Allen-Bradley

# ControlLogix Starter Kit

**1756-STRT3**

**Quick Start Manual**

Rockwell Automation

## Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards. In no event will Allen-Bradley be responsible or liable for indirect or consequential damage resulting from the use or application of these products.

Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.



Throughout this publication, notes may be used to make you aware of safety considerations. The following annotations and their accompanying statements help you to identify a potential hazard, avoid a potential hazard, and recognize the consequences of a potential hazard:

**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.

**ATTENTION**

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

**IMPORTANT**

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

## Table of Contents

**Notes:**_____

## Welcome to ControlLogix Controller Quick Start: About the Exercises

The objective of these exercises is to introduce you to the ControlLogix controller and the RSLogix 5000 programming software. The ControlLogix controller is part of the Logix family of controllers, including the CompactLogix, FlexLogix, and SoftLogix5800 platforms.

During these exercises, you create and edit a Controller1.ACD file. You will also use the following files:

- ImportExport.ACD
- ReusableCode.ACD
- UserDefined.ACD
- ControlLogixSampleTags.CSV

See http://www.ab.com/logix/controllogix/programfiles for these additional files. They are in a zip file named control_verA.zip. After you install the RSLogix 5000 software and you download the zip file, unzip the contents to: C:\RSLogix 5000\Projects. This is the default directory for RSLogix 5000 software project files. You can save to a different location, just remember the location when you are prompted to open one of the above files.

### About the ControlLogix Platform

The ControlLogix platform provides a modular control platform suited for sequential, process, drive, or motion control - in any combination. With this platform, you can mix multiple processors, networks, and I/O without restrictions. And as your system grows, you can use the ControlNet network to distribute control to additional chassis and/or other Logix platforms.

A ControlLogix system can consist of anything from a stand-alone controller and I/O modules in a single chassis, to a highly distributed system consisting of multiple chassis and networks working together. ControlLogix will fit your applications if they:

- require a high performance control solution
- demand the integration of multiple control disciplines (e.g., high speed packaging machines integrating sequential and motion control, or web handling applications integrating sequential and drive control)
- combine batch and process control, but seek a flexible choice of visualization software
- require a plant-wide control solution, from incoming materials to outbound shipping
- expand an existing investment in a PLC-5 or SLC 500 controller-based system

### About the FlexLogix Platform

The FlexLogix platform combines the high performance Logix control engine with the popular distributed FLEX I/O to provide a cost-effective distributed controller. The FlexLogix system is built on these components:

- a FlexLogix controller which supports Logix instructions
- RSLogix 5000 programming software
- FLEX I/O modules which provide a compact, DIN-rail mounted I/O system
- a 1788 communication daughtercard which provides communication over a standards-based ControlNet network

A simple FlexLogix system can consist of a single, stand-alone assembly with one controller and as many as eight I/O modules, or you can use multiple controllers across networks and distribute multiple I/O platforms over multiple I/O links. FlexLogix will fit your applications if:

- you are already using FLEX I/O and are looking for a simple way to add control to your distributed architecture
- you are currently using a centralized control architecture to control multiple stations in a process

### About the CompactLogix Platform

The features, scalability, and small size of the CompactLogix platform provide a powerful alternative for machine-level control, material handling, data acquisition, and other applications requiring limited I/O (up to 128 points) and limited communications capability.

CompactLogix will fit your applications if:

- you are an existing Logix customer with lower-end, lower-cost control applications
- you are a new customer who wishes to apply Logix technology, but at a lower initial investment
- you are an existing PLC and/or SLC customer who wishes to convert to Logix technology
- you run SCADA/RTU applications within a range of industries (e.g., petrochemical, wastewater, etc.)

### About the SoftLogix Platform

The SoftLogix platform is a PC-based control system that integrates sequential and motion control. The SoftLogix system is built on these components:

- the Logix control engine
- RSLogix 5000 programming software
- a virtual chassis application which runs on a Pentium-based computer

SoftLogix will fit your applications if:

- you are already using PC-based control
- you have a need for integrated motion capabilities
- you have a need for high-level information integration
- you want to completely customize your application

## Before You Begin

Before you begin these exercises, please be sure to close any applications that are currently running. The starter kit includes this equipment:

- **1756-L55M13 ControlLogix controller** (install in slot 0)
- **1756-A7 chassis with 7 slots**
- **1756-PA72 power supply**
- **1756-CP3 serial cable**
- **1756IB16 digital input module** (install in slot 1)
- **1756-IF8 analog input module** (install in slot 3)
- **1756-OB16E digital output module** (install in slot 2)
- **1756-OF4 analog output module** (install in slot 4)
- **1756-TBNH removable terminal block (three blocks for use with the 1756-IB16, 1756-OB16E, and 1756-OF4 modules)**
- **1756-TBS6H (for use with the 1756-IF8 module)**
- **9324-RLD300ENE RSLogix 5000 programming software, standard package**
- **1756-DPALEN ControlLogix controller documentation set**
- **1756-QS104A-EN-P ControlLogix quick start manual**

## Document Conventions

Throughout this manual, we have used the following conventions to help guide you through the exercises:

| This style or symbol: | Indicates: |
|---|---|
| Words shown in bold italics (e.g., ***RSLogix 5000***) | An item that you must click on or a menu name from which you must choose an option or command. |
| Words shown in single quotes (e.g., 'Controller1') | An item that you must type in the specified field. |
| **FYI** | The text that follows this symbol is additional information regarding the exercises, but not information that is required reading in order for you to complete the exercises |
| **Tip** | The text that follows this symbol provides you with helpful hints that may make it easier for you to use the software. |
| | The text that follows this symbol is a step in the exercise in which you are working. Place a checkmark in this box as you complete each step. |

Note, also, that if the mouse button is not specified in the text, you should click on the left mouse button.

## Installing the Hardware

For information on installing the ControlLogix controller, see the ControlLogix Controller Installation Instructions, publication *1756-IN101*. This publication is part of the documentation set, *1756-DPALEN*, that is included with the ControlLogix Starter Kit.

For information on installing the remaining hardware, see:

| Hardware | Documentation |
|---|---|
| 1756-PA72 | 1756-IN067 |
| 1756-IB16 | 1756-IN031 |
| 1756-IF8 | 1756-IN040 |
| 1756-OB16E | 1756-IN030 |
| 1756-OF4 | 1756-IN016 |

These publications are available as PDF files from the Automation Bookstore at http://www.theautomationbookstore.com/

## Installing the RSLogix 5000 Programming Software

The personal computer must meet these requirements:

- Pentium II 450 MHz (733 MHz recommended)
- 128 Mbytes of RAM (256 Mbytes recommended)
- 100 Mbytes of available hard disk space
- 800 x 600 video resolution (1024 x 768 recommended)

Before you install RSLogix 5000 programming software, you must:

- Make sure RSLinx software is already installed on the personal computer. If it is not, you can install RSLinx software from the CDs that come with RSLogix 5000 programming software.
- Install firmware onto the ControlLogix controller. The installation instructions for the controller (publication 1756-IN101) describe how to install the firmware. The firmware files are on the second CD that comes with the RSLogix 5000 software package.

When you insert the RSLogix 5000 installation CD into your CDROM drive, the CD automatically begins the Setup program for the programming software. If your computer meets the hardware and software requirements for the controller, you can install the programming software.

**Note:** These installation instructions are only a summary of the installation procedure. For the complete procedure, see the *RSLogix 5000 Programming Software Getting Results Guide*, publication 9399-RLD300GR. This document is available in PDF format on the RSLogix 5000 CD.

1. Select Install RSLogix 5000.

2. When prompted for a serial number, enter any sequence of characters, not longer than 10 characters in length. Press F1 if you need help.

3. When prompted, click Yes to complete the activation of the software.

   Follow the directions that appear on your screen.

4. Click on Finish to complete the installation.

   When the setup utility finishes, an entry for the RSLogix 5000 application program appears in the program list in the Rockwell Software group.

## Exercise 1:
## Creating a New Controller File and Configuring Your I/O

In this exercise, we introduce the ControlLogix controller. In this exercise, you:

- create a new controller file
- write ladder logic using symbolic tag names
- configure your I/O modules
- alias the module tags to the tags you created in your ladder logic

Follow the steps below to complete Exercise 1. **Place a checkmark in the square next to each step as you complete it.** This will help you keep your place as you work through the steps.

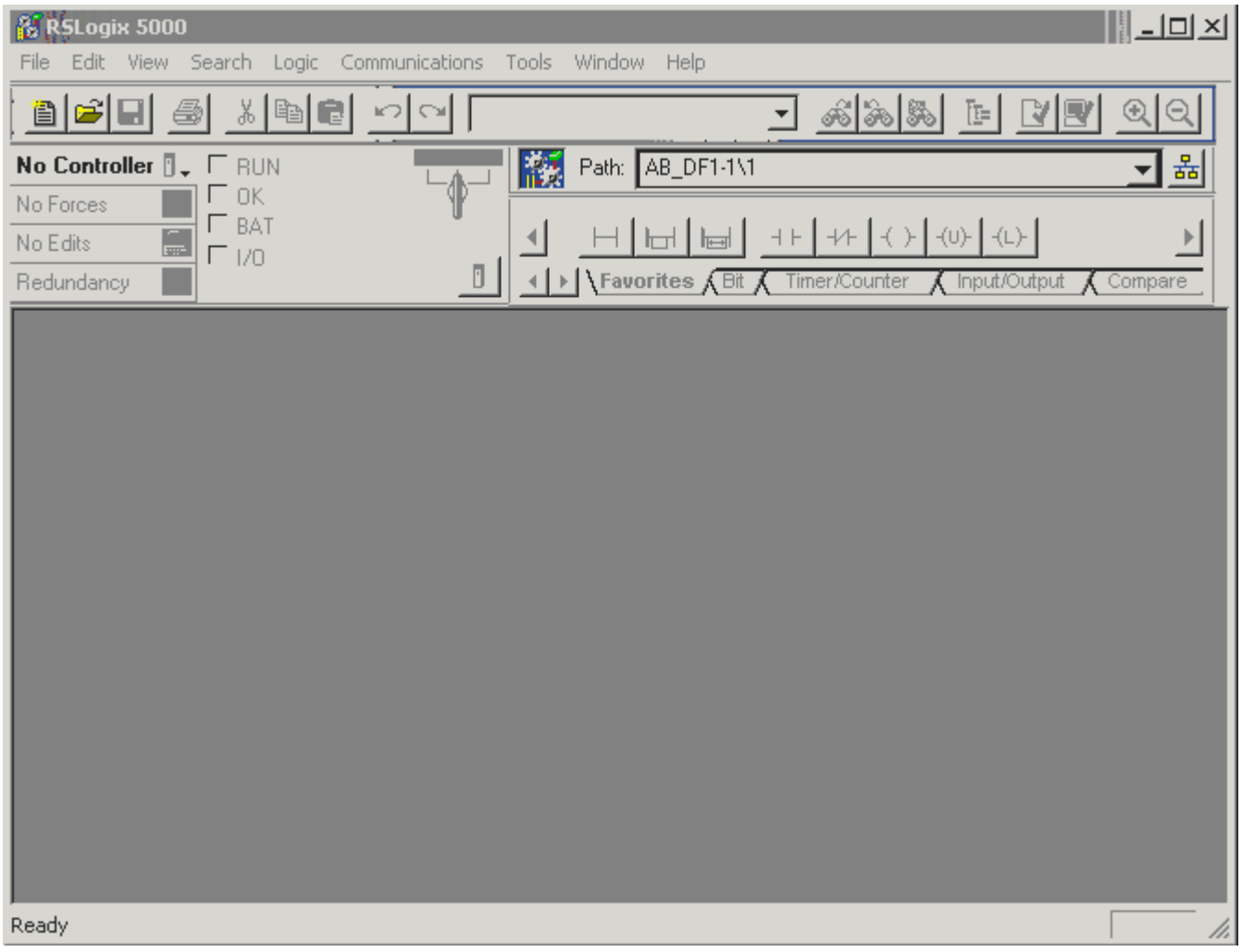
### Launching RSLogix 5000 Programming Software

Launch the RSLogix 5000 software, which allows you to program the controller.

☐ 1. Double click on the ***RSLogix 5000*** icon 

on the Desktop to launch RSLogix 5000 software.

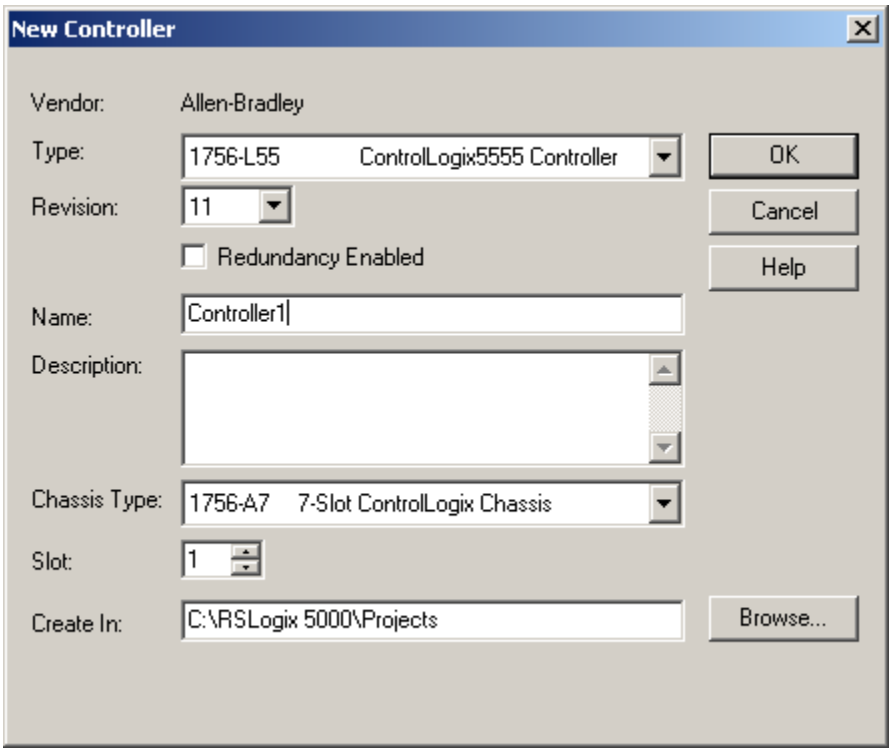
The RSLogix 5000 screen appears.



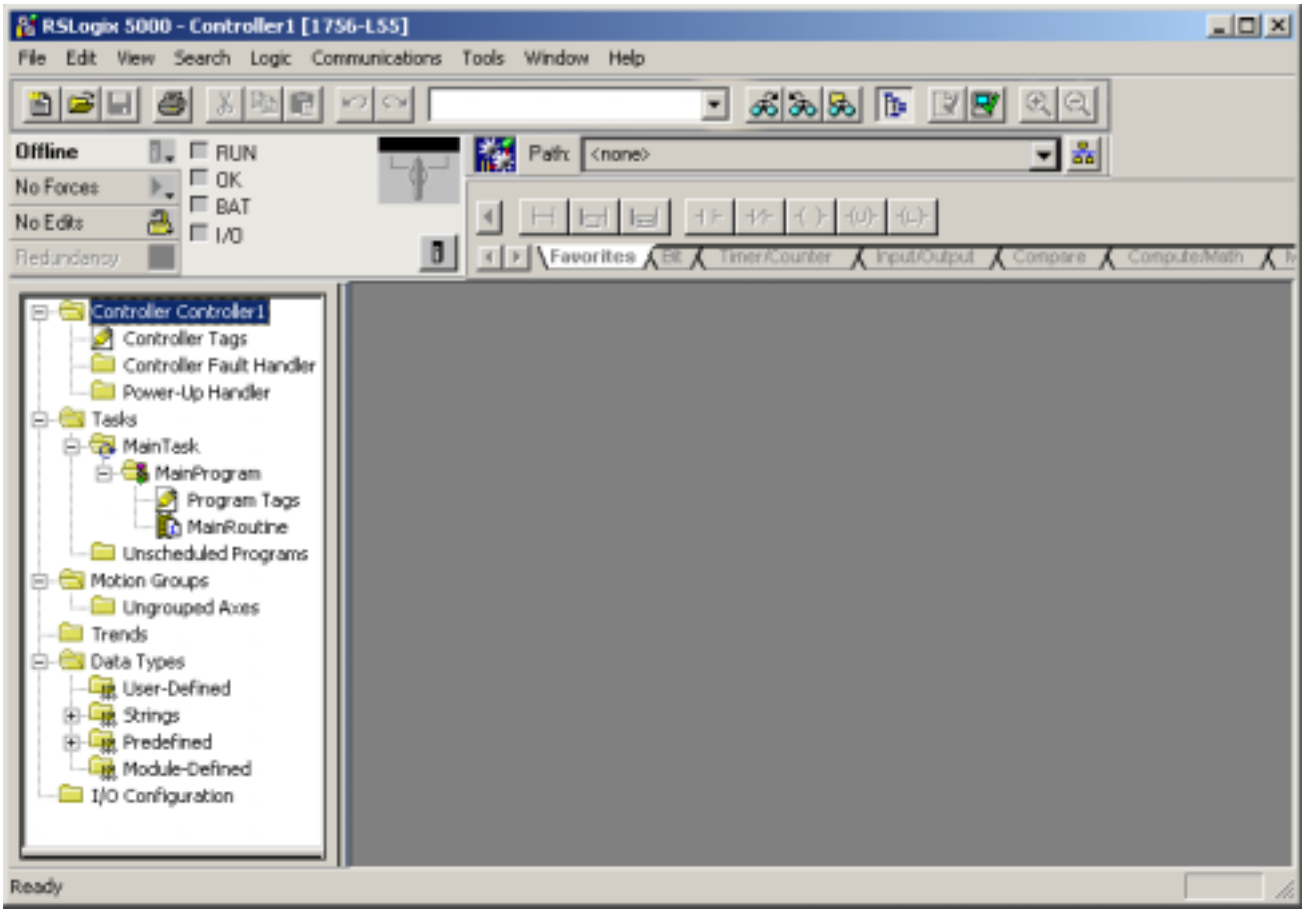
## Creating a New Controller File

Create a controller file.

1. From the ***File*** menu, choose ***New***. The New Controller dialog Box appears.
2. From the ***Type*** pull-down menu, choose a ***1756-L55 ControlLogix 5555 Controller***.
3. In the ***Revision*** field, select the highest revision number available (revision 11 in the example screen shown below).
3. In the ***Name*** field, type 'Controller1' for the controller name.
4. From the ***Chassis Type*** pull-down menu, choose the ***1756-A7 7-Slot ControlLogix Chassis***.
5. In the ***Number*** field, choose ***0*** to match the position of the controller in the chassis.
6. In the ***Create In*** field, type 'C:\RSLogix5000\Projects' or click on the Browse button to navigate to that directory.
7. Verify that your entries match those shown below, then click ***OK***.



The Controller Organizer appears on the left side of the RSLogix 5000 window, with a folder called Controller Controller1. You have now created your first controller file. At this time, there is no I/O, no tag database, and no logic associated with the controller file.




**FYI**

The Controller Organizer is a graphical representation of the contents of your controller file. This display consists of a tree of folders and files that contain all of the information about the programs and data in the current controller file. The default main folders in this tree are:

- **Controller File Name** - contains controller-scoped tags, controller fault handler and the power up handler.
- **Tasks** - tasks are shown in this folder. Each task shows its own programs with ladder routines and program-scoped tags.
- **Trends** - trends are shown in this folder.
- **Data Types** - shows predefined and user-defined data types. User-defined data is created in this folder.
- **I/O Configuration** - contains the information about the hardware configuration of this controller file. It holds a hierarchy of modules with which the controller is configured to communicate.

**FYI (continued)**

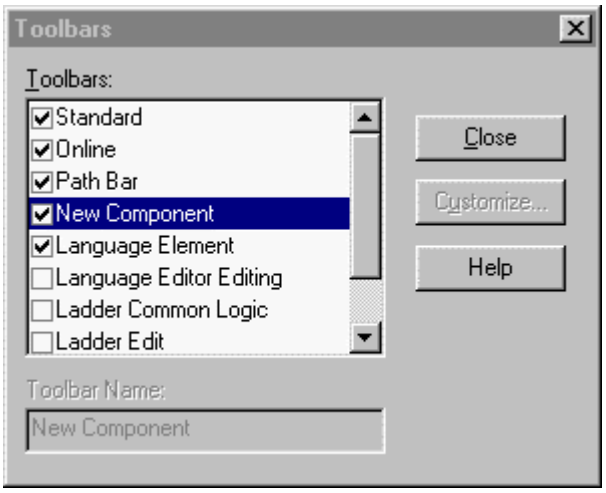
In front of each folder, there is a square containing a + sign or a - sign. The + sign indicates that the folder is closed. Click on it to expand the tree display and display the files in the folder. The - sign indicates that the folder is already open and its contents are visible.

Clicking on the right mouse button brings up many different context-sensitive popup menus. Often, you will find that this is a shortcut to access the property window or to menu options from the menu bar. Double clicking on files in the Controller Organizer display brings up functional dialogs, from which you can enter parameters to accomplish relevant tasks.

## Editing the Main Routine

Edit the ladder logic for the main routine in your MainProgram folder, and then add an input and an output instruction.

1. From the ***View*** menu, choose ***Toolbars***.
   The Toolbars dialog appears.




2. Verify that the first 5 toolbars are checked, and click on ***Close***.

3. From the ***Controller Organizer***, double click on the ***Main Routine*** icon 

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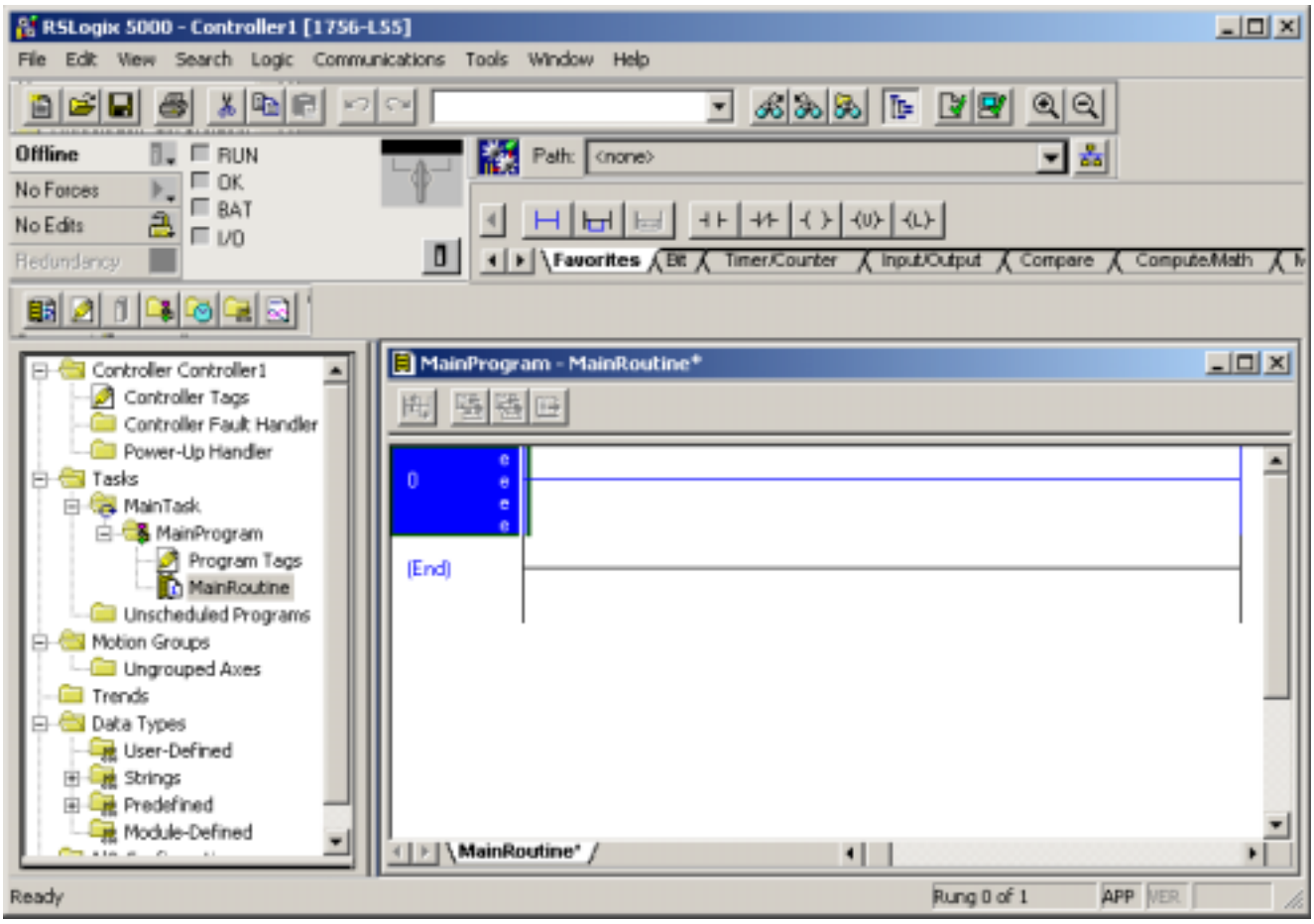
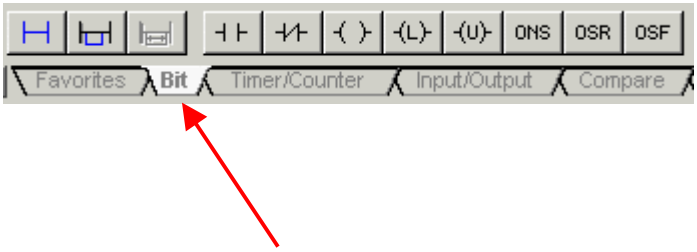
An empty rung appears in the Ladder Editor.



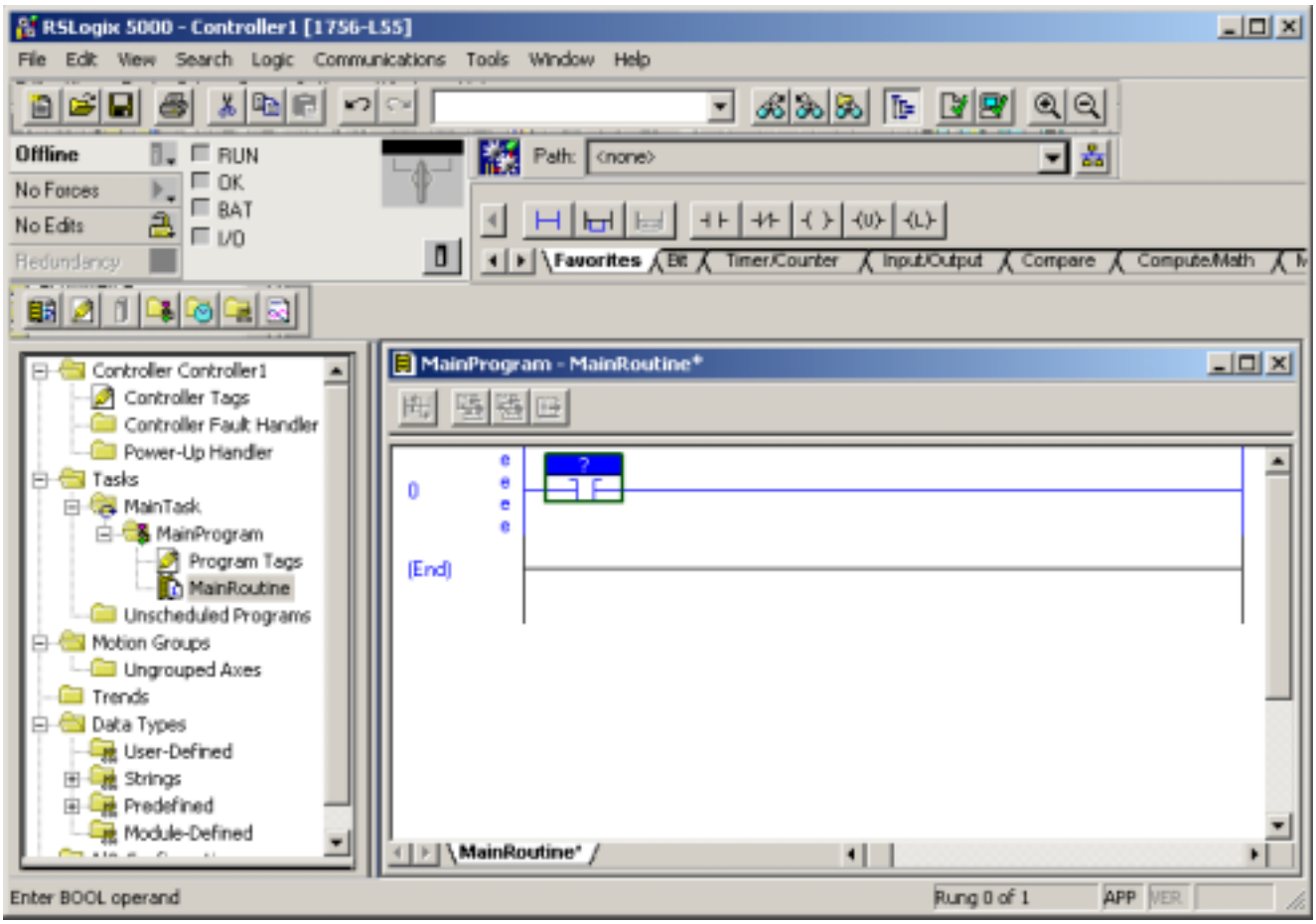

4. From the Ladder Instructions toolbar (as shown below), click on the ***Bit*** tab.

The Ladder Instruction toolbar refreshes to show you all of the available Bit instructions.



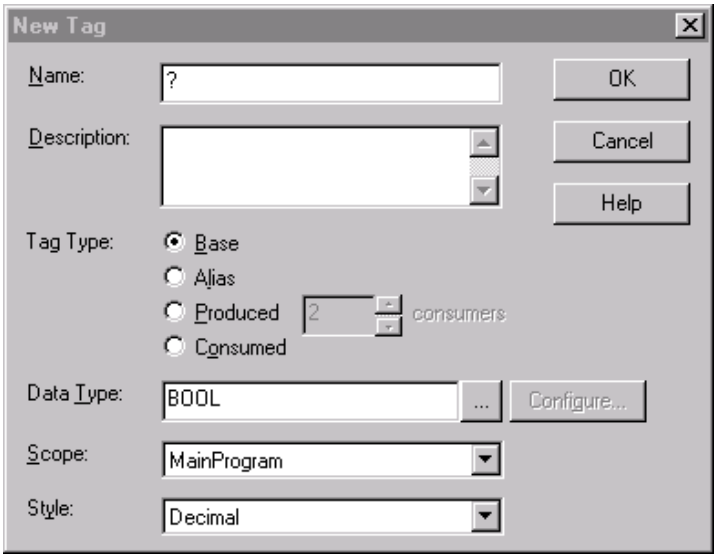
5. Click on the ***XIC (Examine On)*** icon to enter the instruction on the rung.

