



Atop Technologies, Inc.

Protocol Gateway IEC60870-5-103 Master/Slave

Protocol and
eNode Designer configuration

eNode Configuration Manual

V1.4

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This PDF Document contains internal hyperlinks for ease of navigation.
For example, click on any item listed in the [Table of Contents](#) to go to that page.

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We have checked the contents of this manual for agreement with the hardware and the software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual is reviewed regularly and any necessary corrections will be included in subsequent editions.

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1 Introduction

Thank you for Buying Atop's Protocol Gateway. The product is bundled with the following three user manuals:

- 1) Hardware specific installation user manual, **not covered in this document**. It covers Atop's hardware installation procedure, wiring, power connection etc.
- 2) Getting started with Atop's Protocol Gateway user manual – configuration tool introduction, web configuration, software architecture introduction– **not covered in this document**. This manual covers the introduction, installation, network set-up maintenance and using of the configuration tool software, including the procedure to be followed for uploading new configurations to Atop's device.
- 3) Protocol specific user manual (**This Manual**). **One protocol-specific manual will be provided for each protocol installed on the device**. This manual covers:
 - a. Basic device network configuration
 - b. Step-by-step protocol set-up for in eNode designer
 - c. Description of the protocol-specific software features, the device profile and the implementation table of supported functionalities.

This manual is for **IEC-60870-5-103 slave** and describes how to use the **IEC-60870-5-103 eNode Designer Module** to configure Atop's *IEC 60870-5-101/103 ADH Application* within the eNode Designer configuration tool.

1.1 Scope

This document is divided into 3 major sections:

- **General Description;**
- **Configuration Guide;** and
- **Interoperability**

1.2 Document Reference

- [1] Document Title: eNode Designer User Manual
Revision: Version 1.00
- [2] Document Title: IEC 60870-5-103 International Standard
Revision: First Edition, December 1997

1.3 List of Abbreviations

ADH	= Application Data Hub
IEC	= International Electrotechnical Commission
IED	= Intelligent Electronic Device

2 General Description

The IEC 60870-5-103 eNode Module can be used to configure the IEC 60870-5-103 ADH Application as a master or slave. For naming consistency across eNode Designer, the master is called a client, and the slave is called a server.

The client can communicate with many servers, whose data point details can be configured using this module. Atop's Protocol Gateway supports one server/slave per protocol per device.

2.1 IEC 60870-5-103 Standard

IEC 60870-5-103 is an international standard, released by IEC(International Electrotechnical Commission), used for telecontrol(supervisory control and data acquisition)in electrical engineering and power system automation applications.

This manual assumes that reader has some basic knowledge of the IEC 60870 standard documents and the IEC 60870-5-103 protocol.

IEC 60870 Document Part	Description
IEC 60870-5-1	Transmission Frame Formats
IEC 60870-5-2	Data Link Transmission Services
IEC 60870-5-3	General Structure of Application Data
IEC 60870-5-4	Definition and Coding of Information Elements
IEC 60870-5-5	Basic Application Functions
IEC 60870-5-6	Guidelines for conformance testing for the IEC 60870-5 companion standards
IEC 60870-5-103	Transmission Protocols, companion standard for the informative interface of protection equipment

2.2 ISO/OSI of IEC 60870-5-103

Data Unit	Layer	Functional
Data	7. Application Layer	IEC 60870-5-4 IEC 60870-5-5 IEC 60870-5-103 standard
	6. Presentation Layer	N/A
	5. Session Layer	N/A
Segments	4. Transport Layer	N/A
Packet/Datagram	3. Network Layer	N/A
Bit/Frame	2. Data Link Layer	Unbalanced IEC 60870-5-2 IEC 60870-5-1(FT 1.2)
	1. Physical Layer	RS232, RS422, RS485

2.3 Configuration Theory

Most configuration properties describe a server. When configuring the ADH application server, you are configuring the properties of the server itself. When configuring the ADH application client, you are describing the properties of all the remote servers with which the client is communicating.

Configuring the protocol specific information (such as object addressing) is handled in the module. This is explained in this document.

Communication port properties (such as Baud Rate) are configured on the communication port itself. The Device module handles the communication port properties, so heavy details are outside the scope of this document. Port configuration instructions are provide in the eNode Designer general user manual. However, screenshots of the typical configuration method are shown in section [4](#).

2.4 General Screen Description

A small configuration example is shown below to better help describe the layout of the screen.

The screenshot shows the 'Settings' tab for IED [1]. The 'ASDU Address' is set to 1. The 'Data Point' table contains the following data:

Tag	Function Type	ASDU	Information Number	Element
Auto Recloser Status	128 Distance Protection	Time Tag Message	16 Auto Recloser Status	DPI: Double point information
Auto Recloser SiN	128 Distance Protection	Time Tag Message	16 Auto Recloser Status	SiN: Supplementary information
Teleprotection Status	128 Distance Protection	Time Tag Message	17 Teleprotection Status	DPI: Double point information
Teleprotection SiN	128 Distance Protection	Time Tag Message	17 Teleprotection Status	SiN: Supplementary information

The 'Commands' table contains the following data:

Tag	Function Type	Information Number
Cmd Auto Recloser on/off	128 Distance Protection	16 Auto Recloser on/off
Cmd Teleprotection on/off	128 Distance Protection	17 Teleprotection on/off
Cmd Protection on/off	128 Distance Protection	18 Protection on/off
Cmd LED Reset	128 Distance Protection	19 LED Reset
Cmd Characteristic 1 Activate	128 Distance Protection	23 Characteristic 1 Activate
Cmd Characteristic 2 Activate	128 Distance Protection	24 Characteristic 2 Activate
Cmd Characteristic 3 Activate	128 Distance Protection	25 Characteristic 3 Activate
Cmd Characteristic 4 Activate	128 Distance Protection	26 Characteristic 4 Activate

Figure 2-1 - Example screen.

