Setting the AXC F 2152 as a Modbus Client

Objective:

This document will provide instructions on how to download the Modbus TCP library, add that library into PLCnext Engineer, and set the PLCnext Controller (AXC F 2152) up as a Modbus TCP client. This guide will use PLCnext Engineer 2021.0, IL ETH BK DI8 DO4 2TX-PAC – 2703981, and the AXC F 2152 – 2404267.

Prerequisites:

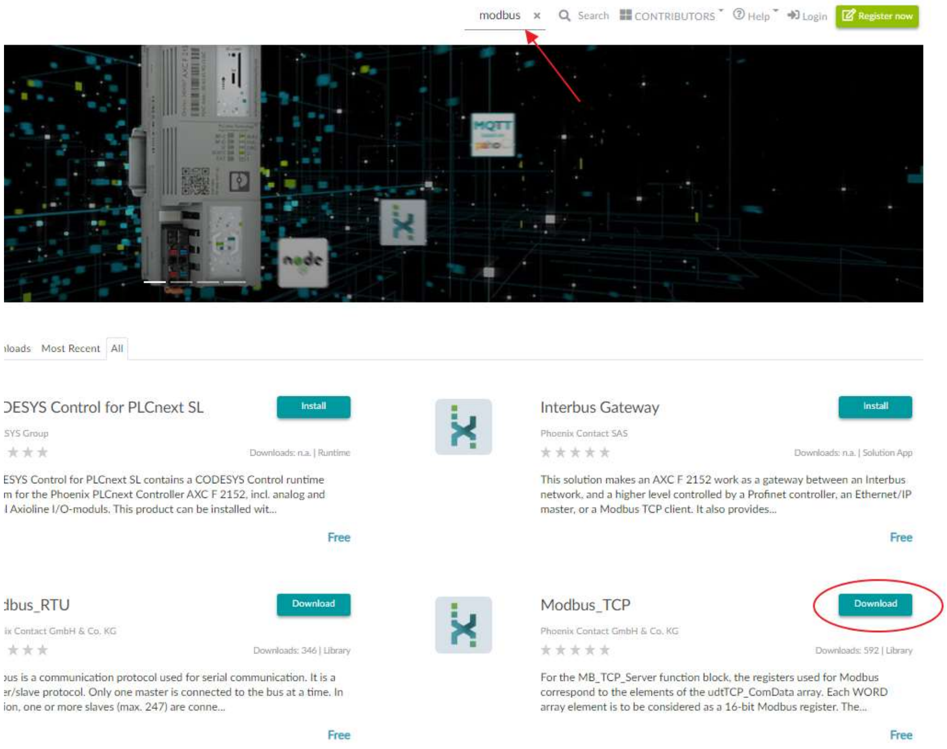
Basic understanding of PLCnext Engineer and the Modbus TCP protocol.

Procedure:

A. **Download the Modbus_TCP library**.

1. Navigate to the PLCNext store - https://www.plcnextstore.com/#/. In the search bar on the top right of the page, search for Modbus_TCP. Once the Modbus_TCP library is shown, press the download button.

2. Once downloaded, locate the .msi and "Install." It is advisable to save all PLCnext libraries in the same file location for simplicity. Follow the prompts until the initial setup is finished.



ESYS Control for PLCnext SL contains a CODESYS Control runtime m for the Phoenix PLCnext Controller AXC F 2152, incl. analog and l Axioline I/O-moduls. This product can be installed wit...