   The XIC instruction appears on the rung in the Ladder Editor, as shown below.




6. Right click on the ***Question Mark (?)*** in the blue highlighted area above the XIC instruction, and choose ***New Tag***.

   The New Tag dialog appears.



7. In the ***Name*** field, type 'Switch'.

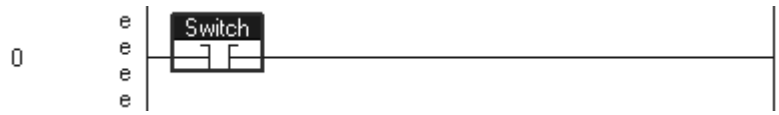
   Verify that MainProgram appears in the Scope field. This indicates that you want ***Switch*** created as a program-scoped tag.

**FYI**

> There are two types of tag scopes: program-scoped and controller-scoped. Program-scoped tags are accessible only to the routines of a specific program. Controller-scoped tags are accessible to the routines of all programs in a controller.

8. From the ***Tag Type*** selections, choose ***Base***.
9. From the ***Data Type*** menu, choose ***BOOL***.
10. From the **Scope** selections, choose **MainProgram**.
11. Click on ***OK***.

    Your rung should now look like this:



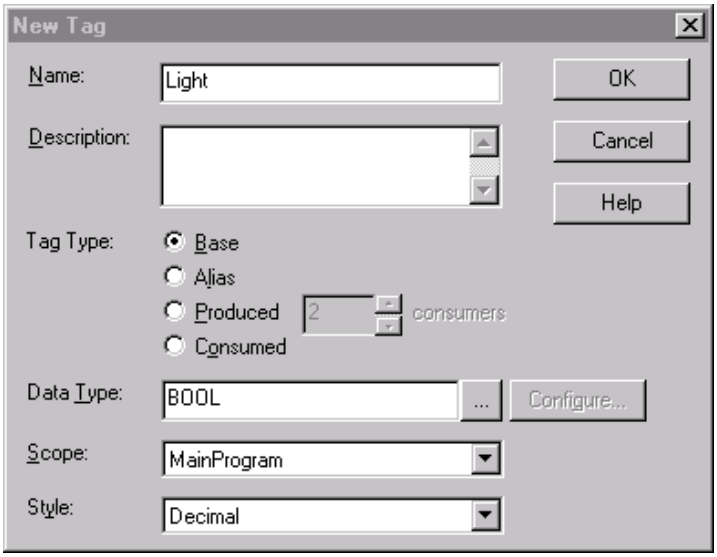

12. Click and hold the mouse button on the ***OTE (Output Energize)*** icon  in the toolbar, and drag it over the blue line of rung 0 until a green dot appears to the right of the XIC instruction that you just entered.

    When you release the mouse button, the OTE instruction will be placed at the end of rung 0. This is an alternate way of entering an instruction on a rung.

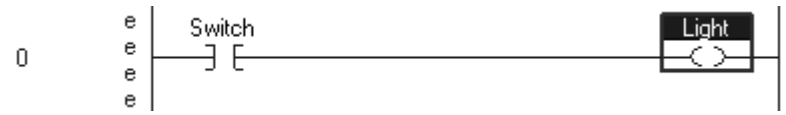
13. Right click on the ***Question Mark (?)*** in the blue area above the ***OTE instruction***, and choose ***New Tag***.

    The New Tag dialog appears.

14. Enter the parameters as shown below and click on ***OK***.



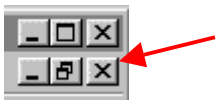
Your rung should now look like this:




15. Right click on the rung number ***(0)***, and choose ***Verify Rung***.

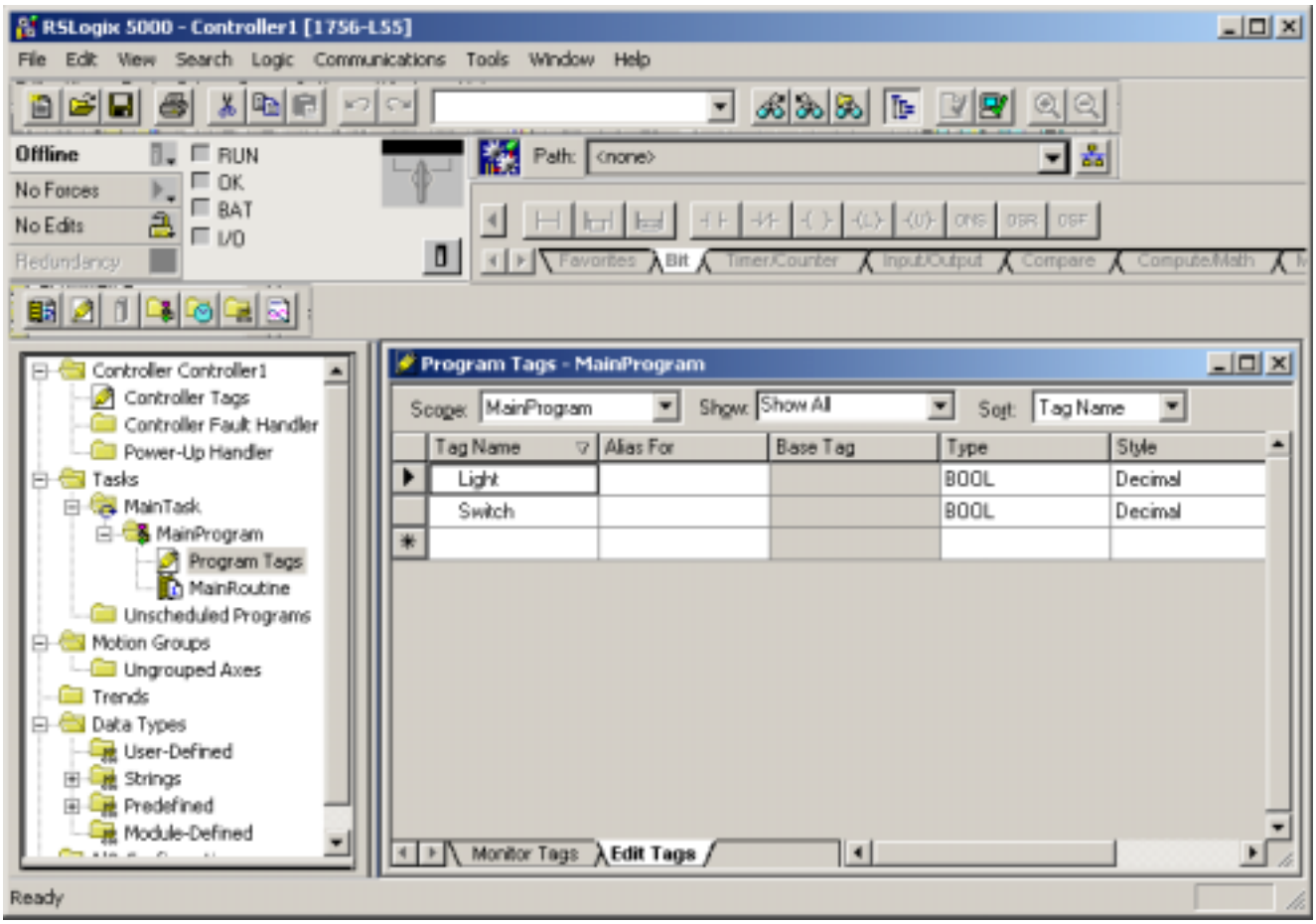
    A message appears at the bottom of the RSLogix 5000 window indicating the results of the Verify Rung command.

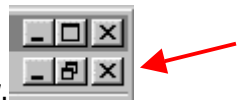
    **Note:** The message will appear either in the status bar at the bottom of the screen, or in the Results window if it is selected under the View menu. If there are errors, you must correct them before the rung will verify. You can also verify the entire routine by choosing ***Verify > Routine*** from the ***Logic*** menu.

16. Click on the ***X*** at the upper right corner of the Ladder Editor to close the editor. 

17. From the ***Controller Organizer***, under ***MainProgram***, double click on the ***Program Tags*** folder to view the two program scoped tags.

    The Data Monitor appears, with two entries in the Tag Name column.




18. Click on the ***X*** at the upper right corner of the Data Monitor to close the window. 

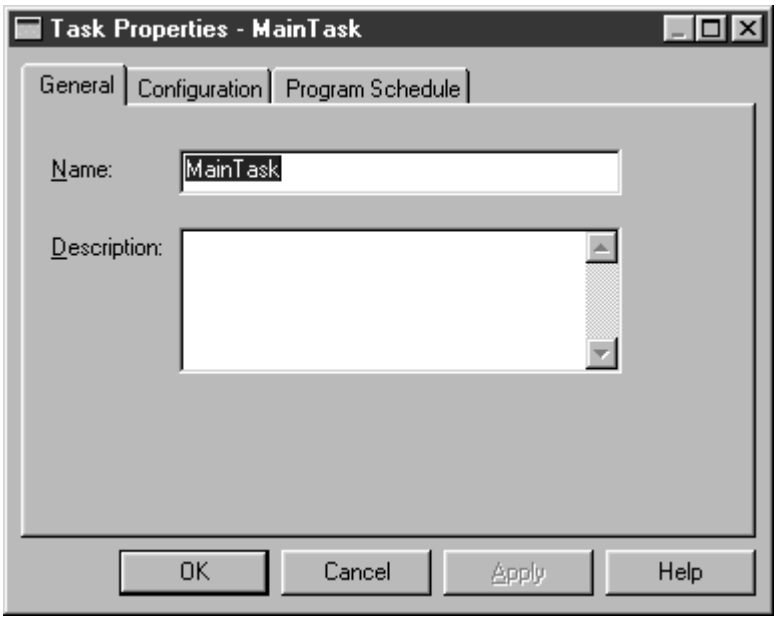
### Verifying the Properties for the Main Task and the Main Program

Verify the properties of the controller's main task and main program.

1. From the ***Controller Organizer***, right click on the ***MainTask*** icon 

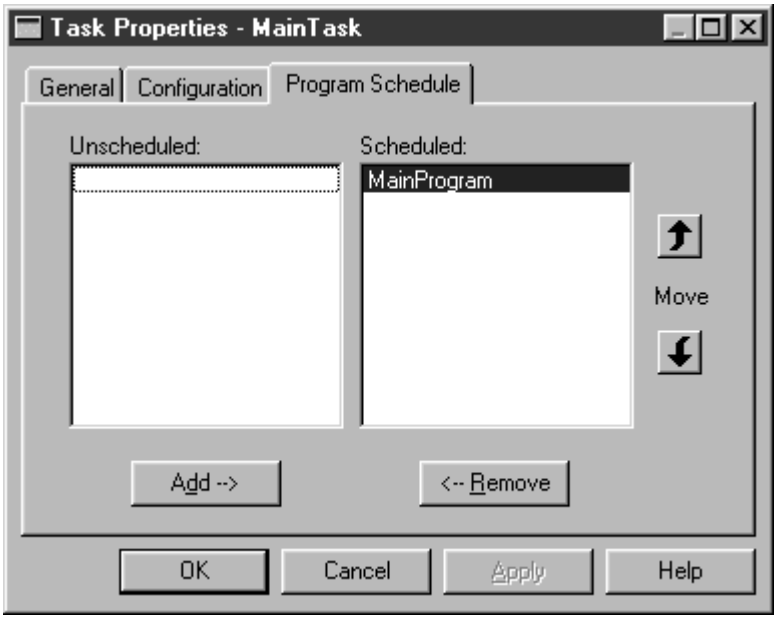
and choose ***Properties***.

   The Task Properties dialog appears.

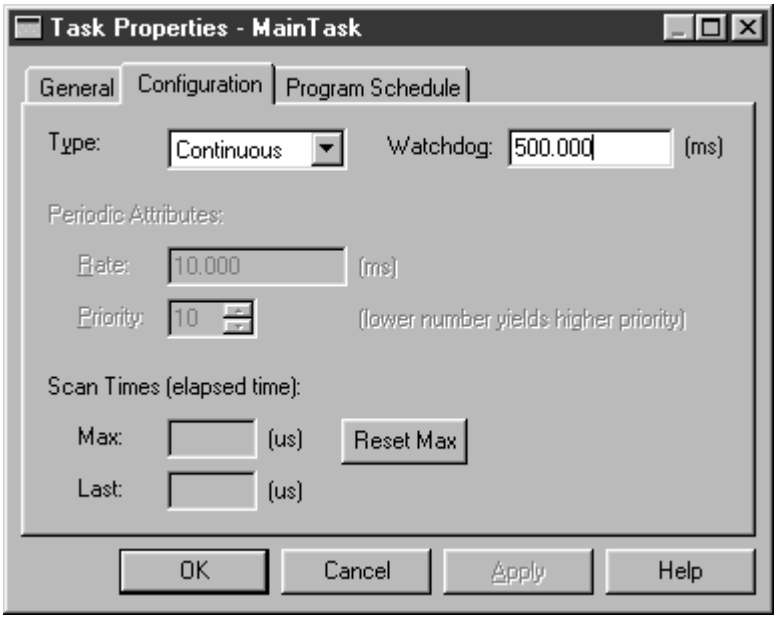



2. Click on the ***Program Schedule*** tab and verify that the MainProgram appears in the Scheduled programs field.

   If it does not, click on the ***Add*** button to schedule the MainProgram. If a program folder is not scheduled under a task, it will not be executed and it will appear in the Unscheduled Programs folder in the Controller Organizer.



3. Click on the ***Configuration*** tab and verify that the Watchdog is set for 500 ms.



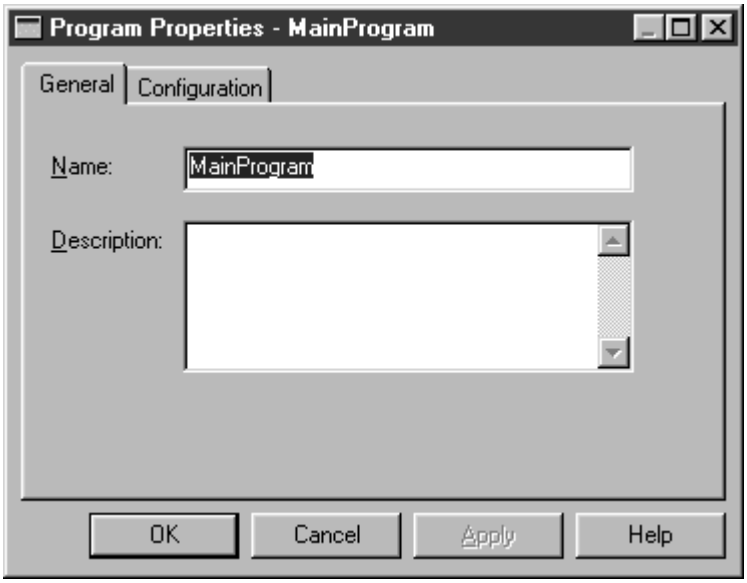

The Watchdog is a task scan time watchdog which, if exceeded, faults the processor.

4. Click on ***OK*** to close the Task Properties dialog.

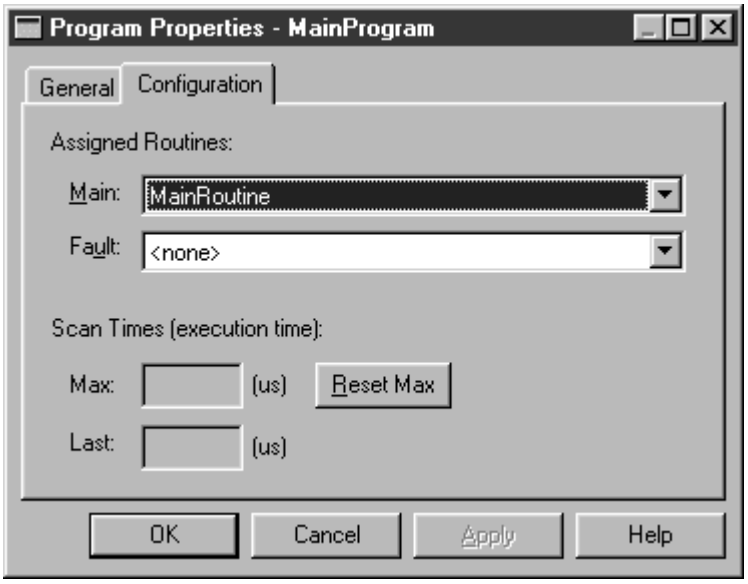
5. From the ***Controller Organizer***, right click on the ***MainProgram*** icon 

and choose ***Properties***.

The Program Properties dialog appears.



6. Click on the ***Configuration*** tab and verify that MainRoutine appears in the Main field. If it does not, choose MainRoutine from the Main field pull-down menu.




**FYI**

> Every program folder must have a main routine assigned. All other routines in a program folder are only executed if they are selected as a fault routine, or if they are called using a JSR instruction from another routine in the same folder.

7. Click on ***OK*** to close the Program Properties dialog.
8. From the ***File*** menu, choose ***Save*** to save your program.

## Configuring Your I/O

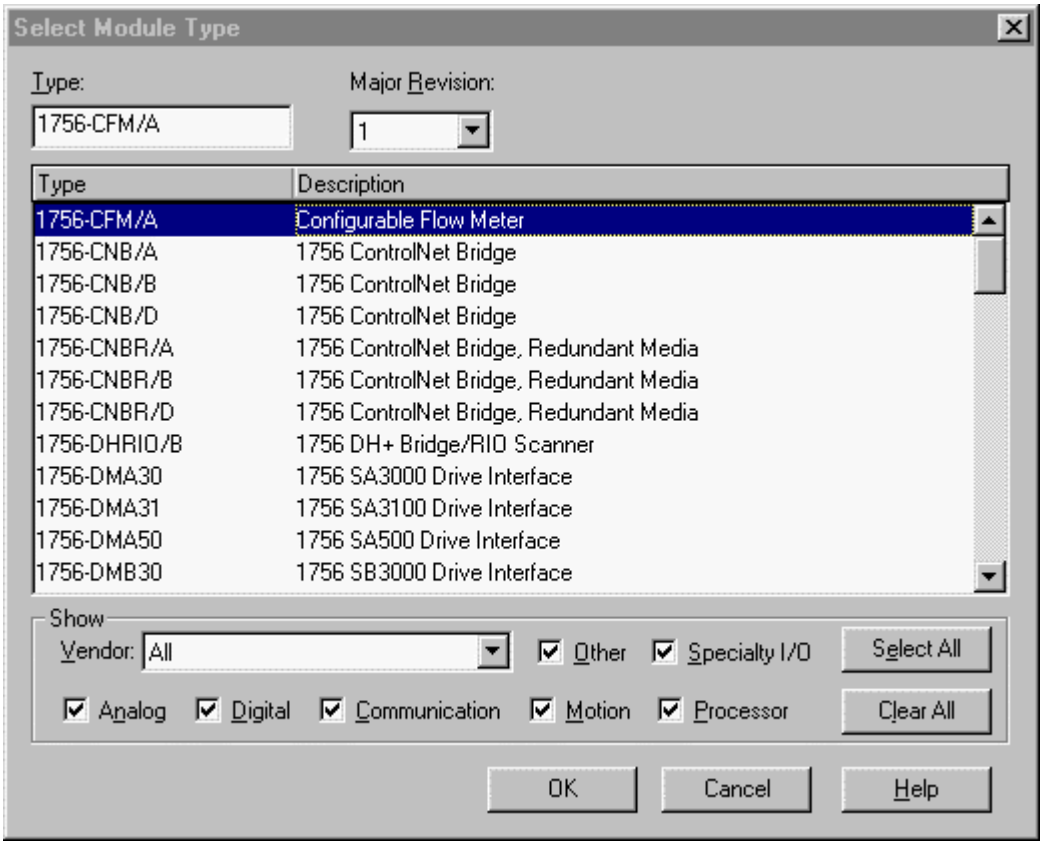
Configure your I/O modules and use the aliasing capabilities of the RSLogix 5000 software to alias the tags you have already created in your ladder logic to module tags.

## Configuring the Discrete Output Module

Add the discrete output module in slot 0 of the I/O Configuration list.

1. From the ***Controller Organizer***, right click on the ***I/O Configuration*** folder and choose ***New Module***.

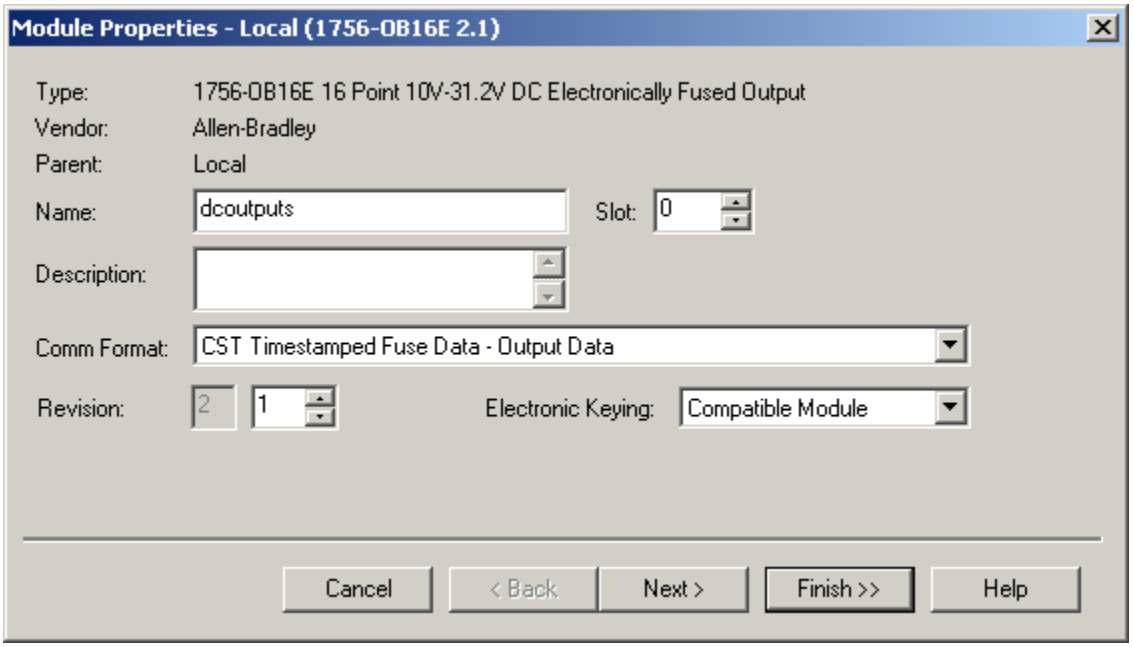
   The Select Module Type dialog appears, with a list of available modules. Click on the down arrow on the lower right side of the dialog to scroll down through the list of modules to the 1756-OB16E module.




2. Double click on the ***1756-OB16E*** module.

   The Module Properties dialog appears.

☐ 3. Enter the parameters as shown below, and click on ***Finish***.




The RSLogix 5000 software will complete the module configuration for you, using default values for the remaining configuration parameters.

**FYI**

**Electronic Keying**

This feature prevents the inadvertent insertion of the wrong module in the wrong slot. When you insert a module into a slot in a ControlLogix chassis, RSLogix 5000 compares the information read from the newly inserted hardware with what the user configured for that particular slot in their project. The following data is read and compared: *Vendor, Product Type, Catalog Number, Major Revision, Minor Revision.*

Select one of the following module keying options during initial module configuration:

**1) Exact Match** - all of the parameters described above must match or the inserted module will reject the connection.

**2) Compatible Module** - The following criteria must be met, or else the inserted module will reject the connection causing the I/O light to flash on the Processor: *Module Types, Catalog Number, and Major Revision must match and the Minor Revision of the physical module must be equal to or greater than the one specified in the software*

**3) Disable Keying** – No keying used at all.

## Viewing Tags

View the tags that were created for the 1756-OB16E module in slot 0 when you created the module.

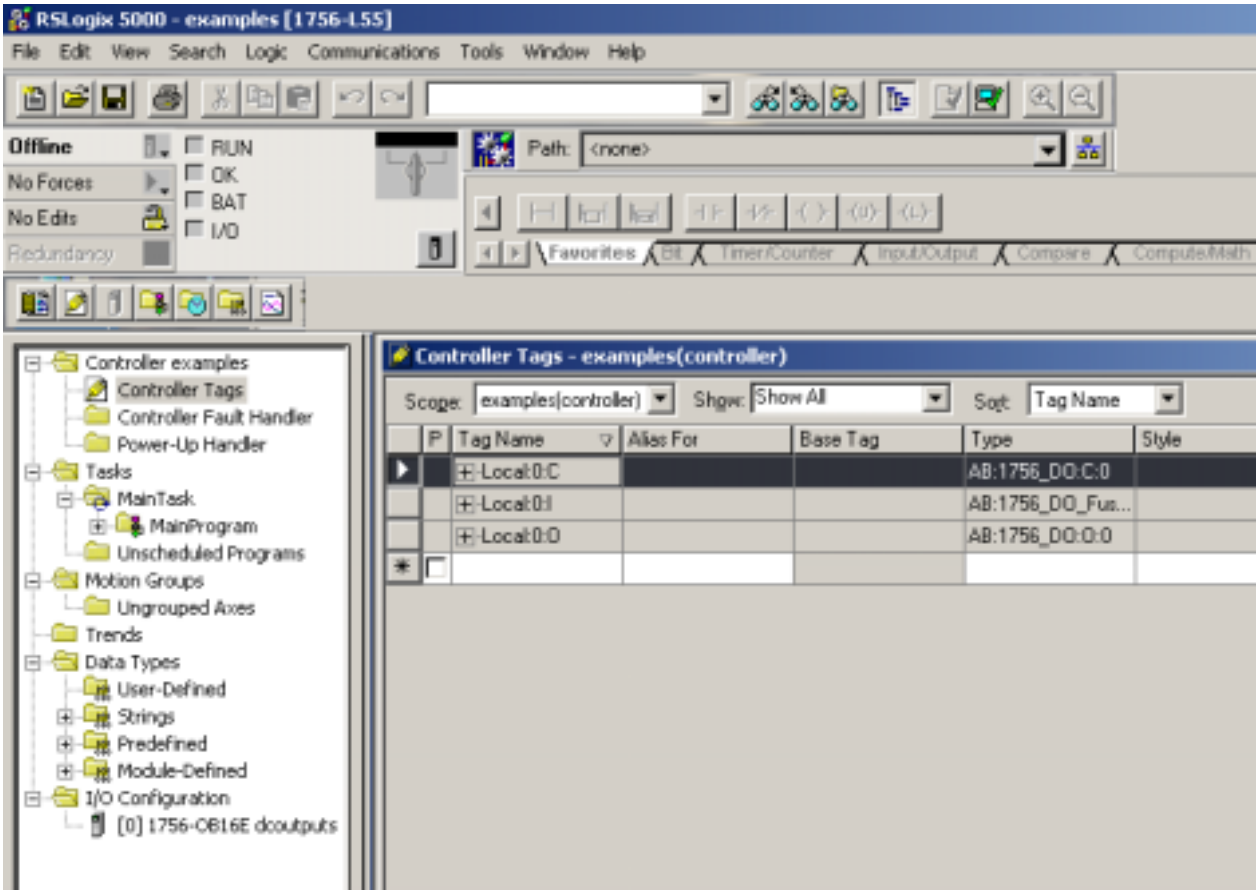
1. From the ***Controller Organizer***, double click on the ***Controller Tags*** icon 

.

   The Data Monitor appears, with 3 entries in the Tag Name column:

   - Local:0:C
   - Local:0:I
   - Local:0:O

   These entries are tag structures (resulting from the configuration of the 1756-OB16E), and they contain more tags than are actually displayed in the Data Monitor screen. Note the + sign next to the tag name; this indicates that you can expand the tag structure to see more tag information.



**FYI**

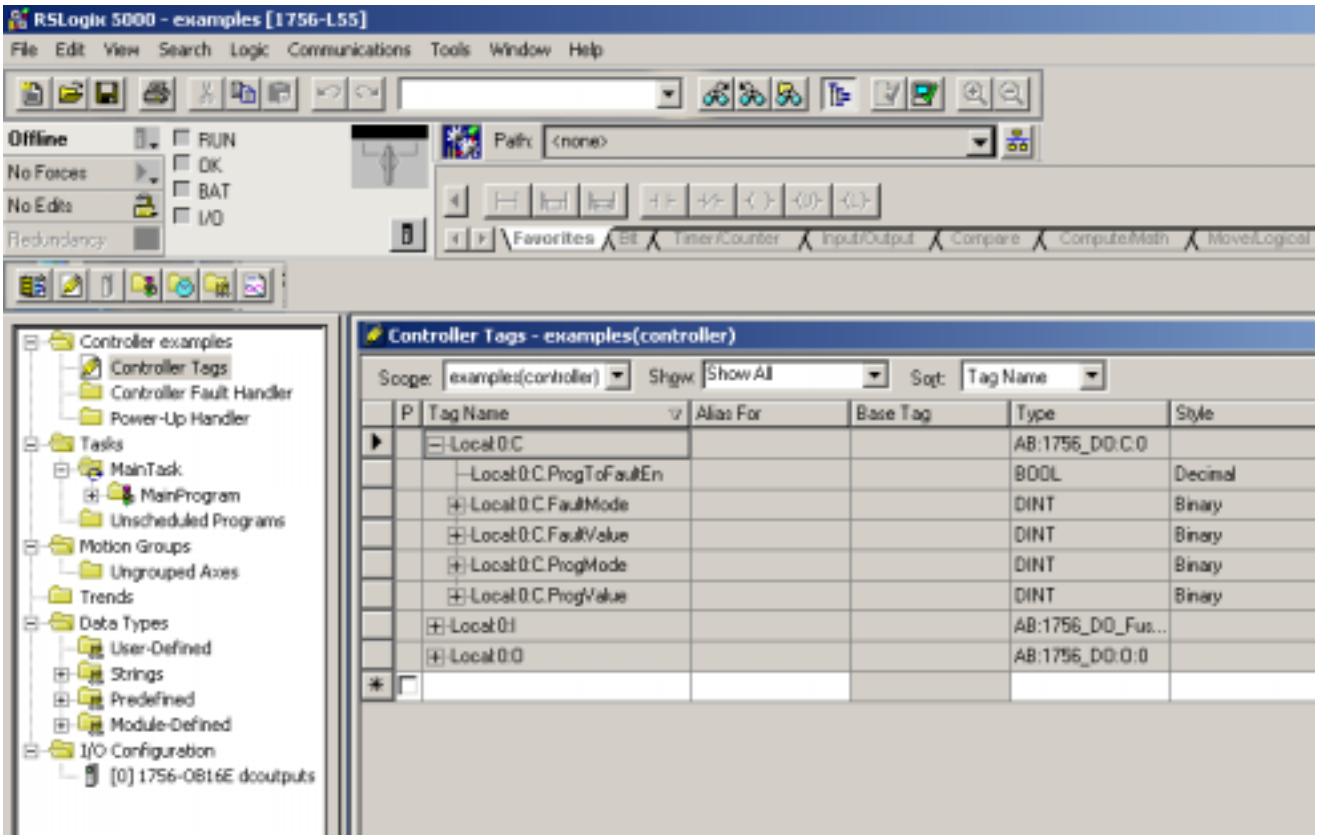
The name Local indicates that these tags are associated with a module that is in the same chassis as the controller. The number between the colons is the slot number of the module; in this case, the module is in slot 0. The characters appearing after the last colon (i.e., the C, the I, and the O) indicate whether the data is **C**onfiguration, **I**nput, or **O**utput data. This particular module has all three types of data.

