

ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

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TEST REPORT

Sheet 1 of 23

NAME & ADDRESS OF CUSTOMER ASHIDA ELECTRONICS PVT. LTD. PLOT NO. A-308, ROAD NO. 21, WAGLE INDUSTRIAL ESTATE, THANE-400604, MAHARASHTRA,INDIA	TEST REPORT NO. : RP-1819-015628 DATE :24/07/2018	
	CUSTOMER REF.NO.	DATED
	LETTER	28/05/2018
	DATE OF SAMPLE RECEIPT	DATE OF TESTING
	29/05/2018	31/05/2018 to 24/07/2018
SAMPLE DETAILS ADR241B FEEDER PROTECTION RELAY Auxiliary voltage range : 24-230 VAC/DC Rated current : 1/5 A AC Rated Frequency : 50/60 Hz Binary input voltage : 18-230 VDC Binary input : 8 Nos. Binary output : 8 Nos. Quantity (tested) :01 No.	SAMPLE IDENTIFICATION ERDA sample code no. : ERDA-00259959 Model number: ADR241B-B-0-0-2-0-1-1-0-2-1-H Serial number: 17I241B0006 Make: ASHIDA ELECTRONICS PVT. LTD.	
TEST DETAILS 1. Documentation and version control test procedure Overview 2. Application association model 3. Server, Logical device, Logical node and data model Overview	TEST SPECIFICATION IEC 61850-4:2011, IEC 61850-6:2009, IEC 61850-7-2:2010, IEC 61850-7-3:2010 IEC 61850-7-4:2010, IEC 61850-8-1:2011 IEC 61850-10:2012	
ENCLOSURE: 1) Photograph No. :1819-003335/A to C 2) Oscillogram No. : Nil 3) Drawing No. : Nil		
TEST WITNESSED BY: Mr. Amol Dhuri of M/s. ASHIDA ELECTRONICS PVT. LTD.		
REMARKS: Sample has not shown to be non-conforming to the requirement of the standard for the tests carried out.		
 Prepared By	 Checked By	 Approved By (Dr.S.H.CHETWANI)

Note: 1. This report relates only to the particular sample received in good condition for testing at ERDA, Vadodara.

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-Identification

DUT	SOFTWARE VERSION:V 2.2.0 HARWARE VERSION:V 1.0 FIRMWARE VERSION:V 3.02
PICS	"Protocol Implementation Conformance Statement for the IEC 61850 Ed.2"
MICS	"Model Implementation Conformance Statement for the IEC 61850 Ed.2"
TICS	"TISSUES Implementation Conformance Statement for the IEC 61850 Ed.2 "
PIXIT	"Protocol Implementation extra Information for Testing (PIXIT) the IEC 61850 Ed.2 "
CLIENT SIMULATOR	UNIGRID Substation automation version 1.4.401.76
ANALYZER	UniCA 61850 Analyzer 5.31.00.0
HMI	To monitor processed data: Avenue To configure DUT and force commands: RTV2 and GOOSE configurator
TIME SERVER	KemaSNTP.exe, DNV KEMA SNTP Master

