Motors

**Automation**

Energy

Transmission and Distribution

Coatings

# CFW320 - AOI

## Configuration


**Driving efficiency and sustainability**

# Table of Contents

## WEG CFW320 AOI Configuration



**SUMMARY OF REVISIONS**

The information below describes the revisions made to this manual.

| Version | Description |
|---|---|
| 1.0 | Initial release of the document. |
| 2.0 | Updated to include additional information for setup and troubleshooting. |
| - | - |
| - | - |

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To ensure safe operation, observe all instructions in this manual, and the warning information in the other applicable documents for the variable frequency drive technology that is used.
Work on and with variable frequency drives, must only be carried out by qualified personnel.

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# About This Manual

This manual supplies the necessary information to operate the CFW320 drive using the Ethernet IP interface to communicate with a Rockwell PLC with an AOI. It must be used together with the CFW320 user's manual and programming manual.

This document is intended for qualified personnel experienced in the operation of the specified equipment and the installation of EtherNet IP networks. Proficiency in automation and programmable logic controllers, particularly with Rockwell Automation software, is required.

## REFERENCED DOCUMENTS

This manual was developed based on the following documents and tools:

| Document/Tool | Version | Source |
|---|---|---|
| CFW320 User's Manual | 10008951923 /00 | WEG |
| CFW320 Programming Manual | 10004274148 / 02 | WEG |
| Studio 5000 PLC programming software | 37 | Rockwell Automation |

These documents and tools can be referred to for additional information.

# Terms and Definitions

**AOI:** Add On Instruction. Add On Instructions are used to encapsulate and reuse logic in Rockwell PLCs.

**BOOl:** Boolean is a data type that has one of two possible values, which is intended to represent the two truth values of logic and Boolean algebra.

**CFG:** Configuration

**CIP:** Common Industrial Protocol. CIP connections are automatically established over a TCP connection and transfer data from one device on the EtherNet/IP network to another.

**DINT:** Double integer equates to 32 bits of data. Creating a DINT structure on the PLC will result in a structure that will have 32 BOOLs.

**EDS:** Electronic Data Sheets.  EDS files are simple text files used by software to help you identify products and quickly commission them on a network.

**INT:** Integer. The structure within the PLC can be broken down into 16 distinct booleans, which correlates to the fact that an integer is 16 bits.

**IP:** Internet Protocol. A set of rules governing the format of data sent over the internet or other networks.

**PLC:** Programmable Logic Controller

**RPI:**  Requested Packet Interval, generally expressed in milliseconds, is the interval of periodic data exchange between the scanner and the adapter. A connection request from the scanner establishes the repetition interval, or RPI, in both directions.

**VFD:** Variable Frequency Drive

# WEG CFW320 AOI Configuration

## Prerequisites

### Exclusions

This document does not go into detail of setting up a controller in RSLOGIX/STUDIO 5000.

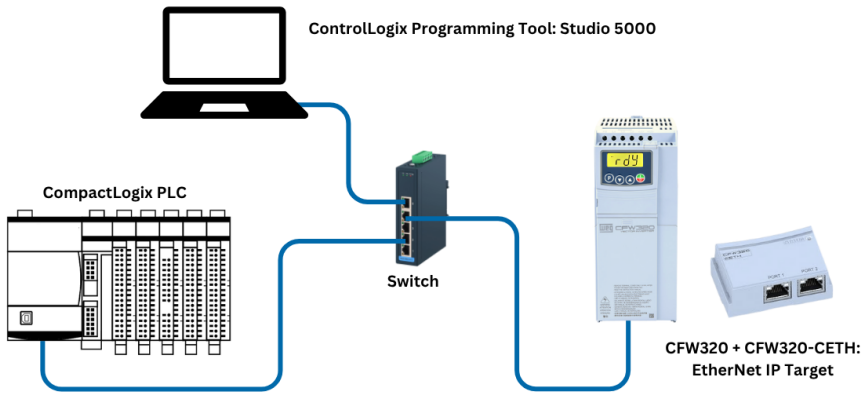
The connection and configuration of the IP network is beyond the scope of this document.

All non-communication specific parameters on the CFW320 are excluded from the configuration requirements of this document.

### System Components

This document assumes that the following components are available and configured:

- A CFW320 running version 1.10 (or higher) firmware with an EtherNet/IP card installed (CFW320-CETH).
- A 10/100 or Faster Ethernet network with IP connectivity and IP addresses for both the PLC and VFW. The Fast Ethernet 100BASE-TX standard is recommended.
- Programming tools for the PLC (RS Logix or Studio 5000 Logix Designer).
- We recommend using certified components for all passive network components (cables and Ethernet switches) in industrial applications. Please refer to the CFW320 Ethernet card documentation for information about the proper network installation.



# WEG CFW320 AOI Configuration

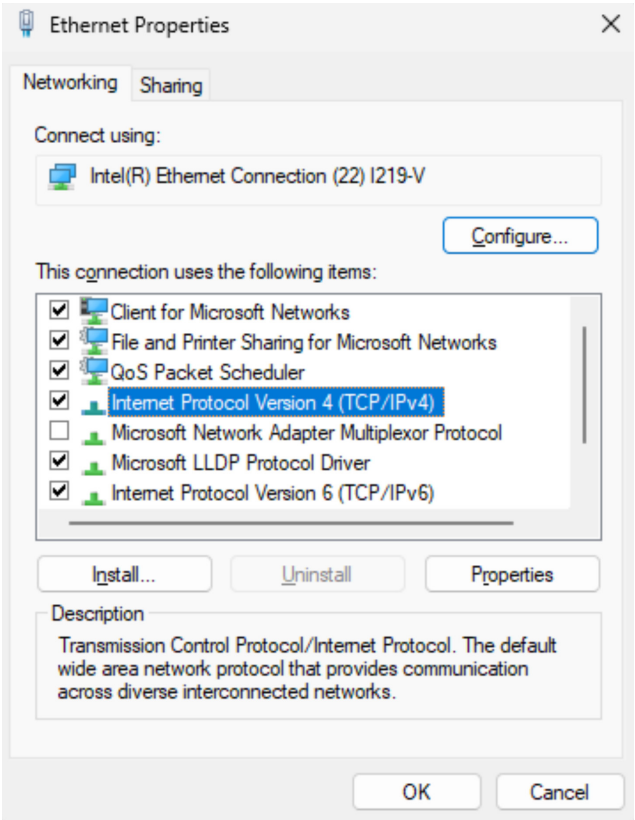
## IP Address and Network Configuration

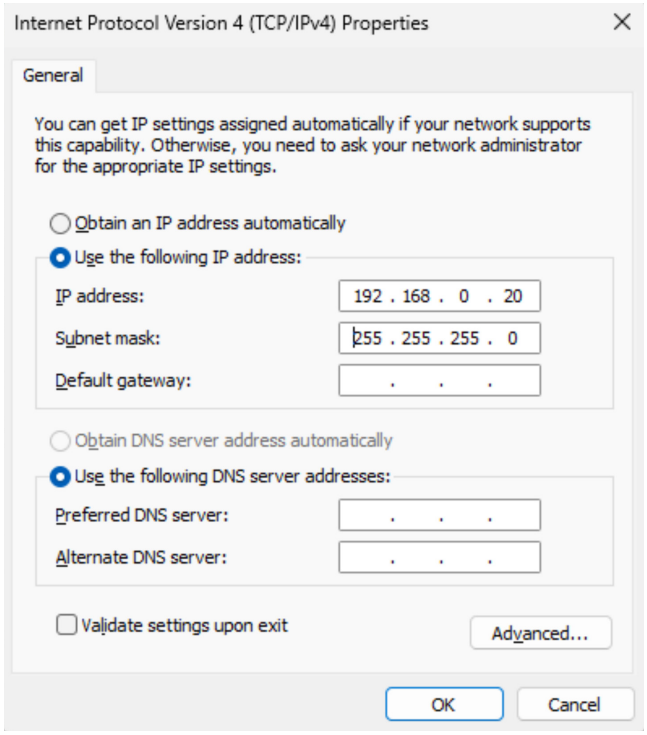
To allow communication among the devices, they need to have an compatible IP address configuration. It means the IP address must be at the same range, according to network mask. For this example, we will use the following IP addresses in this document:

- Subnet mask: 255.255.255.0
- IP addresses: each device must have a different IP address.
  PC: 192.168.0.20
  ControlLogix: 192.168.0.71
  CFW320: 192.168.0.126

## PC IP Address Configuration

To configure these options at Windows platform, go to “Network Connections” and open “Properties” of the desired

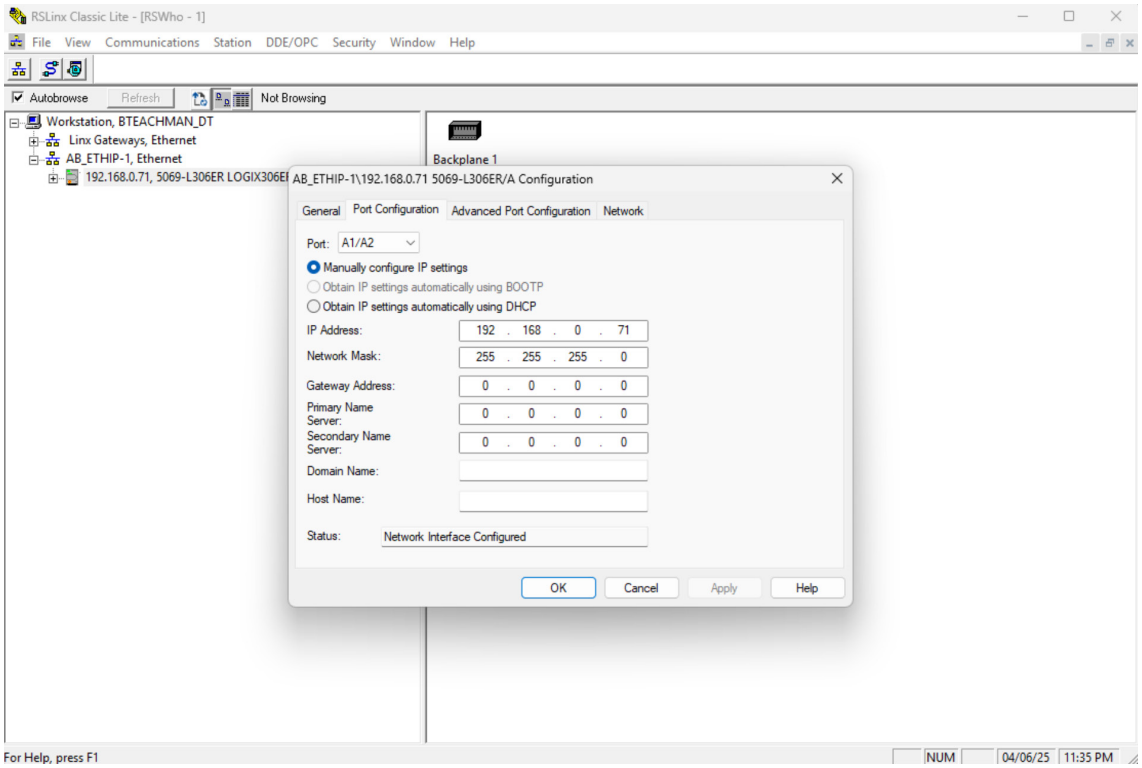


# WEG CFW320 AOI Configuration

## PLC IP Address Configuration

User can set IP Address for the Rockwell PLC using Rockwell configuration tools. Check PLC documentation to obtain information about how to perform this configuration.




