Simplex 4120 Fire Alarm Network

4120 Network Applications, Communications, Options and Specifications

Features

4120 network communications among system fire alarm control panels provides:

- Support for up to 99 nodes per network loop to provide network emergency voice broadcasts and centralized command center operations
- Multiple network loops for campus and other high panel quantity applications
- Network-wide initiation of alarm silence, acknowledge, and reset; and investigation of status and details of system points and point lists
- Distributed system operation to ensure excellent survivability; during a communications fault condition, Network nodes remaining connected will regroup and continue communicating
- Flexible network annunciator options such as TrueSite workstations, network display units (NDU) and NDUs with voice command center (VCC)
- Use of InfoAlarm command center equipped nodes to provide increased network information display capability
- Network level command and control provides manual point control for on/off or disable/enable, as well as gathering specific point detail

Simplex 4120 fire alarm network communications are available for wired or fiber optic connections

- Wired communications are available on network interface cards (NICs); available with either wired connections only, or as a modular design allowing selection of either wired or fiber optic media modules
- Fiber optic communications are available with fiber media modules on the NIC or when using the higher performance multiple signal fiber optic modems
- Fiber optic links are point-to-point continuous (unswitched) connections between fire alarm network nodes
- LED status indicators assist with system setup and servicing

Modular network interface cards details

- Class B or Class X network communications using wired or fiber optic media modules; selectable separately to match media requirements

Wired media module details

- Provides isolated earth detection
- Compatible with Simplex isolated loop and over-voltage protectors
- Electrical characteristics are similar to RS-485

Duplex fiber optic media module details

- Fiber optic links provide immunity to electrical transients, short circuits, and ground conditions
- Laser based fiber optic media modules use one multi-mode or one single-mode fiber to communicate; includes a single type SC connector compatible with 62.5/125µm or 50/125µm multi-mode fiber, or 9/125µm single-mode fiber
- On-board diagnostics provide information regarding the performance and health of the fiber link.

Multiple signal fiber modem details

- Laser based half-duplex communications for a variety of signal combinations over a single fiber connection
- Available for single mode or multi-mode fiber
- Increased transmission distances compared to copper wiring (over 20 miles (32 km) may be possible with low-loss single-mode fiber)
- Multiple signal modems can be mounted within the cabinet for 4100 series control units. For other compatible fire alarm control units external cabinets are available. Please refer to data sheet *S4100-0049* for details.

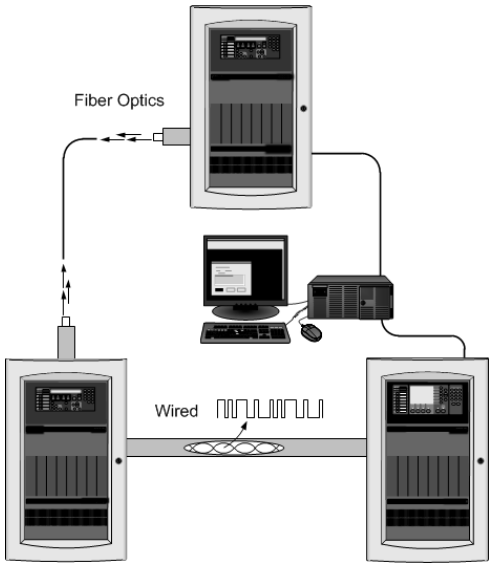


Figure 1: Fire alarm network communications, wired or fiber optic

Physical bridge modules connect multiple network loops and provide star topology connections

- Physical bridge modules connect to network communications using wired or fiber optic media and interconnect using modem media modules. Refer to data sheet *S4100-0057* for details.
- TCP/IP physical bridge modules are similar but provide local area network (LAN) compatible interconnections. Refer to data sheet *S4100-0029* for details.

Network diagnostics include:

- Attendance and polling error logging
- LED status indications on interface board
- Synchronized time and date allowing precise data logging

Listings information

Applicable listings for 4120 network control units and accessories:

- UL 864, Fire Detection and Control (UOJZ), Smoke Control Service (UUKL), Releasing Device Service (SYZV)
- UL 1076, Proprietary Alarm Units - Burglar (APOU)
- UL 2017, Process Management Equipment (QVAX), Emergency Alarm System Control Units (FSZI)
- UL 1730, Smoke Detector Monitor (UULH)
- UL 2572, Mass Notification Systems (PGWM)
- CAN/ULC-S527 Control Units for Fire Alarm Systems (UOJZ7), Releasing Device Service (SYZV7)
- ULC/ORD-C1076 Proprietary Burglar Alarm Units and Systems (APOU7)
- ULC/ORD-C100 Smoke Control System Equipment (UUKL7)

Refer to individual product data sheets for specific product listing details.

Basic 4120 network operation

Simplex fire alarm networks communicate information among distributed Simplex fire alarm control panels. Systems may be composed of similar capability panels sharing information, or specific nodes may be added to perform dedicated network functions. Illustrations on the following pages provide a summary of a variety of fire alarm Network applications.

For non-Simplex panels, a Network System Integrator can be used to connect equipment to the network using optically isolated inputs and relay contact outputs.

Nodes

Each panel with direct communications into the network is defined as a node. Each node can be a large or small fire alarm control panel, TrueSite Workstation, TrueSite Incident Commander, or Network System Integrator.

Communications process

Network information is sequentially transmitted from one node to another. At each node, the network message is captured and either retransmitted as received, or modified before retransmission to provide the network with a status update. The ability of the message to circulate through the network will define the network status and allow the nodes to respond accordingly.

