

# IEC 61850 Standard Application Guide

For the Nexus® 1450 Meter



Nexus® 1450 Meter



P70N  
Color Touchscreen LCD Display

V.1.07  
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Nexus® 1450 Meter IEC 61850 Standard Application Guide V.1.07

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# 1: Introduction

This application guide contains detailed information on the IEC 61850 Standard implementation for the Electro Industries' Nexus® 1450 meter. This information is intended as a supplemental aid for using this meter's IEC 61850 feature.

For additional information concerning the meter and the IEC 61850 Standard implementation for it, refer to the *Nexus® 1450 Meter Installation and Operation Guide*.

Download the manual from the 1450 meter webpage:

<https://www.electroind.com/products/nexus-1450-energy-panel-meter-with-advanced-power-quality/>.

Click Tech Documents>User Manual to download the user manual.

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## 2: Protocol Implementation Conformance Statement (PICS)

This chapter explains how the IEC 61850 interface in the Nexus® 1450 meter with comm runtime firmware version 4.00 or higher adheres to the IEC 61850 Standard Edition 2.

### 2.1: Overview

The following Abstract Communications Service Interface (ACSI) conformance statements are used to provide an overview and details about the Nexus® 1450 meter:

- ACSI basic conformance statement
- ACSI models conformance statement,
- ACSI service conformance statement

The statements specify the communication features mapped to IEC 61850-8-1.

## 2.2: ACSI Basic Conformance Statement

The basic conformance statement is defined in Table 2.1.

		Client/ Subscriber	Server/ Publisher	Value/ Comments
Client-Server roles				
B11	Server side (of TWO-PARTY-APPLICATION-ASSOCIATION)	—	Y	
B12	Client side of (TWO-PARTY-APPLICATION-ASSOCIATION)	N	—	
SCSMs supported				
B21	SCSM: IEC 61850-8-1 used		Y	
B22	SCSM: IEC 61850-9-1 used			Depre- cated Ed. 2
B23	SCSM: IEC 61850-9-2 used			
B24	SCSM: other			
Generic substation event model (GSE)				
B31	Publisher side		Y	
B32	Subscriber side	Y		
Transmission of sampled value model (SVC)				
B41	Publisher side	—		
B42	Subscriber side		—	
Y = supported N or empty = not supported — = not applicable				

Table 2.1: ACSI Basic Conformance Statement

## 2.3: ACSI Models Conformance Statement

The ACSI models conformance statement is defined in Table 2.2.

		Client/ Subscriber	Server/ Publisher	Value/Comments
If Server or Client side (B11/12) supported				
M1	Logical device		Y	
M2	Logical node		Y	
M3	Data		Y	
M4	Data set		Y	
M5	Substitution		N	
M6	Setting group control		N	
	Reporting			
M7	Buffered report control		Y	
M7-1	sequence-number		Y	
M7-2	report-time-stamp		Y	
M7-3	reason-for-inclusion		Y	
M7-4	data-set-name		Y	
M7-5	data-reference		Y	
M7-6	buffer-overflow		Y	
M7-7	entryID		Y	
M7-8	BufTim		Y	
M7-9	IntgPd		Y	
M7-10	GI		Y	
M7-11	conf-revision		Y	
M8	Unbuffered report control		Y	
M8-1	sequence-number		Y	
M8-2	report-time-stamp		Y	
M8-3	reason-for-inclusion		Y	
M8-4	data-set-name		Y	
M8-5	data-reference		Y	
M8-6	BufTim		Y	
M8-7	IntgPd		Y	

		Client/ Subscriber	Server/ Publisher	Value/Comments
M8-8	GI		Y	
M8-9	conf-revision		Y	
	Logging		N	
M9	Log control		N	
M9-1	IntgPd		N	
M10	Log		N	
M11	Control		N	
M17	File Transfer		Y	
M18	Application Association		Y	
M19	GOOSE Control Block		Y	
M20	Sampled Value Control Block		N	
If GSE (B31/32) is supported				
M12	GOOSE		Y	
M13	GSSE			Deprectaed Ed. 2
If SVC (41/42) is supported				
M14	Multicast SVC		N	
M15	Unicast SVC		N	
For All IEDs				
M16	Time	Y	N	Time source with required accuracy shall be available. Only Time Master are SNTP (Mode 4 response) time server. All other Client / Server devices require SNTP (Mode 3 request) clients
Y = service is supported N or empty = service is not supported				

Table 2.2: ACSI Models Conformance Statement

## 2.4: ACSI Service Conformance Statement

The ACSI service conformance statement is defined in Table 2.3 (dependent on the statements in Table 2.1).

	Ed.	Services	AA: TP/ MC	Client (C)	Server (S)	Comments
Server						
S1	1,2	GetServerDirectory (LOGICAL-DEVICE)	TP		Y	
Application association						
S2	1,2	Associate			Y	
S3	1,2	Abort			Y	
S4	1,2	Release			Y	
Logical device						
S5	1,2	GetLogicalDeviceDirectory	TP		Y	
Logical node						
S6	1,2	GetLogicalNodeDirectory	TP		Y	
S7	1,2	GetAllDataValues	TP		Y	
Data						
S8	1,21,2	GetDataValues	TP		Y	
S9	1,2	SetDataValues	TP		N	
S10	1,2	GetDataDirectory	TP		Y	
S11	1,2	GetDataDefinition	TP		Y	
Data set						

	Ed.	Services	AA: TP/ MC	Client (C)	Server (S)	Comments
S12	1,2	GetDataSetValues	TP		Y	
S13	1,2	SetDataSetValues	TP		N	
S14	1,2	CreateDataSet	TP		N	
S15	1,2	DeleteDataSet	TP		N	
S16	1,2	GetDataSetDirectory	TP		Y	
Substitution						
S17	1	SetDataValues	TP		N	
Setting group control						
S18	1,2	SelectActiveSG	TP		N	
S19	1,2	SelectEditSG	TP		N	
S20	1,2	SetSGValues	TP		N	
S21	1,2	ConfirmEditSGValues	TP		N	
S22	1,2	GetSGValues	TP		N	
S23	1,2	GetSGCBValues	TP		N	
Reporting						
Buffered report control block (BRCB)						
S24	1,2	Report	TP		Y	
S24-1	1,2	data-change (dchg)			Y	
S24-2	1,2	qchg-change (qchg)			Y	
S24-3	1,2	data-update (dupd)			Y	
S25	1,2	GetBRCBValues	TP		Y	
S26	1,2	SetBRCBValues	TP		Y	



	Ed.	Services	AA: TP/ MC	Client (C)	Server (S)	Comments
Unbuffered report control block (URCB)						
S27	1,2	Report	TP		Y	
S27-1	1,2	data-change (dchg)			Y	
S27-2	1,2	qchg-change (qchg)			Y	
S27-3	1,2	data-update (dup)			Y	
S28	1,2	GetURCBValues	TP		Y	
S29	1,2	SetURCBValues	TP		Y	
Logging						
Log control block						
S30	1,2	GetLCBValues	TP		N	
S31	1,2	SetLCBValues	TP		N	
Log						
S32	1,2	QueryLogBy-Time	TP		N	
S33	1,2	QueryLog-ByEntry	TP		N	
S34	1,2	GetLogStatusValues	TP		N	
Generic substation event model (GSE)						
GOOSE						
S35	1,2	SendGOOSE-Message	MC		Y	
GOOSE-CONTROL-BLOCK						
S36	1,2	GetReference	TP		N	
S37	1,2	GetGOOSEElement-Number	TP		N	
S38	1,2	GetGoCBValues	TP		Y	
S39	1,2	SetGoCBValues	TP		N	

	Ed.	Services	AA: TP/ MC	Client (C)	Server (S)	Comments
GSSE						
S40	1	SendGSSEMessage	MC	N	N	
GSSE-CONTROL-BLOCK						
S41	1	GetReference	TP	N	N	
S42	1	GetGSSEElementNumber	TP	N	N	
S43	1	GetGsCBValues	TP	N	N	
S44	1	SetGsCBValues	TP	N	N	
Transmission of sampled value model (SVC)						
Multicast SVC						
S45	1,2	SendMSVMMessage	MC		N	
Multicast Sampled Value Control Block						
S46	1,2	GetMSVCBValues	TP		N	
S47	1,2	SetMSVCBValues	TP		N	
Unicast SVC						
S48	1,2	SendUSVMMessage	TP		N	
Unicast Sample Value Control Block						
S49	1,2	GetUSVCBValues	TP		N	
S50	1,2	SetUSVCBValues	TP		N	
Control						
S51	1,2	Select			N	
S52	1,2	SelectWithValue	TP		N	
S53	1,2	Cancel	TP		N	
S54	1,2	Operate	TP		N	

	Ed.	Services	AA: TP/ MC	Client (C)	Server (S)	Comments
S55	1,2	Command-Termination	TP		N	
S56	1,2	TimeActivated-Operate	TP		N	
File transfer						
S57	1,2	GetFile	TP		Y	
S58	1,2	SetFile	TP		N	
S59	1,2	DeleteFile	TP		N	
S60	1,2	GetFileAttributeValues	TP		Y	
S61	1,2	GetServerDirectory (FILE-SYSTEM)	TP		Y	
Time						
T1	1,2	Time resolution of internal clock			13	nearest negative power of 2 <sup>-n</sup> in seconds (number 0...24)
T2	1,2	Time accuracy of internal clock			T0 (SNTP) T1 (IRIG-B) T2 (IRIG-B) T3 (IRIG-B) T4 (IRIG-B) T5 (IRIG-B)	TL (ms)(low accuracy), T3 < 7) (only Ed. 2) T0 (ms)(≤ 10 ms), 7 ≤ T3 < 9 T1 (μs)(≤ 1 ms), 10 ≤ T3 < 13 T2 (μs)(≤ 100 μs), 13 ≤ T3 < 15 T3 (μs)(≤ 25 μs), 15 ≤ T3 < 18 T4 (μs)(≤ 25 μs), 15 ≤ T3 < 18 T5 (μs)(≤ 1 μs), T3 ≥ 20
T3	1,2	Supported TimeStamp resolution			10 (SNTP) 14 (IRIG-B)	nearest negative power of 2 <sup>-n</sup> in seconds (number 0...24)
Y = service is supported N or empty = service is not supported						

Table 2.3: ACSI Service Conformance Statement

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## 3: Protocol Implementation Extra Information for Testing (PIXIT)

This chapter specifies the PIXIT of the IEC 61850 interface in the Nexus® 1450 meter with comm runtime firmware version 4.00 or higher. The PIXIT entries contain information which is not available in the PICS, MICS, TICS documents or the SCL file. The table in each section specifies the PIXIT for the applicable ACSI service model as structured in IEC 61850-10. The Ed. column indicates whether or not the entry is applicable to IEC 61850 Ed. 2.

### 3.1: Overview

Together with the PICS (see Chapter 2) and the MICS (see Chapter 6), the PIXIT forms the basis for a conformance test according to IEC 61850-10.

### 3.2: PIXIT for Association Model

ID	Ed.	Description	Value / Clarification
As1	1	Maximum number of clients that can set up an association simultaneously	6
As2	1, 2	TCP_KEEPALIVE value; the recommended range is 1..20s	60 seconds
As3	1, 3	Lost connection detection time	90 seconds
As4	–	Authentication is not supported yet	N
As5	1, 2	What association parameters are necessary for successful association?	Transport Selector Y Session selector Y Presentation selector Y AP Title N AE Qualifier N
As6	1,2	If association parameters are necessary for association, describe the correct values	Transport Selector * Session selector * Presentation selector * *=As specified in ICD file
As7	1,2	What is the maximum and minimum MMS PDU size?	Max MMS PDU size 32717 Min MMS PDU size 400
As8	1,2	What is the maximum start up time after a power supply interrupt?	180 seconds

### 3.3: PIXIT for Server Model

ID	Ed.	Description	Value / Clarification
Sr1	1,2	Which analog value (MX) quality bits are supported (can be set by server)?	Validity: Y Good Y Invalid N Reserved N Questionable N Overflow N OutofRange N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Source: Y Process N Substituted N Test N OperatorBlocked
Sr2	1,2	Which status value (ST) quality bits are supported (can be set by server)?	Validity: Y Good Y Invalid N Reserved N Questionable N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Source: Y Process N Substituted N Test N OperatorBlocked
Sr3	–	What is the maximum number of data object references in one GetDataValues request?	Deprecated
Sr4	–	What is the maximum number of data object references in one SetDataValues request?	Deprecated
Sr5	1	Which Mode / Behavior values are supported?	Y On N [On-]Blocked N Test N Test/Blocked N Off

**NOTE:** MX measurements and ST values have differentiated update rates based upon their data type:

- Internal digital input - updated every 20 ms.
- All others - updated every s.

