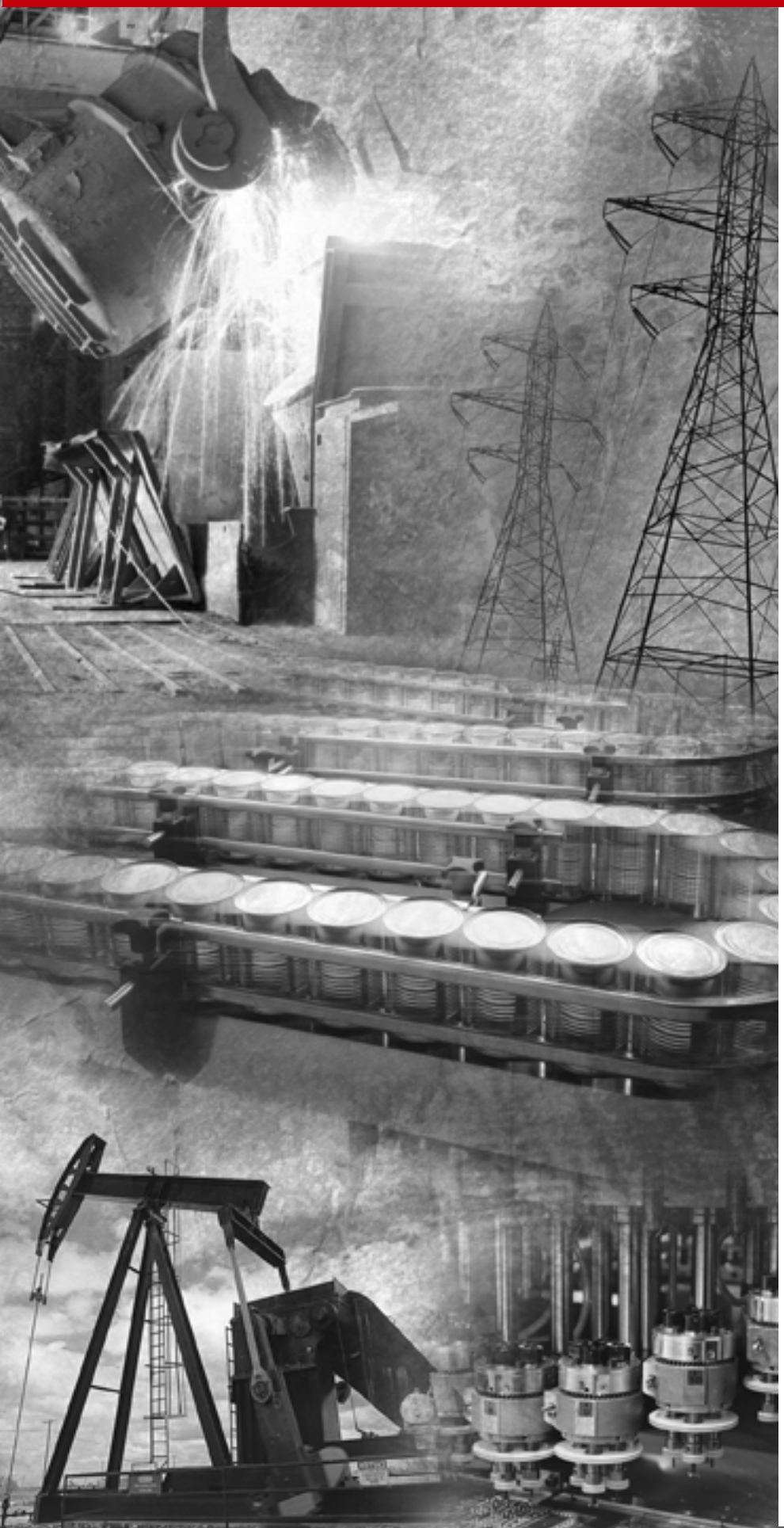


Allen-Bradley

ControlNet-to-DeviceNet Linking Device

1788-CN2DN

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.

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

WARNING

Identifies information about practices or circumstances that have the potential to create an explosion hazard.

ATTENTION

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

Warning and 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, publication 1770-4.1.

Open style devices must be provided with environmental and safety protection by proper mounting in enclosures designed for specific application conditions. See NEMA Standards publication 250 and IEC publication 529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.

Rockwell Automation Support

Rockwell Automation offers support services worldwide, with over 75 sales/support offices, 512 authorized distributors and 260 authorized systems integrators located throughout the United States alone, as well as Rockwell Automation representatives in every major country in the world.

Local Product Support

Contact your local Rockwell Automation representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

Technical Product Assistance

If you need to contact Rockwell Automation for technical assistance, call your local Rockwell Automation representative, or call Rockwell directly at: 1 440 646-5800.

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

You can also 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 on this Manual

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

About This User Manual

What this Preface Contains

This preface describes how to use this manual. The following table describes what this preface contains and where to find specific information.

Who Should Use This Manual

This manual is intended for control engineers and technicians who are installing, configuring, and maintaining a ControlLogix, PLC-5, or SLC 500 based control system that links a DeviceNet network to a ControlNet network using a 1788-CN2DN linking device.

We assume you have a good understanding of ControlNet and DeviceNet, as well as familiarity with RSNetWorx software and application programming using RSLogix 5, RSLogix 500, or RSLogix 5000 software.

How To Use This Manual

This manual describes how to install and configure the 1788-CN2DN linking device. It provides examples of ControlNet configurations with a ControlLogix processor, a PLC-5 processor, and a SLC 500 processor, and an example of configuring a DeviceNet network.

The example configurations are intended as guides to help you get your own system up and running. We recommend that you set up and perform the example configurations for the platforms you are working with and use them as building blocks for your own system.

About the Examples

The examples presented in this manual are as follows:

- ControlNet ControlLogix configuration (chapter 3)
- ControlNet PLC-5 configuration (chapter 4)
- ControlNet SLC 500 configuration (chapter 5)
- DeviceNet configuration (chapter 6)

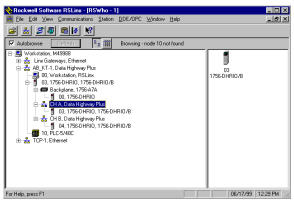
Common Techniques Used in This Manual

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.



The screen captures shown in this manual are pictures of the software's actual screens. The names of screen buttons and fields are generally in bold in the text of a procedure. Pictures of keys or icons represent the actual keys or icons you select.

System Components

The following components were used for the examples shown in this manual. (See pages 1-1 to 1-2 for minimum system requirements.)

Quantity	Product Name	Catalog Number
1	ControlNet-to-DeviceNet Linking Device	1788-CN2DN
1	Personal computer with ControlNet communications card (1784-KTCx, 1784-PCIC, or 1784-PCICS) and driver	Any appropriate model running Windows NT 4.0, Service Pack 3 or higher, or Windows 2000
	RSLinx Communications software, V2.30	9355-WABENE
	RSNetworx for DeviceNet V3.00 and RSNetWorx for ControlNet V3.00 software	9357-ANETL3
For ControlLogix on ControlNet:		
1	4-Slot ControlLogix chassis	1756-A4
1	ControlLogix power supply	1756-PA72
1	ControlLogix ControlNet Bridge Module	1756-CNB
1	Logix5550 controller	1756-L1
	RSLogix 5000 software, V8.00	9324-RLD300ENE
For PLC-5 on ControlNet:		
1	1771 Universal I/O Chassis	1771-A1B
1	1771 Power Supply	1771-P4S
1	PLC-5 ControlNet Processor	1785-L40C
	RSLogix 5 software, V3.22	9324-RL5300ENE
For SLC 500 on ControlNet:		
1	SLC 500 Modular Chassis	1746-A4/B
1	SLC Chassis power supply	1746-P1
1	SLC 500 ControlNet scanner	1747-SCNR
1	SLC 500 processor	1747-L542/B
	RSLogix 500 software, V3.01	9324-RL0300ENE
For DeviceNet:		
1	24V DC power supply	Regulated 24V dc, 8A
1	RediStation	2705-T3DN1A42A-A
1	Series 9000 Photoeye	42GNU-9000
Associated ControlNet and DeviceNet media (taps, connectors, cable) as needed		

Where to Find More Information

Refer to the following Rockwell publications as needed for additional help when setting up your networks.

For information about	See this publication	Publication number
ControlNet Media	ControlNet Cable System, Planning and Installation Manual	1786-6.2.1
DeviceNet Media	DeviceNet Cable System, Planning and Installation Manual	DN-6.7.2-MAY99

Many Rockwell publications are available online from the Automation Bookstore:

http://www.theautomationbookstore.com.

Rockwell Software products are provided with extensive tutorials and online Help. We recommend that you use the tutorials and Help menus to learn about these products.

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

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

Appendix A

LED Status Indicators

Appendix B

1788-CN2DN Input, Output, and Status Structures

Index

Module Description

What This Chapter Contains

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

Product Overview

The ControlNet-to-DeviceNet (CN2DN) linking device connects a ControlNet™ network to a DeviceNet™ network. The DeviceNet network typically consists of multiple devices, such as RediStation's, photoeyes, etc. The ControlNet network consists of controllers, such as Logix™ or PLC-5™ processors, HMIs, drives, I/O devices, etc.

The CN2DN has two broad functions:

1. supporting closed-loop control
2. configuration and monitoring

The CN2DN maintains internal input, output, and status structures to reduce the complexity of connecting DeviceNet I/O and status data with ladder programs and to make diagnostic information available to the user. For more information on these structures see Appendix B.

System Requirements

You need the following hardware and software components to use the 1788-CN2DN linking device. These components are required irrespective of the platform (e.g., ControlLogix, PLC-5, SLC 500) you are using.

Required Hardware

- ControlNet-to-DeviceNet linking device
- PC access to ControlNet through RSLinx™
- ControlNet and DeviceNet cabling

Required Software

- Windows NT™ 4.0 with service pack 3 or higher or Windows 2000™
- RSLinx™ 2.10 or later; this is the communication software for the Allen-Bradley controller interfaces.
- RSNetWorx for ControlNet™ version 2.0 or later; this is the ControlNet configuration tool.
- RSNetWorx for DeviceNet™ version 2.11 or later; this is the DeviceNet configuration tool.

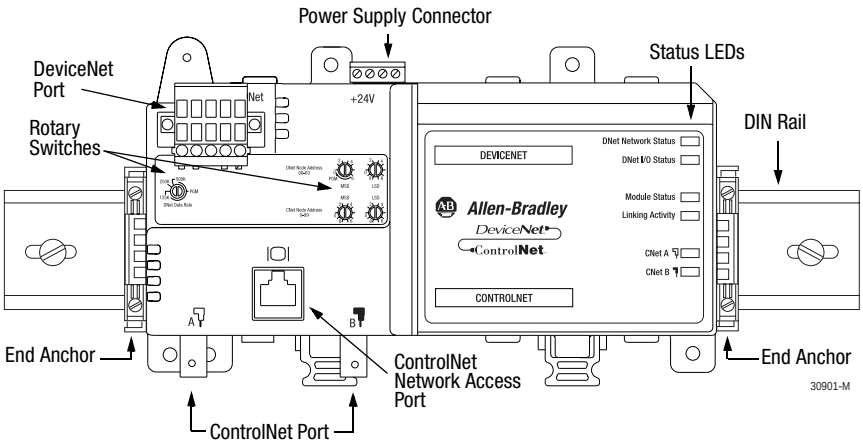
Compatibility Information

The 1788-CN2DN linking device is compatible with the DeviceNet and ControlNet specifications issued by the Open DeviceNet Vendor Association (ODVA), Inc. and ControlNet International, Ltd.

Hardware Description

Figure 1.1 shows the components of the CN2DN linking device.

Figure 1.1 CN2DN Linking Device



The CN2DN module is designed to be mounted on a 35 mm steel DIN rail. End anchors are provided to keep the module in position.

The device has one ControlNet port with support for redundant media as well as a ControlNet network access port. Rotary switches are used to set the ControlNet node address. The CNet Status LEDs display the current status of each of the redundant media channels.

The CN2DN has one DeviceNet port. Rotary switches are used to set the DeviceNet node address and the data rate. DNet LEDs display the current status of the network and the I/O channel.

Module Status and Linking Activity LEDs are provided. For information about the LEDs, see Appendix A.

The power supply connector is wired to 24V dc.

Installing the 1788-CN2DN

What This Chapter Contains

Use this chapter as a guide when you install the 1788-CN2DN. This chapter covers the following topics:

Precautionary Statements

We recommend that you adhere to this precautionary information.

WARNING

If you connect or disconnect the ControlNet or DeviceNet cable with power applied to this module or any device on the respective network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

ATTENTION

This module contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing or testing this assembly. Component damage may result if these procedures are not followed.

Because of the variety of uses for the product 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, sample programs, and layout examples shown in this manual 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.

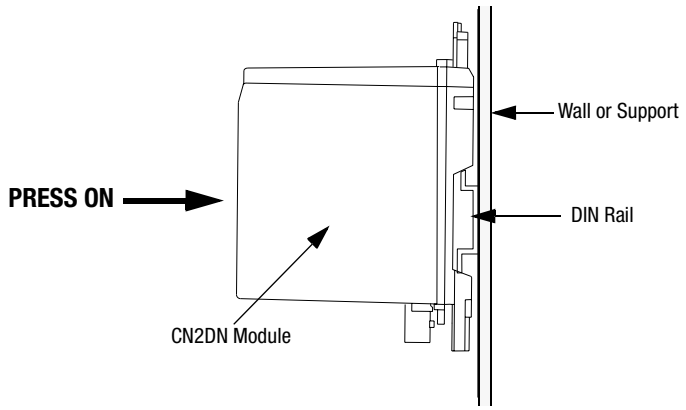
Installation Procedure

The CN2DN module should be mounted on a standard 35 mm steel DIN rail. Follow the steps below to mount the CN2DN on the DIN rail.

IMPORTANT You must use a steel DIN rail (A-B P/N 199-DR1 or equivalent) to meet the 1788-CN2DN's vibration specifications. DO NOT use an aluminum DIN rail.

