

# Industrial Measurement Device Profile (IMDP)

## **Bluetooth® Test Suite**

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# 1 Scope

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This Bluetooth document contains the Test Suite Structure (TSS) and test cases to test the implementation of the Bluetooth Industrial Measurement Device Profile 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

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### 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] Industrial Measurement Device Profile (IMDP) Specification, Version 1.0
- [4] Industrial Measurement Device Service (IMDS) Specification, Version 1.0
- [5] ICS Proforma for Industrial Measurement Device Profile (IMDP.ICS)
- [6] IXIT Proforma for IMPD
- [7] Characteristic and Descriptor descriptions are accessible via the [Bluetooth SIG Assigned Numbers](#)
- [8] GATT Test Suite, GATT.TS
- [9] Document Naming and Marking Document
- [10] Device Information Server (DIS) Specification, Version 1.1 or later
- [11] Battery Service (BAS) Specification, Version 1.1 or later
- [12] Elapsed Time Service (ETS) Specification, Version 1.0

### 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 Industrial Measurement Device Profile requires the presence of GAP, SM (when used over LE transport), SDP (when used over BR/EDR transport), L2CAP, and GATT. This is illustrated in [Figure 3.1](#).

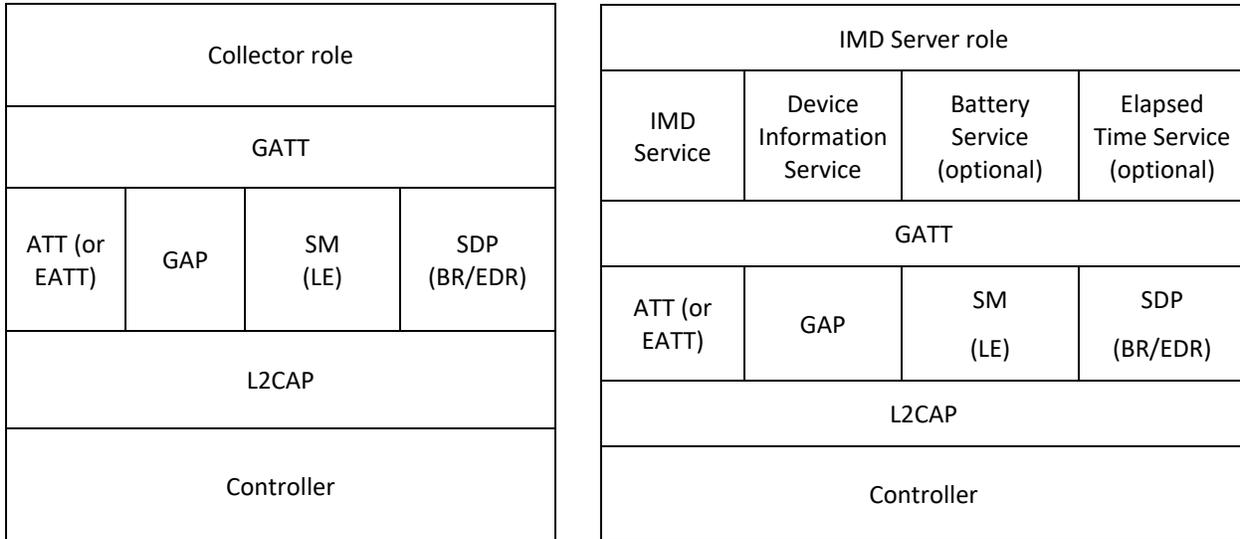


Figure 3.1: Industrial Measurement Device Profile test model

### 3.2 Test Strategy

The test objectives are to verify the functionality of the Industrial Measurement Device Profile 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
- Discovery of IMD Measurement Characteristics and Descriptors
- Read IMD Measurement Characteristics and Descriptors

- Write IMD Measurement Characteristics and Descriptors
- Industrial Measurement Device Features
- IMD Control
- Record Access Control Point
- Elapsed Time Service Procedures

## 4 Test cases (TC)

### 4.1 Introduction

#### 4.1.1 Test case identification conventions

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

Additionally, testing of this specification includes tests from the GATT Test Suite [8] 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>
IMDP	Industrial Measurement Device Profile
Identifier Abbreviation	Role Identifier <IUT role>
COL	Collector role
SR	IMD Server
Identifier Abbreviation	Reference Identifier <GGIT test group>
CGGIT	Client Generic GATT Integrated Tests
Identifier Abbreviation	Reference Identifier <GGIT class>
CHA	Characteristic
SER	Service
Identifier Abbreviation	Features and Behaviors Identifier <feat>
DCCD	Discover Characteristics and Characteristic Descriptors
ETSP	Elapsed Time Service Procedures
IMDC	IMD Control
IMDF	Industrial Measurement Device Features
RACP	Record Access Control Point Procedures
RCCD	Read Characteristics and Characteristic Descriptors
WCCD	Write Characteristics and Characteristic Descriptors

Table 4.1: IMDP TC feature naming conventions

#### 4.1.2 Conformance

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

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

Such tests may verify:

- That claimed capabilities may be used in any order and any number of repetitions not excluded by the specification

- That capabilities enabled by the implementations are sustained over durations expected by the use case
- That the implementation gracefully handles any quantity of data expected by the use case
- That in cases where more than one valid interpretation of the specification exists, the implementation complies with at least one interpretation and gracefully handles other interpretations
- That the implementation is immune to attempted security exploits

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

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

### 4.1.3 Pass/Fail verdict conventions

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

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

## 4.2 Setup preambles

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

### 4.2.1 ATT Bearer on LE transport

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

### 4.2.2 ATT Bearer on BR/EDR transport

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

### 4.3 Generic GATT Integrated Tests

Execute the Generic GATT Integrated Tests defined in Section 6.4, Client test procedures (CGGIT), in [8] using Table 4.2 below as input:

TCID	Service/Characteristic	Reference	Properties	Value Length (Octets)	Service Type
IMDP/COL/CGGIT/SER/BV-01-C [Service GGIT – Industrial Measurement Device]	Industrial Measurement Device Service	[3] 4	-	-	Primary Service, Unique
IMDP/COL/CGGIT/SER/BV-02-C [Service GGIT – Device Information]	Device Information Service	[3] 4	-	-	Primary Service, Unique
IMDP/COL/CGGIT/SER/BV-03-C [Service GGIT – Battery]	Battery Service	[3] 4	-	-	Primary Service
IMDP/COL/CGGIT/SER/BV-04-C [Service GGIT – Elapsed Time]	Elapsed Time Service	[3] 4	-	-	Primary Service
IMDP/COL/CGGIT/CHA/BV-01-C [Characteristic GGIT – IMD Status]	IMD Status characteristic	[3] 4.4.3	0x10 (Notify)	Skip	-
IMDP/COL/CGGIT/CHA/BV-02-C [Characteristic GGIT – IMDS Descriptor Value Changed]	IMDS Descriptor Value Changed characteristic	[3] 4.4.4	0x20 (Indicate)	Skip	-
IMDP/COL/CGGIT/CHA/BV-03-C [Characteristic GGIT – First Use Date]	First Use Date characteristic	[3] 4.4.5	0x0A (Read, Write)	2, Skip-Write	-
IMDP/COL/CGGIT/CHA/BV-04-C [Characteristic GGIT – Life Cycle Data]	Life Cycle Data characteristic	[3] 4.4.6	0x0A (Read, Write)	2-35, Skip-Write	-
IMDP/COL/CGGIT/CHA/BV-05-C [Characteristic GGIT – Work Cycle Data]	Work Cycle Data	[3] 4.4.7	0x1A (Read, Write, Notify)	12, Skip-Write	-
IMDP/COL/CGGIT/CHA/BV-06-C [Characteristic GGIT – Service Cycle Data]	Service Cycle Data characteristic	[3] 4.4.8	0x0A (Read, Write)	2-17, Skip-Write	-
IMDP/COL/CGGIT/CHA/BV-07-C [Characteristic GGIT – IMD Control]	IMD Control characteristic	[3] 4.4.9	0x08 (Write)	Skip	-
IMDP/COL/CGGIT/CHA/BV-08-C [Characteristic GGIT – IMD Historical Data]	IMD Historical Data characteristic	[3] 4.4.10	0x10 (Notify)	Skip	-



TCID	Service/Characteristic	Reference	Properties	Value Length (Octets)	Service Type
IMDP/COL/CGGIT/CHA/BV-09-C [Characteristic GGIT – Record Access Control Point]	Record Access Control Point characteristic	[3] 4.4.10	0x28 (Write, Indicate)	Skip	-
IMDP/COL/CGGIT/CHA/BV-10-C [Characteristic GGIT – Manufacturer Name String]	Manufacturer Name String characteristic	[3] 4, 4.5	0x02 (Read)	Variable	-
IMDP/COL/CGGIT/CHA/BV-11-C [Characteristic GGIT – Serial Number String]	Serial Number String characteristic	[3] 4, 4.5	0x02 (Read)	Variable	-
IMDP/COL/CGGIT/CHA/BV-12-C [Characteristic GGIT – Hardware Revision String]	Hardware Revision String characteristic	[3] 4, 4.5	0x02 (Read)	Variable	-
IMDP/COL/CGGIT/CHA/BV-13-C [Characteristic GGIT – Firmware Revision String]	Firmware Revision String characteristic	[3] 4, 4.5	0x02 (Read)	Variable	-
IMDP/COL/CGGIT/CHA/BV-14-C [Characteristic GGIT – Battery Level]	Battery Level characteristic	[3] 4, 4.6	0x12 (Read, Notify)	1	-
IMDP/COL/CGGIT/CHA/BV-15-C [Characteristic GGIT – Current Elapsed Time]	Current Elapsed Time characteristic	[3] 4, 4.7	0x2A (Read, Write, Indicate)	11	-

