

Banner IOL S15S-TH Parameter Data Function Block

March 17th, 2026

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 S15S-TH 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 S15S TH Library v16.zal16

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

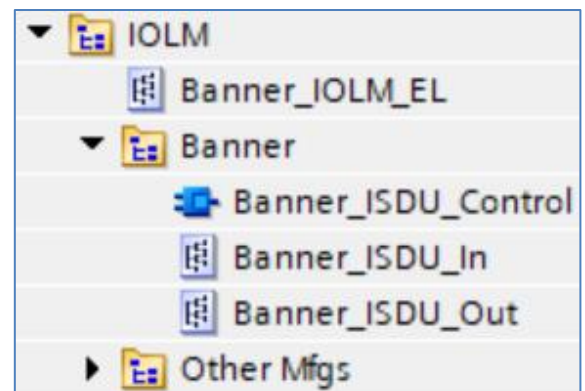
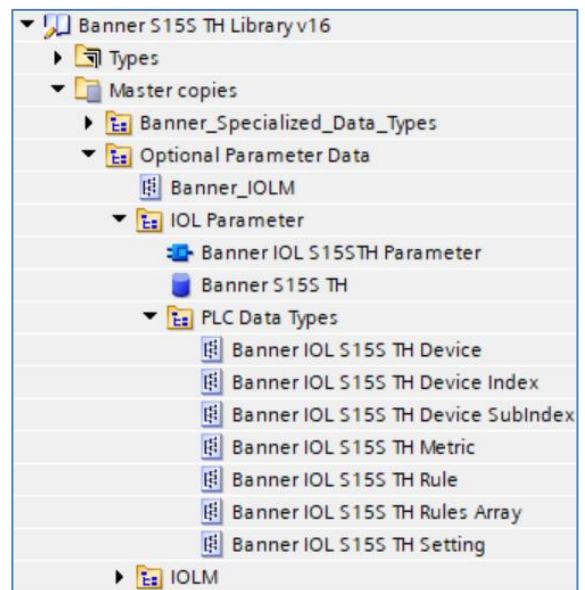
1. Go to Device and Networks to configure the DXMR. Add the DXMR it has yet to be added to the system.
2. Add Banner IO-Link Master Info to Slot 1. This sets the DXMR for IO-Link mode.

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 S15S TH Library should already be opened (see previous section if it is not).
5. Expand the “Master copies” folder.
6. Expand “Optional Parameter Data”.
7. Expand the “IOLM” and “Banner” folders.
8. Drag the Banner_IOLM and Banner_IOLM_EL to the PLC Data Types area under your PLC.
9. Open the Banner folder and drag the Banner_ISDU_Control to the “Program blocks” area.
10. Also move the Banner_ISDU_In and Banner_ISDU_Out to the “PLC Data Types” area.
11. Now expand the “IOL Parameter” folder.
12. Move the “Banner IOL S15STH Parameter” to the Program blocks area.
13. Move database “Banner S15S TH” to the Program blocks area.
14. Expand the “Data Types” folder.
15. Move all the data types to the “PLC Data Types” area.



16. The database will have two items in it. The “S15STH Rules” tells the Function Block how the data is organized. The “S15STH 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 S15S-TH units are in the system this tag should have copies made of it. One for each S15S-TH in the system.

Name	Data type
▼ Static	
▶ S15STH Rules	"Banner IOL S15S TH Rules Array"
▶ S15STH IOLM1 01	"Banner IOL S15S TH 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.

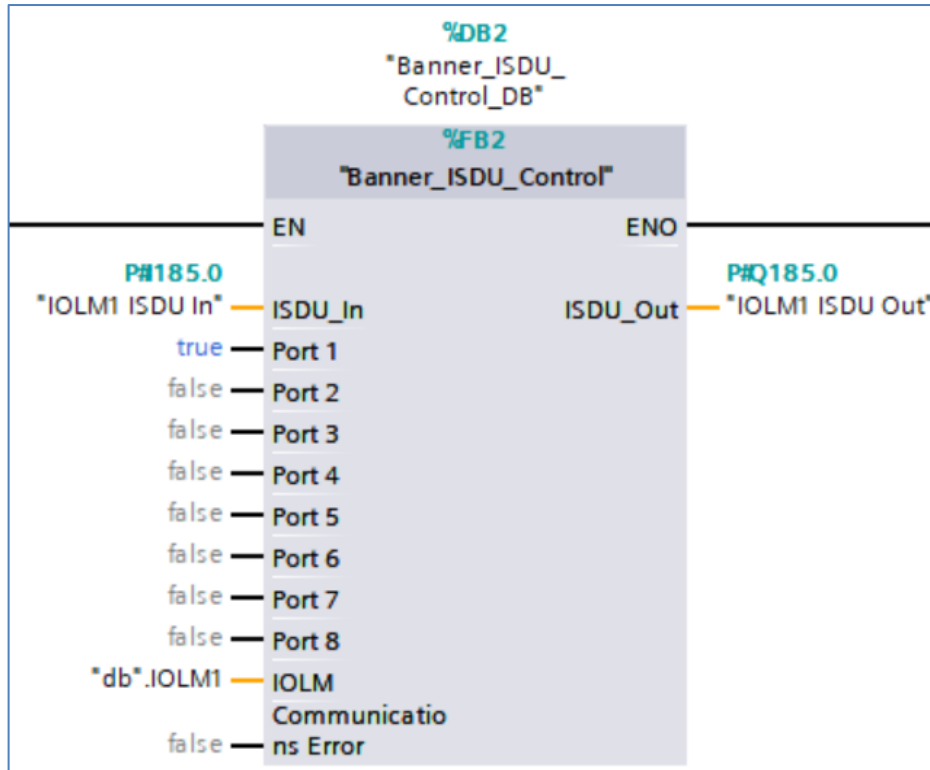
▶ IOLM1 ISDU In	"Banner_ISDU_In"	%I185.0
▶ IOLM1 ISDU Out	"Banner_ISDU_Out"	%Q185.0

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.

