



# IEC 61850 Client PIXIT

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The last revision of the technical content accommodates changes in PcVue 15.1.3. Unless otherwise stated, this document is valid for releases made publicly available since.

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# Authorization

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# 1 Introduction

This document specifies the Protocol Implementation eXtra Information for Testing (PIXIT) of the CimWay built-in driver for IEC 61850, further referred to as “the Client”.

Together with the PICS, MICS and TICS, the PIXIT forms the basis for conformance testing 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”.

The following documents are available separately:

- The Protocol Implementation Conformance Statement (PICS),
- The Protocol Implementation eXtra Information for Testing (PIXIT),
- The Model Implementation Conformance Statement (MICS),
- The Tissues Implementation Conformance Statement (TICS).

## 1.1 Glossary

Apart from the IEC 61850 terminology for which basic knowledge is assumed, this document makes use of the following terms related to CimWay or PcVue. While they will sound familiar to users of ARC Informatique’s products, a definition is given here to avoid confusion.

### **Network item**

Also referred to as Network configuration item.

Represents and provides access to the physical connection to a network of IEC 61850 devices.

### **Device item**

Also referred to as Device configuration item.

Represents and provides access to an IEC 61850 physical device.

### **Group**

Represents and provides access to a subset of data – Data Objects and/or Data Attributes – available in an IEC 61850 server.

3 types of groups exist: Report groups, Dataset groups and Data groups, each making use of a particular data exchange mechanism.

### **Variable**

Represents and provide access to a particular data in general, and an IEC 61850 data in particular.

A variable has configuration properties, including mapping information to an IEC 61850 DO or DA (Network, Device, LD, LN, CDC/DO or DA).

At runtime, it holds a value, a timestamp and a quality (among other properties).

Variables are also used to support commands and controls.

### **Data acquisition server and server association**

A data acquisition server is a computer where PcVue is installed and acts as an IEC 61850 client, exchanging data with IEC 61850 servers over one or more networks.

Data acquisition server redundancy is based on “associations of PcVue server stations”, often referred to as “clusters of servers”.

Such an association of servers for data acquisition redundancy is not to be confused with an association

to an IEC 61850 server that is, 61850 speaking, the process of connecting an IEC 61850 client to an IEC 61850 server.

### Client diagnostic traces

Apart from data logging and archiving (not discussed here), the Client is able to log diagnostic messages.

By activating specific levels of traces, more detailed messages (information, warnings and errors) may be logged, which is particularly useful for diagnostics during development, testing, commissioning and maintenance phases.

Such traces are easily accessible via the well-known "Event viewer". They are also stored in files for preventive and post-mortem analysis.

## 1.2 Reference documentation

The online help is worth reading for more advanced explanation, in particular for more information on:

- Licensing,
- Configuration,
- Runtime data handling,
- Diagnostics.

## 2 PIXIT for Configuration

**Table 1 – PIXIT for Configuration**

Id	Ed	Description	Value / Clarification
Cf1	1,2	Describe how the client handles nameplate configuration revision mismatches	<p>Cyclically, the nameplate configuration revision is read. If there is a difference between the last read value and the previous one, the association with the device is released, a new association is done and the configuration of the device is reread.</p> <p>In this case, a warning is logged in the client diagnostic traces and the new configuration revision value is taken into account as the new reference.</p> <p>Note that the period of the nameplate configuration revision is configurable and the default period is 5 seconds.</p>

Id	Ed	Description	Value / Clarification
Cf2	1,2	Describe how the client handles report control block configuration revision mismatches	<p>When a report control block configuration revision mismatch is detected, the association with the device is released, a new association is done and the configuration of the device is reread.</p> <p>A warning is logged in the client diagnostic traces and the received revision value is taken into account as the new reference confRev for later data exchanges.</p> <p><u>Note:</u> This does not affect data exchange consistency because RCB handling supports the transmission of data names in reports. Measures are taken at the time of receiving reports if inconsistencies in data names are detected.</p>

### 3 PIXIT for Association model

**Table 2 – 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)	Tested with up to 250 associations. Performance in general and maximum number of associations in particular are mainly limited by system resources availability.
As2	1,2	Lost connection detection time range (default range of TCP_KEEPALIVE is 1 – 20 seconds)	TCP_KEEPALIVE: 5 seconds Not configurable
As3	1,2	Describe the behavior when association fails	An attempt to re-connect is performed cyclically. Configurable from 1 second to 10 minutes Defaults to 5 seconds
As4	3	Is authentication supported	<b>Yes</b>
As5	1,2	What is the maximum and minimum MMS PDU size	Max MMS PDU size: 65 000 bytes Min MMS PDU size: The Client does not impose a minimum MMS PDU size. One or more services may not be usable if a server device constrains PDU size.
As6	1,2	What is the typical startup time after a power supply interrupt	Depends on the project configuration, computer and network set-up. May range from a few seconds to several minutes.
As7	1,2	How does the client disconnect from the server?	The Release service is used.