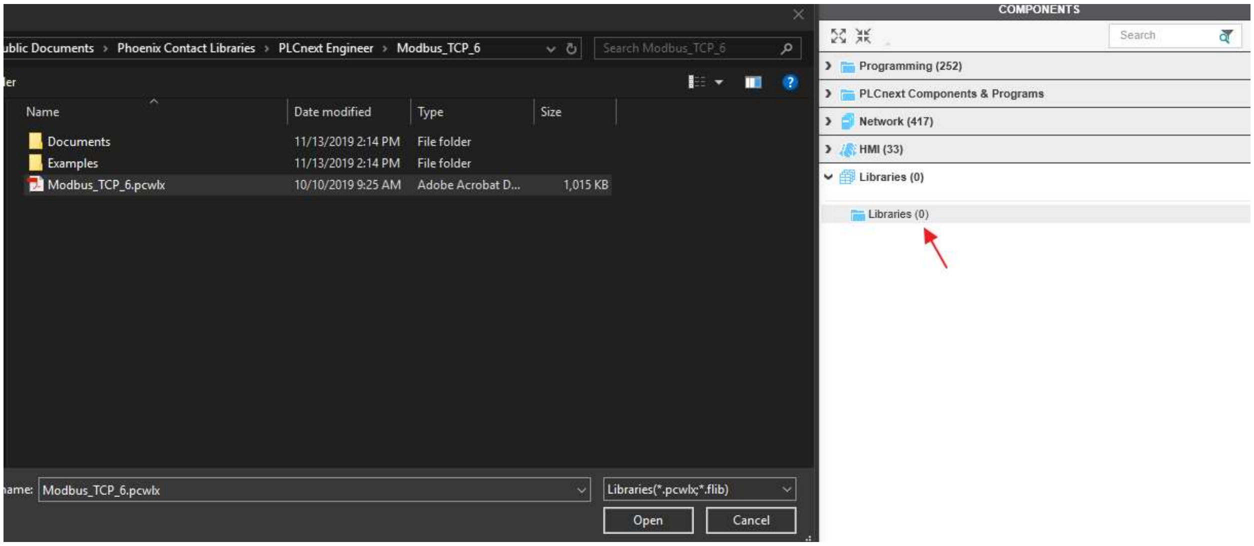
This solution makes an AXC F 2152 work as a gateway between an Interbus network, and a higher level controlled by a Profinet controller, an Ethernet/IP master, or a Modbus TCP client. It also provides...

ɔus is a communication protocol used for serial communication. It is a ɛr/slave protocol. Only one master is connected to the bus at a time. In ion, one or more slaves (max. 247) are conne...

For the MB_TCP_Server function block, the registers used for Modbus correspond to the elements of the udtTCP_ComData array. Each WORD array element is to be considered as a 16-bit Modbus register. The...

B. **Adding the Modbus_TCP library to your PLCnext program.**

1. In the Components area, expand the Libraries' tab. Right click on the Libraries option underneath that and select Add User Library. This will open the file explorer. Navigate to the folder that the Modbus library story is stored at and double click on the Modbus_TCP_8.pcwlx folder. (NOTE: The 6 might differ depending on what version of the library you have).

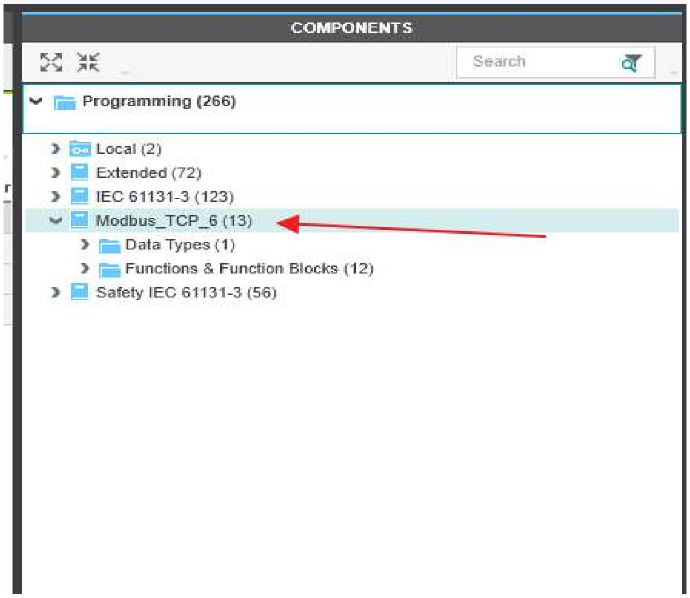

ublic Documents › Phoenix Contact Libraries › PLCnext Engineer › Modbus_TCP_6

Name	Date modified	Type	Size
Documents	11/13/2019 2:14 PM	File folder	
Examples	11/13/2019 2:14 PM	File folder	
Modbus_TCP_6.pcwlx	10/10/2019 9:25 AM	Adobe Acrobat D...	1,015 KB

ame: Modbus_TCP_6.pcwlx

Libraries(*.pcwlx;*.flib)

