YASKAWA
PARTNER SUPPORT
Shared Integration Experience

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Experience with Automation Direct PLC with YRC1000

Introduction

Partner Support had an opportunity to test the use of an Automation Direct Productivity 1000 PLC connecting via Ethernet/IP. This document will summarize what we learned. This was not an attempt to "certify" all the PLC features or the Automation Direct product line. We were interested in determining whether Implicit messaging could be used with our standard YRC1000 EIP settings. In short, we were able to verify these settings worked without problem.

We assume you are familiar with the Automation Direct Productivity Suite software for configuration of the PLC. This document will provide high level steps and screen shots to help configure it for use with a YRC controller.

NOTE: there are many helpful videos at automationdirect.com. Select the "Videos" link at the top and then scroll or search for Ethernet/IP videos.

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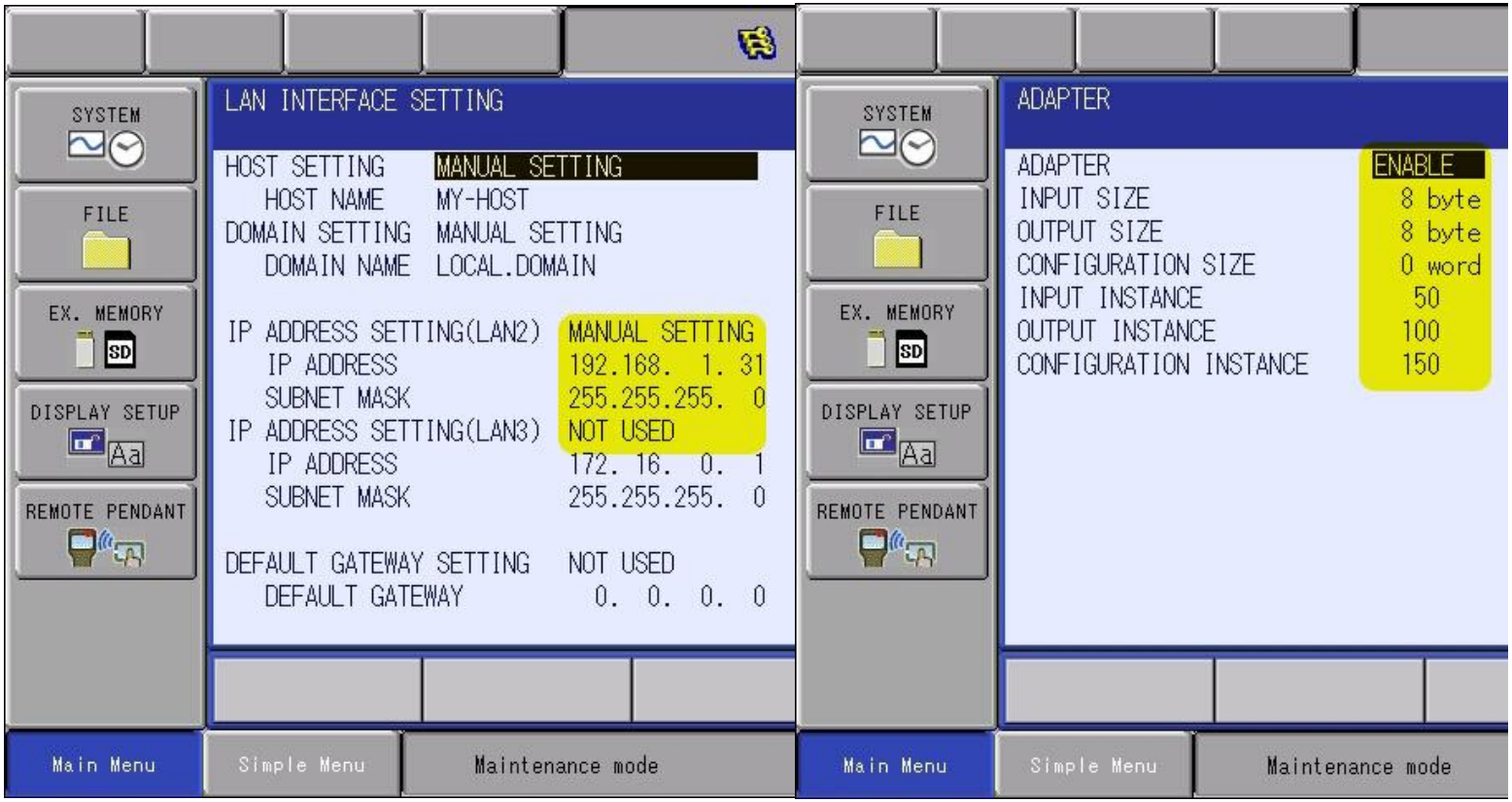
Controller Configuration

