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MiCOM P40 Agile

P345

PIXIT
Protocol Implementation eXtra Information for Testing - IEC 61850 Edition 2

Software Version: 91
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CONTENTS

1 INTRODUCTION

This document specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in P345 with firmware version 91.

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.

2 PIXIT FOR ASSOCIATION MODEL

ID	Ed	Description	Value/Clarification
As1	1	Maximum number of clients that can set-up an association simultaneously	16
As2	1, 2	TCP_KEEPALIVE value. The recommended range is 1..20s	The default interval for TCP_KEEPALIVE messages transmitted by the relay is five (5) seconds. The TCP_KEEPALIVE messages are transmitted for a fixed period of approximately 20 seconds following the last received keep-alive response, after which time the client association will be dropped.
As3	1, 2	Lost connection detection time	The time-out period for aborted sockets is approximately sixty (60) seconds. For the duration of this time-out period the socket resources are unavailable for new client association requests. A total of 100 sockets are available.
As4	-	Authentication is not supported yet	
As5	1, 2	What association parameters are necessary for successful association Called values:	Transport selector Y Session selector Y Presentation selector Y AP Title N AE Qualifier N
		Calling values:	Transport selector N Session selector N Presentation selector N AP Title N AE Qualifier N
As6	1, 2	If association parameters are necessary for association, describe the correct Called values:	Transport selector 0001 Session selector 0001 Presentation selector 00000001 AP Title na AE Qualifier na
		Calling parameters:	Transport selector na Session selector na Presentation selector na AP Title na AE Qualifier na
As7	1, 2	What is the maximum and minimum MMS PDU size	Max MMS PDU size 16,384 bytes Min MMS PDU size 500 bytes
As8	1, 2	What is the maximum start up time after a power supply interrupt	The typical start up time of basic Ethernet services, following an interruption to the power supply is approximately 30 seconds. Full IEC 61850 services are available after an approximate start up time of min 80 seconds (the time is according to configuration).
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

3 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, Y Invalid, N Reserved, N Questionable N Overflow N OutofRange N BadReference N Oscillatory Y Failure (only for Fault Record LN 'PriFltMLFR1' and 'PriPreFltMLFR1') N OldData N Inconsistent N Inaccurate Source: Y Process N Substituted Y 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 Y Failure, for GosGGIO1.Indx only N OldData N Inconsistent N Inaccurate Source: Y Process N Substituted 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 Test Y Test/Blocked Y Off Y

ID	Ed	Description	Value/Clarification
		<additional items>	MiCOM Px40 IEDs do not have a built in range-limit for measurements, but deadbands are specified as a percentage change based on such a range. To resolve this, each measurement provides a range configuration in the data model where a minimum and maximum value can be set. Deadbands will be configured based on a percentage change of the applied measurement range. A deadband setting of zero (0) forces the measurement to follow the instantaneous value (i.e. deadbanding is disabled). For complex measurement types supporting both magnitude and angle, the deadband will only apply to the magnitude element.

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)	N/A (refer to SCL)
Ds2	1	How many persistent data sets can be created by one or more clients (this number includes predefined datasets)	N/A (refer to SCL)
Ds3	1	How many non-persistent data sets can be created by one or more clients	N/A (refer to SCL)

5 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	4
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)	None. ConfirmEditSGValues not supported.
Sg3	1	Can multiple clients edit the same setting group	na
Sg4	1	What happens if the association is lost while editing a setting group	na
Sg5	1	Is EditSG value 0 allowed	na
Sg6	2	When ResvTms is not present how long is an edit setting group locked	na

6 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	Y
Rp4	1, 2	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)	Send report immediately
Rp5	1	Multi client URCB approach (compare IEC 61850-7-2:2003 $14.2.1)	Each URCB is reserved by one client only
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	50000 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	10 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. The change of DatSet from SetBRCBValues Service is not supported.
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 IP PSEL SEL TSEL AP Title if configured AE Qualifier if configured AP Invoke ID if configured AE Invoke ID if configured
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)	0 ResvTms is exposed
Rp15	2	Is data model db=0 supported	Y