Survivability

If a node goes "off-line" or if the connection between nodes either shorts, opens, or has any other form of communication problem, the nodes will isolate that section of wiring. Nodes that cannot retransmit onto the next node of the network will transmit back to the previous node to maintain communications and to notify the network of the node status. In the event of multiple wiring problems, the remaining nodes will effectively “regroup” and establish new, smaller “sub-networks” that will maintain communications among the active nodes.

Communications options

Figure 2 shows a multiple node network interconnected with a variety of communications means for reference.

- Wired communications are compatible with a variety of new and retrofit wiring
- Duplex fiber optic media card communications use a single fiber (available for single mode or multi-mode fiber) and are dedicated to Network communications
- Multiple communication modems use a single fiber (available for single mode or multi-mode fiber) and can carry multiple communications signals such as network communications and network audio broadcasts
- TCP/IP physical bridge modem communications are also available, refer to Additional 4120 network reference for more information

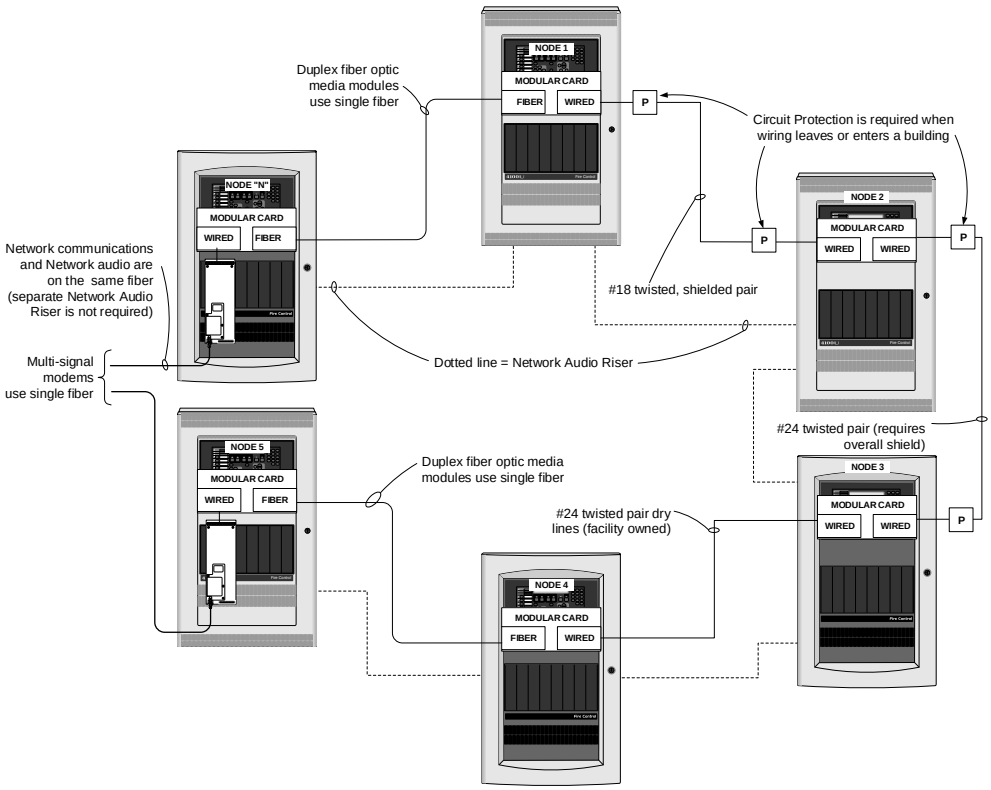


Figure 2: 4120 network communications options reference

Notes:

1. Refer to NFPA 70 (NEC) or other applicable codes for shielded wiring and protective device requirements when wiring enters and leaves a building.
2. For additional details on network audio requirements, refer to data sheet *S4100-0034*.

Multiple loop network operation using a TrueSite Workstation or Incident Commander

When extensive network expansion or interconnection of existing, separate networks is required, up to seven 4120 network loops may be interfaced using the TrueSite Workstation. Up to two network loops can be interfaced using the Incident Commander.

Each network loop is connected to its own network interface card allowing the workstation to appear as a node in each individual loop. With the workstation as a network loop interface, information from all nodes on the network (up to 7 loops) can be annunciated on a central workstation.

With a multi-loop network connection, the TrueSite Workstation and Incident Commander are member nodes of each network loop with up to 98 additional nodes per loop. This allows up to 686 total nodes and the TrueSite Workstation Server (687 total) to be interconnected.

Multiple-loop 4120 and ES Net networks

A TrueSite Workstation node can attach to as many as (7) network loops; up to (1) ES Net loop and (6) additional 4120 loops, or up to (7) 4120 loops. An Incident Commander node can attach to as many as (2) network loops; up to (1) ES Net loop and (1) additional 4120 loop, or up to (2) 4120 loops.

