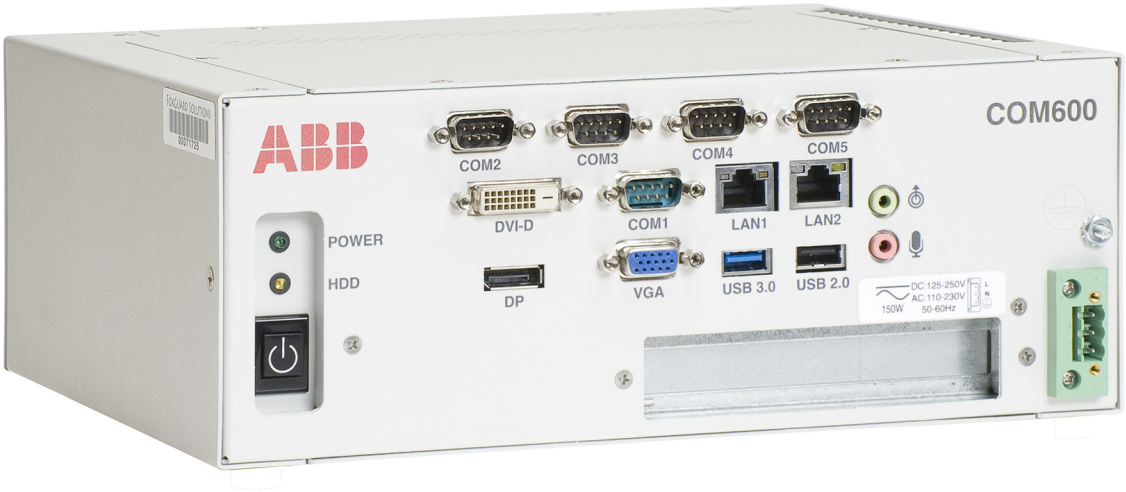
COM600 series, Version 5.1

DNP 3.0 Serial Master (OPC) User's Manual



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1. About this manual

1.1. Copyright

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This product complies with the directive of the Council of the European Communities on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2004/108/EC) and concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2006/95/EC). This conformity is the result of tests conducted by ABB in accordance with the product standards EN 50263 and EN 60255-26 for the EMC directive, and with the product standards EN 60255-1 and EN 60255-27 for the low voltage directive. The product is designed in accordance with the international standards of the IEC 60255 series.

1.4. Trademarks

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1.5. General information

This manual provides thorough information on the DNP 3.0 OPC Server and the central concepts related to it. You find instructions on how to configure DNP 3.0 OPC Server related objects. The basic operation procedures are also discussed.

Information in this user’s manual is intended for application engineers who configure the OPC Server.

This user’s manual is divided into following sections:

Introduction

This section gives an overview of the DNP 3.0 OPC Server and its features.

Configuration

In this section you will find an overview of configuration. You are given instructions on how to configure DNP 3.0 OPC Server related objects and the model of a substation or system.

Operation

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

You are also given instructions on how to monitor and control the conditions of DNP 3.0 network.

1.6. 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

1.7. 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.

1.8. Terminology

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.
COM600 Series; COM600	COM600 as a generic name for COM600S IEC and COM600F ANSI products
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.

Term	Description
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.
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.

1.9. Abbreviations

Abbreviation	Description
AE	Alarms and Events
DA	Data Access
DO	Data Object
GW	Gateway, component connecting two communication networks together
WebHMI	Web Human Machine Interface
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Device
LAN	Local Area Network
LD	Logical Device
LN	Logical Node
NCC	Network Control Center
OLE	Object Linking and Embedding
OPC	OLE for Process Control
P&C	Protection & Control

Abbreviation	Description
PLC	Programmable Logic Controller
POU	Program Organization Unit
RTS	Request To Send
SA	Substation Automation
SCD	Substation Configuration Description
SCL	Substation Configuration Language
SFC	Sequential Function Chart
SLD	Single Line Diagram
XML	eXtended Markup Language

1.10. Related documents

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

1.11. Document revisions

Document version/date	Product revision	History
A/17.6.2008	3.2	Document created
B/13.2.2009	3.3	Document revised
C/26.6.2009	3.3	Document revised
D/06.11.2009	3.4	Document revised
E/30.6.2011	3.5	Document revised
F/31.5.2012	4.0	Document revised
G/13.3.2015	4.1	Document revised
H/24.5.2017	5.0	Document revised
J/3.4.2018	5.1	Document revised

2. Introduction

2.1. General information about the COM600 series

The COM600 product series are versatile Substation Management Units that help realize smart substation and grid automation solutions in industrial and utility distribution networks.

They get deployed together with protection and control IEDs, substation devices such as RTUs, meters and PLCs in dedicated cabinets and switchgear.

The COM600 product is an all-in-one unit that functions as:
- Communication gateway
- Web Human Machine Interface (WebHMI)
- Automation controller
- Real-time and historical data management unit

The COM600 product series use process information and device data, acquired over Ethernet or serial communication protocol interfaces to execute specific substation functions and applications. Thus, they are critical building blocks to realize substation secondary system solutions and in the process solving diverse customer needs.

2.2. COM600 product series variants and rationale

To facilitate substation and grid automation solutions in IEC and ANSI market areas, a variant-based system similar to Relion® 615 and 620 series is being followed from COM600 5.0 release.

The main reasons for such an approach are the following:

- To ensure all COM600 product series features are advantageously used in end-customer projects in the medium voltage substation automation domain.
- To ensure an optimum feature set to be bundled together to realize specific applications required in IEC and ANSI market areas.
- To ensure a future-proof product approach.

This release then comprises of two variants, based on the primary intent or application are defined as follows:
- COM600S IEC – COM600 for substation automation, analysis and data management (for IEC markets)
  - COM600S IEC is a substation automation, analyzer and data management unit that integrates devices, facilitates operations, manages communication and runs analysis applications pertinent to equipment or operations in utility or industrial distribution substations.
- COM600F ANSI – COM600 as distribution automation controller (for ANSI markets)

- COM600F is a dedicated distribution automation controller unit that runs distributed grid and feeder applications for ANSI power networks and inherits all core features of the COM600 series.

2.3. Functional overview

The DNP OPC Server provides methods for OPC clients to exchange data with devices communicating via the DNP protocol.

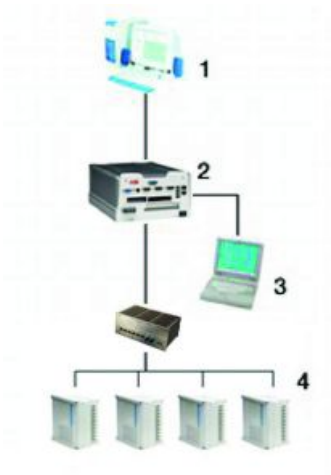


Figure 2.3-1 DNP system overview

(1) NCC (Network Control Center)

(2) COM600 with DNP OPC Server

(3) Station Automation Builder 600 (SAB600)

(4) Protection and control devices communicating through the DNP protocol

2.4. DNP 3.0 OPC Server features

The DNP Serial OPC Server supports the following features:

- OPC Data Access v. 1.0/2.0
- OPC Alarms and Events specifications v. 1.10
- IEC 61850 data modeling
- System supervision:
  - DNP channel communication
  - DNP device communication
- Level of DNP implementation

For more information, see Appendix6.1, Device profile.

3. Configuration

3.1. About this section

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

Start Station Automation Builder 600 (later referred to as SAB600). Then either open a project where at least one DNP OPC server is present, or where a new DNP OPC server will be added. You can also open and name a new project to include one or more DNP OPC servers.

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 DNP OPC Server, build and configure an object tree in Station Automation Builder 600 (SAB600) to define the Communication structure within the Gateway object. An object tree contains the following branches:

- Gateway
- DNP Serial OPC Server
- DNP Serial Channel
- Logical Device objects
- Logical Node objects
- Data objects

After you have added the necessary objects to the object tree in the communication structure, configure them.

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

First, build an object tree. This is done by adding objects to the object tree, see 3.3.1, General information about building object tree.

In the object tree communication view, you can see the DNP OPC Server object and its child objects such as channels, devices, and data objects. After you have added the necessary objects to the object tree in the communication structure, configure them, see 3.4.1, General information about configuring objects.

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

3.3. Building object tree

3.3.1. General information about building object tree

The object tree is built in the Communication structure of SAB600. It is built by adding objects in a logical order starting from the Gateway.

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. Then select **New** > **Object type group** > **Object name**, for example
- You can right-click the object type and select **New** > **New**. A New Object window appears. Select the object type you want to add and click **OK** or double-click it.
- You can copy the object.

Add the objects in the following order:

1. Gateway
2. DNP Serial OPC Server
3. DNP Serial Channel
4. Logical Device objects
5. Logical Node objects
6. Data objects

For information on building a substation structure, see COM600 HMI Configuration Manual.

3.3.2. Adding Gateway object

To start building the object tree, add a Gateway object in the Communication structure by selecting the project name, right-click it and select **New > Communication > Gateway**.

3.3.3. Adding DNP OPC Server object

After the Gateway object has successfully been added, you can continue building the object tree by adding DNP OPC Server object.

To add DNP OPC Server object:
1. Select the Gateway object in the communication structure and right-click it.
2. Add DNP OPC Server object.

By using the SCL Import function, it is possible to import an entire server’s or individual device's configurations without having to insert them manually. To open the SCL Import function, right-click the desired object, and select **SCL Import**.

For more information about the SCL Import function, see COM600 User's Manual.

Connectivity Packages for certain protection and control devices can also support other ways to build this structure, depending on the configuration of an individual device, for example device-related object types and wizards. Typically, Connectivity Packages include SCL description files which must be installed. For further information on these Connectivity Packages, see the Connectivity Package of a certain device in the product documentation.

3.3.4. Adding DNP Channel objects

After the server object has been successfully added, you can continue building the object tree by adding DNP Channel objects.

To add DNP Channel object:

1. Select DNP OPC Server object.
2. Right-click the DNP OPC Server object.
3. Add DNP Channel object.
4. Rename the new object. The names of the DNP Channel objects have to be unique.

3.3.5. Adding DNP IED objects

After adding a subnetwork you can add device objects.

To add an IED object:
1. Select a Serial channel object.
2. Add DNP IED object.
3. Rename the new object. The names of the devices within a DNP Serial channel have to be unique.

The maximum number of devices per Serial channel is 30.

With SCL import function, you can import new objects with configurations from an existing file. Right-click the device and select **SCL Import** from the shortcut menu.

To import a new configuration file:
1. Click **Choose File**.
2. Browse to a new configuration file from the appearing dialog.
3. Select the file and click **Open**.
4. Select the device to import from the drop-down list. You can preview the configuration on the right.
5. Click **Import**.

The new preconfigured objects appear in the object tree. If the configuration file is large, the import may take time. To import a configuration file for a different device, right-click the device, select **SCL Import** again and repeat the steps above.

