Description

Multiple Signal Fiber Optic Modems combine multiple system communications signals and convert them to fiber optic communications for transmission. Both individual and combined communications are available.

For additional application information, refer to ***4120 Network Products and Specifications datasheet S4100-0056*** and ***Fiber Optic Modem Installation Instructions 579-831***.

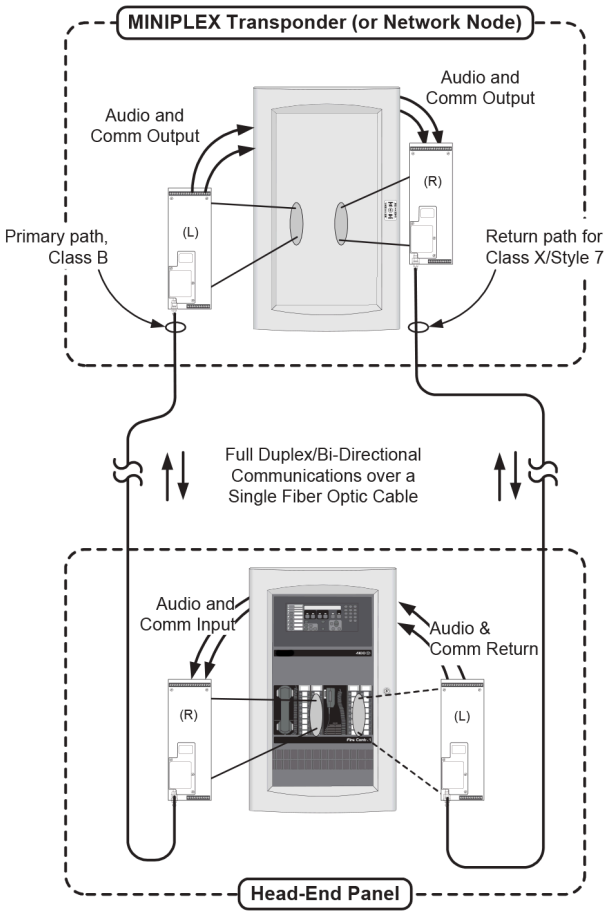


Figure 1: 4100ES system reference with audio and data fiber modems

Features

Compatible with Simplex 4120 network

- Converts Multiplex analog or digital audio signals and digital communications into full-duplex transmission over a single fiber optic cable.
- Communicates from a fire alarm control unit (FACU) to a Transponder, or provides 4120 Network communications.
- Provides 4120 Network communication support for any combination of Ring, Hub, and Star Topologies by performing the function of a Physical Bridge without slowing data rates.
- Laser optical transmitters provide increased transmission distances compared to those that use copper wiring. Up to 20 miles, or 32 km, of communication is possible with low-loss single-mode fiber.
- Models available that optimize either single-mode fiber or multi-mode fiber.

Enhanced analog audio (EAA)

- Provides a decoded analog audio signal at the receiving modem for local use, and the original digitally-encoded signal for connection to the next modem in the communications link.
- With EAA, total system distance is essentially unlimited.

Communication combinations

- Digital Audio Riser with Analog Audio Riser #2 and 4120 Network Communications
- Digital Audio Riser with Analog Audio Riser #2 and Remote Unit Interface (RUI) Communications
- Both Analog Audio Risers with 4120 Network Communications
- Both Analog Audio Risers with RUI Communications
- Any individual signal. See MINIPLEX transponders application reference and 4120 network with hub node application reference for more details

Panel-mounted applications

- Standard two-slot module for 4100ES and 4100U FACU or 4100ES/4100U MINIPLEX Transponder mounting
- A separate mounting plate is available for 4100/4120 panel mounting or utility cabinet mounting.

Note: 4120 Network Fiber Modems communicate in pairs. A Left-Port Modem only communicates with a Right-Port Modem

Fiber Modem remote cabinet mounting

- Available in beige or red. Includes a Left-Port Fiber Modem. Space is provided for a Right-Port Fiber Modem. Right-Port Fibre modems must be ordered separately.
- Compatible with Simplex control panel model Series 4100ES, 4100U, 4010ES, 4010, 4007ES, 4190 Series TrueSite Workstation, RUI and RUI+ compatible equipment, and legacy 4100/4100+/4120

Optional audio expansion module

- Optional modules are available that provide an interface to 25 VRMS and 70.7 VRMS audio levels from 4100/4120 fire alarm control panels

Operation

Bi-directional communications

Fiber optic communications use two different light wavelengths for transmitting and receiving. See Fiber modem operation reference.

A fiber optic communication link requires a pair of complementary receive and transmit modems: Left-Port Modems and Right-Port Modems. See Product selection for model numbers.

Note: Left and Right are for reference purposes only and do not refer to physical locations.

Multiple connections

Each modem has field wiring connections for the Digital Audio Riser, Analog Audio Risers, and 4120 Network communications, and RUI. See Fiber modem terminal descriptions for terminal reference information.

* This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7165-0026:251 for allowable values and/or conditions concerning material presented in this document. It is subject to re-examination, revision, and possible cancellation. MEA (NYC) Approvals are not applicable for this product category. Additional listings may be applicable; contact your local product supplier for the latest status. Listings and approvals under Time Recorder Co. are the property of Tyco Fire Protection Products.