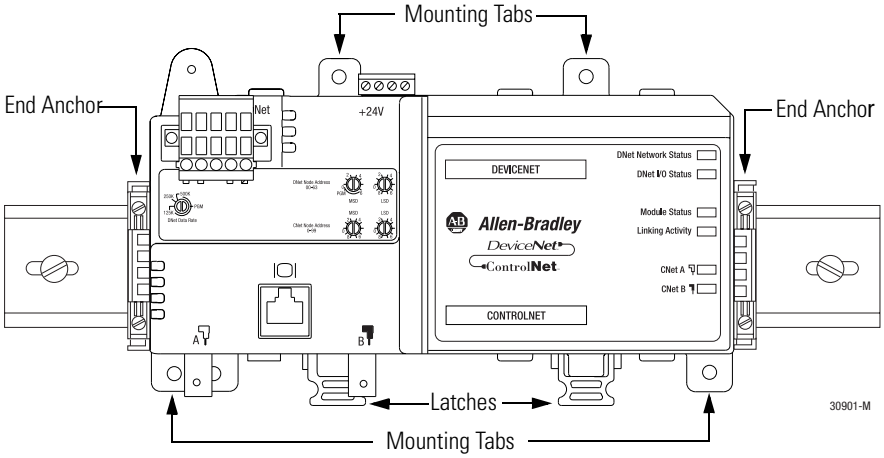
1. Press the module straight onto the DIN rail at the desired location. Be sure that both latches snap into place.

Figure 2.1 - Mounting the CN2DN Module on the DIN Rail



2. Use the supplied end anchors to lock the module into place.

Figure 2.2 - End Anchors and Mounting Tabs



Note that for very high shock applications the module may be bolted to a panel through the four mounting tabs on the base. See page 2-10 for dimensions.

Removing the CN2DN module

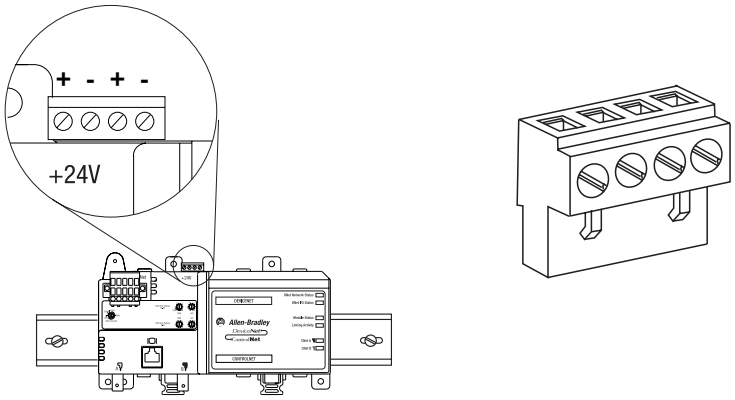
To remove the CN2DN module from the DIN rail, simultaneously pull the 2 latches away from the rail and pull the module off the panel. (Note: It may require two screwdrivers to pry the latches open.)

Connecting Power

The CN2DN linking device requires 18-30V dc input power. The CN2DN filters and regulates the supplied power. The power connector is a 4-pin redundant screw terminal connector.

The pinout for the power connector is shown in Figure 2.3.

Figure 2.3 - Power Connector Pinout



Connect the primary power supply to the left + and - pair. The right + and - pair may be used to chain the primary power supply to downstream devices.

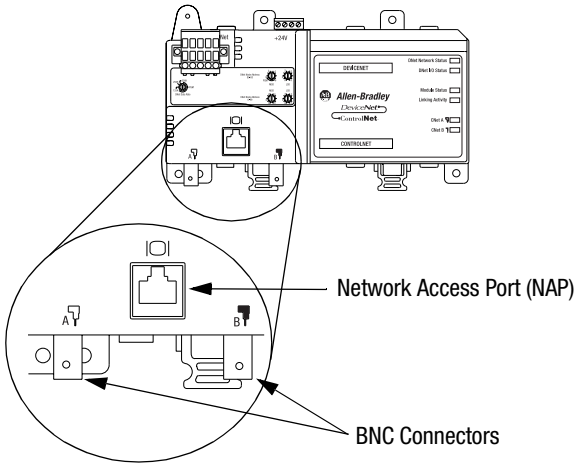
IMPORTANT No connection will be made to downstream devices unless the connector is plugged into the CN2DN.

ControlNet Connections

BNC Connectors

The CN2DN linking device must be connected to the ControlNet network using the BNC connectors on the device. The BNC connectors should be connected to the ControlNet network through taps as shown in figure 2.5 on the following page.

Figure 2.4 - ControlNet Connections



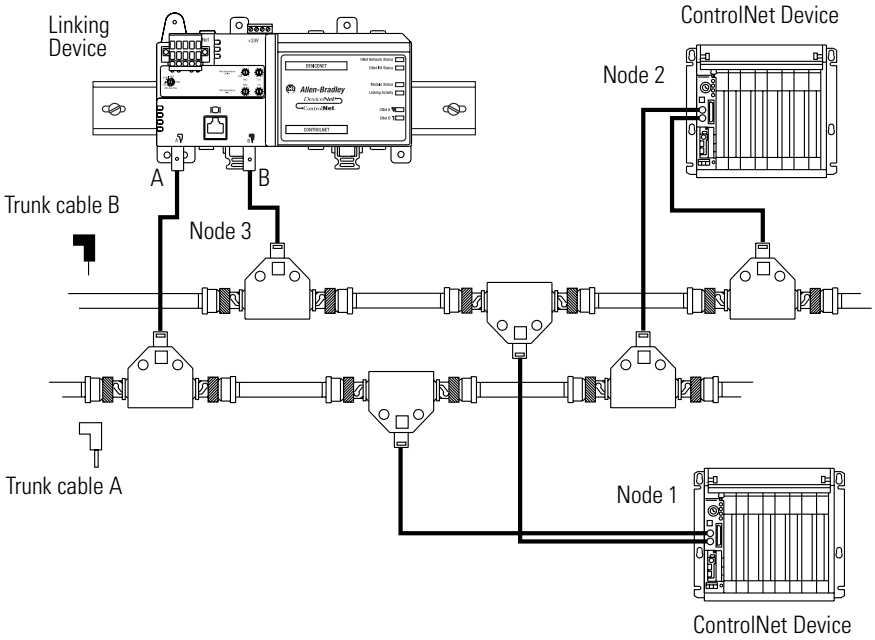
Network Access Port (NAP)

The CN2DN includes a Network Access Port (NAP) with an RJ-45 connector for connecting programming terminals to devices on the ControlNet network. You can use the NAP to temporarily connect a device such as a laptop computer to the network.

IMPORTANT Do not connect the CN2DN to more than one ControlNet network at a time. Attempting to connect to a second network will cause the CN2DN to operate erratically.

Figure 2.5 shows an example of a ControlNet network using redundant media.

Figure 2.5 - CN2DN on ControlNet (Redundant Media)



ATTENTION

When using redundant media, connect all channel A connectors to one cable, and all channel B connectors to the other cable.

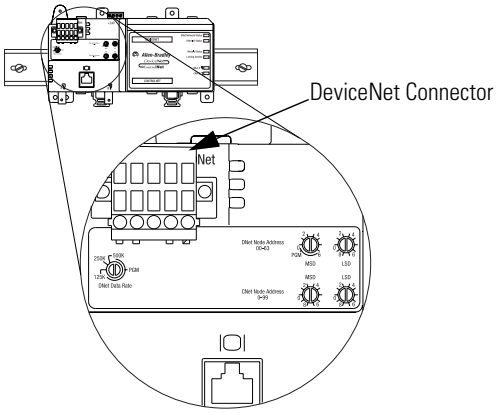
If you connect the product to a cable system that does not support redundant media, connect the tap dropline to the BNC connector labeled channel A. Leave Channel B open when using single media.

Refer to publication number 1786-6.2.1, *ControlNet Cable System, Planning and Installation Manual*, for further information.

DeviceNet Connections

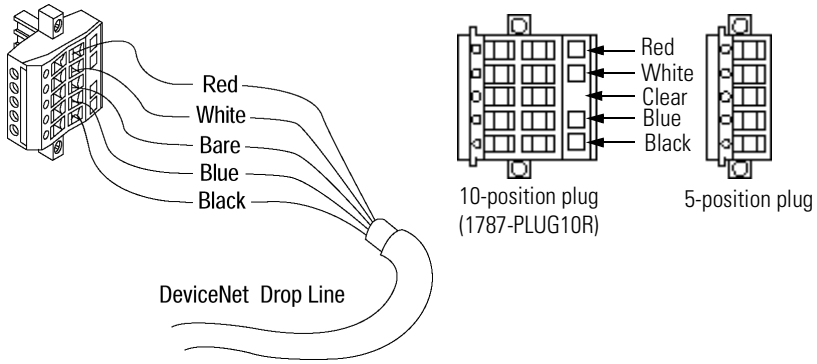
The location of the DeviceNet connector is shown in figure 2.6.

Figure 2.6 - DeviceNet Connector on the CN2DN



Use an open-style 5- or 10-position linear plug to connect to the DeviceNet network. An open-style 10-position linear plug is provided with your CN2DN. Wire the connector as shown in figure 2.7.

Figure 2.7 - Connector Pinout to CN2DN



Refer to publication number *DN-6.7.2*, *DeviceNet Cable System, Planning and Installation Manual*, for further information.

Setting the Node Address Switches

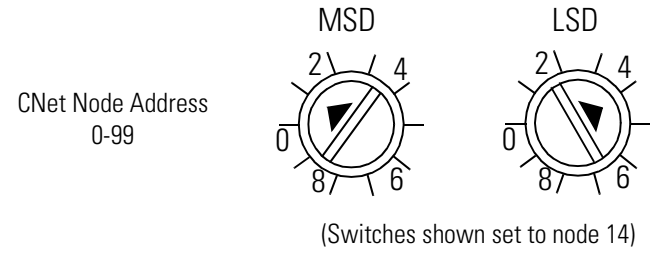
IMPORTANT When using a 1788-CN2DN, the ControlNet network must have an "Active Keeper" to keep track of network scheduling, clock synchronization, etc. The Active Keeper can be any 1785-PLC5C, 1756-CNB, 1784-KTCS, 1784-PCICS, or 1747-SCNR.

CN2DN ControlNet Address

Choose and set a ControlNet network address for the CN2DN. Refer to figure 2.8.

IMPORTANT ControlNet addresses must be in the range of 01-99.

Figure 2.8 - CNet Node Address Switches



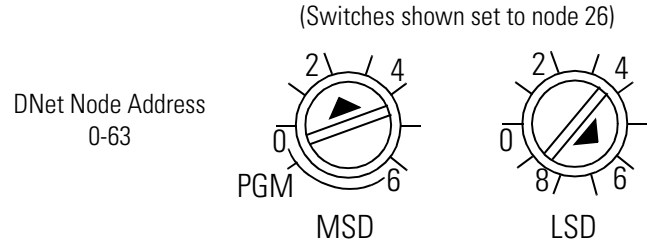
(Switches shown set to node 14)

CN2DN DeviceNet Address

Choose and set a DeviceNet network address for the CN2DN. Refer to figure 2.9:

IMPORTANT DeviceNet addresses must be in the range 00-63. The default address is 63. DeviceNet address settings in the PGM area are not supported.

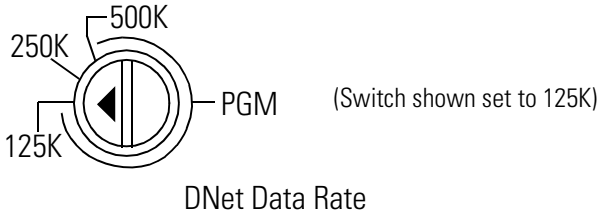
Figure 2.9 - DNet Node Address Switches



Setting the DNet Data Rate

Set the data rate for your DeviceNet network: 125K, 250K, or 500K. Data rate settings in the PGM area are not supported. Refer to figure 2.10:

Figure 2.10 - DNet Data Rate Switch

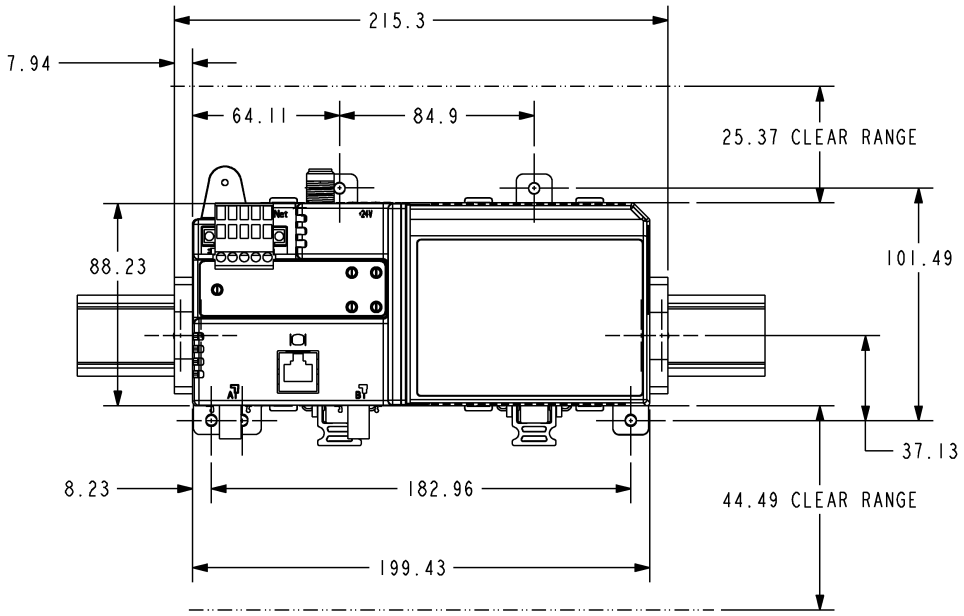


This concludes the hardware installation of the 1788-CN2DN linking device. To use the device you must configure it for your DeviceNet and ControlNet networks. Note that if you are accessing your DeviceNet network from your PC via your ControlNet network, you must perform the ControlNet configuration first. Proceed to one of the following chapters, as applicable:

- ControlNet configuration for a Logix processor - chapter 3
- ControlNet configuration for a PLC-5 processor - chapter 4
- ControlNet configuration for an SLC 500 processor - chapter 5
- DeviceNet configuration - chapter 6

Mounting Dimensions

Dimensions in millimeters (mm)



ControlLogix ControlNet Configuration

What This Chapter Contains

This chapter provides an example of the ControlNet configuration of the 1788-CN2DN linking device for use with a ControlLogix processor. The DeviceNet configuration is independent of the type of processor used and is covered in chapter 6.

