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Driving efficiency and sustainability

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WEG SSW900 AOI Configuration

SUMMARY OF REVISIONS

The information below describes the revisions made to this manual.

Version	Revision	Description
-	R00	First edition
-	-	-
-	-	-
-	-	-

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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 SSW900 soft starter using the Ethernet IP interface to communicate with a Rockwell PLC with an AOI. It must be used together with the SSW900 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
SSW900 User's Manual	10005616165/09	WEG
SSW900 Soft-Starter Programming Manual	10003989140 / 05 (1.4x)	WEG
SSW900 Ethernet User's Guide	10008083244 / 03 (1.6x)	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 SSW900 AOI Configuration

Prerequisites

Exclusions

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

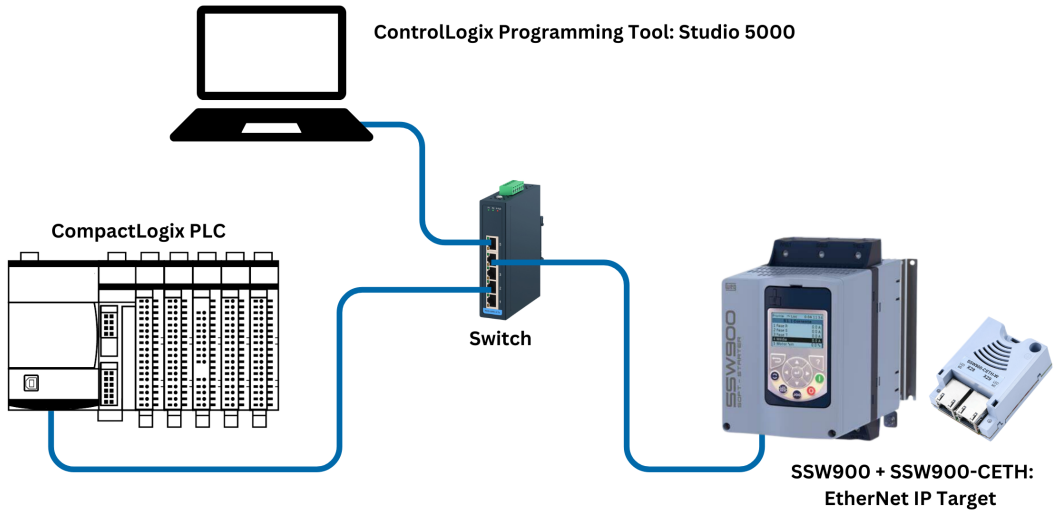
The connection and configuration of the IP network is beyond the scope of this document.

All non-communication specific parameters on the SSW900 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 SSW900 running version 1.3 (or higher) firmware with an EtherNet/IP card installed (SSW900-CETH-W or SSW900-CETH-N).
- 10/100 or faster ethernet network with IP connectivity and IP addresses for both the PLC and SSW900. 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) for industrial applications. Please refer to the SSW900 ethernet card documentation for information about the proper network installation.



WEG SSW900 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
  SSW900: 192.168.0.126 (as described at item 3).

PC IP Address Configuration

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

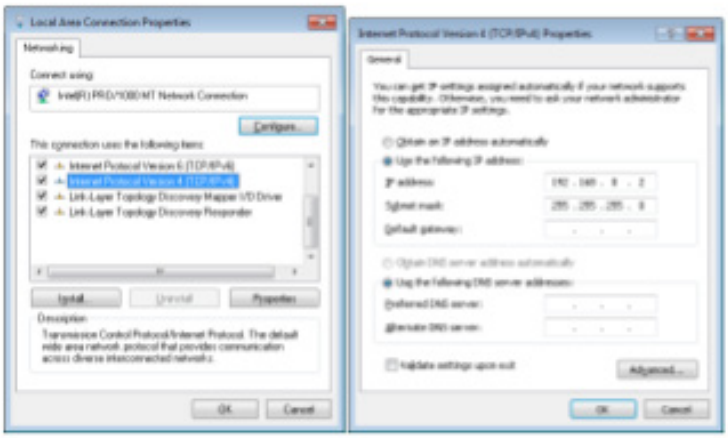


Figure 2.1: PC IP Address Configuration

WEG SSW900 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.

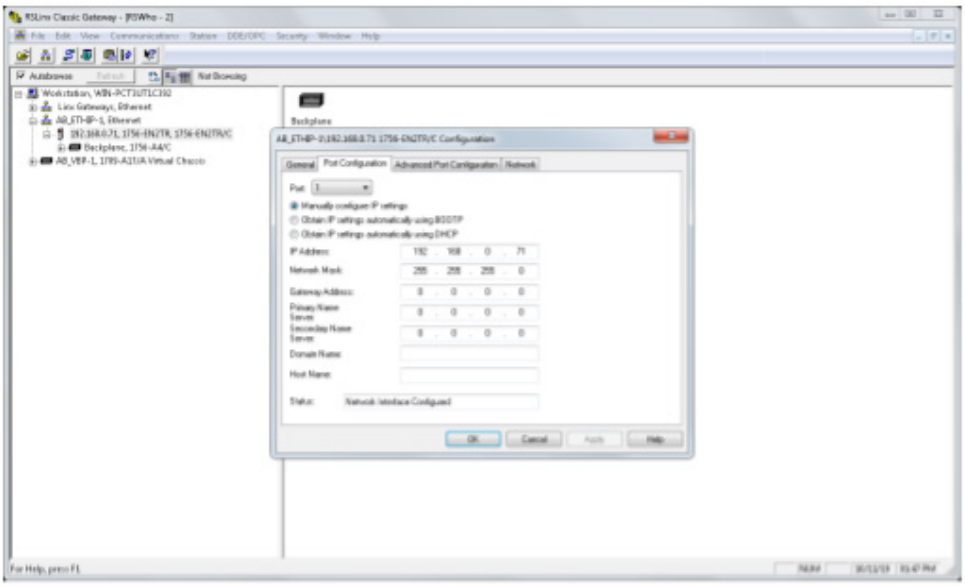


Figure 2.2: ControlLogix IP Address Configuration

SSW900 Etherinet Interface

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

- C8.5.1 IP Address Config: 0 (Parameters).
- C8.5.2 IP Address: 192.168.0.15.
- C8.5.3 CIDR: 255.255.255.0.
- C8.5.4 Gateway: 0.0.0.0.

✓ **NOTE!**

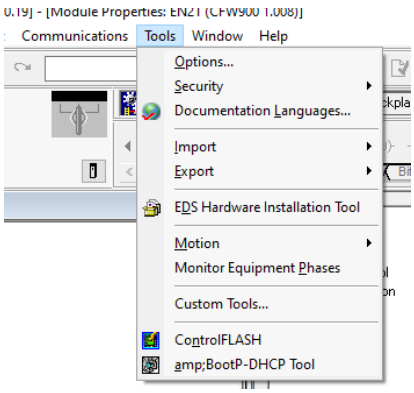
After changing these configurations, for the modification to be effective, the equipment must be turned off and then turned on again.

WEG SSW900 AOI Configuration

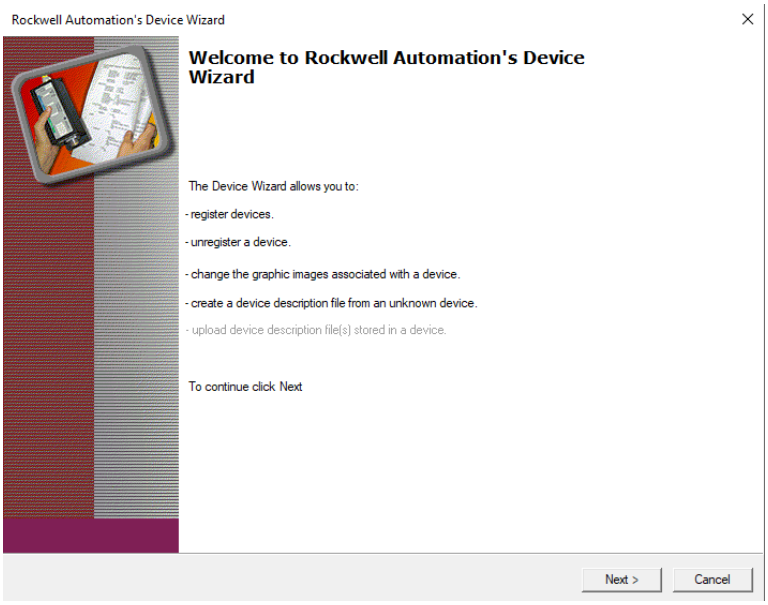
EDS Installation

Begin by adding the EDS file for the SSW900 if it is not already in the project.

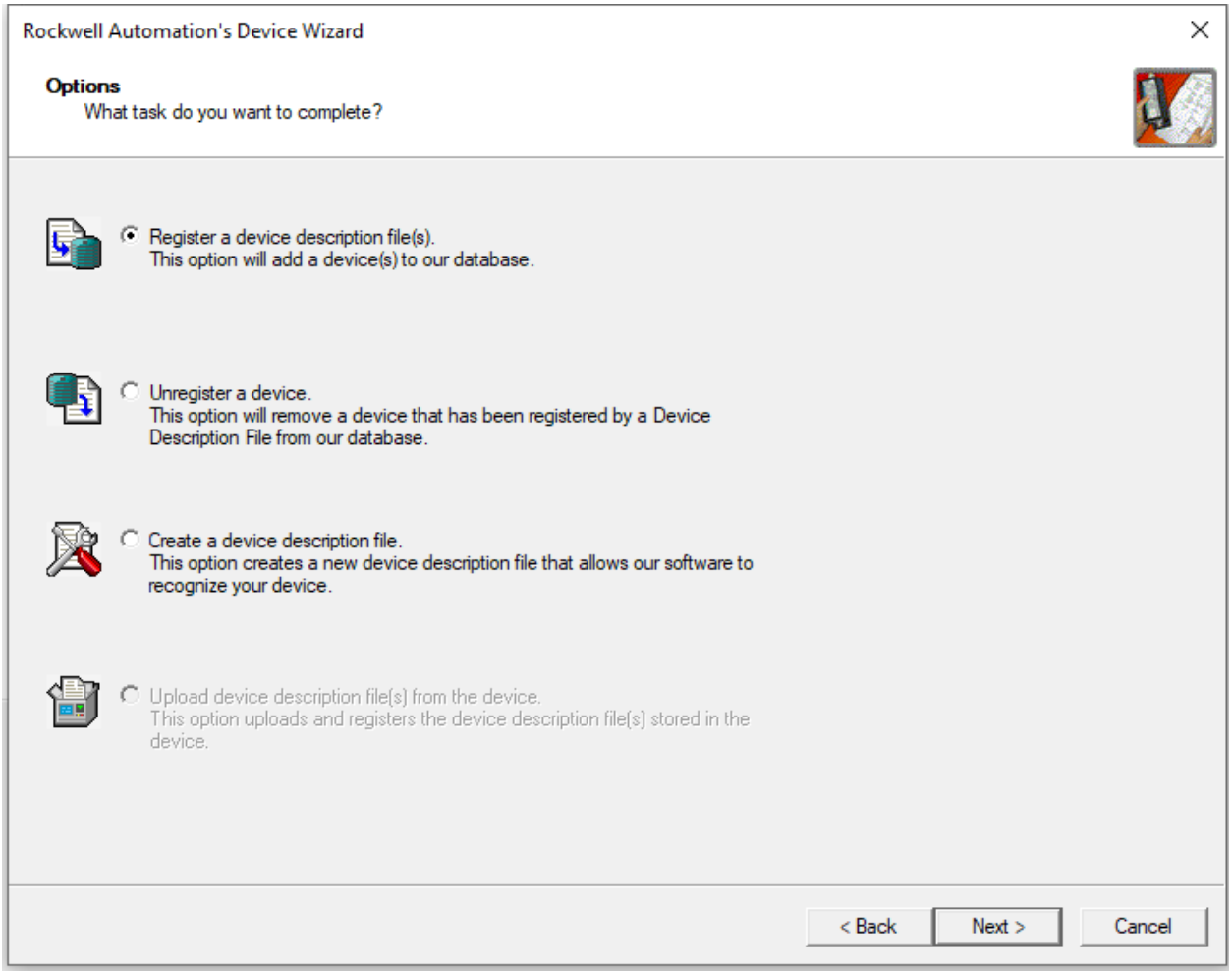
Note: Please ensure you select the appropriate version of the EDS file. There are two versions available: SSW-CETH-W and SSW900-CETH-N. This manual is uses the SSW-CETH-W as the example, but the same process would be used for the SSW900-CETH-N.



