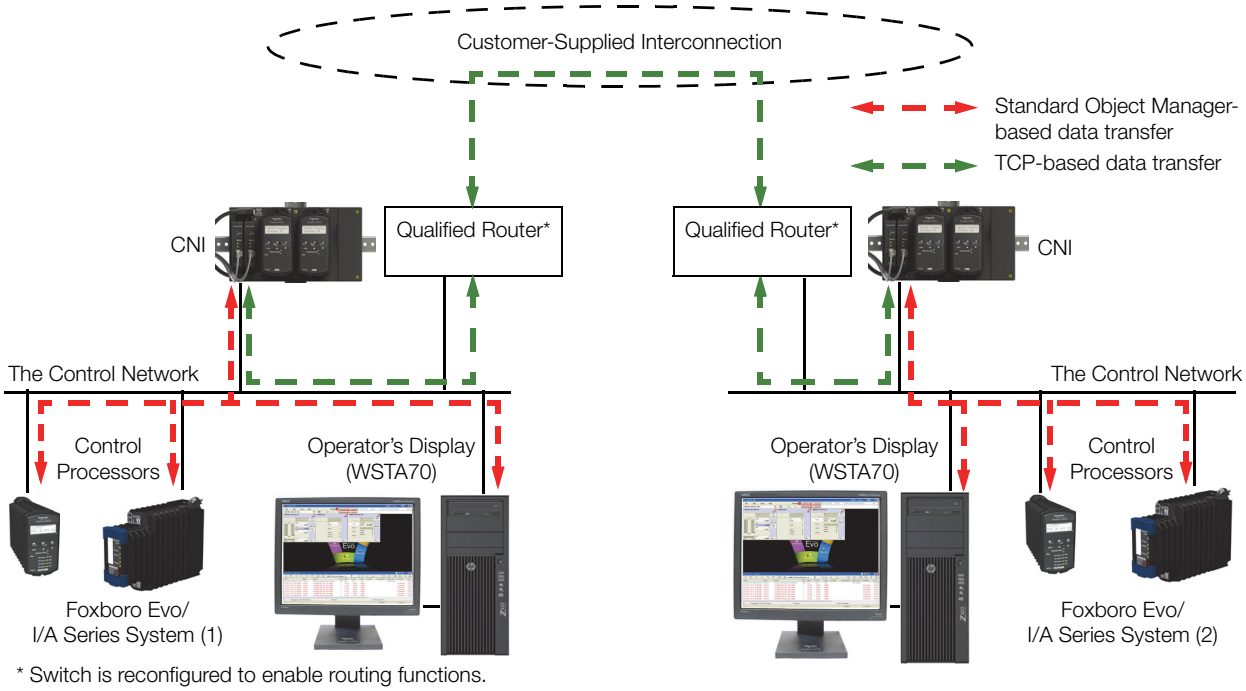
Foxboro Evo™ Process Automation System

Product Specifications

Foxboro® by Schneider Electric

PSS 31H-1CNI

Control Network Interface



Multiple Foxboro Evo™ Process Automation Systems and/or I/A Series® systems can be combined or partitioned to meet plant operational and management requirements. Likewise, in cases where large systems pose a maintenance burden or a cyber-security risk, it may be desirable for the system to be separated into independent systems linked over a customer-supplied interconnection (network). The Control Network Interface (CNI) is an optionally fault-tolerant solution to couple two systems and permit (or restrict) communications of designated data items between the two Foxboro Evo systems (that can be distributed in two separate plant areas), to enable the combining, partitioning, or separation of systems.

OVERVIEW

If a plant has multiple Foxboro Evo or I/A Series systems, it can be necessary in some scenarios to share process control data among these systems. The Control Network Interface (CNI) is an optionally fault-tolerant station that facilitates Ethernet communications between two Foxboro Evo or I/A Series systems over a customer-supplied interconnection, which can enable or restrict access to the control data used in the system of which the CNI is part.

The customer-supplied interconnection consists of connections to routable ports, currently through Qualified routers connected to the control network. These switches must be configured to enable routing functions using the SCAS tool discussed in *EcoStruxure™ Foxboro DCS Switch Configurator Application Software for the Control Network User's*

Guide (B0700CA).

