Continuous Glucose Monitoring Service (CGMS)

***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 Continuous Glucose Monitoring Service Specification with the objective to provide a high probability of air interface interoperability between the tested implementation and other manufacturers' Bluetooth devices.

2 References, definitions, and abbreviations

2.1 References

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

[1] Test Strategy and Terminology Overview

[2] Continuous Glucose Monitoring Service Specification, Version 1.0 or later

[3] Continuous Glucose Monitoring Service Characteristics, Version 1.0 or later

[4] ICS Proforma for Continuous Glucose Monitoring Service

[5] GATT Test Suite, GATT.TS

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

[7] Continuous Glucose Monitoring Service Implementation extra Information for Test, IXIT

[8] Core Specification Supplement (CSS), Version 6 or later

[9] Bluetooth Core Specification, Version 4.0 or later

2.2 Definitions

In this Bluetooth document, the definitions from [1] and [9] apply.

2.3 Acronyms and abbreviations

In this Bluetooth document, the definitions, acronyms, and abbreviations from [1] and [9] apply.

3 Test Suite Structure (TSS)

3.1 Overview

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

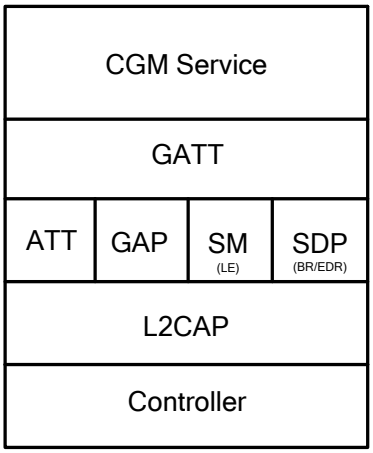

Figure 3.1: CGM Service test model

3.2 Test Strategy

The test objectives are to verify functionality of the CGM 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
- Characteristic Write
- Configure indication and notification
- CGM Measurement Characteristic Notification

- Record Access Control Point (RACP) procedures
- CGM Specific Ops Control Point 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 [1]. The convention used here is:
<spec abbreviation>/<IUT role>/<class>/**<feat>**/<func>/<subfunc>/<cap>/**<xx>-<nn>-<y>**.

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

Identifier Abbreviation	**Spec Identifier <spec abbreviation>**
CGMS	Continuous Glucose Monitoring Service
Identifier Abbreviation	**Role Identifier <IUT role>**
SEN	CGM Sensor role
Identifier Abbreviation	**Reference Identifier <GGIT test group>**
SGGIT	Server Generic GATT Integrated Tests
Identifier Abbreviation	**Reference Identifier <GGIT class>**
CHA	Characteristic
ISFC	Indication Supported Features Characteristic
SER	Service
Identifier Abbreviation	**Feature and Behaviors Identifier <feat>**
CBE	Common Behavior of Control Point – Error Handling
CGMCP	CGM Specific ops Control Point Procedures
CN	Characteristic Notification
CON	Configure Indication and Notification
CR	Characteristic Read
CW	Characteristic Write
RAA	Record Access Control Point – Abort Procedure
RAD	Record Access Control Point – Delete Procedure
RAE	Record Access Control Point – Specific Errors
RAN	Record Access Control Point – Number Procedure
RAR	Record Access Control Point – Report Procedure

Table 4.1: CGMS TC feature naming conventions

4.1.2 Conformance

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

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

Such tests may verify:

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

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

In any case, where a member finds an issue with the test plan generated by Launch Studio, 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 LE Transport

- Preamble Procedure

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

4.2.2 ATT Bearer on BR/EDR Transport

- Preamble Procedure

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

4.2.3 Record Access Control Point

- Preamble Purpose

  This preamble procedure enables the IUT to use the Record Access Control Point (RACP).

- Preamble Procedure

  1. If a connection exists, it gets disconnected.
  2. Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.
  3. The handle of the CGM Measurement characteristic and Record Access Control Point 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.
  4. The handle of the Client Characteristic Configuration descriptor of the CGM Measurement characteristic and Record Access Control Point 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.
  5. If the Lower Tester and IUT were not previously bonded, perform a bonding procedure. If previously bonded, re-enable encryption.
  6. The CGM Measurement characteristic is configured for notifications.
  7. The Record Access Control Point characteristic is configured for indications.

4.2.4 CGM Specific Ops Control Point

- Preamble Purpose

  This preamble procedure enables the IUT to use CGM Specific Ops Control Point.

- Preamble Procedure

  1. If a connection exists, it gets disconnected.
  2. Establish an ATT Bearer connection between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.
  3. The handle of the CGM Measurement characteristic and CGM Specific Ops Control Point 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.
  4. The handle of the Client Characteristic Configuration descriptor of the CGM Measurement characteristic and CGM Specific Ops Control Point 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.
  5. If the Lower Tester and IUT were not previously bonded, perform a bonding procedure. If previously bonded, re-enable encryption.
  6. The CGM Measurement characteristic is configured for notifications.
  7. The CGM Specific Ops Control Point characteristic is configured for indications.

4.3 Generic GATT Integrated Tests

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

TCID	Service / Characteristic	Reference	Properties	Value Length (Octets)	Type
CGMS/SEN/SGGIT/SER/BV-01-C [Service GGIT – Continuous Glucose Monitoring]	CGM Service	[2] 2	-	-	Not defined
CGMS/SEN/SGGIT/CHA/BV-02-C [Characteristic GGIT – CGM Measurement]	CGM Measurement characteristic	[2] 3	0x10 (Notify)	Skip	-
CGMS/SEN/SGGIT/CHA/BV-03-C [Characteristic GGIT – CGM Feature]	CGM Feature characteristic	[2] 3.2	0x02 (Read)	Skip	-
CGMS/SEN/SGGIT/CHA/BV-04-C [Characteristic GGIT – CGM Status]	CGM Status characteristic	[2] 3.3	0x02 (Read)	Skip	-
CGMS/SEN/SGGIT/CHA/BV-05-C [Characteristic GGIT – CGM Session Start Time]	CGM Session Start Time characteristic	[2] 3.4	0x0A (Read, Write)	Skip	-
CGMS/SEN/SGGIT/CHA/BV-06-C [Characteristic GGIT – CGM Session Run Time]	CGM Session Run Time characteristic	[2] 3.5	0x02 (Read)	Skip	-
CGMS/SEN/SGGIT/CHA/BV-07-C [Characteristic GGIT – Record Access Control Point]	Record Access Control Point characteristic	[2] 3.6	0x28 (Write, Indicate)	Skip	-
CGMS/SEN/SGGIT/CHA/BV-08-C [Characteristic GGIT – CGM Specific Ops Control Point]	CGM Specific Ops Control Point characteristic	[2] 3.7	0x28 (Write, Indicate)	Skip	-
CGMS/SEN/SGGIT/CHA/BV-09-C [Characteristic GGIT – CGM Feature - Indicate]	CGM Feature characteristic	[2] 3.2	0x22 (Read, Indicate)	Skip	-
CGMS/SEN/SGGIT/SDP/BV-10-C [SDP Record – Continuous Glucose Monitoring]	CGM Service	[2] 4	-	-	-

Table 4.2: Input for the GGIT Server test procedure

4.3.1 Generic GATT Indication Supported Features characteristic

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

TCID	Characteristic	Reference	TC Configuration
CGMS/SEN/SGGIT/ISFC/BV-11-C [Characteristic GGIT – CGM Feature indication]	CGM Feature	[2] 3.2.1	N/A

Table 4.3: GGIT Indication Supported Features Characteristic tests

4.4 Characteristic Read

- Test Purpose

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

- Reference

  [2] 3.2.1

- Initial Condition

  - The handle of each characteristic value referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.

- Test Case Configuration

Test Case	Value (Requirements)
CGMS/SEN/CR/BV-01-C [Characteristic Read – 'CGM Feature']	3 octets received with RFU bits set to 0. (Section 3.2.1.1 in [2])
CGMS/SEN/CR/BV-02-C [Characteristic Read – 'CGM Feature Type Sample Location'] Note: Set the bit 0 of the Type Nibble to 1 for a precise distinction between LSN and MSN.	2 Nibbles received containing the following: • LSN = Type Nibble • MSN = Sample-Location Nibble The RFU bits in both nibble are set to 0 (Section 3.2.1.2 in [2])

Table 4.4: Characteristic Read Value test cases

- Test Procedure

  1. The Lower Tester sends an ATT_Read_Request to the IUT to read the characteristic value.

- Expected Outcome

  Pass verdict

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

  A 2 octet E2E-CRC-Field is present in the read characteristic value. The field value depends on if the IUT supports E2E-safety or not. If not, the value should be set to 0xFFFF.

CGMS/SEN/CR/BV-03-C [Characteristic Read – 'CGM Feature' – Multiple Bonds]

- Test Purpose

  Verify that the IUT claims proper support for multiple bonds in the CGM Feature characteristic (CGM Feature Bit 13 'Multiple Bond supported' is set to 1).

- Reference

  [2] 3.2.1.1

- Initial Condition
  - The handle of the CGM Feature 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.
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.
- Test Procedure
  1. The Lower Tester sends an ATT_Read_Request to the IUT to read the CGM Feature characteristic value.
- Expected Outcome

  Pass verdict

  The characteristic is successfully read and Bit 13 of the CGM Feature characteristic 'Multiple Bond supported' is set to 1.

CGMS/SEN/CR/BV-04-C [Characteristic Read – 'CGM Session Start Time with E2E-CRC']

- Test Purpose

  Verify that the IUT can read the CGM Session Start Time characteristic.
- Reference

  [2] 3.4
- Initial Condition
  - The handle of the CGM Session Start Time 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.
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.
  - Both the IUT and the Lower Tester support E2E-CRC safety (Bit 12 'E2E-CRC supported' in CGM Feature flags is set to 1).
- Test Procedure
  1. The Lower Tester sends an ATT_Read_Request to the IUT to read the CGM Session Start Time characteristic value.
- Expected Outcome

  Pass verdict

  The CGM Session Start Time characteristic is successfully read and the characteristic value meets the requirements of the service.

  The E2E-CRC field is present in the CGM Session Start Time characteristic value.

CGMS/SEN/CR/BV-05-C [Characteristic Read – 'CGM Session Start Time without E2E-CRC']

- Test Purpose

  Verify that the IUT can read the CGM Session Start Time characteristic.

- Reference

  [2] 3.4

- Initial Condition

  - The handle of the CGM Session Start Time 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.
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.
  - Neither the IUT nor the Lower Tester support E2E-CRC safety (Bit 12 'E2E-CRC supported' in CGM Feature flags is set to 0).

- Test Procedure

  1. The Lower Tester sends an ATT_Read_Request to the IUT to read the CGM Session Start Time characteristic value.

- Expected Outcome

  Pass verdict

  The CGM Session Start Time characteristic is successfully read and the characteristic value meets the requirements of the service.

  The E2E-CRC field is excluded and not present in CGM Session Start Time characteristic value.

CGMS/SEN/CR/BV-06-C [Characteristic Read – 'CGM Session Run Time with E2E-CRC']

- Test Purpose

  Verify that the IUT can read the CGM Session Run Time characteristic.

- Reference

  [2] 3.5

- Initial Condition

  - The handle of the CGM Session Run Time 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.
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.
  - Both the IUT and the Lower Tester support E2E-CRC safety (Bit 12 'E2E-CRC supported' in CGM Feature flags is set to 1).

- Test Procedure

  1. The Lower Tester sends an ATT_Read_Request to the IUT to read the CGM Session Run Time characteristic value.

- Expected Outcome

  Pass verdict

  The CGM Session Run Time characteristic is successfully read and the characteristic value meets the requirements of the service.

  The E2E-CRC field is present in CGM Session Run Time characteristic value.

CGMS/SEN/CR/BV-07-C [Characteristic Read – 'CGM Session Run Time without E2E-CRC']

- Test Purpose

  Verify that the IUT can read the CGM Session Run Time characteristic.

- Reference

  [2] 3.5

- Initial Condition

  - The handle of the CGM Session Start Time 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.
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.
  - Neither the IUT nor and the Lower Tester support E2E-CRC safety (Bit 12 'E2E-CRC supported' in CGM Feature flags is set to 0).

- Test Procedure

  1. The Lower Tester sends an ATT_Read_Request to the IUT to read the CGM Session Run Time characteristic value.

- Expected Outcome

  Pass verdict

  The CGM Session Run Time characteristic is successfully read and the characteristic value meets the requirements of the service.

