Battery Service (BAS)

***Bluetooth*® Test Suite**

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Contents

1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and test cases to test the implementation of the Bluetooth Battery 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. 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] Battery Service Specification, Version 1.0 or later

[4] ICS Proforma for Battery Service, BAS.ICS

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

[6] GATT Test Suite, GATT.TS

[7] GAP Test Suite, GAP.TS

[8] IXIT Proforma for Battery Service

[9] Battery Service Specification, Version 1.1

[10] Specification of the Bluetooth System, Volume 3, Part C (Generic Access Profile), Version 4.2 or later

[11] Specification of the Bluetooth System, Volume 3, Part G (Generic Attribute Profile), Version 4.2 or later

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 Battery Service requires the presence of GAP, SM (LE), SDP (BR/EDR), and GATT. This is illustrated in Figure 3.1.

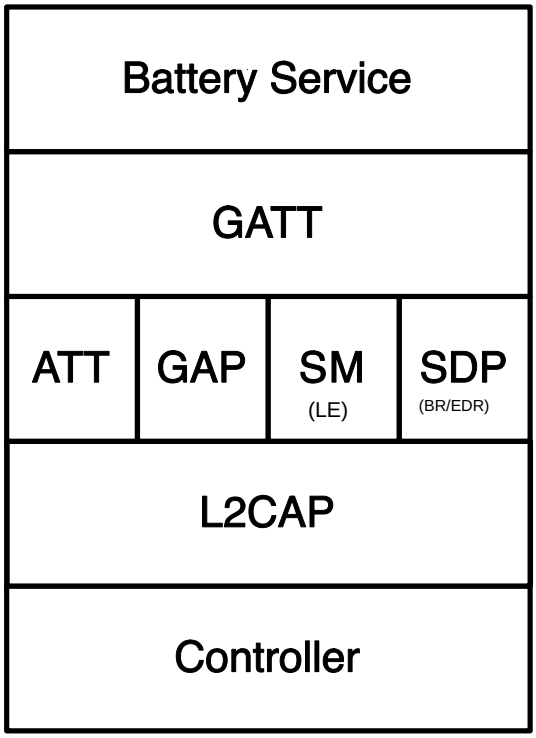

Figure 3.1: Battery Service test model

3.2 Test Strategy

The test objectives are to verify functionality of the Battery 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 Read
- Notifications
- Indications
- Broadcast

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 [6] 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>**
BAS	Battery Service
Identifier Abbreviation	**Role 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
DES	Characteristic Descriptors
SDP	SDP Record
SER	Service
Identifier Abbreviation	**Feature Identifier <feat>**
BR	Broadcast Characteristic
CBR	Configure Broadcast
CIN	Configure Indication
CN	Characteristic Notification
CON	Configure Notification
CR	Characteristic Read
IND	Characteristic Indication

Table 4.1: Battery Service 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, 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 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.
  3. If the IUT requires a bonding procedure, then perform a bonding procedure.
  4. If IUT permissions for the characteristics require a specific security mode or security level, then establish a connection meeting those requirements.

4.2.2 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.

3. If the IUT requires a bonding procedure, then perform a bonding procedure.
4. If IUT permissions for the characteristics require a specific security mode or security level, then establish a connection meeting those requirements.

4.2.3 Observation Procedure Passive Scanning

- Preamble Procedure

1. The Lower Tester enters Broadcast Mode using the specified advertising data.
2. The Upper Tester orders the IUT to perform the Observation procedure using Passive Scanning.

4.2.4 Broadcast Mode No Scan Response

- Preamble Procedure

1. The Lower Tester performs the Observation procedure using Passive Scanning.
2. The Upper Tester orders the IUT to enter Broadcast Mode using Configured Broadcast.

4.3 Generic GATT Integrated Tests

Execute the Generic GATT Integrated Tests defined in GATT.TS [6], Section 6.3, Server test procedures (SGGIT), using Table 4.2 below as input.

- Additional Initial Condition
  - The IUT has populated the service database with at least one session and at least one sub-session and has data available.
  - The IUT is configured to send measurements to the Lower Tester.
- Additional Pass verdict
  - All RFU bits are set to 0 and all included fields are not set to RFU values.

TCID	Service / Characteristic / Descriptor	Reference	Properties	Value Length (Octets)	Service Type
BAS/SR/SGGIT/SER/BV-01-C [Service GGIT – Battery Service]	Battery Service	[3] 2	-	-	Primary Service
BAS/SR/SGGIT/CHA/BV-01-C [Characteristic GGIT – Battery Level]	Battery Level Characteristic	[3] 3.1	0x02 (Read)	1	Unique
BAS/SR/SGGIT/CHA/BV-13-C [Characteristic GGIT – Battery Level – Notify]	Battery Level Characteristic	[3] 3.1	0x12 (Read, Notify)	1	Unique
BAS/SR/SGGIT/CHA/BV-02-C [Characteristic GGIT – Battery Level Status]	Battery Level Status Characteristic	[9] 3.2	0x12 (Read, Notify)	3–7	Unique
BAS/SR/SGGIT/CHA/BV-14-C [Characteristic GGIT – Battery Level Status – Broadcast]	Battery Level Status Characteristic	[9] 3.2	0x13 (Read, Notify, Broadcast)	3–7	Unique
BAS/SR/SGGIT/CHA/BV-15-C [Characteristic GGIT – Battery Level Status – Indicate]	Battery Level Status Characteristic	[9] 3.2	0x32 (Read, Notify, Indicate)	3–7	Unique
BAS/SR/SGGIT/CHA/BV-20-C [Characteristic GGIT – Battery Level Status – Broadcast, Indicate]	Battery Level Status Characteristic	[9] 3.2	0x33 (Read, Notify, Broadcast, Indicate)	3–7	Unique
BAS/SR/SGGIT/CHA/BV-03-C [Characteristic GGIT – Estimated Service Date]	Estimated Service Date Characteristic	[9] 3.3	0x12 (Read, Notify)	3	Unique
BAS/SR/SGGIT/CHA/BV-16-C [Characteristic GGIT – Estimated Service Date – Indicate]	Estimated Service Date Characteristic	[9] 3.3	0x32 (Read, Notify, Indicate)	3	Unique
BAS/SR/SGGIT/CHA/BV-04-C [Characteristic GGIT – Battery Critical Status]	Battery Critical Status Characteristic	[9] 3.4	0x22 (Read, Indicate)	1	Unique
BAS/SR/SGGIT/CHA/BV-05-C [Characteristic GGIT – Battery Energy Status]	Battery Energy Status Characteristic	[9] 3.5	0x12 (Read, Notify)	1–13	Unique
BAS/SR/SGGIT/CHA/BV-17-C [Characteristic GGIT – Battery Energy Status – Indicate]	Battery Energy Status Characteristic	[9] 3.5	0x32 (Read, Notify, Indicate)	1–13	Unique
BAS/SR/SGGIT/CHA/BV-06-C [Characteristic GGIT – Battery Time Status]	Battery Time Status Characteristic	[9] 3.6	0x12 (Read, Notify)	4–10	Unique
BAS/SR/SGGIT/CHA/BV-18-C [Characteristic GGIT – Battery Time Status – Indicate]	Battery Time Status Characteristic	[9] 3.6	0x32 (Read, Notify, Indicate)	4–10	Unique
BAS/SR/SGGIT/CHA/BV-07-C [Characteristic GGIT – Battery Health Status]	Battery Health Status Characteristic	[9] 3.7	0x12 (Read, Notify)	1–7	Unique

TCID	Service / Characteristic / Descriptor	Reference	Properties	Value Length (Octets)	Service Type
BAS/SR/SGGIT/CHA/BV-19-C [Characteristic GGIT – Battery Health Status – Indicate]	Battery Health Status Characteristic	[9] 3.7	0x32 (Read, Notify, Indicate)	1–7	Unique
BAS/SR/SGGIT/CHA/BV-08-C [Characteristic GGIT – Battery Health Information]	Battery Health Information Characteristic	[9] 3.8	0x22 (Read, Indicate)	1–5	Unique
BAS/SR/SGGIT/CHA/BV-09-C [Characteristic GGIT – Battery Information]	Battery Information Characteristic	[9] 3.9	0x22 (Read, Indicate)	3–19	Unique
BAS/SR/SGGIT/CHA/BV-10-C [Characteristic GGIT – Manufacturer Name String]	Manufacturer Name String Characteristic	[9] 3.10	0x22 (Read, Indicate)	Variable	Unique
BAS/SR/SGGIT/CHA/BV-11-C [Characteristic GGIT – Model Number String]	Model Number String Characteristic	[9] 3.11	0x22 (Read, Indicate)	Variable	Unique
BAS/SR/SGGIT/CHA/BV-12-C [Characteristic GGIT – Serial Number String]	Serial Number String Characteristic	[9] 3.12	0x22 (Read, Indicate)	Variable	Unique
BAS/SR/SGGIT/SDP/BV-01-C [Validate SDP Record – Battery Service]	Battery Service	[9] 4	-	-	Unique

Table 4.2: Generic GATT Integrated Test Configuration

4.4 Characteristic descriptors

Verify that the characteristic descriptors meet the requirements of the service.

BAS/SR/DES/BV-01-C [Battery Level descriptor – Characteristic Presentation Format Descriptor]

- Test Purpose

  Verify that the characteristic descriptor of the Battery Level characteristic, Characteristic Presentation Format meets the requirements of the service.

- Reference

  [3] 3.1.2.1

- Initial Condition

  - The handle range of each Battery Level characteristic 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.

- Test Procedure

  1. The Lower Tester executes the GATT Discover all Characteristic Descriptors sub-procedure, using the handle range of the Battery Level characteristic, and the IUT returns one or more handle-UUID pairs.
  2. If the UUID in a handle-UUID pair from Step 1 is for a Characteristic Presentation Format characteristic descriptor, the Lower Tester reads the characteristic descriptor by executing the Read Characteristic Descriptors sub-procedure with the Attribute Handle parameter set to the characteristic descriptor handle.
  3. Verify that the value of the characteristic descriptor from Step 2 meets the requirements of the service.
  4. Repeat Steps 2–3 for each handle-UUID pair.
  5. Repeat Steps 1–4 for each instance of the characteristic and service.

- Expected Outcome

  Pass verdict

  For each instance of the Battery Service implemented on the IUT, the Client Characteristic Presentation Format descriptor is discovered for every Battery Level characteristic.

  Each discovered Client Characteristic Presentation Format descriptor is successfully read, and the namespace/description value of the characteristic descriptor is unique for that instance of the Battery service.

