Telephone Bearer Service (TBS)

***Bluetooth*® Test Suite**

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Contents

1 Scope . . . 6
2 References, definitions, and abbreviations . . . 7
2.1 References . . . 7
2.2 Definitions . . . 7
2.3 Acronyms and abbreviations . . . 7
3 Test Suite Structure (TSS) . . . 8
3.1 Overview . . . 8
3.2 Test Strategy . . . 8
3.3 Test groups . . . 9
4 Test cases (TC) . . . 10
4.1 Introduction . . . 10
4.1.1 Test case identification conventions . . . 10
4.1.2 Conformance . . . 10
4.1.3 Pass/Fail verdict conventions . . . 11
4.2 Setup preambles . . . 11
4.2.1 ATT Bearer on LE Transport . . . 11
4.2.2 ATT Bearer on BR/EDR Transport . . . 11
4.2.3 EATT Bearer on LE Transport . . . 12
4.2.4 EATT Bearer on BR/EDR Transport . . . 12
4.2.5 Call Control Point . . . 12
4.3 Generic GATT Integrated Tests . . . 13
TBS/SR/SGGIT/SER/BV-01-C [Service GGIT – Telephone Bearer] . . . 13
TBS/SR/SGGIT/CHA/BV-01-C [Characteristic GGIT – Bearer Provider Name] . . . 13
TBS/SR/SGGIT/CHA/BV-02-C [Characteristic GGIT – Bearer UCI] . . . 13
TBS/SR/SGGIT/CHA/BV-03-C [Characteristic GGIT – Bearer Technology] . . . 13
TBS/SR/SGGIT/CHA/BV-04-C [Characteristic GGIT – Bearer URI Schemes Supported List] . . . 13
TBS/SR/SGGIT/CHA/BV-05-C [Characteristic GGIT – Bearer Signal Strength] . . . 13
TBS/SR/SGGIT/CHA/BV-06-C [Characteristic GGIT – Bearer Signal Strength Reporting Interval] . . . 13
TBS/SR/SGGIT/CHA/BV-07-C [Characteristic GGIT – Bearer List Current Calls] . . . 13
TBS/SR/SGGIT/CHA/BV-08-C [Characteristic GGIT – Content Control ID] . . . 13
TBS/SR/SGGIT/CHA/BV-09-C [Characteristic GGIT – Status Flags] . . . 13
TBS/SR/SGGIT/CHA/BV-10-C [Characteristic GGIT – Incoming Call Target Bearer URI Characteristic] . . . 13
TBS/SR/SGGIT/CHA/BV-11-C [Characteristic GGIT – Call State] . . . 13
TBS/SR/SGGIT/CHA/BV-12-C [Characteristic GGIT – Call Control Point] . . . 13
TBS/SR/SGGIT/CHA/BV-13-C [Characteristic GGIT – Call Control Point Optional Opcodes] . . . 13
TBS/SR/SGGIT/CHA/BV-14-C [Characteristic GGIT – Termination Reason] . . . 13
TBS/SR/SGGIT/CHA/BV-15-C [Characteristic GGIT – Incoming Call] . . . 13
TBS/SR/SGGIT/CHA/BV-16-C [Characteristic GGIT – Call Friendly Name] . . . 13
TBS/SR/SGGIT/SDP/BV-01-C [SDP Record, Telephone Bearer Service, BR/EDR] . . . 13
GTBS/SR/SGGIT/SER/BV-01-C [Service GGIT – Generic Telephone Bearer] . . . 14
GTBS/SR/SGGIT/CHA/BV-01-C [Characteristic GGIT – Bearer Provider Name] . . . 14
GTBS/SR/SGGIT/CHA/BV-02-C [Characteristic GGIT – Bearer UCI] . . . 14
GTBS/SR/SGGIT/CHA/BV-03-C [Characteristic GGIT – Bearer Technology] . . . 14
GTBS/SR/SGGIT/CHA/BV-04-C [Characteristic GGIT – Bearer URI Schemes Supported List] . . . 14
GTBS/SR/SGGIT/CHA/BV-05-C [Characteristic GGIT – Bearer Signal Strength] . . . 14

GTBS/SR/SGGIT/CHA/BV-06-C [Characteristic GGIT – Bearer Signal Strength Reporting Interval] . . . 14
GTBS/SR/SGGIT/CHA/BV-07-C [Characteristic GGIT – Bearer List Current Calls] . . . 14
GTBS/SR/SGGIT/CHA/BV-08-C [Characteristic GGIT – Content Control ID] . . . 14
GTBS/SR/SGGIT/CHA/BV-09-C [Characteristic GGIT – Status Flags] . . . 14
GTBS/SR/SGGIT/CHA/BV-10-C [Characteristic GGIT – Incoming Call Target Bearer URI Characteristic] . . . 14
GTBS/SR/SGGIT/CHA/BV-11-C [Characteristic GGIT – Call State] . . . 14
GTBS/SR/SGGIT/CHA/BV-12-C [Characteristic GGIT – Call Control Point] . . . 14
GTBS/SR/SGGIT/CHA/BV-13-C [Characteristic GGIT – Call Control Point Optional Opcodes] . . . 14
GTBS/SR/SGGIT/CHA/BV-14-C [Characteristic GGIT – Termination Reason] . . . 14
GTBS/SR/SGGIT/CHA/BV-15-C [Characteristic GGIT – Incoming Call] . . . 14
GTBS/SR/SGGIT/CHA/BV-16-C [Characteristic GGIT – Call Friendly Name] . . . 14
GTBS/SR/SGGIT/SDP/BV-01-C [SDP Record, Generic Telephone Bearer Service, BR/EDR] . . . 14
4.4 Call Control Point procedures . . . 17
4.4.1 Accept procedure . . . 17
TBS/SR/CP/BV-01-C [Accept Procedure] . . . 17
GTBS/SR/CP/BV-01-C [Accept Procedure] . . . 17
4.4.2 Terminate procedure . . . 18
TBS/SR/CP/BV-02-C [Terminate Procedure] . . . 18
GTBS/SR/CP/BV-02-C [Terminate Procedure] . . . 18
4.4.3 Hold procedure . . . 19
TBS/SR/CP/BV-03-C [Locally Hold Procedure – Incoming] . . . 19
TBS/SR/CP/BV-04-C [Locally Hold Procedure – Active] . . . 19
TBS/SR/CP/BV-05-C [Locally and Remotely Hold Procedure] . . . 19
GTBS/SR/CP/BV-03-C [Locally Hold Procedure – Incoming] . . . 19
GTBS/SR/CP/BV-04-C [Locally Hold Procedure – Active] . . . 19
GTBS/SR/CP/BV-05-C [Locally and Remotely Hold Procedure] . . . 19
4.4.4 Retrieve Locally Held Call . . . 21
TBS/SR/CP/BV-06-C [Retrieve Locally Held Call] . . . 21
GTBS/SR/CP/BV-06-C [Retrieve Locally Held Call] . . . 21
4.4.5 Retrieve Locally and Remotely Held Call . . . 22
TBS/SR/CP/BV-07-C [Retrieve Locally and Remotely Held Call] . . . 22
GTBS/SR/CP/BV-07-C [Retrieve Locally and Remotely Held Call] . . . 22
4.4.6 Originate procedure . . . 23
TBS/SR/CP/BV-08-C [Originate Procedure] . . . 23
GTBS/SR/CP/BV-08-C [Originate Procedure] . . . 23
4.4.7 Join Call procedure . . . 24
TBS/SR/CP/BV-09-C [Join Call Procedure] . . . 24
GTBS/SR/CP/BV-09-C [Join Call Procedure] . . . 24
TBS/SR/CP/BV-11-C [Join Call Procedure – Remotely Held] . . . 24
GTBS/SR/CP/BV-11-C [Join Call Procedure – Remotely Held] . . . 24
4.4.8 Join Call Not Possible . . . 26
TBS/SR/CP/BV-10-C [Join Call Not Possible] . . . 26
GTBS/SR/CP/BV-10-C [Join Call Not Possible] . . . 26
4.5 Service procedure . . . 27
4.5.1 Signal Strength Reporting Interval . . . 27
TBS/SR/SP/BV-01-C [Signal Strength Reporting Interval] . . . 27
GTBS/SR/SP/BV-01-C [Signal Strength Reporting Interval] . . . 27
4.5.2 CCID Does Not Change . . . 29
TBS/SR/SP/BV-02-C [CCID Has Not Changed] . . . 29

