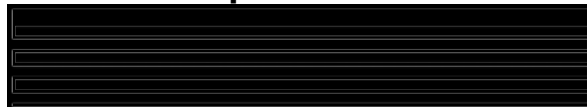




# LonPoint® Module Hardware and Installation User's Guide

Version 2.0

 ECHELON  
Corporation



078-0167-01B

078-0167-01B

Echelon, LON, LONWORKS, LonBuilder, NodeBuilder, LonManager, LonTalk, LONMARK, Neuron, 3120, 3150, LonPoint, the LonUsers logo, the LONMARK logo, and the Echelon logo are trademarks of Echelon registered in the United States and other countries. LonSupport and LonMaker are trademarks of Echelon Corporation.

Other brand and product names are trademarks or registered trademarks of their respective holders.

Neuron Chips, LonPoint Modules, and other OEM Products were not designed for use in equipment or systems which involve danger to human health or safety or a risk of property damage, and Echelon assumes no responsibility or liability for use of the Neuron Chips or LonPoint Modules in such applications.

Parts manufactured by vendors other than Echelon and referenced in this document have been described for illustrative purposes only and may not have been tested by Echelon. It is the responsibility of the customer to determine the suitability of these parts for each application.

ECHELON MAKES AND YOU RECEIVE NO WARRANTIES OR CONDITIONS, EXPRESS, IMPLIED, STATUTORY OR IN ANY COMMUNICATION WITH YOU, AND ECHELON SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of Echelon Corporation.

Model Number 39510

Printed in the United States of America.  
Copyright ©1997 - 1999 by Echelon Corporation.

Echelon Corporation  
4015 Miranda Avenue  
Palo Alto, CA 94304, USA  
[www.echelon.com](http://www.echelon.com)

# Regulatory Information

## FCC NOTICE (for USA only)

### Federal Communications Commission Radio Frequency Interference Statement

Warning: This equipment 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. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## Safety

UL	Listed, per UL-916.
c-UL (CSA)	Certified, per C22.2, No. 205



# Contents

<b>1</b>	<b>Introduction</b>	<b>1-1</b>
	Applications	1-2
	Audience	1-4
	Content	1-4
	Related Documents	1-4
<b>2</b>	<b>Description of the LonPoint Modules and Base Plates</b>	<b>2-1</b>
	LonPoint Interface Modules	2-2
	LonPoint Interface and Router Module Symbology	2-9
	Network Connector	2-9
	Front Panel Label	2-9
	Service Switch/LED	2-9
	Power or Power/Wink LED	2-10
	I/O Number	2-10
	Digital Input	2-10
	Digital Output	2-10
	Analog Input	2-10
	Analog Output	2-11
	Hand/Off/Auto Switch	2-11
	Input Status LEDs	2-11
	Output Status LEDs	2-11
	Router Channel A	2-12
	Router Channel B	2-12
	Router Activity LED	2-12
<b>3</b>	<b>Network Cabling and Connections</b>	<b>3-1</b>
	Network Cabling – TP/FT-10 Channel	3-2
	System Performance and Cable Selection – TP/FT-10 Channel	3-4
	TP/FT-10 Cable Termination	3-5
	Free Topology	3-5
	Doubly Terminated Bus Topology Segment	3-6
	Terminating Shielded Cables for the TP/FT-10 Channel	3-6
	Network Cabling – TP/XF-1250 Channel	3-7
	Distribution Rule for TP/XF-1250 Channel	3-7
	Terminator for TP/XF-1250 Channel	3-9
	I/O Cabling	3-9
	Power Cabling	3-9
<b>4</b>	<b>Installation and Wiring of Base Plate</b>	<b>4-1</b>
	LonPoint Type 1 Base Plate Installation	4-2
	Installing a Compatible Electrical Box	4-5
	Connecting Wiring	4-8
	LonPoint Type 1D DIN Base Plate Installation	4-9
	Connecting Wiring	4-12
	Connecting the Jumper Plug(s)	4-13

LonPoint Type 2 Base Plate Installation	4-17	
Installing a Compatible Electrical Box	4-20	
Connecting Wiring	4-23	
LonPoint Type 2D DIN Base Plate Installation	4-24	
Connecting Wiring	4-27	
Connecting the Jumper Plug(s)	4-29	
<b>5</b>	<b>Installing the DI-10 Digital Input Module</b>	<b>5-1</b>
	LonPoint DI-10 Digital Input Module	5-2
	DI-10 Module Software Settings	5-4
	Installing the DI-10 Module	5-4
<b>6</b>	<b>Installing the DIO-10 Digital Input/Output Module</b>	<b>6-1</b>
	LonPoint DIO-10 Digital Input/Output Module	6-2
	DIO-10 Module Digital Inputs	6-3
	DIO-10 Digital Input/Output Module Software Settings	6-5
	DIO-10 Digital Input/Output Module Firmware	6-5
	Installing the DIO-10 Digital Input/Output Module	6-5
<b>7</b>	<b>Installing the DO-10 Digital Output Module</b>	<b>7-1</b>
	LonPoint DO-10 Digital Output Module	7-2
	DO-10 Module Software Settings	7-5
	Installing the DI-10 Module	7-5
<b>8</b>	<b>Installing the AI-10 Analog Input Module</b>	<b>8-1</b>
	LonPoint AI-10 Analog Input Module	8-2
	AI-10 Module Software Settings	8-6
	Installing the AI-10 Module	8-6
<b>9</b>	<b>Installing the AO-10 Analog Output Module</b>	<b>9-1</b>
	LonPoint AO-10 Analog Output Module	9-2
	AO-10 Module Software Settings	9-5
	Installing the AO-10 Module	9-4
<b>10</b>	<b>Installing the SCH-10 Scheduler Module</b>	<b>10-1</b>
	LonPoint SCH-10 Scheduler Module	10-2
	SCH-10 Module Software Settings	10-4
	Installing the SCH-10 Module	10-4
<b>11</b>	<b>Installing the LPR Router Module</b>	<b>11-1</b>
	LonPoint LPR Router Modules	11-2
	Installing the LPR Router	11-5
<b>12</b>	<b>Troubleshooting</b>	<b>12-1</b>
	Troubleshooting Table	12-2

## Declaration of Conformity

# 1

## Introduction

The LonPoint System is a family of products designed to integrate both new and legacy sensors and actuators into cost-effective, interoperable, control systems for building and industrial applications. Designed to take best advantage of the LONWORKS® Network Services (LNS) operating system, LONMARK® interoperability, and the distributed processing capability of the Neuron® Chip and LonTalk® protocol, the LonPoint System provides a truly distributed control architecture that reduces installation time, lowers installation and life-cycle costs, and can be economically integrated into applications both large and small.

---

## Applications

Traditional control networks have been based on an hierarchical architecture using proprietary controllers. This approach to control system design is expensive, complex, and locks the customer into a closed, non-interoperable architecture. Ultimately, the high costs of this design approach limits the market for control systems.

Overcoming the limits of traditional, closed, hierarchical systems is best accomplished with a flat, fully distributed control architecture. Such a system must: (a) interface with a broad range of sensors and actuators, (b) incorporate application programs that blur the distinction between legacy sensors/actuators and intelligent, networked devices, (c) include a design and installation tool that can seamlessly interconnect everything in the control network, and (d) incorporate software that simplifies hardware configuration and reduces commissioning time. Satisfying these diverse requirements requires a systems approach to the architecture, hardware, and software; it cannot be accomplished easily with a piecemeal collection of devices and components.

The LonPoint System is the result of just such a systems approach, providing at once the low cost of a flat system architecture, the multi-user capabilities of the LNS operating system, the distributed processing of capabilities of the Neuron Chip and LonTalk protocol, and the wiring flexibility of free topology communications. The system consists of the LNS-based LonMaker™ for Windows® Integration Tool, the LonPoint Plug-In, LonPoint application programs, network interfaces, and LonPoint interface, router, and scheduler modules.

The LonMaker for Windows tool is an LNS-based installation tool with a Visio™ user interface and support for both LonPoint devices and 3rd party LONWORKS® devices. The Visio user-interface provides a familiar, CAD-like design environment from which a control system can be designed. Installation consists of interconnecting function blocks (LONMARK objects) within LonPoint modules and 3rd party devices, using their application resources to create a distributed control system. The LonMaker for Windows tool can be used to design, configure, and commission a distributed control network, yet is economical enough to be left behind as a maintenance tool. The LonPoint Plug-In is provided with the tool to simplify the configuration of LonPoint devices.

Resident within each LonPoint module is a powerful, configurable LONMARK® application program. The program includes a variety of function blocks (i.e., PID Controller, digital encoder, analog output, digital input, type translator) that are configured by the LonMaker for Windows tool. Linking the function blocks of multiple LonPoint modules, together with the resources of third party LONWORKS® devices, creates a distributed control system that is interconnected via the network, yet which offers greater functionality, higher reliability, and lower cost than a traditional central controller-based system. The LonPoint System may be operated as a self-contained control system, integrated with other LONMARK or LONWORKS devices, or combined with remote systems and a remote supervisory station via a WAN, IP, or PSTN network to form a wide area control system.

The LonPoint interface, scheduler, and router modules provide I/O processing, application resources, timekeeping, and routing for a LonPoint System. The interface



modules seamlessly integrate sensors, actuators, and controllers into peer-to-peer, interoperable networks. There are several different interface modules, including the DI-10 Digital Input Module (4 digital inputs with a status LED per input), DO-10 Digital Output Module (4 digital outputs with a separate hand/off/auto switch and status LED per output), DIO-10 Digital Input/Output Module (2 digital inputs, 2 relay outputs, status LEDs and hand/off/auto switches), AI-10 Analog Input Module (2 independent 16-bit analog inputs), and AO-10 Analog Output Module (2 independent 12-bit analog outputs with PID). The SCH-10 Scheduler Module provides scheduling or data logging for the system.

LPR Router Modules can be used to create high speed backbones, optimize network traffic, extend the size of the network, as well as to create bridges to other channels containing third-party devices. LPR Routers are available in any combination of TP/FT-10, TP/XF-78, and TP/XF-1250 channels.

Many innovative labor-saving features have been built into the LonPoint modules to minimize installation time:

- A two-piece design allows pre-wiring and cable testing by an electrician prior to installing the electronics. Technician time can be reserved for tasks such as node configuration;
- Screw terminals and polarity-insensitive power and network connections minimize the chance of miswiring;
- All modules operate from 16-30VAC or VDC, allowing the modules to be powered from the same sources as the sensors and actuators;
- Power and network wiring are “looped” through each base plate, providing continuity in case of module replacement without network disruption;
- All modules can be hot-plugged, minimizing service time;
- Every module includes a front panel jack that accesses the twisted pair network without any disassembly, saving time when the network must be accessed for configuration or maintenance;
- All modules include a front panel bar code with the model, software revision, and two removable Neuron Chip ID stickers. When placed on the building or system design plans, these stickers save installation time, especially for inaccessible nodes.

When used in the context of a complete LonPoint System, the LonPoint modules provide tremendous flexibility and lower overall equipment, installation, and life-cycle costs. The modules simplify programming by using a CAD-like design environment, minimize cabling requirements by using free topology transceivers, and reduce the need for on-site calls by offering over-the-network downloading. The LonPoint modules support a flat architecture that is at once interoperable, lower cost to install and maintain, and flexible enough for future adds, moves, and changes.

---

## Audience

This User's Guide is intended for anyone designing or installing a control network using LonPoint Modules. Electricians and installation technicians involved with the physical installation of the cable plant and hardware will find this User's Guide sufficient for them to complete their work. Designers and those charged with commissioning LonPoint Modules, including those who will configure the LonPoint software, must also review the the user's guide for the LonMaker for Windows Integration Tool as well as the *LonPoint Application and Plug-In Guide*.

---

## Content

This manual provides detailed technical specifications on the electrical and mechanical interfaces and operating environment characteristics for the LonPoint Modules.

---

## Related Documentation

The following Echelon documents are suggested reading:

*SLTA-10 Adapter User's Guide* (078-0160-01)

*LONWORKS PCLTA-10 PC LonTalk Adapter User's Guide* (078-0159-01)

*LONWORKS PCC-10 PC Card User's Guide* (078-0155-01)

*LonManager Protocol Analyzer User's Guide* (078-0121-01)

*LonPoint Application and Plug-In Guide* (078-0166-01)

*LonMaker for Windows User's Guide* (078-0168-01)

*Junction Box and Wiring Guidelines for Twisted Pair LONWORKS Networks*  
(engineering bulletin 005-0023-02)

# 2

## Description of the LonPoint Modules and Base Plates

This chapter provides a description of the LonPoint Interface, Router, and Scheduler modules, Type 1 and Type 2 Base Plates, and Type 1D and Type 2D DIN Base Plates mounting enclosures.

---

## LonPoint Interface Modules

The LonPoint Interface Modules are designed to monitor and control a wide variety of analog and digital sensors and actuators, and are the primary means of interfacing a LonPoint system to devices that lack an integral LONWORKS interface, i.e., a Neuron Chip and transceiver. By selecting the correct LonPoint Interface Module and configuring both its hardware and software correctly, a wide and varied assortment of sensors and actuators can be supported.

There are five types of LonPoint Interface Modules which share a common form factor but differ in terms of their I/O and internal software functions. The five modules include the DI-10 Digital Input Module, DO-10 Digital Output Module, DIO-10 Digital Input Output Module, AI-10 Analog Input Module, and AO-10 Analog Output Module.

The DI-10 Digital Input Module provides four digital inputs for supervising voltage ranges 0-5VDC through 0-32VDC or dry contacts. Inputs are isolated from the input power and the network but not from each other. Separate status LEDs are provided for each input.

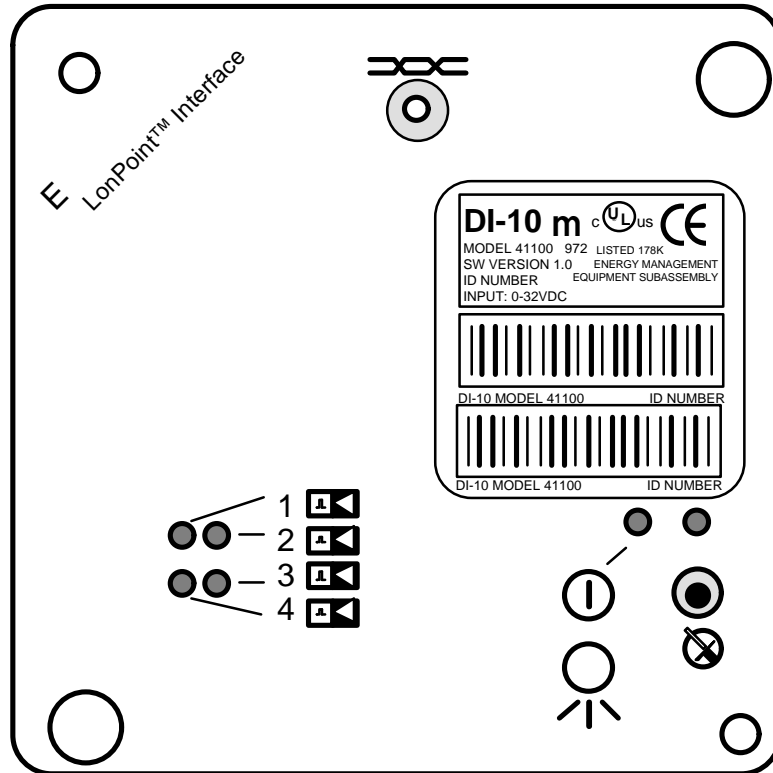
The DO-10 Digital Output Module includes four digital outputs rated at 0-12V, 100mA source/sink per output, 110mA source, 400mA sink all outputs combined. Outputs are isolated from the input power and the network but not from each other. Each output may be separately overridden by a hand/off/auto switch accessible from the front panel. Separate status LEDs are provided for each output.

The DIO-10 Digital Input Output Module provides two digital inputs and two relay outputs. The digital inputs include configurable input thresholds for supervising dry contacts or 5V, 12V, 24V, or 31V DC inputs. In addition, the digital inputs can be set to measure frequency (< 20kHz) inputs. The inputs are isolated from the input power and the network, but are not isolated from each other. Each relay output consists of a Form A (normally open) and Form B (normally closed) contact which share a common wiper. The relay contacts are rated for 2A continuous, 6A momentary, at 30VAC or 42VDC. Each output may be separately controlled by a hand/off/auto switch accessible from the front panel. Separate status LEDs are provided for each input and output.

The AI-10 Analog Input Module provides two independent 16-bit resolution analog inputs which are isolated from the input power and the network but not from each other. Each input can be configured via jumper blocks to monitor RTDs, thermistors, and other types of analog inputs. Inputs can be separately configured as a voltage input, resistive transducer input, loop-powered 0-24mA current input, or remote-powered 0-24mA current input. Voltage input ranges can be selected via the LonPoint Plug-in to be 0-156mV, 0-625mV, 0-10V, or 0-20V. Current input ranges can be set via the LonPoint Plug-in to be 0-25mA, 0-12.5mA, 0-781μA, or 0-19.5μA. Resolution in the 0-20V range is 0.3mV per step; current input resolution in the 0 - 25mA range is 0.37μA per step. For resistive transducers, the module includes a configurable current source which can be set, under software control, to provide either 25μA or 400μA current for resistance measurement of transducers from 100 to 15k (nominal).

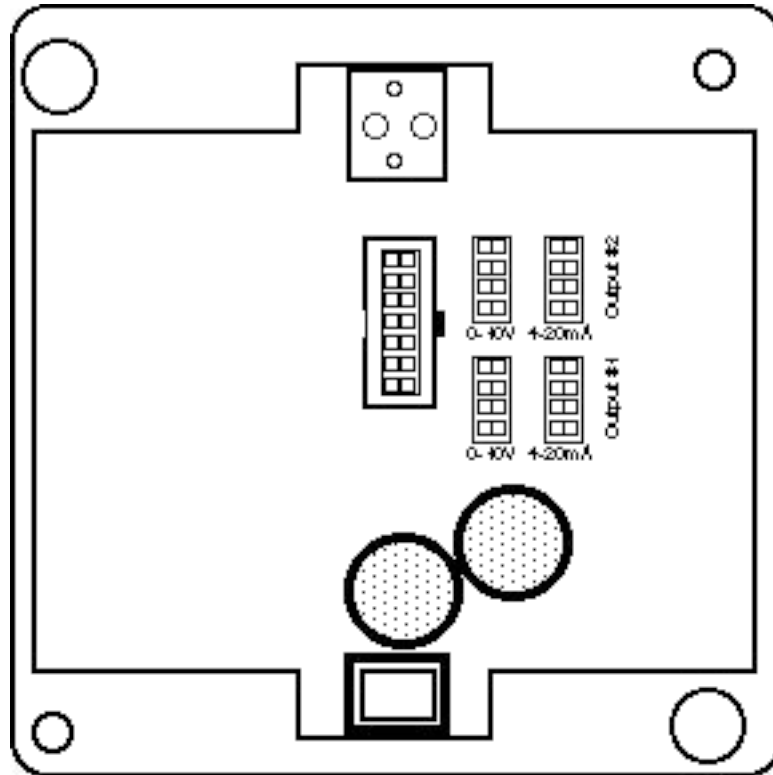
The AO-10 Analog Output Module offers two independent 12-bit resolution analog outputs. Each output can be separately configured for voltage or current output, and can drive 0-10V into a 1k load or 0-20mA or 4-20mA @ 0-12V. Outputs are isolated from the input power and the network but not from each other.

The LonPoint Interface Modules share a common form factor that includes a front panel assembly to which a printed circuit board (PCB) with active electronics is connected. The front panel of all of the modules includes a service switch and service LED, a combination power/wink LED, and a network connector (figure 2.1).}



**Figure 2.1** LonPoint Interface Module - Typical Front Panel

The rear of the PCB assembly includes a polarized, shrouded, 14-pin interface connector that connects to a mating socket in a Type 1 Base Plate or Type 1D DIN Base Plate. Any user-configured jumpers are also located on the rear of the PCB assembly (figure 2.2).

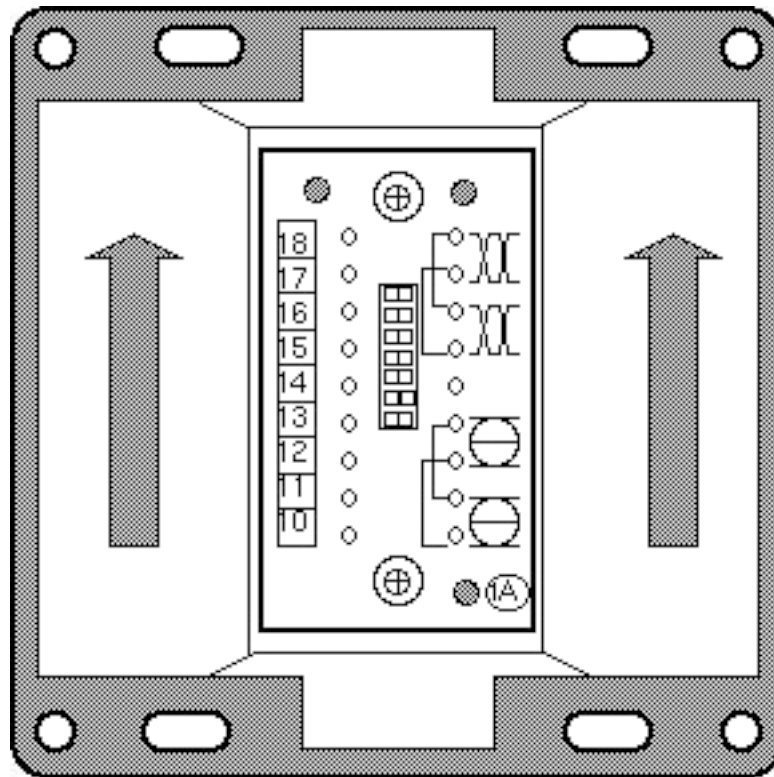


**Figure 2.2** LonPoint Interface Module - Typical Rear Panel and Jumpers

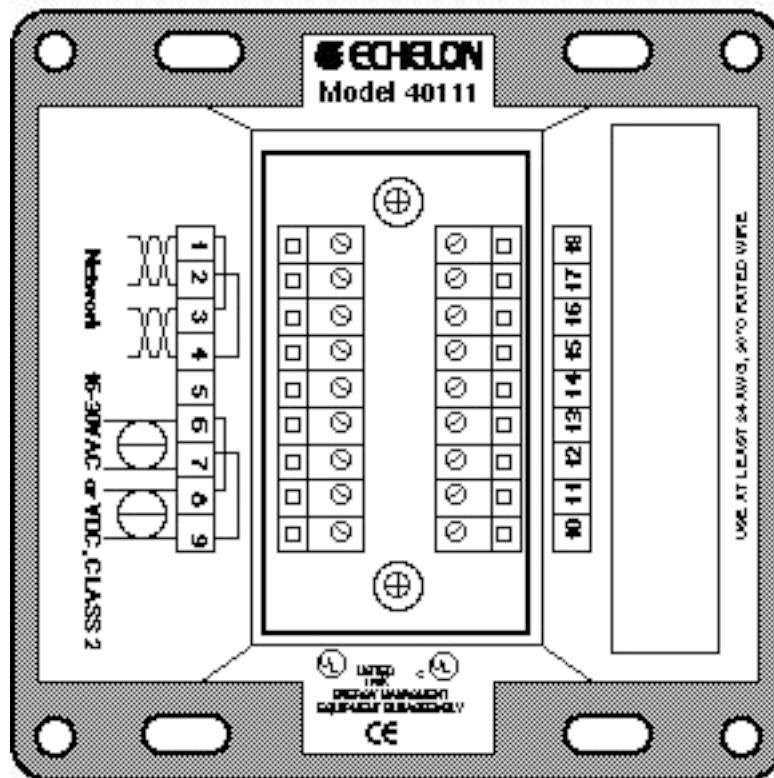
Network, power, and I/O wiring is connected to screw terminals located on a Type 1 Base Plate (figure 2.3) or Type 1D DIN Base Plate (figure 2.4), into which the LonPoint Interface Module is plugged; no wiring is ever connected directly to an Interface Module. A writing space is provided on the back of the Type 1 Base Plate for recording the date of installation or other pertinent information. Installers should take care to use a fine-point (smudge-free) pen.

Type 1/1D and Type 2/2D Base Plates are keyed to prevent accidental insertion of an incorrect module type. The Type 1 Base Plate (Model 40111) and the Type 1D DIN Base Plate (Model 48111) will only accommodate Interface Modules and Scheduler Modules. The Type 2 Base Plate (Model 40222) and the Type 2D DIN Base Plate (Model 48222) will only accept LPR-1X Router Modules.

In either Type 1/1D or Type 2/2D Base Plates, the associated module is affixed to the Base Plate by means of two 8-32, 3/8" screws (Echelon 205-0130-01) that are provided with each module.

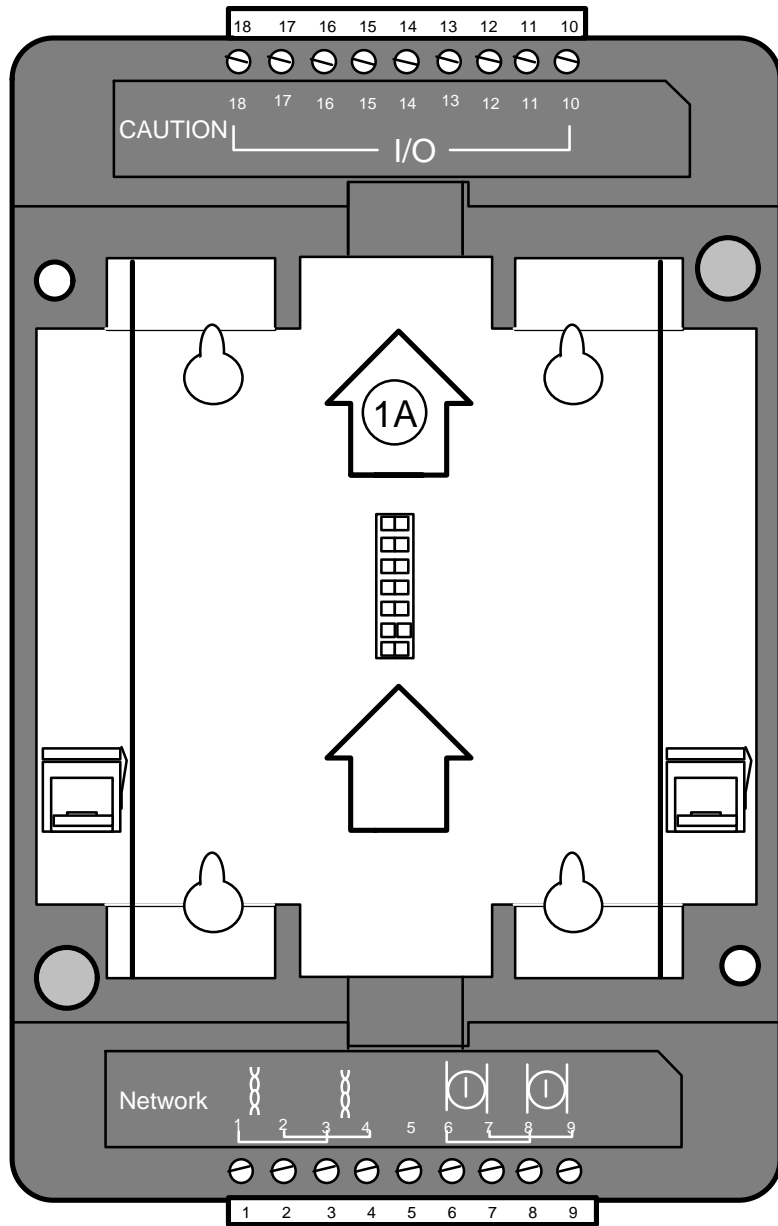


Front View



Rear View

Figure 2.3 LonPoint Type 1 Base Plate



Front View

Jumper Plug  
(one supplied with  
each DIN Base  
Plate)

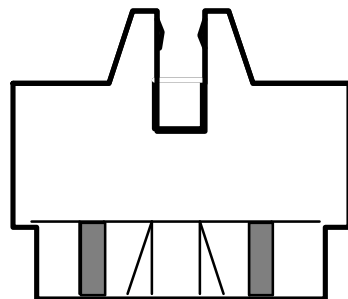
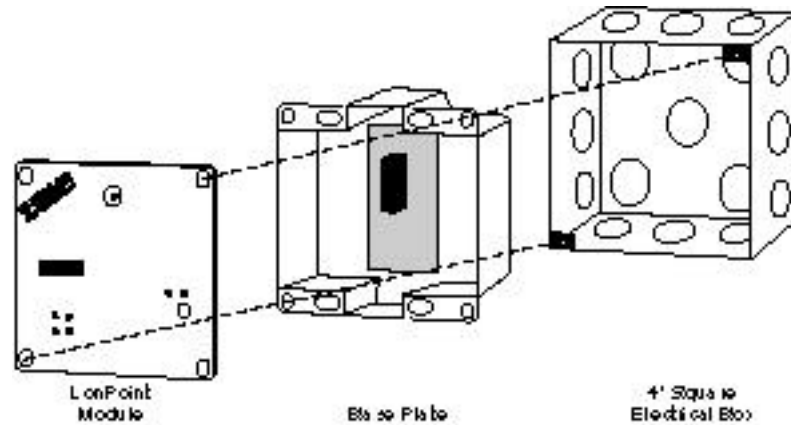


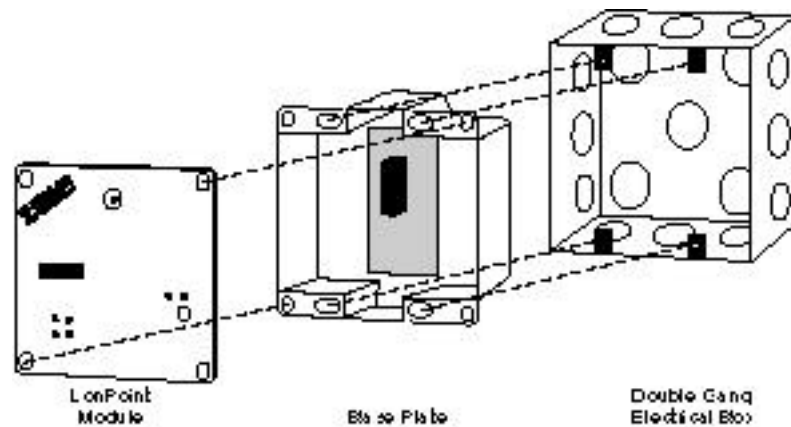
Figure 2.4 LonPoint Type 1D Base Plate



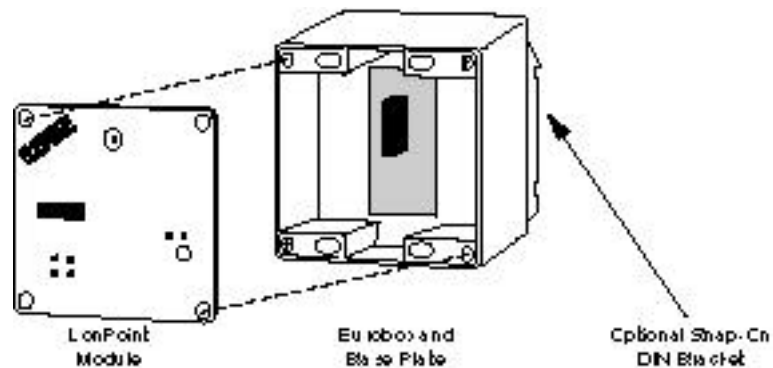
The Type 1 Base Plate is mounted to either a suitable US 4" square, 2" deep (10.16cm x 5.08cm) electrical box, US double gang electrical box, plastic Echelon EuroBox (figures 2.5-2.7), or an IP-65 (NEMA 4) enclosure.



