

Add-On Instructions for ENA IO-Link Encoders

Configuration and Process Data Using IO-Link Masters

Introduction

Add-On instructions are easy-to-use function blocks designed for RSLogix 5000®/Studio 5000®. The instructions allow IO-Link parameters to be read and written by simple logic. Process data is also displayed in the correct format with the help of the Process Add-On instructions.

Available Instructions

Instruction	Description
PF_ENA_Encoder_IOLINK2	Configuration of ENA Series IO-Link encoders—Preset, Direction, resolution per turn and total resolution are only some parameters available
PF_ENA_IO_Process_INT	Process Data display for ENA Series IO-Link encoders when the configured module uses an INT[] array
PF_ENA_IO_Process_SINT	Process Data display for ENA Series IO-Link encoders when the configured module uses an SINT[] array

Supported IO-Link Masters

IO-Link Master	Description
ICE1-8IOL-G60L-V1D	8-port Pepperl+Fuchs IO-Link master in metal housing
ICE1-8IOL-G30L-V1D	8-port Pepperl+Fuchs IO-Link master in compact metal housing
ICE2-8IOL-G65L-V1D	8-port Pepperl+Fuchs IO-Link master in plastic housing
ICE2-8IOL-K45P-RJ45	8-port Pepperl+Fuchs Panel Mount IO-Link master, spring terminals
ICE2-8IOL-K45S-RJ45	8-port Pepperl+Fuchs Panel Mount IO-Link master, screw terminals
1734-4IOL	Allen-Bradley® Point-IO IO-Link Master
1732E-8IOLM12R	Allen-Bradley ArmorBlock® IO-Link Master

Version

All Add-Ons were created in Studio 5000 V24. The instructions were also copied, pasted, and exported to a version 16 project. This allows the instructions to work on all PLC versions.

PF_ENA_Encoder_IOLINK2 Add-On

This instructions has the ability to read and write all IO-Link parameters, reset all parameters to default, and set the encoder preset.

Trigger Reading and Writing IO-Link Parameters

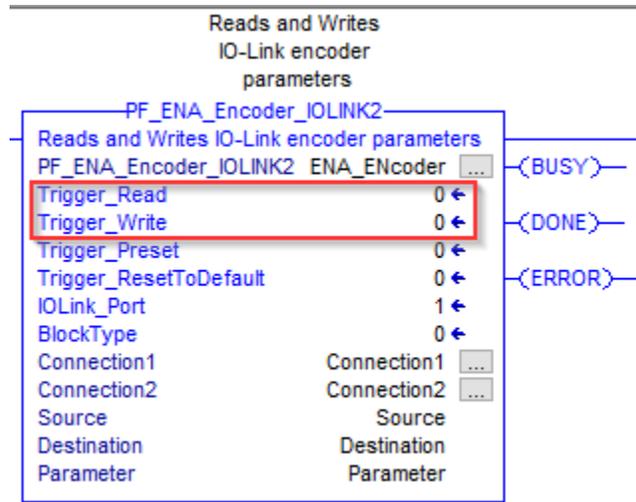


Figure 1: Trigger commands to read or write parameters

When all triggers are low, the “Busy, Done, and Error” bits will go low. Only one trigger can be issued at a time. The command is executed in the off-to-on transition and is complete when either a DONE or ERROR bit turns on. When complete, the parameters are read/written to a user-defined type. The description of each variable is listed and marked as read-only (ro) or read/write (rw). Additionally, the index and sub index are listed to allow access to each variable separately.

Suggested order of operations to change parameters:

1. Read parameters
2. Make changes
3. Write parameters

Parameter Identification

Parameter	{...}	{...}		PF_ENA1	
Parameter Identification	{...}	{...}		PF_Identification3	
Parameter Identification.Vendor_Name	{...}	{...}	ASCII	SINT[32]	ro, 16-0
Parameter Identification.Vendor_Text	{...}	{...}	ASCII	SINT[32]	ro, 17-0
Parameter Identification.Product_Name	{...}	{...}	ASCII	SINT[32]	ro, 18-0
Parameter Identification.Product_ID	{...}	{...}	ASCII	SINT[32]	ro, 19-0
Parameter Identification.Product_Text	{...}	{...}	ASCII	SINT[64]	ro, 20-0
Parameter Identification.Serial_Number	{...}	{...}	ASCII	SINT[32]	ro, 21-0
Parameter Identification.Hardware_Revision	{...}	{...}	ASCII	SINT[32]	ro, 22-0
Parameter Identification.Firmware_Revision	{...}	{...}	ASCII	SINT[64]	ro, 23-0
Parameter Identification.App_Specific_Tag	{...}	{...}	ASCII	SINT[32]	rw, 24-0
Parameter Identification.Function_Tag	{...}	{...}	ASCII	SINT[32]	rw, 25-0
Parameter Identification.Location_Tag	{...}	{...}	ASCII	SINT[32]	rw, 26-0
Parameter Identification.Minimum_Cycle_Time	0		Decimal	SINT	ro, 0-2
Parameter Identification.Master_Cycle_Time	0		Decimal	SINT	ro, 0-1
Parameter Identification.IOLink_Version	16#00		Hex	SINT	ro, 0-4
Parameter Configuration	{...}	{...}		PF_ENAConfiguration	
Parameter Diagnostics	{...}	{...}		PF_ENADiagnostics	

Parameter Configuration

Parameter	{...}			PF_ENA1	
Parameter Identification	{...}			PF_Ide...	
Parameter Configuration	{...}			PF_EN...	
Parameter Configuration.Resolution	0	Decimal	DINT	rw 96, Single-Turn Resolution 1-65535, for numbers above 31767 enter data in HEX	
Parameter Configuration.Total_Resolution	0	Decimal	DINT	rw 100, 0..2147483647	
Parameter Configuration.Direction	0	Decimal	SINT	rw 97, 0 = Count up Clockwise, 1 = Count up Counter clockwise	
Parameter Configuration.Preset	0	Decimal	DINT	rw 99, Defines the preset value, which is set for the current position on trigger of the com...	
Parameter Configuration.Switching_Sig1_Setpoint1	0	Decimal	DINT	rw 64-1, Defines the setpoint 1 value for the switching signal channel.	
Parameter Configuration.Switching_Sig1_Setpoint2	0	Decimal	DINT	rw 64-2, Defines the setpoint 2 value for the switching signal channel.	
Parameter Configuration.Switching_Sig1_Logic	0	Decimal	SINT	rw 65-1, Defines the logical behavior of the switching signal. 0 = High active, 1 = Low act...	
Parameter Configuration.Switching_Sig1_Mode	0	Decimal	SINT	rw 65-2, Defines the evaluation mode for the switching signal. 0 = Deactivated, 1 = Singl...	
Parameter Configuration.Switching_Sig1_Hysteresis	0	Decimal	INT	rw 65-3, Defines the hysteresis at the switchpoint. A higher hysteresis may help to improv...	
Parameter Configuration.Switching_Sig2_Setpoint1	0	Decimal	DINT	rw 66-1, Defines the setpoint 1 value for the switching signal channel.	
Parameter Configuration.Switching_Sig2_Setpoint2	0	Decimal	DINT	rw 66-2, Defines the setpoint 2 value for the switching signal channel.	
Parameter Configuration.Switching_Sig2_Logic	0	Decimal	SINT	rw 67-1, Defines the logical behavior of the switching signal. 0 = High active, 1 = Low act...	
Parameter Configuration.Switching_Sig2_Mode	0	Decimal	SINT	rw 67-2, Defines the evaluation mode for the switching signal. 0 = Deactivated, 1 = Singl...	
Parameter Configuration.Switching_Sig2_Hysteresis	0	Decimal	INT	rw 67-3, Defines the hysteresis at the switchpoint. A higher hysteresis may help to improv...	
Parameter Configuration.Temperature_Config	0	Decimal	SINT	rw 101, Defines if the Temperature indicator channel is active or not.	
Parameter Configuration.Temperature_High_Limit	0	Decimal	INT	rw 80-1, Defines the upper temperature threshold. At ambient temperatures above this limi...	
Parameter Configuration.Temperature_Low_Limit	0	Decimal	INT	rw 80-2, Defines the lower temperature threshold. At ambient temperatures below this limi...	
Parameter Configuration.Temperature_Logic	0	Decimal	SINT	rw 81-1, Defines the logic of the temperature threshold indicator, 0 = High active, 1 = Lo...	
Parameter Configuration.Temperature_Mode	0	Decimal	SINT	rw 81-2, Defines the Mode of the temperature threshold indicator, 0 = Deactivated, 80h ...	
Parameter Configuration.Temperature_Hysteresis	0	Decimal	INT	rw 81-3, Defines the Hysteresis of the temperature threshold indicator, 0..20	
Parameter Configuration.Event_Config_Sig1	0	Decimal	SINT	rw 120 bit 0, INT, Enabled: an event is generated, if the position value is outside the conf...	
Parameter Configuration.Event_Config_Sig2	0	Decimal	SINT	rw 120 bit 1, INT, Enabled: an event is generated, if the position value is outside the conf...	
Parameter Configuration.Event_Config_Temp	0	Decimal	SINT	rw 120 bit 2, INT, Enabled: an event is generated, if the detected temperature is outside t...	
Parameter Configuration.DeviceAccessLocks	0	Decimal	INT	rw 12-0, bit 0 Parameter write access lock, bit 1 Data Storage Lock	
Parameter Diagnostics	{...}			PF_EN...	