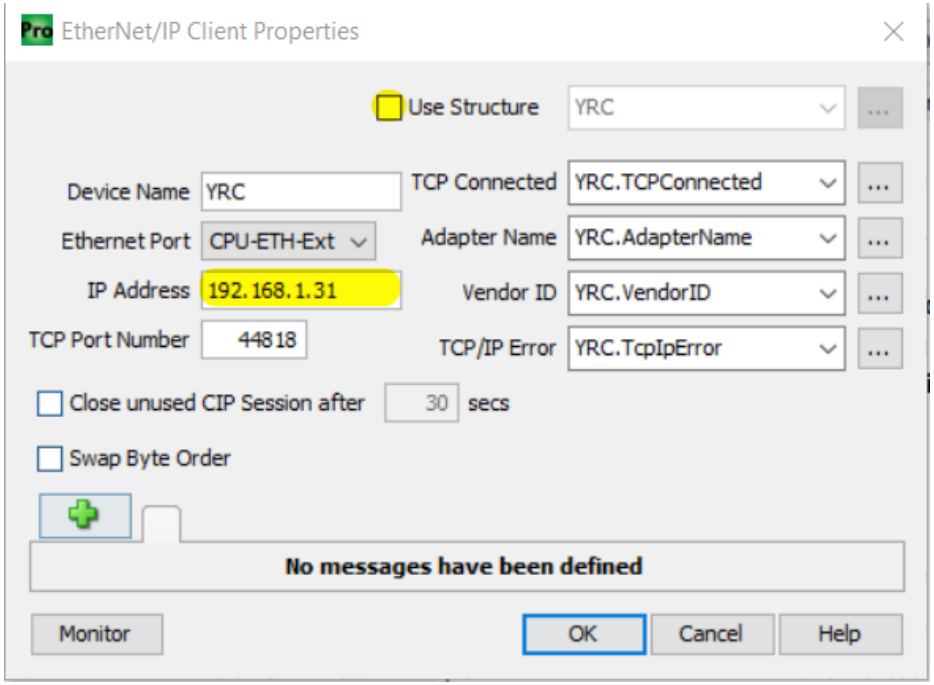
We tested on both a YRC1000 and YRC1000Micro. Each was setup as if Ethernet/IP were ordered and installed with defaults we set by Yaskawa manufacturing. (Controller is an adapter, 8 bytes in / out, instance numbers as shown below.) Below is a summary of the LAN Interface Settings and Ethernet/IP settings. TIP: When setting up EIP for the first time, follow these instructions *exactly*. We know this combination of controller and PLC settings will work. You can change IP Addresses, bytes transferred, etc. after you get things working.