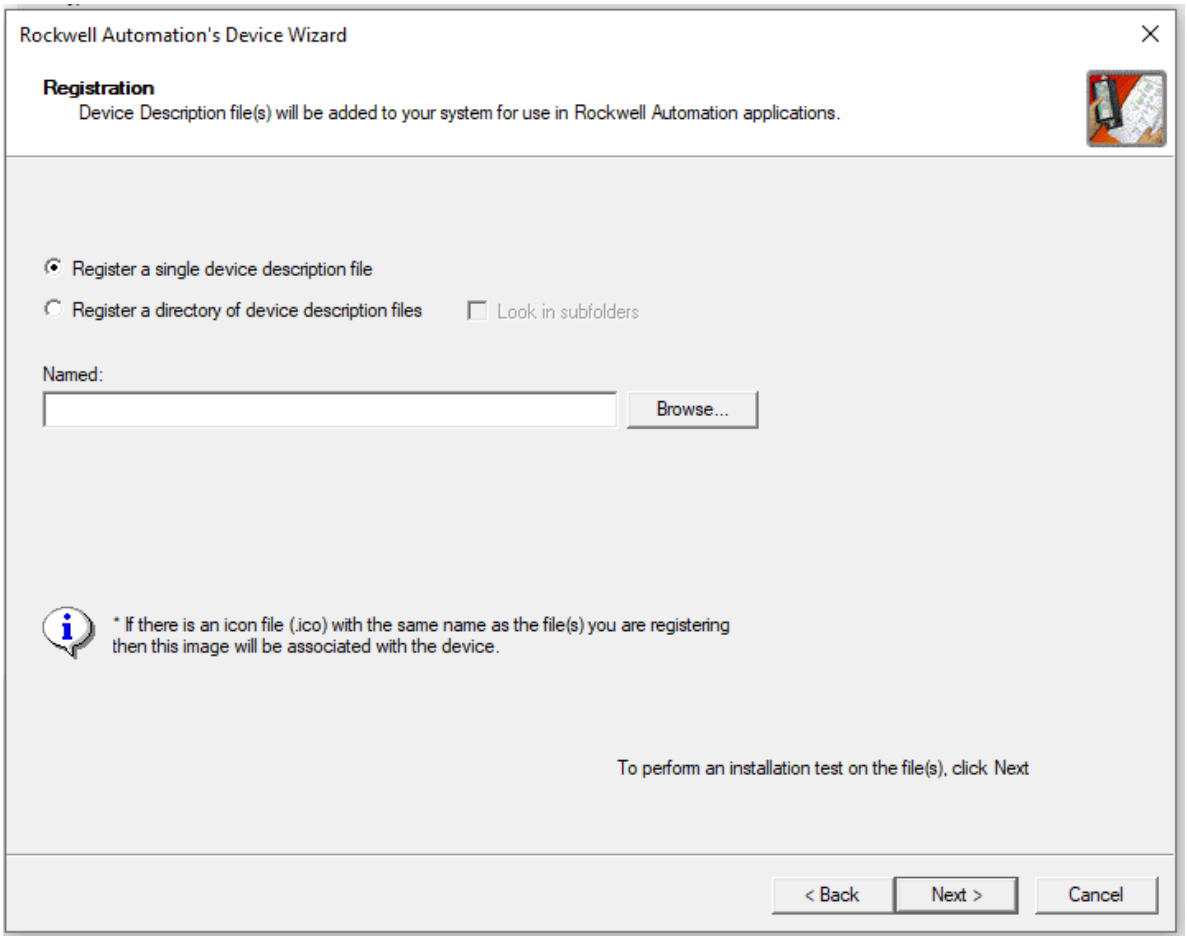
From inside Logix Designer, go to Tools -> EDS Hardware Installation Tool



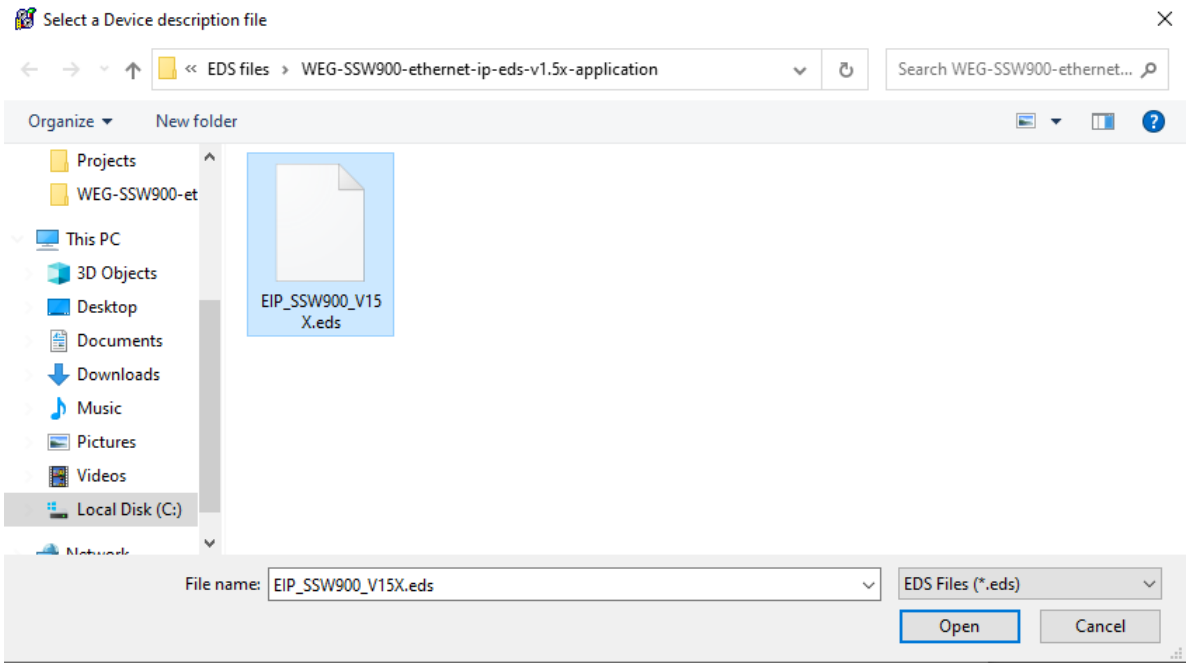
Click Next >


Rockwell Automation's Device Wizard
Options
What task do you want to complete?
Register a device description file(s).
This option will add a device(s) to our database.
Unregister a device.
This option will remove a device that has been registered by a Device Description File from our database.
Create a device description file.
This option creates a new device description file that allows our software to recognize your device.
Upload device description file(s) from the device.
This option uploads and registers the device description file(s) stored in the device.
< Back
Next >
Cancel