Fiber Modem terms

Enhanced analog audio for systems using only one Analog Audio Riser

At the Head-End audio control panel, the Riser 1 analog audio signal is digitally encoded and transmitted with fiber optics to the receiving Fiber Modem. At the receiving modem, the digital signal is decoded back to analog for local use. With Enhanced Analog Audio (EAA), the digital signal is also available, routed to the Digital Audio Riser (DAR) terminals. It can then be wired to the next Fiber Modem in the communications link without additional signal conversion.

Note: The next modem in the link must be in the same cabinet or in a close-nippled cabinet.

With EAA, Riser 1 distances are limited to system distances. Without EAA, Riser 1 signals can pass through a maximum of six Fiber Modem pairs. Six pairs is the limit for systems using both Analog Audio Risers 1 and 2. DAR connections for digital audio are not available as those terminals are used for EAA. See Enhanced analog audio (EAA) reference for more information.

Head-end modem

For Class X communications, a Head-End modem is the first fiber optic modem in a fiber optic communications loop. This modem is typically connected to the primary side of the communications channel in the head-end cabinet. A modem with wired connections to 4120 Network nodes, or system transponders between itself and the head-end cabinet, is still considered to be the Head-End modem if it is the first modem in the communications path.

Tail-end modem

For Class X communications a Tail-End modem is the last fiber optic modem in a fiber optic communications loop. This modem is typically connected to the secondary, or return, side of the communications channel in the head-end cabinet. A modem with wired connections to 4120 Network nodes or system transponders between itself and the return connection is still considered to be a Tail-End modem if it is the last modem in the communications path.

Generic modem

For Class X or Style 7 communications, Fiber Modems in a stand-alone system or in a 4120 Network loop have specific functions and internal settings depending on whether they are Head-End modem or Tail-End modem, or any modem in between. Generic Modem is the term for Class B connected modems and for modems located within a Class X fiber loop.

Local side

The Local Side of a wiring link has direct and non-isolated electrical connection to the head-end cabinet.

NIC

Network Interface Card.

Remote side

The remote side of a wiring link is wiring that is electrically isolated from the connections to the head-end cabinet by passing through a Fiber Modem pair.

RIC

Riser Interface Card. This card is typically located in a MINIPLEX transponder cabinet.

X-Link connection

For Class X RUI communications or Class A Analog Audio Risers, these wired connections complete the primary-to-secondary supervision path. The wired connection provides a non-isolated electrical connection between the primary and secondary sides of the local-side wiring loop, and connects between the Head-End and Tail-End modems or Audio Expansion Modules. In the event of a wiring fault, the Fiber Modems separate the x-link connection, which initiates Class X fiber optic communications. Digital Audio and 4120 Network communications do not require x-link connections.

Note: X-Link wiring can be run external to the cabinets. See X-Link connection reference.

Fiber modem operation reference

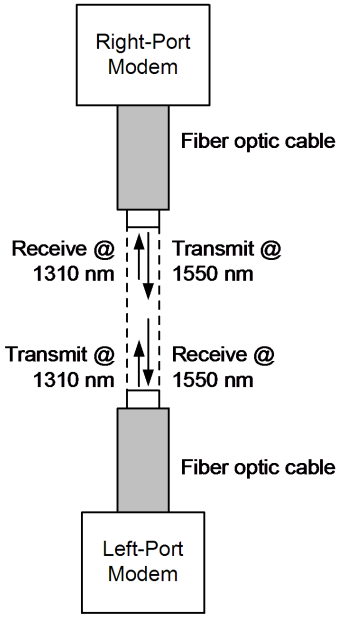


Figure 2: Fiber optic transmission reference; Full duplex/bi-directional communications

Product selection

Note: See Specifications for product dimensions.

Table 1: 4120 Network fiber modems for internal mounting in FACUs

Model	Fiber Type	Description	Application
4100-6120	Single-Mode	Left-Port Fiber Modem Assembly	Use for direct mounting onto a 4100ES/4100U expansion bay. Order Fiber Modems in pairs, as Left-Port Fiber Modems only communicate with Right-Port Fiber Modems.
4100-6122	Multi-Mode		
4100-6121	Single-Mode	Right-Port Fiber Modem Assembly	
4100-6123	Multi-Mode		
4100-9840	Single Fiber Modem Mounting Bracket; not required for 4100ES/4100U internal mounting; order Fiber Modems separately		Use for internal mounting in a 4100/4120 series FACU or in a compatible utility cabinet
4100-9841	Audio Expansion Module Assembly, with mounting bracket		Use for internal mounting in a 4100/4120 series FACU. These units convert two analog audio input channels at 25 VRMS or 70.7 VRMS to 10 VRMS for compatibility with the Fiber Modem Audio Input requirements. The units mount next to the Fiber Modem
4100-9842	Audio Expansion Module only, mounts onto bracket of 4100-9841		

