

**Protocol Implementation eXtra Information for Testing (PIXIT)
for the IEC 61850 Client interface in MVI56E-61850C**

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Introduction

This document specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in the client system: “MVI56E-61850C” with version 1.01.022, further referred to as “client”.

Together with the PICS and the MICS the PIXIT forms the basis for a conformance test according to IEC 61850-10.

The following chapters specify the PIXIT for each applicable ACSI service model as structured in IEC 61850-10 and the “Conformance Test Procedures for Client System with IEC 61850-8-1 interface”.

Legend: “NS” = “Not Supported”

PIXIT for Configuration

ID	Ed	Description	Value / Clarification
Cf1	1,2	Describe how the client handles nameplate configuration revision mismatches	Ignores, does not verify
Cf2	1,2	Describe how the client handles report control block configuration revision mismatches	Fail report subscription

PIXIT for Association model

ID	Ed	Description	Value / Clarification
As1	1,2	Guaranteed number of servers that can set-up an association simultaneously (one association per server)	40
As2	1,2	Lost connection detection time range (default range of TCP_KEEPAIVE is 1 – 20 seconds)	12-15 seconds
As3	1,2	Describe the behavior when association fails	Retry after 0.1 or 2.0 or 5.0 seconds, dep on nature of failure
As4	3	Is authentication supported	Yes
As5	1,2	What is the maximum and minimum MMS PDU size	Max 120000 Min none
As6	1,2	What is the typical startup time after a power supply interrupt	60 s
As7	1,2	How does the client disconnect from the server?	Normally does not disconnect; necessary disconnections use “conclude”, which on failure falls back to “abort”, e.g. when recovering in prep for association retry

PIXIT for Server model

ID	Ed	Description	Value / Clarification
Sr1	1,2	Maximum object identification length	129 octets: <64>/<64>
Sr2	1,2	Does client support auto description	N
Sr3	1,2	Describe how to view data values	Tag Monitor or Studio 5000 Logix Designer (of data polled/received)
Sr4	1,2	What analogue value (MX) quality bits are used in the client	See client MICS
Sr5	1,2	Which status value (ST) quality bits are used in the client	See client MICS
Sr6	1,2	Describe how to view/display quality values	Tag Monitor or Studio 5000 Logix Designer (of data polled/received)
Sr7	1,2	Describe how to force a SetDataValues request	Map a writable point ("command")
Sr8	1,2	Describe how to force a GetDataValues request	Map a readable point ("command")
Sr9	1,2	Describe how to force a GetAllDataValues request	NS
Sr10	1,2	Does the client support writing blkEna values?	N
Sr11	1,2	Describe how the client behaves in case of: <ul style="list-style-type: none"> - GetDataDefinition response- - GetDataDefinition response+ with more or less attributes as expected - GetLogicalDeviceDirectory response- - GetAllDataValues response- - GetAllDataValues response+ with more or less attributes as expected - GetDataValues response- - GetDataValues response+ with more or less attributes as expected - SetDataValues response- 	<ul style="list-style-type: none"> - Fail subscribe report/GOOSE or schedule MMS command - See item Ds4: its FCDA behaviour also applies to MMS polls. - NS - NS - NS - Fail the read operation - A poll of a single DO (or DA) with a different number of leaf attributes than expected fails completely (no update of client database for any attribute). - Fail the write (control) operation
Sr12	1,2	Which time quality attributes from the server are used in the client	See client MICS
Sr13	1,2	Describe how to view time quality attributes	Review network packet capture with third party software.

PIXIT for Data set model

ID	Ed	Description	Value / Clarification
Ds1	1,2	Describe how to force a GetDataSetValues request	NS
Ds2	1,2	Describe how to force a SetDataSetValues request	NS
Ds3	1,2	Describe how to force a DeleteDataSet request	NS
Ds4	1,2	<p>Describe how the client handles following dataset mismatches between the SCL and the data sets exposed via MMS:</p> <ul style="list-style-type: none"> (1) new dataset element (2) missing dataset element (3) Reordered dataset members in a dataset of a different data type (4) Reordered dataset members in a dataset of the same data type 	<p>For reports: Upon subscription, client issues GetDataSetDirectory and associates one-by-one, by data element name, server FCDA's with FCDA's configured from SCL, which association may fail. Then, each reported FCDA deposits its data into its associated client database element if it exists, else FCDA is discarded. Types of database elements underlying each FCDA association must match between server and SCL; else, depending on the severity of the mismatch, data for that FCDA could be (a) transferred correctly (e.g. basic type Vstring32 to Vstring64), or (b) misinterpreted (e.g. basic type INT32 to FLOAT32), or (c) completely ignored (e.g. structure change that alters the total count of basic types); each FCDA is managed independently. Specific points:</p> <ul style="list-style-type: none"> -(1): New FCD ignored, others processed correctly -(2): Other FCDs processed correctly -(3), (4): FCD reordering is not significant, all FCDs processed correctly --: All above statements expect FCD of same name in both datasets to have same type in both.

