EPIC CODESYS TO MODBUS TCP DEVICE

DE 5/8/2020

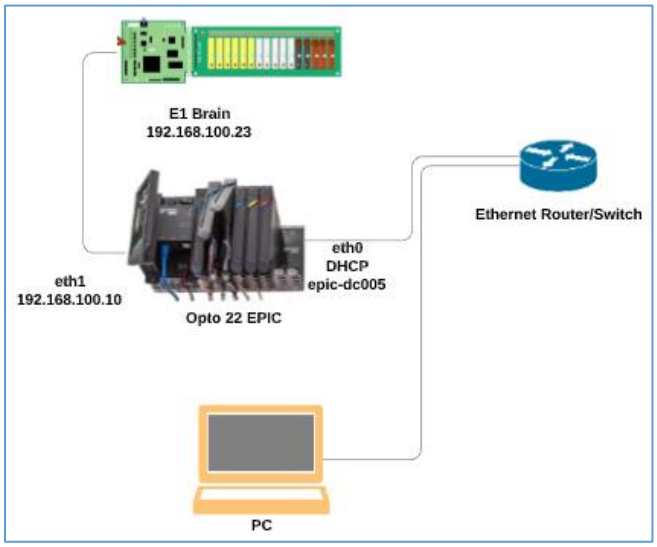
General

This is a step by step procedure to configure Epic with a simple CodeSys Ladder Logic project to work with an Opto 22 E1 brain board via Modbus TCP. The technique should be the same for most other Modbus devices.

The objective is to show how to setup the Modbus communications, assign tag names to the IO Points, and to use the IO Points in a ladder logic program.

We will build a very simple ladder logic program that turns on a digital output when the digital input is on.

Hardware and Software



The E1 Brain board has been set to static IP address 192.168.100.23. Setup for the E1 is described in Opto 22 document E1 Users Guide 1563.

The EPIC Processor is running firmware version 1.5 and has eth1 set to static IP 192.168.100.10. Eth0 is connected to the PC through the network and is set for DHCP. Using groovManage, the CodeSys control engine is running, the PAC Control engine has been disabled.

The PC is running CodeSys V3.5 SP15 Patch 4, and has the Epic libraries installed. Detailed setup of the CodeSys environment is available on OptoU training site: https://training.opto22.com/series/groov-epic-training-series#codesys

The photo to the left show the E1 brain connected to a G4PB8H IO Rack, and a 5vdc power supply. Digital input module switches (G4IDC5MA) in channels 0 and 1, Digital output modules (G4ODC5) in channels 2 and 3.

Preliminary Requirements

The CodeSys control engine in the Epic must be enabled and the PAC Control engine disabled.
The CodeSys development environment must be running on the PC with the Epic library loaded.
The E1 Brain must have the IP address configured.
Verify communications to the E1 and EPIC with a ping from your PC. You could also perform a ping from your Epic to the E1 using groovManage | System | Network | Diagnostics.

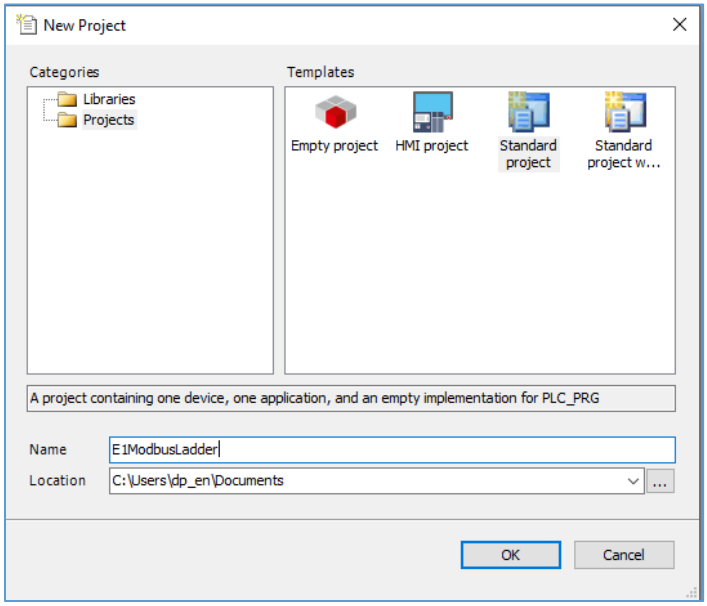
CODESYS INSTRUCTIONS

We are going to:

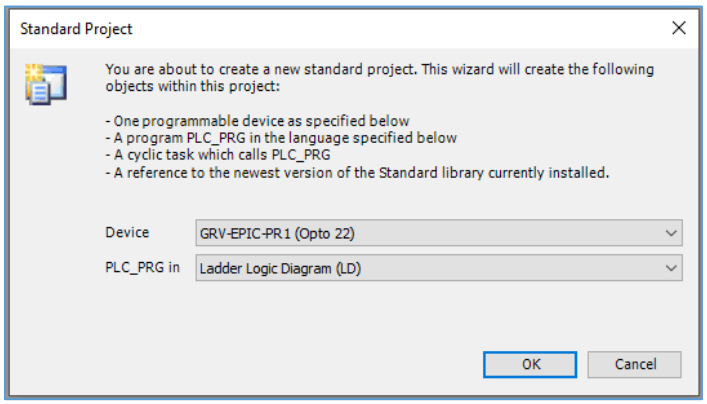
1. Create the CodeSys Project
2. Connect CodeSys to the Epic
3. Add the Modbus Master and Slave
4. Map tagnames to the digital input and outputs
5. Create the Ladder Logic
6. Download and Run the Program

1. Create the CodeSys Project

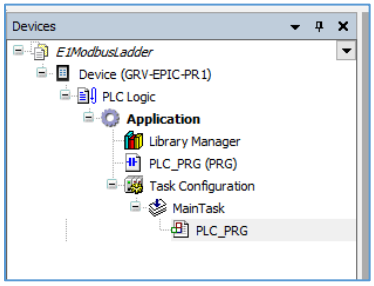
Run CodeSys and select *File* | *New* to create a new project.
Select the Standard Project type and enter a Name and Location for the project.
Then click *OK*.



For the Standard Project, change the Device to *GRV-EPIC-PR1 (Opto 22)* and change the PLC_PRG in to *Ladder Logic Diagram (LD)*.
Then click *OK*.

