Q5X Process Data Function

2/8/2022

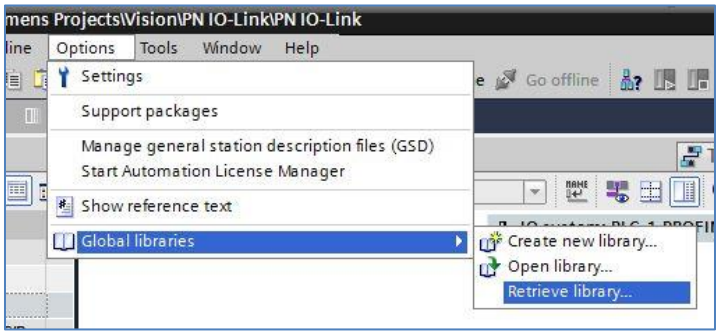
This document covers the installation and use of a function for Siemen's TIA Portal software package. This function handles cyclic IO-Link Process Data In and Process Data Out from a Banner Q5X (2000, 3000, or 5000) sensor via an IO-Link Master to a Siemens PLC. The function covers parsing and display of the Q5X sensor Process Data In and Process Data Out.

Components

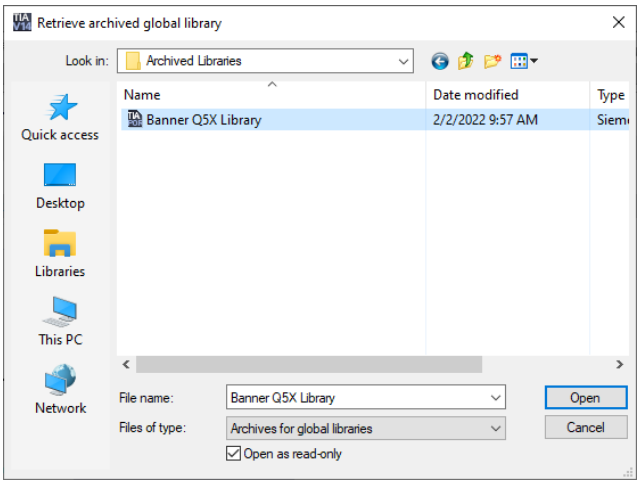
Banner Q5X Library.zal14

Installation Instructions

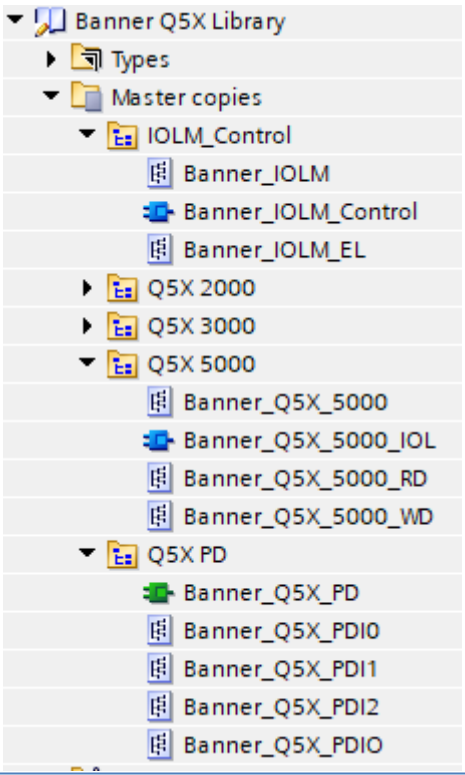
1. Open a project.
2. Go to Options > Global Libraries > Retrieve Library.



