

FTT-10 MULTI-SEGMENT PHYSICAL LAYER REPEATER

- Extends wiring distance of FTT-10 LonWorks® Networks.
- Up to 5 repeaters can be daisy chained together to create a multi-segment repeater of up to 10 channels. *(New Feature)*
- Low cost alternative to routers configured as repeaters.
- All wiring is to removable terminal blocks for ease of service.
- Polarity insensitive AC/DC wide input voltage range.
- Input power has over current and transient voltage suppression.
- Termination for bus and free topology.
- 3.5 mm network jack for local installation tool connection.
- Communication and power indicators to assist in field diagnostics.
- DIN Rail mount enclosure is only 36 mm (1.42") W x 90 mm (3.54") L x 58 mm (2.28") H



DESCRIPTION

Each Model 110A is a two-channel physical layer repeater for FTT-10 LonWorks networks. Data received on one channel is reconditioned and re-transmitted on the other channel. Each Model 110A effectively doubles the wiring distance and the number of nodes that can be placed on the network. On-board jumpers allow each channel to be terminated independently for bus or free topology.

A local 3.5 mm network jack allows a convenient way to connect an installation or diagnostic tool to the network without disconnecting any wires.

Three LED's provide diagnostic information for troubleshooting. A green LED indicates when power is applied. Two red LED's indicate when data is being received on each of the two local channels.

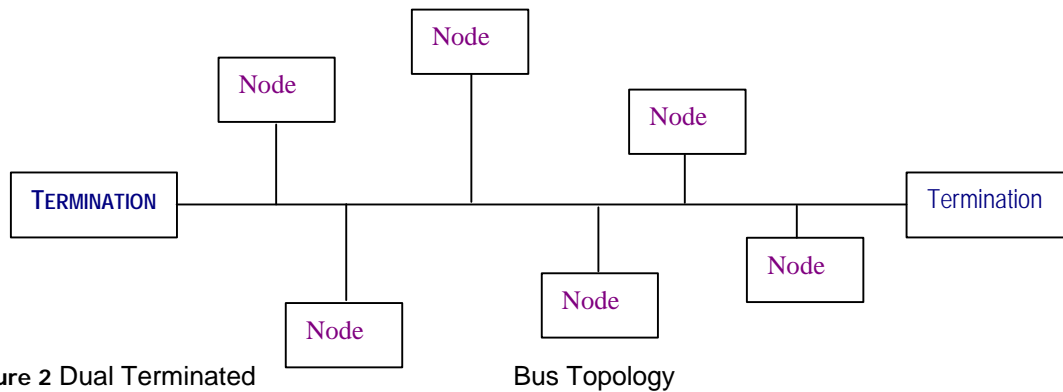
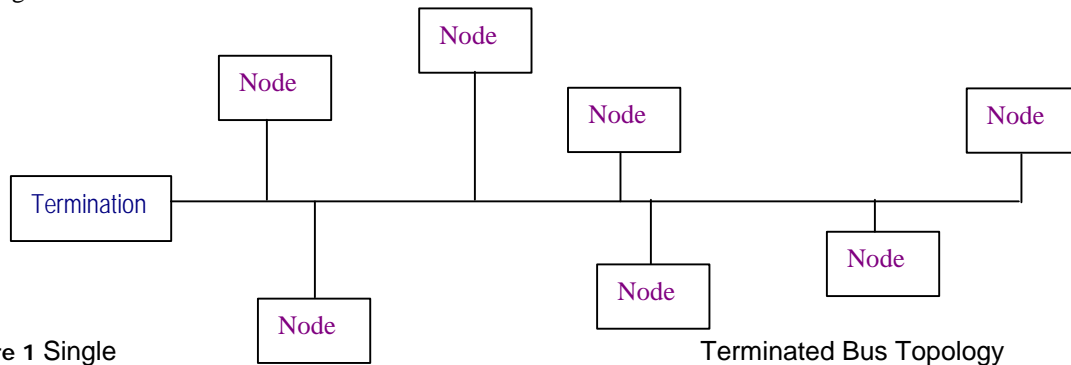
The Model 110A operates from a wide range of low voltage AC or DC power sources allowing it to be easily added to existing systems. The power input has transient voltage suppression as well as over current protection using a self-resetting fuse. This provides protection to the unit under most fault conditions.

