Installation Instructions

ControlNet-to-Foundation Fieldbus H1 Linking Device

Catalog 1788-CN2FF

Product Overview

The ControlNet-to-Foundation Fieldbus H1 linking device (1788-CN2FF) connects a ControlNet™ network with one or two FOUNDATION Fieldbus H1 (Fieldbus) networks. Each H1 network consists of multiple Fieldbus devices. Each field device has one or more function blocks. Each function block performs an elementary control function such as analog input, analog output, discrete input, or discrete output. The ControlNet network consists of controllers, such as PLC® processors, HMIs, drives, I/O devices, and so on. The linking device has two broad functions, supporting the following:

- closed-loop control
- configuration and monitoring

Use this document as a guide when you install the 1788-CN2FF module. Refer to the Rockwell Fieldbus Solutions User Manual publication 1757-UM006A-EN-P, for detailed information.

Publication 1788-IN051B-EN-P - March 2002

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.

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:

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.

Handling the Linking Device

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.

System Requirements

This section describes the required hardware and software components you need before you can use the linking device. You should also review the README.TXT file on the linking device setup disk for the latest information.

Hardware

- ControlNet-to-Foundation Fieldbus H1 linking device, 1788-CN2FF module
- PC ControlNet interface: 1784-KTC15, 1784-PCC, 1784-PCIC
- ControlNet and Fieldbus cabling

Software

- Windows NT® 4.0 with service pack 3 or higher
- NI-FBUS Configurator, 1788-FFCT version 2.3.6 or higher.

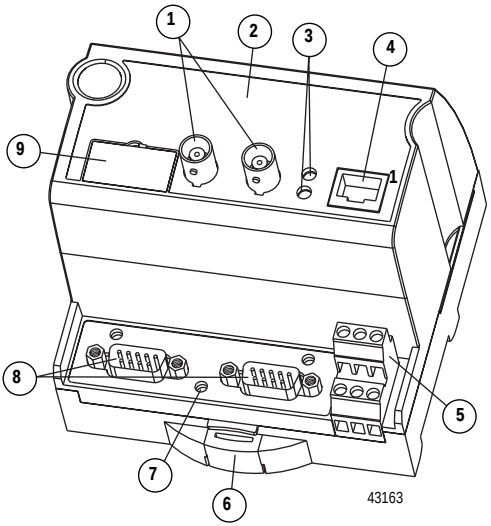
The following software is necessary to configure the Fieldbus devices and the linking device using ControlNet.

- RSLinx OEM™ 2.0 or later; this is the driver for the Allen-Bradley PC interfaces (RSLinx Lite™ is not sufficient.)
- RSNetWorx™ for ControlNet version 1.8 or later; this is the ControlNet configuration tool

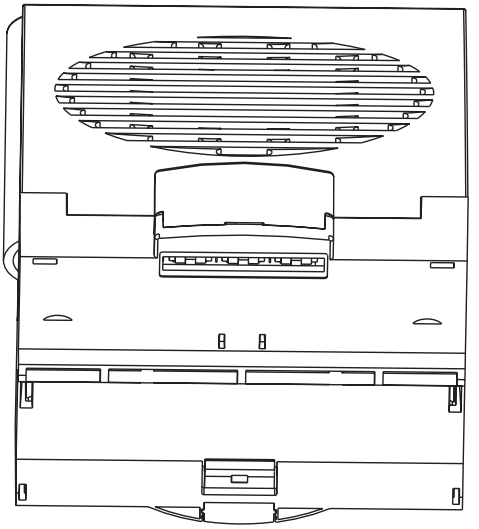
Linking Device Hardware Description

Figure 1 shows the components of the linking device.