**Table 3 – PIXIT for Association model – Additional items**

Description	Value / Clarification
How does the client behave in case of a lost connection with (one of) the associated servers?	<p>An error is logged in the Client diagnostic traces.</p> <p>System variables allow application-specific processing to react in a way defined by the application designer (such as trigger an alarm for the operators, hot-standby data acquisition server switch...)</p> <p>All variables mapped on this server are set invalid (NS COM). The Client tries to reconnect to the server device automatically.</p> <p>Losing an association to a server device does not affect associations with other servers.</p>
How does the client behave when a server denies an Association request by the client?	<p>An error is logged in the Client diagnostic traces.</p> <p>System variables allow application-specific processing to react in a way defined by the application designer (such as trigger an alarm for the operators, hot-standby data acquisition server switch...)</p> <p>All variables mapped on this server are set invalid (NS COM). The Client tries to reconnect to the server device automatically.</p> <p>Losing an association to a server device does not affect associations with other servers.</p>
Does the client automatically reconnect to the configured servers after startup (Automatic statup)?	<p><b>Yes</b></p> <p>The startup of the operating system can be configured to launch the SCADA on a specific project automatically.</p>
Do standby data acquisition servers associate to server devices ?	<p><b>Yes</b>, if the Network setting Redundancy mode is set to Warm mode and the data acquisition belongs to a multiple active server association. In this case a standby server maintains connections to server devices, with RCBs enabled. Using this capability requires configuring redundant reports.</p> <p><b>No</b>, if the Network setting Redundancy mode is set to Cold mode or if the data acquisition belongs to a single active server association. In this case a standby server does not maintain connections to server devices. Using this configuration does not require configuring redundant reports, but depending on the exact behavior of the server devices, a data acquisition server may fail to enable a report upon switching active. In particular for devices supporting the RsvTm attribute, a delay of 1 min (in general) occurs before a report can be enabled. The use of the Cold mode is not recommended.</p>



## 4 PIXIT for Server model

**Table 4 – 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 autodescription	<b>Yes</b> , the driver includes online browsing mechanisms that can be used at configuration time: <ul style="list-style-type: none"> <li>- List of Datasets and RCBs to set up data groups,</li> <li>- Full hierarchical browsing - LDs, LNs, DOs, DAs – to easily map variables to IEC 61850 object/data.</li> </ul>
Sr3	1,2	Describe how to view data values	The mapping dialog can used to view data even if no variable is mapped. The value of data mapped on variables can be viewed with the Application Explorer or the variable selector.
Sr4	1,2	What analogue value (MX) quality bits are used in the client	<b>Yes</b> Good <b>Yes</b> Invalid <b>Yes</b> Reserved <b>Yes</b> Questionable <b>Yes</b> Overflow <b>Yes</b> OutofRange <b>Yes</b> BadReference <b>Yes</b> Oscillatory <b>Yes</b> Failure <b>Yes</b> OldData <b>Yes</b> Inconsistent <b>Yes</b> Inaccurate <b>Yes</b> Process <b>Yes</b> Substituted <b>Yes</b> Test <b>Yes</b> OperatorBlocked

Id	Ed	Description	Value / Clarification
Sr5	1,2	Which status value (ST) quality bits are used in the client	<b>Yes</b> Good <b>Yes</b> Invalid <b>Yes</b> Reserved <b>Yes</b> Questionable <b>Yes</b> BadReference <b>Yes</b> Oscillatory <b>Yes</b> Failure <b>Yes</b> OldData <b>Yes</b> Inconsistent <b>Yes</b> Inaccurate <b>Yes</b> Process <b>Yes</b> Substituted <b>Yes</b> Test <b>Yes</b> OperatorBlocked
Sr6	1,2	Describe how to view/display quality values	<p>An information is logged in the Client diagnostic traces if the quality is configured to be processed as <i>Invalid</i>.</p> <p>The IEC 61850 quality can be stored in variable extended attributes for further application-specific processing.</p>
Sr7	1,2	Describe how to force a SetDataValues request	<p>Map a variable on a writable DA.</p> <p>Set the variable value via a command animation.</p>
Sr8	1,2	Describe how to force a GetDataValues request	<p>From the Mapping dialog box, right-click in an empty area and click the Read command.</p> <p>Alternatively, variables mapped onto a group of type Datagroup are refreshed cyclically by calling the GetDataValues service.</p>
Sr9	1,2	Describe how to force a GetAllDataValues request	Not applicable
Sr10	1,2	Does the client support writing blkEna values?	<b>Yes</b>