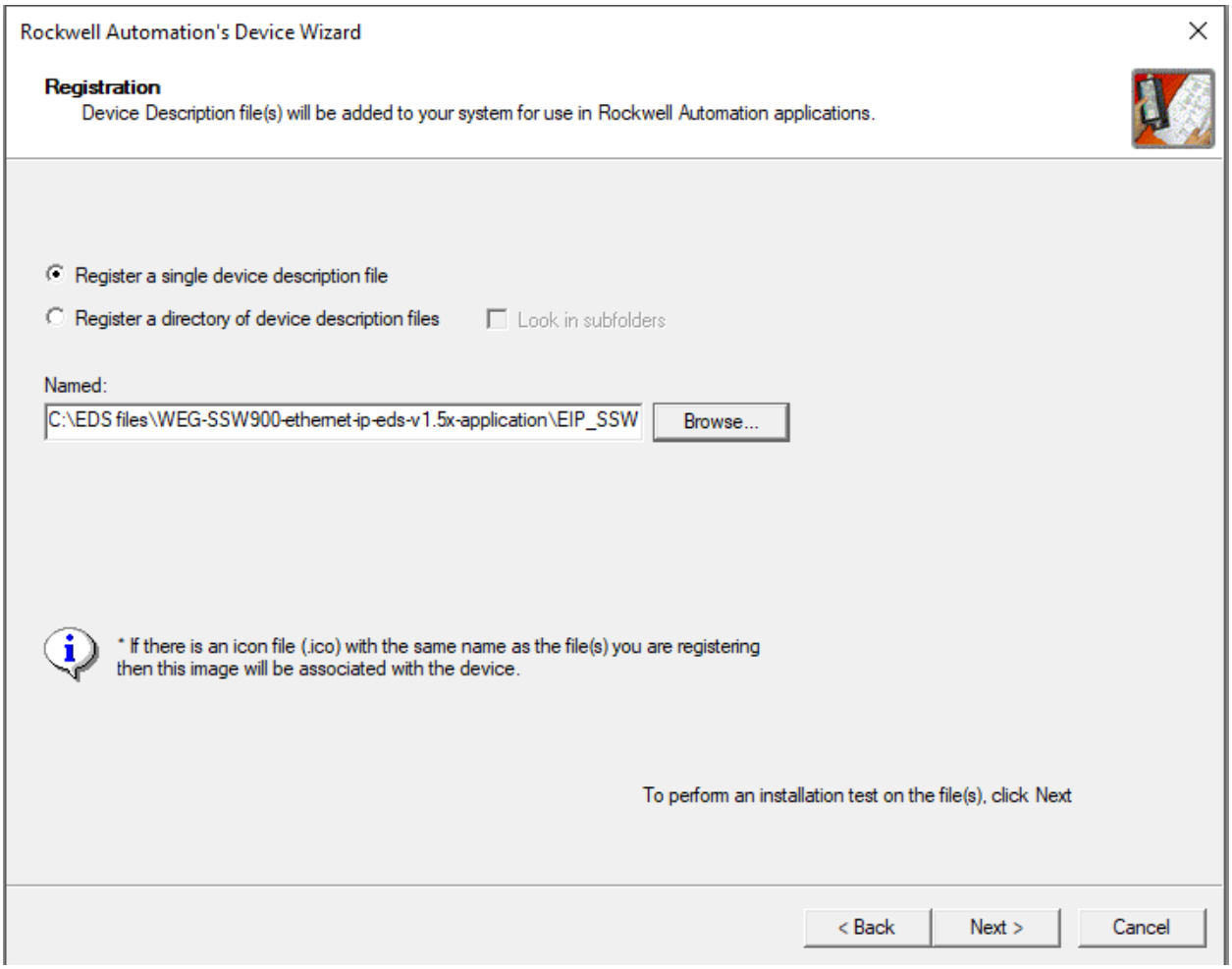
Click Next >



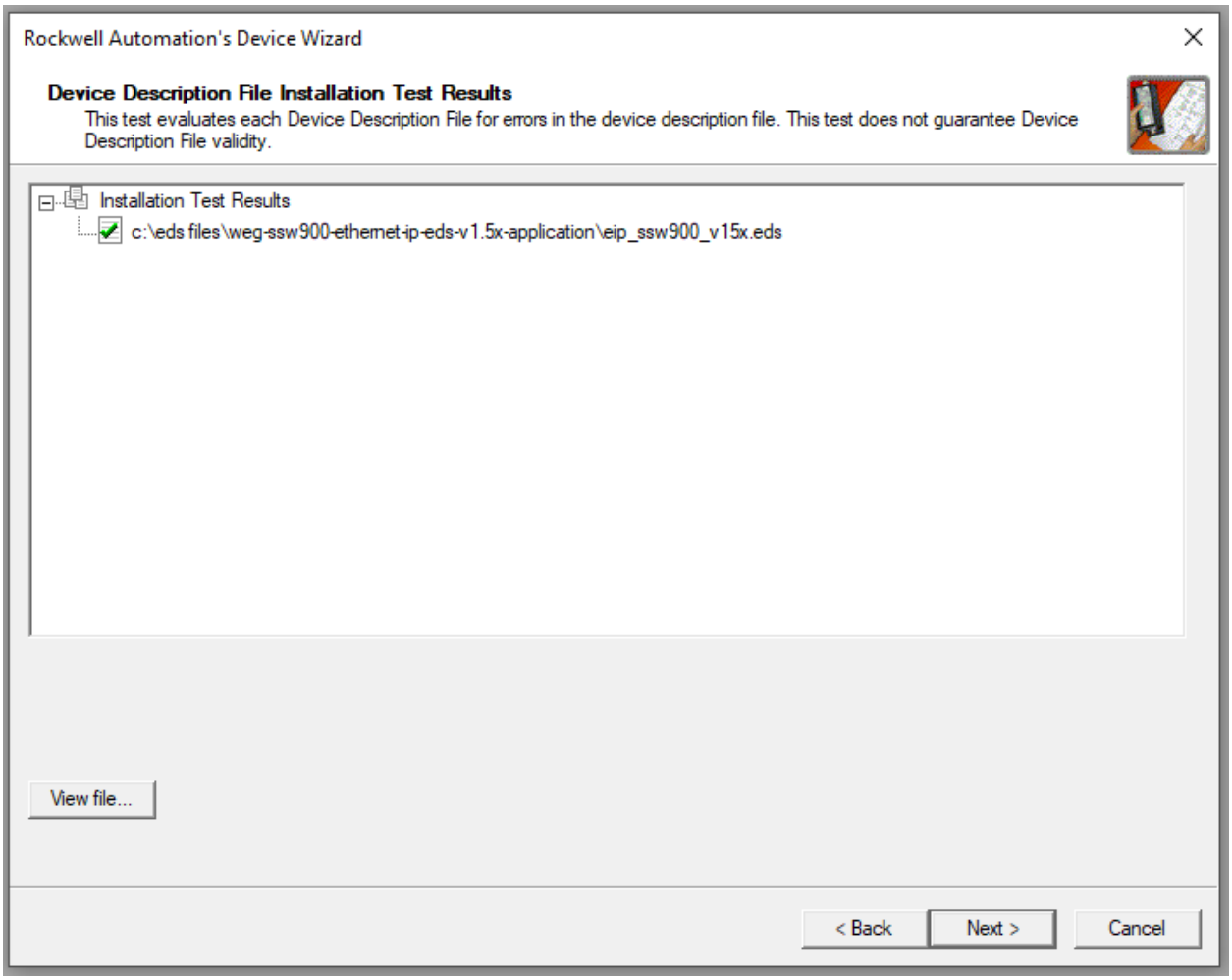
Click Browse ...



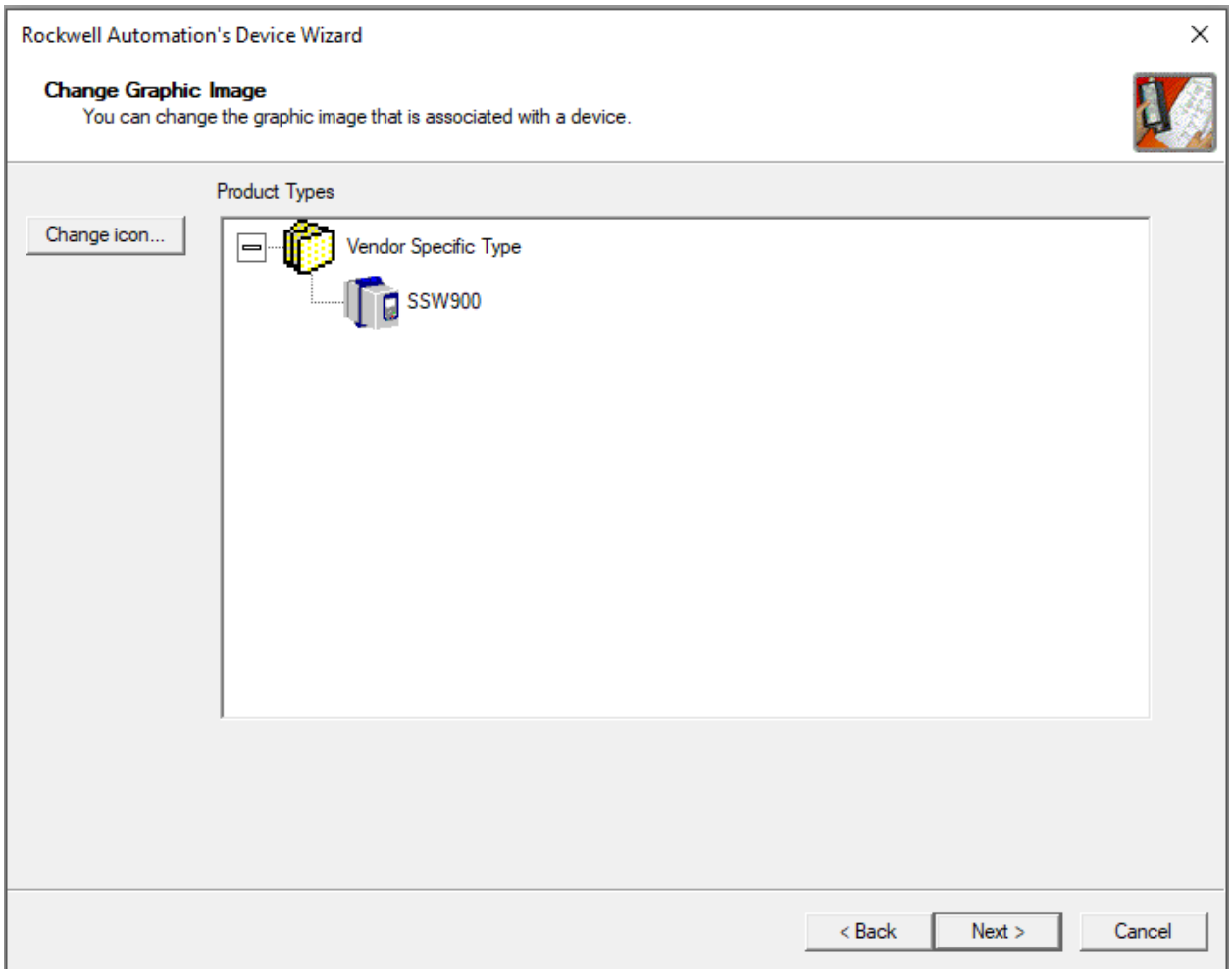
Browse to where the downloaded eds file is located and click Open


Rockwell Automation's Device Wizard
Registration
Device Description file(s) will be added to your system for use in Rockwell Automation applications.
Register a single device description file
Register a directory of device description files
Look in subfolders
Named:
C:\EDS files\WEG-SSW900-ethernet-ip-eds-v1.5x-application\EIP_SSW
Browse...
* If there is an icon file (.ico) with the same name as the file(s) you are registering then this image will be associated with the device.
To perform an installation test on the file(s), click Next
< Back
Next >
Cancel