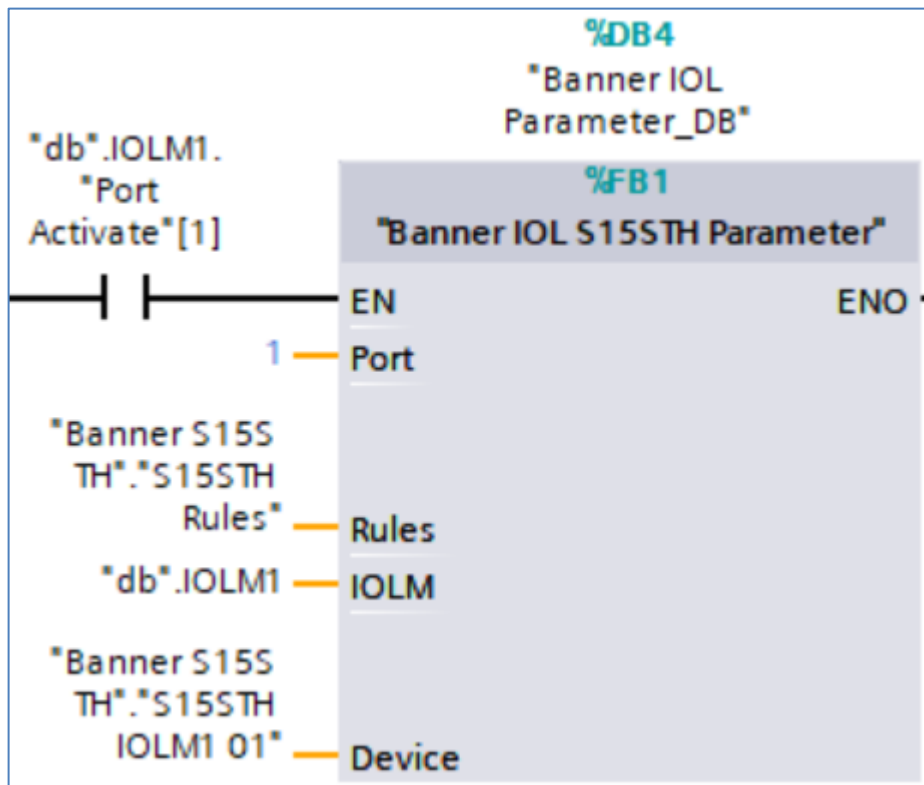


21. Link the IOLM variable to the database IOLM tag created in step 19. While ISDU_In and ISDU_Out are linked to variables created in step 17.

22. Now add the “Banner IOL S15STH 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 S15STH” database pulled in during step 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 S15STH 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 S15STH Parameter Data for a Banner DXMR is complete.

24. Go to Page 12 for information on how to use the Function Block.

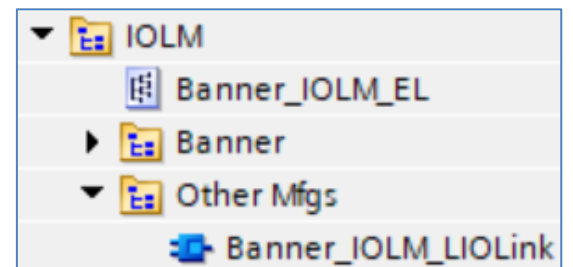
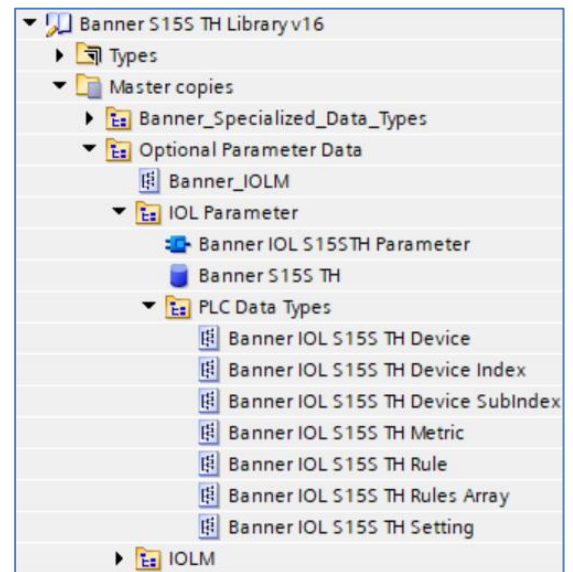
Setup of Banner IOL Parameter with other IO-Link Masters

