QCM50-K3/5 Process Data Function

12/2/2022

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 from a Banner QCM50-K3/5 sensor via an IO-Link Master to a Siemens PLC. The function covers parsing and display of the QCM50-K3/5 sensor Process Data In.

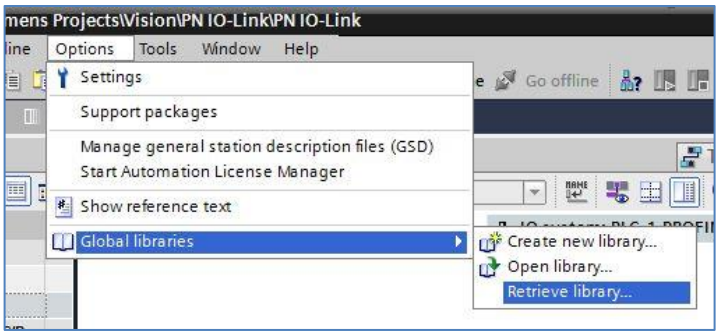
Components

Banner QCM50 Library.zal14

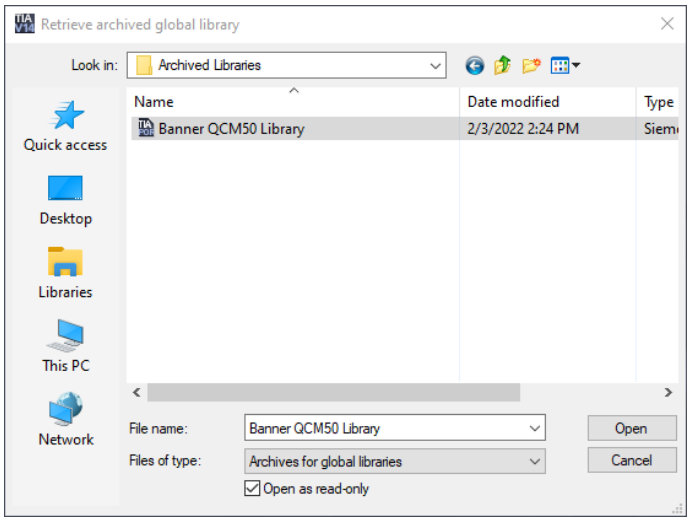
There are two methods for the process data. The first is used when creating a connection to Banner's IO-Link masters. The second set of instructions are for systems using other manufacturer's IO-Link masters.

Installation Instructions

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



3. Select the Banner QCM50 Library. Click Open.



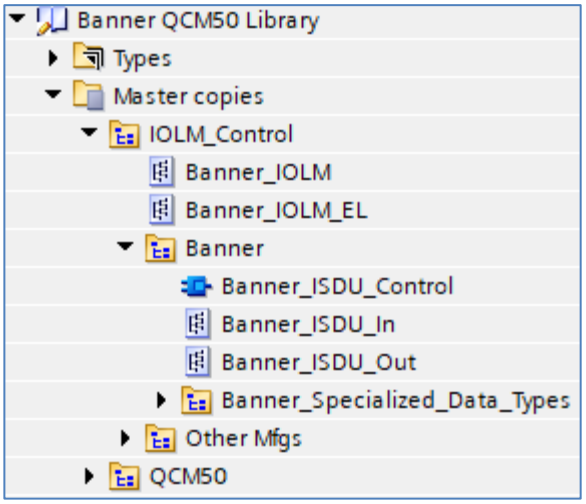
4. The library is now accessible in the Libraries tab.
5. Go to page 3 for Banner IO-Link Masters and to page 6 for all other IO-Link Masters.