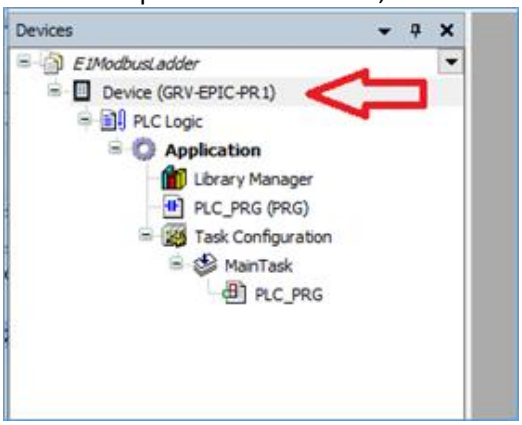


The Device (GRV-EPIC-PR1) now appears in the Device Tree.

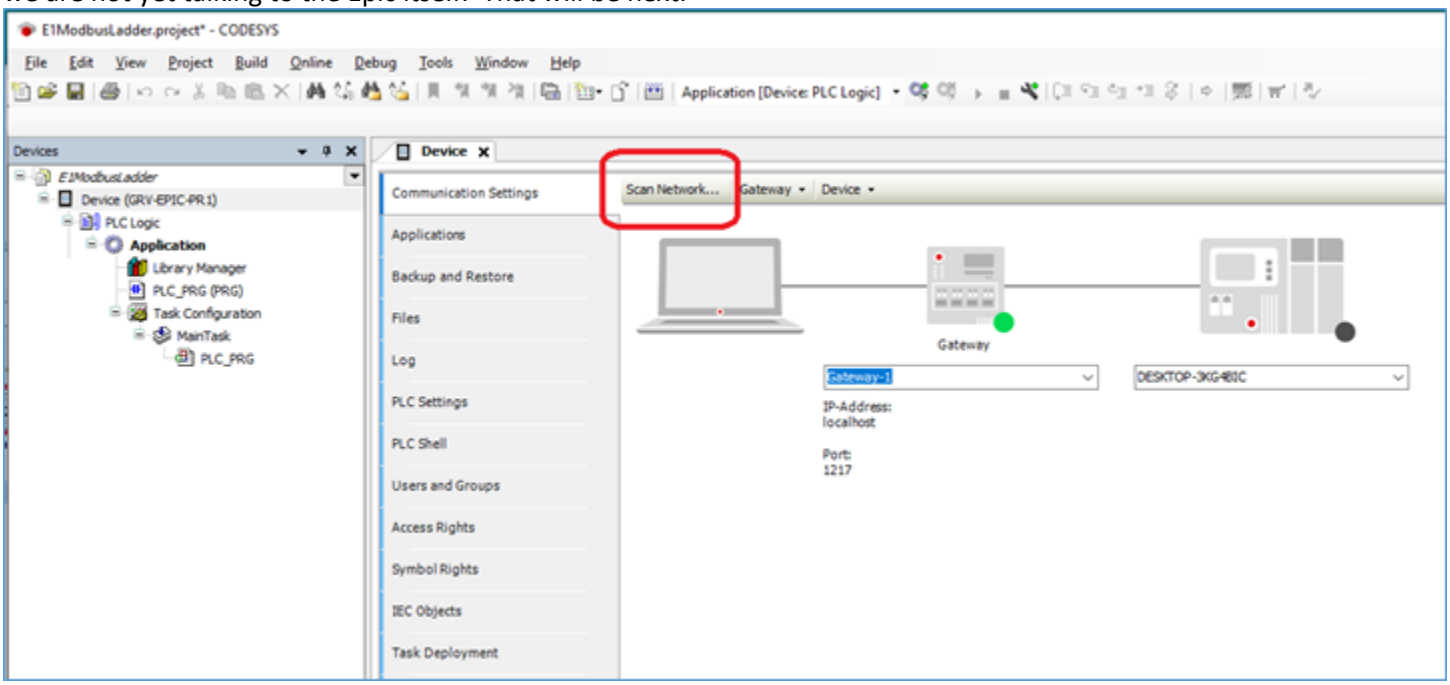


2. Connect CodeSys to the Epic

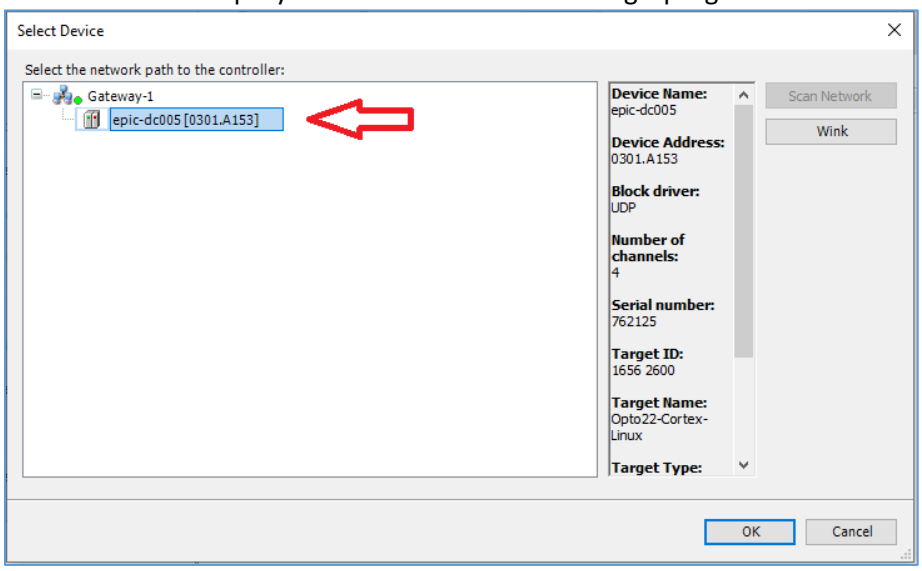
We are going to establish communications from the PC to the EPIC.
Near the top of the Device Tree, double-click on *Device (GRV-EPIC-PR1)*



