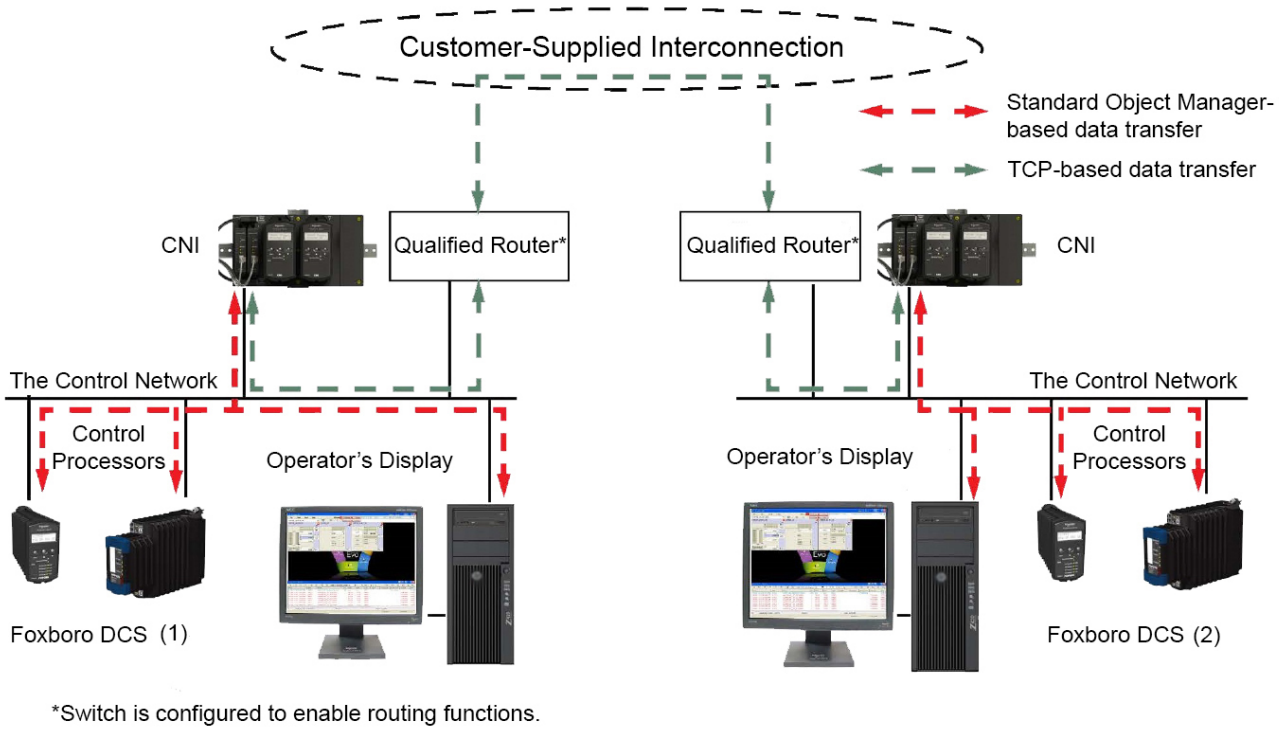
Foxboro™ DCS

Control Network Interface

PSS 41H-1CNI

Product Specification

June 2019



*Switch is configured to enable routing functions.

Legal Information

Overview

If a site has multiple Foxboro™ DCS 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 communication between two Foxboro DCS 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 switches 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 paths through redundant routers for CNI communications between systems. For more information on these switches, see *The Foxboro DCS Control Network Ethernet Equipment* (PSS 41H-7NWEQUIP).

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 this control data to be shared among systems:

- Control point data read/write requests
- Compound:Block.Parameter addresses
- Foxboro DCS/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 DCSs:

- 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 this data is 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 DCS 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 DCS and/or I/A Series systems that are geographically distributed
- Integrating separate Foxboro DCS and/or I/A Series systems that need to be isolated for security and/or business confidentiality
- Integrating Foxboro DCS and/or I/A Series systems, allowing each system to be updated to different versions of Foxboro DCS 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 DCS 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 DCS and/or I/A Series system into two or more separate systems, to help simplify upgrade requirements, and to help protect against security attacks by providing isolation.

Figure 1. CNIs Mounted on CNI Vertical Mounted Baseplate (RH100HJ)

NOTE: This image shows network adapters to the Foxboro DCS control network (fiber adapters shown, copper adapters available).