For more information about the SCL Import function, see COM600 User's Manual.

3.3.6. Adding Logical Device objects

To add a Logical Device object:
1. Select a DNP IED object and right-click it.
2. Add a Logical Device object.
3. Rename the new object. The names of the Logical Device objects have to be unique.

Each physical device must have at least one Logical Device object as a child object.

3.3.7. Adding Logical Node objects

To add a Logical Node:
1. Select a Logical Device object and right-click it.
2. Add a Logical Node object.
3. Rename the new object. The names of the Logical Node objects have to be unique.

You should have only one Logical Node 0 (LLN0) as a child object to a Logical Device object.

3.3.8. Adding data objects

To add a data object:
1. Select a Logical Node object and right-click it.
2. Add a data object.
3. Rename the new object. The names of the data objects have to be unique.

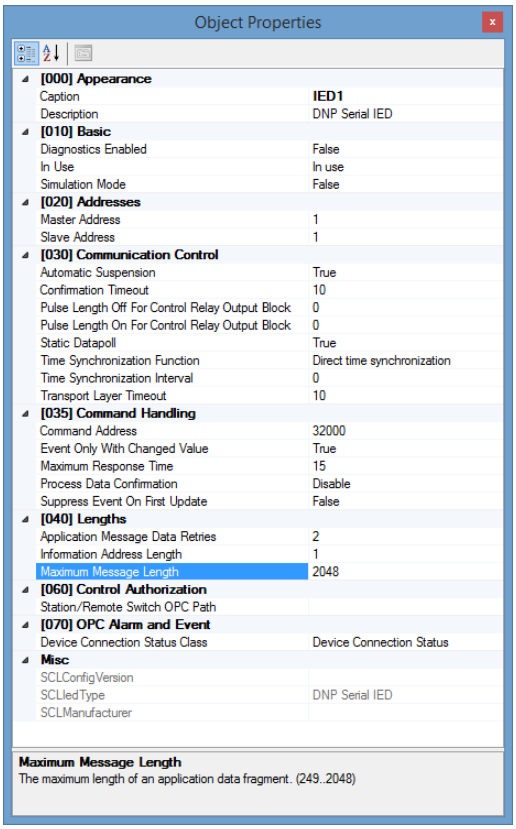
3.4. Configuring objects

3.4.1. General information 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 DNP OPC Server.

To configure an object:

1. Select an object in the object tree of the communication structure.
2. 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.



SAB600_DNP_Serial_Slave_Object_Properties.png

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

3. Select the property you want to configure. Depending on the property value type, configure 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 DNP OPC Server properties

Table 3.4.2-1 DNP OPC Server properties

Property/Parameter	Value or Value range/Default	Description
Basic		
AE Prog ID		Instance identification of diagnostic OPC alarm and event server.
DA Prog ID		Instance identification of diagnostic OPC data access server.

3.4.3. Configuring DNP OPC Server Serial Channel properties

The DNP OPC Server Serial 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 Station Automation Builder 600 (SAB600) is performed as described in 3.4.1, General information about configuring objects.

Table 3.4.3-1 DNP Serial Channel properties

Property/Parameter	Value or Value range/Default	Description
Basic		
Buffer Pool Size	1 to 250 Default 20	Specifies the number of message buffers reserved for the line.
In use	In Use Not In Use Default: In Use	Specifies if channel is in use or not.
Communication Port		

Property/Parameter	Value or Value range/Default	Description
Bit Rate	300 Bits/s 600 Bits/s 1200 Bits/s 2400 Bits/s 4800 Bits/s 9600 Bits/s 19200 Bits/s 38400 Bits/s 56000 Bits/s 115200 Bits/s 128000 Bits/s 256000 Bits/s Default: 19200 Bits/s	Transmission rate used on the line.
Communication Port	COM01 to COM32 Default: COM2	Serial port used by the DNP serial protocol.
Parity	No parity check Odd parity Even parity Default: Even parity	Defines the parity check used for the characters transferred on the line.
Receiver Data Bit Count	5 to 8 Default: 8	Specifies the number of data bits in each received character.
Stop Bits	1 stop bit 2 stop bits Default: 1 stop bit	Specifies the number of stop bits attached to each transmitted character.
Transmitter Data Bit Count	5 to 8 Default: 8	Specifies the number of data bits in each transmitted character.
Communication Control		
Carrier Blocking	Carrier detection ignored Carrier detection must be set Default: Carrier detection ignored	Specifies whether the Carrier Detect (DCD) signal of the serial port must be set for the DNP station to receive messages.

Property/Parameter	Value or Value range/Default	Description
Collision Detection	Carrier detection not in use Carrier detection in use Default: Carrier detection not in use	Defines of collision detection is in use or not.
CTS Delay	0 to 65535 Default: 50	Time delay in milliseconds between the activation of the RTS signal and the start of a new transmission.
Disable Reset of the Remote Link	True False Default: False	Specifies if Reset of the Remote Link is disabled. Disabling this configuration is useful when the link initialization is not needed in both directions or if it is possible that this message collides with other transmitted frames from the IEDs sharing the channel.
Enquiry Limit	0 to 255 Default: 1	Specifies the maximum number of times that a message is retransmitted after a timeout.
Header Timeout	0 to 65535 Default: 2000	Specifies the maximum waiting time (in milliseconds) within which the first byte of a link layer response should have been received.
Link Layer Confirmation Enabled	In use Not in use Default: In use	Determines whether the link layer confirmations are in use or not.
Maximum Message Length	50 to 249 Default: 230	Maximum length of a data link fragment.
Maximum Random Delay for Retransmission	0 to 65535 Default: 0	Maximum random delay in milliseconds for retransmission.

Property/Parameter	Value or Value range/Default	Description
Only One Active Application Layer Command Enabled	True False Default: False	Specifies if only one application layer command (e.g. poll) may be active at any time. Enabling this configuration is useful when the communication hardware does not support collision detection. The poll intervals defined with the topic configuration tool define the intervals the IED is tried to be polled. When multiple IEDs are connected, the actual polling interval may be longer. When multiple simultaneous application layer commands are allowed, the command's transmission is not related to the state of the other IEDs connected to the same communication channel. This mode of operation can be used in systems with collision detection.
Polling Period	0 to 255 Default: 10	Data polling period.
Response Timeout	0 to 255 Default: 2	Specifies the time (in seconds) that the DNP 3.0 link waits for the end of the received message.
RTS Keep Up Padding Characters	0 to 255 Default: 0	The number of padding characters inserted in the end of a telegram to delay the passivation of the RTS signal.
Test Function For Link	True False Default: False	Specifies if 'Test Function For Link' is enable. False = Enabled True = Disabled
Test Function of Link Interval	Default: 500	Delay in milliseconds between test function link commands. If the value is zero (0), the test function of link command is not sent.
Transmission Wait Delay	Default: 5	Specifies the transmission delay in milliseconds the protocol stack must wait after receiving a CTS signal until starting the transmission of a message.

3.4.4. Configuring DNP Serial Device

Table 3.4.4-1 Configuring DNP Serial Device properties

Name	Value or Value range / Default	Description
Basic		
Diagnostics enabled	True False Default: False	Diagnostics Enabled
In Use	In use Not in use Default: In use	Controls whether the device communication is initially in use or not.
Simulation Mode	True False Default: False	Specifies whether the device is in simulation mode or not.
Event only with changed value	True False	If True, then no events are generated for IED if the new value and quality are the same as the current value and quality.
Suppress event on first update	True False	If True, no is event generated when the item tag is updated for the first time.
Addresses		
Master Station Address	0 to 65535 Default: 1	Station address of the master station.
Slave Station Address	0 to 65535 Default: 1	Station address of the DNP 3.0 slave station.
Communication Control		
Automatic Suspension	True False Default: True	When True, consequent application layer response timeouts set the station to suspended state and the corresponding process objects are suspended.
Confirmation Timeout	0 to 600 Default: 10	Maximum time in seconds that the the master station waits for an application layer confirmation from the master.

Name	Value or Value range / Default	Description
Pulse Length Off For Control Relay Output Block	0 to 65535 Default: 0	Length of pulse, in milli-seconds, used in the output commands of the control relay.
Pulse Length On For Control Relay Output Block	0 to 65535 Default: 0	Length of pulse, in milli-seconds, used in the output commands of the control relay.
Static Datapoll	True False Default: True	When True, a static poll (class 0) poll request is always sent when the object status of the DN Master station gets the value zero (0).
Time Synchronization Function	Direct time synchronization Delay compensated time syn-chronization Default: Direct time synchroniz-ation	Function code for time Syn-chronization.
Time Synchronization Interval	0 to 65535 Default: 0	Time in seconds between device time updates.
Transport Layer Timeout	0 to 600 default: 0	Maximum time in seconds that the transport layer is allowed to assemble message fragments.
Control Authorization		
Station/Remote Switch OPC Path		OPC path of the station remote switch position used with this device. The format is: Node#ProgID For OPC Server#Channel Name\IED Name\Logical Device Name\Logical Node Name\Data Object Name For example: GW#ABB.MOD-BUS_SERIAL_OPC_DA_ Server.Instance1#Chan-nel1\IED1\LD1 \GGIO1\loc
Command Handling		
Command Address	0 to 65535 Default: 32000	The object address of the bit-stream process object.
Maximum Response Time	0 to 600 Default: 15	The maximum time in seconds that the master station waits for a response to a command from the slave.

Name	Value or Value range / Default	Description
Process Data Confirmation	Default: Disable	Defines application level confirmation handling.
Lengths		
Application Message Data retries	0 to 5 Default: 5	Maximum number of retries of an application data fragment.
Information Address Length	1 to 2 Default: 2	Length of data object address used in DNP 3.0 messages.
Maximum Message Length	249 to 2048 Default: 2048	Maximum length of a data link fragment.

