International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.845.13

(04/2017)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

E-health multimedia services and applications – Interoperability compliance testing of personal health systems (HRN, PAN, LAN, TAN and WAN)

Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 5M: Basic electrocardiograph

Recommendation ITU-T H.845.13

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Recommendation ITU-T H.845.13

Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 5M: Basic electrocardiograph

Summary

Recommendation ITU-T H.845.13 provides a test suite structure (TSS) and the test purposes (TP) for basic electrocardiograph in the Personal Health Devices (PHD) interface, based on the requirements defined in the Recommendations of the ITU-T H.810 sub-series, of which Recommendation ITU-T H.810 (2016) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

Recommendation ITU-T H.845.13 is a transposition of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 5M: Device Specializations. Personal Health Device (Basic Electrocardiograph) (Version 1.4, 2016-09-20), that was developed by the Personal Connected Health Alliance. A number of versions of this specification existed before transposition.

This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T H.845.13	2015-01-13	16	11.1002/1000/12273
2.0	ITU-T H.845.13	2016-07-14	16	11.1002/1000/12950
3.0	ITU-T H.845.13	2017-04-13	16	11.1002/1000/13230

Keywords

Basic electrocardiograph, conformance testing, Continua Design Guidelines, e-health, IEEE 11073 device specialization, ITU-T H.810, personal area network, personal connected health devices, Personal Health Devices interface, touch area network.

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* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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Electronic attachment: This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

Introduction

This Recommendation is a transposition of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 5M: Device Specializations. Personal Health Device (Basic Electrocardiograph) (Version 1.4, 2016-09-20), that was developed by the Personal Connected Health Alliance. The table below shows the revision history of this test specification; it may contain versions that existed before transposition.

Version	Date	Revision history
1.0	2013-05-24	Initial release for Test Tool DG2012.
1.1	2014-01-24	Initial release for Test Tool DG2013. This uses "TSS&TP_DG2012_ PAN-LAN_PART_5M_v1.0.doc" as a baseline and adds new features included in [b-ITU-T H.810 (2013)]/[b-CDG 2013]: • Adds glucose meter BLE • Adds BLE SSP support • Adds NFC new transport • Adds INR device specialization
1.2	2014-04-24	TM Lite & Doc Enhancements (Test Tool v4.0 Maintenance Release 1). It uses "TSS&TP_DG2013_PLT_PART_5M_v1.1.doc" as a baseline and adds new features included in Documentation Enhancements: • "Other PICS" row added
1.3	2015-07-01	Initial release for Test Tool DG2015. It uses "TSS&TP_DG2013_PLT_ PART_5M_v1.2.doc" as a baseline and adds new features included in [b-ITU-T H.810 (2015)]/[b-CDG 2015]
1.4	2016-09-20	Initial release for Test Tool DG2016. It uses "TSS&TP_DG2015_PLT_ PART_5M_v1.3.doc" as a baseline and adds new features included in [ITU-T H.810 (2016)]/[b-CDG 2016]

Recommendation ITU-T H.845.13

Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 5M: Basic electrocardiograph

1 Scope

The scope of this Recommendation[1] is to provide a test suite structure (TSS) and the test purposes (TP) for the Personal Health Devices interface based on the requirements defined in the Continua Design Guidelines (CDG) [ITU-T H.810 (2016)]. The objective of this test specification is to provide a high probability of interoperability at this interface.

The TSS and TP for the Personal Health Devices interface have been divided into the parts specified below. This Recommendation covers Part 5, subpart 5M.

– Part 1: Optimized exchange protocol Personal Health Device
– Part 2: Optimized exchange protocol Personal Health Gateway
– Part 3: Continua design guidelines. Personal Health Device
– Part 4: Continua design guidelines. Personal Health Gateway
– Part 5: Device specializations. Personal Health Devices interface. This document is divided into the following subparts:
  - Part 5A: Weighing scales
  - Part 5B: Glucose meter
  - Part 5C: Pulse oximeter
  - Part 5D: Blood pressure monitor
  - Part 5E: Thermometer
  - Part 5F: Cardiovascular fitness and activity monitor
  - Part 5G: Strength fitness equipment
  - Part 5H: Independent living activity hub
  - Part 5I: Adherence monitor
  - Part 5J: Insulin pump
  - Part 5K: Peak expiratory flow monitor
  - Part 5L: Body composition analyser
  - **Part 5M: Basic electrocardiograph**
  - Part 5N: International normalized ratio monitor
  - Part 5O: Sleep apnoea breathing therapy equipment (SABTE)
  - Part 5P: Continuous glucose monitor (CGM)
– Part 6: Device specializations. Personal Health Gateway
– Part 7: Continua Design Guidelines. BLE Personal Health Device
– Part 8: Continua Design Guidelines. BLE Personal Health Gateway

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[1] This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

– Part 9: Personal Health Devices Transcoding Whitepaper. Personal Health Devices

– Part 10: Personal Health Devices Transcoding Whitepaper. Personal Health Gateway

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T H.810 (2016)] Recommendation ITU-T H.810 (2016), *Interoperability design guidelines for personal health systems*.

[ISO/IEEE 11073-20601-2015A] ISO/IEEE 11073-20601:2010, *Health informatics – Personal health device communication – Part 20601: Application profile – Optimized exchange protocol*, including ISO/IEEE 11073-20601:2010 Amd 1:2015.
https://www.iso.org/standard/54331.html with
https://www.iso.org/standard/63972.html

[ISO/IEEE 11073-20601-2016C] ISO/IEEE 11073-20601:2016, *Health informatics – Personal health device communication – Part 20601: Application profile – Optimized exchange protocol*, including ISO/IEEE 11073-20601:2016/Cor.1:2016.
https://www.iso.org/standard/66717.html with
https://www.iso.org/standard/71886.html

[ISO/IEEE 11073-10406] ISO/IEEE 11073-10406:2012, *Health informatics – Personal health device communication – Part 10406: Device specialization – Basic electrocardiograph (ECG) (1- to 3-lead ECG)*.
https://www.iso.org/standard/61876.html

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 agent [ISO/IEEE 11073-20601-2016C]: A node that collects and transmits personal health data to an associated manager.

3.1.2 manager [ISO/IEEE 11073-20601-2016C]: A node receiving data from one or more agent systems. Some examples of managers include a cellular phone, health appliance, set top box, or a computer system.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

DUT Device Under Test

CDG Continua Design Guidelines

CGM Continuous Glucose Monitor

INR International Normalized Ratio

IP Insulin Pump

MDS Medical Device System

NFC Near Field Communication

PAN Personal Area Network

PHD Personal Health Device

PHDC Personal Healthcare Device Class

PHG Personal Health Gateway

PICS Protocol Implementation Conformance Statement

PIXIT Protocol Implementation extra Information for Testing

SABTE Sleep Apnoea Breathing Therapy Equipment

SCR Static Conformance Review

SDP Service Discovery Protocol

SOAP Simple Object Access Protocol

TP Test Purpose

TSS Test Suite Structure

USB Universal Serial Bus

5 Conventions

The key words "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "MAY", "MAY NOT" in this Recommendation are to be interpreted as in [b-ETSI SR 001 262].

– SHALL is equivalent to 'must' or 'it is required to'.

– SHALL NOT is equivalent to 'must not' or 'it is not allowed'.

– SHOULD is equivalent to 'it is recommended to'.

– SHOULD NOT is equivalent to 'it is not recommended to'.

– MAY is equivalent to 'is permitted'.

– MAY NOT is equivalent to 'it is not required that'.

NOTE – The above-mentioned key words are capitalized for illustrative purposes only and they do not appear capitalized within this Recommendation.

Reference is made in the ITU-T H.800-series of Recommendations to different versions of the Continua Design Guidelines (CDG) by a specific designation. The list of terms that may be used in this Recommendation is provided in Table 1.

Table 1 – List of designations associated with the various versions of the CDG

CDG release	Transposed as	Version	Description	Designation
2016 plus errata	[ITU-T H.810 (2016)]	6.1	Release 2016 plus errata noting all ratified bugs [b-CDG 2016].	–
2016	–	6.0	Release 2016 of the CDG including maintenance updates of the CDG 2015 and additional guidelines that cover new functionalities.	Iris
2015 plus errata	[b-ITU-T H.810 (2015)]	5.1	Release 2015 plus errata noting all ratified bugs [b-CDG 2015]. The 2013 edition of H.810 is split into eight parts in the H.810-series.	–
2015	–	5.0	Release 2015 of the CDG including maintenance updates of the CDG 2013 and additional guidelines that cover new functionalities.	Genome
2013 plus errata	[b-ITU-T H.810 (2013)]	4.1	Release 2013 plus errata noting all ratified bugs [b-CDG 2013].	–
2013	–	4.0	Release 2013 of the CDG including maintenance updates of the CDG 2012 and additional guidelines that cover new functionalities.	Endorphin
2012 plus errata	–	3.1	Release 2012 plus errata noting all ratified bugs [b-CDG 2012].	–
2012	–	3.0	Release 2012 of the CDG including maintenance updates of the CDG 2011 and additional guidelines that cover new functionalities.	Catalyst
2011 plus errata	–	2.1	CDG 2011 integrated with identified errata.	–
2011	–	2.0	Release 2011 of the CDG including maintenance updates of the CDG 2010 and additional guidelines that cover new functionalities [b-CDG 2011].	Adrenaline
2010 plus errata	–	1.6	CDG 2010 integrated with identified errata	–
2010	–	1.5	Release 2010 of the CDG with maintenance updates of the CDG Version 1 and additional guidelines that cover new functionalities [b-CDG 2010].	1.5
1.0	–	1.0	First released version of the CDG [b-CDG 1.0].	–

6 Test suite structure (TSS)

The test purposes (TPs) for the Personal Health Devices interface have been divided into the main subgroups specified below. Annex A describes the TPs for subgroup 1.3.13 (shown in bold).

– Group 1: Personal Health Device (PHD)
  - Group 1.1: Transport (TR)

    - Subgroup 1.1.1: Design guidelines: Common (DGC)
    - Subgroup 1.1.2: USB design guidelines (UDG)
    - Subgroup 1.1.3: Bluetooth design guidelines (BDG)
    - Subgroup 1.1.4: Pulse oximeter design guidelines (PODG)
    - Subgroup 1.1.5: Cardiovascular design guidelines (CVDG)
    - Subgroup 1.1.6: Activity hub design guidelines (HUBDG)
    - Subgroup 1.1.7: ZigBee design guidelines (ZDG)
    - Subgroup 1.1.8: Glucose meter design guidelines (GLDG)
    - Subgroup 1.1.9: Bluetooth low energy design guidelines (BLEDG)
    - Subgroup 1.1.10: Basic electrocardiograph design guidelines (ECGDG)
    - Subgroup 1.1.11: NFC design guidelines (NDG)
- Group 1.2: IEEE 20601: Optimized exchange protocol (OXP)
    - Subgroup 1.2.1: PHD domain information model (DIM)
    - Subgroup 1.2.2: PHD service model (SER)
    - Subgroup 1.2.3: PHD communication model (COM)
- Group 1.3: Devices class specializations (CLASS)
    - Subgroup 1.3.1: Weighing scales (WEG)
    - Subgroup 1.3.2: Glucose meter (GL)
    - Subgroup 1.3.3: Pulse oximeter (PO)
    - Subgroup 1.3.4: Blood pressure monitor (BPM)
    - Subgroup 1.3.5: Thermometer (TH)
    - Subgroup 1.3.6: Cardiovascular (CV)
    - Subgroup 1.3.7: Strength (ST)
    - Subgroup 1.3.8: Activity hub (HUB)
    - Subgroup 1.3.9: Adherence monitor (AM)
    - Subgroup 1.3.10: Insulin pump (IP)
    - Subgroup 1.3.11: Peak flow (PF)
    - Subgroup 1.3.12: Body composition analyser (BCA)
    - **Subgroup 1.3.13: Basic electrocardiograph (ECG)**
    - Subgroup 1.3.14: International normalized ratio (INR)
    - Subgroup 1.3.15: Sleep apnoea breathing therapy equipment (SABTE)
    - Subgroup 1.3.16: Continuous glucose monitor (CGM)
- Group 1.4: Personal health device transcoding whitepaper (PHDTW)
    - Subgroup 1.4.1: Whitepaper general requirements (GEN)
    - Subgroup 1.4.2: Whitepaper thermometer requirements (TH)
    - Subgroup 1.4.3: Whitepaper blood pressure requirements (BPM)
    - Subgroup 1.4.4: Whitepaper heart rate requirements (HR)
    - Subgroup 1.4.5: Whitepaper glucose meter requirements (GL)
    - Subgroup 1.4.6: Whitepaper weight scale requirements (WS)
    - Subgroup 1.4.7: Whitepaper pulse oximeter requirements (PLX)
    - Subgroup 1.4.8: Whitepaper continuous glucose monitoring requirements (CGM)

