ZigBee Cluster Library
Diagnostics Cluster (0x0b05)
Test Specification
Version 1.0

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Abstract	This document describes the certification tests for devices which implement the ZCL Diagnostics cluster.
Keywords	ZCL, Diagnostics, cluster, test specification

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Revision history

Revision	Date	Details	Editor
000	July 11th, 2017	Initial draft.	Phil Jamieson
001	July 11th, 2017	Added document number.	Phil Jamieson

41

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Table of Contents

70

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1 Introduction

This document contains the PICS, test specification and PICS/test case cross reference for the ZCL *diagnostics* cluster.

1.1 Conformance levels

The key words "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED" and "MAY" in this document are to be interpreted as described in [R4].

2 References

2.1 ZigBee Alliance documents

[R1] ZigBee Cluster Library Specification, ZigBee Alliance document 07-5123.
[R2] ZCL General Test Specification, ZigBee Alliance document 17-0xxxx.
[R3] ZCL Diagnostics Cluster XML PICS, ZigBee Alliance document 17-02934.

2.2 IETF documents

[R4] S. Bradner, Key words for use in RFCs to Indicate Requirement Levels, IETF RFC 2119, March 1997.

88 # 3 PICS

89 All references are for the ZigBee Cluster Library specification [R1] unless otherwise indicated.
90 An XML version of these PICS is also available in [R3].

91 ## 3.1 Usage

Item number	Feature	Reference	Status	Support
DIAG.S	Does the device implement the *diagnostics* cluster as a server?	3.15.2	O	Yes/No ✓
DIAG.C	Does the device implement the *diagnostics* cluster as a client?	3.15.3	O	Yes/No ✓

92

93 ## 3.2 Server

94 ### 3.2.1 Attributes

Item number	Feature	Reference	Status	Support
DIAG.S.A0000	Does the device implement the *NumberOfResets* attribute?	Table 3-124, 3.15.2.2.1.1	DIAG.S: O	Yes/No ✓
DIAG.S.A0001	Does the device implement the *PersistentMemoryWrites* attribute?	Table 3-124, 3.15.2.2.1.2	DIAG.S: O	Yes/No ✓
DIAG.S.A0100	Does the device implement the *MacRxBcast* attribute?	Table 3-125, 3.15.2.2.2.1	DIAG.S: O	Yes/No ✓
DIAG.S.A0101	Does the device implement the *MacTxBcast* attribute?	Table 3-125, 3.15.2.2.2.2	DIAG.S: O	Yes/No ✓
DIAG.S.A0102	Does the device implement the *MacRxUcast* attribute?	Table 3-125, 3.15.2.2.2.3	DIAG.S: O	Yes/No ✓
DIAG.S.A0103	Does the device implement the *MacTxUcast* attribute?	Table 3-125, 3.15.2.2.2.4	DIAG.S: O	Yes/No ✓
DIAG.S.A0104	Does the device implement the *MacTxUcastRetry* attribute?	Table 3-125, 3.15.2.2.2.5	DIAG.S: O	Yes/No ✓
DIAG.S.A0105	Does the device implement the *MacTxUcastFail* attribute?	Table 3-125, 3.15.2.2.2.6	DIAG.S: O	Yes/No ✓
DIAG.S.A0106	Does the device implement the *APSRxBcast* attribute?	Table 3-125, 3.15.2.2.2.7	DIAG.S: O	Yes/No ✓
DIAG.S.A0107	Does the device implement the *APSTxBcast* attribute?	Table 3-125, 3.15.2.2.2.8	DIAG.S: O	Yes/No ✓
DIAG.S.A0108	Does the device implement the *APSRxUcast* attribute?	Table 3-125, 3.15.2.2.2.9	DIAG.S: O	Yes/No ✓

