



Configuring Kepware KEPServerEX 5.0 for Communications with Acromag Busworks Modbus I/O Modules

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Introduction

This document provides example steps for configuring the Kepware KEPServerEX OPC Server for communications with Acromag Busworks Modbus RTU and Modbus TCP/IP Distributed I/O Modules. Once the server is configured, data may be read from or written to the I/O module using an OPC compliant client application.

The following hardware and software were used in the creation of this document:

- Microsoft Windows XP Professional – Service Pack 3
- Kepware KEPServerEX (version V5.0.1176.0 – U) with Modicon Modbus Driver Suite
- Acromag Model 914MB Quad DC Voltage Input (Modbus/RS485)
- Acromag Model 983EN-4012 12 Tandem Digital Input/Output (Modbus TCP/IP)

This application note is a supplement to the information found in Kepware's KEPServerEX and Modbus Driver help documentation. Please refer to those documents for additional details about the configuration steps discussed in this application note.

Note that this document does not cover the DCOM and firewall configuration settings required to allow remote clients to connect to the server. Good sources of information on this topic are the Kepware and OPC Foundation websites.

Server Configuration Example

Starting a Server Project

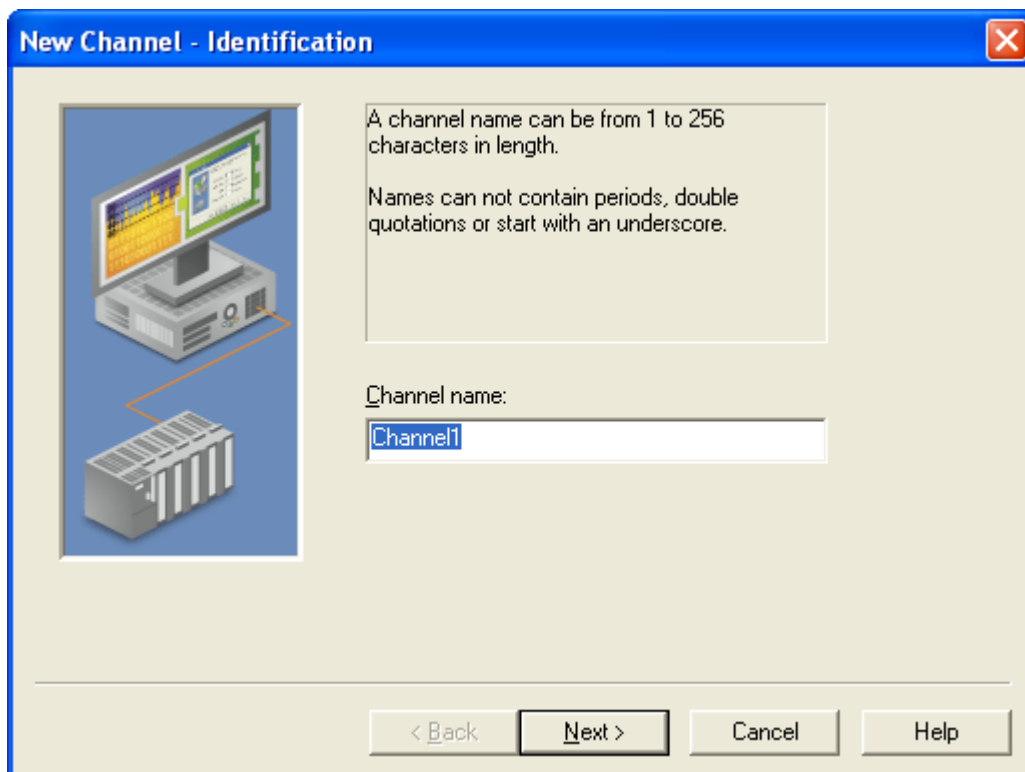
Select **File | New** from the menu or click the **New Project** button on the toolbar. Throughout development, the project can be saved via the **File** menu or the **Save** button on the toolbar. The file will be saved with the name you specify and an “.opf” extension.

Add a Channel

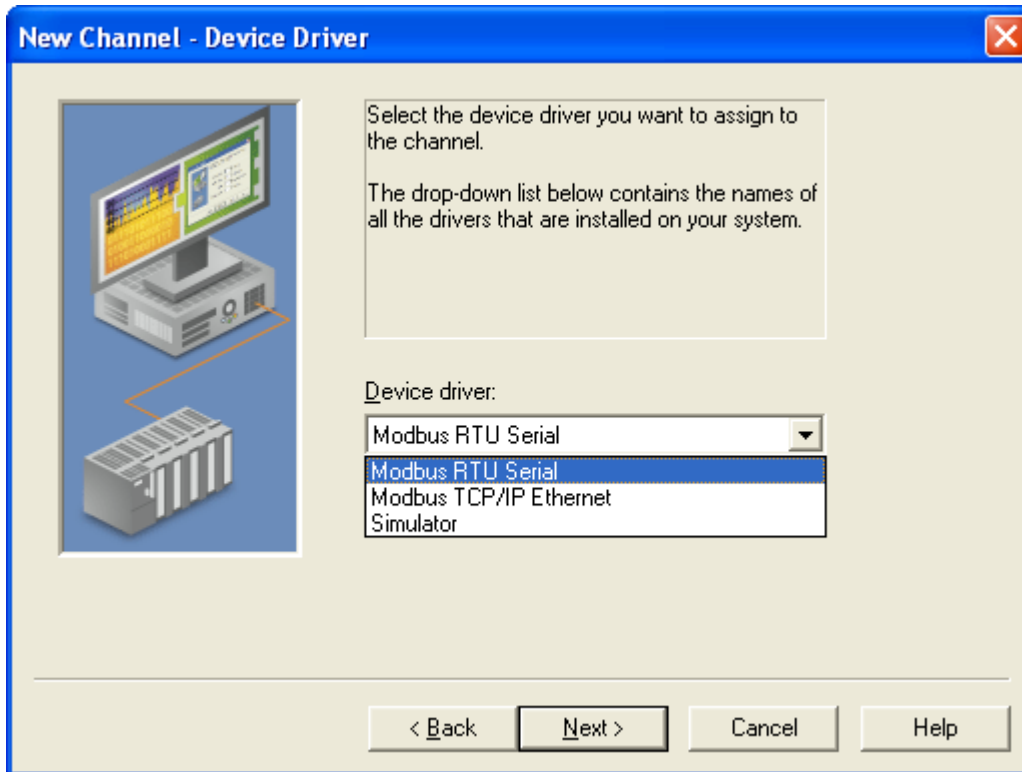
The steps for adding and configuring a channel differ depending upon whether you will be using a Modbus RTU or a Modbus TCP/IP module. This step determines the communications driver(s) that will be used by the application.

MODBUS RTU

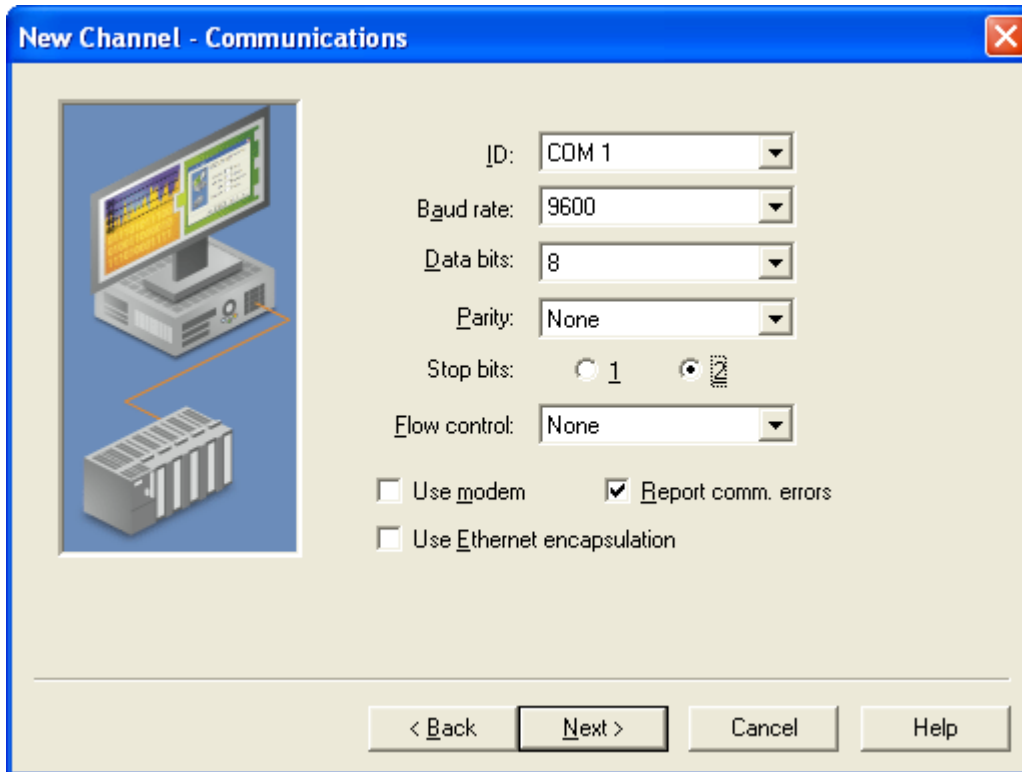
1. Click the **New Channel** button on the toolbar. This launches the channel wizard that will guide you through the configuration of the channel. A help button is provided on each page of the wizard for additional information about configuration options.



2. **Channel name** – Enter a name for the channel (for example “Channel1”).



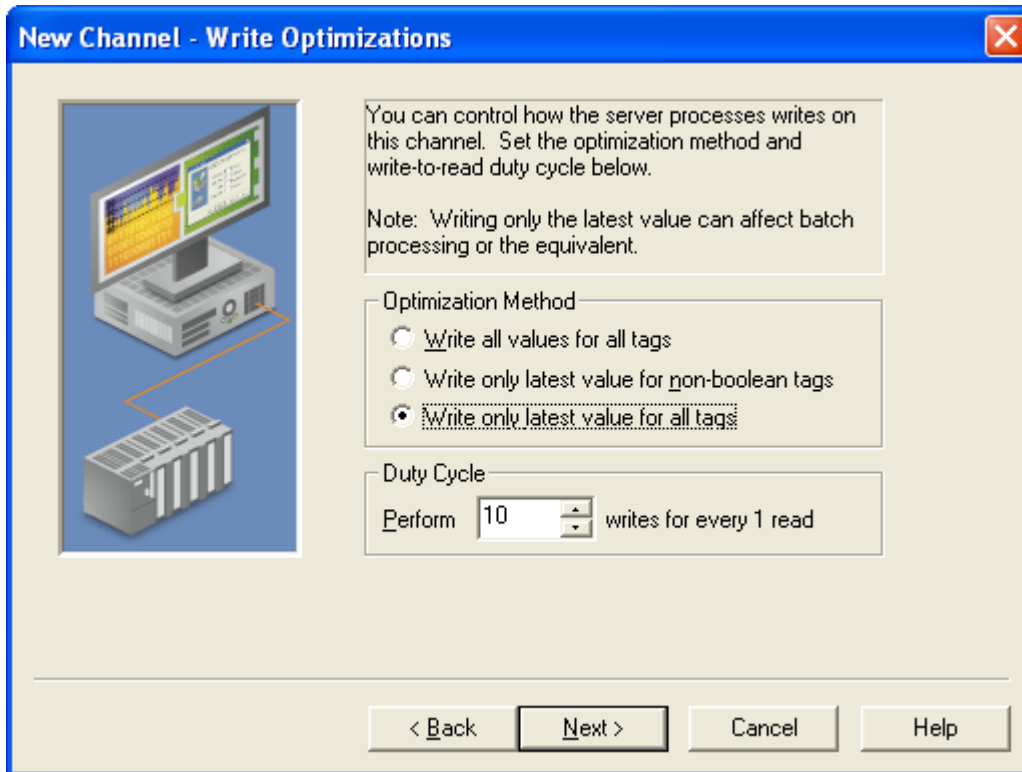
3. **Device Driver** – Select **Modbus RTU Serial** from the drop-down menu.



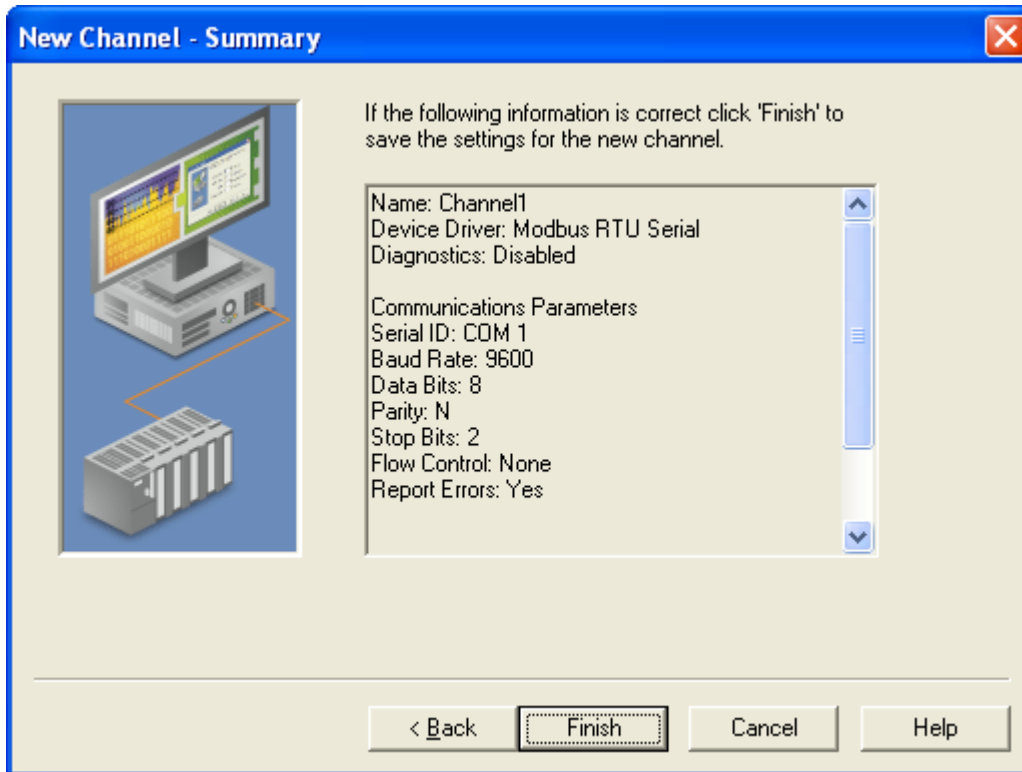
4. **Communications** – Set the communication parameters to match the current configuration of the I/O module. For example, if the module is connected to COM port 1 and is in Default Communication mode, make the following selections:

- **ID:** COM 1
- **Baud rate:** 9600
- **Data bits:** 8
- **Parity:** None
- **Stop bits:** 2
- **Flow Control:** None

The **Report comm errors** checkbox may be selected to post low-level errors to the event log. The **Use Ethernet encapsulation** checkbox should remain unselected.



