Motors

Automation

Energy

Transmission and Distribution

Coatings

CFW500 G2 - AOI
MW500 G2 - AOI
Configuration

Driving efficiency and sustainability

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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.
-	-
-	-

Safety & Legal

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Safety information
Only use Add On Instructions (AOI's) from WEG Electric Corp. for their intended purpose.
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.

Limitation of liability
This technical documentation is for users who wish to use the Add On Instructions from WEG Electric Corp. It is solely for information purposes and only for qualified and adequately trained specialist personnel. The information is intended as a guide and was compiled and produced in good faith. No claim is made with regard to the completeness of this documentation. The technical and schematic diagrams do not constitute binding solutions or application suggestions for the application.

The illustrated application examples only relate to equipment from WEG Electric Corp. It is the sole responsibility of the user to check and comply with all the laws, directives, and standards which are relevant for the application, design, manufacture, and operation of the products. Users act independently at their own responsibility. It is not the intention of this manual to present all the possibilities for the application of the Add On Instructions, and WEG Electric Corp. is not liable for the use of the Add On Instructions, which is not based on this manual. WEG Electric Corp. accepts no liability or warranties for solutions designed by the user.

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About This Manual

This manual supplies the necessary information to operate the CFW500 G2 or the MW500 G2 drive using the EtherNet/IP interface to communicate with a Rockwell PLC with an AOI. It must be used together with the CFW500 G2 and MW500 G2 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
CFW500 G2 User's Manual	10001278006 / 16	WEG
CFW500 G2 Programming Manual	10006739425 / 12	WEG
MW500 G2 Programming Manual	10010219069 / 02	WEG
MW500 G2 Programming Manual	10010648794 / 02	WEG
Studio 5000 PLC programming software	37	Rockwell Automation

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

All data subject to change without notice

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 CFW500 AOI Configuration

Prerequisites

Exclusions

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

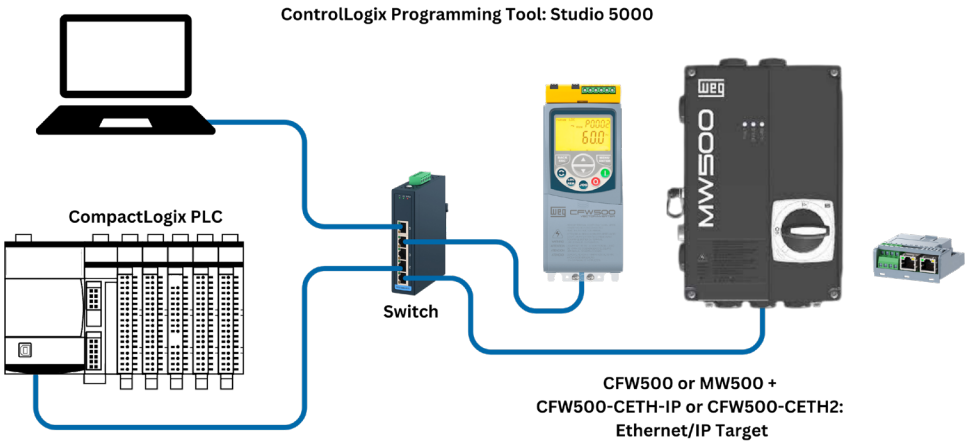
The connection and configuration of the IP network is beyond the scope of this document.

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

System Components

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

- A ControlLogix or CompactLogix PLC controller running version 20 (or higher) firmware.
- A CFW500 G2 running version 3.1 (or higher) firmware or a MW500 G2 running firmware version 3.01 (or higher) with an EtherNet/IP card installed (CFW500-CETH-IP or CFW500-CETH2).
- 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 CFW500 Ethernet card documentation for information about the proper network installation



WEG CFW500 AOI Configuration

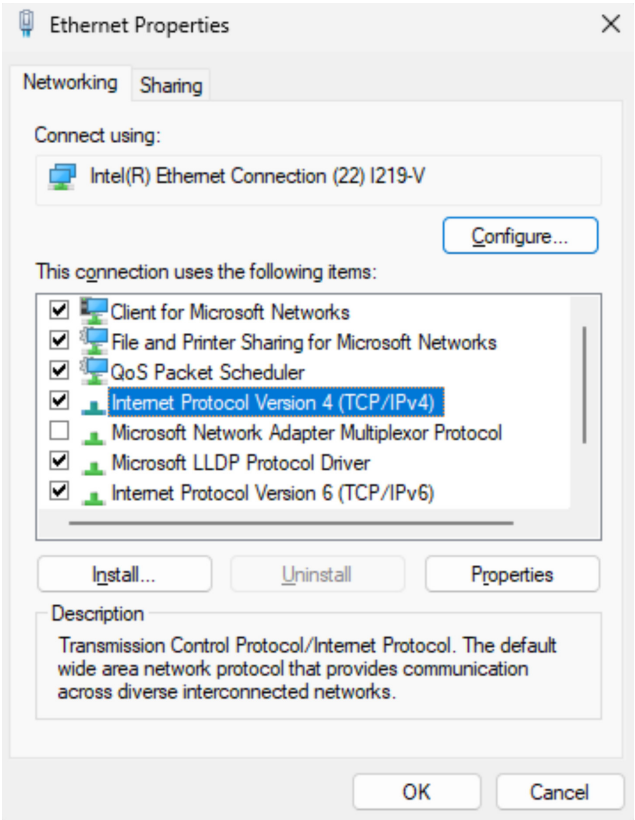
IP Address and Network Configuration

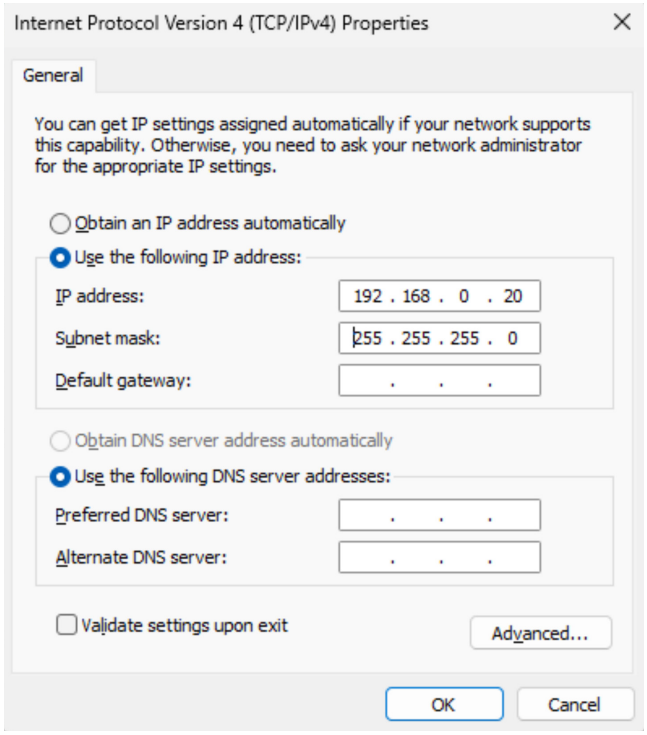
To allow communication among the devices, they need to have an compatible IP address configuration. It means the IP address must be at the same range, according to network mask. For this example, we will use the following IP addresses in this document:

- 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
  VFD: 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

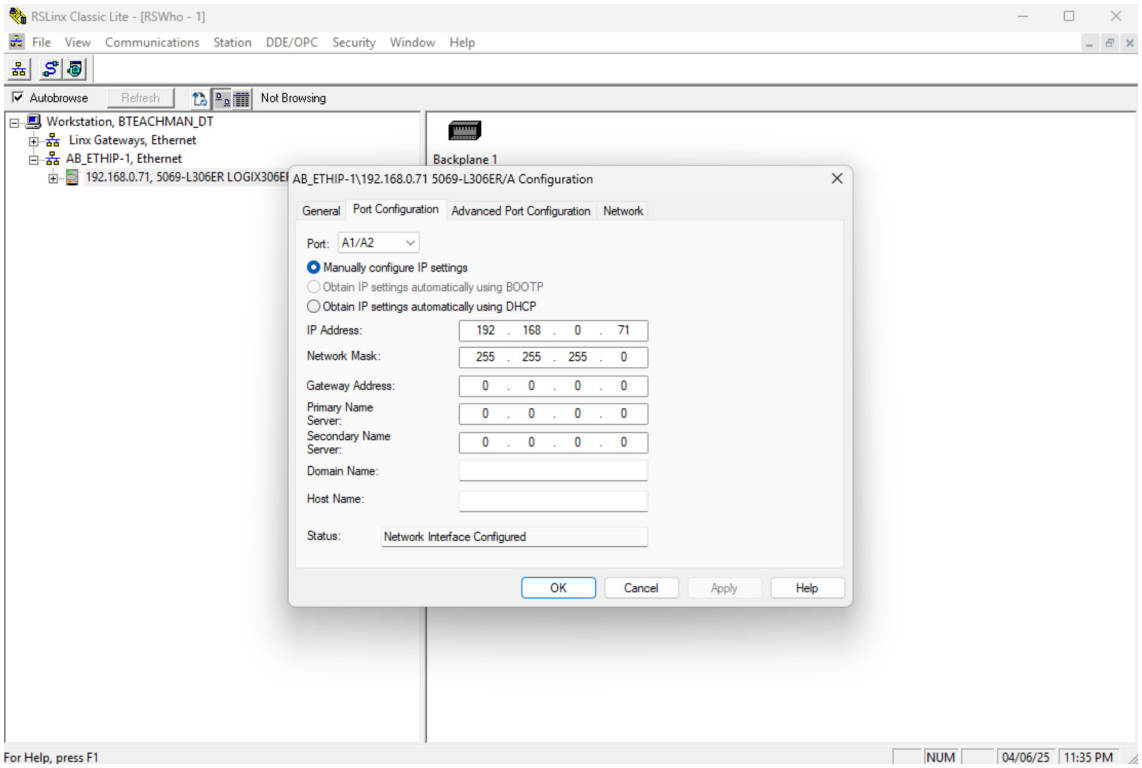




WEG CFW500 AOI Configuration

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.



CFW500 Ethernet Interface

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

- P810 IP Address Config: 0 (Parameters).
- P0811 IP Address 1: 192
- P0812 IP Address 2: 168
- P0813 IP Address 3: 0
- P0814 IP Address 4: 126
- P0815 CIDR Sub-net: 24
- P0816 Gateway 1: 0
- P0817 Gateway 2: 0
- P0818 Gateway 3: 0
- P0819 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.

All data subject to change without notice

WEG CFW500 AOI Configuration

EDS Installation

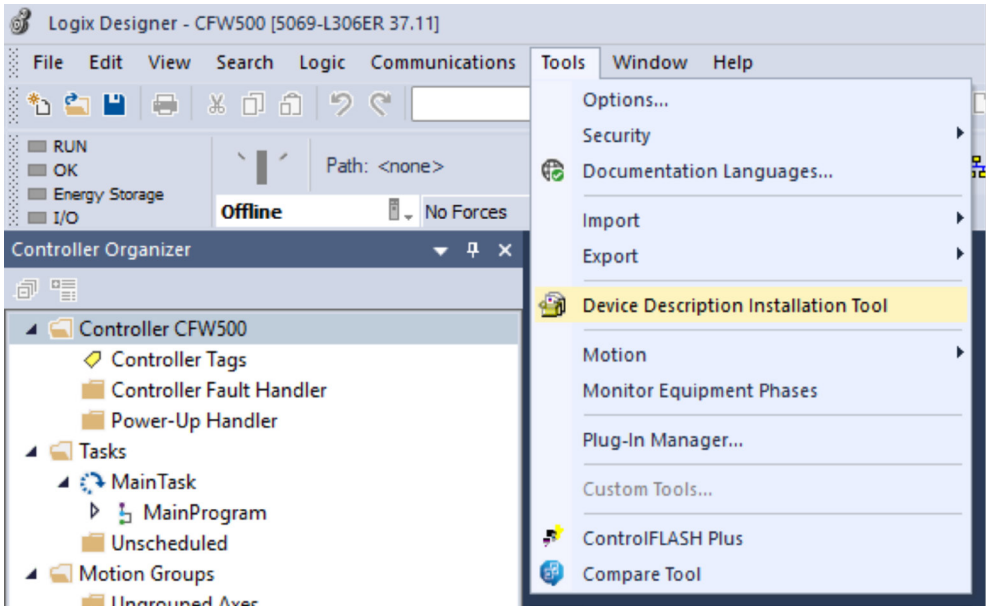
Begin by adding the EDS file for the CFW500 G2 or MW500 G2 if it not already in the project.