3. Select the Banner Q5X Library. Click Open.



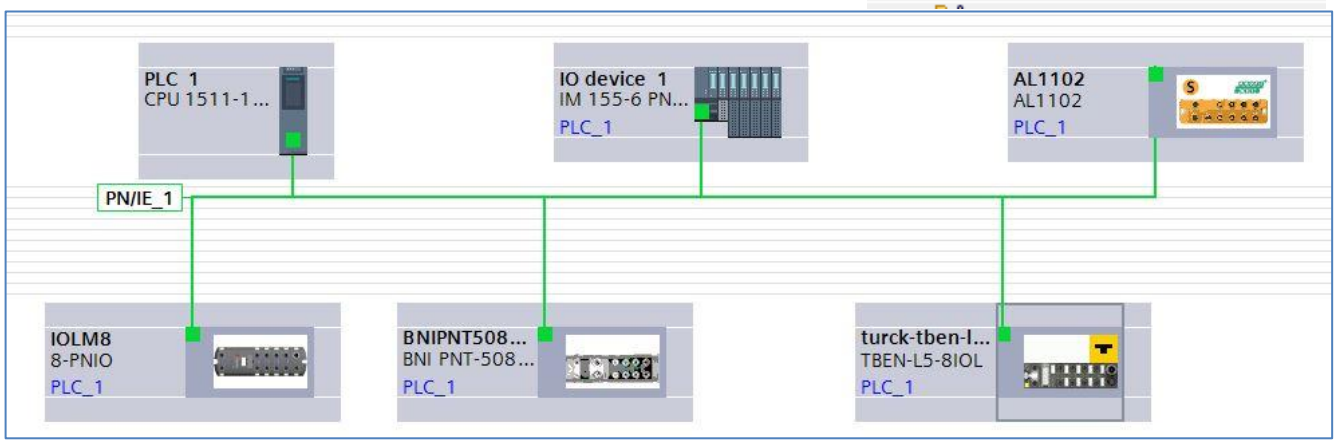
4. The Banner Q5X Library will now be in the Global Library List. Expand the Master copies section. Any of the Q5X folders contains the elements for both Process Data. Move the Process Data items: Banner_Q5X_PD, Banner_Q5X_PDI0, Banner_Q5X_PDI1, Banner_Q5X_PDI2, and Banner_Q5X_PDIO.



5. Drag Banner_Q5X_PD to the Program Blocks area under your PLC.

6. Drag the other items to the PLC Data Types area under your PLC.

7. Go to Devices and networks to configure the system as necessary. Below is an example of what a configuration might look like. This example shows 5 different IO-Link Masters connected to the same PLC.



8. Click on the relevant device and configure the IO-Link Master as necessary. Refer to the documentation for the IO-Link Master. Recall that a Q5X requires 4 bytes of space for the Process Data In and 1 byte for the Process Data Out.

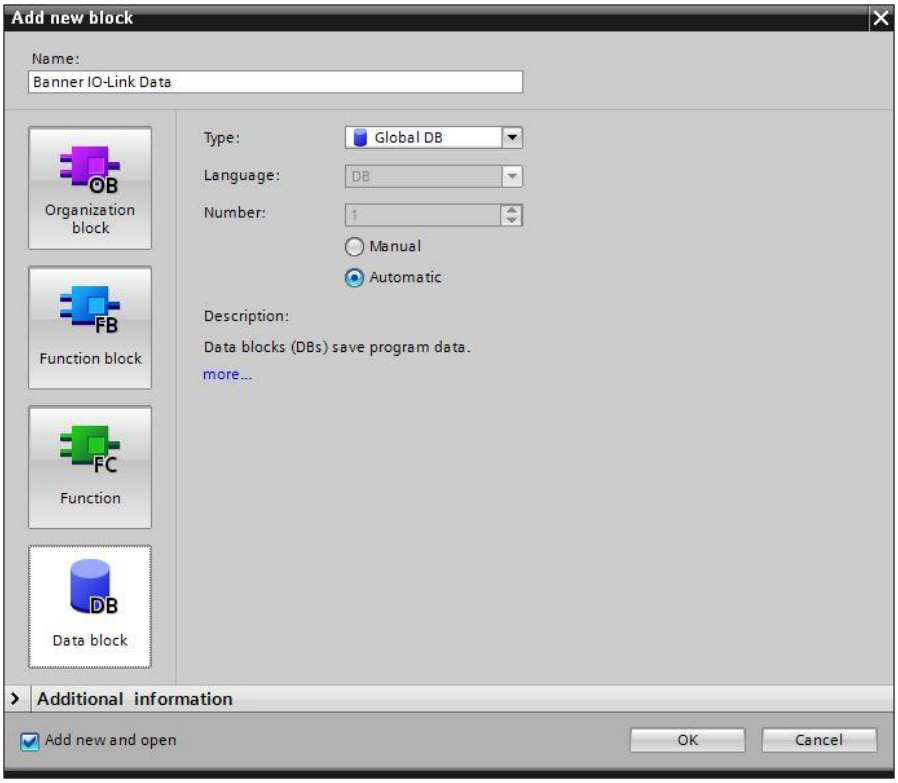
9. Record the "I" address where this Q5X Process Data In is to be stored, as the address will be required in the next step. In this example, 4 bytes of Process Data In for port 5 on the IO-Link Master will be stored in I66 through I69. The one byte of Process Data Out will be in Q66.