Multi-loop operation features

Improved survivability

- Individual network loops operate independently
- In the event of loss of one or more loops, remaining loops continue to operate

Loop independence

New loops can be added without impacting existing loops

Assists with phased-in system expansion

- Each loop can be installed as a stand-alone network allowing local node programming to evolve as required
- When construction or renovation reaches completion, loops can be consolidated for coordinated facility protection

TrueSite Workstation hardware requirements

- Each loop requires a dedicated network interface card with media modules, as required.
- A maximum of 7 network interface cards are allowed per workstation

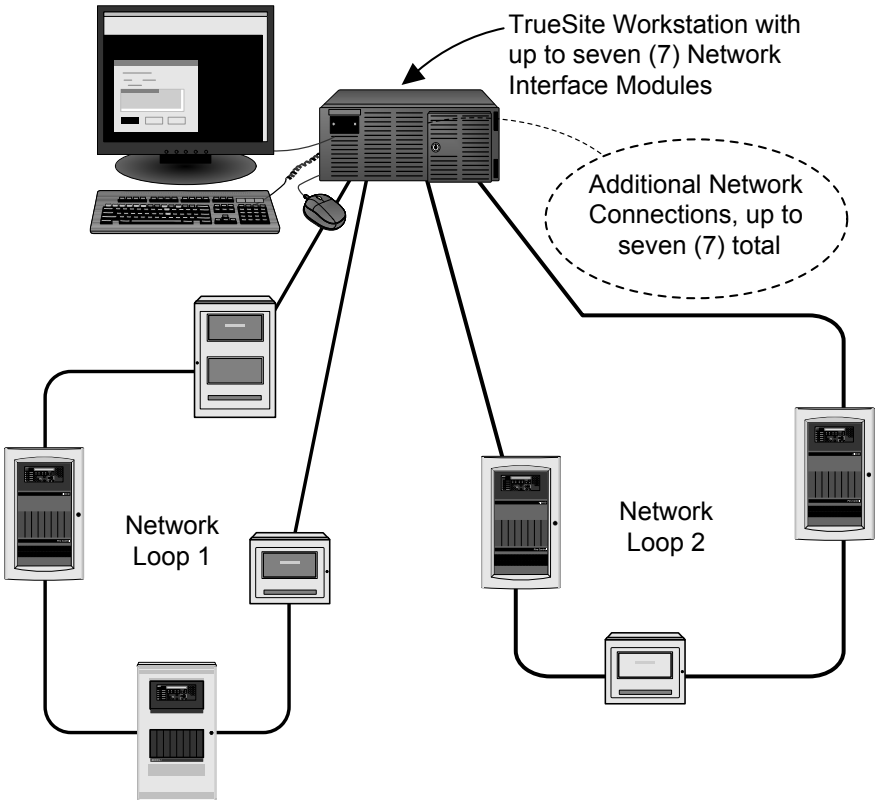


Figure 3: Typical interface of multiple network loops using a TrueSite Workstation

Multiple building 4120 network example

Multiple building/campus network

Multiple building 4120 network example represents a multiple building/campus network with duplicate InfoAlarm network display unit (NDU) locations. The East security office might normally be the master command center in the event of an emergency while the west security office can take control if needed.

Hub node function using physical bridge modules

The east security office NDU also performs as a basic hub node, supporting a star topology via physical bridge modules, and allowing the two panel network of the research & development loop to connect to the main network loop. Physical bridge modules allow a variety of other network connections (refer to data sheet *S4100-0057* for additional information).

Network oversight

System activity recording occurs at both of the NDU locations with each capable of manually investigating and operating the same network points. Access to the operation is pass-code controlled such that only authorized operators have access to override the automatic operation.

Support for "In control" command centers

"In control" network operation allows a prioritization to establish which command center is in control.

"In control" functions include:

- Annunciation of which command center is "In control"
- Establishing whether command centers have equal access to control or are prioritized
- Allowing a "Request control" command to be accepted where a specific command center takes control over other equal priority command centers – typically due to location of the incident of concern

