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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)

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**Conformance of ITU-T H.810 personal health  
system: Personal Health Devices interface  
Part 8: Continua Design Guidelines for  
Bluetooth Low Energy: Personal Health  
Gateway**

Recommendation ITU-T H.848



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## Recommendation ITU-T H.848

### Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 8: Continua Design Guidelines for Bluetooth Low Energy: Personal Health Gateway

#### Summary

Recommendation ITU-T H.848 provides a test suite structure (TSS) and the test purposes (TP) for personal health gateways using Bluetooth Low Energy transport 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.848 is a transposition of Continua Test Tool DG2016, Test Suite Structure & Test Purposes, Personal Health Devices Interface; Part 8: Continua Design Guidelines. Personal Health Gateway BLE (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*
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3.0	ITU-T H.848	2017-04-13	16	<a href="http://handle.itu.int/11.1002/1000/13237">11.1002/1000/13237</a>

#### Keywords

Bluetooth Low Energy (BLE), conformance testing, Continua Design Guidelines, e-health, ITU-T H.810, personal area network, personal connected health devices, Personal Health Devices interface, touch area network, Personal Health Gateway.

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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>.

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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 8: Continua Design Guidelines. Personal Health Gateway BLE (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	2012-10-05	Initial release for Test Tool DG2011.
1.1	2013-05-24	Initial release for Test Tool DG2012. This uses "TSS&TP_DG2011_PAN-LAN-TAN_PART_8_v1.0.doc" as a baseline and adds new features included in [b-CDG 2012]: <ul style="list-style-type: none"><li>• BPM and HR profiles</li></ul>
1.2	2014-01-24	Initial release for Test Tool DG2013. This uses "TSS&TP_DG2012_LP-PAN PART_8_v1.1.doc" as a baseline and adds new features included in [b-ITU-T H.810 (2013)]/[b-CDG 2013]: <ul style="list-style-type: none"><li>• Adds glucose meter BLE</li><li>• Adds BLE SSP support</li><li>• Adds NFC new transport</li><li>• Adds INR device specialization</li></ul>
1.3	2014-04-24	TM Lite & Doc Enhancements (Test Tool v4.0 Maintenance Release 1). It uses "TSS&TP_DG2013_LP-PAN_PART_8_v1.2.doc" as a baseline and adds new features included in Documentation Enhancements: <ul style="list-style-type: none"><li>• "Other PICS" row has been added</li></ul>
1.3	2015-07-01	Initial release for Test Tool DG2015. It is the same version as "TSS&TP_DG2013_LP-PAN_PART_8_v1.2.doc" because the new features included in [b-ITU-T H.810 (2015)]/[b-CDG 2015] do not affect the test procedures specified in this document.
1.4	2016-09-20	It uses "TSS&TP_DG2015_PLT_PART_8_v1.3.doc" as a baseline and adds new features included in [ITU-T H.810 (2016)]/[b-CDG 2016]

# Recommendation ITU-T H.848

## Conformance of ITU-T H.810 personal health system: Personal Health Devices interface Part 8: Continua Design Guidelines for Bluetooth Low Energy: Personal Health Gateway

### 1 Scope

The scope of this Recommendation<sup>1</sup> is to provide 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 8.

- 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
  - 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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<sup>1</sup> 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*.
- [Bluetooth PHDT v1.4] Bluetooth SIG (2013), *Personal Health Devices Transcoding White Paper, v1.4*.  
[https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc\\_id=294539](https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc_id=294539)
- [Bluetooth PHDT v1.5] Bluetooth SIG (2014), *Personal Health Devices Transcoding White Paper, v1.5*.  
[https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc\\_id=272346](https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc_id=272346)
- [Bluetooth PHDT v1.6] Bluetooth SIG (2015), *Personal Health Devices Transcoding White Paper, v1.6*.  
[https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc\\_id=310657](https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc_id=310657)
- [ISO/IEEE 11073-104xx] ISO/IEEE 11073-104xx (in force), *Health informatics – Personal health device communication – Device specialization*.  
NOTE – Shorthand is used to refer to the collection of device specialization standards that utilize [ISO/IEEE 11073-20601-2015A], where xx can be any number from 01 to 99, inclusive.
- [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>

## 3 Definitions

### 3.1 Terms defined elsewhere

None.