Setup of QCM50 K3 K5 with a Banner DXMR90-4K

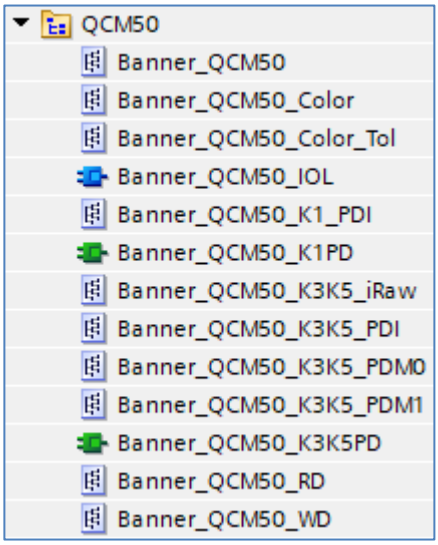
1. Go to Device and Networks to configure the DXMR90-4K. Add the DXMR90-4K if it has yet to be added to the system.
2. Add Banner IO-Link Master Info to Slot 1. This sets the DXMR90-4K for IO-Link mode.
3. Open the IO-Link Generic Devices and select the proper module. The 8/8 byte option has been selected for port 1. Make note of the I address for the Slot 2 which represents Port 1. Slot 2 starts are 10. The other number needed is I14. The data for the port start at that point (I14). The previous four bytes represents Port Status, Process Data In Size, and Process Data Out Size.

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	1...9		Banner IO-Link Master Info
IO-Link In/Out 8/ 8 Byte + Status_1	0	2	10...21	1...22	IO-Link In/Out 8/ 8 Byte + Status

4. Drag the Banner_QCM50_K3K5_iRaw, Banner_QCM50 K3K5_PDI, Banner_QCM50_K3K5_PDM0, and Banner_QCM50_K3K5_PDM1 to the PLC Data Types area under your PLC. Drag the Banner_QCM50_K3K5_PD to the Program Blocks area.