7 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	Y According to IED 'Publisher Sim' setting.
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	All the common data classes in the data model.
Gp4	1, 2	What is the slow retransmission time Is it fixed or configurable	1000 milliseconds with TAL = 2010 Configured by 'Maximum Cycle Time' parameter ('IED Configurator')
Gp5	1, 2	What is the fastest retransmission time Is it fixed or configurable	Approx. 10 ms Configurable
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 = 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?	Y

8 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 a ethernet switch and shall not be checked the simulation flag shall always be checked (Ed2) the ndsCom shall always be checked (Ed2)	Y destination MAC address Y APPID N gocbRef Y timeAllowedtoLive Y datSet Y goID N t N stNum N sqNum Y simulation/test Y confRev Y ndsCom N numDatSetEntries (After successful subscription, DUT checks the numDatSetEntries and invalid the first GOOSE with different numDatSetEntries) Y 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)	a) message does not arrive prior to TAL TAL = (2 * (time to next message)) + ('Minimum Cycle Time' parameter). A 'GOOSE IED Absent' alarm is raised by the IED.
Gs3	1, 2	What is the behaviour when one or more subscribed GOOSE messages isn't received or syntactically incorrect (missing GOOSE)	If one subscribed message is not received or is syntactically incorrect, it is ignored. (If the next message is also not received or is syntactically incorrect, the TAL will be exceeded.)
Gs4	1, 2	What is the behaviour when a subscribed GOOSE message is out-of-order	It is processed as if it were in order.
Gs5	1, 2	What is the behaviour when a subscribed GOOSE message is duplicated	It is processed as if it were in order.
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	SPS DPS
Gs9	1, 2	Are subscribed GOOSE with test=T (Ed1)/ simulation=T (Ed2) accepted in test/simulation mode	Y
Gs10	1, 2	Max number of dataset members	No count limitation. User can configure dataset members up to maximum limit GOOSE packet can hold. The capacity of Goose Packet is indicated in IED Configurator.
Gs11	1	Is Fixed-length encoded GOOSE supported	Y
Gs12	2	Is IEC 62351-6 security supported	N

9 PIXIT FOR CONTROL MODEL

ID	Ed	Description	Value/Clarification
Ct1	-	What control models are supported (compare PICS)	Deprecated
Ct2	1, 2	Is the control model fixed, configurable and/or dynamic	Configurable
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	Deprecated
Ct4	-	Is “operate-many” supported (compare sboClass)	Deprecated
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)	N
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	What is the behaviour of the DUT when the check conditions are set Is this behaviour fixed, configurable, online changeable	N synchrocheck Y interlock-check DUT uses the check value to perform the check Fixed
Ct9	1, 2	Which additional cause diagnosis are supported	Y Unknown Y Not-supported Y Blocked-by-switching-hierarchy Y Select-failed Y Invalid-position Y Position-reached N Parameter-change-in-execution (Ed1) N Step-limit Y Blocked-by-Mode N Blocked-by-process Y Blocked-by-interlocking N Blocked-by-synchrocheck Y Command-already-in-execution N Blocked-by-health Y 1-of-n-control N Abortion-by-cancel N Time-limit-over N Abortion-by-trip Y Object-not-selected Edition 2 specific values: Y 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 Y Inconsistent-parameters Y Locked-by-other-client N Parameter-change-in-execution (Ed2 semantics)

ID	Ed	Description	Value/Clarification
Ct10	1, 2	How to force a “test-not-ok” respond with SelectWithValue request	1. Send an invalid orCat value 2. Select control object twice 3. Select an operating control object 4. Send a SelectWithValue with a value the same as the current Data Objects stVal Note: This list is not exhaustive.
Ct11	1, 2	How to force a “test-not-ok” respond with Select request	Select request only returns ReadResponse+ with: The selected control object name for a successful operation An empty/null string for a failed select request
Ct12	1, 2	How to force a “test-not-ok” respond with Operate request	1. Blocked by mode checking 2. Select more than 1 control object (fail on control uniqueness checks) 3. Send an invalid orCat value 4. Attempt to operate an already operating control object 5. Select control object from Client A, operate same control object from Client B. 6. For SBO/SBOw, do not select the control object prior to sending the operate request 7. For SBO/SBOw, ensure data in operate request is different to that sent in the select request 8. Send an operate request with a value the same as the current Data Objects stVal Note: This list is not exhaustive.
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 Internally the IED supports: Process From external clients: All categories supported (the IED simply records the given category so long as it is within the valid range).
Ct14	1, 2	What happens if the orCat value is not supported or invalid	IED returns AddCause ‘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: N SBOns: N DOes: N SBOes: N Configurable N AddCause = ‘Position-reached’ with MMS AccessResult = ‘object-access-denied’
Ct16	1	Does the IED accept a select/operate on the same control object from 2 different clients at the same time	DOns: N SBOns: N DOes: N SBOes: N
Ct17	1	Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (Tissue #334)	SBOns: N SBOes: N
Ct18	1, 2	Is for SBOes the internal validation performed during the SelectWithValue and/or Operate step	SelectWithValue and Operate

