



Allen-Bradley

ControlLogix DeviceNet Interface Module

1756-DNB

DeviceNet[®]

User 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 this control equipment 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.

The illustrations, charts, sample programs and layout examples shown in this guide 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.

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

ATTENTION

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

Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

IMPORTANT

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

European Communities (EC) Directive Compliance

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet the Council Directive 89/336/EC Electromagnetic Compatibility (EMC) by applying the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2 EMC — Generic Emission Standard, Part 2 — Industrial Environment
- EN 50082-2 EMC — Generic Immunity Standard, Part 2 — Industrial Environment

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 - Equipment Requirements and Tests. For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as the Allen-Bradley publication Industrial Automation Wiring and Grounding Guidelines For Noise Immunity, publication 1770-4.1.

This equipment is classified as open equipment and must be mounted in an enclosure during operation to provide safety protection.

About This User Manual

Introduction

This user manual is designed to provide you enough information to get a small example application up and running. Use this manual if you are knowledgeable about DeviceNet™ and ControlLogix™ products, but may not have used the products in conjunction. The information provided is a base; modify or expand the examples to suit your particular needs.

The manual contains instructions on configuring a DeviceNet network using RSLinx and RSNetWorx for DeviceNet software over various networks:

- directly over the DeviceNet network
- from a ControlNet network
- from an Ethernet network
- from a Data Highway Plus network

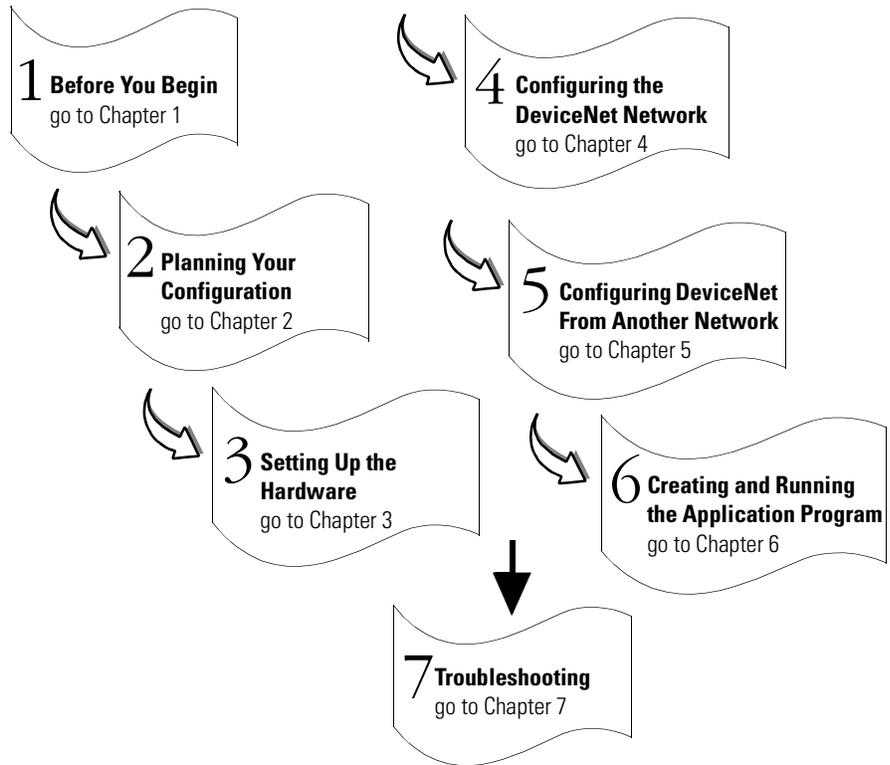
The example application demonstrates how to perform control on a DeviceNet network using a Logix5550 controller and the 1756-DNB module. You use RSLogix 5000 programming software to create a ladder logic program to control a photoeye and a RediSTATION™.

IMPORTANT

This User Manual should be used in conjunction with the 1756-DNB DeviceNet Scanner Module Installation Instructions, publication 1756-5.66. The Installation Instructions contain important information on configuring your scanner.

Contents

This user manual contains the following chapters:



Audience

This manual is intended for control engineers and technicians who are installing, programming, and maintaining a control system that includes a Logix5550 controller communicating on a DeviceNet network through a 1756-DNB module.

We assume that you:

- are developing a DeviceNet network using a ControlLogix chassis in conjunction with a 1756–DNB interface module
- know each of your device’s I/O parameters and requirements
- are experienced with the Microsoft® Windows™ environment
- are familiar with RSNetWorx for DeviceNet software

The Example Application

This manual describes how to set up an example application. The manual provides examples of each step of the setup, with references to other manuals for more details.

System Components

We used the following devices and software for the example application. For your own application, substitute your own devices to fit your needs. The recommended configurations in this user manual will help you set up the test system and get it working. Your eventual configuration will depend on your application.

Note: If you use different software or firmware versions of these products some of your screens may appear slightly different from those shown in the example.

	Product Name	Catalog Number	Series	Revision
Qty	Hardware			
1	ControlLogix chassis	1756-A4, -A7, -A10	-	-
1	Logix5550 controller	1756-L1	A	5.12
1	ControlLogix DeviceNet Interface module	1756-DNB	A	3.003
1	DeviceNet Quad-Tap	1492-DN3TW	-	-
1	RediSTATION operator interface module	2705-T3DN1A42A	-	-
1	Series 9000 Photoeye	42GNP-9000 or equivalent	-	-
1	DeviceNet PC serial communication module	1770-KFD	A	1.04
1	RS-232 cable	1787-RSCABL/A (PC to 1770-KFD)	-	-
1	24V Power Supply	Regulated 24VDC, 8A	-	-
1	PC	IBM-compatible Windows NT 4.0	-	-
	DeviceNet dropline or trunkline cables, as needed	1787-PCABL, -TCABL, -MCABL	-	-
1 ⁽¹⁾	ControlLogix ControlNet Interface module	1756-CNB	B	2.24
1 ⁽²⁾	ControlLogix Data Highway Plus Interface module	1756-DHRIO	B	2.17
1 ⁽³⁾	ControlLogix Ethernet Interface module	1756-ENET	A	1.18
	Software			
	RSLogix 5000	9324-RL5300END	-	2.51
	RSNetWorx for DeviceNet	9357-DNETL3,	-	2.11
	RSLinx	9355-WAB	-	2.10

⁽¹⁾ Required if interfacing the DeviceNet network and a ControlNet network. See chapters 5 and 6.

⁽²⁾ Required if interfacing the DeviceNet network and a Data Highway Plus network. See chapters 5 and 6.

⁽³⁾ Required if interfacing the DeviceNet network and an Ethernet network. See chapters 5 and 6.

Common Techniques Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists provide information, not procedural steps.
- Numbered lists provide sequential steps.
- Information in **bold** contained within text identifies menu windows, or screen options, screen names and areas of the screen, such as dialog boxes, status bars, radio buttons and parameters.

TIP

This symbol identifies helpful tips.



This is a definition box. When a word is bold within the text of a paragraph, a definition box will appear in the left margin to further define the text.

A **definition box** defines terms that may be unfamiliar to you.



Screen captures are pictures of the software's actual screens. The names of screen buttons and fields are often in bold in the text of a procedure. Pictures of keys represent the actual keys you press.



The "MORE" icon is placed beside any paragraph that references sources of additional information outside of this document.

Where to Find More Information



Refer to the following publications as needed for additional help when setting up and using your DeviceNet network:

For information about	See this publication	Publication Number
the ControlLogix DeviceNet interface module	ControlLogix DeviceNet Scanner Module Installation Instructions	1756-5.66
the ControlLogix Chassis	ControlLogix Chassis Installation Instructions	1756-5.2
ControlLogix power supplies	ControlLogix Power Supplies Installation Instructions	1756-5.1
connecting the DeviceNet network	DeviceNet Cable Planning and Installation Manual	DN-6.7.2
the 1770-KFD communication module	DeviceNet RS-232 Interface Module Installation Instructions	1770-5.6
the Logix5550 controller	Logix5550 Controller User Manual	1756-6.5.12
the RediSTATION	RediSTATION Operator Interface User Manual	2705-804
the ControlLogix ControlNet Interface module	ControlLogix ControlNet Bridge Installation Instructions	1756-5.32
the ControlLogix DH+ Interface module	ControlLogix DHRIO Module Installation Instructions	1756-5.4
the ControlLogix Ethernet Interface module	ControlLogix Ethernet Module Installation Instructions	1756-5.3
RSLogix 5000 software	Getting Results with RSLogix 5000	9399-RLD300GR
RSLinx software	RSLinx Lite User Guide	9399-WAB32LUG
RSNetWorx for DeviceNet software	See the software's online Help	N/A
terms and definitions	Allen-Bradley Industrial Automation Glossary	AG-7.1

TIP


Many of the above publications are available online from the Automation Bookstore:

<http://www.theautomationbookstore.com>.

TIP


For more information about Rockwell Software products, visit the Rockwell Software internet site:

<http://www.software.rockwell.com>.

Terminology

This term	Means
Bridge	The interface module's support of explicit message transfer.
Change of State	A type of I/O data communication. The interface module can send and receive data with slave devices that have the change of state feature. Data is sent whenever a data change occurs. Data is updated at the rate of the heartbeat.
Communication Module	The 1756-DNB interface module or the 1770-KFD module.
Cyclic	A type of I/O data communication. The interface module can send and receive data with slave devices that have the cyclic feature. Data is only sent at a user-configurable rate.
EDS	Electronic Data Sheet. A vendor-supplied template that specifies how information is displayed as well as what is an appropriate entry (value).
Explicit Messaging	A type of messaging used for lower priority tasks, such as configuration and data monitoring.
Heartbeat Rate	Devices that are configured for change of state data can also send a "heartbeat" signal to indicate proper operation.
Host Platform	The computer that hosts the 1756-DNB interface module.
I/O	An abbreviation for "input and output".
Implicit Messaging	The type of messaging used for high priority I/O control data; e.g., change of state, cyclic, polled, or strobed.
Input Data	Data produced by a DeviceNet device and collected by the interface module for a host platform to read.
MAC ID	The network address of a DeviceNet node.
Network	The DeviceNet network or the RSNetWorx for DeviceNet software representation of the network.
Node	Hardware that is assigned a single address on the network (also referred to as device).
Offline	When the PC communication interface is not communicating on the network.
Online	When the PC communication interface is configured and enabled to communicate on the network.
Output Data	Data produced by a host platform that is written to the interface module's memory. This data is sent by the interface module to DeviceNet devices.
PC	Abbreviation for an IBM® compatible personal-computer.
Polled	A type of input/output-data communication. A polled message solicits a response from a single, specified device on the network (a point-to-point transfer of data).
Record	The node address and channel-specific memory assigned in the interface module's non-volatile storage for a node in the scanlist.
Rx	An abbreviation for "receive".
Scanlist	The list of devices (nodes) with which the scanner is configured to exchange I/O data.
Scanner	The function of the 1756-DNB interface module to support the exchange of I/O with slave modules.
Slave Mode	The interface module is in slave mode when it is placed in another interface module's scanlist as a slave device.
Strobed	A type of I/O data communication. A strobed message solicits a response from each strobed device (a multicast transfer). It is a 64-bit message that contains one bit for each device on the network.
Tx	An abbreviation for "transmit".

Rockwell Automation Support

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Contact your local Rockwell Automation representative for:

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- product technical training
- warranty support
- support service agreements

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For presales support, call 1 440 646-3NET.

You can obtain technical assistance online from the following Rockwell Automation WEB sites:

- www.ab.com/mem/technotes/kbhome.html (knowledge base)
- www.ab.com/networks/eds (electronic data sheets)

Your Questions or Comments about This Manual

If you find a problem with this manual, please notify us of it on the enclosed Publication Problem Report (at the back of this manual).

If you have any suggestions about how we can make this manual more useful to you, please contact us at the following address:

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Control and Information Group
Technical Communication
1 Allen-Bradley Drive
Mayfield Heights, OH 44124-6118

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Before You Begin

What This Chapter Contains This chapter provides an overview of communication between a Logix5550 controller and DeviceNet devices via a 1756-DNB module. The data tables and the RSNetWorx for DeviceNet screens and windows used to configure data tables are also described.

The following table identifies what this chapter contains and where to find specific information.

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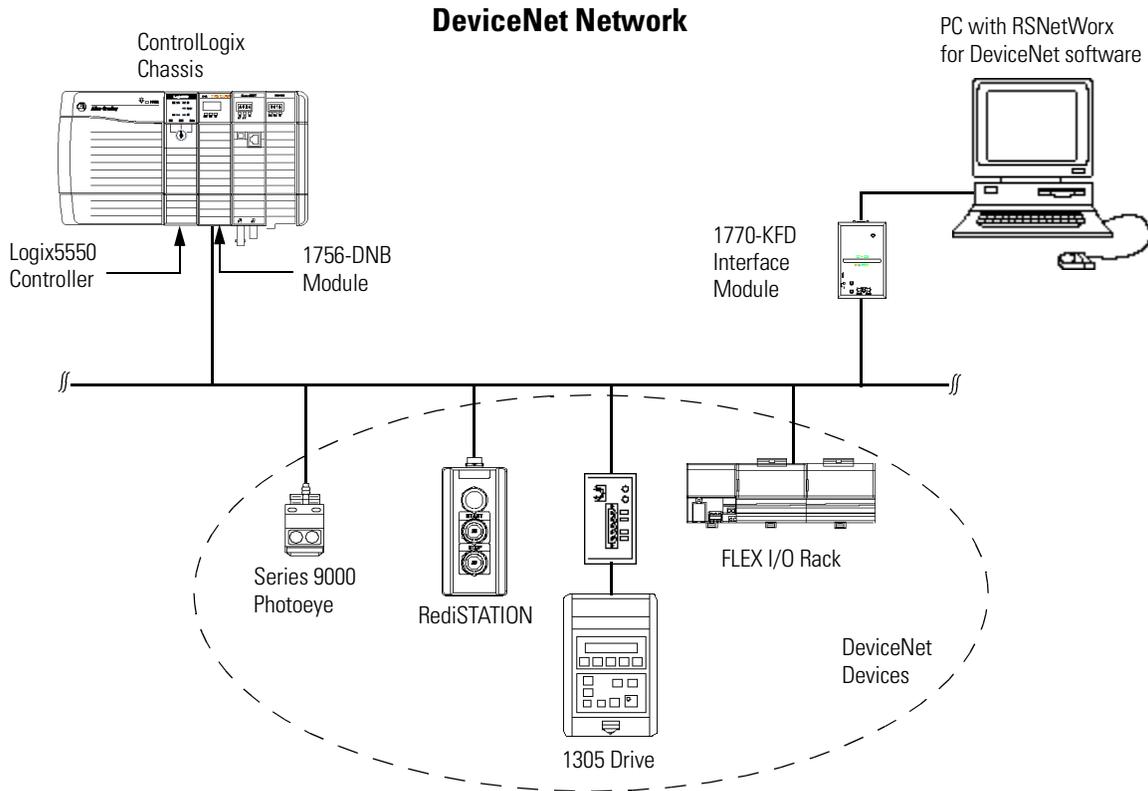
What You Need to Know

Before configuring your 1756-DNB module, you must understand:

- the data exchange between the controller and DeviceNet devices through the 1756-DNB module
- user-configurable 1756-DNB module data tables
- the role of RSNetWorx for DeviceNet software

What Your 1756-DNB Module Does

In a typical configuration, the 1756-DNB module acts as an interface between DeviceNet devices and the Logix5550 controller.



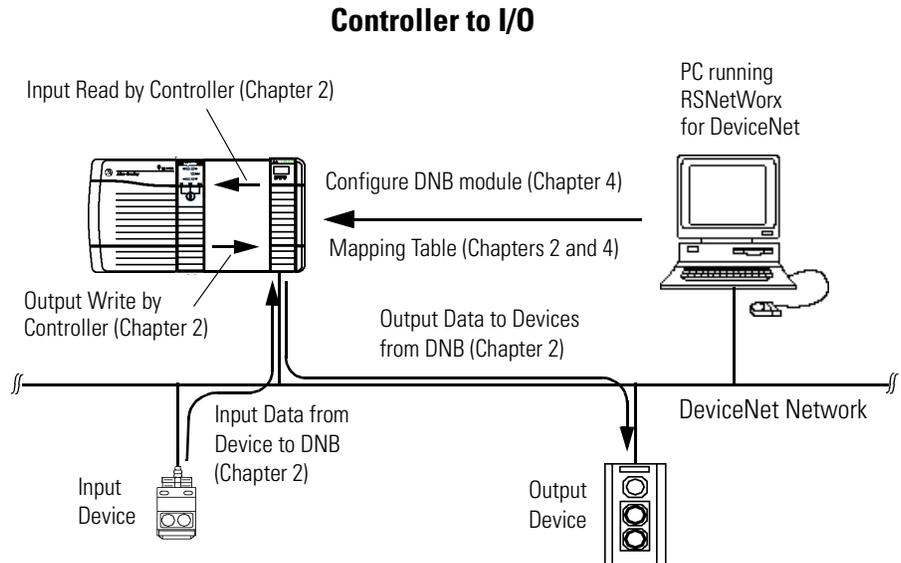
The 1756-DNB module communicates with DeviceNet devices over the network to:

- read inputs from a device
- write outputs to a device
- download configuration data
- monitor a device's operational status

The 1756-DNB module communicates with the controller in the form of Input, Output, and Diagnostic Tables. Information exchanged includes:

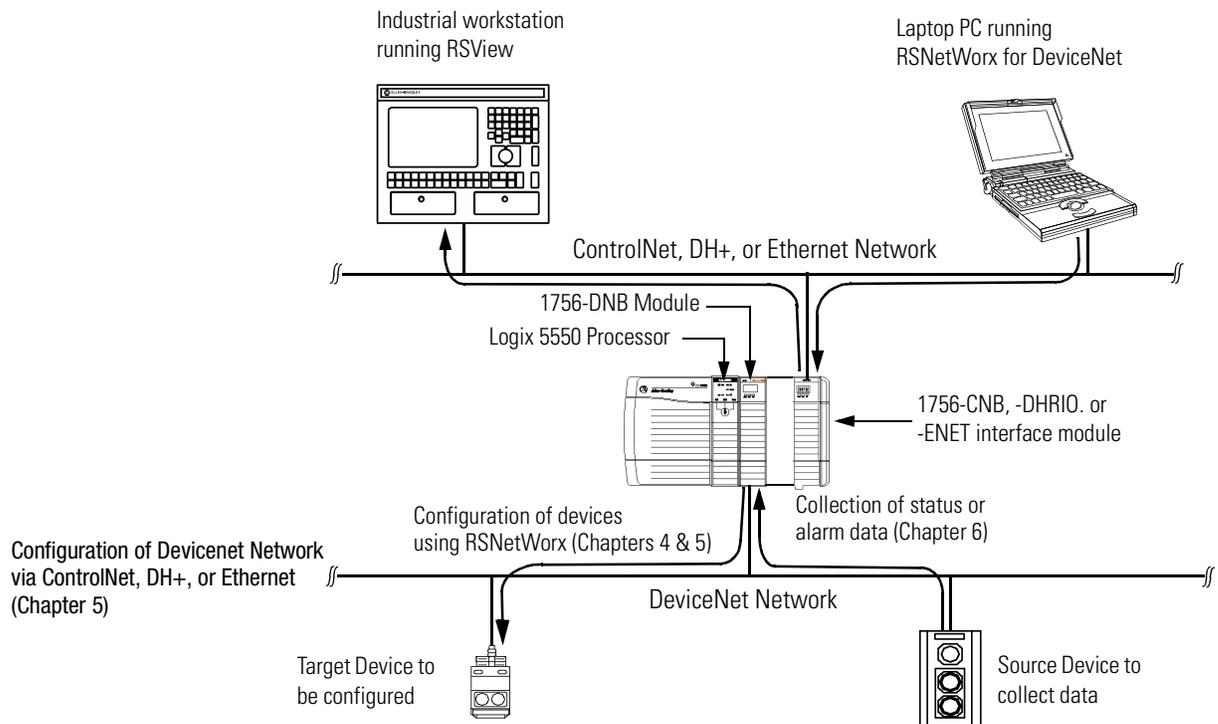
- device I/O data
- status information
- configuration data

A controller to I/O DeviceNet configuration is shown in the following figure. See the referenced chapters for information on a particular topic.