Id	Ed	Description	Value / Clarification
Sr11	1,2	<p>Describe how the client behaves in case of:</p> <ul style="list-style-type: none"> <li>- GetDataDefinition response-</li> <li>- GetDataValues response-</li> <li>- GetDataDefinition response+ with more or less attributes as expected</li> <li>- GetLogicalDeviceDirectory response-</li> <li>- GetAllDataValues response-</li> <li>- GetAllDataValues response+ with more or less attributes as expected</li> <li>- SetDataValues response-</li> </ul>	<p>A warning is logged in the Client diagnostic traces.</p> <p>When a GetDataDefinition response- is received, up to 4 attempts are done. New data attributes found in a GetDataDefinition do not affect i.e. SUT behaves as normally.</p> <p>When a GetDataValues response- is received, the polling continues with the same polling period as defined. The quality of variables mapped on the IEC 61850 object is set invalid (NS COM).</p> <p>When a GetDataDefinition response+ is received with more or less attributes as expected, the connection is released, a new association is done and the configuration is reread (as for the detection of a configuration change).</p> <p>When a GetLogicalDeviceDirectory response- is received, up to 4 attempts are done.</p> <p>GetAllDataValues: Not applicable</p> <p>When a SetDataValues response- is received, in addition to the warning related to the negative service response, an additional error related to the unsuccessful command is logged in the client diagnostic traces.</p>
Sr12	1,2	Which time quality attributes from the server are used in the client	<p><b>No</b> Leap Second Known, <b>Yes</b> ClockFailure <b>Yes</b> Clock not synchronized <b>Yes</b> Accuracy</p>
Sr13	1,2	Describe how to view time quality attributes	The time quality can be stored in the variable text extended attribute.

## 5 PIXIT for Data set model

**Table 5 – PIXIT for Data set model**

<b>Id</b>	<b>Ed</b>	<b>Description</b>	<b>Value / Clarification</b>
Ds1	1,2	Describe how to force a GetDataSetValues request	A periodic call to the GetDataSetValues service is performed for each group of data of type <i>Dataset group</i> . At least one variable must be mapped on the data group for the service to be called.
Ds2	1,2	Describe how to force a SetDataSetValues request	Not applicable
Ds3	1,2	Describe how to force a DeletaDataSet request	Not applicable
Ds4	1,2	Describe how the client handles following dataset mismatches between the SCL and the data sets exposed via MMS: (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	When a mismatch between SCL and dataset exposed by MMS is detected, the association with the device is released, a new association is done and the configuration of the device is reread.  In this case, a warning is logged in the client diagnostic traces.

Id	Ed	Description	Value / Clarification
		<p>Describe how the client behaves in case of:</p> <ul style="list-style-type: none"> <li>- GetLogicalNodeDirectory (DATA-SET) response-</li> <li>- GetDataSetDirectory response-</li> <li>- GetDataSetValues response-</li> <li>- SetDataSetValues response-</li> </ul>	<p>A warning is logged in the Client diagnostic traces.</p> <p>Note about GetLogicalNodeDirectory: GetLogicalNodeDirectory(DATA-SET) is requested by SUT only after association. 1/ It isn't possible to request GetLogicalNodeDirectory(DATA-SET) on inexistent logical device of the server since the list of Logical devices are read by SUT after each association 2/ Newly declared Dataset in the server are detected after association by SUT and are available immediately in the configuration of the SUT. In case a GetLogicalNodeDirectory response- is received, for example due to a dataset or a logical device having been renamed in the IED, the connection is released, a new association is done and the configuration is reread.</p> <p>Note about GetDataSetDirectory: This service is used at runtime. Upon reception of a GetDataSetDirectory response-, the data acquisition server aborts the association to the server device.</p> <p>Note about GetDataSetValues When a GetDataSetValues response- is received, the quality of variables mapped on the IEC 61850 object is set invalid (NS COM) and the polling continues with the same polling period as defined.</p> <p>In normal case, GetDataSetValues response contains dataset members as defined and ordered by GetDataSetDirectory response+. As the GetDataSetDirectory is called at each association with the device, no deviation should occur. In case deviations such as 'new dataset element', 'missing dataset element' or 'reordered dataset members of a different data type' are detected, the connection is released, a new association is done and the configuration is reread. In case a deviation such as 'reordered dataset members of the same data type', SUT does not detect anything and the data acquisition continues.</p> <p>Note about SetDataSetValues : Not applicable, the service is not supported</p>
Ds6	1,2	<p>Maximum name length for dataset</p> <p>Maximum name length for dataset member, including LD and FC</p>	<p>&lt;64/16\$32&gt;</p> <p>&lt;64/61+3&gt;</p>