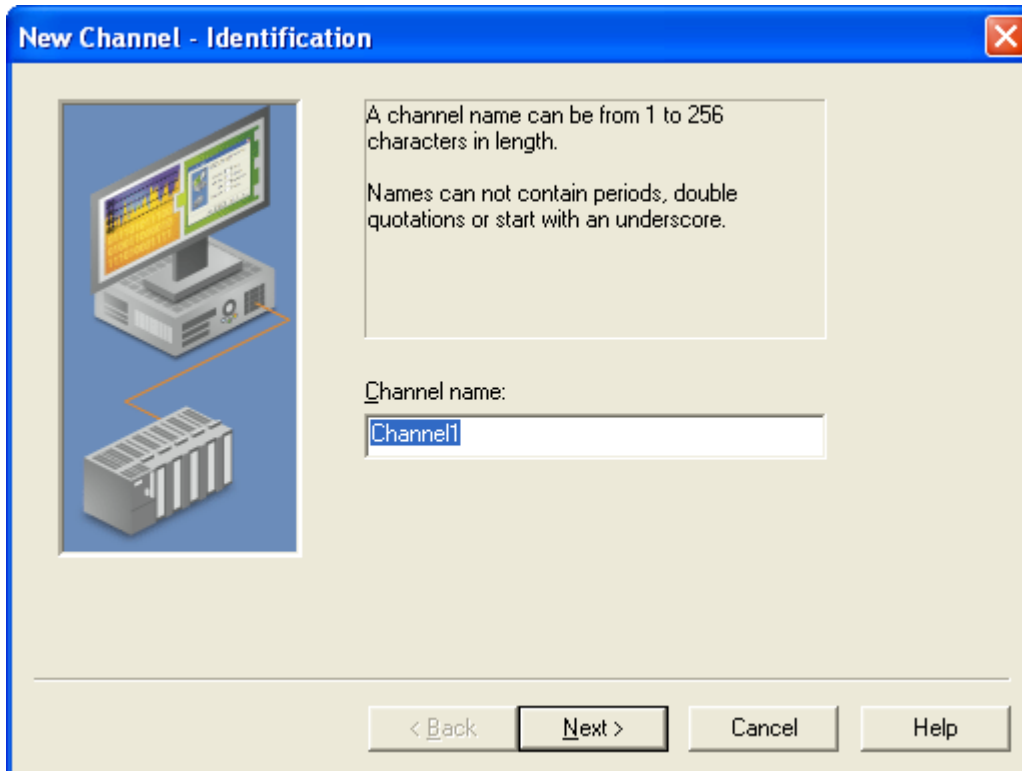
5. **Write Optimizations** – This page allows you to configure how data is written to the Modbus driver and to adjust the write-to-read duty cycle. The ideal settings are dependent upon your application. Read the online help associated with this page for a detailed explanation of these settings.



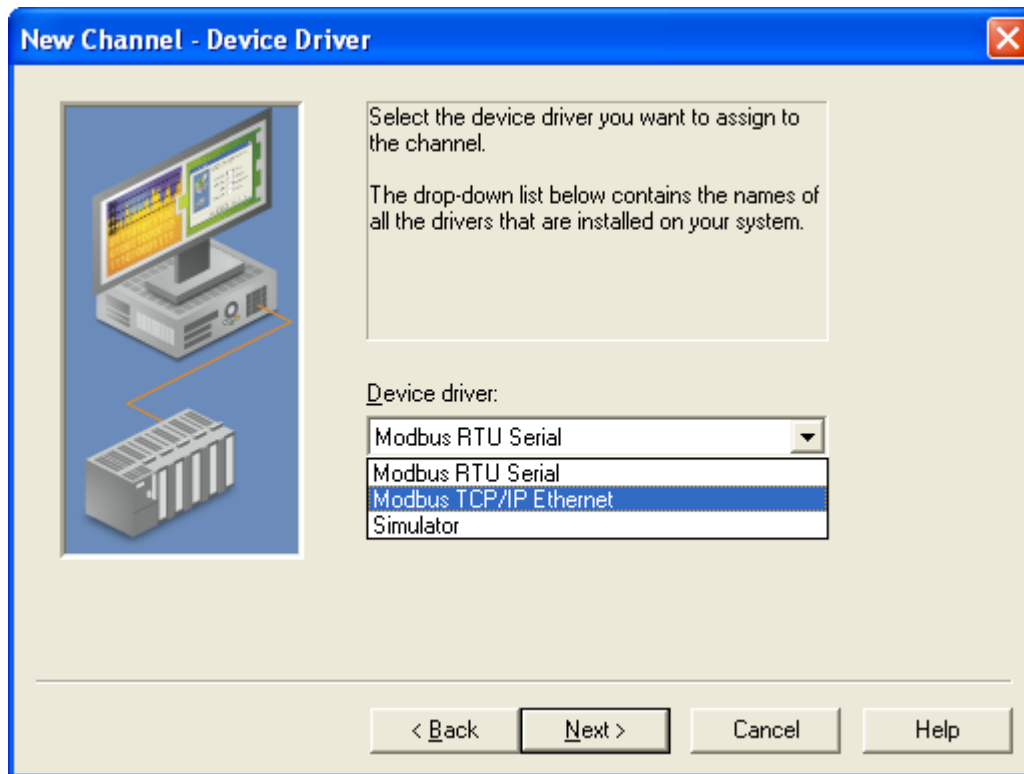
6. **Summary** – This page summarizes the selections made on the previous pages. Click **Finish** to exit the wizard and add the channel to your project. A channel icon will be added to the **Channel Device Group** area of the main program window. Settings for the channel can be modified in the future by right clicking on the channel icon and selecting **Properties...**

MODBUS TCP/IP

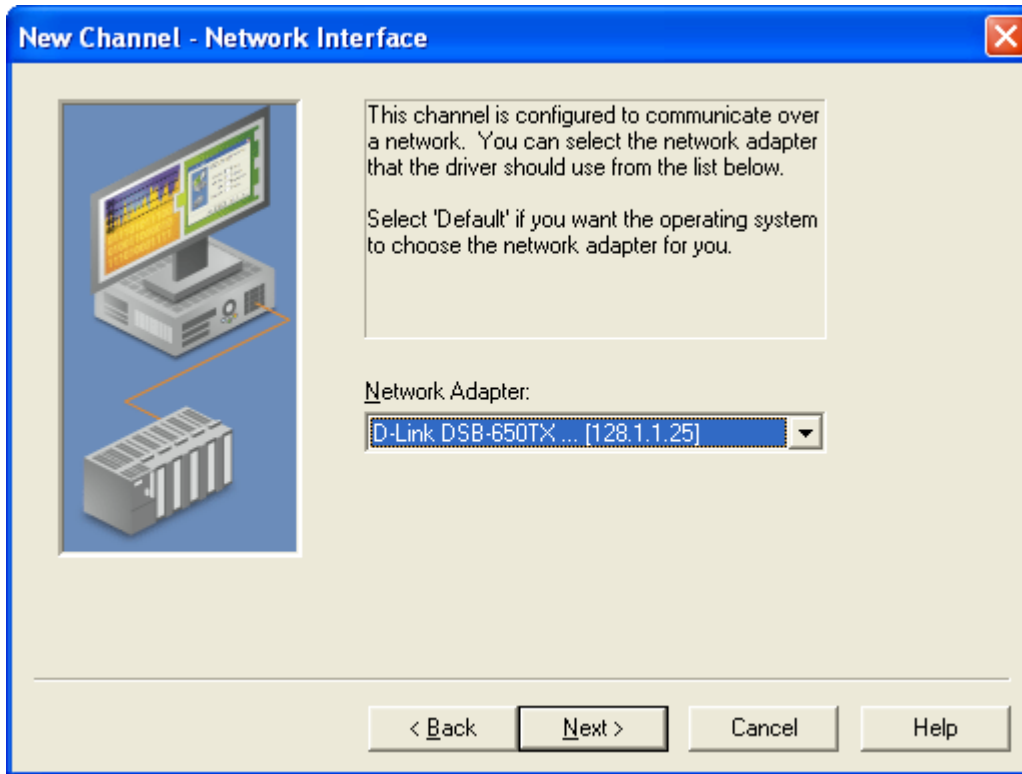
1. Click the **New Channel** button on the toolbar. This launches the channel wizard which will guide you through the configuration of the channel. A help button is provided on each page of the wizard for additional information about configuration options.



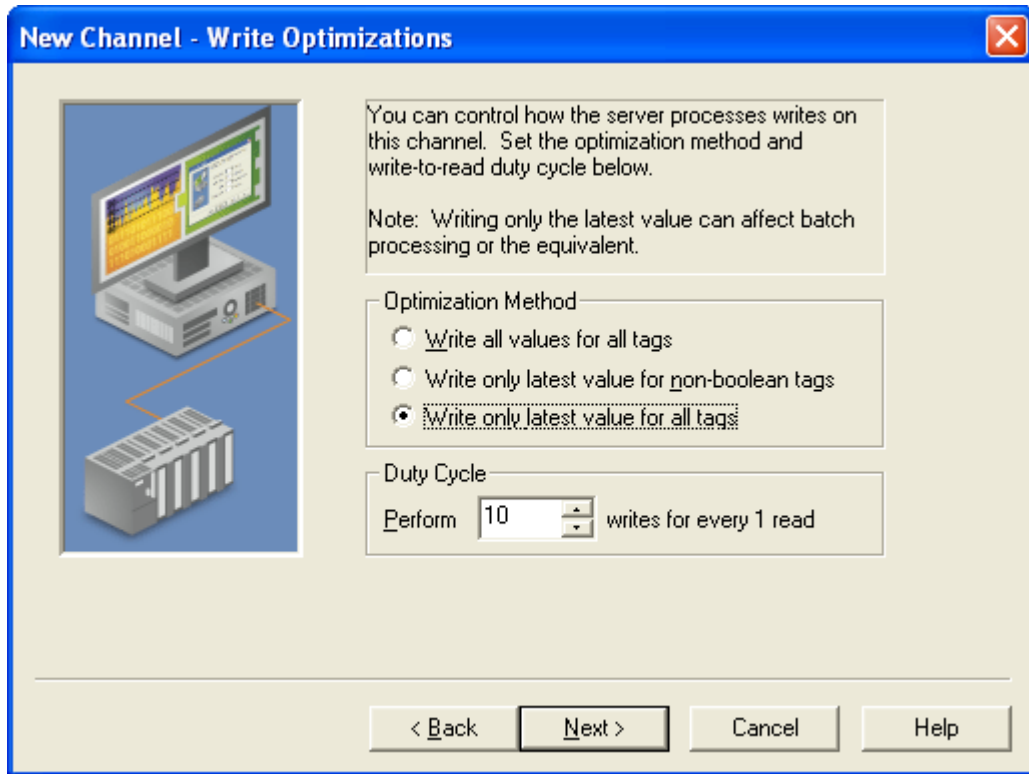
2. **Channel Name** – Enter a name for the channel (for example “Channel1”).



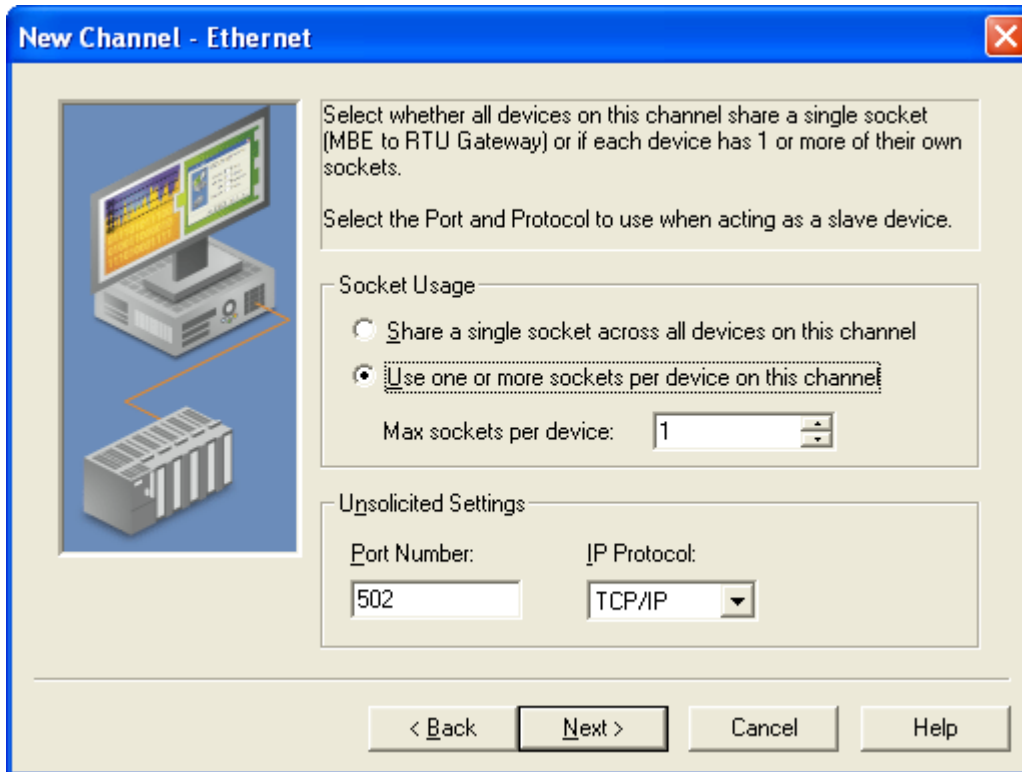
3. **Device Driver** – Select **Modbus TCP/IP Ethernet** from the drop-down menu.