### 3.4: PIXIT for Data Set Model

ID	Ed.	Description	Value / Clarification
Ds1	1	What is the maximum number of data elements in one data set (compare ICD setting)?	256
Ds2	1	How many persistent data sets can be created by one or more clients (this number includes predefined datasets)?	32 (only through configuration file)
Ds3	1	How many non-persistent data sets can be created by one or more clients?	0

### 3.5: PIXIT for Reporting Model

ID	Ed. 1	Description	Value / Clarification
Rp1	1	The supported trigger conditions are (compare PICS)	Y integrity Y data change Y quality change N data update Y general interrogation
Rp2	1	The supported optional fields are	Y sequence-number Y report-time-stamp Y reason-for-inclusion Y data-set-name Y data-reference Y buffer-overflow Y entryID Y conf-rev Y segmentation
Rp3	1,2	Can the server send segmented reports?	Y
Rp4	1,2	Mechanism on second internal data change notification of the same analog data value within buffer period (Compare IEC 61850-7-2 14.2.2.9)	Send report immediately
Rp5	1	Multi client URCB approach (compare IEC 61850-7-2: 2003 14.2.1)	Each URCB is visible to all clients
Rp6	–	What is the format of EntryID?	Deprecated
Rp7	1,2	What is the buffer size for each BRCB or how many reports can be buffered?	30000 octets
Rp8	–	Pre-configured RCB attributes that cannot be changed online when RptEna = FALSE (see also the ICD report settings)	Deprecated
Rp9	1	May the reported data set contain: - structured data objects? - data attributes?	Y Y
Rp10	1,2	What is the scan cycle for binary events? Is this fixed, configurable?	1 second Fixed
Rp11	1	Does the device support pre-assigning an RCB to a specific client in the SCL?	N
RP12	2	After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart?	Restored from original configuration



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ID	Ed. 1	Description	Value / Clarification
RP13	1,2	Does the server accept any client to configure / enable a BRCB with ResvTms=-1? What fields are used to do the identification?	No.  No Addressing is checked, but once a client has reserved or enabled a BRCB with ResvTms=-1, that reservation is enforced until the association is terminated. This means that no other client can re-use the BRCB until the reserving client has disconnected.

### 3.6: PIXIT for GOOSE Publish Model

ID	Ed.	Description	Value / Clarification
Gp1	1,2	Can the test (Ed1) / simulation (Ed2) flag in the published GOOSE be set?	N
Gp2	1	What is the behavior when the GOOSE publish configuration is incorrect?	NdsCom=T DUT keeps GoEna=F
Gp3	1.2	Published FCD supported common data classes are	SPS, SPC, INS, INC, DPL, MV, WYE, DEL, BCR, ASG  BOOLEAN, INT8(ENUM), INT64, INT32U, FLOAT32  Timestamp, Quality Arrays are [not] supported
Gp4	1,2	What is the slow retransmission time? Is it fixed or configurable?	30000 ms Fixed
Gp5	1,2	What is the fastest retransmission time? Is it fixed or configurable?	At least 10 ms Fixed
Gp6	–	Can the GOOSE publish be turned on / off by using SetGoCBValues(GoEna)?	Deprecated
Gp7	1,2	What is the initial GOOSE sqNum after restart?	sqNum = 0
Gp8	1	May the GOOSE data set contain: - structured data objects (FCD)? - timestamp data attributes?	Y Y

### 3.7: PIXIT for GOOSE Subscribe Model

ID	Ed.	Description	Value / Clarification
Gs1	1,2	What elements of a subscribed GOOSE header are checked to decide the message is valid and the allData values are accepted? If yes, describe the conditions. Notes: - The VLAN tag may be removed by an Ethernet switch and should not be checked - The simulation flag shall always be checked (Ed2) - The ndsCom shall always be checked (Ed, 2)	N destination MAC address Y APPID Y gocbRef N timeAllowedtoLive N datSet Y goID N t N stNum N sqNum Y simulation/test N confRev Y ndsCom N numDatSetEntries
Gs2	1.2	When is a subscribed GOOSE marked as lost?	Message does not arrive prior to TAL (TAL = time allowed to live value from the last received GOOSE message).
Gs3	1,2	What is the behavior when one or more subscribed GOOSE messages aren't received or are syntactically incorrect (missing GOOSE)	Data is marked invalid.
Gs4	1,2	What is the behavior when a subscribed GOOSE message is out-of-order	No special action is taken.
Gs5	1,2	What is the behavior when a subscribed GOOSE message is duplicated	No special action is taken.
Gs6	1	Does the device subscribe to GOOSE messages with/without the VLAN tag?	Y, with the VLAN tag. Y, without the VLAN tag.
Gs7	1	May the GOOSE data set contain: - structured data objects (FCD)? - timestamp data attributes?	Y N
Gs8	1,2	Subscribed FCD supported common data classes are:	SPS  BOOLEAN, INT32U, FLOAT32  Arrays are [not] supported
Gs9	1,2	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/simulation mode?	N

### 3.8: PIXIT for GOOSE Performance

ID	Ed.	Description	Value / Clarification	
Gf1	1,2	Performance Class	P1	
Gf2	1.2	GOOSE ping-pong processing method	Scan cycle based	
Gf3	1,2	Application logic scan cycle (ms)	Max Min	1s 1s
Gf4	1	Maximum number of data attributes in GOOSE dataset (value and quality have to be counted as separate attributes)	256	

### 3.9: PIXIT for Time Synchronization Model

ID	Ed.	Description	Value / Clarification
Tm1	1,2	What time quality bits are supported (may be set by the IED)?	Y LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized
Tm2	1,2	Describe the behavior when the time server(s) ceases to respond  What is the time server lost detection time	When any time synch is lost, the IEC 61850 time-stamp sets "clock not synchronized" to 1 and "Time accuracy" to 7 IRIG 1 s SNTP programmable (synch rate and synch process) s
Tm3	1,2	How long does it take to take over the new time from time server	IRIG-B 3 s SNTP 3 s
Tm4	1,2	When is the time quality bit "ClockFailure" set?	Set if the meter UTC time is before 1-1-1970, with or without any external time synchronization
Tm5	1,2	When is the time quality bit "Clock not synchronized" set?	When connection to all time servers is lost (see PIXIT Tm2)
Tm6	–	Is the timestamp of a binary event adjusted to the configured scan cycle?	Deprecated
Tm7	1	Does the device support time zone and day-light saving?	Y
Tm8	1,2	Which attributes of the SNTP response packet are validated?	N Leap indicator not equal to 3? Y Mode is equal to SERVER N OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp N RX/TX timestamp fields are checked for reasonableness Y SNTP version 3 Y Other (describe) Stratum >0 and Stratum <14
Tm9	1,2	Do the COMTRADE files have local time or UTC time?	No COMTRADE files available

### 3.8: PIXIT for File Transfer Model

ID	Ed.3	Description	Value / Clarification
Ft1	1	What is structure of files and directories?  Where are the COMTRADE files stored? Are COMTRADE files zipped and what files are included in each zip file?	Flat file system with pseudo folders (Ed. 2) No comtrade files available  Not zipped
Ft2	1,2	Directory names are separated from the file name by	"/" or "\"
Ft3	1	The maximum file name size including path (recommended 64 chars)	1024 chars
Ft4	1,2	Are directory/file name case sensitive?	Case sensitive
Ft5	1.2	Maximum file size for SetFile	No file can be written
Ft6	1	Is the requested file path included in the MMS fileDirectory respond file name?	Y (Ed. 2: always complete path)
Ft7	1	Is the wild char supported MMS fileDirectory request?	N
Ft8	1,2	Is it allowed that 2 clients get a file at the same time?	Y same file Y different files
Ft9	1,2	Which files can be deleted?	None

### 3.9: PIXIT Models Not Supported

The following models are not supported for the Nexus® 1450 meter's IEC 61850 interface:

- Substitution model
- Setting group control model
- Setting group model
- Logging model
- Control model
- Service tracking model

## 4: TISSUES (Technical Issues) Implementation Conformance Statement (TICS)

According to the UCA IUG QAP the TICS is required to perform a conformance test and is referenced on the certificate.

### 4.1: Mandatory IntOp TISSUES

The Table below shows mandatory IntOp TISSUES that are implemented in the Nexus® 1450 meter with firmware version 4.00 or higher.

<b>Part 6 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
658	Tracking related features <i>EntryID and CST missing, these are checked by schema</i>	Y
663	FCDA element cannot be a "functionally constrained logical node" <i>doName now mandatory in FCDA element, SCT: refuse to make empty doName? ICT: Refuse SCD</i>	Y
668	Autotransformer modeling <i>Autotransformer model in substation section has changed</i>	Y
687	SGCB ResvTms <i>SettingControl has added attribute resvTms see also TISSUE 845</i>	Y
719	ConfDataSet - maxAttributes definition is confusing <i>maxAttributes now means max count of FCDA in dataset</i>	Y
721	Log element name <i>LN0/Log now has optional attribute "name"</i>	Y
768	bType VisString65 is missing <i>VisString65 added as SCL BasicType</i>	Y
779	object references <i>"@" as first character in object references now allowed</i>	Y
788	SICS S56 from optional to mandatory <i>SICS S56="Interpret IED capabilities and prohibit unsupported usage"</i>	Y
789	ConfLdName as services applies to both server and client <i>Many changes made to Services section</i>	Y

804	valKind and IED versus System configuration <i>valImport missing/false DAI means ICT shall ignore value in SCD and SCT shall not change from ICD/IID value. Instance section inherits from DA/BDA element.</i>	Y
806	Max length of log name inconsistent between -6 and -7-2 <i>LogControl.logName and Log.name restricted to 32 chars</i>	Y
807	Need a way to indicate if "Owner" present in RCB <i>Services/ReportSettings@owner added</i>	Y
823	ValKind for structured data attributes <i>valKind is prohibited on structured attributes</i>	Y
824	Short addresses on structured data attributes <i>sAddr is now allowed for structured attributes</i>	Y
825	Floating point value <i>Server shall support &lt;Val&gt; with exponential notation</i>	Y
845	SGCB ResvTms <i>Services/SettingGroups/SGEdit added attribute resvTms Services/SettingGroups/ConfSG added attribute resvTms See also TISSUE 687</i>	Y
853	SBO and ProtNs <i>DA[@name=SBO] element shall have ProtNS element</i>	Y
855	Recursive SubFunction <i>Substation section extension must be tolerated</i>	Y
856	VoltageLevel frequency and phases <i>Substation section extension must be tolerated</i>	Y
857	Function/SubFunction for ConductingEquipment <i>Substation section extension must be tolerated</i>	Y
886	Missing 8-1 P-types <i>"tP_IP_UDP_PORT" and "tP_IP_TCP_PORT" added</i>	Y
901	tServices as AP or as IED element <i>Rules for contents of AP/Server/Services are now defined</i>	Y
936	SupSubscription parameter usage is difficult <i>SupSubscription "max" replaced by "maxGo" and "maxSv"</i>	Y
1147	tServices - FileHandling not consistent with -7-2 <i>Services/FileHandling now means only support for GetFile and GetFileAttributeValues and NOT SetFile/DeleteFile</i>	Y
1185	Valkind value Conf for EX FC data <i>valKind=Conf is allowed for dataNs</i>	Y
1284	SCSM mapping may require a communication section in an ICD file <i>Server IEDs supporting client/server associations to 61850-8-1 shall include a &lt;Communication&gt; section</i>	Y