Id	Ed	Description	Value / Clarification
Ds1 1	1,2	Describe how to force a CreateDataSet request - non-persistent - persistent	Not applicable
Ds1 2	1,2	Describe how to force a DeleteDataSet request - non-persistent - persistent	Not applicable
Ds1 3	1,2	Describe how the client behaves in case of: - CreateDataSetDirectory response- - DeleteDataSet response-	Not applicable

## 6 PIXIT for Substitution model

**Table 6 – PIXIT for Substitution model**

Id	Ed	Description	Value / Clarification
Sub1	1,2	Describe how to substitute a value	Not applicable

## 7 PIXIT for Setting group control model

**Table 7 – PIXIT for Setting group control model**

Id	Ed	Description	Value / Clarification
Sg1	1,2	How can the client be forced to send a GetLogicalNodeDirectory(SGCB) request	Not applicable
Sg2	1,2	Describe how to change the active setting group	Not applicable
Sg3	1,2	Describe how to get the actual setting group values	Not applicable
Sg4	1,2	Describe how to edit setting group values	Not applicable
Sg5	1,2	Describe how the client behaves in case of: - GetSGCBValues response- - SelectEditSG response- - SetEditSGValue response- - SelectActiveSG response- - ConfirmEditSGValues response- The configured SG differs from the actual setting group	Not applicable
Sg6		Does the client read the optional ResvTms value?	Not applicable

## 8 PIXIT for Reporting model

**Table 8 – PIXIT for Reporting model**

Id	Ed	Description	Value / Clarification
Rp1	1,2	Does the client search for RCB in all logical nodes? when not specify the logical nodes	<p>No</p> <p>RCBs are searched for in the following logical nodes:</p> <ul style="list-style-type: none"> <li>- LLN0,</li> <li>- Any other logical node having at least a dataset configured.</li> </ul> <p>The RCBs are searched using the GetDataDefinition service.</p>
Rp2	1,2	Which dynamic RCB attributes are/can be configured by the client	<p>Dynamic RCB attributes configuration can be optionnally enabled separately for each of them on the Report group</p> <p>RptID <b>Yes</b> (set by default to the alias of the report in the SUT)</p> <p>DataSet <b>Yes</b></p> <p>Optional fields <b>Yes</b> (set by default to sequence-number, reason-for-inclusion, data-set-name, data-reference, conf-revision)</p> <p>Trigger conditions <b>Yes</b> (set by default to data-change, quality-change, integrity-period, general-integration)</p> <p>Buffer time <b>Yes</b> (set by default to 100 ms)</p> <p>Integrity period <b>Yes</b> (set by default to 0)</p> <p>This is only true and effective if the setting <i>Enable discovery services</i> is enabled. Otherwise, RCB attributes are considered static and not set upon association.</p>
Rp3	1,2	Does the client supports IEDs with indexed and non-indexed report control blocks (RCB)	<p>Buffered RCB indexed <b>Yes</b></p> <p>Buffered RCB not indexed <b>Yes</b></p> <p>Unbuffered RCB indexed <b>Yes</b></p> <p>Unbuffered RCB not indexed <b>Yes</b></p>
Rp4	1,2	The supported trigger conditions are	<p>integrity <b>Yes</b></p> <p>data change <b>Yes</b></p> <p>quality change <b>Yes</b></p> <p>data update <b>Yes</b></p> <p>general interrogation <b>Yes</b></p>

Id	Ed	Description	Value / Clarification
Rp5	1,2	The supported optional fields are	sequence-number <b>Yes</b> report-time-stamp <b>Yes</b> reason-for-inclusion <b>Yes</b> data-set-name <b>Yes</b> data-reference <b>Yes</b> buffer-overflow <b>Yes</b> entryID <b>Yes</b> conf-rev <b>Yes</b>
		The minimum required optional fields are	sequence-number Not required report-time-stamp Not required reason-for-inclusion Not required data-set-name Not required data-reference Not required buffer-overflow Not required entryID Not required conf-rev Not required
Rp6	1,2	Does the client support segmented reports	<b>Yes</b>
Rp7	1	Does the client support pre-assigned RCB	<b>Yes</b> There is no difference in the SUT with pre-assigned or not RCBs.
Rp8	1,2	Does the client support reported data set containing structured data objects or data attributes?	reporting of data objects <b>Yes</b> reporting of data attributes <b>Yes</b>
Rp9	1,2	Describe how the client does respond when a previously used URCB is reserved by another client for: <ul style="list-style-type: none"> <li>- Indexed URCB with max&gt; 1 configured in SCL (static reporting)</li> <li>- Indexed URCB with max=1 configured in SCL (static reporting)</li> <li>- URCB not configured in SCL (dynamic reporting)</li> </ul>	Upon connection, the URCB initialization phase includes an attempt to write the RptEna attribute to False and then to True. If the URCB is already reserved, the attempt fails, and the Client tries to set the RptEna attribute to False on timer, by default every 5 seconds (configurable). Upon first error during this phase, variables are set invalid (NS COM) immediately.
Rp10	1,2	Describe how the client does respond when a previously used BRCB is reserved by another client for: <ul style="list-style-type: none"> <li>• Indexed BRCB with max&gt; 1 configured in SCL (static reporting)</li> <li>• Indexed BRCB with max=1 configured in SCL (static reporting)</li> <li>• BRCB not configured in SCL (dynamic reporting)</li> </ul>	Upon connection, the BRCB initialization phase starts by reading the resvTms attribute and then the BRCB attributes' values. If the BRCB is already reserved, the attempt fails, and the Client tries to set the RptEna attribute to False on timer, by default every 5 seconds (configurable). Upon first error during this phase, variables are set invalid (NS COM) immediately.