Item	Description
A	100 Mbps Duplex Fiber Cable
B	To/From the Foxboro DCS Control Network Ethernet Fiber Switch 1
C	To/From the Foxboro DCS Control Network Ethernet Fiber Switch 2
D	Control Network Interfaces

Features

- Minimizes the effort, time and complexity of enabling multiple Foxboro DCSs to read/write shared control data
- Enables segmentation of an existing large Foxboro DCS into two or more independent but linked systems, to help simplify upgrade requirements, and to help protect against security attacks by providing isolation
- Enables data from Foxboro DCS and/or I/A Series control blocks, 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 DCS Control HMI and FoxView
- Liquid Crystal Display (LCD) displays letterbug, real-time roles, and status
- Connects to the Foxboro DCS 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 DCS Integration and Partitioning

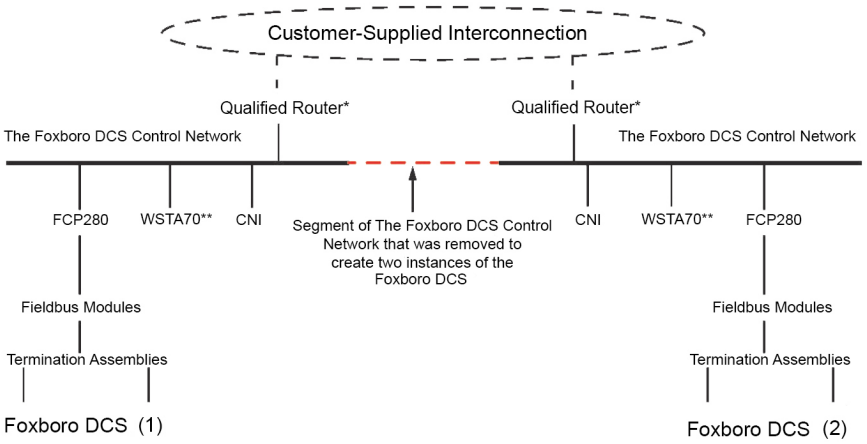
When control points are shared between systems using a CNI-to-CNI link, two or more dispersed Foxboro DCS and/or I/A Series systems can act as a single, extended system. Two or more integrated systems allow:

- Operators to monitor adjacent processes
- Engineers to run supervisory control processes across multiple units when process timing constraints can be met
- Designers to design Foxboro DCS 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.

Figure 2. Partitioning a Foxboro DCS



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

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

In addition, these message types can 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 connects 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.

Figure 3. Fiber Optic and Copper Network Adapters

MultiMode Fiber Adapter (RH924WA)

Copper Adapter (RH924UQ)

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:

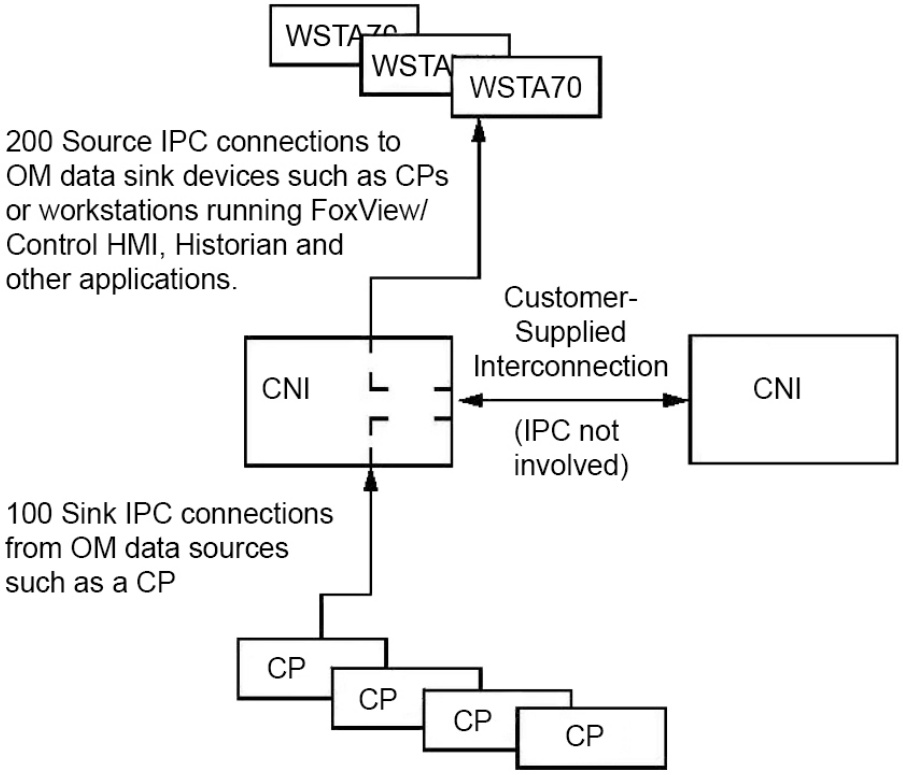
- Internal and external power supply health status
- Communications activity to the Foxboro DCS Control Network and Ethernet communications between the network adapters and the CNI modules

