

# Integrating Ethernet-enabled Motor Control and Process Control Systems



*For Classroom Use Only!*

LISTEN.  
THINK.  
SOLVE.®

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Throughout this manual we use the following notes to make you aware of safety considerations:

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**WARNING**

Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

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**IMPORTANT**

Identifies information that is critical for successful application and understanding of the product.

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**ATTENTION**

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you:

- identify a hazard
  - avoid a hazard
  - recognize the consequence
- 

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**SHOCK HAZARD**

Labels may be located on or inside the drive to alert people that dangerous voltage may be present.

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**BURN HAZARD**

Labels may be located on or inside the drive to alert people that surfaces may be dangerous temperatures.

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# Integrating Ethernet-enabled Motor Control and Process Control Systems

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## Before you begin

### About this lab

This lab demonstrates how to use IntelliCENTER Software to monitor and configure Ethernet enabled CENTERLINE MCCs, as well as how to leverage and integrate Ethernet-enabled motor control and overload components into your Integrated Architecture and process control system.

This lab takes approximately 60 minutes to complete.

### Tools & prerequisites

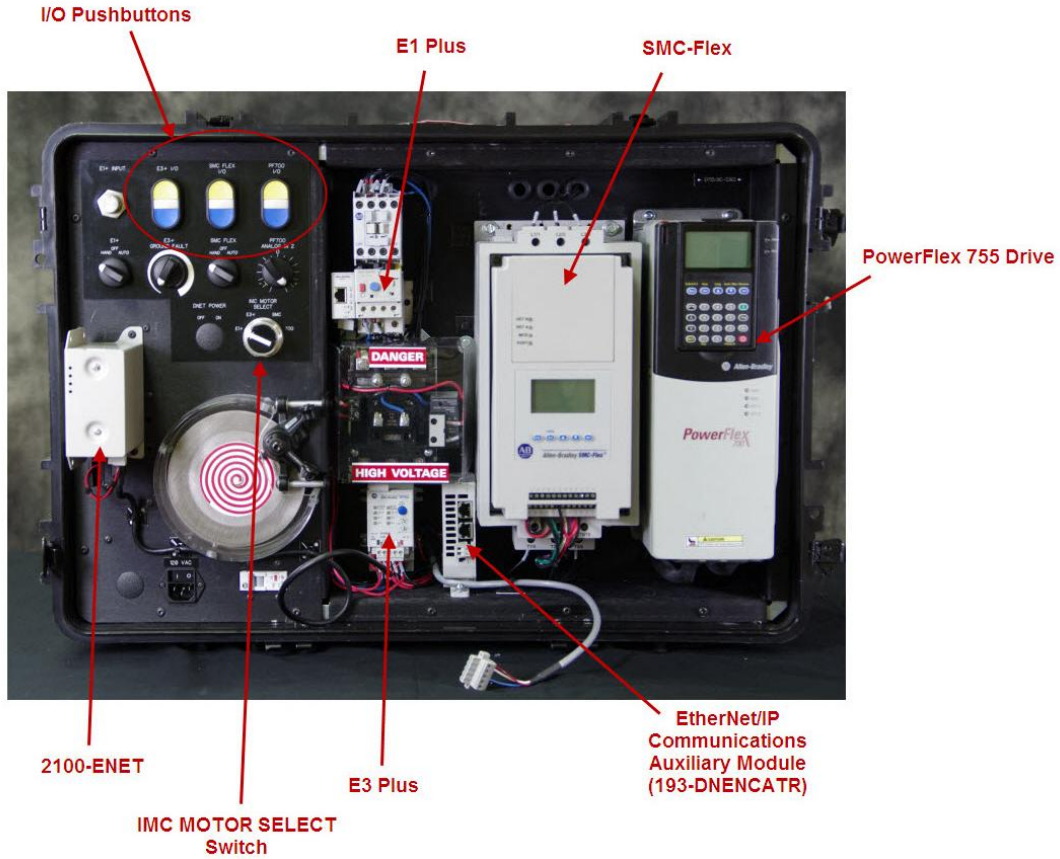
- IntelliCENTER Software 3.00.01
- RSLogix 5000 v20
- FactoryTalk View Studio for Machine Edition v6.10
- IMCv1 IMC Ethernet demo box
- CL31 IAOT demo box
- Ethernet\_MCP.ACD
- DNENCATR\_AOP\_Example.ACD
- Ethernet\_MCP.apa
- Motor1.par
- ME\_E1\_Plus\_ENET\_Faceplate.gfx
- E1\_Plus\_AOI.L5X

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## Introduction to Your Lab Hardware

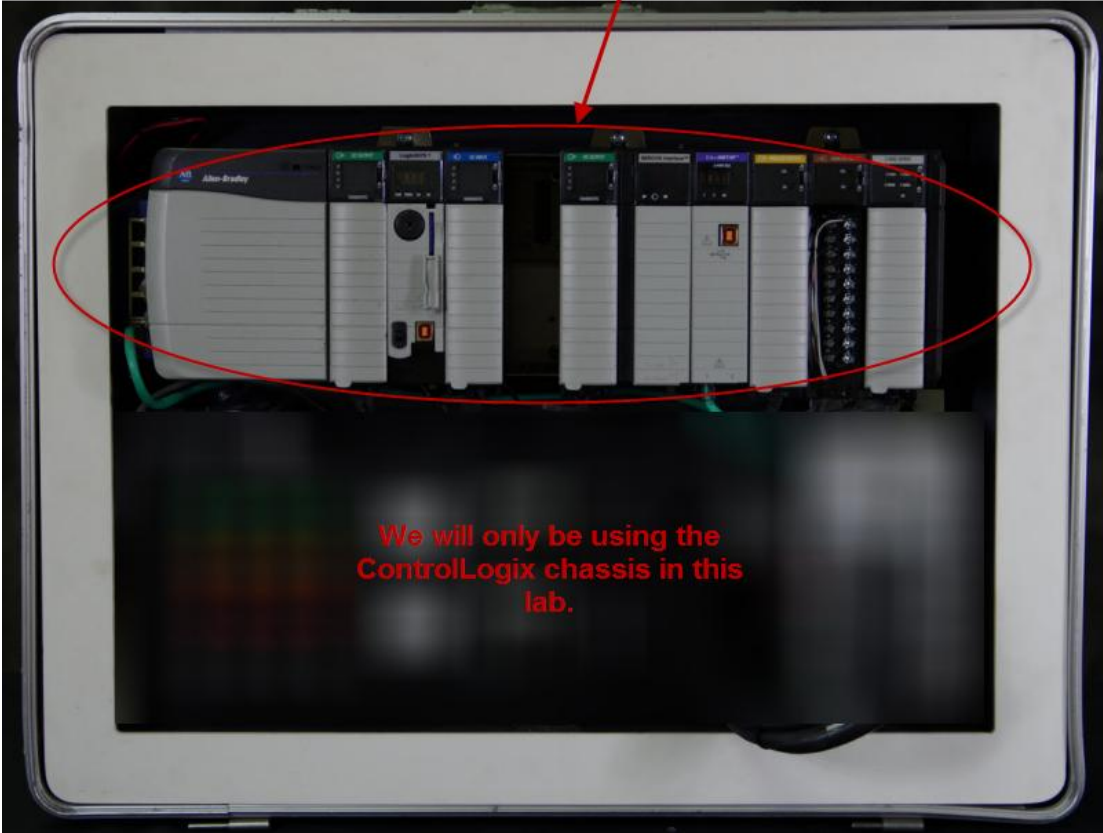
Your lab hardware consists of an IMC and ControlLogix demo kit. Take a minute to familiarize yourself with the hardware and the device names, as they will be referenced in this lab.

### IMC Demo Box



**ControlLogix Demo Box**

**ControlLogix chassis**



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## **Monitoring and Configuring Devices in Your Ethernet MCC using IntelliCENTER Software**

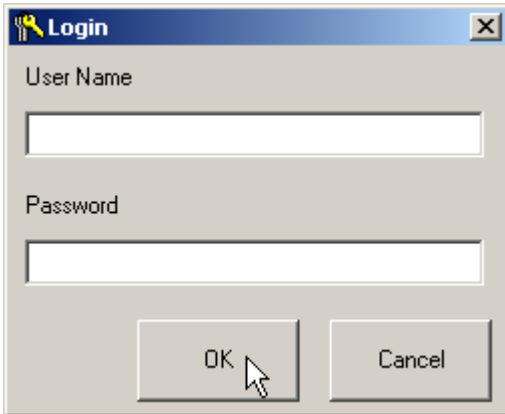
In this section of the lab, you will learn how to use the IntelliCENTER software to connect to your CENTERLINE MCC via Ethernet, and how to monitor and configure devices such as solid-state motor overloads, Smart Motor Controllers, and PowerFlex drives.

## Connect to your CENTERLINE® Motor Control Center (MCC)

1. Double-click on the IntelliCENTER Software shortcut icon on the desktop.

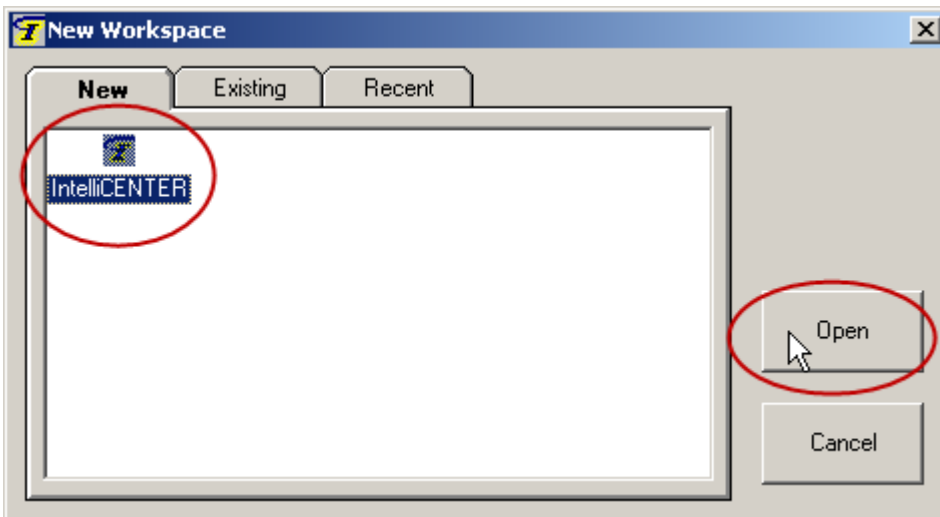


2. Login with the user name **Administrator** and password **password**, and click OK.

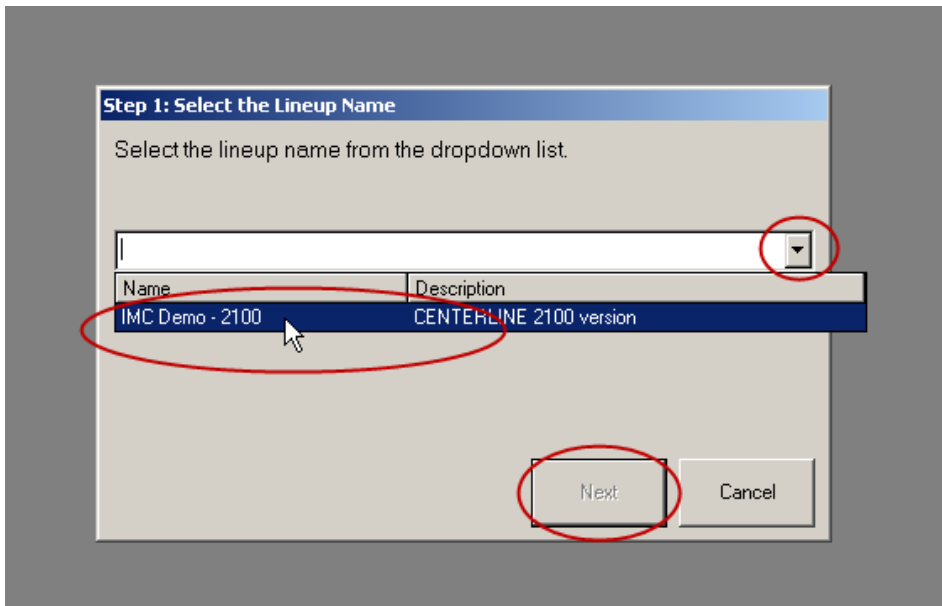


3. You will now be prompted to select a **Workspace**.

A Workspace defines which IntelliCENTER software screens to open, which MCC is connected, etc. Since a workspace has not been set up, choose **IntelliCENTER** under the **New** tab and click **Open**.

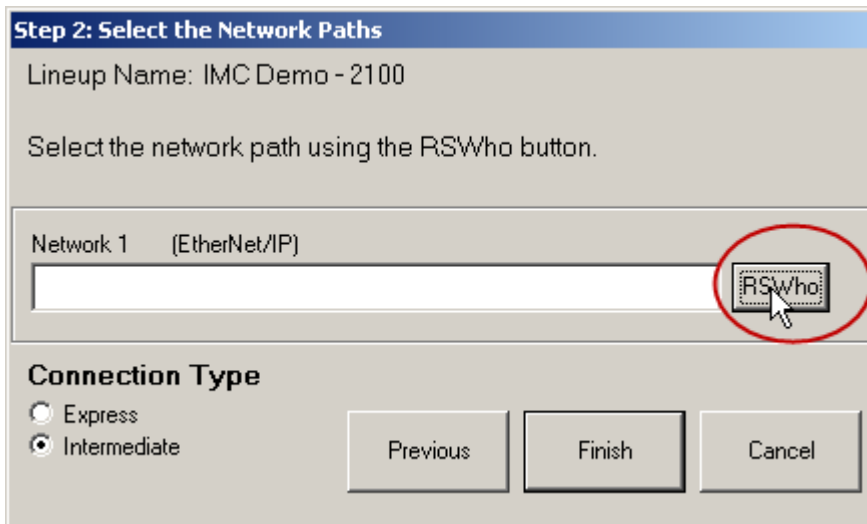


4. After selecting your Workspace, you will be prompted to select which MCC Lineup to connect to. Select **IMC Demo – 2100**, then click **Next**.

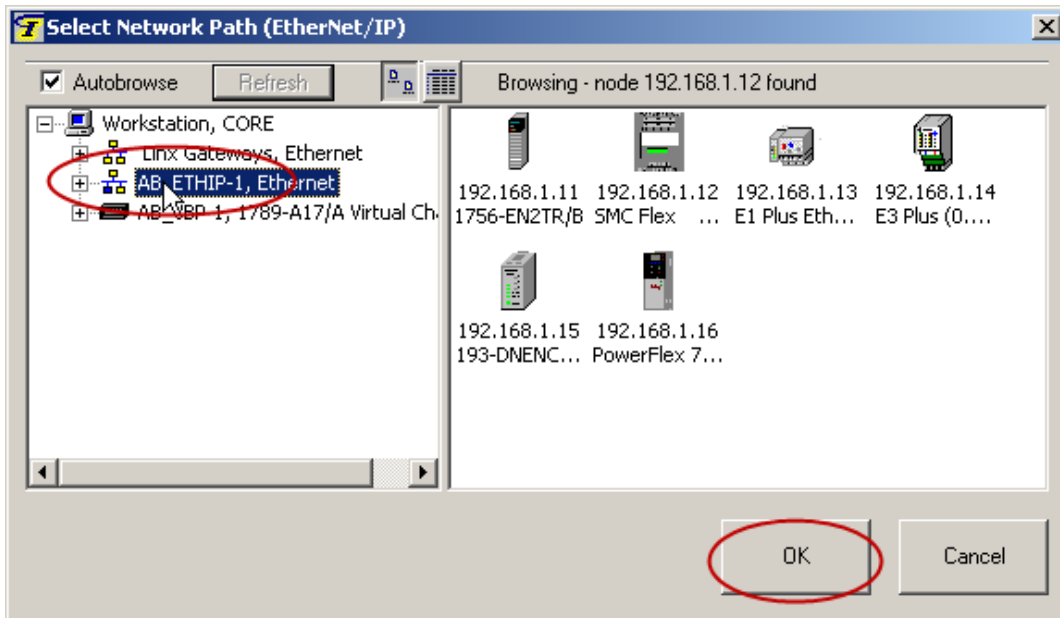


5. You will now be prompted to select a network path to connect to your MCC. We will take advantage of RSLinx communications to browse and select our network.

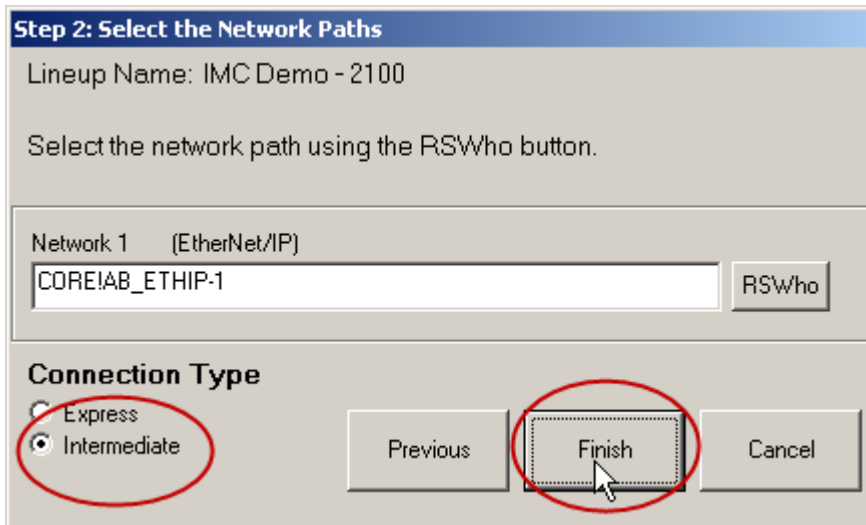
Click **RSWho**.



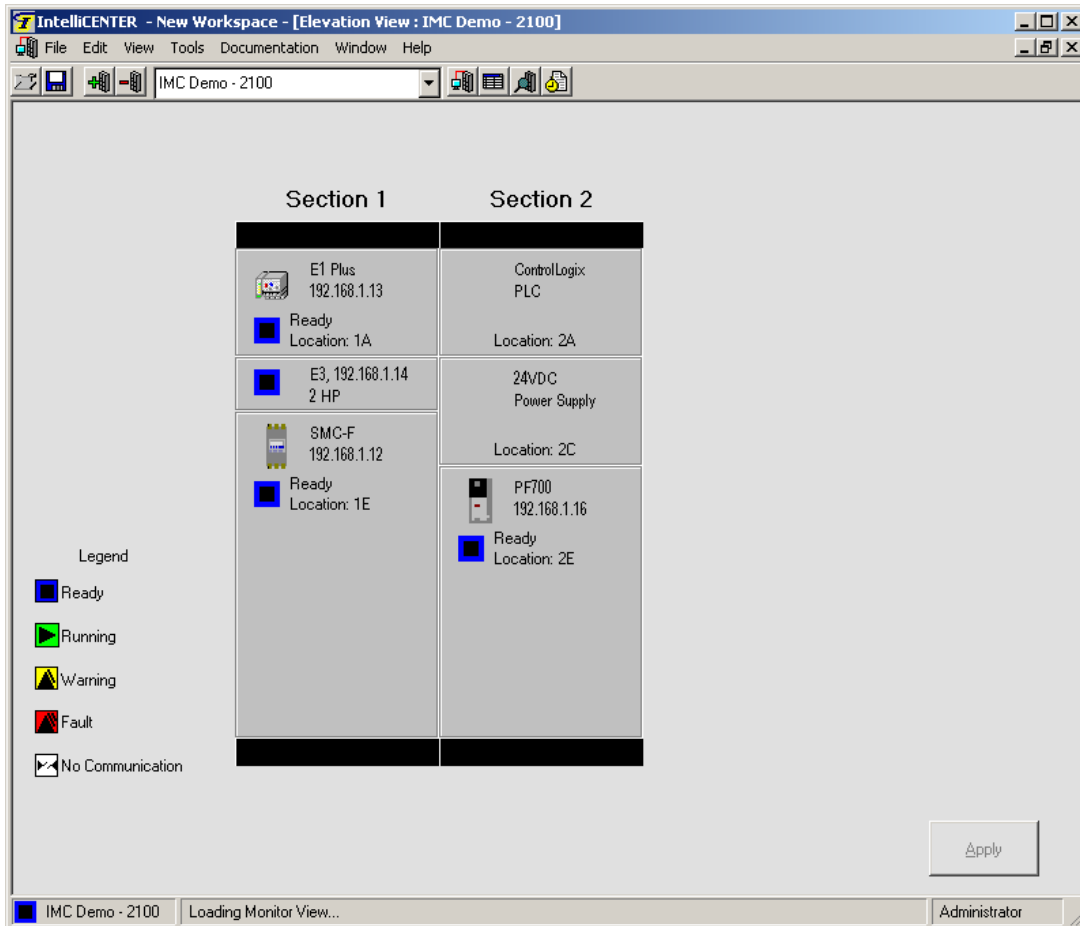
6. Select the network, **AB\_ETHIP-1, Ethernet**, in the left hand pane, then click **OK**.



7. Verify the connection type is set for **Intermediate**, then click **Finish**.



8. The IntelliCENTER software will now go out and browse your Ethernet network and set up an **Elevation View**. Your Elevation View should look like the following.



