## Installation and Maintenance Manual

### IM 1012-1

# MicroTech® III Fan Coil Unit Controller LONWORKS® Communication Module



LONMARK®3.4

## Revision History

| IM 1012 | April 2013 | Initial release |
|---------|------------|-----------------|
| IM 1012-1 | February 2016 | Formatting updates |

## Reference Documents

| Number | Company | Title | Source |
|--------|---------|-------|--------|
| 078-0014-01E | LonMark® Interoperability Association | LonMark® Layers 1-6 Interoperability Guidelines, Version 3.0 | www.lonmark.org |
| 078-0120-01E | LonMark Interoperability Association | LonMark Application Layer Interoperability Guidelines, Version 3.2 | www.lonmark.org |
| 078-0156-01G | Echelon® Corporation | LonWorks® FTT-10A Free Topology Transceiver Users Guide | www.echelon.com |
| 8503_ | LonMark Interoperability Association | Space Comfort Control (SCC) -Fan Coil Functional Profile | www.lonmark.org |
| ED 15135 | Daikin Applied | Protocol Information for MicroTech III Fan Coil Unit Controller, LonWorks and BACnet MS/TP | www.DaikinApplied.com |
| OM 1111 | Daikin Applied | MicroTech III Fan Coil Unit Controller Operation and Maintenance Manual | www.DaikinApplied.com |

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## General Information

This manual contains the information you need to install and configure the MicroTech® III LonWorks® communication module on the fan coil unit controller  For installation technical support, contact the Daikin Applied Controls Support Group at (866) 462-7829.

## Hazardous Information Messages

### *Recognize Safety Symbols, Words and Labels*

The following symbols and labels are used throughout this manual to indicate immediate or potential hazards. It is the owner and installer's responsibility to read and comply with all safety information and instructions accompanying these symbols. Failure to heed safety information increases the risk of property damage and/or product damage, serious personal injury or death. Improper installation, operation or maintenance can void the warranty.

| ⚠ CAUTION |
|-----------|
| Static sensitive components. Can cause equipment damage. |
| Discharge any static electrical charge by touching the bare metal inside the control panel before performing any work. Never unplug cables, circuit board terminal blocks, or power plugs while power is applied to the unit. |

| ⚠ WARNING |
|-----------|
| Electric shock hazard. Can cause personal injury or equipment damage. |
| This equipment must be properly grounded. Connections and service to the unit controller must be performed only by personnel knowledgeable in the operation of the equipment being controlled. |

| NOTICE |
|--------|
| Use this manual to physically connect the LonWorks communication module to the MicroTech III fan coil unit controller and connect it to the network. Connections and service to the unit controller must be performed only by personnel knowledgeable in the operation of the equipment being controlled. Use the Engineering Data (ED) protocol information document to integrate the unit into your network. The ED contains addressing details, LonWorks protocol information, and a list of the data points available to the network. See the Reference Documents section for details. Control integration literature is available from your local Daikin Applied sales representative and on www.DaikinApplied.com. |
| This equipment generates, uses, and can radiate radio frequency, and if not installed and used in accordance with this instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area may cause harmful interference, in which case the user will be required to correct the interference at their expense. Daikin Applied disclaims any liability resulting from any interference or for the correction thereof. |

## Overview

This manual provides the instructions for installing a LonWorks Communication Module (communication module) to a MicroTech III Fan Coil Unit Controller (unit controller). It also explains the initial configuration steps required so that the fan coil unit can be integrated into a LonWorks network.

This document is intended for service technicians or other qualified personnel who need to replace or install a new communication module on the fan coil unit controller. It

is assumed that users of this manual are familiar with standard LonWorks terminology and concepts. Please read the Important Messages in the preceding section before replacing or installing a communication module as they will be referenced throughout the process.

### LonWorks Device

The communication module is the physical interface between the fan coil unit controller and the LonWorks network. The device software loaded in the communication module allows for the exchange of LonTalk® variables between the unit controller and the network. The communication module translates these variables in accordance with the LonMark® fan coil functional profile.

Refer to the MicroTech III Fan Coil Unit Controller Operation and Maintenance manual, OM 1111 (www.DaikinApplied.com).

## Components

The following section describes the key physical components of the communication module and their functions. The communication module is a rectangular printed circuit board that plugs on the top side of the unit controller baseboard. Important features include the service pin and service LED, network connector, transceiver and 8-pin header. Figure 1 shows the major components and their locations.