Id	Ed	Description	Value / Clarification
Rp11	1,2	Describe how the client does respond on a SetBRCBValues(EntryID) respond-	<p>The client responds by a sequence attempting to:</p> <ol style="list-style-type: none"> <li>1. Purge the buffer</li> <li>2. Configure the report</li> <li>3. Set RptEna to True</li> <li>4. Request for a GI</li> </ol> <p>If an error is returned during this sequence, the report initialization phase is aborted and retried on timer.</p>
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	<ul style="list-style-type: none"> <li>- Unknown Dataset - During the initialization phase: If the Dataset referenced by the RCB does not exist, variables associated to the data group are set invalid (NSCOM), and a warning is logged in the Client diagnostic traces.</li> <li>- Unknown Dataset - During the reporting phase: If the Dataset associated to a report is changed, the client behaves as if the ConfRev had been changed.</li> <li>- Unknown RptID: A warning is logged in the Client diagnostic traces, indicating the unknow RptID, and the connection to the IED is aborted (communication is stopped for the CimWay device item). The communication with the IED can only be resume by a user action or script.</li> <li>- Unexpected number of dataset entries: The client behaves as if the ConfRev had been changed.</li> <li>- Unexpected data type format entries: The client behaves as if the ConfRev had been changed.</li> </ul> <p>Note that in the case of dataset mismatch, if variables are mapped on missing dataset members, they are flagged as NS COM but the other variables of this dataset continue to be monitored normally.</p>
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?	<p>The conf revision value is checked if included in reports. In the case of configuration revision change, the connection is released, a new association is done and the configuration is reread.</p>
Rp14	1,2	Describe how to force the client to change the RCB BufTm	<p>The bufTm attribute value is configurable separately for each data report group.</p>

Id	Ed	Description	Value / Clarification
Rp15	1,2	Does the client set server TrgOps.GI prior to first issuance of GI command?	<b>Yes</b> , if the Trigger option general-interrogation is set in the client configuration for the report and if the setting Enable discovery services is enabled. Otherwise, the Trigger option is not set by the client and no GI command is issued at runtime.
Rp16	1,2	Describe how to force the client to send the GI request	Either stop and restart the Report (or Device or Network) with a Report group having the property <i>Send GI after enable report</i> set., or use the GI command from within the Application Explorer.
Rp17	1,2	Describe how to force the client to enable a RCB	Stop and restart a configured Report group.
Rp18	1,2	Describe how the client does respond when a report control block is renamed or deleted - Does it prevent reading the deleted RCB - If it reads the missing RCB, how does it handle the GetURCBValues or GetBRCBValues response-	When a report control block is renamed or deleted, the client behaves in a way similar to how it behaves upon initial connection if the RCB is defined with an unknown RptID: A warning is logged in the Client diagnostic traces, indicating the unknow RCB, and the connection to the IED is aborted (communication is stopped for the CimWay device item). The communication with the IED can only be resume by a user action or script.
Rp19	1,2	Describe how the client behaves in case of: - SetURCBValues response- - Unsupported optional fields - Unsupported trigger condition(s)	An error or a warning is logged in the Client diagnostic traces. Depending on the considered RCB attribute, a negative response is processed as: - A warning (but data acquisition can be done) or, - An error (too much risks to proceed, the report initialization phase is aborted).  Failing to write one of the following attribute is processed as a warning: - BufTm, - TrgOp, - IntgPd, - OptFlds, - EntryId.  Failing to write one of the following attribute is processed as an error: - RptID (only if the configuration requires setting the RptID), - RptEna, - PurgeBuf, - GI.  All optional fields are supported but not all optional are used. All standard trigger conditions are supported.