  The E2E-CRC field is excluded and not present in CGM Session Run Time characteristic value.

CGMS/SEN/CR/BV-08-C [Characteristic Read – 'CGM Status']

- Test Purpose

  Verify that the IUT can read the CGM Status characteristic.

- Reference

  [2] 3.3

- Initial Condition

  - The handle of the CGM 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.
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.

- Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).

- Test Procedure

  1. The Lower Tester sends an ATT_Read_Request to the IUT to read the CGM Status characteristic value.

- Expected Outcome

  Pass verdict

  The CGM Status characteristic is successfully read and the characteristic value meets the requirements of the service.

CGMS/SEN/CR/BV-09-C [Characteristic Read – ‘Verify E2E-CRC calculation’]

- Test Purpose

  Verify the calculated E2E-CRC value.

- Reference

  [2] 3.1.1.8, 3.2.1.1, 3.2.1.3, 3.3.2, 3.4.4, 3.5.2, 3.7.2

- Initial Condition

  - The handle of the characteristic in the test case below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.
  - Both the IUT and the Lower Tester support E2E-CRC safety (Bit 12 ‘E2E-CRC supported’ in CGM Feature flags is set to 1).

- Test Procedure

  1. The Lower Tester sends an ATT_Read_Request to the IUT to read out any characteristic value which supports E2E-CRC safety (e.g., CGM Status).
  2. Verify that the read out characteristic contains an E2E-CRC field and that the calculated CRC meets the requirement of the service.

- Expected Outcome

  Pass verdict

  The calculated CRC meets the requirement of the service.

4.5 Characteristic Write

CGMS/SEN/CW/BV-01-C [Characteristic Write - ‘CGM Session Start Time’, Type 1]

- Test Purpose

  Verify that the CGM Session Start Time characteristic can be written.

- Reference

  [2] 3.4.1

- Initial Condition
  - The handle of the characteristic value referenced in the test case below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or to 0).
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.
- Test Procedure
  1. Select a value that is valid for the characteristic. The Lower Tester sends an ATT_Write_Request, with the CGM Session Start Time characteristic handle and value, to the IUT.
  2. The Lower Tester sends an ATT_Read_Request to the IUT to read the CGM Session Start Time characteristic value.
  3. The Lower Tester sends an ATT_Read_Request to the IUT to read the CGM Status characteristic to obtain the Time Offset field value.
  4. Verify that the characteristic value is successfully written in step 1 based on the CGM Session Start Time and the CGM Status Time Offset field read in steps 2 and 3.
- Expected Outcome

  Pass verdict

  The characteristic value is successfully written in step 1 and is verified by the Lower Tester to be within 10% of the CGM Session Start time minus the CGM Status Time Offset Field.

CGMS/SEN/CW/BI-01-C [Characteristic Write - ‘CGM Session Start Time’, Type 2]

- Test Purpose

  Verify that the CGM Session Start Time characteristic can´t be written when value is invalid.
- Reference

  [2] 3.4.1
- Initial Condition
  - The handle of the characteristic value referenced in the test case below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.
- Test Procedure
  1. Select a value that is invalid for the characteristic, (e.g., set the Time Zone field to a value of 126). The Lower Tester sends an ATT_Write_Request, with the CGM Session Start Time characteristic handle and value, to the IUT.
  2. The Lower Tester receives an ATT Error Response.

- Expected Outcome

  Pass verdict

  The IUT sends an ATT Error Response with the error code '0xFF' set to 'Out-Of-Range' as defined in [8] Section 2.1.

  The IUT responds within the applicable timeout.

4.6 Configure Indication and Notification

- Test Purpose

  Verify compliant operation in response to enable and disable characteristic indication or notification and reading of the client characteristic configuration descriptor value.

- Reference

  [2] 3.1.1

- Initial Condition

  - The handle of each characteristic value referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.
  - The handle of the client characteristic configuration descriptor of each characteristic referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.
  - An ATT Bearer connection has been established between the Lower Tester and IUT as described in Section 4.2.1 if using LE Transport or Section 4.2.2 if using a BR/EDR Transport.

- Test Case Configuration

Test Case	Value (Requirements)
CGMS/SEN/CON/BV-01-C [Configure Notification – 'CGM Measurement']	0x0001 (Section 3.1.1 in [2])
CGMS/SEN/CON/BV-02-C [Configure Indication – 'Record Access Control Point']	0x0002 (Section 3.5 in [2])
CGMS/SEN/CON/BV-03-C [Configure Indication – 'CGM Specific Ops Control Point']	0x0002 (Section 3.7 in [2])

Table 4.5: Configure Indication and Notification test cases

- Test Procedure

  1. Disable indication or notification by writing value 0x0000 to the client characteristic configuration descriptor of the characteristic.
  2. The Lower Tester reads the value of the client characteristic configuration descriptor.
  3. Enable notification or indication by writing the Value (Requirements) described in Table 4.5 to the client characteristic configuration descriptor of the characteristic.
  4. The Lower Tester reads the value of the client characteristic configuration descriptor.

- Expected Outcome

  Pass verdict

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

4.7 CGM Measurement Characteristic Notification

This test group is for generic use and contains one or more test cases to verify that the value of the CGM Measurement characteristic meets the requirements of the service particular the presence of the optional Sensor Status Annunciation field, CGM Trend Information field, CGM Quality field and E2E-CRC field.

CGMS/SEN/CN/BV-01-C [CGM Measurement Notifications – Type 1]

- Test Purpose

  Verify that the IUT can send notifications of the CGM Measurement characteristic with only mandatory field values.

- Reference

  [2] 3.1.1

- Initial Condition

  - Perform the preamble described in Section 4.2.3.

- Test Procedure

  1. Perform an action on the IUT to create at least one CGM Measurement characteristic with at least the mandatory field values as defined in [3].
  2. The Lower Tester uses the RACP (e.g., using the procedure in Section 4.10) to cause the record to be notified.

- Expected Outcome

  Pass verdict

  The IUT sends a number of notifications of the CGM Measurement characteristic depending on the used MTU size.

  At least a Size field, a Flags field, a CGM Glucose Concentration field and a Time Offset field are present in the record.

  The value of the characteristic meets the requirements of the service as defined in the CGM Feature requirement of the different test cases.

CGMS/SEN/CN/BV-02-C [CGM Measurement Notifications – Type 2]

- Test Purpose

  Verify that the IUT can send notifications of the CGM Measurement characteristic that include Sensor Status Annunciation values.

- Reference

  [2] 3.1.1

- Initial Condition

  - Perform the preamble described in Section 4.2.3.

- Test Procedure

  1. Perform an action on the IUT to create at least one CGM Measurement characteristic that includes Sensor Status Annunciation values.
  2. The Lower Tester uses the RACP (e.g., using the procedure in Section 4.10) to cause the record to be notified.

- Expected Outcome

  Pass verdict

  The IUT sends a number of notifications of the CGM Measurement characteristic depending on the used MTU size.

  A Size field, a Flags field, a CGM Glucose Concentration field and a Time Offset field are present in the record.

  At least in one record the Sensor Status Annunciation Field is present.

  The value of the characteristic meets the requirements of the service as defined in the CGM Feature requirement.

CGMS/SEN/CN/BV-03-C [CGM Measurement Notifications – Type 3]

- Test Purpose

  Verify that the IUT can send notifications of the CGM Measurement characteristic that includes CGM Trend Information values.

- Reference

  [2] 3.1.1

- Initial Condition

  - Perform the preamble described in Section 4.2.3.

- Test Procedure

  1. Perform an action on the IUT to create at least one CGM Measurement characteristic that includes CGM Trend Information value.
  2. The Lower Tester uses the RACP (e.g., using the procedure in Section 4.10) to cause the record to be notified.

- Expected Outcome

  Pass verdict

  The IUT sends a number of notifications of the CGM Measurement characteristic depending on the used MTU size.

  A Size field, a Flags field, a CGM Glucose Concentration field and a Time Offset field are present in the record.

  At least in one record the CGM Trend Information Field is present.

  The value of the characteristic meets the requirements of the service as defined in the CGM Feature requirement.

CGMS/SEN/CN/BV-04-C [CGM Measurement Notifications – Type 4]

- Test Purpose

  Verify that the IUT can send notifications of the CGM Measurement characteristic that includes CGM Quality values.

- Reference

  [2] 3.1.1

- Initial Condition

  - Perform the preamble described in Section 4.2.3.

- Test Procedure

  1. Perform an action on the IUT to create at least one CGM Measurement characteristic that includes CGM Quality value.
  2. The Lower Tester uses the RACP (e.g., using the procedure in Section 4.10) to cause the record to be notified.

- Expected Outcome

  Pass verdict

  The IUT sends a number of notifications of the CGM Measurement characteristic depending on the used MTU size.

  A Size field, a Flags field, a CGM Glucose Concentration field and a Time Offset field are present in the record.

  At least in one record the CGM Quality Field is present.

  The value of the characteristic meets the requirements of the service as defined in the CGM Feature requirement.

CGMS/SEN/CN/BV-05-C [CGM Measurement Notifications – Type 5]

- Test Purpose

  Verify that the IUT can send notifications of the CGM Measurement characteristic that includes E2E-CRC values.

- Reference

  [2] 3.1.1

- Initial Condition

  - Perform the preamble described in Section 4.2.3.

- Test Procedure

  1. Perform an action on the IUT to create at least one CGM Measurement characteristic including an E2E-CRC value as defined in [3].
  2. The Lower Tester uses the RACP (e.g., using the procedure in Section 4.10) to cause the record to be notified.

- Expected Outcome

  Pass verdict

  The IUT sends a number of notifications of the CGM Measurement characteristic depending on the used MTU size.

  A Size field, a Flags field, a CGM Glucose Concentration field, a Time Offset field and an E2E-CRC field are present in the record.

  The value of the characteristic meets the requirements of the service as defined in the CGM Feature requirement of the different Test Cases.

4.8 Record Access – Report Number of Stored Records

This test group contains test cases to verify compliant operation when the Lower Tester uses Record Access Control Point (RACP) 'Report Number of Stored Records' procedures.

CGMS/SEN/RAN/BV-01-C [Report Number of Stored Records – 'All records']

- Test Purpose

  Verify that the IUT can perform the 'Report Number of Stored Records' procedure with an Operator of 'All records'.

- Reference

  [2] 3.6.2, 3.6.3.2

- Initial Condition

  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate a defined number of patient records.

- Test Procedure

  1. The Lower Tester writes the 'Report number of stored records' Op Code (0x04) to the RACP using an Operator of 'All records' (0x01) and no Operand.
  2. The IUT sends an indication of the Record Access Control Point characteristic with the 'Report Number of Stored Records Response' Op Code (0x05), an Operator of Null (0x00), and an Operand representing the number of records generated in step 1.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

  The value of the Operand represents the correct number of all records in the IUT.

CGMS/SEN/RAN/BV-02-C [Report Number of Stored Records – 'Greater than or equal to Time Offset']

- Test Purpose

  Verify that the IUT can perform the 'Report Number of Stored Records' procedure with an Operator of 'greater than or equal to' and use the Operand's Time Offset Filter Type.

- Reference

  [2] 3.6.2, 3.6.3.2

- Initial Condition

  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate a defined number of records (at least three).

- Test Procedure

  1. The Lower Tester writes the 'Report number of stored records' Op Code (0x04) to the RACP using an Operator of 'greater than or equal to' (0x03) and an Operand containing the Time Offset Filter Type (0x01) followed by the value of the Time Offset of the second record.
  2. The IUT sends an indication of the Record Access Control Point characteristic with the 'Number of Stored Records Response' Op Code (0x05), an Operator of Null (0x00), and an Operand representing the number of records generated in step 1 minus 1.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

CGMS/SEN/RAN/BV-03-C [Report Number of Stored Records – 'No records found']

- Test Purpose

  Verify that the IUT responds properly if the 'Report Number of Stored Records' procedure is performed with an Operator of 'all records' and the IUT does not contain any records.

- Reference

  [2] 3.6.2, 3.6.3.2

- Initial Condition

  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that clears all records from the IUT database

- Test Procedure

  1. The Lower Tester writes the 'Report number of stored records' Op Code (0x04) to the RACP using an Operator of 'all records' (0x01) and no Operand.