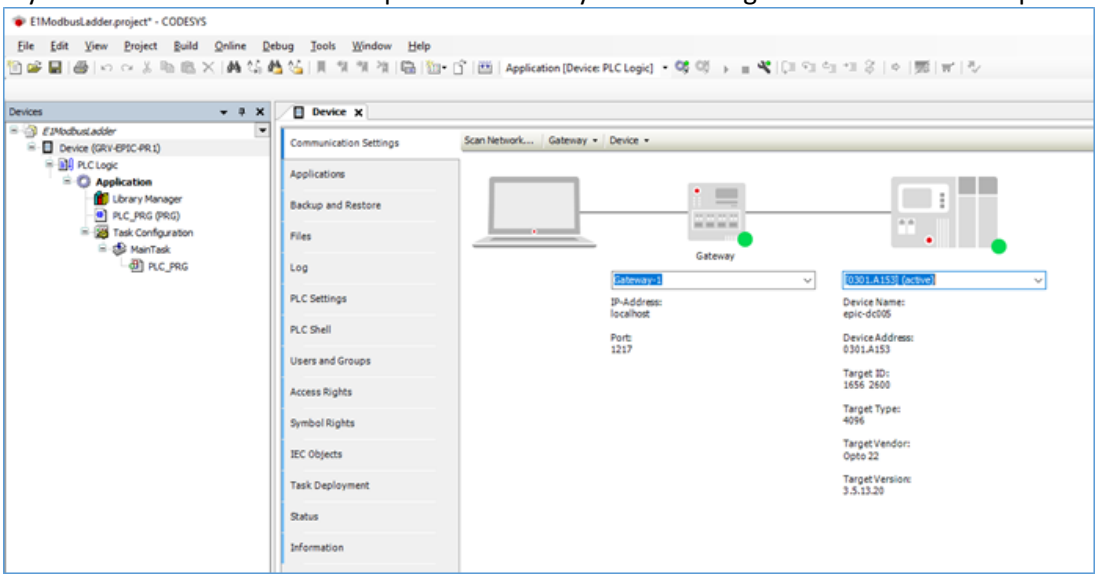
The Device (GRV-EPIC-PR1) now appears as a tab in the main workspace area.
Click on the *Scan Network…* button.
Note the green dot by the Gateway. This indicates you can communicate to the network. The black dot indicates that we are not yet talking to the Epic itself. That will be next.



The Scan Network screen will display the Epics you have on the network. In this example there is only one named *epic-dc005*. Select the Epic you want to run the ladder logic program and click the *OK* button to close this screen.



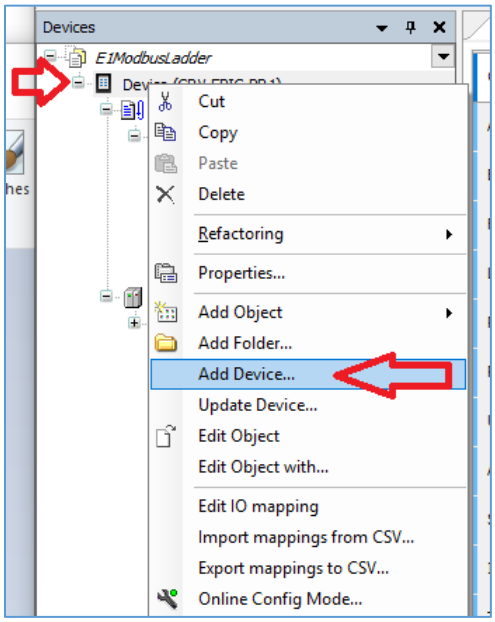
If your communications to the Epic is successful you will see a green dot next to the Epic device.



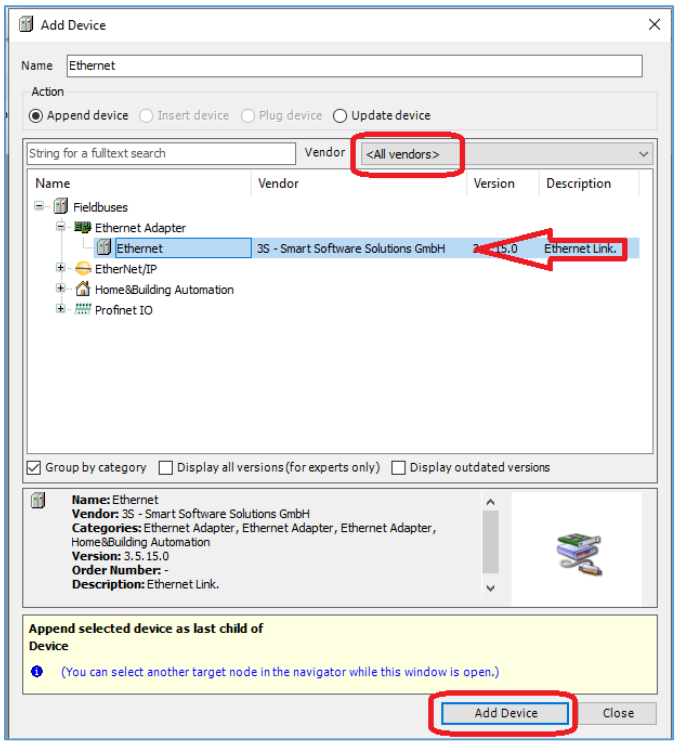
3. Add the Modbus Master and Slave

Add the Modbus device by adding the Ethernet interface, then the Modbus Master, then the Modbus Slave device (the E1 brain).

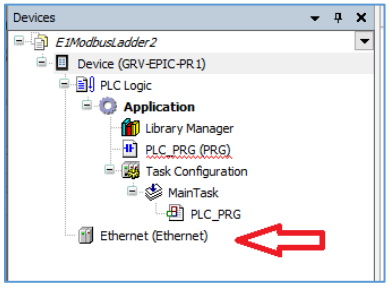
Near the top of the Device Tree, right-click on Device (GRV-EPIC-PR1)
Then select Add Device.



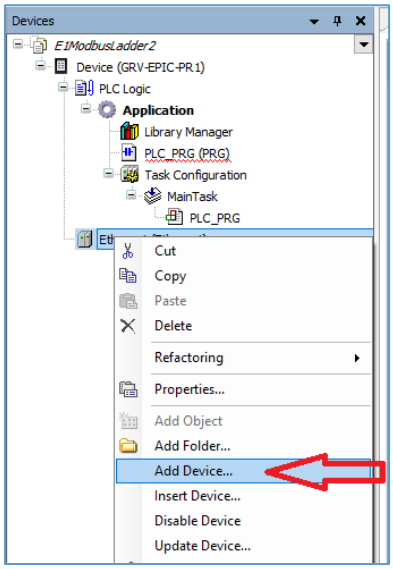
In the Add Device window, make sure Vendor is set to *<All Vendors>*, then under Fieldbuses and Ethernet Adapter select *Ethernet*, then click *Add Device* at the bottom of the window. Then *Close* the window.