Additional Component Needed

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

Installation Instructions

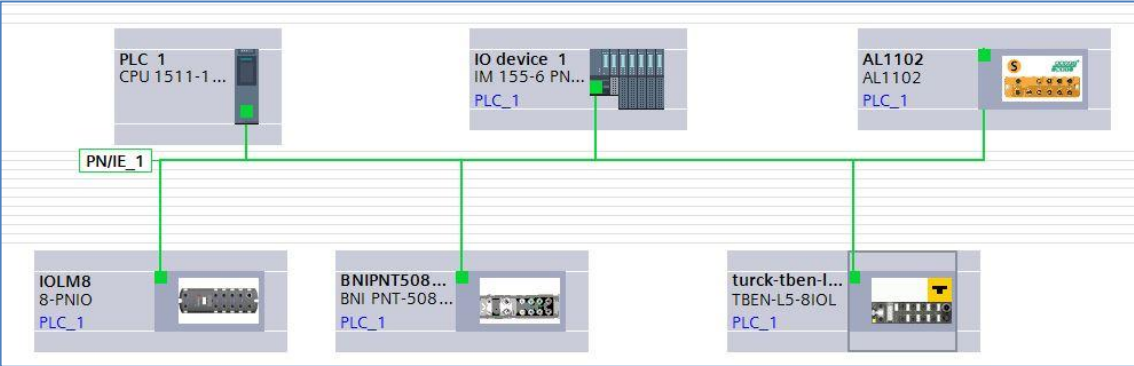
1. The Banner IOL Parameter Library will now be in the Global Library List. Expand the “Master copies” folder.
2. Expand “Optional Parameter Data”.
3. Expand the “IOLM” folder.
4. Drag the Banner_IOLM and Banner_IOLM_EL to the “PLC Data types” folder.
5. Expand the “Other Mfgs” folder.
6. Move the Banner_IOLM_LIOLink to the area under “Program Blocks”.
7. Now expand the “IOL Parameter” folder.
8. Move the “Banner IOL S15STH Parameter” to the Program blocks area.
9. Expand the “PLC Data Types” folder.
10. Move all the data types to the “PLC Data Types” area.
11. Move the “Banner S15S TH” to the Program blocks area.
12. The database will have two items in it. The “S15STH Rules” tells the Function Block how the data is organized. The “S15STH 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 S15S-TH units are in the system this tag should have copies made of it. One for each S15S-TH in the system.



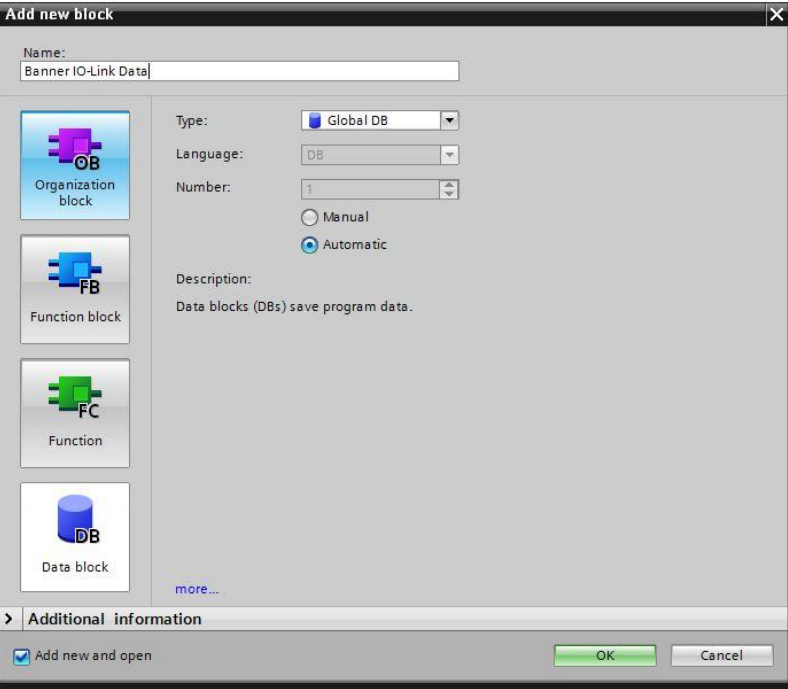
Name	Data type
▼ Static	
■ ▶ S15STH Rules	"Banner IOL S15S TH Rules Array"
■ ▶ S15STH IOLM1 01	"Banner IOL S15S TH Device"

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 “db”.



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"

17. 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.