GTBS/SR/SP/BV-02-C [CCID Has Not Changed] . . . 29
4.6 Service procedure – Notifications . . . 30
4.6.1 Update characteristics - Connected Client . . . 30
TBS/SR/SPN/BV-01-C [Update Bearer Provider Name – Connected Client] . . . 30
TBS/SR/SPN/BV-02-C [Update Bearer Technology – Connected Client] . . . 30
TBS/SR/SPN/BV-03-C [Update Bearer URI Schemes Supported List – Connected Client] . . . 30
TBS/SR/SPN/BV-04-C [Update Status Flags – Connected Client] . . . 30
GTBS/SR/SPN/BV-01-C [Update Bearer Provider Name – Connected Client] . . . 30
GTBS/SR/SPN/BV-02-C [Update Bearer Technology – Connected Client] . . . 30
GTBS/SR/SPN/BV-03-C [Update Bearer URI Schemes Supported List – Connected Client] . . . 30
GTBS/SR/SPN/BV-04-C [Update Status Flags – Connected Client] . . . 30
4.6.2 Update characteristics - Oversized Values . . . 31
TBS/SR/SPN/BV-05-C [Update Bearer Provider Name – Oversized Value] . . . 31
TBS/SR/SPN/BV-06-C [Update Bearer URI Schemes Supported List – Oversized Value] . . . 31
TBS/SR/SPN/BV-07-C [Update Bearer List Current Calls – Oversized Value] . . . 31
TBS/SR/SPN/BV-08-C [Update Incoming Call Target Bearer URI – Oversized Value] . . . 31
TBS/SR/SPN/BV-09-C [Update Call State – Oversized Value] . . . 31
TBS/SR/SPN/BV-10-C [Update Incoming Call – Oversized Value] . . . 31
TBS/SR/SPN/BV-11-C [Update Call Friendly Name – Oversized Value] . . . 31
GTBS/SR/SPN/BV-05-C [Update Bearer Provider Name – Oversized Value] . . . 31
GTBS/SR/SPN/BV-06-C [Update Bearer URI Schemes Supported List – Oversized Value] . . . 31
GTBS/SR/SPN/BV-07-C [Update Bearer List Current Calls – Oversized Value] . . . 31
GTBS/SR/SPN/BV-08-C [Update Incoming Call Target Bearer URI – Oversized Value] . . . 31
GTBS/SR/SPN/BV-09-C [Update Call State – Oversized Value] . . . 31
GTBS/SR/SPN/BV-10-C [Update Incoming Call – Oversized Value] . . . 31
GTBS/SR/SPN/BV-11-C [Update Call Friendly Name – Oversized Value] . . . 31
4.7 Service procedure – Error Handling . . . 33
4.7.1 Call Control - Opcode Not Supported . . . 33
TBS/SR/SPE/BI-01-C [Call Control – Op Code Not Supported] . . . 33
GTBS/SR/SPE/BI-01-C [Call Control – Op Code Not Supported] . . . 33
4.7.2 Call Control - Invalid Call Index . . . 34
TBS/SR/SPE/BI-02-C [Call Control – Invalid Call Index] . . . 34
GTBS/SR/SPE/BI-02-C [Call Control – Invalid Call Index] . . . 34
4.7.3 Call Control - State Mismatch . . . 35
TBS/SR/SPE/BI-03-C [Call Control – State Mismatch] . . . 35
GTBS/SR/SPE/BI-03-C [Call Control – State Mismatch] . . . 35
4.7.4 Call Control - INVALID OUTGOING URI . . . 36
TBS/SR/SPE/BI-04-C [Call Control – INVALID OUTGOING URI] . . . 36
GTBS/SR/SPE/BI-04-C [Call Control – INVALID OUTGOING URI] . . . 36
4.7.5 Call Control - Invalid Join . . . 37
TBS/SR/SPE/BI-05-C [Call Control – Invalid Join] . . . 37
GTBS/SR/SPE/BI-05-C [Call Control – Invalid Join] . . . 37
5 Test case mapping . . . 39
6 Revision history and acknowledgments . . . 43

1 Scope

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

2 References, definitions, and abbreviations

2.1 References

This document incorporates provisions from other publications by dated or undated reference. These references are cited at the appropriate places in the text, and the publications are listed hereinafter. Additional definitions and abbreviations can be found in [1] and [2].

[1] Bluetooth Core Specification, Version 4.2 or later
[2] Test Strategy and Terminology Overview
[3] Telephone Bearer Service Specification, Version 1.0
[4] Telephone Bearer Service ICS
[5] GATT Test Suite, GATT.TS
[6] Characteristic and Descriptor descriptions are accessible via the Bluetooth SIG Assigned Numbers.
[7] IXIT Proforma for TBS and GTBS

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 Overview

Telephone Bearer Service and Generic Telephone Bearer Service require the presence of GAP, SM (when used over LE transport), SDP (when used over BR/EDR transport), L2CAP, and GATT. EATT can optionally be used. This is illustrated in Figure 3.1.

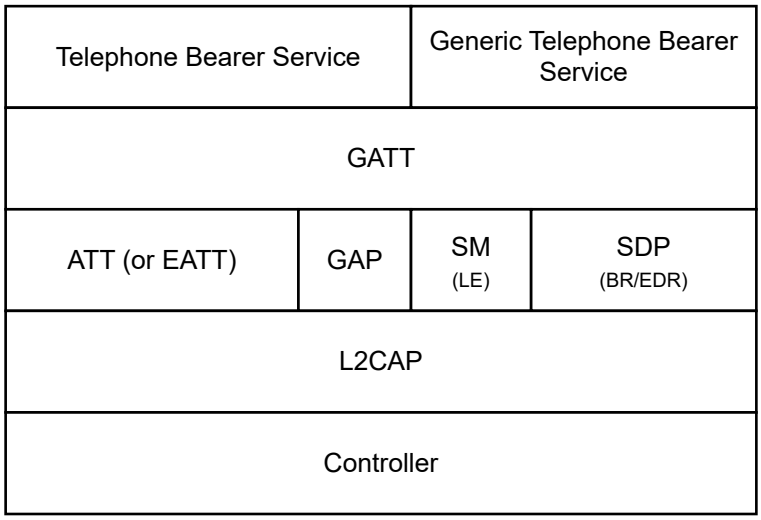


Figure 3.1: Telephone Bearer Service and Generic Telephone Bearer Service test model

3.2 Test Strategy

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

The distinction between instances of GTBS and TBS is in the service UUIDs. Running the tests in this Test Suite enables the Lower Tester to discover the GATT handles of the IUT.

The test equipment provides an implementation of the Radio Controller and the parts of the Host needed to perform the test cases defined in the 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.

The 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.

3.3 Test groups

The following test groups have been defined:

- Generic GATT Integrated Tests
- Control Point Procedures
- Service Procedures
- Service Procedures – Notifications
- Service Procedure – Error Handling

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 test cases in GGIT 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>**
GTBS	Generic Telephone Bearer Service
TBS	Telephone Bearer Service
Identifier Abbreviation	**Role Identifier <IUT role>**
SR	Server
Identifier Abbreviation	**Feature Identifier <feat>**
CP	Control Point Procedures
SP	Service Procedures
SPE	Service Procedure – Error Handling
SPN	Service Procedure – Notifications
Identifier Abbreviation	**Reference Identifier <GGIT test group>**
SGGIT	Server Generic GATT Integrated Tests
Identifier Abbreviation	**Reference Identifier <GGIT class>**
CHA	Characteristic GGIT
SDP	SDP GGIT
SER	Service GGIT

Table 4.1: TBS and GTBS TC feature naming conventions

4.1.2 Conformance

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

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

Such tests may verify:

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

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

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

4.1.3 Pass/Fail verdict conventions

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

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

4.2.3 EATT Bearer on LE Transport

Preamble procedure:

1. Establish an LE transport connection between the IUT and the Lower Tester.
2. Establish an L2CAP channel 0x0005 for signaling and one L2CAP channel (for ATT bearers) with EATT PSM (as defined in Assigned Numbers) between the IUT and the Lower Tester over that LE transport.

4.2.4 EATT 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 0x0001 for signaling and one L2CAP channel (for ATT bearers) with EATT PSM (as defined in Assigned Numbers) between the IUT and the Lower Tester over that BR/EDR transport.

4.2.5 Call Control Point

Preamble procedure:

1. Establish a Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport, or Section 4.2.3 if using EATT over an LE transport, or Section 4.2.4 if using EATT over a BR/EDR transport.
2. The handle of the Call State and Call Control Point characteristic has been previously discovered by the Lower Tester during a test procedure in Section 4.3 or is known to the Lower Tester by other means.
3. The handle of the Client Configuration descriptor of the Call State and Call Control Point characteristic has been previously discovered by the Lower Tester during a test procedure in Section 4.3 or is known to the Lower Tester by other means.
4. If the IUT requires bonding, then the Lower Tester performs a bonding procedure.