1328	Limitation on the size of data type templates identifiers <i>Identifer now limited to 255 characters</i>	Y
1395	Client LN attributes <i>ReportControl/RptEnabled/ClientLN@IdInst shall be "LD0" for pure clients (without any Logical Devices)</i>	Y
1419	Support of IdName on other IEDs <i>SICS I212 is now mandatory</i>	Y
1444	Need to support fixed and SCT controlled Datasets <i>Services/xxxSetttings@datSet=fix now means "data set pointed by Control Block cannot be altered from ICD/IID value &lt;&lt;applicable for SCL tool test&gt;&gt;</i>	Y
1445	ConfReportControl and a fixed ReportSettings <i>Control block capabilities must be consistent &lt;&lt;applicable for SCL tool test&gt;&gt;</i>	Y
1450	originalSclXxx computation rules <i>Ed2 ICD/IID files specifying SCL@version=2007 SHALL include originalSCLVersion=2007 and originalSCLRevision as attributes of the &lt;IED&gt;element</i>	Y
1485	Need to supercede Tissue 1398 to clarify SCT behavior <i>Same as TISSUE 1450 &lt;&lt;applicable for SCL tool test&gt;&gt;</i>	Y

<b>Part 7-1 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
828	Data model namespace revision IEC 61850-7-4:2007[A] <i>Both 2007 and 2007A are allowed for namespace name</i>	Y
948	Enumeration (string) values format <i>Enums are limited to 127 characters from Basic-Latin and Latin-1 character sets</i>	Y
1151	simulated GOOSE disappears after 1st appearance when LPHD.Sim = TRUE <i>New LGOS state machine defined, but TISSUE is not IntOp2, therefore TISSUE is optional if LGOS is used</i>	Y
1396	The use and configuration flow of LGOS and LSVS is unclear <i>If Services/SupSubscription@maxGo &gt; 1 then at least 1 LGOS must exist. Same for maxSv/LSVS. If maxGo &gt; count(LGOS) then SCT can create additional LGOS. Same for maxSv/LSVS</i>	Y
1447	Restriction on ENUMtypes in SCL <i>If a ENUM DA limits write or configuration to a subset, then that subset must be declared</i>	Y
1457	Multiple DOI nodes with the same name <i>LN can have no more than one DOI with same name</i>	Y

1468	Re-use DO from other LN <i>allow standard or private dataNs</i>	Y
1491	CmdBlk blocks itself? <i>The data CmdBlk shall have no effect on the controllable data Mod or CmdBlk</i>	Y
1495	GetVariableAccessAttributes error code <i>Return MMS error access/object-non-existent if the object does not exist</i>	Y

<b>Part 7-2 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
728	BRCB: could PurgeBuf be set when RptEna=TRUE? <i>PurgeBuf while RptEna=true is prohibited</i>	Y
778	AddCause values – add value not-supported <i>Align 7-2 with 8-1 (nothing new to 8-1)</i>	Y
780	What are unsupported trigger option at a control block? <i>All control blocks must support all trigger options</i>	Y
783	TimOper Resp- ; add Authorization check <i>Clarifies Time-Operated Controls</i>	Y
786	AddCause values 26 and 27 are switched <i>Annex B.2 has wrong AddCause values</i>	Y
820	Mandatory ACSI services (use for PICS template) <i>Model entries M18 (Application Association), M19 (GCB), M20 (SVCB) are new. Services S17 (Substitution) and S61 (Get-ServerDirectory) are new. Services S1, S3, S4, S5, S6, S8, S16, S18, S23, S36, S37, S41, S42 are changed.</i>	Y
858	typo in enumeration ServiceType <i>Tracking serviceType now has GetLogicalNodeDirectory</i>	Y
861	dchg of ConfRev attribute <i>Clarifies (tracking) BTS.confRev is AFTER BRCB change</i>	Y
1050	GTS Phycomaddr definition in SCL <i>(Tracking) GTS needs a special structure for SCL</i>	Y
1071	Length of DO name <i>Private DO name length shall be &lt;=12 including instance</i>	Y
1127	Missing owner attribute in BTS and UTS <i>NSD files for 61850-7-3 show owner in (tracking) BTS/UTS</i>	Y
1202	GI not optional <i>GI support is mandatory for both URCB and BRCB</i>	Y

1232	EntryID needs clarification <i>Segments of a report shall have same identifiers</i>	Y
1242	NTS definition <i>NTS.resv have been added</i>	Y
1307	Segmented report with Buffer overflow <i>Segments of a report shall have identical buf-overflow value</i>	Y
1428	MTS and NTS should use svOptFlds <i>MTS.optFlds and NTS.optFlds now have bType=SvOptFlds</i>	Y
1630	Attributes in CDC=LTS do not match 8-1 definition <i>Order of attributes in LTS changed to: logEna, logRef, datSet, oldEntrTm, newEntrTm, oldEnt, newEnt, trgOps, intgPd</i>	Y

<b>Part 7-3 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
697	persistent command / PulseConfig <i>PulseConfig adds enum "persistent-feedback" DPC.cmdQual=="persistent" is conditionally allowed</i>	Y
698	Wrong case is BAC.db attribute <i>attribute renamed from "dB" to "db"</i>	Y
711	blkEna freeze data update while setting its quality to operatorBlocked <i>Mode=Blocked shall not cause q.operatorBlocked</i>	Y
722	Units for 'h' and 'min' not in UnitKind enumeration. <i>New unit enums 84=hours, 85=minutes</i>	Y
919	Presence Condition for svc <i>svc may be valKind=Conf in ICD file</i>	Y
925	Presence of i or f attribute - Problem with writing <i>New constructed attribute class "AnalogueValueCtl"</i>	Y
926	Presence Conditions within RangeConfig <i>All or none of hhLim+hLim+lLim+lLim shall be present</i>	Y
954	Data attributes with FC=CF should have trgOp=dchg <i>Some INS and HST and CSG attributes missing dchg</i>	Y
1078	CMV.t update if rangeAng changed <i>Add rangeAng to "reasons-to-update-timestamp-of-CMV"</i>	Y
1565	db = 0 behaviour <i>db=0 not longer suppresses reporting</i>	Y
1578	dataAttribute NameSpace content <i>Attributes with FC=EX must be initialized in ICD/IID file</i>	Y

<b>Part 7-4 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
671	mistake in definition of Mod & Beh <i>Beh=on,q=test should be "Processed as valid"</i>	Y
674	CDC of ZRRC.LocSta is wrong <i>ZRRC LocSta should be CDC=SPC</i>	Y
676	Same data object name used with different CDC <i>LCCH.Fer renamed to FerCh, LCCH.RedFer to RedFerCh</i>	Y
677	MotStr is used with different CDC in PMMS and SOPM LN classes <i>Rename SOPM.MotStr to MotStrNum</i>	Y
679	Remove CycTrMod Enum <i>Enum is no longer used, use TrMod instead</i>	Y
680	SI unit for MHYD.Cndct <i>Change unit from S/cm<sup>2</sup> to S/m</i>	Y
681	Enum PIDAlg <i>Typographical error, invalid XML syntax</i>	Y
682	ANCR.ParColMod <i>ParColMod enum values text have changed</i>	Y
683	Enum QVVR.IntrDetMth <i>IntrDetMth enum values text have changed</i>	Y
685	Enum ParTraMod <i>ParTraMod enum values text have changed</i>	Y
686	New annex H - enums types in XML <i>Many changes have been made to enumeration names</i>	Y
694	Data object CmdBlk <i>CmdBlk semantics have changed</i>	Y
696	LSVS.St (Status of subscription) <i>LSVS.St is now mandatory</i>	Y
712	interpretation of quality operatorBlocked <i>Mode and Behavior semantics have changed</i>	Y
713	DO Naming of time constants in FFIL <i>Many DO names in FFIL have changed</i>	Y
714	Enums for ShOpCap and SwOpCap <i>Type for YPSH.ShOpCap and XSWI.SwOpCap have changed</i>	Y
715	RBDR.ChNum1 <i>RBDR.ChNum1 changes from optional to conditional</i>	Y

716	TAXD text for condition <i>TAXD.SmRte condition for inclusion has changed</i>	Y
724	ANCR.Auto <i>ANCR.Auto changes from mandatory to optional</i>	Y
725	Loc in LN A-group <i>Loc changes to optional, LockKey/LocSta conditions change</i>	Y
734	LLN0.OpTmh vs. LPHD.OpTmh <i>LLN0.OpTmh deleted, LPHD.OpTmH added as conditional</i>	Y
736	PFSign <i>MMXU.PFSign enum is extended with 3=Excitation</i>	Y
742	GAPC.Str, GAPC.Op and GAPC.StrVal <i>Objects have instance indicator removed (ex, Str1 to Str)</i>	Y
743	CCGR.PmpCtl and CCGR.FanCtl <i>Object have instance indicator added (ex:PmpCtl to PmpCtl1)</i>	Y
744	LN STMP, EEHealth and EENAME <i>Removed STMP.EEHealth and STMP.EENAME</i>	Y
772	LPHD.PwrUp/PwrDn should be transient <i>These objects are now transient</i>	Y
773	Loc, LockKey and LocSta YPSH and YLTC <i>Add Loc, LockKey and LocSta in YLTC and YPSH (optional)</i>	Y
774	ITCI.LockKey <i>Add ITCI.LockKey as optional</i>	Y
776	LPHD.OutOv/InOv and LCCH.OutOv/InOv <i>Clarified: stays true until buffer space again available</i>	Y
800	Misspelling in CSYN <i>CSYN.VInvTmms renamed to CSYN.VIntvTmms</i>	Y
802	CCGR and Harmonized control authority <i>Add Loc, LockSta to every controllable LN (e.g.FSPT)</i>	Y
808	Presence condition of ZMoT.DExt and new DOs <i>Change ZMOT.DExt to optional; add TotThmSt and MotSt</i>	Y
831	Setting of ConfRevNum in LGOS <i>Add RxConfRevNum to LGOS and LSVS</i>	Y
838	Testing in Beh=Blocked <i>Change sematic of Beh=Blocked to allow controls to be acknowledged even when LN is blocked.</i>	Y

844	MFLK.PhPiMax, MFLK.PhPiLoFil, MFLK.PhPiRoot DEL->WYE <i>Change these NFLK objects from cdc=DEL to cdc=WYE</i>	Y
877	QVUB -settings should be optional <i>Change QVUB.UnbDetMth and QVUB.StrVal to optional</i>	Y
908	ARIS.StrSeq – transient <i>Change ARIS.StrSeq to transient</i>	Y
909	Remove ANCR.ColOpR and ColOpL <i>Replace ANCR.ColOpR and ANCR.ColOpL with ANCR.Col-Chg. Add YEFN.ColChg</i>	Y
912	Clarification of PwrRtg/VARTg <i>Change many DOs in YPTR, and ZGEN</i>	Y
920	Resetable Counter is NOT resetable <i>Change GGIO.CntRs to CntVal; Same for FCNT</i>	Y
932	Rename AVCO.SptVol to AVCO.VolSpt	Y
933	Presence of LCCH.RedFerCh and RedRxCnt <i>Change the presence condition of LCCH.RedChLiv</i>	Y
939	Change CDC for ANCR.FixCol <i>Change ANCR.FixCol from APC to ASG</i>	Y
991	LGOS: GoCBRef (as well as LSVS.SvCBRef) should be mandatory <i>LGOS.GoCBRef and LSVS.SvCBRef are now both mandatory</i>	Y
1007	PTRC as fault indicator - Update of description required <i>PTRC.Tr and Op and Str conditional (at least 1 of group)</i>	Y
1044	TapChg in AVCO <i>AVCO.TapChg is now optional</i>	Y
1077	Rename DOnames within LTIM <i>LTIM.TmChgDayTm, changed to TmChgDay ; LTIM.TmChgStdTm changed to TmChgStd</i>	Y
1256	New DO for LTIM to set time "manually" <i>Add LTIM.TmSet</i>	Y
1331	Mod, Beh and Health with q=TEST, client can't receive their states <i>Mod while in Blocked will always be processed</i>	Y
1426	Add two DO for leap seconds in LTIM <i>LTIM.Leap added,</i>	Y
1456	Annex A and Mod/Beh/Health <i>Mod.stVal writes always ignore test bits in controls</i>	Y
1568	ISAF.AlmReset ->transient <i>Change ISAF.AmIReset to transient</i>	Y