– Group 2: Personal Health Gateway (PHG)
  - Group 2.1: Transport (TR)
    - Subgroup 2.1.1: Design guidelines: Common (DGC)
    - Subgroup 2.1.2: USB design guidelines (UDG)
    - Subgroup 2.1.3: Bluetooth design guidelines (BDG)
    - Subgroup 2.1.4: Cardiovascular design guidelines (CVDG)
    - Subgroup 2.1.5: Activity hub design guidelines (HUBDG)
    - Subgroup 2.1.6: ZigBee design guidelines (ZDG)
    - Subgroup 2.1.7: Bluetooth low energy design guidelines (BLEDG)
    - Subgroup 2.1.8: NFC design guidelines (NDG)
  - Group 2.2: IEEE 20601 Optimized exchange protocol (OXP)
    - Subgroup 2.2.1: General (GEN)
    - Subgroup 2.2.2: PHD domain information model (DIM)
    - Subgroup 2.2.3: PHD service model (SER)
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  - Group 2.3: Devices class specializations (CLASS)
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    - Subgroup 2.3.3: Pulse oximeter (PO)
    - Subgroup 2.3.4: Blood pressure monitor (BPM)
    - Subgroup 2.3.5: Thermometer (TH)
    - Subgroup 2.3.6: Cardiovascular (CV)
    - Subgroup 2.3.7: Strength (ST)
    - Subgroup 2.3.8: Activity hub (HUB)
    - Subgroup 2.3.9: Adherence monitor (AM)
    - Subgroup 2.3.10: Insulin pump (IP)
    - Subgroup 2.3.11: Peak flow (PF)
    - Subgroup 2.3.12: Body composition analyser (BCA)
    - Subgroup 2.3.13: Basic electrocardiograph (ECG)
    - Subgroup 2.3.14: International normalized ratio (INR)
    - Subgroup 2.3.15: Sleep apnoea breathing therapy equipment (SABTE)
    - Subgroup 2.3.16: Continuous glucose monitor (CGM)
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    - Subgroup 2.4.5: Whitepaper glucose meter requirements (GL)
    - Subgroup 2.4.6: Whitepaper weight scale requirements (WS)
    - Subgroup 2.4.7: Whitepaper pulse oximeter requirements (PLX)
    - Subgroup 2.4.8: Whitepaper continuous glucose monitoring requirements (CGM)

7 Electronic attachment

The protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A can be downloaded from http://handle.itu.int/11.1002/2000/12067.

In the electronic attachment, letters "C" and "I" in the column labelled "Mandatory" are used to distinguish between "PICS" and "PIXIT" respectively during testing. If the cell is empty, the corresponding PICS is "independent". If the field contains a "C", the corresponding PICS is dependent on other PICS, and the logical expression is detailed in the "SCR_Expression" field. The static conformance review (SCR) is used in the test tool to assert whether the PICS selection is consistent.

Annex A

Test purposes

(This annex forms an integral part of this Recommendation.)

A.1 TP definition conventions

The test purposes (TPs) are defined according to the following rules:

- **TP Id**: This is a unique identifier (TP/<TT>/<DUT>/<GR>/<SGR>/<XX> – <NNN>). It is specified according to the naming convention defined below:
  - Each test purpose identifier is introduced by the prefix "TP".
  - <TT>: This is the test tool that will be used in the test case:
    - PAN: Personal area network (Bluetooth or USB)
    - LAN: Local area network (ZigBee)
    - PAN-LAN: Personal area network (Bluetooth or USB) - Local area network (ZigBee)
    - LP-PAN: Low power personal area network (Bluetooth Low Energy)
    - TAN: Touch area network (NFC)
    - PLT: Personal area network (Bluetooth or USB) – Local area network (ZigBee) – Touch area network (NFC)
  - <DUT>: This is the device under test:
    - PHD: Personal Health Device
    - PHG: Personal Health Gateway
  - <GR>: This identifies a group of test cases.
  - <SGR>: This identifies a subgroup of test cases.
  - <XX>: This identifies the type of testing:
    - BV: Valid behaviour test
    - BI: Invalid behaviour test
  - <NNN>: This is a sequential number that identifies the test purpose.
- **TP label**: This is the TP's title.
- **Coverage**: This contains the specification reference and clause to be checked by the TP.
  - Spec: This indicates the earliest version of the specification from which the testable items to be checked by the TP were included.
  - Testable item: This contains the testable items to be checked by the TP.
- **Test purpose**: This is a description of the requirements to be tested.
- **Applicability**: This contains the PICS items that define if the test case is applicable or not for a specific device. When a TP contains an "ALL" in this field it means that it applies to the device under test within that scope of the test (specialization, transport used, etc.).
- **Other PICS**: This contains additional PICS items (apart from the PICS specified in the Applicability row) which are used within the test case implementation and can modify the final verdict. When this row is empty, it means that only the PICS specified in the Applicability row are used within the test case implementation.
- **Initial condition**: This indicates the state to which the device under test (DUT) needs to be moved at the beginning of TC execution.

- **Test procedure**: This describes the steps to be followed in order to execute the test case.
- **Pass/Fail criteria**: This provides criteria to decide whether the DUT passes or fails the test case.

A.2 Subgroup 1.3.13: Basic electrocardiograph (ECG)

<table>
<tr><td colspan="2">TP Id</td><td colspan="3">TP/PLT/PHD/CLASS/ECG/BV-000</td></tr>
<tr><td colspan="2">TP label</td><td colspan="3">Get MDS Object for Basic ECG specialization/Heart Rate profile: Mandatory, Conditional and Optional Attributes</td></tr>
<tr><td rowspan="5">Coverage</td><td>Spec</td><td colspan="3">[ISO/IEEE 11073-10406]</td></tr>
<tr><td rowspan="4">Testable items</td><td>ECG_MDSAttr1; M</td><td>ECG_MDSAttr2; M</td><td>ECG_MDSAttr3; M</td></tr>
<tr><td>ECG_MDSAttr4; M</td><td>ECG_MDSAttr5; M</td><td>ECG_MDSAttr6; R</td></tr>
<tr><td>ECG_MDSAttr7; R</td><td>ECG_MDSAttr8; R</td><td>ECG_MDSAttr10; M</td></tr>
<tr><td>OperProc2; M</td><td></td><td></td></tr>
<tr><td colspan="2">Test purpose</td><td colspan="3">Check that:
The PHD supports a Get command that requests all attributes
[AND]
The MDS Object contains the attributes specified for a Heart Rate PHD.</td></tr>
<tr><td colspan="2">Applicability</td><td colspan="3">C_AG_OXP_164 AND C_AG_OXP_000</td></tr>
<tr><td colspan="2">Other PICS</td><td colspan="3">C_AG_OXP_181</td></tr>
<tr><td colspan="2">Initial condition</td><td colspan="3">The simulated PHG and the PHD under test are in the Operating state.</td></tr>
<tr><td colspan="2">Test procedure</td><td colspan="3">1. The simulated PHG issues a “roiv-cmip-get” command with the handle set to 0 (to request for an MDS object) and the attribute-id-list set to 0 to indicate all attributes.
2. The PHD under test responds with a “rors-cmip-get” service message in which the attribute-list contains a list of all implemented attributes of the MDS object:
MDS Attributes:
a. Not Recommended attribute System-Type.
❑ attribute-id = MDC_ATTR_SYS_TYPE
❑ attribute-type = TYPE
❑ attribute-value.length = 4 bytes
❑ attribute-value = <not relevant>
b. Mandatory attribute System-Type-Spec-List
❑ attribute-id = MDC_ATTR_SYS_TYPE_SPEC_LIST
❑ attribute-type = TypeVerList
❑ attribute-value.length = 4 bytes attribute-value = {MDC_DEV_SPEC_PROFILE_ECG, 1} and {MDC_DEV_SUB_SPEC_PROFILE_HR, 1}
c. Mandatory attribute System-model
❑ attribute-id = MDC_ATTR_ID_MODEL
❑ attribute-type = SystemModel
❑ attribute-value.length = <variable>
❑ attribute-value = {Manufacturer, Model}</td></tr>
</table>

	d. Mandatory attribute Dev-Configuration-Id ❑ attribute-id = MDC_ATTR_DEV_CONFIG_ID ❑ attribute-type = ConfigId ❑ attribute-value.length = 2 bytes ❑ attribute-value = – IF NOT C_AG_OXP_181 then attribute-value = 0x0258 – ELSE attribute-value = < between 0x4000 and 0x7FFF> e. Recommended attribute Power-Status ❑ attribute-id = MDC_ATTR_POWER_STAT ❑ attribute-type = PowerStatus (BITS-16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = ON_MAINS (0x8000) or ON_BATTERY(0x4000) Only one of the following may be active: ▪ chargingFull(8), ▪ chargingTrickle(9), ▪ chargingOff(10). ▪ The rest of the bits must not be set f. Recommended attribute Battery-Level ❑ attribute-id = MDC_ATTR_VAL_BATT_CHARGE (0X09 0X9C) ❑ attribute-type = INT-U16 ❑ attribute-value.length = 2 bytes ❑ attribute-value = <value between 0 and 100> If value >100, the meaning of the value is "undefined" g. Recommended attribute Remain-Battery-Time ❑ attribute-id = MDC_ATTR_TIME_BATT_REMAIN (0X09 0X88) ❑ attribute-type = BatMeasure ❑ attribute-value.length = 6 bytes ❑ attribute-value = <4 bytes to define the value. 2 remaining bytes to define the units, which shall be set to one of: MDC_DIM_MIN (0x08 0xA0), MDC_DIM_HR (0x08 0xC0) or MDC_DIM_DAY (0x08 0xE0) >
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-001		
TP label		Get MDS Object for Basic ECG specialization/Simple ECG profile: Mandatory, Conditional and Optional Attributes		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	ECG_MDSAttr1; M	ECG_MDSAttr2; M	ECG_MDSAttr3; M
		ECG_MDSAttr4; M	ECG_MDSAttr5; M	ECG_MDSAttr6; R
		ECG_MDSAttr7; R	ECG_MDSAttr8; R	ECG_MDSAttr10; M
		OperProc2; M		

Test purpose	Check that: The PHD supports a Get command that requests all attributes [AND] The MDS Object contains the attributes specified for a Simple ECG PHD.
Applicability	C_AG_OXP_165 AND C_AG_OXP_000
Other PICS	C_AG_OXP_181
Initial condition	The simulated PHG and the PHD under test are in the Operating state.
Test procedure	1. The simulated PHG issues a "roiv-cmip-get" command with the handle set to 0 (to request for an MDS object) and the attribute-id-list set to 0 to indicate all attributes. 2. The PHD under test responds with a "rors-cmip-get" service message in which the attribute-list contains a list of all implemented attributes of the MDS object: MDS Attributes: a. Not recommended attribute System-Type ❑ attribute-id = MDC_ATTR_SYS_TYPE ❑ attribute-type = TYPE ❑ attribute-value.length = 4 bytes ❑ attribute-value = <not relevant> b. Mandatory attribute System-Type-Spec-List ❑ attribute-id = MDC_ATTR_SYS_TYPE_SPEC_LIST ❑ attribute-type = TypeVerList ❑ attribute-value.length = 4 bytes attribute-value = {MDC_DEV_SPEC_PROFILE_ECG, 1} and {MDC_DEV_SUB_SPEC_PROFILE_ECG, 1} c. Mandatory attribute System-model ❑ attribute-id = MDC_ATTR_ID_MODEL ❑ attribute-type = SystemModel ❑ attribute-value.length = <variable> ❑ attribute-value = {Manufacturer, Model} d. Mandatory attribute Dev-Configuration-Id ❑ attribute-id = MDC_ATTR_DEV_CONFIG_ID ❑ attribute-type = ConfigId ❑ attribute-value.length = 2 bytes ❑ attribute-value = < between 0x4000 and 0x7FFF> e. Recommended attribute Power-Status ❑ attribute-id = MDC_ATTR_POWER_STAT ❑ attribute-type = PowerStatus (BITS-16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = ON_MAINS (0x8000) or ON_BATTERY(0x4000) Only one of the following may be active: ▪ chargingFull(8), ▪ chargingTrickle(9), ▪ chargingOff(10). ▪ The rest of the bits must not be set

	f. Recommended attribute Battery-Level ❑ attribute-id = MDC_ATTR_VAL_BATT_CHARGE (0X09 0X9C) ❑ attribute-type = INT-U16 ❑ attribute-value.length = 2 bytes ❑ attribute-value = <value between 0 and 100> If value >100, the meaning of the value is "undefined" g. Recommended attribute Remain-Battery-Time ❑ attribute-id = MDC_ATTR_TIME_BATT_REMAIN (0X09 0X88) ❑ attribute-type = BatMeasure ❑ attribute-value.length = 6 bytes ❑ attribute-value = <4 bytes to define the value. 2 remaining bytes to define the units, which shall be set to one of: MDC_DIM_MIN (0x08 0xA0), MDC_DIM_HR (0x08 0xC0) or MDC_DIM_DAY (0x08 0xE0) >
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-002		
TP label		MDS Configuration objects events for Basic ECG specialization/Heart Rate profile		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	ECG_MDSEvent1; M	ECG_NumGen1; M	ECG_RTSAGen1; M
		ECG_EnumGen1; M	HeartRate1; C	HeartRateProfile1; M
		HeartRateProfile2; O	HeartRateProfile3; O	HeartRateProfile4; O
		HeartRateProfile5; M	ConfigProc1; M	
Test purpose		Check that: A Basic ECG PHD shall send the [MDS-Configuration-Event] using a [Confirmed] event report. The [MDS-Configuration-Event] shall include the event-info [ConfigReport]. [AND] Check objects supported by the Heart Rate PHD (standard /extended configuration)		
Applicability		C_AG_OXP_164 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_010, C_AG_OXP_181, C_AG_ECG_001, C_AG_ECG_002, C_AG_ECG_003, C_AG_ECG_004, C_AG_ECG_005		
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		
Test procedure		1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD responds with a "Remote Operation Invoke | Confirmed Event Report" message with an MDC_NOTI_CONFIG event to send its configuration to the PHG: a. APDU Type ❑ field- type = PrstApdu ❑ field-length =2 bytes ❑ field-value =0xE7 0x00 b. invoke-id		