Item number	Feature	Reference	Status	Support
DIAG.S.A0109	Does the device implement the *APSTxUcastSuccess* attribute?	Table 3-125, 3.15.2.2.2.10	DIAG.S: O	Yes/No
DIAG.S.A010a	Does the device implement the *APSTxUcastRetry* attribute?	Table 3-125, 3.15.2.2.2.11	DIAG.S: O	Yes/No
DIAG.S.A010b	Does the device implement the *APSTxUcastFail* attribute?	Table 3-125, 3.15.2.2.2.12	DIAG.S: O	Yes/No
DIAG.S.A010c	Does the device implement the *RouteDiscInitiated* attribute?	Table 3-125, 3.15.2.2.2.13	DIAG.S: O	Yes/No
DIAG.S.A010d	Does the device implement the *NeighborAdded* attribute?	Table 3-125, 3.15.2.2.2.14	DIAG.S: O	Yes/No
DIAG.S.A010e	Does the device implement the *NeighborRemoved* attribute?	Table 3-125, 3.15.2.2.2.15	DIAG.S: O	Yes/No
DIAG.S.A010f	Does the device implement the *NeighborStale* attribute?	Table 3-125, 3.15.2.2.2.16	DIAG.S: O	Yes/No
DIAG.S.A0110	Does the device implement the *JoinIndication* attribute?	Table 3-125, 3.15.2.2.2.17	DIAG.S: O	Yes/No
DIAG.S.A0111	Does the device implement the *ChildMoved* attribute?	Table 3-125, 3.15.2.2.2.18	DIAG.S: O	Yes/No
DIAG.S.A0112	Does the device implement the *NWKFCFailure* attribute?	Table 3-125, 3.15.2.2.2.19	DIAG.S: O	Yes/No
DIAG.S.A0113	Does the device implement the *APSFCFailure* attribute?	Table 3-125, 3.15.2.2.2.20	DIAG.S: O	Yes/No
DIAG.S.A0114	Does the device implement the *APSUnauthorizedKey* attribute?	Table 3-125, 3.15.2.2.2.21	DIAG.S: O	Yes/No
DIAG.S.A0115	Does the device implement the *NWKDecryptFailures* attribute?	Table 3-125, 3.15.2.2.2.22	DIAG.S: O	Yes/No
DIAG.S.A0116	Does the device implement the *APSDecryptFailures* attribute?	Table 3-125, 3.15.2.2.2.23	DIAG.S: O	Yes/No
DIAG.S.A0117	Does the device implement the *PacketBufferAllocateFailures* attribute?	Table 3-125, 3.15.2.2.2.24	DIAG.S: O	Yes/No
DIAG.S.A0118	Does the device implement the *RelayedUcast* attribute?	Table 3-125, 3.15.2.2.2.25	DIAG.S: O	Yes/No
DIAG.S.A0119	Does the device implement the *PhyToMACQueueLimitReached* attribute?	Table 3-125	DIAG.S: O	Yes/No
DIAG.S.A011a	Does the device implement the *PacketValidateDropCount* attribute?	Table 3-125, 3.15.2.2.2.26	DIAG.S: O	Yes/No

Item number	Feature	Reference	Status	Support
DIAG.S.A011b	Does the device implement the *AverageMACRetryPerAPSMessageSent* attribute?	Table 3-125, 3.15.2.2.2.27	DIAG.S: O	Yes/No ✓
DIAG.S.A011c	Does the device implement the *LastMessageLQI* attribute?	Table 3-125, 3.15.2.2.2.28	DIAG.S: O	Yes/No ✓
DIAG.S.A011d	Does the device implement the *LastMessageRSSI* attribute?	Table 3-125, 3.15.2.2.2.29	DIAG.S: O	Yes/No ✓
DIAG.S.Afffd	Does the device implement the *ClusterRevision* global attribute?	Table 2-1, 2.3.5.1.1	DIAG.S: M	Yes/No ✓
DIAG.S.Afffe	Does the device implement the *AttributeReportingStatus* global attribute?	Table 2-1, 2.3.5.1.2	DIAG.S: O	Yes/No ✓

3.3 Client

3.3.1 Attributes

Item number	Feature	Reference	Status	Support
DIAG.C.Afffd	Does the device implement the *ClusterRevision* global attribute?	Table 2-1, 2.3.5.1.1	DIAG.C: M	Yes/No ✓
DIAG.C.Afffe	Does the device implement the *AttributeReportingStatus* global attribute?	Table 2-1, 2.3.5.1.2	DIAG.C: O	Yes/No ✓

4 Test specification

4.1 Introduction

4.1.1 Test case overview

The following test cases are available for the *diagnostics* cluster:

Test ID	Description	Reference
Global tests		
DIAG-TC-01G	Global attributes	4.2.1
Server side tests		
DIAG-TC-01S	Attributes with server as DUT	4.3.1

4.1.2 Testing tolerances

In test cases where a change in an attribute value is tested over time, it is permitted for the devices involved in the test to be within a tolerance of ±15% of the expected value. As such, these test cases indicate that the attribute value must be approximately equal to an expected value, to which the ±15% tolerance should then be applied. All other attribute values presented are expected to be exact.

