

Protocol Implementation eXtra Information for Testing (PIXIT)
for the IEC 61850 Edition 2 server interface in
MRZS-F, MRZS-S, MRZS-T, MRZS-U

Version 1
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Based Upon UCAIug 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

MRZS-F, with firmware 14.13.2,
MRZS-S, with firmware 16.13.1,
MRZS-T, with firmware 17.11.1,
MRZS-U, with firmware 25.13.0.

All variants share the same IEC 61850 library LIB61850ID=LIBIEC61850 1.2.2 and use the same hardware platform for the MRZS series.

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 data model	The device menu on the front panel, go to “Settings” - “Info”

PIXIT for Association model

ID	Ed	Description	Value / Clarification
As1	1	Maximum number of clients that can set-up an association simultaneously	1 (can be 2 with a maximum of 4 reports and small datasets)
As2	1,2	TCP_KEEPALIVE value. The recommended range is 1..20s	Not configurable. The default value is 5 s.
As3	1,2	Lost connection detection time	Lost connection time = TCP_KEEPALIVE + 30s.
As4	-	Authentication is not supported yet	No
As5	1,2	What association parameters are necessary for successful association: Called values:	Transport selector Y Session selector Y Presentation selector Y AP Title Y AE Qualifier Y

ID	Ed	Description	Value / Clarification
		Calling values:	Transport selector Y Session selector Y Presentation selector Y AP Title Y AE Qualifier Y
As6	1,2	If association parameters are necessary for association, describe the correct Called values: e.g. Calling parameters: e.g.	Transport selector 0001 Session selector 0001 Presentation selector 00000001 AP Title 1,1,9999,1 AE Qualifier 12 Transport selector 0001 Session selector 0001 Presentation selector 00000001 AP Title 1,1,9999,1 AE Qualifier 12
As7	1,2	What is the maximum and minimum MMS PDU size	Max MMS PDU size 8500 bytes Min MMS PDU size 400 bytes
As8	1,2	What is the maximum start up time after a power supply interrupt	Full IEC61850 services are available after approximate start-up time of 60 seconds. For even big IEC61850 configuration file, time will extend 30 seconds.
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

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)	Validity: Y Good, N Invalid, N Reserved, N Questionable Detail Quality N Overflow N OutofRange N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Miscellaneous: N Source 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 (only for Boolean values), N Reserved, N Questionable Detail Quality N BadReference N Oscillatory N Failure Y OldData N Inconsistent N Inaccurate Miscellaneous: Y Source Y 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	On Y [On-]Blocked N

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

ID	Ed	Description	Value / Clarification
			Test N Test/Blocked N Off Y

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)	100
Ds2	1	How many persistent data sets can be created by one or more clients (this number includes predefined datasets)	0
Ds3	1	How many non-persistent data sets can be created by one or more clients	0
Ds_ex1	1	The fixed location of pre-configured data sets.	LDCTRL\LLN0
Ds_ex2	1	How many pre-configured data sets can be created by one or more clients	10
Ds_ex3	1	How many data attributes supported in all datasets totally?	1000

PIXIT for Substitution model

ID	Ed	Description	Value / Clarification
Sb1	1	Are substituted values stored in volatile memory	Y

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	N/A, EditSG is 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)	N/A, EditSG is not supported.
Sg3	1	Can multiple clients edit the same setting group	N/A, EditSG is not supported.
Sg4	1	What happens if the association is lost while editing a setting group	N/A, EditSG is not supported.
Sg5	1	Is EditSG value 0 allowed	N/A, EditSG is not supported.
Sg6	2	When ResvTms is not present how long is an edit setting group locked	N/A, EditSG is not supported.

