

S100 Process Data Function

This document covers the installation and use of a function for Siemens' TIA Portal software package. This function handles cyclic IO-Link Process Data Out to a Banner S100 light via an IO-Link Master from Siemens PLC. The function covers parsing and display of the S100 sensor Process Data Out.

Components

Banner S100 Library v16.zal16

There are two methods for 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 manufacturers' IO-Link masters.

Installation 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.

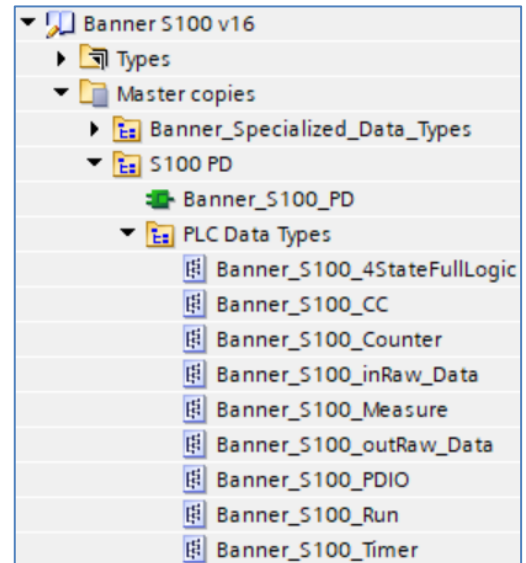
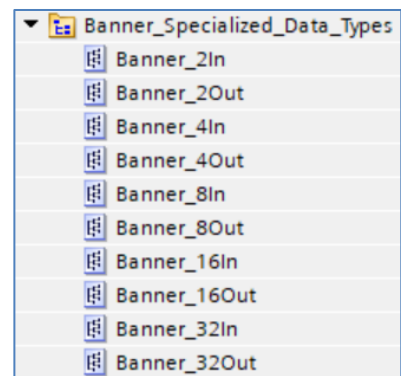
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Setup of S100 with a Banner DXMR

1. Go to Device and Networks to configure the DXMR. Add the DXMR if 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.
3. Open the IO-Link Generic Devices and select the proper module. The 32/32 byte is required for S100 Select. Make note of the I and Q address for Slot 2 which represents Port 1 (%I2 & %Q2).

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	68...76		Banner IO-Link Master Info
IO-Link In/Out 32/32 Byte + Status_1	0	2	2...37	2...47	IO-Link In/Out 32/32 Byte + Status