- ① **Tabs** – There is one single “Settings” tab in both client and server. The server is allocated to a single tab. The client may communicate with many servers of different protocols, so there may be many server tabs. In a server application, there is only one server tab that is used to describe the properties of the local server itself.
- ② **Server IED Properties** – Describes the protocol-specific properties of the server IED.
- ③ **Data Table and buttons** – Shows all (information) data associated with the IED, and buttons used to modify them.
- ④ **Commands Table and buttons** – Shows all commands associated with the IED, and buttons used to modify them.

The user is able to add, delete and organise data points using buttons. The user may also edit the contents of the data and command tables freely after points are created.

Each tab is named “IED [{X}]” where {X} is the ASDU address.

3 IEC60870-5-103 Configuration Guide

3.1 Adding the Module in eNode Designer

The IEC 60870-5-103 module can be added to *Serial* ports only.

The application can be set up as a Client. The choice will be presented when adding it to the project.

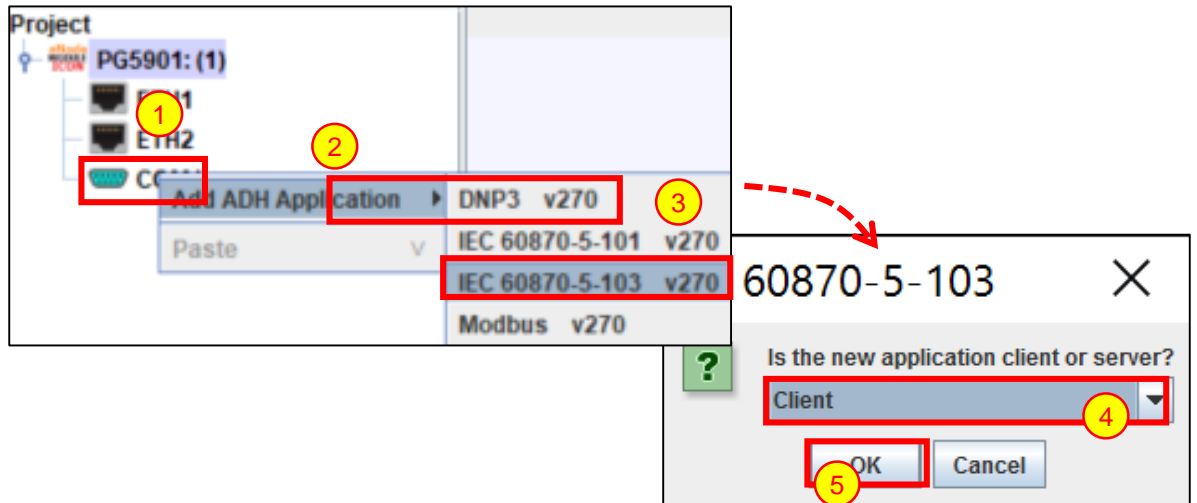


Figure 3-1 - Adding the module in eNode Designer.

- 1 Right click the desired **communication port**.
- 2 Open the **Add ADH Application** menu.
- 3 Select **IEC 60870-5-103**.
- 4 Select **Client** from the drop-down menu.
- 5 Click **OK**.

3.2 Server IED Properties

The server IED properties are at the top of the module screen. It has a single configurable item: the ASDU address of the slave.

ASDU Address:

3.2.1.1 ASDU Address

Description	The ASDU address of the server (slave) IED. For clients, it describes the ASDU address of the remote server.
Data Entry	Integer

Range	0 to 255
Input Option	Mandatory

3.3 Client Configuration

Adding a client application will immediately show the following figure. The first tab shows the settings that apply to the whole client application. Each tab after this represents a single IEC 60870-5-103 server with which the client is communicating.

Figure 3-2 - Client settings panel.

Selecting the IED tab will show the following view.

Figure 3-3 - Client IED panel.

Here the “Add” and “+1” button can be used to add data points. Adding data points is explained in the “Add data points” section, and the other buttons are described in section [7: Reference Guide](#).

3.3.1 Client Settings

Listed below are details about each client setting.

