

Generic IO-Link Device Configuration

July 24th, 2023

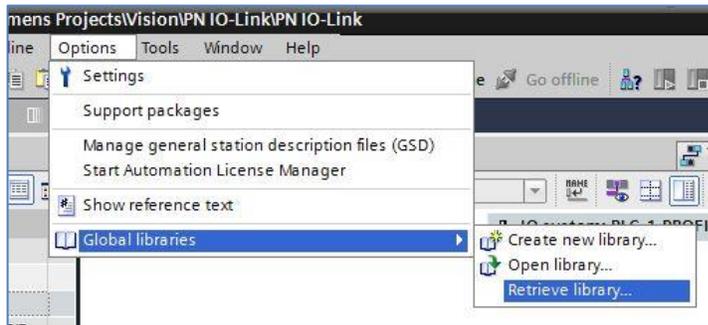
This document covers the installation and use of a Generic IO-Link Device along with a Banner DXMR90-4K or DXMR110-8K in the Siemens' TIA Portal software package. Banner DXMR90-4K and DXMR110-8K will be referenced as DXM from this point on in the document.

Components

Banner IOL Generic Device Library v14.zal14

Installation Instructions

1. Open a project.
2. Go to step 3 for TIA v14 to TIA v15 and step 6 for TIA v16 to recent release.
3. Go to Options > Global Libraries > Retrieve Library for TIA Portal Version 14 or 15.



4. Select the compressed Banner IOL Generic Device Library. Click Open.
5. The library is now accessible in the Libraries tab in v14.
6. Go to the Open Global Library option in the Libraries tab in TIA Portal v16 or greater.



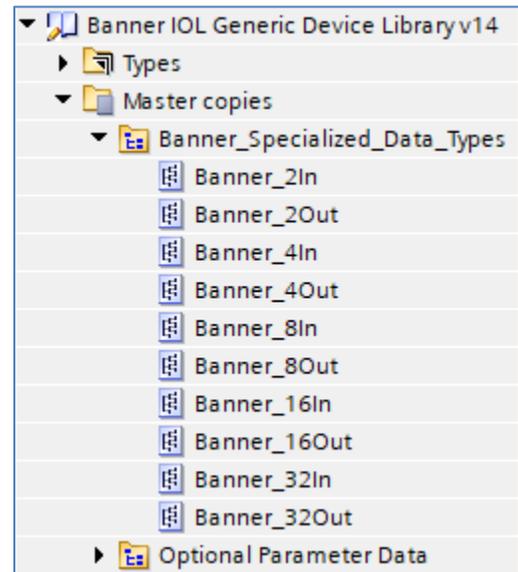
7. Switch the "Files of type" to Compressed libraries. Go to the location of the compressed library.
8. Press the Open button and the library will be uncompressed and opened.
9. The library is now accessible in the Libraries tab in v16 or greater.

Setup of IO-Link Device with a Banner DXM

1. Go to Device and Networks to configure the DXM. Add the DXM from the Hardware Catalog if it has yet to be added to the system.
2. Add Banner IO-Link Master Info to Slot 1. This sets the DXM for IO-Link mode.
3. Open the IO-Link Generic Devices and select the proper module. The 4/4 byte option has been selected for port 1. Make note of the I and Q addresses for Slot 2 which represents Port 1. This example has %I2 and %Q2 as the starting addresses.

Module	Rack	Slot	I address	Q address	Type
▼ dxm	0	0			1-port Device
▶ Interface	0	0 X1			dxm
Banner IO-Link Master Info_1	0	1	100...108		Banner IO-Link Master Info
IO-Link In/Out 4/ 4 Byte + Status_1	0	2	2...9	2...19	IO-Link In/Out 4/ 4 Byte + Status

4. Open the “Master copies” folder. Then open the Banner_Specialized_Data_types” folder.
5. Drag the correct tags for the IO-Link Device. The tag used in this example is “Banner_4In” and “Banner_4Out”. These tags represent the full raw process data along with port information.
6. Go to PLC Tags. Create two tags. The tags created are for the full data for process input and output. Depending on the IO-Link Device it is possible that only input or output data is required. The example shows both input and output.



