

# Banner IOL Parameter Data Function Block

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August 29<sup>th</sup>, 2025

This document covers the installation and use of a function block for Siemen's TIA Portal software package. This function block handles acyclic IO-Link commands to and from a Banner IO-Link Device and allows the user to easily change the IO-Link Device Parameter Data.

**Each Banner IO-Link Device Parameter Data function block is meant to be used alongside an IO-Link Master Control function block. This paper describes how to set up both blocks.**

## **Components**

Banner IOL Parameter.zal16 (using Siemens LIOLink v7.2 Library)

There are two methods for parameter data. The first is used when creating a connection to Banner's IO-Link masters. The second set of instructions are for systems using other manufacturers' IO-Link masters.

### **Open Global Library Instructions**

1. Open a project.
2. Go to the Open Global Library option in the Libraries tab in TIA Portal v16 or greater.



3. Switch the “Files of type” to Compressed libraries. Go to the location of the compressed library.
4. Press the Open button and the library will be uncompressed and opened.
5. The library is now accessible in the Libraries tab in v16 or greater.

### **Setup of IO-Link Device with a Banner DXMR Device**

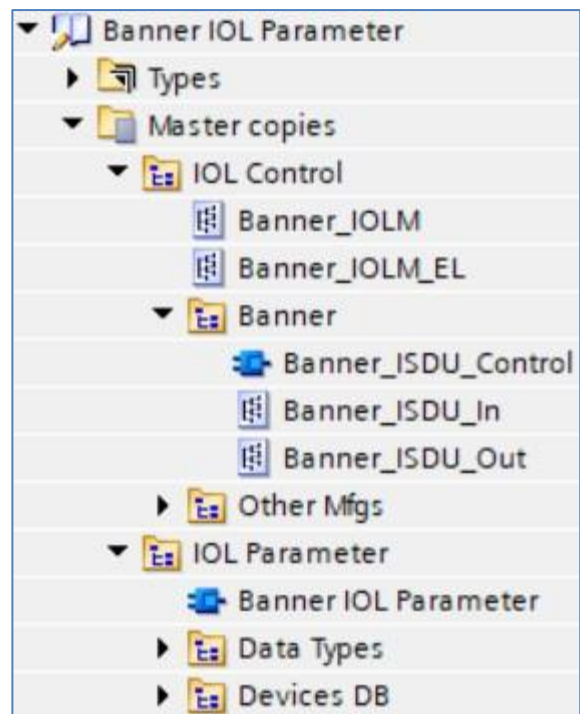
1. Go to Device and Networks to configure the DXMR. Add the DXM it has yet to be added to the system.
2. Add Banner IO-Link Master Info to Slot 1. This sets the DXMR for IO-Link mode.

Banner IO-Link Master Info_1	0	1	1...9	Banner IO-Link Master Info
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3. Open the IO-Link ISDU folder. Select the IO-Link ISDU 190/190 Byte option. Make note of the I address for 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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4. Switch to the Libraries Tab. The Banner IOL Parameter Library should already be opened (See previous section if it is not).
5. Expand the “Master copies” folder.
6. Expand the “IOL Control” folder.
7. Drag the Banner\_IOLM and Banner\_IOLM\_EL to the PLC Data Types area under your PLC.
8. Open the Banner folder and drag the Banner\_ISDU\_Control to the “Program blocks” area.
9. Also move the Banner\_ISDU\_In and Banner\_ISDU\_Out to the “PLC Data Types” area.
10. Now expand the “IOL Parameter” folder.
11. Move the “Banner IOL Parameter” to the Program blocks area.
12. Expand the “Data Types” folder.
13. Move all the data types to the “PLC Data Types” area.
14. Finally open the “Devices DB”.
15. Look for the Banner IO-Link Device that a



- parameter data connection will be created too. Move that database to the “Program blocks” area. This example will use “Banner Q5X2K” (found in Sensors).
16. The database will have two items in it. The “Q5X2K Rules” tells the Function Block how the data is organized. The “Q5X2K IOLM1 01” is the location the data is saved into by the Function Block. This tag can/should be renamed by the user. If multiple Q5X2K units are in the system this tag should have copies made of it. One for each Q5X2K in the system.

Name	Data type
▼ Static	
■ ► Q5X2K Rules	"Banner IOL Rules Array"
■ ▼ Q5X2K IOLM1 01	"Banner IOL Device"

17. 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 3.

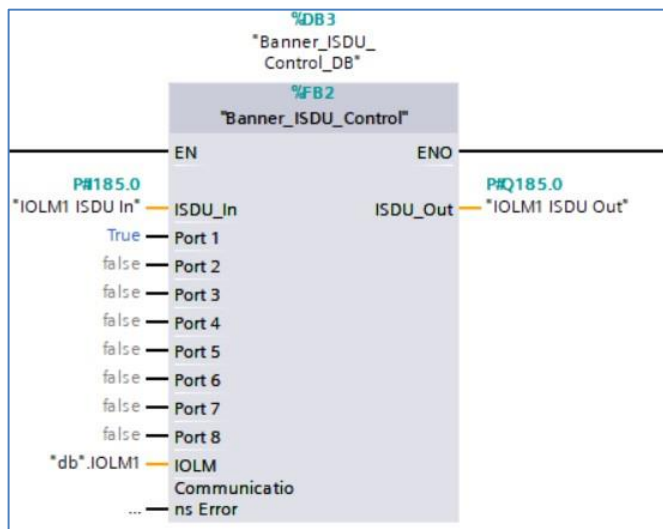
▶ IOLM1 ISDU In	*Banner_ISDU_In*	%I185.0
▶ IOLM1 ISDU Out	*Banner_ISDU_Out*	%Q185.0

18. Go to Program blocks. Add a new Data block if necessary (can use the device db that was imported). In this example the new data block is named “db”.

