FOXBORO®

PSS 21H-7F6 B4

I/A Series® Hardware
Active Concentrator

The Active Concentrator is a fiber optic distribution unit used in IEEE 802.4 compatible networks, providing an active (powered) five megabit per second communication link among stations in an I/A Series fiber optic LAN. It allows for cabling distribution of up to 10 km (6.2 mi) for direct connections between the concentrator and stations (or other active devices) on the fiber optic LAN. It is a self-contained unit that mounts in a standard 19-inch EIA rack or in an optionally available enclosure.

The unit has nine transmitter/receiver ports, which accept industry standard ST fiber connections and have LED status indicators.

The unit has a single-pole, two-position relay that remains inactive until the concentrator fails to receive any transmissions from any of its ports. It does not, however, indicate which devices have caused the network problem, or if the network is only partially down. The relay can be monitored by a device such as an FBM via relay contact terminals located on the rear of the unit.

Active concentrators can connect with other devices in fiber optic networks by using Star, Tree, and Bus topologies. Each of these topologies have redundant configurations, to prevent network communications from being interrupted in case of equipment failure.

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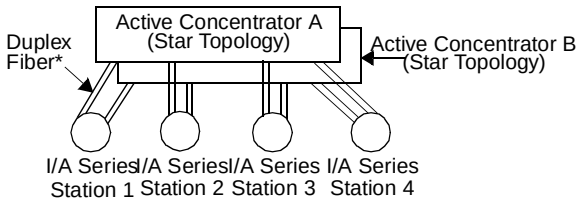
Product Specifications

Star Topology

Typical Star topologies are shown in Figure 1 and Figure 2. Figure 1 shows a basic Star topology. It provides up to 10 km (6.2 mi) of communication distance between the concentrators and each I/A Series station (node). An active concentrator (shown redundant in Figure 1) can directly interconnect I/A Series stations with up to four fault-tolerant, or nine non-fault-tolerant Fiber Optic Carrierband LAN Interfaces.

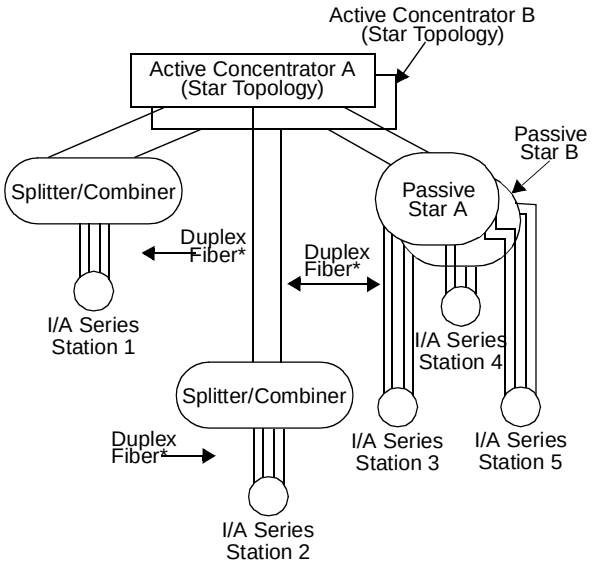


*NOTE: Each line represents two fiber optic cables (one duplex cable).

Figure 1. Typical Redundant Fiber Optic LAN using Star Topology with Fault-Tolerant Fiber Optic Carrierband LAN Interfaces

Figure 2 shows a topology using splitter/combiners and passive stars in conjunction with the active concentrators. These devices allow additional I/A Series stations to be connected to the concentrators. Variations of this topology are possible. Splitter/combiners enable up to nine stations with fault-tolerant Interfaces and up to 18 stations with non-fault-tolerant Interfaces to be interconnected to the concentrators. Splitter/combiners reduce the maximum communication distance between the concentrators and the stations from 10 km (6.2 mi) to 7 km (4.3 mi).

Passive stars can individually interconnect multiple I/A Series stations (and Fiber Optic LAN Converters) to one port on the concentrator. The exact number of connections and maximum distance between these connections varies, depending on the type of passive star used. At least two passive stars must be used: one for each redundant cable.



*NOTE: Each line represents two fiber optic cables (one duplex cable).