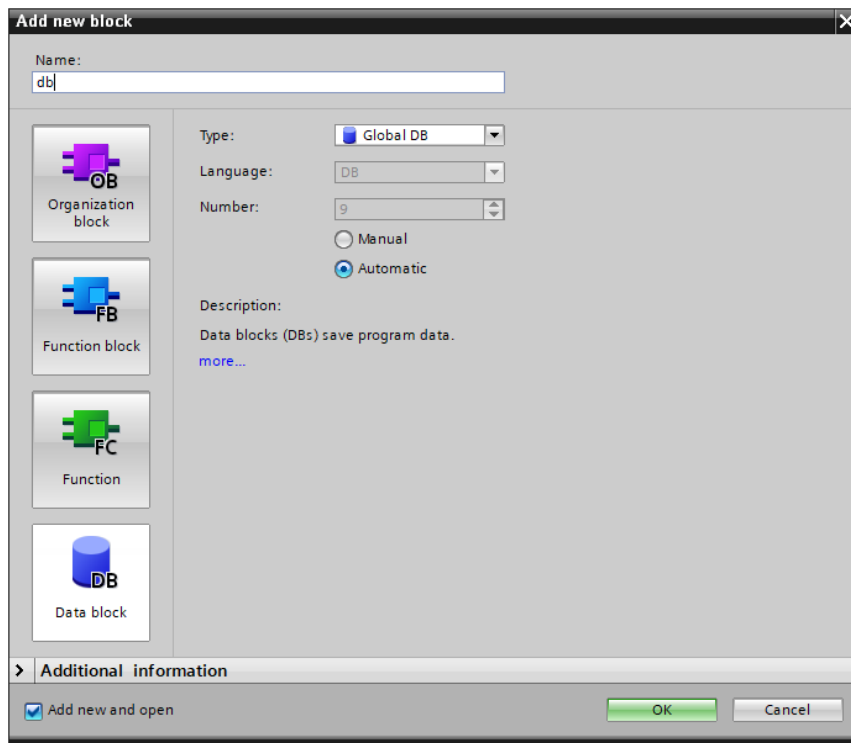
4. Drag the necessary tag from Banner_Specialized_Data_Types. The tag used in this example is "Banner_32In" and "Banner_32Out". These tags represent the full raw process data along with port information.
5. Drag the necessary files from the S100 PD Folder.
 - a. Move Banner_S100_4StateFullLogic, Banner_S100_CC, Banner_S100_Counter, Banner_S100_inRaw_Data, Banner_S100_Measure, Banner_S100_outRaw_Data, Banner_S100_PDIO, Banner_S100_Run, and Banner_S100_Timer to the PLC Data Types area.
 - b. Move Banner_S100_PD to the Program Blocks area.
6. Go to PLC Tags. Create four tags. In this example, Tag table_1 was created, then the tag "S100 IOLM1 01 PDO" was created using a Data Type of "Banner_32Out". This naming convention calls out the type of device 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 "Q" address found in step 2 (%Q2) is tied to this new tag. The second is "S100 IOLM1 01 outraw" and uses the "Q" address found in step 3 plus 2 (%Q4). This is the tag that will be used in the Function block. The same process is done for the input data. Tags "S100 IOL 01 inraw" and "S100 IOLM1 01 PDI" are created using "Banner_S100_inRaw_Data" and "Banner_32In". These are addressed to %I6 and %I2 in this example



Name	Data type	Address
▶ S100 IOLM1 01 inraw	"Banner_S100_inRaw_Data"	%I6.0
▶ S100 IOLM1 01 outraw	"Banner_S100_outRaw_Data"	%Q4.0
▶ S100 IOLM1 01 PDI	"Banner_32In"	%I2.0
▶ S100 IOLM1 01 PDO	"Banner_32Out"	%Q2.0

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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 S100. The tag name again calls out the type of sensor, the IO-Link Master, and the port number. Use the data type "Banner_S100_PDIO" for the new tag.

▼ S100 IOLM1 01 PDIO	"Banner_S100_PDIO"
■ ▶ 0-Run	"Banner_S100_Run"
■ ▶ 1-4 State Full Logic	"Banner_S100_4StateFullLogic"
■ ▶ 2-Measure	"Banner_S100_Measure"
■ ▶ 3-Timer	"Banner_S100_Timer"
■ ▶ 4-Counter	"Banner_S100_Counter"

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9. Add the “Banner_S100_PD” function to an OB ladder. Link the “PDI”, “PDO”, and “S100 PDIO” to the tags created from step 6 and 8.

The last variable, “Operational Mode”, allows the function to correctly interpret the Process Data Out. In the case of the S100, there are five user-selected modes for the Process Data Out. This function needs to know what choice has been made in the S100 for this Operational Mode variable.

There are two ways to achieve this goal. We can simply type in the correct number for Operational Mode (see Fig. 1), or we can link this S100 Process Data Function to the S100 Parameter Data Function Block (see Fig. 2).