2. The IUT sends an indication of the Record Access Control Point characteristic with the 'Number of Stored Records Response' Op Code (0x05), an Operator of Null (0x00), and an Operand representing that no records were found (0x0000).
3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

4.9 Record Access - Delete Stored Records

This test group contains test cases to verify compliant operation when the Lower Tester uses Record Access Control Point (RACP) 'Delete Stored Records' procedures.

CGMS/SEN/RAD/BV-01-C [Delete Stored Records – 'All records']

- Test Purpose

  Verify that the IUT can perform the 'Delete Stored Records' procedure with an Operator of 'All records'.

- Reference

  [2] 3.6.2, 3.6.3.3

- Initial Condition

  - Perform the preamble described in Section 4.2.3.

- Test Procedure

1. Perform a 'Report Number of Stored Records' (CGMS/SEN/RAN/BV-01-C [Report Number of Stored Records – 'All records']) procedure.
2. The Lower Tester writes the 'Delete stored records' Op Code (0x02) to the RACP using an Operator of 'All records' (0x01) and no Operand.
3. The IUT sends an indication of the Record Access Control Point characteristic with the 'Response Code' Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x02) followed by the Response Code for 'Success' (0x01).
4. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
5. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
6. The Lower Tester writes the 'Report Number of Stored Records' Op Code (0x05) to the RACP using an Operator of 'All records' (0x01) and no Operand.
7. The IUT sends an indication of the Record Access Control Point characteristic with the 'Number of Stored Records Response' Op Code (0x05), an Operator of Null (0x00), and an Operand representing that no records were found (0x0000).
8. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
9. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

  All records have been deleted from the IUT.

CGMS/SEN/RAD/BV-02-C [Delete Stored Records – 'Within range of (inclusive) Time Offset value pair']

- Test Purpose

  Verify that the IUT can perform the 'Delete Stored Records' procedure with an Operator of 'Within range of (inclusive)'.

- Reference

  [2] 3.6.2, 3.6.3.3

- Initial Condition

  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate a defined number of patient records (at least four).

- Test Procedure

  1. The Lower Tester writes the 'Delete stored records' Op Code (0x02) to the RACP using an Operator of 'Within range of' (0x04) and an Operand containing the Time Offset Filter Type (0x01) followed by a pair of Time Offset values representing the value of the second record and the value of the third record.
  2. The IUT sends an indication of the Record Access Control Point characteristic with the Response Code Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x02) followed by the Response Code for 'Success' (0x01).
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

  The second and third records have been deleted from the IUT.

4.10 Record Access – Report Stored Records

This test group contains test cases to verify compliant operation when the Lower Tester uses Record Access Control Point (RACP), 'Report Stored Records' procedures.

CGMS/SEN/RAR/BV-01-C [Report Stored Records – 'All records']

- Test Purpose

  Verify that the IUT can perform the 'Report Stored Records' procedure with an Operator of 'All records'.

- Reference

  [2] 3.6.2, 3.6.3.4

- Initial Condition

  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate a defined number of records.

- Test Procedure

  1. The Lower Tester writes the 'Report Stored Records' Op Code (0x01) to the RACP using an Operator of 'All Records' (0x01) and no Operand.
  2. The IUT sends a number of notifications of the CGM Measurement characteristic depending on the used MTU size.
  3. The Lower Tester receives ATT_Handle_Value_Notification(s) from the IUT containing the CGM Measurement characteristic handle and value.
  4. The IUT sends an indication of the Record Access Control Point characteristic with the 'Response Code' Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x01) followed by the Response Code for 'Success' (0x01).
  5. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
  6. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected notifications of the CGM Measurement characteristic with the correct fields.

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

  The oldest record is transmitted before newer records.

CGMS/SEN/RAR/BV-02-C [Report Stored Records – 'Less than or equal to Time Offset']

- Test Purpose

  Verify that the IUT can perform the 'Report Stored Records' procedure with an Operator of 'Less than or equal to' and using the Time Offset Filter Type in the Operand.

- Reference

  [2] 3.6.2, 3.6.3.4

- Initial Condition
  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate a defined number of records (at least three).
- Test Procedure
  1. The Lower Tester writes the ‘Report Stored Records’ Op Code (0x01) to the RACP using an Operator of ‘Less than or equal to’ (0x02), an Operand representing the Filter Type ‘Time Offset’ (0x01), and the maximum value for the filter representing Time Offset of the second record.
  2. The IUT sends notification(s) of the CGM Measurement characteristic representing the oldest two records.
  3. The Lower Tester receives ATT_Handle_Value_Notification(s) from the IUT containing the CGM Measurement characteristic handle and value.
  4. The IUT sends an indication of the Record Access Control Point characteristic with the ‘Response Code’ Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x01) followed by the Response Code for ‘Success’ (0x01).
  5. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
  6. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
- Expected Outcome

  Pass verdict

  The IUT sends all expected notifications of the CGM Measurement characteristic with the correct fields.

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

CGMS/SEN/RAR/BV-03-C [Report Stored Records – ‘Greater than or equal to Time Offset’]

- Test Purpose

  Verify that the IUT can perform the ‘Report Stored Records’ procedure with an Operator of ‘greater than or equal to’ and using the Time Offset Filter Type in the Operand.
- Reference

  [2] 3.6.2, 3.6.3.4
- Initial Condition
  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate a defined number of records (at least three).
- Test Procedure
  1. The Lower Tester writes the ‘Report Stored Records’ Op Code (0x01) to the RACP using an Operator of ‘Greater than or equal to’ (0x03) and an Operand containing the Filter Type ‘Time Offset’ (0x01) followed by the value of the Time Offset for the second record.
  2. The IUT sends notification(s) of the CGM Measurement characteristic representing the most recent records beginning with record two.

3. The Lower Tester receives an ATT_Handle_Value_Notification from the IUT containing the CGM Measurement characteristic handle and value.
4. The IUT sends an indication of the Record Access Control Point characteristic with the 'Response Code' Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x01) followed by the Response Code for 'Success' (0x01).
5. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
6. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
7. Perform step 3 again using the Filter Type 'Time Offset' (0x01) followed by a value for the Time Offset greater than the most recent record.
8. The IUT sends an indication of the Record Access Control Point characteristic with the 'Response Code' Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x01) followed by the Response Code for 'No Records found' (0x06).

- Expected Outcome

  Pass verdict

  The IUT sends all expected notifications of the CGM Measurement characteristic with the correct fields.

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

CGMS/SEN/RAR/BV-04-C [Report Stored Records – 'Within range of (inclusive) Time Offset value pair']

- Test Purpose

  Verify that the IUT can perform the 'Report Stored Records' procedure with an Operator of 'within range of (inclusive)' and using the Time Offset Filter Type in the Operand.

- Reference

  [2] 3.6.2, 3.6.3.4

- Initial Condition

  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate a defined number of records (at least 4).

- Test Procedure

1. The Lower Tester writes the 'Report Stored Records' Op Code (0x01) to the RACP using an Operator of 'Within range of' (0x04) and an Operand containing the Filter Type 'Time Offset' (0x01) followed by a pair of Time Offset values representing the value of the second record and the value of the third record.
2. The IUT sends notification(s) of the CGM Measurement characteristic representing the second and the third record.
3. The Lower Tester receives an ATT_Handle_Value_Notification from the IUT containing the CGM Measurement characteristic handle and value.
4. The IUT sends an indication of the Record Access Control Point characteristic with the 'Response Code' Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x01) followed by the Response Code for 'Success' (0x01).

5. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
6. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected notifications of the CGM Measurement characteristic with the correct fields.

  The CGM Measurement characteristic contains the values of the second and third record.

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

CGMS/SEN/RAR/BV-05-C [Report Stored Records – 'First record']

- Test Purpose

  Verify that the IUT can perform the 'Report Stored Records' procedure with an Operator of 'First record'.

- Reference

  [2] 3.6.2, 3.6.3.4

- Initial Condition

  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate a defined number of records (at least two).

- Test Procedure

  1. The Lower Tester writes the 'Report Stored Records' Op Code (0x01) to the RACP using an Operator of 'First record' (0x05) and no Operand.
  2. The IUT sends one notification of the CGM Measurement characteristic.
  3. The Lower Tester receives an ATT_Handle_Value_Notification from the IUT containing the CGM Measurement characteristic handle and value.
  4. The IUT sends an indication of the Record Access Control Point characteristic with the 'Response Code' Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x01) followed by the Response Code for 'Success' (0x01).
  5. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
  6. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected notifications of the CGM Measurement characteristic with the correct fields.

  The CGM Measurement characteristic contains the value of the oldest record.

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

CGMS/SEN/RAR/BV-06-C [Report Stored Records – 'Last record']

- Test Purpose

  Verify that the IUT can perform the 'Report Stored Records' procedure with an Operator of 'last record'.

- Reference

  [2] 3.6.2, 3.6.3.4

- Initial Condition

  - If a connection exists, it gets disconnected.
  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate a defined number of records (at least two).

- Test Procedure

  1. The Lower Tester writes the 'Report Stored records' Op Code (0x01) to the RACP using an Operator of 'Last record' (0x06) and no Operand.
  2. The IUT sends one notification of the CGM Measurement characteristic representing the most recent record.
  3. The Lower Tester receives an ATT_Handle_Value_Notification from the IUT containing the CGM Measurement characteristic handle and value.
  4. The IUT sends an indication of the Record Access Control Point characteristic with the 'Response Code' Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x01) followed by the Response Code for 'Success' (0x01).
  5. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
  6. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected notifications of the CGM Measurement characteristic with the correct fields.

  The CGM Measurement characteristic contains the value of the most recent record.

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

4.11 Record Access – Abort operation procedure

This test group contains test cases to verify compliant operation when the Lower Tester uses Record Access Control Point (RACP) 'Abort Operation' procedure.

CGMS/SEN/RAA/BV-01-C [Abort Operation – 'Report Stored Records']

- Test Purpose

  Verify that the IUT can perform an 'Abort' of the Report Stored Records procedure.

- Reference

  [2] 3.6.2, 3.6.3.5

- Initial Condition
  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate enough records such that the transmission is not able to complete before the abort is attempted. In most cases, ~200 records are sufficient since this will take over 5 seconds to transfer.
- Test Procedure
  1. The Lower Tester writes the 'Report Stored Records' Op Code (0x01) to the RACP using an Operator of 'All records' (0x01) and no Operand.
  2. The IUT starts to send notifications of the CGM Measurement characteristic.
  3. The Lower Tester receives a number of ATT_Handle_Value_Notifications from the IUT containing the CGM Measurement characteristics handle and value.
  4. The Lower Tester writes the 'Abort Operation' Op Code (0x03) to the RACP with an Operator of Null (0x00) and no Operand.
  5. The IUT sends an indication of the Record Access Control Point characteristic with the 'Response Code' Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x03) followed by the Response Code for 'Success' (0x01).
  6. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
  7. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
- Expected Outcome

  Pass verdict

  The IUT sends all expected notifications of the CGM Measurement characteristic with the correct fields.

  The CGM Measurement characteristics contain some but not all record values.

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

  The notifications stopped after write the 'Abort Operation' Op Code.

4.12 Record Access – RACP specific Errors

This test group contains test cases to verify compliant operation when the Lower Tester uses Record Access Control Point (RACP) procedure and specific error results.

CGMS/SEN/RAE/BI-01-C [RACP specific Errors – 'Unsupported Filter Type']

- Test Purpose

  Verify that the IUT responds appropriately when a Client writes an Op Code to the RACP with an unsupported Filter Type.
- Reference

  [2] 3.6.2, 3.6.3.6
- Initial Condition
  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate a defined number of records (at least 3).

- Test Procedure

  1. The Lower Tester writes the ‘Report Stored Records’ Op Code (0x01) to the RACP using an Operator of ‘Greater than or equal to’ (0x03) and an Operand containing a Filter Type from the ‘Reserved for future use’ range followed by a value of 0x000F.
  2. The IUT sends an indication of the Record Access Control Point characteristic with the ‘Response Code’ Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x01) followed by the Response Code Value for ‘Operand not supported’ (0x09).

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

CGMS/SEN/RAE/BI-02-C [RACP specific Errors – ‘Procedure Already In Progress’]

- Test Purpose

  Verify that the IUT responds appropriately when a Client attempts to perform a procedure before another procedure is completed.

- Reference

  [2] 3.6.2, 3.6.3.6

- Initial Condition

  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate several (~100) records.

- Test Procedure

  1. The Lower Tester writes the ‘Report Stored Records’ Op Code (0x01) to the RACP using an Operator of ‘all records’ (0x01) and no Operand.
  2. Before the procedure is completed, the Lower Tester performs the same procedure again.