Figure 1 ControlNet-to-Foundation Fieldbus Linking Device



1. ControlNet BNC Connectors
2. Case/Enclosure
3. ControlNet Network Status LEDs
4. ControlNet Network Access Port (NAP)
5. Power Supply Connector
6. DIN Rail Clip
7. ControlNet Module STATUS LED
8. Fieldbus Connectors
9. Network Address Switches (under cover)



Installation Considerations

The linking device is designed to be mounted on a 35 mm DIN rail. The device dimensions are of 4.375 x 4.375 and is 4.5 inches high. ControlNet connectors are on top of the unit, allow 1.5 inches for the connectors. It has one ControlNet port with support for redundant media and a network access port.

The ControlNet status LEDs on the front of the linking device display the current status of each of the redundant media channels. The rotary switches are used to set the ControlNet network address. You can write the network address in the space provided on front of the device.

The linking device has two separate Fieldbus ports. The CN2FF supports 2 Fieldbus networks. The status LED indicates if the device is powered on and operating properly. The power connections are used to supply power to the linking device.

You need to leave some space for the installation of the power conditioner which keeps the modulation on the Fieldbus network away from the power supply. You need a power conditioner for each Fieldbus network. Refer to Power Conditioner and Expander Description on page 7 for space requirements.

The CN2FF uses about 270 ma at 24 V. Typical Foundation Fieldbus transmitters only use about 20 ma, therefore one power supply will handle many FF devices. One CN2FF supports a maximum of 30 connections to function blocks in Fieldbus devices. Count the contained function blocks that are going to be connected to the ControlLogix or ProcessLogix processor. A typical Fieldbus pressure transmitter will publish both a Pressure Output function block and a separate Temperature Function Block. That example would account for two connections.

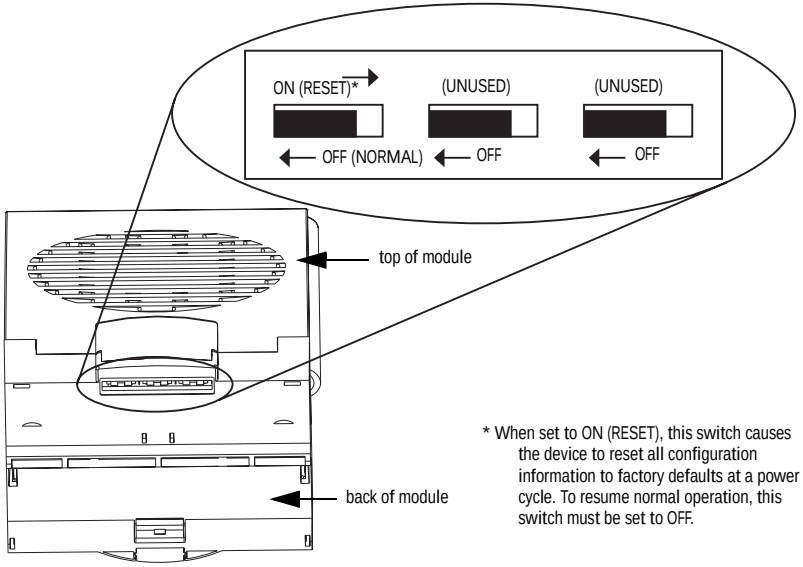
Reading Fieldbus Values Example

If you have 12 connections on each Fieldbus network, or if all the connections are going on one of the two H1 Fieldbus networks on the CN2FF, limit the connections to 18. It takes 40 to 50 milliseconds to transmit all the data associated with on Function Bloc. Therefore if you have 18 Analog Input connections on one H1 Fieldbus network, it will take about 900 milliseconds to read all the values once.

Configuring the 1788-CN2FF Linking Device

The linking device has three configuration switches accessible from an opening in the bottom of the module. These switches are illustrated in Figure 2.

Figure 2 The 1788-CN2FF Configuration Switches



Power Conditioner and Expander Description

A power conditioner must be installed between the Fieldbus network and the network power supply. Without this power conditioner the modulation from the 1788-CN2FF and the Fieldbus devices is shorted out.