3.3.1.1 Link Address

Description	The link address to use.
Data Entry	Integer
Range	0 to 255. Default 1
Input Option	Mandatory

3.3.1.2 Link Layer Timeout (ms)

Description	The timeout for a data link layer confirmation in milliseconds.
Data Entry	Integer
Range	100 to 65535. Default 1000
Input Option	Mandatory

3.3.1.3 Station Initialization

Description	The option to use in the station initialization (reset communications) command. CU = Communications unit, FCB = Frame count bit.
Data Entry	Drop down menu
Options	Reset CU, Reset FCB
Input Option	Mandatory

3.3.1.4 Time Sync Interval (s)

Description	The interval that the time synchronisation commands are sent, in seconds.
Data Entry	Integer
Range	1 to 65535. Default: 3600
Input Option	Mandatory

3.3.1.5 General Interrogation Interval (s)

Description	The interval that general interrogation commands are sent, in seconds.
Data Entry	Integer
Range	0 to 65535. Default: 60
Input Option	Mandatory

3.3.1.6 Poll Class2 Interval (ms)

Description	The interval at which the classes are polled, in milliseconds.
Data Entry	Integer

Range	<i>0 to 65535. Default 1000</i>
Input Option	Mandatory

3.3.1.7 Command Timeout (ms)

Description	The timeout to wait for a command to complete, in milliseconds.
Data Entry	Integer
Range	<i>0 to 65535. Default 3000</i>
Input Option	Mandatory

3.3.2 Adding Data Points

To add data points, left click the “Add” button beneath the tables in the main view. . Doing so will show the following window. The window is used to add many data points at once with the specified values. For details on the meaning of each column, see section 7.2.

The screenshot shows the 'Add Data Points' dialog box. It contains a 'Preview' table at the top, a 'New values' table below it, and a section for 'Number of rows' and 'Auto-increment' settings. At the bottom, there are three 'Define counter' sections for [X], [Y], and [Z], each with 'Start at' and 'Step by' fields. The 'OK' and 'Cancel' buttons are at the bottom right.

Preview:

Tag	Function Type	ASDU Type	Information Number	Element
Ex 1	128 Distance Protection	Time Tag Message	16 Auto Recloser Status	DPI: Double point information
Ex 2	128 Distance Protection	Time Tag Message	17 Teleprotection Status	DPI: Double point information
Ex 3	128 Distance Protection	Time Tag Message	18 Protection Status	DPI: Double point information
Ex 4	128 Distance Protection	Time Tag Message	19 LED Reset	DPI: Double point information

New values:

Tag	Function Type	ASDU Type	Information Number	Element
Ex [X]	128 Distance Protection	Time Tag Message	16 Auto Recloser Status	DPI: Double point information

Number of rows: 4

Auto-increment: ☐ None ☒ Information Number ☐ Element

You can use "[X]" as an auto increment counter. [Y] and [Z] work similarly. Use [3X] to produce values like "001".

Define counter [X]

Start at: 1 Step by: 1

Define counter [Y]

Start at: 0 Step by: 0

Define counter [Z]

Start at: 0 Step by: 1

OK Cancel

Figure 3-4 - Add data points window.

- 1 **Preview Area** – Shows the preview of the data points that will be added.
- 2 **New values** – This area is used to enter values. Tag use manual data entry (click the box and type new values). Data type use drop-down menus.
- 3 **Number of rows** – This counter can be used to add many data points at once.
- 4 **Auto-increment** – Chooses what increment type to use in each successive row.
 - None No increments in any row
 - Information Number Increments the information number by one per row
 - Data Object Increments the data object by one per row. When no more data objects for that information number exist, the next information number is used and the data object index resets to the first item.
- 5 **Counters** – The starting values and step values of counters can be set in this area. Counters are used in the input areas resulting in the substituted values appearing in the preview area. See also 5 Using Counters.
- 6 **OK button** – to accept the new data points.

3.3.2.1 Add a Single Data Point

A single data point can be added at a time using the “+1” button beneath the desired table. Clicking “+1” will copy the information of the selected row, and automatically increase the address field to the next unused address. This means increasing the data object, or if the data object is at the last value, it increases the information number and uses the first data object in the new information number. This process continues until it finds an unused address.