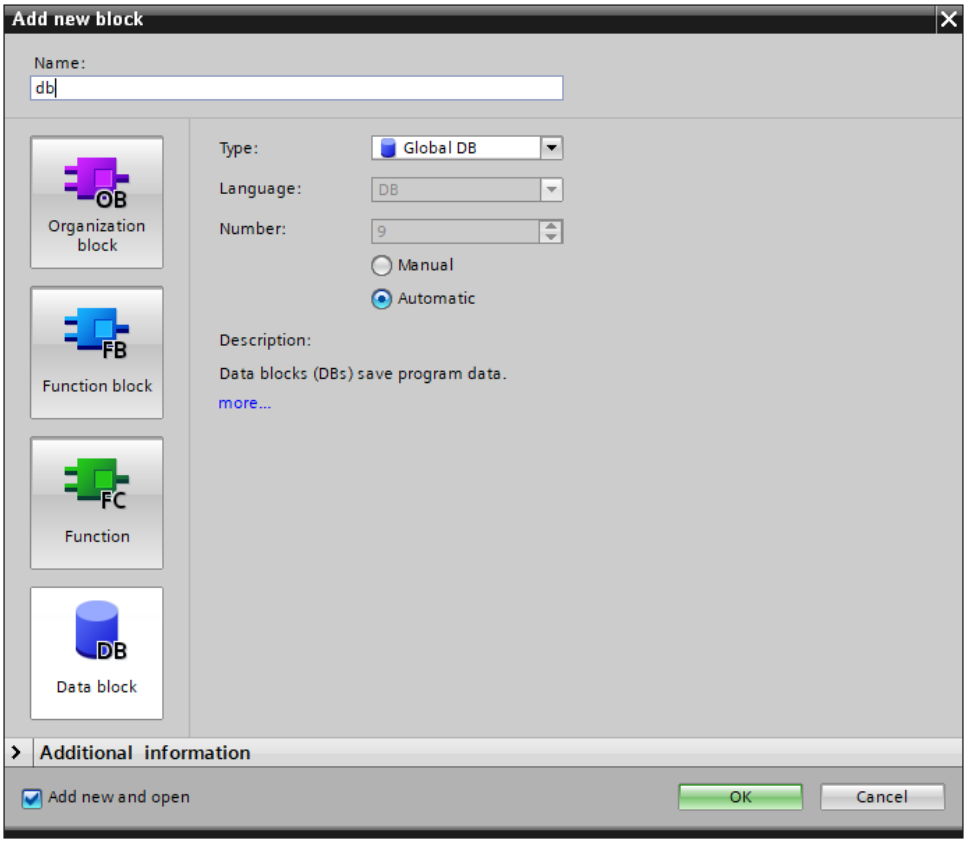


5. Drag the necessary tag from IOLM_Control > Banner > Banner_Specialized_Data_Types. The tag used in this example is “Banner_8in”. This tag represents the full raw process data along with port status information.
6. Go to PLC Tags. Create two tags. One tag is for the full data structure while the second creates a tag to represent the raw Process Data from the IO-Link Master. In this example, Tag table_1 was created, then the tag “QCM50 K1 IOLM1 01 PDI” was created using a Data Type of “Banner_8In”. 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 IOLM2 or IOLM3, for instance, and other specific sensors may be connected to different port numbers. The “I” address found in step 2 is tied to this new tag. The second is “QCM50K3K5 IOLM1 01 inRaw”. This is the tag that will be used in the Function block.



Name	Data type	Address
QCM50K3K5 IOLM1 01 PDI	"Banner_8In"	%I10.0
QCM50K3K5 IOLM1 01 inRaw	"Banner_QCM50_K3K5_iRaw"	%I14.0

7. Go to Program blocks. Add a new Data block if necessary. In this example the new data block is named “db”.



8. In the new data block, create a new tag to represent the parsed Process Data In for our QCM50 K3 or K5. The tag name again calls out the type of sensor, the IO-Link Master, and the port number. Use the data type “Banner_QCM50_K1K5_PDI” for the new tag.

Name	Data type
Static	
QCM50 K3K5 IOLM 01 PD	"Banner_QCM50_K3K5_PDI"
PDM0	"Banner_QCM50_K3K5_PDM0"
Signal Quality	UInt
Switching Quality	USInt
Channel Output State	Array[1..12] of Bool
PDM1	"Banner_QCM50_K3K5_PDM1"
Ratio Red	UInt
Ratio Green	UInt
Ratio Blue	UInt
Energy	UInt

9. Add the “Banner_QCM50_K3K5_PD” function to an OB ladder. Link the “PDI” to the raw Process Data variable from step 5. Link the “QCM50 PD” to the parsed Process Data variable from step 7.

   The last variable, “PD Mapping”, allows the function to correctly interpret the Process Data. In the case of the QCM50 K3 or K5. This function needs to know what choice has been made.

   There are two ways to achieve this goal. We can simply type in the correct number for “PD Mapping” (see Fig. 1), or we can link this QCM50K3K5 Function to the QCM50K3K5 Data Function Block (see Fig. 2). See Appendix A for more information about QCM50 Process Data.

