A·B QUALITY

Installation Instructions

ControlLogix DeviceNet Scanner Module

(Catalog Number 1756-DNB)

To the Installer

The 1756-DNB module is a DeviceNet™ scanner module that resides in a Control**Logix**™ chassis and provides DeviceNet monitoring, configuration, and I/O scan capabilities.

Use this document as a guide to install the ControlLogix DeviceNet scanner module.

Handling the Module

⚠️ **ATTENTION:** The module uses CMOS technology, which is highly sensitive to electrostatic discharge (ESD). ESD may be present whenever you are handling the module. Handling a module without any ESD protection can cause internal circuit damage that may not be apparent during installation or initial use.

Take these precautions to guard against ESD damage:

● Before handling the module, be sure to wear the provided static strap and touch a grounded object to discharge any built-up static charge.

● Avoid touching the backplane connector or interface connector pins located on the module.

● If the module is not in use, store it in the anti-static clamshell in which the module was shipped.

Important: Remember, a computer with ac power disconnected is *not* a grounded object.

Understand Compliance to European Union Directives

If this product bears the $\mathbf{C}\mathbf{E}$ 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 Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN 50082-2EMC – 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 these Allen-Bradley publications:

- Industrial Automation Wiring and Grounding Guidelines for Noise Immunity, publication 1770-4.1
- Guidelines for Handling Lithium Batteries, publication AG-5.4
- Automation Systems Catalog, publication B111

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

Understand the Module's Software Features

The 1756-DNB module has the following software features. You activate these features by using DeviceNetManager™ software (catalog no. 1787-MGR) or **RS**NetWorx for DeviceNet™ (catalog no. 9357-DNETL3). For more information, refer to the DeviceNet Manager Software User Manual, publication 1787-6.5.3, the appropriate **RS**NetWorx for DeviceNet documentation, and the 1756-DNB Scanner Configuration Manual, publication 1756-6.5.15.

Slave Mode

The slave mode feature allows processor-to-processor communication. Slave mode also allows the scanner to perform as a slave device to another master on the network.

Like any other slave, when the scanner module is in slave mode, it exchanges data with only one master. You control what information is exchanged through scan list configuration and associated mapping functions of DeviceNet Manager software.

The slave mode function has these variations:

Scanner is in this mode	when it
Null	contains an empty or disabled scan list (out-of-box default)
Master	serves as a master to one or more slaves but is not simultaneously serving as a slave to another master
Slave	serves as a slave to another master
Dual	serves as both a master to one or more slaves and as a slave to another master simultaneously

Change of State

The scanner module can send and receive data on a change of state basis with slave devices that also have this feature. Data is sent:

- whenever a data change occurs, or
- at a user-configurable heartbeat rate

Change of state increases system performance by reducing network traffic, since data is only sent on an as-needed basis. Use DeviceNet Manager software to activate this feature.
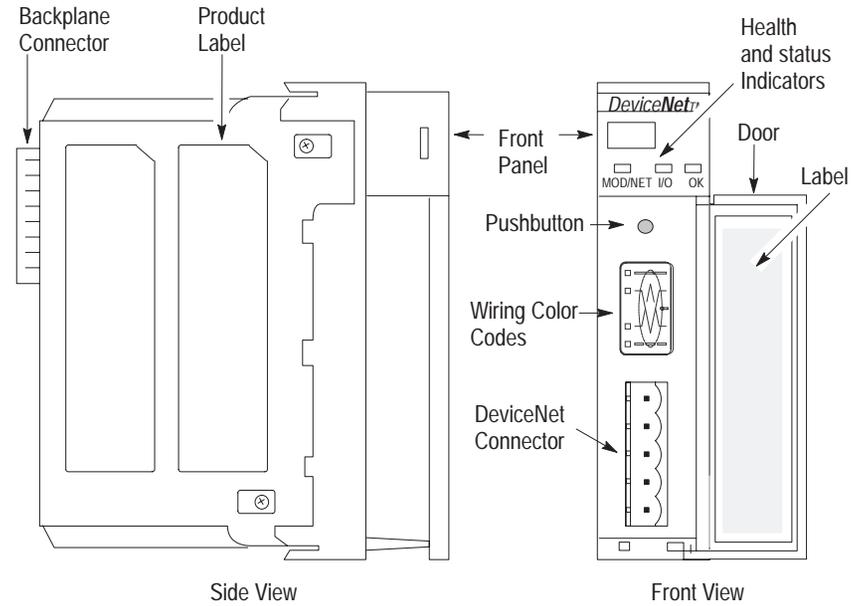
Cyclic I/O

The scanner module can send and receive data on a cyclic basis with slave devices that also have this feature.