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.

Figure 4. CNI Vertical-Mounted Baseplate (RH100HJ) for Control Network Interface

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 total connections: • 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 like 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)

Alarm Messages and Events	• Logical Message Destinations: Up to 30 alarm/event destinations • Message Forwarding Performance: High Alarm Activity: 6,000 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 2,000 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 2,000-10,000 alarms/events can be queued.
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	2,000 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 points 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
Regulatory Compliance: 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 (CNI) User's Guide* (B0700GE). • *European Low Voltage Directive 2014/35/EU and Explosive Atmospheres (ATEX) Directive 2014/24/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.
Regulatory Compliance: Security	Wurldtech Achilles Certification™ Level 1 on control network connection

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

CNI Environmental Specifications

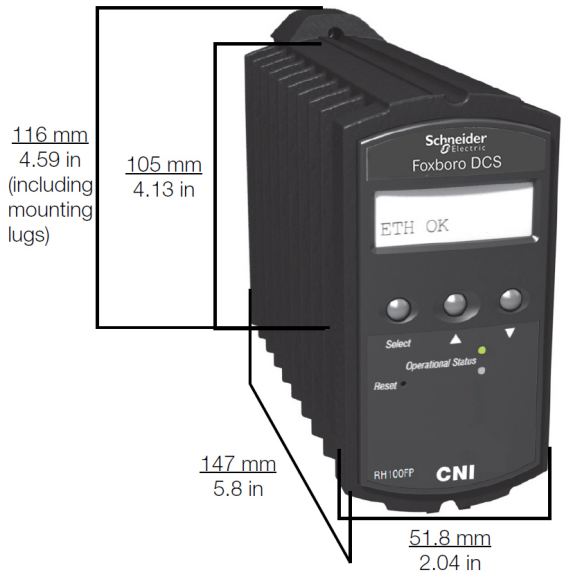
	Operating	Storage
Temperature	0 to 60°C (32 to 140°F)	-40 to +70°C (-40 to +158°F)
Relative Humidity	5 to 95% (noncondensing)	5 to 95% (Noncondensing)
Altitude	-300 to +3,000 m (-1,000 to +10,000 ft)	-300 to +12,000 m (-1,000 to +40,000 ft)
Contamination (for CNI and Network Adapters)	Class G3 (Harsh) 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)	

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.)

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	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)
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

Figure 5. CNI Dimensions



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
Regulatory Compliance: 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 2014/24/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

	Operating	Storage
Temperature	-20 to +60°C (-4 to +140°F)	-40 to +70°C (-40 to +158°F)
Relative Humidity	5 to 95% (noncondensing)	5 to 95% (Noncondensing)
Altitude	-300 to +3,000 m (-1,000 to +10,000 ft)	-300 to +12,000 m (-1,000 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	

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

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 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

Related Product Documents

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

PSS 41H-2SOV	*Standard 200 Series Subsystem Overview*
PSS 41H-2CERTS	*Standard and Compact 200 Series I/O, Agency Certifications*
PSS 31H-2W3	*Standard 200 Series Power Supply - FPS400-24*
PSS 41H-2SBASPLT	*Standard 200 Series Baseplates*
PSS 31H-2C480	*Compact Power Supply - FPS480-24*
PSS 41H-2FPS	*200 Series Power Supplies - FPS240-24 and FPS120-24*
PSS 41H-2GOV	*G-Series Enclosures Overview*
PSS 41H-7NETWORK	*The Foxboro DCS Control Network Architecture*
PSS 41H-7NWEQUIP	*The Foxboro DCS 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*

WARNING: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.p65warnings.ca.gov/.

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

PSS 41H-1CNI, Rev B