Functional Description

Name: Modbus TCP Setup in Codesys

Software Used: CodeSys V3 SP18

Communication Protocol: Modbus TCP

Hardware Compatibility:

- Applied Motion Drives with Modbus TCP compatibility

References:

- Host Command Reference Manual

Table of Contents

Overview

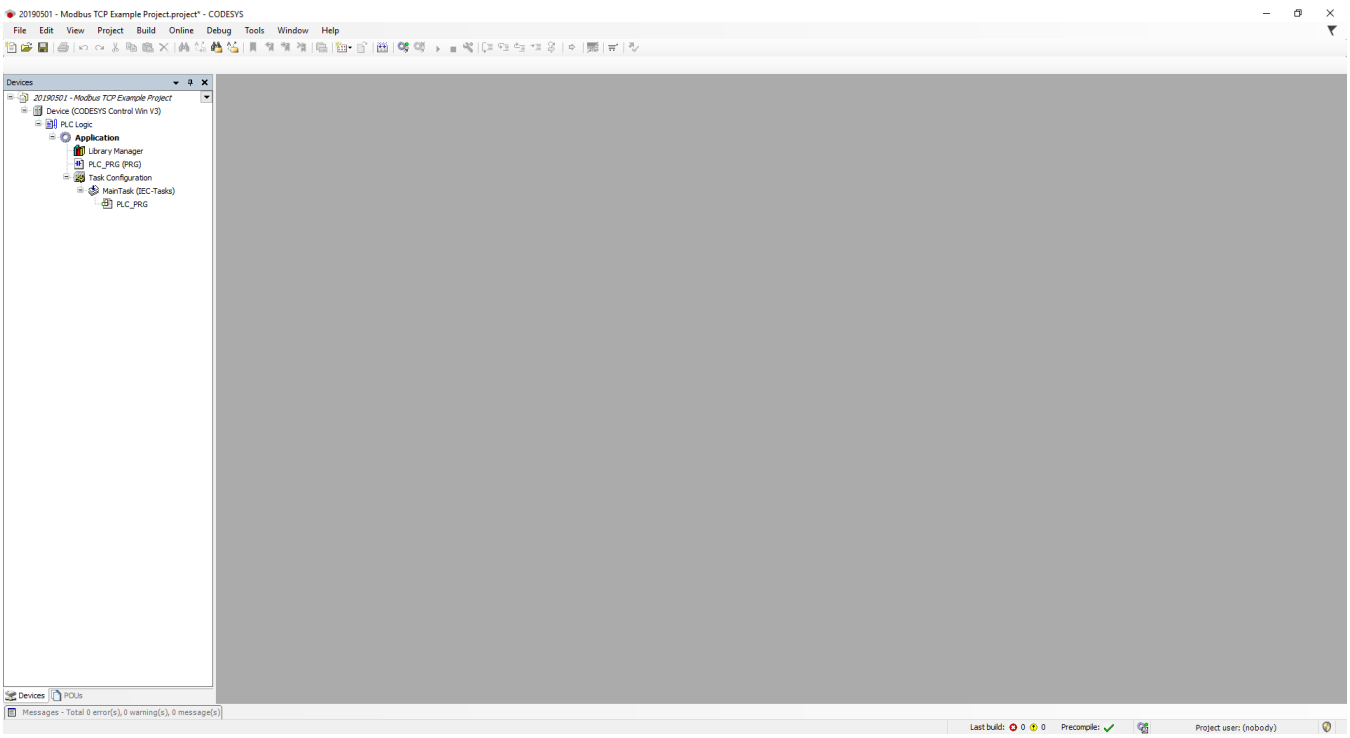
The primary purpose of this document is to show how to connect the different product lines offered by Applied Motion Products into the Codesys Development Platform. Codesys, as well as being the programming platform behind a number of the largest PLC manufacturers in the world, allows for multiple communication protocols to be used simultaneously. This document has been made to show how to connect your Applied Motion device (Drive or Integrated Motor) to your Codesys project over Modbus TCP.

Modbus TCP Device Setup

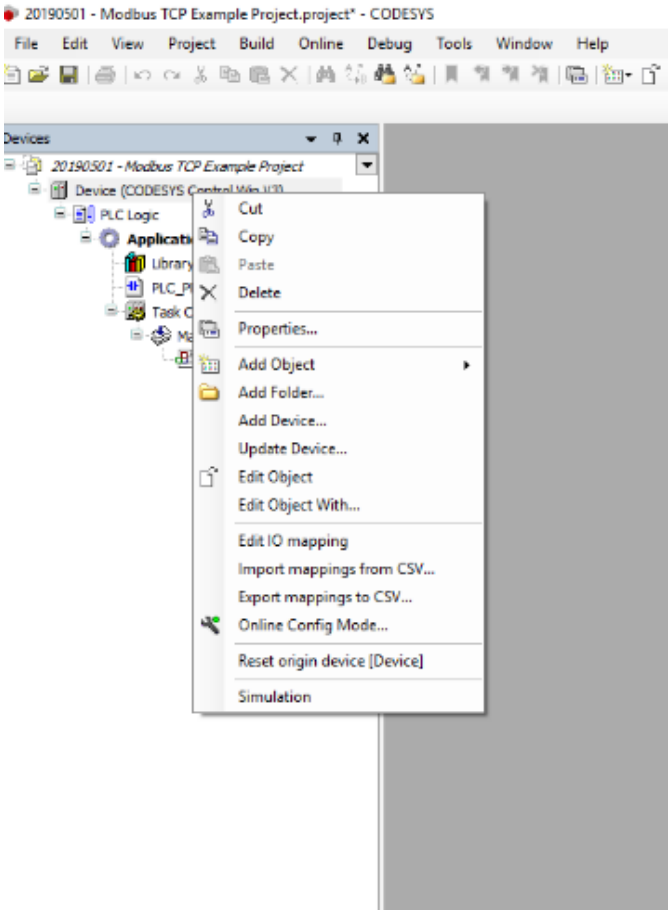
Below is a step by step instructions for how to connect an Applied Motion Products Modbus TCP Device in Codesys V3. For this example, the project will be a blank new project. It will be noted which steps can be used to add an AMP device to an existing Codesys Project.

