



EtherNet/IP-to-DeviceNet Linking Device

Catalog number 1788-EN2DN

This publication tells you how to install the 1788-EN2DN EtherNet/IP-to-DeviceNet linking device and use RSNetWorx for DeviceNet to configure it.

For information on	See page
About the Linking Device	1
Installing and Configuring the Linking Device	7
Understanding Status and Diagnostic LEDs	34
Using Diagnostic Web Pages	38
Specifications	42
Dimensions	44
DeviceNet Connector Pinouts	44
EtherNet/IP RJ45 Connector Pinouts	45

About the Linking Device

The 1788-EN2DN EtherNet/IP-to-DeviceNet linking device lets you seamlessly connect your information- or control-level networks with your device-level network.

The linking device provides full DeviceNet master functionality, so you can connect up to 63 DeviceNet slave devices to an Ethernet TCP/IP interface that supports EtherNet/IP and a HTTP web server. As examples, you could use the linking device:

- as a gateway to connect information- or control-level networks to device-level networks for programming, configuration, control or data collection
- as a router/bridge to connect the EtherNet/IP network to the DeviceNet network

The linking device provides centralized data storage, or I/O tables, for data shared between the DeviceNet and EtherNet/IP networks. Data is placed into the I/O tables by one network interface, allowing the data to be read through the other network interface.

The linking device appears as a single device on either network using standard protocol mechanisms. No special, or extended, protocol features are required for the devices on either network to read or write the data flowing through the I/O tables; all cross-network activity is transparent to the devices on either network.

All connections, whether power or fieldbus, to the linking device are made on one end of the module. Phoenix connectors are provided for power and DeviceNet connections. A RJ-45 style connector is provided for EtherNet/IP connection.

The linking device can be mounted to a DIN rail.

Important User Information

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

Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation 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 Rockwell Automation 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.

Reproduction of the contents of this copyrighted publication, in whole or part, without written permission of Rockwell Automation, is prohibited.

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

<p>WARNING</p> 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
<p>ATTENTION</p> 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.
<p>IMPORTANT</p>	Identifies information that is critical for successful application and understanding of the product.

ATTENTION**Environment and Enclosure**

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as “open type” equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosures. Also see the appropriate sections in this publication, as well as the Allen-Bradley publication 1770-4.1 (“Industrial Automation Wiring and Grounding Guidelines”), for additional installation requirements pertaining to this equipment.

ATTENTION**Preventing Electrostatic Discharge**

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

ATTENTION



This Product is grounded through the DIN rail to chassis ground. Use zinc plated yellow-chromate steel DIN rail to assure proper grounding. The use of other DIN rail materials (e.g. aluminum, plastic, etc.) that can corrode, oxidize, or are poor conductors, can result in improper or intermittent grounding.

European Hazardous Location Approval

If you install the module in a European Zone 2 location, consider:

European Zone 2 Certification

This equipment is intended for use in potentially explosive atmospheres as defined by European Union Directive 94/9/EC.

DEMKO certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of Category 3 equipment intended for use in potentially explosive atmospheres given in Annex II to this Directive.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 50021.

IMPORTANT

When using this product, also consider the following:

- This equipment is not resistant to sunlight or other sources of UV radiation.
 - The secondary of a current transformer shall not be open-circuited when applied in Class I, Zone 2 environments.
 - Equipment of lesser Enclosure Type Rating must be installed in an enclosure providing at least IP54 protection when applied in Class I, Zone 2 environments.
 - This equipment shall be used within its specified ratings defined by Allen-Bradley.
 - Provision shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40% when applied in Class I, Zone 2 environments.
-

North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations:

Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.

Informations sur l'utilisation de cet équipement en environnements dangereux:

Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.

WARNING



EXPLOSION HAZARD

- Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
- Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.
- Substitution of components may impair suitability for Class I, Division 2.
- If this product contains batteries, they must only be changed in an area known to be nonhazardous.

AVERTISSEMENT



RISQUE D'EXPLOSION

- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.
- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit.
- La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

DeviceNet is a trademark of Open Device Vendor Association (ODVA), Inc.
EtherNet/IP is a trademark of ControlNet International LTD.

RSLinx, RSLogix, and RSNetWorx are trademarks of Rockwell Software.
MS-DOS and Windows are trademarks of the Microsoft Corporation.

System Requirements

The following hardware and software components are required to use the linking device.

Required Hardware

- 1788-EN2DN linking device
- DeviceNet cabling, power, and devices forming a DeviceNet network
- Ethernet cabling and power
- PC or other controller with access to the Ethernet network
- PC running DeviceNet Configuration Software. The DeviceNet slave devices with which the linking device communicates are specified using a DeviceNet Configuration Software tool such as RSNetWorx for DeviceNet.
- 24V dc power to the linking device (DeviceNet power may be used)

Required Software

- DeviceNet configuration software such as RSNetWorx for DeviceNet, version 4.01 or later to configure DeviceNet devices and the linking device's DeviceNet functionality
- RSLinx version 2.31 or later
- Rockwell Automation BOOTP/DHCP Server version 2.3.2.0 or later

Installing and Configuring the Linking Device

WARNING



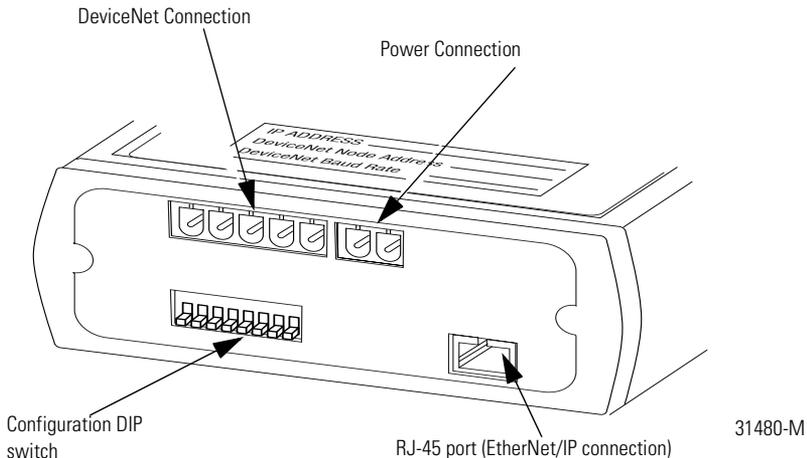
- If you connect or disconnect the communications cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations.
- When used in a Class I, Division 2, hazardous location, this equipment must be mounted in a suitable enclosure with proper wiring method that complies with the governing electrical codes.
- If you insert or remove the card while host power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.
- If you connect or disconnect wiring while the field-side power is on, 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.

Follow these steps to install the linking device (described in the sections that follow):

Step 1: Connect the Linking Device to the EtherNet/IP Network

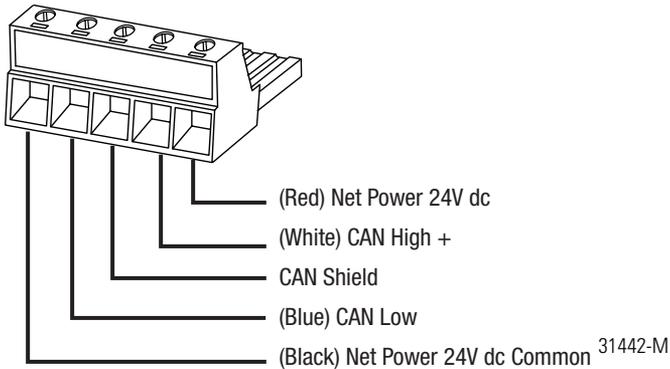
Connect the EtherNet/IP network cable to the RJ-45 port on the end of the linking device.