Table 4.2: Input for the GGIT Client test procedure



## 4.4 Discover characteristics and characteristic descriptors

### IMDP/COL/DCCD/BV-01-C [Discover IMD Measurement characteristics]

- Test Purpose
 

Verify that the IUT can discover all supported IMD Measurement characteristics.
- Reference
 

[3] 4.4.2
- Initial Condition
  - A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
  - The Lower Tester includes one instantiation of the Industrial Measurement Device Service [4], including all characteristics and descriptors. These include:
    - Two instances of a supported IMD Measurement characteristic with the same UUID. The instances are distinguishable from each other by means of their Measurement Description descriptors, which have different values in at least one field.
    - One instance of an IMD Measurement characteristic with a UUID not recognized by the Collector on the Lower Tester.
  - The IUT has executed the [IMDP/COL/CGGIT/SER/BV-01-C \[Service GGIT – Industrial Measurement Device\]](#) procedure and has saved the handle range for an instantiation of the Industrial Measurement Device Service.
- Test Procedure
  1. The Upper Tester orders the IUT to discover the IMD Measurement characteristics.
  2. The IUT executes either alternative 2A or 2B:
    - Alternative 2A (Discover All Characteristics of a Service sub-procedure):
      - 2A.1 The IUT executes the Discover All Characteristics of a Service sub-procedure using the specified IMDS handle range.
    - Alternative 2B (Discover Characteristics by UUID sub-procedure):
      - 2B.1 The IUT executes the GATT Discover Characteristics by UUID sub-procedure for each supported IMPD characteristic UUID.
- Expected Outcome
 

Pass verdict

For each IMD Measurement characteristic supported by the IUT contained in the Lower Tester's instantiation of the Industrial Device Measurement Service, the IUT reports each attribute handle/value pair for each characteristic specified in the ICS [5] to the Upper Tester.

The IMD Measurement characteristic with the unrecognizable UUID is ignored and not reported to the Upper Tester.

#### 4.4.1 Discover IMD Measurement characteristic descriptors

- Test Purpose

Verify that the IUT can discover all supported characteristic descriptors associated with IMD Measurement characteristics.

- Reference

[3] 4.4.2

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The Lower Tester includes one instantiation of the Industrial Measurement Device Service [4], including all characteristics and descriptors. These include:
  - Two instances of a supported IMD Measurement characteristic with the same UUID. The instances are distinguishable from each other by means of their Measurement Description descriptors, which have different values in at least one field.
  - One instance of an IMD Measurement characteristic with a UUID not recognized by the Collector on the Lower Tester.
- The Lower Tester exposes the characteristic descriptor in Table 4.3 for each instance of the IMD Measurement characteristic.
- The IUT has discovered the handle range of each supported IMD Measurement characteristic.

- Test Case Configuration

Test Case	Descriptor
IMDP/COL/DCCD/BV-02-C [Discover IMD Measurement Client Configuration characteristic descriptor]	Client Configuration Characteristic Descriptor
IMDP/COL/DCCD/BV-03-C [Discover Measurement Description descriptor]	Measurement Description
IMDP/COL/DCCD/BV-04-C [Discover Characteristic User Description descriptor]	Characteristic User Description
IMDP/COL/DCCD/BV-05-C [Discover Manufacturer Limits descriptor]	Manufacturer Limits
IMDP/COL/DCCD/BV-06-C [Discover Process Tolerances descriptor]	Process Tolerances
IMDP/COL/DCCD/BV-07-C [Discover Trigger Settings descriptor]	Trigger Settings
IMDP/COL/DCCD/BV-08-C [Discover Valid Range descriptor]	Valid Range

Table 4.3: Discover IMD Measurement characteristic descriptors test cases

- Test Procedure

For each supported IMD Measurement characteristic handle range discovered:

1. The Upper Tester orders the IUT to discover all characteristic descriptors of the IMD Measurement characteristic.
2. The IUT executes the GATT Discover All Characteristic Descriptors sub-procedure using the specified handle range.



- Expected Outcome

Pass verdict

The IUT discovers the descriptor from [Table 4.3](#) in each instance of the IMD Measurement characteristic.

### IMDP/COL/DCCD/BV-09-C [Discover Other Device Information Service characteristics]

- Test Purpose

Verify that the IUT can discover all supported Device Information Service characteristics.

- Reference

[3] 4.5

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section [4.2.1](#), if using ATT over an LE transport, or Section [4.2.2](#) if using ATT over a BR/EDR transport.
- TSPX\_IUT\_Supported\_DIS\_Characteristics in the IXIT [\[6\]](#) specifies all characteristics of the Device Information Service supported by the IUT.
- The Lower Tester includes one instantiation of the Device Information Service [\[10\]](#), including all characteristics.
- The IUT has executed the [IMDP/COL/CGGIT/SER/BV-02-C \[Service GGIT – Device Information\]](#) procedure and has saved the handle range for an instantiation of the Device Information Service.

- Test Procedure

1. The Upper Tester orders the IUT to discover all DIS characteristics supported by the IUT in the Lower Tester.
2. The IUT executes either alternative 2A or 2B:
  - Alternative 2A (Discover All Characteristics of a Service sub-procedure):
    - 2A.1 The IUT executes the Discover All Characteristics of a Service sub-procedure using the specified DIS handle range.
  - Alternative 2B (Discover Characteristics by UUID sub-procedure):
    - 2B.1 The IUT executes the GATT Discover Characteristics by UUID sub-procedure for each supported DIS characteristic UUID.

- Expected Outcome

Pass verdict

For each DIS characteristic supported by the IUT contained in the Lower Tester's instantiation of the Device Information Service, the IUT reports an attribute handle/value pair for each characteristic specified in the IXIT [\[6\]](#) to the Upper Tester.

### IMDP/COL/DCCD/BV-10-C [Discover Other Battery Service characteristics]

- Test Purpose

Verify that the IUT can discover all supported Battery Service characteristics.

- Reference

[3] 4.6



- Initial Condition
  - A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
  - TSPX\_IUT\_Supported\_BAS\_Characteristics in the IXIT [6] specifies all characteristics of the Battery Service supported by the IUT.
  - The Lower Tester includes one instantiation of the Battery Service [11], including all characteristics.
  - The IUT has executed the IMDP/COL/CGGIT/SER/BV-03-C [Service GGIT – Battery] procedure and has saved the handle range for an instantiation of the Battery Service.
- Test Procedure
  1. The Upper Tester orders the IUT to discover all BAS characteristics supported by the IUT in the Lower Tester.
  2. The IUT executes either alternative 2A or 2B:
    - Alternative 2A (Discover All Characteristics of a Service sub-procedure):
      - 2A.1 The IUT executes the Discover All Characteristics of a Service sub-procedure using the specified BAS handle range.
    - Alternative 2B (Discover Characteristics by UUID sub-procedure):
      - 2B.1 The IUT executes the GATT Discover Characteristics by UUID sub-procedure for each supported BAS characteristic UUID.

- Expected Outcome

Pass verdict

For each BAS characteristic supported by the IUT contained in the Lower Tester's instantiation of the Battery Service, the IUT reports an attribute handle/value pair for each characteristic specified in the IXIT [6] to the Upper Tester.

## 4.5 Read characteristics and characteristic descriptors

### IMDP/COL/RCCD/BV-01-C [Read IMD Measurement characteristic]

- Test Purpose
 

Verify that the IUT can read the IMD Measurement characteristic.
- Reference
 

[3] 4.4.2
- Initial Condition
  - A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
  - The Lower Tester includes one instantiation of the Industrial Measurement Device Service [4] including all characteristics.
  - The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.

- Test Procedure

For each supported IMD Measurement characteristic that is discovered:

1. The Upper Tester orders the IUT to read the IMD Measurement characteristic.
2. The IUT executes the GATT Read Characteristic Value sub-procedure with the IMD Measurement characteristic.

- Expected Outcome

Pass verdict

The IUT successfully reads each supported IMD Measurement characteristic.

### IMDP/COL/RCCD/BV-02-C [Read Measurement Description descriptor]

- Test Purpose

Verify that the IUT can read the Measurement Description descriptor of an IMD Measurement characteristic and ignore RFU values in descriptor fields.

- Reference

[3] 4.4.2.1

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The Lower Tester includes one instantiation of the Industrial Measurement Device Service [4] in which multiple supported IMD Measurement characteristics containing the Measurement Description descriptor are present.
- One of the supported IMD Measurement characteristics on the Lower Tester has a Measurement Description descriptor with non-zero RFU bits in the Flags field.
- One of the supported IMD Measurement characteristics on the Lower Tester has a Measurement Description descriptor with Sampling Field, Measurement Period, and Internal Update Interval set to an RFU value.
- The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.

- Test Procedure

For each IMD Measurement characteristic containing the Measurement Description descriptor:

1. The Upper Tester orders the IUT to read the Measurement Description descriptor.
2. The IUT executes the GATT Read Characteristic Descriptors sub-procedure with the Measurement Description descriptor.

- Expected Outcome

Pass verdict

The IUT successfully reads the Measurement Description descriptor for each supported IMD Measurement characteristic.

The descriptor's Flags fields non-zero RFU bits are ignored, and the Flag field is read as if the RFU bits were set to 0.

The descriptor's Sampling Function and Application field RFU values are ignored as well.



**IMDP/COL/RCCD/BV-03-C [Read Long Characteristic User Description descriptor]**

## • Test Purpose

Verify that the IUT can read the Characteristic User Description descriptor of the IMD Measurement characteristics.