10. Go to PLC Tags. Add a new tag table, then create a new tag to represent the raw Process Data from the IO-Link Master. In this example, Tag table_1 was created, then the tag “Q5X 2000 IOLM2 05 PDI” was created using a Data Type of “DWord”. This naming convention calls out the type of sensor in question as well as the specific IO-Link Master and port number where the sensor is connected. A different IO-Link Master might be named IOLM1 or IOLM3, for instance, and other specific sensors may be connected to different port numbers. The “I” address found in step 9 is tied to this new tag. Another tag is created for the Q5X Process Data Out. This one is a Byte data type and is linked to the memory address found in step 9.

Default tag table

	Name	Data type	Address
1	Q5X 2000 IOLM2 05 PDI	DWord	%ID68
2	Q5X 2000 IOLM2 05 PDO	Byte	%QB64

11. Go to Program blocks. Add a new Data block if necessary. In this example the new data block is named “Banner IO-Link Data”.

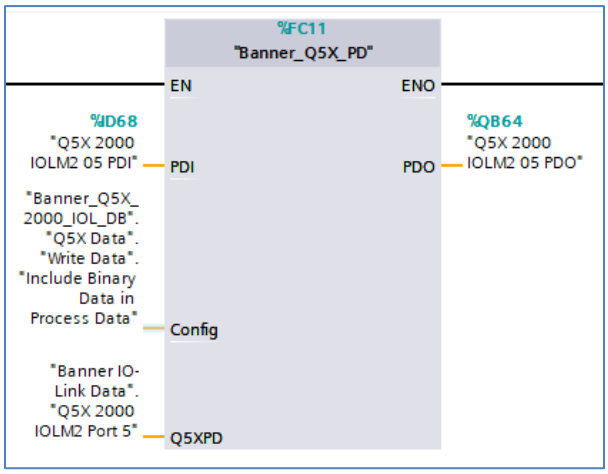


12. In the new data block, create a new tag to represent the parsed Process Data for our Q5X. The tag name again calls out the type of sensor, the IO-Link Master, and the port number. Use the data type “Banner_Q5X_PDIO” for the new tag.

Banner IO-Link Data

		Name	Data type
1		Static	
2		Q5X 2000 IOLM2 Port 5	"Banner_Q5X_PDIO"

13. Add the “Banner_Q5X_PD” function to an OB ladder. Link the “Process Data In” and “Process Data Out” to the raw Process Data variables from step 10. Link the “Q5XPD” to the parsed Process Data variable from step 12. For “Config” link it uses the parameter data tag if using that Function Block, otherwise see Appendix A to enter a 0,1, or 2 manually.



14. Process Data setup is complete.

15. Compile and download the configuration to the PLC, then go online. Open the “Banner IO-Link Data” data block and click Monitor all. You should see parsed Q5X Process Data In, like that shown below.