PLC Configuration

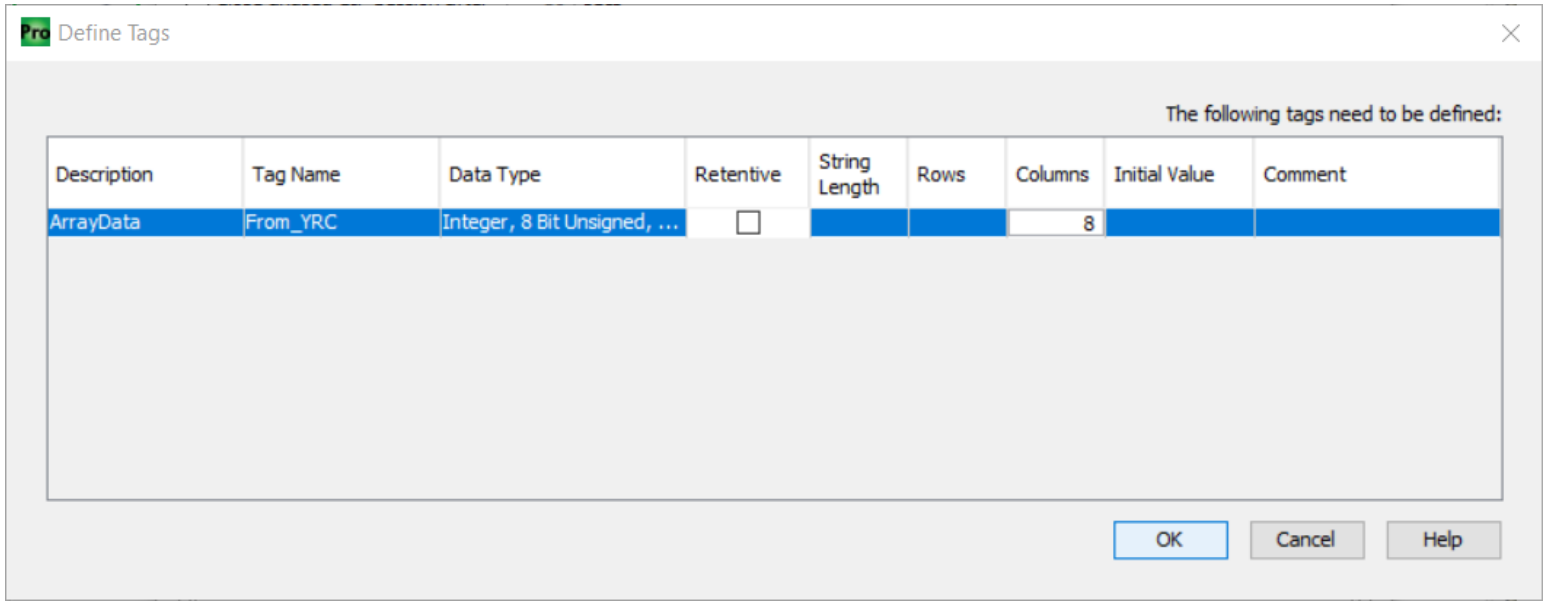
Add an Ethernet Client

1. Open Productivity Suite PLC software
2. Start a new project.
3. Click on Hardware Configuration
4. Click on the Ethernet/IP tab.
5. Drag and drop a Generic Client over to your hardware configuration and define the Ethernet Interface. Provide a Device Name (I used “YRC”.)
   5.1. Provide the IP address of the YRC Controller. The default set by the factory is 192.168.1.31
   5.2. Click on the Use Structure box and enter YRC to create a data structure to be used in your PLC ladder to be able to monitor the connection and view details. You can then remove the check box.
   5.3. When finished with this portion, the screen should look as follows:



Define PLC Ethernet Input

6. Click on the green plus sign at the lower left of the window and select Add IO Message to define the Implicit messages.
7. In the bottom portion of the screen (the T >O(INPUT) tab we will define how inputs will be processed on the PLC
8. Set the Delivery Option to UNICAST
9. Set the RPI Time to 20. (NOTE: You may get a warning message later to consider all processing needs of the PLC before using a setting this low. This is a starting point to use for RPI with Yaskawa Motoman. See "Notes on RPI" at the end of this document.)
10. Set the Assembly Instance connection point to 100. (Note: This was defined as the OUTPUT instance for the controller.)
11. Next, we will define the amount of data to be transferred. Name the Data Array. I used "From_YRC".
12. Once you enter the name, a window will open to further define the data array. Switch the Data Type to "Integer, 8 Bit Unsigned")
13. The Columns value defines how many bytes will be transferred. Set it to 8, to match what we set as output size from the controller. Your screen should look as follows:



Click OK to complete the Define Tags Window. Your screen should now appear as follows:

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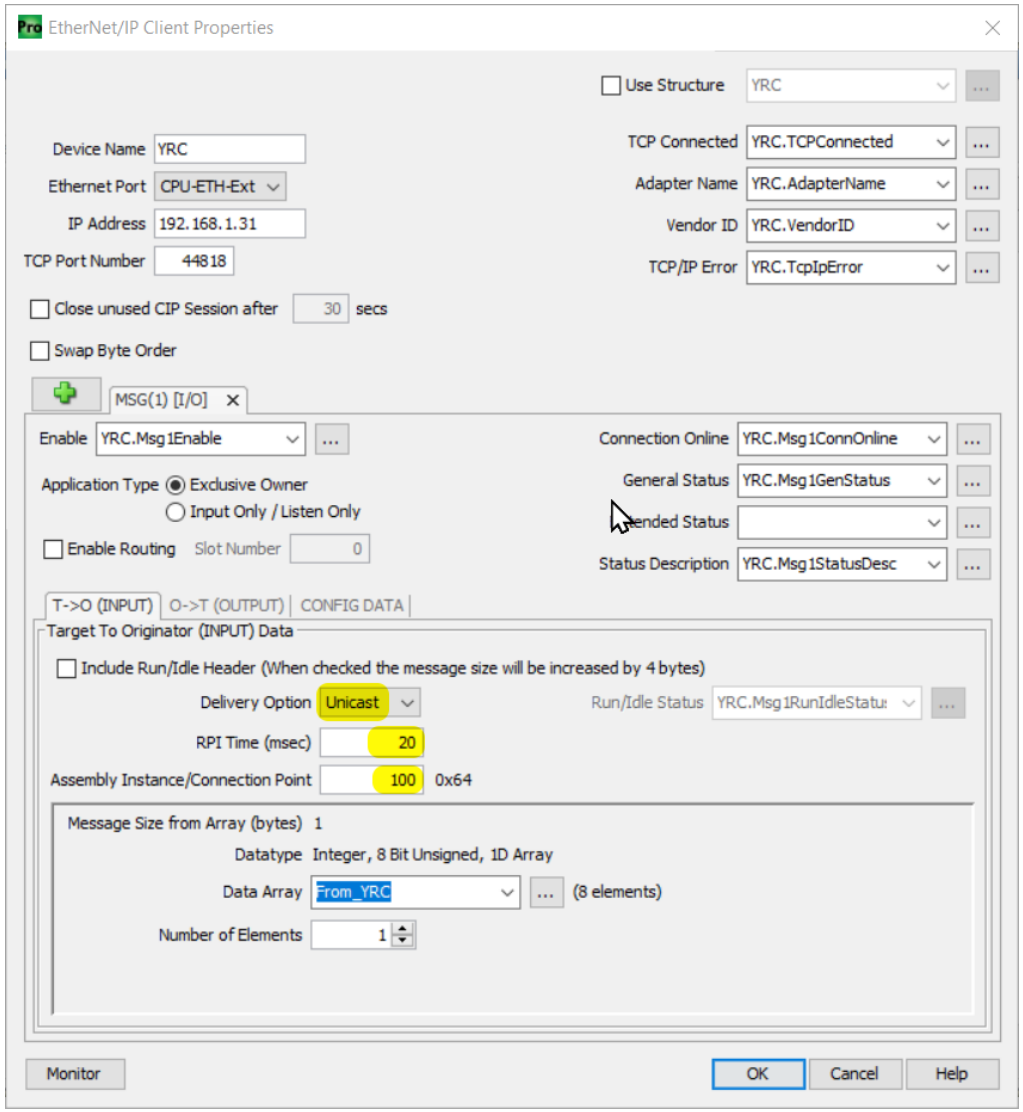
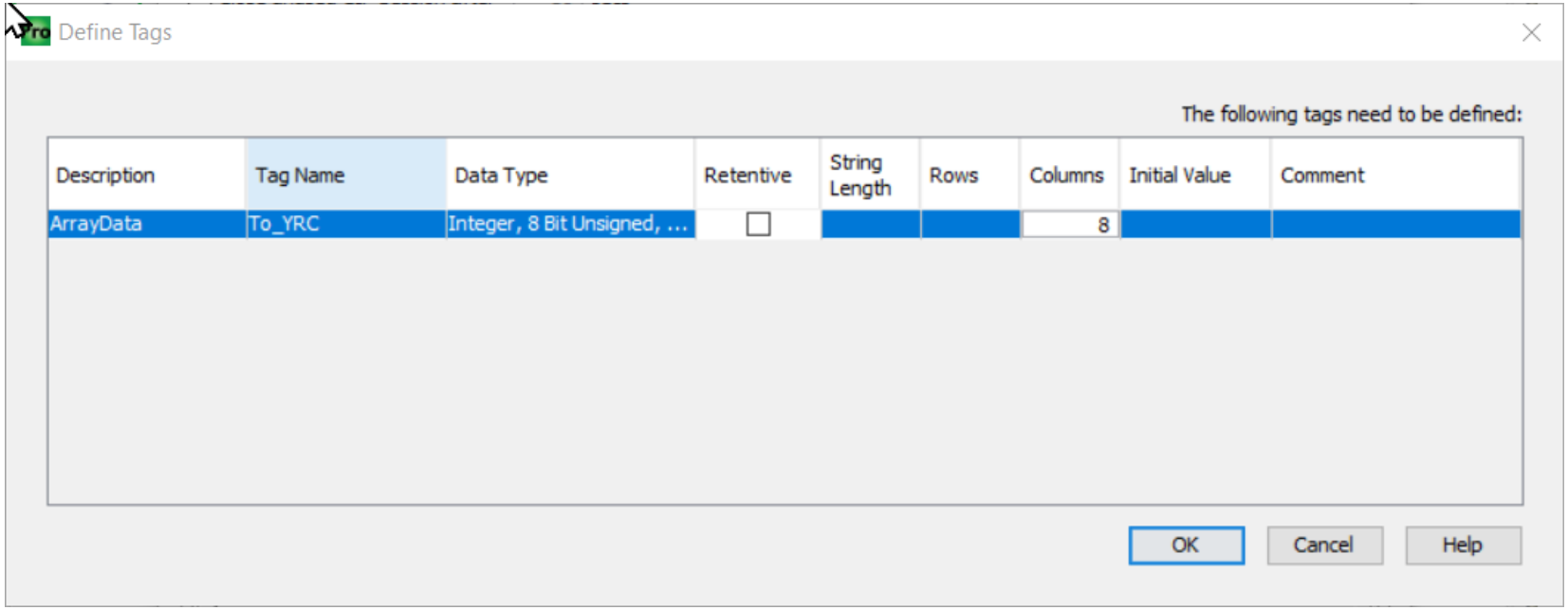