New Blank Codesys Project – Generic Ethernet Device

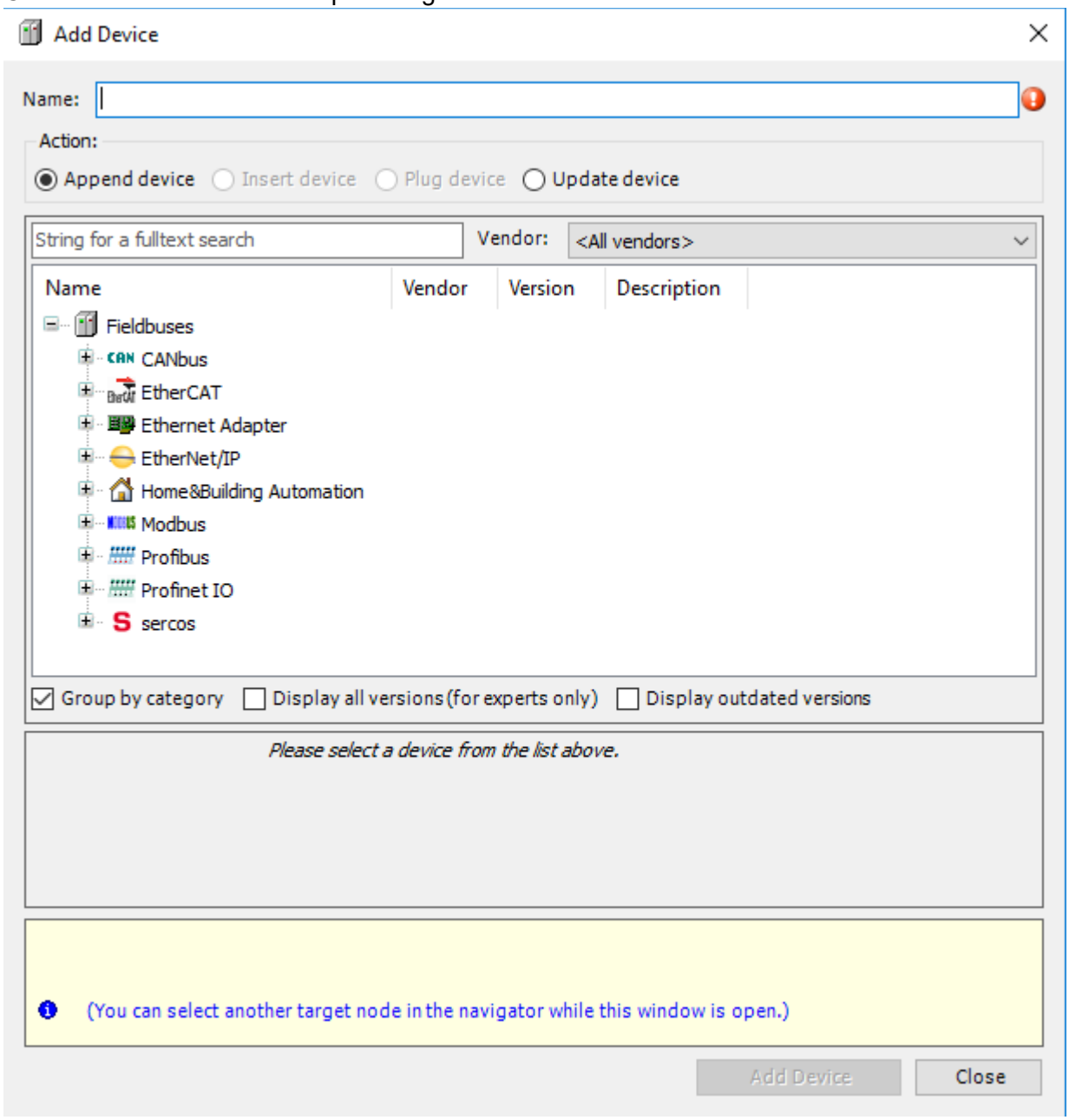
1. Begin by opening a blank project.
    a. For this example project, the main PLC_PRG will be in Ladder Logic



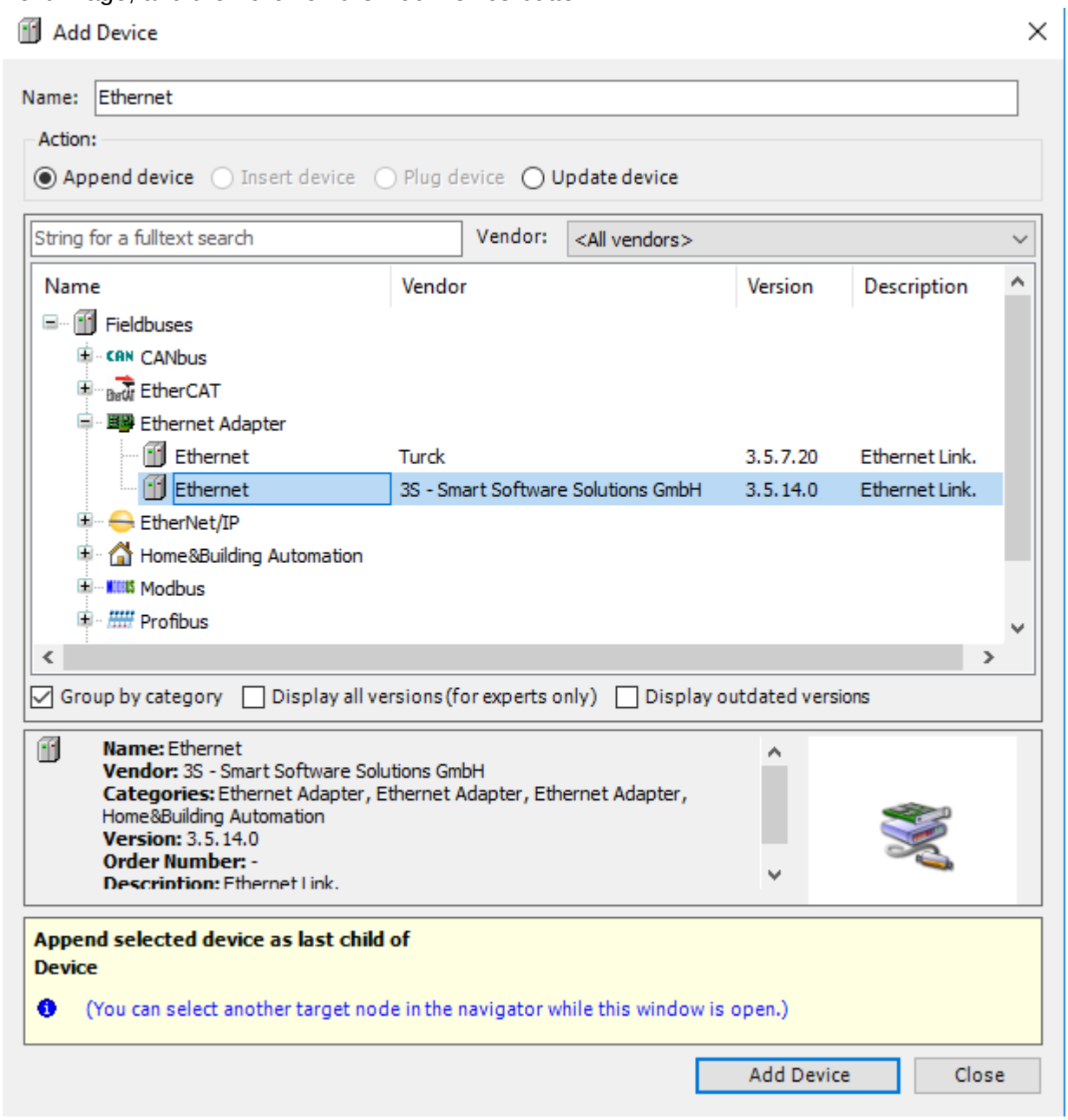
2. Begin by Right-Clicking on the Device
    a. For this example, Device (Codesys Control Win V3)



