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EATON Integration into EtherNet/IP Networks

INTRODUCTION

OVERVIEW

The purpose of this guide is to assist technicians and engineers in integrating Eaton's motor control products into a new or existing EtherNet/IP network, specifically Rockwell Automation (RA) Programmable Logic Controllers (PLC). EtherNet/IP (EIP) is being used in a wide range of industries and is one of the fastest growing industrial protocols in the United States. EtherNet/IP is an open source implementation, thus allowing for the continuous development and support from industry leaders (such as Eaton), and ensuring that this industrial application layer protocol support sustainability.

Instructions and examples will be based on Eaton EIP Assist tool, Eaton add-on instructions, RSLINX, and a Compact/ControlLogix™ PLC platform, configured with the RSLogix 5000 or Studio 5000 (RS5K) software environment. This guide will navigate, configure and explore the functionality of Eaton EIP-Assist I/O Tag Generation tool.

The EIP I/O Tag Generation tool was developed to allow technicians and engineers to select multiple Eaton EtherNet/IP products, their functions (pre-defined I/O assemblies), and then output the compiled data to a Comma Separated Value (CSV) file.

Once imported into the RS5K environment, these tags are then aliased to generic tags created when adding the Eaton module[s], thus simplifying integration and reducing commissioning time.

USE OF THIS INFORMATION/ DOCUMENTATION

INDEMNIFICATION

WARRANTY DISCLAIMER

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PRE-REQUISITE SKILLS

This document is written and intended for technicians and engineers who will be commissioning and/or supporting Eaton's motor control product on the plant floor. The intended users should know, at the very least, familiarity with navigating through the RS5K software environment.

REQUIRED HARDWARE/SOFTWARE

1. Eaton Motor Control Products (DG1 & C445 in our case)
2. PC with RSLINX and RS5K
3. Rockwell CompactLogix™ or ControlLogix™ PLC (1756-L71 ControlLogix in our case)

** Note: All Eaton EDS files and software may be downloaded from Eaton.com via links provided in the Appendices*

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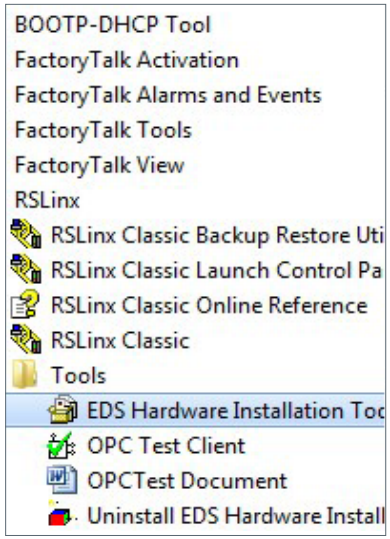
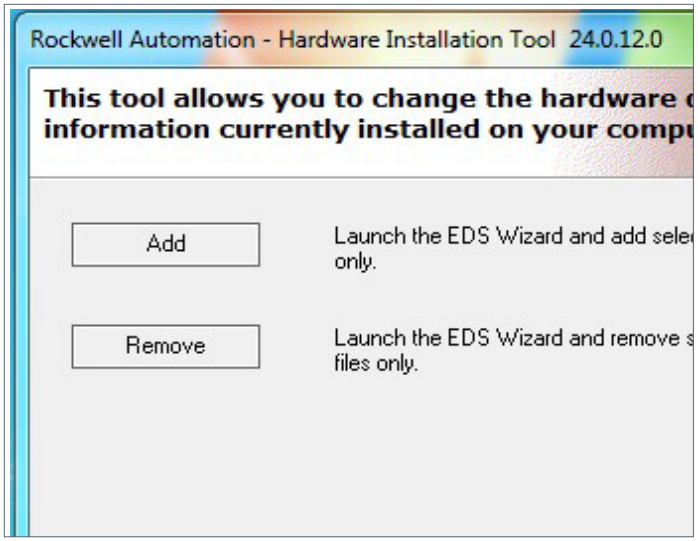
ROCKWELL AUTOMATION ENVIORNMENTS

RSLINX



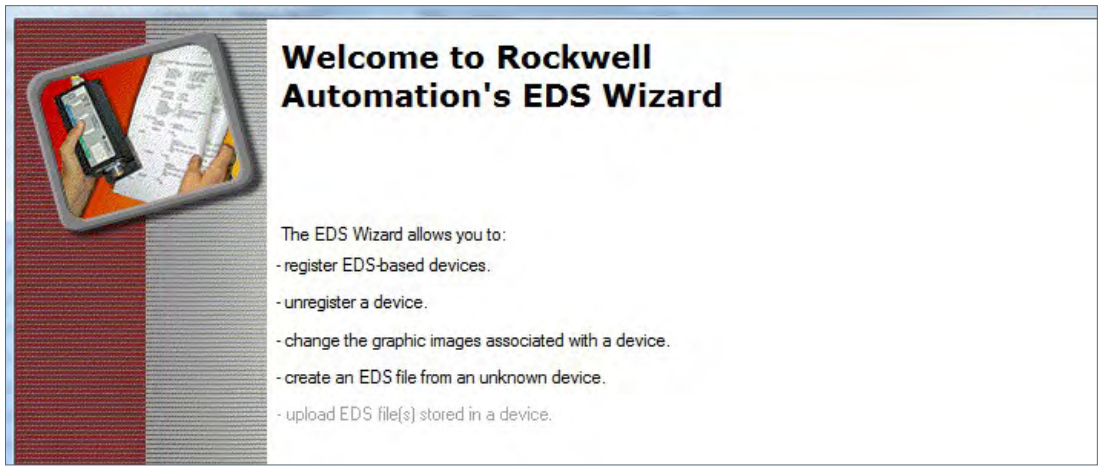


Let's start off by registering the EATON EDS files into RSLINX with the EDS Wizard.

Open the start menu and under RSLINX

STEP 1: Select the **EDS Hardware Installation Tool**

STEP 2: Select **add**

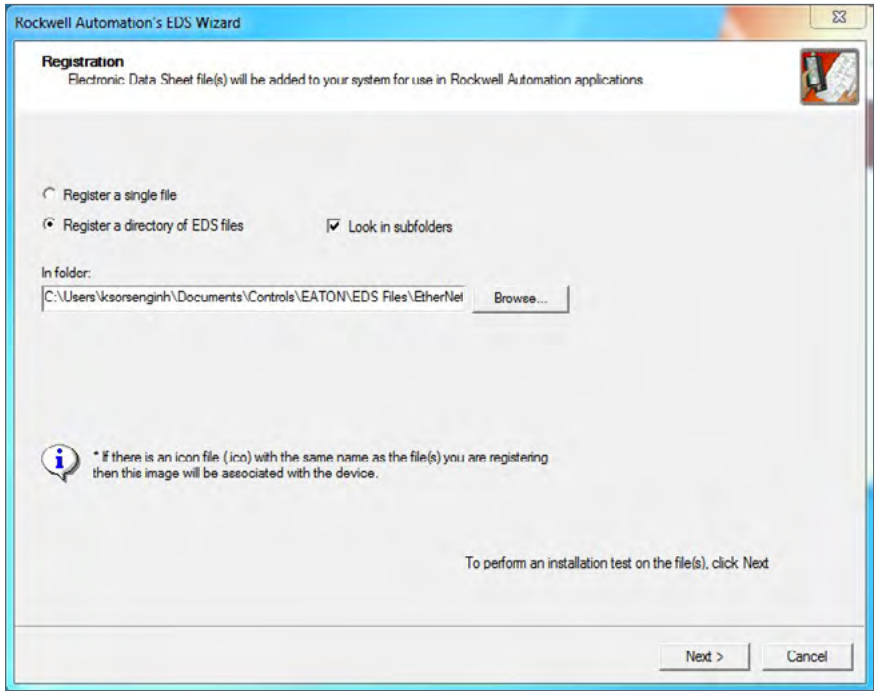


Beginning with **v20 of RS5K**, this may be accomplished with other additional options within the environment under the **Tools Menu**.

Select whether you would like to register a single or a directory of EDS files. If the latter, please tick **Look in subfolders** as well.

STEP 3: **Browse** to the folder directory containing the EDS[s]

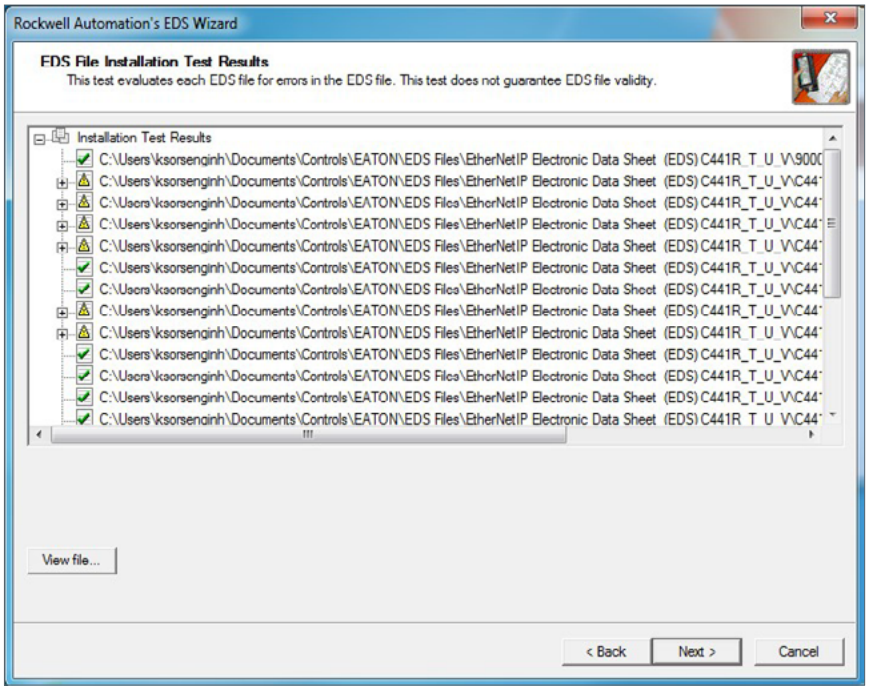
STEP 4: Click **next**



The system will do a scan and *populate a test result*.