Define PLC Ethernet Output

13. Click on the O >T (OUTPUT) tab at the bottom part of the screen to define the outputs from the PLC to the controller.
14. Click on the check box to enable "Include Run/Idle header…."
15. Set the RPI Time to 40
16. Set the Assembly Instance /Connection point to 50. (Note: This was defined as the INPUT instance for the controller.)
17. Next, we will define the amount of data to be transferred. Name the Data Array. I used "To_YRC".
18. Once you enter the name, a window will open to further define the data array. Switch the Data Type to "Integer, 8 Bit Unsigned")
19. The Columns value defines how many bytes will be transferred. Set it to 8, to match what we set as input size from the controller. Your screen should look as follows:



Change the number of elements to 8. Your screen should look as follows:

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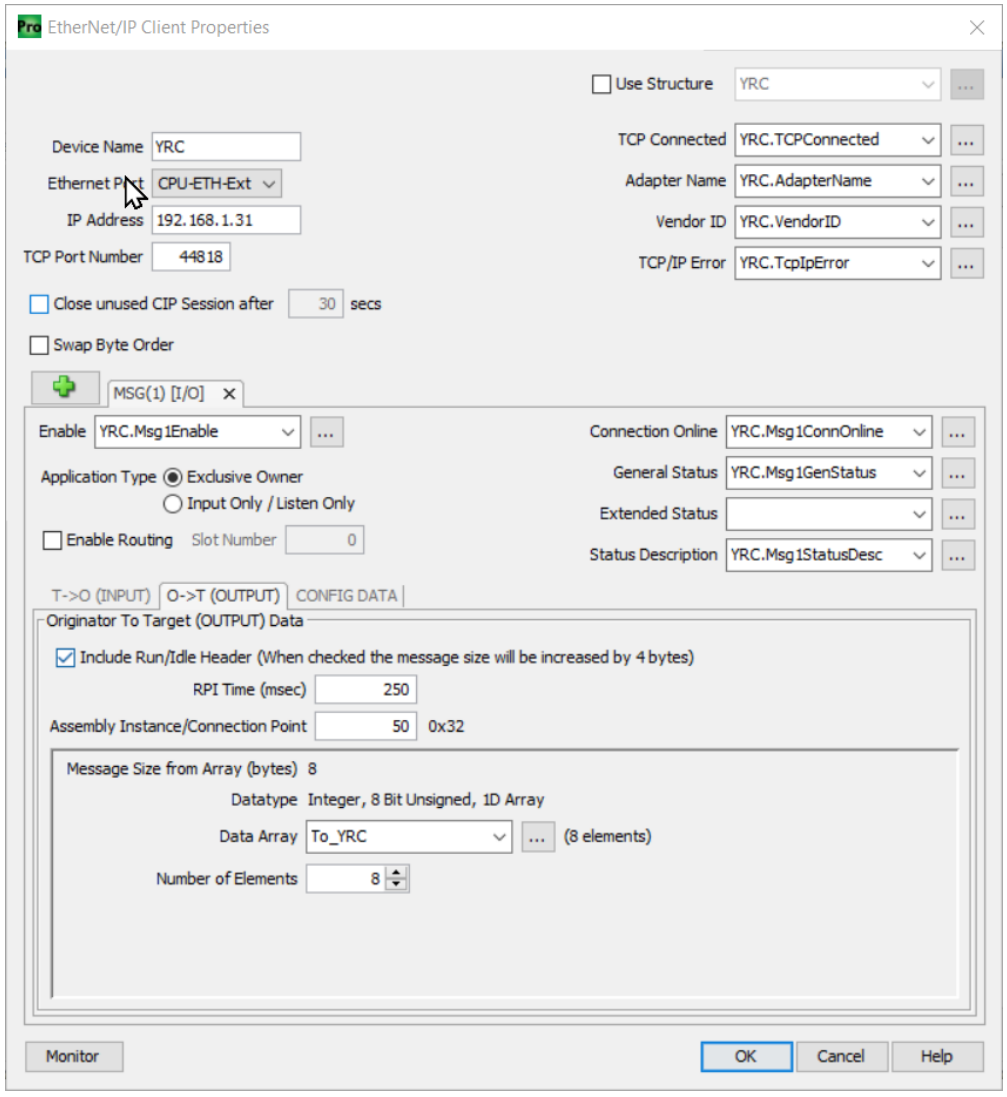
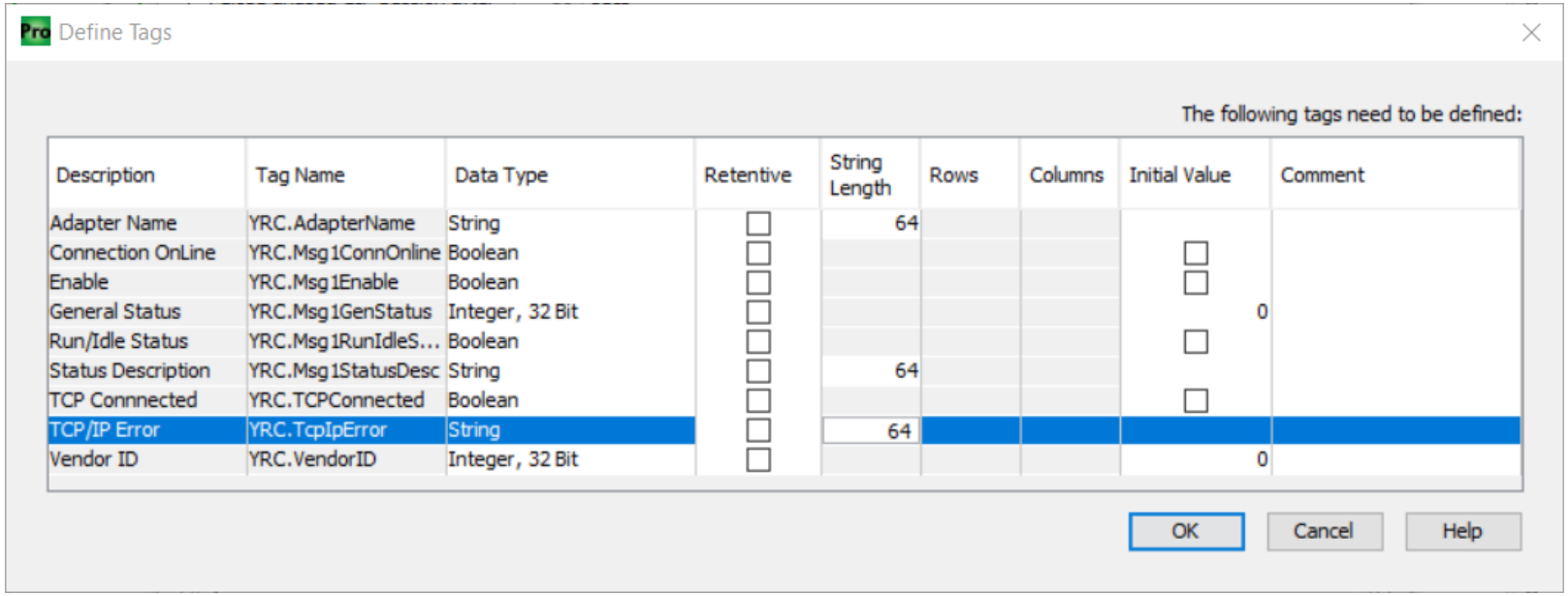


