Features

4120 network communications among system fire alarm control units provide:

- 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 (NDUs) 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
- Onboard 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 datasheet S4100-0049 for details.

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 datasheet S4100-0057 for details.
- TCP/IP physical bridge modules are similar but provide local area network (LAN) compatible interconnections. Refer to datasheet 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)
Basic 4120 network operation

Simplex fire alarm networks communicate information among distributed Simplex fire alarm 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 unit, 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 datasheet 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 seven 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 in total, to be interconnected.

Multiple-loop 4120 and ES Net networks

A TrueSite Workstation node can attach to as many as seven network loops; up to one ES Net loop and six additional 4120 loops, or up to seven 4120 loops. An Incident Commander node can attach to as many as two network loops; up to one ES Net loop and one additional 4120 loop, or up to two 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 seven network interface cards are allowed per workstation

![Figure 3: Typical interface of multiple network loops using a TrueSite Workstation](image-url)
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 and development loop to connect to the main network loop. Physical bridge modules allow a variety of other network connections. Refer to datasheet 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 the 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

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

Circuit Protection is required when wiring leaves or enters a building

Network communications and Network audio can be on the same fiber

Multi-signal modems use single fiber

Multiple signal modems are 2-slot modules and fit in option bay or in separate enclosure if required

#18 twisted, shielded pair, external to building

#24 twisted pair, external to building (requires overall shield)

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

Duplex fiber optic media modules use single fiber

#18 twisted pair or #24 twisted pair dry lines (facility owned)

Modular cards are single slot and can fit in 4100ES CPU bay

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 through a local area network (LAN) connection. Refer to datasheet S4100-0029 for additional TCP/IP physical bridge module details.

Figure 8: Multiple loop 4120 network with TCP/IP modems
### Table 1: Network interface cards for fire alarm control units and TrueSite Workstation

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Description</th>
<th>Size</th>
<th>Alarm/Supv.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4100ES/4100U</td>
<td>4100-6078</td>
<td>Modular network interface for master controller</td>
<td>One slot</td>
<td>46 mA</td>
<td>Network interface cards require up to two media cards. Ordered separately, see below.</td>
</tr>
<tr>
<td></td>
<td>4100-6061</td>
<td>Modular network interface for redundant master controller</td>
<td>One slot</td>
<td>46 mA</td>
<td></td>
</tr>
<tr>
<td>TrueSite Workstation</td>
<td>4190-6061</td>
<td>Modular network interface, PCI slot card</td>
<td>One PCI slot</td>
<td>46 mA</td>
<td></td>
</tr>
<tr>
<td>4007ES</td>
<td>4007-9810</td>
<td>Modular network interface</td>
<td>Block L</td>
<td>30 mA</td>
<td></td>
</tr>
<tr>
<td>4010ES</td>
<td>4010-9922</td>
<td>Modular network interface</td>
<td>Two vertical blocks</td>
<td>30 mA</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Network media cards

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Description</th>
<th>Transmission mode</th>
<th>Port</th>
<th>Alarm/Supv.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4007ES fiber media cards</td>
<td>4007-6301</td>
<td>4120 duplex fiber media card for the 4007ES</td>
<td>Single-mode</td>
<td>Left</td>
<td>55 mA</td>
<td>Mounts on modular network interface cards listed above. Maximum of one left port and one right port 4120 multi-mode fiber media card for each 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).</td>
</tr>
<tr>
<td></td>
<td>4007-6302</td>
<td></td>
<td>Multi-mode</td>
<td>Right</td>
<td>55 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4007-6303</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4007-6304</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4010ES/4010 fiber media cards</td>
<td>4010-6301</td>
<td>4120 duplex fiber media card for the 4010/4010ES</td>
<td>Single-mode</td>
<td>Left</td>
<td>55 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4010-6302</td>
<td></td>
<td>Multi-mode</td>
<td>Right</td>
<td>55 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4010-6303</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4010-6304</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4100ES/4100U fiber media cards</td>
<td>4100-6301</td>
<td>4120 duplex fiber media card for the 4100ES/4100U</td>
<td>Single-mode</td>
<td>Left</td>
<td>55 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4100-6302</td>
<td></td>
<td>Multi-mode</td>
<td>Right</td>
<td>55 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4100-6303</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4100-6304</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TrueSite Workstation fiber media cards</td>
<td>4190-6301</td>
<td>4120 duplex fiber media card for the TrueSite Workstation</td>
<td>Single-mode</td>
<td>Left</td>
<td>55 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4190-6302</td>
<td></td>
<td>Multi-mode</td>
<td>Right</td>
<td>55 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4190-6303</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4190-6304</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wired media cards</td>
<td>4100-6056</td>
<td>Wired media card for 4100ES/4100U/NSI</td>
<td></td>
<td></td>
<td>55 mA</td>
<td>Mounts on 4100-6078 or 4100-6061 modular network interface; also used with network system integrator</td>
</tr>
<tr>
<td></td>
<td>4190-6036</td>
<td>Wired media card for the TrueSite Workstation</td>
<td></td>
<td></td>
<td>55 mA</td>
<td>Mounts on 4190-6061 modular network interface</td>
</tr>
<tr>
<td></td>
<td>4010-9818</td>
<td>Wired media card for the 4010/4010ES</td>
<td></td>
<td></td>
<td>55 mA</td>
<td>Mounts on 4010-9817 or 4010-9922 modular network interface</td>
</tr>
<tr>
<td></td>
<td>4007-9813</td>
<td>Wired media card for 4007ES</td>
<td></td>
<td></td>
<td>55 mA</td>
<td>Mounts on 4007-9810 modular network interface</td>
</tr>
</tbody>
</table>

### Table 3: Duplex fiber media card service kits

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

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, replace the card on the other side of the link as well.