**Figure 2.5** LonPoint Interface Module 4" Square (2" Deep) Electrical Box Mounting Configuration

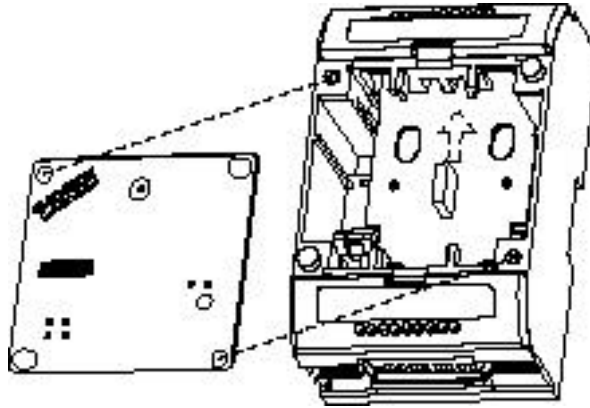


**Figure 2.6** LonPoint Interface Module Double Gang (2" Deep) Electrical Box Mounting Configuration



**Figure 2.7** LonPoint Interface Module Eurobox Mounting Configuration

The Type 1D DIN Base Plate may be mounted to either a 35mm DIN rail or to a wall panel (figures 2.8). A jumper plug supplied with the Base Plate permits the power and network connections of several Type 1D DIN Base Plates to be interconnected without additional wiring.



**Figure 2.8** LonPoint Interface Type 1D Base Plate Mounting Configuration

Prior to installing the base plate, it is important to understand the symbology used on the base plates, interface modules, and router modules.

---

## LonPoint Interface and Router Module Symbology

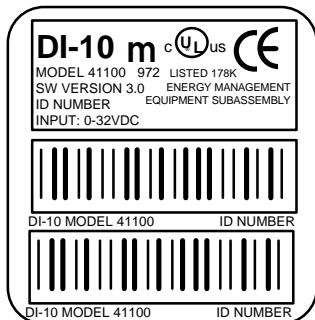
The front and rear panels of the LonPoint Modules and Base Plates contain legends that identify the function of the module and its various LEDs, switches, and network connector. A common legend marking scheme is used that allows the module to be rotated clockwise 90° and still be legible, in the event that the mounting enclosure is installed off axis. The symbols used are as follows:

### Network Connector



Each module includes a network connector for accessing the TP/FT-10 network directly from the front panel. This feature is intended to allow a laptop PC equipped with a Model 73200 PCC-10 PC Card and Model 78303 cable assembly to plug into the LonPoint module and program, monitor, troubleshoot, or update a LonPoint system. The 3.5mm mating plug is a Hosiden 315-0201-01 miniature phone jack, or equal.

### Front Panel Label



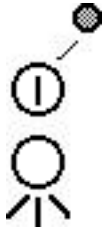
Every module is supplied with a front panel label that identifies the model number and software version number of the module. The front panel label also includes two peel-off Code 39 bar code labels on which are printed the Neuron Chip ID of that module (LPR modules have two Neuron Chip IDs, one per channel). These labels are intended to assist the installer during installation time, and may be removed from the module and placed on installation drawings for reference purposes.

### Service Switch/LED



Every module includes a service switch and LED which may be used during module installation and to identify configured and unconfigured modules.

### Power or Power/Wink LED



Every module includes either a power LED or a combination power/wink LED. The wink function is used by a network management/installation tool to visually identify a particular module; the wink command causes the power LED to blink.

### I/O Number

- 1
- 2
- 3
- 4

Every input and output symbol is accompanied by an I/O Number designating which hardware input or output the function is associated. The DI-10 has four inputs, the DO-10 has four outputs, the DIO-10 has two inputs and two outputs, the AI-10 has two inputs, and the AO-10 has two outputs.

### Digital Input



This symbol designates the I/O as a digital input and is accompanied by an I/O Number.

### Digital Output



This symbol designates the I/O as a digital or relay output and is accompanied by an I/O Number.

### Analog Input



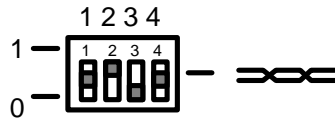
This symbol designates the I/O as an analog input and is accompanied by an I/O Number.

## Analog Output

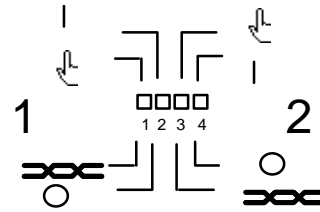


This symbol designates the I/O as an analog output and is accompanied by an I/O Number.

## Hand/Off/Auto Switch




DO-10 Hand/Off/Auto Switch

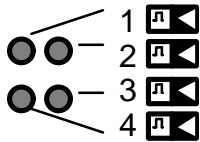


DIO-10 Hand/Off/Auto Switch

The DO-10 and DIO-10 modules include a Hand/Off/Auto switch that allows the user to determine the mode of operation of the outputs. One three-position switch is provided for each of the four outputs. The switch positions function as follows:

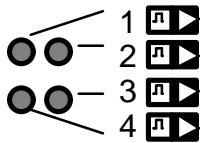
1	Output turned ON (voltage level high or relay actuated)
0	Output turned OFF (voltage level low or relay not actuated)
	Output state is determined automatically according configuration programs loaded into the LonPoint modules on the network.

## Input Status LEDs



Input status LEDs indicate the state of the inputs.

## Output Status LEDs



Output status LEDs indicate the logical state of the outputs.

#### Router Channel A

##### **A**

LPR Routers route packets between two twisted pair channels, designated A and B.

#### Router Channel B

##### **B**

LPR Routers route packets between two twisted pair channels, designated A and B.

#### Router Activity LED



Indicates that a router is transferring packets from one channel to another.

# 3

## Network Cabling and Connections

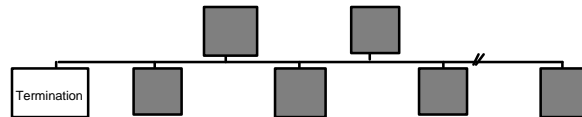
This chapter provides information about network, power, and input/output cabling for the LonPoint system.

---

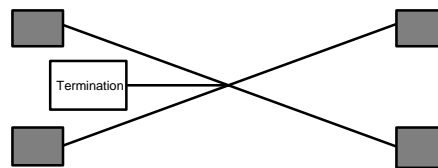
## Network Cabling - TP/FT-10 Channel

The LonPoint modules (excluding some LPR Routers) use Echelon's FTT-10A Free Topology Transceiver for network communications. This transceiver operates at 78 kilobits per second and is designed to support free topology wiring; it will accommodate bus, star, loop, or any combination of these cabling topologies using a twisted pair cable. By eliminating restrictions on the cabling topology, the installer is free to locate LonPoint modules anywhere on the network cabling provided only that the maximum cabling distance limitations are observed<sup>99</sup> This capability simplifies system installation and makes it easy to add nodes should the network need to be expanded. Figures 3.1 through 3.5 present five typical network topologies.

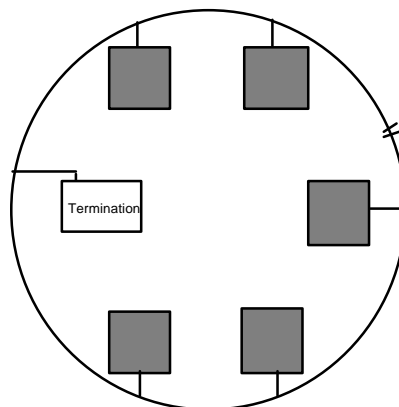
In free topology cabling it is necessary to use one Echelon Model 44100 terminator. In bus topology cabling it is necessary to use two Echelon Model 44101 terminators. Terminators are required for proper network operation and must not be omitted.



**Figure 3.1** Singly Terminated Bus Topology (Model 44100 Terminator)

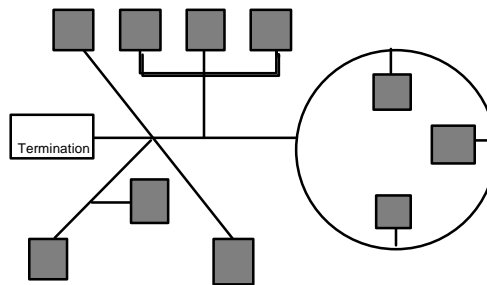


**Figure 3.2** Star Topology (Model 44100 Terminator)

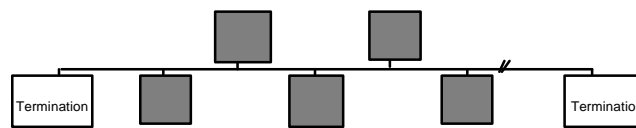


**Figure 3.3** Loop Topology (Model 44100 Terminator)





**Figure 3.4** Mixed Topology (Model 44100 Terminator)



**Figure 3.5** Doubly Terminated Bus Topology - Used for Very Long Cabling Distances (Two Model 44101 Terminators)

A network consisting of LonPoint modules using the FTT-10A transceiver is said to reside on a “TP/FT-10 channel.” In some cases all of the LonPoint modules will be connected to a single TP/FT-10 channel. A maximum of 64 devices (LonPoint modules, routers, PCLTA-10 and PCC-10 PC adapters, third-party LONMARK® devices) may be connected to any one channel. If more than 64 devices are to be used, or if it is necessary to add more cabling than is permitted on a single channel, then one or more model 42100 LPR-10 Routers (TP/FT-10 to TP/FT-10) would be placed in series with the network cabling.

Another application for the LPR Router is to limit the amount of network communications passing between different parts of a control network. For example, LPR Routers can restrict the transfer of messages from a portion of the network with many active PID loops to other, more quiescent parts of the network. In this case one or more model 42100 LPR-10 Routers would be placed in series with the network cabling.

The LPR Router can also be used to create a high-speed backbone that brings together many different channels, perhaps to a monitoring PC. In this case it may be desirable to increase the speed of the backbone channel in order to better manage the communication traffic. For example, in a highrise building it might be desirable to have a 78 kilobit per second TP/FT-10 free topology channel operating on each floor, and use a 1.25 megabit per second channel to link together all of the floor channels with a PC in the basement. In this case, one model 42102 LPR-12 Router (TP/FT-10 to TP/XF-1250) would be placed on each floor and a separate 1.25Mbps twisted pair channel would serve as a backbone.

The Model 42100 LPR-10 Router (TP/FT-10 to TP/FT-10) uses the TP/FT-10 channel cabling scheme. The Model 42102 LPR-12 Router (TP/FT-10 to TP/XF-1250) uses a different cabling scheme that is designed to handle high speed, 1.25Mbps communications. This 1.25Mbps cabling scheme is described in a later section.

---

## *System Performance and Cable Selection - TP/FT-10 Channel*

The system designer may choose a variety of cables, depending on cost, availability, and performance. Currently, Echelon has documented system performance on the cable types shown in tables 3.1 and 3.2. Up to 64 devices may be connected to each channel; one or more Model 42100 LPR-10 Routers may be used to increase the number of devices and cable distance. Network performance specifications assume that the average wire temperature is +55°C, although individual segments of wire may be as hot as +85°C.

The free topology transmission specification includes two components which must both be met for proper system operation. The distance from each LonPoint module, network interface, or third party device to all other devices, and the distance from each LonPoint module, network interface, or third-party device to the Model 44100 Terminator, 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 channel.

**Table 3.1** Free Topology Specifications

	<b><i>Maximum node-to-node distance</i></b>	<b><i>Maximum total wire length</i></b>	<b><i>Wire Diameter AWG/mm</i></b>
Belden 85102	500 meters	500 meters	16AWG/1.3mm
Belden 8471	400 meters	500 meters	16AWG/1.3mm
Level IV, 22AWG	400 meters	500 meters	22AWG/0.65mm
JY (St) Y 2x2x0.8	320 meters	500 meters	20.4AWG/0.8mm
TIA Category 5	250 meters	450 meters	24AWG/0.51mm

If a shielded cable is used, the shield should be connected to earth ground via the termination circuit shown in the LONWORKS FTT-10A Free Topology Transceiver User's Guide, version 5 or later.

Distributors of cable are listed in Echelon's engineering bulletin, *Junction Box and Wiring Guidelines*, part number 005-0023-01.

**Table 3.2** Doubly-Terminated Bus Topology Specifications  
(Requires Two Model 44101 Terminators)

	<i>Maximum bus length</i>	<i>Wire Diameter AWG/mm</i>
Belden 85102	2700 meters	16AWG/1.3mm
Belden 8471	2700 meters	16AWG/1.3mm
Level IV, 22AWG	1400 meters	22AWG/0.65mm
JY (St) Y 2x2x0.8	900 meters	20.4AWG/0.8mm
TIA Category 5	900 meters	24AWG/0.51mm

A doubly-terminated bus may have cable lengths (stubs) of up to 3 meters from the bus to each LonPoint module, network interface, or third-party device.

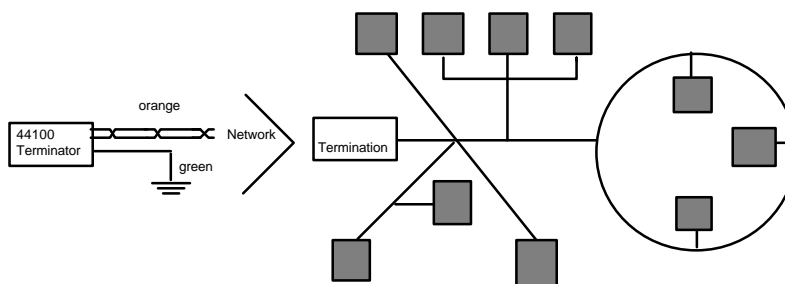
---

## TP/FT-10 Cable Termination

The TP/FT-10 channel must be terminated for proper data transmission performance.

### Free Topology

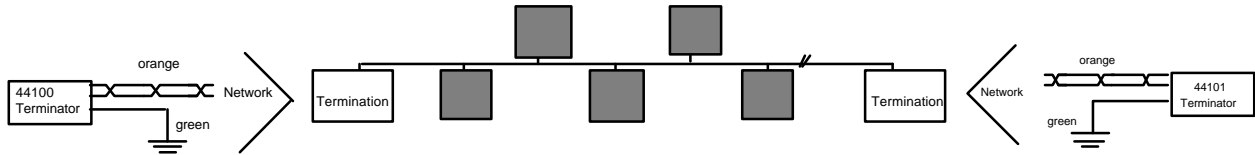
If free topology cabling is used then only one Model 44100 Terminator is required and may be placed anywhere on the free topology segment, as shown in figure 3.6. The Model 44100 Terminator's orange wires should be connected to the twisted pair network. The Terminator's green wire must be connected to earth ground. The green wire must **never** be connected to the shield of a twisted pair cable.



**Figure 3.6** Single Termination for Free Topology (Model 44100 Terminator)

### Doubly Terminated Bus Topology Segment

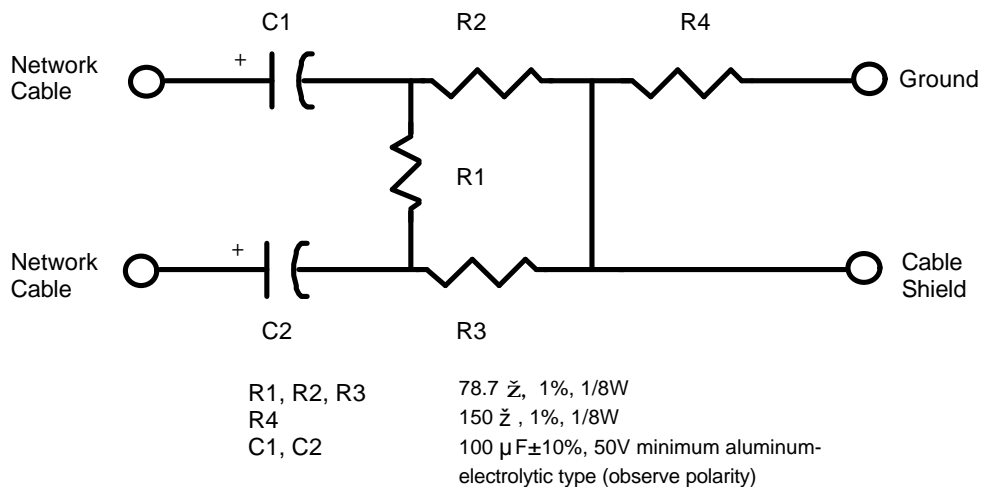
If a doubly-terminated bus topology is used, then two Model 44101 terminators are required, one at each end of the bus, as shown in figure 3.7. The Model 44100 Terminator's orange wires should be connected to the twisted pair network. The Terminator's green wire must be connected to earth ground. The green wire must **never** be connected to the shield of a twisted pair cable.



**Figure 3.7** Double Termination for Bus Topology (Two Model 44101 Terminators)

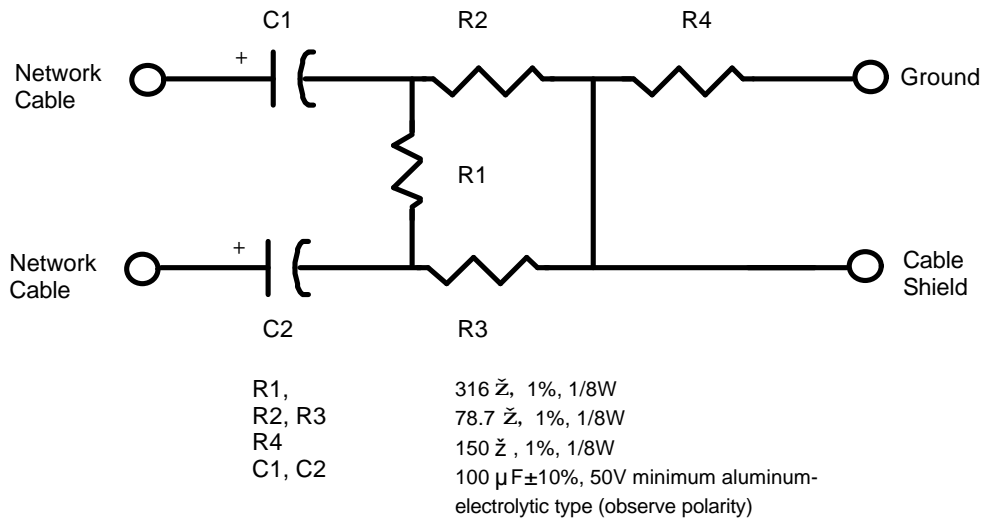
## Terminating Shielded Cables for the TP/FT-10 Channel

Model 44100 and 44101 Terminators are intended for use exclusively with unshielded twisted pair cables and must NOT be used as terminators for shielded cables. If a shielded cable is to be used then special Terminators must be fabricated for both free topology and bus cabling architectures. These special Terminators will ensure the effectiveness of the shield in providing noise immunity in electromagnetically harsh environments. Figure 3.8 presents the schematic for a Free Topology Shielded Cable termination.



**Figure 3.8** Free Topology Network Terminator for use with Shielded Cables (Use only one Terminator.)

Figure 3.9 presents the schematic for a Bus Topology Shielded Cable termination.



**Figure 3.9** Bus Topology Network Terminators for use with Shielded Cables (Two Required)

---

## Network Cabling - TP/XF-1250 Channel

If a high-speed backbone is created using the Model 42102 LPR-12 Routers (TP/FT-10 to TP/XF-1250), then a doubly-terminated bus topology using data grade cable that is intended specifically for this channel must be installed. The TP/XF-1250 channel can be used only with Level IV, 22 AWG (0.65mm) twisted pair cable, and the channel must be terminated at each end with a Model 44200 Terminator (do **NOT** use the Model 44100 or 44101 Terminators.) Suppliers of cable are listed in Echelon's engineering bulletin, *Junction Box and Wiring Guidelines*, part number 005-0023-01, Rev D or higher.

Under no circumstances should smaller gauge Level IV cable be substituted for Level IV, 22 AWG (0.65mm) twisted pair cable. Echelon periodically qualifies new cables for twisted pair transceivers, and it is advisable to check with Echelon from time to time to determine if new cables are available. **DO NOT** attempt to use any other type of cabling, including but not limited to Category 5 data cabling, or improper or erratic operation will result.

A maximum of sixty-four (64) Model 42102 LPR-12 Routers (TP/FT-10 to TP/XF-1250), PC adapters, and other devices can be installed on a backbone channel, with a maximum cable length of 130 meters with a maximum stub length of 1 feet (0.3m). If additional cabling or devices must be installed, then one or more model 42105 LPR-15 (TP/XF-1250 to TP/XF-1250) Routers may be placed in series with the backbone cabling.

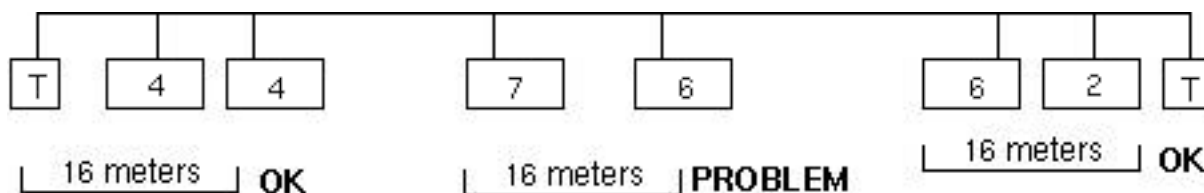
---

### *Distribution Rule for TP/XF-1250 Channel*

Due to the transmission characteristics of the TP/XF-1250 channel, communication failures may result from reflections of the TP/XF-1250 transceiver's 1.25Mbps transmitted signal under conditions where devices are concentrated in one point of cabling. These communication failures are eliminated when devices are used in a

distributed configuration. For this reason, it is essential to follow a simple topology rule when using the TPT/XF-1250 channel.

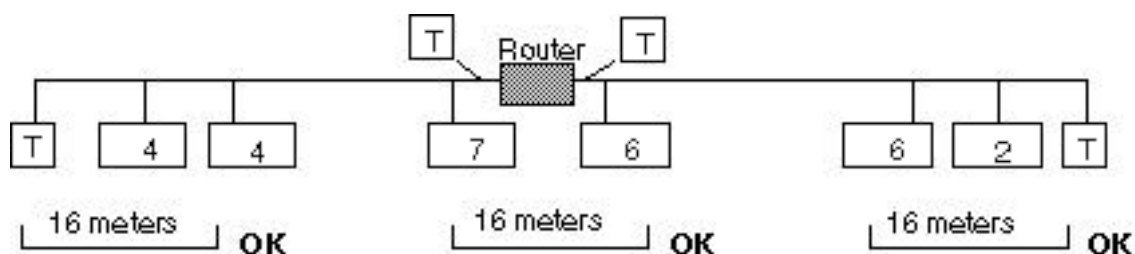
Referred to as the “8-in-16” topology rule, this rule requires that no more than 8 devices be connected to the TP/XF-1250 channel within any 16 meter length of cable. This means that no matter where along the bus the 16 meter measurement is taken, there should be no more than 8 devices. Figure 3.10 provides a diagram of such a measurement technique.



**Figure 3.10** 8-in-16 Topology Rule Example

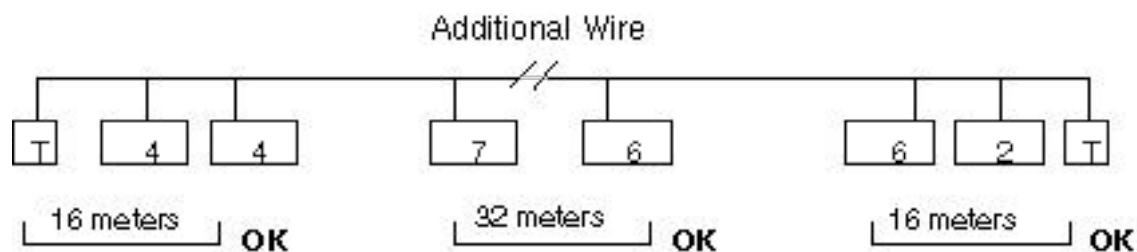
In the example we see an installation with six groups of devices, varying in size from 2 to 7 devices, in a doubly-terminated bus that is terminated with Model 44200 Terminators. By using a 16 meter measurement stick that we can move from side-to-side over the length of the bus, we can determine whether the 8-in-16 rule has been met (designated by the word "OK") or violated (shown by the designation "PROBLEM"). In the case of the PROBLEM area, a total of 13 devices are located within a 16 meter length of the bus, which amounts to five more devices than are permitted under the 8-in-16 rule.

There are two solutions that can be applied to situations in which the 8-in-16 rule has been, or must be, violated by virtue of the installation scenario. The first and simplest remedy is to insert a Model 42105 LPR-15 Router (TP/XF-1250 to TP/XF-1250) and two Model 44200 Terminators in the bus to break the network into two channels (figure 3.11). Since each side of the router comprises a different channel, the bus is effectively split and the nodes divided between two channels.



**Figure 3.11** Using a Router to Meet the 8-in-16 Topology Rule

The second remedy to a violation of the 8-in-16 rule is to add additional cable to the bus such that the rule is no longer violated (figure 3.12). It is important to ensure that the maximum bus length (130 meters of 22AWG/0.65mm Level IV twisted pair) is not exceeded by the additional cable. Due to the complex interactions between the bus and the devices with regard to reflections and transmission line delays, it is not possible to substitute an inductor/capacitor network in lieu of the additional cable to resolve this rule violation.

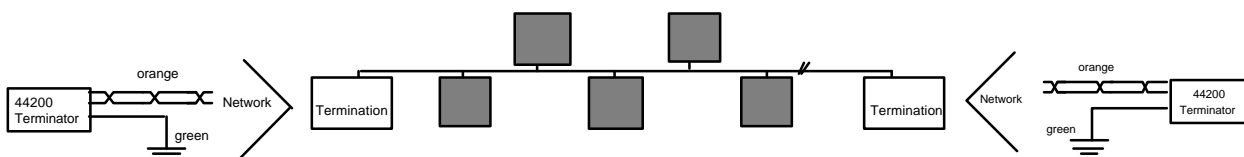


**Figure 3.12** Using Additional Bus Cable to Meet the 8-in-16 Topology Rule

---

### Terminator for TP/XF-1250 Channel

It is necessary to terminate both endpoints of the TP/XF-1250 channel twisted pair bus for proper data transmission performance. Failure to terminate the bus will degrade network performance. Use only the Model 44200 Terminator, and connect it as shown in figure 3.13.



**Figure 3.13** Double Termination for Bus Topology (Two Model 44200 Terminators)

---

## I/O Cabling

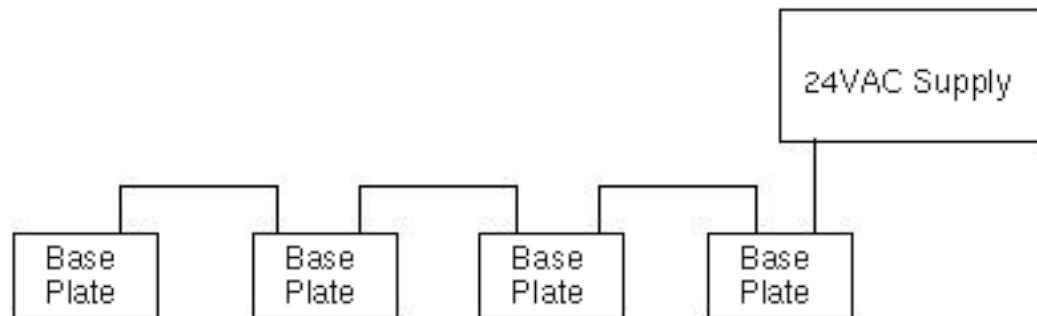
The installer generally has wide latitude in the type of cabling selected for the I/O. It is good practice to ensure that all I/O cabling is made from twisted pair wire, as this has the advantage of minimizing susceptibility to differential noise. If the sensor or actuator requires a shield then a ground will have to be provided in the electrical box since the LonPoint modules are floating and do not include a ground screw connection. Note when selecting the I/O cabling that the Base Plate screw terminals accommodate wire guages from 24AWG/0.5mm to 12AWG/2mm. In all cases, use at least 90°C rated wire.

