SystemCORP ENERGY

Digital IO

eNode Configuration Manual

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1 Introduction

This document describes how to use the **Digital IO eNode Designer Module** to configure SystemCORP's *Digital IO ADH Application* within the eNode Designer.

The Digital IO module handles direct physical inputs and outputs on a target device.

The same Digital IO eNode Designer module is used on many eNode Devices, with the input & output count and capabilities matching that of the target device. As such, this document describes each part in detail, but the number of inputs and outputs may differ per device, as may the availability of some functions.

1.1 Scope

This document is divided into 3 major sections:

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

1.2 Document Reference

[1] Document Title: eNode Designer User Manual: 197-0100
Revision: Version 1.00 or later

1.3 List of Abbreviations

ADH	= Application Data Hub
DP	= Double Point
IED	= Intelligent Electronic Device
I/O	= Input / Output
LED	= Light Emitting Diode
N/A	= Not Applicable
SP	= Single Point

2 General Description

The digital IO module is used to configure physical inputs and outputs on a target platform. The module is automatically added underneath target platforms when supported.

2.1 General Screen Description

A small example configuration is shown below to help describe the layout of the screen. In this example, there are four (4) digital inputs, four (4) digital outputs and three (3) other sensor inputs.

Important: The available options are device specific. If your device has a different number of inputs, outputs, none or different sensor types, your screen will appear different. This is an example used to explain the behaviour.