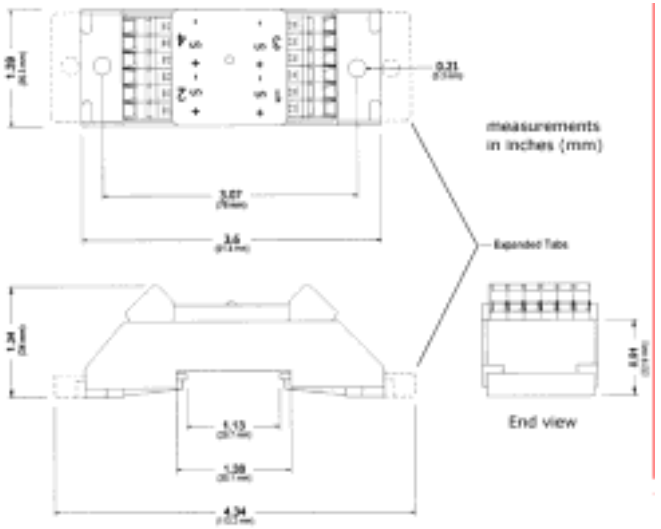
Rockwell recommends using the Relcom, FCS-BPCT2-CC with both the 1757-FIM and the 1788-CN2FF. To obtain a RELCOM power conditioner and expander, refer to http://www.relcominc.com/fieldbus/fbproducts.htm.

Relcom Fieldbus Connection System (FCS) includes all the components necessary to provide device connection, termination, short circuit protection, and conditioned power to a Foundation Fieldbus network. FCS wiring blocks are DIN rail and flat panel mountable. Most components are now available with a choice of pluggable, screw terminal, or Cage Clamp connectors.

A power conditioner dimension is about 1.5 inches wide, (along the DIN Rail) x 3.5 inches (perpendicular to the DIN Rail) x 1 inch high. The wires attach to both 1.5 inch sides of the power conditioner.

A Conditioner with two Terminators, FCS-BPCT2-CC, is used on very short networks where there may not be any home run cable. In this case, all devices, the controller and the power supply are connected to a central hub. The power conditioner with two terminations provides all the Fieldbus termination and power supply conditioning requirements. This configuration is typically useful in a demo or laboratory test environment. It is not expected that this configuration would be used in an actual field installation.

If more than two fieldbus connection points are needed, an expander block is plugged into the power conditioner to provide four additional cable connection points. The Power Conditioner blocks are internally current limited, allowing the use of a single power source for multiple Fieldbus segments. If a short circuit or over current condition exists on one of the segments, it will not affect the operation of the other segments as long as the total current capability of the single power source is not exceeded. Output power is referenced to the ground bolt and the fieldbus segment cable shield. Conditioned Fieldbus power is provided at two sets of terminals and the expansion connector. All Power Conditioners have a built-in differential surge suppressor which limits spikes that may be present on the fieldbus. This protects attached devices from damage. The Power Conditioners have an LED that illuminates to indicate when segment power is present. A separate power conditioner is required for each Fieldbus network.