---

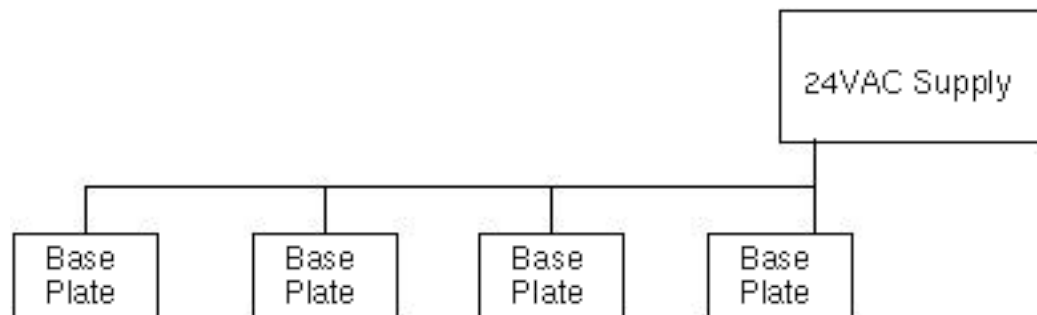
## Power Cabling

It is important to note that a maximum of 16 Amperes RMS at 24VAC RMS can be passed through the internal jumpers on the Power terminals of the Type 1/2 Base Plates, 10 Amperes RMS at 24 VAC RMS for Type 1D/2D DIN Base Plates using Jumper Plugs. This means that if power wiring is looped in and out of the power terminals of the LonPoint Base Plates, the current load presented by all of the LonPoint modules and any other devices powered by that circuit must be 16 Amperes ( 10 Amperes for Type 1D/2D DIN Base Plates using Jumper Plugs), as

shown in figure 3.14. If >16 Amperes (>10 Amperes RMS at 24 VAC RMS for Type 1D/2D DIN Base Plates using Jumper Plugs) must be supplied then the loop-through capability of the LonPoint Base Plate power terminals must not be used and the power cabling should be run in parallel, as shown in figure 3.15. To calculate the load current, divide the total VA (sum of all devices powered by the power supply) by the power supply voltage. For example, if the total VA of all LonPoint Modules and sensors/actuators equals 100VA, and the power supply provides 24 VAC, then the load current is 4.16A.



**Figure 3.14** Looped-through Power Wiring - •16 Amperes at 24VAC for Type 1/2 Base Plates, •10 Amperes for Type 1D/2D DIN Base Plates using Jumper Plugs



**Figure 3.15** Parallel Power Wiring - >16 Amperes at 24VAC for Type 1/2 Base Plates, •10 Amperes for Type 1D/2D DIN Base Plates using Jumper Plugs

As a rule of thumb, it is recommended that power and I/O cabling be separated by 18"/ 46cm to prevent inadvertent pick-up of noise from the power circuit by sensitive analog I/O cabling. Power and network twisted pairs may be combined in a common cable if using an approved network cable.

Depending on the model, the LonPoint modules require between 2 and 6.5VA at an operating voltage of 16 to 30V DC or AC. The LonPoint Type 1/1D and Type 2/2D Base Plates include a power-looping capability that provides continuity through the Base Plate - even if the LonPoint module is removed - when the power cabling is daisy-chained through each Base Plate.



Tables 3.4 and 3.5 present the wire gauge that should be used in order to deliver the specified power (total VA) across the distance shown. These tables only include wire gauges from 24AWG (0.5mm) to 12AWG (2mm) as these are the wire gauges supported by the Base Plate screw terminals. For the supply cabling use at least 24AWG/0.5mm, 90° C rated wire.

To determine the total power that a power cable must carry, total the VA requirements for all of the devices that will be drawing power from that cable, including both LonPoint modules and other devices. The VA ratings for the LonPoint Modules are shown in the module data sheets and are summarized in the following table.

**Table 3.3** VA Ratings for LonPoint Modules

LonPoint Module	VA Rating
DI-10	2.2VA
DO-10	6.5VA
DIO-10	4.75VA
AI-10 (all modes except 2-wire mode)	2.1VA
AI-10 (2-wire mode)	4.5VA
AO-10	4.5VA
SCH-10	2.4VA
LPR	2.0VA

To determine what gauge cable (in AWG or metric) will be required based on the total distance of the power cabling, refer to table 3.4 for cabling measured in AWG and table 3.4 for cabling measured in mm. If the wire gauge used is smaller than required, improper operation of one of more modules will result. All data in tables 3.4 and 3.5 assume an average wire temperature of +55°C.

**Table 3.4** Power Cabling Requirements in AWG

Feet	Meters	Load (VA)												AWG
		10	15	20	25	30	40	55	75	100	130	180	200	
35	10.7	22	22	22	22	22	22	22	22	22	22	22	22	22
40	12.2	22	22	22	22	22	22	22	22	22	22	22	22	20
55	16.8	22	22	22	22	22	22	22	22	22	22	20	20	20
65	19.8	22	22	22	22	22	22	22	22	22	20	20	18	18
70	21.3	22	22	22	22	22	22	22	22	22	20	18	18	18
75	22.9	22	22	22	22	22	22	22	22	22	20	18	18	18
90	27.4	22	22	22	22	22	22	22	22	20	20	18	18	18
100	30.5	22	22	22	22	22	22	22	22	20	18	18	16	16
105	32.0	22	22	22	22	22	22	22	20	20	18	18	16	16
115	35.1	22	22	22	22	22	22	22	20	20	18	16	16	16
135	41.1	22	22	22	22	22	22	22	20	18	18	16	16	16
145	44.2	22	22	22	22	22	22	20	20	18	18	16	16	16
150	45.7	22	22	22	22	22	22	20	20	18	16	16	16	16

155	47.2	22	22	22	22	22	22	20	20	18	16	16	14
165	50.3	22	22	22	22	22	22	20	18	18	16	16	14

**Table 3.4** Power Cabling Requirements in AWG (continued)

Feet	Meters	Load (VA)											
		10	15	20	25	30	40	55	75	100	130	180	200
185	56.4	22	22	22	22	22	22	20	18	18	16	14	14
215	65.5	22	22	22	22	22	20	20	18	16	16	14	14
230	70.1	22	22	22	22	22	20	18	18	16	16	14	14
235	71.6	22	22	22	22	22	20	18	18	16	14	14	14
250	76.2	22	22	22	22	22	20	18	18	16	14	14	12
265	80.8	22	22	22	22	20	20	18	16	16	14	14	12
295	89.9	22	22	22	22	20	20	18	16	16	14	12	12
300	91.4	22	22	22	22	20	18	18	16	16	14	12	12
340	103.6	22	22	22	20	20	18	18	16	14	14	12	12
365	111.3	22	22	22	20	20	18	16	16	14	14	12	12
375	114.3	22	22	22	20	20	18	16	16	14	12	12	12
395	120.4	22	22	20	20	20	18	16	16	14	12	12	
400	121.9	22	22	20	20	18	18	16	16	14	12	12	
420	128.0	22	22	20	20	18	18	16	14	14	12	12	
470	143.3	22	22	20	20	18	18	16	14	14	12		
475	144.8	22	22	20	20	18	16	16	14	14	12		
500	152.4	22	22	20	18	18	16	16	14	12	12		
545	166.1	22	20	20	18	18	16	16	14	12	12		
580	176.8	22	20	20	18	18	16	14	14	12	12		
595	181.4	22	20	20	18	18	16	14	14	12			
630	192.0	22	20	18	18	18	16	14	14	12			
635	193.5	22	20	18	18	16	16	14	14	12			
750	228.6	22	20	18	18	16	16	14	12	12			
755	230.1	20	20	18	18	16	14	14	12	12			
795	242.3	20	20	18	16	16	14	14	12				
865	263.7	20	18	18	16	16	14	14	12				
945	288.0	20	18	18	16	16	14	12	12				
1000	304.8	20	18	16	16	16	14	12	12				
1010	307.8	20	18	16	16	14	14	12	12				
1190	362.7	20	18	16	16	14	14	12					
1200	365.8	18	18	16	16	14	12	12					
1260	384.0	18	18	16	14	14	12	12					
1375	419.1	18	16	16	14	14	12	12					
1500	457.2	18	16	16	14	14	12						
1590	484.6	18	16	14	14	14	12						
1645	501.4	18	16	14	14	12	12						

AWG

**Table 3.5 Power Cabling Requirements In mm**

Feet	Meters	Load (VA)											
		10	15	20	25	30	40	55	75	100	130	180	200
23.0	7	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
32.8	10	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.65
36.1	11	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.65
42.7	13	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.80
45.9	14	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.80
55.8	17	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.65	0.80
59.1	18	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.65	1.00
62.3	19	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.65	0.80	1.00
75.5	23	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.65	0.80	1.00
82.0	25	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.80	0.80	1.00
88.6	27	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.65	0.80	0.80	1.00
91.9	28	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.65	0.80	1.00	1.00
101.7	31	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.65	0.80	1.00	1.30
114.8	35	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.65	0.80	0.80	1.00	1.30
141.1	43	0.50	0.50	0.50	0.50	0.50	0.65	0.65	0.80	0.80	1.00	1.00	1.30
150.9	46	0.50	0.50	0.50	0.50	0.50	0.65	0.80	0.80	0.80	1.00	1.30	1.30
154.2	47	0.50	0.50	0.50	0.50	0.65	0.65	0.80	0.80	0.80	1.00	1.30	1.30
170.6	52	0.50	0.50	0.50	0.50	0.65	0.65	0.80	1.00	1.00	1.00	1.30	1.60
183.7	56	0.50	0.50	0.50	0.50	0.65	0.65	0.80	1.00	1.00	1.00	1.30	1.60
193.6	59	0.50	0.50	0.50	0.65	0.65	0.65	0.80	1.00	1.00	1.30	1.30	1.60
213.3	65	0.50	0.50	0.50	0.65	0.65	0.80	0.80	1.00	1.00	1.30	1.30	1.60
229.7	70	0.50	0.50	0.50	0.65	0.65	0.80	1.00	1.00	1.00	1.30	1.30	1.60
232.9	71	0.50	0.50	0.65	0.65	0.65	0.80	1.00	1.00	1.00	1.30	1.30	1.60
239.5	73	0.50	0.50	0.65	0.65	0.65	0.80	1.00	1.00	1.00	1.30	1.30	1.60
242.8	74	0.50	0.50	0.65	0.65	0.65	0.80	1.00	1.00	1.00	1.30	1.60	2.00
259.2	79	0.50	0.50	0.65	0.65	0.65	0.80	1.00	1.00	1.30	1.30	1.60	2.00
292.0	89	0.50	0.50	0.65	0.65	0.80	0.80	1.00	1.00	1.30	1.30	1.60	2.00
305.1	93	0.50	0.50	0.65	0.65	0.80	1.00	1.00	1.00	1.30	1.30	1.60	2.00
308.4	94	0.50	0.65	0.65	0.65	0.80	1.00	1.00	1.00	1.30	1.30	1.60	2.00
334.6	102	0.50	0.65	0.65	0.80	0.80	1.00	1.00	1.00	1.30	1.60	1.60	2.00
360.9	110	0.50	0.65	0.65	0.80	0.80	1.00	1.00	1.30	1.30	1.60	1.60	2.00
387.1	118	0.50	0.65	0.65	0.80	0.80	1.00	1.00	1.30	1.30	1.60	2.00	2.00
390.4	119	0.50	0.65	0.80	0.80	0.80	1.00	1.00	1.30	1.30	1.60	2.00	2.00
400.3	122	0.50	0.65	0.80	0.80	1.00	1.00	1.00	1.30	1.30	1.60	2.00	2.00
413.4	126	0.50	0.65	0.80	0.80	1.00	1.00	1.00	1.30	1.30	1.60	2.00	2.00
459.3	140	0.50	0.65	0.80	0.80	1.00	1.00	1.00	1.30	1.60	1.60	2.00	2.00
469.2	143	0.65	0.65	0.80	0.80	1.00	1.00	1.30	1.30	1.60	1.60	2.00	2.00
518.4	158	0.65	0.65	0.80	1.00	1.00	1.00	1.30	1.30	1.60	1.60	2.00	2.00

mm

**Table 3.5 Power Cabling Requirements In mm (continued)**

Feet	Meters	Load (VA)											
		10	15	20	25	30	40	55	75	100	130	180	200
554.5	169	0.65	0.80	0.80	1.00	1.00	1.30	1.30	1.60	2.00	2.00		
564.3	172	0.65	0.80	0.80	1.00	1.00	1.30	1.30	1.60	2.00			
587.3	179	0.65	0.80	0.80	1.00	1.00	1.30	1.60	1.60	2.00			
613.5	187	0.65	0.80	1.00	1.00	1.00	1.30	1.60	1.60	2.00			
626.6	191	0.65	0.80	1.00	1.00	1.30	1.30	1.60	1.60	2.00			
721.8	220	0.65	0.80	1.00	1.00	1.30	1.30	1.60	2.00	2.00			
734.9	224	0.65	0.80	1.00	1.00	1.30	1.30	1.60	2.00				
777.6	237	0.65	0.80	1.00	1.30	1.30	1.30	1.60	2.00				
784.1	239	0.80	0.80	1.00	1.30	1.30	1.60	1.60	2.00				
856.3	261	0.80	1.00	1.00	1.30	1.30	1.60	1.60	2.00				
918.6	280	0.80	1.00	1.00	1.30	1.30	1.60	2.00	2.00				
961.3	293	0.80	1.00	1.30	1.30	1.30	1.60	2.00	2.00				
1036.7	316	0.80	1.00	1.30	1.30	1.30	1.60	2.00					
1177.8	359	0.80	1.00	1.30	1.30	1.60	1.60	2.00					
1227.0	374	1.00	1.00	1.30	1.30	1.60	2.00	2.00					
1243.4	379	1.00	1.30	1.30	1.30	1.60	2.00	2.00					
1312.3	400	1.00	1.30	1.30	1.60	1.60	2.00	2.00					
1555.1	474	1.00	1.30	1.30	1.60	1.60	2.00						
1571.5	479	1.00	1.30	1.60	1.60	1.60	2.00						
1640.4	500	1.00	1.30	1.60	1.60	2.00	2.00						

mm

# 4

## Installation and Wiring of Base Plates

This chapter describes the process of installing LonPoint Base Plates.

Type 1 Base Plates are used for mounting LonPoint Interface and Scheduler Modules to 4-inch square electrical boxes or Echelon's Eurobox. Type 1D DIN Rail Base Plates are used for mounting LonPoint Interface and Scheduler Modules to 35mm DIN rails (CENELEC EN 50022) or to walls or panels.

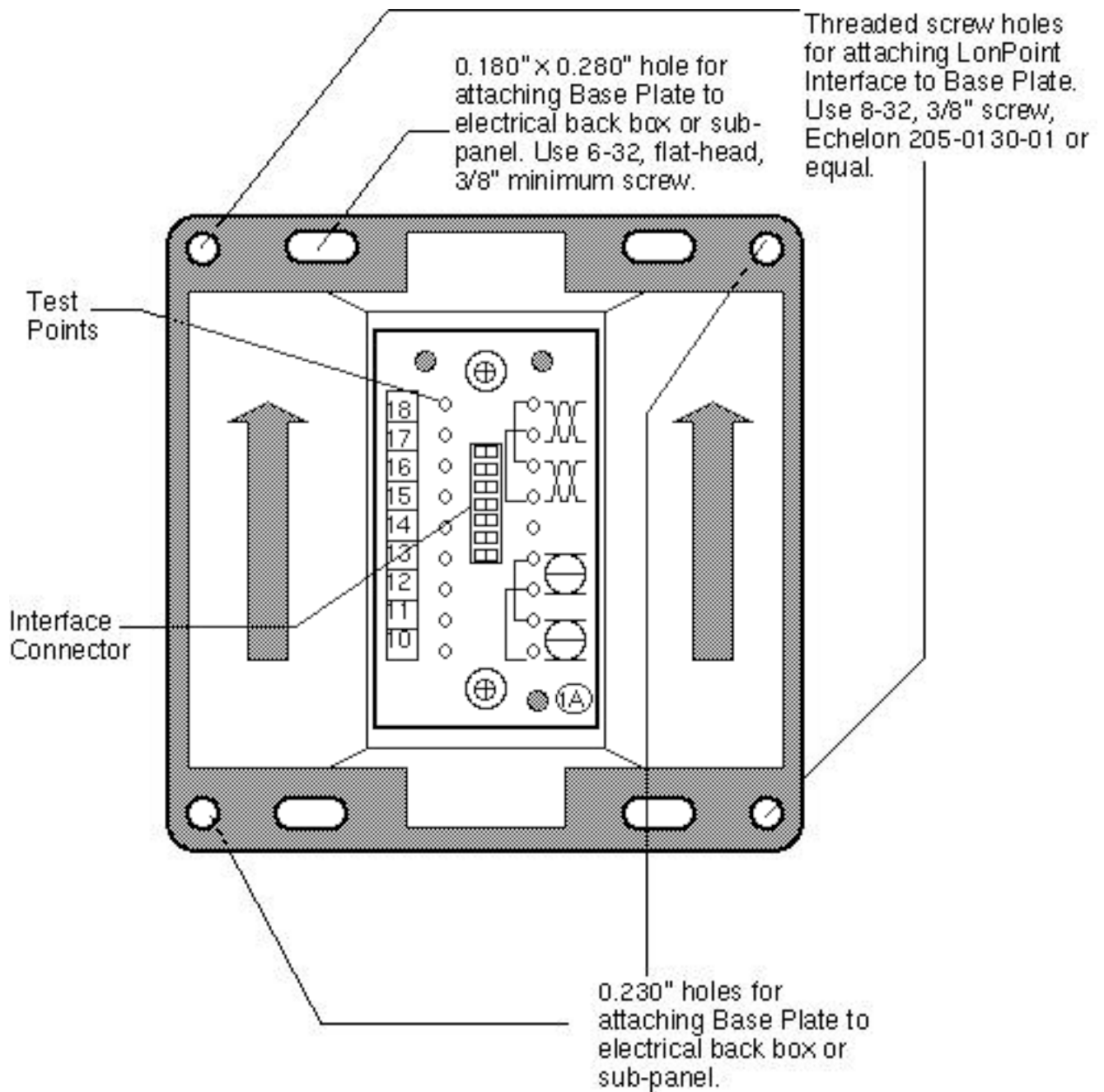
Type 2 Base Plates are used for mounting LonPoint LPR Router Modules to 4-inch square electrical boxes or Echelon's Eurobox. Type 2D DIN Rail Base Plates are used for mounting LonPoint LPR Router Modules to 35mm DIN rails or to walls or panels.

---

## LonPoint Type 1 Base Plate Installation

Figure 4.1 presents a detailed view of the front side of the base plate. The circuit board inside the Type 1 Base Plate includes a large number “1A” in the lower right corner, as viewed from the front of the base plate, designating it as a Type 1 Base Plate with a Revision A circuit board. The “1A” designation indicates compatibility with LonPoint modules such as the DIO-10, that make use of screw terminal 14. Screw terminal 14 is **NOT** connected on older base plates marked “1”.

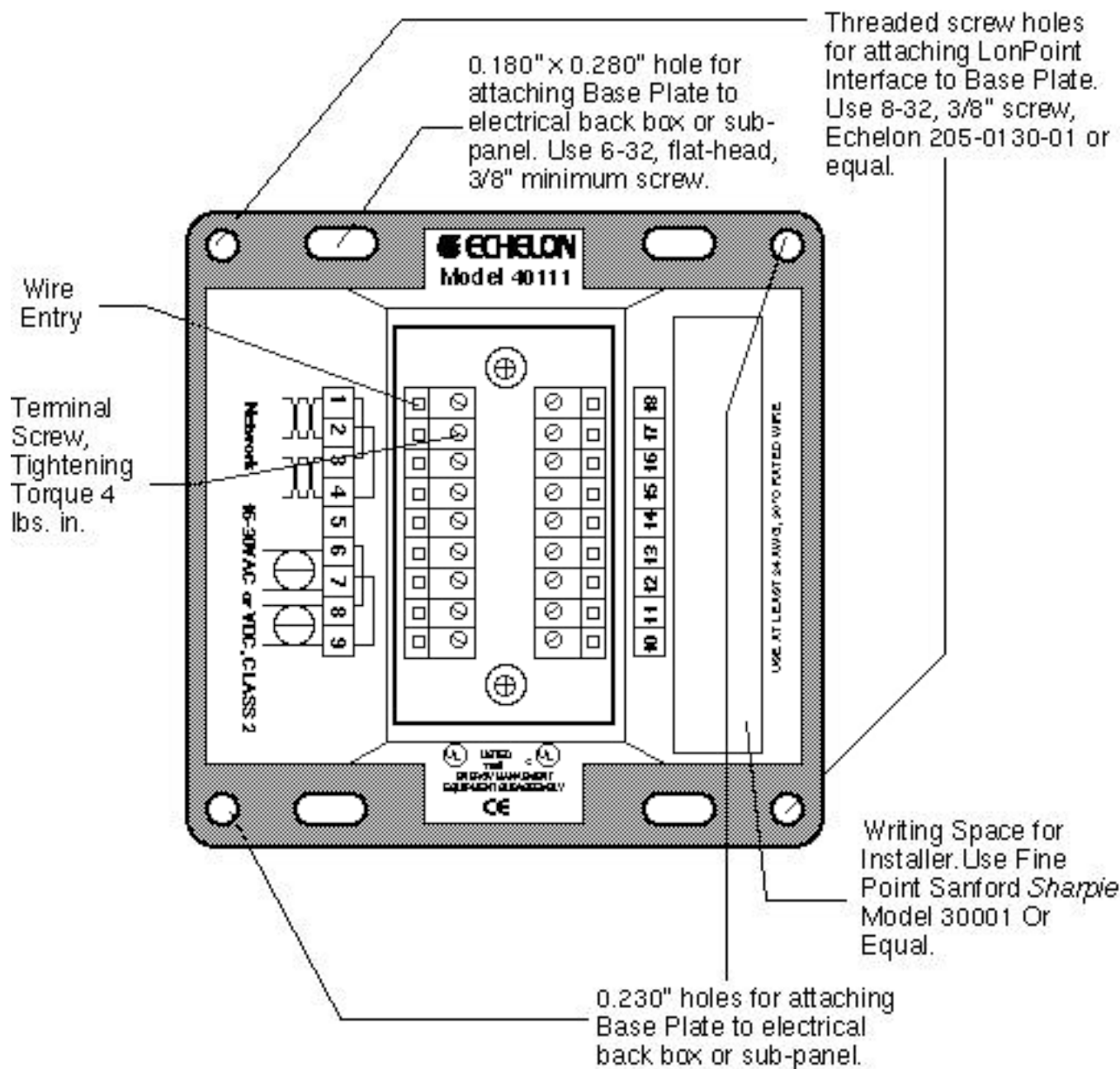
Test points are provided on the circuit board for measuring all of the wiring connections. Symbols are silk-screened on the PCB to identify the functions of the test points.



**Figure 4.1** LonPoint Type 1 Base Plate - Front Panel

Figure 4.2 shows a detailed view of the rear side of the base plate, the side to which

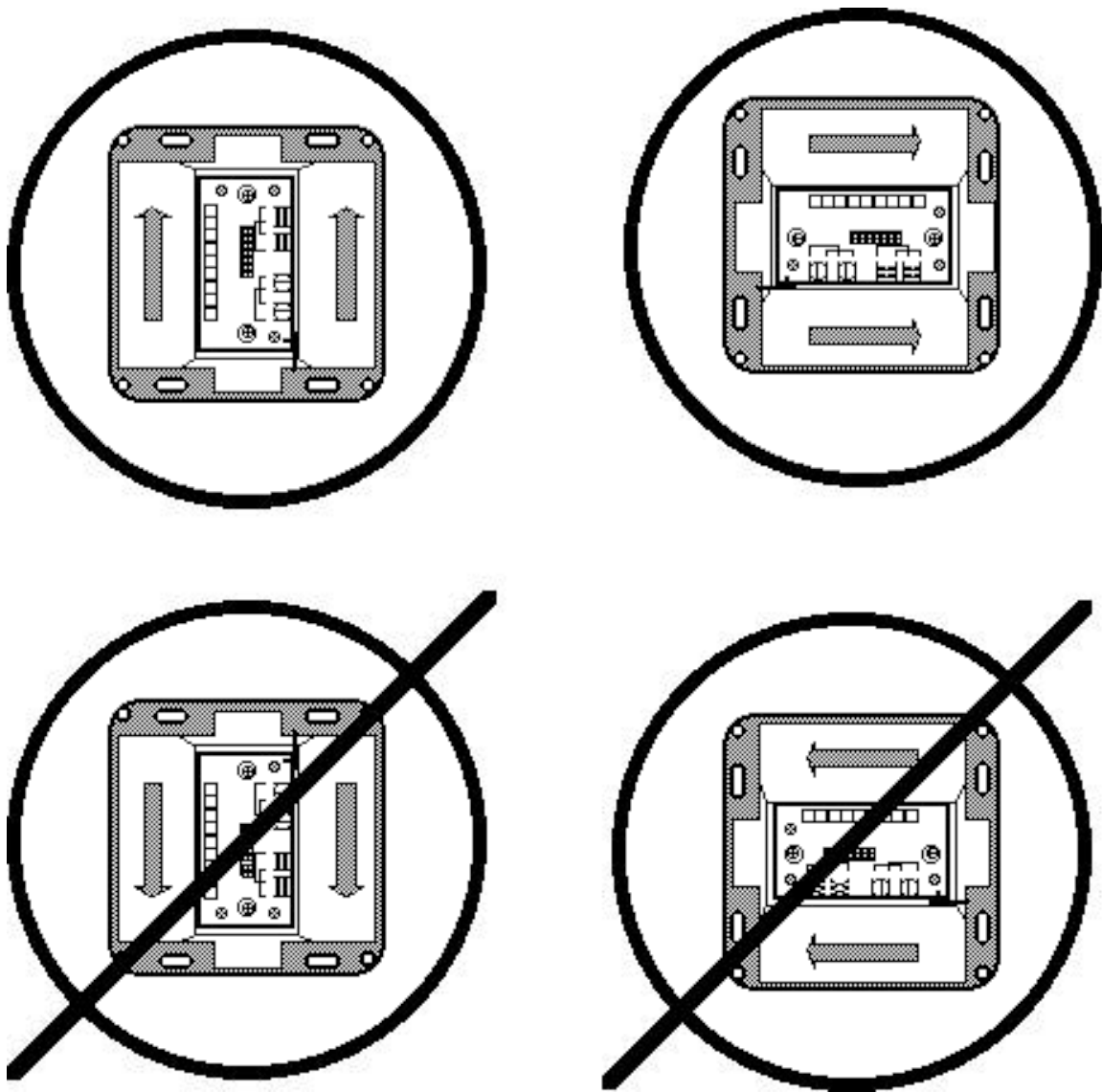
wiring connections are made.



**Figure 4.2** LonPoint Type 1 Base Plate - Rear Wiring Panel

As shown in figure 4.3, the Type 1 Base Plate is intended to be installed in an electrical box either vertically (base plate interior arrows pointing up) or rotated clockwise 90° (base plate interior arrows pointing to the right). These two orientations provide optimal viewing of the front panel legends of an installed LonPoint module, and also accommodate different methods of installing electrical boxes.





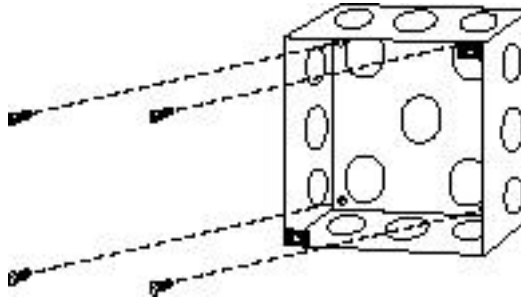
**Figure 4.3** LonPoint Type 1 Base Plate Mounting Orientations

---

### *Installing A Compatible Electrical Box*

Compatible electrical boxes that will accept a Type 1 Base Plate include a 4" square electrical enclosure (Raco model No. 232, 236, 7232, 7054 or equal), two-gang PVC switch box (Raco 7834 or equal), and Echelon's Model 48001 EuroBox for wall or electrical box applications.

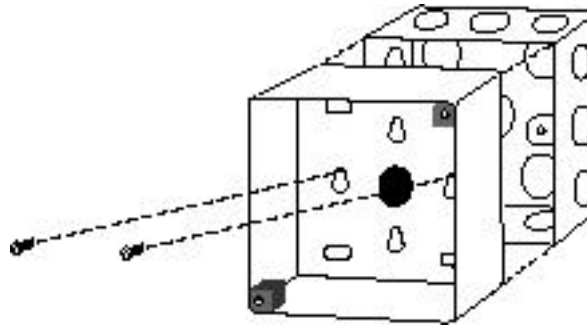
A 4" square electrical enclosures should be either affixed to a wall or to equipment using suitable mounting screws, or recessed using a suitable mounting clamp (figure 4.4). Due to variations in the location of knock-outs, care must be taken to ensure that 3/4" conduit fittings do not interfere with the Base Plate when it is installed in the electrical box; 1/2" conduit fittings have not been found to cause an interference problem.



**Figure 4.4** 4" Square Electrical Box Mounting

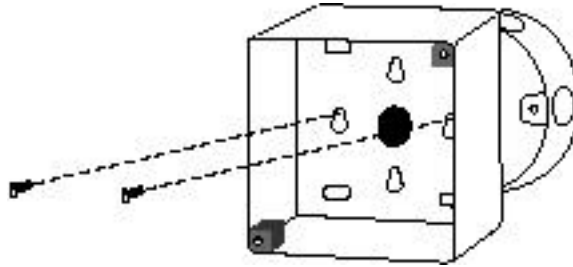
There are four mounting options if Echelon's EuroBox is used. The Eurobox requires the installer to drill cabling holes: ensure that suitable holes are drilled **prior** to mounting. In order to avoid interference with the Base Plate enclosure walls, all glands and conduit fittings must be located within 1.4"/35cm of the bottom of the box (as measured from the outside of the box). Wire glands and conduit fittings must not extend more than 0.63"/16mm into the EuroBox in order to prevent associated cabling from interfering with the Base Plate screw terminals.