- Expected Outcome

  Pass verdict

  The IUT rejects the Write Request to start the second procedure and responds with an Attribute Protocol Application Error Code set to ‘Procedure Already in Progress’ (0xFE).

CGMS/SEN/RAE/BI-03-C [RACP specific Errors – ‘Client Characteristic Configuration Descriptor Improperly Configured’]

- Test Purpose

  Verify that the IUT responds appropriately when a Client attempts to perform an RACP procedure with a Client Characteristic Configuration descriptor that is improperly configured.

- Reference

  [2] 3.6.2, 3.6.3.6

- Initial Condition
  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate 3 records.
- Test Procedure
  1. The Lower Tester resets to 0 one or both of the Client Characteristic Configuration descriptors from the CGM Measurement characteristic or Record Access Control Point characteristic.
  2. The Lower Tester writes the 'Report Stored Records' Op Code (0x01) to the RACP using an Operator of 'all records' (0x01) and no Operand.
- Expected Outcome

  Pass verdict

  The IUT rejects the Write Request to start the second procedure and responds with an Attribute Protocol Application Error Code set to 'Client Characteristic Configuration Descriptor Improperly Configured' (0xFD).

4.13 CGM Specific Ops Control Point

This test group contains test cases to verify compliant operation when the Lower Tester uses CGM Specific Ops Control Point procedures.

CGMS/SEN/CGMCP/BV-01-C [CGM Specific Ops – 'Get CGM Communication Interval with E2E-CRC']

- Test Purpose

  Verify that the IUT can perform the 'Get CGM Communication Interval' procedure.
- Reference

  [2] 3.7.1, 3.7.2.1
- Initial Condition
  - Perform the preamble described in Section 4.2.4.
  - Both the IUT and the Lower Tester support E2E-CRC safety (Bit 12 'E2E-CRC supported' in CGM Feature flags is set to 1).
- Test Procedure
  1. The Lower Tester writes the 'Get CGM Communication Interval' Op Code (0x02) to the CGM Specific Ops Control Point with no operands.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Get Communication Interval response' Op Code (0x03) and an Operand representing the communication interval in minutes.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The E2E-CRC field is present in CGM Specific Ops Control Point characteristic value.

CGMS/SEN/CGMCP/BV-02-C [CGM Specific Ops – 'Get CGM Communication Interval without E2E-CRC']

- Test Purpose

  Verify that the IUT can perform the 'Get CGM Communication Interval' procedure.

- Reference

  [2] 3.7.1, 3.7.2.1

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - Neither the IUT nor the Lower Tester support E2E-CRC safety (Bit 12 'E2E-CRC supported' in CGM Feature flags is set to 0).

- Test Procedure

  1. The Lower Tester writes the 'Get CGM Communication Interval' Op Code (0x02) to the CGM Specific Ops Control Point with no operands.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Get Communication Interval response' Op Code (0x03) and an Operand representing the communication interval in minutes.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The E2E-CRC field is excluded and not present in CGM Specific Ops Control Point characteristic value.

4.13.1 CGM Specific Ops – 'Set CGM Communication Interval'

- Test Purpose

  Verify that the IUT can perform the 'Set CGM Communication Interval' procedure.

- Reference

  [2] 3.7.1, 3.7.2.1

- Initial Condition
  - Perform the preamble described in Section 4.2.4.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0). Setting is found in Table 4.6.
- Test Case Configuration

Test Case	E2E-CRC Value (Requirements)
CGMS/SEN/CGMCP/BV-03-C [CGM Specific Ops – ‘Set CGM Communication Interval’ – with E2E-CRC]	Bit 12 “E2E-CRC supported” is set to 1
CGMS/SEN/CGMCP/BV-26-C [CGM Specific Ops – ‘Set CGM Communication Interval’ – without E2E-CRC]	Bit 12 “E2E-CRC supported” is set to 0

Table 4.6: CGM Specific OPS - Set CGM Communication Interval test cases

- Test Procedure
  1. The Lower Tester writes the ‘Set CGM Communication interval’ Op Code (0x01) to the CGM Specific Ops Control Point with an Operand containing a value which is supported by the device for a communication interval time in minutes (e.g., 0x05 representing 5 minutes). The supported range is defined in the IXIT [7].
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the ‘Response Code’ Op Code (0x1C) and an Operand representing the Request Op Code (0x01) followed by the Response Code for ‘Success’ (0x01).
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
  5. If E2E-CRC is supported, perform CGMS/SEN/CGMCP/BV-01-C [CGM Specific Ops – ‘Get CGM Communication Interval with E2E-CRC’] to verify that the previous set ‘Communication Time Interval’ is stored in IUT. If E2E-CRC is not supported, perform CGMS/SEN/CGMCP/BV-02-C [CGM Specific Ops – ‘Get CGM Communication Interval without E2E-CRC’] to verify that the previous set ‘Communication Time Interval’ is stored in IUT.
- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The new Communication interval is stored in IUT as used in step 2.

4.13.2 CGM Specific Ops – ‘Set smallest CGM Communication Interval supported by Device’

- Test Purpose

  Verify that when the IUT performs the ‘Set CGM Communication Interval’ procedure with a communication interval value of 0xFF the communication interval is set to the smallest interval supported by the device.
- Reference

  [2] 3.7.1, 3.7.2.1

- Initial Condition
  - Perform the preamble described in Section 4.2.4.
  - The smallest Communication Interval supported by the device is known.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0). Setting is found in Table 4.7.
- Test Case Configuration

Test Case	E2E-CRC Value (Requirements)
CGMS/SEN/CGMCP/BV-04-C [CGM Specific Ops – ‘Set smallest CGM Communication Interval supported by Device’ – with E2E-CRC]	Bit 12 “E2E-CRC supported” is set to 1
CGMS/SEN/CGMCP/BV-27-C [CGM Specific Ops – ‘Set smallest CGM Communication Interval supported by Device’ – without E2E-CRC]	Bit 12 “E2E-CRC supported” is set to 0

Table 4.7: CGM Specific OPS - Set smallest CGM Communication Interval supported test cases

- Test Procedure
  1. The Lower Tester writes the ‘Set CGM Communication Interval’ Op Code (0x01) to the CGM Specific Ops Control Point with an Operand containing the value 0xFF.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the ‘Response Code’ Op Code (0x1C) and an Operand representing the Request Op Code (0x01) followed by the Response Code for ‘Success’ (0x01).
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
  5. If E2E-CRC is supported, perform CGMS/SEN/CGMCP/BV-01-C [CGM Specific Ops – ‘Get CGM Communication Interval with E2E-CRC’] to verify that the new communication interval is stored in the IUT and set to smallest value supported by the device. If E2E-CRC is not supported, perform CGMS/SEN/CGMCP/BV-02-C [CGM Specific Ops – ‘Get CGM Communication Interval without E2E-CRC’] to verify that the new communication interval is stored in the IUT and set to smallest value supported by the device.
- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The new Communication interval is stored in IUT and set to the value used by the device, which means the smallest Communication interval supported by the device.

4.13.3 CGM Specific Ops – ‘Disable communication interval’

- Test Purpose

  Verify that the IUT can disable periodic communication when a communication interval value of 0x00 is used in the ‘Set CGM Communication Interval’ procedure.

- Reference

  [2] 3.7.1, 3.7.2.1

- Initial Condition
  - Perform the preamble described in Section 4.2.4.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0). Setting is found in Table 4.8.
- Test Case Configuration

Test Case	E2E-CRC Value (Requirements)
CGMS/SEN/CGMCP/BV-05-C [CGM Specific Ops – ‘Disable communication interval’ – with E2E-CRC]	Bit 12 “E2E-CRC supported” is set to 1
CGMS/SEN/CGMCP/BV-28-C [CGM Specific Ops – ‘Disable communication interval’ – without E2E-CRC]	Bit 12 “E2E-CRC supported” is set to 0

Table 4.8: CGM Specific OPS - Disable Communication Interval supported test cases

- Test Procedure
  1. The Lower Tester writes the ‘Set CGM Communication Interval’ Op Code (0x01) to the CGM Specific Ops Control Point with an Operand containing the value 0x00.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the ‘Response Code’ Op Code (0x1C) and an Operand representing the Request Op Code (0x01) followed by the Response Code for ‘Success’ (0x01).
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
  5. If E2E-CRC is supported, perform CGMS/SEN/CGMCP/BV-01-C [CGM Specific Ops – ‘Get CGM Communication Interval with E2E-CRC’] to verify that the new communication interval is stored in the IUT and is set to 0x00. If E2E-CRC is not supported, perform CGMS/SEN/CGMCP/BV-02-C [CGM Specific Ops – ‘Get CGM Communication Interval without E2E-CRC’] to verify that the new communication interval is stored in the IUT and is set to 0x00.
- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The new Communication interval is stored in IUT and set to 0x00.

CGMS/SEN/CGMCP/BV-06-C [CGM Specific Ops – ‘Get Glucose Calibration Value’ Type 1]

- Test Purpose

  Verify that the IUT can perform the ‘Get Glucose Calibration value’ procedure.
- Reference

  [2] 3.7.1, 3.7.2.2
- Initial Condition
  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Calibration is set to 1.

- More than one Calibration Data record is present in the IUT, e.g., by performing CGMS/SEN/CGMCP/BV-08-C [CGM Specific Ops – 'Set Glucose Calibration value']. The number of records stored is known.
- Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester writes the 'Get Glucose Calibration value' Op Code (0x05) to the CGM Specific Ops Control Point with an Operand containing a valid value of the Calibration Data Record Number as defined in [2].
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Read Glucose Calibration Value response' Op Code (0x06) and an Operand representing the actual Calibration Data of the requested record.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

CGMS/SEN/CGMCP/BV-07-C [CGM Specific Ops – 'Get Glucose Calibration Value' Type 2]

- Test Purpose

  Verify that the IUT can perform the 'Get Glucose Calibration value' procedure with a record number of 0xFFFF to read out the last stored Calibration Data.

- Reference

  [2] 3.7.1, 3.7.2.2

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Calibration is set to 1.
  - One or more Calibration Data records are present in the IUT.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester writes the 'Get Glucose Calibration value' Op Code (0x05) to the CGM Specific Ops Control Point with an Operand containing 0xFFFF as value for the Calibration Data Record Number.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Read Glucose Calibration Value response' Op Code (0x06) and an Operand representing the Calibration Data of the last stored record.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.

4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
5. Verify that the read Calibration Data has the record number of the last stored Calibration Data record.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The read Calibration Data contains the record number of the last stored Calibration Data record.

CGMS/SEN/CGMCP/BV-29-C [CGM Specific Ops – 'Get Glucose Calibration Value' Type 4]

- Test Purpose

  Verify that the IUT can perform the 'Get Glucose Calibration value' procedure with a Calibration Data Record number of 0x00.

- Reference

  [2] 3.7.1, 3.7.2.2

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Calibration is set to 1.
  - No Calibration Data records are present in the IUT.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester writes the 'Get Glucose Calibration value' Op Code (0x05) to the CGM Specific Ops Control Point with an Operand containing 0x00 as a value for the Calibration Data Record Number.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Read Glucose Calibration Value response' Op Code (0x06) and an Operand representing the Calibration Data.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends an indication of the CGM Specific Ops Control Point characteristic with an Operand representing the Calibration Data with the:

  - Glucose Concentration of Calibration = NaN,
  - Calibration Time = 0,
  - Calibration Data Record Number = 0.

The remaining field values, Calibration Type-Sample Location, Next Calibration Time, and Calibration Status fields, are set to a valid value left to the implementation.

CGMS/SEN/CGMCP/BI-01-C [CGM Specific Ops – 'Get Glucose Calibration Value' Type 3]

- Test Purpose

  Verify that the IUT can perform the 'Get Glucose Calibration value' procedure with a record number of 0xFFFE representing an invalid record number.

- Reference

  [2] 3.7.1, 3.7.2.2

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Calibration is set to 1.
  - One or more Calibration Data records are present in the IUT, but not more than 65533 records.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester writes the 'Get Glucose Calibration value' Op Code (0x05) to the CGM Specific Ops Control Point with an Operand containing 0xFFFE as value for the Calibration Data Record Number.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x05) followed by the Response Code for 'Parameter out of Range' (0x05).
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

CGMS/SEN/CGMCP/BV-08-C [CGM Specific Ops – 'Set Glucose Calibration value']

- Test Purpose

  Verify that the IUT can perform the 'Set Glucose Calibration value' procedure.