3.4.5. Configuring Logical Device properties

Table 3.4.5-1 Logical Device properties

Property/Parameter	Value or Value range/ Default	Description
Basic		
Station/Remote Switch OPC Path		OPC path of the station remote switch position to be used with this device. The format is Node#ProgID For OPC Server#Channel Name\IED Name\Logical Device Name\Logical Node Name\Data Object Name e.g. GW#ABB.Modbus_Serial_OPC_DA_Server.Instance[1]#Channel1\IED1\LD1\GGIO1\loc

3.4.6. Configuring Logical Node properties

Table 3.4.6-1 Configuring Logical Node properties

Property/Parameter	Value or Value range/ Default	Description
Basic		
LLN0		
Logical Node Class	LLN0	Logical node class
GGIO1		

Property/Parameter	Value or Value range/ Default	Description
Logical Node Class	ANCR, ARCO, ATCC, AVCO, LPHD, CALH, CCGR, CILO, CPOW, CSWI, GAPC, GGIO, GSAL, IARC, IHMI, ITCI, ITMI, MDIF, MHAI, MHAN, MMTR, MMXN, MMXU, MSQI, MSTA, PDIF, PDIR, PDIS, PDOP, PDUP, PFRC, PHAR, PHIZ, PIOC, PMRI, PMSS, POPF, PPAM, PSCH, PSEF, PTEF, PTOC, PTOF, PTOV, PTRC, PTTR, PTUC, PTUV, PUPF, PTUF, PVOC, PVPH, PZSU, RDRE, RADR, RBDR, RDRS, RBRF, RDIR, RFLO, RPSB, RREC, RSYN, SARC, SIMG, SIML, SPDC, XCBR, XSWI, TCTR, TVTR, YEFN, YLTC, YPSH, YPTR, ZAXN, ZBAT, ZBSH, ZCAB, ZCAP, ZCON, ZGEN, ZGIL, ZLIN, ZMOT, ZREA, ZRRC, ZSAR, ZTCF, ZTCR Default: GGIO	Logical node class
Logical Node Instance	LN Inst Range is from 1 - 2147483647	Logical node instance number
Logical Node Prefix	Default: None	Prefix for logical node

3.4.7. Configuring data objects for internal OPC data

3.4.7.1. General information about configuring data objects for Internal OPC Data

Internal data objects describe internal status information of an OPC server, for example whether the connection between the OPC Server and the device (IED) is working or not. When internal information of an OPC server needs to be transferred, that is information that does not originate from a device, to an OPC Client, virtual data objects must be created.

OPC Server supports three internal data object types that provide status information:

- 3.4.7.2, Integer status (INS)
- 3.4.7.4, Single point status (SPS)
- 3.4.7.3, Controllable single point (SPC) for OPC internal data

3.4.7.2. Integer status (INS)

Table 3.4.7.2-1

Property/Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	INS	Common data class according to IEC 61850
Addresses		
Item Tag Path	Default: None	Item tag path for the internal status information. The internal server tags that can be used are located in the Attributes nodes that are located under the root, line, and IED nodes. When an attribute tag is referred to in the internal item definitions below, it is possible to use either the whole tag path or just the path relative to the IED (the internal tags are configured per IED); for example, Attributes\Diagnostic counters\Transmitted data messages. When the whole path is used, it must be preceded by a slash (/) character, for example, /Channel Name\Attributes\Diagnostic counters\Transmitted data messages.

3.4.7.3. Controllable single point (SPC) for OPC internal data

Table 3.4.7.3-1 Configurable SPC (for OPC internal data) properties for OPC Servers

Property/Parameter	Value or Value range/ Default	Description
Basic		
61850-Type	SPC	61850-Type
Sub-Type		
Sub Type		Sub type of object
Addresses		
Control Coil	0...65535	Coil address for the control. Coil (0X reference) address range 1...9999. Address 0 equals to no information available.
Indication Coil/Input	0...65535	Coil or input address for the indication. Coil = 0X reference address range 1...9999 or input = 1X reference address range 10001...19999. Address 0 equals to no information available.

3.4.7.4. Single point status (SPS)

Table 3.4.7.4-1 Configurable SPS (for OPC internal data) properties for OPC servers

Property/Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	SPS	Common data class according to IEC 61850
Addresses		
Item Tag Path		Item tag path for the internal status information. The internal server tags that can be used are located in the Attributes nodes that are located under the root, line, and IED nodes. When an attribute tag is referred to in the internal item definitions below, it is possible to use either the whole tag path or just the path relative to the IED (the internal tags are configured per IED); e.g. Attributes\Diagnostic counters\Transmitted data messages. When the whole path is used, it must be preceded by a slash (/) character, e.g. /Channel Name\Attributes\Diagnostic counters\Transmitted data messages.

3.4.8. Configuring data objects

3.4.8.1. General information about configuring data objects

Object properties of the data objects are listed in the following tables.

When configuring address values for DNP IED data objects, the valid address range is 0 - 65535. If the value is -1, then the address is not available.

3.4.8.2. Directional protection activation information (ACD)

Table 3.4.8.2-1 Configurable ACD properties

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

Property/ Parameter	Value or Value range/ Default	Description
General Index	-1..65535 Default: -1	General Index
Neutral Index	-1..65535 Default: -1	Neutral Index
Phase A Index	-1..65535 Default: -1	Phase A Index
Phase B Index	-1..65535 Default: -1	Phase B Index
Phase C Index	-1..65535 Default: -1	Phase C Index
Data Class Specific		
Indication Object	Binary input (1, 2) Binary output (10) Default: Binary input (1, 2)	Object number for indication.
OPC Alarm and Event		
Indication Event Class for General		Event class used with this signal
Indication Event Class for Neutral		Event class used with this signal
Indication Event Class for Phase A		Event class used with this signal
Indication Event Class for Phase B		Event class used with this signal
Indication Event Class for Phase C		Event class used with this signal

3.4.8.3. Protection activation information (ACT)

Table 3.4.8.3-1 Configurable ACT properties

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

Property/ Parameter	Value or Value range/ Default	Description
Addresses		
General Index	-1..65535 Default: -1	General Index
Neutral Index	-1..65535 Default: -1	Neutral Index
Phase A Index	-1..65535 Default: -1	Phase A Index
Phase B Index	-1..65535 Default: -1	Phase B Index
Phase C Index	-1..65535 Default: -1	Phase C Index
Data Class Specific		
Indication Object	Binary input (1, 2) Binary output (10) Default: Binary input (1, 2)	Object number for indication.
OPC Alarm and Event		
Indication Event Class for General		Event class used with this signal
Indication Event Class for Neutral		Event class used with this signal
Indication Event Class for Phase A		Event class used with this signal
Indication Event Class for Phase B		Event class used with this signal
Indication Event Class for Phase C		Event class used with this signal

3.4.8.4. Analog set point (APC)

Table 3.4.8.4-1 Configurable APC properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		

Property/ Parameter	Value or Value range/ Default	Description
Common Data Class	APC	Common data class according to IEC 61850.
Addresses		
Control Index	-1...65535 Default: -1	Control index.
Indication Index	-1…65535 Default: -1	Indication index.
Data Class Specific		
Indication Object	Analog input (30, 32) Analog output (40) Default: Analog input (30, 32)	Object number for indication.
OPC Alarm and Event		
Command Tracking Event		Event class used with this signal
Indication Event		Event class used with this signal
Scale and unit		
Control Scale		Scale used with this type.
Indication Scale		Scale used with this type.

3.4.8.5. Binary counter reading (BCR)

Table 3.4.8.5-1 Configurable BCR properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	BCR	Common data class according to IEC 61850.
Addresses		
Indication Index	-1 to 65535 Default: -1	Indication index.
Data Class Specific		

Property/ Parameter	Value or Value range/ Default	Description
Counter Object	Binary counter (20) Frozen counter (21) Default: Binary counter (20)	Object number for counter.
Multiplier	Default: Deka	Specifies the multiplier for current SI unit.
Unit	Default: Dimensionless	SI unit for measurement as described in IEC 61850

3.4.8.6. Binary controlled step position information (BSC)

Table 3.4.8.6-1 Configurable BSC properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	BSC	Common data class according to IEC 61850.
Addresses		
Control Index	-1 to 65535 Default: -1	Control index.
Indication Index	-1 to 65535 Default: -1	Indication index.
Data Class Specific		
Control Code Qualifier	Momentary Latched Pulsed Default: Momentary	Qualifier for control.
Control Variation	0 to 65535	Variation for control
Operate	Direct Operate Select Before Operate Default: Direct Operate	Specifies using two-step, select-before-operate method for issuing control request or not.
Scale and Unit		
Scale	Default: None	Scale used with this type.

3.4.8.7. Complex measured value (CMV)

Table 3.4.8.7-1 Configurable CMV properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	CMV	Common data class according to IEC 61850.
Addresses		
Index	-1 to 65535 Default: -1	Indication index.
Sub-Type		
Subtype	Simple	MV sub-type
Data Class Specific		
Indication Object	Analog input (30, 32) Analog output (40) Default: Analog input (30, 32)	Object number for indication.
Scale and Unit		
Multiplier	Default: Deka	Specifies the multiplier for current SI unit.
Phase Number of Decimals	Default: 0	Specifies the number of decimals shown in HSI. (0 to 9)
Scale	Default: None	Scale used with this type.
Unit	Default: Dimensionless	SI unit for measurement as described in IEC 61850
Limit Value Supervision		
Max		Maximum value for measurement
Min		Minimum value for measurement

Table 3.4.8.7-2 Additional configurable properties for Sub-Type Limit Check

Property/ Parameter	Value or Value range/ Default	Description
Sub-Type	Limit Check	MVSubTypeDescription
Limit Value Supervision		
High	Default: 0	High limit for measurement. Event is created when value crosses the limit.

Property/ Parameter	Value or Value range/ Default	Description
High-High	Default: 0	High-high limit for measurement. Event is created when value crosses the limit.
Low	Default: 0	Low limit for measurement. Event is created when value crosses the limit.
Low-Low	Default: 0	Low-low limit for measurement. Event is created when value crosses the limit.

3.4.8.8. Delta (DEL)

Table 3.4.8.8-1 Configurable DEL properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	DEL	Common data class according to IEC 61850.
Addresses		
Phase AB Index	-1 to 65535 Default: -1	Phase AB Index
Phase BC Index	-1 to 65535 Default: -1	Phase BC Index
Phase CA Index	-1 to 65535 Default: -1	Phase CA Index
Sub-Type		
Subtype	DEL Simple	DEL Subtype
Data Class Specific		
Indication Object	Analog input (30, 32) Analog output (40) Default: Analog input (30, 32)	Object number for indication.
Scale and Unit		
Phase Multiplier	Default: Deka	Specifies the multiplier for current SI unit.
Phase Number of Decimals	0 to 9 Default: 0	Specifies the number of decimals shown in HSI.
Scale	Default: None	Scale used with this type.

Property/ Parameter	Value or Value range/ Default	Description
Unit	Default: Dimensionless	SI unit for measurement as described in IEC 61850

Table 3.4.8.8-2 Additional configurable properties for Sub-Type Limit Check

Property/ Parameter	Value or Value range/ Default	Description
Sub-Type	DEL Full	Sub-type of current data object
Limit Value Supervision		
High	Default: 0	High limit for measurement. Event is created when value crosses the limit.
High-High	Default: 0	High-high limit for measurement. Event is created when value crosses the limit.
Low	Default: 0	Low limit for measurement. Event is created when value crosses the limit.
Low-Low	Default: 0	Low-low limit for measurement. Event is created when value crosses the limit.