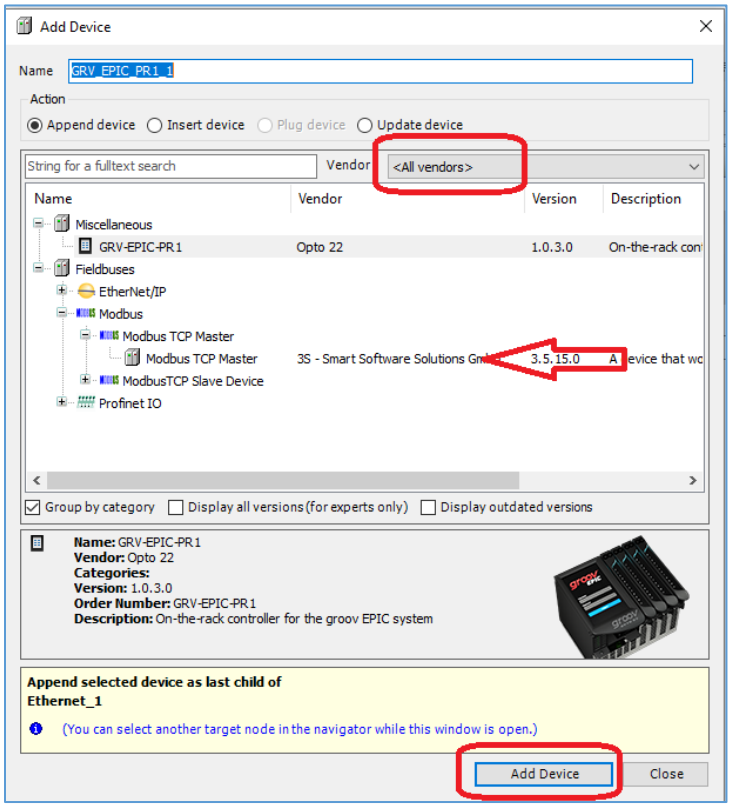
The Device Tree should now show the Ethernet device that represent the Epics connection to the Modbus network.



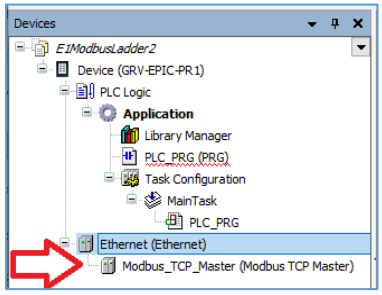
Right-click on the new Ethernet device and select *Add Device…*



For the Add Device screen, for Vendor select *<All vendors>* .
Then under *Fieldbuses* select *Modbus*, then select *Modbus TCP Master*, then finally choose *Modbus TCP Master*.
Click the *Add Device* button. Then Close the window.



The Device Tree now shows the Modbus Master device



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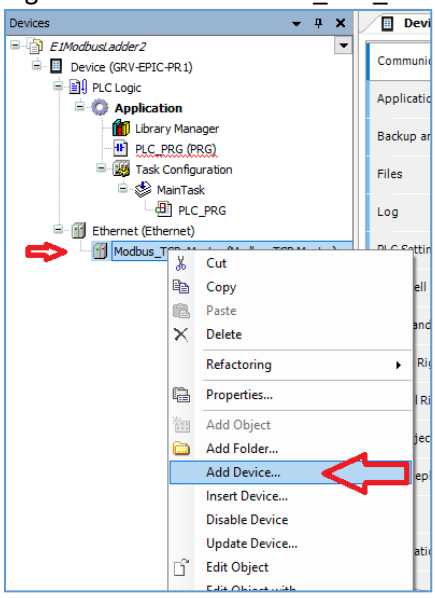
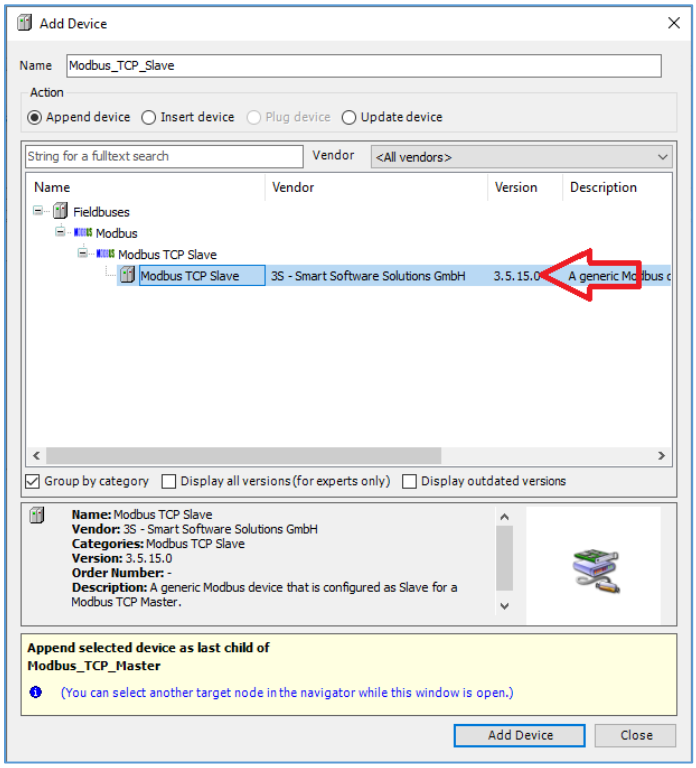
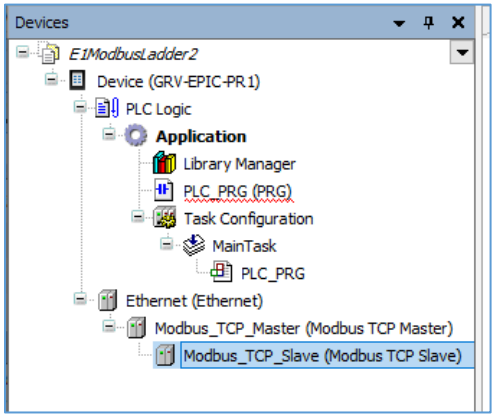
Right-click on the Modbus_TCP_Master (Modbus TCP Master) and select Add Device…



For the Add Device screen select *Modbus TCP Slave*.
Click the *Add Device* button. Then Close the window.