## • Reference

[3] 4.4.2.2

## • Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The Lower Tester includes one instantiation of the Industrial Measurement Device Service [4] in which multiple supported IMD Measurement characteristics containing the Characteristic User Description are present.
- The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.

## • Test Procedure

For each IMD Measurement characteristic containing the Characteristic User Description descriptor:

1. The Upper Tester orders the IUT to read the Characteristic User Description descriptor.
2. The IUT executes the GATT Read Characteristic Descriptors sub-procedure with the Characteristic User Description descriptor.

## • Expected Outcome

Pass verdict

The IUT successfully reads the Characteristic User Description descriptor for each supported IMD Measurement characteristic.

**4.5.1 Read IMD Measurement descriptors**

## • Test Purpose

Verify that the IUT can read the IMD Measurement characteristic descriptors.

## • Reference

[3] 4.4.2.3–4.4.2.6

## • Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The Lower Tester includes one instantiation of the Industrial Measurement Device Service [4] in which multiple supported IMD Measurement characteristics containing the descriptor in Table 4.4 are present.
- The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.

- Test Case Configuration

Test Case	Descriptor
<a href="#">IMDP/COL/RCCD/BV-04-C [Read Manufacturer Limits descriptor]</a>	Manufacturer Limits
<a href="#">IMDP/COL/RCCD/BV-05-C [Read Process Tolerances descriptor]</a>	Process Tolerances
<a href="#">IMDP/COL/RCCD/BV-06-C [Read Trigger Settings descriptor]</a>	Trigger Settings
<a href="#">IMDP/COL/RCCD/BV-07-C [Read Valid Range descriptor]</a>	Valid Range
<a href="#">IMDP/COL/RCCD/BV-08-C [Read Characteristic Extended Properties descriptor]</a>	Characteristic Extended Properties

Table 4.4: Read IMD Measurement descriptors test cases

- Test Procedure

For each IMD Measurement containing the descriptor from [Table 4.4](#):

1. The Upper Tester orders the IUT to read the descriptor from [Table 4.4](#).
2. The IUT executes the GATT Read Characteristic Descriptors sub-procedure with the descriptor from [Table 4.4](#).

- Expected Outcome

Pass verdict

The IUT successfully reads the descriptor from [Table 4.4](#) for each supported IMD Measurement characteristic.

## 4.6 Write characteristics and characteristic descriptors

### 4.6.1 Characteristic Write

- Test Purpose

Verify that the IUT can write the IMD Measurement characteristic descriptors.

- Reference

[3] 4.4.5, 4.4.6, 4.4.8

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in [Section 4.2.1](#), if using ATT over an LE transport, or [Section 4.2.2](#) if using ATT over a BR/EDR transport.
- The Lower Tester includes one instantiation of the Industrial Measurement Device Service [\[4\]](#), including all characteristics.
- The IUT has discovered the Industrial Measurement Device Service [\[4\]](#) and characteristics.
- If an authorized session is required to write the characteristic in [Table 4.5](#), then the IUT has established an authorized session with the Lower Tester.

- Test Case Configuration

Test Case	Characteristic
<a href="#">IMDP/COL/WCCD/BV-01-C [Write First Use Data characteristic]</a>	First Use Data
<a href="#">IMDP/COL/WCCD/BV-02-C [Write Life Cycle Data characteristic]</a>	Life Cycle Data
<a href="#">IMDP/COL/WCCD/BV-03-C [Write Service Cycle Data characteristic]</a>	Service Cycle Data

Table 4.5: Characteristic Write test cases

- Test Procedure

1. The Upper Tester orders the IUT to write the characteristic from [Table 4.5](#) with a valid value.
2. The IUT executes the GATT Write Characteristic Value sub-procedure with the characteristic from [Table 4.5](#).

- Expected Outcome

Pass verdict

The IUT successfully writes the characteristic from [Table 4.5](#).

### [IMDP/COL/WCCD/BV-04-C \[Write Long Characteristic User Description descriptor\]](#)

- Test Purpose

Verify that the IUT can write the Characteristic User Descriptor descriptors.

- Reference

[\[3\]](#) 4.4.2.2

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in [Section 4.2.1](#), if using ATT over an LE transport, or [Section 4.2.2](#) if using ATT over a BR/EDR transport.
- The Lower Tester includes one instantiation of the Industrial Measurement Device Service [\[4\]](#) in which multiple supported IMD Measurement characteristics containing the Characteristic User Description descriptor are present.
- The IUT has discovered the Industrial Measurement Device Service [\[4\]](#) and characteristics.
- The Characteristic Extended Properties descriptor is present, and the Writable Auxiliaries bit is set to 1 for each IMD Measurement characteristic containing the Characteristic User Description descriptor.
- If an authorized session is required to write the Characteristic User Description descriptor, then the IUT has established an authorized session with the Lower Tester.

- Test Procedure

For each IMD Measurement characteristic containing the Characteristic User Description descriptor:

1. The Upper Tester orders the IUT to write the Characteristic User Description descriptor with a valid value.
2. The IUT executes the GATT Write Long Characteristic Descriptors sub-procedure with the Characteristic User Description descriptor.

- Expected Outcome

Pass verdict

The IUT successfully writes the Characteristic User Description descriptor for each supported IMD Measurement characteristic.

#### 4.6.2 Write IMD Measurement characteristic descriptors

- Test Purpose

Verify that the IUT can write the IMD Measurement characteristic descriptors.

- Reference

[3] 4.4.2.4, 4.4.2.5

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The Lower Tester includes one instantiation of the Industrial Measurement Device Service [4] in which multiple supported IMD Measurement characteristics containing the descriptor in Table 4.6 are present.
- The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.
- If an authorized session is required to write the descriptor in Table 4.6, then the IUT has established an authorized session with the Lower Tester.

- Test Case Configuration

Test Case	Descriptor
IMDP/COL/WCCD/BV-05-C [Write Process Tolerances descriptor]	Process Tolerances
IMDP/COL/WCCD/BV-06-C [Write Trigger Settings descriptor]	Trigger Settings

Table 4.6: Write IMD Measurement characteristic descriptors test cases

- Test Procedure

For each IMD Measurement characteristic containing the descriptor from Table 4.6:

1. The Upper Tester orders the IUT to write the descriptor from Table 4.6 with a valid value.
2. The IUT executes the GATT Write Characteristic Descriptors sub-procedure with the descriptor from Table 4.6.

- Expected Outcome

Pass verdict

The IUT successfully writes the descriptor from Table 4.6 for each supported IMD Measurement characteristic.

**IMDP/COL/WCCD/BV-07-C [Write Work Cycle Data characteristic]**

## • Test Purpose

Verify that the IUT can write the Operation Request Codes to the Work Cycle Data characteristic.

## • Reference

[3] 4.4.7

## • Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The Lower Tester includes one instantiation of the Industrial Measurement Device Service [4] including all characteristics.
- The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.
- If an authorized session is required to write the Work Cycle Data characteristic, then the IUT has established an authorized session with the Lower Tester.

## • Test Procedure

For each round in Table 4.7:

1. The Upper Tester orders the IUT to write the Work Cycle Data characteristic with the Operation Request Code in Table 4.7.
2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Work Cycle Data characteristic.

Round	Operation Request Code
1	0x00
2	0x01

Table 4.7: Write Work Cycle Data characteristic rounds

## • Expected Outcome

Pass verdict

The IUT successfully writes the Work Cycle Data characteristic with the Operation Request Codes in Table 4.7.

**IMDP/COL/WCCD/BI-01-C [Write Life Cycle Data characteristic error]**

## • Test Purpose

Verify that the IUT can remain in normal operation after receiving the “Value Not Allowed” error when attempting to write a Life Cycle Data characteristic that has already been written to.

## • Reference

[3] 4.4.6

- Initial Condition
  - A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
  - The Lower Tester includes one instantiation of the Industrial Measurement Device Service [4] including all characteristics. The Life Cycle Data characteristic on the Lower Tester contains valid values for all fields.
  - The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.
  - If an authorized session is required to write the Life Cycle Data characteristic, then the IUT has established an authorized session with the Lower Tester.
- Test Procedure
  1. The Upper Tester orders the IUT to write the Life Cycle Data characteristic with a valid value.
  2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Life Cycle Data characteristic.
  3. The Lower Tester sends the “Value Not Allowed” ATT Error Response to the IUT.
  4. The Upper Tester orders the IUT to execute any sub-procedure that reads any characteristic.

- Expected Outcome

Pass verdict

The IUT remains in normal operation after receiving the “Value Not Allowed” ATT Error Response from the Lower Tester. This is verified by successful execution of Step 4.

### IMDP/COL/WCCD/BI-02-C [Write Work Cycle Data characteristic error]

- Test Purpose

Verify that the IUT can remain in normal operation after receiving the “Value Not Allowed” error when attempting to write the Work Cycle Data characteristic.
- Reference

[3] 4.4.7
- Initial Condition
  - A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
  - The Lower Tester includes one instantiation of the Industrial Measurement Device Service [4], including all characteristics.
  - The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.
  - If an authorized session is required to write the Work Cycle Data characteristic, then the IUT has established an authorized session with the Lower Tester.
- Test Procedure
  1. The Upper Tester orders the IUT to write the Work Cycle Data characteristic with a valid value.
  2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Work Cycle Data characteristic.

3. The Lower Tester sends the “Value Not Allowed” ATT Error Response to the IUT.
4. The Upper Tester orders the IUT to execute any sub-procedure that reads any characteristic.

- Expected Outcome

Pass verdict

The IUT remains in normal operation after receiving the “Value Not Allowed” ATT Error Response from the Lower Tester. This is verified by successful execution of Step 4.