2. To verify that the library was properly inserted into the program, there should now be a Modbus_TCP_8 folder in the Components area under the Programming tab.



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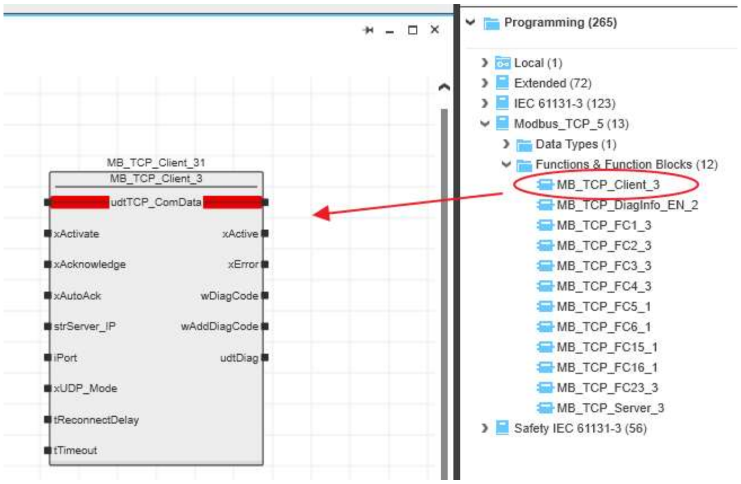
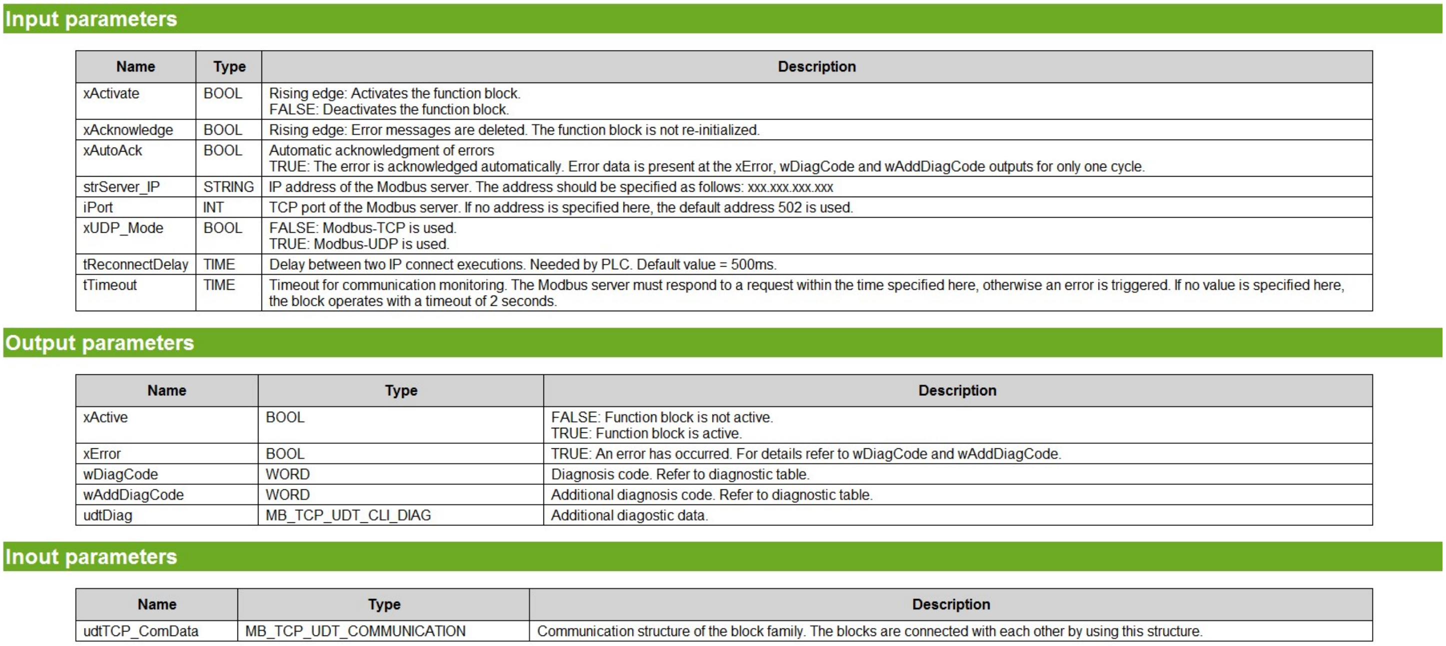
C. **Adding the Modbus function blocks.**

