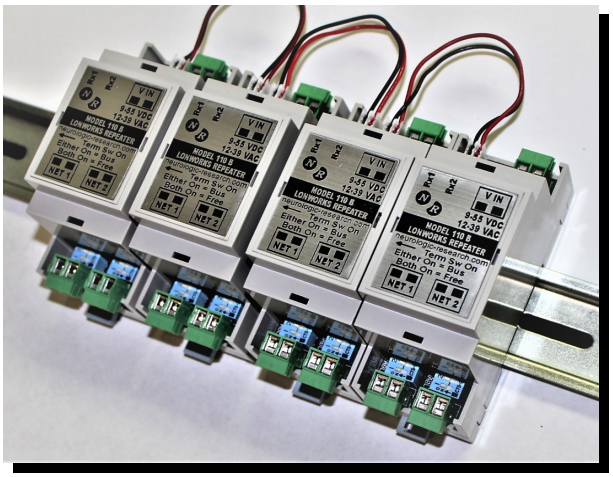
## FEATURES

- Extends wiring distance of FT-10 LonWorks® Networks.
- (2) channels using a single Model 110B. Up to 10 channels using (5) Model 110B.
- Low cost alternative to routers configured as repeaters.
- Wring via removable terminal blocks.
- **Operates from 12 VDC, 24VDC, 48VDC and 24VAC power supply rails. Power input is not polarity sensitive**
- Termination for bus and free topology.
- 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 110B is a two-channel physical layer repeater for TP/FT-10 LonWorks networks. Data received on one channel is reconditioned and re-transmitted on the other channel. Each Model 110B 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.

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.

Up to (5) Model 110B units can be daisy chained together to create up to a (10) channel repeater. This is accomplished via a short jumper cable between units. Data received on one network segment is transmitted on all other network segments. This allows the user to create a field expandable repeater from two to ten channels using a single product.

Note, the daisy chain feature of the Model 110B 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 110Bs), 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.

### *Power Supply*

The Model 110B features an exceptionally flexible switching power supply. It allows the Model 110B to be easily integrated into building automation, industrial automation, telecommunication and remote telemetry type systems. It operates from 12 VDC, 24 VDC, 48 VDC and 24 VAC power supply rails with a design margin better than +/-25% to allow for installation variations. A main advantage of the on board power supply is low power consumption. The unit draws less than 10 mA at 24 VDC. This makes it ideal for low cost battery backup systems if one is desired.

The power supply is well protected against overvoltage spikes via solid state transient voltage suppressors. It is additionally protected against over current conditions via fuses on both voltage input lines. On board thermal fuses do not have to be replaced. They will simply recover when the fault condition is corrected. Input voltage is polarity insensitive.

## TP/FT-10 NETWORK TOPOLOGIES

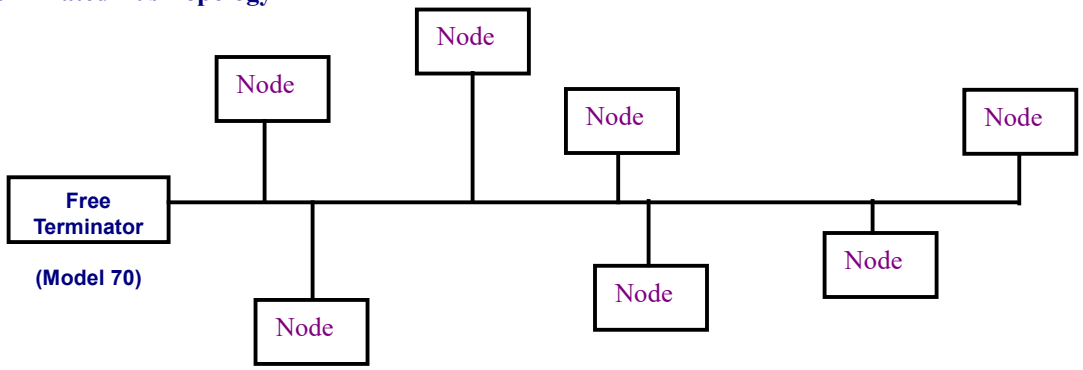
The LonWorks TP/FT-10 network is designed to support free topology wiring, and will accommodate bus, star, loop, or any combination of these topologies.

Network devices using FT-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. The following sections present five different network topologies.and how they should be terminated using a single Free Topology terminator or two Bus Topology terminators. Please see our Model 70 Universal FT-10 Network Terminator which can be used for either type.

