MANUFACTURER-SOURCE TECHNICAL IDENTIFICATION REFERENCE

Triconex 4201N

Remote Extender Module

Manufacturer	Triconex
Model / order number	4201N
Product identification	Remote Extender Module
System / family context	Tricon Nuclear Equipment

Verified scope

The manufacturer maps 4201N to the standard remote multimode RXM. The original pages document ST optical connections, the multimode link specification and channel routing.

Engineering checks before replacement

- Confirm remote-end identity and the 4201-3N set distinction.
- Trace transmit/receive polarity for each optical channel.
- Include connectors and splices in the measured loss budget.
- Check local remote-chassis power and qualification traceability.

Original manufacturer source reference

Planning and Installation Guide for Tricon v9-v11 Systems, 9700077-019, June 2014. Original PDF pages 50, 82, 262, 263.

Open manufacturer document (hosted copy)

This cover is an independent Sales PLC reference, not a manufacturer-issued datasheet. The following manufacturer pages retain their original text, layout and page numbering.

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Tricon v10.x Equipment Certified for Use in Nuclear 1E Applications

Invensys has qualified specific Tricon version 10 products for use in 1E (safety-related) applications in accordance with EPRI Report TR-107330, "Generic Requirements Specification for Qualifying Commercially Available PLC for Safety-Related Applications in Nuclear Power Plants." EMC testing was performed in accordance with US Nuclear Regulatory Commission (NRC) Regulatory Guide 1.180, Revision 1, "Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems." The NRC issued a Safety Evaluation Report (ADAMS Accession Number ML120900890) for Triconex Topical Report 7286-545-1-A, Revision 4.

All of the information (specifications, simplified schematics, installation guidelines, and so on) for standard equipment also applies to nuclear equipment. The following table lists the model numbers of Tricon 10.x equipment certified for use in Nuclear 1E applications and identifies the standard model to see for information about the equipment.

Table 6 Tricon v10.x Equipment Certified for Use in Nuclear 1E Applications

Model Number	Description	See this Standard Model
Modules and Chassis		
8110N2	Main Chassis	8110
8111N	Expansion Chassis	8111
8112N	Remote Expansion Chassis	8112
8310N2	High-Density Power Module, 120 V	8310
8311N2	High-Density Power Module, 24 VDC	8311
8312N2	High-Density Power Module, 230 VAC	8312
3008N	Enhanced Main Processor III, 16 Mb	3008
4200N	Remote Extender Module	4200
4200-3N	Remote Extender Module (Set)	4200-3
4201N	Remote Extender Module	4201
4201-3N	Remote Extender Module (Set)	4201-3
4352AN	Tricon Communication Module (TCM)	4352A
4352BN	Tricon Communication Module (TCM)	4352B
3701N2	0–10 VDC, Differential DC Coupled, TMR	3701
3703EN	0–5 VDC or 0–10 VDC, Differential, Isolated, TMR	3703E
3721N	0–5 VDC or –5 to +5 VDC, Differential, DC Coupled, TMR	3721
3805HN	4–20 mA, Current Loop, DC Coupled, TMR	3805H
3501TN2	115 VAC, Opto-isolated, Non-commoned, TMR	3501T
3502EN2	48 VAC/VDC, Commoned in Groups of 8, Self-Test, TMR	3502E
3503EN2	24 VAC/VDC, Commoned in Groups of 8, Self-Test, TMR	3503E

On Model 3006, 3007, and 3008 MPs, the port has a 25-pin DB-25 socket that operates at 9600 bits per second. On Model 3009 MPs, the port has a 9-pin DB-09 socket that operates at 115200 bits per second.

RXM and SRXM Modules

This section describes RXM and SRXM Modules, which are used in RXM Chassis to extend the I/O communication from the Main Chassis. Multi-mode cable is used for locations as far as 1.2 miles (2 kilometers) from the Main Chassis; single-mode cable is used for locations as far as 7.5 miles (12 kilometers). RXM and SRXM Modules communicate at 375 kilobits per second. The modules provide exceptional immunity against electro-static and electro-magnetic interference and use optical modems and fiber-optic point-to-point cabling.

For installation information, see RXM Chassis Installation on page 259.

Table 16 RXM and SRXM Module Sets

Model	Description
4200-3	Primary RXM Module Set uses multi-mode fiber optic cable. Supports three remote RXM Chassis or Expansion Chassis.
4201-3	Remote RXM Module Set uses multi-mode fiber optic cable.
4210-3	Primary SRXM Module Set uses single-mode fiber optic cable. Supports three remote RXM Chassis or Expansion Chassis.
4211-3	Remote SRXM Module Set uses single-mode fiber optic cable.

RXM Modules

RXM Modules (Model 4200-3 and 4201-3) are optimized for use with 62.5/125 micrometer multi-mode fiber. The cable should be specified for operation at a wave length of 850 nanometers (nm), with a worst-case optical attenuation of 4 decibels per kilometer. The RXM optical transmitter/receiver pair has a total optical power budget of 15 decibels, typical (8 decibels, worst case), which allows a maximum cable length of 1.2 miles (2 kilometers).