**Figure 1: LonWorks Communication Module Major Components**
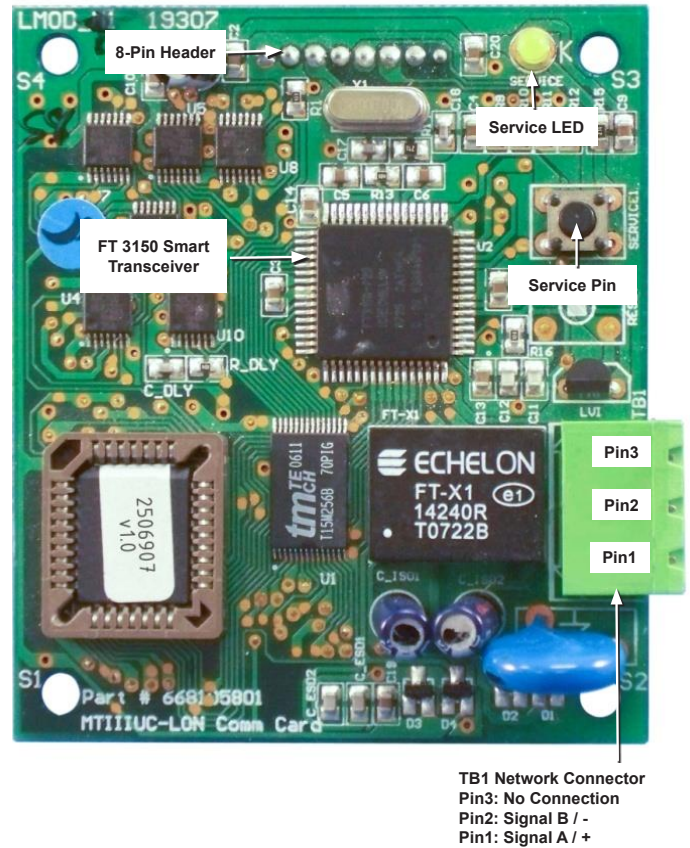


TB1 Network Connector
Pin3: No Connection
Pin2: Signal B / -
Pin1: Signal A / +

## Service Pin

The service pin button generates a service-switch message, which contains the Neuron® ID and the Standard Program Identification code (SPID) of the device, or node. A service-switch message is a network message that is generated by a node and broadcast on the network. It can be used to commission the device on the LonWorks network. The service pin is activated by pressing down on the small round black button on top of the service switch. See Figure 1 for the location of the service pin button.

## Service Light Emitting Diode (LED)

Table 1 describes the various modes of LED activity as implemented by the communication module. See Figure 1 for location of the Service LED.

*Table 1: Service LED Activity Summary*

| LED Activity | Description |
| --- | --- |
| LED flashes once at power up, or comes ON when pressing the service pin button | Indicates normal operation for a commissioned communication module |
| LED is OFF continuously as soon as power is applied | Faulty communication module hardware and/or power supply |
| LED is ON continuously, even when power is first applied | Faulty communication module hardware and/or power supply |
| LED flashes at power-up; goes OFF; then comes ON solid | Indicates the device does not have the application image (APB/NXE) file installed |
| | Reload application and interface files, which can be found on www.DaikinApplied.com or www.lonmark.org[1] |
| LED flashes very briefly once every second | Communication module could be experiencing an error with the device application code or possibly the communication module hardware |
| | Reload application and interface files, which can be found on www.DaikinApplied.com or www.lonmark.org[1] |
| LED steadily blinks ON and OFF at ½ Hz Rate (1 Sec = ON; 1 Sec = OFF) | Indicates normal operation for a decommissioned communication module |

[1]Contact the Daikin Applied Controls Customer Support Group at 866-462-7829 for additional assistance, if necessary.

## LONWORKS Network Connector (TB1)

The TB1 network connector joins the communication module to the LONWORKS FTT-10 bus. The communication module is not polarity sensitive. See Table 2 for a description of the TB1 network pins and their function as well as Figure 1 for location of the TB1 connector.

*TABLE 2: LONWORKS Communication Module Network Connector Pins*

| Pin | Designation | Function |
| --- | --- | --- |
| 1 | Signal A / + | FTT-10 |
| 2 | Signal B / − | FTT-10 |
| 3 | | Not Used |

## 8-Pin Header

The 8-pin header connects the fan coil unit controller (via the SPI bus) to the communication module. See Figure 1 for location of the 8-pin header.