For UK applications, a second mounting option is to affix the EuroBox to a single gang 25mm BS4662 flush mounting box (MK 866ZIC or similar). Two keyhole slots are provided in the EuroBox to accommodate the flush mounting box as shown in figure 4.5. Use screws with flush mounting and ensure that suitable cabling holes are drilled in the Eurobox prior to mounting, as discussed above.



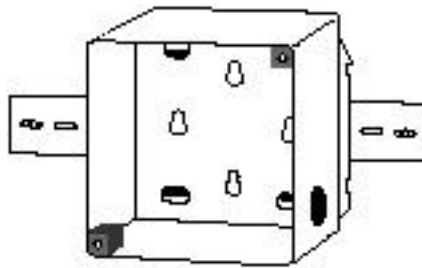
**Figure 4.5** MK Electrical Box Mounting the EuroBox

For continental applications, a third mounting option is to affix the EuroBox to a recessed 6.5cm diameter plastic DIN box (Kaiser or equal). Two keyhole slots are provided in the EuroBox to accommodate DIN box mounting, as shown in figure 4.6. Use the screws provided with the DIN box and ensure that suitable cabling holes are drilled in the EuroBox prior to mounting.



**Figure 4.6** DIN Box Mounting the EuroBox

A fourth mounting option is to affix the EuroBox to 35mm DIN rail using DIN Clips (one pair included). Two sets of rectangular slots are provided for the DIN clips. Ensure that the clips provided with each EuroBox lock in place on the box and then snap them onto the DIN rail (figure 4.7). Ensure that suitable cabling holes are drilled in the EuroBox prior to mounting.



**Figure 4.7** DIN Rail Mounting the EuroBox



The Type 1D DIN Base Plate offers a lower profile and easier access to wiring terminals for DIN rail applications.

---

## Connecting Wiring

Route network, power, and input/output cabling into the electrical enclosure using suitable conduit fittings, bushings, or wire glands. It is good practice to separate the input/output cabling as much as possible from the network and power cabling, especially if low level analog signals are being supervised. Once the cabling has been brought into the electrical enclosure, leave a service loop of 6 inches (15cm) of cable to simplify wiring the Type 1 Base Plate. Dress the cables using tie wraps or tape to ensure that the cabling is not compressed or caught when the base plate is screwed into place.

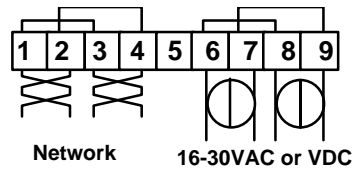
Strip the cable jacket and wire conductors. The base plate screw terminals will accept 26AWG (0.4mm) to 12AWG (2.2mm) wire, which should be stripped to a length of 0.32" (8mm). Although not required, it may be useful to use a soldering iron to tin the stripped lengths of any stranded wires to prevent fraying and inadvertent contact with adjacent terminals. The screw terminal blocks on the real panel of the Type 1 Base Plate are color coded to simplify wiring. The color coding scheme is shown in table 4.1. The optimum tightening torque for the Type 1 Base Plate screw terminals is 4 lbs. in. (0.5Nm) maximum. The ideal flathead screwdriver tip width is 0.125" (3mm).

**Table 4.1** Type 1 Base Plate Terminal Block Color Coding\*

<b>Terminal Number</b>	<b>Terminal Color</b>	<b>Function</b>
1 - 4	Orange	Network
5	Orange	Cable shield, if used
6 - 9	Black	Power
10 - 18	Green	I/O

\* In beta release Type 1 Base Plates, terminals 5 and 14 were connected together but not connected to any I/O. In Type 1 Base Plate marked 1A, terminal 5 is floating and may be used to connect cable shield wires; terminal 14 is reserved for I/O.

Two sets of screw terminals are provided for both the power and network wiring connections. These connections are internally jumpered on the Type 1 Base Plate PCB to provide continuity of the network and power wiring, even if no LonPoint module is installed, as shown figure 4.8. This feature permits the base plate wiring to be pre-installed and the network and power circuits checked for continuity throughout the installation, before a single LonPoint module is ever installed. This feature also prevents network and power interruptions as a result of hot-swapping LonPoint modules during commissioning or service operations. Finally, providing two sets of screw terminals permits incoming and outgoing wiring to be landed at separate screw terminals without the need to insert more than one wire in any given screw terminal.



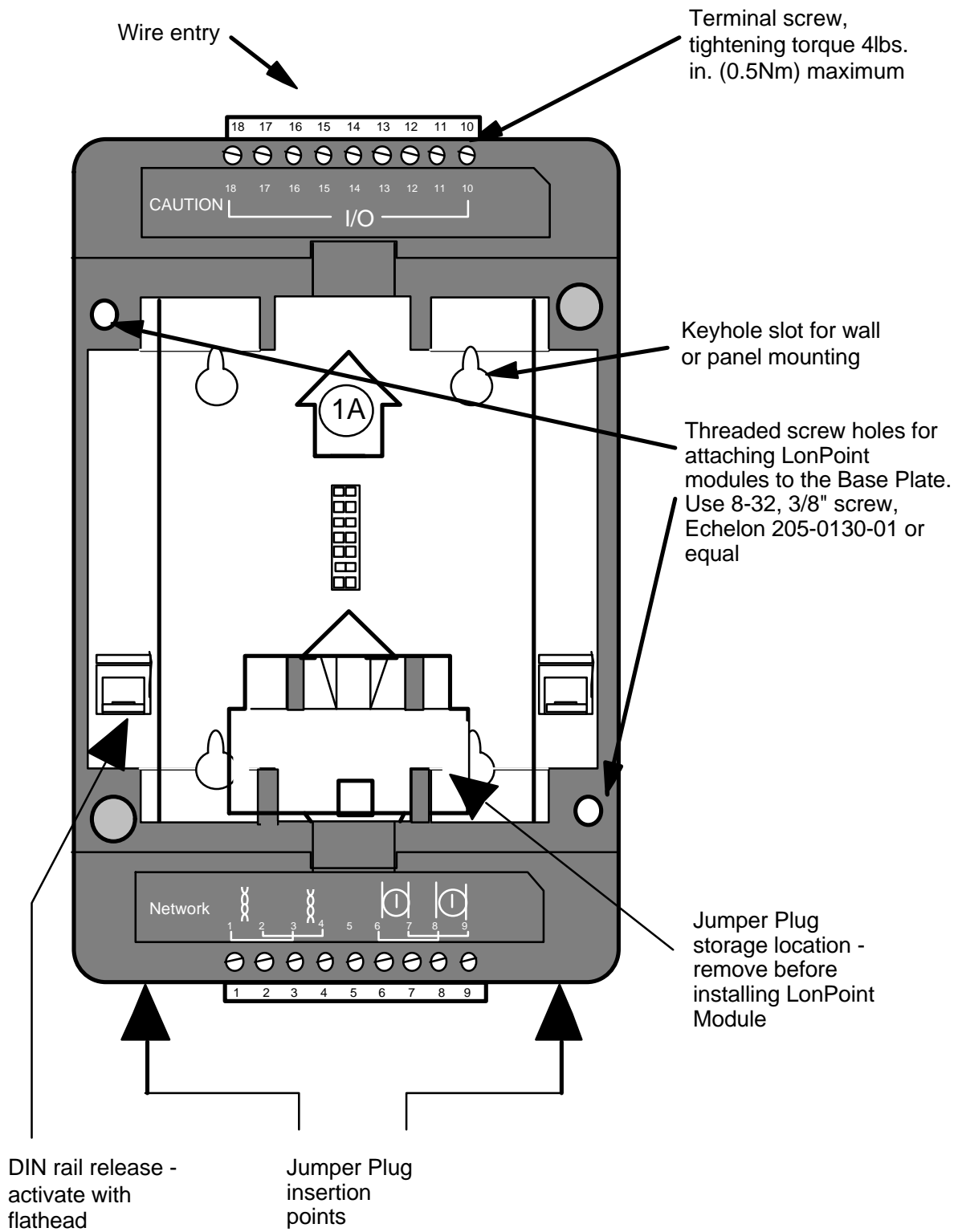
**Figure 4.8** Base Plate Power and Network Wiring Connections

See chapters 5 through 9 for specific I/O wiring connections.

---

## LonPoint Type 1D DIN Base Plate Installation

Figure 4.9 presents a detailed view of the front side of the base plate. The circuit board inside the Type 1D DIN Base Plate includes an arrow with the designation "1A," designating it as a Type 1 Base Plate with a Revision A circuit board. The 1D Base Plate is intended to be installed either on a 35mm DIN rail, or using the integral keyhole slots, on a wall or panel. Two arrows indicates the vertical orientation of the Base Plate that will provide the best viewing of the front panel legends.



**Figure 4.9** Front Side of Type 1D DIN Base Plate

The base plate contains two integral DIN rail tabs that securely grab a 35mm DIN rail onto which the base plate is mounted. The base plate may be used on both 35mm x 7.5mm and 35mm x 15mm DIN rails. To release the Base Plate from the DIN rail, sequentially insert a flathead screwdriver into the DIN rail release tabs and gently pull away from the DIN rail (figure 4.10).

Four keyhole slots are provided for affixing the Type 1D DIN Base Plate to a wall or panel (figure 4.11).

The 1D Base Plate is supplied with a jumper plug that connects the power and network connections between adjacent base plates. The Jumper Plug is shipped inserted into the main cavity of the Base Plate, and can be removed by gently pulling the plug handle in the direction of the mounting arrow. The Jumper Plug **must** be removed before a LonPoint module can be inserted into the Base Plate.

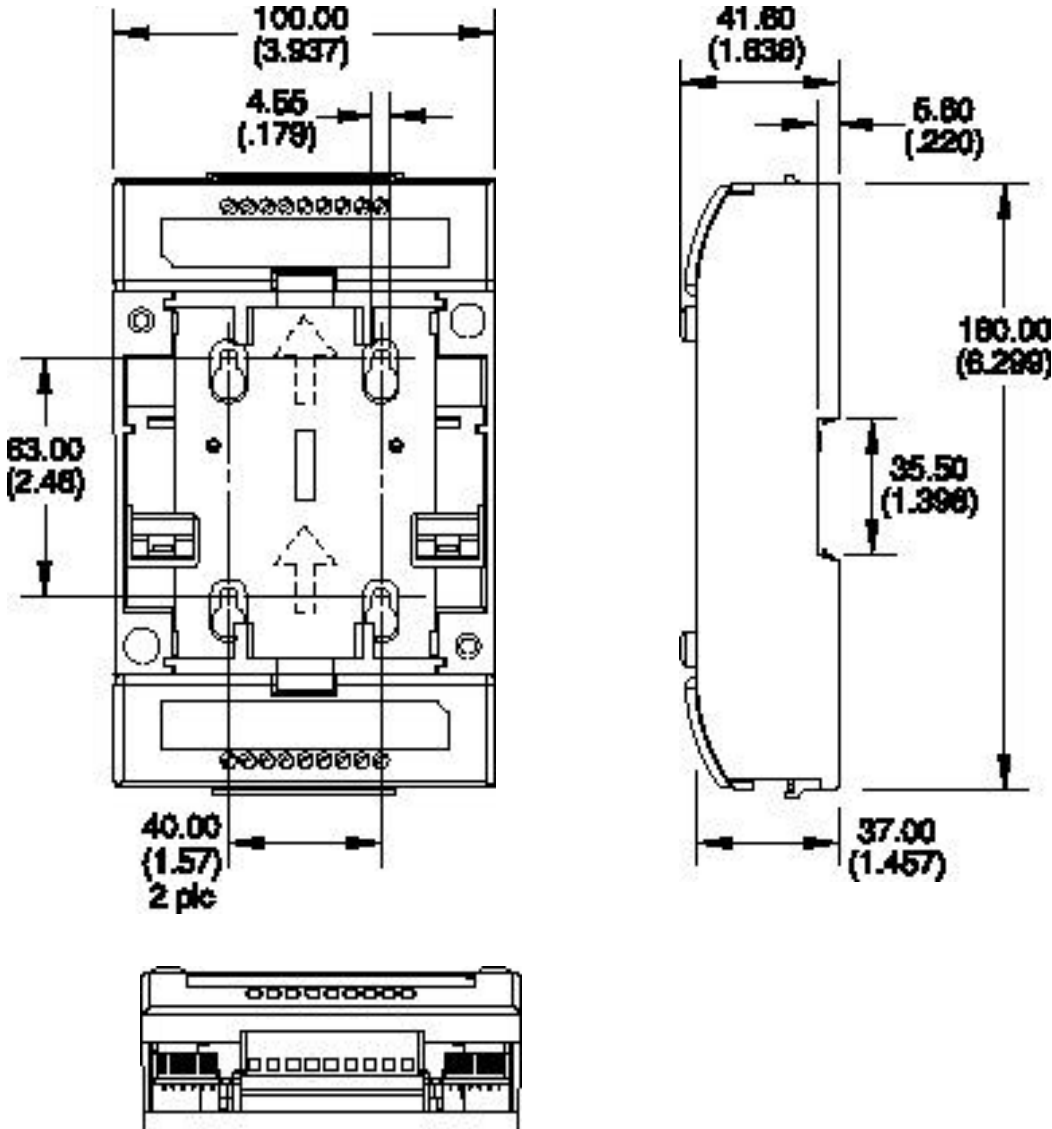
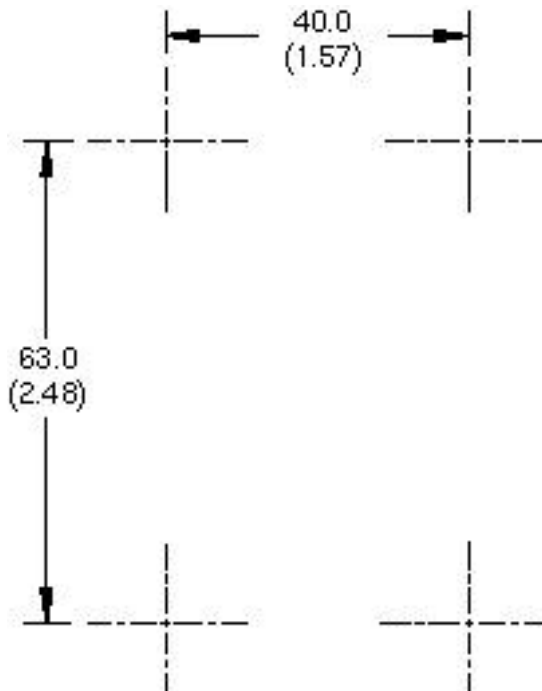


Figure 4.10 DIN Rail Base Plate Dimensions (Dimensions are in mm (inches).)



**Figure 4.11** Mounting Hole Pattern Dimensions for Type1D Base Plates

---

## Connecting Wiring

Route all network, power, and input/output cabling to the pertinent screw terminals located at the top and bottom of the Base Plate. It is good practice to separate the input/output cabling as much as possible from the network and power cabling, especially if low-level analog signals are being supervised.

Strip the cable jacket and wire conductors. The base plate screw terminals will accept 24AWG (0.5mm) to 12AWG(2.2mm) wire, which should be stripped to a length of 0.32" (8mm). Although not required, it may be useful to use a soldering iron to tin the stripped lengths of any strand wired to prevent fraying and inadvertent contact with adjacent terminals. Identifying screw terminal numbers are conveniently located both above and below each screw terminal. Symbols and/or language identifying the function of the screw terminals also are provided.



Note that terminals 1 and 9 are numbered from left to right, but terminals 10 to 18 are numbered from right to left.

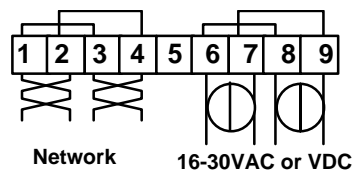
The optimum tightening torque for the screw terminals is approximately 4 pounds (0.5Nm). The ideal flathead screwdriver tip width is 3/32" (2.5mm).



**Table 4.2** Type 1D Base Plate Terminal Block Connections

<b>Terminal Number</b>	<b>Function</b>
1 -4	Network
5	Cable shield, if used
6 - 9	Power
10 - 18	I/O

Two sets of screws are provided for both the power and network wiring connections. These connections are internally jumpered on the Type 1D Base Plate PCB to provide continuity of the network and power wiring, even if no LonPoint module is installed, as shown in figure 4.12. This feature permits the base plate wiring to be pre-installed and the network and power circuits checked for continuity throughout the installation, before a single LonPoint module is ever installed. This feature also prevents network and power interruptions as a result of hot swapping LonPoint modules during commissioning or service operations. Finally, providing two sets of screw terminals permits incoming and outgoing wiring to be landed at separate screw terminals without the need to insert more than one wire in any given screw terminal.



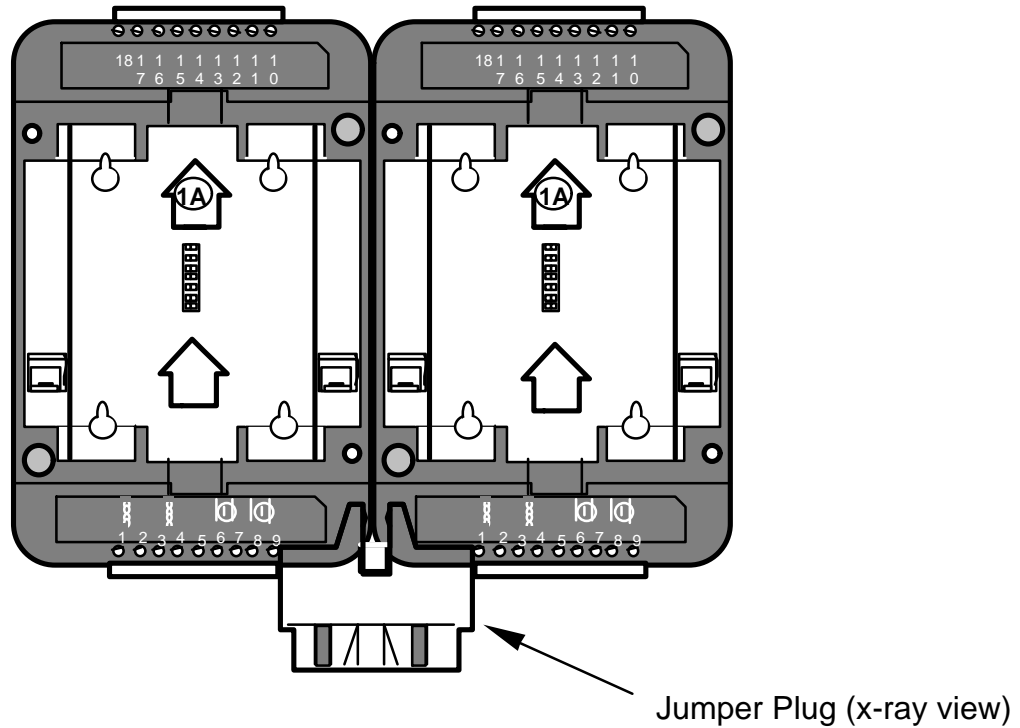
**Figure 4.12** Base Plate Power and Network Wiring Connections

---

### *Connecting the Jumper Plug(s)*

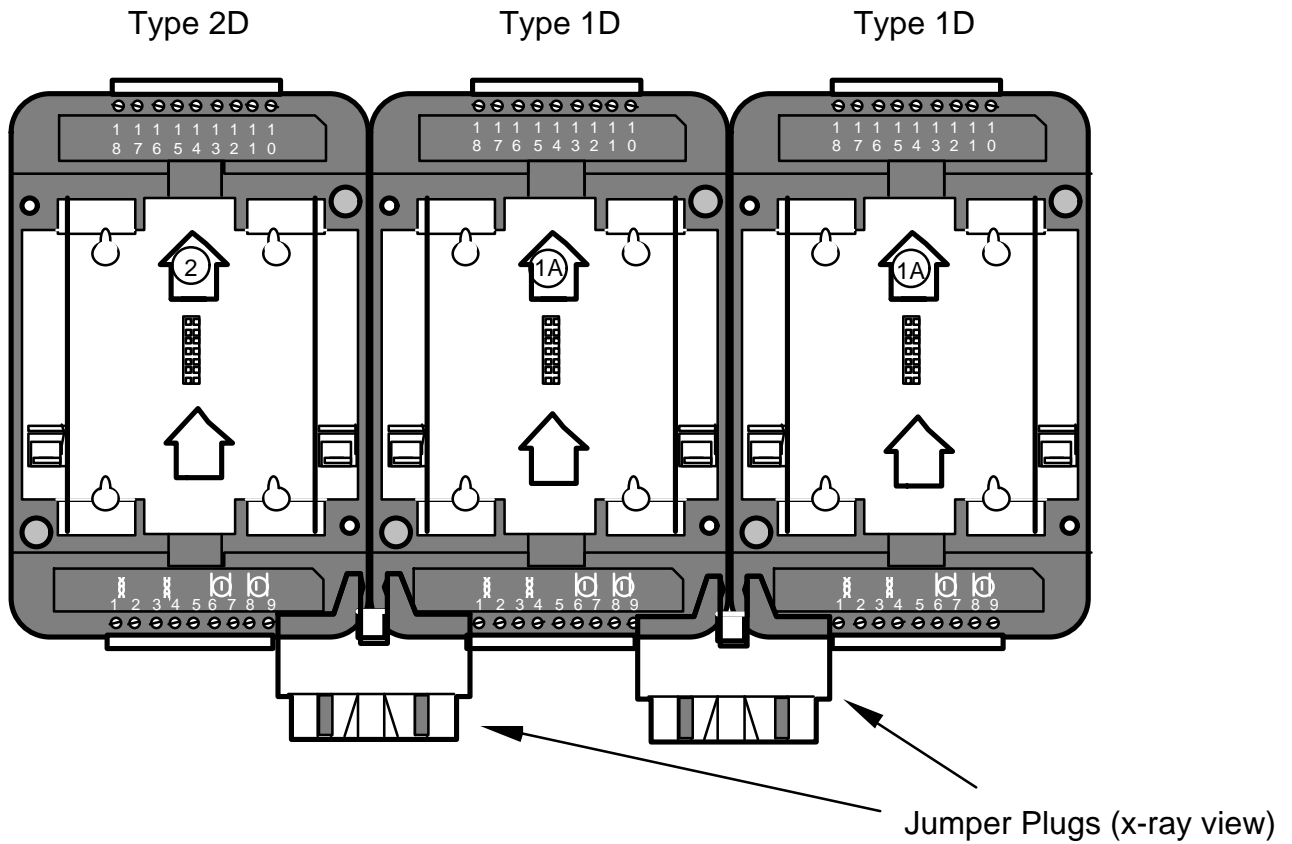
From time to time it may be necessary to mount two or more LonPoint Type 1D or 2D Base Plates adjacent to one another. In these instances, power and network wiring must be daisy-chained between each Base Plate. Routing power and network wiring between multiple base plates can be a laborious and time consuming task, and there is always the risk of a wiring error. For this reason, the Type 1D and 2D Base Plates are each supplied with a Jumper Plug and Jumper Plug connectors which simply and easily bus the power and network between adjacent Base Plates.

The Jumper Plug connectors are located on either side of the terminal block with connections 1 to 9. The Jumper Plug connectors are wired in parallel with the network and power connections on the screw terminals. When two Base Plates are mounted adjacent to each other, with the mounting arrows pointing in the same direction, the Jumper Plug connectors will be aligned such that a Jumper Plug may be inserted into the two connectors, thus bridging power and network between the two Base Plates (figure 4.13).



**Figure 4.13** Mounting Two Base Plates with Jumper Plug Connectors

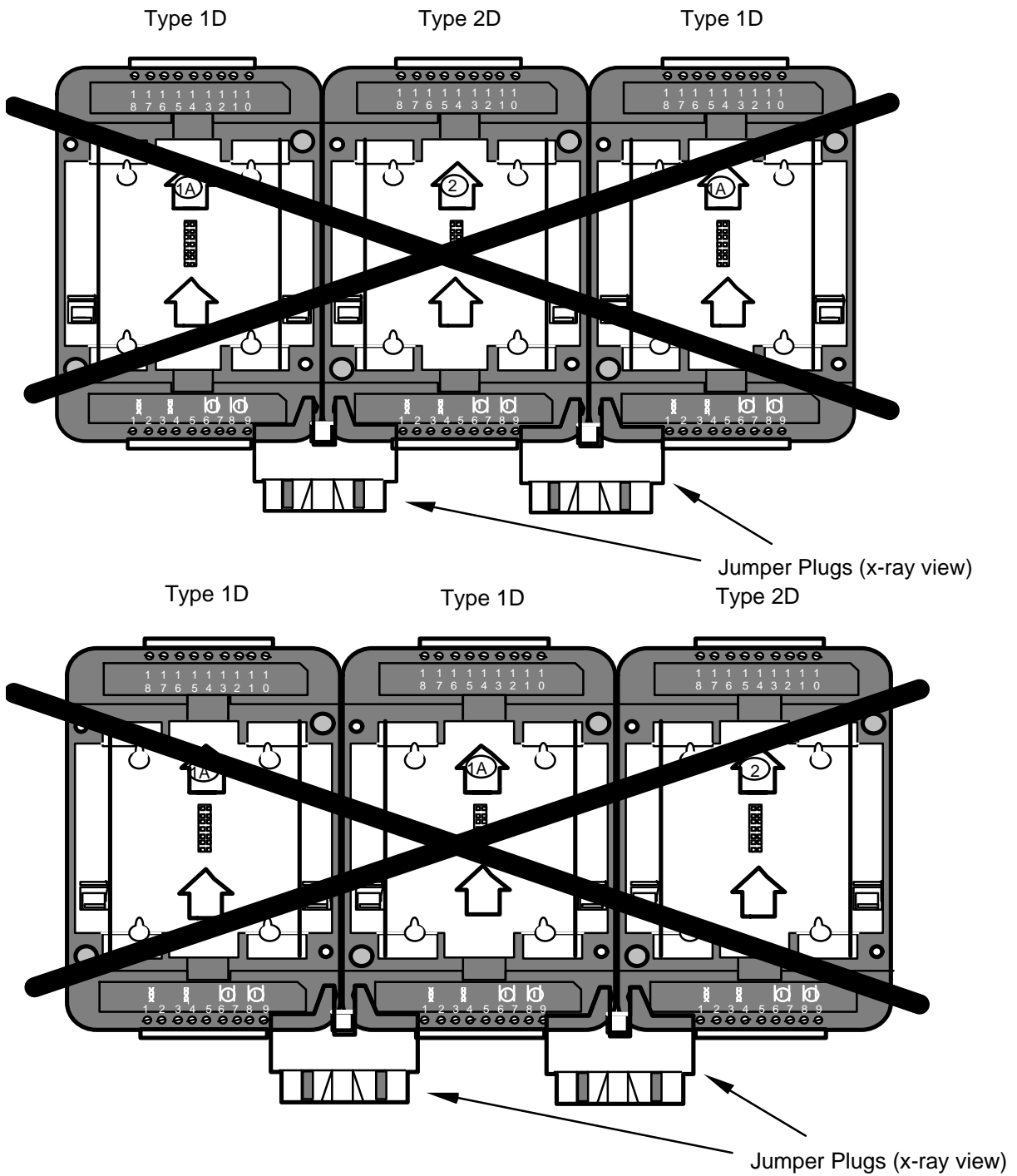
When used with a Type 2D Base Plate, there are restrictions about the placement of the Type 2D Base Plates (and the routers they contain) relative to the adjacent Type 1D Base Plates. In all cases, any Type 2D Base Plates must be located to the left side of any Type 1D Base Plates (figure 4.14) with which they will share a common channel.



**Figure 4.14** Mixing Type 1D and Type 2D Base Plates

The reason for this limitation is that only the right Jumper Plug connector on a Type 2D Base Plate bridges the network connection; the left Jumper Plug connector on a Type 2D Base Plate bridges only the power connection. This arrangement permits several routers, each with a different channel type, to be mounted on a common DIN rail and share a common power supply. Figure 4.15 shows mounting configurations that are problematic and **must be avoided** because the router will be unable to communicate with the other LonPoint modules via the Jumper Plug.

If such a mounting arrangement must be used, then the base plates must be interconnected using wiring instead of the Jumper Plug.

