Bond Management Service (BMS)

***Bluetooth*® Test Suite**

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Contents

1 Scope

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

2 References, definitions, and abbreviations

2.1 References

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

[1] Bluetooth Core Specification, Version 4.0 or later

[2] Test Strategy and Terminology Overview

[3] Bond Management Service Specification, Version 1.0 or later

[4] ICS Proforma for Bond Management Service

[5] GATT Test Suite, GATT.TS

[6] Characteristic and Descriptor descriptions are accessible via the Bluetooth SIG Assigned Numbers

[7] GAP Test Suite, GAP.TS

[8] LMP Test Suite, LMP.TS

[9] Bond Management Service Implementation extra Information for Test, IXIT

2.2 Definitions

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

2.3 Acronyms and abbreviations

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

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 specification and to match these to the support of the IUT as described in the ICS. Any defined test herein is applicable to the IUT, if the ICS logical expression defined in the Test Case Mapping Table (TCMT) evaluates to true.

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

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

3.2 Test groups

The following test groups have been defined:

- Generic GATT Integrated Tests
- Characteristic Write
- Service Procedures

4 Test cases (TC)

4.1 Introduction

4.1.1 Test case identification conventions

Test cases are assigned unique identifiers per the conventions in [2]. The convention used here is: **<spec abbreviation>/<IUT role>/**<class>/<feat>/<func>/<subfunc>**/<cap>/<xx>-<nn>-<y>**.

Additionally, testing of this specification includes tests from the GATT Test Suite [5] referred to as Generic GATT Integrated Tests (GGIT); when used, the GGIT tests are referred to through a TCID string using the following convention:
<spec abbreviation>/<IUT role>/<GGIT test group>/< GGIT class >/<xx>-<nn>-<y>.

Identifier Abbreviation	**Spec Identifier <spec abbreviation>**
BMS	Bond Management Service
Identifier Abbreviation	**Role Identifier <IUT role>**
SEN	Sensor role
Identifier Abbreviation	**Reference Identifier <GGIT test group>**
SGGIT	Server Generic GATT Integrated Tests
Identifier Abbreviation	**Reference Identifier <GGIT class>**
CHA	Characteristic
ISFC	Indication Supported Features Characteristic
SDP	Validate SDP Record
SER	Service
Identifier Abbreviation	**Feature and Behaviors Identifier <feat>**
CPE	Bond Management Control Point Error Handling
CPP	Bond Management Control Point Procedures
CW	Characteristic Write

Table 4.1: BMS TC feature naming convention

4.1.2 Conformance

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

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

Such tests may verify:

- That claimed capabilities may be used in any order and any number of repetitions that is not excluded by the specification
- That capabilities enabled by the implementations are sustained over durations expected by the use case
- That the implementation gracefully handles any quantity of data expected by the use case

- That in cases where more than one valid interpretation of the specification exists, the implementation complies with at least one interpretation and gracefully handles other interpretations
- That the implementation is immune to attempted security exploits

A single execution of each of the required tests is required 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 generated by Launch Studio, 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. The IUT is granted the Pass verdict when all the detailed pass criteria conditions within the Expected Outcome section are met.

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

4.2 Setup preambles

The procedures defined in this section are used to achieve specific conditions on the IUT and the test equipment within tests defined in this document. The preambles here are commonly used to establish initial conditions.

4.2.1 ATT Bearer on LE Transport

- Preamble Procedure

1. Establish an LE transport connection between the IUT and the Lower Tester.
2. Establish an L2CAP channel 0x0004 between the IUT and the Lower Tester over that LE transport.

4.2.2 ATT Bearer on BR/EDR Transport

- Preamble Procedure

1. Establish a BR/EDR transport connection between the IUT and the Lower Tester.
2. Establish an L2CAP channel (PSM 0x001F) between the IUT and the Lower Tester over that BR/EDR transport.

