Scan Parameters Service (SCPS)

***Bluetooth*® Test Suite**

- **Revision:** SCPS.TS.p4
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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 Scan Parameters 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 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.

[1] Test Strategy and Terminology Overview

[2] Bluetooth Core Specification, Version 4.0 or later

[3] Scan Parameters Service Specification, Version 1.0

[4] ICS Proforma for Scan Parameters Service, SCPS.ICS

[5] GATT Test Suite, GATT.TS

[6] GAP Test Suite, GAP.TS

[7] Characteristic and Descriptor descriptions are accessible via the Bluetooth SIG developer portal

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

The Scan Parameters Service requires the presence of GAP, SM, and GATT. This is illustrated in Figure 3.1.

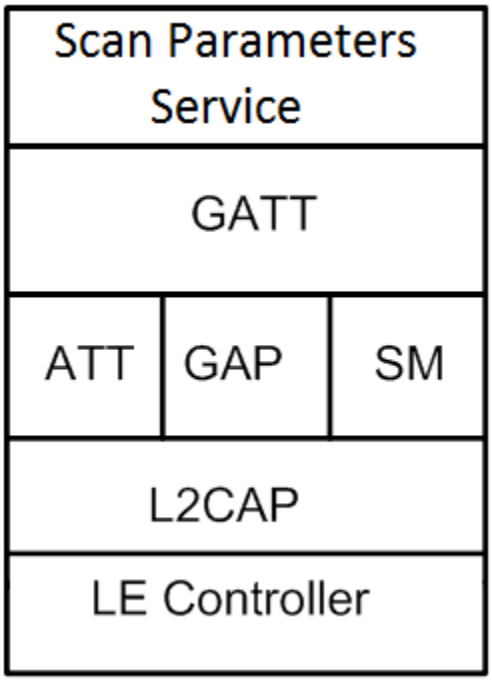

Figure 3.1: Scan Parameters Service Test Model

3.2 Test Strategy

The test objectives are to verify functionality of the Scan Parameters Service 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 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.

3.3 Test groups

The following test groups have been defined:

- Generic GATT Integrated Tests
- Characteristic Write Without Response
- Configure Notification
- Characteristic Notification

I

4 Test cases (TC)

4.1 Introduction

4.1.1 Test case identification conventions

Test cases are assigned unique identifiers per the conventions in [1]. The convention used here is:
<spec abbreviation>/<IUT role>/<class>/**<feat>**/<func>/<subfunc>/<cap>/**<xx>-<nn>-<y>**.

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 Abbreviation Identifier <spec abbreviation>**
SCPS	Scan Parameters Service
Identifier Abbreviation	**Role Abbreviation Identifier <IUT role>**
SR	Server Role
Identifier Abbreviation	**Reference Identifier <GGIT test group>**
SGGIT	Server Generic GATT Integrated Tests
Identifier Abbreviation	**Reference Identifier <GGIT class>**
CHA	Characteristic
SER	Service
Identifier Abbreviation	**Feature Abbreviation Identifier <feat>**
CON	Configure Notification
CN	Characteristic Notification
CW	Characteristic Write

Table 4.1: SCPS 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 Launch Studio, 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

Follow the preamble procedure described in [5] Section 4.2.1.2.

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)	Service Type
SCPS/SR/SGGIT/SER/BV-01-C [Service GGIT – Scan Parameters]	Scan Parameters Service	[3] 2.1	-	-	Primary Service, Unique
SCPS/SR/SGGIT/CHA/BV-01-C [Characteristic GGIT – Scan Interval Window]	Scan Interval Window Characteristic	[3] 2.4	0x04 (Write Without Response)	Skip	-
SCPS/SR/SGGIT/CHA/BV-02-C [Characteristic GGIT – Scan Refresh]	Scan Refresh Characteristic	[3] 2.5	0x10 (Notify)	Skip	-

Table 4.2: Input for the GGIT Server test procedure

4.4 Characteristic Write Without Response

- Test Purpose

  This test group contains test cases to write without response to characteristic values and verify that the values written by the service are compliant with the specification. The verification is done one value at the time, as enumerated in the test cases in Table 4.3, using this generic test procedure.

- Reference

  [3] 3.1

- Initial Condition

  - The handle of the characteristic value referenced in the test case 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 bonding procedure then perform a bonding procedure.
  - Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1.
  - If IUT permissions for the characteristic require a specific security mode or security level, establish a connection meeting those requirements.

- Test Case Configuration

Test Case	Requirements
SCPS/SR/CW/BV-01-C [Characteristic Write Without Response – Scan Interval Window]	[3] 2.4.1 [7] Scan Parameters Service

Table 4.3: Characteristic Write Without Response test cases

- Test Procedure

  1. Select a value that is valid for the characteristic. Write the characteristic value by executing the GATT Write Without Response sub-procedure.
  2. Verify that the characteristic value is successfully written.

- Expected Outcome

  Pass verdict

  The characteristic value is successfully written.

4.5 Configure Notification

- Test Purpose

  This test group contains test cases to verify responses to enabling and/or disabling characteristic notifications. The verification is done one value at a time, as enumerated in the test cases in Table 4.4, using this generic test procedure.