	❑ field- type = InvokeIDType ❑ field-length =INT-U16 ❑ field- value=<Not relevant for this test> c. message ❑ field- type = roiv-cmip-confirmed-event-report ❑ field-length =two bytes ❑ field- value=0x01 0x01 (EventReportArgumentSimple) d. obj-handle (EventReportArgumentSimple) ❑ field- type = HANDLE ❑ field-length =INT-U16 e. event-time (EventReportArgumentSimple) ❑ field- type = Relative Time ❑ field-length =INT-U32 ❑ field-value = • IF NOT C_AG_OXP_010 THEN value = 0xFF 0xFF 0xFF 0xFF f. event-type (EventReportArgumentSimple) ❑ field- type = OID-Type ❑ field-length =INT-U16 ❑ field- value=0x 0D 0x 1C (MDC_NOTI_CONFIG) g. config-report-id (ConfigReport) ❑ field- type = ConfigId ❑ field-length = INT-U16 ❑ field- value = – IF NOT C_AG_OXP_181 then attribute-value = 0x0258 – ELSE attribute-value = < between 0x4000 and 0x7FFF > h. obj-class (ConfigReport → ConfigObjectList (ConfigObject)). To check the objects that are supported by the PHD, Type Attribute will be checked in AttributeList. ❑ field- type = OID-Type ❑ field-length = INT-U16 ❑ field- value = – One mandatory numeric object for Heart Rate. – One optional numeric object for R-R Interval. – Up to three optional RT-SA objects for ECG Waveforms. – Two optional enumeration objects for Device Status and Context Data Trigger.
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-003		
TP label		MDS Configuration objects events for Basic ECG specialization/Simple ECG profile		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable	ECG_MDSEvent1; M	ECG_NumGen1; M	ECG_RTSAGen1; M

	items	ECG_EnumGen1; M	SimpleECGProfile1; M	SimpleECGProfile2; O
		SimpleECGProfile3; O	SimpleECGProfile4; O	SimpleECGProfile5; O
		ConfigProc1; M		
Test purpose		Check that: A Basic ECG PHD shall send the [MDS-Configuration-Event] using a [Confirmed] event report. The [MDS-Configuration-Event] shall include the event-info [ConfigReport]. [AND] Check objects supported by the Simple ECG PHD (standard /extended configuration)		
Applicability		C_AG_OXP_165 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_010, C_AG_OXP_181, C_AG_ECG_001, C_AG_ECG_002, C_AG_ECG_003, C_AG_ECG_004, C_AG_ECG_005		
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		
Test procedure		1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG: a. APDU Type ❑ field- type = PrstApdu ❑ field-length =2 bytes ❑ field-value =0xE7 0x00 b. invoke-id ❑ field- type = InvokeIDType ❑ field-length =INT-U16 ❑ field- value=<Not relevant for this test> c. message ❑ field- type = roiv-cmip-confirmed-event-report ❑ field-length =two bytes ❑ field- value=0x01 0x01 (EventReportArgumentSimple) d. obj-handle (EventReportArgumentSimple) ❑ field- type = HANDLE ❑ field-length =INT-U16 e. event-time (EventReportArgumentSimple) ❑ field- type = Relative Time ❑ field-length =INT-U32 ❑ field-value = • IF NOT C_AG_OXP_010 THEN value = 0xFF 0xFF 0xFF 0xFF f. event-type (EventReportArgumentSimple) ❑ field- type = OID-Type ❑ field-length =INT-U16 ❑ field- value=0x 0D 0x 1C (MDC_NOTI_CONFIG) g. config-report-id (ConfigReport) ❑ field- type = ConfigId		

	❑ field-length = INT-U16 ❑ field- value = < between 0x4000 and 0x7FFF > h. obj-class (ConfigReport → ConfigObjectList (ConfigObject)). To check the objects that are supported by the PHD, the Type Attribute will be checked in AttributeList. ❑ field- type = OID-Type ❑ field-length = INT-U16 ❑ field- value = – One to three mandatory RT-SA objects for ECG Waveforms numeric objects for. – Two optional numeric objects, one for Heart Rate and other for R-R Interval. – Two optional enumeration objects, one for Device Status and the other for Context Data Trigger.
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-004		
TP label		MDS objects events Basic ECG specialization		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	ECG_MDSEvent3; M	ECG_MDSEvents 4; M	ECG_MDSEvents 5; M
		ECG_MDSEvents 6; M	ObjAccServ1; M	ObjAccServ3; M
		ObjAccServ4; M	ObjAccServ5; O	ObjAccServ7; O
Test purpose		Check that: The PHD sends the MDS-Dynamic-Data-Update-Fixed using a confirmed or unconfirmed event report and it includes the event-info ScanReportInfoFixed. [AND/OR] The PHD sends the MDS-Dynamic-Data-Update-Var using a confirmed or unconfirmed event report and it includes the event-info ScanReportInfoVar. [AND] Agent-initiated mode shall be supported for measurement data transmission. [AND] A Simple ECG or Heart Rate PHD may support either one or both single-person and multi-person event reports [AND] A Heart Rate PHD with standard configuration shall use the fixed format data update messages method for transmitting measurement data [AND] A Simple ECG or Heart Rate PHD with extended configuration may use either fixed or variable format data update messages for transmitting measurement data.		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_OXP_000 AND (C_AG_OXP_182 OR C_AG_OXP_183 OR C_AG_OXP_184 OR C_AG_OXP_189)		
Other PICS		C_AG_OXP_009, C_AG_OXP_014, C_AG_OXP_181, C_AG_OXP_293		
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		

Test procedure	1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD under test responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 4. Check that the field Dev-Config-Id is set to the tested configuration. If it is not, the PHG responds with an “unsupported-config” and waits for a new configuration. Repeat this step until a Dev-config-Id equal to the tested configuration is received. 5. Record the PHD configuration. 6. IF C_AG_OXP_293: a. Once in Configuring/Sending GetMDS substate simulated PHG issues roiv-cmip-get command with handle set to 0 (to request for MDS object) and attribute-id-list set to 0 to indicate all attributes. b. The PHD responds with a rors-cmip-get service message in which the attribute-list contains a list of all implemented attributes of the MDS object. c. IF the mds-time-mgr-set-time bit is set: ❑ The PHG moves to Configuring/Sending Set Time substate and: • IF C_AG_OXP_009 it issues the Set-Time action command. • IF C_AG_OXP_014 it issues the Set-Base-Offset-Time action command. ❑ Once its internal time setting operation is completed, the PHD responds to the PHG. 7. Take Measurements for every supported object in the PHD under test. 8. Wait to receive every event report and check: ❑ field- type = Event Report ❑ field-length = 2 bytes ❑ field- value=0x01 0x01 (EventReportArgumentSimple, confirmed) This field identifies the type of message sent by the PHD, for the confirmed event configuration, roiv-cmip-confirmed-event-report.
Pass/Fail criteria	• Check that every received MDS Event report is one of the following Data APDU and that it is confirmed. • For Standard Configuration (NOT C_AG_OXP_181): an MDS Event Report is sent by the PHD under test to report measurements for every object: ❑ MDC_NOTI_SCAN_REPORT_FIXED ❑ MDC_NOTI_SCAN_REPORT_MP_FIXED • For Extended Configuration, an MDS Event Report is sent by the PHD under test to report measurements for every object: ❑ MDC_NOTI_SCAN_REPORT_FIXED ❑ MDC_NOTI_SCAN_REPORT_MP_FIXED ❑ MDC_NOTI_SCAN_REPORT_VAR ❑ MDC_NOTI_SCAN_REPORT_MP_VAR
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-005		
TP label		Heart rate Object for Standard Configuration (0x0258)		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable	HeartRate2; M	HeartRate4; M	HeartRate6; R

	items	HeartRate8; M	HeartRate10; R	HeartRate12; O
		HeartRate14; R	HeartRate16; R	HeartRate18; R
		HeartRate20; M	HeartRate22; M	HeartRate24; R
		HeartRate26; O	HeartRate28; O	HeartRate30; R
		HeartRate32; R	HeartRate34; C	HeartRate36; R
		HeartRate38; R	HeartRate40; R	HeartRate42; R
		HeartRate44; C	HeartRate46; R	HeartRate48; R
		HeartRate50; R	HeartRate52; R	HeartRate54; M
		HeartRate55; C	HeartRate56; C	ConfigProc2; M
Test purpose		Check that: Heart Rate Numeric Object contains the attributes specified for Standard Configuration (0x0258)		
Applicability		C_AG_OXP_164 AND (NOT C_AG_OXP_181) AND C_AG_OXP_000		
Other PICS				
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		
Test procedure		1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 4. Check that the field Dev-Config-Id is set to 0x0258. If it is not, the PHG responds with an “unsupported-config” and waits for a new configuration. Repeat this step until a Dev-config-Id equal to 0x0258 is received. 5. Once the PHD under test sends a standard configuration, check Heart Rate object. 6. The Heart Rate object contents shall be: a. Mandatory attribute Handle ❑ attribute-id = MDC_ATTR_ID_HANDLE ❑ attribute-type = HANDLE ❑ attribute-value = 0x00 0x01 b. Mandatory attribute Type ❑ attribute-id = MDC_ATTR_ID_TYPE ❑ attribute-type = TYPE ❑ attribute-value = 0x00 0x02 (MDC_PART_SCADA), 0x41 0x82 (MDC_ECG_HEART_RATE 16770) c. Mandatory attribute Metric-Spec-Small ❑ attribute-id = MDC_ATTR_METRIC_SPEC_SMALL ❑ attribute-type = MetricSpecSmall ❑ attribute-value.length = 2 bytes ❑ attribute-value ≠ 0x00 0x00 • Bit 1 (mss-avail-stored-data(1)) is set. • Bit 9 (mss-acc-agent-initiated(9)) is set. • IF bit 3 (mss-msmt-aperiodic) is set THEN bit 5 (mss-msmt-btb-metric)		

	d. Mandatory attribute Unit-Code ❑ attribute-id = MDC_ATTR_UNIT_CODE ❑ attribute-type = OID-Type ❑ attribute-value.length = 2 bytes ❑ attribute-value = MDC_DIM_BEAT_PER_MIN e. Mandatory attribute Attribute-Value-Map ❑ attribute-id = MDC_ATTR_ATTRIBUTE_VAL_MAP ❑ attribute-type = AttrValMap ❑ attribute-count = 2 ❑ attribute-value = (MDC_ATTR_NU_VAL_OBS_BASIC, 2 MDC_ATTR_TIME_STAMP_REL, 4) 7. Check that no other attributes are present in the initial configuration.
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-006		
TP label		Heart Rate Object for Extended Configuration		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	HeartRate3; M	HeartRate5; M	HeartRate7; R
		HeartRate9; M	HeartRate11; R	HeartRate13; O
		HeartRate15; R	HeartRate17; R	HeartRate19; R
		HeartRate21; M	HeartRate23; C	HeartRate25; R
		HeartRate27; O	HeartRate29; O	HeartRate31; C
		HeartRate33; C	HeartRate35; C	HeartRate37; C
		HeartRate39; R	HeartRate41; C	HeartRate43; C
		HeartRate45; C	HeartRate47; C	HeartRate49; C
		HeartRate51; C	HeartRate53; R	HeartRate55; C
		HeartRate56; C		
Test purpose		Check that: Heart Rate Numeric Object contains the attributes specified for Extended Configuration		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_ECG_001 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_041, C_AG_OXP_046, C_AG_OXP_047, C_AG_OXP_183, C_AG_OXP_189		
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		
Test procedure		1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD under test responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the		

PHG.