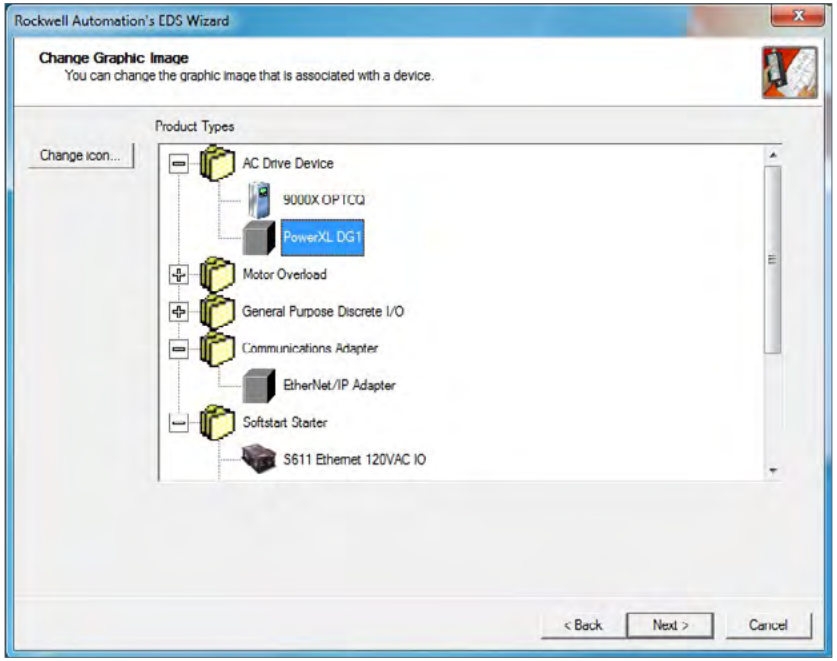
STEP 5: Select the desired file[s] to register

STEP 6: Click **next**



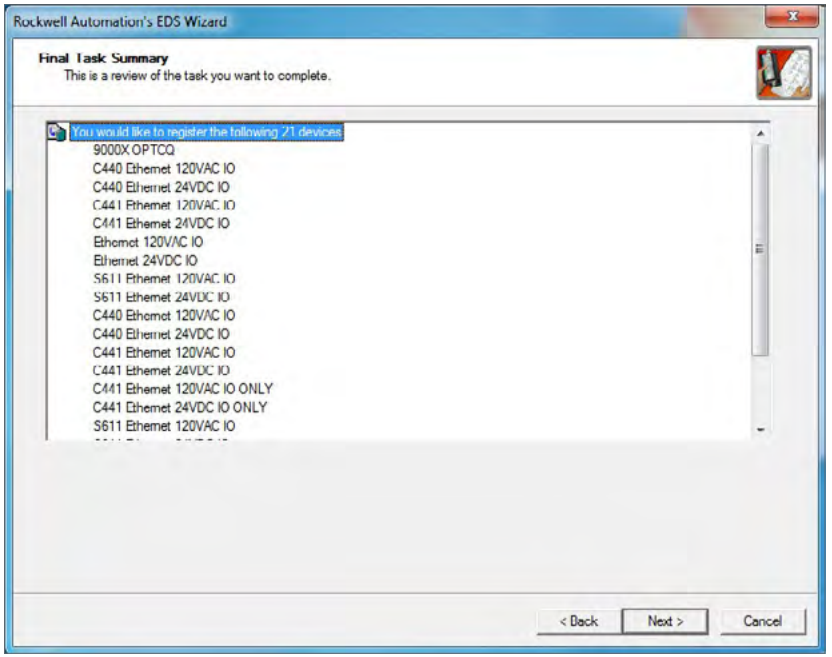
Change the icons if needed

STEP 7: Click **next**



A final task summary window will appear. *Ensure the information is correct.*

STEP 8: Click **next** to complete the EDS registration process



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STUDIO 5000
PART 1

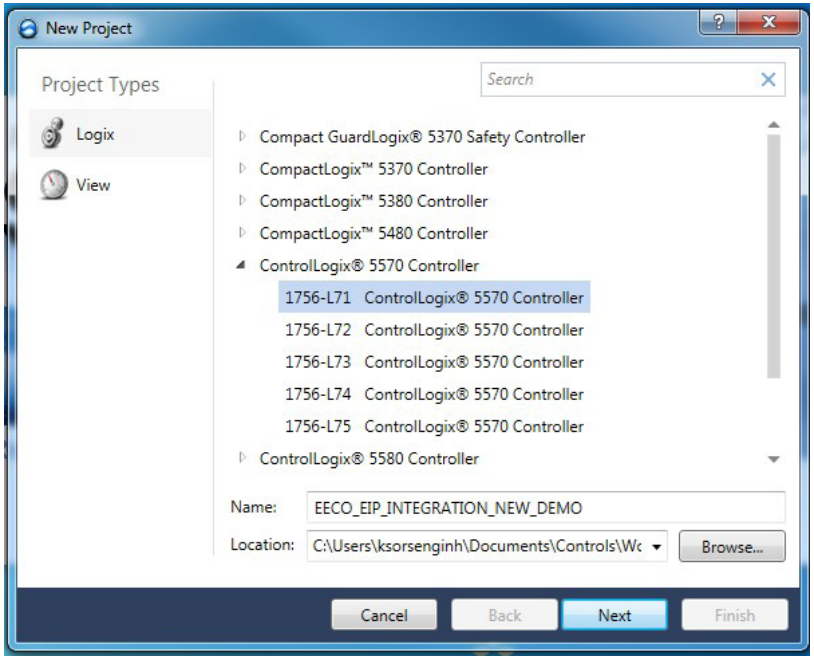
STEP 1: **Open** or **create** a new project in RS5K.

If starting a new project -

STEP 2: **Select** the processor and **name** your project

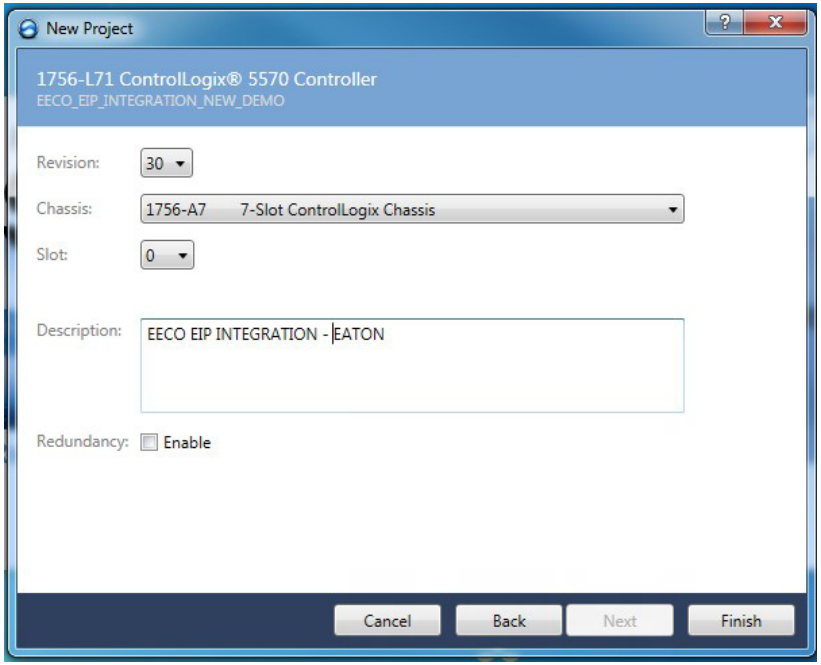
STEP 3: **Browse** to the desired project save location

STEP 4: Click **next**



STEP 5: Select the **chassis type**

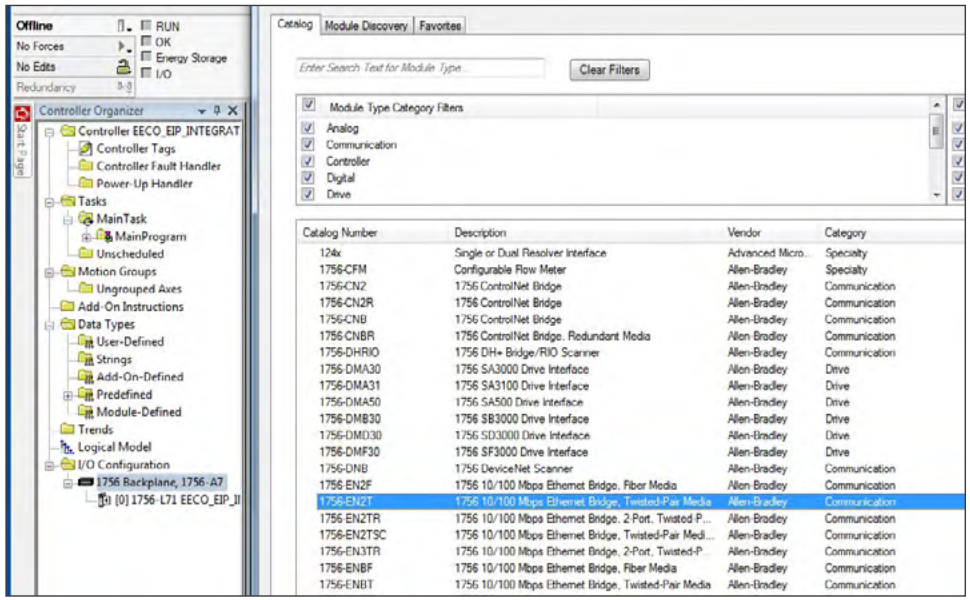
STEP 6: Click **finish**



In the Controller Organizer -

STEP 7: **Right click** the processor Backplane (slot 0)

STEP 8: **Create a new** Ethernet module.

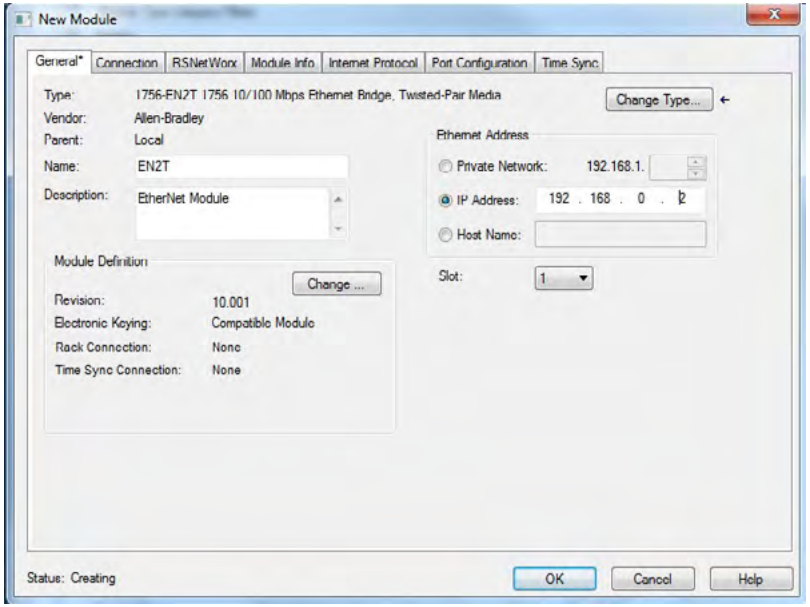


For this example, the 1756-EN2T will be used. Click **create**

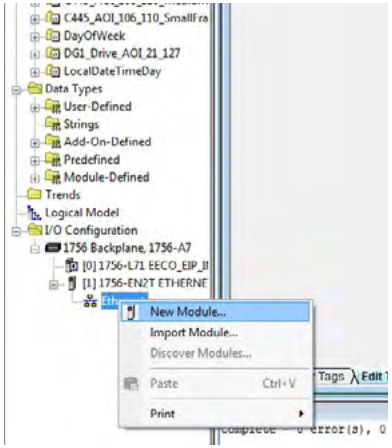
STEP 9: **Name the EN2T** and input an unused IP Address (192.168.0.2)

STEP 10: Click **OK**

An EN2T module (slot 1) now exists under the *Backplane*.



Multiple Eaton devices will be added to the project using different methods, with or without an EDS file. The PowerXL DG1 VFD will be added as a Generic Ethernet Module and a C445 Smart Motor Protection Device will be utilizing the previously registered EDS file. Using an EDS file allows technicians and engineers to select the I/O Assembly pair directly from a drop down list instead of having to input manually.



