SI-RF Parameter Data Function Block

5/14/2019

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 SI-RF device and allows the user to easily read SI-RF Parameter Data.

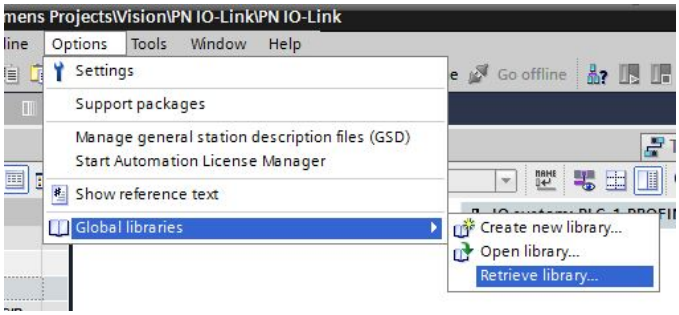
Each Banner IO-Link Device Parameter Data function block is meant to be used alongside a Banner IO-Link Device Master Control function block. This paper describes how to set up both of these blocks.

Components

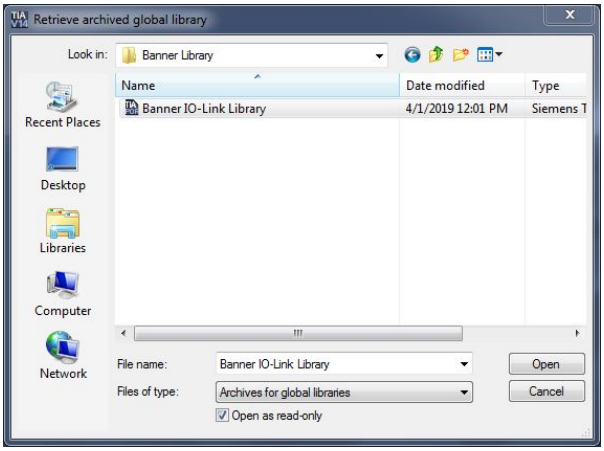
Banner IO-Link Library.zal14
also requires Siemens IO_LINK_DEVICE function block

Installation Instructions

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



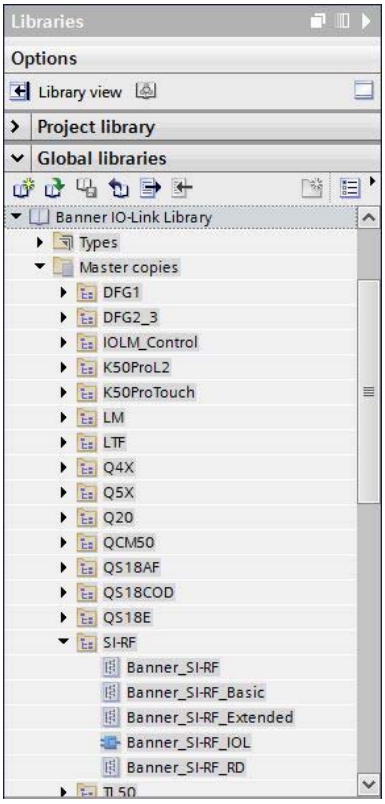
3. Select the Banner IO-Link Library. Click Open.



4. The Banner IO-Link Library will now be in the Global Library List. Expand the Master copies section. The SI-RF folder contains the following elements: Banner_SI-RF, Banner_SI-RF_Basic, Banner_SI-RF_Extended, Banner_SI-RF_IOL, and Banner_SI-RF_RD.

5. Drag Banner_SI-RF_IOL to the Program Blocks area under your PLC.

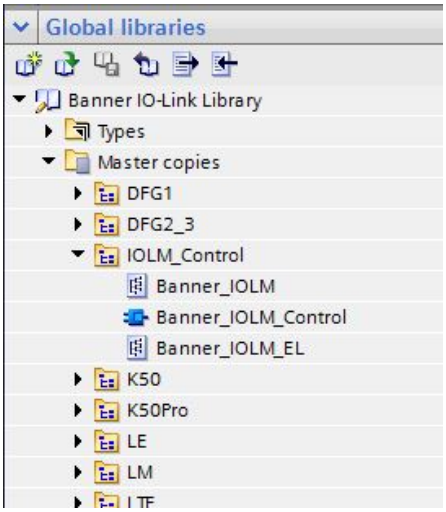
6. Drag the Banner_SI-RF, Banner_SI-RF_Basic, Banner_SI-RF_Extended, and Banner_SI-RF_RD to the PLC Data Types area under your PLC.



7. We also have to prepare for setting up the IO-Link Master. Go to the IOLM_Control section of the Banner IO-Link Library List.