4.3 Generic GATT Integrated Tests

Execute the Generic GATT Integrated Tests defined in [5] in Section 6.3, Server test procedures (SGGIT), using Table 4.2 and Table 4.3 below as input:

TCID	Service/Characteristic/ Descriptor	Reference	Properties	Value Length (Octets)	Type
TBS/SR/SGGIT/SER/BV-01-C [Service GGIT – Telephone Bearer]	Telephone Bearer Service	[3] 2.3.1	-	-	Primary
TBS/SR/SGGIT/CHA/BV-01-C [Characteristic GGIT – Bearer Provider Name]	Bearer Provider Name Characteristic	[3] 3.1	0x12 (Read, Notify)	skip	-
TBS/SR/SGGIT/CHA/BV-02-C [Characteristic GGIT – Bearer UCI]	Bearer UCI Characteristic	[3] 3.2	0x02 (Read)	skip	-
TBS/SR/SGGIT/CHA/BV-03-C [Characteristic GGIT – Bearer Technology]	Bearer Technology Characteristic	[3] 3.3	0x12 (Read, Notify)	skip	-
TBS/SR/SGGIT/CHA/BV-04-C [Characteristic GGIT – Bearer URI Schemes Supported List]	Bearer URI Schemes Supported List Characteristic	[3] 3.4	Mandatory: 0x02 (Read) Optional: 0x10 (Notify)	skip	-
TBS/SR/SGGIT/CHA/BV-05-C [Characteristic GGIT – Bearer Signal Strength]	Bearer Signal Strength Characteristic	[3] 3.5	0x12 (Read, Notify)	1	-
TBS/SR/SGGIT/CHA/BV-06-C [Characteristic GGIT – Bearer Signal Strength Reporting Interval]	Bearer Signal Strength Reporting Interval Characteristic	[3] 3.6	0x0E (Read, Write Without Response, Write)	1	-
TBS/SR/SGGIT/CHA/BV-07-C [Characteristic GGIT – Bearer List Current Calls]	Bearer List Current Calls Characteristic	[3] 3.7	0x12 (Read, Notify)	skip	-
TBS/SR/SGGIT/CHA/BV-08-C [Characteristic GGIT – Content Control ID]	Content Control ID Characteristic	[3] 3.8	0x02 (Read)	1	Unique
TBS/SR/SGGIT/CHA/BV-09-C [Characteristic GGIT – Status Flags]	Status Flags Characteristic	[3] 3.9	0x12 (Read, Notify)	2	-
TBS/SR/SGGIT/CHA/BV-10-C [Characteristic GGIT – Incoming Call Target Bearer URI Characteristic]	Incoming Call Target Bearer URI Characteristic	[3] 3.10	0x12 (Read, Notify)	skip	-

TCID	Service/Characteristic/ Descriptor	Reference	Properties	Value Length (Octets)	Type
TBS/SR/SGGIT/CHA/BV-11-C [Characteristic GGIT – Call State]	Call State Characteristic	[3] 3.11	0x12 (Read, Notify)	skip	-
TBS/SR/SGGIT/CHA/BV-12-C [Characteristic GGIT – Call Control Point]	Call Control Point Characteristic	[3] 3.12	0x1C (Write Without Response, Write, Notify)	skip	-
TBS/SR/SGGIT/CHA/BV-13-C [Characteristic GGIT – Call Control Point Optional Opcodes]	Call Control Point Optional Opcodes Characteristic	[3] 3.13	0x02 (Read)	2	-
TBS/SR/SGGIT/CHA/BV-14-C [Characteristic GGIT – Termination Reason]	Termination Reason Characteristic	[3] 3.14	0x10 (Notify)	2	
TBS/SR/SGGIT/CHA/BV-15-C [Characteristic GGIT – Incoming Call]	Incoming Call Characteristic	[3] 3.15	0x12 (Read, Notify)	skip	-
TBS/SR/SGGIT/CHA/BV-16-C [Characteristic GGIT – Call Friendly Name]	Call Friendly Name Characteristic	[3] 3.16	0x12 (Read, Notify)	skip	-
TBS/SR/SGGIT/SDP/BV-01-C [SDP Record, Telephone Bearer Service, BR/EDR]	Telephone Bearer Service	[3]	-	-	-

Table 4.2: TBS Generic GATT Integrated Test configuration

TCID	Service/Characteristic/ Descriptor	Reference	Properties	Value Length (Octets)	Type
GTBS/SR/SGGIT/SER/BV-01-C [Service GGIT – Generic Telephone Bearer]	Generic Telephone Bearer Service	[3] 2.3.1	-	-	Primary Unique
GTBS/SR/SGGIT/CHA/BV-01-C [Characteristic GGIT – Bearer Provider Name]	Bearer Provider Name Characteristic	[3] 3.1	0x12 (Read, Notify)	skip	-
GTBS/SR/SGGIT/CHA/BV-02-C [Characteristic GGIT – Bearer UCI]	Bearer UCI Characteristic	[3] 3.2	0x02 (Read)	skip	-
GTBS/SR/SGGIT/CHA/BV-03-C [Characteristic GGIT – Bearer Technology]	Bearer Technology Characteristic	[3] 3.3	0x12 (Read, Notify)	skip	-

TCID	Service/Characteristic/ Descriptor	Reference	Properties	Value Length (Octets)	Type
GTBS/SR/SGGIT/CHA/BV-04-C [Characteristic GGIT – Bearer URI Schemes Supported List]	Bearer URI Schemes Supported List Characteristic	[3] 3.4	Mandatory: 0x02 (Read) Optional: 0x10 (Notify)	skip	-
GTBS/SR/SGGIT/CHA/BV-05-C [Characteristic GGIT – Bearer Signal Strength]	Bearer Signal Strength Characteristic	[3] 3.5	0x12 (Read, Notify)	1	-
GTBS/SR/SGGIT/CHA/BV-06-C [Characteristic GGIT – Bearer Signal Strength Reporting Interval]	Bearer Signal Strength Reporting Interval Characteristic	[3] 3.6	0x0E (Read, Write Without Response, Write)	1	-
GTBS/SR/SGGIT/CHA/BV-07-C [Characteristic GGIT – Bearer List Current Calls]	Bearer List Current Calls Characteristic	[3] 3.7	0x12 (Read, Notify)	skip	-
GTBS/SR/SGGIT/CHA/BV-08-C [Characteristic GGIT – Content Control ID]	Content Control ID Characteristic	[3] 3.8	0x02 (Read)	1	Unique
GTBS/SR/SGGIT/CHA/BV-09-C [Characteristic GGIT – Status Flags]	Status Flags Characteristic	[3] 3.9	0x12 (Read, Notify)	2	-
GTBS/SR/SGGIT/CHA/BV-10-C [Characteristic GGIT – Incoming Call Target Bearer URI Characteristic]	Incoming Call Target Bearer URI Characteristic	[3] 3.10	0x12 (Read, Notify)	skip	-
GTBS/SR/SGGIT/CHA/BV-11-C [Characteristic GGIT – Call State]	Call State Characteristic	[3] 3.11	0x12 (Read, Notify)	skip	-
GTBS/SR/SGGIT/CHA/BV-12-C [Characteristic GGIT – Call Control Point]	Call Control Point Characteristic	[3] 3.12	0x1C (Write Without Response, Write, Notify)	skip	-
GTBS/SR/SGGIT/CHA/BV-13-C [Characteristic GGIT – Call Control Point Optional Opcodes]	Call Control Point Optional Opcodes Characteristic	[3] 3.13	0x02 (Read)	2	-
GTBS/SR/SGGIT/CHA/BV-14-C [Characteristic GGIT – Termination Reason]	Termination Reason Characteristic	[3] 3.14	0x10 (Notify)	2	
GTBS/SR/SGGIT/CHA/BV-15-C [Characteristic GGIT – Incoming Call]	Incoming Call Characteristic	[3] 3.15	0x12 (Read, Notify)	skip	-

TCID	Service/Characteristic/ Descriptor	Reference	Properties	Value Length (Octets)	Type
GTBS/SR/SGGIT/CHA/BV-16-C [Characteristic GGIT – Call Friendly Name]	Call Friendly Name Characteristic	[3] 3.16	0x12 (Read, Notify)	skip	-
GTBS/SR/SGGIT/SDP/BV-01-C [SDP Record, Generic Telephone Bearer Service, BR/EDR]	Generic Telephone Bearer Service	[3]	-	-	-

Table 4.3: GTBS Generic GATT Integrated Test configuration

4.4 Call Control Point procedures

Test group to test Call Control Point procedures.

4.4.1 Accept procedure

- Test Purpose

  Verify that the Server IUT responds to setting the Accept Op Code and updates all required characteristics and data values in the Call State characteristic.

- Reference

  [3] 3.12.1.1

- Initial Condition
  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Incoming Call Target Bearer URI CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Incoming Call CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Friendly Name CCCD.
  - The IUT has no calls.