Parameter Diagnostics

[-] Parameter	{...}		PF_ENA1	
+ Parameter.Identification	{...}		PF_Ide...	
+ Parameter.Configuration	{...}		PF_EN...	
[-] Parameter.Diagnostics	{...}		PF_EN...	
+ Parameter.Diagnostics.Status	0	Decimal	SINT	0 = Device is OK, 1 = Maintenance 36-0, required, 2 = Out of specification, 3
+ Parameter.Diagnostics.Status_Detail	{...}	Decimal	SINT[12]	37-0
+ Parameter.Diagnostics.Teach_In_Status	0	Decimal	SINT	59-0 or 79-0, Status of Teach Operation
+ Parameter.Diagnostics.Operating_Hours	0	Decimal	DINT	224-0, Total Operating hours
+ Parameter.Diagnostics.Temperature_Indicator	0	Decimal	SINT	225-0, shows the overall hours of operation, 0 = safe operation temperature, 1
+ Parameter.Diagnostics.Maximum_Resolution	0	Decimal	INT	232-0 First INT
+ Parameter.Diagnostics.Maximum_Revolutions	0	Decimal	INT	232-0 Second INT
+ Parameter.Diagnostics.Maximum_Current	0	Decimal	INT	232-0 Third INT
+ Parameter.Diagnostics.Position	0	Decimal	DINT	236-0, Indicates the current position value.
+ Parameter.Diagnostics.Resolution	0	Decimal	DINT	236-0, Indicates the current resolution of the position value.
+ Parameter.Diagnostics.Temperature	0	Decimal	DINT	236-0, Indicates the current approximated ambient temperature value.
+ Parameter.Diagnostics.Switching_Signal_1	0	Decimal	SINT	236-0, Indicates the current status of the switching signal 1.
+ Parameter.Diagnostics.Switching_Signal_2	0	Decimal	SINT	236-0, Indicates the current status of the switching signal 2.
+ Parameter.Diagnostics.Direction	0	Decimal	SINT	236-0, Indicates the current status of the direction of position count.
+ Parameter.Diagnostics.Temperature_Over	0	Decimal	SINT	236-0, Indicates that the configured temperature threshold has been exceeded
+ Parameter.Diagnostics.Temperature_Under	0	Decimal	SINT	236-0, Indicates that the configured temperature threshold has been undersho
+ Parameter.Diagnostics.Indication_Control	0	Decimal	SINT	rw, 127-0 Flashes the LEDs so you can better identify the product.

Trigger Reset to Default

Resetting the sensor to default will reset all the sensors parameters to default. Read the parameters after to see the default settings, then make changes as necessary.

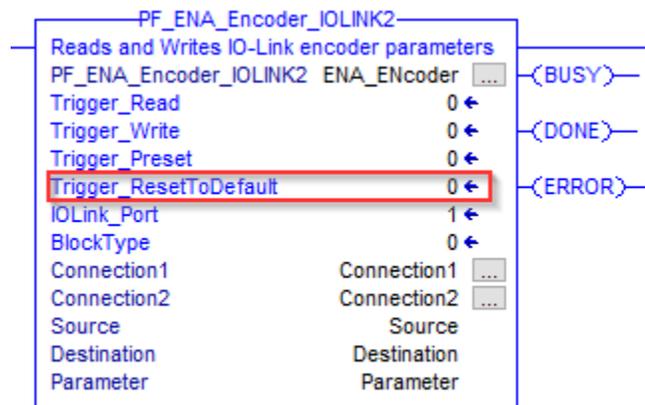


Figure 2: Trigger command to reset all parameters to default

Trigger Preset

When the Trigger preset is used, the current position is set to the value in parameter.configuration.preset. See Figure 4.