- Reference

  [2] 3.7.1, 3.7.2.2

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Calibration is set to 1.
  - The Calibration Process Pending bit is set to 0 (Bit 14 of the CGM Status field in the CGM Status Characteristic).

- The TSPX_iut_maximum_calibration_process_time is known from the IXIT [7].
- Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).

- Test Procedure

1. The Lower Tester writes the ‘Set Glucose Calibration Value’ Op Code (0x04) to the CGM Specific Ops Control Point with an Operand containing a Glucose Calibration.

The example of a possible valid Glucose Calibration value is shown in the table below:

	Glucose Concentration mg/dL	Calibration Time (Minutes)	Sample Location	Next Calibration (Minutes)	Calibration Data Record Number	Calibration Status
Value	78	5	Arterial Plasma	5	0	0
Hex	0x004E	0x0005	0x06	0x0005	0x0000	0x00

Note: If the Calibration Data Record gets written, the Calibration Data Record Number and the data in the Calibration Status field will be ignored.

2. The IUT sends an indication of the CP CGM Specific Ops Control Point characteristic with the ‘Response Code Value’ Op Code (0x1C) and an Operand representing the Request Op Code (0x04) followed by the Response Code for ‘Success’ (0x01).
3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
5. The Lower Tester sends an ATT_Read_Request to the IUT to read the CGM Status characteristic to determine the value of the Calibration Process Pending bit.
6.

   Alternative 6A (Calibration Process Pending bit is set to 0):

   6A.1. Continue to step 7.

   Or,

   Alternative 6B (Calibration Process Pending bit is set to 1):

   6B.1. The Lower Tester sends an ATT_Read_Request to the IUT to read the CGM Status characteristic repeatedly until the TSPX_iut_maximum_calibration_process_time, known from the IXIT [7], is reached or until the Calibration Process Pending bit is reset to 0.

7. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-07-C [CGM Specific Ops – ‘Get Glucose Calibration Value’ Type 2] to verify that the previously written Glucose Calibration value’ is stored in the IUT.

- Expected Outcome

Pass verdict

The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

In step 5, the CGM Status characteristic is successfully read.

In step 6, Alternative 6B.1, the IUT resets the Calibration Process Pending bit to 0 within the TSPX_iut_maximum_calibration_process_time.

The record number is increased.

The new Calibration Data is stored in the IUT.

CGMS/SEN/CGMCP/BV-09-C [CGM Specific Ops – 'Get Patient High Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Get Patient High Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.3

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Patient High/Low Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester writes the 'Get Patient High Alert Level' Op Code (0x08) to the CGM Specific Ops Control Point with no Operand.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Get Patient High Alert Level Response' Op Code (0x09) and an Operand representing the actual Patient High Alert Level value in milligrams per deciliter.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

CGMS/SEN/CGMCP/BV-10-C [CGM Specific Ops – 'Set Patient High Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Set Patient High Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.3

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Patient High/Low Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-09-C [CGM Specific Ops – 'Get Patient High Alert Level'] to get the actual stored High Alert Level value.
  2. The Lower Tester writes the 'Set Patient High Alert Level' Op Code (0x07) to the CGM Specific Ops Control Point with an Operand containing a Patient High Alert Level value in milligrams per

deciliter, within a range supported by the device (e.g., 200 mg/dl, value should be different from actual value of step 1). The supported range is defined in the IXIT [7].

3. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x07) followed by the Response Code for 'Success' (0x01).
4. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
5. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
6. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-09-C [CGM Specific Ops – 'Get Patient High Alert Level'] to verify the new high alert level value.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The 'Patient High Alert Level' is set to the new value as used in step 3.

CGMS/SEN/CGMCP/BI-02-C [CGM Specific Ops – 'Set invalid Patient High Alert Level']

- Test Purpose

  Verify that the IUT can't write an invalid (too high) 'Patient High Alert Value' when performing the 'Write Patient High Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.3

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Patient High/Low Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

1. The Lower Tester writes the 'Set Patient High Alert Level' Op Code (0x07) to the CGM Specific Ops Control Point with an Operand containing a Patient High Alert Level value outside the supported range of the IUT as provided in the IXIT [7].
2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x07) followed by the Response Code for 'Parameter out of Range' (0x05).
3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  Former value of the high alert level value already exists.

CGMS/SEN/CGMCP/BV-11-C [CGM Specific Ops – 'Get Patient Low Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Get Patient Low Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.3

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Patient High/Low Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester writes the 'Get Patient Low Alert Level' Op Code (0x0B) to the CGM Specific Ops Control Point with no Operand.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Get Patient Low Alert Level Response' Op Code (0x0C) and an Operand representing the Patient Low Alert Level value in milligrams per deciliter.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

CGMS/SEN/CGMCP/BV-12-C [CGM Specific Ops – 'Set Patient Low Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Set Patient Low Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.3

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Patient High/Low Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-11-C [CGM Specific Ops – 'Get Patient Low Alert Level'] to get the actual stored Low Alert Level value.
  2. The Lower Tester writes the 'Set Patient Low Alert Level' Op Code (0x0A) to the CGM Specific Ops Control Point with an Operand containing a Patient Low Alert Level value in milligrams per

deciliter, within a range supported by the device (e.g., 55 mg/dl, value should be different from actual value of step 2). The supported range is defined in the IXIT [7].

3. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x0A) followed by the Response Code for 'Success' (0x01).
4. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
5. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
6. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-11-C [CGM Specific Ops – 'Get Patient Low Alert Level'] to verify the new low alert level value.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The 'Patient Low Alert Level' is set to the new value as used in step 3.

CGMS/SEN/CGMCP/BI-03-C [CGM Specific Ops – 'Set invalid Patient Low Alert Level']

- Test Purpose

  Verify that the IUT can't write an invalid (to high) 'Patient Low Alert Value' when performing the 'Set Patient Low Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.3

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Patient High/Low Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

1. The Lower Tester writes the 'Set Patient Low Alert Level' Op Code (0x0A) to the CGM Specific Ops Control Point with an Operand containing a Patient Low Alert Level value outside the supported range of the IUT as provided in the IXIT [7].
2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x0A) followed by the Response Code for 'Parameter out of Range' (0x05).
3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  There is no change of the 'Patient Low Alert Level' values stored in the IUT.

CGMS/SEN/CGMCP/BV-13-C [CGM Specific Ops – 'Get Hypo Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Get Hypo Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.4

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Hypo Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester writes the 'Get Hypo Alert Level' Op Code (0x0E) to the CGM Specific Ops Control Point with no Operand.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Get Hypo Alert Level Response' Op Code (0x0F) and an Operand representing the Hypo Alert Level value in milligrams per deciliter.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

CGMS/SEN/CGMCP/BV-14-C [CGM Specific Ops – 'Set Hypo Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Set Hypo Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.4

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Hypo Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-13-C [CGM Specific Ops – 'Get Hypo Alert Level'] to get the actual stored Hypo Alert Level value.
  2. The Lower Tester writes the 'Set Hypo Alert Level' Op Code (0x0D) to the CGM Specific Ops Control Point with an Operand containing a Hypo Alert Level value in milligrams per deciliter,

within a range supported by the device (e.g., 60 mg/dl, value should be different from actual value of step 2) The supported range is defined in the IXIT [7].

3. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x0D) followed by the Response Code for 'Success' (0x01).
4. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
5. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
6. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-13-C [CGM Specific Ops – 'Get Hypo Alert Level'] to verify the new Hypo Alert Level value.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The 'Hypo Alert Level' is set to the new value as used in step 3.

CGMS/SEN/CGMCP/BI-04-C [CGM Specific Ops – 'Set invalid Hypo Alert Level']

- Test Purpose

  Verify that the IUT can't write an invalid (too high) 'Hypo Alert Value' when performing the 'Set Hypo Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.4

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Hypo Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

1. The Lower Tester writes the 'Set Hypo Alert Level' Op Code (0x0D) to the CGM Specific Ops Control Point with an Operand containing a Hypo Alert Level value outside the supported range of the IUT as provided in the IXIT [7].
2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x0D) followed by the Response Code for 'Parameter out of Range' (0x05).
3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The original Hypo Alert Level value isn't changed.

CGMS/SEN/CGMCP/BV-15-C [CGM Specific Ops – 'Get Hyper Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Get Hyper Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.5

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Hyper Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester writes the 'Get Hyper Alert Level' Op Code (0x11) to the CGM Specific Ops Control Point with no Operand.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Get Hyper Alert Level Response' Op Code (0x12) and an Operand representing the Hyper Alert Level value in milligrams per deciliter.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

CGMS/SEN/CGMCP/BV-16-C [CGM Specific Ops – 'Set Hyper Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Set Hyper Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.5

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Hyper Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-15-C [CGM Specific Ops – 'Get Hyper Alert Level'] to get the actual stored Hyper Alert Level value.
  2. The Lower Tester writes the 'Set Hyper Alert Level' Op Code (0x10) to the CGM Specific Ops Control Point with an Operand containing a Hyper Alert Level value in milligrams per deciliter,

within a range supported by the device (e.g., 200 mg/dl, value should be different from actual value of step 2). The supported range is defined in the IXIT [7].

3. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x10) followed by the Response Code for 'Success' (0x01).
4. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
5. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
6. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-15-C [CGM Specific Ops – 'Get Hyper Alert Level'] to verify the new Hyper Alert Level value.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The 'Hyper Alert Level' is set to the new value as used in step 3.

CGMS/SEN/CGMCP/BI-05-C [CGM Specific Ops – 'Set invalid Hyper Alert Level']

- Test Purpose

  Verify that the IUT can't write an invalid (to high) 'Hyper Alert Value' when performing the 'Set Hyper Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.5

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Hyper Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

1. Verify that a connection between the Lower Tester and IUT is established.
2. The Lower Tester writes the 'Set Hyper Alert Level' Op Code (0x10) to the CGM Specific Ops Control Point with an Operand containing a Hyper Alert Level value outside the supported range of the IUT as provided in the IXIT [7].
3. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x10) followed by the Response Code for 'Parameter out of Range' (0x05).
4. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
5. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The original Hyper Alert Level value isn't changed.

CGMS/SEN/CGMCP/BV-17-C [CGM Specific Ops – 'Get Rate of Decrease Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Get Rate of Decrease Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.6

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Rate of Increase/Decrease Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester writes the 'Get Rate of Decrease Alert Level' Op Code (0x14) to the CGM Specific Ops Control Point with no Operand.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Get Rate of Decrease Alert Level Response' Op Code (0x15) and an Operand representing the Rate of Decrease Alert Level value in milligrams per deciliter.
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

CGMS/SEN/CGMCP/BV-18-C [CGM Specific Ops – 'Set Rate of Decrease Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Set Rate of Decrease Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.6

- Initial Condition

  - Perform the preamble described in Section 4.2.4.

- The CGM Feature Characteristic bit for supporting Increase/Decrease Alerts is set to 1.
- Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).

- Test Procedure

1. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-17-C [CGM Specific Ops – ‘Get Rate of Decrease Alert Level’] to get the actual stored Rate of Decrease Alert Level value.
2. The Lower Tester writes the ‘Set Rate of Decrease Alert Level’ Op Code (0x13) to the CGM Specific Ops Control Point with an Operand containing a Rate of Decrease Alert Level value in milligrams per deciliter per minute, within a range supported by the IUT (e.g., -5 mg/dl/min, value should be different from actual value of step 2). The supported range is defined in the IXIT [7].
3. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the ‘Response Code’ Op Code (0x1C) and an Operand representing the Request Op Code (0x13) followed by the Response Code for ‘Success’ (0x01).
4. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
5. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
6. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-17-C [CGM Specific Ops – ‘Get Rate of Decrease Alert Level’] to verify the new Rate of Decrease Alert Level value.

- Expected Outcome

Pass verdict

The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

The ‘Rate of Decrease Alert Level’ is set to the new value as used in step 3.

CGMS/SEN/CGMCP/BI-06-C [CGM Specific Ops – ‘Set invalid Rate of Decrease Alert Level’]

- Test Purpose

Verify that the IUT can’t write an invalid (to high) ‘Rate of Decrease Alert Value’ when performing the ‘Set Rate of Decrease Alert Level’ procedure.

- Reference

[2] 3.7.1, 3.7.2.6

- Initial Condition

- Perform the preamble described in Section 4.2.4.
- The CGM Feature Characteristic bit for supporting Increase/Decrease Alerts is set to 1.
- Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).