On the customer-supplied interconnection, Virtual Router Redundancy Protocol (VRRP) must be used to provide redundant routers to utilize redundant paths through the network to the remote CNIs with which the local CNI communicates. For more information on these switches, see *The Foxboro Evo Control Network Ethernet Equipment* (PSS 31H-7NW_EQUIP).

For more information on recommendations and security concerns for the customer-supplied interconnection, see the *Control Network Interface (CNI) User's Guide* (B0700GE).

The CNI enables these control data to be shared among systems:

- Control point data read/write requests
- Compound:Block.Parameter addresses
- Foxboro Evo/I/A Series Application Objects (excluding shared variables)

With Control Core Services v9.3 or later, the CNI v1.1 or later supports the distribution of these types of alarm and other types of messages between Foxboro Evo systems:

- Process Alarm messages sent using the APRINT mechanism. Acknowledgements (ACK), such as horn ACK and horn silence commands, are sent through existing Object Manager mechanisms.
- SOE messages from EVENT blocks
- SOE messages from Triconex System Access Application (TSAA)
- Sequence block messages
- Operator Action Journal (OAJ) messages

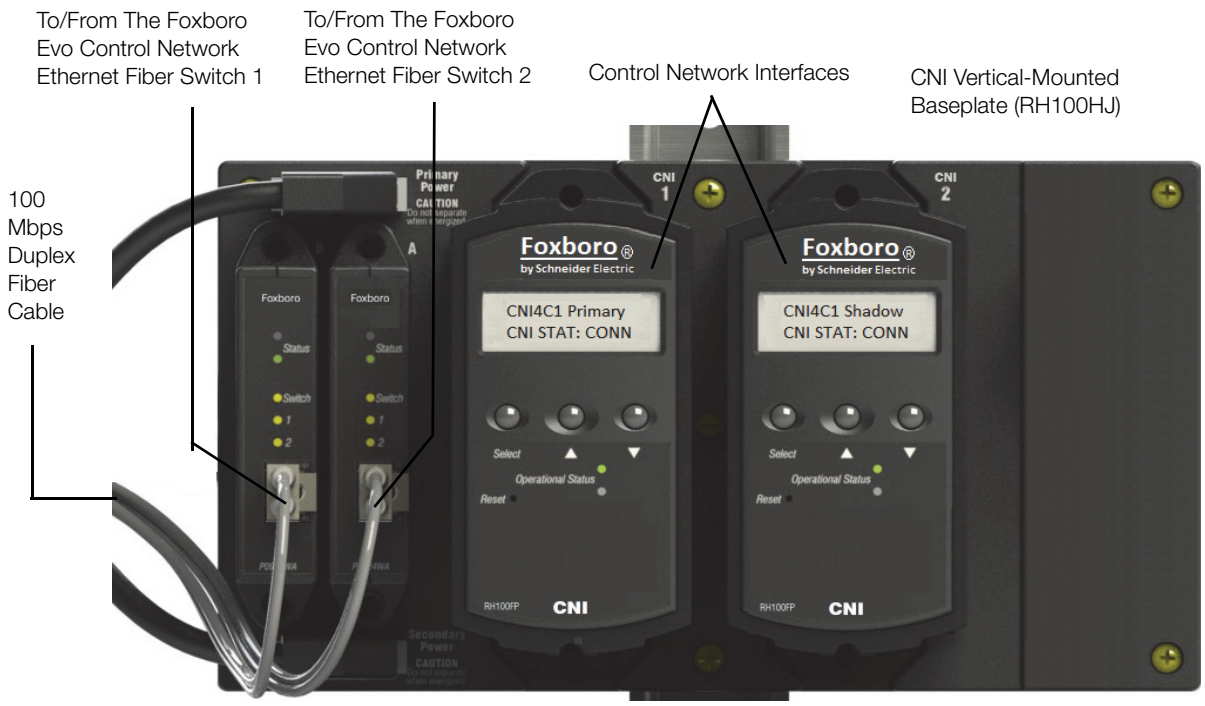
Access and restriction to these data are configured by the CNI Access List Editor which assigns “Read Only”, “Read/Write” and “Deny Access” lists to the CNI. When a CNI receives a request for control data, it only returns the data as allowed by these access lists. The Access List Editor is installed on host workstations for the CNI as part of the Foxboro Evo Control Core Services v9.3 or later installation.