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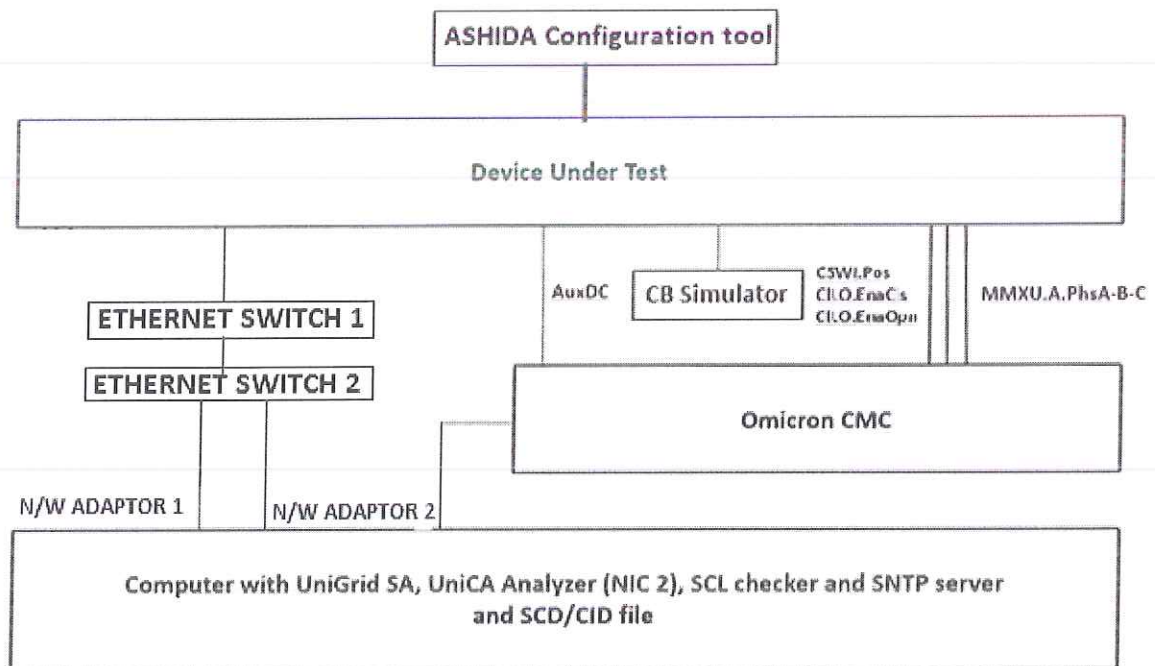


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- Components in the test environment



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Abbreviation:

DUT	Device Under Test
HMI	Human machine interface
MICS	Model Implementation Conformance Statement
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
IID	Instantiated IED description
SCL	Substation Configuration Language
SNTP	Simple Network Time Protocol
TICS	TISSUES Implementation Conformance Statement
TISSUE	Technical issue

A handwritten signature in blue ink, appearing to read 'R. P. J.' with a flourish at the end.

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A handwritten signature in blue ink, appearing to read 'N. K. J.' with a flourish at the end.

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1.1 Documentation and version control test procedure overview

Ref.: Cl. No. 6.2.4.3 of IEC 61850-10:2012

1.1.1 Documentation and version control

Test case	Test procedure	verdict
sDoc1	Check if the major/minor software version in the PICS documentation and the DUT do match (IEC 61850-4:2011). PICS shall contain the ACSI conformance statement according to IEC 61850-7-2:2010 Annex A	Passed
sDoc2	Check if the major/minor software version in the PIXIT documentation and software version of the DUT does match (IEC 61850-4:2011). PIXIT shall indicate the required information as requested in the test cases	Passed
sDoc3	Check if the major/minor software version in the MICS documentation and software version of the DUT does match (IEC 61850-4:2011). MICS shall indicate the semantics of all non-standard Logical Nodes, Data Objects, Data Attributes and enumeration	Passed
sDoc4	Check if the major/minor software version in the TICS documentation and software version of the DUT does match (IEC 61850-4:2011). TICS shall indicate the implemented technical issues.	Passed

1.1.2 Configuration file

Test case	Test procedure	verdict
sCnf1	Test if the ICD configuration file conforms to the SCL schema (IEC 61850-6:2009)	Passed
sCnf2	Check if the ICD configuration file corresponds with the actual data names, data types, data-sets, pre-defined data values exposed by the DUT on the network. When more data or services are exposed, attach a list and set the test result to Passed. When less data or services are exposed the test result is Failed.	Passed
sCnf3	Change at least 5 end-user configurable parameters that are exposed by the DUT on the network in the SCD configuration file, configure the DUT using the SCD configuration file (using the supplied configuration tool) and check the updated configuration using online services corresponds with the updated SCD file. Restore the original SCD file and re-configure the DUT to its original state.	Passed
sCnf4	Check if the server capabilities in the ICD "services" section do match with the IED capabilities	Passed
sCnf5	In case the control model is fixed (not configurable) check if the ICD correctly initializes the ctlModel values for all controllable objects	Passed
sCnf6	Check the edition 2 SCL changes: - version="2007" with revision="A" or higher - name Length = 64	Passed
sCnf7	Check the "ldName" naming structure when supported. All online object references (including data sets and control block references) shall start with the "LDevice ldName" value instead of the "IED name" + "LDevice inst"	Passed