<b>Part 8-1 Tissue</b>	<b>Description</b>	<b>Implemented Y/na</b>
770	GoID type mismatch 18.1.1 and 18.1.2.5.2 <i>GoID string length is now 129</i>	Y
784	Tracking of control (CTS) <i>Tracking CTS has been added</i>	Y
817	Fixed-length GOOSE float encoding <i>GOOSE float is encoded Tag-0x87, length=5, first octet=8</i>	Y
827	Mandatory ACSI services (Part of 7-2 TISSUE resolution) <i>Change Table 111 (ServicesSupported): Add initiate, abort, and release. Change conditions for defineNamed-Variables.</i>	Y
834	File dir name length 64 <i>Filename length changed from 32 to 64</i>	Y
951	Encoding of Owner attribute <i>xRCB.owner is encoded as 4 octets(IPv4) or 16 octets(IPv6)</i>	Y
1040	More associate error codes <i>3 additional associate error codes added</i>	Y
1178	Select Response+ is non-null value <i>Response to SBO read should be &lt;CO_CtrlObjectRef&gt;</i>	Y
1324	The response- for DeleteNamedVariableList is not defined <i>numDeleted=0; error=service/object-constraint-conflict</i>	Y
1345	Fixed-length GOOSE ASN.1 length encoding <i>GOOSE publisher shall always encode minimum size legth field</i>	Y
1441	Optional fields in buffered reports <i>Writing BRCB.optFld shall not cause a purgeBuf operation</i>	Y
1442	Journal variableTag for ReasonCode <i>Example in the standard isincorrect</i>	Y
1453	Purge buffer on write to BRCB <i>PurgeBuf only occurs if different value is written</i>	Y
1454	Reports can be transmitted before write(RptEna=true) is confirmed	Y

1500	the response for DeleteNamedVariableList with a non-existent LN is not specified <i>CreateDataSet/DefineNamedVariableList specifying a non-existing LD/LN shall fail with access/object-non-existent</i>	Y
------	---	---

**Note:** Tissues 675, 735, 772, 775, 776, 878 are not relevant for conformance testing.

See the TISSUE database for more details: [www.tissues.iec61850.com](http://www.tissues.iec61850.com).



## 5: Logical Nodes

This chapter provides a list of the logical nodes supported by the Nexus® 1450 meter's IEC 61850 implementation and related information on them.

### 5.1: Available Logical Nodes

Name	Group	Class	Description
LLN0	L (system local)	LLN0	Logical node zero
LPHD1	L (system local)	LPHD	Physical device information
nsMMXU1	M (Metering & Measurement)	MMXU	Analog Measurements
hsMFLK	M (Measurement)	MFLK	Flicker
IsMHAI1	M (Measurement)	MHAI	Harmonic/THDs
IsMSQI1	M (Measurement)	MSQI	Sequence and imbalance
eneMMTR1	M (Measurement)	MMTR	Energy counters
gimGGIO1	G (Generic IO reference)	GGIO	Goose Input for data from subscribed publishers
alarmGGIO1	G (Generic IO reference)	GGIO	Limit Alarms
intdiGGIO1	G (Generic IO reference)	GGIO	Built-in Digital Inputs
extdiGGIO1	G (Generic IO reference)	GGIO	Digital Inputs Module 1
extdiGGIO2	G (Generic IO reference)	GGIO	Digital Inputs Module 2
extdiGGIO3	G (Generic IO reference)	GGIO	Digital Inputs Module 3
extdiGGIO4	G (Generic IO reference)	GGIO	Digital Inputs Module 4
ctrtnTCTR1	T (Transformer)	TCTR	Current transformer ratio phase A
ctrtnTCTR2	T (Transformer)	TCTR	Current transformer ratio phase B
ctrtnTCTR3	T (Transformer)	TCTR	Current transformer ratio phase C
ctrtnTCTR4	T (Transformer)	TCTR	Current transformer ratio phase Neutral
ptrtanTVTR1	T (Transformer)	TVTR	Voltage transformer ratio phase A
ptrbnTVTR2	T (Transformer)	TVTR	Voltage transformer ratio phase B
ptrcnTVTR3	T (Transformer)	TVTR	Voltage transformer ratio phase C
ptrtaxTVTR4	T (Transformer)	TVTR	Voltage transformer ratio phase AUX

## 5.2: Additional Information for the Logical Nodes

The table below lists the logical nodes with the CommunicatorPQA® application's polling screen or Device Profile setting that is supplying that data to the IEC 61850 system. Where applicable, it also contains explanatory details regarding the data.

Index	IEC61850 Node	CommunicatorPQA® Data Origin	Notes
1	alarmGGIO1, ST	Alarm/Limit Status polling	Mapped to meter's alarm/limit channels 1-32.  Default IEC 61850 alarm configuration in Nexus® 1500+/1450 for each channel; is monitoring ANY of the limit status from meter's Limit 1, Limit2 and Limit 3.
2	ctrtnTCTR1, SP	Meter device profile, CT ratio, Ia	
3	ctrtnTCTR2, SP	Meter device profile, CT ratio, Ib	
4	ctrtnTCTR3, SP	Meter device profile, CT ratio, Ic	
5	ctrtnTCTR4, SP	Meter device profile, CT ratio, In	
6	eneMMTR1, ST	Energy, primary values polling	Fixed rollover value is applied to primary energy values, at $10^{15}$ , which is the max range for meter scaled energy 999,999,999M, or 999,999,999,000,000.
7	extdiGGIO1, ST	External digital inputs, Module 1, States polling	0=shorted, 1=open
8	extdiGGIO2, ST	External digital inputs, Module 2, States polling	0=shorted, 1=open
9	extdiGGIO3, ST	External digital inputs, Module 3, States polling	0=shorted, 1=open
10	extdiGGIO4, ST	External digital inputs, Module 4, States polling	0=shorted, 1=open

11	gimGGIO1, MX and ST	n/a	<p>For GOOSE inputs, monitor values from a device with GOOSE subscriber configured in association with other devices' GOOSE publisher configuration.</p> <p>Data is mapped into two categories and four data type groups:  <b>ST</b> category (status values, such as digital input states): <b>Boolean</b> type (Ind index 1-16) and <b>SPS</b> type (Ind index 17-32).  <b>MX</b> category (measured analog values, such as Van, Ia or Frequency values) <b>Integer</b> type (AnIn index 1-16) and <b>Float</b> type (AnIn index 17-32).</p>
12	hsMFLK1, MX	Flicker, PST, and PLT polling	
13	intdiGGIO1, ST	Internal digital inputs, States polling	0=shorted, 1=open
14	IsMHAI1, MX	3 Seconds Updated Harmonics polling	
15	IsMSQI1, MX	<p>Voltage &amp; Current Unbalance polling</p> <p>Values not shown in software:  -3 sec Symm Comp Ratio (Current PN) - Zero Sequence  -3 sec Symm Comp Ratio (Current PN) - Neg Sequence  -3 sec Symm Comp Ratio (Voltage PN) - Zero Sequence  -3 sec Symm Comp Ratio (Voltage PN) - Neg Sequence</p>	<p>*IEC 61850 data quality flag will show as invalid when meter hookup is not WYE or 2.5 Element WYE.</p> <p>Current data c1/c2/c3 corresponding to Positive, Negative, Zero sequences; with magnitudes and angles.</p> <p>Volt data c1/c2/c3 corresponding to Positive, Negative, Zero sequences; with magnitudes and angles.</p>
16	nsMMXU1, MX	Instantaneous polling, Meter one second updated values	
17	ptrtanTVTR1, SP	Meter device profile, PT ratio, Va	
18	ptrtanTVTR2, SP	Meter device profile, PT ratio, Vb	
19	ptrtanTVTR3, SP	Meter device profile, PT ratio, Vc	

20	ptrtanTVTR4, SP	Meter device profile, PT ratio, Vaux	
21	LPHD1, DC	Device status polling	Vendor Firmware version Meter model Meter serial number

### 5.3: Standard Server Features

This section lists information on the IEC 61850 server implementation.

#### Data Set 1: Voltages

Name LLN0\$ANABASIC  
 Type Variable List  
 Path IEC61850SRVMeas/LLN0\$ANABASIC

#### Readings: P-N voltages

Name IEC61850SRVMeas/nsMMXU1\$MX\$PhV\$phsA  
 Name IEC61850SRVMeas/nsMMXU1\$MX\$PhV\$phsB  
 Name IEC61850SRVMeas/nsMMXU1\$MX\$PhV\$phsC

#### Data Set 2: Digital Inputs

Name LLN0\$DIBASIC  
 Type Variable List  
 Path IEC61850SRVMeas/LLN0\$DIBASIC

#### Readings: Digital input status on channels 1-3

Name IEC61850SRVMeas/intdiGGIO1\$ST\$Ind1  
 Name IEC61850SRVMeas/intdiGGIO1\$ST\$Ind2  
 Name IEC61850SRVMeas/intdiGGIO1\$ST\$Ind3

GOOSE Publisher

Name	gocbpub
Type	
Path	IEC61850SRVMeas/LLN0\$GO\$gocbpub
GoID	GoosePub
DatSet	IEC61850SRVMeas/LLN0\$GoosePub

Readings: Device name plate text

Name	IEC61850SRVMeas/LLN0\$DC\$NamPlt
------	----------------------------------

Unbuffered Report

Name	urcbANABASIC01
Type	Information Report
Path	IEC61850SRVMeas/LLN0\$RP\$urcbANABASIC01
RptID	uANABASIC
DatSet	IEC61850SRVMeas/LLN0\$ANABASIC (Data Set 1: Voltages)

Buffered Report

Name	brcbDIBASIC01
Type	Information Report
Path	IEC61850SRVMeas/LLN0\$BR\$brcbDIBASIC01
RptID	bDIBASIC
DatSet	IEC61850SRVMeas/LLN0\$DIBASIC (Data Set 2: Digital Inputs)

### File Access

Upon startup, a copy of current meter's IEC61850 configuration file and factory set template files will be placed in the meter's IEC61850 root directory. The files are meter.cid, iedsrv.ICD, and iedsrv.CID.

The user can retrieve the files from the meter's IEC61850 server, but can't modify or delete any files.

The files can be downloaded and uploaded from the meter's IEC 61850 WebView™ Energy Dashboard. See the *Nexus® 1450 Meter Installation and Operation Guide* for instructions. Download the manual from the 1450 meter webpage:

<https://www.electroind.com/products/nexus-1450-energy-panel-meter-with-advanced-power-quality/>.

Click Tech Documents>User Manual to download the user manual.

## **5.4: GOOSE Subscriber**

In the Nexus® 1450 meter's IEC 61850 implementation, there are a total of 64 mapped readings for GOOSE subscriber inputs, in two categories and four data type groups.

- Analog readings, in IEC61850SRVMeas/gimGGIO1\$MX
  - Integer type, index 1-16
  - Floating point type, index 17-32
- Digital readings, in IEC61850SRVMeas/gimGGIO1\$ST
  - Boolean type, index 1-16
  - SPS type, index 17-32

## 6: Programming Information

This chapter contains some information and examples for programming and alarms and deadbands for the meter's IEC 61850 CID file.

