**Features**

**Simplex® Fire Alarm Network communications are available for wired or fiber optic connections:**

- Wired communications are available on Network interface modules; 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 Network interface modules 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

**Multiple communication signal modems use laser optical transmitters to provide:**

- Increased transmission distances compared to copper wiring (over 20 miles (32 km) may be possible with low-loss single-mode fiber)
- Designs are optimized for fiber type; models are selected for single mode fiber, or multi-mode fiber
- Multiple signal modems are two slot modules and are available with separate enclosures if required for smaller Network node control panels

**Network modular interface modules provide:**

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

**Wired media module details:**

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

**Network signal fiber optic media module:**

- Fiber optic links provide immunity to electrical transients, short circuits, and ground conditions
- LED based fiber optic media module uses two multi-mode fibers to communicate; has type ST connectors, compatible with 62.5/125 or 50/125 fiber
- Bi-Directional Couplers are available to allow use of single fiber cable (for Network communications)

**Multiple communications fiber optic modules provide:**

- Laser based half-duplex communications over single fiber connections
- Available for single mode, or multi-mode fiber
- Refer to information summary on pages 2 and 3 and to data sheet S4100-0049 for additional feature description

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**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 LAN (Local Area Network) compatible interconnections (refer to data sheet S4100-0029 for details)

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**Network Panel List**

**Network nodes include the following Simplex fire alarm products:**

- 4100ES, 4100U, 4007ES, 4010ES, and 4010 Series Fire Alarm Control Panels and 4100ES or 4100U Network Display Units (NDU)
- 4190 Series TrueSite Workstations (TSW)
- 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

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- **NOTE:** Refer to individual product data sheets for specific product listing details, see reference data sheet list on page 3.
Network Communications Module Selection Reference

Network Interface Modules for Fire Alarm Control Panels and TrueSite Workstation

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Description</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>Requires two media modules (below)</td>
</tr>
<tr>
<td></td>
<td>4100-6061</td>
<td>Modular Network Interface for Redundant Master Controller</td>
<td>Mounts on 4100-6078 or 4100-6061 Network Interface also used with Network System Integrator</td>
</tr>
<tr>
<td></td>
<td>4100-6056</td>
<td>Wired Media Module</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4100-6057</td>
<td>Fiber Optic Media Module</td>
<td></td>
</tr>
<tr>
<td>TrueSite Workstation</td>
<td>4190-6060</td>
<td>Network Interface with fixed, wired media, PCI slot card</td>
<td>Requires two media modules (below)</td>
</tr>
<tr>
<td></td>
<td>4190-6061</td>
<td>Modular Network Interface, PCI slot card</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4190-6036</td>
<td>Wired Media Module</td>
<td>Mounts on 4190-6061 Network Interface</td>
</tr>
<tr>
<td></td>
<td>4190-6037</td>
<td>Fiber Optic Media Module</td>
<td></td>
</tr>
<tr>
<td>4010</td>
<td>4010-9821</td>
<td>Network Interface with fixed, wired media</td>
<td>Requires two media modules (below)</td>
</tr>
<tr>
<td>4010ES</td>
<td>4010-9817</td>
<td>Modular Network Interface</td>
<td></td>
</tr>
<tr>
<td>4010/4010ES</td>
<td>4010-9819</td>
<td>Wired Media Module</td>
<td>Mounts on 4010-9817 or 4010-9922 Network Interface</td>
</tr>
<tr>
<td></td>
<td>4010-9819</td>
<td>Fiber Optic Media Module</td>
<td></td>
</tr>
<tr>
<td>4007ES</td>
<td>4007-9810</td>
<td>Network Interface Card, Modular Network Interface</td>
<td>Requires two media modules (below)</td>
</tr>
<tr>
<td></td>
<td>4007-9813</td>
<td>Wired Media Card</td>
<td>Mounts on 4007-9810 Network Interface Card</td>
</tr>
<tr>
<td></td>
<td>4007-9814</td>
<td>Fiber-Optic Media Card</td>
<td></td>
</tr>
</tbody>
</table>

Network Multiple Signal Modems Reference (refer to data sheet S4100-0049 for additional information)