## 4.7 Industrial Measurement Device features

### IMDP/SR/IMDF/BV-01-C [Industrial Measurement Device Service UUID in AD]

- Test Purpose

Verify that the Industrial Measurement Device Service UUID is included in AD from the IMD Server IUT when using the LE transport.

- Reference

[3] 3.1.1.1

- Initial Condition

- The IUT is powered on in GAP Discoverable Mode.
- The IUT is induced to generate Advertising packets.

- Test Procedure

1. The Lower Tester listens for Advertising packets from the IUT.

- Expected Outcome

Pass verdict

At least one received Advertising packet contains the defined Service UUID for «Industrial Measurement Device Service».

### IMDP/SR/IMDF/BV-02-C [Local Name included in AD or Scan Response]

- Test Purpose

Verify that the Local Name is included in AD or Scan Response data from the IMD Server IUT when using the LE transport.

- Reference

[3] 3.1.1.2

- Initial Condition

- The IUT is powered on in GAP Discoverable Mode.
- The IUT is induced to generate Advertising packets.

- Test Procedure

1. The Lower Tester listens for Advertising packets from the IUT.
2. When the Lower Tester receives an Advertising packet from the IUT, it sends a Scan Request to the IUT.
3. The Lower Tester listens for a Scan Response from the IUT.



- Expected Outcome

Pass verdict

The IUT sends an Advertising packet and a Scan Response packet.

The IUT includes the Local Name in either the Advertising packet or Scan Response packet, but not both.

### IMDP/SR/IMDF/BV-03-C [Appearance included in AD or Scan Response]

- Test Purpose

Verify that the Appearance characteristic value is included in AD or Scan Response data from the IMD Server IUT when using the LE transport.

- Reference

[3] 3.1.1.4

- Initial Condition

- The IUT is powered on in GAP Discoverable Mode.
- The IUT is induced to generate Advertising packets.

- Test Procedure

1. The Lower Tester listens for Advertising packets from the IUT.
2. When the Lower Tester receives an Advertising packet from the IUT, it sends a Scan Request to the IUT.
3. The Lower Tester listens for a Scan Response from the IUT.

- Expected Outcome

Pass verdict

The IUT sends an Advertising packet and a Scan Response packet.

The IUT includes the Appearance characteristic value in either the Advertising packet or Scan Response packet, but not both.

### IMDP/SR/IMDF/BV-04-C [Service Data included in AD]

- Test Purpose

Verify that the Service Data value is included in AD from the IMD Server IUT when using the LE transport.

- Reference

[3] 3.1.1.1

- Initial Condition

- The IUT is powered on in GAP Discoverable Mode.
- The IUT is induced to generate Advertising packets.
- The IMD Server IUT is in a mode in which it will include the Service Data AD type in its advertising data.

- Test Procedure
  1. The Lower Tester listens for Advertising packets from the IUT.

- Expected Outcome

Pass verdict

The IUT sends Advertising packets.

The IUT includes the Service Data AD type in the Advertising packet with a format meeting the requirements of the service [4].

In addition to the UUID of the Industrial Measurement Device Service, the Service AD Type value includes the full or partial concatenation of 16-bit unique UUIDs of the IMD Measurement characteristics supported by the IMD Server as defined in [7].

### IMDP/COL/IMDF/BV-01-C [Configure and receive IMD Measurement characteristic notifications]

- Test Purpose

Verify that the IUT can configure and receive IMD Measurement characteristic notifications from the Lower Tester.

- Reference

[3] 4.4.2

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The IUT has discovered the Client Characteristic Configuration descriptor for the supported IMD Measurement characteristics on the Lower Tester.

- Test Procedure

1. The Upper Tester orders the IUT to configure the Lower Tester to send IMD Measurement characteristic notifications.
2. For each IMD Measurement characteristic supported by the IUT, the Lower Tester sends a notification containing a valid IMD Measurement value to the IUT.

- Expected Outcome

Pass verdict

The IUT executes the GATT Write Characteristic Value procedure with the Lower Tester with the handle set to the Client Characteristic Configuration descriptor for an IMD Measurement characteristic and the value set to «notification».

The IUT correctly receives each IMD Measurement notification sent by the Lower Tester.

### IMDP/COL/IMDF/BV-02-C [Configure and receive IMDS Descriptor Value Changed characteristic indications]

- Test Purpose

Verify that the IUT can configure and receive IMDS Descriptor Value Changed characteristic indications from the Lower Tester.

- Reference

[3] 4.4.4

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The IUT has discovered the Client Characteristic Configuration descriptor for the IMDS Descriptor Value Changed characteristic on the Lower Tester.

- Test Procedure

1. The Upper Tester orders the IUT to configure the Lower Tester to send IMDS Descriptor Value Changed characteristic indications.
2. The Lower Tester sends an indication containing a valid IMDS Descriptor Value Changed value to the IUT.

- Expected Outcome

Pass verdict

The IUT executes the GATT Write Characteristic Value procedure with the Lower Tester with the handle set to the Client Characteristic Configuration descriptor for the IMDS Descriptor Value Changed characteristic and the value set to «indication».

The IUT correctly receives the IMDS Descriptor Value Changed indication sent by the Lower Tester.

### IMDP/COL/IMDF/BV-03-C [Configure and receive IMD Status characteristic notifications]

- Test Purpose

Verify that the IUT can configure and receive IMD Status characteristic notifications from the Lower Tester.

- Reference

[3] 4.4.3

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The IUT has discovered the Client Characteristic Configuration descriptor for the IMD Status characteristics on the Lower Tester.

- Test Procedure
  1. The Upper Tester orders the IUT to configure the Lower Tester to send IMD Status characteristic notifications.
  2. The Lower Tester sends a notification containing a valid IMD Status value to the IUT.

- Expected Outcome

Pass verdict

The IUT executes the GATT Write Characteristic Value procedure with the Lower Tester with the handle set to the Client Characteristic Configuration descriptor for the IMD Status characteristic and the value set to «notification».

The IUT correctly receives the IMD Status notification sent by the Lower Tester.

### IMDP/COL/IMDF/BV-04-C [Configure and receive Work Cycle Data characteristic notifications]

- Test Purpose

Verify that the IUT can configure and receive Work Cycle Data characteristic notifications from the Lower Tester.

- Reference

[3] 4.4.7

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The IUT has discovered the Client Characteristic Configuration descriptor for the Work Cycle Data characteristics on the Lower Tester.

- Test Procedure

1. The Upper Tester orders the IUT to configure the Lower Tester to send Work Cycle Data characteristic notifications.
2. The Lower Tester sends a notification containing a valid Work Cycle Data value to the IUT.

- Expected Outcome

Pass verdict

The IUT executes the GATT Write Characteristic Value procedure with the Lower Tester with the handle set to the Client Characteristic Configuration descriptor for the Work Cycle Data characteristic and the value set to «notification».

The IUT correctly receives the Work Cycle Data notification sent by the Lower Tester.

## 4.8 IMD Control

### 4.8.1 Request to start measurement without Measurement Description descriptor or parameters

- Test Purpose

Verify that the IUT can request the Lower Tester to start the measurement by writing the IMD Control characteristic with Op Code set to 0x00.

- Reference

[3] 4.4.9.1

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.
- The IUT has registered for the IMD Measurement characteristic notifications using the Client Characteristic Configuration descriptor.
- The IMD Measurement characteristic includes or excludes the Measurement Description descriptor based on Table 4.8. If the Measurement Description descriptor is included, then the Sampling Function field and Description field are not included.
- If an authorized session is required to write the IMD Control characteristic, then the IUT has established an authorized session with the Lower Tester.

- Test Case Configuration

Test Case	Measurement Descriptor Included
IMDP/COL/IMDC/BV-01-C [Request to start measurement: No Measurement Description descriptor]	No
IMDP/COL/IMDC/BV-02-C [Request to start measurement: No required Measurement Description descriptor parameters]	Yes

Table 4.8: Request to start measurement without Measurement Description descriptor or parameters test cases

- Test Procedure

1. The Upper Tester orders the IUT to start measurement.
2. The IUT executes the GATT Write Characteristic Value sub-procedure with the handle of the IMD Control characteristic, the Op Code set to 0x00, and the Parameters field set to valid values.
3. The IUT receives an IMD Measurement notification after the Lower Tester completes the measurement.

- Expected Outcome

Pass verdict

The IUT successfully writes the IMD Control characteristic with Op Code set to 0x00 and processes the IMD Measurement notification received after measurement has been completed.

During the GATT Write Characteristic Value sub-procedure, the IUT successfully sets the Sampling Function parameter to the default value of 0x01 and the Description parameter to the default value of 0x00.

### IMDP/COL/IMDC/BV-03-C [Request to abort current operation]

- Test Purpose

Verify that the IUT can request the Lower Tester to abort the current operation by writing the IMD Control characteristic with Op Code set to 0x01.

- Reference

[3] 4.4.9.2

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.
- The IUT has registered for the IMD Measurement characteristic notifications using the Client Characteristic Configuration descriptor.
- If an authorized session is required to write the IMD Control characteristic, then the IUT has established an authorized session with the Lower Tester.

- Test Procedure

1. The Upper Tester orders the IUT to start a delayed measurement.
2. The IUT executes the GATT Write Characteristic Value sub-procedure with the handle of the IMD Control characteristic, the Op Code set to 0x00, and the Parameters field set to valid values, including Delay set to 1 minute.
3. The Upper Tester orders the IUT to abort the current operation.
4. The IUT executes the GATT Write Characteristic Value sub-procedure with the handle of the IMD Control characteristic and the Op Code set to 0x01.

- Expected Outcome

Pass verdict

The IUT successfully writes the IMD Control characteristic with Op Code set to 0x01 to abort the current measurement operation.