4.3 Generic GATT Integrated Tests

Execute the Generic GATT Integrated Tests defined in Section 6.3, Server test procedures (SGGIT), in [5] using Table 4.2 below as input:

TCID	Service / Characteristic	Reference	Properties	Value Length (Octets)	Type
BMS/SEN/SGGIT/SER/BV-01-C [Service GGIT – Bond Management]	Bond Management Service	[3] 2	-	-	Not defined
BMS/SEN/SGGIT/SDP/BV-02-C [SDP Record – Bond Management]	Bond Management Service	[3] 4	-	-	-
BMS/SEN/SGGIT/CHA/BV-03-C [Characteristic GGIT – Bond Management Feature]	Bond Management Feature characteristic	[3] 3	0x02 (Read)	1-3	-
BMS/SEN/SGGIT/CHA/BV-04-C [Characteristic GGIT – Bond Management Control Point]	Bond Management Control Point characteristic	[3] 3	0x08 (Write)	Skip	-
BMS/SEN/SGGIT/CHA/BV-05-C [Characteristic GGIT – Bond Management Control Point – Reliable Writes]	Bond Management Control Point characteristic	[3] 3	0x88 (Write, Reliable Writes)	Skip	-
BMS/SEN/SGGIT/CHA/BV-06-C [Characteristic GGIT – Bond Management Feature - Indicate]	Bond Management Feature characteristic	[3] 3	0x22 (Read, Indicate)	1-3	-

Table 4.2: Input for the GGIT Server test procedure

4.3.1 Generic GATT Indication Supported Features characteristic

Execute the Generic GATT Indication Supported Features Characteristic Test defined in Section 6.3, Server test procedures (SGGIT), in [5] using Table 4.3 below as input:

TCID	Characteristic	Reference	TC Configuration
BMS/SEN/SGGIT/ISFC/BV-07-C [Characteristic GGIT – Bond Management Feature indication]	Bond Management Feature	[3] 3.2.1	N/A

Table 4.3: GGIT Indication Supported Features Characteristic tests

4.4 Characteristic Write

- Test Purpose

  This test group contains test cases to write and verify that the characteristic values required by the service are compliant.

- 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 Case Configuration

TCID	Value (Requirements)	Supported Transport
BMS/SEN/CW/BV-01-C [Characteristic Write – Bond Management Control Point, BR/EDR]	Defined in [6].	BR/EDR
BMS/SEN/CW/BV-02-C [Characteristic Write – Bond Management Control Point, LE]	Defined in [6].	LE

Table 4.4: Characteristic Write Value test cases

- Test Procedure

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

  1. The Lower Tester sends an ATT_Write_Request, with the Bond Management Control Point handle and value defined in [6], to the IUT.
  2. Verify that 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.

4.5 Characteristic Write – Reliable Write

- Test Purpose

  Verify that the IUT supports Reliable Write procedure and that that the characteristic values required by the service are compliant.

- 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 Case Configuration

TCID	Value (Requirements)	Supported Transport
BMS/SEN/CW/BV-03-C [Characteristic Write – Bond Management Control Point, Reliable Write, BR/EDR]	Defined in [6].	BR/EDR
BMS/SEN/CW/BV-04-C [Characteristic Write – Bond Management Control Point, Reliable Write, LE]	Defined in [6].	LE

Table 4.5: Characteristic Reliable Write test cases

- Test Procedure

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

  1. The Lower Tester writes to the characteristic, with the value defined in [6], by executing the GATT Characteristic Value Reliable Writes sub-procedure.
  2. Verify that 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.

4.6 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.

4.6.1 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.

- 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.
  - If authorization is required, the TSPX_Parameter_Authorization_Code entry in IXIT [9] describes the Authorization Code of the IUT.
  - 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 Case Configuration

TCID	Supported Transport / Opcode ([3] Table 3.1)	Tested Transport	Authorization Code
BMS/SEN/CPP/BV-01-C [Delete bond of requesting device, BR/EDR/LE, using BR/EDR transport]	BR/EDR and LE / 0x01	BR/EDR	N/A
BMS/SEN/CPP/BV-02-C [Delete bond of requesting device, BR/EDR/LE, using LE transport]	BR/EDR and LE / 0x01	LE	N/A
BMS/SEN/CPP/BV-03-C [Delete bond of requesting device, BR/EDR]	BR/EDR / 0x02	BR/EDR	N/A
BMS/SEN/CPP/BV-04-C [Delete bond of requesting device, LE]	LE / 0x03	LE	N/A
BMS/SEN/CPP/BV-05-C [Delete bond of requesting device, BR/EDR/LE, using BR/EDR transport and authorization code]	BR/EDR and LE / 0x01	BR/EDR	Required
BMS/SEN/CPP/BV-06-C [Delete bond of requesting device, BR/EDR/LE, using LE transport and authorization code]	BR/EDR and LE / 0x01	LE	Required