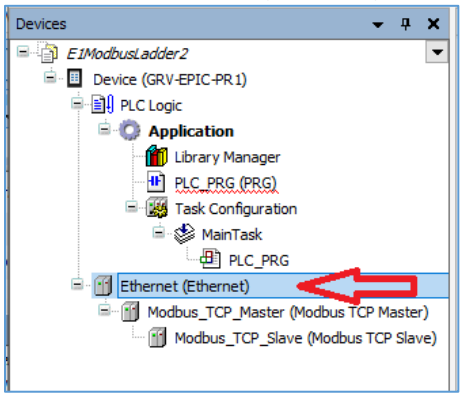


Now the Device Tree should look like the following, with the Modbus Slave under the Modbus Master.

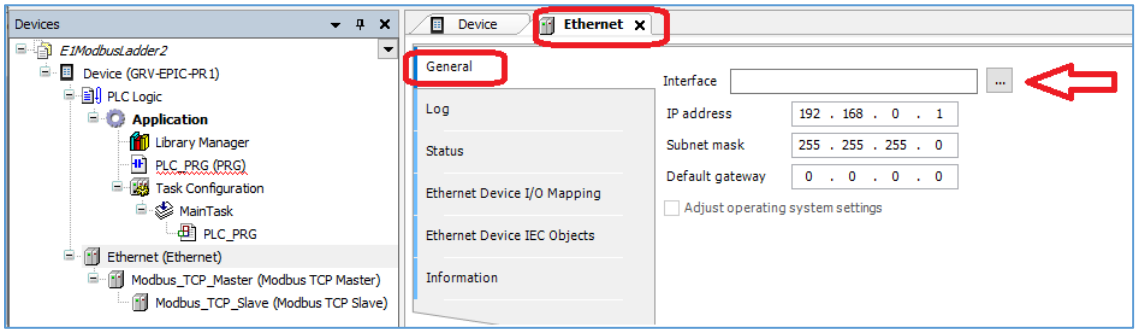


Next we assign the Ethernet port the Epic uses to communicate to the Modbus TCP devices. From our diagram, this is eth1.

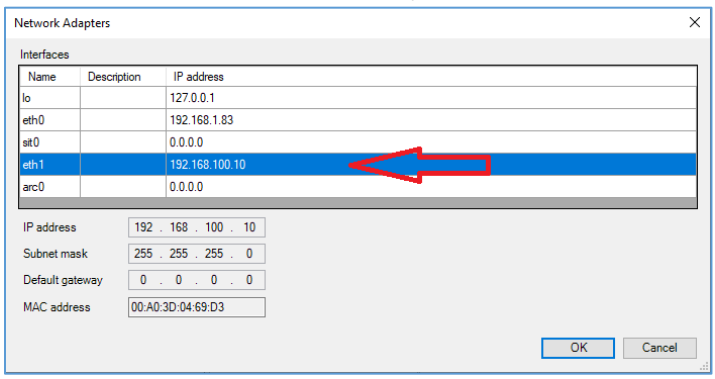
Double-click *Ethernet (Ethernet).*



This puts an Ethernet tab on the main workspace area. There are sub-tabs across the left edge, make sure you have the General tab selected. Then click the ellipse box to select an Interface.

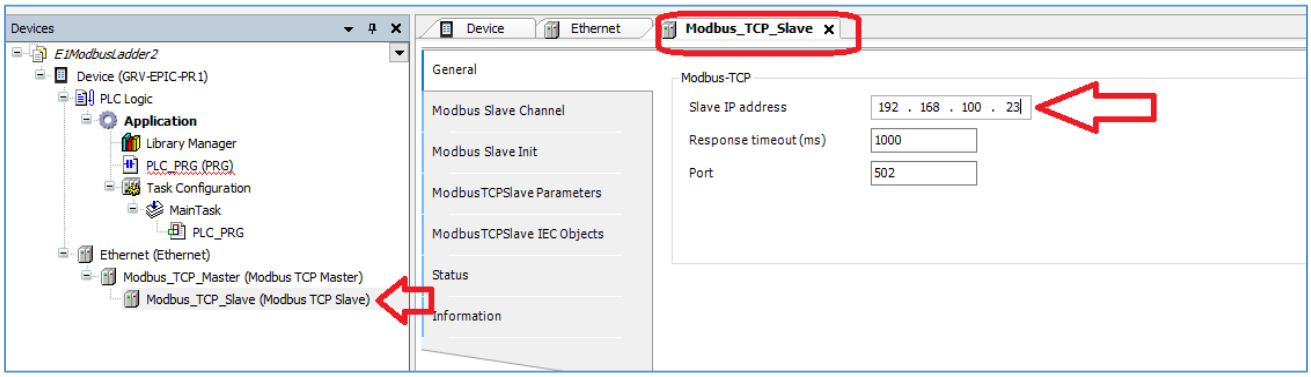


The screen for selecting the Ethernet port on the Epic will display. For our example, the eth1 port is being used for the Modbus TCP network. Select *eth1*, then click *OK*.