Figure 2. Typical Redundant Fiber Optic LAN using Star Topology with Splitter/Combiners, Passive Stars, and Fault-Tolerant Fiber Optic Carrierband LAN Interfaces

Tree Topology

A typical Tree topology is shown in Figure 3. The Tree topology links multiple active concentrators, each in the Star topology, through a redundant passive star or active concentrator, to provide an expanded communications network. The redundant passive star can be used if the active concentrators are located within 4 km (2.48 mi) or less(1) of each other. If longer distances are required, the redundant passive star must be replaced with a redundant active concentrator, which provides additional ports as well as supporting longer distances. While this topology increases the number of stations included in the network, the total communication distance between I/A Series stations must remain 20 km (12.4 mi) or less. Due to retiming delays, the maximum communication distance each signal can travel in the LAN is reduced by 1.25 km (0.78 mi) for every active concentrator or Fiber Optic LAN Converter the signal passes through. Each individual fiber optic cable run in the LAN may not exceed 10 km (6.2 mi) in length.

(1) This distance changes to 1 km (0.62 mi) if five or more connections to the required passive star are required.

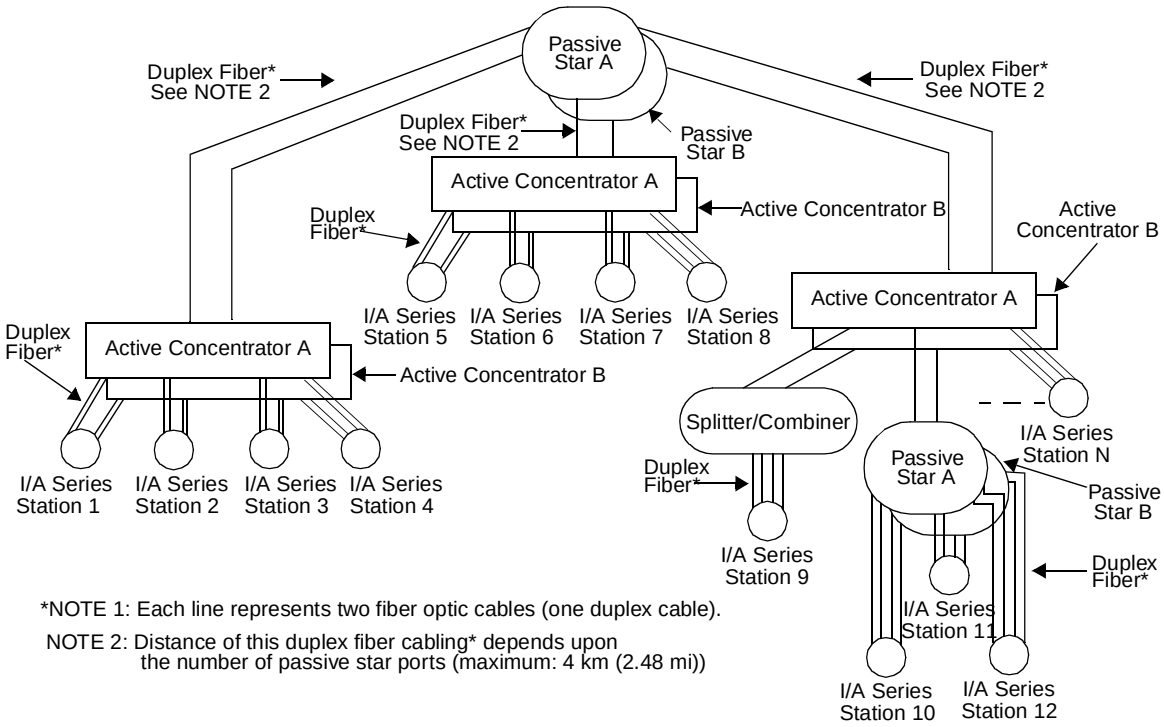


Figure 3. Typical Redundant Fiber Optic LAN using Tree Topology with Splitter/Combiners, Passive Stars, and Fault-Tolerant Fiber Optic Carrierband LAN Interfaces

Bus Topology

Figure 4 shows a fiber optic LAN in Bus topology. In this topology, multiple stations are interconnected via a series of daisy-chained active concentrators in a bus formation. This configuration saves on fiber optic cabling, as it does not require long runs of cable from each station to a central source, as in the other fiber optic topologies. More concentrator ports are available for direct connections(1) in the Bus topology than the other three topologies. Splitter/combiners and passive stars can be used in conjunction with the concentrators, as in Star topology, to increase the number of ports available, or to reduce cabling.

As in other fiber optic LAN topologies, the nodes farthest apart in the LAN are limited to a total communication distance of 20 km (12.4 mi) or less between them, and each individual fiber optic cable run may not exceed 10 km (6.2 mi) in length. Due to retiming delays, each active concentrator or Fiber Optic LAN Converter that a signal passes through reduces this distance by 1.25 km (0.78 mi). Since this topology uses more concentrators than any other, this signal reduction may impact the communication distance of the LAN more than in other topologies.

