Station Automation COM600 3.4
IEC 60870-5-104 Slave (OPC) User's Manual

ABB

Contents:

1. About this manual

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1.2. Trademarks

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1.3. General

This manual provides thorough information on the OPC Client for IEC 60870-5-104 Slave protocol (later referred to as IEC104 Slave OPC Client) and the central concepts related to it. You find instructions on to take it into use. The basic operation procedures are also discussed.

Information in this user's manual is intended for application engineers who configure IEC104 Slave OPC Client to establish communication to an OPC server.

As a prerequisite, you should understand IEC 60870-5-104 protocol and the basic procedures in Station Automation Builder 600 (later referred to as SAB600).

This user's manual is divided into following sections:

Introduction

This section gives an overview of the IEC104 Slave OPC Client and states the system requirements to be met when using the client.

Configuration

In this section you find an overview of the configuration tasks and instructions on how to create and configure IEC104 Slave OPC Client related objects.

Operation

This section covers the basic operation procedures you can carry out when transferring or activating Station Automation COM600 (later referred to as COM600) with new configurations.

You are also given instructions on how to monitor and control the IEC104 communication.

Technical reference

This section contains a list of status codes and information about the IEC 61850 data modeling.

1.4.   Document conventions

The following conventions are used for the presentation of material:
- The words in names of screen elements (for example, the title in the title bar of a window, the label for a field of a dialog box) are initially capitalized.
- Capital letters are used for the name of a keyboard key if it is labeled on the keyboard. For example, press the ENTER key.
- Lowercase letters are used for the name of a keyboard key that is not labeled on the keyboard. For example, the space bar, comma key, and so on.
- Press CTRL+C indicates that you must hold down the CTRL key while pressing the C key (to copy a selected object in this case).
- Press ESC E C indicates that you press and release each key in sequence (to copy a selected object in this case).
- The names of push and toggle buttons are boldfaced. For example, click **OK**.
- The names of menus and menu items are boldfaced. For example, the **File** menu.
  - The following convention is used for menu operations: **MenuName > MenuItem > CascadedMenuItem**. For example: select **File > New > Type**.
  - The **Start** menu name always refers to the **Start** menu on the Windows taskbar.
- System prompts/messages and user responses/input are shown in the Courier font. For example, if you enter a value out of range, the following message is displayed:

```
Entered value is not valid. The value must be 0 - 30  .
```

- You can be asked to enter the string MIF349 in a field. The string is shown as follows in the procedure:

  MIF349

- Variables are shown using lowercase letters:

  sequence name

1.5. Use of symbols

This publication includes warning, caution, and information icons that point out safety-related conditions or other important information. It also includes tip icons to point out useful information to the reader. The corresponding icons should be interpreted as follows.

The electrical warning icon indicates the presence of a hazard which could result in electrical shock.

The warning icon indicates the presence of a hazard which could result in personal injury.

The caution icon indicates important information or warning related to the concept discussed in the text. It may indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.

The information icon alerts the reader to relevant facts and conditions.

The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

1.6.   Terminology

The following is a list of terms associated with COM600 that you should be familiar with. The list contains terms that are unique to ABB or have a usage or definition that is different from standard industry usage.

Term	Description
Alarm	An abnormal state of a condition.
Alarms and Events; AE	An OPC service for providing information about alarms and events to OPC clients.
Data Access; DA	An OPC service for providing information about process data to OPC clients.
Data Object; DO	Part of a logical node object representing specific information, for example, status, or measurement. From an object-oriented point of view, a data object is an instance of a class data object. DOs are normally used as transaction objects; that is, they are data structures.
Data Set	The data set is the content basis for reporting and logging. The data set contains references to the data and data attribute values.
Device	A physical device that behaves as its own communication node in the network, for example, protection relay.
Event	Change of process data or an OPC internal value. Normally, an event consists of value, quality, and timestamp.
Intelligent Electronic Device	A physical IEC 61850 device that behaves as its own communication node in the IEC 61850 protocol.
Logical Device; LD	Representation of a group of functions. Each function is defined as a logical node. A physical device consists of one or several LDs.
Logical Node; LN	The smallest part of a function that exchanges data. An LN is an object defined by its data and methods.
LON	A communication protocol developed by Echelon.
LON Application Guideline for substation automation; LAG	A proprietary method of ABB on top of the standard LON protocol.
OPC	Series of standards specifications aiming at open connectivity in industrial automation and the enterprise systems that support industry.
OPC item	Representation of a connection to the data source within the OPC server. An OPC item is identified by a string <object path>:<property name>. Associated with each OPC item are Value, Quality, and Time Stamp.
Property	Named data item.
Report Control Block	The report control block controls the reporting processes for event data as they occur. The reporting process continues as long as the communication is available.

Term	Description
SPA	ABB proprietary communication protocol used in substation automation.
SPA device	Protection and/or Control Product supporting the SPA protocol version 2.5 or earlier.
Substation Configuration Language; SCL	XML-based description language for configurations of electrical substation IEDs. Defined in IEC 61850 standard.

1.7. Abbreviations

The following is a list of abbreviations associated with COM600 that you should be familiar with. See also 1.6, Terminology.

Abbreviation	Description
AE	Alarms and Events
ASDU	Application Service Data Unit
BRCB	Buffered Report Control Block
DA	Data Access
DMCD	Data Message Code Definition
DO	Data Object
GW	Gateway, component connecting two communication networks together
HMI	Human Machine Interface
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Device
LAG	LON Application Guideline for substation automation
LAN	Local Area Network
LD	Logical Device
LMK	LonMark interoperable device communicating in LonWorks network. In this document, the term is used for devices that do not support the ABB LON/LAG communication.
LN	Logical Node
LSG	LON SPA Gateway
NCC	Network Control Center
NUC	Norwegian User Convention
NV	Network Variable
OLE	Object Linking and Embedding
OPC	OLE for Process Control
P&C	Protection & Control

Abbreviation	Description
RTS	Request To Send
SA	Substation Automation
SAB600	Station Automation Builder 600
SCL	Substation Configuration Language
SLD	Single Line Diagram
SNTP	Simple Network Time Protocol
SOAP	Simple Object Access Protocol
RCB	Report Control Block
URCB	Unbuffered Report Control Block
XML	eXtended Markup Language

1.8.   Related documents

Name of the manual	MRS number
COM600 User's Manual	1MRS756125

1.9.   Document revisions

Documentversion/date	Product revision	History
A/30.6.2004	1.0	Document created
B/10.3.2005	1.1	Document revised
C/16.10.2006	3.0	Document revised
D/21.12.2007	3.1	Document revised
E/17.6.2008	3.2	Document revised
F/13.2.2009	3.3	Document revised
G/26.6.2009	3.3	Document revised
H/06.11.2009	3.4	Document revised

2. Introduction

2.1. Functional overview

The IEC 60870-5-104 protocol slave interface of COM600 enables master systems communicating with 60870-5-104 protocol to receive data from and deliver commands to P&C devices connected to the GW. The IEC104 slave is implemented as an OPC client, which transfers and converts data between the IEC 60870-5-104 slave protocol interface and the OPC servers of COM600. See COM600 User's Manual for more details.

The IEC104 Slave OPC Client is configured using SAB600. SAB600 can also be used for diagnosing and controlling the operation of the IEC104 Slave OPC Client. COM600 has a web server that can be used for remote diagnostic of the Gateway including the IEC104 Slave OPC Client.

The IEC104 Slave OPC Client uses TCP/IP communication (Ethernet interface). Before you can start using the IEC104 OPC Client, configure at least one OPC server to provide access to the process devices. In this user's manual, the term "IEC104 Device" is used for a virtual station in COM600 representing the slave stations visible to the IEC104 master system.

2.2. IEC104 Slave OPC Client features

The IEC104 Slave OPC Client supports the following features:
- OPC Data Access Client v. 1.0/2.0 for accessing data from the OPC servers
- OPC Alarms and Events specifications v. 1.10 for diagnostic and control purposes
- IEC 61850 data modeling
- System supervision:
  - NCC connection supervision
- Supported IEC 60870-5-104 data types and functions (see , Interoperability list for IEC104 Slave OPC Client for more information):
  - Single and double indications
  - Measurement values
  - Direct and secured commands
  - Reception of time synchronization
- Parameterization and disturbance recorder upload via Transparent SPA
- File transfer
- Redundant communication according to NUC

3.   Configuration

3.1.   About this section

This section guides you in the configuration tasks required before you can start using the IEC104 Slave OPC Client. For information on the IEC 61850 data modeling, refer to COM600 User's Manual.

Start Station Automation Builder 600 (later referred to as SAB600) to open a project where at least one OPC server has been configured. You can also open and name a new project, where you configure at least one OPC server.

1. Select **File > Open/Manage Project...**.
2. In the Open/Manage Project dialog, select the required location for the project:
    *   Projects on my computer
    *   Projects on network
3. Select **New Project** on the left.
    *   Enter a Project Name. The Description is optional.
4. Click **Create**.
5. Click **Open Project**.

3.2.   Overview of configuration

Before you can start using the IEC104 Slave OPC Client, you need to build and configure an object tree in SAB600 to define the Communication structure within the Gateway object.

*   IEC104 Slave OPC Client
*   IEC104 OPC Channel
*   IEC104 Device (IEC104 IED)
*   Data objects

Figure 3.2-1 shows an example view of SAB600 including an object tree in the communication structure on the left and Object Properties window displaying the object properties on the right.

> When configuring OPC servers the following characters cannot be used in object names: \ ` ' ' #
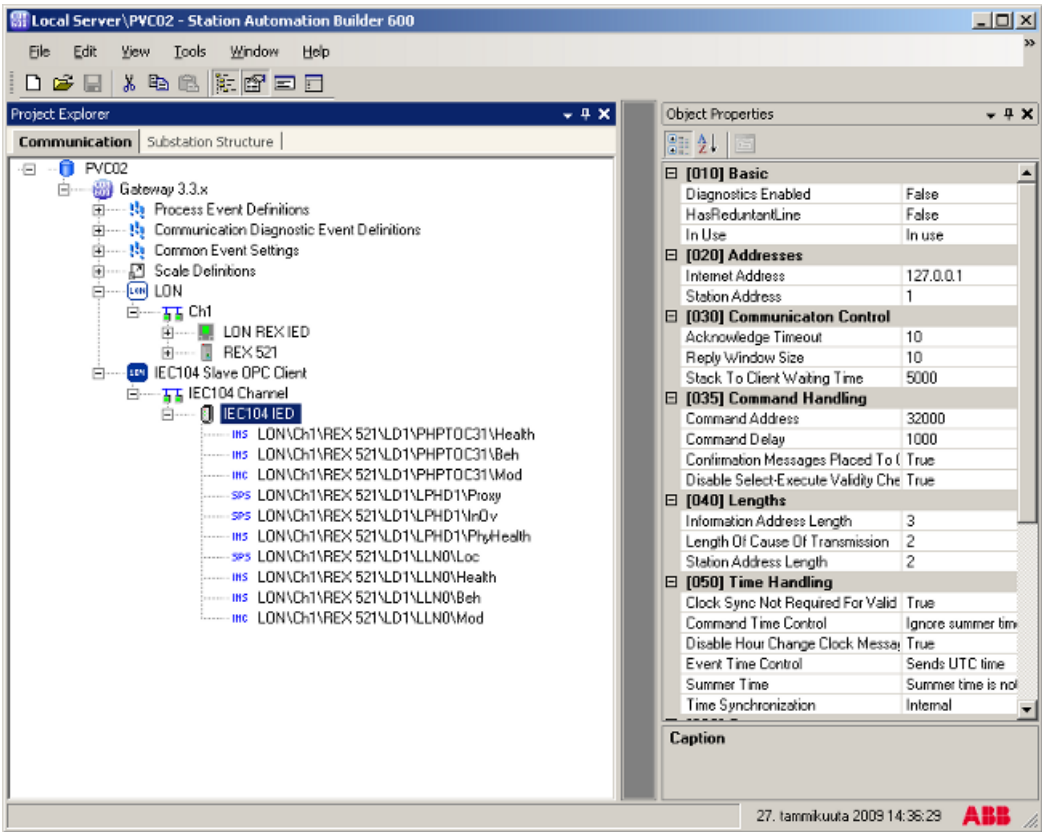
IEC104_configuration_overview.bmp

Figure 3.2-1 Example view of SAB600

The configuration work can basically be divided into two separate tasks:
1. building an object tree, and
2. configuring object properties.