- Test Case Configuration

TCID	Service
TBS/SR/CP/BV-01-C [Accept Procedure]	Telephone Bearer Service
GTBS/SR/CP/BV-01-C [Accept Procedure]	Generic Telephone Bearer Service

Table 4.4: Accept Opcode test configuration

- Test Procedure
  1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Bearer List Current Calls characteristic and receives an empty value from the IUT.
  2. The Upper Tester orders the IUT to create a call in the Incoming state.
  3. The IUT sends these notifications in any order:
     - The IUT sends a GATT Characteristic Value Notification for the Call State characteristic.
     - The IUT sends a GATT Characteristic Value Notification for the Incoming Call Target Bearer URI

characteristic.
    - The IUT sends a GATT Characteristic Value Notification for the Call Friendly Name characteristic.
    - The IUT sends a GATT Characteristic Value Notification for the Incoming Call characteristic.
4. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Accept opcode and the Call Index parameter.
5. The IUT sends a GATT Characteristic Value Notification for the Call State characteristic.
6. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.
7. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Bearer List Current Calls characteristic.

- Expected Outcome

  Pass verdict

  In Step 3, the IUT sends a notification of the Call State with a Call Index in the Incoming state and Bit 0 of the Call Flags field set to 0b0.

  In Step 3, the IUT sends a notification of the Incoming Call Target Bearer URI with that Call Index and a correctly formatted Incoming Call Target Bearer URI.

  In Step 3, the IUT sends a notification of the Incoming Call with that Call Index and a correctly formatted Friendly Name.

  In Step 3, the IUT sends a notification of the Incoming Call with that Call Index and URI.

  In Step 5, the IUT sends a notification of the Call State with that Call Index in the Active state and Bit 0 of the Call Flags field set to 0b0.

  In Step 6, the IUT sends a notification of the Call Control Point with that Call Index, the requested opcode set to the Accept opcode, and the Result Code set to SUCCESS (0x00).

  In Step 7, the call data matches between the Call State data in Step 5 and Bearer List Current Calls, and the Call URI field matches between the Incoming_Call_Target_URI field from the Incoming Call Target Bearer URI Notification in Step 3 and Bearer List Current Calls.

4.4.2 Terminate procedure

- Test Purpose

  Verify that the Server IUT responds to setting the Terminate opcode and update all required characteristic and data values in the Call State characteristic.

- Reference

  [3] 3.12.1.2

- Initial Condition

  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-

procedure for the Call State CCCD.

- Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
- Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Termination Reason CCCD.
- The IUT has a call in any state.

- Test Case Configuration

TCID	Service
TBS/SR/CP/BV-02-C [Terminate Procedure]	Telephone Bearer Service
GTBS/SR/CP/BV-02-C [Terminate Procedure]	Generic Telephone Bearer Service

Table 4.5: Terminate Opcode test configuration

- Test Procedure

1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call State characteristic.
2. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Terminate opcode and the first Call Index.
3. The IUT sends a GATT Characteristic Value Notification for the Call State characteristic.
4. The IUT sends a GATT Characteristic Value Notification for the Termination Reason characteristic.
5. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.

- Expected Outcome

Pass verdict

After Step 2, the IUT sends a notification of the Call State characteristic in which the Call Index is removed.

After Step 2, the IUT sends a notification of the Termination Reason characteristic with that Call Index and Reason Code set to 0x06.

After Step 2, the IUT sends a notification with that Call Index, the requested opcode set to the Terminate opcode, and the Result Code set to SUCCESS (0x00).

4.4.3 Hold procedure

- Test Purpose

Verify that the Server IUT responds to setting the Local Hold Op Code and updates all required characteristic and data values in the Call State characteristic.

- Reference

[3] 3.12.1.3

- Initial Condition
  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - The IUT has a call in the Initial State as specified in Table 4.6.
- Test Case Configuration

TCID	Initial State	End-State	Service
TBS/SR/CP/BV-03-C [Locally Hold Procedure – Incoming]	Incoming	Locally Held	TBS
TBS/SR/CP/BV-04-C [Locally Hold Procedure – Active]	Active	Locally Held	TBS
TBS/SR/CP/BV-05-C [Locally and Remotely Hold Procedure]	Remotely Held	Locally and Remotely Held	TBS
GTBS/SR/CP/BV-03-C [Locally Hold Procedure – Incoming]	Incoming	Locally Held	GTBS
GTBS/SR/CP/BV-04-C [Locally Hold Procedure – Active]	Active	Locally Held	GTBS
GTBS/SR/CP/BV-05-C [Locally and Remotely Hold Procedure]	Remotely Held	Locally and Remotely Held	GTBS

Table 4.6: Hold Procedure test cases

- Test Procedure
  1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call Control Point Optional Opcodes characteristic.
  2. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call State characteristic.
  3. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Local Hold opcode and the target Call Index.
  4. The IUT sends a GATT Characteristic Value Notification for the Call State characteristic.
  5. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.
- Expected Outcome

  Pass verdict

  In Step 1, the IUT has the Local Hold bit set in the Call Control Point Optional Opcodes characteristic.

  In Step 2, the IUT has a Call Index in the Initial State as specified in Table 4.6.

  After Step 3, the IUT sends a notification of the Call State characteristic with that Call Index in the End State as specified in Table 4.6.

After Step 3, the IUT sends a notification with that Call Index, the requested opcode set to the Local Hold opcode, and the Result Code set to SUCCESS (0x00).

4.4.4 Retrieve Locally Held Call

- Test Purpose

  Verify that the Server IUT responds to setting the Local Retrieve opcode for a Locally Held call and update all required characteristic and data values in the Call State characteristic.

- Reference

  [3] 3.12.1.4

- Initial Condition

  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - The IUT has two calls: one call (Call_Index_1) in the Locally Held state and another (Call_Index_2) in the Active state.

- Test Case Configuration

TCID	Service
TBS/SR/CP/BV-06-C [Retrieve Locally Held Call]	Telephone Bearer Service
GTBS/SR/CP/BV-06-C [Retrieve Locally Held Call]	Generic Telephone Bearer Service

Table 4.7: Retrieve Locally Held Call test configuration

- Test Procedure

  1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call Control Point Optional Opcodes characteristic.
  2. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call State characteristic.
  3. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Local Retrieve opcode and the Call Index of the Locally Held call.
  4. The IUT sends a GATT Characteristic Value Notification for the Call State characteristic.
  5. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.

- Expected Outcome

  Pass verdict

  In Step 1, the IUT has the Local Hold bit set in the Call Control Point Optional Opcodes characteristic.

In Step 2, the IUT has the Call Index in an Active state and a Call Index in a Locally Held state.

After Step 3, the IUT sends a notification of the Call State characteristic where the call with the Call_Index_1 value that was in the Active state is now in the Locally Held state, and the one that was in the Locally Held state (Call_Index_2) is now in the Active state.

After Step 3, the IUT sends a notification with that Call Index, the requested opcode set to the Local Retrieve opcode, and the Result Code set to SUCCESS (0x00).

4.4.5 Retrieve Locally and Remotely Held Call

- Test Purpose

  Verify that the Server IUT responds to setting the Local Retrieve opcode for a Locally and Remotely Held call and updates all required characteristic and data values in the Call State characteristic.

- Reference

  [3] 3.12.1.4

- Initial Condition
  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - The IUT has three calls: one call in the Locally and Remotely Held state, one call in the Remotely Held state, and another call in the Active state.

- Test Case Configuration

TCID	Service
TBS/SR/CP/BV-07-C [Retrieve Locally and Remotely Held Call]	Telephone Bearer Service
GTBS/SR/CP/BV-07-C [Retrieve Locally and Remotely Held Call]	Generic Telephone Bearer Service

Table 4.8: Retrieve Locally and Remotely Held Call test configuration

- Test Procedure

  1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call Control Point Optional Opcodes characteristic.
  2. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call State characteristic.
  3. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Local Retrieve opcode and the Call Index of the Locally and Remote Held call.

4. The IUT sends a GATT Characteristic Value Notification for the Call State characteristic.
5. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.

- Expected Outcome

  Pass verdict

  In Step 1, the IUT has the Local Hold bit set in the Call Control Point Optional Opcodes characteristic.

  In Step 2, the IUT has a Call Index in an Active state, a Call Index in a Remotely Held state, and a Call Index in a Locally and Remotely Held state.

  After Step 4, the IUT sends a notification of the Call State characteristic with the Call Index in the Active state now in the Locally Held state, the Call Index in the Remotely Held state now in the Locally and Remotely Held state, and the Locally and Remotely Held Call Index now in the Remotely Held state.

  After Step 4, the IUT sends a notification with that Call Index, the requested opcode set to the Local Retrieve opcode, and Result Code set to SUCCESS (0x00).

4.4.6 Originate procedure

- Test Purpose

  Verify that the Server IUT responds to setting the Originate opcode and updates all required characteristic and data values in the Call State characteristic.

- Reference

  [3] 3.12.1.5

- Initial Condition
  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - The IUT has no calls in the Calling state.

- Test Case Configuration

TCID	Service
TBS/SR/CP/BV-08-C [Originate Procedure]	Telephone Bearer Service
GTBS/SR/CP/BV-08-C [Originate Procedure]	Generic Telephone Bearer Service

Table 4.9: Originate Procedure test configuration

- Test Procedure

  1. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Originate opcode and the URI set to the TSPX_Outgoing_Remote_Caller_URI IXIT entry.
  2. The IUT sends a GATT Characteristic Value Notification for the Call State characteristic.
  3. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.