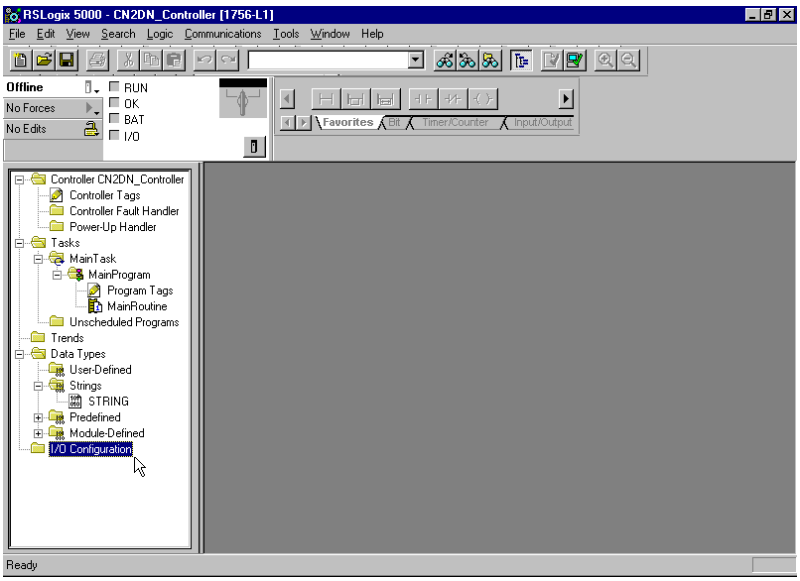
The procedure consists of first adding the 1788-CN2DN to the processor's I/O configuration using RSLogix 5000 software, and then configuring the ControlNet network using RSNetWorx software. A 1756-CNB or 1756-CNBR ControlNet bridge module must be installed in the ControlLogix chassis to connect the controller to the network.

The following table describes where to find specific information.

RSLogix 5000 Configuration

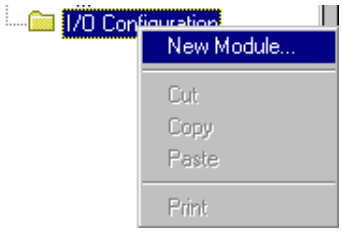
To interface the 1788-CN2DN module to a ControlLogix processor you must first add a local 1756-CNB module to the I/O configuration, and then add the CN2DN as a “child” of the 1756-CNB. The following example describes this procedure.

1. Open your **RSLogix5000** project.



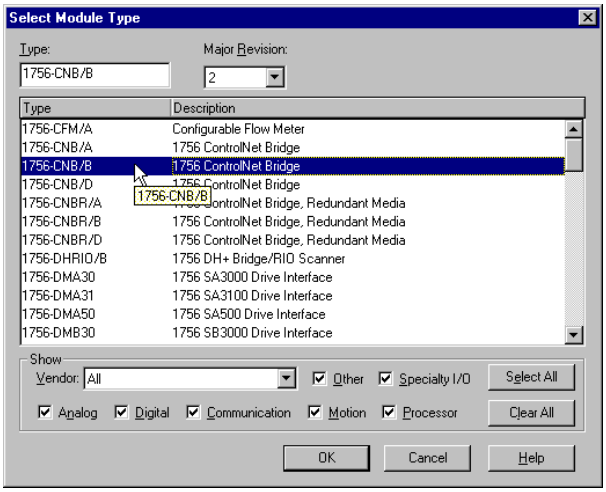
1. Right-click on the **I/O Configuration** folder at the bottom of the project window, as shown above.

   The following pop-up menu will appear.

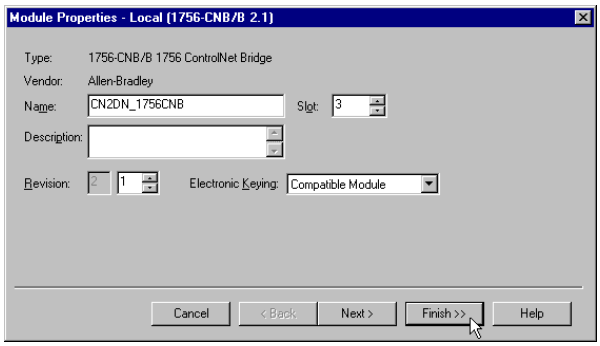


2. Select **New Module**.

The **Select Module Type** window will appear:



3. Select your **1756 ControlNet Bridge** from the list and click on **OK**. The **Module Properties** window will appear:



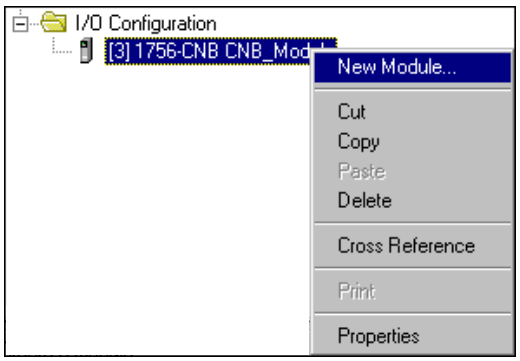
4. Enter the following information:

Name	Enter a name of your choice.
Description	(Optional)
Slot	Select the module's slot number.
Revision	Select the firmware minor revision number for the module.
Electronic Keying	Select "Compatible Module."

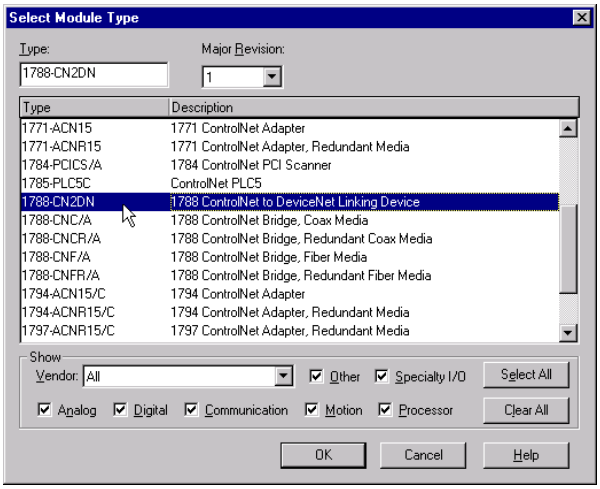
5. Click on the Finish >> button. The 1756-CNB module will be added to the I/O Configuration folder.

Next add the 1788-CN2DN linking device to the I/O configuration:

1. Right-click on the 1756-CNB module you have just created. The following pop-up window will appear:

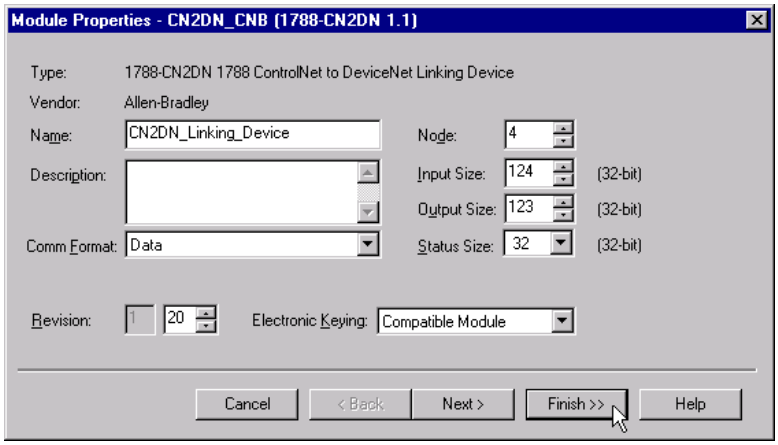


2. Select **New Module**. The **Select Module Type** window will appear.



3. Select the **1788-CN2DN ControlNet to DeviceNet Linking Device** and click on **OK**.

The **Module Properties** window will appear.



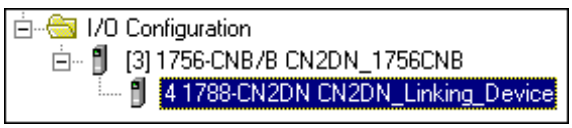
4. Enter the following information:

IMPORTANT Click on the **Help** button if you need assistance in selecting and setting these values.

Name	Enter a name of your choice.
Description	(Optional)
Comm Format	Data
Revision	Select the firmware minor revision number for the module.
Node	Select the ControlNet node you set with the faceplate switches.
Input Size	124 (default)
Output Size	123 (default)
Status Size	32 (default)
Electronic Keying	Compatible Module

5. When you are done, click on the Finish >> button.

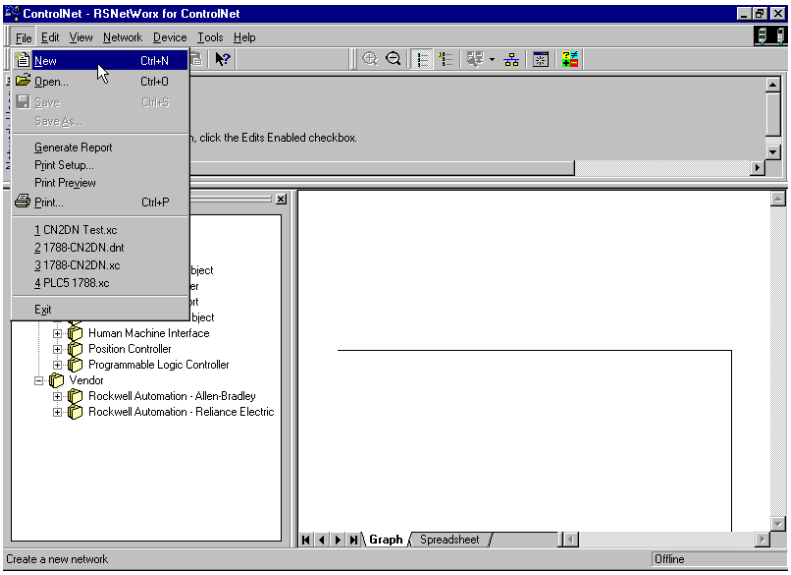
The I/O configuration should now appear as shown below:



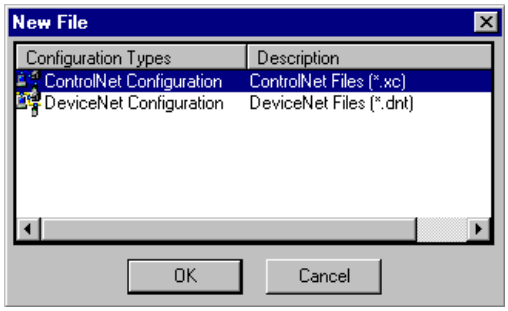
RSNetWorx for ControlNet Configuration

After you have added the linking device to the processor's I/O Configuration folder, use the following procedure to configure the ControlNet network.

1. Start **RSNetWorx**.



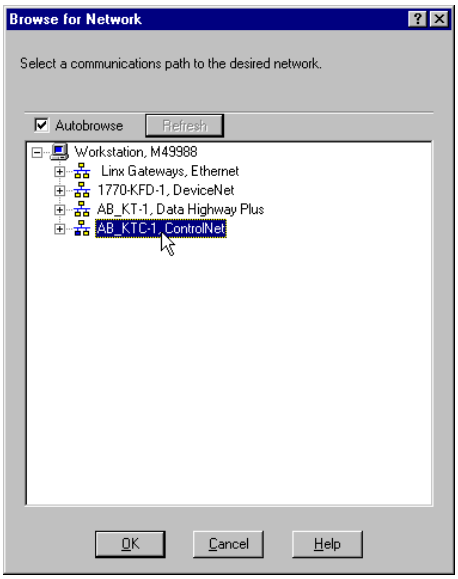
2. From the **File** menu select **New**. You will see the following pop-up window.



3. Select **ControlNet Configuration** and click on **OK**.

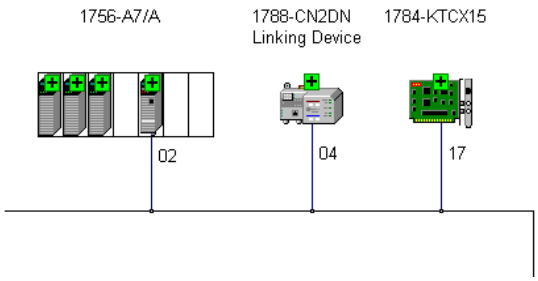
4. Click on the **Online**  button.

The **Browse for Network** window will appear. Your window will appear different from that shown below, depending upon the drivers you have configured on your system. However, you should have a ControlNet interface card (e.g., 1784-KTCX15) installed and the appropriate driver configured.



5. Select your **ControlNet** driver.

RSNetWorx will browse the ControlNet network for connected devices. When RSNetWorx is finished browsing, your network should appear on your screen similar to that shown below.

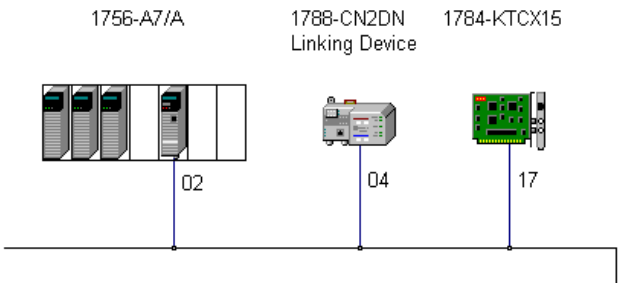


Note: "+" sign indicates the devices are new additions to the network.

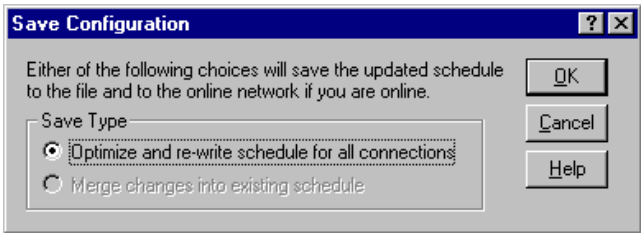
6. Check the **Edits Enabled** box. If you are initially configuring or reconfiguring your network you may see the following message.

7. Select "Use offline data (download)" and click on **OK**.

The new devices will be added to the network configuration (Note the "+" signs have disappeared).