First, you need to build an object tree. This is done by adding objects to the object tree, see 3.3.1, General about building object tree and 3.3.5, Adding data objects using Cross-References function.

Figure 3.2-1 shows an example of how the object tree may look like after it has been built. In the example tree you can see the IEC104 OPC Client object and its child objects like channels, devices, and data objects. Indentation is used to indicate the parent-child relationship between the objects.

After you have added the necessary objects to the object tree in the communication structure, you need to configure them, see 3.4.5.1, General about configuring data objects.

Table 3.2-1 describes the objects shown in the object tree (Figure 3.2-1).

Table 3.2-1 IEC104 OPC Client related objects

Object	Description
IEC104 OPC Client	An object representing the IEC104 OPC Client.
IEC104 Channel	An object representing the IEC104 channel
IEC104 Device (IEC104 IED)	IEC104 Device is used for a virtual station in COM600 representing the slave stations visible to the IEC104master system.
Data Object (DO)	A data object is an instance of one of the IEC Common data classes, for example single point status, measured value etc. Depending on the class, each data object has a set of attributes for monitoring and controlling the object, for instance value, quality and control. Data objects are connected from OPC servers to the IEC104 Slave OPC Client with the cross reference function. They are shown as child objects of the IEC104 Device object in the object tree.
Event Definitions	Event definitions are used for the diagnostic OPC Alarm and Event Server.

3.3.   Building object tree

3.3.1.   General about building object tree

The object tree is built in the Communication structure of SAB600, see Figure 3.2-1. It is built by adding objects in a logical order starting from the IEC104 Slave OPC Client object.

Before the IEC104 Slave OPC Client can be taken into use, configure an OPC server for the process communication. For more information on this subject, refer to COM600 User's Manual.

You have several possible ways to add objects to the object tree in the Communication structure:
• You can right-click the object to which you want to add a child object.
• You can copy the object.

Add the objects in the following order:
1. IEC104 Slave OPC Client
2. IEC104 Channel
3. IEC104 Device (IEC104 IED)
4. Data objects

3.3.2.   **Adding IEC104 Slave OPC Client**

To add the OPC client object:

1.   Add the IEC104 Slave OPC Client object in the Communication structure by selecting the Gateway object.
2.   Right-click the Gateway object and select **New > IEC104 > IEC104 Slave OPC Client**.

3.3.3.   **Adding Channel objects**

After the IEC104 Slave OPC Client object has been successfully added, you can continue building the object tree by adding either the IEC104 Channel object.

To add IEC104 Channel object:
1.   Select an IEC104 Slave OPC Client object and right-click it.
2.   Add an IEC104 Channel object.
3.   Rename the new object. The names of the IEC104 Channels have to be unique.

3.3.4.   **Adding Device objects**

After a channel object has been successfully added, you can continue building the structure by adding the IEC104 Device object. All the data can be connected to one device or divided to several slave devices. Before dividing data to several slave devices, it must be checked that the current protocol mode and the master system support the feature.

To add IEC104 Device object:
1.   Select a Channel object.
2.   Add an IEC104 Device object.
3.   Rename the new object. The names within an IEC104 Channel have to be unique.

3.3.5.   **Adding data objects using Cross-References function**

Data objects are added somewhat differently than the upper level objects. Basically, you drag and drop the data objects you need from an OPC server to the IEC104 Slave OPC Client.

To add data objects:
1.   Select IEC104 Device object (IEC104 IED) and right-click it.
2.   Select Cross-References. The Cross References function appears (Figure 3.3.5-1).
3.   In the Project Explorer, select now a logical node within an OPC server, from which you want to connect the data objects to IEC104 Slave OPC Client.
     Note that you can also select an upper level (server, channel, etc.) object and drag and drop it into the Cross-References function. As a result, all the data objects within

the selected object appear now in the Cross-References function and can be connected to IEC104 Slave OPC Client.

4. Drag and drop the logical node into the Cross-References function. The data objects within the logical node appear now in the Cross-References function.
   Note that only data objects that have been given a non zero information address in the Cross-References table will be connected to the IEC104 Device.

5. At this point, click **Apply** to create the cross-references (to connect the data objects to the IEC104 Device object).

CrossReferences104.bmp
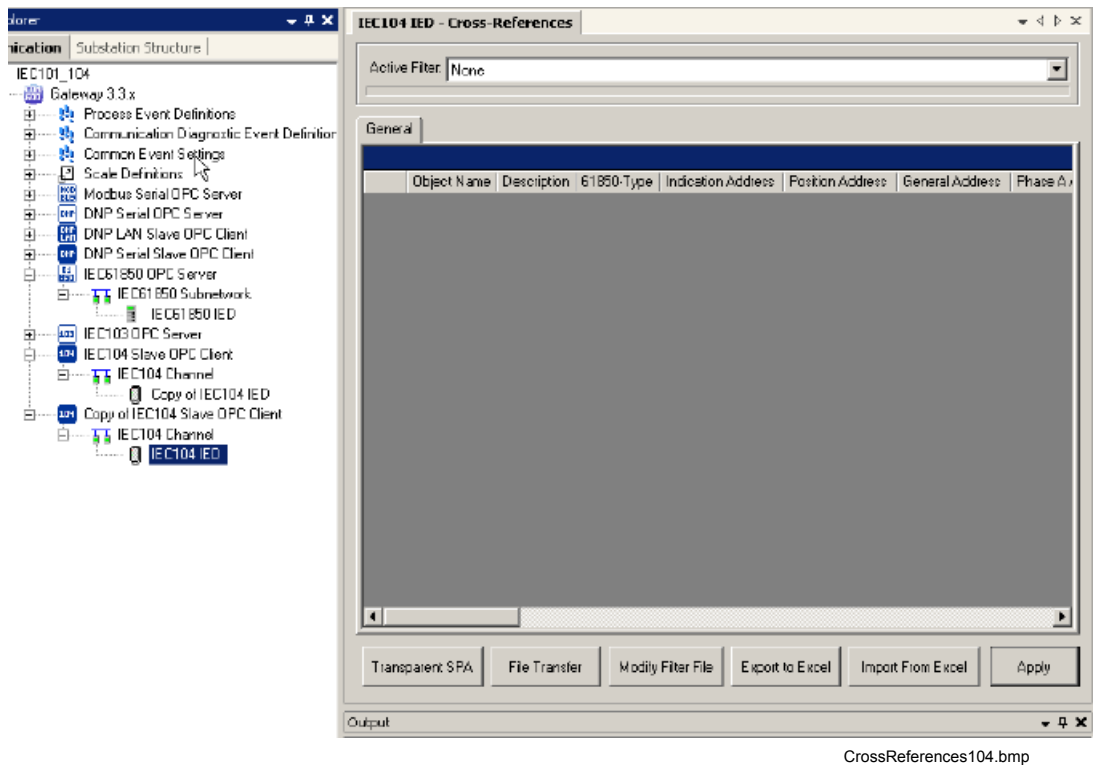
Figure 3.3.5-1 The Cross References window

For more detailed information about the Cross-References function, see *Cross-References function* in COM600 User's Manual.

3.3.6.   File transfer function

The **File transfer** function allows the transfer of disturbance recordings from COM600 to IEC104 master system. Configure COM600 to retrieve disturbance recording files from the IEDs, for example using IEC 61850 communication. The files retrieved can be offered to the IEC104 master. To enable the IEC104 file transfer function, you need configure the File Transfer properties of the slave IED object and further configure the file transfer addresses with the File Transfer of the Cross- References function.

- File Transfer Enabled: Specifies whether the file transfer function is enabled
- File Transfer Source Directory: Defines the source directory for the disturbance recording files. Default is C:\COMTRADE

File names in IEC104 file transfer are built from two numbers; IOA (Information object address) and NOF (name of file). For NOF a running number (1..0xFFFF) is used. For IOA, a unique number assigned to each source IED is used. The IOA is assigned with the File Transfer function of the Cross-References function. There must be at least one cross referenced signal from the IED, which must be included in the file transfer handling. When the File Transfer dialog is opened from the Cross-References function, it shows the source IEDs, which can be used for the file transfer. The Information Object Address is automatically assigned by the tool, but it can be manually changed if necessary .

All files belonging to the same disturbance recording are zipped into a single file, which is offered to the IEC 104 master. Only one file is offered at a time. When the file is transferred successfully, the next recording if available is offered. In the master system, the received file should be renamed with zip extension and unzipped to access the contents.

3.3.7. Transparent SPA function

COM600 supports encapsulated SPA telegrams over IEC 104 communication. It enables IEC104 master systems with SPA support accessing SPA parameters of IEDs connected to COM600. The IEC information address used for the SPA telegrams is configured using the Transparent SPA of the Cross-References function. There must be at least one cross referenced signal from the IED, which must be included in Transparent SPA handling. When the Transparent SPA dialog is opened from the Cross-References function, it shows the source IEDs which can be used for transparent SPA access. The Information Object Address for each source IED is assigned in the table of the dialog.

3.4. Configuring objects

3.4.1. General about configuring objects

After the objects have been added, configure the object properties. Figure 3.4.1-1 shows an example of how to use SAB600 to configure the object properties for IEC104 Slave OPC Client.

To configure an object:
1. Select an object in the object tree of the communication structure.
   a. The object properties appear now in the Object Properties window. The properties and their values can be viewed as shown in Figure 3.4.1-1.
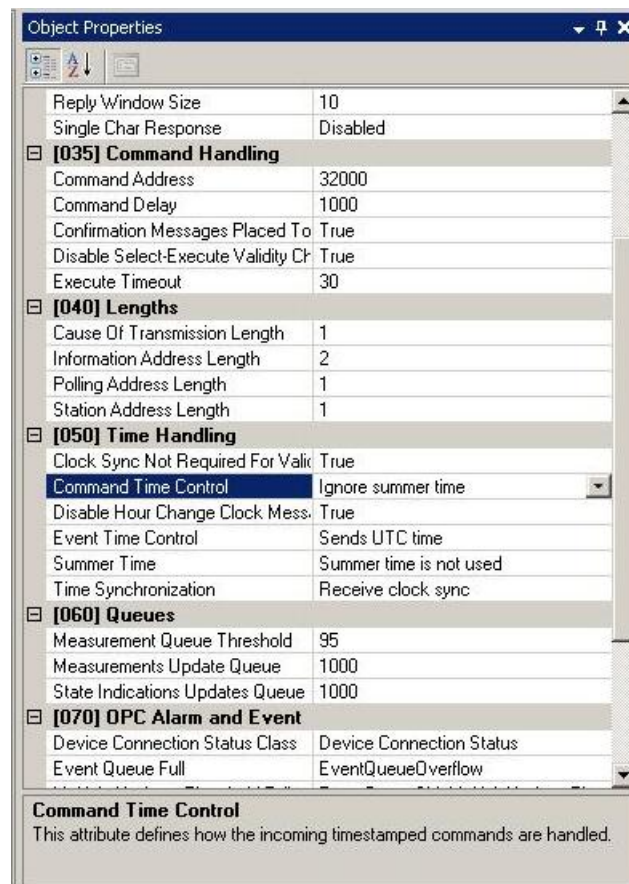
ObjPropIED104.jpg

Figure 3.4.1-1 Example of object properties in the Objects Properties window

2. Select the property you want to configure. Depending on the property value type, configuring is always done either by
    • selecting a predefined value from a drop-down menu, or
    • entering a text string or a numerical value in a text field.