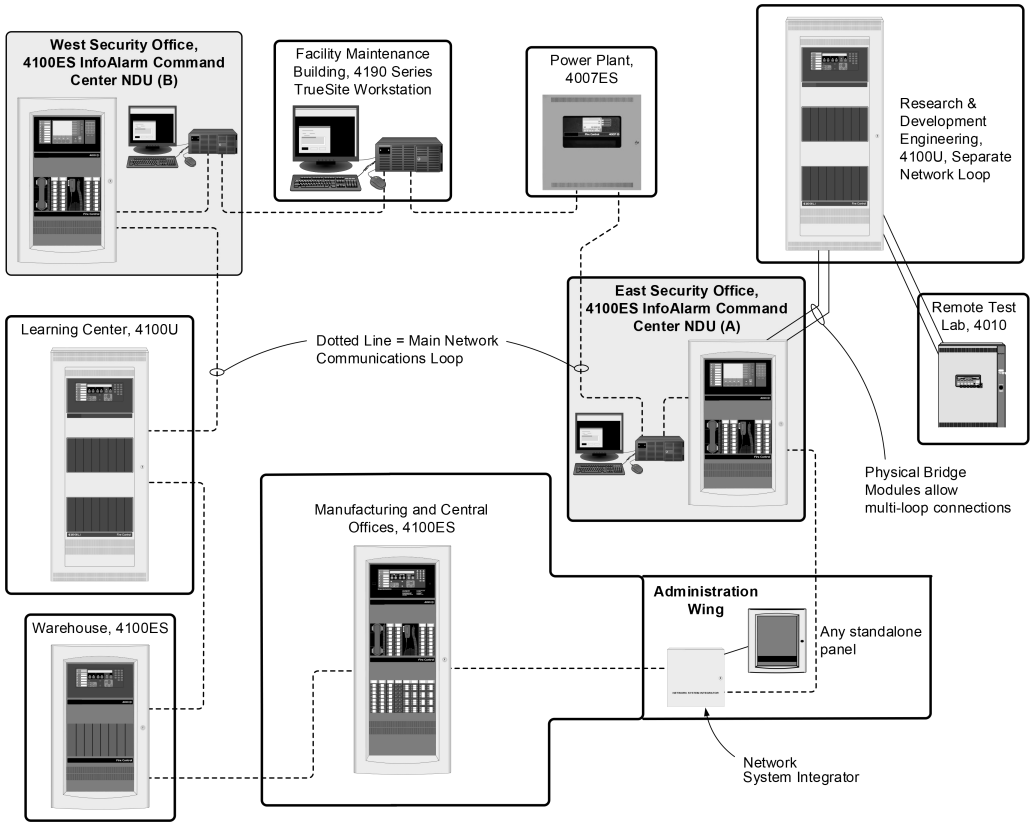


Figure 4: Multiple Building 4120 Network Application

4120 network high rise audio example

Fire alarm network principles apply equally to high rise applications. For the example shown in Figure 5, a wired network communications link is paired with a wired audio riser.

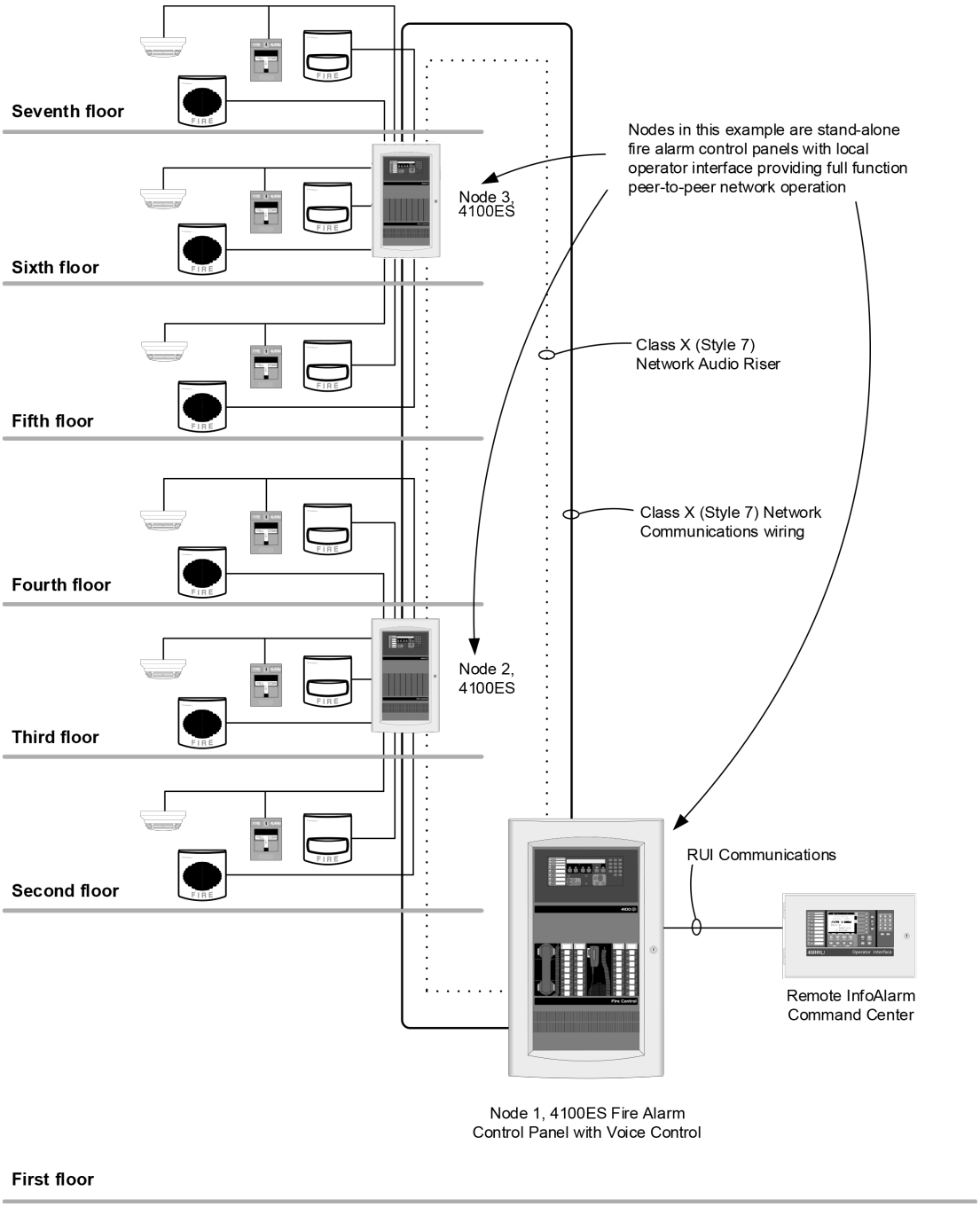


Figure 5: Network high rise audio example

Multiple signal fiber optic modem example

Network interconnection flexibility

Multiple communication signal fiber optic modems provide the ability to communicate 4120 network information and network audio information over a single fiber. Additionally, they also can provide a variety of interconnection capabilities functioning as a hub node to tie into star topology wiring and to interconnect network loops.

As shown below, a network can consist of both Class B (Style 4) and Class X (Style 7) communications wiring depending on system requirements.