Cyclic I/O increases system performance by reducing network traffic, since data is only sent at a user-configurable rate. Use DeviceNet Manager or **RS**NetWorx for DeviceNet software to activate this feature.

Identify the Module's Hardware Features

Use this illustration to identify the external features of the module.

Backplane
Connector

Product
Label

Health
and status
Indicators

DeviceNet™

Door

Front
Panel

Label

MOD/NET I/O   OK

Pushbutton

Wiring Color
Codes

DeviceNet
Connector

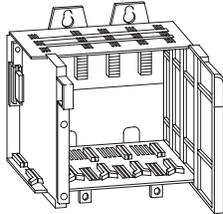Side View

Front View

Prepare to Install the Module

Before you install the module, make sure that you have these components.

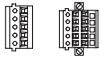1756-DNB module   1756-A4, 1756-A7, 1756-A10, or   1756-PA72 or 1756-PB72
                          1756-A13 chassis   power supply

DeviceNet open-style   small screwdriver
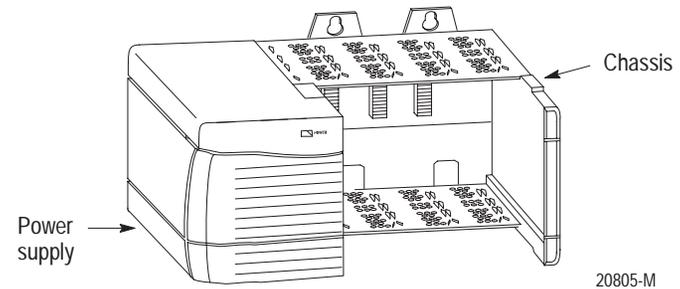5- or 10-position connector

DeviceNet trunk
or drop cable

Prepare the Chassis for Module Installation

Before you install the module, you must install and connect a ControlLogix chassis and power supply. To install these products, refer to the installation instructions you received with them.

Chassis

Power supply

20805-M

Install or Remove the Module

This module is designed to be installed or removed while chassis power is applied.

ATTENTION: When you insert or remove a module while backplane power is on, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field device causing unintended machine motion or loss of process control
- causing an explosion in a hazardous environment

Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

Determine Module Slot Location

This example shows chassis slot numbering in a 4-slot chassis. Slot 0 is the first slot and is always located to the right of the power supply. You can use any size ControlLogix chassis and install the module in any slot.
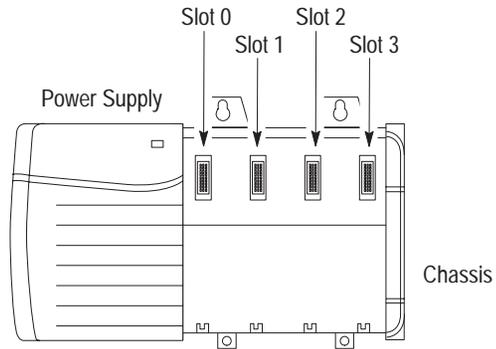
You can use multiple 1756-DNB modules in the same chassis. You can use as many 1756-DNB modules as your power supply can accommodate (i.e., number for which the power supply is rated).

Install the Module

1

Align the circuit board with top
and bottom guides in the chassis.