Any application that can request Object Manager (OM) data (such as the Wonderware Historian) can access this data through the CNI.

The CNI supports these integration scenarios:

- Integrating multiple Foxboro Evo and/or I/A Series systems that are geographically distributed
- Integrating separate Foxboro Evo and/or I/A Series systems that need to be isolated for security and/or business confidentiality
- Integrating Foxboro Evo and/or I/A Series systems, allowing each system to be updated to different versions of Foxboro Evo Control Core Services and/or I/A Series software independently without having to bring the entire extended system down, or without requiring all interconnected systems to be at the same system software version
- Integrating Foxboro Evo and/or I/A Series systems that have duplicate IP and/or MAC addresses

The CNI also provides the functionality to partition an existing Foxboro Evo and/or I/A Series system into two or more separate systems, to help provide easy upgrade, and help protect against cyber-security attacks by providing isolation.



Network Adapters to The Foxboro Evo Control Network (Fiber Adapters shown, Copper Adapters available)

Figure 1. CNIs Mounted on CNI Vertical Mounted Baseplate

FEATURES

- Minimizes the effort, time and complexity of enabling multiple Foxboro Evo Process Automation Systems to read/write shared control data
- Enables segmentation of an existing large Foxboro Evo Process Automation System into two or more independent but linked systems, to help provide easy upgrade, and help protect against cyber-security attacks by providing isolation.
- Enables data from Foxboro Evo control blocks, data from I/A Series Application Objects (excluding shared variables), and alarms/events to be shared between systems. Alarms can be acknowledged remotely.
- Control data and alarms/events from other systems are available to operators using applications such as the Foxboro Evo Control HMI and FoxView
- Liquid Crystal Display (LCD) displays letterbug, real-time roles, and status
- Connects to the Foxboro Evo Control Network (referred to as the control network) using standard fiber optic or copper Ethernet cables
- Uses a rugged, die cast aluminum housing for mounting in a non-vented field enclosure

- Can operate in Class G3 harsh environments
- CE certified for field mounting in enclosures
- Uses soft letterbugs configurable using the keys on the CNI faceplate