## Neuron ID

The means for implementing the communication module's LonTalk protocol node is the Neuron® chip. Each Neuron chip stores a unique, 48-bit serial number called the Neuron ID. The Neuron ID is used to address the fan coil unit controller/communication module on the LONWORKS network. The service-message containing the Neuron ID is activated by pressing the service pin button.

## Transceiver and Transformer

The Echelon Corporation® Free Topology transceiver is used in conjunction with the transformer. Together, they allow the unit to communicate on the LONWORKS network with minimal noise. Data transmission rate on the network is 78-kbps (baud). See the Appendix for network topology details and Figure 1 for hardware locations.

## Network Specifications

Table 3 below summarizes the network characteristics that apply to the communication module.

*TABLE 3: LONWORKS Communication Module Specifications*

| Component | Description |
| --- | --- |
| Network Topology | Flexible Free Topology |
| Free Topology Smart Transceiver | FT3150 |
| Cable Types | Belden 8471, NEMA Level 4, or Echelon-approved equivalent |
| Maximum Bus Length | 1640 feet (500 meters) per segment |
| Maximum Node Separation | 1312 feet (400 meters) |
| Data Transmission | Two-wire, half duplex |
| Data Transmission Rate | 78 kbps (baud) |

## LonMark Functional Profile Software

The communication module software translates the LonMark Standard Network Variable Types (SNVTs) and Standard Network Configuration Parameter Types (SCPTs) in accordance with the LonMark profiles used on the LONWORKS network into the variables and parameters used in the unit controller.

The communication module is LonMark 3.4 certified and is configured in accordance with the LonMark SCC - Fan Coil functional profile. The unit controller, along with the communication module, is ready to operate with the default parameter values in the unit controller. Refer to the protocol document, ED 15135 (www.DaikinApplied.com).

# Overview

The communication module may already be attached to the unit controller or it can be installed and configured in the field. The following section describes how to install a new communication module or replace an existing one. It also describes how to connect the communication module to the LONWORKS network.

The communication module mounts on the fan coil unit controller with connector pins. It is held in place with four plastic locking standoffs. Field wiring connections to the LONWORKS network are made at the three-terminal plug (TB1) on the communication module (Figure 1).

Field installation/replacement and network connection requires the following:

- The LONWORKS communication module
- Four plastic standoffs
- Flat-head screwdriver
- Network connector (attached to the communication module)
- Installation Manual, IM 1012
- Twisted-pair network cable

To order a replacement communication module or a field installation kit, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787). Note that the network wire is not included in the kit. See Aftermarket Services for part numbers.

| ⚠ DANGER |
|---|
| The terminals on the fan coil unit controller are high voltage. Disconnect power to avoid electrical shock potential, which could result in death or serious injury. |

# Installing a new Communication Module

Follow these procedures to install a new communication module on the fan coil unit controller so that it can be incorporated into a LONWORKS network.

1. Remove power from the fan coil unit controller.

2. Remove the unwired cable plug from the communication module TB1 network connector socket (Figure 1).

3. Locate the four standoffs on the communication module.

4. Install the four standoffs on the fan coil unit controller (Figure 2).

5. Locate the 8-pin header on the unit controller.

6. Orient the communication module so that the side with the components faces out and the connector socket can mate with the 8-pin header on the unit controller.

7. Push the communication module onto the connector pins and standoffs until you hear the faint click of the locking standoffs securing the communication module in place.

8. Connect the network wires into the network plug using a flat-head screwdriver.

9. Insert the network cable plug into the communication module TB1 network connector socket.

10. Apply power to the unit controller.

**NOTE:** The communication module software version requires compatibility with the unit controller software version. Refer to the MicroTech III Fan Coil Unit Controller Operation and Maintenance manual, OM 1095 (www.DaikinApplied.com).