The Scope field above the Tag Name column displays the scope for the tags that are displayed. The scope defines the range in which tags are recognized within the routines. Tags created at the controller scope are accessible to all routines in all program folders; those created at the program scope are accessible only to routines within that single program folder.

In this case, the tag scope is Controller1 (controller), which indicates that the tags are valid for all routines in all program folders in this controller file. If the scope field contained a program name, then the tags would be valid only for the routines in the program folder specified.

☐ 2. Click on the **+** sign in front of the ***Local:0:C*** tag to display the configuration tags for this module.

The Data Monitor refreshes to show you all of the tags underneath the Local:0:C tag. If you cannot see the entire tag name and value, drag the edges of the respective columns to increase their width.



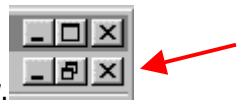
Click on the arrow pointing to the right at the bottom of the screen to view the other columns of the tag database. The 2's in the Value column indicate that the style (or radix) of the values is binary. The # sign serves as a delimiter between the style and the rest of the value. Note that some of the configuration tags consist of 32 bits. These bits are numbered from 0 to 31 from right to left. The individual bits that are set in these tags are the result of the default configuration that was used when you entered the module in the I/O Configuration list.

3. Click on the **+** sign in front of the ***Local:0:I*** tag to display all of the input tags for this module.

   You should see 4 entries under this tag structure.

4. Click on the **+** sign in front of the ***Local:0:O*** tag to display all of the output tags for this module.

   The Local:0:O.Data tag appears under the Local:0:O tag structure. Tags labeled Local:0:O.Data are the actual output bits (like the output image data in a PLC-5 processor).

5. Click on the ***X*** at the upper right corner of the Data Monitor to close the window. 

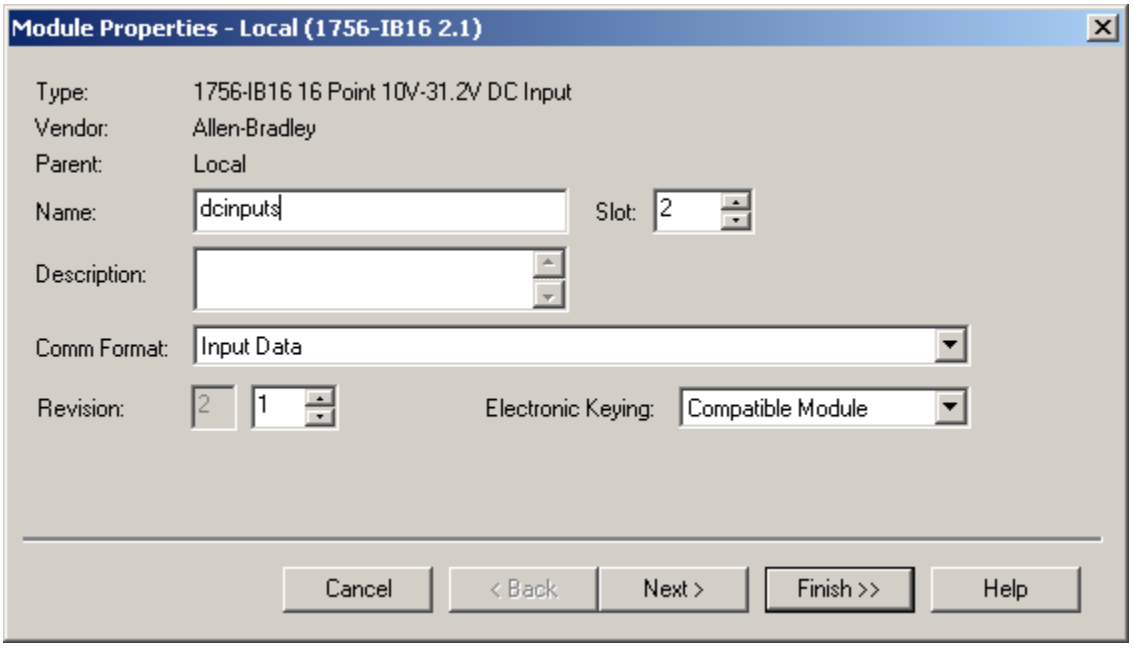
## Configuring the Discrete Input Module

Add the discrete input module in slot 2 to the I/O Configuration list.

1. From the ***Controller Organizer***, right click on the ***I/O Configuration*** folder and choose ***New Module***. The Select Module Type dialog appears, with a list of available modules.

2. Scroll down the list to the ***1756-IB16*** module, then click ***OK***. The Module Properties dialog appears.

3. Enter the parameters as shown below, and click on ***Finish***.



## Verifying Tag Creation

Verify that the tags were created for the 1756-IB16 module in slot 2.

1. From the ***Controller Organizer***, double click on the ***Controller Tags*** icon 

.

   The Data Monitor appears, with 2 new entries in the Tag Name column:

   - Local:2:C
   - Local:2:I

   The input module you created has Input and Configuration data.

2. Click on the **+** sign in front of the ***Local:2:C*** tag to display all of the configuration tags for this module.

   Resize the Tag Name column if you need to in order to see the complete tag names.

3. Click on the **+** sign in front of the ***Local:2:I*** tag to display all of the input tags for this module.

   The Local:2:I.Data tag contains all of the actual input bits (like the input image data table in a PLC-5 processor).

## Mapping I/O Points to Tags

Assign the tags Light and Switch to points on the1756-OB16E and 1756-IB16 modules.

1. Click on the ***Edit Tags*** tab at the lower left of the Data Monitor window.

2. From the ***Scope*** pull-down menu, choose ***MainProgram.***

3. In the ***Alias For*** column, click in the box to the right of the tag named Light, and click on the down arrow that appears on the right hand side of the box.

4. From the tag browser that appears, click on ***Controller Scoped Tags***.

5. Click on the **+** sign in front of ***Local:0:O***, and click on ***Local:0:O.Data***.

   Again, a down arrow appears on the right hand side of the box.

6. Click on the arrow.

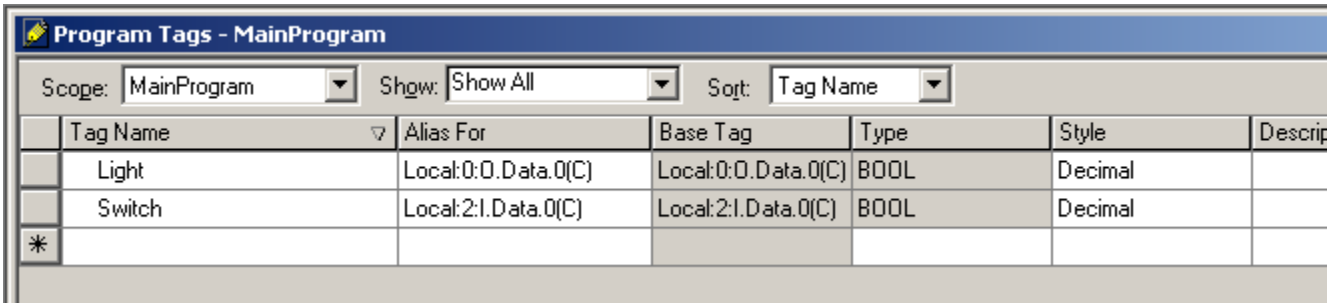
   A grid of numbers appears, representing the bits in the tag.

7. Click on ***0*** to select bit 0.

8. Repeat steps 3 through 7 for the tag called Switch.

   Choose the Local:2.I to access the inputs of the module, and use Local:2:I.Data.0 as the alias tag.

9. Verify your tag database appears as follows, then choose ***Save*** to save your program.




***Congratulations! You have now completed the steps for Exercise 1.***

## Exercise 2:
## Configuring Your Communications Driver, Verifying Communications, Downloading Your Program, Creating a New Task, Program, and Routine, and Creating an Array of Counters

In this exercise, we introduce you to the online operations that you will complete with the RSLogix 5000 software. In this exercise, you will:

- launch RSLinx communications software and configure your communications driver
- verify communications to the controller
- download your program to the controller, using the driver you configured
- create a new periodic task
- create a new program
- create a new routine
- create an array of counters

Follow the steps below to complete Exercise 2. **Place a checkmark in the square next to each step as you complete it.** This will help you keep your place as you work through the steps.

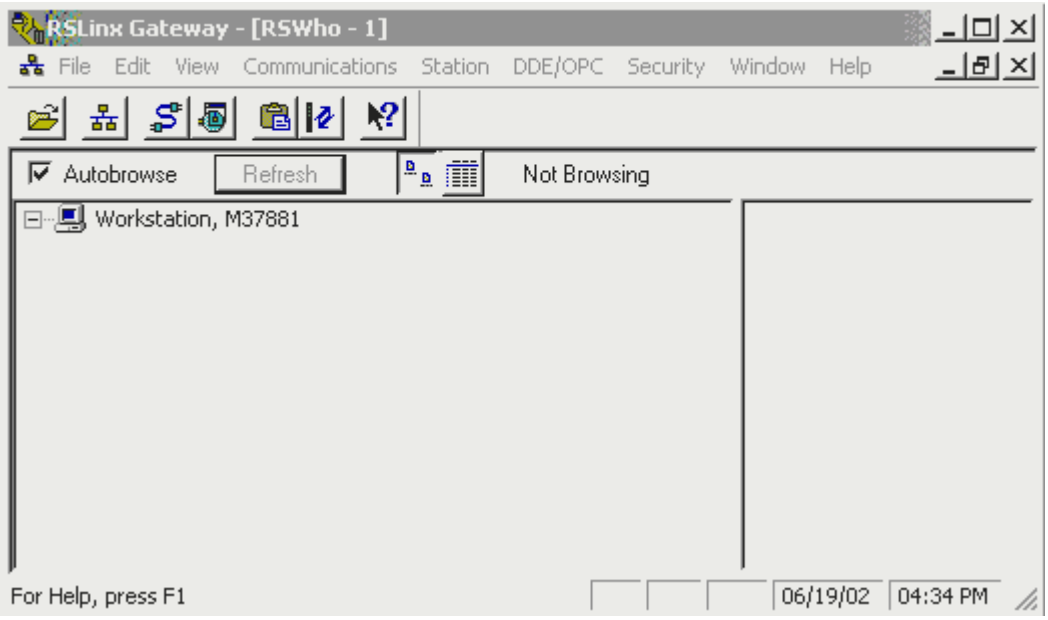
### Launching RSLinx Software

Launch RSLinx software so you can configure the communications driver to communicate with the controller.

☐ 1. Launch RSLinx software.

☐ 2. Click the ***RSWho*** icon .

The Rockwell Software RSLinx Gateway - [RSWho - 1] screen appears.



**FYI**

The RSWho screen is actually RSLinx's network browser interface, which allows you to view all of your active network connections.

The left pane of this display is the Tree Control, which shows networks and devices in a hierarchical view. When a network or device is collapsed, as indicated by the + sign, you can click on the + sign or double click on the network or device icon to expand the view and begin browsing. When a network or device is expanded, as indicated by the - sign, you can click on the - sign or double click on the network or device icon to collapse the view.

The right pane of the RSWho display is the List Control, which is a graphical representation of all of the devices present on the network.

**Tip**

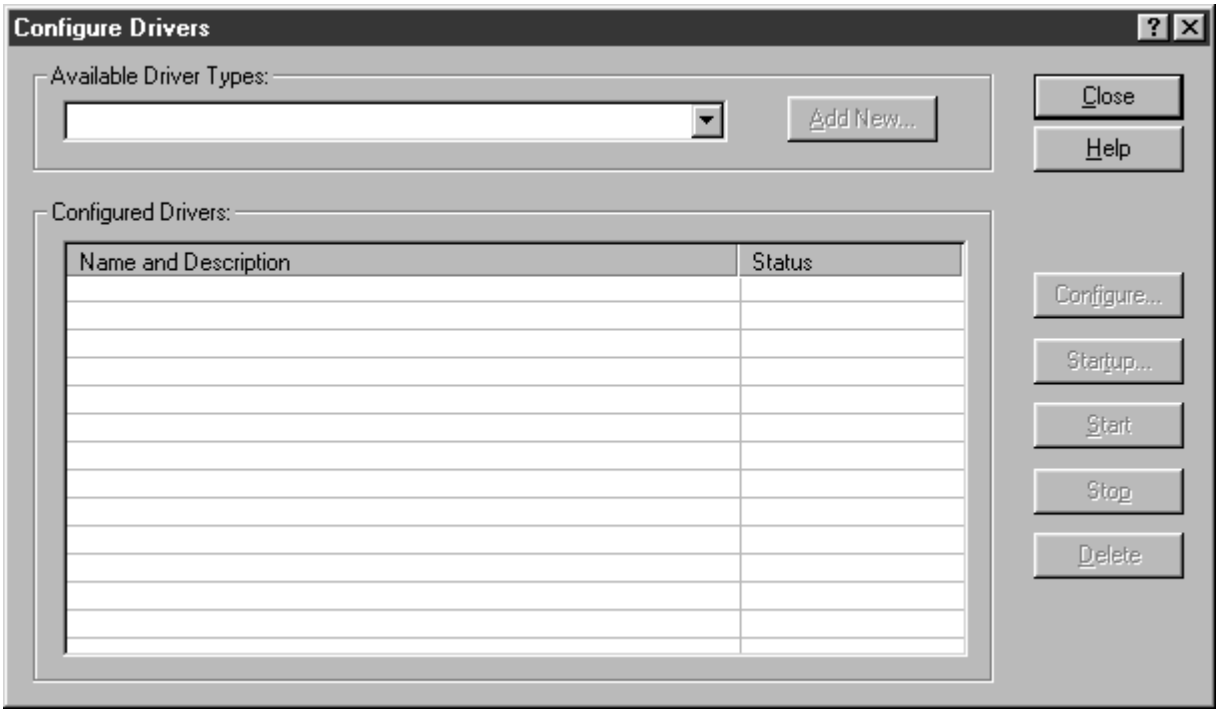
If there is a communication status error with a device (e.g., when a recognized device is inadvertently unplugged), that device appears with a red X, indicating that RSWho previously recognized it, but now it can not. You can choose to remove the device from the RSWho display, or to correct the communication error.

### Adding the RS232-DF1 Driver

Add the RS-232 so that you can communicate with the controller.

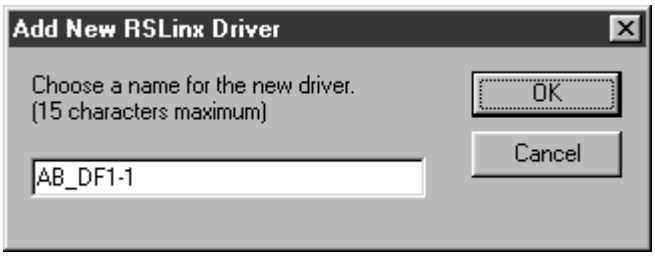
1. From the ***Communications*** menu, choose ***Configure Drivers***.

   The Configure Drivers dialog appears.



2. From the ***Available Driver Types*** pull-down menu, choose ***RS-232 DF1 Devices*** then click on the ***Add New*** button.

   The Add New RSLinx Driver dialog box appears. You are prompted to enter a name for the driver.




3. Click on ***OK*** to accept the default name (AB_DF1).

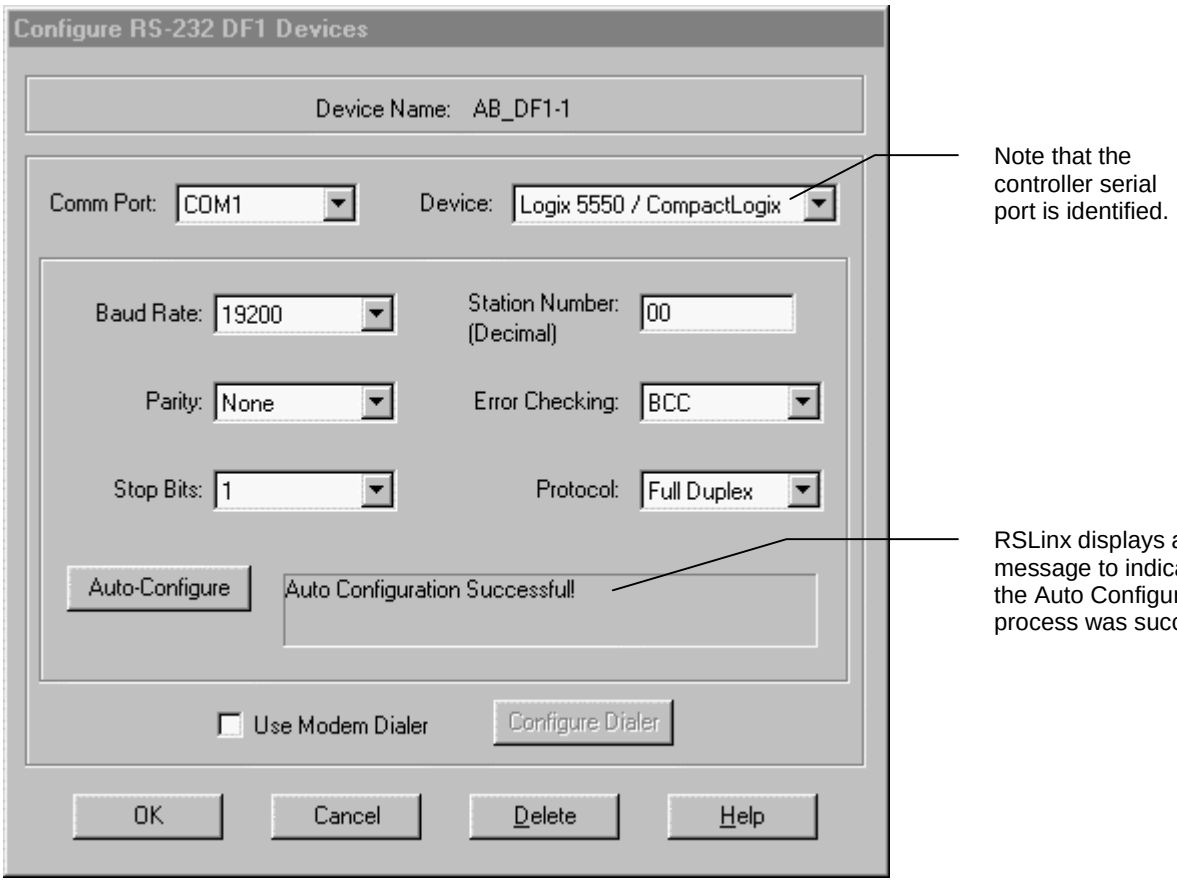
   The Configure Allen-Bradley DF1 Communications Device dialog box appears.

   Important: Before you proceed, make sure that the serial cable (1756-CP3) is connected from the serial port on the front of the controller to the serial port on your PC.

4. Click on the ***Auto-Configure*** button.

   If the serial cable is attached correctly, RSLinx automatically sets the proper DF1 parameters for you when you click this button.

   The Configure Allen-Bradley DF1 Communications Device dialog refreshes, and the parameters appear as follows:



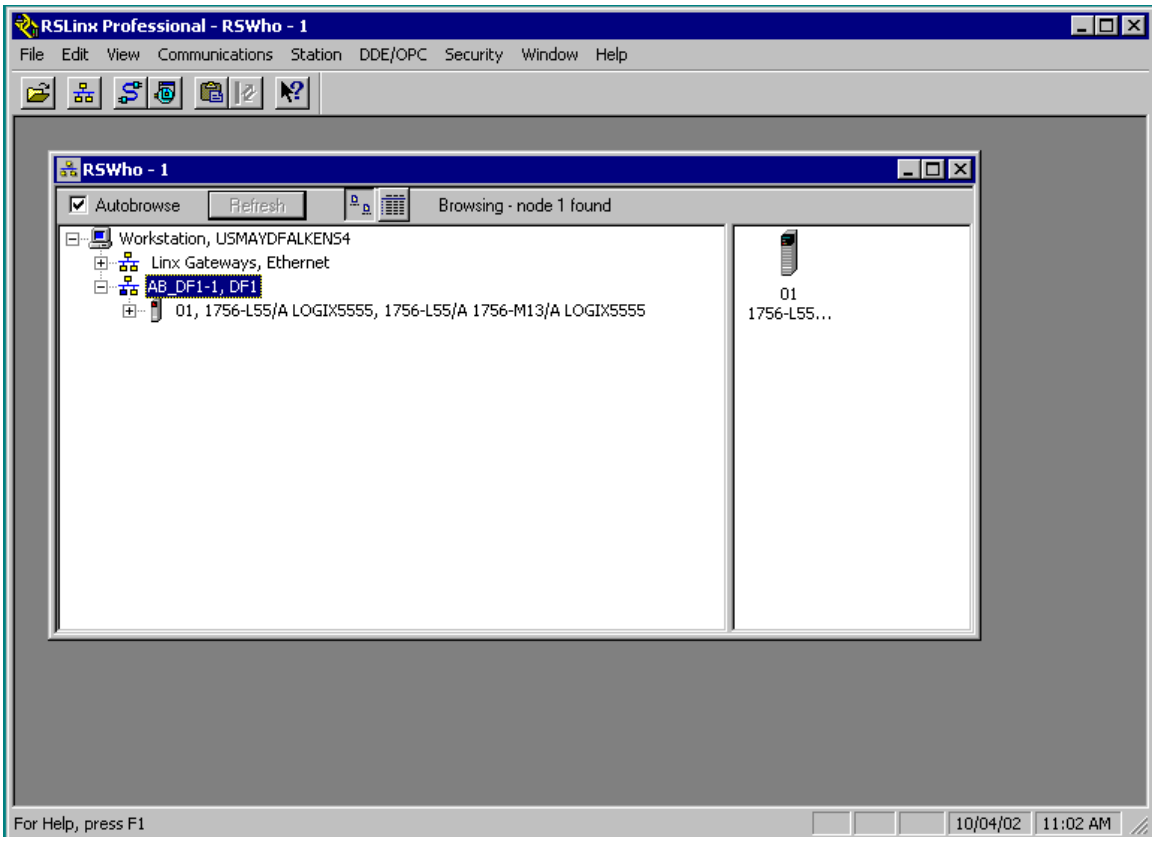

   **Note:** The device field contains "Logix 5550/CompactLogix" regardless of the platform you are using.

5. If the parameters on your screen match the dialog as shown above, click on ***OK***.

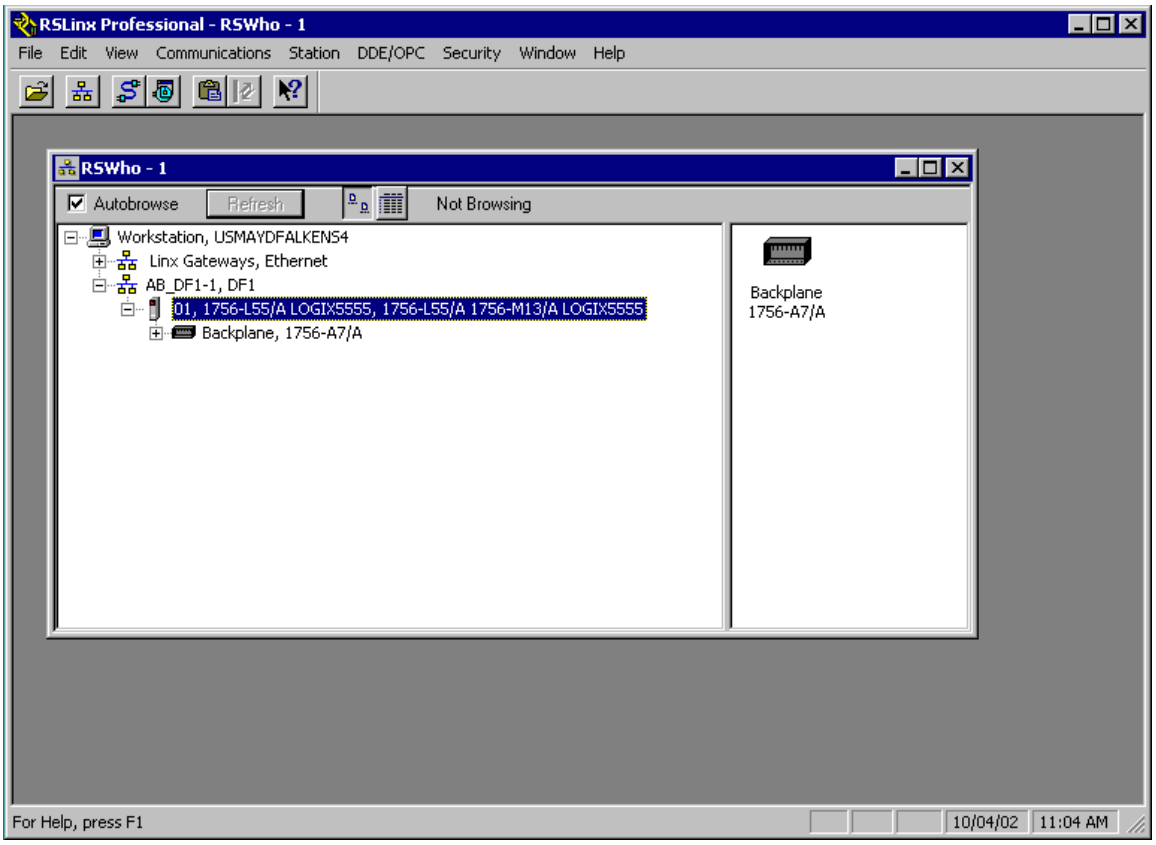
## Verifying Communications to the Controller

Use RSWho to verify that you can communicate with the controller via the RS-232 DF1 driver you just configured.

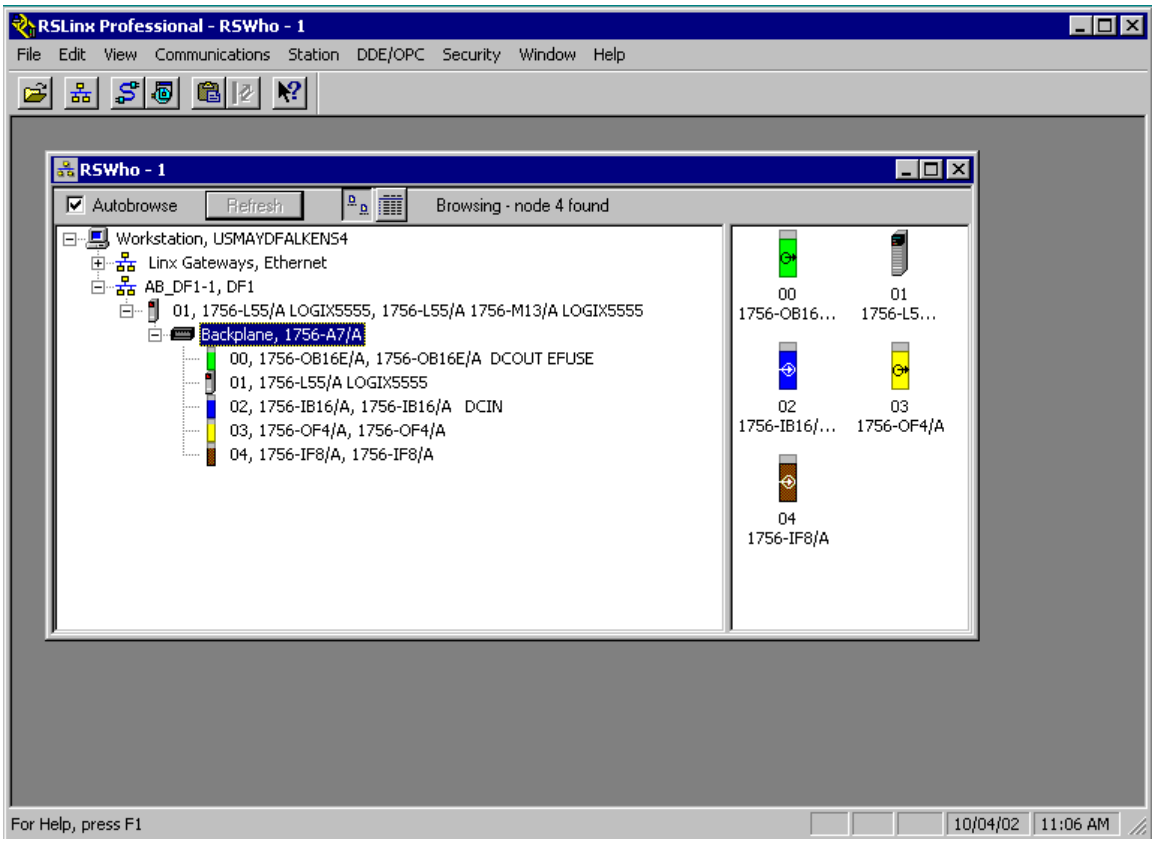
1. From the RSWho window in RSLinx, double click on the ***AB_DF1-1*** driver icon:



2. Double click on the controller icon. The controller expands to display the backplane.

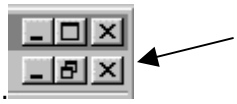


3. Double click on the Backplane icon. You can see the ControlLogix Controller. Browse through the tree until you see all the devices connected to the backplane as shown below:




4. Verify that the small square LED to the right of the serial cable on the controller in slot 1 is flashing green.

5. Click on the ***X*** in the upper right corner of the RSWho window to stop RSWho.



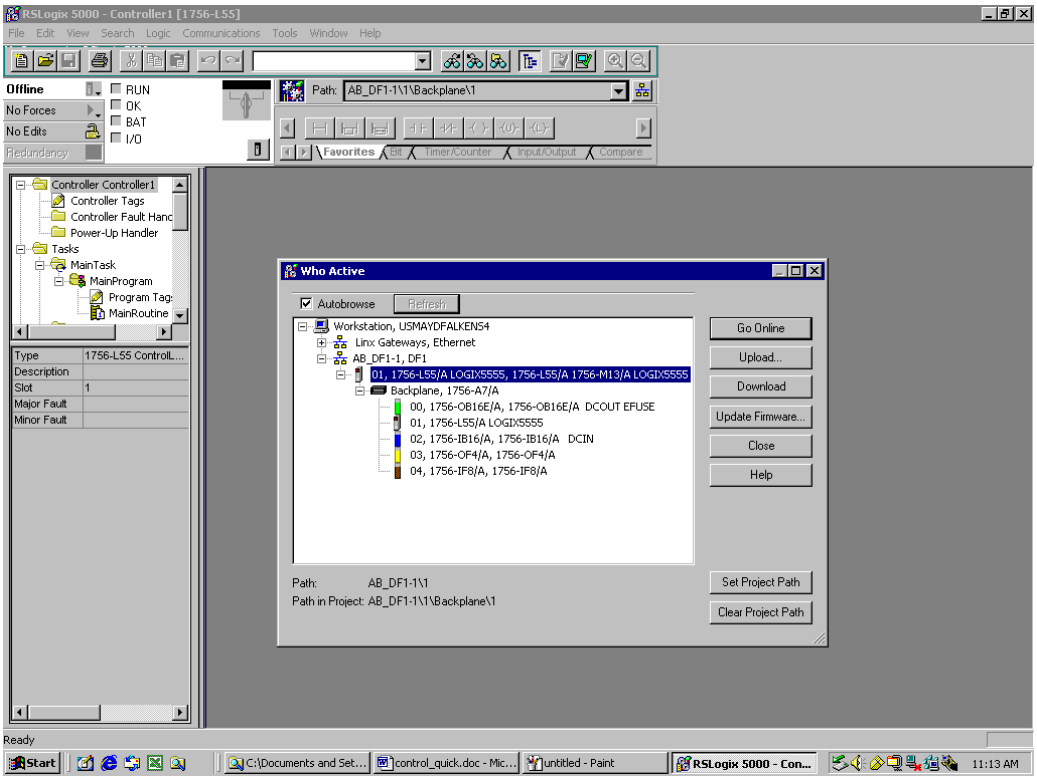
6. Click on the **-** in the upper right corner of the RSLinx window to minimize RSLinx.