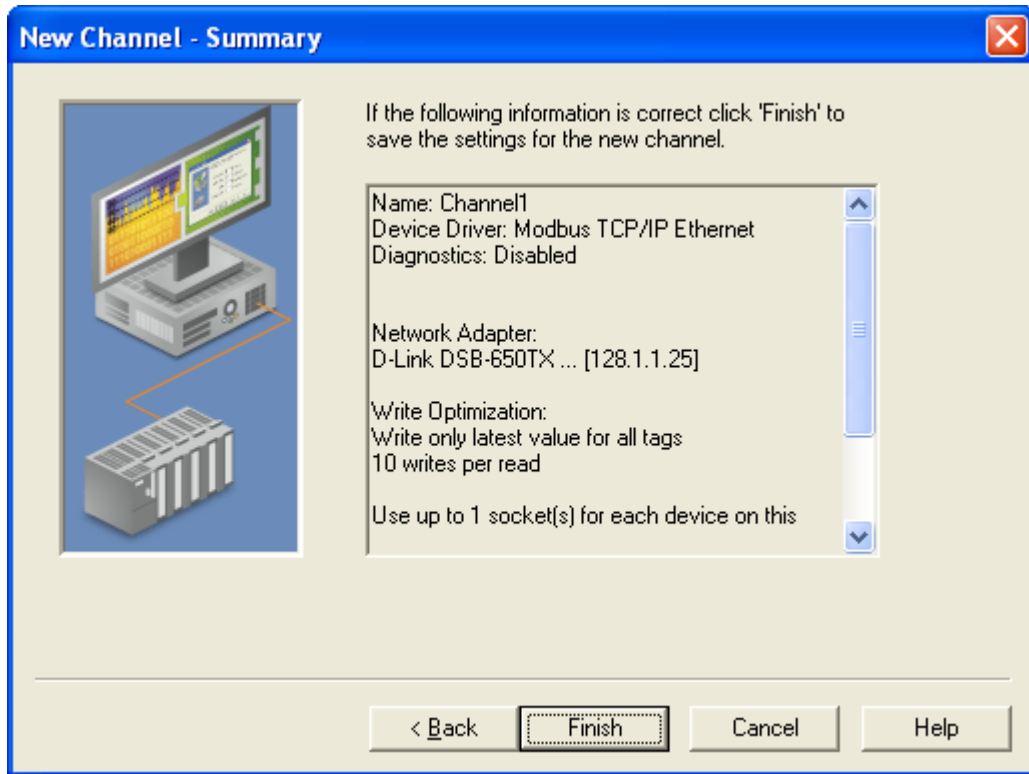
4. **Network Interface** – Select a network interface from the drop-down menu. The driver will use this adapter for all Ethernet communications with the device. The network interface will differ from one PC to another.



5. **Write Optimizations** – This page allows you to configure how data is written to the Modbus driver and to adjust the write-to-read duty cycle. The ideal settings are dependent upon your application. Read the online help associated with this page for a detailed explanation of these settings.



6. **Socket Usage** – Leave the default setting, **Use Multiple sockets for device connections**, checked.



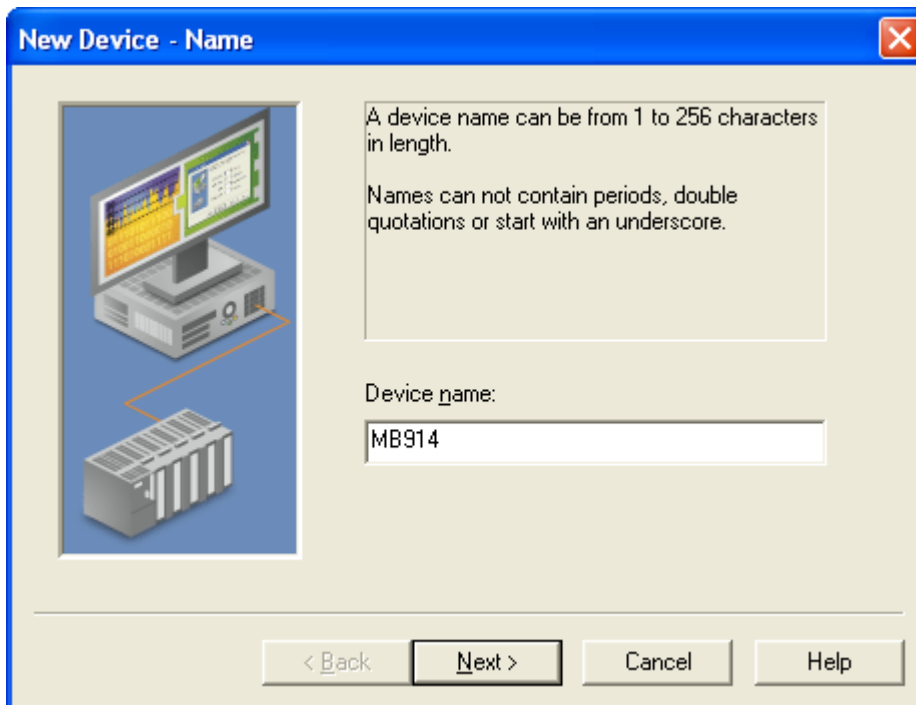
7. **Summary** – This page summarizes the selections made on the previous pages. Click **Finish** to exit the wizard and add the channel to your project. A channel icon will be added to the **Channel Device Group** area of the main program window. Settings for the channel can be modified in the future by right clicking on the channel icon and selecting **Properties...**

Add a Device

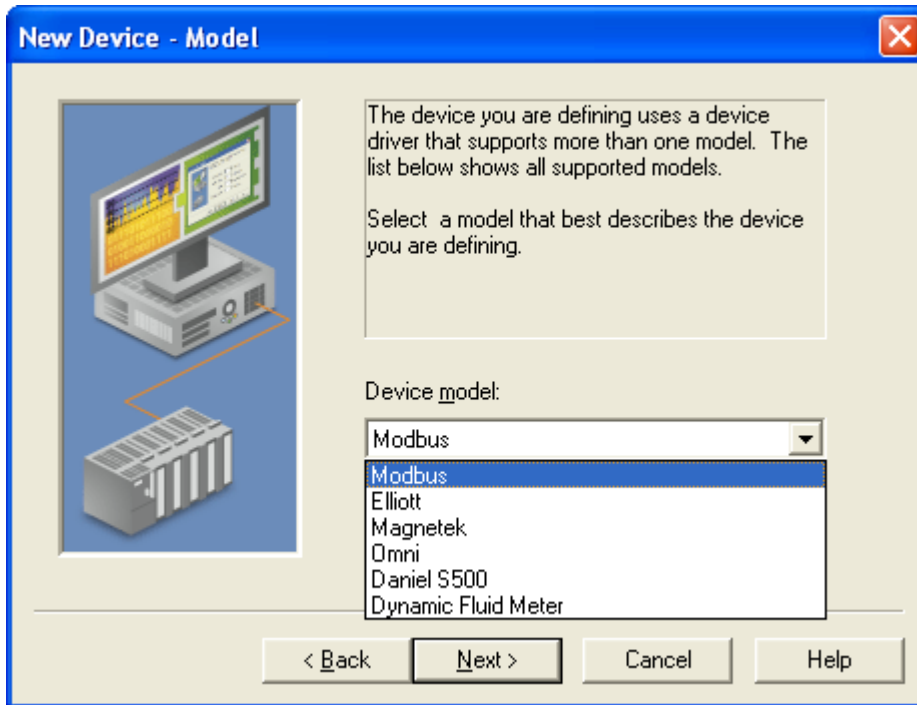
The next step is to add a device to a previously configured channel. A device refers to the specific I/O module on the network. The steps for adding and configuring a device differ depending upon whether you will be using a Modbus RTU or a Modbus TCP/IP module.

MODBUS RTU

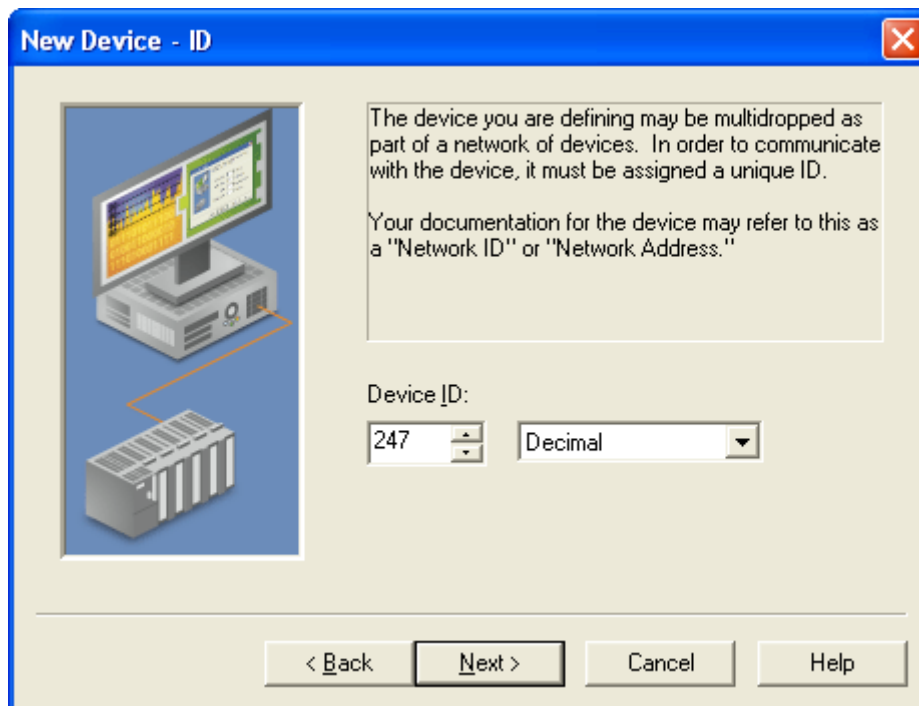
1. Click the **New Device** button on the toolbar. This launches the device wizard that will guide you through the configuration of the device. A help button is provided on each page of the wizard for additional information about configuration options.



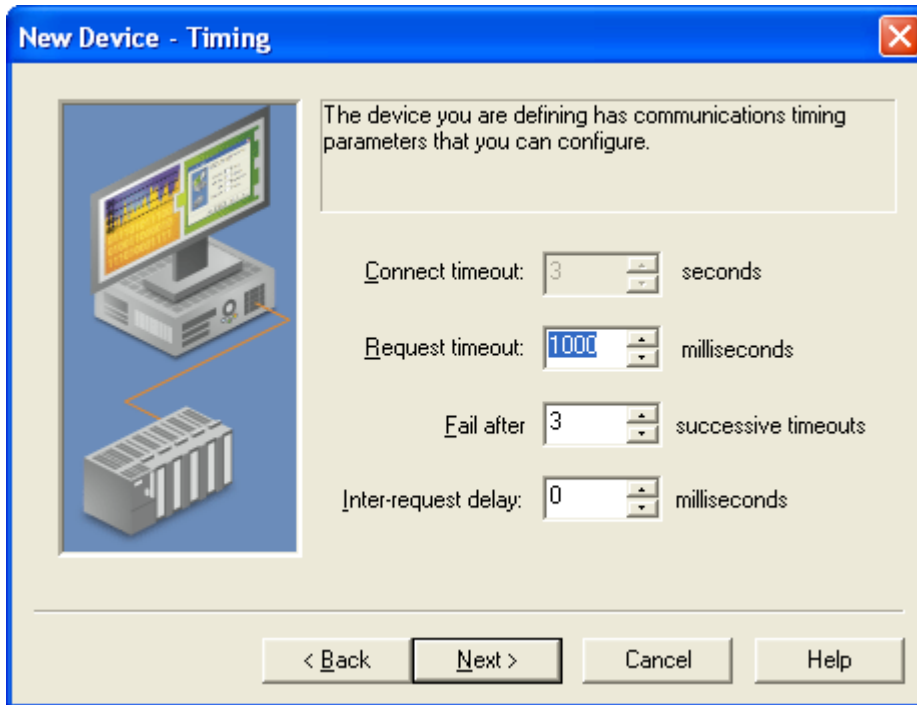
2. **Name** – Enter a name for the device (for example “MB914”).



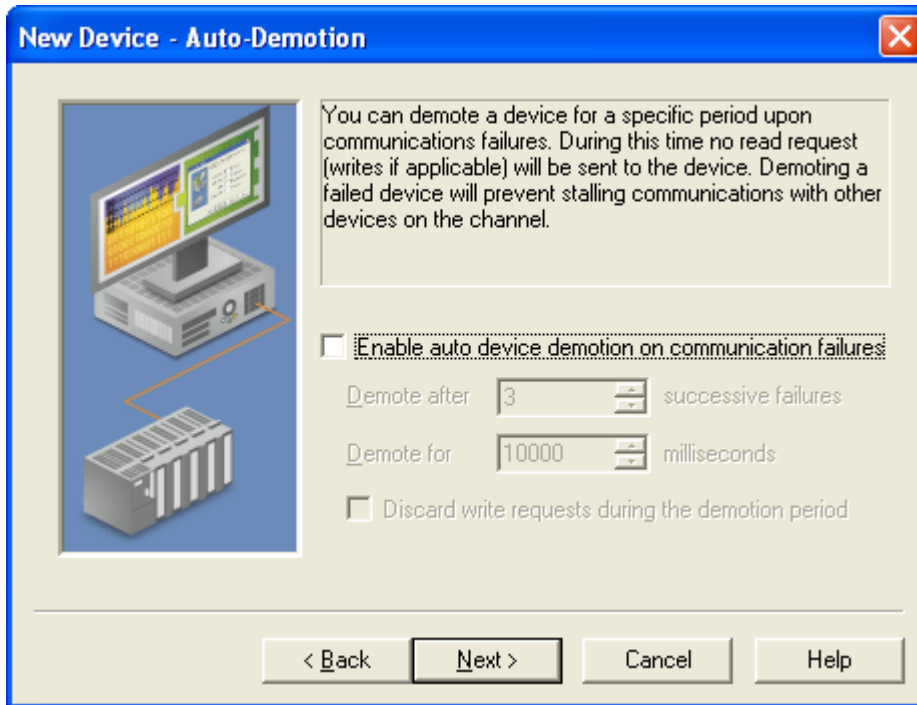
3. **Model** – Select **Modbus** from the drop-down menu.