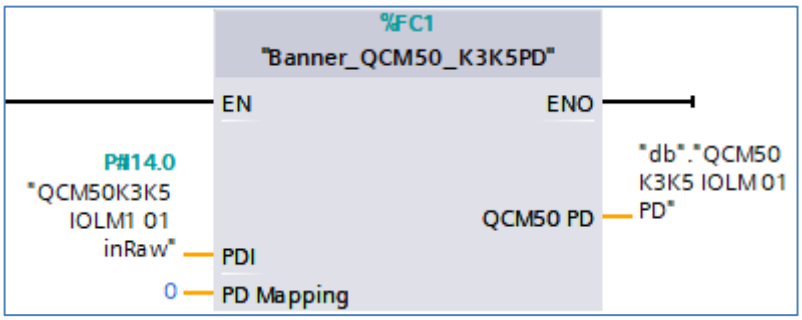
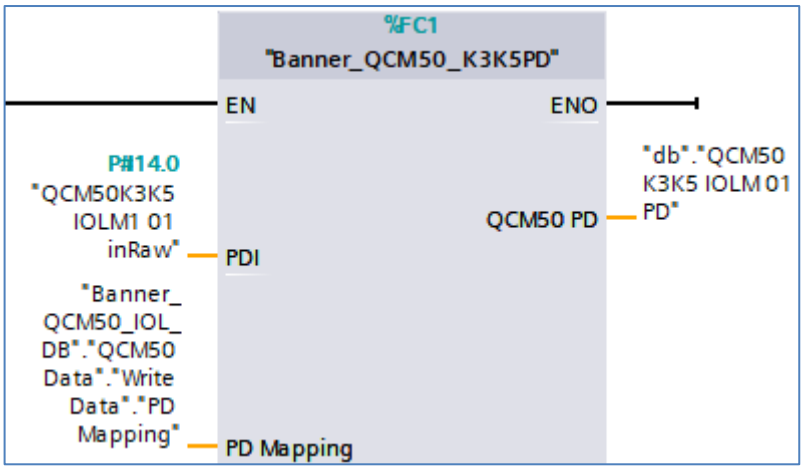


Figure 1: Hand typed correct numbers for PD Mapping

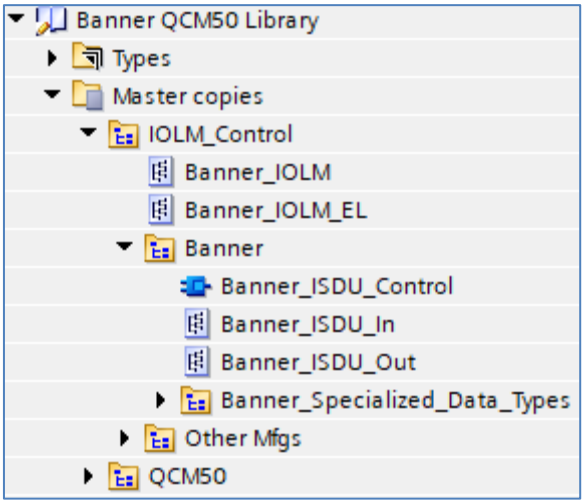
NOTE: if you type in the incorrect number, you will get incorrectly displayed Process Data information.

PD Mapping: the options here are “0” (Switching Channel) and “1” (Color Values). The default is “0”.

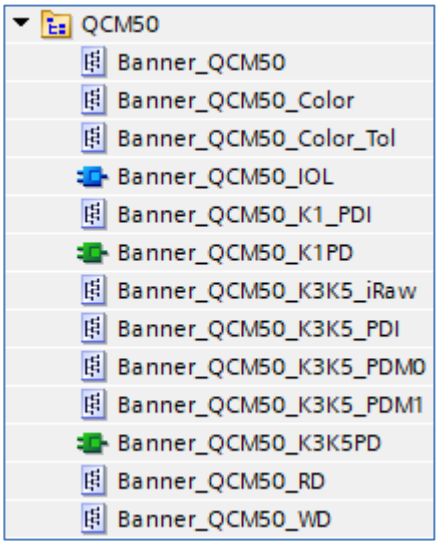


10. Process Data setup is complete.
11. Compile and download the configuration to the PLC, then go online. Open the “db” data block and click Monitor all. You should see parsed QCM50 K1 Process Data In, like that shown below.