### 3.2 Terms defined in this Recommendation

None.

## 4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ATS	Abstract Test Suite
CDG	Continua Design Guidelines
CGM	Continuous Glucose Monitor
DUT	Device Under Test
GUI	Graphical User Interface
INR	International Normalized Ratio
IUT	Implementation Under Test
IP	Insulin Pump
MDS	Medical Device System
NFC	Near Field Communication
PAN	Personal Area Network
PCO	Point of Control and Observation
PCT	Protocol Conformance Testing
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
TCRL	Test Case Reference List
TCWG	Test and Certification Working Group
TP	Test Purpose
TSS	Test Suite Structure
USB	Universal Serial Bus
WDM	Windows Driver Model

## 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	Adrenaline

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

CDG release	Transposed as	Version	Description	Designation
			functionalities [b-CDG 2011].	
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 2.1.7 (shown in bold).

- Group 1: Personal Health Devices (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)
    - Subgroup 2.2.4: PHD communication model (COM)
  - Group 2.3: Devices class specializations (CLASS)
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    - Subgroup 2.3.2: Glucose meter (GL)
    - 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)
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  - Subgroup 2.4.3: Whitepaper blood pressure measurement requirements (BPM)
  - Subgroup 2.4.4: Whitepaper heart rate requirements (HR)
  - 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)
    - PAN-LAN-TAN: 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).
- **TP label:** This is the title of the TP.
- **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 are 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 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 2.1.7: Bluetooth low energy design guidelines (BLEDG)

<b>TP Id</b>		TP/LP-PAN/PHG/TR/BLEDG/BV-000		
<b>TP label</b>		Discovery and pairing process and Pairing/Auth notification		
<b>Coverage</b>	<b>Spec</b>	[b-ITU-T H.810 (2015)]		
	<b>Testable items</b>	Discovery_Pairing BT LE 1; M	Notify BT LE 2; M	
<b>Test purpose</b>		<p>Check that:</p> <p>Once a BLE Personal Health Gateway (PHG) has discovered a BLE Personal Health Device (PHD) that supports a compatible service, it shall support pairing with that BLE PHD</p> <p>[AND]</p> <p>If supported by the UI, the BLE PHG shall inform the user that a pairing and authentication was successful</p>		
<b>Applicability</b>		C_MAN_BLE_000		
<b>Other PICS</b>		C_MAN_BLEDG_001		
<b>Initial condition</b>		The PHG under test and the simulated PHD are in a Standby state and they have not been paired before.		
<b>Test procedure</b>		<ol style="list-style-type: none"> <li>1. Reset the PHG under test to default configuration and turn it on.</li> <li>2. Set the simulated PHD in discoverable mode (Advertising state).</li> <li>3. The PHG under test initiates a search for discoverable PHDs (Scanning state).</li> <li>4. Once the simulated PHD has been discovered, make the PHG under test pair with it as stated in the documentation (Initiating state).</li> <li>5. When the pairing has been completed (Connection state), IF PICS C_MAN_BLEDG_001 = TRUE then the PHG under test notifies of the successful pairing and authentication process.</li> </ol>		
<b>Pass/Fail criteria</b>		<p>In step 4, the PHG under test completes the pairing process successfully.</p> <p>In step 5, if the PHG supports an UI that provides information about the Bluetooth connection (C_MAN_BLEDG_001 = TRUE) then the PHG has notified the successful pairing and authentication process.</p>		
<b>Notes</b>				

<b>TP Id</b>		TP/LP-PAN/PHG/TR/BLEDG/BV-001		
<b>TP label</b>		Store pairing data		
<b>Coverage</b>	<b>Spec</b>	[b-ITU-T H.810 (2015)]		
	<b>Testable items</b>	Discovery_Pairing BT LE 12; M	Discovery_Pairing BT LE 13; R	
<b>Test purpose</b>		<p>Check that:</p> <p>BLE PHG should store pairing data from at least the most recently paired device such that the data is persistent (e.g. With loss of power including removal of a battery)</p> <p>[AND]</p>		