The available properties for different objects are listed in the following subsections.

3.4.2.   Configuring IEC104 Slave OPC Client properties

Table 3.4.2-1 lists the configurable IEC104 Client properties and value ranges for them. The actual configuration by using SAB600 is performed as described in 3.2, Overview of configuration.

Table 3.4.2-1 IEC104 Slave OPC Client properties

Property / Para-meter	Value or Value range/ Default	Description
Basic		

Property / Parameter	Value or Value range/ Default	Description
Maximum OPC Server Initialization Time	0...65535 Default: 5	Specifies the maximum time in seconds that any connected (configured) OPC Server requires to retrieve all its initial data.
Prog ID AE		Instance identification of diagnostic OPC alarm and event server.
ProgID DA		Instance identification of diagnostic OPC data access server.
Time Zone Correction	-720...720 Default: 0	The value of this property in minutes is added to the synchronization time received from an IEC104 master.
Station/Remote Switch		
Station/Remote Switch Handling	Do not check Station/Remote switch position, command always allowed. Check Station/Remote switch position. Default: Do not check Station/Remote switch position, command always allowed.	Specifies if a position check for the station remote switch is going to be made.
Station/Remote Switch Error	Reject commands if position bad or unknown. Allow commands if position bad or unknown. Default: Reject commands if position bad or unknown	Specifies what to do with commands if the position of the switch is uncertain.

3.4.3. Configuring IEC104 Channel Properties

The IEC104 Channel properties that can be configured and value ranges for them can be found in Table 3.4.3-1. The actual configuration by using the COM600 Station Automation Builder 600 (SAB600) is performed as described in 3.4.1, General about configuring objects.

Table 3.4.3-1 IEC104 Channel properties

Property / Parameter	Value or Value range/ Default	Description
Basic		

Property / Para-meter	Value or Value range/ Default	Description
In Use	In use Not in use Default: In use	Specifies whether the channel is initially in use or not.
Protocol	IEC60870-5-104 Slave	Protocol
Communication Control		
Operating Mode	Handshaking messages not restarted Handshaking messages restarted Default: Handshaking messages not restarted	Specifies whether the handshaking messages (request, status of link, reset of remote link) are restarted when a 'request status of link' message is received from the remote end.
Polling Delay	0...65535 Default: 5000	Delay between the communication test polling messages in seconds.
Response Timeout	0...255 Default: 2	The time that IEC link waits for the end of the received message in seconds.
Communication Port		
Local Address	127.0.0.1	The IP address which is locally used in COM600. When redundant communication is used, multiple IP addresses can be given separated by a space, for example, "127.0.1.1 127.0.2.2".

3.4.4.   Configuring IEC104 Device properties

Table 3.4.4-1 lists the configurable properties for IEC104 Device and value ranges for these properties. The actual configuration by using SAB600 is performed as described in 3.4.1, General about configuring objects.

Table 3.4.4-1 IEC104 Device properties

Name	Value/Value range	Description
Basic		
Diagnostics Enabled	True False Default: False	Specifies whether diagnostic AE events are sent for the station or not.

Name	Value/Value range	Description
Has Redundant Line	True False Default: False	Specifies whether redundant channel is used or not.
In Use	In use Not in use Default: In use	Controls whether the station communication is initially in use or not.
Addresses		
Internet Address 1		The IP address or the host name of the remote host. With redundant communication, the used Local Address is specified with an index after the IP Address separated by a colon. The index points to the IP Addresses specified in the Local Address property of the channel object, for example, "127.0.1.12:1".
Internet Address 2		The IP address or the host name of the remote host. With redundant communication, the used Local Address is specified with an index after the IP Address separated by a colon. The index points to the IP Addresses specified in the Local Address property of the channel object, for example, "127.0.1.12:1".
Internet Address 3		The IP address or the host name of the remote host. With redundant communication, the used Local Address is specified with an index after the IP Address separated by a colon. The index points to the IP Addresses specified in the Local Address property of the channel object. For example, "127.0.1.12:1".

Name	Value/Value range	Description
Internet Address 4		The IP address or the host name of the remote host. With redundant communication, the used Local Address is specified with an index after the IP Address separated by a colon. The index points to the IP Addresses specified in the Local Address property of the channel object, for example, "127.0.1.12:1".
Station Address	0...255 or 0...65535 Default: 1 The maximum value depends on the corresponding Station Address Length property value as follows: • when Station Address Length property value is 1, the value range for the Information Address is 0...255 and • when Station Address Length property value is 2, the value range for the Station Address is 0...65535	The station address of the IEC 60870-5-104 slave station (the common address of ASDU in an IEC message).
Communication Control		
Acknowledge Timeout	0...100 Default: 10	The timeout for sending an acknowledgment if the amount of APDUs defined by the Unacknowledge Receive property is not received.
Reply Window Size	0...100 Default: 10	Defines how many data items can be written without a reply or request from the master.
Stack To Client Waiting Time	0...60000 Default: 5000	The maximum time that the client waits for reply from the stack.
Command Handling		
Command Address	0...65535 Default: 32000	The object address of the bit-stream process object in the OPC Client, where an unrecognized message is handled.

Name	Value/Value range	Description
Command Delay	0...65535 Default: 1000	Specifies the maximum delay for timestamped commands, if the timestamp of the incoming command message indicates that the transmission delay has been bigger than the value defined with this attribute, the command is not accepted. The attribute defines a time window in which the timestamped command is accepted.
Confirmation Messages Placed To Class 2 Queue	True False Default: True	Place confirmation messages to class 2 queue instead of class 1 queue.
Disable Select-execute Validity Check	True False Default: True	Disable select-execute validity check.
Lengths		
Information Address Length	1...3 Default: 2	The length of the information object address in octets. Information address maximum value: 0...255 when length = 1, 65535 when length = 2 and 16777215 when length =3.
Length of Cause of Transmission	1...2 Default: 1	The length of the cause of transmission field in an IEC 60870-5-104 message
Maximum Message Length	20...255 Default: 253	The maximum length of transmitted message in octets.
Station Address Length	1...2 Default: 1	The length of the station address in octets. Station address maximum value: 0...255 when length = 1 and 65535 when length = 2.
Time Handling		

Name	Value/Value range	Description
Clock Sync Not Required For Valid Timestamp	True False Default: True	Received clock synchronization not required for valid timestamp.
Command Time Control	Ignore summer time Use summer time	Defines how incoming time stamped commands are handled.
Disable Hour Change Clock Message	True False Default: True	Disable sending of hour change clock synchronization message.
Event Time Control	Sends UTC time Sends local time	Controls the time stamps (UTC, local) of events (indications) sent to the NCC Master.
Time Synchronization	Receive clock sync Ignore clock sync Default: Receive clock sync	Determines the behavior of the slave device, when it receives a time synchronization message.
Queues		
Measurement Queue Threshold	1...100 Default: 95	Defines a threshold (percent of the queue capacity) which causes that update of a measurement removes the oldest entry of the same measurement from the queue.
Measurement Update Queue	0...65535 Default: 1000	Maximum number of measurement process data changes that are stored internally in a queue in the client.
State Indications Updates Queue	0...65535 Default: 1000	Maximum number of state indication process data changes that are stored internally in a queue in the client.
OPC Alarm and Event		
Device Connection Status	Default: Device Connection Status	Device Connection Status Class definition used with current device.
Event Queue Full	EventQueueOverflow EventQueueSkipMultipleUpdatesThreshold Default: EventQueueOverflow	Defines current state of event buffers.

Name	Value/Value range	Description
Multiple Updates Threshold Full	EventQueueOverflow EventQueueSkipMultipleUpdatesThreshold Default: EventQueueSkipMultipleUpdatesThreshold	Defines current state of skipping multiple measurements updates threshold.
File Transfer		
File Transfer Enabled	True False Default: False	States whether File Transfer functionality is enabled or not.
File Transfer Source Directory		Defines the source directory for file transfer.
File Transfer Working Directory		Defines working directory for file transfer.

3.4.5. Configuring Data objects

3.4.5.1. General about configuring data objects

You can configure data objects either in the Object Properties window or in the Cross References window.

The actual configuration in Object Properties window by using the COM600 Station Automation Builder 600 (SAB600) is performed as described in 3.2, Overview of configuration.

The parameters are stored in Object properties in the COM600 Station Automation Builder 600 (SAB600) (see the tables for each data object type).

Clicking **Apply** connects the data objects to the IEC104 Device. After clicking **Apply** the connected data objects appears as child objects for the IEC104 Device. The cross reference information can then be also modified by selecting the data object and using the object properties window.

If you change the object names or structuring of objects of OPC Server, which are connected to the IEC104 Device, re-open the cross reference tool and verify that the changes are correctly handled and then click **Apply** to update the IEC104 configuration accordingly.

IEC104 Slave OPC Client supports data objects for status, measurements, controllable status, and controllable analog information. The following subsections list the configurable data object properties for the IEC104 Slave OPC Client.

3.4.5.2.　Single point status (SPS)

Information in the following table applies also to the Internal SPS data object.

Table 3.4.5.2-1 Configurable SPS properties for OPC client

Property/ Para-meter	Value or Value range/ Default	Description
Basic		
Common Data Class	SPS	Common data class according to IEC 61850.
Addresses		
Indication Address	0...16777215 Default: 0	IEC address for indication
Common		
Class	1 = Class 1 2 = Class 2 Default: 1 = Class 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counter)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation (1...16).
Over Write	True (A new information object overwrites an older object in the queue) False (No overwriting) Default: False	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle of queue = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is paced in the class 1 and class 2 queues.
Update Rate	0...60000	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send as Double Point	True = 1 False= 0 Default: False	Specifies if a value of indication signal is sent as double point value.

Property/ Parameter	Value or Value range/ Default	Description
Send as Inverse Value	True = 1 False = 0 Default: False	Specifies if a value of indication signal is sent as inverse value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.3. Double point status (DPS)

Table 3.4.5.3-1 Configurable DPS properties for OPC client

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	DPS	Common data class according to IEC 61850.
Addresses		
Indication Address	0...16777215 Default: 0	IEC address for indication.
Common		
Class	1 = Class 1 2 = Class 2 Default: 1 = Class 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	1 = True 0 = False Default: 0 = False	Defines whether a new indication value overwrites an older one in the queue.

Property/ Para-meter	Value or Value range/ Default	Description
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send as Inverse Value	True = 1 False = 0 Default: False	Specifies if a value of indication signal is sent as inverse value.
Send as Single Point	True = 1 False = 0 Default: False	Specifies if a value of indication signal is sent as single point value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.4.   Integer status (INS)

Information in the following table applies also to the Internal INS data object.

Table 3.4.5.4-1 Configurable INS properties for OPC client

Property/ Para-meter	Value or Value range/ Default	Description
Basic		
Common Data Class	INS	Common data class according to IEC 61850.
Addresses		

Property/ Parameter	Value or Value range/ Default	Description
Indication Address	0...16777215 Default: 0	IEC address for indication.
Common		
Class	Class 1 = 1 Class 2 = 2 Default: Class 1 = 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False = 0 Default: False = 0	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send as Indication as Value Type	Send with normalized value = 0 Send with scaled value = 1	Specifies whether the value of indication signal is sent as normalized or scaled value. Long timestamp format cannot be used with scaled value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.5. Protection activation information (ACT)

Table 3.4.5.5-1 Configurable ACT properties for OPC client

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	ACT	Common data class according to IEC 61850.
Addresses		
General Address	0...16777215	IEC address for general indication.
Neutral Address	0...16777215	IEC address for neutral indication
Phase A Address	0...16777215 0 = Not in use	IEC address for phase A.
Phase B Address	0...16777215 0 = Not in use	IEC address for phase B.
Phase C Address	0...16777215 0 = Not in use	IEC address for phase C.
Common		
Class	1 = Class 1 2 = Class 2 Default: 1 = Class 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False =0 Default: False = 0	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		

Property/ Para-meter	Value or Value range/ Default	Description
Send as Double Point	True = 1 False = 0	Specifies if the value of indication signal is sent as double point.
Send as Inverse Value	True = 1 False = 0	Specifies the value of indication signal is sent as inverse value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.6.   Directional protection activation information (ACD)

Table 3.4.5.6-1 Configurable ACD properties for OPC client

Property/ Para-meter	Value or Value range/ Default	Description
Basic		
Common Data Class	ACD	Common data class according to IEC 61850.
Addresses		
General Address	0...16777215	IEC address for general indication
Neutral Address	0...16777215	IEC address for neutral
Phase A Address	0...16777215 0 = Not in use	IEC address for phase A
Phase B Address	0...16777215 0 = Not in use	IEC address for phase B
Phase C Address	0...16777215 0 = Not in use	IEC address for phase C
Common		
Class	1 = Class 1 2 = Class 2 Default: 1 = Class 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.