Figure 1 Power and Network Connections



Step 2: Connect the Linking Device to the DeviceNet Network

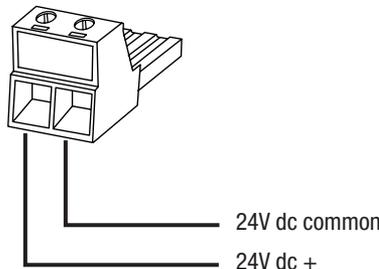
1. Make sure a PC running RSNetWorx for DeviceNet is connected to the EtherNet/IP network.
2. With power to the linking device off, connect the DeviceNet network cable to the DeviceNet connector on the linking device. The female terminal block connector is provided with the linking device.



TIP

Two 120 ohm termination resistors (supplied with the linking device) may be required for proper network termination at each end of the trunk line. See the DeviceNet Specification (available from the Open DeviceNet Vendors Association at www.odva.com) for specific rules on DeviceNet connections and termination.

3. Connect the power cable to the linking device. See Figure 1 on page 7. The female terminal block connector is provided with the linking device.



4. Power up the linking device and DeviceNet network.

IMPORTANT

The linking device defaults to Autobaud. This means that the linking device automatically finds the network baud rate at power-up. You must have installed a device, such as a DeviceNet Bridge Module (1756-DNB) so that the linking device can pick up the correct baud rate. If you do not have another device installed, you must use RSNetWorx for DeviceNet to set the baud rate, as described in “Step 6: Set the DeviceNet MAC ID and Baud Rate” on page 17. Do not attempt to commission the linking device on a network configured at a different baud rate.

Step 3: Configure the Linking Device IP Address

Several methods may be used to set the IP Address. These methods include:

- IP address configuration DIP switch
- DHCP protocol
- web page

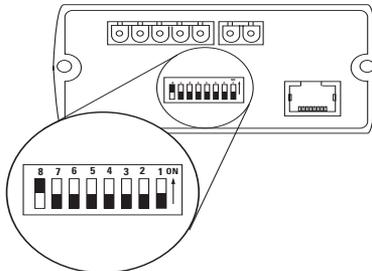
Setting the IP Address with the Configuration DIP Switch

A configuration DIP switch on the end of the linking device lets you set the IP address. See Figure 1 on page 7 to locate the switch. If the configuration DIP switch is set to 1 (in the up position, as shown in Figure 2), on power-up the value of the switch creates the IP address of 192.168.1.1.

IMPORTANT

The numbers that appear above the switches on the DIP switch do not correspond to bit locations in the address value. In fact, the numbers on the switch are opposite the address value bit locations; i.e., bit 0 is set by switch 8.

Figure 2 IP Address Configuration DIP Switch



31421-M

The switch represents the binary value of the last byte in the 4-byte IP address. In this case it is n . If $n = 0$, the linking device obtains its IP address from the software configuration (DHCP or web page).

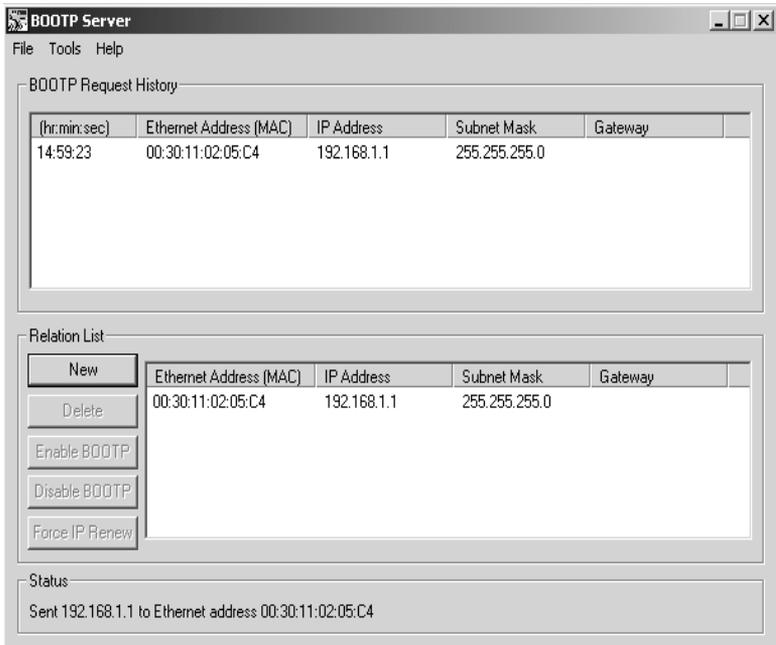
IP address	192.168.1. n
Subnet mask	255.255.255.0
Gateway address	0.0.0.0 (No gateway set)

Setting the IP Address Using DHCP/BootP

TIP

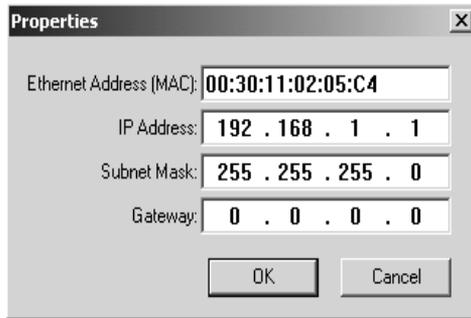
The use of DHCP is the default configuration for the linking device as shipped. The IP address configuration DIP switch ships with $n = 0$.

When DHCP/BootP is enabled and a DHCP or BootP server is found, the IP address, Subnet mask, and Gateway address are automatically configured by the DHCP server, as shown in the figure below.



You can change the IP address, Subnet mask, and Gateway address from this screen. To do this:

1. Click **New**. You see the Properties screen.



The screenshot shows a dialog box titled "Properties" with a close button (X) in the top right corner. It contains four input fields for network configuration:

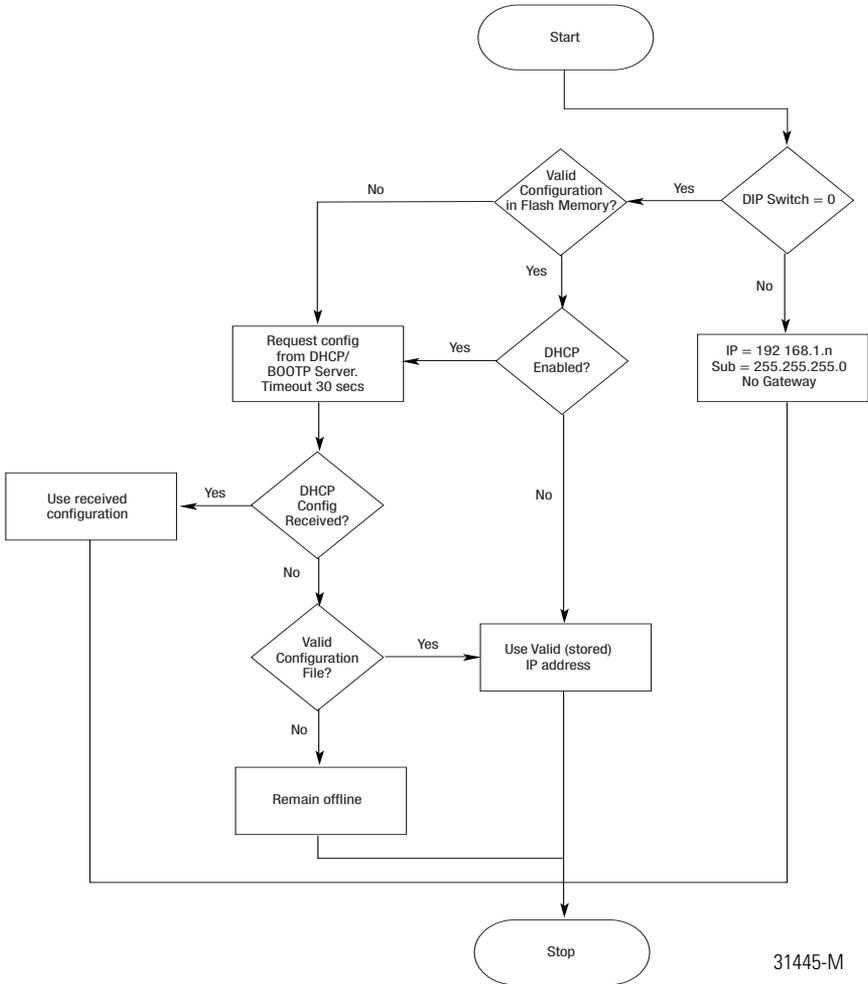
- Ethernet Address (MAC): 00:30:11:02:05:C4
- IP Address: 192 . 168 . 1 . 1
- Subnet Mask: 255 . 255 . 255 . 0
- Gateway: 0 . 0 . 0 . 0

At the bottom of the dialog box are two buttons: "OK" and "Cancel".

2. In the Properties screen that appears, enter the following:
 - Ethernet address (MAC ID) [from the linking device product ID label]
 - IP address
 - Subnet Mask
 - Gateway (IP address)
3. Click **Ok**.

Figure 3 shows a flowchart describing how the IP configuration is determined when the linking device is powered up.

Figure 3 Configuration Initialization Sequence



31445-M

TIP

You can enable these values using the linking device's IP Configuration web page. Refer to Setting the IP Address Using the Web Page on page 13.

Setting the IP Address Using the Web Page

The EtherNet/IP address can also be configured using the IP Configuration web page on the linking device, as shown in the figure below.



The IP address can be set with the web page only if the linking device already has a valid IP address. Typically, you can do this by using the DIP switch to force the linking device to use a temporary IP address after you cycle power. To configure the IP address with the web page:

IMPORTANT

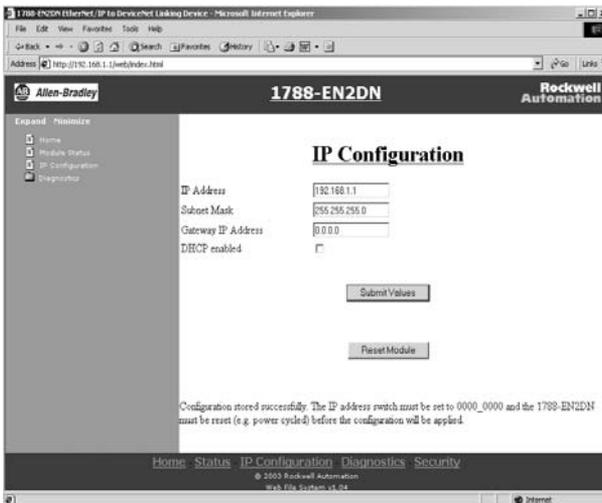
Because the DIP switch setting overrides other IP address configurations, be sure to set the DIP switch to the 0 position before continuing.

1. Browse to the linking device by entering the temporary IP address in your web browser's address bar and click **Enter**.
2. In the left pane, click on **IP Configuration**. You see the Enter Network Password screen.
3. In the Username field, enter **Administrator**.

4. Leave the password field blank.



5. Click **Ok**. You see the IP Configuration screen.



6. Enter the following values into the IP Configuration screen.

In this field	Enter
IP Address	Any valid value. See your system administrator for a valid IP address.
Subnet Mask	
Gateway IP Address	Any valid value
DHCP enabled	

7. Click **Submit Values**.
8. Follow the on-screen prompts.
9. Click the **Reset Module** button to reset the linking device.

Step 4: Register the Driver in RSLinx

1. In RSLinx software, select **Communications** ⇒ **Configure Driver**.
2. In the Configure Drivers menu, select **Ethernet Devices** from the Available Driver Types pull-down menu.
3. Click **Add New**.
4. In the Add New RSLinx Drivers pop-up menu, click **Ok**.
5. In the Configure Driver window that appears, enter the IP address of the linking device.
6. Click **Close**.
7. Click **Ok**.

Step 5: (Optional) Register the EDS file in RSNetWorx

RSNetWorx for DeviceNet software requires an electronic data sheet (EDS) to recognize a device and its capabilities. If you do not already have a registered EDS file for the device, you can download an EDS file from www.ab.com/networks.

IMPORTANT

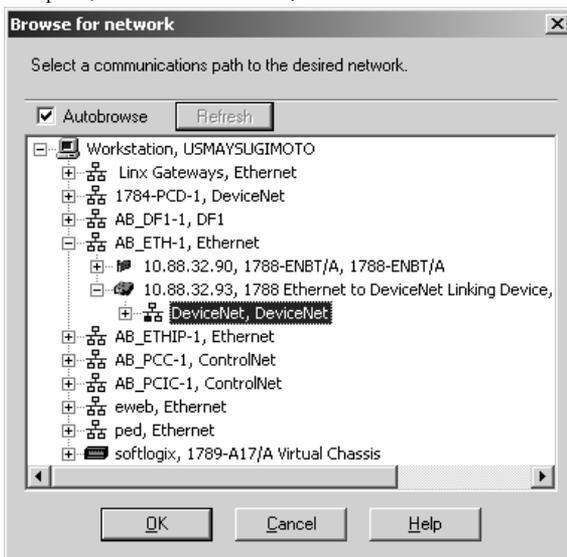
If RSLinx or RSNetWorx for DeviceNet software cannot find the EDS file for the linking device, the linking device's icon may be labeled an "unrecognizable device" in the software.

1. In RSNetWorx for DeviceNet software, select **Tools** ⇒ **EDS Wizard**.
2. Click **Next**.
3. Select **Register an EDS File** and click **Next**.

4. Select **Register a Single File** and enter or browse to the location of the EDS file for the linking device.
5. Click **Next** or **Finish** for the remaining option screens.

Step 6: Use RSNetWorx for DeviceNet Software to Locate the Module on the Network

1. In RSNetWorx for DeviceNet, select **Network** ⇒ **Online**.
2. In the left pane, click on the RSLinx Ethernet driver you added previously (in step 5).
3. In the left pane, click on the + next to the 1788-EN2DN linking device icon.
4. In the left pane, click on **DeviceNet, DeviceNet**.