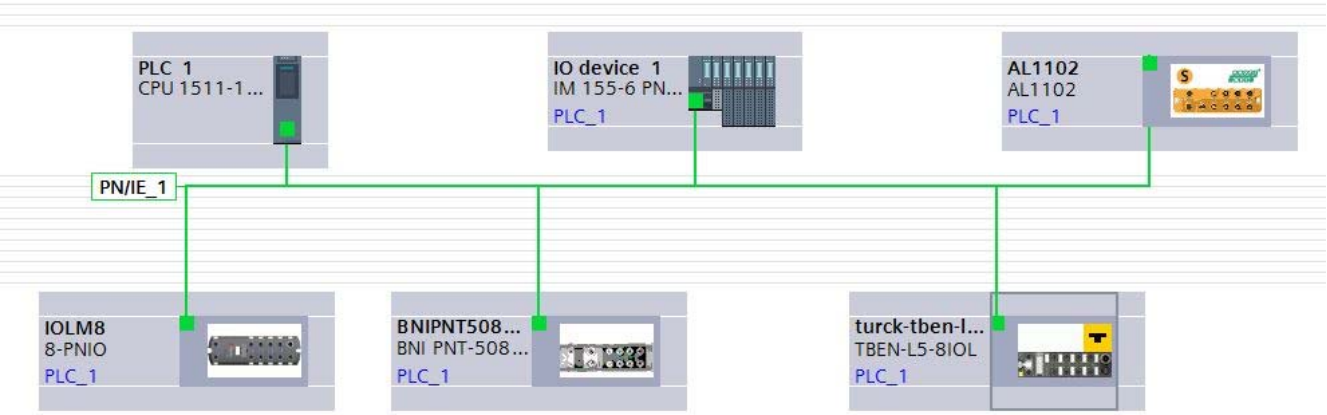
8. Drag Banner_IOLM and Banner_IOLM_EL to the PLC Data Types area under your PLC.

9. Drag the Banner_IOLM_Control to the Program Blocks area under your PLC.



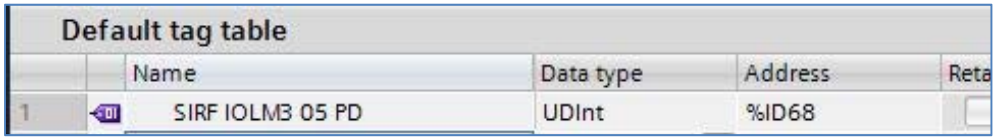
10. Finally, we have to bring the Siemens-made IO_LINK_DEVICE function block specific to your PLC into our project. This can be found in a Siemens IO-Link Library. See their website for more details. Once that library is retrieved and opened, drag IO_LINK_DEVICE to the Program Blocks area under your PLC.

11. 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.

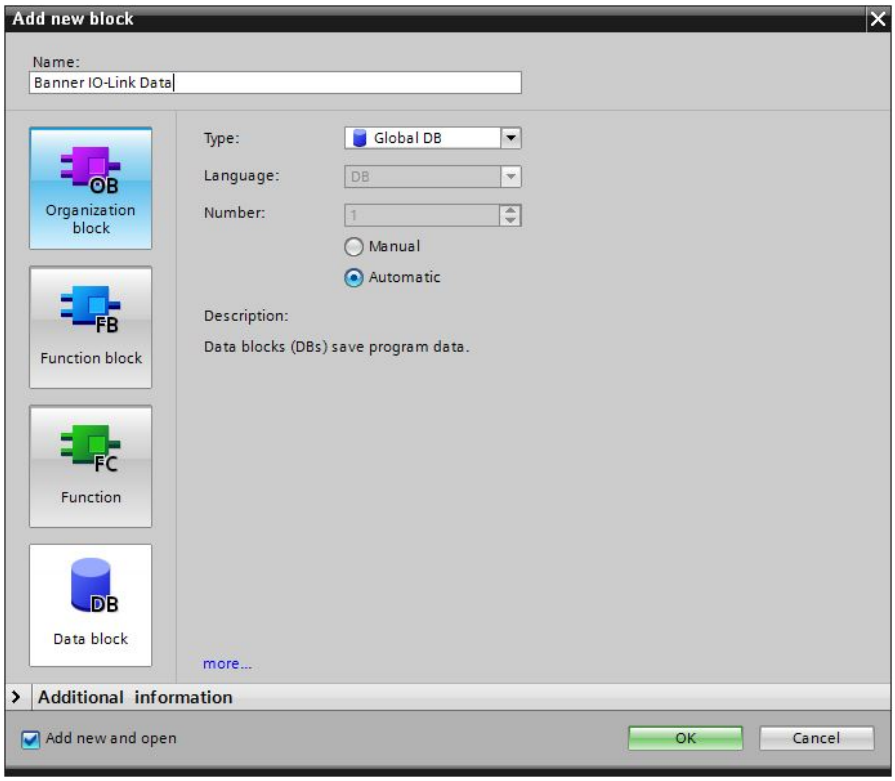


12. Record the "I" address where this SI-F Process Data is to be stored, as the address will be required in the next step. In this example, 4 bytes of Process Data In for port 5 on the IO-Link Master will be stored in I68 through I71.

