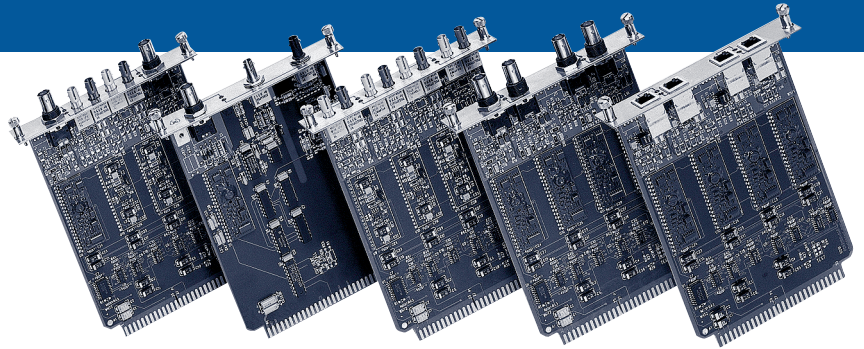


# EXP Series

## Cabling Support for MOD HUB Series of Modular Active Hubs

### Description

The EXP series of expansion modules provide multi-media cabling support for the MOD HUB series of active hubs. Coaxial cable, twisted-pair wire, and glass fiber optic cable can all operate on the same network by selecting the appropriate expansion modules.



Expansion modules utilize a family of transceivers each designed to support a particular cable technology. Transceivers are identified by a suffix designation (e.g., -FOG) which follows the EXP model number. Each expansion module usually supports from two to four ports of the identified transceiver. Some expansion modules mix two cable technologies within one module minimizing the cost in some applications.

### Benefits

- Compatible with baseband ARCNET® networks
- Compatible with MOD HUB series active hubs
- Three different types of cabling supported: coaxial, fiber optic and twisted-pair.
- Supports star or distributed star topologies
- Internal BALUNs support twisted-pair cabling
- Interfaces to either single mode or multi-mode fiber optics
- Support of either SMA or ST™ fiber connectors
- Activity LEDs on each port isolate network faults
- Extends AC or DC coupled EIA-485 segments

Expansion modules can be inserted into an empty slot in any of the MOD HUB series of modular active hubs without regard for power consumption. Cabling technologies can be freely mixed offering extreme flexibility in configuring hub, link and repeater applications. Expansion modules are fastened using thumb screws and can be installed in the field. Each port has an LED indicator to identify network activity.

Expansion modules support star and distributed star topologies (node to hub and hub to hub connections); however, bus segments, including popular AC or DC coupled EIA-485 segments, can also be extended using expansion modules.



**Transceivers Match the Cable and Topology*****-CXS Coaxial Star***

Typically, ARCNET is cabled with RG-62/u coaxial cable (with BNC connectors) in a star topology, each network interface module (NIM) connects directly to a port on an active or passive hub. Alternatively, RG-59/u coaxial cable can be used, but at a cost of reduced distances between a node and a hub. Overall, coaxial cable offers good performance, good noise immunity, low propagation delays, low signal attenuation, sufficient ruggedness and low cost. The coaxial star configuration also provides the longest coaxial distance and simplified troubleshooting.

***-TPS Twisted-Pair Star***

Unshielded twisted-pair wiring such as IBM Type 3 (#24 or #22 AWG solid copper twisted-pair cable or telephone wiring) can be used. BALUNs are required at both the hub and NIM to use this cable. Contemporary Controls' twisted-pair NIMs and hubs have internal BALUNs, so external BALUNs are not needed. Twisted-pair is convenient to install; however, its attenuation exceeds coaxial, its noise immunity is less, and its maximum length between a node and a hub is lower. RJ-11 connectors are used with this cable.

***-FOG Glass Fiber Optics***

Duplex glass, multimode fiber optic cable uses either SMA or ST™ connectors and is available in three sizes: 50/125, 62.5/125 and 100/140. Larger core sizes launch more energy allowing longer distances. The industry appears to have selected 62.5/125 as the preferred size. This core size provides long distances, immunity to electrical noise, lightning protection and

data security. Glass fiber optic cable is used in hazardous areas and interbuilding cabling on campus installations or whenever metallic connections are undesirable. Connectors can be either SMAs or STs. The STs look like a small BNC and are more tolerant to abuse than SMAs. ST connectors have become more popular than the traditional SMA connector. The -FOG transceiver utilizes 850 nm technology.

***-FG3 1300 nm Fiber Optics***

For long distances of either single mode or multimode fiber optics, the -FG3 transceiver is used. The 1300 nm technology offers much longer distances but at a higher cost. Only -ST connectors are available with this technology.

***-485 DC Coupled EIA-485***

One popular cabling standard in industrial installations is EIA-485. A single twisted-pair supports several nodes over a limited distance. Screw terminal connections or twin RJ-11 jacks are provided with each NIM so that the modules can be wired in a "daisy-chain" fashion. EIA-485 offers a hubless solution, but with limited distance and low common mode breakdown voltage. These segments can be extended using expansion modules.

***-485X AC Coupled EIA-485***

The EIA-485 transformer coupled option provides the convenience of EIA-485 connectivity, but with a much higher common mode breakdown voltage. Distances and node count are reduced from the DC coupled EIA-485 (-485) option. The AC coupled option is insensitive to phase reversal of the single twisted-pair which connects the various nodes.

