

AS3 Application Note 3.2.1

Ethernet IP Basic Tutorial

Connecting an AS3 to a PLC over Ethernet for command and feedback.

Estimated Time: 30 Minutes

Level: 3

Prerequisite:

- AS3 Application Note 1.1.1
Navigating Menus & Parameters

AS3 Ethernet IP Basic Tutorial



AS3 Ethernet IP Basic Tutorial

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Introduction

This tutorial is intended for use as a learning aid with basic localized setup and ASD run/stop examples. Please visit www.toshiba.com/tic/ to download the latest ASD Instruction Manuals and Ethernet Function Manuals for the complete guide.

For the content below, this setup uses an Allen Bradley CompactLogix L24ER-QBFC1B controller (revision 28) with a Toshiba AS3 typeform VFAS3-2007P (230V, 1HP) revision V108 and Windows 7 PC, but the fundamental setup is similar for all Toshiba ASDs. The programming tutorial below may vary slightly depending on your setup.

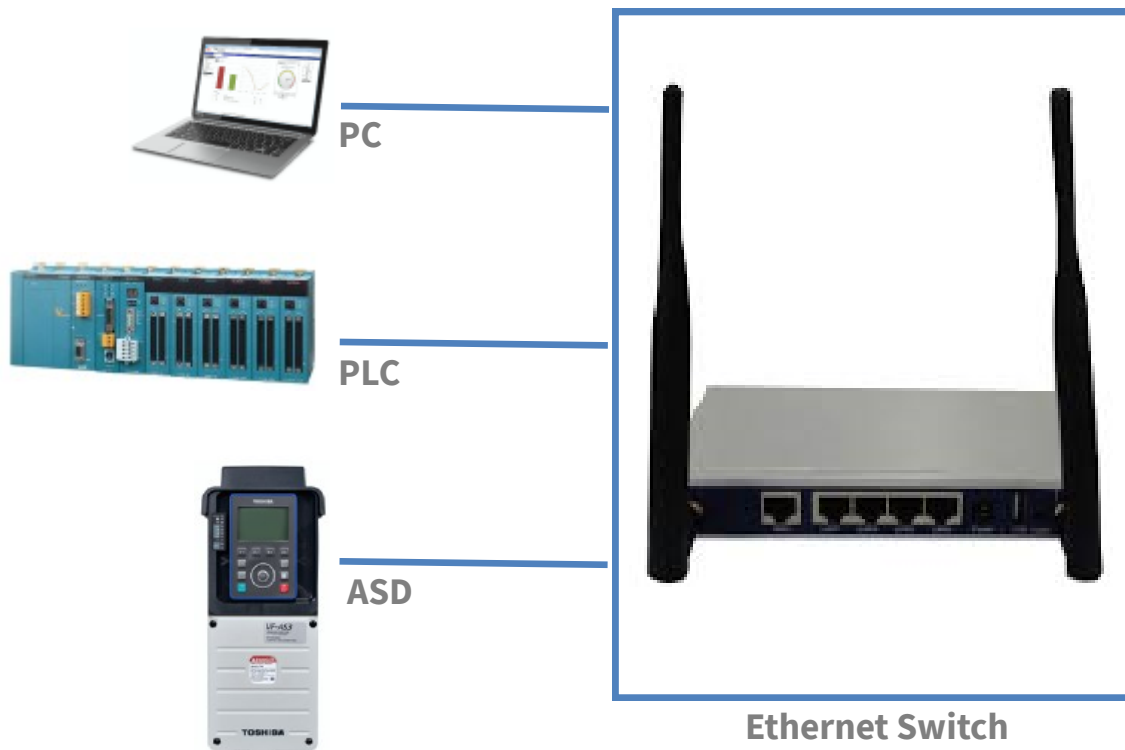
Referenced manuals:

E6582125 – AS3 Embedded Ethernet Function Manual

E6582062 – AS3 Instruction Manual

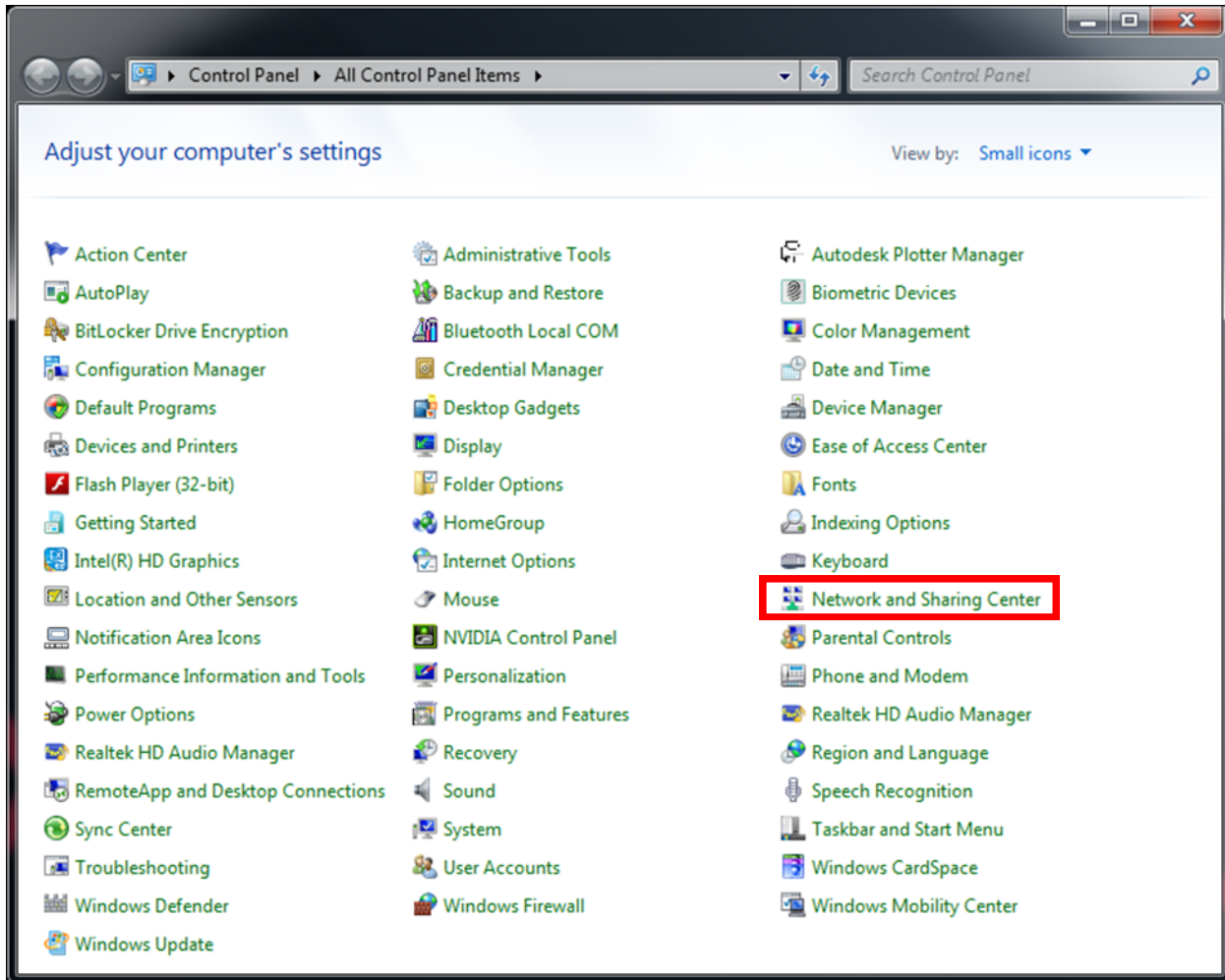
For advanced users, please proceed to section 3 (**Setting Up Network IP Addresses**) to immediately begin setting up the AS3 IP address and create an Ethernet Module in Studio (RSLogix) 5000.

Local Connection Setup



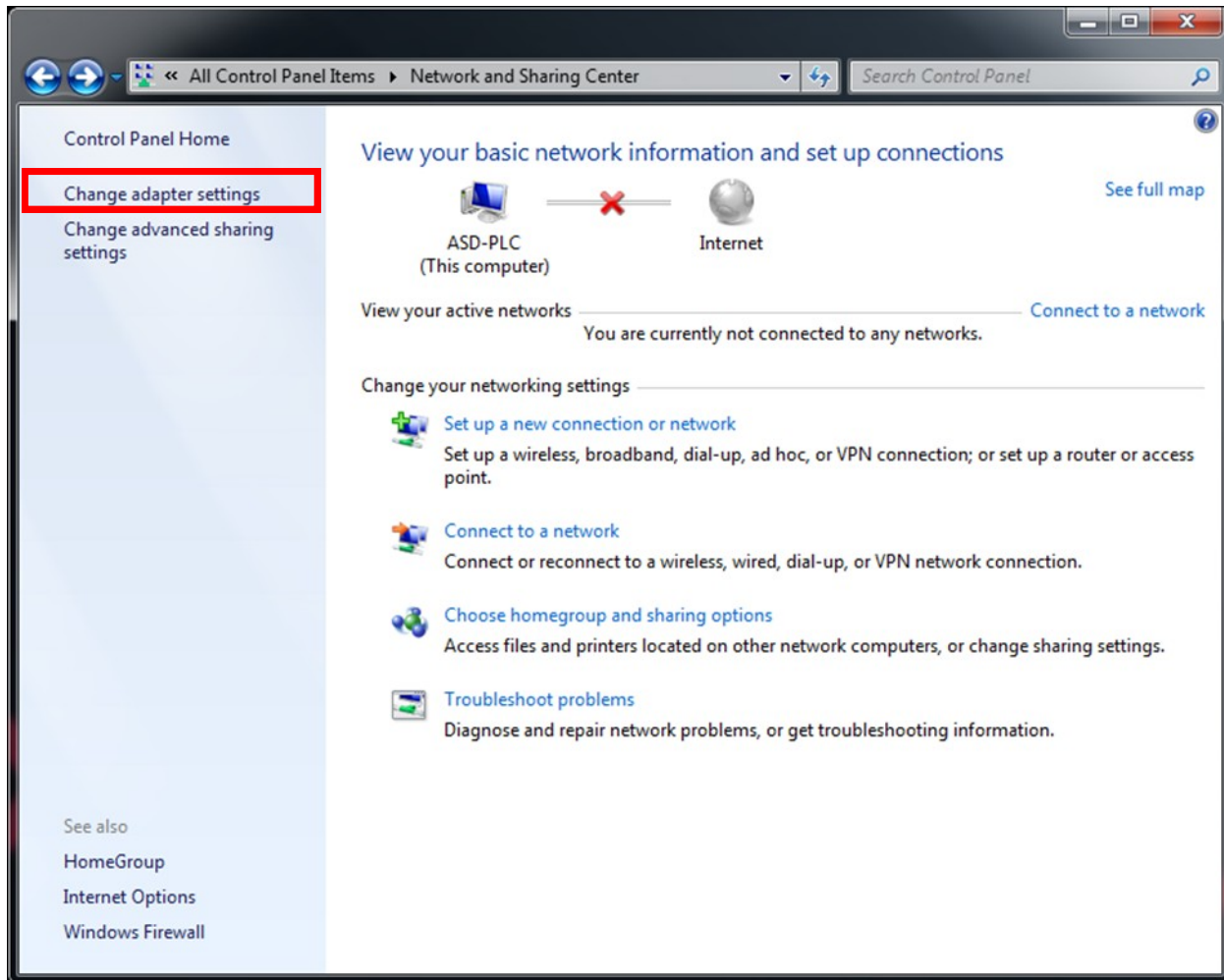
Assigning a Local PC Static IP Address (If applicable)

1. To configure the IP address and subnet mask on the PC, open the Windows **Start** menu and click **Control Panel**. From the Control Panel, click **Network and Sharing Center**.