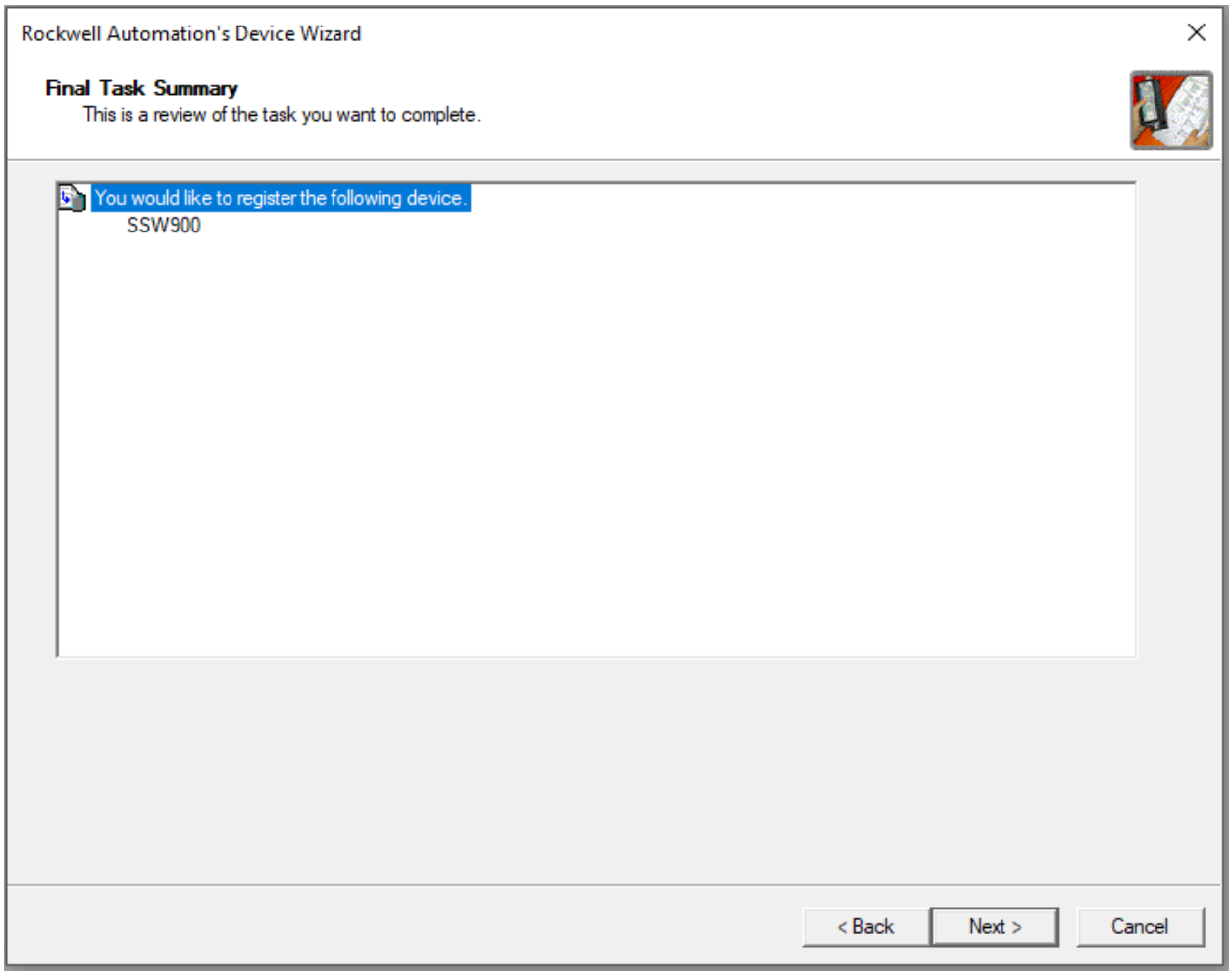
Click Next >



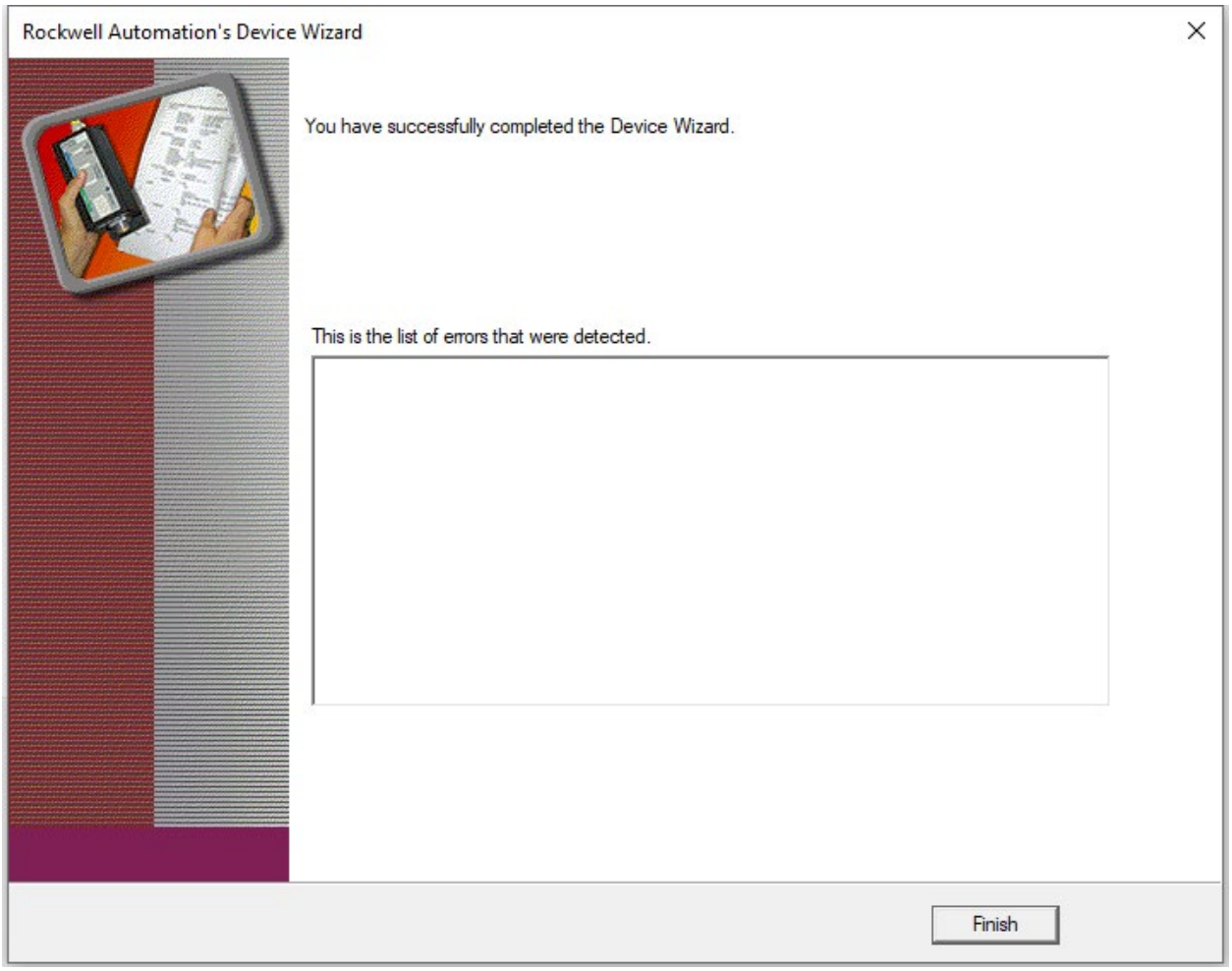
There should be a green checkmark. Click Next >


Rockwell Automation's Device Wizard
Change Graphic Image
You can change the graphic image that is associated with a device.
Product Types
Change icon...
Vendor Specific Type
SSW900
< Back
Next >
Cancel

Click Next >


Rockwell Automation's Device Wizard
Final Task Summary
This is a review of the task you want to complete.
You would like to register the following device.
SSW900
< Back
Next >
Cancel

Click Next >



Click Finish

The EDS file is now installed and the SSW900 can be added as an EtherNet/IP device in the device tree.

AOI

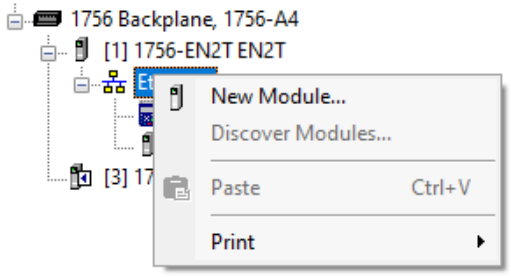
SSW900

This AOI controls the SSW900 and handles the following additional parameters:

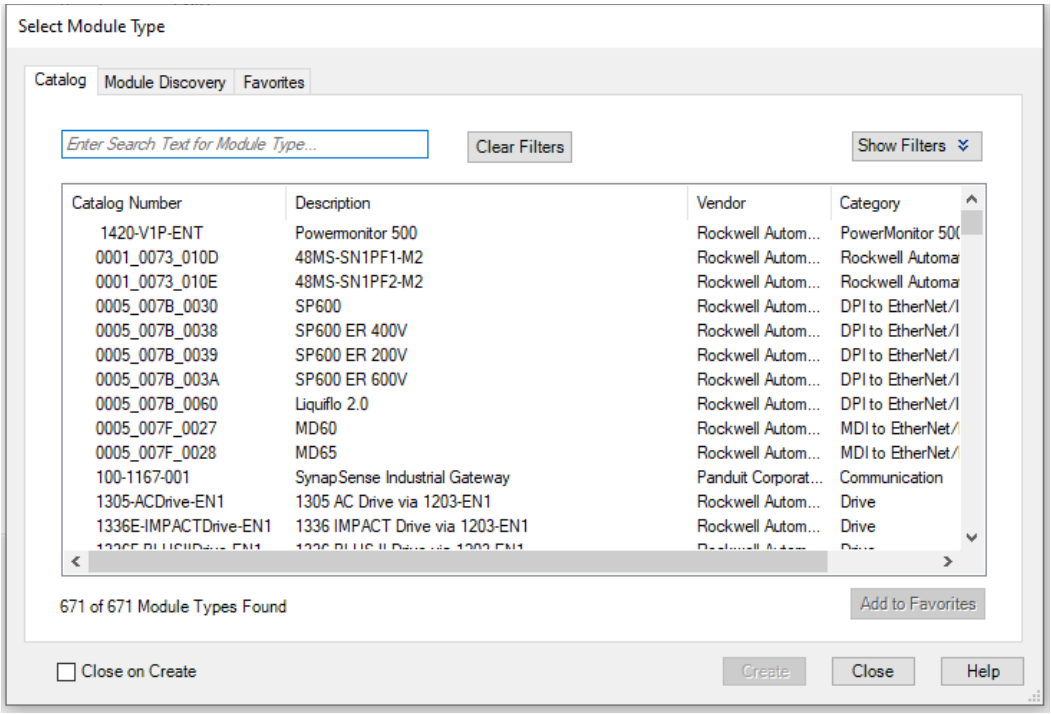
Outputs

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

Create the EtherNet/IP Device

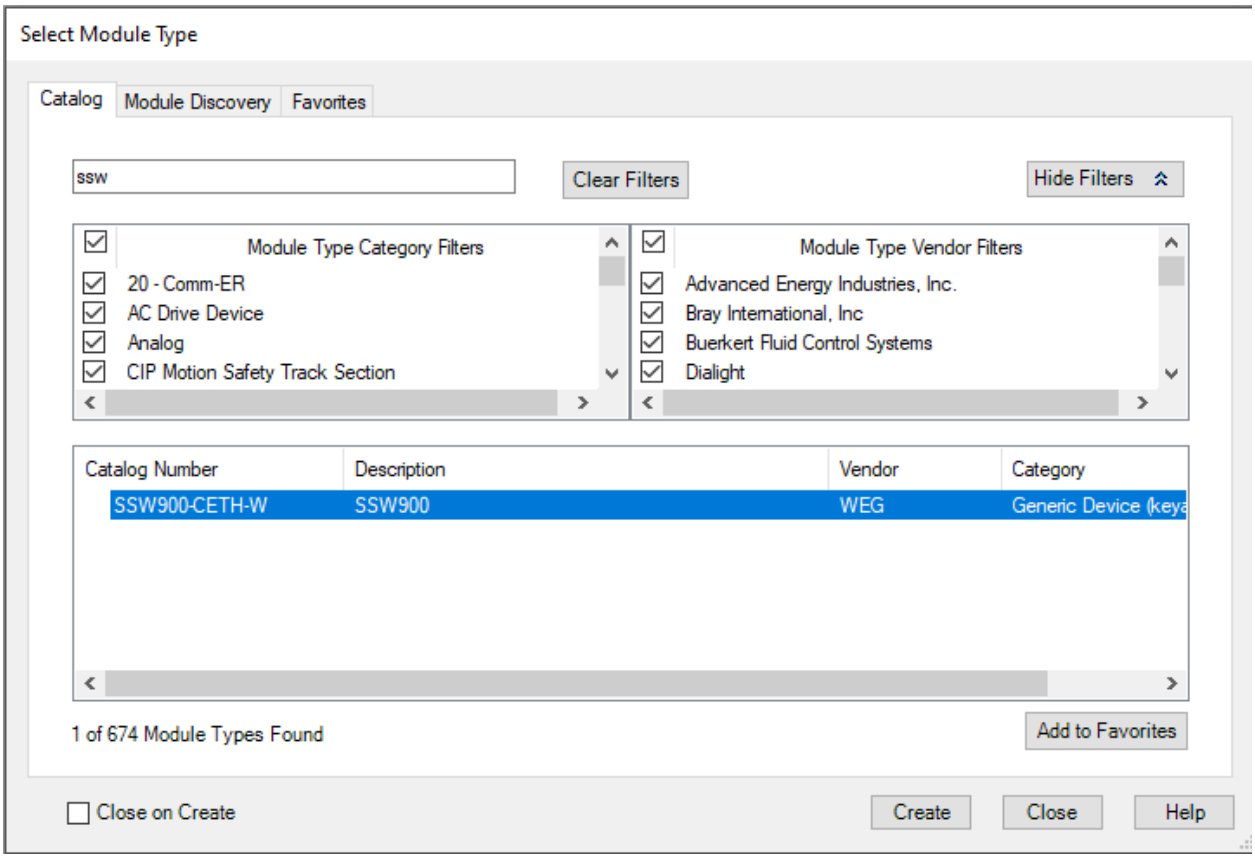


In the device tree, right click on the Ethernet bus that will contain the SSW900 and click New Module….