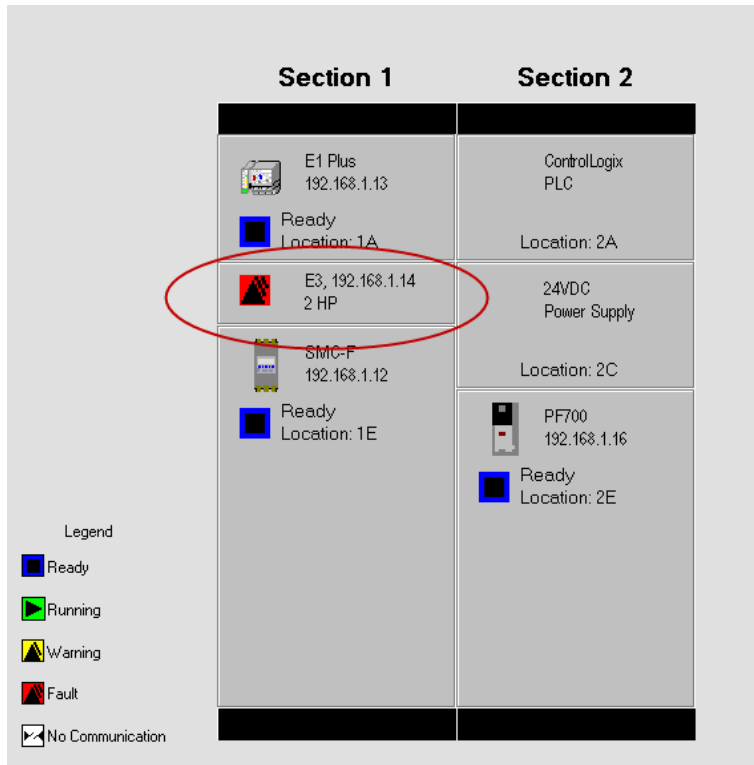
**Elevation View** is a graphical representation of your CENTERLINE MCC. It allows you to quickly see high-level device information and status of your MCC devices. It also serves as a portal into in-depth monitoring and configuring of your MCC devices, as well as a resource portal for obtaining documentation (user manuals and drawings), and maintenance information, such as spare parts lists.

## Monitor and Configure Devices in Your CENTERLINE® MCC

Now that you've learned how to setup an Elevation View of your MCC in IntelliCENTER software, we can now leverage more features of the software and use it to monitor in-depth information (such as diagnostic faults) from your MCC devices, as well as configure device parameters.

In this section, we will create an overload fault in our E3 Plus motor overload, and monitor it in IntelliCENTER software.

1. Hold the blue **TEST/RESET** button on the E3 Plus motor overload to create a trip condition.
2. Observe the red fault light on both the E3 Plus Trip Status LED and the corresponding unit in the Elevation View.



3. Double-click the E3 Plus unit in your Elevation View. This will launch the **Monitor View** for the E3 Plus.

Monitor View gives you a more in-depth look at your device and allows you to monitor and trend parameters in real-time. It also allows you to configure and change device parameters, such as FLA, Trip Class, etc.

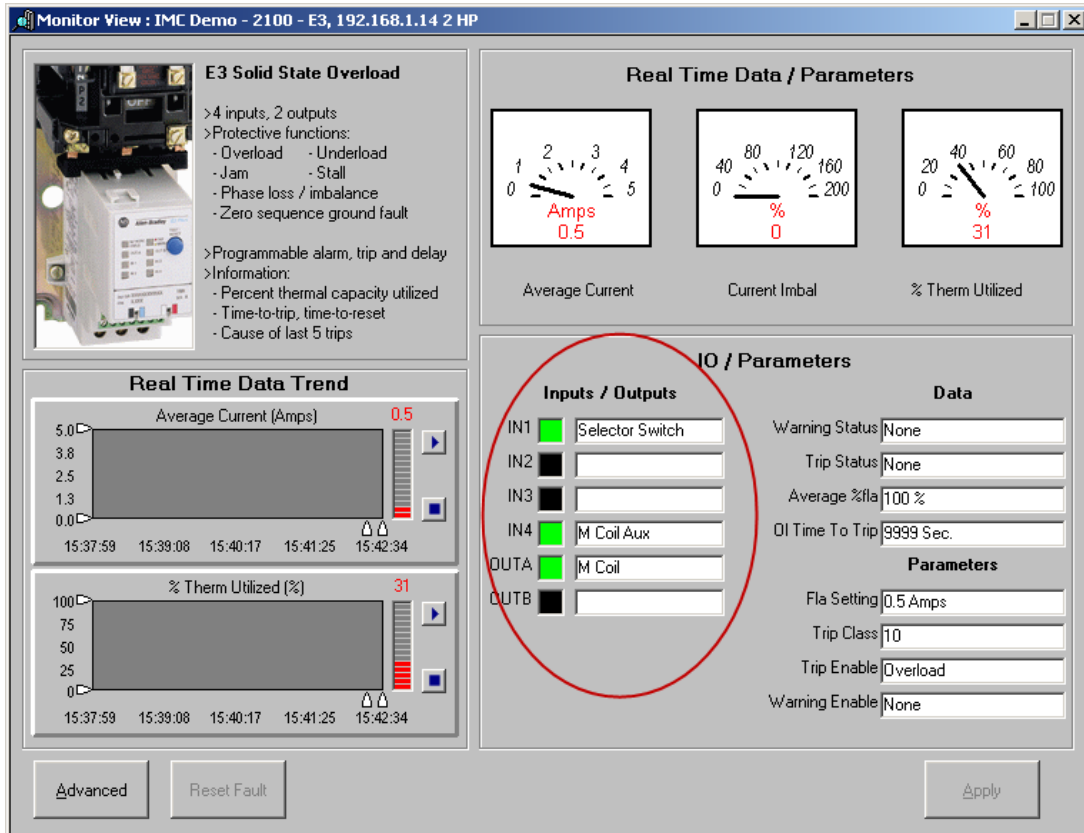
Observe that the **Trip Status** of your E3 Plus displays a value of **Test Trip**. This shows that the E3 Plus is in a Trip state, and that it was tripped via the TEST button.

Notice the **Reset Fault** button in the bottom left corner. This button allows you to reset the E3 Plus remotely, without having to access the equipment.

4. Reset the overload trip by pressing the blue button on the E3 Plus or by clicking the Reset Fault button in the Monitor View. Observe the Trip Status change in the IntelliCENTER software, as well as on the E3 Plus Trip Status LED.

- Now let's observe some more real-time data!

On the demo box, set the IMC MOTOR SELECT switch position to E3+. Press the **yellow E3+ I/O pushbutton** to start the motor. Observe the Input and Output status changes.



The E3 Plus has DeviceLogix functionality embedded in the device that allows you to program how the inputs and outputs will function. This allows you to add simple logic control in instances where the complexity of a PLC may not be needed.

For this lab, we created some DeviceLogix code that allows three-wire control of the motor.

You can find more information on DeviceLogix on our website at:

<http://ab.rockwellautomation.com/networks-and-communications/devicelogix-enabled-products>

Now let's observe the changes in the **Real Time Data / Parameter** gauges, and the **Real Time Data Trend**.

**Monitor View : IMC Demo - 2100 - E3, 192.168.1.14 2 HP**

**E3 Solid State Overload**

>4 inputs, 2 outputs  
>Protective functions:  
 - Overload - Underload  
 - Jam - Stall  
 - Phase loss / imbalance  
 - Zero sequence ground fault

>Programmable alarm, trip and delay  
>Information:  
 - Percent thermal capacity utilized  
 - Time-to-trip, time-to-reset  
 - Cause of last 5 trips

**Real Time Data / Parameters**

Average Current: 0.5 A  
 Current Imbal: 0 %  
 % Therm Utilized: 31 %

**Real Time Data Trend**

Average Current (Amps): 0.5  
 % Therm Utilized (%): 31

**IO / Parameters**

Inputs / Outputs	Data
IN1 <input checked="" type="checkbox"/> Selector Switch	Warning Status: None
IN2 <input type="checkbox"/>	Trip Status: None
IN3 <input type="checkbox"/>	Average %Ia: 100 %
IN4 <input checked="" type="checkbox"/> M Coil Aux	Ol Time To Trip: 9999 Sec.
OUTA <input checked="" type="checkbox"/> M Coil	<b>Parameters</b>
OUTB <input type="checkbox"/>	Fla Setting: 0.5 Amps
	Trip Class: 10
	Trip Enable: Overload
	Warning Enable: None

Buttons: Advanced, Reset Fault, Apply

The values being monitored in the trend and gauges are the default parameters configured for the E3 Plus Monitor View. These parameters can be changed and customized to any parameter in the E3 Plus.

You should notice the Average Current and % Therm Utilization gauges fluctuate a little as the motor is running. To start the trend log, click the play button on the right side of each trend.

- Now let's create a true overload condition to observe the real-time data changes.

On your demo box, apply the disc brake until the disc stops spinning. Observe the changes in the Average Current and %Therm Utilized gauges. Hold the brake until the E3 Plus overload trips. It should trip once 100% Thermal Utilization is reached.

7. Observe that the Trip Status now shows a value of **Overload**.

Inputs / Outputs		Data	
IN1	<input type="checkbox"/> Selector Switch	Warning Status	None
IN2	<input type="checkbox"/>	Trip Status	Overload
IN3	<input type="checkbox"/>	Average %Ia	0 %
IN4	<input type="checkbox"/> M Coil Aux	OI Time To Trip	9999 Sec.
OUTA	<input type="checkbox"/> M Coil	<b>Parameters</b>	
OUTB	<input type="checkbox"/>	Fla Setting	0.5 Amps
		Trip Class	10
		Trip Enable	Overload
		Warning Enable	None

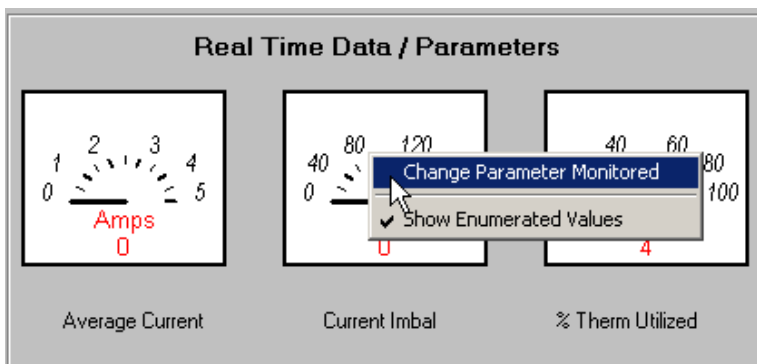
8. Reset the trip (if you forgot how to do this, refer back to step 4).

Hint: You will have to wait until the E3 Plus %Thermal Utilization goes below 75% before you can reset the trip. This will take a minute or two.

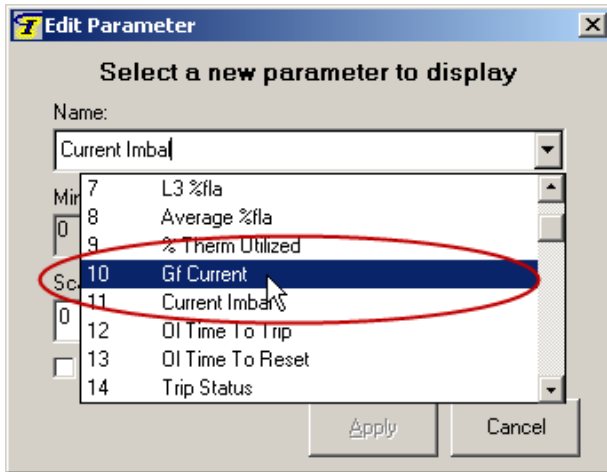
Observe the Trip Status change once you reset the trip.

9. Now let's show you how to change a monitoring parameter by changing the Current Imbalance gauge to monitor Ground Fault current instead.

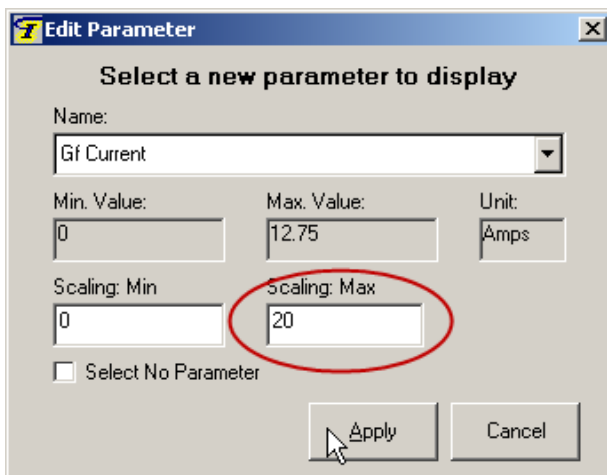
Right-click the Current Imbalance gauge and select **Change Parameter Monitored**.



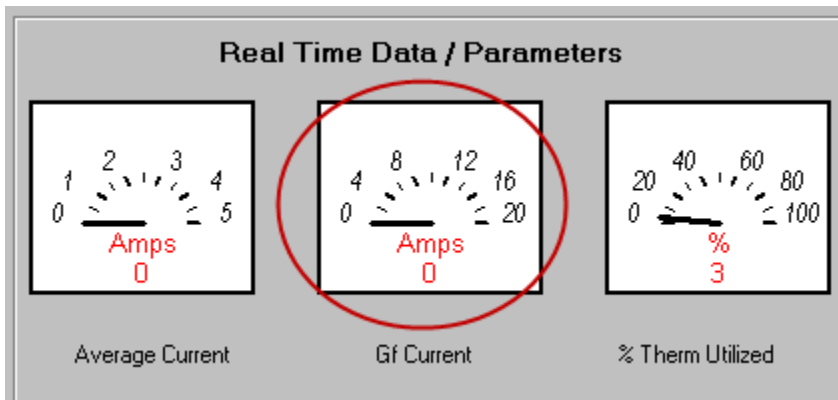
10. The **Edit Parameter** configuration window should pop up. Select the **Name** drop down box, and select **Gf Current**.



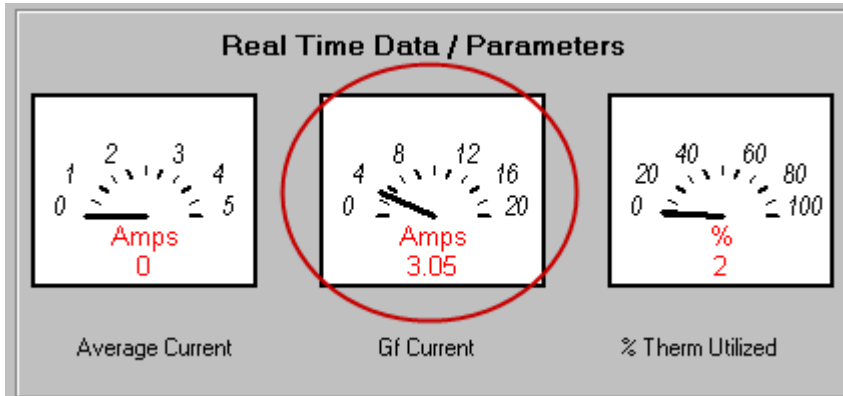
11. Configure the **Scaling: Max** to **20**, then click **Apply**.



12. The gauge should now display **Gf Current**.



13. On your demo box, slowly turn the **E3+ Ground Fault** dial clockwise. Observe the changes on the gauge. The GF Current value should increase as you turn the dial clockwise.



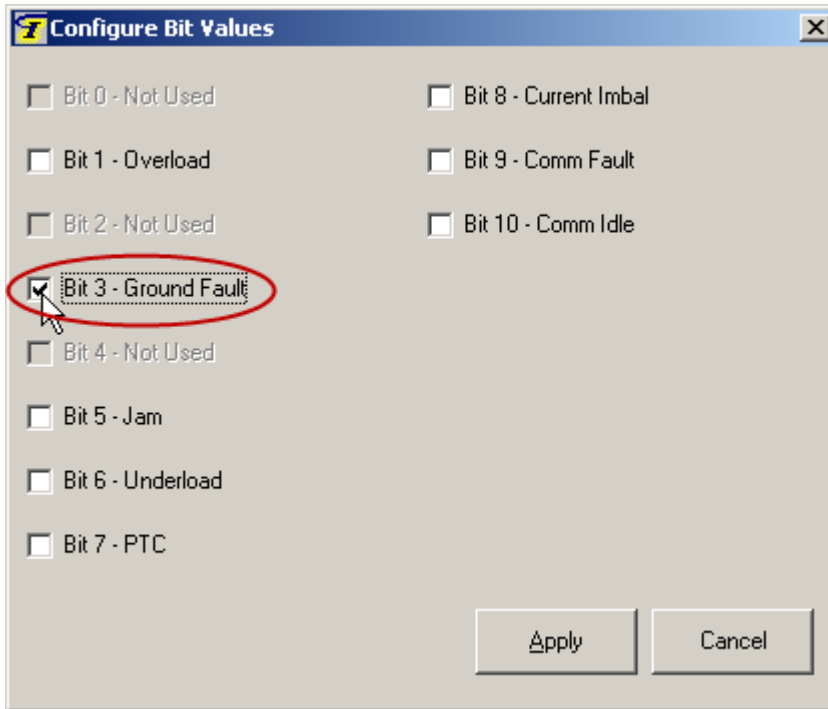
14. Next, let's show you how to change the value of a parameter in the E3 Plus by configuring the Warning Status to warn on a GF Current detection. Turn the **E3+ Ground Fault** dial all the way counter-clockwise so that the current on your GF Current gauge reads 0.00 Amps.
15. Click **Warning Enable** in the **IO / Parameters** panel.

The figure shows the "IO / Parameters" panel. It is divided into three sections: "Inputs / Outputs", "Data", and "Parameters".

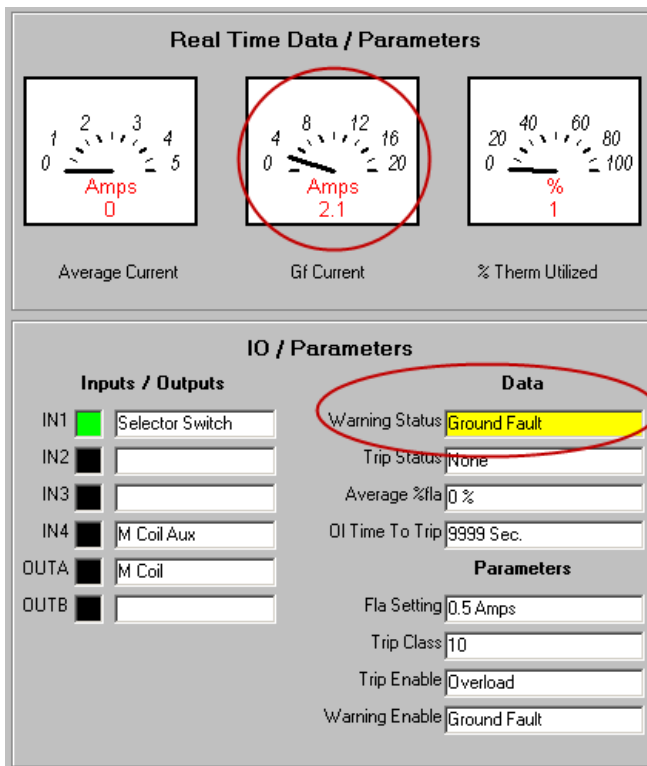
Inputs / Outputs		Data	
IN1	<input checked="" type="checkbox"/> Selector Switch	Warning Status	None
IN2	<input type="checkbox"/>	Trip Status	None
IN3	<input type="checkbox"/>	Average %fla	0 %
IN4	<input type="checkbox"/> M Coil Aux	Ol Time To Trip	9999 Sec.
OUTA	<input type="checkbox"/> M Coil	<b>Parameters</b>	
OUTB	<input type="checkbox"/>	Fla Setting	0.5 Amps
		Trip Class	10
		Trip Enable	Overload
		Warning Enable	None

The "Warning Enable" field is circled in red, and a mouse cursor is pointing at it.

16. Select **Ground Fault**, then click **Apply**.

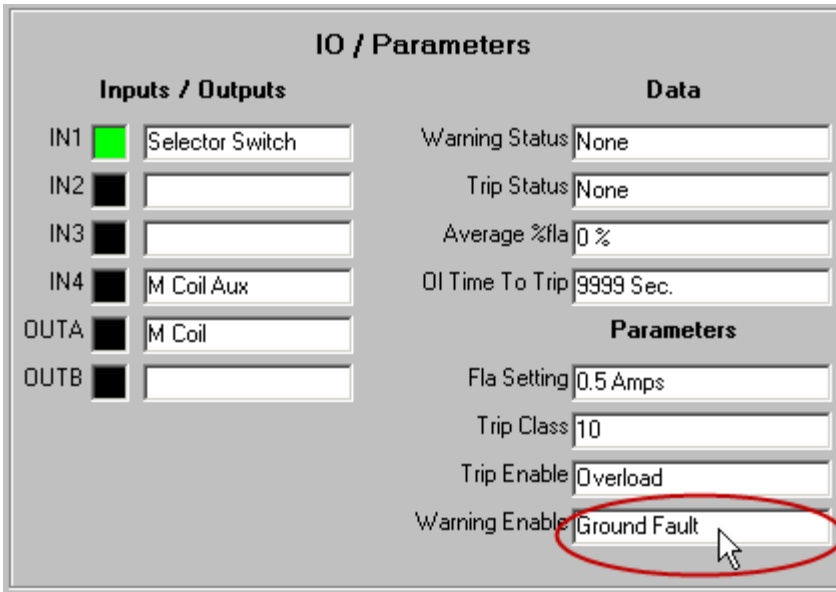


17. On the demo box, slowly turn the **E3+ Ground Fault** dial clockwise. You will receive a Ground Fault Warning Status when the GF Current reaches 2.0+ Amps. Observe the warning in **Monitor View**, as well as the blinking LED status on your E3 Plus.