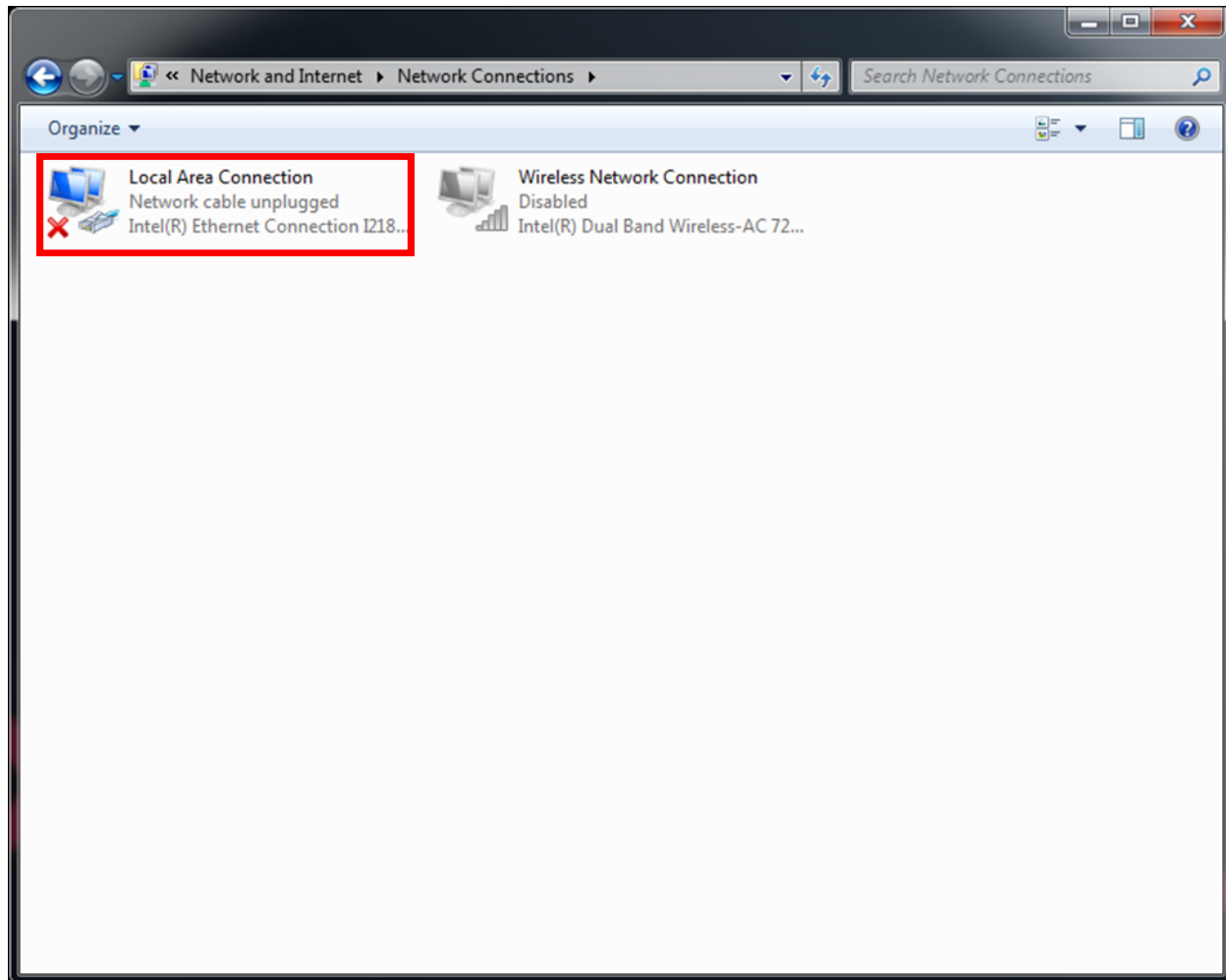
Setting Up Network IP Addresses

2. Click **Change adaptor settings**.



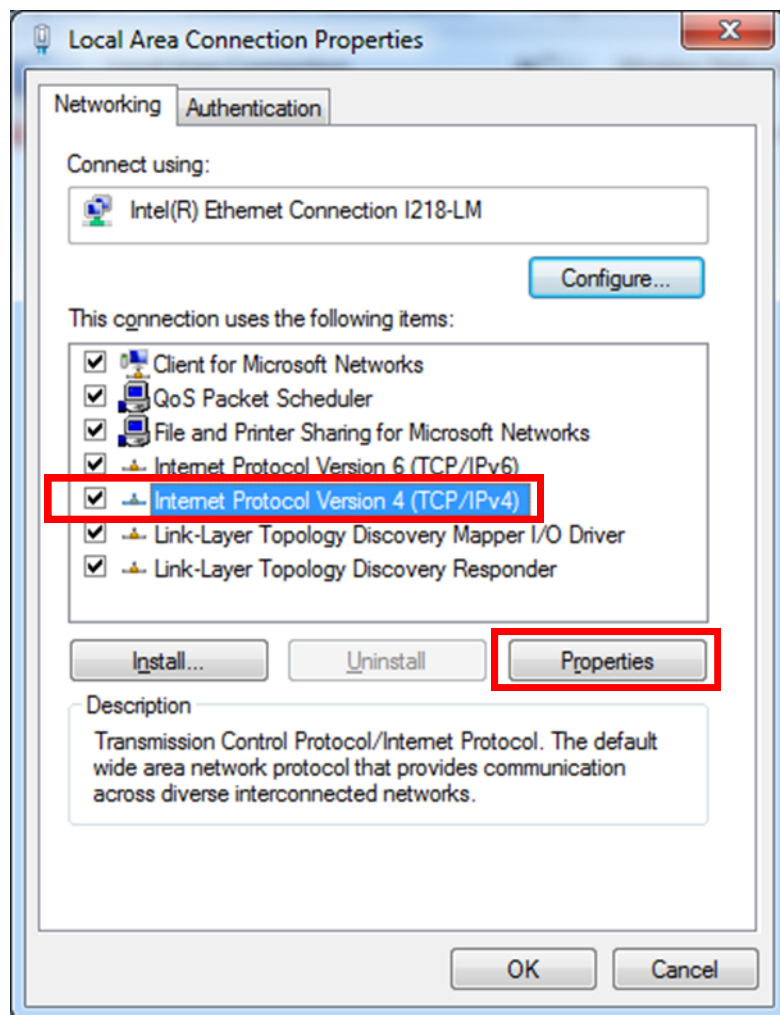
Setting Up Network IP Addresses

3. **Right** click **Local Area Connection** and click **Properties**.



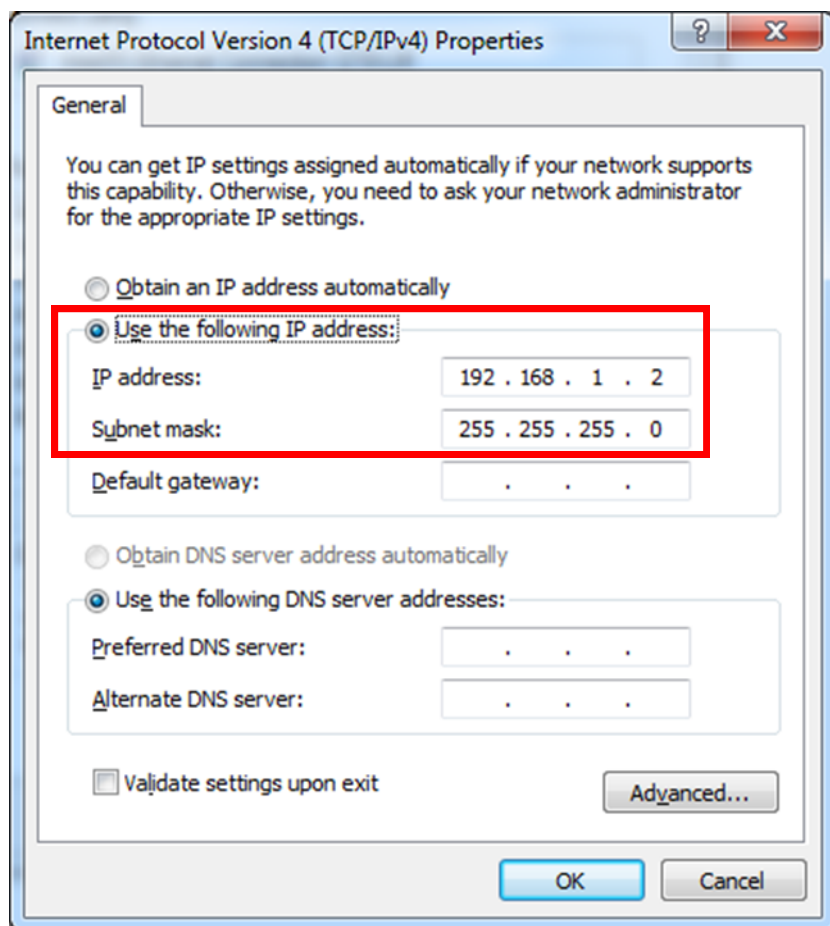
Setting Up Network IP Addresses

4. Click **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**.



Setting Up Network IP Addresses

5. Click **Use the following IP address:** and enter the **IP address:** fields and **Subnet mask:** fields. For this example, you will use **192.168.1.2** for the PC IP address and **255.255.255.0** for the Subnet mask. Click **OK** once the **IP address** and **Subnet mask** fields are filled in.

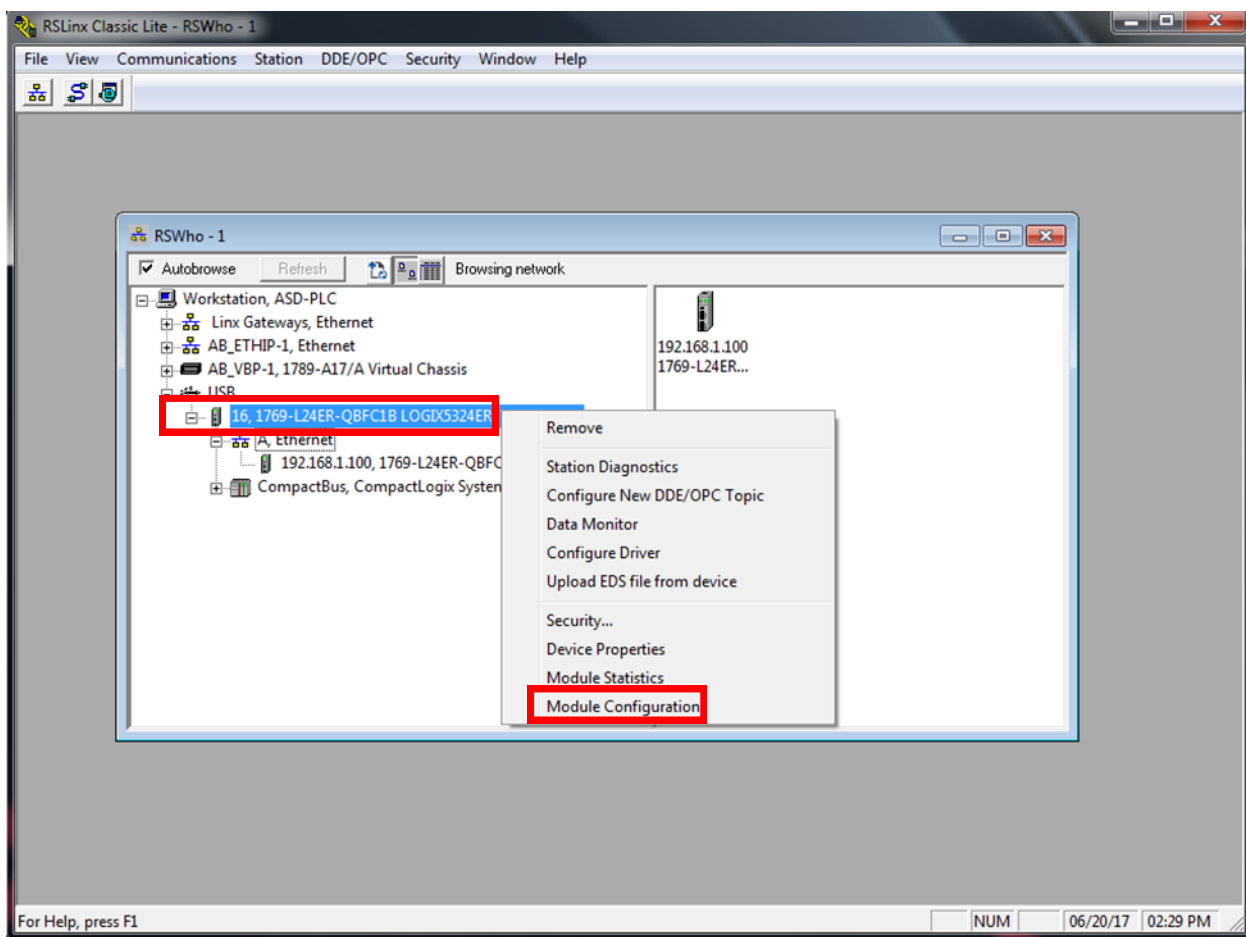


Setting Up Network IP Addresses

a. Setting Up Allen Bradley Controller Static IP Address

There are multiple ways to set the Allen Bradley controller's static IP address. The simplest way is to directly connect an RS232 or USB connector to the controller and use **RSLink** to change the IP address shown below.

1. Connect a USB cable to the controller and open **RSLink**.
2. Right click the controller and select **Module Configuration**.



Setting Up Network IP Addresses

a. Setting Up Allen Bradley Controller Static IP Address

3. Select the **Port Configuration** tab, click **Manually configure IP settings**, and enter the **IP Address**: and **Network Mask**: fields. For this example, use **192.168.1.100** for the controller IP Address and **255.255.255.0** for the Network Mask. Disconnect the USB cable once the static IP addresses of the controller and PC are set.