The Model 110A is a drop in replacement to our Model 110 product. A new feature in the Model 110A allows multiple repeaters to be daisy chained together to create multi-segment repeaters. This is accomplished via a short jumper cable between units. Data received on one network segment is transmitted on all other network segments. For example, assume three Model 110As are daisy chained together. This equates to six total network segments since each repeater has two. Data received on any one network segment is reconditioned and sent on the other five network segments. This ability allows the user to create a field expandable multi-segment repeater from two to ten channels using a single product.

Note, the daisy chain feature of the Model 110A is not on the network side but actually takes place on a separate daisy chain bus between repeaters. This has several advantages. One, there is minimal delay between the received signal and the repeated signal. Even with a ten-segment repeater (5 Model 110As), the delay is equivalent to a single repeater. Two, each network segment is completely isolated from all other network segments. A short on one segment will only affect that segment and not the others.

NETWORK OVERVIEW

The TP/FT-10 network is designed to support free topology wiring, and will accommodate bus, star, loop, or any combination of these topologies. Network devices using FTT-10A transceivers can be located at any point along the network wiring. This capability simplifies system installation and makes it easy to add nodes should the network need to be expanded. Figures 1 through 5 present five different network topologies.



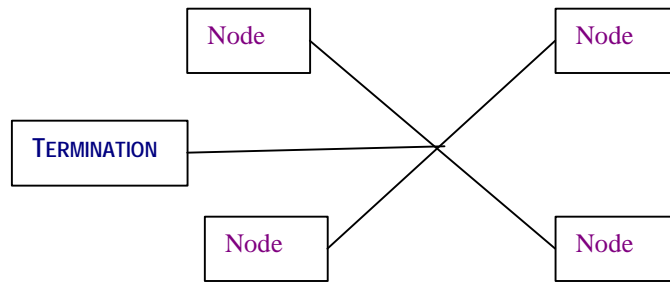


Figure 3 Star Topology

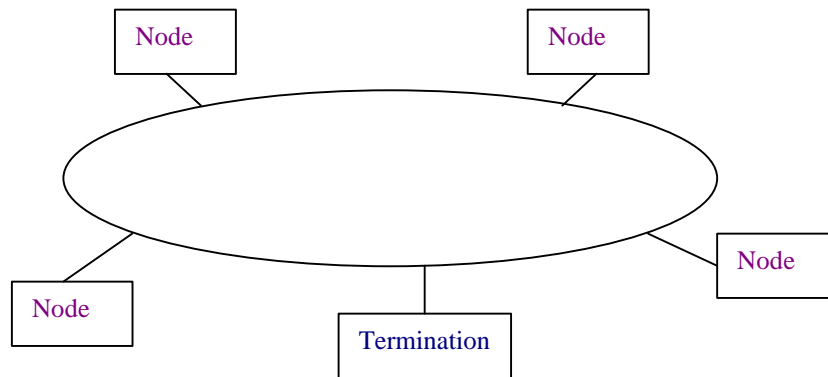


Figure 4 Loop Topology

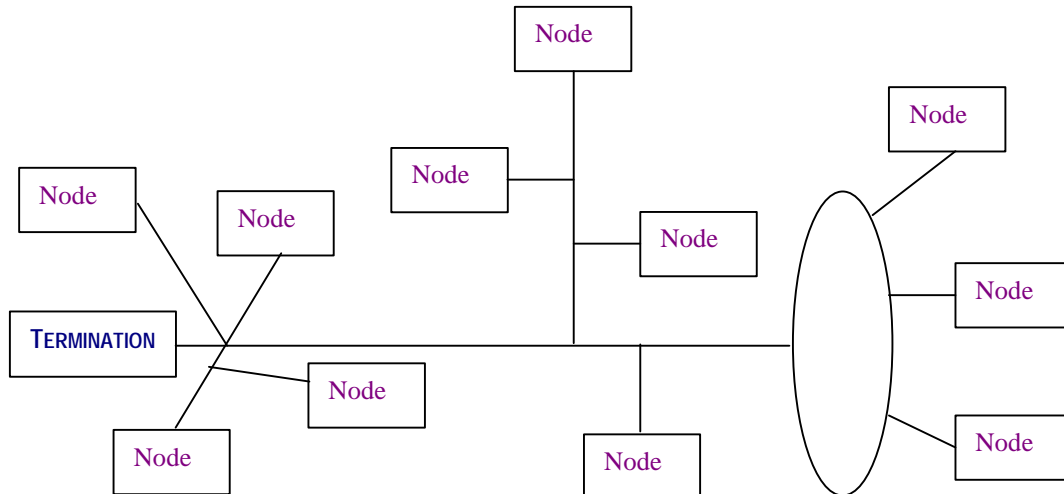


Figure 5 Mixed Topology

In the event that the limits on the number of transceivers or total wire distance are exceeded, then the Model FTT-10 Physical Layer Repeater can be added to interconnect two segments and double the overall system capability.

SYSTEM PERFORMANCE AND CABLE SELECTION

TP/FT-10 network system and transmission specifications are outlined on the following pages. Both of these specifications must be met to ensure proper operation. The system designer may choose a variety of cables, depending on cost, availability, and performance. Performance may vary with cable type. The transmission specification depends on such factors as resistance, mutual capacitance, and the velocity of propagation. Currently, Echelon has documented system performance on the cable types shown in table 1.