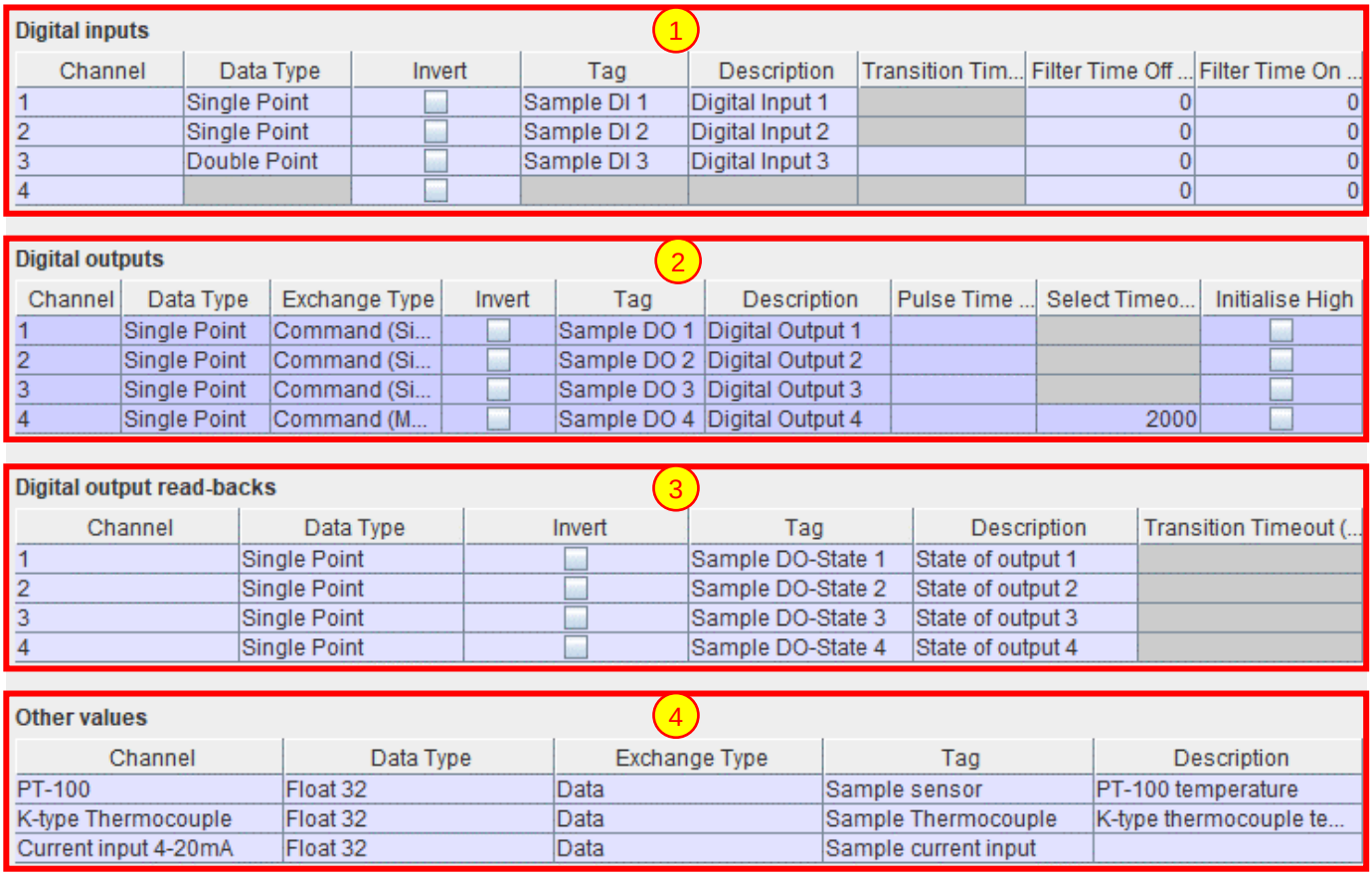

Figure 2-1 - Example screen

1. **Digital Inputs** – Each row corresponds with a digital input channel.
2. **Digital Outputs** – Each row corresponds with a digital output channel.
3. **State of Digital Outputs** – Indicates whether an output channel is currently energised. The number of channels here matches the number of digital outputs.
4. **Other values or sensors** – Shows any other sensor information that the device has available.

3 Configuration Guide

3.1 Adding the Module in eNode Designer

The Digital IO module is added automatically to target platforms when their physical I/O is supported.

3.2 Adding and Modifying Data Points

Adding, modifying and removing data points is carried out using the tables directly. A data point is added to eNode Designer when the required information is completed. This is the *Data Type* column for digital inputs, and the *Data Type* and *Exchange Type* columns for digital outputs. The data points use the tag name, description and other properties as described in the table. All relevant values in the table are freely editable. Values which are not relevant are automatically disabled and hidden.

Digital inputs

Channel	Data Type	Invert	Tag	Description	Transition Timeout (...
1		☐	SGC-22 DI 1	SGC-22 digital input 1	
2		☐	SGC-22 DI 2	SGC-22 digital input 2	
3		☐	SGC-22 DI 3	SGC-22 digital input 3	
4		☐	SGC-22 DI 4	SGC-22 digital input 4	

Digital outputs

Channel	Data Type	Exchange Type	Invert	Tag	Description	Pulse Time (ms)	Select Timeout ...
1			☐	SGC-22 DO 1	SGC-22 digital ...		
2			☐	SGC-22 DO 2	SGC-22 digital ...		
3			☐	SGC-22 DO 3	SGC-22 digital ...		
4			☐	SGC-22 DO 4	SGC-22 digital ...		

Energised state of digital outputs

Channel	Data Type	Invert	Tag	Description	Transition Timeout (...
1		☐	SGC-22 State DO 1	SGC-22 state of digit...	
2		☐	SGC-22 State DO 2	SGC-22 state of digit...	
3		☐	SGC-22 State DO 3	SGC-22 state of digit...	
4		☐	SGC-22 State DO 4	SGC-22 state of digit...	

Figure 3-1 - Freshly created module screen

Figure 3-1 shows the initial digital IO module panel when a new SGC-22 is added to the project. This target platform has four (4) digital inputs and four (4) digital outputs, each section labeled one to four. A device with six (6) digital inputs labeled from digital input 0 to 5 would have six rows in the input table, with the channel number starting at 0 to match the labels on the physical device.

In this example, the default tags and descriptions have also been added.

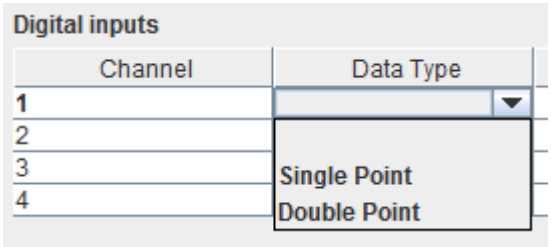

Figure 3-2 - Modify data type example

Figure 3-2 shows the editor menu when the “Data Type” cell is clicked. Use this menu to set the data type of the channel. Selecting single point will allow the channel to be used a single bit data point, which can then be mapped

in eNode Designer. Double point objects require two consecutive channels – The first channel is the 'off'-contact indicator and the second channel is the 'on'-contact indicator.