STEP 11; **Right click** on the 1756-EN2T module

STEP 12: Select **create new module**

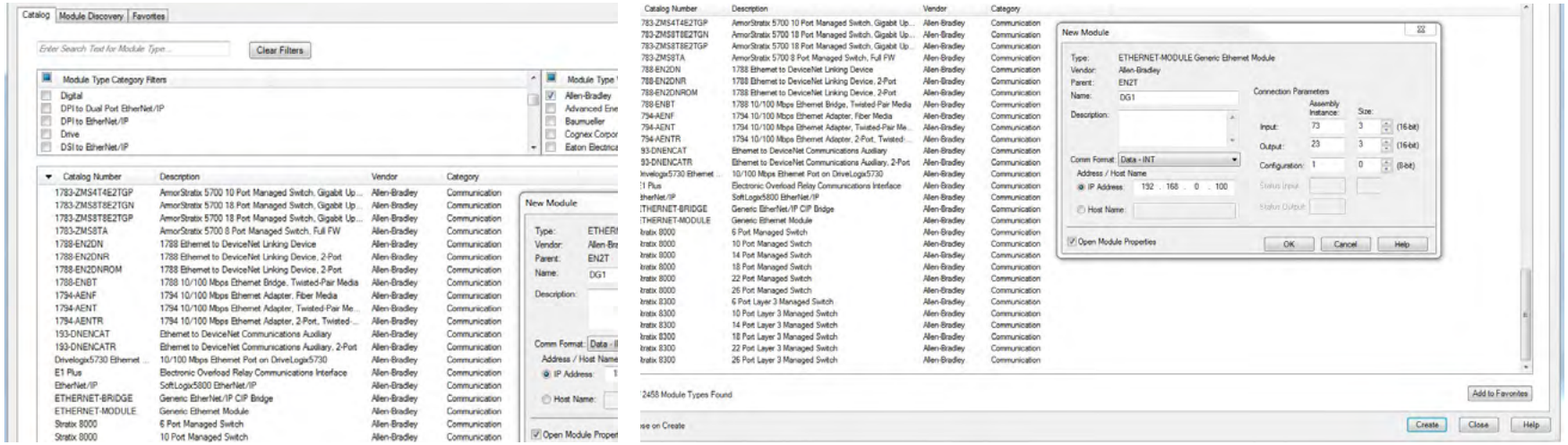
Next, the Select Module Type window appears. To enter the DG1 as a Generic Ethernet Module -

STEP 13: **Deselect both filters** for Category and Vendor and select only **Communication** and **Allen-Bradley**

STEP 14: Scroll down toward the bottom of the list and select **ETHERNET-MODULE Generic Ethernet Module**

STEP 15: Click **create**

A New Module window will appear. *See following page for instructions on adding the next Eaton device.*



STEP 16: Input a name that is distinctive yet simple **(DG1)** as *you will need to reuse this identical name* in the EIP Assist Software

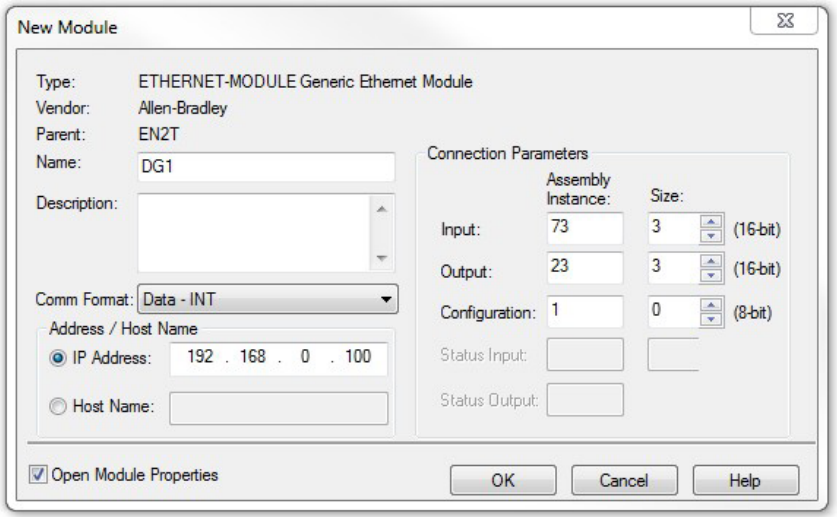
STEP 17: Change the Comm Format from **DINT >> INT**

STEP 18: Input an unused IP Address **(192.168.0.100** that is on the same subnet as the EN2T, i.e. 192.168.0.x. {x = 2-254}

STEP 19: **Input 73** for the Input Assembly Instance, **size = 3** bytes (INT) (pg. 66 in DG1 Manual)

STEP 20: **Input 23** for the Output Assembly Instance, **size = 3** bytes (INT) (pg. 62 in DG1 Manual)

STEP 21: Configuration assembly is not used, but there must be a value there as a place holder so **input 1** for Configuration Assembly Instance, **size = 0**



Adding the next Eaton device, a **C445**, is similar to the previous steps with minor changes.

STEP 22: Right click on the **1756-EN2T** module again and select create new module.

STEP 23: The Select Module Type window reappears

STEP 24: **Deselect the filters** for Vendor and select only **Eaton Electrical**

The list will only show *Eaton devices based on the EDS files that were previously registered*

STEP 25: Select **C445XC-E C445 EtherNet Communication Card**

STEP 26: Click **create**

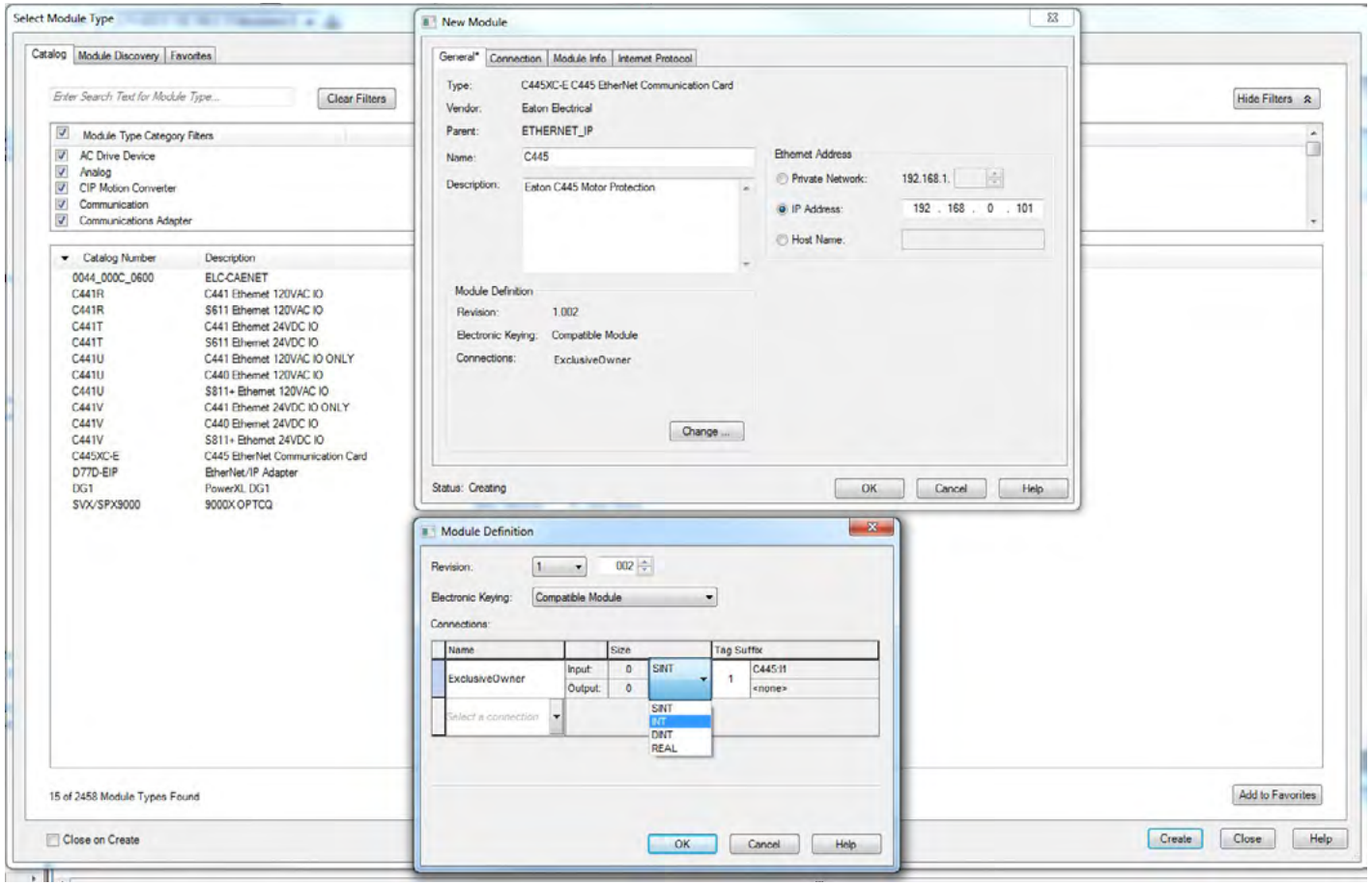
A New Module window appears

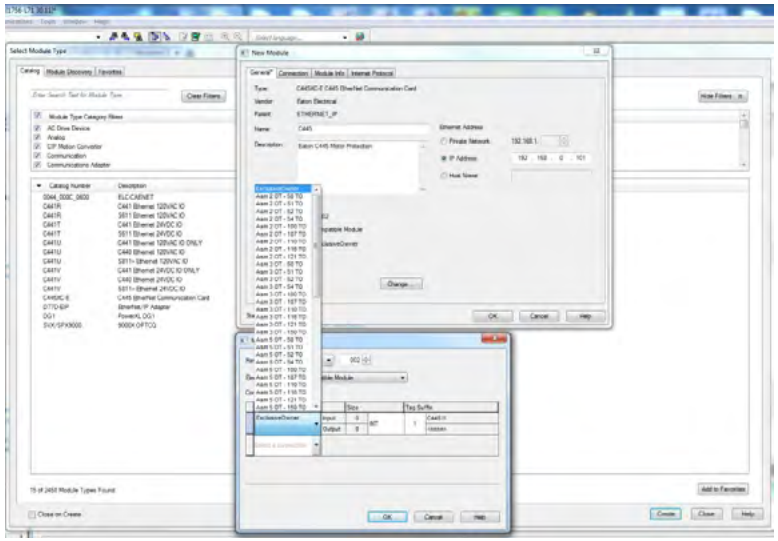
Input a name that is distinctive yet simple **(C445)** as you will need to reuse this identical name in the EIP Assist Software.

STEP 27: Input an unused IP Address **(192.168.0.101)** that is on the same subnet as the EN2T, i.e. 192.168.0.x. {x = 2-254}.

STEP 28: Click the **change button**

STEP 29: Change the size from **SINT >> INT**





STEP 30: Click on **ExclusiveOwner** and select the **I/O Assembly on 106 OT – 110 TO**.