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1.1.3 Data model

Test case	Test procedure	verdict
sMdl1	Verify presence of mandatory objects for each LN. Passed when all objects/attributes are present	Passed
sMdl2	Verify presence of conditional presence true objects for each LN. Passed when all objects/attributes are present	Passed
sMdl3	Verify non-presence of conditional presence false objects. Passed when these objects/attributes are not present	Passed
sMdl4	Verify data model mapping according to applicable SCSM concerning name length and object expansion. Passed when mapping is according to applicable SCSM	Passed
sMdl5	Verify data model mapping according to applicable SCSM concerning organisation of functional components. Passed when mapping is according to applicable SCSM	Passed
sMdl6	Verify data model mapping according to applicable SCSM concerning naming of control blocks and logs. Passed when mapping is according to applicable SCSM	Passed
sMdl7	Verify data type of all objects for each LN. Passed when data type of all objects/attributes do match with the IEC 61850-7-3:2010, IEC 61850-7-4:2010 and the applicable SCSM	Passed
sMdl8	Verify that the preconfigured enumerated data attribute values from the device and SCL are in specified range. Passed when all values are in range	Passed
sMdl9	Check if manufacturer specific data model extensions are implemented according to the extension rules in IEC 61850-7-1:2011 Clause 14 (only when extensions are implemented). Passed when all extensions are implemented according to the rules	Passed
sMdl10	Check if the order of the data attributes within the functional constraints of the Data Object types match with IEC 61850-7-3:2010. Passed when all attributes are in matching order	Passed
sMdl11	Check the maximum name length of Logical Device, Logical Node, data sets and control blocks according to IEC 61850-7-2 :2010 Subclause 22.2 and SCSM	Passed
sMdl12	Check that the rules for multiple data object instantiation are kept (IEC 61850-7-1:2011,14.6, IEC 61850-7-4:2010)	Passed
sMdl13	Check the logical device name space or the LLNO logical node name space refers to edition 2	Passed

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2.0 Application association model

Ref.:Cl. No. 6.2.4.7 of IEC 61850-10:2012

2.1 Positive test cases

Ref.:Cl. No. 6.2.4.7.1 of IEC 61850-10:2012

Test case	Description
sAss1	Associate and client-release a TPAA association (IEC 61850-7-2 :2010 Sub clause 8.3.2)
sAss2	Associate and client-abort TPAA association (IEC 61850-7-2 :2010 Sub clause 8.3.2)
sAss3	Associate with maximum number of clients simultaneously(PIXIT)

sAss1	Associate and release a TPAA association	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 8.3.2 IEC 61850-8-1:2011 Subclause 10.2		
<u>Expected result</u> 2.DUT sends Associate response+ 3.DUT sends Release response+		
<u>Test description</u> 1.Configure the simulator and DUT with the correct association and authentication parameters 2.Client request Associate 3.Client request Release 4.Repeat step 2 and 3 for 250 times		
<u>Comment</u>		

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sAss2	Associate and client-abort TPAA association	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 8.3.2 IEC 61850-8-1:2011 Subclause 10.2		
<u>Expected result</u> 2.DUT sends Associate response+ 3.DUT sends Abort response+		
<u>Test description</u> 1.Configure the simulator and DUT with the correct association and authentication parameters 2.Client request Associate 3.Client request Abort 4.Repeat step 2 and 3 for 250 times		
<u>Comment</u>		

sAss3	Associate with maximum number of clients simultaneously(PIXIT)	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 8.3.2 IEC 61850-8-1:2011 Subclause 10.2 PIXIT		
<u>Expected result</u> 2.DUT sends Associate response+ for each Client 3.DUT sends Release response+ for each Client		
<u>Test description</u> 1.Configure the simulator and DUT with the correct association and authentication parameters 2.Client 1 to max requests Associate 3.Client 1 to max requests Release 4.Repeated step 2 and 3 for 250 times		
<u>Comment</u>		