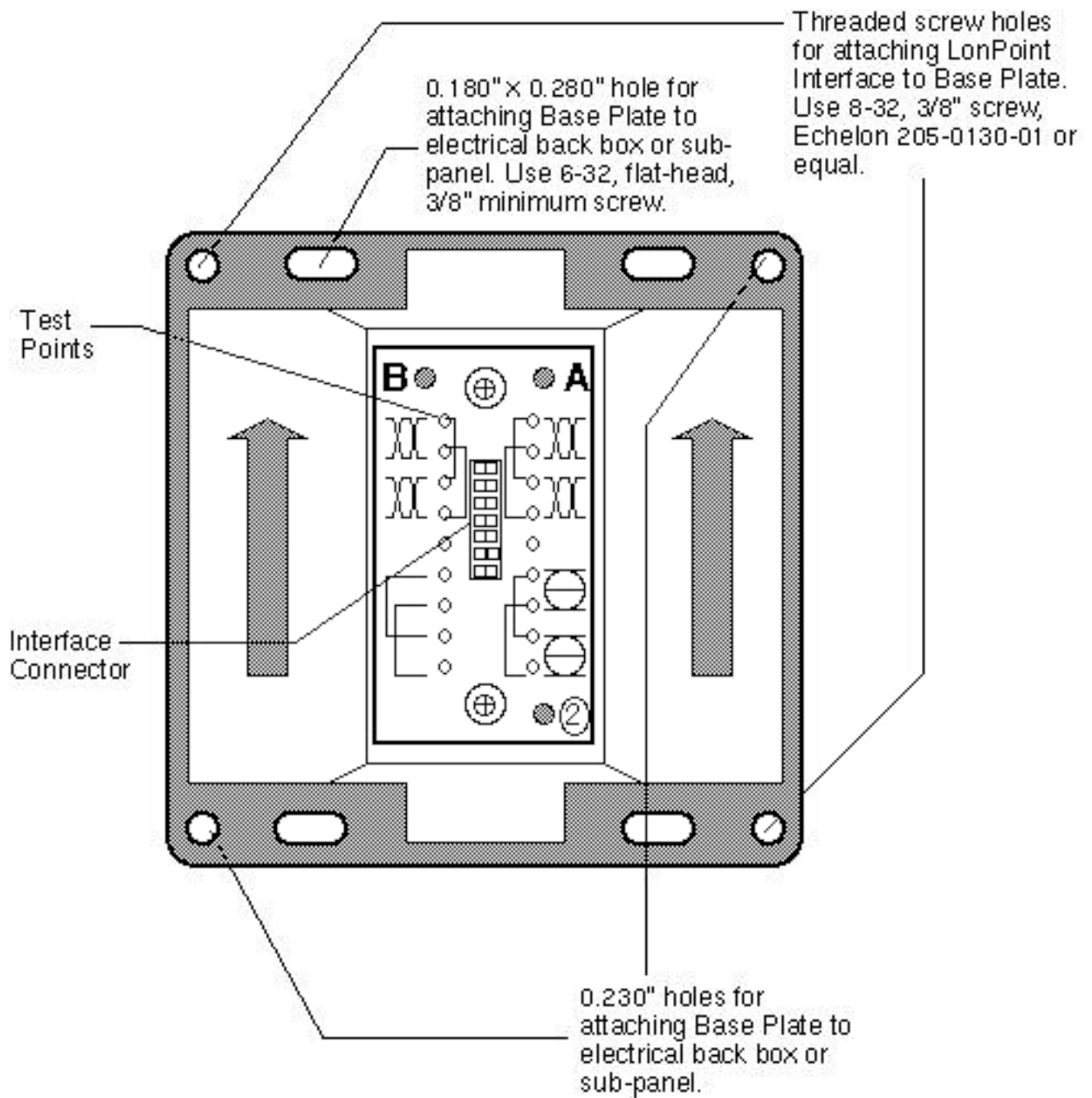


**Figure 4.15** Problematic Mounting Configurations when Using Routers

---

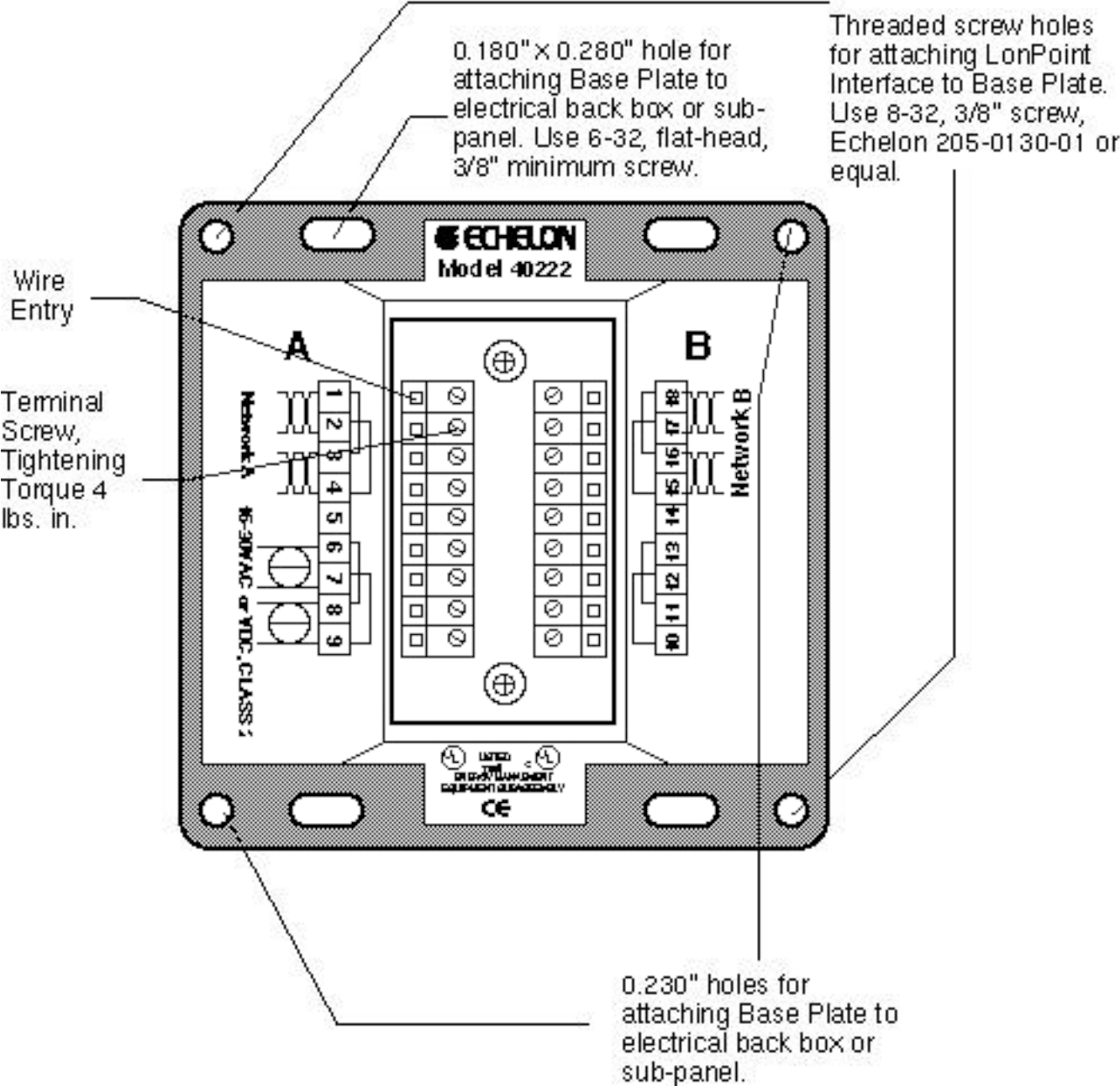
## LonPoint Type 2 Base Plate Installation

All LonPoint LPR Routers may be installed in either a Type 2 Base Plate (Model 40222) or a Type 2D DIN Base Plate (Model 48222). Figure 4.16 presents a detailed view of the front side of the Base Plate. The circuit board inside the Type 2 Base Plate includes a large number “2” in the lower right corner, as viewed from the front of the base plate, designating it as a Type 2 Base Plate. Test points are provided on the circuit board for measuring all of the wiring connections; symbols are silk-screened on the PCB to identify the functions of the test points.



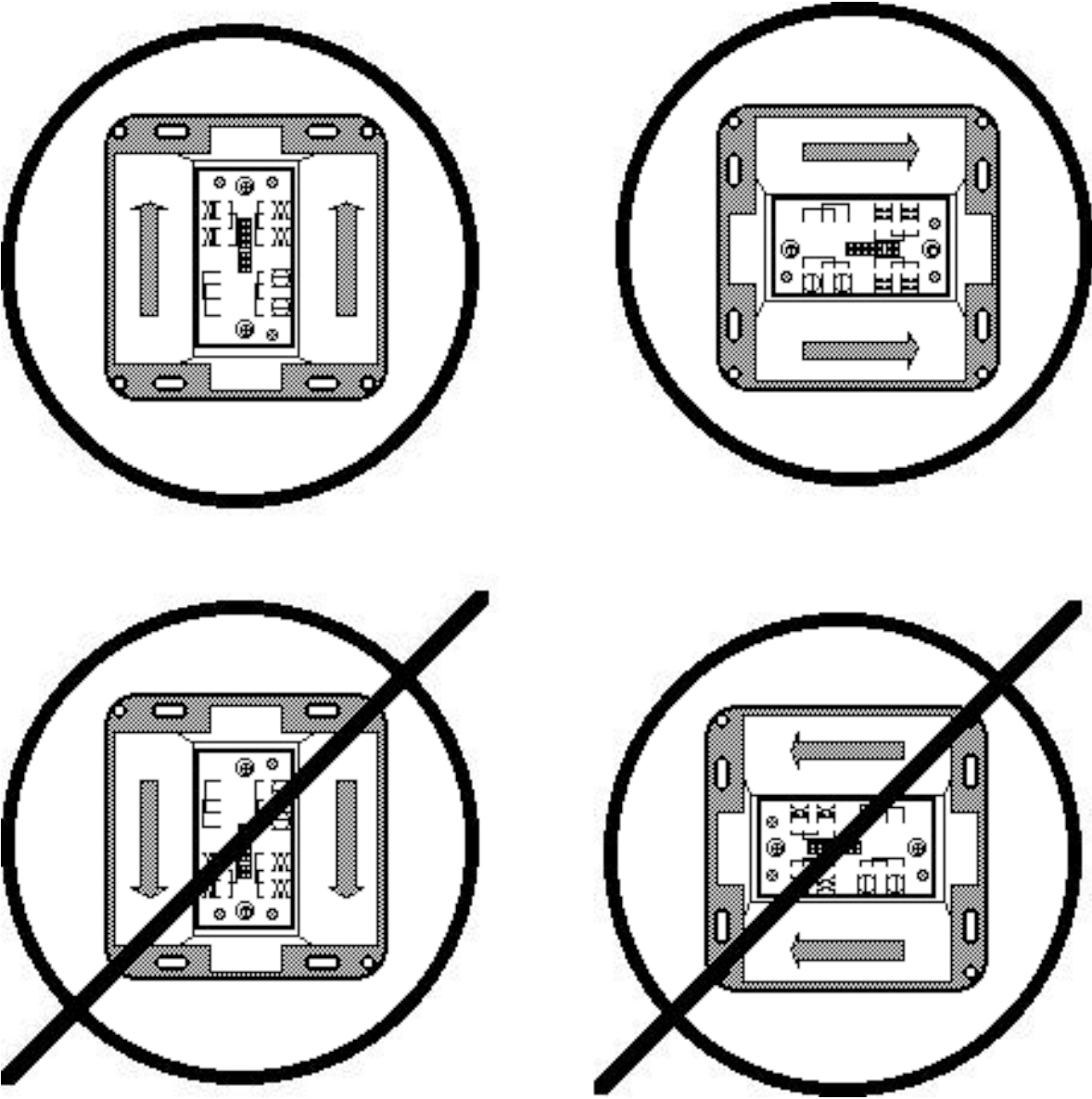
**Figure 4.16** LonPoint Type 2 Base Plate - Front Panel

Figure 4.17 shows a detailed view of the rear side of the Base Plate, the side to which wiring connections are made.



**Figure 4.17** LonPoint Type 2 Base Plate - Rear Wiring Panel

As shown in figure 4.18, the Type 2 Base Plate is intended to be installed in an electrical box either vertically (base plate interior arrows pointing up) or rotated clockwise 90° (base plate interior arrows pointing to the right). These two orientations provide optimal viewing of the front panel legends of an installed LonPoint module, and also accommodate different methods of installing electrical boxes.



**Figure 4.18** LonPoint Type 2 Base Plate Mounting Orientations

---

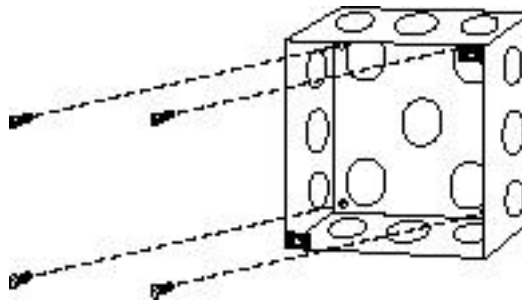
### *Installing A Compatible Electrical Box*

Compatible electrical boxes that will accept a Type 2 Base Plate include a 4" square by 2" deep electrical enclosure (Raco model No. 232, 236, 7232, 7054 or equal), two-



gang PVC switch box (Raco 7834 or equal), and Echelon's Model 48001 EuroBox for wall and 35mm DIN rail applications.

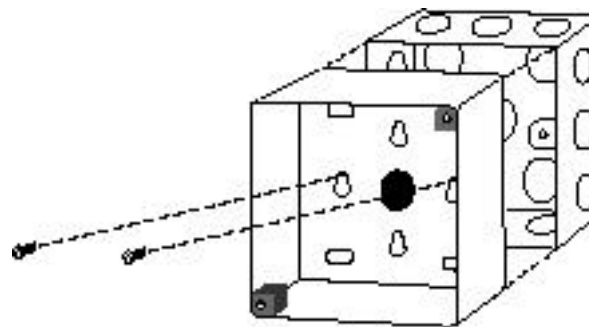
A 4" square electrical enclosures should be either affixed to a wall or to equipment using suitable mounting screws, or recessed using a suitable mounting clamp (figure 4.19). Due to variations in the location of knock-outs, care must be taken to ensure that 3/4" conduit fittings do not interfere with the Base Plate when it is installed in the electrical box; 1/2" conduit fittings have not been found to cause an interference problem.



**Figure 4.19** 4" Square Electrical Box Mounting

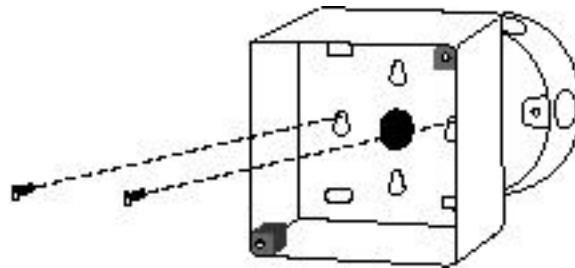
There are four mounting options if Echelon's EuroBox is used. The Eurobox requires the installer to drill cabling holes: ensure that suitable holes are drilled **prior** to mounting. In order to avoid interference with a Type 1 or Type 2 Base Plate, all glands and conduit fittings must be located within 1.4"/35cm of the bottom of the box (as measured from the outside of the box). Wire glands and conduit fittings must not extend more than 0.63"/16mm into the EuroBox in order to prevent associated cabling from interfering with the Base Plate screw terminals.

For UK applications, a second mounting option is to affix the EuroBox to a single gang 25mm BS4662 flush mounting box (MK 866ZIC or similar). Two keyhole slots are provided in the EuroBox to accommodate the flush mounting box as shown in figure 4.20. Use screws with flush mounting and ensure that suitable cabling holes are drilled in the Eurobox prior to mounting, as discussed above.



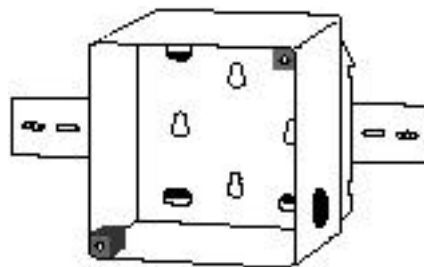
**Figure 4.20** MK Electrical Box Mounting the EuroBox

A third mounting option is to affix the EuroBox to a recessed 6.5cm diameter plastic DIN box (Kaiser or equal). Two keyhole slots are provided in the EuroBox to accommodate DIN box mounting, as shown in figure 4.21. Use the screws provided with the DIN box and ensure that suitable cabling holes are drilled in the EuroBox prior to mounting.



**Figure 4.21** DIN Box Mounting the EuroBox

A fourth mounting option is to affix the EuroBox to 35mm DIN rail using DIN Clips (one pair included). Two sets of rectangular slots are provided for the DIN clips. Ensure that the clips lock in place on the EuroBox and then snap them onto the DIN rail (figure 4.22). Ensure that suitable cabling holes are drilled in the EuroBox prior to mounting.



**Figure 4.22** DIN Rail Mounting the EuroBox



The Type 2D DIN Base Plate offers a lower profile and easier access to wiring terminals for 25mm DIN rail applications.

---

## Connecting Wiring

Since a Type 2 Base Plate is designed for use with an LPR Router, the only cabling that will be connected to the Base Plate is power and the network cables for the two channels between which the router is connected. Bring the cabling into the electrical enclosure using suitable conduit fittings, bushings, or wire glands, and be sure to leave a service loop of 6 inches (15cm) of cable to simplify wiring the Type 2 Back Plate. Dress the cables using tie wraps or tape to ensure that the cabling is not compressed or caught when the base plate is screwed into place.

Strip the cable jacket and wire conductors. The base plate screw terminals will accept 24AWG (0.5mm) to 12AWG (2.2mm) wire, which should be stripped to a length of 0.32" (8mm). Although not required, it may be useful to use a soldering iron to tin the stripped lengths of any stranded wires to prevent fraying and inadvertent contact with adjacent terminals. The screw terminal blocks on the rear panel of the Type 2 Base Plate are color coded to simplify wiring. The color coding scheme is shown in table 4.3. The optimum tightening torque for the Type 1 Base Plate screw terminals is 4 lbs. in. (0.5Nm) maximum. The proper screwdriver tip width is 0.125" (3mm).

**Table 4.3** Type 2 Base Plate Terminal Block Color Coding

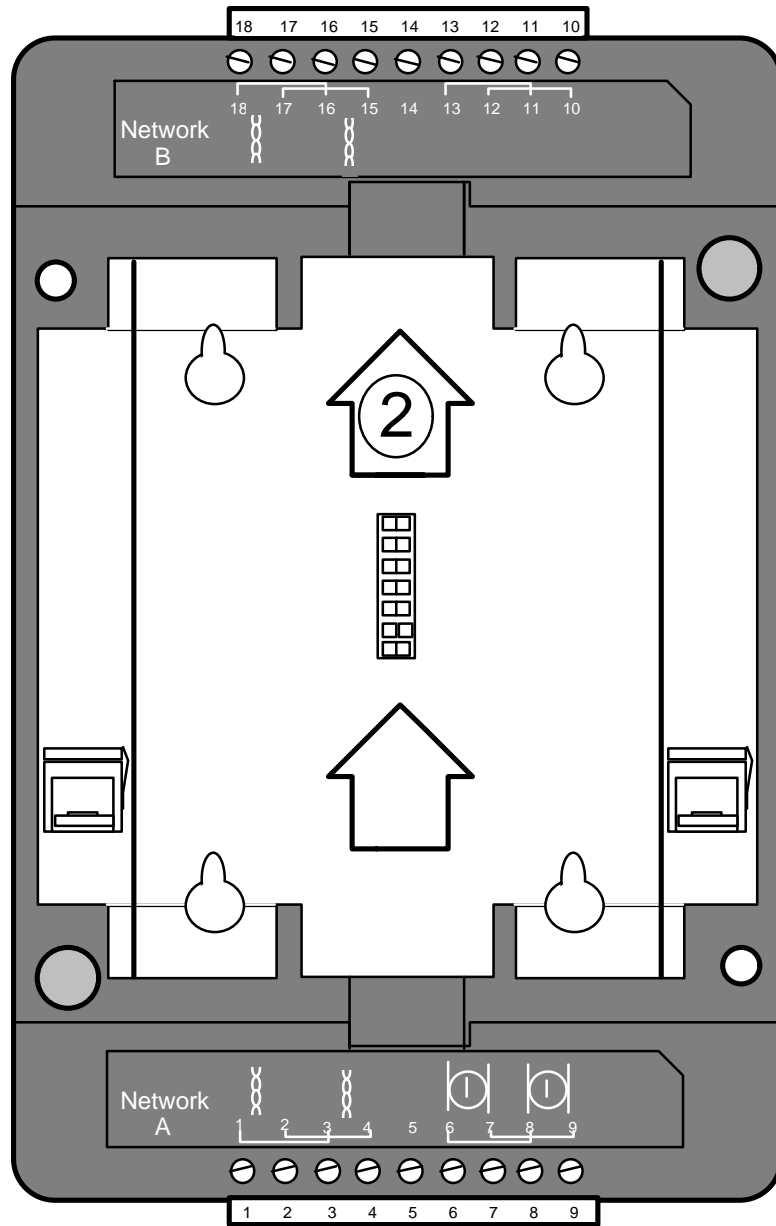
<i>Terminal Number</i>	<i>Terminal Color</i>	<i>Function</i>
1 - 4	Orange	Network A
5	Orange	Cable shield, if used, internally connected to terminal 14
6 - 9	Black	Power
10 and 12	Black	None Jumpered together internally - may be used to land extra wires
11 and 13	Black	None Jumpered together internally - may be used to land extra wires
14	Orange	Cable shield, if used, internally connected to terminal 5
15 - 18	Orange	Network B

Two sets of screw terminals are provided for both the power and network wiring connections. These connections are internally jumpered on the Type 2 Base Plate PCB to provide continuity of the network and power wiring, even if no LonPoint Router module is installed. This feature permits the Base Plate wiring to be pre-installed and the network and power circuits checked for continuity throughout the installation, before a single LonPoint module is ever installed. This feature also prevents network and power interruptions as a result of hot-swapping LonPoint modules during commissioning or servicing operations. Finally, providing two sets of screw terminals permits incoming and outgoing wiring to be landed at separate screw terminals without the need to insert more than one wire in any given screw terminal, which improves wiring reliability.

---

## LonPoint Type 2D DIN Base Plate Installation

Figure 4.23 presents a detailed view of the front side of the base plate. The circuit board inside the Type 2D DIN Base Plate includes an arrow with the designation "2." The 2D Base Plate is intended to be installed either on a 35mm DIN rail or, using the integral keyhole slots, on a wall or panel. An arrow indicates the vertical orientation of the base plate which will provide the base viewing of the front panel legends of an installed LonPoint module.



Front View

Jumper Plug  
(one supplied with  
each DIN Base  
Plate)

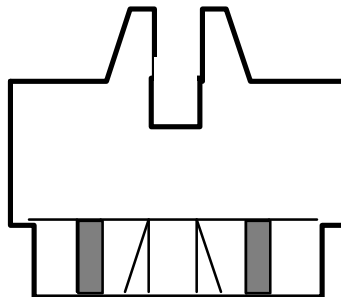


Figure 4.23 Front View of the Type 2D DIN Base Plate

The base plate contains two integral DIN rail locks which securely grab a 35mm DIN rail onto which the base plate is mounted. The Base Plate may be used on both 35mm x 7.5mm and 35mm x 15mm DIN rails. To release the Base Plate from the DIN rail, sequentially insert a flathead screwdriver into each DIN rail release tabs and gently pull away from the DIN rail (figure 4.24).

Four keyhole slots are provided for affixing the Type 2D DIN Base Plate to a wall or panel (figure 4.25).

The 2D Base Plate is supplied with a Jumper Plug that connects the power and network connections between adjacent base plates. The Jumper Plug is shipped inserted into the main cavity of the Base Plate, and can be removed by gently pulling the plug handle in the direction of the mounting arrow. The Jumper Plug **must** be removed before a LonPoint Router can be inserted into the Base Plate.

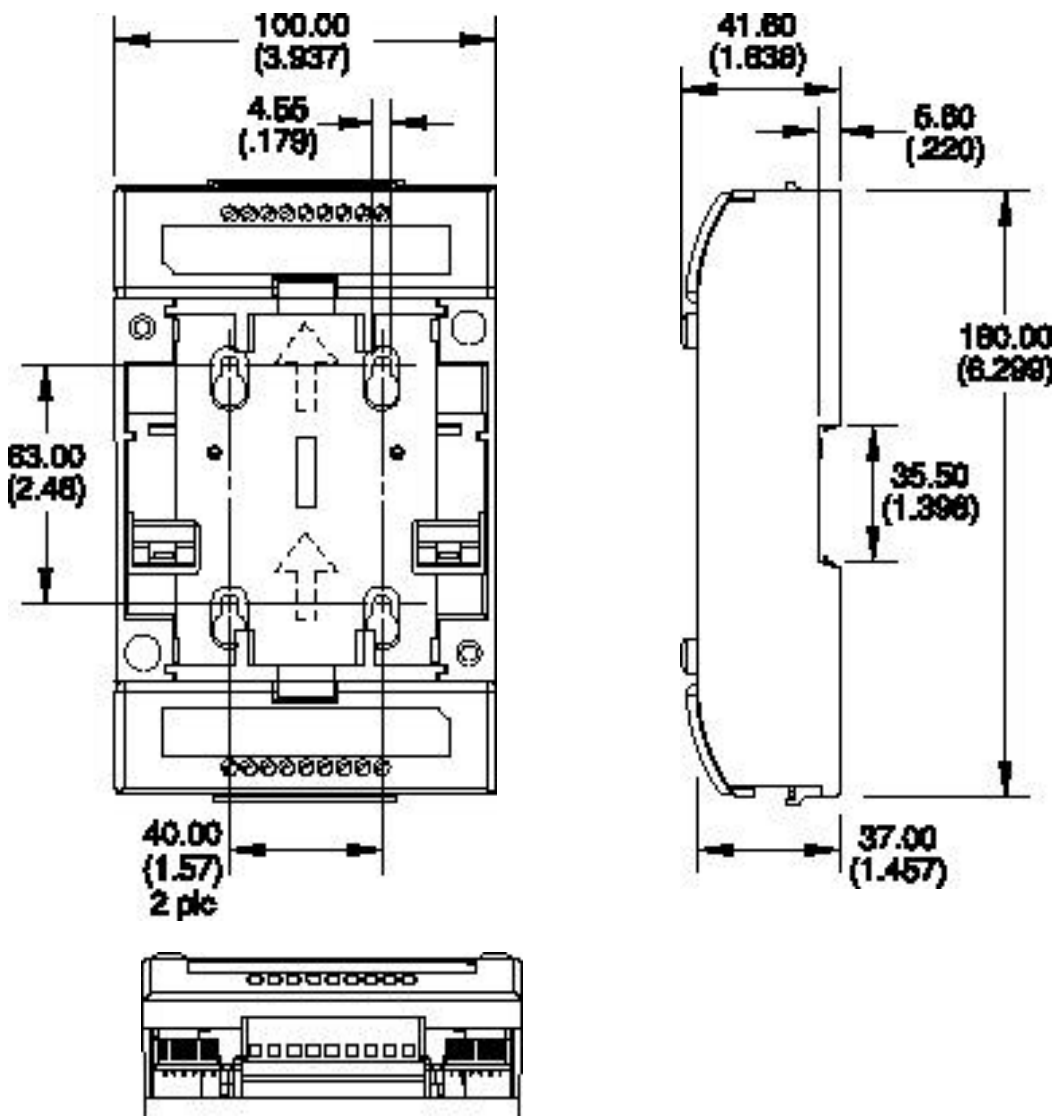
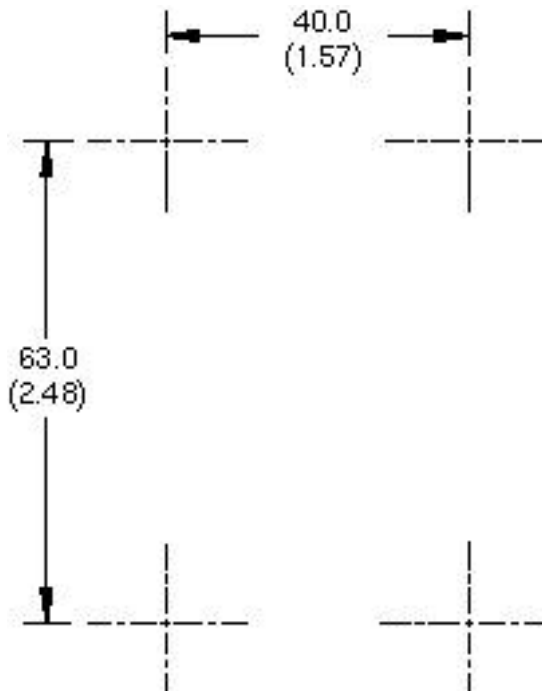


Figure 4.24 DIN Rail Base Plate Dimensions (Dimensions are in mm (inches).)



**Figure 4.25** Mounting Hole Pattern Dimensions for Type 2D Base Plates

---

## Connecting Wiring

Route all network and power cabling to the pertinent screw terminals located at the top and bottom of the Base Plate. It is good practice to separate any nearby input/output cabling as much as possible from the network and power cabling, especially if low-level analog signals are being supervised.

Strip the cable jacket and wire conductors. The base plate screw terminals will accept 24AWG (0.5mm) to 12AWG (2.2mm) wire, which should be stripped to a length of 0.32" (8mm). Although not required, it may be useful to use a soldering iron to tin the stripped lengths of any stranded wire to prevent fraying and inadvertent contact with adjacent terminals. Identifying screw terminal numbers are conveniently located both above and below each screw terminal. Symbols and/or language identifying the function of the screw terminals also are provided.



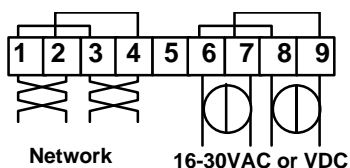
Note that terminals 1 to 9 are numbered from left to right, but terminals 10 to 18 are numbered from right to left.

The optimum tightening torque for the screw terminals is approximately 4 pounds (0.5Nm). The ideal flathead screwdriver tip width is 3/32" (2.5mm).

**Table 4.4** Type 2D Base Plate Terminal Block Connections

<i>Terminal Number</i>	<i>Function</i>
1 -4	Network A
5	Cable shield, if used, internally connected to terminal 14
6 - 9	Power
10 and 12	None Jumpered together internally, may be used to land extra wires
11 and 13	None Jumpered together internally, may be used to land extra wires
14	Cable shield, if used, internally connected to terminal 5
15 - 18	Network B

Two sets of screws are provided for both the power and network wiring connections. These connections are internally jumpered on the Type 2D Base Plate PCB to provide continuity of the network and power wiring, even if no LonPoint module is installed, as shown in figure 4.26. This feature permits the Base Plate wiring to be pre-installed and the network and power circuits checked for continuity throughout the installation, before a single LonPoint module is ever installed. This feature also prevents network and power interruptions as a result of hot-swapping LonPoint modules during commissioning or service operations. Finally, providing two sets of screw terminals permits incoming and outgoing to be landed at separate screw terminals without the need to insert more than one wire in any given screw terminal.