- Expected Outcome

  Pass verdict

  In Step 2, the IUT sends a notification of the Call State characteristic with a new Call Index in the Dialing Calling state and Bit 0 of the Call Flags field set to 0b1.

  In Step 3, the IUT sends a notification with a valid Call Index, the requested opcode set to the Originate opcode, and the Result Code set to SUCCESS (0x00).

- Note

  After Step 1, the IUT can send a notification of the Call State characteristic with the new Call Index in the Alerting Calling state and Bit 0 of the Call Flags field set to 0b1.

4.4.7 Join Call procedure

- Test Purpose

  Verify that the Server IUT responds to setting the Join opcode and updates all required characteristic and data values in the Call State characteristic.

- Reference

  [3] 3.12.1.6

- Initial Condition

  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - The IUT has a set of calls configured as specified in Table 4.10.

- Test Case Configuration

CALL INDEX	Initial State	End State
A	Active	Active
B	Locally Held	Active
C	Remotely Held	Remotely Held
D	Locally and Remotely Held	Remotely Held
E	Alerting	Alerting
F	Dialing	Dialing or Alerting
G	Active	Locally Held

Table 4.10: Join Opcode test configuration

TCID	Service	Used Call Indexes
TBS/SR/CP/BV-09-C [Join Call Procedure]	Telephone Bearer Service	A,B,E,F,G
GTBS/SR/CP/BV-09-C [Join Call Procedure]	Generic Telephone Bearer Service	A,B,E,F,G
TBS/SR/CP/BV-11-C [Join Call Procedure – Remotely Held]	Telephone Bearer Service	A,B,C,D,E,F,G
GTBS/SR/CP/BV-11-C [Join Call Procedure – Remotely Held]	Generic Telephone Bearer Service	A,B,C,D,E,F,G

Table 4.11: Join Opcode test configuration

- Test Procedure

1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call Control Point Optional Opcodes characteristic.
2. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call State characteristic.

The Lower Tester will execute Steps 3-5 with unique random pairings of Call Indexes as specified in Table 4.11 (excluding CALL INDEX G) until all Call Indexes are used.

3. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Join opcode and the list of Call Indexes chosen.
4. Perform Alternative 4A if a state change is expected otherwise perform Alternative 4B:

   Alternative 4A:

   4A.1. The IUT sends one or more GATT Characteristic Value Notification for the Call State characteristic.

   4A.2. If there is a partial notification in Step 4A.1, the Lower Tester reads the Call State characteristic by executing the GATT Read Long Characteristic Value sub-procedure with a Value Offset of (ATT_MTU-3).

Alternative 4B:

4B.1. The Lower Tester reads the Call State characteristic by executing the GATT Read Characteristic Value sub-procedure.

5. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic with the Call Index field set to the first Call Index in the list of Call Indexes in Step 4.

- Expected Outcome

  Pass verdict

  The IUT has the Join Call Control Opcode Supported bit set in the Call Control Point Optional Opcodes characteristic in Step 1.

  The Lower Tester reads the Call Indexes as specified in Table 4.11 with the proper Initial State as specified in Table 4.10.

  After Step 3, the Call State characteristic value for both Call Indexes transition to the End State as specified in Table 4.10.

  After Step 3, the IUT sends a notification with Call Index set to the first Call Index from the list of Call Indexes in Step 3, requested opcode set to the Join opcode, and Result Code set to SUCCESS (0x00).

  The IUT transitions Call Index G to the End State specified in Table 4.10.

4.4.8 Join Call Not Possible

- Test Purpose

  Verify that the Server IUT responds to setting the Join opcode with an Operation Not Possible when the IUT cannot support the Join.

- Reference

  [3] 3.12.1.6

- Initial Condition

  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - The IUT has two calls in any state.

- Test Case Configuration

TCID	Service
TBS/SR/CP/BV-10-C [Join Call Not Possible]	Telephone Bearer Service
GTBS/SR/CP/BV-10-C [Join Call Not Possible]	Generic Telephone Bearer Service

Table 4.12: Join Call Not Possible test configuration

- Test Procedure

  1. The Upper Tester configures the IUT to disallow Joins.
  2. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call Control Point Optional Opcodes characteristic.
  3. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call State characteristic.
  4. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Join opcode and the list of Call Indexes.
  5. The IUT sends a notification with a Result Code of OPERATION NOT POSSIBLE.

- Expected Outcome

  Pass verdict

  The IUT has the Join Call Control Opcode Supported bit set in the Call Control Point Optional Opcodes characteristic in Step 2.

  The IUT sends a notification with a Result Code of OPERATION NOT POSSIBLE in Step 5.

4.5 Service procedure

4.5.1 Signal Strength Reporting Interval

- Test Purpose

  Verify that the IUT waits at least the Bearer Signal Strength Reporting Interval between sending notifications for the Bearer Signal Strength characteristic when the Bearer Signal Strength Reporting Interval is set to a non-zero value.

- Reference

  [3] 3.6.1

- Initial Condition

  - Establish a Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport, or Section 4.2.3 if using EATT over an LE transport, or Section 4.2.4 if using EATT over a BR/EDR transport.
  - The handle of the Bearer Signal Strength and Bearer Signal Strength Reporting Interval characteristic has been previously discovered by the Lower Tester during a test procedure in Section 4.3 or is known to the Lower Tester by other means.
  - The handle of the Client Configuration descriptor of the Bearer Signal Strength characteristic has been

previously discovered by the Lower Tester during a test procedure in Section 4.3 or is known to the Lower Tester by other means.

- If the IUT requires bonding, then the Lower Tester performs a bonding procedure.
- Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Bearer Signal Strength CCCD.
- The Bearer Signal Strength Reporting Interval is defined by the TSPX_Signal_Strength_Reporting_Interval the IXIT entry.

- Test Case Configuration

TCID	Service
TBS/SR/SP/BV-01-C [Signal Strength Reporting Interval]	Telephone Bearer Service
GTBS/SR/SP/BV-01-C [Signal Strength Reporting Interval]	Generic Telephone Bearer Service

Table 4.13: Signal Strength Reporting Interval test configuration

- Test Procedure

1. The Lower Tester executes the GATT Write Characteristic Value sub-procedure for the Bearer Signal Strength Reporting Interval characteristic with Reporting Interval set to TSPX_Signal_Strength_Reporting_Interval.
2. The IUT sends a Write Response indicating a successful write.
3. The Upper Tester forces the signal strength to change on the IUT to a random value.
4. The IUT sends a GATT Characteristic Value Notification to the Lower Tester for the Bearer Signal Strength characteristic with the value from Step 3.
5. Within TSPX_Signal_Strength_Reporting_Interval seconds after Step 4, the Upper Tester repeats Step 6 three times with random intervals between each repeat.
6. The Upper Tester forces the signal strength on the IUT to change to a random value that is different from the signal strength from all previous steps.
7. The IUT sends a GATT Characteristic Value Notification to the Lower Tester for the Bearer Signal Strength characteristic with any of the values received in Step 6 at least TSPX_Signal_Strength_Reporting_Interval seconds after Step 4.
8. The Upper Tester forces the signal strength to change on the IUT to a random value that is different from the signal strength from Step 7 at a time between TSPX_Signal_Strength_Reporting_Interval and 2´TSPX_Signal_Strength_Reporting_Interval seconds after Step 7.
9. The IUT sends a GATT Characteristic Value Notification to the Lower Tester for the Bearer Signal Strength characteristic with the value received from Step 8.

- Expected Outcome

Pass verdict

In Step 7, the IUT sends a Bearer Signal Strength notification to the Lower Tester at least TSPX_Signal_Strength_Reporting_Interval seconds after Step 4 with any of the values received in Step 6.

In Step 9, the IUT sends a Bearer Signal Strength notification to the Lower Tester with the value received in Step 8.

Fail verdict

The IUT sends a Bearer Signal Strength notification within TSPX_Signal_Strength_Reporting_Interval seconds between Steps 4 and 7.

The IUT sends a Bearer Signal Strength notification within TSPX_Signal_Strength_Reporting_Interval seconds between Steps 7 and 9.

4.5.2 CCID Does Not Change

- Test Purpose

  Verify that the Server IUT does not change the CCID value.

- Reference

  [3] 3.13

- Initial Condition

  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport, or Section 4.2.3 if using EATT over an LE transport, or Section 4.2.4 if using EATT over a BR/EDR transport.
  - The handle of the CCID characteristic has been previously discovered by the Lower Tester during a test procedure in Section 4.2.5 or is known to the Lower Tester by other means.
  - If the IUT requires bonding, then the Lower Tester performs a bonding procedure.