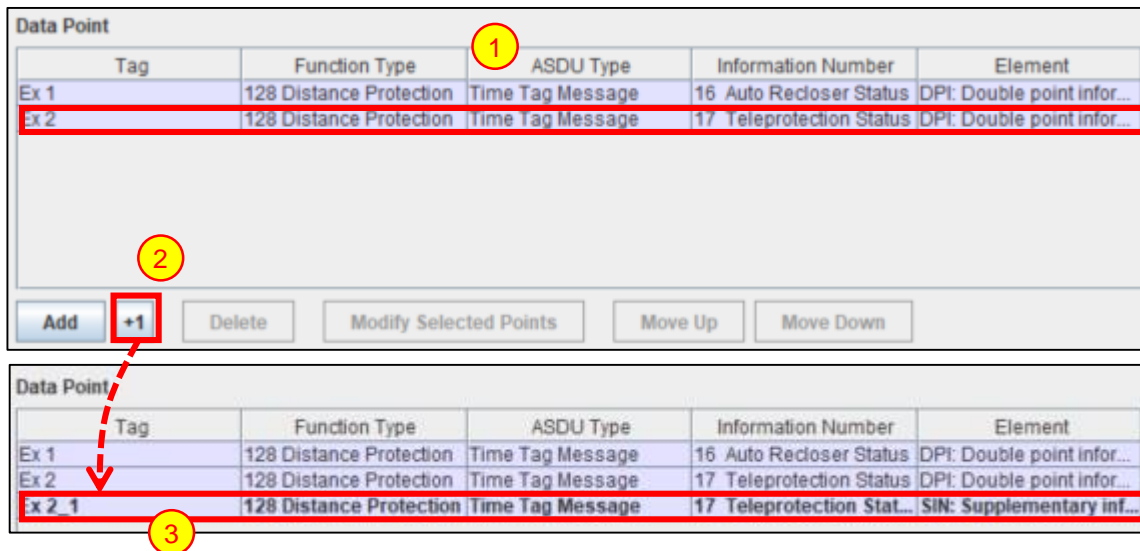


Figure 3-5 - Adding a single data point with +1 button.

- ① (Optional) **Select the data point to copy.** Using no selection will just add a default data point.
- ② Click the **+1** button– This will add a new data point with details copied from the selected data point, with an automatically increased *Address*. eNode Designer will make sure that a new unique tag name is generated for the point.
- ③ A new point has been added. You may want to change the tags etc. as required.

3.3.3 Connected Servers (Remote IEDs)

Each slave IED is represented by a single tab and a tree node in the eNode Designer project tree.

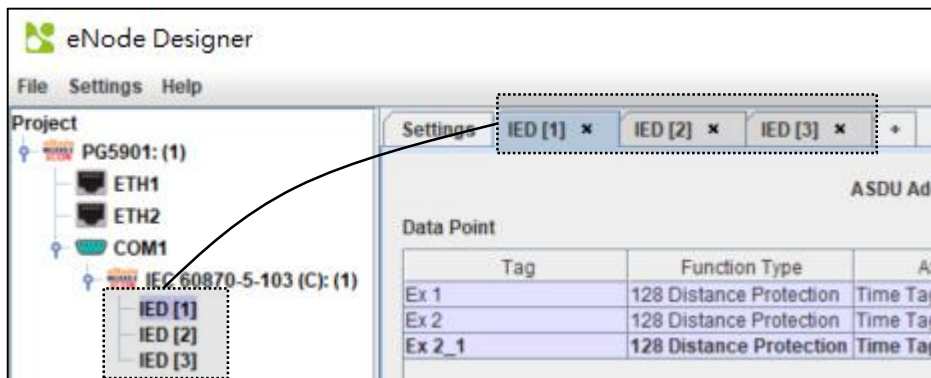


Figure 3-6 - Multiple connected servers example.

To modify the connected IEDs list follow the instructions below:

- 1 To **add** a new remote IED, click the "+" tab at the end of the list of existing remote servers.

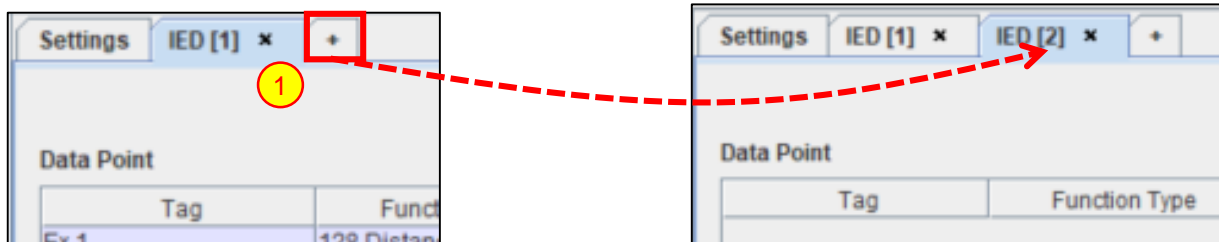


Figure 3-7 - Add a connected server.

To remove a remote IED, it must have no data points specified. If there are data points in the table and you still wish to remove the IED, you will have to remove such data points first.

- 1 To **remove** a remote IED, click the cross on the right side of the tab of the IED you wish to remove.



Figure 3-8 - Remove a connected server.

3.4 Miscellaneous Common

3.4.1 Incomplete, Conflicting and not needed Information

Incomplete or conflicting information is shown in red. This will cause warning symbols on the tab and in the project tree. Hovering over the warning icons will show further details about what is causing the warning. This allows the user to quickly fix invalid information.