The 1756-DNB interface module can also be used to bridge a DeviceNet network with another network. See the referenced chapters for information on a particular topic.

Configuring Devices and Data Collection on Higher-Level Networks Via ControlLogix/DNB



Communicating with Your Devices

A strobe message is a multicast transfer of data (which is 64 bits in length) sent by the 1756-DNB module that solicits a response from each strobed slave device. There is one bit for each of the possible 64 node addresses. The devices respond with their data, which can be as much as 8 bytes.

A poll message is a point-to-point transfer of data (0-255 bytes) sent by the 1756-DNB module that solicits a response from a single device. The device responds with its input data (0-255 bytes).

A change of state message is a transfer of data sent whenever a data change occurs. A user-configurable heartbeat rate can also be set to allow devices to indicate proper operation during intervals between data changes. This does not solicit response data, but may receive an acknowledge message.

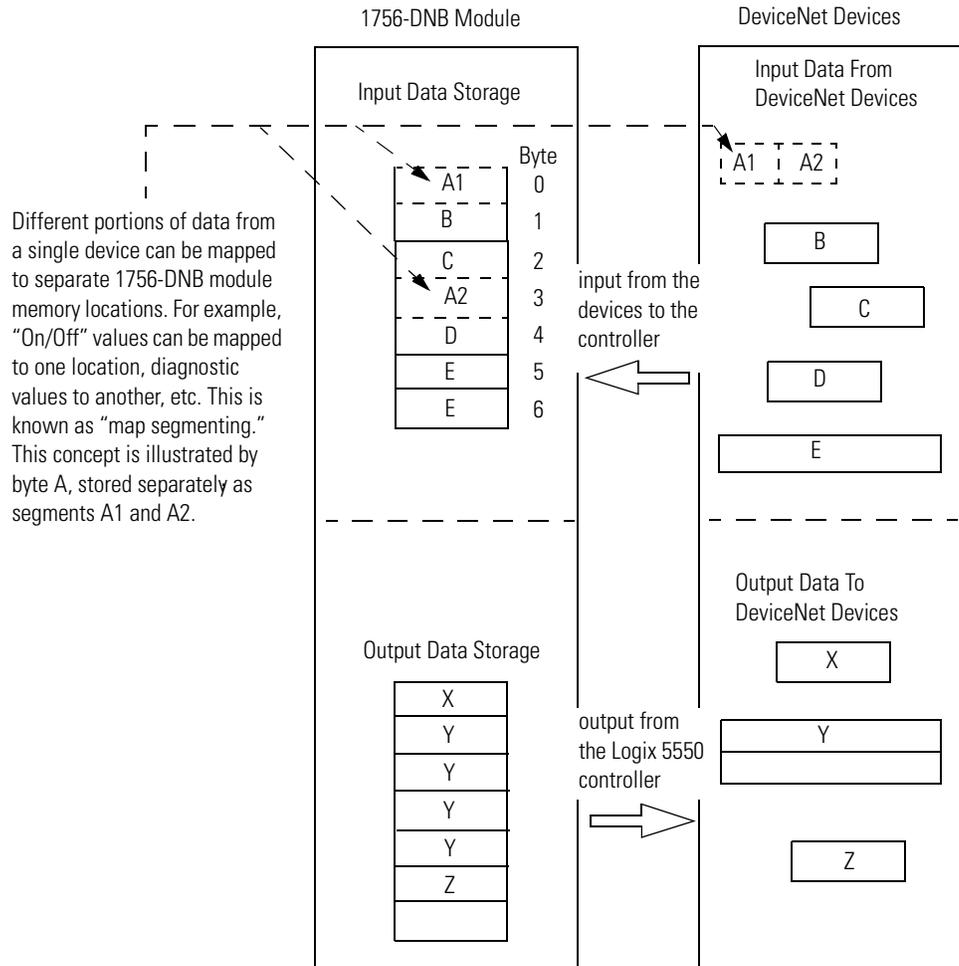
A cyclic message is sent only at a user-configurable rate, such as every 10 ms.

The 1756-DNB module communicates with a device via **strobe**, **poll**, **change of state**, and/or **cyclic** messages. It uses these messages to solicit data from or deliver data to each device. Data received from the devices, or input data, is organized by the 1756-DNB module and made available to the controller. Data received from your Logix5550 controller, or output data, is organized in the 1756-DNB module and sent on to your devices.

IMPORTANT

Throughout this document, *input* and *output* are defined from the Logix5550 controller's point of view. Output is data sent from the Logix5550 controller *to* a device. Input is data collected by the Logix5550 controller *from* a device.

All data sent and received on a DeviceNet network is in byte lengths. A device may, for example, produce only two bits of input information. Nevertheless, since the minimum data size on a DeviceNet network is one byte, two bits of information are included in the byte of data produced by the device. In this example (only two bits of input information), the upper six bits are insignificant.



What 1756-DNB Module Data Tables Are and What They Do

To manage the flow of data between your controller and the network devices, the 1756-DNB module uses the following data tables.

- 1756-DNB Module Configuration Table
- Scanlist Table
- Device Input Data Table
- Device Output Data Table
- Device Idle Table
- Device Failure Table

You can configure two of these data tables through RSNetWorx software. These two tables are stored in the 1756-DNB module's non-volatile memory and used to construct all other data tables:

- Scanner Configuration Table (SCT)
- Scanlist Table (SLT)

The Scanner Configuration Table (SCT)

The SCT controls basic information your 1756-DNB module needs to function on your DeviceNet network. It tells your 1756-DNB module:

- if it can transmit and receive input and output data
- how long it waits after each scan before it scans the devices again
- when to send out its poll messages

The Scanlist Table (SLT)

The SLT supports I/O updating for each of your devices on the network. It also makes it possible for your 1756-DNB module to make device data available to your controller. The SLT tells your 1756-DNB module:

- which device node addresses to scan
- how to scan each device (strobe, poll, change of state, cyclic or any valid combination)
- how often to scan your devices
- exactly where in each device’s total data to find the desired data
- the size of the input data/output data
- exactly where to map the input or output data for your controller to read or write

Interscan delay is the time between I/O scans (polled and strobed). It is the time the 1756-DNB module will wait between the last poll message request and the start of the next scan cycle.

Background poll ratio sets the frequency of poll messages to a device in relation to the number of I/O scans. For example, if the ratio is set at 10, that device will be polled once every 10 scans.

User-configured Tables	Data in this Table	RSNetWorx Configuration Screen
SCT	<ul style="list-style-type: none"> • basic operation • module parameters • interscan delay • background poll ratio 	1756-DNB Module Configuration
SLT	<ul style="list-style-type: none"> • device-specific identification data 	Scanlist Editor (SLE)
	<ul style="list-style-type: none"> • data transfer method • transmit/receive data size 	Edit Device I/O Parameters
	<ul style="list-style-type: none"> • input and output data source and destination locations 	These values can be configured automatically through the AutoMap function or manually through the Data Table Map.

RSNetWorx Software as a Configuration Tool

RSNetWorx for DeviceNet software is used to configure the 1756-DNB module’s data tables. This software tool connects to the 1756-DNB module over the DeviceNet network via a 1770-KFD interface module or PC Card (1784-PCID, -PCIDS, or -PCMCIA).

TIP

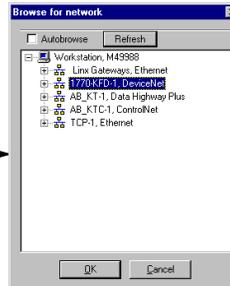
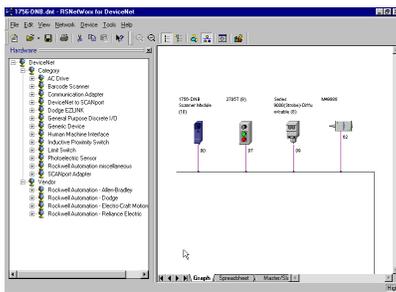


The 1756-DNB module can also be configured remotely from a ControlNet, Ethernet, or Data Highway Plus network. See chapter 5.

The configuration screen map below shows the RSNetWorx for DeviceNet screens used to configure the 1756-DNB module and the navigation paths between them. The use of these screens is described in Chapter 4.

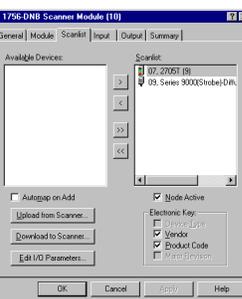
RSNetWorx for DeviceNet Configuration Screen Map

The main **RSNetWorx for DeviceNet** screen.



To browse the network, click on the Online button and select the driver.

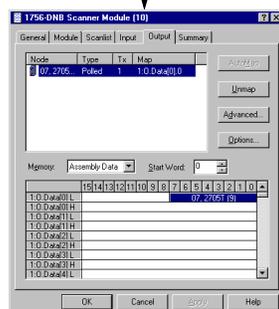
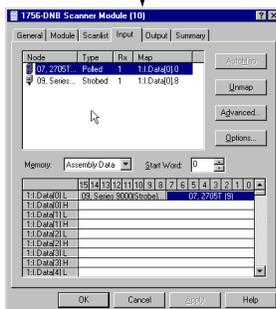
To access the 1756-DNB Interface Module, double-click on the 1756-DNB icon



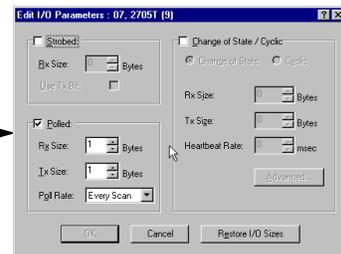
To access the scanlist, click on the Scanlist button

To automatically map input devices, select the Input tab and click on the AutoMap button

To automatically map output devices, select the Output tab and click on the AutoMap button.



To edit a device's I/O parameters, double-click on the device in the scanlist



What's Next?

The remaining sections of this manual provide the following information:

- Chapter 2 covers the configuration process planning stage through a data mapping example.
- Chapter 3 describes the hardware setup for the example application.
- Chapter 4 covers configuration of the DeviceNet network using RSNetWorx for DeviceNet software.
- Chapter 5 describes how to configure a DeviceNet network from another network.
- Chapter 6 describes how to create, download, and run the example application program.
- Chapter 7 covers the diagnostics provided for troubleshooting the 1756-DNB module.

Planning Your Configuration and Data Mapping Your Devices

This chapter introduces questions you should ask before configuring your 1756-DNB interface module. In addition, it presents an example DeviceNet network and I/O data mapping scheme for a photoeye and a RediSTATION operator interface. The following table identifies what this chapter covers and where to find specific information.

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RediSTATION Input Data Mapping Example	2-5
RediSTATION Output Data Mapping Example	2-6

What You Need to Know

To map data via your 1756-DNB interface module, you must understand:

- your network requirements
- how input data is mapped
- how output data is mapped

Beginning the Process

Planning before configuring your 1756-DNB module helps make sure that you can:

- use your memory and bandwidth efficiently
- cater to device-specific needs and requirements
- give priority to critical I/O transfers
- leave room for expansion

A very important question to answer is “what is on your network?” You should be familiar with each device’s:

- communication requirements
- I/O importance and size
- frequency of message delivery

You should also ask “how might this network appear in the future?” At this point in your planning, it is advantageous for you to have some idea of how the network could be expanded. I/O data mapping can be performed automatically by the RSNetWorx software. But when mapping your I/O, you also have the opportunity to allot room for future I/O. This can save time and effort in the future.

For example, RSNetWorx will automatically map the devices as efficiently as possible, but the result is that multiple devices may share the same word location in memory. However, you can also have the system map the devices such that no two devices share the same memory location by selecting the “Dword align” option when performing automapping. You can manually map the devices if you need to assign them to specific memory locations.

For details refer to the Help screens provided by the RSNetWorx for DeviceNet software. Additional support can be found at the Rockwell Software website: <http://www.software.rockwell.com>.

The Example Network

The following example illustrates a data mapping plan for a DeviceNet network. Note that even if the mapping is performed automatically by the RSNetWorx software, you must know where the devices are mapped in order to use them in your application.

Example Network Devices

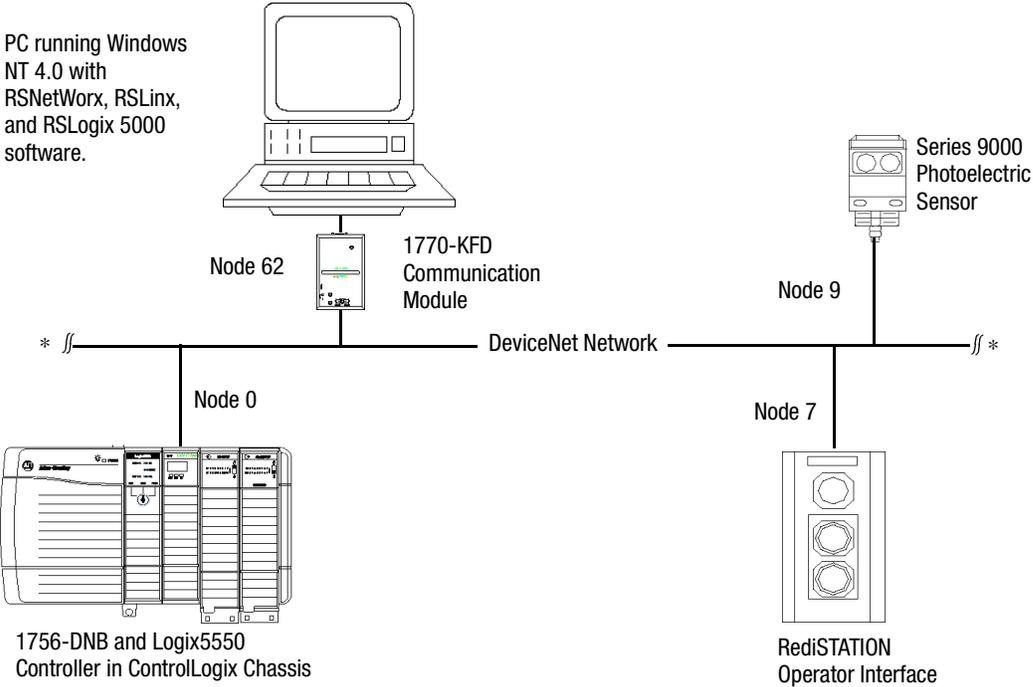
This example network has the following devices:

- a Windows NT 4.0 PC running RSNetWorx for DeviceNet, RSLinx, and RSLogix 5000 software
- a 1756-DNB communication module interfacing a Logix5550 controller with DeviceNet
- a Series 9000 photoelectric sensor (strobed)
- a RediSTATION operator interface (polled)

IMPORTANT

In the following example, output is data sent *to* a device from a controller. Input is data collected *from* a device by a controller.

The system you will set up is shown below:



* See note below

IMPORTANT

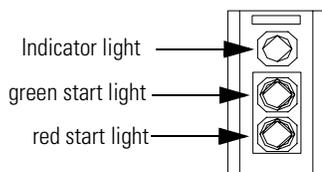
Each end of the DeviceNet trunk cable must be properly terminated with a resistor. Refer to the DeviceNet Cable Planning and Installation Manual, publication DN-6.7.2 for information.

RediSTATION Operator Interface Data Mapping

The RediSTATION has both inputs and outputs that must be mapped. The input byte is mapped to the 1756-DNB module's input data file and then to the Logix5550 controller's input image table. The output byte is mapped to the 1756-DNB module's output data file and then to the Logix5550 controller's output image table.

The mapping procedure, using RSNetWorx for DeviceNet software, is described on pages 4-15 to 4-18.

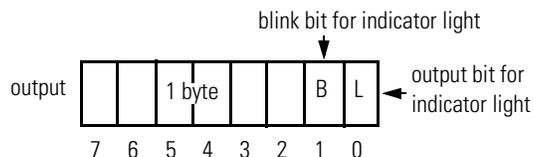
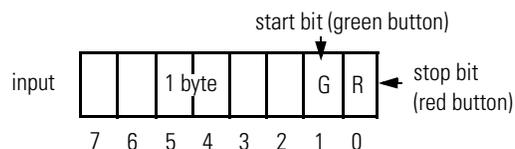
RediSTATION operator interface



Two input bits from the RediSTATION will be mapped: bit 1 for the green **Start** button and bit 0 for the red **Stop** button.

Bit 4 of the input byte can be commanded on by the Logix 5550's ladder logic if the indicator light bulb is burnt out or missing.

The RediSTATION operator interface produces one byte of input data and uses one byte of output data.



One output bit for the RediSTATION's indicator light (on/off) will be mapped.

In the RediSTATION's bits for the red and green buttons and the indicator light status bit:

- 1 = ON
- 0 = OFF

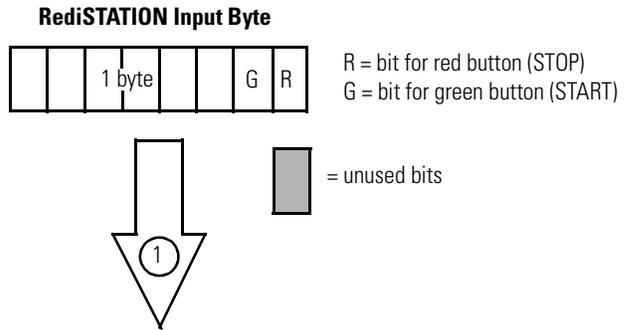
RediSTATION Input Data Mapping Example

The following is an example of input data mapping for the RediSTATION.

What's Happening?

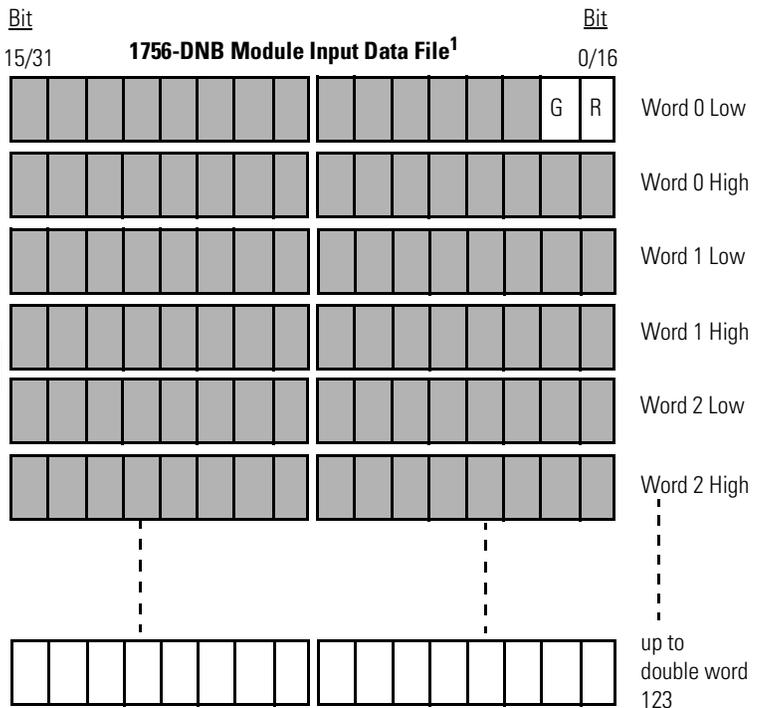
- 1 The bits for the RediSTATION operator interface's red and green buttons are mapped into the 1756-DNB module's input data file.
- 2 The data file is then transferred to the controller's input image table.

Important: The 1756-DNB module only makes the data file available for the Logix5550 controller to read. The 1756-DNB module does not move the data file to the controller.



Logix5550 Controller Input Image Table¹

Address	Data
Word 0,L	0000 0000 0000 00GR
Word 0,H	0000 0000 0000 0000
Word 1,L	0000 0000 0000 0000
Word 1,H	0000 0000 0000 0000
Word 2,L	0000 0000 0000 0000
Word 2,H	0000 0000 0000 0000



Example: The green START button from the RediSTATION appears in the Logix5550 controller's input image table in double word 0, bit 1.
The red STOP button from the RediSTATION appears in the Logix5550 controller's input image table in double word 1, bit 0.

¹ This mapping is based upon the example in chapter 4. The actual mapping for your system may be different.

RediSTATION Output Data Mapping Example

The RediSTATION's output is mapped to the 1756-DNB module's output data file. Within the output byte is a bit for the indicator light. The output data file is then transferred from the Logix5550 controller application to turn the light on or off.

What's Happening?