4.5 Characteristic Read

Read and verify that the characteristic values required by the service are compliant.

BAS/SR/CR/BV-02-C [Characteristic Read – Battery Level Status, Battery Charge Level]

- Test Purpose

  Verify that the characteristic value of the Battery Level Status characteristic exposed by the Battery Service correctly reflects the Battery Charge Level field.

- Reference

  [9] 3.2.1, 3.5.1

- Initial Condition

  - The Battery Level Status and Battery Energy Status characteristic handles have been previously discovered by the Lower Tester during the test procedure in Section 4.3 or are known to the Lower Tester by other means.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
  - Parameters: TSPX_iut_Battery_Low_Energy, TSPX_iut_Battery_Critical_Energy

- Test Procedure

  1. The Upper Tester modifies the Available Energy field, in the Battery Energy Status characteristic in the IUT, to be greater than the TSPX_iut_Battery_Low_Energy value, as specified in IXIT [8].
  2. The Lower Tester reads the Battery Level Status characteristic value by executing a GATT Read Characteristic Value sub-procedure.
  3. The Upper Tester modifies the Available Energy field, in the Battery Energy Status characteristic in the IUT, to be less than or equal to the TSPX_iut_Battery_Low_Energy value and above the TSPX_iut_Battery_Critical_Energy value.
  4. The Lower Tester reads the Battery Level Status characteristic value by executing a GATT Read Characteristic Value sub-procedure.
  5. The Upper Tester modifies the Available Energy field, in the Battery Energy Status characteristic in the IUT, to be less than or equal to the TSPX_iut_Battery_Critical_Energy value and greater than or equal to 0.
  6. The Lower Tester reads the Battery Level Status characteristic value by executing a GATT Read Characteristic Value sub-procedure.

- Expected Outcome

  Pass verdict

  In Step 2, the Battery Level Status characteristic is successfully read, and the Battery Charge Level field is “Good”.

  In Step 4, the Battery Level Status characteristic is successfully read, and the Battery Charge Level field is “Low”.

  In Step 6, the Battery Level Status characteristic is successfully read, and the Battery Charge Level field is “Critical”.

  All RFU bits are set to 0.

BAS/SR/CR/BV-03-C [Characteristic Read – Battery Level, Battery Energy Status exposed]

- Test Purpose

  Verify that the value of the Battery Level characteristic is computed correctly when the Battery Energy Status characteristic exposed by the Battery Service is compliant.

- Reference

  [9] 3.1.1, 3.5.1

- Initial Condition

  - The Battery Level and Battery Energy Status characteristic handles have been previously discovered by the Lower Tester during the test procedure in Section 4.3 or are known to the Lower Tester by other means.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.

- Test Procedure

  For each supported transport, the following test procedure applies:

  1. The Lower Tester reads the Battery Level and the Battery Energy Status characteristic values by executing a GATT Read Characteristic Value sub-procedure.
  2. Verify that the characteristic value meets the requirements of the service.
  3. Repeat Steps 1–2 for each instance of the characteristic and service.

- Expected Outcome

  Pass verdict

  In Step 1, the Battery Level characteristic is successfully read and its value is calculated as (Available Energy / Available Battery Capacity) * 100 in units of percent, where the Available Energy is the value of the Available Energy field of the Battery Energy Status characteristic, and Available Battery Capacity is the value of the Available Battery Capacity field of the Battery Energy Status characteristic.

  All RFU bits are set to 0.

BAS/SR/CR/BV-04-C [Characteristic Read – Battery Critical Status, Battery Level Status exposed]

- Test Purpose

  Verify that the characteristic value of the Battery Critical Status characteristic exposed by the Battery Service is compliant when the Battery Level Status characteristic is also exposed.

- Reference

  [9] 3.2, 3.4

- Initial Condition
  - The Battery Level Status and Battery Critical Status characteristic handles have been previously discovered by the Lower Tester during the test procedure in Section 4.3 or are known to the Lower Tester by other means.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
- Test Procedure

  For each supported transport, the following test procedure applies:

  For each round in Table 4.3:

  1. The Upper Tester sets bits in the Set Bits column of the field in the Set Field column in the Battery Level Status characteristic in the IUT to the value indicated in the Set Value column.
  2. The Lower Tester reads the Battery Critical Status characteristic value by executing a GATT Read Characteristic Value sub-procedure.

Round	Set Field	Set Bits	Set Value	Read Field	Expected Value
1	Power State	Battery Charge Level	Good	Critical Power State	False
2	Power State	Battery Charge Level	Critical	Critical Power State	True
3	Power State	Battery Charge Level	Low	Critical Power State	False
4	Additional Status	Service Required	False	Immediate Service Required	False
5	Additional Status	Service Required	True	Immediate Service Required	True

Table 4.3: Characteristics contents for each test case variation

- Expected Outcome

  Pass verdict

  For all rounds described in the test procedure, the following condition occurs:
  - In Step 2, the Battery Critical Status characteristic is successfully read.
  - The field in the Read Field column of the Battery Critical Status characteristic has the value indicated in the Expected Value column.
  - All RFU bits are set to 0.

BAS/SR/CR/BV-05-C [Characteristic Read – Battery Energy Status, External Power Source not present]

- Test Purpose

  Verify that the External Source Power field is not present in the Battery Energy Status characteristic when the external power source is not connected.

- Reference

  [9] 3.5

- Initial Condition
  - The Battery Energy Status characteristic handle 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
  - The IUT does not have an external power source connected.
- Test Procedure
  1. The Lower Tester reads the value of the Battery Energy Status characteristic by executing a GATT Read Characteristic Value sub-procedure.
  2. Verify that the characteristic value is valid and does not contain the External Source Power field.
  3. Repeat Steps 1–2 for each instance of the characteristic and service.
- Expected Outcome

  Pass verdict

  The characteristic value does not contain the External Source Power field.

  All RFU bits are set to 0.

4.5.1 Characteristic Read – Battery not present

- Test Purpose

  Verify that the characteristic values exposed by the Battery Service meet the service requirements when the battery is not present.
- Reference

  [9] 3.1, 3.2, 3.5, 3.10, 3.11
- Initial Condition
  - The handle range of each relevant characteristic value specified in Table 4.4 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 the relevant characteristic, as specified in Table 4.4, 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
- Test Case Configuration

Test Case	Characteristic Name	Characteristic Value
BAS/SR/CR/BV-06-C [Characteristic Read – Battery not present – Manufacturer Name String]	Manufacturer Name String	Characteristic value is empty.
BAS/SR/CR/BV-07-C [Characteristic Read – Battery not present – Model Number String]	Model Number String	Characteristic value does not change.
BAS/SR/CR/BV-08-C [Characteristic Read – Battery not present – Battery Energy Status – Present Voltage]	Battery Energy Status	Present Voltage field is not present.

Test Case	Characteristic Name	Characteristic Value
BAS/SR/CR/BV-09-C [Characteristic Read – Battery not present – Battery Energy Status – Charge Rate]	Battery Energy Status	Charge Rate field is not present.
BAS/SR/CR/BV-10-C [Characteristic Read – Battery not present – Battery Energy Status – Available Energy at Last Charge]	Battery Energy Status	Available Energy at Last Charge field is not present.
BAS/SR/CR/BV-11-C [Characteristic Read – Battery not present – Battery Level Status – Power State]	Battery Level Status	In Power State field: - Battery Present set to No - Battery Charge State set to Unknown - Battery Charge Level set to Unknown - Charging Type set to Unknown or Not Charging - Charging Fault Reason set to Battery
BAS/SR/CR/BV-12-C [Characteristic Read – Battery not present – Battery Energy Status – Available Battery Capacity]	Battery Energy Status	Available Battery Capacity field is not present.

Table 4.4: Characteristic Read – Battery not present test cases

- Test Procedure

  1. The Lower Tester reads the value of the Characteristic Name specified in Table 4.4 by executing a GATT Read Characteristic Value sub-procedure.
  2. Verify that the characteristic has a valid value.
  3. Remove the battery that the IUT monitors.
  4. The Lower Tester reads the value of the Characteristic Name specified in Table 4.4 by executing a GATT Read Characteristic Value sub-procedure.
  5. Verify that the characteristic read in Step 4 satisfies the condition in the Characteristic Value column in Table 4.4.
  6. Repeat Steps 1–4 for each instance of the characteristic and service.

- Expected Outcome

  Pass verdict

  The characteristic read in Step 4 satisfies the condition in the Characteristic Value column, as specified in Table 4.4.

  All RFU bits are set to 0.

4.6 Notifications

Verify compliant operation relative to notifications.

4.6.1 Configure Notification

- Test Purpose

  Verify that the IUT can be configured for notifications of characteristic values.

- Reference

  [3] 3.1.2.2

  [9] Table 3.1, 3.1.1, 3.2.1, 3.3.1, 3.5.1, 3.6.1, 3.7.1

- Initial Condition
  - The handle range of each relevant characteristic value as specified in Table 4.5 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 the relevant characteristic, as specified in Table 4.5, 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
- Test Case Configuration

Test Case	Characteristic Name
BAS/SR/CON/BV-01-C [Configure Notification – Battery Level]	Battery Level
BAS/SR/CON/BV-02-C [Configure Notification – Battery Level Status]	Battery Level Status
BAS/SR/CON/BV-03-C [Configure Notification – Estimated Service Date]	Estimated Service Date
BAS/SR/CON/BV-04-C [Configure Notification – Battery Energy Status]	Battery Energy Status
BAS/SR/CON/BV-05-C [Configure Notification – Battery Time Status]	Battery Time Status
BAS/SR/CON/BV-06-C [Configure Notification – Battery Health Status]	Battery Health Status

Table 4.5: Configure Notification test cases

- Test Procedure

  For each supported transport, the following test procedure applies:

  1. The Lower Tester enables notifications by writing value 0x0001 to the Client Characteristic Configuration descriptor of the characteristic, as specified in Table 4.5, using the GATT Write Characteristic Descriptor sub-procedure.
  2. The IUT sends a notification to the Lower Tester.
  3. The Lower Tester disables notifications by writing value 0x0000 to the Client Characteristic Configuration descriptor of the relevant characteristic, as specified in Table 4.5, using the GATT Write Characteristic Descriptor sub-procedure.
  4. The IUT stops sending notifications to the Lower Tester.
  5. Repeat Steps 1–4 for each instance of the characteristic and service.

- Expected Outcome

  Pass verdict

  In Step 2, the IUT successfully notifies the Lower Tester.

  The Client Characteristic Configuration characteristic descriptor for the characteristic in Table 4.5 is successfully written.