19. Create a tag with the type of “Banner\_IOLM”. This example uses IOLM1.

db	
Name	Data type
Static	
▶ IOLM1	*Banner_IOLM*

20. Next add the “Banner\_ISDU\_Control” function block to a ladder rung. You will be prompted to make a new data block. Accept this. You now must define the input variables for this function block: ISDU\_In, ISDU\_Out, and IOLM. Also set which ports the Function Block will interact with by changing the Port # to True. In this example only Port 1 will be used so that is the only one set to True. Only set a Port to True is the sensor/device is present and the parameter data Function block is configured for this device.

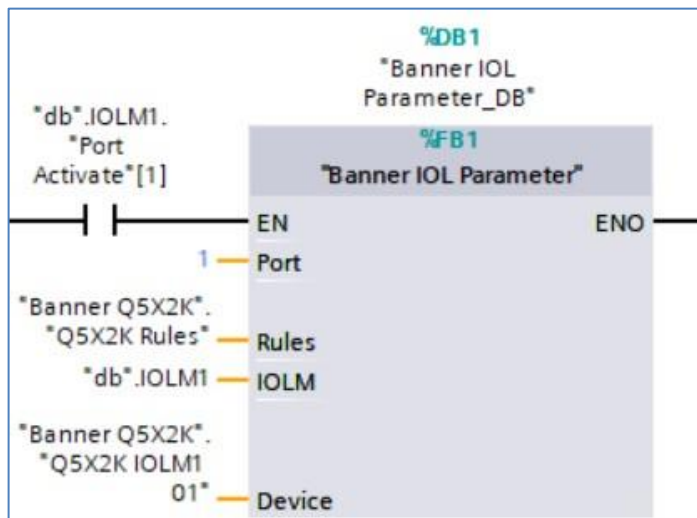


21. Link the IOLM variable to the database IOLM tag created in step 19. While ISDU\_In and ISDU\_Out are linked to variables created in step 17.

22. Now add the “Banner IOL Parameter” function block to a ladder rung. You will be prompted to make a new data block. Accept this. Type in the port number for the device, then link the “IOLM” variable to the IO-Link master variable created in step 19.

The Rules and Device need to be linked to the tags from the “Banner Q5X2K” database pulled in during step 15 and 16.

As a last step, the Port Activate (which is part of the IOLM tag from step 19) bit is added on the same rung as the “Banner IOL Parameter” 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 operate.



23. Setup of Parameter Data for a Banner DXMR is complete.

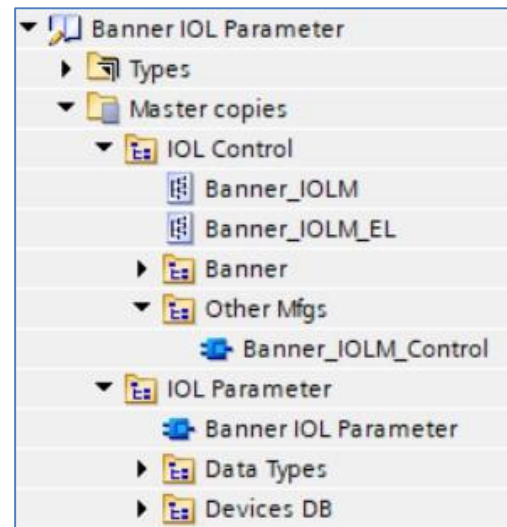
## **Setup of Banner IOL Parameter with other IO-Link Masters**

### **Additional Component Needed**

*Siemens LIOLink V7.2 Library for TIA Portal V16+ (downloadable on Siemens website)*

### **Installation Instructions**

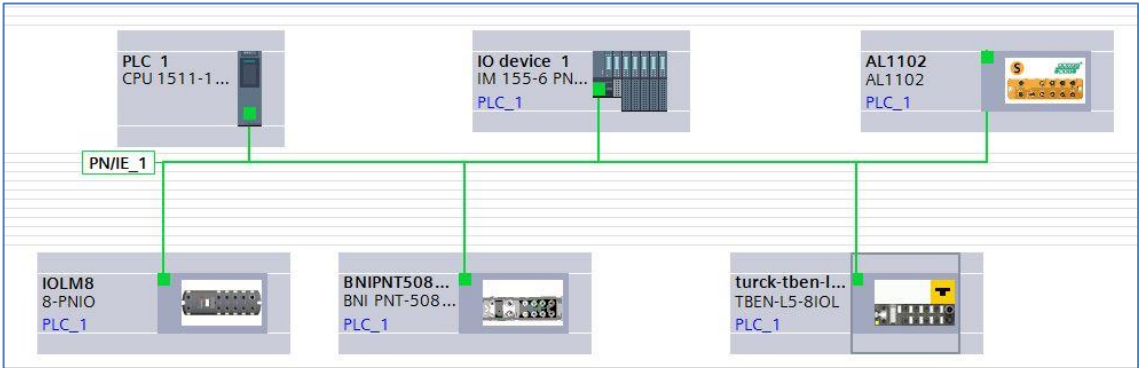
1. The Banner IOL Parameter Library will now be in the Global Library List. Expand the “Master copies” folder.
2. Expand the “IOL Control” folder.
3. Drag the Banner\_IOLM and Banner\_IOLM\_EL to the “PLC Data types” folder.
4. Expand the “Other Mfgs” folder.
5. Move the Banner\_IOLM\_LIOLink to the area under “Program Blocks”.
6. Now expand the “IOL Parameter” folder.
7. Move the “Banner IOL Parameter” to the Program blocks area.
8. Expand the “Data Types” folder.
9. Move all the data types to the “PLC Data Types” area.
10. Finally open the “Devices DB”.
11. Look for the Banner IO-Link Device that a parameter data connection will be created to. Move the database to the “Program blocks” area. This example will use “Banner Q5X2K”.
12. The database will have two items in it. The “Q5X2K Rules” tells the Function Block how the data is organized. The “Q5X2K IOLM1 01” is the location the data is saved into by the Function Block. This tag can/should be renamed by the user. If multiple Q5X2K units are in the system this tag should have copies made of it. One for each Q5X2K in the system.



