



# DeviceNet Daughtercard

Catalog Number 1788-DNBO

This document describes how to install and configure the DeviceNet™ 1788-DNBO daughtercard. The daughtercard is a DeviceNet scanner that provides DeviceNet monitoring, configuration, and I/O scan capabilities.

<b>For information about</b>	<b>See page</b>
Important User Information	2
About the DeviceNet Daughtercard	4
Required Software	4
Related Publications	4
Preventing Electrostatic Discharge	5
Set the Node Address	5
Set the Network Baud Rate	6
Install the Daughtercard	6
Connect the Card to the Network	7
Daughtercard Performance	8
Interpret the LED Status Indicators	8
Logix Controller Interface	10
Hazardous Location Information	14
Specifications	15

# Allen-Bradley

## Important User Information

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

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

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

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:

---

**WARNING**



Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

---

**ATTENTION**



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

---

**IMPORTANT**

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

---

**ATTENTION****Environment and Enclosure**

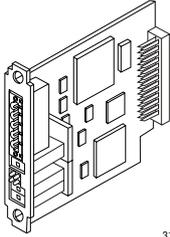
This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating.

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.

See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. 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.

## About the DeviceNet Daughtercard



31291-M

The network daughtercard architecture defines a common hardware and software interface that several different network interface cards will support. This lets products that have been designed to support the network daughtercard option support several different Rockwell Automation networks.

You can install the 1788-DNBO DeviceNet daughtercard in any host device that supports the DeviceNet daughtercard.<sup>(1)</sup>

## Required Software

Use RSNetWorx for DeviceNet 3.0 Service Pack 2 or later to configure the scanlist for the 1788-DNBO daughtercard.

Use RSLogix 5000 programming software V10 or later to configure a FlexLogix system for use with the 1788-DNBO daughtercard.

## Related Publications

Publication Title	Publication Number
DeviceNet System Overview	DN-2.5
DeviceNet Selection Guide	DNET-SG001A-EN-P
DeviceNet Cable System Planning and Installation Manual	DN-6.7.2
DeviceNet Media	1485-CG001A-EN-P
Getting Results with RSNetWorx for DeviceNet	9399-DNETGR
FlexLogix System User Manual	1794-UM001C-EN-P

<sup>(1)</sup> The host device must provide suitable power source per the restrictions in the specifications table on page 15.

## Preventing Electrostatic Discharge

### 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.

## Set the Node Address

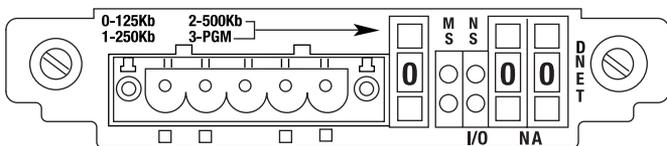
You must set two switches to configure the daughtercard with its unique network address. Figure 1 shows the location of the switches. These switches are read on powerup to establish the network address of the card.

Set the node address to a value between 00 and 63. The node address of the daughtercard must be unique to the other nodes on your DeviceNet network.

### IMPORTANT

Setting the node address to 99 and cycling power to the host will cause the daughtercard to erase its scanlist. Set the node address to 99 **only** if you want to erase the scanlist.

**Figure 1 - Set the Node Address and Network Baud Rate**



31288-M

Allen-Bradley

## Set the Network Baud Rate

You must set one switch to configure the network baud rate. Figure 1 shows the location of the switch. The switch is read on power-up.

Set the switch to a value between 0 and 2, according to this table:

Switch Setting	Baud Rate
0	125Kb
1	250Kb
2	500Kb

## Install the Daughtercard

Due to wide variation in available host devices, we cannot provide specific installation instructions in this document. For instructions on how to install the daughtercard in a host device, refer to the user manual for the particular host device.

---

**IMPORTANT**

Do not install or remove the daughtercard while the host is under power.