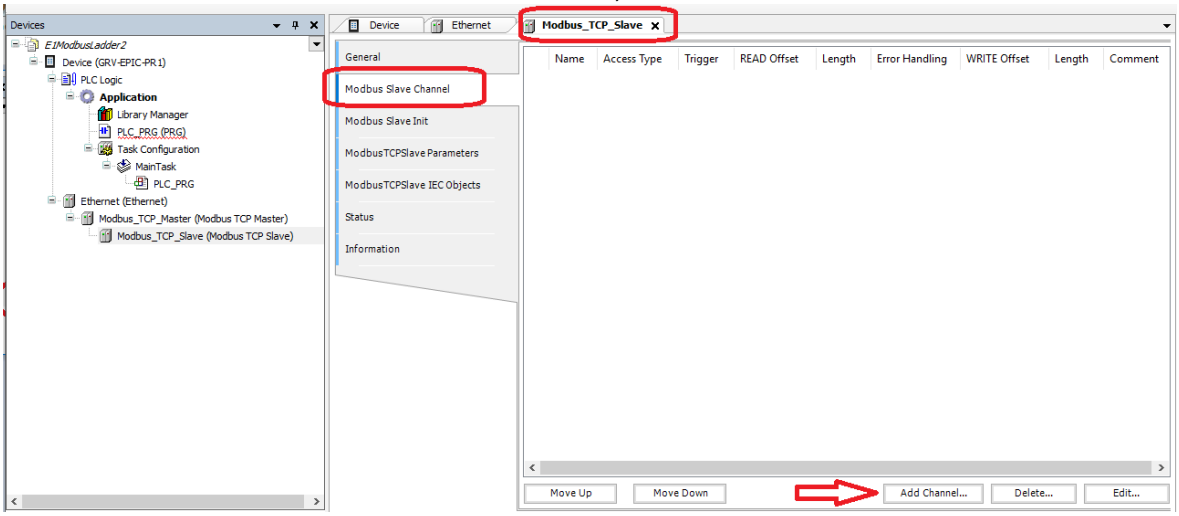
Next we configure the IP Address for the Modbus Slave device, which is the E1 brain board.
In the Device Tree, double click on *Modbus_TCP_Slave (Modbus TCP Slave).*
This will create a tab across the main work area of the screen.

For the *Modbus_TCP_Slave* tab, make sure you are on the *General* subtab on the left edge, then enter the *Slave IP Address as 192.168.100.23*. That is the IP Address of our E1 Brain board.

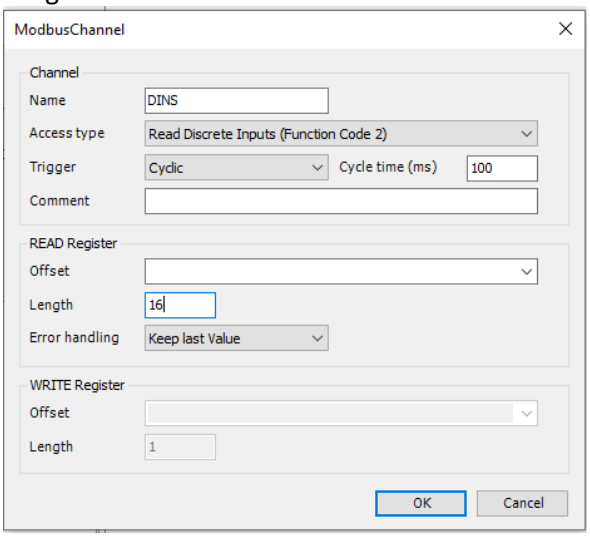


4. Map Tagnames to the Modbus Digital Inputs and Outputs on the E1

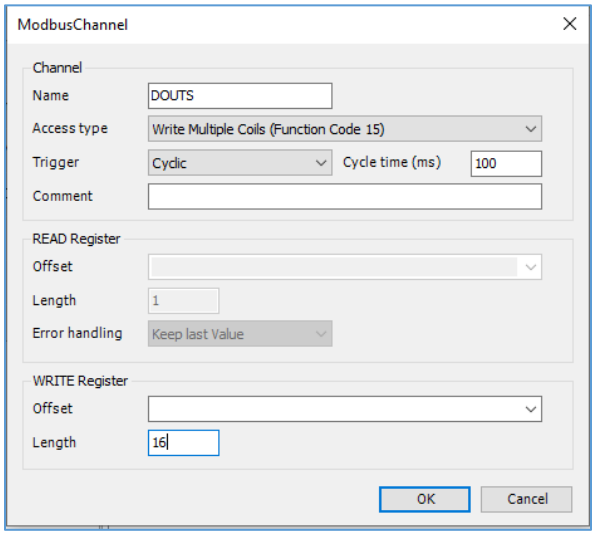
In the Device Tree, double click on *Modbus_TCP_Slave (Modbus TCP Slave).*
This will create a tab across the main work area of the screen.
Select the *Modbus Slave Channel* subtab on the left, then click *Add Channel…*



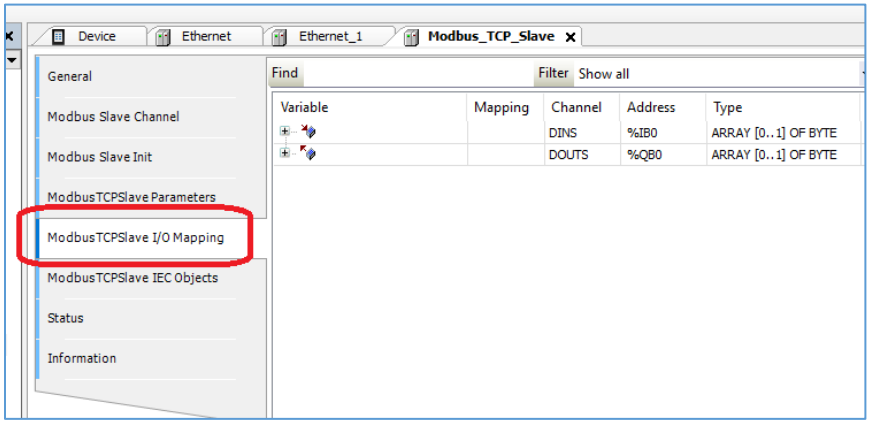
Enter the following to define the digital input channel on the E1. Then click OK.
We are configuring 16 digital inputs, although I only have 4 plugged into the IO Rack. We can add more modules later.
Name : DINS
Access Type: Read Discrete Inputs (Function Code 2)
Length: 16