✓ **NOTE!**

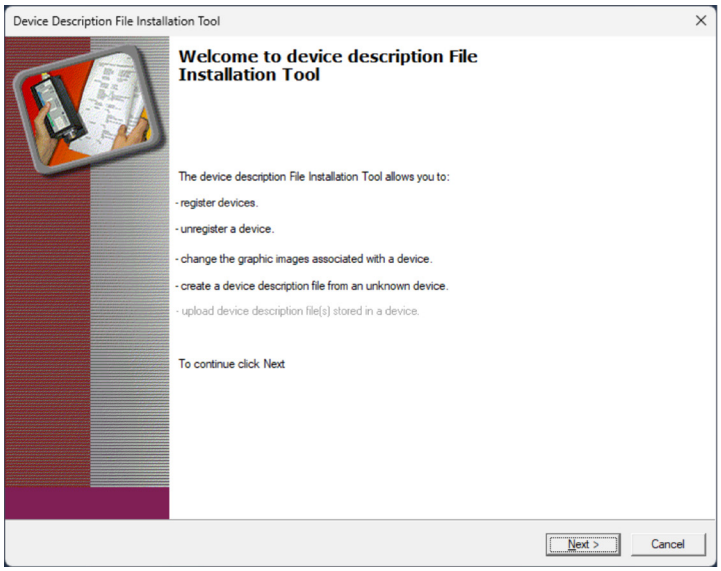
Please ensure you select the appropriate version of the EDS file. There are 4 EDS files available:

- CFW500 G2 with a single Ethernet port (CFW500-CETH-IP)
- CFW500 G2 with a dual Ethernet port (CFW500-CETH2)
- MW500 G2 with a single Ethernet port (CFW500-CETH-IP)
- MW500 G2 with a dual Ethernet port (CFW500-CETH2)

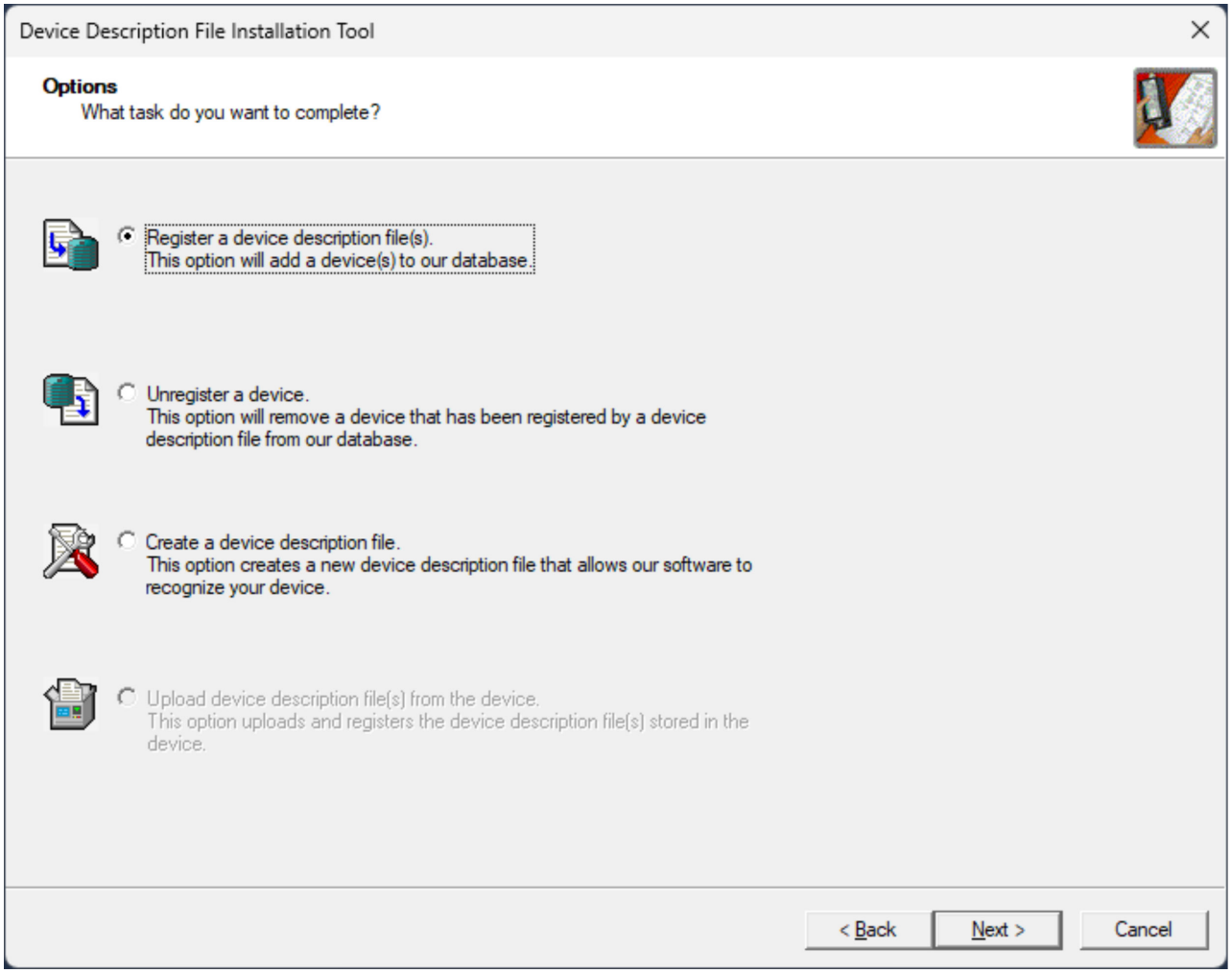
This manual uses the CFW500 G2 with a dual Ethernet port (CFW500-CETH2) as the example, but the same process would be used for the other options.



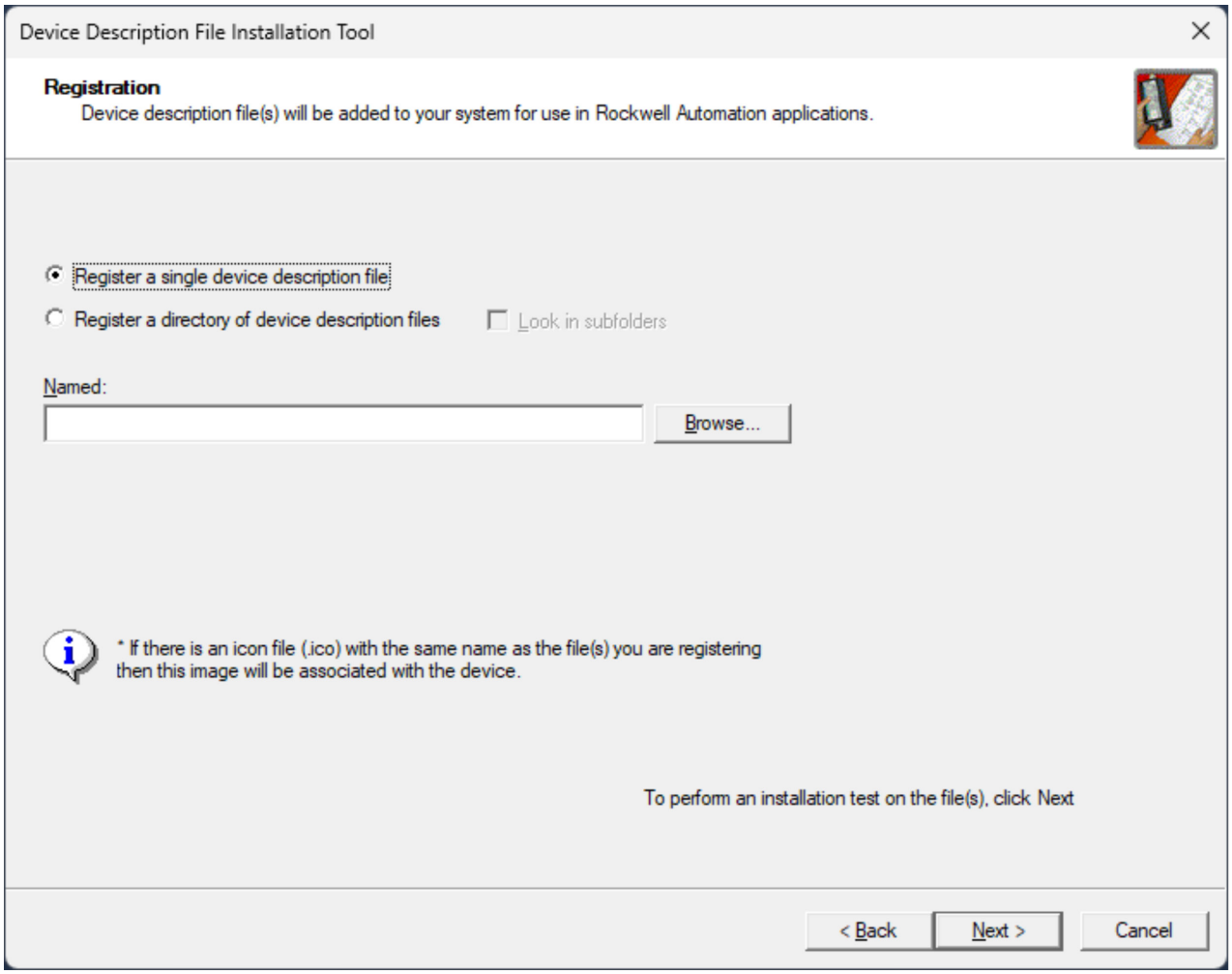
From inside Logix Designer, go to Tools -> Device Description Installation Tool