ID	Ed	Description	Value / Clarification
Ds5	1,2	Describe how the client behaves in case of: <ul style="list-style-type: none"> - GetLogicalNodeDirectory(DATA-SET) response- - GetDataSetDirectory response- - GetDataSetValues response- - SetDataSetValues response- 	<ul style="list-style-type: none"> - NS - Fails to subscribe report (temporary; retry in 60s) (the only place this service is used) - NS - NS
Ds6	1,2	Maximum name length for dataset Maximum name length for dataset member, including LD and FC	<64/16\$32> <64/61+3>
Ds11	1,2	Describe how to force a CreateDataSet request <ul style="list-style-type: none"> - non-persistent - persistent 	NS
Ds12	1,2	Describe how to force a DeleteDataSet request <ul style="list-style-type: none"> - non-persistent - persistent 	NS
Ds13	1,2	Describe how the client behaves in case of: <ul style="list-style-type: none"> - CreateDataSet response- - DeleteDataSet response- 	NS

PIXIT for Reporting model

ID	Ed	Description	Value / Clarification
Rp1	1,2	Does the client search for RCB in all logical nodes? If not, specify the logical nodes	Client does not search; configurator selects from imported CIDs; all are available
Rp2	1,2	Which dynamic RCB attributes are/can be configured by the client	RptID N DataSet N Optional fields Y Trigger conditions Y Buffer time Y Integrity period Y “optFlds” sets all but “data-reference”; other three each confirms its SCL setting. Written only if SCL ReportSettings is “Dyn”, which settings are not available from the server.
Rp3	1,2	Does the client supports IED's with indexed and non-indexed report control blocks (RCB)	BRCB indexed Y BRCB not indexed Y URCB indexed Y URCB not indexed Y See “Rp9” below.
Rp4	1,2	The supported trigger conditions are	integrity Y data change Y quality change Y data update Y general interrogation Y

ID	Ed	Description	Value / Clarification
Rp5	1,2	The minimum required optional fields are	sequence-number N report-time-stamp N reason-for-inclusion N data-set-name N data-reference N buffer-overflow N entryID Y confRev N All options except data-reference are requested by the client during the subscription sequence and cannot be changed by the user.
Rp6	1,2	Does the client support segmented reports	Y <mandatory>
Rp7	1	Does the client support pre-assigned RCB	Y <mandatory for non-test equipment Ed2 part 6 9.3.8> TISSUE #1276
Rp8	1,2	Does the client support reported data set containing structured data objects or data attributes?	reporting of data objects Y reporting of data attributes Y
Rp9	1,2	Describe how the client does respond when an previously used URCB is reserved by another client for: <ul style="list-style-type: none"> Indexed URCB with max>1 configured in SCL (static reporting) Indexed URCB with max=1 configured in SCL (static reporting) URCB not configured in SCL (dynamic reporting) 	In all cases: (1) Dynamic RCBs are NS; (2) Configuration Manager SW bursts any indexed RCBs of SCL into separate instances to appear as non-indexed but suffixed RCBs; (3) User chooses RCB(s) to be mapped; (4) Client attempts to subscribe, and if failure is deemed (a) permanent (e.g. mismatched confRev) disables subscription until reconfiguration, or (b) temporary (e.g. subscribed by other) retries subscription after 1m (=60s).
Rp10	1,2	Describe how the client does respond when an previously used BRCB is reserved by another client for: <ul style="list-style-type: none"> Indexed BRCB with max>1 configured in SCL (static reporting) Indexed BRCB with max=1 configured in SCL (static reporting) BRCB not configured in SCL (dynamic reporting) 	Same as URCB ("Rp9" above).
Rp11	1,2	Describe how the client does respond on a SetBRCBValues(EntryID) respond-	Ignores error (assumes "value-inappropriate"), then subsequent SetBRCBValues(RptEna) starts rpt transmission from EntryID 0