## CFW320 Ethernet Interface

For this application, the following configurations have been done via keypad to allow Ethernet communication to PLC:

- P0850 IP Address Config: 0 (Parameters).
- P0851 IP Address 1: 192
- P0852 IP Address 2: 168
- P0853 IP Address 3: 0
- P0854 IP Address 4: 126
- P0855 CIDR: 24
- P0856 Gateway 1: 0
- P0857 Gateway 2: 0
- P0858 Gateway 3: 0
- P0859 Gateway 4: 0

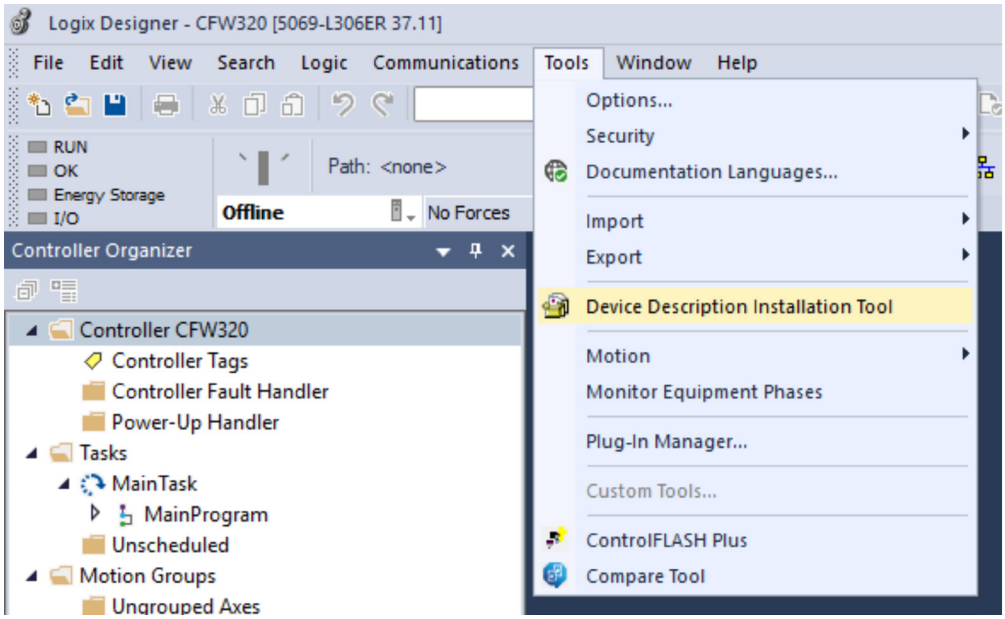
✓ **NOTE!**

After changing these configurations, for the modification to be effective, the equipment must be turned off and then turned on again.

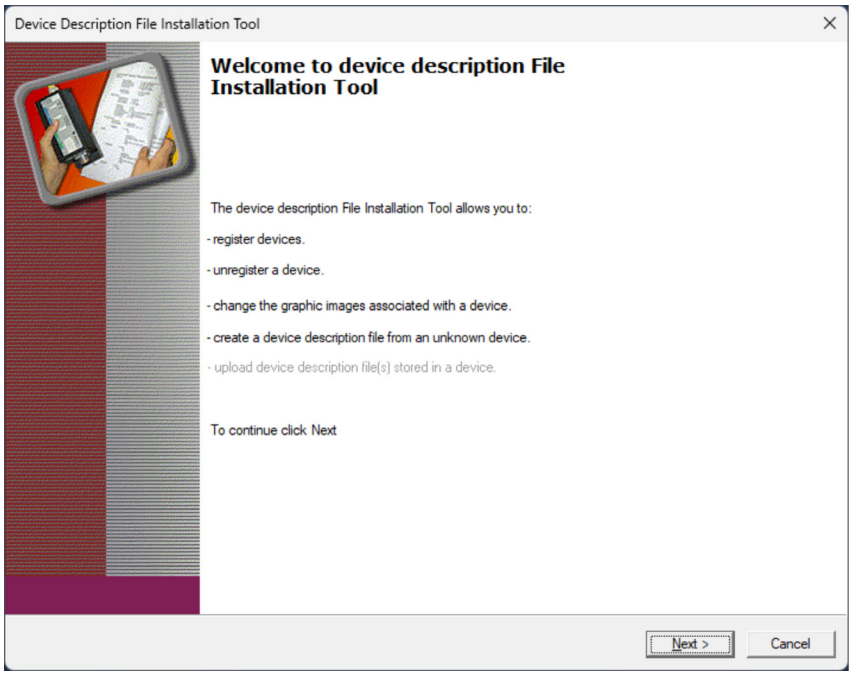
# WEG CFW320 AOI Configuration

## EDS Installation

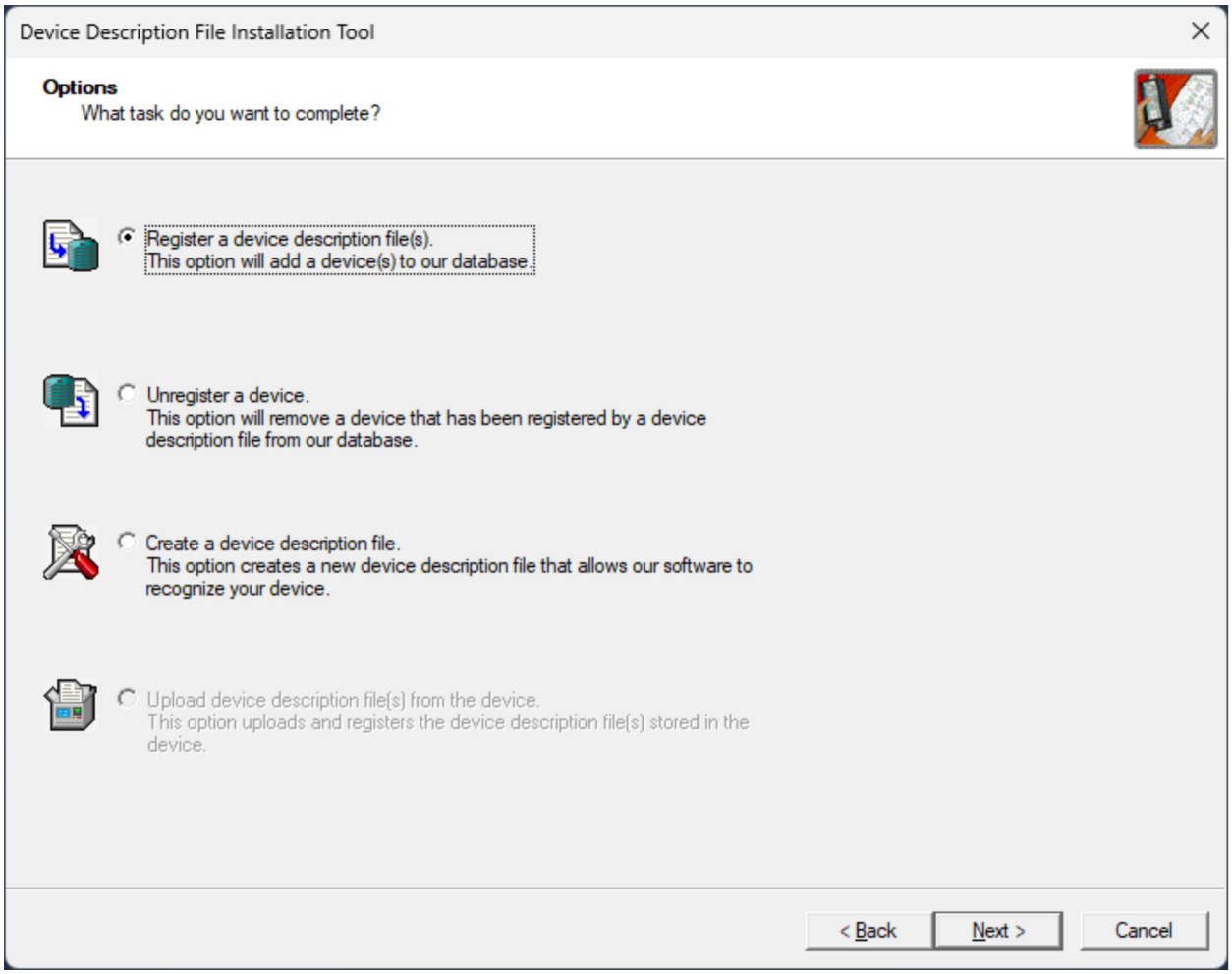
Begin by adding the EDS file for the CFW320 if it is not already in the project.