### IMDP/COL/IMDC/BV-04-C [Request to start measurement: Measurement Description descriptor parameters present]

- Test Purpose

Verify that the IUT can request the Lower Tester with Measurement Description descriptors present to start the measurement by writing the IMD Control characteristic with Op Code set to 0x00.

- Reference

[3] 4.4.9.1



- Initial Condition
  - A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
  - The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.
  - The IUT has registered for the IMD Measurement characteristic notifications using the Client Characteristic Configuration descriptor.
  - The IMD Measurement characteristic includes the Measurement Description descriptor and contains valid values for Sampling Function and Description.
  - If an authorized session is required to write the IMD Control characteristic, then the IUT has established an authorized session with the Lower Tester.
- Test Procedure
  1. The Upper Tester orders the IUT to start measurement.
  2. The IUT executes the GATT Write Characteristic Value sub-procedure with the handle of the IMD Control characteristic, the Op Code set to 0x00, and the Parameters field set to valid values.
  3. The IUT receives an IMD Measurement notification after the Lower Tester completes the measurement.

- Expected Outcome

#### Pass verdict

The IUT successfully writes the IMD Control characteristic with Op Code set to 0x00 and processes the IMD Measurement notification received after measurement has been completed.

During the GATT Write Characteristic Value sub-procedure, the IUT successfully sets the Sampling Function parameter and the Description parameter to the values of the IMD Measurement characteristic's Measurement Description descriptor.

### IMDP/COL/IMDC/BI-01-C [Request to abort current operation error]

- Test Purpose
 

Verify that the IUT remains in normal operation after receiving the “Request Not Supported” ATT Error Response when trying to abort the current operation on the Lower Tester by writing the IMD Control characteristic with Op Code set to 0x01.
- Reference
 

[3] 4.4.9.2
- Initial Condition
  - A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
  - The IUT has discovered the Industrial Measurement Device Service [4] and characteristics.
  - The IUT has registered for the IMD Measurement characteristic notifications using the Client Characteristic Configuration descriptor.
  - If an authorized session is required to write the IMD Control characteristic, then the IUT has established an authorized session with the Lower Tester.



- Test Procedure
  1. The Upper Tester orders the IUT to abort the current operation.
  2. The IUT executes the GATT Write Characteristic Value sub-procedure with the handle of the IMD Control characteristic and the Op Code set to 0x01.
  3. The Lower Tester sends the “Request Not Supported” ATT Error Response to the IUT.
  4. The Upper Tester orders the IUT to execute any sub-procedure that reads any characteristic.

- Expected Outcome

Pass verdict

The IUT remains in normal operation after receiving the “Request Not Supported” ATT Error Response from the Lower Tester. This is verified by successful execution of Step 4.

## 4.9 Record Access Control Point

Round	Record Type
1	0x00 (IMD Service Cycle Data Record)
2	0x01 (IMD Work Cycle Data Record)

Table 4.9: RACP Record Type rounds

### 4.9.1 Report Number of Stored Records

- Test Purpose

Verify that the IUT can execute the Report Number of Stored Records procedure with the selected Operator, Record Types, Filter Type, and Filter Parameters.

- Reference

[3] 4.4.10.2.2

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The IUT has registered for the Record Access Control Point characteristic indications using the Client Characteristic Configuration descriptor.
- If an authorized session is required to execute the Report Number of Stored Records procedure, then the IUT has established an authorized session with the Lower Tester.
- The Lower Tester contains at least five records with the record type set to the round in Table 4.9.

- Test Case Configuration

Test Case	Operator	Record Types	Operand Filter Type	Operand Filter Parameters
IMDP/COL/RACP/BV-01-C [Report Number of Stored Records: All Records]	All records	Round in Table 4.9	N/A	N/A
IMDP/COL/RACP/BV-02-C [Report Number of Stored Records: First Record]	First record	Round in Table 4.9	N/A	N/A
IMDP/COL/RACP/BV-03-C [Report Number of Stored Records: Last Record]	Last record	Round in Table 4.9	N/A	N/A

Test Case	Operator	Record Types	Operand Filter Type	Operand Filter Parameters
IMDP/COL/RACP/BV-04-C [Report Number of Stored Records: Less Than Or Equal To Sequence Number]	Less than or equal to	Round in Table 4.9	Sequence Number	<maximum filter value>
IMDP/COL/RACP/BV-05-C [Report Number of Stored Records: Less Than Or Equal To Timestamp]	Less than or equal to	Round in Table 4.9	Timestamp	<maximum filter value>
IMDP/COL/RACP/BV-06-C [Report Number of Stored Records: Greater Than Or Equal To Sequence Number]	Greater than or equal to	Round in Table 4.9	Sequence Number	<minimum filter value>
IMDP/COL/RACP/BV-07-C [Report Number of Stored Records: Greater Than Or Equal To Timestamp]	Greater than or equal to	Round in Table 4.9	Timestamp	<minimum filter value>
IMDP/COL/RACP/BV-08-C [Report Number of Stored Records: Within Range Of Sequence Number]	Within range of	Round in Table 4.9	Sequence Number	<minimum filter value>, <maximum filter value>
IMDP/COL/RACP/BV-09-C [Report Number of Stored Records: Within Range Of Timestamp]	Within range of	Round in Table 4.9	Timestamp	<minimum filter value>, <maximum filter value>

Table 4.10: Report Number of Stored Records test cases

- Test Procedure

Repeat Steps 1–4 using RACP Records with the Record Type enumerated in Table 4.9 on the Lower Tester:

1. The Upper Tester orders the IUT to execute the Report Number of Stored Records procedure using the Record Types, Operator, Operand Filter Type (if applicable), and Operand Filter Parameters (if applicable) from Table 4.10.
2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Record Access Control Point characteristic, Op Code set to 0x04, and the parameter values from Step 1.
3. The Lower Tester sends the Number of Stored Records Response indication with the Operand containing the number of stored records available in the server matching the request.
4. The IUT reports the Number of Stored Records Response indication to the Upper Tester.

- Expected Outcome

Pass verdict

For each round in Table 4.9, the IUT successfully initiates the Report Number of Stored Records procedure and receives the number of stored records that matches the Filter Parameters from the Lower Tester.

## 4.9.2 Combined Report

- Test Purpose

Verify that the IUT can execute the Combined Report procedure with the selected Operator, Record Types, Filter Type, and Filter Parameters.

- Reference

[3] 4.4.10.2.3



- Initial Condition
  - A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
  - The IUT has registered for the Record Access Control Point characteristic indications using the Client Characteristic Configuration descriptor.
  - The IUT has registered for the IMD Historical Data characteristic notifications using the Client Characteristic Configuration descriptor.
  - If an authorized session is required to execute the Combined Report procedure, then the IUT has established an authorized session with the Lower Tester.
  - The Lower Tester contains at least five records with the record type set to the round in Table 4.9.
- Test Case Configuration

Test Case	Operator	Record Types	Operand Filter Type	Operand Filter Parameters
IMDP/COL/RACP/BV-10-C [Combined Report: All Records]	All records	Round in Table 4.9	N/A	N/A
IMDP/COL/RACP/BV-11-C [Combined Report: First Record]	First record	Round in Table 4.9	N/A	N/A
IMDP/COL/RACP/BV-12-C [Combined Report: Last Record]	Last record	Round in Table 4.9	N/A	N/A
IMDP/COL/RACP/BV-13-C [Combined Report: Less Than Or Equal To Sequence Number]	Less than or equal to	Round in Table 4.9	Sequence Number	<maximum filter value>
IMDP/COL/RACP/BV-14-C [Combined Report: Less Than Or Equal To Timestamp]	Less than or equal to	Round in Table 4.9	Timestamp	<maximum filter value>
IMDP/COL/RACP/BV-15-C [Combined Report: Greater Than Or Equal To Sequence Number]	Greater than or equal to	Round in Table 4.9	Sequence Number	<minimum filter value>
IMDP/COL/RACP/BV-16-C [Combined Report: Greater Than Or Equal To Timestamp]	Greater than or equal to	Round in Table 4.9	Timestamp	<minimum filter value>
IMDP/COL/RACP/BV-17-C [Combined Report: Within Range Of Sequence Number]	Within range of	Round in Table 4.9	Sequence Number	<minimum filter value>, <maximum filter value>
IMDP/COL/RACP/BV-18-C [Combined Report: Within Range Of Timestamp]	Within range of	Round in Table 4.9	Timestamp	<minimum filter value>, <maximum filter value>

Table 4.11: Combined Report test cases

- Test Procedure
 

Repeat Steps 1–5 using RACP Records with the Record Types enumerated in Table 4.9 on the Lower Tester:

  1. The Upper Tester orders the IUT to execute the Combined Report procedure using the Record Types, Operator, Operand Filter Type (if applicable), and Operand Filter Parameters (if applicable) from Table 4.11.
  2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Record Access Control Point characteristic, Op Code set to 0x07, and the parameter values from Step 1.
  3. The Lower Tester sends the IMD Historical Data characteristic notifications for each matching record based on the criteria from Step 2.



4. The Lower Tester sends the Combined Report Response indication with the Operand containing the number of records sent that matches the request.
5. The IUT reports the Combined Report Response indication to the Upper Tester.

- Expected Outcome

Pass verdict

For each round in [Table 4.9](#), the IUT successfully initiates the Combined Report procedure and receives the notifications of the IMD Historical Data characteristic that match the Filter Parameters from the Lower Tester. The number of notifications received by the IUT matches the Operand value in the Combined Report Response indication.

### 4.9.3 Delete Stored Records

- Test Purpose

Verify that the IUT can execute the Delete Stored Records procedure with the selected Operator, Record Types, Filter Type, and Filter Parameters.