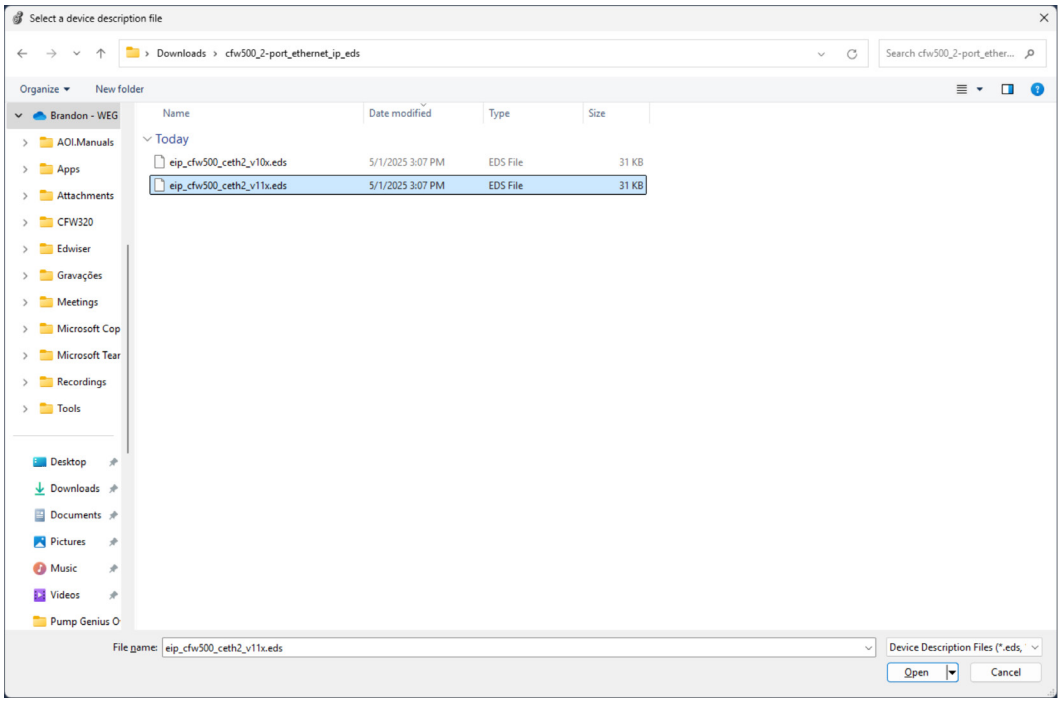
Click Next >



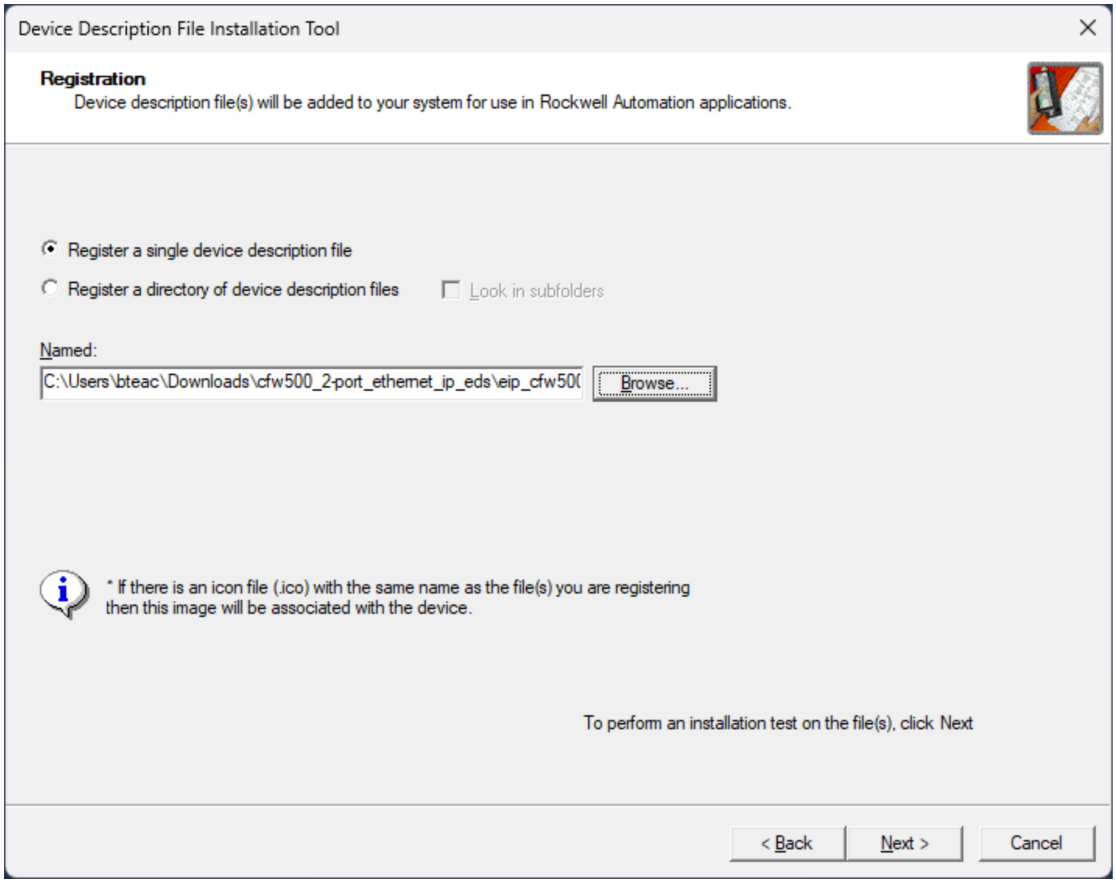
Click Next >



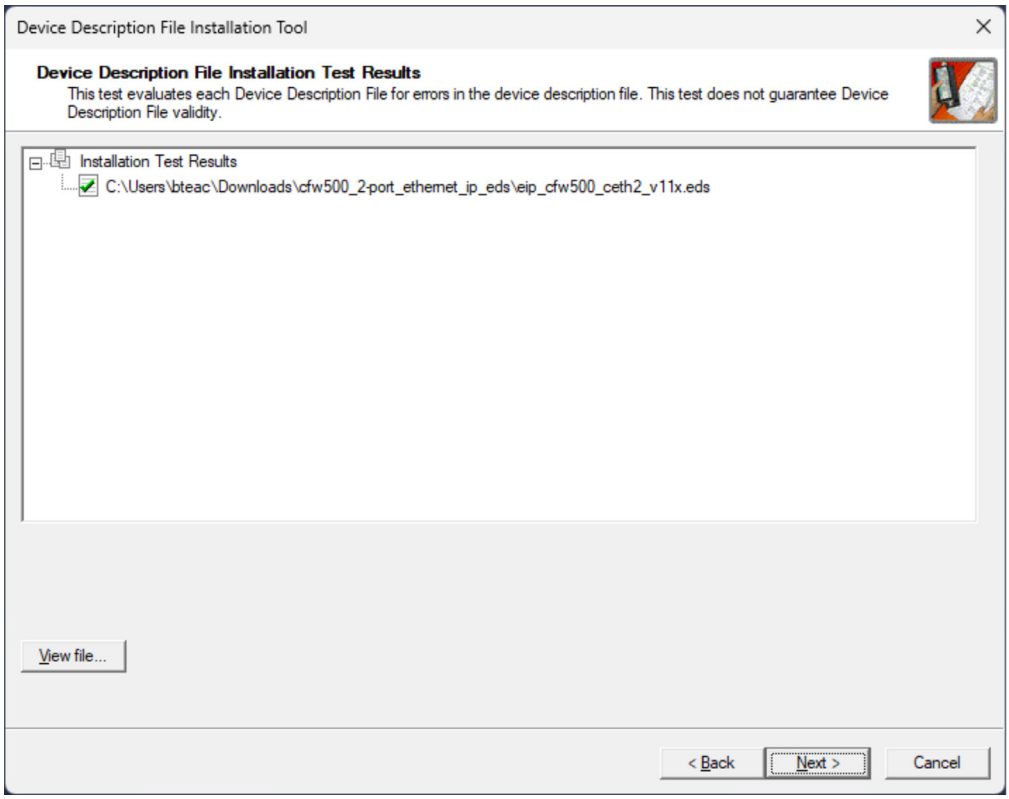
Click Browse ...



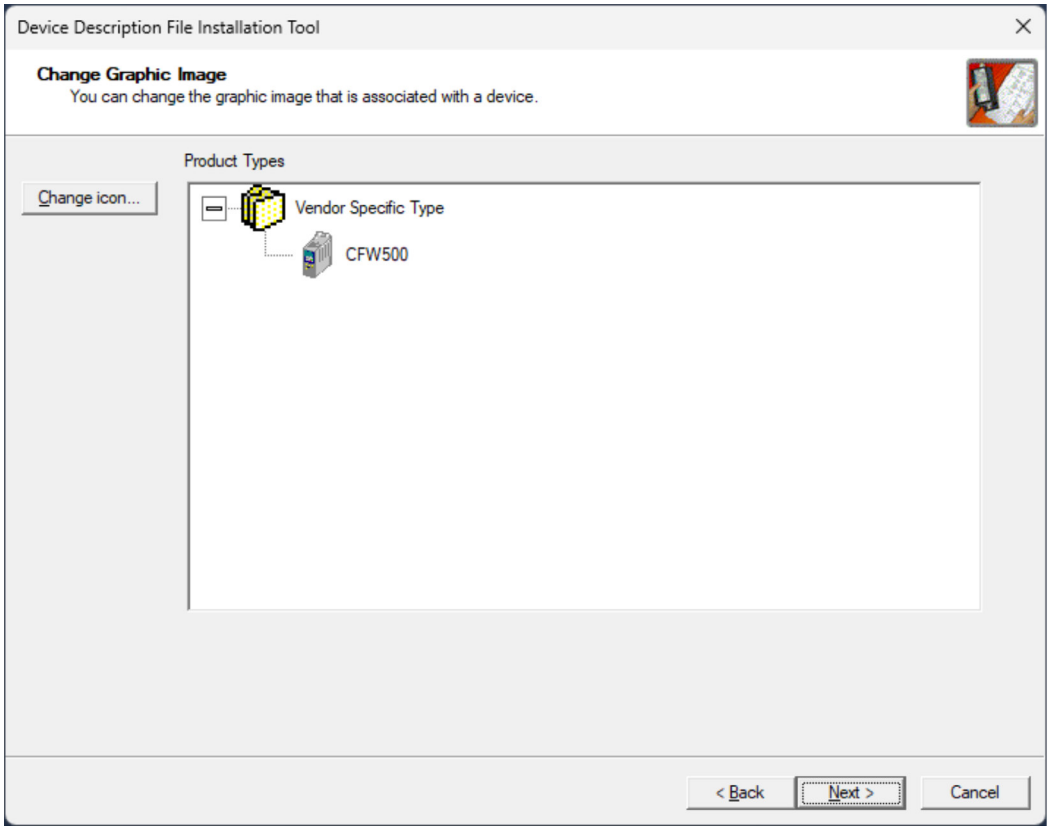
Browse to where the downloaded eds file is located and click Open