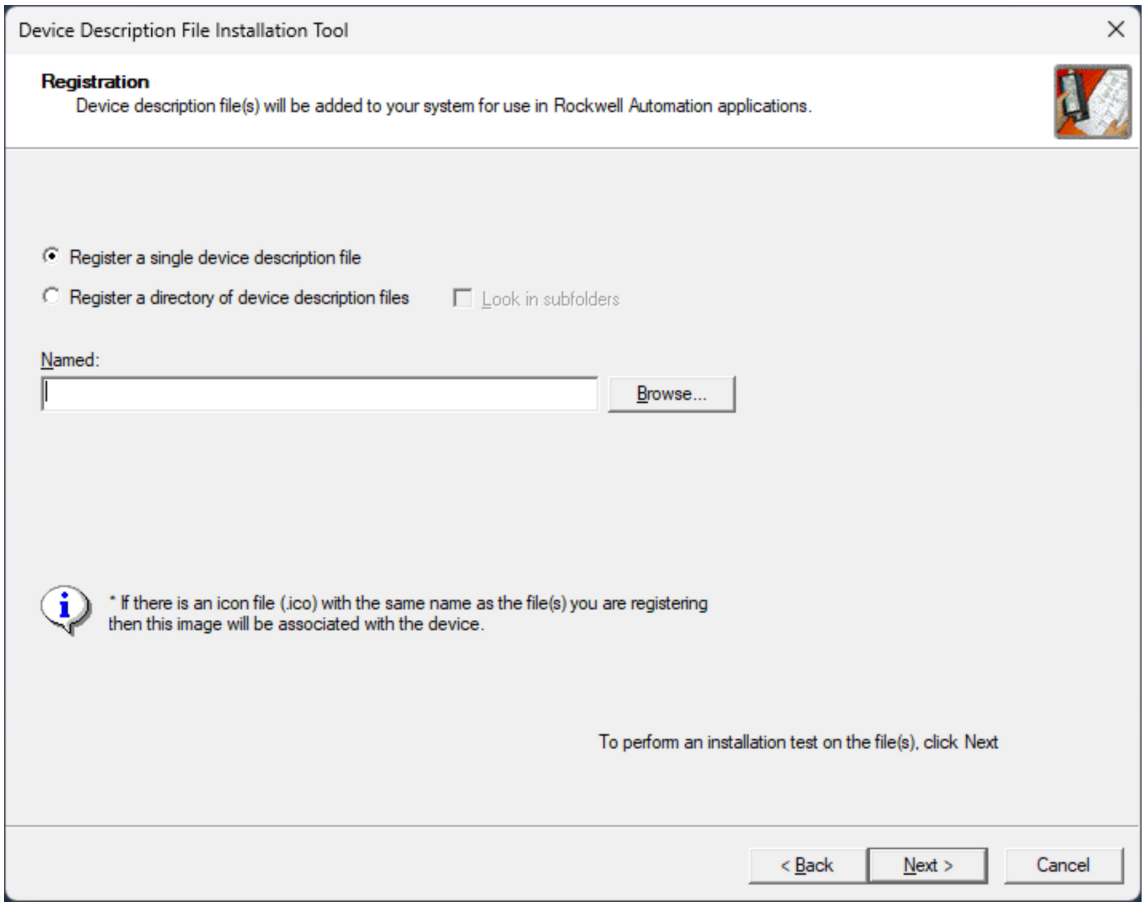

From inside Logix Designer, go to Tools -> Device Description Installation Tool



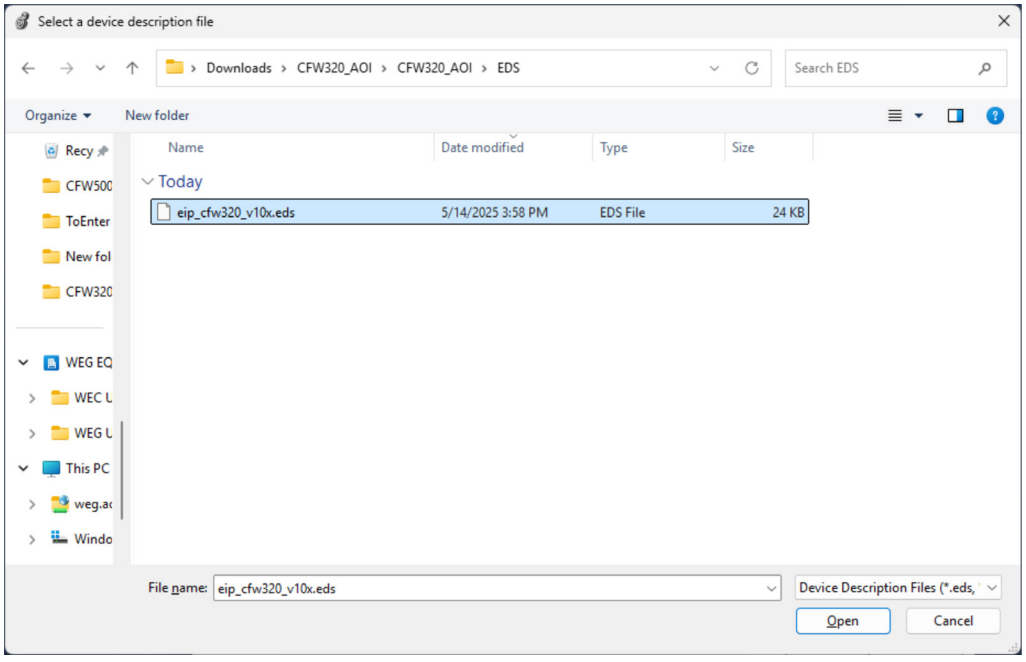

Click Next >



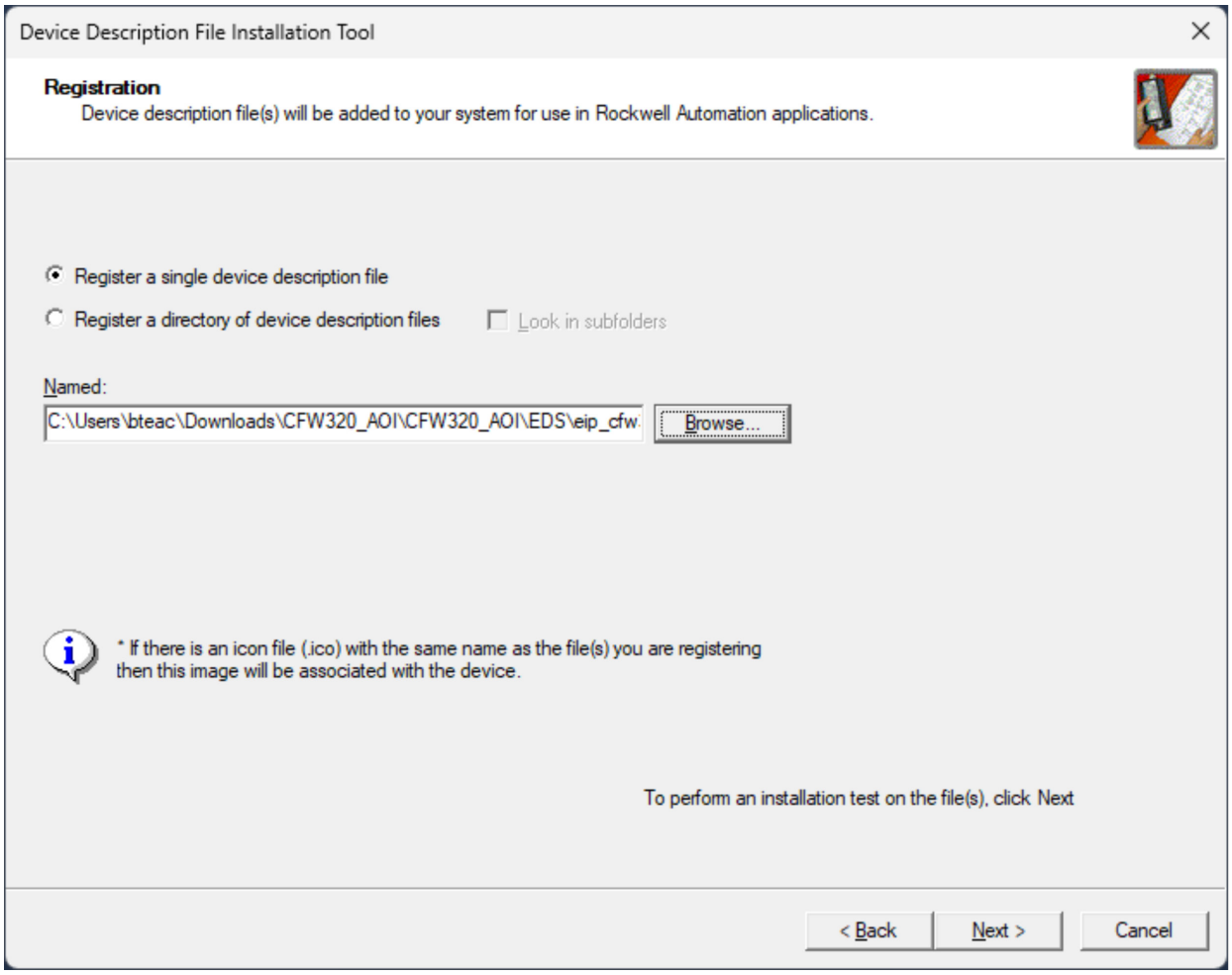

Click Next >



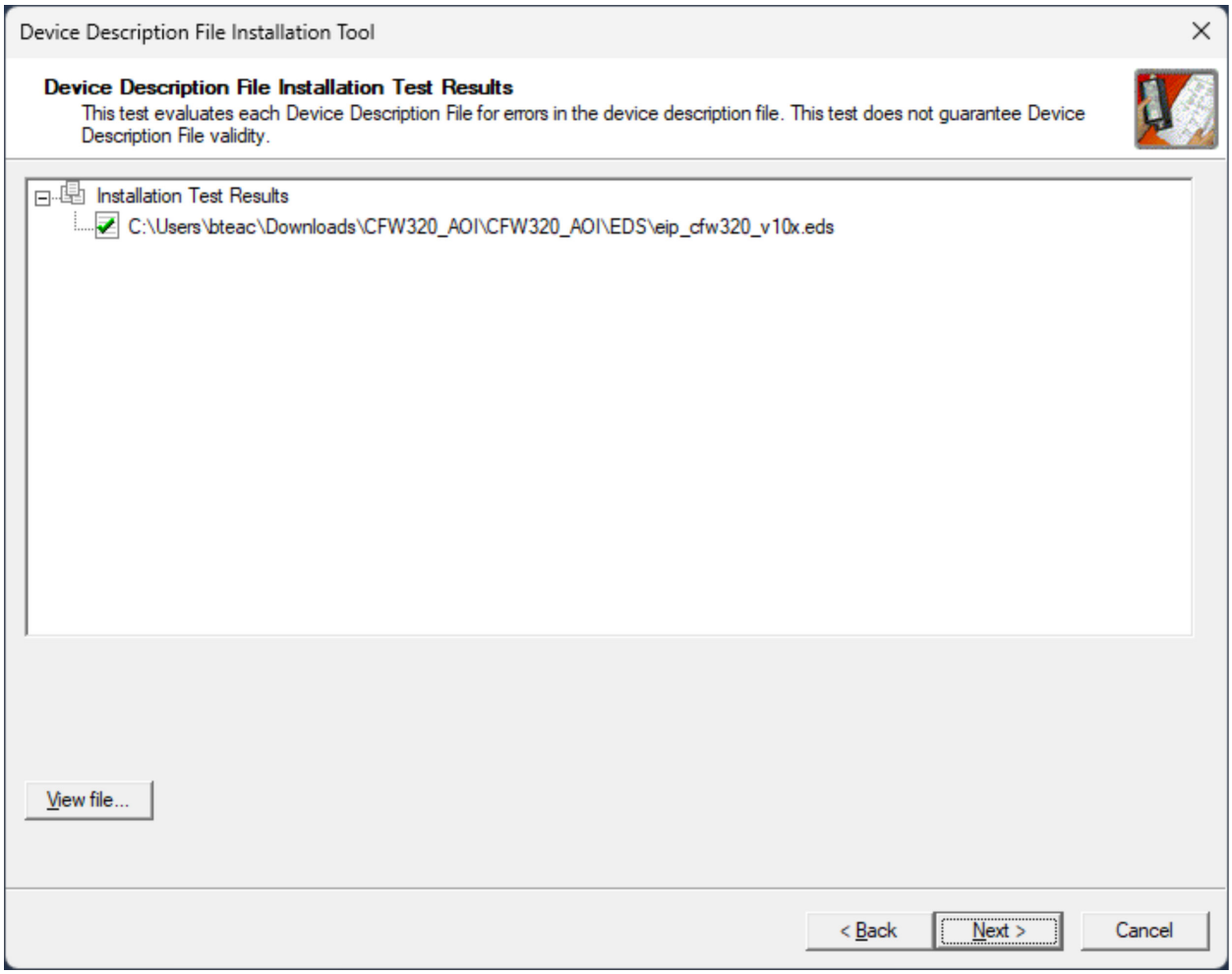

Click Browse ...