4.6.2 Characteristic Notification

- Test Purpose

  Verify that the IUT sends notifications of characteristic values.

- Reference

  Table 4.6

- Initial Condition
  - The handle range of each characteristic specified in Table 4.6 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
- Test Case Configuration

Test Case	Reference	Field	Characteristic
BAS/SR/CN/BV-01-C [Characteristic Notification – Battery Level]	[3] 3.1.1	Battery Level	Battery Level
BAS/SR/CN/BV-02-C [Characteristic Notification – Battery Level Status – Battery Level Change]	[9] 3.2.1	Battery Level	Battery Level Status
BAS/SR/CN/BV-03-C [Characteristic Notification – Battery Level Status – Power State Change]	[9] 3.2.1	Power State	Battery Level Status
BAS/SR/CN/BV-04-C [Characteristic Notification – Battery Level Status – Additional Status Change]	[9] 3.2.1	Additional Status	Battery Level Status
BAS/SR/CN/BV-05-C [Characteristic Notification – Estimated Service Date]	[9] 3.3.1	Estimated Service Date	Estimated Service Date
BAS/SR/CN/BV-06-C [Characteristic Notification – Battery Energy Status – Available Energy Change]	[9] 3.5.1	Available Energy	Battery Energy Status
BAS/SR/CN/BV-07-C [Characteristic Notification – Battery Energy Status – Available Battery Capacity Change]	[9] 3.5.1	Available Battery Capacity	Battery Energy Status
BAS/SR/CN/BV-08-C [Characteristic Notification – Battery Time Status – Time until Discharged Change]	[9] 3.6.1	Time until Discharged	Battery Time Status
BAS/SR/CN/BV-09-C [Characteristic Notification – Battery Time Status – Time until Discharged on Standby Change]	[9] 3.6.1	Time until Discharged on Standby	Battery Time Status
BAS/SR/CN/BV-10-C [Characteristic Notification – Battery Time Status – Time until Recharged Change]	[9] 3.6.1	Time until Recharged	Battery Time Status
BAS/SR/CN/BV-11-C [Characteristic Notification – Battery Health Status – Battery Health Summary Change]	[9] 3.7.1	Battery Health Summary	Battery Health Status
BAS/SR/CN/BV-12-C [Characteristic Notification – Battery Health Status – Cycle Count Change]	[9] 3.7.1	Cycle Count	Battery Health Status
BAS/SR/CN/BV-13-C [Characteristic Notification – Battery Health Status – Current Temperature Change]	[9] 3.7.1	Current Temperature	Battery Health Status
BAS/SR/CN/BV-14-C [Characteristic Notification – Battery Health Status – Deep Discharge Count Change]	[9] 3.7.1	Deep Discharge Count	Battery Health Status

Table 4.6: Characteristic Notification test cases

- Test Procedure

  For each supported transport, the following test procedure applies:

  1. The Lower Tester reads the relevant characteristic as specified in Table 4.6.
  2. Change the value indicated in the Field column of the characteristic specified in Table 4.6 on the IUT to trigger the notification of this characteristic.
  3. The IUT sends an ATT_HANDLE_VALUE_NTF PDU to the Lower Tester, containing the characteristic handle and value.
  4. Verify that the characteristic value field is changed from the one read in Step 1 and meets the requirements of the service.

- Expected Outcome

  Pass verdict

  The characteristic is successfully notified; the characteristic value in the notification is different from the one in Step 1 and meets the requirements of the Battery Service.

  All RFU bits are set to 0.

BAS/SR/CN/BV-15-C [Characteristic Notification – Battery Energy Status – Power State Change]

- Test Purpose

  Verify that the IUT sends notifications of the Battery Energy Status characteristic when the value of the Power State field in the Battery Level Status characteristic changes.

- Reference

  [9] 3.5.1

- Initial Condition

  - The handle range of the Battery Energy Status characteristic and of the Battery Level Status characteristic 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 Battery Energy Status characteristic is configured for notification.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.

- Test Procedure

  For each supported transport, the following test procedure applies:

  1. The Lower Tester reads the Battery Energy Status characteristic.
  2. The Upper Tester changes the value of the Power State field in the Battery Level Status characteristic.
  3. The IUT sends an ATT_HANDLE_VALUE_NTF PDU to the Lower Tester containing the Battery Energy Status characteristic handle and value.
  4. Verify that the characteristic value is changed from the one read in Step 1 and meets the requirements of the service.

- Expected Outcome

  Pass verdict

  The Battery Energy Status characteristic is successfully notified; the characteristic value in the notification is different from the one in Step 1 and meets the requirements of the Battery Service.

  All RFU bits are set to 0.

BAS/SR/CN/BV-16-C [Device not charging – Time until Recharged not notified]

- Test Purpose

  Verify that the Time until Recharged field value exposed by the Battery Service is not present in the notified characteristic when the device is not charging.

- Reference

  [9] 3.6

- Initial Condition

  - The Battery Time Status characteristic handle 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
  - The IUT is in a not charging state.

- Test Procedure

  1. The Upper Tester modifies the Battery Time Status characteristic in the IUT, such that a notification is generated.
  2. The characteristic is notified.

- Expected Outcome

  Pass verdict

  In Step 2, the characteristic value is notified, and Time until Recharged is not present.

BAS/SR/CN/BV-17-C [Characteristic Notification – Battery Energy Status, Multiple Instances]

- Test Purpose

  Verify that the IUT sends notifications of the External Source Power field values exposed by the Battery Energy Status characteristic.

- Reference

  [9] 3.5

- Initial Condition
  - The handle range of the Battery Energy Status characteristic value 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 for all the present service instances.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
- Test Procedure

  For each supported transport, the following test procedure applies:

  1. Perform an action on the IUT so that it sends a notification of the Battery Energy Status characteristic.
  2. The Lower Tester receives an ATT_HANDLE_VALUE_NTF PDU from the IUT containing the characteristic handle and value.
  3. Verify that the characteristic value has a valid value.
  4. The Lower Tester performs a disconnection.
  5. Repeat Step 1.
  6. The Lower Tester reestablishes the connection with the IUT.
  7. Repeat Step 2.
- Expected Outcome

  Pass verdict

  In Step 2 and Step 7, the characteristic is successfully notified.

  The value of the External Source Power field is the same across all instances within the same Aggregation Group.

  All RFU bits are set to 0.

BAS/SR/CN/BV-18-C [Characteristic Notification – Battery Energy Status, State Change]

- Test Purpose

  Verify that the characteristic value exposed by the Battery Energy Status characteristic is notified when the device state changes.
- Reference

  [9] 3.2.1, 3.5.1
- Initial Condition
  - The handle of the Battery Energy Status characteristic and the Battery Level Status characteristic 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
  - The Battery Energy Status and Battery Level Status characteristics are configured for notification for all the present service instances.
  - The IUT has a battery present and the external power source connected.

- Test Procedure

  For each supported transport, the following test procedure applies:

  1. The Upper Tester performs an action on the IUT so that it sends a notification of the Battery Energy Status characteristic.
  2. The IUT sends an ATT_HANDLE_VALUE_NTF PDU to the Lower Tester containing the Battery Energy Status characteristic handle and value.
  3. Remove the battery from the IUT.
  4. The IUT sends an ATT_HANDLE_VALUE_NTF PDU to the Lower Tester containing the Battery Level Status characteristic, with the Battery Present bit set to No.
  5. Re-attach the battery to the IUT.
  6. The IUT sends an ATT_HANDLE_VALUE_NTF PDU to the Lower Tester containing the Battery Level Status characteristic, with the Battery Present bit set to Yes.
  7. Repeat Steps 1 and 2.

- Expected Outcome

  Pass verdict

  In Steps 2, 4, and 6, the characteristic is successfully notified.

  All RFU bits are set to 0.

BAS/SR/CN/BV-19-C [Characteristic Notification – Battery Energy Status, external power source removal]

- Test Purpose

  Verify that the characteristic value exposed by the Battery Energy Status characteristic is notified after the external power source is removed.

- Reference

  [9] 3.5.1

- Initial Condition

  - The handle of the Battery Level Status characteristic and of the Battery Energy Status characteristic 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
  - The Battery Energy Status and Battery Level Status characteristics are configured for notification for all the present service instances.
  - The IUT has a battery present and the external power source connected.

- Test Procedure

  For each supported transport, the following test procedure applies:

  1. Remove the external power source from the IUT.
  2. The IUT sends an ATT_HANDLE_VALUE_NTF PDU to the Lower Tester containing the Battery Level Status characteristic, with the Wired External Power Source Connected or Wireless External Power Source Connected bit field (depending on the hardware configuration) in the Power State field set to No.

3. Perform an action on the IUT so that it sends a notification of the Battery Energy Status characteristic.
4. The IUT sends an ATT_HANDLE_VALUE_NTF PDU to the Lower Tester containing the Battery Energy Status characteristic handle and value.
5. Re-attach the external power source to the IUT.
6. Repeat Steps 2–4. In the notification of the Battery Level Status, the Wired External Power Source Connected or Wireless External Power Source Connected bit field (depending on the hardware configuration) in the Power State field is set to No.

- Expected Outcome

  Pass verdict

  In Step 2, the Battery Level Status characteristic is successfully notified.

  In Step 4, the Battery Energy Status characteristic is successfully notified.

  The value of the External Source Power field is the same across all instances within the same Aggregation Group.

  All RFU bits are set to 0.

BAS/SR/CN/BV-20-C [Characteristic Notification – Battery Level, Battery Level Status]

- Test Purpose

  Verify that the IUT sends notifications of characteristic values.

- Reference

  [9] 3.1, 3.2

- Initial Condition

  - The handle range of the Battery Level characteristic value and of the Battery Level Status characteristic value 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 Battery Level Status characteristic is configured for notification and indication for all the present service instances.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.

- Test Procedure

  For each supported transport, the following test procedure applies:

  1. The Lower Tester reads the Battery Level Status characteristic.
  2. The Upper Tester changes the value of a field in the Battery Level Status characteristic that generates a notification of this characteristic.
  3. The Lower Tester receives an ATT_HANDLE_VALUE_NTF PDU from the IUT containing the characteristic handle and value.
  4. Verify that the Battery Level Status characteristic has a valid value.
  5. The Lower Tester reads the Battery Level characteristic.
  6. If the Battery Level characteristic supports notification, then the Lower Tester enables notifications by writing value 0x0001 to the Client Characteristic Configuration descriptor of this characteristic, using the GATT Write Characteristic Descriptor sub-procedure.
  7. The Upper Tester changes the value of the Battery Level characteristic.