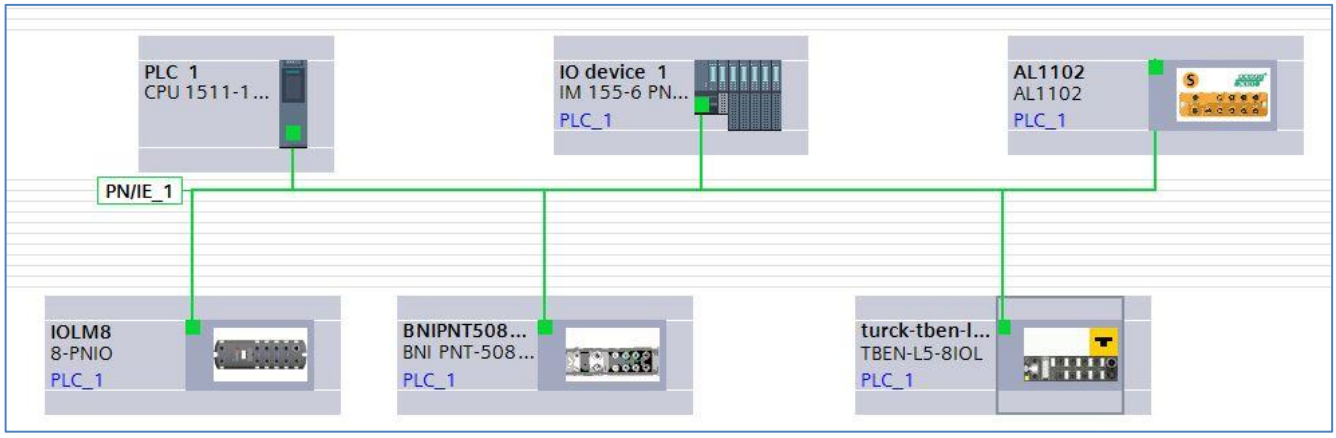
Setup of QCM50 K3 K5 with other IO-Link Masters



1. The Banner QCM50 Library will now be in the Global Library List. Expand the Master copies section. The QCM50 folder contains elements for both Process Data (for K1 and K3/5) and Parameter Data (for all) connections to a QCM50 sensor. As Process Data for a QCM50-K3/5 is the focus of this paper, we will concern ourselves with these five items: Banner_QCM50_K3K5_iRaw, Banner_QCM50_K3K5_PDI, Banner_QCM50_K3K5_PDM0, Banner_QCM50_K3K5_M1, and Banner_QCM50_K3K5PD.
2. Drag Banner_QCM50_K3K5PD to the Program Blocks area under your PLC.
3. Drag Banner_QCM50_K3K5_iRaw, Banner_QCM50_K3K5_PDI, Banner_QCM50_K3K5_PDM0, and Banner_QCM50_K3K5_M1 to the PLC Data Types area under your PLC.

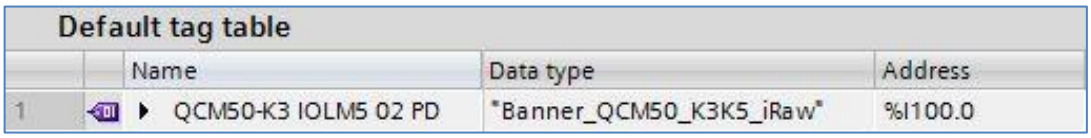


4. Go to Devices and networks to configure the system as necessary. Below is an example of what a configuration might look like. This example shows 5 different IO-Link Masters connected to the same PLC.