Id	Ed	Description	Value / Clarification
Rp20	1,2	Describe how the client behaves in case of: Buffer overflow	The client sets the RptEna attribute to false and issue a report initialization phase (including a purge buffer and a general interrogation). An error is logged in the Client diagnostic traces.
Rp21	1,2	Describe how to force the client to send SetBRCBValues request for - EntryID - PurgeBuf	EntryIDs are tracked by the client, persisted and restored upon re-start. In order to allow IEDs to free-up buffers, the EntryID is written: - Upon report initialization, - On timer (configurable – defaults to 10 sec) - Every n reports (configurable – defaults to 100)  It is also possible to map a commandable variable on the EntryID attribute of the RCB and set it to an arbitrary value.  Buffer is purged when an overflow is detected. Upon reception of a response- while writing an EntryID, SUT assumes that an overflow occurred and the buffer is purged.  It is also possible to map a variable on the PurgeBuf attribute of the RCB and set it to True.
Rp22	1,2	Does the client support writing resvTms	<b>Yes</b>
Rp23	2	Does the client support reading owner	<b>No</b> Reading the Owner attribute is possible but it is not used by the driver for report handling.
Rp24	2	Does the device function only as test equipment?	<b>No</b>

**Table 9 – PIXIT for Reporting model – Additional items**

Description	Value / Clarification																
Recommended optional fields are	<table> <tr><td>sequence-number</td><td><b>Yes</b></td></tr> <tr><td>report-time-stamp</td><td>No</td></tr> <tr><td>reason-for-inclusion</td><td>No</td></tr> <tr><td>data-set-name</td><td><b>Yes</b></td></tr> <tr><td>data-reference</td><td><b>Yes</b></td></tr> <tr><td>buffer-overflow</td><td><b>Yes</b></td></tr> <tr><td>entryID</td><td><b>Yes</b></td></tr> <tr><td>conf-rev</td><td><b>Yes</b></td></tr> </table> <p>For most of these optional fields, not having them in reports lead the Client to a downgraded mode close to URCBs handling.</p>	sequence-number	<b>Yes</b>	report-time-stamp	No	reason-for-inclusion	No	data-set-name	<b>Yes</b>	data-reference	<b>Yes</b>	buffer-overflow	<b>Yes</b>	entryID	<b>Yes</b>	conf-rev	<b>Yes</b>
sequence-number	<b>Yes</b>																
report-time-stamp	No																
reason-for-inclusion	No																
data-set-name	<b>Yes</b>																
data-reference	<b>Yes</b>																
buffer-overflow	<b>Yes</b>																
entryID	<b>Yes</b>																
conf-rev	<b>Yes</b>																

Description	Value / Clarification
Describe how the client responds when it receives a GetXRCBValues.response-	An error is logged in the Client diagnostic traces and the report initialization phase is aborted.
Describe how the client behaves when it encounters an RCB with a different dataset configuration than expected.	The Client behaves as if the ConfRev had been changed: connection is released, a new association is done and the configuration is reread but the dataset is not set to its original value by the SUT.
Describe how the client behaves when it encounters an RCB with a different confRev value than expected.	An error is logged in the Client diagnostic traces, the communication with the IED is stopped and restarted in order to achieve the initialization sequence including a full synchronization of Datasets and RCB attributes.
Describe how the client responds when it sets an EntryID value that is not recognized by the server.	A warning is logged in the Client diagnostic traces and the buffer is purged before enabling reports.
Is there a maximum number of report control blocks that the client can enable?	<p>No maximum number of report control blocks is enforced.</p> <p>The ability to support a large number of enabled RCBs depends on the available computer resources and network infrastructure. They shall be sized according to project requirements in planning phases.</p>

## 9 PIXIT for Logging model

**Table 10 – PIXIT for Logging model**

Id	Ed	Description	Value / Clarification
Lg1	1,2	Does the client search for LCB in all logical nodes? when not specify the logical nodes	Not applicable
Lg2	1,2	Describe how to change LCB attributes	Not applicable
Lg3	1,2	Describe how to force the client to enable a LCB	Not applicable
Lg4	1	Does the client support sending QueryLogByTime and/or QueryLogAfter	Not applicable
Lg5	2	Describe how to force the client to change GLOG settings	Not applicable
Lg6	1,2	Describe how the client behaves in case of: <ul style="list-style-type: none"> <li>- Renamed LCB</li> <li>- Removed LCB</li> <li>- Renamed Logical Device</li> <li>- Renamed LOG</li> </ul>	Not applicable

<b>Id</b>	<b>Ed</b>	<b>Description</b>	<b>Value / Clarification</b>
Lg7	1,2	Describe how the client behaves in case of: <ul style="list-style-type: none"><li>- GetLCBValues response-</li><li>- GetLogStatusValues response-</li><li>- SetLCBValues response-</li></ul>	Not applicable