Circuit board
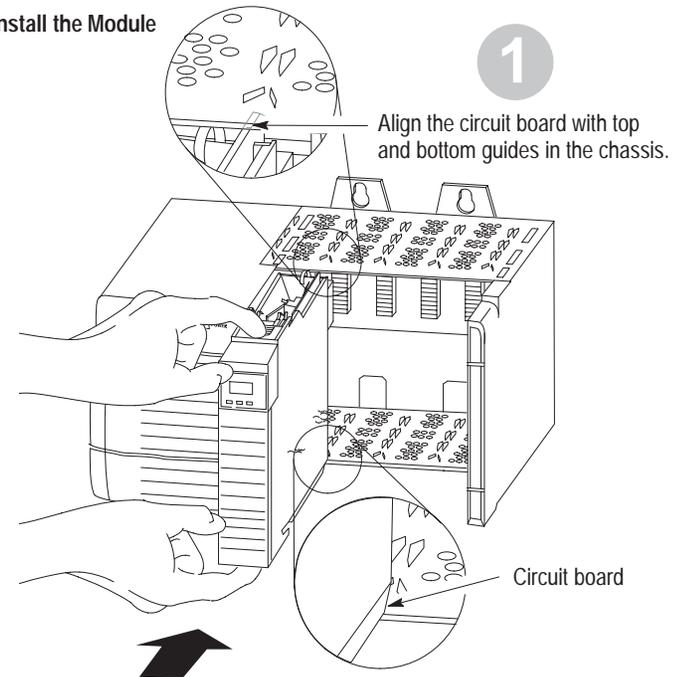
2

Slide the module into the chassis.
Make sure the module properly connects
to the chassis backplane.

3

The module is fully installed
when it is flush with the power
supply or other installed modules.
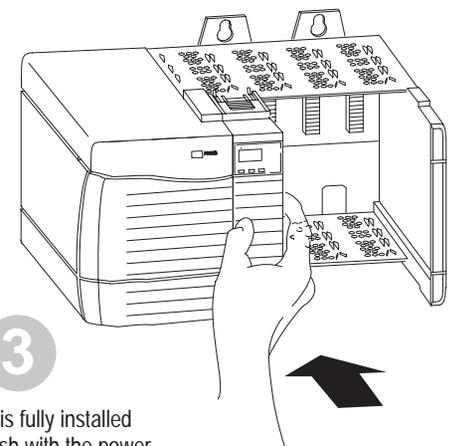
Remove or Replace the Module (when applicable)

Important: If you are replacing an existing 1756-DNB module with another 1756-DNB module and you want to resume identical system operation, you must install the new module in the same slot.

Push on upper and lower module tabs to disengage them.

Slide module out of chassis.
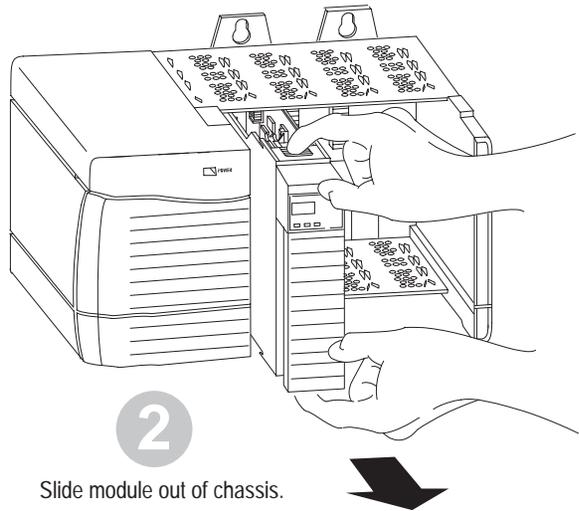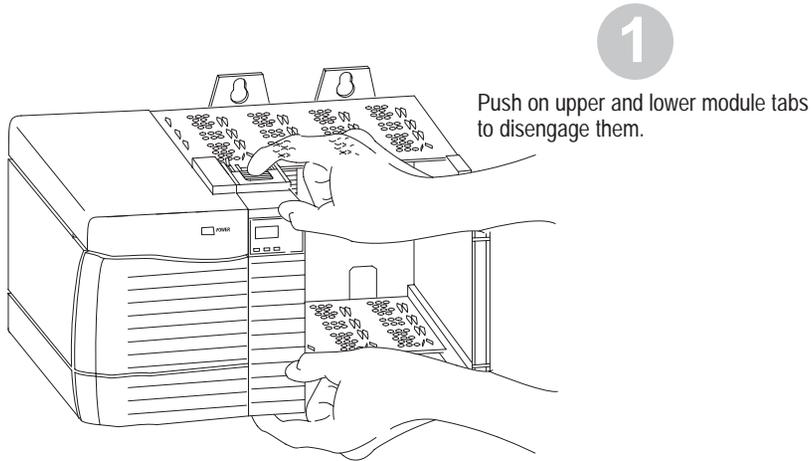
Wire the DeviceNet Connector

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 module.