The screenshot shows the 'USB\16 1769-L24ER-QBFC1B/A LOGIX5324ER Configuration' dialog box with the 'Port Configuration' tab selected. The 'Port' dropdown is set to '1'. The 'Manually configure IP settings' radio button is selected and highlighted with a red box. Below it, the 'IP Address' field is set to '192 . 168 . 1 . 100' and the 'Network Mask' field is set to '255 . 255 . 255 . 0', both highlighted with red boxes. Other fields include 'Gateway Address' (0 . 0 . 0 . 0), 'Primary Name Server' (0 . 0 . 0 . 0), 'Secondary Name Server' (0 . 0 . 0 . 0), 'Domain Name', 'Host Name', and 'Status' (Network Interface Configured). The 'OK' button is highlighted in blue.

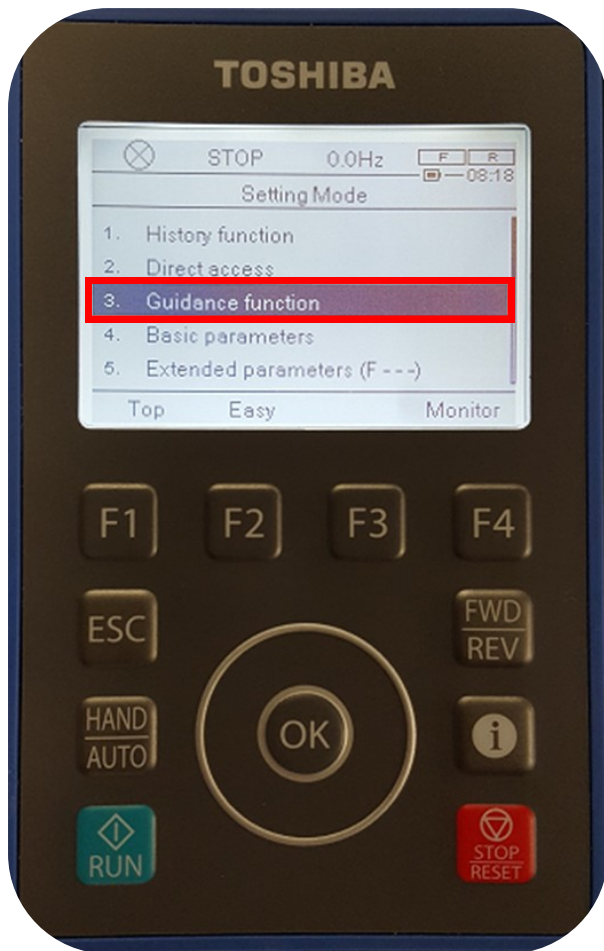
Field	Value
Port	1
Manually configure IP settings	☒
Obtain IP settings automatically using BOOTP	☐
Obtain IP settings automatically using DHCP	☐
IP Address:	192 . 168 . 1 . 100
Network Mask:	255 . 255 . 255 . 0
Gateway Address:	0 . 0 . 0 . 0
Primary Name Server:	0 . 0 . 0 . 0
Secondary Name Server:	0 . 0 . 0 . 0
Domain Name:	
Host Name:	
Status:	Network Interface Configured

Setting Up Network IP Addresses

b. Setting Up Toshiba AS3 Static IP Address (Advanced users start here)

To change the AS3 IP address, the Embedded Ethernet interface through the keypad Guidance Function. Similar to an Allen Bradley controller, the Toshiba AS3 ASD can be remotely found via the BootP-DHCP Server tool as the default AS3 IP Setting Parameter (C610) is set to DHCP.

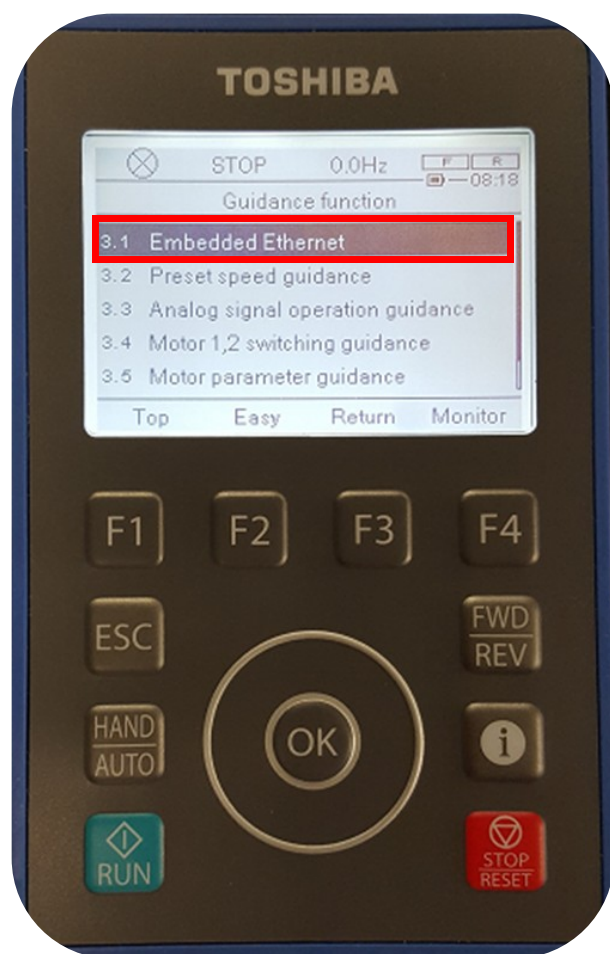
1. Accessing the Embedded Ethernet interface on the AS3 keypad:
Press the **ESC** key to access the **Setting Mode** programming menu.
2. Scroll down to **Guidance function**  and press



Setting Up Network IP Addresses

b. Setting Up Toshiba AS3 Static IP Address (Advanced users start here)

3. Press  on the first highlighted menu item (**Embedded Ethernet**).

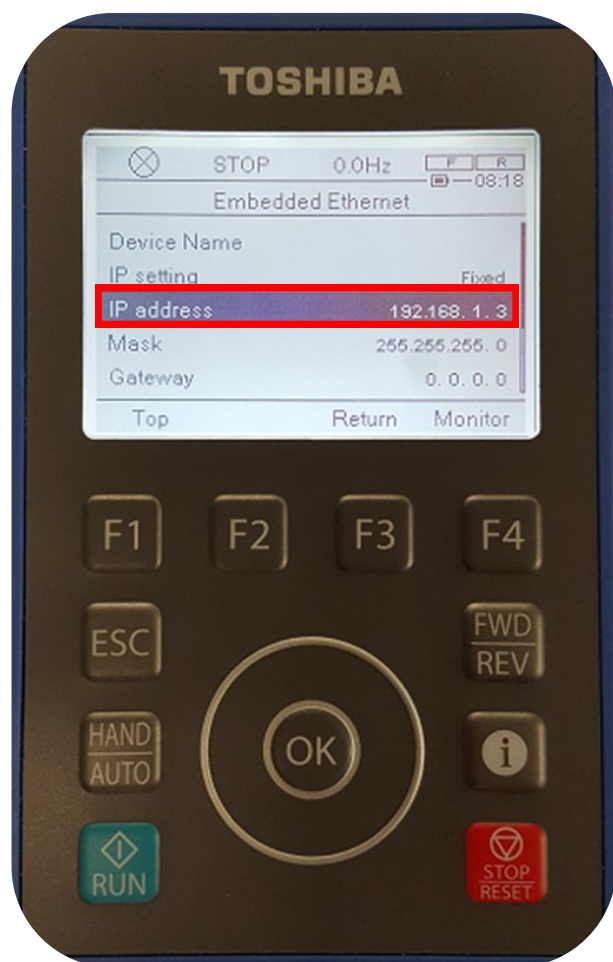


Setting Up Network IP Addresses

b. Setting Up Toshiba AS3 Static IP Address (Advanced users start here)

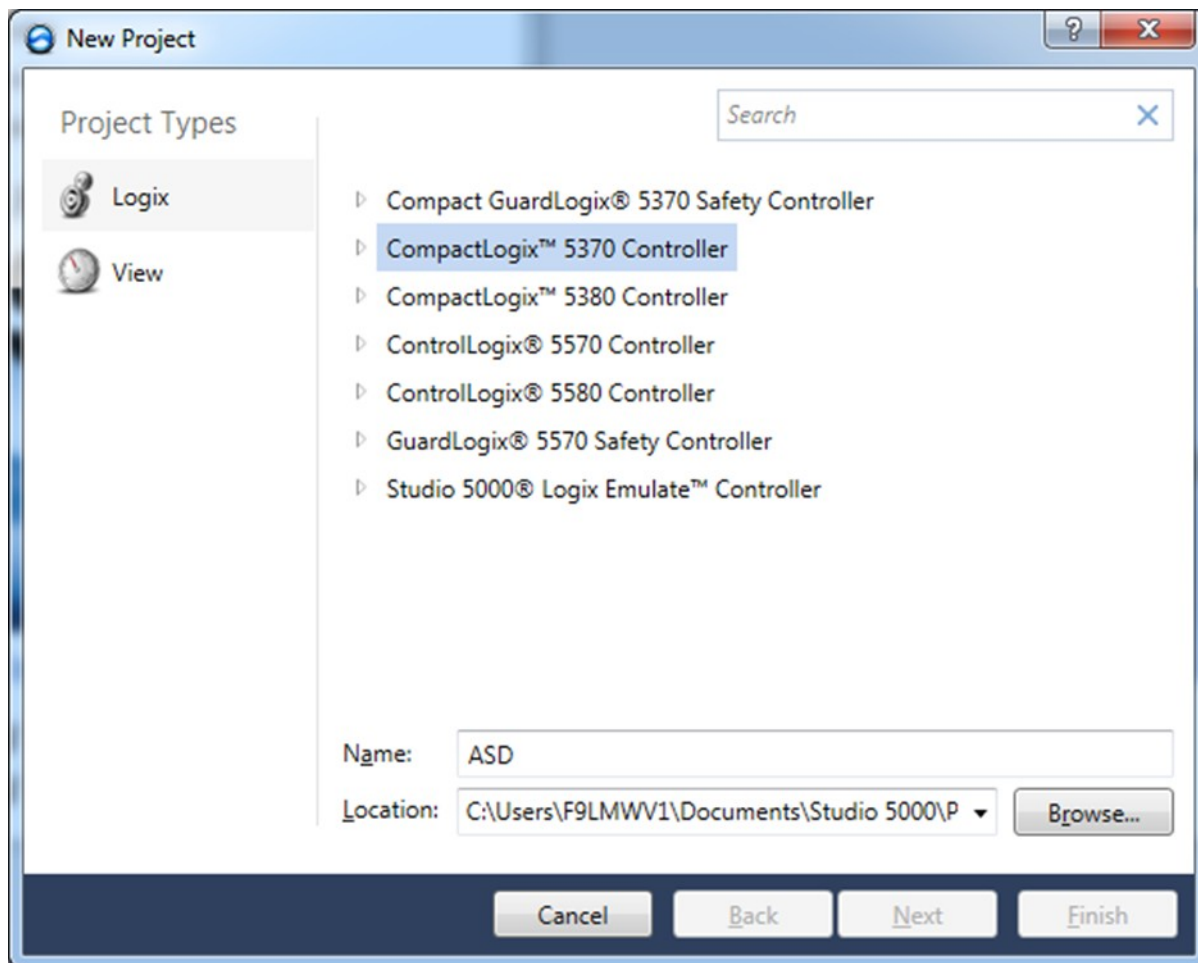
4. Change **IP setting** to **Fixed** and enter the AS3 IP address and Mask. For this example, use **192.168.1.3** for the IP Address and **255.255.255.0** for the Mask.

5. To apply these changes, cycle power to the drive or perform a soft reset with parameter **F899: Communication function reset**.



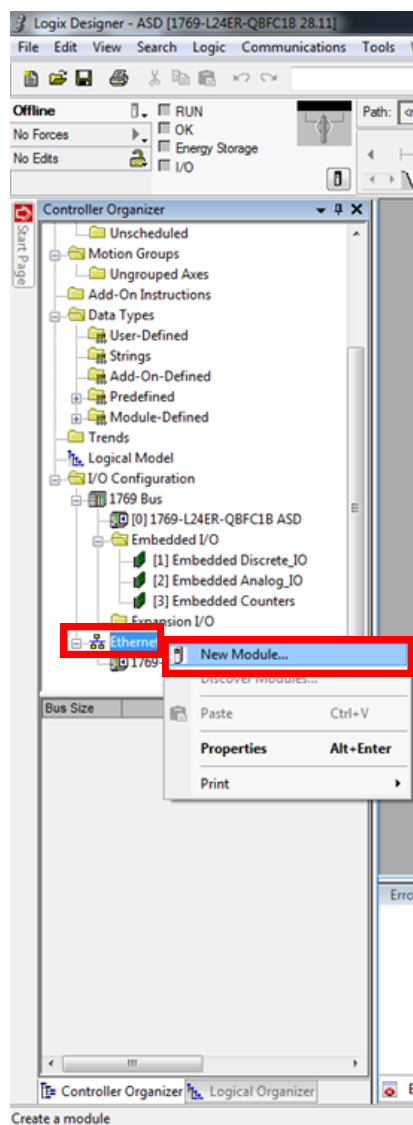
Creating a New Studio (RSLogix) 5000 Project and Ethernet Module

1. Open a new Studio (RSLogix) 5000 project in Logix Designer and select the appropriate controller. For this example, the CompactLogix L24ER-QBFC1B controller is located under CompactLogix™ 5370 Controller.