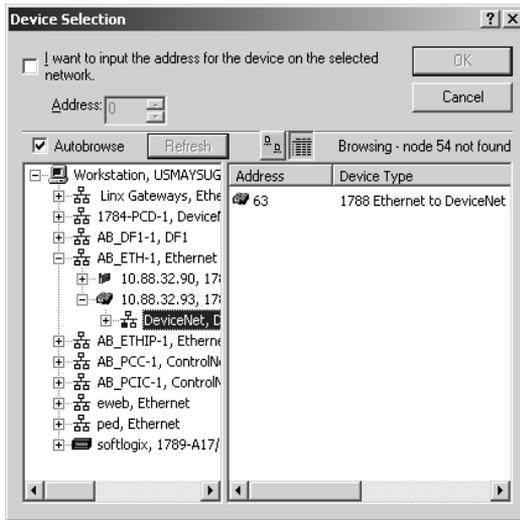
5. When asked to upload from the network, click **Ok** to perform a single pass browse.

Step 6: Set the DeviceNet MAC ID and Baud Rate

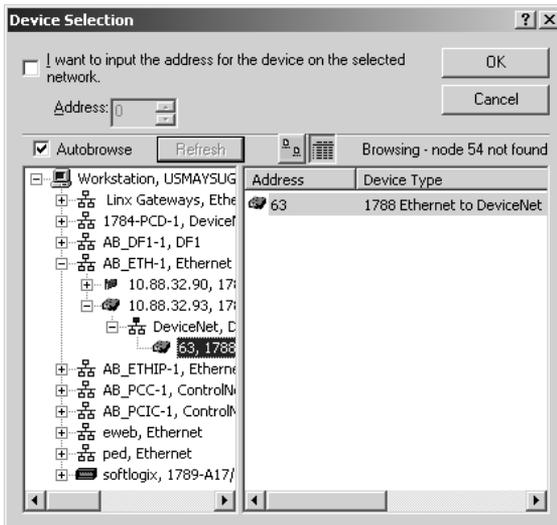
1. In RSNetWorx for DeviceNet software, select **Tools** ⇒ **Node Commissioning**. You see the Node Commissioning screen.



- On the Node Commissioning screen, click **Browse**. You see the Device Selection screen.



- In the left pane, click on the + next to the RSLinx driver for the 1788-EN2DN linking device.
- In the left pane of the screen, click on the + next to the IP address for the 1788-EN2DN linking device.



5. In the left pane, click on the + next to the DeviceNet network. You see the 1788-EN2DN linking device in the left pane.
6. Click on the 1788-EN2DN linking device in the left pane. It appears in the right pane.
7. Click **Ok**.
8. If a warning text box asking you if you wish to continue appears, click **Yes**.
9. Enter the desired MAC address and/or data rate, then click **Apply**



10. Click **Close**.

IMPORTANT

The linking device will automatically reset if a new MAC ID is entered. If only the baud rate is changed you must cycle power to the linking device before the new baud rate will take effect.

When the MAC ID is changed, the linking device's I/O configuration is cleared.

TIP

If you are using the linking device as a network gateway, you may need to re-start RSNetWorx for DeviceNet software before continuing.

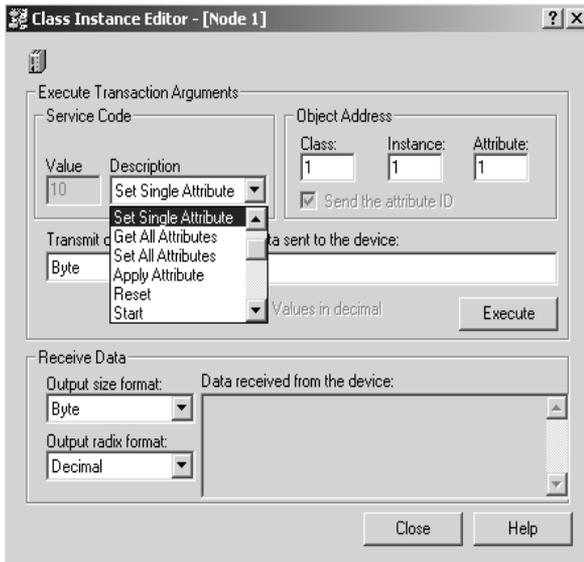
11. Re-start RSNetworkx for DeviceNet software and go online.

Step 7: (Optional) Disable Autobaud

If you do not want the linking device to automatically determine the network baud rate, disable Autobaud. By default, the linking device has Autobaud enabled.

1. In RSNetWorx for DeviceNet software, highlight the linking device by left-clicking on its icon.
2. From the pull-down menu, select **Device ⇒ Class Instance Editor**. If a warning text box appears, click **Yes**.

3. You see the Class Instance Editor screen. From the pull-down menu, select **Description** ⇒ **Set Single Attribute**.

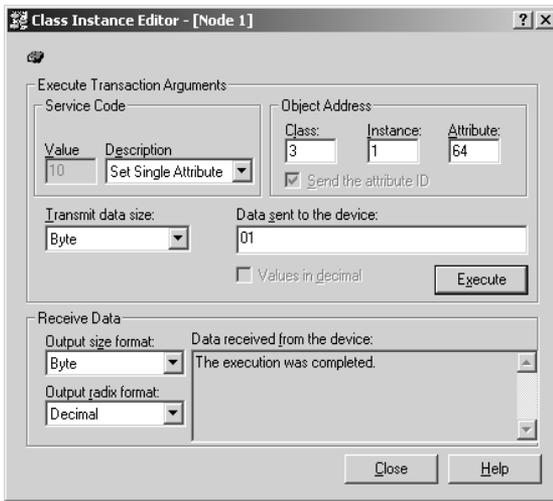


In this field	select
Object Address	
Class	3
Instance	1
Attribute	64h
Data Sent to Device	00 to enable Autobaud 01 to disable Autobaud
Transmit Data Size	Byte

IMPORTANT

Make sure the check box titled Values in Decimal is NOT checked.

4. Click **Execute**. You should see a message in the Data received from device dialog box indicating that the execution was completed.



IMPORTANT

Changes to the autobaud option configuration do not take effect until you cycle power to the linking device. You may also have to cycle power to the slave devices.

IMPORTANT

If the linking device is the only master on the DeviceNet network, do not enable autobaud. Automatic baud detection requires there to be traffic on the network. There is typically no traffic until the master establishes connections.

5. Click **Close**.

Step 8: (Optional) Configure DeviceNet I/O

IMPORTANT

Steps 8 and 9 are required only if the linking device is used as an I/O scanner. The linking device can function as a gateway/bridge, even if no I/O is configured.

I/O Mapping

The DeviceNet I/O configuration defines the format of the Input and Output tables, or the *mapping* of DeviceNet slaves' I/O data to the I/O tables. As slaves are added to the linking device's DeviceNet scanner configuration, the location in the I/O tables of each part of the slave's I/O data is determined and stored.

IMPORTANT

The organization of the I/O tables is very important. I/O tables define the format of the data that will be provided to the EtherNet/IP scanner. The Input and Output table formats should be planned and documented to ensure the EtherNet/IP scanner is working with the correct data from the DeviceNet network.

The size of the I/O data that can be exchanged with the EtherNet/IP scanner (and, hence, the size of the I/O tables) is restricted as explained below.

- The Input table size cannot be larger than 496 bytes.
 - The Output table size cannot be larger than 492 bytes.
 - Either table may be empty (0 bytes).
-

To configure DeviceNet I/O, use RSNetWorx for DeviceNet software to set the linking device's scan list and I/O table mapping.

IMPORTANT

Automap is used in this example for simplicity. In some cases, you may want to organize the I/O data in other ways; you can do this using the Advanced data table editor in the Input and Output tabs. Refer to RSNetWorx online help for complete details.