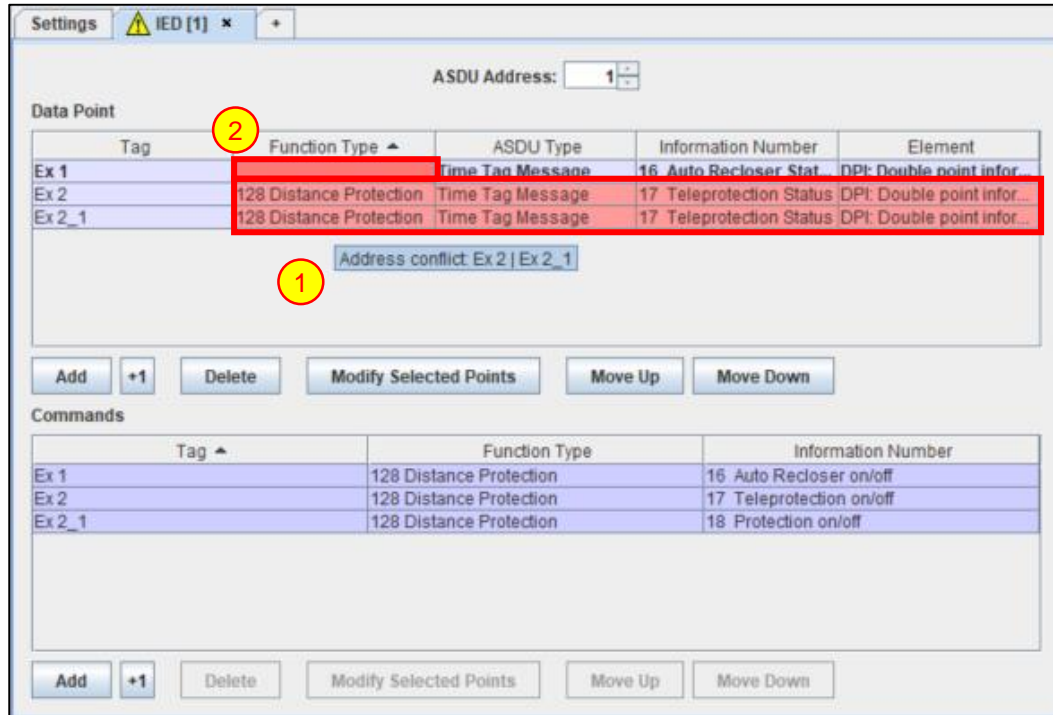


Figure 3-9 – Incomplete and missing information example.

- 1 **Mouse-over a warning** to show a tooltip explaining the warning.
- 2 **Invalid data** shows in red. The dark red color means the data is invalid, and the light red color means there is an address conflict.

3.4.2 Modify Selected Points Window

The “Modify Selected Points” window is used to change many row properties in one single step.

Select the data points you want to change, and then click the “**Modify Selected Points**” button beneath the tables. It will generate the following window.

The screenshot shows the 'Modify Data Points' window with the following sections and callouts:

- Original:** A table with 5 columns: Tag, Function Type, ASDU Type, Information Number, and Element. It contains three rows of data. Callout 1 points to this table.
- Preview:** A table with the same 5 columns as the original table, showing the data after modifications. Callout 2 points to this table.
- New values:** A table with the same 5 columns, where the 'Tag' column contains '[N]'. Callout 3 points to this table.
- Auto-increment:** A section with three radio buttons: 'None' (selected), 'Information Number', and 'Element'. Callout 4 points to this section.
- Counter properties:** Three sections for 'Define counter [X]', 'Define counter [Y]', and 'Define counter [Z]'. Each section has 'Start at' and 'Step by' input fields. Callout 5 points to these sections.
- OK button:** A red-bordered button at the bottom right. Callout 6 points to this button.

Figure 3-10 - Modify data points window example.

- 1 **Original table data** – Shows the original table data.
- 2 **Preview** – Shows the new table data that will be used if the modifications are accepted. These fields update according to the contents of (3).
- 3 **New values** – The new values for the table cells. “[N]” can be used to maintain the original value of the cell, and the auto-incrementing counters [X], [Y] and [Z] can be used to add numbers. For details, see [Using Counters](#).
- 4 **Auto-increment:** Chooses what increment type to use in each successive row.
 - None* No increments in any row
 - Information Number* Increments the information number by one per row
 - Data Object* Increments the data object by one per row. When no more data objects for that information number exist, the next information number is used and the data object index resets to the first item.
- 5 **Counter properties** – Sets the initial values and step amounts of the counters [X], [Y] and [Z].
- 6 **OK button** – to accept the modifications.

4 Communication Port Properties

The device module handles how the communication port properties are displayed. However, the typical method is briefly described below.

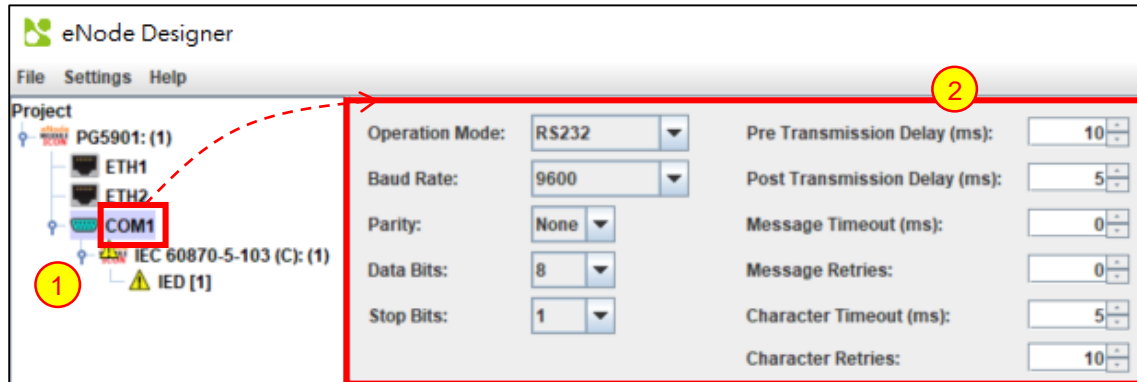


Figure 4-1 - Serial port properties.