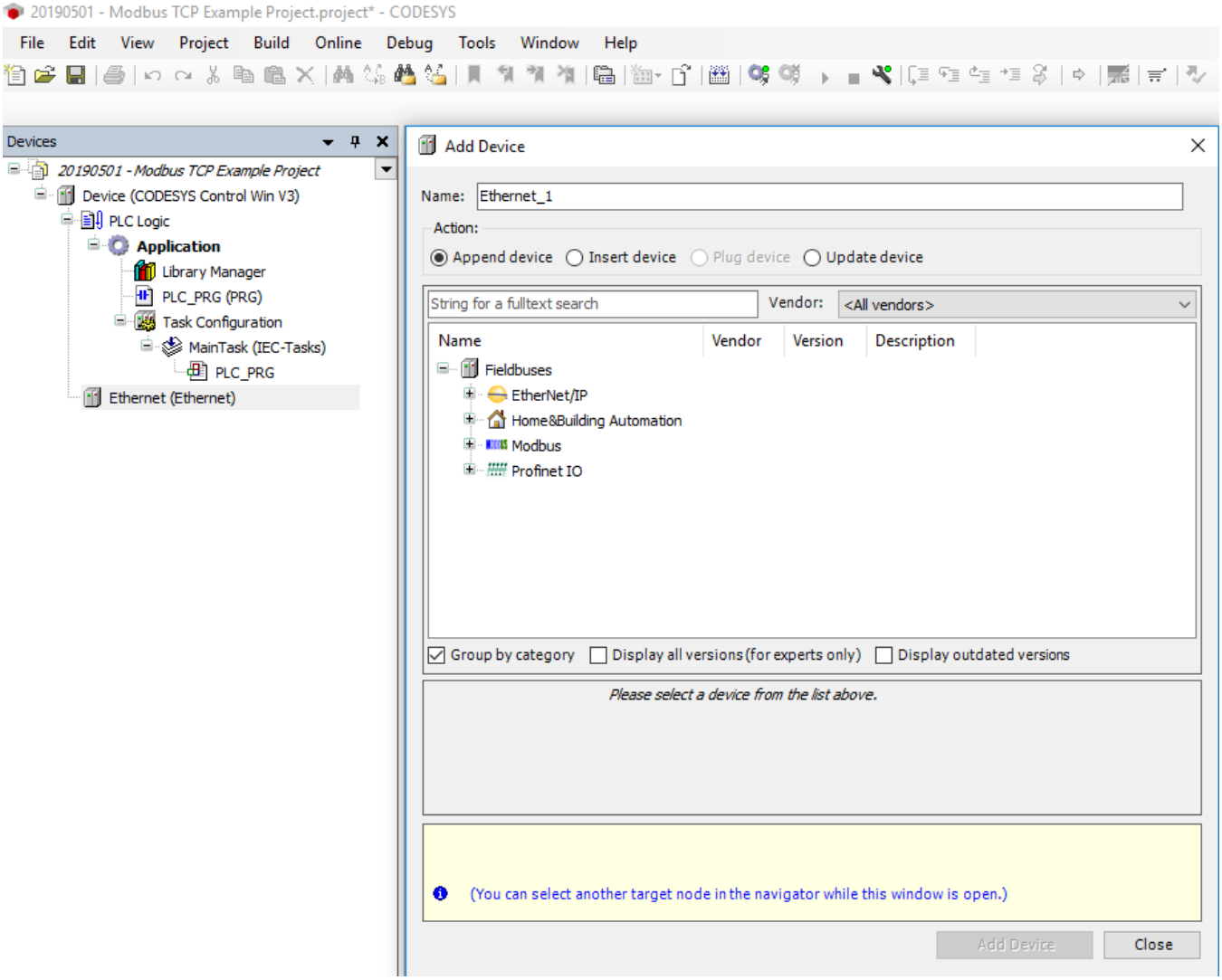
3. Choose the ‘Add Device…” option to get the follow screen:



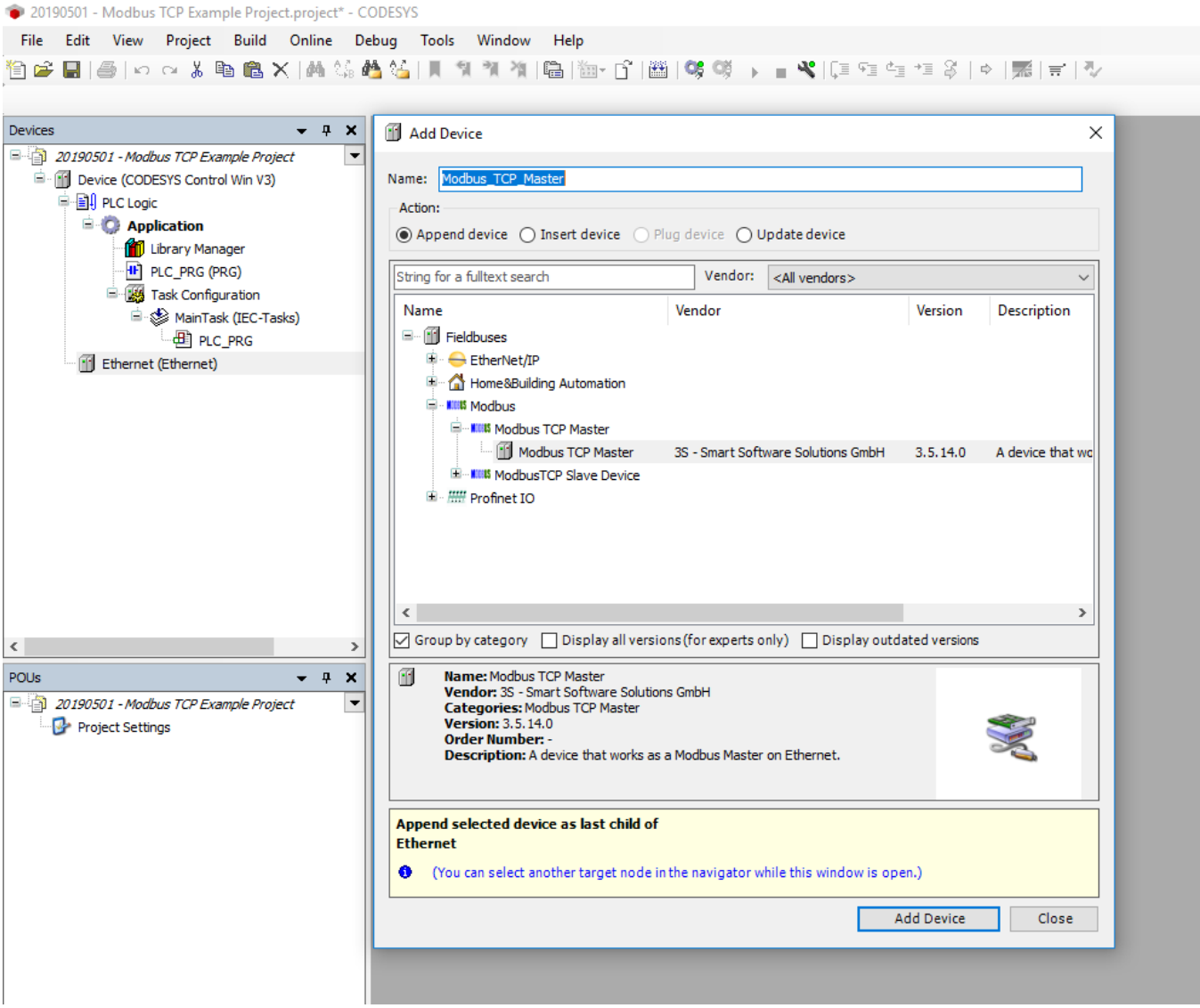
4. Select Ethernet Adapter and then Ethernet 3S – Smart Software Solutions GmbH shown in the next image, and then click on the Add Device button.



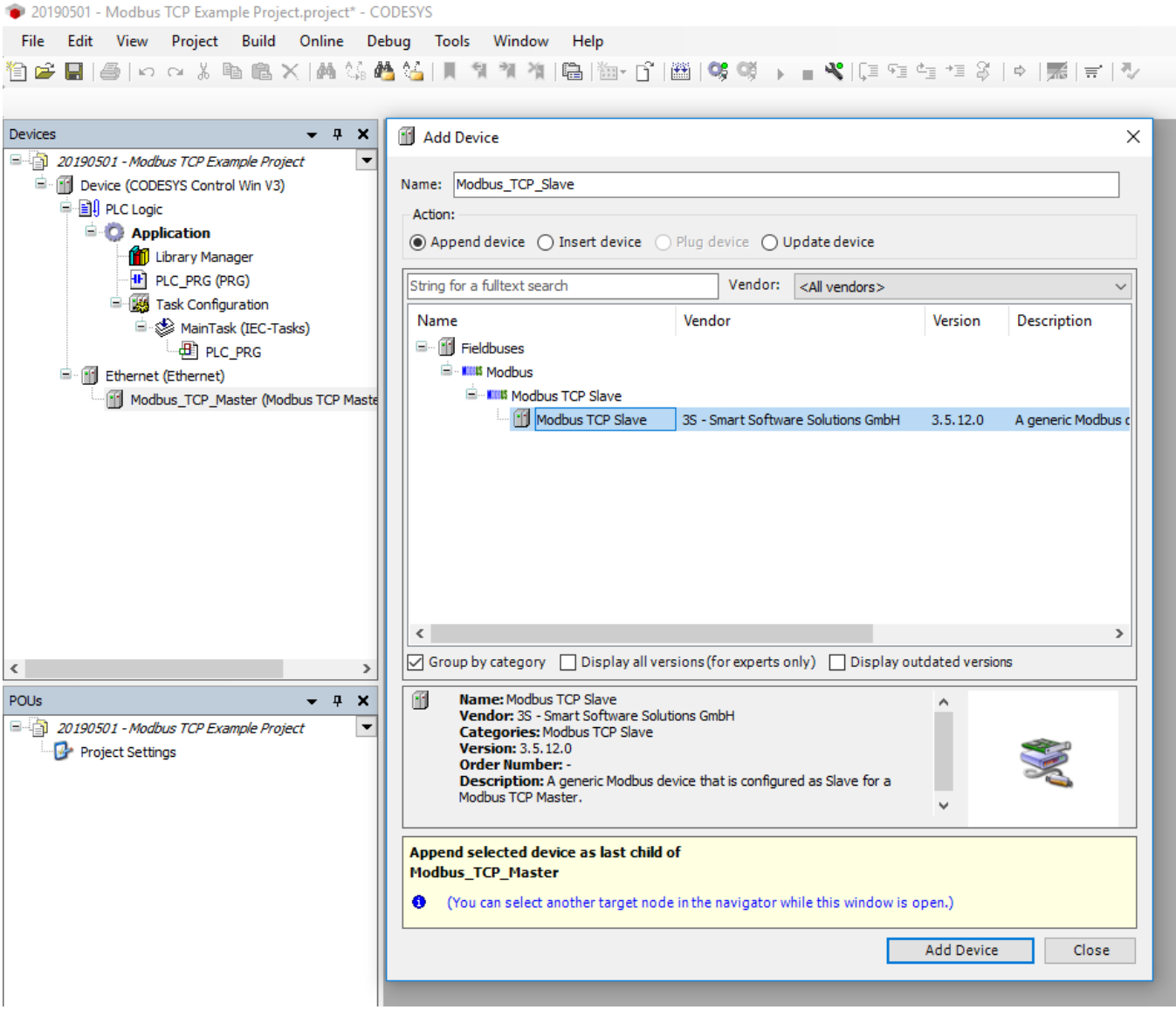
5. Once the Ethernet Device is added, the Add Device window will not disappear. Move the mouse over to the device tree and click on the new Ethernet Device that was added to the tree to have the Add Device window update to the following screen. If you have already closed the window, right click on the Ethernet device and select Add Device to get back to the Add Device Window seen.