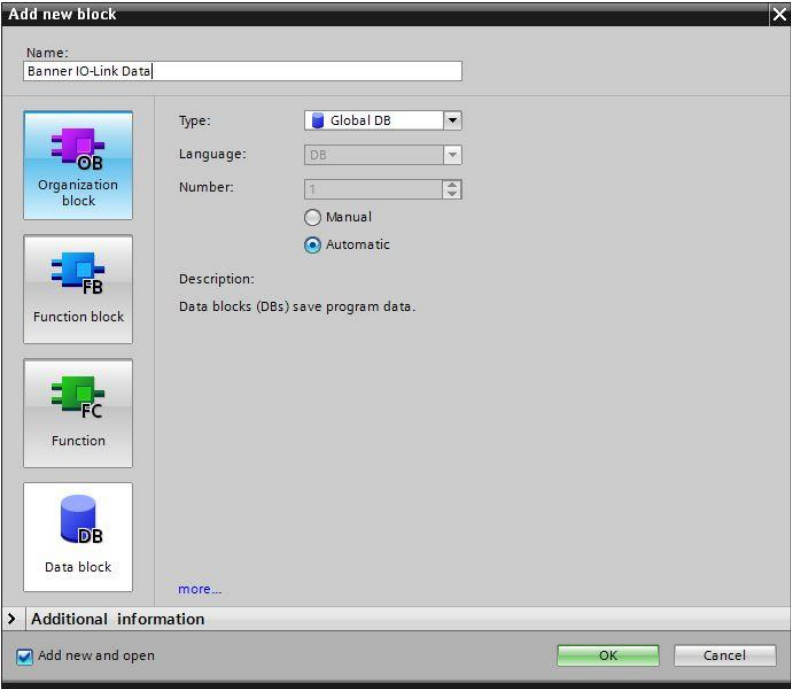
Name	Data type
▼ Static	
■ ► Q5X2K Rules	"Banner IOL Rules Array"
■ ▼ Q5X2K IOLM1 01	"Banner IOL Device"

13. Now we must bring the Siemens-made IO\_LINK\_DEVICE function block or LIOLink function block specific to your PLC into our project. This example will use IO\_LINK\_DEVICE. This can be found in a Siemens IO-Link Library. See their website for more details. Once that library is retrieved and opened, drag IO\_LINK\_DEVICE to the Program Blocks area under your PLC.

14. 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.



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



16. In the new data block, create a new tag to represent the IO-Link Master, using the data type “Banner\_IOLM”. This example uses the tag name “IOLM1”. A different IO-Link Master might be called IOLM2 or IOLM3, for instance.

Banner IO-Link Data		
	Name	Data type
1	Static	
2	IOLM1	"Banner_IOLM"

- Next add the “Banner\_IOLM\_Control” function block to an OB ladder. You will be prompted to make a new data block. You now must define the input variables for this function block.

Defining an input variable for the last input, Communications Error, is optional.

The Client Access Point (CAP) varies, depending on the specific IO-Link Master used.

IO-Link Master	CAP
Balluff (BNI PNT-508-105-Z015)	255
Control (IOLMPN8P)	255
ifm (AL1102)	46080
Siemens (CM 4xIO-Link)	227
Turck (TBEN-L5-8IOL)	251

The ID Control state variable should be “true” if using an IO-Link Master from ifm; otherwise, it should be set to “false”.

All Ports that will be accessed by the Function Block set them to “true”. In this example only Port 1 will be set to “true”. Only set to “true” if sensor/device is present and the parameter data function block is configured for this device.

Link the “IOLM” input variable to the tag created in step 16.