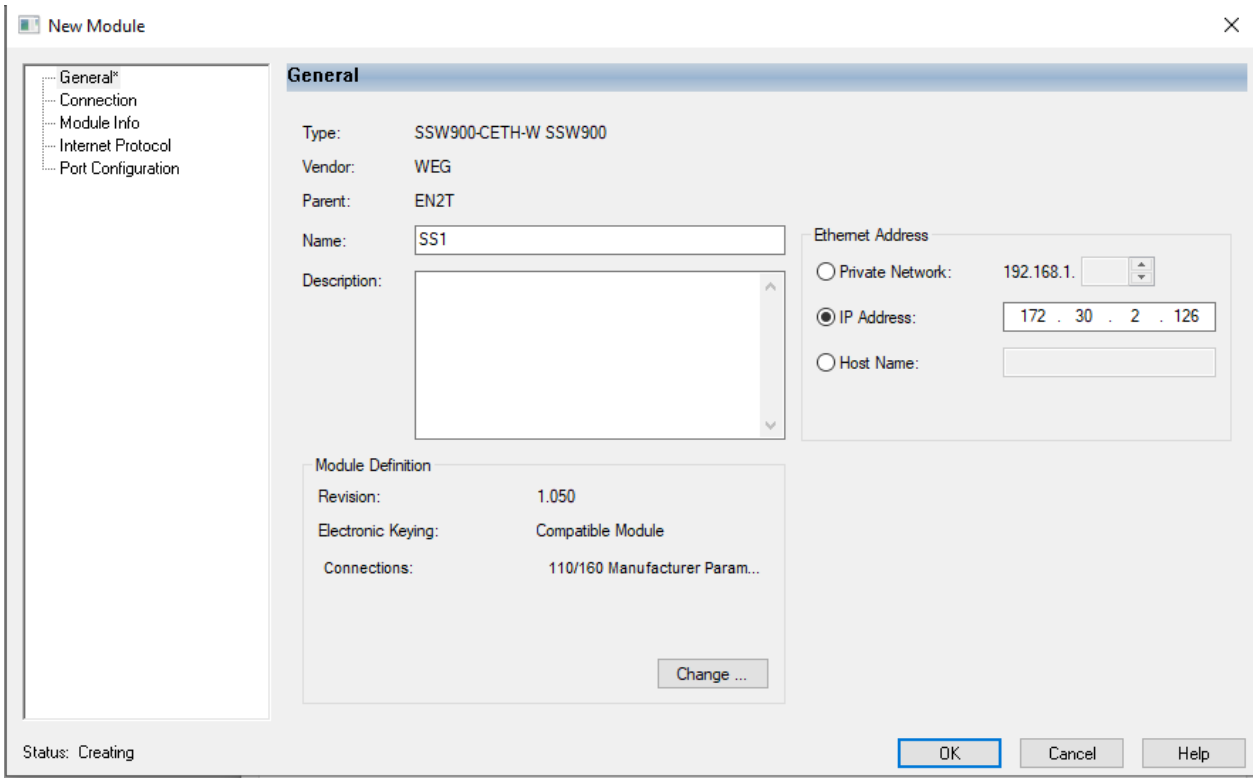
In the Select Module Type dialog box, enter in “SSW900” in the search field

Note: there are two versions of the EtherNet/IP card for the SSW900. This document assumes the model is the SSW900-CETH-W. Using SSW900-CETH-N will require importing a different EDS file and creating a different device in the Ethernet tree. Beyond this, everything else remains the same.



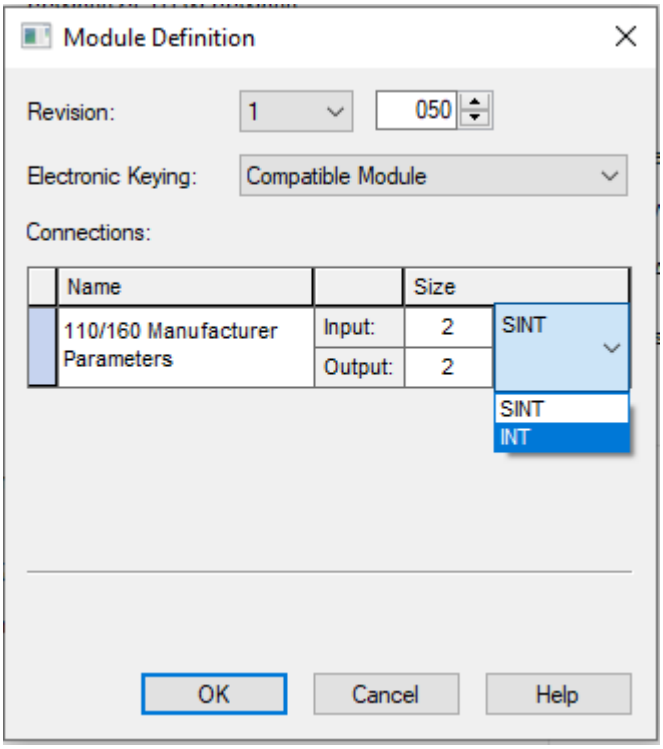
There should be an entry matching the above screenshot.

Highlight the SSW900-CETH-W and click Create

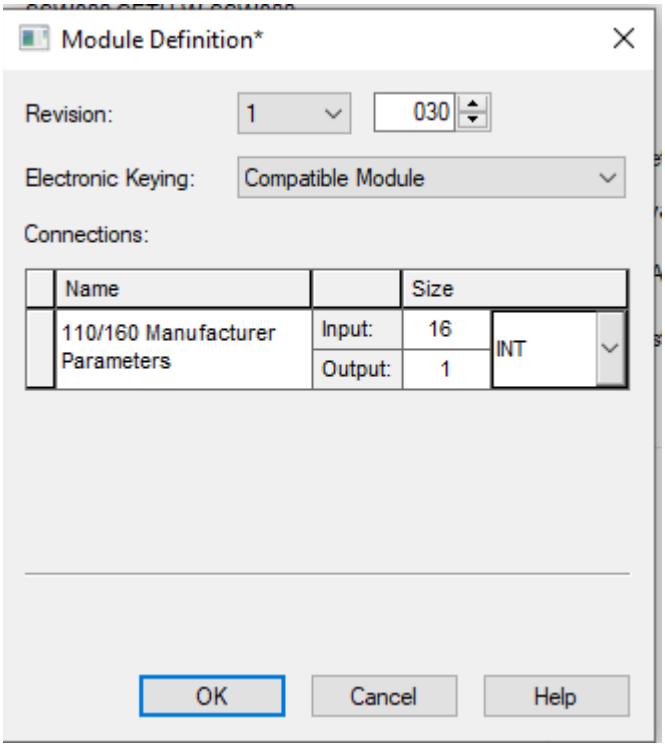


Give the SSW900 a name and enter the IP address of the drive.

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

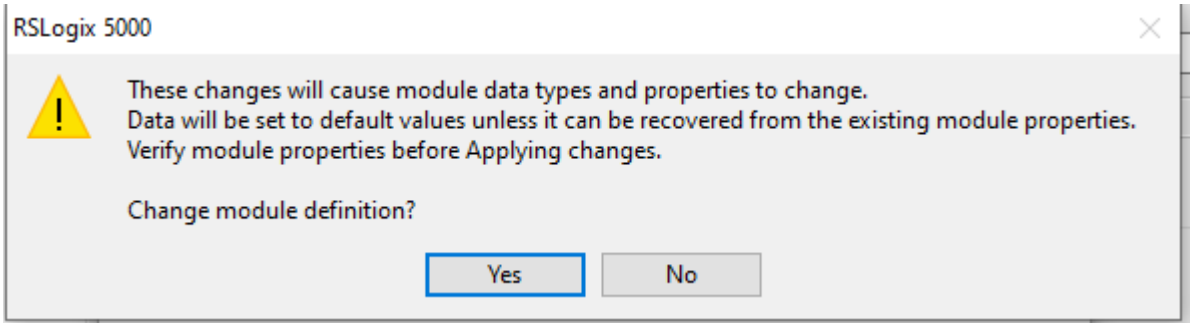


Change the type to INT



The Input and output size should be set to 16 and 1 respectively. Also, change the revision to 1.030. At the time of this publication, this is the firmware version available.

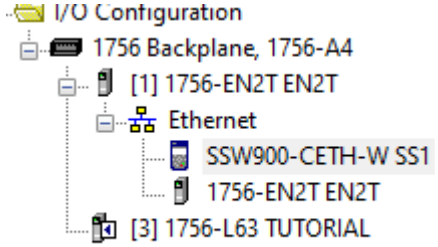
Click OK



Click Yes

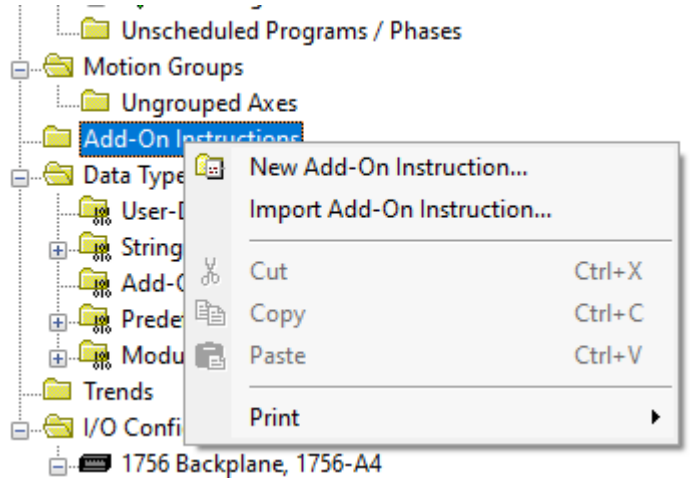
At this point, no other changes are required. However, changing the RPI can be done if the need arises. See the Trouble Shooting section to learn more about changing the RPI.