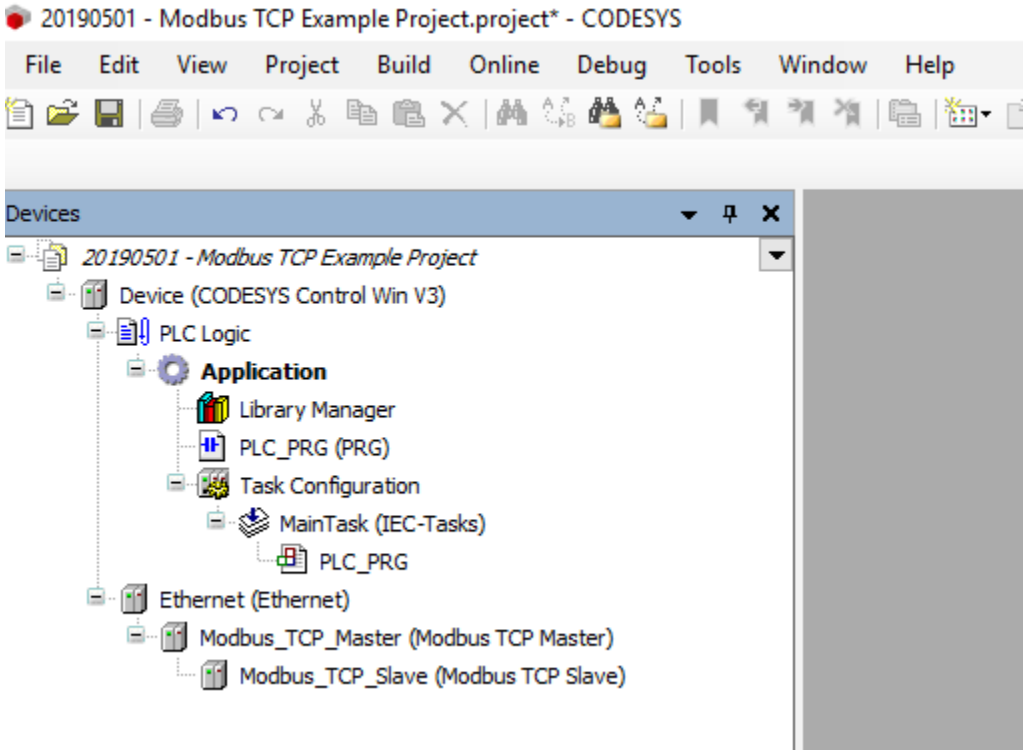
6. Under Fieldbuses, expand Modbus Option to show the Modbus TCP Master and ModbusTCP Slave Device Options. Expand the Modbus TCP Master Option to so the Modbus TCP Master Device from 3S show below. Click Add Device to add your TCP Master to the Device File Tree.



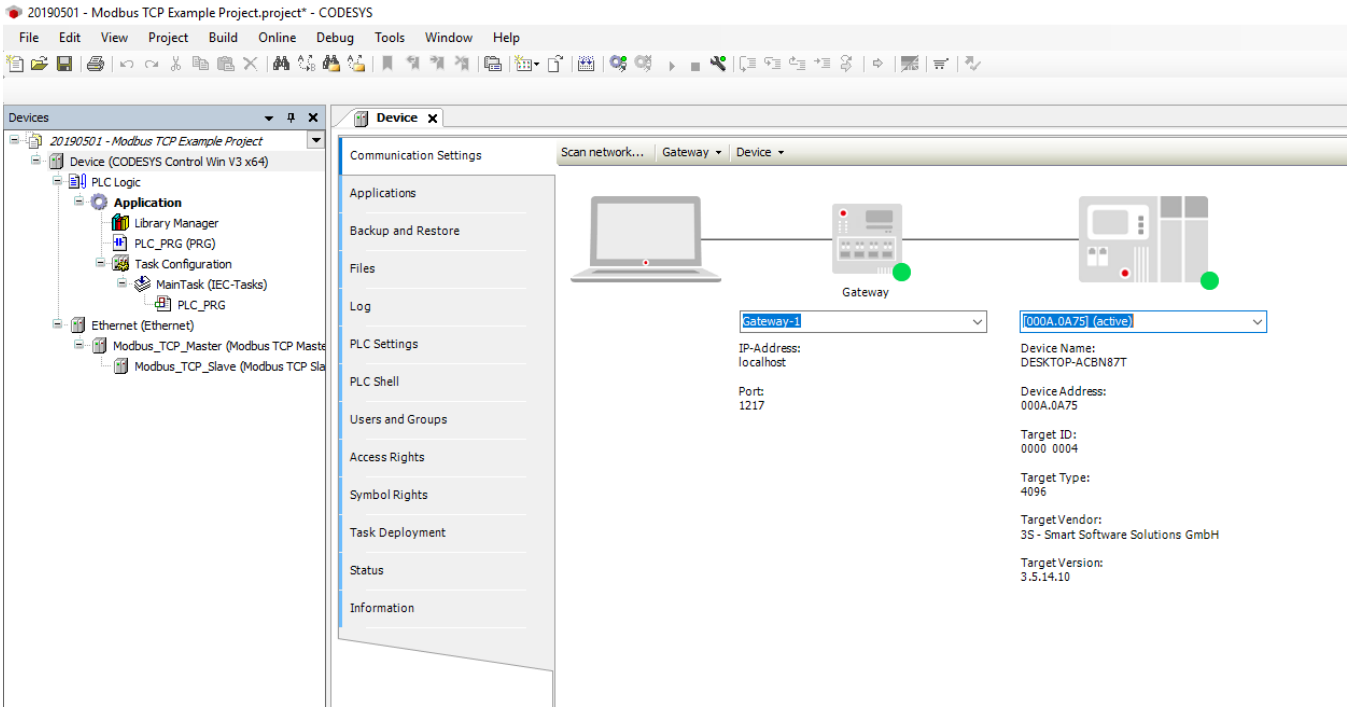
7. One the Modbus TCP Master has been added, do not close the Add Device window or right click on your TCP Master to get back to the Add Device option. This should bring up the option to add a Modbus TCP Slave. Expand any options you have until the Modbus TCP Slave from 3S is present and then click add device, shown below.