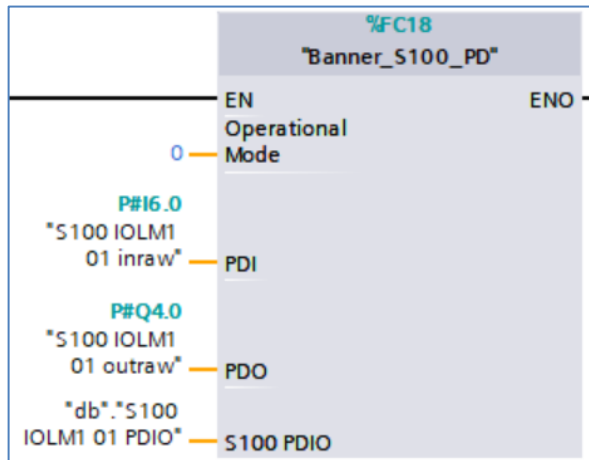


Figure 1: Hand type correct number for Operational Mode

NOTE: if you type in the incorrect number (i.e. it does not match the display module, S100, current Operational Mode configuration) you will get incorrectly displayed Process Data Out information.

Operational Mode: the options here are “0” (Run Mode), “1” (Four State Full Logic Mode), “2” (Measure Mode), “3” (Timer Mode), and “4” (Counter Mode). The default is “0”.

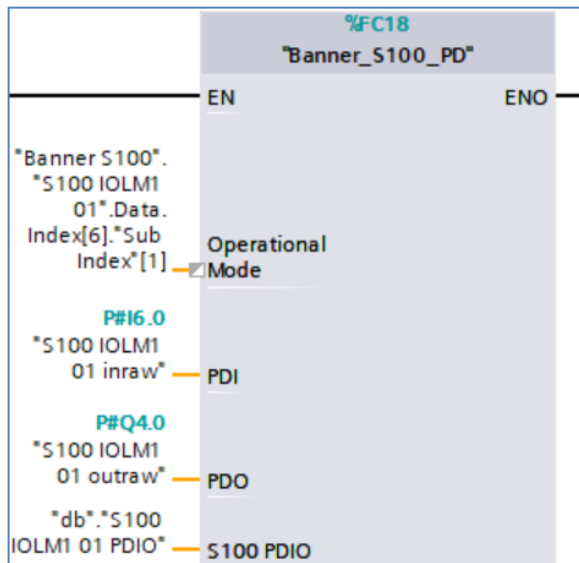
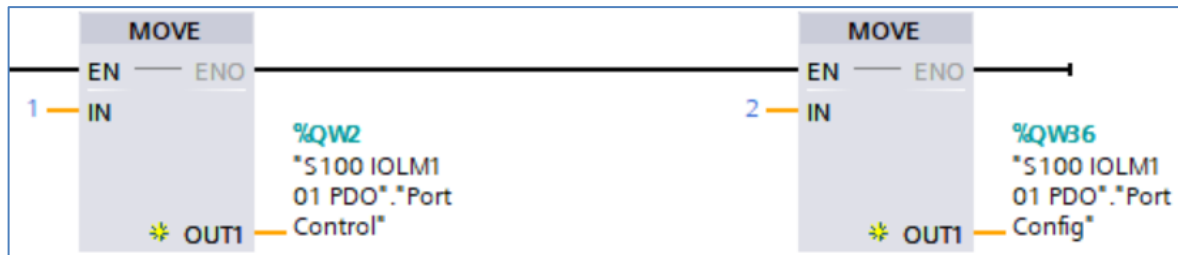


Figure 2: Linking Operational Mode variable to S100 Parameter Data Function Block

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10. The final step is to configure the IO-Link output control. This is done by sending a 1 to Port Control and a 2 to Port Config. Both parameters are part of the tag created in step 6 "S100 IOLM1 01 PDO".