For detailed DeviceNet connection information, see the DeviceNet Cable System Planning and Installation Manual, publication DN-6.7.2. Also see the Industrial Automation Wiring and Grounding Guidelines for Noise Immunity, publication 1770-4.1.

Wire the connector according to these illustrations.

Color chips (dots)

red dot
white dot

blue dot
black dot

10-position plug

5-position plug

Module label shows
wiring color scheme:

RED
WHITE
BARE
BLUE
BLACK

10-position
linear plug

Red
White
Bare
Blue
Black

DeviceNet
drop line or
trunk line
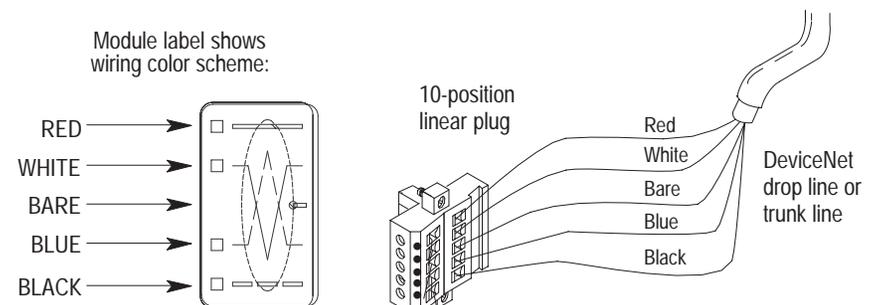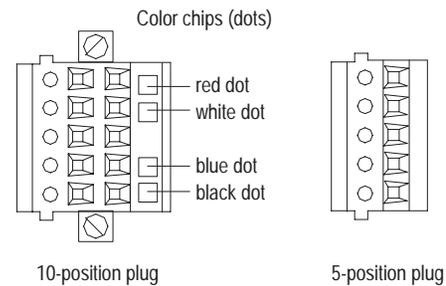
20479-M

20474-M

Connect the Module to the DeviceNet Network

1. Attach the connector to the DeviceNet port.

10-position
linear plug

DeviceNet port connector

DeviceNet drop line or trunk line
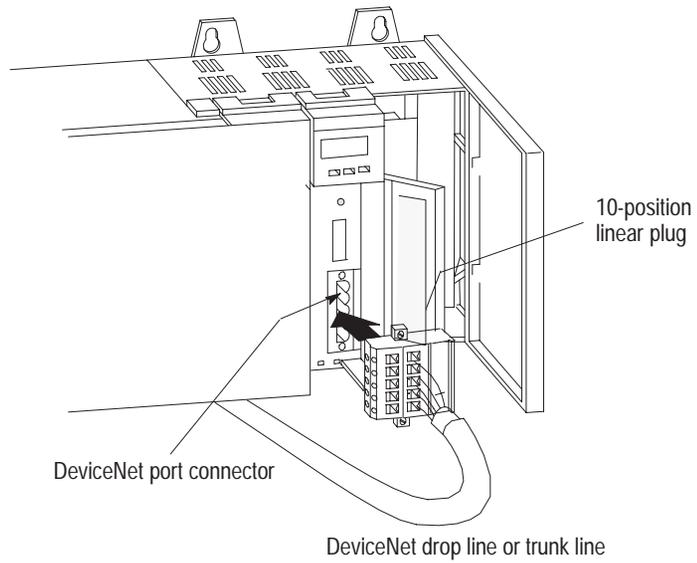
20441–M

2. Tighten screws as needed.

Apply Chassis Power

Power supply indicator is green when power supply is working correctly.