- Test Procedure

1. The Lower Tester writes the ‘Set Rate of Decrease Alert Level’ Op Code (0x13) to the CGM Specific Ops Control Point with an Operand containing a Rate of Decrease Alert Level value of 0X0802 (- Infinity).

2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x13) followed by the Response Code for 'Parameter out of Range' (0x05).
3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The original Rate of Decrease Alert Level value isn't changed.

CGMS/SEN/CGMCP/BV-19-C [CGM Specific Ops – 'Get Rate of Increase Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Get Rate of Increase Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.6

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Rate of Increase/Decrease Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

1. The Lower Tester writes the 'Get Rate of Increase Alert Level' Op Code (0x17) to the CGM Specific Ops Control Point with no Operand.
2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Get Rate of Increase Alert Level Response' Op Code (0x18) and an Operand representing the Rate of Increase Alert Level value in milligrams per deciliter.
3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

CGMS/SEN/CGMCP/BV-20-C [CGM Specific Ops – 'Set Rate of Increase Alert Level']

- Test Purpose

  Verify that the IUT can perform the 'Set Rate of Increase Alert Level' procedure.

- Reference

  [2] 3.7.1, 3.7.2.6

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - The CGM Feature Characteristic bit for supporting Increase/Decrease Alerts is set to 1.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).

- Test Procedure

  1. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-19-C [CGM Specific Ops – ‘Get Rate of Increase Alert Level’] to get the actual stored Rate of Increase Alert Level value.
  2. The Lower Tester writes the ‘Set Rate of Increase Alert Level’ Op Code (0x16) to the CGM Specific Ops Control Point with an Operand containing a Rate of Increase Alert Level value in milligrams per deciliter per minute, within a range supported by the device (e.g., +5 mg/dl/min, value should be different from actual value of step 2). The supported range is defined in the IXIT [7].
  3. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the ‘Response Code’ Op Code (0x1C) and an Operand representing the Request Op Code (0x16) followed by the Response Code for ‘Success’ (0x01).
  4. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  5. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
  6. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-19-C [CGM Specific Ops – ‘Get Rate of Increase Alert Level’] to verify the new Rate of Increase Alert Level value.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The ‘Rate of Increase Alert Level’ is set to the new value as used in step 3.

CGMS/SEN/CGMCP/BI-07-C [CGM Specific Ops – ‘Set invalid Rate of Increase Alert Level’]

- Test Purpose

  Verify that the IUT can’t write an invalid (to high) ‘Rate of Increase Alert Value’ when perform the ‘Set Rate of Increase Alert Level’ procedure.

- Reference

  [2] 3.7.1, 3.7.2.6

- Initial Condition

  - Perform the preamble described in Section 4.2.4.

- The CGM Feature Characteristic bit for supporting Increase/Decrease Alerts is set to 1.
- Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).

- Test Procedure

1. The Lower Tester writes the ‘Set Rate of Increase Alert Level’ Op Code (0x16) to the CGM Specific Ops Control Point with an Operand containing a Rate of Increase Alert Level value of 0X0802 (- Infinity).
2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the ‘Response Code’ Op Code (0x1C) and an Operand representing the Request Op Code (0x16) followed by the Response Code for ‘Parameter out of Range’ (0x05).
3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

Pass verdict

The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

The original Rate of Increase Alert Level value isn’t changed.

CGMS/SEN/CGMCP/BV-21-C [CGM Specific Ops – ‘Reset Device Specific Alert’]

- Test Purpose

Verify that the IUT can perform the ‘Reset Device Specific Alert’ procedure.

- Reference

[2] 3.7.1, 3.7.2.7

- Initial Condition

- Perform the preamble described in Section 4.2.4.
- The CGM Feature Characteristic bit for supporting Device Specific Alerts is set to 1.
- Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).
- Perform an action on the IUT that will set the Device Specific Alert flag.

- Test Procedure

1. Perform CGMS/SEN/CR/BV-08-C [Characteristic Read – ‘CGM Status’] to verify that the Device Specific Alert bit is set.
2. The Lower Tester writes the ‘Reset Device Specific Alert’ Op Code (0x19) to the CGM Specific Ops Control Point with no Operand.
3. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the ‘Response Code’ Op Code (0x1C) and an Operand representing the Request Op Code (0x19) followed by the Response Code for ‘Success’ (0x01).
4. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.

5. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
6. Perform CGMS/SEN/CR/BV-08-C [Characteristic Read – 'CGM Status'] to verify that the Device Specific Alert bit is cleared.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The Device Specific Alert Bit in the CGM Status and Status Annunciation Field are reset.

CGMS/SEN/CGMCP/BV-22-C [CGM Specific Ops – 'Start Session' Type 1]

- Test Purpose

  Verify that the IUT can perform the 'Start session' procedure if no Session is currently running.

- Reference

  [2] 3.7.1, 3.7.2.8

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - No CGM Session is currently running.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

  1. The Lower Tester writes 'Start Session' Op Code (0x1A) to the CGM Specific Ops Control Point with no Operand.
  2. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x1A) followed by the Response Code for 'Success' (0x01).
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
  5. The Lower Tester executes the procedure included in CGMS/SEN/CR/BV-08-C [Characteristic Read – 'CGM Status'].

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The CGM Status Bit 'Session stopped' is set to 0.

CGMS/SEN/CGMCP/BI-08-C [CGM Specific Ops – 'Start Session' Type 2]

- Test Purpose

  Verify that the IUT cannot perform the 'Start session' procedure if a Session is currently running.

- Reference

  [2] 3.7.1, 3.7.2.8

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - A CGM Session is currently running.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).

- Test Procedure

  1. The Lower Tester executes the procedure included in CGMS/SEN/CR/BV-08-C [Characteristic Read – ‘CGM Status’].
  2. Verify that the CGM Status Bit ‘Session stopped’ is set to 0.
  3. The Lower Tester writes ‘Start Session’ Op Code (0x1A) to the CGM Specific Ops Control Point with no Operand.
  4. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the ‘Response Code’ Op Code (0x1C) and an Operand representing the Request Op Code (0x1A) followed by the Response Code for ‘Procedure not completed’ (0x04).
  5. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  6. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
  7. The Lower Tester executes the procedure included in CGMS/SEN/CR/BV-08-C [Characteristic Read – ‘CGM Status’].

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The CGM Status Bit ‘Session stopped’ is set to 0.

CGMS/SEN/CGMCP/BV-23-C [CGM Specific Ops – ‘Stop Session’]

- Test Purpose

  Verify that the IUT can perform the ‘Stop session’ procedure to stop a currently running Session.

- Reference

  [2] 3.7.1, 3.7.2.9

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - A CGM Session is currently running.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).

- Test Procedure

  1. The Lower Tester executes the procedure included in CGMS/SEN/CR/BV-08-C [Characteristic Read – ‘CGM Status’].

2. Verify that the CGM Status Bit ‘Session stopped’ is set to 0.
3. The Lower Tester writes ‘Stop Session’ Op Code (0x1B) to the CGM Specific Ops Control Point with no Operand.
4. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the ‘Response Code’ Op Code (0x1C) and an Operand representing the Request Op Code (0x1B) followed by the Response Code for ‘Success’ (0x01).
5. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
6. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
7. The Lower Tester executes the procedure included in CGMS/SEN/CR/BV-08-C [Characteristic Read – ‘CGM Status’].

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  The CGM Status Bit ‘Session stopped’ bit set to 1.

CGMS/SEN/CGMCP/BV-24-C [CGM Specific Ops – ‘Start Session’ Type 3]

- Test Purpose

  Verify that the IUT can‘t perform the ‘Start session’ procedure if a currently running Session is stopped and the IUT does not support Multiple Sessions.

- Reference

  [2] 3.7.1, 3.7.2.8

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - A CGM Session is currently running.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 “E2E-CRC supported” is set to 1 or 0).

- Test Procedure

  1. The Lower Tester executes the procedure included in CGMS/SEN/CR/BV-08-C [Characteristic Read – ‘CGM Status’].
  2. Verify that the CGM Status Bit ‘Session stopped’ is set to 0.
  3. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-23-C [CGM Specific Ops – ‘Stop Session’] to stop the currently running session.
  4. The Lower Tester executes the procedure included in CGMS/SEN/CR/BV-08-C [Characteristic Read – ‘CGM Status’].
  5. Verify that the CGM Status Bit ‘Session stopped’ is set to 1.
  6. The Lower Tester writes ‘Start Session’ Op Code (0x1A) to the CGM Specific Ops Control Point with no Operand.
  7. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the ‘Response Code’ Op Code (0x1C) and an Operand representing the Request Op Code (0x1A) followed by the Response Code for ‘Procedure not completed’ (0x04).

8. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
9. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

CGMS/SEN/CGMCP/BV-25-C [CGM Specific Ops – 'Start Session' Type 4]

- Test Purpose

  Verify that the IUT can perform the 'Start session' procedure after a currently running Session is stopped.

- Reference

  [2] 3.7.1, 3.7.2.8

- Initial Condition

  - Perform the preamble described in Section 4.2.4.
  - A CGM Session is currently running.
  - Both the IUT and the Lower Tester have the same CGM Feature Bit settings concerning E2E-CRC safety (Bit 12 "E2E-CRC supported" is set to 1 or 0).

- Test Procedure

1. The Lower Tester executes the procedure included in CGMS/SEN/CR/BV-08-C [Characteristic Read – 'CGM Status'].
2. Verify that the CGM Status Bit 'Session stopped' is set to 0.
3. The Lower Tester executes the procedure included in CGMS/SEN/CGMCP/BV-23-C [CGM Specific Ops – 'Stop Session'] to stop the currently running session.
4. The Lower Tester executes the procedure included in CGMS/SEN/CR/BV-08-C [Characteristic Read – 'CGM Status'].
5. Verify that the CGM Status Bit 'Session stopped' is set to 1.
6. The Lower Tester writes 'Start Session' Op Code (0x1A) to the CGM Specific Ops Control Point with no Operand.
7. The IUT sends an indication of the CGM Specific Ops Control Point characteristic with the 'Response Code' Op Code (0x1C) and an Operand representing the Request Op Code (0x1A) followed by the Response Code for 'Success' (0x01).
8. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
9. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
10. The Lower Tester executes the procedure included in CGMS/SEN/CR/BV-08-C [Characteristic Read – 'CGM Status'].
11. Verify that the CGM Status Bit 'Session stopped' is set to 0.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the CGM Specific Ops Control Point characteristic with the correct fields.

  Session Stopped bit is set to 0.

4.14 Common Behavior of Control Points – General Error Handling

This test group contains test cases to verify compliant operation when the Lower Tester uses Control Point (RACP, and CGM specific Ops CP) procedures and an error results.

CGMS/SEN/CBE/BI-01-C [General Error Handling – 'Op Code Not Supported']

- Test Purpose

  Verify that the IUT responds appropriately when a Client writes an unsupported Op Code to the Control Points.

- Reference

  [2] 3.8, 3.8.2

- Initial Condition

  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate 3 or more records.

- Test Procedure

  1. The Lower Tester writes an Op Code (0x00) to the Record Access Control Point using an Operator of 'All Records' (0x01) and no Operand.
  2. The Lower Tester writes an Op Code value from the Reserved for Future Use range other than 0x00 to the Record Access Control Point using an Operator of 'All Records' (0x01) and no Operand.

- Expected Outcome

  Pass verdict

  For both cases, the IUT sends an indication of the Record Access Control Point characteristic with the 'Response Code' Op Code (0x06), an Operator of Null (0x00), and an Operand representing the Request Op Code (i.e., the RFU value written) followed by the Response Code Value for 'Op Code not supported' (0x02).

CGMS/SEN/CBE/BI-02-C [General Error Handling – 'Invalid Operator']

- Test Purpose

  Verify that the IUT responds appropriately when a Client writes a 'Report Stored Records' Op Code to the Record Access Control Point with an invalid Operator.

