

Protocol Implementation eXtra Information for Testing (PIXIT)
for the IEC 61850 Edition 2 server interface in MVI56E-61850C

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Based Upon UCAlug Server PIXIT Template version 20

PIXIT for Server

Introduction

This document specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in MVI56E-61850C with firmware version 1.01.022.

Together with the PICS and the MICS the PIXIT forms the basis for a conformance test according to IEC 61850-10. The PIXIT entries contain information which is not available in the PICS, MICS, TICS documents or SCL file.

Each table specifies the PIXIT for applicable ACSI service model as structured in IEC 61850-10. The "Ed" column indicates if the entry is applicable for IEC 61850 Edition 1 and/or Edition 2. A hyphen ("-") in the Ed column indicates the PIXIT entry is not applicable for any version.

PIXIT for Documentation

ID	Ed	Description	Value / Clarification
Do1	2	How to expose required firmware versions not present in the datamodel	Viewable on the DUT's webpage
		<additional items>	

PIXIT for Association model

ID	Ed	Description	Value / Clarification
As1	1	Maximum number of clients that can set-up an association simultaneously	Not supported
As2	1,2	TCP_KEEPALIVE value. The recommended range is 1..20s	NS
As3	1,2	Lost connection detection time	NS
As4	-	Authentication is not supported yet	
As5	1,2	What association parameters are necessary for successful association:	NS
As6	1,2	If association parameters are necessary for association, describe the correct Called values: e.g. Calling parameters: e.g.	NS
As7	1,2	What is the maximum and minimum MMS PDU size	NS
As8	1,2	What is the maximum start up time after a power supply interrupt	60 seconds

ID	Ed	Description	Value / Clarification
As9	1,2	Does this device function only as test equipment? (test equipment need not have a non-volatile configuration; but it cannot be part of the substation automation system)	N
		<additional items>	

PIXIT for Server model

ID	Ed	Description	Value / Clarification
Sr1	1,2	Which analogue value (MX) quality bits are supported (can be set by server)	None; local server does not support analogue values
Sr2	1,2	Which status value (ST) quality bits are supported (can be set by server)	Validity: Y Good, Y Invalid, N Reserved, Y Questionable Detail Quality N BadReference Y Oscillatory N Failure Y OldData N Inconsistent N Inaccurate Miscellaneous: N Source 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 values are supported ¹	NS
		<additional items>	

¹ IEC 61850-6:2009 clause 9.5.6 states that if only a subrange of the enumeration value set is supported, this shall be indicated within an ICD file by an enumeration type, where the unsupported values are missing

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)	Local server: 120
Ds2	1	How many persistent data sets can be created by one or more clients (this number includes predefined datasets)	Local server configures max 8. Remote client cannot create.
Ds3	1	How many non-persistent data sets can be created by one or more clients	0
		<additional items>	

PIXIT for Substitution model

ID	Ed	Description	Value / Clarification
Sb1	1	Are substituted values stored in volatile memory	Not supported
		<additional items>	

PIXIT for Setting group control model

ID	Ed	Description	Value / Clarification
Sg1	1	What is the number of supported setting groups for each logical device	Not supported
Sg2	1,2	What is the effect of when and how the non-volatile storage is updated (compare IEC 61850-8-1 §16.2.4)	
Sg3	1	Can multiple clients edit the same setting group	
Sg4	1	What happens if the association is lost while editing a setting group	
Sg5	1	Is EditSG value 0 allowed	
Sg6	2	When ResvTms is not present how long is an edit setting group locked	
		<additional items>	

PIXIT for Reporting model

ID	Ed	Description	Value / Clarification
Rp1	1	The supported trigger conditions are (compare PICS)	Reporting not supported by local server
Rp2	1	The supported optional fields are	
Rp3	1,2	Can the server send segmented reports (when not supported the device shall refuse an association request with a smaller than minimum PDU size)	
Rp4	1,2	Mechanism on second internal data change notification of the same analogue data value within buffer period (Compare IEC 61850-7-2 Ed2 §17.2.2.9)	
Rp5	1	Multi client URCB approach (compare IEC 61850-7-2:2003 §14.2.1)	
Rp6	-	What is the format of EntryID	
Rp7	1,2	What is the buffer size for each BRCB or how many reports can be buffered	
Rp8	-	Pre-configured RCB attributes that are dynamic, compare SCL report settings	
Rp9	1	May the reported data set contain: - structured data objects - data attributes	
Rp10	1,2	What is the scan cycle for binary events Is this fixed, configurable	
Rp11	1	Does the device support to pre-assign a RCB to a specific client in the SCL	
Rp12	2	After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart	
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?	
Rp14	1,2	When BRCB.ResvTms is exposed, what is the default value for BRCB.ResvTms if client does not write (must be > 0) or When BRCB.ResvTms is not exposed, what is the internal reservation time (must be >= 0)	