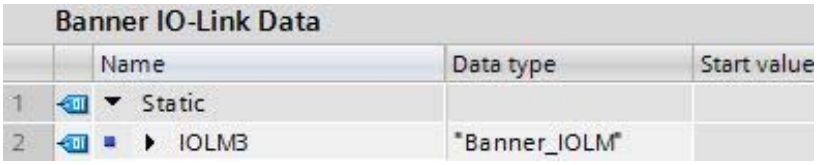
13. Go to PLC Tags. Add a new tag table, then create a new tag to represent the raw Process Data from the IO-Link Master. In this example, Tag table_1 was created, then the tag "SIRF IOLM3 05 PD" was created using a Data Type of "DUInt". This naming convention calls out the type of device in question as well as the specific IO-Link Master and port number where the device is connected. A different IO-Link Master might be named IOLM1 or IOLM2, for instance, and other specific sensors may be connected to different port numbers. The "I" address found in step 12 is tied to this new tag.



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



15. 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 “IOLM3”. A different IO-Link Master might be called IOLM1 or IOLM2, for instance.



16. Expand the IOLM3 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.

Banner IO-Link Data

	Name	Data type	Start value	Mor
1	Static			
2	IOLM3	"Banner_IOLM"		
3	Port Controlled	Array[1..8] of Bool		
4	Port Controlled[1]	Bool	false	
5	Port Controlled[2]	Bool	false	
6	Port Controlled[3]	Bool	false	
7	Port Controlled[4]	Bool	false	
8	Port Controlled[5]	Bool	true	
9	Port Controlled[6]	Bool	false	
10	Port Controlled[7]	Bool	false	
11	Port Controlled[8]	Bool	false	
12	Port Activate	Array[1..8] of Bool		
13	Port Read Request	Array[1..8] of Bool		
14	Port Write Request	Array[1..8] of Bool		
15	Port RW Complete	Array[1..8] of Bool		
16	Port Device Read	Array[1..8] of Bool		
17	Transfer Data	Array[0..231] of Byte		
18	Wr_Length	Int	0	
19	Rd_Length	Int	0	
20	IO-Index	Int	0	
21	Reset	Bool	false	

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 have to define three input variables for this function block: CAP, ID Control state, and IOLM.

    Defining an input variable for the fourth 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
Comtrol (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”.

    Link the “IOLM” input variable to the tag created in step 13.