RXM Modules are compatible with industry-standard ST fiber-optic connectors. The specified worst-case optical power budget of 8 decibels includes losses due to the fiber-optic connectors at the RXM transmitter and receiver. Additional losses incurred by fiber-optic cable splices or junction-box couplings should be considered when calculating the maximum installed cable length.

SRXM Modules

SRXM Modules (Model 4210-3 and 4211-3) are optimized for use with 9/125 micrometer single-mode fiber. The cable should be specified for operation at a wave length of 1300 nanometers (nm), with a worst-case optical attenuation of 0.5 decibels per kilometer. The RXM optical transmitter/receiver pair has a total optical power budget of 10 decibels, typical (7 decibels, worst case), which allows a maximum cable length of 7.5 miles (12 kilometers).

Guidelines for Fiber-Optic Cables

The selection and installation of the fiber-optic cabling used with RXM and SRXM Modules requires special knowledge, training, and tools. In the United States, Canada, and Western Europe, fiber-optic cabling is widely used in the telecommunications industry, and a wide choice of vendors is available to aid in the selection and installation of it. For example, in the United States, AT&T Network Services has been used with great success in many Tricon controller installations.

Invensys recommends that, whenever possible, the services of a qualified vendor should be utilized for the selection and installation of fiber-optic cabling. The *Directory of Instrumentation* published by the Instrumentation Society of America (ISA), and distributed annually to ISA members, provides a list of United States vendors specializing in industrial applications.

Multi-Mode Fiber Alternatives

In parts of the world where the above services are not readily available, or in those installations where it is desirable to have in-house personnel install and maintain the cabling, other multi-mode fiber alternatives exist. For more information, contact the Global Customer Support (GCS) center.

Main Fiber-Optic Cable

Several types of cable core and sheath designs are available from various vendors. Selection of the cable sheath must be based on the physical and environmental requirements of the application. Indoor cable is available for general usage, riser, and plenum applications. Outdoor cable is available for cable tray, aerial, underground, directly buried, or underwater uses. Outdoor cable with protective over-sheath coverings for lightning and rodent protection is also available.

An RXM installation requires a total of six fibers (a Transmit and Receive for each channel) between the primary and remote locations. If you use a single primary cable, then you should select a cable with six fibers plus spares.

For very critical applications, where loss of communication to the remote location cannot be tolerated and the physical integrity of the RXM cable cannot be assured, use a separate cable for each channel. In this case, a total of three main cables is required, each having two fibers plus spares. Route each cable between the primary and remote location along a different path to provide additional protection.

Invensys recommends installing cables with spare fibers in all cases. The cost of additional fibers in a cable is small compared to the cost of installing a new cable in the event that a single fiber is accidentally damaged.

Junction Boxes

A junction box is typically used to terminate each end of the main cable. Each fiber in the cable must be individually mated to an ST connector. The type of junction box and the mounting location depend on the requirements of the application.

Jumper Cables

Use a general-purpose jumper cable with ST connectors on each end to make connections between the junction box and the RXM modules.

Connectors

Twelve ST connectors are required for each remote connection. Connectors should be bayonet type with a ceramic tip plug.

Installing an RXM Chassis

This procedure explains how to install a typical configuration which includes an RXM Chassis located near the Main Chassis and additional RXM and Expansion Chassis connected to this RXM Chassis. The configuration cannot exceed 15 chassis.

WARNING

During installation of RXM modules and after each maintenance activity, make sure that all fiber-optic ST connectors are fully seated and engaged. Because ST connectors from different manufacturers may exhibit minor variations, close inspection is necessary to verify proper engagement of the ST locking mechanism. Failure to properly secure a connector could result in unreliable operation of the Tricon controller and could ultimately lead to a false plant trip.

Procedure

1. For the RXM Chassis located near the Main Chassis, use I/O bus cables (Model 9000) to connect to the I/O Bus Connectors on the backplanes of each chassis. The length between the Main Chassis and the last RXM or Expansion Chassis cannot exceed 100 feet (30 meters).
2. In this RXM Chassis, install a Primary RXM Set (Model 4200-3 or 4210-3) immediately to the right of the Power Modules. Install I/O modules, as needed. At least one I/O module must be configured in the RXM Chassis., The Primary RXM Set can support up to three RXM or Expansion Chassis. To set up more than three remote locations in a single Tricon controller, please contact the Global Customer Support (GCS) center.
3. For each RXM Chassis at a remote location, install Remote RXM Sets (Model 4201-3 or 4211-3). Install I/O modules, as needed.
4. Connect each RXM Chassis at remote locations with the RXM Chassis located near the Main Chassis using fiber-optic cables to connect to the Transmit and Receive paths for each channel. This connection can be as far as 7.5 miles (12 kilometers) from the Main Chassis. See Figure 94 for a diagram of this wiring.
5. Install I/O modules, as needed.
6. Add Expansion Chassis as needed in both local and remote locations. The I/O Bus length between the chassis cannot exceed 100 feet (30 meters).
7. Ground the remote RXM chassis. See Controller Grounding on page 264.