1. In RSNetWorx for DeviceNet, go online by selecting **Network** ⇒ **Online**.
2. Select **Network** ⇒ **Single Pass Browse**. Wait for browsing to complete.
3. Select **Network** ⇒ **Upload from Network**. Wait for the device information to be uploaded from the network.

4. Double-click on the linking device icon to bring up the Module Description screen.

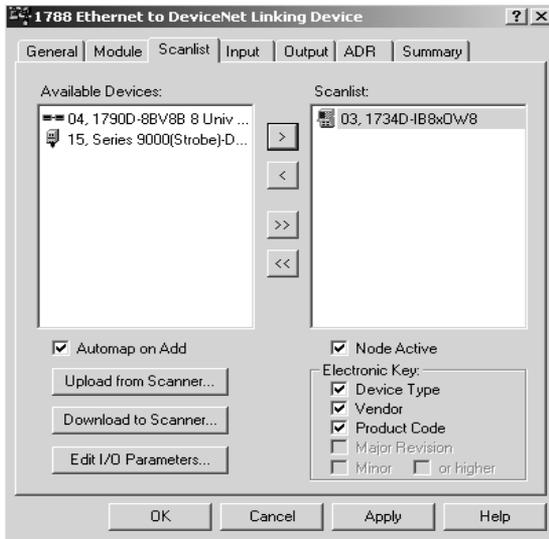


5. Several tabs appear on the top of the screen. Click the **Scanlist** tab.
6. In the informational text box that appears, click **Upload**.

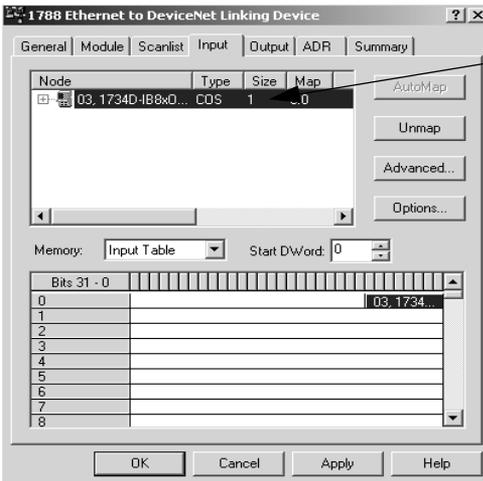
The screen shows 2 columns. On the left is a list of available devices that may be added to the scan list. On the right is a list of devices that are configured in the scan list.

7. Check the **AutoMap on Add** check box.

- Select the I/O devices on the left side of the screen. Click > to move it to the right side of the screen.

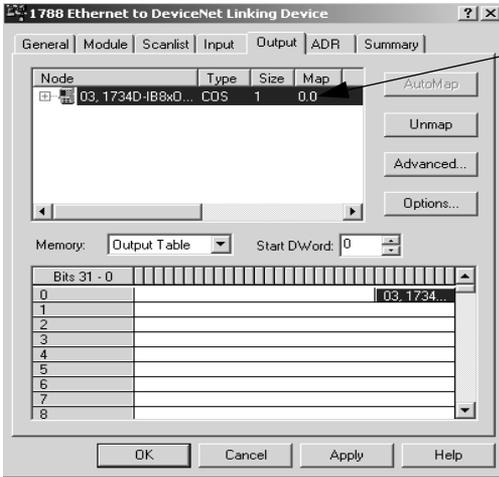


- Select the **Input** tab. The Input mapping screen is displayed.



The top portion of this screen gives a list of the devices in the scan list from which the linking device receives input data. The bottom shows the location in the Input table where the data will be placed for each device. **This shows the format of the Input table of the linking device. This is the format of the input data that will be sent to the EtherNet/IP scanner.**

10. Select the **Output** tab. The Output mapping screen is displayed.



The top portion of this screen gives a list of the devices in the scan list to which the linking device will send output data. The bottom shows the location in the Output table where the data will be placed for each device. **This shows the format of the Output table of the linking device. This is the format of the output data that will be sent to the linking device from the EtherNet/IP scanner.**

11. Click **Apply**, and click on **Yes** to download the scanlist to the linking device.

TIP

The linking device starts scanning as soon as it finds entries in its scanlist. However, in Idle mode, output data will not be sent to the devices.

12. Click **Ok**.

Step 9: (Optional) Add the Linking Device to an RSLogix 5000 Project

1. Create a new project in RSLogix 5000. Select **File** ⇒ **New**. You see the New Controller screen.
2. From the Type pull-down menu, select the controller type.
3. From the Revision pull-down menu, select the controller version.
4. Enter a name for the controller project.
5. Click **Ok**. A project is created.
6. In the left pane, right-click **I/O Configuration**. Left-click on **New Module**.

- In the Select Module Type menu, select any EtherNet/IP Bridge Module (such as the 1788-ENBT module).
- Click **Ok**. You see the Module Properties screen.

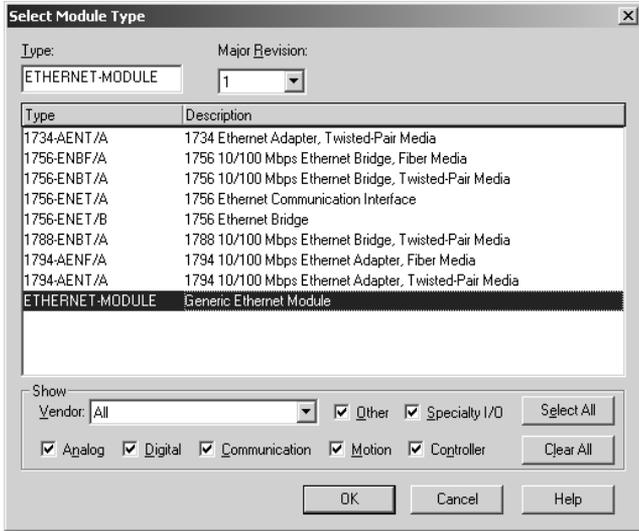
The screenshot shows a dialog box titled "Module Properties - Controller (1788-ENBT/A 1.1)". The dialog contains the following fields and controls:

- Type: 1788-ENBT/A 1788 10/100 Mbps Ethernet Bridge, Twisted-Pair Media
- Vendor: Allen-Bradley
- Parent: Controller
- Name: ENBT
- Description: (empty text box with up/down arrows)
- Address / Host Name: (grouped box containing)
 - IP Address: (text box with dots)
 - Host Name: (text box)
- Slot: 2
- Revision: 1 1
- Electronic Keying: Compatible Module

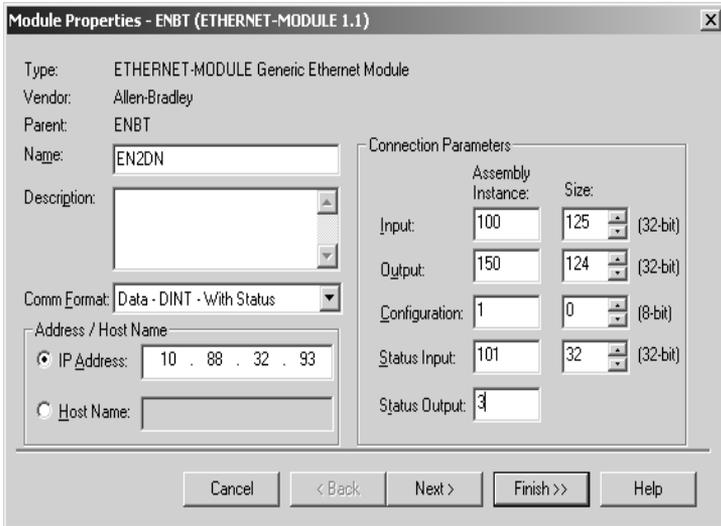
At the bottom of the dialog are five buttons: Cancel, < Back, Next >, Finish >>, and Help.