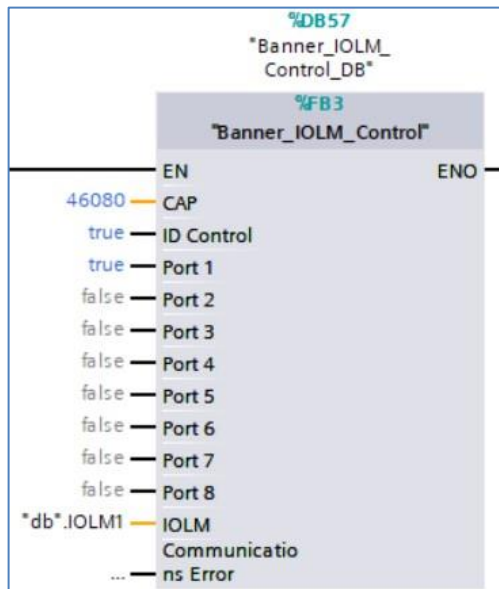


Figure 1: An example using an ifm IO-Link Master

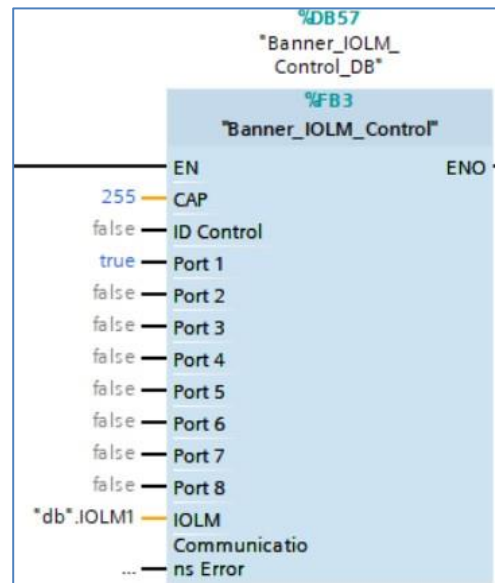


Figure 2: An example using a Balluff IO-Link Master



18. The ID Control true/false state is linked to an array called “ID\_Array”, found in “Banner\_IOLM\_Control\_DB”. This array contains the Hardware ID property of the PROFINET configuration.

See Appendix A for more information on how to find the correct value for your specific IO-Link Master.

In the case of an IO-Link Master from ifm, each port has a different Hardware ID and each number must be entered into the correct place. The example shown in Figure 3 is of an IO-Link device connected to port 6 of an ifm IO-Link Master. The ifm IO-Link Master’s port 6 Hardware ID is entered into the “ID\_Array[6]” slot. This full array of different Hardware IDs, based on port used, is used when the “ID Control” variable is set to true (i.e. only when the IO-Link Master is from ifm).

IO-Link Masters from other vendors use a single Hardware ID value for all ports. In this case, the Hardware ID is entered into the “ID\_Array[1]” slot of the array, regardless of the port to which the device is connected. This array is ignored (but the [1] slot is still important) when the “ID Control” variable is set to false.

ID_Array		Array[1..8] of HW_IO	
■	ID_Array[1]	HW_IO	0
■	ID_Array[2]	HW_IO	0
■	ID_Array[3]	HW_IO	0
■	ID_Array[4]	HW_IO	0
■	ID_Array[5]	HW_IO	0
■	ID_Array[6]	HW_IO	279
■	ID_Array[7]	HW_IO	0
■	ID_Array[8]	HW_IO	0

Figure 3: The ID\_Array when using an ifm IO-Link Master; device attached to port 6

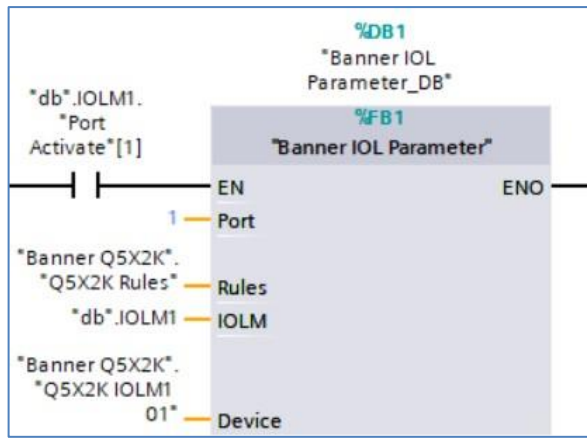
ID_Array		Array[1..8] of HW_IO	
■	ID_Array[1]	HW_IO	309
■	ID_Array[2]	HW_IO	0
■	ID_Array[3]	HW_IO	0
■	ID_Array[4]	HW_IO	0
■	ID_Array[5]	HW_IO	0
■	ID_Array[6]	HW_IO	0
■	ID_Array[7]	HW_IO	0
■	ID_Array[8]	HW_IO	0

Figure 4: The ID\_Array when using a Balluff IO-Link Master; device attached to any port (only ID\_Array[1] is used)

19. Now add the “Banner IOL Parameter” function block to an OB ladder. You will be prompted to make a new data block. Type in the port number for the device, then link the “IOLM” variable to the IO-Link master variable created in step 15.

The Rules and Device need to be linked to the tags from the “Banner Q5X2K” database pulled in during steps 11 and 12.

As a final step, the Port Activate bit is added on the same rung as the Banner IOL Parameter 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 operate.



20. Setup of Parameter Data for IO-Link Master is complete.

## Using the Banner IOL Parameter Function Block

The Banner IOL Parameter function block will automatically gather data for all IO-Link devices in the system when first powered on. Parameter data is an acyclic process and can take some time to complete. The initial read is complete when the “Initial Global Read” tag is set to “true”. This flag can be set to false to request another full global read of all parameter data for an IO-Link device. The flag is found in the tag that is part of the pulled in database from the library. This example uses the Q5X2K database. The tag is in the “Data type” “Banner IOL Device”. There should be one tag of “Banner IOL Device” for each device in the system. If you have 3 Q5X2K sensors then copy the “Q5X2K IOLM1 01” until you have three copies of it. One for each device. Rename them as needed for the system.

Name	Data type	Monitor value
▼ Static		
▀ Q5X2K Rules	"Banner IOL Rules Array"	
▀ ▼ Q5X2K IOLM1 01	"Banner IOL Device"	
▀ Initial Global Read	Bool	TRUE
▀ Command	USInt	0

The Data section in “Banner IOL Device” should be expanded. Now the Index should also be expanded. Now the Index array is fully visible. Start at index[2] each line is labeled. These labels represent the IO-Link Indices in the device. Read only indices will have a “ro” in the comment. Write only has a “wo”. Everything with neither a “ro” or a “wo” is Read Write capable. See the below image for an example of this.