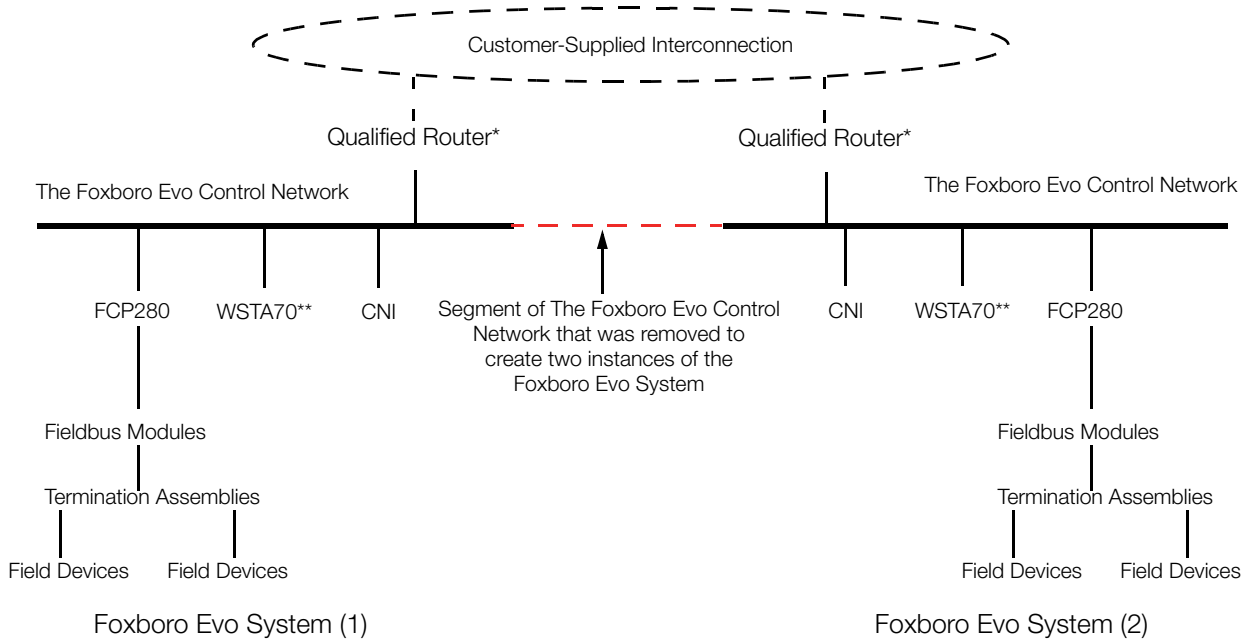
FOXBORO EVO PROCESS AUTOMATION SYSTEM INTEGRATION AND PARTITIONING

When control points are shared between systems using a CNI-to-CNI link, two or more dispersed Foxboro Evo and/or I/A Series systems can act as a single, extended system. Two or more integrated systems allow:

- Operators to monitor adjacent processes
- Engineers to run supervisory control processes across multiple units when process timing constraints can be met
- Designers to engineer Foxboro Evo and I/A Series systems in a phased approach, knowing that there is a solution for tying individual systems together at a later time

The CNI manages bi-directional control point data read/write requests between the systems with internal access lists, which can be edited from a workstation with the CNI Access List Editor. Any control data on the “Deny Access” list, or not included on the “Read Only” or “Read/Write” lists, cannot be accessed remotely.

Operators can monitor CNI health from the System Manager, and also items such as hostname, IP address, fault-tolerant state, run mode, and so forth.



* Switch must be configured to act as a router.
** Control Core Services v9.3 installed

Figure 2. Partitioning an Foxboro Evo Process Automation System

ALARM AND EVENT MESSAGE INTEGRATION

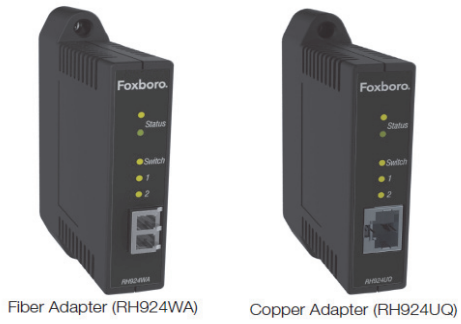
The CNI's message forwarding functionality maintains a centralized alarm management subsystem that aggregates process alarms and events from all the Foxboro Evo and/or I/A Series systems with which the CNI communicates. Distributing process alarms and events to multiple systems allows alarm clients, such as annunciators, printers and/or Historians, in other systems to receive, record, and acknowledge these alarms and events. This allows a central operator to monitor alarm and event conditions in multiple systems, and be alerted to any issues that occur. This also allows alarm strategies to remain intact when a system is split into multiple Foxboro Evo systems, as these strategies can then be logically recombined using the CNIs, saving the re-engineering cost.

In addition, these message types can also be distributed among multiple systems using the CNIs.

- Control Processor Generated Messages - The control processor generates a number of different APRINT messages for process alarms and events, including HIABS, LOABS, HHABS, LLABS, HIDEV, LODEV, RATE, BADIO, STATE, INFO, CONF, EVENT, TRIP, ALACK, HIOUT, LOOUT, RANGE, DISABL, CHANGE, and ENABLE. The CNI can distribute these messages to supported destinations such as workstations, printers or Historians in other systems. You can configure various actions to occur when these destinations receive certain types of messages, such as sounding horns for alarm messages.
- Operator Action Journal (OAJ) Messages
- System Alarm Messages - The CNI does not support the forwarding of system alarm messages.

FIBER AND COPPER NETWORK ADAPTERS

The CNI supports direct connections to the control network through network adapters (see Figure 3) on the CNI baseplate, and each connect to one Ethernet switch. The CNI baseplate passes inbound traffic from either of the two switches to both CNIs, and passes outbound traffic from the primary CNI module to one switch using the selected network adapter.



Fiber Adapter (RH924WA) Copper Adapter (RH924UQ)

Figure 3. Fiber Optic and Copper Network Adapters

LIQUID CRYSTAL DISPLAY (LCD)

The CNI has a liquid crystal display (LCD) on its faceplate, which displays various status and identification information:

- The first line typically displays the CNI's letterbug and role (Primary/Shadow/Single).
- The second line displays the CNI's operational status, part number, and various configuration and operating parameters, such as hardware revision, software revision, Ethernet connection status, and CNI connection status.

LED INDICATORS

Light-emitting diodes (LEDs) on the front of the CNI module provide visual indication of the CNI's operational status.