- Reference

  [2] 3.6.3.6, 3.8.2

- Initial Condition
  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate 3 or more records.
- Test Procedure
  1. The Lower Tester writes the ‘Report Stored Records’ Op Code (0x01) to the RACP using an Operator of Null (0x00) and no Operand.
  2. The IUT sends an indication of the Record Access Control Point characteristic with the ‘Response Code’ Op Code (0x06), an Operator of Null (0x00), and an Operand representing Request Op Code (0x01) followed by the Response Code Value for ‘Invalid Operator’ (0x03).
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the CGM Specific Ops Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

CGMS/SEN/CBE/BI-03-C [General Error Handling – ‘Unsupported Operator’]

- Test Purpose

  Verify that the IUT responds appropriately when a Client writes an Op Code to the RACP with an unsupported Operator.
- Reference

  [2] 3.8, 3.8.2
- Initial Condition
  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate 3 or more records.
- Test Procedure
  1. The Lower Tester writes the ‘Report Stored Records’ Op Code (0x01) to the Record Access Control Point using an Operator from the ‘Reserved for Future Use’ range and no Operand.
  2. The IUT sends an indication of the Record Access Control Point characteristic with the ‘Response Code’ Op Code (0x06), an Operator of Null (0x00), and an Operand representing the Request Op Code (0x01) followed by the Response Code Value for ‘Operator not supported’ (0x04).
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.
- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

CGMS/SEN/CBE/BI-04-C [General Error Handling – 'Invalid Operand' – Type 1]

- Test Purpose

  Verify that the IUT responds appropriately when a Client writes an Op Code to the Record Access Control Point with an Operand where none was expected.

- Reference

  [2] 3.8, 3.8.2

- Initial Condition

  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate 3 or more records.

- Test Procedure

  1. The Lower Tester writes the 'Report stored records' Op Code (0x01) to the Record Access Control Point using an Operator of 'all records' (0x01) and an Operand containing the Time Offset Filter Type and a Time Offset value of 0x0001.
  2. The IUT sends an indication of the Record Access Control Point characteristic with the 'Response Code' Op Code (0x06) and an Operand representing the Request Op Code (0x01) followed by the Response Code Value for 'Invalid Operand' (0x05).
  3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
  4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

CGMS/SEN/CBE/BI-05-C [General Error Handling – 'Invalid Operand' – Type 2]

- Test Purpose

  Verify that the IUT responds appropriately when a Client writes an Op Code to the Record Access Control Point with an Operand that is invalid.

- Reference

  [2] 3.8, 3.8.2

- Initial Condition

  - If a connection exists, it gets disconnected.
  - Perform the preamble described in Section 4.2.3.
  - Perform an action on the IUT that induces it to generate 3 or more records.

- Test Procedure

  1. The Lower Tester writes the 'Report Stored Records' Op Code (0x01) to the Record Access Control Point using an Operator of 'Within range of' (0x04) and an Operand containing the Time Offset Filter Type (0x01) followed by a pair of Time Offset values 0xFFFF representing the 'minimum' value and 0x0000 representing the 'maximum' value.

2. The IUT sends an indication of the Record Access Control Point characteristic with the ‘Response Code’ Op Code (0x06), an Operator of Null (0x00), and an Operand representing the Request Op Code (0x01) followed by the Response Code Value for ‘Invalid Operand’ (0x05).
3. The Lower Tester receives an ATT_Handle_Value_Indication from the IUT containing the Record Access Control Point characteristic handle and value.
4. The Lower Tester sends an ATT_Handle_Value_Confirmation to the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends all expected indications of the Record Access Control Point characteristic with the correct fields.

CGMS/SEN/CBE/BI-06-C [General Error Handling – ‘Missing CRC’]

- Test Purpose

  Verify that the IUT does not allow a write of the CGM Session Start Time characteristic if a required E2E-CRC is missing.

- Reference

  [2] 1.8, 3.4.4

- Initial Condition

  - IUT supports E2E-CRC safety; the Lower Tester does not support E2E-CRC safety.
  - The handle of the characteristic value referenced in the test case below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.

- Test Procedure

  1. The Lower Tester writes the ‘Write CGM Session Start Time’ Op Code with an Operand containing a value for a Session Start time as defined in [6] without an E2E-CRC.
  2. The Lower Tester receives an ATT_Error Response from the IUT.

- Expected Outcome

  Pass verdict

  The IUT sends an ATT Error Response with the error code ‘0x80’ set to ‘Missing CRC’ as defined in [2].

CGMS/SEN/CBE/BI-07-C [General Error Handling – ‘Invalid CRC’]

- Test Purpose

  Verify that the IUT does not allow a write of the CGM Specific Ops Control Point characteristic if a required E2E-CRC is invalid.

- Reference

  [2] 1.8, 3.7.2

- Initial Condition
  - Both the IUT and the Lower Tester support E2E-CRC safety (Bit 12 ‘E2E-CRC supported’ in CGM Feature flags is set to 0).
  - The handle of each characteristic value referenced in the test cases below has been previously discovered by the Lower Tester during the test procedure in Section 4.3 or is known to the Lower Tester by other means.
- Test Procedure
  1. The Lower Tester writes the ‘Set CGM Communication interval’ Op Code (0x01) to the CGM Specific Ops Control Point with an Operand containing a valid communication interval (e.g., 5 min) and an invalid CRC.
  2. The Lower Tester receives an ATT_Error Response.
- Expected Outcome

  Pass verdict

  The IUT sends an ATT Error Response with the error code ‘0x81’ set to ‘Invalid CRC’ as defined in [2].

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 CGMS [4].

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

Test Case(s): The applicable test case identifiers are required for Bluetooth Qualification if the corresponding y/x references defined in the Item column are supported.

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

Item	Feature	Test Case(s)
(CGMS 1/1 OR CGMS 1/2) AND CGMS 3/1	CGM Service Definition	CGMS/SEN/SGGIT/SER/BV-01-C
CGMS 1/1	SDP Record	CGMS/SEN/SGGIT/SDP/BV-10-C
CGMS 3/2	CGM Measurement Characteristic	CGMS/SEN/SGGIT/CHA/BV-02-C CGMS/SEN/CON/BV-01-C
CGMS 3/3 AND CGMS 3/4 AND CGMS 3/5 AND CGMS 3/6	Size Field, Flags Field, CGM Glucose Concentration Field and Time Offset Field of CGM Measurement Characteristic	CGMS/SEN/CN/BV-01-C
CGMS 3/7	Sensor Status Annunciation Field of CGM Measurement Characteristic	CGMS/SEN/CN/BV-02-C
CGMS 3/8	CGM Trend Information Field of CGM Measurement Characteristic	CGMS/SEN/CN/BV-03-C
CGMS 3/9	CGM Quality Field of CGM Measurement Characteristic	CGMS/SEN/CN/BV-04-C
CGMS 3/10	E2E-CRC Field of CGM Measurement Characteristic	CGMS/SEN/CN/BV-05-C
CGMS 3/11 AND NOT CGMS 2a/2	CGM Feature Characteristic	CGMS/SEN/SGGIT/CHA/BV-03-C
CGMS 3/11 AND CGMS 2a/2	CGM Feature indication	CGMS/SEN/SGGIT/CHA/BV-09-C CGMS/SEN/SGGIT/ISFC/BV-11-C
CGMS 3/11	CGM Feature Characteristic read	CGMS/SEN/CR/BV-01-C CGMS/SEN/CR/BV-02-C
CGMS 2/8 AND CGMS 3/11	CGM Feature Characteristic read with Multiple Bonds	CGMS/SEN/CR/BV-03-C
CGMS 3/13 AND CGMS 2/7	CGM Session Start Time with E2E-CRC	CGMS/SEN/CR/BV-04-C CGMS/SEN/CBE/BI-06-C
CGMS 3/13 AND NOT CGMS 2/7	CGM Session Start Time without E2E-CRC	CGMS/SEN/CR/BV-05-C

Item	Feature	Test Case(s)
CGMS 3/14 AND CGMS 2/7	CGM Session Run Time without E2E-CRC	CGMS/SEN/CR/BV-06-C
CGMS 3/14 AND NOT CGMS 2/7	CGM Session Run Time without E2E-CRC	CGMS/SEN/CR/BV-07-C
CGMS 2/7	Verify E2E-CRC	CGMS/SEN/CR/BV-09-C
CGMS 3/12	CGM Status Characteristic	CGMS/SEN/SGGIT/CHA/BV-04-C CGMS/SEN/CR/BV-08-C
CGMS 3/13	CGM Session Start Time Characteristic	CGMS/SEN/SGGIT/CHA/BV-05-C CGMS/SEN/CW/BV-01-C CGMS/SEN/CW/BI-01-C
CGMS 3/14	CGM Session Run Time Characteristic	CGMS/SEN/SGGIT/CHA/BV-06-C
CGMS 3/15	Record Access Control Point Characteristic	CGMS/SEN/SGGIT/CHA/BV-07-C CGMS/SEN/CON/BV-02-C CGMS/SEN/CBE/BI-01-C
CGMS 3/17 AND CGMS 5/1	Record Access - Delete Stored Records	CGMS/SEN/RAD/BV-01-C
CGMS 3/17 AND CGMS 4/6	Record Access - Delete Stored Records, Within range Operator	CGMS/SEN/RAD/BV-02-C
CGMS 3/16	Record Access - Report Stored Records	CGMS/SEN/RAE/BI-01-C CGMS/SEN/RAE/BI-02-C
CGMS 3/18	Record Access – Abort Operation	CGMS/SEN/RAA/BV-01-C
CGMS 4/1	Record Access - Report Stored Records	CGMS/SEN/RAR/BV-01-C CGMS/SEN/CBE/BI-02-C CGMS/SEN/CBE/BI-03-C CGMS/SEN/CBE/BI-04-C CGMS/SEN/RAE/BI-03-C
CGMS 4/1 AND CGMS 4/6	General Error Handling – ‘Invalid Operand’ – Type 2	CGMS/SEN/CBE/BI-05-C
CGMS 4/2 AND CGMS 4/3	Record Access – Report Stored Records, Less than or equal to Operator	CGMS/SEN/RAR/BV-02-C
CGMS 4/4 AND CGMS 4/5	Record Access – Report Stored Records, Greater than or equal to Operator	CGMS/SEN/RAR/BV-03-C
CGMS 4/6 AND CGMS 4/7	Record Access – Report Stored Records, Within range Operator	CGMS/SEN/RAR/BV-04-C
CGMS 4/8	Record Access – Report Stored Records, First record Operator	CGMS/SEN/RAR/BV-05-C
CGMS 4/9	Record Access – Report Stored Records, Last record Operator	CGMS/SEN/RAR/BV-06-C
CGMS 7/1	Record Access – Report Stored Records, All Records Operator	CGMS/SEN/RAN/BV-01-C
CGMS 5/1 AND CGMS 7/1	Record Access – Report Number of stored Records, All Records – No records found	CGMS/SEN/RAN/BV-03-C
CGMS 7/4 AND CGMS 7/5	Record Access – Report Number of stored Records, Within range Operator	CGMS/SEN/RAN/BV-02-C