1. The Modbus_TCP_Client function block must be used to configure the AXC F 2152 as a Modbus Client. The function block can be added by expanding the Functions & Function Blocks and dragging the MB_TCP_Client function block into your code.



2. Once the function block is placed into the code, variables will need to be assigned to the inputs and outputs. The help file explains the parameters for this function block.



Input parameters

Name	Type	Description
xActivate	BOOL	Rising edge: Activates the function block. FALSE: Deactivates the function block.
xAcknowledge	BOOL	Rising edge: Error messages are deleted. The function block is not re-initialized.
xAutoAck	BOOL	Automatic acknowledgment of errors TRUE: The error is acknowledged automatically. Error data is present at the xError, wDiagCode and wAddDiagCode outputs for only one cycle.
strServer_IP	STRING	IP address of the Modbus server. The address should be specified as follows: xxx.xxx.xxx.xxx
iPort	INT	TCP port of the Modbus server. If no address is specified here, the default address 502 is used.
xUDP_Mode	BOOL	FALSE: Modbus-TCP is used. TRUE: Modbus-UDP is used.
tReconnectDelay	TIME	Delay between two IP connect executions. Needed by PLC. Default value = 500ms.
tTimeout	TIME	Timeout for communication monitoring. The Modbus server must respond to a request within the time specified here, otherwise an error is triggered. If no value is specified here, the block operates with a timeout of 2 seconds.

Output parameters

Name	Type	Description
xActive	BOOL	FALSE: Function block is not active. TRUE: Function block is active.
xError	BOOL	TRUE: An error has occurred. For details refer to wDiagCode and wAddDiagCode.
wDiagCode	WORD	Diagnosis code. Refer to diagnostic table.
wAddDiagCode	WORD	Additional diagnosis code. Refer to diagnostic table.
udtDiag	MB_TCP_UDT_CLI_DIAG	Additional diagostic data.

Inout parameters

Name	Type	Description
udtTCP_ComData	MB_TCP_UDT_COMMUNICATION	Communication structure of the block family. The blocks are connected with each other by using this structure.

3. For this guide, FC4 will be used to read the digital inputs from the Modbus slave (IL ETH BK DI8 DO4 2TX-PAC – 2703981). To connect the Client Function Block to the FC4 Function block, they need to have the same variable for the inout parameter “udtTCP_ComData”.

