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.

If authorization is required, the Authorization Code of the IUT shall be known, see IXIT [9].

The Lower Tester bonds with the IUT using Address A and Address B.

Establish an ATT Bearer connection between the Lower Tester, using Address A and the IUT on the transport defined in Table 4.8. See Section 4.2.1 if using an LE transport or Section 4.2.2 if using a BR/EDR transport.

If the attribute permissions for the characteristic set by the IUT, have specific authentication requirements, the established connection should meet these.

• Test Procedure

The following test procedure applies to the test cases listed in Table 4.8.

1. The Lower Tester writes the corresponding OpCode defined in Table 4.8 to the Bond Management Control Point. If Authorization is required, the OpCode is followed by a parameter containing the Authorization Code.

2. The IUT sends a Write Response with success to acknowledge the procedure is successfully completed.

3. The Lower Tester shall terminate the ATT Bearer connection.

4. The IUT shall delete all bond information of the Lower Tester using Address B.

5. Establish a connection between the Lower Tester and IUT on transport defined in Table 4.8, using Address B. See:

   a. Section 4.2.1 if using an LE transport or
   b. Section 4.2.2 if using a BR/EDR transport

6. Run test depending on transport:

   a. For LE-Transport:

      • The Lower Tester challenges the bond by (re)-encrypting the link with the distributed LTK.

      • The IUT responds “PIN or Key Missing” to the encryption request.

   b. For BR/EDR Transport:

      • The Lower Tester sends an LMP._au_rand PDU with the challenge random number.
- The IUT responds LMP_not accepted, reason “PIN or Key Missing” to the LMP-au_rand PDU.

7. The Lower Tester shall terminate the ATT Bearer connection.

8. Establish a connection between the Lower Tester and IUT on transport defined in Table 4.8, using Address A. See:
   a. Section 4.2.1 if using an LE transport or
   b. Section 4.2.2 if using a BR/EDR transport

9. The Lower Tester (Lower Tester Address A) authenticates the link by encrypting it.

• Expected Outcome

   The following pass verdict applies to the test cases listed in Table 4.8:

   Pass verdict
   The (re)connection from step 5 requires a new pairing procedure to reauthenticate (encrypt) the link.
   The (re)connection from step 8 can reauthenticate (encrypt) without a new pairing procedure being required.
Delete all but active bond on server Test Cases

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.7.3.1 BMS/SEN/CPP/BV-17-C [Delete all but active bond on server, BR/EDR/LE, using BR/EDR transport]</td>
<td>BR/EDR and LE 0x07 ([3] Table 3.3)</td>
<td>BR/EDR</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.3.2 BMS/SEN/CPP/BV-18-C [Delete all but active bond on server, BR/EDR/LE, using LE transport]</td>
<td>BR/EDR and LE 0x07 ([3] Table 3.3)</td>
<td>LE</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.3.3 BMS/SEN/CPP/BV-19-C [Delete all but active bond on server, BR/EDR]</td>
<td>BR/EDR 0x08 ([3] Table 3.3)</td>
<td>BR/EDR</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.3.4 BMS/SEN/CPP/BV-20-C [Delete all but active bond on server, LE]</td>
<td>LE 0x09 ([3] Table 3.3)</td>
<td>LE</td>
<td>N/A</td>
</tr>
<tr>
<td>4.7.3.5 BMS/SEN/CPP/BV-21-C [Delete all but active bond on server, BR/EDR/LE, using BR/EDR transport and authorization code]</td>
<td>BR/EDR and LE 0x07 ([3] Table 3.1)</td>
<td>BR/EDR</td>
<td>Required</td>
</tr>
<tr>
<td>4.7.3.6 BMS/SEN/CPP/BV-22-C [Delete all but active bond on server, BR/EDR/LE, using LE transport and authorization code]</td>
<td>BR/EDR and LE 0x07 ([3] Table 3.1)</td>
<td>LE</td>
<td>Required</td>
</tr>
<tr>
<td>4.7.3.7 BMS/SEN/CPP/BV-23-C [Delete all but active bond on server, BR/EDR, with authorization code]</td>
<td>BR/EDR 0x08 ([3] Table 3.1)</td>
<td>BR/EDR</td>
<td>Required</td>
</tr>
<tr>
<td>4.7.3.8 BMS/SEN/CPP/BV-24-C [Delete all but active bond on server, LE, with authorization code]</td>
<td>LE 0x09 ([3] Table 3.1)</td>
<td>LE</td>
<td>Required</td>
</tr>
</tbody>
</table>

*Table 4.8: Delete all but active bond on server test cases*

### 4.8 Service Procedure – General Error Handling

This test group contains test cases to verify compliant operation when the Lower Tester uses Bond Management Control Point procedure and an error results.
4.8.1 Op Code Not Supported

- Test Purpose
  Verify that the IUT responds appropriately when a Client writes an unsupported OpCode to the Bond Management Control Point.