**Figure 4.26** Base Plate Power and Network Wiring Connections

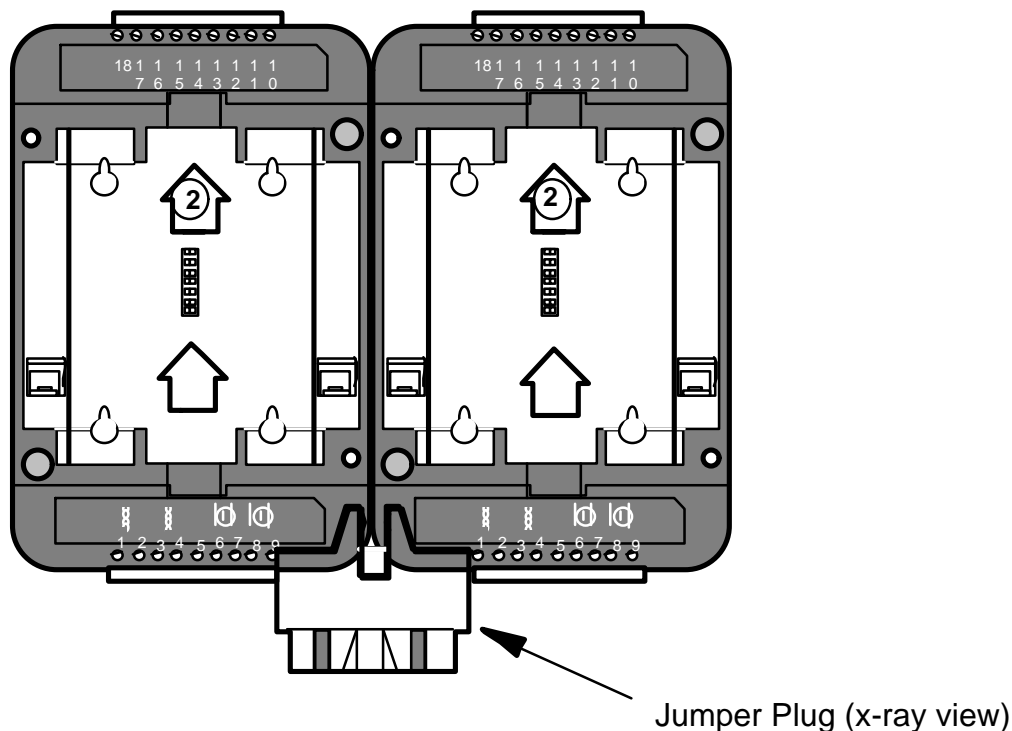


---

## Connecting the Jumper Plug(s)

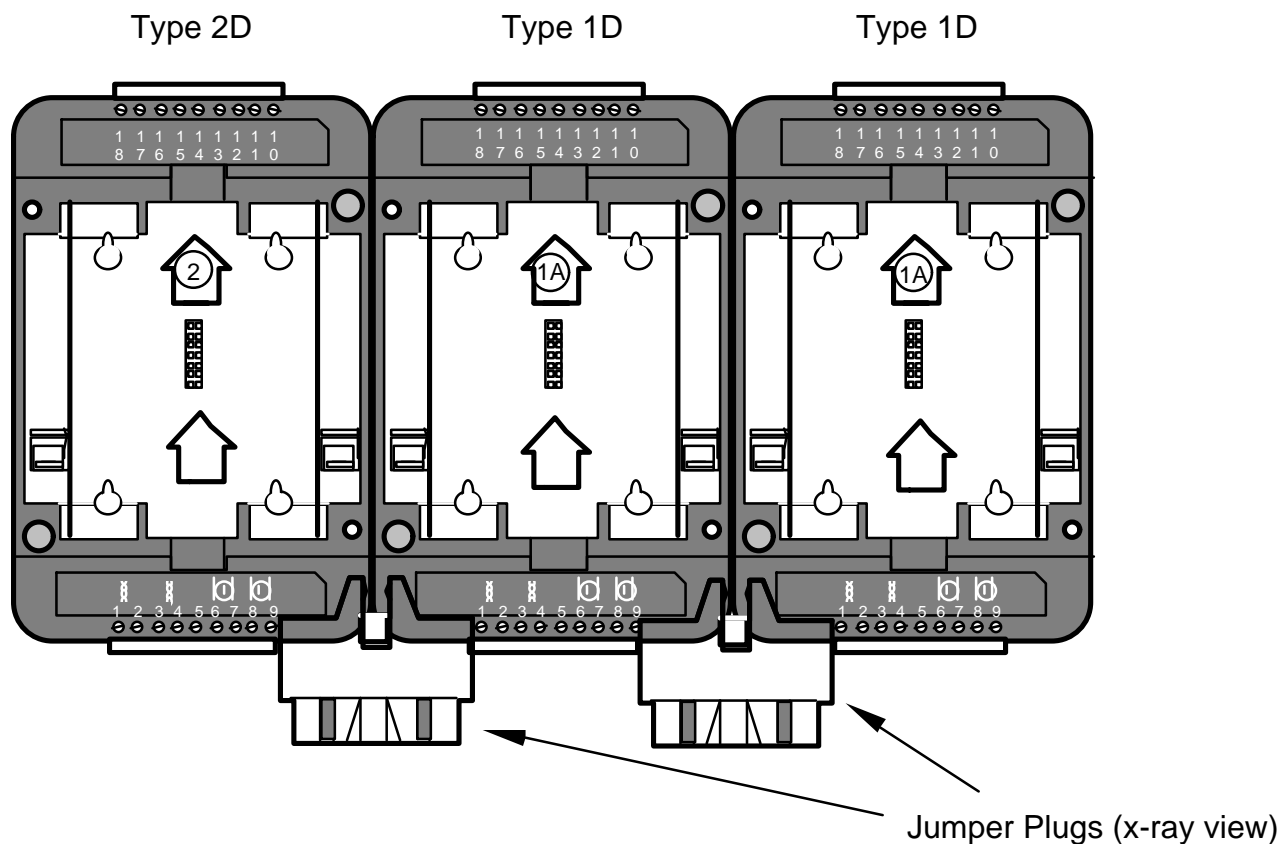
From time to time it may be necessary to mount two or more LonPoint Type 1D or 2D Base plates adjacent to one another. When this happens, power and network wiring must be daisy-chained between each Base Plate. Routing power and network wiring between multiple Base Plates can be a laborious and time consuming task, and there is always the risk of a wiring error. For this reason, the Type 1D and 2D Base Plates are each supplied with a Jumper Plug and Jumper Plug connectors which simply and easily bus the power and network between adjacent Base Plates.

The Jumper Plug connectors are located on either side of the terminal block with connections 1 to 9. The Jumper Plug connectors are wired in parallel with the network and power connections on the screw terminals. When two base plates are mounted adjacent to each other, with the mounting arrows pointing in the same direction, the Jumper Plug connectors will be aligned such that a Jumper Plug may be inserted into the two adjacent connectors thus bridging power and network between the two Base Plates (figure 4.27).



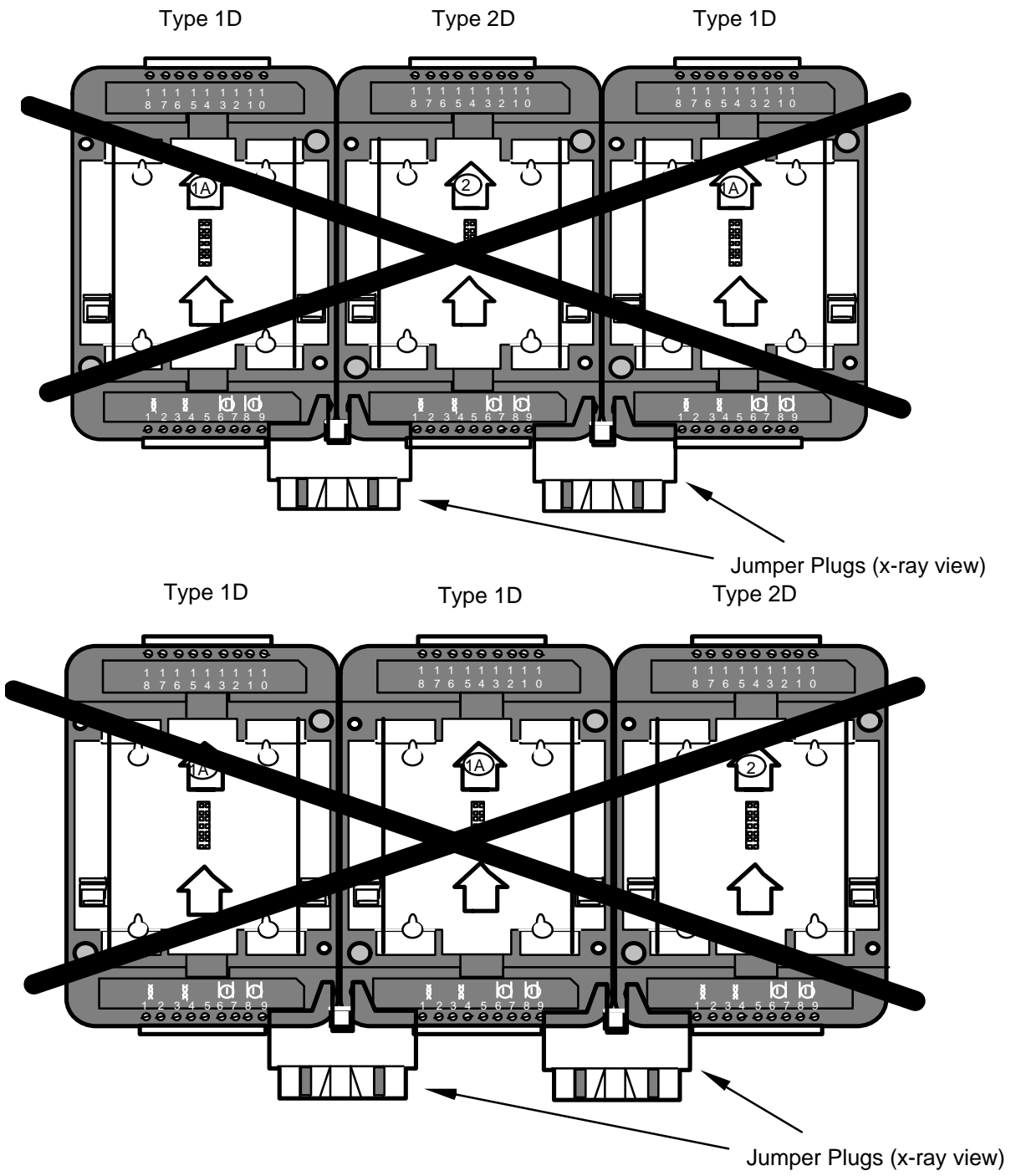
**Figure 4.27** Jumper Plug Insertion Points for Type 2D Base Plates

There are restrictions about the placement of a Type 2D Base Plate relative to other Type 1D or Type 2D Base Plates to which it will be connected via Jumper Plugs. In all cases, any Type 2D Base Plates must be located to the left side of other Type 2D Base Plates (figure 4.28).



**Figure 4.28** Locate the Type 2D Base Plate to the Left of Type 1D Base Plates

Type 1D Base Plates must be located to the right of any router in a Type 2D Base Plate with which they share a common channel. The reason for this limitation is that only the right Jumper Plug connector on a Type 2D Base Plate bridges the network connection, the left Jumper Plug connector on a Type 2D Base Plate bridges only the power connection. This arrangement permits several routers, each with a different channel type, to be connected to a common power supply. Figure 4.29 shows mounting configurations that are problematic and **must be avoided** because the router will be unable to communicate with the other LonPoint modules.



**Figure 4.29** Problematic Mounting Configurations when Using Routers



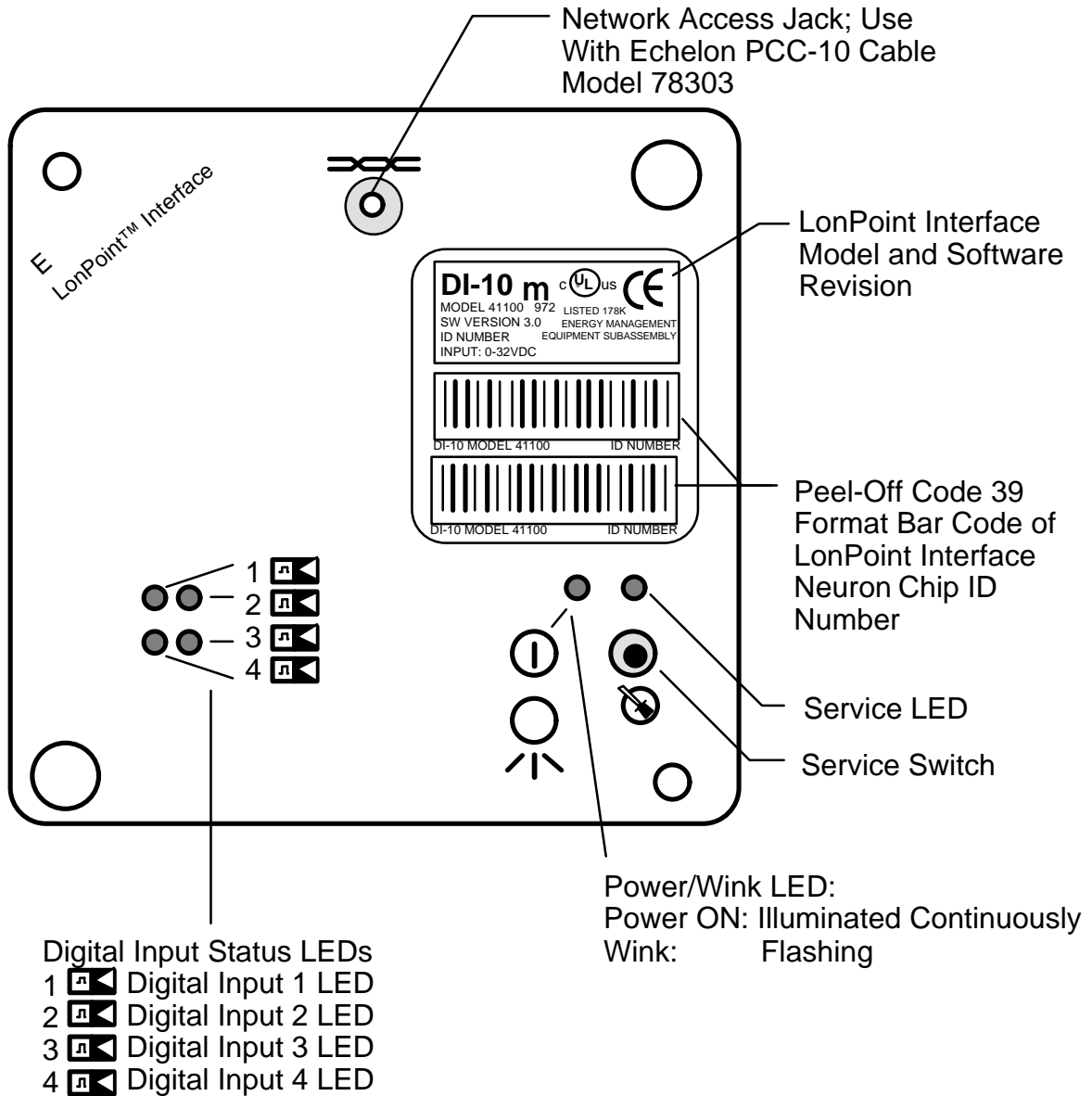
# 5

## Installing the DI-10 Digital Input Module

This chapter describes the process of installing the Model 41100 DI-10 Digital Input Module.

## LonPoint DI-10 Digital Input Module

The front panel of the DI-10 module is shown in figure 5.1. There are no user-configured jumper blocks or other adjustable controls on the DI-10 module. A separate front panel LED is provided for each input.



**Figure 5.1** LonPoint DI-10 Digital Input Module - Front Panel

The DI-10 module is installed in a Type 1 or Type 1D Base Plate. Wiring connections to the DI-10 module are presented in table 5.1. Specifications for the DI-10 module are shown in table 5-2.

**Table 5.1** DI-10 Digital Input Module Wiring Connections

<b>Screw Terminal</b>	<b>Wiring Connection</b>
1 and 2	Incoming network wiring, TP/FT-10 channel, polarity-insensitive
3 and 4	Outgoing network wiring, TP/FT-10 channel, polarity-insensitive
5	Unused
6 and 7	Incoming power wiring, 16-30VAC or VDC, 2.2VA, polarity-insensitive. If using DC power, it is good practice to maintain continuity of the power polarity throughout the network: terminals 6 and 8 should be the same polarity, and terminals 7 and 9 should be the same polarity.
10	+ input of digital input 1
11	- input of digital input 1 (common to all inputs)
12	+ input of digital input 2
13	- input of digital input 2 (common to all inputs)
14	Unused
15	+ input of digital input 3
16	- input of digital input 3 (common to all inputs)
17	+ input of digital input 4
18	- input of digital input 4 (common to all inputs)

**Table 5.2** LonPoint DI-10 Digital Input Module Specifications

<b>Function</b>	<b>Description</b>
Processor/memory	Neuron 3150 Chip, 10MHz, 56K flash memory
Service function	Recessed service switch, service LED, power/wink LED. Dual tear-off bar-code Neuron ID self-adhesive tag for application to red-line drawings in the field
I/O	4 digital inputs, 0-32VDC or dry contact; 2.5V input logic threshold; separate status LEDs for each input
I/O isolation	100V, transformer isolation. Inputs are isolated from the input power and the network but not from each other.
Transceiver type	FTT-10A with blocking capacitors for compatibility with link power channel
Network connector	Phone plug connector accessible from front panel
Input power	16-30VAC or VDC @ 2.2VA, internally isolated power supply
Mounting	Type 1 or Type 1D Base Plate
Temperature	-40 to +85°C, operating and non-operating

Humidity	10 to 95% RH @ 50°C
EMI	FCC A, CE Mark
Safety agency	UL 916
Function Blocks	Node object (1), digital input open-loop sensor objects (4), digital encoder controller objects (2), analog function block controller objects (4), type translators (6)
Software Configuration	Wide variety of LONMARK Standard Configuration Parameter Types supported by direct memory read/write function of LNS compatible network management tools

---

## DI-10 Module Software Settings

The software settings of the DI-10 module are described in the *LonPoint Application and Plug-In Guide*.

---

## Installing the DI-10 Module

Installation of the DI-10 module involves the following steps:

1. Ensure that the Type 1 or Type 1D Base Plate has been wired and installed correctly.
2. Check for continuity on all network and power wiring. Ensure that the correct sensors are connected to the correct Base Plate I/O terminals.
3. Make certain that all network channels are terminated with the correct number and type of Terminator.
4. Insert the DI-10 module into the Base Plate by aligning the network access jack on the DI-10 with the arrow head on the Base Plate (the arrow should point in the direction of the jack), and then pressing firmly to ensure that the module is properly seated in its mating Base Plate connector.
5. The DI-10 module can be hot-plugged: there is no need to disconnect power when installing the module. If power is present then the Power LED will illuminate continuously. If power is not present then the Power LED will remain off.
6. Securely attach the DI-10 module to the Base Plate by screwing the two Echelon 205-0130-01 screws (8-32 [M8], 3/8" [9.5mm]) into the threaded inserts in the Base Plate. Use approximately 4 lbs. in. (0.5Nm) torque on the screws.
7. Follow the node configuration procedure described in the *LonPoint Application and Plug-In Guide* to configure the software in the DI-10 module.
8. See *Troubleshooting* for assistance with improper DI-10 module operation.



# 6

## Installing the DIO-10 Digital Input/Output Modules

This chapter describes the process of installing the Model 41500 DIO-10 Digital Input/Output Modules.

## LonPoint DIO-10 Digital Input/Output Modules

The front panel is shown in figure 6.1. There are no user-configured jumper blocks on the DIO-10 module. A separate front panel LED is provided for each input, and a Hand/Off/Auto switch and LED are provided for each output.

The four hand/off/auto switches control the outputs of the DIO-10 as long as the module is powered, regardless of the software state of the module. The four status LEDs will track the state of the outputs only if the application program is running and the module is in the configured state. The status LEDs will **not** function if the module is in an unconfigured state.

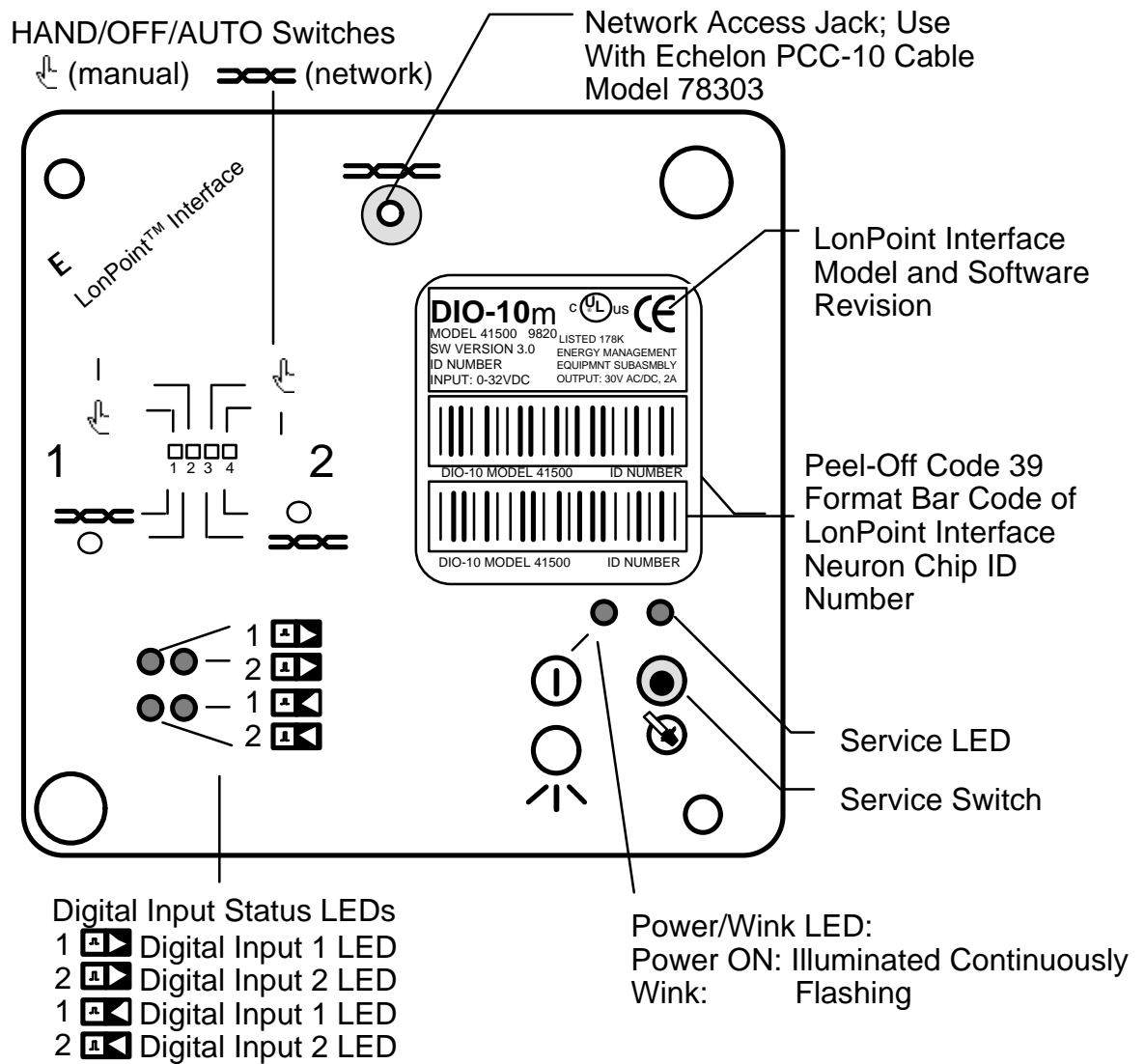


Figure 11.1 LonPoint DIO-10 Digital Input/Output Module - Front Panel

The DIO-10 module is installed in a Type 1 or Type 1D Base Plate. Wiring connections to the DIO-10 module are presented in table 6.1. Specifications for the DIO-10 module are shown in table 6.4.

**Table 6.1** DIO-10 Digital Input/Output Module Wiring Connections

<b>Screw Terminal</b>	<b>Wiring Connection</b>
1 and 2	Incoming network wiring, TP/FT-10 channel, polarity-insensitive
3 and 4	Outgoing network wiring, TP/FT-10 channel, polarity-insensitive
5	Unused
6 and 7	Incoming power wiring, 16-30VAC or VDC, 4.75VA, polarity-insensitive. If using DC power, it is good practice to maintain continuity of the power polarity throughout the network: terminals 6 and 8 should be the same polarity, and terminals 7 and 9 should be the same polarity.
10	Output 1 relay wiper
11	Output 1 normally closed output
12	Output 1 normally open output
13	Output 2 relay wiper
14	Output 2 normally closed output
15	Output 2 normally open input
16	- input of digital input 1
17	+ input of digital input common
18	- input of digital input 2

## DIO-10 Module Digital Inputs

The following table lists the input switching levels of the DIO-10 Module digital inputs (over full operational range).

**Table 6.2** DIO-10 Module Input Switching Levels

<b>Input Range</b>	<b>Maximum Positive Threshold Voltage (<math>V_{pmax}</math>) [V]</b>	<b>Minimum Negative Threshold Voltage (<math>V_{nmin}</math>) [V]</b>	<b>Minimum Hysteresis (<math>V_{hmin}</math>) [V]</b>
0 - 5, dry contacts	3.85	1.35	0.40
0 - 12 V	9.48	3.15	0.93
0 - 24 V	19.28	6.28	1.86
0 - 31 V	24.90	8.08	2.39

Both digital inputs have internal pull-up resistors (2.43 K ) connected to 5V through a diode. This pull-up resistor allows the use of low-cost (non-noble, metal-plated) contacts in external dry contacts (relays). The diode prevents current flow through the pull-up resistor to the power supply when the input is not a dry contact but a logic voltage above 5V. When the input voltage is below 5V, the external electronics must sink current. When the input voltage is above 5V, then the diode prevents the flow of current through the pull-up resistor. For inputs above 5V, a separate protection diode is forward biased through a 21.5K resistor. Table 6.3 details the sink (-)/source (+) currents required of the external electronics at various input voltages.

**Table 6.3** Sink/Source Currents

<b>Input Voltage</b>	<b>Input Current</b>
0V	-1.7mA
3V	-0.5mA
5V	0mA
10V	+0.2mA
20V	+0.65mA
32V	+1.21mA

*Note: The two inputs on the DIO-10 are isolated from the power supply and from the network, but are not isolated from each other. If the installation requires that the inputs be isolated from each other, additional LonPoint modules should be used.*

**Table 6.4** LonPoint DI-10 Digital Input Module Specifications

<b>Function</b>	<b>Description</b>
Processor/memory	Neuron 3150 Chip, 10MHz, 56K flash memory
Service function	Recessed service switch, service LED, power/wink LED. Dual tear-off bar-code Neuron ID self-adhesive tag for application to red-line drawings in the field
I/O	2 digital inputs, 5,12,24,31V or dry contact. Up to 20kHz frequency measurement; 2 relay outputs (each has one Form A and one Form B contact with a common wiper) rated at 2A continuous 6A surge at 30 VAC or 24VDC. Separate status LEDs for each input
I/O isolation	100V, transformer isolation. Inputs are isolated from the input power and the network but not from each other.
Transceiver type	FTT-10A with blocking capacitors for compatibility with link power channel
Network connector	Phone plug connector accessible from front panel
Input power	16-30VAC or VDC @ 4.75VA, internally isolated power supply
Mounting	Type 1 or Type 1D Base Plate
Temperature	-40 to +85°C, operating and non-operating

---

## DIO-10 Digital Input/Output Module Software Settings

The software settings of the DIO-10 are described in the *LonPoint Application and Plug-In Guide*.

---

## DIO-10 Digital Input/Output Module Firmware

The DIO-10 firmware contains the following function blocks: Digital Input/Counter function block (2), Digital Output function blocks (2), Analog function block (2), Digital Encoder function block (2), Type Translator function block (4), Node Object (1).

See the *LonPoint Application and Plug-In Guide* for details on those function blocks.

---

## Installing the DIO-10 Digital Input/Output Module

Installation of the DIO-10 module involves the following steps.

1. Ensure that the Type 1 or Type 1D Base Plate has been wired and installed correctly.
2. Check for continuity on all network and power wiring. Ensure that the correct sensors are connected to the correct Base Plate I/O terminals.
3. Make certain that all network channels are terminated with the correct number and type of Terminator.
4. Insert the DIO-10 module into the Base Plate by aligning the network access jack on the module with the arrow head on the Base Plate (the arrow should point in the direction of the jack), and then pressing firmly to ensure that the module is properly seated in its mating Base Plate connector.
5. The DIO-10 module can be hot-plugged: there is no need to disconnect power when installing the module. If power is present then the Power LED will illuminate continuously. If power is not present then the Power LED will remain off.
6. Securely attach the DIO-10 module to the Base Plate by screwing the two Echelon 205-0130-01 screws (8-32 [M8], 3/8" [9.5mm]) into the threaded inserts in the Base Plate. Use approximately 4 lbs. in. (0.5Nm) torque on the screws.
7. Follow the node configuration procedure described in the *LonPoint Application and Plug-In Guide* to configure the software in the DIO-10 module.
8. See *Troubleshooting* for assistance with improper DIO-10 module operation.



# 7

## Installing the DO-10 Digital Output Module

This chapter describes the process of installing the Model 41200 DO-10 Digital Output Module.