18. Now let's change the Warning Enable parameter back to **None** so it's ready for the next lab attendee.

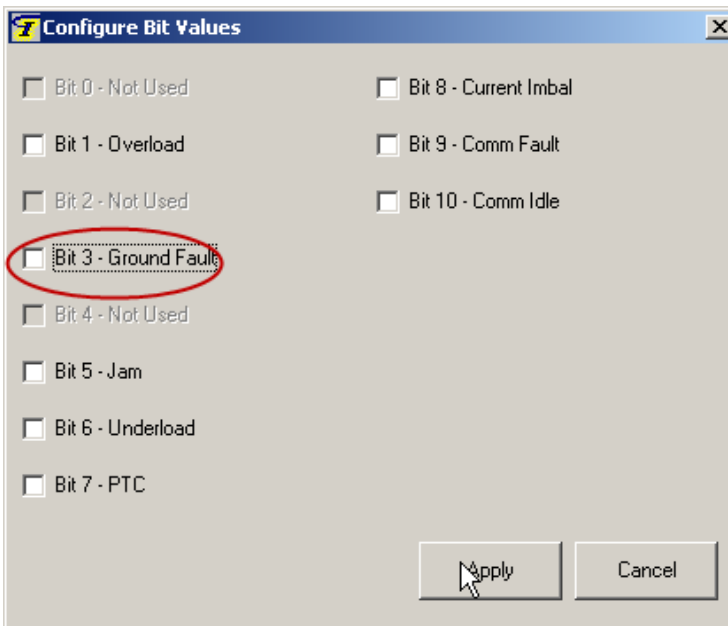
Click **Warning Enable**.



The image shows a software window titled "IO / Parameters". It is divided into two main sections: "Inputs / Outputs" and "Data".

- Inputs / Outputs:** Contains six rows of input/output points. IN1 is set to "Selector Switch" (indicated by a green square). IN2, IN3, and IN4 are empty. OUTA is set to "M Coil". OUTB is empty.
- Data:** Contains several parameters:
  - Warning Status: None
  - Trip Status: None
  - Average %fla: 0 %
  - OI Time To Trip: 9999 Sec.
- Parameters:** Contains four more parameters:
  - Fla Setting: 0.5 Amps
  - Trip Class: 10
  - Trip Enable: Overload
  - Warning Enable: Ground Fault (This dropdown menu is circled in red, and a mouse cursor is pointing at it.)

19. Unselect **Ground Fault**, then click **Apply**.

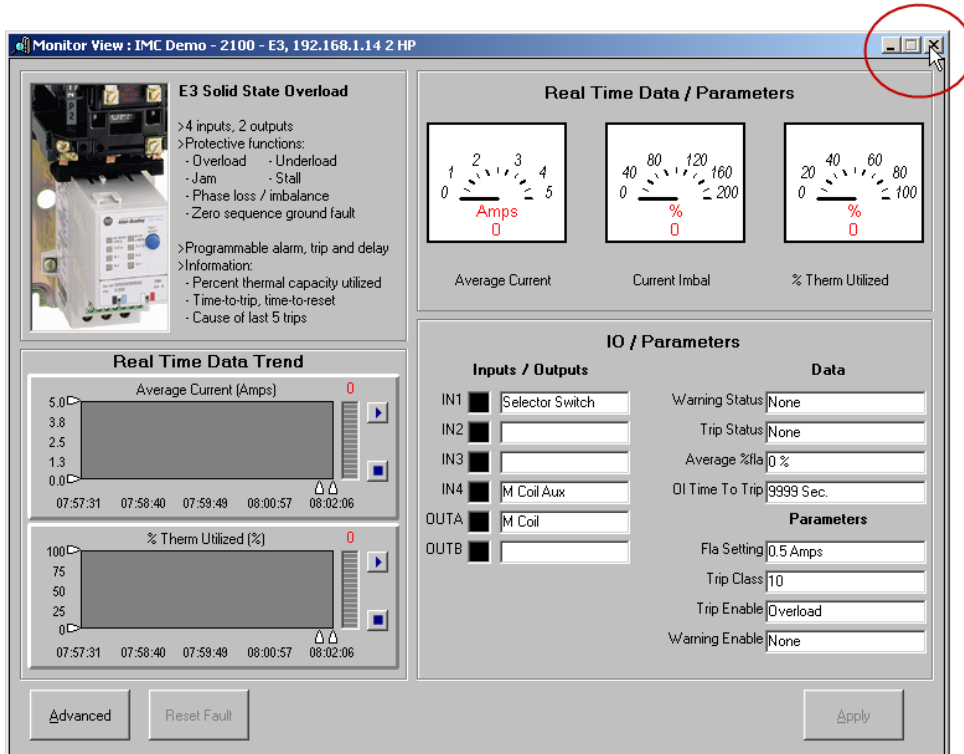


The image shows a dialog box titled "Configure Bit Values". It contains a list of ten bits, each with a checkbox and a label:

- Bit 0 - Not Used
- Bit 1 - Overload
- Bit 2 - Not Used
- Bit 3 - Ground Fault (This checkbox is circled in red.)
- Bit 4 - Not Used
- Bit 5 - Jam
- Bit 6 - Underload
- Bit 7 - PTC
- Bit 8 - Current Imbal
- Bit 9 - Comm Fault
- Bit 10 - Comm Idle

At the bottom of the dialog box, there are two buttons: "Apply" and "Cancel". A mouse cursor is pointing at the "Apply" button.

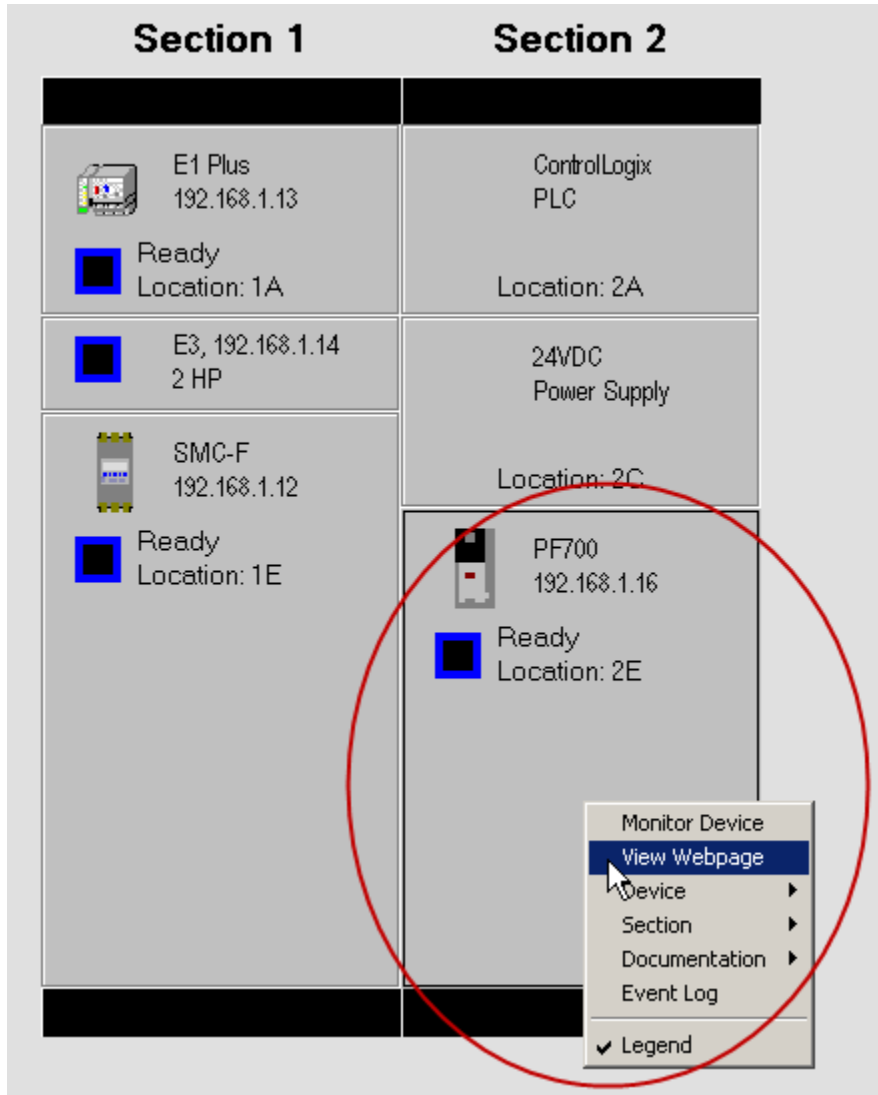
20. Close the E3 Plus Monitor View window by clicking the X in the upper right hand corner



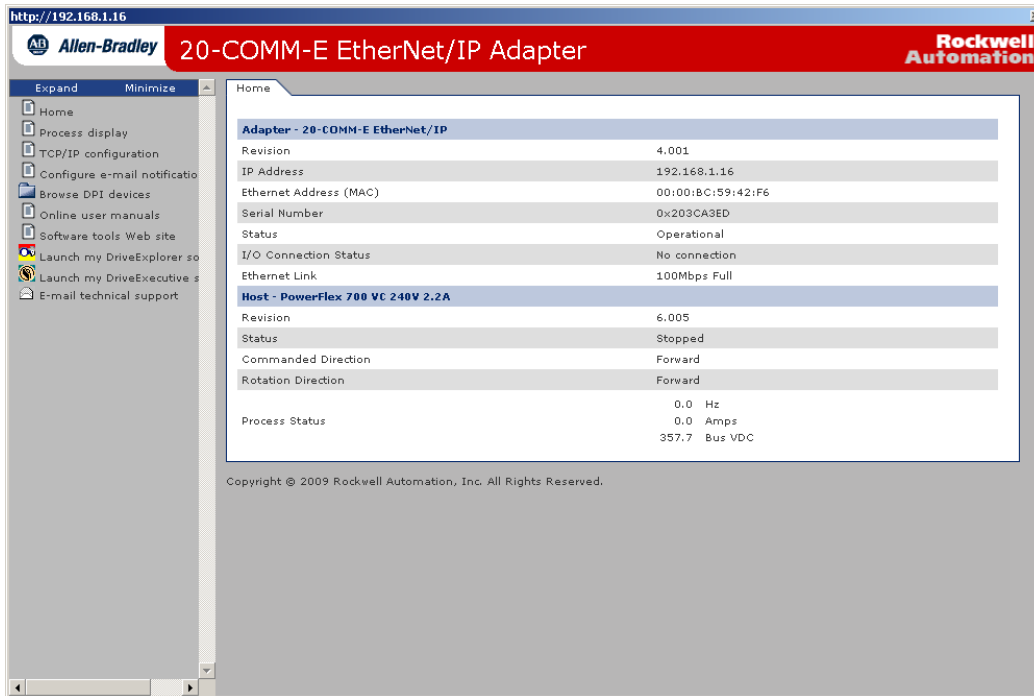
21. You have successfully configured and monitored parameters in an E3 Plus motor overload!

22. Now let's take a look at another great feature of the IntelliCENTER software and the benefits of Ethernet – device web pages!

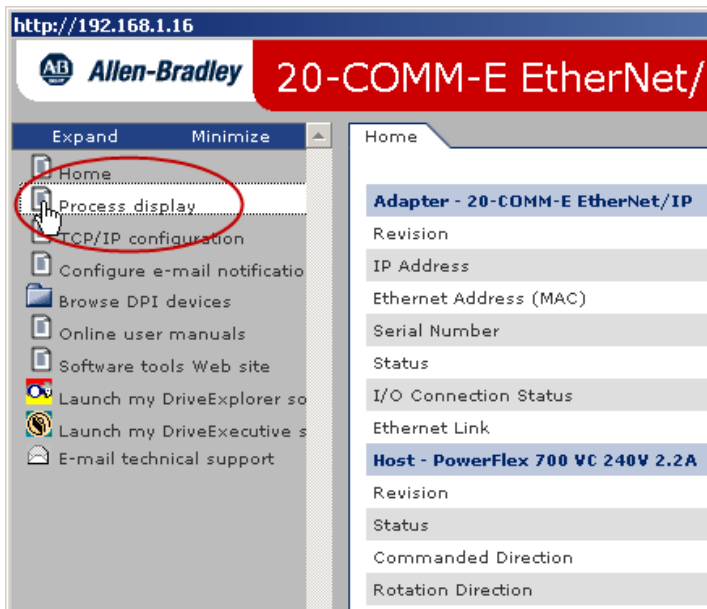
Right-click the **PF700 unit** and select **View Webpage**.



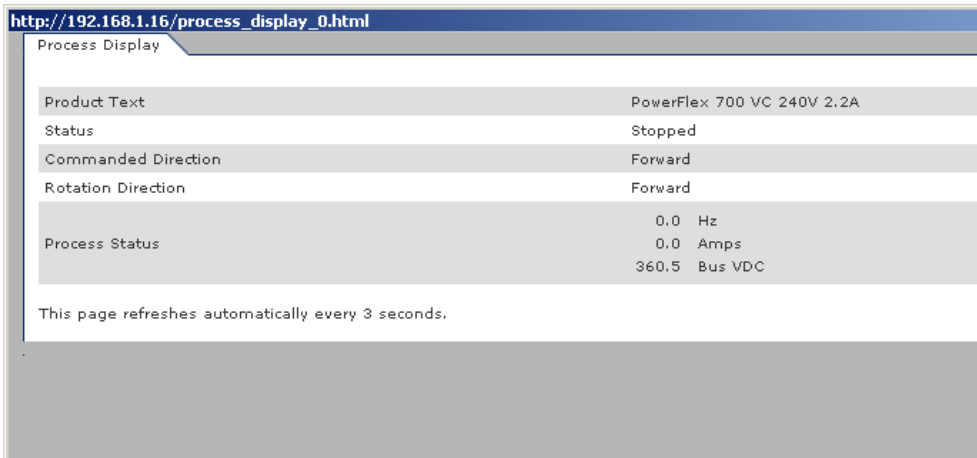
23. This will launch the device webpage of the PowerFlex 700. From here, we can view diagnostic and status information about the PowerFlex 700 drive.



24. Let's view some real-time status of the drive. In the left hand pane, click **Process display**.



25. You will now get a pop-up window that shows some process information about your PowerFlex 700 drive, such as status, direction, rotation, hertz, amps, and bus voltage.



Process Display	
Product Text	PowerFlex 700 VC 240V 2.2A
Status	Stopped
Commanded Direction	Forward
Rotation Direction	Forward
Process Status	0.0 Hz
	0.0 Amps
	360.5 Bus VDC

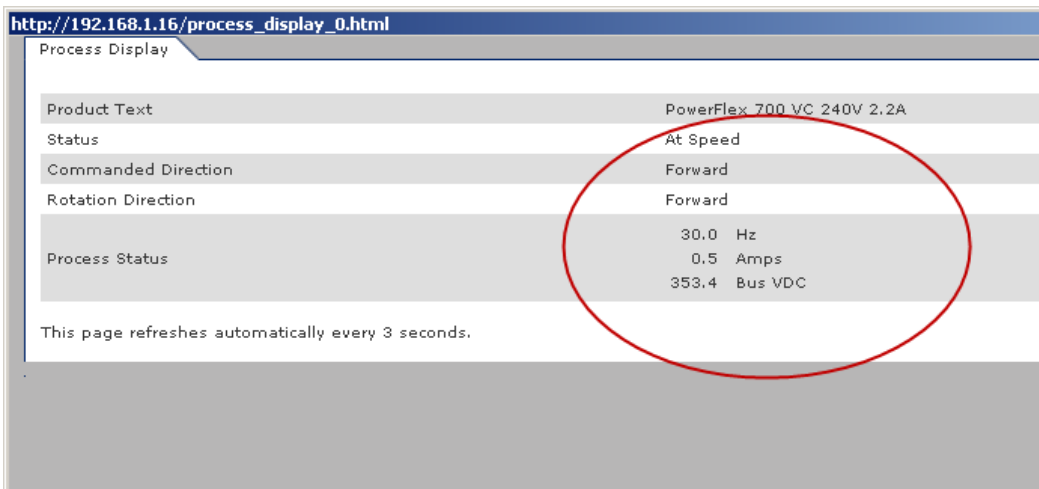
This page refreshes automatically every 3 seconds.

For quick viewing of device information, opening the device webpage is a very simple and efficient way of getting information about your device. This is just one of the great benefits of Ethernet and web page enabled devices!

26. Let's turn on the motor using the PowerFlex 700 drive so that we can see some of this information change.

Turn the **IMC MOTOR SELECT** switch to **700**, and then press the **yellow PF700 I/O pushbutton**.

27. Observe the **Process Status** values on the webpage.



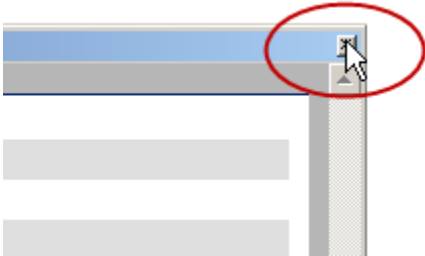
Process Display	
Product Text	PowerFlex 700 VC 240V 2.2A
Status	At Speed
Commanded Direction	Forward
Rotation Direction	Forward
Process Status	30.0 Hz
	0.5 Amps
	353.4 Bus VDC

This page refreshes automatically every 3 seconds.

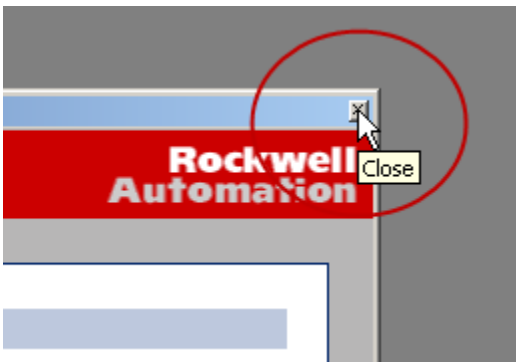
28. Now turn the **PF700 ANALOG IN 2** dial (on the demo box) to regulate the motor speed (frequency). Observe the **Hz** value update on the webpage as you increase and decrease the motor speed (Note: The webpage only updates every 3 seconds – so the update won't be instantaneous).

29. If you want to actually view and configure the parameter values of your PowerFlex 700 drive, then you will need to use DriveExecutive software, which can also be launched from IntelliCENTER software.

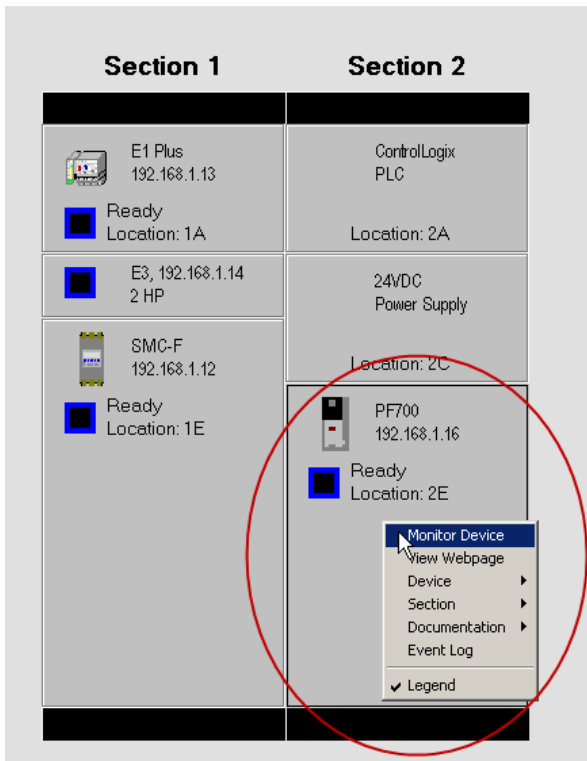
Let's go ahead and try that out! Close out the PowerFlex 700 webpage by clicking the **X** in the upper right-hand corner of the Process Display webpage.



30. Close the main device web page as well.

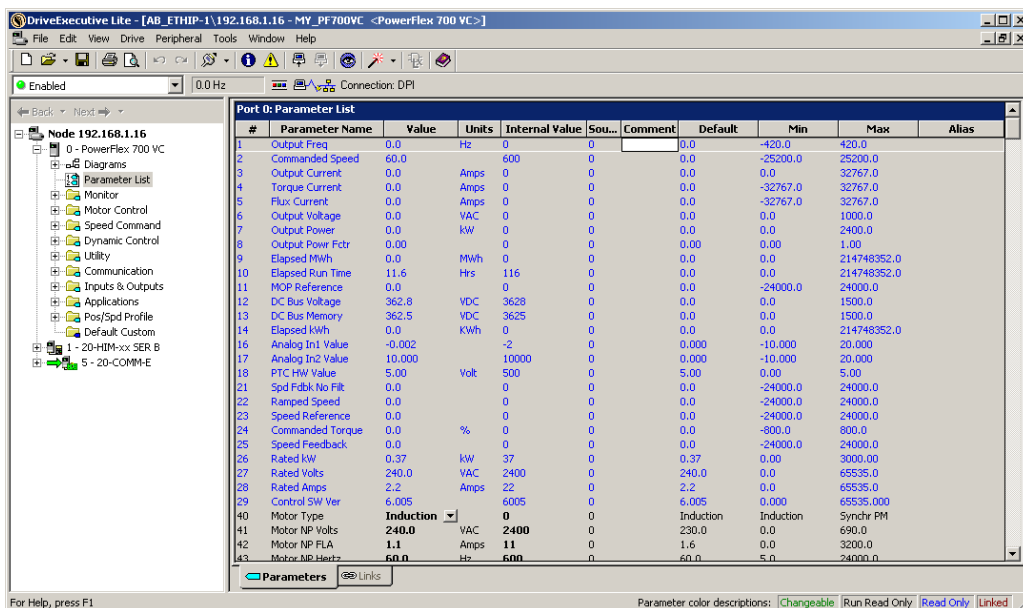


31. Right-click on the **PF700 unit**, and select **Monitor Device**.



This will launch the DriveExecutive software and connect directly to your drive without any configuration or network browsing needed (IntelliCENTER software does that all for you).