The invert checkbox can simply be checked and unchecked by left-clicking. The textual cells can be edited by double-clicking with the left mouse button, as seen in Figure 3-3.

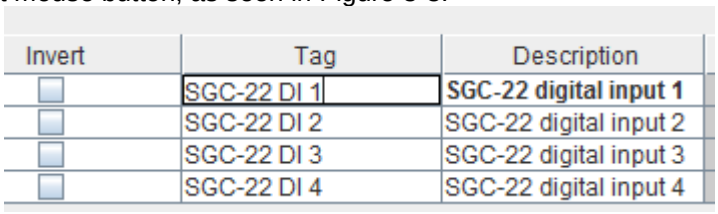

Figure 3-3 - Edit textual cell example.

Some target platforms allow the digital outputs may be mapped to regular ADH data points. This means the digital output will mimic the value. It should only be used for non-critical behavior such as lighting LEDs, since there is no feedback of command success or failure.

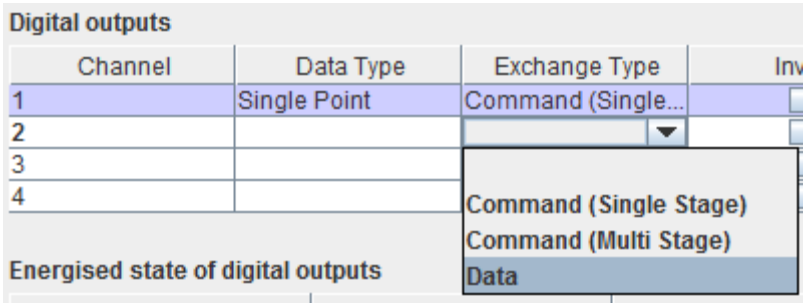

Figure 3-4 - Setting a digital output as a data point reference

Settings the digital output to a reference type (Figure 3-4) will bring up the window (Figure 3-5), which will allow you to select which data point you want to reference.