4.1.3 Test steps manipulating attributes

In test case steps that require more than one attribute to be manipulated (e.g. read), the tester may decide whether it is appropriate or practical to send a single attribute manipulation command, containing multiple attributes, or multiple attribute manipulation commands, each containing a single attribute. The test case is designed to verify the behavior of the device supporting the attribute rather that verifying the attribute manipulation command in question.

4.2 Generic test cases

4.2.1 DIAG-TC-01G: Global attributes

This test case verifies the behavior of the global attributes of the *diagnostics* cluster client and server.

In this test, the PICS notation DIAG.S.A*gm* and DIAG.C.A*gm* represents the list of global attributes that are specified as being mandatory for either the server or client, respectively. Similarly, the PICS notation DIAG.S.A*go* and DIAG.C.A*go* represents the list of global attributes that are specified as being optional for either the server or client, respectively.

4.2.1.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Write attributes* command (0x02)
- *Write attributes response* command (0x04)

Diagnostics cluster (0x0b05):

- All global attributes

PICS:

- DIAG.S, DIAG.C
- DIAG.S.A*gm*, DIAG.C.A*gm*, DIAG.S.A*go*, DIAG.C.A*go*

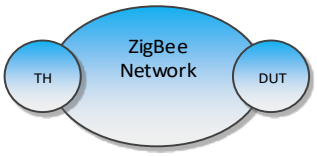
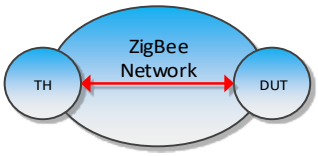
4.2.1.2 Required devices

Designation	Symbol	Description
DUT		Device under test implementing: • The *diagnostics* cluster server or client.
TH		Test harness implementing: • The *diagnostics* cluster client or server, i.e. the opposite cluster instantiation as implemented on the DUT.

4.2.1.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.

140 #### 4.2.1.4 Test preparation

Link TH CLIENT with DUT SERVER	
 *Before*	 *After*

141

DIAG-TC-01G: Global attributes		
Item	**Preparation Step**	**Observation**
P2	Power on TH and DUT.	TH and DUT are powered on.
P3	Ensure TH and DUT are on the same ZigBee network.	Observe appropriate communication between TH, DUT and any other relevant node on the ZigBee network.

--- End of test case DIAG-TC-01G preparation ---

142

143 #### 4.2.1.5 Test procedure

DIAG-TC-01G: Global attributes			
Item	**PICS**	**Test Harness Step**	**DUT pass Verification**
1	DIAG.S.A*gm*, DIAG.C.A*gm*	TH unicasts a ZCL *read attributes* command frame to DUT to read each mandatory global attribute of this cluster one at a time.	DUT unicasts a ZCL *read attributes response* command frame to TH containing each requested attribute. The data type in each command must match the value listed in the specification(s). The data value in each command for the attribute must fall within the valid range described in the specification(s).
2a	DIAG.S.A*gm*, DIAG.C.A*gm*	TH unicasts a ZCL *write attributes* command frame to DUT to write the respective default value to each mandatory global attribute of this cluster one at a time.	DUT unicasts a ZCL *write attributes response* command frame to TH for each attribute. If the access control of DUT is set to READ, the DUT response will indicate that the attribute write command was not a SUCCESS. If the access control of DUT is set to READ/WRITE, the DUT response will indicate that the write command was a SUCCESS.
2b	DIAG.S.A*gm*, DIAG.C.A*gm*	TH unicasts a ZCL *read attributes* command frame to DUT to read back each attribute written in step 2a.	DUT unicasts a ZCL *read attributes response* command frame to TH containing the requested attribute. If the *Status* field of the *write attributes response* command frame was equal to SUCCESS, the updated value is read back. If the *Status* field of the *write attributes response* command frame was not equal to SUCCESS the value is not updated when read back.