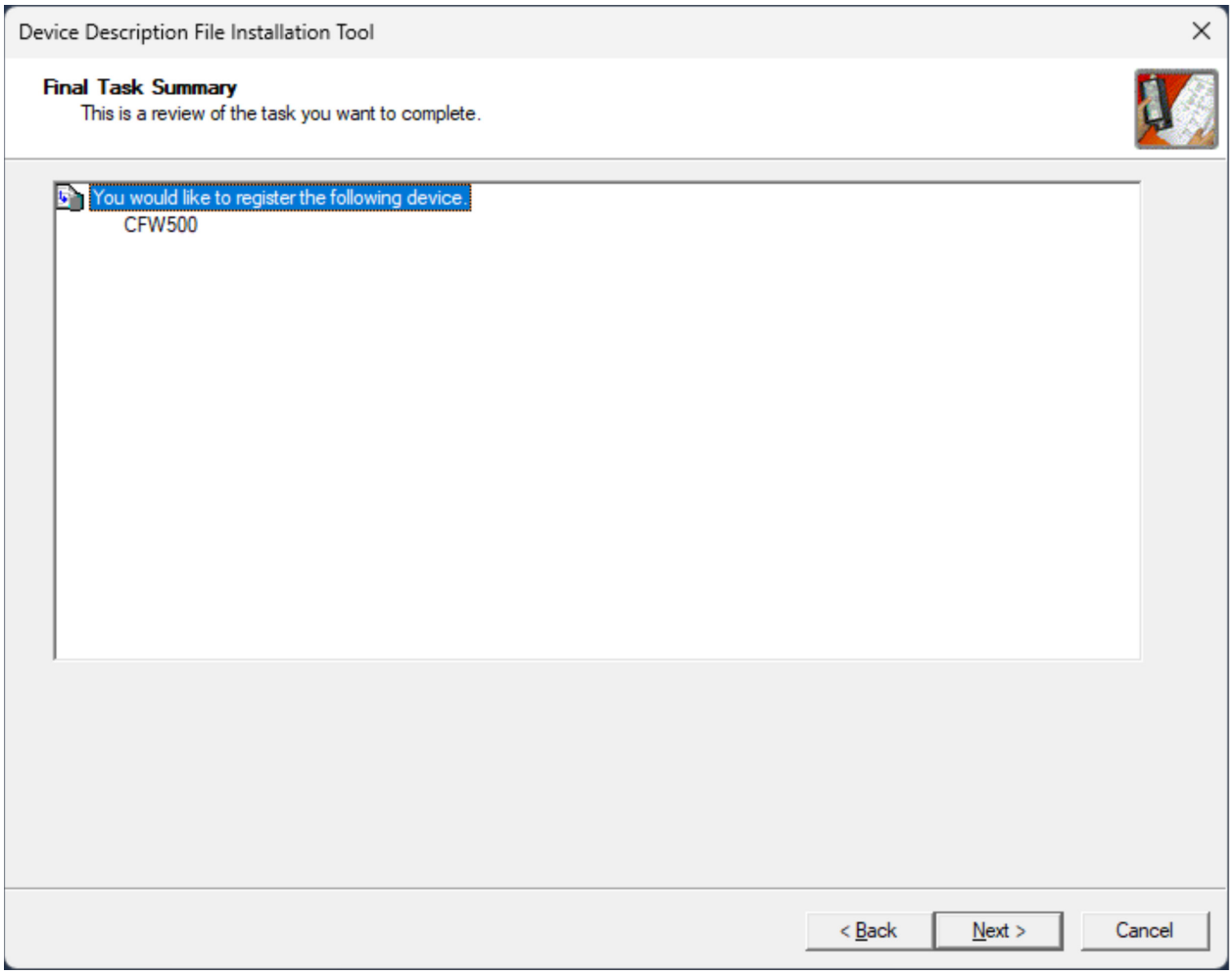
Click Next >



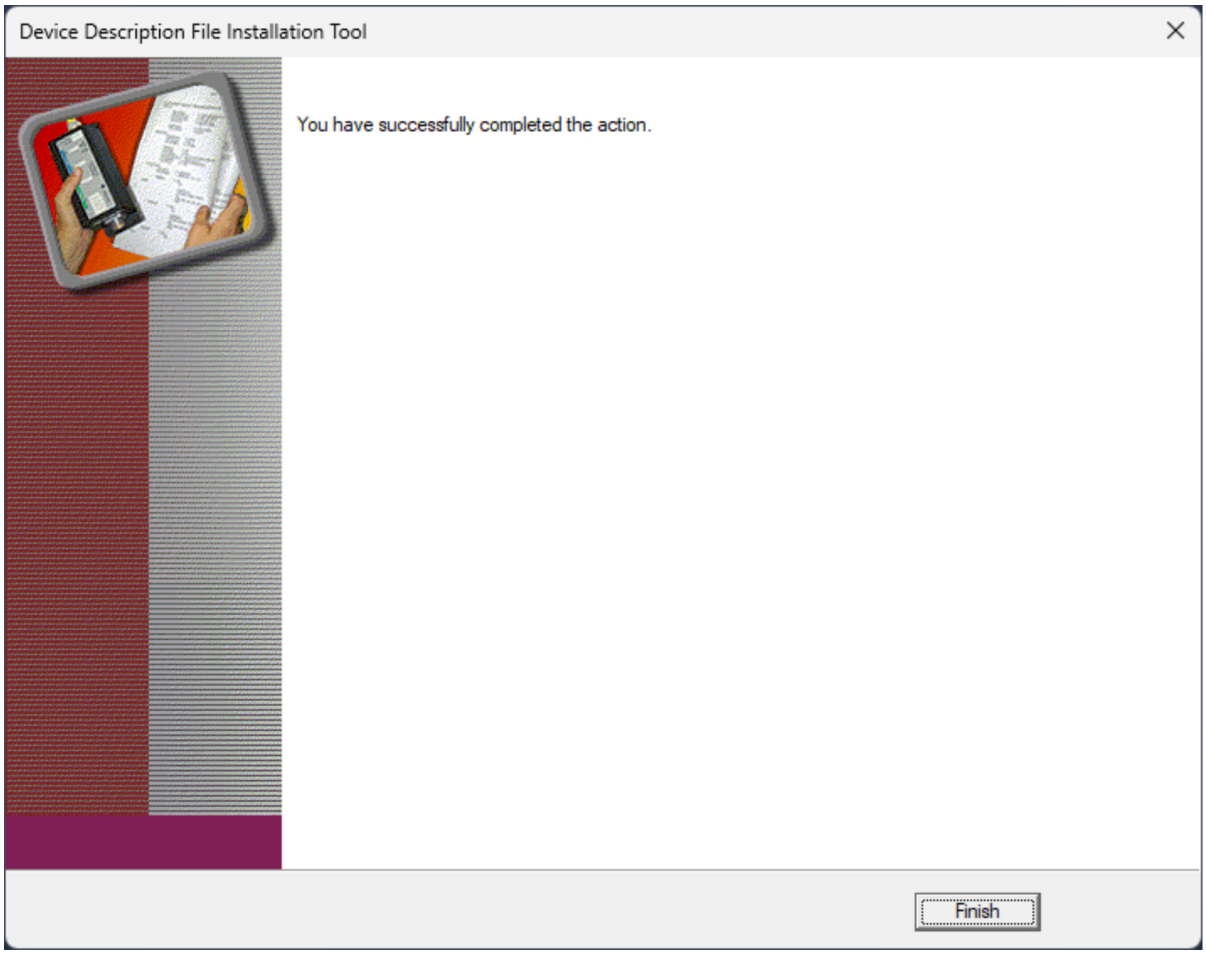
There should be a green checkmark. Click Next >



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.
CFW500
< Back
Next >
Cancel

Click Next >



Click Finish

The EDS file is now installed and the CFW500 can be added as an EtherNet/IP device in the device tree.

AOI

CFW500

This AOI controls the CFW500 and handles the following additional parameters:

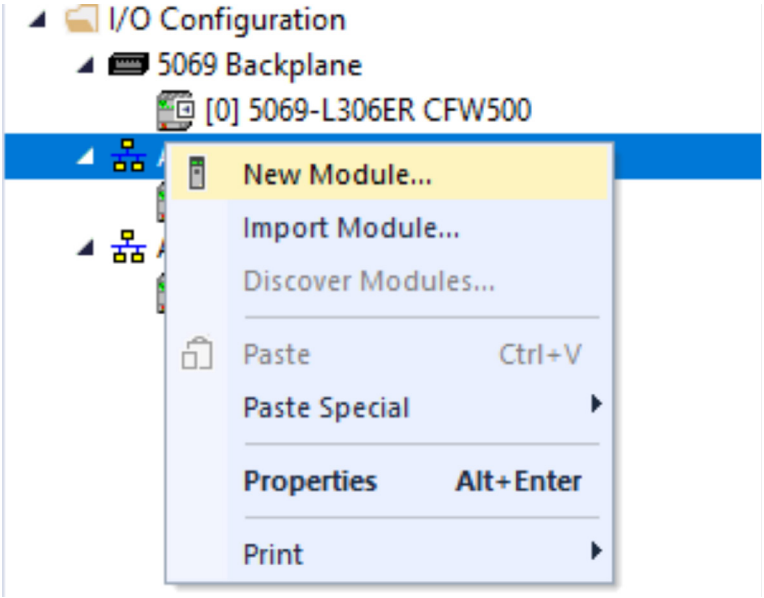
Outputs

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

Inputs

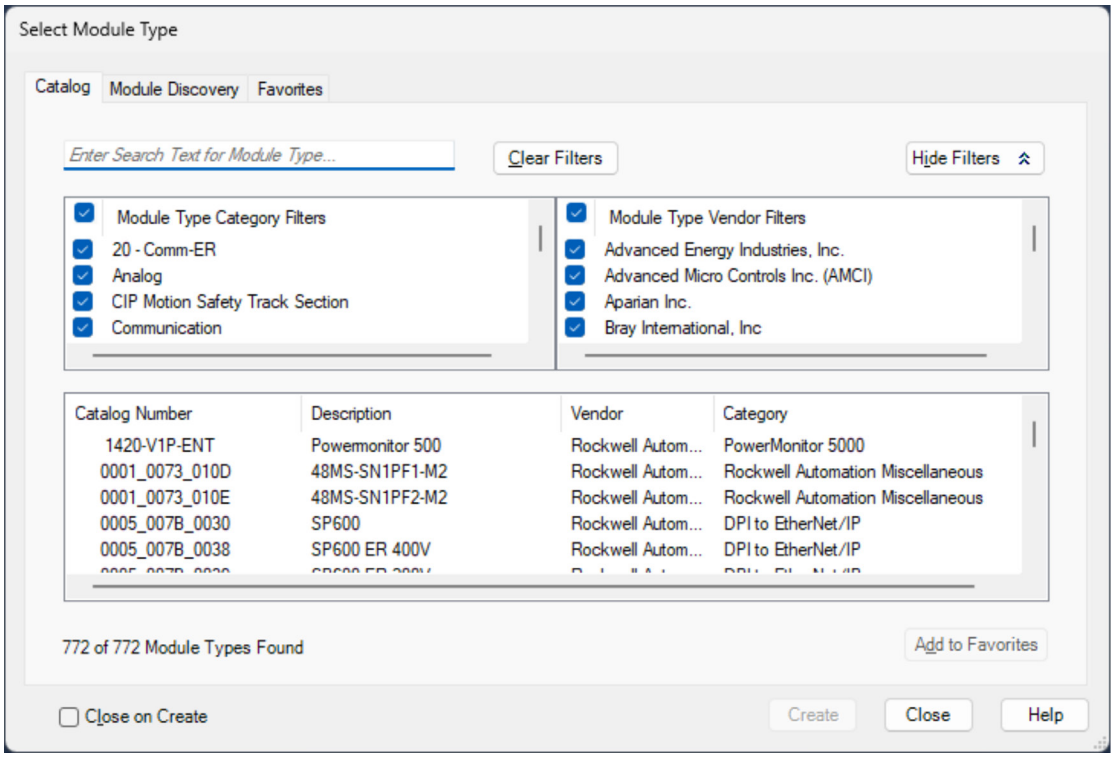
- Acceleration Ramp 1
- Deceleration Ramp 1

Create the EtherNet/IP Device

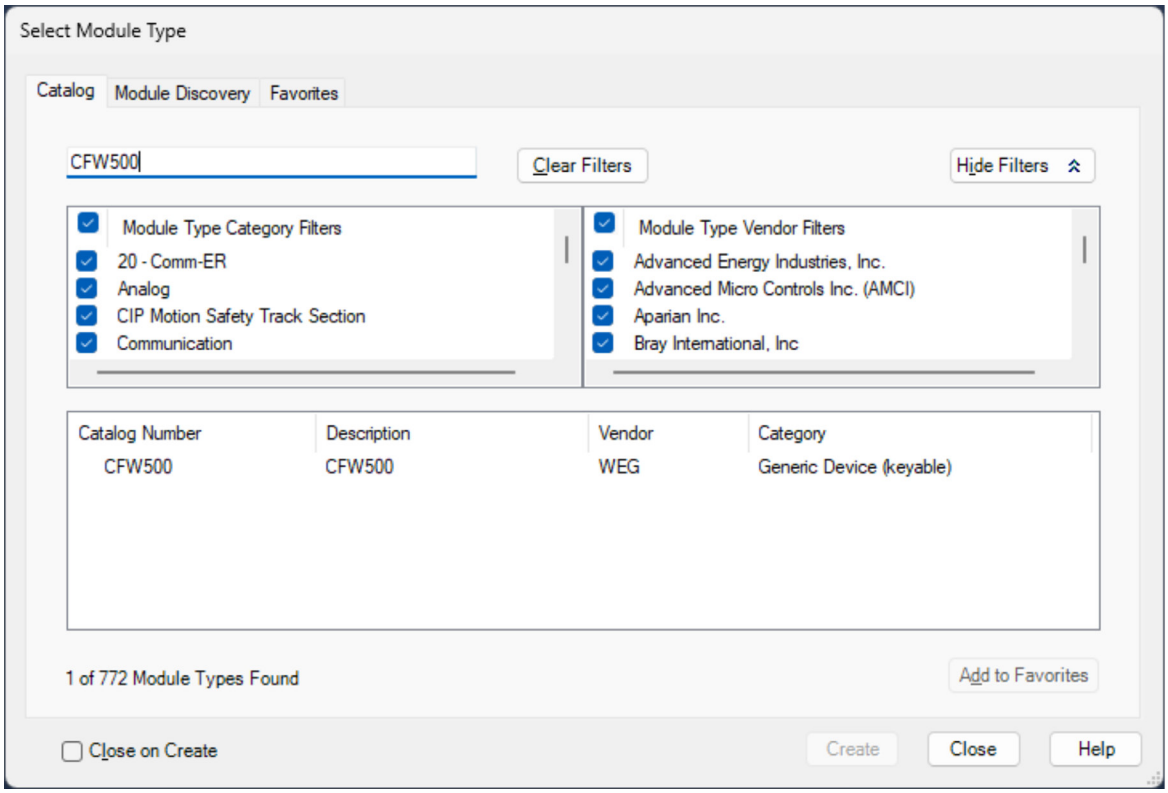


In the device tree, right click on the Ethernet bus that will contain the VFD and click New Module...