TCID	Supported Transport / Opcode ([3] Table 3.1)	Tested Transport	Authorization Code
BMS/SEN/CPP/BV-07-C [Delete bond of requesting device, BR/EDR, with authorization code]	BR/EDR / 0x02	BR/EDR	Required
BMS/SEN/CPP/BV-08-C [Delete bond of requesting device, LE, with authorization code]	LE / 0x03	LE	Required

Table 4.6: Delete bond of requesting device test cases

- 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 that the procedure is successfully completed.
  3. The Lower Tester terminates the ATT Bearer connection.
  4. The IUT deletes 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.
     a. Execute the procedure in Section 4.2.1 if using an LE transport or
     b. Execute the procedure in Section 4.2.2 if using a BR/EDR transport
  6. Execute step a or step b depending on transport:
     a. For the 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 the BR/EDR Transport:
        - The Lower Tester will challenge the bond by executing the LMP/AUT/BV-01-C in the LMP Test Suite [8].
        - 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 4.6:

  Pass verdict

  In step 6, based on the transport, the IUT responds with:

  - “PIN or Key Missing” to the encryption request, or
  - PDU LMP_not_accepted with reason “PIN or Key missing”.

4.6.2 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.

- Reference

  [3] 3.1.1

- Initial Condition
  - The Lower Tester uses two different Addresses (A & B). The handle of the 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 TSPX_Parameter_Authorization_Code entry in IXIT [9] describes the the Authorization Code.
  - 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 Case Configuration

TCID	Supported Transport / OpCode ([3] Table 3.3)	Tested Transport	Authorization Code
BMS/SEN/CPP/BV-09-C [Delete all bonds on server, BR/EDR/LE, using BR/EDR transport]	BR/EDR and LE / 0x04	BR/EDR	N/A
BMS/SEN/CPP/BV-10-C [Delete all bonds on server, BR/EDR/LE, using LE transport]	BR/EDR and LE / 0x04	LE	N/A
BMS/SEN/CPP/BV-11-C [Delete all bonds on server, BR/EDR]	BR/EDR / 0x05	BR/EDR	N/A
BMS/SEN/CPP/BV-12-C [Delete all bonds on server, LE]	LE / 0x06	LE	N/A
BMS/SEN/CPP/BV-13-C [Delete all bonds on server, BR/EDR/LE, using BR/EDR transport and authorization code]	BR/EDR and LE / 0x04	BR/EDR	Required
BMS/SEN/CPP/BV-14-C [Delete all bonds on server, BR/EDR/LE, using LE transport and authorization code]	BR/EDR and LE / 0x04	LE	Required
BMS/SEN/CPP/BV-15-C [Delete all bonds on server, BR/EDR, with authorization code]	BR/EDR / 0x05	BR/EDR	Required
BMS/SEN/CPP/BV-16-C [Delete all bonds on server, LE, with authorization code]	LE / 0x06	LE	Required

Table 4.7: Delete all bonds on server test cases

- 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 terminates the ATT Bearer connection.
  4. The IUT deletes 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.
     a. Execute the procedure in Section 4.2.1 if using an LE transport or
     b. Execute the procedure in Section 4.2.2 if using a BR/EDR transport
  6. Execute step a or step b 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 terminates the ATT Bearer connection.
  8. Establish a connection between the Lower Tester and IUT on transport defined in Table 4.7, using Address B.
     a. Execute the procedure in Section 4.2.1 if using an LE transport or
     b. Execute the procedure in Section 4.2.2 if using a BR/EDR transport
  9. Execute step a or step b 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

  In step 6 and 9, based on the transport, the IUT responds with:

  - “PIN or Key Missing” to the encryption request, or
  - PDU LMP_not_accepted with reason “PIN or Key missing”.

4.6.3 Delete all but the active bond on server procedures

- Test Purpose

  This test subgroup contains test cases to verify the ‘Delete all but the active bond on Server’ procedure of the service.