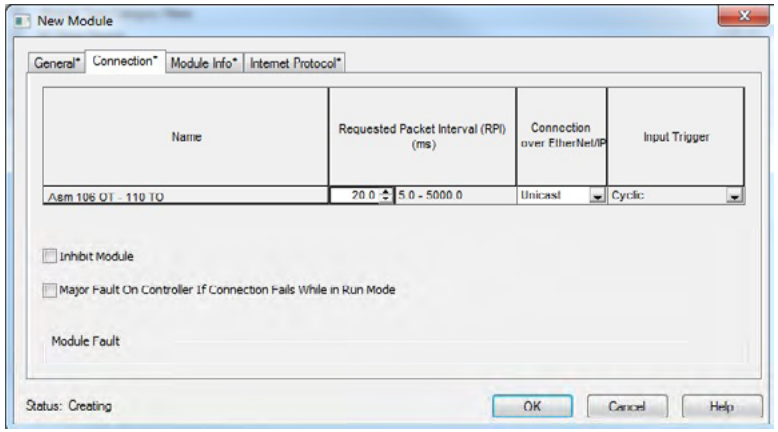
Notice the size changed on the Input and Output to 11 & 1

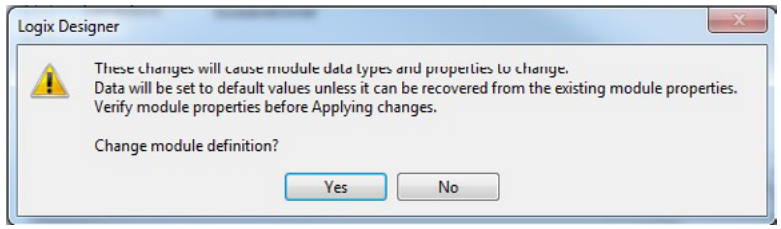
STEP 31: Click **OK** and select **Yes**

Back on the New Module Window -

STEP 32: Select the **Connection Tab** to change the RPI or select **OK**.

STEP 33: Close the Select Module Type window.





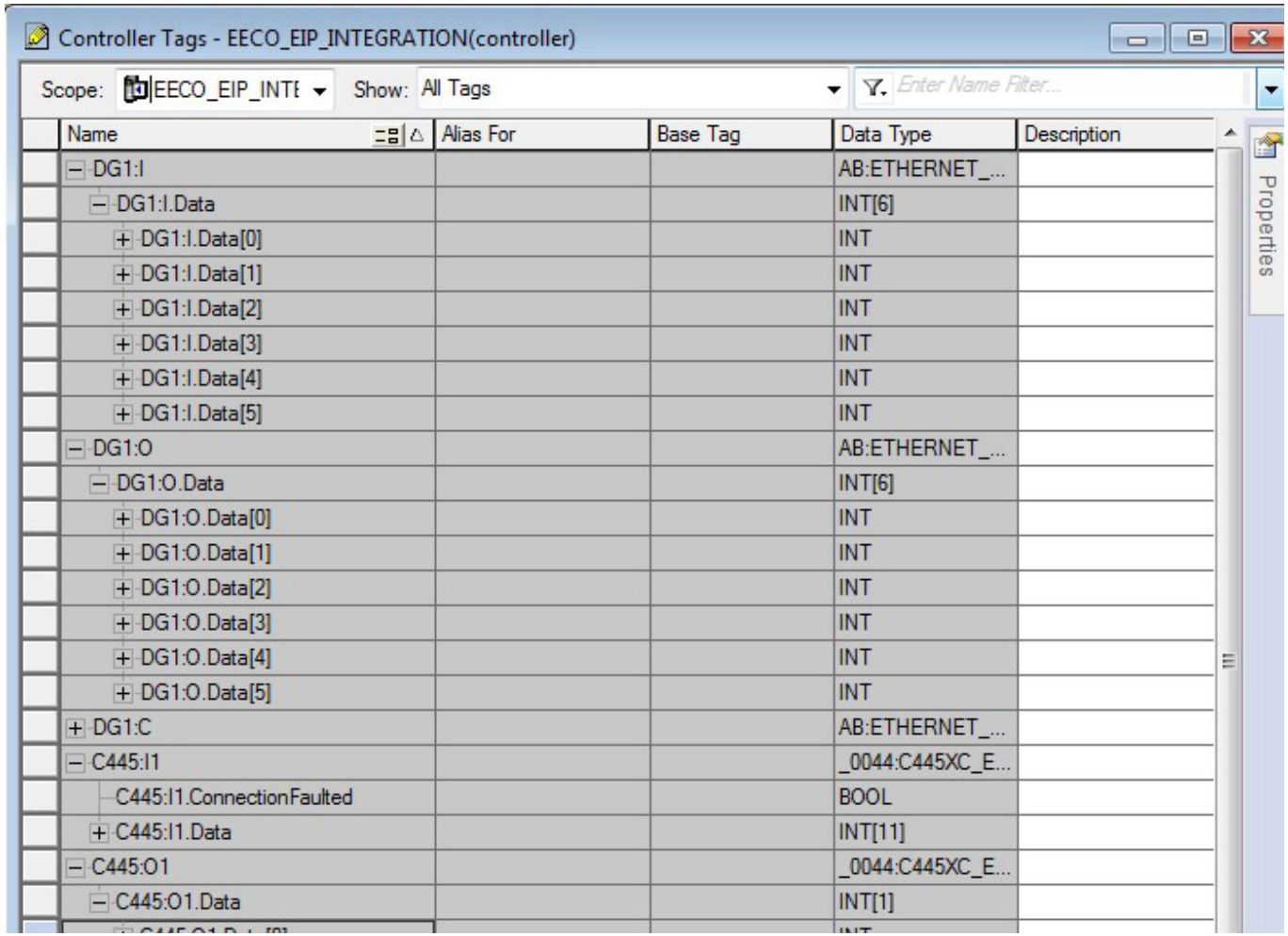
In the Controller Tags window, *notice the general tags that were created when we added the Eaton EtherNet/IP modules.*

STEP 34: **Save** the project

**Ensure that the RS5K project file is saved periodically to mitigate the risk of losing data.*

Normally, technicians or engineers manually input information in the **Description column**, but this can take days if not weeks depending on the tag counts. Eaton recognized this barrier and developed the **EIP-Assist tool** to help technicians and engineers eliminate this burden.

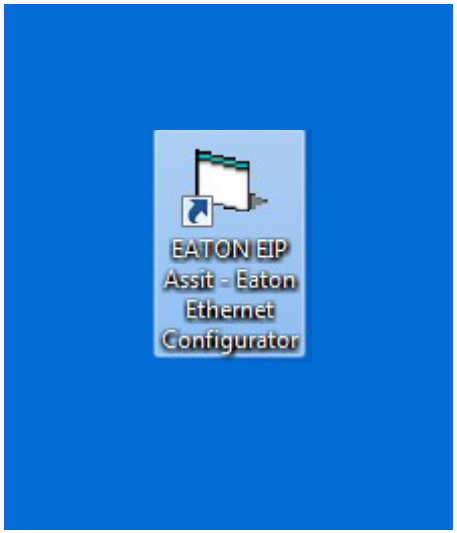
At this point, allow RS5K to continue to run in the background. Let's navigate to the location where the Eaton EIP-Assist tool was downloaded.

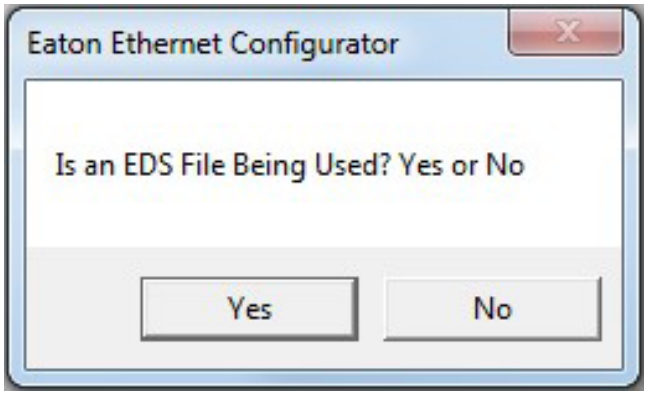


EATON'S ETHERNET CONFIGURATOR
1.3.16

STEP 1: Start EIP-Assist by **double clicking the icon**.

STEP 2: The splash screen will appear indicating the tool is initializing.



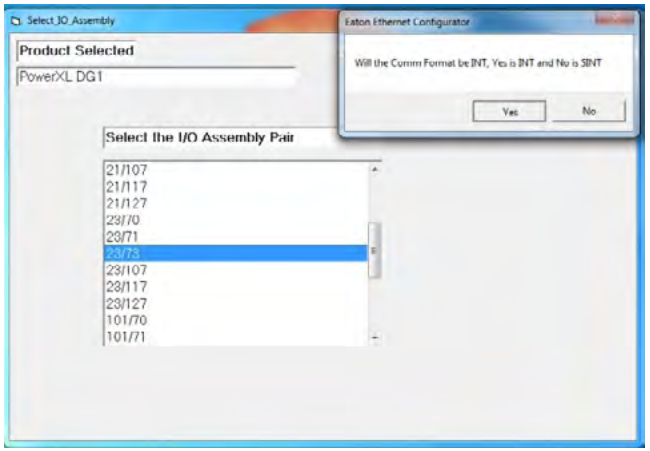


EIP-Assist will ask if an EDS file is being used for the first product.

STEP 3: In our case we did not use an EDS to add the DG1, so **select no**

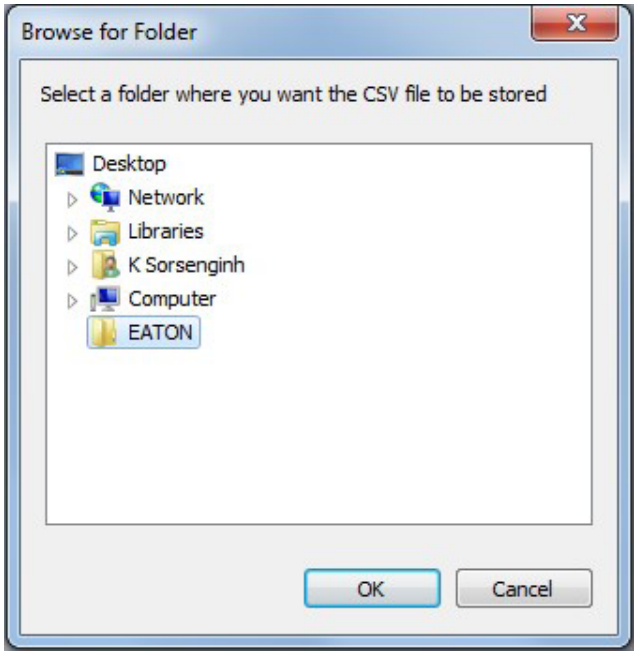
STEP 4: Enter the number of DG1 devices we added to our project - **1 in our case**.

But if multiple DG1 were added, we could generate the tags in one instance utilizing EIP-Assist.