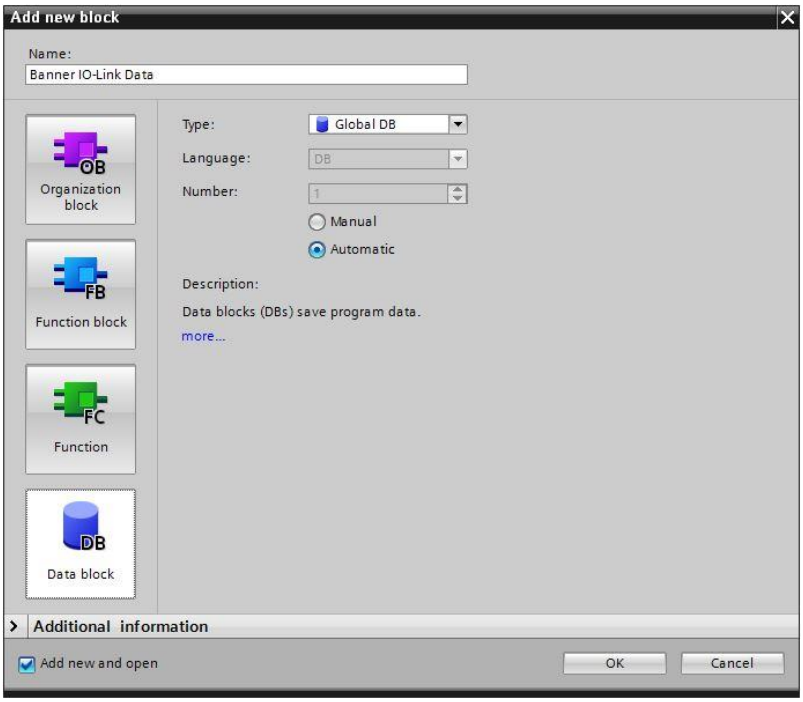


5. Click on the relevant device and configure the IO-Link Master as necessary. Refer to the documentation for the IO-Link Master. Recall that a QCM50-K3/5 requires 6 bytes of space for the Process Data.
6. Record the "I" address where this QCM50-K3/5 Process Data is to be stored, as the address will be required in the next step. In this example, 6 bytes of Process Data In for port 2 on the IO-Link Master will be stored in I100 through I105.

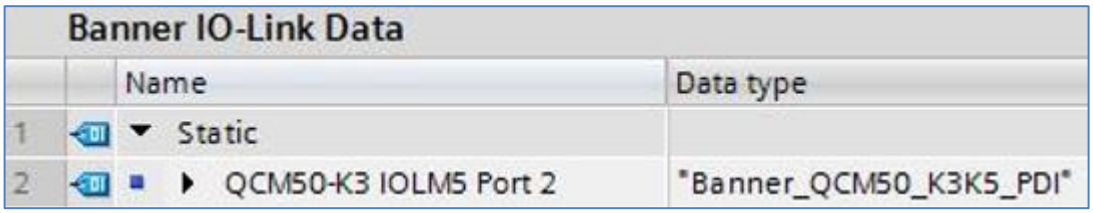
7. Go to PLC Tags. Add a new tag table, then create a new tag to represent the raw Process Data from the IO-Link Master. In this example, Tag table_1 was created, then the tag “QCM50-K3 IOLM5 02 PD” was created using a Data Type of “Banner_QCM50_K3K5-iRaw”. This naming convention calls out the type of 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 IOLM2, 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.



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



9. In the new data block, create a new tag to represent the parsed Process Data In for our QCM50. The tag name again calls out the type of sensor, the IO-Link Master, and the port number. Use the data type “Banner_QCM50_K3K5_PDI” for the new tag.



10. Add the “Banner_QCM50_K3K5PD” function to an OB ladder. Link the “PDI” to the raw Process Data variable from step 10. Link the “QCM50 PD” to the parsed Process Data variable from step 12.

    The last variable, “PD Mapping”, allows the function to correctly interpret the Process Data In. In the case of the QCM50-K3/5, there are two user-selected modes for the Process Data In. This function needs to know what choice has been made in the QCM50 for this PD Mapping variable.

    There are two ways to achieve this goal. We can simply type in the correct number for PD Mapping (see Fig. 1), or we can link this QCM50-K3/5 Process Data Function to the QCM50 Parameter Data Function Block (see Fig. 2). See Appendix A for more information about QCM50 Process Data In.