	BLE PHG should store pairing data for at least the number of devices they are intended to simultaneously support.
<b>Applicability</b>	C_MAN_BLE_000
<b>Other PICS</b>	
<b>Initial condition</b>	The PHG under test and the simulated PHD are in a Standby state and they have not been paired before.
<b>Test procedure</b>	<ol style="list-style-type: none"> <li>1. Reset the PHG under test to the default configuration and turn it on.</li> <li>2. Set the simulated PHD to discoverable and pairable mode (Advertising state).</li> <li>3. The PHG initiates a discovery process (Scanning state), it finds the simulated PHD, establishes a pairing with it (Initiating state) and starts a Bluetooth connection (Connection state).</li> <li>4. Turn off the PHG under test and remove the batteries or unplug the power supply.</li> <li>5. Turn on the PHG under test again (Standby state).</li> <li>6. Set the simulated PHD in discoverable and pairable mode (Advertising state).</li> <li>7. The PHG under test initiates a discovery process (Scanning state), it finds the simulated PHD and starts a Bluetooth connection with it (Connection state).</li> </ol>
<b>Pass/Fail criteria</b>	In step 7, the pairing process should not be dispatched again because both devices should have stored the pairing data from the previous pairing process. If the pairing process is dispatched again then the test tool gives a WARNING message.
<b>Notes</b>	

<b>TP Id</b>	TP/LP-PAN/PHG/TR/BLEDG/BV-002		
<b>TP label</b>	Discovered devices filter		
<b>Coverage</b>	<b>Spec</b>	[b-ITU-T H.810 (2015)]	
	<b>Testable items</b>	Notify BT LE 3; R	
<b>Test purpose</b>	<p>Check that:</p> <p>PHG shall support all pairing methods for Bluetooth 4.0, including Just Works and Passkey Entry, if the PHG has the appropriate I/O capabilities</p>		
<b>Applicability</b>	C_MAN_BLE_000		
<b>Other PICS</b>	C_MAN_BLEDG_001		
<b>Initial condition</b>	The PHG under test and the simulated PHD are in a Standby state and they have not been paired before.		
<b>Test procedure</b>	<ol style="list-style-type: none"> <li>1. Reset the PHG under test to the default configuration and turn it on.</li> <li>2. Set the simulated PHD to discoverable and pairable mode.</li> <li>3. The PHG initiates a discovery process, it finds the simulated PHD and establishes a pairing with it.</li> </ol>		
<b>Pass/Fail criteria</b>	<p>In step 3, if the PHG under test does not filter the discovered devices to include only the test tool simulated PHD that supports the supported service/profile, the test tool displays a warning message.</p> <p>In step 3, if the PHG supports an UI that provides information about the Bluetooth connection (C_MAN_BLEDG_001= TRUE) check that the PHG has notified the successful pairing and authentication process.</p>		