- Reference

[3] 4.4.10.2.4

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The IUT has registered for the Record Access Control Point characteristic indications using the Client Characteristic Configuration descriptor.
- If an authorized session is required to execute the Delete Stored Records procedure, then the IUT has established an authorized session with the Lower Tester.
- The Lower Tester contains at least five records with the record type set to the round in [Table 4.9](#).

- Test Case Configuration

Test Case	Operator	Record Types	Operand Filter Type	Operand Filter Parameters
<a href="#">IMDP/COL/RACP/BV-19-C [Delete Stored Records: All Records]</a>	All records	Round in <a href="#">Table 4.9</a>	N/A	N/A
<a href="#">IMDP/COL/RACP/BV-20-C [Delete Stored Records: First Record]</a>	First record	Round in <a href="#">Table 4.9</a>	N/A	N/A
<a href="#">IMDP/COL/RACP/BV-21-C [Delete Stored Records: Last Record]</a>	Last record	Round in <a href="#">Table 4.9</a>	N/A	N/A
<a href="#">IMDP/COL/RACP/BV-22-C [Delete Stored Records: Less Than Or Equal To Sequence Number]</a>	Less than or equal to	Round in <a href="#">Table 4.9</a>	Sequence Number	<maximum filter value>
<a href="#">IMDP/COL/RACP/BV-23-C [Delete Stored Records: Less Than Or Equal To Timestamp]</a>	Less than or equal to	Round in <a href="#">Table 4.9</a>	Timestamp	<maximum filter value>
<a href="#">IMDP/COL/RACP/BV-24-C [Delete Stored Records: Greater Than Or Equal To Sequence Number]</a>	Greater than or equal to	Round in <a href="#">Table 4.9</a>	Sequence Number	<minimum filter value>
<a href="#">IMDP/COL/RACP/BV-25-C [Delete Stored Records: Greater Than Or Equal To Timestamp]</a>	Greater than or equal to	Round in <a href="#">Table 4.9</a>	Timestamp	<minimum filter value>
<a href="#">IMDP/COL/RACP/BV-26-C [Delete Stored Records: Within Range Of Sequence Number]</a>	Within range of	Round in <a href="#">Table 4.9</a>	Sequence Number	<minimum filter value>, <maximum filter value>

Test Case	Operator	Record Types	Operand Filter Type	Operand Filter Parameters
IMDP/COL/RACP/BV-27-C [Delete Stored Records: Within Range Of Timestamp]	Within range of	Round in Table 4.9	Timestamp	<minimum filter value>, <maximum filter value>

Table 4.12: Delete Stored Records test cases

- Test Procedure

Repeat Steps 1–4 using RACP Records with the Record Types enumerated in Table 4.9 on the Lower Tester:

1. The Upper Tester orders the IUT to execute the Delete Stored Records procedure using the Record Types, Operator, Operand Filter Type (if applicable), and Operand Filter Parameters (if applicable) from Table 4.12.
2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Record Access Control Point characteristic, Op Code set to 0x02, and the parameter values from Step 1.
3. The Lower Tester sends the Response Code indication with the Response Code value set to Success.
4. The IUT reports the Response Code indication to the Upper Tester.

- Expected Outcome

Pass verdict

For each round in Table 4.9, the IUT successfully initiates the Delete Stored Records procedure and receives the Response Code indication indicating Success from the Lower Tester.

### IMDP/COL/RACP/BV-28-C [Abort Operation procedure]

- Test Purpose

Verify that the IUT can execute the Abort Operation procedure.

- Reference

[3] 4.4.10.2.5

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The IUT has registered for the Record Access Control Point characteristic indications using the Client Characteristic Configuration descriptor.
- The IUT has registered for the IMD Historical Data characteristic notifications using the Client Characteristic Configuration descriptor.
- If an authorized session is required to execute the Abort Operation procedure, then the IUT has established an authorized session with the Lower Tester.
- The Lower Tester contains enough records with the record type set to the round in Table 4.9 such that transmission cannot complete before an abort procedure is attempted.

- Test Procedure

Repeat Steps 1–7 using RACP Records with the Record Types enumerated in [Table 4.9](#) on the Lower Tester:

1. The Upper Tester orders the IUT to execute the Combined Report procedure using the “All records” Operator.
2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Record Access Control Point characteristic, Op Code set to 0x07, and the parameter values from Step 1.
3. As the Lower Tester sends the IMD Historical Data characteristic notifications, the Upper Tester orders the IUT to execute the Abort Operation procedure.
4. The IUT executes the GATT Write Characteristic Value sub-procedure with the Record Access Control Point characteristic and Op Code set to 0x03.
5. The Lower Tester sends an additional IMD Historical Data characteristic notification before sending the Response Code indication with the Request Op Code set to Abort Operation.
6. The IUT reports the Response Code indication to the Upper Tester.
7. The Lower Tester sends an additional IMD Historical Data characteristic notification.

- Expected Outcome

Pass verdict

For each round in [Table 4.9](#), the IUT successfully initiates the Abort Operation procedure and waits for the Response Code indication indicating Abort Operation from the Lower Tester. The IUT successfully ignores or processes the additional IMD Historical Data characteristic notification sent after the Response Code indication is received.

### IMDP/COL/RACP/BV-29-C [RACP procedure timeout]

- Test Purpose

Verify that the IUT remains in normal operation following a procedure timeout after executing a Combined Report procedure with the Lower Tester.

- Reference

[3] 4.4.10.1.1

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in [Section 4.2.1](#), if using ATT over an LE transport, or [Section 4.2.2](#) if using ATT over a BR/EDR transport.
- The IUT has registered for the Record Access Control Point characteristic indications using the Client Characteristic Configuration descriptor.
- The IUT has registered for the IMD Historical Data characteristic notifications using the Client Characteristic Configuration descriptor.
- If an authorized session is required to execute the Combined Report procedure, then the IUT has established an authorized session with the Lower Tester.
- The Lower Tester contains at least five records.

- Test Procedure
  1. The Upper Tester orders the IUT to execute the Combined Report procedure using the “All records” Operator.
  2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Record Access Control Point characteristic, Op Code set to 0x07, and the parameter values from Step 1.
  3. The Lower Tester sends only two IMD Historical Data characteristic notifications and then pauses for at least 30 seconds.
  4. The Upper Tester orders the IUT to execute the Combined Report procedure using the “All records” Operator.
  5. The IUT does not execute the procedure.
  6. The connection between the IUT and the Lower Tester is disconnected and then reconnected.
  7. The IUT executes either alternative 7A or 7B:
    - Alternative 7A:
      - 7A.1 The IUT autonomously re-executes the Combined Report procedure from Step 2.
    - Alternative 7B:
      - 7B.1 The Upper Tester orders the IUT to execute the Combined Report procedure using the “All records” Operator.
      - 7B.2 The IUT executes the GATT Write Characteristic Value sub-procedure with the Record Access Control Point characteristic, Op Code set to 0x07, and the parameter values from Step 7B.1.
  8. The Lower Tester sends the IMD Historical Data characteristic notifications.
- Expected Outcome

#### Pass verdict

The IUT successfully starts a 30-second timer when a procedure starts, resets the 30-second timer when IMD Historical Data characteristic notifications are received, and refuses to start a new procedure after the first procedure times out until a new connection is made.

### IMDP/COL/RACP/BV-30-C [Support for record addition and deletions between procedures]

- Test Purpose
 

Verify that the IUT remains in normal operation after receiving a different number of records from a Combined Report procedure after executing the Report Number of Stored Records procedure.
- Reference
 

[3] 4.4.10.2
- Initial Condition
  - A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
  - The IUT has registered for the Record Access Control Point characteristic indications using the Client Characteristic Configuration descriptor.
  - The IUT has registered for the IMD Historical Data characteristic notifications using the Client Characteristic Configuration descriptor.

- If an authorized session is required to execute the Combined Report procedure, then the IUT has established an authorized session with the Lower Tester.
- The Lower Tester contains at least five records.
- Test Procedure
  1. The Upper Tester orders the IUT to execute the Report Number of Stored Records procedure using the “All records” Operator.
  2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Record Access Control Point characteristic, Op Code set to 0x04, and the parameter values from Step 1.
  3. The Lower Tester sends the Number of Stored Records Response indication with the Operand containing the number of stored records available in the server matching the request.
  4. The IUT reports the Number of Stored Records Response indication to the Upper Tester.
  5. The Upper Tester orders the IUT to execute the Combined Report procedure using the “All records” Operator.
  6. The IUT executes the GATT Write Characteristic Value sub-procedure with the Record Access Control Point characteristic, Op Code set to 0x07, and the parameter values from Step 1.
  7. The Lower Tester sends the IMD Historical Data characteristic notifications for each matching record based on the criteria from Step 6. The number of notifications sent by the Lower Tester is less than the Number of Stored Records Response given in Step 3.
  8. The Lower Tester sends the Combined Report Response indication with the Operand containing the number of records sent that matches the request.
  9. The IUT reports the Combined Report Response indication to the Upper Tester.

- Expected Outcome

#### Pass verdict

The IUT remains in normal operation after receiving fewer notifications of the IMD Historical Data characteristic than the Number of Stored Records value received after executing the Report Number of Stored Records procedure.

### 4.9.4 RACP error codes

- Test Purpose

Verify that the IUT remains in normal operation after receiving Response Code Op Code indications with error codes from the Lower Tester.

- Reference

[3] 4.4.10.3

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The IUT has registered for the Record Access Control Point characteristic indications using the Client Characteristic Configuration descriptor.
- The IUT has registered for the IMD Historical Data characteristic notifications using the Client Characteristic Configuration descriptor.