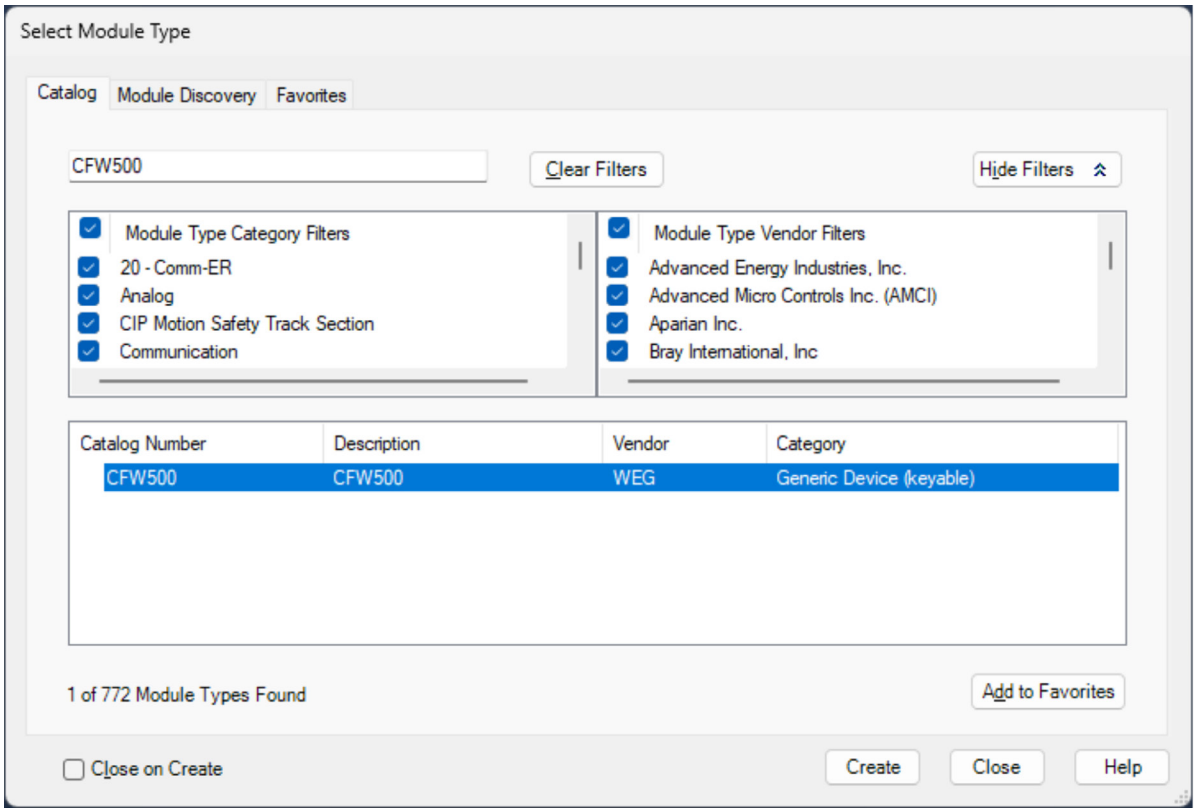
All data subject to change without notice



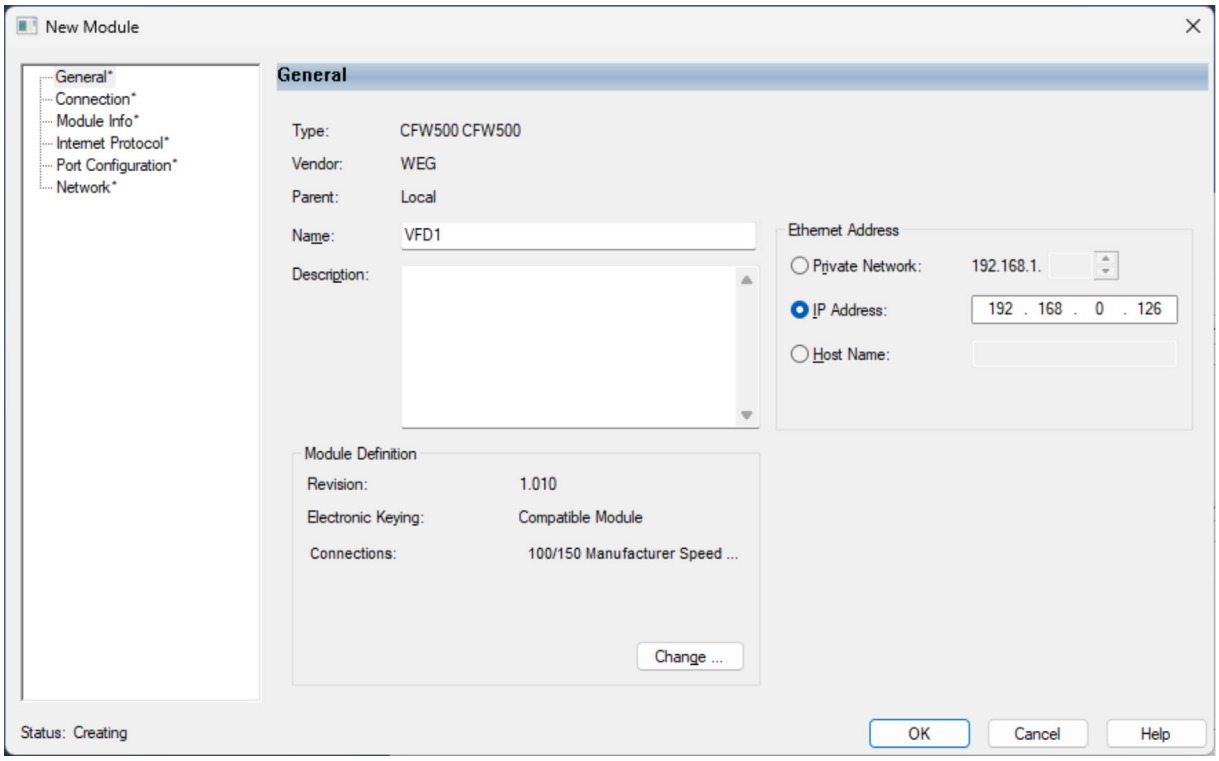
In the Select Module Type dialog box, enter “CFW500” in the search field



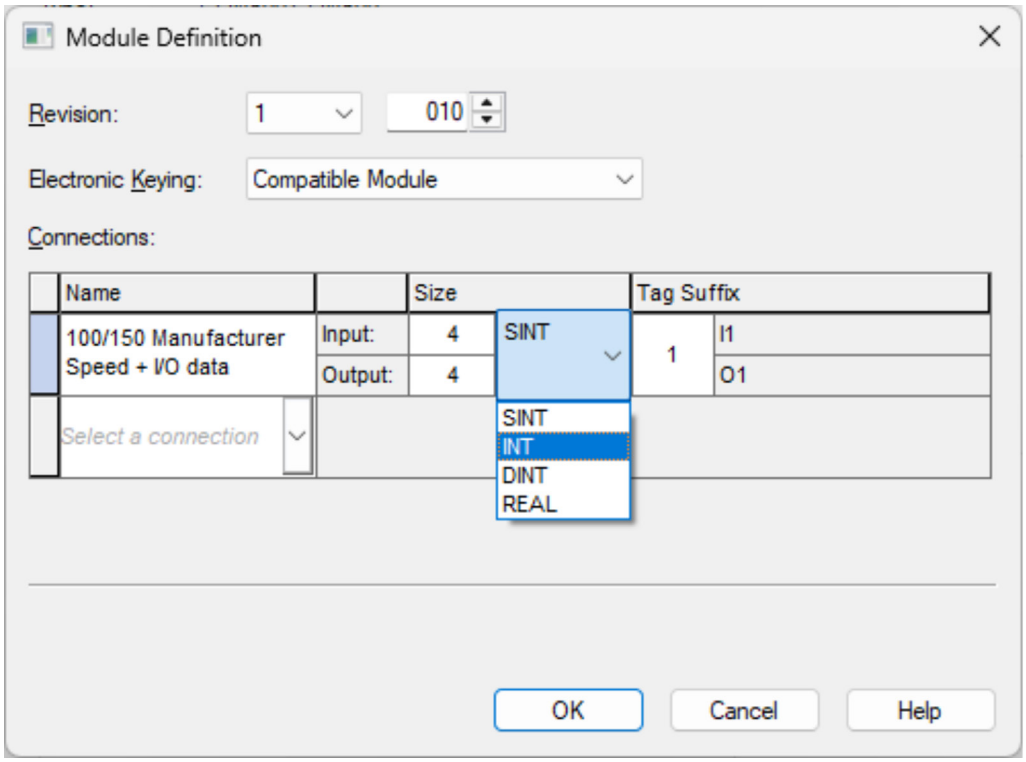
There should be an entry matching the above screenshot.



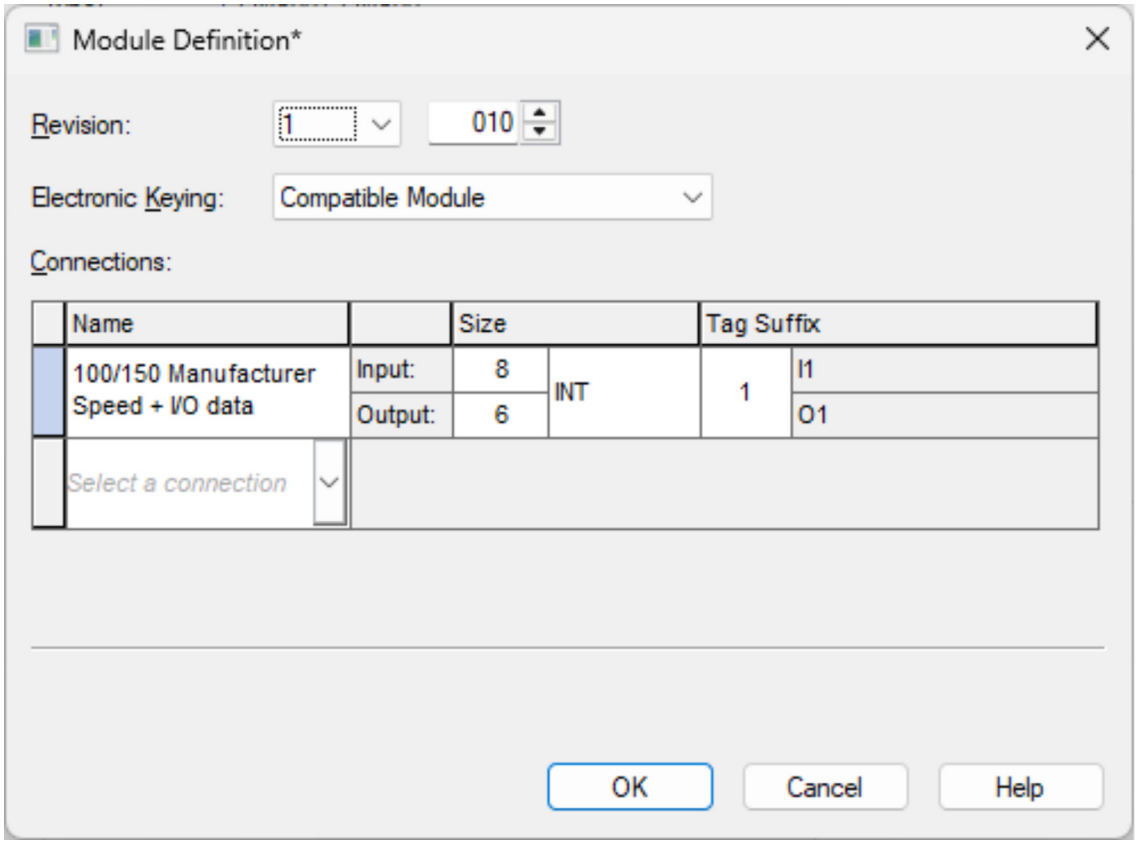
Highlight the CFW500 and click Create



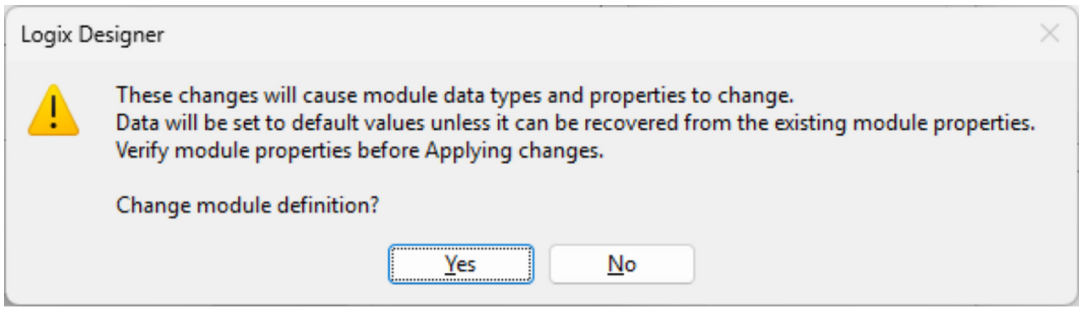
Give the CFW500 a Name and IP address. Before clicking on OK, click on the Change ... button in the module definition.