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2.2 Negative test cases

Ref.: Cl. No 6.2.4.7.2 of IEC 61850-10:2012

sAssN3	Set up maximum+1 associations, verify the last associate is refused
sAssN4	Disconnect the communication interface, the DUT shall detect link lost within a specified period
sAssN5	Interrupt and restore the power supply, the DUT should accept an association request when ready

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sAssN3	Associate with maximum+1 number of clients simultaneously	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 8.3.2, IEC 61850-8-1:2011 Subclause 10.2 PIXIT		
<u>Expected result</u> 2. DUT sends Associate response+ for at least the maximum server association as defined in the PIXIT and response- for the last associate 3. DUT sends Release response+		
<u>Test description</u> 1. Configure the Client and DUT with the correct association and authentication parameters 2. Client 1 to N send associate request until the DUT send response 3. Client 1 to N-1 send release 4. Repeat step 2 and 3 250 times		
<u>Comment</u>		

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sAssN4	Detection of lost link	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 subclause 8.3.2, IEC 61850-8-1:2011 subclause 10.2 PIXIT		
<u>Expected result</u> 2. DUT sends Associate response+ 3. DUT sends GetDataValues Resonse+ 4. DUT sends KEEP ALIVE messages according to PIXIT specifies interval 7. DUT sends no response		
<u>Test description</u> 1. Configure the Client and DUT with the correct association and authentication parameters 2. Client requests Associate 3. Client requests a correct GetDataValues 4. Wait multiple KEEP ALIVE timeout 5. Disable TCP communication between client and DUT E.g. Disconnect the physical link between two Ethernet switches (reventing Ethernet hardware error detection at both client and server), some seconds longer than a KEEP ALIVE timeout specified in the PIXIT 6. Enable TCP communication E.g. connect the physical link 7. Verify the DUT has lost the association by sending a correct GetDataValues request		
<u>Comment</u>		

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sAssN5	Power supply interrupt	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 subclause 8.3.2, IEC 61850-8-1:2011 subclause 10.2 PIXIT		
<u>Expected result</u> 2. DUT sends Associate response+ 3. The DUT sends associate Response+ within the specified power up time (PIXIT)		
<u>Test description</u> 1. Configure the Client and DUT with the correct association and authentication parameters 2. Client requests Associate 3. Power down and wait until the DUT is off . Restore the DUT power supply and wait the specified Power up time or until the DUT is initialized 4. Client requests Associate and DUT response+		
<u>Comment</u>		

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3.0 Server, Logical device, logical node, and data model

Ref.: Cl. No. 6.2.4.8 of IEC 61850-10:2012

3.1 Positive Test cases:

Ref.: Cl. No. 6.2.4.8.1 of IEC 61850-10:2012

Test case	Test case description
sSrv1	Request GetServerDirectory(LOGICAL-DEVICE) and check response (IEC 61850-7-2 :2010 clause 7.2.2)
sSrv2	For each GetServerDirectory(LOGICAL-DEVICE) response issue a GetLogicalDeviceDirectory request and check response (IEC 61850-7-2 :2010 clause 9.2.1)
sSrv3	For each GetLogicalDeviceDirectory response issue a GetLogicalNodeDirectory(DATA) request and check response (IEC 61850-7-2 :2010 clause 10.2.2)
sSrv4	For each GetLogicalNodeDirectory(DATA) response issue a <ul style="list-style-type: none">- GetDataDirectory request and check response (IEC 61850-7-2 :2010 clause 11.4.4)- GetDataDefinition request and check response (IEC 61850-7-2 :2010 clause 11.4.5)- GetDataValues request and check response (IEC 61850-7-2 :2010 clause 11.4.2)
sSrv5	Issue one GetDataValues request with the maximum number of data values and check response
sSrv8	Request GetAllDataValues for each functional constraint and check response (IEC 61850-7-2 :2010 clause 10.2.3)