- 1 **Select the communication port in the project tree** – This will typically let the central panel show the port's properties.
- 2 **Properties** – The communication port's properties can be set.

5 Using Counters

The following is a full example that shows how auto-increment works. The example given shows the IEC 60870-5-104 window. The IEC 60870-5-103 auto-increment works in the same way.

Add Points

Preview

Tag	Data Type	Start IOA	Count
example_tag_0	Single Point	1	1
example_tag_2	Single Point	2	1
example_tag_4	Single Point	3	1
example_tag_6	Single Point	4	1
example_tag_8	Single Point	5	1

New values:

Tag	Data Type	Start IOA	Count
example_tag [X]	Single Point	1	1

Number of rows: (1)

You can use "[X]" as an auto increment counter. [Y] and [Z] work similarly. Use [3X] to produce values like "001".

Define counter [X]

Start at: Step by:

Define counter [Y]

Start at: Step by:

Define counter [Z]

Start at: Step by:

Figure 5-1 – Using Auto Increment when adding Data Points or Commands.

- 1 The *Number of Rows* can be modified to set the number of data points or commands created from the *New values* section. As shown in the example above, five data points/commands are created and shown in the preview section as the *Number of Rows* is set to 5.

When using the auto increment counters by default, they will start at one and increment by one. Anyway auto-increment value has its own section for configuration. Adjusting *Start At* will change the value that the first data point/command receives. Adjusting *Step By* will change the value that the second and subsequent values will be incremented by.

- 2 In this example, the [X] counter is used. The *Start At* value has been set to 0 and the *Step By* value has been set to 2. This results in the values seen in the preview section.

It is also possible to include a number within the square brackets and before the X, Y or Z while using auto increment. This will produce values that contain the entered number of digits. Any digit that is not taken up by the value determined by the *Start At* and *Step By* values will be shown as zeros.

If no auto increment value is entered in any field, each data point/command field value will be created the same with the exception of *Tag* and *IOA*. The first new data point/command's *Tag* value will represent what was entered in the *New value* section. However, the subsequent data points/commands will contain the initial *Tag* value followed by an underscore and a number incrementing by one from 1 onwards. (Example: tag, tag_1, tag_2 etc.). This is an artefact of eNode Designer ensuring all data point tag names are unique.

6 Interoperability

This interoperability list refers to section 8 of the IEC 60870-5-103 International Standard (reference number CEI/IEC 60870-5-103:1997, pages 159 to 171).

The selected parameters should be marked in the white boxes as follows:

<input type="checkbox"/>	Function or ASDU is not used
<input checked="" type="checkbox"/>	Function or ASDU is used as standardized (default)
<input type="checkbox"/>	Function or ASDU is not support
<input type="checkbox"/> R	Function or ASDU is used in reverse mode
<input type="checkbox"/> A	Function or ASDU supported in addition to the standard

6.1 Physical layer

6.1.1 Electrical Interface

- ☒ EIA RS-485
- ☐ Number of loads ____ for one protection equipment
- ☒ RS-232
- ☒ RS-422

6.1.2 Optical Interface

- ☐ Glass fibre
- ☐ Plastic fibre
- ☐ F-SMA type connector
- ☐ BFOC/2,5 type connector

6.1.3 Transmission speed

- ☐ 300 bit/s ☒ 9600 bit/s ☒ 57600 bit/s ☒ 921600 bit/s
- ☒ 1200 bit/s ☐ 14400 bit/s ☒ 115200 bit/s
- ☒ 2400 bit/s ☒ 19200 bit/s ☒ 230400 bit/s
- ☒ 4800 bit/s ☒ 38400 bit/s ☒ 460800 bit/s

6.2 Link Layer

There are no choices for the link layer.

6.3 Application Layer

6.3.1 Transmission mode for application data

Mode 1 (least significant octet first), as defined in 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

6.3.2 Common address of ASDU

- ☒ One COMMON ADDRESS OF ASDU (identical with station address)
- ☐ More than one COMMON ADDRESS OF ASDU

6.3.3 Selection of standard information numbers in monitor direction

6.3.3.1 System functions in monitor direction

INF Semantics

- ☐ <0> End of general interrogation
- ☐ <0> Time synchronization
- ☒ <2> Reset FCB
- ☒ <3> Reset CU
- ☒ <4> Start/restart
- ☒ <5> Power on

6.3.3.2 Status indications in monitor direction

INF Semantics

- ☒ <16> Auto-recloser active
- ☒ <17> Teleprotection active
- ☒ <18> Protection active
- ☒ <19> LED reset
- ☒ <20> Monitor direction blocked
- ☒ <21> Test mode
- ☒ <22> Local parameter setting
- ☒ <23> Characteristic 1
- ☒ <24> Characteristic 2
- ☒ <25> Characteristic 3
- ☒ <26> Characteristic 4
- ☒ <27> Auxiliary input 1
- ☒ <28> Auxiliary input 2
- ☒ <29> Auxiliary input 3