8. The Lower Tester receives from the IUT an ATT_HANDLE_VALUE_NTF PDU containing the Battery Level characteristic handle and value, if this characteristic supports notification, and an ATT_HANDLE_VALUE_NTF PDU containing the Battery Level Status characteristic handle and value, or an ATT_HANDLE_VALUE_IND PDU containing the Battery Level Status characteristic handle and value.
9. If the Lower Tester receives from the IUT an ATT_HANDLE_VALUE_IND PDU, then the Lower Tester responds with an ATT_HANDLE_VALUE_CFM PDU to the IUT.
10. If the Battery Level characteristic does not support notification, then read the Battery Level characteristic.
11. Verify that the Battery Level characteristic value is changed from the one read in Step 5, that the Battery Level Status characteristic value is changed from the one read in Step 1, and that they meet the requirements of the service.

- Expected Outcome

  Pass verdict

  In Steps 3 and 8, the Battery Level Status characteristic is successfully notified; the characteristic value is different from the one in Step 1 and meets the requirements of the Battery Service.

  If the Battery Level supports notification, the Battery Level characteristic is successfully notified; the characteristic value is different from the one in Step 5 and meets the requirements of the Battery Service.

  All RFU bits are set to 0.

4.6.3 Characteristic Notification – Reconnection

- Test Purpose

  Verify that the IUT sends notifications of characteristic values when reconnecting with a bonded client.

- Reference

  Table 4.7

- Initial Condition

  - The handle range of each characteristic value and of the characteristic in which the change action is performed, as specified in Table 4.7, 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.
  - The IUT and the Lower Tester have been previously bonded.

- Test Case Configuration

Test Case	Reference	Field	Characteristic
BAS/SR/CN/BV-21-C [Characteristic Notification – Battery Level – Reconnection]	[3] 3.1.1	Battery Level	Battery Level
BAS/SR/CN/BV-22-C [Characteristic Notification – Battery Level Status – Battery Level Change – Reconnection]	[3] 3.2.1	Battery Level	Battery Level Status
BAS/SR/CN/BV-23-C [Characteristic Notification – Battery Level Status – Power State – Reconnection]	[9] 3.2.1	Power State	Battery Level Status

Test Case	Reference	Field	Characteristic
BAS/SR/CN/BV-24-C [Characteristic Notification – Battery Level Status – Additional Status Change – Reconnection]	[9] 3.2.1	Additional Status	Battery Level Status
BAS/SR/CN/BV-25-C [Characteristic Notification – Battery Energy Status – Available Energy Change – Reconnection]	[9] 3.4.1	Available Energy	Battery Energy Status
BAS/SR/CN/BV-26-C [Characteristic Notification – Battery Energy Status – Available Battery Capacity Change – Reconnection]	[9] 3.5.1	Available Battery Capacity	Battery Energy Status
BAS/SR/CN/BV-27-C [Characteristic Notification – Battery Time Status – Time until Discharged Changed – Reconnection]	[9] 3.6.1	Time until Discharged	Battery Time Status
BAS/SR/CN/BV-28-C [Characteristic Notification – Battery Time Status – Time until Discharged on Standby Change – Reconnection]	[9] 3.6.1	Time until Discharged on Standby	Battery Time Status
BAS/SR/CN/BV-29-C [Characteristic Notification – Battery Time Status – Time until Recharged Change – Reconnection]	[9] 3.6.1	Time until Recharged	Battery Time Status

Table 4.7: Characteristic Notification – Reconnection test cases

- Test Procedure

  For each supported transport, the following test procedure applies:

  1. Change the value indicated in the Field column of the characteristic specified in Table 4.7 on the IUT to trigger it to send a notification of the relevant characteristic.
  2. The IUT sends an ATT_HANDLE_VALUE_NTF PDU to the Lower Tester containing the characteristic handle and value.
  3. Verify that the characteristic value meets the requirements of the service.
  4. The Lower Tester performs a disconnection.
  5. Repeat Step 1.
  6. The Lower Tester reestablishes the connection with the IUT.
  7. Repeat Step 2.

- Expected Outcome

  Pass verdict

  In Steps 2 and 7, the characteristic is successfully notified, and the characteristic value meets the requirements of the Battery Service.

  All RFU bits are set to 0.

BAS/SR/CN/BV-30-C [Characteristic Notification – Battery Energy Status – Reconnection]

- Test Purpose

  Verify that the IUT sends notifications of the Battery Energy Status characteristic when reconnecting to a bonded client and when the Power State field in the Battery Level Status characteristic has changed.

- Reference

  [9] 3.5.1

- Initial Condition
  - The handle range of the Battery Energy Status characteristic and of the Battery Level Status characteristic 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 Battery Energy Status characteristic is configured for notification.
  - The IUT and the Lower Tester have been previously bonded.
- Test Procedure

  For each supported transport, the following test procedure applies:

  1. The Upper Tester changes the value of the Power State field in the Battery Level Status characteristic.
  2. The IUT sends an ATT_HANDLE_VALUE_NTF PDU to the Lower Tester containing the Battery Energy Status characteristic handle and value.
  3. Verify that the characteristic value meets the requirements of the service.
  4. The Lower Tester performs a disconnection.
  5. Repeat Step 1.
  6. The Lower Tester reestablishes the connection with the IUT.
  7. Repeat Step 2.
- Expected Outcome

  Pass verdict

  The Battery Energy Status characteristic is successfully notified, and the characteristic value meets the requirements of the Battery Service.

  All RFU bits are set to 0.

4.7 Indications

Verify compliant operation relative to indications.

4.7.1 Configure Indication

- Test Purpose

  Verify that the IUT can be configured for indications of characteristic values.
- Reference

  [9] Table 3.1, 3.2.1, 3.3.1, 3.4.1, 3.5.1, 3.6.1, 3.7.1, 3.8.1, 3.9.1, 3.10.1, 3.11.1, 3.12.1
- Initial Condition
  - The handle range of each relevant characteristic value specified in Table 4.8 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 the relevant characteristic, as specified in Table 4.8, 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.

- Test Case Configuration

Test Case	Characteristic Name
BAS/SR/CIN/BV-01-C [Configure Indication – Battery Level Status]	Battery Level Status
BAS/SR/CIN/BV-02-C [Configure Indication – Estimated Service Date]	Estimated Service Date
BAS/SR/CIN/BV-03-C [Configure Indication – Battery Energy Status]	Battery Energy Status
BAS/SR/CIN/BV-04-C [Configure Indication – Battery Time Status]	Battery Time Status
BAS/SR/CIN/BV-05-C [Configure Indication – Battery Information]	Battery Information
BAS/SR/CIN/BV-06-C [Configure Indication – Manufacturer Name String]	Manufacturer Name String
BAS/SR/CIN/BV-07-C [Configure Indication – Model Number String]	Model Number String
BAS/SR/CIN/BV-08-C [Configure Indication – Serial Number String]	Serial Number String
BAS/SR/CIN/BV-09-C [Configure Indication – Battery Critical Status]	Battery Critical Status
BAS/SR/CIN/BV-10-C [Configure Indication – Battery Health Status]	Battery Health Status
BAS/SR/CIN/BV-11-C [Configure Indication – Battery Health Information]	Battery Health Information

Table 4.8: Configure Indication test cases

- Test Procedure

1. The Lower Tester disables indication by writing the value 0x0000 to the Client Characteristic Configuration descriptor of the relevant characteristic, as specified in Table 4.8, using the GATT Write Characteristic Descriptor sub-procedure.
2. The Lower Tester reads the value of the Client Characteristic Configuration descriptor.
3. The Lower Tester enables indication by writing the value 0x0002 to the Client Characteristic Configuration descriptor of the characteristic.
4. The Lower Tester reads the value of the Client Characteristic Configuration descriptor.
5. Repeat Steps 1–4 for each instance of the characteristic and service.

- Expected Outcome

  Pass verdict

  The Client Characteristic Configuration descriptor for the characteristic in Table 4.8 is successfully written, and the value returned when read is consistent with the value written.

4.7.2 Characteristic Indication

- Test Purpose

  Verify that the IUT sends indications of characteristic values.

- Reference

  Table 4.9

- Initial Condition

  - The handle range of each relevant characteristic value and of the characteristic in which the change action is performed as specified in Table 4.9 have 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 the relevant characteristic, as specified in Table 4.9, 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 indication.
- Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.

- Test Case Configuration

Test Case	Reference	Field	Characteristic
BAS/SR/IND/BV-01-C [Characteristic Indication – Battery Level Status – Battery Level Change]	[9] 3.2.1	Battery Level	Battery Level Status
BAS/SR/IND/BV-02-C [Characteristic Indication – Battery Level Status – Additional Status Change]	[9] 3.2.1	Additional Status	Battery Level Status
BAS/SR/IND/BV-03-C [Characteristic Indication – Battery Level Status – Power State Change]	[9] 3.2.1	Power State	Battery Energy Status
BAS/SR/IND/BV-04-C [Characteristic Indication – Estimated Service Date]	[9] 3.3.1	Estimated Service Date	Estimated Service Date
BAS/SR/IND/BV-05-C [Characteristic Indication – Battery Critical Status]	[9] 3.4.1	Battery Critical Status	Battery Critical Status
BAS/SR/IND/BV-06-C [Characteristic Indication – Battery Energy Status – Available Energy Change]	[9] 3.5.1	Available Energy	Battery Energy Status
BAS/SR/IND/BV-07-C [Characteristic Indication – Battery Energy Status – Available Battery Capacity Change]	[9] 3.5.1	Available Battery Capacity	Battery Energy Status
BAS/SR/IND/BV-08-C [Characteristic Indication – Battery Time Status – Time until Discharged Change]	[9] 3.6.1	Time until Discharged	Battery Time Status
BAS/SR/IND/BV-09-C [Characteristic Indication – Battery Time Status – Time until Discharged on Standby Change]	[9] 3.6.1	Time until Discharged on Standby	Battery Time Status
BAS/SR/IND/BV-10-C [Characteristic Indication – Battery Time Status – Time until Recharged Change]	[9] 3.6.1	Time until Recharged	Battery Time Status
BAS/SR/IND/BV-11-C [Characteristic Indication – Battery Health Status – Battery Health Summary Change]	[9] 3.7.1	Battery Health Summary	Battery Health Status
BAS/SR/IND/BV-12-C [Characteristic Indication – Battery Health Status – Cycle Count Change]	[9] 3.7.1	Cycle Count	Battery Health Status
BAS/SR/IND/BV-13-C [Characteristic Indication – Battery Health Status – Current Temperature Change]	[9] 3.7.1	Current Temperature	Battery Health Status
BAS/SR/IND/BV-14-C [Characteristic Indication – Battery Health Status – Deep Discharge Count Change]	[9] 3.7.1	Deep Discharge Count	Battery Health Status
BAS/SR/IND/BV-15-C [Characteristic Indication – Battery Health Information – Cycle Count Designed Lifetime Change]	[9] 3.8.1	Cycle Count Designed Lifetime	Battery Health Information
BAS/SR/IND/BV-16-C [Characteristic Indication – Battery Health Information – Min / Max Designed Operating Temperature Change]	[9] 3.8.1	Min / Max Designed Operating Temperature	Battery Health Information
BAS/SR/IND/BV-17-C [Characteristic Indication – Battery Information – Battery Features Change]	[9] 3.9.1	Battery Features	Battery Information
BAS/SR/IND/BV-18-C [Characteristic Indication – Battery Information – Battery Manufacture Date Change]	[9] 3.9.1	Battery Manufacture Date	Battery Information
BAS/SR/IND/BV-19-C [Characteristic Indication – Battery Information – Battery Expiration Date Change]	[9] 3.9.1	Battery Expiration Date	Battery Information