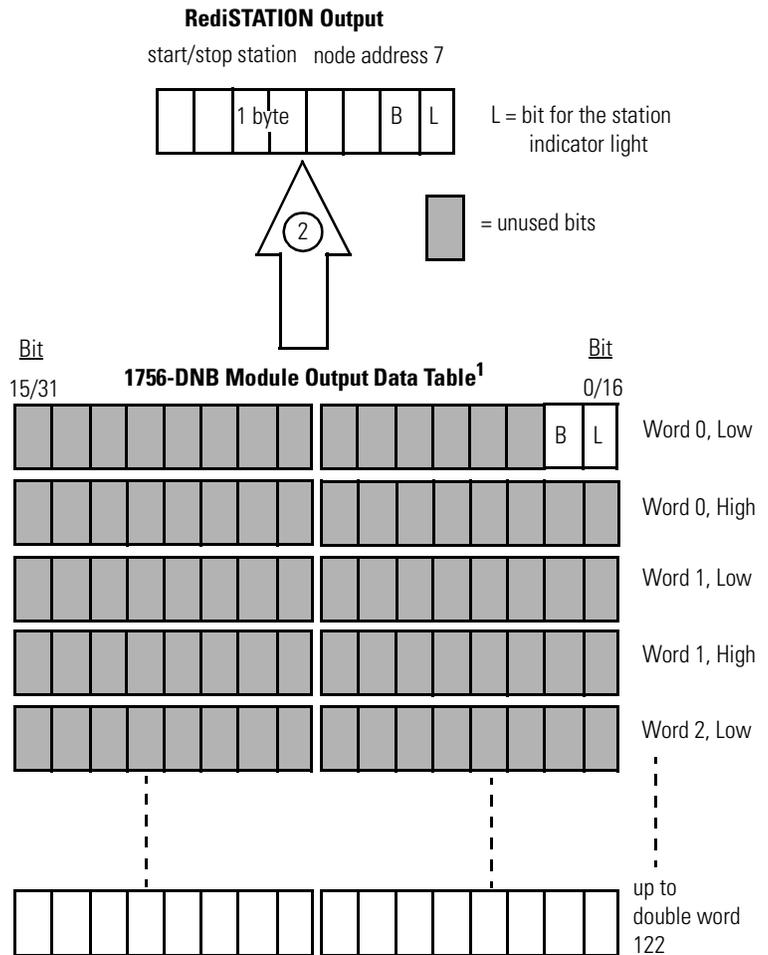
- 1 The indicator-light bit for the RediSTATION operator interface is mapped to the 1756-DNB module's output data file.
- 2 The output data file is then sent out to the RediSTATION via a poll message from which the RediSTATION receives its indicator light bit.

Logix5550 Controller Output Image Table¹

Address	Data
Word 0,L	0000 0000 0000 00BL
Word 0,H	0000 0000 0000 0000
Word 1,L	0000 0000 0000 0000
Word 1,H	0000 0000 0000 0000
Word 2,L	0000 0000 0000 0000

Example: The RediSTATION's indicator light (L) is taken from double word 0, bit 0, in the 1756-DNB Output Image Table.

¹This mapping is based upon the example in chapter 4. The actual mapping for your system may be different.

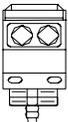


Photoeye Input Data Mapping

The photoelectric sensor (photoeye) inputs are mapped to the 1756-DNB module's input data file and then to the Logix5550 controller's input image table. The procedure for doing this using RSNetWorx for DeviceNet software is described on pages 4-15 to 4-17.

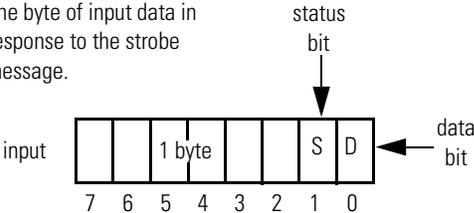
The photoeye has no outputs to map.

Series 9000 Photoeye



Two input bits from the photoeye will be mapped: the status bit and the data bit.

The photoeye produces one byte of input data in response to the strobe message.

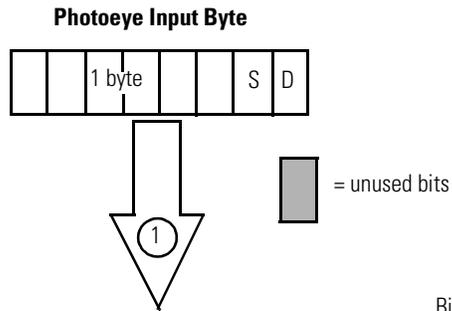


Photoeye Input Data Mapping Example

What's Happening?

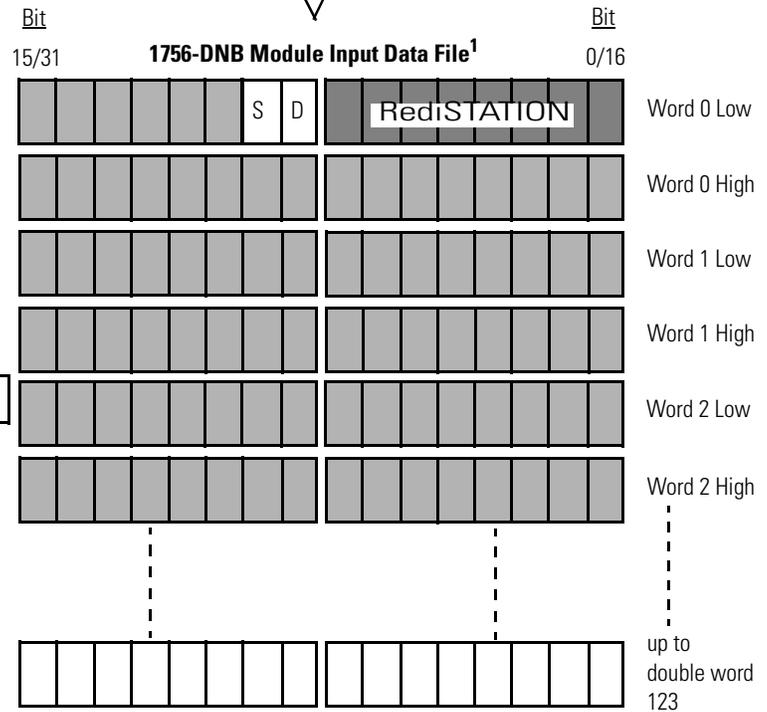
- 1 The status and data bits from each photoelectric sensor are mapped into the 1756-DNB module's input data file.
- 2 The input data file is then transferred to the Logix5550 controller's input image table.

Important: The 1756-DNB module only makes the data available for the controller to read. The 1756-DNB module does not move the data to the controller.



Logix5550 Controller Input Image Table¹

Address	Data
Word 0,L	0000 00SD 0000 0000
Word 0,H	0000 0000 0000 0000
Word 1,L	0000 0000 0000 0000
Word 1,H	0000 0000 0000 0000
Word 2,L	0000 0000 0000 0000
Word 2,H	0000 0000 0000 0000



¹ This mapping is based upon the example in chapter 4. The actual mapping for your system may be different.

What's Next?

Chapter 3 describes how to set up the system hardware for the example application.

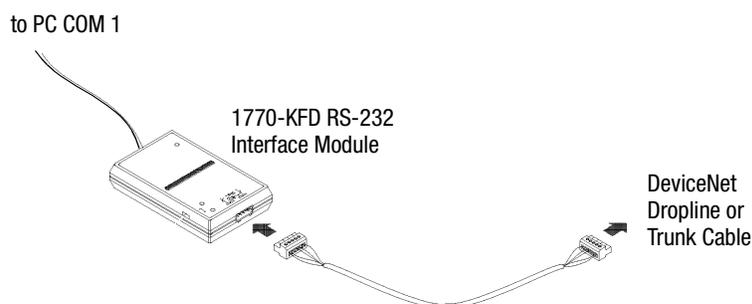
Hardware Setup

What This Chapter Contains This chapter describes how to set up the hardware for the example application. The following table describes what this chapter contains and where to find specific information.

For information about	See page
Installing the 1770-KFD Communication Module	3-1
Installing the Logix5550 Controller	3-2
Installing the 1756-DNB Interface Module	3-2
Installing a ControlNet, Ethernet, or DH+ Interface Module	3-3
Installing the RediSTATION Operator Interface	3-5
Installing the Series 9000 Photoeye	3-6
How Your Example System Will Look	3-7

Installing the 1770-KFD Communication Module

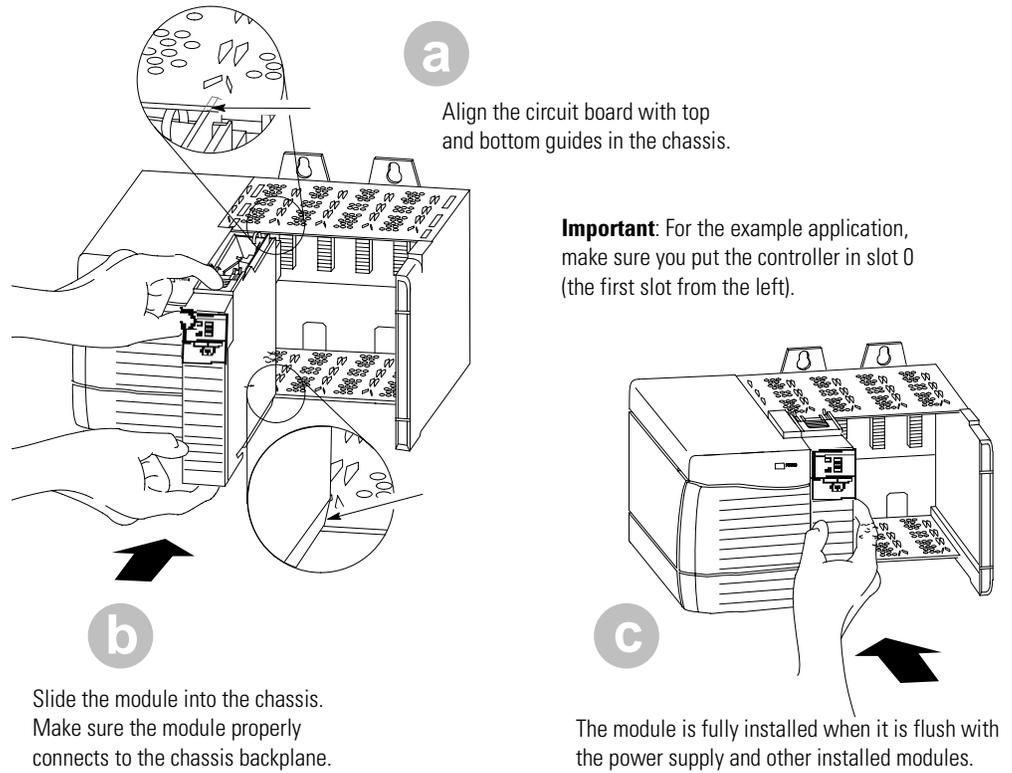
Connect the RS-232 connector on the 1770-KFD interface module to one of the serial ports on your PC workstation (e.g., COM1). Connect the DeviceNet connector on the 1770-KFD module to a DeviceNet dropline or trunk cable. You can make the connection to the network in several ways; for example, using a DeviceNet Quad Tap (part no. 1492-DN3TW) as shown on page 3-7.



For detailed directions on how to install the 1770-KFD interface module, see the DeviceNet RS-232 Interface Module Installation Instructions, publication 1770-5.6.

Installing the Logix5550 Controller

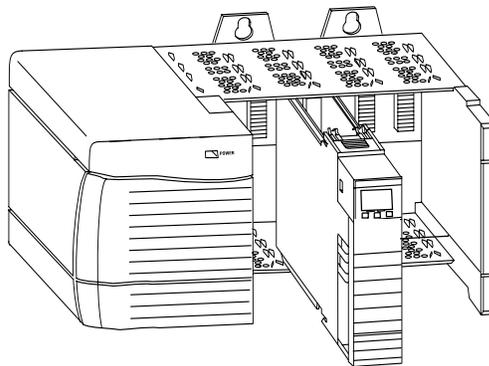
Refer to the following illustration as you install the Logix5550 controller in the ControlLogix chassis.



For detailed directions on how to install the controller, see the Logix5550 Controller User Manual, publication 1756-6.5.12.

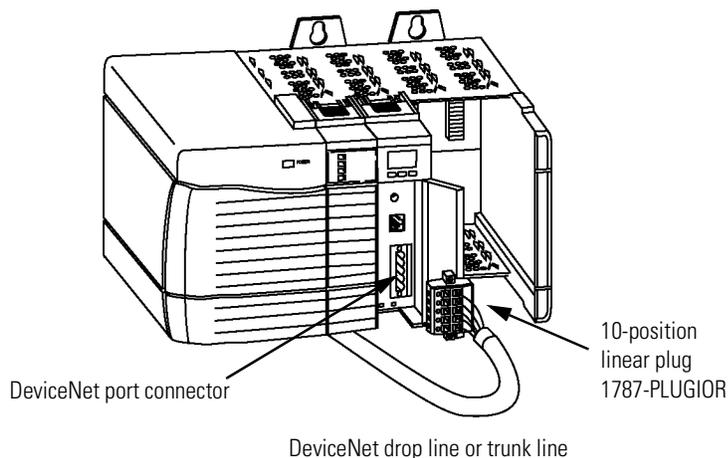
Installing the 1756-DNB Interface Module

For the example application, insert the 1756-DNB module into slot 1 (the second slot from the left).



41595

Refer to the following illustration as you connect the 1756-DNB module to the network.



For additional information about how to connect the 1756-DNB module to the network, see the ControlLogix DeviceNet Scanner Module Installation Instructions, publication 1756-5.66.

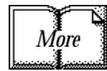
Installing a ControlNet, Ethernet, or DH+ Interface Module

You cannot go online to the Logix5550 controller over the DeviceNet network. In order to download the example application program in chapter 6 you must use the controller's RS-232 connector, or download over another network. Chapter 6 provides examples of downloading over ControlNet, Ethernet, and Data Highway Plus networks.

To download over one of these networks you must have that network configured and running and one of the following interface modules installed in the ControlLogix chassis with the controller.

For this network	Install this module
ControlNet	1756-CNB
Data Highway Plus	1756-DHRIO
Ethernet	1756-ENET

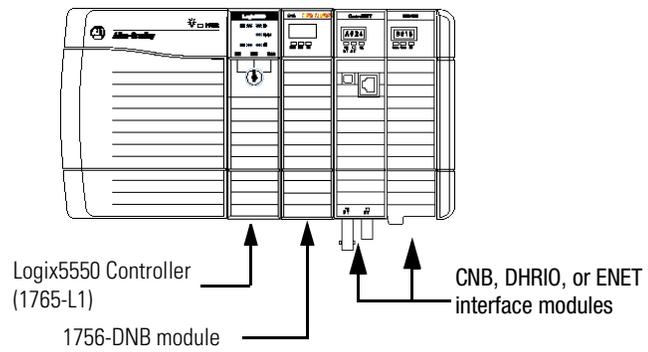
Install the module in any open slot in the ControlLogix chassis in the same way that you installed the controller and 1756-DNB module. Then connect the module to the appropriate network.



Refer to the following publications for more information on installing these modules:

Publication	Publication Number
ControlLogix ControlNet Bridge Installation Instructions	1756-5.32
ControlLogix DHRIO Module Installation Instructions	1756-5.4
ControlLogix Ethernet Module Installation Instructions	1756-5.3

When you have completed installation, your ControlLogix chassis should resemble the following illustration:



Installing the RediSTATION Operator Interface

Begin installing the RediSTATION by removing the six screws fastening the cover and setting the DIP switches inside as follows:

Set this position	To this value:	
1	1	On
2	1	On
3	1	On (node
4	0	Off address ¹)
5	0	Off
6	0	Off
7	0	Off (data
8	1	On rate ²)
9	0	Off
10	0	Off

¹The DeviceNet address is 000111 (node 7).

²The data rate is 10 (500k bps).

The output fault rate is 0 (outputs turned off).

The output flash rate is 0 (outputs tuned off).



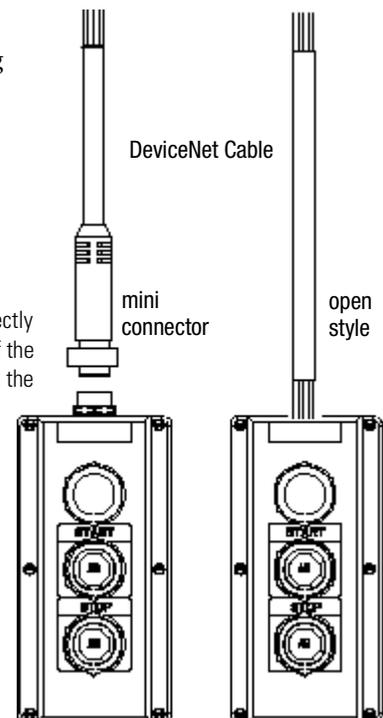
See Chapter 2 of the RediSTATION Operator Interface User Manual, publication 2705-804, for complete information about setting the DIP switches to configure the node address, data rate, output flash rate, and output fault state.

Refer to the following illustration as you connect the RediSTATION to the network.

TIP

You do not need to disconnect incoming power from the DeviceNet network before connecting the RediSTATION.

The DeviceNet cable connects directly to the mini connector on the top of the RediSTATION enclosure or through the conduit opening (open style).

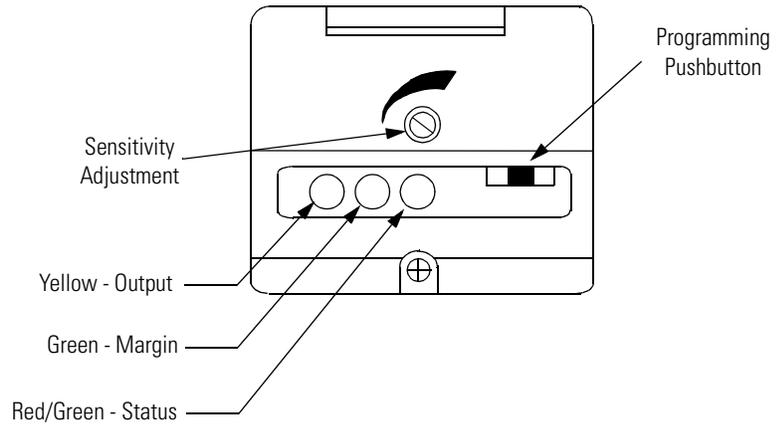


Installing the Series 9000 Photoeye

Connect the photoeye to the network and configure the photoeye as follows:

- Node Address: 9
- Operating Mode: Light Operate (default)
- Baud Rate: 500 kb

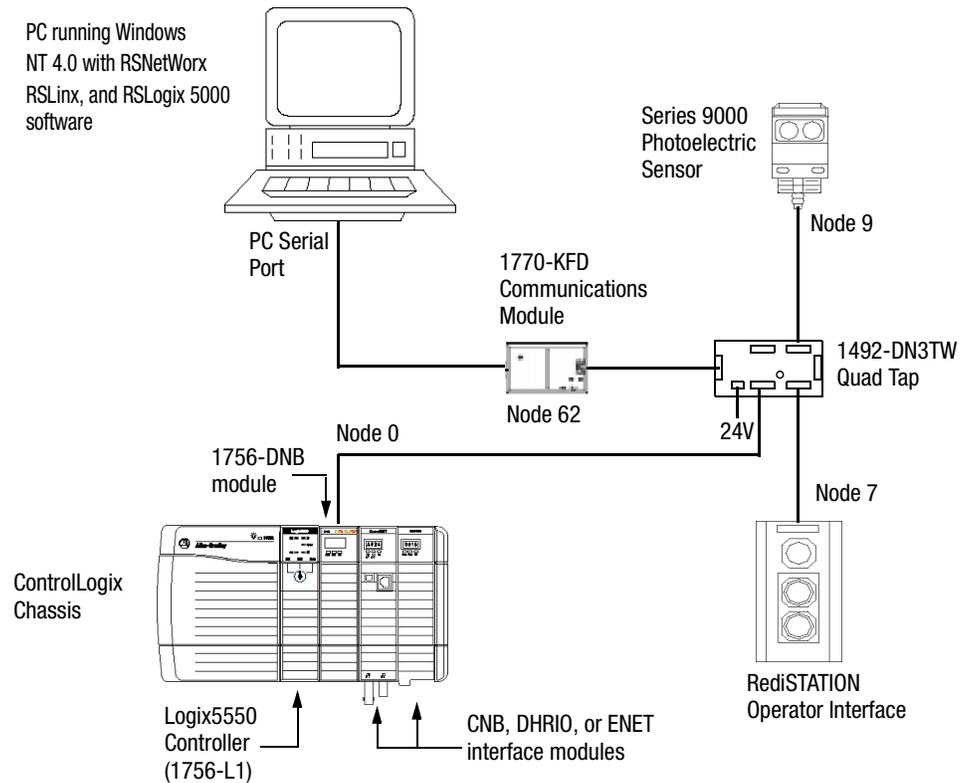
Top View of Series 9000 Photoeye



For detailed directions, see the instructions that came with your photoeye.