## Downloading the Program Using the RS-232 DF1 Driver

Download the program to the controller, using the RS-232 DF1 driver.

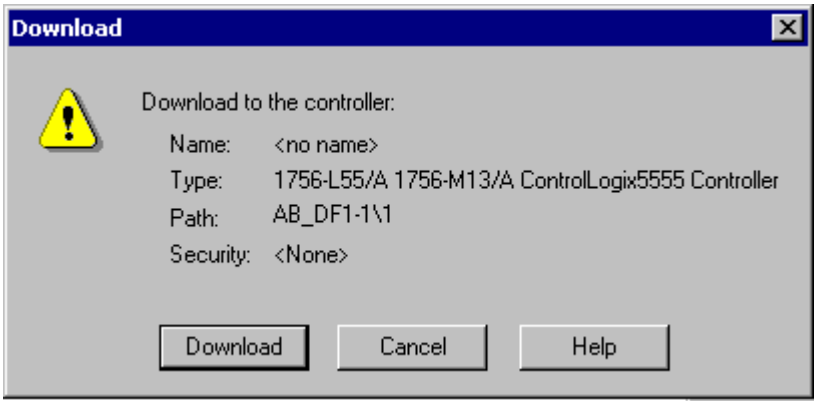
1. Open the ***Controller1.ACD*** project in ***RSLogix 5000***. From the ***Communications*** menu, choose ***Who Active***.

2. Double click on the ***AB_DF1-1, DF1*** icon and browse through the tree to select the controller in slot 1.




3. Click on the ***Download*** button.

   You will see the following dialog box:




   The controller must be in Program or Remote Program mode in order to download. If it is not, you are prompted to change modes before downloading. Depending on what mode you are in, the prompt varies. Follow the instructions on the prompt and continue with the download.

   If the controller does not have the same firmware revision as specified in the project, the software prompts you to update the controller firmware. Accept the prompt to update the controller firmware.

4. Click on the ***Download*** button.

   You will see a series of progress dialogs as your program is downloaded to the controller.

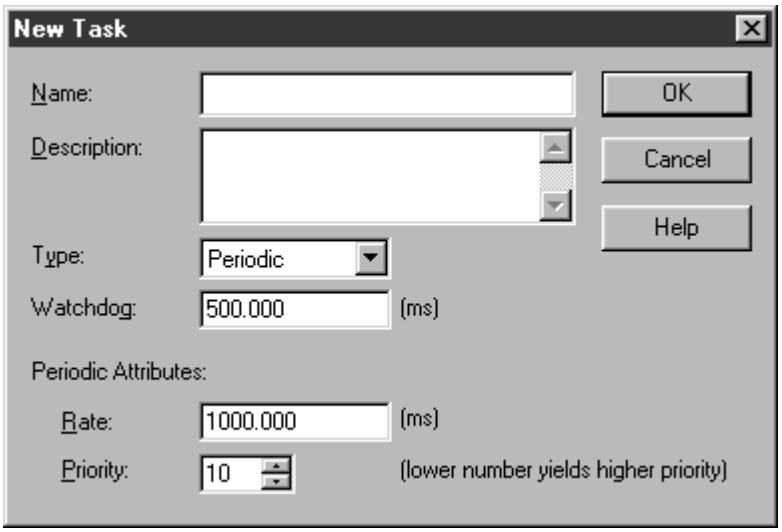
## Creating a New Periodic Task

Create a new periodic task that we will then use to schedule the execution of a new program. At this point, you should be online with your controller. Make sure the controller is in Program mode.

1. From the ***Controller Organizer***, right click on the ***Tasks*** icon 

and choose ***New Task***.

   The New Task dialog appears.




2. In the ***Name*** field, type 'Task2'.
3. In the ***Description*** field, type 'This task is similar to an STI in a PLC-5.'
4. In the ***Type*** field, be sure that ***Periodic*** is selected.
5. In the ***Watchdog*** field, leave the value at the default of ***500*** ms.
6. In the ***Rate*** field, enter '1000' milliseconds (1 second); leave the other parameters set to their default values.
7. Click on ***OK*** to create the task.

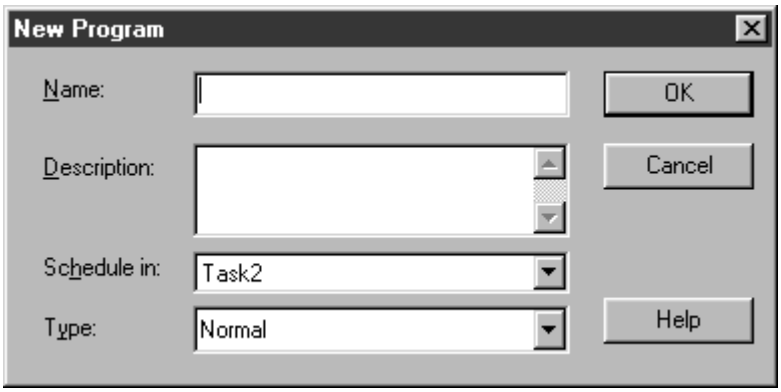
   Task2 now appears in the Controller Organizer. The folder icon for Task2 includes a small clock, indicating that this is a periodic, or time-based, task.

### Creating a New Program

Create a new program under Task2, which is the periodic task.

1. From the ***Controller Organizer***, right click on the ***Task2*** icon  and choose ***New Program***.

   The New Program dialog appears.




2. In the ***Name*** field, type 'Program2'.

3. In the ***Schedule In*** field, be sure that ***Task2*** is selected and click on **OK**.

   You have now created a new program under Task2. All of the routines created and called under this program folder will execute once every 1000 milliseconds (or once every second).

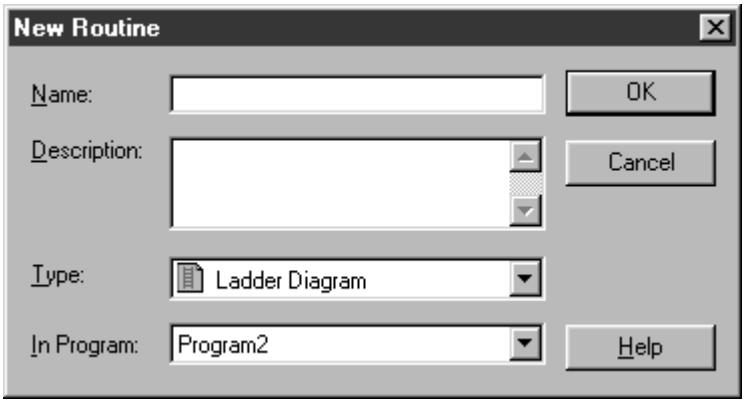
   Also notice that under Program2 in the Controller Organizer, there is now an item called Program Tags. All program-scoped tags are kept under this entry; any tags stored here are accessible by Program2 and all of its routines, but not by other programs in the controller.

### Creating a New Routine

Create a new routine under the Program2 folder.

1. From the ***Controller Organizer***, click on the **+** sign in front of Task2 to expand it, right click on ***Program2*** and choose ***New Routine***.

   The New Routine dialog appears.

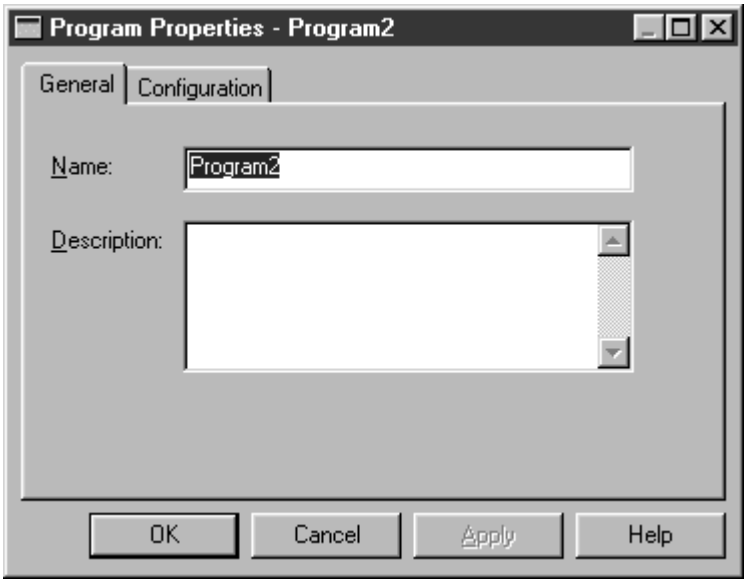



2. In the ***Name*** field, type 'Routine2'.
3. In the ***Description*** field, type 'This routine will increment a counter each time the routine is executed.'

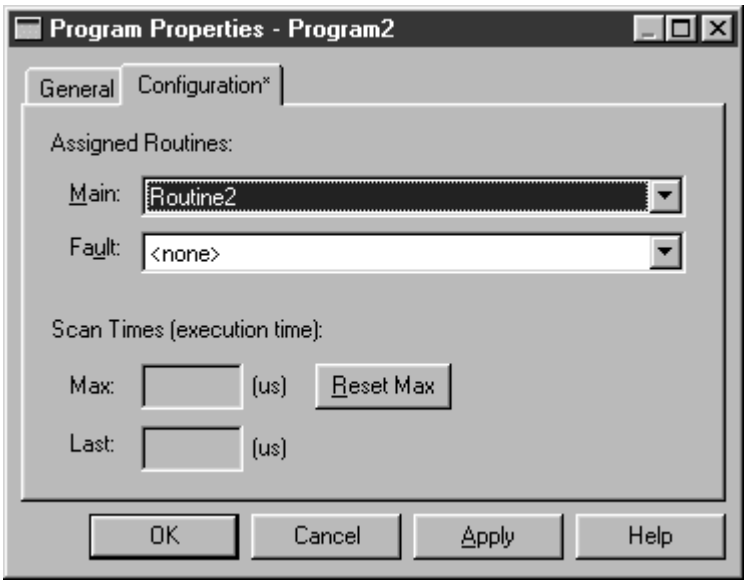
4. In the ***Type*** field, be sure that ***Ladder Diagram*** is selected.
5. In the ***In Program*** field, be sure that ***Program2*** is selected and click on **OK**.

   The next thing you want to do is assign a routine to be the MainRoutine for Program2.
6. From the ***Controller Organizer***, right click on the ***Program2*** icon and choose ***Properties***.

   The Program Properties dialog appears, with the General tab selected.




7. Click on the Configuration tab to display the assigned routines for Program2.




8. From the ***Main*** pull-down menu, choose ***Routine2*** and click on ***OK***.

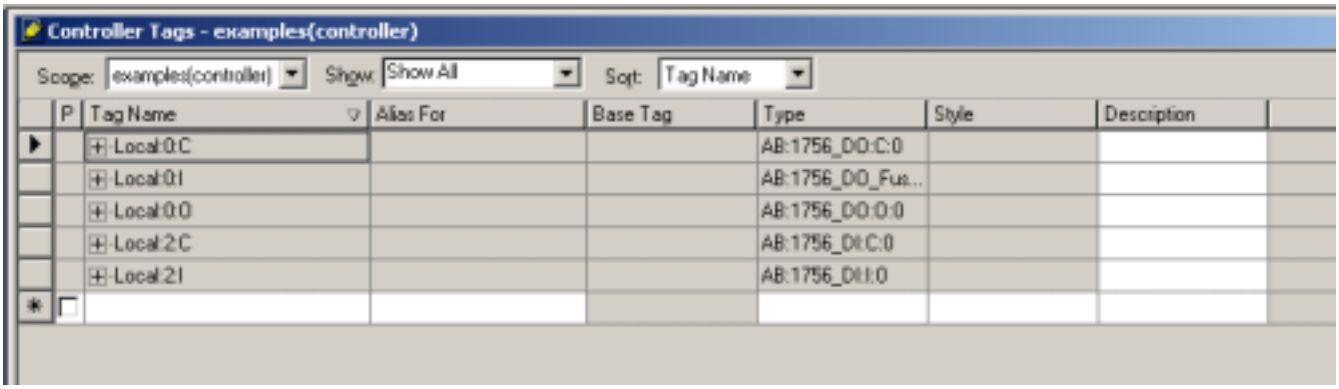
   This makes Routine2 the main routine for Program2.

## Creating an Array of Counters

Create an array of counters that you can then use in the rest of your routines.

1. From the ***Controller Organizer***, double click on ***Controller Tags*** icon 

to open the Data Monitor.




2. Click on the ***Edit Tags*** tab at the bottom of the window to open the Tag Editor.

3. Under the ***Tag Name*** column, click in the row next to the * button and type 'C5' for the tag name.

4. Press the ***Tab*** key until your cursor appears in the ***Type*** column.

5. Click on the ... button, choose a data type of ***COUNTER***.

6. In the ***Dim 0*** field, click on the up arrow until a value of ***10*** is displayed, and click on ***OK***.

7. Press the ***Enter*** key to accept the tag.

8. Click on the **+** sign in front of the ***C5*** tag name to display the array of 10 counters that you created.

9. Click on the **+** sign in front of the ***C5[0]*** tag name to display all of the members in the counter structure (tag) associated with the C5[0] counter.

9. From the ***File Menu***, click on ***Save*** to save your project.

***Congratulations! You have now completed the steps for Exercise 2.***

**Notes:**_____

## Exercise 3:
## Editing and Testing Your Routines, Programs, and Tasks

This exercise continues with online operations to edit and test what you have done. In this exercise, you will:

- edit and test your routine
- create a trend to monitor the Counter Accum value
- test your program's continuous task
- test your program's periodic task

Follow the steps below to complete Exercise 3. **Place a checkmark in the square next to each step as you complete it.** This will help you keep your place as you work through the steps.

### Editing and Testing Your Routine

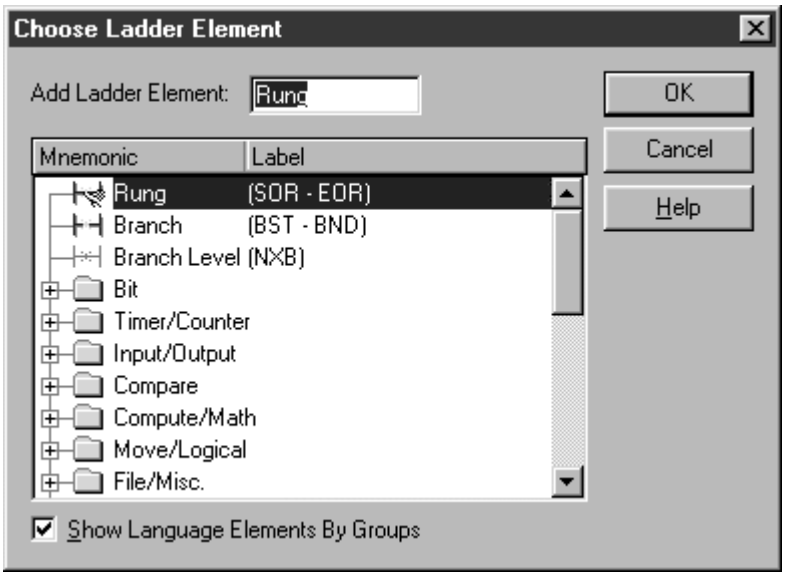
Add ladder instructions to your routine, using a different method than you used in the previous exercise.

☐ 1. From the ***Controller Organizer***, double click on ***Routine2*** icon.

The Ladder Editor appears, with a blank rung 0 displayed.

☐ 2. Press the ***Insert*** key on your keyboard.

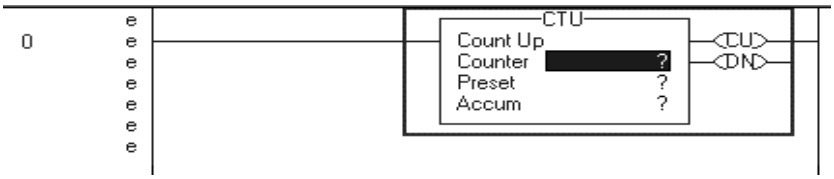
The Choose Ladder Element dialog appears.




If the folders do not appear in this dialog, click on the Show Language Elements by Groups checkbox.

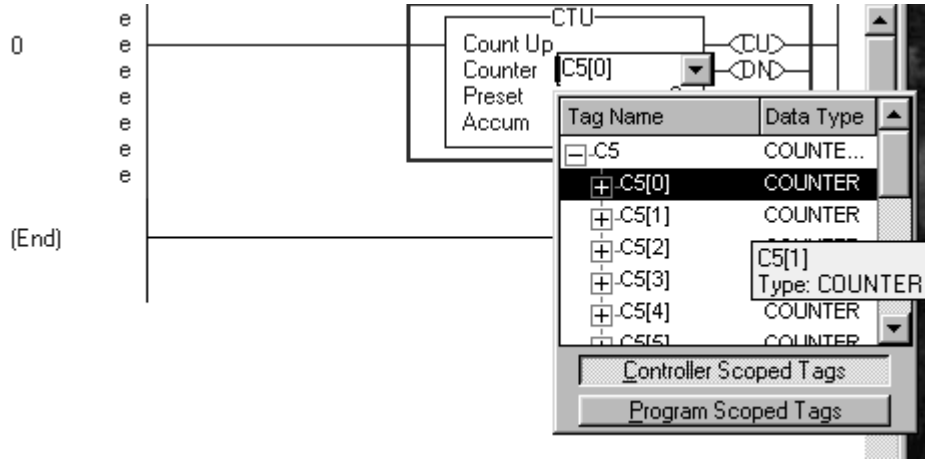
☐ 3. Type 'CTU' and press ***Enter***.

The instruction is inserted on rung 0 as shown:



4. Double click on the ***blue field*** next to the word ***Counter*** in the CTU instruction block.

5. Click on the ***down arrow*** to display the drop-down list.




6. Click on the **+** sign in front of the ***C5*** tag, double click on ***C5[0]***, and press ***Enter*** to select the tag.

   If you do not see the tags, make sure you have clicked on the "Controller Scoped Tags" button.

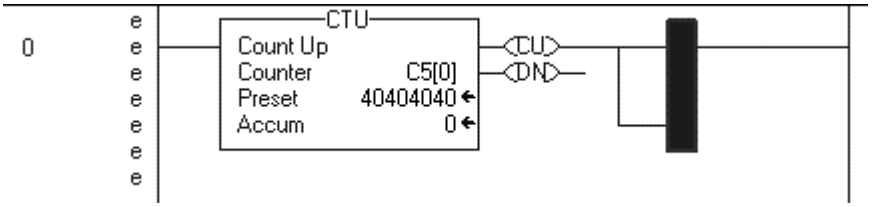
7. In the ***Preset*** field, type '40404040' and press ***Enter***.

8. Press ***Enter*** again to accept 0 as the Accum value.

   The Preset and Accumulator values in ControlLogix are double integer words. This allows you to enter 32-bit values.

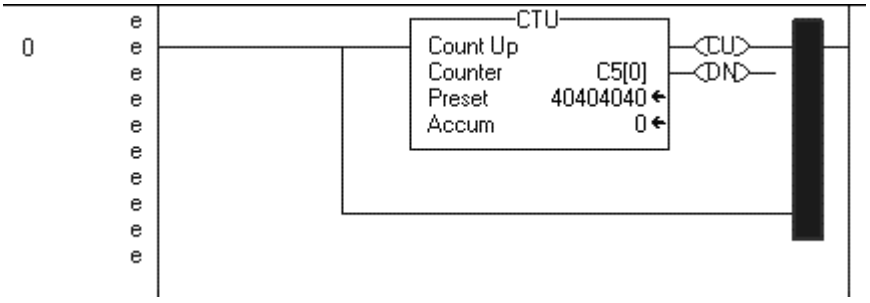
9. Press the ***Insert*** key, type 'BST', and press ***Enter***.

   Rung 0 should now look like this:




10. Click and hold the mouse button on the vertical blue bar of the branch on Rung 0, and drag it to the left until it is past the CTU instruction and a green dot appears. Release the mouse button to place the branch around the CTU instruction.

    Rung 0 now looks like this:

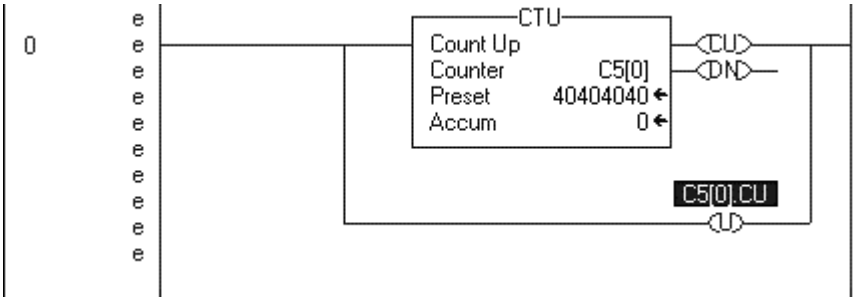



11. Click on the lower left corner of the branch to move the cursor.

12. Press the ***Insert*** key, type 'OTU' for the Output Unlatch instruction, and press ***Enter***.

13. Press ***Enter*** with your cursor on the ***Question Mark (?)***, and press the down arrow to view the available tags; select the ***C5[0].CU*** tag for the OTU instruction, and press ***Enter*** to accept the operand.

    Rung 0 now looks like this:




14. Right click on the rung number ***(0)*** and choose ***Verify Rung***.

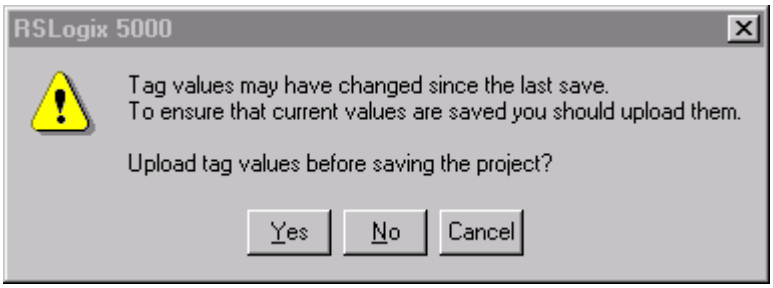
    A message appears at the bottom of the RSLogix 5000 window indicating the results of the Verify Rung command. (Note: The message will appear either in the status bar at the bottom of the screen, or in the Results window if it is selected under the View menu. If there are errors, you must correct them before the rung will verify. If there are no errors, the "e's" next to the rung will change to "i's"; this indicates the logic still needs to be inserted into your controller image. You can also verify the entire routine by choosing ***Verify > Routine*** from the ***Logic*** menu.

15. Right click on the rung number ***(0)*** and choose ***Accept Pending Rung***.

    This merges the rung edits into your existing code. You can also verify the entire routine by choosing ***Accept Pending Rung Edit*** from the ***Logic*** menu.

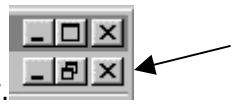
16. From the ***File*** menu, choose ***Save*** to save your program.

    A dialog appears, prompting you to confirm whether you would like to upload the tag values.




17. Click on ***No***.

18. Click on the ***X*** in the upper right corner of the Ladder Editor to close the editor.

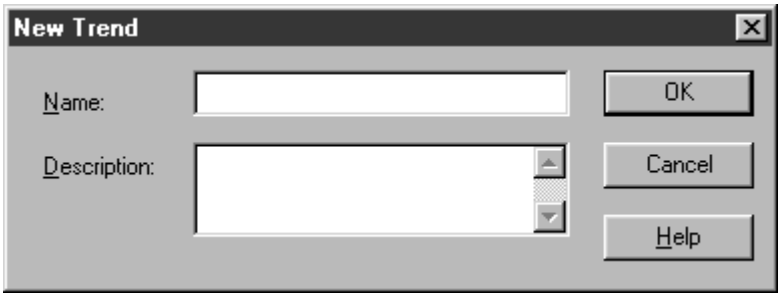


### Creating a Trend to Monitor the CTU Accum Value

Use the trending feature of RSLogix 5000 software.

1. From the ***Controller Organizer***, right click on the ***Trends*** folder and choose ***New Trend***.

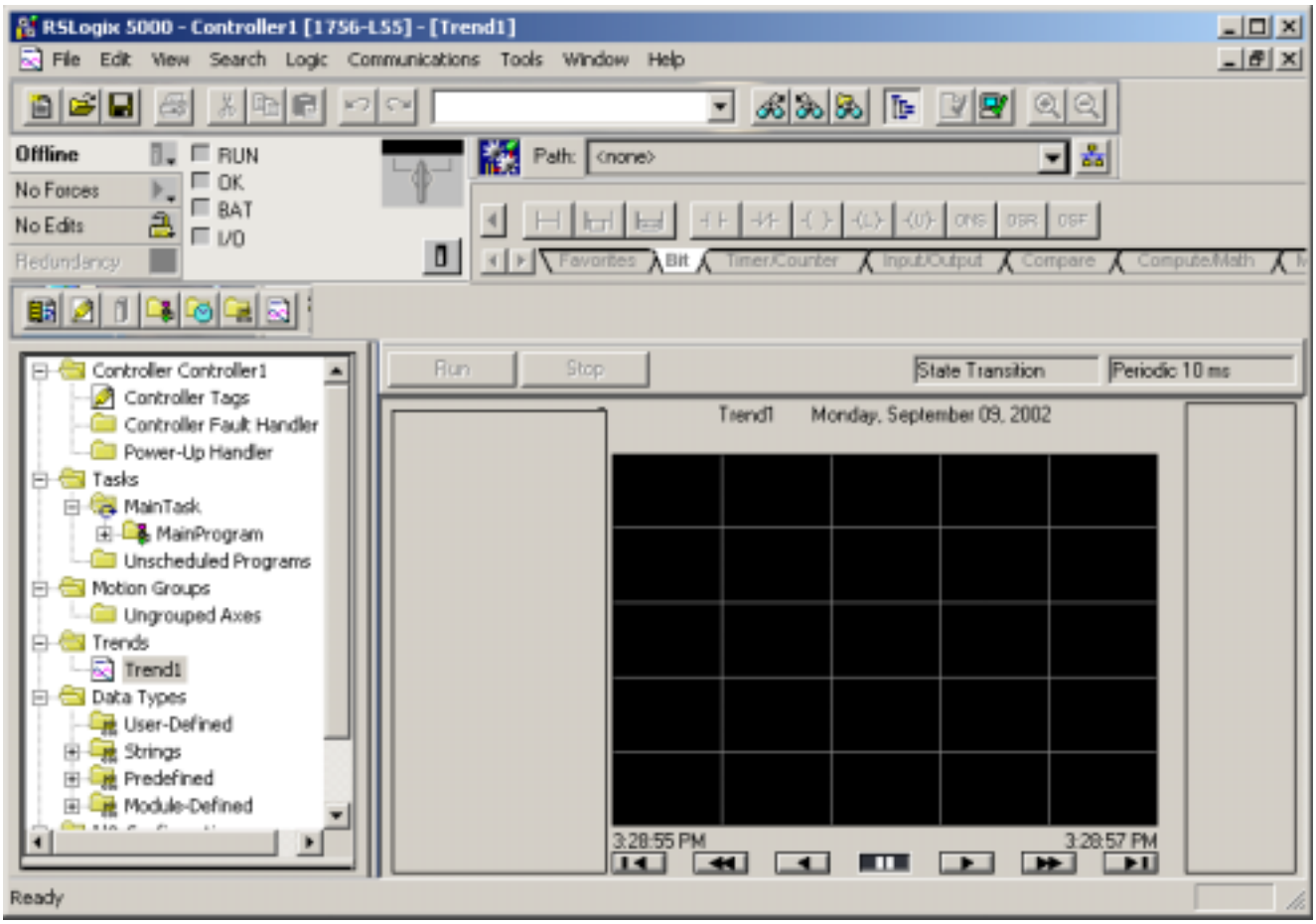
   The New Trend dialog appears.