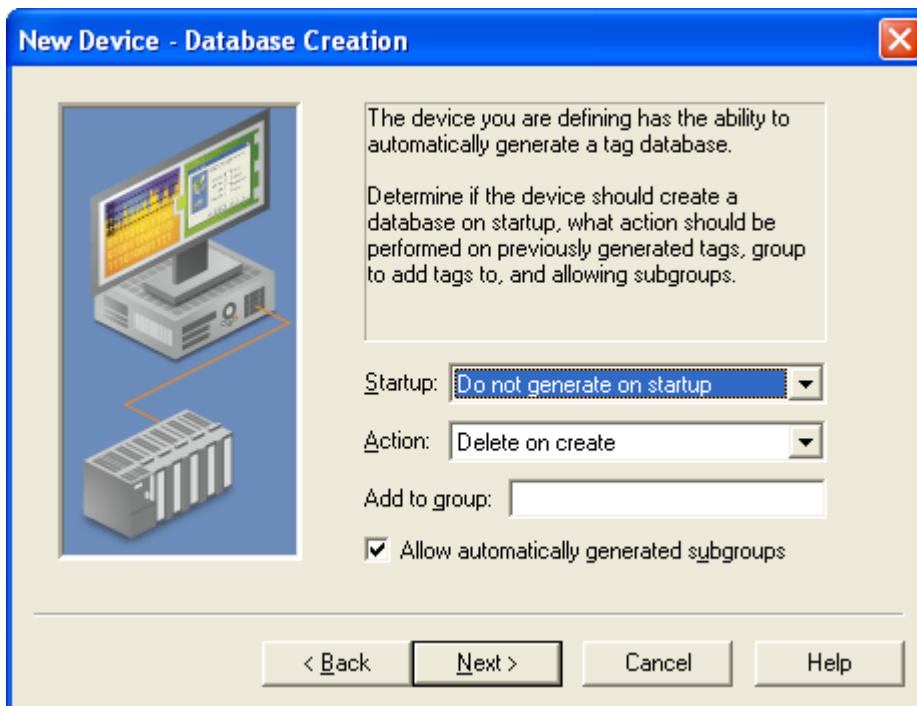
4. **ID** – Set the device ID to match the current Slave Address of the I/O module. For example, if the module is in Default Communication mode, set the ID to 247.



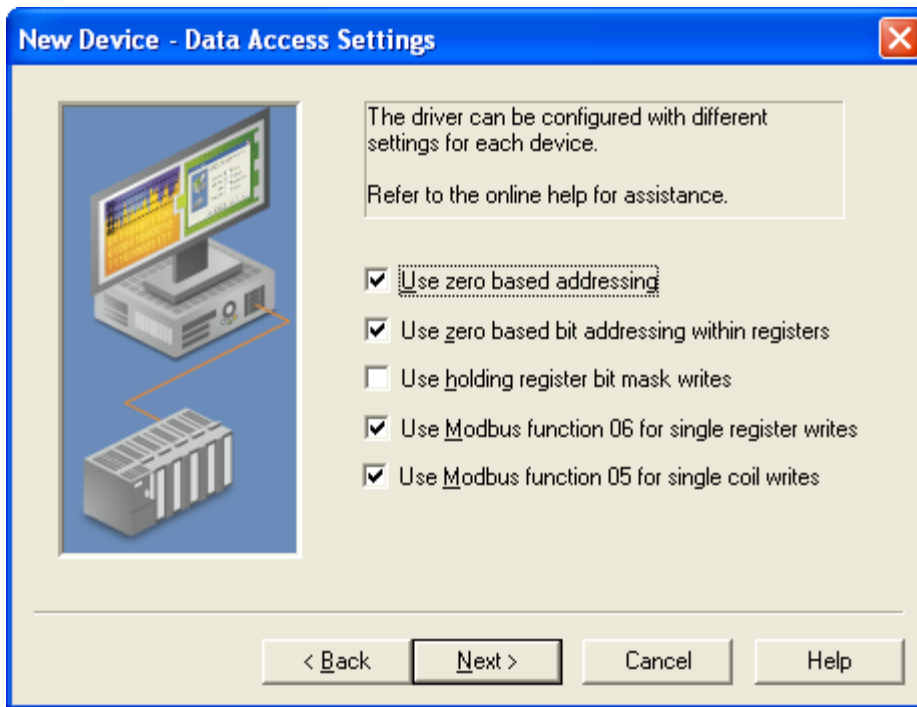
5. **Timing** – This page allows you to configure the **Request timeout** settings. The default settings are typically adequate. However, it may be necessary to adjust these values based on your communications environment and the needs of your application. Read the online help associated with this page for a detailed explanation of these settings.



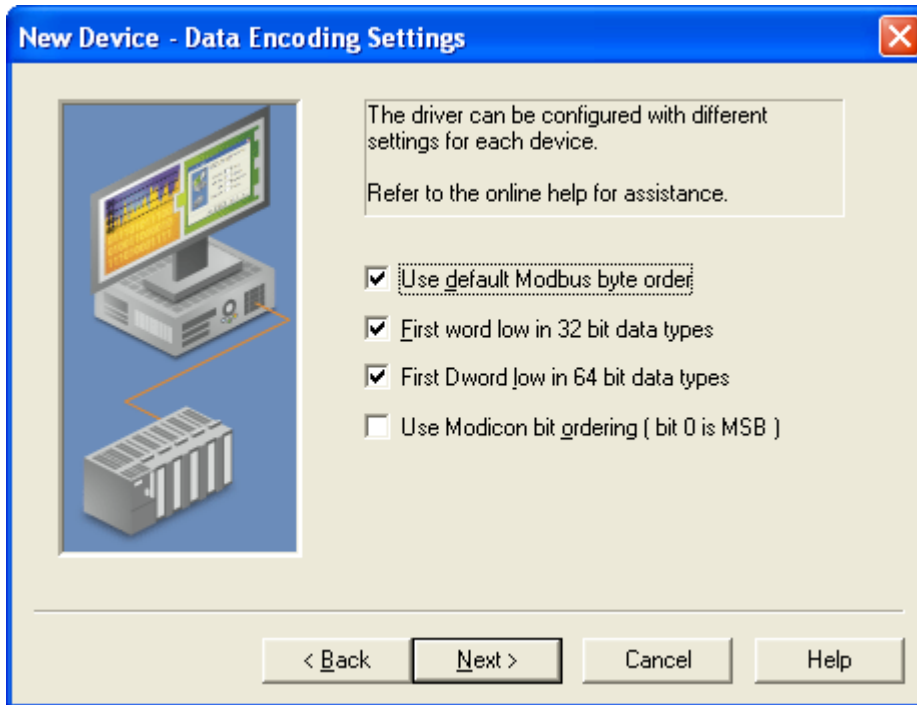
6. **Auto-Demotion** – This page allows you to stop communications to a device if there are communication failures.



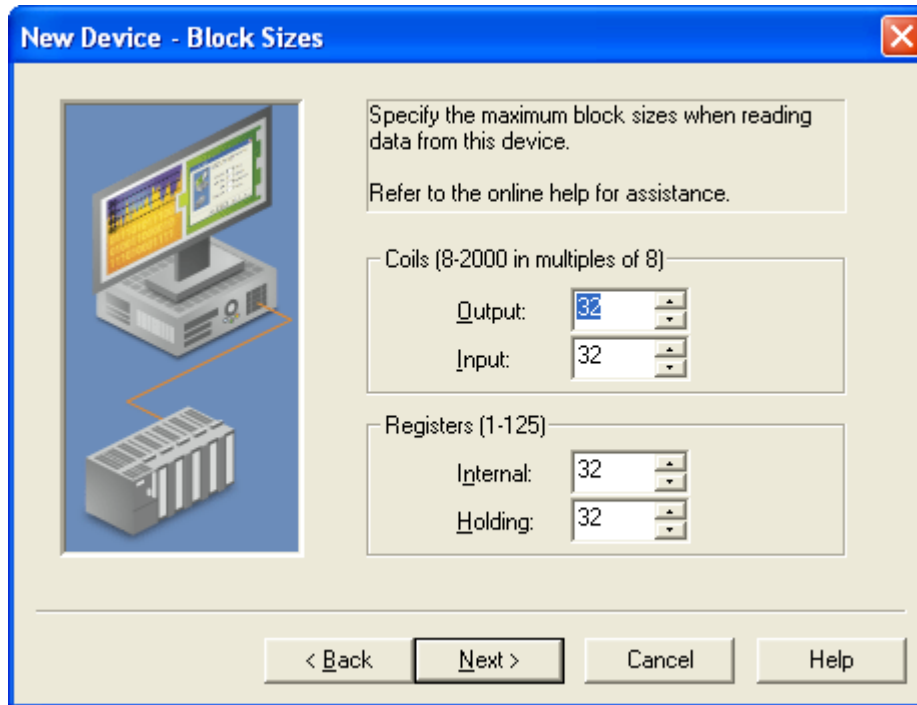
7. **Database Creation** – Automatic tag database generation is not supported. Leave the **Startup** selection at its default setting (**Do not generate on startup**).



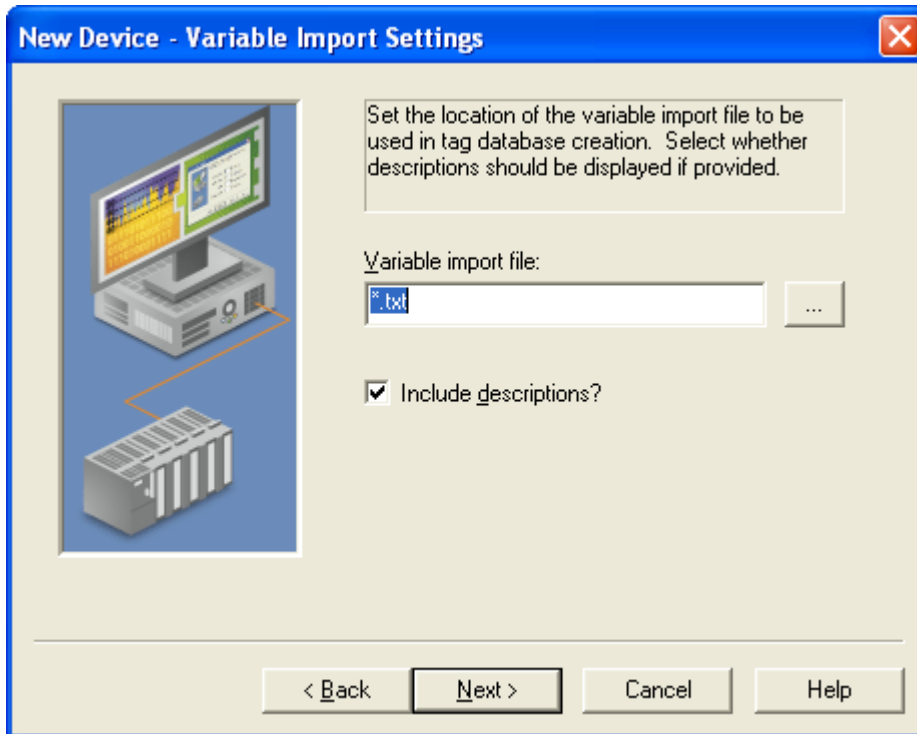
8. **Data Access Settings** – The default settings on this page, which are consistent with Modicon Modbus programming conventions, do not need to be changed.



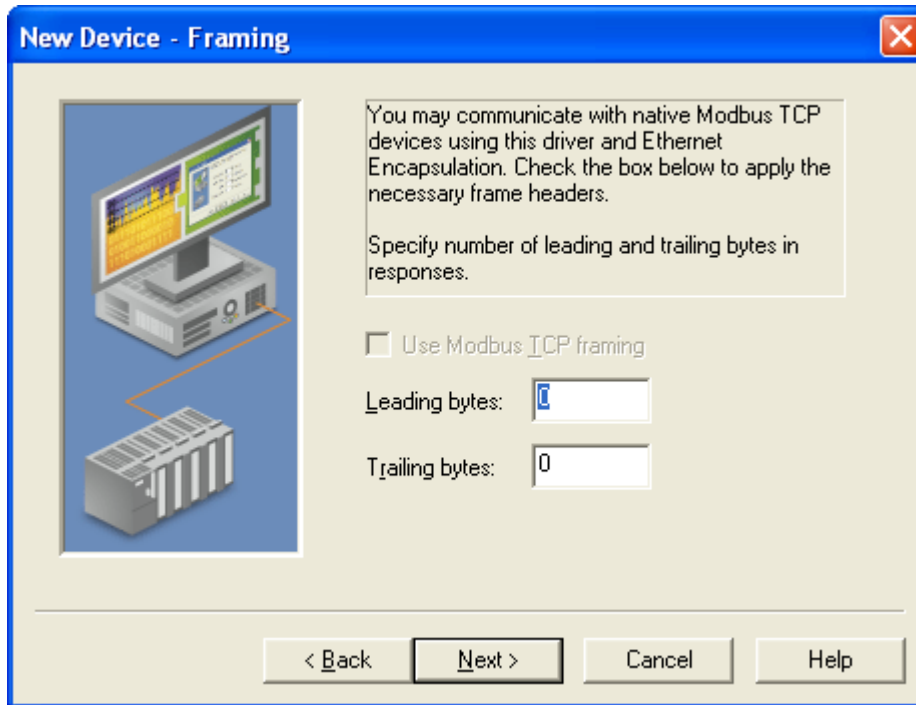
9. **Data Encoding Settings** – The default settings on this page, which are consistent with Modicon Modbus programming conventions, do not need to be changed for most devices. Please consult Modbus map in the user manual for any variations.



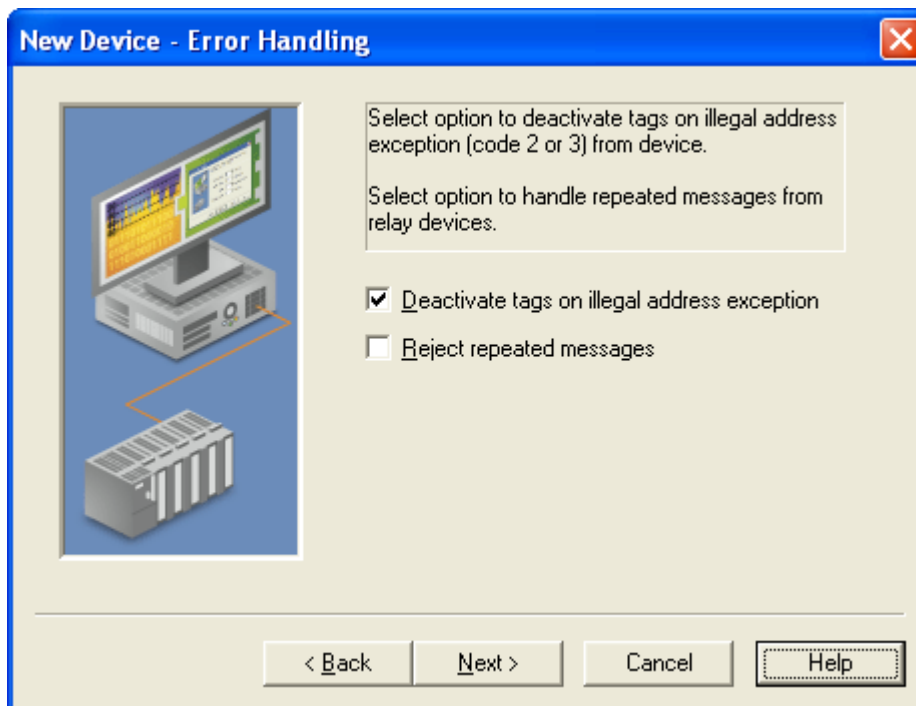
10. **Block Sizes** – The page is used to specify the maximum number of coils or registers that will be read in a single request. These settings may need to be adjusted to reflect the number of each type of coil (output and/or input) and register (internal and/or holding) present on the device.