## 10 PIXIT for Control model

**Table 11 – PIXIT for Control model**

Id	Ed	Description	Value / Clarification
Ctl1	1,2	What control modes are supported	<b>Yes</b> status-only <b>Yes</b> direct-with-normal-security <b>Yes</b> sbo-with-normal-security <b>Yes</b> direct-with-enhanced-security <b>Yes</b> sbo-with-enhanced-security
Ctl2	1,2	Is Time activated operate (operTm) supported	No
Ctl3	1,2	Is "operate-many" supported	No
Ctl4	1,2	Can the client set the test flag?	<b>Yes</b>
Ctl5	1,2	What check conditions can be set	<b>Yes</b> synchro-check <b>Yes</b> interlock-check
Ctl6	1,2	Which originator categories are supported and what is the originator identification?	Originator category and originator identification are configurable (global settings)
Ctl7	1,2	Describe if and how the client sets/increments the ctlNum	The ctlNum is handled internally in the client driver. It is auto incremented with each new control sequence and cannot be set to an arbitrary value (even for test purpose).
Ctl8	1,2	What does the client do when it receives a LastApplicationError and describes how to view the additional cause?	An information is logged in the Client diagnostic traces along with the description.
Ctl9	1,2	What does the client do when it receives a Select, SelectWithValue or Operate respond negative ?	An error is logged in the Client diagnostic traces.
Ctl10	1,2	Can the client change the control model via online services?	Yes, by mapping a variable on the CtlModel data attribute and setting it to the desired value (if supported by the IED).
Ctl11	1	What does the client do when the ctlModel is not initialized in the SCL?	<p>The use of a particular ctlModel for a given command is defined by a property of the corresponding variable. A possible value of this property - Automatic detection - enforces the use of the ctlModel as defined in the device at the time of sending the command.</p> <p>This behavior allows adaptation to the current device configuration, whatever SCL definition was used.</p>

Id	Ed	Description	Value / Clarification
Ctl12	1,2	<p>What does the client do when the ctlModel in SCD and in SERVER SIMULATOR is different?</p>	<p>The behavior depends on several factors related to the variable configuration and the user-specific PcVue project design (scripts in particular).</p> <p>By default, a commandable variable will be configured to detect the control model automatically at configuration time (either online or offline). When sending a command in a generic way for a variable configured in such a way, via a send command animation for example, the control model as expected by the server is used. If the control model is not set to 'Automatic detection', a discrepancy can occur, the control will be refused by the server, and the response- will be dealt with.</p> <p>Independantly from the configuration of the variable and command animations, controls can also be sent by script. Depending on the user-specific script design, it may force the use of a control model that is different from the one expected by the server. In such a case, PcVue tries to send the control, which will be refused by the server, and the response- will be dealt with.</p>
Ctl13	1,2	<p>Describe how to view a</p> <ul style="list-style-type: none"> <li>- CommandTermination request+</li> <li>- CommandTermination request-</li> <li>- TimeActivatedOperateTermination request+ and request-</li> </ul>	<p>About CommandTermination request+:</p> <p>The internal write request corresponding to the command is positively acknowledged.</p> <p>An information can be logged in the Client diagnostic traces along with the description.</p> <p>If the command was started by script, the command status (step and response value - positive or negative) is asynchronously brought back to the script for further application-specific processing.</p> <p>About CommandTermination request-:</p> <p>The internal write request corresponding to the command is negatively acknowledged.</p> <p>A warning is logged in the Client diagnostic traces along with the description.</p> <p>If the command was started by script, the command status (step and response value - positive or negative) is asynchronously brought back to the script for further application-specific processing.</p> <p>About TimeActivatedOperateTermination request+ and request-:</p> <p>Not applicable</p>

**Table 12 – PIXIT for Control model – Additional items**

Description	Value / Clarification
Describe how the client responds when it receives a negative Operate response	Same as for a negative Command Termination reception.
Describe how the client send a cancel command	When executing a command via a script, a dedicated instruction can be used to send a cancel command.
Describe how the client responds when it receives a cancel negative response	<p>The pending internal write request corresponding to the command is negatively acknowledged. A warning is logged in the Client diagnostic traces along with the description.</p> <p>If the command was started by script, the command status (step and response value - positive or negative) is asynchronously brought back to the script for further application-specific processing.</p>