Continued…

DIAG-TC-01G: Global attributes			
Item	**PICS**	**Test Harness Step**	**DUT pass Verification**
3	DIAG.S.A*go*, DIAG.C.A*go*	TH unicasts a ZCL *read attributes* command frame to DUT to read each optional global attribute of this cluster one at a time.	DUT unicasts a ZCL *read attributes response* command frame to TH containing each attribute. If the DUT implements the attribute, the *Status* field will be equal to SUCCESS and the command will contain the requested attribute. If the DUT does not implement the attribute, the *Status* field will not be equal to SUCCESS. The data type in each command must match the value listed in the specification(s). The data value in each command for the attribute must fall within the valid range described in the specification(s).
4a	DIAG.S.A*go*, DIAG.C.A*go*	TH unicasts a ZCL *write attributes* command frame to DUT to write the respective default value to each optional global attribute of this cluster one at a time.	DUT unicasts a ZCL *write attributes response* command frame to TH for each attribute. If the attribute is not implemented or the access control of DUT is set to READ, the DUT response will indicate that the attribute write command was not a SUCCESS. If the attribute is implemented and the access control of DUT is set to READ/WRITE, the DUT response will indicate that the write command was a SUCCESS.
4b	DIAG.S.A*go*, DIAG.C.A*go*	TH unicasts a ZCL *read attributes* command frame to DUT to read back each attribute written in step 4a.	DUT unicasts a ZCL *read attributes response* command frame to TH containing the requested attribute. If the *Status* field of the *write attributes response* command frame was equal to SUCCESS, the updated value is read back. If the *Status* field of the *write attributes response* command frame was not equal to SUCCESS the value is not updated when read back.

--- End of test case DIAG-TC-01G ---

144

4.3 Server test cases

4.3.1 DIAG-TC-01S: Attributes with server as DUT

This test case verifies the behavior of the non-global attributes of the *diagnostics* cluster server. In this test, the PICS notation DIAG.S.A*m* represents the list of non-global attributes that are specified as being mandatory. Similarly, the PICS notation DIAG.S.A*o* represents the list of non-global attributes that are specified as being optional.

4.3.1.1 Scope

General:

- *Read attributes* command (0x00)
- *Read attributes response* command (0x01)
- *Write attributes* command (0x02)
- *Write attributes response* command (0x04)

Diagnostics cluster (0x0b05):

- All non-global attributes

PICS:

- DIAG.S,
- DIAG.S.A*m*, DIAG.S.A*o*

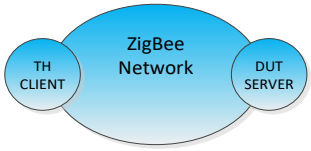
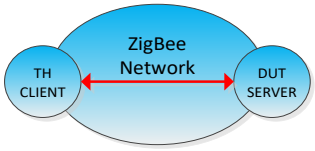
4.3.1.2 Required devices

Designation	Symbol	Description
TH CLIENT		Test harness client implementing: • The *diagnostics* cluster client.
DUT SERVER		Device under test server: • The *diagnostics* cluster server.

4.3.1.3 Initial conditions

Item	Initial Conditions
1	A packet sniffer shall be observing the communication over the air interface.
2	All devices are factory new and powered off until used.

167 #### 4.3.1.4 Test preparation

Link TH CLIENT with DUT SERVER	
 *Before*	 *After*

168

DIAG-TC-01S: Attributes with server as DUT		
Item	**Preparation Step**	**Observation**
P2	Power on TH CLIENT and DUT SERVER.	TH CLIENT and DUT SERVER are powered on.
P3	Ensure TH CLIENT and DUT SERVER are on the same ZigBee network.	Observe appropriate communication between TH CLIENT, DUT SERVER and any other relevant node on the ZigBee network.