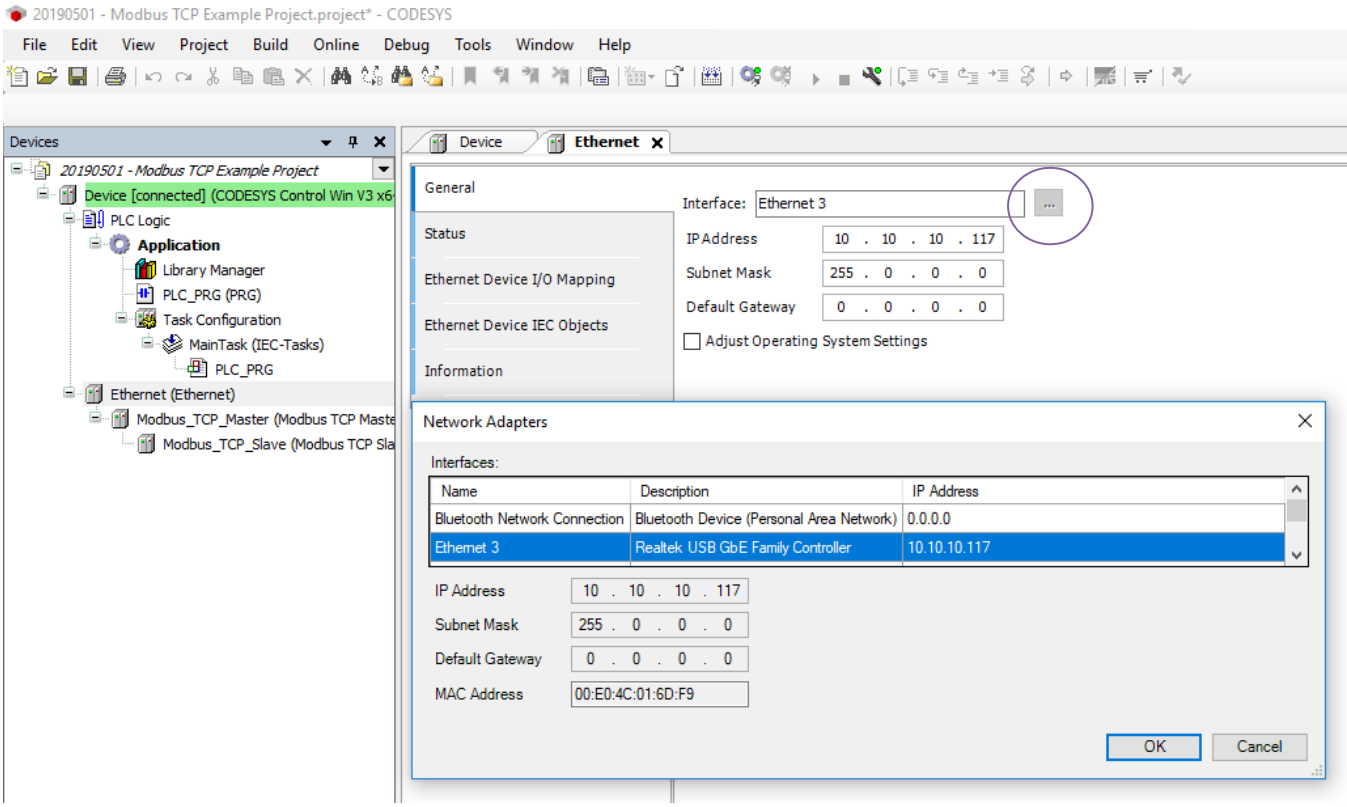
8. Once the slave device has been added, close out of the Add Device Window. The Device Tree should look like the image below.



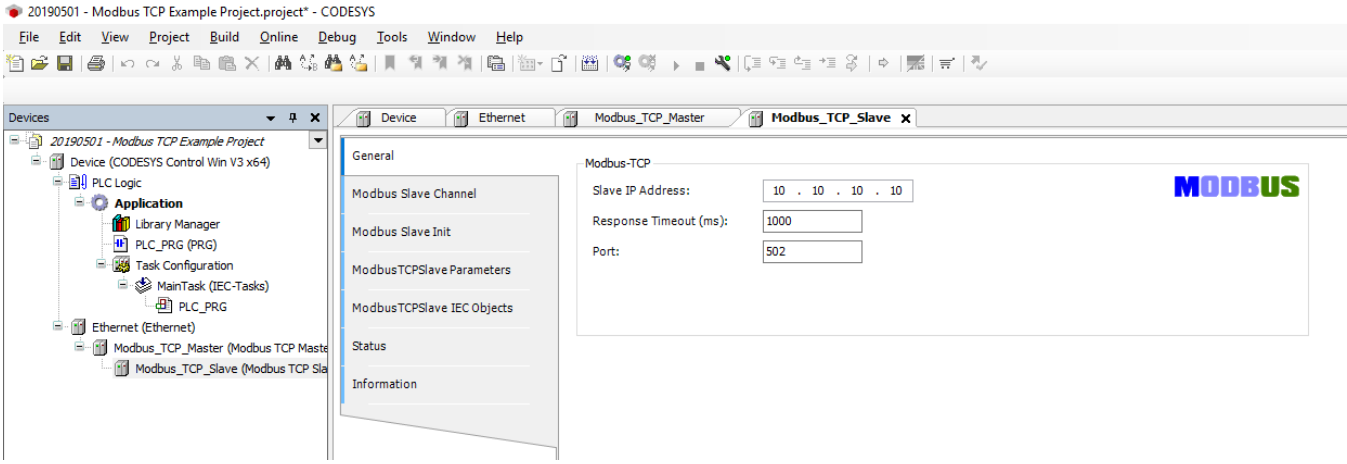
9. After all devices have been added, setting the communications for each one is required. For this example, the Codesys Virtual PLC will be utilized. Double-click on the Device to get the following screen. Using the default Gateway-1 that was created in the initialization of a Standard Project, Scan the Network to find the Virtual PLC.
***Note**: If Codesys Control Win Sys Tray has not been initialized no PLC will be found in the network discovery. Once Codesys Control Win Sys Tray has been initialized in the system tray, right-click to Start and Stop the PLC. The PLC must be Started before network discovery will be successful.*