- Test Case Configuration

TCID	Service
TBS/SR/SP/BV-02-C [CCID Has Not Changed]	Telephone Bearer Service
GTBS/SR/SP/BV-02-C [CCID Has Not Changed]	Generic Telephone Bearer Service

Table 4.14: CCID Has Not Changed test cases

- Test Procedure

  1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the CCID characteristic.
  2. The Lower Tester drops the bearer connection and re-establishes the bearer connection.
  3. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the CCID characteristic.

- Expected Outcome

  Pass verdict

  The CCID value from Step 1 is equal to the CCID value from Step 3.

4.6 Service procedure – Notifications

4.6.1 Update characteristics - Connected Client

- Test Purpose

  This test group contains one or more test cases to verify the behavior of the Server IUT when it updates its characteristics while a Client is connected.

- Reference

  [3] 3

- Initial Condition

  - Establish a Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport, or Section 4.2.3 if using EATT over an LE transport, or Section 4.2.4 if using EATT over a BR/EDR transport.
  - The Lower Tester has cached the service and characteristics handles (e.g., by running the procedures in Section 4.3).
  - The Lower Tester enables notification for the characteristic in Table 4.15 by writing the value 0x0001 to the CCCD associated with the specified characteristic using the GATT Write Characteristic Descriptor sub-procedure.

- Test Case Configuration

TCID	Characteristic UUID	Service
TBS/SR/SPN/BV-01-C [Update Bearer Provider Name – Connected Client]	<< Bearer Provider Name >>	TBS
TBS/SR/SPN/BV-02-C [Update Bearer Technology – Connected Client]	<< Bearer Technology >>	TBS
TBS/SR/SPN/BV-03-C [Update Bearer URI Schemes Supported List – Connected Client]	<< Bearer URI Schemes Supported List >>	TBS
TBS/SR/SPN/BV-04-C [Update Status Flags – Connected Client]	<< Status Flags >>	TBS
GTBS/SR/SPN/BV-01-C [Update Bearer Provider Name – Connected Client]	<< Bearer Provider Name >>	GTBS
GTBS/SR/SPN/BV-02-C [Update Bearer Technology – Connected Client]	<< Bearer Technology >>	GTBS
GTBS/SR/SPN/BV-03-C [Update Bearer URI Schemes Supported List – Connected Client]	<< Bearer URI Schemes Supported List >>	GTBS
GTBS/SR/SPN/BV-04-C [Update Status Flags – Connected Client]	<< Status Flags >>	GTBS

Table 4.15: Characteristics Update – Connected Client test cases

- Test Procedure

  1. The Lower Tester reads the characteristic value for the characteristic specified by the Characteristic UUID referenced in Table 4.15 by executing the GATT Read Characteristic Value sub-procedure.

2. The Upper Tester commands the IUT to update the characteristic read in Step 1 with different data.
3. Upon the update in Step 2, the IUT sends a notification containing the updated value of the characteristic in Table 4.15.

- Expected Outcome

  Pass verdict

  In Step 1, the characteristic value is correctly formatted and contains valid data for that characteristic.

  In Step 3, the characteristic value is correctly formatted and is different from the one received in Step 1.

4.6.2 Update characteristics - Oversized Values

- Test Purpose

  This test group contains one or more test cases to verify the behavior of the Server IUT when it updates its characteristics when the characteristic value is greater than (ATT_MTU-3).

- Reference

  [3] 3

- Initial Condition

  - Establish a Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport, or Section 4.2.3 if using EATT over an LE transport, or Section 4.2.4 if using EATT over a BR/EDR transport.
  - The Lower Tester has cached the service and characteristics handles (e.g., by running the procedures in Section 4.3).
  - The Lower Tester enables notification for the characteristic in Table 4.16 by writing the value 0x0001 to the CCCD associated with the specified characteristic using the GATT Write Characteristic Descriptor sub-procedure.
  - The characteristic in Table 4.16 has a value whose length is greater than the (ATT_MTU-3) length.

- Test Case Configuration

Test Case	Characteristic UUID	Service
TBS/SR/SPN/BV-05-C [Update Bearer Provider Name – Oversized Value]	<< Bearer Provider Name >>	TBS
TBS/SR/SPN/BV-06-C [Update Bearer URI Schemes Supported List – Oversized Value]	<< Bearer URI Schemes Supported List >>	TBS
TBS/SR/SPN/BV-07-C [Update Bearer List Current Calls – Oversized Value]	<< Bearer List Current Calls >>	TBS
TBS/SR/SPN/BV-08-C [Update Incoming Call Target Bearer URI – Oversized Value]	<< Incoming Call Target Bearer URI >>	TBS
TBS/SR/SPN/BV-09-C [Update Call State – Oversized Value]	<< Call State >>	TBS
TBS/SR/SPN/BV-10-C [Update Incoming Call – Oversized Value]	<< Incoming Call >>	TBS
TBS/SR/SPN/BV-11-C [Update Call Friendly Name – Oversized Value]	<< Call Friendly Name >>	TBS
GTBS/SR/SPN/BV-05-C [Update Bearer Provider Name – Oversized Value]	<< Bearer Provider Name >>	GTBS
GTBS/SR/SPN/BV-06-C [Update Bearer URI Schemes Supported List – Oversized Value]	<< Bearer URI Schemes Supported List >>	GTBS
GTBS/SR/SPN/BV-07-C [Update Bearer List Current Calls – Oversized Value]	<< Bearer List Current Calls >>	GTBS
GTBS/SR/SPN/BV-08-C [Update Incoming Call Target Bearer URI – Oversized Value]	<< Incoming Call Target Bearer URI >>	GTBS
GTBS/SR/SPN/BV-09-C [Update Call State – Oversized Value]	<< Call State >>	GTBS
GTBS/SR/SPN/BV-10-C [Update Incoming Call – Oversized Value]	<< Incoming Call >>	GTBS
GTBS/SR/SPN/BV-11-C [Update Call Friendly Name – Oversized Value]	<< Call Friendly Name >>	GTBS

Table 4.16: Characteristics Update – Oversized Data test cases

- Test Procedure

  1. The Lower Tester reads the characteristic value for the characteristic specified by the Characteristic UUID referenced in Table 4.16 by executing the GATT Read Long Characteristic Value sub-procedure with a Value Offset of 0.
  2. The Upper Tester commands the IUT to update the characteristic specified by the Characteristic UUID referenced in Table 4.16 with a different value whose length is greater than the (ATT_MTU-3).
  3. Upon the update in Step 2, the IUT sends a notification containing the updated value of the characteristic in Table 4.16.
  4. The Lower Tester reads the characteristic value for the characteristic specified by the Characteristic UUID referenced in Table 4.16 by executing the GATT Read Long Characteristic Value sub-procedure with a Value Offset of (ATT_MTU-3).
  5. The IUT returns a Value Changed During Read Long application error code.
  6. The Lower Tester reads the characteristic value for the characteristic specified by the Characteristic UUID referenced in Table 4.16 by executing the GATT Read Long Characteristic Value sub-procedure

with a Value Offset of 0.

7. The IUT responds successfully to the read in Step 6.

- Expected Outcome

  Pass verdict

  In Step 3, the characteristic value has a length that is equal to ATT_MTU-3.

  In Step 5, the IUT returns a Value Changed During Read Long error code.

  In Step 7, the IUT successfully returns data to the GATT Read Long Characteristic Value sub-procedure.

4.7 Service procedure – Error Handling

4.7.1 Call Control - Opcode Not Supported

- Test Purpose

  Verify that the Server IUT responds to setting an opcode that is not supported by the IUT, or is within a range that is reserved for future use, by returning an Opcode Not Supported error response.

- Reference

  [3] 3.12.1

- Initial Condition

  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - The IUT has two calls in any state except for Incoming.

- Test Case Configuration

TCID	Service
TBS/SR/SPE/BI-01-C [Call Control – Op Code Not Supported]	Telephone Bearer Service
GTBS/SR/SPE/BI-01-C [Call Control – Op Code Not Supported]	Generic Telephone Bearer Service

Table 4.17: Opcode Not Supported test configuration

- Test Procedure

1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call State characteristic.
2. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the opcode set to an RFU value and the Call Index parameter.

3. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.
4. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call Control Point Optional Opcodes characteristic.

Repeat Steps 5-6 for each opcode not supported in Bit 0 and Bit 1 of the Call Control Point Optional Opcodes characteristic.

5. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the opcode set to an opcode that is not supported (from Step 4) and the Call Index parameter.
6. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.

- Expected Outcome

  Pass verdict

  The Lower Tester reads the Call State characteristic and finds two Call Indexes in any state except for Incoming.

  After Step 2, the IUT sends a notification of the Call Control Point characteristic with the Call Index set to zero and the requested opcode set to an RFU value and the Result Code set to OPCODE NOT SUPPORTED.

  After each Step 5, the IUT sends a notification of the Call Control Point characteristic with the Call Index set to zero and the requested opcode set to the unsupported opcode and the Result Code set to OPCODE NOT SUPPORTED.