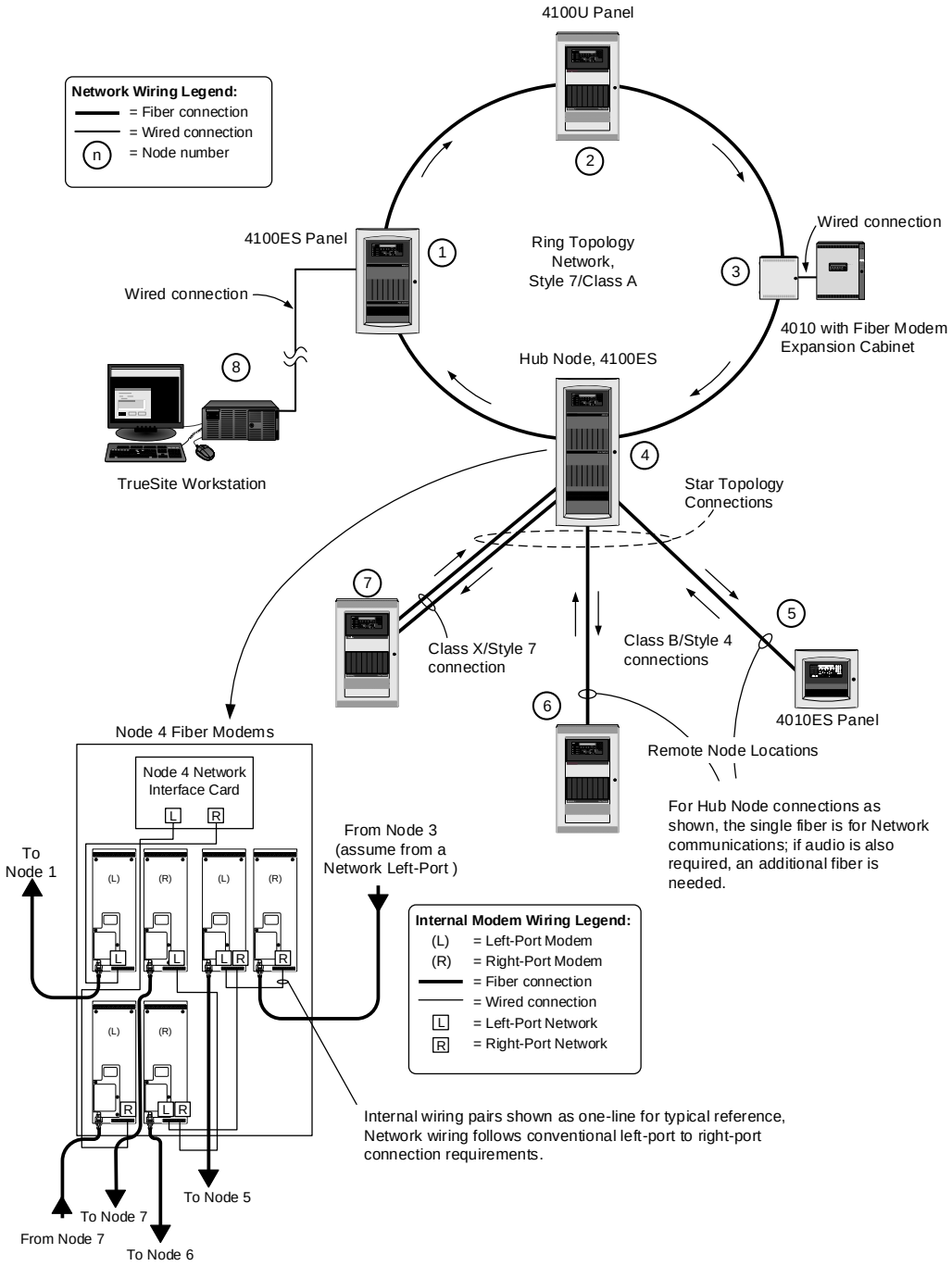


Figure 6: 4120 network connections using multiple signal fiber modem communications

Note: This arrangement is shown for reference only. Alternate interconnections are detailed in Installation Instructions 579-831.