How Your Example System Will Look

When you have finished installing all the devices, your example system should appear similar to the one shown below.



IMPORTANT

Make sure each end of your DeviceNet trunk cable is properly terminated with a resistor. Refer to the DeviceNet Cable Planning and Installation Manual, publication DN-6.7.2 for information.

What's Next?

The next step is to configure the 1756-DNB module and perform I/O data mapping using RSNetWorx for DeviceNet software.

Configuring the DeviceNet Network

What This Chapter Contains This chapter describes how to configure the DeviceNet network using RSLinx and RSNetWorx for DeviceNet software. The following table describes what this chapter contains and where to find specific information.

For information about	See page
Installing the Software	4-1
Using RSLinx to Configure the DeviceNet Driver	4-2
Using RSNetWorx to Configure the 1756-DNB Module Scanlist	4-4
Setting Up an Online Connection	4-4
Setting the 1756-DNB Node Address	4-6
Configuring the Scanlist	4-9
Verifying the RediSTATION Configuration	4-14
AutoMapping the Devices into the Scanlist	4-15
Saving the DeviceNet Configuration	4-18

Installing the Software

For both the **RSLinx** and **RSNetWorx** software.

1. Insert the installation CD in the CD-ROM drive.

Note: The CD-ROM supports Windows Autorun. Once inserted into the CD-ROM drive, if you have Autorun configured, the installation will automatically start at the first setup screen.

If Autorun is not configured for your CD-ROM drive, go to step 2.

2. From the **Start** menu, choose Run.

You will see the Run pop-up window.

3. Type **d:/setup** (if it doesn't appear automatically), where **d:** is your CD-ROM driver letter.

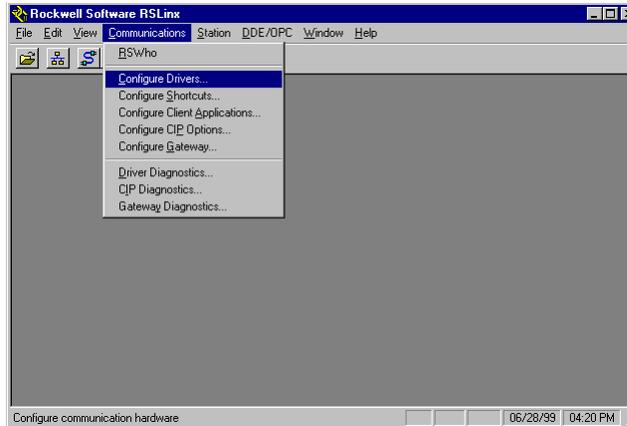
4. Click on **OK**.

You will see the progress bar, followed by the welcome screen.

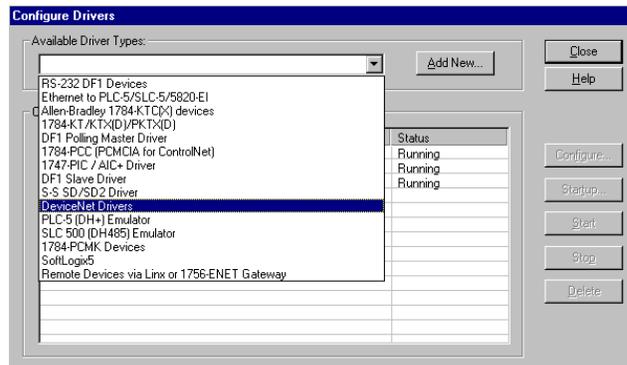
Using RSLinx to Configure the DeviceNet Driver

After you install the software, you use RSLinx to configure your DeviceNet driver and RSNetWorx for DeviceNet to configure the network.

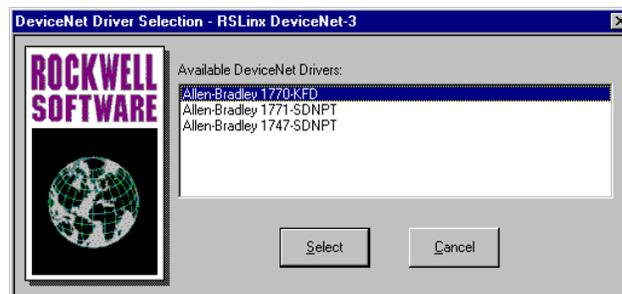
1. Start **RSLinx**. The RSLinx main window will appear.



2. From the **Communications** menu, select **Configure Drivers**. The following window will appear.



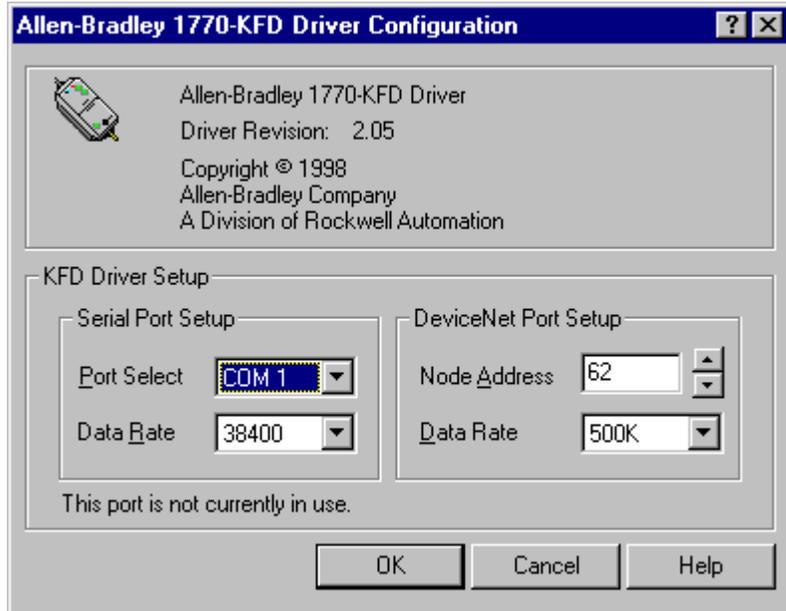
3. Select **DeviceNet Drivers** from the above pull-down list and click on **Add/New**. You will see the following choices.



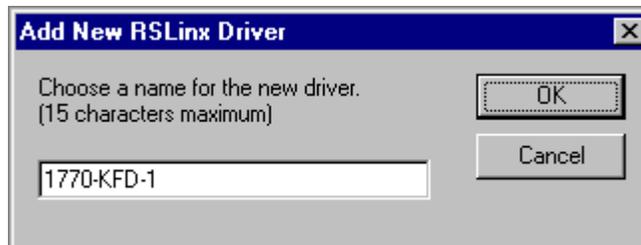
4. Select the **Allen-Bradley 1770-KFD** driver.

The 1770-KFD Driver Configuration window will appear.

Your driver setup will vary according to your particular system setup (COM port, Data Rate, Node Address). Choose the appropriate settings for your system. We set the Serial Port Setup Data Rate to 500K for the example application.



5. Configure the driver using the example above as a guide and click on **OK**. The software will take a few seconds to configure the driver. When it is done the following prompt will appear:



6. Select the default driver name **1770-KFD-1** and click on **OK**.
7. Close RSLinx.

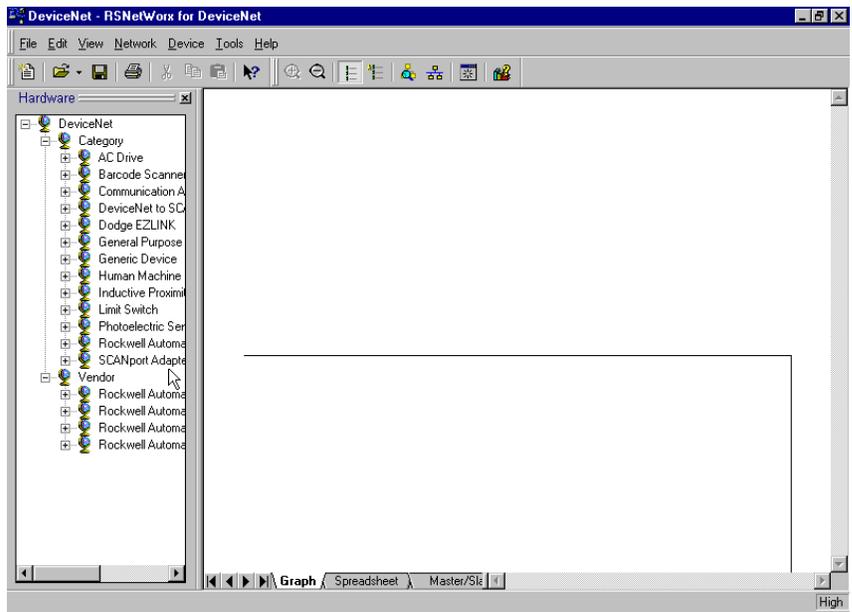
You will use the driver you just configured to browse and configure the network with RSNetWorx for DeviceNet.

Using RSNetWorx to Configure the 1756-DNB Module Scanlist

Setting Up an Online Connection

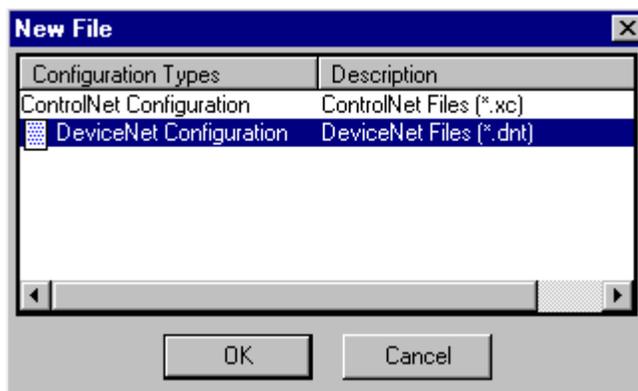
Follow the procedure below to set up the DeviceNet network using the 1770-KFD driver.

1. Start **RSNetWorx**.



2. From the **File** menu, select **New**.

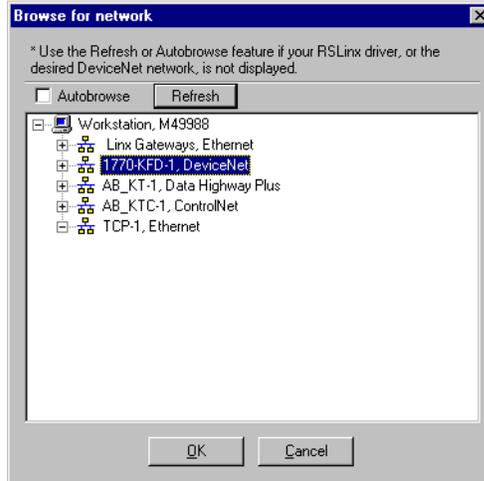
If you have RSNetWorx for ControlNet installed on your computer you may see the following window. Otherwise, proceed to step 4.



3. Highlight **DeviceNet Configuration** and click on **OK**.

4. Click on the **Online** button  on the toolbar.

A list of the available drivers in RSLinx will appear. (Your list may appear different from that shown below, depending upon the drivers you have installed on your system.)



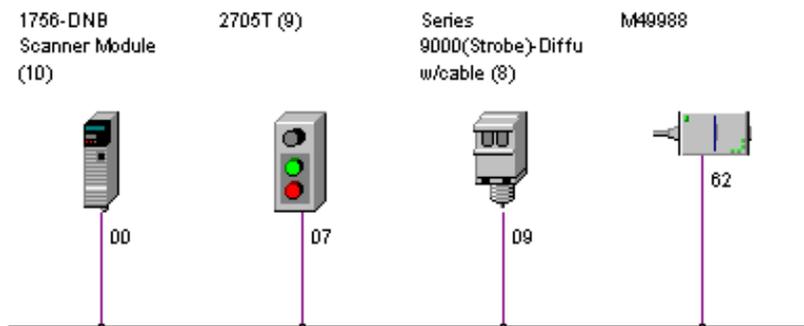
5. Select the **1770-KFD-1, DeviceNet** driver and click on **OK**.

You will be prompted to upload or download devices before going online.



6. Click on **OK** to go online and upload the network.

RSNetWorx for DeviceNet will begin browsing for network devices. When the software is finished browsing, the network displayed on your screen should look similar to the one shown below.



TIP



RSNetWorx for DeviceNet performs a one-shot browse when you go online or choose the browse feature. The software will poll for devices once and display the results. If a node which was online later goes offline, there will be no “live” indication in RSNetWorx. You must manually perform a browse to detect the missing node.

To perform a manual browse, press the  button.

Setting the 1756-DNB Node Address

Once the devices are uploaded, their node addresses appear below their icons. For the example application, the 1756-DNB interface module should have a node address of 0 (or 00). If you need to change the module’s node address, use the following procedure.

TIP



You can use this procedure to change the node address of other devices on the network (e.g., the Photoeye). You can also change the network data rate (baud rate) of some devices. Power must be recycled for baud rate changes to take effect.

If "00" appears to the right of the 1756-DNB icon and you do not need to change the node address of any other device, skip the remainder of this section and go to “Configuring the Scanlist” on page 4-9.

IMPORTANT

The network must not be active when performing node commissioning on the 1756-DNB module. Make sure the controller is in Program mode.

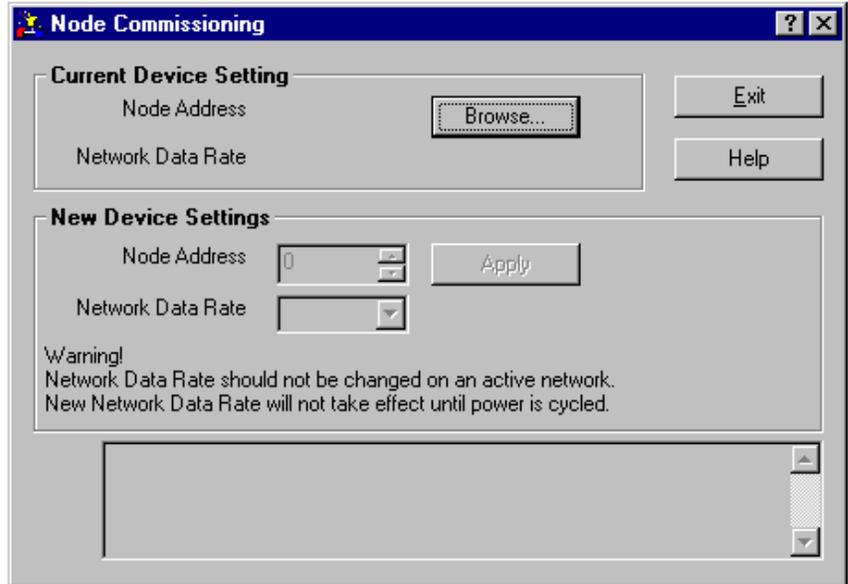
(Note that this applies only to the 1756-DNB. You may commission other devices with the controller in Run mode.)

To change the node address of a device perform the following steps:

1. From the **Tools menu select **Node Commissioning**.**

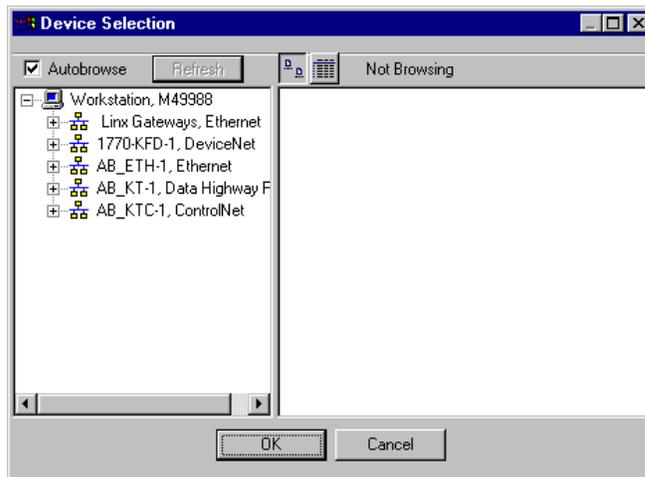
You will see the **Node Commissioning** window.

Note: You can also use the **Manual Configuration** button on the front of the 1756-DNB module to change its node address and data rate. See the ControlLogix DeviceNet Scanner Module Installation Instructions for more information.



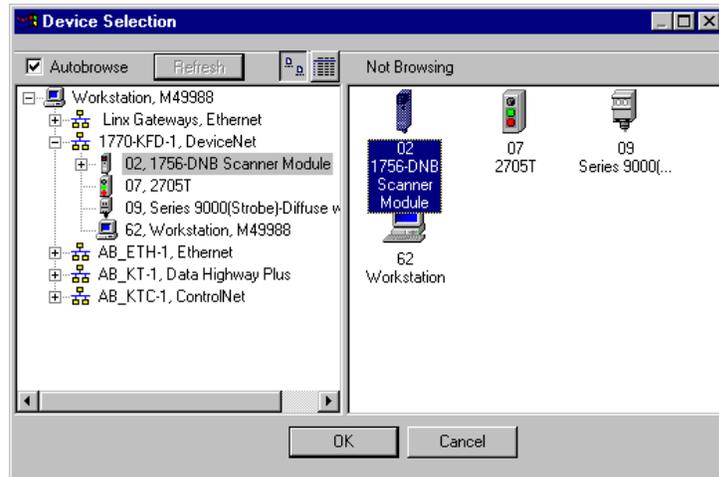
2. Click on the **Browse button.**

You will see the **Device Selection** window.



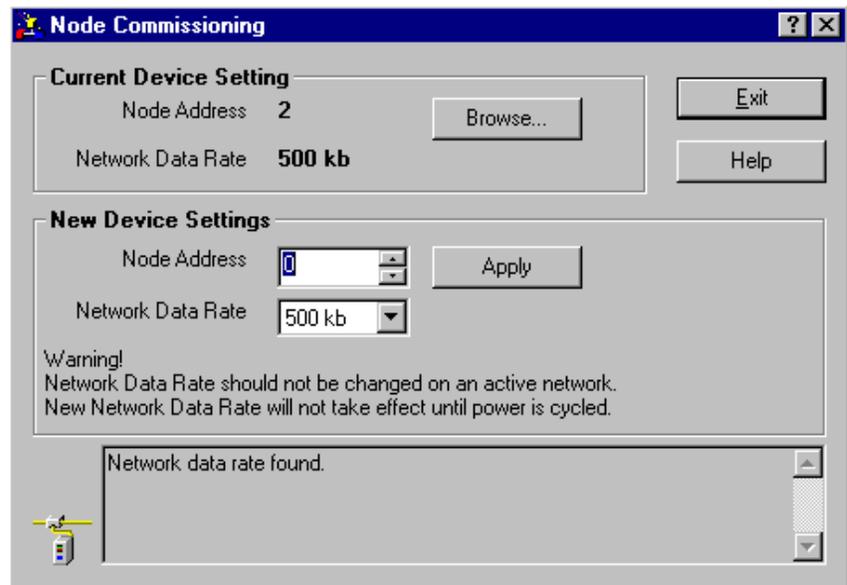
3. Select the 1770-KFD driver (1770-KFD-1 above).

The devices on the network will appear in the right panel.