Q5X2K IOLM1 01	"Banner IOL Device"		
Initial Global Read	Bool	TRUE	
Command	USInt	0	
▼ Data	"Banner IOL Device Index"		
▀ ▼ Index	Array[0..40] of "Banner IOL Devi...		
▀ ▸ Index[0]	"Banner IOL Device SubIndex"		
▀ ▸ Index[1]	"Banner IOL Device SubIndex"		
▀ ▸ Index[2]	"Banner IOL Device SubIndex"		Direct Parameters (ro)
▀ ▸ Index[3]	"Banner IOL Device SubIndex"		Standard Command (wo)
▀ ▸ Index[4]	"Banner IOL Device SubIndex"		Device Access Locks
▀ ▸ Index[5]	"Banner IOL Device SubIndex"		Serial Number
▀ ▸ Index[6]	"Banner IOL Device SubIndex"		Teach Channel
▀ ▸ Index[7]	"Banner IOL Device SubIndex"		Teach Status (ro)
▀ ▸ Index[8]	"Banner IOL Device SubIndex"		BDC1 Setpoints
▀ ▸ Index[9]	"Banner IOL Device SubIndex"		BDC1 Configuration
▀ ▸ Index[10]	"Banner IOL Device SubIndex"		BDC2 Setpoints
▀ ▸ Index[11]	"Banner IOL Device SubIndex"		BDC2 Configuration

A Global Read can be started by either entering a 1 into the Command or setting the “Initial Global Read” to false. A singular Index read is started by entering the index number into Command. As an example, if “BDC1 Setpoints” should be updated then entering an eight into the Command does the Read operation for that Index. The Data in the index is now updated. Expand the index to see the data.

The Write operation requires a few steps to complete. Start by expanding the Index that will be updated. For this example, “BDC1 Setpoints” will be used.

▼ Index[8]	*Banner IOL Device SubIndex*		BDC1 Setpoints
■ ▼ Sub Index	Array[0..34] of UDInt		
■ Sub Index[0]	UDInt	0	
■ Sub Index[1]	UDInt	472	SP1
■ Sub Index[2]	UDInt	0	SP2. In FGS teach, defines the 2nd switchpoint. In other modes,

Change all the “Sub Index” values that need to be updated. This example changes SP1 from 472 to 480.

▼ Index[8]	*Banner IOL Device SubIndex*		BDC1 Setpoints
■ ▼ Sub Index	Array[0..34] of UDInt		
■ Sub Index[0]	UDInt	0	
■ Sub Index[1]	UDInt	480	SP1

The Command needs to be set for the Write command to be updated. Take the index number and add 40 to it. This is the value that needs to be entered into the Command value. Here the value 48 (40 + 8) is entered and the device is updated.

▼ Q5X2K IOLM1 01	*Banner IOL Device*	
■ Initial Global Read	Bool	TRUE
■ Command	USInt	48

The Command value will be set back to 0 after the operation is completed. When the Command is set back to 0 look at the “Communications Error” tag from the “Banner\_IOLM\_Control” or “Banner\_ISDU\_Control” database. This tells the user if the write operation was successful or not.

▼ Q5X2K IOLM1 01	*Banner IOL Device*	
■ Initial Global Read	Bool	TRUE
■ Command	USInt	0

Communications Error	Bool	false	TRUE
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Appendix A IO-Link Master Hardware ID Numbers

The Hardware ID number used in “ID\_Array” in the “Banner\_IOLM\_Control\_DB” function block is not trivial to find. Each manufacturer uses the Hardware Identifier of a slightly different subcomponent as the value required for our purposes. Furthermore, the particular Hardware Identifier numbers will change based on the number of devices in your configuration. These pictures show which subcomponent’s Hardware ID is relevant to the function block.

In each case, click on the hardware device from the “Devices & Networks” view. Click on “Properties”, then click on “System Constants” to see the screen shots below.

Balluff

Use the Hardware Identifier from the “BNI\_PNT-508-105-Z015\_1” Hw\_SubModule. Type this number into the [1] slot of the ID\_Array found in the “Banner\_IOLM\_Control\_DB” data block.