- If an authorized session is required to execute the Combined Report procedure, then the IUT has established an authorized session with the Lower Tester.
- The Lower Tester contains at least five records.
- Test Case Configuration

Test Case	Op Code, Operator, Operand	Response Operand Values
IMDP/COL/RACP/BI-01-C [RACP error codes: Op Code Not Supported]	Op Code: 0x02 (Delete Stored Records) Operator: All records	Request Op Code: 0x02 Response Code Value: Op Code Not Supported
IMDP/COL/RACP/BI-02-C [RACP error codes: Invalid Operator]	Op Code: 0x04 (Report Number of Stored Records) Operator: Optional Operator Operand: Relevant Operator Filter Type and Filter Parameters	Request Op Code: 0x04 Response Code Value: Invalid Operator
IMDP/COL/RACP/BI-03-C [RACP error codes: Operator Not Supported]	Op Code: 0x04 (Report Number of Stored Records) Operator: Optional Operator Operand: Relevant Operator Filter Type and Filter Parameters	Request Op Code: 0x04 Response Code Value: Operator Not Supported
IMDP/COL/RACP/BI-04-C [RACP error codes: Invalid Operand]	Op Code: 0x04 (Report Number of Stored Records) Operator: Supported Operator Operand: Optional Operand Filter Type and Filter Parameters	Request Op Code: 0x04 Response Code Value: Invalid Operand
IMDP/COL/RACP/BI-05-C [RACP error codes: Operand Not Supported]	Op Code: 0x04 (Report Number of Stored Records) Operator: Supported Operator Operand: Optional Operand Filter Type and Filter Parameters	Request Op Code: 0x04 Response Code Value: Operand Not Supported
IMDP/COL/RACP/BI-06-C [RACP error codes: Procedure Not Completed]	Op Code: 0x07 (Combined Report) Operator: All records	Request Op Code: 0x04 Response Code Value: Procedure Not Completed

Table 4.13: RACP error codes test cases

- Test Procedure
  1. The Upper Tester orders the IUT to write to the RACP characteristic with the Op Code, Operator, and Operand in [Table 4.13](#) and Record Types set to a supported record type.
  2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Record Access Control Point characteristic with the values from Step 1.
  3. The Lower Tester sends the Response Code indication with the Response Code Op Code and Response Operand Values set to the values in [Table 4.13](#).
  4. The IUT reports the Response Code indication to the Upper Tester.
  5. The Upper Tester orders the IUT to execute any supported RACP procedure with valid values.
- Expected Outcome

Pass verdict

The IUT remains in normal operation after receiving Response Code Op Code indications with error codes from the Lower Tester. This is verified by successful execution of Step 5.

## 4.10 Elapsed Time Service procedures

### IMDP/SR/ETSP/BV-01-C [Generate IMD Historical Records with Time Stamps]

- Test Purpose

Verify that the IUT can set accurate time stamps that match the Current Elapsed Time characteristic for IMD Historical Records.

- Reference

[3] 3.4

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The Lower Tester has discovered the Industrial Measurement Device Service [4] and characteristics.
- The Lower Tester has discovered the Elapsed Time Service [12] and characteristics.
- The IUT's Current Elapsed Time characteristic is accurately set to the current time.
- The IUT has no previous IMD Historical Records generated.

- Test Procedure

1. The Lower Tester induces the IUT to generate an IMD Historical Record by writing to the Service Cycle Data characteristic with a valid value.
2. The IUT creates an IMD Historical Record.
3. The Lower Tester executes the GATT Read Characteristic Value sub-procedure with the Current Elapsed Time characteristic.
4. The Lower Tester executes the RACP Combined Report procedure using the "All records" Operator.

- Expected Outcome

Pass verdict

The IUT uses the Current Elapsed Time characteristic value for the Record Timestamp and the time stamp is within one minute of the Current Elapsed Time value when read.

### IMDP/SR/ETSP/BV-02-C [Updating Current Elapsed Time characteristic]

- Test Purpose

Verify that the IUT can update Record Timestamps for IMD Historical Records when Current Elapsed Time characteristic Time Value is changed.

- Reference

[3] 3.4

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.



- The IUT contains at least one valid IMD Historical Record in the IMD Historical Data characteristic. If only one IMD Historical Record exists, then Bit 5 of the Current Elapsed Time Flags is set to 1. If more than one IMD Historical Record exists, then all but one IMD Historical Records have Bit 5 of the Current Elapsed Time Flags set to 1.
  - The IUT has Bit 4 of the Current Elapsed Time Flags set to 0.
  - The Lower Tester has discovered the Elapsed Time Service [12] and characteristics.
  - If an authorized session is required to write the Current Elapsed Time characteristic, then the Lower Tester has established an authorized session with the IUT.
- Test Procedure
    1. The Lower Tester executes the GATT Write Characteristic Value sub-procedure with the Current Elapsed Time characteristic with Bit 4 of the Current Elapsed Time Flag set to 1, but all other values remain the same.
    2. The IUT does not update any IMD Historical Records.
    3. The Lower Tester executes the GATT Write Characteristic Value sub-procedure with the Current Elapsed Time characteristic with a Time Value increased by one hour.
    4. The IUT executes either alternative 4A or 4B to the IMD Historical Records with Record Timestamp Flags Bit 5 set to 1:
      - Alternative 4A:
        - 4A.1 The IUT sets the select IMD Historical Records Record Timestamp Flag Bit 5 to 0.
      - Alternative 4B:
        - 4B.1 The IUT increments the select IMD Historical Records Record Timestamp value by one hour.
- Expected Outcome

Pass verdict

The IUT successfully updates select IMD Historical Records when the Current Elapsed Time characteristic Time Value is changed.

### IMDP/COL/ETSP/BV-01-C [Setting Time on IMD Server]

- Test Purpose
 

Verify that the IUT can set the time on the Lower Tester by writing the Current Elapsed Time characteristic.
- Reference
 

[3] 4.7
- Initial Condition
  - A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
  - The Lower Tester includes one instantiation of the Elapsed Time Service [12] including all characteristics with the Current Elapsed Time characteristic flags set to the round in Table 4.14.
  - The IUT has discovered the Elapsed Time Service and characteristics.
  - If an authorized session is required to write the Current Elapsed Time characteristic, then the IUT has established an authorized session with the Lower Tester.



- Test Procedure

For each round in [Table 4.14](#):

1. The Upper Tester orders the IUT to write the Current Elapsed Time characteristic with a valid time value.
2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Current Elapsed Time characteristic.

Round	Current Elapsed Time Flags	Current Elapsed Time Characteristic Type
1	0b00111010	Coordinated Universal Time (UTC) with TZ and DST offset
2	0b00100000	Local time
3	0b00101101	Tick counter

*Table 4.14: Setting Time on IMD Server rounds*

- Expected Outcome

Pass verdict

For each round, the IUT successfully writes the Current Elapsed Time characteristic using the format of the characteristic from [Table 4.14](#).

### IMDP/COL/ETSP/BI-01-C [Elapsed Time Service errors]

- Test Purpose

Verify that the IUT remains in normal operation after receiving Elapsed Time Service error codes from the Lower Tester.

- Reference

[3] 4.7

- Initial Condition

- A bearer connection between the Lower Tester and the IUT is established as described in Section 4.2.1, if using ATT over an LE transport, or Section 4.2.2 if using ATT over a BR/EDR transport.
- The Lower Tester includes one instantiation of the Elapsed Time Service [12], including all characteristics.
- The IUT has discovered the Elapsed Time Service and characteristics.
- If an authorized session is required to write the Current Elapsed Time characteristic, then the IUT has established an authorized session with the Lower Tester.

- Test Procedure

For each round in [Table 4.15](#):

1. The Upper Tester orders the IUT to write the Current Elapsed Time characteristic with a valid time value.
2. The IUT executes the GATT Write Characteristic Value sub-procedure with the Current Elapsed Time characteristic.
3. The Lower Tester responds with an Attribute Protocol Application Error Code from [Table 4.15](#).
4. The IUT reports the Attribute Protocol Application Error Code to the Upper Tester.



Round	Error Code Name	Error Code
1	Time Source Quality Too Low	0x80
2	Incorrect Time Format	0x81
3	Out of Range	0xFF

Table 4.15: Elapsed Time Service errors rounds

- Expected Outcome

Pass verdict

For each round in [Table 4.15](#), the IUT successfully reports the Attribute Protocol Application Error Code to the Upper Tester.