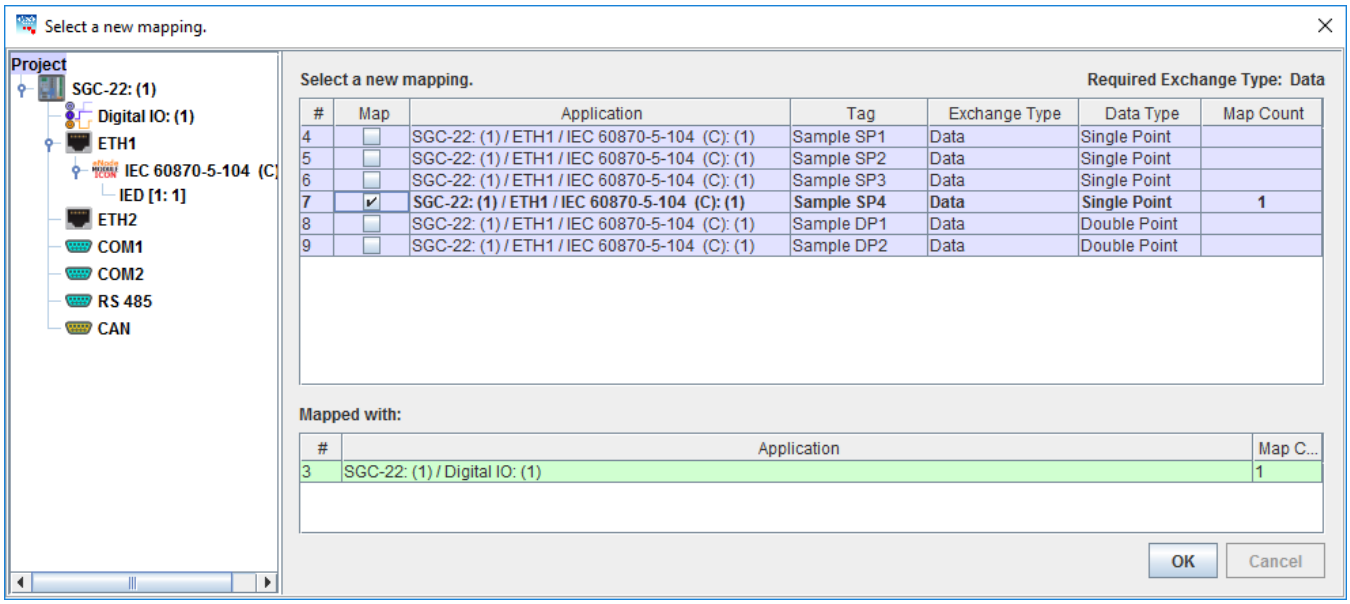

Figure 3-5 - Adding a digital output reference

3.2.1 Modifying Multiple Points at Once

Changes can be made en masse by selecting the rows and using the “Modify Selected Points” button beneath the table. This allows the user to set, for example, all of the selected rows to use a certain data type without changing each item individually.

Select the rows you want to change, and then press the “Modify Selected Points” button beneath the table. It will generate the following window.

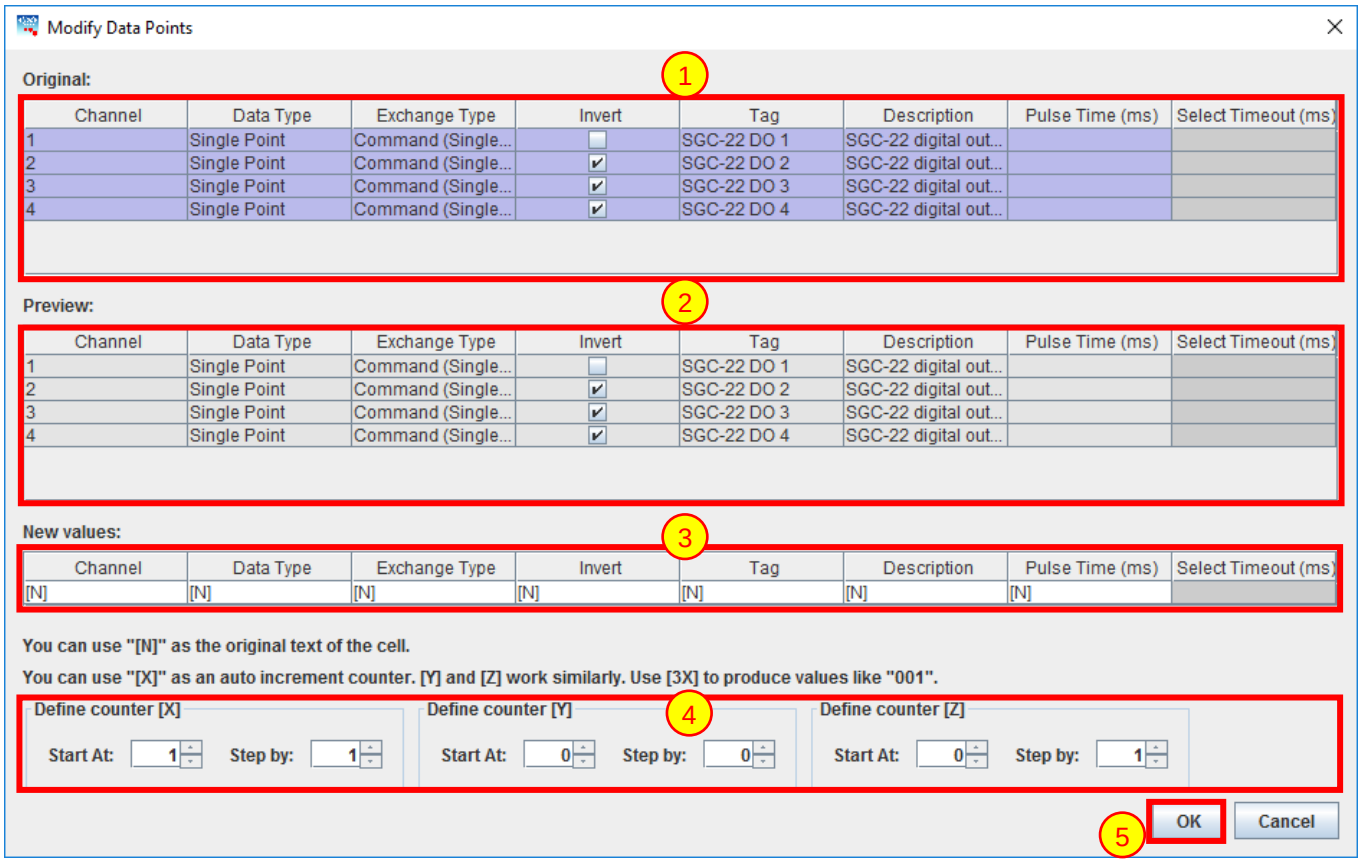

Figure 3-6 - Modify data points window example

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. **Counter properties** – Sets the initial values and step amounts of the counters [X], [Y] and [Z].