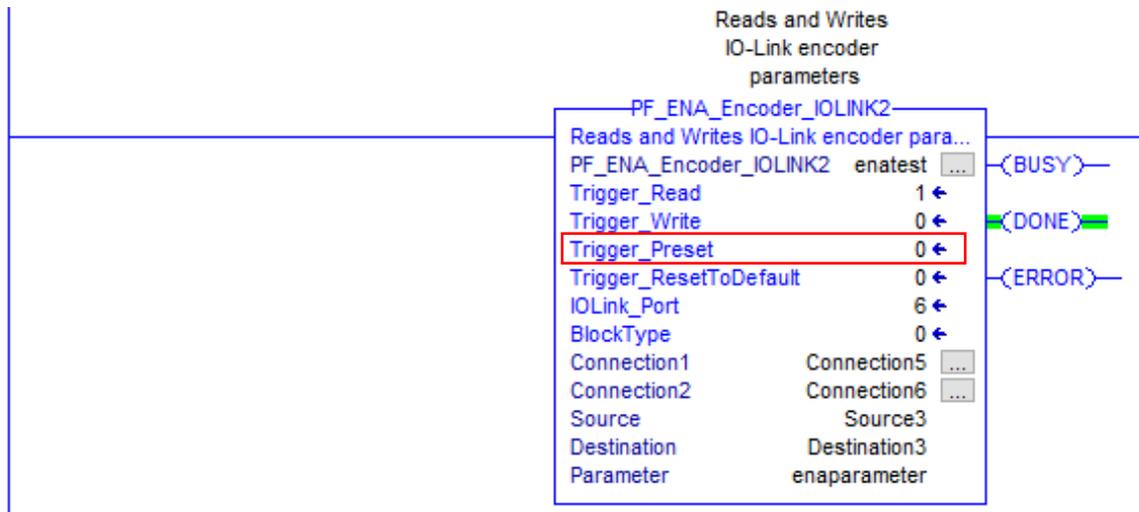


Figure 3: Trigger command to the current position and a preset value

enaparameter.Configuration	{...}	{..
+ enaparameter.Configuration.Resolution	65535	
+ enaparameter.Configuration.Total_Resolution	2147483647	
+ enaparameter.Configuration.Direction	0	
+ enaparameter.Configuration.Preset	0	
+ enaparameter.Configuration.Switching_Sig1_Setpol...	0	
+ enaparameter.Configuration.Switching_Sig1_Setpol...	0	

Value used with Trigger Preset

Figure 4: Value used to preset encoder

Port Number and Module Type

The port number, IOLink_Port, indicates the port to which the sensor is connected. The Pepperl+Fuchs modules have ports numbered 1–8, and the Allen-Bradley master has ports labeled 0–3 or 1–8, depending on the version.

The 'BlockType' defines the type of IO-Link master being used.

- BlockType = 0 > ICE1... IO-Link Masters
- BlockType = 1 > Allen-Bradley IO-Link Masters
- BlockType = 2 > ICE2... IO-Link Masters

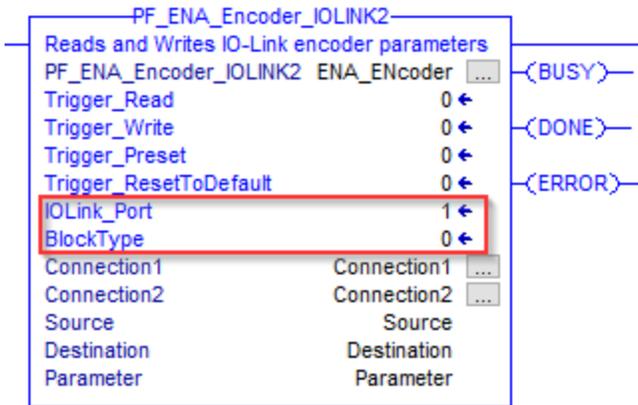


Figure 5: IOLink_Port and BlockType configuration

Connections

These are the connection messages used to read and write the parameters. Only four parameters in each must be set. The service code will depend on what BlockType is used.