ID	Ed	Description	Value/Clarification
Ct19	-	Can a control operation be blocked by Mod=Off or [On-]Blocked (Compare PIXIT-Sr5)	Deprecated (ThmPTTR1.MTRRs only)
Ct20	1, 2	Does the IED support local/remote operation	Y for CB control only.
Ct21	1, 2	Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security	SBOns: Y DOns: Y
Ct22	2	How to force a “parameter-change-in-execution”	SBOns: Not supported SBOes: Not supported
Ct23	1,2	How many SBOns/SBOes control objects can be selected at the same time?	SBOns: n = 1 SBOes: n = 1
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?	Y (CB)
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 point (if any) with a finite operate timeout specify the timeout (in milliseconds)	Control/XCBR.Pos, 2000 ms
Ct27	2	Does the IED support control objects with external signals?	DOns: Y SBOns: Y DOes: Y SBOes: Y
Ct28		Deprecated	

10 PIXIT FOR TIME SYNCHRONISATION MODEL

ID	Ed	Description	Value/Clarification
Tm1	1	What time quality bits are supported (may be set by the IED)	N LeapSecondsKnown N ClockFailure Y ClockNotSynchronized
Tm2	1, 2	Describe the behaviour when the time server(s) ceases to respond What is the time server lost detection time	If no configured external SNTP server responds within 5 seconds, the 'ClockNotSynchronized' bit will be set to 1. PTP: 2 seconds.
Tm3	1, 2	How long does it take to take over the new time from time server	If configured external SNTP server responds within 5 seconds, the 'ClockNotSynchronized' bit will be set to 0. PTP: 2 seconds
Tm4	1, 2	When is the time quality bit "ClockFailure" set	Never set
Tm5	1, 2	When is the time quality bit "Clock not Synchronized" set	The 'Clock not synchronized' bit at power-up has a default status of not synchronized (set to 1). When the clock becomes synchronized, the bit will be reset to 0. All available time synchronization sources will affect the 'Clock not synchronized' bit. These time sources include SNTP and, where applicable, IRIG-B, PTP.
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	Y Leap indicator not equal to 3 Y Mode is equal to SERVER N Originate Timestamp 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/or 4 Y other (describe)
Tm9	1, 2	Do the COMTRADE files have local time or UTC time and is this configurable	Local Not Configurable

11 PIXIT FOR FILE TRANSFER MODEL

ID	Ed	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	Device Root/ COMTRADE/ dr/ dr_unextracted/ Files (*.cfg and *.dat) according to the COMTRADE standard ASCII format. /COMTRADE/ and /dr_unextracted/ Not Zipped
Ft2	1, 2	Directory names are separated from the file name by	"/" The use of "\" directory separator will return a positive result to the file transfer MMS service requests but with no data elements (directory or filenames).
Ft3	1	The maximum file name size including path (recommended 64 chars)	255 chars
Ft4	1, 2	Are directory/file name case sensitive	Case sensitive
Ft5	1, 2	Maximum file size for SetFile	Not supported for SetFile
Ft6	1	Is the requested file path included in the MMS fileDirectory respond file name	Y (Ed2: always complete path)
Ft7	1	Is the wild char supported MMS fileDirectory request	Yes, wild card = * No
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	.cfg and .dat files Only from /dr_unextracted/ Once the .cfg or .dat file is deleted, the paired .dat or .cfg file will be automatically removed.

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