4. Check that the field Dev-Config-Id is set to the tested extended configuration. If it is not, the PHG responds with an “unsupported-config” and waits for a new configuration. Repeat this step until a Dev-config-Id equal to the extended configuration is received.
5. Once the PHD under test sends the tested configuration, check the Heart Rate object.
6. The Heart Rate object contents shall be:
   a. Mandatory attribute Type
      - ❑ attribute-id = MDC_ATTR_ID_TYPE
      - ❑ attribute-type = TYPE
      - ❑ attribute-value = one of these values:
        - 0x00 0x02 (MDC_PART_SCADA), 0x41 0x82 (MDC_ECG_HEART_RATE 16770)
        - 0x00 0x80 (MDC_PART_DM 182), 0x55 0xDE (MDC_ECG_HEART_RATE_INSTANT 21982)
   b. IF Not Recommended attribute Supplemental-Types
      - ❑ attribute-id = MDC_ATTR_SPPLEMENTAL_TYPES
      - ❑ attribute-type = SupplementalTypeList
      - ❑ attribute-value.length = <variable>Sequence of TYPE (TYPE.length= 4 bytes)
      - ❑ attribute-value = <Not relevant for this test>
   c. Mandatory attribute Metric-Spec-Small
      - ❑ attribute-id = MDC_ATTR_METRIC_SPEC_SMALL
      - ❑ attribute-type = MetricSpecSmall
      - ❑ attribute-value.length = 2 bytes
      - ❑ attribute-value =
        - IF bit 3 (mss-msmt-aperiodic) is set THEN bit 5 (mss-msmt-btb-metric)
   d. IF Not recommended attribute Metric-Structure-Small is present
      - ❑ attribute-id = MDC_ATTR_METRIC_STRUCTURE_SMALL
      - ❑ attribute-type = MetricStructureSmall
      - ❑ attribute-length = 2 bytes
      - ❑ attribute-value = <Not relevant for this test>
   e. IF Optional attribute Measurement-Status is present
      - ❑ attribute-id = MDC_ATTR_MSMT_STAT
      - ❑ attribute-type = MeasurementStatus
      - ❑ attribute-value.length = 2 bytes
      - ❑ attribute-value = <Not relevant for this test>
   f. IF Not recommended attribute Metric-Id is present
      - ❑ attribute-id = MDC_ATTR_ID_PHYSIO
      - ❑ attribute-type = OID-Type(INT-U16)
      - ❑ attribute-value.length =2 bytes
      - ❑ attribute-value = <Not relevant for this test>
   g. IF Not Recommended attribute Metric-Id-List is present
      - ❑ attribute-id = MDC_ATTR_ID_PHYSIO_LIS
      - ❑ attribute-type = MetricIdList
      - ❑ attribute-value = <Not relevant for this test>
   h. IF Not recommended attribute Metric-Id-Partition is present

	❑ attribute-id = MDC_ATTR_METRIC_ID_PART ❑ attribute-type = NomPartition(INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> i. Mandatory attribute Unit-Code ❑ attribute-id = MDC_ATTR_UNIT_CODE ❑ attribute-type = OID-Type ❑ attribute-value.length = 2 bytes ❑ attribute-value = MDC_DIM_BEAT_PER_MIN j. IF Not recommended attribute Source-Handle-Reference is present ❑ attribute-id = MDC_ATTR_SOURCE_HANDLE_REF ❑ attribute-type = HANDLE(INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> k. IF Not recommended attribute Measure-Active-Period ❑ attribute-id = MDC_ATTR_TIME_PD_MSMT_ACTIVE ❑ attribute-type = FLOAT-Type (INT-U32) ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant for this test> l. IF Not Recommended attribute Accuracy is present ❑ attribute-id = MDC_ATTR_NU_ACCUR_MSMT ❑ attribute-type = FLOAT-Type (INT-U32) ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant for this test>
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-007		
TP label		R-R Interval Object for Extended Configuration		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	RRInterval1; M	RRInterval2; M	RRInterval3; R
		RRInterval4; M	RRInterval5; R	RRInterval6; O
		RRInterval7; R	RRInterval8; R	RRInterval9; R
		RRInterval10; M	RRInterval11; C	RRInterval12; R
		RRInterval13; O	RRInterval14; O	RRInterval15; C
		RRInterval16; C	RRInterval17; C	RRInterval18; C
		RRInterval19; R	RRInterval20; C	RRInterval21; C
		RRInterval22; C	RRInterval23; C	RRInterval24; C
		RRInterval25; C	RRInterval26; R	RRInterval27; M

Test purpose	Check that: R-R Interval Numeric Object contains the attributes specified for Extended Configuration
Applicability	(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_ECG_002 AND C_AG_OXP_181 AND C_AG_OXP_000
Other PICS	C_AG_OXP_041, C_AG_OXP_046, C_AG_OXP_047, C_AG_OXP_183, C_AG_OXP_189
Initial condition	The simulated PHG and the PHD under test are in the Unassociated state.
Test procedure	1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD under test responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 4. Check that the field Dev-Config-Id is set to the tested extended configuration. If it is not, the PHG responds with an “unsupported-config” and waits for a new configuration. Repeat this step until a Dev-config-Id equal to the extended configuration is received. 5. Once the PHD under test sends the tested configuration, check the R-R Interval object. 6. The R-R Interval object contents shall be: a. Mandatory attribute Type ❑ attribute-id = MDC_ATTR_ID_TYPE ❑ attribute-type = TYPE ❑ attribute-value = 0x00 0x02 (MDC_PART_SCADA), 0x3F 0x28 (MDC_ECG_TIME_PD_RR_GL 16168) b. IF Not Recommended attribute Supplemental-Types ❑ attribute-id = MDC_ATTR_SPPLEMENTAL_TYPES ❑ attribute-type = SupplementalTypeList ❑ attribute-value.length = <variable>Sequence of TYPE (TYPE.length= 4 bytes) ❑ attribute-value = <Not relevant for this test> c. Mandatory attribute Metric-Spec-Small ❑ attribute-id = MDC_ATTR_METRIC_SPEC_SMALL ❑ attribute-type = MetricSpecSmall ❑ attribute-value.length = 2 bytes ❑ attribute-value = • Bit 3 (mss-msmt-aperiodic) is set • Bit 5 (mss-msmt-btb-metric) is set d. IF Not recommended attribute Metric-Structure-Small is present ❑ attribute-id = MDC_ATTR_METRIC_STRUCTURE_SMALL ❑ attribute-type = MetricStructureSmall ❑ attribute-length = 2 bytes ❑ attribute-value = <Not relevant for this test> e. IF Optional attribute Measurement-Status is present ❑ attribute-id = MDC_ATTR_MSMT_STAT ❑ attribute-type = MeasurementStatus ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> f. IF Not recommended attribute Metric-Id is present

	❑ attribute-id = MDC_ATTR_ID_PHYSIO ❑ attribute-type = OID-Type(INT-U16) ❑ attribute-value.length =2 bytes ❑ attribute-value = <Not relevant for this test> g. IF Not Recommended attribute Metric-Id-List is present ❑ attribute-id = MDC_ATTR_ID_PHYSIO_LIS ❑ attribute-type = MetricIdList ❑ attribute-value = <Not relevant for this test> h. IF Not recommended attribute Metric-Id-Partition is present ❑ attribute-id = MDC_ATTR_METRIC_ID_PART ❑ attribute-type = NomPartition(INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> i. Mandatory attribute Unit-Code ❑ attribute-id = MDC_ATTR_UNIT_CODE ❑ attribute-type = OID-Type ❑ attribute-value.length = 2 bytes ❑ attribute-value = MDC_DIM_MILLI_SEC or MDC_DIM_TICK j. IF Not recommended attribute Source-Handle-Reference is present ❑ attribute-id = MDC_ATTR_SOURCE_HANDLE_REF ❑ attribute-type = HANDLE(INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> k. IF Not recommended attribute Measure-Active-Period ❑ attribute-id = MDC_ATTR_TIME_PD_MSMT_ACTIVE ❑ attribute-type = FLOAT-Type (INT-U32) ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant for this test> l. IF Not Recommended attribute Accuracy is present ❑ attribute-id = MDC_ATTR_NU_ACCUR_MSMT ❑ attribute-type = FLOAT-Type (INT-U32) ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant for this test>
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-008		
TP label		Tick-Resolution attribute for R-R Interval Tick units		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	ECG_MDSAttr9; C	RRInterval28; C	

Test purpose	Check that: If the PHD implements the R-R interval object and uses MDC_DIM_TICK for the corresponding Unit-Code attribute, the Tick-Resolution attribute shall be implemented.
Applicability	(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_ECG_002 AND C_AG_OXP_181 AND C_AG_OXP_000
Other PICS	
Initial condition	The simulated PHG and the PHD under test are in the Unassociated state.
Test procedure	1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD under test responds with a "Remote Operation Invoke | Confirmed Event Report" message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 4. Check that the field Dev-Config-Id is set to the tested extended configuration. If it is not, the PHG responds with an "unsupported-config" and waits for a new configuration. Repeat this step until a Dev-config-Id equal to the extended configuration is received. 5. Once the PHD under test sends the tested configuration, check the R-R Interval object: a. Mandatory attribute Unit-Code ❑ attribute-id = MDC_ATTR_UNIT_CODE ❑ attribute-type = OID-Type ❑ attribute-value.length = 2 bytes ❑ attribute-value = MDC_DIM_MILLI_SEC or MDC_DIM_TICK 6. IF the Unit-code of the R-R Interval object is MDC_DIM_TICK THEN i. The simulated PHG issues a "roiv-cmip-get" command with the handle set to 0 (to request for an MDS object) and the attribute-id-list set to 0 to indicate all attributes. ii. The PHD under test responds with a "rors-cmip-get" service message in which the attribute-list contains a list of all implemented attributes of the MDS object: a. Conditional attribute Tick-Resolution is present ❑ attribute-id = MDC_ATTR_TICK_RES ❑ attribute-type = FLOAT-Type (INT-U32) ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant for this test>
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-009		
TP label		ECG waveform Object for Extended Configuration		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	Waveform1; M	Waveform2; M	Waveform3; R
		Waveform4; M	Waveform5; O	Waveform6; R
		Waveform7; R	Waveform8; R	Waveform9; M
		Waveform10; C	Waveform11; R	Waveform12; O

		Waveform13; O	Waveform14; C	Waveform15; C
		Waveform16; C	Waveform17; C	Waveform18; R
		Waveform19; M	Waveform20; M	Waveform21; M
		WaveforM22; M		
Test purpose		Check that: ECG waveform RT-SA Object contains the attributes specified for Extended Configuration		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_ECG_003 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_009, C_AG_OXP_014, C_AG_OXP_041, C_AG_OXP_046, C_AG_OXP_047, C_AG_OXP_180, C_AG_OXP_183, C_AG_OXP_189, C_AG_OXP_293		
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		
Test procedure		1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD under test responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 4. Check that the field Dev-Config-Id is set to the tested extended configuration. If it is not, the PHG responds with an “unsupported-config” and waits for a new configuration. Repeat this step until a Dev-config-Id equal to the extended configuration is received. 5. Once the PHD under test sends the tested configuration, check the ECG waveform object. 6. The ECG waveform object contents shall be: a. Mandatory attribute Type ❑ attribute-id = MDC_ATTR_ID_TYPE (0x09 0x2F) ❑ attribute-type = TYPE ❑ attribute-value = one of these values: • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x00 (MDC_ECG_ELEC_POTL 256) • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x01 (MDC_ECG_ELEC_POTL_I 257) • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x02 (MDC_ECG_ELEC_POTL_II 258) • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x3D (MDC_ECG_ELEC_POTL_III 317) • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x3E (MDC_ECG_ELEC_POTL_AVR 318) • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x3F (MDC_ECG_ELEC_POTL_AVL 319) • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x40 (MDC_ECG_ELEC_POTL_AVF 320) • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x03 (MDC_ECG_ELEC_POTL_V1 259) • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x04 (MDC_ECG_ELEC_POTL_V2 260) • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x05 (MDC_ECG_ELEC_POTL_V3 261) • 0x00 0x02 (MDC_PART_SCADA), 0x01 0x06		