<b>Notes</b>	
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<b>TP Id</b>	TP/LP-PAN/PHG/TR/BLEDG/BV-003		
<b>TP label</b>	Failures notification		
<b>Coverage</b>	<b>Spec</b>	[b-ITU-T H.810 (2015)]	
	<b>Testable items</b>	Notify BT LE 4; M	
<b>Test purpose</b>	<p>Check that:</p> <p>If there is a failure during the discovery, pairing and authentication process, and if supported by the UI, the BLE PHG shall inform the user whether the failure is because 1) no compatible BLE PHD was found (compatible device not found) or 2) the pairing failed (pairing failure) or 3) the authentication process timed out (authentication timeout) or 4) the user entered the incorrect passkey (incorrect PIN)</p>		
<b>Applicability</b>	C_MAN_BLE_000 AND C_MAN_BLEDG_001		
<b>Other PICS</b>			
<b>Initial condition</b>	The PHG under test and the simulated PHD are in a Standby state and they have not been paired before.		
<b>Test procedure</b>	<ol style="list-style-type: none"> <li>1. Disable the simulated PHD (it is not discoverable).</li> <li>2. The PHG under test initiates discovery as stated in the product documentation.</li> <li>3. The simulated PHD is not discovered because it has not been initialized yet. Check the PHG under test for error messages.</li> <li>4. Configure the simulated PHD with a device specialization not supported by the PHG under test.</li> <li>5. Set the simulated PHD to discoverable mode.</li> <li>6. The PHG under test starts a discovery and pairing process with the simulated PHD.</li> <li>7. Check the PHG under test for error messages.</li> <li>8. Restart the simulated PHD.</li> <li>9. Restart the PHG under test.</li> <li>10. Configure the simulated PHD with a device specialization that is supported by the PHG under test.</li> <li>11. Disable the pairable mode in the simulated PHD.</li> <li>12. The PHG under test starts a discovery and pairing process with the simulated PHD.</li> <li>13. Check the PHG under test for error messages.</li> <li>14. Restart the simulated PHD.</li> <li>15. Restart the PHG under test.</li> <li>16. Configure simulated PHD with a device specialization that is supported by the PHG under test.</li> <li>17. Set the simulated PHD to discoverable and pairable mode.</li> <li>18. The PHG under test starts a discovery and pairing process with the simulated PHD.</li> <li>19. Force the test tool simulated PHD not to complete the authentication process.</li> <li>20. Check the PHG under test for error messages.</li> </ol>		

<b>Pass/Fail criteria</b>	<ul style="list-style-type: none"> <li>In step 3, the PHG under test shall inform the user that the pairing process cannot be completed (the simulated PHD has not been found).</li> <li>In step 7, the PHG under test shall inform the user that the pairing process cannot be completed (the simulated PHD implements an unsupported specialization).</li> <li>In step 13, the PHG under test shall inform the user that the pairing process cannot be completed (the simulated PHD is not in pairable mode).</li> <li>In step 20, the PHG under test shall inform the user that the authentication process cannot be completed (authentication timeout).</li> </ul>
<b>Notes</b>	

<b>TP Id</b>	TP/LP-PAN/PHG/TR/BLEDG/BV-004		
<b>TP label</b>	Secure Simple Pairing with PHD with NoInputNoOutput capabilities		
<b>Coverage</b>	<b>Spec</b>	[b-ITU-T H.810 (2015)]	
	<b>Testable items</b>	Authentication BT LE 2; M	
<b>Test purpose</b>	<p>Check that:</p> <p>PHG shall support all pairing methods for Bluetooth 4.0, including Just Works and Passkey Entry, if the PHG has the appropriate I/O capabilities.</p>		
<b>Applicability</b>	C_MAN_BLE_000		
<b>Other PICS</b>			
<b>Initial condition</b>	The PHG under test and the simulated PHD support the same device specialization, they are in a Disconnected state and they have not been paired before.		
<b>Test procedure</b>	<ol style="list-style-type: none"> <li>Check that the PHG under test IO capabilities are declared in PIXIT I_MAN_BLEDG_002 and the man in the middle (MITM) protection is declared in PIXIT I_MAN_BLEDG_003 <ol style="list-style-type: none"> <li>IF the PHG under test does not support MITM protection (PIXIT I_MAN_BDG_003 = FALSE) THEN the test tool simulated PHD is configured with NoInputNoOutput capabilities and without MITM protection and the Just Works Association Model shall be used during the pairing process and the generated link key will be unauthenticated (without MITM protection).</li> <li>IF the PHG under test supports MITM protection (PIXIT I_MAN_BDG_003 = TRUE) THEN <ul style="list-style-type: none"> <li>IF the PHG under test supports NoInputNoOutput capabilities (PIXIT I_MAN_BDG_002 = 4) THEN the combination of IO capabilities and MITM support declared by the PHG under test in PIXITs is not feasible and the test case ends by giving a FAIL verdict due to inconsistency among the PHG under test SSP features declared in PIXITs</li> <li>IF the PHG under test supports other IO capabilities (PIXIT I_MAN_BDG_002 = 0 or 1 or 2 or 3) it will not pair with PHDs with NoInputNoOutput capabilities because they do not fulfil the security level required (i.e., MITM protection) and the test case execution ends by giving a PASS verdict</li> </ul> </li> </ol> </li> <li>Set the test tool simulated PHD in discoverable and pairable mode.</li> <li>The PHG under test initiates a discovery process as stated in the product documentation.</li> <li>Once the simulated PHD has been discovered, make the PHG under test pair with it as stated in the documentation.</li> </ol>		
<b>Pass/Fail criteria</b>	In step 4, the PHG under test completes the pairing process successfully.		
<b>Notes</b>			