- In the Slot Number field, enter the slot number in which the device resides.
- Click **Finish**.
- In the right pane, right-click on the EtherNet/IP module you just added to your project.
- Left click on **New Module**.

- In the Select Module Type menu, select Generic Ethernet Module.



- Click **Ok**. You see the Module Properties screen.



in this field	enter or select
Name	a module name
Comm Format	Data - DINT - With - Status

- Click the **IP Address** radio button and enter the IP address for which the linking device is configured.
- Enter the following connection parameters:

Table 1 Connection Parameters

	assembly instance	size (DINT)
Input	100	1 -125 (125 max.)
Output	150	1 - 124 (124 max.)
Configuration	1	0
Status input	101	1 - 32 (32 max.)
Status output	3	None

- Click **Next**.
- Click the **Connection** tab. Enter the Requested Packet Interval (RPI or update rate) in a range from 2 to 750ms.

If you see errors in this field when you are online, see Table 2 on page 30.

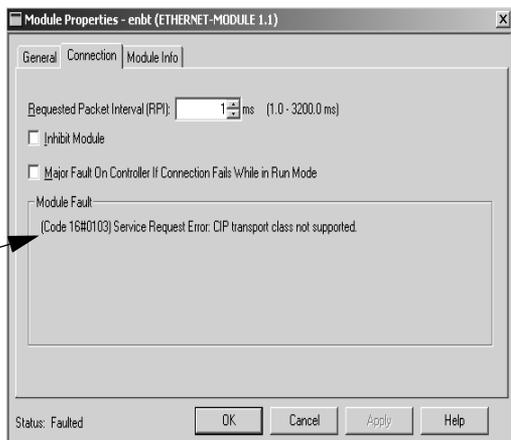


Table 2 RSLogix 5000 Error Codes

this error code	means	so you should
16#0203	Connection timed out	Check IP configuration and Ethernet cabling
16#0204	Connection Request Error: Connect request timed out	Check IP configuration and Ethernet cabling
16#0103	Service Request Error: CIP transport class not supported.	Check for valid RPI range (i.e., 2-3200ms)
16#0005	Connection Request Error: Bad class.	Check for correct assembly instance numbers in connection parameters

19. Click **Finish**. You can now use the linking device as both a bridge and a scanner
20. Write a user program to use the linking device on the network. Consult Rockwell Automation Technical Support or your Rockwell Automation representative for assistance in writing the program.
21. To view information specific to the RSLogix 5000 tags that pertain to the linking device, do the following:
 - a. In the left pane of the RSLogix 5000 window, click on **Controller Tags**. In the right pane, you see the 1788-EN2DN linking device controller tags.

Tag Name	Value	Force Mask	Style	Type
EN2DN:C	{...}	{...}		AB.ETHERNET_MODULE:C:0
EN2DN:I	{...}	{...}		AB.ETHERNET_MODULE_DINT_500Bytes:I:0
EN2DN:I.Data	{...}	{...}	Decimal	DINT[125]
EN2DN:O	{...}	{...}		AB.ETHERNET_MODULE_DINT_496Bytes:O:0
EN2DN:O.Data	{...}	{...}	Decimal	DINT[124]
EN2DN:S	{...}	{...}		AB.ETHERNET_MODULE_DINT_128Bytes:S:0
EN2DN:S.Data	{...}	{...}	Decimal	DINT[32]

- b. Click on the + to the left of the tag name to expand it.
- c. Review data in the fields that appear for each tag, as described in the section entitled “Assembly Objects and Connections,” below.

Assembly Objects and Connections

Three Assembly Object instances are accessible from EtherNet/IP: input, output and status. The input and output assemblies are linked to the input and output tags created in RSLogix 5000 software. The status assembly provides current status information about the linking device.

IMPORTANT

With a generic profile for the linking device, I/O tags are offset by one DINT compared to input and output mapping found in RSNetWorx for DeviceNet. For example, the RSLogix 5000 input tag EN2DN:I.Data[1] corresponds to word 0 of the RSNetWorx Input Mapping table. Tag EN2DN:I.Data[0] contains module status.

The assembly instances associated with these 3 assemblies are listed in Table 1 on page 29.

Input Assembly

The input assembly contains a 32-bit status register followed by the data in the linking device's input data table.

Table 3 Input Assembly Format

DINT offset	size in DINTs	description	RSLogix 5000 example tags
0	1	Status register	EN2DN:I.Data[0]
1	Up to 123	Input data	EN2DN:I.Data[1 - 124]

The input data format and content is determined by the DeviceNet scanner configuration. The data appears in the table as it is mapped from the DeviceNet input connections. The input data in the assembly is 124 DINTs long; however, only the size of the input data table will be used. The remaining space will be filled with the value 0 (zero).

The status register is a bit string with the following bit definitions.

Table 4 Input Status Register Bit Definitions

Bit	Description
0	EN2DN is in Run mode (Cleared if in Idle mode)
1	EN2DN is faulted
2	DeviceNet network interface is disabled
3	Communication has failed with at least 1 DeviceNet slave
4	At least 1 DeviceNet slave is an incorrect device type
5	DeviceNet network interface is bus-off

Table 4 Input Status Register Bit Definitions

Bit	Description
6	Duplicate MAC ID error
7	No DeviceNet power
8-31	Not used

Output Assembly

The output assembly contains a 32-bit command register followed by the data in the linking device's output data table.

Table 5 Output Assembly Format

DINT offset	size in DINTs	description	RSLogix 5000 example tags
0	1	Command register	EN2DN:O.Data[0]
1	Up to 123	Output data	EN2DN:O.Data[1 - 123]

The output data format and content is determined by the DeviceNet scanner configuration. The data appears in the table as it is mapped to the DeviceNet output connections. The output data in the assembly is 123 DINT long; however, only the size of the output data table will be used. The remaining space will be ignored.

The command register is a bit string with the following bit definitions.

Table 6 Output Command Register Bit Definitions

Bit	Description
0	Run mode Sets the linking device to Run mode when set Sets the linking device to Idle mode when cleared For the linking device to be in Run mode, both of these bits must be set and the controller must be in Run mode
1	Fault. Sets a fault condition in the linking device
2	Disable DeviceNet network
3	Not used
4	Reset the linking device
5-31	Not used

Status Assembly

The status assembly is a collection of status and diagnostic information for the linking device's DeviceNet interface. The information in the assembly is updated once a second.

IMPORTANT

All information in the status assembly is stored in little endian format. The least significant byte of multi-byte values is stored first.