Connection 1 > Service Code 4B for BlockType 0, and 2
Service Code 4D for BlockType 1

Connection 2 > Service Code 4C for BlockType 0, and 2
Service Code 4E for BlockType 1

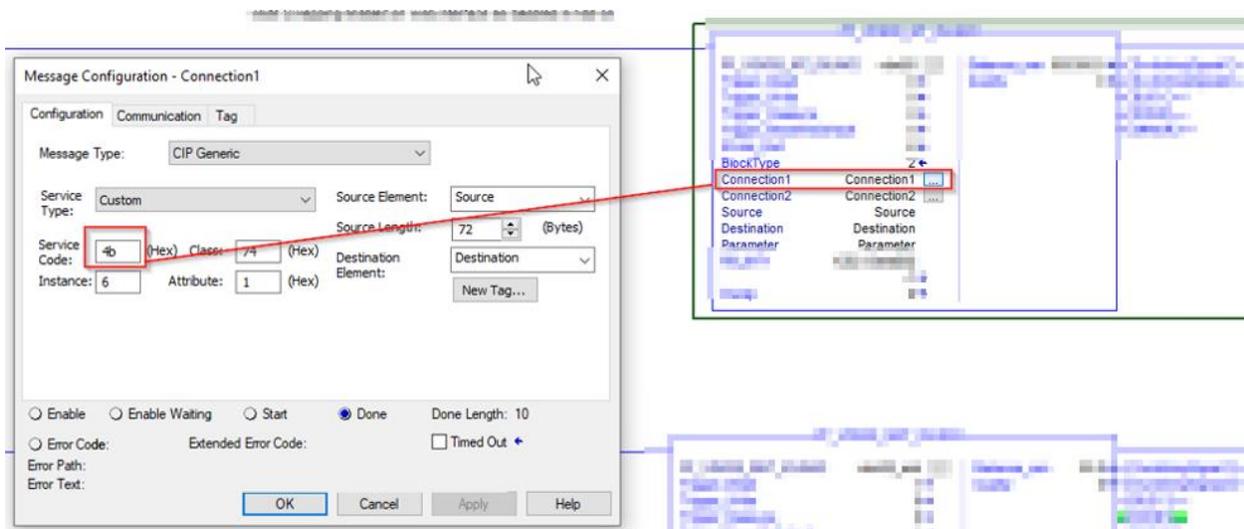


Figure 6: Connection 1 Service Code