Change the type to INT



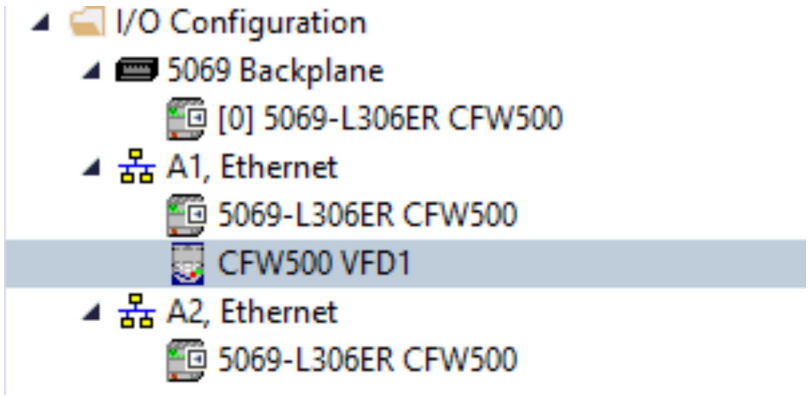
The Input and output size should be set to 8 and 6 respectively. Click OK



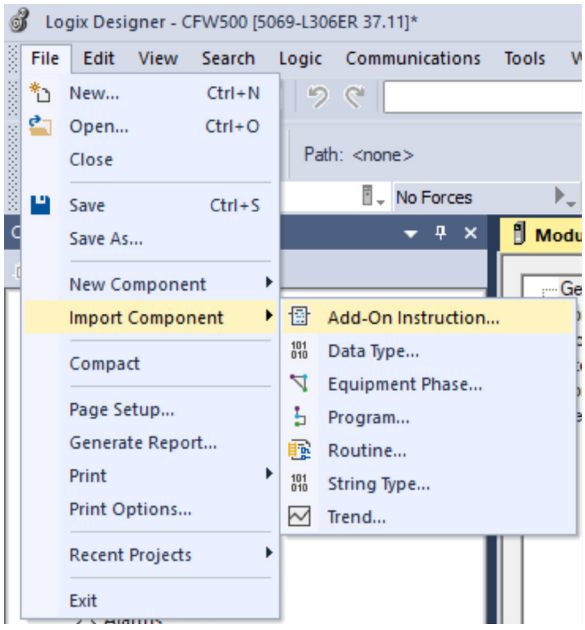
Click Yes

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

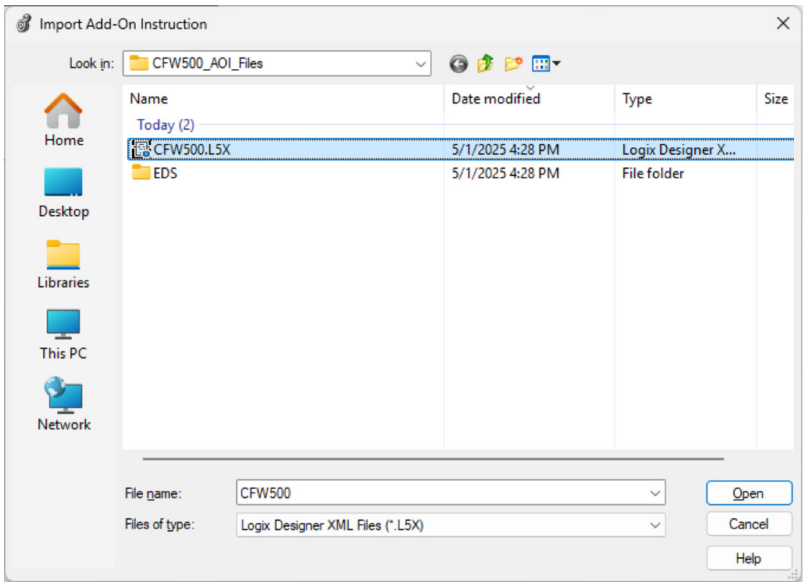
Once satisfied with the settings, Click OK



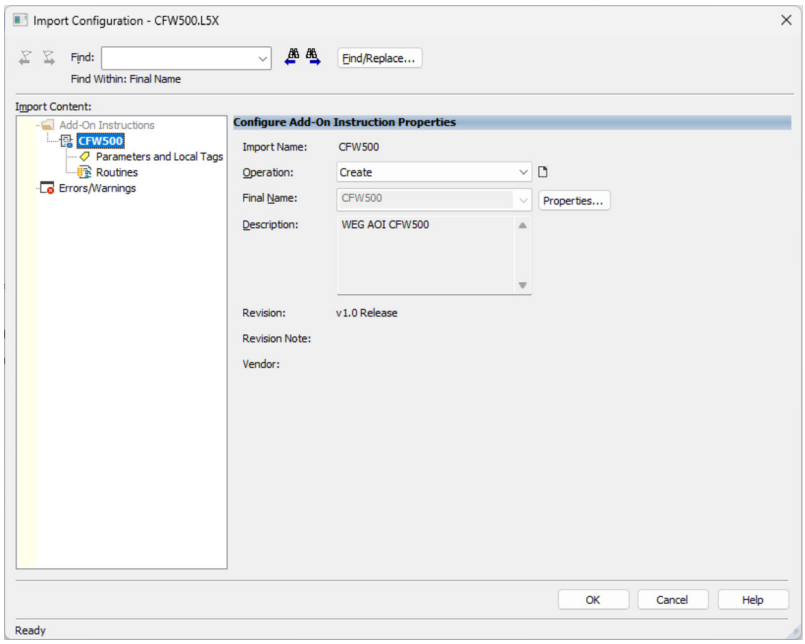
There should now be an instance of the CFW500 in the device tree



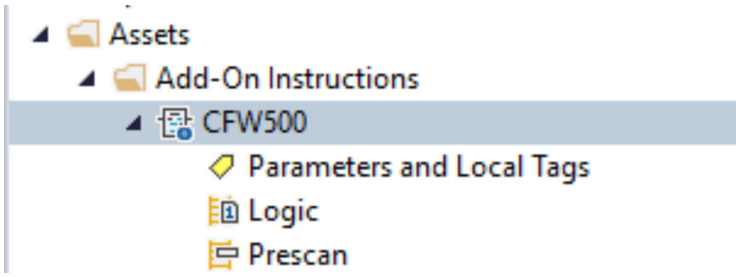
From the menu bar go to File, Import Component, Add-On Instruction...



Select the appropriate add-on instruction (CFW500.L5X) and click Import...



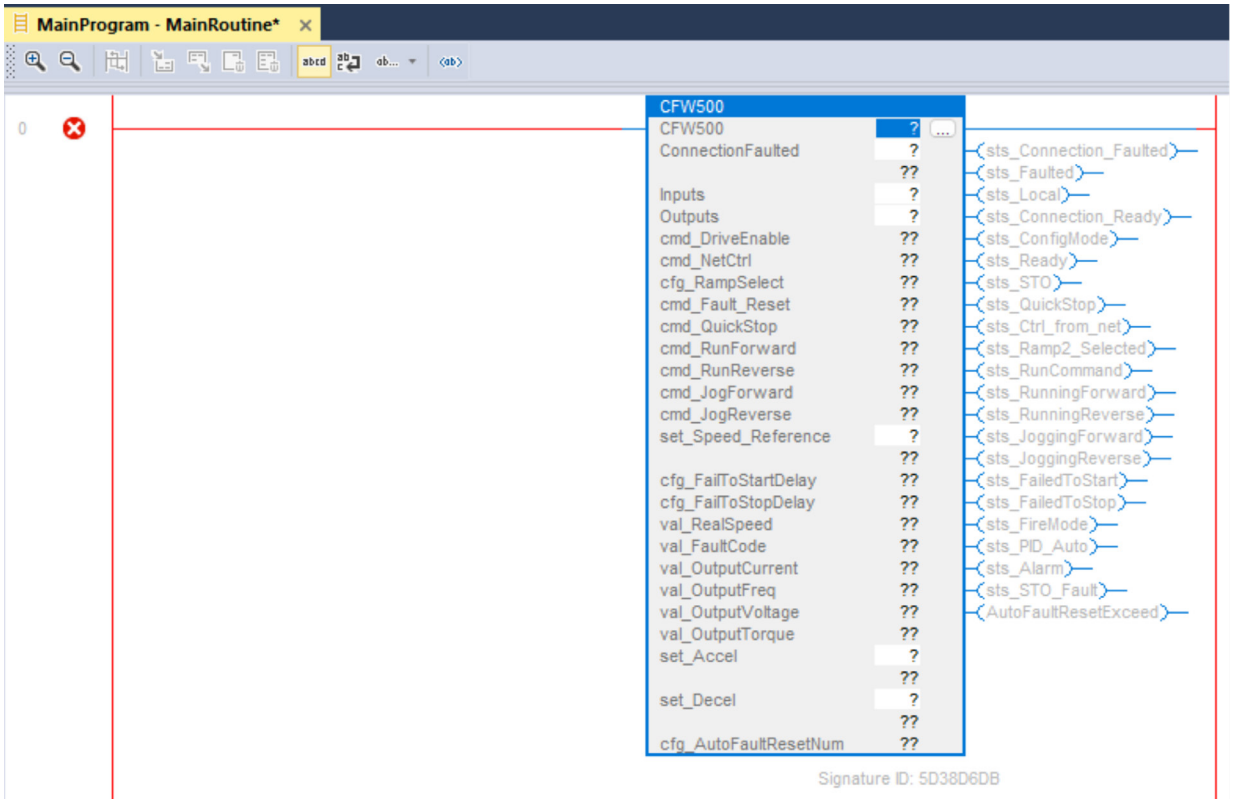
Review the proposed changes and click OK



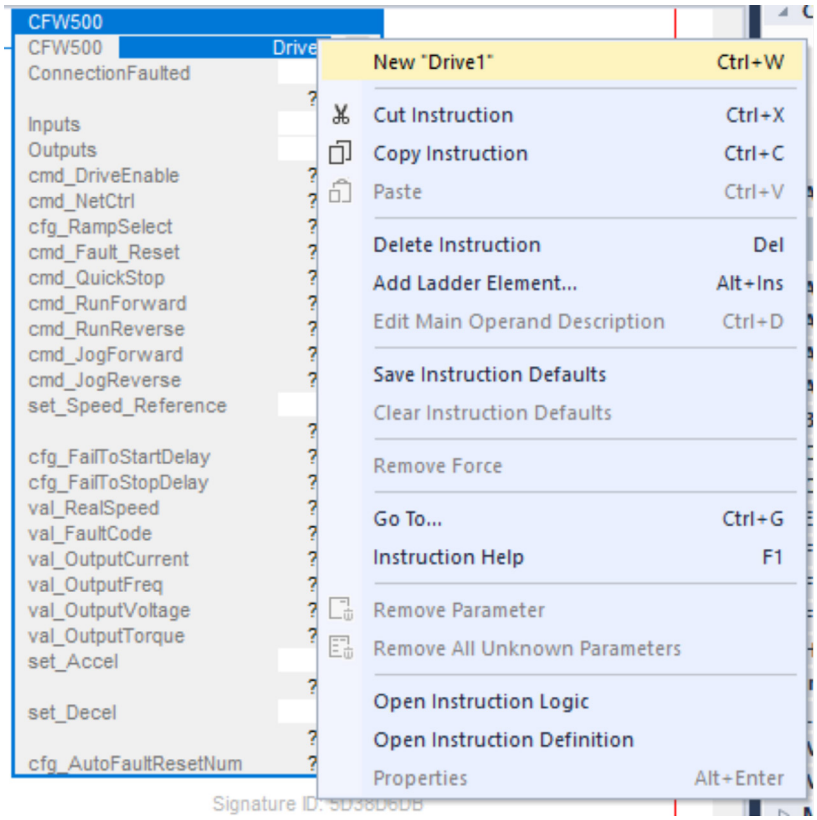
There should now be this add-on instruction in the project.