Table 7 Status Assembly Format

Byte Offset	Size in Bytes	Data Type	Name	Description
0	4	UDINT	Scan Counter	The number of DeviceNet I/O scans that have taken place since the linking device was powered up
4	8	64-bit Bitstring	Faulted Node Table	Indicates which DeviceNet slaves are faulted. Each bit represents the status of the slave at the corresponding MAC ID.
12	8	64-bit Bitstring	Auto Verify Error Table	Indicates which DeviceNet slaves are the incorrect device type. Each bit represents the status of the slave at the corresponding MAC ID.
20	8	64-bit Bitstring	Idle Node Table	Indicates which DeviceNet slaves are in Idle mode. Each bit represents the status of the slave at the corresponding MAC ID.
28	8	64-bit Bitstring	Active Node Table	Indicates which DeviceNet nodes are configured in the EN2DN's scan list. Each bit represents the status of the slave at the corresponding MAC ID.
36	4	ASCII[4]	Status Display	Mimics a 4-character alpha-numeric display. If there are no faults, the display shows the linking device's MAC ID and its Run/Idle status. If there are faults, the display will scroll through the MAC IDs of the faulted nodes and display the error code associated with each.
40	1	USINT	EN2DN MAC ID	The DeviceNet MAC ID of the linking device

Table 7 Status Assembly Format (Continued)

Byte Offset	Size in Bytes	Data Type	Name	Description
41	1	USINT	Scanner Status	The current status of the DeviceNet scanner
42	1	USINT	Scrolling MAC ID	The scrolling address and status fields scroll through the address and status of all DeviceNet slaves that are faulted. This scrolling includes the linking device scanner itself.
43	1	USINT	Scrolling Status	If there are no faulted nodes, both the scrolling address and status are set to 0. The scrolling fields change once a second.
44	20	USINT[20]	Reserved	
64	64	USINT[64]	Node Status Table	The current status of each DeviceNet slave node. Each array element is the status of the node at the corresponding MAC ID. If a node is not configured in the linking device scan list, the status value will be set to 0. The linking device scanner status appears at the entry associated with the linking device MAC ID.

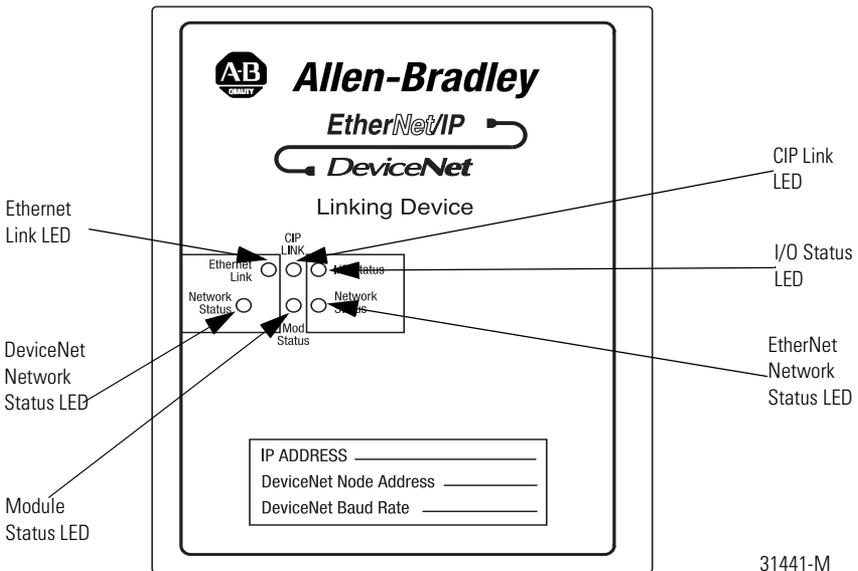
Understanding Status and Diagnostic LEDs

A group of LED indicators on the front panel of the linking device shows the current status of the linking device and the network interfaces. See Figure .

The following tables provide information on status LED states.

for information about the	see	on page
I/O Status LED	Table 8	36
DeviceNet Network Status LED	Table 9	36
Module Status LED	Table 10	36

for information about the	see	on page
Ethernet Link LED	Ethernet Link LED	37
EtherNet Network Status LED	Table 11	37
CIP Link LED	CIP Link LED	37



I/O Status LED

TIP

If the I/O Status LED is flashing red and green for an extended period of time, count the number of red and green flashes and call Rockwell Automation technical support. Refer to the back cover of this publication for details on contacting technical support.

Table 8 I/O Status LED States

state	summary	description
Flashing Green	Idle	Module is in Idle mode
Solid Green	Running	Module is in Run mode
Solid Orange	Hardware Initialization	The LED will be in this state immediately after power is applied
Flashing Red/Green	Error	A fault has been detected
Off	No I/O	No DeviceNet I/O configured

DeviceNet Network Status LED

Table 9 DeviceNet Network Status LED States

state	summary	description
Solid Green	Online and communicating	The linking device is on the DeviceNet network and communicating with at least 1 device
Flashing Green	Online, no communication	The linking device is on the DeviceNet network and is not currently communicating with any devices
Solid Red	DeviceNet interface fault	A major fault in the DeviceNet interface has been detected. Possible causes include Bus-off or duplicate MAC ID.
Flashing Red	Connection time-out	A connection with at least 1 slave device has timed out

Module Status LED

Table 10 DeviceNet Module Status LED States

state	summary	description
Flashing Green	Standby or not configured	The module has not been configured and is currently using default values. This LED state is also used to indicate that the module is in a standby state. This could occur during initialization or DeviceNet autobaud.

Table 10 DeviceNet Module Status LED States

state	summary	description
Solid Green	Normal	Normal operation
Solid Red	Unrecoverable major fault	A fault the requires user intervention has been detected. Correct the problem and reset the linking device
Flashing Red	Recoverable minor fault	A fault that can be corrected and does not require a linking device reset has been detected

Ethernet Link LED

The Ethernet Link LED indicates that the module is connected to an Ethernet network. The LED displays green if the link is active. The LED will flash when Ethernet packets are received and transmitted.

Ethernet Network Status LED

Table 11 Ethernet Network Status LED States

state	summary	description
Off	No IP Address	The module has no IP address assigned
Solid Green	Network OK and communicating	There is at least one EtherNet/IP connection
Flashing Green	Network OK	There are no active connections
Solid Red	Address conflict	The module's IP address is already in use by another module
Flashing Red	Connection Time-out	One or more of the connections in which this module is the target has timed out. This state is only left if all timed out connections are re-established or if the module is reset.
Red,Green Alternate Flashing	Self Test	A self-test of the module is in progress

CIP Link LED

The CIP Link LED indicates bridged and gateway activity between EtherNet/IP and DeviceNet. The LED will flash green when a CIP message is bridged from EtherNet/IP to DeviceNet. The LED will be solid green if an EtherNet/IP I/O connection is active.

Using Diagnostic Web Pages

Status

The Status page displays the linking device identification information, current status, and IP configuration. The module status is updated approximately every 2.5 seconds.

Active Nodes

The Active Nodes page indicates which DeviceNet nodes are currently configured as slaves to the linking device's DeviceNet scanner. Each node that is configured as a slave will be displayed with "Active" next to the node's MAC ID.

Idle Nodes

The Idle Nodes page indicates which DeviceNet nodes are currently in the Idle state. If a node is Idle, the page will display "Idle" next to the node's MAC ID. Note that only nodes configured as slaves to the linking device and the linking device itself are updated on this page.

Faulted Nodes

The Faulted Nodes page indicates which DeviceNet nodes are currently in a faulted state. If a node is faulted, the page will display "Faulted" next to the node's MAC ID. Note that only nodes configured as slaves to the linking device and the linking device itself are updated on this page.

A node is considered faulted if the linking device has lost communications or is unable to establish communications with the node. The actual problem can be determined by viewing the Node Status web page.