PIXIT for Reporting model

ID	Ed	Description	Value / Clarification
Rp1	1	The supported trigger conditions are (compare PICS)	integrity Y data change Y quality change Y data update N general interrogation Y
Rp2	1	The supported optional fields are	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 Y
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)	Y Reports will be segmented, and sent with subsequence numbers, if the data is too big to fit into a single MMS frame.
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)	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	8000 bytes
Rp8	-	Pre-configured RCB attributes that are dynamic, compare SCL 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	5 ms Fixed
Rp11	1	Does the device support to pre-assign a 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

ID	Ed	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?	N AP-Title N AE-Qualifier N
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)	N/A 30 seconds
Rp15	2	Is data model db=0 supported	N
Rp_ex1	1	How many URCB and BRCB support	4 URCB + 4 BRCB

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)	N/A
Lg2	-	What is the format of EntryID	N/A
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)	N/A
Lg4	-	Pre-configured LCB attributes that cannot be changed online	N/A
Lg5	1	Which TrgOps are supported for logging (note Ed2 and up requires support for all TrgOps)	N/A

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	DUT don't create the GoCB in the model
Gp3	1,2	Published FCD supported common data classes are	SPC,SPS,ACD,ACT

ID	Ed	Description	Value / Clarification
Gp4	1,2	What is the maximum value of TAL (maxTime) Is it fixed or configurable	20000 ms (factory default 5000 ms) Configurable Configured by GoCB Maximum Cycle Time
Gp5	1,2	What is the fastest retransmission time	2 ms (factory default 4 ms) Configured by GoCB Minimum Cycle Time
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 = 1
Gp8	1	May the GOOSE data set contain: - structured data objects (FCD) - timestamp data attributes	Y Y
Gp9	1,2	Does Server or ICT refuse GOOSE payload dataset length greater than SCSM supports?	N

PIXIT for GOOSE subscribe model

ID	Ed	Description	Value / Clarification
Gs1	1,2	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. Notes: <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) 	Y destination MAC address Y APPID Y gocbRef Y timeAllowedtoLive Y datSet Y gold N T Y stNum N sqNum Y simulation / test Y confRev N ndsCom N numDatSetEntries N out-of-order dataset members
Gs2	1,2	When is a subscribed GOOSE marked as lost (TAL = time allowed to live value from the last received GOOSE message)	2 * TAL

ID	Ed	Description	Value / Clarification
Gs3	1,2	What is the behaviour when one or more subscribed GOOSE messages is not received or syntactically incorrect (missing GOOSE)	In case a subscribed GOOSE messages is lost we prefer that the published value does not change to the safe position; instead we prefer the quality is set to invalid.
Gs4	1,2	What is the behaviour when a subscribed GOOSE message is out-of-order	No checks are made for out-of-order GOOSE messages, they are validated in accordance with the rules given in Gs1
Gs5	1,2	What is the behaviour when a subscribed GOOSE message is duplicated	Receive this message as normal.
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	N N
Gs8	1,2	Subscribed FCD supported common data classes are	SPS[ST], ACT[ST], ACD[ST], SPC[ST]
Gs9	1	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/simulation mode	Y, Subscribed GOOSE messages are accepted but subVal is not set.
Gs10	1,2	Max number of dataset members	100
Gs11	1	Is Fixed-length encoded GOOSE supported	Y
Gs12	2	Is IEC 62351-6 security supported	N
Gs13	Amd1	How does the subscriber handle incoming data flagged as test when the destination LN.Beh is On or Blocked? Is this behavior:	Processed as valid fixed
Gs_ex1	1	What is the behavior when the numDatSetEntries in a subscribed GOOSE message is more than DO index which IED want to subscribe	Accept as a normal GOOSE and parse GOOSE message

PIXIT for GOOSE performance

ID	Ed	Description	Value / Clarification	
Gf1	1,2	Performance class	P2/P3 = 3 ms	
Gf2	1,2	GOOSE ping-pong processing method	Event driven based	
Gf3	1,2	Application logic scan cycle (ms)	Max.	3 ms
			Min.	1 ms
Gf4	1	Maximum number of data attributes in GOOSE dataset (value and quality has to be counted as separate attributes)	100	

PIXIT for Control model

ID	Ed	Description	Value / Clarification	
Ct1	1	What control models are supported (compare ICD file enums for Ed2)	DOns: Y SBOs: Not supported DOes: Not supported SBOes: Not supported	
Ct2	1,2	Is the control model fixed, configurable and/or dynamic	Fixed	
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	Deprecated	
Ct4	-	Is "operate-many" supported (compare sboClass)	N/A	
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 Ctl2 is applicable)	Test mode is not supported	
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	
Ct8	1,2	What is the behaviour of the DUT when the check conditions are not set	DUT ignores the check condition value and always perform the check.	
		This behaviour is:	Fixed	