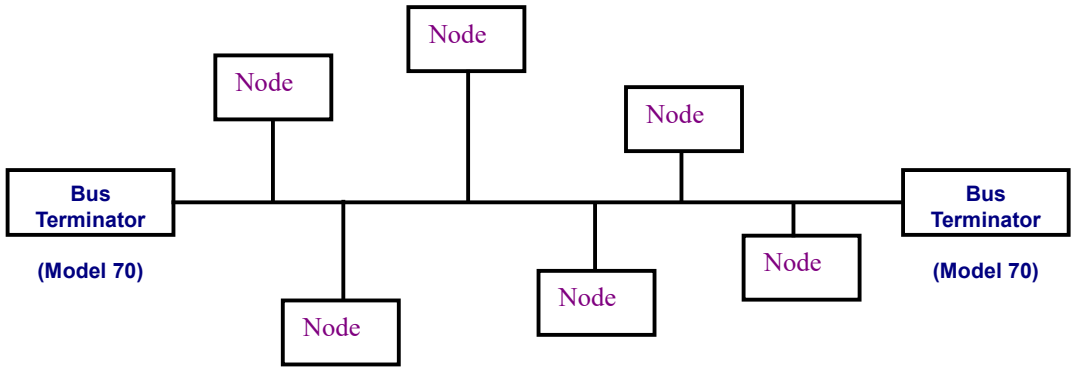
In the event that the limits on the number of transceivers or total wire distance is exceeded, then the Model 110B Repeater can be added to interconnect two network segments doubling the overall system capability.

| NOTE | **Each network segment connected to the Model 110B must be properly terminated as a separate network.** |
|---|---|