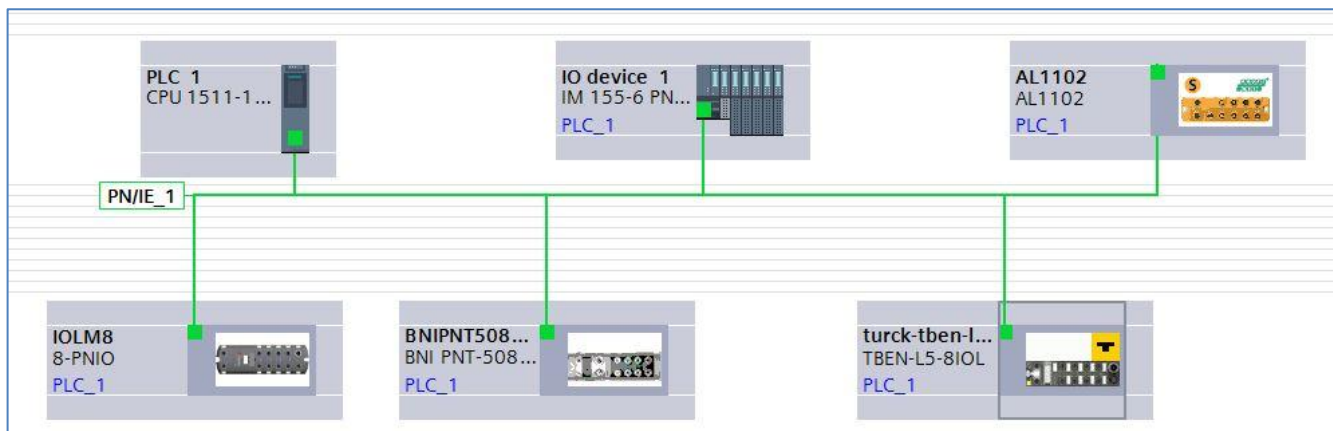
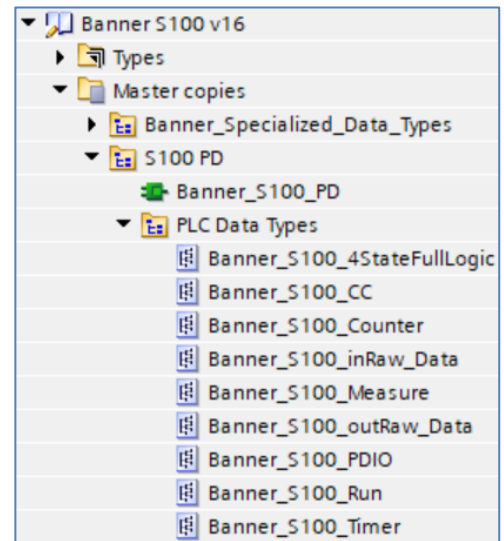


11. Process Data setup is complete.
12. Compile and download the configuration to the PLC, then go online. Open the "db" data block and click Monitor all. You can now control the S100 via the data located here.

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Setup of S100 with other IO-Link Masters

1. The Banner S100 Library will now be in the Global Library List. Expand the Master copies section. The S100 folder contains elements for both Process Data and Parameter Data connections to a S100 device. As Process Data is the focus of this paper on those items.
2. Drag Banner_S100_PD to the Program Blocks area under your PLC.
3. Drag Banner_S100_4StateFullLogic, Banner_S100_CC, Banner_S100_Counter, Banner_S100_inRaw_Data, Banner_S100_Measure, Banner_outRaw_Data, Banner_S100_PDIO, Banner_S100_Run, and Banner_S100_Timer 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.