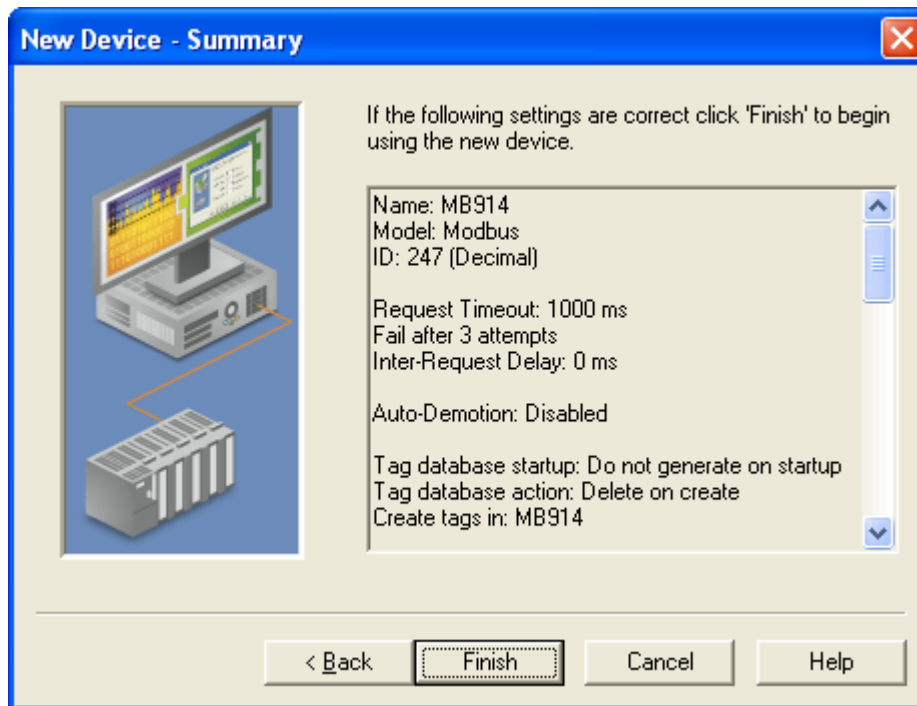
11. **Variable Import Settings** – The page is used to specify the variable import file used for automatic tag database generation. Since database generation was not enabled in step 6, this page can be ignored.



12. **Framing** – It is recommended that you use a separate channel setup for Modbus TCP versus using this feature.



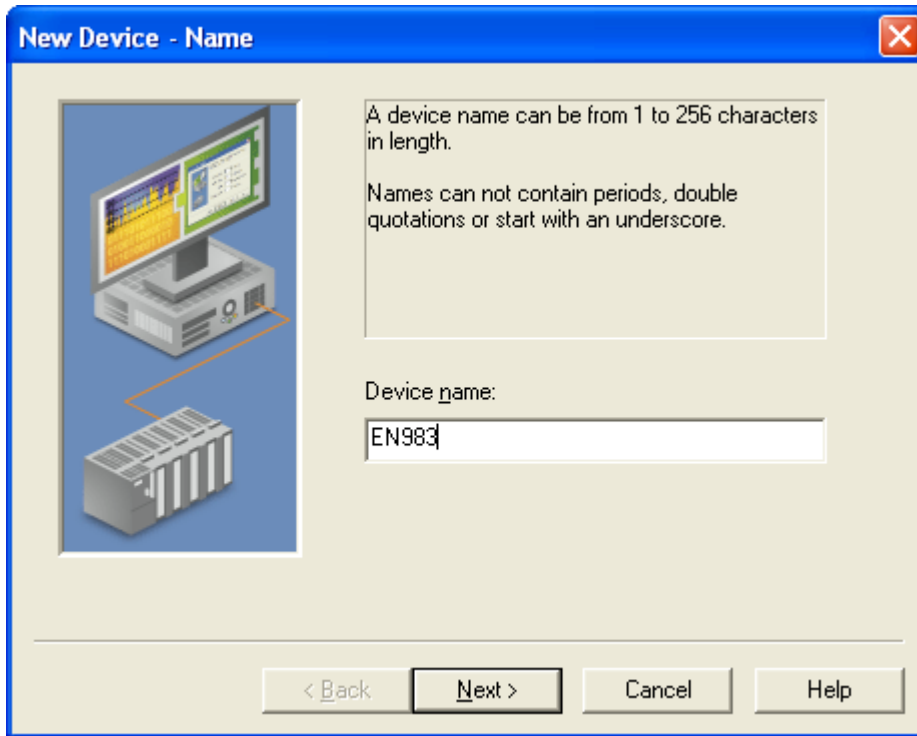
13. **Error Handling** – This page allows you to configure how illegal address and illegal data errors are handled.



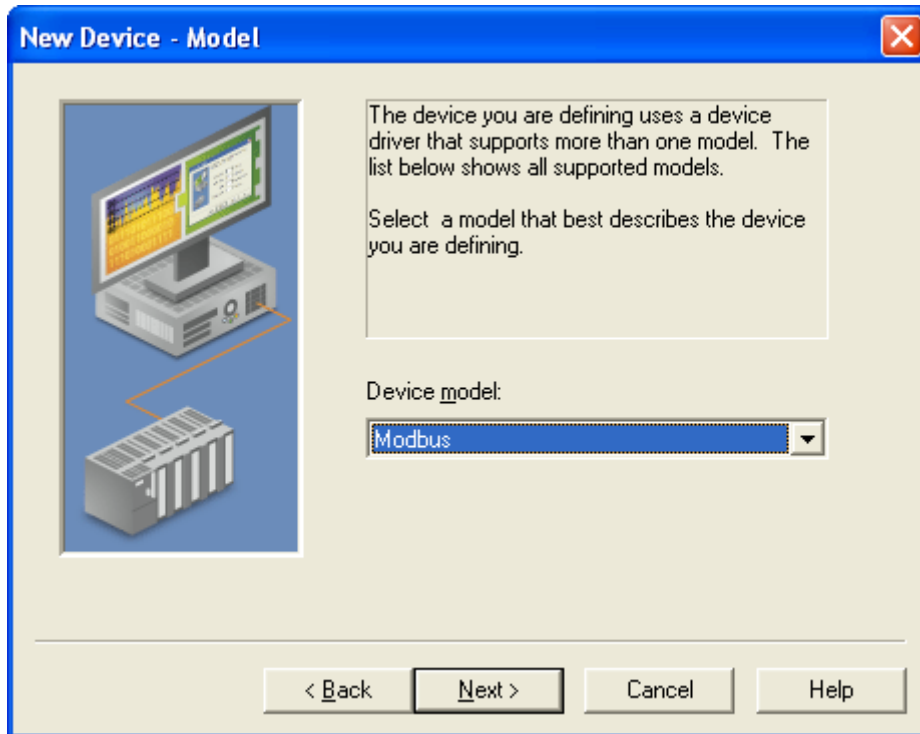
14. **Summary** – This page summarizes the selections made on the previous pages. Click **Finish** to exit the wizard and add the device to your project. A device icon will be added to the **Channel Device Group** area of the main program window. Settings for the device can be modified in the future by right clicking on the device icon and selecting **Properties...**

MODBUS TCP/IP

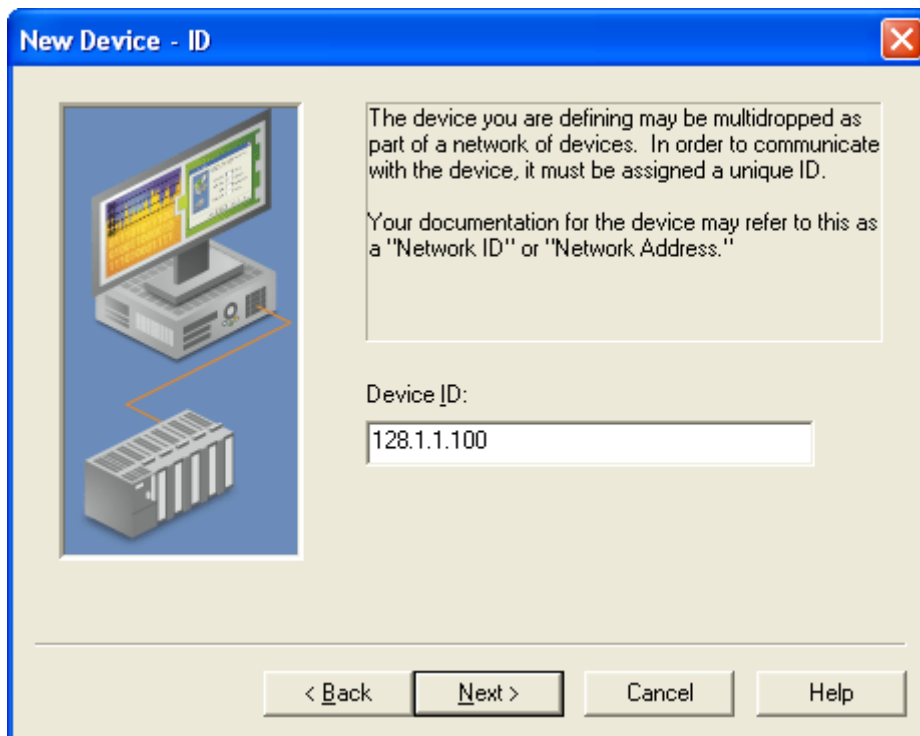
15. Click the **New Device** button on the toolbar. This launches the device wizard that will guide you through the configuration of the device. A help button is provided on each page of the wizard for additional information about configuration options.



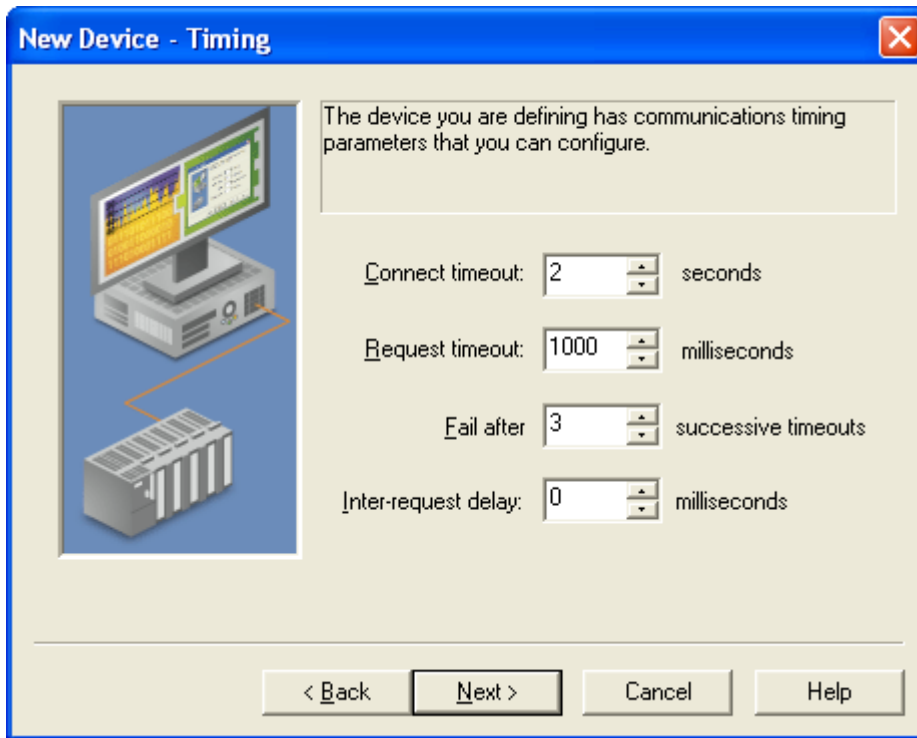
16. **Name** – Enter a name for the device (for example “EN983”).



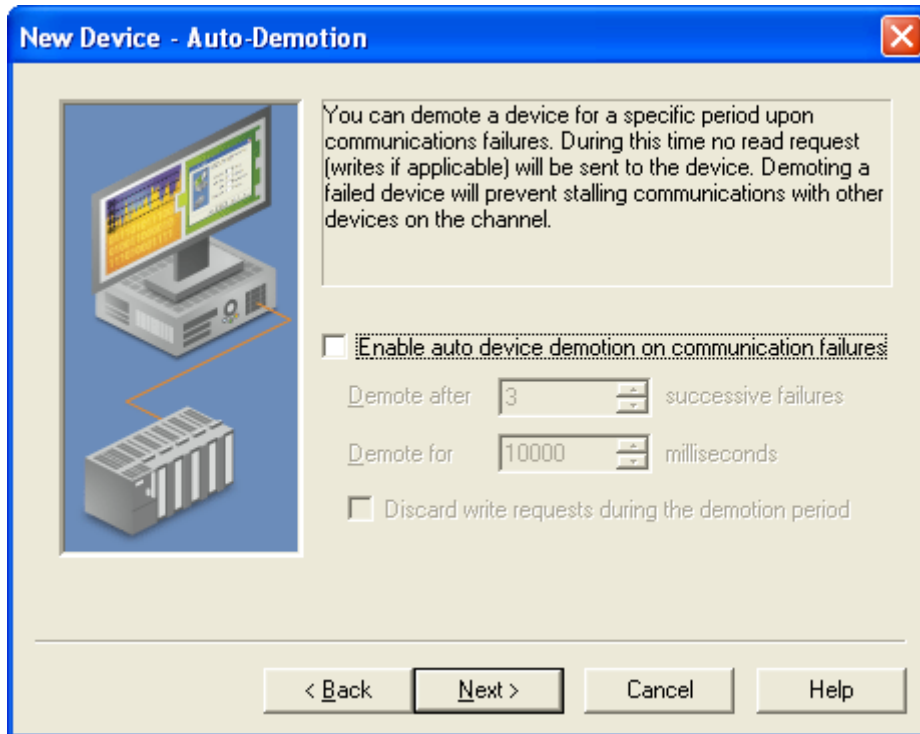
17. **Model** – Select **Modbus** from the drop-down menu.