4. Select the device from the right panel.
5. Click on **OK**.

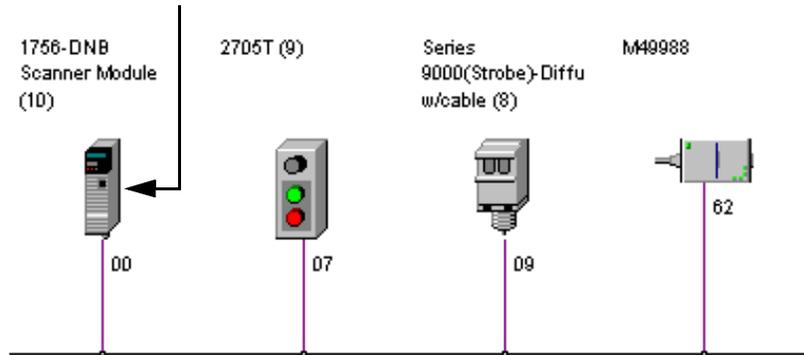
You will see the **Node Commissioning** window with the current settings for the device. Your window will look similar to the one shown below.



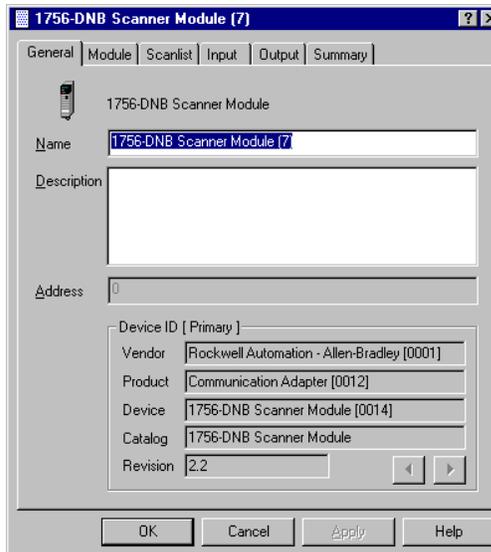
6. In the **New Device Settings: Node Address** box, enter the new node address (e.g., a 0 as shown above).
7. Click on **Apply**.
8. Click on **Exit** to close the window.

Configuring the Scanlist

1. Double-click on the **1756-DNB** module icon.



The following window will appear:



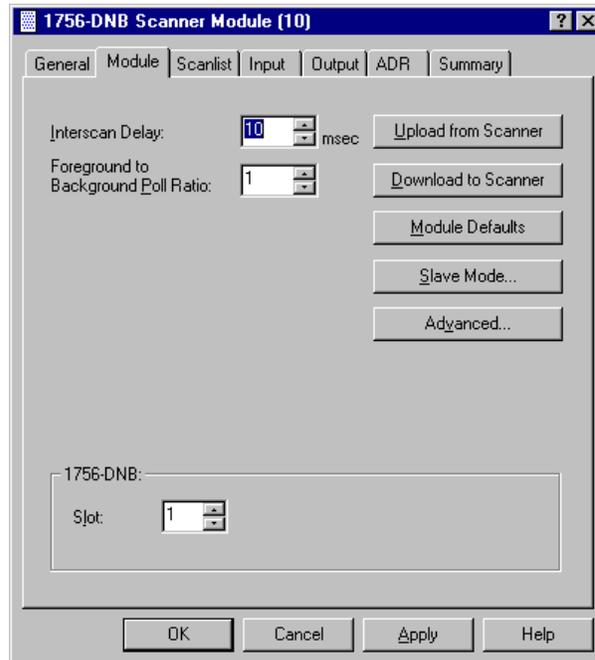
2. Select the **Module** tab.

You will be prompted to upload or download the configuration.



3. Click on **Upload**.

After uploading the following window will appear:



4. Make sure the 1756-DNB module's **Slot** number is correct. We used Slot 1 for the example application.

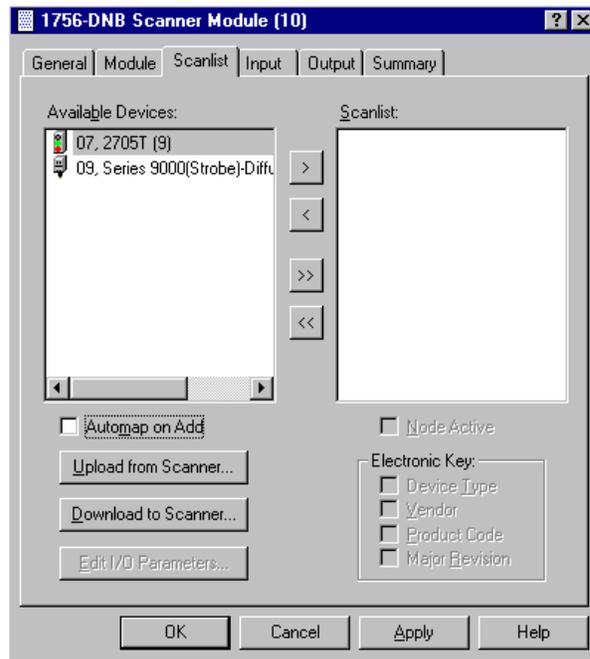
TIP



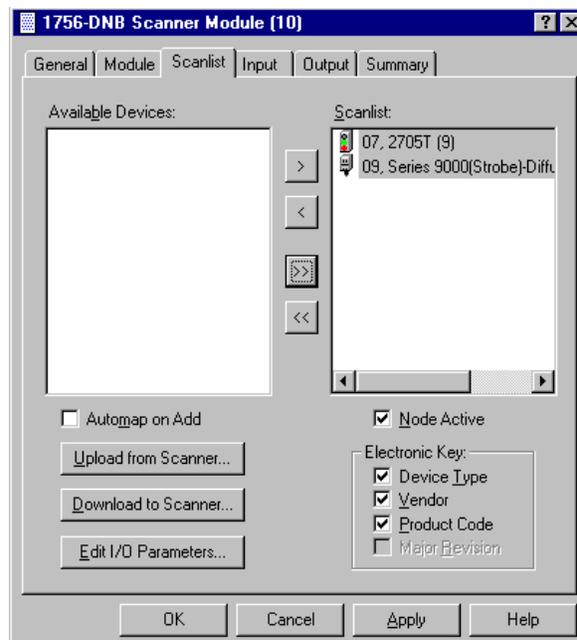
We used the Module Defaults for the other parameters. For an explanation of these parameters click on the **Help** button.

5. Select the **Scanlist** tab.

You will see **Scanlist** window with the RediSTATION and photoeye in the list of **Available Devices**.



6. For this example, uncheck the **Automap on Add** box, as shown above. You will do the mapping later.
7. Click on the double arrow  button to add the photoeye and RediSTATION to the Scanlist. The photoeye and the RediSTATION will then appear in the Scanlist on the right side of the window.



8. Click on **OK**.

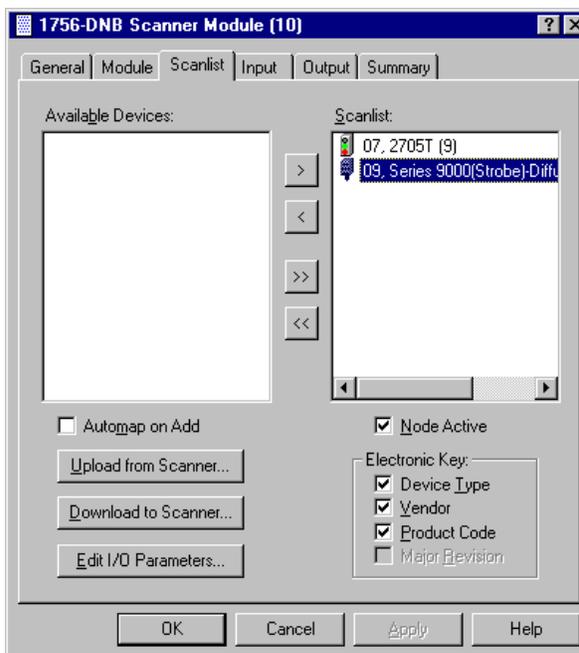
You will be prompted to download the changes to the device (i.e., the scanner).



9. Click on **Yes**.

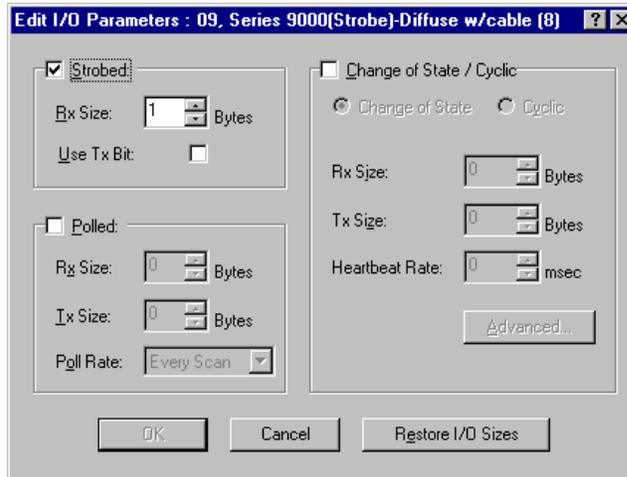
Verifying the Photoeye Configuration

1. Double-click on the **1756-DNB** module icon and again select the **Scanlist** tab.



2. Double-click on the **photoeye** in the Scanlist.

The **Edit I/O Parameters** window will appear for the photoeye.

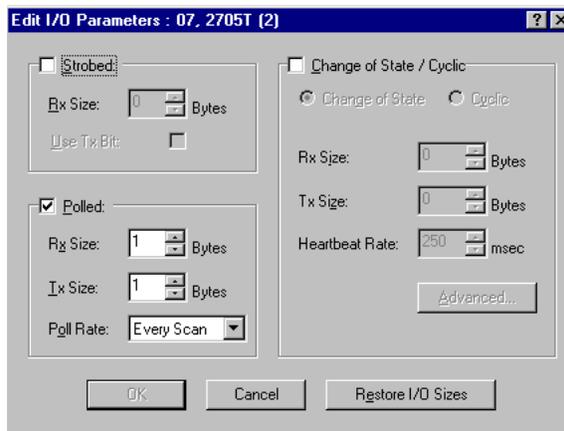


The I/O parameters define the configuration for the device in terms of how much and what data the device will exchange with the 1756-DNB module. By default, the photoeye will send 1 byte when it receives the strobe request. Recall from chapter 3 that the output of the photoeye will be returned in bit 0 of this byte.

3. Verify that the photoeye parameters are set as shown above.
4. Make any changes as necessary and click on **OK**.
5. Close the **Edit I/O Parameters** window for the photoeye.

Verifying the RediSTATION Configuration

1. Double-click on the **RediSTATION** in the Scanlist window. The **Edit I/O Parameters** window will appear for the RediSTATION.



2. Make sure that the **Polled** box is checked and that the **Rx Size** and **Tx Size** are each 1 byte.
3. Make any changes as necessary and click on **OK**.
4. Close the **Edit I/O Parameters** window for the RediSTATION.

AutoMapping the Devices into the Scanlist

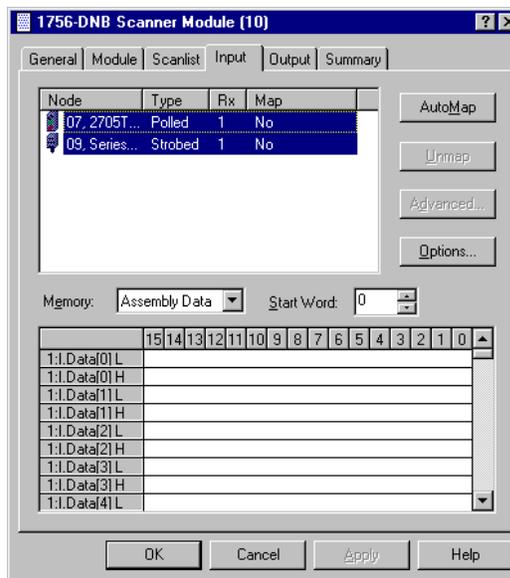
Follow the procedure below to automatically map the photoeye and RediSTATION to the Logix5550 controller.

TIP



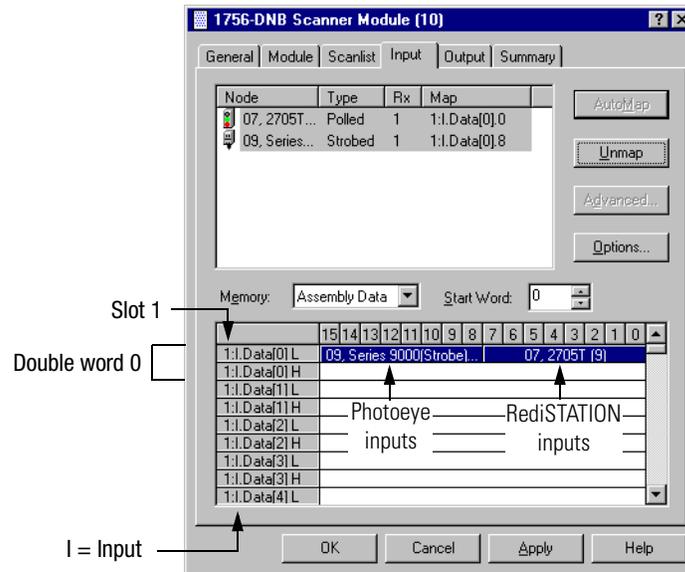
If you want to know how to map the devices manually, click on the **Help** button at the bottom of the screen and select "Map device input data manually".

1. Select the **Input** tab.



2. Highlight the RediSTATION and the photoeye as shown above and click on the **AutoMap** button.

The resulting device mapping will appear in the lower panel:



In chapter 3 the 1756-DNB module was installed in slot 1 in the ControlLogix chassis. In this example the inputs from the RediSTATION are mapped to double word 0 for slot 1 as bits 0-7 of the low word (L). Recall from chapter 2 that the START button is bit 1 and the STOP button is bit 0. Therefore, the addresses for the RediSTATION inputs are:

START Local:1:I.Data[0].1
 STOP Local:1:I.Data[0].0

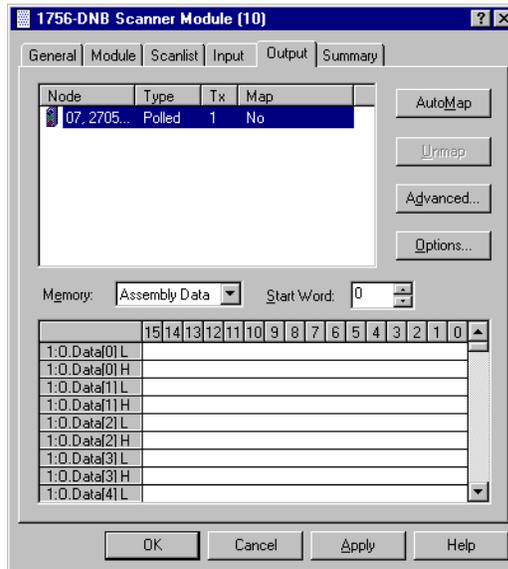
The input from the photoeye is mapped to double word 0 for slot 1 as bits 8-15 of the low word. Recall from chapter 3 that the input bit is bit 0. Therefore, the address of the photoeye input is:

Local:1:I.Data[0].8

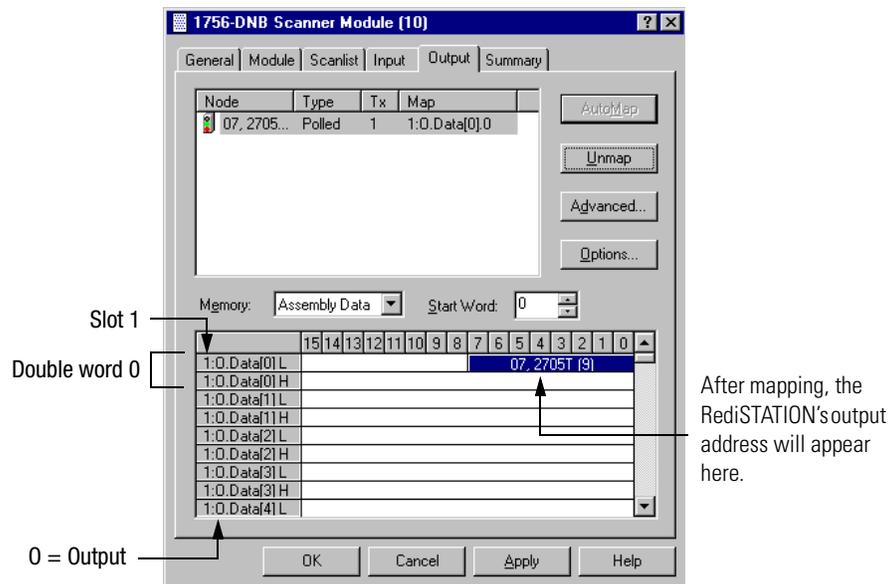
3. Note the addresses assigned to the START and STOP buttons and the photoeye in your system. You will use these addresses in the example application program.

4. Select the **Output** tab.

You will see the following window:



- Highlight the RediSTATION and click on the **AutoMap** button. The output mapping of the RediSTATION will appear in the lower panel of the window.



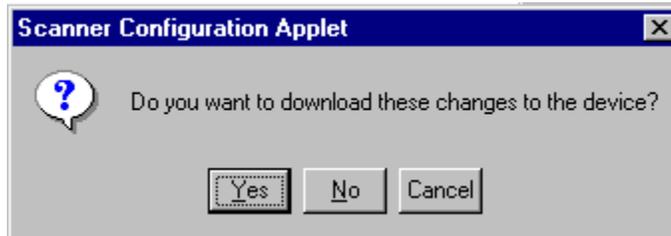
In this example, the output to the RediSTATION is mapped to double word 0 for slot 1 as the lower byte (bits 0-7) of the low word. Recall from chapter 2 that the indicator light is output bit 0. Therefore, the address for the RediSTATION indicator light is:

Local:1:O.Data[0].0

- Note the address assigned to this output in your system.** You will use this address in the example application program.

7. Click on **OK**.

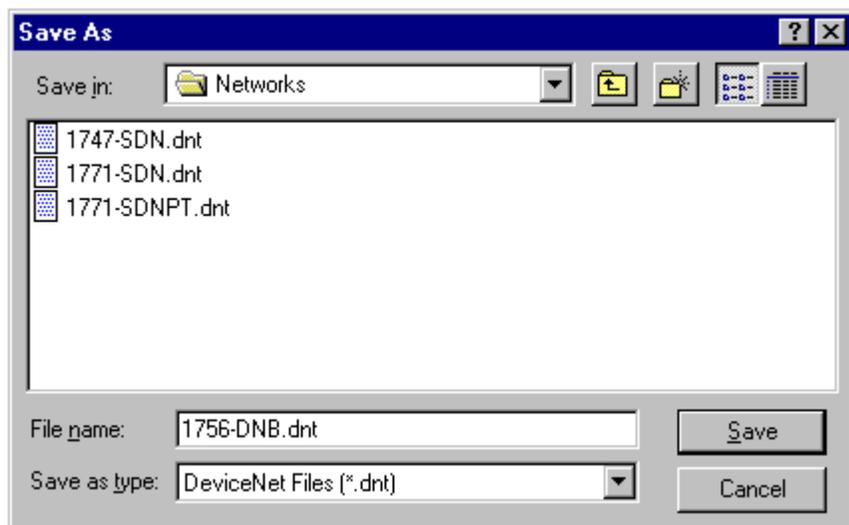
You will be prompted to download the changes to the device (the scanner):



8. Click on **Yes**.

Saving the DeviceNet Configuration

1. From the **File** menu, select **Save As**.



2. **Save** your DeviceNet configuration using an appropriate file name e.g., 1756-DNB).

3. Close or minimize RSNetWorx for DeviceNet.

What's Next?

The next chapter describes how to configure a DeviceNet network remotely from other networks: ControlNet, Ethernet, and Data Highway Plus.

Configuring DeviceNet From Another Network

What This Chapter Contains This chapter describes how to configure a DeviceNet network remotely from another network. It provides examples of configuring the DeviceNet network from ControlNet, Ethernet, and Data Highway Plus networks.

We assume that you have previously set up the network you will use to communicate with the DeviceNet network and that you have installed the appropriate interface hardware. For these examples we set up a 7-slot ControlLogix chassis with the following modules:

Slot 0	1756-L1, Logix5550 controller
Slot 1	1756-DNB, DeviceNet Interface module
Slot 2	1756-DHRIO, Data Highway Plus Interface module
Slot 3	1756-CNB, ControlNet Interface module
Slot 4	1756-ENET, Ethernet Interface module

The following table describes what this chapter contains and where to find specific information. Refer to the section(s) that apply to your installation.