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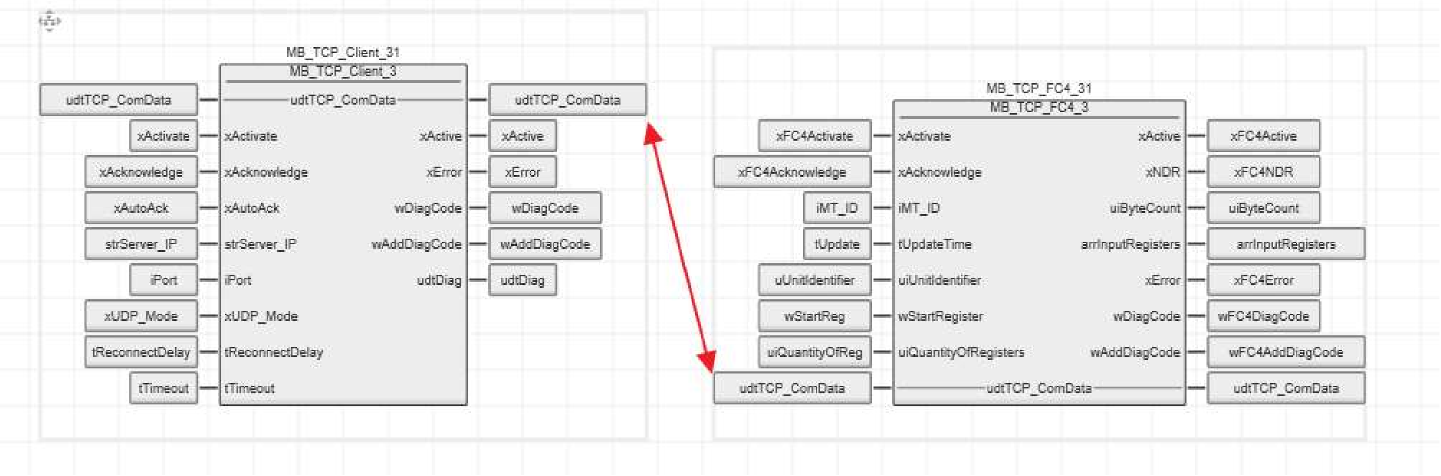
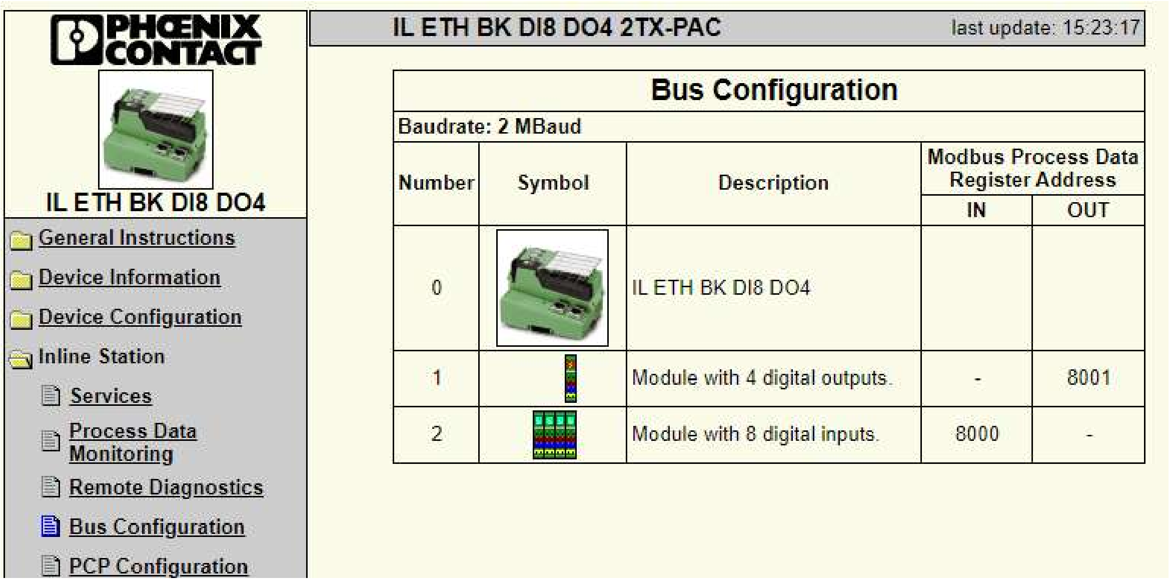


D. **Running the Project and Pulling Register Data**

1. Download the project to the AXC F 2152, and enter debug mode in PLCnext Engineer. Before activating the Client function block, enter the Modbus TCP server's IP address into the "strServer_IP" variable, and then verify that there is no error after activating it.