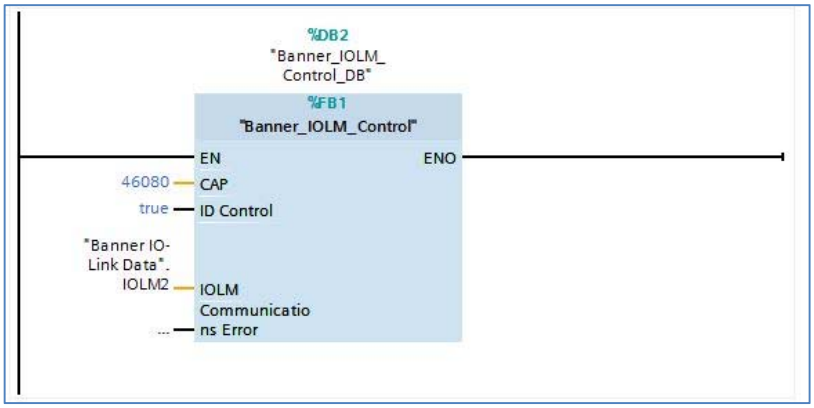


Figure 1: An example using an ifm IO-Link Master

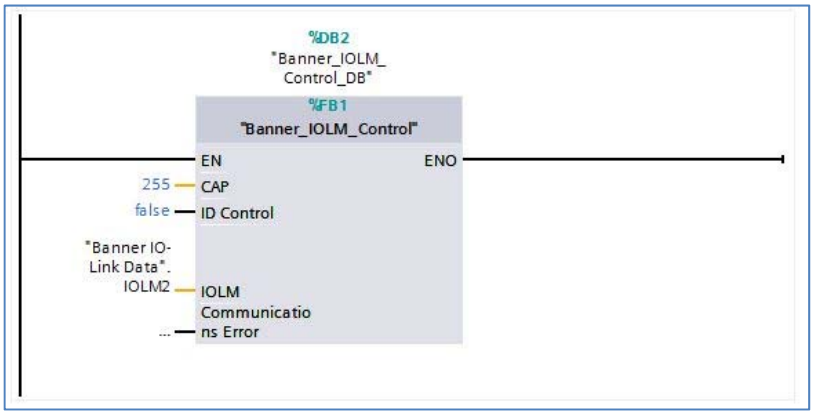


Figure 2: An example using a Balluff IO-Link Master

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

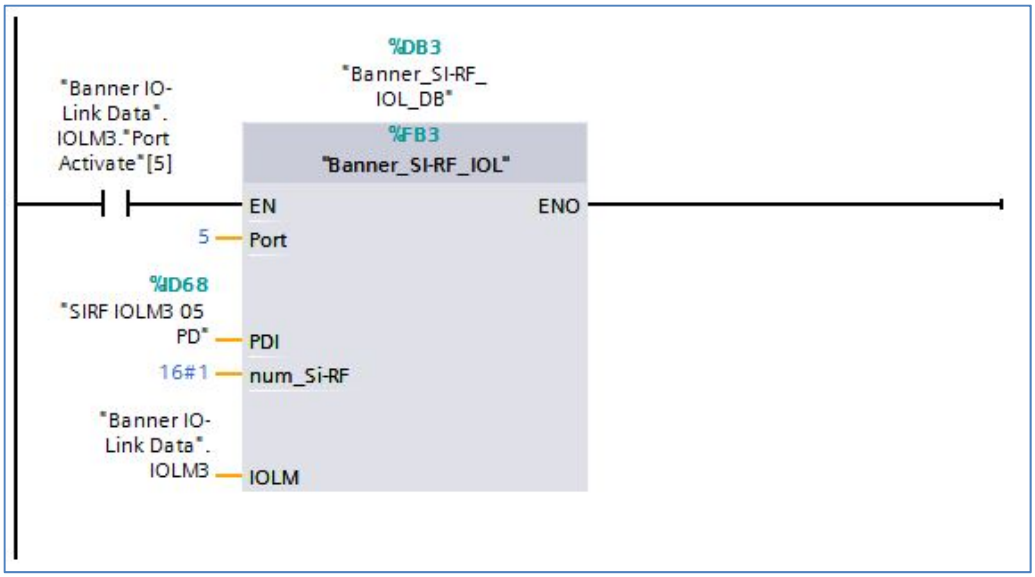
Figure 3: The ID_Array when using an ifm IO-Link Master; device attached to port 6

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

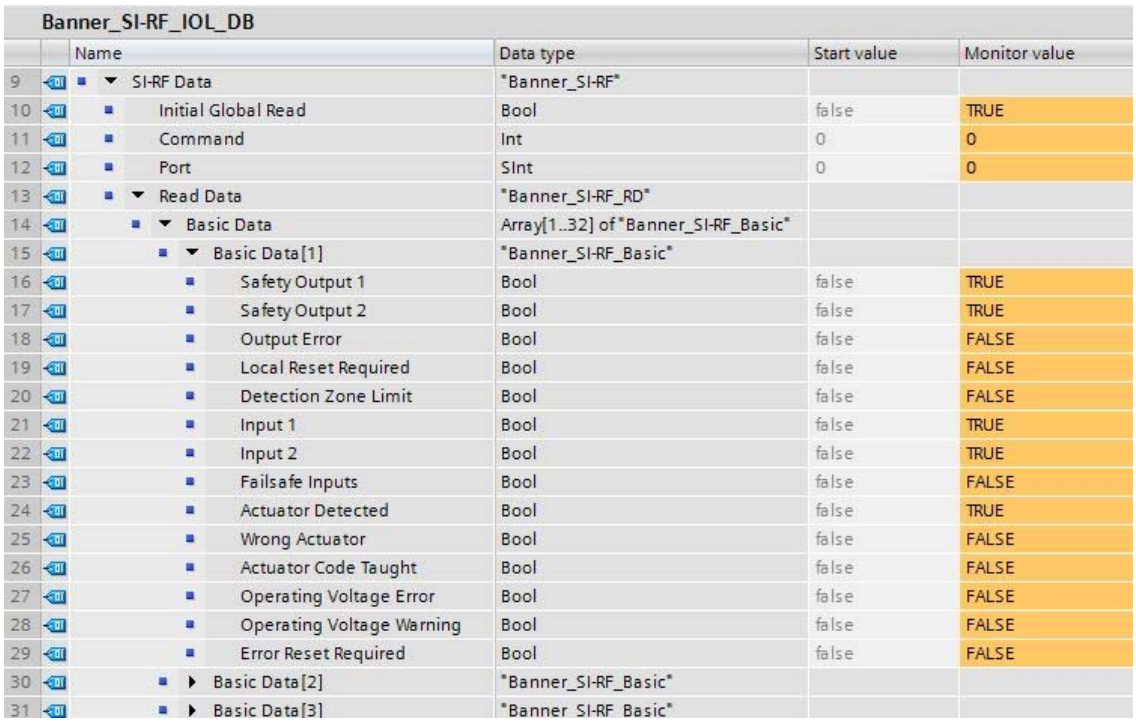
Figure 4: The ID_Array when using a Balluff IO-Link Master; device attached to any port (only ID_Array[1] is used)

19. Now add the “Banner_SI-RF_IOL” function block to an OB ladder. You will be prompted to make a new data block. Type in the port number for the device, link the raw Process Data In variable to the “PDI” input, fill in the number of SI-RF devices in the daisy chain for the “num_SI-RF” variable, then link the “IOLM” variable to the IO-Link master variable created in step 13.