AOI Usage

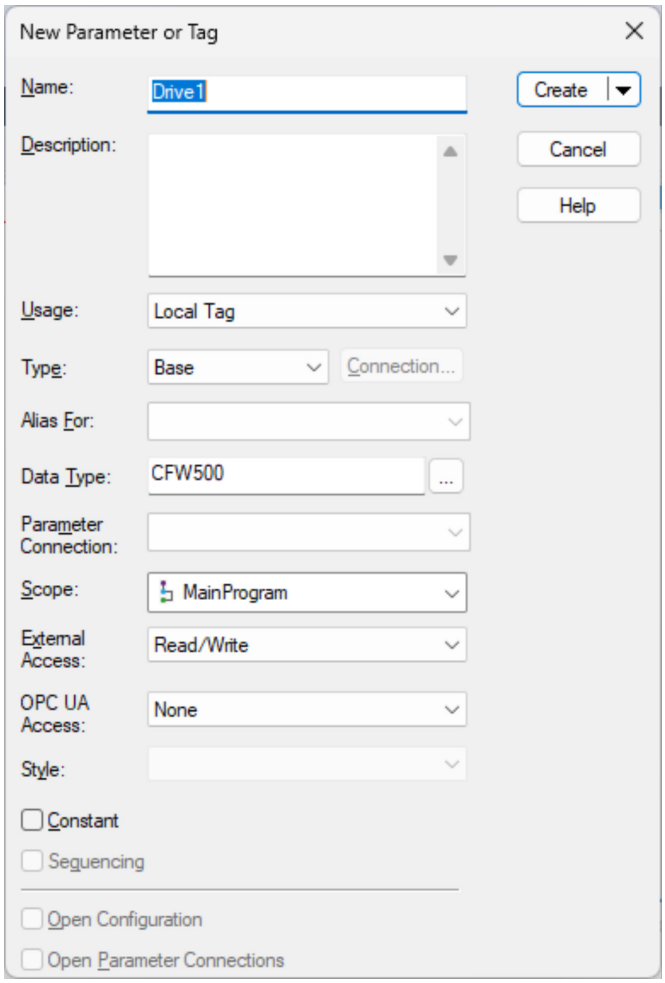
On an empty rung of ladder, add an instance of the newly imported add-on instruction by clicking on the Toolbox bar and clicking the CFW500 symbol under Add-On



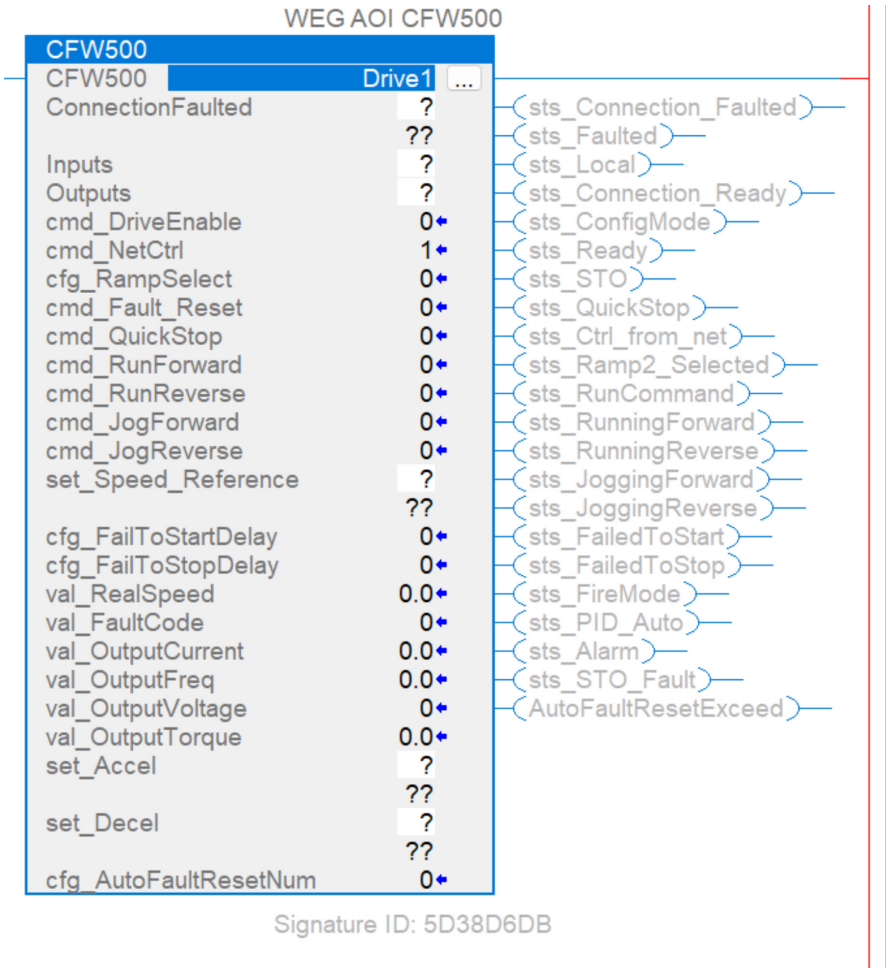
Your ladder logic should look like this after you add the add-on instruction



The Add-On requires a tag to be created. Create this tag by typing a name in the CFW500 field and right clicking and selecting New “Tag”.



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

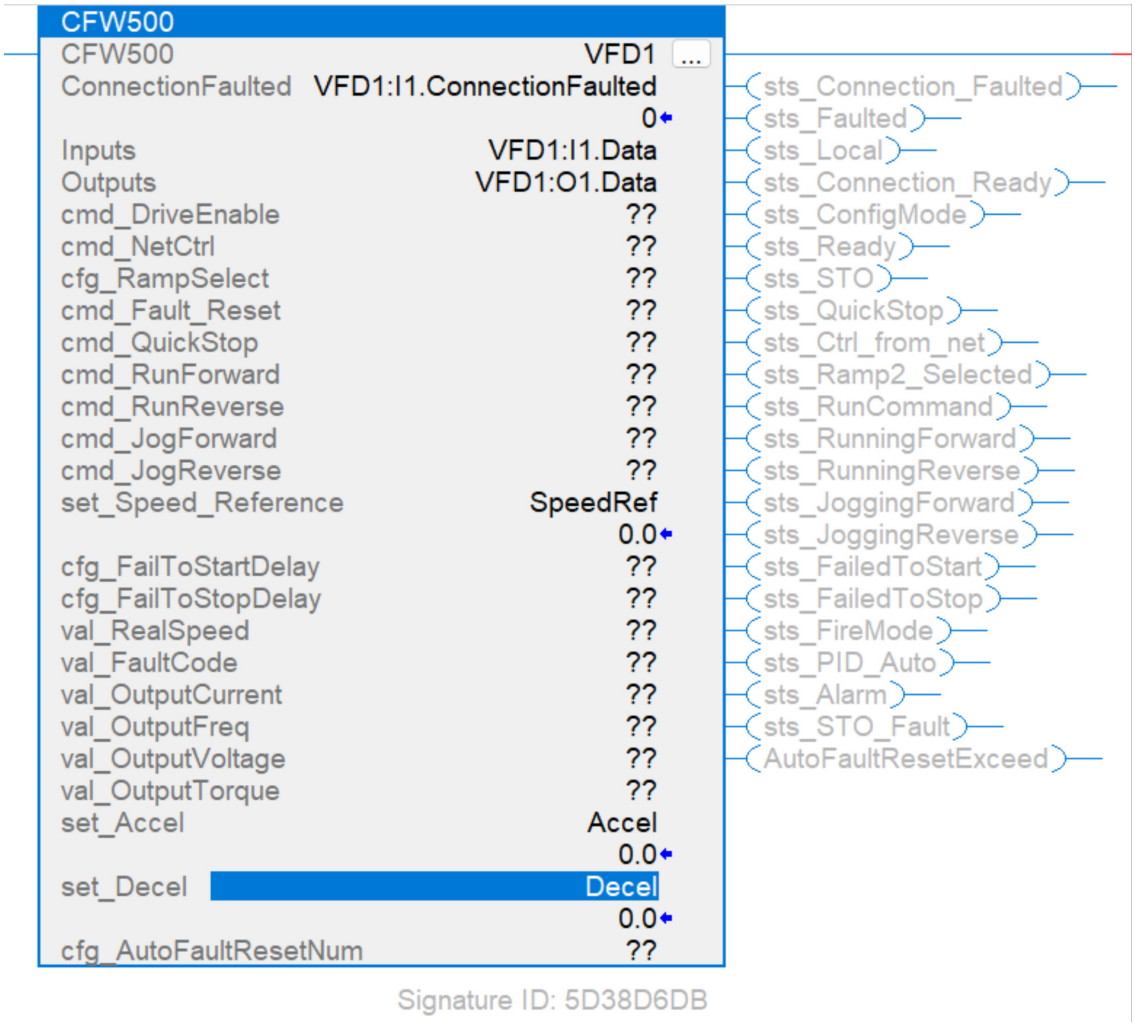


Next, the Connection Faulted, Inputs, Outputs, set_Speed_Reference, set_Accel, and set_Decel need to be populated as follows:

- 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.

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



All data subject to change without notice

AOI Parameter Description

InOut Parameters

Parameter	Type	Description
Inputs	INT[8]	Input Assembly from CFW500
Outputs	INT[6]	Output Assembly to CFW500

Input Parameters

Parameter	Type	Description
Cfg_FailToStartDelay	DINT	Time in seconds before faulting on fail to start if VFD does not start when commanded Set to 0 to disable
Cfg_FailToStopDelay	DINT	Time in seconds before faulting on fail to stop if VFD does not stop when commanded Set to 0 to disable
ConnectionFaulted	BOOL	From CFW500 Ethernet Module.
		1 = Connection is faulted 0 = Connection is OK
cfg_RampSelect	BOOL	1 = Ramp 2 (P0102/P0103) 0 = Ramp 1 (P0100/P0101)
cmd_DriveEnable	BOOL	1 = Enable operation of VFD 0 = Disable operation of VFD
cmd_Fault_Reset	BOOL	1 = Send Reset Fault Signal to VFD 0 = No action
cmd_JogForward	BOOL	1 = Jog Forward 0 = No Action / Stop
cmd_JogReverse	BOOL	1 = Jog Reverse 0 = No Action / Stop
cmd_NetCtrl	BOOL	1 = Remote (Ethernet) control 0 = Local (Other) control
cmd_QuickStop	BOOL	1 = Quick stop 0 = No Quick Stop (must be 0 to run)

cmd_RunForward	BOOL	1 = Run Forward 0 = Stop
cmd_RunReverse	BOOL	1 = Run Reverse 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 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 1 = Connection has been faulted from VFD to PLC 0 = Connection OK
sts_Connection_Ready	BOOL	1 = Connection from VFD to PLC is established
sts_Ctrl_from_net	BOOL	1 = VFD controlled remotely (PLC) 0 = VFD controlled locally
sts_Faulted	BOOL	1 = VFD Fault, connection fault, or failedToStart/Stop Fault 0 = No faults
sts_FailedToStart	BOOL	1 = VFD failed to start in time allotted 0 = Normal
sts_FailedToStop	BOOL	1 = VFD failed to stop in time allotted 0 = Normal
sts_FireMode	BOOL	1 = Drive Operating in Fire Mode

All data subject to change without notice

sts_PID_Auto	BOOL	1 = PID in Automatic Mode 0 = PID in Manual Mode
sts_Local	BOOL	1 = Local 0 = Remote
sts_QuickStop	BOOL	1 = Quick stop commanded 0 = No Quick stop commanded
sts_Ramp2_Selected	BOOL	1 = Ramp 2 rates selected 0 = Ramp 1 rates selected
sts_Ready	BOOL	1 = VFD is ready to operate (states Ready, Enabled, or Stopping) 0 = VFD is not ready to operate
sts_RunCommand	BOOL	1 = Commanded to run 0 = Not commanded to run
sts_RunningForward	BOOL	1 = Running forward 0 = Not running forward
sts_RunningReverse	BOOL	1 = Running reverse 0 = Not running reverse
sts_STO	BOOL	1 = Safe Torque Off is active 0 = Safe Torque Off is not active
sts_STO_Fault	BOOL	1 = AOI is preventing running due to STO trip until cmd_RunForward/Reverse shows a rising edge 0 = Normal Operation
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
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.