32. Once the DriveExecutive software opens, it will default to the **Parameter List** view, which allows you to view ALL the PowerFlex 700 drive parameters. You can configure parameters from here, as well as monitor them in real-time.



- Turn the **PF700 ANALOG IN 2** dial (on the demo box) to change the motor speed. Observe that **Parameter 1 Output Freq** changes (in DriveExecutive) as you do this.

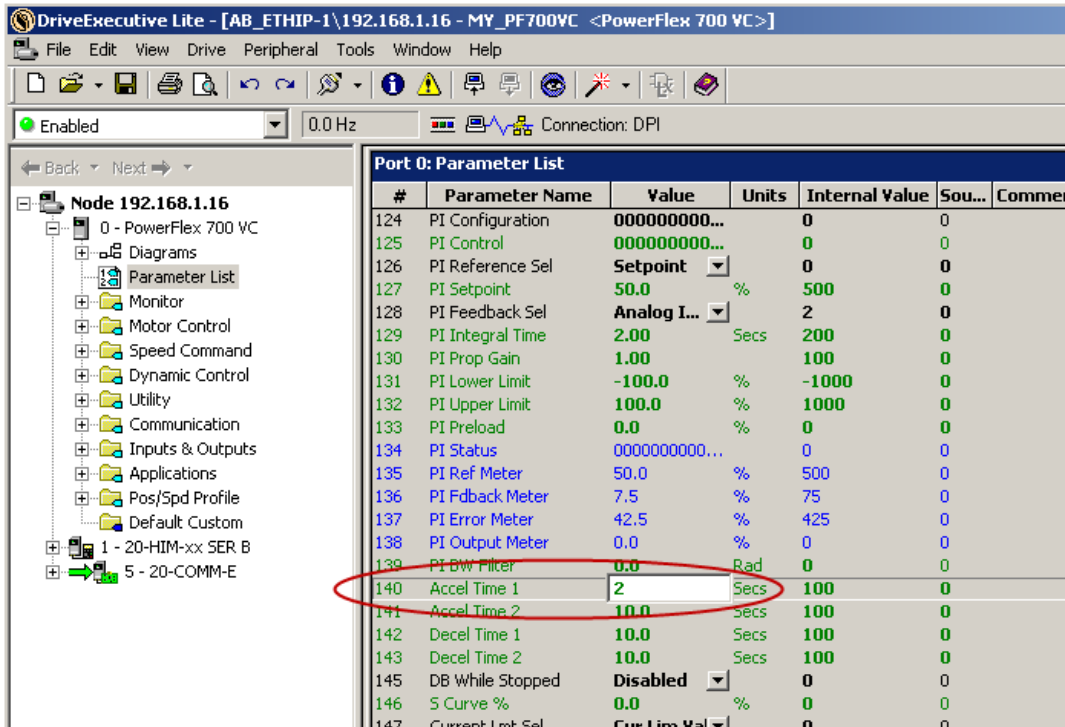
#	Parameter Name	Value	Units	Internal Value	Sou...	Comm
1	Output Freq	30.0	Hz	300	0	
2	Commanded Speed	30.0		300	0	
3	Output Current	0.5	Amps	5	0	
4	Torque Current	0.1	Amps	1	0	
5	Flux Current	0.5	Amps	5	0	
6	Output Voltage	118.0	VAC	1180	0	
7	Output Power	0.0	kW	0	0	
8	Output Powr Fctr	0.23		23	0	
9	Elapsed MWh	0.0	MWh	0	0	
10	Elapsed Run Time	11.6	Hrs	116	0	
11	MOP Reference	0.0		0	0	
12	DC Bus Voltage	356.6	VDC	3566	0	
13	DC Bus Memory	362.6	VDC	3626	0	
14	Elapsed kWh	0.0	KWh	0	0	
16	Analog In1 Value	-0.002		-2	0	
17	Analog In2 Value	0.691		691	0	
18	PTC HW Value	5.00	Volt	500	0	
21	Spd Fdbk No Flt	30.0		300	0	
22	Ramped Speed	30.0		300	0	

- Now let's configure a drive parameter! By default, the PowerFlex 700 drive is configured with a 10 second accel and decel rate. Let's change this to 2 seconds.

- Scroll down the Parameter List view, and find **Parameter #140 – Accel Time 1**, and select its **Value** field.

#	Parameter Name	Value	Units	Internal Value	Sou...	Comment
124	PI Configuration	00000000...		0	0	
125	PI Control	00000000...		0	0	
126	PI Reference Sel	Setpoint		0	0	
127	PI Setpoint	50.0	%	500	0	
128	PI Feedback Sel	Analog I...		2	0	
129	PI Integral Time	2.00	Secs	200	0	
130	PI Prop Gain	1.00		100	0	
131	PI Lower Limit	-100.0	%	-1000	0	
132	PI Upper Limit	100.0	%	1000	0	
133	PI Preload	0.0	%	0	0	
134	PI Status	000000000...		0	0	
135	PI Ref Meter	50.0	%	500	0	
136	PI Fdbk Meter	7.6	%	76	0	
137	PI Error Meter	42.5	%	425	0	
138	PI Output Meter	0.0	%	0	0	
139	PI BW Filter	0.0	Rad	0	0	
140	Accel Time 1	10.0	Secs	100	0	
141	Accel Time 2	10.0	Secs	100	0	
142	Decel Time 1	10.0	Secs	100	0	
143	Decel Time 2	10.0	Secs	100	0	
145	DB While Stopped	Disabled		0	0	
146	S Curve %	0.0	%	0	0	
147	Current Lmt Sel	Cur Lim Val		0	0	
148	Current Lmt Val	3.3	Amps	33	0	

36. Enter a new value of **2** in this field, and then press the **Enter** key.



37. Repeat these steps for **Parameter #142 – Decel Time 1**.

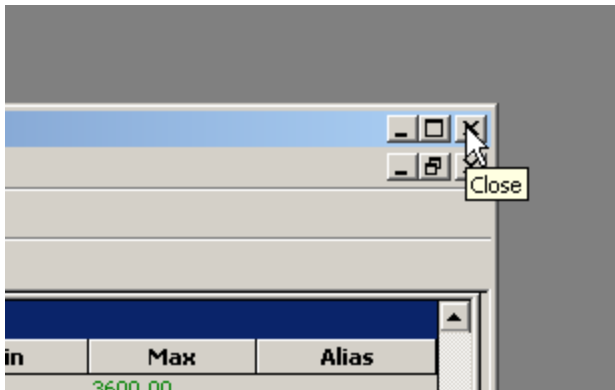
38. Now turn the **PF700 ANALOG IN 2** dial (on the demo box) to regulate the motor speed (frequency). Observe how much faster the motor accelerates and decelerates!

There are over 800 parameters in a drive that can be monitored or configured. And this was just a quick example of how easy it is to configure them using DriveExecutive software.

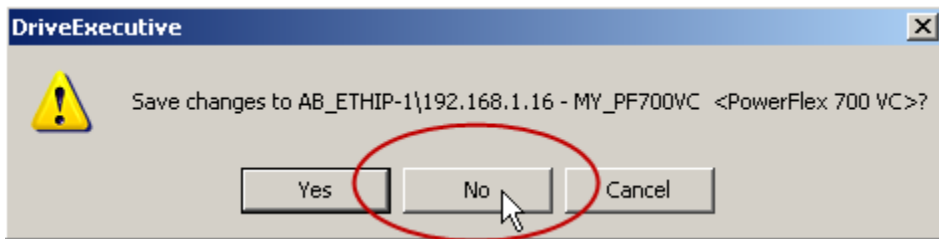
39. Now let's change the drive Accel and Decel times back to 10 for the next lab attendee.

Set **Parameter #140 – Accel Time 1** and **Parameter #142 – Decel Time 1** back to 10.

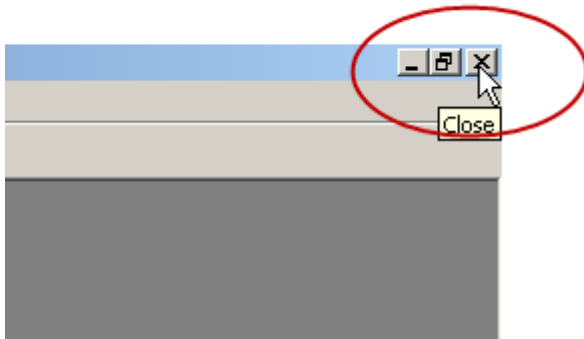
40. Close DriveExecutive software by clicking **X** in the upper right hand corner.



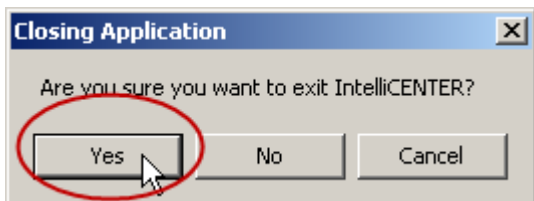
41. You will be prompted to save changes. Select **No**.



42. Close the IntelliCENTER software by clicking **X** in the upper right hand corner.



43. You will be prompted to confirm that you want to exit the software. Select **Yes**.



44. You have completed this section of the lab.

In review, you learned how to use IntelliCENTER software to:

- Connect to an Ethernet CENTERLINE MCC
- Monitor and configure its devices such as solid-state motor overloads (E1 Plus and E3 Plus) and PowerFlex drives.

You also learned about the advantages of Ethernet enabled devices and their ease of configuration and remote visibility (i.e. device webpages).

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## **Integrating an EtherNet/IP Motor Overload into Your Integrated Architecture**

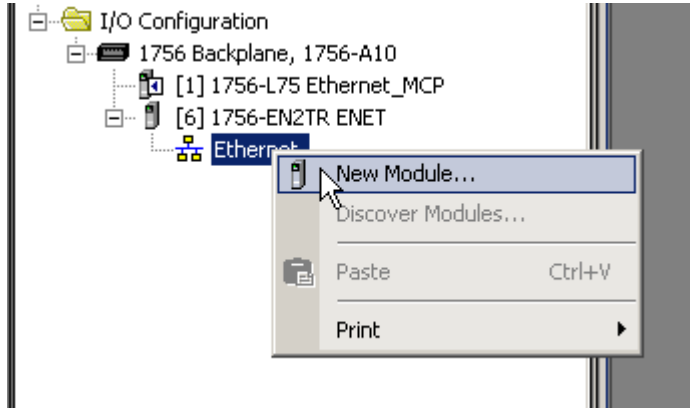
In this section of the lab, you will learn how to extend the capabilities of your solid-state motor overloads by integrating them into your Integrated Architecture platform with our FREE pre-engineered Add-On-Instructions (AOI) and Faceplates found on the Rockwell Automation sample-code website. <http://samplecode.rockwellautomation.com>

In this section, we will cover how to add an E1 Plus AOI to your RSLogix 5000 project, and how to integrate it with the FactoryTalk View Machine Edition E1 Plus Faceplate.

## Add the E1 Plus Ethernet to your RSLogix 5000 project

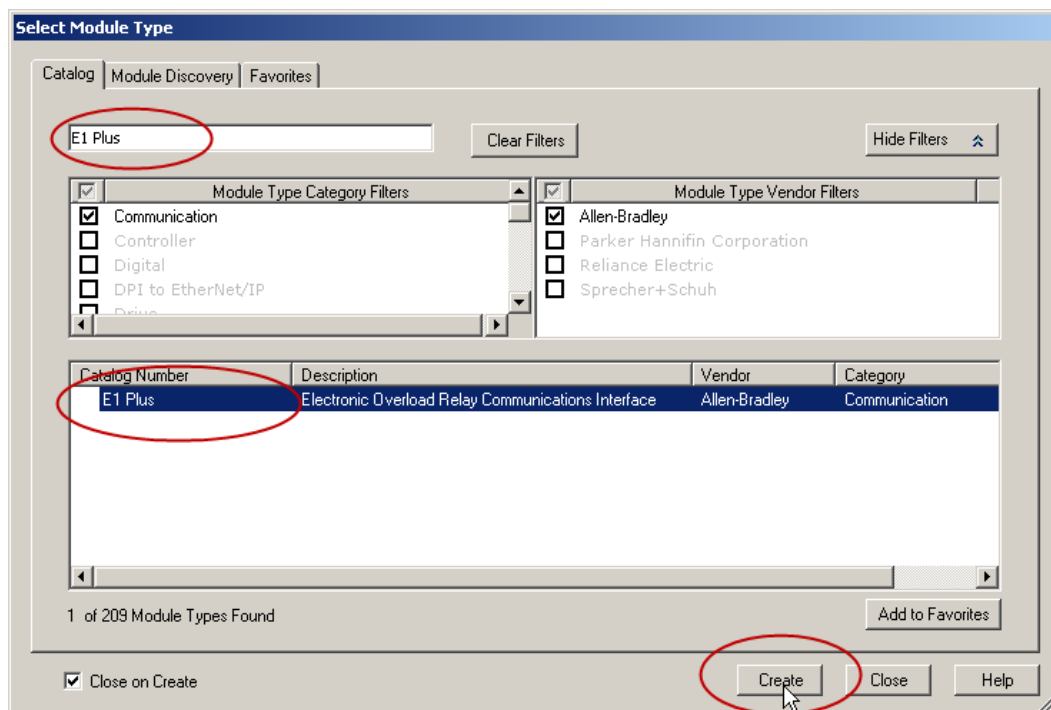
1. Open the RSLogix 5000 project file, **Ethernet\_MCP.ACD**, located at **C:\Lab Files\Integrating Ethernet-enabled Motor Control and Process Control Systems\Application Files**.
2. Locate the **I/O Configuration** tree in the lower left-hand side of the Controller Organizer pane. You will notice an Ethernet Communications module (1756-EN2TR) has already been added and configured at slot 6 – now you just need to add your E1 Plus to the Ethernet network configuration.

Right-click the **Ethernet** network and select **New Module....**



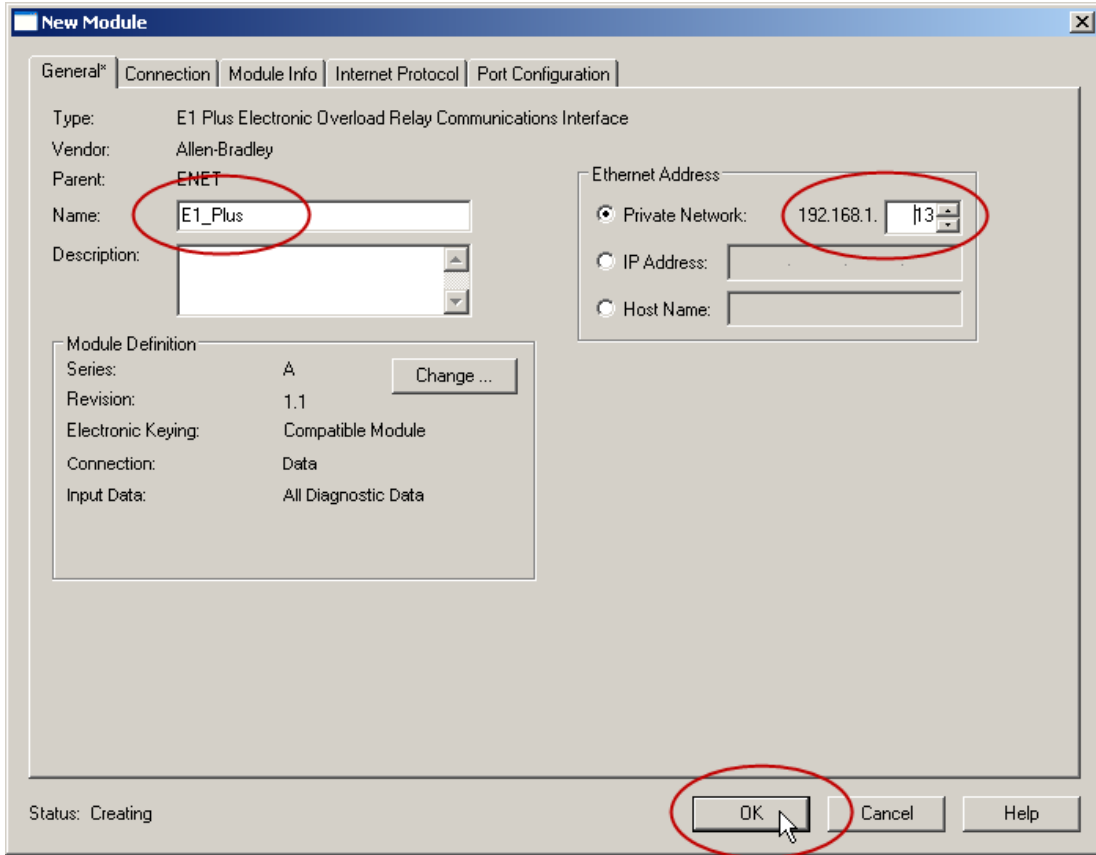
3. The **Select Module Type** window should now launch – this is where you can search for and add the E1 Plus module to your Ethernet network configuration.

Type **E1 Plus** into the filter search box at the top of the window, then select the E1 Plus in the lower results window, and click **Create**.

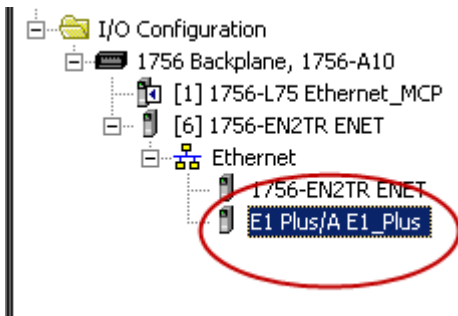


4. The **New Module** configuration window should now launch. Configure the E1 Plus module with the following settings.

Type **E1\_Plus** in the name text box field. Select the **Private Network** radio button, and configure it for IP Address, **192.168.1.13**. And then select the **OK** button.