- ☒ <30> Auxiliary input 4

6.3.3.3 *Supervision indications in monitor direction*

INF Semantics

- ☒ <32> Measurand supervision I
- ☒ <33> Measurand supervision V
- ☒ <35> Phase sequence supervision
- ☒ <36> Trip circuit supervision
- ☒ <37> I>> back-up operation
- ☒ <38> VT fuse failure
- ☒ <39> Teleprotection disturbed
- ☒ <46> Group warning
- ☒ <47> Group alarm

6.3.3.4 *Earth fault indications in monitor direction*

INF Semantics

- ☒ <48> Earth fault L1
- ☒ <49> Earth fault L2
- ☒ <50> Earth fault L3
- ☒ <51> Earth fault forward, i.e. line
- ☒ <52> Earth fault reverse, i.e. busbar

6.3.3.5 *Fault indications in monitor direction*

INF Semantics

- ☒ <64> Start /pick-up L1
- ☒ <65> Start /pick-up L2
- ☒ <66> Start /pick-up L3
- ☒ <67> Start /pick-up N
- ☒ <68> General trip
- ☒ <69> Trip L1
- ☒ <70> Trip L2
- ☒ <71> Trip L3
- ☒ <72> Trip I>> (back-up operation)
- ☒ <73> Fault location X in ohms
- ☒ <74> Fault forward/line
- ☒ <75> Fault reverse/busbar
- ☒ <76> Teleprotection signal transmitted
- ☒ <77> Teleprotection signal received
- ☒ <78> Zone 1
- ☒ <79> Zone 2
- ☒ <80> Zone 3
- ☒ <81> Zone 4
- ☒ <82> Zone 5
- ☒ <83> Zone 6
- ☒ <84> General start/pick-up
- ☒ <85> Breaker failure
- ☒ <86> Trip measuring system L1
- ☒ <87> Trip measuring system L2
- ☒ <88> Trip measuring system L3
- ☒ <89> Trip measuring system E
- ☒ <90> Trip I>
- ☒ <91> Trip I>>
- ☒ <92> Trip IN>

- ☒ <93> Trip IN>>

6.3.3.6 Auto-reclosure indications in monitor direction

INF Semantics

- ☒ <128> CB 'on' by AR
- ☒ <129> CB 'on' by long-time AR
- ☒ <130> AR blocked

6.3.3.7 Measurands in monitor direction

INF Semantics

- ☒ <144> Measurand I
- ☒ <145> Measurands I, V
- ☒ <146> Measurands I, V, P, Q
- ☒ <147> Measurands IN, VEN
- ☒ <148> Measurands IL1,2,3, VL1,2,3, P, Q, f

6.3.3.8 Generic functions in monitor direction

INF Semantics

- ☐ <240> Read headings of all defined groups
- ☐ <241> Read values or attributes of all entries of one group
- ☐ <243> Read directory of a single entry
- ☐ <244> Read value or attribute of a single entry
- ☐ <245> End of general interrogation of generic data
- ☐ <249> Write entry with confirmation
- ☐ <250> Write entry with execution
- ☐ <251> Write entry aborted

6.3.4 Selection of standard information numbers in control direction

6.3.4.1 System functions in control direction

INF Semantics

- ☒ <0> Initiation of general interrogation
- ☒ <0> Time synchronization

6.3.4.2 General commands in control direction

INF Semantics

- ☒ <16> Auto-recloser on/off
- ☒ <17> Teleprotection on/off
- ☒ <18> Protection on/off
- ☒ <19> LED reset
- ☒ <23> Activate characteristic 1
- ☒ <24> Activate characteristic 2
- ☒ <25> Activate characteristic 3
- ☒ <26> Activate characteristic 4

6.3.4.3 General functions in control direction

INF Semantics

- ☐ <240> Read headings of all defined groups
- ☐ <241> Read values or attributes of all entries of one group
- ☐ <243> Read directory of a single entry
- ☐ <244> Read value or attribute of a single entry
- ☐ <245> End of general interrogation of generic data
- ☐ <248> Write entry
- ☐ <249> Write entry with confirmation
- ☐ <250> Write entry with execution
- ☐ <251> Write entry abort

6.3.5 Basic application functions

- ☐ Test mode
- ☐ Blocking of monitor direction
- ☐ Disturbance data
- ☐ Generic services
- ☐ Private data

6.3.6 Miscellaneous

Measurands are transmitted with ASDU 3 as well as with ASDU 9. As defined in 7.2.6.8, the maximum MVAL can either be 1,2 or 2,4 times the rated value. No different rating shall be used in ASDU 3 and ASDU 9, i.e. for each measurand there is only one choice.