CFW500 G2 or MW500 G2 Parameter Requirements

The following paramaters must be set in the CFW500 G2 or the MW500 G2:

Parameter	Setting
P0105 1st / 2nd Ramp Selection	5 = CO/DN/PB/Eth
P0220 LOC/REM Selection Source	10 = CO/DN/PB/Eth (REM
P0222 REM Rotation Selection	11 = CO/DN/PB/Eth
P0226 REM Rotation Selection	9 = CO/DN/PB/Eth (FWD)
P0227 REM Run/Stop Selection	4 = CO/DN/PB/Eth
P0228 REM JOG Selection	5 = CO/DN/PB/Eth
P0820 Eth: Read Word #3	9
P0821 Eth: Read Word #4	49
P0822 Eth: Read Word #5	3
P0823 Eth: Read Word #6	5
P0824 Eth: Read Word #7	7
P0825 Eth: Read Word #8	403
P0835 Eth: Write Word #3	100
P0836 Eth: Write Word #4	101
P0837 Eth: Write Word #5	169
P0838 Eth: Write Word #6	170

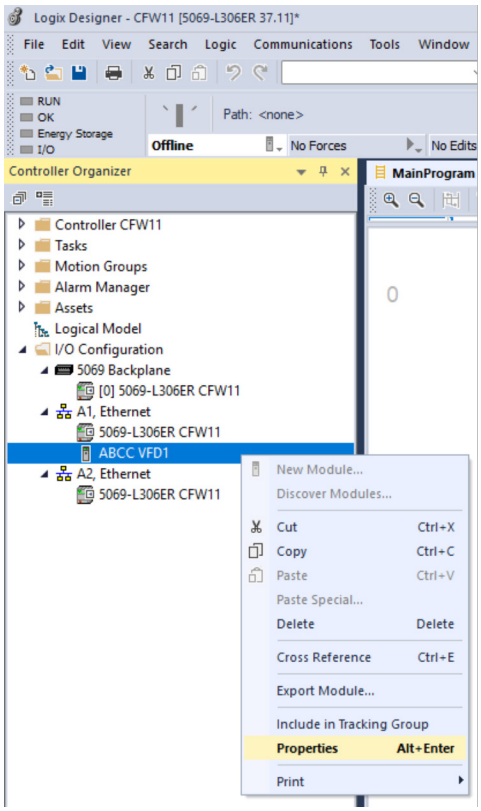
All data subject to change without notice

Trouble Shooting

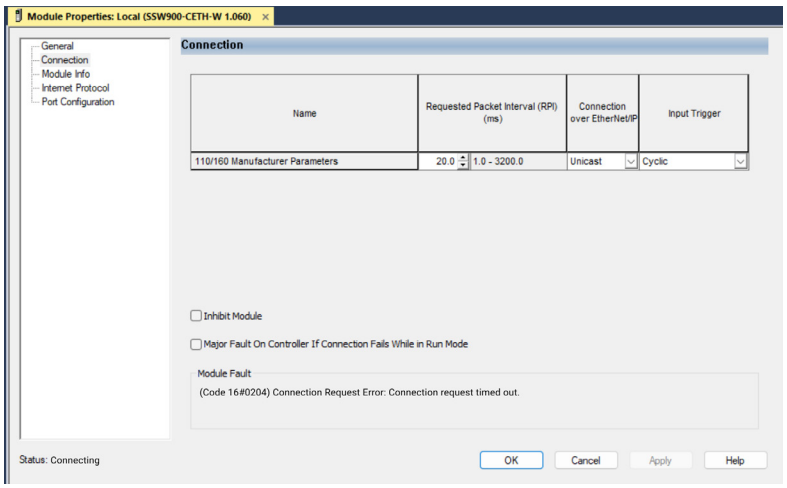
This section is to help with any problems you may encounter.

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 VFD 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.

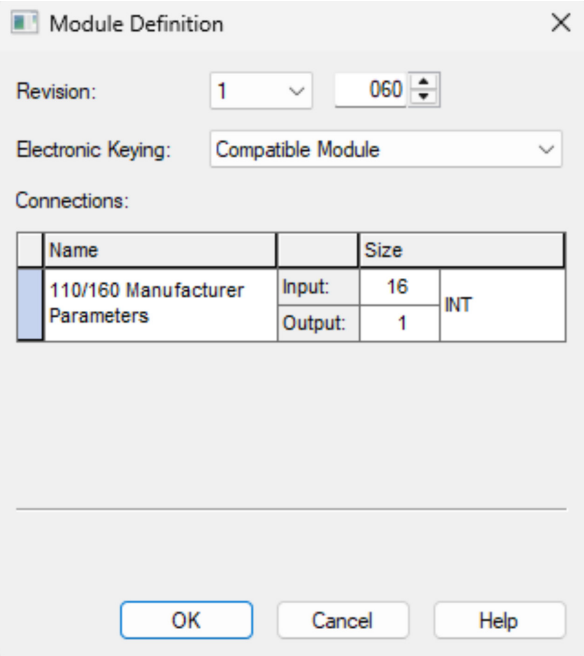


Error Code 16#0005 = Connection Request Error: Bad Class.

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 “CFW500 G2 & MW500 G2 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 “CFW500 G2 & MW500 G2 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:

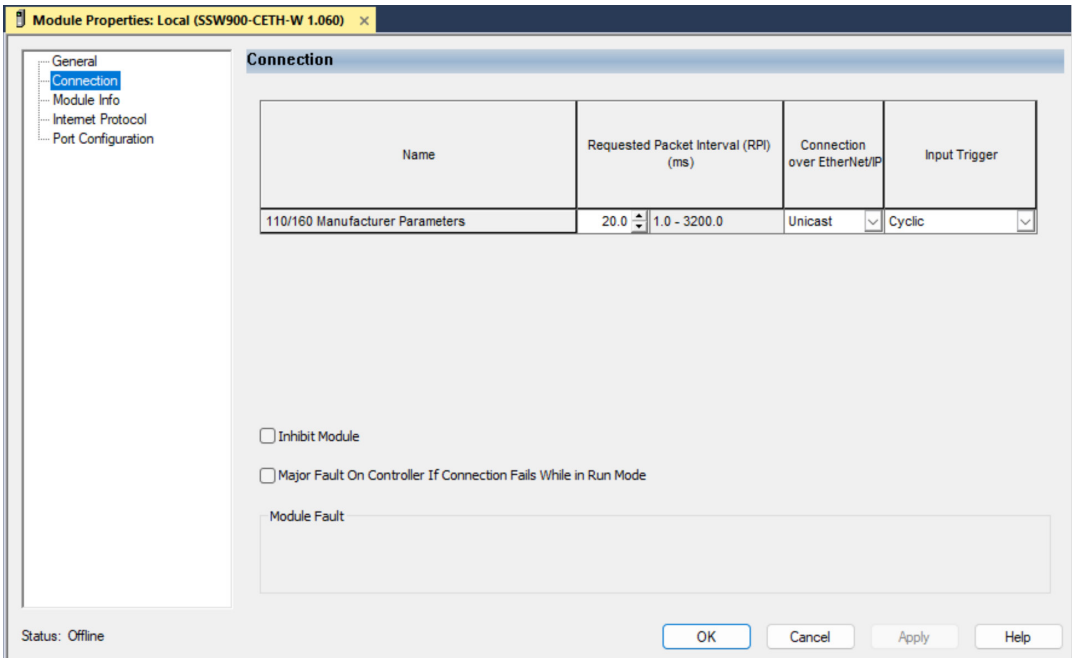
- Check the programmed connection size in the PLC and the VFD (example the VFD is sending 2 words and the PLC is programmed to 4 words).
- Ensure the comm format for the module is set to a data type of INT in the PLC. This can be found under the properties for the module.

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:

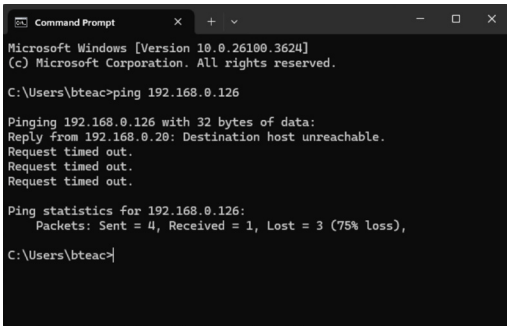
- Check the programmed connection size in the PLC and the VFD (example the VFD is sending 2 words and the PLC is programmed to 4 words).
- Ensure the comm format for the module is set to a data type of INT in the PLC. This can be found under the properties for the module.

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 P0843 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 A0148: Ethernet Interface Access Error

This indicates error in data exchange between CFW500 frequency inverter and Ethernet module.

What to check:

- Check if Ethernet module is properly connected to the VFD.
- Check if the equipment firmware version supports the Ethernet accessory.
- Hardware errors caused by the improper handling or installation of the accessory can cause this error. If possible, test it by replacing the communication module.

3) VFD has A0149: Ethernet Offline

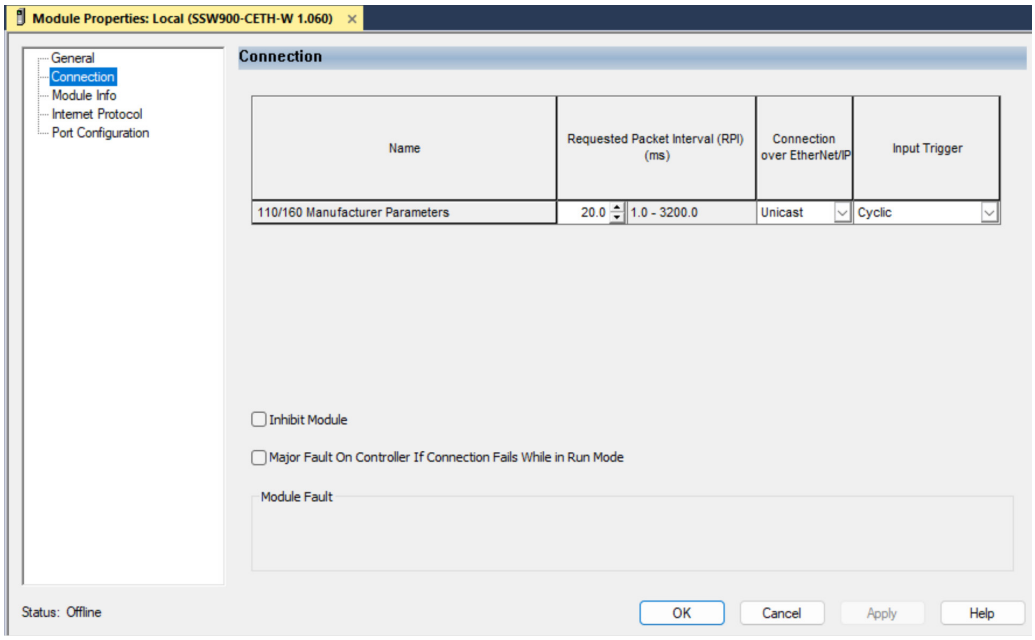
This indicates failure in cyclic data communication with the master. It occurs when cyclical communication between the master and the VFD is interrupted for some reason. This fault is only for the CFW500-CETHIP accessory.

What to check:

- Check the network installation, broken cable, or fault/poor contact on the connections with the network, grounding.
- Check if the PLC is correctly configured and operating properly.

5) 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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