    As a final step, the Port Activate bit is added on the same rung as the SI-RF function block in order 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.



20. The SI-RF Parameter Data function block is now set up. Compile the project and download it to the PLC. Go online, then open the SI-RF data block. When the function block starts out, it does an initial global read of all SI-RF information. The Read Data section of the data block shows this information.



Banner_SI-RF_IOL_DB

	Name	Data type	Start value	Monitor value
9	SI-RF Data	"Banner_SI-RF"		
10	Initial Global Read	Bool	false	TRUE
11	Command	Int	0	0
12	Port	SInt	0	0
13	Read Data	"Banner_SI-RF_RD"		
14	Basic Data	Array[1..32] of "Banner_SI-RF_Basic"		
15	Basic Data[1]	"Banner_SI-RF_Basic"		
16	Safety Output 1	Bool	false	TRUE
17	Safety Output 2	Bool	false	TRUE
18	Output Error	Bool	false	FALSE
19	Local Reset Required	Bool	false	FALSE
20	Detection Zone Limit	Bool	false	FALSE
21	Input 1	Bool	false	TRUE
22	Input 2	Bool	false	TRUE
23	Failsafe Inputs	Bool	false	FALSE
24	Actuator Detected	Bool	false	TRUE
25	Wrong Actuator	Bool	false	FALSE
26	Actuator Code Taught	Bool	false	FALSE
27	Operating Voltage Error	Bool	false	FALSE
28	Operating Voltage Warning	Bool	false	FALSE
29	Error Reset Required	Bool	false	FALSE
30	Basic Data[2]	"Banner_SI-RF_Basic"		
31	Basic Data[3]	"Banner_SI-RF_Basic"		

21. There is no writeable data associated with the SI_RF devices. Whenever a change in state for one of the RF interlocks is detected, the Process Data In will change, alerting this SI_RF Function Block so it can go and read the detailed status.

    It is almost like the SI-RF is a PROFINET-speaking device!

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.

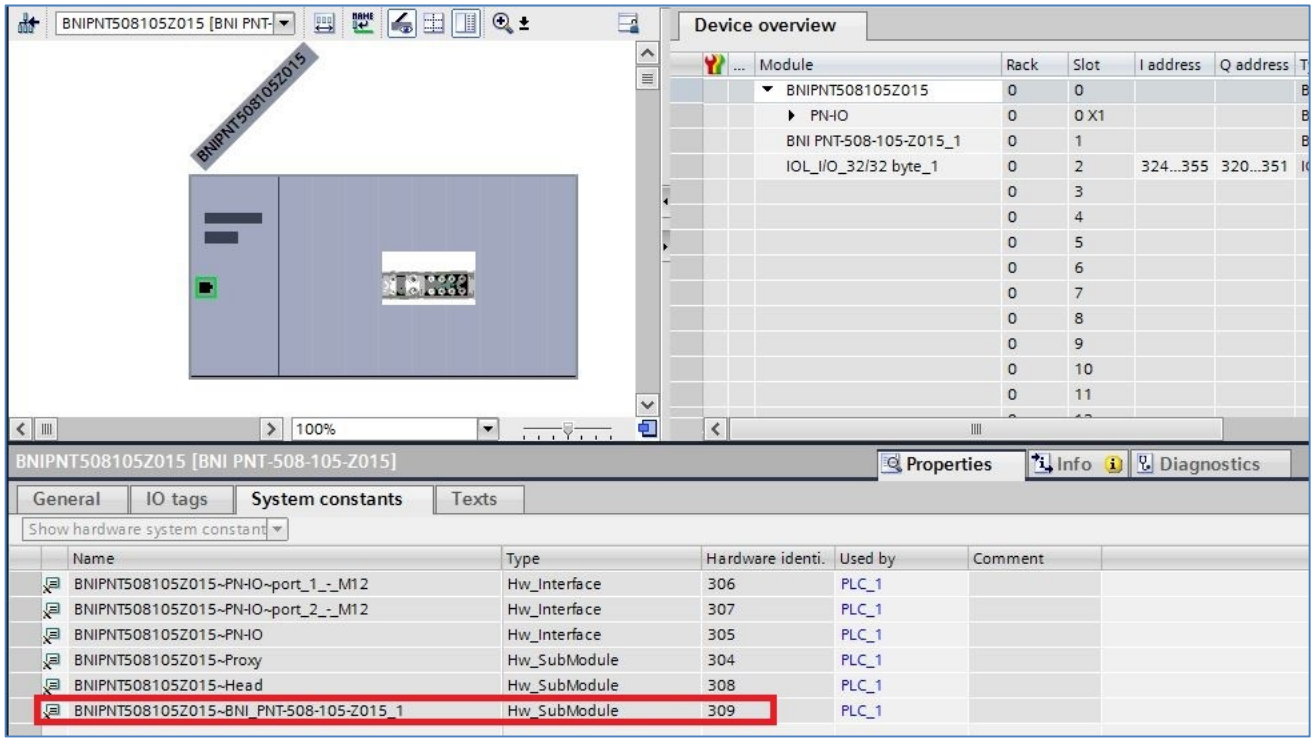


Figure 5: Balluff BNI005H. Type this value into the “ID_Array[1]” location.