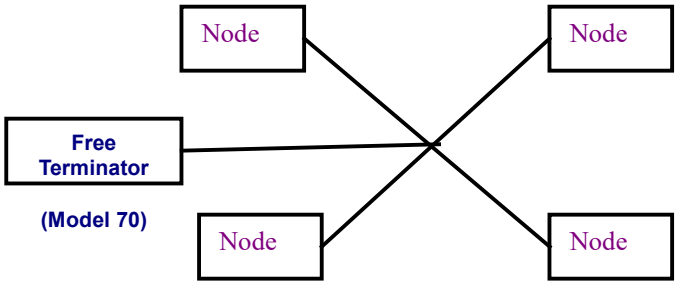
### Single Terminated Bus Topology

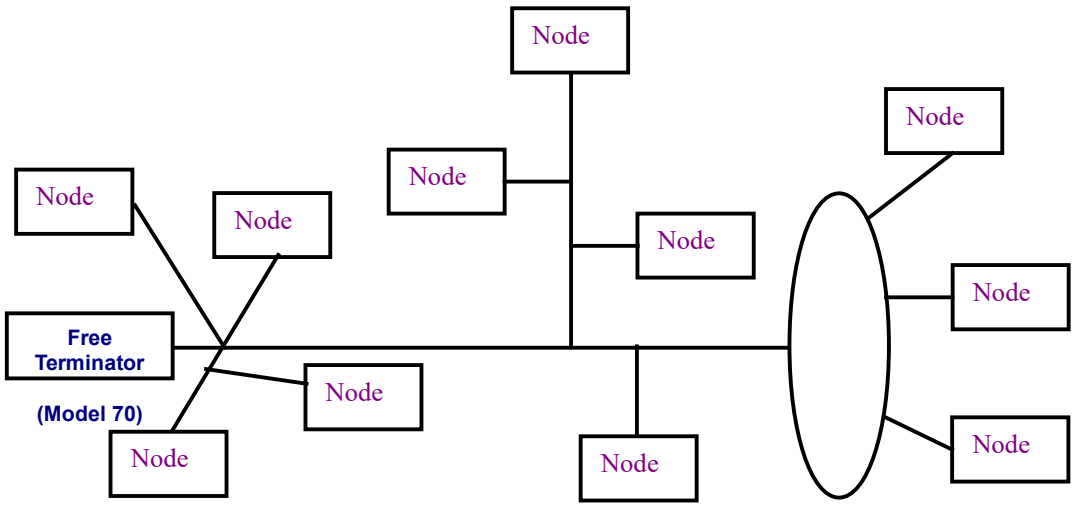



### Dual Terminated Bus Topology



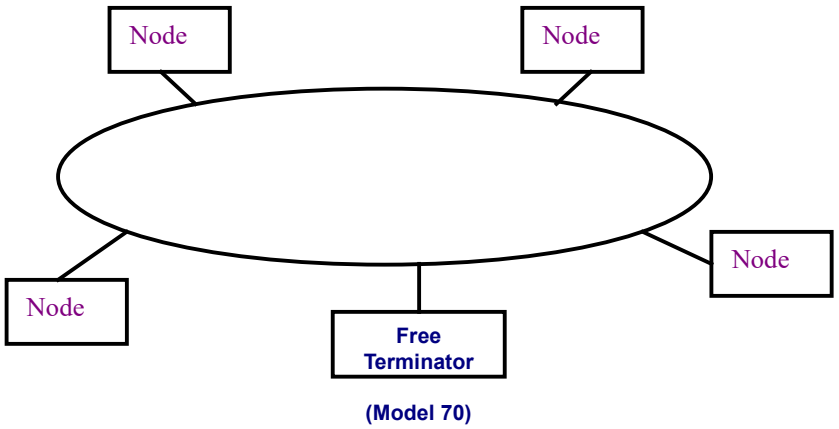

### Star Topology






**Mixed Topology**

**Loop Topology**



## WIRING AND INSTALLATION

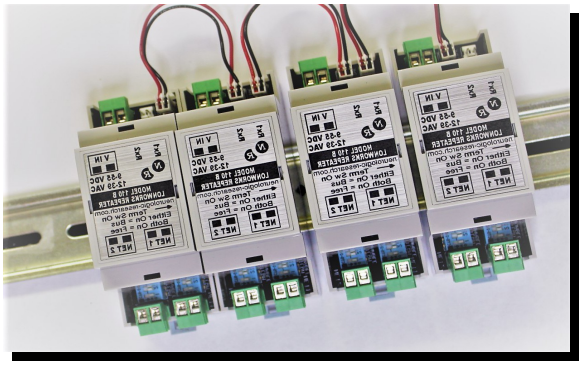
All wiring is done via two sets of removable terminal blocks. The top terminal block has two positions and supplies power to the unit. 12-36 VDC or 9-26 VAC can be used. The terminals are polarity insensitive. Optionally, the Model 110 is also available with a much wider input voltage range of 12-72 VDC or 12-50 VAC.

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 3.5 mm 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.

### *Mounting Options*

The Model 110B 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 110B can be inside a weatherproof box for best protection. Alternatively, the DIN rail and Model 110B can be wall mounted if it is in a clean indoor environment.

### *Expansion via Daisy Chaining*



Up to 5 Model 110B units can be daisy chained to form up to a ten-channel repeater. Please note, the Model 110B can be daisy chained with the Model 110A and is fully compatible. To operate properly in daisy chain mode the user must observe the following installation requirements:

- All Model 110A/110B repeaters must be placed next to each other and powered from the same power supply.

- All previous Model 110A units that are daisy chained must be powered. A Model 110A 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 Model 110B can lose power and will not affect the other units in the daisy chain.
- 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 110B 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.

## Termination Switches

The Model 110B has (2) groups of 2 switches that control termination of the two wiring segments independently. The switches are located behind the terminal blocks used to connect each of the segments. Please see picture on the previous page.

If both switches are off, no termination is enabled. If either switch is on, the Bus terminator is enabled. If both switches are on, the Free Toplogy terminator is enabled. Both switches are on by default.

Each of the network segments must be properly terminated depending on how they are wired. Please see the TP/FT-10 Network Typologies Section.

If a particular network segment has terminators, both termination swithes for that segment must be turned off.. If not adding the Model 110B to your network nay actually degrade your signal until the terminators are disabeled on the Model 110B.

If the particular network segment is to be terminated as a bus, the repeater must be placed at one of the ends. Set the termination jumper for that network to bus topology and there must be an additional terminator at the other end of the bus segment. Please see our Model 70 FT10 Universal Terminator if you require additional terminators.

| NOTE | **The Model 110B is shipped with each network segment being terminated as a Free Topology network. This must be the only terminator on the network** |
|---|---|

# SPECIFICATION

## 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.

### 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 150ºC | 1.2mm/16 | 28 | 56 | 62 |
| Belden 8471 single twisted pair stranded 19/29 unshielded 150ºC | 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. Please see our Model 70 Universal TP/FT10 Terminator which supports this function. 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.

## Dual Terminated Bus Topology Specifications

| Cable Type | Max bus length (Meters) |
|---|---|
| Belden 85102 | 2700 |
| Belden 8471 | 2700 |
| Level IV 22 awg | 1400 |
| JY (St) Y 2x2x0.8 | 900 |
| TIA Category 5 | 900 |

## Free Topology Specifications

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

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.

## Electronics

| | |
|---|---|
| Operating Environment | 0 to 80 C or 32 to 176F |
| Input Voltage Operating | 9 to 55 VDC or 18 to 39 VAC at 0.25W maximum. |
| Input Voltage Maximum | 65 VDC / 45 VAC. Please note at this voltage the unit will start to draw more current and may trip the internal thermal fuses but will not be damaged. Normal operation resumes when voltage returns to operating range. |
| Input Power Protection | Input power is fused and transient voltage protected. (Fuses do not need to be replaced) |
| Communication Transceiver Type | Two Echelon FTT-10A transceivers at 78 kbps. DC blocking capacitors for Link Power network are installed. |
| Communication Line Protection | Each communication line is has transient voltage protection |
| Network Termination | Separate jumpers for each channel support free and bus topology termination. |
| Daisy Chain Operation | Max of 5 repeaters can be daisy chained to construct a 10-channel repeater hub. |

## Dimension and Materials

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|---|---|
| External Dimension | 36 mm (1.8”) 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 |

## ORDERING INFORMATION

| | |
|---|---|
| 0110B-00 | Model 110B FTT-10 Expandable Physical Layer Repeater. |



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