<b>TP Id</b>		TP/LP-PAN/PHG/TR/BLEDG/BV-005		
<b>TP label</b>		Secure Simple Pairing with PHD with DisplayOnly capabilities		
<b>Coverage</b>	<b>Spec</b>	[b-ITU-T H.810 (2015)]		
	<b>Testable items</b>	Authentication BT LE 2; M		
<b>Test purpose</b>		<p>Check that:</p> <p>PHG shall support all pairing methods for Bluetooth 4.0, including Just Works and Passkey Entry, if the PHG has the appropriate I/O capabilities.</p>		
<b>Applicability</b>		C_MAN_BLE_000		
<b>Other PICS</b>				
<b>Initial condition</b>		The PHG under test and the simulated PHD support the same device specialization, they are in a Disconnected state and they have not been paired before.		
<b>Test procedure</b>		<ol style="list-style-type: none"> <li>1. Check that PHG under test IO capabilities are declared in PIXIT I_MAN_BDG_002 and that the MITM protection is declared in PIXIT I_MAN_BDG_003 <ol style="list-style-type: none"> <li>a. IF the PHG under test does not support MITM protection (PIXIT I_MAN_BDG_003 = FALSE) THEN the test tool simulated PHD is configured with Secure Simple Pairing, NoInputNoOutput capabilities and without MITM protection in addition the Just Works Association Model shall be used during the Pairing process and the generated link key will be unauthenticated (without MITM protection)</li> <li>b. IF the PHG under test supports MITM protection (PIXIT I_MAN_BDG_003 = TRUE) THEN <ul style="list-style-type: none"> <li>• IF the PHG under test supports KeyboardOnly or KeyboardDisplaycapabilities (PIXIT I_MAN_BDG_002 = 2 or 3) THEN the test tool simulated PHD is configured with Secure Simple Pairing, DisplayOnly capabilities and MITM protection in addition the passkey entry association model shall be used during the pairing process and the generated link key will be authenticated (with MITM protection)</li> <li>• IF the PHG under test supports DisplayOnly or DisplayYesNo capabilities (PIXIT I_MAN_BDG_002 = 0 or 1) THEN it will not pair with PHDs with DisplayOnly capabilities because they do not fulfil the security level required (i.e., MITM protection) and the test case execution ends by giving a PASS verdict</li> <li>• IF PHG under test supports NoInputNoOutput capabilities (PIXIT I_MAN_BDG_002 = 4) THEN the combination of IO capabilities and MITM support declared by the PHG under test in PIXITs is not feasible and the test case ends by giving a FAIL verdict due to inconsistency among the PHD under test SSP features declared in PIXITs</li> </ul> </li> </ol> </li> <li>2. Set the test tool simulated PHD in discoverable and pairable mode.</li> <li>3. The PHG under test initiates a discovery process as stated in the product documentation.</li> <li>4. Once the simulated PHD has been discovered, make the PHG under test pair with it as stated in the documentation.</li> </ol>		
<b>Pass/Fail criteria</b>		In step 4, the PHG under test completes the pairing process successfully.		
<b>Notes</b>				

<b>TP Id</b>		TP/LP-PAN/PHG/TR/BLEDG/BV-006		
<b>TP label</b>		Secure Simple Pairing with PHD with DisplayYesNo capabilities		
<b>Coverage</b>	<b>Spec</b>	[b-ITU-T H.810 (2015)]		
	<b>Testable items</b>			