Comtrol

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.

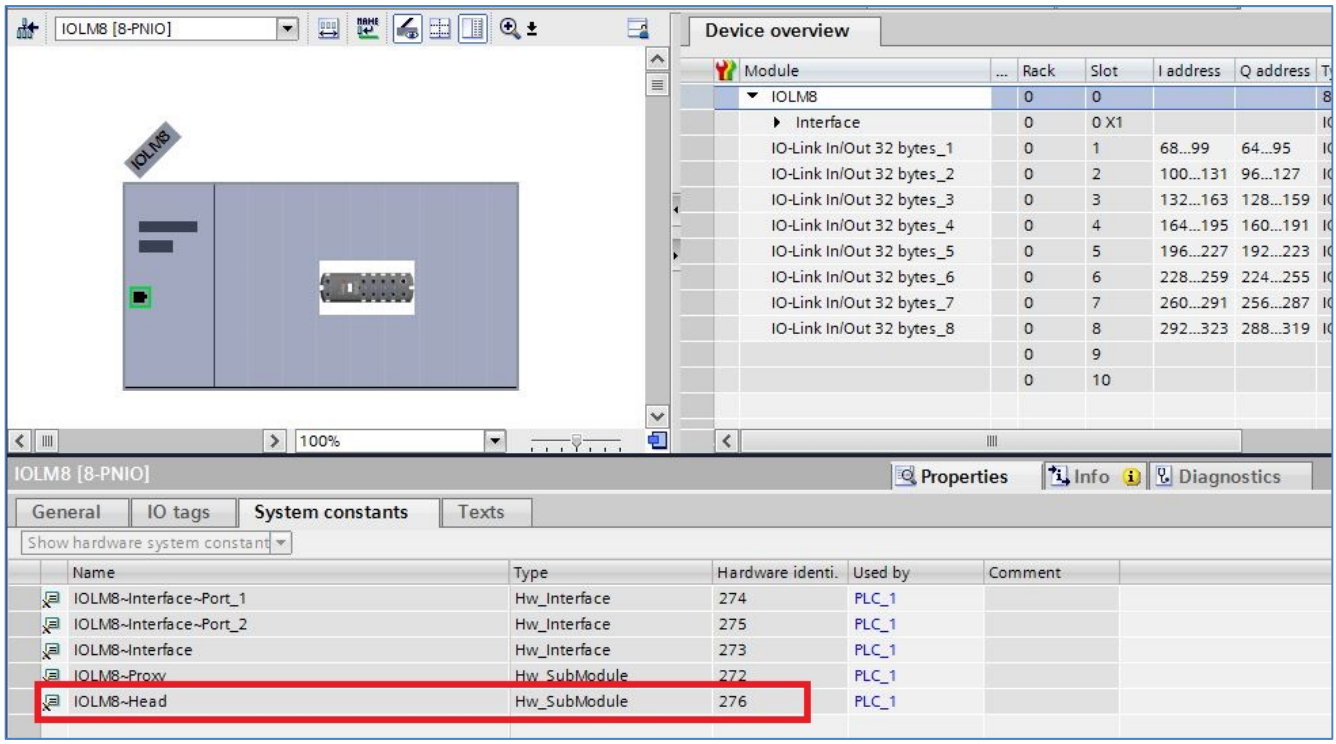


Figure 6: Comtrol IOLM8 PNIO. Type this value into the “ID_Array[1]” location.

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.