Property/ Para-meter	Value or Value range/ Default	Description
Over Write	True = 1 False = 0 Default: False = 0	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send as Double Point	True = 1 False = 0	Specifies if a value of indication signal is sent as double point.
Send as Inverse Point	True = 1 False = 0	Specifies if a value of indication signal is sent as inverse value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.7.   Binary counter reading (BCR)

Table 3.4.5.7-1 Configurable BCR properties for OPC client

Property/ Para-meter	Value or Value range/ Default	Description
Basic		
Common Data Class	BCR	Common data class according to IEC 61850.
Addresses		
Indication Address	0...16777215 Default:0	IEC Address for indication.
Common		

Property/ Parameter	Value or Value range/ Default	Description
Class	Class 1 = 1 Class 2 = 2 Default: Class 1 = 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False = 0 Default: False = 0	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.8. Measured value (MV)

Table 3.4.5.8-1 Configurable MV properties for OPC client

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	MV	Common data class according to IEC 61850.
Addresses		

Property/ Parameter	Value or Value range/ Default	Description
Indication Address	0...16777215 Default:0	IEC Address for indication.
Common		
Class	Class 1 = 1 Class 2 = 2 Default: Class 2 = 2	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False = 0 Default: True = 1	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send As Measurand As Value Type	Send with normalized value = 0 Send with scaled value = 1 Send with float value = 2	Specifies the type of the indication signal value. Long timestamp format cannot be used with a scaled value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.9. Complex measured value (CMV)

Table 3.4.5.9-1 Configurable CMV properties for OPC client

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	CMV	Common data class according to IEC 61850.
Addresses		
Indication Address	0...16777215 Default:0	IEC Address for indication.
Common		
Class	Class 1 = 1 Class 2 = 2 Default: Class 2 = 2	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False = 0 Default: True = 1	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send As Measurand As Value Type	Send with normalized value = 0 Send with scaled value = 1 Send with float value = 2	Specifies the type of the indication signal value. Long timestamp format cannot be used with a scaled value.

Property/ Para-meter	Value or Value range/ Default	Description
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.10.   WYE

Table 3.4.5.10-1 Configurable WYE properties for OPC client

Property/ Para-meter	Value or Value range/ Default	Description
Basic		
Common Data Class	WYE	Common data class according to IEC 61850.
Addresses		
Neutral Address	0...16777215 0 = Not in use	IEC address for neutral.
Phase A Address	0...16777215 0 = Not in use	IEC address for phase A.
Phase B Address	0...16777215 0 = Not in use	IEC address for phase B.
Phase C Address	0...16777215 0 = Not in use	IEC address for phase C.
Net Address	0...16777215 0 = Not in use	IED address for net.
Res Address	0...16777215 0 = Not in use	IED address for res.
Common		
Class	Class 1 = 1 Class 2 = 2 Default: Class 2 = 2	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.

Property/ Parameter	Value or Value range/ Default	Description
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False = 0 Default: True = 1	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 1000	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send As Measurand As Value Type	Send with normalized value = 0 Send with scaled value = 1 Send with float value = 2	Specifies the type of the indication signal value. Long timestamp format cannot be used with a scaled value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.11. Delta (DEL)

Table 3.4.5.11-1 Configurable DEL properties for OPC client

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	DEL	Common data class according to IEC 61850.

Property/ Para-meter	Value or Value range/ Default	Description
Phase AB Address	0...16777215 0 = Not in use	IEC address for phase AB.
Phase BC Address	0...16777215 0 = Not in use	IEC address for phase BC.
Phase CA Address	0...16777215 0 = Not in use	IEC address for phase CA.
Common		
Class	Class 1 = 1 Class 2 = 2 Default: Class 2 = 2	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False = 0 Default: True = 1	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 1000	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send As Measurand As Value Type	Send with normalized value = 0 Send with scaled value = 1 Send with float value = 2	Specifies the type of the indication signal value. Long timestamp format cannot be used with a scaled value.

Property/ Para-meter	Value or Value range/ Default	Description
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.12. Controllable single point (SPC)

Information in the following table applies also to the Internal SPC data object.

Table 3.4.5.12-1 Configurable SPC properties for OPC client

Property/ Para-meter	Value or Value range/ Default	Description
Basic		
Common Data Class	SPC	Common data class according to IEC 61850.
Addresses		
Command Address	0...16777215 Default: 0	IEC address for command.
Indication Address	0...16777215 Default: 0	IEC address for indication.
Common		
Class	Class 1 = 1 Class 2 = 2 Default: Class 1 = 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False = 0 Default: False = 0	Defines whether a new indication value overwrites an older one in the queue.

Property/ Para-meter	Value or Value range/ Default	Description
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Spe-cific		
Receive As Inverse Value	True = 1 False = 0	Specifies if a value of indication signal is sent as inverse value.
Send as Double Point Value	True = 1 False = 0	Specifies if a value of indication signal is sent as double point.
Send As Inverse Value	True False	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	

3.4.5.13. Controllable double point (DPC)

Table 3.4.5.13-1 Configurable DPC properties for OPC client

Property/ Para-meter	Value or Value range/ Default	Description
Basic		
Common Data Class	DPC	Common data class according to IEC 61850.
Addresses		
Command Address	0...16777215	IEC address for command.
Indication Address	0...16777215	IEC address for indication.

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Property/ Parameter	Value or Value range/ Default	Description
Common		
Class	Class 1 = 1 Class 2 = 2 Default: Class 1 = 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False = 0 Default: False = 0	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Direct Operate	True = 1 False = 0	If the value of this attribute is True, then no select is required.
Receive As Inverse Value	True = 1 False = 0	Specifies if the received open / close commands are handled inversely.
Send as Inverse Value	True = 1 False = 0	Specifies if a value of indication signal is sent as inverse value.
Send as Single Point	True = 1 False = 0	Specifies if a value of indication signal is sent as single point value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.14.   Controllable integer status (INC)

Table 3.4.5.14-1 Configurable INC properties for OPC client

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	INC	Common data class according to IEC 61850
Addresses		
Command Address	0...16777215 Default: 0	IEC address for command.
Indication Address	0...16777215 Default: 0	IEC address for indication.
Common		
Class	Class 1 = 1 Class 2 = 2 Default: Class 1 = 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False = 0 Default: False = 0	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send Indication As Value Type	Send with normalized value = 0 Send with scaled value = 1	Send value of indication signal as normalized or scaled. Long timestamp format cannot be used with a scaled value.

Property/ Para-meter	Value or Value range/ Default	Description
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.15. Binary controlled step position information (BSC)

Table 3.4.5.15-1 Configurable BSC properties for OPC client

Property/ Para-meter	Value or Value range/ Default	Description
Basic		
Common Data Class	BSC	Common data class according to IEC 61850.
Addresses		
Command Address	0...16777215	IEC address for command.
Position Address	0...16777215	IEC address for position.
Common		
Class	Class 1 = 1 Class 2 = 2 Default: Class 1 = 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.
Over Write	True = 1 False = 0 Default: False = 0	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.

Property/ Parameter	Value or Value range/ Default	Description
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send Indication As Value Type	Send with normalized value = 0 Send with scaled value = 1	Specifies if the value of indication signal is sent as normalized or scaled. Long timestamp format cannot be used with a scaled value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.16.   Integer controlled step position information (ISC)

Table 3.4.5.16-1 Configurable ISC properties for OPC client

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	ISC	Common data class according to IEC 61850.
Addresses		
Command Address	0...16777215	IEC address for command.
Position Address	0...16777215	IEC address for position.
Common		
Class	Class 1 = 1 Class 2 = 2 Default: Class 1 = 1	Class of ASDU. Data sent from the slave to the master can be assigned to two classes: class 1 and class 2. Data in class 1 is sent with higher priority than data in class 2.
Interrogation Group	1...16 (general) or 1...4 (counters)	Interrogation group. 1 - 16 general or 1 - 4 counter interrogation.

Property/ Parameter	Value or Value range/ Default	Description
Over Write	True = 1 False = 0 Default: False = 0	Defines whether a new indication value overwrites an older one in the queue.
Priority	0...3 End of queue = 0 Middle = 1, 2 Beginning of queue = 3	Priority of ASDU. This property defines how the ASDU sent is placed in the class 1 and class 2 queues.
Update Rate	0...60000 Default: 0	Maximum update rate of indication changes between OPC server and client in milliseconds. 0 means that server sends all the changes to the client.
Data Class Specific		
Send Indication As Value Type	Send with normalized value = 0 Send with scaled value = 1	Specifies if the value of indication signal is sent as normalized or scaled. Long timestamp format cannot be used with a scaled value.
Time Tag Handling	Do not Send Time Tag = 0 Send Short Format Time Tag = 1 Send Long Format Time Tag = 2 Default: Send Long Format Time Tag	Specifies the format of timestamp if one is used: none, short, or long. Long time tag format cannot be used with a scaled value.

3.4.5.17.   Analogue set point (APC)

Table 3.4.5.17-1 Configurable APC properties for OPC client

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	APC	Common data class according to IEC 61850.
Addresses		
Command Address	0...16777215	IEC address for command.

3.5.   Configuring communication redundancy

Communication redundancy can be configured using the Local Address property of the channel object and the Internet Address properties of the IED object. The Local Address property specifies the IP addresses of the COM600 computer used for the communication. The Internet Address properties of the IED object specify the possible IEC104 master IP addresses.

> Only one configured connection should be active at a time. If multiple connections are active simultaneously, it is recommended to configure an IEC104 OPC Client for each.

See Example 1: One master connected with two redundant communication networks and Example 2: Two redundant masters connected with two redundant communication networks for more information.

Example 1: One master connected with two redundant communication networks

Local address is configured with two IP addresses, one for each communication network.

For example, local address = "127.0.1.1 127.0.2.1"

IED Internet addresses are configured to specify the corresponding IEC104 master addresses. The index separated by a colon specifies the used local address.

For example,

*   Internet address 1 = "127.0.1.11:1"
*   Internet address 2 = "127. 0.2.11:2"

Example 2: Two redundant masters connected with two redundant communication networks

Local address is configured with two IP addresses, one for each communication network.

For example, local address = "127.0.1.1 127.0.2.1"

IED Internet addresses are configured to specify the corresponding IEC104 master addresses. The index separated by a colon specifies the used local address.

For example,

```
Internet Address 1 = "127.0.1.11:1"          // First master using network 1
Internet Address 2 = "127.0.2.11:2"          // First master using network 2
```

Internet Address 3 = "127.0.1.12:1"   // Second master using network 1

Internet Address 4 = "127.0.2.12:2"   // Second master using network 2

4.   Operation

4.1.   About this section

This section describes the basic operation procedures you can carry out after the object properties for the IEC104 Slave OPC Client have been configured.

After this, you can, for example, monitor and control the condition of connections in network. This is done by using the Online diagnostics function in SAB600.

4.2.   Activating COM600 with new configurations

For information about activating COM600 with new configuration, see COM600 User's Manual.