---

**WARNING**

Inserting or removing the module while host power is on may cause an electrical arc. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

---

## Connect the Card to the Network

After you have installed the daughtercard, you can connect it to the network.

### WARNING

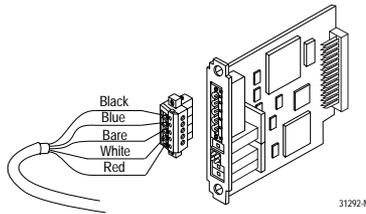


If you insert or remove the card while host power is on **OR** if you connect or disconnect the DeviceNet cable with power applied to this module or any device on the network, an electrical arc can occur.

Either could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

1. Connect the DeviceNet drop line to the 5-pin DeviceNet connector provided with the card. Match the wire insulation colors to the colors shown on the label.



Pin Number	Wire Color	Symbol	Description
1	Black	V-	24V dc Power Return
2	Blue	CAN_L	Data Low - Data Line
3	Bare	DRAIN	Shield
4	White	CAN_H	Data High - Data Line
5	Red	V+	+24V dc

2. Attach the connector to the DeviceNet port on the daughtercard.
3. Tighten the connector screws.

# Allen-Bradley

## Daughtercard Performance

Due to wide variation in available host devices, we cannot provide specific performance capabilities in this document. For information concerning host/daughtercard performance characteristics, refer to the user manual for the particular host device.

## Interpret the LED Status Indicators

The three status indicators on the daughtercard provide information about the network, the daughtercard, and its connections.

**Note:** The bottom left-hand LED is not used and is always off.

The following tables outline the possible states, explain what each state means, and indicate what action you should take, if any, to correct that state.

### Module Status (MS) Indicator

This bi-color (green/red) LED provides device status. It indicates whether or not the device has power and is operating properly.

Condition	Status	Indicates
off	no power	No power applied to device.
green	device operational	Device is operating in a normal condition.
flashing green <sup>1</sup>	device in standby (device needs commissioning)	Device needs commissioning due to configuration missing, incomplete, or incorrect. Device may be in the standby state. Refer to the DeviceNet Specification, Volume II, Identity Object.
flashing red <sup>1</sup>	recoverable fault	E.g., the device's scan list configuration does not match the actual network configuration.
red	unrecoverable fault	Device has an unrecoverable fault. Cycle power to the daughtercard by shutting down and cycling power to the host. If the problem persists, the device may need to be replaced.
flashing red-green	device self testing	Device is in self test. Refer to the DeviceNet Specification, Volume II, Identity Object.

<sup>1</sup> The flash rate of the LED is approximately 1 flash per second. The LED should be on for approximately 0.5 seconds and off for approximately 0.5 seconds.

## Network Status (NS) Indicator

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

Condition	Status	Indicates
off	not powered, not online	Device is not online. The device has not completed the Dup_MAC_ID test yet. The device may not be powered; look at the Module Status LED.
flashing green <sup>1</sup>	online, not connected	Device is online, but has no connections in the established state. The device has passed the Dup_MAC_ID test, is online, but has no established connections to other nodes.
green	link okay, online, connected	The device is online and has connections in the established state.
flashing red <sup>1</sup>	connection time-out	One or more I/O connections are in the timed-out state.
red	critical link failure	Failed communication device. The device has detected an error that has rendered it incapable of communicating on the network (Duplicate MAC ID or Bus-off). Check network integrity and baud rate of all devices. Then cycle power to the daughtercard by shutting down and cycling power to the host.

<sup>1</sup> The flash rate of the LED is approximately 1 flash per second. The LED should be on for approximately 0.5 seconds and off for approximately 0.5 seconds.

## I/O Status Indicator

This bi-color (green/red) LED indicates the I/O scanning state. The I/O Status LED informs you whether this device has outputs under control and whether any outputs or inputs are active (outputs active, inputs producing, etc.). The LED reflects the mode of the inputs and outputs, not necessarily the on/off condition of the I/O points themselves.