--- End of test case DIAG-TC-01C preparation ---

169

170 #### 4.3.1.5 Test procedure

DIAG-TC-01S: Attributes with server as DUT			
Item	**PICS**	**Test Harness Step**	**DUT pass Verification**
1	DIAG.S.A*m*	TH CLIENT unicasts a ZCL *read attributes* command frame to DUT SERVER to read each mandatory attribute of this cluster one at a time.	DUT SERVER unicasts a ZCL *read attributes response* command frame to TH CLIENT containing each requested attribute. The data type in each command must match the value listed in the specification(s). The data value in each command for the attribute must fall within the valid range described in the specification(s).
2a	DIAG.S.A*m*	TH CLIENT unicasts a ZCL *write attributes* command frame to DUT SERVER to write the respective default value to each mandatory attribute of this cluster one at a time.	DUT SERVER unicasts a ZCL *write attributes response* command frame to TH CLIENT for each attribute. If the access control of DUT SERVER is set to READ, the DUT SERVER response will indicate that the attribute write command was not a SUCCESS. If the access control of DUT SERVER is set to READ/WRITE, the DUT SERVER response will indicate that the write command was a SUCCESS.
2b	DIAG.S.A*m*	TH CLIENT unicasts a ZCL *read attributes* command frame to DUT SERVER to read back each attribute written in step 2a.	DUT SERVER unicasts a ZCL *read attributes response* command frame to TH CLIENT containing the requested attribute. If the *Status* field of the *write attributes response* command frame was equal to SUCCESS, the updated value is read back. If the *Status* field of the *write attributes response* command frame was not equal to SUCCESS the value is not updated when read back.

Continued…

DIAG-TC-01S: Attributes with server as DUT			
Item	**PICS**	**Test Harness Step**	**DUT pass Verification**
3	DIAG.S.A*o*	TH CLIENT unicasts a ZCL *read attributes* command frame to DUT SERVER to read each optional attribute of this cluster one at a time.	DUT SERVER unicasts a ZCL *read attributes response* command frame to TH CLIENT containing each attribute. If the DUT SERVER implements the attribute, the *Status* field will be equal to SUCCESS and the command will contain the requested attribute. If the DUT SERVER does not implement the attribute, the *Status* field will not be equal to SUCCESS. The data type in each command must match the value listed in the specification(s). The data value in each command for the attribute must fall within the valid range described in the specification(s).
4a	DIAG.S.A*o*	TH CLIENT unicasts a ZCL *write attributes* command frame to DUT SERVER to write the respective default value to each optional attribute of this cluster one at a time.	DUT SERVER unicasts a ZCL *write attributes response* command frame to TH CLIENT for each attribute. If the attribute is not implemented or the access control of DUT SERVER is set to READ, the DUT SERVER response will indicate that the attribute write command was not a SUCCESS. If the attribute is implemented and the access control of DUT SERVER is set to READ/WRITE, the DUT response will indicate that the write command was a SUCCESS.

Continued…

DIAG-TC-01S: Attributes with server as DUT			
Item	**PICS**	**Test Harness Step**	**DUT pass Verification**
4b	DIAG.S.A*o*	TH CLIENT unicasts a ZCL *read attributes* command frame to DUT SERVER to read back each attribute written in step 4a.	DUT SERVER unicasts a ZCL *read attributes response* command frame to TH CLIENT containing the requested attribute. If the *Status* field of the *write attributes response* command frame was equal to SUCCESS, the updated value is read back. If the *Status* field of the *write attributes response* command frame was not equal to SUCCESS the value is not updated when read back.

--- End of test case DIAG-TC-01S ---

171
172

173 5 Annex A: PICS to test case cross reference

174 5.1 Server

	Test case	
PICS	DIAG-TC-01G	DIAG-TC-01S
DIAG.S	X	X
DIAG.S.A0000		X
DIAG.S.A0001		X
DIAG.S.A0100		X
DIAG.S.A0101		X
DIAG.S.A0102		X
DIAG.S.A0103		X
DIAG.S.A0104		X
DIAG.S.A0105		X
DIAG.S.A0106		X
DIAG.S.A0107		X
DIAG.S.A0108		X
DIAG.S.A0109		X
DIAG.S.A010a		X
DIAG.S.A010b		X
DIAG.S.A010c		X
DIAG.S.A010d		X
DIAG.S.A010e		X
DIAG.S.A010f		X
DIAG.S.A0110		X
DIAG.S.A0111		X
DIAG.S.A0112		X
DIAG.S.A0113		X
DIAG.S.A0114		X
DIAG.S.A0115		X
DIAG.S.A0116		X
DIAG.S.A0117		X
DIAG.S.A0118		X
DIAG.S.A0119		X
DIAG.S.A011a		X
DIAG.S.A011b		X
DIAG.S.A011c		X

	Test case	
PICS	DIAG-TC-01G	DIAG-TC-01S
DIAG.S.A011d		X
DIAG.S.Afffd	X	
DIAG.S.Afffe	X	

175

176 ## 5.2 Client

	Test case
PICS	DIAG-TC-01G
DIAG.C	X
DIAG.C.Afffd	X
DIAG.C.Afffe	X

177