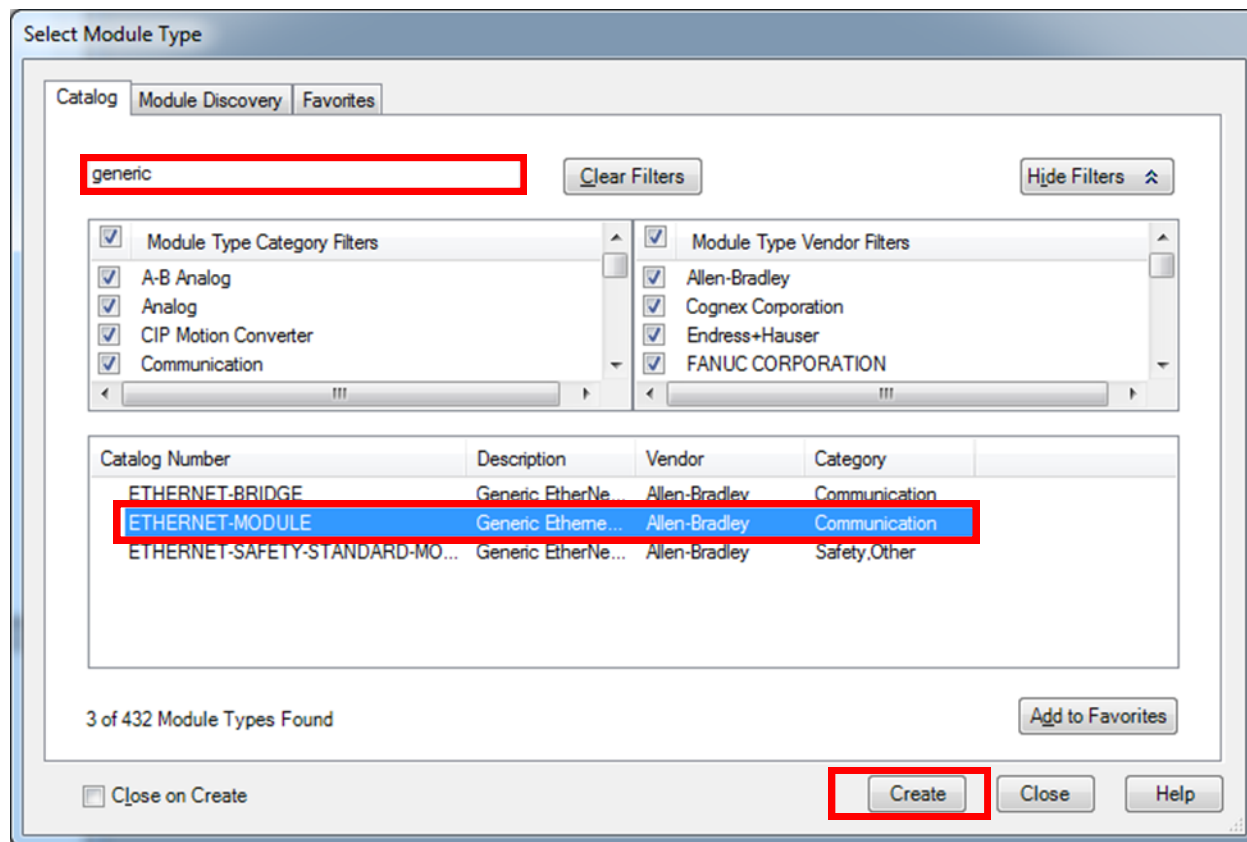
Creating a New Studio (RSLogix) 5000 Project and Ethernet Module

2. From the Controller Organizer view, right click the connected **Ethernet** module and select **New Module**.



Creating a New Studio (RSLogix) 5000 Project and Ethernet Module

3. Scroll down or type “generic” in the filter box to find and **create** a Generic **ETHERNET-MODULE**.



Creating a New Studio (RSLogix) 5000 Project and Ethernet Module

4. Provide a **Name (ASD_AS3)** and the appropriate **IP Address (192.168.1.3)** of the AS3 programmed earlier then enter the following information and click **OK**:

- a. Input Assembly Instance: **150**
- b. Output Assembly Instance: **100**
- c. Configuration: **1**
- d. Input Size: **2**
- e. Output Size: **2**
- f. Configuration Size: **0**
- g. Comm Format: **Data – INT**

Module Properties Report: Local (ETHERNET-MODULE 1.001)

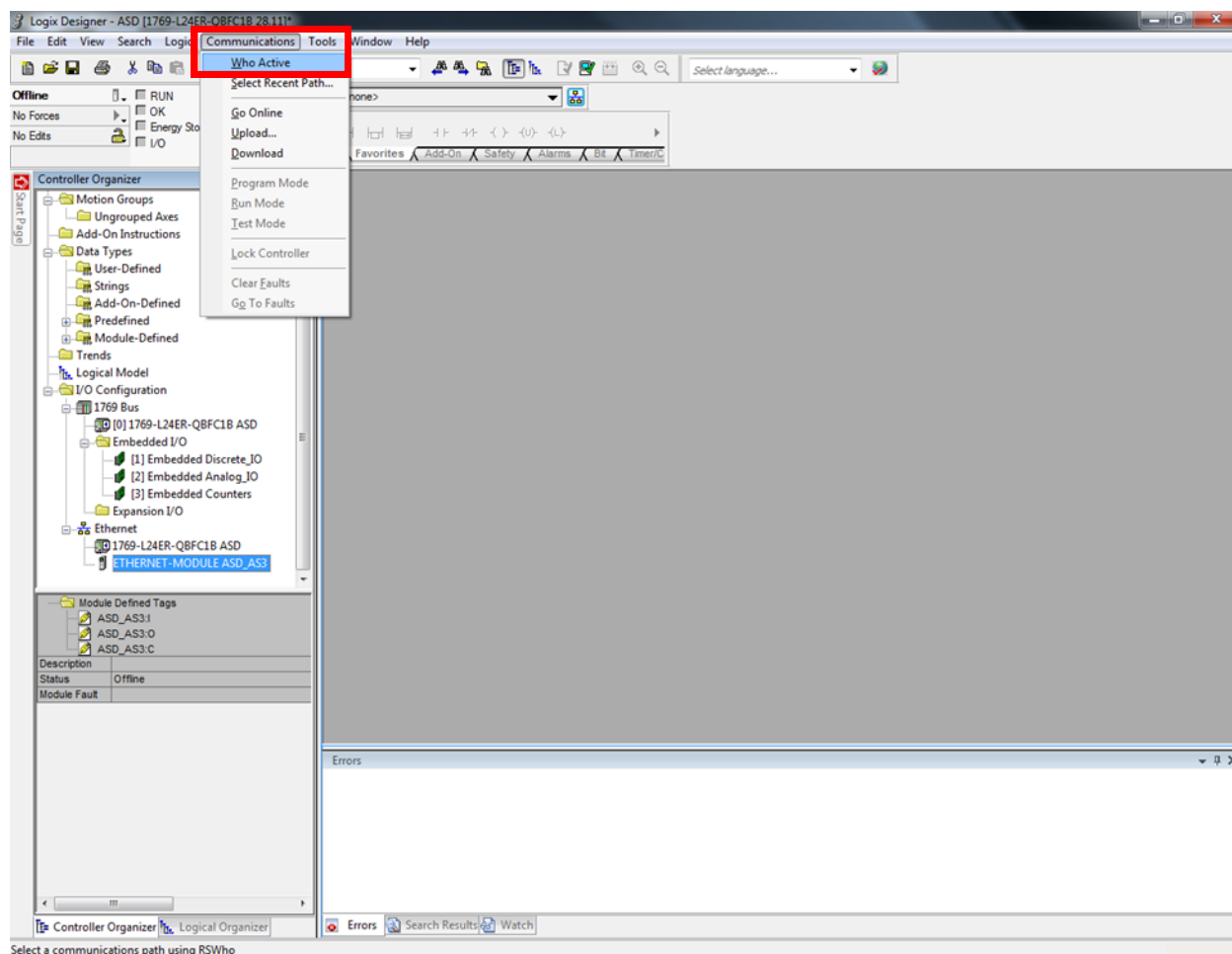
General* Connection Module Info

Type: ETHERNET-MODULE Generic Ethernet Module
Vendor: Allen-Bradley
Parent: Local
Name: **ASD_AS3**
Description:
Comm Format: **Data - INT**
Address / Host Name
☒ IP Address: **192 . 168 . 1 . 3**
☐ Host Name:
Connection Parameters
Input: Assembly Instance: **150** Size: **2** (16-bit)
Output: Assembly Instance: **100** Size: **2** (16-bit)
Configuration: Assembly Instance: **1** Size: **0** (8-bit)
Status Input:
Status Output:
Status: Offline
OK Cancel Apply Help

Setting Project Path and Going Online

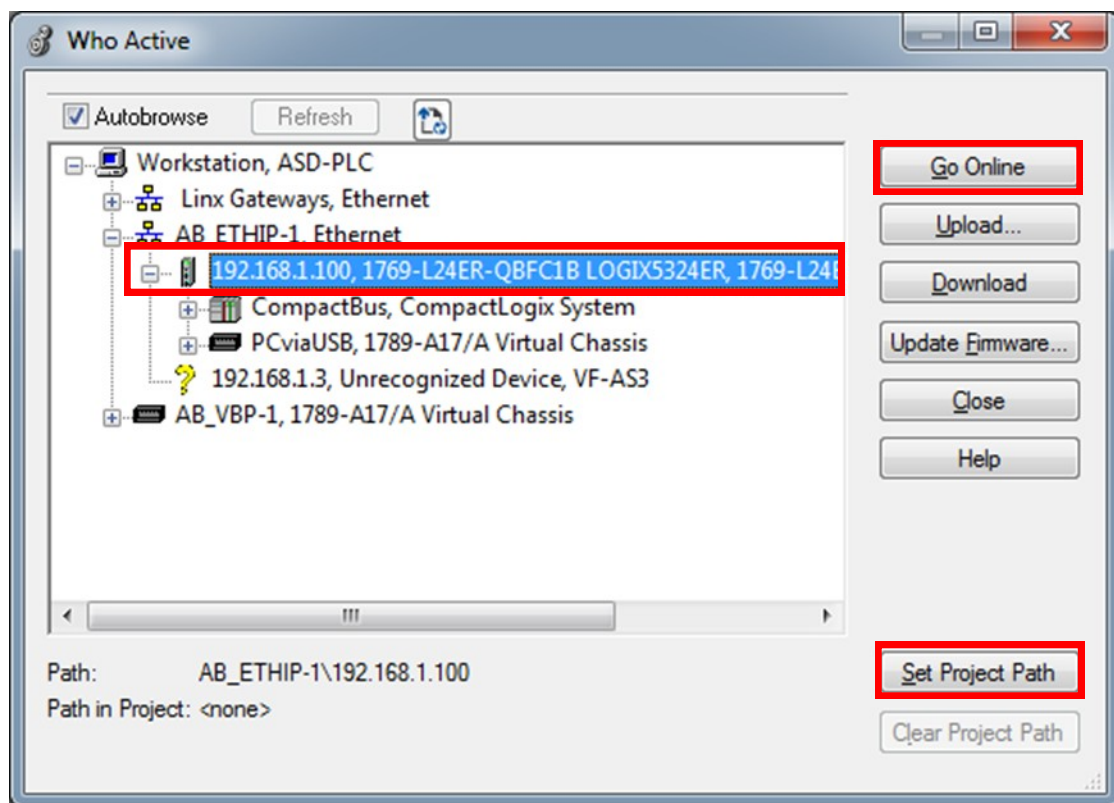
The network and module are now configured. The next step is to go online with the controller.