ON
POWER
OFF
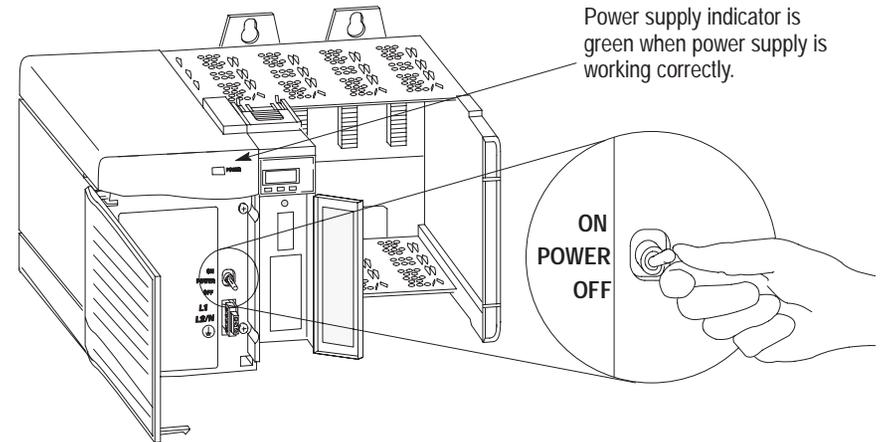
Check Module Alphanumeric Indicators

Check the module alphanumeric indicators to determine if the module is operating. When you apply chassis power, the module alphanumeric indicators cycle through these displays:

DeviceNet™

Module alphanumeric indicator

MOD/NET   I/O   OK

Pushbutton

Top part of module
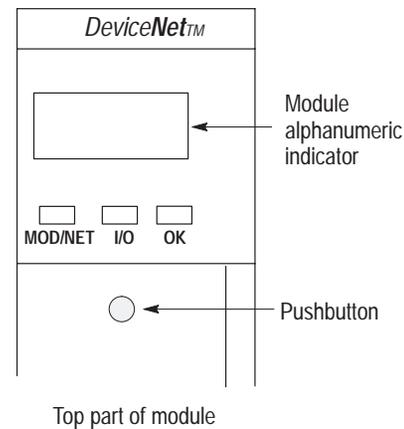
- Firmware major revision (01 through 128)

- Firmware minor revision (01 through 255)

- MAC ID (A#00 to A#63, with A#63 as the default)

- Baud rate (125, 250, or 500, with 125 as the default)

Use the DeviceNet Manager software or 1756-DNB pushbutton to change the baud rate and MAC ID.

Using Manual Configuration Pushbutton Operation

The 1756-DNB scanner module has a dual-function pushbutton.

- Without a network connection, when pushed, it displays network baud rate, allowing you to select the rate.
- With a network connection, when pushed, it displays the MAC ID or network node address, allowing you to select the node address.

If your module is not connected to a network:

1. Select the network baud rate by pushing in and holding the pushbutton.

The module's alphanumeric indicator cycles through the allowable baud rates.

2. Release the button when the baud rate shown on the display is the baud rate you want to select.

If your module is connected to the network:

1. Select the network node address by pushing in and holding the pushbutton.

The display starts at the *current* MAC ID and cycles through the network node addresses.

2. Release the button when the address number shown on the display is the number you want to select.

Interpret the Node Address/Status Indicator

Your 1756-DNB scanner module has a node address/status indicator that uses alphanumeric displays to indicate diagnostic information about your module. The display flashes at approximately 1 second intervals, depending on network traffic. The table summarizes the meanings of the alphanumeric codes.

What Is Displayed?

The display, for instance, for RUN would look like this, and would toggle between the network address and the mode:

A#01
RUN

If there is a *problem*, the display looks like this, and displays the network address, followed by the MAC ID of the problem node, followed by the error code. The display toggles through these elements until the error is corrected.