8. From the **File** menu, select **Save As**. You will see the following message:



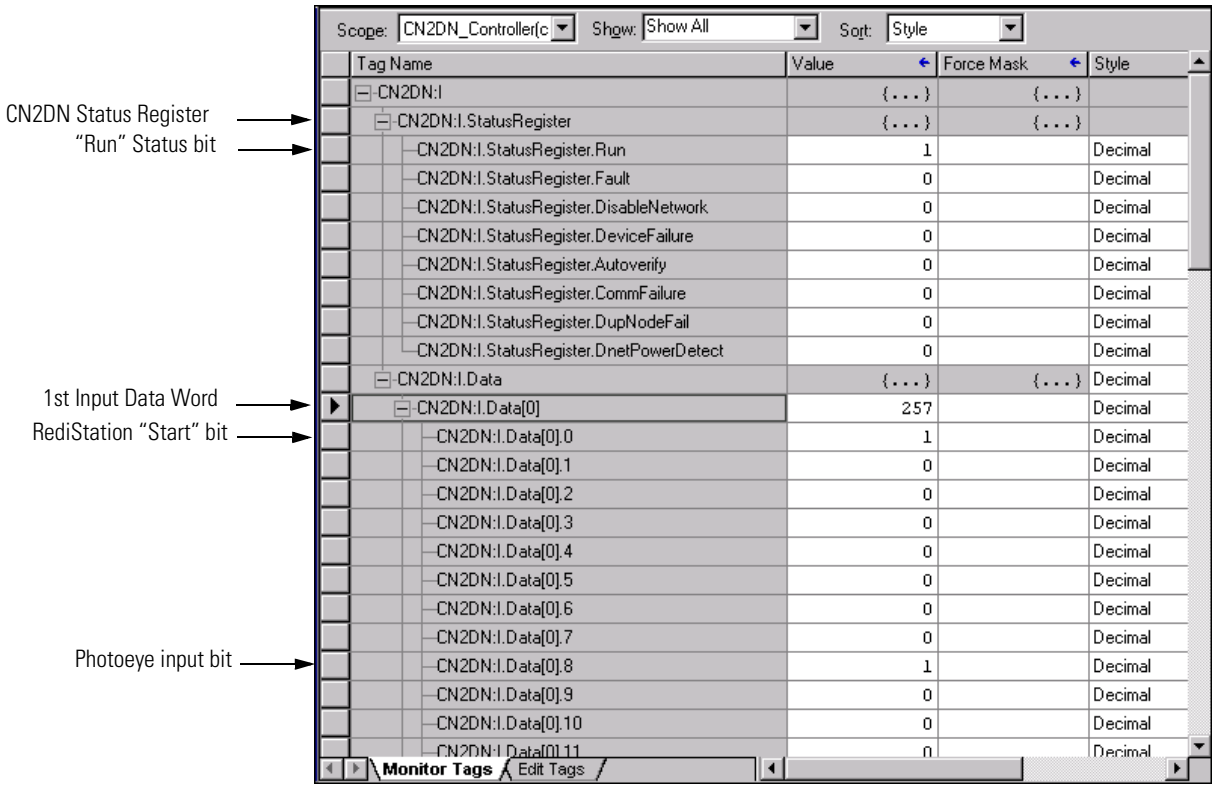
9. Select "Optimize and re-write schedule for all connections" and click on **OK**.

The ControlNet network is now configured and scheduled, and the controller is able to communicate with the ControlNet devices. If you have not done so, you should now configure your DeviceNet network. See chapter 6.

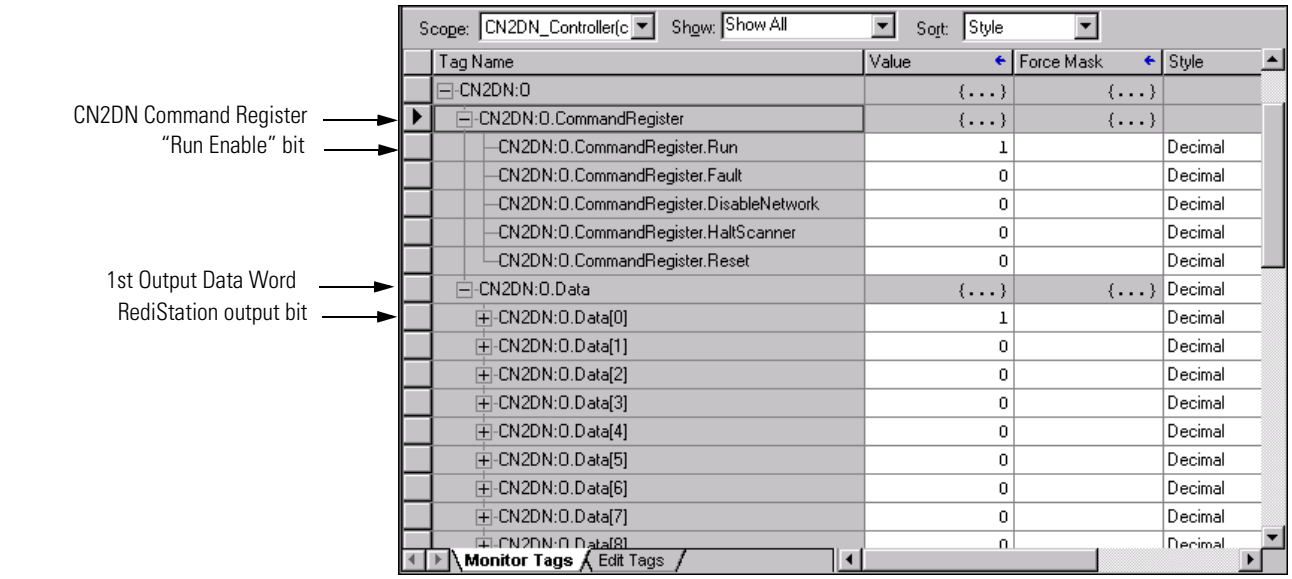
Viewing the CN2DN's Input, Output, and Status Structures

These examples are based on the configurations described in chapter 6. On the DeviceNet side, the RediStation input is mapped to bits 0-7 of the first input data word and the Photoeye to bits 8-15. The RediStation output is mapped to bits 0-7 of the first output data word. The 1788-CN2DN module also maintains an internal status structure that provides information about the module's ability to exchange DeviceNet messages with other nodes on the network.

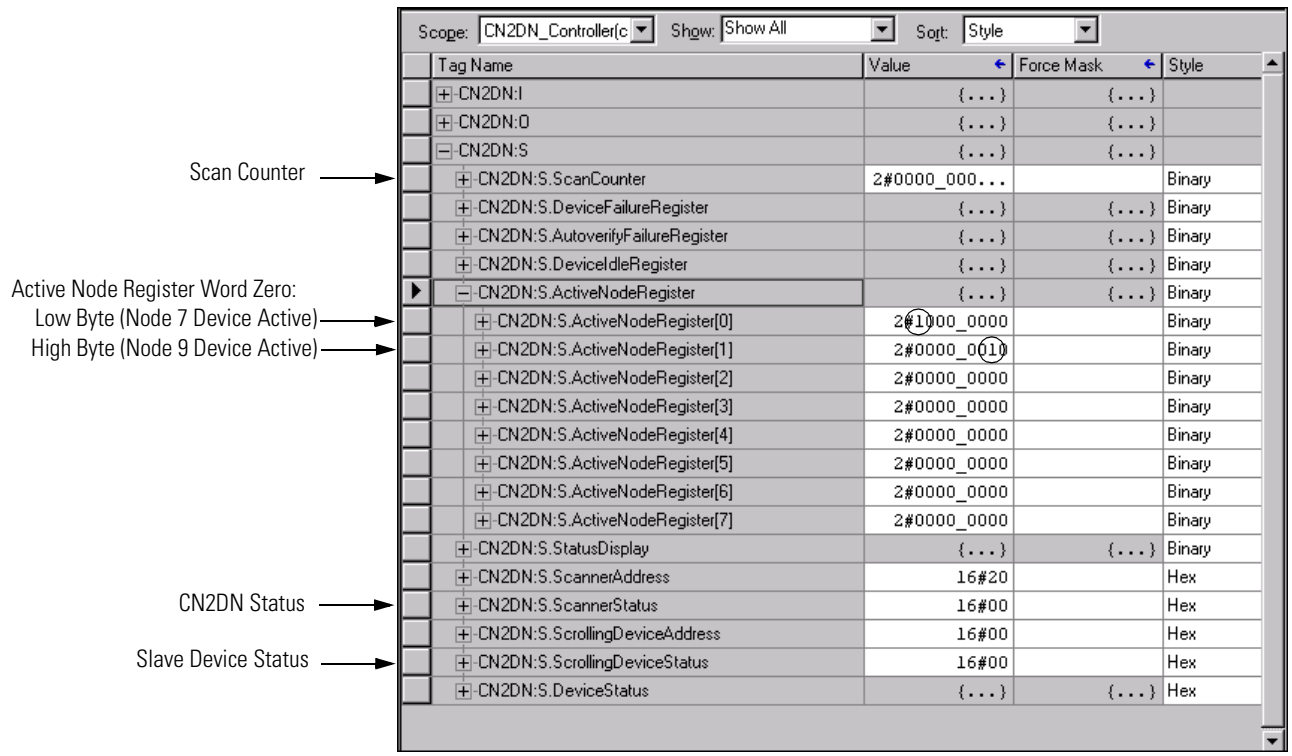
You can view these structures by monitoring the controller tags in RSLogix 5000. The following figure shows the CN2DN's input structure.



The following figure shows the CN2DN's output structure.



The 1788-CN2DN's status structure is shown below.



See Appendix B for a description of the status structure.

PLC-5 ControlNet Configuration

What This Chapter Contains

This chapter provides an example of the ControlNet configuration of the 1788-CN2DN linking device for a PLC-5/C processor. The procedure consists of configuring the ControlNet network using RSNetWorx software. The DeviceNet configuration is independent of the platform and is covered in chapter 6.

The following table describes where to find specific information.

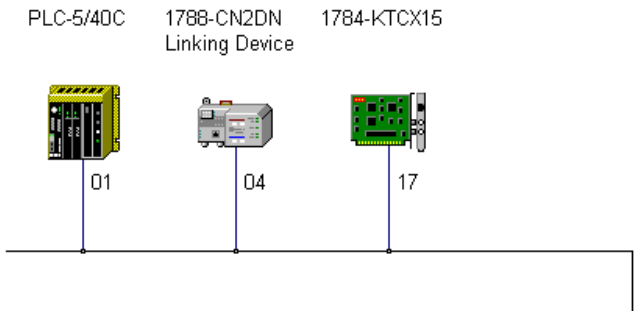
RSNetWorx for ControlNet Configuration

Use the following procedure to configure your ControlNet network.

1. Run **RSNetWorx for ControlNet**.

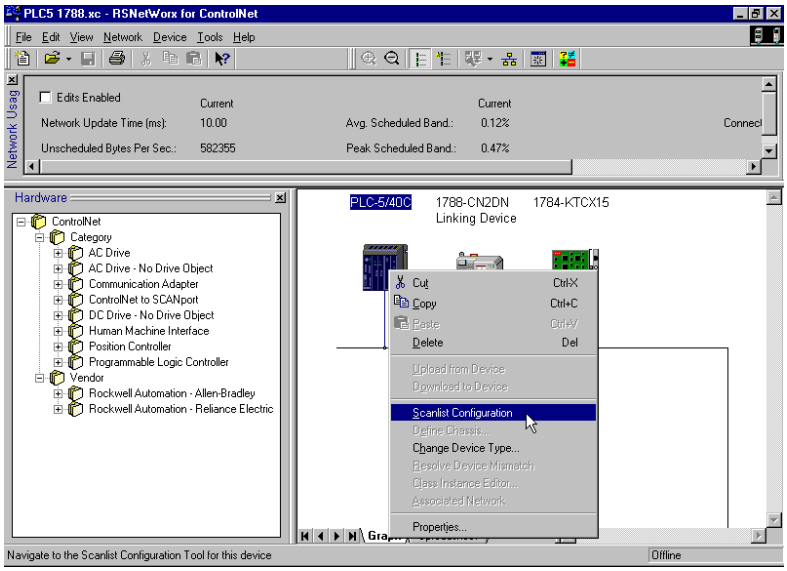
2. Go **Online**, **Browse** the network, and check the **Edits Enabled** box.

   Your network will appear on your screen showing the devices on your ControlNet network, similar to the one shown below.

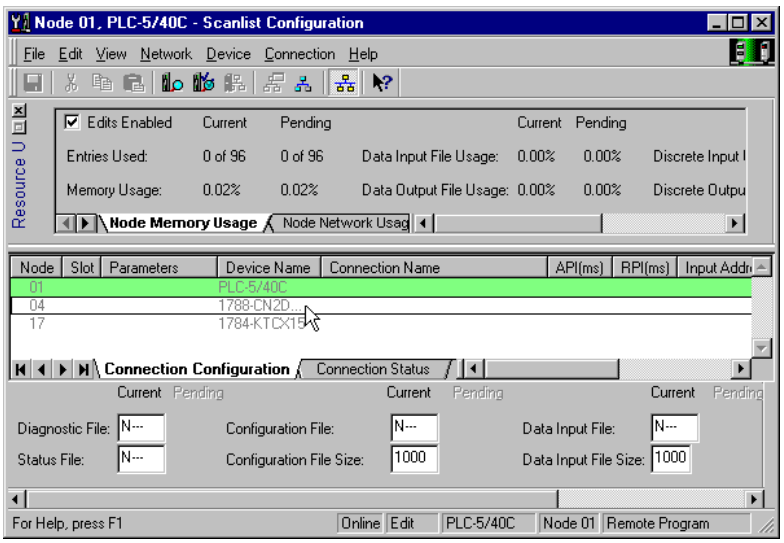


3. Right click on the PLC-5/40C icon on your screen.

You will see the following pop-up menu.

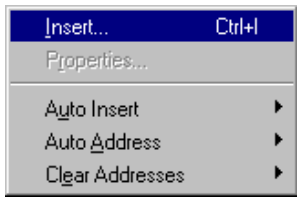


4. Select **Scanlist Configuration**. You will see the screen shown below.



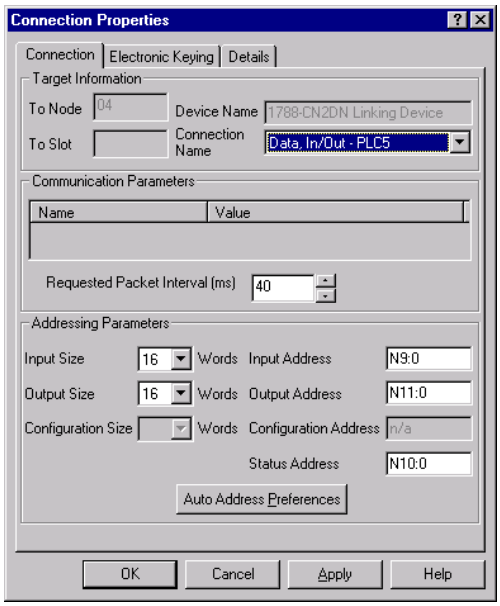
5. Go **Online**, **Enable Edits**, and select the 1788-CN2DN.

6. Select the **Connection** pull-down menu.



7. Select **Insert**.

The **Connection Properties** window will open.