LED indicators on the copper or fiber network adapters provide visual indication for:

- Internal and external power supply health status
- Communications activity to the Foxboro Evo Control Network and Ethernet communications between the network adapters and the CNI modules

CNI BASEPLATE

The CNI is installed on the CNI vertically-mounted baseplate, as shown in Figure 4. This DIN rail mounted baseplate supports a non-fault-tolerant single or fault-tolerant pair of CNIs. It also supports two copper or fiber network adapters, which are needed for connection to the control network.

CNI Vertical-Mounted Baseplate (RH100HJ)
for Control Network Interface

Figure 4. CNI Vertical-Mounted Baseplate

CNI FUNCTIONAL SPECIFICATIONS

Processor Type

CONTROL NETWORK INTERFACE

ARM® System on a Chip (SOC) with stored programs, using high-speed communication capability.

SIZE

128 MB SDRAM
128 MB flash memory

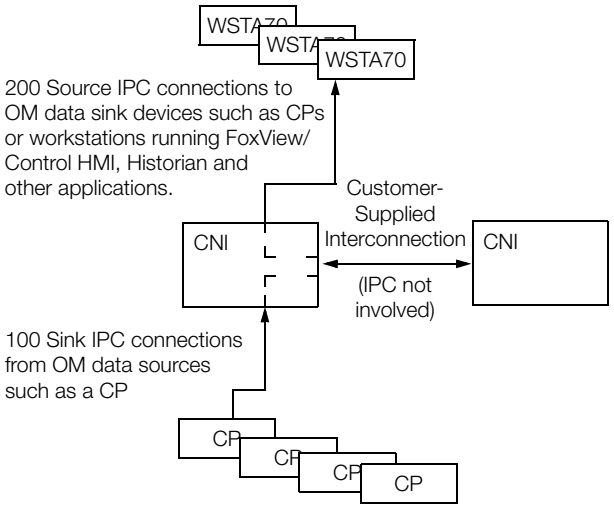
ERROR DETECTION

ECC providing single-bit error detection and correction as well as multiple-bit error detection.

Maximum Number of IPC Connections

300
200 connections for source devices
100 connections for sink devices(1)

An IPC connection provides the means to exchange continuous process control information.



A source IPC connection is a connection to a destination device executing a process that consumes OM data. So a CNI can provide data for up to 200 destination stations, such as CPs or workstations executing applications, such as FoxView/Control HMIs and Historian Data Collectors. A sink IPC connection is an external device to which the CNI can connect in order to acquire process control data. The CNI can receive continuous updates from up to 100 other data sources(1).

The customer-supplied interconnection between local and remote CNIs is not involved when it comes to determining the number of IPC connections (source or sink) that have been consumed.

Alarm Messages and Events

LOGICAL MESSAGE DESTINATIONS

Up to 30 alarm/event destinations

MESSAGE FORWARDING PERFORMANCE

High Alarm Activity
6000 Alarms/Hour (Averaging 100 Alarms/Minute, or 2 Alarms/Second)

BURST/QUEUE

Burst up to 25 Alarm/Events per second, able to support a queue of 2000 entries
The communications messages forwarded and queued can contain up to five alarm/event items. So the performance seen can be as low as five alarms/events per second, and a range of 2000-10,000 alarms/events can be queued.

(1) Some capacity limitations can apply based on certain scenarios when connecting many data sources. Multiple CNIs can be used to enable load sharing. To enable an assessment of CNI capacity requirements, see Control Network Interface (CNI) Sizing Guidelines and Excel Workbook (B0700HL). For more information on sizing details and to assess the CNI capacity requirements, see Control Network Interface (CNI) User's Guide (B0700GE).

Maximum OM Scanner Database

10,000 points. OM scan rate and BPC fixed for 500ms.

The Object Manager (OM) scanner database is the total of all points in the control scheme for which the CNI is scanning and providing updates.

Maximum Throughput

2000 change driven updates (value, status, time stamp) each second cumulative between incoming and outgoing data. The CNI also supports one-shot gets/sets at a rate of 10 requests each second, again cumulative between incoming and outgoing requests. This slower rate is due to the processing overhead and turnaround time associated with these operations.

Maximum Number of OM Sink Points

10,000

The OM sink point limitations refer to the number of points that can be received from outside sources.