1. Open the **Communications** menu and select **Who Active**.



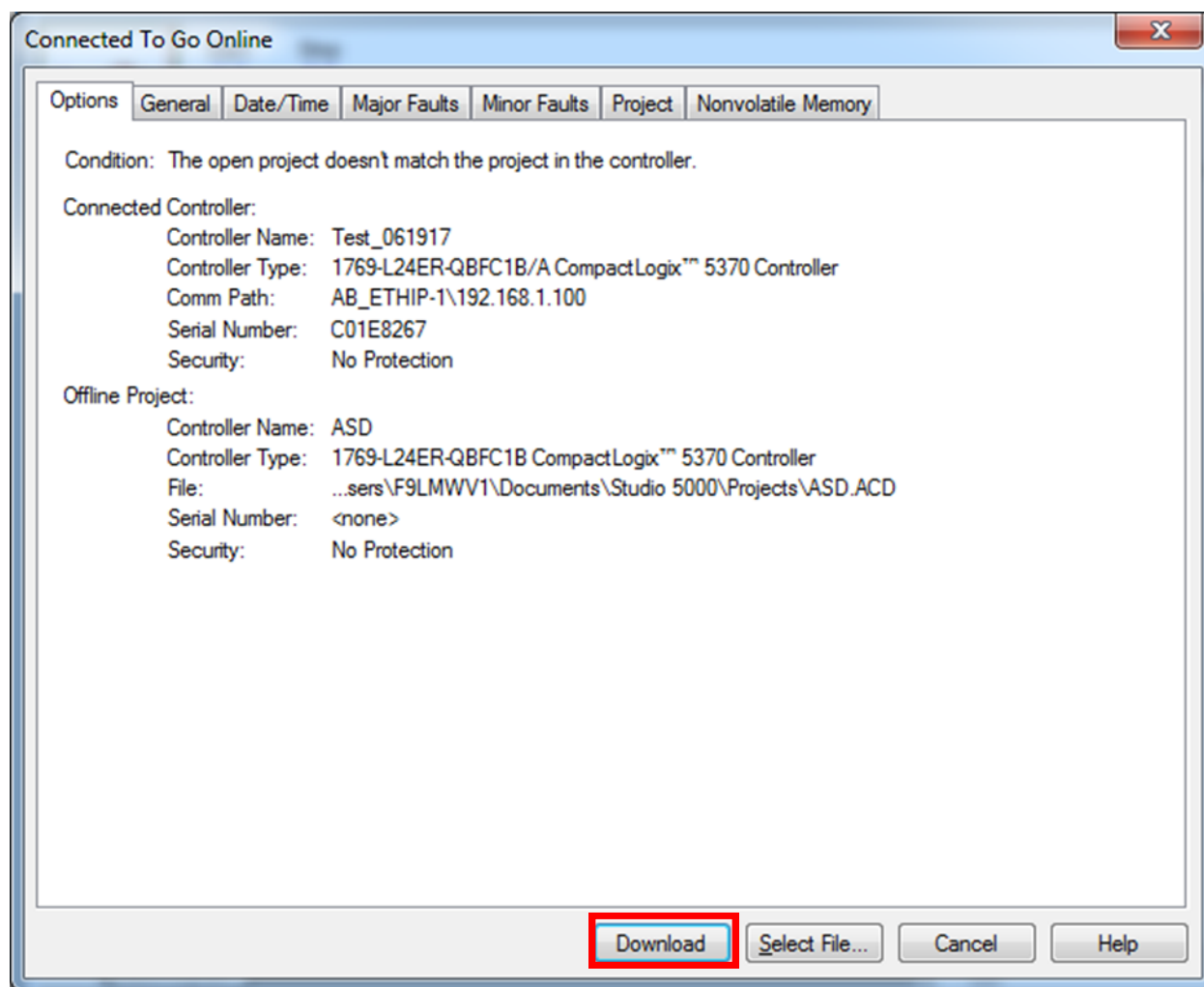
Setting Project Path and Going Online

2. From the **Who Active** screen, select the appropriate controller and set the **Project Path** and/or **Go Online** to download the new project to the controller. Notice the **Unrecognized Device, VF-AS3** connected in the Ethernet tab. This can be remedied by adding the AS3's .EDS file to recognize the connected ASD. This step is optional, but recommended and will be explained in **section 9, AS3's EDS, Adding the AS3 .EDS File (Optional), page 29**.



Setting Project Path and Going Online

3. The controller now compares the project in the controller to the current offline project. If the project is different, the prompt below will appear to download the offline project to the controller.

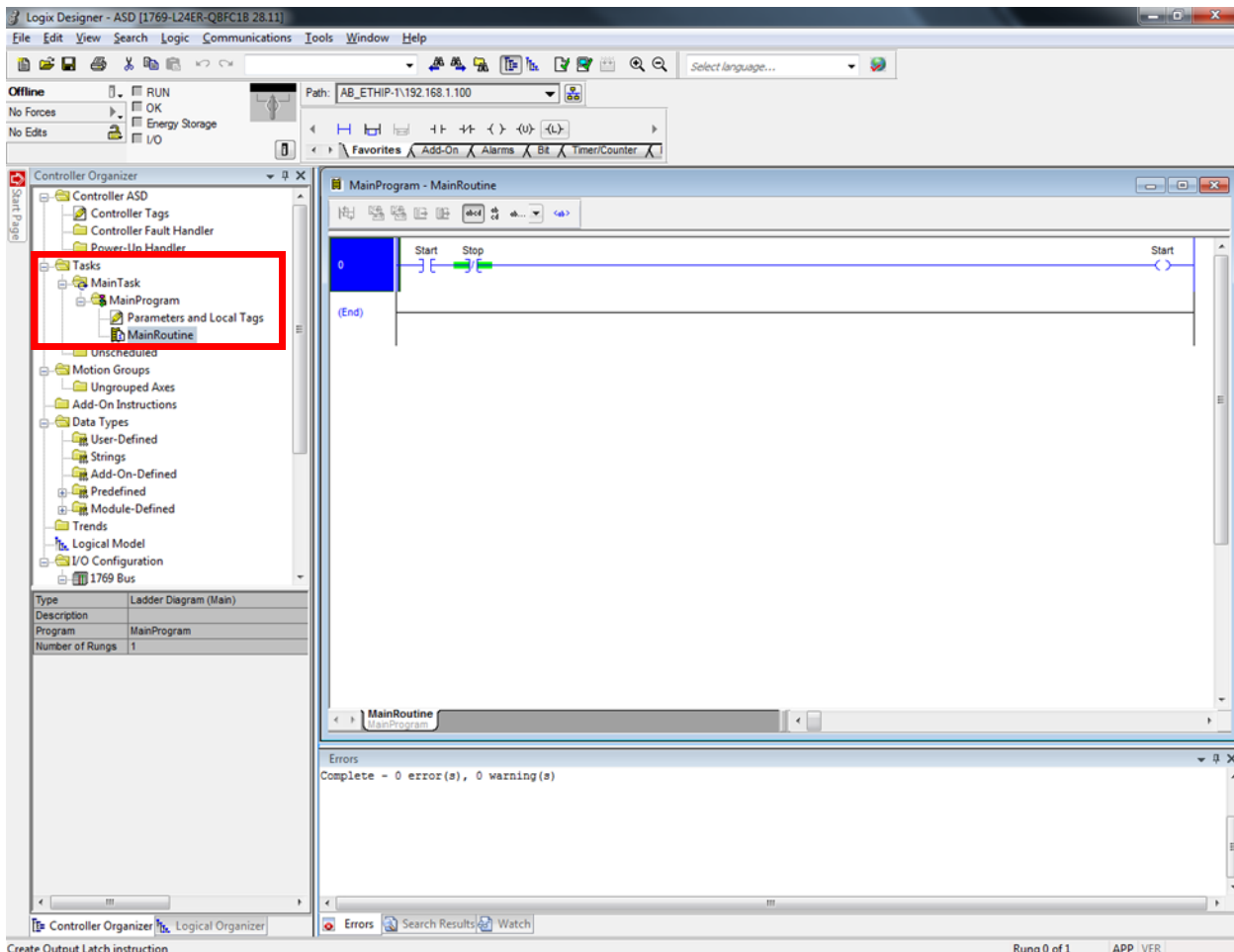


1 of 2

Setting Project Path and Going Online

- Once online, set the controller to **Run Mode** via the front controller switch or go to the **Communications** menu and select **Run Mode**.

Note: An error may occur in a new project during the download due the no rungs or logic in the current program. To continue the tutorial, create a generic rung in the **MainRoutine** as shown below. A more complete rung example is shown in **section 8, Example: Basic Start Stop Rung**, **page 28**, using the **AS3 Controller Tags**.



Toshiba AS3 Assembly Instance 150/100

The two most common I/O Assembly Instances for the Toshiba AS3 ASD are instances **100/150** and **102/152**. Instance 102/152 allows the user to customize the type of I/O data using the drive parameters C641 through C660. Please reference E6582125 – AS3 Embedded Ethernet Function Manual found at www.toshiba.com/tic/ for additional information on the AS3 Embedded Ethernet functionality and other I/O Assembly Instances.

The Ethernet module configuration programmed in this document utilizes Instance **100/150**, which allocates 2 Words (16 Bits) each for the Output Control and Input Feedback.

Module Properties Report: Local (ETHERNET-MODULE 1.001)

General* Connection Module Info

Type: ETHERNET-MODULE Generic Ethernet Module
Vendor: Allen-Bradley
Parent: Local
Name: ASD_AS3
Description:
Comm Format: Data - INT
Address / Host Name
☒ IP Address: 192 . 168 . 1 . 3
☐ Host Name:
Status: Offline

Connection Parameters

	Assembly Instance:	Size:	
Input:	150	2	(16-bit)
Output:	100	2	(16-bit)
Configuration:	1	0	(8-bit)
Status Input:			
Status Output:			

OK Cancel Apply Help

Toshiba AS3 Assembly Instance 150/100

Controller Output (ASD Input) Instance 100 utilizes 2 Words (0,1) labeled from Bit 0 to Bit 15 each and is primarily used for Run/Stop and Speed Reference to the ASD.

The first Word in Instance 100 provides basic drive control such as preset speeds, forward/reverse, run/stop, emergency stop, fault reset, and communication override:

For example: Activating Word 0, Bit 10 will send a Run command to the ASD.

The second Word provides the speed reference to the ASD in decimal format labeled in Hz:

For example: Entering “6000” in decimal format in Word 1 will result in a 60.00 Hz speed reference to the ASD.

Instance 100 Mapping

Word 0	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
	Preset Speed 1	Preset Speed 2	Preset Speed 3	Preset Speed 4	V/f Switching	PID Off	AccDec 1/ AccDec 2	DC Braking
	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15
	Jog Run	Forward/ Reverse	Run/Stop	Free Run (ST)	Emergency Stop	Reset Trip	Speed Ref Override	Control Ref Override
Word 1	Drive Speed Reference in Hz (decimal format)							

Toshiba AS3 Assembly Instance 150/100

Similarly, controller Input (ASD Output) Instance 150 utilizes 2 Words (0,1) labeled from Bit 0 to Bit 15 each and is primarily used for Status Feedback and Speed Feedback.

The first Word in Instance 150 provide basic ASD status feedback such as fault status, alarm status, undervoltage, running in forward, or reverse and ready to run:

For example: An active Word 0, Bit 0 indicates the ASD is currently faulted.

The second word provides speed feedback from the ASD in decimal format labeled in Hz.

For example: Receiving “6000” in decimal format in Word 1 indicates the drive is running at 60.00 Hz.

Instance 150 Mapping

Word 0	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
	Faulted	Emergency Stopped	Alarm	Under Voltage	V/F 2	PID	AccDec Mode	DC Braking
	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15
	Jog Running	Forward/ Reverse	Run/Stop	Free Run (ST)	Emergency Stopping	Ready with ST	Ready without ST	Hand/Auto
Word 1	Drive Speed Feedback in Hz (decimal format)							

Testing with Controller Tags

a. Example: Input Fault Status

The Studio (RXLogix) 5000 controller tags will display the Input Instance 150 mapping as Word 0 and Word 1 each labeled from Bit 0 to Bit 15.

As shown below the first word in the Controller Tags window under **ASD_AS3.I.Data** can be expanded to show the 16 Bits mapped above.

For example: The **ASD_AS3.I.Data[0]** indicates Word 0 from the Instance 100 mapping and is expanded to display all 16 Bits. **ASD_AS3.I.Data[0].14** (Bit 14) is active and indicates the ASD is Ready to Run.

The screenshot shows the Logix Designer interface with the Controller Tags window open. The scope is set to ASD. The tag list shows ASD_AS3.I.Data[0] expanded, displaying 16 bits. Bit 14 is highlighted in red, indicating it is active (Value 1). The Properties window on the right shows details for the selected tag.

Name	Value	Force Mask	Style	Data Type	Description
ASD_AS3.C	{...}	{...}		AB.ETHERNET_...	
ASD_AS3.I	{...}	{...}		AB.ETHERNET_...	
ASD_AS3.I.Data	{...}	{...}	Decimal	INT[2]	
ASD_AS3.I.Data[0]	16384		Decimal	INT	
ASD_AS3.I.Data[0].0	0		Decimal	BOOL	
ASD_AS3.I.Data[0].1	0		Decimal	BOOL	
ASD_AS3.I.Data[0].2	0		Decimal	BOOL	
ASD_AS3.I.Data[0].3	0		Decimal	BOOL	
ASD_AS3.I.Data[0].4	0		Decimal	BOOL	
ASD_AS3.I.Data[0].5	0		Decimal	BOOL	
ASD_AS3.I.Data[0].6	0		Decimal	BOOL	
ASD_AS3.I.Data[0].7	0		Decimal	BOOL	
ASD_AS3.I.Data[0].8	0		Decimal	BOOL	
ASD_AS3.I.Data[0].9	0		Decimal	BOOL	
ASD_AS3.I.Data[0].10	0		Decimal	BOOL	
ASD_AS3.I.Data[0].11	0		Decimal	BOOL	
ASD_AS3.I.Data[0].12	0		Decimal	BOOL	
ASD_AS3.I.Data[0].13	0		Decimal	BOOL	
ASD_AS3.I.Data[0].14	1		Decimal	BOOL	
ASD_AS3.I.Data[0].15	0		Decimal	BOOL	
ASD_AS3.I.Data[1]	0		Decimal	INT	
ASD_AS3.O	{...}	{...}		AB.ETHERNET_...	
Local:1.C	{...}	{...}		AB.Embedded_Di...	
Local:1.I	{...}	{...}		AB.Embedded_Di...	
Local:1.O	{...}	{...}		AB.Embedded_Di...	
Local:2.C	{...}	{...}		AB.Embedded_Di...	