### 6.1: Alarm Setting Example

Following is an example of setting alarm types in the meter's IEC 61850 configuration file:

First alarm data status, where settings are in 'sAddr' attribute:

```
<LN prefix="alarm" InClass="GGIO" inst="1" InType="NX1450_GGIO_ALARM"
desc="Limit Alarms">

  <DOI name="Alm1">

    <DAI name="stVal" sAddr="R192A0V3T143"/>

    <DAI name="q" sAddr="Q143V1T143"/>

    <DAI name="t" sAddr="T143"/>

    <DAI name="d" valKind="RO"><Val>Alarm chn #01</Val></DAI>

  </DOI>
```

In the above code, in sAddr="R192A0V3T143", the letter 'V' is for the alarm type setting that follows:

- V0=Limit 1.
- V1=Limit 2.
- V2=Limit 3.
- V3=ANY of the limit statuses - limit 1, limit 2, or limit 3.

## 6.2: Deadband Setting

The deadband setting is defined as 1/1000 of 1%. It is set in the IEC 61850 configuration file for an analog value where the attribute value is "db."

- Setting of 100000=100%, deadband detection is disabled.
- Setting of 1000=1%
- Setting of 1=0.001%

In the meter's factory-set, default IEC 61850 configuration file, all deadband values are set to 100000, which is equivalent to 100%, meaning deadband detection is disabled.

### 6.2.1: Example

Following is a deadband example for Voltage phase AN, setting at 5%.

```
<DOI name="PhV">
  <SDI name="phsA">
    .....
    <DAI name="db" valKind="RO" sAddr="DS1" >
      <Val>5000</Val>
    </DAI>
```



## 6.2.2: Deadband Detection

Deadband detection is enabled when the deadband setting is less than 100% (<10000) but not equal to 0.

Deadband computation also involves the use of the data's max and min settings. Below are the max and min settings used in the Nexus® 1450 meter.

Type	Max	Min
Iaux	21 x CT Iaux ratio	0
Ia,b,c	21 x CT Ia,b,c ratio	0
Vpn, Vpp	720 x PT Va,b,c ratio	0
Power, VA pp, total	32768 x PT Va,b,c ratio x CT Ia,b,c ratio	-32768 x PT Va,b,c ratio x CT Ia,b,c ratio
Frequency (50/60 Hz system)	69	45
Frequency (Wide Band system)	500	20
Power Factor	1	-1
Percentages	100	0
Flicker	100	0
Phase angle	180	-180

These are the deadband computation steps:

Step 1:)

$$\frac{(\max - \min) * \text{db\_setting}}{100000} = \text{db\_value}$$

Step 2):

$$\text{current\_read\_value} - \text{previous\_read\_value} = \text{diff\_value}$$

Step 3:)

Make value positive:

$$\text{if diff\_value} < 0, \text{ then diff\_value} * -1$$

Step 4):

if (diff\_value < db\_value) OR if (diff\_vlaue = 0), then no deadband is detected. Otherwise, deadband is detected.

## 7: Links to Supporting Files

### 7.1: IEC 61850 Files

All of the IEC 61850 files for the meter can be downloaded from either the meter's webpage or from EIG's website.

- From the meter's website:
  - a. In your browser, enter the url `http://meter's IP address` to access the meter's webpage.
  - b. From the left side of the screen, click IEC 61850.

IEC61850

Status

IEC61850	Goose
enabled	enabled

Configuration

	MAC	IP address	TCP port	Goose MAC
Meter	00:01:58:00:C6:6A	172.20.167.47	102	00:01:58:00:C6:6A
CID file	00-00-00-00-00-00	172.20.167.47	102	01-0C-CD-99-00-99
Status		match		mismatch

Download SCL

Download ICD Template

Download CID Template

Upload the SCL (\*.cid) file:

Choose File | No file chosen

Upload IEC61850 SCL File

Upload Status

- c. From this webpage, you can download the SCL (CID) file from the meter and upload it to the meter once you have edited it. You can also download ICD or CID file templates.
- d. See Appendix C in the *Nexus® 1450 Meter User Manual* for more information on using this webpage. Download the manual from the 1450 meter webpage: <https://www.electroind.com/products/nexus-1450-energy-panel-meter-with->

[advanced-power-quality/](#). Click Tech Documents>Tech User Manual to download the user manual.

- From EIG’s website:
  - a. You can download the CID and ICD template files from the Nexus® 1450 meter’s webpage, as well as the IEC 61850 MICS file. Access this link in your browser: <https://www.electroind.com/products/nexus-1450-energy-panel-meter-with-advanced-power-quality/>.
  - b. From the webpage, click Tech Documents>User Manual and then the name of the file you want to download, e.g., IEC 68150 MICS file.

## 7.2: Link to SCD to CID Converter

You can access a free SCD to CID converter tool through the Internet. Follow these steps:

1. Go to the website <http://www.ucaiug.org>.

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---	--	--	--	--	---	---

**Welcome to UCA International Users Group!**

**UCA International Users Group** is a not-for-profit corporation focused on assisting users and vendors in the deployment of standards for real-time applications for several industries with related requirements. The Users Group does not write standards, however works closely with those bodies that have primary responsibility for the completion of standards (notably IEC TC 57: Power Systems Management and Associated Information Exchange).

The UCAIug as well as its member groups (CIMug, Open Smart Grid, and IEC61850) draws its membership from utility user and supplier companies. The mission of the UCA International Users Group is to enable integration through the deployment of open standards by providing a forum in which the various stakeholders in the energy and utility industry can work cooperatively together as members of a common organization to:

- Influence, select, and/or endorse open and public standards appropriate to the energy and utility market based upon the needs of the membership.
- Specify, develop and/or accredit product/system-testing programs that facilitate the field interoperability of products and systems based upon these standards.
- Implement educational and promotional activities that increase awareness and deployment of these standards in the energy and utility industry.
- Influence and promote the adoption of standards and technologies specific to the ever-increasing Smart Grid initiatives worldwide.

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2. If this is your first time logging in, follow the steps below; otherwise, proceed to step 3.

- a. Fill in the information needed to create an account in the Register for an Account section in the right bottom side of the webpage.

**NOTE:** The password you enter must be at least six characters in length.

If your company is listed as a [corporate member](#) of UCAIug and you register for a new account using **your company email address**, you will be assigned the privileges of your company's membership. If you use any other email address, you will be granted a UCAIug Guest account.

First Name:

Middle Name:

Last Name:

Password:

Confirm Password:

Email:

Company:

Address 1:

Address 2:

City:

State:

Zip Code:

Country:

Fax:

Phone:

Industry:

Interest Areas:

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- CIM
- IEC61850
- OpenDR
- OpenAMI
- Testing
- UtilityAMI
- AMI - SEC
- AMI - Enterprise
- fredsfriends
- TOC

Group Email:

Company Size:

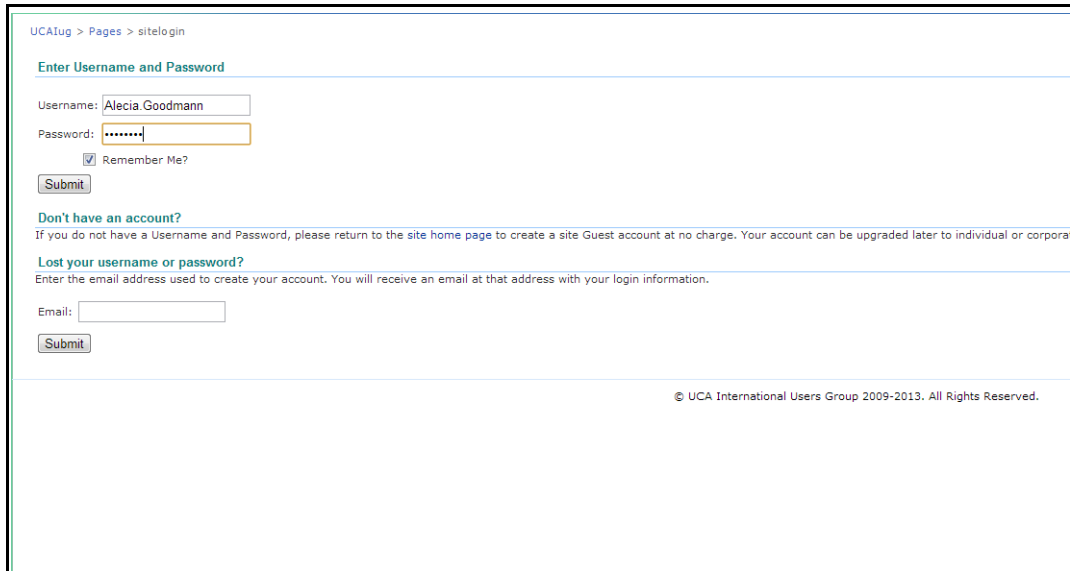
Order Confirmation Number:

I agree to this site's Intellectual Property Rights (IPR) Policy. [Click here](#) to read more about the IPR Policy.

- b. Click Submit. Once the information is processed the webpage shows the message User Successfully Created above the Register for an Account section.

**NOTE:** If your company is registered with this site and you use your company email when you register, you will have a registered account rather than a guest account. This will give you access to more than just the free application.

3. Click [Free Tools](#) on the bottom left side of the webpage. You will see the screen shown below.



UCAIug > Pages > sitelogin

**Enter Username and Password**

Username:

Password:

Remember Me?

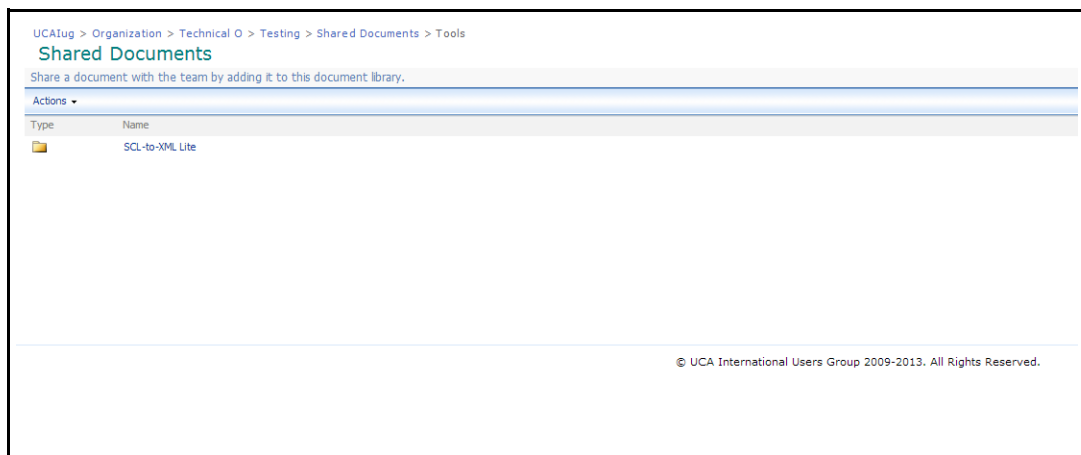
**Don't have an account?**  
If you do not have a Username and Password, please return to the [site home page](#) to create a site Guest account at no charge. Your account can be upgraded later to individual or corporate.

**Lost your username or password?**  
Enter the email address used to create your account. You will receive an email at that address with your login information.

Email:

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4. Log in with your username, which is your First Name.Last Name, and the password you used to create the account, and click Submit.
5. You will see the screen shown below. Click on SCL-to-XML Lite.