(MDC_ECG_ELEC_POTL_V4 262)

- 0x00 0x02 (MDC_PART_SCADA), 0x01 0x07 (MDC_ECG_ELEC_POTL_V5 263)
- 0x00 0x02 (MDC_PART_SCADA), 0x01 0x08 (MDC_ECG_ELEC_POTL_V6 264)

b. If Not Recommended attribute Supplemental-Types is present

- ❑ attribute-id = MDC_ATTR_SUPPLEMENTAL_TYPES (0x0A 0x61)
- ❑ attribute-type = SupplementalTypeList
- ❑ attribute.value.lenngth= Sequence of TYPE (TYPE.length= 4 bytes)
- ❑ attribute-value = <Nor relevant for this test>

c. Mandatory attribute Metric-Spec-Small

- ❑ attribute-id = MDC_ATTR_METRIC_SPEC_SMALL (0x0A 0x46)
- ❑ attribute-type = MetricSpecSmall (2 bytes)
- ❑ attribute-value = 0x00 0x40
  - Bit 9 (mss-acc-agent-initiated(9)) is set

d. IF Optional attribute Measurement-Status is present

- ❑ attribute-id = MDC_ATTR_MSMT_STAT
- ❑ attribute-type = MeasurementStatus
- ❑ attribute-value.length = 2 bytes
- ❑ attribute-value = <Not relevant for this test>

e. IF Not recommended attribute Metric-Id is present

- ❑ attribute-id = MDC_ATTR_ID_PHYSIO
- ❑ attribute-type = OID-Type(INT-U16)
- ❑ attribute-value.length =2 bytes
- ❑ attribute-value = <Not relevant for this test>

f. IF Not Recommended attribute Metric-Id-List is present

- ❑ attribute-id = MDC_ATTR_ID_PHYSIO_LIS
- ❑ attribute-type = MetricIdList
- ❑ attribute-value = <Not relevant for this test>

g. IF Not recommended attribute Metric-Id-Partition is present

- ❑ attribute-id = MDC_ATTR_METRIC_ID_PART
- ❑ attribute-type = NomPartition(INT-U16)
- ❑ attribute-value.length = 2 bytes
- ❑ attribute-value = <Not relevant for this test>

h. Mandatory attribute Unit-Code

- ❑ attribute-id = MDC_ATTR_UNIT_CODE (0x09 0x96)
- ❑ attribute-type = OID-Type
- ❑ attribute-value.length = 2 bytes
- ❑ attribute-value = MDC_DIM_MILLI_VOLT

i. IF Not recommended attribute Source-Handle-Reference is present

- ❑ attribute-id = MDC_ATTR_SOURCE_HANDLE_REF
- ❑ attribute-type = HANDLE(INT-U16)
- ❑ attribute-value.length = 2 bytes
- ❑ attribute-value = <Not relevant for this test>

j. IF Not recommended attribute Measure-Active-Period

	❑ attribute-id = MDC_ATTR_TIME_PD_MSMT_ACTIVE ❑ attribute-type = FLOAT-Type (INT-U32) ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant for this test> k. Mandatory attribute Sample-Period ❑ attribute-id = MDC_ATTR_TIME_PD_SAMP ❑ attribute-type = RelativeTime ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant in this test> l. Mandatory attribute Scale-and-Range-Specification ❑ attribute-id = MDC_ATTR_SCALE_SPECN_I8 or MDC_ATTR_SCALE_SPECN_I16 or MDC_ATTR_SCALE_SPECN_I32 ❑ attribute-type = ScaleRangeSpec8 OR ScaleRangeSpec16 OR ScaleRangeSpec32 ❑ attribute-value.length = 1, 2 OR 4 bytes, depending on the type ❑ attribute-value = <Not relevant in this test> m. Mandatory attribute Sa-Specification ❑ attribute-id = MDC_ATTR_SA_SPECN ❑ attribute-type = SaSpec ❑ attribute-value.length = 6 bytes ❑ attribute-value = <Not relevant in this test> 7. IF C_AG_OXP_293: a. Once in Configuring/Sending GetMDS substate simulated PHG issues roiv-cmip-get command with handle set to 0 (to request for MDS object) and attribute-id-list set to 0 to indicate all attributes. b. The PHD responds with a rors-cmip-get service message in which the attribute-list contains a list of all implemented attributes of the MDS object. c. IF the mds-time-mgr-set-time bit is set: ❑ The PHG moves to Configuring/Sending Set Time substate and: • IF C_AG_OXP_009 it issues the Set-Time action command. • IF C_AG_OXP_014 it issues the Set-Base-Offset-Time action command. ❑ Once its internal time setting operation is completed, the PHD responds to the PHG. 8. IF the PHD under sends the ECG waveforms RT-SA observations through a scanner object THEN the simulated PHG enables the scanner and receives the RT-SA event reports. The attribute of interest is: a. Mandatory attribute Type ❑ attribute-id = MDC_ATTR_SIMP_SA_OBS_VAL ((x0A 0x48) ❑ attribute-type = OCTET STRING ❑ attribute-value = <length must be even> 9. IF the PHD under sends the ECG waveforms RT-SA observations through a PM-Store object THEN the simulated PHG sends a request for PM-Sore data (TrigSegmDataXfer) and the PHD sends the RT-SA stored data. The attribute of interest is: a. Mandatory attribute Type ❑ attribute-id = MDC_ATTR_SIMP_SA_OBS_VAL ((x0A 0x48) ❑ attribute-type = OCTET STRING ❑ attribute-value = <length must be even>

Pass/Fail Criteria	All checked values are as specified in the test procedure.
Notes	MetricSpecSmall must set bit mss-acc-agent-initiated(9) to TRUE because Scanner events are agent-initiated by intent in [ISO/IEEE 11073-20601-2015A] in spite of the fact that the PHG enables/disables these objects (see bugzilla #856 for further details, http://continua.plugfests.com/show_bug.cgi?id=856).

TP Id		TP/PLT/PHD/CLASS/ECG/BV-010		
TP label		ECG waveform data availability		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	Waveform23; M		
Test purpose		Check that: The ECG waveform data shall be made available only through a scanner object or PM-Store object		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_ECG_003 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS				
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		
Test procedure		1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 4. Check that the field Dev-Config-Id is set to the tested extended configuration. If it is not, the PHG responds with an “unsupported-config” and waits for a new configuration. Repeat this step until a Dev-config-Id equal to the extended configuration is received. 5. Check that ECG waveform RT-SA object/s is/are present and record its/their object handle/s. 6. If the PHD supports PM-Store: a. The simulated PHG sends a Get-Segment-Info object action for the PM-Store object with SegmSelection = all-segment b. The PHD issues a response (rors-cmip-confirmed-action) with the PM-Segment attributes it supports in the SegmentInfoList structure 7. Check that all ECG waveform RT-SA object/s handle/s are referenced in the Scanner or PM-Store objects: a. If EpiCfgScanner object (MDC_MOC_SCAN_CFG_EPI) or PeriCfgScanner (MDC_MOC_SCAN_CFG_PERI) is present i. IF Attribute Scan-Handle-List is supported: ❑ attribute-id = MDC_ATTR_SCAN_HANDLE_LIST ❑ attribute-type = HANDLEList ❑ attribute-value.length = <Variable> ❑ attribute-value = It must include references to ECG waveform RT-SA objects handles ii. IF attribute Scan-Handle-Attr-Val-Map is supported: ❑ attribute-id = MDC_ATTR_SCAN_HANDLE_ATTR_VAL_MAP ❑ attribute-type = HANDLEAttrValMap		

	❑ attribute-value.count = N ❑ attribute-value.length = <Variable> ❑ attribute-value = It must include references to ECG waveform RT-SA objects handles b. If the PM-Store object (MDC_MOC_VMO_PMSTORE) is present, then check the PM-Segment-Entry-Map of each PM-Segment 8. Check the MDS event reports sent by the PHD under test.
Pass/Fail criteria	• In step 7.a, all ECG waveform RT-SA objects implemented by the PHD under test must be referenced in the Scan-Handle-List or Scan-Handle-Attr-Val-Map attributes. • In step 7.b, all ECG waveform RT-SA objects implemented by the PHD under test must be referenced (through the PM-Segment-Entry-Map attribute) at least one time in the set of PM-Segments implemented by PM-Store objects. • In step 8, the MDS event report sent by the PHD under test must not include the ECG waveform RT-SA object observations.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-011		
TP label		Device Status Object for Extended Configuration		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	DeviceStatus1; M	DeviceStatus2; M	DeviceStatus3; R
		DeviceStatus4; M	DeviceStatus5; R	DeviceStatus6; O
		DeviceStatus7; R	DeviceStatus8; R	DeviceStatus9; R
		DeviceStatus10; R	DeviceStatus11; C	DeviceStatus12; R
		DeviceStatus13; O	DeviceStatus14; O	DeviceStatus15; C
		DeviceStatus16; C	DeviceStatus17; C	DeviceStatus18; C
		DeviceStatus19; R	DeviceStatus20; R	DeviceStatus21; R
		DeviceStatus22; M	DeviceStatus23; R	DeviceStatus24; R
		DeviceStatus25; R	DeviceStatus27; O	DeviceStatus28; M
Test purpose		Check that: Device Status Enumeration Object contains the attributes specified for Extended Configuration		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_ECG_004 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_041, C_AG_OXP_046, C_AG_OXP_047, C_AG_OXP_183, C_AG_OXP_189		
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		
Test procedure		1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 4. Check that the field Dev-Config-Id is set to extended configuration. If it is not, the PHG		

	responds with an “unsupported-config” and waits for a new configuration. Repeat this step until a Dev-config-Id equal to tested extended configuration is received. 5. Once the PHD under test sends the tested configuration, check the Device Status object. 6. The Device Status object contents shall be: a. Mandatory attribute Type ❑ attribute-id = MDC_ATTR_ID_TYPE ❑ attribute-type = TYPE ❑ attribute-value = MDC_PART_PHD_DM, MDC_ECG_DEV_STAT b. IF Not Recommended attribute Supplemental-Types ❑ attribute-id = MDC_ATTR_SPPLEMENTAL_TYPES ❑ attribute-type = SupplementalTypeList ❑ attribute-value.length = <variable>Sequence of TYPE (TYPE.length= 4 bytes) ❑ attribute-value = <Not relevant for this test> c. IF Not recommended attribute Metric-Structure-Small is present ❑ attribute-id = MDC_ATTR_METRIC_STRUCTURE_SMALL ❑ attribute-type = MetricStructureSmall ❑ attribute-length = 2 bytes ❑ attribute-value = <Not relevant for this test> d. IF Optional attribute Measurement-Status is present ❑ attribute-id = MDC_ATTR_MSMT_STAT ❑ attribute-type = MeasurementStatus ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> e. IF Not recommended attribute Metric-Id is present ❑ attribute-id = MDC_ATTR_ID_PHYSIO ❑ attribute-type = OID-Type(INT-U16) ❑ attribute-value.length =2 bytes ❑ attribute-value = <Not relevant for this test> f. IF Not Recommended attribute Metric-Id-List is present ❑ attribute-id = MDC_ATTR_ID_PHYSIO_LIS ❑ attribute-type = MetricIdList ❑ attribute-value = <Not relevant for this test> g. IF Not recommended attribute Metric-Id-Partition is present ❑ attribute-id = MDC_ATTR_METRIC_ID_PART ❑ attribute-type = NomPartition(INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> h. IF Not recommended attribute Unit-Code is present ❑ attribute-id = MDC_ATTR_UNIT_CODE ❑ attribute-type = OID-Type(INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> i. IF Not recommended attribute Source-Handle-Reference is present ❑ attribute-id = MDC_ATTR_SOURCE_HANDLE_REF