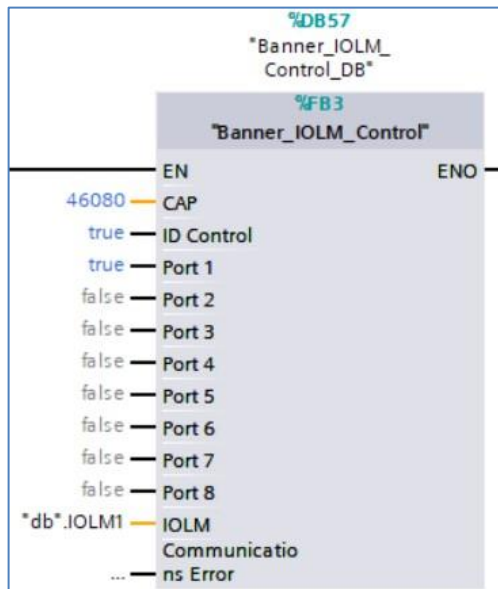


Figure 1: An example using an ifm IO-Link Master

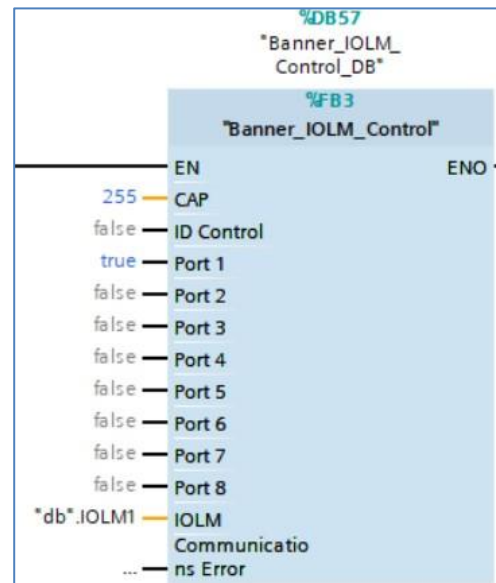


Figure 2: An example using a Balluff IO-Link Master

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

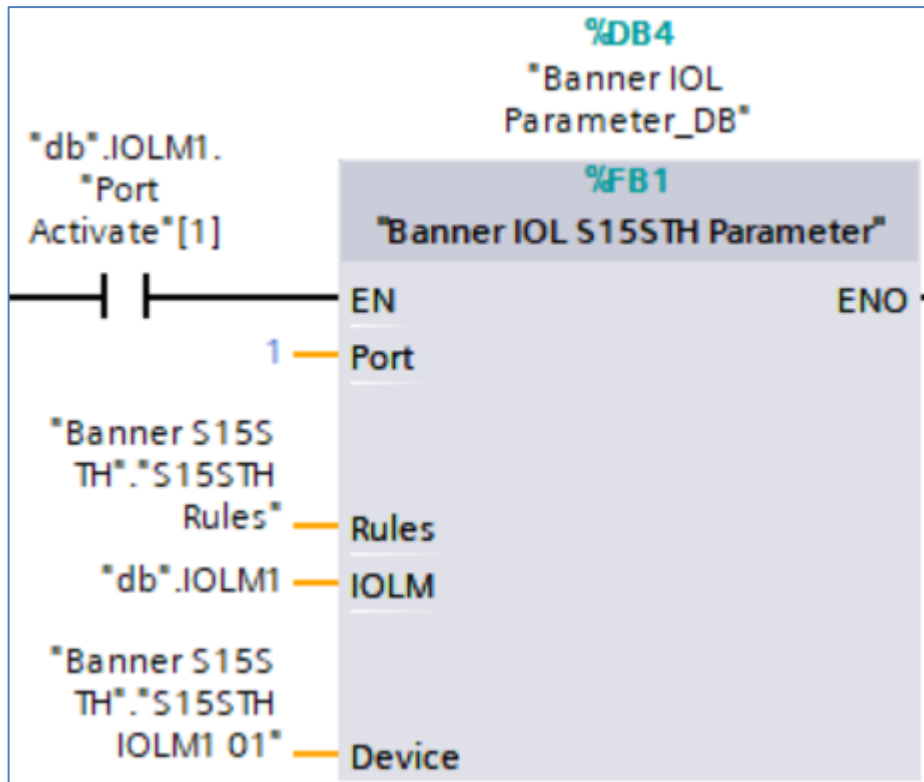
ID_Array		Array[1..8] of HW_IO	
■	ID_Array[1]	HW_IO	309
■	ID_Array[2]	HW_IO	0
■	ID_Array[3]	HW_IO	0
■	ID_Array[4]	HW_IO	0
■	ID_Array[5]	HW_IO	0
■	ID_Array[6]	HW_IO	0
■	ID_Array[7]	HW_IO	0
■	ID_Array[8]	HW_IO	0

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 S15STH 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 S15STH” database pulled in during steps 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.
21. Go to next page for information on how to use the Function Block.

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 S15STH database. The tag is in the “Data type” “Banner IOL S15S TH Device”. There should be one tag of “Banner IOL Device” for each device in the system. If you have 3 S15S-TH sensors then copy the “S15STH 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		
■ ► S15STH Rules	"Banner IOL S15S TH Rules Array"	
■ ▼ S15STH IOLM1 01	"Banner IOL S15S TH Device"	
■ Initial Global Read	Bool	TRUE
■ Command	USInt	0
■ ► Data	"Banner IOL S15S TH Device Index"	
■ Reset	Bool	FALSE

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 image below for an example of this.

▼ Data	*Banner IOL S15S TH Device Index*		
■ ▼ Index	Array[0..12] of *Banner IOL S15S T...		
■ ▶ Index[0]	*Banner IOL S15S TH Device SubIn...		
■ ▶ Index[1]	*Banner IOL S15S TH Device SubIn...		
■ ▶ Index[2]	*Banner IOL S15S TH Device SubIn...		Direct Parameters (ro)
■ ▶ Index[3]	*Banner IOL S15S TH Device SubIn...		Standard Command (wo)
■ ▶ Index[4]	*Banner IOL S15S TH Device SubIn...		Serial Number (ro)
■ ▶ Index[5]	*Banner IOL S15S TH Device SubIn...		All Time Run Time (ro)
■ ▶ Index[6]	*Banner IOL S15S TH Device SubIn...		Resettable Run Time
■ ▶ Index[7]	*Banner IOL S15S TH Device SubIn...		Alarm Configuration
■ ▶ Index[8]	*Banner IOL S15S TH Device SubIn...		Alarm Counter
■ ▶ Index[9]	*Banner IOL S15S TH Device SubIn...		Process Data Mode
■ ▶ Index[10]	*Banner IOL S15S TH Device SubIn...		Output Configuration
■ ▶ Index[11]	*Banner IOL S15S TH Device SubIn...		
■ ▶ Index[12]	*Banner IOL S15S TH Device SubIn...		
■ ▶ Alarm Config	Array[1..12] of Real		

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 “Vibe IQ Configuration” 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, “Process Data Mode” will be used.