Test Case	Reference	Field	Characteristic
BAS/SR/IND/BV-20-C [Characteristic Indication – Battery Information – Battery Low Energy Change]	[9] 3.9.1	Battery Low Energy	Battery Information
BAS/SR/IND/BV-21-C [Characteristic Indication – Battery Information – Battery Designed Capacity Change]	[9] 3.9.1	Battery Designed Capacity	Battery Information
BAS/SR/IND/BV-22-C [Characteristic Indication – Battery Information – Battery Critical Energy Change]	[9] 3.9.1	Battery Critical Energy	Battery Information
BAS/SR/IND/BV-23-C [Characteristic Indication – Battery Information – Battery Chemistry Change]	[9] 3.9.1	Battery Chemistry	Battery Information
BAS/SR/IND/BV-24-C [Characteristic Indication – Battery Information – Nominal Voltage Change]	[9] 3.9.1	Nominal Voltage	Battery Information
BAS/SR/IND/BV-25-C [Characteristic Indication – Battery Information – Battery Aggregation Group Change]	[9] 3.9.1	Battery Aggregation Group	Battery Information
BAS/SR/IND/BV-26-C [Characteristic Indication – Manufacturer Name String]	[9] 3.10.1	Manufacturer Name String	Manufacturer Name String
BAS/SR/IND/BV-27-C [Characteristic Indication – Model Number String]	[9] 3.11.1	Model Number String	Model Number String
BAS/SR/IND/BV-28-C [Characteristic Indication – Serial Number String]	[9] 3.12.1	Serial Number String	Serial Number String

Table 4.9: Characteristic Indication test cases

- Test Procedure

  1. The Upper Tester changes the value indicated in the Field column of the characteristic specified in Table 4.9 on the IUT to trigger an indication of the relevant characteristic, containing a valid value.
  2. The IUT sends an ATT_HANDLE_VALUE_IND PDU to the Lower Tester containing the characteristic handle and value.
  3. The Lower Tester responds with an ATT_HANDLE_VALUE_CFM PDU to the IUT.

- Expected Outcome

  Pass verdict

  The characteristic is successfully indicated, the characteristic value meets the requirements of the Battery Service, and the IUT successfully receives the confirmation from the Lower Tester.

  All RFU bits are set to 0.

BAS/SR/IND/BV-29-C [Characteristic Indication – Battery Energy Status – Power State Field Change]

- Test Purpose

  Verify that the IUT sends indications of the Battery Energy Status characteristic when the value of the Power State field in the Battery Level Status characteristic changes.

- Reference

  [9] 3.5.1

- Initial Condition
  - The handle range of the Battery Energy Status characteristic, of its Client Characteristic Configuration descriptor, and of the Battery Level Status characteristic 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 Battery Energy Status characteristic is configured for indication.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
- Test Procedure

  For each supported transport, the following test procedure applies:

  1. The Upper Tester changes the value of the Power State field in the Battery Level Status characteristic.
  2. The IUT sends an ATT_HANDLE_VALUE_IND PDU to the Lower Tester containing the Battery Energy Status characteristic handle and value.
  3. The Lower Tester responds with an ATT_HANDLE_VALUE_CFM PDU to the IUT.
- Expected Outcome

  Pass verdict

  The Battery Energy Status characteristic is successfully indicated, the characteristic value in the indication meets the requirements of the Battery Service, and the IUT successfully receives the confirmation from the Lower Tester.

  All RFU bits are set to 0.

BAS/SR/IND/BV-30-C [Device not charging – Time until Recharged not indicated]

- Test Purpose

  Verify that the Time until Recharged field value exposed by the Battery Service is not present in the indicated characteristic when the device is not charging.
- Reference

  [9] 3.6
- Initial Condition
  - The Battery Time Status characteristic handle 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
  - The IUT is not charging.
- Test Procedure

  For each supported transport, the following test procedure applies:

  1. The Upper Tester modifies the Battery Time Status characteristic in the IUT such that an indication is generated.
  2. The characteristic is indicated.

- Expected Outcome

  Pass verdict

  In Step 2, the characteristic value is indicated and the Time until Recharged field is not present.

BAS/SR/IND/BV-31-C [Characteristic Indication – Battery Energy Status, Multiple Instances within a Battery Aggregation Group]

- Test Purpose

  Verify that the IUT sends indications of the External Source Power field values exposed by the Battery Energy Status characteristic.

- Reference

  [9] 3.5.1

- Initial Condition

  - The handle range of the Battery Energy Status characteristic value and the handle of the Client Characteristic Configuration descriptor of the Battery Energy Status characteristic have been previously discovered by the Lower Tester during the test procedure in Section 4.3 or are known to the Lower Tester by other means.
  - The Battery Energy Status characteristic is configured for indication for all the present service instances.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.

- Test Procedure

  1. Perform an action on the IUT so that it sends an indication of the Battery Energy Status characteristic within a Battery Aggregation Group, containing a valid value of the External Source Power field.
  2. The IUT sends an ATT_HANDLE_VALUE_IND PDU to the Lower Tester containing the characteristic handle and value.
  3. The Lower Tester responds with an ATT_HANDLE_VALUE_CFM PDU to the IUT.
  4. To obtain all External Source Power values, the Lower Tester reads all the Battery Energy Status characteristic values by executing a GATT Read Characteristic Value sub-procedure.
  5. To obtain all Battery Aggregation Group values, the Lower Tester reads all the Battery Information characteristic values by executing a GATT Read Characteristic Value sub-procedure.

- Expected Outcome

  Pass verdict

  The characteristic is successfully indicated, and the IUT successfully receives the confirmation from the Lower Tester.

  The value of the External Source Power field is the same across all instances within the same Aggregation Group.

  All RFU bits are set to 0.

4.7.3 Characteristic Indication – Reconnection

- Test Purpose

  Verify that the IUT sends indications of characteristic values after reconnection.

- Reference

  Table 4.10

- Initial Condition

  - The handle range of each relevant characteristic value and the characteristic in which the change action is performed as specified in Table 4.10 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 the relevant characteristic, as specified in Table 4.10, 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 indication.
  - The IUT and the Lower Tester have been previously bonded.
  - A connection is not established between the IUT and the Lower Tester.

- Test Case Configuration

Test Case	Reference	Field	Characteristic
BAS/SR/IND/BV-32-C [Characteristic Indication – Battery Level Status – Battery Level Change – Reconnection]	[9] 3.2.1	Battery Level	Battery Level Status
BAS/SR/IND/BV-33-C [Characteristic Indication – Battery Level Status – Power State Field Change – Reconnection]	[9] 3.2.1	Power State	Battery Level Status
BAS/SR/IND/BV-34-C [Characteristic Indication – Battery Level Status – Additional Status Change – Reconnection]	[9] 3.2.1	Additional Status	Battery Level Status
BAS/SR/IND/BV-35-C [Characteristic Indication – Battery Energy Status – Available Energy Change – Reconnection]	[9] 3.5.1	Available Energy	Battery Energy Status
BAS/SR/IND/BV-36-C [Characteristic Indication – Battery Energy Status – Available Battery Capacity Change – Reconnection]	[9] 3.5.1	Available Battery Capacity	Battery Energy Status
BAS/SR/IND/BV-37-C [Characteristic Indication – Battery Time Status – Time until Discharged Change – Reconnection]	[9] 3.6.1	Time until Discharged	Battery Time Status
BAS/SR/IND/BV-38-C [Characteristic Indication – Battery Time Status – Time until Discharged on Standby Change – Reconnection]	[9] 3.6.1	Time until Discharged on Standby	Battery Time Status
BAS/SR/IND/BV-39-C [Characteristic Indication – Battery Time Status – Time until Recharged Change – Reconnection]	[9] 3.6.1	Time until Recharged	Battery Time Status
BAS/SR/IND/BV-40-C [Characteristic Indication – Battery Health Information – Cycle Count Designed Lifetime Change – Reconnection]	[9] 3.8.1	Cycle Count Designed Lifetime	Battery Health Information
BAS/SR/IND/BV-41-C [Characteristic Indication – Battery Health Information – Min / Max Designed Operating Temperature Change – Reconnection]	[9] 3.8.1	Min / Max Designed Operating Temperature	Battery Health Information

Test Case	Reference	Field	Characteristic
BAS/SR/IND/BV-42-C [Characteristic Indication – Battery Information – Battery Features Change – Reconnection]	[9] 3.9.1	Battery Features	Battery Information
BAS/SR/IND/BV-43-C [Characteristic Indication – Battery Information – Battery Manufacture Date Change – Reconnection]	[9] 3.9.1	Battery Manufacture Date	Battery Information
BAS/SR/IND/BV-44-C [Characteristic Indication – Battery Information – Battery Expiration Date Change – Reconnection]	[9] 3.9.1	Battery Expiration Date	Battery Information
BAS/SR/IND/BV-45-C [Characteristic Indication – Battery Information – Battery Low Energy Change – Reconnection]	[9] 3.9.1	Battery Low Energy	Battery Information
BAS/SR/IND/BV-46-C [Characteristic Indication – Battery Information – Battery Designed Capacity Change – Reconnection]	[9] 3.9.1	Battery Designed Capacity	Battery Information
BAS/SR/IND/BV-47-C [Characteristic Indication – Battery Information – Battery Critical Energy Change – Reconnection]	[9] 3.9.1	Battery Critical Energy	Battery Information
BAS/SR/IND/BV-48-C [Characteristic Indication – Battery Information – Battery Chemistry Change – Reconnection]	[9] 3.9.1	Battery Chemistry	Battery Information
BAS/SR/IND/BV-49-C [Characteristic Indication – Battery Information – Nominal Voltage Change – Reconnection]	[9] 3.9.1	Nominal Voltage	Battery Information
BAS/SR/IND/BV-50-C [Characteristic Indication – Battery Information – Battery Aggregation Group Change – Reconnection]	[9] 3.9.1	Battery Aggregation Group	Battery Information
BAS/SR/IND/BV-51-C [Characteristic Indication – Manufacturer Name String – Reconnection]	[9] 3.10.1	Manufacturer Name String	Manufacturer Name String
BAS/SR/IND/BV-52-C [Characteristic Indication – Model Number String – Reconnection]	[9] 3.11.1	Model Number String	Model Number String
BAS/SR/IND/BV-53-C [Characteristic Indication – Serial Number String – Reconnection]	[9] 3.12.1	Serial Number String	Serial Number String

Table 4.10: Characteristic Indication – Reconnection test cases

- Test Procedure

  1. The Upper Tester changes the value indicated in the Field column of the characteristic specified in Table 4.10 on the IUT to trigger an indication of the relevant characteristic, containing a valid value.
  2. The Lower Tester reestablishes a connection with the IUT.
  3. The IUT sends an ATT_HANDLE_VALUE_IND PDU to the Lower Tester containing the characteristic handle and value.
  4. The Lower Tester responds with an ATT_HANDLE_VALUE_CFM PDU to the IUT.