---

## LonPoint DO-10 Digital Output Module

The front panel of the DO-10 module is shown in figure 7.1. There are no user-configured jumper blocks on the DO-10 module. The front panel of the module includes four three-position hand/off/auto switches that permit the user to force an output to an ON or OFF state, or to allow the network to select the output state. The switches force the output low (0 position) or high (1 position), or allows the application program to select the output state (center network position). A separate front panel LED is provided for each output.

The four hand/off/auto switches control the outputs of the DO-10 as long as the module is powered, regardless of the software state of the module. The four status LEDs will track the state of the outputs only if the application program is running and the module is in the configured state. The status LEDs will **not** function if the module is in an unconfigured state.



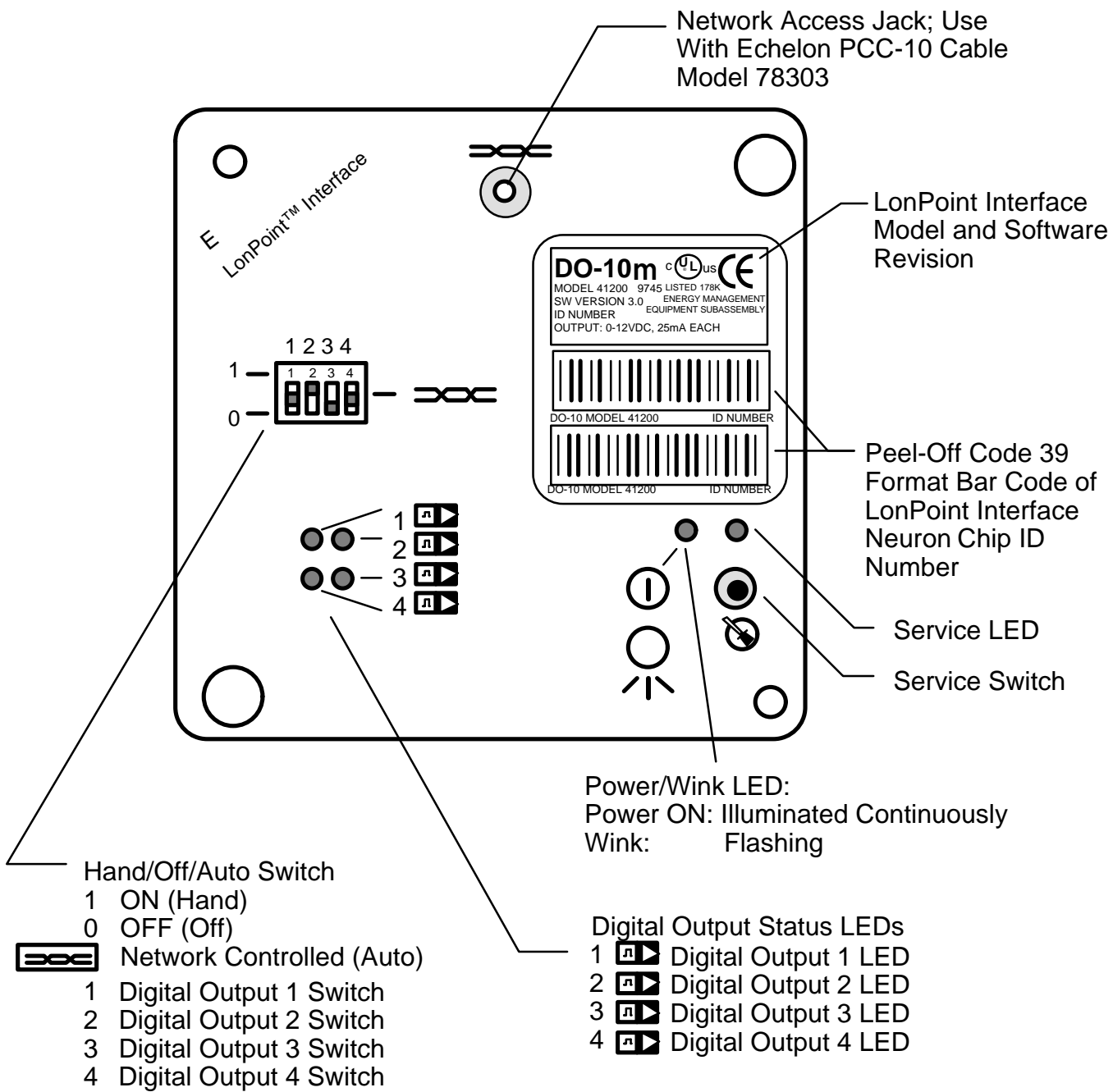


Figure 7.1 LonPoint DO-10 Digital Output Module - Front Panel

The DO-10 module is installed in a Type 1 or Type 1D Base Plate. Wiring connections to the DO-10 module are presented in table 7.1. Specifications for the DO-10 module are shown in table 7.2.

**Table 7.1** DO-10 Digital Output Module Wiring Connections

<b>Screw Terminal</b>	<b>Wiring Connection</b>
1 and 2	Incoming network wiring, TP/FT-10 channel, polarity-insensitive
3 and 4	Outgoing network wiring, TP/FT-10 channel, polarity-insensitive
5	Unused
6 and 7	Incoming power wiring, 16-30VAC or VDC, 3.2 to 6.5VA depending on load maximum, polarity-insensitive. If using DC power, it is good practice to maintain continuity of the power polarity throughout the network. Terminals 6 and 8 should be the same polarity, and terminals 7 and 9 should be the same polarity.
10	+ output of digital output 1
11	- output of digital output 1 (common to all outputs)
12	+ output of digital output 2
13	- output of digital output 2 (common to all outputs)
14	Unused
15	+ output of digital output 3
16	- output of digital output 3 (common to all outputs)
17	+ output of digital output 4
18	- output of digital output 4 (common to all outputs)

**Table 7.2** LonPoint DO-10 Digital Output Module Specifications

<b>Function</b>	<b>Description</b>
Processor/memory	Neuron 3150 Chip, 10MHz, 56K flash memory
Service function	Recessed service switch, service LED, power/wink LED. Dual tear-off bar-code Neuron ID self-adhesive tag for application to red-line drawings in the field
I/O	4 digital outputs, 0-12V, 100mA source/sink maximum on any one output, 110mA source/400mA sink combined; separate status LEDs for each output; separate hand/off/auto front panel DIP switches for each output
I/O isolation	100V, transformer isolation. Outputs are isolated from the input power and the network but not from each other.
Transceiver type	FTT-10A with blocking capacitors for compatibility with link power channel
Network connector	Phone plug connector accessible from front panel
Input power	16-30VAC or VDC @ 3.2 to 6.5VA depending on load, internally isolated power supply
Mounting	Type 1 or Type 1D Base Plate
Temperature	-40 to +85°C, operating and non-operating
Humidity	10 to 95% RH @ 50°C

EMI	FCC A, CE Mark
Safety agency	UL 916
Function Blocks	Node object (1), digital output open-loop actuator objects (4), digital encoder controller objects (2), analog function block controller objects (2), type translators (6)
Software Configuration	Wide variety of LONMARK Standard Configuration Parameter Types supported by direct memory read/write function of LNS compatible network management tools

---

## DO-10 Module Software Settings

The software settings of the DO-10 module are described in the *LonPoint Application and Plug-In Guide*

---

## Installing the DO-10 Module

Installation of the DO-10 module involves the following steps:

1. Ensure that the Base Plate has been wired and installed correctly, and is securely fastened to the electrical enclosure.
2. Check for continuity on all network and power wiring. Ensure that the correct actuators are connected to the correct Base Plate I/O terminals.
3. Make certain that all network channels are terminated with the correct number and type of Terminator.
4. Insert the DO-10 module into Base Plate by aligning the network access jack on the DO-10 with the arrow head on the Base Plate (the arrow should point in the direction of the jack), and then pressing firmly to ensure that the module is properly seated in its mating Base Plate connector.
5. The DO-10 module can be hot-plugged: there is no need to disconnect power when installing the module. If power is present then the Power LED will illuminate continuously. If power is not present then the Power LED will remain off. The hand/off/auto switches will not function unless the DO-10 module is powered.
6. Securely attach the DO-10 module to the Base Plate by screwing the two Echelon 205-0130-01 screws (8-32 [M8], 3/8" [9.5mm]) into the threaded inserts in the Base Plate. Use approximately 4 lbs. in/0.5Nm torque on the screws.
7. Follow the node configuration procedure described in the *LonPoint Application and Plug-In Guide* to configure the software in the DO-10 module.
8. See *Troubleshooting* for assistance with improper DO-10 module operation.



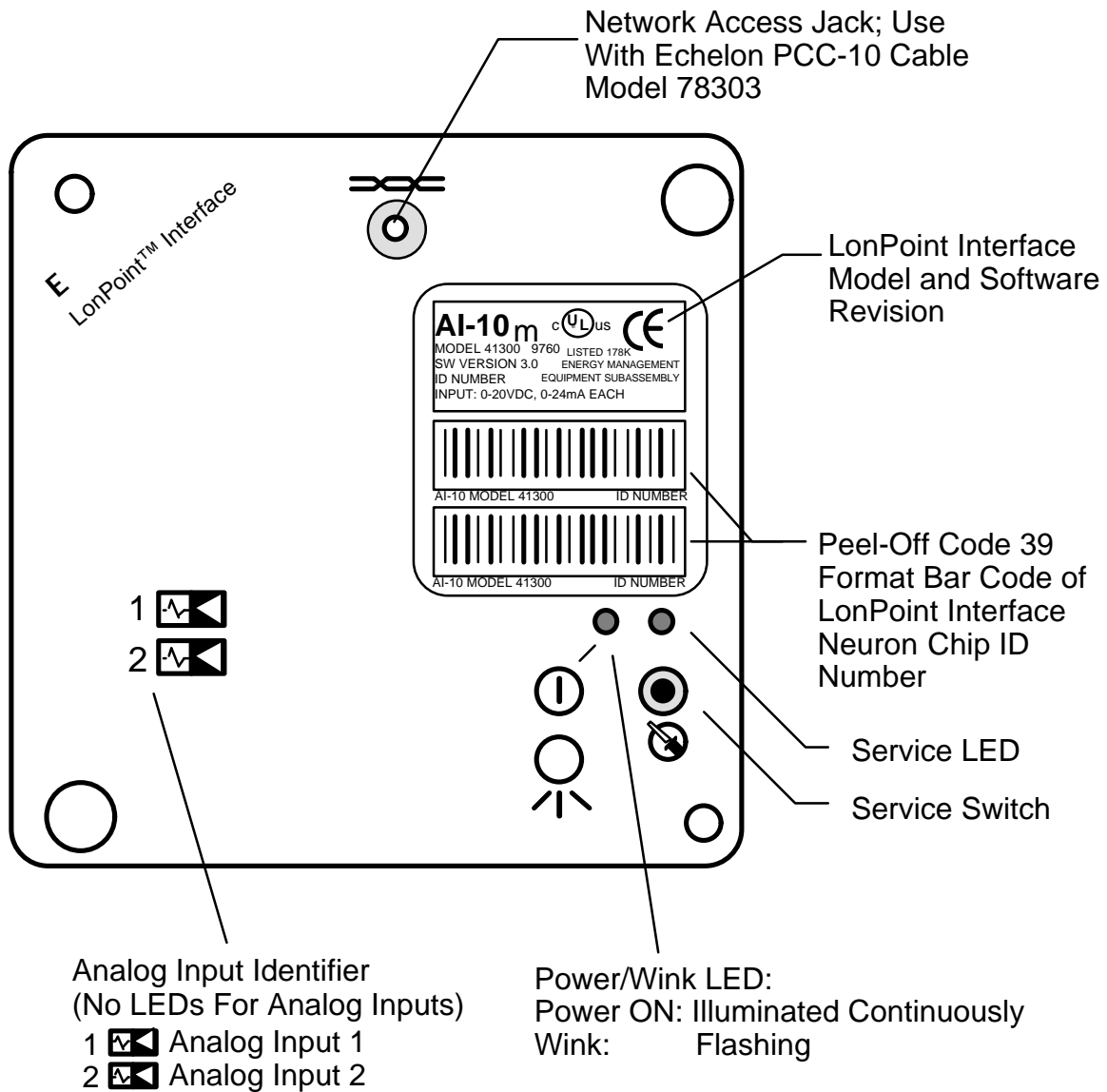
# 8

## Installing the AI-10 Analog Input Module

This chapter describes the process of installing the Model 41300 AI-10 Analog Input Module.

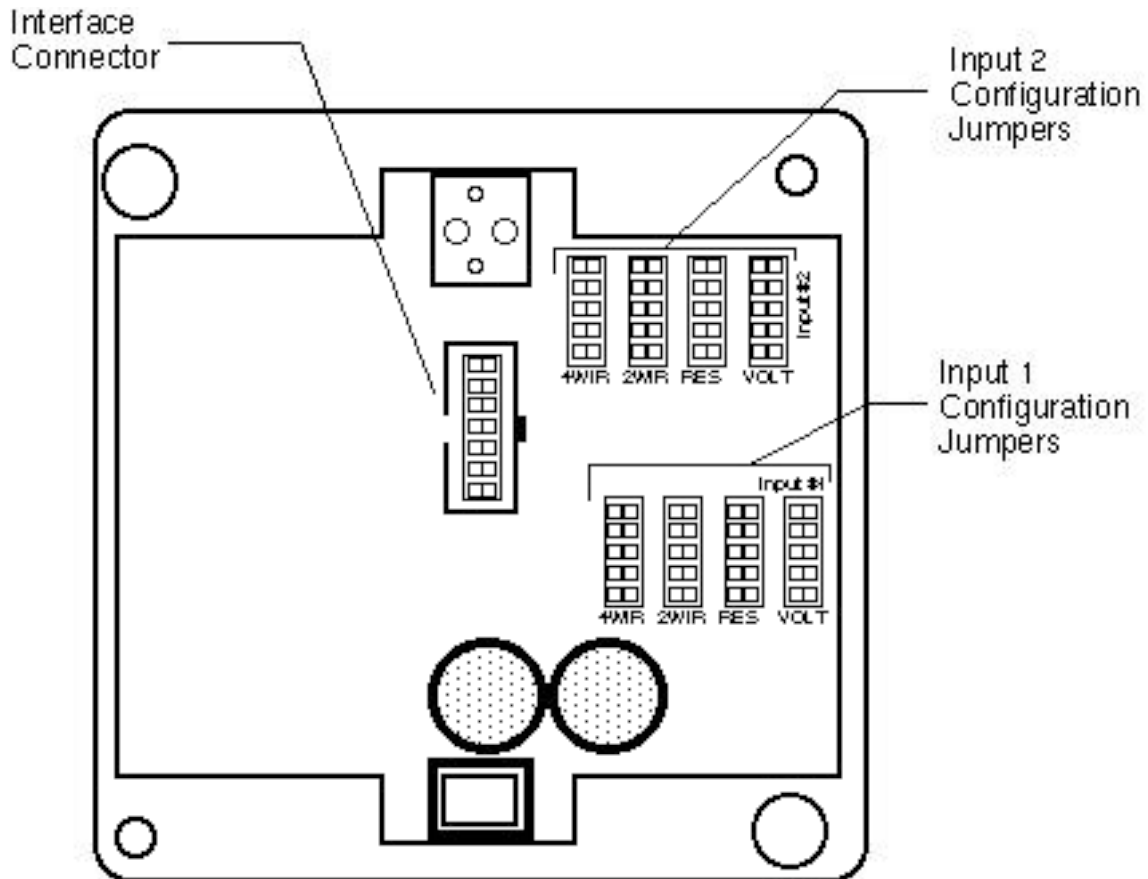
# LonPoint AI-10 Analog Input Module

The front panel of the AI-10 module is shown in figure 8.1. There are no front panel LEDs associated with the inputs, however, there are user-configured jumper blocks that must be set correctly for each analog input.



**Figure 8.1** LonPoint AI-10 Analog Input Module - Front Panel

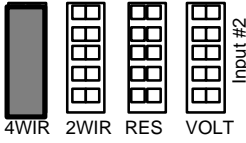
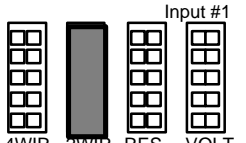
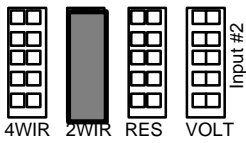
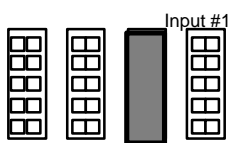
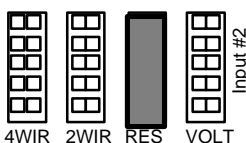
The AI-10 module includes four 5 x 2 jumper blocks for each input. These jumper blocks, labeled 2WIR, 4WIR, RES, and VOLT, are used to configure the module for the type of analog input signal that will be monitored (figure 8.2); using an incorrect jumper setting will result in improper input supervision and could cause damage to the module and/or the sensor. Each of the two sensor inputs may be configured differently. Table 8.1 presents the correct jumper position for different types of analog inputs.



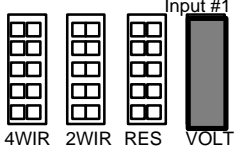
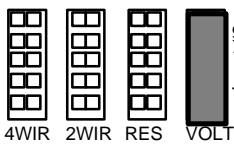
**Figure 8.2** LonPoint AI-10 Jumper Block Settings - Rear Panel

**Table 8.1** AI-10 Analog Input Module Wiring Connections

<b>Function</b>	<b>Jumper Position</b>	<b>Description</b>
Input 1 4-Wire 0-24mA Remotely Powered	<p>Input #1 4WIR 2WIR RES VOLT</p>	This setting is used for connecting 0-20mA, 4-20mA, 4-24mA, or 0-24mA intelligent transmitters that are powered by either their own power supply or a separate power supply. The maximum allowable current range is 0-25mA. In this setting the AI-10 does not supply power to the current loop.

<p>Input 2 4-Wire 0-24mA Remotely Powered</p>		<p>This setting is used for connecting 0-20mA, 4-20mA, 4-24mA, or 0-24mA intelligent transmitters that are powered by either their own power supply or a separate power supply. The maximum allowable current range is 0-25mA. In this setting the AI-10 does not supply power to the current loop.</p>
<p>Input 1 2-Wire 4-20mA Current Loop Powered</p>		<p>This setting is used for connecting 4-20mA intelligent transmitters that are powered by the current loop provided by the AI-10 module. The maximum allowable current range is 0-25mA in order to permit fault conditions to be detected (open as 0mA, short circuit as 25mA). This mode is not suitable for measuring passive resistive devices. Minimum loop voltage is 12VDC.</p>
<p>Input 2 2-Wire 4-20mA Current Loop Powered</p>		<p>This setting is used for connecting 4-20mA intelligent transmitters that are powered by the current loop provided by the AI-10 module. The maximum allowable current range is 0-25mA in order to permit fault conditions to be detected (open as 0mA, short circuit as 25mA). This mode is not suitable for measuring passive resistive devices. Minimum loop voltage is 12VDC.</p>
<p>Input 1 Passive Resistive Sensor</p>		<p>This setting is used for connecting passive resistive sensors to the AI-10 module. Resistance is measured by passing a controlled current through the sensor and then measuring the resulting voltage across the AI-10 screw terminals. Measurements of passive resistive devices may only be taken using the RES mode - the 2WIR mode is not suitable for this purpose. See text below for a discussion of the range and software settings for the RES mode. In this mode 3.5V is provided on the (+) terminal and programmable current sink (25mA or 400mA on the (-) terminal).</p>
<p>Input 2 Passive Resistive Sensor</p>		<p>This setting is used for connecting passive resistive sensors to the AI-10 module. Resistance is measured by passing a controlled current through the sensor and then measuring the resulting voltage across the AI-10 screw terminals. Measurements of passive resistive devices may only be taken using the RES mode - the 2WIR mode is not suitable for this purpose. See text below for a discussion of the range and software settings for the RES mode. In this mode 3.5V is provided on the (+) terminal and programmable current sink (25mA or 400mA on the (-) terminal).</p>



Input 1 Voltage Sensing		This setting is used for connecting an intelligent transmitter that generates a 0-5V, 0-10V, or 0-20V output. See text below for a discussion of the range and software settings for the VOLT mode. This setting also can be used to measure passive thermocouples. The input resistance of the analog input is 7.246K Ohms $\pm$ 0.3%.
Input 2 Voltage Sensing		This setting is used for connecting an intelligent transmitter that generates a 0-5V, 0-10V, or 0-20V output. See text below for a discussion of the range and software settings for the VOLT mode. This setting also can be used to measure passive thermocouples. In this mode 3.5V is provided on the (+) terminal and programmable current sink (25mA or 400mA on the (-) terminal).

The AI-10 module is installed in a Type 1 Base Plate. Wiring connections to the AI-10 module are presented in table 8.2. Specifications for the AI-10 module are shown in table 8.3.

**Table 8.2** AI-10 Analog Input Module Wiring Connections

<b>Screw Terminal</b>	<b>Wiring Connection</b>
1 and 2	Incoming network wiring, TP/FT-10 channel, polarity-insensitive
3 and 4	Outgoing network wiring, TP/FT-10 channel, polarity-insensitive
5	Unused
6 and 7	Incoming power wiring, 16-30VAC or VDC, 2.1VA for all modes except 2-wire mode (4.5VA) maximum, polarity-insensitive. If using DC power, it is good practice to maintain continuity of the power polarity throughout the network. Terminals 6 and 8 should be the same polarity, and terminals 7 and 9 should be the same polarity.
10	+ input of analog input 1
11	- input of analog input 1
12	+ input of analog input 2
13	- input of analog input 2
14	Unused
15	Unused
16	Unused
17	Unused
18	Unused

**Table 8.3** LonPoint AI-10 Analog Input Module Specifications

<b>Function</b>	<b>Description</b>
Processor/memory	Neuron 3150 Chip, 10MHz, 56K flash memory
Service function	Recessed service switch, service LED, power/wink LED. Dual tear-off bar-code Neuron ID self-adhesive tag for application to red-line drawings in the field
I/O	2 independent 16-bit resolution analog inputs

I/O type	0 to 156mV 0 to 625mV 0 to 10V 0 to 20V 0 to 24mA 0 - 12.5µA 0 - 781µA 0 - 19.5µA Resistive transducer ranging from 100• to 15k•, nominal
I/O resolution	0 to 20VDC: 0.3mV resolution 0 to 24mA: 0.37µA resolution
I/O isolation	100V, transformer isolation. Inputs are isolated from the input power and the network but not from each other.
Transceiver type	FTT-10A with blocking capacitors for compatibility with link power channel
Network connector	Phone plug connector accessible from front panel
Input power	16-30VAC or VDC, internally isolated power supply—2.1VA for all modes except 2-wire mode (4.5VA)
Mounting	Type 1 or Type 1D Base Plate
Temperature	-40 to +85°C, operating and non-operating
Humidity	10 to 95% RH @ 50°C
EMI	FCC A, CE Mark
Safety agency	UL 916
Function Blocks	Node object (1), analog input open-loop sensor objects (2), digital encoder controller objects (2), analog function block controller objects (4), type translators (4)
Software Configuration	Wide variety of LONMARK Standard Configuration Parameter Types supported by direct memory read/write function of LNS compatible network management tools

---

## AI-10 Module Software Settings

The software settings of the AI-10 module are described in the *LonPoint Application and Plug-In Guide*.

---

## Installing the AI-10 Module

Installation of the AI-10 module involves the following steps:

1. Ensure that the Base Plate has been wired and installed correctly, and is securely fastened to the electrical enclosure.
2. Check for continuity on all network and power wiring. Ensure that the correct sensors are connected to the correct Base Plate I/O terminals.
3. Make certain that all network channels are terminated with the correct number and type of Terminator.
4. Insert the AI-10 module into Base Plate by aligning the network access jack on the AI-10 with the arrow head on the Base Plate (the arrow should point in the

direction of the jack), and then pressing firmly to ensure that the module is properly seated in its mating Base Plate connector.

5. The AI-10 module can be hot-plugged: there is no need to disconnect power when installing the module. If power is present then the Power LED will illuminate continuously. If power is not present then the Power LED will remain off.

6. Securely attach the AI-10 module to the Base Plate by screwing the two Echelon 205-0130-01 screws (8-32 [M8], 3/8" [9.5mm]) into the threaded inserts in the Base Plate. Use approximately 4 lbs. in/0.5Nm torque on the screws.
7. Follow the node configuration procedure described in the *LonPoint Application and Plug-In Guide* to configure the software in the AI-10 module.
8. See *Troubleshooting* for assistance with improper AI-10 module operation.



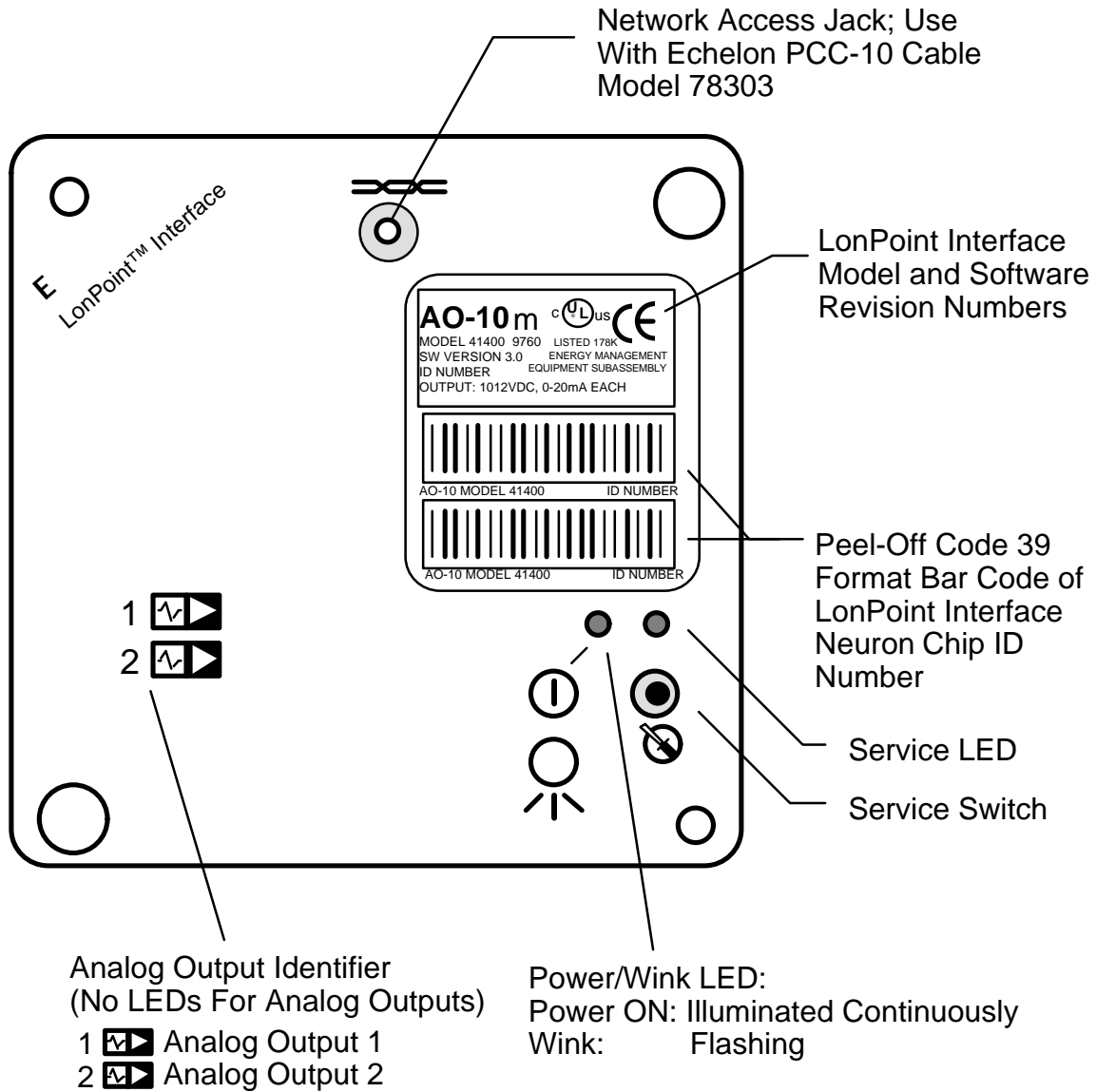
# 9

## Installing the AO-10 Analog Output Module

This chapter describes the process of installing the Model 41400 AO-10 Analog Output Module.

## LonPoint AO-10 Analog Output Module

The front panel of the AO-10 module is shown in figure 9.1. There are no front panel LEDs associated with the outputs, however, there are user-configured jumper blocks that must be set correctly for each analog output.