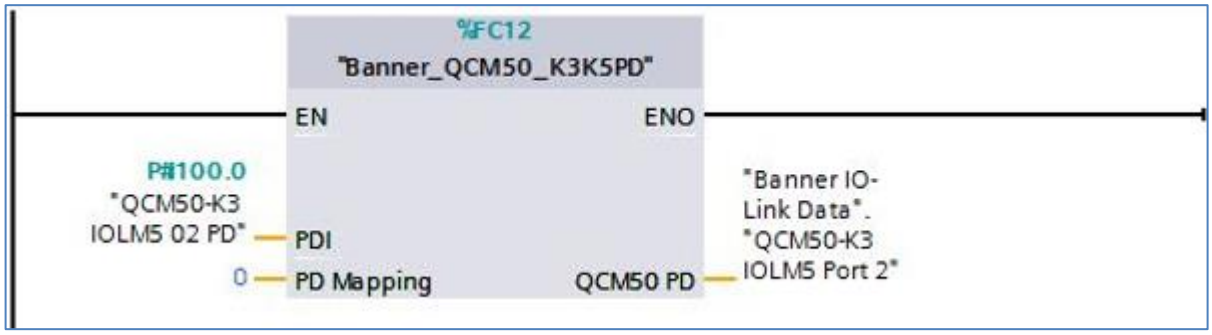


Figure 2: Hand type correct number for PD Mapping

NOTE: if you type in the incorrect number (i.e. it does not match the QCM50’s current PD Mapping configuration) you will get incorrectly displayed Process Data In information.

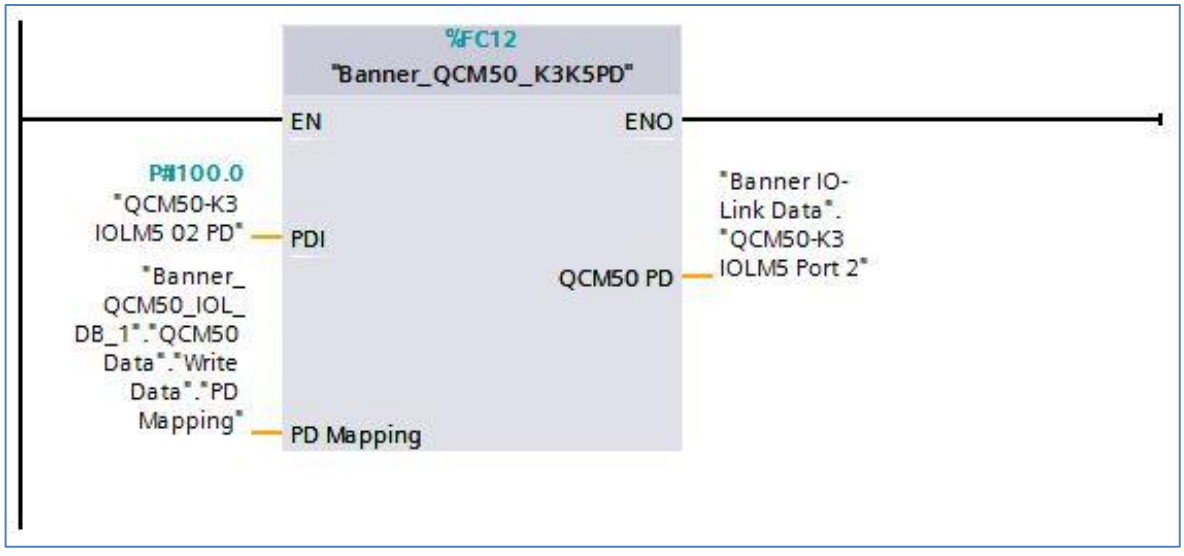
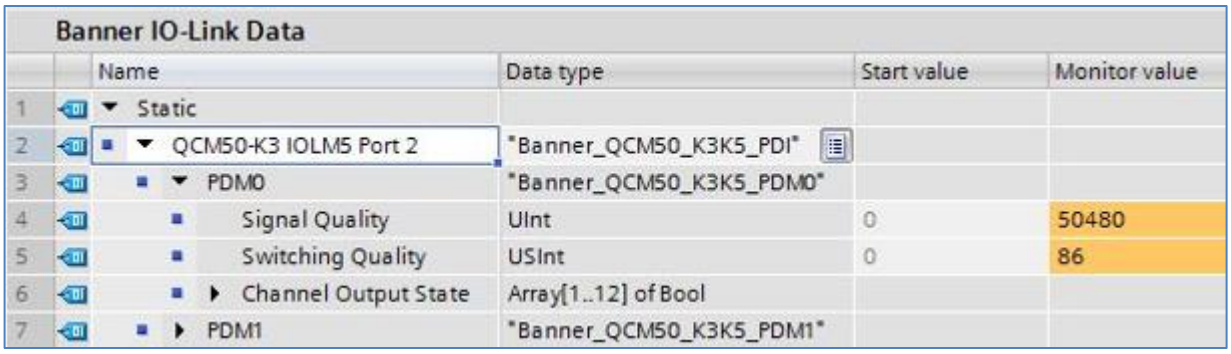