   Before activating the Function Code function block, enter 1 into the iMT_ID variable. This input parameter represents the connection between the blocks and may only be assigned once per MB_TCP_Client. You will also want to enter the Modbus register of the slave into the "wStartRegister" variable. The input parameter will convert the register into Hexadecimal automatically. Lastly, enter the quantity of registers you want to view into the "uiQuantityOfRegisters".

   The (IL ETH BK DI8 DO4 2TX-PAC – 2703981) has an IP address of 192.168.14.174 and the digital input register starts at 8000.



IL ETH BK DI8 DO4 2TX-PAC last update: 15:23:17

Bus Configuration

Baudrate: 2 MBaud

Number	Symbol	Description	Modbus Process Data Register Address	
			IN	OUT
0		IL ETH BK DI8 DO4		
1		Module with 4 digital outputs.	-	8001
2		Module with 8 digital inputs.	8000	-

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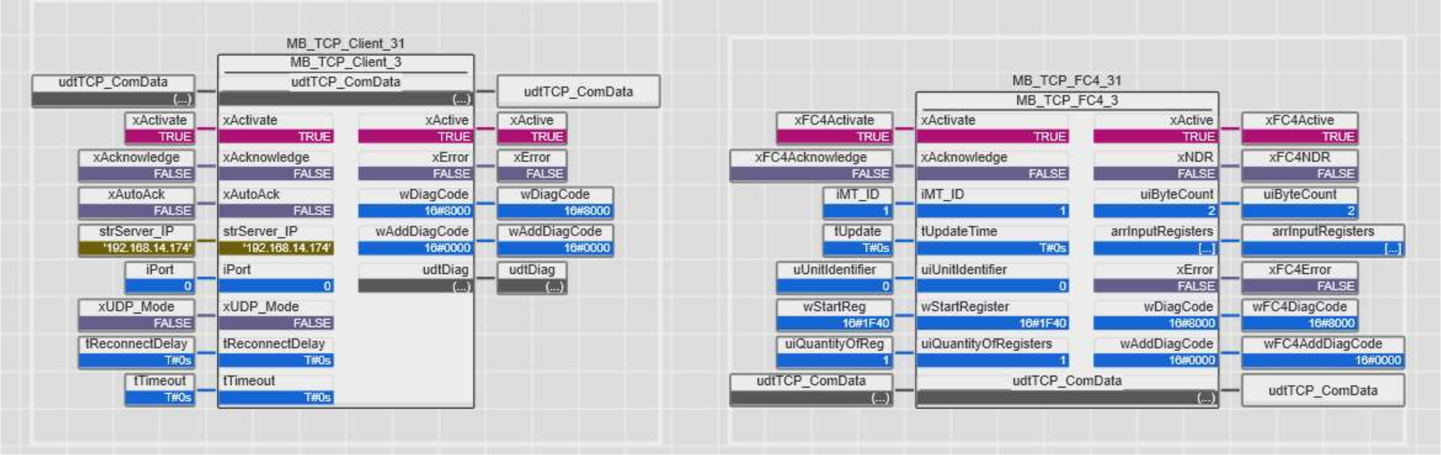
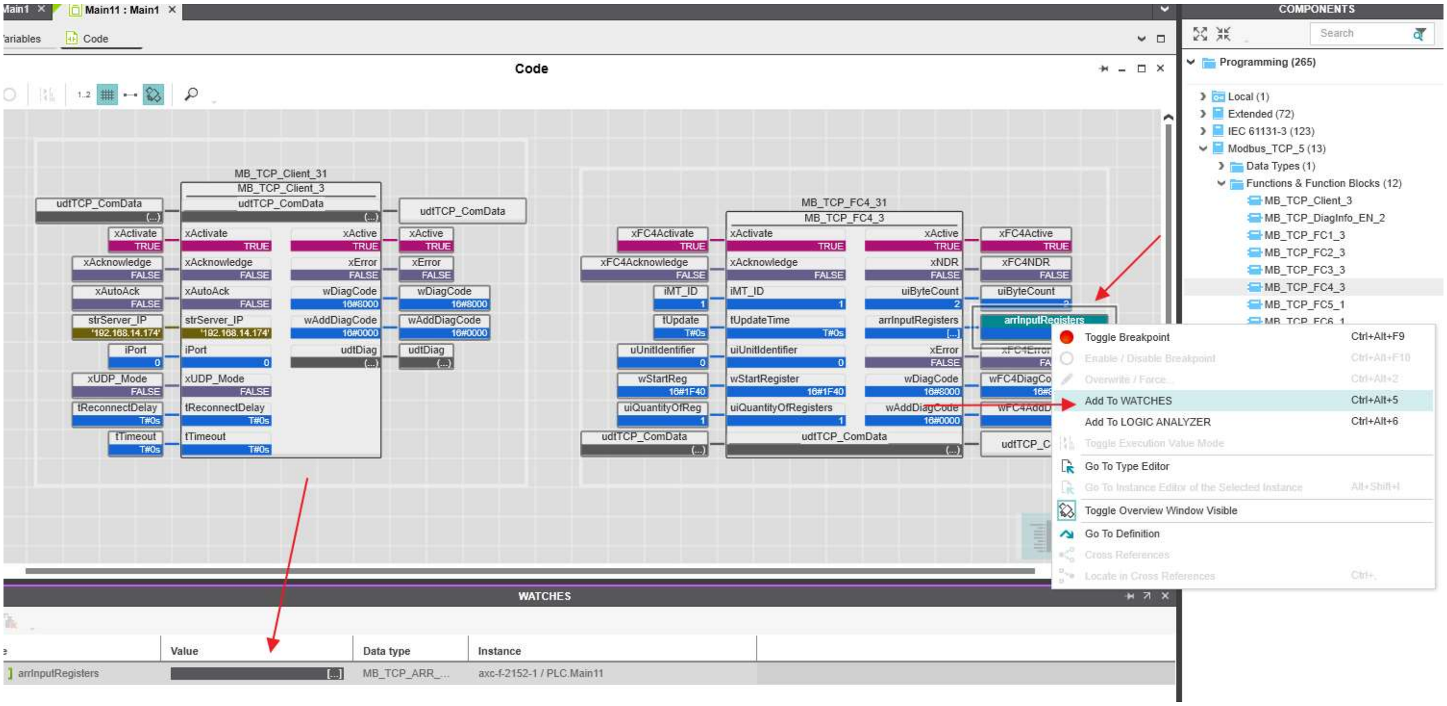
2. When everything is connected and the correct parameters are entered, the “xActive” will be true and the “xError” will be false.