ID	Ed	Description	Value / Clarification
Rp12	1,2	Describe how the client does respond when a report has an unknown: dataset, RptID, unexpected number of dataset entries, and/or unexpected data type format entries	Dataset ref: Enable subscription; deal with server's dataset per item Ds4. RptID: Fail to recognize reported packet (no data update). Dataset structure: see item Ds4
Rp13	1,2	Describe how the client detects reporting configuration changes (mismatches). Does it check the "configuration revision" attributes and/or does it check the dataset members? Is the dataset update done online or offline?	Check ConfRev: Y, at subscription. Check dataset members: Y, but not if confRev check fails. See items Rp9 and Ds4.
Rp14	1,2	Describe how to force the client to change the RCB buffer time	Using a separate method change server's bufTime to differ from SCL value presented to Configuration Manager; configure our client to subscribe to the report; start client and verify bufTime reset to SCL value.
Rp15	1,2	Does client set server TrgOps.GI prior to first issuance of GI command?	Y, if configured in SCL.
Rp16	1,2	Describe how to force the client to send the GI request	Subscribe to the report; successful subscription issues initial GI.
Rp17	1,2	Describe how to force the client to enable a RCB	Configure the report subscription, start the client.
Rp18	1,2	Describe how the client does respond when a report control block is renamed or deleted <ul style="list-style-type: none"> - Does it prevent reading the deleted RCB - If it reads the missing RCB, how does it handle the GetURCBValues or GetBRCBValues response- 	<ul style="list-style-type: none"> - No - Fail subscription (permanent; confRev failure); see item Rp9
Rp19	1,2	Describe how the client behaves in case of: <ul style="list-style-type: none"> - SetURCBValues response- - Unsupported optional fields - Unsupported trigger condition(s) 	In all cases, fail to subscribe (temporary; retry after 60s); see item Rp9
Rp20	1,2	Describe how the client behaves in case of: <ul style="list-style-type: none"> - Buffer overflow 	Ignored.
Rp21	1,2	Describe how to force the client to send SetBRCBValues request for <ul style="list-style-type: none"> - EntryID - PurgeBuf 	See also item Rp11. <ul style="list-style-type: none"> - Interrupt BRCB subscription & let client resubscribe - No direct support, only as consequence of other action
Rp22	1,2	Does the client support writing resvTms	N
Rp23	2	Does the client support reading owner	N
Rp24	2	Does the device function only as test equipment?	N

PIXIT for GOOSE control block model

ID	Ed	Description	Value / Clarification
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PIXIT for Control model

ID	Ed	Description	Value / Clarification
Ctl1	1,2	What control modes are supported	Y status-only; "CO"-constrained data elements are not offered for writing Y direct-with-normal-security Y sbo-with-normal-security Y direct-with-enhanced-security Y sbo-with-enhanced-security
Ctl2	1,2	Is Time activated operate (operTm) supported	N
Ctl3	1,2	Is "operate-many" supported	N
Ctl4	1,2	Can the client set the test flag?	Y
Ctl5	1,2	What check conditions can be set	Y synchrocheck Y interlock-check
Ctl6	1,2	Which originator categories are supported and what is the originator identification?	All categories supported; originator ID chosen by user.
Ctl7	1,2	Describe if and how the client sets/increments the ctlNum	Edit the value of the corresponding Tag in the ControlLogix database, include ladder to deliver the Oper structure to the backplane connection object.
Ctl8	1,2	What does the client do when it receives a LastApplicationError and describe how to view the additional cause?	Mark command as "failed"; view addCause via network packet sniffer
Ctl9	1,2	What does the client do when its receives a Select, SelectWithValue or Operate respond negative ?	Mark command as "failed", with MMS error code.
Ctl10	1,2	Can the client change the control model via online services?	N
Ctl11	1	What does the client when the ctlModel is not initialized in the SCL?	Assumes "direct-normal"
Ctl12	1,2	What does the client when the ctlModel in SCD and in SERVER SIMULATOR is different?	Execute control op according to SCD, which then (often) fails
Ctl13	1,2	Describe how to view a - CommandTermination request+ - CommandTermination request- - TimeActivatedOperateTermination request+ and request-	All via network packet sniffer

PIXIT for Time and time synchronization model

ID	Ed	Description	Value / Clarification
Tm1	1,2	Describe how to view the internal time & quality or how to expose the timestamp and timestamp quality via the IEC 61850 interface	View: Unavailable Expose: e.g. in Operate request (view with a packet sniffer)
Tm2	1,2	What time quality bits are supported	Y LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized
Tm3	1,2	What is the behavior when the time synchronization signal/messages are lost	Set "ClockNotSynchronized"
Tm4	1,2	When is the quality bit "Clock failure" set?	Fail to get time-of-day from OS kernel (OS source) <or> seconds-of-epoch = 0 (other source)
Tm5	1	When is the quality bit "Clock not synchronized" set?	Mandatory for Ed2 in case connection to time master is lost