Table 1 Cable Types and Typical Parameters

Cable Type	Wire dia. / AWG	R_{loop} Ω/km	CnF/km	Vprop % of c
Belden 85102 single twisted pair stranded 19/29 unshielded 150°C	1.2mm/16	28	56	62
Belden 8471 single twisted pair stranded 19/29 unshielded 150°C	1.3mm/a6	28	72	55
Level IV 22 awg twisted pair typically solid and unshielded	0.65 mm/22	106	49	67
JY (ST) Y 2x2x0.8 4 wire helical twist solid shielded	0.8 mm/20.4	73	98	41
Tia568 Category 5 24 awg twisted pair	0.51 mm/24	168	46	58

If a shielded cable is used, the shield should be connected to earth ground via a single 470K Ω , 1/4 Watt, 10%, metal film resistor to prevent static charge build-up. Note that the following specifications are for one network segment. Multiple segments may be combined using repeaters as described in the network overview section to increase the number of nodes and distance.

SYSTEM SPECIFICATIONS

- Up to 64 FTT-10/FTT-10A transceivers are allowed per network segment.
- LPT-10 transceivers may be used on network segments with FTT-10/FTT-10A transceivers, but are subject to additional constraints, particularly on distance. See the LPT-10 User's Guide for more information.
- The average temperature of the wire must not exceed +55°C, although individual segments of wire may be as hot as +85°C.

TRANSMISSION SPECIFICATIONS

Table 2 Dual Terminated Bus Topology Specifications

Cable Type	Maximum bus length	Units
Belden 85102	2700	meters
Belden 8471	2700	meters
Level IV 22 awg	1400	meters
JY (St) Y 2x2x0.8	900	meters
TIA Category 5	900	meters

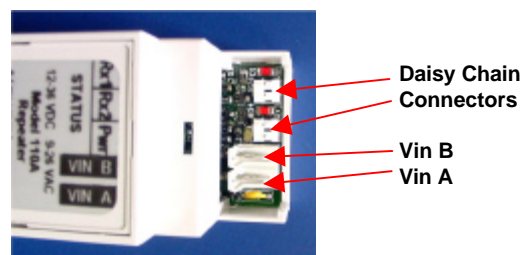
Table 3 Free Topology Specifications

Cable Type	Maximum node-to-node distance	Maximum total wire length	Units
Belden 85102	500	500	meters
Belden 8471	400	500	meters
Level IV 22 awg	400	500	meters
JY (St) Y 2x2x0.8	320	500	meters
TIA Category 5	250	450	meters

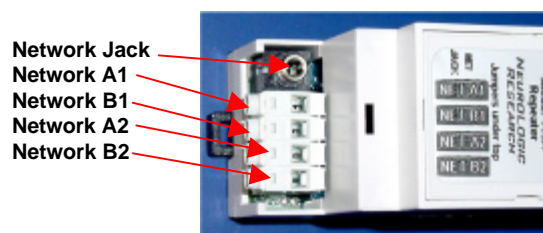
The free topology transmission specification includes two components, which must both be met for proper system operation. The distance from each transceiver to all other transceivers and to the termination (including the LPI-10 termination, if used) must not exceed the maximum node-to-node distance. If multiple paths exist, e.g., a loop topology, then the longest path should be used for the calculations. The maximum total wire length is the total amount of wire connected per segment.