ID	Ed	Description	Value / Clarification
Ct9	1,2	Which additional cause diagnosis are supported	N Unknown N Not-supported N Blocked-by-switching-hierarchy N Select-failed N Invalid-position N Position-reached N Step-limit N Blocked-by-Mode N Blocked-by-process N Blocked-by-interlocking N Blocked-by-synchrocheck N Command-already-in-execution N Blocked-by-health N 1-of-n-control N Abortion-by-cancel N Time-limit-over N Abortion-by-trip N Object-not-selected Edition 1 specific values: N Parameter-change-in-execution (Ed1 semantics) Edition 2 specific values: N Object-already-selected N No-access-authority N Ended-with-overshoot N Abortion-due-to-deviation N Abortion-by-communication-loss N Blocked-by-command N None N Inconsistent-parameters N Locked-by-other-client N Parameter-change-in-execution (Ed2 semantics)
Ct10	1,2	How to force a “test-not-ok” respond with SelectWithValue request	Not supported
Ct11	1,2	How to force a “test-not-ok” respond with Select request	Not supported
Ct12	1,2	How to force a “test-not-ok” respond with Operate request	Not supported

ID	Ed	Description	Value / Clarification
Ct13	1,2	Which origin categories are supported / accepted	Y bay-control Y station-control Y remote-control Y automatic-bay Y automatic-station Y automatic-remote Y maintenance Y process
Ct14	1,2	What happens if the orCat value is not supported or invalid	DOns: Not supported SBOs: Not supported DOes: Not supported SBOes: Not supported
Ct15	1,2	Does the IED accept a SelectWithValue / Operate with the same control value as the current status value Is this behaviour configurable	DOns: Y SBOs: Not supported DOes: Not supported SBOes: Not supported Configurable N
Ct16	1	Does the IED accept a select/operate on the same control object from 2 different clients at the same time	DOns: N SBOs: Not supported DOes: Not supported SBOes: Not supported
Ct17	1	Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (Tissue #334)	SBOs: Not supported SBOes: Not supported
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	Y
Ct21	1,2	Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security	SBOs: Not supported DOns: N
Ct22	2	How to force a "parameter-change-in-execution"	SBOs: Not supported SBOes: Not supported
Ct23	1,2	How many SBOs/SBOes control objects can be selected at the same time?	N/A

ID	Ed	Description	Value / Clarification
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?	N
Ct25	1,2	When CDC=DPC is supported, is it possible to have DPC (Controllable Double Point) go to the intermediate state? (00)	N
Ct26	1,2	Name an enhanced security control point (if any) with a finite operate timeout Specify the operate timeout (in milliseconds)	DOes: N/A SBOes: N/A
Ct27	2	Does the IED support control objects with external signals?	DOes: N SBOes: N/A DOes: N/A SBOes: N/A
Ct28		Deprecated, kept as placeholder	

PIXIT for Time synchronization 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	Keep the previous synchronization time.
Tm3	1,2	How long does it take to take over the new time from time server	0 seconds
Tm4	1,2	When is the time quality bit "ClockFailure" set	Not supported.
Tm5	1	When is the time quality bit "Clock not Synchronized" set	N/A.
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	Y
Tm8	1,2	Which attributes of the SNTP response packet are validated	N Leap indicator not equal to 3 N Mode is equal to SERVER Y OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp Y RX/TX timestamp fields are checked for reasonableness Y SNTP version 3 and/or 4
Tm9	1,2	Do the COMTRADE files have local time or UTC time and is this configurable	N/A

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	directory structure / N/A
Ft2	1,2	Directory names are separated from the file name by	"/"
Ft3	1	The maximum file name size including path (recommended 64 chars)	Filename have standart length 8 char and extention 3 char (FAT)
Ft4	1,2	Are directory/file name case sensitive	Not Case sensitive
Ft5	1,2	Maximum file size for SetFile	N/A
Ft6	1	Is the requested file path included in the MMS fileDirectory respond file name	N
Ft7	1	Is the wild card supported in the MMS fileDirectory request	No
Ft8	1,2	Is it allowed that 2 clients get a file at the same time	N same file N different files
Ft9	1,2	Which files can be deleted	All files, except files *.dat and init.cid

PIXIT for Service tracking model

ID	Ed	Description	Value / Clarification
Tr1	2	Which ACSI services are tracked by LTRK.GenTrk	N/A