### Table 4: 4120 network options

<table>
<thead>
<tr>
<th>Model</th>
<th>Control Unit</th>
<th>Description</th>
<th>Size</th>
<th>Alarm/Supv.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4100-6047</td>
<td>4100ES</td>
<td>Building network interface card (BNIC), refer to datasheet S4100-0061 for details</td>
<td>Two blocks</td>
<td>291 mA</td>
</tr>
<tr>
<td>4100-6055</td>
<td>4100ES</td>
<td>Network access dial-in service modem, mounts to 4100-6078 or 4100-6061 modular network interface card, requires telephone line connection</td>
<td>N.A.</td>
<td>60 mA</td>
</tr>
<tr>
<td>4010-9914</td>
<td>4010ES</td>
<td>Building network interface card (BNIC), refer to datasheet S4100-0061 for details</td>
<td>Two blocks</td>
<td>236 mA</td>
</tr>
</tbody>
</table>
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>
<thead>
<tr>
<th>Wire size and specifications</th>
<th>Data rate (baud)</th>
<th>Distance</th>
<th>Distance note</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 AWG Unshielded Twisted Pair (UTP); maximum of 58 pF/ft (190 pF/m) between conductors; shielded cable is allowed; see note below.</td>
<td>9600</td>
<td>17,000 ft (5.4 km)</td>
<td>Distance is with or without isolated loop protector or over-voltage protectors.</td>
</tr>
<tr>
<td>57.6 k</td>
<td>10,000 ft (3 km)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 AWG Telephone cable Unshielded Twisted Pair (UTP); maximum of 52 pF/ft (72.2 pF/m) between conductors; overall shielded cable is allowed; see note below.</td>
<td>9600</td>
<td>12,000 ft (3.65 km)</td>
<td></td>
</tr>
<tr>
<td>57.6 k</td>
<td>7,000 ft (2.13 km)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Duplex fiber media module specifications

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 at 1300nm, Single-mode at 1310nm

Multiple signal fiber optic modem specifications

Refer to datasheet 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 units and 4100ES or 4100U NDU's
- 4190 Series TrueSite Workstations and Incident Commanders
- 4190 Series Network System Integrators
- Legacy 4120 Series control units, 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>
<thead>
<tr>
<th>Subject</th>
<th>Datasheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>4007ES Hybrid Fire Alarm Control Unit</td>
<td>S4007-0001</td>
</tr>
<tr>
<td>4007ES Fire Alarm Control Unit</td>
<td>S4007-0002</td>
</tr>
<tr>
<td>4010ES Fire Alarm Control Unit</td>
<td>S4010-0004</td>
</tr>
<tr>
<td>4010ES Fire Alarm Control Unit (International)</td>
<td>S4010-0006</td>
</tr>
<tr>
<td>4010ES Addressable Basic Control Unit with IDNAC</td>
<td>S4010-0011</td>
</tr>
<tr>
<td>4010ES Addressable Basic Control Unit with IDNAC (International)</td>
<td>S4010-0012</td>
</tr>
<tr>
<td>TCP/IP Physical Bridge Modules for 4120 Networks</td>
<td>S4100-0029</td>
</tr>
<tr>
<td>Multiple Signal Fiber Optic Modems and Accessories for 4120 networks</td>
<td>S4100-0049</td>
</tr>
<tr>
<td>Physical Bridge Modules for 4120 Networks</td>
<td>S4100-0057</td>
</tr>
<tr>
<td>Building Network Interface Card (BNIC) Models</td>
<td>S4100-0061</td>
</tr>
<tr>
<td>4100ES Basic Units with ES-PS Power Supplies</td>
<td>S4100-1031</td>
</tr>
<tr>
<td>NDU with ES-PS Power Supplies for 4120 Network</td>
<td>S4100-1036</td>
</tr>
<tr>
<td>TrueSite Workstations</td>
<td>S4190-0016</td>
</tr>
<tr>
<td>TrueSite Incident Commander</td>
<td>S4190-0020</td>
</tr>
<tr>
<td>TrueSite Graphic Annunciator</td>
<td>S4190-0022</td>
</tr>
<tr>
<td>TrueSite Graphic Annunciator Incident Commander</td>
<td>S4190-0023</td>
</tr>
<tr>
<td>Truesite Mobile Client</td>
<td>S4190-0024</td>
</tr>
<tr>
<td>Network Systems Integrator for ES Net and 4120 networks</td>
<td>S4190-0026</td>
</tr>
</tbody>
</table>