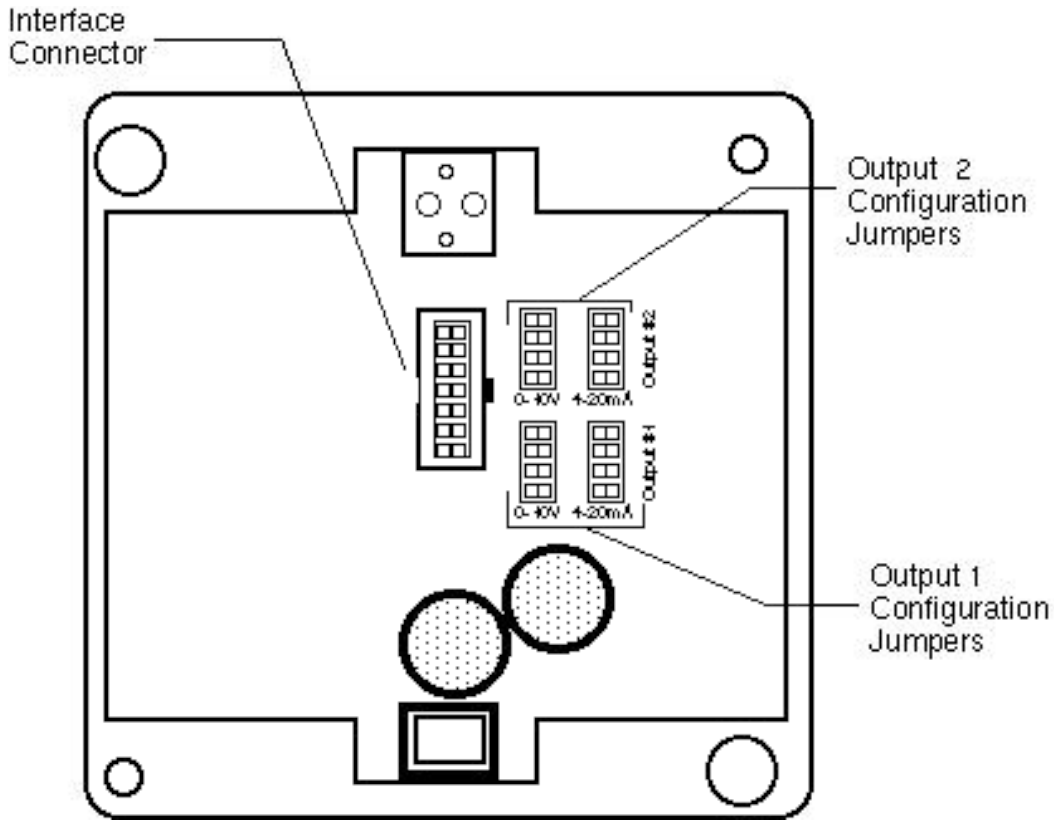


**Figure 9.1** LonPoint AO-10 Analog Input Module - Front Panel

The AO-10 module includes two 4 x 2 jumper blocks for each output. These jumper blocks, labeled 0-10V and 4-20mA, are used to configure the module for the type of analog output signal that will be generated (figure 9.2); using an incorrect jumper setting will result in improper output signals. Each of the two outputs may be

configured differently. Table 9.1 presents the correct jumper position for different types of analog outputs.

The AO-10 sources, but does not sink, current. For wiring simplicity, 4-20mA actuators attached to the AO-10 module should be operated in 2-wire mode, provided that they can operate at 12V or less. Actuators that require >12V across their terminals should be operated in a 4-wire mode and powered from a separate power supply.

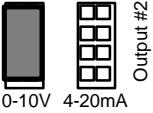
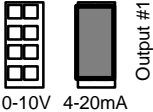
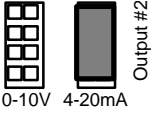


**Figure 9.2** LonPoint AO-10 Jumper Block Settings - Rear Panel

**Table 9.1** AO-10 Analog Output Module Wiring Connections

<b>Function</b>	<b>Jumper Position</b>	<b>Description</b>
Output 1 0-10V Output	 0-10V 4-20mA Output #1	This setting is used for generating a 0-10V output from the 12-bit D/A converter via a voltage amplifier. Output load may be as low as 1K Ohms.



Output 2 0-10V Output		This setting is used for generating a 0-10V output from the 12-bit D/A converter via a voltage amplifier. Output load may be as low as 1K Ohms.
Output 1 Programmable range within 0-20mA		This setting is used for generating any output range from 0-20mA (software programmable), i.e., 4-20mA from the 12-bit D/A converter via a current amplifier. The AO-10 sources current only - it cannot function as a current sink. Output load may be as low as 1K Ohms.
Output 2 Programmable range within 0-20mA		This setting is used for generating any output range from 0-20mA (software programmable), i.e., 4-20mA from the 12-bit D/A converter via a current amplifier. The AO-10 sources current only - it cannot function as a current sink. Output load may be as low as 1K Ohms.

The AO-10 module is installed in a Type 1 or Type 1D Base Plate. Wiring connections to the AO-10 module are presented in table 9.2. Specifications for the AO-10 module are shown in table 9.3.

**Table 9.2** AO-10 Analog Output Module Wiring Connections

<b>Screw Terminal</b>	<b>Wiring Connection</b>
1 and 2	Incoming network wiring, TP/FT-10 channel, polarity-insensitive
3 and 4	Outgoing network wiring, TP/FT-10 channel, polarity-insensitive
5	Unused
6 and 7	Incoming power wiring, 16-30VAC or VDC @4.2VA, polarity-insensitive. If using DC power it is good practice to maintain continuity of the power polarity throughout the network. Terminals 6 and 8 should be the same polarity, and terminals 7 and 9 should be the same polarity.
10	+ input of analog output 1
11	- input of analog output 1
12	+ input of analog output 2
13	- input of analog output 2
14	Unused
15	Unused
16	Unused
17	Unused
18	Unused

**Table 9.3** LonPoint AO-10 Analog Output Module Specifications

<b>Function</b>	<b>Description</b>
Processor/memory	Neuron 3150 Chip, 10MHz, 56K flash memory
Service function	Recessed service switch, service LED, power/wink LED. Dual tear-off bar-code Neuron ID self-adhesive tag for application to red-line drawings in the field
I/O	2 independent 12-bit resolution analog outputs
I/O type	0-10V into 1k $\Omega$ , minimum, or 0 to 20mA @ 0-12V
I/O resolution	0-10VDC: 2.5mV resolution 0-20mA: 5.0 $\mu$ A resolution
I/O isolation	100V, transformer isolation. Outputs are isolated from the input power and the network but not from each other.
Transceiver type	FTT-10A with blocking capacitors for compatibility link power channel
Network connector	Phone plug connector accessible from front panel
Input power	16-30VAC or VDC @ 4.2VA, internally isolated power supply
Mounting	Type 1 or Type 1D Base Plate
Temperature	-40 to +85°C, operating and non-operating
Humidity	10 to 95% RH @ 50°C
EMI	FCC A, CE Mark
Safety agency	UL 916
Function Blocks	Node object (1), analog output open-loop actuator objects (2), digital encoder controller objects (1), analog function block controller objects (2), PID controller objects (2), type translators (3)
Software Configuration	Wide variety of LONMARK Standard Configuration Parameter Types supported by direct memory read/write function of LNS compatible network management tools

---

## AO-10 Module Software Settings

The software settings of the AO-10 module are described in the *LonPoint Application and Plug-In Guide*.

---

## Installing the AO-10 Module

Installation of the AO-10 module involves the following steps:

1. Ensure that the Base Plate has been wired and installed correctly, and is securely fastened to the electrical enclosure.
2. Check for continuity on all network and power wiring. Ensure that the correct actuators are connected to the correct Base Plate I/O terminals.
3. Make certain that all network channels are terminated with the correct number and type of Terminator.
4. Insert the AO-10 module into the Base Plate by aligning the network access jack on the AO-10 with the arrow head on the Base Plate (the arrow should point in the direction of the jack), and then pressing firmly to ensure that the module is properly seated in its mating Base Plate connector.

5. The AO-10 module can be hot-plugged: there is no need to disconnect power when installing the module. If power is present then the Power LED will illuminate continuously. If power is not present then the Power LED will remain off.

6. Securely attach the AO-10 module to the Base Plate by screwing the two Echelon 205-0130-01 screws (8-32 [M8], 3/8" [9.5mm]) into the threaded inserts in the Base Plate. Use approximately 4 lbs. in/0.5Nm torque on the screws.
7. Follow the node configuration procedure described in the *LonPoint Application and Plug-In Guide* to configure the software in the AO-10 module.
8. See *Troubleshooting* for assistance with improper AO-10 module operation.

# 10

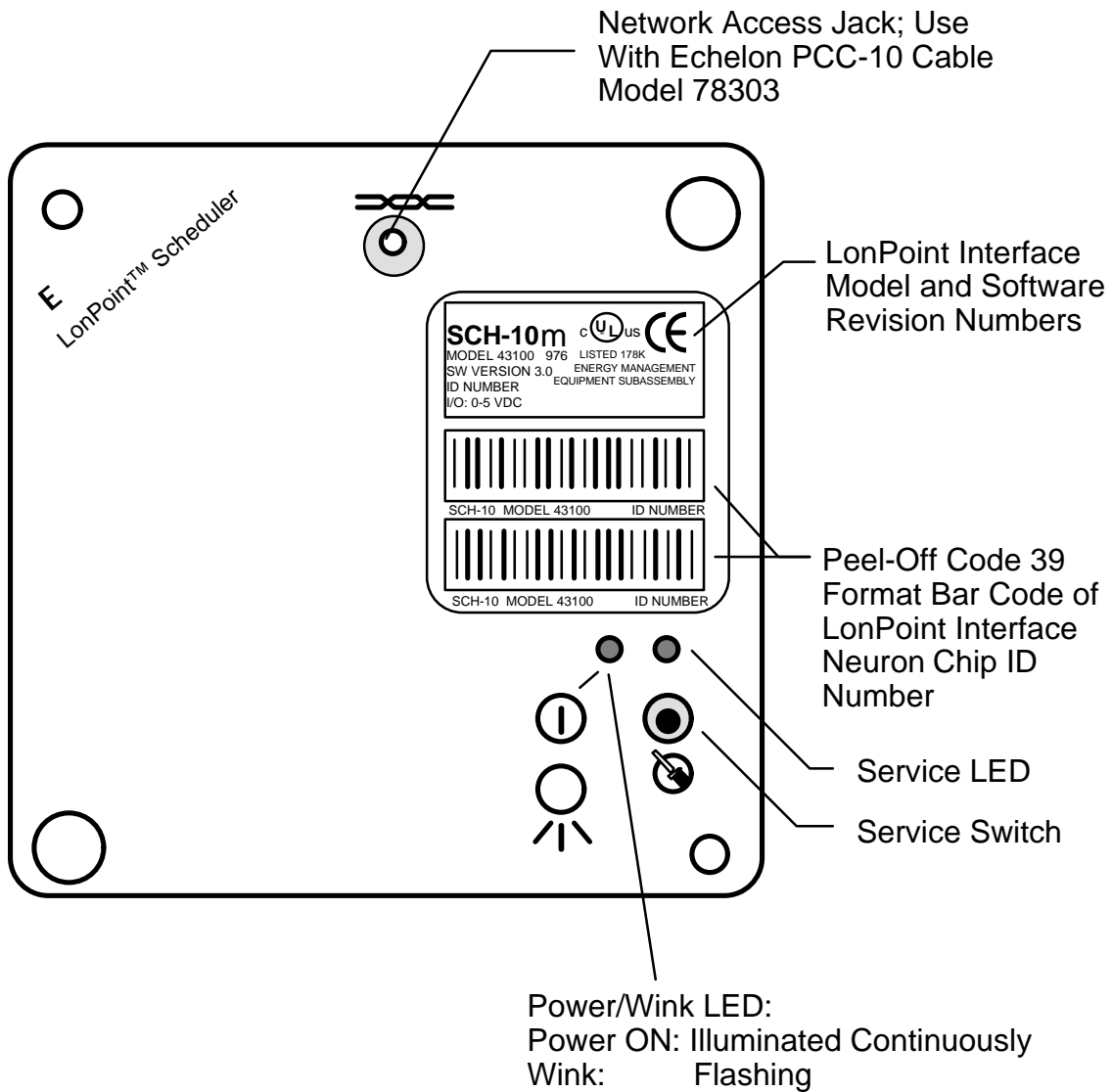
## Installing the SCH-10 Scheduler Module

This chapter describes the process of installing the Model 43100 SCH-10 Scheduler Module.

---

## LonPoint SCH-10 Scheduler Module

The front panel of the SCH-10 module is shown in figure 10.1. There are no user-configured jumper blocks or other adjustable controls on the SCH-10 module.



**Figure 10.1** LonPoint SCH-10 Scheduler Module - Front Panel

The SCH-10 module is installed in a Type 1 or Type 1D Base Plate. Wiring connections to the SCH-10 module are presented in table 10.1. Specifications for the SCH-10 module are shown in table 10.2.

**Table 10.1** SCH-10 Scheduler Module Wiring Connections

<b>Screw Terminal</b>	<b>Wiring Connection</b>
1 and 2	Incoming network wiring, TP/FT-10 channel, polarity-insensitive
3 and 4	Outgoing network wiring, TP/FT-10 channel, polarity-insensitive
5	Unused
6 and 7	Incoming power wiring, 16-30VAC or VDC, 2.4VA, polarity-insensitive. If using DC power, it is good practice to maintain continuity of the power polarity throughout the network. Terminals 6 and 8 should be the same polarity, and terminals 7 and 9 should be the same polarity.
10	TXD
11	GND
12	RXD
13	GND
14	Unused
15	RTS
16	GND
17	CTS
18	GND

**Table 10.2** LonPoint SCH-10 Scheduler Module Specifications

<b>Function</b>	<b>Description</b>
Processor/memory	Neuron 3150 Chip, 10MHz, 56K flash memory, 512K battery-backed RAM (2 weeks minimum back-up, 5 months typical; low-battery detection)
Clock/calendar	Battery-backed clock/calendar (10 year life, low-battery detection), seconds, minutes, hours, day of week, month, year
Service function	Recessed service switch, service LED, power/wink LED. Dual tear-off bar-code Neuron ID self-adhesive tags for application to red-line drawings in the field
I/O — <b>Not Currently Supported</b> — Reserved for Future Use	EIA-232 serial port with software UART, selectable bit rate (600, 1200, 2400, 4800), two start, one stop, and no parity bits. Designed to support Termiflex or equal terminal
I/O isolation	100V, transformer isolation. Outputs are isolated from the input power and the network but not from each other.
Transceiver type	FTT-10A with blocking capacitors for compatibility with link power channel
Network connector	Phone plug connector accessible from front panel
Input power	16-30VAC or VDC @ 2.4VA, internally isolated power supply
Mounting	Type 1 or Type 1D Base Plate

Temperature	-10 to +60°C, operating and non-operating
Humidity	10 to 95% RH @ 50°C
EMI	FCC A, CE Mark
Safety agency	UL 916
Function Blocks	Node object (1), state machine controller object, event scheduler controller object, real-time clock object
Software Configuration	Wide variety of LONMARK Standard Configuration Parameter Types supported by direct memory read/write function of LNS compatible network management tools

---

## SCH-10 Module Software Settings

The software settings of the SCH-10 module are described in the *LonPoint Application and Plug-In Guide*.

---

## Installing the SCH-10 Module

Installation of the SCH-10 module involves the following steps:

1. Ensure that the Base Plate has been wired and installed correctly, and is securely fastened to the electrical enclosure.
2. Check for continuity on all network and power wiring. Ensure that the correct EIA-232 connections, if used, have been made to the correct Base Plate I/O terminals.
3. Make certain that all network channels are terminated with the correct number and type of Terminator.
4. Insert the SCH-10 module into the Base Plate by aligning the network access jack on the SCH-10 with the arrow head on the Base Plate (the arrow should point in the direction of the jack), and then pressing firmly to ensure that the module is properly seated in its mating Base Plate connector.
5. The SCH-10 module can be hot-plugged: there is no need to disconnect power when installing the module. If power is present then the Power LED will illuminate continuously. If power is not present then the Power LED will remain off.
6. Securely attach the SCH-10 module to the Base Plate by screwing the two Echelon 205-0130-01 screws (8-32 [M8], 3/8" [9.5mm]) into the threaded inserts in the Base Plate. Use approximately 4 lbs. in/0.5Nm torque on the screws.
7. Follow the node configuration procedure described in the *LonPoint Application and Plug-In Guide* to configure the software in the SCH-10 module.
8. See *Troubleshooting* for assistance with improper SCH-10 module operation.



# 11

## Installing the LPR Router Modules

This chapter describes the process of installing the Model 4210x LPR Router Modules.

---

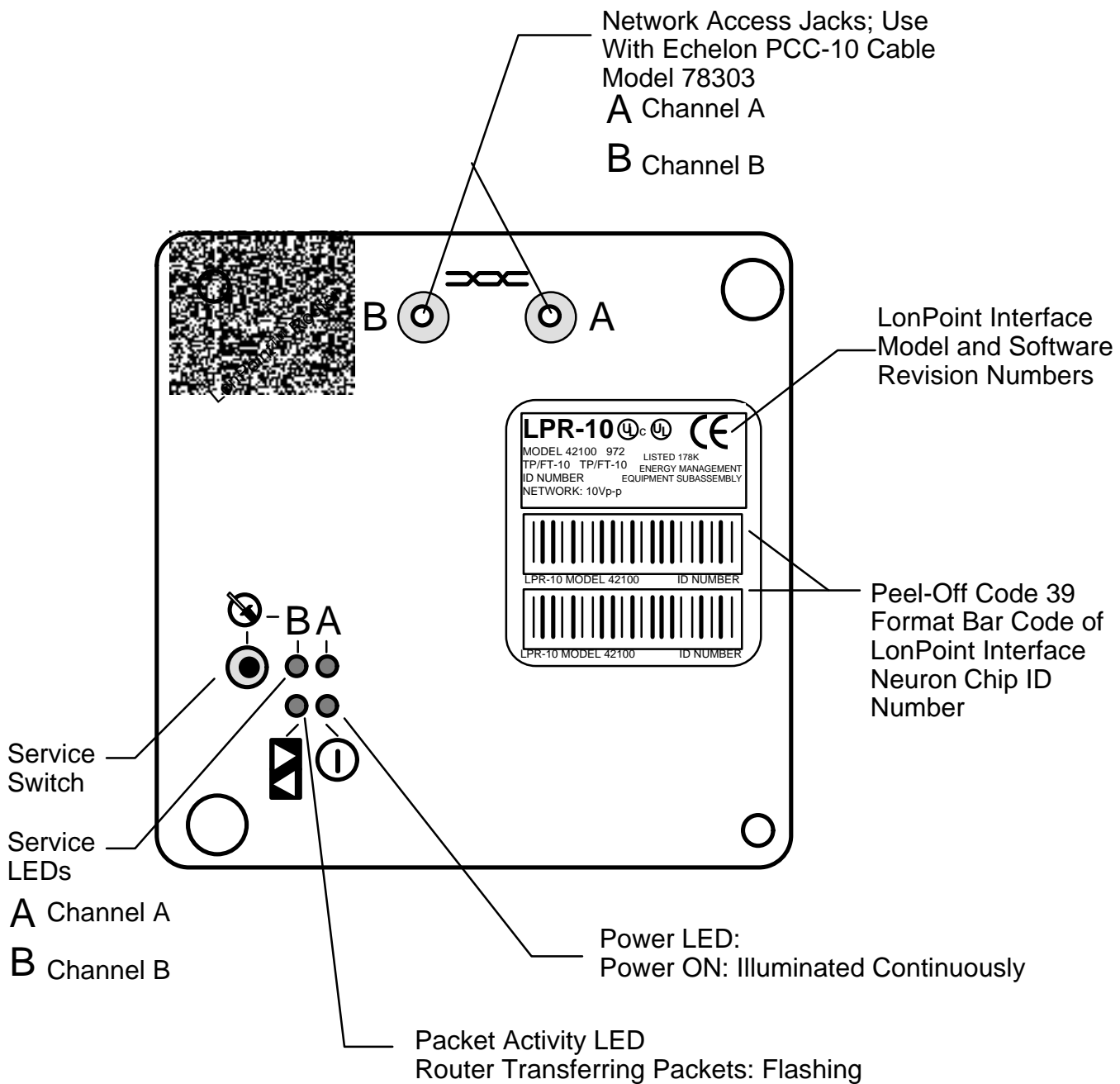
## LonPoint LPR Router Modules

There are six models of the LPR Router Module, all of which share a common front panel (figure 11.1). The models include:

42100	LPR-10 TP/FT-10 to TP/FT-10 module
42101	LPR-11 TP/FT-10 to TP/XF-78 router module
42102	LPR-12 TP/FT-10 to TP/XF-1250 router module
42103	LPR-13 TP/XF-78 to TP/XF-78 router module
42104	LPR-14 TP/XF-78 to TP/XF-1250 router module
42105	LPR-15 TP/XF-1250 to TP/XF-1250 router module

The front panel label identifies the model number and which transceiver type is associated with which channel. The front panel indicator LEDs are shown in figure 10.1; there are no user-configured jumper blocks or other adjustable controls on the LPR Routers. The front panel includes two network access jacks, one for each channel.

If using an LPR-11, -12, -13, -14, or -15 Router, be certain to use a PCC-10 PC Card together with a PCC-10 TP-78 or TP-1250 Pod, as required, for connecting to the TP/XF-78 or TP/XF-1250 channel network access jack. The PCC-10 PC Card includes a transceiver that will communicate only on the TP/FT-10 channel; a pod (adapter) must be connected to the PCC-10 to allow it to be used on a TP/XF-78 or TP/XF-1250 channel. Use Model 73250 pod for a TP/XF-78 channel and Model 73251 pod for a TP/XF-1250 channel. Pods will require the addition of a 3.5mm monaural phone plug (LZR HP147 or equal).



**Figure 11.1** LonPoint LPR Router Module - Front Panel

All LPR Routers are installed in a Type 2 or Type 2D Base Plate. Wiring connections to the LPR Routers are presented in table 11.1. Specifications for the routers are shown in table 11.2.

**Table 11.1** LPR Router Wiring Connections

<b><i>Screw Terminal</i></b>	<b><i>Wiring Connection</i></b>
1 and 2	Incoming network wiring, polarity-insensitive - CHANNEL A
3 and 4	Outgoing network wiring, polarity-insensitive - CHANNEL A
5 and 14	Cable shields - terminals 5 and 14 are internally connected.
6 and 7	Incoming power wiring, 16-30VAC or VDC, 2.0VA, polarity-insensitive. If using DC power, it is good practice to maintain continuity of the power polarity throughout the network. Terminals 6 and 8 should be the same polarity, and terminals 7 and 9 should be the same polarity.
10 and 12	Unused Jumpered together internally - may be used to land extra wires
11 and 13	Unused Jumpered together internally - may be used to land extra wires
15 and 16	Incoming network wiring, polarity-insensitive - CHANNEL B
17 and 18	Outgoing network wiring, polarity-insensitive - CHANNEL B

**Table 11.2** LonPoint LPR Router Module Specifications

<b><i>Function</i></b>	<b><i>Description</i></b>
Processor	Two Neuron 3150 Chips, 10MHz
Service function	Recessed service switch, service LED. Dual tear-off bar-code Neuron ID self-adhesive tag for application to red-line drawings in the field
Transceiver type	Varies by model
Network connector	Two phone plug connectors accessible from front panel - one per channel
Input power	16-30VAC or VDC @ 2.0VA, internally isolated power supply
Mounting	Type 2 or Type 2D Base Plate
Temperature	-40 to +85°C, operating and non-operating
Humidity	10 to 95% RH @ 50°C
EMI	FCC A, CE Mark
Safety agency	UL 916

---

## Installing the LPR Router

Installation of the LPR-1X module involves the following steps:

1. Ensure that the Type 2 or Type 2D Base Plate has been wired and installed correctly, and is securely fastened to the electrical enclosure.
2. Check for continuity on all network and power wiring. There are no I/O connections on a Type 2 or Type 2D Base Plate.
3. Make certain that all network channels are terminated with the correct number and type of terminator. Terminator(s) may be installed in unused screw terminals at end of network run(s).
4. Insert the LPR Router into the Base Plate by aligning the network access jacks on the LPR Router with the arrow head on the Base Plate (the arrow should point in the direction of the jacks), and then pressing firmly to ensure that the module is properly seated in its mating Base Plate connector.
5. The LPR Router can be hot-plugged: there is no need to disconnect power when installing the module. If power is present then the Power LED will illuminate continuously. If power is not present then the Power LED will remain off.
6. Securely attach the LPR Router to the Base Plate by screwing the two Echelon 205-0130-01 screws (8-32 [M8], 3/8" [9.5mm]) into the threaded inserts in the Base Plate. Use approximately 4 lbs. in/0.5Nm torque on the screws.
7. Follow the router configuration procedure described in the *LonMaker for Windows User's Guide* to configure the software in the LPR Router.
8. See *Troubleshooting* for assistance with improper LPR Router operation.



# 12

## Troubleshooting

This chapter describes the process of troubleshooting the LonPoint Modules.

## Troubleshooting Table

Table 12.1 presents common troubleshooting symptoms, and associated diagnoses, that may be encountered in the field.

**Table 12.1** Troubleshooting Symptoms and Diagnoses

<b>Symptom</b>	<b>Diagnosis</b>
Power LED illuminated	This is the normal state of the LED when the node is powered.
Power LED flashing then returning to continually illuminated	This is the normal state for a network management Wink function, and indicates that the module is being signalled by the LonMaker for Windows Integration Tool.
Power LED extinguished	Power supply providing power to the module has lost primary power. Check power supply output for the presence of power.
	Power wiring not correctly connected to module. Use a volt meter to check for power on base plate power terminals.
	Input voltage too low due to excessive load on the power supply providing power to the module, excessively long power cabling, or shorted power wiring. Use a volt meter to check for the correct voltage level on the base plate power terminals. Correct cabling length if too long. Repair faulty power cable.
	Type 1D or 2D DIN Base Plate Jumper Plug not correctly inserted.
Service LED extinguished	This is the normal state of the LED for a configured module.
Service LED flashing	The module is unconfigured. This is the normal state of a new module. The module must be commissioned by the LonMaker tool.
Service LED illuminated	The module is applicationless - it has lost its application software program. The module must be reloaded by the LonMaker for Windows Integration Tool.
No network communications	Network wiring not correctly connected to module.
	Network cabling shorted, open, or otherwise damaged. Use continuity meter to check cabling.
	Router(s) on network not commissioned, not powered, or otherwise not functioning correctly.
	Type 1D or Type 2D DIN Base Plate Jumper Plug not correctly inserted.
	Incorrect orientation of Type 1D and Type 2D DIN Base Plates.
	Incorrect router channel type installed on channel.
Erratic or improper network communications	Network wiring not securely connected to Base Plate terminals. The optimum tightening torque for a Base Plate screw terminal is 4 lbs. in. (0.5Nm) maximum.
	Module not properly seated in the Base Plate. Ensure that the module is pressed firmly into the Base Plate and secured with suitable fixing screws.



Erratic or improper network communications (continued)	Improper or missing network termination. A free topology TP/FT-10 channel requires one Model 44100 Terminator located anywhere on the channel. A bus topology TP/FT-10 channel requires two Model 44101 terminators, one at each end of the bus. A TP/XF-1250 channel only operates in a bus topology, and requires two Model 44200 Terminators, one at each end of the bus.
	Excessive network cabling. See Chapter 3 for a discussion of the maximum cable distances permissible on the TP/FT-10 and TP/XF-1250 channels. If the channel cabling is too long, install one or more LPR Routers in series with the network cabling.
	Improper network cabling. See Chapter 3 for a discussion of the types of cabling that are approved for use on the TP/FT-10 and TP/XF-1250 channels. In some cases it is possible to correct network communications by installing one or more LPR Routers in series with the network cabling. In other cases the cabling must be replaced with an approved cable.
	Excessive number of modules on a channel. See Chapter 3 for a discussion of the number of devices that can be installed on a channel. If too many modules are on the channel, install one or more LPR Routers in series with the network cabling.
	Modules are connected to the wrong channel of an LPR Router. Care must be taken to ensure that correct types of devices are connected to the two channels of a router. LonPoint modules should only be connected to a TP/FT-10 channel.
Improper operation of digital inputs	Input voltage is too low to be detected. Ensure that the input signal level matches the capabilities of the DI-10 module.
Improper operation of digital input LEDs	Node unconfigured. LEDs only function in configured mode.
Improper operation of digital output	Mismatch between the output current of the module and the device being driven. The maximum current from any single DO-10 output is 100mA source, with a maximum total of 110mA source for all four outputs.
	Hand/off/auto switch(es) in the wrong position. The hand/off/auto switch forces the output low (0 position), high (1 position), or allows the application program to select the output state (center network position).
Improper operation of digital output LEDs	Node unconfigured. LEDs only function in configured mode.
Improper operation of analog inputs	Jumpers incorrectly set on AI-10 modules. See Chapter 7 for a discussion of jumper settings. Make certain that the Input 1 jumpers are set correctly for analog input 1, and likewise that Input 2 jumpers are set correctly for analog input 2.
	Common wiring shared between two analog inputs. Each analog input to the AI-10 module must have a separate + and - connection; the two analog inputs should not share a common + or - connection.
	Software configuration is incorrectly set for the specified analog input. The gain and range settings must be configured correctly in order for the AI-10 to properly supervise the analog input.

Improper operation of analog outputs	Jumpers incorrectly set on AO-10 modules. See Chapter 8 for a discussion of jumper settings. Make certain that the Output 1 jumpers are set correctly for actuator output 1, and likewise that Output 2 jumpers are set correctly for actuator output 2.
	Common wiring shared between two analog outputs. Each analog output on the AO-10 module must have a separate + and - connection; the two analog outputs should not share a common + or - connection.
	Software configuration is incorrectly set for the specified voltage or current output. The voltage and current settings must be configured correctly in order for the AO-10 to properly drive the analog output.

---

---

E

## DECLARATION OF CONFORMITY

### LONPOINT® MODULES

---

---

Application of Council Directive : 89/23EEC; 89/337/EEC

Manufacturer's Name: Echelon Corporation

Manufacturer's Address: 4015 Miranda Avenue  
Palo Alto, CA 94304  
USA

Manufacturer's Address:  
in Europe Echelon BV  
Printerweg 3  
3821 AP Amersfoort  
The Netherlands

Product Model Number: 40111, 40222, 41100, 41200, 41300, 41400,  
41500, 42100, 42101, 42102, 42103, 42104,  
42105, 43100, 44100, 44200, 48111, 48222.

Type of Equipment: Industrial Control, Energy Management  
Equipment

Standards to which:	EN55011-A, 1991	EN50082-2, 1995
Conformity is	EN61000-4-2	EN61000-4-3
Declared	EN61000-4-4	EN61000-4-5
	EN61000-4-6	EN61000-4-8
	EN61000-4-11	ENV50204

---

---

I, Paul Smith, hereby declare that the equipment specified above conforms to the above Directives and Standards.

Place: Amersfoort, The Netherlands

Date: March, 1999

Position: Controller, Echelon BV

---

---