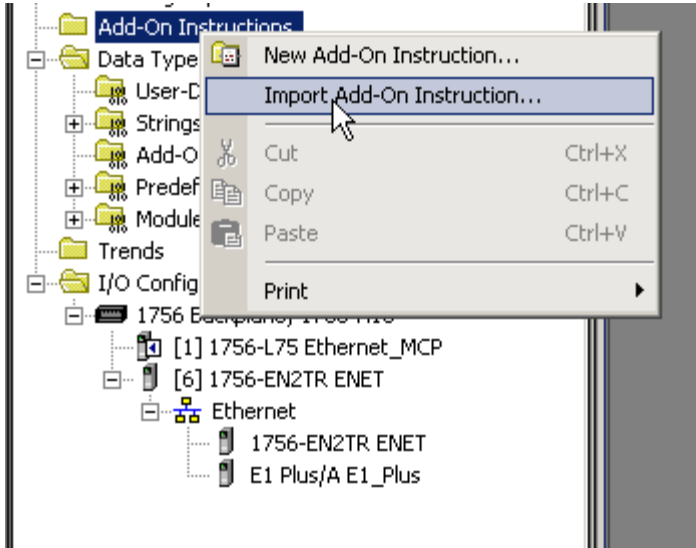


5. You have successfully added the E1 Plus to your project!

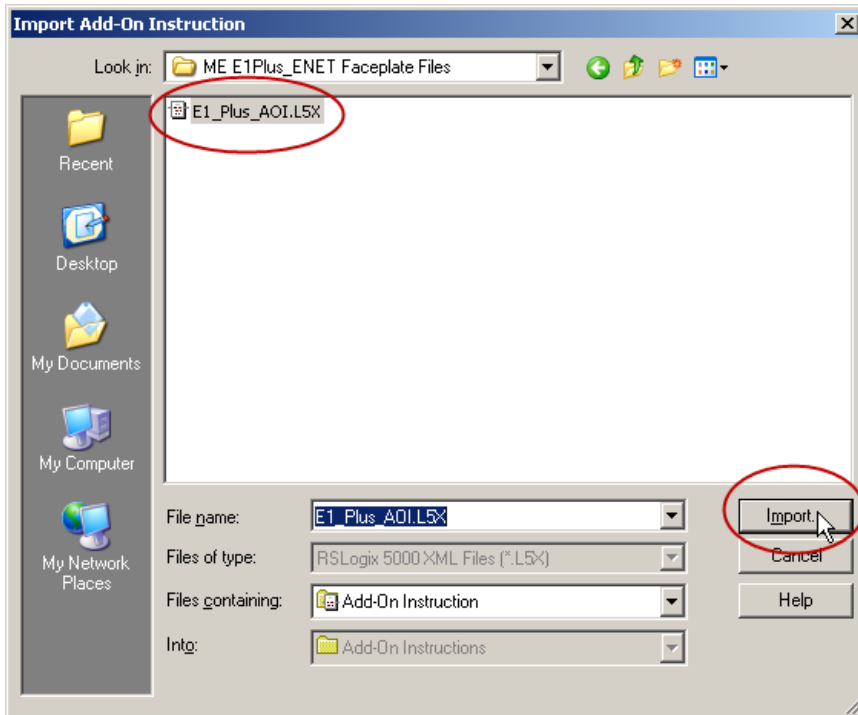


## Add the E1 Plus Ethernet Add-On Instruction (AOI) to your project

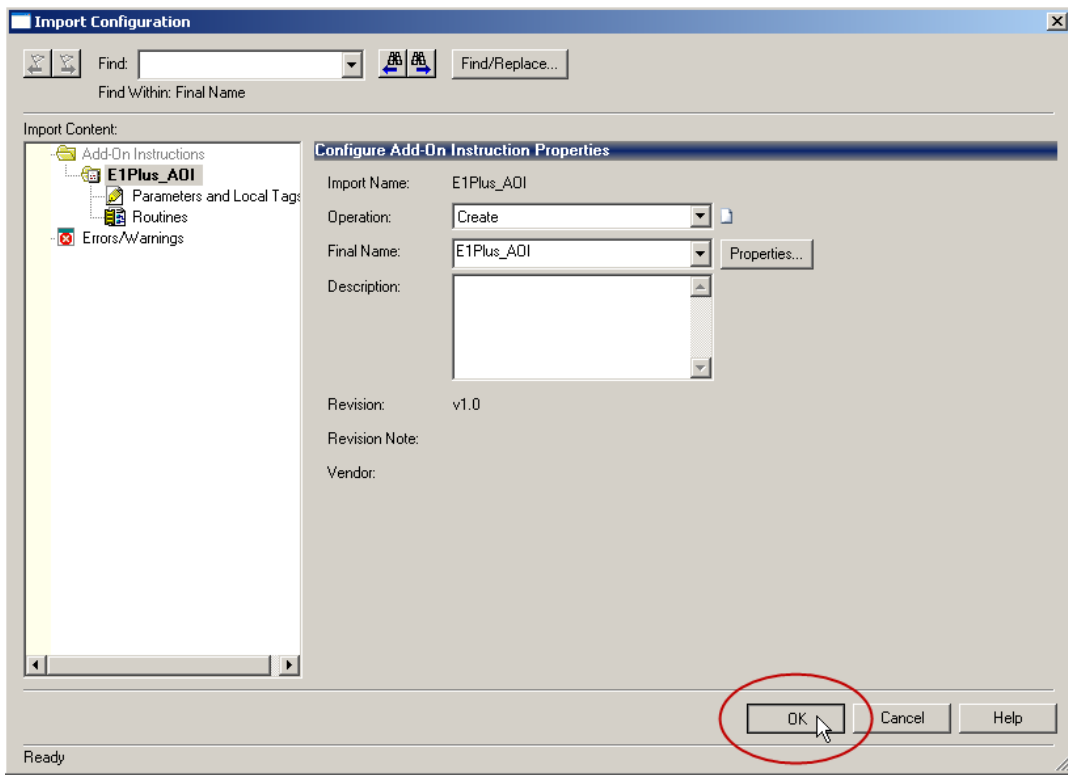
1. Right-click **Add-On Instruction** and select **Import Add-On Instruction**.



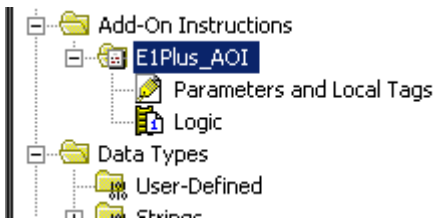
2. Browse for the AOI file **E1\_Plus\_AOI.L5X**, located in directory: **C:\Lab Files\Integrating Ethernet-enabled Motor Control and Process Control Systems\Application Files\ME E1Plus\_ENET Faceplate Files**. Select the file, and then click **Import**.



- This will launch the **Import Configuration** window. You can leave all these settings at their default settings, and just click **OK**.



- You have successfully added the E1 Plus AOI into your project!

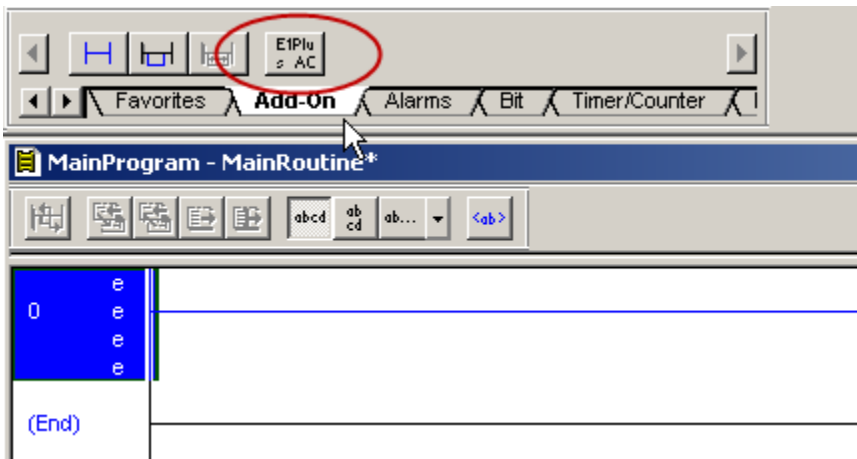


## Add the E1 Plus Ethernet AOI instruction to your project code

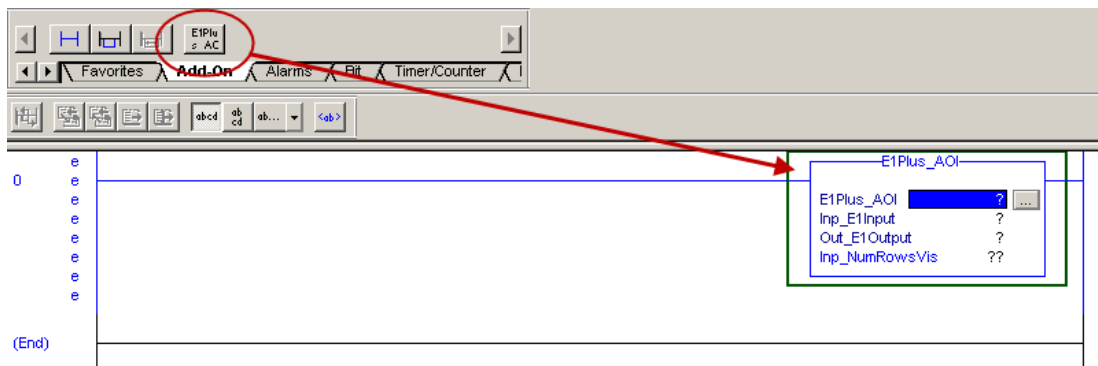
1. Double-click the **MainRoutine** routine in your project's **MainProgram** (you might need to expand the MainTask folder and drill down to the actual routine).



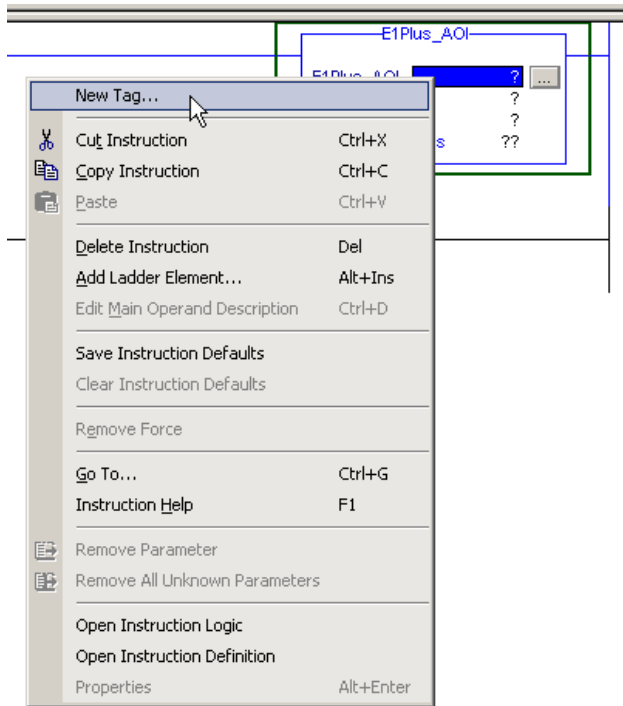
2. Select the **Add-On** element group tab on the Language Element toolbar. Notice the E1 Plus AOI instruction (this was added when we imported the AOI into the project).



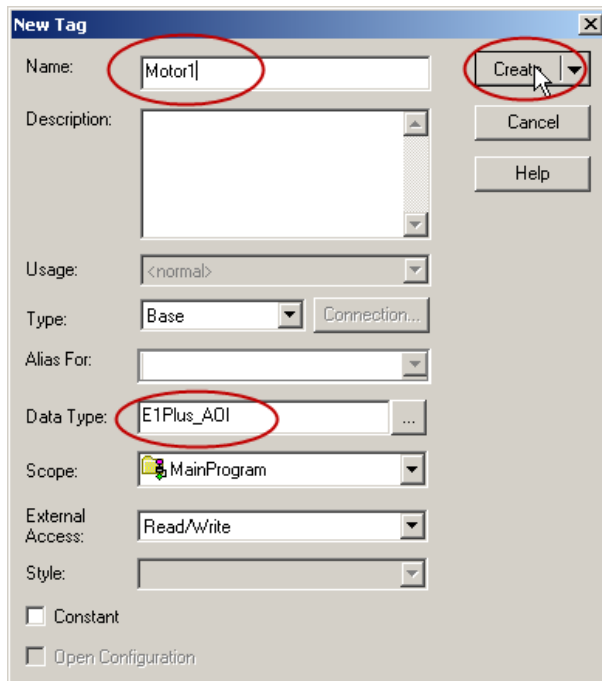
3. Drag-n-drop this instruction into your MainRoutine at rung 0.



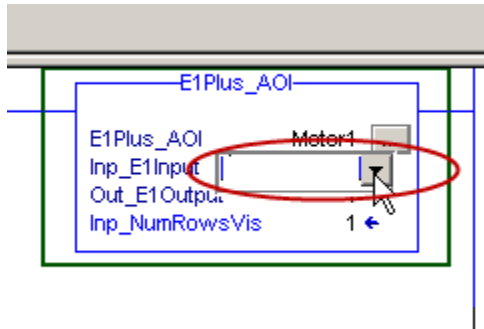
- To configure the E1 Plus AOI instruction, we first need to create a E1Plus\_AOI tag. On the instruction that you just added, right-click next to the parameter **E1Plus\_AOI**, and select **New Tag**.



- This will launch the **New Tag** configuration window. Type **Motor1** in the Name text box field, (the data type should already be defaulted to **E1Plus\_AOI** ), and then click **Create**.

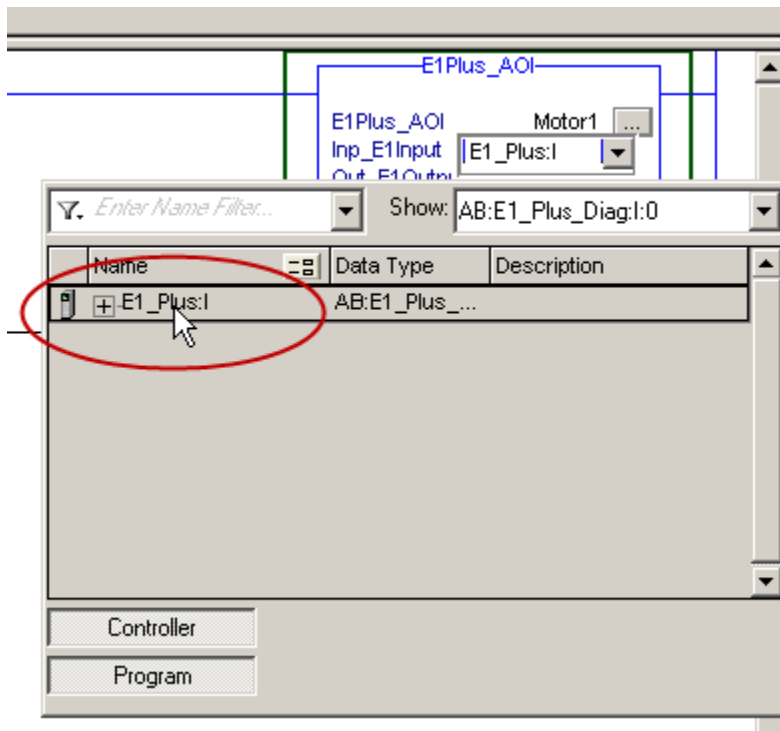


- We now need to assign a tag to the parameter, **Inp\_E1Input**. Double-click next to the parameter **Inp\_E1Input** and a drop down arrow should appear.

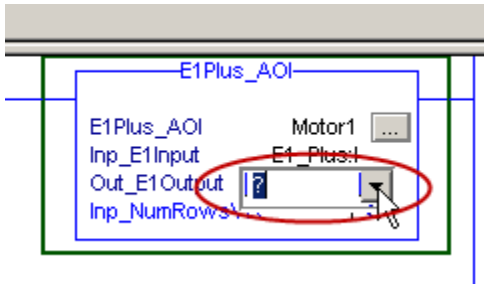


Select the drop down arrow, and a tag browser window will appear where you can select the tag to assign to this parameter.

- Double-click the tag **E1\_Plus:I**. This is the array of input tags that were created when we added the E1 Plus module to our I/O Configuration. Assigning this AOI parameter to the E1\_Plus:I array of tags allows us to pass that information into our AOI.

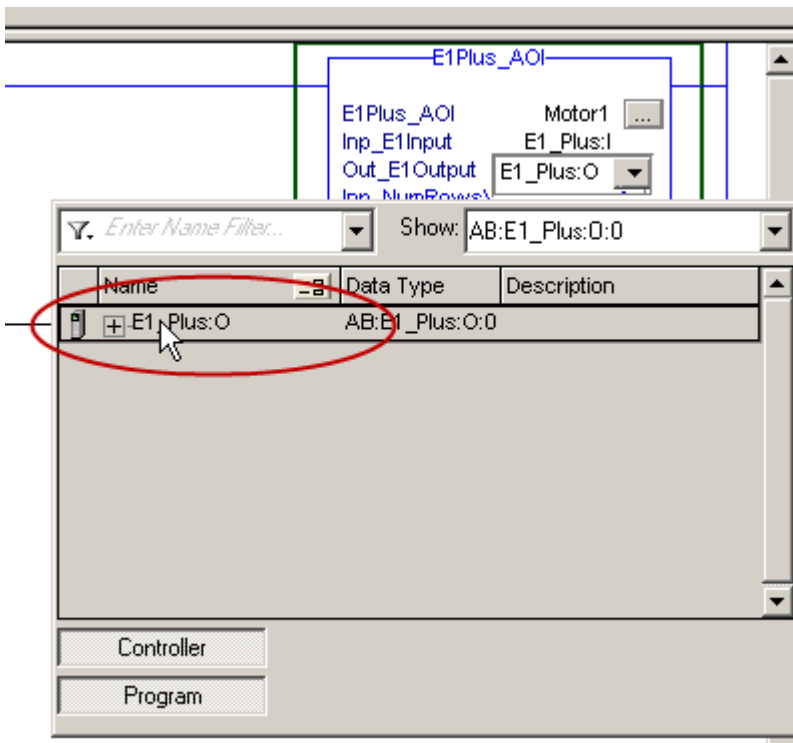


- We now need to do the same for the **Out\_E1Output** parameter. Double-click next to the parameter, **Out\_E1Output**, and a drop down arrow should appear.

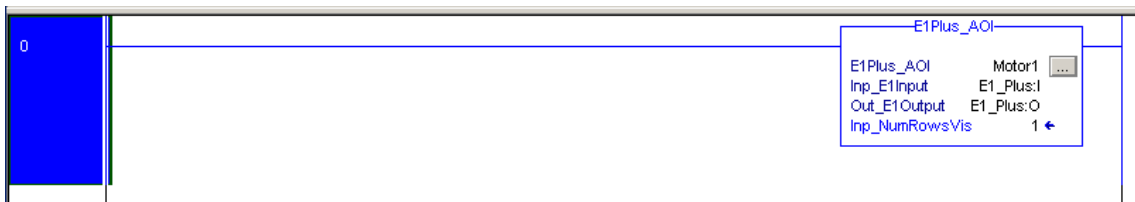


Select the drop down arrow, and a tag browser window will appear where you can select the tag to assign to this parameter.

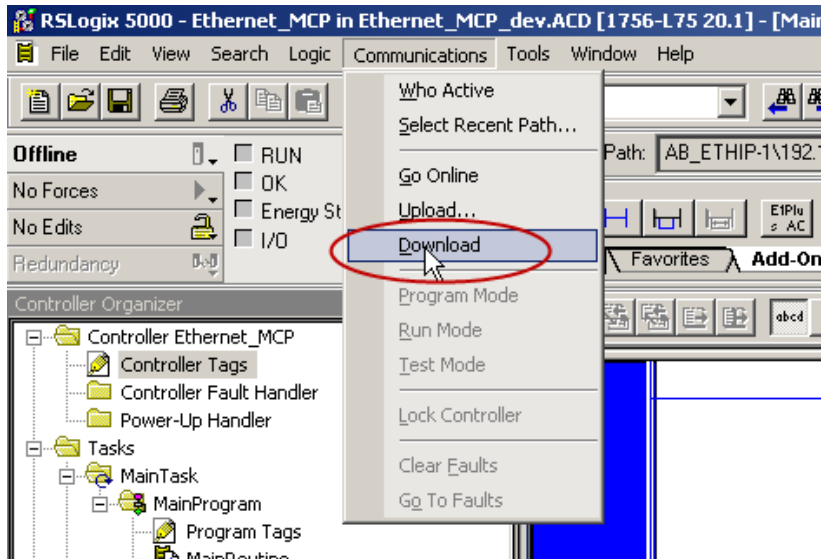
- Double-click the tag **E1\_Plus:O** tag. This is the array of output tags that were created when we added the E1 Plus module to our I/O Configuration. Assigning this AOI parameter to the E1\_Plus:O array of tags allows us to pass that information into our AOI.



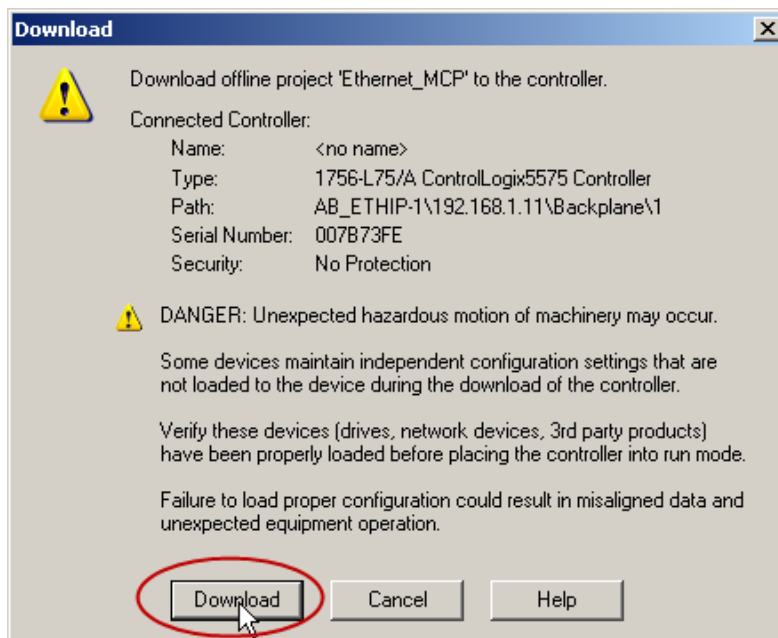
- You have successfully added the E1 Plus AOI to your project code!



11. We now need to download your project to the controller. Select the **Communications** menu, and click **Download**.

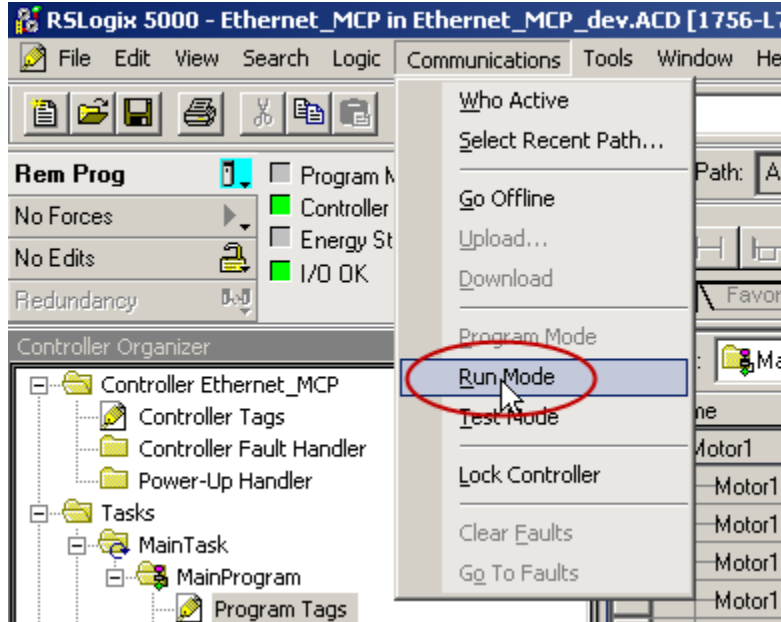


A download warning prompt will appear. Select **Download**.