Measurand	Max. MVAL = rated value times 1,2	Max. MVAL = rated value times 2,4
Current L1	<input type="checkbox"/>	<input type="checkbox"/>
Current L2	<input type="checkbox"/>	<input type="checkbox"/>
Current L3	<input type="checkbox"/>	<input type="checkbox"/>
Voltage L1-E	<input type="checkbox"/>	<input type="checkbox"/>
Voltage L2-E	<input type="checkbox"/>	<input type="checkbox"/>
Voltage L3-E	<input type="checkbox"/>	<input type="checkbox"/>
Active power P	<input type="checkbox"/>	<input type="checkbox"/>
Reactive power Q	<input type="checkbox"/>	<input type="checkbox"/>
Frequency f	<input type="checkbox"/>	<input type="checkbox"/>
Voltage L1 – L2	<input type="checkbox"/>	<input type="checkbox"/>

7 Reference Guide

7.1 Table Buttons

Client Options:

Add	+1	Delete	Modify Selected Points	Move Up	Move Down
-----	----	--------	------------------------	---------	-----------

<i>Add</i>	Adds new data points in the client. See section 3.3.2 .
<i>+1</i>	Adds a single new data point in the client. See section 3.3.2.1 .
<i>Add Reference</i>	Adds a new data point reference in the server. See section 錯誤! 找不到參照來源。
<i>Delete</i>	Deletes the selected data points.
<i>Modify Selected Points</i>	Modify the properties of the selected data points. See section 3.4.2 .
<i>Move Up</i>	Moves the selected data points up one row in the table.
<i>Move Down</i>	Moves the selected data points down one row in the table.

7.2 Table Columns

7.2.1.1 Tag

Description	A unique Tag name for each data point. Since data point references use the tag name of the "real" point, the tag cannot be changed in the server instance.
Data Entry	String
Min Length	1
Max Length	N/A
Input Option	Mandatory

7.2.1.2 Function Type

Description	The IEC 60870-5-103 function type.
Data Entry	Drop Down Menu
Types	<i>128 Distance Protection</i> <i>160 Overcurrent Protection</i> <i>176 Transformer Differential Protection</i> <i>192 Line Differential Protection</i> <i>254 Generic Function Type</i> <i>255 Global Function Type</i>
Input Option	Mandatory

7.2.1.3 Information Number

Description	The IEC 60870-5-103 information number. The drop down menus will only show relevant information numbers for the data point (usually, just shows information numbers with the given type ID).
Data Entry	Drop Down Menu
Types	===== Data ===== 2 <i>Info Reset FCB</i> 3 <i>Info Reset CU</i> 4 <i>Info Start Restart</i>

5	Info Power On
16	Auto Recloser Status
17	Tele Protection Status
18	Protection Status
19	Led Reset
20	Monitor Direction Blocked
21	Test Mode Info
22	Local Parameter Setting
23	Characteristic 1
24	Characteristic 2
25	Characteristic 3
26	Characteristic 4
27	Auxiliary Input 1
28	Auxiliary Input 2
29	Auxiliary Input 3
30	Auxiliary Input 4
32	Measurand Supervision I
33	Measurand Supervision V
35	Phase Sequence Supervision
36	Trip Circuit Supervision
37	Over I Backup Operation
38	Vt Fuse Failure
39	Teleprotection Disturbed
46	Group Warning
47	Group Alarm
48	Earth Fault L1
49	Earth Fault L2
50	Earth Fault L3
51	Earth Fault Forward
52	Earth Fault Reverse
64	Start Pickup L1
65	Start Pickup L2
66	Start Pickup L3
67	Start Pickup N
68	General Trip
69	Trip L1
70	Trip L2
71	Trip L3
72	Trip Over I Backup
73	Fault Location
74	Fault Forward
75	Fault Reverse
76	Teleprotection Signal Transmitted
77	Teleprotection Signal Received
78	Zone 1
79	Zone 2
80	Zone 3
81	Zone 4
82	Zone 5
83	Zone 6
84	General Start Pickup
85	Breaker Failure
86	Trip Measuring System L1
87	Trip Measuring System L2
88	Trip Measuring System L3
89	Trip Measuring System E
90	Trip I
91	Trip Over I
92	Trip In
93	Trip Over In
128	CB On By AR
129	CB On By Long Time AR
130	Auto Recloser Blocked
144	Measurand I

	145 <i>Measurands I V</i>
	146 <i>Measurands I V P Q</i>
	147 <i>Measurands In Ven</i>
	148 <i>Measurands II123 VI123 P Q F</i>
	===== Commands =====
	16 <i>Auto Recloser on/off</i>
	17 <i>Teleprotection on/off</i>
	18 <i>Protection on/off</i>
	19 <i>LED Reset</i>
	23 <i>Characteristic 1 Activate</i>
	24 <i>Characteristic 2 Activate</i>
	25 <i>Characteristic 3 Activate</i>
	26 <i>Characteristic 4 Activate</i>
Input Option	Mandatory

7.3 IEC 60870-5-103's Related ADH Types

The IEC 60870-5-103 data types correspond to the ADH types given in the table below.

IEC 60870-5-103 Point Type	ADH Data Type	ADH Exchange Type
COL: Compatibility level	Unsigned 8	Data
DCO: Double point command	Double Point	Command (Single Stage)
DPI: Double point information	Double Point	Data
FAN: Fault number	Unsigned 16	Data
MVAL: Measurand value	Integer 16	Data
RET: Relative time	Unsigned 16	Data
SCL: Short circuit location	Float 32	Data
SIN: Supplementary information	Unsigned 8	Data

Table 7-1 – IEC 60870-5-103 data types relation to ADH data point types.



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