▼ Index[9]	*Banner IOL S15S T...	
■ ▼ Sub Index	Array[0..14] of DInt	
■ Sub Index[0]	DInt	0
■ Sub Index[1]	DInt	1

Change all the “Sub Index” values that need to be updated. This example changes Process Data Mode from 1 to 2. Value 1 represents Smart Sensor Profile F while value 2 represents Smart Sensor Profile C.

▼ Index[9]	"Banner IOL S15S T...	
■ ▼ Sub Index	Array[0..14] of DInt	
■ Sub Index[0]	DInt	0
■ Sub Index[1]	DInt	2

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 49 (40 + 9) is entered and the device is updated.

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.

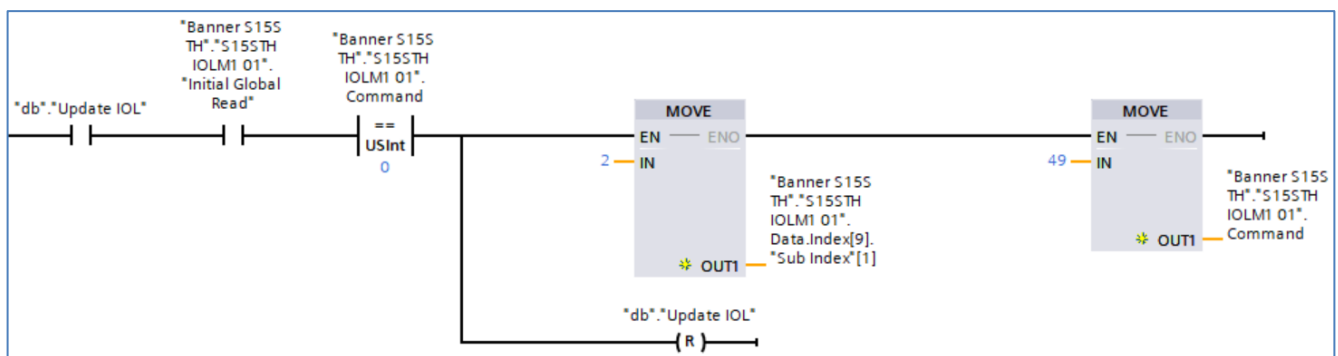
▼ S15STH IOLM1 01	"Banner IOL S15S TH Device"	
■ Initial Global Read	Bool	TRUE
■ Command	USInt	0

Communications Error	Bool	false	TRUE
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The previous section went through the steps of how to manually read and write the data. This section will show an example of how the update could happen when programmed. The user will need to come up with some logic that determines when the update should occur. This logic should not be able to be continuously activated.

***NOTE:** Parameter Data is meant to be updated infrequently. The data is stored in EEPROM that has a limited number of writings available. Exceeding this limit can cause the IO-Link device to error out. Each Index data element has a separate counter for this. If the application requires very quick Index writes, contact Banner Engineering to discuss. Never need to worry about Reads, however.

Example Logic for IO-Link Parameter Data Update



In this example the “db.Update IOL” represents the logic that triggers the parameter data update. Here it is just a simple Boolean value; however, it will likely be more complex in the actual system. Next is a normally open contact that is checking that the “Initial Global Read” has been set to true. This ensures that the system has read all the parameter data correctly. If the parameter data has yet to be read then the data cannot be update yet. Next is an Equal comparison check. This looks at the Command variable for the function block. If Command is already processing a command/operation wait until that is completed before trying to do another command/operation. Finally, all the data for one Parameter Data Index can be adjusted as needed. In this example the Sub-Index[1] (Process Dat Mode) is updated to the necessary value for the system. Command has a 49 sent to it which represent Index 9 (remember writes are activated by adding 40 to the Index number). The Boolean used to activate the routine it turned off. It may be necessary to handle this in another way depending on the logic used to activate this process. The Banner IOL S15S-TH Parameter Function Block will update the IO-Link device to the new parameters.

S15S-TH Alarm Configuration Index

Index[7] or the Alarm Configuration Index has several sub-index values that are of the Real/Float format. The Function Block is configured to store data in a DINT data type by default. The data is gathered and stored in the Index. The S15S-TH Parameter Function Block has been specially setup to convert this data into the correct format and stored in the Alarm Config Array.

▶ Index[7]	"Banner IOL S15S TH Device SubIndex"	Alarm Configuration
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TO

▶ Alarm Config	Array[1..12] of Real
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The Alarm Config array contains twelve elements. The data has been converted into Real data type. Use the Commands of 7 for Read and 47 for Write to update the data. This array is also used instead of Index[7] for the Alarm Configuration.