Figure 3: Linking PD Mapping variable to QCM50 Parameter Data Function Block

11. Process Data setup is complete.
12. 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 QCM50-K3/5 Process Data In, like that shown below.



Banner IO-Link Data

	Name	Data type	Start value	Monitor value
1	Static			
2	QCM50-K3 IOLM5 Port 2	"Banner_QCM50_K3K5_PDI"		
3	PDM0	"Banner_QCM50_K3K5_PDM0"		
4	Signal Quality	UInt	0	50480
5	Switching Quality	USInt	0	86
6	Channel Output State	Array[1..12] of Bool		
7	PDM1	"Banner_QCM50_K3K5_PDM1"		

Appendix A QCM50-K3/5 Process Data

The QCM50-K3/K5 has 6 bytes of Process Data In, as shown below. The specific information included in the Process Data In varies by mode.

First is Mode = 0, also called Switching Channel.

ProcessDataIn "Process Data Input" id=PD_ProcessDataInWithSignal

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 = False, true = True					Output State	true (1) = C/Q Output Active
2	1	Boolean	false = False, true = True					Health State	true (1) = Sensor is Healthy
3	2	Boolean	false = False, true = True					Marginal Light State	true (1) = Sensor is Marginal Light
4	3	Boolean	false = False, true = True					Marginal Dark State	true (1) = Sensor is Marginal Dark
5	4	10-bit UInteger						Normalized Signal Strength Value	Normalized Signal Strength value.
6	16	16-bit UInteger						Signal	The raw ADC signal.

Octet 0

bit offset	31	30	29	28	27	26	25	24
subindex	6							
element bit	15	14	13	12	11	10	9	8

Octet 1

bit offset	23	22	21	20	19	18	17	16
subindex	6							
element bit	7	6	5	4	3	2	1	0

Octet 2

bit offset	15	14	13	12	11	10	9	8
subindex	//////	//////	5					
element bit			9	8	7	6	5	4

Octet 3

bit offset	7	6	5	4	3	2	1	0
subindex	5				4	3	2	1
element bit	3	2	1	0				

Mode = 1 is called Color Values.

ProcessDataIn "Color values" id=PDIN_Color

bit length: 48
data type: 48-bit Record

subindex	bit offset	data type	allowed values	default value	acc. restr.	mod. other var.	excl. from DS	name	description
1	0	12-bit UInteger	0 = no signal, 1 = overflow, 10..4095		ro			Ratio red	
2	12	12-bit UInteger	0 = no signal, 1 = overflow, 10..4095		ro			Ratio green	
3	24	12-bit UInteger	0 = no signal, 1 = overflow, 10..4095		ro			Ratio blue	
4	36	12-bit UInteger	0 = no signal, 1 = overflow, 10..4095		ro			Energy	

This Process Data is mapped to a specific group of PROFINET addresses.

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