Item	Feature	Test Case(s)
CGMS 3/22	CGM Specific Ops Control Point	CGMS/SEN/SGGIT/CHA/BV-08-C CGMS/SEN/CON/BV-03-C
CGMS 3/22 AND CGMS 2/7	CGM Specific Ops Control Point, Invalid CRC	CGMS/SEN/CBE/BI-07-C
CGMS 3/23 AND CGMS 2/7	CGM Specific Ops Control Point – Set Communication Interval – with E2E-CRC	CGMS/SEN/CGMCP/BV-03-C CGMS/SEN/CGMCP/BV-04-C
CGMS 3/23 AND NOT CGMS 2/7	CGM Specific Ops Control Point – Set Communication Interval – without E2E-CRC	CGMS/SEN/CGMCP/BV-26-C CGMS/SEN/CGMCP/BV-27-C
CGMS 3/24b AND CGMS 2/7	Disable Periodic Communication – with E2E-CRC	CGMS/SEN/CGMCP/BV-05-C
CGMS 3/24b AND NOT CGMS 2/7	Disable Periodic Communication – without E2E-CRC	CGMS/SEN/CGMCP/BV-28-C
CGMS 2/7 AND CGMS 3/24	CGM Specific Ops Control Point – Get Communication Interval, with E2E-CRC	CGMS/SEN/CGMCP/BV-01-C
CGMS 3/24 AND NOT CGMS 2/7	CGM Specific Ops Control Point – Get Communication Interval, without E2E-CRC	CGMS/SEN/CGMCP/BV-02-C
CGMS 2/1 AND CGMS 3/25	CGM Specific Ops Control Point – Set Glucose Calibration	CGMS/SEN/CGMCP/BV-08-C
CGMS 2/1 AND CGMS 3/26	CGM Specific Ops Control Point – Get Glucose Calibration	CGMS/SEN/CGMCP/BV-06-C CGMS/SEN/CGMCP/BV-07-C CGMS/SEN/CGMCP/BI-01-C
CGMS 2/1 AND CGMS 2/1a AND CGMS 3/26	CGM Specific Ops Control Point – Get Glucose Calibration with Calibration Data Record number 0	CGMS/SEN/CGMCP/BV-29-C
CGMS 2/2 AND CGMS 3/27	CGM Specific Ops Control Point – Set Patient High Alert Level	CGMS/SEN/CGMCP/BV-10-C CGMS/SEN/CGMCP/BI-02-C
CGMS 2/2 AND CGMS 3/28	CGM Specific Ops Control Point – Get Patient High Alert Level	CGMS/SEN/CGMCP/BV-09-C
CGMS 2/2 AND CGMS 3/29	CGM Specific Ops Control Point – Set Patient Low Alert Level	CGMS/SEN/CGMCP/BV-12-C CGMS/SEN/CGMCP/BI-03-C
CGMS 2/2 AND CGMS 3/30	CGM Specific Ops Control Point – Get Patient Low Alert Level	CGMS/SEN/CGMCP/BV-11-C
CGMS 2/3 AND CGMS 3/31	CGM Specific Ops Control Point – Set Hypo Alert Level	CGMS/SEN/CGMCP/BV-14-C CGMS/SEN/CGMCP/BI-04-C
CGMS 2/3 AND CGMS 3/32	CGM Specific Ops Control Point – Get Hypo Alert Level	CGMS/SEN/CGMCP/BV-13-C
CGMS 2/4 AND CGMS 3/33	CGM Specific Ops Control Point – Set Hyper Alert Level	CGMS/SEN/CGMCP/BV-16-C CGMS/SEN/CGMCP/BI-05-C
CGMS 2/4 AND CGMS 3/34	CGM Specific Ops Control Point – Get Hyper Alert Level	CGMS/SEN/CGMCP/BV-15-C
CGMS 2/5 AND CGMS 3/35	CGM Specific Ops Control Point – Set Rate of Decrease Alert Level	CGMS/SEN/CGMCP/BV-18-C CGMS/SEN/CGMCP/BI-06-C
CGMS 2/5 AND CGMS 3/36	CGM Specific Ops Control Point – Get Rate of Decrease Alert Level	CGMS/SEN/CGMCP/BV-17-C
CGMS 2/5 AND CGMS 3/37	CGM Specific Ops Control Point – Set Rate of Increase Alert Level	CGMS/SEN/CGMCP/BV-20-C CGMS/SEN/CGMCP/BI-07-C

Item	Feature	Test Case(s)
CGMS 2/5 AND CGMS 3/38	CGM Specific Ops Control Point – Get Rate of Increase Alert Level	CGMS/SEN/CGMCP/BV-19-C
CGMS 2/6 AND CGMS 3/39	CGM Specific Ops Control Point – Reset Device Specific Alert	CGMS/SEN/CGMCP/BV-21-C
CGMS 3/40	CGM Specific Ops Control Point – Start Session	CGMS/SEN/CGMCP/BV-22-C CGMS/SEN/CGMCP/BI-08-C
CGMS 2/9 AND CGMS 3/40	CGM Specific Ops Control Point – Start Session, multiple sessions	CGMS/SEN/CGMCP/BV-25-C
CGMS 3/41	CGM Specific Ops Control Point – Stop Session	CGMS/SEN/CGMCP/BV-23-C
CGMS 3/40 AND CGMS 3/41 AND NOT CGMS 2/9	CGM Specific Ops Control Point – Start Session, no multiple sessions	CGMS/SEN/CGMCP/BV-24-C

Table 5.1: Test case mapping

6 RACP Test Matrix

The following tables summarize the features of RACP and the combinations with other features that are tested and not tested. For the tables, below, the following key applies:

- YES = A test for this combination exists.
- NO = A test for this combination does not exist.
- N/A = Not a valid combination.

	RACP Request Op Codes			
RACP Operands	Report stored records	Delete stored records	Abort operation	Report number of stored records
All records	YES	YES	YES	YES
Less than or equal to	YES	NO	N/A	NO
Greater than or equal to	YES	NO	N/A	YES
Within range of (inclusive)	YES	YES	N/A	NO
First record	YES	NO	N/A	NO
Last record	YES	NO	N/A	NO

	RACP Request Op Codes			
RACP Response Codes	Report stored records	Delete stored records	Abort operation	Report number of stored records
Success	YES	YES	YES	YES
Op Code not supported	NO (tested by Profile)	N/A	N/A	N/A
Invalid Operator	YES	NO	N/A	NO
Operator not supported	YES	NO	N/A	NO
Invalid Operand	YES	NO	N/A	NO
No records found	YES	NO	N/A	N/A
Abort unsuccessful	N/A	N/A	NO	N/A
Procedure not completed	N/A	N/A	N/A	N/A
Operand not supported	YES	N/A	N/A	NO
Unsupported Filter Type	YES	N/A	N/A	NO
Procedure already in progress	YES	NO	N/A	NO

7 Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	1.0.0	2014-11-25	Prepare for Publication
	1.0.1r00	2015-05-10	TSE 6171: Changed characteristic from CGM Specific Ops Control Point to Record Access Control Point in TP/CBE/BI-04-C (CGMS/SEN/CBE/BI-04-C after ID conversion) TSE 6170: Deleted steps 7 and 8 in TP/RAR/BV-02-C (CGMS/SEN/RAR/BV-02-C after ID conversion) and updated Pass verdict accordingly.
1	1.0.1	2015-07-14	Prepared for TCRL 2015-1 publication
	1.0.2r00	2015-10-01	TSE 6430: Added clarifying text to the TP/CGMCP/BV-24-C (CGMS/SEN/CGMCP/BV-24-C after ID conversion) test case purpose in Section 4.15.32. TSE 6571: Removed mapping of TP/CGMP/BV-12-C (CGMS/SEN/CGMCP/BV-12-C after ID conversion) to item 3/27 in the test case mapping table in Section 5. TSE 6431: Corrected the Calibration Value Response Op Code in step 2 of the Test Procedure in Section 4.15.8. TSE 6429: Corrected the Request Op Code in Section 4.15.14 and the 'Get Hypo Alert Level Response' Op Code in Section 4.15.16.
	1.0.1.0r00	2015-10-28	Updated version numbering to align with Specification version change from 1.0 to 1.0.1 for ESR09. With the specification taking a third identifying number, the TS version identifier moves to the fourth number and starts again at 0.
2	1.0.1.0	2015-12-22	Prepared for TCRL 2015-2 publication.
	1.0.1.1r00	2016-02-05	TSE 6770: TCMT Item and Feature updated for Test Cases CGMS/SEN/DEC/BV-04-C and CGMS/SEN/DEC/BV-06-C.
	1.0.1.1r01	2016-04-13	Converted to new Test Case ID conventions as defined in TSTO v4.1.
3	1.0.1.1	2016-07-13	Prepared for TCRL 2016-1 publication.
	1.0.1.2r00	2016-10-05	TSE 7199: Added reference to CSS v6. Corrected reference in CGMS/SEN/CW/BV-01-C. Corrected Pass verdict error code in CGMS/SEN/CW/BI-01-C with reference to CSS v6. TSE 7200: Corrected mapping for CGMS/SEN/CGMCP/BV-05-C TSE 7201: Updated restrictions on fields in CGMS/SEN/CN/BV-01-C from "only to "at least". TSE 7298: updated out of range parameter values in CGMS/SEN/CGMCP/BI-02-C, CGMS/SEN/CGMCP/BI-03-C, CGMS/SEN/CGMCP/BI-04-C, CGMS/SEN/CGMCP/BI-05-C.

Publication Number	Revision Number	Date	Comments
4	1.0.1.2	2016-12-13	Approved by BTI. Prepared for TCRL 2016-2 publication.
	1.0.1.3r00–r02	2019-02-26 – 2019-06-17	TSE 11260 (rating 4): Updated template. Split tests CGMS/SEN/CGMCP/BV-03-C – -05-C to variants with and without E2E-CRC support. New tests CGMS/SEN/CGMCP/BV-26-C – -28-C added for the E2E-CRC not supported variants. Updated TCMT accordingly. TSE 11261 (rating 3): Updated test case CGMS/SEN/CW/BV-01-C Test Procedure steps and Pass Verdict to better align with ICS.
5	1.0.1.3	2019-07-29	Approved by BTI. Prepared for TCRL 2019-1 publication.
	1.0.1.3 edition 2r00	2020-05-07	TSE 14786 (rating 1): Updated TCIDs CGMS/SEN/CON/BV-26-C – -28-C to align with TCMT and TCRL as CGMS/SEN/CGMCP/BV-26-C – -28-C.
	1.0.1.3 edition 2	2020-08-13	Performed minor formatting and template updates and accepted all tracked changes. Approved by BTI on 2020-08-13. Prepared for edition 2 publication.
	p6r00–r01	2020-10-21 – 2020-11-17	TSE 15726 (rating 2): Updated TCMT entry for TC CGMS/SEN/CBE/BI-06-C. Consistency Checker fixes and template-related editorials, including updating Conformance and Pass/Fail Verdict Conventions text and updating the document number, setting previous v1.0.1.3 to p5.
6	p6	2020-12-22	Approved by BTI on 2020-12-02. Prepared for TCRL 2020-1 publication.
	p7r00–r06	2021-03-10 – 2021-12-21	TSE 16857 (rating 4): Changes from E16239. Added new test group ISFC. New test cases added CGMS/SEN/SGGIT/CHA/BV-09-C and CGMS/SEN/SGGIT/ISFC/BV-11-C. Added TCMT for the new test cases. Minor editorial updates to the preambles. TSE 17627 (rating 2): Corrected the pass verdict of CGMS/SEN/CW/BV-01-C with the CGM Status Time Offset Field as the second half of the equation for determining the pass criteria. TSE 18084 (rating 2): Converted the following test cases into GGIT tests: CGMS/SEN/DEC/BV-01-C – -07-C, CGMS/SEN/DES/BV-01-C – -03-C, and CGMS/SEN/SD/BV-01-C. The new GGIT converted TCIDs are: CGMS/SEN/SGGIT/SER/BV-01-C, CGMS/SEN/SGGIT/CHA/BV-02-C – -08-C, and CGMS/SEN/SGGIT/SDP/BV-10-C. Updated TCMT for the new GGIT tests and tests impacted by the GGIT conversion. TSE 18085 (rating 1): Removed direct references to GATT test cases in the following test cases: CGMS/SEN/CR/BV-01-C – -09-C, CGMS/SEN/CW/BV-01-C, CGMS/SEN/CW/BI-01-C, CGMS/SEN/CON/BV-01-C – -03-C.

Publication Number	Revision Number	Date	Comments
			TSE 18087 (rating 4): Changes from E17414. Added test case CGMS/SEN/CGMCP/BV-29-C and mapping. Modified CGMS/SEN/CGMCP/BV-08-C to include optionally supporting the Calibration Process bit in an already existing bit field and updates to initial conditions, test procedure, and pass verdict to include the new alternative and new IXIT entry. Template-related editorials, including consistency checker fixes and updating the copyright page to align with v2 of the DNMD.
7	p7	2022-01-25	Approved by BTI on 2022-01-06. Prepared for TCRL 2021-2 publication.
	p7ed2r00–r01	2023-03-08 – 2023-04-13	TSE 22662 (rating 1): Updated the test purpose, initial condition, test procedure, and/or expected outcome for CGMS/SEN/CR/BV-01-C – -09-C, CGMS/SEN/CW/BV-01-C, CGMS/SEN/CW/BI-01-C, CGMS/SEN/CON/BV-01-C – -03-C, CGMS/SEN/CN/BV-01-C – -05-C, CGMS/SEN/RAN/BV-01-C – -03-C, CGMS/SEN/RAD/BV-01-C and -02-C, CGMS/SEN/RAR/BV-01-C – -06-C, CGMS/SEN/RAA/BV-01-C, CGMS/SEN/RAE/BI-01-C and -03-C, CGMS/SEN/CGMCP/BV-01-C – -29-C, CGMS/SEN/CGMCP/BI-01-C – -08-C, CGMS/SEN/CBE/BI-01-C – -07-C. Added a missing test purpose to CGMS/SEN/CN/BV-01-C. Made small grammatical improvements throughout. Editorials to align the document with the latest ICS template.
	p7 edition 2	2023-04-14	Approved by BTI on 2023-04-13. Prepared for edition 2 publication.

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