- Reference
  [3] 3.1.1

- Initial Condition
  The handle of Bond Management Control Point has been discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.

  Perform a bonding procedure with IUT.

  Establish an ATT Bearer connection between the Lower Tester and the IUT on the transport defined in Table 4.9. See Section 4.2.1 if using an LE transport or Section 4.2.2 if using a BR/EDR transport.

  If the attribute permissions for the characteristic set by the IUT have specific authentication requirements, then the established connection should meet these requirements.

- Test Procedure
  The following test procedure applies to the test cases listed in Table 4.9.

  1. The Lower Tester writes the first OpCode value from the Reserved for Future Use range to the Bond Management Control Point without operant.

  2. Verify the IUT response with 0x80 OpCode not supported.

  3. Step 1-2 shall be repeated for one more OpCode values in the Reserved for Future Use range.

  4. The Lower Tester writes the corresponding OpCode defined in Table 4.9 to the Bond Management Control Point.

  5. Verify the IUT response with 0x80 OpCode not supported

  6. Step 1-5 shall be repeated with a valid operant.

- Expected Outcome
  The following pass verdict applies to the test cases in Table 4.9:

  Pass verdict

  For all cases, the IUT sends an error response with the Attribute Application Error Code set to “Op Code not supported” as defined in [3] Section1.7.
Unsupported Op Code Test Cases

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Op Code</th>
<th>Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.8.1.1   BMS/SEN/CPE/BI-01-C [Op Code not supported, BR/EDR]</td>
<td>0x03</td>
<td>BR/EDR</td>
</tr>
<tr>
<td>4.8.1.2   BMS/SEN/CPE/BI-02-C [Op Code not supported, LE]</td>
<td>0x02</td>
<td>LE</td>
</tr>
</tbody>
</table>

*Table 4.9: Unsupported Op Code test cases*

4.8.2 Insufficient Authorization

- **Test Purpose**
  Verify that the IUT responds appropriately when a Client writes an OpCode to the Bond Management Control Point with a parameter not matching the stored Authorization Code.

- **Reference**
  [3] 3.1.1, 3.1.2.1

- **Initial Condition**
  The handle of Bond Management Control Point has been discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.
  Perform a bonding procedure with IUT.
  The Authorization Code of the IUT shall be known, see IXIT [9].
  Establish an ATT Bearer connection between the Lower Tester and the IUT on the transport defined in Table 4.10. See Section 4.2.1 if using an LE transport or Section 4.2.2 if using a BR/EDR transport.
  If the attribute permissions for the characteristic set by the IUT, have specific authentication requirements, the established connection should meet these.

- **Test Procedure**
  The following test procedure applies to the test cases listed in Table 4.10.
  1. The Lower Tester writes one of the supported Op Codes defined in Table 4.9 to the Bond Management Control Point with an operand not matching the IUT’s Authorization Code.
  2. Verify the IUT response meets the requirements of the service.
  3. Step 1-2 is repeated with an empty operand.
• **Expected Outcome**

The following pass verdict applies to the test cases in **Table 4.10:**

**Pass verdict**

The IUT sends an error response with the Error Code set to “Insufficient Authorization”.

### Insufficient Authorization Test Cases

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Op Code</th>
<th>Tested Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.8.2.1 BMS/SEN/CPE/BI-03-C [Insufficient Authorization, BR/EDR]</td>
<td>0x01 or 0x02 or 0x04 or 0x05 or 0x07 or 0x08</td>
<td>BR/EDR</td>
</tr>
<tr>
<td>4.8.2.2 BMS/SEN/CPE/BI-04-C [Insufficient Authorization, LE]</td>
<td>0x01 or 0x03 or 0x04 or 0x06 or 0x07 or 0x09</td>
<td>LE</td>
</tr>
</tbody>
</table>