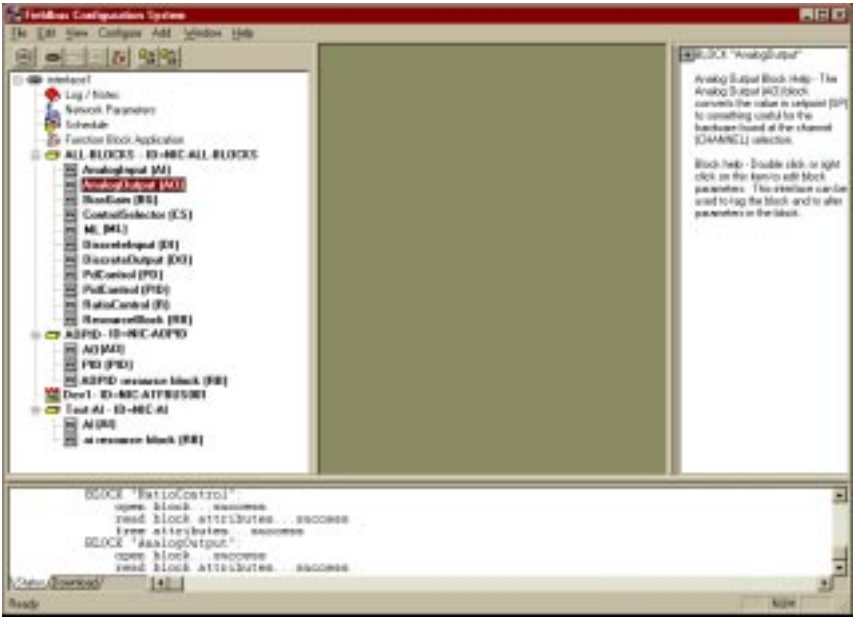


NI-FBUS Configurator Software Description

Use the NI-FBUS Fieldbus Configurator to configure a Fieldbus network and keep track of your configurations. The Configurator is an easy-to-use graphical environment for creating Fieldbus linkages, loops, and schedules.

Figure 3 shows the Configurator Main window. For more information, refer to the NI-FBUS Configurator User Manual, publication 1788-6.5.2.

Figure 3 NI-FBUS Configurator Main Window



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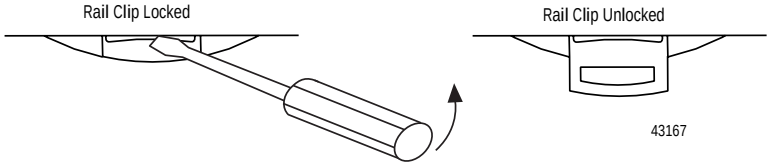
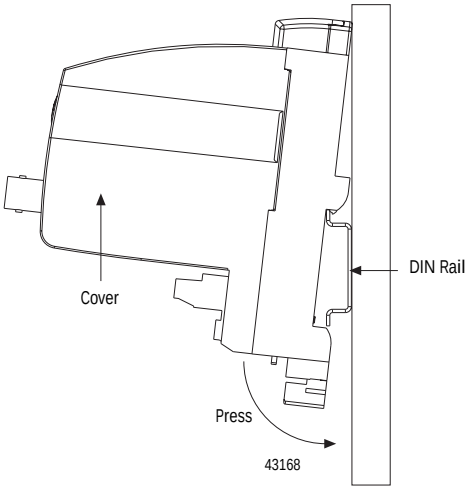
Installing the 1788-CN2FF Linking Device

The linking device has a rugged, simple clip for mounting reliably on a standard 35mm DIN rail. Follow these steps to mount the linking device onto a DIN rail.

1. Use a flat-bladed screwdriver to open the DIN Rail Clip to the unlocked position.

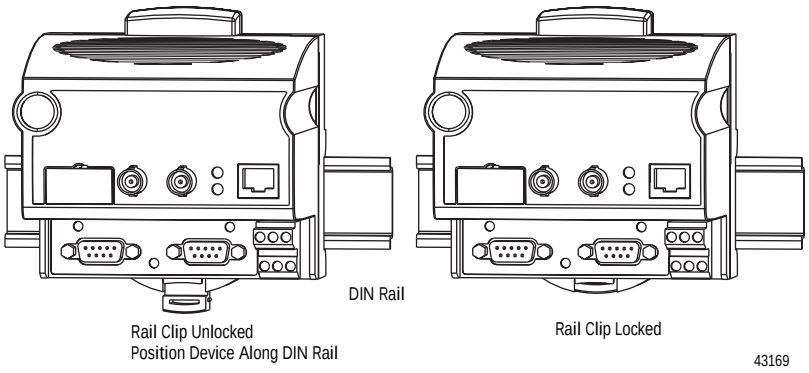


2. Hook the lip on the rear of the linking device onto the top of a 35mm DIN rail and press the linking device down onto the DIN rail.



3. Slide the linking device to the desired position on the DIN rail. After it is in position, push the rail clip into the locked position to lock it in place on the DIN rail.