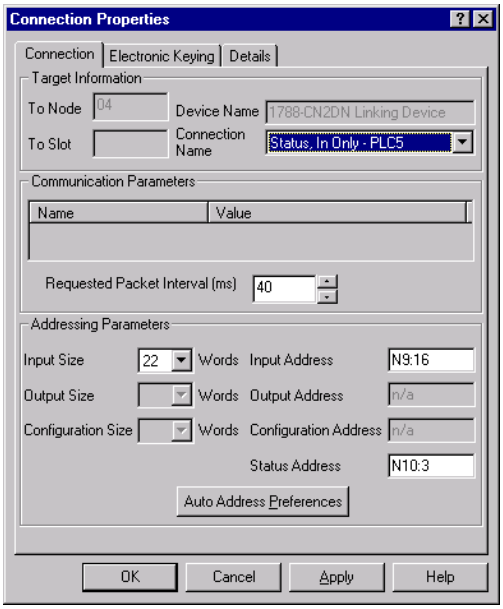
8. In the **Connection Name** box, select “Data, In/Out - PLC5” from the pull down list.

9. Click on the **Auto Address Preferences** button and verify that **Auto Addressing** is enabled (default).

10. Set the **Input Size** and **Output Size** to 16 Words for this example, and note the addresses assigned by the system (N9:0 and N11:0 above).

11. Click on **Apply**.

In order to see the diagnostic tables in the CN2DN you must also create a connection the CN2DN's status structure.



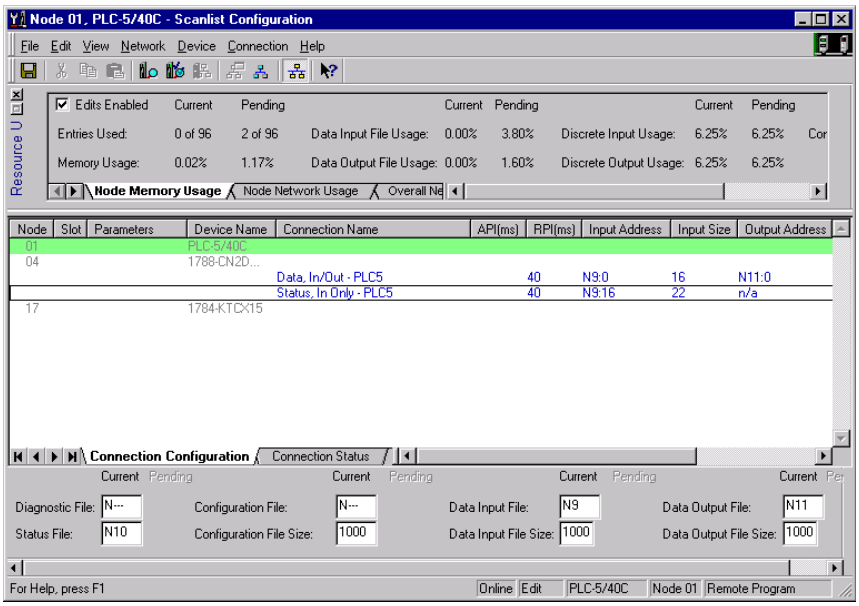
12. In the **Connection Name** field, select "Status, In Only - PLC5".

13. Set the **Input Size** to 22 words.

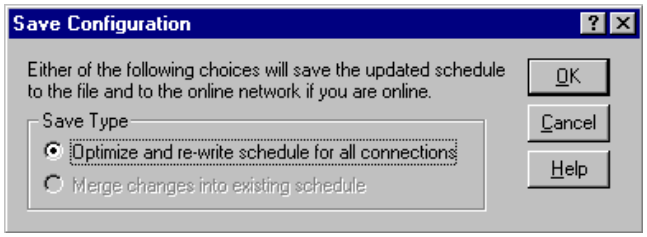
14. Note the **Input Address**. (N9:16 in the example above)

15. Click on **OK**. (You can leave the other parameters at their default settings.)

You will see the following screen. Note that the **Input (N9:0)**, **Output (N11:0)**, and **Status In Only - PLC5 (N9:16)** files have been assigned.

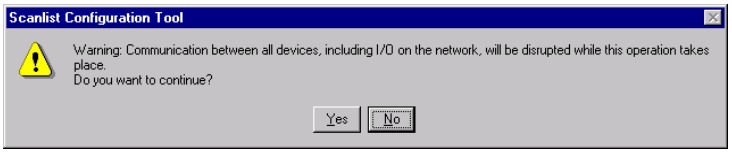


16. From the **File** menu, select **Save As**. Enter the name you want to save the file as and click on **Save**. You will see the following message:



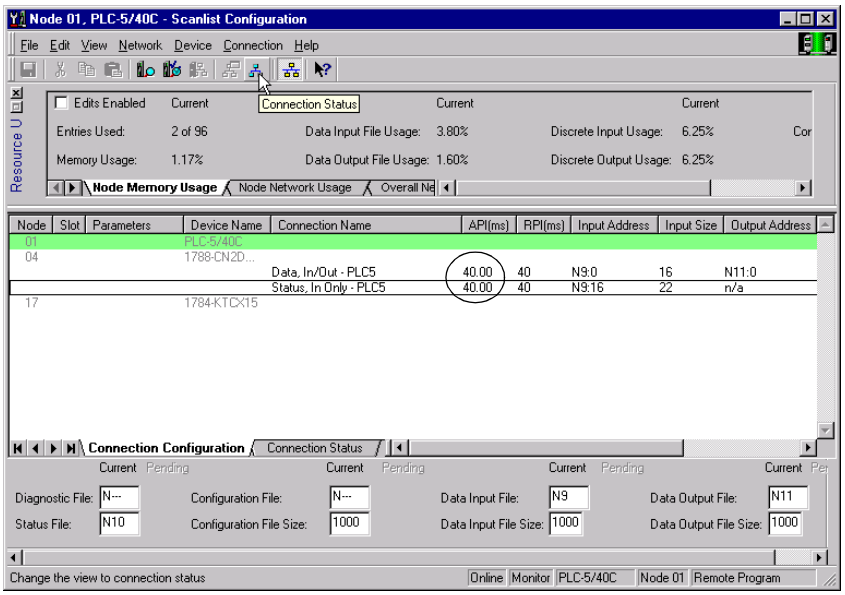
17. Select "Optimize and re-write schedule for all connections" and click on **OK**.

18. You will receive the following warning.

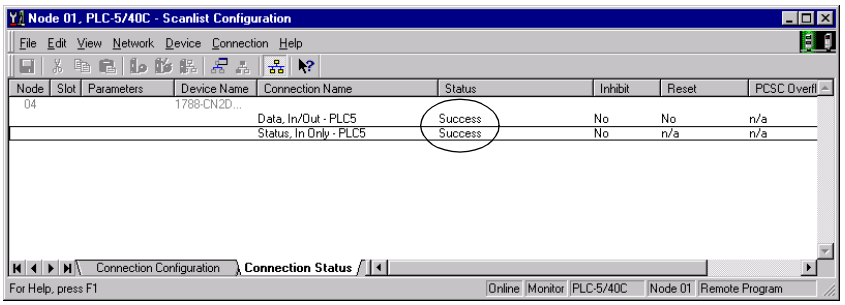


19. Click on **Yes**.

Note that after the configuration has been saved, the API (Actual Packet Interval) should be assigned as shown below.



20. Click on the **Connection Status** button in the Toolbar. You will see the following information.



21. Verify that the **Status** is "Success" for both connections.

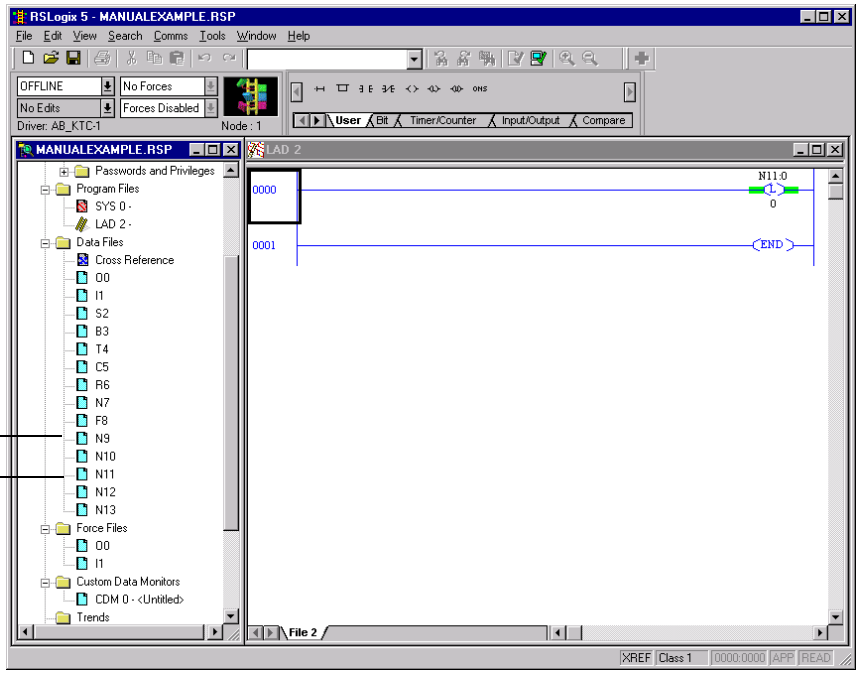
The ControlNet network is now configured and scheduled, and the controller is able to communicate with the ControlNet devices. If you have not done so, you should now configure your DeviceNet network. See chapter 6.

Viewing the CN2DN's Input, Output, and Status Structures

This example is based on the configurations described earlier in this chapter and in chapter 6. On the ControlNet side, the CN2DN's input data was connected to PLC-5 file N9, the output data was connected to file N11, and the status input data was connected as 22 words beginning at word N9:16. In chapter 6, on the DeviceNet side, the RediStation input is mapped to bits 0-7 of the first input word and the Photoeye to bits 8-15. The RediStation output is mapped to bits 0-7 of the first output word.

To view the CN2DN's input, output, and status structures perform the following steps:

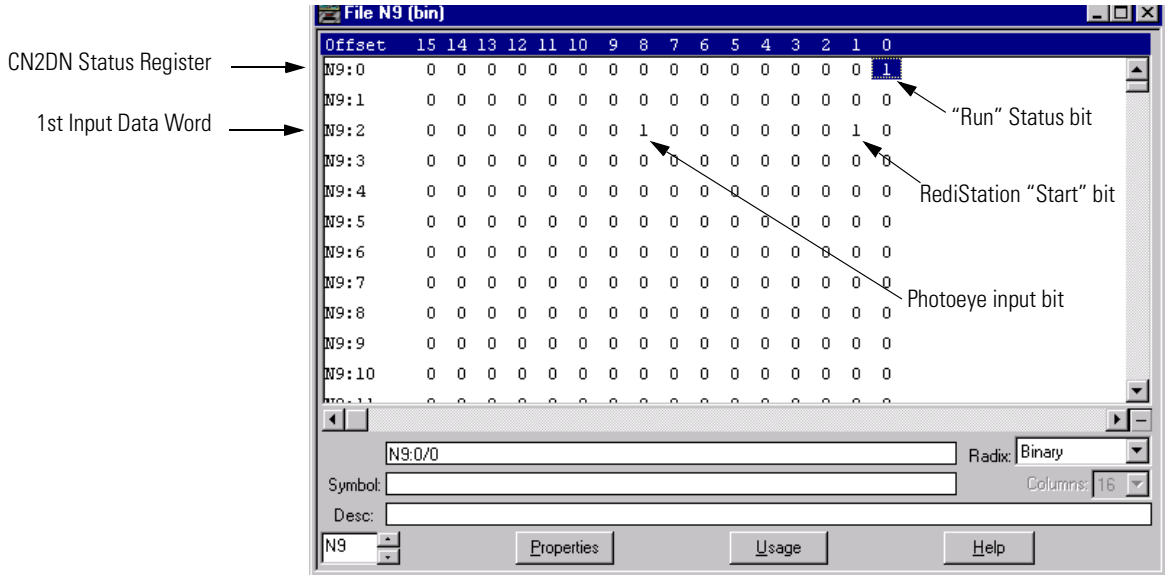
1. Open your project file in RSLogix 5. You will see the files created during the RSNetWorx configuration in the Project window.



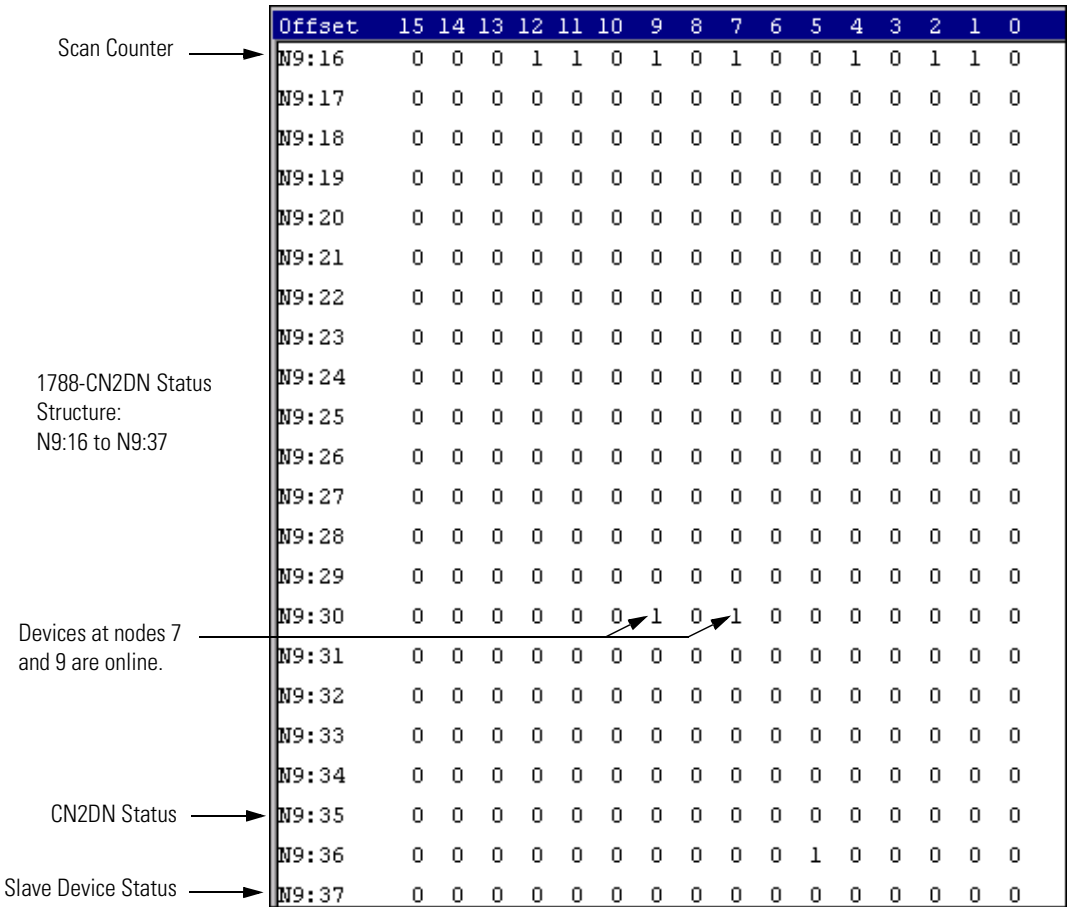
Files created during RSNetWorx for ControlNet configuration

2. Select file **N9** to view the input word and CN2DN status structure.

The example below shows the mapping of the CN2DN's input word to file **N9**.