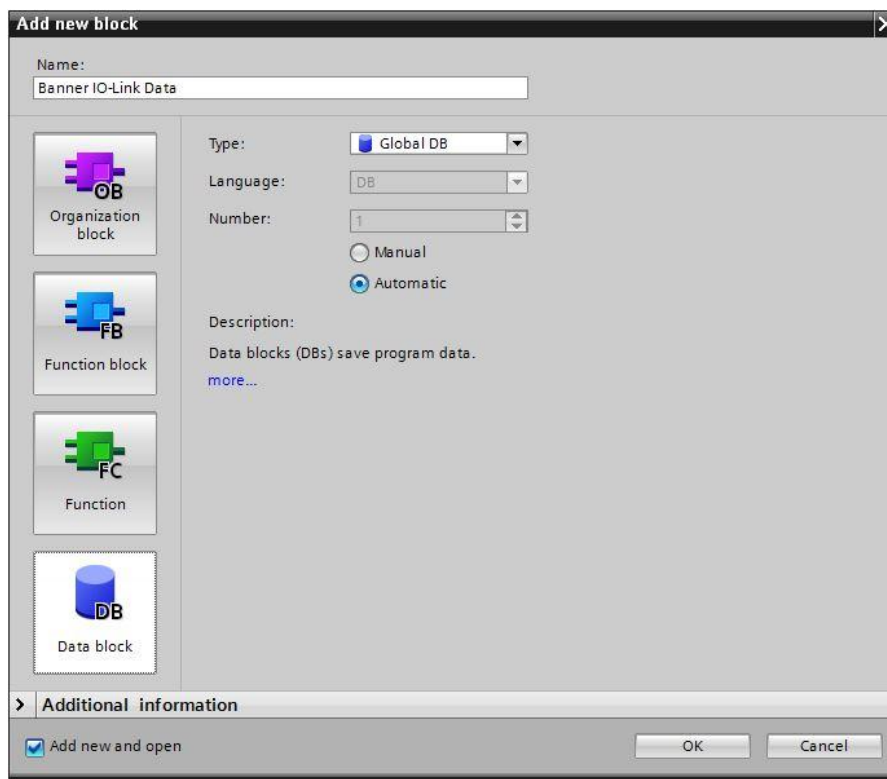
5. Click on the relevant device and configure the IO-Link Master as necessary. Refer to the documentation for the IO-Link Master. Recall that a S100 requires 32 bytes of space for the Process Data.
6. Record the "I" and "Q" address where this S100 Process Data is to be stored, as the address will be required in the next step. In this example, 32 bytes of Process Data Out for port 1 on the IO-Link Master will be stored starting at Q4. The 32 bytes of Process Data In starts at I6.

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- Go to PLC Tags. Add a new tag table, then create a new tag to represent the raw Process Data Out to be sent to the IO-Link Master. In this example, Tag table_1 was created, then the tag "S100 IOLM1 01 outRaw" was created using a Data Type of "Banner_S100_outRaw_Data". 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. Reference IO-Link Documentation for addressing. This example uses %Q4. Must also link the input data. This example uses "S100 IOLM1 01 inraw" uses Data Type "Banner_S100_inRaw_Data" addressed at %I6.

Name	Data type	Address
▶ S100 IOLM1 01 inraw	"Banner_S100_inRaw_Data"	%I6.0
▶ S100 IOLM1 01 outraw	"Banner_S100_outRaw_Data"	%Q4.0

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



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- In the new data block, create a new tag to represent the parsed Process Data In for our S100. The tag name again calls out the type of sensor, the IO-Link Master, and the port number. Use the data type "Banner_S100_PDIO" for the new tag.

▼ S100 IOLM1 01 PDIO	"Banner_S100_PDIO"
■ ▶ 0-Run	"Banner_S100_Run"
■ ▶ 1-4 State Full Logic	"Banner_S100_4StateFullLogic"
■ ▶ 2-Measure	"Banner_S100_Measure"
■ ▶ 3-Timer	"Banner_S100_Timer"
■ ▶ 4-Counter	"Banner_S100_Counter"

- Add the "Banner_S100_PD" function to an OB ladder. Link the "PDO" to the raw Process Data variable from step 7. Link "S100 PDIO" to the parsed Process Data variable from step 9.

The last variable, "Operational Mode", allow the function to correctly interpret the Process Data Out. In the case of the S100, there are four user-selected modes for the Process Data Out. This function needs to know what choice has been made in the S100 for this Operational Mode variable.

There are two ways to achieve this goal. We can simply type in the correct number for Operational Mode (see Fig. 3), or we can link this S100 Process Data Function to the S100 Parameter Data Function Block (see Fig. 4). See Appendix A for more information about S100 Process Data Out.