Figure 4 Install the 1788-CN2FF on to the DIN Rail



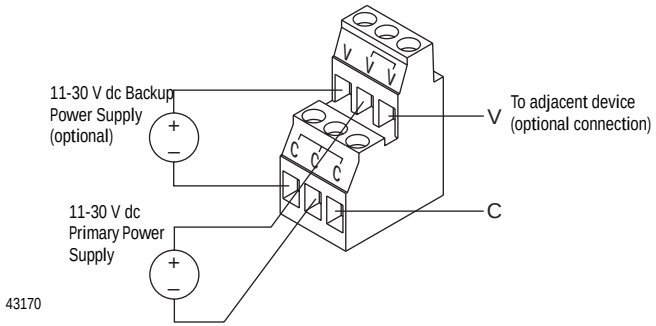
Removing the Linking Device

To remove a linking device, unlock it from the DIN rail by placing a screwdriver in the slot on the rail clip and opening the rail clip to the unlocked position as shown in step 1 on page 10. Then lift the device off of the rail.

Connecting Power

The linking device requires 11-30V dc power. One power supply can support several linking devices. The power connector is a 6-pin screw terminal connector. The pinout for the power connector is shown in Figure 5.

Figure 5 Power Connector Pinout



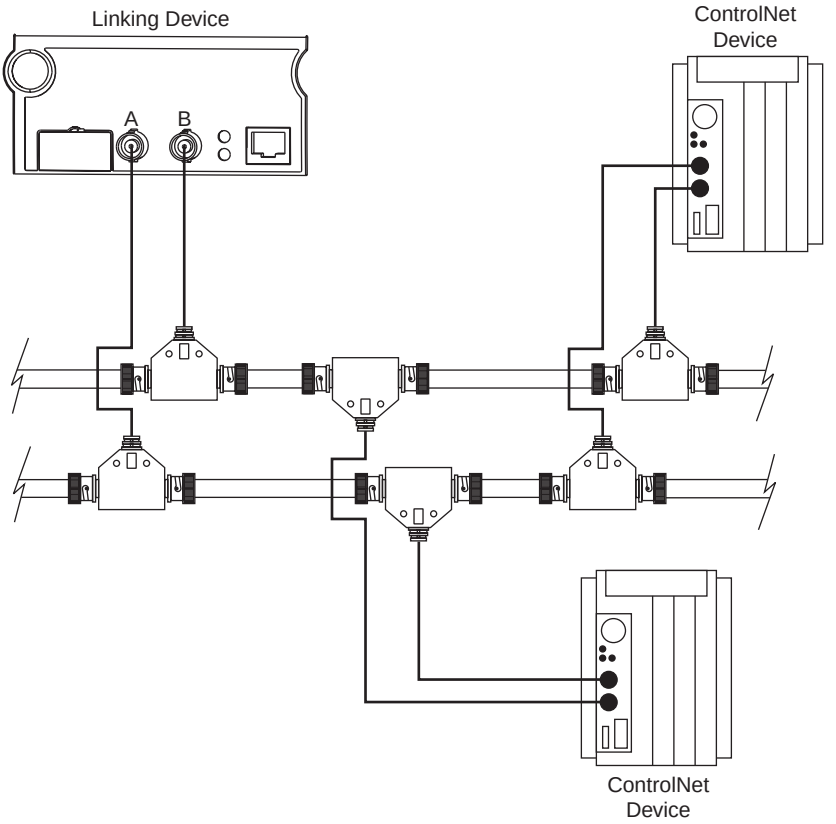
Connect the primary power supply to the center V and C pair. An optional backup power supply may be connected to the left V and C pair. The right V and C pair may be used to chain the primary power supply to other devices. All three terminals labeled C are connected in the linking device. The right two V terminals are connected in the linking device. These connections are indicated on the power connector by the lines over the V and C terminals.