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sSrv1	Request GetServerDirectory(LOGICAL-DEVICE) and check response	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 7.2.2 IEC 61850-8-1:2011 Subclause 9.3		
<u>Expected result</u> 1.DUT sends Associate response+ 2.DUT sends GetServerDirectory(LOGICAL-DEVICE) Response+ with a list of logical devices		
<u>Test description</u> 1.Client requests correct Association 2.Client requests GetServerDirectory(LOGICAL-DEVICE) 3.Client with Srv2		
<u>Comment</u>		

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sSrv2	For each GetServerDirectory(LOGICAL-DEVICE) response, issue a GetLogicalDeviceDirectory request and check response	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 9.2.1 IEC 61850-8-1:2011 Subclause 11.1		
<u>Expected result</u> 1. DUT sends GetLogicalDeviceDirectory response+ with a list of logical nodes		
<u>Test description</u> 1. For each responded logical device Client requests GetLogicalDeviceDirectory 2. Continue with Srv3		
<u>Comment</u>		

sSrv3	For each GetLogicalDeviceDirectory response, issue a GetLogicalNodeDirectory(DATA) request and check response	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 9.2.2 IEC 61850-8-1:2011 Subclause 12.3.1		
<u>Expected result</u> 1. DUT sends GetLogicalNodeDirectory(DATA) response+ with a list of data		
<u>Test description</u> 1. For each responded logical node directory Client requests GetLogicalNodeDirectory(DATA) 2. Continue with Srv4		
<u>Comment</u>		

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sSrv4	For each GetLogicalNodeDirectory(DATA) response, issue a - GetDataDirectory request and check response - GetDataDefinition request and check response - GetDataValues request and check response	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 11.4.4, 11.4.5 and 11.4.2 IEC 61850-8-1:2011 Subclause 13.4.3, 13.4.4 and 13.4.1		
<u>Expected result</u> 1.DUT sends GetDataDirectory response+ 2.DUT sends GetDataDefinition response+ 3.DUT sends GetDataValues response+		
<u>Test description</u> For each responded data object client requests a: 1.GetDataDirectory 2.GetDataDefinition 3.GetDataValues		
<u>Comment</u> Note 1: IEC 61850-8-1:2004 maps the functional constraint between the Logical Node and Data Object. As such Srv4 issues requests including the functional constraint: <LD>/<LN><FC><DO> where FC can be ST, MX , CF, SP, DC, EX , BL, OR Note 2:IEC 61850-8-1:2004 maps both GetDataDirectory and GetDataDefinition to GetVariableAccessAttributes		

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sSrv5	Request GetAllDataValues for each functional constraint	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2:2010 Subclause 10.4.2 IEC 61850-8-1:2004 Subclause 13.2.1		
<u>Expected result</u> 1.DUT sends GetDatavalues response+ with requested data hierachy		
<u>Test description</u> 2.Clent requests one GetDataValues of at least the following data objects for the supported data hierachy level: - Functional constrained data:LLN0\$ST\$Mod - Functional constrained data attribute: LLN0\$ST\$Mod\$stVal - Functional constrained data attribute type attribute		
<u>Comment</u> Note:It is allowed that the GetDataValues on Logical node level may fail for large logical nodes caused by server MMS PDU size limitations.		