4.7.2 Call Control - Invalid Call Index

- Test Purpose

  Verify that the Server IUT correctly responds to writing of the Terminate opcode to the Call Control Point using an invalid Call Index by returning an Invalid Call Index error response.

- Reference

  [3] 3.12

- Initial Condition
  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.

- Test Case Configuration

TCID	Service
TBS/SR/SPE/BI-02-C [Call Control – Invalid Call Index]	Telephone Bearer Service
GTBS/SR/SPE/BI-02-C [Call Control – Invalid Call Index]	Generic Telephone Bearer Service

Table 4.18: Invalid Call Index test configuration

- Test Procedure

  1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call State characteristic.
  2. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Terminate opcode and Call Index that is not being used.
  3. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.

- Expected Outcome

  Pass verdict

  In Step 3, the IUT sends a notification of the Call Control Point characteristic with the Call Index set to zero and the requested opcode set to Terminate, and the Result Code is set to INVALID CALL INDEX.

4.7.3 Call Control - State Mismatch

- Test Purpose

  Verify that the Server IUT correctly responds to the writing of the Accept opcode to the Call Control Point when the current Call State for that Call Index is not in the expected state by returning a State Mismatch error response.

- Reference

  [3] 3.12.2

- Initial Condition

  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - The IUT has a call in the Locally Held state.

- Test Case Configuration

TCID	Service
TBS/SR/SPE/BI-03-C [Call Control – State Mismatch]	Telephone Bearer Service
GTBS/SR/SPE/BI-03-C [Call Control – State Mismatch]	Generic Telephone Bearer Service

Table 4.19: State Mismatch test configuration

- Test Procedure

  1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call State characteristic.
  2. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Accept opcode and the Call Index in the Locally Held state.
  3. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.

- Expected Outcome

  Pass verdict

  In Step 3, the IUT sends a notification of the Call Control Point characteristic with the Call Index set to zero and the requested opcode set to Accept, and the Result Code is set to STATE MISMATCH.

4.7.4 Call Control - INVALID OUTGOING URI

- Test Purpose

  Verify that the Server IUT correctly responds to the writing of the Call Control Point opcode to Originate using an invalid Caller ID by returning an INVALID OUTGOING URI error response.

- Reference

  [3] 3.12.2

- Initial Condition

  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - The TSPX_Outgoing_Remote_Caller_URI IXIT entry is set to an invalid Caller URI.

- Test Case Configuration

TCID	Service
TBS/SR/SPE/BI-04-C [Call Control – INVALID OUTGOING URI]	Telephone Bearer Service
GTBS/SR/SPE/BI-04-C [Call Control – INVALID OUTGOING URI]	Generic Telephone Bearer Service

Table 4.20: INVALID OUTGOING URI test configuration

- Test Procedure

  1. The IUT sends a Write Response from the IUT indicating that the write succeeded.
  2. The Lower Tester executes the GATT Write Without Response Value sub-procedure for the Call Control Point characteristic with the Originate opcode and the URI set to the TSPX_Outgoing_Remote_Caller_URI IXIT entry.
  3. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.

- Expected Outcome

  Pass verdict

  The IUT sends a notification of the Call Control Point characteristic with a Call Index of zero and the requested opcode set to Originate, and the Result Code is set to INVALID OUTGOING URI.

4.7.5 Call Control - Invalid Join

- Test Purpose

  Verify that the Server IUT correctly responds to setting the Call Control Point opcode to Join with the incorrect number of Call Indexes.

- Reference

  [3] 3.12.1.6

- Initial Condition

  - Enable the IUT for use with the Call Control Point by performing the preamble described in Section 4.2.5.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call State CCCD.
  - Enable notification by writing the value 0x0001 using the GATT Write Characteristic Descriptor sub-procedure for the Call Control Point CCCD.
  - The IUT has at least one call (CALL A) in the Incoming state and another call (CALL B) in any state.

- Test Case Configuration

TCID	Service
TBS/SR/SPE/BI-05-C [Call Control – Invalid Join]	Telephone Bearer Service
GTBS/SR/SPE/BI-05-C [Call Control – Invalid Join]	Generic Telephone Bearer Service

Table 4.21: Invalid Join test configuration

- Test Procedure

  1. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call Control Point Optional Opcodes characteristic.
  2. The Lower Tester executes the GATT Read Characteristic Value sub-procedure for the Call State characteristic.
  3. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Join opcode, and Call Index B.
  4. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.
  5. The Lower Tester executes the GATT Write Without Response sub-procedure for the Call Control Point characteristic with the Join opcode, and Call Index A and B.
  6. The IUT sends a GATT Characteristic Value Notification for the Call Control Point characteristic.

- Expected Outcome

  Pass verdict

  The Lower Tester reads the Call Control Point Optional Opcodes characteristic and the “Join Call Control Point Opcode supported” bit is set.

  The Lower Tester reads the two Call Indexes.

  In Steps 4 and 6, the IUT sends a notification of the Call Control Point characteristic with a Call Index of zero and the requested opcode set to Join and the Result Code set to OPERATION NOT POSSIBLE.

5 Test case mapping

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

The columns for the TCMT are defined as follows:

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

If a test case is mandatory within the respective layer, then the y/x reference is omitted.

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

Test Case(s): The applicable test case identifiers are required for Bluetooth Qualification if the corresponding y/x references defined in the Item column are supported. Further details about the function of the TCMT are elaborated in [2].

For the purpose and structure of the ICS/IXIT, refer to [2].

Item	Feature	Test Case(s)
TBS 1/1 AND TBS 2/1	SDP Record, Telephone Bearer Service	TBS/SR/SGGIT/SDP/BV-01-C
TBS 2/1	Telephone Bearer Service	TBS/SR/SGGIT/SER/BV-01-C
TBS 2/11	Bearer List Current Calls Characteristic	TBS/SR/SGGIT/CHA/BV-07-C
TBS 2/11 AND TBS 2/12	Bearer List Current Calls – Read Long	TBS/SR/SPN/BV-07-C
TBS 2/13	Content Control ID Characteristic	TBS/SR/SGGIT/CHA/BV-08-C TBS/SR/SP/BV-02-C
TBS 2/14	Status Flags Characteristic	TBS/SR/SGGIT/CHA/BV-09-C TBS/SR/SPN/BV-04-C
TBS 2/15	Incoming Call Target Bearer URI Characteristic	TBS/SR/SGGIT/CHA/BV-10-C
TBS 2/15 AND TBS 2/16	Incoming Call Target Bearer URI – Read Long	TBS/SR/SPN/BV-08-C
TBS 2/17	Call State Characteristic	TBS/SR/SGGIT/CHA/BV-11-C
TBS 2/17 AND TBS 2/18	Call State – Read Long	TBS/SR/SPN/BV-09-C
TBS 2/19	Call Control Point Characteristic	TBS/SR/SGGIT/CHA/BV-12-C TBS/SR/SPE/BI-01-C TBS/SR/SPE/BI-02-C
TBS 2/19 AND TBS 3/3	Call Control Point Characteristic – State Mismatch error	TBS/SR/SPE/BI-03-C

Item	Feature	Test Case(s)
TBS 2/2	Bearer Provider Name Characteristic	TBS/SR/SGGIT/CHA/BV-01-C TBS/SR/SPN/BV-01-C
TBS 2/2 AND TBS 2/3	Bearer Provider Name – Read Long	TBS/SR/SPN/BV-05-C
TBS 2/20	Call Control Point Optional Opcodes Characteristic	TBS/SR/SGGIT/CHA/BV-13-C
TBS 2/21	Termination Reason Characteristic	TBS/SR/SGGIT/CHA/BV-14-C
TBS 2/22	Incoming Call Characteristic	TBS/SR/SGGIT/CHA/BV-15-C
TBS 2/22 AND TBS 2/23	Incoming Call – Read Long	TBS/SR/SPN/BV-10-C
TBS 2/24	Call Friendly Name Characteristic	TBS/SR/SGGIT/CHA/BV-16-C
TBS 2/24 AND TBS 2/25	Call Friendly Name – Read Long	TBS/SR/SPN/BV-11-C
TBS 2/4	Bearer UCI Characteristic	TBS/SR/SGGIT/CHA/BV-02-C
TBS 2/5	Bearer Technology Characteristic	TBS/SR/SGGIT/CHA/BV-03-C TBS/SR/SPN/BV-02-C
TBS 2/6	Bearer URI Schemes Supported List Characteristic	TBS/SR/SGGIT/CHA/BV-04-C
TBS 2/6 AND TBS 2/7	Bearer URI Schemes Supported List Notification	TBS/SR/SPN/BV-03-C
TBS 2/6 AND TBS 2/7 AND TBS 2/8	Bearer URI Schemes Supported List – Read Long	TBS/SR/SPN/BV-06-C
TBS 2/9 AND TBS 2/10	Bearer Signal Strength and Reporting Interval Characteristic	TBS/SR/SGGIT/CHA/BV-05-C TBS/SR/SGGIT/CHA/BV-06-C TBS/SR/SP/BV-01-C
TBS 3/1	Accept Procedure	TBS/SR/CP/BV-01-C
TBS 3/2	Terminate Procedure	TBS/SR/CP/BV-02-C
TBS 3/3	Local Hold Procedure	TBS/SR/CP/BV-03-C TBS/SR/CP/BV-04-C
TBS 3/3 AND TBS 2/26	Local Hold Procedure – Remotely Held	TBS/SR/CP/BV-05-C
TBS 3/4	Local Retrieve Procedure	TBS/SR/CP/BV-06-C
TBS 3/4 AND TBS 2/26	Local Retrieve Procedure – Remotely Held	TBS/SR/CP/BV-07-C
TBS 3/5	Originate Procedure	TBS/SR/CP/BV-08-C TBS/SR/SPE/BI-04-C
TBS 3/6	Join Procedure	TBS/SR/CP/BV-09-C TBS/SR/CP/BV-10-C TBS/SR/SPE/BI-05-C
TBS 3/6 AND TBS 2/26	Join Procedure – Remotely Held	TBS/SR/CP/BV-11-C
TBS 21/1 AND TBS 22/1	SDP Record, Generic Telephone Bearer Service	GTBS/SR/SGGIT/SDP/BV-01-C