3.4.8.9. Controllable double point (DPC)

Table 3.4.8.9-1 Configurable DPC properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	DPC	Common data class according to IEC 61850.
Addresses		
Control Index Close	-1..65535 Default: -1	General Index
Control Index Open	-1..65535 Default: -1	Neutral Index
Index BFI	-1..65535 Default: -1	Phase A Index
Index Close (52a)	-1..65535 Default: -1	Phase B Index
Index Close (52b)	-1..65535 Default: -1	Phase C Index

Property/ Parameter	Value or Value range/ Default	Description
Data Class Specific		
Control Code Qualifier	Momentary Latched Pulse Default: Momentary	Qualifier for control
Control Object	Default: Binary control output block (12).	Object number for control.
Control Variation	0..65535 Default: 1	
Indication Object	Binary input (1, 2) Double binary input (3, 4) Binary output (10) Default: Binary input (1, 2)	Object number for indication.
Operate	Direct Operate Select Before Operate Default: Direct Operate	Specifies using two-step, select-before-operate method for issuing the control request.
OPC Alarm and Event		
Command Tracking Event		Event class used with this signal
Indication Event		Event class used with this signal

3.4.8.10. Device Name Plate (DPL)

Table 3.4.8.10-1 Configurable LPL properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
61850 Data Object	DPL	61850 Data Object
Data Class Specific		
Hardware revision	1.0	Text string describing hardware revision.

Property/ Parameter	Value or Value range/ Default	Description
Location	User defined Default: Vaasa	Text string describing location.
Serial number	User defined. Default: ABB123456789	Text string describing serial number.
Software Revision	Default: 1.0	Text string describing software revision.
Vendor	ABB	Text string describing vendor.

3.4.8.11. Double point status (DPS)

Table 3.4.8.11-1 Configurable DPS properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	DPS	Common data class according to IEC 61850.
Addresses		
Index BFI	-1..65535 Default: -1	Phase A Index
Index Close (52a)	-1..65535 Default: -1	Phase B Index
Index Close (52b)	-1..65535 Default: -1	Phase C Index
Data Class Specific		
Indication Object	Binary input (1, 2) Double binary input (3, 4) Binary output (10) Default: Binary input (1, 2)	Object number for indication.
Operate	Direct Operate Select Before Operate Default: Direct Operate	Specifies using two-step, select-before-operate method for issuing the control request.
OPC Alarm and Event		

Property/ Parameter	Value or Value range/ Default	Description
Indication Event		Event class used with this signal

3.4.8.12. Controllable Enumerated status (ENC)

Table 3.4.8.12-1 Configurable ENC properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	ENC	Common data class according to IEC 61850
Addresses		
Control Index	-1 to 65535 Default: -1	Control index.
Index	-1 to 65535 Default: -1	Index.
Data Class Specific		
Control Object	Default: Analog control output block (41).	Object number for control.
Control Variation	0 to 65535 Default: 2	Variation for control.
Indication Object	Analog input (30, 32) Analog output (40) Default: Analog input (30, 32)	Object number for indication.
Scale and Unit		
Scale	Default: None	Scale used with this type.

3.4.8.13. Enumerated status (ENS)

Table 3.4.8.13-1 Configurable ENS properties

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

Property/ Parameter	Value or Value range/ Default	Description
Addresses		
Index	-1 to 65535 Default: -1	Index.
Data Class Specific		
Indication Object	Analog input (30, 32) Analog output (40) Default: Analog input (30, 32)	Object number for indication.
Scale and Unit		
Scale	Default: None	Scale used with this type.

3.4.8.14. Controllable integer status (INC)

Table 3.4.8.14-1 Configurable INC properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	INC	Common data class according to IEC 61850
Addresses		
Control Index	-1 to 65535 Default: -1	Control index.
Index	-1 to 65535 Default: -1	Index.
Data Class Specific		
Control Object	Default: Analog control output block (41).	Object number for control.
Control Variation	0 to 65535 Default: 2	Variation for control.
Indication Object	Analog input (30, 32) Analog output (40) Default: Analog input (30, 32)	Object number for indication.
Scale and Unit		

Property/ Parameter	Value or Value range/ Default	Description
Scale	Default: None	Scale used with this type.

3.4.8.15. Integer status (INS)

Table 3.4.8.15-1 Configurable INS properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	INS	Common data class according to IEC 61850.
Addresses		
Index	-1 to 65535 Default: -1	Index.
Data Class Specific		
Indication Object	Analog input (30, 32) Analog output (40) Default: Analog input (30, 32)	Object number for indication.
Scale and Unit		
Scale	Default: None	Scale used with this type.

3.4.8.16. Integer Controlled Step Position Information (ISC)

Table 3.4.8.16-1 Configurable ISC properties

Property/Parameter	Value or value range/Default	Description
Basic		
Common Data Class	ISC	Common Data Class according to IEC 61850
Addresses		
Control Index	-1..65535 Default: -1	Control Index
Indication Index	-1..65535 Default: -1	Indication Index
Data Class Specific		

Control Object	Default: Analog control output block (41)	Object Number for control
Control Variation	Default: 2	Variation for control
Indication Object	Binary input (1, 2) Double binary input (3, 4) Binary output (10) Default: Binary input (1, 2)	Object number for indication
OPC Alarm and Event		
Command Tracking Event		Event class used with this signal
Indication Event		Event class used with this signal
Scale and Unit		
Scale		

3.4.8.17. Logical Node Name Plate (LPL)

Table 3.4.8.17-1 Configurable LPL properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
61850 Data Object	LPL	61850 Data Object
Data Class Specific		
Serial number	User defined. Default: ABB123456789	Text string describing serial number.
Software Revision	Default: 1.0	Text string describing software revision.
Vendor	ABB	Text string describing vendor.

3.4.8.18. Measured value (MV)

Table 3.4.8.18-1 Configurable MV properties

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

Property/ Parameter	Value or Value range/ Default	Description
Addresses		
Index	-1 to 65535 Default: -1	Indication index.
Sub-Type		
Subtype	Simple	MV Sub-type
Data Class Specific		
Indication Object	Analog input (30, 32) Analog output (40) Default: Analog input (30, 32)	Data object number for indication.
Scale and Unit		
Multiplier	Default: Deka	Specifies the multiplier for current SI unit.
Phase Number of Decimals	Default: 0	Specifies the number of decimals shown in HSI. (0..9)
Scale	Default: None	Scale used with this type
Unit	Default: Dimensionless	SI unit for measurement as described in IEC 61850
Limit Value Supervision		
Max		Maximum value for measurement
Min		Minimum value for measurement

Table 3.4.8.18-2 Additional configurable properties for Sub-Type MV Limit Check

Property/ Parameter	Value or Value range/ Default	Description
Sub-Type	MV Limit Check	MVSubTypeDescription
Limit Value Supervision		
High	Default: 0	High limit for measurement. Event is created when value crosses the limit.
High-High	Default: 0	High-high limit for measurement. Event is created when value crosses the limit.
Low	Default: 0	Low limit for measurement. Event is created when value crosses the limit.
Low-Low	Default: 0	Low-low limit for measurement. Event is created when value crosses the limit.

3.4.8.19. Controllable single point (SPC)

Table 3.4.8.19-1 Configurable SPC properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	SPC	Common data class according to IEC 61850.
Addresses		
Control Index	-1...65535 Default: -1	Control index
Indication Index	-1...65535 Default: -1	Indication index
Data Class Specific		
Control Code Qualifier	Momentary Latched Pulse Default: Momentary	Qualifier for control
Control Object	Default: Binary control output block (12).	Object number for control
Control Variation	0...65535 Default: 1	Variation for control
Indication Object	Binary input (1, 2) Double binary input (3, 4) Binary output (10) Default: Binary input (1, 2)	Object number for indication
Operate	Direct Operate Select Before Operate Default: Direct Operate	Specifies using two-step, select-before-operate method for issuing the control request.
OPC Alarm and Event		
Command Tracking Event		Event class used with this signal
Indication Event		Event class used with this signal
Scale and Unit		

Property/ Parameter	Value or Value range/ Default	Description
Control Scale		Scale used with this type
Input Scale		Scale used with this type

3.4.8.20. Single point status (SPS)

Table 3.4.8.20-1 Configurable SPS properties for OPC client

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	SPS	Common data class according to IEC 61850
Addresses		
Indication Index	0...65535 Default: 0	Indication index.
Common		
Class	Class 0...3 Default: Class 0	Class of ASDU. Data sent from the slave to the master can be assigned to four classes. Data in class 1 is sent with higher priority than data in class 3.
Update Rate	0...65535 Default: 0	Maximum update rate of signal state changes between the OPC server and client in milliseconds. 0 means that the server sends all the changes to the client.
Data Class Specific		
Indication Object	Binary input (1, 2) Binary output (10) Default: Binary input (1, 2)	Object number for indication.
Send All Updates	True False Default: False	Defines if all changes in value are sent to the master.
Send As Double Point	True False Default: False	Defines if a value is sent as double point.

Property/ Parameter	Value or Value range/ Default	Description
Send As Inverse Value	True False Default: False	Defines if the value of a message is inverse.
Time And Type Variation	Send as static data (always without time) Event without time Event with time Event with relative time (valid for binary inputs only) Default: Event with time	Specifies the type of the timestamp a message is sent with.

3.4.8.21. WYE

Table 3.4.8.21-1 Configurable WYE properties

Property/ Parameter	Value or Value range/ Default	Description
Basic		
Common Data Class	WYE	Common data class according to IEC 61850.
Sub-Type		
Subtype	WYE Simple	Subtype of WYE
Addresses		
Neutral Index	-1 to 65535 Default: -1	Neutral Index
Phase A Index	-1 to 65535 Default: -1	Phase A Index
Phase B Index	-1 to 65535 Default: -1	Phase B Index
Phase C Index	-1 to 65535 Default: -1	Phase C Index
Net Index	-1 to 65535 Default -1	Net Index

Property/ Parameter	Value or Value range/ Default	Description
Res Index	-1 to 65535 Default -1	Res Index
Data Class Specific		
Indication Object	Analog input (30, 32) Analog output (40) Default: Analog input (30, 32)	Object number for indication.
Scale and Unit		
Neutral Multiplier	Default: Deka	Specifies the multiplier for the current SI unit.
Neutral Scale	Default: None	Scale for neutral used with this data object.
Neutral Unit	Default: Dimensionless	Unit for Neutral phase.
Neutral Number of Decimals	0 to 9 Default: 0	Specifies the number of decimals shown in HSI.
Phase Multiplier	Default: Deka	Specifies the multiplier for the current SI unit.
Phase Scale	Default: None	Scale for phases used with this data object.
Phase Unit	Default: Dimensionless	Unit for phases.
Phase Number of Decimals	0 to 9 Default: 0	Specifies the number of decimals shown in HSI.
Net Multiplier	Default: Deka	Specifies the multiplier for the current SI unit.
Net Scale	Default: None	Scale for Net used with this data object.
Net Unit	Default: Dimensionless	Unit for Net.
Net Number of Decimals	0 to 9	Specified the number of decimals shown in HSI.
Res Multiplier	Default: Deka	Specifies the multiplier for the current SI unit.
Res Scale	Default: None	Scale for Res used with this data object.
Res Unit	Default: Dimensionless	Unit for Res.
Res Number of Decimals	0 to 9	Specified the number of decimals shown in HSI.
Phase Limit Value Supervision		
Max	Default: 20000	Maximum value for measurement.