<table>
<thead>
<tr>
<th>Model</th>
<th>Fiber Type</th>
<th>Description</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>4100-6072</td>
<td>Single Mode</td>
<td>Left-Port Fiber Modem Assembly</td>
<td>For direct mounting onto a 4100ES/4100U expansion bay; Fiber Modems are required to be ordered in pairs (Left-Port Fiber Modems communicate only to Right-Port Fiber Modems)</td>
</tr>
<tr>
<td>4100-6074</td>
<td>Multi-Mode</td>
<td>Multi-Mode Fiber Modem Assembly</td>
<td></td>
</tr>
<tr>
<td>4100-6073</td>
<td>Single Mode</td>
<td>Right-Port Fiber Modem Assembly</td>
<td></td>
</tr>
<tr>
<td>4100-6075</td>
<td>Multi-Mode</td>
<td>Multi-Mode Fiber Modem Assembly</td>
<td></td>
</tr>
<tr>
<td>4190-9023</td>
<td>Single Mode</td>
<td>Right-Port Fiber Modem Assembly; for Expansion</td>
<td>Select if required; one maximum</td>
</tr>
<tr>
<td>4190-9026</td>
<td>Multi-Mode</td>
<td>Multi-Mode Fiber Modem Assembly</td>
<td></td>
</tr>
</tbody>
</table>

Fire Alarm Network Example with Multiple Communication Media

- For direct mounting onto a 4100ES/4100U expansion bay; Fiber Modems are required to be ordered in pairs (Left-Port Fiber Modems communicate only to Right-Port Fiber Modems)
- Select if required; one maximum
- Network communications and Network audio can be on the same fiber
- Multi-signal modems use single fiber
- Modular cards are single slot and can fit in 4100ES/4100U CPU bay
- Circuit Protection is required when wiring leaves or enters a building
- Per NFPA 70 (NEC) shielded wiring is required when wiring leaves the building
- Select if required; one maximum
- 18 twisted pair, external to building
- 24 twisted pair, external to building (requires overall shield)
- 18 twisted pair or 24 twisted pair dry lines (facility owned)
Multiple Signal Fiber Modems

For Network communications, or local Control Panel equipment communications, Multiple signal fiber modems communicate a variety of system signal combinations to a single fiber optic cable. These modules are dual slot module sized and can be housed in external cabinets for connection to smaller control panels. Please refer to data sheet S4100-0049 for details.

Below is a summary of the distance specifications for the Multiple Signal Fiber Modems.

### Multiple Signal Fiber Optic Modem Distance Specifications

(see page 4 for additional module reference)

<table>
<thead>
<tr>
<th>Compatible Fiber</th>
<th>General Notes</th>
<th>Fiber Connector Type</th>
<th>Allowed Fiber Connections</th>
<th>Transmit and Receive Wavelengths</th>
<th>Transmission Distances for Single-Mode Fiber</th>
<th>Transmission Distances for Multi-Mode Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ST</td>
<td></td>
<td></td>
<td>(preferred fiber type; Modules 4190-6072, 4100-6073, and 4190-9023)</td>
<td>(Modules 4100-6074, 4100-6075, and 4190-9026)</td>
</tr>
<tr>
<td>Single-Mode</td>
<td>Nominal 9/125 µm</td>
<td></td>
<td></td>
<td>Left-Port Modems: Transmit = 1310 nm; Receive = 1550 nm</td>
<td>Maximum total attenuation = 15 dB</td>
<td>5000 ft (1.6 km) maximum distance</td>
</tr>
<tr>
<td>Multi-Mode</td>
<td>50/125 µm or 62.5/125 µm graded index</td>
<td></td>
<td></td>
<td>Right-Port Modems: Transmit = 1550 nm; Receive = 1310 nm</td>
<td></td>
<td>Maximum total attenuation = 6 dB</td>
</tr>
</tbody>
</table>

**Important Installation Note:** An initial acceptance test of each fiber link shall be performed in accordance with NFPA 72, the National Fire Alarm and Signaling Code using an OTDR (Optical Time Domain Reflectometer)

1. Fiber backbone components must meet or exceed standard EIA/TIA 568 (Electronic Industries Alliance/Telecommunications Industry Association) for fiber network performance
2. Single-mode fiber is preferred
3. Multi-mode attenuation shall be measured at 850 nm and 1300 nm.
4. Single-mode attenuation shall be measured at 1310 nm and 1550 nm.

**Fiber Connector Type:** ST

**Allowed Fiber Connections:**
- Single Mode Fiber: No Limit
- Multi-Mode Fiber: Three (3) external connections maximum per link (does not include connectors on modems)

**Transmit and Receive Wavelengths:**
- Left-Port Modems: Transmit = 1310 nm; Receive = 1550 nm
- Right-Port Modems: Transmit = 1550 nm; Receive = 1310 nm

**Launch power:** 250 µW (-6 dBm)

**Minimum safety margin:**
- 5 dB or greater; a 3 dB safety margin is generally acceptable

**Example 1 (low loss fiber):**
Assume fiber with attenuation of 0.34 db/km; a target distance of 35,000 ft (10.7 km); connector loss totaling 6 dB attenuation; calculate the safety margin:

$$10.7 \text{ km} \times (0.34 \text{ db/km}) = 3.68 \text{ db fiber loss}$$
$$15 \text{ dB} - 3.68 \text{ dB} - 6 \text{ dB} = > 5 \text{ dB safety margin}$$