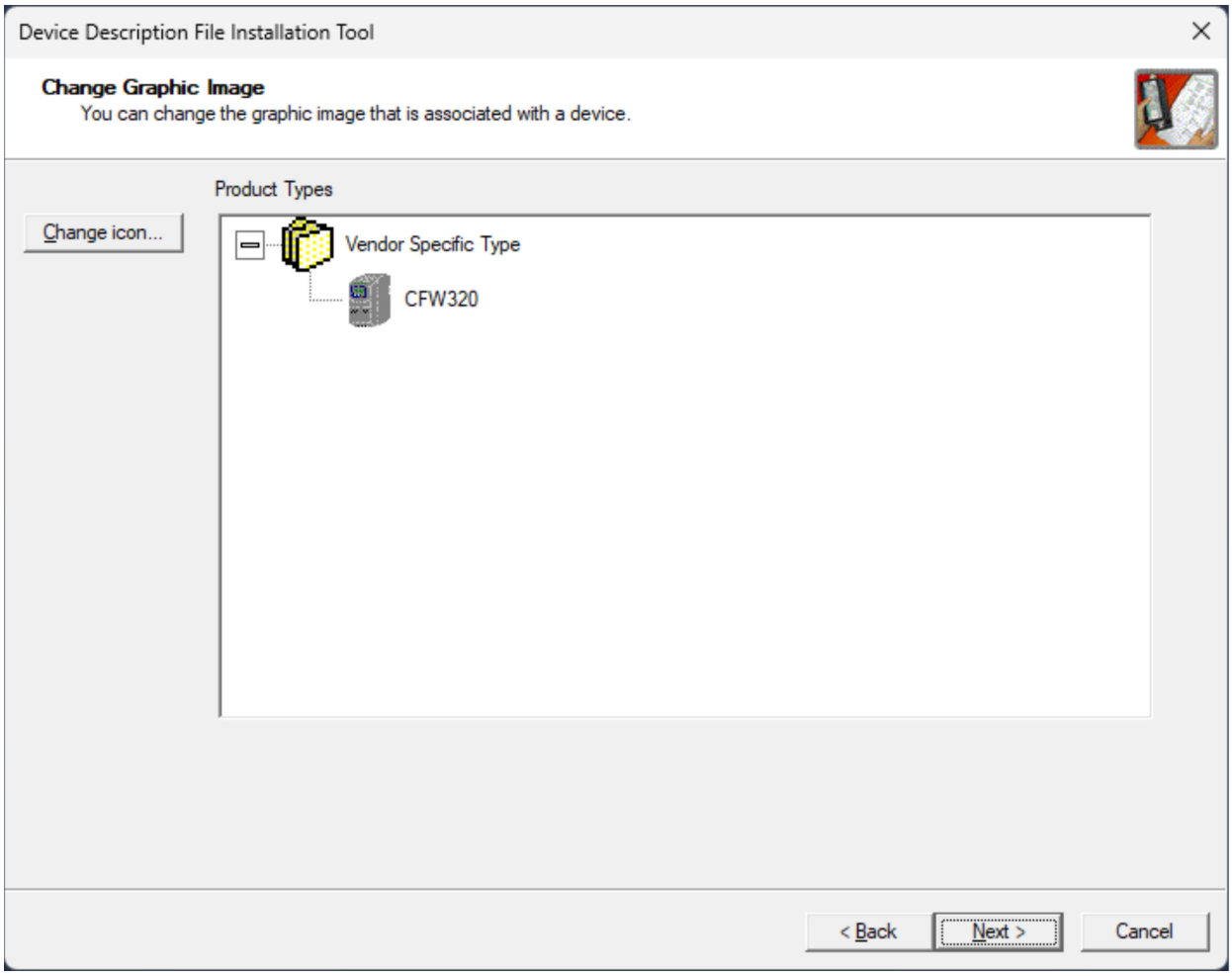

Browse to where the downloaded eds file is located and click Open



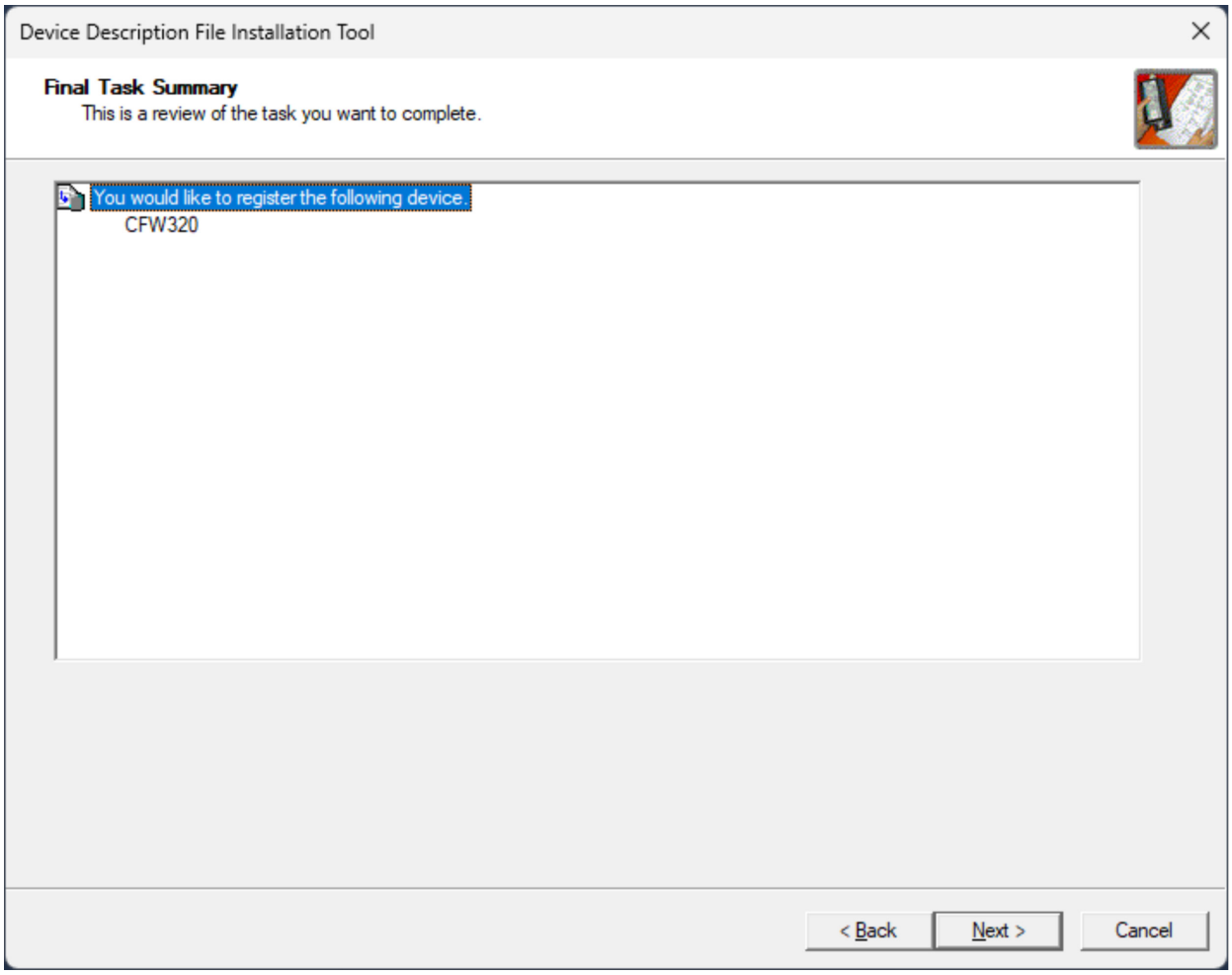

Click Next >



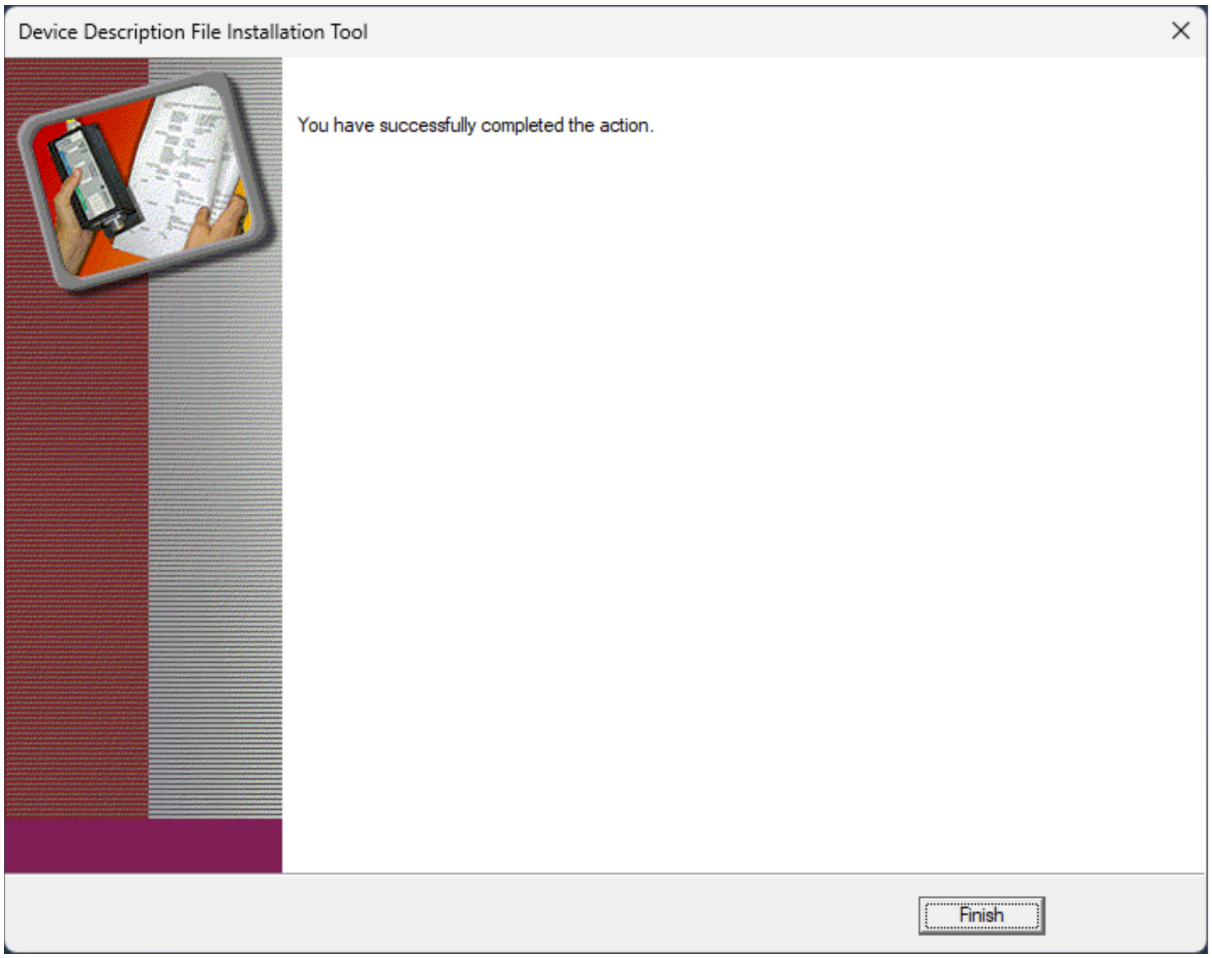

There should be a green checkmark. Click Next >


Device Description File Installation Tool
Change Graphic Image
You can change the graphic image that is associated with a device.
Product Types
Change icon...
Vendor Specific Type
CFW320
< Back
Next >
Cancel

Click Next >


Device Description File Installation Tool
Final Task Summary
This is a review of the task you want to complete.
You would like to register the following device.
CFW320
< Back
Next >
Cancel

Click Next >




Click Finish

The EDS file is now installed and the CFW320 can be added as an Ethernet/IP device in the device tree.

# AOI

## CFW320

This AOI controls the CFW320 and handles the following additional parameters:

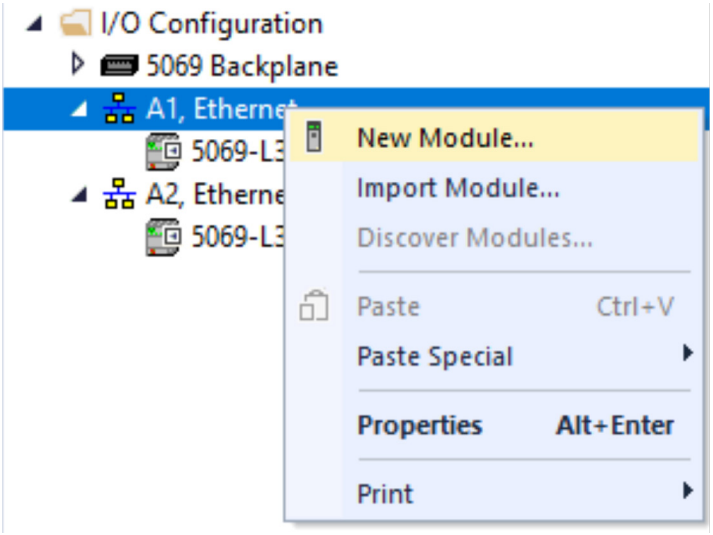
Outputs

- Output Current
- Output Torque
- Output Voltage
- Output Frequency
- Last Fault Code

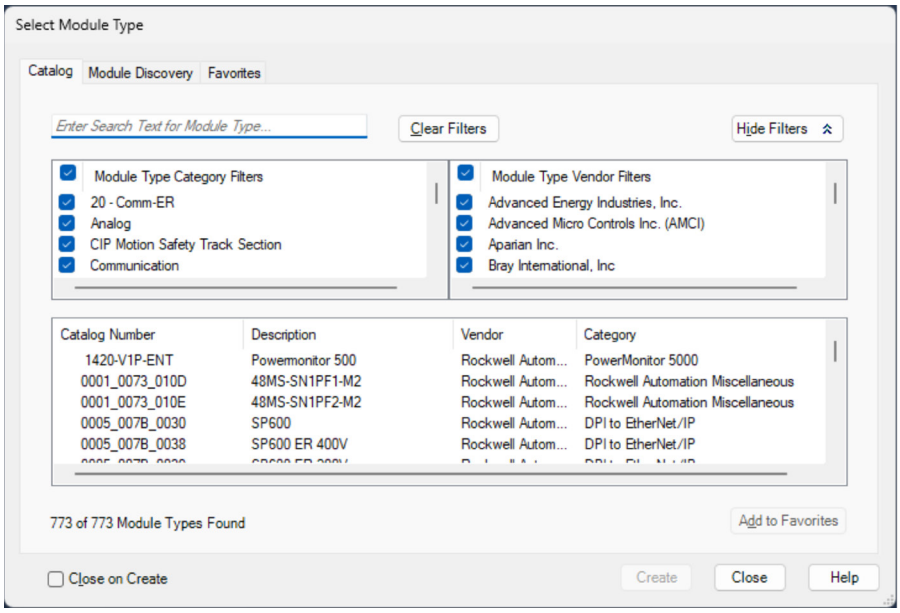
Inputs

- Acceleration Ramp 1
- Deceleration Ramp 1

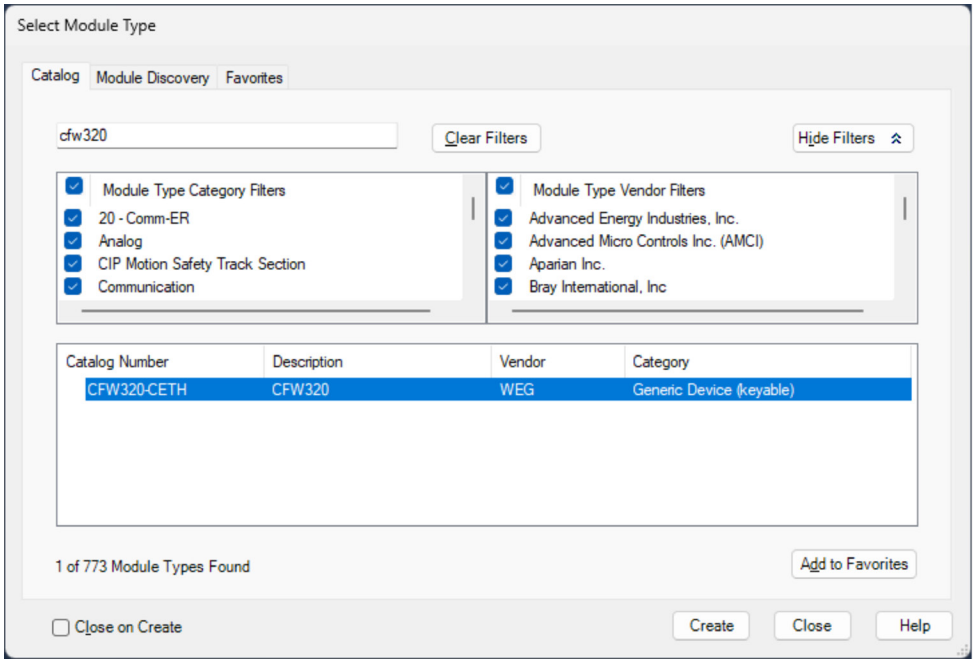
## Create the EtherNet/IP Device




In the device tree, right click on the Ethernet bus that will contain the CFW320 and click New Module...