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sSrv8	Request GetAllDataValues for each functional constraint and check response	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 10.2.3 IEC 61850-8-1:2011 Subclause 12.3.2		
<u>Expected result</u> 1.DUT sends GetAllDataValues response+ 2.DUT sends GetAllDataValues response+		
<u>Test description</u> 1.For each Logical node and supported functional constraint the Client sends a GetAllDataValues request using MMS Alternate Access where the alternate access contains at least an allowed Data FC= ST, MX, CF, SP, DC, EX, BL, OR. 2. For each Logical node the client sends a GetAllDataValues request using object reference <IED><LD>/<LN>\$<FC> where FC= ST, MX, CF, SP, DC, EX, BL, OR.		
<u>Comment</u>		


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3.2 Negative test cases

Ref.: Cl. No 6.2.4.8.2 of IEC 61850-10:2012

Test case	Test case description
sSrvN1	Request the following data services with wrong parameters (unknown object, name case mismatch, wrong logical device or wrong logical node) and verify response- service error - ServerDirectory(LOGICAL-DEVICE) (IEC 61850-7-2 :2010, Subclause 7.2.2) - GetLogicalDeviceDirectory (IEC 61850-7-2 :2010, Subclause 9.2.1) - GetLogicalNodeDirectory(DATA) (IEC 61850-7-2 :2010, Subclause 10.2.2) - GetAllDataValues (IEC 61850-7-2 :2010, Subclause 10.2.3) - GetDataValues (IEC 61850-7-2 :2010, Subclause 11.4.2) - SetDataValues (IEC 61850-7-2 :2010, Subclause 11.4.3) - GetDataDirectory (IEC 61850-7-2 :2010, Subclause 11.4.4) - GetDataDefinition (IEC 61850-7-2 :2010, Subclause 11.4.5)
sSrvN4	Request SetDataValues for read-only data values and verify response- service error (IEC 61850-7-2 :2010 Subclause 11.4.3)

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sSrvN1	LD/LN/Data services with incorrect parameters	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 7.2.2, 8.2.1, 10.2-3, 11.4.2-5 IEC 61850-8-1:2011 Subclause 8.1.3.4		
<u>Expected result</u> a) DUT sends MMS service error with error class access object-non existent b) DUT sends MMS service error with error class access object-non existent c) DUT sends MMS service error with error class access object-non existent d) DUT sends response with Access result "object-non-existent" e) DUT sends response with Access result "object-non-existent" f) DUT sends response with Access result "object-non-existent"		
<u>Test description</u> Client requests the following data services with wrong parameters (unknown object, logical device and/or logical node, known object but with a name case mismatch when applicable): a) GetLogicalDeviceDirectory b) GetLogicalNodeDirectory (for part 8-1 same as a)) c) GetDataDirectory / GetDataDefinition (same for part 8-1) d) GetDataValues e) SetDataValues f) GetAllDataValues		
<u>Comment</u>		


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SrvN4	Request SetDataValues for read-only data values and verify response- service error (IEC 61850-7-2 :2010Subclause 10.4.3)	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Inconclusive
IEC 61850-7-2 :2010 Subclause 10.4.3 IEC 61850-8-1:2011 Subclause 13.2.1-4, Table 23		
<u>Expected result</u> 1. DUT sends response- with data access error "object-acces-denied"		
<u>Test description</u> 1. Client sends a SetDataValues request with an read-only FC		
<u>Comment</u>		

REMARKS: Sample has **not shown to be non-conforming** to the requirement of the standard for the tests carried out.