WIRING AND INSTALLATION

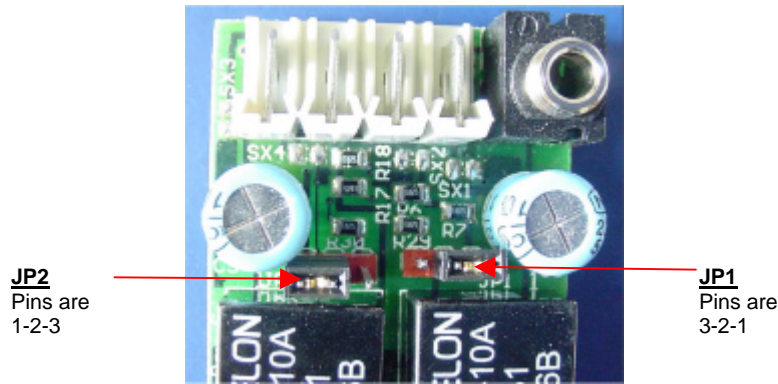
All wiring is done via two sets of removable terminal blocks. The top terminal block has two positions and supplies power to the unit. 12-36 VDC or 9-26 VAC can be used. The terminals are polarity insensitive.



The bottom terminal block has four positions. Two terminals for each network. The terminals for the first network are labeled Network A1 and Network B1. The second network channel is labeled Network A2 and Network B2. The network wiring is polarity insensitive. The network jack provides an access point for a network management tool. It can be used for monitoring or configuration without the disturbing the network wiring.



MODEL 110A



TERMINATION JUMPERS FOR MODEL 110A FTT-10 REPEATER

JUMPER	FUNCTION	FREE TOPOLOGY (DEFAULT SHOWN)	BUS TOPOLOGY	NO TERMINATION
JP1	Side 1 Termination	1-2	2-3	Off
JP2	Side 2 Termination	1-2	2-3	Off

MULTI-SEGMENT DAISY CHAINING

Up to 5 Model 110A Repeaters can be daisy chained to form a ten-channel repeater. To operate properly in multi-segment mode the user must observe the following installation requirements:

- All repeaters must be placed next to each other and powered from the same power source.
- All units that are daisy chained together must be powered. A unit that is connected on the daisy chain bus but not powered will cause other units to fail. There is no physical damage but the units will not operate properly.
- The jumper cable is polarity sensitive and the jumper cable is keyed and should only plug onto the header in the proper orientation. If it feels that it is not going on correctly, chances are it is reversed.
- Each segment should be properly terminated.

Each Model 110A is delivered with a short jumper cable attached to the two daisy chain jumper headers. This is simply a convenient place to store it. It is not needed for proper operation if used as a standalone two-channel repeater. The two daisy chain headers provide identical connections. Two headers are needed to daisy chain between more than two units.



MODEL 110A

MOUNTING OPTIONS

The Model 110A is housed in a very compact DIN rail mount enclosure that is only 36 mm (1.42") W x 90 mm (3.54") L x 58 mm (2.28") H. The enclosure snaps onto an industry standard 35 mm DIN rail. The DIN rail and Model 110A can be inside a weatherproof box for best protection. Alternatively, the DIN rail and Model 110A can be wall mounted if it is in a clean indoor environment.

SPECIFICATION

Operating Environment	0 to 80C, 0-90% RH non-condensing
Input Power	12-36 VDC or 9 to 26 VAC @ 30 mA typical. Polarity insensitive wiring.
Network Transceiver Type	Two Echelon FTT-10A transceivers at 78 kbps. DC blocking capacitors for Link Power network are installed.
Network Termination	Separate jumpers for each channel support free and bus topology termination.
Multi-Segment Operation	Max of 5 repeaters can be daisy chained to construct a 10-channel repeater hub.
External Dimension	36 mm (1.42") W x 90 mm (3.54") L x 58 mm (2.28") H
Enclosure Type	DIN rail mount to 35 mm rail
Enclosure Material	Grey frame retardant Noryl UL94_V0
Protection	Input power is fused and transient voltage protected. Fuse automatically resets when fault is removed.

ORDERING INFORMATION

0110A-00	Model 110A FTT-10 Physical Layer Repeater
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