ID	Ed	Description	Value / Clarification
Rp15	2	Is data model db=0 supported	NS
		<additional items>	

PIXIT for Logging model

ID	Ed	Description	Value / Clarification
Lg1	1,2	What is the default value of LogEna (Compare IEC 61850-8-1 §17.3.3.2.1, the default value should be FALSE)	Logging not supported
Lg2	-	What is the format of EntryID	
Lg3	1,2	Are there multiple Log Control Blocks that specify the Journaling of the same MMS NamedVariable and TrgOps and the Event Condition (Compare IEC 61850-8-1 §17.3.3.3.2)	
Lg4	-	Pre-configured LCB attributes that cannot be changed online	
Lg5	1	Which TrgOps are supported for logging (note Ed2 and up requires support for all TrgOps)	
		<additional items>	

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 behaviour when the GOOSE publish configuration is incorrect	NdsCom=T DUT keeps GoEna=F
Gp3	1,2	Published FCD supported common data classes are	SPS, INS, no others FC="ST" only FCDA is either full DO {"stVal","q","t"} or standalone "stVal"; nothing else Arrays are not supported
Gp4	1,2	What is the maximum value of TAL (maxTime) Is it fixed or configurable	Configured by (internal) SCL; see CID accompanying MICS
Gp5	1,2	What is the fastest retransmission time	1 ms
Gp6	-	Can the GOOSE publish be turned on / off by using SetGoCBValues(GoEna)	Deprecated See PICS – SetGoCBValues
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 N (unless member of a FCD)
Gp9	1,2	Does Server or ICT refuse GOOSE payload dataset length greater than SCSM supports?	Y
		<additional items>	

PIXIT for GOOSE subscribe model

ID	Ed	Description	Value / Clarification
Gs1	1,2	<p>What elements of a subscribed GOOSE message are checked to decide the message is valid and the allData values are accepted? If yes, describe the conditions.</p> <p>Notes:</p> <ul style="list-style-type: none"> the VLAN tag may be removed by an Ethernet switch and shall not be checked the simulation flag shall always be checked (Ed2) 	<p>Y destination MAC address : must match</p> <p>N APPID</p> <p>Y gocbRef : must match</p> <p>Y timeAllowedtoLive : fail => timeout; a received TAL=0 is treated as 1 second</p> <p>Y datSet : must match</p> <p>Y gold : must match</p> <p>N T (UTC time)</p> <p>Y stNum : change => new data; sequencing not verified</p> <p>Y sqNum : sequencing verified if same stNum; auto-resynced; data unchanged so no record of this; if stNum changes, sqNum not verified.</p> <p>Y simulation / test : T message discarded</p> <p>Y confRev : must match</p> <p>Y ndsCom : T message discarded</p> <p>Y numDatSetEntries : must match</p> <p>N out-of-order dataset members : Dataset FCD(A)s are expected to match between server and SCL. Discrepancies usually will result in data misinterpretation and consequent unexpected values in DUT's database. FCDs with differing structures may raise decoding errors, which may abort decoding of the current FCD and may also abort decoding of the remainder of the packet.</p>

ID	Ed	Description	Value / Clarification
Gs2	1,2	When is a subscribed GOOSE marked as lost (TAL = time allowed to live value from the last received GOOSE message)	message does not arrive by TAL, message is discarded
Gs3	1,2	What is the behaviour when one or more subscribed GOOSE messages is not received or syntactically incorrect (missing GOOSE)	Syntactically incorrect message discarded. No notification of missing messages.
Gs4	1,2	What is the behaviour when a subscribed GOOSE message is out-of-order	stNum sequencing not detected (detect change only); sqNum sequencing verified, auto-resynced
Gs5	1,2	What is the behaviour when a subscribed GOOSE message is duplicated	duplicate stNum ignored (no new data); duplicate sqNum detected, auto-resynced
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 Y
Gs8	1,2	Subscribed FCD supported common data classes are	Refer to the client MICS for the supported CDCs. Datatype INT128 interpreted as INT64. Arrays are not supported.
Gs9	1	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/simulation mode	N Test/Sim mode not supported; received Test/Sim messages discarded
Gs10	1,2	Max number of dataset members	120
Gs11	1	Is Fixed-length encoded GOOSE supported	Note: Ed2 Am1 requires support
Gs12	2	Is IEC 62351-6 security supported	N
		<additional items>	

PIXIT for GOOSE performance

ID	Ed	Description	Value / Clarification
Gf1	1,2	Performance class	P3 = 20 ms
Gf2	1,2	GOOSE ping-pong processing method	Scan cycle based

ID	Ed	Description	Value / Clarification	
Gf3	1,2	Application logic scan cycle (ms)	Max.	20 Ms
			Min.	1 Ms
Gf4	1	Maximum number of data attributes in GOOSE dataset (value and quality has to be counted as separate attributes)	Subscribe: unlimited. Publish: limited by max FCDA count (120) and structured FCDA standard contents ("stVal", "q", "t") =>120*3=360	
		<additional items>		