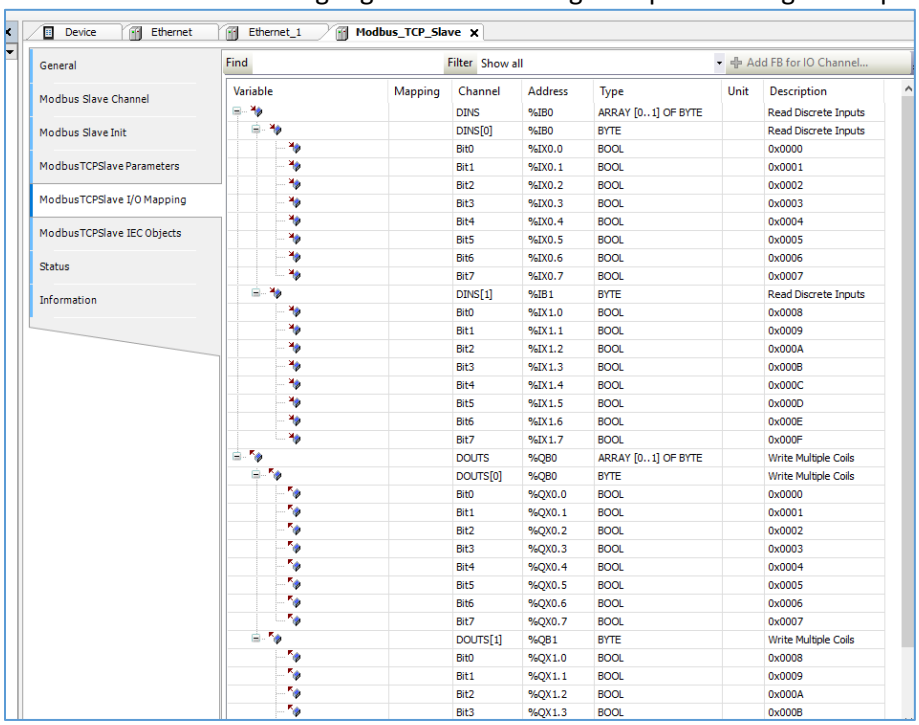
Click the Add Channel… again to define the digital outputs.
Enter the following to define the digital output channel on the E1. Then click OK.
We are configuring 16 digital outputs, although I only have 4 plugged into the IO Rack. We can add more modules later.
Name : DOUTS
Access Type: Write Multiple Coils (Function Code 15)
Length: 16



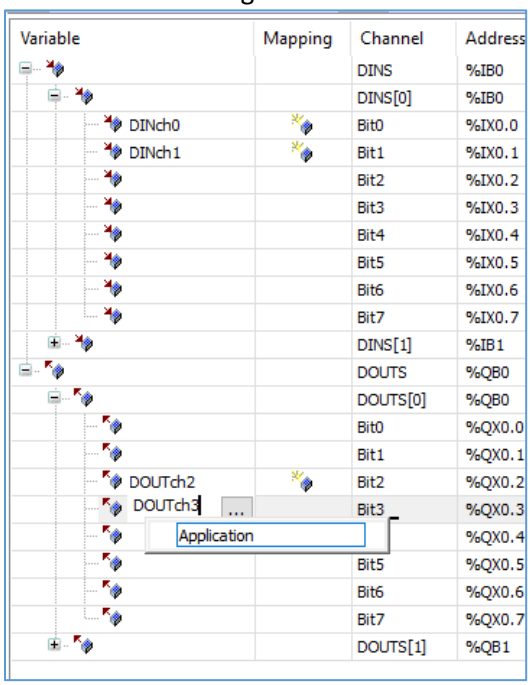
From the subtabs along the left edge, select *Modbus TCP Slave I/O Mappings*.



Under the heading called Variable, click both of the + to expand those sections.
Then click the + again to continue to expand the entire hierarchy.
This is the area for entering tagnames for the digital inputs and digital outputs.

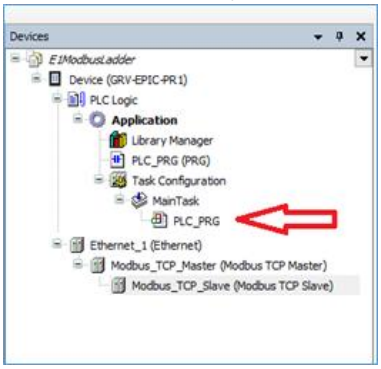


The tagnames are entered adjacent to the Channel bits. Just click in the blank area and type the tagname.
Here we are entering channel 0 and 1 as DINch0 and DINch1. And channel 2 and 3 as DOUTch2 and DOUTch4.

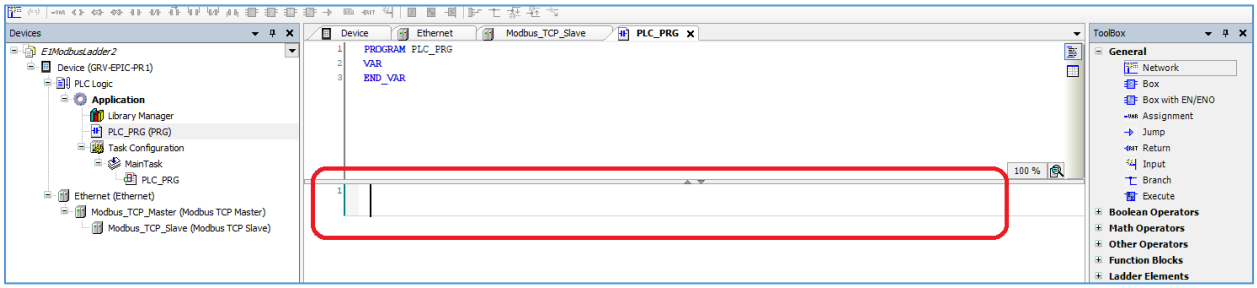


5. Create the Ladder Program

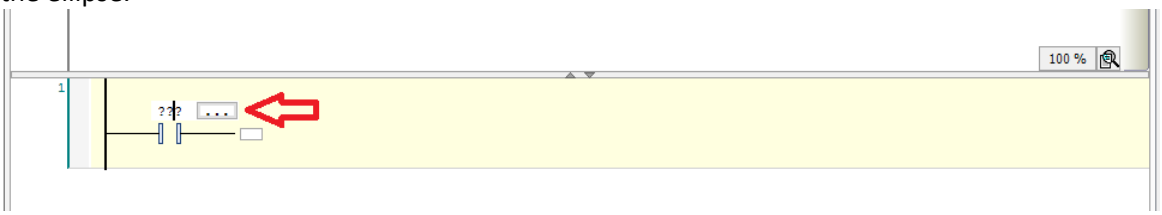
The ladder logic program will be one rung.
When DINch0 is closed, turn on DOUTch2.
On the Device Tree, double-click on *PLC_PRG.*