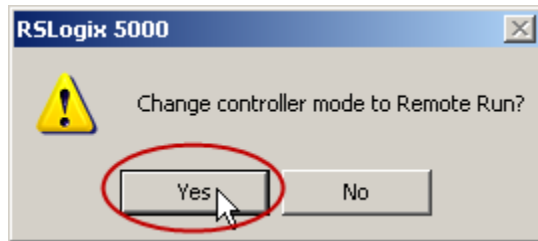


12. Once the program finishes downloading, RSLogix 5000 will automatically go **Online** with your controller. From here, we want to put the controller into RUN mode.

Select the **Communications** menu, and then click **Run Mode**.



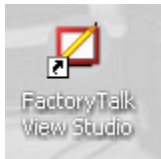
13. You will then be prompted to put the controller into RUN mode. Select **Yes**.



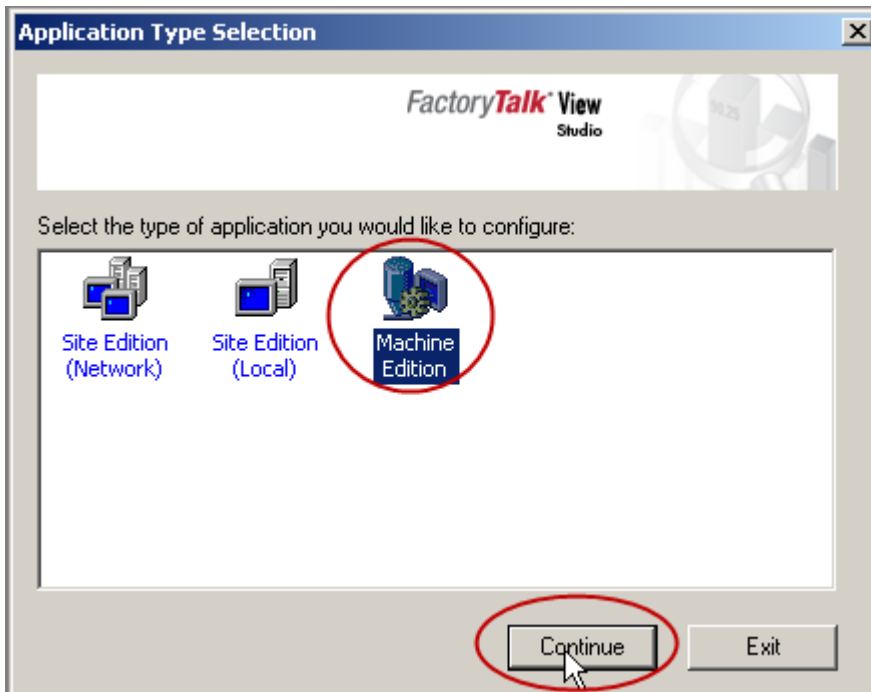
14. You have successfully downloaded your program to the controller and placed the controller in run mode!

## Add the E1 Plus Ethernet Faceplate to your FactoryTalk View Machine Edition project

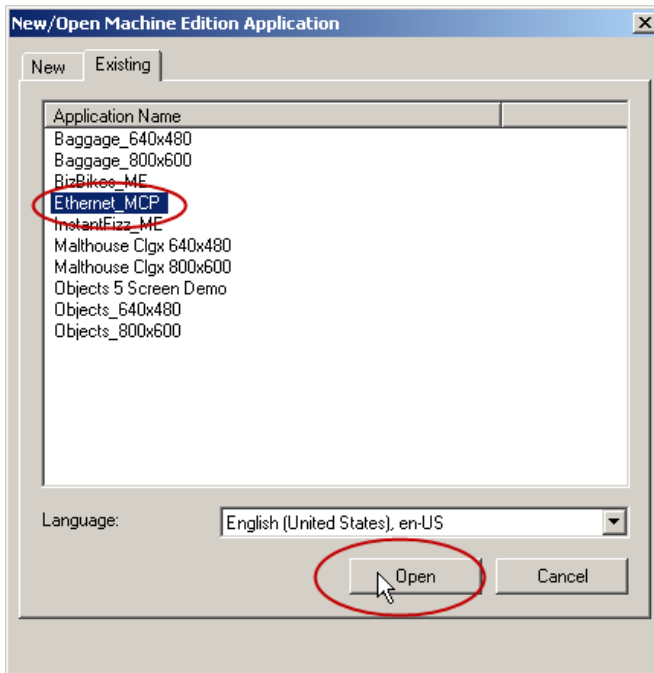
1. Launch FactoryTalk View Studio for Machine Edition by double-clicking on the desktop shortcut icon.



2. In the **Application Type Selection** prompt, select **Machine Edition** and click **Continue**.

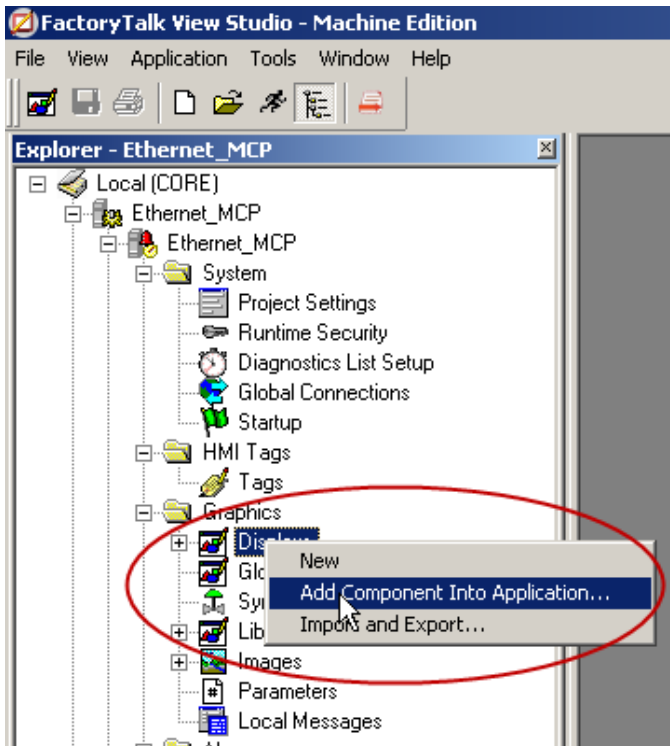


3. Select the existing project, **Ethernet\_MCP**, then click **Open**.



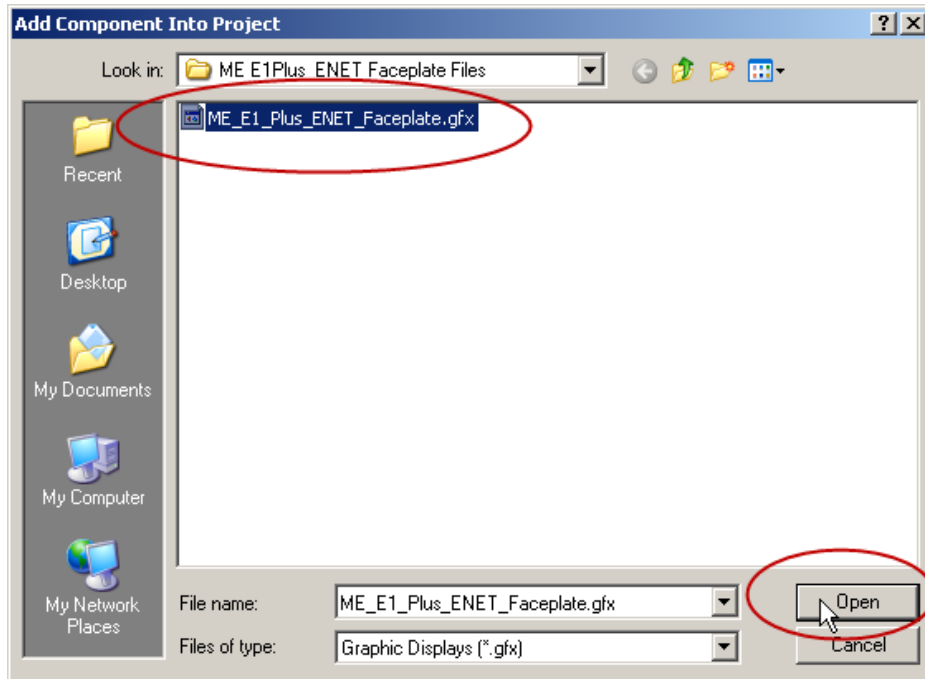
4. Your project should now be open. We can now add the E1 Plus Ethernet Faceplate graphic display into your project.

In the Project Explorer, find the project's Graphics folder, and right-click on **Displays**, and select **Add Component Into Application**.

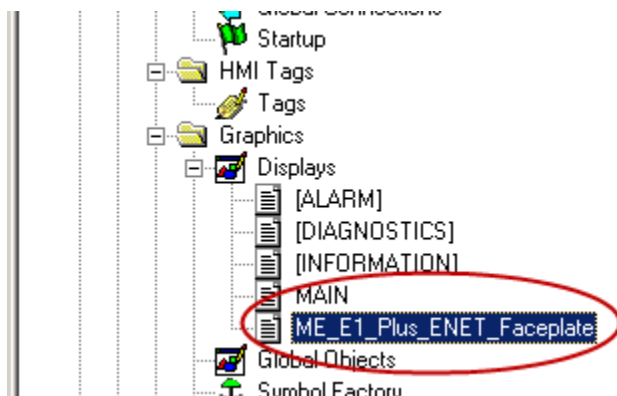


5. Browse for the E1 Plus Faceplate graphic display file, **ME\_E1\_Plus\_ENET\_Faceplate.gfx**, located at: **C:\Lab Files\Integrating Ethernet-enabled Motor Control and Process Control Systems\Application Files\ME E1Plus\_ENET Faceplate Files**.

Select the file, and click **Open**.



6. Your E1 Plus Faceplate graphic display should now show up in your Graphic Displays list.

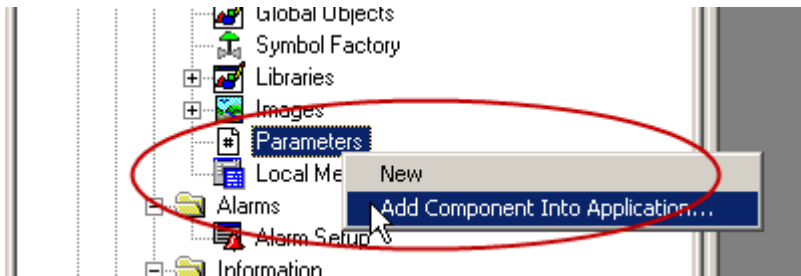


7. We now need to create a parameter file that references the Motor1 AOI tag we created in our RSLogix 5000 project.

Faceplate graphic displays are designed so that they only need to be added to your project once, and then dynamically passed parameter values to reference device addresses or tags. This results in minimal memory resources, and allows you to maintain minimal graphic displays across your project.

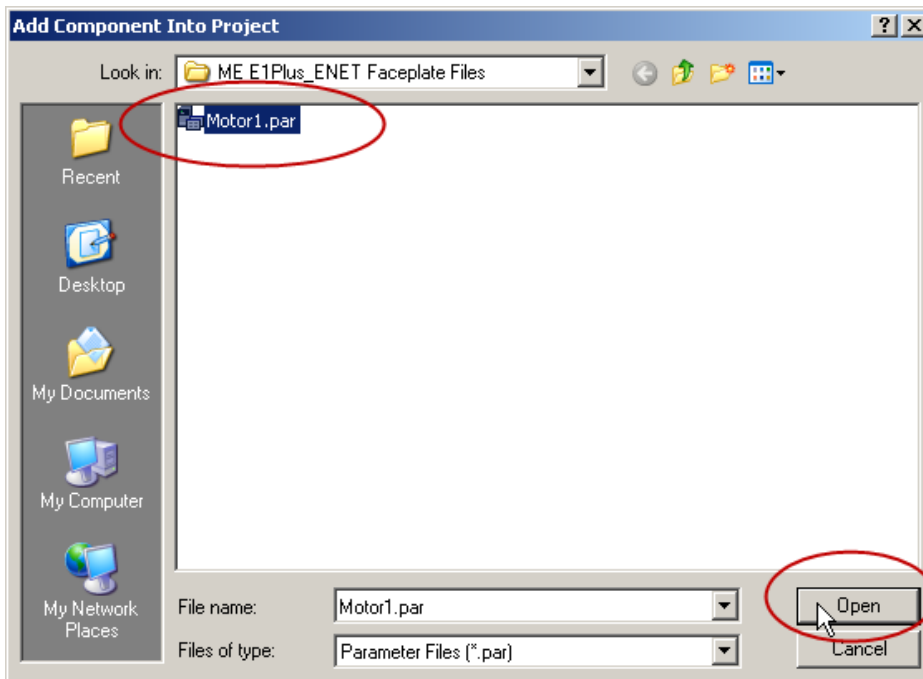
We've already gone ahead and created the parameter file for you, so you just need to add the parameter file to your project.

Right-click on **Parameters**, and select **Add Component Into Application....**

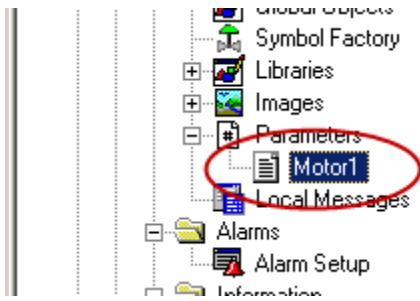


8. Browse for the parameter file, **Motor1.par**, located at: **C:\Lab Files\Integrating Ethernet-enabled Motor Control and Process Control Systems\Application Files\ME E1Plus\_ENET Faceplate Files**.

Select the file, and click **Open**.



9. The parameter file should now show up in your **Parameters** list.

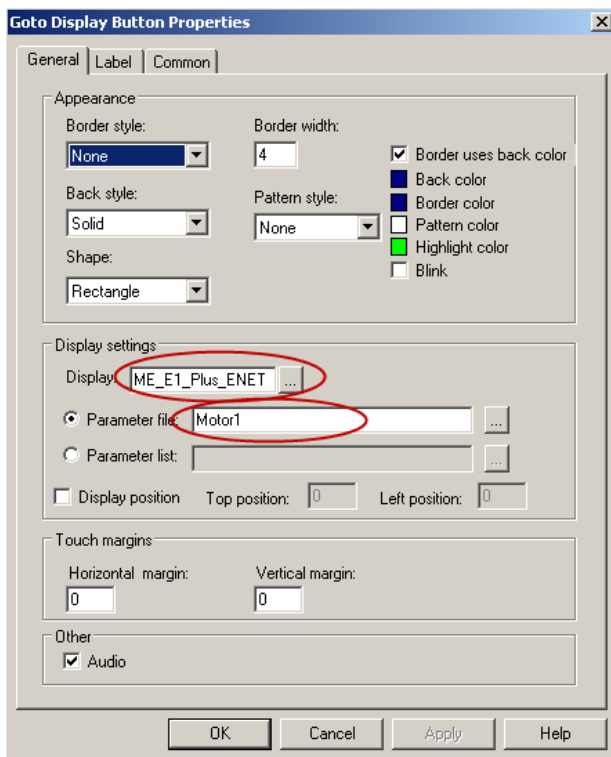


The parameter file has already been configured to reference the E1 Plus AOI Motor1 tag we created in our RSLogix 5000 program.

10. The final step would be to create a Goto Display Button to launch the Faceplate display.

We've already gone ahead and created and configured this button in the MAIN graphic display for you, but let's review the button configuration below so that you are familiar with the configuration setup.

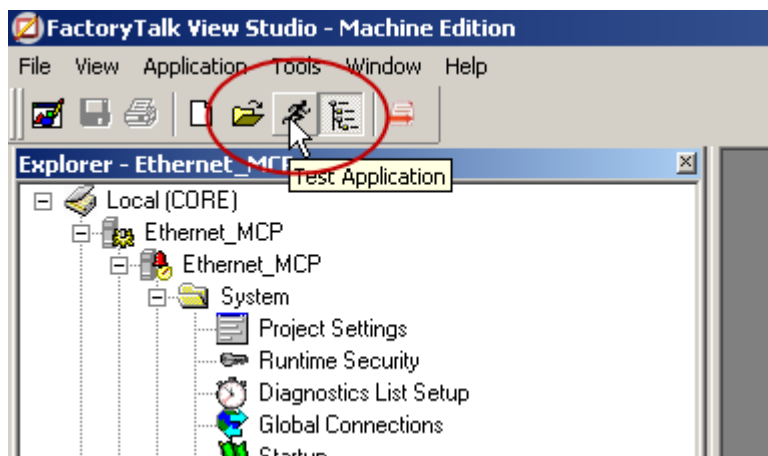
The Goto Display Button is configured to open the **ME\_E1\_Plus\_ENET\_Faceplate** graphic display and use the **Motor1** parameter file.



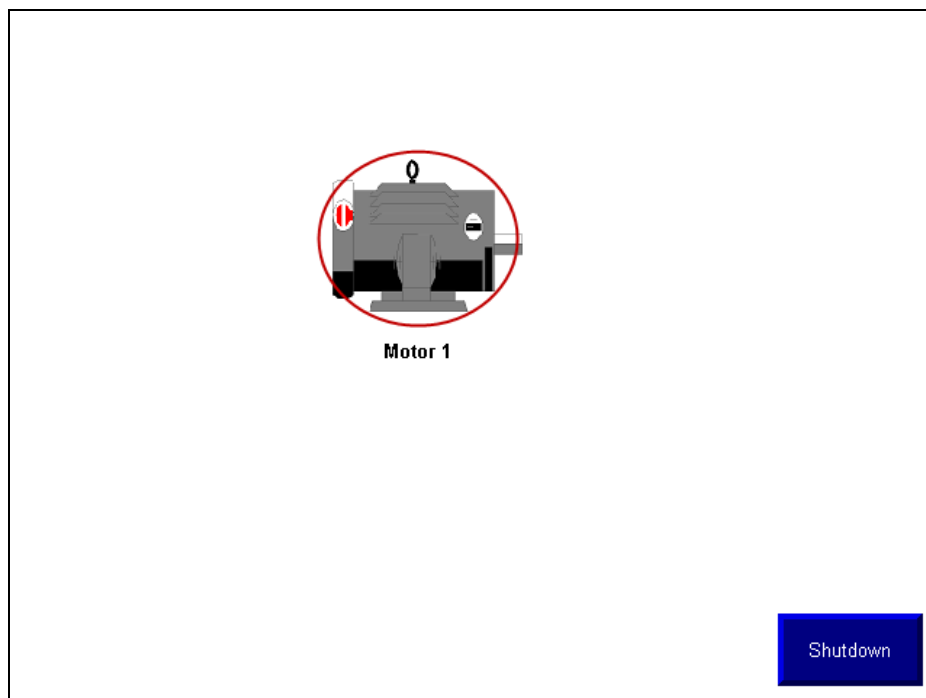
11. You have successfully completed adding a Faceplate graphic display into your FactoryTalk View Machine Edition project.

## Test Your E1 Plus Ethernet Faceplate

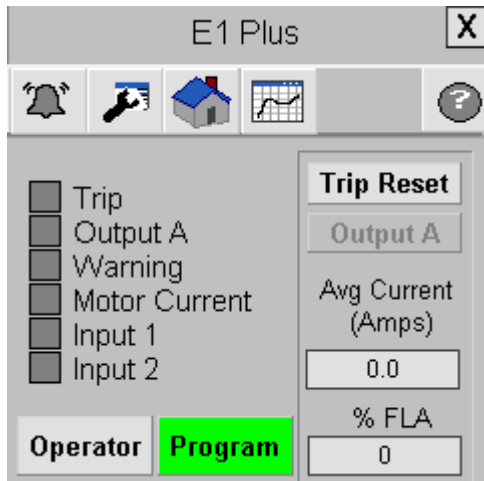
1. We can now test our E1 Plus Ethernet Faceplate. Click the **Test Application** icon in the upper toolbar.



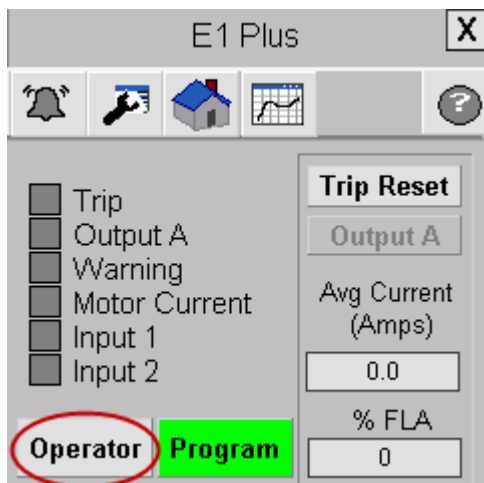
2. Once your application launches, click the **Motor** to launch the E1 Plus Ethernet Faceplate.



- Your E1 Plus Ethernet Faceplate should look like the following.

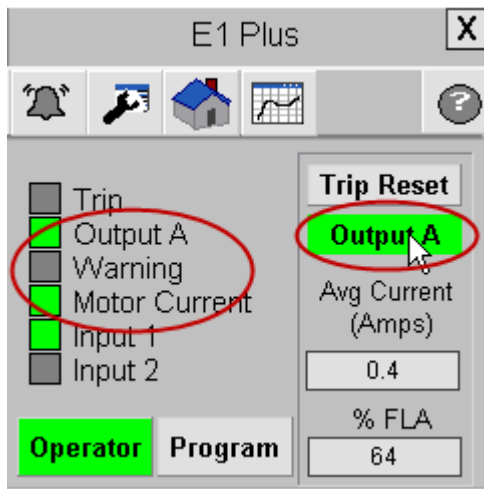


- Click the **Operator** button.