**Extending Bus Segments**

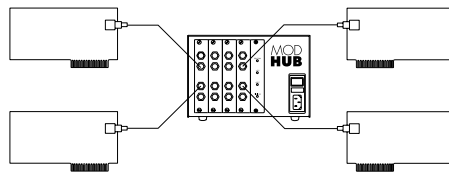
Some NIMs incorporate -CXB (coaxial bus) and -TPB (twisted-pair bus) transceivers in a bus topology. Active hubs can be used to extend these bus segments. For -CXB NIMs, simply connect one end of the bus segment to a -CXS port on an expansion module without an external terminator. Do the same for -TPB NIMs except use a -TPS port on an expansion module instead.

**Specifications**

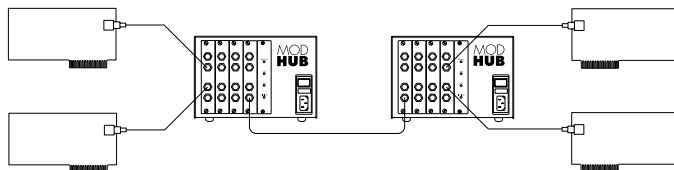
Optical Power Budget (25°C)		
	-FOG	-FG3
<b>Fiber Size (Microns)</b>	<b>850 nm (dB)</b>	<b>1300 nm (dB)</b>
Single mode	N/A	13
50/125	6.6	21
62.5/125	10.4	22
100/140	15.9	N/A
<b>Mechanical</b>		
Each module occupies one slot in either the MODHUB-16, MODHUB-16F, MODHUB-16F-N or MODHUB-48 powered enclosures		
<b>Environmental</b>		
Operating temperature:	0°C to 60°C	
Storage temperature:	-40°C to +85°C	
<b>Functional</b>		
Data rate:	2.5 Mbps nominal	
Compliance:	ANSI/ATA 878.1	
<b>Regulatory Compliance</b>		
Refer to MOD HUB series data sheet		

**Topologies**

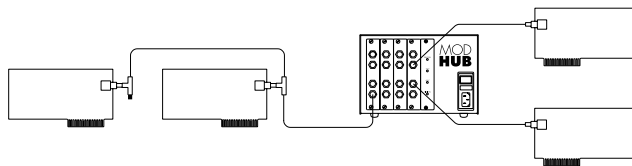
**Star**



**Distributed Star**



**Star/Bus**



## Permissible Cable Lengths and Nodes Per Segment

Transceiver	Description	Cable	Connectors	Cable Length		Max Nodes/ Bus Segment	Notes
				Min	Max		
-CXS	coaxial star	RG-62/u	BNC	0	2000ft/610m	N/A	5.5 dB/1000ft max
-CXS	coaxial star	RG-59/u	BNC	0	1500ft/457m	N/A	7.0 dB/1000ft max
-CXB	coaxial bus	RG-62/u	BNC	6ft/2m <sup>1</sup>	1000ft/305m	8	5.5 dB/1000ft max
-FOG	duplex fiber optic	50/125	SMA or ST	0	3000ft/915m	N/A	4.3 dB/km max
-FOG	duplex fiber optic	62.5/125	SMA or ST	0	6000ft/1825m	N/A	4.3 dB/km max
-FOG	duplex fiber optic	100/140	SMA or ST	0 <sup>2</sup>	9000ft/2740m	N/A	4.0 dB/km max
-FG3	duplex fiber optic	single mode	ST	0	46000ft/14000m	N/A	0.5 dB/km max
-FG3	duplex fiber optic	50/125	ST	0 <sup>2</sup>	32800ft/10000m	N/A	1.5 dB/km max
-FG3	duplex fiber optic	62.5/125	ST	0 <sup>2</sup>	35000ft/10670m	N/A	1.5 dB/km max
-TPS	twisted-pair star	IBM type 3	RJ-11	0	330ft/100m	N/A	uses internal BALUNs
-TPB	twisted-pair bus	IBM type 3	RJ-11	6ft/2m <sup>1</sup>	400ft/122m	8	
-485	DC coupled EIA-485	IBM type 3	RJ-11	0	900ft/274m	17	DC coupled
-485X	AC coupled EIA-485	IBM type 3	RJ-11	0	700ft/213m	13	transformer isolated

<sup>1</sup> This represents the minimum distance between any two nodes or between a node and a hub.

<sup>2</sup> May require a jumper change on the EXP module to achieve this distance.

## Ordering Information

Model	Description	Number of Ports
EXP-CXS	4-port coaxial star expansion module	4
EXP-CXS/FG3-ST	Coax/1300 nm fiber expansion module	1/1
EXP-CXS/FOG <sup>3</sup>	2-port coax/fiber expansion module	2/2
EXP-CXS/485	2-port coax/485 expansion module	2/2
EXP-CXS/485X	2-port coax/485X expansion module	2/2
EXP-FOG <sup>3</sup>	4-port fiber expansion module	4
EXP-TPS	4-port twisted-pair expansion module	4
EXP-TPS/CXS	2-port twisted-pair/coax expansion module	2/2
EXP-TPS/FOG <sup>3</sup>	2-port twisted-pair/fiber expansion module	2/2
EXP-485	4-port DC EIA-485 expansion module	4
EXP-485/FOG <sup>3</sup>	2-port 485/fiber expansion module	2/2
EXP-485X	4-port AC EIA-485 expansion module	4
EXP-485X/FOG <sup>4</sup>	2-port 485X/fiber expansion module	2/2

<sup>3</sup> Specify the type of fiber optic connector by adding the appropriate suffix (-ST for ST or -SMA for SMA).

<sup>4</sup> Specify the type of fiber optic connector by adding the appropriate suffix (-ST for ST or -SM for SMA).

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