Connecting to the ControlNet Network

There are two types of ControlNet connectors on the linking device. The BNC connectors are for direct connection to a ControlNet network through a tap. The BNC connectors must be used to connect the linking device to the ControlNet network. The RJ-45 connector is a network access port (NAP). This port is only for temporary connections to a ControlNet network.

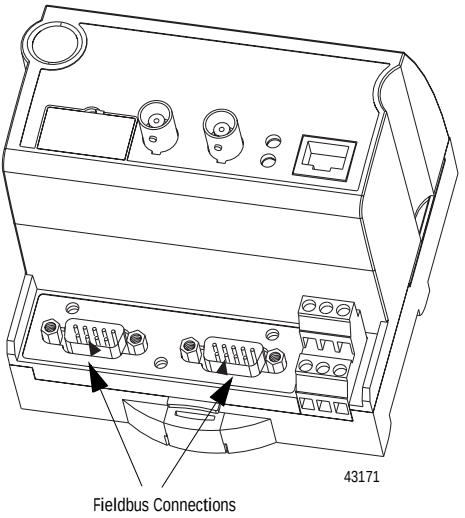
IMPORTANT Do not connect the linking device to more than one ControlNet network at a time. Attempting to connect to a second network will cause the linking device to operate erratically.

Figure 6 Typical Linking Device Connections to a ControlNet Network



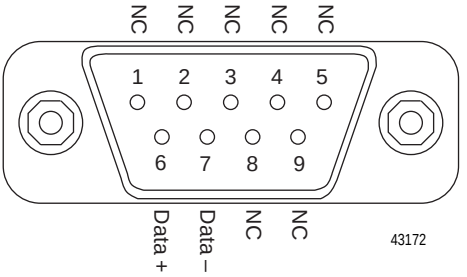
Connecting to the Fieldbus Network

Figure 7 Fieldbus Connector Locations on the Linking Device



Use pins 6 and 7 for the Fieldbus signals, as specified in the *Fieldbus Standard for Use in Industrial Control Systems, Part 2, ISA-S50.02.1992*. Refer to Figure 8 for the connector pinout of the linking device.

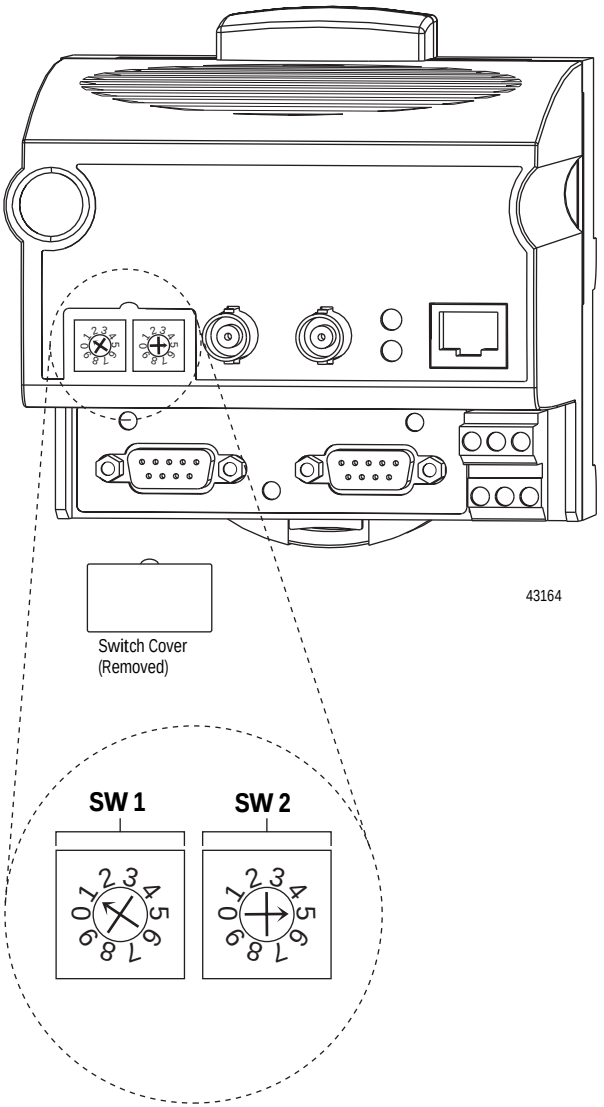
Figure 8 Fieldbus Connector Pinout for the Linking Device