- Expected Outcome

  Pass verdict

  The characteristic is successfully indicated, the characteristic value meets the requirements of the Battery Service, and the IUT successfully receives the confirmation from the Lower Tester.

  All RFU bits are set to 0.

BAS/SR/IND/BV-54-C [Characteristic Indication – Battery Energy Status – Power State Field Change – Reconnection]

- Test Purpose

  Verify that the IUT sends indications of characteristic values after reconnection.

- Reference

  [9] 3.5.1

- Initial Condition

  - The handle range of the Battery Energy Status characteristic, its Client Characteristic Configuration descriptor, and the Battery Level Status characteristic have been previously discovered by the Lower Tester during the test procedure in Section 4.3 or are known to the Lower Tester by other means.
  - The characteristic is configured for indication.
  - The IUT and the Lower Tester have been previously bonded.
  - A connection is not established between the IUT and the Lower Tester.

- Test Procedure

  1. The Upper Tester changes the value of the Power State field in the Battery Level Status characteristic.
  2. The Lower Tester reestablishes a connection with the IUT.
  3. The IUT sends an ATT_HANDLE_VALUE_IND PDU to the Lower Tester containing the Battery Energy Status characteristic handle and value.
  4. The Lower Tester responds with an ATT_HANDLE_VALUE_CFM PDU to the IUT.

- Expected Outcome

  Pass verdict

  The characteristic is successfully indicated, the characteristic value meets the requirements of the Battery Service, and the IUT successfully receives the confirmation from the Lower Tester.

  All RFU bits are set to 0.

4.8 Broadcast

Verify compliant operation relative to broadcast.

Since broadcasting is not a reliable transmission method, multiple broadcast packets may need to be sent to verify compliance.

BAS/SR/CBR/BV-01-C [Configure Broadcast – Battery Level Status]

- Test Purpose

  Verify that the IUT can be configured for the broadcast of characteristic values.

- Reference

  [9] 3.2.1

  [10] 9.1.1

  [11] 2.7

- Initial Condition
  - The handle range of each Battery Level Status characteristic value 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 Server Characteristic Configuration descriptor of the Battery Level Status characteristic 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.
  - Establish an ATT Bearer connection between the Lower Tester and the IUT as described in Section 4.2.1 or Section 4.2.2.
- Test Procedure
  1. The Lower Tester disables broadcast by writing the value 0x0000 to the Server Characteristic Configuration descriptor of the Battery Level Status characteristic using the GATT Write Characteristic Descriptor sub-procedure.
  2. The Lower Tester reads the value of the Server Characteristic Configuration descriptor.
  3. The Lower Tester enables broadcast by writing the value 0x0001 to the Server Characteristic Configuration descriptor of the characteristic.
  4. The Lower Tester reads the value of the Server Characteristic Configuration descriptor.
  5. Repeat Steps 1–4 for each instance of the service.
- Expected Outcome

  Pass verdict

  The Server Characteristic Configuration descriptor for the Battery Level Status is successfully written, and the value returned when read is consistent with the value written.

BAS/SR/BR/BV-01-C [Characteristic Broadcast – Battery Level Status]

- Test Purpose

  Verify that the IUT sends a broadcast of characteristic values.
- Reference

  [9] 3.2.1

  [10] 9.1.1
- Initial Condition
  - The handle range of each Battery Level Status characteristic value 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 Battery Level Status is configured for broadcast for all the present service instances.
  - Execute the preamble in Section 4.2.3.
- Test Procedure
  1. The Upper Tester commands the IUT to enter broadcast mode.
  2. The IUT sends advertising packets containing the Battery Level Status characteristic value to the Lower Tester.

- Expected Outcome

  Pass verdict

  The IUT successfully broadcasts non-connectable advertising events containing the Battery Level Status characteristic value.

  If the Battery Level Characteristic Presentation Format descriptor is present and the Identifier field is present, the value of the Identifier field is identical to the value of the Description field of the Battery Level Characteristic Presentation Format descriptor. Otherwise, if the Identifier field is present, the Identifier field has the value representing ‘main’.

  All RFU bits are set to 0.

BAS/SR/BR/BV-02-C [Characteristic Broadcast – Battery Level Status, Multiple Instances]

- Test Purpose

  Verify that the IUT sends a broadcast of characteristic values.

- Reference

  [9] 3.2.1

  [10] 9.1.1

- Initial Condition

  - The handle range of each Battery Level Status characteristic value 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 broadcast for all the present service instances supporting Characteristic Broadcast for the Battery Level Status characteristic.
  - Execute the preamble in Section 4.2.3.

- Test Procedure

  1. The Upper Tester commands the IUT to enter broadcast mode.
  2. The IUT sends advertising packets including the specified advertising data to the Lower Tester.

- Expected Outcome

  Pass verdict

  The Battery Level Status characteristic is successfully broadcasted.

  The Identifier field is present and contains a valid value from the GATT Bluetooth Namespace Descriptions [5], equal to the Description field value, in the Battery Level Characteristic Presentation Format descriptor.

  The Identifier field is present and has the same value as the Description field of the Battery Level Characteristic Presentation Format descriptor.

  All RFU bits are set to 0.

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 Battery Service (BAS) [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 [1].

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

Item	Feature	Test Case(s)
BAS 2/1 OR BAS 2/6	Battery Service	BAS/SR/SGGIT/SER/BV-01-C
BAS 2/3 AND NOT BAS 2a/1	Battery Level Characteristic	BAS/SR/SGGIT/CHA/BV-01-C
BAS 2/3 AND BAS 2/9	Battery Level Characteristic, Battery Energy Status characteristic exposed	BAS/SR/CR/BV-03-C
BAS 2/4	Battery Level descriptor – Characteristic Presentation Format Descriptor	BAS/SR/DES/BV-01-C
BAS 2/3 AND BAS 2a/1	Battery Level Characteristic – Notifications	BAS/SR/CON/BV-01-C BAS/SR/CN/BV-01-C BAS/SR/SGGIT/CHA/BV-13-C
BAS 2/6	SDP interoperability	BAS/SR/SGGIT/SDP/BV-01-C
BAS 2/7 AND BAS 2/43	Battery Level Status Characteristic when battery is not present	BAS/SR/CR/BV-11-C
BAS 2/7 AND NOT BAS 2a/8 AND NOT BAS 2a/16	Battery Level Status Characteristic	BAS/SR/SGGIT/CHA/BV-02-C
BAS 2/8 AND NOT BAS 2a/9	Estimated Service Date Characteristic	BAS/SR/SGGIT/CHA/BV-03-C
BAS 2/9 AND NOT BAS 2a/10	Battery Energy Status Characteristic	BAS/SR/SGGIT/CHA/BV-05-C
BAS 2/7 AND BAS 2/9	Battery Energy Status – Power State change	BAS/SR/CR/BV-02-C
BAS 2/10 AND NOT BAS 2a/11	Battery Time Status Characteristic	BAS/SR/SGGIT/CHA/BV-06-C
BAS 2a/6	Notify Battery Time Status Characteristic	BAS/SR/CN/BV-08-C

Item	Feature	Test Case(s)
BAS 2/10 AND BAS 2/27	Battery Time Status – Time until Recharged change	BAS/SR/CN/BV-16-C BAS/SR/IND/BV-30-C
BAS 2/11	Battery Information Characteristic	BAS/SR/SGGIT/CHA/BV-09-C
BAS 2/12	Manufacturer Name String Characteristic	BAS/SR/SGGIT/CHA/BV-10-C
BAS 2/12 AND BAS 2/43	Manufacturer Name String Characteristic when battery is not present	BAS/SR/CR/BV-06-C
BAS 2/13	Model Number String Characteristic	BAS/SR/SGGIT/CHA/BV-11-C
BAS 2/13 AND BAS 2/43	Model Number String Characteristic when battery is not present	BAS/SR/CR/BV-07-C
BAS 2/14	Serial Number String Characteristic	BAS/SR/SGGIT/CHA/BV-12-C
BAS 2/15	Battery Critical Status Characteristic	BAS/SR/SGGIT/CHA/BV-04-C
BAS 2/16 AND NOT BAS 2a/18	Battery Health Status Characteristic	BAS/SR/SGGIT/CHA/BV-07-C
BAS 2/17	Battery Health Information Characteristic	BAS/SR/SGGIT/CHA/BV-08-C
BAS 2/15 AND BAS 2/7	Read Battery Critical Status – Battery Level Status exposed	BAS/SR/CR/BV-04-C
BAS 2/9 AND BAS 2/21 AND BAS 2/43	Battery not present – Battery Energy Status – Present Voltage	BAS/SR/CR/BV-08-C
BAS 2/9 AND BAS 2/24 AND BAS 2/43	Battery not present – Battery Energy Status – Charge Rate	BAS/SR/CR/BV-09-C
BAS 2/9 AND BAS 2/25 AND BAS 2/43	Battery not present – Battery Energy Status – Available Energy at Last Charge	BAS/SR/CR/BV-10-C
BAS 2/9 AND BAS 2/23 AND BAS 2/43	Battery not present – Battery Energy Status – Available Battery Capacity	BAS/SR/CR/BV-12-C
BAS 2a/1 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Notify Battery Level – Reconnection	BAS/SR/CN/BV-21-C
BAS 2/7 AND BAS 2a/3	Notify Battery Level Status	BAS/SR/CON/BV-02-C BAS/SR/CN/BV-03-C
BAS 2/7 AND BAS 2/18 AND BAS 2a/3	Notify Battery Level Status – Battery Level field change	BAS/SR/CN/BV-02-C
BAS 2/20 AND BAS 2/43 AND BAS 2/46 AND BAS 2a/3 AND BAS 2a/1	Notify when State Change – Operate without battery	BAS/SR/CN/BV-18-C
BAS 2/20 AND (BAS 2/44 OR BAS 2/45) AND BAS 2/46 AND BAS 2a/3 AND BAS 2a/5	Notify when State Change – Wired or Wireless External Power Source	BAS/SR/CN/BV-19-C
BAS 2a/1 AND BAS 2a/3	Notify Battery Level, Battery Level Status	BAS/SR/CN/BV-20-C