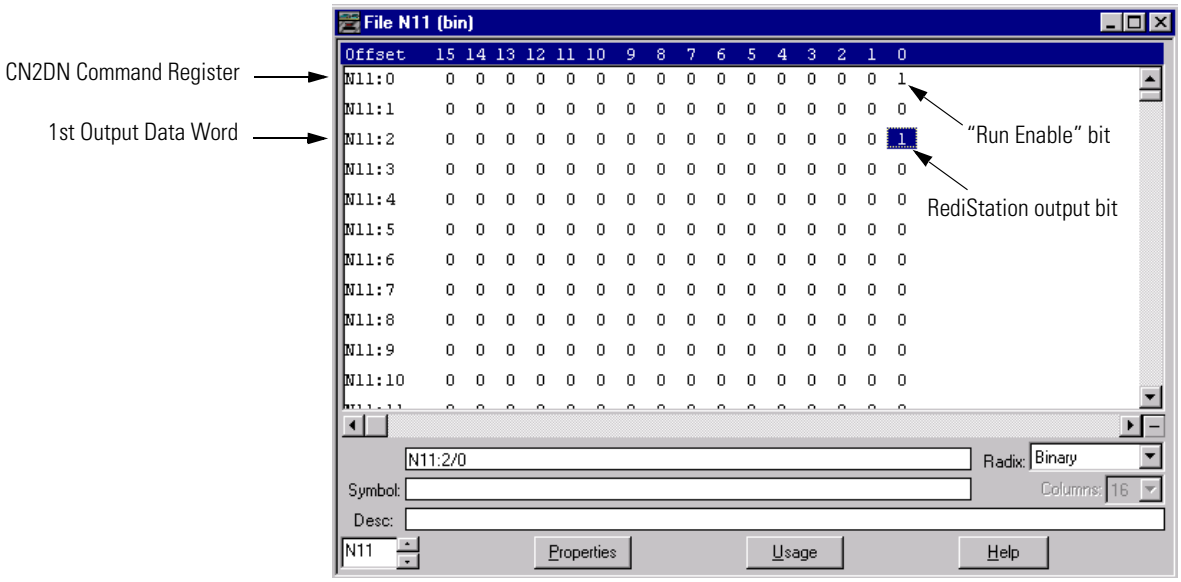


3. Scroll to **N9:16** to see the CN2DN status structure, as seen below.



See Appendix B for a description of the status structure.

4. Select file **N11** to view the CN2DN's output word.



This concludes the PLC-5/C example. You should now be able to perform the steps described in this chapter on your actual system.

SLC 500 ControlNet Configuration

What This Chapter Contains

This chapter provides an example of the ControlNet configuration of 1788-CN2DN linking device for use with a SLC 500 processor. The procedure consists of configuring the ControlNet network using RSNetWorx software. The DeviceNet configuration is independent of the platform and is covered in chapter 6.

The following table describes where to find specific information.

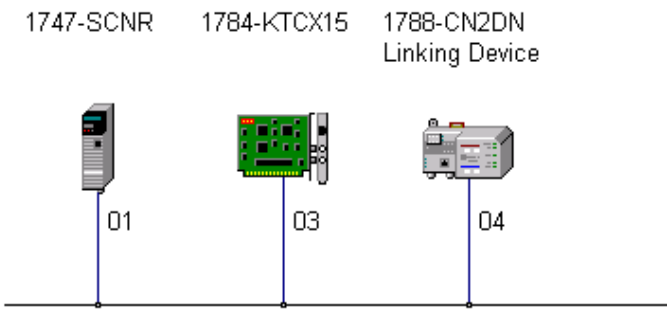
RSNetWorx for ControlNet Configuration

Use the following procedure to configure your ControlNet network.

1. Run **RSNetWorx for ControlNet**.

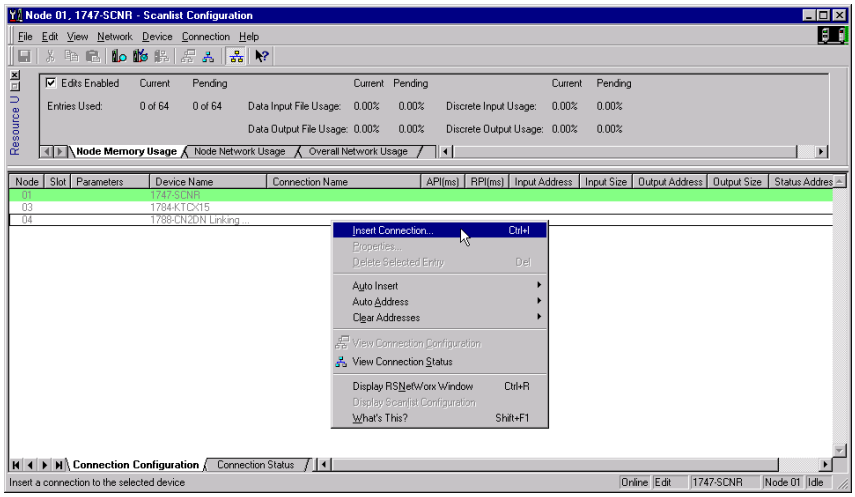
2. Go **Online**, **Browse** the network, and check the **Edits Enabled** box.

   Your network will appear on your screen showing the devices on your ControlNet network, similar to the one shown below.

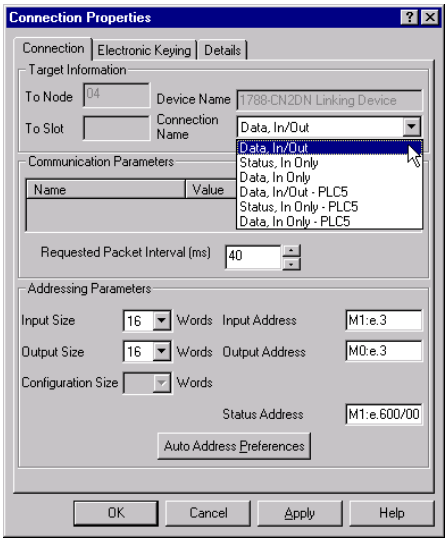


3. Right click on the 1788-CN2DN icon on your screen. (Alternately, select the **Connection** pull-down menu.)

You will see the pop-up menu shown below.

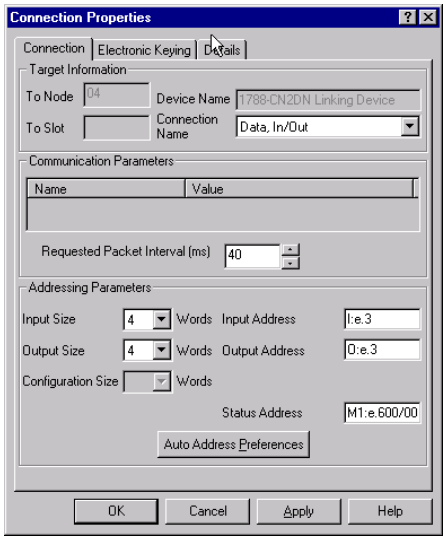


4. Select **Insert Connection**. The **Connection Properties** window will open.



5. In the **Connection Name** box, select **Data, In/Ou**t from the pull down list.

Note that in this example we use discrete input and output tables in order to show the mapping to the CN2DN module at the end of this chapter. Normally, you would use the default M1 and M0 files.



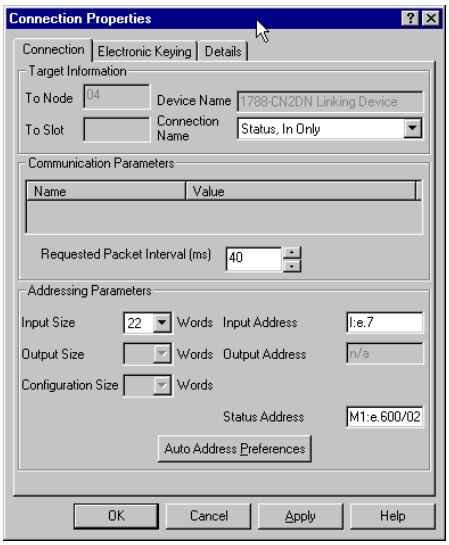
6. Click on the **Auto Address Preferences** button and disable **Auto Addressing**.

7. Set the **Input Size** and **Output Size** to 4 Words.

8. Set the **Input Address** and **Output Address** to "I:e.3" and "O:e.3".

9. Click on **Apply**.

   In order to see the diagnostic tables in the CN2DN you must also create a connection the CN2DN's status structure.



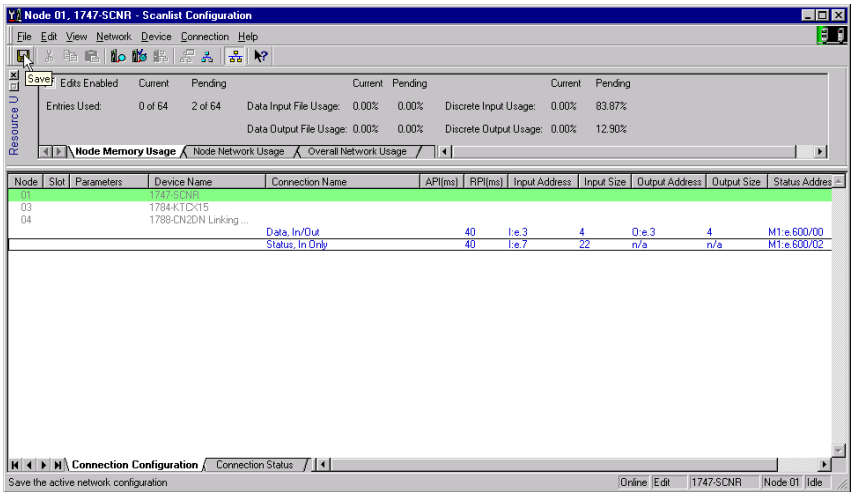
10. In the **Connection Name** field, select "Status, In Only".

11. Set the **Input Size** to 22 words.

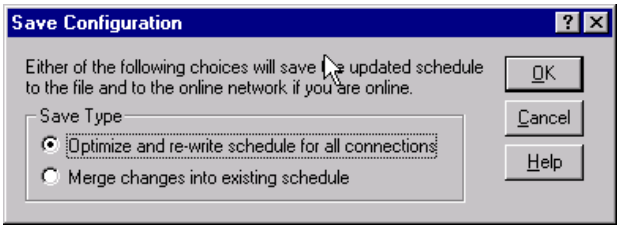
12. Set the **Input Address** to "I:e.7".

13. Click on **OK**. (You can leave the other parameters at their default settings.)

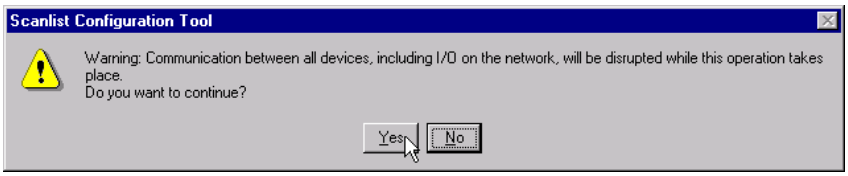
You will see the following screen. Note that the **Input (I:e.3)**, **Output (O:e.3)**, and **Status In Only (I:e.7)** files have been assigned.



14. From the **File** menu, select **Save As**. Enter the name you want to save the file as and click on **Save**. You will see the following message:

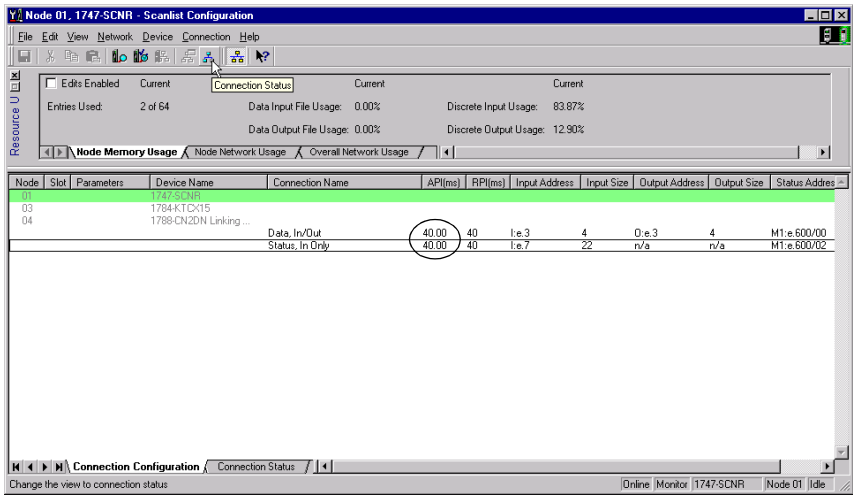


15. Select "Optimize and re-write schedule for all connections" and click on **OK**. You will see the following warning:

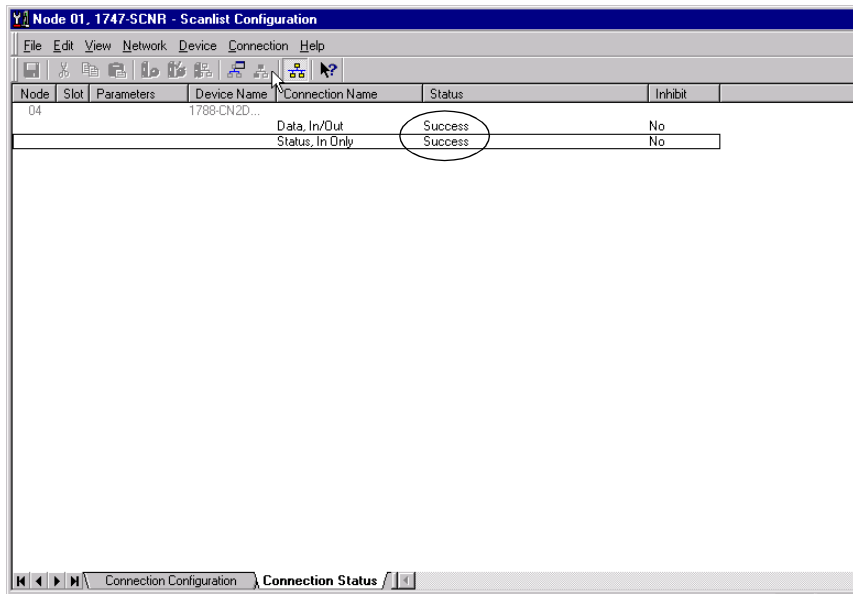


16. Click on **Yes**.

Note that after the configuration has been saved, the API (Actual Packet Interval) should be assigned as shown below.