**Example 2 (higher loss fiber):**
Assume fiber with attenuation of 0.6 db/km; a target distance of 25,000 ft (7.7 km); and connector loss totaling 5 dB attenuation; calculate the safety margin:

$$7.7 \text{ km} \times (0.6 \text{ db/km}) = 4.62 \text{ db fiber loss}$$
$$15 \text{ dB} - 4.62 \text{ dB} - 5 \text{ dB} = > 5 \text{ dB safety margin}$$
Fiber Optic Communications

Modular Network Interface modules accept either a wired or fiber optic media module. When using Fiber Optic media module 4010-9819, 4100-6057, or 4190-6037 or fiber optic communications use two multi-mode fiber optic cables; one for transmit, and the other for receive. Distances can be determined using the information and examples shown below. (Refer to individual product data sheets for module size and location information.)

With a Bi-Directional Coupler (model 4190-9010) at each end, Network communications with the media modules will operate over a single fiber optic cable with some reduction in distance. Please refer to the coupler requirements and the specifications below for details.

4190-9010 Bi-Directional Coupler Requirements:
1. Use with Fiber Optic Media Board part number 746-109, 566-376, or 565-261, revision “C” or higher.
2. Two 4190-9010 Bi-Directional Couplers are required per connection, one at each node.
3. The 4190-9010 is equipped with type ST connectors. To make type ST to type ST connections, an ST to ST coupler, by others, is required.
4. ST to ST Couplers are available from:
   - Black Box, part # FO200
   - Fiber Instrument Sales, part # F1-8101
   - Newark Electronics, part # 95F2097 (or equivalent)
5. Refer to Installation Instructions 574-492 for additional information. (4190-9010 cross references to part number 271-012.)

Modular Network Interface Media Modules Distance Specifications

Wired Media Module Communications Distances
(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 Overvoltage 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 22 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

Dual Fiber Optic Cable Distance Reference
(Media Modules 4010-9819, 4100-6057, 4190-6037, or 4007-9814 see notes below)

<table>
<thead>
<tr>
<th>Fiber Type</th>
<th>MIFL</th>
<th>Power Margin</th>
<th>Maximum Distance</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/125 numerical aperture = 0.2</td>
<td>3 dB/km</td>
<td>3 dB</td>
<td>15,000 ft (4.57 km)</td>
<td>17 dB</td>
</tr>
<tr>
<td>62.5/125 numerical aperture = 0.275</td>
<td>3.75 dB/km</td>
<td>3 dB</td>
<td>15,000 ft (4.57 km)</td>
<td>20.4 dB</td>
</tr>
</tbody>
</table>

Single Fiber Optic Cable Distance Reference
(for Media Modules 4010-9819, 4100-6057, 4190-6037, or 4007-9814 with 4190-9010 Bi-Directional Couplers; see notes below)

<table>
<thead>
<tr>
<th>Fiber Type</th>
<th>MIFL</th>
<th>Power Margin</th>
<th>Maximum Distance</th>
<th>Budget</th>
<th>4190-9010 Coupler Loss</th>
<th>ST to ST Coupler Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/125 numerical aperture = 0.2</td>
<td>3 dB/km</td>
<td>2 dB</td>
<td>6560 ft (2.0 km)</td>
<td>20.4 dB</td>
<td>-9.4 dB</td>
<td>-3 dB</td>
</tr>
<tr>
<td>62.5/125 numerical aperture = 0.275</td>
<td>3.2 dB/km</td>
<td>2 dB</td>
<td>7215 ft (2.2 km)</td>
<td>-2 dB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Fiber Type: Cable specifications are for 50 or 62.5 micron core with 125 micron cladding, multi-mode graded index fiber. Wavelength = 850 nm.
2. MIFL: Maximum Individual Fiber Loss. Numbers shown are for reference only, refer to specific cable for exact specifications.
3. Distance: Maximum distance is determined by the distance listed or by reaching budget value, whichever is shorter. Budget using 4190-9010 Bi-Directional Coupler is the same with either size cable because the coupler input cables are 62.5/125 fiber allowing launch power to be the same.
4. Dual Fiber optic distances are using 4010-9819, 4100-6057, 4190-6037, or 4007-9814 media modules. Single fiber optic distances require using 4190-9010 Bi-Directional Couplers
5. Refer page 3 for Multiple signal fiber optic modem distance reference.