4.3.   IEC104 Slave OPC Client diagnostics

To view version information on IEC104 Slave OPC Client or to monitor and control the state of the client, right-click the IEC104 Slave OPC Client and select **Online diagnostics**, see Figure 4.3-1.
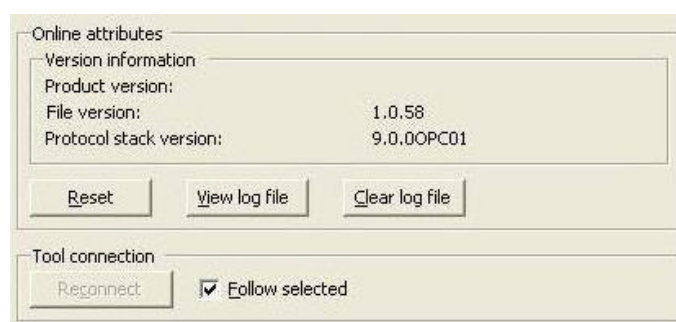
IEC104_Slave_OPC_Client_Online_diagnostics.jpg

Figure 4.3-1 IEC104 Slave OPC Client Online diagnostics

In Online diagnostics box you can:
- reset IEC104 Slave OPC Client
- view the event log file, see Figure 4.3-2
- clear the event log file
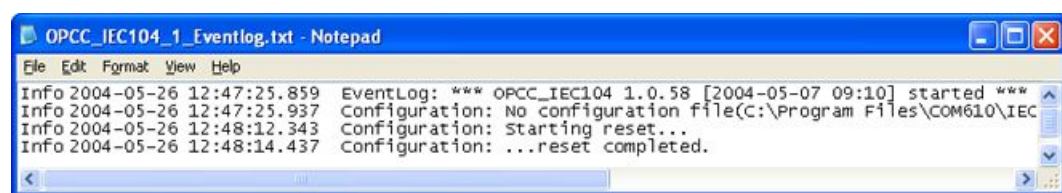
IEC104_OPC_Client_Online_Diagnostics_view_log_file.jpg
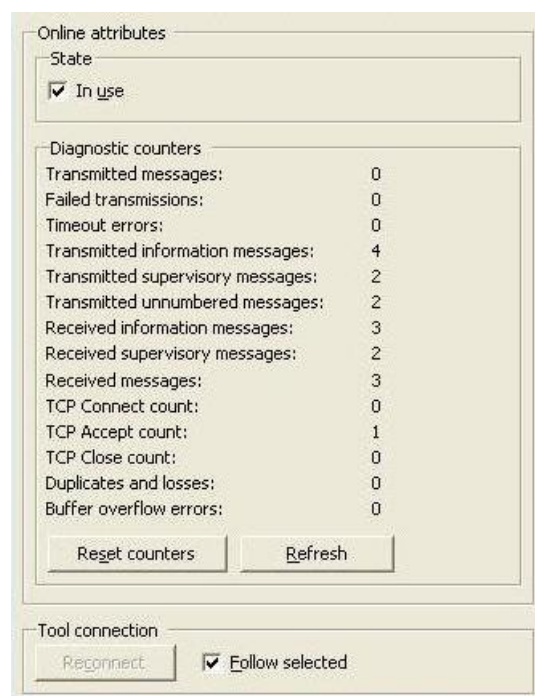
Figure 4.3-2 Event log file

4.4. IEC104 Channel diagnostics

The IEC104Channel activity can be monitored with the Online diagnostics function.

You can also take a channel into use or out of use as described in this section.

To monitor and control Channel activity:
1. Select the channel you want to monitor in the object tree of SAB600.
2. Right-click the channel.
3. Select **Online diagnostics**.

IEC104_Channel_Online_Diagnostics.jpg

Figure 4.4-1 IEC104 Channel Online Diagnostics

In the Diagnostic counters field, you can monitor the channel activity. The available attributes can be seen in Figure 4.4-1. To reset Diagnostic counters, click **Reset counters**.

You can take an IEC104Channel into use by marking the **In use** check box. If you unmark the check box, the channel is taken out of use. To update diagnostic counters, click **Refresh**.

4.5.   IEC104 Device diagnostics

The IEC104 Device communication can be monitored with the Online diagnostics function. You can also take a device into use or out of use as described in this section.

To monitor and control IEC104 Device communication:
1.   Select the device you want to monitor in the object tree of SAB600.
2.   Right-click the device.
3.   Select **Online diagnostics**.

In the Status information field, you can monitor the device status.

The Diagnostic counters field provides information on device activity. To reset diagnostic counters, click **Reset counters**.

You can take an IEC104 Device into use by marking the **In use** check box. If you unmark the check box, the device is taken out of use. To manually update diagnostic counters, click **Refresh**.

4.6.   Signal diagnostics

The IEC104 Slave OPC client has a diagnostic function which makes it possible to monitor the flow of process data changes and commands. The diagnostic function is activated by marking the **Diagnostic Events Enabled** check box, located in the Online diagnostics function of the IEC104 Device. When the diagnostic function is activated, the IEC104 OPC Client Alarm & Event server generates events with information about data changes and commands.

To view the event list:
1.   Select the IEC104 Slave OPC Client object in the object tree of SAB600.
2.   Right-click the IEC104 Slave OPC Client.
3.   Select **Diagnostic AE client** (see Figure 4.6-1)

Event count:	33				
Time	Type	Source	M...	Value	Quality
2004.05.26 12:51:11.413	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		105	GOOD (0xc
2004.05.26 12:51:13.631	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		107	GOOD (0xc
2004.05.26 12:51:15.994	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		112	GOOD (0xc
2004.05.26 12:51:17.527	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		48	GOOD (0xc
2004.05.26 12:51:18.343	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		56	GOOD (0xc
2004.05.26 12:51:20.347	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		97	GOOD (0xc
2004.05.26 12:51:23.352	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		104	GOOD (0xc
2004.05.26 12:51:40.022	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		104	GOOD (0xc
2004.05.26 12:52:01.812	DM - Command	LON Channel\LON REX IED\Logical Device\LLN0\DPC		1	
2004.05.26 12:52:01.906	DM - Comma...	LON Channel\LON REX IED\Logical Device\LLN0\DPC			
2004.05.26 12:52:03.343	DM - Command	LON Channel\LON REX IED\Logical Device\LLN0\DPC		1	
2004.05.26 12:52:03.421	DM - Comma...	LON Channel\LON REX IED\Logical Device\LLN0\DPC			
2004.05.26 12:52:03.421	DM - Comma...	LON Channel\LON REX IED\Logical Device\LLN0\DPC			
2004.05.26 12:52:03.452	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\DPC\stVal		1	GOOD (0xc
2004.05.26 12:52:03.532	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		45	GOOD (0xc
2004.05.26 12:52:05.551	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		0	GOOD (0xc
2004.05.26 12:52:16.046	DM - Applica...	IEC104 Channel.IEC104 IED			
2004.05.26 12:52:16.062	DM - Comma...	IEC104 Channel.IEC104 IED			
2004.05.26 12:52:03.452	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\DPC\stVal		1	GOOD (0xc
2004.05.26 12:52:05.551	DM - Indication	LON Channel\LON REX IED\Logical Device\LLN0\MV\mag		0	GOOD (0xc

IEC104_Diagnostic_AE_Client.jpg

Figure 4.6-1 IEC104 Slave OPC Client Diagnostic AE client

Detailed information about field values (ASDU types, qualifier values and so on) can be found in the IEC 60870-5-104 standard documentation.

5.   Technical reference

5.1.   About this section

This section provides reference information about the following issues:
- IEC 61850 data modeling
- Attributes
- Status codes

5.2.   IEC 61850 data modeling

5.2.1.   General about IEC 61850 data modeling

The relationship between the IEC 61850 data modeling and IEC104 Slave OPC Client is described in this section.

For each data class, there is a table giving a detailed description about the relation between the IEC104 data and IEC 61850 data object attributes and services. The tables also describe how the data is presented on the OPC Server name space.

The columns in the tables have the following content types:
- **Name** specifies the OPC item name of the attribute/service.
- **Type** specifies the IEC 61850 type of the attribute.
- **Value/ Value range** specifies the allowed values and ranges of the attribute/service.
- **Mandatory/Optional** specifies whether the attribute is considered as mandatory or optional according to the IEC 61850 standard.
- **IEC104 information element** specifies the IEC104 information element related to the attribute/service.
- **OPC data types** specify the OPC data type used for the OPC item.

5.2.2.   Single point status (SPS)

SPS represents DMCD M_SP_NA_1, M_SP_TA_1, M_SP_TB_1.

Name	Type	Value/Value range	Mandatory/Optional	Protocol information element	OPC data types
stVal	BOOLEAN	TRUE | FALSE	M	SPI(0=ON, 1=OFF)	VT_BOOL
q	Quality		M	BL, SB, NT, IV	VT_I4
t	TimeStamp		M	CP24Time2a CP56Time2a	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.3. Double point status (DPS)

DPS represents DMCD M_DP_NA_1, M_DP_TA_1, M_DP_TB_1.

Name	Type	Value/ Value range	Mandat-ory/Optional	Protocol informa-tion element	OPC data types
stVal	ENUMERATED	Intermediate-state (0) off (1) on (2) bad-state (3)	M	DPI	VT_I4
q	Quality		M	BL, SB, NT, IV	VT_I4
t	TimeStamp		M	CP24Time2a CP56Time2a	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.4. Integer status (INS)

INS represents DMCD M_ME_NA_1, M_ME_TA_1, M_ME_TD_1.

Name	Type	Value/ Value range	Mandat-ory/Optional	Protocol informa-tion element	OPC data types
stVal	INTEGER		M	NVA, COI	VT_I4
q	Quality		M	OV, BL, SB, NT, IV	VT_I4
t	TimeStamp		M	CP24Time2a CP56Time2a	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.5. Protection activation information (ACT)

ACT represents DMCD M_SP_NA_1, M_SP_TA_1, M_SP_TB_1, M_DP_NA_1, M_DP_TA_1, M_DP_TB_1.

Name	Type	Value/ Value range	Mandat-ory/Optional	Protocol informa-tion element	OPC data types
general	BOOLEAN		M	SPI	VT_BOOL
phsA	BOOLEAN		O	SPI	VT_BOOL
phsB	BOOLEAN		O	SPI	VT_BOOL
phsC	BOOLEAN		O	SPI	VT_BOOL
neut	BOOLEAN		O	SPI	VT_BOOL

Name	Type	Value/ Value range	Mandat-ory/Optional	Protocol informa-tion element	OPC data types
q	Quality		M	EI, BL, SB, NT, IV	

5.2.6. Directional protection activation information (ACD)

ACD represents M_SP_NA_1, M_SP_TA_1, M_SP_TB_1, M_DP_NA_1, M_DP_TA_1, M_DP_TB_1.

Name	Type	Value/ Value range	Mandat-ory/Optional	Protocol informa-tion element	OPC data types
general	BOOLEAN		M	SPI	VT_BOOL
dirGeneral	ENUMERATED	unknown forward backward	M		VT_I4
phsA	BOOLEAN		O	SPI	VT_BOOL
dirPhsA	ENUMERATED	unknown forward backward	O		VT_I4
phsB	BOOLEAN		O	SPI	VT_BOOL
dirPhsB	ENUMERATED	unknown forward backward	O		VT_I4
phsC	BOOLEAN		O	SPI	VT_BOOL
dirPhsC	ENUMERATED	unknown forward backward	O		VT_I4
neut	BOOLEAN		O	SPI	VT_BOOL
dirNeut	ENUMERATED	unknown forward backward	O		VT_I4
q	Quality		M	EI, BL, SB, NT, IV	
t	TimeStamp		M	CP24Time2a, CP56Time2a	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.7. Binary counter reading (BCR)

BCR represent DMCD M_IT_NA_1, M_IT_TA_1, M_IT_TB_1.