2. In the ***Name*** field, type 'Trend1' and click on ***OK***.

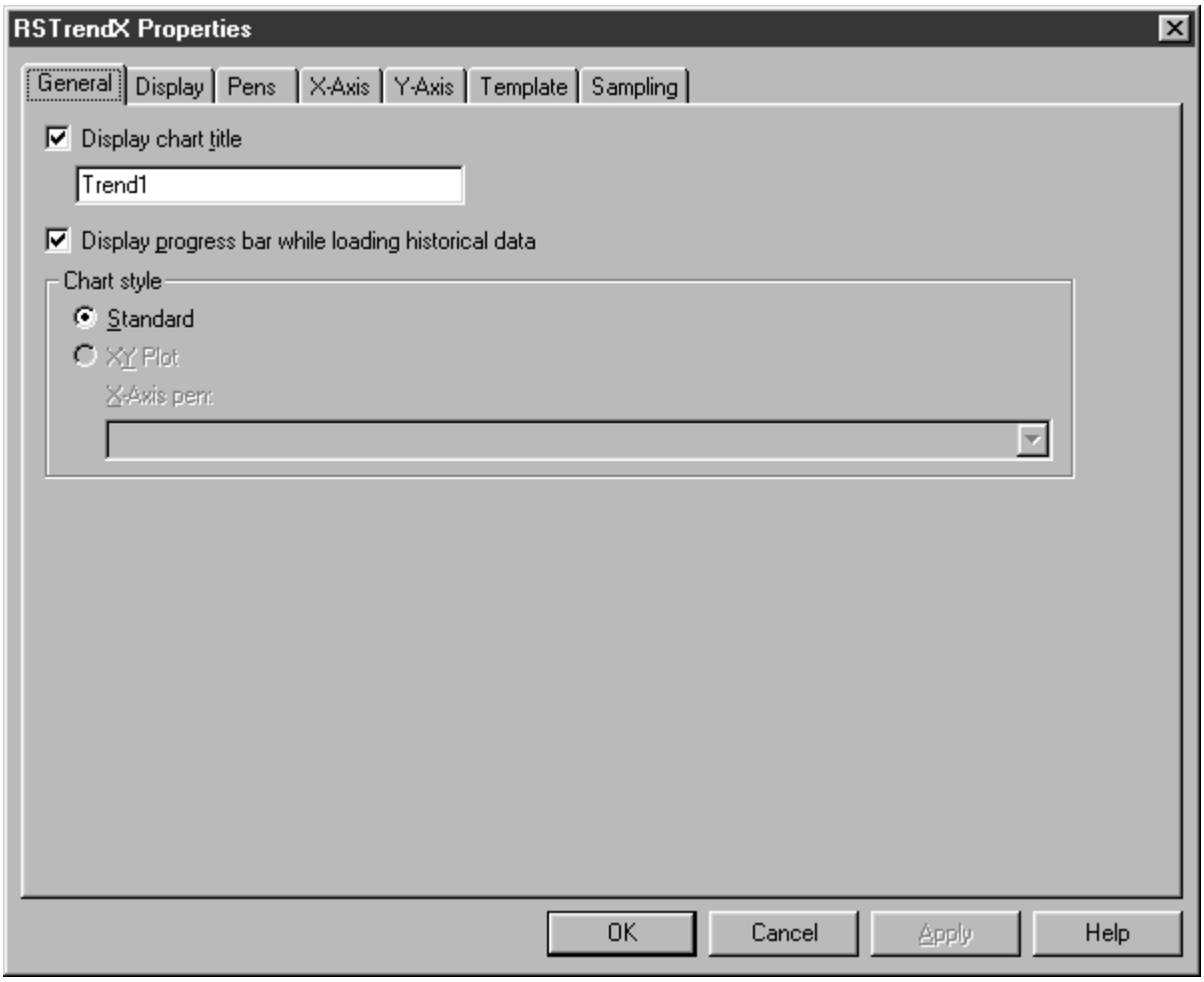
   The Trend1 icon appears in the Controller Organizer under the Trends folder.

3. Double click on the ***Trend1*** icon to open the Trend Chart window.

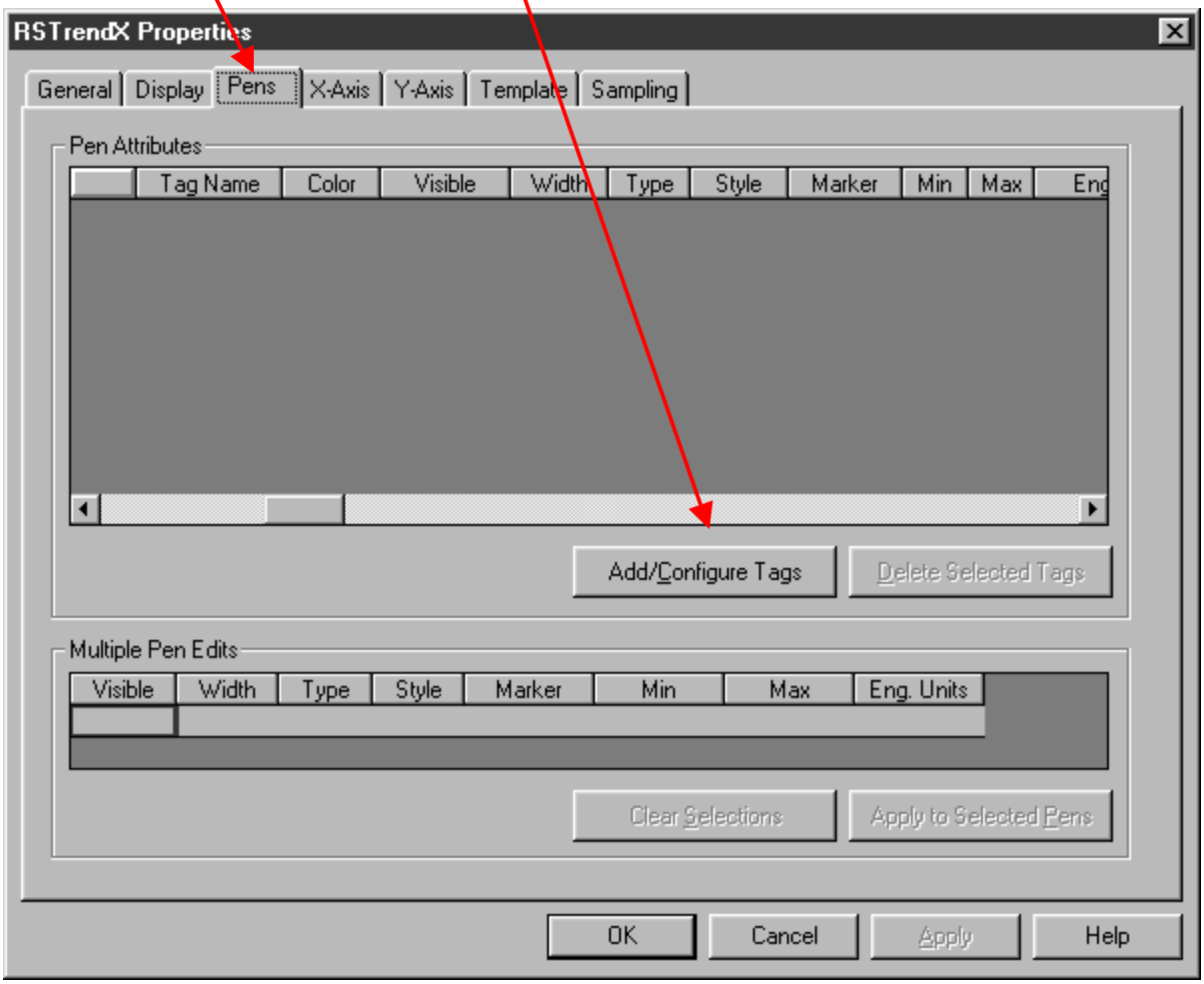


4. Right click on the Trend Chart window and choose ***Chart Properties***.

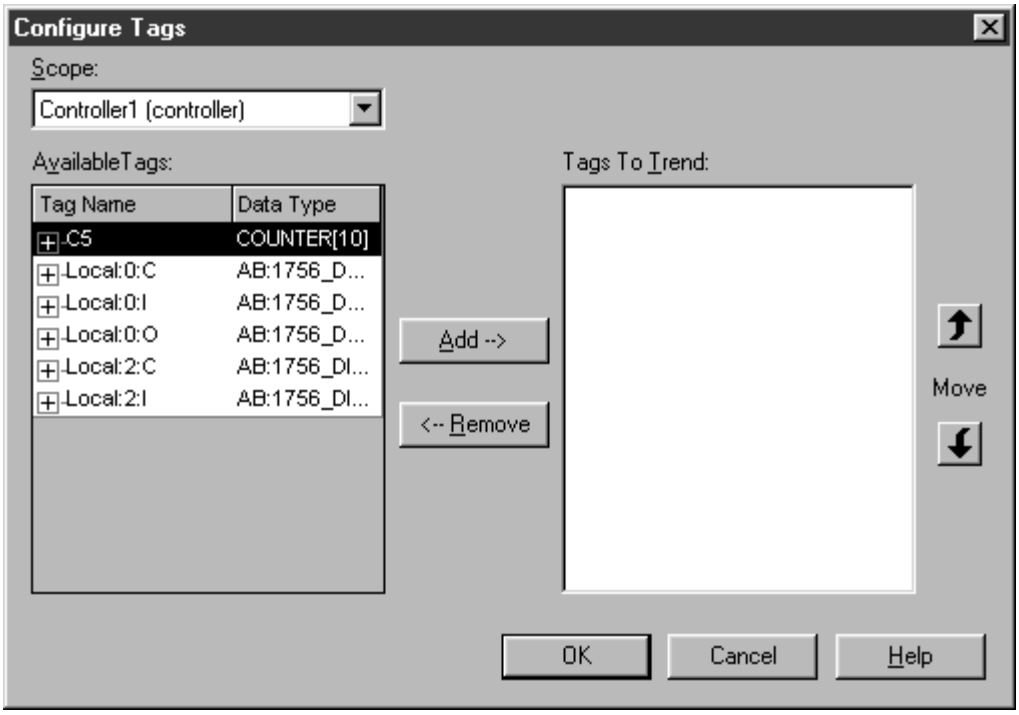
   The RSTrendX Properties dialog appears.



5. Click on the ***Pens*** tab, then click on ***Add/Configure Tags***.




The Configure Tags dialog appears.



6. Choose the ***Controller1 (controller)*** scope from the pull-down menu.

7. Click on the **+** sign to the left of the C5 tag to expand the counter array.

8. Click on the **+** sign to the left of C5[0] to expand the counter.

9. Click on ***C5[0].ACC***, click on the ***down arrow***, and select ***bit 0*** of the C5[0].ACC tag.

   The tag is now copied to the list of Tags to Trend.

10. Click on ***OK***.

    You are returned to the RSTrendX Properties screen.

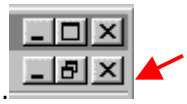
11. Click on the ***Type*** field in the C5[0].ACC.0 row and choose ***Digital***.

12. Click on the ***X-Axis*** tab and change the ***Time Span*** to ***5 seconds***.

13. Click on the ***Sampling*** tab and change the ***Period*** to ***1 second***.

14. Click on ***Apply***.

15. Click on ***OK*** to close the RSTrendX Properties dialog.

16. Click on the ***X*** in the upper right corner of the Trend Chart to close Trend1. 

17. ***Save*** your project.

### Testing Your Program – Periodic Task

Continue with the testing of the Periodic Task to see that your program does what you intended it to do.

**Periodic Task** – Recall we created Task2 as a periodic task running every 1 second. The Routine2 contained a counter that counts up every scan. We then added a Trend to capture the 0 bit of the counter accumulator.

1. Double click on the ***Trend1*** icon to open the Trend Chart window.

2 To run the trend, click on the ***Run*** button in the upper left corner of the Trend Chart window.

   You should be able to observe a trend of the C5[0].ACC.0 changing state once per second. This is the rate of the periodic task.

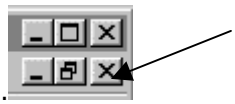
   **Note:** The workstation must be online to the controller, with the chart open, and have at least one tag configured to be able to Run the current trend. When a trend is started, all existing trend data is permanently deleted. Notice the pen legend in the upper right corner. You can see the value of bit 0 of the accumulator changing once every second.

**FYI**

Basic Trending in RSLogix 5000 allows you to view data sampled over a time period in a graphical display for a set of up to eight data elements. Data is sampled at a periodic rate that is configurable from 10 milliseconds to 30 minutes. RSLogix 5000 will allow you to create a trend, configure the data elements and display attributes, and save it as part of your project file. Basic Trending has these constraints: you can trend data elements of type BOOL, SINT, INT, DINT, and REAL, you are limited to sampling eight unique data elements, and you will be limited to activating data collection for one trend at a time.

3. Click on the ***Stop*** button to stop the trend.

4. Click on the ***X*** in the upper right corner of the Trend Chart to close the trend.



5. From the ***Communications*** menu, choose ***Go Offline***.

6. From the ***File*** menu, choose ***Save*** to save the controller file.

***Congratulations! You have now completed the steps for Exercise 3.***

## Exercise 4:
## Demonstrating Reusable Code

Explore the power of reusable code in the ControlLogix system. You will copy existing code and tags from one project to another, and map the copied tags to existing I/O.

Follow the steps below to complete Exercise 4. **Place a checkmark in the square next to each step as you complete it.** This will help you keep your place as you work through the steps.

### Opening Two Sessions of RSLogix 5000

Open two sessions of the RSLogix 5000 software.

- ☐ 1. From the ***File*** menu, choose ***Open*** to open the controller file ***Controller1.ACD*** that you created in Exercise 1.
- ☐ 2. Double click on the ***RSLogix 5000*** icon on the desktop to open another session of RSLogix 5000.
- ☐ 3. Open the ***ReusableCode.ACD*** controller file in the second session of RSLogix 5000.

  You should now have both Controller1.ACD and ReusableCode.ACD opened in the two sessions of RSLogix 5000.

### Copying the Main Program and Pasting Reusable Code

Copy the main program from Controller1.ACD and paste it into the ReusableCode.ACD file.

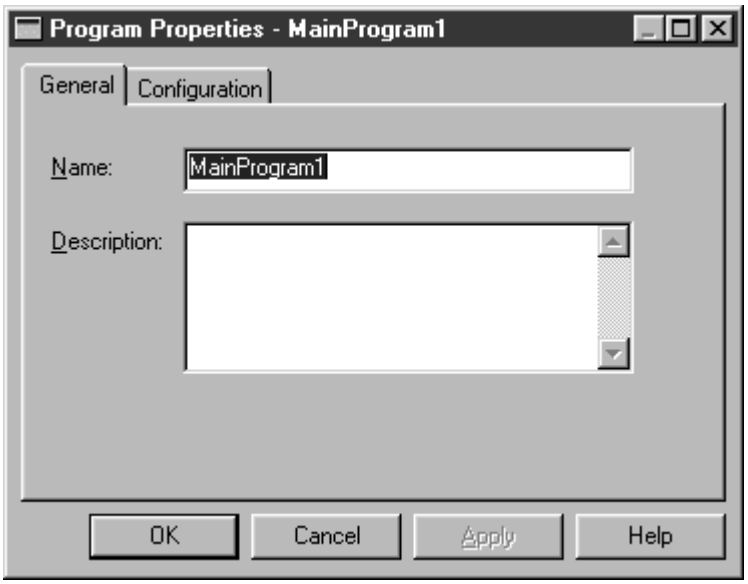
- ☐ 1. In the ***Controller1.ACD*** controller file right click on the ***MainProgram*** icon and choose ***Copy***.
- ☐ 2. In the ***ReusableCode.ACD*** controller file right click on the ***Main Task*** icon and choose ***Paste***.
- ☐ 3. Verify in the ReusableCode.ACD controller file that MainProgram was pasted under the task, MainTask, as MainProgram1.

### Changing the Name of the Program You Pasted

Change the name of MainProgram1 in the ReusableCode.ACD controller file.

1. In the ***ReusableCode.ACD*** controller file, right click on ***MainProgram1*** and choose ***Properties***.

   The Program Properties dialog box appears.




2. In the ***Name*** field, type 'ReusedProgram'.

3. In the ***Description*** field, type 'This program was copied from Controller1.ACD. The code and tags will be reused in this project to perform the same function.'

4. Click on ***OK*** to save your changes and close the Program Properties dialog.

### Changing the Name of the Main Routine

Change the name of MainRoutine and review the ladder diagram.

1. In the ***ReusableCode.ACD*** controller file, under ***ReusedProgram***, right click on ***MainRoutine*** and choose ***Properties***.

2. Change the name of MainRoutine to ***ReusedRoutine***.

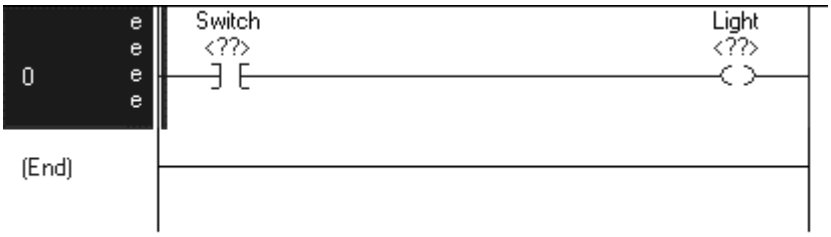
3. Click on ***OK*** to save your changes and close the routine properties dialog.

**FYI**

> You probably noticed that there were two routines named MainRoutine. ControlLogix provides program scoping, which allows routines under different programs to have the same name. Program scoping also allows program tags to have the same name as tags under other programs. The program scoping concept makes it easy to cut and paste code for reuse.

4. Double Click on ***ReusedRoutine.***

   The Ladder Editor should appear, as shown below.

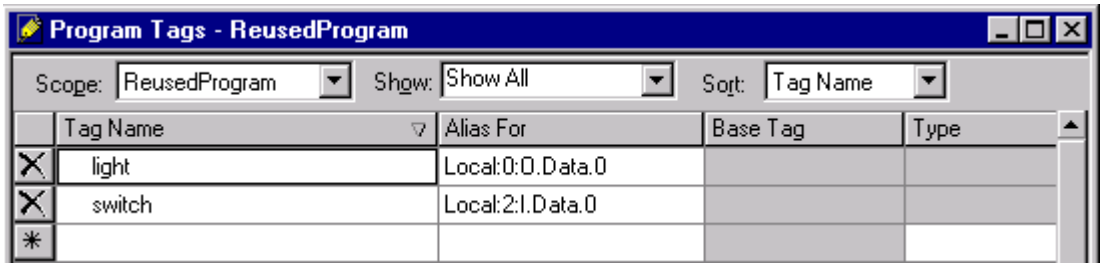



## Mapping the Tags

Map the tags to I/O in the ReusableCode controller file.

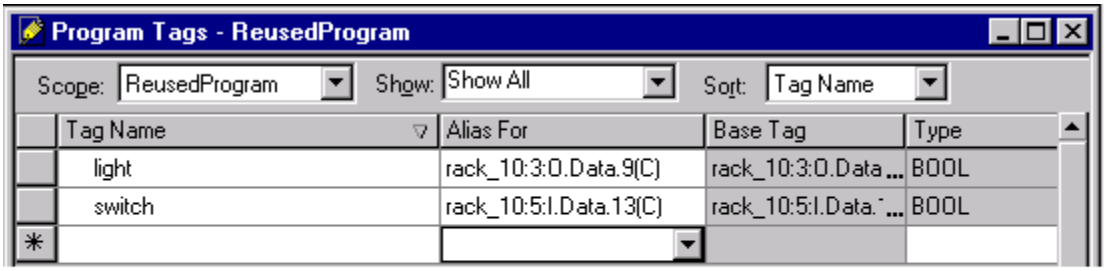
1. In the ***ReusableCode.ACD*** controller file, under ***ReusedProgram***, right click on ***Program Tags*** and choose ***Edit Tags***.

   The Program Tags - ReusedProgram dialog appears.




   Notice the ***X***s to the left of the tag names. This is because the tag points to an alias that does not exist in this project. You must "re-map" the tag to the I/O configuration in this project.

2. Change the fields in the Alias For column to match the screen below.




Select the 'Alias For' addresses as shown above for the 'light' and 'switch' tags. Notice that you have remapped the original tag names to I/O which is located in a remote chassis on ControlNet.

3. Press the ***Enter*** key to accept the Alias For tag once you have changed it.

   You have now completed mapping the tags to different I/O points in a remote rack on ControlNet. We will now review the steps for reusing existing code.

## Reviewing the Steps for Reusing Existing Code

With a few simple steps, the MainProgram from Controller1.ACD has been copied into the ReusableCode.ACD file and is ready for execution. Let's review the steps for reusing code.

1. The first step required us to cut and paste the Program from one Project to another Project.

   You can also accomplish this by dragging and dropping the program across projects.

   **FYI**

   > You can copy Tasks, Programs, Routines, Tags, User Defined Types, Modules, Rungs and Instructions to other projects the same way we copied the Program.

2. The second step we renamed the Program and the Routine.

   This is not a required step; we renamed them to emphasize their reuse.

3. The third step we mapped the tags to I/O that already existed in our project.

   **FYI**

   > All “Program Tags” get copied with the program. Therefore, since the “switch” and “light” tags were program scoped the tags were copied over with the program.

4. Close both .ACD files and shut down one session of RSLogix 5000.

   Do not save any changes you have made.

***Congratulations! You have now completed the steps for Exercise 4.***

## Exercise 5:
## Demonstrating Import-Export Capabilities

In this exercise, you will examine, import, and export a controller file to demonstrate the Import/Export capabilities of the ControlLogix system.

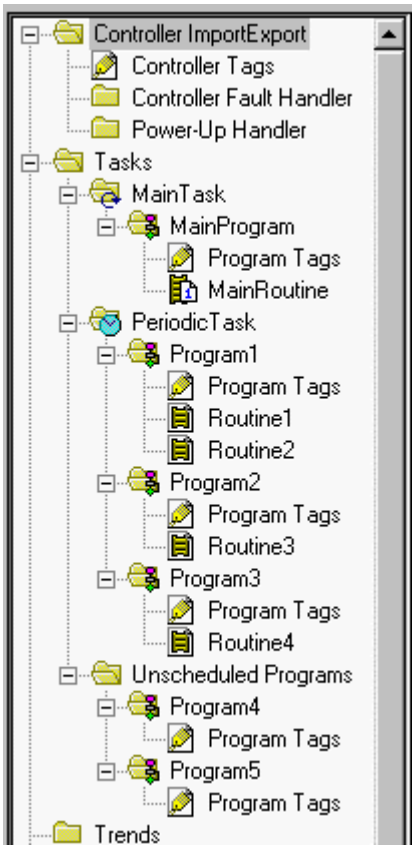
Follow the steps below to complete Exercise 5. **Place a checkmark in the square next to each step as you complete it.** This will help you keep your place as you work through the steps.

### Examining the Controller File

Open the ImportExport.ACD file.

☐ 1. From the ***File*** menu, choose ***Open*** to open the ***ImportExport.ACD*** controller file.

The Controller Organizer should look like this:




Notice that the controller file contains:

- (1) Continuous Task (MainTask)
- (1) Periodic Task (PeriodicTask)
- (4) Scheduled Programs (MainProgram, Program1, Program2, and Program3)
- (2) Unscheduled Programs (Program4, Program5)
- (2) I/O modules
- (1) CNB ControlNet bridge
- (1) Logix5550 controller

### Exporting the controller file

1. From the ***File*** menu, choose ***Save As***.
2. Click on the ***down arrow*** next to the ***Save As Type*** field and click on ***RSLogix 5000 Import/Export File (*.L5K)*** to change the file format to an Export format.
3. Note the directory you are saving the controller file to and click on ***Save*** to export the controller file.

### Reviewing the Export File Format

1. Open Windows NT Explorer and navigate to the directory to which you exported the controller file.
2. Use NotePad to open the ***ImportExport.L5K*** export file.

   Notice the first few lines tell you what version of RSLogix 5000 exported this file, who the owner is, and when it was exported.

   The second section lists the Controller Name (ImportExport in this case), the Time Slice, and the Communications path.

   The next section deals with Modules. Notice that each module configured in our controller file is listed. The name identifies the module; other attributes such as the catalog number and the major and minor revision are listed and easy to read.
3. Scroll down in the Export file until you see the section labeled ***Tag*** as shown below. Under this section, notice that all of the tags you created in the controller file and their values are listed.

```
TAG
        IntArray : INT[10] (RADIX := Decimal) := [0,0,0,0,0,0,0,0,0,0];
        Light : BOOL (RADIX := Decimal) := 0;
        LightTimer : TIMER  := [0,10000,0];
        myCounter : COUNTER  := [0,50,0];
        myTime : Time  := [0,0,0];
        Switch : BOOL (RADIX := Decimal) := 0;
END_TAG
```

4. Change the values in the ***IntArray*** to ***[0,1,2,3,4,5,6,7,8,9]***.
5. Change the Preset of ***myCounter*** to ***100*** by changing the value field to ***[0,100,0]***.
6. From the ***File*** menu in Notepad, choose ***Save*** to save your changes.
7. Scroll through the remainder of the file.

   Notice the program and routine configuration.
8. From the ***File*** menu, choose ***Exit*** to close the file and Notepad.

### Importing the Changed Export File

1. From the ***File*** menu in RSLogix 5000, choose ***Open.***
2. Click on ***ImportExport.L5K*** and then click on ***Open***.
3. In the ***File name*** field, type 'myInitials_ImportExport.ACD' (e.g., PYL_ImportExport.ACD).
4. Click on ***Import*** to import the file.

### Verifying Your Changes in the Imported File

1. From the ***Controller Organizer***, right click on ***Controller Tags*** and choose ***Monitor Tags***.

   The Tag Monitor appears.

2. Click on the **+** sign in front of the ***IntArray*** tag to display the entire array. Verify the values have changed from all zeros to 0-9.

3. Click on the **+** sign in front of the ***myCounter*** tag to display the counter values. Verify the preset has changed from 50 to 100.

### Importing Tags From a .CSV File

1. From the ***Start menu***, choose ***Programs > Microsoft Excel***.

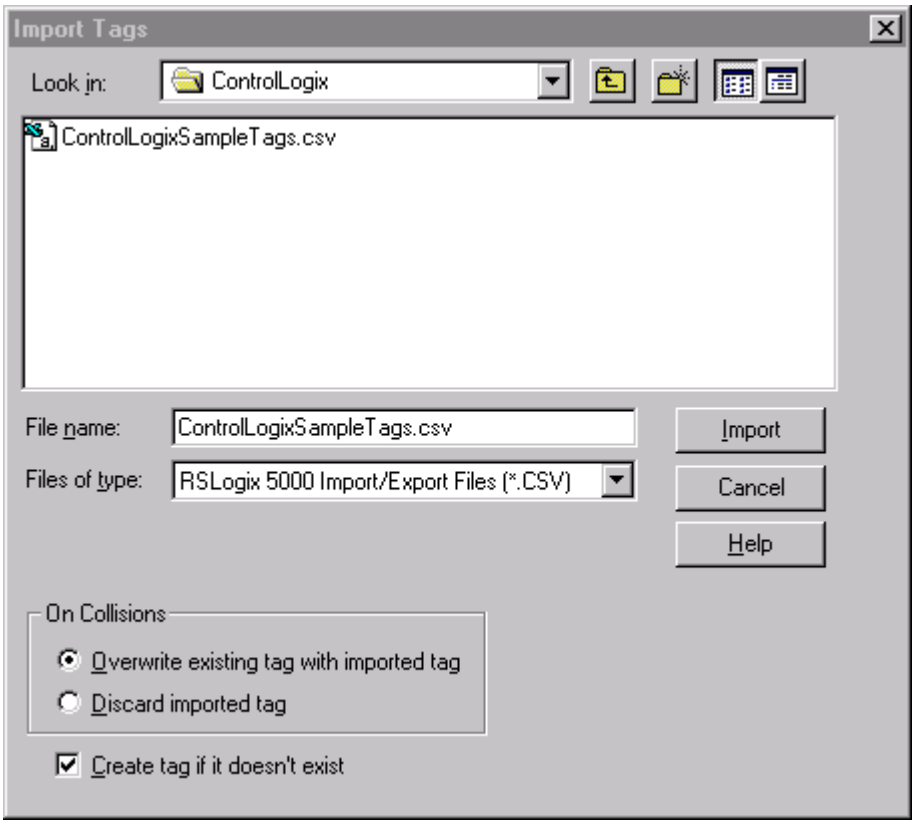
2. Open the ControlLogixSampleTags.CSV file and look at the tags in this file.

   Make sure that you choose Text Files (*.prn, *.txt, *.csv) in the Files of type field.

3. ***Close*** Microsoft Excel.

4. From the ***Tools*** menu in RSLogix 5000, choose ***Import Tags***.

   The Import Tags dialog appears.




5. Click on the ControlLogixSampleTags.CSV file in the window to highlight it.

   It should now appear in the File name field.

6. In the ***On Collisions*** box, choose ***Overwrite existing tag with imported tag***.

**FYI**

> These options determine what happens when the name of an imported tag matches the name of a tag in the project database.

7. If it is not checked already, check the "Create tag if it doesn't exist" checkbox.

   By default, if a tag with a matching name for an imported tag is not found in the project database, a tag is created by that name.

8. Click on ***Import***.

9. If it is not already open, open the Data Monitor so that you can view the Controller Tags.

10. Click on the ***Edit Tags*** tab to enter the edit mode.

    Observe the new tags that were created in the ImportExport controller file.

11. Click on the ***Errors*** tab in the ***Results*** window to see how many tags were created, skipped, overwritten, and discarded.

12. From the ***File*** menu, choose ***Close*** to close the controller file.

13. Choose ***Yes*** to save your changes.

***Congratulations! You have now completed the steps for Exercise 5.***

## Exercise 6:
## Demonstrate Discrete Diagnostic I/O Capabilities

In this exercise, you will explore the diagnostic capabilities of ControlLogix discrete I/O. As you proceed through the exercise, you will look at the diagnostic options, download your controller file, and test a routine that exercises these diagnostic capabilities.

Follow the steps below to complete Exercise 6. **Place a checkmark in the square next to each step as you complete it.** This will help you keep your place as you work through the steps.

### Opening the Controller file and Saving it as a New File

Open the controller file and save it under a new name.

☐ 1. Open the controller file ***Controller1.ACD***.