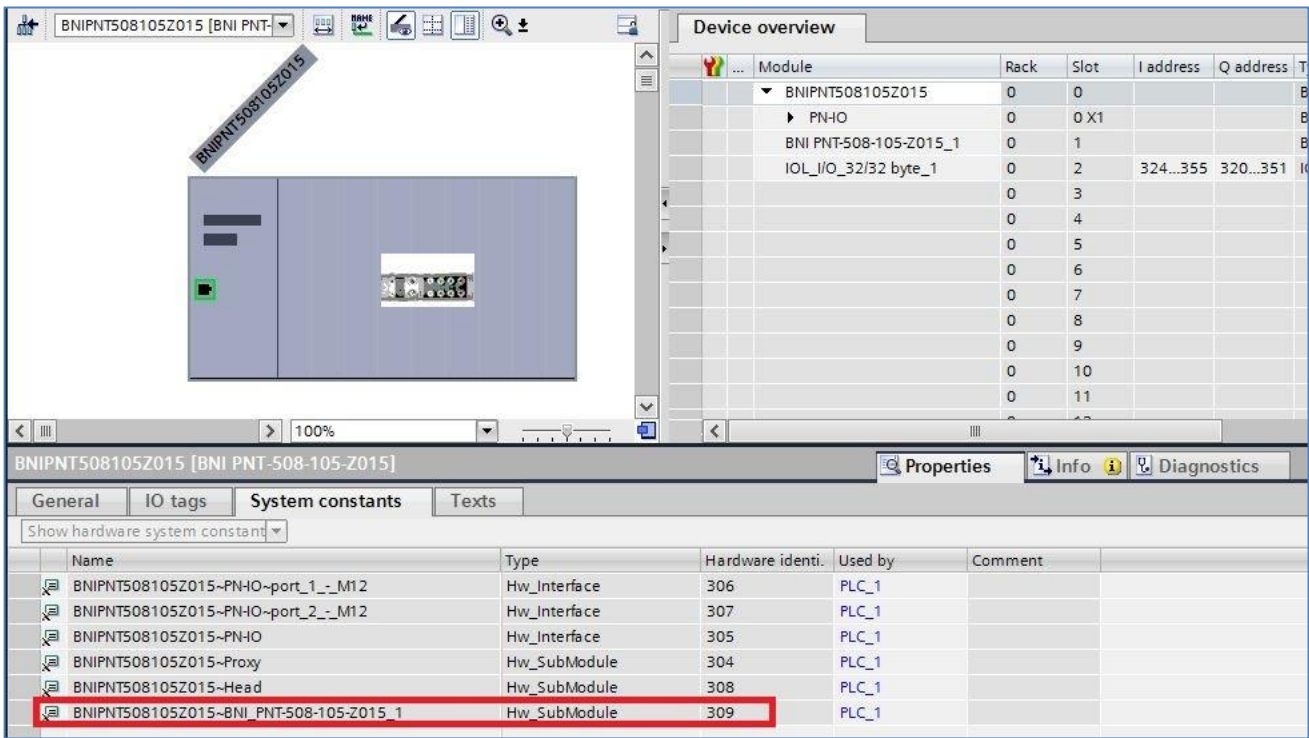


Figure 2: Balluff BNI005H. Type this value into the “ID\_Array[1]” location.

Control

Use the Hardware Identifier from the “Head” Hw\_SubModule. Type this number into the [1] slot of the ID\_Array found in the “Banner\_IOLM\_Control\_DB” data block.

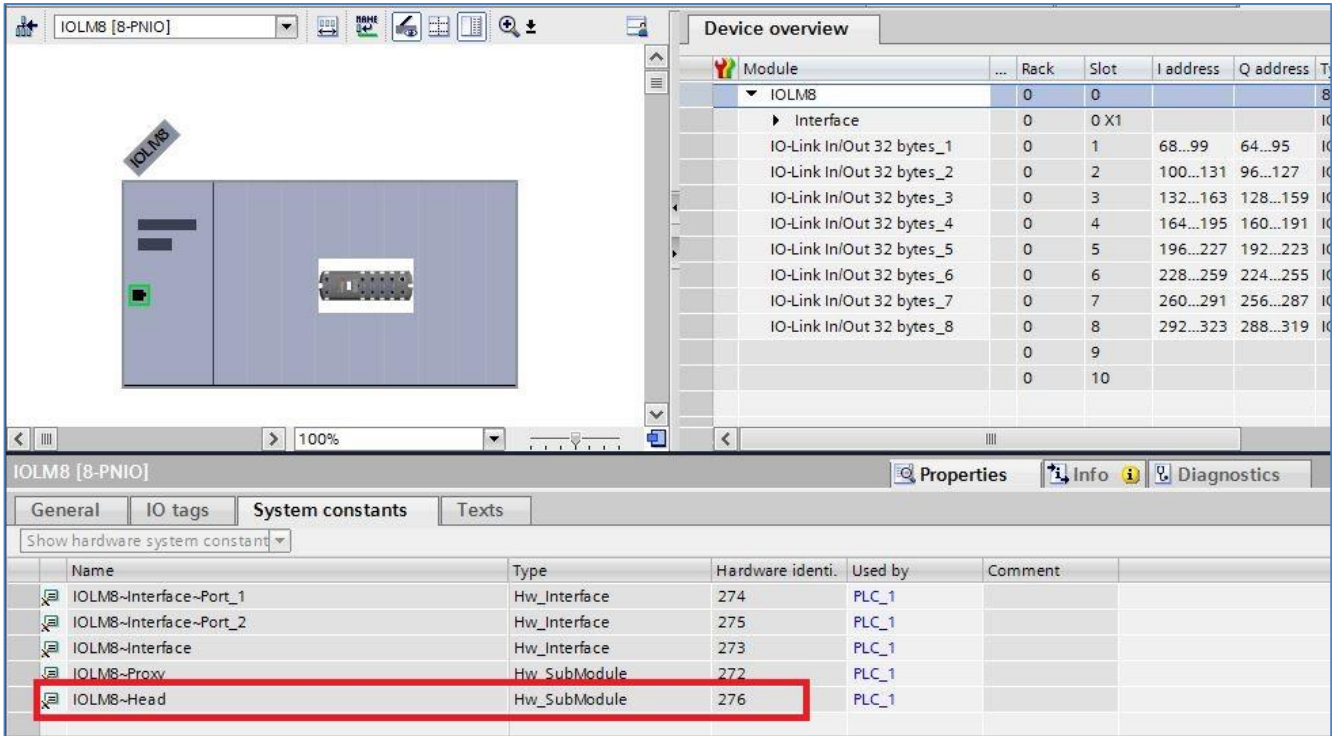


Figure 3: Control IOLM8 PNIO. Type this value into the “ID\_Array[1]” location.



Turck

Use the Hardware Identifier from the “Basic\_1” Hw\_SubModule. Type this number into the [1] slot of the ID\_Array found in the “Banner\_IOLM\_Control\_DB” data block.