Table 2: Expansion cabinet and related modem assemblies for remote mounting

Model	Fiber Type	Description		Application
4190-9035	Multi-Mode	Red	Expansion Cabinet with Left-Port Fiber Modem Assembly	Cabinets mount externally to compatible panels where internal mounting space is not available. Typical applications are for 4010ES/4010 FACUs or 4100/4120 or 4100ES/4100U cabinets without internal available space.
4190-9038	Single-Mode			
4190-9036	Single-Mode	Beige		
4190-9039	Multi-Mode			
4190-9037	Single-Mode	Right-Port Fiber Modem Assembly; for Expansion Cabinet Mounting		Select if required; one maximum
4190-9040	Multi-Mode			
4190-9018	Audio Expansion Module; for Expansion Cabinet Mounting only			Operation is the same as for Audio Expansion Modules, select as required; two maximum for each cabinet. Two are required for Class A Audio Riser connections

Enhanced analog audio (EAA) reference

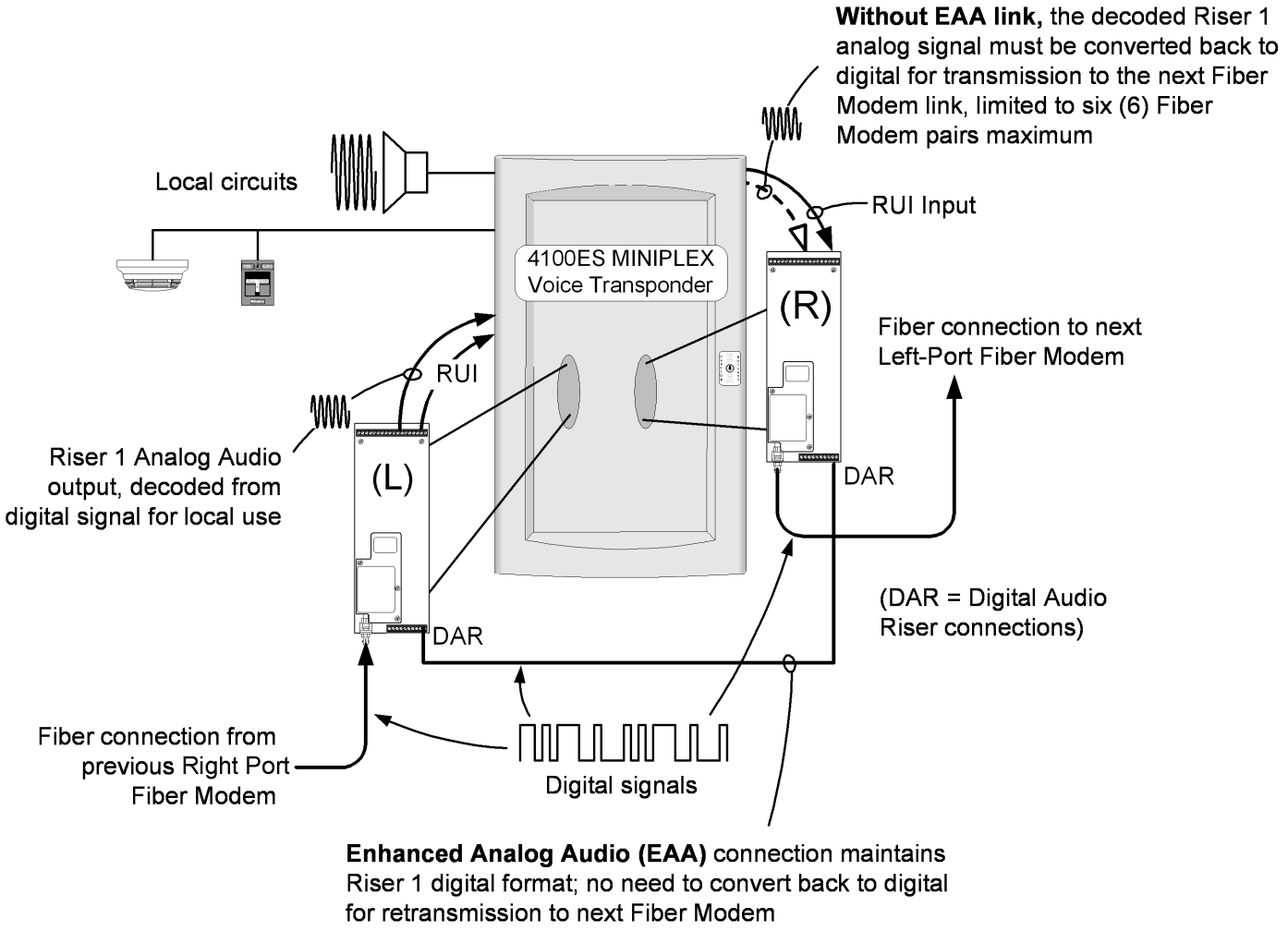


Figure 3: Enhanced analog audio (EAA) reference

MINIPLEX transponders application reference

Figure 4 shows a 4100ES Emergency Voice/Alarm System with two 4100ES MINIPLEX Transponders. Communications between the FACU and the Transponders are Class X/Style 7 using a fiber loop.

Communications include Remote Unit Interface (RUI), Analog Audio Riser 1 and Analog Riser 2. For detailed installation instructions and additional applications information, refer to *Fiber Optic Modem Installation Instructions 579-831*.

Note: RUI Communications are limited to up to eight modem pairs.