	❑ attribute-type = HANDLE(INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> j. IF Not recommended attribute Measure-Active-Period ❑ attribute-id = MDC_ATTR_TIME_PD_MSMT_ACTIVE ❑ attribute-type = FLOAT-Type (INT-U32) ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant for this test> k. IF Not Recommended attribute Enum-Observed-Value-Simple-OID is present ❑ attribute-id= MDC_ATTR_ENUM_OBS_VAL_SIM_OID ❑ attribute-type = OID-Type (INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> l. IF Not Recommended attribute Enum-Observed-Value-Simple-Bit-Str is present ❑ attribute-id= MDC_ATTR_ENUM_OBS_VAL_SIM_BIT_STR ❑ attribute-type = BITS-32 ❑ attribute-value.length = BITS-32 ❑ attribute-value= <Not relevant for this test> m. IF PHD supports fixed or variable format MDS event report and it does not support PM-Store or Scanner THEN Mandatory attribute Enum-Observed-Value-Basic-Bit-Str is present ❑ attribute-id= MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR ❑ attribute-type = BITS-16 ❑ attribute-value.length = 2 bytes ❑ attribute-value = One of the following bits may be active: • leadwire-loss(0) • leadsignal-loss(1) • leadwire-loss-first-lead(2) • leadsignal-loss-first-lead(3) • leadwire-loss-second-lead(4) • leadsignal-loss-second-lead(5) • leadwire-loss-third-lead(6) • leadsignal-loss-third-lead(7) • The rest of the bits must not be set n. IF Not Recommended attribute Enum-Observed-Value-Simple-Str is present ❑ attribute-id= MDC_ATTR_ENUM_OBS_VAL_SIM_STR ❑ attribute-type = EnumPrintableString ❑ attribute-value.length = <variable> ❑ attribute-value = <Not relevant for this test> o. IF Not Recommended attribute Enum-Observed-Value is present ❑ attribute-id= MDC_ATTR_VAL_ENUM_OBS ❑ attribute-type = EnumObsValue ❑ attribute-value.length = <variable> ❑ attribute-value = <Not relevant for this test>

	p. IF Not recommended attribute Enum-Observed-Value-Partition is present ❑ attribute-id= MDC_ATTR_ENUM_OBS_VAL_PART ❑ attribute-type = NomPartition (INT-U16) ❑ attribute-value-length=2 bytes ❑ attribute-value = <Not relevant for this test>
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-012		
TP label		Context Data Trigger Object for Extended Configuration		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	ContextDataTrig1; M	ContextDataTrig2; M	ContextDataTrig3; R
		ContextDataTrig4; M	ContextDataTrig5; R	ContextDataTrig6; O
		ContextDataTrig7; R	ContextDataTrig8; R	ContextDataTrig9; R
		ContextDataTrig10; R	ContextDataTrig11; C	ContextDataTrig12; R
		ContextDataTrig13; O	ContextDataTrig14; O	ContextDataTrig15; C
		ContextDataTrig16; C	ContextDataTrig17; C	ContextDataTrig18; C
		ContextDataTrig19; R	ContextDataTrig20; M	ContextDataTrig21; R
		ContextDataTrig22; R	ContextDataTrig23; R	ContextDataTrig24; R
		ContextDataTrig25; R		
Test purpose		Check that: Context Data Trigger Enumeration Object contains the attributes specified for Extended Configuration		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_ECG_005 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_041, C_AG_OXP_046, C_AG_OXP_047, C_AG_OXP_183, C_AG_OXP_189		
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		
Test procedure		1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 4. Check that the field Dev-Config-Id is set to extended configuration. If it is not, the PHG responds with an “unsupported-config” and waits for a new configuration. Repeat this step until a Dev-config-Id equal to the tested extended configuration is received. 5. Once the PHD under test sends the tested configuration, check the Context Data Trigger object. 6. The Context Data Trigger object contents shall be: a. Mandatory attribute Type ❑ attribute-id = MDC_ATTR_ID_TYPE		

	❑ attribute-type = TYPE ❑ attribute-value = MDC_PART_PHD_DM, MDC_ECG_EVT_CTXT_GEN b. IF Not Recommended attribute Supplemental-Types ❑ attribute-id = MDC_ATTR_SPPLEMENTAL_TYPES ❑ attribute-type = SupplementalTypeList ❑ attribute-value.length = <variable>Sequence of TYPE (TYPE.length= 4 bytes) ❑ attribute-value = <Not relevant for this test> c. IF Not recommended attribute Metric-Structure-Small is present ❑ attribute-id = MDC_ATTR_METRIC_STRUCTURE_SMALL ❑ attribute-type = MetricStructureSmall ❑ attribute-length = 2 bytes ❑ attribute-value = <Not relevant for this test> d. IF Optional attribute Measurement-Status is present ❑ attribute-id = MDC_ATTR_MSMT_STAT ❑ attribute-type = MeasurementStatus ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> e. IF Not recommended attribute Metric-Id is present ❑ attribute-id = MDC_ATTR_ID_PHYSIO ❑ attribute-type = OID-Type(INT-U16) ❑ attribute-value.length =2 bytes ❑ attribute-value = <Not relevant for this test> f. IF Not Recommended attribute Metric-Id-List is present ❑ attribute-id = MDC_ATTR_ID_PHYSIO_LIS ❑ attribute-type = MetricIdList ❑ attribute-value = <Not relevant for this test> g. IF Not recommended attribute Metric-Id-Partition is present ❑ attribute-id = MDC_ATTR_METRIC_ID_PART ❑ attribute-type = NomPartition(INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> h. IF Not recommended attribute Unit-Code is present ❑ attribute-id = MDC_ATTR_UNIT_CODE ❑ attribute-type = OID-Type(INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> i. IF Not recommended attribute Source-Handle-Reference is present ❑ attribute-id = MDC_ATTR_SOURCE_HANDLE_REF ❑ attribute-type = HANDLE(INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> j. IF Not recommended attribute Measure-Active-Period ❑ attribute-id = MDC_ATTR_TIME_PD_MSMT_ACTIVE ❑ attribute-type = FLOAT-Type (INT-U32)

	❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant for this test> k. IF PHD supports fixed or variable format MDS event report and it does not support PM-Store or Scanner THEN Mandatory attribute Enum-Observed-Value-Simple-OID is present ❑ attribute-id= MDC_ATTR_ENUM_OBS_VAL_SIMP_OID ❑ attribute-type = OID-Type (INT-U16) ❑ attribute-value.length = 2 bytes ❑ attribute-value = One of these values: • MDC_ECG_EVT_CTXT_USER (21978) • MDC_ECG_EVT_CTXT_PERIODIC (21979) • MDC_ECG_EVT_CTXT_DETECTED (21980) • MDC_ECG_EVT_CTXT_EXTERNAL (21981) l. IF Not Recommended attribute Enum-Observed-Value-Simple-Bit-Str is present ❑ attribute-id= MDC_ATTR_ENUM_OBS_VAL_SIMP_BIT_STR ❑ attribute-type = BITS-32 ❑ attribute-value.length = BITS-32 ❑ attribute-value= <Not relevant for this test> m. IF Not Recommended attribute Enum-Observed-Value-Basic-Bit-Str is present ❑ attribute-id= MDC_ATTR_ENUM_OBS_VAL_BASIC_BIT_STR ❑ attribute-type = BITS-16 ❑ attribute-value.length = 2 bytes ❑ attribute-value = <Not relevant for this test> n. IF Not Recommended attribute Enum-Observed-Value-Simple-Str is present ❑ attribute-id= MDC_ATTR_ENUM_OBS_VAL_SIM_STR ❑ attribute-type = EnumPrintableString ❑ attribute-value.length = <variable> ❑ attribute-value = <Not relevant for this test> o. IF Not Recommended attribute Enum-Observed-Value is present ❑ attribute-id= MDC_ATTR_VAL_ENUM_OBS ❑ attribute-type = EnumObsValue ❑ attribute-value.length = <variable> ❑ attribute-value = <Not relevant for this test> p. IF Not recommended attribute Enum-Observed-Value-Partition is present ❑ attribute-id= MDC_ATTR_ENUM_OBS_VAL_PART ❑ attribute-type = NomPartition (INT-U16) ❑ attribute-value-length=2 bytes ❑ attribute-value = <Not relevant for this test>
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id	TP/PLT/PHD/CLASS/ECG/BV-013
TP label	PM-Store Object for Basic ECG specialization Extended Configuration. Disable agent-initiated

		transmissions (MDS Event Reports and Scanner objects)		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	ECG_PMStoreGen2; M		
Test purpose		Check that: Any configuration with a PM-store shall disable agent-initiated transmission as well as the use of scanner objects and support manager-initiated transmission of data recorded in PM-stores.		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_OXP_041 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS				
Initial condition		The simulated PHG and the PHD under test are in the Operating state.		
Test procedure		1. Check if the PHD configuration includes scanner objects. 2. The simulated PHG shall send a Get request for the PM-Store object with an attribute-id-list set to 0 to indicate all PM-Store attributes. 3. The simulated PHG shall send a Get-Segment-Info object action for the PM-Segment object with SegmSelection = all-segments to indicate the PM-Segments attributes of all available PM-Segments. 4. The simulated PHG asks for measurement. 5. Check event reports that are sent by the PHD.		
Pass/Fail criteria		In step 1, the PHD configuration shall not include scanner objects. In step 5, the PHD shall not send the data with MDS event reports.		
Notes				

TP Id		TP/PLT/PHD/CLASS/ECG/BV-014		
TP label		PM-Store Object for Basic ECG specialization Extended Configuration. Periodic PM-Store		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	PerPMStoreAtt4; M	PerPMStoreAtt5; M	PerPMStoreAtt8; M
		PerPMStoreAtt9; M	PerPMStoreAtt14; M	
Test purpose		Check that: The pmsc-epi-seg-entries bit of the [PM-Store-Capab] attribute shall not be set [AND] The pmsc-peri-seg-entries bit of the [PM-Store-Capab] shall be set [AND] [Store-Capacity-Count] attribute shall be present [AND] [Store-Usage-Count] attribute shall be present [AND] [Clear-Timeout] attribute shall be present		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_OXP_041 AND C_AG_OXP_188 AND C_AG_OXP_181 AND C_AG_OXP_000		

Other PICS	
Initial condition	The simulated PHG and the PHD under test are in the Unassociated state.
Test procedure	1. The simulated PHG receives an association request from the PHD under test. 2. The simulated PHG responds with a result = accepted-unknown-config. 3. The PHD responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 4. Record the handle for the PM-Store objects. 5. For each PM-Store objects: i. The simulated PHG shall send a Get request for the PM-Store object with an attribute-id-list set to 0 to indicate all PM-Store attributes. ii. The PHD issues a GET response with the PM-Store attributes it supports. IF the PmStoreCapab attribute - Bit 5 (pmsc-peri-seg-entries) is set to TRUE THEN a. Mandatory attribute PM-Store-Capab ❑ attribute-id = MDC_ATTR_PM_STORE_CAPAB ❑ attribute-type = PmStoreCapab ❑ attribute-value.length = 2 bytes ❑ attribute-value = • Bit 4 (pmsc-epi-seg-entries) must be set to FALSE • Bit 5 (pmsc-peri-seg-entries) must be set to TRUE b. Mandatory attribute Storage-Capacity-Count is present ❑ attribute-id = MDC_ATTR_METRIC_STORE_CAPAC_CNT ❑ attribute-type = INT-U32 ❑ attribute-value.length = 4 bytes ❑ attribute-value = See relation with next attribute c. Mandatory attribute Storage-Usage-Count is present ❑ attribute-id = MDC_ATTR_METRIC_STORE_USAGE_CNT ❑ attribute-type = INT-U32 ❑ attribute-value.length = 4 bytes ❑ attribute-value = always ≤ than Storage-Cpacity-Count d. Mandatory attribute Clear-Timeout is present ❑ attribute-id = MDC_ATTR_CLEAR_TIMEOUT ❑ attribute-type = RelativeTime ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant in this test> ELSE skip the PM-Store object and check the next one
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id	TP/PLT/PHD/CLASS/ECG/BV-015
TP label	PM-Store Object for Basic ECG specialization Extended Configuration. Episodic PM-Store