Define PLC Ethernet Configuration Data

20. Lastly, we need to define the Configuration to be exchanged. Click on the CONFIG DATA tab.
21. Be sure there is a check in the box for Enable Configuration Data.
22. Set the Assembly Instance/Connection Point to 150 to match what was set on the controller.
23. Provide a name for the Data Array. I used "YRC_Config."
24. Click in the Number of Elements box to bring up the details for the data array and then click OK on the window that pops up. Our configuration size is zero, so it does not matter how the array is defined.
25. Be sure the Number of elements box at the bottom has 0 in it and Click OK to complete the definition of the Ethernet/IP connection.
26. You will be presented with a window summarizing the tags that have been defined.

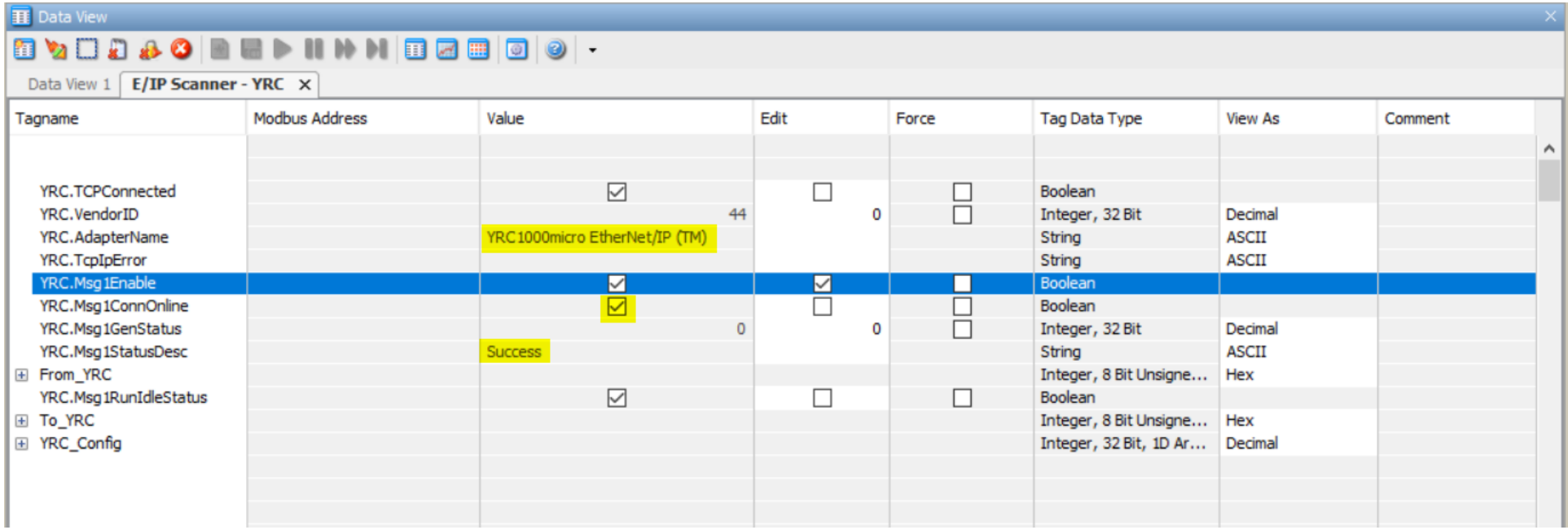


Click OK to be returned to the Hardware Configuration screen.

You can close the Hardware Configuration screen.

Test the Connection

27. At this point, you are ready to test your PLC setup. Click on "Online". You may be prompted to confirm we want to use the project just defined versus one already on the PLC. Select "No, Use PC Project."
28. Click Run to run the project on the PLC.
29. Verify communication has been established by double clicking on Hardware Config in the tree on the left. Then, click on the CPU icon.
30. Click on the Monitor button on the lower left.
31. Click on the OK in the Monitor in Data view window.
    31.1. Click OK to close the Ethernet/IP window.
32. Click on Data View on the left side in the tree.
33. Select the Ethernet/IP Scanner tab at the top.
34. You will see nothing has been populated, since our Enable Signal is still set as 0. Click to put a check box in the Edit column for the YRC.Msg1Enable tag and then Send Edits by clicking on the second icon from the left at the top of the Data View window.
35. You should see values populated in the window as shown below.



36. You can then go to your pendant and navigate to IN/OUT ~ EXTERNAL Input
37. Scroll down to your EIP Status byte at #2006X (YRC1000) or #2002x on YRC1000Micro). You should see all zeros to indicate there are no errors in communication.
38. On the Productivity Suite software Data View screen, you can expand the From_YRC and To_Yrc fields to see data being transferred. On the To_YRC(1) row, you can click on the 0x00 value in the edit column and enter a number. Click on the send edits icon (second from the left at the top.) On the Pendant, you should see the same value in your IN/OUT ~ External Inputs screen. (At #20070 for YRC1000 and #20030 for YRC1000Micro)
39. To send an output from the controller to the plc, select IN/OUT ~ External outputs. Scroll down to #20070
40. Click on the DISPLAY button and top and then select DETAIL.
41. Select the box to the right of the address to show SIM. Then, hold the interlock key while selecting on the circle. You should see the bit value change on the Data View screen under the Value column.

Notes on RPI

Our Concurrent I/O scan rate is 4ms. That is the MAX update to try as a RPI value. We usually set 20ms, sometimes 10ms.

At 20ms, you are getting a theoretical request of 50 updates / second which seems sufficient for any non-real time application. If you need more than that then you are doing process control type stuff, and a dedicated PLC should probably be the brains of the operation.