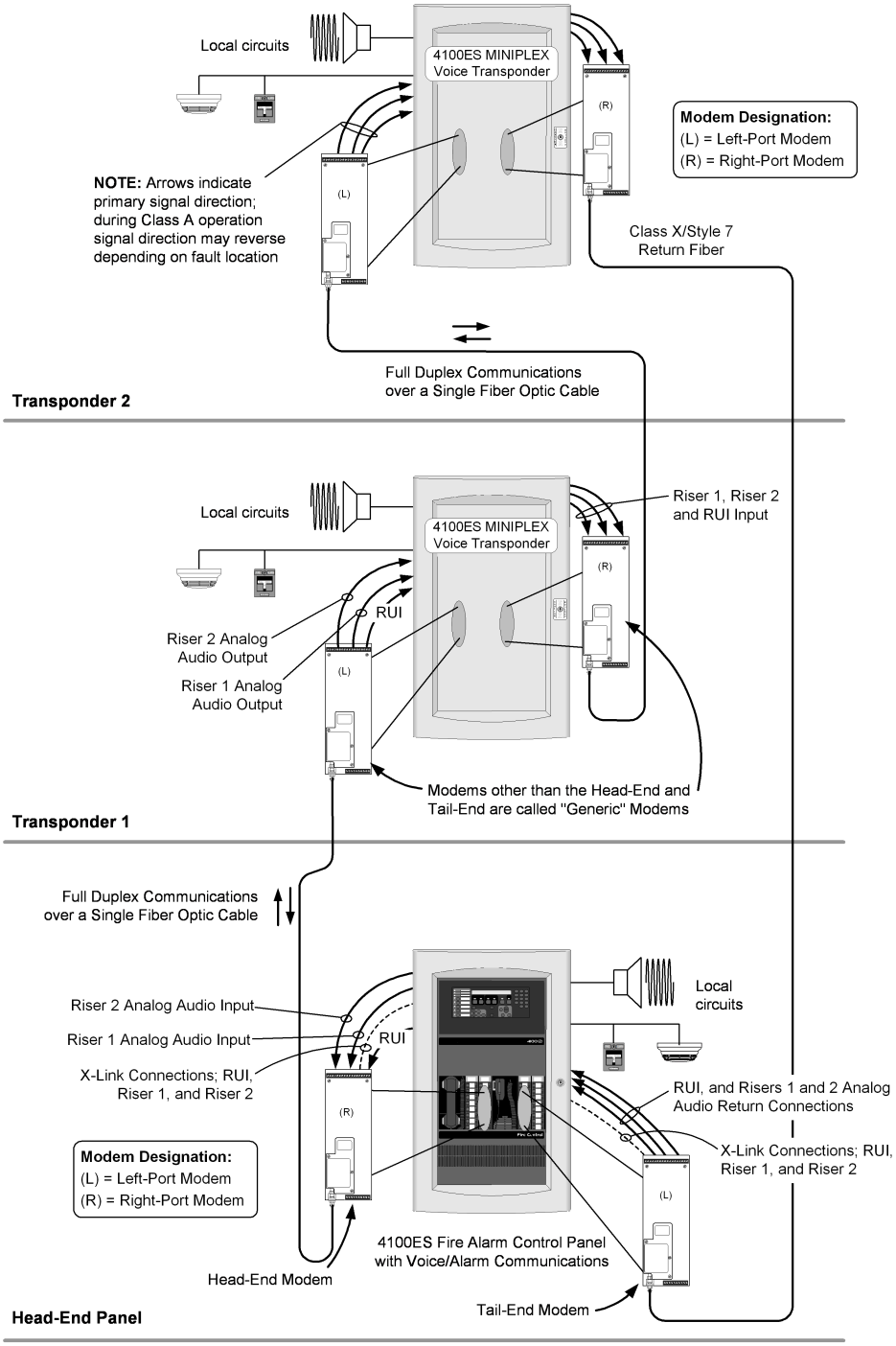
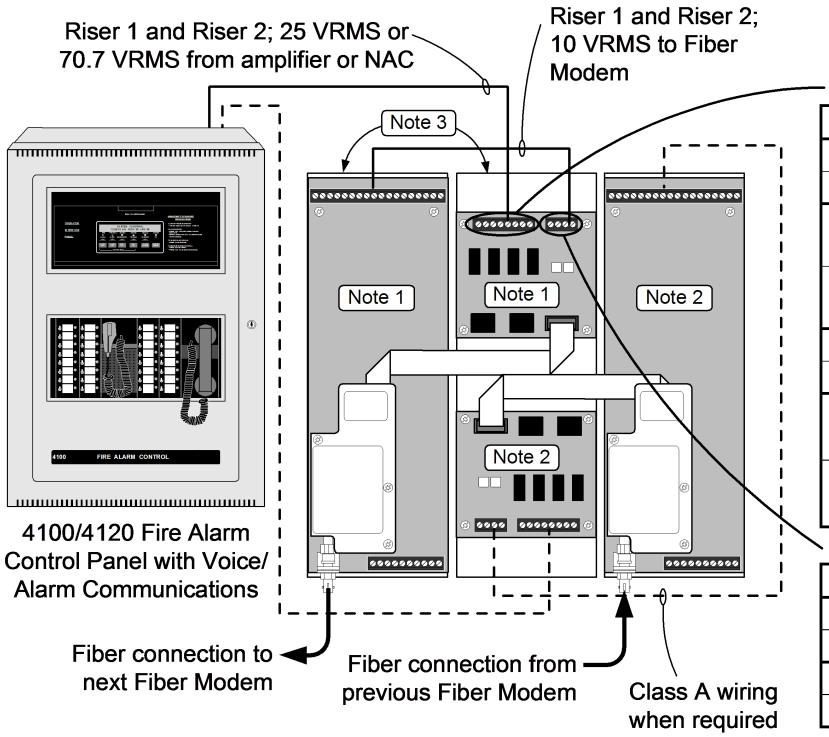