☐ 2. ***Download*** the file to the controller in slot 1.

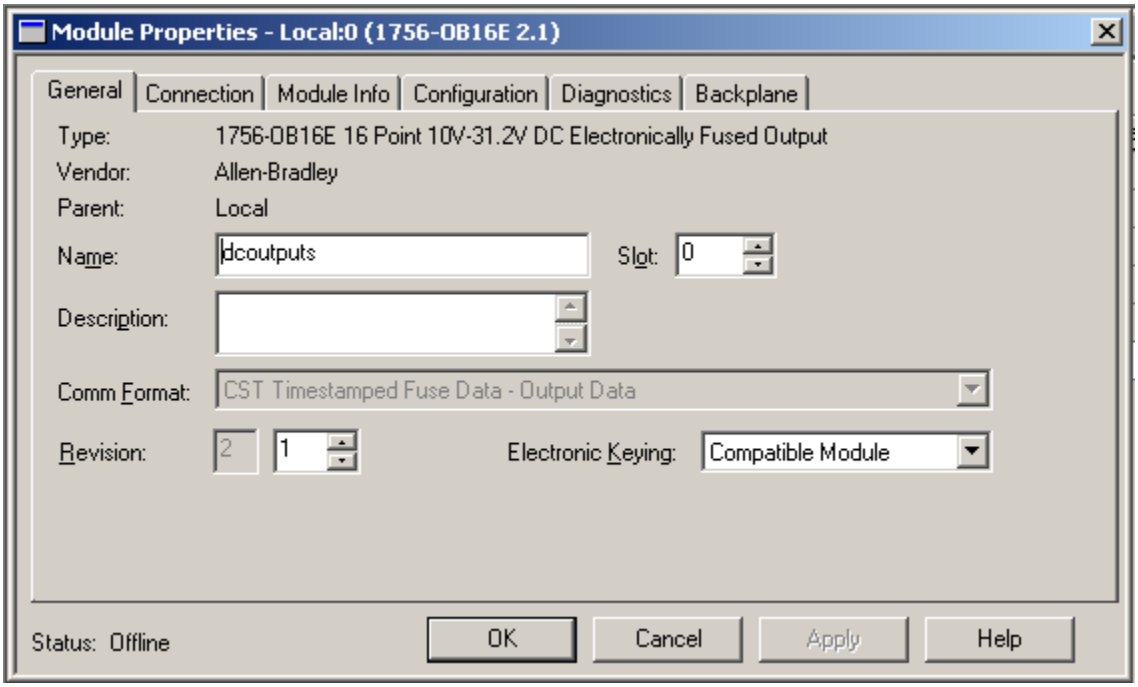
☐ 3. Put the controller in ***Remote Program*** or ***Program*** mode.

### Looking at the Properties of the Output Module

Look at the properties of the 1756-OB16E module in slot 0.

☐ 1. From the ***Controller Organizer***, under the ***I/O Configuration*** folder, right click on the ***dcoutputs*** module and choose ***Properties***.

The Module Properties dialog appears with the General tab selected.




Click on the Help button for more information about the parameters on this dialog. If you are opening Help for the first time, there will be a slight delay before it opens. Close the Help window when you are done.

☐ 2. Click on the ***Connection*** tab.

**FYI**

The data on this tab comes directly from the controller. This tab displays information about the condition of the connection between the module and the controller.

**Requested Packet Interval** - The requested rate of packet arrival (connection update rate). The connection will be scheduled to move data to or from the module at least this often. The minimum and maximum RPI values are shown parenthetically to the right of the box/spin control. These minimum and maximum values are module dependent and will differ depending on the limits of the module. The RPI is determined by the Owner Controller(s) of a module. If a Listen-Only connection is established, the RPI for that connection cannot be faster than the fastest RPI configured for all owner controllers (for input modules), or faster than the RPI configured for the one owner controller (for output modules).

**Inhibit Module checkbox** - Check/Uncheck this box to inhibit/uninhibit your connection to the module. Inhibiting the module causes the connection to the module to be broken.

**Major Fault on Controller if Connection Fails checkbox** - Check this box to configure the controller so that failure of the connection to this module causes a major fault on the controller if the connection for the module fails.

**Module Fault** - Displays the fault code returned from the controller (related to the module you are configuring) and the text detailing the Module Fault that has occurred.

3. Click on the ***Module Info*** tab

**FYI**

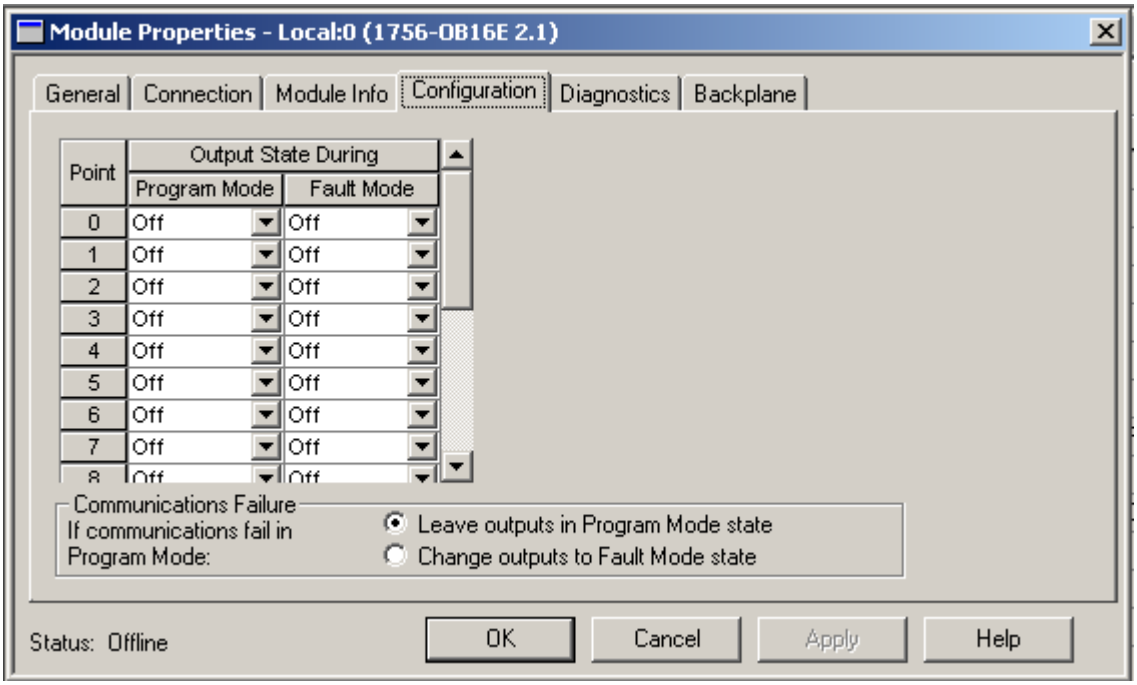
The Module Info tab contains information about the selected module. You can click on refresh to display new data from the module. You can click on Reset Module to return the module to its power-up state by emulating the cycling of power. By doing this, you also clear all faults.

## Configuring Module Output States and Diagnostics

Configure the output states and diagnostic information for the 1756-OB16E module.

1. Click on the ***Configuration*** tab.

   The Configuration tab appears as follows:




   Note that you can configure many diagnostics and output states on the module, down to the point level.

2. Under the ***Output State During*** column, from the ***Program Mode*** pull-down menu for Point 0, choose ***On***.

   Choosing On will turn on output point 0 when the processor is in Program mode.

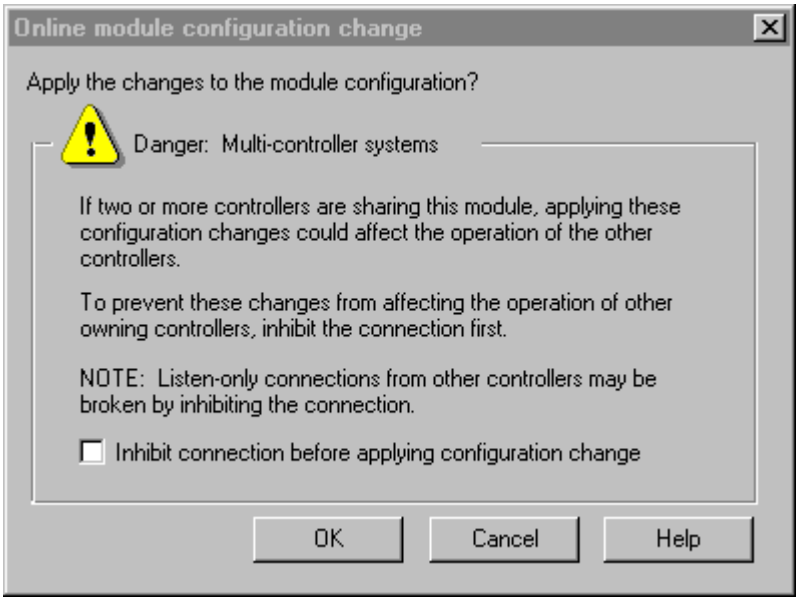
3. Repeat step 2 for output points 1, 2, and 3 as follows:

   - Output Point 1 - On
   - Output Point 2 - Hold
   - Output Point 3 - Hold

   Choosing Hold for outputs 2 and 3 causes them to hold the state they were in before the processor was changed from Run mode to Program mode.

6. Click on ***Apply*** to save the new module configuration.

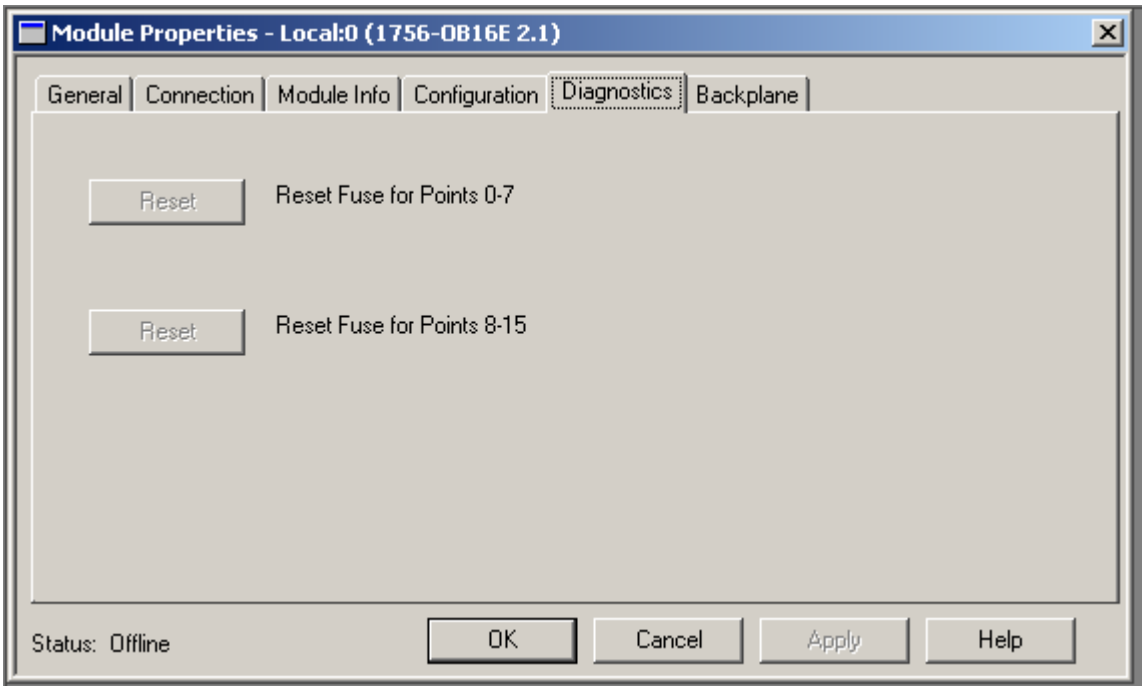
   The following prompt appears.




7. Click on ***OK*** to apply the changes to the module configuration.

8. Click on the ***Diagnostics*** tab.

   The Diagnostics screen that appears is used only in the Online mode to reset the fuses.




9. Click on the ***Backplane*** tab.

   The Backplane screen that appears is used only in the Online mode to check the ControlBus Status and Error Counters, and to set the ControlBus parameters.

10. Click on ***OK*** to close the Module Properties dialog.

## Viewing the Tags Created for the Output Module

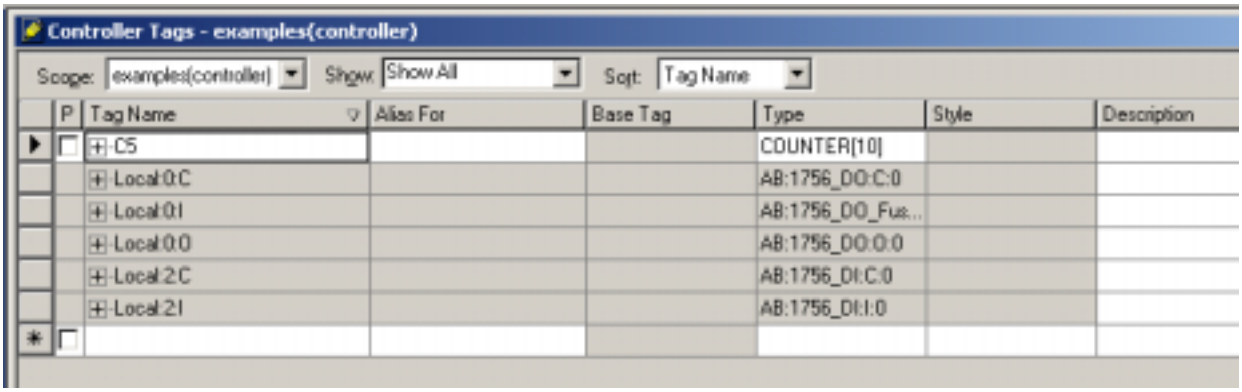
View the tags you have created for the 1756-OB16E module in slot 0.

1. From the ***Controller Organizer***, double click on the ***Controller Tags*** icon.

   The Data Monitor appears, with 3 entries for the 1756-OB16E module in the Tag Name column:

   - Local:0:C
   - Local:0:I
   - Local:0:O

   These three entries are tag structures, and they contain more tags than are actually displayed in the Data Monitor screen. Note the + sign next to the tag name; this indicates that you can expand the tag structure to see more tag information.

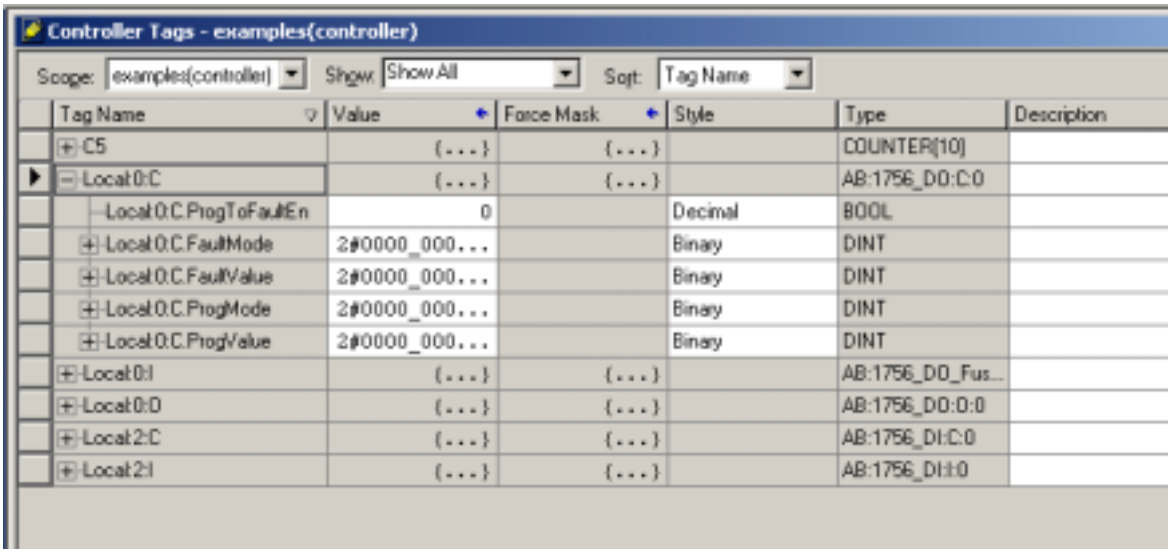



**FYI**

> The name Local indicates that these tags are associated with a module that is in the same chassis as the controller. The number between the colons is the slot number of the module; in this case, the module is in slot 0. The characters appearing after the last colon (i.e., the C, the I, and the O) indicate whether the data is **C**onfiguration, **I**nput, or **O**utput data. This particular module has all three types of data.
>
> The Scope field above the Tag Name column displays the scope for the tags that are displayed. The scope defines the range in which tags are recognized within the routines. Tags created at the controller scope are accessible to all routines in all program folders; those created at the program scope are accessible only to routines within that single program folder.
>
> In this case, the tag scope is Controller1 (controller), which indicates that the tags are valid for all routines in all program folders in this controller file. If the scope field contained a program name, then the tags would be valid only for the routines in the program folder specified.

2. Click on the **+** sign in front of the ***Local:0:C*** tag to display the configuration tags for this module.

   The Data Monitor refreshes to show you all of the tags underneath the Local:0:C tag. If you cannot see the entire tag name and value, drag the edges of the respective columns to increase their width.



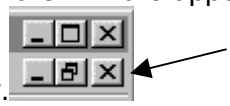

   Click on the arrow pointing to the right at the bottom of the screen to view the other columns of the tag database. The 2's in the Value column indicate that the style (or radix) of the values is binary. The # sign serves as a delimiter between the style and the rest of the value. Note that some of the configuration tags consist of 32 bits. These bits are numbered from 0 to 31 from right to left. The individual bits that are set in these tags are the result of the default configuration that was used when you entered the module in the I/O Configuration list.

3. Click on the **+** sign in front of the ***Local:0:I*** tag to display all of the input tags for this module.

   You should see 6 entries under this tag structure.

4. Click on the **+** sign in front of the ***Local:0:O*** tag to display all of the output tags for this module.

   The Local:0:O.Data tag appears under the Local:0:O tag structure. Tags labeled Local:0:O.Data are the actual output bits (like the output image data in a PLC-5 processor).

5. Click on the ***X*** in the upper right corner of the Controller Tags window to close the Data Monitor. 

### Looking at the Properties of the Input Module

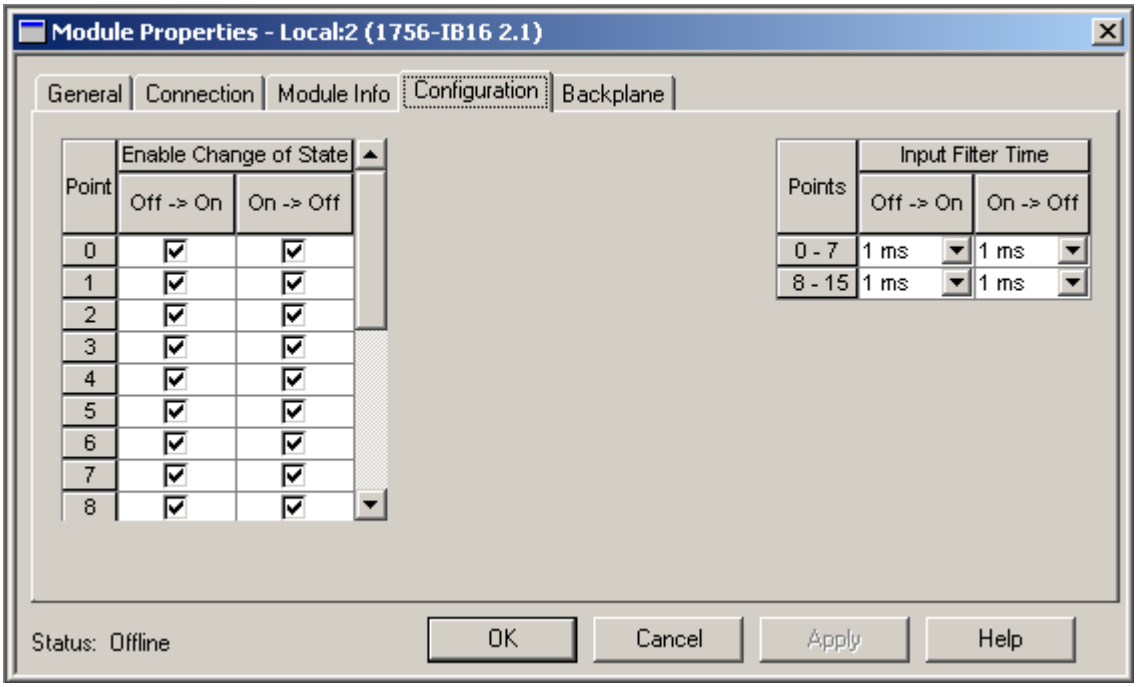
Look at the properties of the 1756-IB16 module in slot 2.

1. From the ***Controller Organizer***, under the ***I/O Configuration*** folder, right click on the ***dcinputs*** module and choose ***Properties***.

   The Module Properties dialog appears with the General tab selected.

2. Click on the ***Configuration*** tab.

   As the Configuration screen below shows, you can configure many diagnostic and input states on the module, down to the point level.




3. Verify that the Enable Change of State settings are as shown above.

4. Click on the ***Backplane*** tab.

   The Backplane screen is used only in an online mode to check ControlBusStatus, Error Counters, and to set ControlBus Parameters.

5. Click ***Apply*** to save your changes.

6. Click ***OK*** on the Online Module Configuration Change dialog.

7. Click on ***OK*** to close the module properties.

***Congratulations! You have now completed the steps for Exercise 6.***

**Notes:**_____

## Exercise 7:
## Configuring and Testing Analog I/O Modules

In this exercise, you will configure an analog input and an analog output module. You will write ladder logic that uses these modules, and then download and test your program.

Follow the steps below to complete Exercise 7. **Place a checkmark in the square next to each step as you complete it.** This will help you keep your place as you work through the steps.

### Opening the Controller file and Saving it as a New File

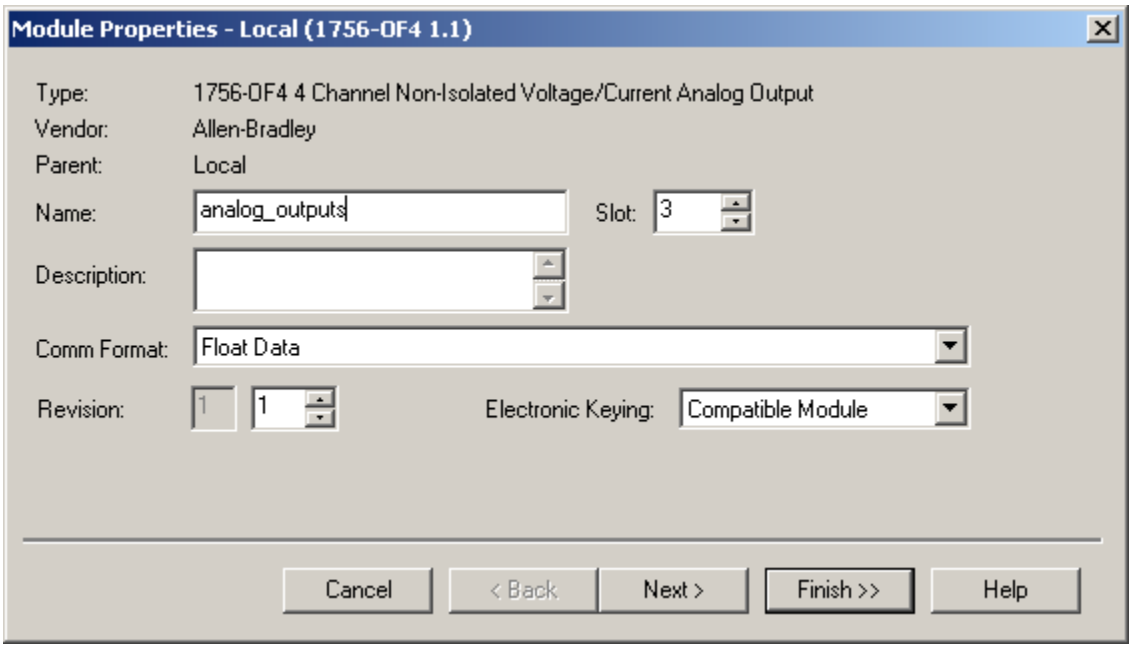
Open the controller file and save it under a new name.

- ☐ 1. Open the controller file ***Controller1.ACD***.
- ☐ 2. From the ***File*** menu, choose ***Save As***.
- ☐ 3. Save the file as 'Analog_Controller1.ACD'.

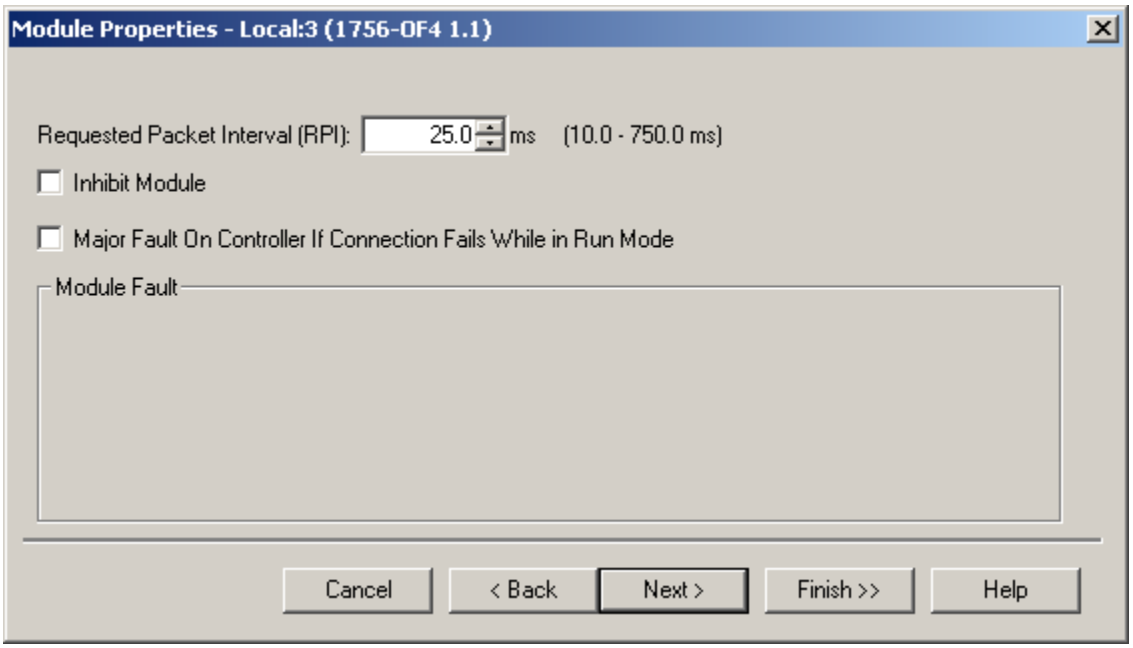
### Configuring the Analog Output Module

Configure the analog output module in slot 3 for this controller.

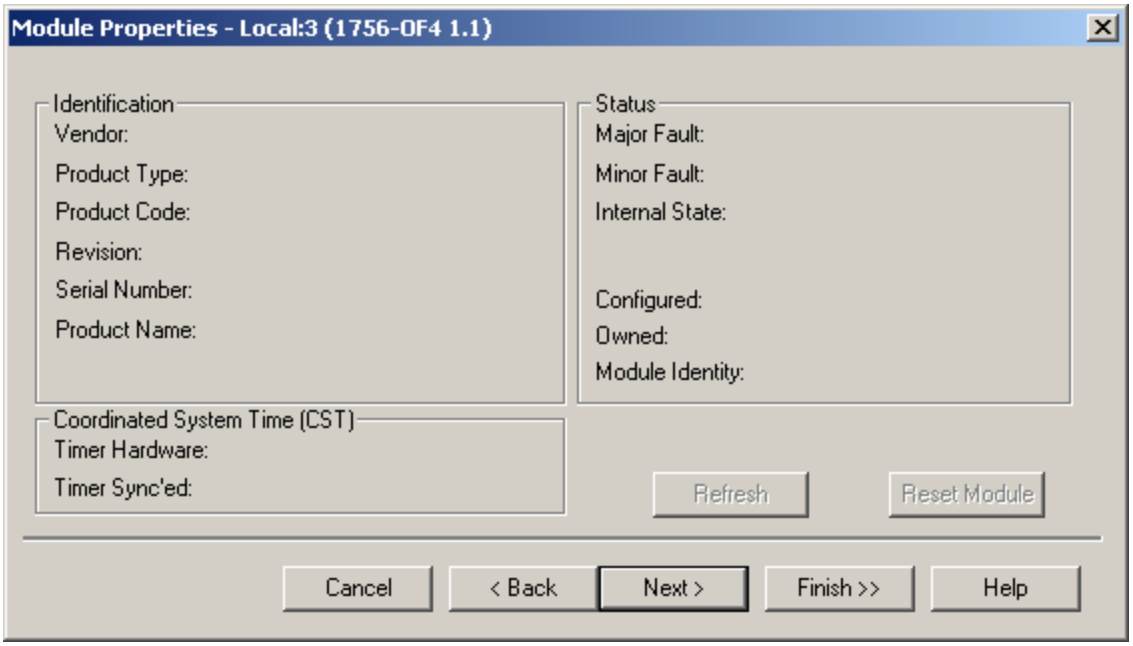
- ☐ 1. From the ***Controller Organizer***, right click on the ***I/O Configuration*** folder and choose ***New Module***.
- ☐ 2. Double click on the ***1756-OF4*** module.
- ☐ 3. Enter selections for this module as shown below and click on ***Next***.



☐ 4. When the next Module Properties screen appears, verify the parameters below and click on ***Next***.

