Protocol Implementation eXtra Information for Testing (PIXIT) for the IEC 61850 interface in MRMV4

Version 2.0.u
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Contents of this document

This document is applicable for MRMV4 Version 2.0.u (Firmware-Build **19933**).
Each chapter specifies the PIXIT for each applicable ACSI service model as structured in IEC 61850-10.

PIXIT for Association model

Description	**Value / Clarification**
Maximum number of clients that can set-up an association simultaneously	4
TCP_KEEPALIVE value	720 seconds, before keep-alive messages are sent
Lost connection detection time	4 * 15 seconds (a lost connection is detected after 720 sec + 4*15 sec = 780 sec)
Is authentication supported?	N
What association parameters are necessary for successful association?	Transport selector Y Session selector Y Presentation selector Y AP Title N AE Qualifier N
If association parameters are necessary for association, describe the correct values e.g.	Transport selector 0001 Session selector 0001 Presentation selector 00000001 AP Title any AE Qualifier any
What is the maximum and minimum MMS PDU size?	Max MMS PDU size 64kB Min MMS PDU size 4000
What is the maximum startup time after a power supply interrupt?	max 300 seconds until HMI is operable max 30 seconds until protection and IEC61850 is operable

PIXIT for Server model

Description	Value / Clarification
Which analogue value (MX) quality bits are supported (can be set by server)?	Validity: Y Good, N 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
Which status value (ST) quality bits are supported (can be set by server)?	Validity: Y Good Y Invalid N Reserved Y Questionable N BadReference N Oscillatory Y Failure N OldData Y Inconsistent N Inaccurate Source: Y Process N Substituted N Test N OperatorBlocked
What is the maximum number of data values in one GetDataValues request?	Not restricted; MMS PDU is the limit.
What is the maximum number of data values in one SetDataValues request?	Not restricted; MMS PDU is the limit.

PIXIT for Data set model

Description	Value / Clarification
What is the maximum number of data elements in one data set (compare ICD setting)?	60
How many persistent data sets can be created by one or more clients?	15 (If there are datasets defined in the SCL file, only the remaining amount can be created by the clients during run-time.)
How many non-persistent data sets can be created by one or more clients?	15

PIXIT for Reporting model

Description	Value / Clarification
The supported trigger conditions are (compare PICS)	integrity Y data change Y quality change Y data update N general interrogation Y
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
Can the server send segmented reports?	Y
Mechanism on second internal data change notification of the same analogue data value within buffer period (Compare IEC 61850-7-2 $14.2.2.9)	The last data value within buffer period will be reported.
Multi client URCB approach (compare IEC 61850-7-2 $14.2.1)	Each URCB is visible to all clients
What is the format of EntryID?	Octet string, the last 4 bytes are used as counter.
What is the buffer size for each BRCB or how many reports can be buffered?	10000 bytes for each BRCB
Pre-configured RCB attributes that cannot be changed online when RptEna = FALSE (see also the ICD report settings)	All RCB attributes can be changed online.
May the reported data set contain: - structured data objects? - data attributes? - timestamp data attributes?	 Y Y Y
What is the scan cycle for binary events? Is this fixed, configurable?	1 second Fixed

PIXIT for Generic substation events model

Description	Value / Clarification
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. Note: the VLAN tag may be removed by a ethernet switch and should not be checked	N source MAC address Y destination MAC address Y Ethertype = 0x88B8 N APPID Y gocbRef Y timeAllowedtoLive Y datSet Y goID N t Y stNum Y sqNum Y test Y confRev Y ndsCom Y numDatSetEntries
What is the behavior when one or more subscribed GOOSE messages aren´t received or are syntactically incorrect (missing GOOSE)? device reaction: 1. Messages will be ignored. 2. Status change will be ignored by the DUT and the quality is set as INVALID 3. Status change will be accepted by the DUT and the quality is set as QUESTIONABLE 4. Status change will be accepted by the DUT and the quality is set as GOOD Remark: A quality change from invalid to good (or questionable) is only done when receiving a new goose message (stNum change)	Reaction to received incorrect or missing GOOSE message: • wrong destination MAC address (1) • Ethertype != 0x88B8 (1) • wrong gocbRef (1) • timeAllowedtoLive exceeded (3) • wrong datSet (2) • wrong goID (2) • unexpected stNum (3) • unexpected sqNum (3) • test flag set (1) • wrong confRev (2) • ndsCom flag set (2) • numDatSetEntries != data entries in received message (1) • unexpected datatype in received message (2) • numDatSetEntries < expected (2) • numDatSetEntries > expected (4)
Can the test flag in the published GOOSE be turned on / off ?	N