Properties window details for ASD_AS3.I.Data[0].14:

- Name: ASD_AS3.I.Data[0].14
- Description: ASD_AS3.I.Data[0].14
- Usage: Base
- Type: Base
- Alias For: Base Tag
- Base Tag: Base Tag
- Data Type: INT
- Scope: ASD
- External Access: Read/Write
- Style: Decimal
- Constant: No
- Required: No
- Visible: No

Errors window shows:

```

Downloading Controller attributes...
Downloading Controller Extended Properties...
Linking all Routines...
Linking routine 'MainRoutine' of program 'MainProgram'
Finalizing download...
Reading ChangeLog...
Complete - 0 error(s), 0 warning(s)
    
```

Testing with Controller Tags

a. Example: Input Fault Status

The example screenshot below shows Controller Tags **ASD_AS3:I.Data[0].0**, **ASD_AS3:I.Data[0].1** and **ASD_AS3:I.Data[0].12** (Bits 0, 1 and 12) are active, indicating that the ASD is Faulted, Emergency Stopped, and Emergency Stopping.

The screenshot shows the Logix Designer interface with the following components:

- Controller Organizer:** Displays the project structure, including Controller ASD, MainTask, MainProgram, and various data types.
- Controller Tags - ASD(controller):** A table listing controller tags. The table has columns for Name, Value, Force Mask, Style, Data Type, and Description. The following tags are highlighted with red boxes:

Name	Value	Force Mask	Style	Data Type	Description
ASD_AS3:I.Data[0].0	1	1	Decimal	BOOL	
ASD_AS3:I.Data[0].1	1	1	Decimal	BOOL	
ASD_AS3:I.Data[0].12	1	1	Decimal	BOOL	
- Properties Window:** Shows the properties for the selected tag ASD_AS3:I.Data[0].0, including Name, Description, Usage, Type, Base Tag, Alias For, Base Tag, Data Type, Scope, External Access, Style, Constant, Required, and Visible.
- Errors Window:** Displays the status of the download process, showing messages such as "Downloading Controller attributes...", "Linking routine 'MainRoutine' of program 'MainProgram'", and "Complete - 0 error(s), 0 warning(s)".

Testing with Controller Tags

b. Example: Output Run and Communication Override

The example displayed below are the Output Controller Tags for an AS3 drive running at 60.00 Hz. From the Controller Tags window, expand the first Word under **ASD_AS3.O.Data** to show the 16 Bits from the Output Instance 150 mapping.

To run the drive using the embedded Ethernet connection both parameters CMod (Run command select) and FMod (Freq command select 1) need to be changed to Embedded Ethernet. By default, these parameters are set to Terminal and Terminal RR.

Writing 6000 into the second Word **ASD_AS3.O.Data[1]** will send a 60.00 Hz speed command to the ASD via Ethernet IP.

The screenshot shows the Logix Designer interface for an ASD controller. The main window displays the 'Controller Tags - ASD(controller)' table. The table has columns: Name, Value, Force Mask, Style, Data Type, and Description. The tag 'ASD_AS3.O.Data[1]' is highlighted with a red box. The Properties window on the right shows details for the selected tag, including Name, Description, Usage, Type, Base Tag, Alias For, Base Tag, Data Type, Scope, External Access, Style, Constant, Required, and Visible. The bottom status bar indicates 'Complete - 0 error(s), 0 warning(s)'.

Name	Value	Force Mask	Style	Data Type	Description
ASD_AS3.I	{...}	{...}		AB.ETHERNET_...	
ASD_AS3.I.Data	{...}	{...}	Decimal	INT[2]	
ASD_AS3.I.Data[0]	25600		Decimal	INT	
ASD_AS3.I.Data[1]	6000		Decimal	INT	
ASD_AS3.O	{...}	{...}		AB.ETHERNET_...	
ASD_AS3.O.Data	{...}	{...}	Decimal	INT[2]	
ASD_AS3.O.Data[0]	-15360		Decimal	INT	
ASD_AS3.O.Data[0].0	0		Decimal	BOOL	
ASD_AS3.O.Data[0].1	0		Decimal	BOOL	
ASD_AS3.O.Data[0].2	0		Decimal	BOOL	
ASD_AS3.O.Data[0].3	0		Decimal	BOOL	
ASD_AS3.O.Data[0].4	0		Decimal	BOOL	
ASD_AS3.O.Data[0].5	0		Decimal	BOOL	
ASD_AS3.O.Data[0].6	0		Decimal	BOOL	
ASD_AS3.O.Data[0].7	0		Decimal	BOOL	
ASD_AS3.O.Data[0].8	0		Decimal	BOOL	
ASD_AS3.O.Data[0].9	0		Decimal	BOOL	
ASD_AS3.O.Data[0].10	0	1	Decimal	BOOL	
ASD_AS3.O.Data[0].11	0		Decimal	BOOL	
ASD_AS3.O.Data[0].12	0		Decimal	BOOL	
ASD_AS3.O.Data[0].13	0		Decimal	BOOL	
ASD_AS3.O.Data[0].14	1		Decimal	BOOL	
ASD_AS3.O.Data[0].15	1		Decimal	BOOL	
ASD_AS3.O.Data[1]	6000		Decimal	INT	
Local I.C	{...}	{...}		AB Embedded Di...	
Local I.C	{...}	{...}		AB Embedded Di...	

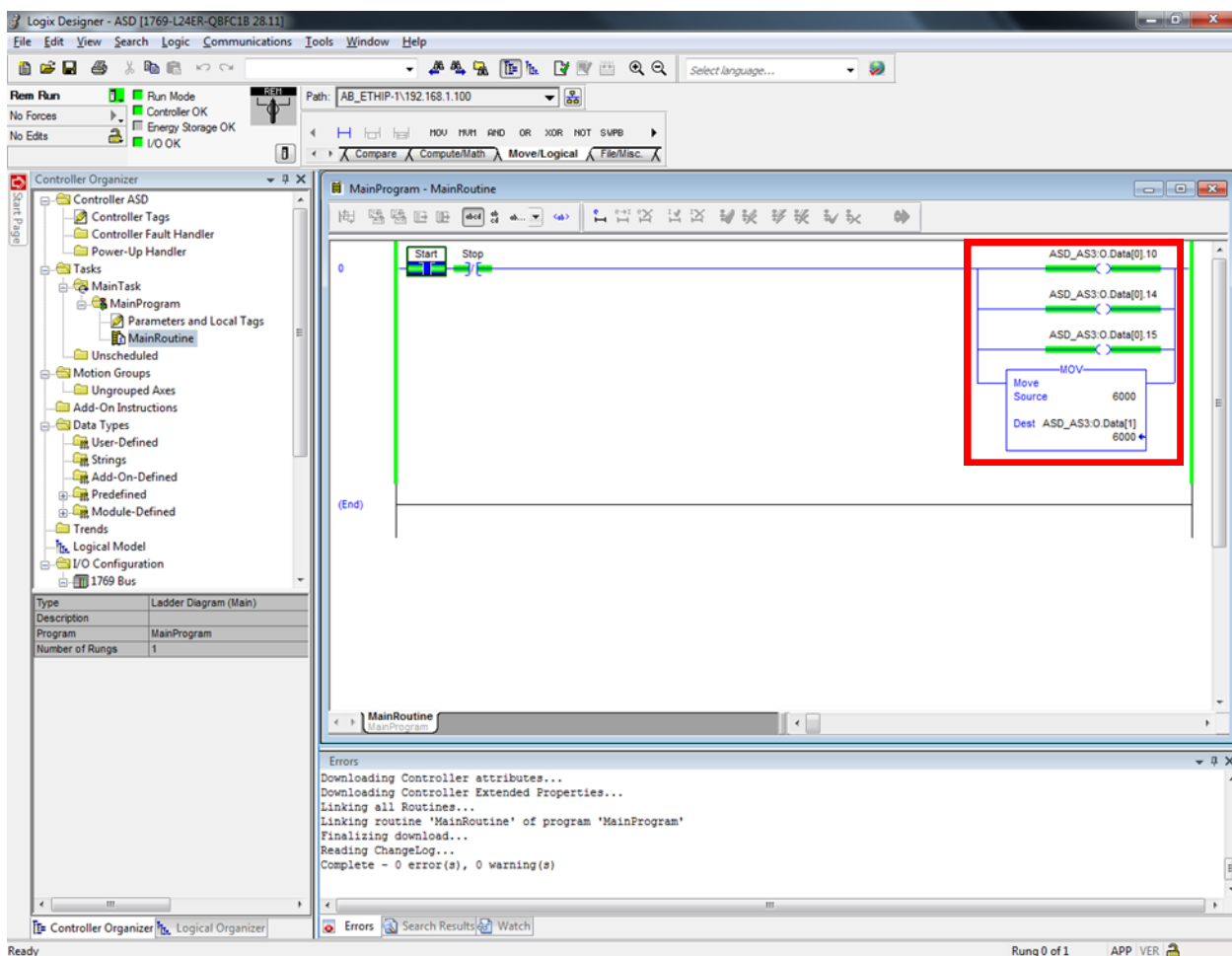
Example: Basic Start Stop Rung Example

Using the same project created above, the add 3 coils and a MOV block into the Start Stop rung in the Main-Routine ladder logic.

Point each coil to **ASD_AS3.O.Data(0).10**, **ASD_AS3.O.Data(0).14** and **ASD_AS3.O.Data(0).15** which correlates with Run/Stop, Speed Ref Override and Control Ref Override from Instance 150 mapping.

Move a speed reference value into destination **ASD_AS3.O.Data(1)** which correlates to the second speed reference Word from Instance 150 mapping.

Once Online, toggle the Start Contact bits in order to send a run command and a speed reference to the drive.



Adding the AS3 .EDS File (Optional)

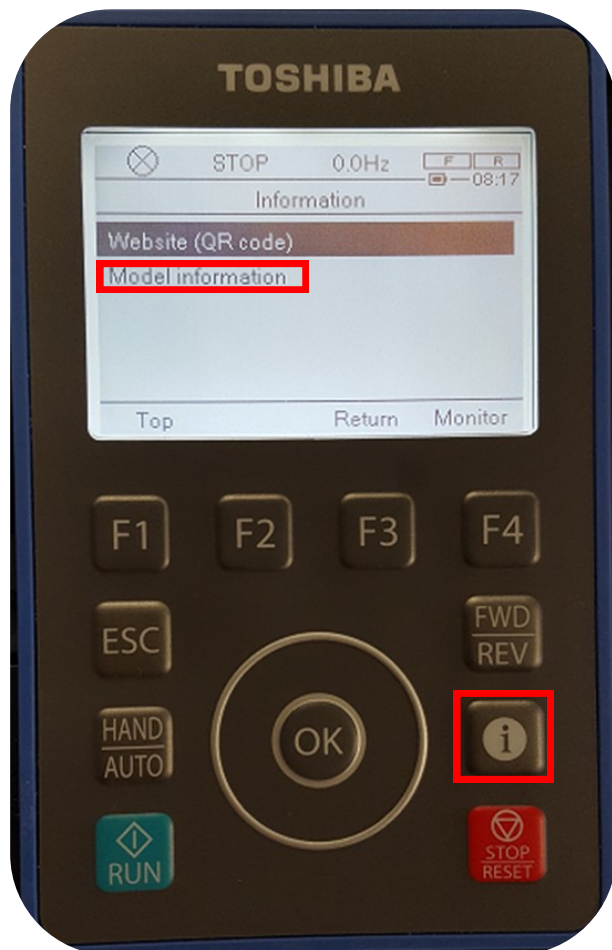
a. Finding the AS3 CPU Version Number

EDS files are used by the network as a configuration file to identify unknown objects for commissioning. Loading an EDS file is not required, but is recommended.

To add an EDS file, download the correct EDS file version from www.toshiba.com/tic/. EDS files are ASD CPU version specific. However, an entire directory may be downloaded and the network will automatically identify the correct EDS file for use.