▼ Alarm Config	Array[1..12] of Real		
■ Alarm Config[1]	Real	32.0	Temperature Low Threshold
■ Alarm Config[2]	Real	120.0	Temperature High Threshold
■ Alarm Config[3]	Real	0.0	Relative Humidity Low Threshold
■ Alarm Config[4]	Real	100.0	Relative Humidity High Threshold
■ Alarm Config[5]	Real	32.0	Dew Point Low Threshold
■ Alarm Config[6]	Real	120.0	Dew Point High Threshold
■ Alarm Config[7]	Real	0.0	Temperature On Delay
■ Alarm Config[8]	Real	0.0	Temperature Off Delay
■ Alarm Config[9]	Real	0.0	Relative Humidity On Delay
■ Alarm Config[10]	Real	0.0	Relative Humidity Off Delay
■ Alarm Config[11]	Real	0.0	Dew Point On Delay
■ Alarm Config[12]	Real	0.0	Dew Point Off Delay

This specialized location is used so all the data is readable and easier to handle. Just keep this specialized location in mind when working with Metric Configuration.

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.

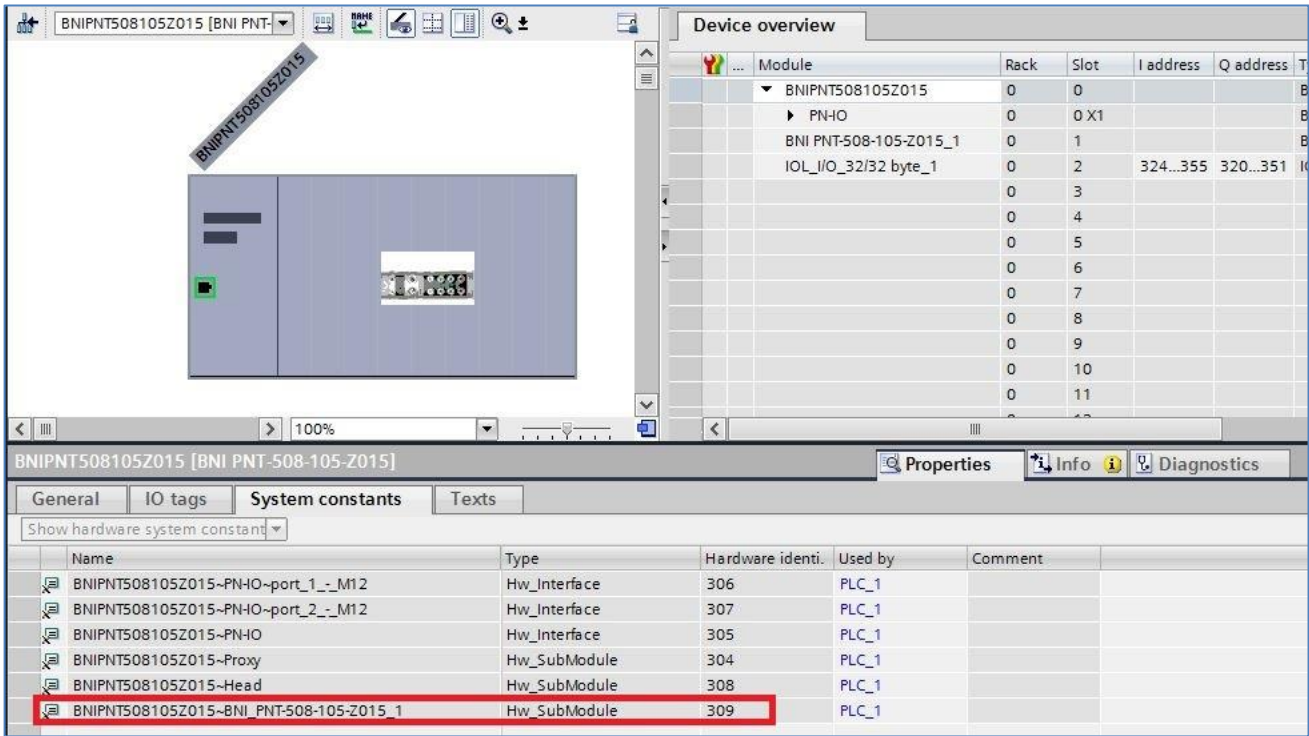


Figure 2: Balluff BNI005H. Type this value into the “ID_Array[1]” location.

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.