- Reference

  [3] 2.5.2.1

- 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.
  - The handle of the client characteristic configuration descriptor of each characteristic 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 bonding procedure then perform a bonding procedure
  - Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1.
  - If IUT permissions for the characteristic require a specific security mode or security level, establish a connection meeting those requirements.
- Test Case Configuration

Test Case	Requirements
SCPS/SR/CON/BV-01-C [Configure Notification - Scan Refresh]	[3] 2.5.2.1 [7] Scan Parameters Service

Table 4.4: Configure Notification test cases

- Test Procedure
  1. The Lower Tester sends an ATT_Write_Request to disable notification by writing value 0x0000 to the client characteristic configuration descriptor of the characteristic.
  2. The Lower Tester sends an ATT_Write_Request to enable notification by writing value 0x0001 to the client characteristic configuration descriptor of the characteristic.
  3. Repeat steps 1-2 for each instance of the characteristic and service.
- Expected Outcome

  Pass verdict

  The characteristic descriptor is successfully written and the value returned when read is consistent with the value written.

4.6 Characteristic Notification

- Test Purpose

  This test group contains test cases to verify compliant operation when the IUT sends notifications of characteristic values. The verification is done one value at a time, as enumerated in the test cases in Table 4.5, using this generic test procedure.

  Verify that the IUT sends notifications of characteristic values.
- Reference

  [3] 2.5.2.1
- 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.

- The characteristic is configured for notification.
- If the IUT requires a bonding procedure then perform a bonding procedure
- Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1.
- If IUT permissions for the characteristic require a specific security mode or security level, establish a connection meeting those requirements.

- Test Case Configuration

Test Case	Requirements
SCPS/SR/CN/BV-01-C [Characteristic Notification - Scan Refresh]	[3] 2.5.2.1 [7] Scan Parameters Service

Table 4.5: Characteristic Notification Value test cases

- Test Procedure

1. Perform an action on the IUT that will induce it to send a notification of the characteristic.
2. A connection is established between the Lower Tester and IUT meeting the security requirements of the IUT, if not already done so prior to step 1.
3. The Lower Tester receives an ATT_Handle_Value_Notification from the IUT containing the characteristic handle and value.
4. Verify that the characteristic value meets the requirements of the service.

- Expected Outcome

Pass verdict

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

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 Proforma Scan Parameters Service (SCPS) [4].

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 [1].

For the purpose and structure of the ICS/IXIT, refer to [1].

Item	Feature	Test Case(s)
SCPS 2/1	Service Definition - Scan Parameters Service	SCPS/SR/SGGIT/SER/BV-01-C
SCPS 2/2	Characteristic - Scan Interval Window	SCPS/SR/CW/BV-01-C SCPS/SR/SGGIT/CHA/BV-01-C
SCPS 2/3	Characteristic - Scan Refresh	SCPS/SR/SGGIT/CHA/BV-02-C SCPS/SR/CON/BV-01-C SCPS/SR/CN/BV-01-C

Table 5.1: Test case mapping

6 Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	1.0.0	2011-12-27	Adopted by the Bluetooth SIG Board of Directors
	1.0.1r1	2013-04-23	TSE 5074: Revision of Pass Verdict for characteristic declaration test cases, SCPS/SR/DEC/BV-01-C and SCPS/SR/DEC/BV-02-C (legacy ID: TP/DEC/BV-01-C and TP/DEC/BV-02-C.
1	1.0.1	2013-07-02	Prepare for Publication
	1.0.2r00	2016-05-26	Converted to new Test Case ID conventions as defined in TSTO v4.1.
	1.0.2r01	2016-06-02	Converted to current test specification template
2	1.0.2	2016-07-14	Prepared for TCRL 2016-1 publication.
	1.0.3r00	2018-02-26	TSE 10374 (rating: 2): Added missing test case SCPS/SR/DES/BV-01-C to item SCPS 2/3 in the TCMT.
3	1.0.3	2018-06-27	Approved by BTI. Prepared for TCRL 2018-1 publication.
	p4r00–r02	2023-05-12 – 2023-05-25	TSE 22808 (rating 2): Converted the following 6 test cases to GGIT: SCPS/SR/SD/BV-01-C, SCPS/SR/DEC/BV-01-C and -02-C, SCPS/SR/DES/BV-01-C, SCPS/SR/DR/BV-01-C, and SCPS/SR/DW/BV-01-C. The 3 new GGIT converted TCIDs are SCPS/SR/SGGIT/SER/BV-01-C and SCPS/SR/SGGIT/CHA/BV-01-C and -02-C. Updated the TCMT accordingly. Updated the test procedure for SCPS/SR/CW/BV-01-C and SCPS/SR/CON/BV-01-C. Updated the test groups section and the test case identification conventions. Performed other editorials to align the document with the latest TS template, including updates to the scope, references, Test Strategy, test case identification conventions, conformance, Pass/Fail verdict conventions, and TCMT introductory text. Replaced the Bluetooth logo in the footer and updated the copyright page to align with v2 of the DNMD. Added a Publication Number column to the Revision History. Revised the document numbering convention, setting the last release publication of 1.0.3 as p3. Deleted draft revision history comments prior to p0.
4	p4	2023-06-29	Approved by BTI on 2023-05-28. Prepared for TCRL 2023-1 publication.

Acknowledgments

Name	Company
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Krishnan Nair	CSR