Property/ Parameter	Value or Value range/ Default	Description
Min	Default: 0	Minimum value for measurement.
Neutral Limit Value Supervision		
Max	Default: 20000	Maximum value for measurement.
Min	Default: 0	Minimum value for measurement.

Table 3.4.8.21-2 Additional configurable properties for Sub-Type WYE Full

Property/ Parameter	Value or Value range/ Default	Description
Sub-Type	WYE Full	Subtype of WYE.
Phase Limit Value Supervision		
High	Default: 0	High limit for measurement. Event is created when value crosses the limit.
High-High	Default: 0	High-high limit for measurement. Event is created when value crosses the limit.
Low	Default: 0	Low limit for measurement. Event is created when value crosses the limit.
Low-Low	Default: 0	Low-low limit for measurement. Event is created when value crosses the limit.
Neutral Limit Value Supervision		
High	Default: 0	High limit for measurement. Event is created when value crosses the limit.
High-High	Default: 0	High-high limit for measurement. Event is created when value crosses the limit.
Low	Default: 0	Low limit for measurement. Event is created when value crosses the limit.
Low-Low	Default: 0	Low-low limit for measurement. Event is created when value crosses the limit.

Table 3.4.8.21-3 Additional configurable properties for Sub-Type WYE Full

Property/ Parameter	Value or Value range/ Default	Description
Sub-Type	WYE Full	Subtype of WYE
Net Limit Value Supervision		
High	Default: 0	High limit for measurement. Event is created when value crosses the limit.
High-High	Default: 0	High-high limit for measurement. Event is created when value crosses the limit.

Property/ Parameter	Value or Value range/ Default	Description
Low	Default: 0	Low limit for measurement. Event is created when value crosses the limit.
Low-Low	Default: 0	Low-low limit for measurement. Event is created when value crosses the limit.
Res Limit Value Supervision		
High	Default: 0	High limit for measurement. Event is created when value crosses the limit.
High-High	Default: 0	High-high limit for measurement. Event is created when value crosses the limit.
Low	Default: 0	Low limit for measurement. Event is created when value crosses the limit.
Low-Low	Default: 0	Low-low limit for measurement. Event is created when value crosses the limit.

3.4.9. Event definitions

For information on event definitions, refer to COM600 User’s Manual.

3.4.10. Using scales

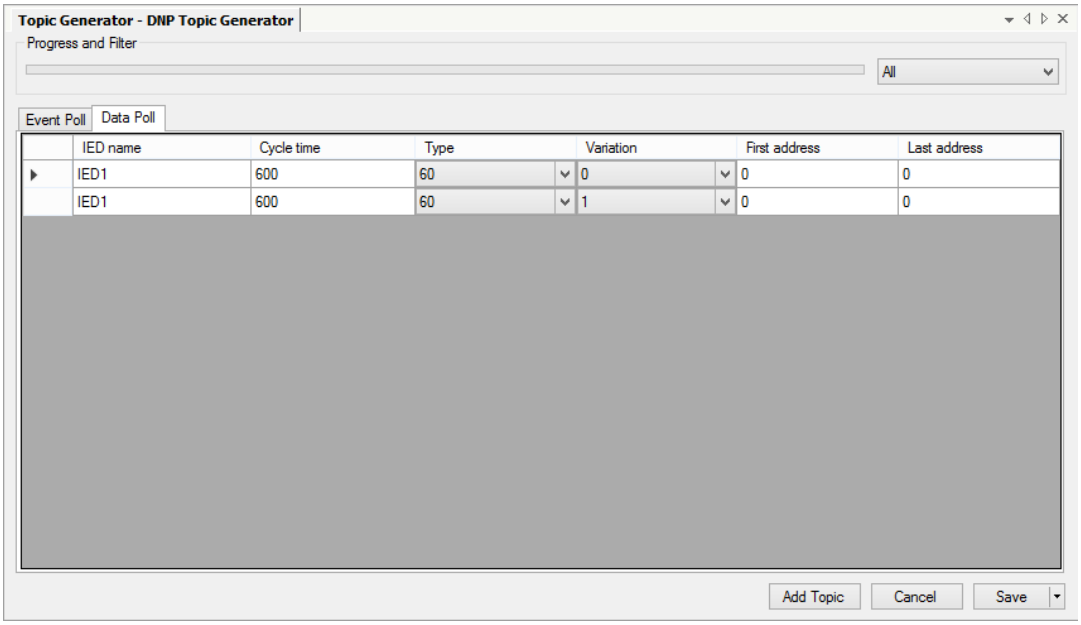
For information on using scales, refer to COM600 User’s Manual.

3.5. Topic Generator

When the data objects have been configured with the DNP data objects, use the **DNP Topic Generator** function to specify how the data is requested from the DNP device.

To create a topic:

1. Click the Communication tab on the left.
2. Right-click the DNP IED and select the **DNP Topic Generator** function. IED selected for the first time has no event and data poll topics. **DNP Topic Generator** tool generates a default event poll and two data poll topics. The event poll topic specifies the unsolicited response mode. Data poll topics specify cyclical data poll methods. You can add, modify, or delete these default topics depending on the specific DNP device connected.



SAB600_DNP_Serial_Topic_Generator.png

Figure 3.5-1 Default Topics Generated

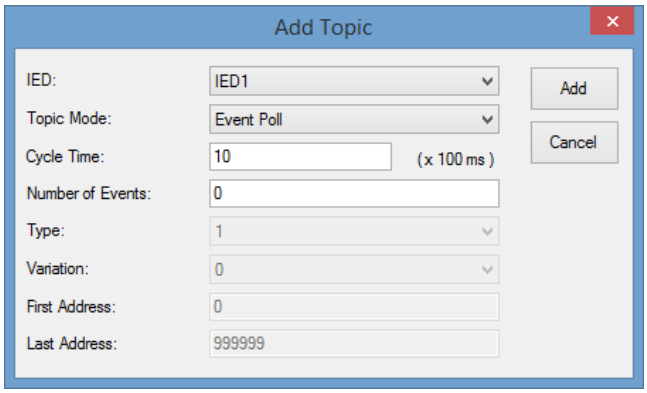
In most cases, modifications to the automatically generated topics are not required. However, some topic definitions may need to be changed, polling interval for example, for some devices to work properly.

To add a new topic:

1. In the DNP Topic Generator window, click **Add Topic**.
2. An **AddTopic** dialog opens. Fill in the data and select the appropriate IED and topic format from the drop-down menus.
3. Click **Add** to close the dialog.
4. Click **Save** to add the topic to the configuration.

In the Add Topic dialog, select the IED the topic is associated with, and the type of the topic.

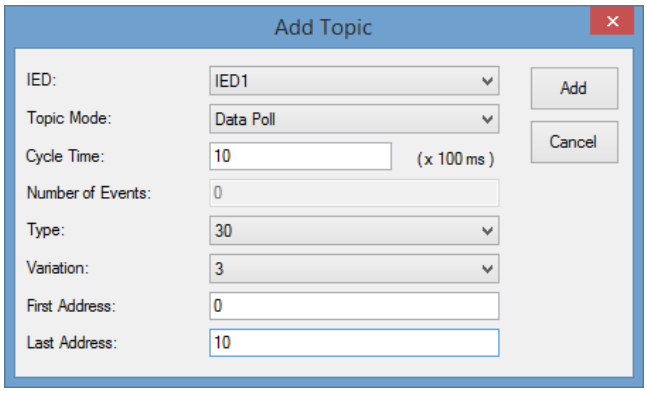
To add an event poll topic, specify the polling interval in hundreds of millisecond and the number of events to poll (Value 0 = all events). If you want to poll all events every 1 s, set up as shown in the Add Topic dialog.



SAB600_DNP_Serial_Topic_Generator_EventPoll.png

Figure 3.5-2 Add Event Poll Topic

To add a data poll topic, specify the polling interval in hundreds of millisecond, data object type and variation, and lower and upper limit of the index range. If you want to poll 32-bit analog without flag every 1 s, you may set up as shown in the Add Topic dialog.

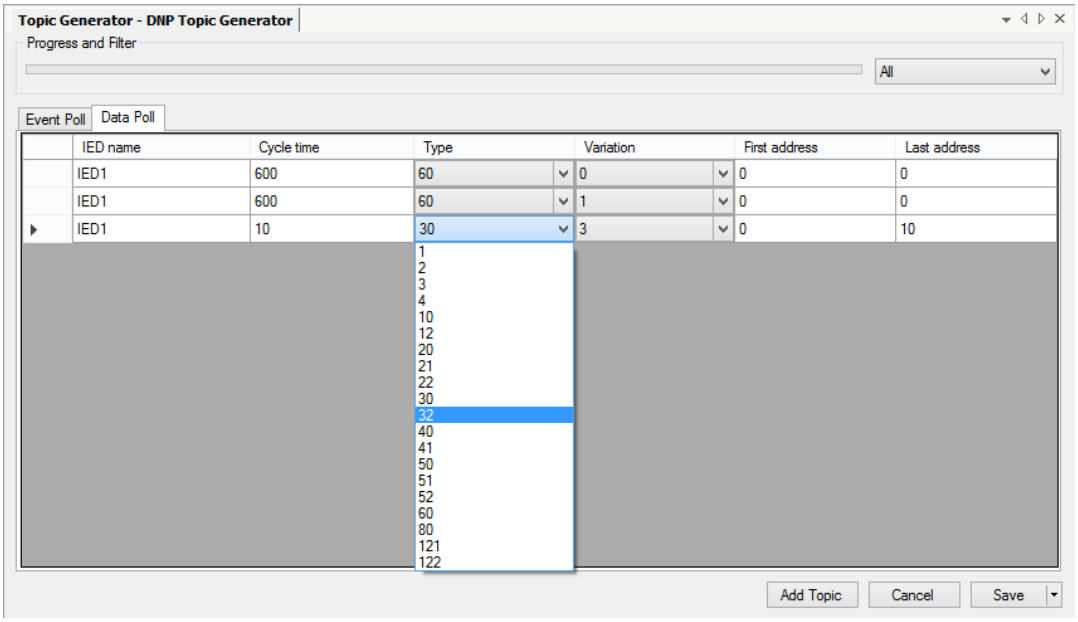


SAB600_DNP_Serial_Topic_Generator_DataPoll.png

Figure 3.5-3 Add Data Poll Topic

To modify an existing topic:

1. In **Topic Generator Tool**, change settings by entering a value or selecting it from the drop-down list.
2. Click the **Save** button to save the topic to the configuration.