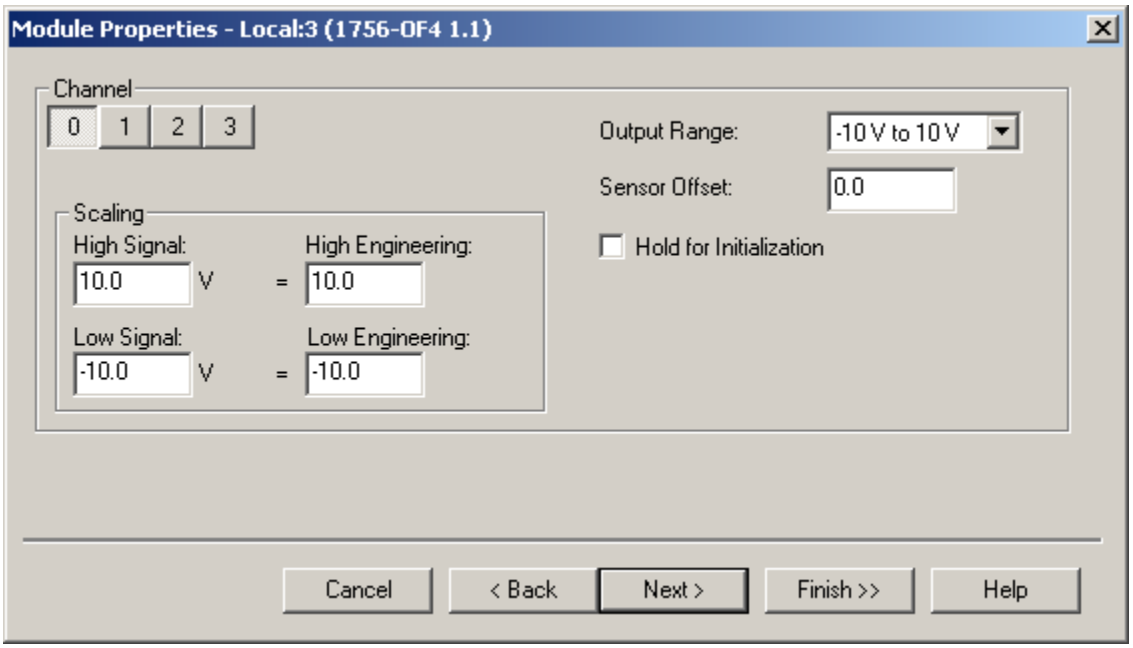



The next Module Properties screen that appears, as shown below, is used only in the Online mode.




☐ 5. Click on ***Next***.

☐ 6. When the next Module Properties screen appears, verify the parameters for Channel 0 are as shown below.




**FYI**

The Channel Configuration Screen shown above allows you to configure scaling values and the other attributes on a per channel basis. To configure, a channel click on the channel button for the channel that you want to configure.

**Scaling -** Scaling allows the user to change a quantity from one notation to another. For ControlLogix analog I/O modules, scaling is only available with the floating point data format. To scale a module, choose two points along the module's operating range and apply low and high values to those points.

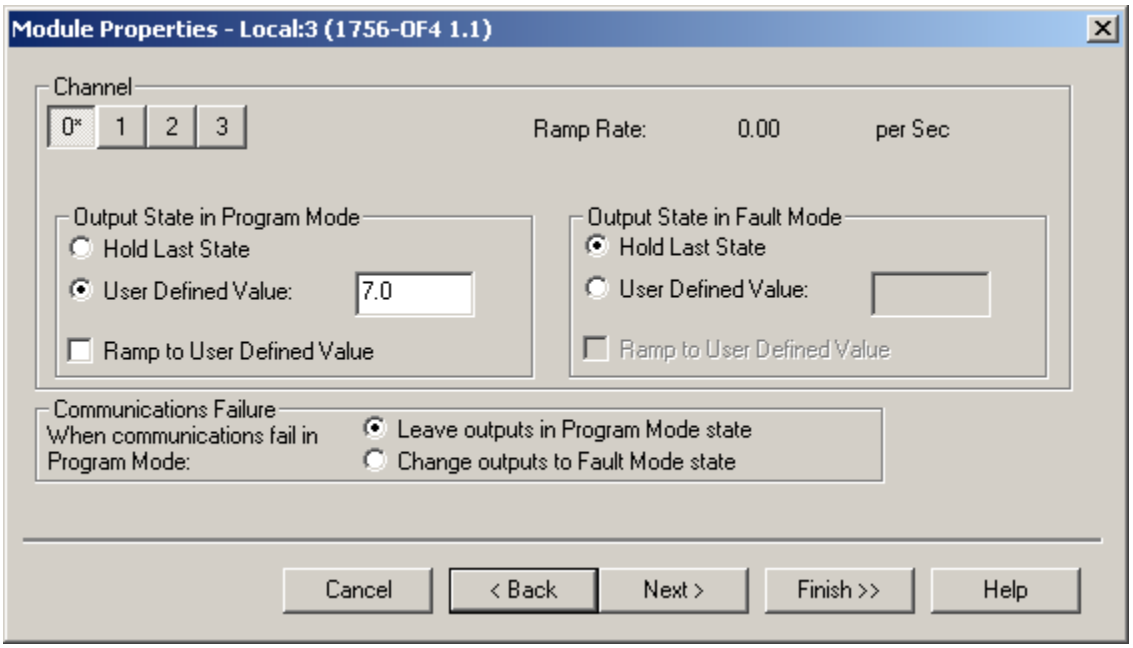
**Note:** In choosing two points for the low and high value of your application, you do not limit the range of the module. The module's range and its resolution remain constant regardless of how you scale it for your application.

**Calibration Bias** - An offset value that is added to the output during the calibration calculation to compensate for inaccuracies of the sensor. These modules are isolated to avoid interactions between channels.

**Hold for Initialization** - Check the Hold for Initialization box if you want the module to hold the output signal unchanged until the output value (received from the controller) is within 0.1% of full scale of the value held.

☐ 7. Click on ***Next***.

☐ 8. When the next Module Properties screen appears, modify the parameters for Channel 0 as shown below.




**FYI**

The Channel Configuration Screen shown above allows you to configure the output state on a per channel basis. To configure a channel, click on the channel button for the channel you want to configure.

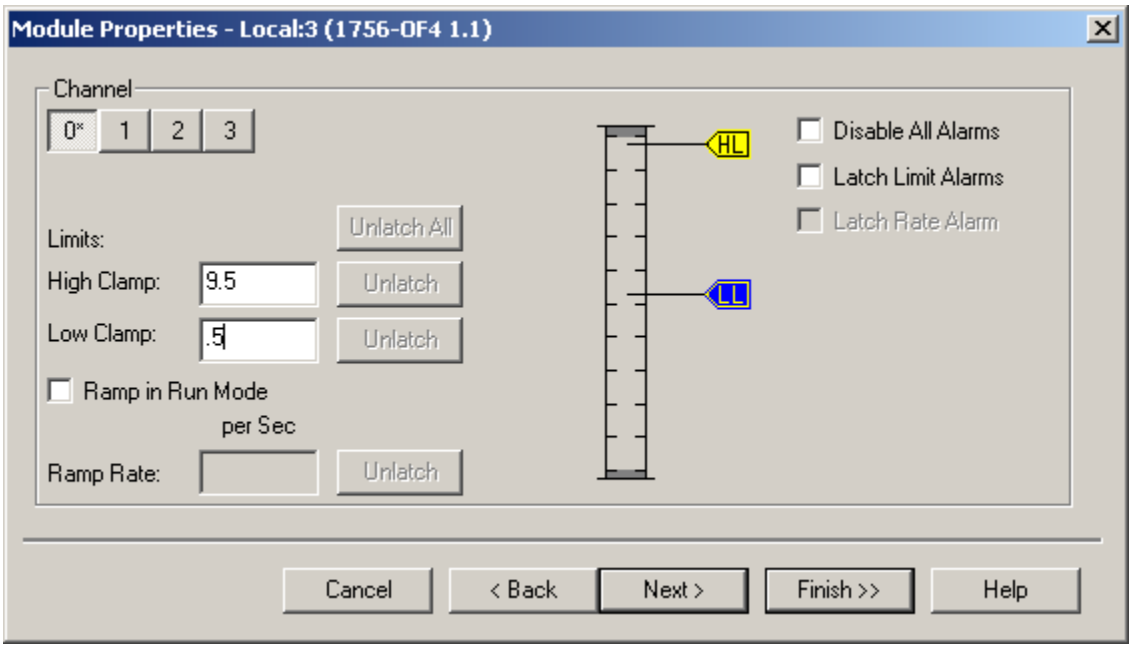
**Program Mode/Fault Mode**

- **Hold Last State** - Click on this button (under Output State in Program Mode or Fault Mode) if you want the output channel to remain at the last output value, OR
- **User Defined Value** - Click on this button (under Output State in Program Mode or Fault Mode) if you want the output channel to go to a specific value when the owner controller is switched into program mode. If you click on this button, you should enter a value in the box to the right:

By checking the Ramp to User Defined Value box, you can choose to ramp to the user-defined value rather than proceed to the value as fast as possible. You select the Ramp Rate on the next configuration screen.

☐ 9. Click on ***Next***.

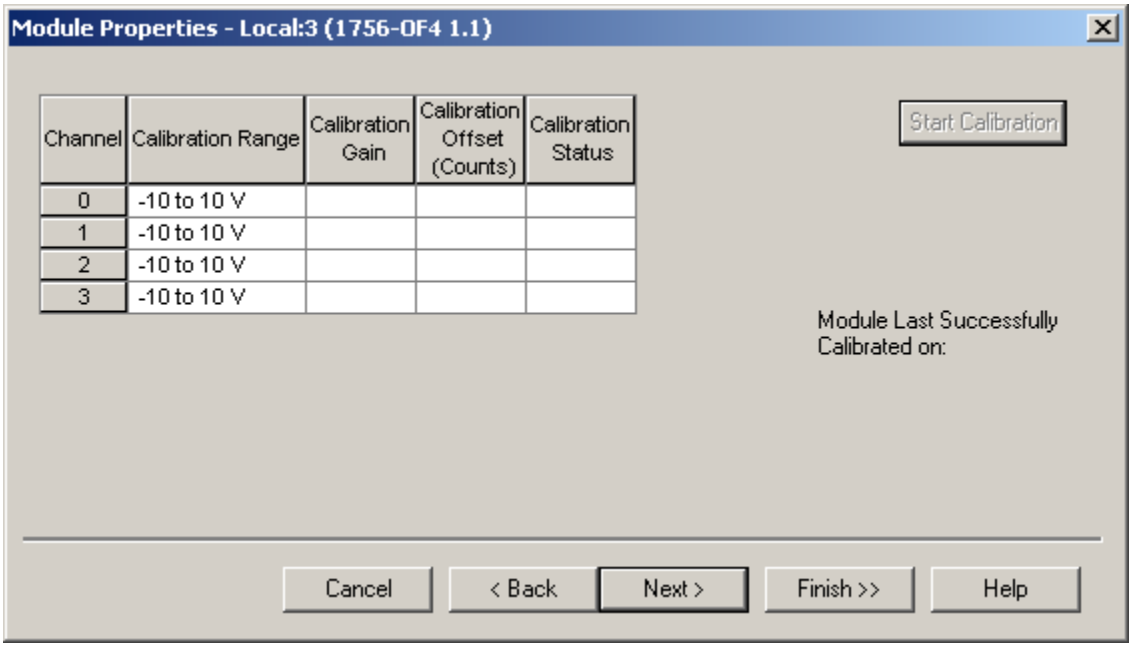
10. When the next Module Properties screen appears, modify the parameters for Channel 0 as shown below.




Notice the ***LL*** and ***HL*** pointers give you a quick visual for your Clamp Limits.

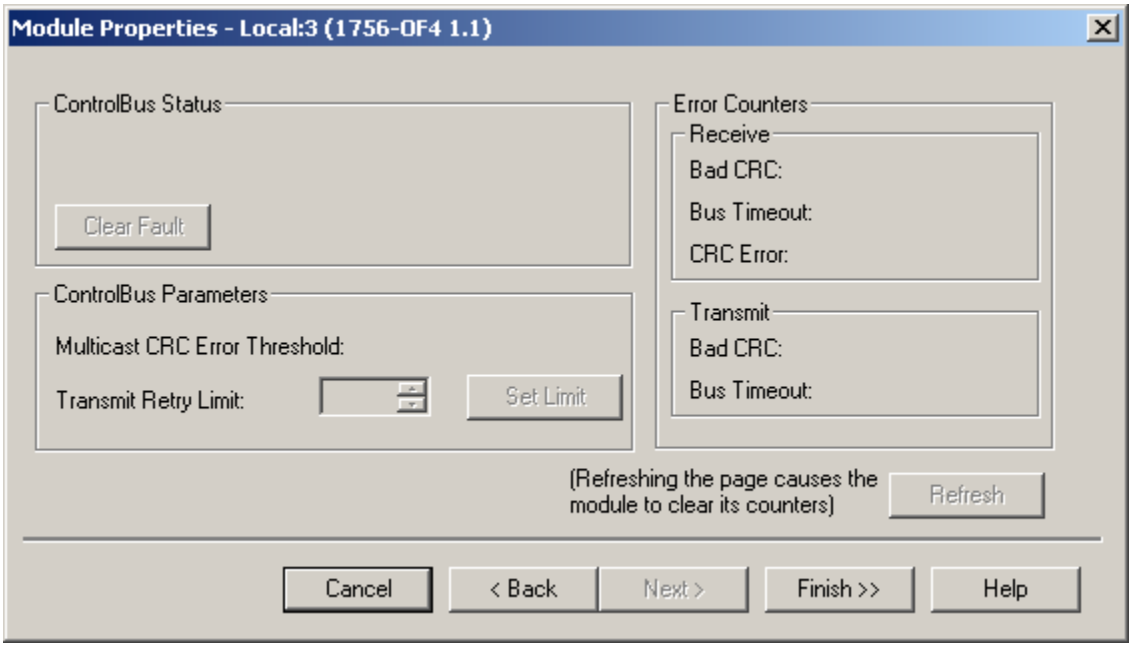
11. Click on ***Next***.

The next Module Properties screen that appears (as shown below) is only used when calibrating the module or checking the last calibration date.



☐ 12. Click on ***Next***.

The next Module Properties screen that appears (as shown below) is used in an Online mode to check ControlBus Status and Error Counters, and to set ControlBus parameters.




☐ 13. Click on ***Finish***.

## Verifying Tags

Verify that the tags were created for the 1756-OF4 module in slot 3.

☐ 1. From the ***Controller Organizer***, double click on the ***Controller Tags*** icon.

Three entries should appear under Tag Name for the 1756-OF4 analog output module.

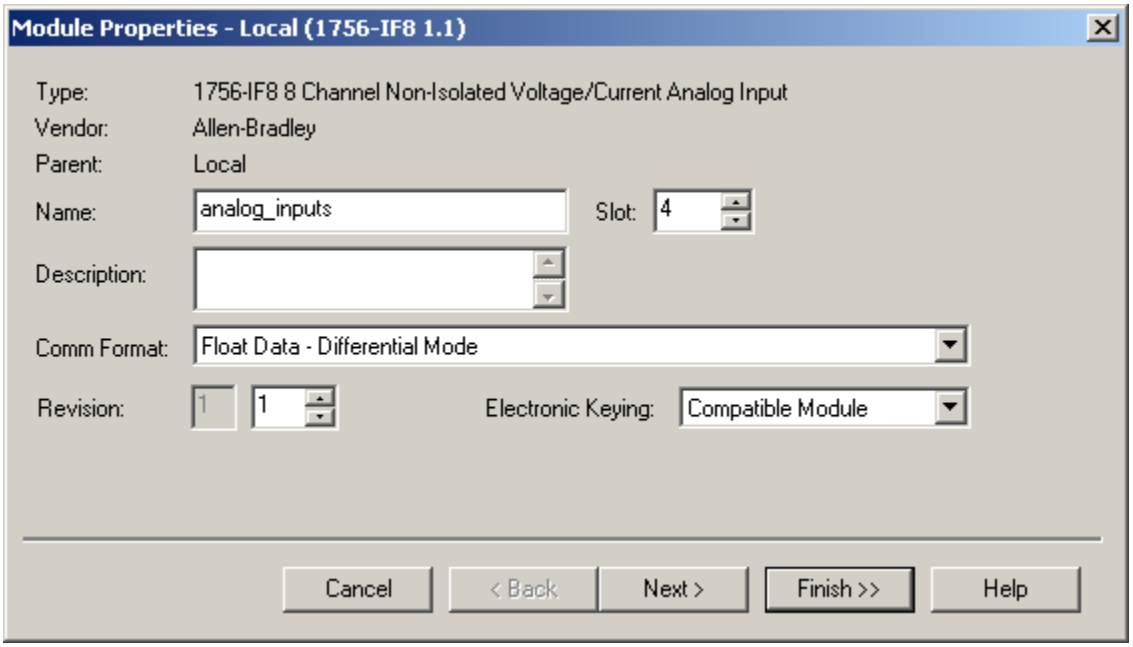
☐ 2. Click on the **+** sign in front of the Local:3:**C**, the Local:3:**I**, and the Local:3:**O** tags to view the **C**onfiguration, **I**nput, and **O**utput tags that are available for this analog output module.

☐ 3. ***Save*** your program.

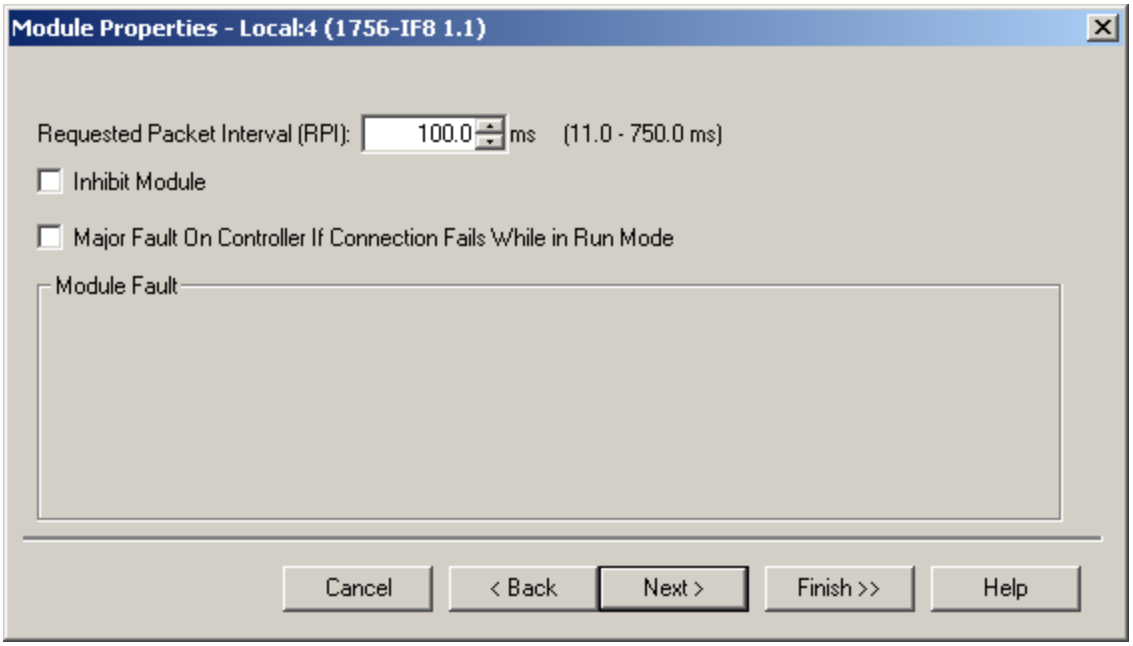
## Configuring the Analog Input Module

Configure the analog input module in slot 4 for this controller.

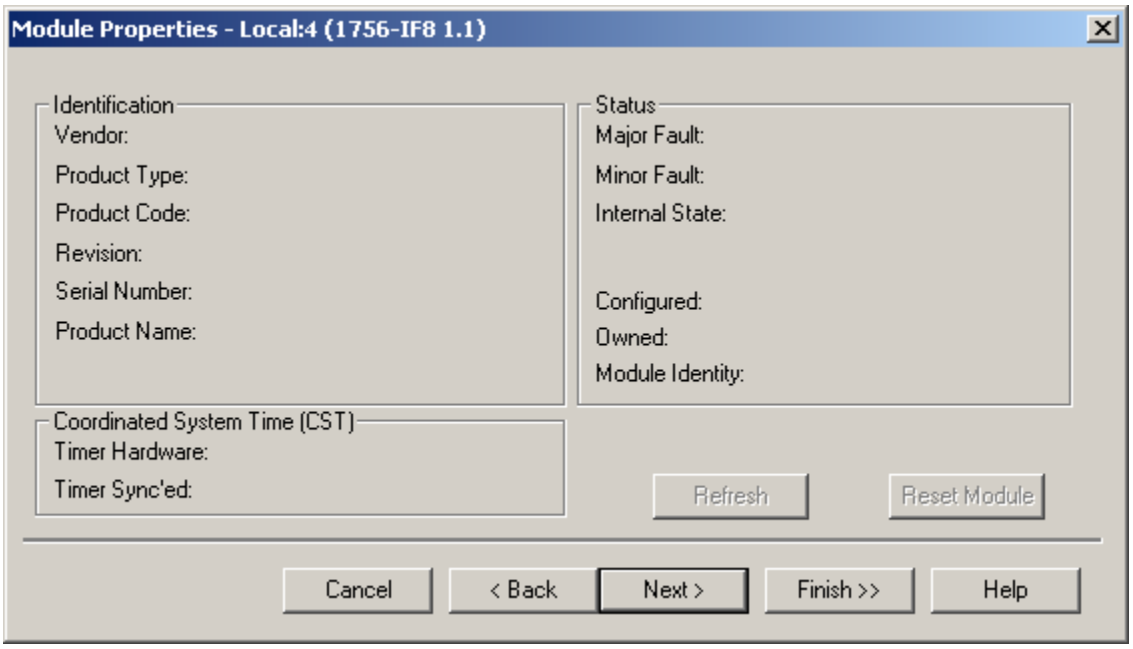
1. Add a ***1756-IF8 Analog Input Module*** to the controller's I/O Configuration.
2. Enter the parameters as shown below and click on ***Next***.




3. When the next Module Properties screen appears, verify the parameters are as shown below and click on ***Next***.

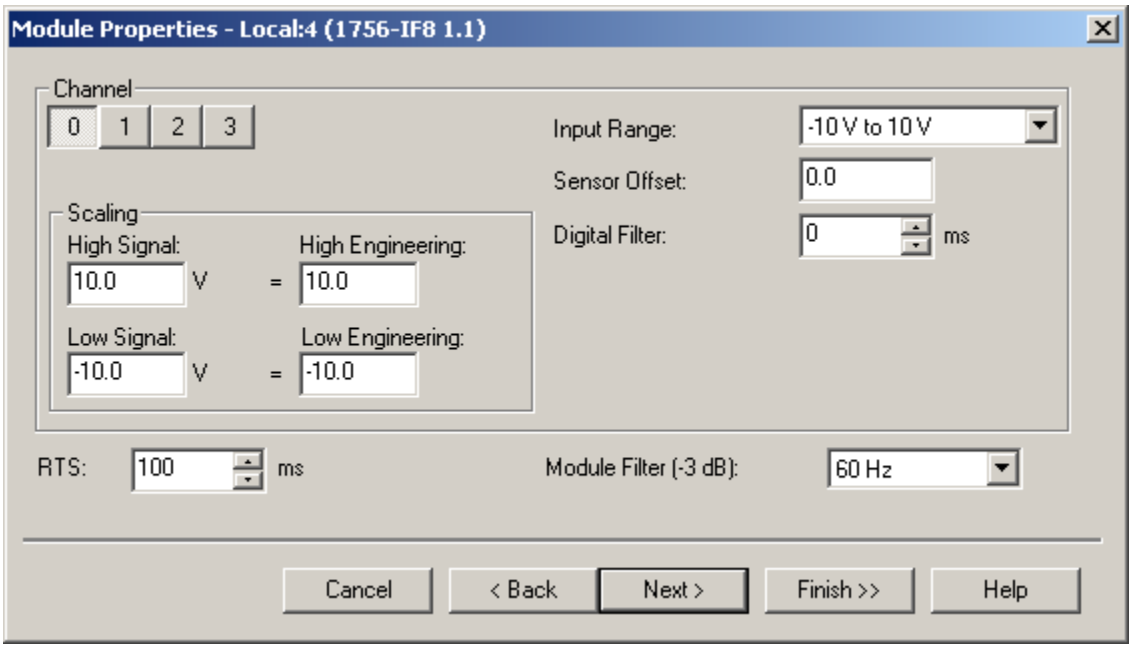


The next Module Properties screen that appears (as shown below) is active only in an Online mode.

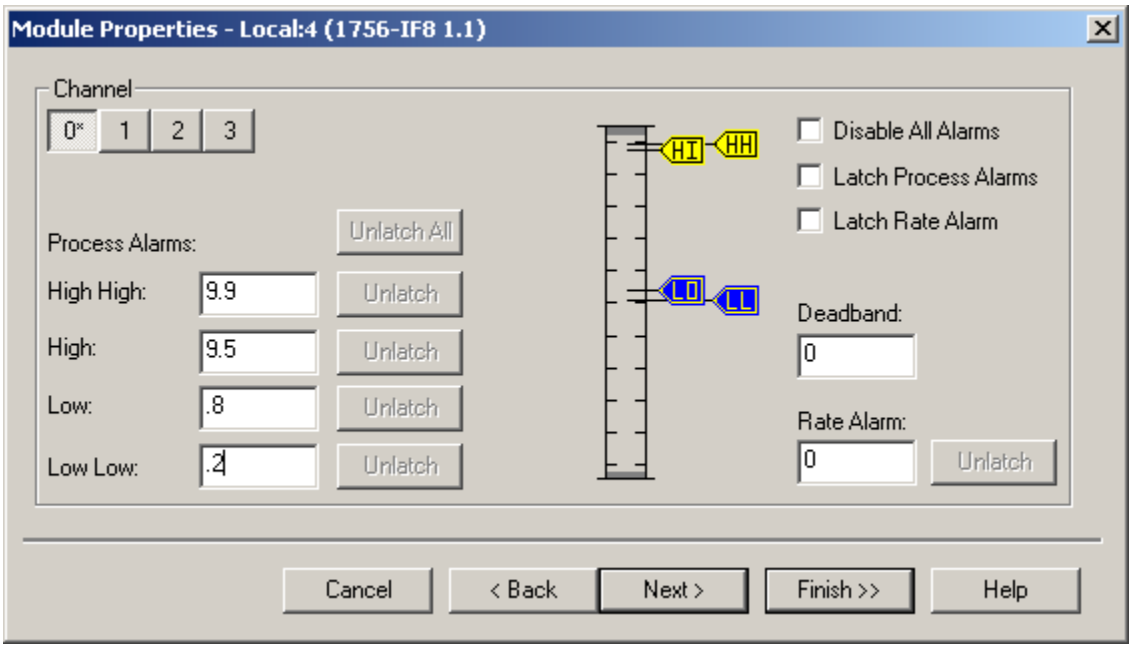



☐ 4. Click on ***Next***.

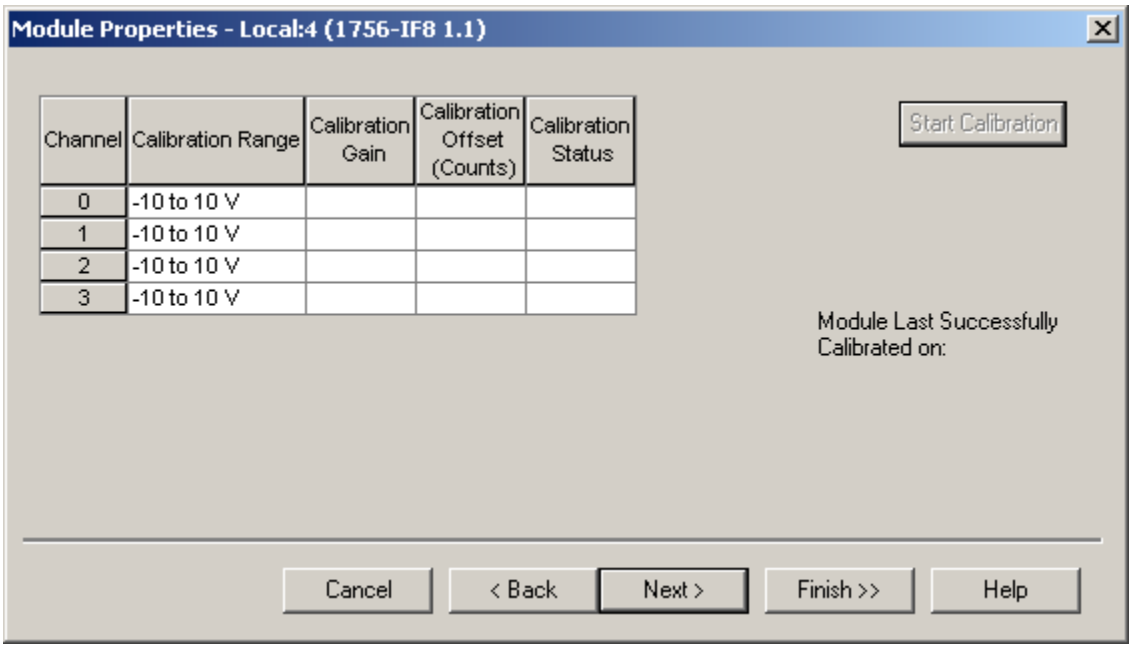
☐ 5. When the next Module Properties screen appears, change the Channel 0 parameters to match those shown below and click on ***Next.***



6. When the next Module Properties screen appears, enter the Process Alarms for channel 0 as shown below, and click on ***Next***.

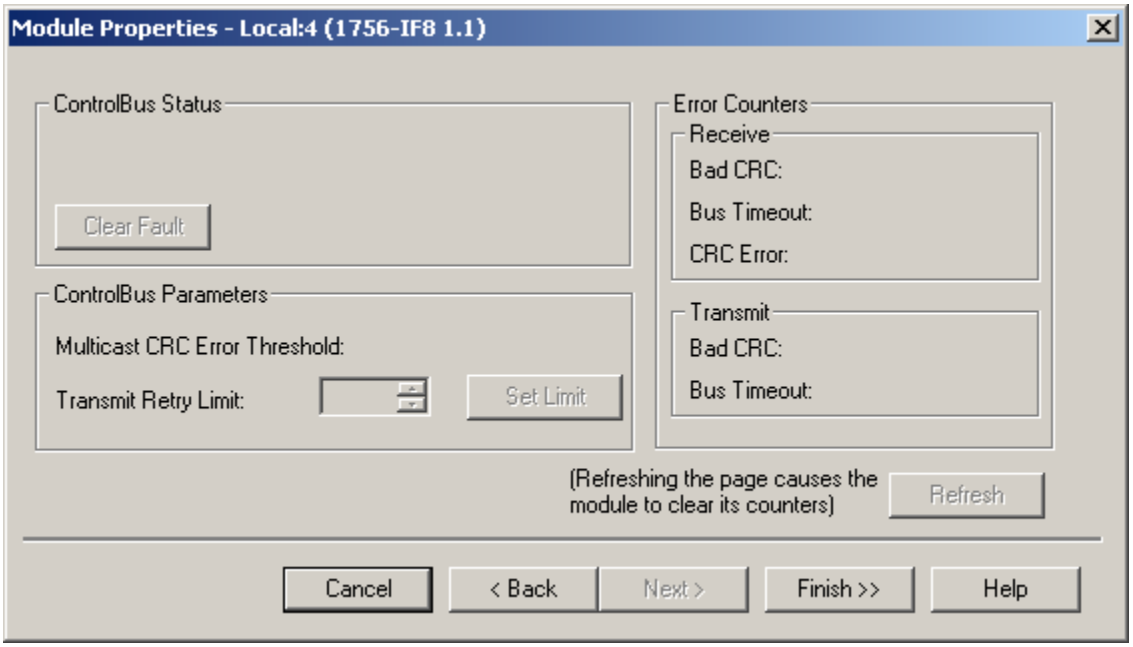



The next Module Properties screen that appears (as shown below) is used to calibrate the module and view the last Calibration date.