Invalid Nodes

The Invalid Nodes page indicates which DeviceNet nodes are not the correct device type. If a node's device type is different than that configured in the scan list, the page will display "Invalid" next to the node's MAC ID. Note that only nodes configured as slaves to the linking device are updated on this page.

Node Status

The Node Status page displays the current status of all DeviceNet nodes that are configured as slaves to the linking device and the linking device itself. The status of each node is displayed next to the node's MAC ID. Note that only nodes configured as slaves to the linking device and the linking device itself are updated on this page.

The page will display the status textually for many of the common status values. However, to save web page size, many of the status values are only displayed numerically. Table 12, below, describes the meaning of each status value.

Table 12 Node Status Codes

this status code	means	so you should
0	Ok	Do nothing
60	Duplicate MAC ID test in progress	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	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 detected on the network	Check the network configuration
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

Table 12 Node Status Codes (Continued)

this status code	means	so you should
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	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. 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

Table 12 Node Status Codes (Continued)

this status code	means	so you should
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	Do nothing. Do not disconnect the module while application FLASH is in progress. You will lose any existing data in the module's memory.
96	COMM port in Test mode	Do nothing
97	Module operation halted by user command	Check Module Command Register for HALT bit set
98	General firmware error	Replace module
99	System failure	Replace module

IP Configuration

The IP Configuration web page is used to change the IP configuration of the linking device.

Security

Use the Security web page to change the security password.

Specifications

Table 13 Specifications

specification	value
DeviceNet Power Requirements	Power will be connected to the EN2DN using a 2 position screw terminal (Phoenix) connector. Operating Voltage: 7 to 32 V dc (24 V dc nominal)
DeviceNet Current Draw	100 mA at 24 V Class 2
Linking Device Current Draw	300 mA at 24 V Class 2
Operational Temperature	IEC 60068-2-1 (Test Ad, Operating, Cold) IEC 60068-2-2 (Test Bd, Operating Dry Heat) IEC 60068-2-14 (Test Nb, Operating Thermal Shock): 0 to 60 °C (32 to 140 °F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold) IEC 60068-2-2 (Test Bb Un-packaged Non-operating Dry Heat) IEC 60068-2-14 (Test Na, Unpackaged Non-operating Thermal Shock): -40 to 85 °C (-40 to 185 °F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged, Non-operating Damp Heat): 5 to 95% non-condensing
Operating Shock	IEC 60068-2-27 (Test Ea, Unpackaged shock): Operating 30g Non-operating 50g
Vibration	IEC 60068-2-6 (Test Fc, Operating): 5g @10-500Hz
Emissions	CISPR 11: Group 1, Class A
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900MHz 10V/m with 200Hz 50% Pulse 100%AM at 1890MHz
EFT/B Immunity	±2kV at 5kHz on power ports ±2kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±500V line-line (DM) and ±1kV line-earth (CM) on DC power ports ±1kV line-earth (CM) on signal ports
Continuous Isolation Voltage	50V

Table 13 Specifications

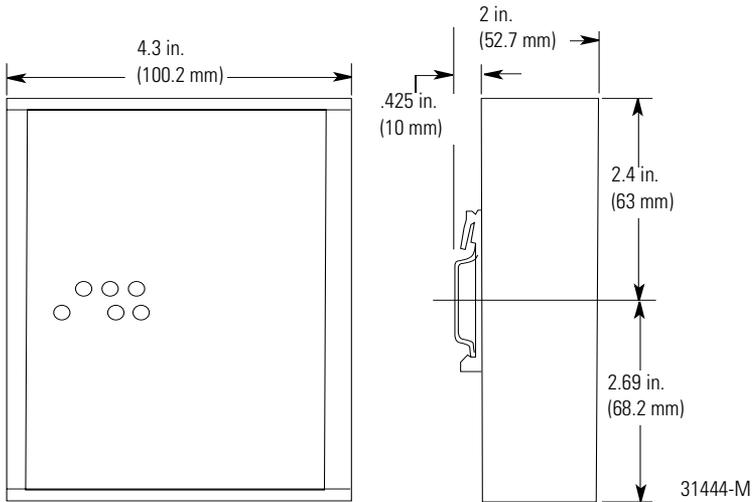
specification	value
Enclosure Type Rating	None (open-style)
Power Conductors	12 AWG (3.31 sq. mm) maximum, 24 AWG (0.205 sq. mm) minimum copper wire 75 °C minimum Category 2 ¹
Torque	5 - 7 in.-lbs. (0.5 - 0.8 Nm)
DeviceNet and EtherNet Conductors	Category 2 ^{1,2}
Certifications (when product is marked)	<p>c-UL-us: UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada</p> <p>CE³: European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions</p> <p>C-Tick³: Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions</p> <p>EEx³: European Union 94/9/EC ATEX Directive, compliant with: EN 50021; Potentially Explosive Atmospheres, Protection "n" (Zone 2)</p> <p>ODVA: ODVA conformance tested to DeviceNet specifications</p> <p>EtherNet/IP: ODVA conformance tested to EtherNet/IP specifications</p>

¹ Use this conductor information for planning conductor routing. Refer to Allen-Bradley publication 1770-4.1 ("Industrial Automation Wiring and Grounding Guidelines") or appropriate System Level Installation Manual.

² Use this Conductor Category information for planning conductor routing as described in the appropriate System Level Installation Manual

³ See the Product Certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Dimensions



DeviceNet Connector Pinouts

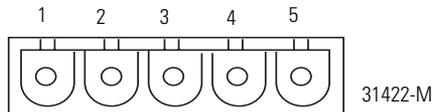
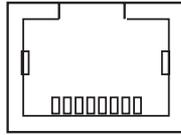


Table 14 DeviceNet Pinouts

pin	signal
1	V-
2	CAN_L
3	Shield
4	CAN_H
5	V+

EtherNet/IP RJ45 Connector Pinouts



31423-M

Table 15 EtherNet/IP Pinouts

pin	signal
1	TD+
2	TD-
3	RD+
4	Termination
5	Termination
6	RD-
7	Termination
8	Termination

Notes:

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using our products. At <http://support.rockwellautomation.com>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://support.rockwellautomation.com>.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of our products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

www.rockwellautomation.com

Corporate Headquarters

Rockwell Automation, 777 East Wisconsin Avenue, Suite 1400, Milwaukee, WI, 53202-5302 USA, Tel: (1) 414.212.5200, Fax: (1) 414.212.5201

Headquarters for Allen-Bradley Products, Rockwell Software Products and Global Manufacturing Solutions

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe: Rockwell Automation SA/NV, Vorstlaan/Boulevard du Souverain 36-BP 3A/B, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Headquarters for Dodge and Reliance Electric Products

Americas: Rockwell Automation, 6040 Ponders Court, Greenville, SC 29615-4617 USA, Tel: (1) 864.297.4800, Fax: (1) 864.281.2433
Europe: Rockwell Automation, Brühlstraße 22, D-74834 Elztal-Dallau, Germany, Tel: (49) 6261 9410, Fax: (49) 6261 17741
Asia Pacific: Rockwell Automation, 55 Newton Road, #11-01/02 Revenue House, Singapore 307987, Tel: (65) 351 6723, Fax: (65) 355 1733

Publication 1788-IN055A-EN-P - October 2003

PN 957782-94

Copyright © 2003 Rockwell Automation, Inc. All rights reserved. Printed in the U.S.A.