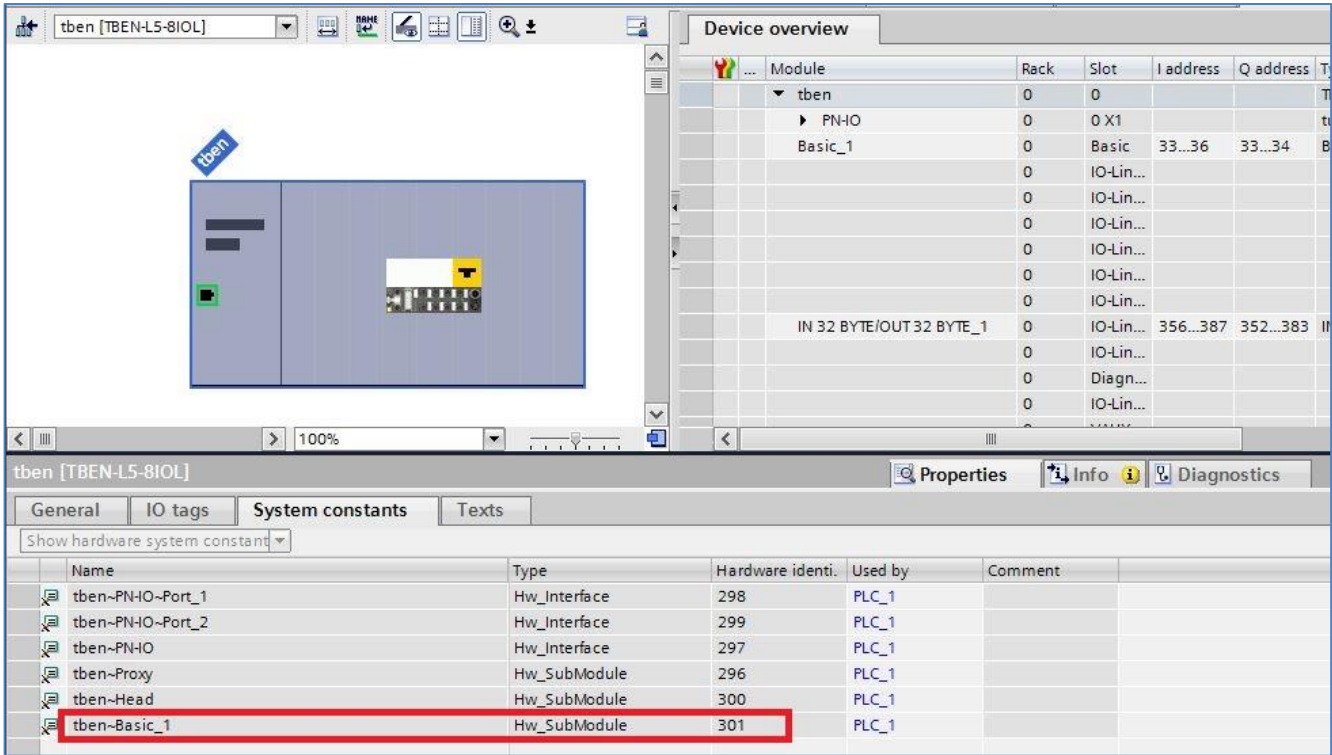


Figure 3: Turck TBEN-L5-8IOL. Type this value into the “ID\_Array[1]” location.

Siemens

Use the Hardware Identifier from the “CM\_4xIO-Link\_1” Hw\_SubModule. Type this number into the [1] slot of the ID\_Array ID\_Array found in the “Banner\_IOLM\_Control\_DB” data block.