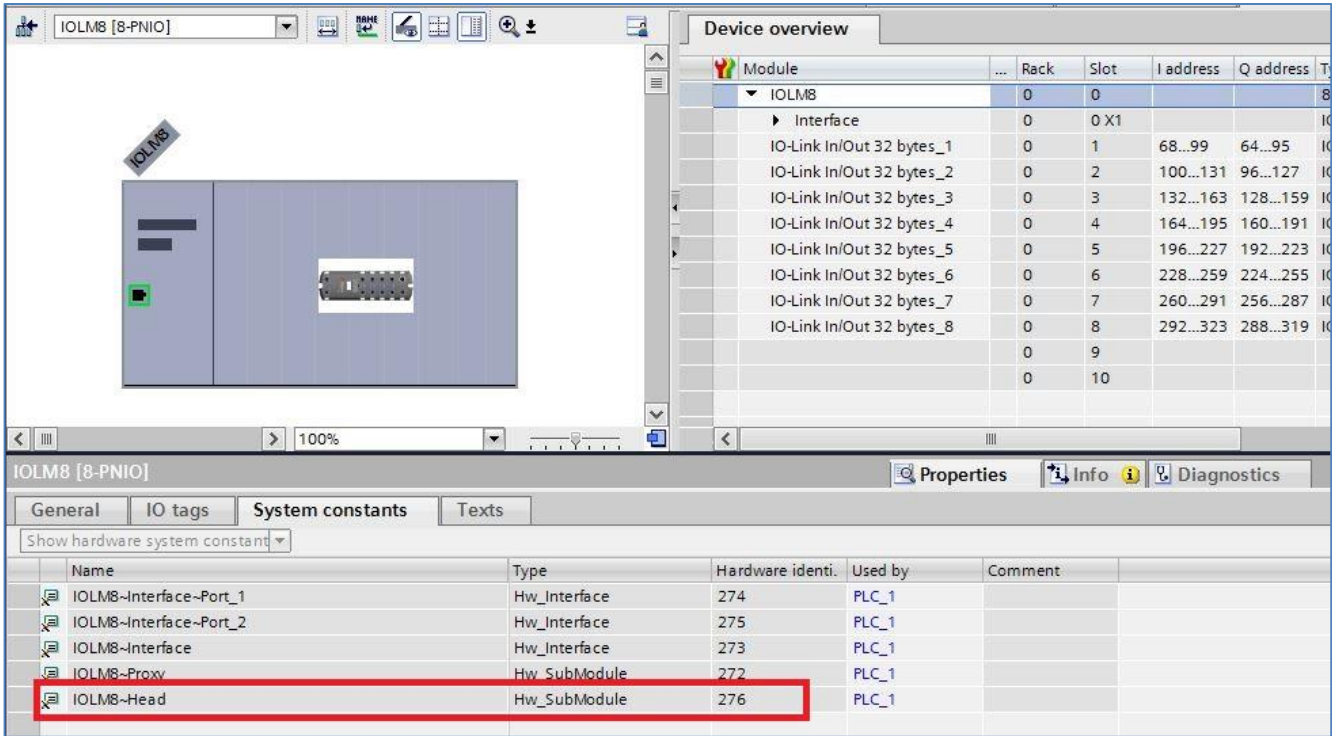


Figure 3: Control IOLM8 PNIO. Type this value into the “ID_Array[1]” location.

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.

The screenshot displays the Siemens STEP 7 HW Config interface. The main window shows a rack configuration with a Turck TBEN-L5-8IOL module. The 'Device overview' table on the right lists the modules and their addresses. The 'System constants' table at the bottom lists the hardware identifiers for each module, with 'tben-Basic_1' highlighted in red.

Module	Rack	Slot	I address	Q address
tben	0	0		
PN-HO	0	0 X1		
Basic_1	0	Basic	33...36	33...34
	0	IO-Lin...		
	0	IO-Lin...		
	0	IO-Lin...		
	0	IO-Lin...		
	0	IO-Lin...		
IN 32 BYTE/OUT 32 BYTE_1	0	IO-Lin...	356...387	352...383
	0	IO-Lin...		
	0	Diagn...		
	0	IO-Lin...		

Name	Type	Hardware identi.	Used by	Comment
tben-PN-HO-Port_1	Hw_Interface	298	PLC_1	
tben-PN-HO-Port_2	Hw_Interface	299	PLC_1	
tben-PN-HO	Hw_Interface	297	PLC_1	
tben-Proxy	Hw_SubModule	296	PLC_1	
tben-Head	Hw_SubModule	300	PLC_1	
tben-Basic_1	Hw_SubModule	301	PLC_1	

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.