	<b>Testable items</b>	Authentication BT LE 2; M		
<b>Test purpose</b>	Check that: PHG shall support all pairing methods for Bluetooth 4.0, including Just Works and Passkey Entry, if the PHG has the appropriate I/O capabilities.			
<b>Applicability</b>	C_MAN_BLE_000			
<b>Other PICS</b>				
<b>Initial condition</b>	The PHG under test and the simulated PHD support the same device specialization, they are in a Disconnected state and they have not been paired before.			
<b>Test procedure</b>	<ol style="list-style-type: none"> <li>1. Check that the PHG under test IO capabilities are declared in PIXIT I_MAN_BDG_002 and that the MITM protection is declared in PIXIT I_MAN_BDG_003 <ol style="list-style-type: none"> <li>a. IF the PHG under test does not support MITM protection (PIXIT I_MAN_BDG_003 = FALSE) THEN the test tool simulated PHD is configured with Secure Simple Pairing, NoInputNoOutput capabilities and without MITM protection in addition the Just Works Association Model shall be used during the pairing process and the generated link key will be unauthenticated (without MITM protection)</li> <li>b. IF the PHG under test supports MITM protection (PIXIT I_MAN_BDG_003 = TRUE) THEN <ul style="list-style-type: none"> <li>• IF the PHG under test supports KeyboardOnly or KeyboardDisplay capabilities (PIXIT I_MAN_BDG_002 = 2 or 3) THEN the test tool simulated PHD is configured with Secure Simple Pairing, DisplayYesNo capabilities and with MITM protection in addition the passkey entry association model shall be used during the pairing process and the generated link key will be authenticated (with MITM protection)</li> <li>• IF the PHG under test supports DisplayOnly or DisplayYesNocapabilities (PIXIT I_MAN_BDG_002 = 0 or 1) THEN it will not pair with PHDs with DisplayYesNo capabilities because they do not fulfil the security level required (i.e., MITM protection) and the test case execution ends by giving a PASS verdict</li> <li>• IF the PHG under test supports NoInputNoOutput capabilities (PIXIT I_MAN_BDG_002 = 4) THEN the combination of IO capabilities and MITM support declared by the PHG under test in PIXITs is not feasible and the test case ends by giving a FAIL verdict due to inconsistency among the PHD under test SSP features declared in PIXITs</li> </ul> </li> </ol> </li> <li>2. Set the test tool simulated PHD in discoverable and pairable mode.</li> <li>3. The PHG under test initiates a discovery process as stated in the product documentation.</li> <li>4. Once the simulated PHD has been discovered, make the PHG under test pair with it as stated in the documentation.</li> </ol>			
<b>Pass/Fail criteria</b>	In step 4, the PHG under test completes the pairing process successfully.			
<b>Notes</b>				

<b>TP Id</b>	TP/LP-PAN/PHG/TR/BLEDG/BV-007			
<b>TP label</b>	Secure Simple Pairing with PHD with KeyboardOnly capabilities			
<b>Coverage</b>	<b>Spec</b>	[b-ITU-T H.810 (2015)]		
	<b>Testable items</b>	Authentication BT LE 2; M		
<b>Test purpose</b>	Check that: PHG shall support all pairing methods for Bluetooth 4.0, including Just Works and Passkey Entry, if the PHG has the appropriate I/O capabilities.			