Time to Marry Fault-Tolerant Modules

Less than 1 second

Internal Diagnostics

Self-checking performed at power-up. Run-time checks and the watchdog timer function performed during operation.

When CNIs are configured as a fault-tolerant pair, constant synchronization checking and message compare operations are also used to detect hardware faults.

Power Requirements

INPUT VOLTAGE (REDUNDANT VOLTAGE)

24 V dc typical

CONSUMPTION (PER NON-FAULT-TOLERANT MODULE)

8.5 W, maximum

Regulatory Compliance

ELECTROMAGNETIC COMPATIBILITY (EMC)

European EMC Directive 2014/30/EU

Meets:

EN61326-1:2013 Class A Emissions and Industrial Immunity Levels

PRODUCT SAFETY

Underwriters Laboratories (UL) for U.S. and Canada

Underwriters Laboratories (UL) for U.S. and Canada UL/UL-C listed as suitable for use in Class I, Groups A-D; Division 2 Communications circuits also meet the requirements for Class 2 as defined in Article 725 of the National Electrical Code (NFPA No.70) and Section 16 of the Canadian Electrical Code (CSA C22.1). Conditions for use are as specified in the *Control Network Interface User's Guide* (B0700GE).

EUROPEAN LOW VOLTAGE DIRECTIVE 2014/35/EU AND EXPLOSIVE ATMOSPHERES (ATEX) DIRECTIVE 2014/34/EU

ATEX (DEMKO) Ex nA IIC T4 Gc certified when connected as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). For use in an enclosure suited for an ATEX Zone 2 classified area.

SECURITY

Wurldtech Achilles Certification™ Level 1 on control network connection

CNI ENVIRONMENTAL SPECIFICATIONS(2)

Operating

TEMPERATURE
0 to 60°C (32 to 140°F)

RELATIVE HUMIDITY
5 to 95% (Noncondensing)

ALTITUDE
-300 to +3000 m (-1000 to +10,000 ft)

CONTAMINATION (FOR CNI AND NETWORK ADAPTERS)
Class G3 (Harsh) as defined in ISA Standard, S71.04. No effect on functionality after simulated 10-year exposure to mixed gas testing per EIA Standard 364-65A, Class III.
The CNI has conformal coating.

VIBRATION
0.5 g (5 to 500 Hz)

Storage

TEMPERATURE
-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY
5 to 95% (Noncondensing)

ALTITUDE
-300 to +12,000 m (-1000 to +40,000 ft)

CNI PHYSICAL SPECIFICATIONS

Configuration

Single processor module
The fault-tolerant version consists of two CNI modules with an interconnecting fault-tolerant connector integral to the baseplate.

Mounting

Can be placed in the CNI vertical mounted baseplate
For the fault-tolerant CNI, the two modules must be mounted in dedicated slots to allow for interconnecting fault-tolerant communication.

Dimensions - Module

HEIGHT
105 mm (4.13 in)
116 mm (4.56 in) including mounting lugs

WIDTH
51.8 mm (2.04 in)

DEPTH
147 mm (5.79 in)

Figure 5. CNI Dimensions

(2) The environmental limits of this module can be enhanced by the type of enclosure containing the module. (See the applicable Product Specification Sheet (PSS) that describes the specific type of enclosure that is to be used.)

Weight (Maximum)
0.8 kg (1.76 lb) for a single, non-fault-tolerant module

Part Numbers

CNI
RH100FP

CNI VERTICAL-MOUNTED BASEPLATE
RH100HJ

MULTIMODE FIBER ADAPTER
RH924WA

COPPER ADAPTER
RH924UQ

Ethernet Switch to CNI Cabling

CABLING CONNECTORS

Fiber Adapter
Ceramic type LC connector on one end (for network adapters) with an MT-RJ or LC connector on the other end (for switch)

Copper Adapter
RJ-45 connectors on both ends

MULTIMODE FIBER OPTIC CABLE

Cable Material
Multimode fiber (MMF) 62.5/125 µm plenum

Cable Lengths
Up to 50 m (164 ft) – Foxboro supplied.
Greater than 50 m – user supplied

Maximum Length
2 km (6,562 ft) from the Ethernet switch to the CNI.