To find the AS3 CPU version number:

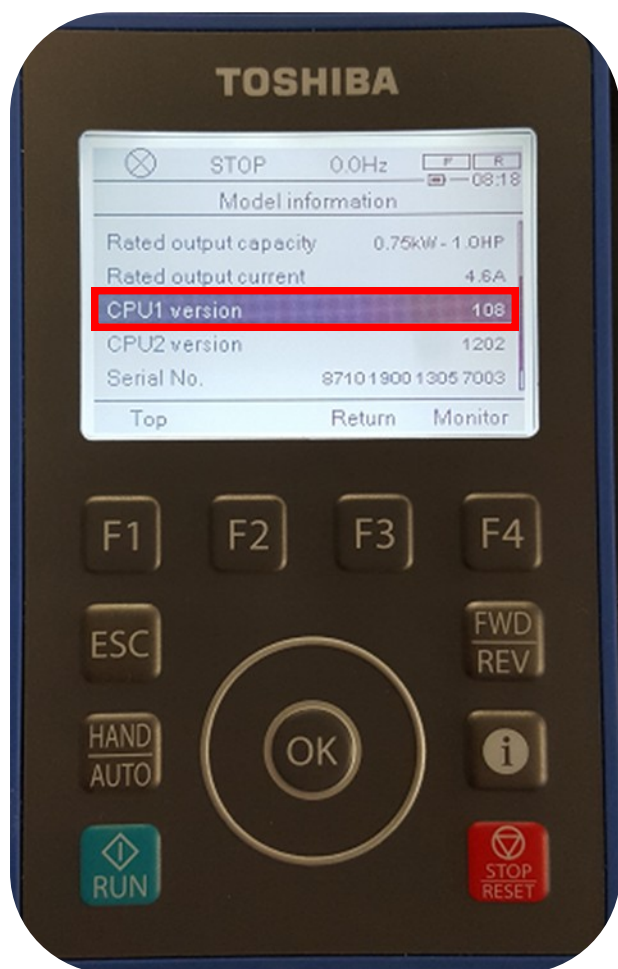
1. Press  on the keypad to access the Information menu.



Adding the AS3 .EDS File (Optional)

a. Finding the AS3 CPU Version Number

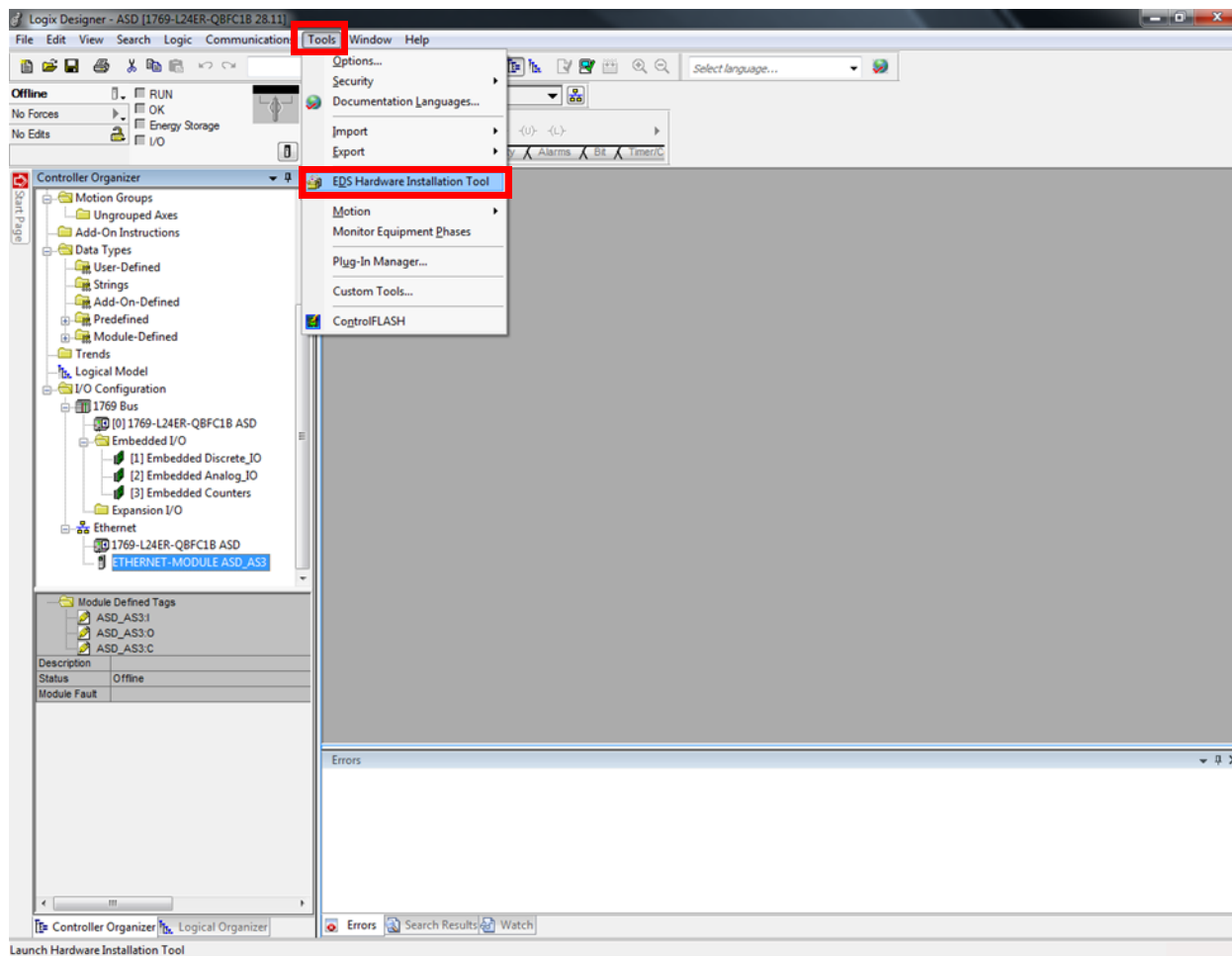
2. Press and select **Model information**. The drive CPU version number is located next to **CPU1 version**. Note this version number and download the correct EDS file(s) from www.toshiba.com/tic/.



Adding the AS3 .EDS File (Optional)

b. Adding an .EDS File in Studio (RSLogix) 5000

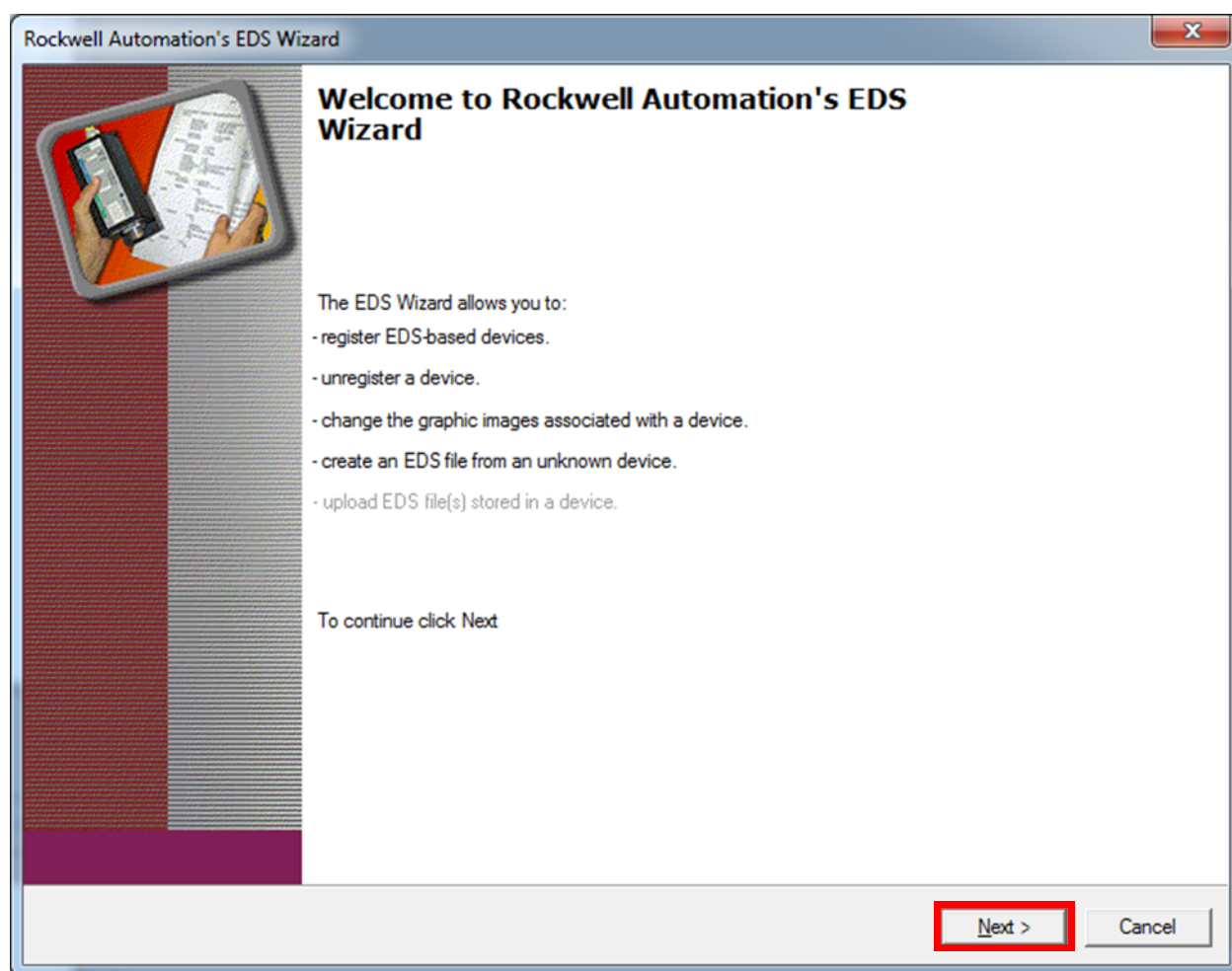
1. Open the **Tools** menu and select **EDS Hardware Installation Tool**.



Adding the AS3 .EDS File (Optional)

b. Adding an .EDS File in Studio (RSLogix) 5000

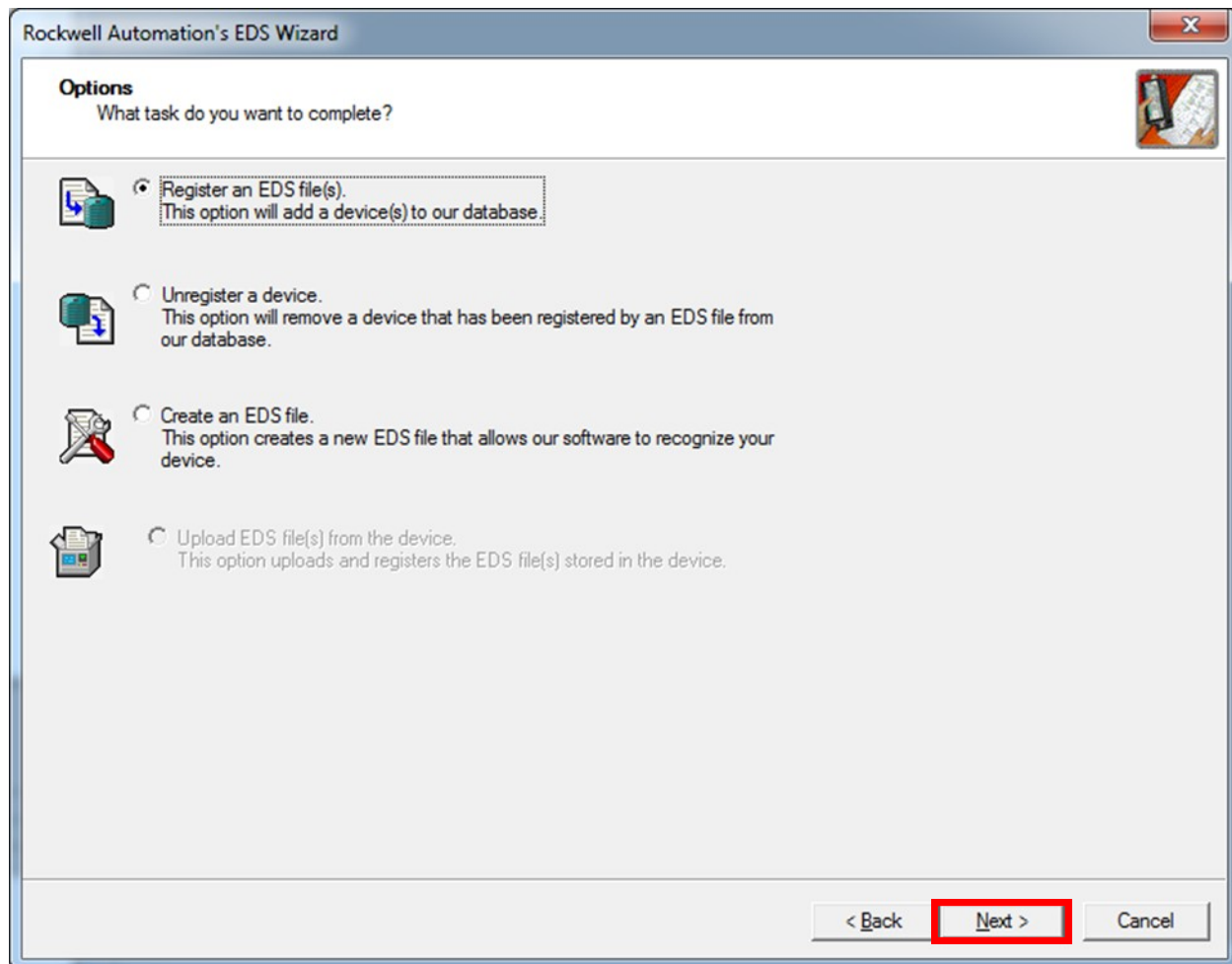
2. Click **Next**.