- 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 TSPX_Parameter_Authorization_Code entry in IXIT [9] describes the the Authorization Code of the IUT.
  - 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 Case Configuration

TCID	Supported Transport / OpCode [3] Table 3.3	Tested Transport	Authorization Code
BMS/SEN/CPP/BV-17-C [Delete all but the active bond on server, BR/EDR/LE, using BR/EDR transport]	BR/EDR and LE / 0x07	BR/EDR	N/A
BMS/SEN/CPP/BV-18-C [Delete all but the active bond on server, BR/EDR/LE, using LE transport]	BR/EDR and LE / 0x07	LE	N/A
BMS/SEN/CPP/BV-19-C [Delete all but the active bond on server, BR/EDR]	BR/EDR / 0x08	BR/EDR	N/A
BMS/SEN/CPP/BV-20-C [Delete all but the active bond on server, LE]	LE / 0x09	LE	N/A
BMS/SEN/CPP/BV-21-C [Delete all but the active bond on server, BR/EDR/LE, using BR/EDR transport and authorization code]	BR/EDR and LE / 0x07	BR/EDR	Required
BMS/SEN/CPP/BV-22-C [Delete all but the active bond on server, BR/EDR/LE, using LE transport and authorization code]	BR/EDR and LE / 0x07	LE	Required
BMS/SEN/CPP/BV-23-C [Delete all but the active bond on server, BR/EDR, with authorization code]	BR/EDR / 0x08	BR/EDR	Required

TCID	Supported Transport / OpCode [3] Table 3.3	Tested Transport	Authorization Code
BMS/SEN/CPP/BV-24-C [Delete all but the active bond on server, LE, with authorization code]	LE / 0x09	LE	Required

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

- 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 terminates the ATT Bearer connection.
  4. The IUT deletes 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.
     a. Execute the procedure in Section 4.2.1 if using an LE transport or
     b. Execute the procedure in Section 4.2.2 if using a BR/EDR transport
  6. Execute step a or step b 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 terminates the ATT Bearer connection.
  8. Establish a connection between the Lower Tester and IUT on transport defined in Table 4.8, using Address A.
     a. Execute the procedure in Section 4.2.1 if using an LE transport or
     b. Execute the procedure in 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

  In step 6, based on the transport, the IUT responds with:

  - “PIN or Key Missing” to the encryption request, or
  - PDU LMP_not_accepted with reason “PIN or Key missing”.

  The (re)connection from step 8 can reauthenticate (encrypt) without a new pairing procedure being required.

4.7 Service Procedures – General Error Handling

This test group contains test cases to verify that the IUT reports valid error responses to Bond Management Control Point procedures using an unsupported or Reserved for Future Use (RFU) Opcode, or a parameter not matching the stored Authorization Code.

4.7.1 Op Code Not Supported

- Test Purpose

  Verify that the IUT responds appropriately when a Client writes an unsupported Op Code 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 Case Configuration

TCID	Op Code	Tested Transport
BMS/SEN/CPE/BI-01-C [Op Code not supported, BR/EDR]	0x03	BR/EDR
BMS/SEN/CPE/BI-02-C [Op Code not supported, LE]	0x02	LE

Table 4.9: Unsupported Op Code test cases

- Test Procedure

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

  1. The Lower Tester writes the first Op Code value from the Reserved for Future Use range to the Bond Management Control Point without operand.
  2. Verify the IUT response with 0x80 Op Code not supported.
  3. Steps 1–2 are repeated for one more Op Code value in the Reserved for Future Use range.
  4. The Lower Tester writes the corresponding Op Code defined in Table 4.9 to the Bond Management Control Point.
  5. Verify the IUT response with 0x80 Op Code not supported.
  6. Steps 1–5 are repeated with a valid operand.

- 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.

4.7.2 Insufficient Authorization

- Test Purpose

  Verify that the IUT responds appropriately when a Client writes an Op Code 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 TSPX_Parameter_Authorization_Code entry in IXIT [9] describes the Authorization Code of the IUT.
  - 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 Case Configuration

TCID	Op Code	Tested Transport
BMS/SEN/CPE/BI-03-C [Insufficient Authorization, BR/EDR]	0x01, or 0x02, or 0x04, or 0x05, or 0x07, or 0x08	BR/EDR
BMS/SEN/CPE/BI-04-C [Insufficient Authorization, LE]	0x01, or 0x03, or 0x04, or 0x06, or 0x07, or 0x09	LE

Table 4.10: Insufficient Authorization test cases

- 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 4.10 to the Bond Management Control Point with an operand not matching the IUT's Authorization Code.
  2. Verify that the IUT response meets the requirements of the service.
  3. Steps 1–2 are 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".