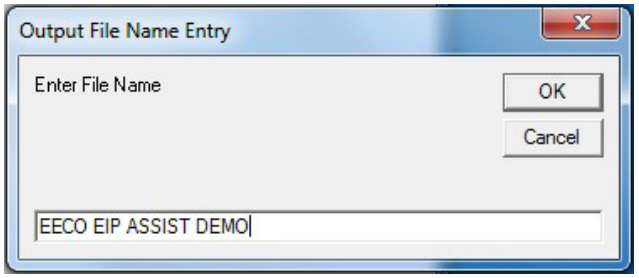
STEP 5: Select the appropriate DG1 I/O Assembly Pair as previously completed in the RS5K project; **23/73** in this example.

STEP 6: Comm Format was also set to INT, so **select yes**.



STEP 7: Browse to a location where the outputted CSV will be saved.

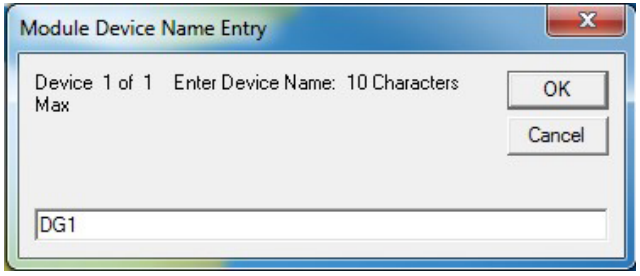
Please note the location as the CSV will need to be accessed at a later time.



STEP 8: **Name the CSV file** to be outputted

This can be anything. *In this example, EECO EIP ASSIST DEMO will be used.*

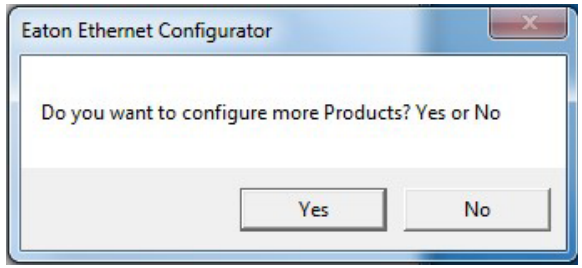
STEP 9: Click **OK**



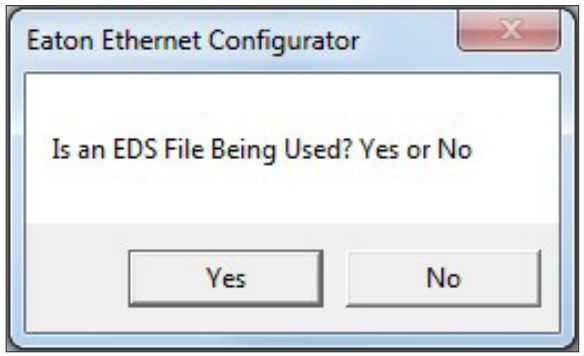
STEP 10: Enter the **DG1 Device Name** as completed in the RS5K project - enter **DG1**

STEP 11: Click **OK**

**THE NAME MUST BE IDENTICAL in order for the tool to properly generate the desired tags!*

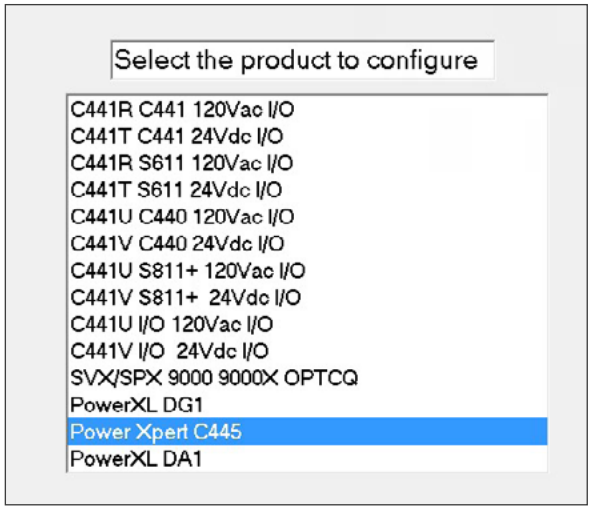


STEP 12: Select **yes** to configure the additional product

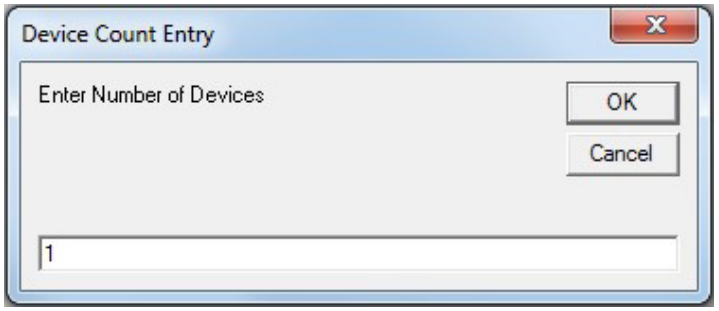


STEP 13: The EIP-Assist tool will loop back to the original prompt of whether an EDS is to be utilized. Referring back to the second Eaton product that was added, *the EDS file was indeed utilized*.

STEP 14: Select **Yes**

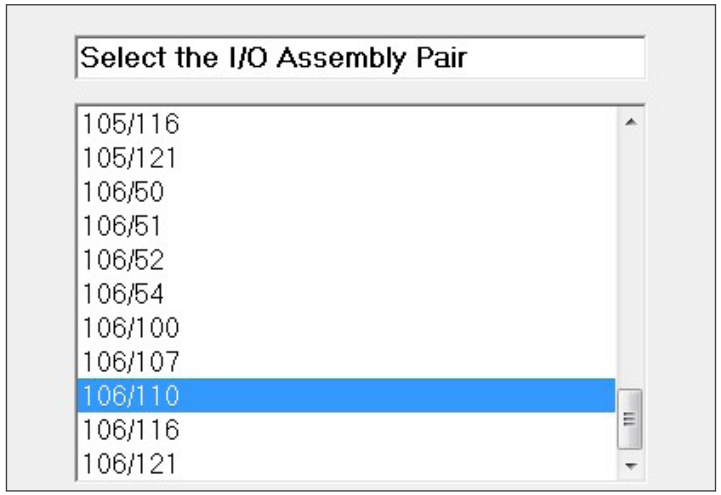


STEP 15: Select **Power Xpert C445**

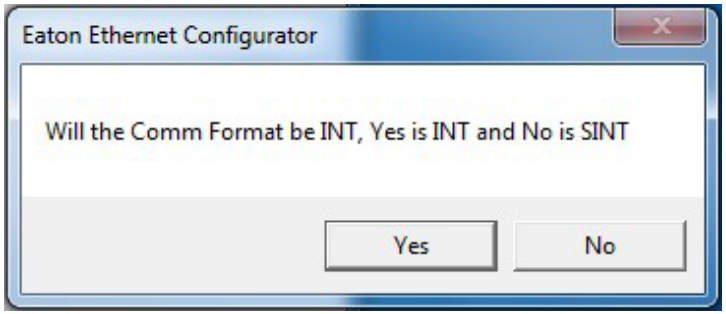


Similar to the DG1 instance -

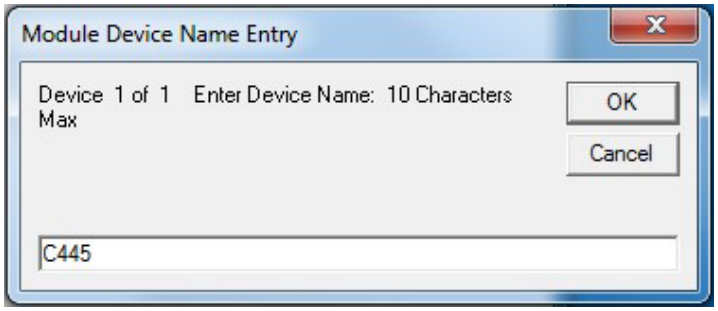
STEP 16: Input the **value of 1** for the C445 Device count. *If additional C445s were added, enter the corresponding value.*



STEP 17: Select the 106/110 I/O Assembly Pair as in the RS5K Project



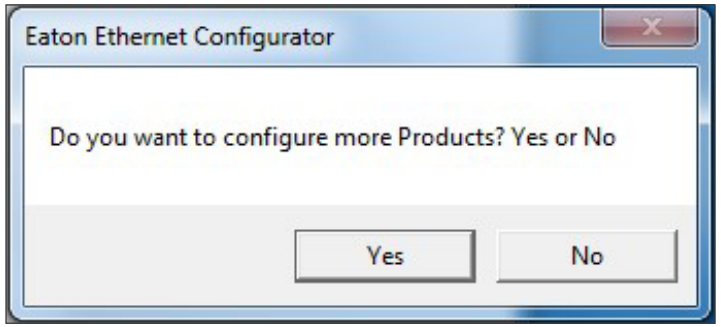
STEP 17: Click **Yes** for Comm Format INT



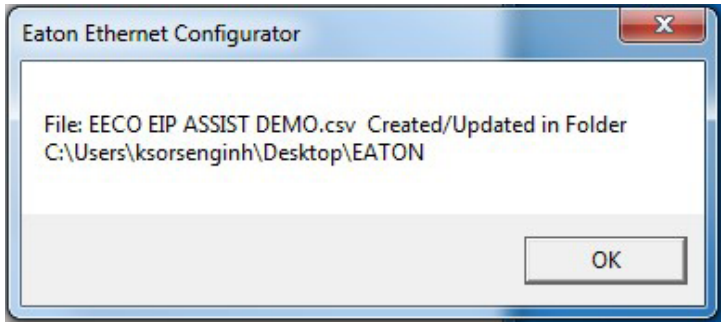
STEP 17: Enter the **C445 Device Name** as completed in the RS5K project

**THE NAME MUST BE IDENTICAL in order for the tool to properly generate the desired tags!*

STEP 18: Click **OK**



STEP 19: Select **No** for configuring additional product.



A final window will pop up to show the CSV file name and folder location.

STEP 20: Click **OK**

EIP-Assist will automatically close any remaining windows and the task is completed.