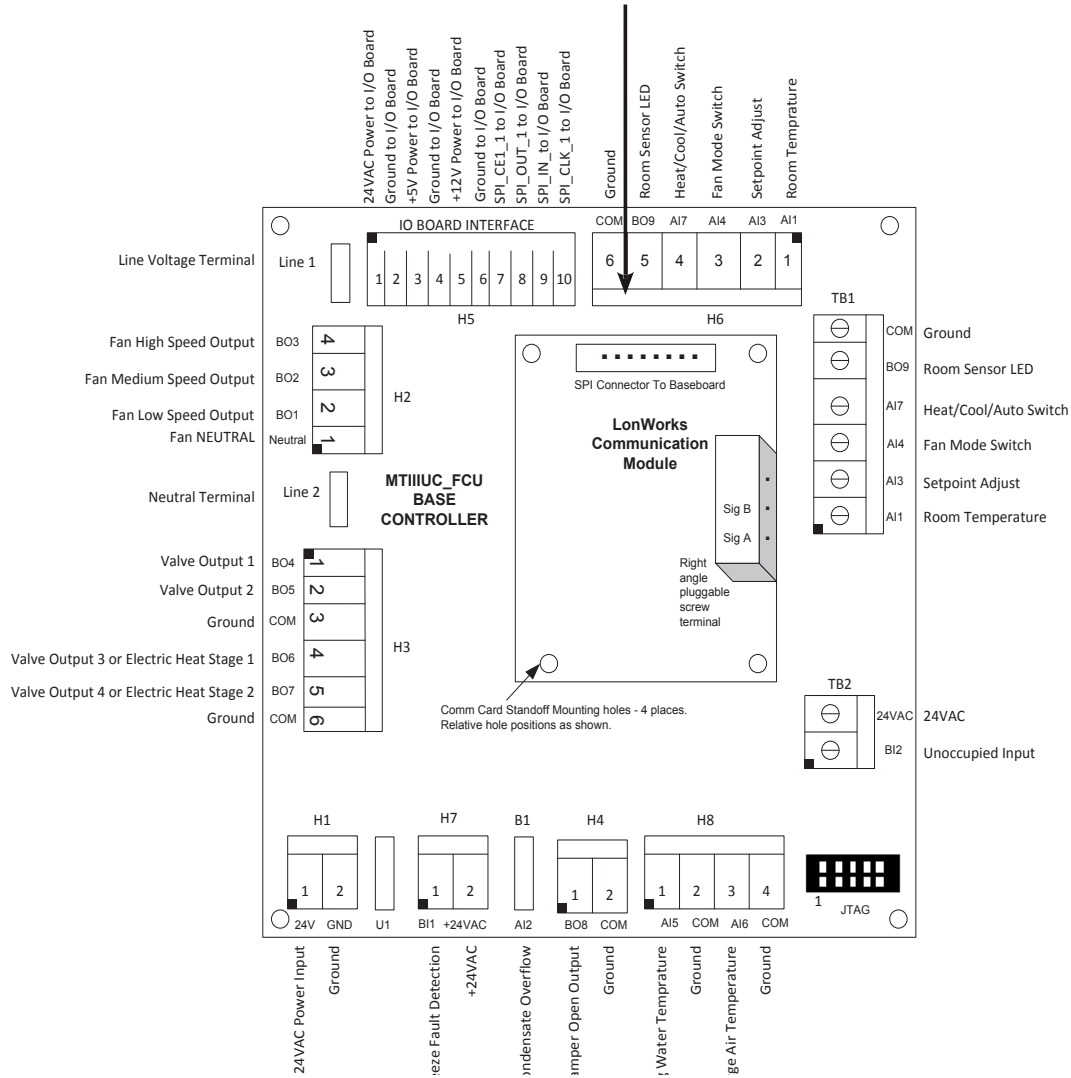# Replacing a Communication Module

Follow these procedures to remove an existing communication module, replace it, and incorporate it into an existing LONWORKS network.

1. Disconnect power from the fan coil unit controller.

2. Remove the wired cable plug from the communication module TB1 network connector socket (Figure 1).

3. Locate the four standoffs for the communication module from the unit controller (Figure 2).

4. Depress the barb on one standoff and gently pull the corner of the communication module over the barb. Do not bend the communication module or misalign the connector pins.

5. Proceed to the other three corners, by carefully removing the communication module from each standoff, and pulling it over the standoffs.

6. Gently lift the communication module from the unit controller.

7. Locate the empty connector pins and four standoffs on the unit controller (Figure 2).

8. Orient the communication module so that the side with the components faces out and the connector socket can mate with the 8-pin header on the unit controller.

9. Push the communication module onto the connector pins and standoffs until you hear the faint click of the locking standoffs securing the communication module in place.