17. Click on the **Connection Status** button. You will see the following information.



18. Verify that the **Status** is "Success" for both connections.

The ControlNet network is now configured and scheduled, and the controller is able to communicate with the ControlNet devices. If you have not done so, you should now configure your DeviceNet network. See chapter 6.

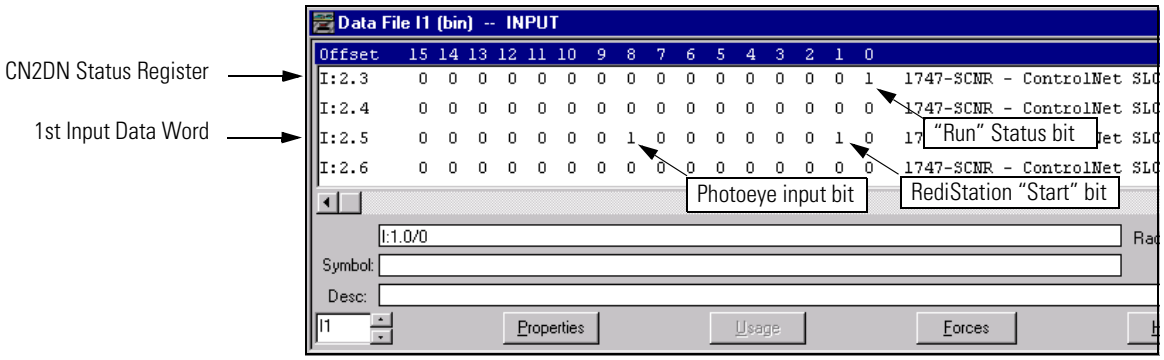
Viewing the CN2DN's Input, Output, and Status Structures

This example is based on the configurations described earlier in this chapter. On the ControlNet side, the CN2DN's input data was connected to SLC 500 discrete input I:e.3, the output data to discrete output O:e.3, and the status input data was connected as 22 words beginning at word I:e.7. In chapter 6, on the DeviceNet side, the RediStation input is mapped to bits 0-7 of the first input word and the Photoeye to bits 8-15. The RediStation output is mapped to bits 0-7 of the first output word.

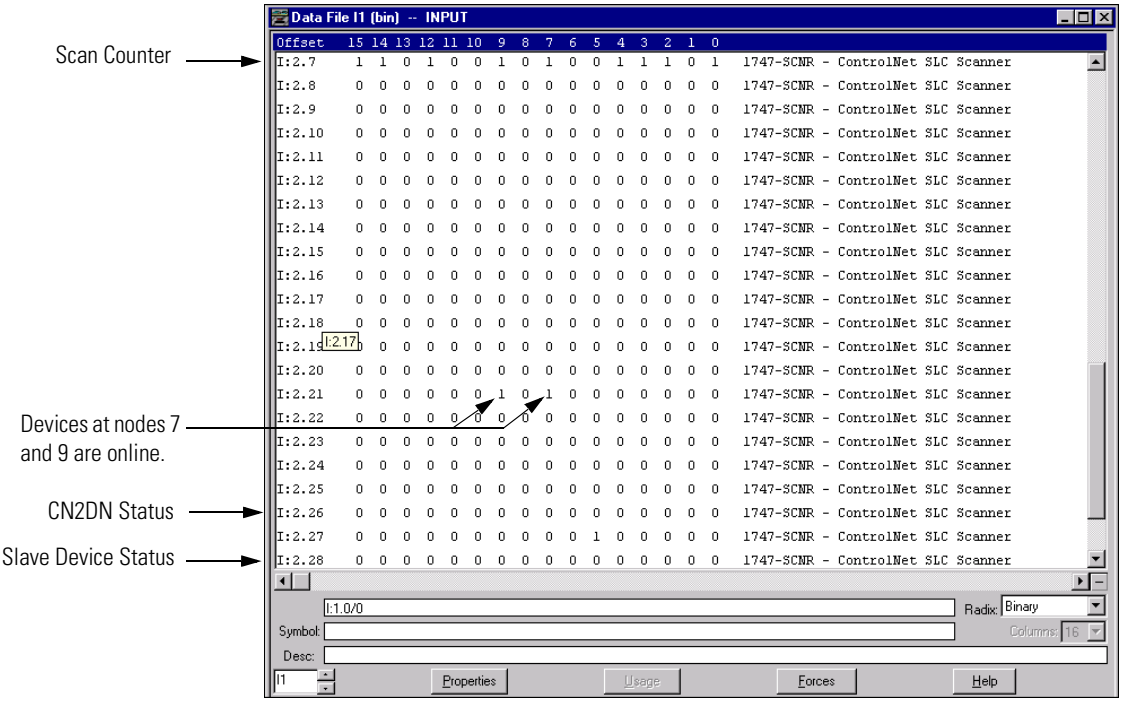
To view the CN2DN's input, output, and status structures perform the following steps:

1. Open your project file in RSLogix 500.

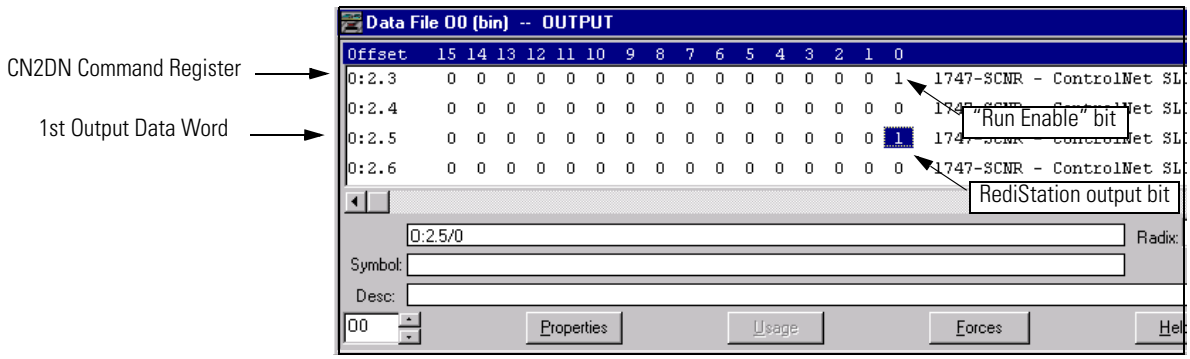
2. Select discrete input **I:e.3** to view the input word.



3. Select discrete input **I:e.7** to see the CN2DN status structure, as seen below. See Appendix B for a description of the status structure.



4. Select discrete output **O:e.3** to view the CN2DN's output word.



This concludes the SLC 500 example. You should now be able to perform the steps described in this chapter on your actual system.

RSNetWorx for DeviceNet Configuration

What This Chapter Contains

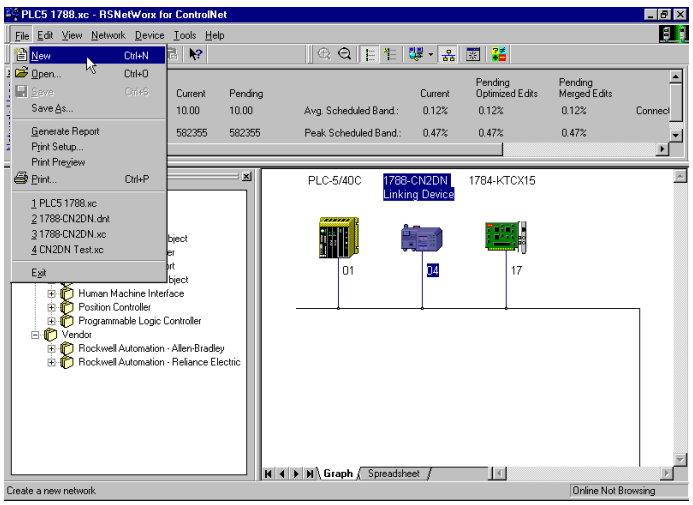
This chapter provides an example of configuring a DeviceNet network using RSNetWorx software. The procedure is the same regardless of the platform (ControlLogix, PLC-5, or SLC 500).

Note: Our example accesses the DeviceNet network via the ControlNet network. This requires you to first configure the ControlNet network. This is not necessary if you have direct access to your DeviceNet network (e.g., via a 1770-KFD, 1784-PCD, 1784-PCID, or 1784-PCIDS).

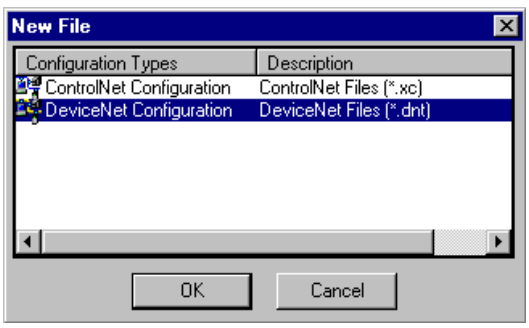
Configuration Procedure

Use the following procedure to configure your DeviceNet network:

1. From the RSNetWorx **File** menu, select **New**.

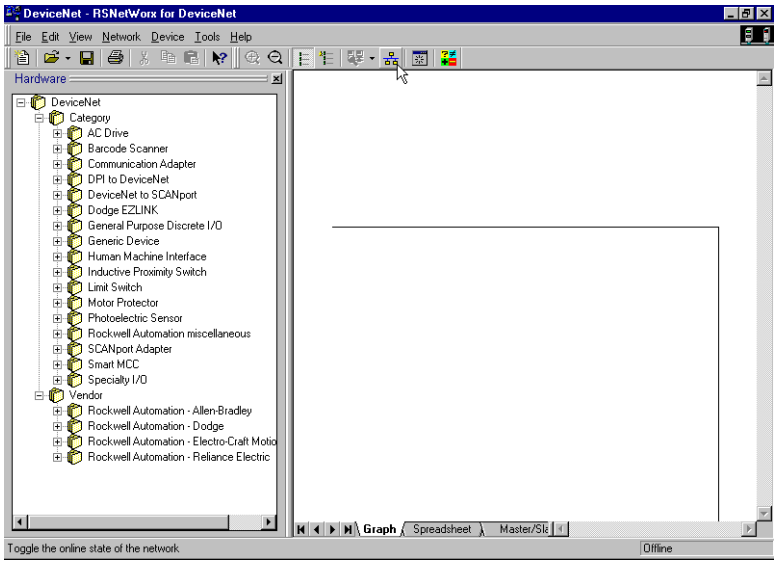


You will see the following pop-up window.

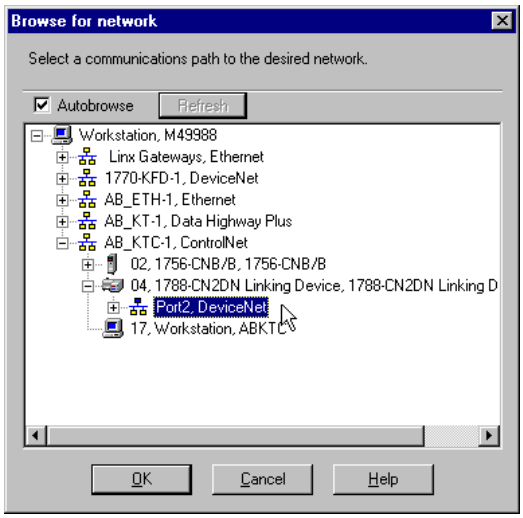


2. Select **DeviceNet Configuration** and click on **OK**.

   The RSNetWorx for DeviceNet main screen will appear.



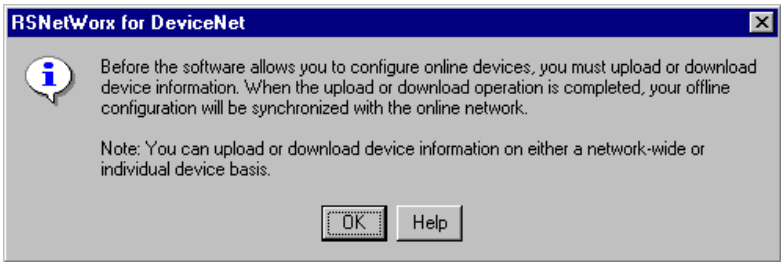
3. Click on the **Online** button. The **Browse for network** window will appear. (Your window will display the drivers you have installed on your system).



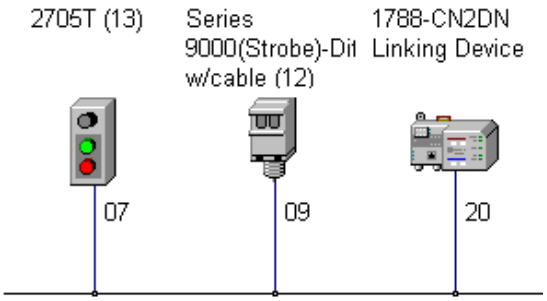
4. Select the ControlNet driver (e.g., AB_KTC-1 in the window above) and expand the tree through the 1788-CN2DN Linking Device to the DeviceNet port.

5. Highlight the DeviceNet port and click on **OK**.

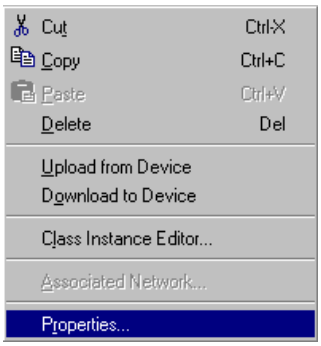
The following prompt will appear:



6. Click on **OK.** RSNetWorx will browse the DeviceNet network. When browsing is complete you should see all of the devices you have on your DeviceNet network. Our example network is shown below.