UCAIug > Organization > Technical O > Testing > Shared Documents > Tools

**Shared Documents**

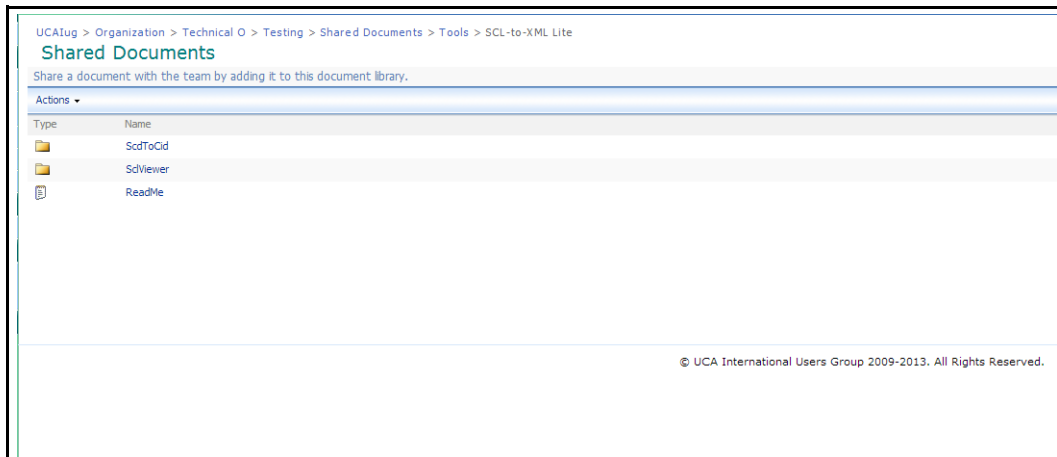
Share a document with the team by adding it to this document library.

Actions ▾

Type	Name
	SCL-to-XML Lite

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6. You will see the screen shown below. Click on ScdToCid.



7. You will see the screen shown below. Click on SCDtoCIDconverter.exe to download the application.



**NOTE:** If you log in with a paid account, you can see the source code for the CSD-to-CID converter and you get the full version of the SCL-viewer.

This page intentionally left blank.



## A: Setting up GOOSE Distributed Fault Recording

The meter's GOOSE implementation is explained in [5.4: GOOSE Subscriber](#), on [page 5-6](#). The Nexus® 1450 meter can be programmed to make a waveform recording in response to Boolean data embedded in a received GOOSE messages sent from another device in the IEC 61850 network. The Boolean data the meter receives will be related to limits/alarms or digital inputs state. The meter has memory to accept sixteen pieces of Boolean data from received GOOSE messages. The specifics of the Boolean data in specific GOOSE messages is set up in the IEC 61850 configuration file (.CID).

A unique and extremely useful implementation of the GOOSE triggered waveform recording functionality is distributed fault recording, in which multiple Nexus® 1450 meters in different locations of the electrical grid will make a waveform recording when a PQ event occurs. In this way it is possible to see the fault from multiple parts of the grid, so that detailed analysis of power quality events can be made. This Appendix explains the settings for GOOSE distributed fault analysis.

### A.1: Overview of Steps

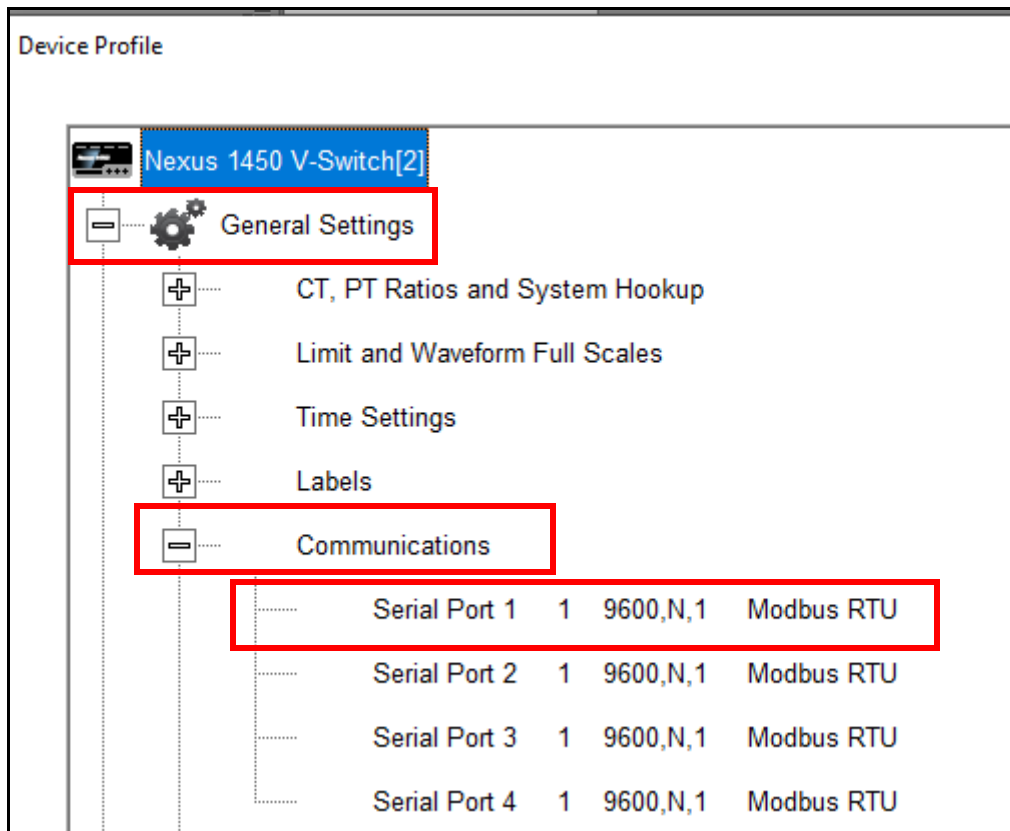
These are the steps you need to follow to set up distributed fault recording through GOOSE messaging:

1. Enable IEC 61850 and IEC 61850 GOOSE for the meters you will be using for the waveform recording. This is done with CommunicatorPQA® software.
2. Configure the meters IEC 61850 servers, as publishers and subscribers. This is done in the CID file.
3. Configure the Boolean triggers. This is done in the CID file.
4. Configure GOOSE triggered waveform recording for the meters. This is done with CommunicatorPQA® software.

## A.2: Enable IEC 61850 and IEC 61850 GOOSE for the Meters

Detailed instructions for programming the meter for IEC 61850 are given in chapters 21 and 27 of the *CommunicatorPQA® and MeterManagerPQA® Software User Manual*. Summary instructions are given here.

1. Connect to the meter and open its Device Profile.
2. Click General Settings>Communications and double-click on one of the Serial Port lines.



3. In the Communications screen, take note of the Ethernet port you will be enabling for IEC 61850. Write down the IP address for that port - you will need it for the CID file. Note that the IP address must be fixed - you can't use DHCP for it.

4. Click Advanced Network Settings at the bottom of the screen.

Port 5 RJ45	
<input type="radio"/> Obtain an IPv4 address automatically	<input type="radio"/> Obtain an
<input checked="" type="radio"/> Use the following IPv4 address	<input checked="" type="radio"/> Use Modifi
IP Address	<input type="text" value="10"/> <input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="1"/>
Subnet Mask	<input type="text" value="255"/> <input type="text" value="255"/> <input type="text" value="255"/> <input type="text" value="0"/>
Default Gateway	<input type="text" value="10"/> <input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/>
Warning: Misc cause issues	

Port 6 Fiber	
<input type="radio"/> Obtain an IPv4 address automatically	<input type="radio"/> Obtain an
<input checked="" type="radio"/> Use the following IPv4 address	<input checked="" type="radio"/> Use Modifi
IP Address	<input type="text" value="10"/> <input type="text" value="0"/> <input type="text" value="1"/> <input type="text" value="1"/>
Subnet Mask	<input type="text" value="255"/> <input type="text" value="255"/> <input type="text" value="255"/> <input type="text" value="0"/>
Default Gateway	<input type="text" value="10"/> <input type="text" value="0"/> <input type="text" value="1"/> <input type="text" value="0"/>
Warning: Misc cause issues	

**Advanced Network Settings**

- From the Advanced Settings screen's Services tab, select Enabled from the pull-down menus, for IEC 61850 and IEC 61850 GOOSE (note that we'll be setting up GOOSE a bit later on, in [A.5: Configure GOOSE Triggered Waveform in the Meters](#), on page A-15).

The screenshot shows the 'Advanced Network Option Settings' interface with the 'Services' tab selected. The 'Services' section is highlighted in blue. Below this, there are several service configurations:

Service	IP Version	Enable	TCP / UDP Port
Web Server	IPv4	Both Port 5 & 6	80
	IPv6	Both Port 5 & 6	80
Modbus TCP Server	IPv4	Both Port 5 & 6	502
	IPv6	Both Port 5 & 6	502
GE EGD		Port 6 Only	18246
DNP LAN/WAN	IPv4	Both Port 5 & 6	To configure the DNP ports, please go to the DNP
	IPv6	Both Port 5 & 6	
SMTP Client (email)		Port 5 Only	25
Network Time Sync		SNTP Port 5	123
IEC 61850		Enabled	To configure additional settings, go to Appendix
IEC 61850 GOOSE		Enabled	

- Click OK to close the Advanced Network Settings screen, click OK to close the Communications setting screen, and click Update Device to save your settings.
- Repeat this procedure for all of the meters you will be using for distributed fault recording.

### **A.3: Configure the Meters as IEC 61850 Server, Publishers, and Subscribers**

In the CID file, you will set up all of the meters as IEC 61850 servers and both publishers of GOOSE messages and subscribers that can receive GOOSE messages.

- Each meter must be given a unique identifier.
- The meter acting as a publisher monitors the dataset it is programmed to receive, looking for a new event, which is indicated by a change in data, e.g., a switch from 0 to 1 for a Boolean data type, which may indicate an input going from open to closed, or a limit being exceeded. When the publisher meter identifies a new event, it publishes the dataset to subscriber meters. A meter can be set as up to ten publishers - each scanning different received datasets. You can set up multiple meters as publishers.
- The meter acting as a subscriber listens for GOOSE messages coming from a publisher and filters them to see if they match the settings in the CID file before storing them in internal memory. The order of the data being saved is also defined in the CID file. You can set up multiple subscribers - the GOOSE messages will be sent in Broadcast mode, so there is no limit to the number of subscribers a publisher can send messages to.