Item	Feature	Test Case(s)
TBS 22/1	Generic Telephone Bearer Service	GTBS/SR/SGGIT/SER/BV-01-C
TBS 22/11	Bearer List Current Calls Characteristic	GTBS/SR/SGGIT/CHA/BV-07-C
TBS 22/11 AND TBS 22/12	Bearer List Current Calls – Read Long	GTBS/SR/SPN/BV-07-C
TBS 22/13	Content Control ID Characteristic	GTBS/SR/SGGIT/CHA/BV-08-C GTBS/SR/SP/BV-02-C
TBS 22/14	Status Flags Characteristic	GTBS/SR/SGGIT/CHA/BV-09-C GTBS/SR/SPN/BV-04-C
TBS 22/15	Incoming Call Target Bearer URI Characteristic	GTBS/SR/SGGIT/CHA/BV-10-C
TBS 22/15 AND TBS 22/16	Incoming Call Target Bearer URI – Read Long	GTBS/SR/SPN/BV-08-C
TBS 22/17	Call State Characteristic	GTBS/SR/SGGIT/CHA/BV-11-C
TBS 22/17 AND TBS 22/18	Call State Characteristic	GTBS/SR/SPN/BV-09-C
TBS 22/19	Call Control Point Characteristic	GTBS/SR/SGGIT/CHA/BV-12-C GTBS/SR/SPE/BI-01-C GTBS/SR/SPE/BI-02-C
TBS 22/19 AND TBS 23/3	Call Control Point Characteristic – State Mismatch error	GTBS/SR/SPE/BI-03-C
TBS 22/2	Bearer Provider Name Characteristic	GTBS/SR/SGGIT/CHA/BV-01-C GTBS/SR/SPN/BV-01-C
TBS 22/2 AND TBS 22/3	Bearer Provider Name – Read Long	GTBS/SR/SPN/BV-05-C
TBS 22/20	Call Control Point Optional Opcodes Characteristic	GTBS/SR/SGGIT/CHA/BV-13-C
TBS 22/21	Termination Reason Characteristic	GTBS/SR/SGGIT/CHA/BV-14-C
TBS 22/22	Incoming Call Characteristic	GTBS/SR/SGGIT/CHA/BV-15-C
TBS 22/22 AND TBS 22/23	Incoming Call – Read Long	GTBS/SR/SPN/BV-10-C
TBS 22/24	Call Friendly Name Characteristic	GTBS/SR/SGGIT/CHA/BV-16-C
TBS 22/24 AND TBS 22/25	Call Friendly Name – Read Long	GTBS/SR/SPN/BV-11-C
TBS 22/4	Bearer UCI Characteristic	GTBS/SR/SGGIT/CHA/BV-02-C
TBS 22/5	Bearer Technology Characteristic	GTBS/SR/SGGIT/CHA/BV-03-C GTBS/SR/SPN/BV-02-C
TBS 22/6	Bearer URI Schemes Supported List Characteristic	GTBS/SR/SGGIT/CHA/BV-04-C

Item	Feature	Test Case(s)
TBS 22/6 AND TBS 22/7	Bearer URI Schemes Supported List Notification	GTBS/SR/SPN/BV-03-C
TBS 22/6 AND TBS 22/7 AND TBS 22/8	Bearer URI Schemes Supported List – Read Long	GTBS/SR/SPN/BV-06-C
TBS 22/9 AND TBS 22/10	Bearer Signal Strength and Reporting Interval Characteristic	GTBS/SR/SGGIT/CHA/BV-05-C GTBS/SR/SGGIT/CHA/BV-06-C GTBS/SR/SP/BV-01-C
TBS 23/1	Accept Procedure	GTBS/SR/CP/BV-01-C
TBS 23/2	Terminate Procedure	GTBS/SR/CP/BV-02-C
TBS 23/3	Local Hold Procedure	GTBS/SR/CP/BV-03-C GTBS/SR/CP/BV-04-C
TBS 23/3 AND TBS 22/26	Local Hold Procedure – Remotely Held	GTBS/SR/CP/BV-05-C
TBS 23/4	Local Retrieve Procedure	GTBS/SR/CP/BV-06-C
TBS 23/4 AND TBS 22/26	Local Retrieve Procedure – Remotely Held	GTBS/SR/CP/BV-07-C
TBS 23/5	Originate Procedure	GTBS/SR/CP/BV-08-C GTBS/SR/SPE/BI-04-C
TBS 23/6	Join Procedure	GTBS/SR/CP/BV-09-C GTBS/SR/CP/BV-10-C GTBS/SR/SPE/BI-05-C
TBS 23/6 AND TBS 22/26	Join Procedure – Remotely Held	GTBS/SR/CP/BV-11-C

Table 5.1: Test case mapping

6 Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	p0	2021-03-16	Approved by BTI on 2021-02-15. TBS v1.0 adopted by the BoD on 2021-03-09. Prepared for publication.
	p1r00–r01	2022-07-28 – 2022-09-28	TSE 18708 (rating 2): Added a step to the test procedure for the section containing TBS/SR/CP/BV-09-C and GTBS/SR/CP/BV-09-C. TSE 20396 (rating 4): To address the issue raised in E18694, added a new section with new TCs GTBS/SR/SP/BV-02-C and TBS/SR/SP/BV-02-C. Updated TCMT accordingly.Template-related editorials, including aligning the copyright page with v2 of the DNMD.
1	p1	2023-02-07	Approved by BTI on 2022-12-19. Prepared for TCRL 2022-2 publication.
	p2r00–r01	2023-10-12 – 2023-12-05	TSE 24008 (rating 2): To support the merging of the GTBS ICS into the TBS ICS, removed the item for the GTBS ICS from the References section and updated all GTBS references in the TCMT to references in the merged TBS ICS.Template-related editorials, including removing the draft rev history entries.
2	p2	2024-07-01	Approved by BTI on 2024-04-21. Prepared for TCRL 2024-1 publication.
	p3r00	2024-11-08	TSE 24847 (rating 2): Updated the pass verdict for the Invalid Join test cases TBS/SR/SPE/BI-05-C and GTBS/SR/SPE/BI-05-C.
3	p3	2025-02-18	Approved by BTI on 2025-02-09. Prepared for TCRL 2025-1 publication.
	p4r00–r04	2025-04-21 – 2025-05-14	TSE 25534 (rating 2): Added the column Used Call Indexes to the test case configuration table. Updated the TCMT for GTBS/SR/CP/BV-05-C and -07-C and TBS/SR/CP/BV-05-C and -07-C. TSE 27664 (rating 4): Added two test cases TBS/SR/CP/BV-11-C and GTBS/SR/CP/BV-11-C. Updated the TCMT accordingly.
4	p4	2025-07-08	Approved by BTI on 2025-05-30. Prepared for TCRL pkg100 publication.

Publication Number	Revision Number	Date	Comments
	p5r00–r01	2026-04-07 – 2026-05-19	TSE 28349 (rating 2): Updated the test strategy. Updated the expected outcome for TBS/SR/CP/BV-01-C and GTBS/SR/CP/BV-01-C. Performed editorial work to align with the current TS template.
5	p5	2026-06-23	Approved by BTI on 2026-05-28. Prepared for TCRL pkg104 publication.
	p6r00	2026-08-20	TSE 29033 (rating 2): Updated Test Case Configuration table, test procedure, and pass verdict for TBS/SR/CP/BV-09-C and -11-C and GTBS/SR/CP/BV-09-C and -11-C.
6	p6	2026-11-03	Approved by BTI on 2026-10-12. Prepared for TCRL pkg105 publication.

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