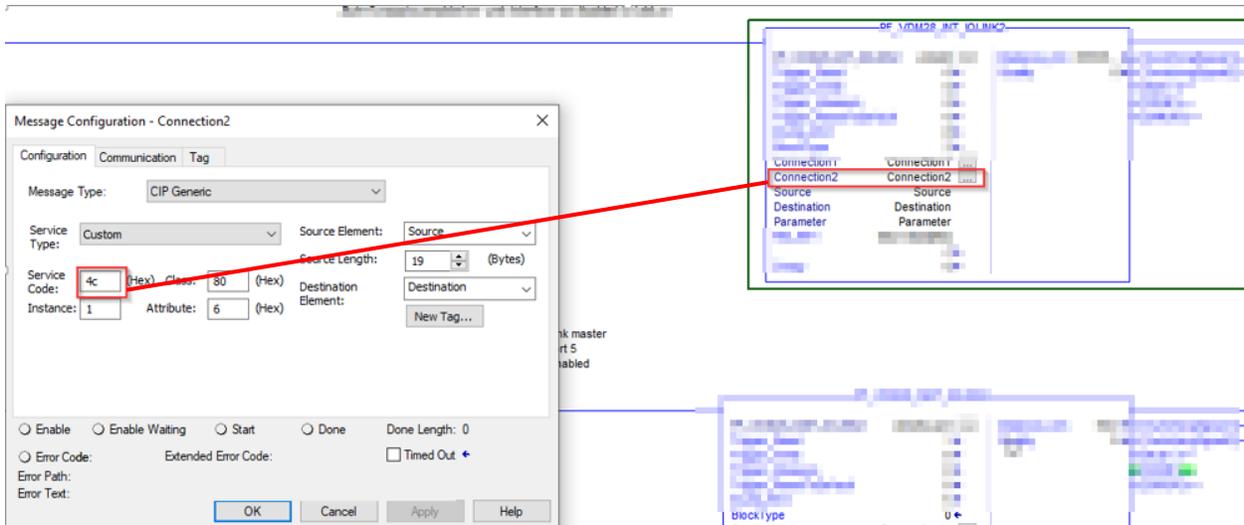


Figure 7: Connection 2 Service Code

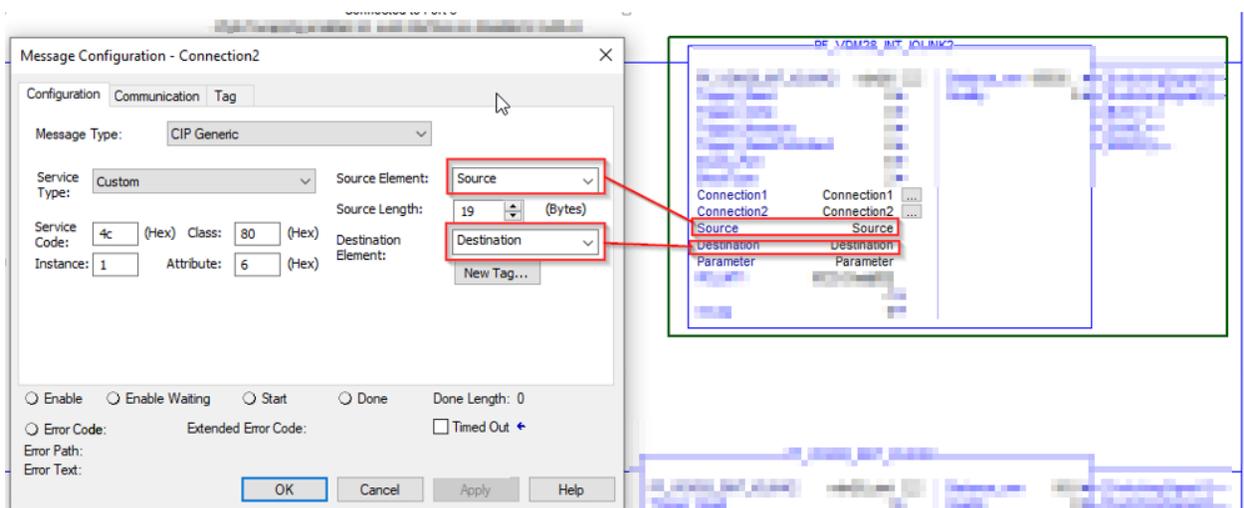


Figure 8: The source and destination variables must be of size sint[100] and must match the source and destination variables in the Add-On