<b>Applicability</b>	C_MAN_BLE_000
<b>Other PICS</b>	
<b>Initial condition</b>	The PHG under test and the simulated PHD support the same device specialization, they are in a Disconnected state and they have not been paired before.
<b>Test procedure</b>	<ol style="list-style-type: none"> <li>1. Check that the PHG under test IO capabilities are declared in PIXIT I_MAN_BDG_002 and that the MITM protection is declared in PIXIT I_MAN_BDG_003 <ol style="list-style-type: none"> <li>a. IF the PHG under test does not support MITM protection (PIXIT I_MAN_BDG_003 = FALSE) THEN the test tool simulated PHD is configured with Secure Simple Pairing, NoInputNoOutput capabilities and without MITM protection and the Just Works Association Model shall be used during the pairing process and the generated link key will be unauthenticated (without MITM protection)</li> <li>b. IF the PHG under test supports MITM protection (PIXIT I_MAN_BDG_003 = TRUE) THEN <ul style="list-style-type: none"> <li>• IF the PHG under test supports DisplayOnly or DisplayYesNo or KeyboardOnly or KeyboardDisplay capabilities (PIXIT I_MAN_BDG_002 = 0 or 1 or 2 or 3) THEN the test tool simulated PHD is configured with Secure Simple Pairing, KeyboardOnly capabilities and with MITM protection in addition the passkey entry association model shall be used during the pairing process and the generated link key will be authenticated (with MITM protection)</li> <li>• IF the PHG under test supports NoInputNoOutput capabilities (PIXIT I_MAN_BDG_002 = 4) THEN the combination of IO capabilities and MITM support declared by the PHG under test in PIXITs is not feasible and the test case ends by giving a FAIL verdict due to inconsistency among the PHD under test SSP features declared in PIXITs</li> </ul> </li> </ol> </li> <li>2. Set the test tool simulated PHD in discoverable and pairable mode.</li> <li>3. The PHG under test initiates a discovery process as stated in the product documentation.</li> <li>4. Once the simulated PHD has been discovered, make the PHG under test pair with it as stated in the documentation.</li> </ol>
<b>Pass/Fail criteria</b>	In step 4, the PHG under test completes the pairing process successfully.
<b>Notes</b>	

<b>TP Id</b>	TP/LP-PAN/PHG/TR/BLEDG/BV-008		
<b>TP label</b>	Secure Simple Pairing with PHD with KeyboardDisplay capabilities		
<b>Coverage</b>	<b>Spec</b>	[b-ITU-T H.810 (2015)]	
	<b>Testable items</b>	Authentication BT LE 2; M	
<b>Test purpose</b>	Check that: PHG shall support all pairing methods for Bluetooth 4.0, including Just Works and Passkey Entry, if the PHG has the appropriate I/O capabilities.		
<b>Applicability</b>	C_MAN_BLE_000		
<b>Other PICS</b>			
<b>Initial condition</b>	The PHG under test and the simulated PHD support the same device specialization, they are in a Disconnected state and they have not been paired before.		
<b>Test procedure</b>	<ol style="list-style-type: none"> <li>1. Check the PHG under test IO capabilities declared in PIXIT I_MAN_BDG_002 and the MITM protection declared in PIXIT I_MAN_BDG_003 <ol style="list-style-type: none"> <li>a. IF the PHG under test does not support MITM protection (PIXIT I_MAN_BDG_003 = FALSE) THEN the test tool simulated PHD is configured with Secure Simple Pairing,</li> </ol> </li> </ol>		

	<p>NoInputNoOutput capabilities and without MITM protection in addition the Just Works Association Model shall be used during the pairing process and the generated link key will be unauthenticated (without MITM protection)</p> <p>b. IF the PHG under test supports MITM protection (PIXIT I_MAN_BDG_003 = TRUE) THEN</p> <ul style="list-style-type: none"> <li>• IF the PHG under test supports DisplayOnly or DisplayYesNo or KeyboardOnly or KeyboardDisplay capabilities (PIXIT I_MAN_BDG_002 = 0 or 1 or 2 or 3) THEN the test tool simulated PHD is configured with Secure Simple Pairing, KeyboardDisplay capabilities and with MITM protection in addition the passkey entry association model shall be used during the pairing process and the generated link key will be authenticated (with MITM protection)</li> <li>• IF the PHG under test supports NoInputNoOutput capabilities (PIXIT I_MAN_BDG_002 = 4) THEN the combination of IO capabilities and MITM support declared by the PHG under test in PIXITs is not feasible and the test case ends giving a FAIL verdict due to inconsistency among the PHD under test SSP features declared in PIXITs</li> </ul> <p>2. Set the test tool simulated PHD in discoverable and pairable mode.</p> <p>3. The PHG under test initiates a discovery process as stated in the product documentation.</p> <p>4. Once the simulated PHD has been discovered, make the PHG under test pair with it as stated in the documentation.</p>
<b>Pass/Fail criteria</b>	In step 4, the PHG under test completes the pairing process successfully.
<b>Notes</b>	

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