4120 fire alarm network example with multiple communication media

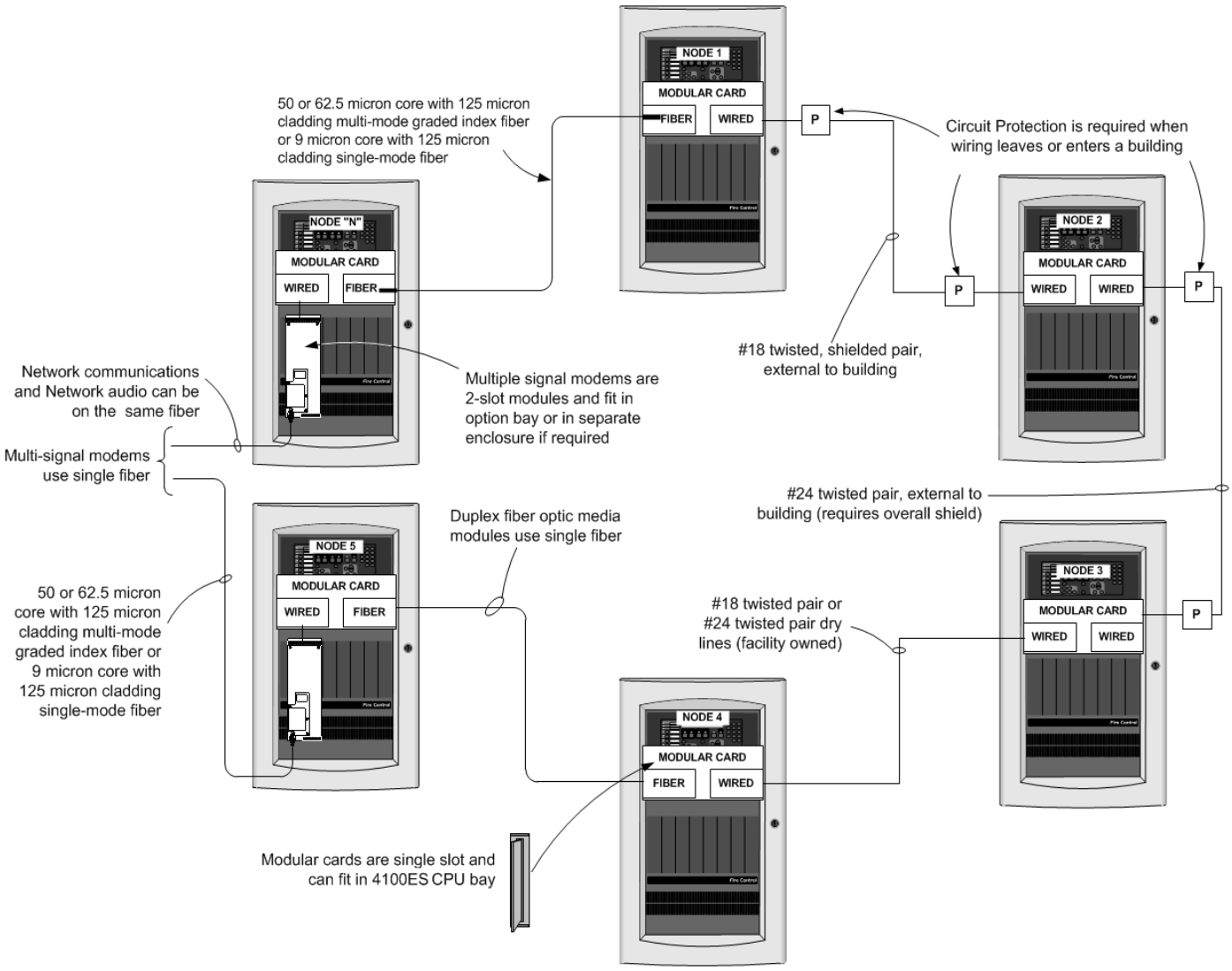


Figure 7: Fire alarm network example with multiple communication media

Note: Refer to NFPA 70 (NEC) or other applicable codes for shielded wiring and protective device requirements when wiring enters and leaves a building.

Multiple 4120 network loop connections using TCP/IP physical bridge modules

For additional 4120 network connection flexibility, TCP/IP physical bridge modules are available. Bridging between network loops or to a star configuration using these modules allows the connection to be via a local area network (LAN) connection.

Refer to data sheet *S4100-0029* for additional TCP/IP physical bridge module details.