For information about	See page
Where to Find More Information	5-2
Configuring DeviceNet from a ControlNet Network	5-2
Configuring DeviceNet from an Ethernet Network	5-5
Configuring DeviceNet From a Data Highway Plus Network	5-8

Where to Find More Information



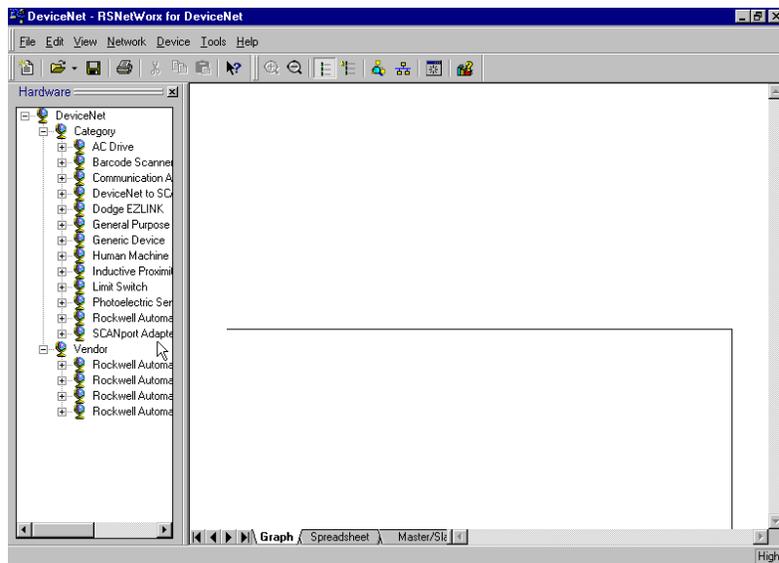
Refer to the following publications as needed for information on configuring other ControlLogix networks:

For information about:	See this publication:	Publication number:
the ControlLogix ControlNet interface module	ControlLogix ControlNet Scanner Installation Instructions	1756-5.32
	ControlLogix ControlNet Interface Module User Manual	1756-6.5.3
the ControlLogix Data Highway Plus interface module	ControlLogix Data Highway Plus Communication Interface Module Installation Instructions	1756-5.4
	ControlLogix Data Highway Plus Communication Interface Module User Manual	1756-6.5.2
the ControlLogix Ethernet interface module	ControlLogix Ethernet Communication Interface Module Installation Instructions	1756-5.3
	ControlLogix Ethernet Communication Interface Module User Manual	1756-6.5.1
TCP/IP protocol and networking in general	Comer, Douglas E., Internetworking with TCP-IP, Volume 1: Protocols and Architecture, 2nd ed. Englewood Cliffs, N.J.:Prentice-Hall, 1995. ISBN 0-13-216987-8.	n/a
	Tannebaum, Andrew S. Computer Networks, 2nd ed. Englewood Cliffs, N.J.: Prentice-Hall, 1989. ISBN 0-13-162959-X.	n/a

Configuring DeviceNet from a ControlNet Network

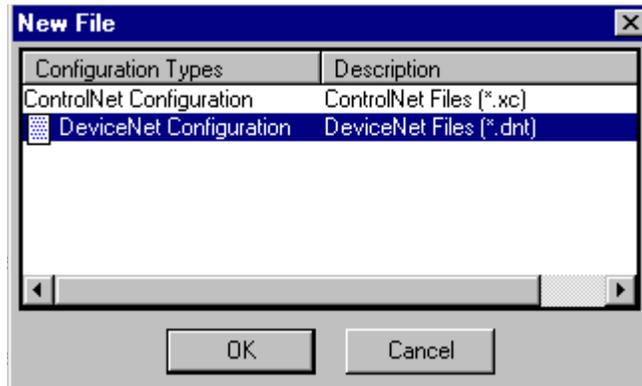
Before performing this example the ControlNet network must be configured and running. A 1756-CNB module must be installed in the ControlLogix chassis with the 1756-DNB module. In this example the 1756-CNB module is in slot 3 of the ControlLogix chassis and is configured as ControlNet node 11. Use the actual configuration of your CNB module when performing this example.

1. Start RSNetWorx.



2. From the **File** menu, select **New**.

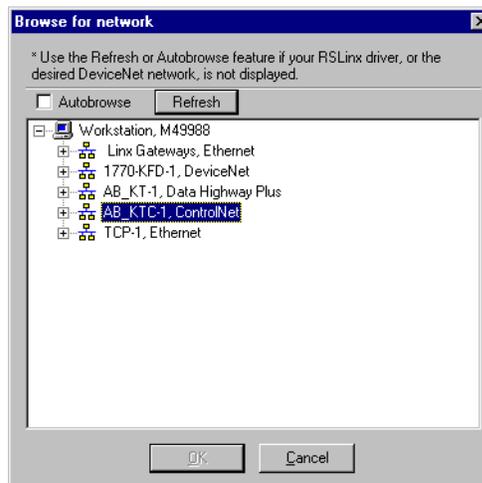
If you have RSNetWorx for ControlNet installed on your computer you may see the following window. Otherwise, proceed to step 4.



3. Highlight **DeviceNet Configuration** and click on **OK**.

4. Click on the **Online** button  on the toolbar.

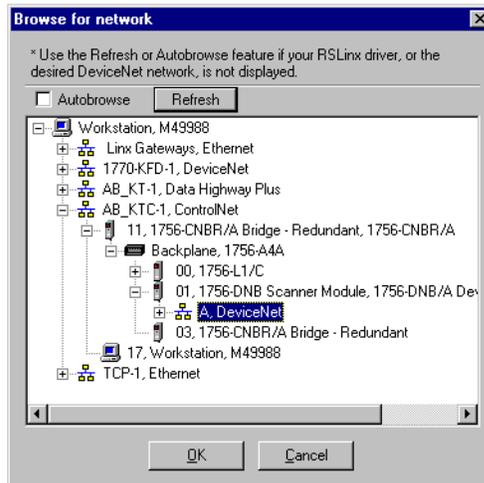
A list of the available drivers in RSLinx will appear. (Your list may appear different from that shown below, depending upon what you have configured on your system.)



5. Select the “+” next to your **ControlNet** driver (AB_KTC-1 above) to expand the tree.

6. Navigate down the tree through the backplane until you reach the DeviceNet network on channel A of the 1756-DNB module.

Your window should appear similar to the following one:

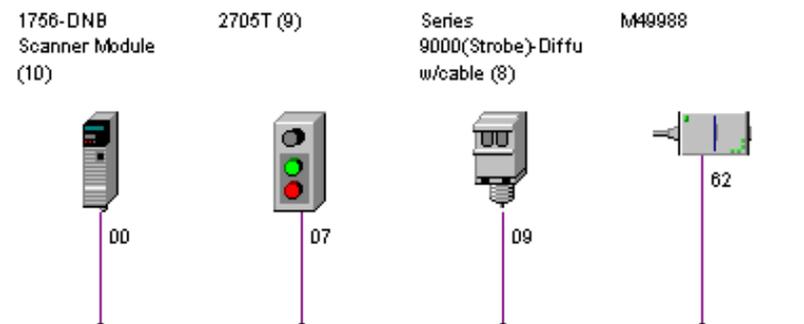


7. Select the **OK** button to accept the path. You will be prompted to upload or download devices before going online.



8. Click on **OK** to go online. RSNetWorx will begin browsing for network devices. Note that this will take longer than in chapter 4 since you are doing a remote browse.

When the software is finished browsing, the network displayed on your screen should look similar to the one shown below.

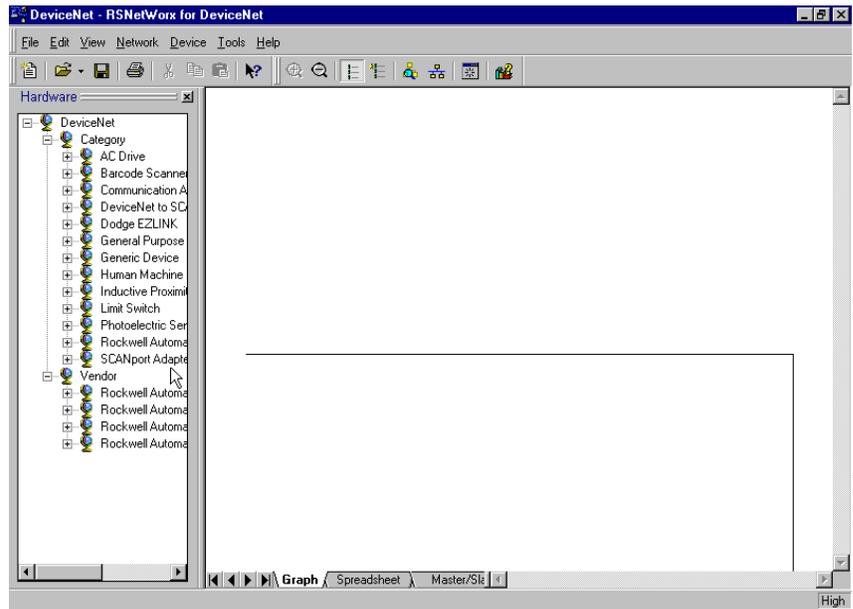


You are now online to the DeviceNet network via the ControlNet network. Perform the procedures described on pages 4-6 to 4-18 to configure the DeviceNet network before downloading and running the example program.

Configuring DeviceNet from an Ethernet Network

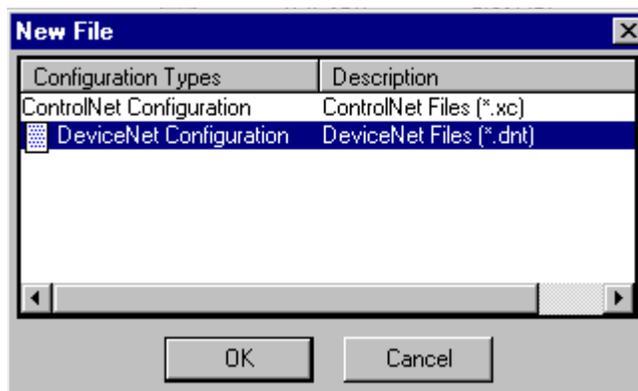
Before performing this example the Ethernet network must be configured and running. A 1756-ENET module must be in the ControlLogix chassis with the 1756-DNB module. In this example the 1756-ENET module is in slot 4 of the ControlLogix chassis and is configured with an IP address of 130.130.130.1. Use the actual configuration of your ENET module when performing this example.

1. Start RSNetWorx.



2. From the **File** menu, select **New**.

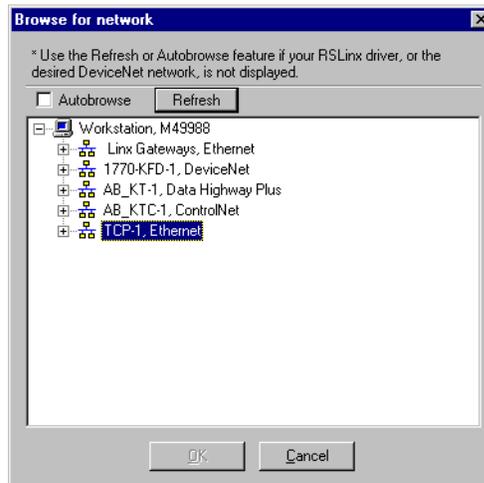
If you have RSNetWorx for ControlNet installed on your computer you may see the following window. Otherwise, proceed to step 4.



3. Highlight **DeviceNet Configuration** and click on **OK**.

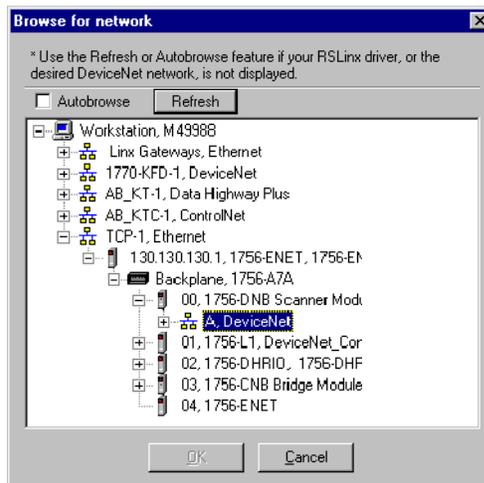
4. Click on the **Online** button on the toolbar.

The **Browse for network** window will appear with the available drivers. (Your window may appear different from that shown below, depending upon the drivers you have configured on your system.)



5. Select the “+” next to your **Ethernet** driver (TCP-1 above) to expand it.
6. Navigate down the tree until you reach the DeviceNet network for channel A of the 1756-DNB module.

Your screen should appear similar to the following one:



7. Select the **OK** button to accept the path.

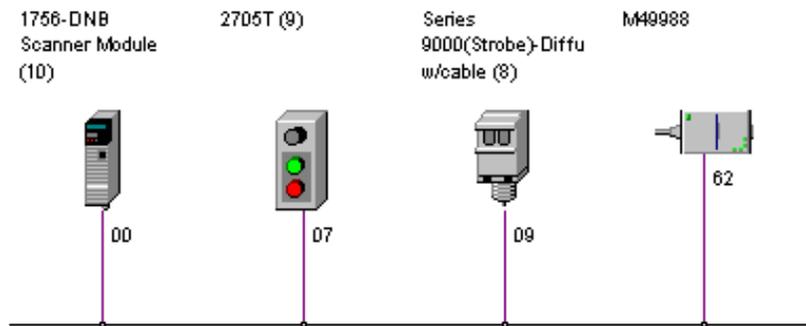
You will be prompted to upload or download devices before going online.



8. Click on **OK** to go online.

RSNetWorx for DeviceNet will begin browsing for network devices. Note that this will take longer than in chapter 4 since you are doing a remote browse.

When the software is finished browsing, the network displayed on your screen should look similar to the one shown below.



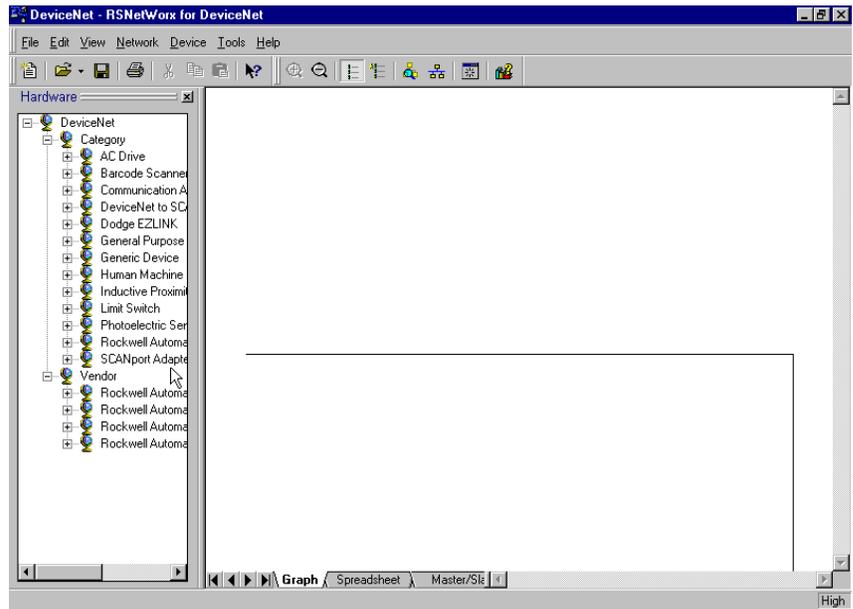
You are now online to the DeviceNet network via the Ethernet network.

Perform the procedures described on pages 4-6 to 4-18 to configure the DeviceNet network before downloading and running the example program.

Configuring DeviceNet From a Data Highway Plus Network

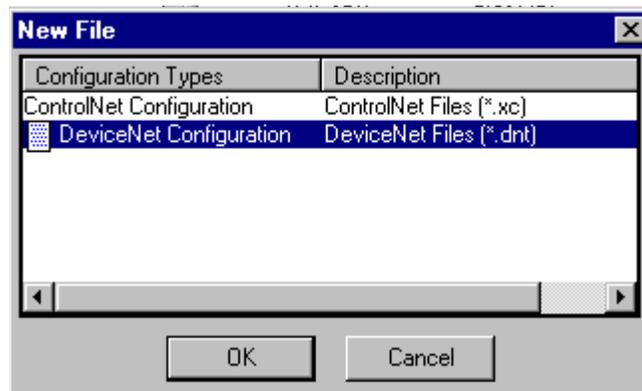
Before performing this example the Data Highway Plus network must be configured and running. A 1756-DHRIO module must be in the ControlLogix chassis with the 1756-DNB module. In this example, the 1756-DHRIO module is in slot 2 of the ControlLogix chassis and channel A is configured for DH+ as node 3. Use your actual DHRIO configuration when performing this example.

1. Open the **RSNetWorx for DeviceNet** software.



2. From the **File** menu, select **New**.

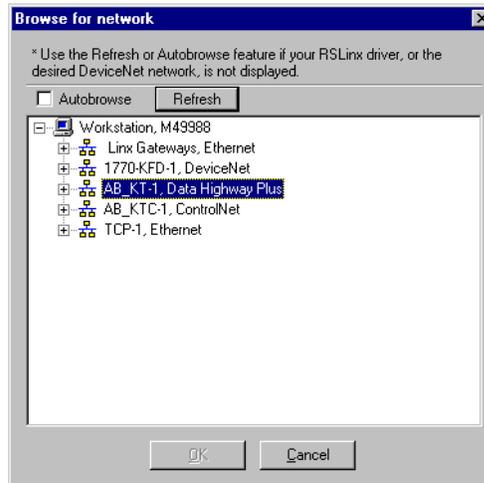
If you have RSNetWorx for ControlNet installed on your computer you may see the following window. Otherwise, proceed to step 4.



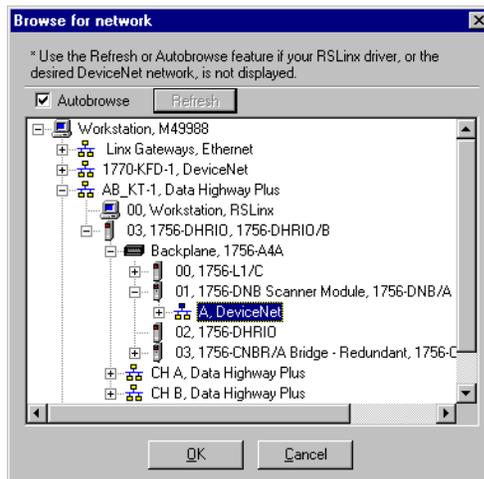
3. Highlight **DeviceNet Configuration** and click on **OK**.

4. Click on the **Online** button  on the toolbar.

The **Browse for network** window will appear with the available drivers. (Your window may appear different from that shown below, depending upon the drivers you have configured on your system.)

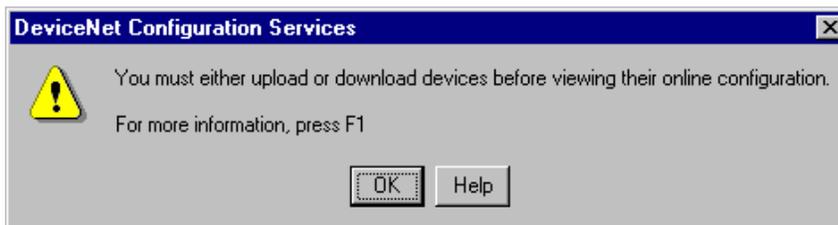


5. Select the “+” next to the **Data Highway Plus** driver (AB_KT-1 above) to expand it.
6. Navigate down the tree until you reach the DeviceNet network for channel A of the 1756-DNB module. Your window should look similar to the following one:



7. Select the **OK** button to accept the path.

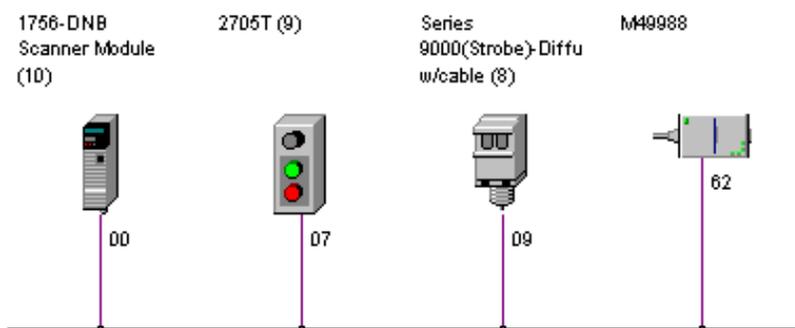
You will be prompted to upload or download devices before going online.