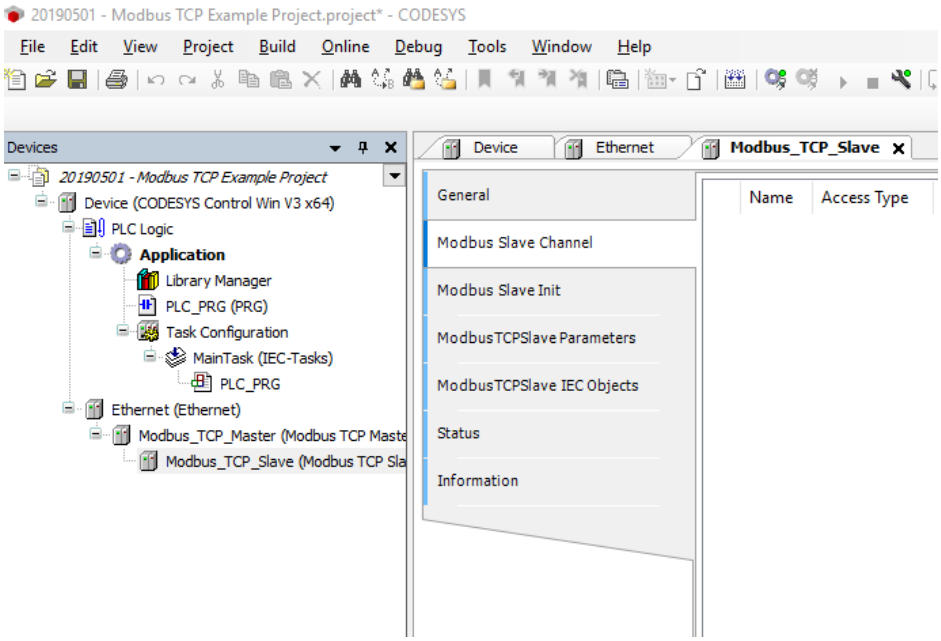
10. Upon completion of PLC Setup, Double-Click on the Ethernet Device from the Device Tree. Click on the [...] box after the interface to select the ethernet port your PLC will be using. For this Example, an Ethernet to USB-C Adapter is connected to an Ethernet Switch. The Ethernet 3 Adapter has been configured to a Static IP address of 10.10.10.117. This Network Adapter will be used for this example as seen below.
***Note**: See Applied Motion Product's Host Command Reference Appendix G: Option 1 for additional information on setting a static IP address. Link for Rev. T of the Host Command Reference included in Appendix A of this Application Note.*



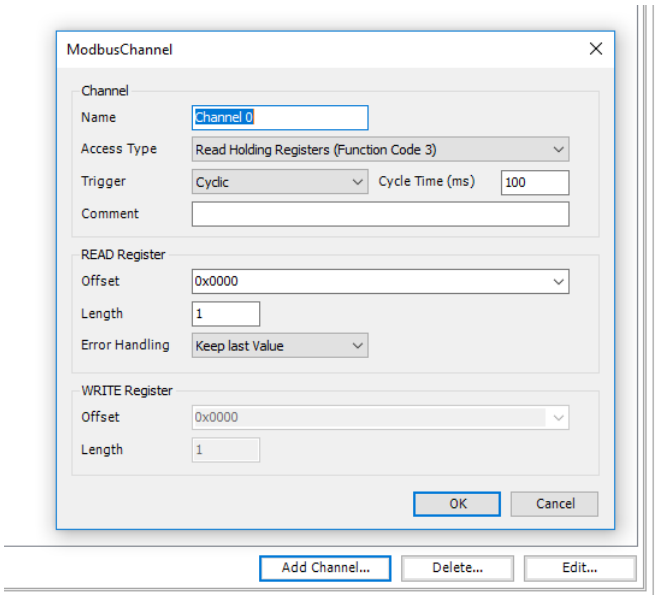
11. To access the device options, double-click on the desired device. For the purposes of this example, No Changes need to be made to the Modbus_TCP_Master device. Start by double-clicking on Modbus_TCP_Slave. This should bring up the Device options in the main work area of Codesys. For this example, the default IP address of the drive will be 10.10.10.10.



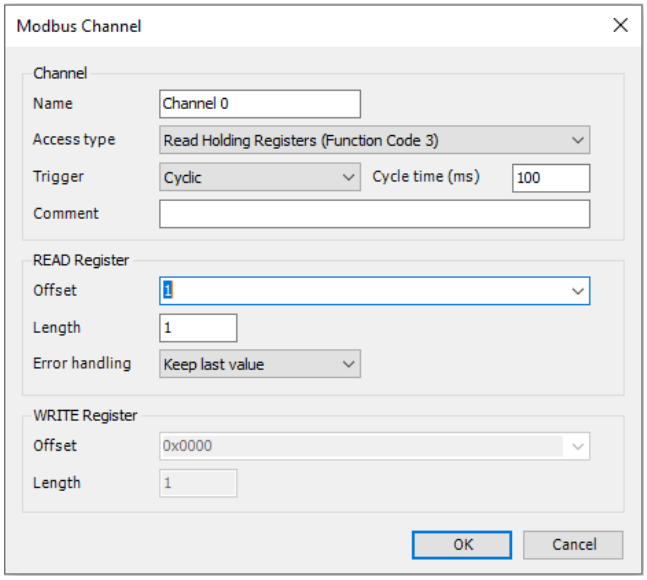
12. Once the IP Address of the Drive has been established. The registers to be read and written to need to be established. The AMP Host Command Reference details which Modbus functions are supported by the Applied Motion Drives. For this reason, this example will show how to set up a new channel to read a register and how to write to a register. An STF06-IP is the device being connected to, so the Modbus Register Map is found on page 398 of Rev. W of the Host Command Reference.
    a. Modbus TCP Read Channel:
        i. Click on the Modbus Slave Channel Tab under the Modbus_TCP_Slave Device.



ii. Click on the Add Channel... button at the bottom of the page to bring up the ModbusChannel box.