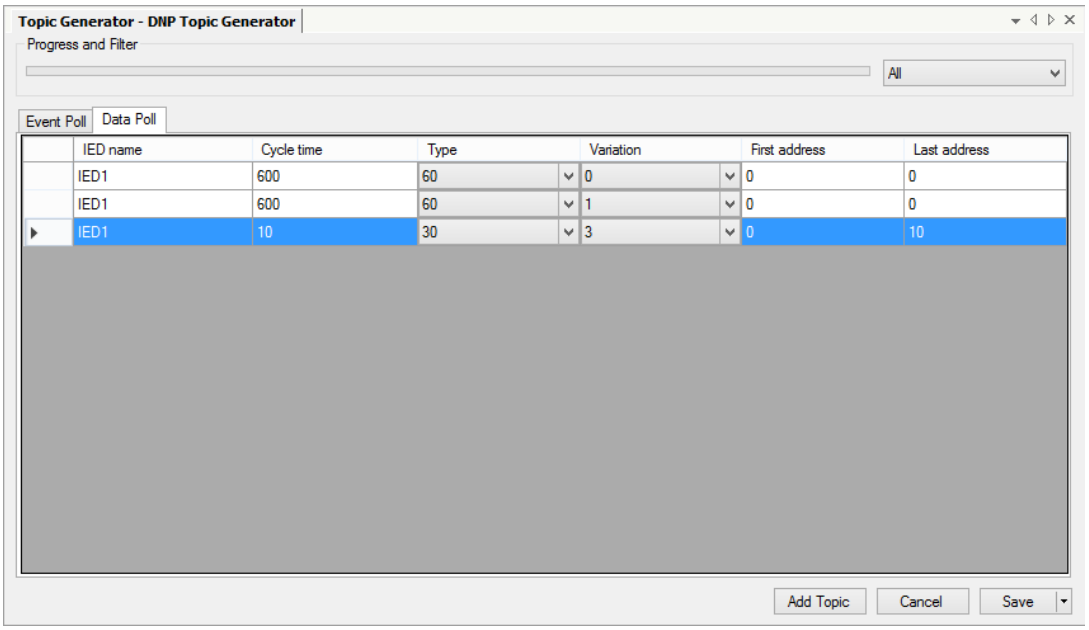


SAB600_DNP_Serial_Modify_Topic.png

Figure 3.5-4 Modify an Existing Topic

To delete a topic:

1. In **Topic Generator Tool**, select whole row of the topic you want to delete.
2. Press the Delete key from the keyboard to delete the topic.



SAB600_DNP_Serial_Delete_Topic.png

Figure 3.5-5 Delete a Topic

4. Operation

4.1. About this section

This section describes the basic operation procedures you can carry out after the server has been configured.

After reading this section, you can, for example, monitor and control network connections. Monitoring and controling is done by using the Online diagnostics function in SAB600.

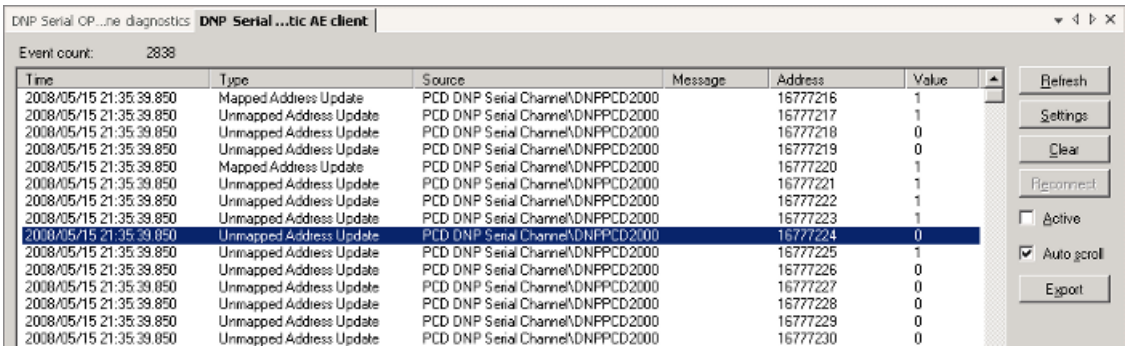
4.2. Activating COM600 with new configurations

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

4.3. Server diagnostics

Diagnostic events can be monitored and controlled using the Diagnostic AE Client function. Click **Refresh** to update the status information. To be able to receive events from a certain device, diagnostic events must be enabled for this respective device.

You have the following alternatives:
- View version information
- Reset the OPC Server
- View the event log file
- Clear the log file



dnp_serial_opc_client_ae.png

Figure 4.3-1 DNP OPC Client Diagnostic AE client

4.4. DNP channel diagnostics

The DNP channel 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 DNP 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**.

In the Diagnostic counters field, you can monitor the channel activity. To reset Diagnostic counters, click **Reset counters**.

You can take a DNP channel into use by marking the **In use** check box. If you unmark the check box, the channel is taken out of use.

For more information on the channel online diagnostics with the Analyzer function, see COM600 User's manual.

4.5. Monitoring and controlling communication

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

To monitor and control communication:
1. Select the device/ module 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 device into use by marking the **In use** check box. If you unmark the check box, the device is taken out of use.

Diagnostic counters are updated every 2 seconds. To update them manually, click **Refresh**.

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 information about IEC 61850 data modeling

The relationship between the IEC 61850 data modeling and DNP OPC Server is described in this section.

For each data class, there is a table giving a detailed description about the relation between the DNP 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.
- **DNP information element** specifies the DNP information element related to the attribute/service.
- **OPC data types** specify the OPC data type used for the OPC item.

5.2.2. Directional protection activation information (ACD)

Name	Type	Value/Value range	Mandat-ory/Optional	DNP data object field	OPC data types
general	BOOLEAN		M	state (0=OFF, 1=ON)	VT_BOOL
phsA	BOOLEAN		O	state (0=OFF, 1=ON)	VT_BOOL
phsB	BOOLEAN		O	state (0=OFF, 1=ON)	VT_BOOL
phsC	BOOLEAN		O	state (0=OFF, 1=ON)	VT_BOOL

Name	Type	Value/Value range	Mandatory/Optional	DNP data object field	OPC data types
neut	BOOLEAN		O	state (0=OFF, 1=ON)	VT_BOOL
q	Quality		M	DNP status	VT_14
t	TimeStamp		M	<server provided if none> | Time of occurrence| MSEC	VT_DATE
d	Description	Text	O	-	VT_BSTR

5.2.3. Protection activation information (ACT)

Name	Type	Value/Value range	Mandatory/Optional	DNP data object field	OPC data types
general	BOOLEAN		M	state (0=OFF, 1=ON)	VT_BOOL
phsA	BOOLEAN		O	state (0=OFF, 1=ON)	VT_BOOL
phsB	BOOLEAN		O	state (0=OFF, 1=ON)	VT_BOOL
phsC	BOOLEAN		O	state (0=OFF, 1=ON)	VT_BOOL
neut	BOOLEAN		O	state (0=OFF, 1=ON)	VT_BOOL
q	Quality		M	DNP status	VT_14
t	TimeStamp		M	<server provided if none> | Time of occurrence	VT_Date
d	Description	Text	O	-	VT_Date

5.2.4. Analogue set point (APC)

Name	Type	Value / Value range	Mandatory / Optional	Protocol information element	OPC data types
ctlVal	AnalogueValue		M	Control Value	VT_R4
mxVal	AnalogueValue		M	Current value	VT_R4
q	Quality		M	DNP status	VT_I4
t	Timestamp		M	<none> | Time of occurrence	VT_DATE

d	Description		O		VT_BSTR

5.2.5. Binary controlled step position information (BSC)

Name	Type	Value/Value range	Mandatory/Optional	DNP data object field	OPC data types
ctlVal	ENUMERATED	stop (0) | lower (1) | higher (2) | reserved (3)	M	Control Code	VT_I1
valWTr	ValWithTrans		M	State	VT_I4
q	Quality		M	DNP status	VT_I4
t	TimeStamp		M	<server provided if none> | Time of occurrence | MSEC	VT_DATE
d	Description	Text	O	-	VT_BSTR

5.2.6. Binary counter reading (BCR)

Name	Type	Value/Value range	Mandatory/Optional	DNP data object field	OPC data types
actVal	INTEGER		M	Value | Frozen value | Current value	VT_I4
siUnit	Integer		O	Config	VT_14
multiplier	Integer		O	Config	VT_14
unit	Integer		O	Config	VT_BSTR
q	Quality		M	DNP status	VT_I4
t	TimeStamp		M	<server provided if none> | Time of occurrence | MSCE	VT_DATE

5.2.7. Complex measured value (CMV)

CMV is configured in the same way as MV.

5.2.8. Delta (DEL)

Name	Type	Value/Value range	Mandat-ory/Optional	DNP information element	OPC data types
phsAB. mag	AnalogueValue		M	Phase AB Current Value	VT_R4
phsAB.q	Quality		M	on-line, com lost	VT_I4
phsAB.t	TimeStamp		M	server provided if none	VT_DATE
phsAB.range	Range		O	Separate Signal	VT_I4
phsAB.hhLim	REAL		O	Separate signal	VT_R4
phsAB.hLim	REAL		O	Separate signal	VT_R4
phsAB.lLim	REAL		O	Separate signal	VT_R4
phsAB.llLim	REAL		O	Separate signal	VT_R4
phsAB.min	REAL		O	Separate signal	VT_R4
phsAB.max	REAL		O	Separate signal	VT_R4
phsAB.siUnit	ENUMRATED		O	Separate signal	VT_I4
phsAB.multiplier	ENUMERATED		O	Separate signal	VT_I4
phsAB.unit	String		O	Separate signal	VT_BSTR
				Separate signal	
phsBC. mag	AnalogueValue		O	Phase BC Current Value	VT_R4
phsBC.q	Quality		O	on-line, com lost	VT_I4
phsBC.t	TimeStamp		O	-	VT_DATE
phsBC.range	Range		O	Separate Signal	VT_I4
phsBC.hhLim	REAL		O	Separate signal	VT_R4
phsBC.hLim	REAL		O	Separate signal	VT_R4
phsBC.lLim	REAL		O	Separate signal	VT_R4
phsBC.llLim	REAL		O	Separate signal	VT_R4
phsBC.min	REAL		O	Separate signal	VT_R4
phsBC.max	REAL		O	Separate signal	VT_R4
phsBC.siUnit	ENUMERATED		O	Separate signal	VT_I4
phsBC.multiplier	ENUMERATED		O	Separate signal	VT_I4
phsBC.unit	String		O	Separate signal	VT_BSTR
				Separate signal	