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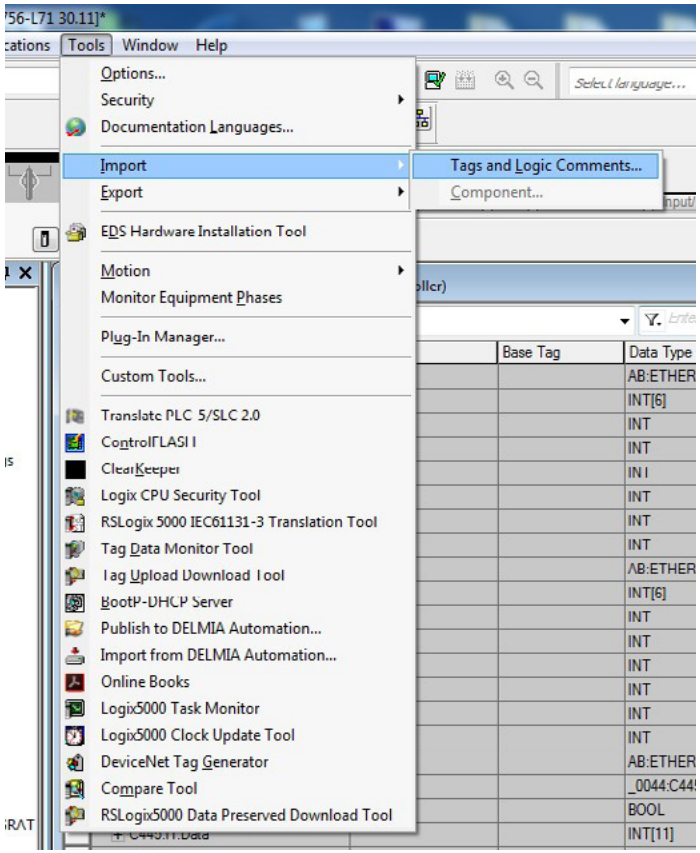
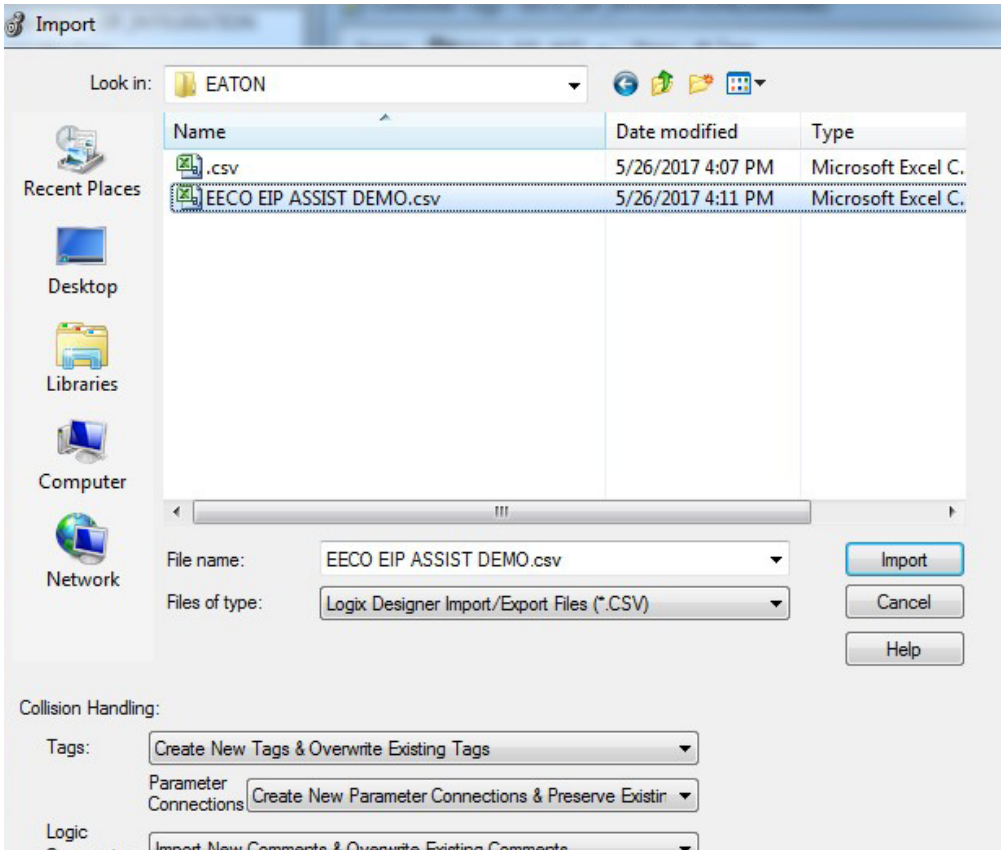
STUDIO 5000
PART 2

Navigate back to the RS5K environment -

STEP 1: Go to the **Tools Menu** > **Import** > **Tags and Logic Comments**



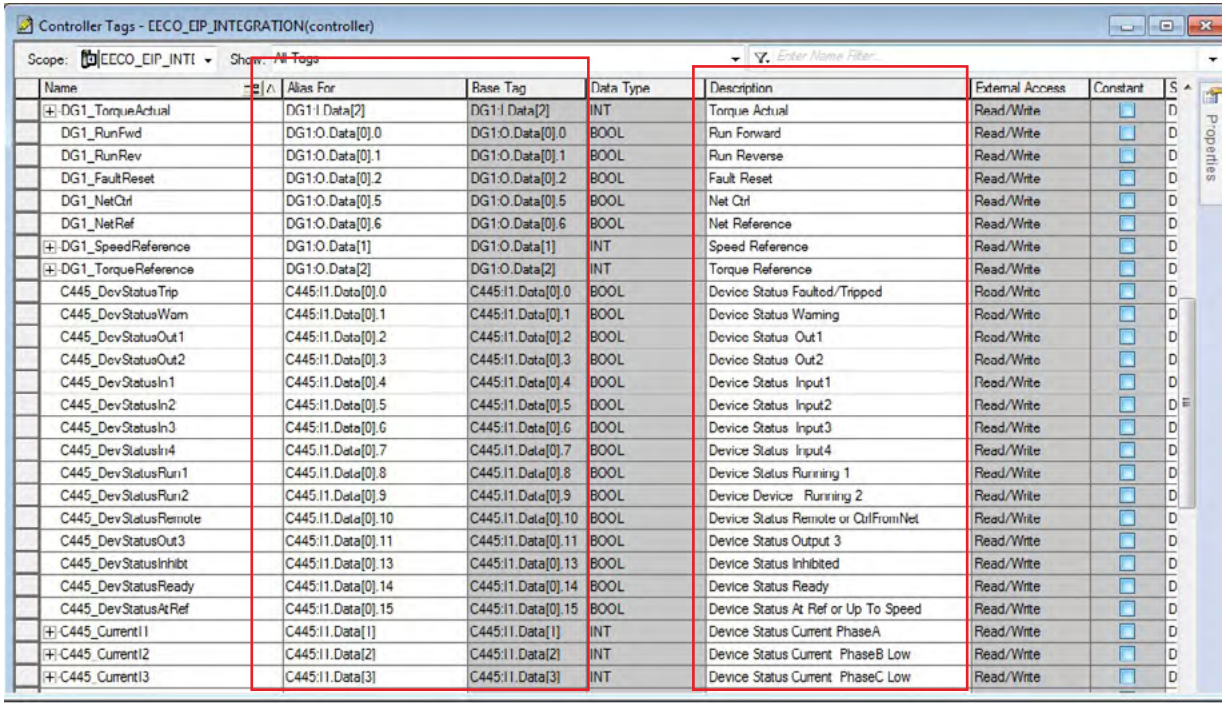
STEP 2: Browse to the previously saved CSV folder location, **select**, and **import**



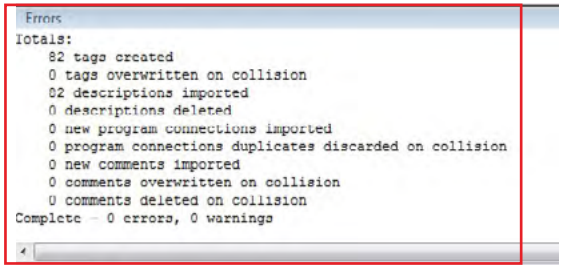
Once the import task is completed, you will notice the lower Error plane that provides feedback on how many tags were created, along with any errors and warnings.

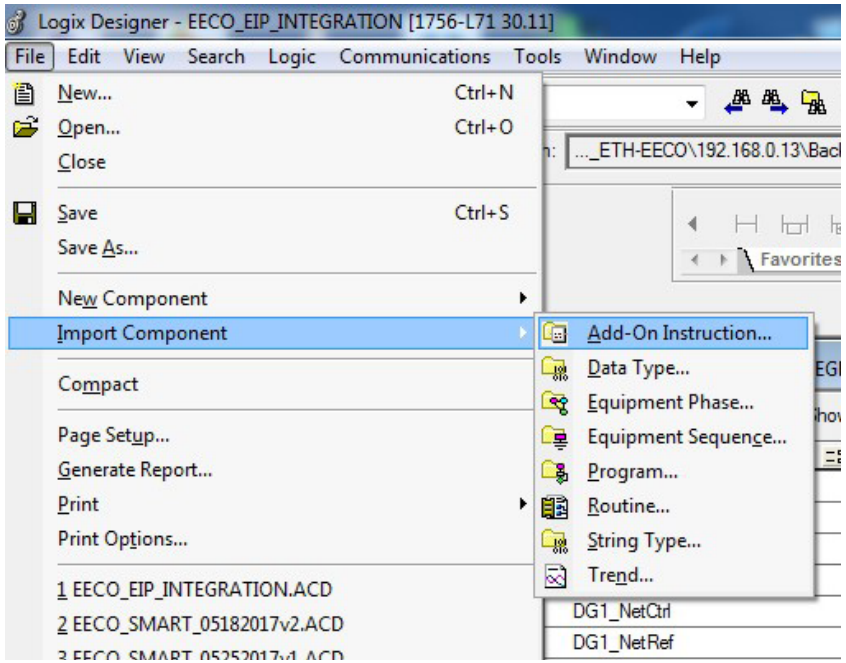
**If there are error[s], ensure that the names specified in the project and EIP-Assist were identical, or re-run EIP-Assist with the correct nomenclature.*

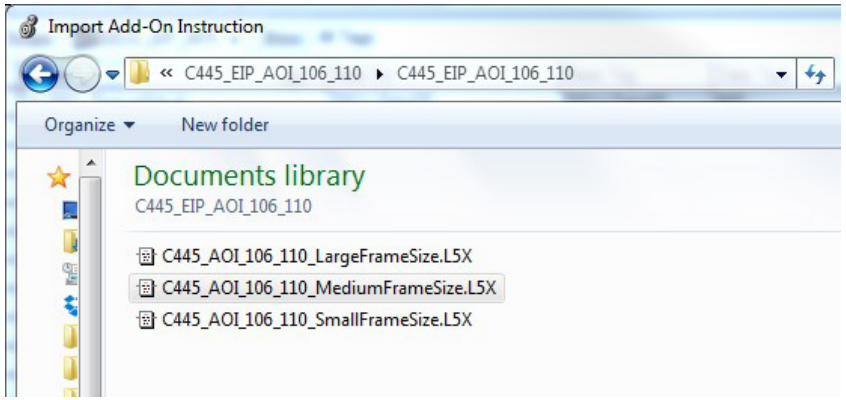
Also notice that the description column is now automatically populated from the EIP-Assist generated CSV. When **Edit Tags** is selected, RS5K will also show exactly where the new tags are alias to in the generic tags. The functionalities of the EIP-Assist tool contribute to the reduction of setup or commissioning time by a great amount, ultimately reducing downtime and increasing productivity. *The import task is now completed.*