A#01
N#33
E#72

Alphanumeric Code	Description	Action
70	Scanner failed Duplicate Node Address check	Change the scanner address to another available one. The node address you selected is already in use on that network.
71	Illegal data in scan list table (node number alternately flashes).	Reconfigure the scan list table and remove any illegal data.
72	Slave device stopped communicating (node number alternately flashes).	Inspect the field devices and verify connections.
73	Device's identity information does not match electronic key in scan list table entry (node number alternately flashes).	Verify that the correct device is at this node number. Make sure that the device at the flashing node address matches the desired electronic key (vendor, product code, product type).
74	Data overrun on port detected.	Modify your configuration and check for invalid data. Check network communication traffic.

Alphanumeric Code	Description	Action
77	Data size expected by the device does not match scan list entry (node number alternately flashes).	Reconfigure your module for the correct transmit and receive data sizes.
78	Slave device in scan list table does not exist (node number alternately flashes).	Add the device to the network, or delete the scan list entry for that device.
79	Scanner has failed to transmit a message.	Make sure that your module is connected to a valid network. Check for disconnected cables.
82	Error detected in sequence of fragmented I/O messages from device (node number alternately flashes).	Check scan list table entry for slave device to make sure that input and output data lengths are correct. Check slave device configuration.
83	Slave device is returning error responses when scanner attempts to communicate with it (node number alternately flashes).	Check accuracy of scan list table entry. Check slave device configuration. Slave device may be in another master's scan list. Reboot slave device.
84	Scanner is initializing the DeviceNet network.	None. This code clears itself once scanner attempts to initialize all slave devices on the network.
85	Data size larger than 255 bytes (node number alternately flashes).	Configure the device for a smaller data size.
86	Device is producing zero length data (idle state) while scanner is in Run Mode.	Check device configuration and slave node status.
91	Bus-off condition detected on comm port. Scanner is detecting communication errors.	Check DeviceNet connections and physical media integrity. Check system for failed slave devices or other possible sources of network interference.
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 scanner's memory.
97	Scanner halted by user command.	Check ladder program for cause of fault bits.
IDLE	Scanner is in IDLE mode.	Put controller in RUN mode. Enable RUN bit in module command register.

Alphanumeric Code	Description	Action
Network Address Displays A#00 - A#63	Normal operation. The numeric display matches the scanner's node address on the DeviceNet network.	Do nothing.
Network Disabled	User has disabled communication port	Reconfigure your module. Check Module Command Register.
No Network Power	No network power detected on comm port.	Provide network power. Make sure that scanner drop cable is providing network power to scanner comm port.
NoRX	No scan list is active in the module or no messages have been received by the scanner.	Enter a scan list. Check DeviceNet connection on front of module.
NoTX	No direct network traffic for scanner detected.	None. The scanner hears other network communication.
Severe Network Error	Scanner is in FAULT mode.	Check ladder program for cause of fault bits.

Interpret the Status Indicators

The three status indicators on the module give you information about your network and its connections. The tables on pages 19 through 21 outline the indicator condition and the corresponding status, and explain what each condition means to you.

Module/Network (MOD/NET) Status Indicator

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

Condition	Status	Indicates
off	not powered/not online	Device is not online. • The device has not completed the Dup_MAC_ID test yet. • The device may not be powered.
green	device operational AND online and connected	The device is operating in a normal condition and the device is online with connections in the established state. • For a Group 2 Only device, it means that the device is allocated to a Master. • For a UCMM capable device, it means that the device has one or more established connections.
flashing green[1]	device operational AND online and not connected, or device online AND device needs commissioning	The device is operating in a normal condition and the device is online with no connections in the established state. • The device has passed the Dup_MAC_ID test, is online, but has no established connections to other nodes. • For a Group 2 Only device, it means that this device is not allocated to a master. • For a UCMM capable device, it means that the device has no established connections. • Configuration missing, incomplete, or incorrect.
flashing red[1]	minor fault and/or connection time-out	Recoverable fault and/or one or more I/O connections are in the timed-out state.
red	critical fault or critical link failure	The device has an unrecoverable fault and may need to be replaced. Failed communication device. The device has detected an error that has rendered it incapable of communicating on the network (duplicate MAC ID or bus-off).

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

I/O Status Indicator

This bi-color (green/red) LED provides information concerning the status of inputs and/or outputs. The terms 'inputs' and 'outputs' are being applied loosely here. For example, a Pneumatic Valve Pack device developer may model its product using Discrete Output Point Objects.