5 Test case mapping

The Test Case Mapping Table (TCMT) maps test cases to specific requirements in the ICS. The IUT will 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 logical expression based on specific entries from the associated ICS document. Contains a logical expression (using the operators AND, OR, NOT as needed) based on specific entries from the applicable ICS document(s). The entries are in the form of y/x references, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS document for BMS [4].

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

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 the purpose and structure of the ICS/IXIT and instructions for completing the ICS/IXIT, refer to the Bluetooth ICS and IXIT Proforma documents.

Item	Feature	Test Case(s)
BMS 2/1 OR BMS 2/2	Service Definition ATT	BMS/SEN/SGGIT/SER/BV-01-C
BMS 2a/1 AND BMS 2/2	Bond Management Control Point - LE	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/SGGIT/SDP/BV-02-C
BMS 2a/1 AND BMS 2/1	Bond Management Control Point – BR/EDR	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 2a/2 AND NOT (BMS 2b/2)	Bond Management Feature	BMS/SEN/SGGIT/CHA/BV-03-C
BMS 2a/1 AND NOT (BMS 2a/3)	Bond Management Control Point – Write support only	BMS/SEN/SGGIT/CHA/BV-04-C
BMS 2a/3	Bond Management Control Point - Reliable Writes supported	BMS/SEN/SGGIT/CHA/BV-05-C
BMS 2b/2	Bond Management Feature indication	BMS/SEN/SGGIT/CHA/BV-06-C BMS/SEN/SGGIT/ISFC/BV-07-C
BMS 2/1 AND BMS 2a/3	Characteristic supporting reliable write, BR/EDR	BMS/SEN/CW/BV-03-C
BMS 2/2 AND BMS 2a/3	Characteristic supporting reliable write, LE	BMS/SEN/CW/BV-04-C
BMS 3/1 AND BMS 2/1 AND BMS 2/2	Delete Bond of requesting device (Dual Mode)	BMS/SEN/CPP/BV-01-C BMS/SEN/CPP/BV-02-C

Item	Feature	Test Case(s)
BMS 3/4 AND BMS 2/1 AND BMS 2/2	Delete Bond of requesting device (Dual Mode) with authorization code	BMS/SEN/CPP/BV-05-C BMS/SEN/CPP/BV-06-C
BMS 3/1 AND BMS 2/2 AND (NOT BMS 2/1)	Delete Bond of requesting device (LE)	BMS/SEN/CPP/BV-04-C
BMS 3/4 AND BMS 2/2 AND (NOT BMS 2/1)	Delete Bond of requesting device (LE) with authorization code	BMS/SEN/CPP/BV-08-C
BMS 3/1 AND BMS 2/1 AND (NOT BMS 2/2)	Delete Bond of requesting device (BR/EDR)	BMS/SEN/CPP/BV-03-C
BMS 3/4 AND BMS 2/1 AND (NOT BMS 2/2)	Delete Bond of requesting device (BR/EDR) with authorization code	BMS/SEN/CPP/BV-07-C
BMS 3/2 AND BMS 2/1 AND BMS 2/2	Delete all bonds on server (Dual Mode)	BMS/SEN/CPP/BV-09-C BMS/SEN/CPP/BV-10-C
BMS 3/5 AND BMS 2/1 AND BMS 2/2	Delete all bonds on server (Dual Mode) with authorization code	BMS/SEN/CPP/BV-13-C BMS/SEN/CPP/BV-14-C
BMS 3/2 AND BMS 2/2 AND (NOT BMS 2/1)	Delete all bonds on server (LE)	BMS/SEN/CPP/BV-12-C
BMS 3/5 AND BMS 2/2 AND (NOT BMS 2/1)	Delete all bonds on server (LE) with authorization code	BMS/SEN/CPP/BV-16-C
BMS 3/2 AND BMS 2/1 AND (NOT BMS 2/2)	Delete all bonds on server (BR/EDR)	BMS/SEN/CPP/BV-11-C
BMS 3/5 AND BMS 2/1 AND (NOT BMS 2/2)	Delete all bonds on server (BR/EDR) with authorization code	BMS/SEN/CPP/BV-15-C
BMS 3/3 AND BMS 2/1 AND BMS 2/2	Delete all but the active bond on server (Dual Mode)	BMS/SEN/CPP/BV-17-C BMS/SEN/CPP/BV-18-C
BMS 3/6 AND BMS 2/1 AND BMS 2/2	Delete all but the active bond on server (Dual Mode) with authorization code	BMS/SEN/CPP/BV-21-C BMS/SEN/CPP/BV-22-C
BMS 3/3 AND BMS 2/2 AND (NOT BMS 2/1)	Delete all but the active bond on server (LE)	BMS/SEN/CPP/BV-20-C
BMS 3/6 AND BMS 2/2 AND (NOT BMS 2/1)	Delete all but the active bond on server (LE) with authorization code	BMS/SEN/CPP/BV-24-C
BMS 3/3 AND BMS 2/1 AND (NOT BMS 2/2)	Delete all but the active bond on server (BR/EDR)	BMS/SEN/CPP/BV-19-C