Name	Alias For	Base Tag	Data Type	Description	External Access	Constant
DG1_TorqueActual	DG1:I.Data[2]	DG1:I.Data[2]	INT	Torque Actual	Read/Write	
DG1_RunFwd	DG1:O.Data[0].0	DG1:O.Data[0].0	BOOL	Run Forward	Read/Write	
DG1_RunRev	DG1:O.Data[0].1	DG1:O.Data[0].1	BOOL	Run Reverse	Read/Write	
DG1_FaultReset	DG1:O.Data[0].2	DG1:O.Data[0].2	BOOL	Fault Reset	Read/Write	
DG1_NetCtrl	DG1:O.Data[0].5	DG1:O.Data[0].5	BOOL	Net Ctrl	Read/Write	
DG1_NetRef	DG1:O.Data[0].6	DG1:O.Data[0].6	BOOL	Net Reference	Read/Write	
DG1_SpeedReference	DG1:O.Data[1]	DG1:O.Data[1]	INT	Speed Reference	Read/Write	
DG1_TorqueReference	DG1:O.Data[2]	DG1:O.Data[2]	INT	Torque Reference	Read/Write	
C445_DevStatusTrip	C445:I1.Data[0].0	C445:I1.Data[0].0	BOOL	Device Status Faulted/Tripped	Read/Write	
C445_DevStatusWarn	C445:I1.Data[0].1	C445:I1.Data[0].1	BOOL	Device Status Warning	Read/Write	
C445_DevStatusOut1	C445:I1.Data[0].2	C445:I1.Data[0].2	BOOL	Device Status Out1	Read/Write	
C445_DevStatusOut2	C445:I1.Data[0].3	C445:I1.Data[0].3	BOOL	Device Status Out2	Read/Write	
C445_DevStatusIn1	C445:I1.Data[0].4	C445:I1.Data[0].4	BOOL	Device Status Input1	Read/Write	
C445_DevStatusIn2	C445:I1.Data[0].5	C445:I1.Data[0].5	BOOL	Device Status Input2	Read/Write	
C445_DevStatusIn3	C445:I1.Data[0].6	C445:I1.Data[0].6	BOOL	Device Status Input3	Read/Write	
C445_DevStatusIn4	C445:I1.Data[0].7	C445:I1.Data[0].7	BOOL	Device Status Input4	Read/Write	
C445_DevStatusRun1	C445:I1.Data[0].8	C445:I1.Data[0].8	BOOL	Device Status Running 1	Read/Write	
C445_DevStatusRun2	C445:I1.Data[0].9	C445:I1.Data[0].9	BOOL	Device Device Running 2	Read/Write	
C445_DevStatusRemote	C445:I1.Data[0].10	C445:I1.Data[0].10	BOOL	Device Status Remote or CtrlFromNet	Read/Write	
C445_DevStatusOut3	C445:I1.Data[0].11	C445:I1.Data[0].11	BOOL	Device Status Output 3	Read/Write	
C445_DevStatusInhibt	C445:I1.Data[0].13	C445:I1.Data[0].13	BOOL	Device Status Inhibited	Read/Write	
C445_DevStatusReady	C445:I1.Data[0].14	C445:I1.Data[0].14	BOOL	Device Status Ready	Read/Write	
C445_DevStatusAtRef	C445:I1.Data[0].15	C445:I1.Data[0].15	BOOL	Device Status At Ref or Up To Speed	Read/Write	
C445_CurrentI1	C445:I1.Data[1]	C445:I1.Data[1]	INT	Device Status Current PhaseA	Read/Write	
C445_CurrentI2	C445:I1.Data[2]	C445:I1.Data[2]	INT	Device Status Current PhaseB Low	Read/Write	
C445_CurrentI3	C445:I1.Data[3]	C445:I1.Data[3]	INT	Device Status Current PhaseC Low	Read/Write	







Eaton has taken additional steps to simplifying integration of its EtherNet/IP supported products by offering a wide range of *Add-On Instruction (AOI)* that may be used in conjunction with or without EIP-Assist.

The **AOI method** is the preferred method of commissioning Eaton's smart devices as the front end work of mapping, combining two byte/word tags into an INT, DINT, or REAL, and the scaling has already been completed.

Technicians and engineers will then focus only on the application programming phase. Let's proceed and explore how technicians and engineers can utilize Eaton's AOIs.

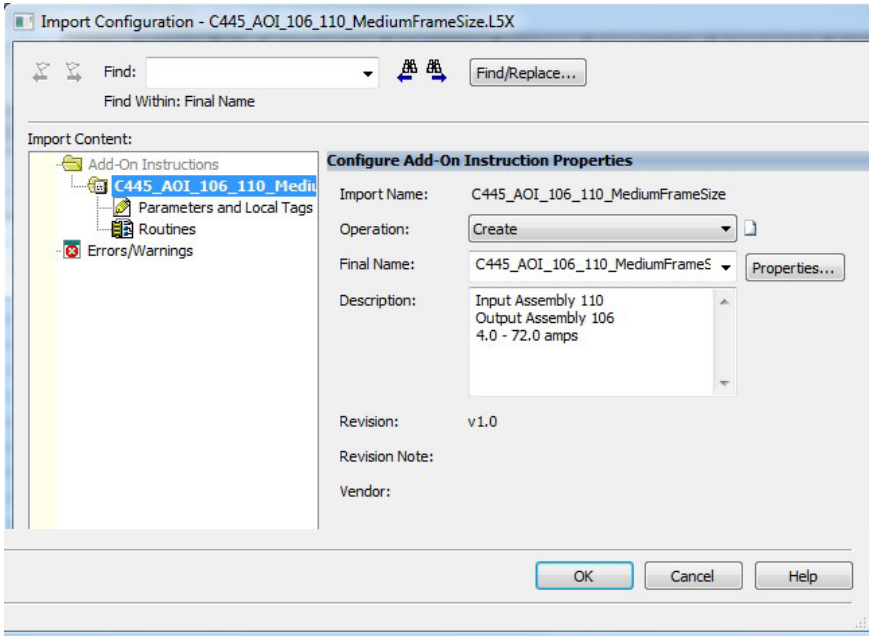
In RS5K -

STEP 4: Navigate to **File** > **Import Component** > **Add-On Instruction**

STEP 5: Browse to the **AOI provided by Eaton**

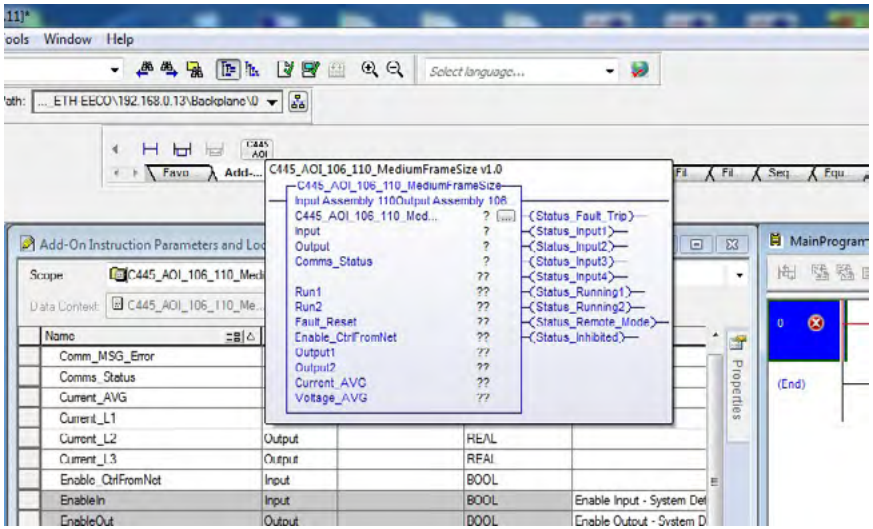
The extension of the file will be a **L5X**.

STEP 6: The **medium frame size C445 AOI** is selected.



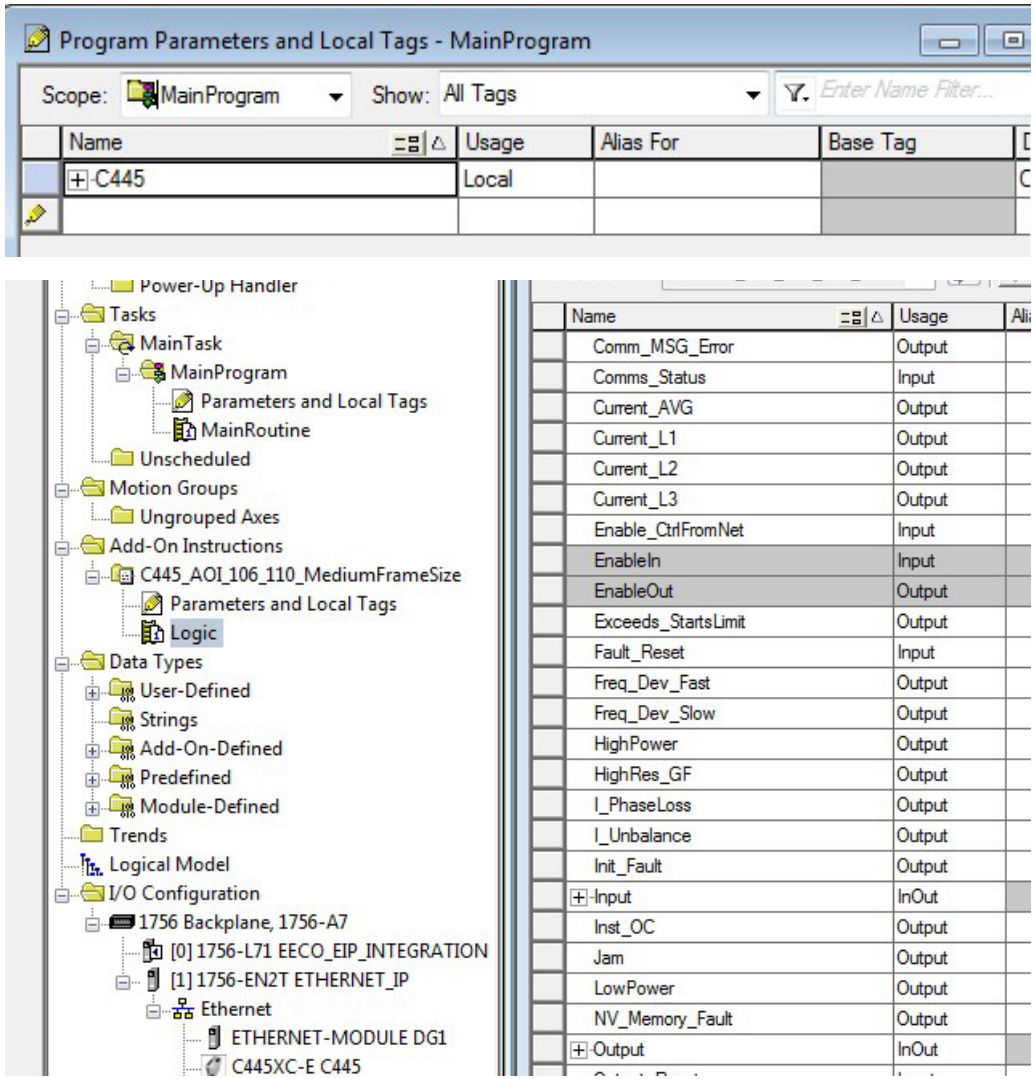
The Import Configuration window appears.