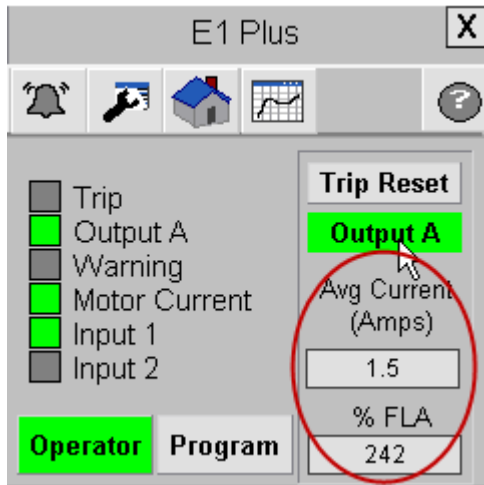


- Turn the IMC MOTOR SELECT switch to E1+. The **Input 1** indicator on the Faceplate will turn green.

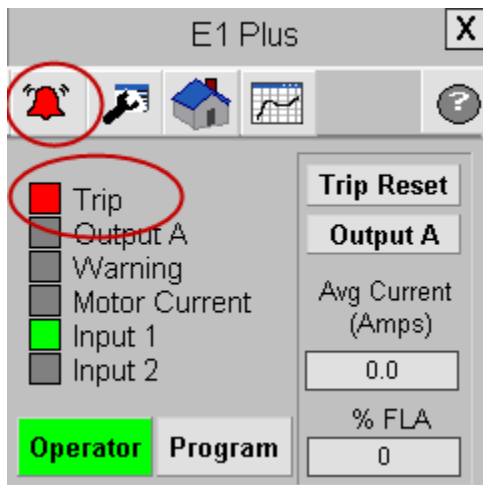
- Click and hold the **Output A** button. This will start the motor. Observe the status indicators turn green next to **Output A** and **Motor Current**, and how the Avg Current and % FLA values also changed.



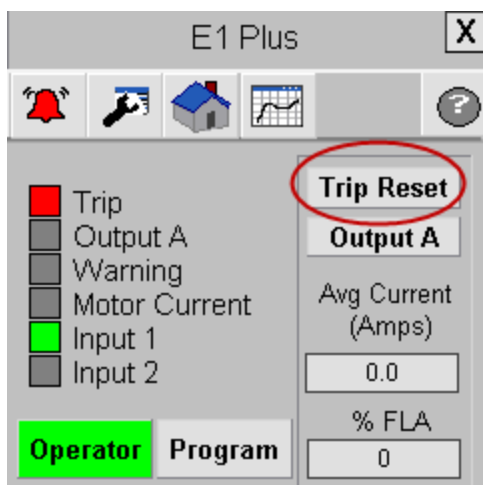
- Now let's cause an overload trip. While still holding down the **Output A** button, apply the disc brake and completely stop the disc until the E1 Plus trips. Observe the Avg Current and %FLA values while waiting for the E1 Plus to trip. The E1 Plus should take about 10 seconds to trip.



8. Once the E1 Plus trips, let go of the disc brake. Observe that the motor has stopped, and that the Trip indicator on the Faceplate is now red, and that an alarm has been triggered.

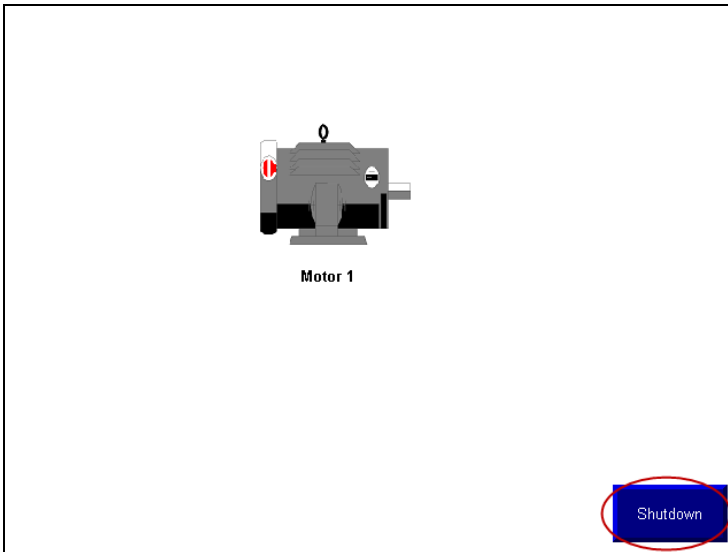


9. You can now reset the trip by clicking on **Trip Reset**.



10. You have successfully tested your E1 Plus Faceplate!

11. Close the E1 Plus Faceplate, and then close the application by selecting the **Shutdown** button in the lower right –hand corner.



12. Close FactoryTalk Studio Machine Edition.

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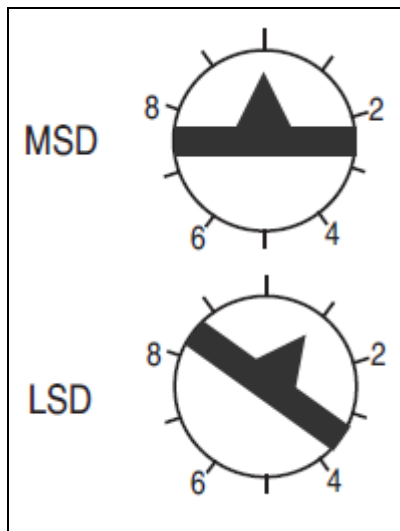
## Retrofitting a DeviceNet E3 Plus onto Ethernet

In this section of the lab, you will learn about the EtherNet/IP Communications Auxiliary module (193-DNENCATR), and how to use it to retrofit your existing DeviceNet E3 Plus motor overloads onto Ethernet. We will also show you how easy it is to integrate it with RSLogix 5000 for use with your Integrated Architecture platform.

### Configure the E3 Plus DeviceNet Node Address

1. For this section of the lab, you will need to change the E3 Plus DeviceNet node address to 1.

To do this, use the supplied screwdriver to turn the rotary dials on the front of the E3 Plus so that the MSD dial is pointing to 0, and the LSD dial is pointing to 1.



2. Next, unplug the 2100-ENET module's DeviceNet cable (black) from the E3 Plus (hold the gray DeviceNet connector and pull straight down). Then plug in the EtherNet/IP Communications Auxiliary module's DeviceNet cable (gray) into the E3 Plus.

## **Configure the EtherNet/IP Communications Auxiliary**

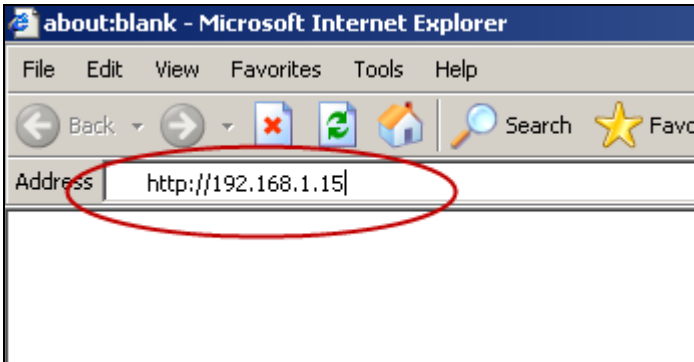
The E3 Plus must first be added to the DeviceNet scan list of the EtherNet/IP Communications Auxiliary module. Typically, you would need to use the RSNetwork for DeviceNet software to configure a DeviceNet scanner, but with the EtherNet/IP Communications Auxiliary, we've leveraged the Ethernet technology and made a device webpage that allows you to configure the scan list from there!

Let's go ahead and use the device web page to add the E3 Plus to the EtherNet/IP Communications Auxiliary module's scan list.

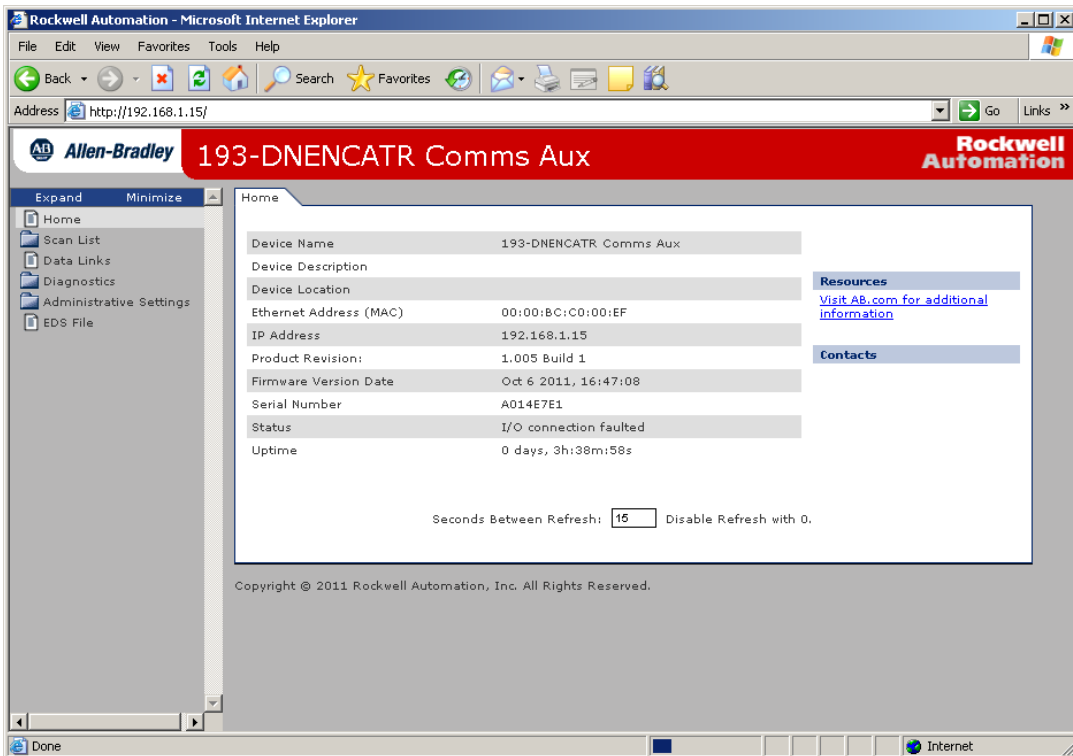
1. Launch **Internet Explorer** by double-clicking the shortcut on the Desktop.



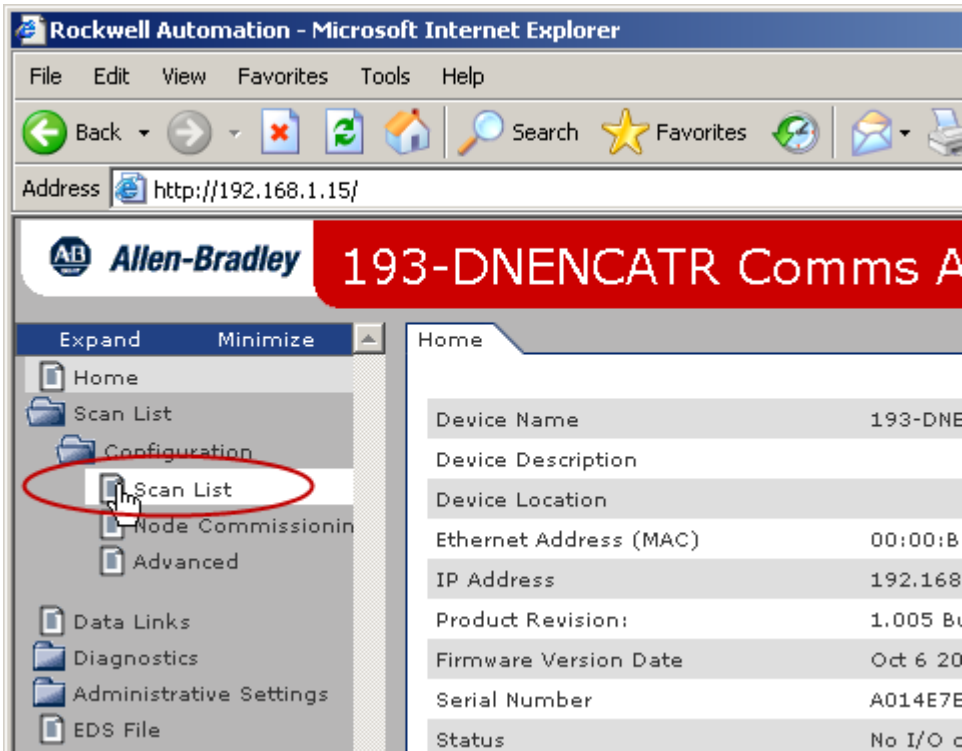
2. In the Address bar, type in the web address of the EtherNet/IP Communications Auxiliary, <http://192.168.1.15>, and then press **Enter**.



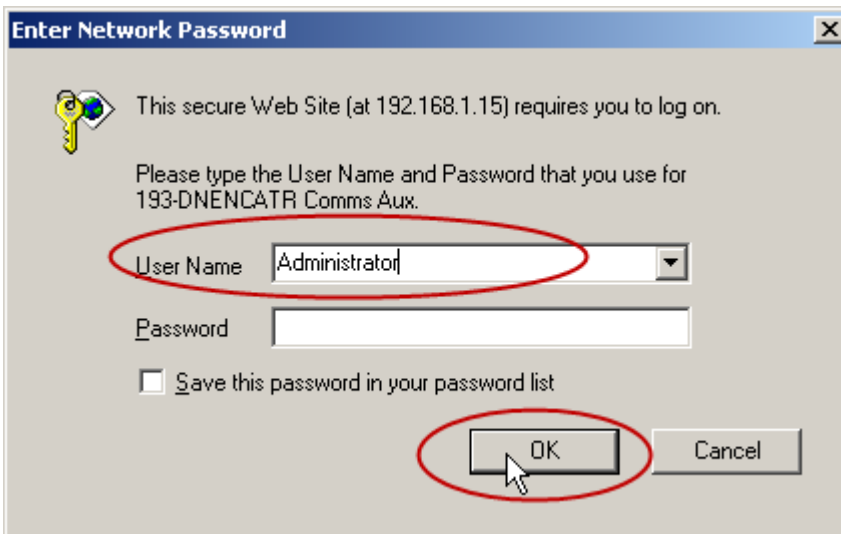
3. The following webpage should appear. This is the Home page of your EtherNet/IP Communications Auxiliary.



- To configure the DeviceNet Scan List, expand the **Scan List** folder and then the **Configuration** folder, and select **Scan List**.



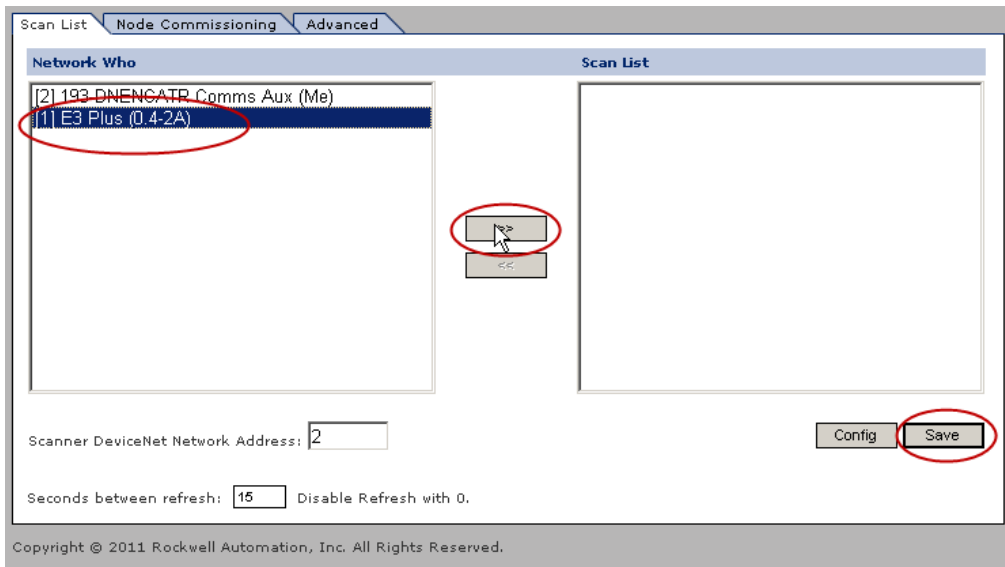
- You will be prompted to enter a user name and password. Enter the user name **Administrator** with no password, and click **OK**.



- You should now be on the Scan List configuration page.

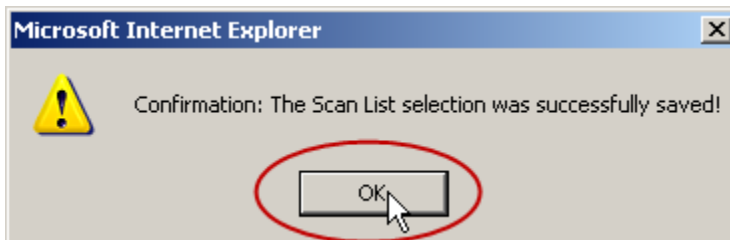
Notice the list of devices in the **Network Who** list. These are the devices that the EtherNet/IP Comms Auxiliary detected on your DeviceNet network. The number in the square brackets is the node number of the device. The device at node 2 is actually the EtherNet/IP Comms Auxiliary itself. The only other device on your network should be the E3 Plus at node 1.

Select the **E3 Plus**, and add it to your scan list by clicking the right arrow >> button. Then click **Save**.

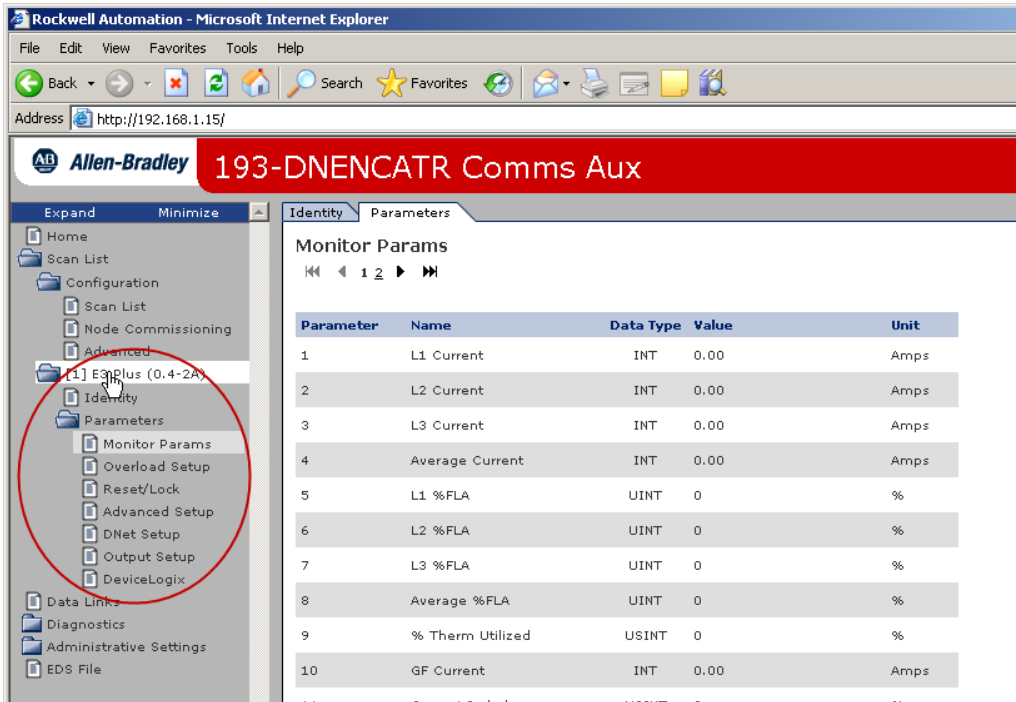


Note: You can add up to six devices to your EtherNet/IP Comms Auxiliary module's scan list.

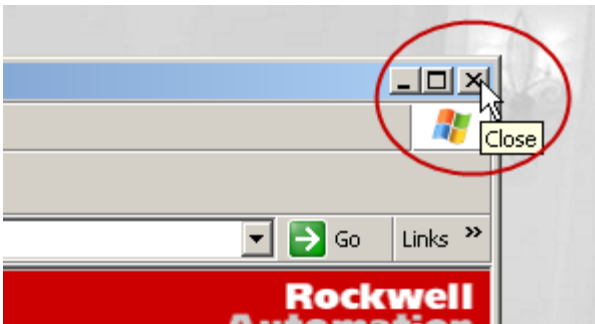
- You should be prompted that the Scan List was successfully saved. Click **OK**.



8. Observe that a new folder has been added on the left hand pane for the E3 Plus. This is another great feature of the EtherNet/IP Comms Auxiliary module. By expanding this folder, you can access the parameters for the E3 Plus and monitor and edit them from the webpage!



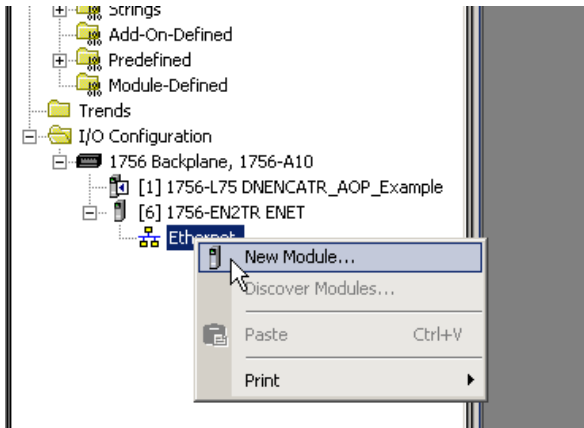
9. You have completed configuring the EtherNet/IP Communications Auxiliary module. Close the webpage by clicking the X in the upper right hand corner of the Internet Explorer web browser.