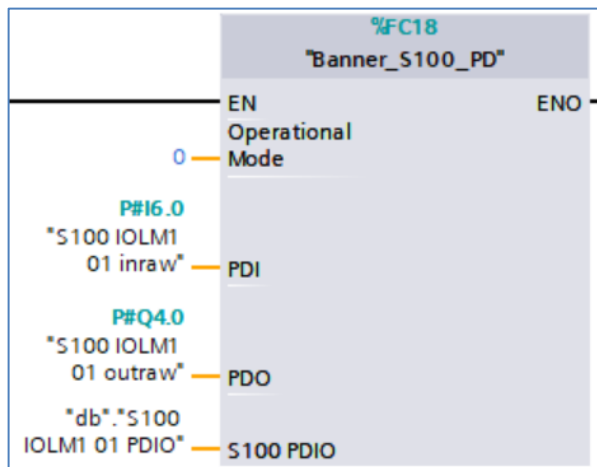


Figure 3: Hand type correct number for Operational Mode

NOTE: if you type in the incorrect number (i.e. it does not match the display module, S100, current Operational Mode configuration) you will get incorrectly displayed Process Data Out information.

Operational Mode: the options here are "0" (Run Mode), "1" (Message Mode), "2" (Measure Mode), "3" (Timer Mode), and "4" (Counter Mode). The default is "0".

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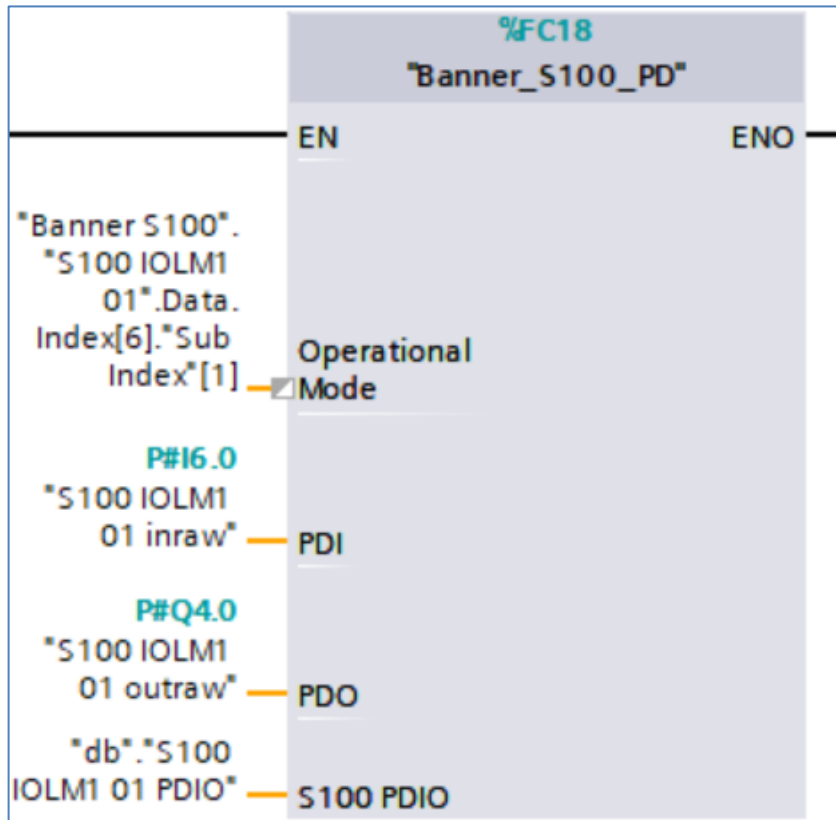


Figure 4: Linking Operational Mode variable to S100 Parameter Data Function Block

11. Process Data setup is complete.

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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 S100 Process Data Out, like that shown below.