## 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 IMDP [5].

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

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

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

Item	Feature	Test Case(s)
IMDP 5/2	Industrial Measurement Device Service UUID in AD	IMDP/SR/IMDF/BV-01-C
IMDP 5/3	Local Name in AD or Scan Response	IMDP/SR/IMDF/BV-02-C
IMDP 5/4	Appearance in AD or Scan Response	IMDP/SR/IMDF/BV-03-C
IMDP 5/5	Service Data included in AD	IMDP/SR/IMDF/BV-04-C
IMDP 5/1	Timestamp in IMD Historical Records	IMDP/SR/ETSP/BV-01-C
IMDP 7/1	Update IMD Historical Records after Timestamp update	IMDP/SR/ETSP/BV-02-C
IMDP 9/1	Discover Industrial Measurement Device Service	IMDP/COL/CGGIT/SER/BV-01-C
IMDP 9/2	Discover Device Information Service	IMDP/COL/CGGIT/SER/BV-02-C
IMDP 9/3	Discover Battery Service	IMDP/COL/CGGIT/SER/BV-03-C
IMDP 9/4	Discover Elapsed Time Service	IMDP/COL/CGGIT/SER/BV-04-C
IMDP 10/1	IMD Measurement characteristic	IMDP/COL/DCCD/BV-01-C
IMDP 10/2	Measurement Description descriptor	IMDP/COL/DCCD/BV-03-C
IMDP 10/3	Characteristic User Description descriptor	IMDP/COL/DCCD/BV-04-C
IMDP 10/4	Manufacturer Limits descriptor	IMDP/COL/DCCD/BV-05-C
IMDP 10/5	Process Tolerances descriptor	IMDP/COL/DCCD/BV-06-C
IMDP 10/6	Trigger Settings descriptor	IMDP/COL/DCCD/BV-07-C
IMDP 10/7	Valid Range descriptor	IMDP/COL/DCCD/BV-08-C
IMDP 10/8	IMDS Descriptor Value Changed characteristic	IMDP/COL/CGGIT/CHA/BV-02-C
IMDP 10/9	First Use Date characteristic	IMDP/COL/CGGIT/CHA/BV-03-C
IMDP 10/10	Life Cycle Data characteristic	IMDP/COL/CGGIT/CHA/BV-04-C
IMDP 10/11	Work Cycle Data characteristic	IMDP/COL/CGGIT/CHA/BV-05-C
IMDP 10/12	Service Cycle Data characteristic	IMDP/COL/CGGIT/CHA/BV-06-C
IMDP 10/13	IMD Control characteristic	IMDP/COL/CGGIT/CHA/BV-07-C

Item	Feature	Test Case(s)
IMDP 10/14	IMD Historical Data characteristic	IMDP/COL/CGGIT/CHA/BV-08-C
IMDP 10/15	Record Access Control Point characteristic	IMDP/COL/CGGIT/CHA/BV-09-C
IMDP 10/16	IMD Status characteristic	IMDP/COL/CGGIT/CHA/BV-01-C
IMDP 12/2	IMD Measurement Notifications	IMDP/COL/DCCD/BV-02-C IMDP/COL/IMDF/BV-01-C
IMDP 12/1	Read IMD Measurement characteristic	IMDP/COL/RCCD/BV-01-C
IMDP 12/4	Read Measurement Description descriptor	IMDP/COL/RCCD/BV-02-C
IMDP 12/5	Read Long Characteristic User Description descriptor	IMDP/COL/RCCD/BV-03-C
IMDP 12/7	Read Manufacturer Limits descriptor	IMDP/COL/RCCD/BV-04-C
IMDP 12/8	Read Process Tolerances descriptor	IMDP/COL/RCCD/BV-05-C
IMDP 12/10	Read Trigger Settings descriptor	IMDP/COL/RCCD/BV-06-C
IMDP 12/12	Read Valid Range descriptor	IMDP/COL/RCCD/BV-07-C
IMDP 12/13	Read Characteristic Extended Properties descriptor	IMDP/COL/RCCD/BV-08-C
IMDP 12/6	Write Long Characteristic User Description descriptor	IMDP/COL/WCCD/BV-04-C
IMDP 12/9	Write Process Tolerances descriptor	IMDP/COL/WCCD/BV-05-C
IMDP 12/11	Write Trigger Settings descriptor	IMDP/COL/WCCD/BV-06-C
IMDP 12/16	Write First Use Data characteristic	IMDP/COL/WCCD/BV-01-C
IMDP 12/18	Write Life Cycle Data characteristic	IMDP/COL/WCCD/BV-02-C IMDP/COL/WCCD/BI-01-C
IMDP 12/20	Write Work Cycle Data characteristic	IMDP/COL/WCCD/BV-07-C IMDP/COL/WCCD/BI-02-C
IMDP 12/21	Work Cycle Data notifications	IMDP/COL/IMDF/BV-04-C
IMDP 12/23	Write Service Cycle Data characteristic	IMDP/COL/WCCD/BV-03-C
IMDP 12/14	IMDS Descriptor Value Changed indications	IMDP/COL/IMDF/BV-02-C
IMDP 12/28	IMD Status notifications	IMDP/COL/IMDF/BV-03-C
IMDP 13/1	IMD Control: Start Measurement without Measurement descriptor	IMDP/COL/IMDC/BV-01-C
IMDP 13/1 AND IMDP 10/2	IMD Control: Start Measurement with Measurement Description descriptor	IMDP/COL/IMDC/BV-02-C IMDP/COL/IMDC/BV-04-C
IMDP 13/2	IMD Control: Abort Operation	IMDP/COL/IMDC/BV-03-C IMDP/COL/IMDC/BI-01-C
IMDP 15/1	Delete Stored Records: All Records	IMDP/COL/RACP/BV-19-C
IMDP 15/2	Delete Stored Records: Less Than Or Equal To Sequence Number	IMDP/COL/RACP/BV-22-C
IMDP 15/3	Delete Stored Records: Less Than Or Equal To Timestamp	IMDP/COL/RACP/BV-23-C
IMDP 15/4	Delete Stored Records: Greater Than Or Equal To Sequence Number	IMDP/COL/RACP/BV-24-C
IMDP 15/5	Delete Stored Records: Greater Than Or Equal To Timestamp	IMDP/COL/RACP/BV-25-C

Item	Feature	Test Case(s)
IMDP 15/6	Delete Stored Records: Within Range of Sequence Number	IMDP/COL/RACP/BV-26-C
IMDP 15/7	Delete Stored Records: Within Range of Timestamp	IMDP/COL/RACP/BV-27-C
IMDP 15/8	Delete Stored Records: First record	IMDP/COL/RACP/BV-20-C
IMDP 15/9	Delete Stored Records: Last record	IMDP/COL/RACP/BV-21-C
IMDP 16/1	Report Number of Stored Records: All Records	IMDP/COL/RACP/BV-01-C
IMDP 16/2	Report Number of Stored Records: Less Than Or Equal To Sequence Number	IMDP/COL/RACP/BV-04-C
IMDP 16/3	Report Number of Stored Records: Less Than Or Equal To Timestamp	IMDP/COL/RACP/BV-05-C
IMDP 16/4	Report Number of Stored Records: Greater Than Or Equal To Sequence Number	IMDP/COL/RACP/BV-06-C
IMDP 16/5	Report Number of Stored Records: Greater Than Or Equal To Timestamp	IMDP/COL/RACP/BV-07-C
IMDP 16/6	Report Number of Stored Records: Within Range of Sequence Number	IMDP/COL/RACP/BV-08-C
IMDP 16/7	Report Number of Stored Records: Within Range of Timestamp	IMDP/COL/RACP/BV-09-C
IMDP 16/8	Report Number of Stored Records: First record	IMDP/COL/RACP/BV-02-C
IMDP 16/9	Report Number of Stored Records: Last record	IMDP/COL/RACP/BV-03-C
IMDP 17/1	Combined Report: All Records	IMDP/COL/RACP/BV-10-C IMDP/COL/RACP/BV-29-C
IMDP 17/2	Combined Report: Less Than Or Equal To Sequence Number	IMDP/COL/RACP/BV-13-C
IMDP 17/3	Combined Report: Less Than Or Equal To Timestamp	IMDP/COL/RACP/BV-14-C
IMDP 17/4	Combined Report: Greater Than Or Equal To Sequence Number	IMDP/COL/RACP/BV-15-C
IMDP 17/5	Combined Report: Greater Than Or Equal To Timestamp	IMDP/COL/RACP/BV-16-C
IMDP 17/6	Combined Report: Within Range of Sequence Number	IMDP/COL/RACP/BV-17-C
IMDP 17/7	Combined Report: Within Range of Timestamp	IMDP/COL/RACP/BV-18-C
IMDP 17/8	Combined Report: First record	IMDP/COL/RACP/BV-11-C
IMDP 17/9	Combined Report: Last record	IMDP/COL/RACP/BV-12-C
IMDP 14/2	RACP Abort Operation procedure	IMDP/COL/RACP/BV-28-C
IMDP 16/1 AND IMDP 17/1	RACP Record Addition and Deletions Between Procedures	IMDP/COL/RACP/BV-30-C
IMDP 14/1	RACP Error Code: Op Code Not Supported	IMDP/COL/RACP/BI-01-C
IMDP 14/3	RACP Operator and Operand Error Codes	IMDP/COL/RACP/BI-02-C IMDP/COL/RACP/BI-03-C IMDP/COL/RACP/BI-04-C IMDP/COL/RACP/BI-05-C

Item	Feature	Test Case(s)
IMDP 14/4	RACP Error Code: Procedure Not Completed	IMDP/COL/RACP/BI-06-C
IMDP 18/1	Manufacturer Name String characteristic	IMDP/COL/CGGIT/CHA/BV-10-C
IMDP 18/2	Serial Number String characteristic	IMDP/COL/CGGIT/CHA/BV-11-C
IMDP 18/3	Hardware Revision String characteristic	IMDP/COL/CGGIT/CHA/BV-12-C
IMDP 18/4	Firmware Revision String characteristic	IMDP/COL/CGGIT/CHA/BV-13-C
IMDP 18/5	Other DIS characteristics	IMDP/COL/DCCD/BV-09-C
IMDP 19/1	Battery Level characteristic	IMDP/COL/CGGIT/CHA/BV-14-C
IMDP 19/2	Other BAS characteristics	IMDP/COL/DCCD/BV-10-C
IMDP 20/1	Current Elapsed Time characteristic	IMDP/COL/CGGIT/CHA/BV-15-C IMDP/COL/ETSP/BV-01-C IMDP/COL/ETSP/BI-01-C

Table 5.1: Test case mapping

## 6 Revision history and acknowledgments

### *Revision History*

Publication Number	Revision Number	Date	Comments
0	p0	2024-10-22	Approved by BTI on 2024-09-30. IMDP v1.0 adopted by the BoD on 2024-10-15. Prepared for initial publication.

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