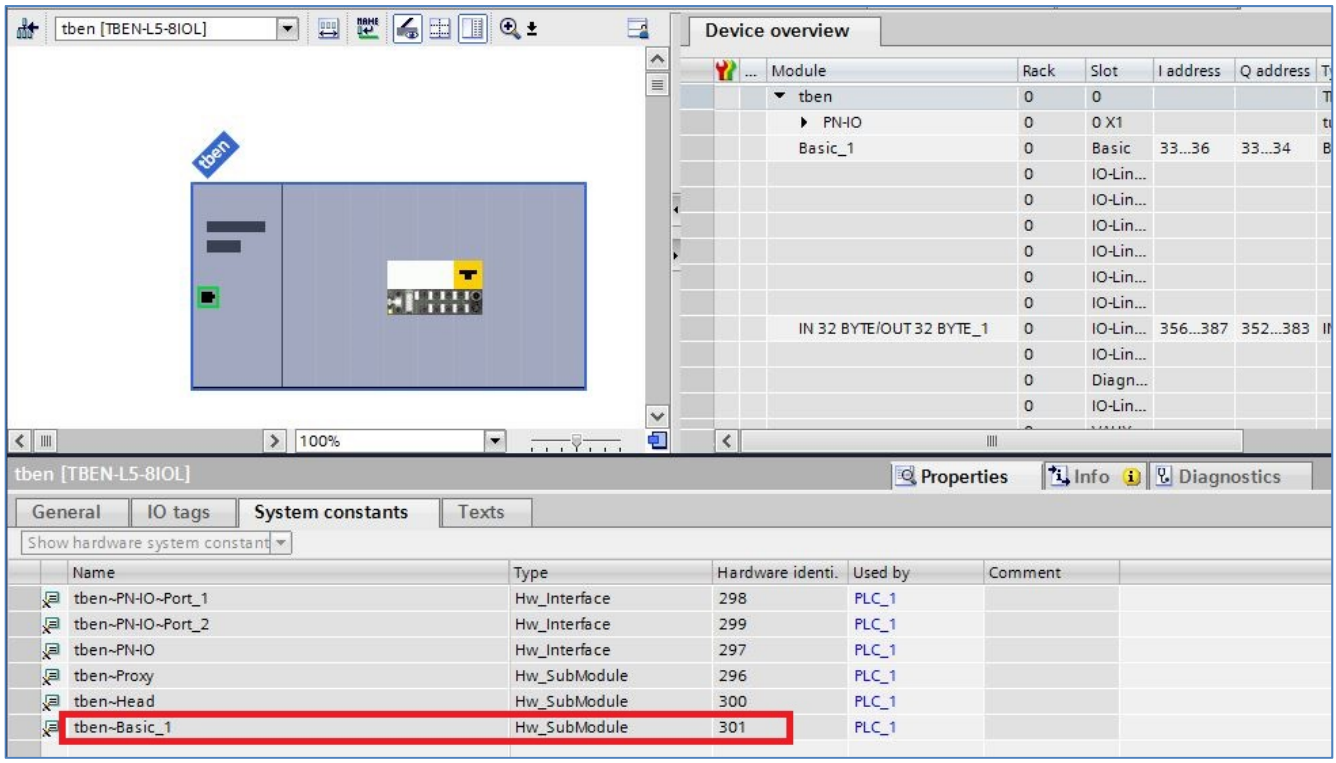


Figure 3: Turck TBEN-L5-8IOL. Type this value into the “ID_Array[1]” location.

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.