Name	Data type	Address
▶ IOL Device 01 PDI	"Banner_4In"	%I2.0
▶ IOL Device 01 PDO	"Banner_4Out"	%Q2.0

7. Process Data setup is complete.

IO-Link Input Process Data

1. If an input tag was created go to the tag created in PLC Tags.
2. Expand the PDI tag. This tag has all the data coming into the PLC. PD Sizes tell you the sizes of the data that should be coming in.

Name	Data type	Address
▼ IOLink Device PDI	"Banner_4In"	%I2.0
Port Status	UInt	%IW2
PD Size In	USInt	%IB4
PD Size Out	USInt	%IB5
▶ In Data	Array[0..3] of USInt	%I6.0
▶ IOLink Device PDO	"Banner_4Out"	%Q2.0

3. Port Status is of importance. It gives information on how the IO-Link device operates. The Port Status is shown below. Each of the bits that has meaning is labeled in the image.

Port Status:

Bit0 = Connected?
Bit1 = Process Data Valid?
Bit2 = Event Pending?
Bit3 = Ready for ISDU?
Bit4 = Pin4 SIO State
Bit5 = Pin2 SIO State

Bit6-7 = Pin4 Mode:
SDCI Mode = 0
SIO Input Mode = 1
SIO Output Mode = 2

Bit8-10 = Pin2 Mode:
Disabled = 0
Input Normal = 1
Output = 2
Diagnostic Input = 3
Inverted Input = 4

4. The raw process data is stored in the In Data tags.
5. Create logic to process the raw data into usable data as necessary.

IO-Link Output Process Data

1. If an input tag was created go to the tag created in PLC Tags.
2. Expand the PDO tag. This tag has all the data being sent out from the PLC.

Name	Data type	Address
▶ IOLink Device PDI	"Banner_4In"	%I2.0
▼ IOLink Device PDO	"Banner_4Out"	%Q2.0
Port Control	UInt	%QW2
▶ Out Data	Array[0..3] of UInt	%Q4.0
Port Config	UInt	%QW8
Cycle Time	UInt	%QW10
Vendor ID	UInt	%QW12
Device ID	UDInt	%QD14
Pin 2 4 Adv Config	UInt	%QW18

3. When IO-Link outputs are needed it is necessary to configure the Port Control and Port Config.
 - a. Port Control needs a 1 placed into it. A value of one allows for the DXM to send the output data to the IO-Link Device. If not set to 1 the IO-Link output Process Data is not sent to the IO-Link Device.
 - b. Port Config needs a 2 placed into it. This setting ensures that the Port is set to IO-Link Mode.



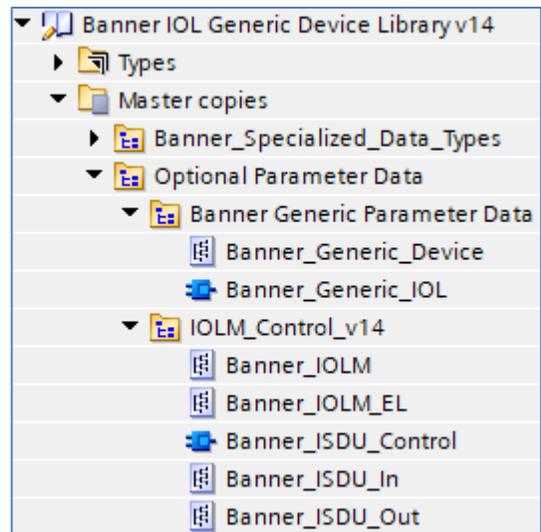
6. Create logic to format the settings for the IO-Link device into the raw byte data that will be sent to the IO-Link device. This data should be stored in the Out Data element.

Setup of the Optional IO-Link Generic Device with a Banner DXM

1. Go to Device and Networks to configure the DXM. Add the DXM if it has yet to be added to the system.
2. Open the IO-Link Generic Devices and select the proper module. The IO-Link ISDU 190/190 Byte_1 is required for this Function Block. Make note of the I address for the Slot 10. The inputs data starts at I185 while the outputs data starts at Q185 for this example.