The intent of the I/O Status LED is to inform you whether this device has outputs under control and whether any outputs or inputs are active (outputs active, inputs producing, etc.) or faulted. The LED is intended to reflect the mode/state of the inputs and outputs, not necessarily the on/off condition of the I/O points themselves.

Condition	Output Status	Indicates
off	output(s) inactive input(s) inactive	All output are inactive. All inputs are inactive.
green	output(s) active input(s) active	One or more outputs are active and under control, and no outputs are 'faulted'. One or more inputs are active and producing data, and no inputs are 'faulted'.
flashing green[1]	output(s) idle	One or more outputs are idle, and no outputs are active or 'faulted'.
flashing red[1]	output(s) faulted input(s) faulted	One or more outputs are 'faulted' — may be in the fault state. One or more inputs are 'faulted' — may be in the fault state.
red	output(s) forced off input unrecoverable fault	One or more outputs are forced off (may be an unrecoverable fault). One or more inputs has an unrecoverable fault.

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

Health (OK) Status Indicator

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

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

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

ControlLogix Controller Interface

The initial release of the 1756-DNB firmware supports a single default input, output, and status structure over the ControlLogix backplane. These default I/O structures were created to 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. The **RS**Logix5000™ 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.

The DeviceNet Manager and **RS**NetWorx for DeviceNet software applications configure scanlist map segments that are used to copy specific portions of I/O data between the I/O structures and DeviceNet network packets.

Important: The 1756-DNB scanner supports ControlLogix connections with only one controller at a time.

Output Structure

The controller controls output I/O by writing output data to an output structure that exists in the 1756-DNB module. The scanner module then delivers a copy of these output values to modules on DeviceNet. The output structure consists of a 32-bit control register and an array of 123 x 32-bit 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

Bit	Name	Description
0	RUN	1 = set for run mode 0 = set for idle mode
1	FAULT	1 = set to fault network
2	Disable_Network	1 = set to disable network
3	Halt_Scanner	1 = set to halt module
4	Reset	1 = set to reset module
5 – 31	Reserved	unused

Input Structure

The controller receives input I/O by reading input data from an input structure that exists in the 1756-DNB module. The scanner module 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 an array of 124 x 32-bit 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 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

Bit	Name	Description
0	RUN	1 = in run mode 0 = in idle mode
1	FAULT	1 = network is faulted
2	Disable Network	1 = network is disabled
3	Device Failure	1 = device failure exists
4	Autoverify Failure	1 = failure is verified automatically
5	Comm Failure	1 = communication failure exists
6	Dup Node Fail	1 = failure due to duplicate node address
7	Dnet Power Detect	1 = DeviceNet power failure exists
8 – 31	Reserved	unused

Status Structure

The controller receives status information concerning the 1756-DNB module's ability to exchange DeviceNet messages with other nodes by reading from a status structure that exists in the 1756-DNB module. The scanner module periodically updates the contents of the status structure and copies its contents to the controller. The status structure consists of several 64-bit tables. The bit position of each of the 64 bits that make up a given status table directly corresponds to the node address of a device.

The status structure consists of these data regions:

Status Structure Element	Description	Data Type
scan_counter	counter incremented each I/O scan	32-bit
device_failure_register	device failed bit table	64-bit
autoverify_failure_register	device I/O size doesn't match	64-bit
device_idle_register	device is idle bit table configuration	64-bit
active_node_register	node online	64-bit
status_display	4-character display	4-character

CSA Hazardous Location Approval

CSA certifies products for general use as well as for use in hazardous locations. **Actual CSA certification is indicated by the product label** as shown below, and not by statements in any user documentation.

Example of the CSA certification product label

CL I DIV 2
GP A,B,C,D
TEMP

To comply with CSA certification for use in hazardous locations, the following information becomes a part of the product literature for this CSA-certified industrial control product.

- This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only.
- The products having the appropriate CSA markings (that is, Class I Division 2, Groups A, B, C, D), are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the CSA or the local inspection office having jurisdiction.