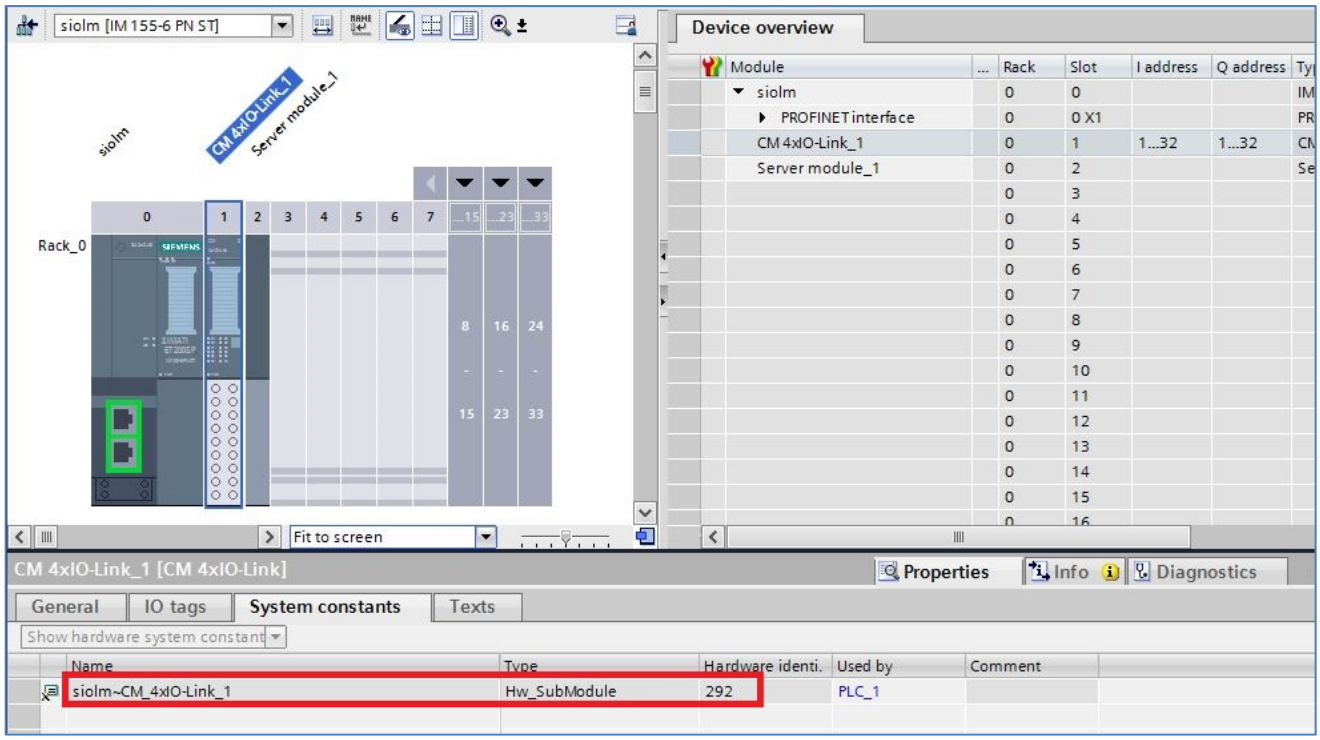


Figure 4: Siemens CM 4xIO-Link Master on ET-200SP. Type this value into the “ID_Array[1]” location.

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”.

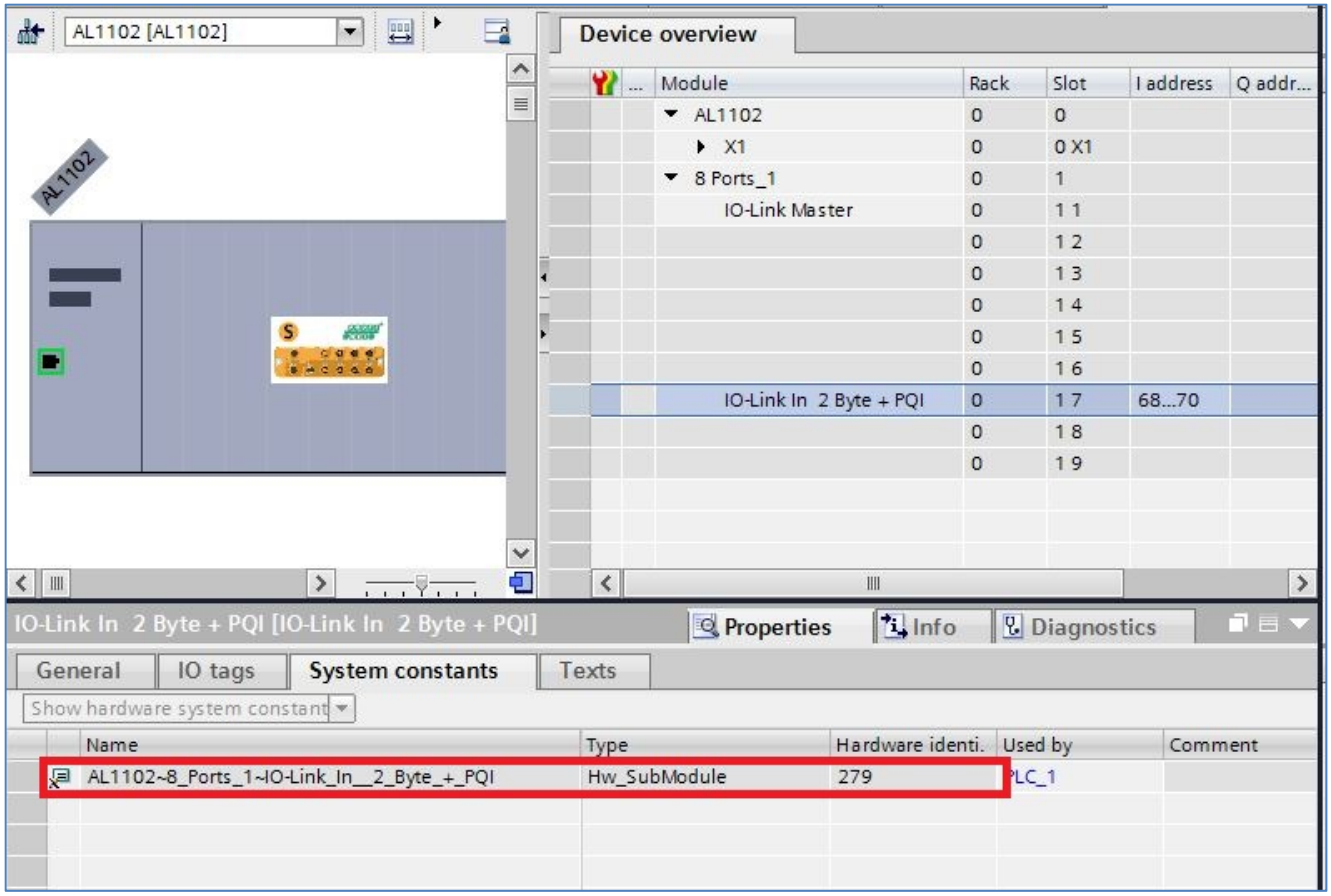


Figure 5: ifm AL1102: each port on the ifm IO-Link Master has its own Hardware ID. Type these values into the correct “ID_Array[x]” location, where ‘x’ is the port number in question ([6] here, as the ports are labeled 2 through 9).