10. Insert the network cable plug into the communication module TB1 network connector socket.

11. Apply power to the unit controller.

**NOTE:** The communication module software version requires compatibility with the unit controller software version. Refer to OM 1095 (www.DaikinApplied.com).

*Figure 2: LonWorks Communication Module Mounted on the Fan Coil Unit Controller*

The 8-pin SPI header and P4 plug on the back of the communication module connects it to the unit controller.

# Overview

Together, the fan coil unit controller and LONWORKS communication module are designed to communicate with a Building Automation System (BAS). The following section describes the process for establishing communication to a BAS using LonMaker or OpenLNS CT. It is not intended to cover proprietary or other third-party LONWORKS integration tools.

There are four basic steps as described in this section: connecting the unit to the network, installing the device and resource files, commissioning, and finally verifying communication between the unit and the BAS.

## Connecting the Unit (Node) to the Network

- Connect the network connector (TB1) pins 2 and 3, located on the communication module, to the LONWORKS network (Figure 1 and Figure 2).
- After the communication module has been properly installed on the unit controller, it can then be physically connected into the LONWORKS network. Refer to the Appendix for network topology and physical network requirements.

## Installing Device and Resource Files

The communication module uses separate device XIF/NXE and resource files specific to the Space Comfort Control (SCC) Fan Coil functional profile.

- Download the XIF/NXE and resource files from www.DaikinApplied.com or www.lonmark.org.
- Refer to MicroTech III Fan Coil Unit Controller Protocol Information, ED 15135 (www.DaikinApplied.com).

### Device External Interface File (XIF) and Application Image (NXE) Files

The communication module is self-documenting so that any LONWORKS network management tool can obtain all the information needed over the network to connect it into the system and to configure and manage it.

An external interface file (a specially formatted PC text file with the extension .XIF) is required, along with a LONWORKS network management tool, so that the device can be designed and configured prior to installation.

The NXE file contains the application image that is downloaded into the communication module.

### Resource Files

Resource files contain definitions of functional profiles, network variables types, configuration property types, and enumerations. *Resource files are used during the commissioning process and are required for displaying user-specific variables that are not included in the standard device profile.* These files must be downloaded to the BAS front end workstation or other commissioning device.

## Commissioning the Device

- Import the Resource and XIF files into a LONWORKS network management tool such as LonMaker or OpenLNS CT.
- Use the LONWORKS network management tool configuration to map the Neuron ID (node) to a logical network address and establish connection information for the unit.
- Address and establish communication using the service pin button (Figure 1). Press the service pin to generate a service-pin message, which contains the Neuron ID and the Standard Program Identification code (SPID) of the device, or node. A service pin message is a network message that is generated by a node and broadcast on the network. Refer to MicroTech III Fan Coil Unit Controller Software Downloading Procedures and Troubleshooting Guide, OM 1095 (www.DaikinApplied.com).

### Addressing Details

Every Neuron Chip has a unique 48-bit Neuron ID or physical address. This address is generally used only at initial installation or for diagnostic purposes. For normal network operation, a device address is used. Device addresses are defined at the time of network configuration. All device addresses have three parts:

1. The Domain ID that designates the domain. Devices must be in the same domain in order to communicate with each other.

2. The Subnet ID that specifies a collection of up to 127 devices that are on a single channel or a set of channels connected by repeaters. There may be up to 255 subnets in a domain.

3. The Node ID that identifies an individual device within the subnet. A group is a logical collection of devices within a domain. Groups are assembled with regard for their physical location in the domain. There may be up to 256 groups in a domain. A group address is the address that identifies all devices of the group. There may be any number of devices in a group when unacknowledged messaging is used. Groups are limited to 64 devices if acknowledged messaging is used. A broadcast address identifies all devices within a subnet or domain.

# Verifying the Network Address Using the Wink Command

A wink command is initiated by the BAS or through the LONWORKS commissioning software. The "wink" unit identification function allows verification of an individual unit network address without opening the unit access panels. The Wink command can be used during all operating and non-operating (ex. Alarm) modes except for the following conditions:

- Invalid Equipment Configuration Alarm
- Emergency Shutdown Alarm
- Actuator Calibration Process

Upon receiving a wink command from a network management node, the unit controller exhibits the following identification sequence (all occur simultaneously):

- Room Sensor LED: flashes ON 3 seconds, then OFF 3 seconds for 15 total seconds, unless an alarm condition exists.
- Fan: the fan turns OFF for 5 seconds then ON 5 seconds, then OFF again for 5 seconds.