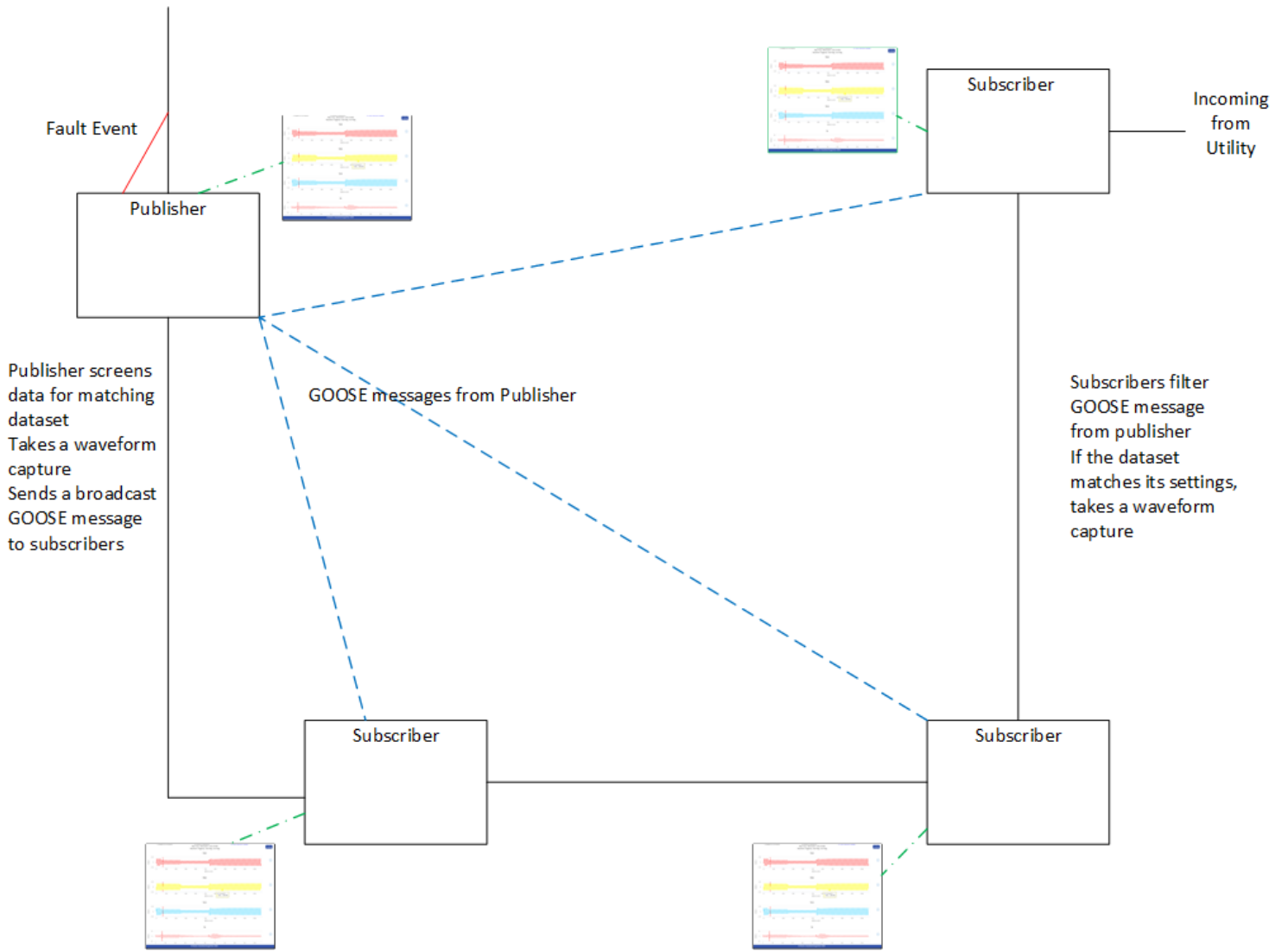


Figure A.1: Illustration of Publisher/Subscriber GOOSE Messaging

### A.3.1: Configuration Steps

You will perform these steps for each of the meters you are setting up.

1. Download the meter's CID file from its webpage:

- From the Webview™ Energy Dashboard, click on IEC 61850 in the menu on the left.
- You can click Download SCL or Browse to locate the CID file if it has already been downloaded.

The screenshot displays the 'Meter Dashboard' interface. On the left, a navigation menu lists various data categories, with 'IEC61850' highlighted at the bottom. The main content area is divided into sections: 'Status' (showing 'IEC61850' and 'enabled'), 'Configuration' (a table with columns for Meter, MAC, IP address, and TCP port), and file management options ('Download SCL', 'Browse...', 'Upload IEC61850 SCL File', and 'Upload Status'). Red boxes highlight the 'IEC61850' menu item, the 'Download SCL' button, the 'Browse...' button, and the 'Upload IEC61850 SCL File' button.

Meter	MAC	IP address	TCP port
Meter	00:01:58:01:23:92	192.168.5.89	102
CID file	00-00-00-00-00-00	192.168.5.89	102

Status	match
Status	match

2. Open the file. You can open and edit it in Notepad or any XML editor. The example below was opened in Notepad.

```

nx1450 - 192.168.5.89 standard - Notepad
File Edit Format View Help
<?xml version="1.0" encoding="UTF-8" ?>
<SCL revision="B" version="2007" xmlns="http://www.iec.ch/61850/2003/SCL" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:
  <Header id="Nexus 1450 ICD" nameStructure="IEDName" version="1.0" revision="">
    <History>
      <Hitem version="1.0" revision="0.1" when="01-Jun-2020" who="DSC" what="Nexus 1450" why="IEC 61850 Ed2">
        1: Based on E154 scl file v3_0_r1_4
      </Hitem>
    </History>
  </Header>
  <!-- ***** -->
  <Communication>
    <SubNetwork name="Subnet_MMS" type="8-MMS">
      <BitRate unit="b/s" multiplier="M">10</BitRate>
      <ConnectedAP iedName="IEC61850SRV" apName="S1">
        <Address>
          <P type="OSI-PSEL" xsi:type="tP_OSI-PSEL">00000001</P>
          <P type="OSI-SSEL" xsi:type="tP_OSI-SSEL">0001</P>
          <P type="OSI-TSEL" xsi:type="tP_OSI-TSEL">0001</P>
        <P type="MMS-Port">102</P>
        <P type="IP" xsi:type="tP_IP">192.68.5.59</P>
      </Address>
      <GSE ldInst="Meas" cbName="gocbpub">
        <Address>
          <P type="VLAN-ID">000</P>
          <P type="VLAN-PRIORITY">4</P>
          <P type="MAC-Address">01-0c-cd-01-00-00</P>
          <P type="APPID">0000</P>
        </Address>
      </GSE>
    </ConnectedAP>
  </SubNetwork>
</Communication>
<!-- ***** -->
<IED name="IEC61850SRV" desc="Electro Industries NX1450" type="Nexus 1450" manufacturer="Electro Industries" configVersion
  <Services nameLength="64">
    <DynAssociation />
    <GetDirectory />

```



3. Enter a unique identifier for the meter in the IED Name section of the file and the same name in the Communication section of the file.

```

<Communication>
  <SubNetwork name="Subnet_MMS" type="8-MMS">
    <BitRate unit="b/s" multiplier="M">10</BitRate>
    <ConnectedAP iedName="IEC61850SRV" apName="S1">
      <Address>
        <P type="OSI-PSEL" xsi:type="tP_OSI-PSEL">00000001</P>
        <P type="OSI-SSEL" xsi:type="tP_OSI-SSEL">0001</P>
        <P type="OSI-TSEL" xsi:type="tP_OSI-TSEL">0001</P>
        <P type="MMS-Port">102</P>
        <P type="IP" xsi:type="tP_IP">192.68.5.59</P>
      </Address>
      <GSE IdInst="Meas" cbName="gocbpub">
        <Address>
          <P type="VLAN-ID">000</P>
          <P type="VLAN-PRIORITY">4</P>
          <P type="MAC-Address">01-0c-cd-01-00-00</P>
          <P type="APPID">0000</P>
        </Address>
      </GSE>
    </ConnectedAP>
  </SubNetwork>
</Communication>
<!-- ***** -->
<IED name="IEC61850SRV" desc="Electro Industries NX1450" type="Nexus 1450" manufacturer=
  <Services nameLength="64">

```

Enter a unique name for the meter in both places

4. In the Communication section of the file, enter the IP address of the Ethernet port you enabled for IEC 61850. This step sets up the IEC 61850 server for the meter. See the example below.

Device Profile: Communications Settings

Serial Port 1	Serial Port 2	Serial Port 3	Serial Port 4
Address: 1	Address: 1	Address: 1	Address: 1
Baud Rate: 9600	Baud Rate: 9600	Baud Rate: 9600	Baud Rate: 9600
Data Bits: 8	Data Bits: 8	Data Bits: 8	Data Bits: 8
Parity: None	Parity: None	Parity: None	Parity: None
Stop Bits: 1	Stop Bits: 1	Stop Bits: 1	Stop Bits: 1
Tx Delay: 20ms	Tx Delay: 20ms	Tx Delay: 20ms	Tx Delay: 20ms
Protocol: Modbus RTU	Protocol: Modbus RTU	Protocol: Modbus RTU	Protocol: Modbus RTU
Mode: Slave	Mode: Slave	Mode: Slave	Mode: Slave

**Port 5 RJ45**

Obtain an IPv4 address automatically  
 Use the following IPv4 address

Obtain an IPv6 address automatically  
 Use Modified EUI-64 IPv6 address

IP Address: 192.68.5.59  
 Subnet Mask: 255.255.255.0  
 Default Gateway: 10.0.0.0

Warning: Misconfiguration of these settings could cause issues communicating with the meter.

**Port 6 Fiber**

Use the following IPv4 address  
 Use Modified EUI-64 IPv6 address

IP Address: 10.0.1.1  
 Subnet Mask: 255.255.255.0  
 Default Gateway: 10.0.1.0

Warning: Misconfiguration of these settings could cause issues communicating with the meter.

Advanced Network Settings

OK Cancel Help

Enter the Ethernet port's IP address in the CID file

```

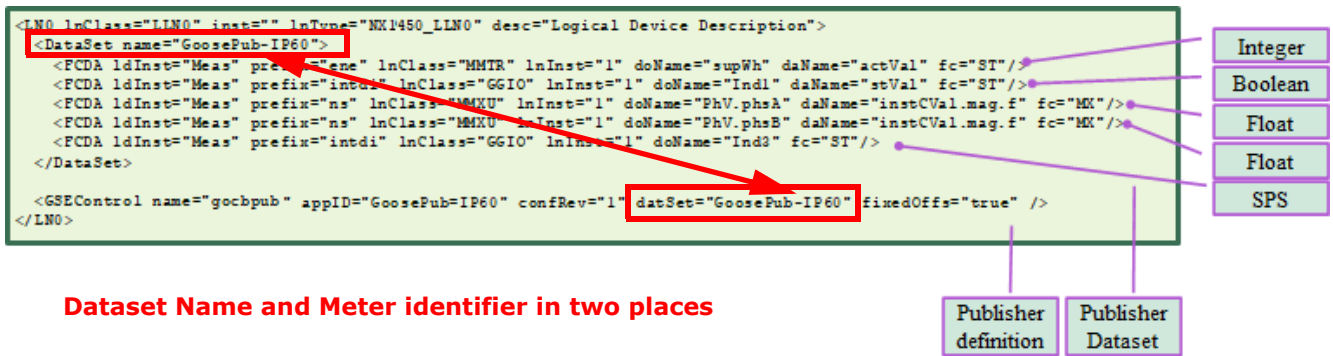
<!-- ***** -->
<Communication>
  <SubNetwork name="Subnet_MMS" type="8-MMS">
    <BitRate unit="b/s" multiplier="M">10</BitRate>
    <ConnectedAP iedName="IEC61850SRV" apName="S1">
      <Address>
        <P type="OSI-PSEL" xsi:type="tP_OSI-PSEL">00000001</P>
        <P type="OSI-SSEL" xsi:type="tP_OSI-SSEL">0001</P>
        <P type="OSI-TSEL" xsi:type="tP_OSI-TSEL">0001</P>
        <P type="MMS-Port">102</P>
        <P type="IP" xsi:type="tP_IP">192.68.5.59</P>
      </Address>
      <GSE ldInst="Meas" cbName="gocbpub">
        <Address>
          <P type="VLAN-ID">000</P>
          <P type="VLAN-PRIORITY">4</P>
          <P type="MAC-Address">01-0c-cd-01-00-00</P>
          <P type="APPID">0000</P>
        </Address>
      </GSE>
    </ConnectedAP>
  </SubNetwork>
</Communication>
    
```

5. To set the meter as a publisher of GOOSE messages, in the Communication section of the CID file, enter a MAC address for the meter/publisher. The MAC address given to each meter acting as a publisher must be unique. The numbers you can use are from 01-0C-CD-01-00-00 to 01-0C-CD-01-FF. See the example below.

```
<Communication>
  <SubNetwork name="Subnet_MMS" type="8-MMS">
    <BitRate unit="b/s" multiplier="M">10</BitRate>
    <ConnectedAP iedName="IEC61850SRV" apName="S1">
      <Address>
        <P type="OSI-PSEL" xsi:type="tP_OSI-PSEL">00000001</P>
        <P type="OSI-SSEL" xsi:type="tP_OSI-SSEL">0001</P>
        <P type="OSI-TSEL" xsi:type="tP_OSI-TSEL">0001</P>
      <P type="MMS-Port">102</P>
      <P type="IP" xsi:type="tP_IP">192.68.5.59</P>
    </Address>
    <GSE IdInst="Meas" cbName="gocbpub">
      <Address>
        <P type="VLAN-ID">000</P>
        <P type="VLAN_PRTORITY">1</P>
        <P type="MAC-Address">01-0c-cd-01-00-01</P>
        <P type="APPID">0000</P>
      </Address>
    </GSE>
  </ConnectedAP>
</SubNetwork>
</Communication>
```

6. The publisher is also defined in the CID file in the LN0 logic node through a GSE control block (GSEControl).

- The GSEControl links to the dataset monitored by this publisher. It directs the publisher to send out GOOSE messages on finding a change in that specific dataset.
- The publisher's dataset is also defined in the LN0 logic node. The meter can accept up to 10 publisher definitions. In the example below, there are four types of data defined for the dataset: Integer, Boolean, Float, and SPS. The data types tell the publisher more information about the type of change it should look for.