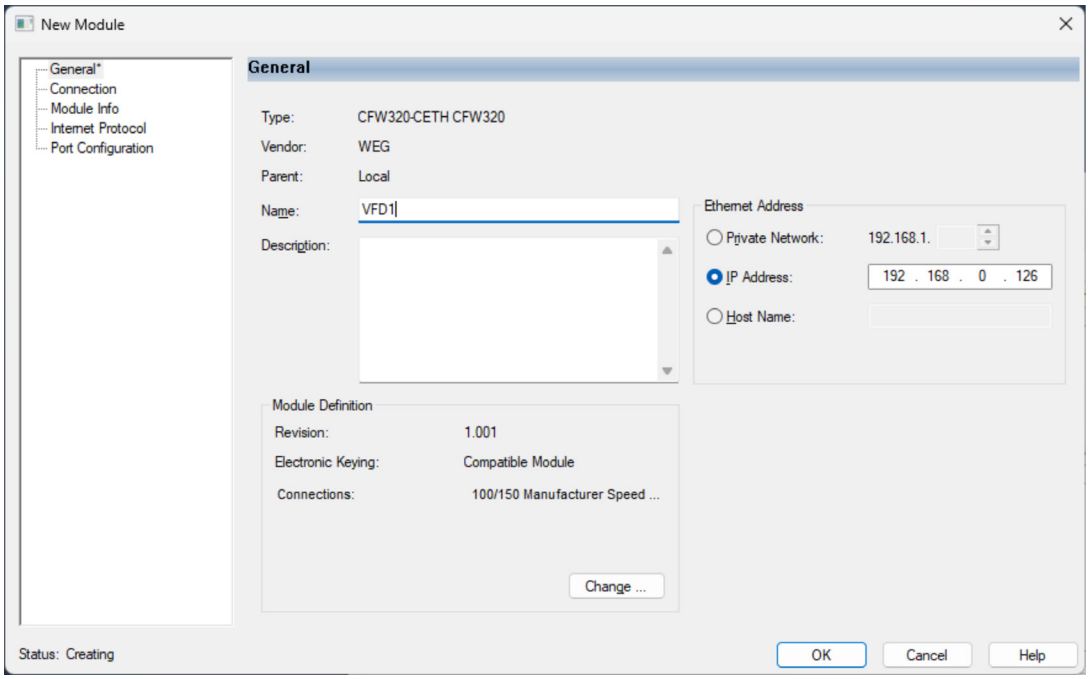



In the Select Module Type dialog box, enter in “CFW320” in the search field



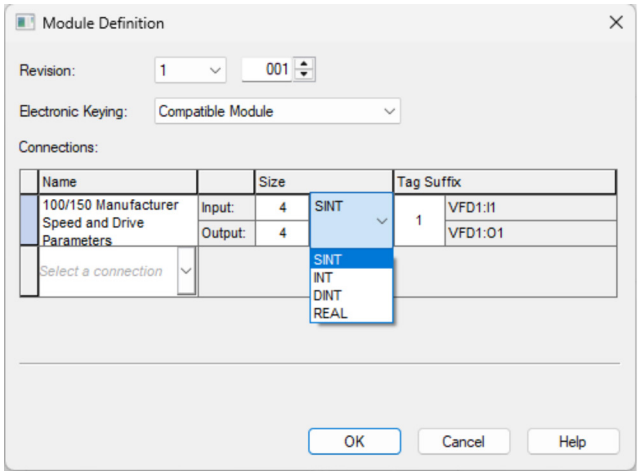

There should be an entry matching the above screenshot.

Highlight the CFW320-CETH and click Create

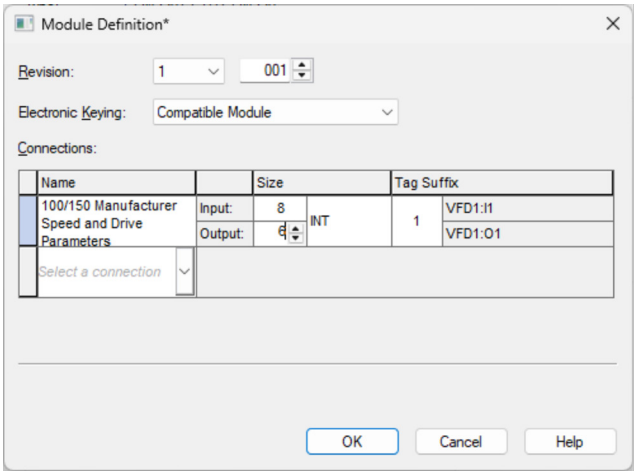



Give the CFW320 a name and enter the IP address of the drive.

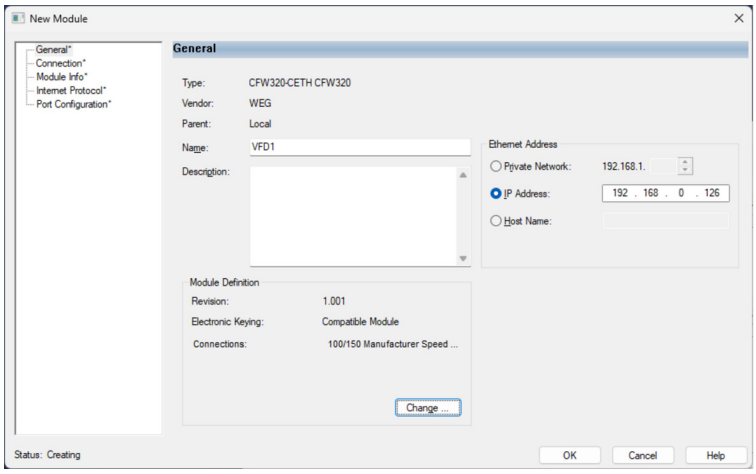
Before clicking on OK, click on the Change … button in the module definition.




Change the type to INT

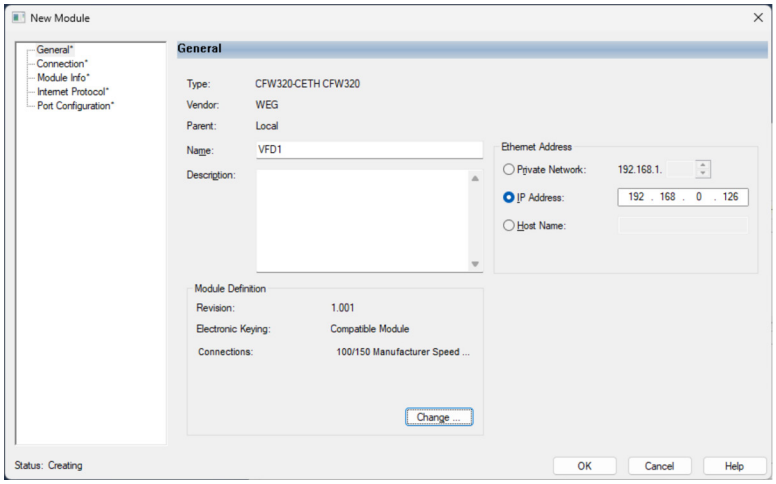



The Input and output size should be set to 8 and 6 respectively. Click OK



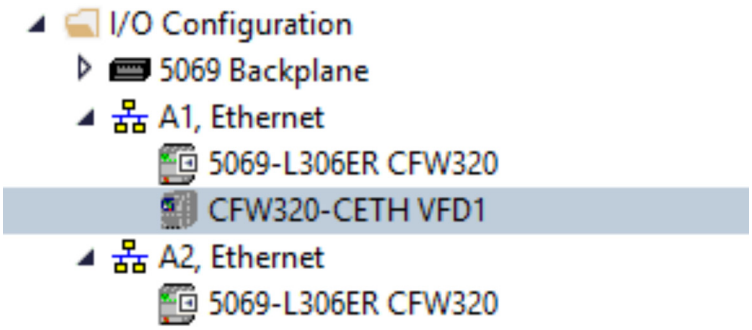

Click Yes

At this point, no other changes are required. However, changing the RPI can be done if the need arises.



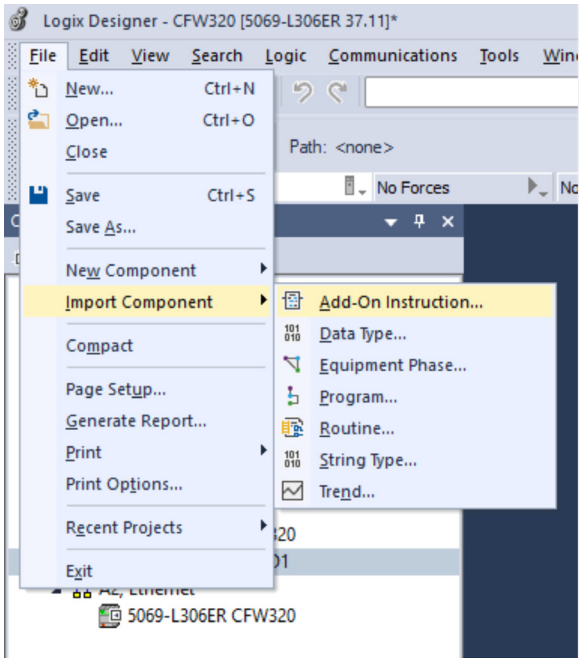

See the Trouble Shooting section to learn more about changing the RPI.