Item	Feature	Test Case(s)
BAS 2/7 AND BAS 2/18 AND BAS 2a/3 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Notify Battery Level Status – Battery Level field change – Reconnection	BAS/SR/CN/BV-22-C
BAS 2/16 AND BAS 2a/7	Notify Battery Health Status	BAS/SR/CON/BV-06-C
BAS 2/7 AND BAS 2a/3 AND BAS 2/19	Notify Battery Level Status – Additional Status field change	BAS/SR/CN/BV-04-C
BAS 2/7 AND BAS 2a/3 AND BAS 2/19 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Notify Battery Level Status – Additional Status field change – Reconnection	BAS/SR/CN/BV-24-C
BAS 2a/3 AND BAS 2/7 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Notify Battery Level Status Power State field change – Reconnection	BAS/SR/CN/BV-23-C
BAS 2a/4 AND BAS 2/8	Notify Estimated Service Date	BAS/SR/CON/BV-03-C BAS/SR/CN/BV-05-C
BAS 2a/5 AND BAS 2/9	Notify Battery Energy Status	BAS/SR/CON/BV-04-C BAS/SR/CN/BV-15-C
BAS 2a/5 AND BAS 2/9 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Notify Battery Energy Status – Reconnection	BAS/SR/CN/BV-30-C
BAS 2/9 AND BAS 2a/5 AND BAS 2a/2	Notify Battery Energy Status – Multiple Instances	BAS/SR/CN/BV-17-C
BAS 2a/5 AND BAS 2/22	Notify Battery Energy Status – Available Energy Change	BAS/SR/CN/BV-06-C
BAS 2a/5 AND BAS 2/22 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Notify Battery Energy Status – Available Energy Change – Reconnection	BAS/SR/CN/BV-25-C
BAS 2a/5 AND BAS 2/23	Notify Battery Energy Status – Available Battery Capacity Change	BAS/SR/CN/BV-07-C
BAS 2a/5 AND BAS 2/23 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Notify Battery Energy Status – Available Battery Capacity Change – Reconnection	BAS/SR/CN/BV-26-C
BAS 2a/6 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Notify Battery Time Status – Time until Discharged Change – Reconnection	BAS/SR/CN/BV-27-C
BAS 2/10 AND BAS 2/26 AND BAS 2a/6	Notify Battery Time Status – Time until Discharged on Standby Change	BAS/SR/CON/BV-05-C BAS/SR/CN/BV-09-C
BAS 2/10 AND BAS 2/26 AND BAS 2a/6 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Notify Battery Time Status – Time until Discharged on Standby Change – Reconnection	BAS/SR/CN/BV-28-C
BAS 2/10 AND BAS 2/27 AND BAS 2a/6	Notify Battery Time Status – Time until Recharged	BAS/SR/CN/BV-10-C
BAS 2/10 AND BAS 2/27 AND BAS 2a/6 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Notify Battery Time Status – Time until Recharged – Reconnection	BAS/SR/CN/BV-29-C

Item	Feature	Test Case(s)
BAS 2a/7 AND BAS 2/16 AND BAS 2/28	Notify Battery Health Status – Battery Health Summary Change	BAS/SR/CN/BV-11-C
BAS 2a/7 AND BAS 2/16 AND BAS 2/29	Notify Battery Health Status – Cycle Count Change	BAS/SR/CN/BV-12-C
BAS 2a/7 AND BAS 2/16 AND BAS 2/30	Notify Battery Health Status – Current Temperature Change	BAS/SR/CN/BV-13-C
BAS 2a/7 AND BAS 2/16 AND BAS 2/31	Notify Battery Health Status – Deep Discharge Count Change	BAS/SR/CN/BV-14-C
BAS 2/9 AND BAS 2/20	Battery not present – Battery Energy Status – External Source Power Change	BAS/SR/CR/BV-05-C
BAS 2/7 AND BAS 2a/8	Indicate Battery Level Status	BAS/SR/CIN/BV-01-C BAS/SR/IND/BV-01-C BAS/SR/IND/BV-03-C
BAS 2/7 AND BAS 2a/8 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Level Status – Power State Change – Reconnection	BAS/SR/IND/BV-32-C BAS/SR/IND/BV-33-C
BAS 2/7 AND BAS 2/19 AND BAS 2a/8	Indicate Battery Level Status – Additional Status Change	BAS/SR/IND/BV-02-C
BAS 2/7 AND BAS 2/19 AND BAS 2a/8 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Level Status – Additional Status Change – Reconnection	BAS/SR/IND/BV-34-C
BAS 2a/19 AND BAS 2/17 AND BAS 2/32 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Health Information – Cycle Count Designed Lifetime Change – Reconnection	BAS/SR/IND/BV-40-C
BAS 2a/19 AND BAS 2/17 AND BAS 2/33 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Health Information – Min Designed Operating Temperature and Max Designed Operating Temperature Change – Reconnection	BAS/SR/IND/BV-41-C
BAS 2/11 AND BAS 2a/12 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Information – Battery Features Change – Reconnection	BAS/SR/IND/BV-42-C
BAS 2/11 AND BAS 2a/12 AND BAS 2/34 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Information – Battery Manufacture Date Change – Reconnection	BAS/SR/IND/BV-43-C
BAS 2/11 AND BAS 2a/12 AND BAS 2/35 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Information – Battery Expiration Date Change – Reconnection	BAS/SR/IND/BV-44-C
BAS 2/11 AND BAS 2a/12 AND BAS 2/37 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Information – Battery Low Energy Change – Reconnection	BAS/SR/IND/BV-45-C

Item	Feature	Test Case(s)
BAS 2/11 AND BAS 2a/12 AND BAS 2/36 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Information – Battery Designed Capacity Change – Reconnection	BAS/SR/IND/BV-46-C
BAS 2/11 AND BAS 2a/12 AND BAS 2/38 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Information – Battery Critical Energy Change – Reconnection	BAS/SR/IND/BV-47-C
BAS 2/11 AND BAS 2a/12 AND BAS 2/39 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Information – Battery Chemistry Change – Reconnection	BAS/SR/IND/BV-48-C
BAS 2/11 AND BAS 2a/12 AND BAS 2/40 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Information – Nominal Voltage Change – Reconnection	BAS/SR/IND/BV-49-C
BAS 2/11 AND BAS 2a/12 AND BAS 2/41 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Information – Battery Aggregation Group Change – Reconnection	BAS/SR/IND/BV-50-C
BAS 2/12 AND BAS 2a/13 AND BAS 2/42	Indicate Manufacturer Name String – Reconnection	BAS/SR/IND/BV-51-C
BAS 2/13 AND BAS 2a/14 AND BAS 2/42	Indicate Model Number String – Reconnection	BAS/SR/IND/BV-52-C
BAS 2/14 AND BAS 2a/15 AND BAS 2/42	Indicate Serial Number String – Reconnection	BAS/SR/IND/BV-53-C
BAS 2/8 AND BAS 2a/9	Indicate Estimated Service Date	BAS/SR/CIN/BV-02-C BAS/SR/IND/BV-04-C BAS/SR/SGGIT/CHA/BV-16-C
BAS 2/9 AND BAS 2/7 AND BAS 2a/10	Indicate Battery Energy Status – Power State Field Change	BAS/SR/IND/BV-29-C
BAS 2/9 AND BAS 2a/10	Indicate Battery Energy Status	BAS/SR/CIN/BV-03-C BAS/SR/SGGIT/CHA/BV-17-C
BAS 2/9 AND BAS 2a/10 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Energy Status – Power State Field – Reconnection	BAS/SR/IND/BV-54-C
BAS 2/9 AND BAS 2a/10 AND BAS 2a/2	Indicate Battery Energy Status, Multiple Instances	BAS/SR/IND/BV-31-C
BAS 2/9 AND BAS 2a/10 AND BAS 2/22	Indicate Battery Energy Status – Available Energy Change	BAS/SR/IND/BV-06-C

Item	Feature	Test Case(s)
BAS 2/9 AND BAS 2a/10 AND BAS 2/22 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Energy Status – Available Energy Change – Reconnection	BAS/SR/IND/BV-35-C
BAS 2/9 AND BAS 2a/10 AND BAS 2/23	Indicate Battery Energy Status – Available Battery Capacity Change	BAS/SR/IND/BV-07-C
BAS 2/9 AND BAS 2a/10 AND BAS 2/23 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Energy Status – Available Battery Capacity Change – Reconnection	BAS/SR/IND/BV-36-C
BAS 2/17 AND BAS 2a/19 AND BAS 2/32	Indicate Battery Health Information – Cycle Count Designed Lifetime Change	BAS/SR/IND/BV-15-C
BAS 2/17 AND BAS 2a/19 AND BAS 2/33	Indicate Battery Health Information – Min Designed Operating Temperature and Max Designed Operating Temperature Change	BAS/SR/IND/BV-16-C
BAS 2/10 AND BAS 2a/11	Indicate Battery Time Status	BAS/SR/CIN/BV-04-C BAS/SR/IND/BV-08-C BAS/SR/SGGIT/CHA/BV-18-C
BAS 2/10 AND BAS 2a/11 AND (BAS 4/3 OR BAS 4/4)	Indicate Battery Time Status – Time until Discharged – Reconnection	BAS/SR/IND/BV-37-C
BAS 2/10 AND BAS 2/26 AND BAS 2a/11	Indicate Battery Time Status – Time until Discharged on Standby Change	BAS/SR/IND/BV-09-C
BAS 2/10 AND BAS 2/26 AND BAS 2a/11 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Time Status – Time until Discharged on Standby Change – Reconnection	BAS/SR/IND/BV-38-C
BAS 2/10 AND BAS 2/27 AND BAS 2a/11	Indicate Battery Time Status – Time until Recharged Change	BAS/SR/IND/BV-10-C
BAS 2/10 AND BAS 2/27 AND BAS 2a/11 AND (BAS 4/3 OR BAS 4/4) AND BAS 2/42	Indicate Battery Time Status – Time until Recharged Change – Reconnection	BAS/SR/IND/BV-39-C
BAS 2/16 AND BAS 2a/18	Indicate Battery Health Status	BAS/SR/IND/BV-11-C BAS/SR/CIN/BV-10-C BAS/SR/SGGIT/CHA/BV-19-C
BAS 2/16 AND BAS 2/29 AND BAS 2a/18	Indicate Battery Health Status – Cycle Count Change	BAS/SR/IND/BV-12-C
BAS 2/16 AND BAS 2/30 AND BAS 2a/18	Indicate Battery Health Status – Current Temperature Change	BAS/SR/IND/BV-13-C
BAS 2/16 AND BAS 2/31 AND BAS 2a/18	Indicate Battery Health Status – Deep Discharge Count Change	BAS/SR/IND/BV-14-C
BAS 2a/12 AND BAS 2/11	Indicate Battery Information	BAS/SR/CIN/BV-05-C BAS/SR/IND/BV-17-C
BAS 2a/12 AND BAS 2/11 AND BAS 2/34	Indicate Battery Information – Battery Manufacture Date Change	BAS/SR/IND/BV-18-C