Once satisfied with the settings, Click OK

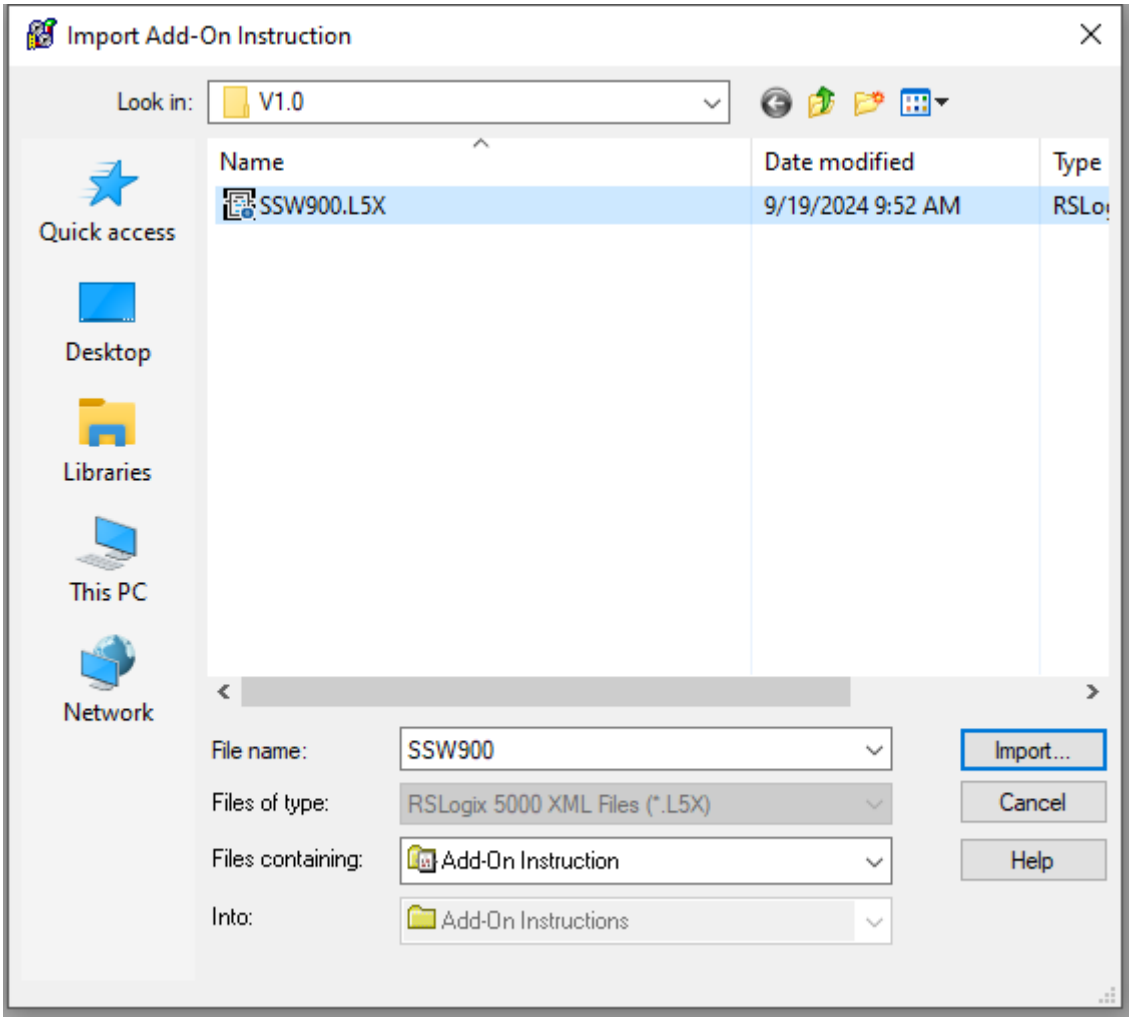


There should now be an instance of the SSW900 in the device tree:

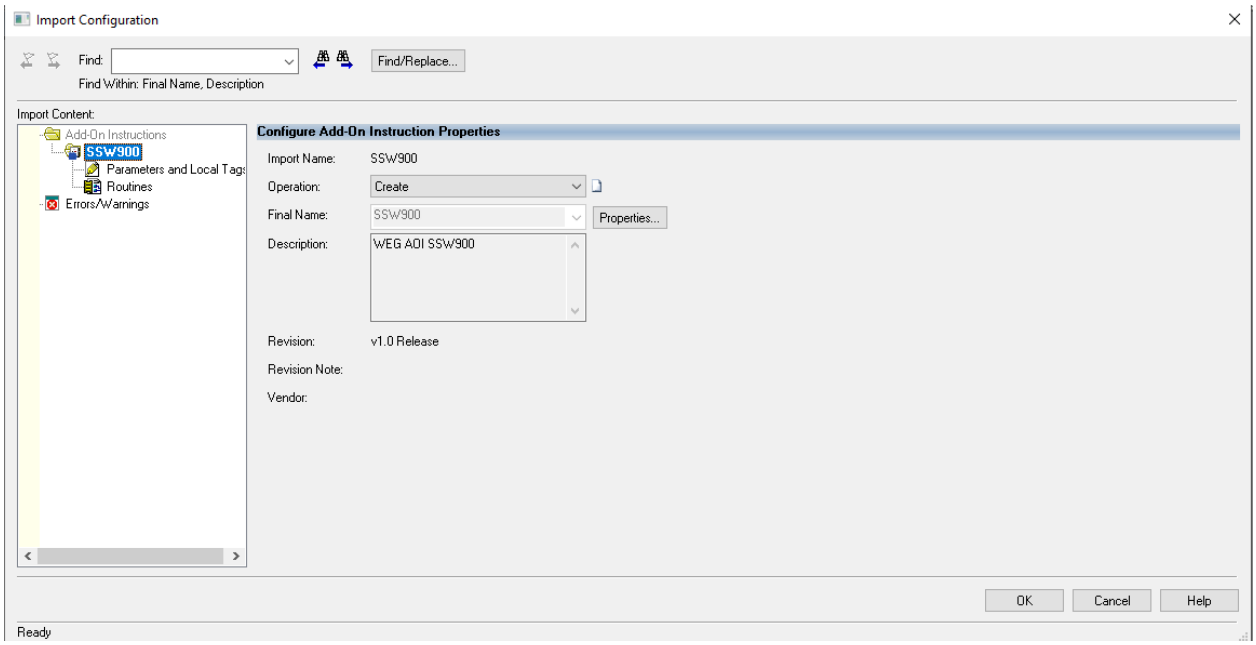
AOI Import



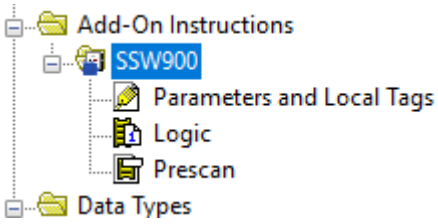
In the device tree, right click on Add-On Instructions and click on Import Add-On Instruction...



Select the appropriate add-on instruction (SSW900.L5X) and click Import….

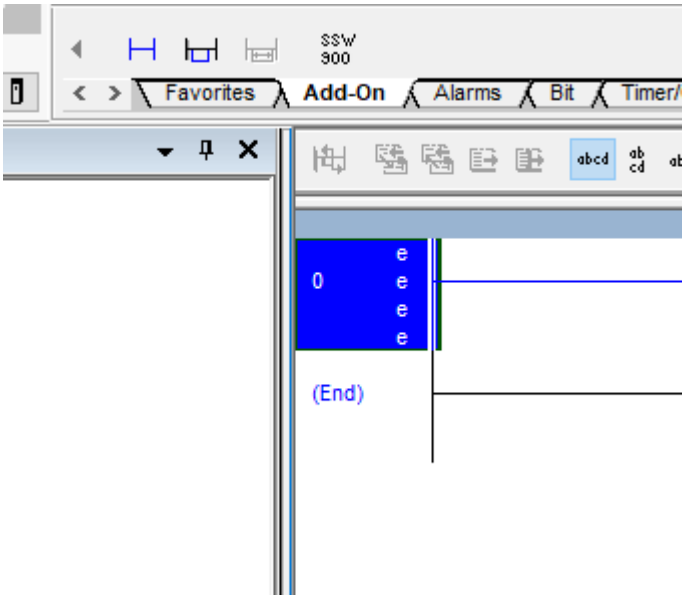


Review the proposed changes and click OK

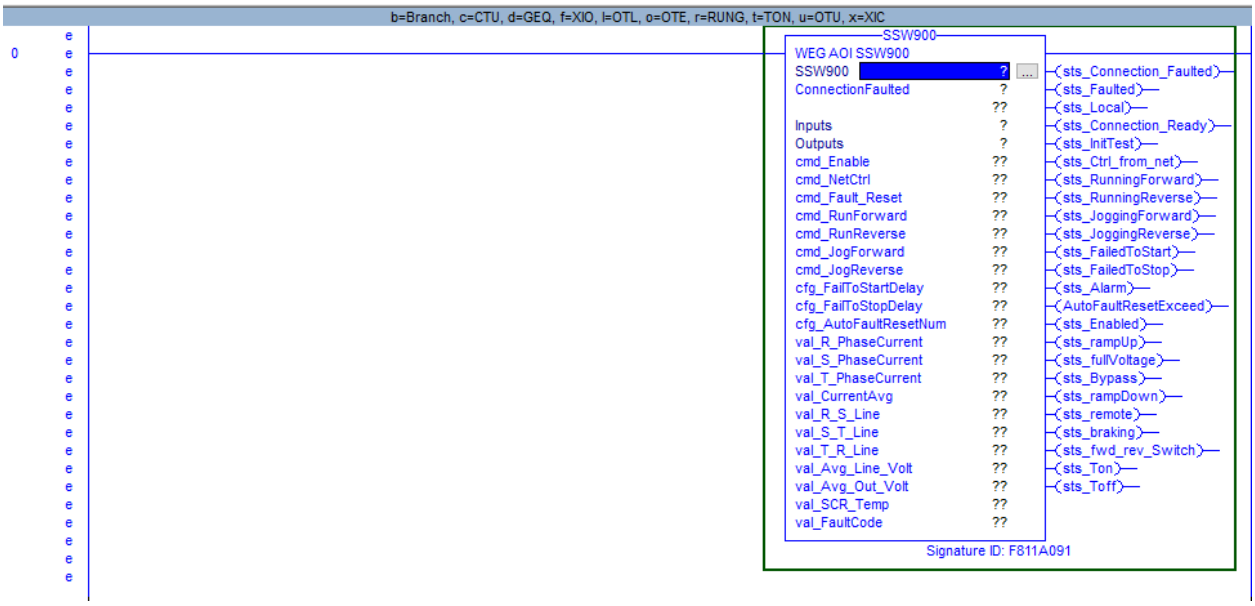


There should now be this add-on instruction in the project.