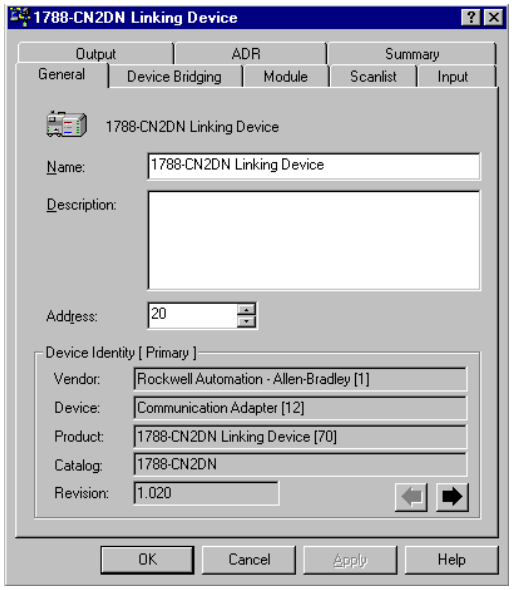


7. Right-click on the **1788-CN2DN** icon. The following pop-up menu will appear:

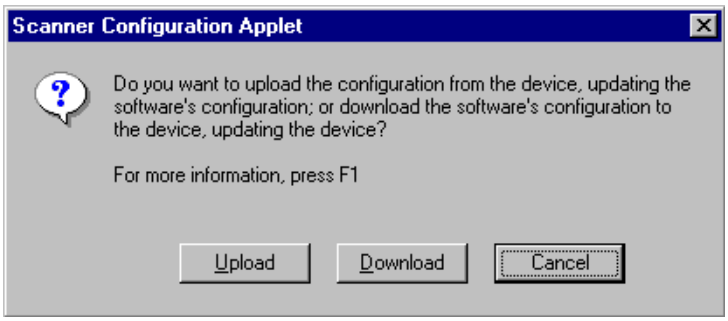


8. Select **Properties**.

The following window will appear.

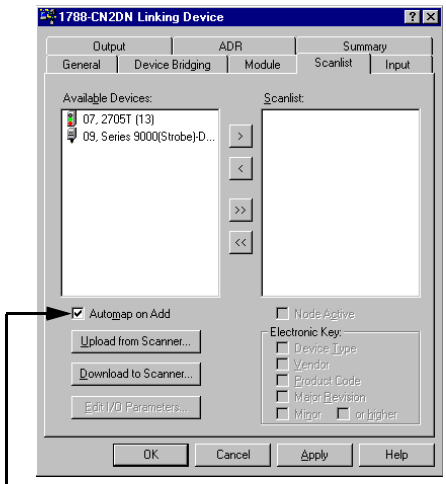


9. Select the **Scanlist** tab. You will see the following Scanner Configuration Applet.



10. Click on **Upload**.

The **Available Devices** on your network will be displayed on the left side of the **Scanlist Tab**.

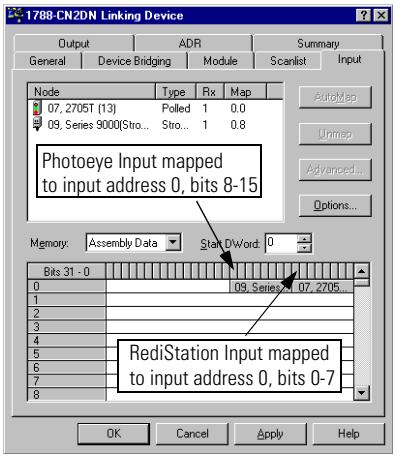


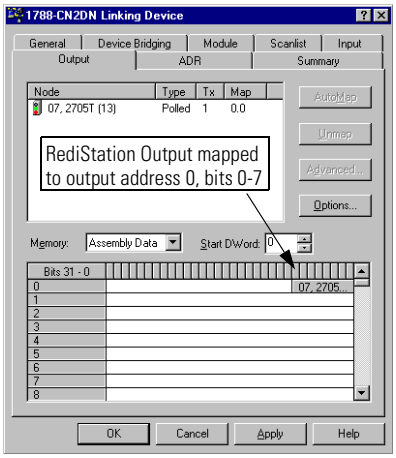
11. Verify that the **Automap on Add** box is checked to automatically map your devices when you add them to the scanlist (recommended).

12. Highlight the desired devices in the **Available** window, and move them to the **Scanlist** window with the > or >> (all devices) button.

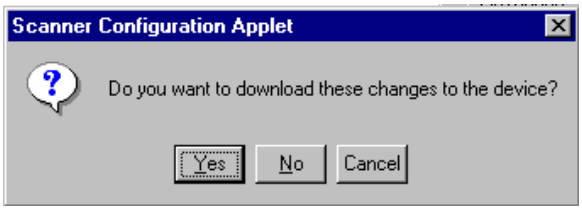
13. After adding the devices to the Scanlist, select the **Input** and **Output** tabs to view and record the mapping of the devices. You will see the following screens:

IMPORTANT Click on the **Help** button if you need assistance in performing these steps and for additional information about how to use these screens.





14. Click on **OK**. You will see the following **Scanner Configuration Applet**.

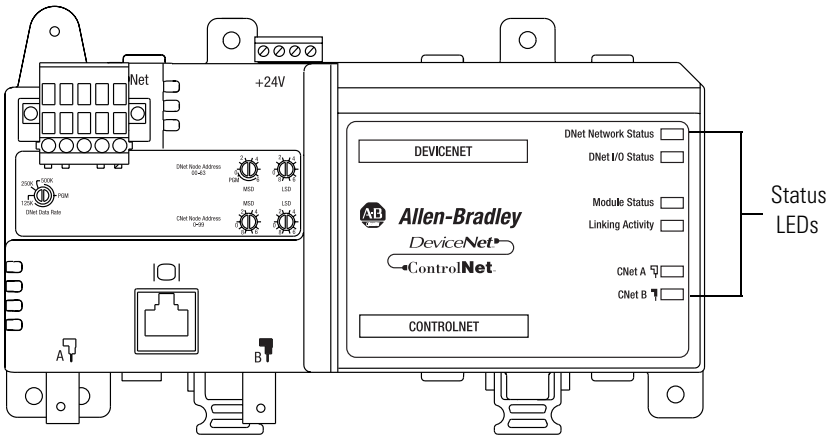


15. Click on **Yes** to download the changes to the 1788-CN2DN linking device.

16. **Save** your DeviceNet configuration.

LED Status Indicators

The Status LEDs are located on the front of the CN2DN module, as shown in figure below.



Module STATUS LED

The Module Status LED indicates whether the CN2DN is powered, configured, and operating properly. The following table shows how to interpret the Module Status LED.

LED State	Meaning
Off	No power to device.
Flashing green	Standby state. The CN2DN module has passed all self tests and is ready to operate, but is not configured.
Steady green	Operational state. The CN2DN module has been configured.
Flashing red	Module has recoverable faults, or the DNet Data Rate or DNet Node Address switches are set in the PGM range.
Steady red	Unrecoverable fault(s)

Linking Activity LED

The Linking Activity LED indicates the rate of traffic through the linking device. The following table shows how to interpret the Linking Activity Status LED.

LED State	Meaning
Off	No traffic
Flashing green	Traffic present (flash rate reflects amount of traffic)
Flashing red and green	Module is running boot code only (reduced functionality code only for FLASH upgrading)

ControlNet Network Status LEDs (CNet A, CNet B)

The ControlNet Network Status LEDs indicate the state of the ControlNet network connected to the BNC connectors. If more than one state is present, the LEDs always reflect the highest priority status present on the network. Note that these LEDs do not reflect the status of the network access port (NAP). The following table describes the LED states and the priority of each status LED.

LED State	Priority	How to View	Cause
Both steady off	1 (highest)	View together	Reset or no power
Both steady red	2		Failed to link interface to ControlNet
Alternating red & green	3		Self testing
Alternating red	4		Bad node configuration (such as duplicate ControlNet network address)
Steady off	5	View independently	Channel disabled or not supported
Flashing red & green	6		Invalid link configuration
Flashing red	7		Link fault or no frames received
Flashing green	8		Temporary channel error or listen only
Steady green	9 (lowest)		Normal operation

DeviceNet Network Status LED (including Slave Mode)

The DeviceNet Network Status LED indicates the functional states of the DNet port. The following table describes each state.

LED State	Meaning
Off	Not online, no network power, or no device power.
Flashing green	No connections established, or timed-out.
Steady green	At least one connection established, none timed-out.
Flashing red	At least one connection in timed-out state.
Steady Red	Bus off, or duplicate MAC ID.

DeviceNet I/O Status LED

The DeviceNet I/O Status LED indicates the functional state of the I/O on the DeviceNet. The following describes each state.

LED State	Meaning
Off	Not online, no network power, or no device power.
Flashing green	Processor (controller) in Program (Idle) mode.
Steady green	Processor (controller) in Run mode.
Flashing red	*Not defined.*
Steady red	*Not defined.*

1788-CN2DN Input, Output, and Status Structures

The 1788-CN2DN provides a single default input, output, and status structure. These default I/O structures reduce the complexity of connecting DeviceNet I/O and status data with ladder programs. The module creates all 3 structures whether or not DeviceNet nodes are configured or online. RSNetWorx for DeviceNet configures scanlist map segments that are used to copy specific portions of I/O data between the I/O structures and DeviceNet network packets.

Input Structure

The control processor receives input data by reading from an input data structure in the 1788-CN2DN module. The scanner (i.e., the CN2DN) receives input data from DeviceNet modules and delivers a copy of these values to the controller. The input structure consists of one 32-bit module status register and an array of 124 32-bit words for input data. The 32-bit module status register reflects the current state of several key module-level operational parameters.

The input structure consists of these data regions.

Input Structure Element	Data Type
module status register	1 x 32-bit register
input_data	124 x 32-bit data array

Module Status Register Bit Definitions

The bits of the module status register as defined in the following table.

Bit	Name	Description
0	Run	1 = in run mode 0 = in idle mode
1	Fault	1 = network is faulted
2	DisableNetwork	1 = network is disabled
3	DeviceFailure	1 = device failure exists (examine the status structure for causes)
4	Autoverify	1 = device I/O size mismatch exists (examine the status structure for details)
5	CommFailure	1 = communication failure exists
6	DupNodeFail	1 = failure due to duplicate node address
7	DnetPowerDetect	1 = DeviceNet power failure
8 - 31	Reserved	unused

TIP

See page 3-9 (ControlLogix), page 4-8 (PLC-5), or page 5-6 (SLC 500) for the location of this register in the input file.

Output Structure

The controller sends output by writing output data to the output structure in the 1788-CN2DN module. The CN2DN then delivers a copy of these output values to modules on DeviceNet. The output structure consists of a 32-bit command register and a variable size 32-bit array of up to 123 words for output data.

The output structure consists of these data regions:

Output Structure Element	Description	Data Type
module command register	This 32-bit register consists of several bits that affect the module's behavior on the network.	1 x 32-bit register
output_data		123 x 32-bit data array

Module Command Register Bit Definitions

The bits of the module command register are defined as follows.

Bit	Name	Description
0	Run	1 = run mode 0 = idle mode
1	Fault	1 = fault network
2	DisableNetwork	1 = disable network
3	HaltScanner	1 = halt module
4	Reset	1 = reset module
5 - 31	Reserved	unused

IMPORTANT If a module is halted because the HaltScanner bit is set, power must be physically recycled to restart the module.

TIP See page 3-10 (ControlLogix), page 4-9 (PLC-5), or page 5-7 (SLC 500) for the location of this register in the output file.

Status Structure

The controller receives status information concerning the 1788-CN2DN module's ability to exchange DeviceNet messages with other nodes by reading from the status structure in the 1788-CN2DN module. The CN2DN periodically updates the contents of the status structure and copies its contents to the controller. The status structure consists of several 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 consists of these data elements:

Status Structure Element	Description	Data Type
ScanCounter	counter incremented each I/O scan	32-bit
DeviceFailureRegister	device failed bit table	64-bit
AutoverifyFailureRegister	device I/O size does not match scanner's internal table	64-bit
DeviceIdleRegister	device's idle bit table	64-bit
ActiveNodeRegister	node online bit table	64-bit
ScannerAddress	DeviceNet address of CN2DN module	8-bit BCD
ScannerStatus	status of CN2DN module	8-bit BCD
ScrollingDeviceAddress	scrolls through DeviceNet nodes once per second by address and status (0 = no faults)	8-bit BCD
ScrollingDeviceStatus		8-bit BCD
Reserved Array	future expansion (20 bytes)	20 x 8-bit
DeviceStatus	DeviceNet node status array, 1 byte per device	64 8-bit

You can view the status structure by monitoring the controller tags in RSLogix 5000 (chapter 3), or by mapping the status structure to a file in a PLC-5 or SLC 500 processor and viewing the file in RSLogix 5 (chapter 4) or RSLogix 500 (chapter 5).

Interpreting the Numeric Codes

The ScannerStatus member displays numeric codes providing diagnostic information about the module. The ScrollingDeviceStatus member provides diagnostic information about the slave devices. The following table summarizes the meanings of the numeric codes.

TIP

See page 3-10 (ControlLogix), page 4-8 (PLC-5), or page 5-6 (SLC 500) for the locations of the numeric codes in the status structure.

Numeric Status Codes

Numeric Code	Description	Action
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.	Reconfigure the scan list table and remove any illegal data.
72	Slave device stopped communicating.	Inspect the field devices and verify connections.
73	Device's identity information does not match electronic key in scan list table entry.	Verify that the correct device is at this node number. Make sure that the device at the scrolling node address matches the desired electronic key (vendor, product code, product type, etc.).
74	Data overrun on port detected.	Modify your configuration and check for invalid data. Check network communication traffic.
75	No traffic from other modules detected on the network.	Check the network configuration. (Scanlist may be empty.)
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.	Reconfigure your module for the correct transmit and receive data sizes.
78	Slave device in scan list table does not exist.	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.

Numeric Status Codes

Numeric Code	Description	Action
82	Error detected in sequence of fragmented I/O messages from device.	Check scan list table entry for slave device to make sure that input and output data lengths are correct. Check slave device configuration.
83	Slave device is returning error responses when module attempts to communicate with it.	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 was incorrect for this device at runtime.	• Slave device is transmitting incorrect length data. • Verify device is not configured for variable poll connection size. • Try replacing the device.
86	Device is producing zero length data (idle state) while module is in Run Mode.	Check device configuration and slave node status.
87	The primary owner has not allocated the slave.	Put the primary owner on line.
88	The connection choices (polled, strobed, etc.) between the primary connection and the shared input only connection do not match.	Reconfigure the shared input only connection's choice(s) to be the same as, or a subset of, the primary connection's choice(s).
89	Slave device initialization using Auto Device Replacement parameters failed.	• Put the slave device into configurable mode. • Check the slave's EDS file, if the slave is configured offline. • Check to see if the slave device has been replaced with an incompatible device.
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 communication 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.
98	General firmware error	Replace module.

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