<table>
<tr><td rowspan="3">Coverage</td><td>Spec</td><td colspan="3">[ISO/IEEE 11073-10406]</td></tr>
<tr><td rowspan="2">Testable items</td><td>AperPMStoreAtt4; M</td><td>AperPMStoreAtt5; M</td><td>AperPMStoreAtt8; M</td></tr>
<tr><td>AperPMStoreAtt9; M</td><td>AperPMStoreAtt12; R</td><td>AperPMStoreAtt14; M</td></tr>
<tr><td colspan="2">Test purpose</td><td colspan="3">Check that:
The pmsc-epi-seg-entries bit of the [PM-Store-Capab] attribute shall be set
[AND]
The pmsc-peri-seg-entries bit of the [PM-Store-Capab] shall not be set
[AND]
[Store-Capacity-Count] attribute shall be present
[AND]
[Store-Usage-Count] attribute shall be present
[AND]
[Sample-Period] attribute is not recommended
[AND]
[Clear-Timeout] attribute shall be present</td></tr>
<tr><td colspan="2">Applicability</td><td colspan="3">(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_OXP_041 AND C_AG_OXP_187 AND C_AG_OXP_181 AND C_AG_OXP_000</td></tr>
<tr><td colspan="2">Other PICS</td><td colspan="3"></td></tr>
<tr><td colspan="2">Initial condition</td><td colspan="3">The simulated PHG and the PHD under test are in the Unassociated state.</td></tr>
<tr><td colspan="2">Test procedure</td><td colspan="3">1. The simulated PHG receives an association request from the PHD under test.
2. The simulated PHG responds with a result = accepted-unknown-config.
3. The PHD responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG.
4. Record the handle for the PM-Store objects.
5. For each PM-Store objects:
i. The simulated PHG shall send a Get request for the PM-Store object with an attribute-id-list set to 0 to indicate all PM-Store attributes.
ii. The PHD issues a GET response with the PM-Store attributes it supports
IF PmStoreCapab attribute - Bit 4 (pmsc-epi-seg-entries) is set to TRUE THEN
a. Mandatory attribute PM-Store-Capab
❑ attribute-id = MDC_ATTR_PM_STORE_CAPAB
❑ attribute-type = PmStoreCapab
❑ attribute-value.length = 2 bytes
❑ attribute-value =
• Bit 4 (pmsc-epi-seg-entries) must be set to TRUE
• Bit 5 (pmsc-peri-seg-entries) must be set to FALSE
b. Mandatory attribute Storage-Capacity-Count is present
❑ attribute-id = MDC_ATTR_METRIC_STORE_CAPAC_CNT
❑ attribute-type = INT-U32
❑ attribute-value.length = 4 bytes
❑ attribute-value = See relation with next attribute
c. Mandatory attribute Storage-Usage-Count is present</td></tr>
</table>

	❑ attribute-id = MDC_ATTR_METRIC_STORE_USAGE_CNT ❑ attribute-type = INT-U32 ❑ attribute-value.length = 4 bytes ❑ attribute-value = always ≤ than Storage-Cpacity-Count d. Not recommended attribute Sample-Period is present ❑ attribute-id = MDC_ATTR_TIME_PD_SAMP ❑ attribute-type = RelativeTime ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant in this test> e. Mandatory attribute Clear-Timeout is present ❑ attribute-id = MDC_ATTR_CLEAR_TIMEOUT ❑ attribute-type = RelativeTime ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant in this test> ELSE skip the PM-Store object and check the next one
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-016		
TP label		Periodic PM-Store for Basic ECG specialization/Simple ECG profile		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	ECG_PersStoreM1; M		
Test purpose		Check that: A PHD that supports PM-store and that has a type value set to DEV_SUB_SPEC_PROFILE_ECG shall implement the periodic PM-store object		
Applicability		C_AG_OXP_165 AND C_AG_OXP_041 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_187, C_AG_OXP_188		
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		
Test procedure		1. Check PICS C_AG_OXP_187 and C_AG_OXP_188 values. 2. The simulated PHG receives an association request from the PHD under test. 3. The simulated PHG responds with a result = accepted-unknown-config. 4. The PHD responds with a “Remote Operation Invoke | Confirmed Event Report” message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 5. Record the handle for the PM-Store objects. 6. For all PM-Store objects i. The simulated PHG shall send a Get request for the PM-Store object with an attribute-id-list set to 0 to indicate all PM-Store attributes. ii. The PHD issues a GET response with the PM-Store attributes it supports: a. Mandatory attribute PM-Store-Capab ❑ attribute-id = MDC_ATTR_PM_STORE_CAPAB		

	❑ attribute-type = PmStoreCapab ❑ attribute-value.length = 2 bytes ❑ attribute-value = • Bit 4 (pmsc-epi-seg-entries) must be set to FALSE • Bit 5 (pmsc-peri-seg-entries) must be set to TRUE
Pass/Fail criteria	• In step 1, the PICS C_AG_OXP_187 is set to FALSE and the PICS C_AG_OXP_188 is set to TRUE. • In step 6, checked values of PM-Stroe-Capab bits are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-017		
TP label		Mandatory Clear-Segments (all-segments) method for Basic ECG specialization		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	PMStoreObjMeth1; M	ECG_PMStoreGen3; M	
Test purpose		Check that: A Basic electrocardiograph (ECG) (1- to 3-lead ECG) PHD shall support the [Clear-Segments] method with [Confirmed] mode. The PHD shall support the [Clear-Segments] method by setting the pmsc-clear-segm-by-all-sup bit for the [PM-Store-Capab] attribute [AND] The data held in PM-store objects may be deleted by user actions via the PHG or user interface on the device, and the capacity is limited only by the PHD's data storage capabilities.		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_OXP_041 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_071		
Initial condition		The simulated PHG and the PHD under test are in the Operating state and the PHD has at least one PM-Segment with data stored.		
Test procedure		1. Check the PICS C_AG_OXP_071 value 2. Make sure the PHD under test is not taking measurements which are stored in PM-Segments. 3. The simulated PHG shall send a Get request for the PM-Store object with an attribute-id-list set to 0 to indicate all PM-Store attributes. 4. The PHD under test issues a GET response with the PM-Store attributes. Check the values of the PM-Store-Capab attribute. a. PM-Store-Capab: ❑ attribute-id = MDC_ATTR_PM_STORE_CAPAB ❑ attribute-type = PmStoreCapab ❑ attribute-value = At least bit pmsc-clear-segm-all-sup(10) is set to TRUE (this bit indicates that PM-Segments in the SegmSelection data type can be cleared by segment selection –all segments) 5. The simulated PHG sends a Clear-Segment: a. Data APDU ❑ Type = Invoke | Confirmed Action,		

	❑ HANDLE = obj-handle ❑ Action = MDC_ACT_SEG_CLEAR ❑ SegmSelection = all-segments 6. If the PHD does not protect all segments, the PHD under test operation response will be: a. Data APDU ❑ Type = Response | Confirmed Action ❑ HANDLE = obj-handle ❑ Action = MDC_ACT_SEG_CLEAR ❑ Check the invoke-id of the response is mirrored from the request. 7. If the PHD does protect all segments, the PHD under test operation response will be: a. Data APDU ❑ Type = Roer ❑ ErrorResult = no-allowed-by-object (24) and return code shall be MDC_RET_CODE_UNKNOWN. ❑ Check the invoke-id of the response is mirrored from the request
Pass/Fail criteria	• In step 1, the PICS C_AG_OXP_071 is set to TRUE. • In step 6, the PHD must send a confirmation if the PHD does not protect any segments, otherwise the PHD shall send a roer message (step 7).
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-018		
TP label		PM-Segment Start/Stop Time attributes (Absolute or Base Offset Time) for Basic ECG specialization		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	PerPMSegObj18; M	PerPMSegObj19; M	PerPMSegObj20; M
		AperPMSegObj17; M		
Test purpose		Check that: For each implemented periodic session PM-segment object, a PHD shall either implement the [Segment-Start-Abs-Time] attribute and the [Segment-End-Abs-Time] attribute or it shall implement the [Segment-Start-BO-Time] attribute and the [Segment-End-BO-Time] attribute. [AND] If [Segment-Start-Abs-Time] and [Segment-End-Abs-Time] are used, then absolute time stamps shall be used in the entries of the PM-segment. [AND] If [Segment-Start-BO-Time] and [Segment-End-BO-Time] are used, then base-offset time stamps shall be used in the entries of the PM-segment.		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_OXP_041 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_009, C_AG_OXP_014		
Initial condition		The simulated PHG and the PHD under test are in the Operating state.		
Test procedure		1. The simulated PHG shall send a Get-Segment-Info object action for the PM-Segment		

	object with SegmSelection = all-segments to indicate the PM-Segments attributes of all available PM-Segments. 2. The PHD issues a “rors-cmip-confirmed-action” response with the PM-Segment attributes it supports: IF C_AG_OXP_009 = TRUE (PHD supports Absolute Time) THEN a. Conditional attribute Segment-Start-Abs-Time shall be present ❑ attribute-id = MDC_ATTR_TIME_START_SEG ❑ attribute-type = AbsoluteTime ❑ attribute-value.length = 8 bytes ❑ attribute-value = ▪ century = ▪ year ≤ 99 ▪ month ≤ 12 ▪ day ≤ 31 ▪ hour ≤ 24 ▪ minute ≤ 60 ▪ second ≤ 60 ▪ sec-fractions ≤ 100 b. Conditional attribute Segment-End-Abs-Time shall be present ❑ attribute-id = MDC_ATTR_TIME_END_SEG ❑ attribute-type = AbsoluteTime ❑ attribute-value.length = 8 bytes ❑ attribute-value = ▪ century = ▪ year ≤ 99 ▪ month ≤ 12 ▪ day ≤ 31 ▪ hour ≤ 24 ▪ minute ≤ 60 ▪ second ≤ 60 ▪ sec-fractions ≤ 100 c. Conditional attribute Segment-Start-BO-Time shall not be present ❑ attribute-id = MDC_ATTR_ TIME_START_SEG_BO ❑ attribute-type = BaseOffsetTime ❑ attribute-value.length = 8 bytes ❑ attribute-value = <Not relevant in this test> d. Conditional attribute Segment-End-BO-Time shall not be present ❑ attribute-id = MDC_ATTR_ TIME_START_SEG_BO ❑ attribute-type = BaseOffsetTime ❑ attribute-value.length = 8 bytes ❑ attribute-value = <Not relevant in this test> e. Mandatory attribute PM-Segment-Entry-Map shall be present ❑ attribute-id = MDC_ATTR_PM_SEG_MAP ❑ attribute-type = PmSegmentEntryMap ❑ attribute-value = SEQUENCE

	▪ segm-entry-header = seg-elem-hdr-absolute-time(0) AND/OR ▪ segm-entry-elem-list = The attr-val-map of all elements of this sequence includes MDC_ATTR_TIME_STAMP_ABS attribute IF C_AG_OXP_014 = TRUE (the PHD supports Base Offset Time) THEN a. Conditional attribute Segment-Start-Abs-Time shall not be present ❑ attribute-id = MDC_ATTR_TIME_START_SEG ❑ attribute-type = AbsoluteTime ❑ attribute-value.length = 8 bytes ❑ attribute-value = <Not relevant in this test> b. Conditional attribute Segment-End-Abs-Time shall not be present ❑ attribute-id = MDC_ATTR_TIME_END_SEG ❑ attribute-type = AbsoluteTime ❑ attribute-value.length = 8 bytes ❑ attribute-value = <Not relevant in this test> c. Conditional attribute Segment-Start-BO-Time shall be present ❑ attribute-id = MDC_ATTR_ TIME_START_SEG_BO ❑ attribute-type = BaseOffsetTime ❑ attribute-value.length = 8 bytes ❑ attribute-value = <Not relevant in this test> d. Conditional attribute Segment-End-BO-Time shall be present ❑ attribute-id = MDC_ATTR_ TIME_START_SEG_BO ❑ attribute-type = BaseOffsetTime ❑ attribute-value.length = 8 bytes ❑ attribute-value = <Not relevant in this test> e. Mandatory attribute PM-Segment-Entry-Map shall be present ❑ attribute-id = MDC_ATTR_PM_SEG_MAP ❑ attribute-type = PmSegmentEntryMap ❑ attribute-value = SEQUENCE ▪ segm-entry-header = seg-elem-hdr-bo-time(3) AND/OR ▪ segm-entry-elem-list = The attr-val-map of all elements of this sequence includes the MDC_ATTR_TIME_STAMP_BO attribute 3. Repeat step 1 and 2 for every PM-Store.
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-019		
TP label		Segment-entry-header for Basic ECG specialization with aperiodic PM-Store objects		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable	AperPMSegObj18; M		

	items			
Test purpose		Check that: For each entry in an implemented aperiodic PM-segment object, a PHD shall include one of the time formats in the segm-entry-header.		
Applicability		C_AG_OXP_164 AND C_AG_OXP_041 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_009, C_AG_OXP_014		
Initial condition		The simulated PHG and the PHD under test are in the Operating state.		

Test procedure		1. For all PM-Store objects:
		i. The simulated PHG shall send a Get request for the PM-Store object with an attribute-id-list set to 0 to indicate all PM-Store attributes.
		ii. The PHD issues a GET response with the PM-Store attributes it supports
		a. Mandatory attribute PM-Store-Capab
		❑ attribute-id = MDC_ATTR_PM_STORE_CAPAB
		❑ attribute-type = PmStoreCapab
		❑ attribute-value.length = 2 bytes
		❑ attribute-value =
		• Check Bit 4 (pmsc-epi-seg-entries) value
		2. For all PM-Store objects which its PM-Store-Capab Attribute – Bit4 (pmsc-epi-seg-entries) is set to TRUE, the simulated PHG sends a Get-Segment-Info object action for the PM-Segment object with SegmSelection = all-segments to indicate the PM-Segments attributes of all available PM-Segments.
		3. The PHD issues a "rors-cmip-confirmed-action" response with the PM-Segment attributes it supports:
		IF C_AG_OXP_009 = TRUE (PHD supports Absolute Time) THEN
		a. Mandatory attribute PM-Segment-Entry-Map shall be present
		❑ attribute-id = MDC_ATTR_PM_SEG_MAP
		❑ attribute-type = PmSegmentEntryMap
		❑ attribute-value = SEQUENCE
		▪ segm-entry-header = seg-elem-hdr-absolute-time(0)
		▪ segm-entry-elem-list = <Not relevant for this test>
		IF C_AG_OXP_014 = TRUE (PHD supports Base Offset Time) THEN
		a. Mandatory attribute PM-Segment-Entry-Map shall be present
		❑ attribute-id = MDC_ATTR_PM_SEG_MAP
		❑ attribute-type = PmSegmentEntryMap
		❑ attribute-value = SEQUENCE
		▪ segm-entry-header = seg-elem-hdr-bo-time(3)
		▪ segm-entry-elem-list = <Not relevant for this test>
		4. Repeat step 2 and 3 for every PM-Store.		