(1) Direct connections between Fiber Optic Carrierband LAN Interfaces and active concentrators are similar to those found in the basic Star topology, as shown in Figure 1.

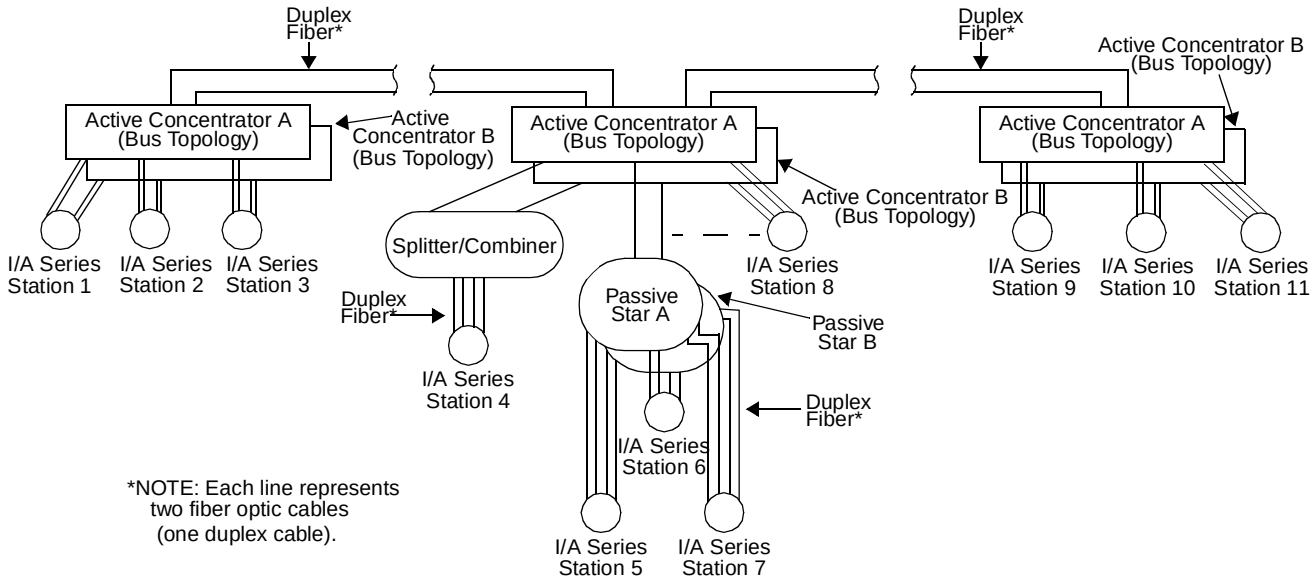


Figure 4. Typical Redundant Fiber Optic LAN using Bus Topology with Splitter/Combiners, Passive Stars, and Fault-Tolerant Fiber Optic Carrierband LAN Interfaces

I/A Series Basic Fiber Optic LAN Configurations

I/A Series uses two fiber optic LAN configurations, which can incorporate the active concentrator:

- Passive Tap/Converter fiber optic LAN – incorporates both coaxial (metallic) and fiber optic cabling(1)
- Direct fiber optic LAN – consists of solely fiber optic cabling

An active concentrator is an integral part of the Direct fiber optic LAN configuration. It can also be used in some Passive Tap/Converter fiber optic LAN configurations.

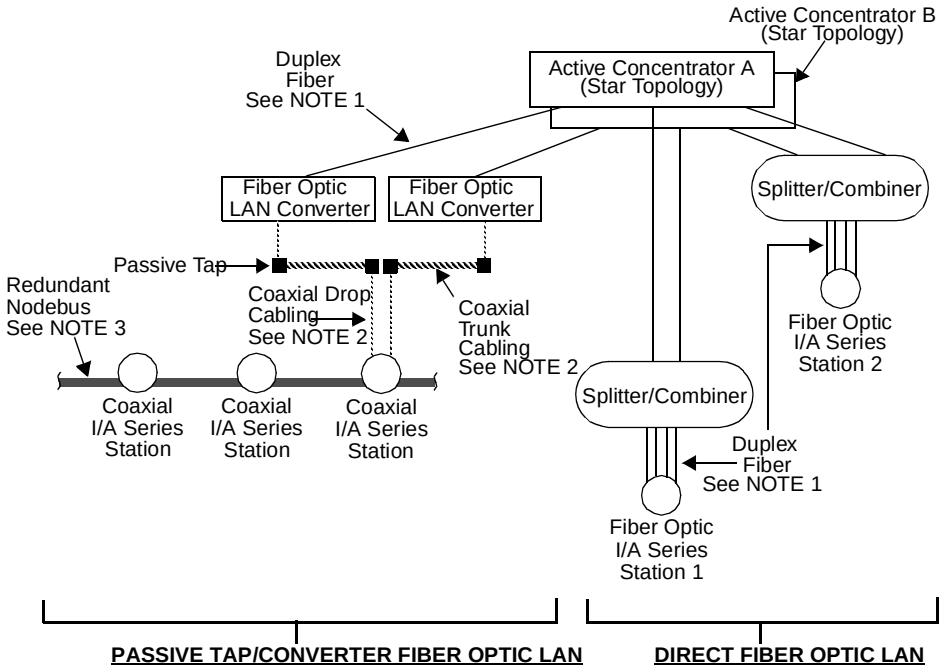
Figure 5 shows an active concentrator interconnecting the two basic I/A Series fiber optic LAN configurations: the Passive Tap/Converter fiber optic LAN and the Direct fiber optic LAN.