Figure 4: MINIPLEX transponder application reference

Audio expansion module reference



TB1 Terminal Description

Pos.	Label	Function
1	RISER 1 +	Analog Audio Riser 1 INPUT; 25 VRMS or 70.7 VRMS
2	RISER 1 –	
3	RISER 1, XLINK +	Analog Audio Riser 1 X-Link connections; wiring that connects between head-end and tail-end for Class A fiber link systems; connect here instead of at Fiber Modem
4	RISER 1, XLINK –	
5	RISER 2 +	Analog Audio Riser 2 INPUT; 25 VRMS or 70.7 VRMS
6	RISER 2 –	
7	RISER 2, XLINK +	Analog Audio Riser 2 X-Link connections; wiring that connects between head-end and tail-end for Class A fiber link systems; connect here instead of at Fiber Modem
8	RISER 2, XLINK –	

TB2 Terminal Description

Pos.	Label	Function
1	RISER 1 +	Analog Audio Riser 1 OUTPUT; 10 VRMS
2	RISER 1 –	
3	RISER 2 +	Analog Audio Riser 2 OUTPUT; 10 VRMS
4	RISER 2 –	

Figure 5: Audio Expansion Module reference

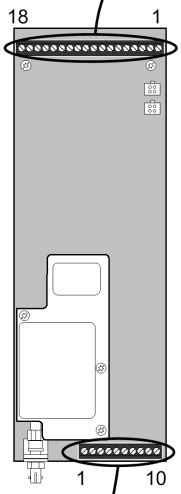
Note:

- A single Audio Expansion Module, 4100-9841 with bracket, and a single internal mount Fiber Modem Assembly are required for Class B operation. Audio Expansion Modules include a harness that connects to the modem assembly.
- Class A connections require an additional Audio Expansion Module, 4100-9842 and an additional Fiber Modem Assembly. For this application, X-Link connections, not shown, are made between Audio Expansion Modules, not at the Fiber Modems.
- When mounted in a 4100/4120 cabinet, 4100-9840, Mounting Brackets are required for each Fiber Modem. Audio Expansion Module model 4100-9841 includes a mounting bracket that accomodates two modules. If internal space is not available, use Expansion Cabinets with options as required.

Fiber modem terminal descriptions

TB2 Terminal Description

Pos.	Label	Function
1	INV –	Network Left-Port terminals; input OR output depending on modem operation
2	NON INV +	
3	EARTH	Earth (ground) connection
4	5C	5 VDC common (–) connection
5	INV –	Network Right-Port terminals; input OR output depending on modem operation
6	NON INV +	
7	EARTH	Earth (ground) connection
8	0V ISO	Isolated common (–) 0 V connection
9	DAR –	Digital Audio Riser terminals; input OR output depending on modem operation
10	DAR +	



TB1 Terminal Description

Pos.	Label	Function
1	24V IN	Input power connections; also available at two separate on-board connectors for Fiber Modem use only
2	24C IN	
3	RUI +	Remote Unit Interface (RUI) terminals; input OR output depending on modem operation
4	RUI –	
5	RUI, XLINK +	RUI X-Link connections; wiring that connects between head-end and tail-end for Class X/Style 7 fiber link systems
6	RUI, XLINK –	
7	24C	Additional 24 VDC common and earth (ground) connection
8	EARTH	
9	RISER 1 +	Analog Audio Riser 1 input OR output depending on modem operation
10	RISER 1 –	
11	RISER 1, XLINK +	Analog Audio Riser 1 X-Link connections; wiring that connects between head-end and tail-end for Class X fiber link systems
12	RISER 1, XLINK –	
13	24C	Additional 24 VDC common and earth (ground) connection
14	EARTH	
15	RISER 2 +	Analog Audio Riser 2 input OR output depending on modem operation
16	RISER 2 –	
17	RISER 2, XLINK +	Analog Audio Riser 2 X-Link connections; wiring that connects between head-end and tail-end for Class X fiber link systems
18	RISER 2, XLINK –	