Name	Type	Value/Value range	Mandat-ory/Optional	DNP information element	OPC data types
phsCA. mag	AnalogueValue		O	Phase CA Current Value	VT_R4
phsCA.q	Quality		O	on-line, com lost	VT_I4
phsCA.t	TimeStamp		O	-	VT_DATE
phsCA.range	Range		O	Separate Signal	VT_I4
phsCA.hhLim	REAL		O	Separate signal	VT_R4
phsCA.hLim	REAL		O	Separate signal	VT_R4
phsCA.lLim	REAL		O	Separate signal	VT_R4
phsCA.llLim	REAL		O	Separate signal	VT_R4
phsCA.min	REAL		O	Separate signal	VT_R4
phsCA.max	REAL		O	Separate signal	VT_R4
phsCA.siUnit	ENUMERATED		O	Separate signal	VT_I4
phsCA.multiplier	ENUMERATED		O	Separate signal	VT_I4
phsCA.unit	String		O	Separate signal	VT_BSTR
d	Description		O	Separate signal	VT_BSTR

5.2.9. Controllable double point (DPC)

Name	Type	Value/Value range	Mandat-ory/Optional	DNP data object field	OPC data types
stVal	BOOLEAN	FALSE | TRUE	M	State (0:OFF, 1:ON)	VT_BOOL
ctlOperOn	BOOLEAN	FALSE | TRUE	O	Control Code	VT_BOOL
ctlOperOff	BOOLEAN	FALSE | TRUE	O	Control Code	VT_BOOL
ctlSelOn	BOOLEAN	FALSE | TRUE	O	Control Code	VT_BOOL
ctlSelOff	BOOLEAN	FALSE | TRUE	O	Control Code	VT_BOOL
ctlCan	BOOLEAN	FALSE | TRUE	O	-	VT_BOOL
stSelt	BOOLEAN	FALSE | TRUE	O	Control Code	VT_BOOL
q	Quality		M	DNP status	VT_I4
t	TimeStamp		M	<server provided if none> | Time of occurrence | MSEC	VT_DATE
d	Description	Text	O	-	VT_BSTR

5.2.10. Device name plate (DPL)

Name	Type	Value/Value range	Mandat-ory/Optional	DNP data object field	OPC data types
vendor	VisibleString		M	-	VT_BSTR
hwRevision	VisibleString		O	-	VT_BSTR
swRevision	VisibleString		O	-	VT_BSTR
serNum	VisibleString		O	-	VT_BSTR
location	VisibleString		O	-	VT_BSTR

5.2.11. Double point status (DPS)

Name	Type	Value/Value range	Mandat-ory/Optional	DNP data object field	OPC data types
stVal	CPT	Intermediate-state (0) | off (1) | on (2) | bad-state (3)	M	state (0=OFF, 1=ON)	VT_I4
q	Quality		M	DNP status	VT_I4
t	TimeStamp	Full Timestamp	M	<server provided if none> | Time of occurrence | MSEC	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.12. Controllable integer status (INC)

Name	Type	Value/Value range	Mandat-ory/Optional	DNP data object field	OPC data types
ctlVal	INTEGER	-	M	Control Code	VT_I4
stVal	BOOLEAN	FALSE | TRUE	M	Current Value	VT_I4
q	Quality		M	DNP status	VT_I4
t	TimeStamp		M	<server provided if none> | Time of occurrence | MSEC	VT_DATE
d	Description	Text	O	-	VT_BSTR

5.2.13. Controllable Enumerated Status (ENC)

Name	Type	Value/ Value range	Mandatory/Optional	Protocol information element	OPC data types
ctlVal	ENUMERATED		M	Control Value	VT_I4
stVal	ENUMERATED		M	Current value	VT_I4
q	Quality		M	DNP status	VT_I4
t	Timestamp		M	<server provided if none> | Time of occurrence	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.14. Integer status (INS)

Name	Type	Value/Value range	Mandatory/Optional	DNP data object field	OPC data types
stVal	INTEGER		M	Current value	VT_I4
q	Quality		M	DNP status	VT_I4
t	TimeStamp		M	<server provided if none> | Time of occurrence	VT_DATE
d	Description	Text	O	-	VT_BSTR

5.2.15. Enumerated Status (ENS)

Name	Type	Value/ Value range	Mandatory/Optional	Protocol information element	OPC data types
stVal	ENUMERATED		M	Current value	VT_I4
q	Quality		M	DNP status	VT_I4
t	Timestamp		M	<server provided if none> | Time of occurrence	VT_DATE
d	Description	Text	O		VT_BSTR

5.2.16. Integer controlled step position information (ISC)

Name	Type	Value/Value range	Mandatory/Optional	DNP data object field	OPC data types
ctlVal	INTEGER	-64 … 63	M	Control Code	VT_I1
valWTr	ValWithTrans		M	State	VT_I4
q	Quality		M	DNP status	VT_I4
t	TimeStamp		M	<server provided if none> | Time of occurrence | MSEC	VT_DATE
d	Description	Text	O	-	VT_BSTR

5.2.17. Logical node name plate (LPL)

Name	Type	Value/Value range	Mandatory/Optional	DNP information element	OPC data types
vendor	VisibleString		M	Separate signal	VT_BSTR
swRev	VisibleString		M	Separate signal	VT_BSTR
d	VisibleString		M	Separate signal	VT_BSTR

5.2.18. Measured value (MV)

Table 5.2.18-1 Measured value (MV) information

Name	Type	Value/Value range	Mandatory/Optional	DNP data object field	OPC data types
mag	AnalogueValue		M	Current value	VT_R4
q	Quality		M	DNP status	VT_I4
t	TimeStamp		M	server provided if none | Time of occurrence | MSEC	VT_DATE
d	Description	Text	O	-	VT_BSTR
hhLim	REAL		O	-	VT_R4
llLim	REAL		O	-	VT_R4
lLim	REAL		O	-	VT_R4
min	REAL		O	-	VT_R4

Name	Type	Value/Value range	Mandat-ory/Optional	DNP data object field	OPC data types
max	REAL		O	-	VT_R4
siUnit	Integer		O	Config	VT_I4
multiplier	Integer		O	Config	VT_I4
unit	String		O	Config	VT_BSTR
numOfDec	Integer		O	Config	VT_I4
range	Range		O	-	VT_I4

5.2.19. Controllable single point (SPC)

Name	Type	Value/Value range	Mandat-ory/Optional	DNP data object field	OPC data types
ctVal	BOOLEAN	FALSE | TRUE	M	Control Code	VT_BOOL
stVal	BOOLEAN	FALSE | TRUE	M	State (0:OFF, 1:ON)	VT_BOOL
q	Quality		M	DNP status	VT_I4
t	TimeStamp		M	<server provided if none> | Time of occurrence | MSEC	VT_DATE
d	Description	Text	O	-	VT_BSTR

5.2.20. Single point status (SPS)

Name	Type	Value/Value range	Mandat-ory/Optional	DNP data object field	OPC data types
stVal	BOOLEAN	TRUE | FALSE	M		VT_BOOL
q	Quality		M		VT_I4
t	TimeStamp		M		VT_DATE

5.2.21. WYE

Name	Type	Value/Value range	Mandat-ory/Optional	DNP information element	OPC data types
phsA. mag	AnalogueValue		M	Phase A Current Value	VT_R4
phsA.q	Quality		M	on-line, com lost	VT_I4
phsA.t	TimeStamp		M	–	VT_DATE
phsA.range	Range		O	Separate Signal	VT_I4
phsA.hhLim	REAL		O	Separate signal	VT_R4
phsA.hLim	REAL		O	Separate signal	VT_R4
phsA.lLim	REAL		O	Separate signal	VT_R4
phsA.llLim	REAL		O	Separate signal	VT_R4
phsA.min	REAL		O	Separate signal	VT_R4
phsA.max	REAL		O	Separate signal	VT_R4
phsA.siUnit	ENUMRATED		O	Separate signal	VT_I4
phsA.multiplier	ENUMERATED		O	Separate signal	VT_I4
phsA.unit	String		O	Separate signal	VT_BSTR
phsB. mag	AnalogueValue		O	Phase B Current Value	VT_R4
phsB.q	Quality		O	on-line, com lost	VT_I4
phsB.t	TimeStamp		O	–	VT_DATE
phsB.range	Range		O	Separate Signal	VT_I4
phsB.hhLim	REAL		O	Separate signal	VT_R4
phsB.hLim	REAL		O	Separate signal	VT_R4
phsB.lLim	REAL		O	Separate signal	VT_R4
phsB.llLim	REAL		O	Separate signal	VT_R4
phsB.min	REAL		O	Separate signal	VT_R4
phsB.max	REAL		O	Separate signal	VT_R4
phsB.siUnit	ENUMERATED		O	Separate signal	VT_I4
phsB.multiplier	ENUMERATED		O	Separate signal	VT_I4
phsB.unit	String		O	Separate signal	VT_BSTR

Name	Type	Value/Value range	Mandat-ory/Optional	DNP information element	OPC data types
phsC. mag	AnalogueValue		O	Phase C Current Value	VT_R4
phsC.q	Quality		O	on-line, com lost	VT_I4
phsC.t	TimeStamp		O	_	VT_DATE
phsC.range	Range		O	Separate Signal	VT_I4
phsC.hhLim	REAL		O	Separate signal	VT_R4
phsC.hLim	REAL		O	Separate signal	VT_R4
phsC.lLim	REAL		O	Separate signal	VT_R4
phsC.llLim	REAL		O	Separate signal	VT_R4
phsC.min	REAL		O	Separate signal	VT_R4
phsC.max	REAL		O	Separate signal	VT_R4
phsC.siUnit	ENUMERATED		O	Separate signal	VT_I4
phsC.multiplier	ENUMERATED		O	Separate signal	VT_I4
phsC.unit	String		O	Separate signal	VT_BSTR
neut. mag	AnalogueValue		O	Neutral Current Value	VT_R4
neut.q	Quality		O	on-line, com lost	VT_I4
neut.t	TimeStamp		O	-	VT_DATE
neut.range	Range		O	Separate Signal	VT_I4
neut.hhLim	REAL		O	Separate signal	VT_R4
neut.hLim	REAL		O	Separate signal	VT_R4
neut.lLim	REAL		O	Separate signal	VT_R4
neut.llLim	REAL		O	Separate signal	VT_R4
neut.min	REAL		O	Separate signal	VT_R4
neut.max	REAL		O	Separate signal	VT_R4
neut.siUnit	ENUMERATED		O	Separate signal	VT_I4
neut.multiplier	ENUMERATED		O	Separate signal	VT_I4
neut.unit	String		O	Separate signal	VT_BSTR
d	Description		O	Separate signal	VT_BSTR