Item	Feature	Test Case(s)
BAS 2/35 AND BAS 2/11 AND BAS 2a/12	Indicate Battery Information – Battery Expiration Date Change	BAS/SR/IND/BV-19-C
BAS 2a/12 AND BAS 2/11 AND BAS 2/36	Indicate Battery Information – Battery Designed Capacity Change	BAS/SR/IND/BV-21-C
BAS 2a/12 AND BAS 2/11 AND BAS 2/37	Indicate Battery Information – Battery Low Energy Change	BAS/SR/IND/BV-20-C
BAS 2a/12 AND BAS 2/11 AND BAS 2/38	Indicate Battery Information – Battery Critical Energy Change	BAS/SR/IND/BV-22-C
BAS 2a/12 AND BAS 2/11 AND BAS 2/39	Indicate Battery Information – Battery Chemistry Change	BAS/SR/IND/BV-23-C
BAS 2a/12 AND BAS 2/11 AND BAS 2/40	Indicate Battery Information – Nominal Voltage Change	BAS/SR/IND/BV-24-C
BAS 2a/12 AND BAS 2/11 AND BAS 2/41	Indicate Battery Information – Battery Aggregation Group	BAS/SR/IND/BV-25-C
BAS 2/17 AND BAS 2a/19	Indicate Battery Health Information	BAS/SR/CIN/BV-11-C
BAS 2/12 AND BAS 2a/13	Indicate Manufacturer Name String	BAS/SR/CIN/BV-06-C BAS/SR/IND/BV-26-C
BAS 2/13 AND BAS 2a/14	Indicate Model Number String	BAS/SR/CIN/BV-07-C BAS/SR/IND/BV-27-C
BAS 2/14 AND BAS 2a/15	Indicate Serial Number String	BAS/SR/CIN/BV-08-C BAS/SR/IND/BV-28-C
BAS 2/15 AND BAS 2a/17	Indicate Battery Critical Status	BAS/SR/IND/BV-05-C BAS/SR/CIN/BV-09-C
BAS 2/7 AND BAS 2a/16	Broadcast Battery Level Status	BAS/SR/CBR/BV-01-C BAS/SR/BR/BV-01-C
BAS 2/7 AND BAS 2a/16 AND NOT BAS 2a/8	Battery Level Status – Broadcast	BAS/SR/SGGIT/CHA/BV-14-C
BAS 2/7 AND BAS 2a/8 AND NOT BAS 2a/16	Indicate Battery Level Status	BAS/SR/SGGIT/CHA/BV-15-C
BAS 2/7 AND BAS 2a/8 AND BAS 2a/16	Battery Level Status – Broadcast and Indicate	BAS/SR/SGGIT/CHA/BV-20-C
BAS 2/2 AND BAS 2/7 AND BAS 2a/16	Broadcast Battery Level Status – Multiple Instances	BAS/SR/BR/BV-02-C

Table 5.1: Test case mapping

6 Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	1.0	2011-12-06	Submitted to BTI as v1.0
	1.0.r1	2011-12-08	Edited after Pal review and resubmitted. (Removed redundant Test Case SP/BV-01)
	1.0.r2	2011-12-12	Addressed BTI review comments
	1.0.r3	2011-12-13	Updated to include SDP record verification test case and transport requirements in all test cases.
	V1.0.r4	2011-12-15	Fixed figure in 3.1
1	1.0.1r0	2012-05-09	TSE 4672: TCMT update for BAS/SR/CON/BV-01-C and BAS/SR/CN/BV-01-C (legacy ID: TP/CON/BV-01-C and TP/CN/BV-01-C)
	1.0.2r00	2016-05-20	Converted to new Test Case ID conventions as defined in TSTO v4.1.
	1.0.2r01	2016-06-02	Converted to current test suite template
2	1.0.2	2016-07-13	Prepared for TCRL 2016-1 publication.
	1.0.3r00	2016-10-09	TSE 7783: Corrected typo in TCMT for BAS/SR/CON/BV-01-C and BAS/SR/CN/BV-01-C from 2/a1 to 2a/1.
3	1.0.3	2016-12-13	Approved by BTI. Prepared for TCRL 2016-2 publication.
	1.0.3 edition 2r00	2018-11-29	Editorial changes only. Template updated. Revision History and Contributors moved to the end of the document.
	1.0.3 edition 2	2019-11-11	Updated copyright page and confidentiality markings to support new Documentation Marking Requirements, performed minor formatting updates, and accepted all tracked changes to prepare for edition 2 publication.
	1.0.3ed3r00	2021-07-15	TSE 17016 (rating 1): Added new setup preambles to clarify procedures. Template-related editorials.
	1.0.3 edition 3	2021-08-19	Approved by BTI on 2021-08-19. Prepared for edition 3 publication.
	p4r00	2021-08-26	TSE 16997 (rating 2): Corrected grammatical and other errors in TC BAS/SR/DES/BV-01-C. Performed template-related formatting fixes. Updated Scope and the introduction text before the TCMT to align with the template. Updated copyright page to align with v2 of the DNMD.
4	p4	2022-01-25	Approved by BTI on 2022-01-06. Prepared for TCRL 2021-2 publication.
	p4ed2r00–r01	2022-03-14 – 2022-04-07	TSE 18679 (rating 1): Editorials to align the document with the latest TS template in anticipation of a future .Z release.

Publication Number	Revision Number	Date	Comments
	p4 edition 2	2022-04-25	Approved by BTI on 2022-04-25. Prepared for edition 2 publication.
	p5r00–r03	2022-08-06 – 2022-10-28	TSE 16891 (rating 2): Converted test cases to GGIT. New TCs BAS/SR/SGGIT/SER/BV-01-C and BAS/SR/SGGIT/CHA/BV-01-C. Deleted TCs BAS/SR/CR/BV-01-C, BAS/SR/DEC/BV-01-C, BAS/SR/DES/BV-02-C, BAS/SR/SD/BV-01-C, and BAS/SR/SDP/BV-01-C. Updated TCMT accordingly. TSE 16892 (rating 3): Updated Initial Condition, test steps, and Pass verdict for BAS/SR/CON/BV-01-C. TSE 16905 (rating 1): Converted BAS/SR/CN/BV-01-C to a generic form. TSE 22145 (rating 2): Updated the Properties in the TC Config table for BAS/SR/SGGIT/CHA/BV-13-C – -19-C and the TCMT entries for BAS/SR/SGGIT/CHA/BV-14-C and -15-C. Incorporated CR for BAS v1.1 updates from CR “BAS.TS.1.1_CRr14”. Includes E18172, E18173, E18196, E18206, E18984, E18985, E19083, and E19143. New test cases BAS/SR/BR/BV-01-C and -02-C; BAS/SR/CBR/BV-01-C; BAS/SR/CIN/BV-01-C – -11-C; BAS/SR/CN/BV-02-C – -30-C; BAS/SR/CON/BV-02-C – -06-C; BAS/SR/CR/BV-01-C – -12-C; BAS/SR/DES/BV-02-C; BAS/SR/IND/BV-01-C – -54-C; BAS/SR/SGGIT/CHA/BV-02-C – -12-C; and BAS/SR/SGGIT/SDP/BV-01-C. Updated BAS/SR/DES/BV-01-C. Updated TCMT accordingly. Updated characteristic value for BAS/SR/CR/BV-11-C. Separated TCIDs for the Optional properties in the GGIT table. Added BAS/SR/SGGIT/CHA/BV-13-C – 19-C. Updated TCMT accordingly. Updated Initial condition and test procedure for BAS/SR/CN/BV-20-C.
5	p5	2022-12-27	Approved by BTI on 2022-11-15. BAS v1.1 adopted by the BoD on 2022-12-20. Prepared for publication.
	p6r00–r01	2023-04-05 – 2023-05-01	TSE 22570 (rating 2): Updated the properties for BAS/SR/SGGIT/CHA/BV-01-C and -13-C in the TCMT. TSE 22588 (rating 2): Added test case BAS/SR/SGGIT/CHA/BV-20-C. Updated the TCMT to correctly differentiate which tests are run based on the ICS. TSE 22910 (rating 1): Updated the initial conditions for BAS/SR/CON/BV-01-C – -06-C. Updated the copyright year. Editorials to align the document with the latest TS template.
6	p6	2023-06-29	Approved by BTI on 2023-05-28. Prepared for TCRL 2023-1 publication.

Publication Number	Revision Number	Date	Comments
	p7r00	2024-10-01	TSE 24843 (rating 2): Updated TCMT to specify the case when battery is not present for certain features, affecting test cases BAS/SR/CR/BV-06-C – 12-C.
7	p7	2025-02-18	Approved by BTI on 2024-12-23. Prepared for TCRL 2025-1 publication.

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Name	Company
Virgil Dragomir	Bluetooth SIG, Inc.
Tiberiu Marinescu	Bluetooth SIG, Inc.
Alicia Courtney	Broadcom
Sadao Nagashima	Casio
Daisuke Matsuoh	Citizen
Shunsuke Koyama	Seiko-Epson