Condition	Indicates
off	Daughtercard is not online. Check network power.
green	Daughtercard is in RUN mode, outputs are under control, and inputs are being consumed.
flashing green <sup>(1)</sup>	Daughtercard is in IDLE mode, outputs are <b>not</b> under control, and inputs are being consumed.

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

## Logix Controller Interface

The 1788-DNBO daughtercard supports several different size input, output, and status structures when communicating with Logix controllers, such as FlexLogix. These I/O structures were created to reduce the complexity of connecting DeviceNet I/O and status data with ladder programs. The daughtercard creates all 3 structures whether or not DeviceNet nodes are configured or online. The RSLogix 5000 software directs the controller to connect to these predefined default I/O structures. The controller automatically performs periodic updates of the structures on a cyclic basis.

### IMPORTANT

You must use RSLogix 5000 programming software version 10 or later in order to configure the 1788-DNBO daughtercard in a FlexLogix system.

The RSNetWorx for DeviceNet software configures scanlist map segments that are used to copy specific portions of I/O data between the I/O structures and DeviceNet network packets.

### Output Structure

The controller controls output I/O by writing output data to an output structure in the 1788-DNBO daughtercard. The daughtercard 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.

Output Structure Element	Description	Data Type
module command register	This 32-bit register consists of several bits that affect the daughtercard'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 (The daughtercard ceases all operation.)
4	Reset	1 = reset module (Put back to 0 to resume operation.)
5 - 31	{Reserved}	<i>unused</i>

### IMPORTANT

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

## Input Structure

The controller receives input I/O by reading input data from an input structure in the 1788-DNBO daughtercard. The daughtercard receives input data from DeviceNet modules and delivers a copy of these values to the controller. The input structure consists of one 32-bit status register and a variable size 32-bit array of up to 124 words for input data. The 32-bit status register reflects the current state of several key module-level operational parameters.

The input structure consists of these data elements.

Input Structure Element	Data Type
module status register	1 x 32-bit register
input_data	123 x 32-bit variable size data array

## Module Status Register Bit Definitions

The bits of the Module Status Register are defined as follows:

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	AutoverifyFailure	1 = at least one device has failed to be initialized by the daughtercard.
5	CommFailure	1 = communication failure exists.
6	DupNodeFail	1 = failure due to duplicate node address.
7	DnetPowerDetect	1 = DeviceNet power failure.
8 - 31	{Reserved}	<i>unused</i>

## Status Structure

The controller receives status information concerning the 1788-DNBO daughtercard's ability to exchange DeviceNet messages with other nodes by reading from the status structure in the daughtercard. The daughtercard 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	DINTS
ScanCounter	counter incremented each I/O scan	32-bit	10
DeviceFailureRegister	device failed bit table; 1 = failed	64-bit	
AutoverifyFailureRegister	device I/O size does not match scanner's internal table; 1 = mismatch	64-bit	
DeviceIdleRegister	device is idle bit table; 1 = idle	64-bit	
ActiveNodeRegister	node online bit table; 1 = online	64-bit	
StatusDisplay	ASCII representation of status	4-byte	
ScannerDeviceStatus	Scanner device status:	4-byte binary	11
ScannerAddress	DeviceNet address of 1788-DNBO daughtercard	8-bit binary	
ScannerStatus	status of 1788-DNBO daughtercard	8-bit binary	
ScrollingDeviceAddress	scrolls through DeviceNet nodes once per second by address and status (0 = no faults).	8-bit binary	
ScrollingDeviceStatus		8-bit binary	
ReservedArray	future expansion (20 bytes)	20 x 8-bit	16
DeviceStatus	DeviceNet node status array, byte per device	64 x 8-bit	24/32