COPPER CABLE

Cable Material
1000Base-T CAT5e copper Ethernet cable

Cable Lengths
Up to 100 m (328 ft) – Foxboro supplied

Maximum Length
100 m (328 ft) from the Ethernet switch to

CNI BASEPLATE FUNCTIONAL SPECIFICATIONS

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)
24 V dc +5%, -10%

POWER CABLING

Cable Lengths
0.4 m (16 in) up to 2.1 m (6.89 ft)

Regulatory Compliance

ELECTROMAGNETIC COMPATIBILITY (EMC)

European EMC Directive 2004/30/EU
Meets:
EN61326-1:2013 Class A Emissions and Industrial Immunity Levels

PRODUCT SAFETY

Underwriters Laboratories (UL) for U.S. and Canada
UL/UL-C listed as suitable for use in Class I, Groups A-D; Division 2; temperature code T4 enclosure based systems. Communications circuits also meet the requirements for Class 2 as defined in Article 725 of the National Electrical Code (NFPA No.70) and Section 16 of the Canadian Electrical Code (CSA C22.1). Conditions for use are as specified in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

EUROPEAN LOW VOLTAGE DIRECTIVE 2014/35/EU AND EXPLOSIVE ATMOSPHERES (ATEX) DIRECTIVE 2014/34/EU
ATEX (DEMKO) Ex nA IIC T4 Gc certified when connected as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). For use in an enclosure suited for an ATEX Zone 2 classified area.

CNI BASEPLATE ENVIRONMENTAL SPECIFICATIONS(3)

Operating

TEMPERATURE
-20 to +60°C (-4 to +140°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

ALTITUDE
-300 to +3000 m (-1000 to +10,000 ft)

Storage

TEMPERATURE
-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

ALTITUDE
-300 to +12,000 m (-1000 to +40,000 ft)

Contamination (Non-Enclosure Mounted)

Class G3 (Harsh) as defined in ISA Standard S71.04

Contamination (Enclosure Mounted)

Class G3 (Harsh) as defined in ISA Standard S71.04
Pollution degree 2 as defined in IEC 664-1

CNI BASEPLATE PHYSICAL SPECIFICATIONS

Mounting

DIN RAIL
CNI baseplates mount on a non-isolated, mechanically supported vertical DIN rail, which can be internal to, or external to an enclosure. The CNI baseplate attaches to the DIN rail by means of fasteners.

RACK MOUNT
A mounting kit (P0930AS) is available for horizontal mounting of the CNI baseplate in a standard, 483 mm (19-inch) rack. This kit provides a 25.4 mm (1 inch) mounting depth.

Size

HEIGHT
120 mm (4.72 in)

WIDTH
216 mm (8.50 in)

DEPTH
27.1 mm (1.07 in)

Mass (Without Modules)

~0.45 kg (1.0 lb)

Rack Mounting Bracket

Material: Steel, Cold-Rolled, 0.0598 mm (16 Gauge)

Construction

MATERIAL
PC and ABS, inflammability UL94 V0

COLOR
Black

(3) The environmental limits of the 200 Series baseplates can be enhanced by the type of enclosure containing the 200 Series baseplate.[See the applicable Product Specification Sheet (PSS) that describes the specific type of enclosure that is to be used.

RELATED DOCUMENTATION

For reference purposes, Table 1 lists the Product Specification Sheets (PSS) and standard user documentation for additional hardware and software elements in the DIN rail mounted subsystem.

Table 1. Related Documentation

Document Number	Title
PSS 31H-2SOV	Standard 200 Series Subsystem Overview
PSS 31H-2CERTS	Standard and Compact 200 Series I/O, Agency Certifications
PSS 31H-2W3	Standard 200 Series Power Supply - FPS400-24
PSS 31H-2SBASEPLT	Standard 200 Series Baseplates
PSS 31H-2C480 B4	Compact Power Supply - FPS480-24
PSS 31H-2FPS	200 Series Power Supplies - FPS240-24 and FPS120-24
PSS 31H-2GOV	G-Series Enclosures Overview
PSS 31H-7NETWORK	The Foxboro DCS, Control Network Architecture
PSS 31H-7NWEQUIP	The Foxboro Evo Control Network Ethernet Equipment
B0700CA	EcoStruxure™ Foxboro DCS Switch Configurator Application Software for the Control Network User's Guide
B0700GE	Control Network Interface (CNI) User's Guide

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