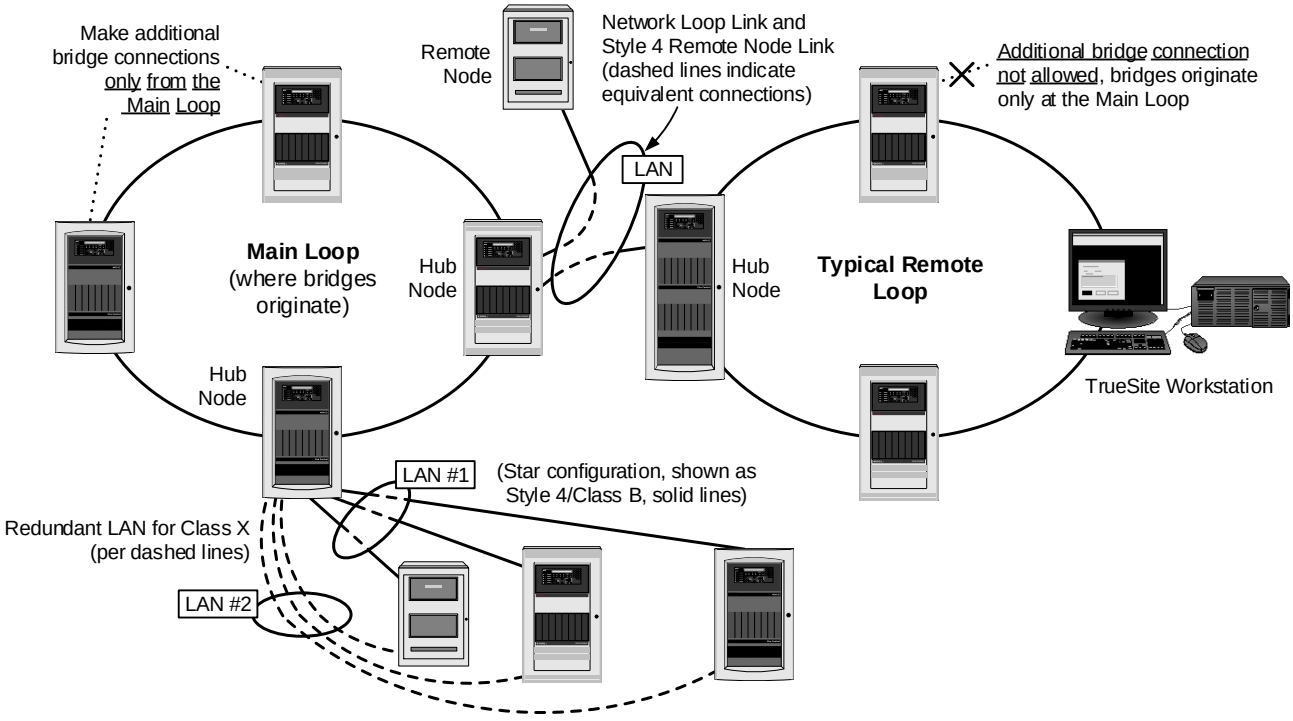


Figure 8: Multiple loop 4120 network with TCP/IP modems

4120 network communications equipment selection reference

Table 1: Network interface cards for fire alarm control panels and TrueSite Workstation

Product	Model	Description	Size	Alarm/Supv.	Notes
4100ES/4100U	4100-6078	Modular network interface for master controller	1 slot	46 mA	Network interface cards require up to two media cards (ordered separately, see below)
	4100-6061	Modular network interface for redundant master controller			
TrueSite Workstation	4190-6061	Modular network interface, PCI slot card	1 PCI slot	46 mA	
4007ES	4007-9810	Modular network interface	Block L	30 mA	
4010ES	4010-9922	Modular network interface	2 Vertical Blocks	30 mA	

Table 2: Network media cards

Product	Model	Description	Transmission mode	Port	Alarm/Supv.	Notes
4007ES fiber media cards	4007-6301	4120 duplex fiber media card for the 4007ES	Single-mode	Left	55mA	Mounts on modular network interface cards listed above. Maximum of 1 left port and 1 right port duplex fiber media card per modular network interface card. Field connections require left port to right port pairing. Order fiber media service kits for retrofit jobs where ST connectors are already installed (see below for service kit ordering information, see install document 579-1238 for additional installation details).
	4007-6302			Right	55mA	
	4007-6303		Multi-mode	Left	55mA	
	4007-6304			Right	55mA	
4010ES/4010 fiber media cards	4010-6301	4120 duplex fiber media card for the 4010/4010ES	Single-mode	Left	55mA	
	4010-6302			Right	55mA	
	4010-6303		Multi-mode	Left	55mA	
	4010-6304			Right	55mA	
4100ES/4100U fiber media cards	4100-6301	4120 duplex fiber media card for the 4100ES/4100U	Single-mode	Left	55mA	
	4100-6302			Right	55mA	
	4100-6303		Multi-mode	Left	55mA	
	4100-6304			Right	55mA	
TrueSite Workstation fiber media cards	4190-6301	4120 duplex fiber media card for the TrueSite Workstation	Single-mode	Left	55mA	
	4190-6302			Right	55mA	
	4190-6303		Multi-mode	Left	55mA	
	4190-6304			Right	55mA	
Wired media cards	4100-6056	Wired media card for 4100ES/4100U/NSI			55mA	Mounts on 4100-6078 or 4100-6061 modular network interface; also used with network system integrator
	4190-6036	Wired media card for the TrueSite Workstation			55mA	Mounts on 4190-6061 modular network interface
	4010-9818	Wired media card for the 4010/4010ES			55mA	Mounts on 4010-9817 or 4010-9922 modular network interface
	4007-9813	Wired media card for 4007ES			55mA	Mounts on 4007-9810 modular network Interface

Table 3: Duplex fiber media card service kits

Install type	Order number	Description
62.5/125 µm installations	650-2013	For retrofit jobs where multi-mode fibers with ST connectors are already installed. Includes (1) left port and (1) right port 4120 multi-mode duplex fiber media cards, (2) ST to SC 18 in (45.7 cm) multi-mode fiber media patch cords, (2) ST-ST couplers, (2) wire clamps, and (2) insulating sleeves.
50/125 µm installations	650-2014	

Note: Fiber optic media cards must be of the same type on each end of the fiber link. When replacing a media card with a different type, the card on the other side of the link should be replaced as well.

Table 4: 4120 network options

Model	Panel	Description	Size	Alarm/Supv.
4100-6047	4100ES	Building network interface card (BNIC), refer to data sheet *S4100-0061* for details	2 Blocks	291 mA
4100-6055	4100ES	Network access dial-in service modem, mounts to 4100-6078 or 4100-6061 modular network interface card, requires telephone line connection	N.A.	60 mA
4010-9914	4010ES	Building network interface card (BNIC), refer to data sheet *S4100-0061* for details	2 Blocks	236 mA

Wired media module distance specifications

The wired media module distance specifications in Table 5 are for media modules 4010-9818, 4100-6056, 4190-6036, or 4007-9813.

Table 5: Wired media module distance specifications

Wire size and specifications	Data rate (baud)	Distance	Distance note
18 AWG Unshielded Twisted Pair (UTP); maximum of 58 pF/ft, (190 pF/m) between conductors; shielded cable is allowed; see note below.	9600	17,000 ft (5.4 km)	Distance is with or without isolated loop protector or over-voltage protectors.
	57.6 k	10,000 ft (3 km)	
24 AWG Telephone cable Unshielded Twisted Pair (UTP); maximum of 22 pF/ft (72.2 pF/m) between conductors; overall shielded cable is allowed; see note below.	9600	12,000 ft (3.65 km)	
	57.6 k	7,000 ft (2.13 km)	

Note: Shielded cable and circuit protection is required when wiring leaves the building.