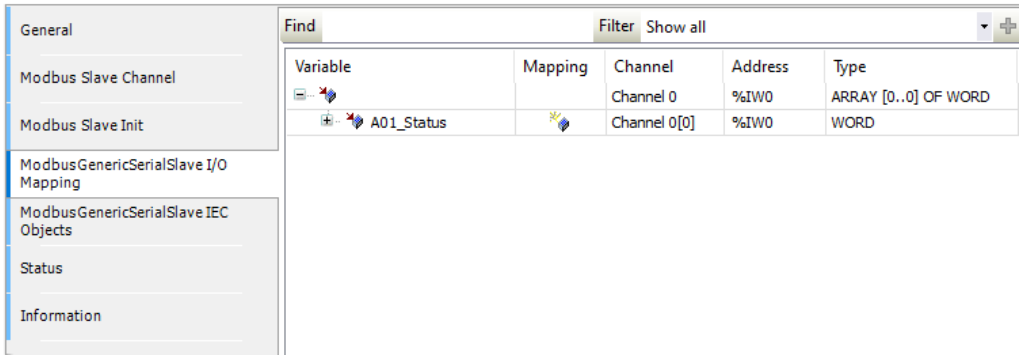


iii. For this example we will look to read the Status Code found at Register 40002 for the STF Drive. The Status Code is listed as a SHORT, giving it a length of 1 register. LONG registers will have a length of 2 in the setup. Additionally, for LONG register, the offset should be set according to the smaller of the two registers it encompasses.
***Note**: Codesys will automatically add the 40000 offset needed in some programs. To read the 40002 register, an offset of 1 is required.*



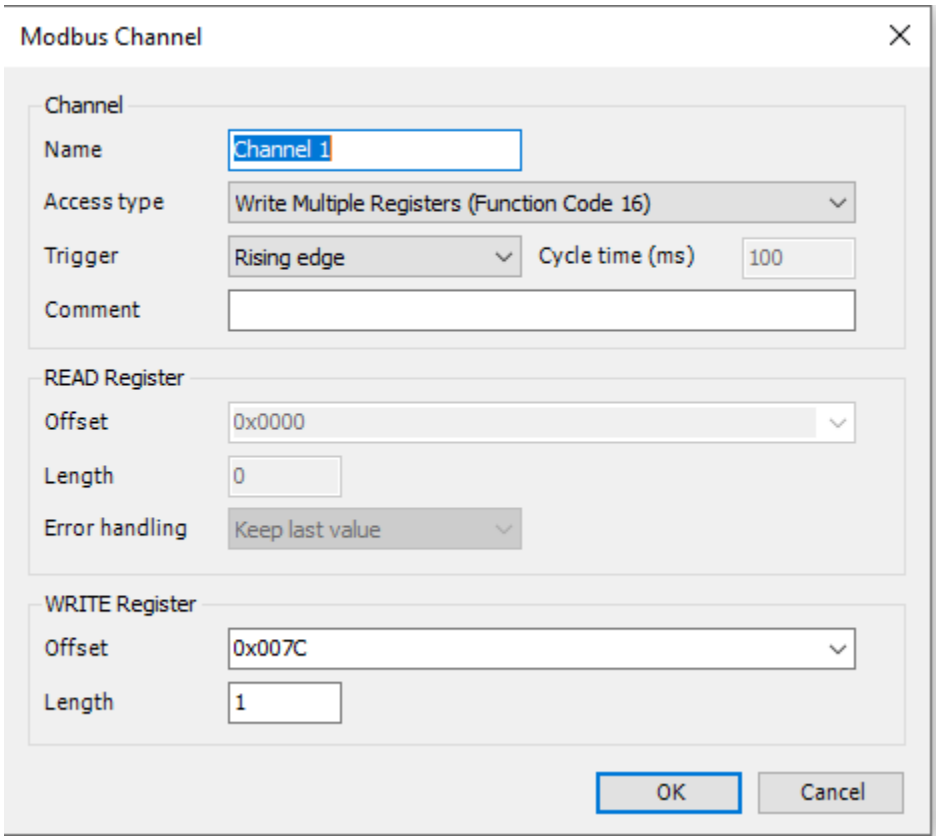
iv. To setup the register to work within the Codesys Applications, you then need to map the register. Go to the Modbus I/O Mapping and expand the newly created channel 0 array. The first word will then be the 40002 register. By Writing a variable name such as A01_Status, the A01_Status

Variable is now a globally assigned variable name and can be directly accessed through the application.



b. Modbus TCP Write Channel

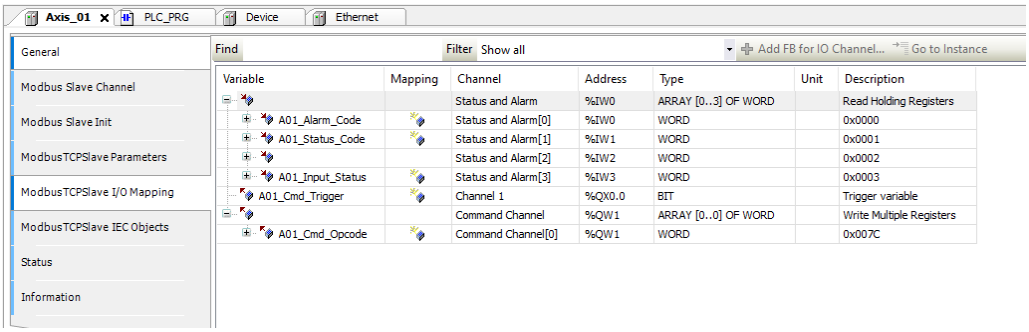
i. Write channel can be done exactly as the Read was set up but instead of using the Access Type Read FC03, you are going to use Write Multiple registers (FC16). Typically, it is recommended to set this up as a rising edge instead of a cyclic write, as the cyclic time can cause multiple commands to be sent by button press if not setup correctly.



ii. Once the channel has been created, it can be mapped the same as 4.a.iv

iii. In addition to mapping the word within the array, you will also need to map a trigger variable that can be toggled to send a single write of the

channel to the drive. In this case, it was setup to write a single register to 40125, which is the command Opcode for using Modbus within Codesys.



Conclusions

Once the registers have been correctly been made, both channel and mapping, the Applied Motion drive is now able to be controlled from Codesys. Please reference the Modbus Appendix in the Host Command Reference for full information on specific registers and scaling for the Modbus registers.

Appendices:

A. Additional Resource Links and Information

I. Host Command Reference, Applied Motion Products, Rev. W Link