Name	Type	Value/Value range	Mandat-ory/Optional	DNP information element	OPC data types
net.mag	AnalogValue		M	Net current value	VT_R4
net.q	Quality		M	Online, com lost	VT_R4
net.t	Timestamp		M	-	VT_DATE
net.range	Range		O	Separate Signal	VT_R4
net.hhLim	REAL		O	Separate Signal	VT_R4
net.hLim	REAL		O	Separate Signal	VT_R4
net.lLim	REAL		O	Separate Signal	VT_R4
net.llLim	REAL		O	Separate Signal	VT_R4
net.min	REAL		O	Separate Signal	VT_R4
net.max	REAL		O	Separate Signal	VT_R4
net.siUnit	ENUMERATED		O	Separate Signal	VT_R4
net.multiplier	ENUMERATED		O	Separate Signal	VT_R4
net.unit	String		O	Separate Signal	VT_BSTR
res.mag	AnalogValue		M	Res current value	VT_R4
res.q	Quality		M	Online, com lost	VT_R4
res.t	Timestamp		M	-	VT_DATE
res.range	Range		O	Separate Signal	VT_R4
res.hhLim	REAL		O	Separate Signal	VT_R4
res.hLim	REAL		O	Separate Signal	VT_R4
res.lLim	REAL		O	Separate Signal	VT_R4
res.llLim	REAL		O	Separate Signal	VT_R4
res.min	REAL		O	Separate Signal	VT_R4
res.max	REAL		O	Separate Signal	VT_R4
res.siUnit	ENUMERATED		O	Separate Signal	VT_R4
res.multiplier	ENUMERATED		O	Separate Signal	VT_R4
res.unit	String		O	Separate Signal	VT_BSTR

Appendix 1

Device profile

Table A1-1 The device profile describing the implementation of the DNP 3.0 master protocol in COM600

DNP 3.0 **DEVICE PROFILE DOCUMENT**	
Vendor Name: ABB Oy Distribution Automation	
Device Name: COM600 3.4	
Highest DNP Level Supported: For Requests: Subset Level 2 For Responses: Subset Level 2	Device Function: [x] Master [ ] Slave
Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table): Additions to level 2 are shaded in the accompanying implementation tables.	
Maximum Data Link Frame Size (octets):	**Maximum Application Fragment Size (octets):**
Transmitted: <292 Received: (must be 292)	Transmitted: <250 (Single fragments only) Received : 2048
Maximum Data Link Re-tries:	**Maximum Application Layer Re-tries:**
[ ] None [ ] Fixed at _____ [x] Configurable, range 0 to 10, Channel Enquiry Limit	[ ] None [ ] [x] Configurable, range 0 to 5, IED Application Message Retries property

Requires Data Link Layer Confirmation:
[ ] Never [ ] Always [ ] Sometimes. If 'Sometimes', when? _____ [x] Configurable, Channel Link Layer Confirmations Enabled property
Requires Application Layer Confirmation:

Requires Data Link Layer Confirmation:
[ ] Never [ ] Always (not recommended) [ ] When reporting Event Data (Slave devices only) [ ] When sending multi-fragment responses (Slave devices only) [ ] Sometimes. If 'Sometimes', when? _____ [x] Configurable, Process Data Confirmation IED property
Timeouts while waiting for:
Data Link Confirm [ ] None [ ] Fixed at _____ [ ] Variable [x] Configurable, Channel Header Timeout
Complete Appl. Fragment [ ] None [ ] Fixed at _____ [ ] Variable [x] Configurable, IED Transport Timeout, Reply Timeout
Application Confirm [ ] None [ ] Fixed at _____ [ ] Variable [x] Configurable, CT IED Confirmation Timeout
Complete Appl. Response [ ] None [ ] Fixed at _____ [ ] Variable [x] Configurable, AT IED Application Timeout
Others: Complete data link frame: Channel Response Timeout Response to a request: IED Reply Timeout, Application Response Timeout
Sends/Executes Control Operations:
WRITE Binary Outputs [x] Never [ ] Always [ ] Sometimes [ ] Configurable
SELECT/OPERATE [ ] Never [ ] Always [ ] Sometimes [x] Configurable
DIRECT OPERATE [ ] Never [ ] Always [ ] Sometimes [x] Configurable
DIRECT OPERATE - NO ACK [ ] Never [ ] Always [ ] Sometimes [x] Configurable
Count > 1 [x] Never [ ] Always [ ] Sometimes [ ] Configurable
Pulse On [ ] Never [ ] Always [ ] Sometimes [x] Configurable

Requires Data Link Layer Confirmation:
Pulse Off [ ] Never [ ] Always [ ] Sometimes [x] Configurable
Latch On [ ] Never [ ] Always [ ] Sometimes [x] Configurable
Latch Off [ ] Never [ ] Always [ ] Sometimes [x] Configurable
Queue [x] Never [ ] Always [ ] Sometimes [ ] Configurable
Clear Queue [x] Never [ ] Always [ ] Sometimes [ ] Configurable
FILL OUT THE FOLLOWING ITEM FOR MASTER DEVICES ONLY:
Expects Binary Input Change Events:
[x] Either time-tagged or non-time-tagged for a single event [ ] Both time-tagged and non-time-tagged for a single event [ ] Configurable (attach explanation)

Supported function codes

Table A1-2 Supported function codes (* = CO attribute is needed)

Code	Function	Description	Supported
		Transfer Function Codes	
0	Confirm	Message fragment confirmation No response	Yes
1	Read	Request objects from outstation Respond with requested objects	Yes
2	Write	Store the specified objects to outstation Respond with status of operation	Yes
		Control Function Codes	
3	Select	Select the output point of outstation Respond with status of control point	Yes
4	Operate	Set the output that has previously been selected Respond with status of control point	Yes

Code	Function	Description	Supported
5	Direct operate	Set the output directly Respond with status of control point	Yes
6	Direct operate - no ack	Set the output directly No respond	Yes
		Freeze Function Codes	
7	Immediate Freeze	Copy the specified objects to freeze buffer Respond with status of operation	Yes
8	Immediate Freeze -no ack	Copy the specified objects to freeze buffer No respond	Yes
9	Freeze and Clear	Copy the specified objects to freeze buffer and clear objects Respond with status of operation	Yes
10	Freeze and Clear - no ack	Copy the specified objects to freeze buffer and clear objects No respond	Yes
11	Freeze with time	Copy the specified objects to freeze buffer at specified time Respond with status of operation	No
12	Freeze with time - no ack	Copy the specified objects to freeze buffer at specified time No respond	No
		Application Control Function Codes	
13	Cold Restart Perform the desired reset sequence Respond with a time object Yes		
14	Warm Restart	Perform the desired partial reset operation Respond with a time object	Yes
15	Initialise Data to Defaults	Initialise the specified data to default Respond with the status of operation	No
16	Initialise Application	Prepare the specified application to run Respond with the status of operation	No
17	Start Application	Start the specified application to run Respond with the status of operation	No
18	Stop Application	Stop the specified application to run Respond with the status of operation	No
		Configuration Function Codes	

Code	Function	Description	Supported
19	Save configuration	Save the configuration Respond with status of operation	No
20	Enable Unsolicited Messages	Enable Unsolicited Messages Respond with status of operation	No
21	Disable Unsolicited Messages	Disable Unsolicited Messages Respond with status of operation	No
22	Assign Class	Assign specified objects to a class Respond with status of operation	No
		Time Synchronization Function Codes	
23	Delay Measurement	Perform propagation delay measurement	Yes
24	Record current time	Used in a network application to allow the Master station and the Out station to record their time at the same instant	Yes
		Response Function Codes	
0	Confirm	Message fragment confirmation	Yes
129	Response	Response to requested message	Yes
130	Unsolicited Message	Spontaneous message without request	Yes

Level of Implementation

DNP has three subset levels, each of which includes a specific subset of DNP message types and functionality. In COM600 the DNP protocol has been implemented according to the Subset Level 2 of the protocol as presented in Table A1-3.

Table A1-3 Data object types and variations supported

Data object type	Variation	Description	Function code of Request message	Qualifier code of Request message	Function code of Response message	Qualifier code of Response message
1	0	Binary input, all variations	1	6		
1	1	Binary input			129,130	0,1
1	2	Binary input with status			129,130	0,1
2	0	Binary input change, all variations	1	6,7,8		

Data object type	Variation	Description	Function code of Request message	Qualifier code of Request message	Function code of Response message	Qualifier code of Response message
2	1	Binary input change without time	1	6,7,8	129,130	17,28
2	2	Binary input change with time	1	6,7,8	129,130	17,28
2	3	Binary input change with relative time	1	6,7,8	129,130	17,28
10	0	Binary output, all variations	1	6		
10	1	Binary output status			129,130	0,1
12	1	Control relay output block	3,4,5,6	17,28	129	echo
20	0	Binary counter, all variations	1,7,8,9,10	17,28		
20	1	32-bit binary counter			129,130	0,1
20	2	16-bit binary counter			129,130	0,1
20	3	32-bit delta counter			129,130	0,1
20	4	16-bit delta counter			129,130	0,1
20	5	32-bit binary counter without flag			129,130	0,1
20	6	16-bit binary counter without flag			129,130	0,1
20	7	32-bit delta counter without flag			129,130	0,1
20	8	16-bit delta counter without flag			129,130	0,1
21	0	Frozen counter, all variations	1	6		
21	1	32-bit frozen counter			129,130	0,1

Data object type	Variation	Description	Function code of Request message	Qualifier code of Request message	Function code of Response message	Qualifier code of Response message
21	2	16-bit frozen counter			129,130	0,1
21	9	32-bit frozen counter without flag			129,130	0,1
21	10	16-bit frozen counter without flag			129,130	0,1
22	0	Counter change event, all variations	1	6,7,8		
22	1	32-bit counter change event without time			129,130	17,28
22	2	16-bit counter change event without time			129,130	17,28
30	0	Analog input, all variations	1	6		
30	1	32-bit analog input			129,130	0,1
30	2	16-bit analog input			129,130	0,1
30	3	32-bit analog input without flag			129,130	0,1
30	4	16-bit analog input without flag	1	0,1,6	129,130	0,1
32	0	Analog change event, all variations	1	6,7,8		
32	1	32-bit analog change event without time			129,130	17,28
32	2	16-bit analog change event without time			129,130	17,28
40	0	Analog output status, all variations	1	6	129,130	0,1
40	2	16-bit analog output status				

Data object type	Variation	Description	Function code of Request message	Qualifier code of Request message	Function code of Response message	Qualifier code of Response message
41	2	16-bit analog output block	3,4,5,6	17,28	129	echo
50	1	Time and date	2	7		
51	1	Time and date CTO			129,130	7
51	2	Unsynchronised time and date CTO			129,130	7
52	1	Time and date coarse			129	7
52	2	Time delay fine			129	7
60	1	Class 0 data	1	6		
60	2	Class 1 data	1	6,7,8		
60	3	Class 2 data	1	6,7,8		
60	4	Class 3 data	1	6,7,8		
80	1	Internal indications	2	0		
		No object	13			
		No object	23			

- Obj. is the data object type.
- Var. is the variation.
- Func. is the function code of the message.
- Qual. is the qualifier code of the message in hexadecimal.
- Echo means that the response is the request mirrored.

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