8. Click on **OK** to go online.

RSNetWorx for DeviceNet will begin browsing for network devices. Note that this will take longer than in chapter 4 since you are doing a remote browse.

When the software is finished browsing, the network displayed on your screen should look similar to the one shown below.



You are now online to the DeviceNet network via the Data Highway Plus network.

Perform the procedures described on pages 4-6 to 4-18 to configure the DeviceNet network before downloading and running the example program.

What's Next?

The next chapter describes how to create and run the example application program to test the DeviceNet network.

The Example Application Program

What This Chapter Contains

This chapter describes the procedure to create, download, and run an example ladder logic program to test the DeviceNet network. When the program is running, pressing the START button on the RediSTATION will cause the red indicator light to come on and stay on until the STOP button is pressed. Passing an object in front of the photoeye will increment a counter.

Remember that you cannot directly communicate with the controller over a DeviceNet network. You must download and run the program by connecting to the controller's RS232 port or via another network. This chapter provides examples of downloading and running the program over ControlNet, Ethernet, and Data Highway Plus networks.

For these examples we set up a 7-slot ControlLogix chassis with the following modules:

Slot 0	1756-L1, Logix5550 controller
Slot 1	1756-DNB, DeviceNet interface module
Slot 2	1756-DHRIO, Data Highway Plus interface module
Slot 3	1756-CNB, ControlNet interface module
Slot 4	1756-ENET, Ethernet interface module

The following table describes what this chapter contains and where to find specific information. Refer to the section(s) that apply to your installation.

For information about	See page
Installing the Software	6-2
Creating a New Controller	6-2
Creating the Controller Tags	6-3
I/O Configuration	6-5
Creating the Ladder Logic	6-7
Downloading and Running the Program from a ControlNet Network	6-9
Downloading and Running the Program from an Ethernet Network	6-11
Downloading and Running the Program from a DH+ Network	6-13



For more information, see *Getting Results With RSLogix 5000*, Rockwell Software publication 9399-RL53GR.

Installing the Software

To install the **RSLogix 5000** software:

1. Insert the CD in the CD-ROM drive.

Note: The CD-ROM supports Windows Autorun. Once inserted into the CD-ROM drive, if you have Autorun configured, the installation will automatically start at the first setup screen.

If Autorun is not configured for your CD-ROM drive, go to step 2.

2. From the **Start** menu, choose Run.

You will see the Run pop-up window.

3. Type **d:/setup** (if it doesn't appear automatically), where **d:** is your CD-ROM driver letter.

4. Click on **OK**.

You will see the progress bar, followed by the welcome screen.

Creating the Example Application

The following sections describe how to create the example application using the RSLogix 5000 software.

Creating a New Controller

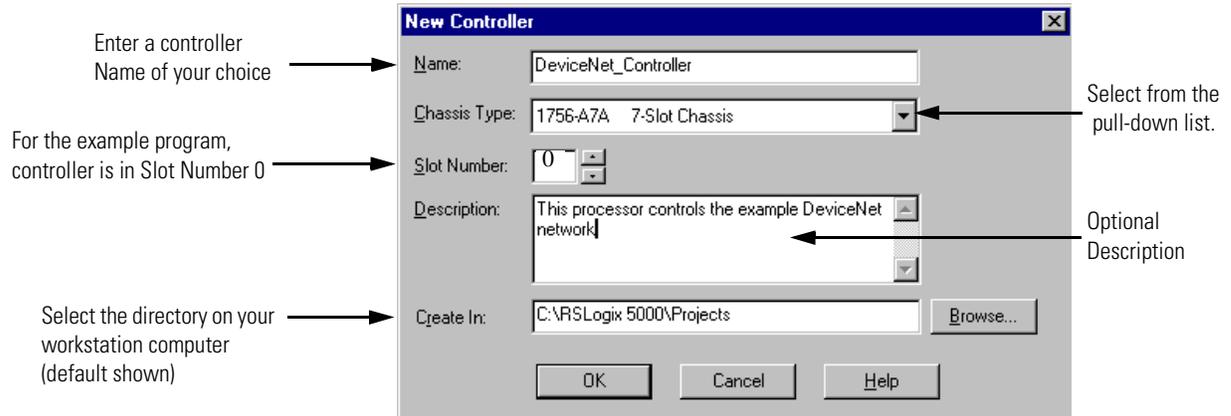
The first step is to create a new controller. Use the following procedure.

1. Start **RSLogix 5000**. You will see the window shown below.



2. Select **File** from the main menu bar, and then select **New** from the dropdown menu.

The **New Controller** window will appear.



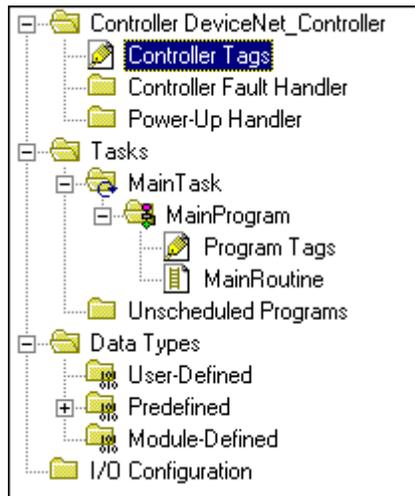
3. Enter a **Name** for your controller. Then select the correct **Chassis Type** and **Slot Number** of your Logix5550 controller, and the folder where you want to save the file (**Create In**).

4. Click on the **OK** button to accept the parameters.

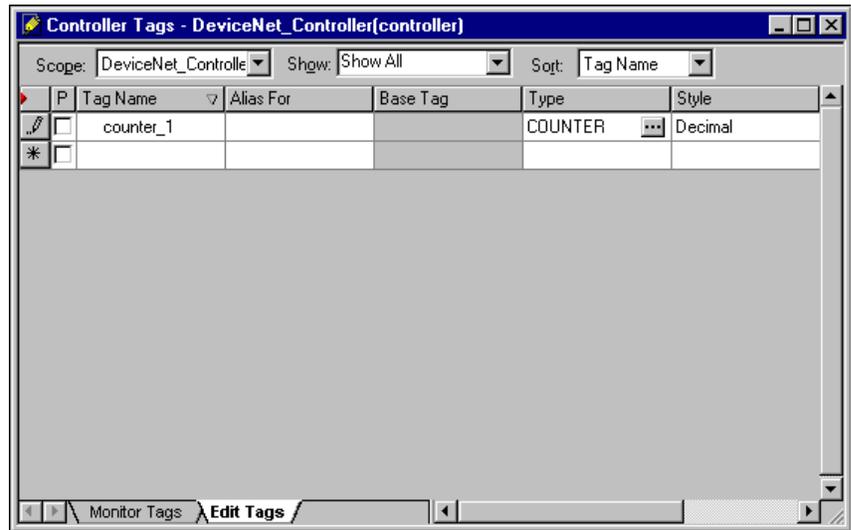
Creating the Controller Tags

Use the following procedure to create the controller tags for your application program.

1. Double-click on **Controller Tags** in the project window.



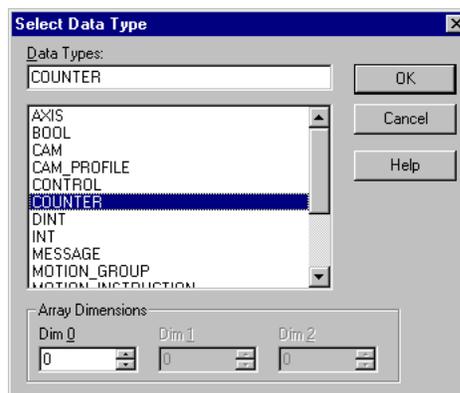
The **Controller Tags** window will appear:



2. Select the **Edit Tags** tab at the bottom of the Controller Tags window.
3. Create the following tag:

Tag Name	Type
counter_1	COUNTER

Enter the name in the **Tag Name** field, then click on the **...** button in the **Type** field. The **Select Data Type** window will open.

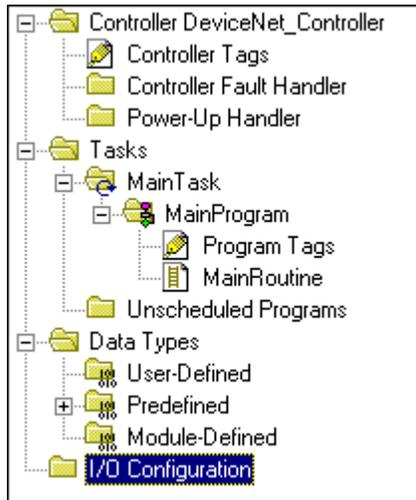


4. Select **COUNTER** from the list of Data Types and click on **OK**.
5. Close the Controller Tags window.

I/O Configuration

Use the following procedure to configure the 1756-DNB module as an I/O device for the application:

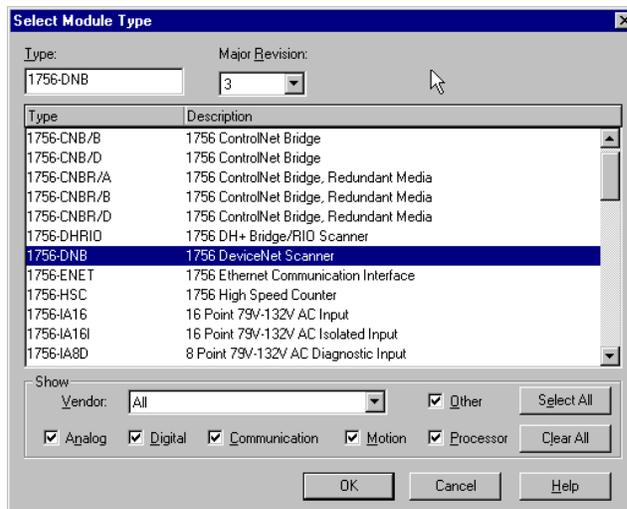
1. Select the **I/O Configuration** folder in the project window.



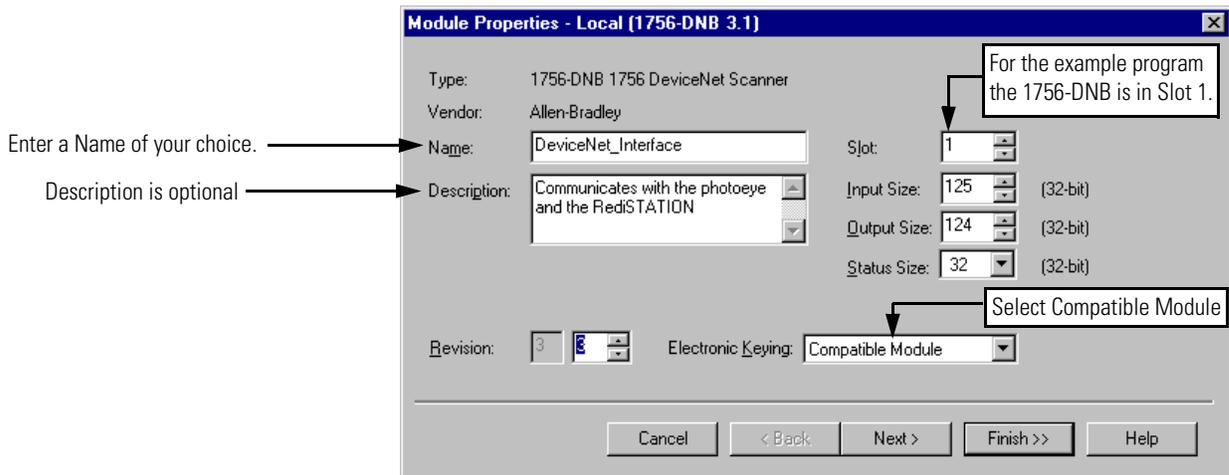
2. Click the right mouse button. The following pop-up window will appear:



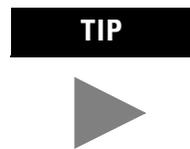
3. Click on **New Module**. The **Select Module Type** window will appear:



4. Select the **1756 DeviceNet Scanner** from the list and click on **OK**. The Module Properties window will appear.



5. Fill in the **Module Properties** window as shown above.



The **Input Size**, **Output Size**, and **Status Size** fields define the I/O image transferred across the connection to the Automation controller. If data is being returned across a ControlNet connection you may want to use as small an I/O image as possible to avoid consuming the entire packet size on ControlNet.

See Appendix A for information on setting the **Status Size**.

6. Click on the **Finish** button. The 1756-DNB module will appear under the I/O Configuration folder.

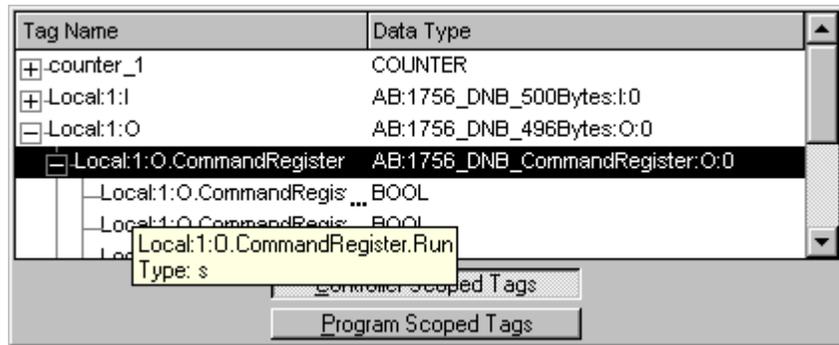


Creating the Ladder Logic

Create the following ladder logic for the example application:

1. Double-click on the **Main Routine** folder in the project window to bring up the ladder logic diagram.
2. Put an output on the first rung. Assign it the tag “Local:1:O.CommandRegister.Run”.

Note that when you added the 1756-DNB to the IO Configuration, the Controller Tag database was updated with the mapping of the 1756-DNB module (see pages 4-16 and 4-17.)

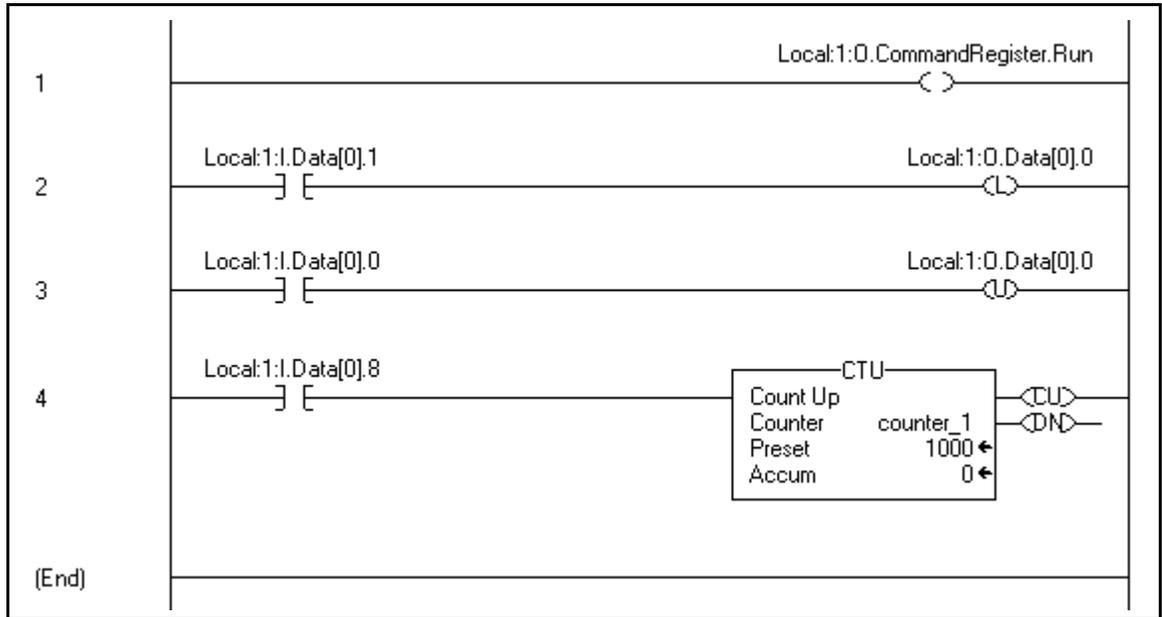


This output is the RUN bit for the 1756-DNB module in the local chassis, slot 1.



3. Add the rungs to communicate to the RediSTATION and cause the photoeye to increment a counter.

Your completed program should look like this:



4. **Save** this program using an appropriate name (e.g., "DeviceNet_Controller.ACD.")

Downloading and Running the Example Application Program

You cannot go online to the controller directly over the DeviceNet network. The following sections provide examples of downloading and running the program using the following networks:

- ControlNet (page 6-9)
- Ethernet (page 6-11)
- Data Highway Plus (page 6-13)

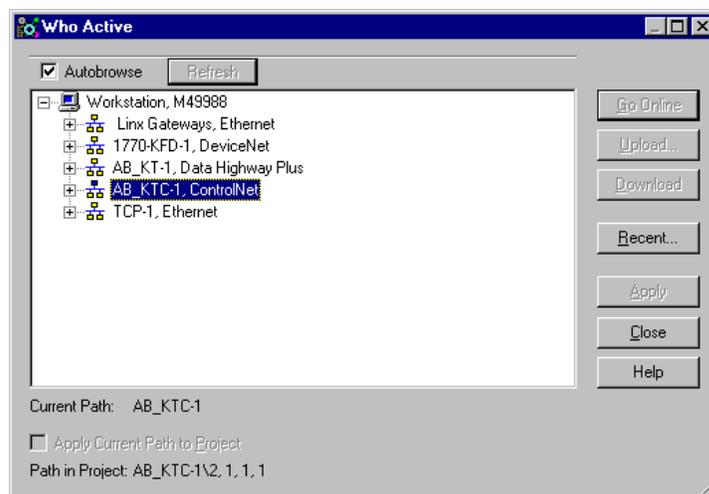
IMPORTANT

Verify that you have the correct controller firmware version. Refer to the Release Notes for RSLogix 5000 for this information.

Downloading and Running the Program from a ControlNet Network

Follow the procedure below to download and run the example program from a ControlNet network.

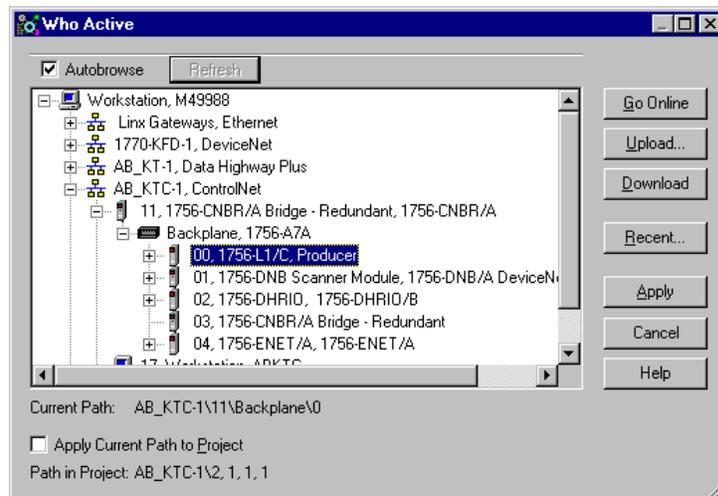
1. Click on the RSLogix 5000 **Communications** menu and select **Who Active**.
2. The **Who Active** window will appear (Your window may look different depending upon the drivers and other devices you have installed):



3. Select the “+” next to your ControlNet driver (**AB_KTC-1** above) to expand the tree.

4. Navigate down the tree through the backplane until you reach the Logix5550 Controller (1756-L1).

Your window should appear similar to the following one:



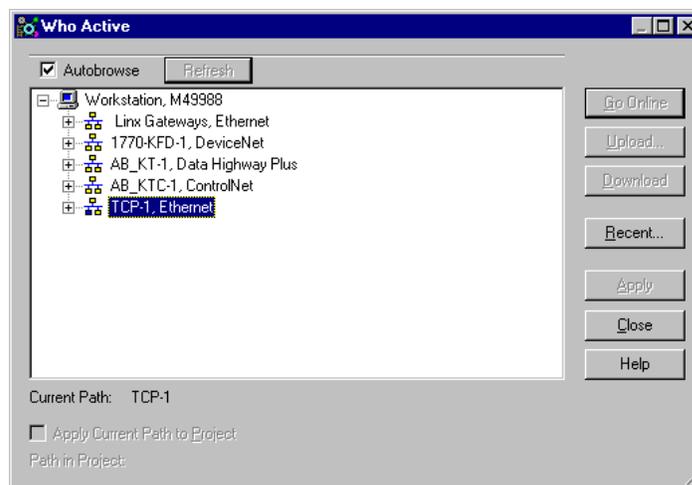
5. Highlight the controller as shown above and click on the **Download** button. You will be prompted to Download to the controller.
6. Click on **Download**. The status bar should increment, and the RS-232 LED indicator on the controller should blink green to indicate communication between the PC and the controller.
7. After the download is complete, change the Logix5550 controller mode to **Run**. The display on the 1756-DNB module should toggle between “Run” and “A#00”.
8. Press and release the **START** button on the RediSTATION. The red light should turn on. On your screen, you will see rung 1 in your ladder program being energized as you press the button.
9. Pass your hand back and forth over the photoeye several times. On your screen you should see the counter increment.
10. Press and release the **STOP** button on the RediSTATION. The red light should turn off. On your screen, you will see rung 2 in your ladder program being energized as you press the button.