Description	Value / Clarification
What is the behavior when the GOOSE publish configuration is incorrect?	Wrong GOOSE configuration in SCD-File is not possible, because it is checked when downloading it to the device. Changing the GOOSE configuration during runtime is not supported.
When is a subscribed GOOSE marked as lost? (TAL = time allowed to live value from the last received GOOSE message)	message does not arrive prior to TAL
What is the behavior when a subscribed GOOSE message is out-of-order?	This means that the DUT receives unexpected sqNum and/ or stNum. DUT reaction see item above.
What is the behavior when a subscribed GOOSE message is duplicated?	This means that the DUT receives unexpected sqNum and stNum. DUT reaction see item above.
Does the device subscribe to GOOSE messages with/without the VLAN tag?	Y with the VLAN tag Y without the VLAN tag
May the GOOSE data set contain: - structured data objects? - data attributes? - timestamp data attributes?	Subscribed / Published N / N Y / Y Y / Y
What is the slow retransmission time? Is it fixed or configurable?	33 sec with TAL = 66 sec Fixed
What is the fast retransmission scheme? Is it fixed or configurable?	Fixed scheme retrans: retrans time **before next** message sqNum / retrans / TAL 0 / 32 msec / 64 msec 1 / 32 msec / 64 msec 2 / 64 msec / 128 msec 3 / 128 msec / 256 msec 4 / 256 msec / 512 msec … until / 33 sec / 66 sec
Can the Goose publish be turned on / off by using SetGoCBValues(GoEna)?	N

TAL = Time Allowed to Live

PIXIT for Control model

Description	Value / Clarification
What control modes are supported (compare PICS)?	N status-only N direct-with-normal-security N sbo-with-normal-security N direct-with-enhanced-security Y sbo-with-enhanced-security
Is the control model fixed, configurable and/or online changeable?	Fixed
Is Time activated operate (operTm) supported?	N
Is “operate-many” supported?	N
What is the behavior of the DUT when the test attribute is set in the SelectWithValue and/or Operate request?	DUT ignores the test value and execute the command as usual
What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request?	DUT ignores the time value and execute the command as usual
Is pulse configuration supported?	N
What is the behavior of the DUT when the check conditions are set Is this behavior fixed, configurable, online changeable?	DUT ignores the check value transmitted by IEC61850 and performs the check depending on the device settings. Behaviour is fixed
What additional cause diagnosis are supported?	Y Blocked-by-switching-hierarchy Y Select-failed N Invalid-position Y Position-reached Y Parameter-change-in-execution N Step-limit N Blocked-by-Mode N Blocked-by-process Y Blocked-by-interlocking Y Blocked-by-synchrocheck Y Command-already-in-execution N Blocked-by-health Y 1-of-n-control N Abortion-by-cancel Y Time-limit-over N Abortion-by-trip
How to force a “test-not-ok” respond with SelectWithValue request?	Double select of the same object.
How to force a “test-not-ok” respond with Select request?	n.a.
How to force a “test-not-ok” respond with Operate request?	DOns: n.a. SBOns: n.a.

Description	Value / Clarification
	DOes: n.a. SBOes: Send an Operate with actual value to an unselected SBOes object.
Which origin categories are supported?	Values 0 – 8 are supported
What happens if the orCat is not supported?	DOns: n.a. SBOns: n.a. DOes: n.a. SBOes: Error message “not supported”
Does the IED accept an selectwithvalue/operate with the same ctlVal as the current status value?	DOns: n.a. SBOns: n.a. DOes: n.a. SBOes: N The DUT performs the check during the SelectWithValue phase.
Does the IED accept a select/operate on the same control object from 2 different clients at the same time?	DOns: n.a. SBOns: n.a. DOes: n.a. SBOes: N
Does the IED accept a select/selectwithvalue from the same client when the control object is already selected (tissue 334)?	SBOns: n.a. SBOes: N
Is for SBOes the internal validation performed during the SelectWithValue and/or Operate step?	SelectWithValue or Operate It depends on the performed validation step.
Can a control operation be blocked by Mod=Off or Blocked?	N
Does the IED support local / remote operation?	Y
Is it possible to select more than one switch at the same time?	N The DUT allows to select only one switch at a time

PIXIT for Time and time synchronisation model

Description	Value / Clarification
What quality bits are supported?	N LeapSecondsKnown N ClockFailure Y ClockNotSynchronized
Describe the behavior when the time synchronization signal/messages are lost	The quality bit “ClockNotSynchronized” is set to TRUE after a fixed time period.
When is the time quality bit "Clock failure" set?	Not supported
When is the time quality bit "Clock not synchronised” set?	90 seconds after receiving the last synchronization signal/messages
Is the timestamp of a binary event adjusted to the configured scan cycle?	N (Timestamps of binary events lying in the past are not adjusted when the system clock is updated.)
Does the device support time zone and daylight saving?	Y
Which attibutes 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 and 4 accepted)

Revision history

Revision	Remarks
1.0	First version