Pass/Fail criteria		All checked values are as specified in the test procedure.		
Notes				

TP Id	TP/PLT/PHD/CLASS/ECG/BV-020
TP label	EpiCfgScanner Object for Basic ECG specialization. Mandatory attribute Min-Reporting-

		Interval		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	EpiScanObjAttr8; M		
Test purpose		Check that: For [Extended-Configuration], the [Min-Reporting-Interval] attribute shall be present.		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_OXP_047 AND C_AG_OXP_181 AND C_AG_OXP_000		
Other PICS		C_AG_OXP_144, C_AG_OXP_180		
Initial condition		The simulated PHG and the PHD under test are in the Unassociated state.		
Test procedure		1. Check the PICS C_AG_OXP_144 value. 2. The simulated PHG receives an association request from the PHD under test. 3. The simulated PHG responds with a result = accepted-unknown-config. 4. The PHD responds with a "Remote Operation Invoke | Confirmed Event Report" message with an MDC_NOTI_CONFIG event to send its configuration to the PHG. 5. The Configurable Episodic Scanner object (ConfigReport → ConfigObject → AttributeList) must include the following attribute: a. Mandatory attribute Min-Reporting-Interval shall be present: ❑ attribute-id = MDC_ATTR_SCAN_REP_PD_MIN ❑ attribute-type = RelativeTime ❑ attribute-value.length = 4 bytes ❑ attribute-value = <Not relevant for this test>		
Pass/Fail criteria		• In step 1, the PICS C_AG_OXP_144 is set to TRUE. • In step 5, all Episodic Scanners included in ConfigReport must include the attribute Min-Reporting-Interval.		
Notes				

TP Id		TP/PLT/PHD/CLASS/ECG/BV-021		
TP label		Operating State. PHG to PHD Maximum APDU Size		
Coverage	**Spec**	[ISO/IEEE 11073-20601-2015A] and [ISO/IEE 11073-20601-2016C]		
	Testable items	CommonCharac 3; M		
	Spec	[ISO/IEEE 11073-10406]		
	Testable items	CommChar1;M	CommChar2;M	CommChar3;M
Test purpose		Check that: The total size of the response do not exceed of the maximum APDU size established by the specialization [AND] A basic ECG (1- to 3-lead ECG) PHD implementing only this device specialization shall be capable of receiving any APDU up to a size of Nrx.		

	For this standard, Nrx shall be 256 octets.
Applicability	C_AG_OXP_000 AND (C_AG_OXP_164 OR C_AG_OXP_165)
Other PICS	C_AG_OXP_041, C_AG_OXP_100
Initial condition	The simulated PHG and the PHD are in the Operating state.
Test procedure	1. The simulated PHG issues a "Remote Operation Invoke | Get" command with: a. Obj-handle set to 0 (to request for MDS object) b. attribute-id-list.count = 119 c. attribute-id-list: (MDC_ATTR_ID_MODEL, MDC_ATTR_SYS_ID, MDC_ATTR_DEV_CONFIG_ID) repeated 39 times followed by an additional MDC_ATTR_ID_MODEL 2. Check the response of the PHD. 3. The simulated PHG issues a "Remote Operation Invoke | Get" command with the handle set to 0 (to request for MDS object) and an empty attribute-id-list to indicate all attributes. 4. Check the response of the PHD.
Pass/Fail criteria	• In step 2, the PHD under test may respond with a rors-cmip-get listing all the requested attributes, or with a roer message. If PICS C_AG_OXP_100 =TRUE and the PHD does not respond with a rors-cmip-get message, it responds with a roer message or rorj(resource-limitation) message, a WARNING will appear. o If the response is a get response, the total size of the response cannot exceed the sum of the APDU sizes of the supported specializations (limited to an absolute limit of 64512 octets): ▪ Pulse oximeter → 9216 octets ▪ Weighing scales → 896 octets ▪ Glucose meter → 5120 octets or 64512 octets if the PHD supports PM-Store ▪ Blood pressure → 896 octets ▪ Thermometer → 896 octets ▪ Independent activity hub → 5120 octets ▪ Cardiovascular → 64512 octets or 6624 octets if the PHD under test only supports Step Counter Profile ▪ Strength → 64512 octets: ▪ Adherence monitor → 1024 octets ▪ Peak flow → 2030 octets ▪ Body composition analyser → 7730 octets ▪ Basic ECG/Simple ECG → 7168 octets or 64512 octets if PHD supports PM-Store ▪ Basic ECG/Heart rate → 1280 octets or 64512 octets if the PHD supports PM-Store ▪ International normalized ratio → 896 octets or 64512 if the PHD supports PM-Store o In the case where it responds with a roer, the reason must not be protocol-violation (23). • In step 4, the PHD must respond with a rors-cmip-get message.
Notes	

<table>
<tr><td colspan="2">TP Id</td><td colspan="3">TP/PLT/PHD/CLASS/ECG/BV-022</td></tr>
<tr><td colspan="2">TP label</td><td colspan="3">Association Basic ECG PHD</td></tr>
<tr><td rowspan="6">Coverage</td><td>Spec</td><td colspan="3">[ISO/IEEE 11073-10406]</td></tr>
<tr><td rowspan="5">Testable items</td><td>AgProcAsReq1; M</td><td>AgProcAsReq2; M</td><td>AgProcAsReq3; M</td></tr>
<tr><td>AgProcAsReq4; M</td><td>AgProcAsReq5; O</td><td>AgProcAsReq8; M</td></tr>
<tr><td>AgProcAsReq9; M</td><td>AgProcAsReq10; M</td><td>AgProcAsReq11; M</td></tr>
<tr><td>AgProcAsReq12; M</td><td>AgProcAsReq13; M</td><td>AgProcAsReq14; M</td></tr>
<tr><td>AgProcAsReq15; M</td><td>ECG_MDSMethod7; M</td><td></td></tr>
<tr><td colspan="2">Test purpose</td><td colspan="3">Check that:
During the association procedure, Body composition analyser PHD sends the correct association request to the simulated PHG</td></tr>
<tr><td colspan="2">Applicability</td><td colspan="3">(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_OXP_000</td></tr>
<tr><td colspan="2">Other PICS</td><td colspan="3">C_AG_OXP_002, C_AG_OXP_017</td></tr>
<tr><td colspan="2">Initial condition</td><td colspan="3">The simulated PHG and the PHD under test are in the Unassociated state.</td></tr>
<tr><td colspan="2">Test procedure</td><td colspan="3">1. The PHD sends a message to associate with the simulated PHG, the expected fields sent by the PHD are:
a. APDU Type
❑ field- type = AarqApdu
❑ field-length =2 bytes
❑ field-value =0xE2 0x00.
b. assoc-version
❑ field- type = AssociationVersion
❑ field-length =BITS-32
❑ field- value=0x80 0x00 0x00 0x00
c. data-proto-id
❑ field- type = DataProtoId(INT-U16)
❑ field-length =2 bytes
❑ field- value=0x50 0x79 (20601)
d. protocol-version
❑ field- type = Protocol Version
❑ field-length = 4 bytes
❑ field- value= At least bit protocol-version2(1) is set to 1 (0x40 0x00 0x00 0x00 OR 0xC0 0x00 0x00 0x00)
e. encoding rules
❑ field- type = EncodingRules
❑ field-length = 2 bytes
❑ field- value=
▪ Bit 0 must be set (support MDER)
▪ Bits 1 and 2 may be set
▪ The rest of the bits must be 0
f. nomenclature-version</td></tr>
</table>

	❑ field- type = NomenclatureVersion ❑ field-length = 4 bytes ❑ field- value=0x80 0x00 0x00 0x00 ❑ This value indicates version1 is supported (nom-version1(0) is set). g. functional-units ❑ field- type = FunctionalUnits ❑ field-length = 4 bytes ❑ field-value = ▪ Bit 0 must not be set, only bit 1 or 2 may be set to 1. h. System type ❑ field- type = SystemType ❑ field-length = 4 bytes ❑ field- value = 0x00 0x80 0x00 0x00 (sys-type-agent) i. System-Id ❑ field- type = OCTET STRING ❑ field-length = 8 bytes ❑ field- value = 0xXX 0xXX 0xXX 0xXX 0xXX 0xXX 0xXX 0xXX (octet string length = 8 | EUI-64 manufacturer and device) ❑ This value will be the System Id attribute of an MDS object and the received value will be compared with the value defined in PIXIT I_AG_OXP_001 and I_AG_OXP_002. j. dev-config-id ❑ field- type = ConfigId(INT-U16) ❑ field-length = 2 bytes ❑ field- value = ▪ <0x07D0> for Basic ECG/Heart Rate profile standard configuration ▪ <between 0x40 0x00 and 0x7F 0xFF > for extended configuration. k. data-req-mode-flags (DataReqModeCapab) ❑ field- type = DataReqModeFlags ❑ field-length = 2 bytes ❑ If PHD supports only Basic ECG specialization → Bit 15 is set (data-req-supp-init-agent(15)) l. data-req-init-agent-count (DataReqModeCapab) ❑ field- type = INT-U8 ❑ field-length = 2 bytes ❑ field.value = 0x01 m. data-req-init-manager-count (DataReqModeCapab) ❑ field- type = INT-U8 ❑ field-length = 2 bytes ❑ field.value = 0x00
Pass/Fail criteria	All checked attributes have proper values.
Notes	

TP Id		TP/PLT/PHD/CLASS/ECG/BV-023		
TP label		Set Time (Absolute Time) Basic ECG PHD		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	ECG_MDSMethod2; M		
Test purpose		Check that: If the PHD supports the [Absolute-Time-Stamp] attribute, the Set-Time method shall be implemented.		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_OXP_000 AND C_AG_OXP_009		
Other PICS				
Initial condition		The simulated PHG and the PHD under test are in the Operating state.		
Test procedure		1. The simulated PHG sends a SET action: ❑ CHOICE = SetTimeInvoke ❑ action-type = MDC_ACT_SET_TIME ❑ the action-info-args are SetTimeInvoke ▪ date-time = <century, year ≤ 99 month ≤ 12 day ≤ 31 hour ≤ 24 minute ≤ 60 second ≤ 60 sec-fractions ≤ 100> ▪ accuracy = 0 2. The PHD under test response shall be a rors-cmip-confirmed-action: ❑ action-type = MDC_ACT_SET_TIME ❑ action-info-args shall be empty.		
Pass/Fail criteria		All checked values are as specified in the test procedure.		
Notes				

TP Id		TP/PLT/PHD/CLASS/ECG/BV-024		
TP label		Set Time (Base Offset Time) Basic ECG PHD		
Coverage	**Spec**	[ISO/IEEE 11073-10406]		
	Testable items	ECG_MDSMethod4; M		
Test purpose		Check that: If the PHD supports the [Base-Offset-Time-Stamp] attribute, the Set-Base-Offset-Time method shall be implemented		
Applicability		(C_AG_OXP_164 OR C_AG_OXP_165) AND C_AG_OXP_000 AND C_AG_OXP_014		
Other PICS				
Initial condition		The simulated PHG and the PHD under test are in the Operating state.		
Test procedure		1. The simulated PHG sends a SET action: ❑ CHOICE = SetBOTimeInvoke ❑ action-type = MDC_ACT_SET_BO_TIME ❑ the action-info-args are SetBOTimeInvoke		

	▪ date-time = bo-seconds = 0x00 0x00 0x00 0x00, bo-fractions = 0x00 0x00, bo-time-offset = 0x3C 2. The PHD under test response shall be a rors-cmip-confirmed-action: ❑ action-type = MDC_ACT_SET_BO_TIME ❑ action-info-args shall be empty.
Pass/Fail criteria	All checked values are as specified in the test procedure.
Notes	

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Printed in Switzerland
Geneva, 2017