Banner IO-Link Data

		Name	Data type	Start value	Monitor value
1		Static			
2		Q5X 2000 IOLM2 Port 5	"Banner_Q5X_PDIO"		
3		PDI 0	"Banner_Q5X_PDI0"		
4		Channel 1 Output State	Bool	false	TRUE
5		Channel 2 Output State	Bool	false	FALSE
6		Stability	Bool	false	TRUE
7		Measurement 1 Value	UInt	0	3120
8		Measurement 2 Value	UInt	0	115
9		PDI 1	"Banner_Q5X_PDI1"		
10		PDI 2	"Banner_Q5X_PDI2"		
11		Transducer Disable	USInt	0	0

Appendix A Q5X Process Data

The Q5X has 4 bytes of Process Data In and 1 byte of Process Data Out, as shown below. There are three modes for this Process Data, called Include, Don't Include, and Measurement Device. The default mode, Include, is shown first. In this mode, the Process Data In includes the binary states of channel 1, channel 2, and the stability indicator alongside the Measurement 1 and Measurement 2 values. The Process Data Out includes control of the Q5X laser transducer.

ProcessDataIn "Process Data In" id=PD_ProcessDataIn

bit length: 32
data type: 32-bit Record (subindex access not supported)

subindex	bit offset	data type	allowed values	default value	acc. restr.	mod. other var.	excl. from DS	name	description
1	0	Boolean	false = Inactive, true = Active					Channel 1 Output State	Channel 1 Output State
2	1	Boolean	false = Inactive, true = Active					Channel 2 Output State	Channel 2 Output State
3	2	Boolean	false = No target or Marginal, true = Stable					Stability	Stability state
4	3	13-bit UInteger						Measurement 1 Value	The selected measurement 1 value
5	16	16-bit Integer						Measurement 2 Value	The selected measurement 2 value

ProcessDataOut "Process Data Out" id=PD_ProcessDataOut

bit length: 8
data type: 8-bit Record (subindex access not supported)

subindex	bit offset	data type	allowed values	default value	acc. restr.	mod. other var.	excl. from DS	name	description
1	0	Boolean	false = Active, true = Inactive					Transducer Disable	

This Process Data is mapped to a specific group of PROFINET addresses. The 32-bits of Process Data In encode five separate pieces of information. Bit 0 is the state of BDC1 (Binary Data Channel 1, also known simply as Output Channel 1). Bit 1 is BDC2 (Channel 2). Bit 2 is the stability indicator. The remaining 29 bits are used to communicate the Q5X measurement values, Measurement 1 and Measurement 2.

This function intelligently parses this Process Data into its component pieces.

The Don't Include mode for the Q5X Process Data In is shown below (the Process Data Out remains unchanged from that shown above). In this mode, the binary components of the Process Data In are removed, simply leaving Measurement 1 and Measurement 2.

ProcessDataIn "Process Data In" id=PD_ProcessDataInWithoutBinary

bit length: 32
data type: 32-bit Record (subindex access not supported)

subindex	bit offset	data type	allowed values	default value	acc. restr.	mod. other var.	excl. from DS	name	description
1	0	16-bit UInteger						Measurement 1 Value	The selected measurement 1 value
2	16	16-bit Integer						Measurement 2 Value	The selected measurement 2 value

The Measurement Device mode for the Q5X Process Data In is shown below. This mode is like the Include mode. It has an added parameter called Measurement Scale. This tells how the Measurement Value is scaled.

ProcessDataIn "Process Data In" id=PD_ProcessDataInMeasurement

bit length: 32
data type: 32-bit Record (subindex access not supported)

subindex	bit offset	data type	allowed values	default value	acc. restr.	mod. other var.	excl. from DS	name	description
1	16	16-bit Integer						Measurement Value	The measurement device value
2	8	8-bit Integer						Measurement Scale	The measurement device scale
3	2	Boolean	false = No target or Marginal, true = Stable					Stability	Stability state
4	1	Boolean	false = Inactive, true = Active					Channel 2 Output State	Channel 2 Output State
5	0	Boolean	false = Inactive, true = Active					Channel 1 Output State	Channel 1 Output State