5. **OK button** – to accept the modifications.

3.2.2 Using Counters

The following is a full example showing how auto-increment works. The example given shows the IEC 60870-5-104 window, however the Digital IO's auto-increment works in the same way.

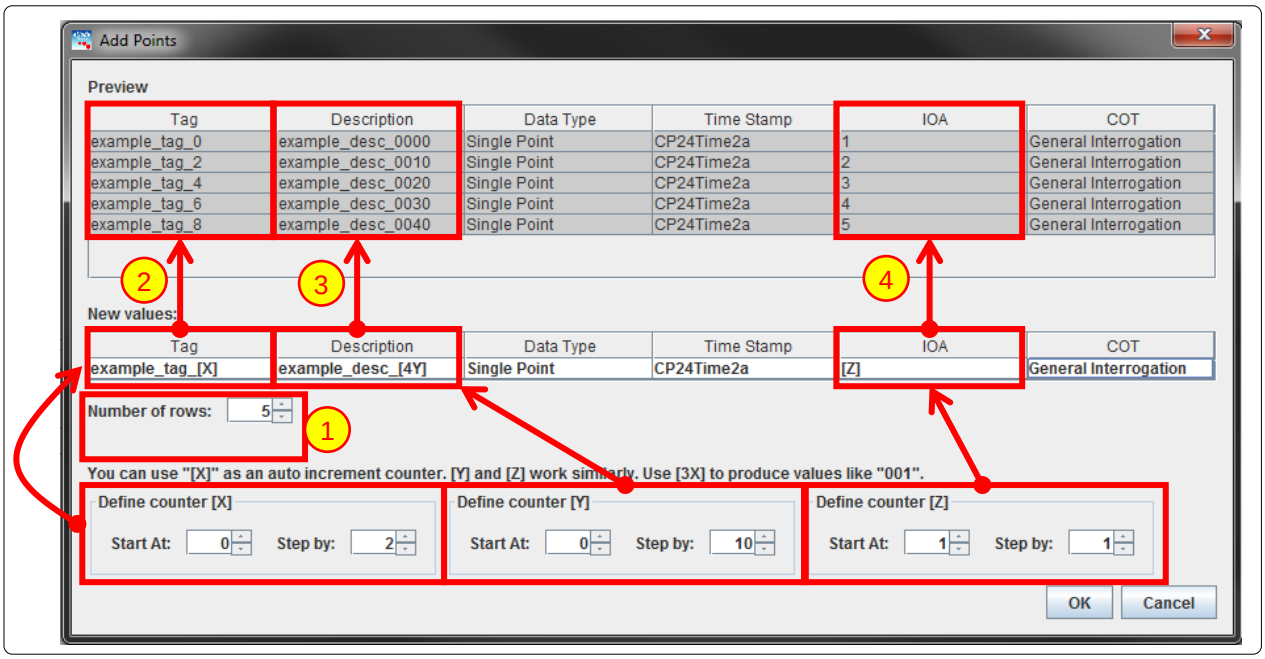

Figure 3-7 - Using auto increment

1 ~~*Number of Rows* can be altered 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.~~ Number of rows is fixed in the IO modules application.

When using the auto increment counters. Each auto-increment counter can be defined to "start at" and "step by" any integer amount – there is one section per counter where there values can be changed. Adjusting *Start At* will change the value that the first data point receives. Adjusting *Step By* adjusts the value that the second and subsequent values will be incremented by.

2 In this example, the *[X]* counter has been 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 digits that are not taken up by the value determined by the *Start At* and *Step By* values will be shown as 0s.

3 In this example, the *[Y]* counter has been used with the integer 4 to indicate the number structure. This results in the values shown in the preview section.

4 In this example, the *[Z]* counter has been used. The *Start At* and *Step By* values have been left at default, this results in the values shown

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 the object address field (in this case the *IOA*). The first new data point's *Tag* value will represent what was entered in the *New value* section and the subsequent data points 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.