## Add the EtherNet/IP Communications Auxiliary to your RSLogix 5000 project

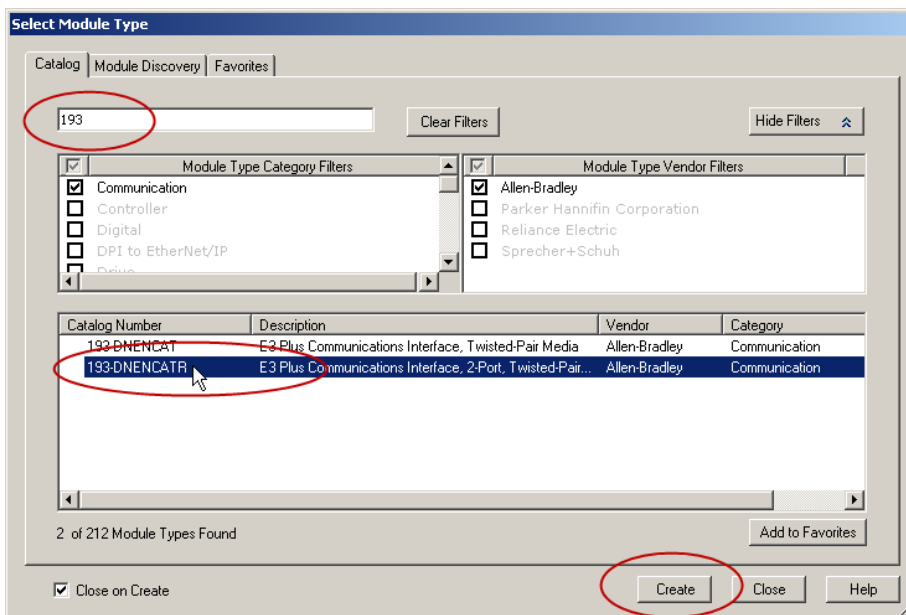
1. Open the RSLogix 5000 project file, **DNENCATR\_AOP\_Example.ACD**, located at **C:\Lab Files\Integrating Ethernet-enabled Motor Control and Process Control Systems\Application Files**.
2. Locate the **I/O Configuration** tree in the lower left-hand side of the Controller Organizer pane. You will notice an Ethernet Communications module (1756-EN2TR) has already been added and configured at slot 6 – now you just need to add an EtherNet/IP Communications Auxiliary module to the Ethernet network configuration.

Right-click the **Ethernet** network and select **New Module....**



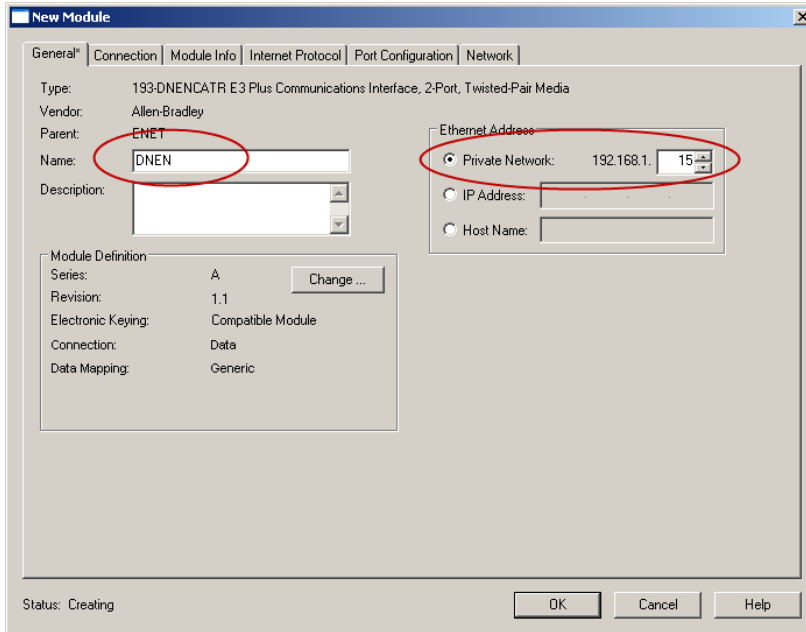
3. The **Select Module Type** window should now launch – this is where you can search for and add the EtherNet/IP Communications Auxiliary module to your Ethernet network configuration.

Type **193** into the filter search box at the top of the window, then select **193-DNENCATR** in the lower results window, and click **Create**.



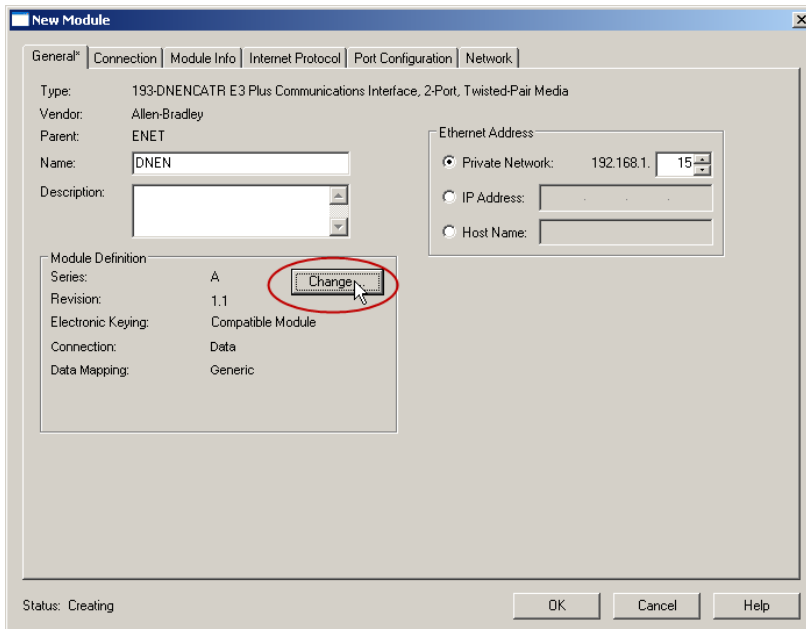
- The New Module configuration window should now launch. Configure it with the following settings.

Type **DNEN** in the name text box field. Select the **Private Network** radio button, and configure it with the IP Address, **192.168.1.15**.



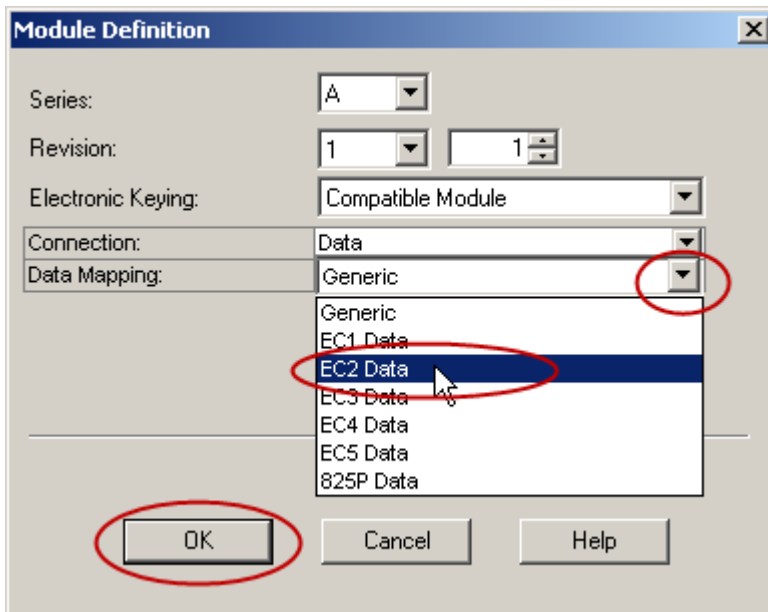
- You now need to define the modules Data Mapping. When interfacing an E3 Plus motor overload with the EtherNet/IP Communications Auxiliary module, you can configure it's Data Mapping so that the data is represented as named controller tags, instead of generic data blocks. This makes your programming quicker, easier, and less prone to error.

Click the **Change** button.

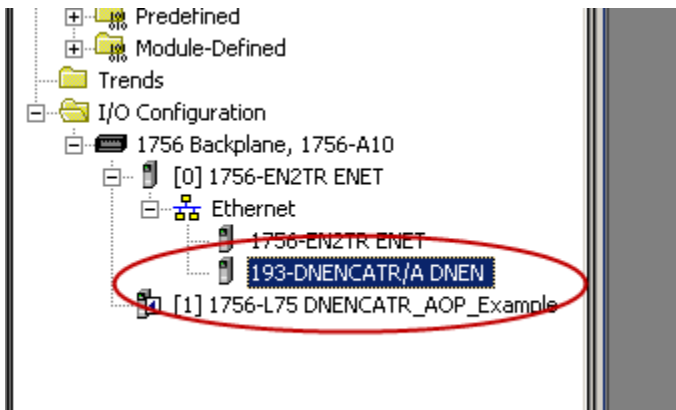


6. Select the **Data Mapping** drop down box, and select **EC2 Data**. Then click **OK**.

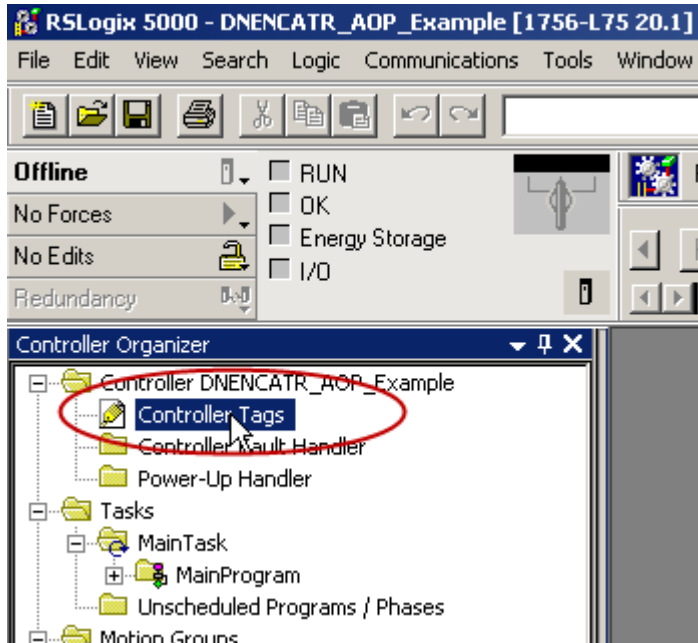
EC2 is the specific E3 Plus catalog model that you are using for this lab.



7. You have successfully added the EtherNet/IP Communications Auxiliary to your project!



- Let's take a look at the tags that are created. Double-click **Controller Tags** located at the top of your Controller Organizer pane.



- Expand the **DNEN:I** tag to display the tags under **DNEN:I.EC2[0]**. These are the input tags for the E3 Plus (Index 0 is the first device in your scan list, which is the E3 Plus). Observe the tags and how they are named. Because we configured the Data Mapping to EC2, our tags are given meaningful tag names that represent the parameters available in an E3 Plus EC2 motor overload.

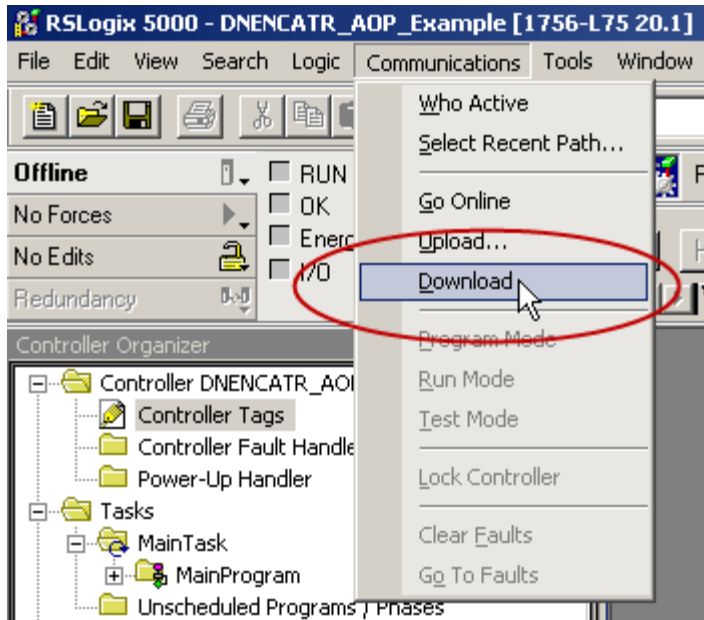
Name	Value
DNEN:C	{...}
DNEN:I	{...}
DNEN:I.Fault	0
DNEN:I.DnetStatus	{...}
DNEN:I.DeviceDnetStatus	{...}
DNEN:I.EC2	{...}
DNEN:I.EC2[0]	{...}
DNEN:I.EC2[0].TripPresent	0
DNEN:I.EC2[0].WarningPresent	0
DNEN:I.EC2[0].OutputA	0
DNEN:I.EC2[0].OutputB	0
DNEN:I.EC2[0].Input1	0
DNEN:I.EC2[0].Input2	0
DNEN:I.EC2[0].Input3	0
DNEN:I.EC2[0].Input4	0
DNEN:I.EC2[0].MotorCurrentPresent	0
DNEN:I.EC2[0].GroundFaultCurrentPresent	0
DNEN:I.EC2[0].L1Current	0
DNEN:I.EC2[0].L2Current	0
DNEN:I.EC2[0].L3Current	0
DNEN:I.EC2[1]	{...}
DNEN:I.EC2[2]	{...}
DNEN:I.EC2[3]	{...}
DNEN:I.EC2[4]	{...}
DNEN:I.EC2[5]	{...}
DNEN:I.AdvancedDataEC2	{...}
DNEN:O	{...}

10. The same can be observed for the Advanced Input tags, **DNEN:I.AdvancedDataEC2[0]**, as well as the Output tags, **DNEN:O.EC2[0]**..

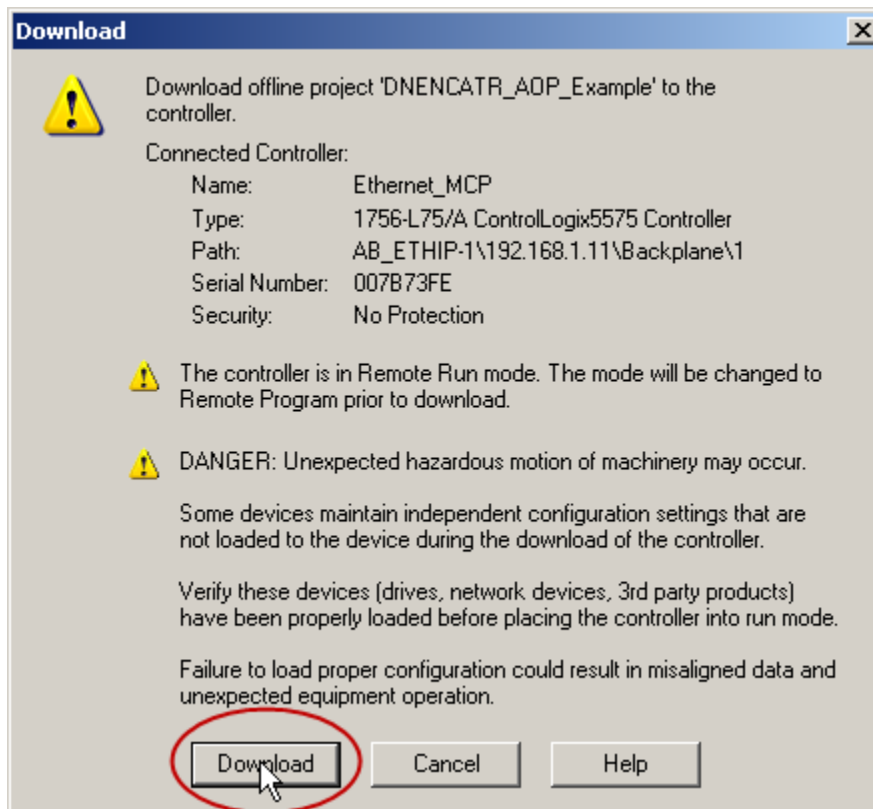
[-] DNEN:I.AdvancedDataEC2	{...}
[-] DNEN:I.AdvancedDataEC2[0]	{...}
[+] DNEN:I.AdvancedDataEC2[0].AvgCurrent	0
[+] DNEN:I.AdvancedDataEC2[0].AvgPercentFLA	0
[+] DNEN:I.AdvancedDataEC2[0].PercentTCU	0
[+] DNEN:I.AdvancedDataEC2[0].GroundFaultCurrent	0
[+] DNEN:I.AdvancedDataEC2[0].CurrentImbalance	0
[-] DNEN:I.AdvancedDataEC2[0].TestTrip	0
[-] DNEN:I.AdvancedDataEC2[0].OverloadTrip	0
[-] DNEN:I.AdvancedDataEC2[0].PhaseLossTrip	0
[-] DNEN:I.AdvancedDataEC2[0].GroundFaultCurrentTrip	0
[-] DNEN:I.AdvancedDataEC2[0].StallTrip	0
[-] DNEN:I.AdvancedDataEC2[0].JamTrip	0
[-] DNEN:I.AdvancedDataEC2[0].UnderloadTrip	0
[-] DNEN:I.AdvancedDataEC2[0].PTCTrip	0
[-] DNEN:I.AdvancedDataEC2[0].CurrentImbalanceTrip	0
[-] DNEN:I.AdvancedDataEC2[0].RemoteTrip	0
[-] DNEN:I.AdvancedDataEC2[0].BlockedStartTrip	0
[-] DNEN:I.AdvancedDataEC2[0].OverloadWarning	0
[-] DNEN:I.AdvancedDataEC2[0].GroundFaultCurrentWarni...	0
[-] DNEN:I.AdvancedDataEC2[0].JamWarning	0
[-] DNEN:I.AdvancedDataEC2[0].UnderloadWarning	0
[-] DNEN:I.AdvancedDataEC2[0].PTCWarning	0
[-] DNEN:I.AdvancedDataEC2[0].CurrentImbalanceWarning	0
[-] DNEN:I.AdvancedDataEC2[0].ProgModeWarning	0
[-] DNEN:I.AdvancedDataEC2[0].ConfigurationWarning	0
[-] DNEN:I.AdvancedDataEC2[0].NumberOfStartsWarning	0
[-] DNEN:I.AdvancedDataEC2[0].OperatingHoursWarning	0
[+] DNEN:I.AdvancedDataEC2[0].OperatingHours	0

[-] DNEN:O	{...}
[-] DNEN:O.EC2	{...}
[-] DNEN:O.EC2[0]	{...}
[-] DNEN:O.EC2[0].OutputAData	0
[-] DNEN:O.EC2[0].OutputBData	0
[-] DNEN:O.EC2[0].ResetTrip	0
[-] DNEN:O.EC2[0].RemoteTrip	0
[+] DNEN:O.EC2[1]	{...}
[+] DNEN:O.EC2[2]	{...}
[+] DNEN:O.EC2[3]	{...}
[+] DNEN:O.EC2[4]	{...}
[+] DNEN:O.EC2[5]	{...}

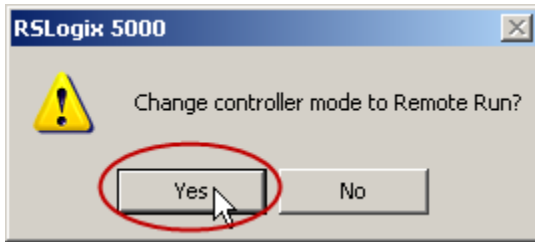
11. Now, let's download our program to the controller and observe some real-time data from the E3 Plus.
12. Select the **Communications** menu, and click **Download**.



13. A download warning prompt will appear. Select **Download**.



- Once the program finishes downloading, RSLogix 5000 will automatically go **Online** with your controller and you will be prompted to put the controller into RUN mode. Select **Yes**.



- You have successfully downloaded your program to the controller and placed the controller in run mode!
- Now let's monitor the tags of the E3 Plus. Turn the **IMC MOTOR SELECT** switch (on the demo) to **E3+** and turn the motor on by pushing the **yellow E3+ I/O** pushbutton.

Observe the values of the input tags under **DNEN:I.EC2[0]** change as you turn on the motor.

[-] DNEN:I.EC2[0]		{...}
	- DNEN:I.EC2[0].TripPresent	0
	- DNEN:I.EC2[0].WarningPresent	0
	- DNEN:I.EC2[0].OutputA	1
	- DNEN:I.EC2[0].OutputB	0
	- DNEN:I.EC2[0].Input1	1
	- DNEN:I.EC2[0].Input2	0
	- DNEN:I.EC2[0].Input3	0
	- DNEN:I.EC2[0].Input4	1
	- DNEN:I.EC2[0].MotorCurrentPresent	1
	- DNEN:I.EC2[0].GroundFaultCurrentPresent	0
	[+] DNEN:I.EC2[0].L1Current	53
	[+] DNEN:I.EC2[0].L2Current	54
	[+] DNEN:I.EC2[0].L3Current	0

Lightly apply the disc brake and you should see the L1 and L2 current values increase.

- Turn the motor off by pushing the **blue E3+ I/O** pushbutton. Observe the input tag values change.
- Congratulations! You have successfully integrated your E3 Plus into an Integrated Architecture system, using the EtherNet/IP Communications Auxiliary!

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