Important: Due to the modular nature of a programmable control system, the product with the highest temperature rating determines the overall temperature code rating of a programmable control system in a Class I, Division 2 location. The temperature code rating is marked on the product label as shown.

Temperature code rating

CL I DIV 2
GP A,B,C,D
TEMP

← Look for temperature code rating here

The following warnings apply to products having CSA certification for use in hazardous locations.

WARNING: Explosion hazard —
- Substitution of components may impair suitability for Class I, Division 2.
- Do not replace components unless power has been switched off or the area is known to be non-hazardous.
- Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
- Do not disconnect connectors unless power has been switched off or the area is known to be non-hazardous. Secure any user-supplied connectors that mate to external circuits on this equipment by using screws, sliding latches, threaded connectors, or other means such that any connection can withstand a 15 Newton (3.4 lb.) separating force applied for a minimum of one minute.
- Batteries must be changed only in an area known to be non-hazardous.

CSA logo is a registered trademark of the Canadian Standards Association.

Approbation d'utilisation dans les environnements dangereux par la CSA

La CSA certifie des produits à utilisation générale aussi bien qu'à utilisation en environnements dangereux. **La certification CSA en vigueur est indiqu**ée **par l'étiquette produit** et non par des indications dans la documentation utilisateur.

Exemple d'étiquette de certification d'un produit par la CSA

CL I DIV 2
GP A,B,C,D
TEMP

Pour satisfaire à la certification CSA pour environnements dangereux, les informations suivantes font partie intégrante de la documentation des produits de commande industrielle certifiés par la CSA.

- Cet équipement ne convient qu'à une utilisation dans des environnements de Classe 1, Division 2, Groupes A, B, C, D, ou non dangereux.
- Les produits portant le marquage CSA approprié (c'est-à-dire, Classe 1, Division 2, Groupes A, B, C, D) sont certifiés pour une utilisation avec d'autres équipements où les combinaisons d'applications et d'utilisation sont déterminées par la CSA ou le bureau local d'inspection qualifié.

Important: De par la nature modulaire des systèmes de commande programmables, le produit ayant le code de température le plus élevé détermine le code de température global du système dans un environnement de Classe 1, Division 2. Le code de température est indiqué sur l'étiquette produit.

Code de température

CL I DIV 2
GP A,B,C,D
TEMP

← Le code de température est indiqué ici

Les avertissements suivants s'appliquent aux produits ayant la certification CSA pour une utilisation dans des environnements dangereux.

AVERTISSEMENT: Risque d'explosion —
- La substitution de composants peut rendre ce matériel inadapté à une utilisation en environnement de Classe I, Division 2.
- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de remplacer des composants.
- 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 connecteurs fournis par l'utilisateur qui se branchent aux circuits externes de cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres, pour que les connexions résistent à une force de séparation de 15 Newtons (1,5 kg - 3,4 lb.) appliquée pendant au moins une minute.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

Le sigle CSA est une marque déposée de la Canadian Standards Association.

Module Specifications

Description	Value
Module Location	any slot in the ControlLogix chassis
Maximum Backplane Current Load	600mA @ 5.0V dc and 3mA @ 24V dc from ControlLogix chassis backplane
Maximum DeviceNet Current Load	90mA maximum @11-25V dc 30mA typical @ 11-25V dc
Power Dissipation	5.3W maximum

Environmental Conditions:
      Operational Temperature
      Storage Temperature
      Relative Humidity
	
	0 to 60°C (32 to 140°F)
	-40 to 85°C (–40 to 185°F)
	5-95% without condensation

Shock Unpackaged	30g operational 50g non-operational
Vibration Unpackaged	5g from 10-150Hz
Conductors	Category 2[1]

Agency Certification
(when product is marked)
	• (CSA) certified
	• (UL) listed
	• CE marked for all applicable directives
	• FM APPROVED (CSA) certified
	    Class 1 Div 2
	    Groups A, B, C, D
	    Hazardous Location

[1] Refer to the Industrial Automation Wiring and Grounding Guidelines for Noise Immunity, publication 1770-4.1.

Rockwell Automation

Allen-Bradley

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