PIXIT for Control model

ID	Ed	Description	Value / Clarification
Ct1	1	What control models are supported (compare PICSICD file enums for Ed2)	Controls are not supported
Ct2	1,2	Is the control model fixed, configurable and/or dynamic	
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	Deprecated
Ct4	-	Is "operate-many" supported (compare sboClass)	Deprecated, see sboClass in datamodel (ICD)
Ct5	1	Will the DUT activate the control output when the test attribute is set in the SelectWithValue and/or Operate request (when N test procedure Ct12 is applicable)	
Ct6	-	What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request	Deprecated
Ct7	-	Is pulse configuration supported (compare pulseConfig)	Deprecated

ID	Ed	Description	Value / Clarification
Ct8	1	What is the behaviour of the DUT when the check conditions are set Is this behaviour fixed, configurable, online changeable	
Ct9	1,2	Which additional cause diagnosis are supported	
Ct10	1,2	How to force a “test-not-ok” respond with SelectWithValue request	
Ct11	1,2	How to force a “test-not-ok” respond with Select request	
Ct12	1,2	How to force a “test-not-ok” respond with Operate request	
Ct13	1,2	Which origin categories are supported / accepted	
Ct14	1,2	What happens if the orCat value is not supported or invalid	
Ct15	1,2	Does the IED accept a SelectWithValue / Operate with the same control value as the current status value Is this behaviour configurable	
Ct16	1	Does the IED accept a select/operate on the same control object from 2 different clients at the same time	
Ct17	1	Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (Tissue #334)	
Ct18	1	Deprecated	
Ct19	-	Can a control operation be blocked by Mod=Off or [On-]Blocked (Compare PIXIT-Sr5)	Deprecated
Ct20	1,2	Does the IED support local / remote operation	

ID	Ed	Description	Value / Clarification
Ct21	1,2	Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security	
Ct22	2	How to force a “parameter-change-in-execution”	
Ct23	1,2	How many SBOs/SBOes control objects can be selected at the same time?	
Ct24	1,2	Can a controllable object be forced to keep its old state e.g. Internal Controllable Objects may not be accessible to force this, whereas a switch like Circuit Breaker outside the DUT can?	
Ct25	1,2	When CDC=DPC is supported, is it possible to have DPC (Controllable Double Point) go to the intermediate state? (00)	
Ct26	1,2	Name an enhanced security control point (if any) with a finite operate timeout Specify the operate timeout (in milliseconds)	
Ct27	2	Does the IED support control objects with external signals?	
Ct28		Deprecated, kept as placeholder	
		<additional items>	

PIXIT for Time synchronisation model

ID	Ed	Description	Value / Clarification
Tm1	1	What time quality bits are supported (may be set by the IED)	Y LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized
Tm2	1,2	Describe the behaviour when all time server(s) cease to respond What is the time server lost detection time	Assert CNS after lost detection time 20 ms
Tm3	1,2	How long does it take to take over the new time from time server	1 second or less
Tm4	1,2	When is the time quality bit "ClockFailure" set	Set when seconds-of-epoch of time source is zero.
Tm5	1	When is the time quality bit "Clock not Synchronized" set	When connection to all time servers is lost (see PIXIT-Tm2) or other (specify) Note: For Ed2 and up, CNS is set according to 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 daylight saving	N – timestamp always UTC
Tm8	1,2	Which attributes of the SNTP response packet are validated	Y/N Leap indicator not equal to 3 Y/N Mode is equal to SERVER Y/N OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp Y/N RX/TX timestamp fields are checked for reasonableness Y/N SNTP version 3 and/or 4 Y/N other (describe)
Tm9	1,2	Do the COMTRADE files have local time or UTC time and is this configurable	COMTRADE files not implemented
		<additional items>	

PIXIT for File transfer model

ID	Ed	Description	Value / Clarification
Ft1	1	What is the structure of files and directories Where are the COMTRADE files stored Are COMTRADE files zipped and what files are included in each zip file	File transfer not supported.
Ft2	1,2	Directory names are separated from the file name by	
Ft3	1	The maximum file name size including path (recommended 64 chars)	
Ft4	1,2	Are directory/file name case sensitive	
Ft5	1,2	Maximum file size for SetFile	
Ft6	1	Is the requested file path included in the MMS fileDirectory respond file name	
Ft7	1	Is the wild card supported in the MMS fileDirectory request	
Ft8	1,2	Is it allowed that 2 clients get a file at the same time	
Ft9	1,2	Which files can be deleted	
		<additional items>	

PIXIT for Service tracking model

ID	Ed	Description	Value / Clarification
Tr1	2	Which ACSI services are tracked by LTRK.GenTrk	Service tracking not supported