*Table 4.10: Insufficient Authorization test cases*
# 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 a y/x reference, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS Proforma for Bond Management Service [3]. 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 Case(s)</th>
<th>Test Case Applicable</th>
</tr>
</thead>
</table>
| BMS 2/2 | Service Definition ATT | BMS/SEN/SD/BV-01-C  
BMS/SEN/CW/BV-02-C  
BMS/SEN/CPE/BI-02-C |  |
| (BMS 3/4 OR BMS 3/5 OR BMS 3/6) AND BMS 2/2 | Insufficient Authorization, LE | BMS/SEN/CPE/BI-04-C |  |
| BMS 2/1 | Service Definition SDP | BMS/SEN/SD/BV-02-C  
BMS/SEN/CW/BV-01-C  
BMS/SEN/CPE/BI-01-C |  |
| (BMS 3/4 OR BMS 3/5 OR BMS 3/6) AND BMS 2/1 | Insufficient Authorization, BR/EDR | BMS/SEN/CPE/BI-03-C |  |
| BMS 1/1 | General Bond Management Service support | BMS/SEN/DEC/BV-01-C  
BMS/SEN/DEC/BV-02-C  
BMS/SEN/CR/BV-01-C |  |
<p>| BMS 5/4 | Reliable Write | BMS/SEN/DEC/BV-03-C |  |
| BMS 2/1 AND BMS 5/4 | Characteristic supporting reliable write, BR/EDR | BMS/SEN/CW/BV-03-C |  |</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>Feature</th>
<th>Test Case(s)</th>
<th>Test Case Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMS 2/2 AND BMS 5/4</td>
<td>Characteristic supporting reliable write, LE</td>
<td>BMS/SEN/CW/BV-04-C</td>
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</tr>
<tr>
<td>BMS 3/1 AND BMS 2/1 AND BMS 2/2</td>
<td>Delete Bond of requesting device (Dual Mode)</td>
<td>BMS/SEN/CPP/BV-01-C, BMS/SEN/CPP/BV-02-C</td>
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</tr>
<tr>
<td>BMS 3/4 AND BMS 2/1 AND BMS 2/2</td>
<td>Delete Bond of requesting device (Dual Mode) with authorization code</td>
<td>BMS/SEN/CPP/BV-05-C, BMS/SEN/CPP/BV-06-C</td>
<td></td>
</tr>
<tr>
<td>BMS 3/1 AND BMS 2/2</td>
<td>Delete Bond of requesting device (LE)</td>
<td>BMS/SEN/CPP/BV-04-C</td>
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<tr>
<td>BMS 3/4 AND BMS 2/2</td>
<td>Delete Bond of requesting device (LE) with authorization code</td>
<td>BMS/SEN/CPP/BV-08-C</td>
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<tr>
<td>BMS 3/1 AND BMS 2/1</td>
<td>Delete Bond of requesting device (BR/EDR)</td>
<td>BMS/SEN/CPP/BV-03-C</td>
<td></td>
</tr>
<tr>
<td>BMS 3/4 AND BMS 2/1</td>
<td>Delete Bond of requesting device (BR/EDR) with authorization code</td>
<td>BMS/SEN/CPP/BV-07-C</td>
<td></td>
</tr>
<tr>
<td>BMS 3/2 AND BMS 2/1 AND BMS 2/2</td>
<td>Delete all bonds on server (Dual Mode)</td>
<td>BMS/SEN/CPP/BV-09-C, BMS/SEN/CPP/BV-10-C</td>
<td></td>
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<tr>
<td>BMS 3/5 AND BMS 2/1 AND BMS 2/2</td>
<td>Delete all bonds on server (Dual Mode) with authorization code</td>
<td>BMS/SEN/CPP/BV-13-C, BMS/SEN/CPP/BV-14-C</td>
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<tr>
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<td>Delete all bonds on server (LE)</td>
<td>BMS/SEN/CPP/BV-12-C</td>
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<tr>
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<td>Delete all bonds on server (LE) with authorization code</td>
<td>BMS/SEN/CPP/BV-16-C</td>
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<tr>
<td>BMS 3/2 AND BMS 2/1</td>
<td>Delete all bonds on server (BR/EDR)</td>
<td>BMS/SEN/CPP/BV-11-C</td>
<td></td>
</tr>
<tr>
<td>BMS 3/5 AND BMS 2/1</td>
<td>Delete all bonds on server (BR/EDR) with authorization code</td>
<td>BMS/SEN/CPP/BV-15-C</td>
<td></td>
</tr>
<tr>
<td>BMS 3/3 AND BMS 2/1 AND BMS 2/2</td>
<td>Delete all but active bond on server (Dual Mode)</td>
<td>BMS/SEN/CPP/BV-17-C, BMS/SEN/CPP/BV-18-C</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Feature</td>
<td>Test Case(s)</td>
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</tr>
<tr>
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</tr>
<tr>
<td>BMS 3/6 AND BMS 2/1 AND BMS 2/2</td>
<td>Delete all but active bond on server (Dual Mode) with authorization code</td>
<td>BMS/SEN/CPP/BV-21-C BMS/SEN/CPP/BV-22-C</td>
<td></td>
</tr>
<tr>
<td>BMS 3/3 AND BMS 2/2</td>
<td>Delete all but active bond on server (LE)</td>
<td>BMS/SEN/CPP/BV-20-C</td>
<td></td>
</tr>
<tr>
<td>BMS 3/6 AND BMS 2/2</td>
<td>Delete all but active bond on server (LE) with authorization code</td>
<td>BMS/SEN/CPP/BV-24-C</td>
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</tr>
<tr>
<td>BMS 3/3 AND BMS 2/1</td>
<td>Delete all but active bond on server (BR/EDR)</td>
<td>BMS/SEN/CPP/BV-19-C</td>
<td></td>
</tr>
<tr>
<td>BMS 3/6 AND BMS 2/1</td>
<td>Delete all but active bond on server (BR/EDR) with authorization code</td>
<td>BMS/SEN/CPP/BV-23-C</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5.1: Test Case Mapping**