This configuration is used to interconnect the Coaxial Carrierband LAN with the fiber optic LANs. It can incorporate any of the topologies used by either of these basic I/A Series fiber optic LAN configurations.

The concentrator is necessary in this combined LAN if it contains more nodes and/or longer cabling distances than a passive star can handle. The fiber optic side of the combined LAN shown in this figure is configured for Star topology; however, any of the topologies discussed above may be used, provided the Fiber Optic LAN Converters always connect to the device at the top of the network.

A network, such as that shown in Figure 5 is functional provided that the distance between any two nodes does not exceed 20 km (12.4 mi), and the optical attenuation of any signal on the fiber optic side of the network does not exceed 17 dB. Each individual fiber optic cable run in the LAN may not exceed 10 km (6.2 mi) in length.

(1) A third basic LAN configuration exists, the Coaxial Carrierband LAN, which cannot directly incorporate an active concentrator.The Passive Tap/Converter fiber optic LAN configuration can be used to connect a Coaxial Carrierband LAN configuration with a Direct fiber optic LAN configuration. Refer to Local Area Network Product Specification Sheet (PSS 21H-7F1 B3) for details.



NOTE 1: Each unbroken line represents two fiber optic cables (one duplex cable).
NOTE 2: Each striped line represents a coaxial cable.
NOTE 3: The Nodebus can consist of either coaxial or fiber optic cable.

Figure 5. Combined Coaxial and Fiber Optic LAN using Active Concentrators with Star Topology

Fiber Optic LAN Enclosures

The optional Fiber Optic LAN Enclosures provide dedicated housing for the active concentrators and other fiber optic LAN equipment. The enclosures are made of steel, have front and rear doors with slotted locks (which are actuated by a supplied key or standard flat-blade screwdriver) and are provided with leveling feet on the bottom.

The interior is equipped with front-to-back adjustable 19-inch EIA rails for mounting the active concentrators. Two independently powered power strips, for the redundant configuration of the fiber optic LAN networks, accept the power cord plugs and a junction box connects customer ac power wiring. The enclosures are available in three sizes to accommodate 4, 6, or 8 active concentrators, or other fiber optic LAN devices.

Fiber Optic Cabling

Fiber optic cabling is purchased by the customer from a fiber optics vendor/installer. Four optical fibers are required for basic configurations, since a single node has two sets of transmit and receive connectors (to allow for redundancy). The cables must be terminated with ST type connectors (to match those on the active concentrator). Other cable requirements (flexibility, durability, etc.) depend on the particular application.

Check with a cable vendor/installer for a listing of application-specific cable characteristics.

The maximum length permitted for a single run of fiber optic cabling is 10 km (6.2 mi). The number of nodes allowed and the maximum allowable cabling distance for a particular installation depend on various hardware and software constraints. Consult your Foxboro representative for more information.