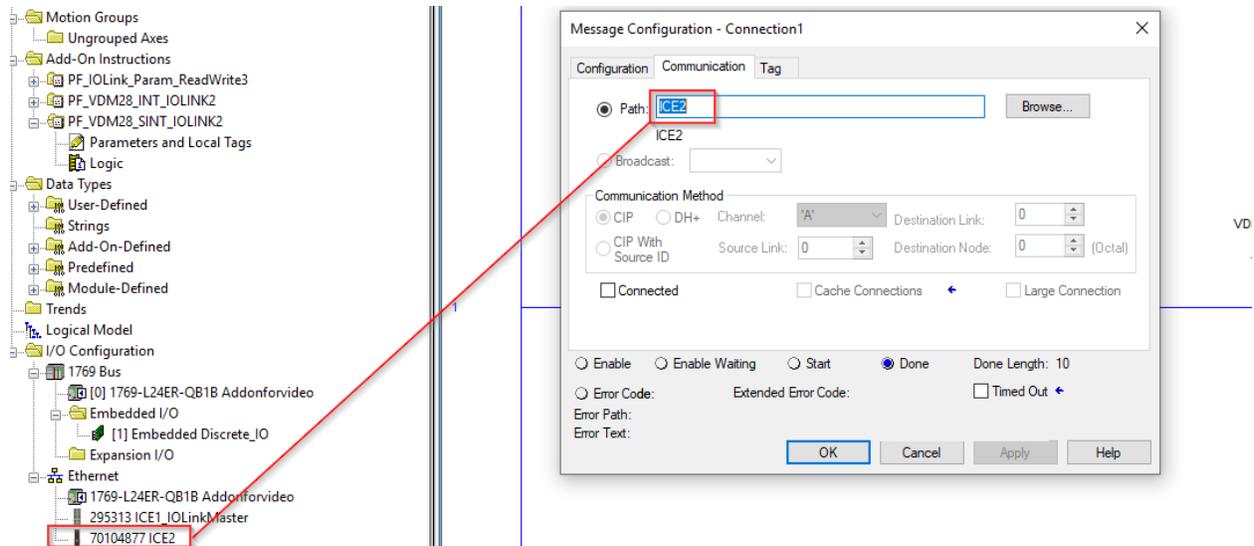


Figure 9: The path must point to the IO-Link block in both connections

PF_ENA_IO_Process_xxx Add-On

These Add-On Instructions take the process data which is in a SINT[] or INT[] array format and displays it in a user-friendly way.

Byte Swapping

The Add-On will do all byte swapping automatically. Make sure that byte-swapping is disabled on the IO-Link master/port that you are using. The ICE2 IO-Link master has this feature enabled by default. Make sure to disable it. See Figure 10.

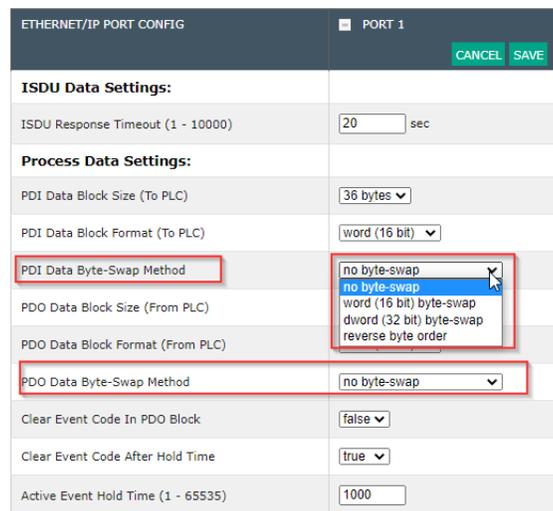


Figure 10: Disable byte-swap in the PLC

Add-On Selection

If the IO-Link masters' Ethernet module is set to INT array, then use the Add-On called PF_ENA_Encoder_INT. See Figure 12. If the IO-Link masters' Ethernet module is set to the SINT array, then use the Add-On called PF_ENA_Encoder_SINT. See Figure 11.