Once satisfied with the settings, Click OK

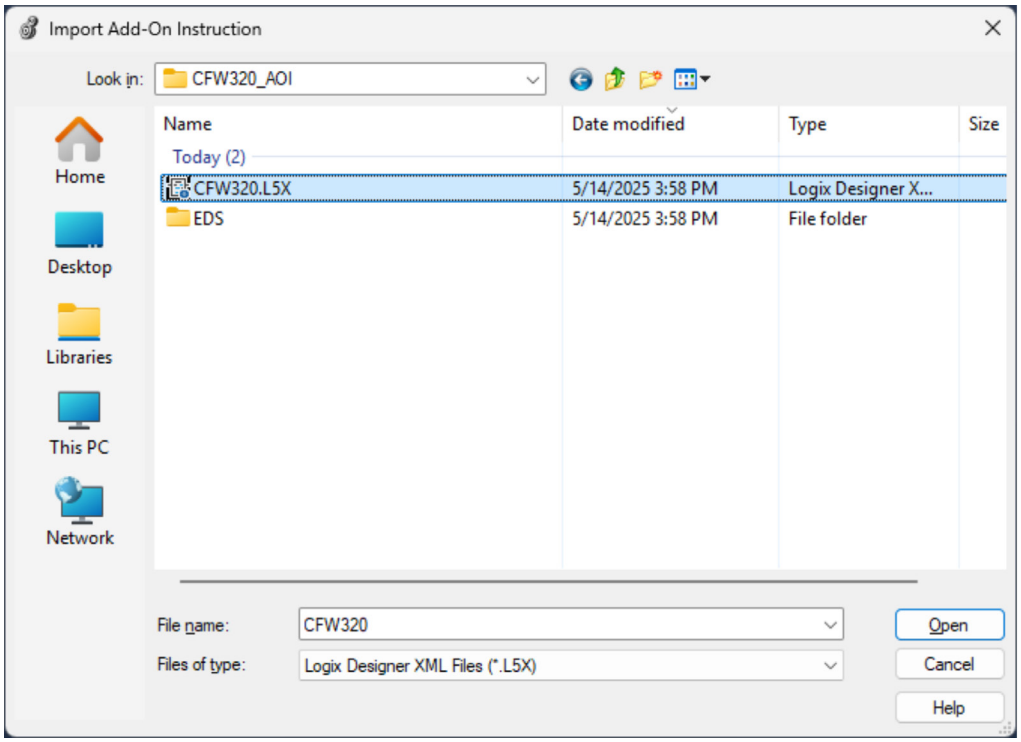



There should now be an instance of the CFW320 in the device tree

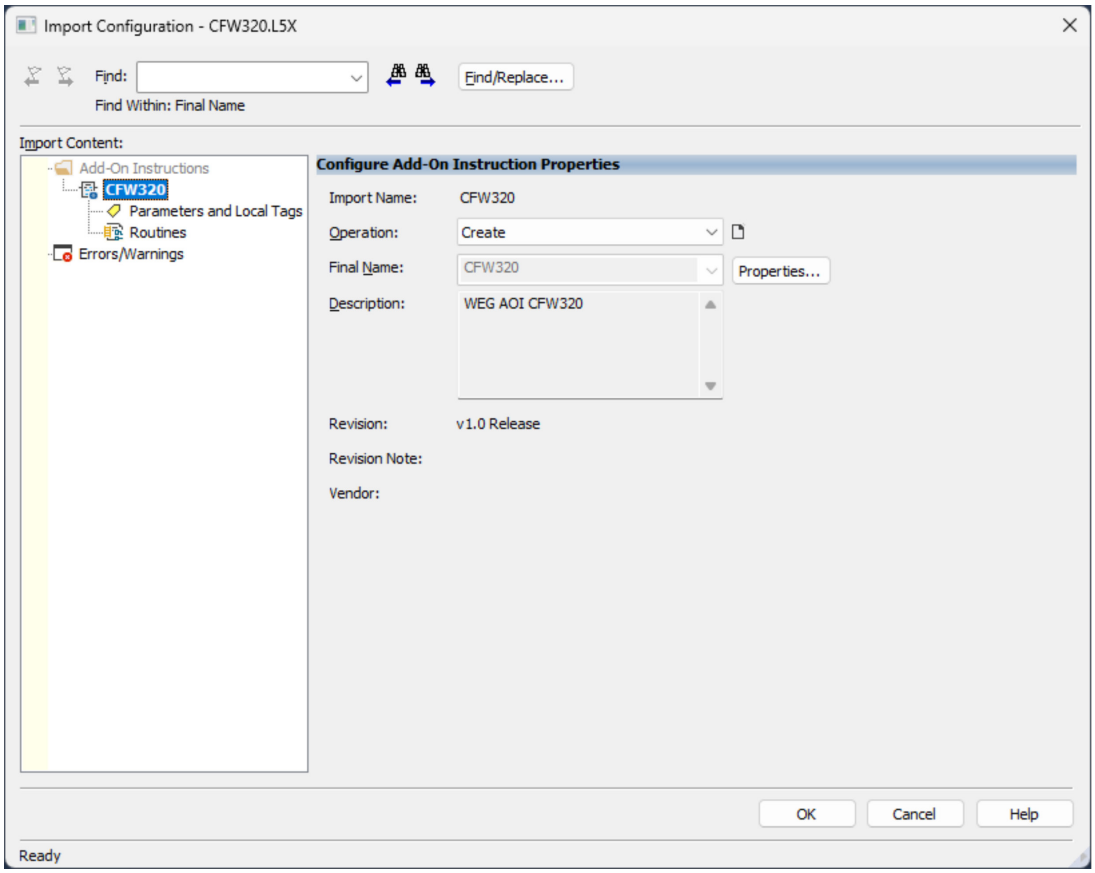
## AOI Import



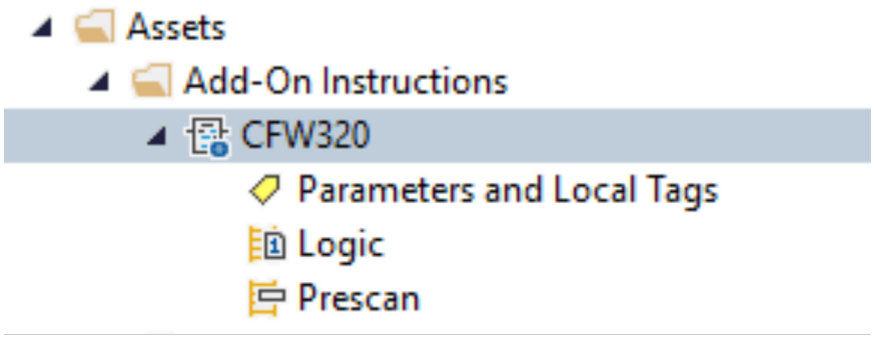

From the menu bar go to File, Import Component, Add-On Instruction...




Select the appropriate add-on instruction (CFW320.L5X) and click Open



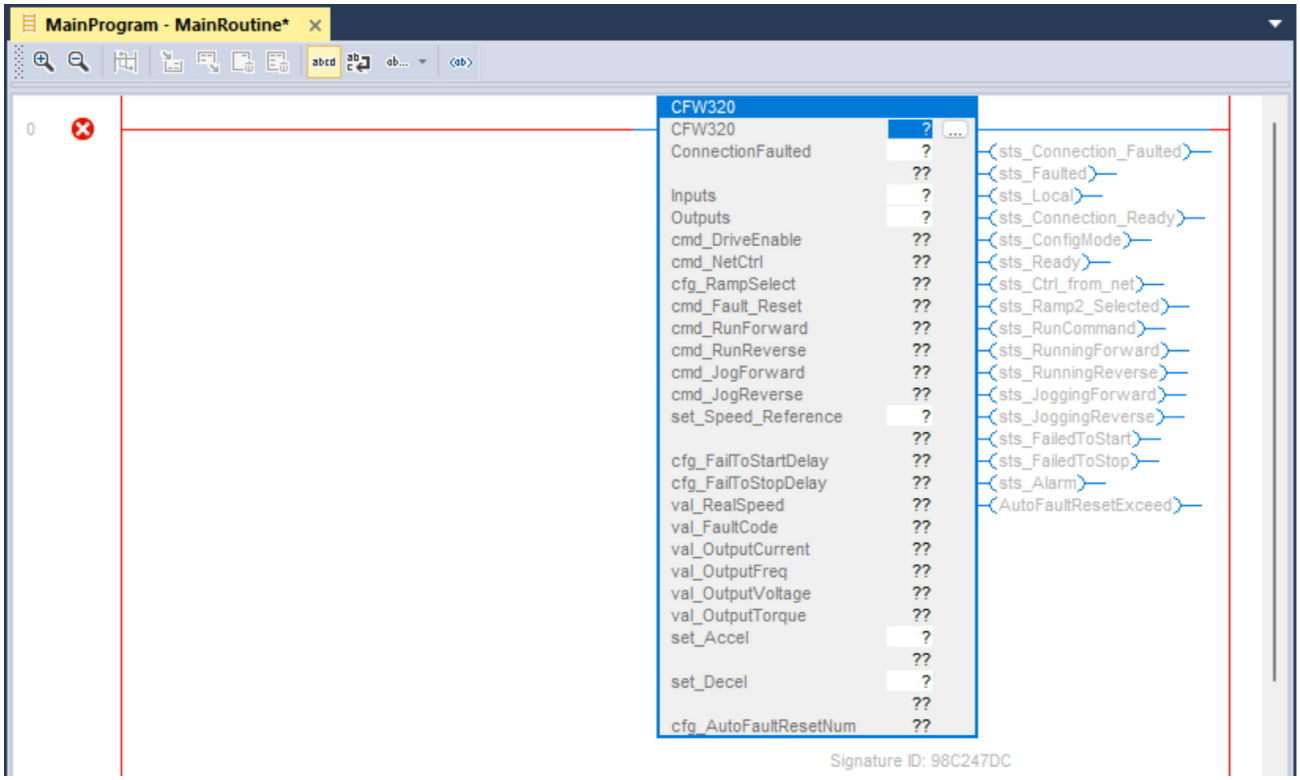

Review the proposed changes and click OK



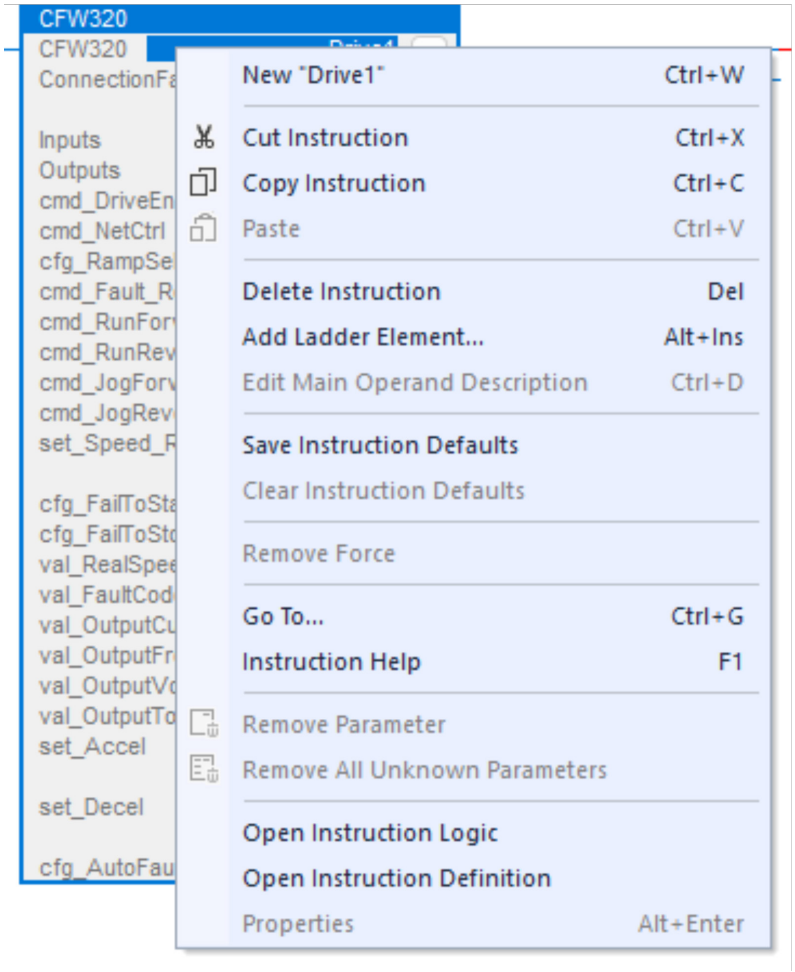

There should now be this add-on instruction in the project.