Name	Type	Value/ Value range	Mandat-ory/Optional	Protocol informa-tion element	OPC data types
actVal	INTEGER		M	BCR	VT_I4
q	Quality		M	CY, CA, IV	VT_I4
t	TimeStamp		M	CP24Time2a CP56Time2a	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.8. Measured value (MV)

MV represents DMCD M_ME_NA_1, M_ME_TA_1, M_ME_TD_1, M_ME_NB_1, M_ME_TB_1, M_ME_NC_1, M_ME_TC_1, M_ME_TF_1.

Name	Type	Value/ Value range	Mandat-ory/Optional	Protection inform-ation element	OPC data types
mag	AnalogueValue		M	SVA, NVA, IEEE STD 754	VT_R4
range	Range		O	L1, L2, L3, L4	VT_I4
q	Quality		M	OV, BL, SB, NT, IV	VT_I4
t	TimeStamp		M	CP24Time2a CP56Time2a <none> | Time of occurence	VT_DATE
hhLim	REAL		O		VT_R4
hLim	REAL		O		VT_R4
lLim	REAL		O		VT_R4
llLim	REAL		O		VT_R4
min	REAL		O		VT_R4
max	REAL		O		VT_R4
unit	SiUnit		O	Config	VT I4
d	Description	Text	O		VT_BSTR

5.2.9. Complex measured value (CMV)

CMV is configured in the same way as MV. The only difference is that instead of a 'mag' item, there is a 'cVal' node containing a 'mag' item.

5.2.10. WYE

WYE represent DMCD M_ME_NA_1, M_ME_TA_1, M_ME_TD_1, M_ME_NB_1, M_ME_TB_1, M_ME_NC_1, M_ME_TC_1, M_ME_TF_1.

Name	Type	Value/ Value range	Mandatory/Optional	Protocol information element	OPC data types
phsA.cVal.mag	AnalogueValue		M	SVA, NVA	VT_R4
phsA.q	Quality		M	OV, BL, SB, NT, IV	VT_I4
phsA.t	TimeStamp		M	CP24Time2A	VT_DATE
phsB.cVal.mag	AnalogueValue		O	SVA, NVA	VT_R4
phsB.q	Quality		O	OV, BL, SB, NT, IV	VT_I4
phsB.t	TimeStamp		O	CP24Time2A	VT_DATE
phsC.cVal.mag	AnalogueValue		O	SVA, NVA	VT_R4
phsC.q	Quality		O	OV, BL, SB, NT, IV	VT_I4
phsC.t	TimeStamp		O	CP24Time2A	VT_DATE
neut.cVal.mag	AnalogueValue		O	SVA, NVA	VT_R4
neut.q	Quality		O	OV, BL, SB, NT, IV	VT_I4
neut.t	TimeStamp		O	CP24Time2A	VT_DATE

5.2.11. Delta (DEL)

DEL represents DMCD M_ME_NA_1, M_ME_TA_1, M_ME_TD_1, M_ME_NB_1, M_ME_TB_1, M_ME_NC_1, M_ME_TC_1, M_ME_TF_1.

Name	Type	Value/ Value range	Mandatory/Optional	Protocol information element	OPC data types
phsAB. cVal.mag t	AnalogueValue		M	SVA, NVA	VT_R4
phsAB.q	Quality		M	OV, BL, SB, NT, IV	VT_I4
phsAB.t	TimeStamp		M	CP24Time2A	VT_DATE
phsBC.cVal.mag q	AnalogueValue		M	SVA, NVA	VT_R4
phsBC.q	Quality		M	OV, BL, SB, NT, IV	VT_I4
phsBC.t	TimeStamp		M	CP24Time2A	VT_DATE
phsCA.cVal.mag q	AnalogueValue		M	SVA, NVA	VT_R4
phsCA.q	Quality		M	OV, BL, SB, NT, IV	VT_I4
phsCA.t	TimeStamp		M	CP24Time2A	VT_DATE

5.2.12. Controllable single point (SPC)

SPC represents DMCD C_SC_NA_1, C_DC_NA_1, M_SP_NA_1, M_SP_TA_1, M_SP_TB_1, M_DP_NA_1, M_DP_TA_1, M_DP_TB_1.

Name	Type	Value/ Value range	Mandat- ory/Optional	Protocol informa- tion element	OPC data types
ctlVal	SPI		M	SCO	VT_BOOL
stVal		FALSE | TRUE	M	SPI	VT_BOOL
q	Quality		M	BL, SB, NT, IV	VT_I4
t	TimeStamp		M	CP24Time2A	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.13. Controllable double point (DPC)

DPC represents DMCD C_SC_NA_1, C_DC_NA_1, M_SP_NA_1, M_SP_TA_1, M_SP_TB_1, M_DP_NA_1, M_DP_TA_1, M_DP_TB_1.

Name	Type	Value/ Value range	Mandat- ory/Optional	Protocol informa- tion element	OPC data types
ctlOperOn	SPI	FALSE | TRUE	O	SCO	VT_BOOL
ctlOperOff		FALSE | TRUE	O	SCO	VT_BOOL
ctlSelOn		FALSE | TRUE	O	SCO	VT_BOOL
ctlSelOff		FALSE | TRUE	O	SCO	VT_BOOL
stVal	ENUMERATED	intermediate-state (0) off (1) on (2) bad-state (3)	M	DPI	VT_I4
q	Quality		M	BL, SB, NT, IV	VT_I4
t	TimeStamp		M	CP24TIME2A	VT_DATE
ctlCan	BOOLEAN	FALSE | TRUE	O	SCO	VT_BOOL
stSeld	BOOLEAN	FALSE | TRUE	O	SPI	VT_BOOL
d	Description	Text	O		VT_BSTR

5.2.14. Controllable integer status (INC)

INC represents DMCD M_ME_NA_1, M_ME_TA_1, M_ME_TD_1, M_ME_NB_1, M_ME_TB_1, C_SE_NA, C_SE_NB_1.

Name	Type	Value/ Value range	Mandat-ory/Optional	Protocol informa-tion element	OPC data types
ctlVal	INTEGER		M	NVA	VT_I4
stVal	INTEGER		M	VAI32	VT_I4
q	Quality		M	BL, SB, NT, IV	VT_I4
t	TimeStamp		M	CP24TIME2A	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.15. Binary controlled step position information (BSC)

BSC represents DMCD M_ST_NA_1, M_ST_TA_1, M_ST_TB_1, M_RC_NA_1.

Name	Type	Value/ Value range	Mandat-ory/Optional	Protocol informa-tion element	OPC data types
ctlVal	ENUMERATED	stop (0) lower (1) higher (2) reserved (3)	M	RCO	VT_I1
valWTr	ValWithTrans		M	VTI	VT_I4
q	Quality		M	BL, SB, NT, IV	VT_I4
t	TimeStamp		M	CP24Time2a	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.16. Integer controlled step position information (ISC)

ISC represents C_SE_NA_1, C_SE_NB_1, M_ST_NA_1, M_ST_TA_1, M_ST_TB_1.

Name	Type	Value/ Value range	Mandat-ory/Optional	Protocol informa-tion element	OPC data types
ctlVal	INTEGER	-64 ... 63	M	NVA	VT_I4
valWTr	ValWithTrans		M	VTI	VT_I4
q	Quality		M	BL, SB, NT, IV	V_I4
t	TimeStamp		M	CP24TIME2A	V_DATE
d	Description	Text	O		VT_BSTR

5.2.17. Analogue set point (APC)

APC represents DMCD C_SE_NC_1.

Name	Type	Value/ Value range	Mandat-ory/Optional	Protocol informa-tion element	OPC data types
spMag	AnalogueValue		M	IEEE STD 754, BSI, SVA	VT_R4
d	Description	Text	O		VT_BSTR

5.3. Status codes

5.3.1. Introduction

The following status codes are defined for the IEC 60870-5-104 slave protocol. Some typical reasons for some of the status codes are also given.

5.3.2. Link layer status codes

17800	ITCP_REMOTE_HOST_CONTINUOUSLY_BUSY. Not used at the moment.
17801	ITCP_LINE_INITIALISING. Line status value before the initialisation of the TCP interface for the protocol is completed.
17802	ITCP_LINE_INITIALISATION_FAILED. Line status value when the initialisation of the TCP interface failed.
17803	ITCP_REMOTE_HOST_BUSY. Device status is set to this value when the data transfer is disabled due to received 'stopdt' frame.
17804	ITCP_REMOTE_HOST_NOT_RESPONDING. Device status is set to this value when the connection to a remote host is not established.
17805	ITCP_LINE_NOT_CONNECTED. Line status is set to this value when there is no connection to any configured host.
17806	ITCP_LINE_STOPPED. Line status value when the line is taken out of use.
17807	ITCP_RECEIVER_OUT_OF_BUFFERS. Internal error situation.
17808	ITCP_REMOTE_HOST_NOT_READY. Returned to SCIL in case there is no connection to the host.
17820	ITPC_ILLEGAL_ATTRIBUTE_VALUE. Returned to SCIL when the attribute value given is out of range.

5.3.3.   Application layer status codes

13851	ICCC_INVALID_ATTRIBUTE_VALUE. The value set to an attribute of an IEC station is incorrect, for example, one of the elements of the vector written to the SD attribute is out of range.
13852	ICCC_INVALID_INDEX_RANGE. The index range used when accessing an attribute of an IEC station is incorrect.
13853	ICCC_INVALID_ATTRIBUTE. The STA object attribute used is not valid for the IEC 60870-5-104 slave protocol.
13854	ICCC_ASDU_TABLE_NOT_CREATED. Internal software error.
13855	ICCC_UNKNOWN_ASDU_NAME. The name of the ASDU written to the SD or EV attribute is not supported.
13856	ICCC_ASDU_QUEUE_FULL. No more events can be written to one of the queues by using the SD or EV attribute since the queue is full.
13857	ICCC_MESSAGE_BUFFER_FULL. Internal software error. The value of the ML attribute may be too small.
13858	ICCC_MESSAGE_FILLING_ERROR. Internal software error. The value of the ML attribute may be too small.
13859	ICCC_UNKNOWN_ASDU. The number of the ASDU written to the SD or EV attribute is not supported.
13860	ICCC_NO_ACTIVE_COMMAND. There is no preceding command with the given address when confirming a command by using the CF attribute. Either the address is incorrect or the command has not been received.
13861	ICCC_INVALID_QUEUE_NUMBER. The index of the SD or EV attribute is incorrect.
13862	ICCC_SC_DATA_OVERFLOW. Internal software error.
13863	ICCC_DEVICE_SUSPENDED. The IEC station is in the suspended state. The reason for this could be that the link is not properly established (for example, incorrect cable wiring) or the master does not respond.
13864	ICCC_MESSAGE_SENDING_ERROR. Internal software error. This may be the result of a problem in wiring or hardware.
13865	ICCC_REMOTE_DEVICE_REPLIES_WITH_NACK. The master did not accept the message but responded with a negative acknowledgment instead. Not used in the unbalanced mode.
13866	ICCC_LINK_NOT_READY. A message is sent to a line with a non-established communication.
13868	ICCC_OUT_OF_BUFFERS. Internal software error. Operation could not be completed since the buffer pool has run out of buffers.
13869	ICCC_DONT_REPLY. Internal software error.
13872	ICCC_DEVICE_STOPPED. The station has been set out of use by using the IU attribute.
13873	ICCC_NO_ADDRESS_IN_ACP. Internal software error.
13875	ICCC_UNEXPECTED_TYPE_IN_ACP. Internal software error.

5.4. Attributes

5.4.1. General about attributes

In addition to item tags for process data (indications and commands), the OPC servers and clients also provide some item tags for controlling the devices and retrieving status information from them. These item tags are called attributes.

There are three categories of attributes: IEC104 Slave OPC Client attributes, IEC104 Channel attributes and IEC104 Device attributes. These attributes are described in the following subsections.

5.4.2. Client attributes

Table 5.4.2-1 Client attributes

Property / Para-meter	Value or Value range/ Default	Description
Protocol Stack Version	Value: Version information	The version information of the Protocol Stack.