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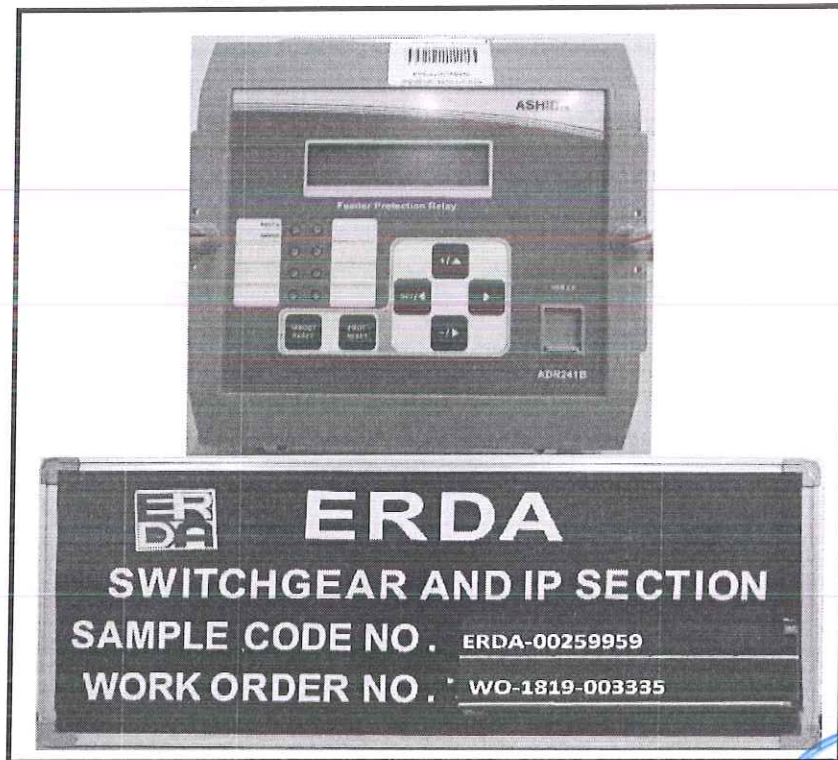
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Photograph No.: 1819-003335/A

ADR241B FEEDER PROTECTION RELAY



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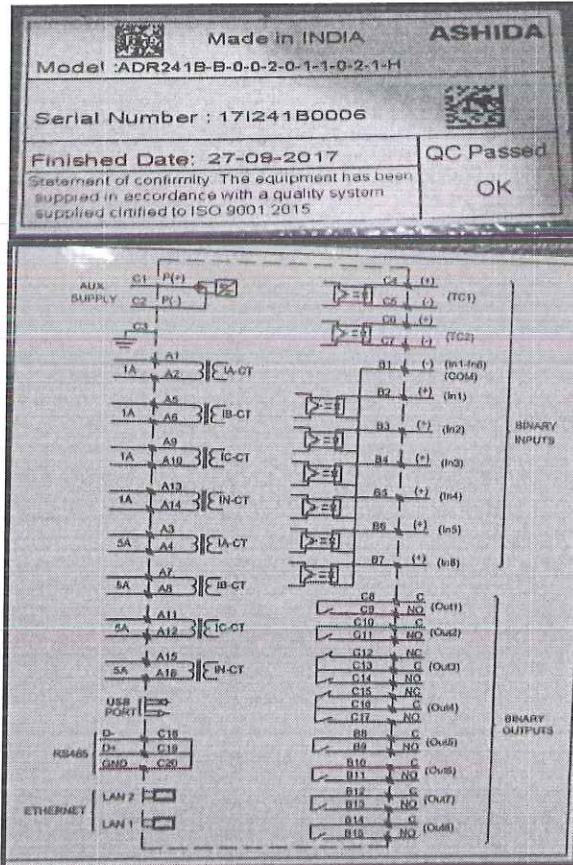
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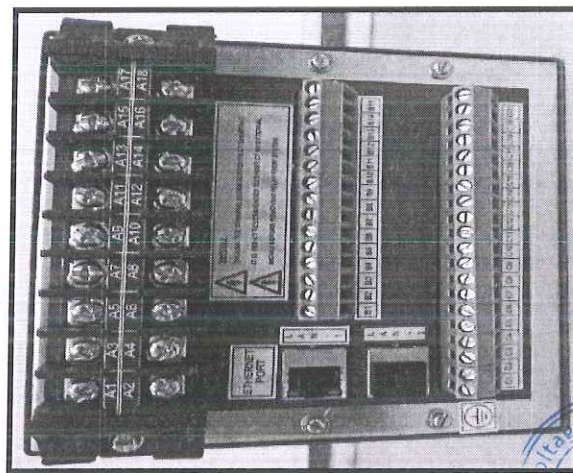
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Photograph No.: 1819-003335/B

NAME PLATE OF ADR241B FEEDER PROTECTION



R. P. Joshi

Photograph No.: 1819-003335/C

REAR VIEW OF ADR241B FEEDER PROTECTION RELAY

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