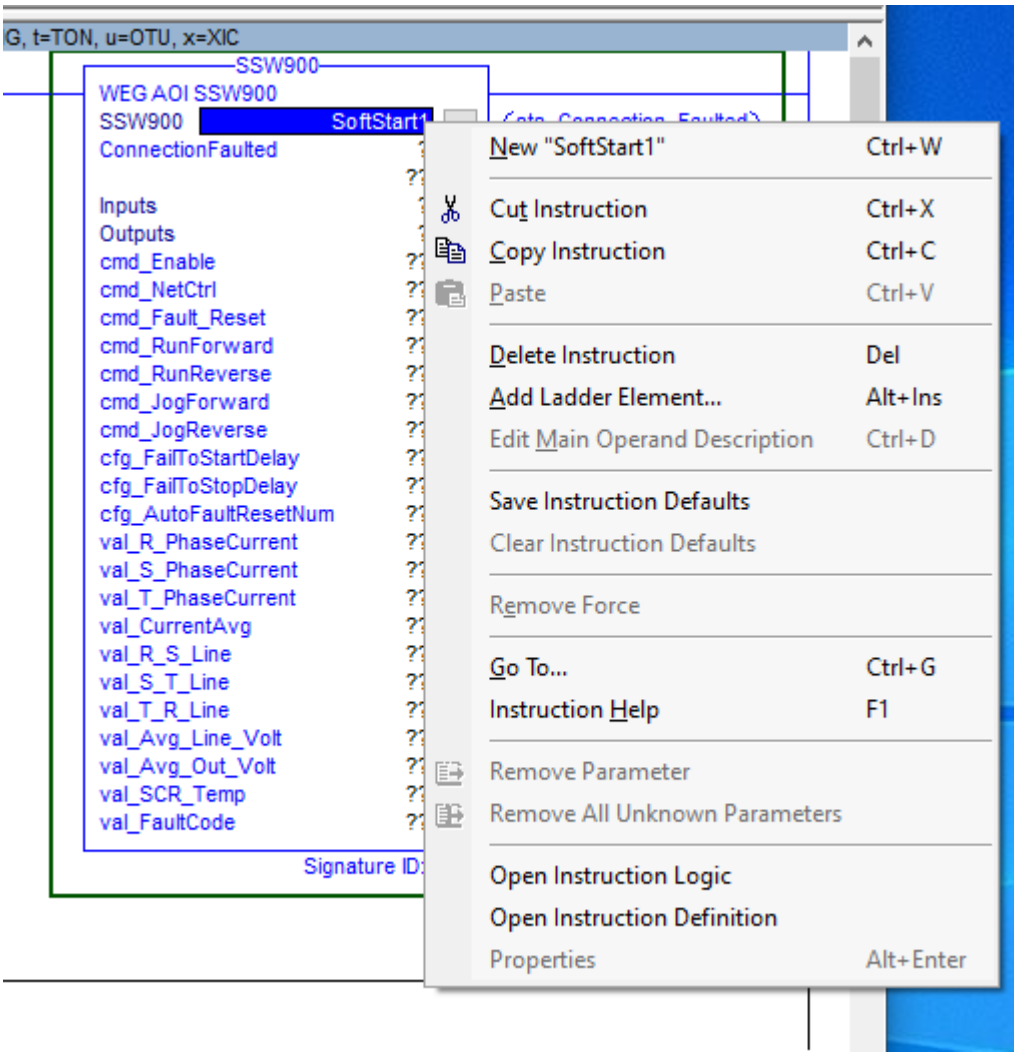
AOI Usage

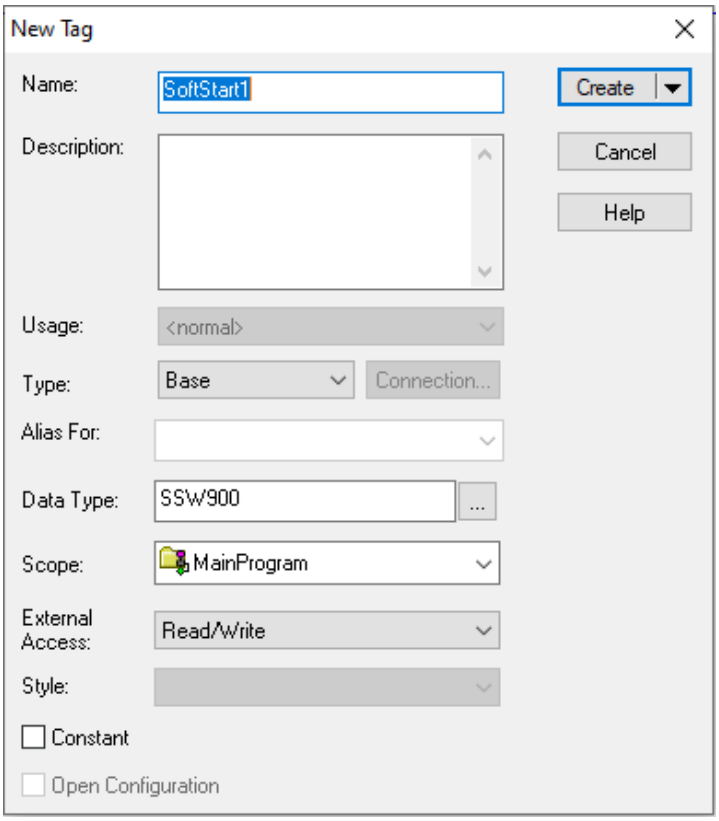


On an empty rung of ladder, add an instance of the newly imported add-on instruction by clicking on the Add-On bar and clicking the SSW900 symbol

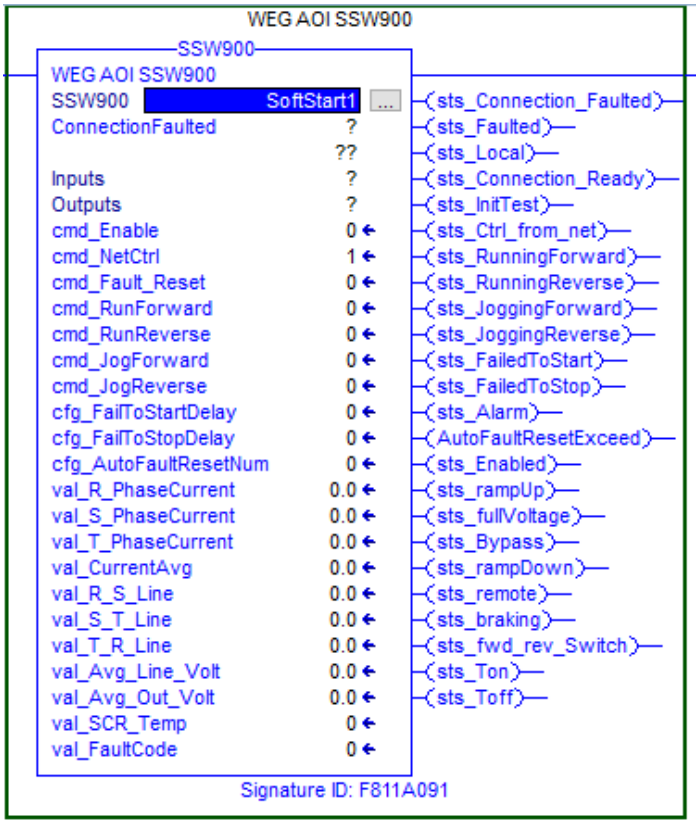


The Add-On requires a tag to be created. Create this tag by typing a name in the SSW900 field and right-clicking and selecting New “Tag”

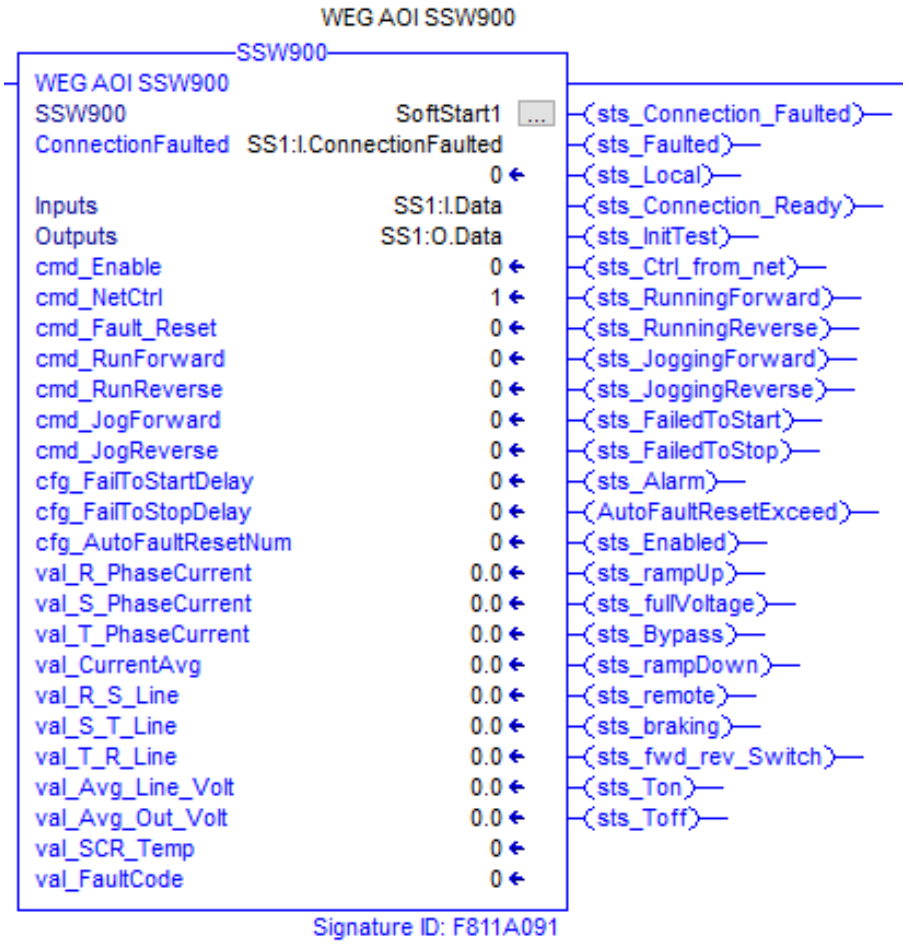

G, t=TON, u=OTU, x=XIC
SSW900
WEG AOI SSW900
SSW900
SoftStart1
ConnectionFaulted
Inputs
Outputs
cmd_Enable
cmd_NetCtrl
cmd_Fault_Reset
cmd_RunForward
cmd_RunReverse
cmd_JogForward
cmd_JogReverse
cfg_FailToStartDelay
cfg_FailToStopDelay
cfg_AutoFaultResetNum
val_R_PhaseCurrent
val_S_PhaseCurrent
val_T_PhaseCurrent
val_CurrentAvg
val_R_S_Line
val_S_T_Line
val_T_R_Line
val_Avg_Line_Volt
val_Avg_Out_Volt
val_SCR_Temp
val_FaultCode
Signature ID:
New "SoftStart1" Ctrl+W
Cut Instruction Ctrl+X
Copy Instruction Ctrl+C
Paste Ctrl+V
Delete Instruction Del
Add Ladder Element... Alt+Ins
Edit Main Operand Description Ctrl+D
Save Instruction Defaults
Clear Instruction Defaults
Remove Force
Go To... Ctrl+G
Instruction Help F1
Remove Parameter
Remove All Unknown Parameters
Open Instruction Logic
Open Instruction Definition
Properties Alt+Enter



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



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



The PLC is now ready to control the SSW900. Ensure you have setup the SSW900 parameters. See the “SSW900 Parameter Requirements” section of this document for more information on this.

AOI Parameter Description

InOut Parameters

Parameter	Type	Description
Inputs	INT[16]	Input Assembly from SSW900
Outputs	INT[1]	Output Assembly to SSW900

Input Parameters

Parameter	Type	Description
Cfg_FailToStartDelay	DINT	Time in seconds before faulting on fail to start if SSW900 does not start when commanded Set to 0 to disable
Cfg_FailToStopDelay	DINT	Time in seconds before faulting on fail to stop if SSW900 does not stop when commanded Set to 0 to disable
ConnectionFaulted	BOOL	From SSW900 Ethernet Module. 1 = Connection is faulted 0 = Connection is OK
cmd_Enable	BOOL	1 = Enable operation of SSW900 0 = Disable operation of SSW900
cmd_Fault_Reset	BOOL	1 = Send Reset Fault Signal to SSW900 0 = No action
cmd_JogForward	BOOL	1 = Jog Forward (if configured) 0 = No Action / Stop
cmd_JogReverse	BOOL	1 = Jog Reverse (if configured) 0 = No Action / Stop
cmd_NetCtrl	BOOL	1 = Remote (Ethernet) control 0 = Local (Other) control
cmd_RunForward	BOOL	1 = Run Forward 0 = Stop
cmd_RunReverse	BOOL	1 = Run Reverse 0 = Stop
cfg_AutoFaultResetNum	DINT	Maximum number of tries that AOI will send fault reset command while being maintained

Output Parameters

Parameter	Type	Description
sts_InitTest	BOOL	1 = Soft start going through initialization test

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 SSW900 to PLC 0 = Connection OK
sts_Connection_Ready	BOOL	1 = Connection from SSW900 to PLC is established 0 = Connection not established
sts_Ctrl_from_net	BOOL	1 = SSW900 controlled remotely (PLC) 0 = SSW900 controlled locally
sts_Bypass	BOOL	1 = Bypass relay active 0 = Bypass relay not active
sts_fullVoltage	BOOL	1 = Output voltage = Line voltage 0 = Output voltage != Line voltage
sts_Faulted	BOOL	1 = SSW900 Fault, connection fault, or failedToStart/Stop Fault 0 = No faults
sts_FailedToStart	BOOL	1 = SSW900 failed to start in time allotted 0 = Normal
sts_FailedToStop	BOOL	1 = SSW900 failed to stop in time allotted 0 = Normal
sts_rampUp	BOOL	1 = SSW900 is Ramping up during start
sts_rampDown	BOOL	1 = SSW900 is Ramping down during stop
sts_braking	BOOL	1 = SSW900 is actively braking to stop
sts_fwd_rev_Switch	BOOL	1 = SSW900 is actively switching between FWD and REV
sts_remote	BOOL	1 = SSW900 is in remote mode (PLC) 0 = SSW900 is in local mode (other)
sts_Local	BOOL	1 = Local 0 = Remote
sts_Ton	BOOL	1 = SSW900 Timer between starts preventing operation
sts_Toff	BOOL	1 = SSW900 Timer between stops preventing operation
sts_RunningForward	BOOL	1 = Running forward

		0 = Not running forward
sts_RunningReverse	BOOL	1 = Running reverse 0 = Not running reverse
val_FaultCode	DINT	Fault code 1 from SSW900
val_R_PhaseCurrent	REAL	R phase current in Amps
val_S_PhaseCurrent	REAL	S phase current in Amps
val_T_PhaseCurrent	REAL	T phase current in Amps
val_CurrentAvg	REAL	Average of all 3 phase currents
val_R_S_Line	REAL	R-S Line Voltage
val_S_T_Line	REAL	S-T Line Voltage
val_T_R_Line	REAL	T-R Line Voltage
val_Avg_Line_Volt	REAL	Average Line Voltage
val_Avg_Out_Volt	REAL	Average Output Voltage
val_SCR_Temp	REAL	SCR Temperature (Celsius)
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.