IO-Link ISDU 190/190 Byte_1	0	10	185...380	185...380	IO-Link ISDU 190/190 Byte
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3. Drag the Banner_IOLM and Banner_IOLM_EL to the PLC Data Types area under your PLC. These are found in the IOLM_Control.
4. Drag the Banner_ISDU_Control to the Program blocks area.
5. Also move the Banner_Generic_IOL to the Program blocks area.
6. Finally move the Banner_Generic_Device, Banner_ISDU_in, and Banner_ISDU_out to the PLC Data Types.
7. Go to PLC Tags. Create two tags. The first tag "IOLM1 ISDU In" and the second tag is "IOLM1 ISDU Out". Use the %I and %Q values from step 2.



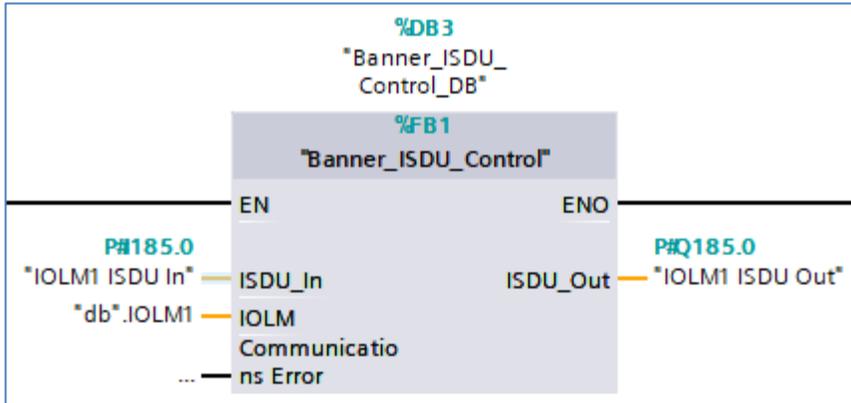
IOLM1 ISDU In	*Banner_ISDU_In*	%I185.0
IOLM1 ISDU Out	*Banner_ISDU_Out*	%Q185.0

8. Go to Program blocks. Add a new Data block if necessary. In this example the new data block is named "db".
9. Create a tag with the type of "Banner_IOLM". This example uses IOLM1.

- Expand the IOLM1 tag, then expand the Port Controlled section. The Port Controlled tag array determines which of the ports has a function block-controlled Banner IO-Link device plugged into it. Each Port Controlled array tag with **true** as the start value is considered to have such a device connected. Correctly setting this array allows the Device and IO-Link Master function blocks to control the device on that port. Errors will occur if a port without an IO-Link device is set to true.

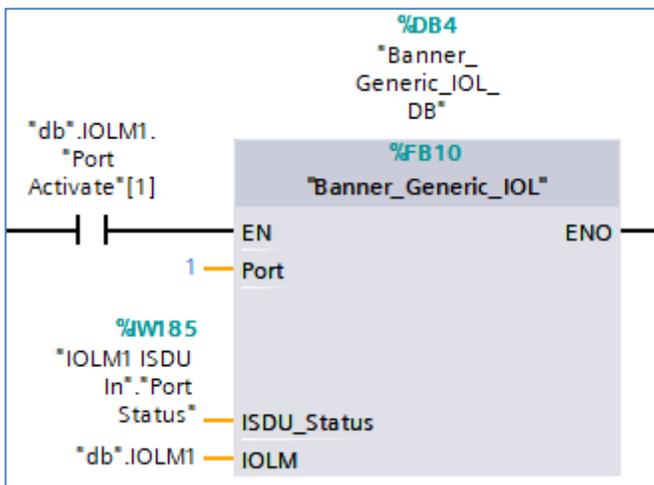
db			
	Name	Data type	Start value
	IOLM1	"Banner_IOLM"	
	Port Controlled	Array[1..8] of Bool	
	Port Controlled[1]	Bool	true
	Port Controlled[2]	Bool	true
	Port Controlled[3]	Bool	true
	Port Controlled[4]	Bool	false
	Port Controlled[5]	Bool	false
	Port Controlled[6]	Bool	false
	Port Controlled[7]	Bool	false
	Port Controlled[8]	Bool	false
	Port Activate	Array[1..8] of Bool	
	Port Read Request	Array[1..8] of Bool	
	Port Write Request	Array[1..8] of Bool	
	Port RW Complete	Array[1..8] of Bool	
	Port Device Read	Array[1..8] of Bool	
	Transfer Data	Array[0..231] of B...	
	Wr_Length	UInt	0
	Rd_Length	UInt	0
	IO-Index	Int	0
	Reset	Bool	false