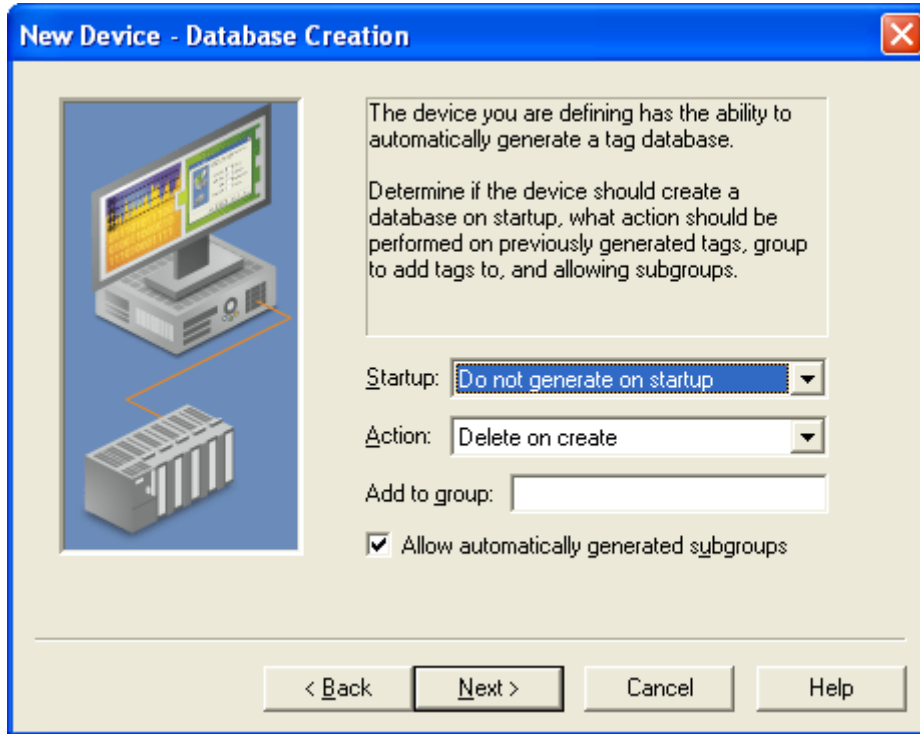
18. **ID** – Set the device ID to match the current TCP/IP ID of the I/O module. For example, if the module is in Default Communication mode, set the ID to 128.1.1.100.



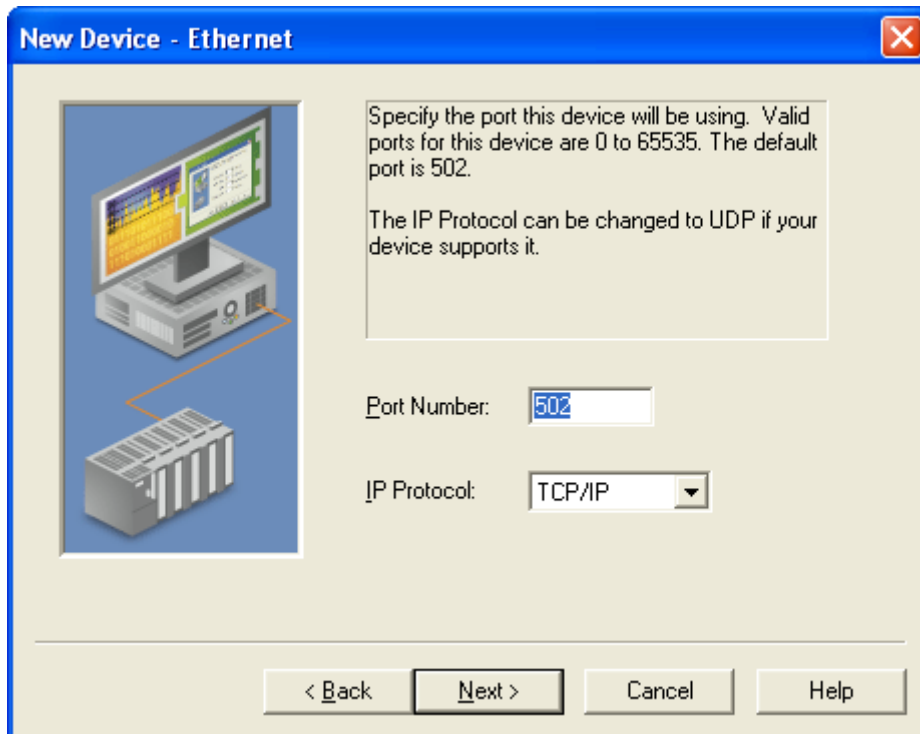
19. **Timing** – This page allows you to configure the **Request timeout** settings. The default settings are typically adequate. However, it may be necessary to adjust these values based on your communications environment and the needs of your application. Read the online help associated with this page for a detailed explanation of these settings.



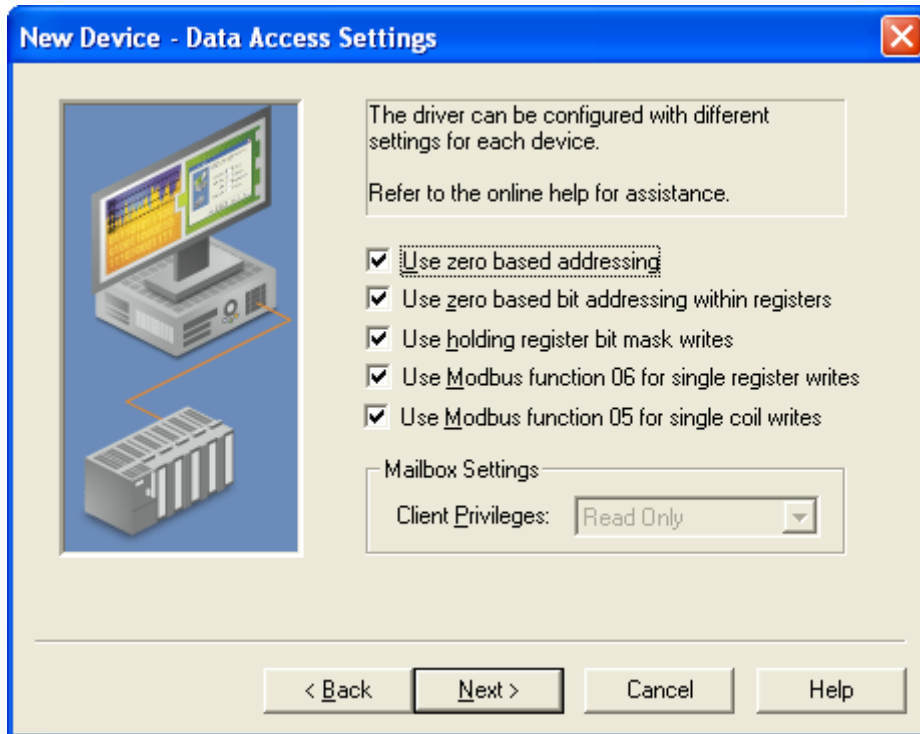
20. **Auto-Demotion** – This page allows you to stop communications to a device if there are communication failures.



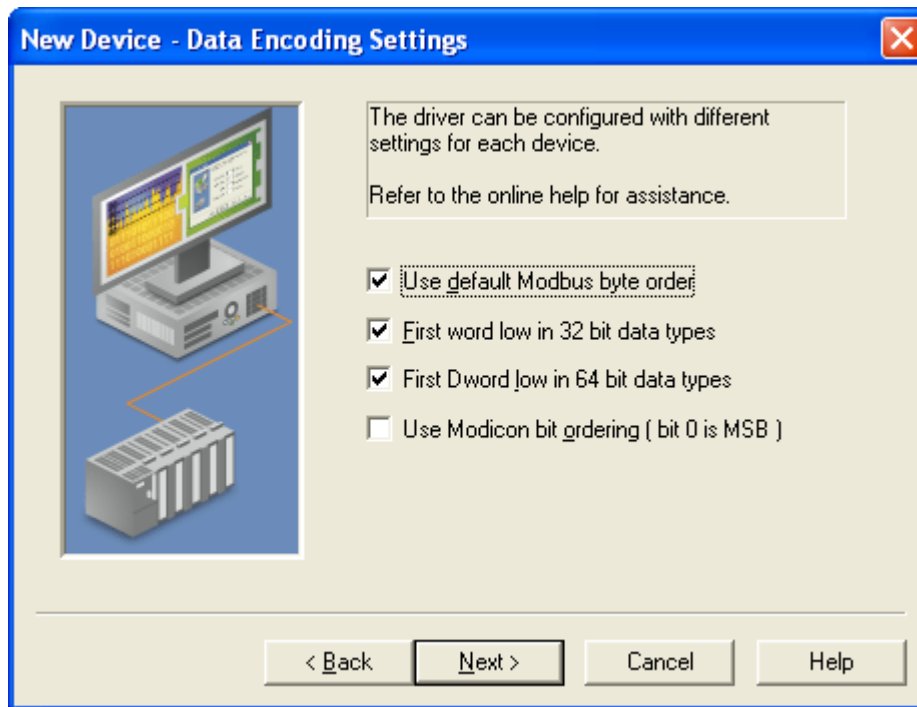
21. **Database Creation** – Automatic tag database generation is not supported. Leave the **Startup** selection at its default setting (**Do not generate on startup**).



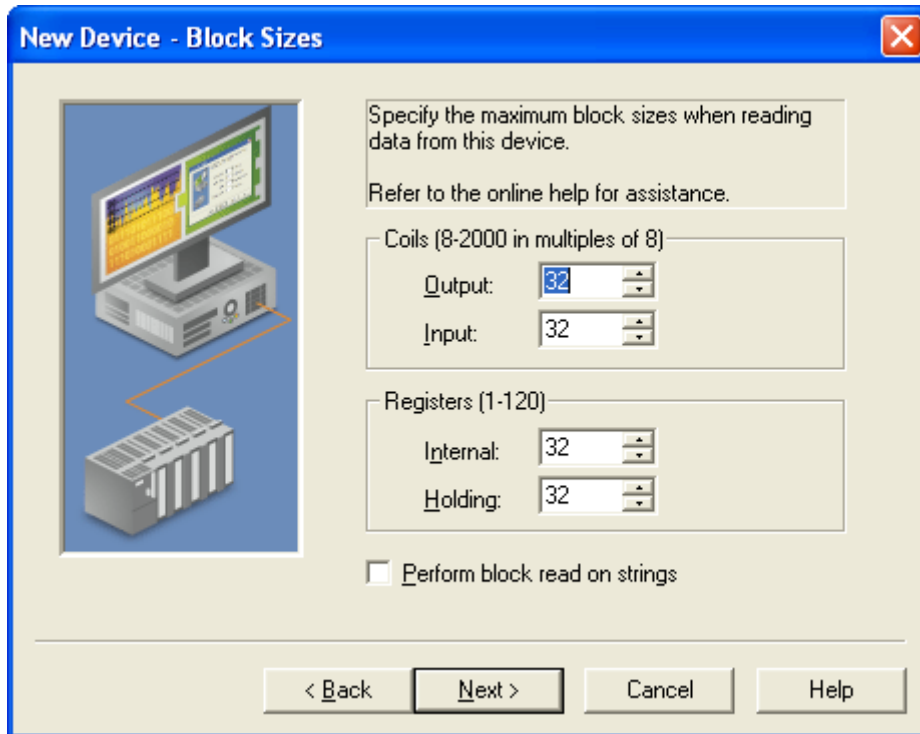
22. **Ethernet** – Leave the port number set to the default value (502).



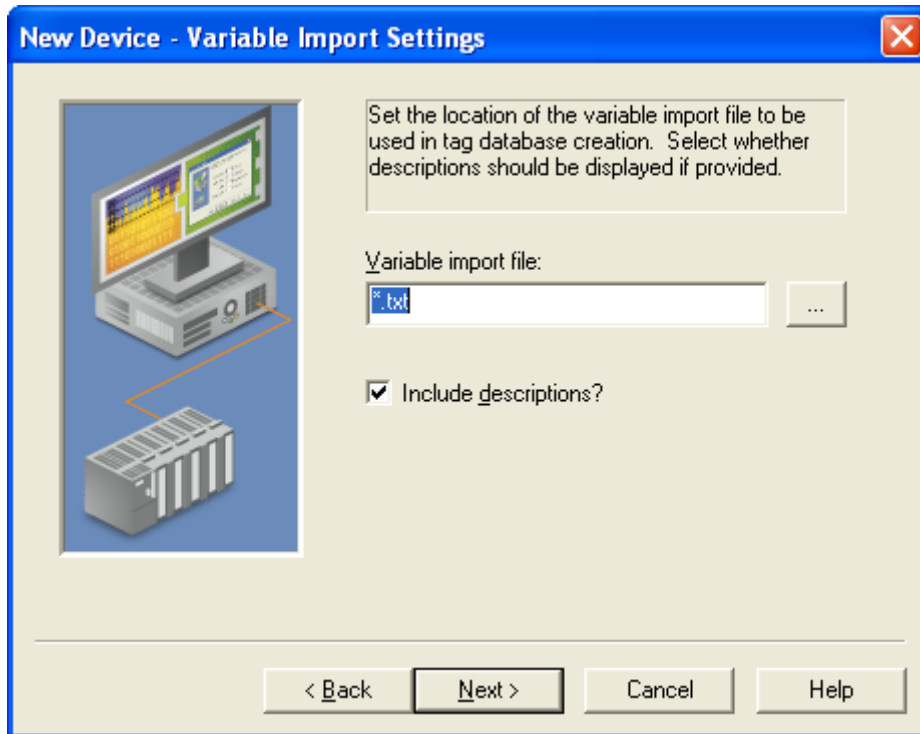
23. **Data Access Settings** – The default Modbus settings on this page do not need to be changed.



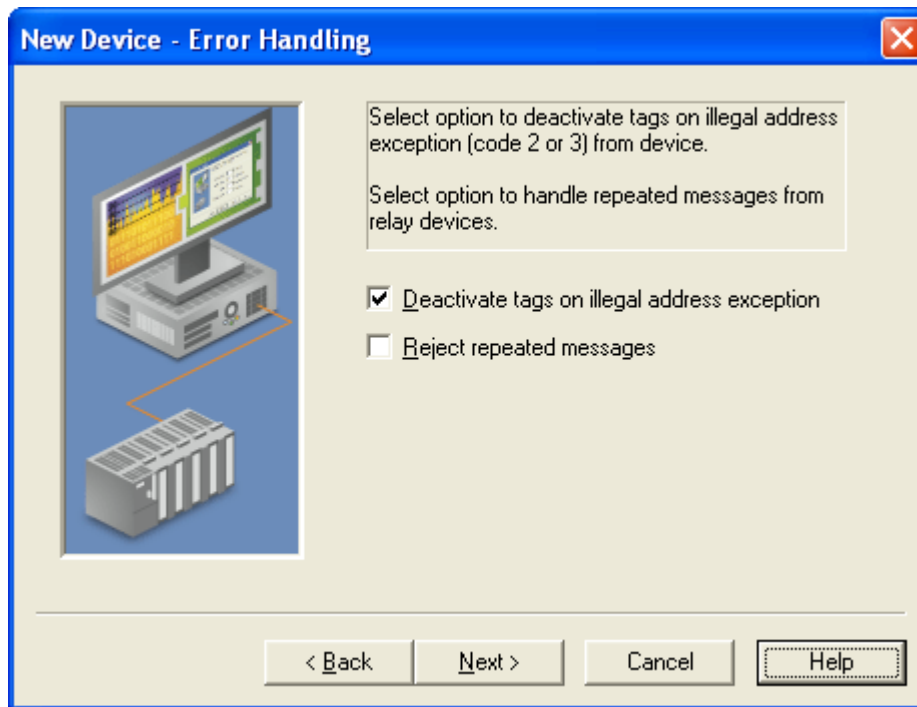
24. **Data Encoding Settings** – The default settings on this page, which are consistent with Modicon Modbus programming conventions, do not need to be changed for most devices. Please consult Modbus map in the user manual for any variations.