# Troubleshooting

If the unit can be controlled from the local room sensor, but is unable to communicate with the unit via the network:

- Check the network wiring.
- Check addressing. Press the Service Switch on the communication module to send the service message to the network. The service-switch message contains the Neuron ID and the Standard Program Identification code (SPID) of the device, or node.

Refer to MicroTech III Fan Coil Unit Controller Software Downloading Procedures and Troubleshooting Guide, OM 1095 (www.DaikinApplied.com) or contact the Controls Customer Support Group at 866-462-7829.

# Aftermarket Services

To find your local parts office, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787).

| Description | Part Number |
|---|---|
| MicroTech III Fan Coil Unit LonWorks field installation kit<br><br>Includes: communication module, four stand-offs, 3-pin network connector, three temperature sensors (EWT, DAT, RAT) and IM 1012 | 910167259 |
| MicroTech III Fan Coil Unit LonWorks replacement communication module<br><br>Includes: communication module and IM 1012 | 910167260 |

# Network Topology

Each communication module is equipped with an FT 3150 Smart Transceiver and FT-X1 Transformer for network communications. They are used together and allow for:

1. Free topology network wiring schemes using twisted pair (unshielded) cable.

2. Polarity insensitive connections at each node.

These features greatly simplify installation and reduce potential network commissioning issues. Additional nodes may be added with little regard to the existing cable routing.

## Free Topology Networks

A LONWORKS "free topology network" means that devices (nodes) can be connected to the network in a variety of geometric configurations. For example, devices can be daisy-chained from one device to the next, connected with stub cables branching off from a main cable, connected using a tree or star topology, or any of these configurations can be mixed on the same network (Figure 3). Free topology segments require termination for proper transmission performance. Only one termination is required. It may be placed anywhere along the segment. Refer to the Echelon LONWORKS Transceiver User's Guide for details.

Free topology networks may take on the following topologies:

• Bus
• Ring
• Star
• Mixed - Any combination of Bus, Ring, and Star

**NOTE:** Limitations to wire lengths apply and must be observed.

A network segment is any part of the free topology network in which each conductor is electrically continuous. Figures 4-7 are illustrations of a network segment type. Some applications may require two or more segments as described in the Free Topology Restrictions section. If necessary, segments can be joined with physical layer repeaters (Figure 4). Refer to the Echelon LONWORKS Transceiver User's Guide for details.

*Figure 4: Combining Network Segments with a Repeater*
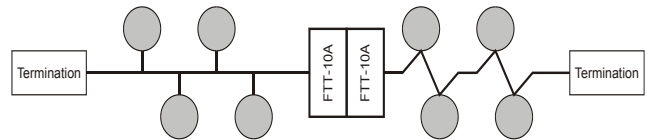


### Free Topology Restrictions

Although free topology wiring is very flexible, there are restrictions. A summary follows below.

• The maximum number of nodes per segment is 64.

• The maximum total bus length depends on the wire size (see "Qualified Cables" section for details).

• One termination is required in each segment. It may be located anywhere along the segment.

| Wire Size | Maximum Node-to-Node Length | Maximum Cable Length |
|-----------|-----------------------------|----------------------|
| 24 AWG | 820 ft (250 m) | 1476 ft (450 m) |
| 22 AWG | 1312 ft (400 m) | 1640 ft (500 m) |
| 16 AWG | 1640 ft (500 m) | 1640 ft (500 m) |