- The publisher will send out messages to its subscribers concerning its monitored datasets in this way: the first message will take place within 20 ms of receipt, the same message will be sent a second time 40 ms after the first, the same message will be sent a third time, 80 ms after the second, and so on, doubling in time between messages, until the frequency reaches one minute. After that point the message will be sent every minute until there is a change in the dataset and then a new message will be sent with the frequency already explained.

7. To set up a meter as a subscriber, copy into the subscriber's CID file the Communication section of any publishers you want the meter to accept GOOSE messages from. The Communication sections of two publishers are outlined in purple in the diagram below.

```

<Communication>
<SubNetwork name="Subnet_MMS" type="8-MMS">
  <BitRate unit="b/s" multiplier="M">10</BitRate>
  <ConnectedAP IedName="IEC61850SRV-IP60" apName="S1">
    <Address>
      <P type="OSI-PSEL" xsi:type="tP_OSI-PSEL">00000001</P>
      <P type="OSI-SSEL" xsi:type="tP_OSI-SSEL">0001</P>
      <P type="OSI-TSEL" xsi:type="tP_OSI-TSEL">0001</P>
      <P type="MMS-Port">102</P>
      <P type="IP" xsi:type="tP_IP">192.168.0.60</P>
    </Address>
    <GSE ldInst="Meas" cbName="gocbpub-ip60">
      <Address>
        <P type="VLAN-ID">000</P>
        <P type="VLAN-PRIORITY">4</P>
        <P type="MAC-Address" 01-0c-cd-01-00-00</P>
        <P type="APPID">0000</P>
      </Address>
    </GSE>
  </ConnectedAP>
  <ConnectedAP IedName="IEC61850SRV-IP40" apName="S1">
    <Address>
      <P type="OSI-PSEL" xsi:type="tP_OSI-PSEL">00000001</P>
      <P type="OSI-SSEL" xsi:type="tP_OSI-SSEL">0001</P>
      <P type="OSI-TSEL" xsi:type="tP_OSI-TSEL">0001</P>
      <P type="MMS-Port">102</P>
      <P type="IP" xsi:type="tP_IP">192.168.0.40</P>
    </Address>
    <GSE ldInst="Meas" cbName="gocbpub-ip40">
      <Address>
        <P type="VLAN-ID">000</P>
        <P type="VLAN-PRIORITY">4</P>
        <P type="MAC-Address" 01-0c-cd-01-00-01</P>
        <P type="APPID">0000</P>
      </Address>
    </GSE>
  </ConnectedAP>
</SubNetwork>
</Communication>

```

**Enter the Communications section, including the MAC address for all publishers (all meters in the distributed fault recording system)**

Subscriber's CID File

**NOTE:** For distributed fault recording, each meter will be set up as a publisher and as a subscriber to all the other meters in the system. This way, wherever a fault occurs, the meter can act as a publisher and the other meters can act as subscribers.

## A.4: Configure the Waveform Triggers

The subscriber will accept all messages coming from the publisher, but will filter the messages for those that it needs to process. The messages that need to be processed are also defined in the CID file; in the case of distributed fault recording, this will be the waveform triggers.

1. In the Inputs section of LNO in the CID file, the datasets that should be processed are listed with the <ExtRef> tag and the publisher's identifier.

```

<IED name="IEC61850SRV" desc="Electro Industries NX1500+" type="Nexus 1500+" manufacturer="ElectroIndustries" configVersion="1.00">
  <AccessPoint name="S1">
    <Server timeout="30">
      <Authentication none="true"/>
      <LDevice inst="Meas" desc="Power Meter">
        <LNO lnClass="LLNO" inst="" lnType="NX1500P_LLNO" desc="Logical Device Description">
          <Inputs>
            <ExtRef iedName="IEC61850SRV-IP40" ldInst="Meas" prefix="ns" lnClass="MMXU" lnInst="1" doName="PhV.phsB" daName="instCVal.mag.f"/>
            <ExtRef iedName="IEC61850SRV-IP40" ldInst="Meas" prefix="ns" lnClass="MMXU" lnInst="1" doName="PhV.phsC" daName="instCVal.mag.f"/>
            <ExtRef iedName="IEC61850SRV-IP40" ldInst="Meas" prefix="intdi" lnClass="GGIO" lnInst="1" doName="Ind1" daName="stVal" />
            <ExtRef iedName="IEC61850SRV-IP40" ldInst="Meas" prefix="intdi" lnClass="GGIO" lnInst="1" doName="Ind2" daName="stVal" />
            <ExtRef iedName="IEC61850SRV-IP60" ldInst="Meas" prefix="intdi" lnClass="GGIO" lnInst="1" doName="Ind1" daName="stVal" />
            <ExtRef iedName="IEC61850SRV-IP60" ldInst="Meas" prefix="ns" lnClass="MMXU" lnInst="1" doName="PhV.phsA" daName="instCVal.mag.f"/>
            <ExtRef iedName="IEC61850SRV-IP60" ldInst="Meas" prefix="intdi" lnClass="GGIO" lnInst="1" doName="Ind3" />
          </Inputs>
        </LNO>
      </LDevice>
    </Server>
  </AccessPoint>
</IED>

```

BOOL 01  
 BOOL(B)

BOOL 02  
 BOOL (C)

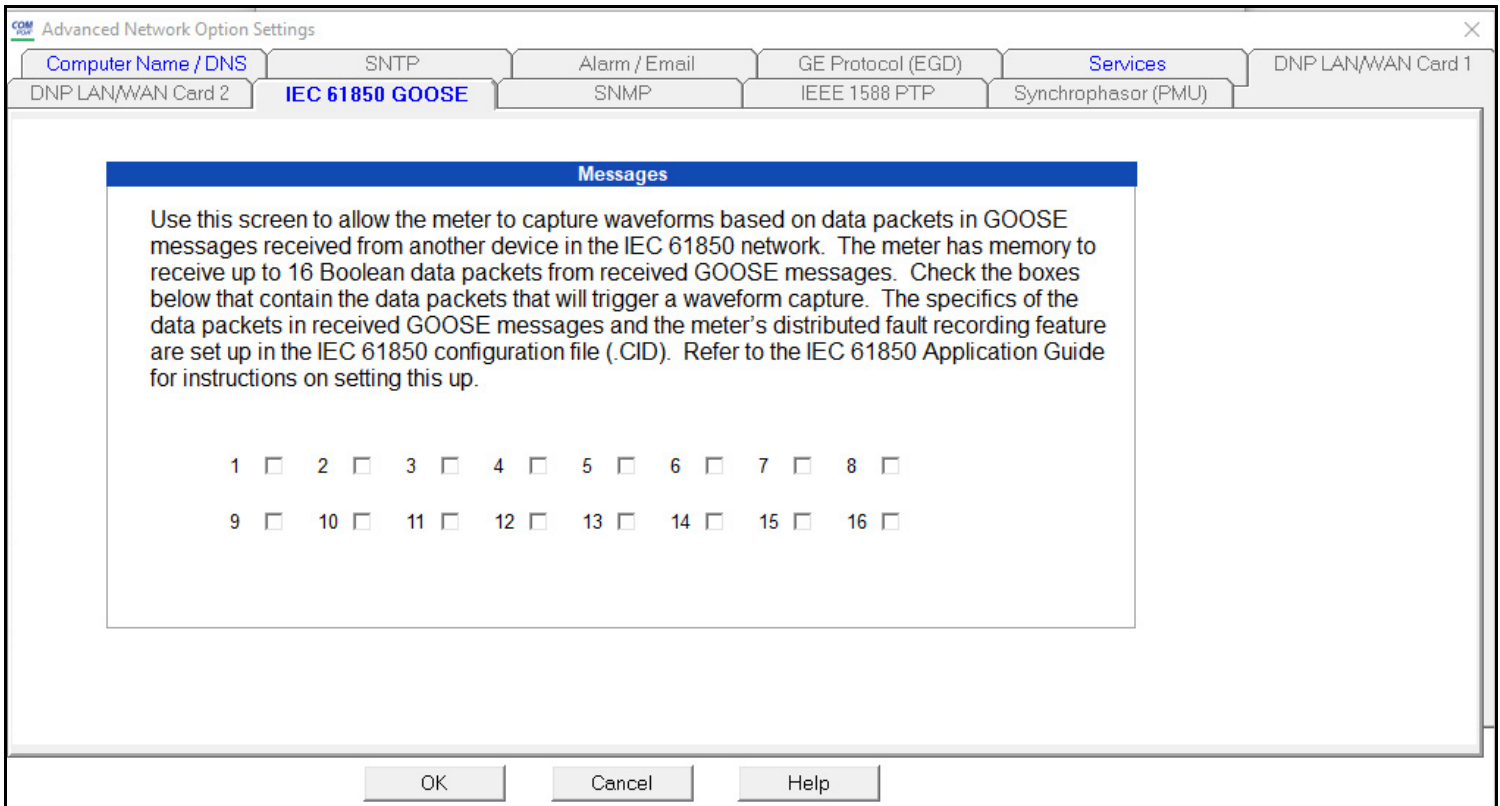
BOOL 03  
 BOOL (A)

- The order of the datasets must be the same in all the meters' CID file.
- The only data type allowed for Waveform recording is Boolean. The meter can accept up to 16 pieces of Boolean data for the purpose of triggering waveform recording.
- This list must be the same for all meters in the distributed fault recording system. Note that the datasets themselves are also set up in the CID file.

## A.5: Configure GOOSE Triggered Waveform in the Meters

The last step in setting up distributed fault recording via GOOSE is configuring the CommunicatorPQA™ settings for triggering waveform recording. For each meter in the system, follow these steps.

1. Open CommunicatorPQA software and connect to the meter.
2. Open the Device Profile and click General Settings>Communications>doubel-click on one of the serial port lines.
3. In the Communications screen, click Advanced Network Settings.
4. Make sure the IEC 61850 and IEC 61850 GOOSE fields both say Enabled.
5. Click the IEC 61850 tab.



6. Use the IEC 61850 GOOSE tab to set waveform capture based on the Boolean data embedded in a received GOOSE messages sent from another device in the IEC 61850 network that is acting as a publisher. Note that when acting as a publisher

the meter will also perform a waveform capture since it is also set to respond to the same dataset changes.

7. Check the boxes (1-16) which contain the Boolean data that you want to trigger a waveform capture. These boxes will correspond to the datasets being monitored by the publisher. See the example chart below.

Subscriber: IEC61850SRVMeas/ gimGGIO1\$ST		Subscriber GOOSE Filtered Data
BOOL 01		BOOL (B)
BOOL 02		BOOL (C)
BOOL 03		BOOL (A)
BOOL 04		
BOOL 05		
BOOL 06		
BOOL 07		
BOOL 08		
BOOL 09		
BOOL 10		
BOOL 11		
BOOL 12		
BOOL 13		
BOOL 14		
BOOL 15		
BOOL 16		

Each BOOL is mapped into a number in the meter's Device Profile

8. Click OK in the GOOSE screen and the Communications screen and then click Update Device to send the settings to the meter.