4 Reference Guide

4.1 Main Table Columns

4.1.1.1 Channel

The channel this row refers to. Automatically assigned by the device module to match the device labels.

4.1.1.2 Data Type

Description	The data type of the point. If the data type is not set, there is no associated data point in eNode Designer or the ADH.
Data Entry	Drop down menu
Values	*<None>* – Point not available in eNode Designer / ADH. *Single Point* – A single bit representation of the data. *Double Point* – A two-bit representation of the data, which requires two consecutive free channels.The first bit is the 'off'-contact, the second bit is the 'on'-contact. Sensor input types may have other fixed values, such as *Float 32*.
Input Option	Optional

4.1.1.3 Exchange Type

Digital outputs only

Description	The data type of the point. If the data type is not set, there is no associated data point in eNode Designer or the ADH.
Data Entry	Drop down menu
Values	*<None>* - Point not available in eNode Designer / ADH *Command (Single Stage)* – A command where only direct operates are supported. *Command (Multi Stage)* – A command which must have a "Select" before "Operate" *Data* – When available, maps the value of a data point to an output value. Only available on some target platforms.
Input Option	Optional

4.1.1.4 Invert

Description	When ticked, inverts the value of channel between ADH and the physical I/O.
Data Entry	Checkbox
Input Option	Mandatory

4.1.1.5 Tag

Description	The unique tag name of the data point associated with eNode Designer.
Data Entry	String
Min Length	1
Max Length	N/A
Input Option	Mandatory

4.1.1.6 Description

Description	A description for this data point.
Data Entry	String

Min Length	0
Max Length	N/A
Input Option	Mandatory

4.1.1.7 Transition Timeout (ms)

Inputs and output states only

Description	If a double point remains "intermediate" (both values 'off') for longer than this period, its quality flags are marked as Non-Topical. Measured in milliseconds. To disallow this behaviour, the cell must be empty or set to zero (0).
Data Entry	Integer
Min Value	0
Max Value	65535
Input Option	Optional; For double point digital inputs and output states only

4.1.1.8 Filter Time Off (ms)

Inputs only

Description	The amount of time to wait for an input to 'settle' towards a raw value of **zero** (0), in milliseconds. The new value will be reported after the input has been confirmed to have settled, but the timestamp of the event is at the initial change.
Data Entry	Integer
Min Value	0
Max Value	65535
Input Option	Mandatory where present; for inputs only

4.1.1.9 Filter Time On (ms)

Inputs only

Description	The amount of time to wait for an input to 'settle' towards a raw value of **one** (1), in milliseconds. The new value will be reported after the input has been confirmed to have settled, but the timestamp of the event is at the initial change.
Data Entry	Integer
Min Value	0
Max Value	65535
Input Option	Mandatory where present; for inputs only

4.1.1.10 Pulse Time (ms)

Digital outputs only

Description	The amount of time in milliseconds to pulse a digital output 'on'. The output will remain 'on' for the duration of the pulse time, then turn off. Using a pulse time means the output can only be operated to 'on'. If an output is *inverted*, its default coil state is *energised*. When it is operated *on*, it will de-energise for the pulse time before returning to its original state.
Data Entry	Integer
Min Value	0
Max Value	65535

Input Option	Optional; For digital outputs only

4.1.1.11 Select Timeout (ms)

Digital outputs only

Description	The amount of time in milliseconds allowable between a “select” and its corresponding “operate”.
Data Entry	Integer
Min Value	0
Max Value	65535
Input Option	Optional; For digital output multi-stage commands only

4.1.1.12 Initialise High

Digital outputs only

Description	If checked (true) then the output should be energised on start-up. Otherwise it should be de-energised.
Data Entry	Checkbox
Input Option	Mandatory where present; digital outputs only.

4.2 Data Type Definitions

The definitions of each data type are described below. Further detail on other data types are described in the eNode Designer user manual [1].

Data Type	Description
Single Point	A one-bit (Boolean) value. Typically, 0 = “false”, “off” or “low” 1 = “true”, “on” or “high”
Double Point	A two-bit value. Bit 0 represents “Off” and bit 1 represents “On”. This indicates that 00 = Intermediate / Transitional period 01 = Off 10 = On 11 = Invalid

Table 4-1 - Data type definitions

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