## Hazardous Location Information

<p><b>The following information applies when operating this equipment in hazardous locations:</b></p>	<p><b>Informations sur l'utilisation de cet équipement en environnements dangereux :</b></p>
<p>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.</p>	<p>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.</p>
<p style="text-align: center;"><b>WARNING</b></p> 	<p><b>EXPLOSION HAZARD</b></p> <ul style="list-style-type: none"> <li>• Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.</li> <li>• 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.</li> <li>• Substitution of components may impair suitability for Class I, Division 2.</li> <li>• If this product contains batteries, they must only be changed in an area known to be nonhazardous.</li> </ul>
<p style="text-align: center;"><b>AVERTISSEMENT</b></p> 	<p><b>RISQUE D'EXPLOSION</b></p> <ul style="list-style-type: none"> <li>• Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.</li> <li>• 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.</li> <li>• La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2.</li> <li>• S'assurer que l'environnement est classé non dangereux avant de changer les piles.</li> </ul>

## Specifications

Characteristic	Value
Power Requirements	5V dc @ 260mA <sup>(1)</sup> 24V dc @ 20mA Class 2
Power Consumption	5 V dc, 1.3W 24 V dc, 0.48W. Total=1.78W
Thermal Dissipation	6.1 BTU/hr
Isolation Voltage	Tested to withstand 707 V dc for 60 seconds
RTB Screw Torque	5-7 inch-pounds (0.56-0.8 Nm)
Conductors Wire Size	24-12 AWG (0.205-3.31 mm <sup>2</sup> ) stranded copper <sup>(2)</sup> 3/64 inch (1.2mm) insulation maximum
Category	2 <sup>(2)</sup>
Emissions	CISPR 11: Group 1, Class A (with appropriate enclosure)
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
EFT/B Immunity	IEC 61000-4-4: ±2kV at 5kHz on communications ports
Surge Transient Immunity	IEC 61000-4-5: ±2kV line-earth (CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Enclosure Type Rating	None (open-style)
Operating 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): This product is suitable for application in equipment that is rated 0 to 60°C (32 to 140°F) maximum. It is acceptable for the ambient slot temperature immediately surrounding this product to reach 85°C (185°F) maximum.
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, Un-packaged 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
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g

# Allen-Bradley

Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz
Weight	0.1 kg (0.2 lb.)
Certifications: (when product is marked)	<p>c-UR-us UL Recognized Component Industrial Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for US and Canada.</p> <p>CE<sup>(3)</sup> European Union 89/336/EEC EMC Directive, compliant with: EN 50081-2; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity</p> <p>C-Tick<sup>(3)</sup> Australian Radiocommunications Act, compliant with: AS/NZS 2064; Industrial Emissions</p> <p>ODVA ODVA conformance tested to ODVA DeviceNet specifications.</p>

<sup>(1)</sup> To comply with UL restrictions, this equipment must be powered from a source compliant with the following: Class 2 or Limited Voltage/Current, as defined in UL 508 Seventeenth Edition Section 32.

<sup>(2)</sup> Refer to publication 1770-4.1, Programmable Controller Wiring and Grounding Guidelines.

<sup>(3)</sup> See the Product Certification link at [www.ab.com](http://www.ab.com) for Declarations of Conformity, Certificates, and other certification details.

Allen-Bradley is a trademark of Rockwell Automation.

DeviceNet is a trademark of Open Device Vendors Association (ODVA).

RSNetWorx, RSLogix, and FlexLogix are trademarks of Rockwell Software, Inc.

**DeviceNet**  
Open Device Vendors Association

**Reach us now at [www.rockwellautomation.com](http://www.rockwellautomation.com)**

Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software, Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors and system integrators around the world.

**Americas Headquarters**, 1201 South Second Street, Milwaukee, WI 53204, USA, Tel: (1) 414 382-2000, Fax: (1) 414 382-4444  
**European Headquarters SA/NV**, avenue Herrmann Debroux, 46, 1160 Brussels, Belgium, Tel: (32) 2 863 06 00, Fax: (32) 2 863 06 40  
**Asia Pacific Headquarters**, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846



**Rockwell Automation**