Figure 6: Fiber modem terminal descriptions

4120 network with hub node application reference

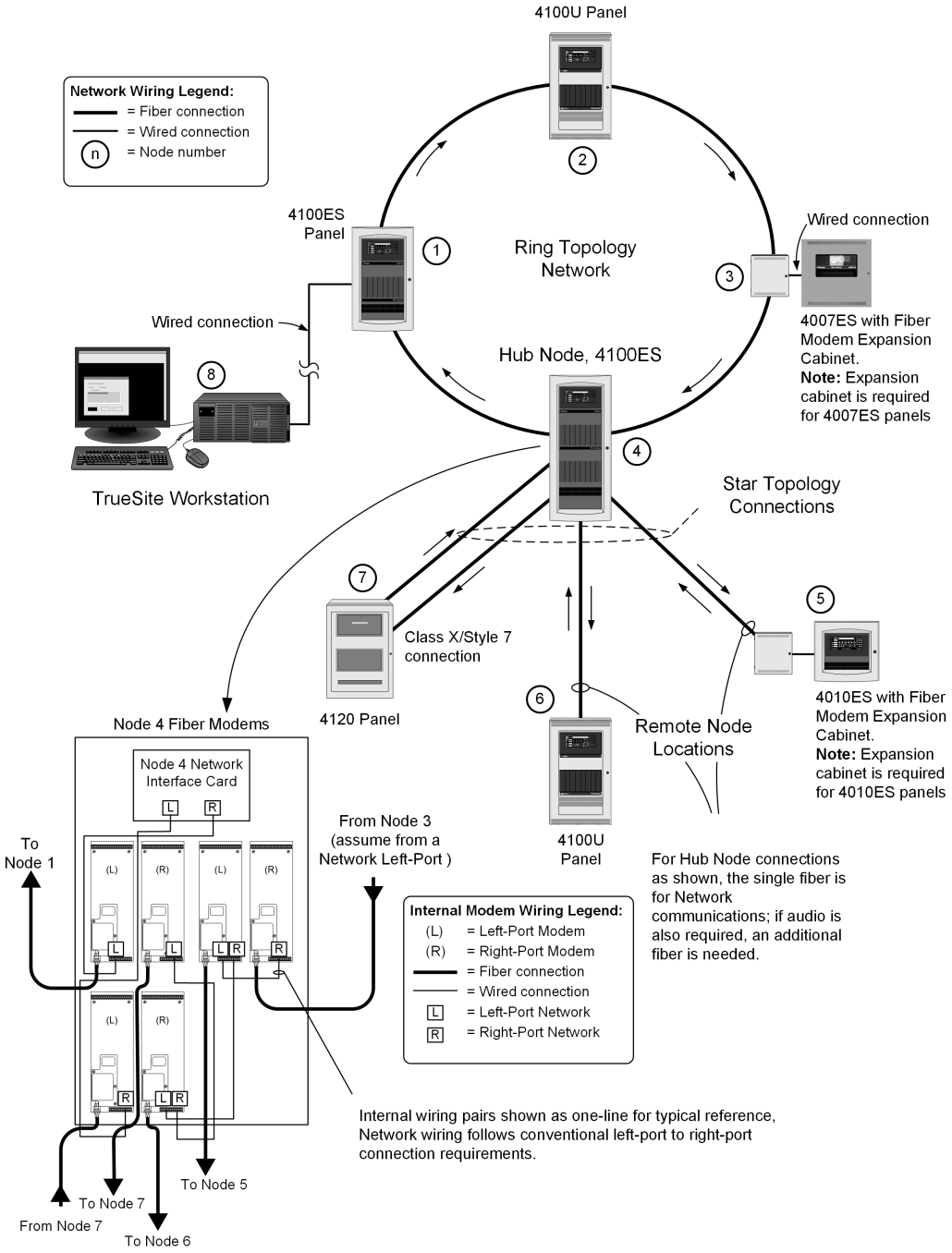


Figure 7: 4120 Network with Hub Node application reference

Note: Alternate interconnections are detailed in *Fiber Optic Modem Installation Instructions 579-831*.