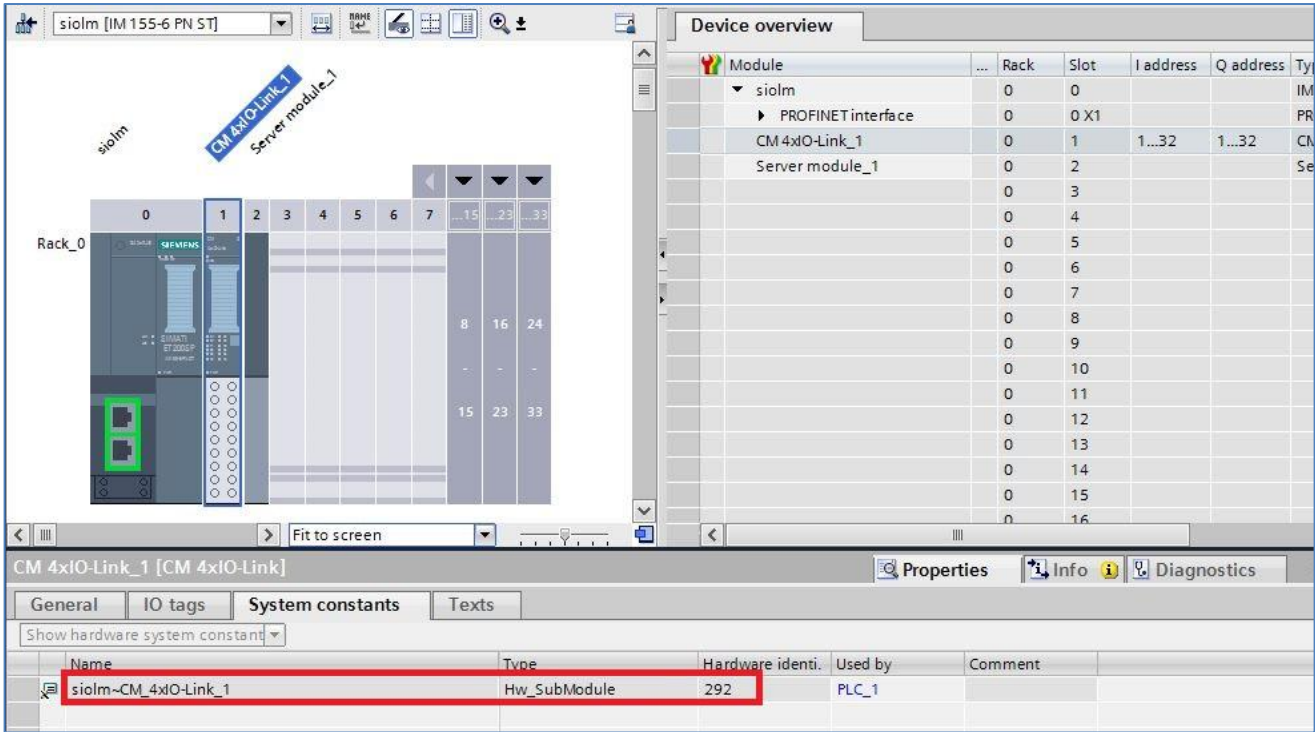


Figure 4: Siemens CM 4xIO-Link Master on ET-200SP. Type this value into the “ID_Array[1]” location.

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”.

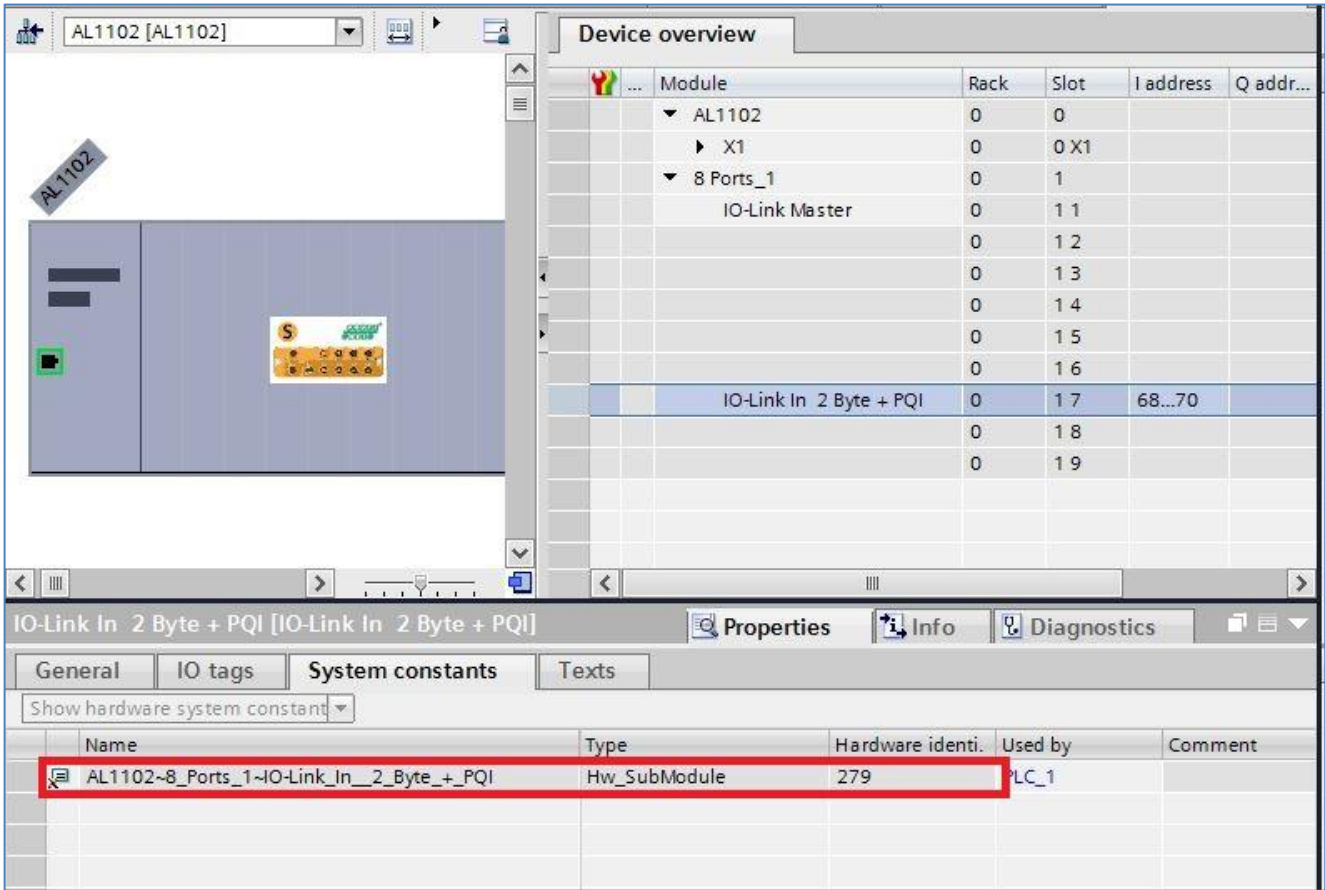


Figure 5: ifm AL1102: each port on the ifm IO-Link Master has its own Hardware ID. Type these values into the correct “ID_Array[x]” location, where ‘x’ is the port number in question ([6] here, as the ports are labeled 2 through 9).