5.4.3. Channel attributes

Table 5.4.3-1 Channel attributes

Property / Para-meter	Value or Value range/ Default	Description
Basic		
In use	0 = Not in use, the channel communication is stopped. 1 = In use.	The state of the channel - whether it is in use or not. When a channel is not in use, no data can be transmitted on it, and no data is received from it. The channel attributes can be read as usual. Generally, a channel must be taken out of use by setting this attribute to 0 before the channel attributes can be written. When a channel is stopped by setting the In use attribute to 0, all data transmission on the channel ceases. However, before that, the protocol stack executes to the end all on-going data transactions. For example, the of the station in turn is completed.
Diagnostic Counters		

Property / Para-meter	Value or Value range/ Default	Description
Transmitted tele-grams		The number of transmitted data messages.
Failed transmissions		The number of failed transmissions.
Timeout errors		The number of transmitted commands.
Transmitted I format messages		The number of transmitted information messages.
Transmitted S format messages		The number of transmitted supervisory messages.
Transmitted U format messages		The number of transmitted unnumbered messages.
Received I format messages		The number of received information mes-sages.
Received S format messages		The number of received supervisory mes-sages.
Received U format messages		The number of received unnumbered messages.
Received messages		The number of received messages.
TCP Connect count		The count of TCP connect request.
TCP Accept count		The count of accepted TCP connect request.
TCP Close count		The count of closed TCP connection.
Duplicates and losses		The number of times duplicates and losses has occurred.
Buffer overflow errors		The number of times there as been a buf-fer overflow.

5.4.4. Device attributes

Table 5.4.4-1 Device attributes

Property / Para-meter	Value or Value range/ Default	Description
Basic		

Property / Parameter	Value or Value range/ Default	Description
In use	0 = Out of use 1 = In use Default: 1	The operational status of the device - in use or out of use. Taking the device out of use with this attribute stops all data communication with the device. All operations that would result in a data exchange are disabled. The device itself is not affected by the attribute, only the protocol stack's image of the device. Setting In use to 1 is allowed only if the device address is legal.
Diagnostic Events Enabled	True = Diagnostic events enabled False = Diagnostic events disabled	This attribute enables or disables diagnostic events.
Status Information		
Connection Status	True = Device connection OK False = Device connection suspended.	Indicates the status of the device connection.
Detailed Status	When written: 1 = Re-transmit system message When read: A status code, for example 0 = OK (communication works properly) 13863 = Device suspended. For more information, see 5.3, Status codes.	Indicates the detailed information about the station device status. Setting Detailed Status of a device to 1 makes the protocol stack to re-transmit the last system message caused by the device. Possible 'Stopped' and 'Suspended' messages cause old marking of OPC items.
Diagnostic counters		
Suspensions		Indicates the number of times the connection has been suspended.
Transmitted Data Messages		The number of transmitted data messages.
Transmitted Command Messages		The number of transmitted command messages.
Transmitted Confirmation Messages		The number of transmitted confirmation messages.
Received Data Messages		The number of received data messages.

Property / Para-meter	Value or Value range/ Default	Description
Received Command Messages		The number of received command messages.
Received Confirmation Messages		The number of received confirmation messages.
Received Unknown Messages		The number of unknown messages received.
Pending Updates		Indicates the current number of pending updates between the client and the protocol stack.
Max Pending Updates		Indicates the maximum number of pending updates between the client and the protocol stack.

Appendix 1

Interoperability list for IEC104 Slave OPC Client

☐   Not supported

■   Supported

▧   Supported, may need additional engineering

This companion standard presents sets of parameters and alternatives from which subsets must be selected to implement particular telecontrol systems. Certain parameter values, such as the choice of "structured" or "unstructured" fields of the Information Object Address (IOA) of ASDUs represent mutually exclusive alternatives. This means that only one value of the defined parameters is admitted per system. Other parameters, such as the listed set of different process information types in command and in monitor direction allow the specification of the complete set or subsets, as appropriate for the applications. This clause summarizes the parameters of the previous clauses to facilitate a suitable selection for a specific application. If a system is composed of equipment stemming from different manufacturers, it is necessary that all partners agree on the selected parameters.

The interoperability list is defined as in the IEC 60870-5-104 protocol and extended with parameters used in this standard. The text descriptions of parameters which are not applicable to this companion standard are struck out (the corresponding check box is marked black).

> The full specification of a system requires individual selection of certain parameters for certain parts of the system, for example individual selection of scaling factors for individually addressable measured values.

Application layer telegram formats

☐   Function or ASDU is not used

☒   Function or ASDU is used as standardized (default)

Ⓡ   Function or ASDU is used in reverse mode

Ⓑ   Function or ASDU is used in standard and reverse mode

Ⓐ   Function or ASDU may need some additional application level work

The possible selection (blank, X, R, B or A) is specified for each specific clause or parameter. A black check box indicates that the option cannot be selected in this companion standard.

Device function (system-specific parameter)

☐   System definition

☐   Controlling station (Master)

☒   Controlled station (Slave)

Network configuration (network-specific parameter)

■   ~~Point to point~~   ■   ~~Multipoint partyline~~

■   ~~Multiple point to point~~   ■   ~~Multipoint star~~

Physical layer (network-specific parameter)

Transmission speed (control direction)

Unbalanced interchange circuit V.24/V.28 Standard	Unbalanced interchange circuit V.24/V.28 Recommended if > 1200 bit/s	Balanced interchange circuit X.24/X.27
■ ~~400 bit/s~~	■ ~~2400 bit/s~~	■ ~~2400 bit/s~~
■ ~~200 bit/s~~	■ ~~4800 bit/s~~	■ ~~4800 bit/s~~
■ ~~300 bit/s~~	■ ~~9600 bit/s~~	■ ~~9600 bit/s~~
■ ~~600 bit/s~~		■ ~~19200 bit/s~~
■ ~~4200 bit/s~~		■ ~~38400 bit/s~~
		■ ~~56000 bit/s~~
		■ ~~64000 bit/s~~

Transmission speed (monitor direction)

Unbalanced interchange circuit V.24/V.28 Standard	Unbalanced interchange circuit V.24/V.28 Recommended if > 1200 bit/s	Balanced interchange circuit X.24/X.27
■ ~~400 bit/s~~	■ ~~2400 bit/s~~	■ ~~2400 bit/s~~
■ ~~200 bit/s~~	■ ~~4800 bit/s~~	■ ~~4800 bit/s~~
■ ~~300 bit/s~~	■ ~~9600 bit/s~~	■ ~~9600 bit/s~~
■ ~~600 bit/s~~		■ ~~19200 bit/s~~
■ ~~4200 bit/s~~		■ ~~38400 bit/s~~
		■ ~~56000 bit/s~~
		■ ~~64000 bit/s~~

Link layer (network-specific parameter)

~~Frame format FT 1.2, signel character 1 and the fixed time-out interval are used exclusively in this companion standard.~~

Link transmission procedure

■ ~~Balanced transmission~~

■ ~~Unbalanced transmission~~

Frame length

■ Maximum length L (number of octets)

Address field of the link

■ ~~not present (balanced transmission only)~~

■ ~~One octet~~

■ ~~Two octet~~

■ structured

■ unstructured

When using an unbalanced link layer, the following ASDU types are returned in class 2 messages (low priority) with the indicated causes of transmission:

■ ~~The standard assignment of ASDUs to class 2 messages is used as follows:~~

Type identification	~~Cause of transmission~~
9, 11, 13, 21	<1>

■ ~~A special assignment of ASDUs to class 2 messages is used as follows:~~

Type identification	~~Cause of transmission~~

Application layer

Transmission mode for application data

Mode 1 (the least significant octet first), as defined in clause 4.10 of IEC 870-5-4, is used exclusively in this companion standard.

Common address of ASDU (system-specific parameter)

■ ~~One octet~~   ☒ ~~Two octets~~

Information object address (system-specific parameter)

■ ~~One octet~~   ☐ structured

■ ~~Two octets~~   ☐ unstructured

☒ ~~Three octets~~

Cause of transmission (system-specific parameter)

■ ~~One octet~~   ☒ Two octets (with originator address)

Length of APDU (system-specific parameter)

The maximum length of the APDU is 253 (default). The maximum length may be reduced per system.

253   Maximum length of APDU
       per system

Selection of standard ASDUs

Process information in monitor direction (station-specific parameter)

☒ <1>   :=Single-point information   M_SP_NA_1

■ ~~<2>~~   ~~:=Single-point information with time tag~~   ~~M_SP_TA_1~~

☒ <3>   :=Double-point information   M_DP_NA_1

■ ~~<4>~~   ~~:=Double-point information with time tag~~   ~~M_DP_TA_1~~

☒ <5>   :=Step position information   M_ST_NA_1

■	<6>	:=Step position information with time tag	M_ST_TA_1
A	<7>	:=Bitstring of 32 bit	M_BO_NA_1
■	<8>	:=Bitstring of 32 bit with time tag	M_BO_TA_1
☒	<9>	:=Measured value, normalized value	M_ME_NA_1
■	<10>	:=Measured value, normalized value with time tag	M_ME_TA_1
☒	<11>	:=Measured value, scaled value	M_ME_NB_1
■	<12>	:=Measured value, scaled value with time tag	M_ME_TB_1
☒	<13>	:=Measured value, short floating point value	M_ME_NC_1
■	<14>	:=Measured value, short floating point value with time tag	M_ME_TC_1
☒	<15>	:=Integrated totals	M_IT_NA_1
■	<16>	:=Integrated totals with time tag	M_IT_TA_1
☐	<17>	:=Event of protection equipment with time tag	M_EP_TA1
■	<18>	:=Packed start events of protection equipment with time tag	M_EP_TB1
■	<19>	:=Packed output circuit information of protection equipment with time tag	M_EP_TC_1
☐	<20>	:=Packed single point information with time tag	M_PS_NA_1
☐	<21>	:=Measured value, normalized value without quality descriptor	M_ME_ND_1
☒	<30>	:=Single-point information with time tag CP56Time2a	M_SP_TB_1
☒	<31>	:=Double-point information with time tag CP56Time2a	M_DP_TB_1
☒	<32>	:=Step position information with time tag CP56Time2a	M_ST_TB_1
☐	<33>	:=Bitstring of 32 bit with time tag CP56Time2a	M_BO_TB_1
☒	<34>	:=Measured value, normalized value with time tag CP56Time2a	M_ME_TD_1
☐	<35>	:=Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1
☒	<36>	:=Measured value, short floating point value with time tag CP56Time2a	M_ME_TF_1
☒	<37>	:=Integrated totals with time tag CP56Time2a	M_IT_TB_1
☐	<38>	:=Event of protection equipment with time tag CP56Time2a	M_EP_TD_1
☐	<39>	:=Packed start events of protection equipment with time tag CP56Time2a	M_EP_TE_1

☐ <40>   :=Packed output circuit information of protection   M_EP_TF_1
              equipment with time tag CP56Time2a

Either the ASDUs of the set <2>, <4>, <6>, <8>, <10>, <12>, <14>, <16>, <17>, <18>, <19> or of the set <30> - <40> are used.

Process information in control direction (station-specific parameter)

☒ <45>   :=Single command   C_SC_NA_1

☒ <46>   :=Double command   C_DC_NA_1

☒ <47>   :=Regulating step command   C_RC_NA_1

☒ <48>   :=Set point command, normalized value   C_SE_NA_1

☒ <49>   :=Set point command, scaled value   C_SC_NB_1

☒ <50>   :=Set point command, short float point value   C_SC_NC_1

Ⓐ <51>   :=Bitstring of 32 bit   C_BO_NA_1

☒ <58>   :=Single command with time tag CP56Time2a   C_SC_TA_1

☒ <59>   :=Double command with time tag CP56Time2a   C_DC_TA_1

☒ <60>   :=Regulating step command with time tag   C_RC_TA_1
              CP56Time2a

☒ <61>   :=Set point command, normalized value with time tag C_SE_TA_1
              CP56Time2a

☒ <62>   :=Set point command, scaled value with time tag   C_SE_TB_1
              CP56Time2a

☒ <63>   :=Set point command, short floating point value with C_SE_TC_1
              time tag CP56Time2a

☐ <64>   :=Bitstring of 32 bit with time tag CP56Time2a   C_BO_TA_1

Either the ASDUs of the set <45> - <51> or of the set <58> - <64> are used.