X-Link connection reference

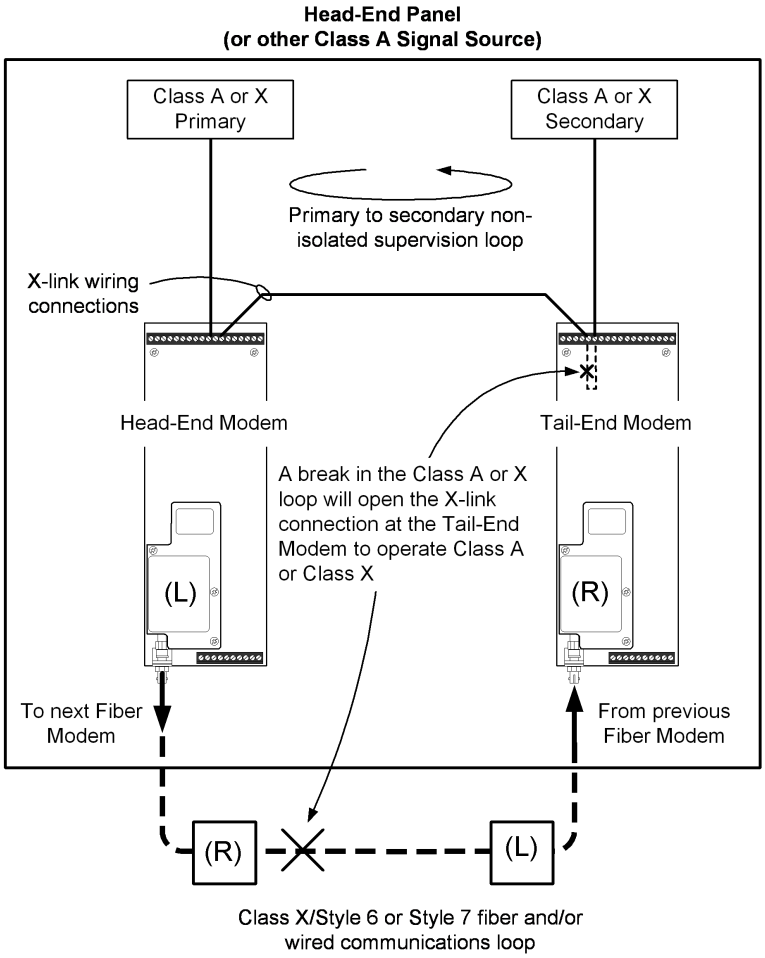


Figure 8: X-Link connection reference

Note:

- X-link connections are only required for Class X RUI and Class A Analog Audio Riser Fiber Modem applications.
- Place Head-End and Tail-End Fiber Modems in the same cabinet.
- You can place loop devices with non-isolated supervision, such as MINIPLEX transponders, between Modems and Head-End Panel and on X-link wiring.
- You can extend X-link wiring between cabinets if required. Use indoor wiring for system simplicity. Equip proper suppression for wiring between buildings.