Setting the ControlNet Network Address

Valid ControlNet network addresses are 1-99. Network address zero is reserved. Switch 1 controls the most significant decimal digit (the tens). Switch 2 controls the least significant decimal digit (the ones). Figure 9 shows the location of the network address switches and an example of switch settings for a network address of 15.

Figure 9 ControlNet Network Address Switches Set to 15



Follow these steps to set the ControlNet network address for the linking device.

For optimum throughput, assign network addresses to your ControlNet nodes in a sequential order starting with 01 for the PC running the configuration software.

1. Choose and set a network address.
2. Write the network address setting in the space provided on the linking device label.
3. Apply (or cycle) power to the linking device to enable the new network address.
4. Make the same address changes in your NI-FBUS configuration software.

Interpreting the LEDs

Module STATUS LED

The STATUS LED is located on the front of the linking device, between the two Fieldbus connectors, as shown in Figure 1, Item 7. It indicates whether the linking device is powered, configured, and operating properly. Table 10 shows how to interpret the STATUS LED states.

Table 10 STATUS LED State Descriptions

LED State	Description
Off	No power to linking device
Flashing red and green	Linking device self testing
Flashing green	Standby state(1)
Solid green	Operational state(2)
Flashing red	Major recoverable fault
Solid red	Major unrecoverable fault

(1) Standby state indicates the linking device has passed all self tests and is ready to operate. Yet, it is not functioning because it is not been configured.

(2) Operational state indicates the linking device has left standby state because the necessary network configuration (if any) has occurred.

ControlNet Network Status LEDs

The ControlNet network status LEDs are located on the front of the linking device, beside the ControlNet BNC connectors, as shown in Figure 1, Item 3. They indicate the state of the ControlNet connected to the BNC connectors. These LEDs do not reflect anything about the status of the network access port (NAP). If more than one state is present, the LEDs always reflect the highest priority status present on the network. Table 11 describes the LED states and the priority of each status.

Table 11 LEDs

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

Specifications

Type	Specifications
Operating Temperature	0 to 60°C (32 to 140°F) 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)
Storage Temperature	–40 to 85°C (–40 to 185°F) 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)
Relative Humidity	5 to 95% non-condensing IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat)
Vibration	IEC60068-2-6 (Test Fc, Operating): 2g @ 10-500Hz
Physical Dimensions	4.375 in. x 4.375 in x 4.5 in • ControlNet connectors are on top of the unit • Allow 1.5 inches for the connectors.
Shock	IEC60068-2-27 (Test Ea Unpackaged shock): Operating 30g Non-operating 50g
Emissions	CISPR 11: Group 1, Class A
ESD Immunity	IEC 61000-4-2: 4kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 1000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz
EFT/B Immunity	IEC 61000-4-4: ±2kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on signal ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Magnetic Field Immunity	IEC 61000-4-8: 30A/m at 50Hz
Enclosure Type Rating	None (open-style)
Communication	• ControlNet - redundant media and network access port • FOUNDATION Fieldbus H1, 2 independent channels • LAS on both channels • Time Master on both channels
Mounting	35 mm DIN rail
Power Requirements	11-30V dc; 270 mA @ 24V dc (typical)
Indicators	• Module Status • ControlNet Status, 1 each connection

Type	Specifications
Connectors	• ControlNet - BNC connectors, two 10-position rotary switches • Network Access Port - RJ45 • Fieldbus - 9-pin sub-D connectors • Power Input Terminals: -Torque 5-7 in-lb. -Not to be used with combination of solid and stranded 16 GA wire
Category Wire	Category 2(1) Copper
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE[1] 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 [1] See the Product Certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

(1) Refer to the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

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

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