## 11 PIXIT for Time and time synchronisation model

**Table 13 – PIXIT for Time and time synchronisation model**

Id	Ed	Description	Value / Clarification
Tm1	1,2	Described how to view the internal time & quality or how to expose the timestamp and timestamp quality via the IEC 61850 interface	<p>The internal time can be viewed via system variables @DATE &amp; @TIME (low precision). The Client relies on the computer clock system. Therefore any tool supported by the operating system can be used to view, monitor, diagnose and synchronize the reference time.</p> <p>Timestamp and timestamp quality of data are properties attached to variables (as the value...VTQ):</p> <ul style="list-style-type: none"> <li>- The timestamp can be viewed directly in the Application Explorer or any other tool showing VTQs.</li> <li>- Timestamp quality is used to determine the variable status. Its 61850 raw value can only be viewed in diagnostic traces and the interpreted value (Timestamp type) can be monitored in the Application Explorer.</li> </ul>



Id	Ed	Description	Value / Clarification
Tm2	1,2	What time quality bits are supported	<p>Quality bits in response supported by the client :</p> <p><b>No</b> LeapSecondsKnown  <b>Yes</b> ClockFailure  <b>Yes</b> ClockNotSynchronized</p> <p>Quality bits in request supported by the client :</p> <p><b>No</b> LeapSecondsKnown  <b>No</b> ClockFailure  <b>Yes</b> ClockNotSynchronized</p>
Tm3	1,2	What is the behavior when the time synchronization signal/messages are lost	<p>It is up to the system designer to define the strategy and implement the required behavior according to the master clock and time sync issues.</p> <p>Typical behavior consists in raising alarms.</p> <p>It is also up to the system designer to signal to the SUT (using scripts) that the clock is synchronized or not in order to set the ClockNotSynchronized quality bit to the adequate value in requests.</p>
Tm4	1,2	When is the quality bit "ClockFailure" set?	The quality bit "ClockFailure" is never set.
Tm5	1	When is the quality bit "ClockNotSynchronised" set?	It is up to the system designer to signal to the SUT (using scripts) that the clock is synchronized or not in order to set the ClockNotSynchronized quality bit to the adequate value in requests.

**Table 14 – PIXIT for Time and time synchronisation model – Additional items**

Description	Value / Clarification
What happens upon reception of a data with quality bit "ClockFailure" or "ClockNotSynchronised" set?	The TS Type property of the corresponding variable is set to <i>PLC ?</i> indicating the fact that the variable timestamp comes from a device, but is considered as "suspect".

## 12 PIXIT for File transfer model

**Table 15 – PIXIT for File transfer model**

Id	Ed	Description	Value / Clarification
Ft1	1,2	Describe when or how to force the client to request GetServerDirectory(FILE) and what it does with the responded filenames	<p>Select an IEC 61850 device in the Application Explorer and click the task File transfer helper.</p> <p>A dialog box opens, the GetServerDirectory service is called to retrieve the list of files available in the IED and show them to the user.</p>
Ft2	1,2	Does the client uses a wildcard in the GetServerDirectory(FILE) request	<b>No</b>

Id	Ed	Description	Value / Clarification
Ft3	1,2	Does the client support IED's that include the path in the file name in the GetServerDirectory(FILE) respond?	<b>Yes</b> path included <b>No</b> path not included
Ft4	1,2	Does the client support IED's that use the file separator	<b>Yes</b> "/" <b>Yes</b> "\"
Ft5	1,2	What is the maximum file name size including path	259 characters
Ft6	1,2	Can the client read a file with size 0	<b>Yes</b>
Ft7	1,2	Are directory/file names case sensitive	Case sensitive
Ft8	1,2	Maximum file size	1 000 MB
Ft9	1,2	Describe how the client behaves in case of: - GetFile response- - GetFileAttributes response- - SetFile response-	- GetFile response- An error is logged in the Client diagnostic traces - GetFileAttributes response- An error is logged in the Client diagnostic traces - SetFile response- Not applicable

**Table 16 – PIXIT for File transfer model – Additional items**

Description	Value / Clarification
Background retrieval	PcVue support a file mirroring feature. Configured at the device level, it allows background copy of new/changed files from the IEDs to a configured folder on the client filesystem.

## 13 PIXIT for Service Tracking model

**Table 17 – PIXIT for Service Tracking model**

Id	Ed	Description	Value / Clarification
Tr1	2	Which tracking services are supported by the client: <ul style="list-style-type: none"> <li>- BrcbTrk</li> <li>- UrcbTrk</li> <li>- LocbTrk</li> <li>- GocbTrk</li> <li>- MsvcbTrk</li> <li>- UsvcbTrk</li> <li>- SgcbTrk</li> <li>- SpcTrk</li> <li>- DpcTrk</li> <li>- IncTrk</li> <li>- EncTrk</li> <li>- ApcFTrk</li> <li>- ApcIntTrk</li> <li>- BscTrk</li> <li>- IscTrk</li> <li>- BacTrk</li> <li>- GenTrk</li> </ul>	Not applicable
Tr2	2	Describe how to view the tracking objects or their attributes	Not applicable

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## IEC 61850 Client PIXIT

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