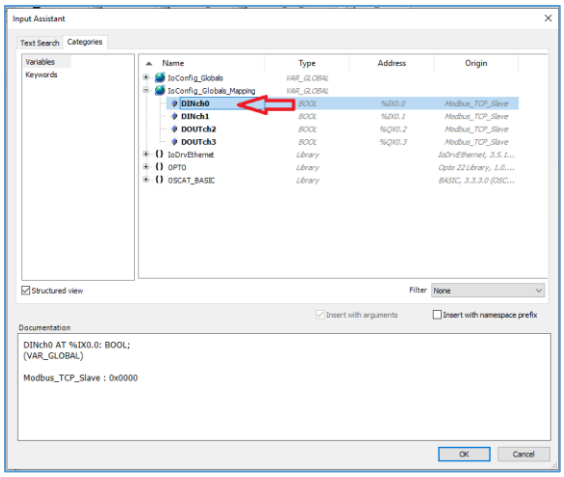
This will load the PLC_PRG program tab into the main working area of the screen.
The area circled below is for the ladder logic.
To start, add a contact, click-right in the ladder section and from the pop-up menu select *Insert Contact.*



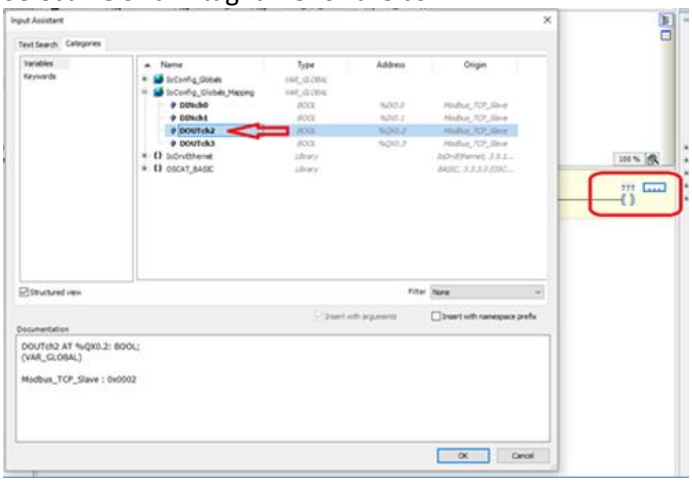
This will put a contact in the rung. To assign the contact to a tagname, click in the ???, then an ellipse will appear. Click the ellipse.



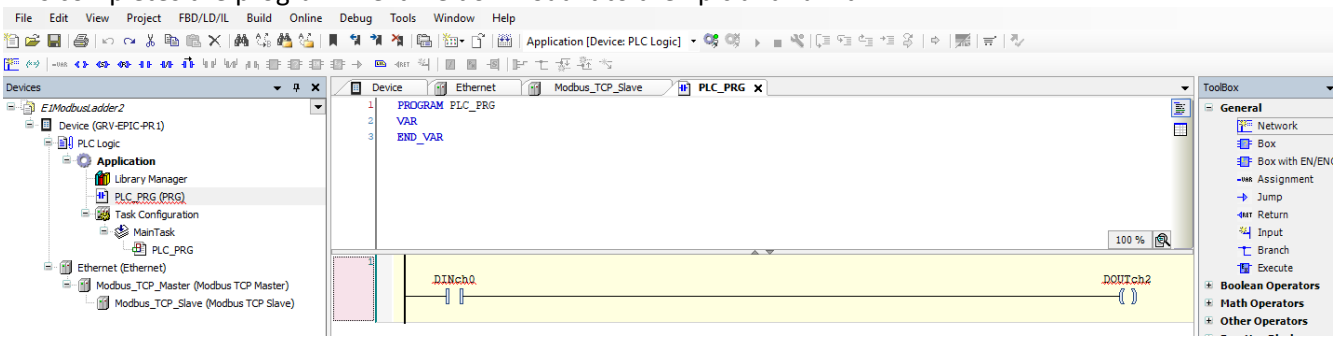
From the Input Assistant screen, expand the section called *IOConfig_Globals_Mapping* and select the *DINch0* tag. Then click *OK*.



To add the coil, click-right in the ladder section and from the pop-up menu select *Insert Coil.*
To add the coil to the rung, right-click and select *Insert Coil*.
Select DOUTch2 tagname for the coil.



This completes the program. Next we download it to the Epic and run it.

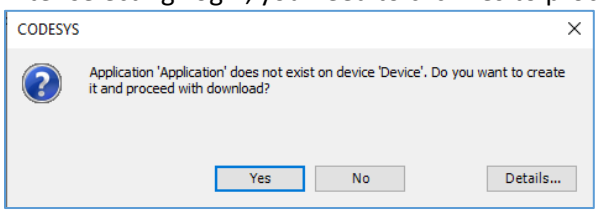


6. Download and Run Program

To download and run the program, we first need to Login.

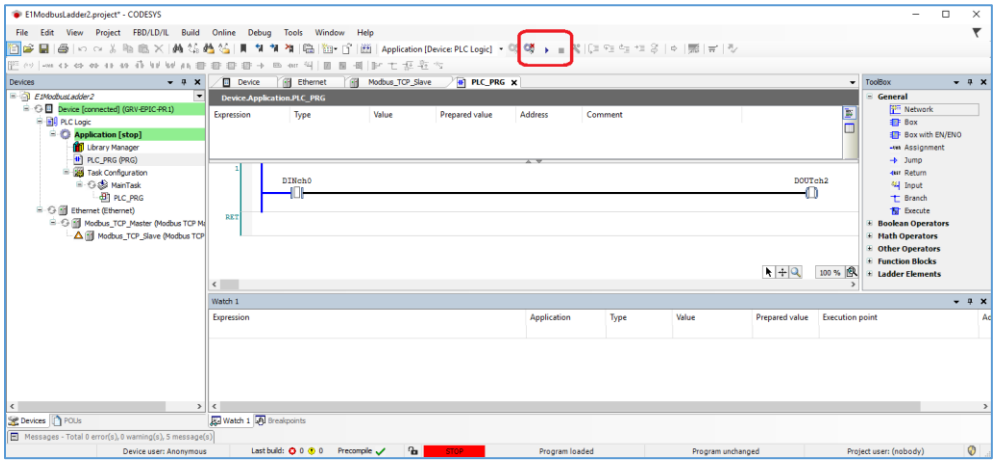
You can click the *Login* icon on the toolbar, or select *Login* from the *Online* pulldown menu.

After selecting Login, you need to click *Yes* to proceed.



After a moment you will be logged in and online.

Click the Start icon (or pulldown menu Debug | Start) to run the program.



Here is shown the program running and the DINch0 activated, which activates DOUTch2.