Name	Data type	Monitor value
▼ Static		
■ ▼ S100 IOLM1 01 PDIO	"Banner_S100_PDIO"	
■ ▼ 0-Run	"Banner_S100_Run"	
■ Button 1 State	Bool	FALSE
■ Button 2 State	Bool	FALSE
■ Button 3 State	Bool	FALSE
■ Button 4 State	Bool	FALSE
■ Button 5 State	Bool	FALSE
■ ▶ Light Control	"Banner_S100_CC"	
■ Haptic Feedback	Bool	FALSE
■ Audible Type	USInt	0
■ Line 1 Text	String	"
■ Line 2 Text	String	"
■ ▶ 1-4 State Full Logic	"Banner_S100_4StateFullLogic"	
■ ▶ 2-Measure	"Banner_S100_Measure"	
■ ▶ 3-Timer	"Banner_S100_Timer"	
■ ▶ 4-Counter	"Banner_S100_Counter"	

Figure 5: Run Mode Process Data Out (Operational Mode = 0)

Name	Data type	Monitor value
▼ Static		
■ ▼ S100 IOLM1 01 PDIO	"Banner_S100_PDIO"	
■ ▶ 0-Run	"Banner_S100_Run"	
■ ▼ 1-4 State Full Logic	"Banner_S100_4StateFullLogic"	
■ PDI Output State	Bool	FALSE
■ PDI State	USInt	0
■ PDO Job Input	Bool	FALSE
■ ▶ 2-Measure	"Banner_S100_Measure"	
■ ▶ 3-Timer	"Banner_S100_Timer"	
■ ▶ 4-Counter	"Banner_S100_Counter"	

Figure 6: Message Mode Process Data Out (Operational Mode = 1)

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Name	Data type	Monitor value
▼ Static		
■ ▼ S100 IOLM1 01 PDIO	"Banner_S100_PDIO"	
■ ▶ 0-Run	"Banner_S100_Run"	
■ ▶ 1-4 State Full Logic	"Banner_S100_4StateFullLogic"	
■ ▼ 2-Measure	"Banner_S100_Measure"	
■ Button 1 State	Bool	FALSE
■ Button 2 State	Bool	FALSE
■ Button 3 State	Bool	FALSE
■ Button 4 State	Bool	FALSE
■ Button 5 State	Bool	FALSE
■ PDI Value	Real	0.0
■ PDO Value	UInt	0
■ ▶ 3-Timer	"Banner_S100_Timer"	
■ ▶ 4-Counter	"Banner_S100_Counter"	

Figure 7: Measure Mode Process Data Out (Operational Mode = 2)

Name	Data type	Monitor value
▼ Static		
■ ▼ S100 IOLM1 01 PDIO	"Banner_S100_PDIO"	
■ ▶ 0-Run	"Banner_S100_Run"	
■ ▶ 1-4 State Full Logic	"Banner_S100_4StateFullLogic"	
■ ▶ 2-Measure	"Banner_S100_Measure"	
■ ▼ 3-Timer	"Banner_S100_Timer"	
■ Button 1 State	Bool	FALSE
■ Button 2 State	Bool	FALSE
■ Button 3 State	Bool	FALSE
■ Button 4 State	Bool	FALSE
■ Button 5 State	Bool	FALSE
■ PDI Value	Real	0.0
■ PDO Run Timer	Bool	FALSE
■ PDO Reset Timer	Bool	FALSE
■ ▶ 4-Counter	"Banner_S100_Counter"	

Figure 8: Timer Mode Process Data Out (Operational Mode = 3)

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Name	Data type	Monitor value
▼ Static		
■ ▼ S100 IOLM1 01 PDIO	"Banner_S100_PDIO"	
■ ▶ 0-Run	"Banner_S100_Run"	
■ ▶ 1-4 State Full Logic	"Banner_S100_4StateFullLogic"	
■ ▶ 2-Measure	"Banner_S100_Measure"	
■ ▶ 3-Timer	"Banner_S100_Timer"	
■ ▼ 4-Counter	"Banner_S100_Counter"	
■ Button 1 State	Bool	FALSE
■ Button 2 State	Bool	FALSE
■ Button 3 State	Bool	FALSE
■ Button 4 State	Bool	FALSE
■ Button 5 State	Bool	FALSE
■ PDI Value	Real	0.0
■ Increment Count	Bool	FALSE
■ Decrement Count	Bool	FALSE
■ Reset Count	Bool	FALSE

Figure 9: Counter Mode Process Data Out (Operational Mode = 4)