*Figure 3: Singly Terminated Free Topology Networks*
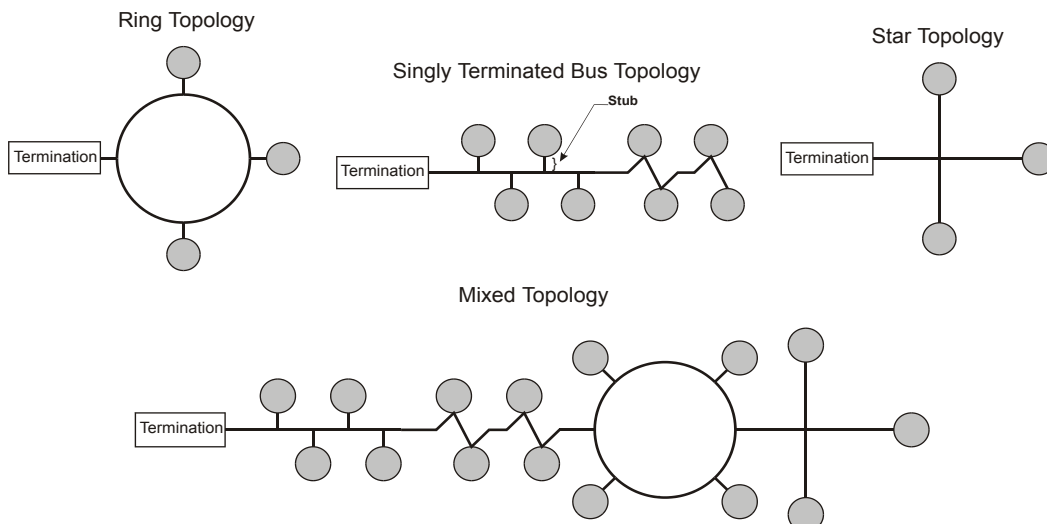
The longest cable path between any possible pair of nodes on a segment must not exceed the maximum node-to-node distance. If two or more paths exist between a pair of nodes (e.g., a loop topology), the longest path should be considered. Note that in a bus topology, the longest node-to-node distance is equal to the total cable length.

**NOTE:** The total length of all cable in a segment must not exceed the maximum total cable length

### Doubly Terminated Topology Networks

The maximum total cable length can be extended without using a repeater by using a doubly terminated network topology (Figure 5). The trade-offs are: (1) this network topology must be rigorously followed during the installation and subsequent retrofits; and (2) two terminations must be installed at the ends of the bus for proper transmission performance. Refer to Echelon LONWORKS FTT-10A Transceiver User's Guide for details.

**NOTE:** Limitations to wire lengths apply and must be observed.

*Figure 5: Doubly Terminated Network Topology*
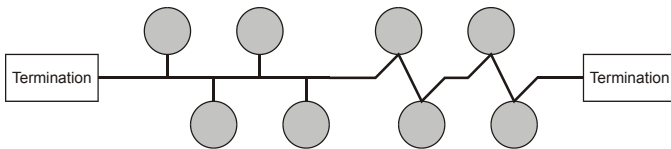


### Doubly Terminated Topology Restrictions

The restrictions on doubly terminated bus topology are as follows:

- The maximum number of nodes per segment is 64.
- The maximum total bus length depends on the wire size (see "Qualified Cables" section for details).
- The maximum stub length is 9.8 ft (3 m). A stub is a piece of cable that is wired between the node and the bus.
- Two terminations are required in each segment. One must be located at each end of the bus.

| Wire Size | Maximum Cable Length |
|-----------|---------------------|
| 24 AWG | 2952 ft (900 m) |
| 22 AWG | 4590 ft (1400 m) |
| 16 AWG | 8855 ft (2700 m) |

**NOTE:** If the bus is wired directly to the node, there is no stub, and thus the stub length is zero. If you are wiring to a field terminal strip on a unit, you should account for any factory wiring between the terminal strip and the unit controller. This wiring is considered part of the stub.

## Physical Network

### Qualified Cables

Echelon has qualified three twisted-pair network communications cables that are available from a large number of different sources. Refer to the Echelon LONWORKS Free Topology Transceiver Users Guide for cable specification details. Some local codes or applications may require the use of plenum-rated cable.

The following cables meet this specification:

- TIA568A Category 5 cable (24AWG/0.51mm)
- NEMA Level IV cable (22AWG/0.65mm)
- Generic 16AWG (1.3mm) (similar to Belden 85102)

> ⚠ **CAUTION**
>
> Do not install the cable in the same conduit with power wiring. The temperature of the cable must not exceed 131°F (55°C), which can result in personal injury or equipment damage if not avoided.

**NOTE:** Ideally, two unit controllers should be connected with one continuous piece of cable in order to reduce the risk of communications errors. If it is necessary to splice the cable, use crimp-type butt connectors (good) or solder (best). Never use wire nuts.

### Network Cable Termination

LONWORKS network segments require termination for proper data transmission performance. The type and number of terminations depend on network topology. Refer to the Echelon LONWORKS Transceiver User's Guide for details.

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