Adding the AS3 .EDS File (Optional)

b. Adding an .EDS File in Studio (RSLogix) 5000

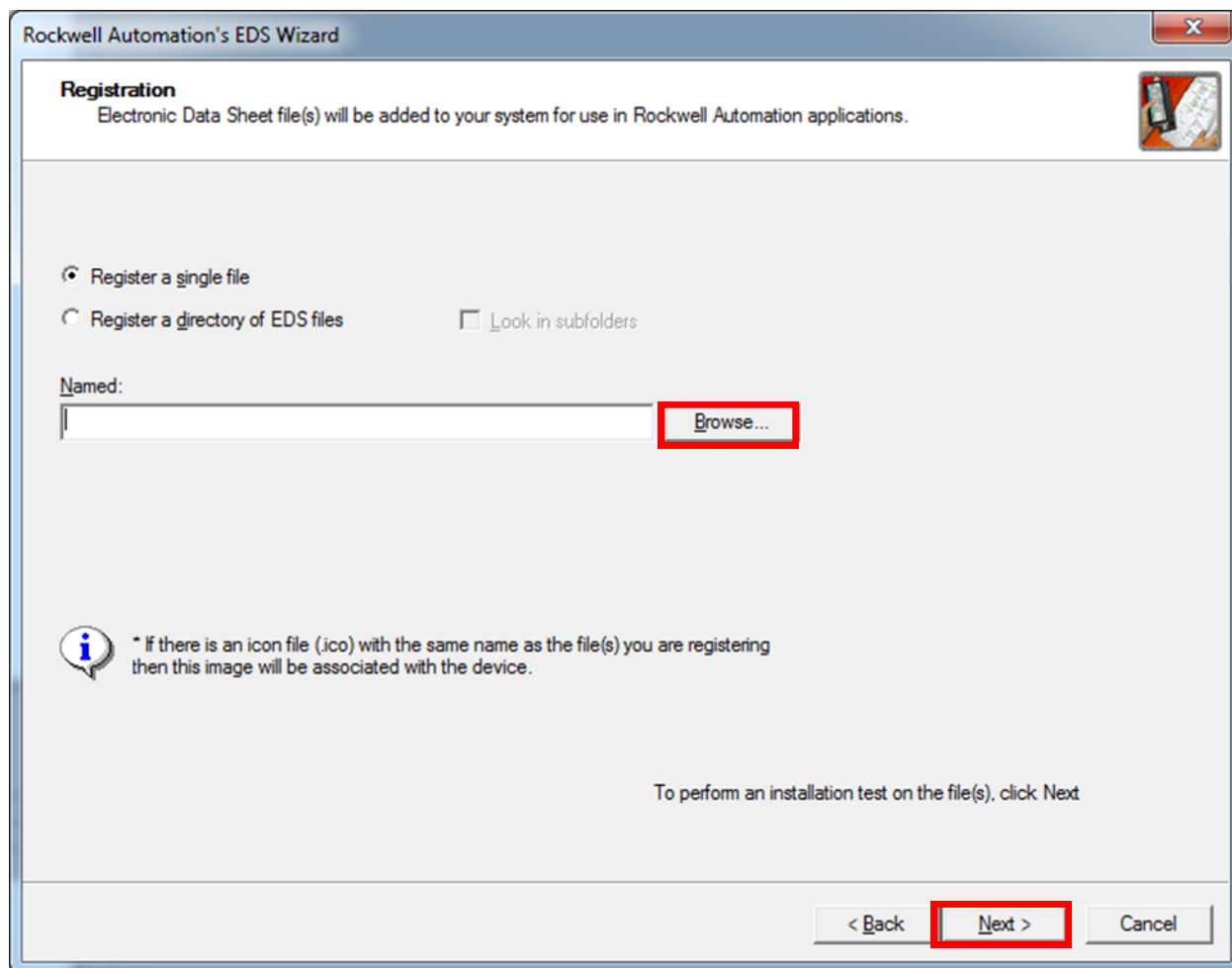
3. Select **Register an EDS file(s)** and click **Next**.



Adding the AS3 .EDS File (Optional)

b. Adding an .EDS File in Studio (RSLogix) 5000

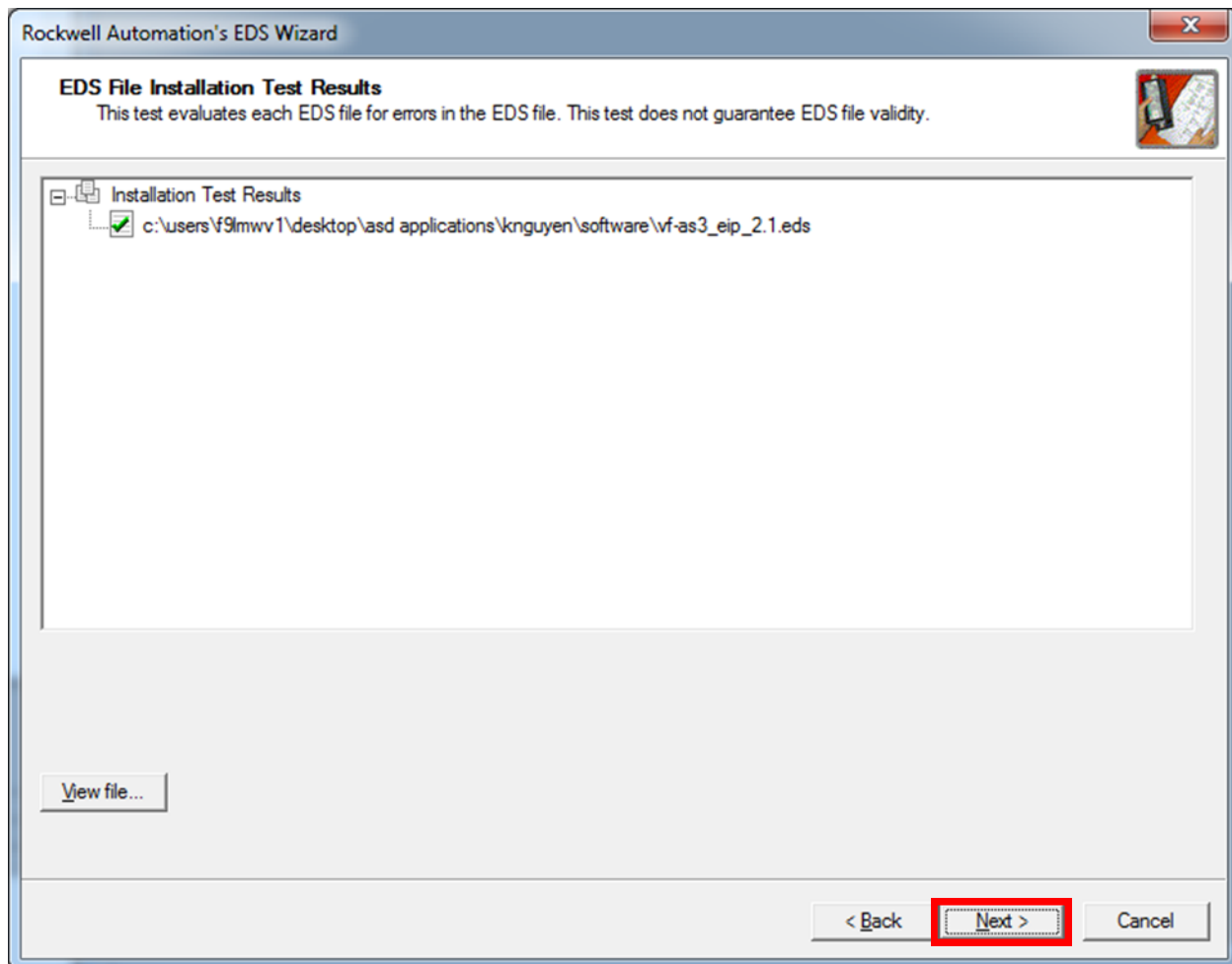
4. Select **Register a single file** for one EDS file or **Register a directory of EDS files** to download multiple EDS files. Click **Browse** and select the file or folder directory containing the EDS file downloaded from www.toshiba.com/tic/. The network will automatically select the correct EDS file if the directory downloaded contains the correct file. Click **Next**.



Adding the AS3 .EDS File (Optional)

b. Adding an .EDS File in Studio (RSLogix) 5000

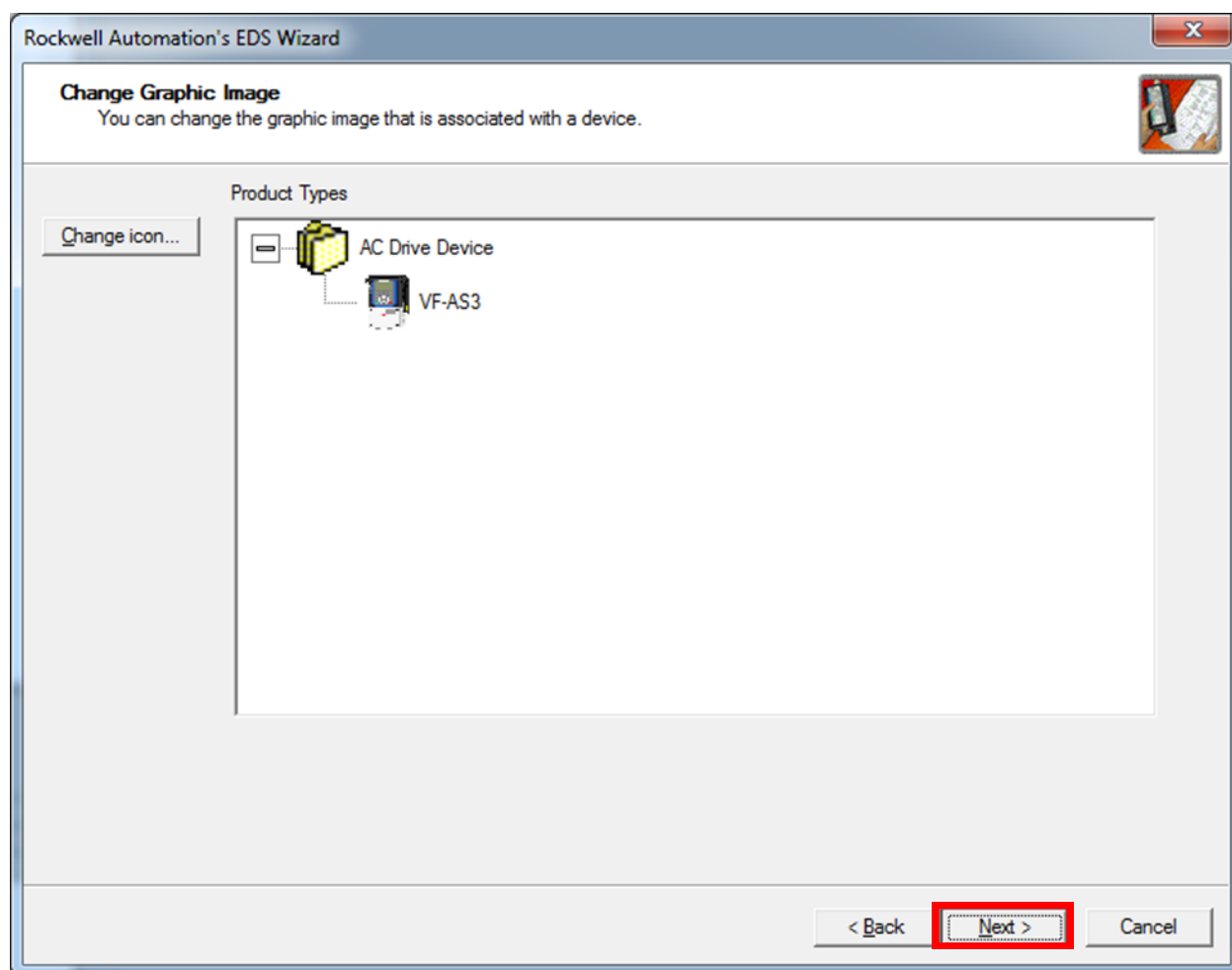
5. Click **Next**.



Adding the AS3 .EDS File (Optional)

b. Adding an .EDS File in Studio (RSLogix) 5000

6. The newly registered device and icon downloaded will populate here. Click **Next** and **Finish**.



Adding the AS3 .EDS File (Optional)

b. Adding an .EDS File in Studio (RSLogix) 5000

7. A quick final check can be done by opening RSLinx and verifying the **Unrecognized Device** is registered as **VF-AS3** with the appropriate icon.