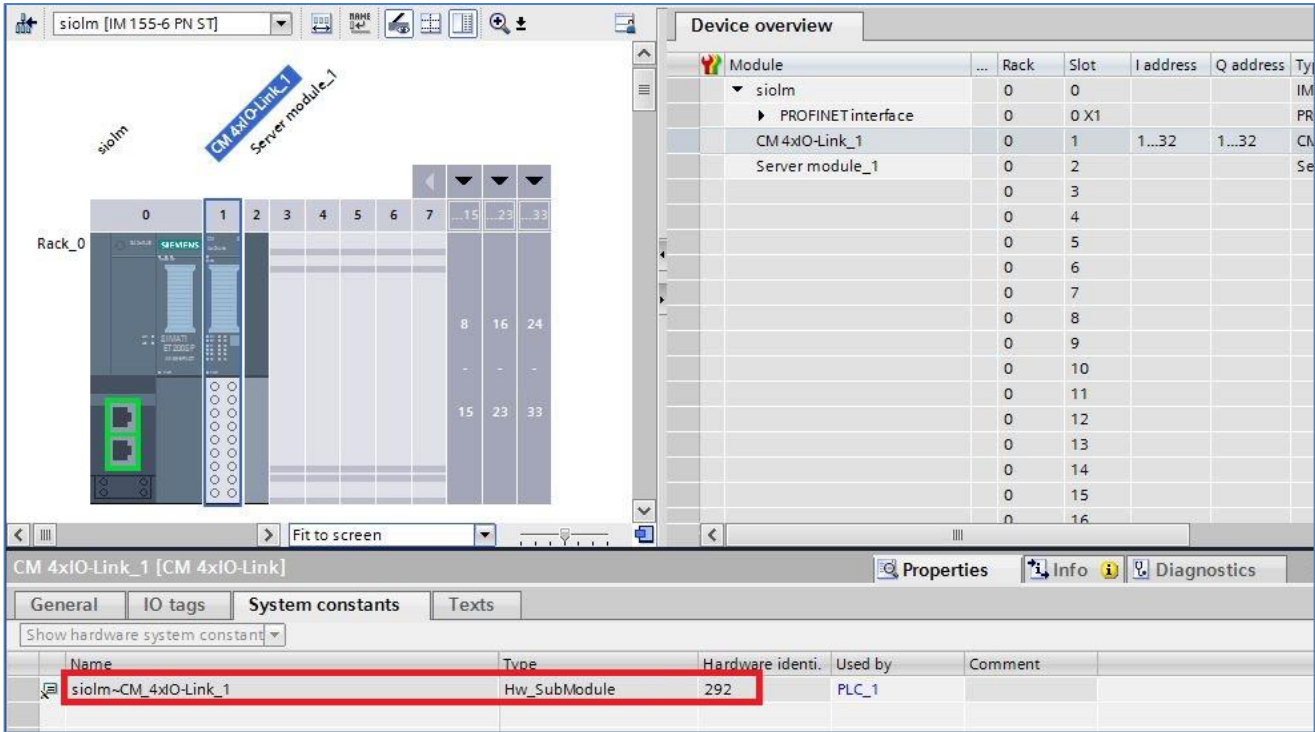


Figure 4: Siemens CM 4xIO-Link Master on ET-200SP. Type this value into the “ID\_Array[1]” location.



ifm

Use the Hardware Identifier from the port to which the IO-Link Device you wish to control is connected Hw\_SubModule. Each port is a different Hardware identifier. You will need to populate the ID\_Array, found in the “Banner\_IOLM\_Control\_DB” data block, with the correct values. In the example below, port 6 on the master has a Hardware ID of “279”. Thus, the [6] entry in the ID\_Array variable should be set to “279”.

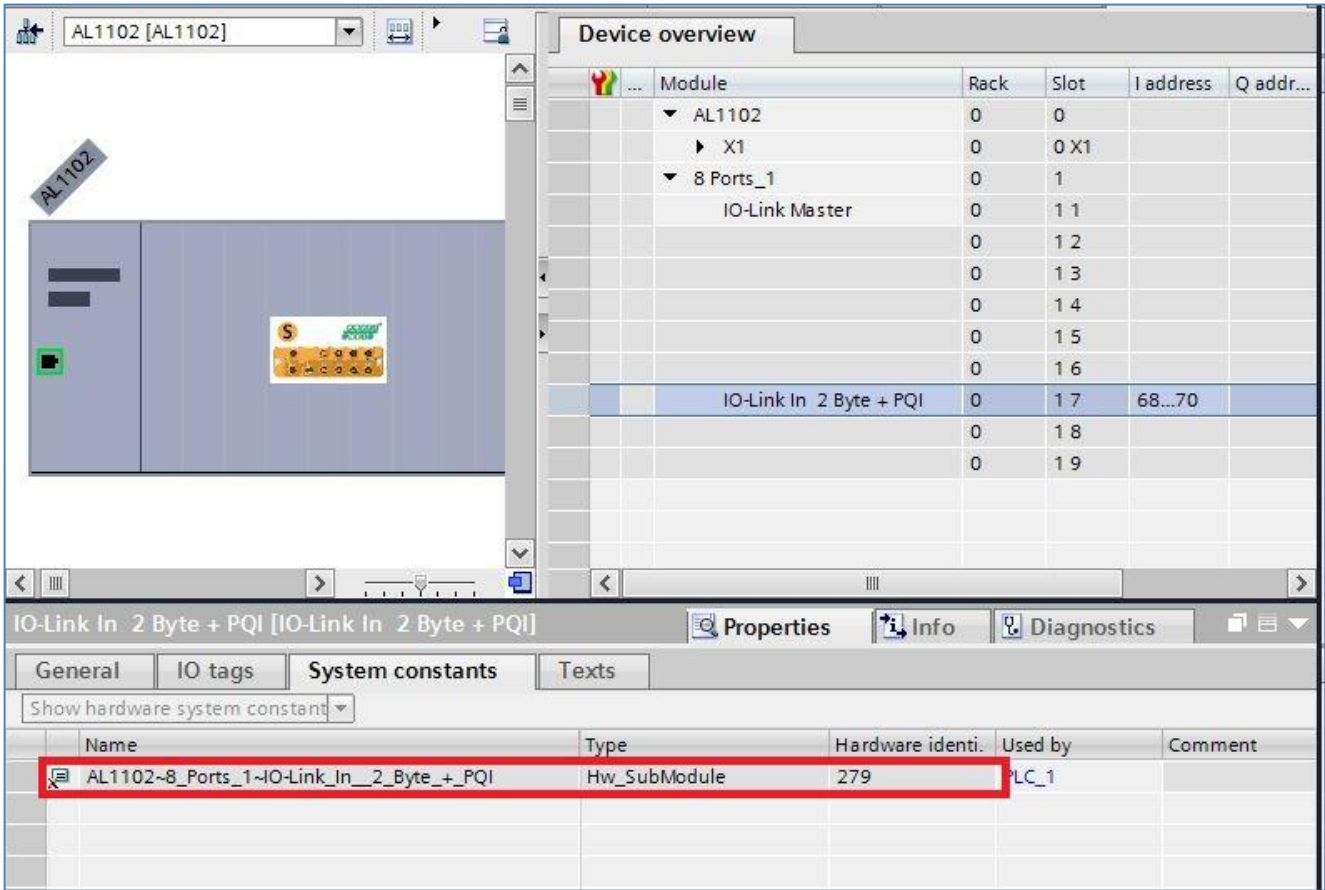


Figure 5: ifm AL1102: each port on the ifm IO-Link Master has its own Hardware ID. Type these values into the correct “ID\_Array[x]” location, where ‘x’ is the port number in question ([6] here, as the ports are labeled 2 through 9).