This completes the ControlNet example.

Downloading and Running the Program from an Ethernet Network

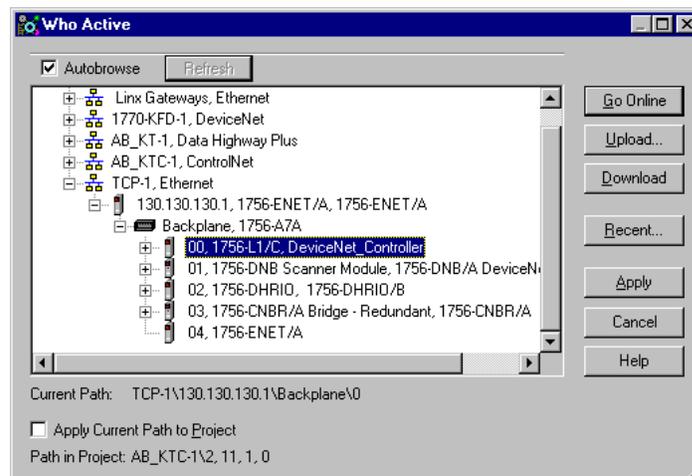
Follow the procedure below to download and run the example program from an Ethernet network.

1. Click on the RSLogix 5000 **Communications** menu and select **Who Active**.
2. The **Who Active** window will appear (Your window may look different depending upon the drivers and other devices you have installed):



3. Select the "+" next to your **Ethernet** driver (TCP-1 above) to expand the tree.
4. Navigate down the tree through the backplane until you reach the Logix5550 Controller.

Your window should appear similar to the following one:



5. Highlight the controller as shown above and click on the **Download** button. The status bar should increment, and the RS-232 LED indicator on the controller should blink green to indicate communication between the PC and the controller.
6. After the download is complete, change the Logix5550 controller mode to **Run**. The display on the 1756-DNB module should toggle between “Run” and “A#00”.
7. Press and release the **START** button on the RediSTATION. The red light should turn on. On your screen, you will see rung 1 in your ladder program being energized as you press the button.
8. Pass your hand back and forth over the photoeye several times. On your screen you should see the counter increment.
9. Press and release the **STOP** button on the RediSTATION. The red light should turn off. On your screen, you will see rung 2 in your ladder program being energized as you press the button.

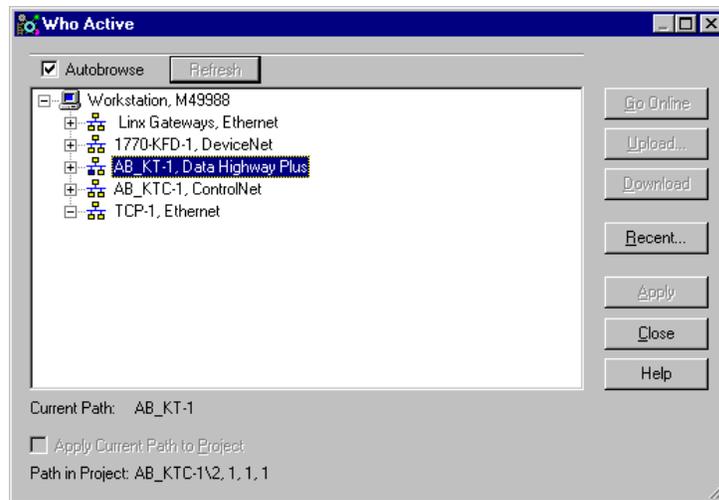
This completes the Ethernet example.

Downloading and Running the Program from a DH+ Network

Follow the procedure below to download and run the example program from a DH+ network.

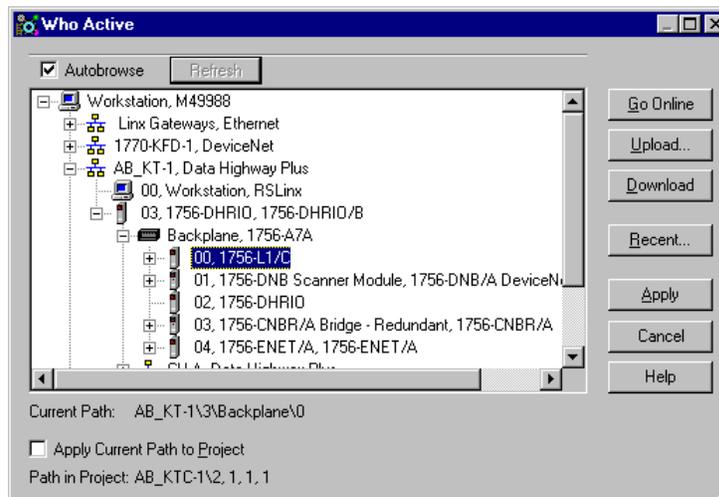
1. Click on the RSLogix 5000 **Communications** menu and select **Who Active**.

The **Who Active** window will appear (Your window may look different depending upon the drivers and other devices you have installed):



2. Select the “+” next to your **Data Highway Plus** driver (AB_KT-1 above) to expand the tree.
3. Navigate down the tree through the backplane until you reach the Logix5550 Controller.

Your window should appear similar to the following one:



4. Highlight the controller as shown above and click on the **Download** button. The status bar should increment, and the RS-232 LED indicator on the controller should blink green to indicate communication between the PC and the controller.
5. After the download is complete, change the Logix5550 controller mode to **Run**. The display on the 1756-DNB module should toggle between “Run” and “A#00”.
6. Press and release the **START** button on the RediSTATION. The red light should turn on. On your screen, you will see rung 1 in your ladder program being energized as you press the button.
7. Pass your hand back and forth over the photoeye several times. On your screen you should see the counter increment.
8. Press and release the **STOP** button on the RediSTATION. The red light should turn off. On your screen, you will see rung 2 in your ladder program being energized as you press the button.

This completes the Data Highway Plus example.

What's Next?

This concludes the application examples. The following chapter describes how the diagnostic indicators on the 1756-DNB module can be used for troubleshooting.

Troubleshooting

What This Chapter Contains This chapter describes the diagnostics provided by the LED diagnostic indicators on the 1756-DNB module's front panel.

For information about	See page:
Power-Up Cycle Diagnostics	7-1
Node Address/Status Indicator	7-2
Interpreting the Three LED Status Indicators	7-4
MOD/NET Status Indicator	7-4
IO Status Indicator	7-5
OK Status Indicator	7-6

TIP

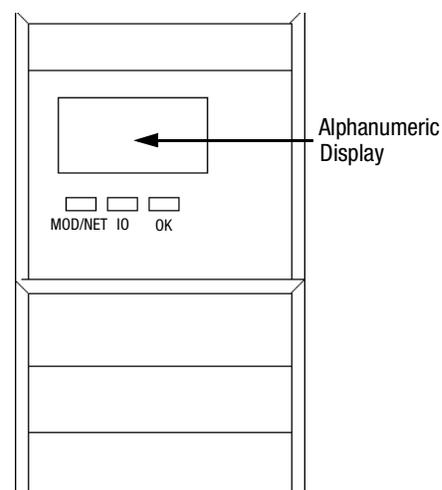


The 1756-DNB module (firmware major revision 3) provides extended status information via the RSLogix 5000 Online Help menu. Access the Online Help for “Troubleshooting using the software” to obtain this information.

Power-Up Cycle Diagnostics

When you apply chassis power, check the module's alphanumeric indicators to determine if the module is operating. The alphanumeric indicators will display the following:

1. Firmware major revision (01 through 128)
2. Firmware minor revision (01 through 255)
3. Baud rate (125, 250, or 500)
4. MAC ID (00 to 63)



Node Address/Status Indicator

After power up the 1756-DNB interface module uses the alphanumeric display as a node address/status indicator that displays numeric codes providing diagnostic information about the module. The display flashes at approximately 1 second intervals. The following table summarizes the meanings of the numeric codes.

Node Address/Status Indicator

Numeric Code	Description	Action
Network Address Displays 0 to 63	Normal operation. The numeric display matches the module's node address on the DeviceNet network.	Do nothing.
70	Module failed Duplicate Node Address check	Change the module address to another available one. The node address you selected is already in use on that network.
71	Illegal data in scan list table (node number alternately flashes).	Reconfigure the scan list table and remove any illegal data.
72	Slave device stopped communicating (node number alternately flashes).	Inspect the field devices and verify connections.
73	Device's identity information does not match electronic key in scan list table entry (node number alternately flashes).	Verify that the correct device is at this node number. Make sure that the device at the flashing node address matches the desired electronic key (vendor, product code, product type).
74	Data overrun on port detected.	Modify your configuration and check for invalid data. Check network communication traffic.
75	No scan list is active in the module.	Enter a scan list.
76	No direct network traffic for module detected.	None. The module hears other network communication.
77	Data size expected by the device does not match scan list entry (node number alternately flashes).	Reconfigure your module for the correct transmit and receive data sizes.
78	Slave device in scan list table does not exist (node number alternately flashes).	Add the device to the network, or delete the scan list entry for that device.
79	Module has failed to transmit a message.	Make sure that your module is connected to a valid network. Check for disconnected cables.
80	Module is in IDLE mode.	Put controller in RUN mode. Enable RUN bit in module command register.
81	Module is in FAULT mode.	Check Module Command Register for fault bit set.
82	Error detected in sequence of fragmented I/O messages from device (node number alternately flashes).	Check scan list table entry for slave device to make sure that input and output data lengths are correct. Check slave device configuration.

Node Address/Status Indicator

Numeric Code	Description	Action
83	Slave device is returning error responses when module attempts to communicate with it (node number alternately flashes).	Check accuracy of scan list table entry. Check slave device configuration. Slave device may be in another master's scan list. Reboot slave device.
84	Module is initializing the DeviceNet network.	None. This code clears itself once module attempts to initialize all slave devices on the network.
85	Data size larger than 255 bytes (node number alternately flashes).	Configure the device for a smaller data size.
86	Device is producing zero length data (idle state) while module is in Run Mode.	Check device configuration and slave node status.
90	User has disabled communication port.	Check Module Command Register for disable bit set.
91	Bus off condition detected on comm port. Module is detecting communication errors.	Check DeviceNet connections and physical media integrity. Check system for failed slave devices or other possible sources of network interference.
92	No network power detected on comm port.	Provide network power. Make sure that module drop cable is providing network power to module comm port.
95	Application FLASH update in progress.	None. Do not disconnect the module while application FLASH is in progress. You will lose any existing data in the module's memory.
97	Module operation halted by user command.	Check Module Command Register for halt bit set.

Interpreting the Three LED Status Indicators

The three LED status indicators on the module provide information about the network and its connections. The tables on pages 7-4 through 7-6 outline the indicator condition and the corresponding status, and explain what each condition means.

MOD/NET Status Indicator

This bi-color (green/red) LED provides limited device and communication status. The combined Module/Network (or Mod/Net) Status LED indicates whether or not the device has power and is operating properly.

MOD/NET Status Indicator

Condition	Status	Indicates
off	not powered/not online	Device is not online. The device has not completed the Dup_MAC_ID test yet. The device may not be powered.
green	device operational	Device is operating in a normal condition.
flashing green ⁽¹⁾	device in standby (device needs commissioning)	Device needs commissioning due to missing, incomplete, or incorrect configuration. Device may be in the standby state. Refer to the DeviceNet Specification, Volume II, Identity Object.
flashing red ⁽¹⁾	minor fault	Recoverable fault.
red	unrecoverable fault	Device has an unrecoverable fault and may need to be replaced.
flashing red/green	device self testing	Device is in self test. Refer to the DeviceNet Specification, Volume II, Identity Object.

⁽¹⁾ The flash rate of the LED is approximately 1 flash per second. The LED should be on for approximately 0.5 seconds and off for approximately 0.5 seconds.

IO Status Indicator

This bi-color (green/red) LED indicates the status of the communication link.

IO Status Indicator

Condition	Status	Indicates
off	not powered, not online	Device is not online. The device has not completed the Dup_MAC_ID test yet. The device may not be powered; look at the Module Status LED.
flashing green ⁽¹⁾	online, not connected	Device is online, but has no connections in the established state. The device has passed the Dup_MAC_ID test, is online, but has no established connections to other nodes. For a Group 2 Only device, it means that this device is not allocated to a master. For a UCMM capable device, it means that the device has no established connections.
green	link okay, online, connected	The device is online and has connections in the established state. For a Group 2 Only device, it means that the device is allocated to a master. For a UCMM capable device, it means that the device has one or more established connections.
flashing red ⁽¹⁾	connection time-out	One or more I/O connections are in the timed-out state.
red	critical link failure	Failed communication device. The device has detected an error that has rendered it incapable of communicating on the network (Duplicate MAC ID or Bus-off).

⁽¹⁾ The flash rate of the LED is approximately 1 flash per second. The LED should be on for approximately 0.5 seconds and off for approximately 0.5 seconds.

OK Status Indicator

This bi-color (green/red) LED provides device status in the ControlLogix chassis. It indicates whether the device has power and is operating properly.

OK Status Indicator

Condition	Status	Indicates
off	no power	No power applied to device. Apply chassis power. Verify module is completely inserted into chassis and backplane.
green	device operational	Device is operating in a normal condition. A controlling device has established connection to the module.
flashing green ¹	device in standby	The device is operating correctly; however, no controlling device has established connection to the module.
flashing red ⁽¹⁾	minor fault	Recoverable fault. To recover, reconfigure the device, reset the device, or perform error recovery.
red	unrecoverable fault or device self testing	Device has an unrecoverable fault; repair or replace it; or device is in self test during power up.

⁽¹⁾ The flash rate of the LED is approximately 1 flash per second. The LED should be on for approximately 0.5 seconds and off for approximately 0.5 seconds.

1756-DNB Status Structure

Module Status Structure

The controller receives status information concerning the 1756-DNB module's ability to exchange DeviceNet messages with other nodes by reading from a **Status Structure** in the 1756-DNB module. The module periodically updates the contents of the Status Structure and copies its contents to the controller.

The Status Structure consists of several 64-bit tables. The bit position of each of the 64 bits that make up a given status table directly corresponds to the node address of a device.

The Status Structure can be seen in the Controller Tags database by expanding the Status tag (i.e., Local:1:S).

The screenshot shows a window titled "Controller Tags - DeviceNet_Controller(controller)". The window contains a table with the following columns: P, Tag Name, Alias For, Base Tag, Type, and Style. The table is filtered to show tags under the scope "DeviceNet_Controller" and sorted by "Tag Name". The "Local:1:S" tag is expanded, showing its sub-entries:

P	Tag Name	Alias For	Base Tag	Type	Style
	[-] Local:1:S			AB:1756_DNB_St...	
	[+] Local:1:S.ScanCounter			DINT	Binary
	[+] Local:1:S.DeviceFailureRegister			SINT[8]	Binary
	[+] Local:1:S.AutoverifyFailureRegister			SINT[8]	Binary
	[+] Local:1:S.DeviceIdleRegister			SINT[8]	Binary
	[+] Local:1:S.ActiveNodeRegister			SINT[8]	Binary
	[+] Local:1:S.StatusDisplay			SINT[4]	Binary
	[+] Local:1:S.ScannerAddress			SINT	Hex
	[+] Local:1:S.ScannerStatus			SINT	Hex
	[+] Local:1:S.ScrollingDeviceAddress			SINT	Hex
	[+] Local:1:S.ScrollingDeviceStatus			SINT	Hex
	[+] Local:1:S.DeviceStatus			SINT[64]	Hex
*	<input type="checkbox"/>				

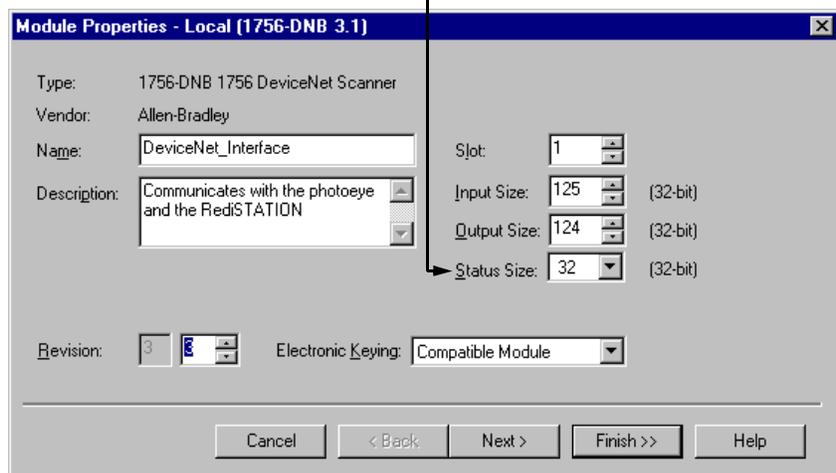
The window also includes a "Scope" dropdown set to "DeviceNet_Controller", a "Show" dropdown set to "Show All", and a "Sort" dropdown set to "Tag Name". At the bottom, there are navigation buttons for "Monitor Tags" and "Edit Tags".

The Status Structure consists of these data regions:

Status Structure	Element Description	Data Type	DINTs
Scan_Counter	counter incremented each I/O scan	32-bit	10
Device_Failure_Register	device failed bit table; 1 = failed	64-bit	
Autoverify_Failure_Register	device I/O size does not match scanner's internal table; 1 = mismatch	64-bit	
Device_Idle_Register	device is idle bit table; 1 = idle	64-bit	
Active_Node_Register	Node online table; 1 = online	64-bit	
Status_Display	ASCII representation of DNB alphanumeric display	4-byte	
Scanner_Device_Status	Scanner Device Status:	4-byte BCD	11
scanner_address	DeviceNet address of DNB module	8-bit BCD	
scanner_status	Status of DNB module	8-bit BCD	
device_address	Scrolls through faulted DeviceNet nodes by address (0 = no faults)	8-bit BCD	
device_status		8-bit BCD	
Reserved_Array	Future Expansion (20 bytes)	20 8-bit	16
Device_Status_Array	DeviceNet node status, 1 byte per device	64 8-bit	24/32

The 1756-DNB, versions 3.002 and higher, and RSLogix 5000, versions 2.25 and higher, support variable size Status Structures.

When the user specifies the size of the Status Structure during the 1756-DNB **Module Properties** configuration (see page 6-6), the elements of the structure correspond the definition of the Status Structure up to the size selected.



For ControlLogix, the available sizes are:

- 10 DINTs (32-bit value)
- 11 DINTs
- 16 DINTs
- 24 DINTs
- 32 DINTs (Default)

For example, if the user selects a status size of 10 DINTs in RSLogix 5000, the Status Structure would consist of fields *Scan_Counter* through *Reserved_Array*. If the user selects a status size of 24, the Status Structure would consist of fields *Scan_Counter* through half of the *Device_Status_Array* (first 32 DeviceNet addresses). If the user selects a Status Size of 32, the Status Structure would consist of fields *Scan_Counter* through the entire *Device_Status_Array*.

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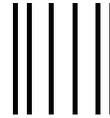
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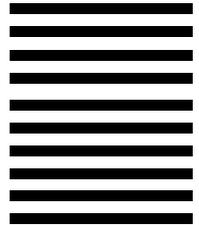
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