- Next add the “Banner_ISDU_Control” function block to an OB ladder. You will be prompted to make a new data block. You now must define three input variables for this function block: ISDU_In, ISDU_Out, and IOLM.



- Link the IOLM variable to the database IOLM tag created in step 10. While ISDU_In and ISDU_Out are linked to variables created in step 8.
- Now add the “Banner_Generic_IOL” function block to an OB ladder. You will be prompted to make a new data block. Link the “Port Status” That is a part of the tag created in step 7. Type in the port number for the device, then link the “IOLM” variable to the IO-Link master variable created in step 9.

As a final step, the Port Activate bit is added on the same rung as the “Banner Generic IOL” function block to ensure orderly behavior. The IO-Link Master function block will cycle through all ports, giving each connected device function block a time to shine.



14. The IO-Link Generic Device Parameter Data function block is now set up. Compile the project and download it to the PLC. Go online, then open the IO-Link Generic Device data block. The Data elements will be empty unless a Read rule has been done. Note that after a Write Operation the data value are reset to 0 automatically.

Name	Data type	Monitor value
▼ Input		
■ Port	SInt	1
■ ISDU_Status	UInt	26
Output		
▼ InOut		
■ IOLM	"Banner_IOLM"	
▼ Static		
■ ▼ IOL_Device	"Banner_Generic_Device"	
■ Activate	Bool	FALSE
■ Index	UInt	60
■ Sub Index	USInt	0
■ Data_Length	USInt	4
■ RW	Bool	FALSE
■ ▼ Data	Array[0..189] of Byte	
■ Data[0]	Byte	16#00
■ Data[1]	Byte	16#00
■ Data[2]	Byte	16#00
■ Data[3]	Byte	16#00

Name	Data type	Monitor value
▼ Input		
■ Port	SInt	1
■ ISDU_Status	UInt	25
Output		
▼ InOut		
■ IOLM	"Banner_IOLM"	
▼ Static		
■ ▼ IOL_Device	"Banner_Generic_Device"	
■ Activate	Bool	FALSE
■ Index	UInt	60
■ Sub Index	USInt	0
■ Data_Length	USInt	4
■ RW	Bool	FALSE
■ ▼ Data	Array[0..189] of Byte	
■ Data[0]	Byte	16#05
■ Data[1]	Byte	16#DC
■ Data[2]	Byte	16#00
■ Data[3]	Byte	16#00

15. Enter the Index that should be accessed (currently sub-index access is not supported).
16. Enter in the necessary values for the ISDU parameter that is be accessed.
 - a. Index – Enter the index value that will be accessed.
 - b. Sub-Index – This should have a value of 0 entered as sub-index access is not supported at this time.
 - c. Data Length – The length in bytes that will be accessed.
 - d. RW – A False value for Read, while a True value is for Write.
 - e. Data – Enter the byte data that is to be used for a Write ISDU Parameter update.

▼ IOL_Device	*Banner_Generic_Device*	
■ Activate	Bool	FALSE
■ Index	UInt	60
■ Sub Index	USInt	0
■ Data_Length	USInt	4
■ RW	Bool	FALSE

17. With all the information set the Activate to True. The operation will be started. The Busy variable will be set to True while the Done will be False. After the operation is completed these values swap. If an issue occurs, then the Error bit will be set True along with the Done.

Output		
Busy	Bool	FALSE
Done	Bool	TRUE
Error	Bool	FALSE

18. Move data around as necessary for the operation being done.
19. Repeat the above process for any ISDU Parameter data for the device.