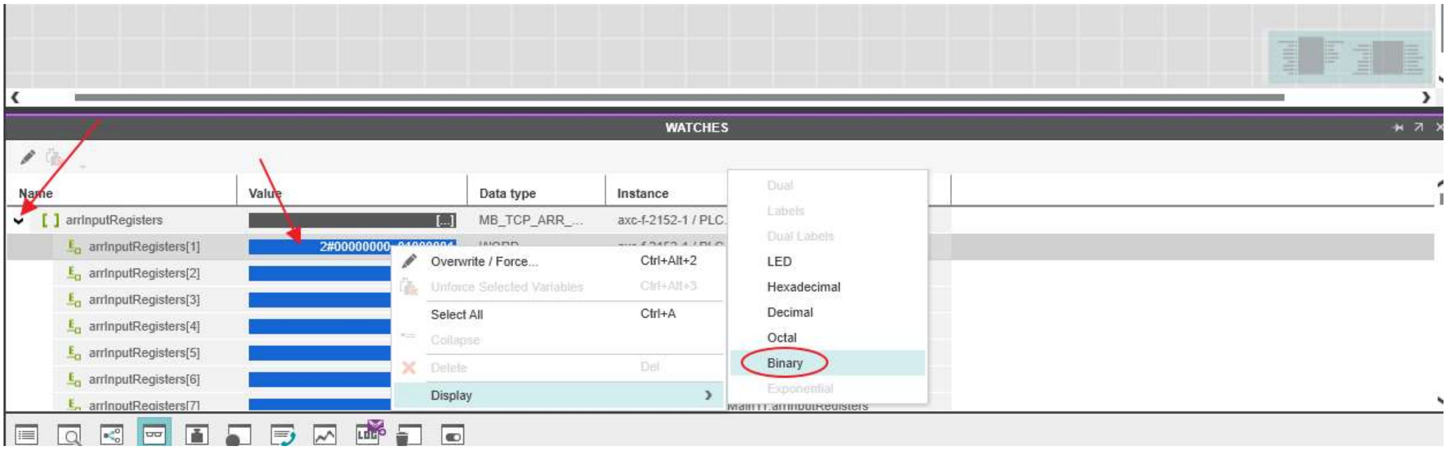


3. To view the data coming from the Modbus slave, right click on the “arrInputRegisters” variable and select “Add to WATCHES”. This will allow you to view that array inside of the watch window.


Main1
Main11 : Main1
Variables
Code
COMPONENTS
Search
Programming (265)
Local (1)
Extended (72)
IEC 61131-3 (123)
Modbus_TCP_5 (13)
Data Types (1)
Functions & Function Blocks (12)
MB_TCP_Client_3
MB_TCP_DiagInfo_EN_2
MB_TCP_FC1_3
MB_TCP_FC2_3
MB_TCP_FC3_3
MB_TCP_FC4_3
MB_TCP_FC5_1
MB_TCP_FC6_1
Toggle Breakpoint Ctrl+Alt+F9
Enable / Disable Breakpoint Ctrl+Alt+F10
Overwrite / Force... Ctrl+Alt+2
Add To WATCHES Ctrl+Alt+5
Add To LOGIC ANALYZER Ctrl+Alt+6
Toggle Execution Value Mode
Go To Type Editor
Go To Instance Editor of the Selected Instance Alt+Shift+I
Toggle Overview Window Visible
Go To Definition
Cross References
Locate in Cross References Ctrl+,
WATCHES

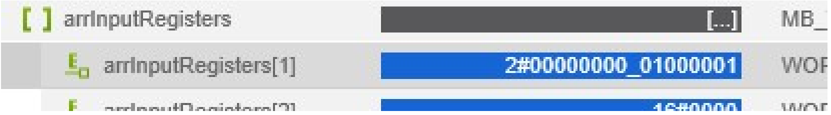
Name	Value	Data type	Instance
arrInputRegisters	[...]	MB_TCP_ARR_...	axc-f-2152-1 / PLC.Main11

4. Inside the WATCHES window, click on the arrow to the left of the "arrInputRegisters" to expand the array. The first array, "arrInputRegisters[1]" will represent Modbus register 8000 since that is the value entered into the "wStartRegister". Right click the value it shows, navigate to "Display", and select Binary to display this value in Binary.



Name	Value	Data type	Instance
[ ] arrInputRegisters	[...]	MB_TCP_ARR_...	axc-f-2152-1 / PLC.
arrInputRegisters[1]	2#00000000_01000001	WORD	axc-f-2152-1 / PLC
arrInputRegisters[2]			
arrInputRegisters[3]			
arrInputRegisters[4]			
arrInputRegisters[5]			
arrInputRegisters[6]			
arrInputRegisters[7]			

5. Voltage is being applied to digital inputs 1 and 7 on the (IL ETH BK DI8 DO4 2TX-PAC – 2703981). The Binary value from "arrInputRegisters[1]" confirms this by showing bits 0 and 6 high.



[ ] arrInputRegisters	[...]	MB_
arrInputRegisters[1]	2#00000000_01000001	WOR
arrInputRegisters[2]	16#0000	WOR