## AOI Usage

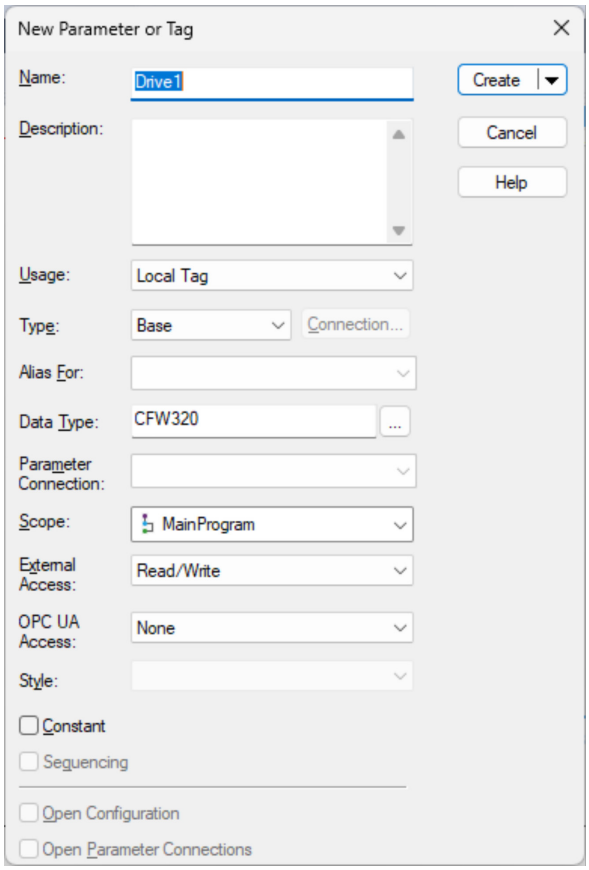

On an empty rung of ladder, add an instance of the newly imported add-on instruction by clicking on the Add-On bar and clicking the CFW320 symbol



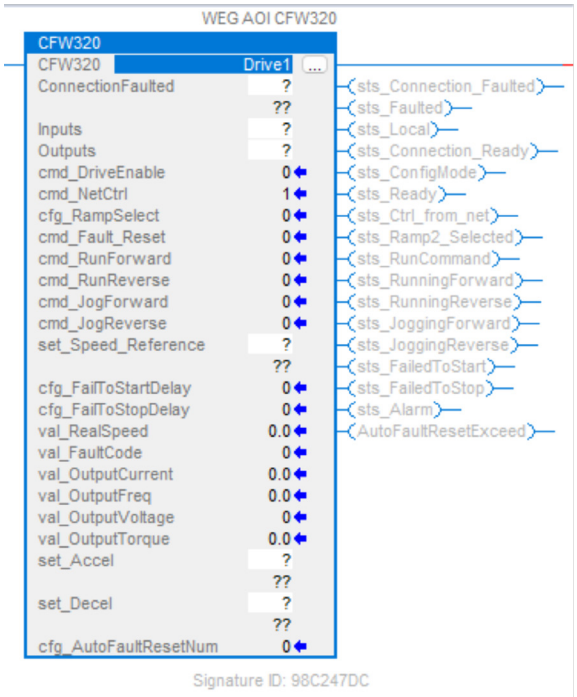

Your ladder logic should look like this after you add the add-on instruction




The Add-On requires a tag to be created. Create this tag by typing a name in the CFW320 field and right clicking and selecting New “Tag”. The Add-On requires a tag to be created.




Give any appropriate description and scope (the tag can be either program or controller scoped and then click Create

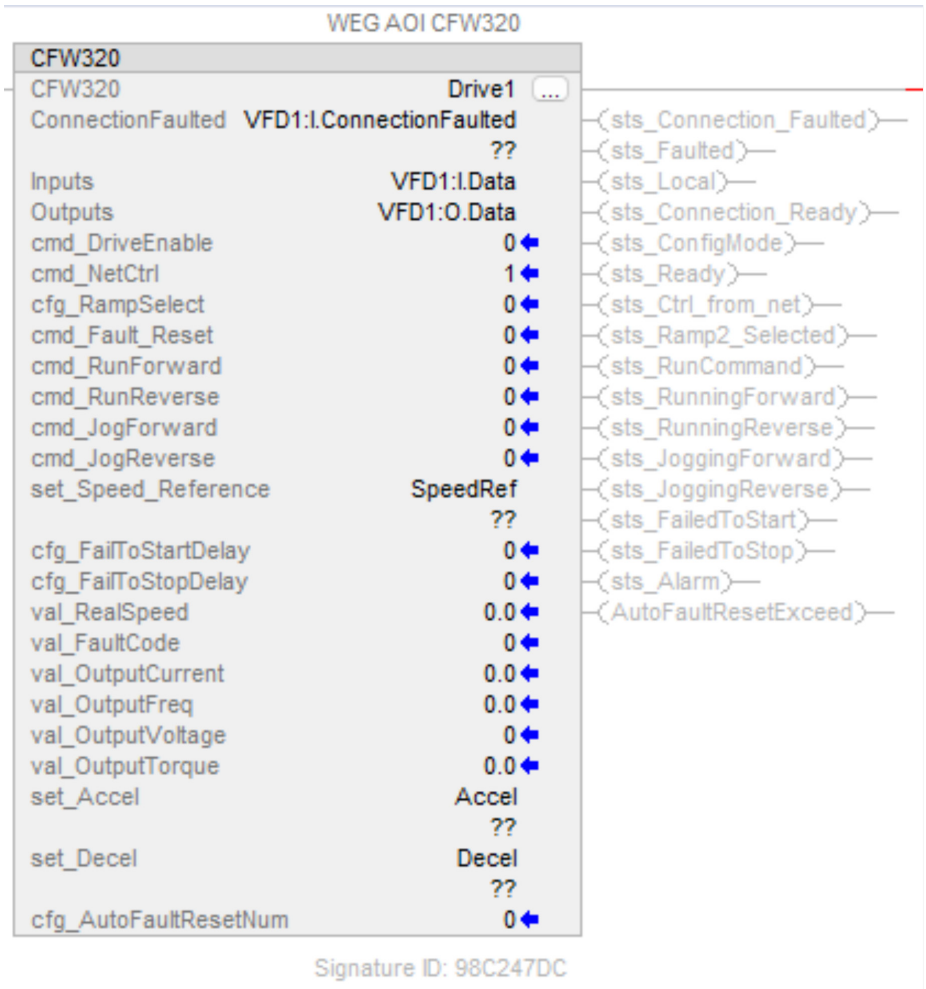



The majority of your parameters for the add-on instruction should now show values

Next, the Connection Faulted, Inputs, Outputs, set_Speed_Reference, set_Accel, and set_Decel need to be populated as follows:

- ConnectionFaulted = VFD1:I.ConnectionFaulted
- Inputs = VFD1:I.Data
- Outputs = VFD1:O.Data
- set_Speed_Reference = SpeedRef
- set_Accel = Accel
- set_Decel = Decel

You will need to create the SpeedRef, Accel, and Decel tags with a data type of REAL.



# AOI Parameter Descrpition

## *InOut Parameters*

| Parameter | Type | Description |
|---|---|---|
| Inputs | INT [8] | Input Assembly from CFW320 |
| Outputs | INT [4] | Output Assembly to CFW320 |

## *Input Parameters*

| Parameter | Type | Description |
|---|---|---|
| Cfg_FailToStartDelay | DINT | Time in seconds before faulting on fail to start if VFD does not start when commanded<br>Set to 0 to disable |
| Cfg_FailToStopDelay | DINT | Time in seconds before faulting on fail to stop if VFD does not stop when commanded<br>Set to 0 to disable |
| ConnectionFaulted | BOOL | From CFW320 Ethernet Module.<br>1 = Connection is faulted<br>0 = Connection is OK |
| cfg_RampSelect | BOOL | 1 = Ramp 2 (P0102/P0103)<br>0 = Ramp 1 (P0100/P0101) |
| cmd_DriveEnable | BOOL | 1 = Enable operation of VFD<br>0 = Disable operation of VFD |
| cmd_Fault_Reset | BOOL | 1 = Send Reset Fault Signal to VFD<br>0 = No action |
| cmd_JogForward | BOOL | 1 = Jog Forward<br>0 = No Action / Stop |
| cmd_JogReverse | BOOL | 1 = Jog Reverse<br>0 = No Action / Stop |
| cmd_NetCtrl | BOOL | 1 = Remote (Ethernet) control<br>0 = Local (Other) control |
| cmd_RunForward | BOOL | 1 = Run Forward<br>0 = Stop |
| cmd_RunReverse | BOOL | 1 = Run Reverse<br>0 = Stop |
| set_Speed_Reference | REAL | Speed Setpoint (0-100%) |
| set_Accel | REAL | Acceleration Ramp 1 Setpoint (0.1-999.0) in Seconds |
| set_Decel | REAL | Deceleration Ramp 1 Setpoint (0.1-999.0) in Seconds |
| cfg_AutoFaultResetNum | DINT | Maximum number of tries that AOI will send fault reset command while being maintained |

*Output Parameters*

| Parameter | Type | Description |
|---|---|---|
| sts_ConfigMode | BOOL | 1 = VFD in Config Mode<br>0 = VFD in Operation Mode |
| sts_Connection_Faulted | BOOL | Goes high when connections interrupted. If “Run” signal is set, it must be reset before this will clear<br>1 = Connection has been faulted from VFD to PLC<br>0 = Connection OK |
| sts_Connection_Ready | BOOL | 1 = Connection from VFD to PLC is established<br>0 = Connection not established |
| sts_Ctrl_from_net | BOOL | 1 = VFD controlled remotely (PLC)<br>0 = VFD controlled locally |
| sts_Faulted | BOOL | 1 = VFD Fault, connection fault, or failedToStart/Stop Fault<br>0 = No faults |
| sts_FailedToStart | BOOL | 1 = VFD failed to start in time allotted<br>0 = Normal |
| sts_FailedToStop | BOOL | 1 = VFD failed to stop in time allotted<br>0 = Normal |
| sts_Local | BOOL | 1 = Local<br>0 = Remote |
| sts_Ramp2_Selected | BOOL | 1 = Ramp 2 rates selected<br>0 = Ramp 1 rates selected |
| sts_Ready | BOOL | 1 = VFD is ready to operate (states Ready, Enabled, or Stopping)<br>0 = VFD is not ready to operate |
| sts_RunCommand | BOOL | 1 = Commanded to run<br>0 = Not commanded to run |
| sts_RunningForward | BOOL | 1 = Running forward<br>0 = Not running forward |
| sts_RunningReverse | BOOL | 1 = Running reverse<br>0 = Not running reverse |

| | | |
|---|---|---|
| val_FaultCode | DINT | Fault code 1 from VFD |
| val_OutputCurrent | REAL | Output current in Amps from VFD |
| val_OutputFreq | REAL | Output frequency in Hertz from VFD |
| val_OutputVoltage | REAL | Output voltage in Volts from VFD |
| val_OutputTorque | REAL | Output Torque Applied to Motor |
| val_RealSpeed | REAL | Speed feedback in % |
| AutoFaultResetExceed | BOOL | Indicates when the maximum number of automatic fault clears has been exceeded. Set cmd_Fault_Reset to 0 to reset and allow fault clear to resume. 1 = Max number of fault clears reached. Fault Reset Disabled 0 = Under threshold for automatic fault clears. Fault Reset Allowed. |

## CFW320 Parameter Requirements

The following paramaters must be set in the CFW320:

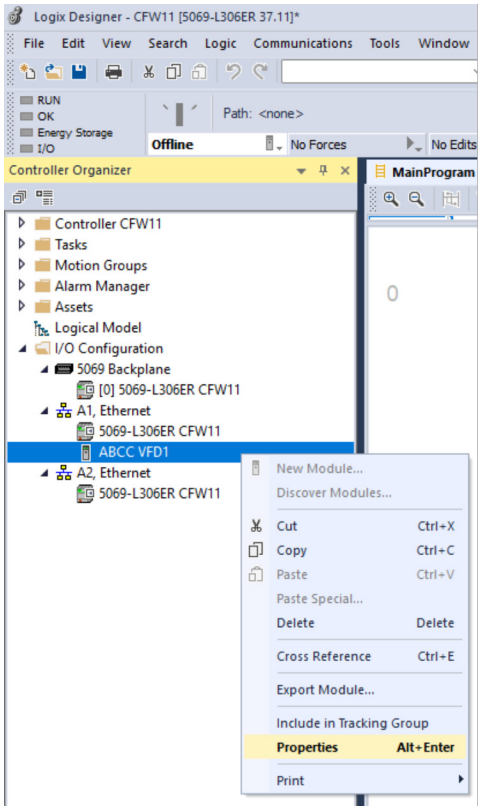
| Parameter | Setting |
|---|---|
| P105 1st / 2nd Ramp Selection | 5= CO/DN/DP/ETH |
| P220 LOC/REM Selection Source | 10=CO/DN/DP/ETH (REM) |
| P222 REM Reference Selection | 11 = CO/DN/DP/ETH |
| P226 REM FWD/REV Selection | 9 = CO/DN/DP/ETH (FWD) |
| P227 REM Run/Stop Selection | 4 = CO/DN/DP/ETH |
| P228 REM JOG Selection | 5 = CO/DN/DP/ETH |
| P872 Ethernet Read Word #3 | 9 |
| P873 Ethernet Read Word #4 | 49 |
| P874 Ethernet Read Word #5 | 3 |
| P875 Ethernet Read Word #6 | 5 |
| P876 Ethernet Read Word #7 | 7 |
| P877 Ethernet Read Word #8 | 6 |
| P880 Ethernet Read Word #3 | 100 |
| P881 Ethernet Read Word #4 | 101 |