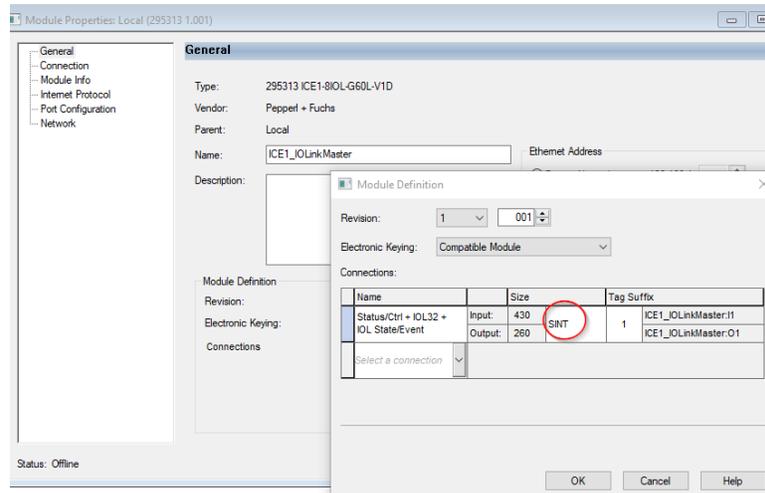


Figure 11: ICE1 IO-Link master with array size set to SINT

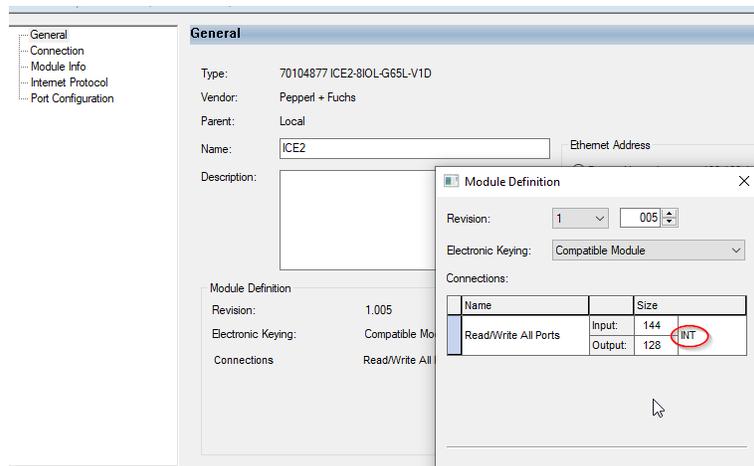
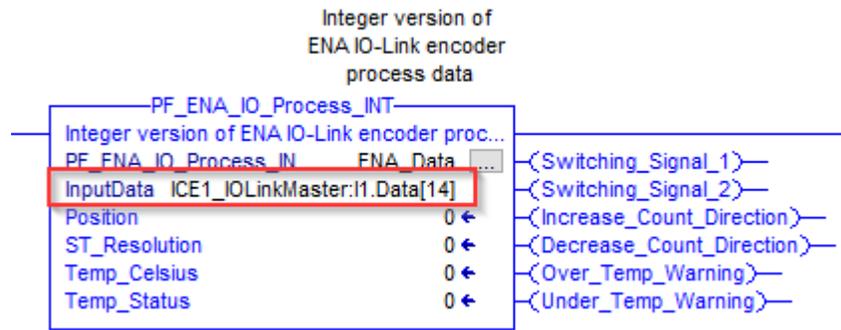


Figure 12: ICE2 IO-Link master with array size set to INT

Input Data

The parameter 'InputData' is used to point to the first SINT or INT of process data, depending on which Add-On is used (See Figure 15). Every IO-Link master will place the process data in a different place. Use tools like the [ICE1 Description Files](#) (See Figure 13) or the [ICE2 Tag Description Generator](#) (See Figure 14) to assist you in pointing to the correct data. The Allen- Bradley IO-Link masters typically use AOPs (Add-on Profiles), so the data is always the first SINT of the process data of that IO-Link port.



Software: ICE1-8IOL-G60L-V1D

Drivers	Release Info	File Type	File Size
Description files for use with Ethernet/IP Protocol and RSLogix 5000 / Studio 5000 V20 or higher / Beschreibungsdateien für EtherNet/IP und RSLogix 5000 / Studio 5000	05/2019	ZIP	13620 KB

Figure 13: Description files for ICE1... IO-Link masters

Software: ICE2-8IOL-G65L-V1D

Software Tools	Release Info	File Type	File Size
EtherNet/IP EDS files ICE2 modules / EtherNet/IP EDS-Dateien ICE2 Module	11/2020	ZIP	33 KB
Ethernet/IP Tag Description Generator. Assists the user in visualizing the input, output, status and event data. Also can generate a CSV file for upload in to RSLogix/Studio 5000. / Software Tools_a	01/2021	ZIP	26974 KB

Figure 14: Tag generator for ICE2... IO-Link masters

Integer version of ENA IO-Link encoder process data

PF_ENA_IO_Process_INT

Integer version of ENA IO-Link encoder pr...

PF_ENA_IO_Process_IN... ENA_Data [14] (Switching_Signal_1)

InputData ICE1_IOLinkMaster:I1.Data[14] (Switching_Signal_2)

Position Increase_Count_Direction

ST_ Ter Ter

Enter Name Filter... Show: All Tags

Name	Data Type	Usage	Description
ICE1_IOLinkMaster:I1.Data[14]	SINT		IO-Link X1 input data Start
ICE1_IOLinkMaster:I1.Data[15]	SINT		
ICE1_IOLinkMaster:I1.Data[16]	SINT		
ICE1_IOLinkMaster:I1.Data[17]	SINT		
ICE1_IOLinkMaster:I1.Data[18]	SINT		

Show controller tags

Show MainProgram tags

Show parameters from other program:

<none>

Figure 15: First SINT of process data of port 1 of ICE1

Example Using Pepperl+Fuchs IO-Link Block

See video attached to the Add-On for step-by-step instructions.