SSW900 Parameter Requirements

The following parameters must be set in the SSW900:

Parameter	**Setting**
C3.1 (Net 220) Mode	9 – Slot1 LOC
C3.3 (Net 230) REM Command	4 – Slot 1
C8.1.1.1 (Net 712) Read Slot 1 1st Word	1
C8.1.1.2 (Net 713) Read Slot 1 Quantity	16
C8.1.2.1 (Net 714) Write Slot 1 1st Word	1
C8.1.2.2 (Net 715) Write Slot 1 Quantity	1
C8.1.1.5 (Net 1300) Read Word #1	680 – Status Word SSW
C8.1.1.6 (Net 1301) Read Word #2	90 – Fault Code
C8.1.1.7 (Net 1302) Read Word #3	26 – R Phase Current (1 of 2)
C8.1.1.8 (Net 1303) Read Word #4	26 – R Phase Current (2 of 2)
C8.1.1.9 (Net 1304) Read Word #5	28 – S Phase Current (1 of 2)
C8.1.1.10 (Net 1305) Read Word #6	28 – S Phase Current (2 of 2)
C8.1.1.11 (Net 1306) Read Word #7	30 – T Phase Current (1 of 2)
C8.1.1.12 (Net 1307) Read Word #8	30 – T Phase Current (2 of 2)
C8.1.1.13 (Net 1308) Read Word #9	24 – Average Current (1 of 2)
C8.1.1.14 (Net 1309) Read Word #10	24 – Average Current (2 of 2)

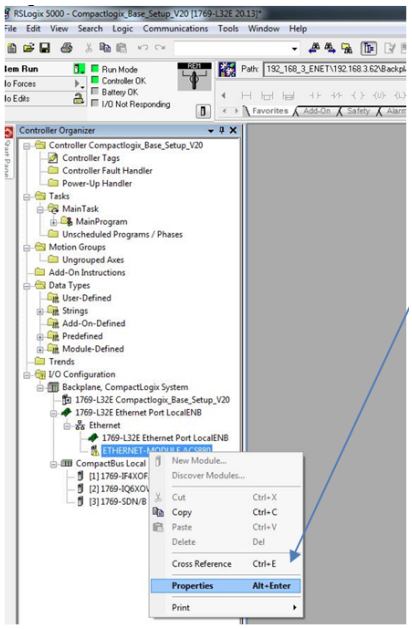
C8.1.1.15 (Net 1310) Read Word #11	33 – R-S Line Voltage
C8.1.1.16 (Net 1311) Read Word #12	34 – S-T Line Voltage
C8.1.1.17 (Net 1312) Read Word #13	35 – T-R Line Voltage
C8.1.1.18 (Net 1313) Read Word #14	4 – Average Line Voltage
C8.1.1.19 (Net 1314) Read Word #15	7 – Average Output Voltage
C8.1.1.20 (Net 1315) Read Word #16	60 – SCR Temperature
C8.1.2.6 (Net 1400) Write Word #1	685 – Slot 1 Command Word

Trouble Shooting

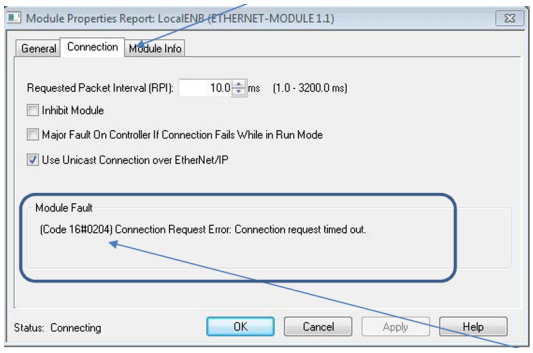
This section is to help with any problems you may encounter.

1) No Communication

a. The RSLogix 5000 Error Codes or Module Fault # can be found under the connection Tab within the RSLogix 5000 software. Right-click on the Generic Ethernet Module and select Properties.



b. Next, click the Connection Tab. The Error Codes or Module Fault # can be found In the Module Fault section. Each error code will mean something different.



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

Reason: There is a mismatch between the PLC and Drive in the selected profile.

What to check:

- Check the Profile setting in the drive (FENA-xx parameter 51.02 or RETA-01 51.16) for the selected Assembly Instances chosen in the PLC.
- There is a mismatch in the selected profile (for example, the drive is programmed for CIP Basic Speed, and the PLC is programmed for Manufacture Speed + IO is desired).
- Also check the programmed connection size in the PLC and the drive (for example, the drive sends 2 words, and the PLC is programmed to 6 words).
- Also check to ensure the Comm Format is programmed to Data – INT in the PLC.

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

Reason: There is a mismatch between the PLC and Drive in the selected profile.

What to check:

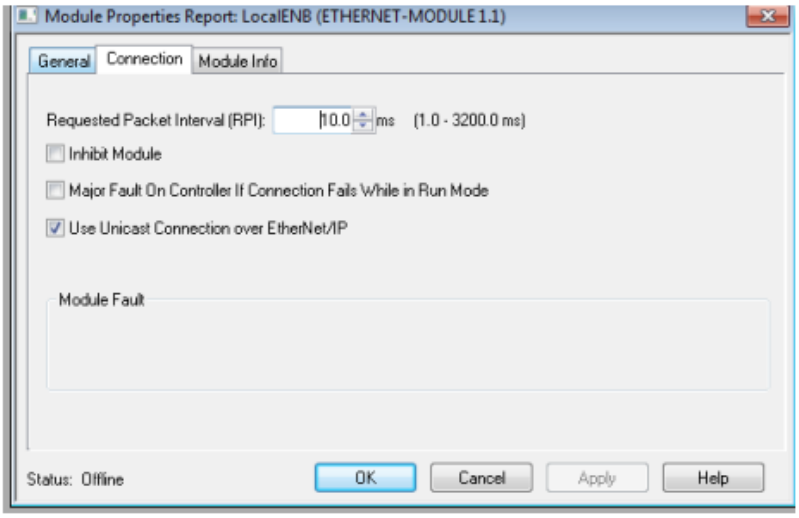
- Check the Profile setting in the drive for the selected Assembly Instances that where chosen in the PLC.
- There is a mismatch in the selected profile (for example, the drive is programmed for 101/151 Manufacture Speed + IO and the PLC is programmed for (CIP Basic Speed)

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

Reason: The programmed RPI rate is lower than the allowed rate for the drive.

What to check:

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



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

Reason: The connection words size for the Input 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 drive (example the drive is sending 2 words and the PLC is programmed to 4 words).
- Also check to make sure the Comm Format is programmed to Data – INT in the PLC.

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 drive (example the drive is sending 13 words and the PLC is programmed to 10 words).
- Also check to make sure the Comm Format is programmed to Data – INT in the PLC.

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

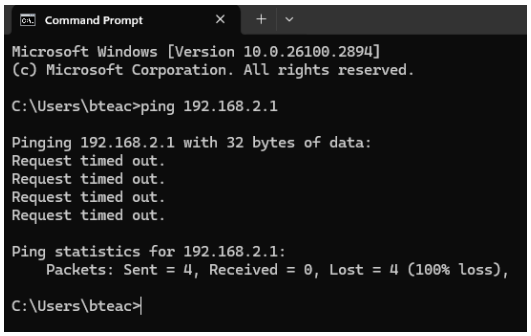
Reason: The PLC can't locate the Drive at the given IP Address.

What to check:

- Check to make sure DHCP is disabled if a Static IP Address is being programmed in the drive.
- Check the programming of the IP address of the Drive and Subnet. Check the programming of the IP Address in the PLC for the drive.
- Try to ping the drive's IP address via a PC connected to the same network. To do this on a Windows 11 PC 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 drive .

    For example: ping 192.168.1.41. 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.

- 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) Drive has F147 or A147: EtherNet/IP Communication Offline

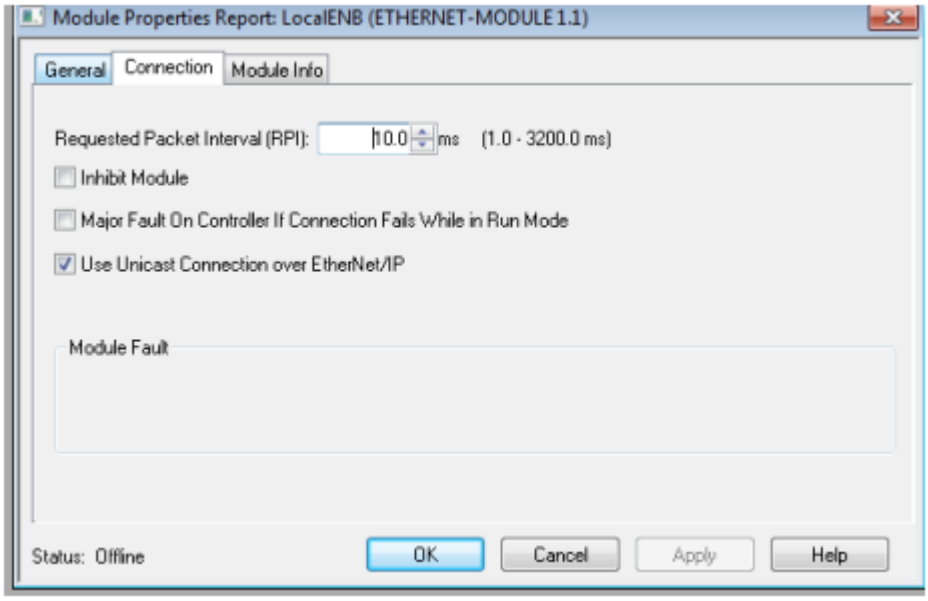
It indicates communication error with EtherNet/IP master. It occurs when, for any reason, after the cyclic communication of the master with the product is started, this communication is interrupted. This is detected if the I/O Exclusive Owner connection times out, or if master goes to IDLE state. Communication interruption is identified.

What to check:

- Check the status of the network master.
- Check the network installation, broken cable or failed/bad contact in the network connections.

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

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



WEG's scope of solutions is not limited to the products and solutions presented in this brochure.
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