System information in monitor direction (station-specific parameter)

☒ <70>   :=End of initialization   M _EI_NA_1

System information in control direction (station-specific parameter)

☒   <100>   :=Interrogation command   C_IC_NA_1

☒   <101>   :=Counter interrogation command   C_CI_NA_1

☒   <102>   :=Read command   C_RD_NA_1

☒   <103>   :=Clock synchronization command   C_CS_NA_1

■   ~~<104>~~   ~~:=Test command~~   ~~C_TS_NA_1~~

☒   <105>   :=Reset process command   C_RP_NA_1

■   ~~<106>~~   ~~:=Delay acquisition command~~   ~~C_CD_NA_1~~

☐   <107>   :=Test command with time tag CP56Time2a   C_TS_TA_1

Parameter in control direction (station-specific parameter)

☐   <110>   :=Parameter of measured value, normalized value   P_ME_NA_1

☐   <111>   :=Parameter of measured value, scaled value   P_ME_NB_1

☐   <112>   :=Parameter of measured value, short floating point   P_ME_NC_1
                               value

☐   <113>   :=Parameter activation   P_AC_NA_1

File transfer (station-specific parameter)

☒   <120>   :=File ready   F_FR_NA_1

☒   <121>   :=Section ready   F_SR_NA_1

☒   <122>   :=Call directory, select file, call file, call section   F_SC_NA_1

☒   <123>   :=Last section, last segment   F_LS_NA_1

☒   <124>   :=Ack file, ack section   F_AF_NA_1

☒   <125>   :=Segment   F_SG_NA_1

☒   <126>   :=Directory (blank or X, only available in monitor   F_DR_TA_1
                               (standard) direction)

Type identifier and cause of transmission assignments (station-specific parameters)

- Shaded boxes are not required
- Black boxes are not permitted in this companion standard
- Blank = Function or ASDU is not used
- Mark Type identification/Cause of transmission combinations:
    - **'X'** if supported only in the standard direction
    - **'R'** if supported only in the reverse direction
    - **'B'** if supported in both directions

Type identification		1	2	3	4	5	6	7	8	9	10	11	12	13	20 10 36	37 10 41	44	45	46	47
<1>	M_SP_NA_1		X	X		X									X					
<2>	M_SP_TA_1			■		■						■	■							
<3>	M_DP_NA_1		X	X		X									X					
<4>	M_DP_TA_1			■		■						■	■							
<5>	M_ST_NA_1		X	X		X									X					
<6>	M_ST_TA_1			■		■						■	■							
<7>	M_BO_NA_1																			
<8>	M_BO_TA_1			■		■														
<9>	M_ME_NA_1	X	X	X		X									X					
<10>	M_ME_TA_1			■		■														
<11>	M_ME_NB_1	X	X	X		X									X					
<12>	M_ME_TB_1			■		■														
<13>	M_ME_NC_1	X	X	X		X									X					
<14>	M_ME_TC_1			■		■														
<15>	M_IT_NA_1			X												X				
<16>	M_IT_TA_1			■												■				
<17>	M_EP_TA_1			■																
<18>	M_EP_TB_1			■																
<19>	M_EP_TC_1			■																
<20>	M_PS_NA_1																			
<21>	M_ME_ND_1																			
<30>	M_SP_TB_1			X		X														
<31>	M_DP_TB_1			X		X														
<32>	M_ST_TB_1			X		X														
<33>	M_BO_TB_1																			
<34>	M_ME_TD_1			X		X														
<35>	M_ME_TE_1																			
<36>	M_ME_TF_1			X		X														
<37>	M_IT_TB_1			X												X				
<38>	M_EP_TD_1																			
<39>	M_EP_TE_1																			
<40>	M_EP_TF_1																			
<45>	C_SC_NA_1						X	X	X	X	X						A	A	A	A

Table — Type identification vs. Cause of transmission (column numbers 1–19 are positional indices for the "Cause of transmission" group):

Type identification		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
<46>	C_DC_NA_1						X	X	X	X	X						A	A	A	A
<47>	C_RC_NA_1						X	X	X	X	X						A	A	A	A
<48>	C_SE_NA_1						X	X	X	X	X						A	A	A	A
<49>	C_SE_NB_1						X	X	X	X	X						A	A	A	A
<50>	C_SE_NC_1						X	X	X	X	X						A	A	A	A
<51>	C_BO_NA_1																			
<58>	C_SC_TA_1						X	X	X	X	X						A	A	A	A
<59>	C_DC_TA_1						X	X	X	X	X						A	A	A	A
<60>	C_RC_TA_1						X	X	X	X	X						A	A	A	A
<61>	C_SE_TA_1						X	X	X	X	X						A	A	A	A
<62>	C_SE_TB_1						X	X	X	X	X						A	A	A	A
<63>	C_SE_TC_1						X	X	X	X	X						A	A	A	A
<64>	C_BO_TA_1																			
<70>	M_EI_NA_1[a]				X															
<100>	C_IC_NA_1						X	X			X									
<101>	C_CI_NA_1						X	X			X									
<102>	C_RD_NA_1					X														
<103>	C_CS_NA_1			X			X	X												
~~<104>~~	~~C_TS_NA_1~~						■	■									■	■	■	■
<105>	C_RP_NA_1						X	X												
~~<106>~~	~~C_CD_NA_1~~			■			■	■									■	■	■	■
<107>	C_TS_TA_1						X	X									A	A	A	A
<110>	P_ME_NA_1																			
<111>	P_ME_NB_1																			
<112>	P_ME_NC_1																			
<113>	P_AC_NA_1																			
<120>	F_FR_NA_1													X						
<121>	F_SR_NA_1													X						
<122>	F_SC_NA_1													X						
<123>	F_DR_TA_1													X						
<124>	F_AF_NA_1													X						
<125>	F_SG_NA_1													X						
<126>	F_DR_TA[b]			X		X														

a. blank or X only
b. blank or X only

Basic application functions

Station limitations (station-specific parameter)

☐   Remote initialization

> An indication ASDU "Controlling Station Initialized" sent to the Controlled Station is not used.

Cyclic data transmission (station-specific parameter)

☐   Cyclic data transmission

Read procedure (station-specific parameter)

☐   Read procedure

Spontaneous transmission (station-specific parameter)

☐   Spontaneous transmission

Double transmission of information objects with cause of spontaneous transmission (station-specific parameter)

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

☐   Single-point information M_SP_NA1, M_SP_TA_1, M_SP_TB_1 and M_PS_NA_1

☐   Double-point information M_DP_NA_1, M_DP_TA_1 and M_DP_TB_1

☐   Step position information M_ST_NA_1, M_ST_TA_1 and M_ST_TB_1

☐   Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1 and M_BO_TB_1 (if defined for a specific project)

☐   Measured value, normalized value M_ME_NA_2, M_ME_TA_1, M_ME_ND_ 1 and M_ME_TD_1

☐   Measured value, scaled value M_ME_NB_1, M_ME_TB_1 and M_ME_TE_1

☐   Measured value, short floating point number M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1

Station interrogation (system parameter or station-specific parameter)

☒   global

A	group 1	A	group 7	A	group 13
A	group 2	A	group 8	A	group 14

$\boxed{A}$ group 3	$\boxed{A}$ group 9	$\boxed{A}$ group 15
$\boxed{A}$ group 4	$\boxed{A}$ group 10	$\boxed{A}$ group 16
$\boxed{A}$ group 5	$\boxed{A}$ group 11	
$\boxed{A}$ group 6	$\boxed{A}$ group 12	

> **i** Information Object Addresses assigned to each group must be defined.

Clock synchronization (station-specific parameter)

☒ Clock synchronization

Command transmission (object-specific parameter)

☒ Direct command transmission

☒ Direct set point command transmission

☒ Select and execute command

☒ Select and execute set point command

☐ C_SE ACTTERM used

☒ No additional information

☐ Short pulse duration (duration determined by a system parameter in the outstation)

☐ Long pulse duration (duration determined by a system parameter in the outstation)

☐ Persistent output

☒ Supervision of maximum delay in command direction of commands and set point commands.

Maximum allowable delay of commands and set point commands

Transmission of integrated totals (station parameter or object-specific parameter)

☐ Mode A: Local freeze with spontaneous transmission

☐   Mode B: Local freeze with counter interrogation

☐   Mode C: Freeze and transmit by counter interrogation commands

☐   Mode D: Freeze by counter interrogation command, frozen values reported spontaneously

☒   General request counter

Ⓐ   Request counter group 1

Ⓐ   Request counter group 2

Ⓐ   Request counter group 3

Ⓐ   Request counter group 4

ℹ️   Addresses per group have to be defined.

Parameter loading (object-specific parameter)

☐   Threshold value

☐   Smoothing factor

☐   Low limit for transmission of measured value

☐   High limit for transmission measured value

Parameter activation (object-specific parameter)

☐   Act / deact of persistent cyclic or periodic transmission of the addressed object

Test procedure (object-specific parameter)

☒   Test procedure

File transfer (station-specific parameter)

File transfer in monitor direction

☐   Transparent file

☐   Transmission of disturbance data of protection equipment

☐   Transmission of sequences of events

☐   Transmission of sequences of recorded analogue values

File transfer in control direction

☐   Transparent file

Background scan (station-specific parameter)

☐   Background scan

Acquisition of transmission delay (station-specific parameter)

■   ~~Acquisition of transmission delay~~

Definition of time-outs

Parameter	~~Default value~~	Remarks	~~Selected value~~
t_0	30 s	Time-out of connection establishment	1 - 255 s
t_1	15 s	Time-out of send or test APDUs	1 - 255 s
t_2	10 s	Time-out for acknowledges in case of no data messages t2 < t1	1 - 255 s
t_3	20	Time-out for sending test frames in case of a long idle state	1 - 255 s

Maximum range of values for all the time-outs: 1 second to 255 seconds, accuracy 1 s.

Maximum number of outstanding I format APDUs (k) and the latest acknowledgment (w)

Parameter	~~Default value~~	Remarks	~~Selected value~~
k	12 APDU	Maximum difference receive sequence number to send state variable	1-32767 s
w	8 APDUs	Latest acknowledg-ment after receiving w I-format APDUs	1-32767 s

Maximum range of values k: 1 to 32767 (215-1) APDUs, accuracy 1 APDU.

Maximum range of values w: 1 to 32767 APDUs, accuracy 1 APDU

(Recommendation: w must not exceed 2/3 of k).

Port number

Parameter	~~Default value~~	Remarks
Port number	2404	In all cases

RFC 2200 suite

RFC 2200 is an official Internet standard which describes the state of standardization of protocols used on the Internet as determined by the Internet Architecture Board (IAB). It offers a broad spectrum of actual standards used in the Internet. The user of this standard must select the suitable selection of documents from RFC 2200 defined in this standard for given projects.

☒ Ethernet 802.3

☐ Serial X.21 interface

☐ Other selection RFC 2200:

List of valid documents from RFC 2200

1.   ....
2.   ....
3.   ....
4.   ....
5.   ....

6.   ....
7.   and so on.

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Contact us

ABB Oy
Distribution Automation
P.O. Box 699
FI-65101 VAASA, FINLAND
Tel.   +358 10 22 11
Fax.   +358 10 224 1094

ABB Inc.
Distribution Automation
655 Century Point
Lake Mary, FL 32746, USA
Tel: +1 407 732 2000
Fax: +1 407 732 2335

www.abb.com/substationautomation

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