STEP 7: **Verify** and select **OK**

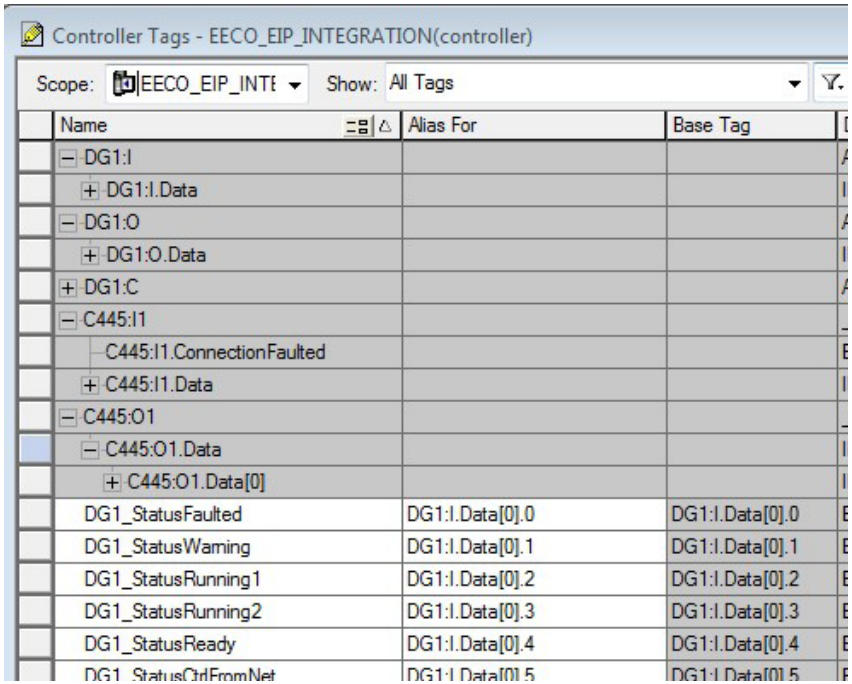


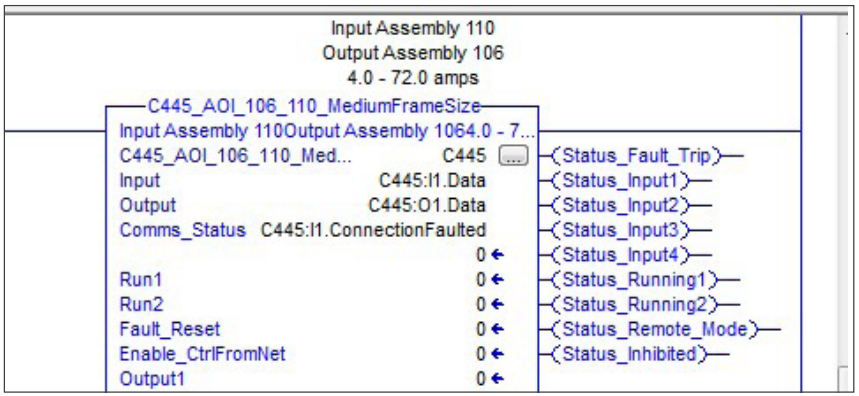
STEP 8: In the **Controller Organizer** > **Add- On Instruction**, the AOI has been successfully imported and is *now available for use in the Language Element Tool Bar > Add-On*

STEP 9: In **MainProgram** > **Parameters and Local Tags**, it's apparent that RS5K created the AOI I/O tags within this location.



UTILIZING THE **AOI**





STEP 1: Next, open **MainProgram** – **MainRoutine**

STEP 2: **Add a rung**

STEP 3: Then in **Add-On,** drag the C445 AOI to the rung 0

Once the C445 AOI block is added to the rung, the top three parameters in the AOI block must be mapped to a specific module.

Within the AOI block -

STEP 4: Double click the **top "?"** next to the View Configuration Dialog button

STEP 5: Input **C445** > **right click** > select **"New C445"**

STEP 6: A new Parameter or Tag window will appear

STEP 7: Confirm the name and scope

STEP 8: Click **create**

Ensure that the Controller Tags and MainProgram windows are open and side-by-side.

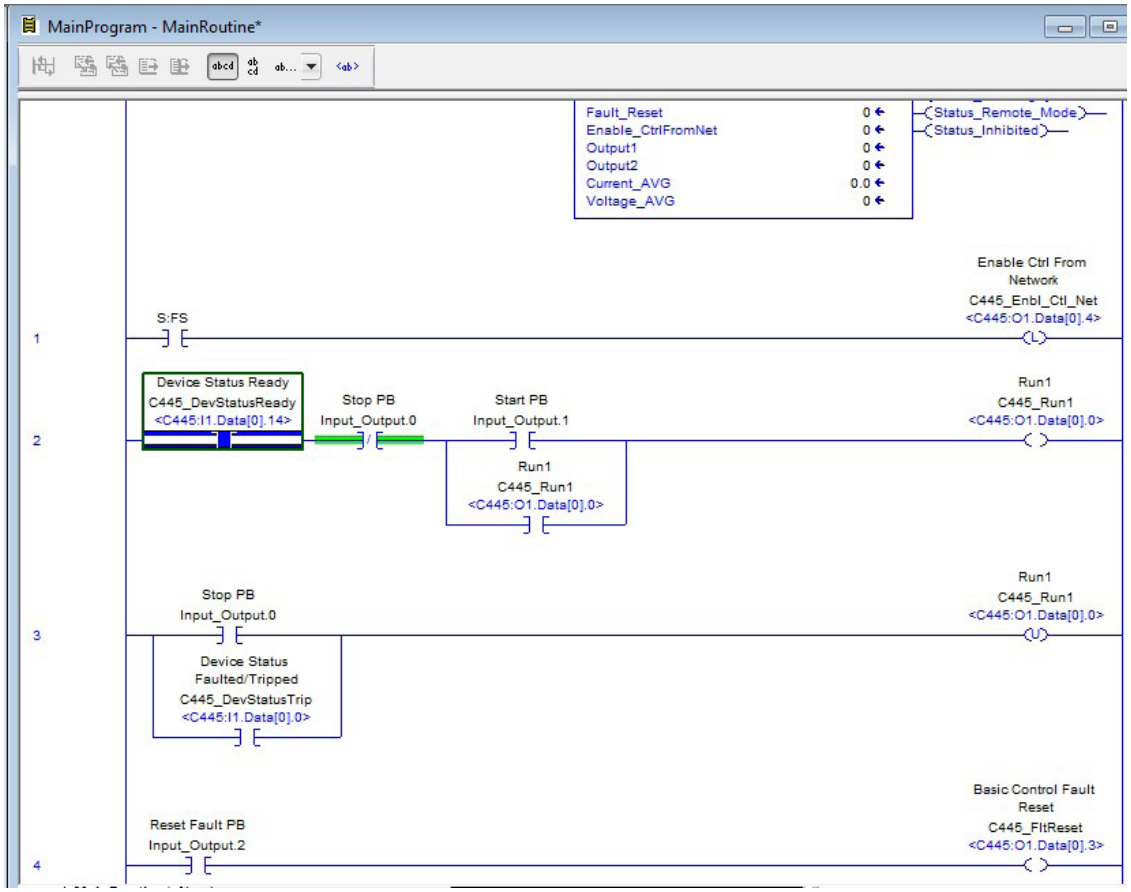
STEP 9: Expand both **C445:I1** and **C445:O1**

STEP 10: Select and drag **C445:I1:Data** to the **"?"** in the Input row

STEP 11: Select and drag **C445:O1:Data** to the **"?"** in the Output row.

STEP 12: Select and drag **C445:I1:ConnectionFaulted** to the **"?"** in the Comms_Status row.

The setup of the AOI is now complete.



Let's create a **DINT tag** —

STEP 13: name it **Input_Output.**

The Boolean within the DINT will be used as logical Push Buttons.

STEP 14: **Add a couple of rungs** to the project

STEP 15: **Enable remote FieldBus control** of the C445 by latching the C445_Enbl_ Ctl_ Net bit.

To ensure that the PLC has control after a power loss, a First Scan bit is used for latching on a power-up condition.

STEP 16: Add a **start**, **stop** and **fault logic** to the program,

STEP 17: **Download** to the processor

The C445 is ready for operation.

APPENDICES
A, B

EATON RESOURCE DOWNLOADS LINKS

- Eaton Software Downloads

http://www.eaton.com/Eaton/ProductsServices/Electrical/Support/SoftwareDownloads/index.htm

- EIP Assist Software

http://www.eaton.com/Eaton/ProductsServices/Electrical/Support/SoftwareDownloads/index.htm?litlibtarget=2000000000866

- Eaton C445

http://www.eaton.com/Eaton/ProductsServices/Electrical/ProductsandServices/AutomationandControl/ContactorsStarters/MotorProtectionRelays/C445/index.htm?wtredirect=www.eaton.com/c445#tabs-3

- Eaton C440/C441

http://www.eaton.com/Eaton/ProductsServices/Electrical/Support SoftwareDownloads/index.htm?litlibtarget=2000000000835

- Eaton PowerXL DA1

http://www.eaton.com/Eaton/ProductsServices/Electrical/Support/SoftwareDownloads/index.htm?litlibtarget=2000000001137

- Eaton PowerXL DG1

http://www.eaton.com/Eaton/ProductsServices/Electrical/Support/SoftwareDownloads/index.htm?litlibtarget=2000000000867

- Eaton SVX 9000

http://www.eaton.com/Eaton/ProductsServices/Electrical/Support/SoftwareDownloads/index.htm?litlibtarget=2000000000726

- Eaton S811+/S801+ Soft Starter

http://www.eaton.com/Eaton/ProductsServices/Electrical/ProductsandServices/AutomationandControl/ContactorsStarters/SoftStartersControllers/S811S801Plus/PCT_377642

http://www.eaton.com/SEAsia/ProductsSolutions/Electrical/ProductsServices/AutomationControl/SolidStateMotorControl/SoftStarters/S811Series/index.htm#tabs-1

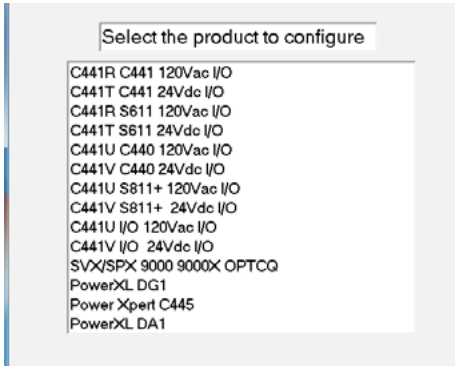
- E-Series Protective Relay

http://www.eaton.com/Eaton/ProductsServices/Electrical/ProductsandServices/ElectricalDistribution/PowerDistributionComponents/ProtectiveRelays/MotorRelays/EMR-4000/index.htm

http://www.eaton.com/Eaton/ProductsServices/Electrical/Support/SoftwareDownloads/index.htm?litlibtarget=2000000000987

EATON SUPPORTED PRODUCTS AND THEIR RESPECTIVE I/O ASSEMBLIES

- Supported Devices



- C441R C441 120 VAC

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105/100
105/107
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105/115
105/121

- C441T C441 24 VDC

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105/107
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- C441R S611 120 VAC

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- C441T S611 24 VDC

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- C441U C440 120 VAC

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105/130

- C441V C440 24 VDC

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105/107
105/120
105/130

- C441U S811+ 120 VAC I/O

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- C441V S811+ 24 VDC

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101/150

- C441U I/O 120 VAC

32/3
32/107

- C441V I/O 24 VDC

32/3
32/107

- SVX/SPX 9000X OPTCQ

21/71
23/73
25/76
101/127
111/127

- PowerXL DG1 drive

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- Power Xpert C445 Smart

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