Duplex fiber media module specifications

Table 6: Duplex fiber optic media module specifications

Specification		Rating	
Compatible fiber	Single mode	Nominal 9/125 µm	
	Multi-mode	50/125 µm or 62.5/125 µm graded index	
Fiber connector		Type SC	
Allowed fiber connections		No limit	
Transmit and receive wavelengths	Single-mode media card	Port A: Transmit = 1310nm, Receive = 1550nm Port B: Transmit = 1550nm, Receive = 1310nm	Optical launch power; -9 dBm (126 µW) minimum, -3 dBm (501 µW) maximum
	Multi-mode media card	Port A: Transmit = 1310nm, Receive = 1550nm Port B: Transmit = 1550nm, Receive = 1310nm	Optical launch power; -8 dBm (159 µW) minimum, 0 dBm (1000 µW) maximum
Transmission distances for single-mode fiber		Maximum distance = 82,000 ft (25km) Maximum total attenuation = 22dB	
Transmission distances for multi-mode fiber		Maximum distance = 16,400 ft (5km) Maximum total attenuation = 18dB	

Table 7: Duplex fiber optic media module distance specifications

Fiber type	MIFL	Power margin	Safety margin	Maximum distance	Power budget	Coupler/splice loss
Multi-mode 50/125 or 62.5/125, numerical aperture = 0.275	1.5 dB/km @ 1300nm	15 dB	-3 dB	16400 ft (5 km)	18 dB	.75dB max for each mated pair connection .30dB max for each fusion splice
Single-mode 9/125, numerical aperture = 0.2	1 dB/km @ 1310nm	19 dB	-3 dB	82000 ft (25 km)	22 dB	

The duplex fiber optic media module distance specifications in Table 7 are for media modules 4007-6301, 4007-6302, 4007-6303, 4007-6304, 4010-6301, 4010-6302, 4010-6303, 4010-6304, 4100-6301, 4100-6302, 4100-6303, 4100-6304, 4190-6301, 4190-6302, 4190-6303, and 4190-6304.

Fiber media notes

1. **Fiber type for duplex fiber optic**: Cable specifications are for 50 or 62.5 micron core with 125 micron cladding multi-mode graded index fiber or 9 micron core with 125 micron cladding single-mode fiber
2. **MIFL**: maximum individual fiber loss. Numbers shown are industry standard reference; refer to specific cable for exact specifications.
3. **Distance**: The maximum distance between nodes is determined by the total loss from the transmitter to the associated receiver (fiber loss, connector loss, splice loss and power margin), or the maximum distance listed, whichever is smaller.
4. **Power budget**: Use attenuation measurements at the following wavelengths: Multi-mode @ 1300nm, Single-mode @ 1310nm

Multiple signal fiber optic modem specifications

Refer to data sheet ***S4100-0049*** for multiple signal fiber optic modem details.

Acceptance test requirements for fiber optic installations

An initial acceptance test of each fiber link shall be performed in accordance with NFPA 72, Chapter 14 Inspection, Testing, and Maintenance (or other applicable local code) requirements. A fiber link is defined as all fiber segments, including patch cords, which create a fiber path from one fiber media board 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 and 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.

Compatible 4120 network products

4120 network nodes include the following Simplex fire alarm products:

- 4100ES, 4100U, 4007ES, 4010ES, and 4010 series fire alarm control panels and 4100ES or 4100U NDU's
- 4190 Series TrueSite Workstations and Incident Commanders
- 4190 Series Network System Integrators
- Legacy 4120 Series panels, NPU, and 2500 NDU; 4190 Series IMS and GCC systems; 4020, 4002 Series systems and retrofitted 4100/4100+ and 2120 systems

Additional 4120 network reference

Table 8: Additional 4120 network reference

Subject	Data sheet
4007ES Hybrid Fire Alarm Control Panel	*S4007-0001*
4007ES Fire Alarm Control Panel	*S4007-0002*
4010ES Fire Alarm Control Panel	*S4010-0004*
4010ES Fire Alarm Control Panel (International)	*S4010-0006*
4010ES Addressable Basic Control Unit with IDNAC	*S4010-0011*
4010ES Addressable Basic Control Unit with IDNAC (International)	*S4010-0012*
TCP/IP physical bridge modules for 4120 networks	*S4100-0029*
4100ES Basic Panels with SPS Power Supplies	*S4100-0031*
4100ES Network Display Unit (NDU) with SPS Power Supplies for 4120 Networks	*S4100-0036*
InfoAlarm Command Center for Control Units with SPS Power Supplies	*S4100-0045*
Multiple Signal Fiber Optic Modems and Accessories for 4120 networks	*S4100-0049*
Physical Bridge Modules for 4120 networks	*S4100-0057*
Building Network Interface Card (BNIC) Models	*S4100-0061*
4100ES Basic Panels with EPS Power Supplies	*S4100-0100*
InfoAlarm Command Center for Control Units with EPS Power Supplies	*S4100-0101*
4100ES Network Display Unit (NDU) with EPS Power Supplies for 4120 networks	*S4100-0102*
TrueSite Workstations	*S4190-0016*
Network Systems Integrator for 4120 networks	*S4190-0017*
TrueSite Incident Commander	*S4190-0020*
TrueSite Graphic Annunciator	*S4190-0022*
TrueSite Graphic Annunciator Incident Commander	*S4190-0023*
Truesite Mobile Client	*S4190-0024*

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