FUNCTIONAL SPECIFICATIONS

Fiber Optic LAN Cables (Customer Supplied)
MAXIMUM LENGTH
10 km (6.2 mi) between active devices
LOSS
1 dB/km at 1300 nm wavelength

Active Concentrator
INPUT POWER
Voltage
Typical
120 V ac to 240 V ac autoselection
Minimum
80 V ac
Maximum
264 V ac
Power Consumption
20 W, maximum when fully loaded
Frequency
47 to 63 Hz
Interruption Tolerance (Ridethrough Time)
100% depression for 33 ms
100% depression for 20 ms at 1 sec intervals
30% depression for 10 ms
60% depression for 100 ms
>95 depression for 5 seconds, auto recovery expected

FIBER OPTIC CABLE PORTS
Input
Power Range
–33 dBm to –9 dBm peak
Output
Transmit Level, HI
–13 dBm to –9 dBm peak
Transmit Level, LO
–22 dBm to –18 dBm peak
Center Wavelength
1250 nm to 1335 nm
Spectral Width
145 nm (maximum)
Rise/Fall Time
10 ns (maximum)
DATA TRANSFER RATE
5 megabits per second
DATA DELAY
4 Octets
CONTROLS
Fiber Optic Mode Selection Switch (For Ports 1-8)[1]
Echo/Non-Echo
Transmit Power Level Switch (For All Ports)
OFF/HI/LOW (OFF disables TX and RX; LOW for Point to Point < 3 km (1.9 mi); HI for all other Configurations.)
INDICATORS
*Power ON (*continuous)
On (Green)
Fiber Optic Port Indicator (One per port)
Receive (Green)
Fiber Optic Error (Yellow)[2]
Fiber Optic Disable (Off)

1. Port 9 always echoes and does not have a Fiber Optic Mode Selection Switch.
2. The yellow error indication check LEDs will remain lit for 100 ms in the event of decoding a bad signal (RX or TX) to insure visibility.

ENVIRONMENTAL SPECIFICATIONS

Active Concentrator

TEMPERATURE

Operating

0 to 60°C (32 to 140°F)

Storage

-40 to 70°C (-40 to 158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing) at 30°C (86°F)

POWER DISSIPATION

20 W (maximum)

RADIATED RFI SUSCEPTIBILITY

80 to 1000 MHz:10 V/m 80% AM @ 1 KHz

CONDUCTED RF SUSCEPTIBILITY

0.15 to 80 MHz: 10 V 80% AM @ 1 KHz

ELECTROSTATIC DISCHARGE (ANY SURFACE)

Direct

4 kV current discharge

Indirect

4 kV current discharge

HIGH FREQUENCY TRANSIENTS (REF. IEC 801-4)

Main Power Lines

2 kV common mode

Signal Lines

1 kV common mode

SWITCHING/INDIRECT LIGHTNING TRANSIENTS (REF. IEC 801-5)

Impulse [1.2 x 50, 8 x 20]

ac Connected Lines (direct coupling)

4 kV common mode

4 kV normal mode

MECHANICAL VIBRATION

0.5 g at 5 to 200 Hz

CONTAMINATION

Class G1 (Mild) as defined in ISA Standard S71.04

PHYSICAL SPECIFICATIONS

Fiber Optic LAN Cables (Customer Supplied)

Multimode graded-index glass fiber; 62.5 micron core, 125 micron cladding

Active Concentrator

CONNECTORS

ST type (18)

INPUT POWER CABLE

Length

1 meter (3.3 feet)

Connector

IEC 320 type

MOUNTING

Standard 483 mm (19 inch) wide rack

Standard EIA rack, configuration 1U

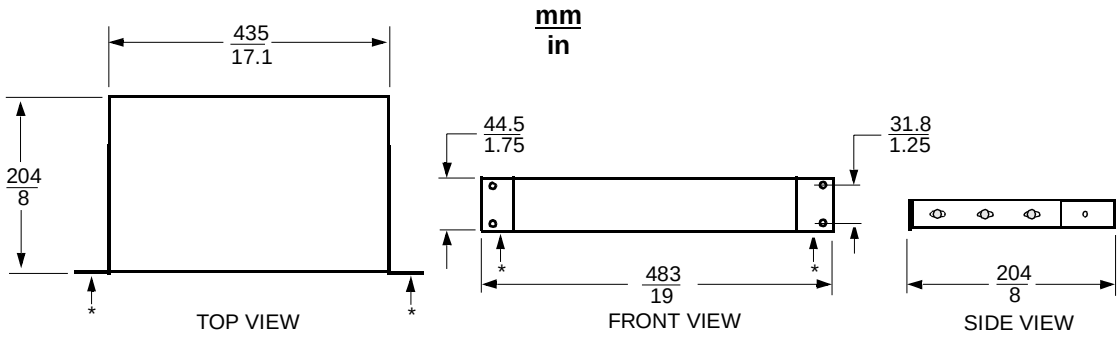
SIZE

See Figure 6

MASS

2.07 kg (4.6 lbs)

DIMENSIONS—NOMINAL



* The mounting brackets are detachable, so the active concentrator may be mounted with either its front or back plate facing the user.

Figure 6. Active Concentrator Dimensions

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