Remote cabinet mounting reference

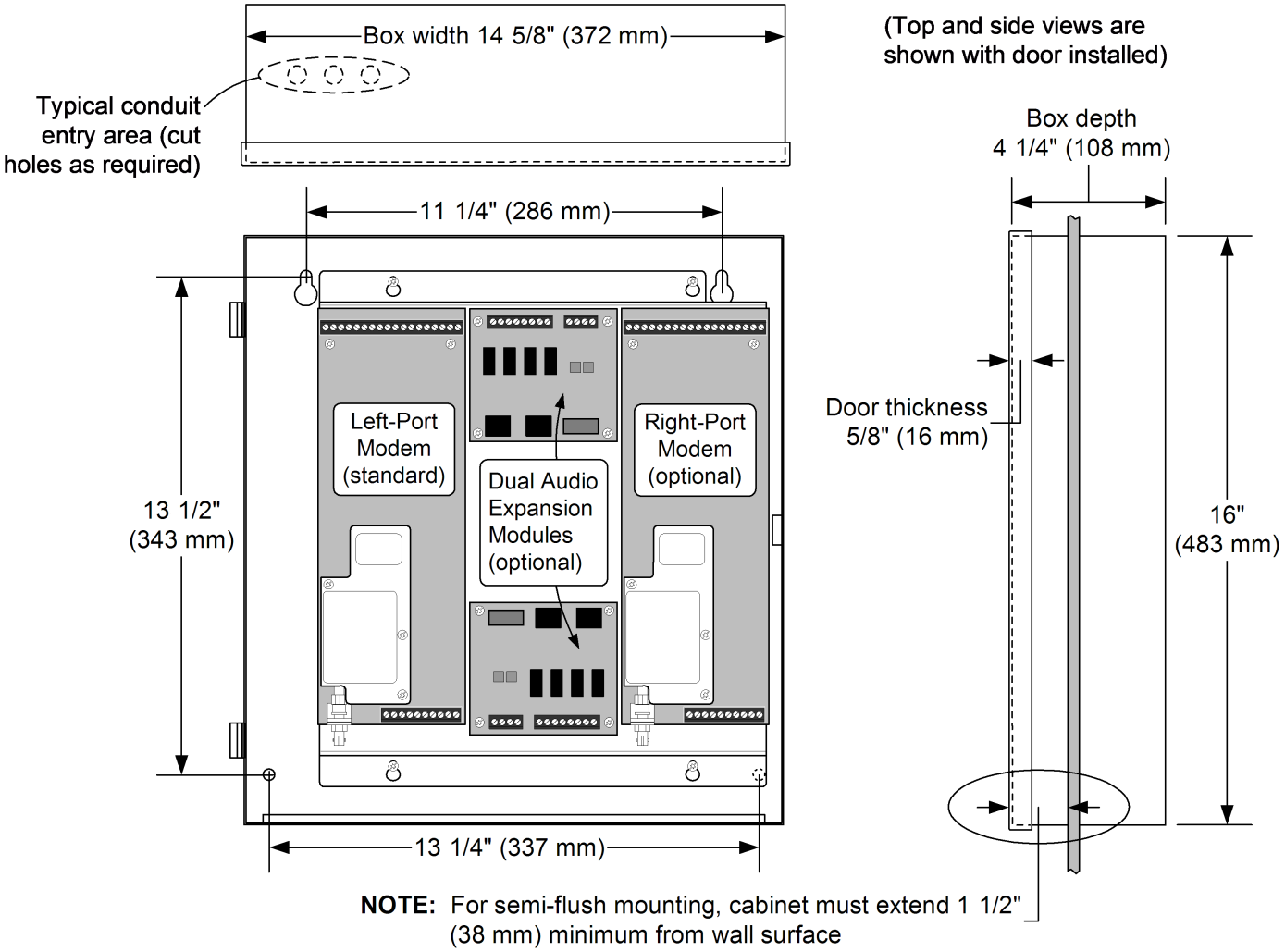


Figure 9: Remote cabinet mounting reference

Specifications

Table 3: General specifications

Specification	Rating
Voltage	18 VDC to 33 VDC, from FACU
Current, Standby and Alarm	380 mA at 24 VDC; with analog channels enabled
	200 mA at 24 VDC; without analog channels enabled
Analog Audio Riser Input and Output Levels	Three levels: 10 VRMS standard; 1 Vp-p 0.35 VRMS; 0.707 VRMS
Network Input Wiring	Optimized for 18 AWG or 0.82 mm^2, or 24 AWG or 0.2 mm^2

Table 4: Audio expansion module electrical specifications

Specification	Rating
Current, Standby and Alarm	20 mA
Audio Input Voltage	25 VRMS or 70.7 VRMS
Audio Output Voltage	10 VRMS
Operation Reference	Each input is transformer isolated to output

Table 5: Fiber optics specifications

Specification			Rating	
Compatible Fiber		General Notes	• Fiber backbone components must meet or exceed standard EIA/TIA 568 (Electronic Industries Alliance/Telecommunications Industry Association) for fiber network performance • Fiber power meters and OTDR's support testing of MM fiber at MM wavelengths. They do not support testing at SM wavelengths. • Single-mode fiber is preferred. • Multi-mode attenuation shall be measured at 850 nm and 1300 nm. • Single-mode attenuation shall be measured at 1310 nm and 1550 nm.	
		Single-Mode	Nominal 9/125 µm	
		Multi-Mode	50/125 µm or 62.5/125 µm graded index	
Fiber Connector			Type SC	
Transmit and Receive Wavelengths	Left-Port Modems		Transmit = 1310 nm; Receive = 1550 nm	Launch power single mode: -9 dBm min.
	Right-Port Modems		Transmit = 1550 nm; Receive = 1310 nm	Launch power multi mode: -8 dBm min.
Transmission Distances for **Single-Mode Fiber**. Single fiber type is recommended.			Maximum total attenuation = 15 dB 20 miles or 32 km maximum distance Maximum total attenuation = 22 dB Nominal 9/125 µm fiber	
Transmission Distances for **Multi-Mode Fiber**			16,400 ft or 5 km maximum distance Maximum total attenuation = 18 dB 50 µm or 62.5 µm graded-index fiber (GRIN)	

Acceptance test requirements for fiber optic installations

An initial acceptance test of each fiber link shall be performed with the use of an OTDR in accordance with ***NFPA 72, Chapter 14 Inspection, Testing, and Maintenance*** (or other applicable local code) requirements. The OTDR will measure the attenuation of the fiber as well as indicate the presence and location of connectors and any defects in the link. A fiber link is defined as all fiber segments, including patch cords, which create a fiber path from one fiber modem to another. Test result data must meet or exceed ANSI/TIA 568-C.3 (or newer) Optical Fiber Cabling Components Standard related to fiber optic lines, connection/splice losses and the manufacturer's published specifications.

1. OTDR launch and receive cables of appropriate length shall be used. If a single cable is used, each link shall be tested in both directions.
2. Multi-mode fiber links shall be measured at 850 nm and 1300 nm.
3. Single mode fiber links shall be measured at 1310 nm and 1550 nm.

Table 6: Mounting/Environmental specifications

Specification			Rating
4100ES/4100U Chassis Mounted			Two Vertical Block Module; 4 in. W x 11 5/16 in. H (102 mm x 287 mm)
4100-9840 Mounting Bracket			4 in. W x 11 9/16 in. H x 0.064 in. D (102 mm x 294 mm x 1.6 mm)
Remote Cabinets: 4190-9035, 4190-9036, 4190-9038, and 4190-9039			14 5/8 in. W x 16 in. H x 4 1/4 in. D (372 mm x 483 mm x 108 mm). See Remote cabinet mounting reference for additional details
4100-9842 Dual Transformer Audio Expansion Assembly		Mounting bracket	4 in. W x 11 1/2 in. H x 0.064 in. D (102 mm x 292 mm x 1.6 mm). Mounts inside 4100/4120 FACU
		Module size	4 in. W x 3 5/8 in. H (102 mm x 91 mm)
Environmental Specifications	Operating Temperature Range		32°F to 120°F (0°C to 49°C)
	Operating Humidity Range		Up to 93% RH, non-condensing at 100°F (38°C)

Additional 4120 Network product reference

Subject	Data Sheet
4007ES Panels with Conventional Notification	S4007-0001
4007ES Panels with Addressable Notification	S4007-0002
4010ES Panels with Conventional Notification	S4010-0004
4010ES Panels with Conventional Notification (INTL)	S4010-0006
4010ES Panels with Addressable Notification	S4010-0011
4010ES Panels with Addressable Notification (INTL)	S4010-0012
4100ES Basic Panels with ES-PS Power Supplies	S4100-1031
NDU with ES-PS Power Supplies for 4120 Network	S4100-1036
4120 Network Products and Specifications	S4100-0056

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