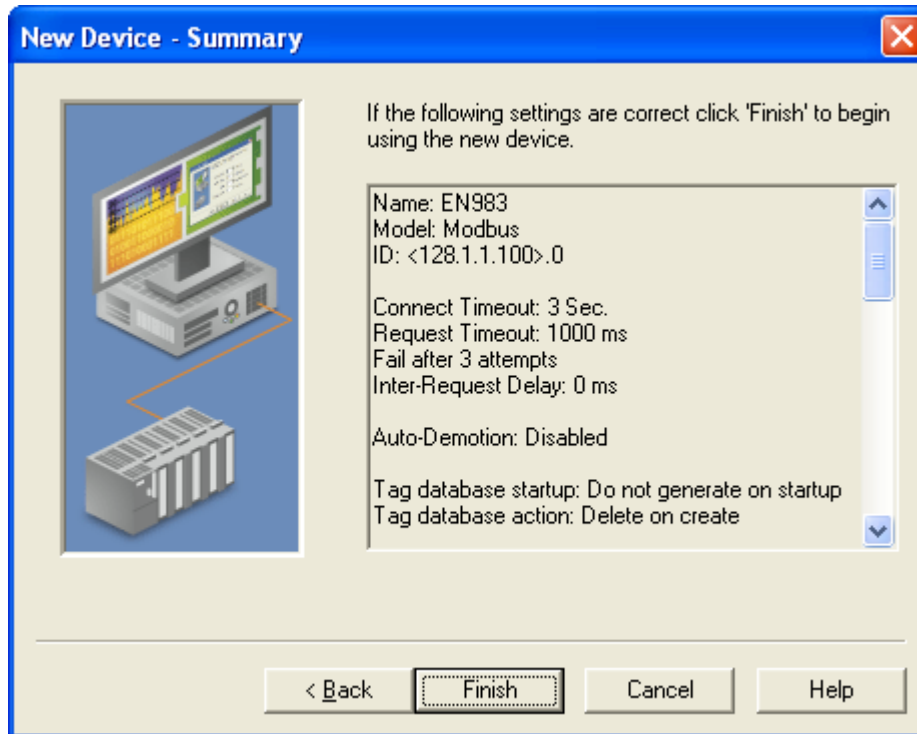
25. **Block Sizes** – The page is used to specify the maximum number of coils or registers that will be read in a single request. These settings may need to be adjusted to reflect the numbers of each type of coil (output and/or input) and register (internal and/or holding) present on the device.



26. **Variable Import Settings** – The page is used to specify the variable import file used for automatic tag database generation. Since database generation was not enabled in step 6, this page can be ignored.



27. **Error Handling** – This page allows you to configure how illegal address and illegal data errors are handled.



28. **Summary** – This page summarizes the selections made on the previous pages. Click **Finish** to exit the wizard and add the device to your project. A device icon will be added to the **Channel Device Group** area of the main program window. Settings for the device can be modified in the future by right clicking on the device icon and selecting **Properties...**

Add Tag Groups

Tag groups, which are optional, are used to organize the various tags defined for the server. For example, a tag group could be defined to hold all the Coil Register tags. Tag groups can be nested to create group hierarchies. To add a group:

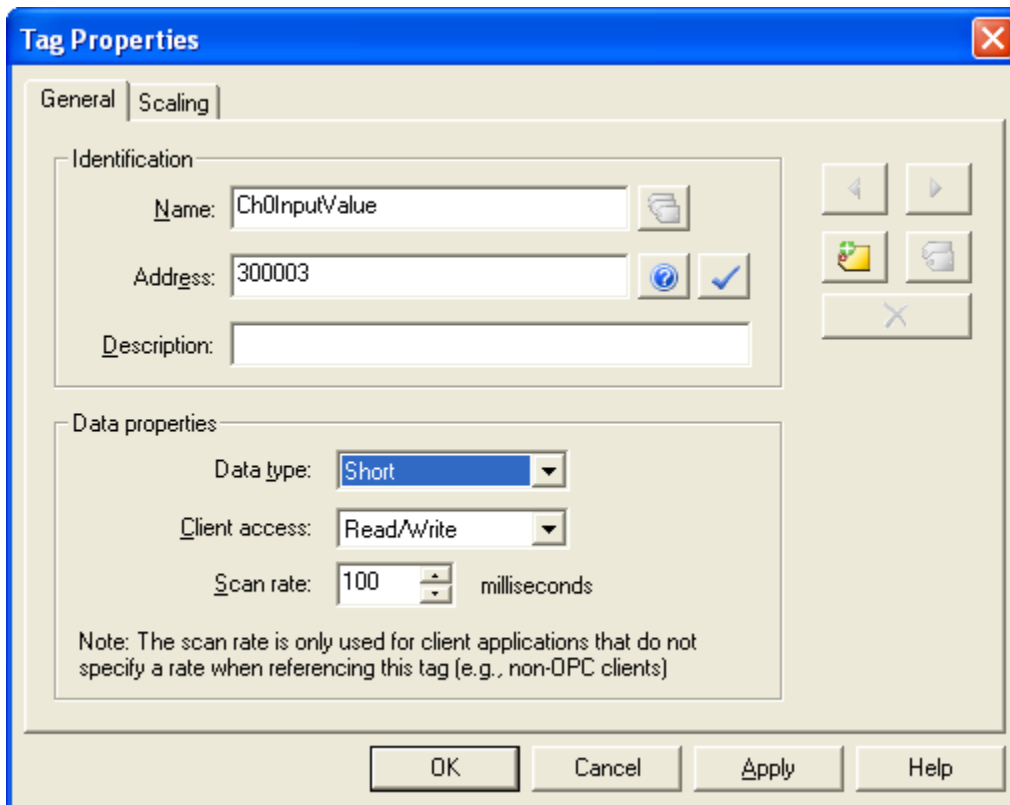
1. Select the device or an existing tag group within the **Channel Device Group** area of the main window and click the **New Tag Group** button.
2. Enter a name in the New Tag Group dialog and click OK.

Add Tags

A tag represents a particular address or register within the device. Tags are typically organized using Tag Groups. OPC clients that support tag browsing can browse the tags you define. The following example adds a tag for the 914MB's Channel 0 Input value (Input Register 30003):

Select the tag group that will hold the tag and click the **New Tag** button. This will launch the **Tag Properties** dialog window.

GENERAL TAB



The screenshot shows the 'Tag Properties' dialog box with the 'General' tab selected. The 'Identification' section contains three fields: 'Name' with the value 'Ch0InputValue', 'Address' with the value '300003', and an empty 'Description' field. The 'Data properties' section contains three fields: 'Data type' set to 'Short', 'Client access' set to 'Read/Write', and 'Scan rate' set to '100' milliseconds. A note at the bottom of the 'Data properties' section states: 'Note: The scan rate is only used for client applications that do not specify a rate when referencing this tag (e.g., non-OPC clients)'. The dialog box has 'OK', 'Cancel', 'Apply', and 'Help' buttons at the bottom.

1. Enter a name for the tag (**Ch0InputValue**) in the **Name** field.
2. Enter **300003** in the **Address** field.
3. If desired, enter a description in the **Description** field.
4. Select **Short** in the **Data type** drop-down menu. In the case of the 914MB, this register represents a signed 16-bit value.
5. Select **Read only** from the **Client access** menu.
6. The **Scan rate** setting is not used with OPC clients and can be ignored.

Note: After specifying the **Address**, **Data type**, and **Client Access**, the green check button can be clicked to test that these settings are valid. A dialog will be displayed if there are any discrepancies.

SCALING TAB

The screenshot shows the 'Tag Properties' dialog box with the 'Scaling' tab selected. At the top, there are three radio buttons: 'None', 'Linear' (which is selected), and 'Square root'. Below these are two main sections: 'Raw Value Range' and 'Scaled Value Range'.
In the 'Raw Value Range' section, the 'Data type' is set to 'Short'. The 'High' field contains '20000' and the 'Low' field contains '-20000'.
In the 'Scaled Value Range' section, the 'Data type' is set to 'Double'. The 'High' field contains '10' and the 'Low' field contains '-10'. There are two checkboxes: 'Clamp' (checked) and 'Negate scaled value' (unchecked). The 'Units' field contains 'Volts'.
At the bottom of the dialog are four buttons: 'OK', 'Cancel', 'Apply', and 'Help'.

Tag scaling is optional and can be used to convert raw data from a device into engineering units. When the 914MB is using its default Input Configuration ($\pm 10V$), a channel input value of -20000 corresponds to $-10V$ and a value of 20000 corresponds to $10V$. The following steps configure this scaling for the tag.

1. Click the **Linear** radio button.
2. Set the **High** and **Low** Raw Value Range limits to 20000 and -20000 respectively.
3. Set the **Data type** for the Scaled Value Range to **Double**.
4. Set the **High** and **Low** Scaled Value Range limits to 10 and -10 respectively.
5. Click the **Clamp** checkboxes if you want to constrain scaled values to the specified range.
6. Enter **Volts** in the Units field.

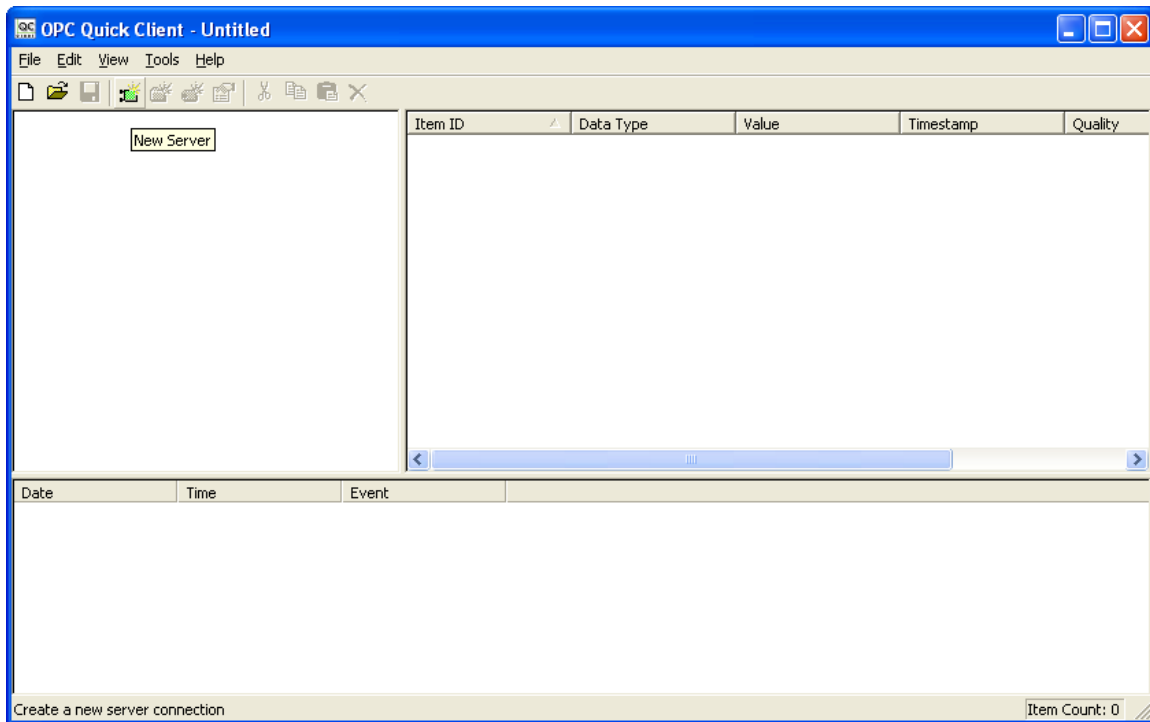
Settings for the tag can be modified in the future by right clicking on the tag icon and selecting **Properties...**

OPC Quick Client

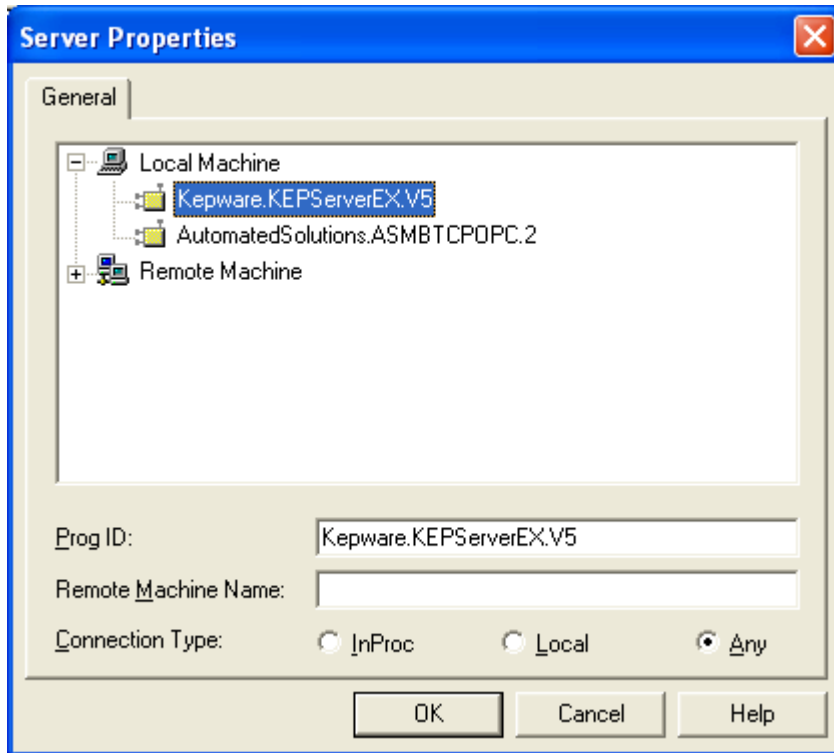
The KEPServerEX software includes a basic OPC client application that can be used to help test your server project. The OPC Quick Client can be launched from a button on the KEPServerEX toolbar or from the Windows **Start | Programs** menu.