Item	Feature	Test Case(s)
BMS 3/6 AND BMS 2/1 AND (NOT BMS 2/2)	Delete all but the active bond on server (BR/EDR) with authorization code	BMS/SEN/CPP/BV-23-C

Table 5.1: Test case mapping

6 Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	1.0.0	2014-10-21	Publication
	1.0.1r00	2015-05-10	TSE 6101: Fixed broken reference in Section 4.7.2.1 TSE 6106: Corrected mapping in TCMT for TP/CPE/BI-01-C through BI-04-C (BMS/SEN/CPE/BI-01-C – 04-C after ID conversion).
1	1.0.1	2015-07-14	Prepared for TCRL 2015-1 publication
	1.0.2r00	2015-10-01	TSE 6579: Added additional valid characteristic property value (0x88) for TP/DEC/BV-02-C (BMS/SEN/DEC/BV-02-C after ID conversion) [Characteristic Declarations – Bond Management Control Point] in Table 4.2.
2	1.0.2	2015-12-22	Prepared for TCRL 2015-2 publication.
	1.0.3r00	2016-02-29	TSE 6912: Insufficient Authorization reference updated. Missing period added to Insufficient Authorization, Test Procedure, step 3. TCMT updated for test cases BMS/SEN/CPE/BI-04-C and BMS/SEN/CPE/BI-03-C.
	1.0.3r01	2016-04-04	Converted to new Test Case ID conventions as defined in TSTO v4.1.
3	1.0.3	2016-07-13	Prepared for TCRL 2016-1 publication.
	1.0.3 edition 2r00	2018-11-29	Editorial changes only. Template updated. Revision History and contributors moved to the end of the document.
4	1.0.3 edition 2	2019-11-12	Updated copyright page and confidentiality markings to support new Documentation Marking Requirements, performed minor formatting updates, and accepted all tracked changes to prepare for edition 2 publication.
	p5r00–r06	2021-02-16 – 2021-12-13	TSE 16764 (rating 4): Changes from E15767. Added new test group ISFC. New test cases added BMS/SEN/SGGIT/CHA/BV-06-C and BMS/SEN/SGGIT/ISFC/BV-07-C. Updated TCMT for BMS/SEN/SGGIT/CHA/BV-03-C. Added TCMT for the new test cases. Minor editorial updates to the preambles. TSE 18046 (rating 3): Updated TCMT to include newly added ICS item BMS 2a/3 - “Bond Management Control Point - Reliable Write”. TSE 18048 (rating 1): Removed direct references to GATT test cases in the following test cases: BMS/SEN/CW/BV-01-C, BMS/SEN/CW/BV-02-C, BMS/SEN/CW/BV-03-C, BMS/SEN/CW/BV-04-C.

Publication Number	Revision Number	Date	Comments
			TSE 18049 (rating 2): Converted the following test cases into GGIT tests: BMS/SEN/DEC/BV-01-C – -03-C, BMS/SEN/CR/BV-01-C, BMS/SEN/SD/BV-01-C and -02-C. The new GGIT converted TCIDs are: BMS/SEN/SGGIT/SER/BV-01-C, BMS/SEN/SGGIT/SDP/BV-02-C, BMS/SEN/SGGIT/CHA/BV-03-C – -05-C. Updated TCMT for the new GGIT tests and tests impacted by the GGIT conversion. TSE 18050 (rating 2): Fixed TCMT for the opcodes corresponding to different transport support to explicitly exclude the transport not applicable to the test case. For the test cases in Section 4.6.1–3, updated the Pass verdict in terms of the IUT. Performed template-related fixes and made editorial changes, including updating the copyright page to align with v2 or the DNMD.
5	p5	2022-01-25	Approved by BTI on 2022-01-06. Prepared for TCRL 2021-2 publication.

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