7. Click on ***Next***.

   The next Module Properties screen that appears (as shown below) is used in an Online mode to check ControlBus Status and Error Counters, and to set ControlBus parameters.




8. Click on ***Finish***.

## Verifying Tags

Verify that the tags were created for the 1756-IF8 module in slot 4.

1. If the Tag Monitor is not already open, double click on ***Controller Tags*** in the Controller Organizer.

   Two entries will appear under Tag Name for the 1756-IF8 analog input module.

2. Click on the **+** sign in front of the Local:4:**C** and the Local:4:**I** tags to view the **C**onfiguration and **I**nput tags that are available for this analog input module.

3. ***Save*** your program.

## Adding Ladder Logic

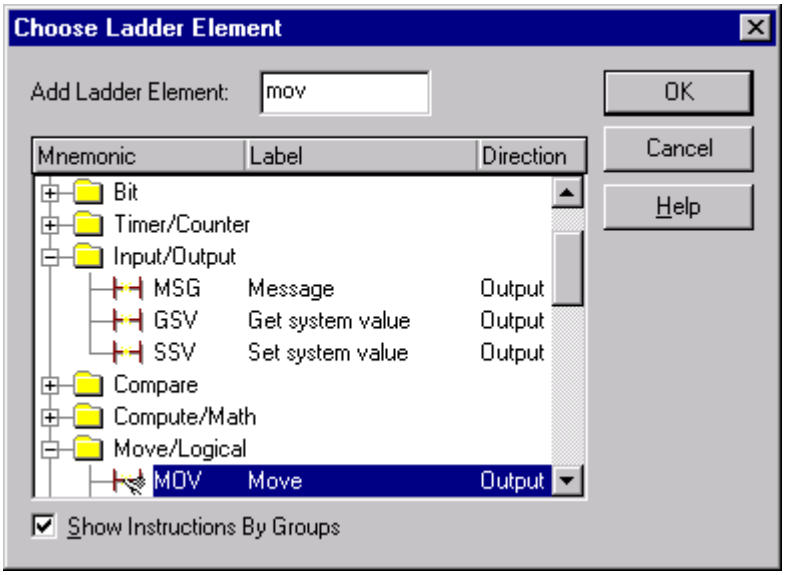
Add ladder logic to your program that uses the analog modules you just configured.

1. From the ***Controller Organizer***, double click on ***MainRoutine*** to open the main routine.

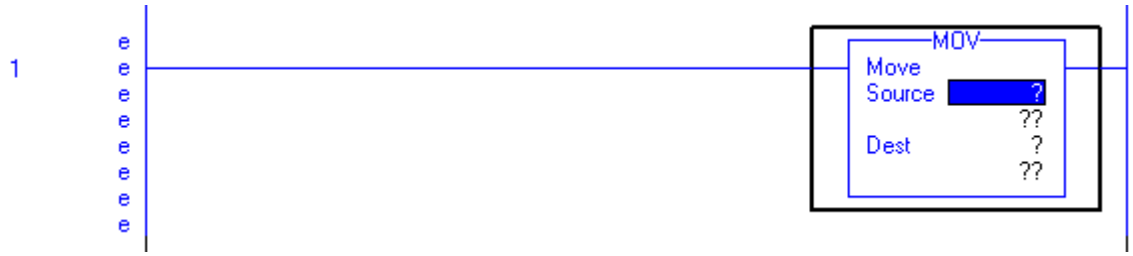
2. Click on the icon on the toolbar to add a new rung to the routine.

3. With rung 1 highlighted, press the ***[Insert]*** key on the keyboard.

4. Type 'mov' as shown below and click on ***OK***.



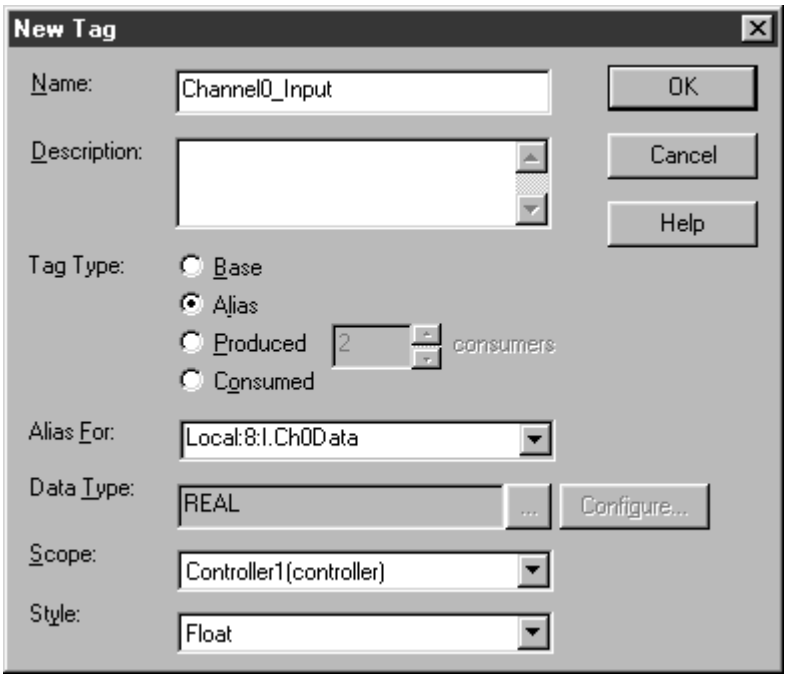

5. Verify that rung 1 appears as shown below.




6. Right click on the ***question mark (?)*** in the blue area next to Source in the MOV instruction and choose ***New Tag***.

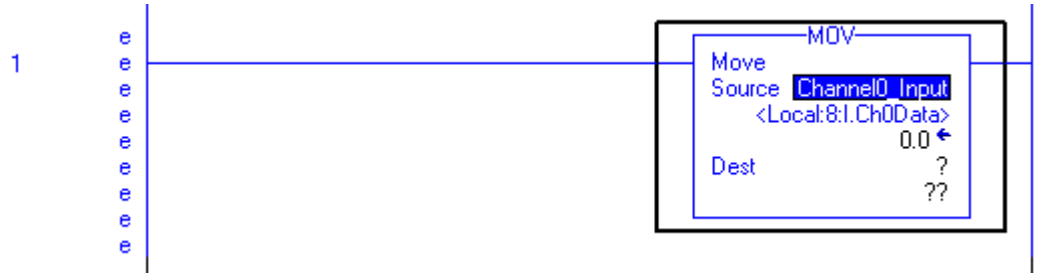
☐ 7. Enter the parameters as shown below.

**Important:** Choose ***Controller1(controller)*** in the Scope field before you select the Alias For tag.



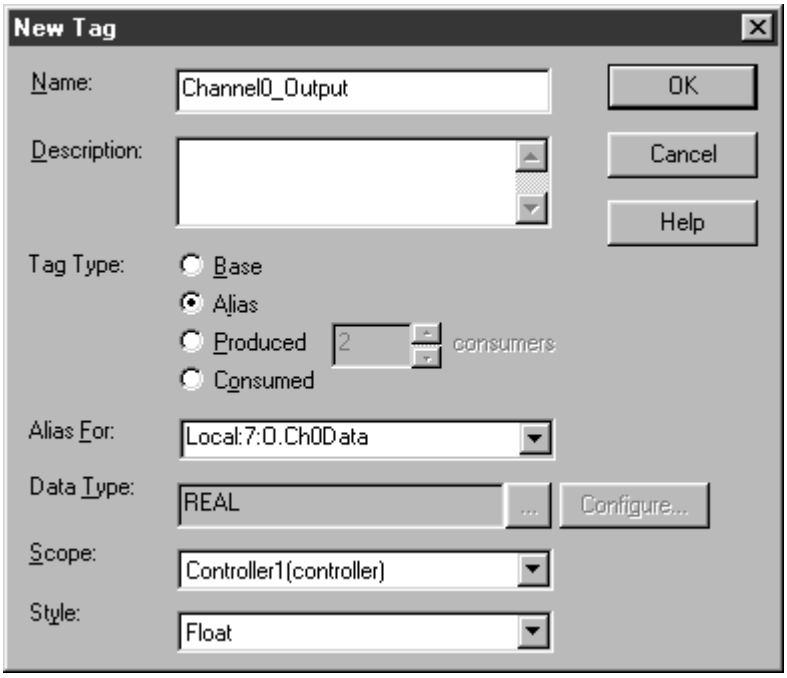

☐ 8. Click on ***OK*** to create this new alias tag.

Rung 1 should now appear as shown below.

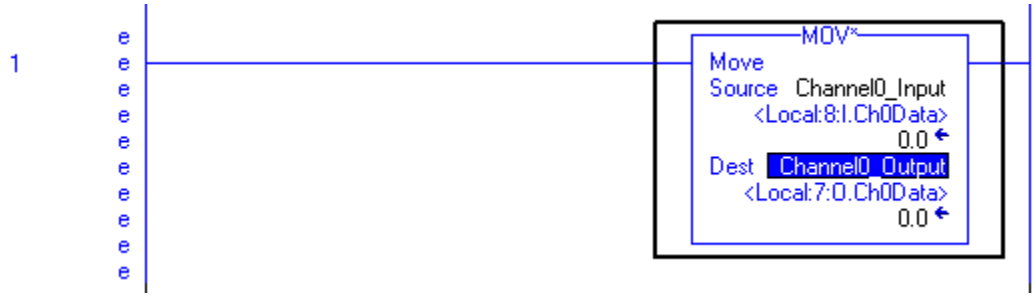



☐ 9. Right click on the single ***Question Mark (?)*** next to ***Dest*** and choose ***New Tag***.

☐ 10. Enter the parameters as shown below and click on ***OK***.




The rung should appear as shown below.




☐ 11. Right click on the rung number (***1***) and choose ***Verify Rung***.

A message appears at the bottom of the RSLogix 5000 window indicating the results of the Verify Rung command. (Note: The message will appear either in the status bar at the bottom of the screen, or in the Results window if it is selected under the View menu. If there are errors, you must correct them before the rung will verify. You can also verify the entire routine by choosing ***Verify > Routine*** from the ***Logic*** menu.

☐ 12. ***Save*** your program.

***Congratulations! You have now completed the steps for Exercise 7.***

**Notes:**_____

## Exercise 8:
## Using User-Defined Structures and Arrays

In this exercise, you will learn how to use user-defined structures and arrays.

Follow the steps below to complete Exercise 8. **Place a checkmark in the square next to each step as you complete it.** This will help you keep your place as you work through the steps.

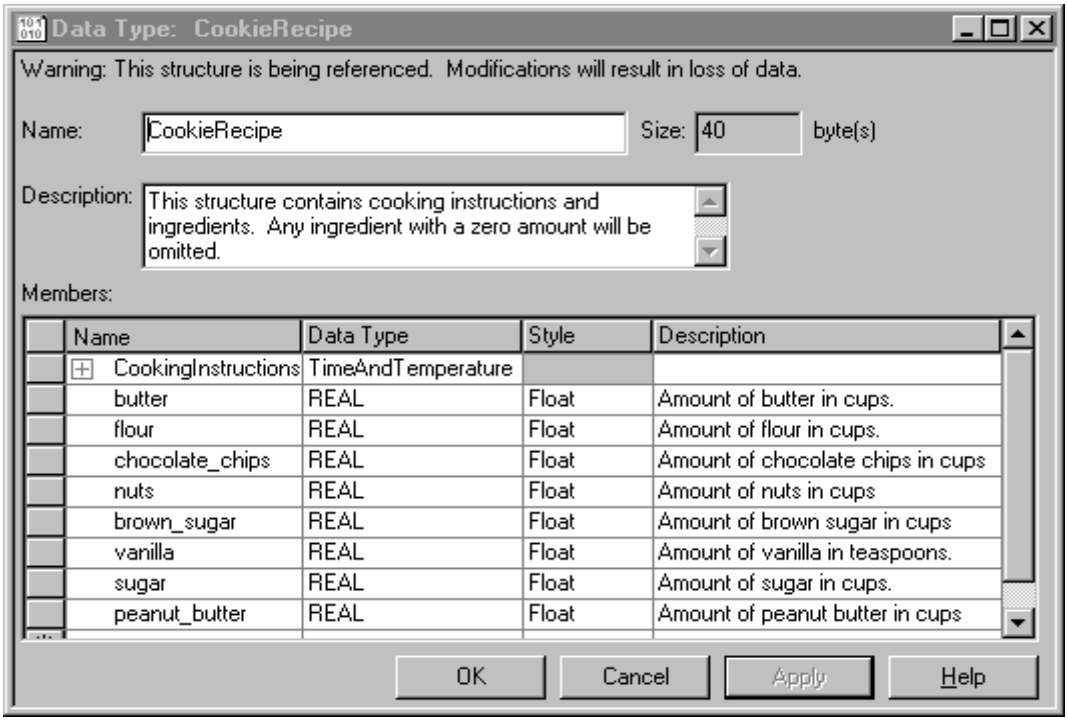
### Opening the Controller File and Examining the Cookie Recipe

Open the controller file and examine the cookie recipe that you will use to learn about user defined structures and arrays.

1. Open the controller file ***UserDefined.ACD***.
2. Click on the **+** to the left of the ***Data Types*** folder to expand it.

   If the folder is already expanded there will be a ***'-'*** to the left of it.
3. Click on the **+** to the left of the ***User-Defined*** folder to expand it.
4. Double click on the ***CookieRecipe*** item.

   The screen appears as shown below.




   As you can see, the User Defined Structure, CookieRecipe, contains another User Defined Structure named CookingInstructions. The other elements in CookieRecipe are all of the ingredients being used for each type of cookie.
5. Click on the **+** to the left of the ***CookingInstructions*** folder to expand it.

   As you can see, CookingInstructions contains two fields: a time and a temperature.
6. Click on ***Cancel*** to close this window.

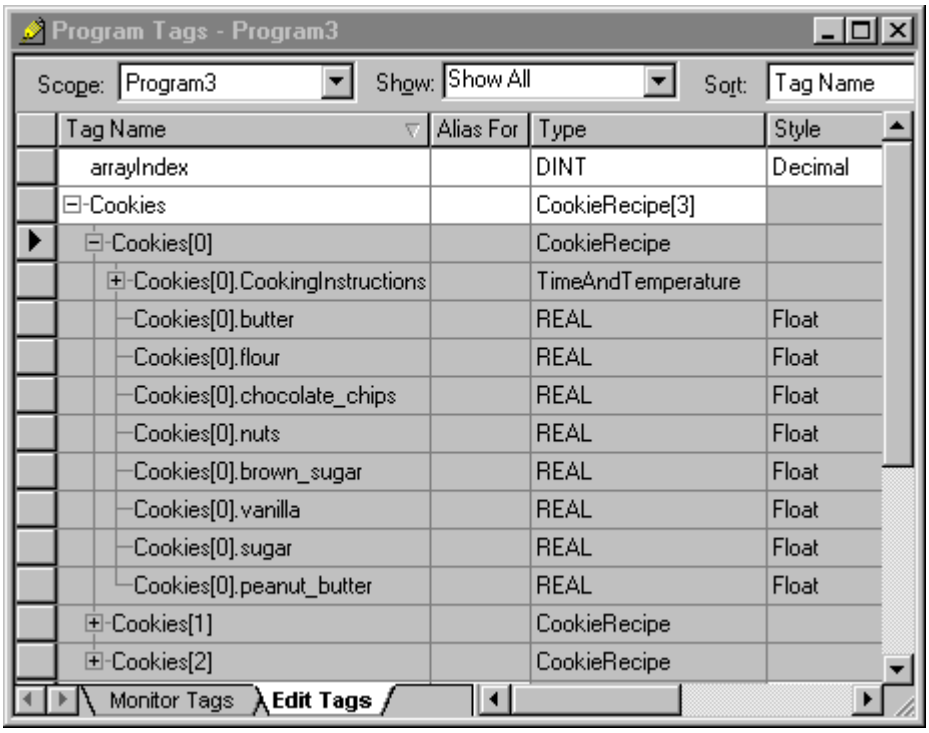
## Examining the Cookie Array and Adding Your Own Cookie Recipe

1. From the ***Controller Organizer***, under ***Program3***, right click on ***Program Tags*** and choose ***Edit Tags***.

2. Click on the **+** sign to the left of the element name for the ***Cookies*** tag.

3. Click on the **+** sign to the left of the ***Cookies[0]*** element.

   The screen appears as shown below.



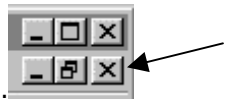

   Notice that Cookies is a 3-element array of type CookieRecipe.

4. Click on the ***Monitor Tags*** tab at the bottom left hand side of the screen.

   The values in the three cookie types in ***Cookies*** have been set up for the following Cookies.

| Cookie Array Element | Cookie |
|---|---|
| Cookies[0] | Chocolate Chip |
| Cookies[1] | Peanut Butter |
| Cookies[2] | Sugar |

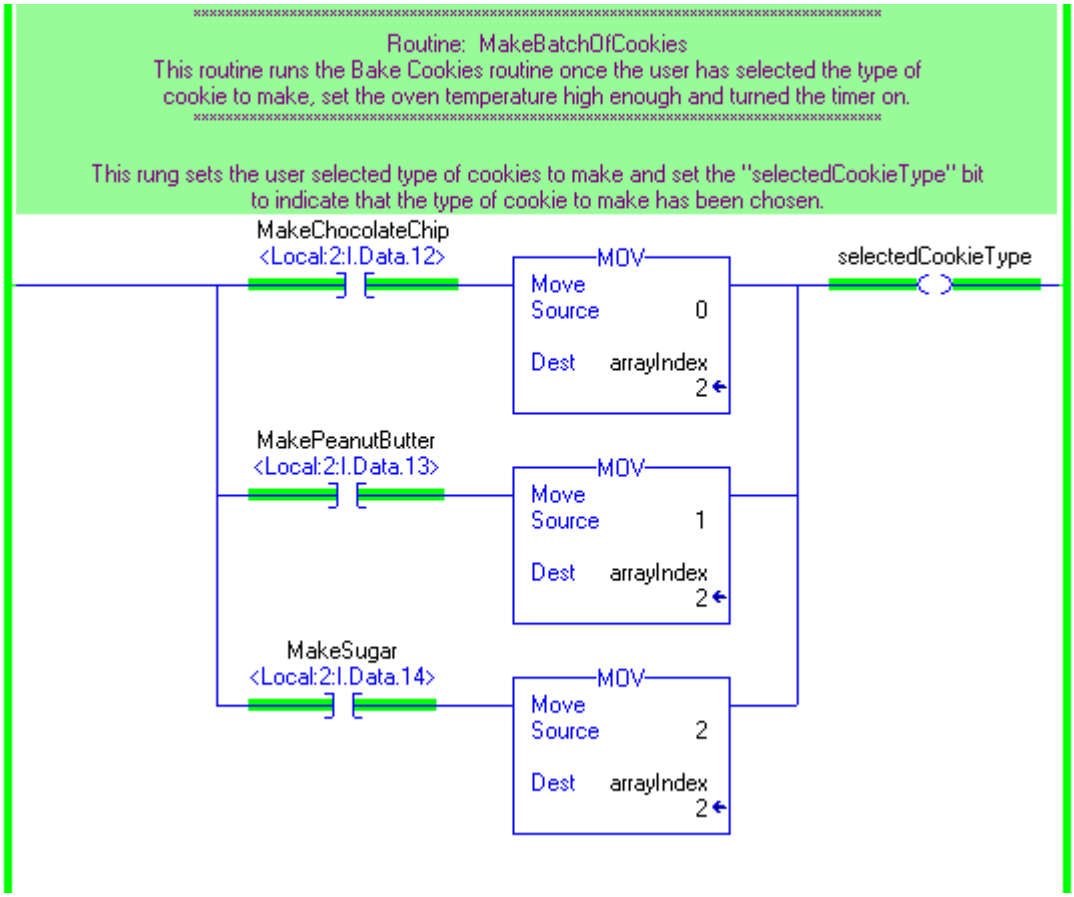
5. Click on the ***X*** in the upper right corner of the screen to close the Data Monitor.



## Reviewing the Ladder Program

Review a ladder program that uses user defined structures and indirect addressing to make different cookies.

1. From the ***Controller Organizer***, under ***Program3***, double click on the ***MakeABatchOfCookies*** routine.



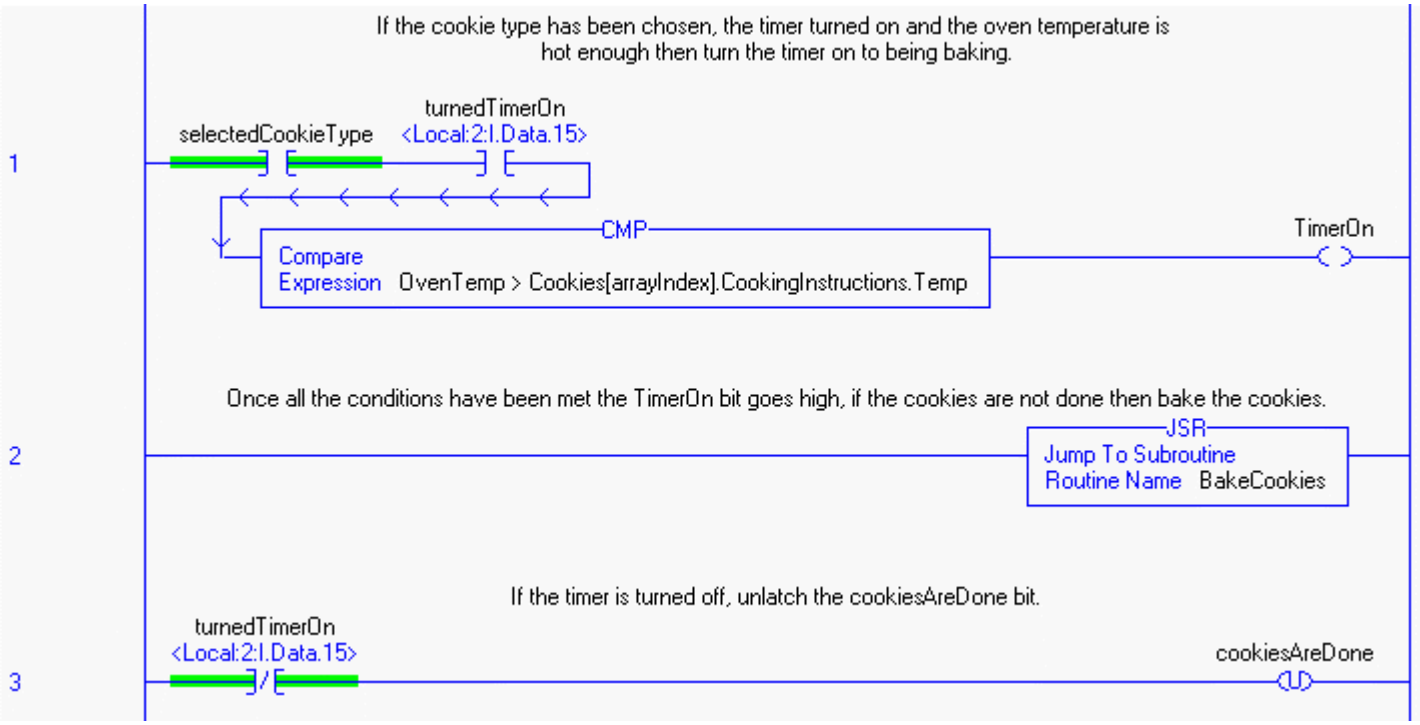

The Ladder Editor appears, as shown on the previous page and below.

On the first rung of the program you select which type of cookie to make, and the index of the Cookie Array is updated to use the correct Cookie Recipe.

This routine allows you to select what type of cookies to make (e.g., chocolate chip, peanut butter, or sugar), set the temperature of the oven, turn the timer on, and then run a subroutine to bake the cookies.

The second rung of the program checks to see that you have selected a type of cookie to make, set the temperature high enough, and turned the timer on.

The third rung runs the subroutine BakeCookies, which makes the cookies and bakes them.




***Congratulations! You have now completed the steps for Exercise 8.***

## Exercise 9:
## Using the Online Manuals and Help Features

In this exercise, you will learn about Online Manuals and Online Help features of the RSLogix 5000 software.

Follow the steps below to complete Exercise 9. **Place a checkmark in the square next to each step as you complete it.** This will help you keep your place as you work through the steps.

### Accessing the Online Manuals

Access the product documentation that is included with your RSLogix 5000 software.

☐ 1. From the ***Help*** menu, choose ***Online Books >RSLogix 5000 Getting Results Guide***.

The Adobe Acrobat Reader is launched, and the .pdf file for the RSLogix 5000 Getting Results Guide opens.

☐ 2. See if you can find the section of the manual entitled Quick Start Steps.

☐ 3. List the 8 Quick Start Steps, as outlined in the Getting Results Guide.

1._____

2._____

3._____

4._____

5._____

6._____

7._____

8._____

☐ 4. Close the Getting Results Guide and choose another manual from the Online Books menu.

Explore this manual and the other online manuals to familiarize yourself with the online documentation that is available to you.

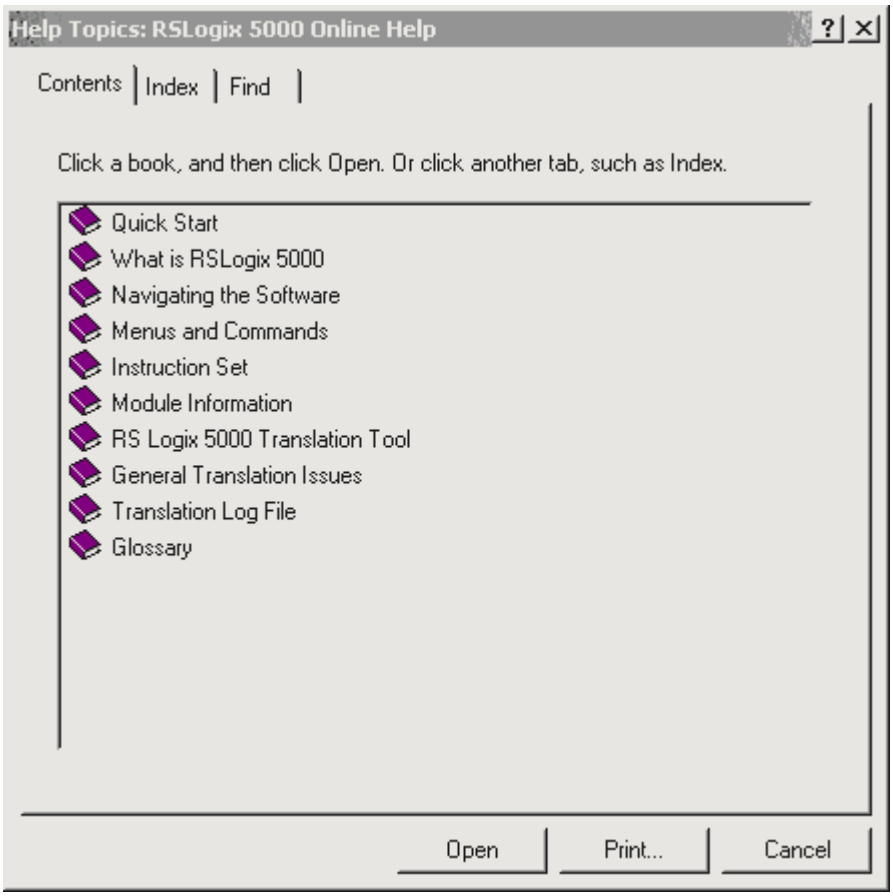
☐ 5. Once you have taken some time to look through the online manuals, you can close the Adobe Acrobat Reader.

## Using Online Help

Use the Online Help system that is included with your RSLogix 5000 software.

1. From the ***Help*** menu, choose ***Contents***.

   The RSLogix 5000 Help window appears.




   From this window, you can quickly find information contained within a number of "books," including:

   - Quick Start steps to help you quickly get up and running with the software
   - Basic information on what RSLogix 5000 is and helpful tips to help you find your way around the software
   - Menu and command information that will help you to learn the different menu options available to you
   - Instruction set reference material
   - Module creation and configuration information
   - Help on the RSLogix 5000 Translation Tool utility
   - A Glossary of terms that are used in ControlLogix and with RSLogix 5000 software

2. Click on the ***Index*** tab.

   From this tab, you can look up specific items you want help on, just as you would use the index of a book.

   For instance, see if you can find information on configuring a routine.

3. Click on the ***Find*** tab.

   From this tab, you can search to see if a specific word or phrase exists anywhere within the help system. This tab is particularly useful when you're not sure of the exact terminology under which something might be indexed, but you know some of the related words or phrases.

4. For example, type in the word 'Alarms.'

   A list of topics containing the word Alarms appears at the bottom of the Find tab. Look through the list to see the types of information available.

5. Click on ***Cancel*** to close the RSLogix 5000 Help window.

***Congratulations! You have now completed the steps for Exercise 9.***

**Notes:**_____

**Notes:**_____

**Notes:**_____

# How Are We Doing?

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Pub. Title/Type ControlLogix Quick Start Manual

Cat. No. 1756-STRT3 Pub. No. 1756-QS104A-EN-P Pub. Date January 2003 Part No. 957707-80

Please complete the sections below. Where applicable, rank the feature (1=needs improvement, 2=satisfactory, and 3=outstanding).

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|---|---|---|
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Publication 1756-QS104A-EN-P - October 2002 PN 957707-80