Using the client it is possible to browse the OPC server tags and read their values. Right-clicking on a tag displays a context menu with various options for reading from or writing to the tag. Please refer to the OPC Quick Client help file for detailed information about this application.

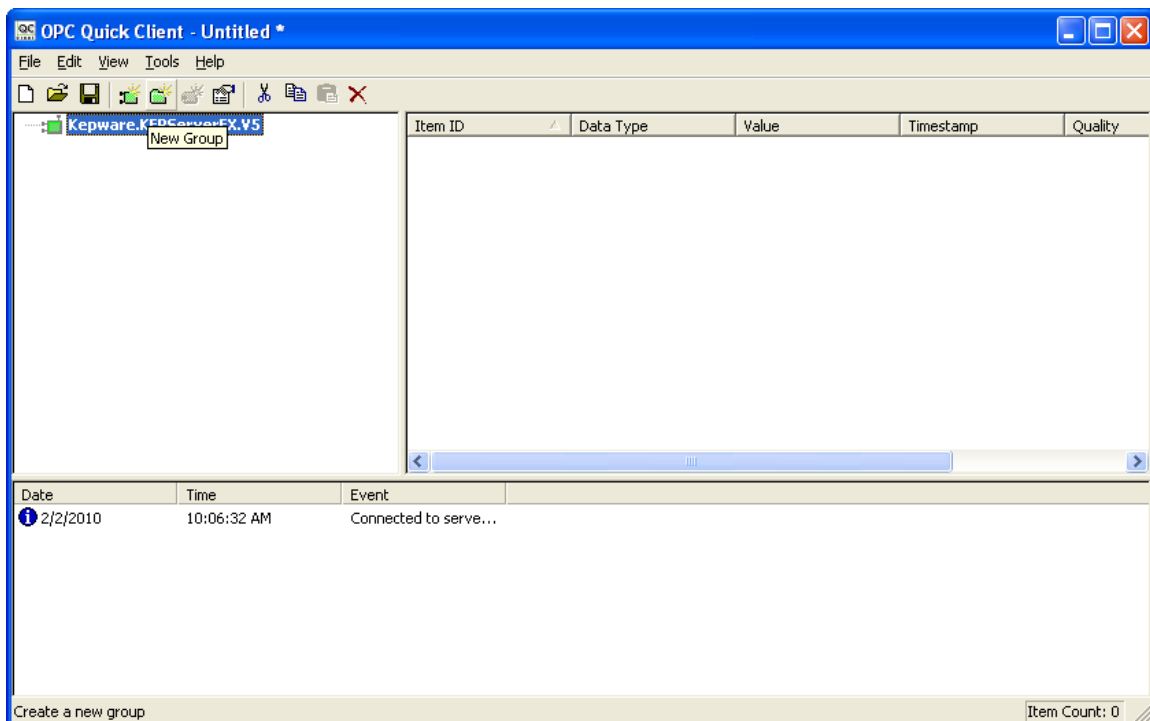
Here is an example of setting up the OPC Quick Client to read a Module Status register that the OPC server has been configured for.



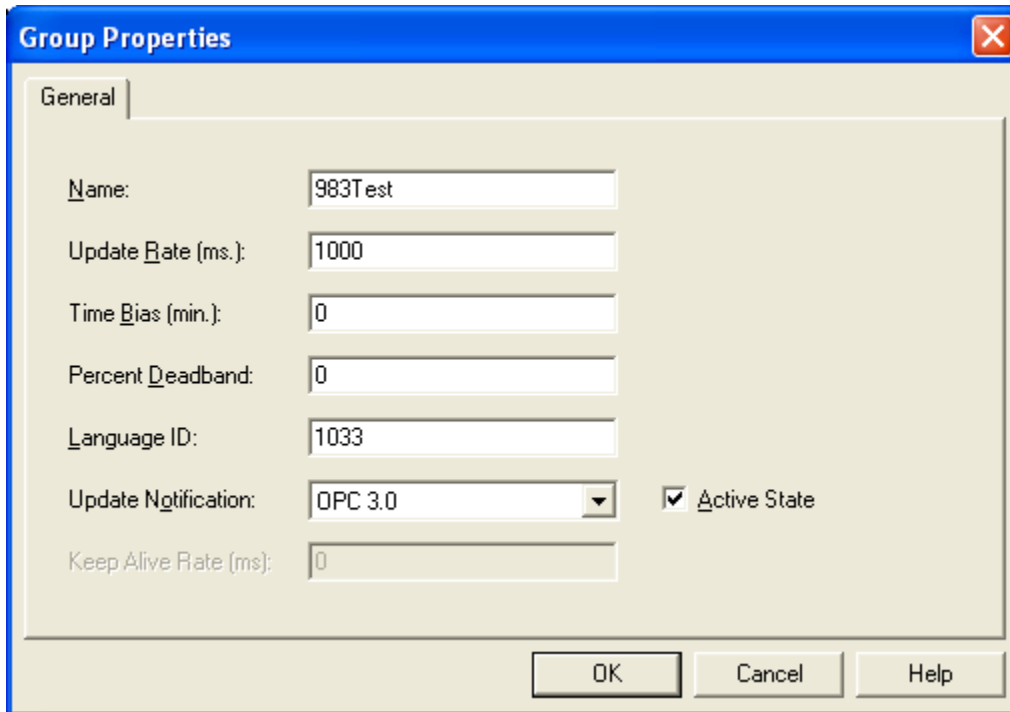
1. Click on the **New Server** icon.



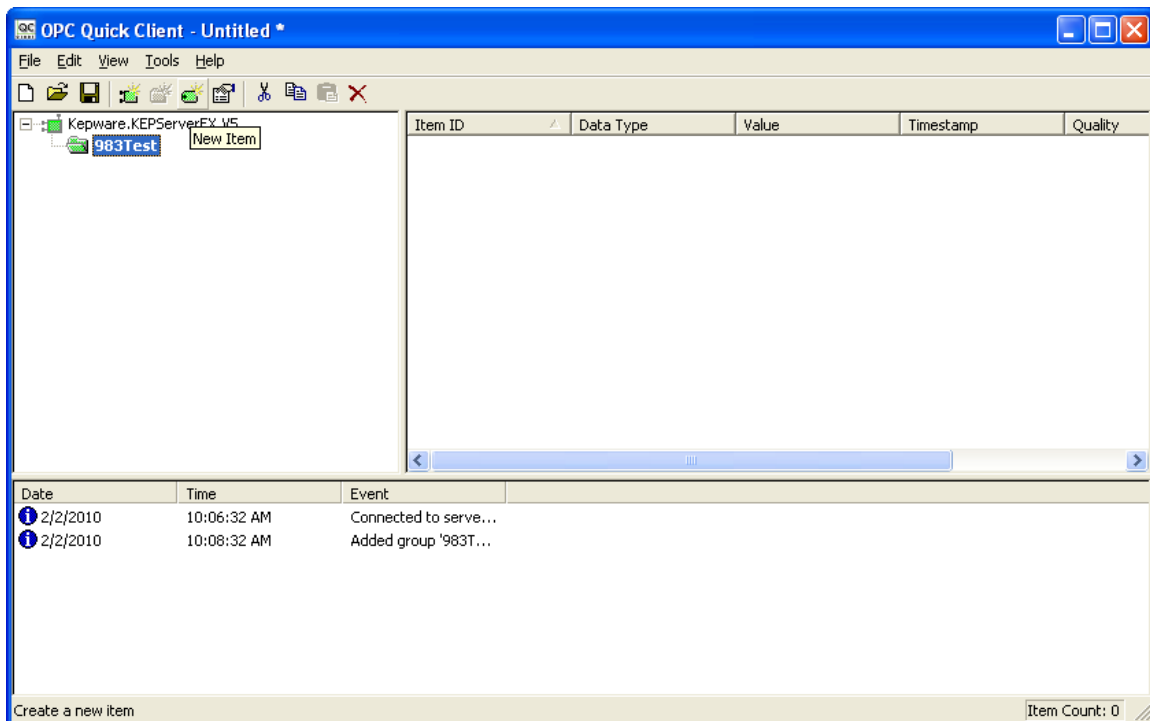
2. Select the **Kepware.KEPServerEX.V5** and then click **OK**. Any OPC server that is resident on the computer will be visible in this window.



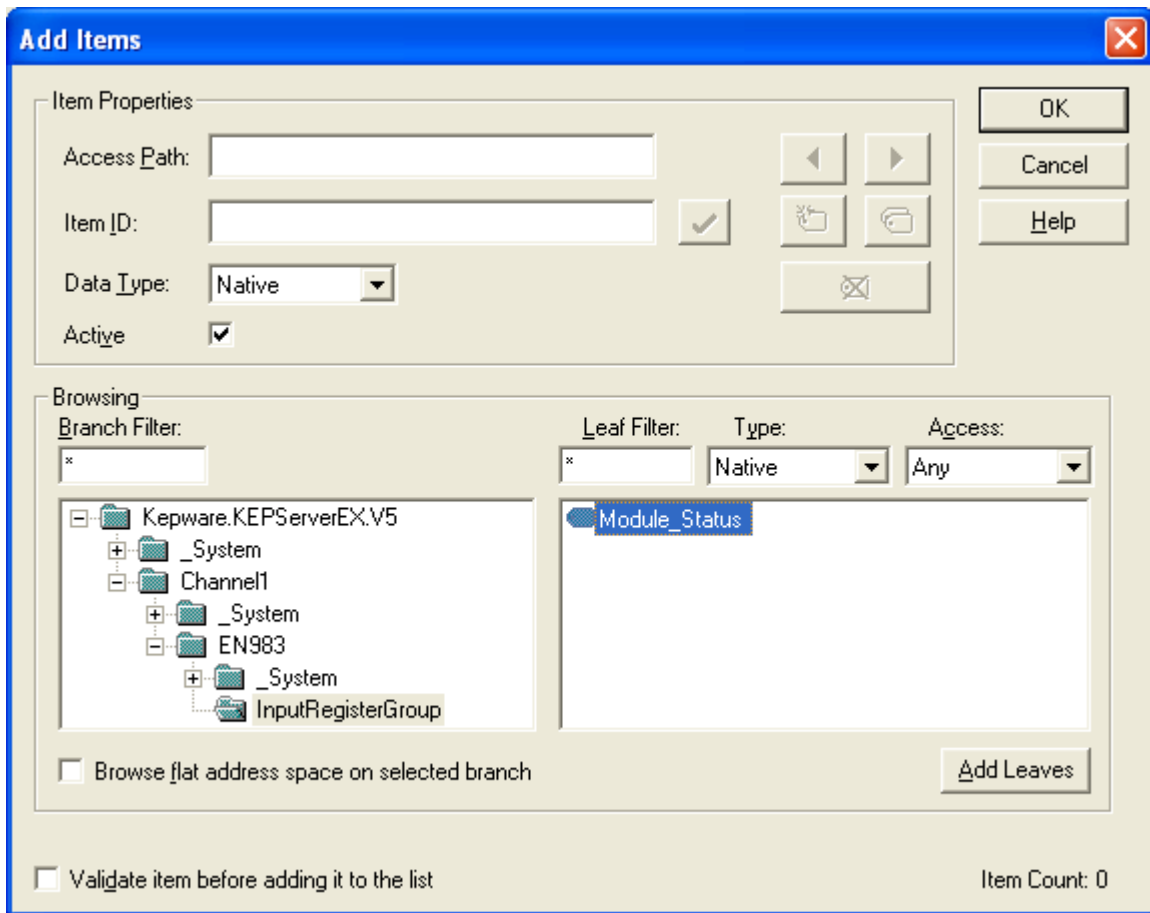
3. Click on the **New Group** icon .



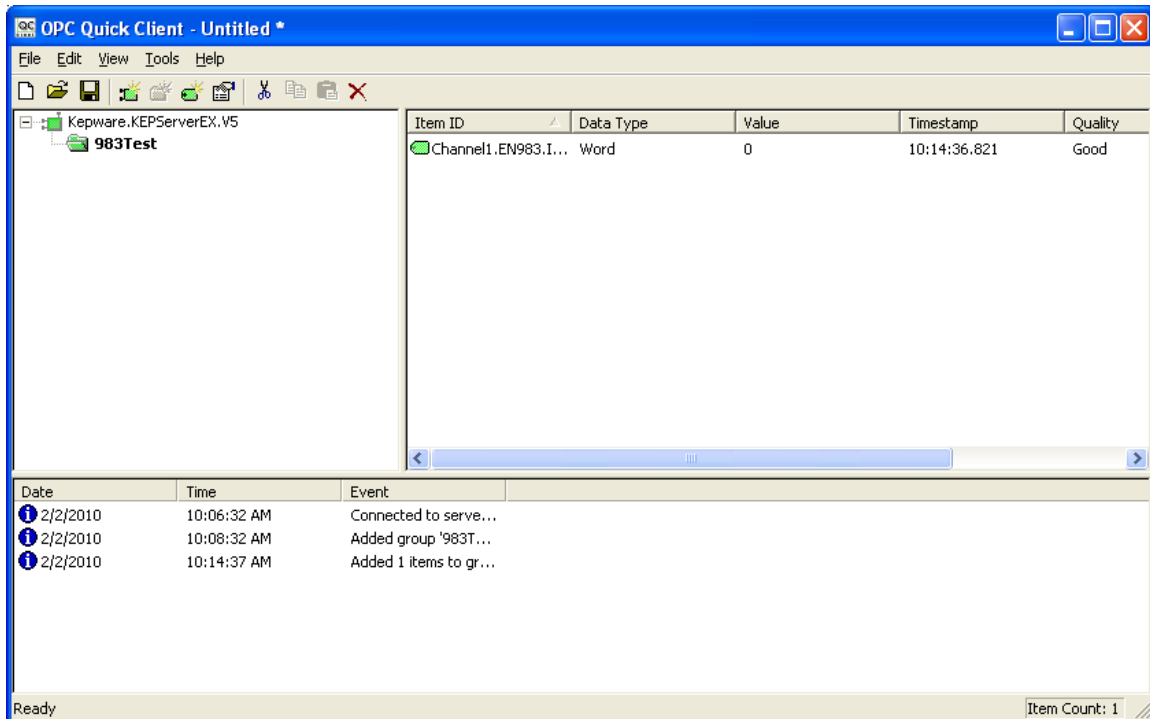
4. Enter a name, in this case "983Test" was used.



5. Click on the **New Item** icon.



6. Expand the **Kepware.KEPServerEX.V5** tree until the tag item you desire is visible in the right window. Select the tag item, click **Add Leaves** and click **OK**.



7. If you have connectivity to your device, the tag will read a value with its quality reported as Good. If the quality is reported as Bad, then you either don't have a path to your device or something in the OPC server isn't configured properly.