# Trouble Shooting

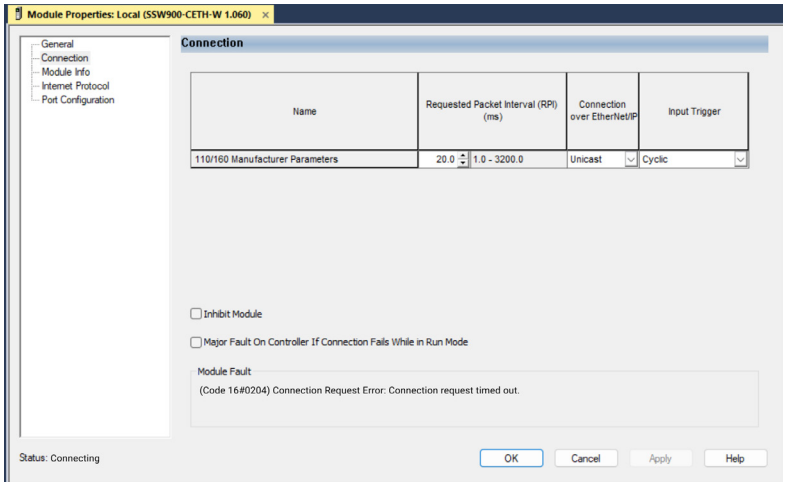
This section is to help with any problems you may encounter.

**1) No Communication**

**a.** The Studio 5000 Error Codes or Module Fault # can be found under the I/O Configuraiton Tab within the Studio 5000 software. Right-click on the CFW320 module and select Properties.




**b.** Next select the 'Connection' section. Then within the 'Module Fault' section, you will find the Module Fault number. Each error code corresponds to a specific issue or condition.

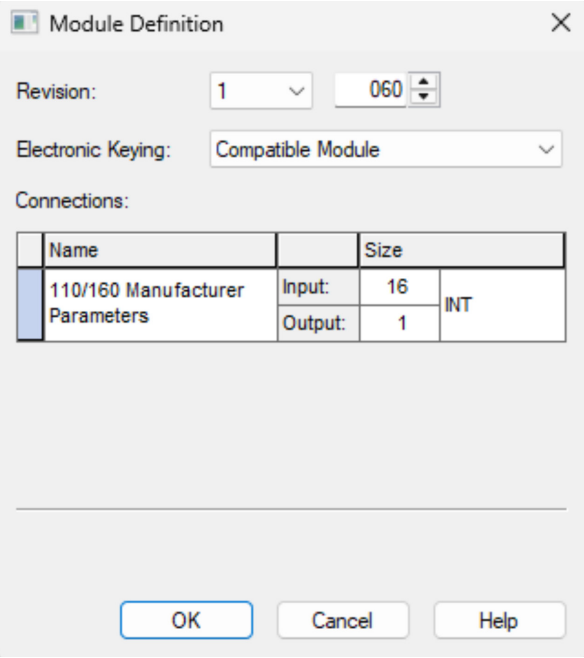


**Error Code 16#0005** = Connection Request Error: Bad Class.

**Reason:** A discrepancy exists between PLC and the selected VFD module configuration.

**What to check:**

- Check the parameters in the VFD to insure they match what is listed in the “CFW320 Parameter Requirements” section of this document.
- Ensure that the programmed connection size in both the PLC and the VFD is consistent. For instance, if the VFD transmits 2 words, confirm that the PLC is configured to receive 2 words rather than 6.
- Ensure the comm format for the module is set to a data type of INT in the PLC. This can be found under the properties for the module.




**Error Code 16#012a** = Connection Request Error: Invalid output application path.

**Reason:** There is a mismatch between the PLC and VFD in the selected module.

**What to check:**

- Check the Module Definition to insure it is set to an input of 16 and an output of 1.
- Check the parameters in the VFD to insure they match what is listed in the “CFW320 Parameter Requirements” section of this document.

**Error Code 16#0109** = Connection Request Error: Invalid connection size (Invalid Input size).

**Reason:** The input connection word size exceeds the capacity of the programmed word array in the PLC.

**What to check:**

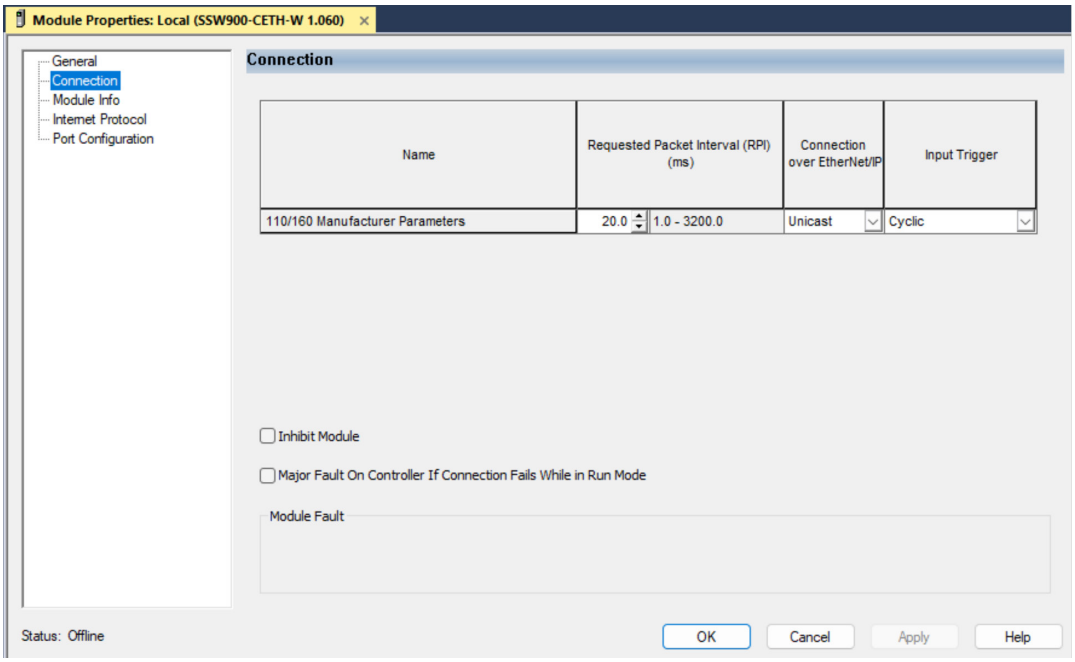
- Check the programmed connection size in the PLC and the VFD (example the VFD is sending 2 words and the PLC is programmed to 4 words).
- Ensure the comm format for the module is set to a data type of INT in the PLC. This can be found under the properties for the module.

**Error Code 16#0111** = Requested Packet Interval (RPI) out of range.

**Reason:** The configured RPI rate is below the allowed rate for the VFD.

**What to check:**

- Increase the RPI rate in Studio 5000. This can be found under the module's Connection tab. A lower number means it is communicating more often.



**Error Code 16#0127 =** Connection Request Error: Invalid output size.

**Reason:** The connection words size is too large to fit in the programmed word array size in the PLC.

**What to check:**

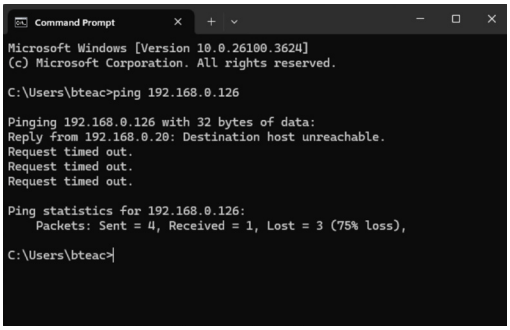
- Check the programmed connection size in the PLC and the VFD (example the VFD is sending 2 words and the PLC is programmed to 4 words).
- Ensure the comm format for the module is set to a data type of INT in the PLC. This can be found under the properties for the module.

**Error Code 16#0204 =** Connection Request Error: Connection request timed out.

**Reason: The PLC is attempting to make a connection; however, the VFD is not responding.**

**What to check:**

- Check to make sure DHCP is disabled if a Static IP Address is being programmed in the VFD. This means that Parameter P0850 IP Address Config should be set to 0 = Parameters.
- Check the programming of the IP address of the VFD and Subnet.
- Check the programming of the IP Address in the PLC communicating to the VFD.
- Try to ping the VFD's IP address via a computer connected to the same network. To do this on a Windows 11 computer that is on the same network as your PLC and VFD:
    - o You can do this by clicking on the Start button, typing "cmd" into the search bar, and hitting Enter. Alternatively, you can press Windows + R, type "cmd", and click OK. Locate and correct the IP address problem.
    - o Once Command Prompt is open, type the ping command followed by the IP address of your VFD. For example: ping 192.168.0.126. Then press Enter.
    - o If you get "Request timed out". You are not able to communication with your VFD and likely your PLC can not either.
    - o In the Command Prompt, type the ping command followed by the IP address of your PLC.
    - o If you get "Request timed out". You are not able to communication with your PLC and likely your VFD can not either.




- Check network wiring.

**2) VFD has A147**: EtherNet/IP Communication Offline

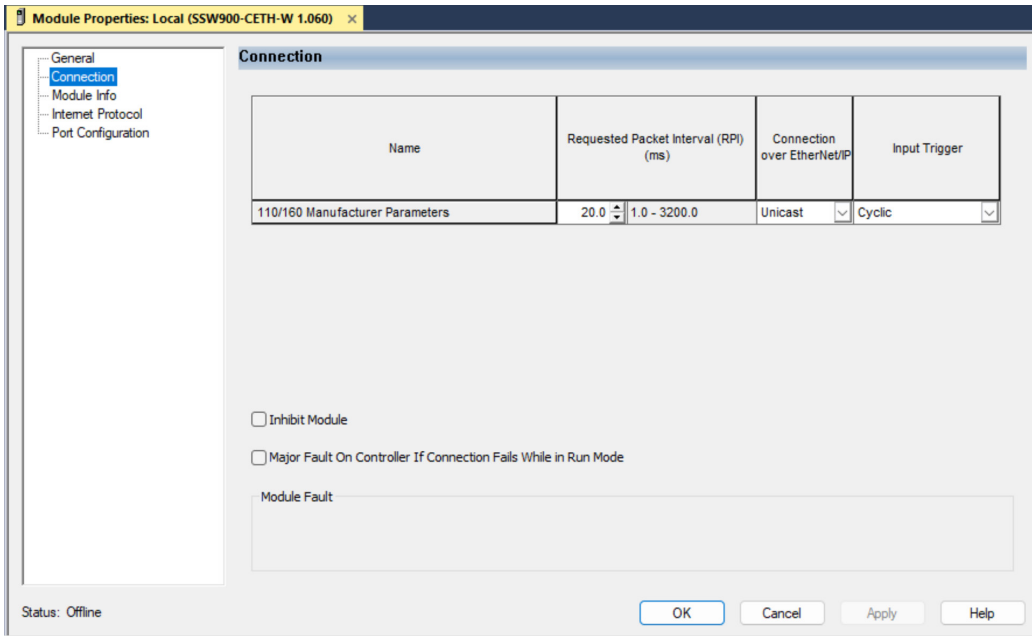
This alarm indicates an interruption of the EtherNet/IP communication.

**What to check:**

- Programming error. Master and slave set with a different number of I/O words.
- Communication with the master has been lost (broken cable, unplugged connector, etc.).

**3) Communication is too slow, or network traffic is to high.**

If your network is seeing heavy traffic or your communication to the VFD is too slow, you want to change your RPI rate in Studio 5000. This can be found under the module's Connection tab.  A lower number means it is communicating more often.



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