![Patton logo — let's Connect!™]

CopperLink™ Model 1101
Line Power PoE Ethernet Extender

User Manual

C E

This is a Class A device and is not intended for use in a residential environment.

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Technical Support: **+1 (301) 975-1007**
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About This Guide

This guide describes the CopperLink Model 1101 hardware, installation, and basic configuration.

Audience

This guide is intended for the following users:

• Operators

• Installers

• Maintenance technicians

Structure

This guide contains the following chapters and appendices:

For best results, read the contents of this guide *before* you install the CopperLink 1101.

Precautions

Notes and cautions, which have the following meanings, are used throughout this guide to help you become aware of potential Router modem problems. ***Warnings*** relate to personal injury issues, and ***Cautions*** refer to potential property damage.

> **Note**   A note presents addition.al information or interesting sidelights.

> ⚠️ **IMPORTANT**   The alert symbol and IMPORTANT heading calls attention to important information.

CAUTION	The alert symbol and CAUTION heading indicate a potential hazard. Strictly follow the instructions to avoid property damage.
CAUTION	The shock hazard symbol and CAUTION heading indicate a potential electric shock hazard. Strictly follow the instructions to avoid property damage caused by electric shock.
WARNING	**The alert symbol and WARNING heading indicate a potential safety hazard. Strictly follow the warning instructions to avoid personal injury.**
WARNING	**The shock hazard symbol and WARNING heading indicate a potential electric shock hazard. Strictly follow the warning instructions to avoid injury caused by electric shock.**

Safety When Working With Electricity

WARNING	• **For devices with an external power adapter, the power adapter shall be a listed Limited Power Source. The mains outlet that is utilized to power the device shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker in compliance with local regulatory requirements.** • **For AC powered devices, ensure that the power cable used meets all applicable standards for the country in which it is to be installed.** • **For AC powered devices which have 3 conductor power plugs (L1, L2 & GND or Hot, Neutral & Safety/Protective Ground), the wall outlet (or socket) must have an earth ground.** • **For DC powered devices, ensure that the interconnecting cables are rated for proper voltage, current, anticipated temperature, flammability, and mechanical serviceability.** • **Do not work on the device or connect or disconnect cables during periods of lightning activity.**

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

WARNING

This device contains no user serviceable parts. This device can only be repaired by qualified service personnel.

CAUTION

Electrostatic Discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures. Do the following to prevent ESD:

• Always follow ESD prevention procedures when removing and replacing cards.

• Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground.

• To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis.

Chapter 1   General information

Chapter contents

Overview

Thank you for purchasing this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for one year for parts and labor. If any questions or problems arise during installation or use of this product, contact Patton Electronics Technical Support at +(301) 975-1007.

Features

- **Ethernet Extension**—Extends 10/100Base-TX Ethernet over 3,000 feet using 2-wire, 24-AWG twisted-pair, Cat 3, Cat 5e/6/7, or coaxial cable.

- **Delivers PoE**—PowerPlus technology powers up both the remote CopperLink extender and the PoE enabled device connected to it. No power is required at the remote location.

- **Transparent LAN Bridging**—Passes higher layer protocols, including 802.1Q VLAN tagged and untagged packets. Fully transparent to various video compression schemes such as WMV, MPEG-4 and MJPEG.

Description

The Patton Electronics CL1101 Power over Ethernet (PoE) Ethernet Extenders provide Ethernet communication and (depending on the model) power across 2-wire, 24-AWG twisted-pair; Cat 3; Cat 5e/6/7; or coaxial cable:

- The CL1101 transmits at 10 or 100 Mbps.

- The two endpoints must both operate at the same bandwidth.

- The CL1101 operates only in full-duplex mode.

- The actual data rate and power delivered by the CL1101 depends on line quality.

The CopperLink 1101 enables Ethernet connectivity over previously installed copper infrastructure. The solution breathes new life into circuits deployed for such traditional non-IP applications as RS232/485 controls, alarms, CCTV, analog phones, intercom speakers, and others. Figure 1 shows a typical application.
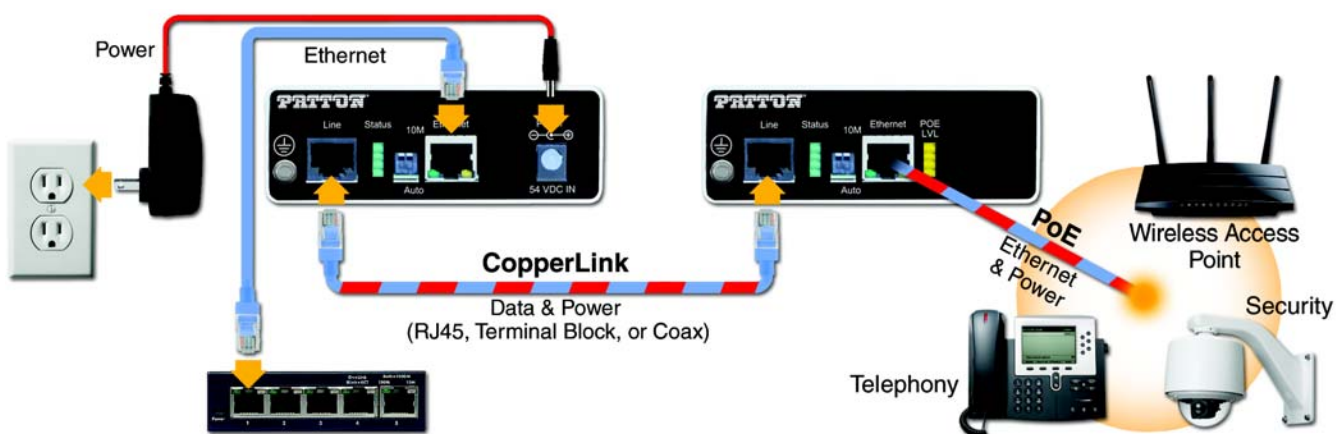
Figure 1. Typical application

Unit Definitions

Local Customer Endpoint (LCE)—Customer equipment that is typically closer to the centralized location. This is often times a server or a network switch.

Remote Customer Endpoint (RCE)—Customer equipment that is typically far away from other devices. It is often a phone, camera, or other small device.

Local (L) Ethernet Extender—The extender closer to the Local Customer Endpoint.

Remote (R) Ethernet Extender—The extender closer to the Remote Customer Endpoint.

Data

Data may be transmitted full duplex at 10Mbit or 100Mbit. LCE and RCE must be able to be at the same data rate.

Both the LCE and the RCE Ethernet ports should support at least 10Mbit full duplex, and be configured identically (see figure 2).
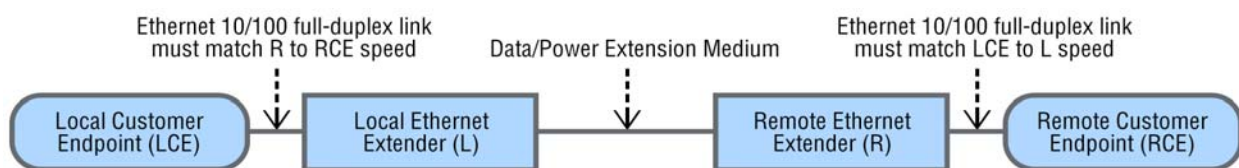
Figure 2. Data path

Power

Power across the system as a whole must be defined before details about each unit can be understood.

The Local Customer Endpoint should not have power on the line in all cases. The Ethernet port on the Local Ethernet Extender is not a PoE port. It is a 10/100 Ethernet port. If IEEE80.2af/at PoE is applied to it, the power negotiation between the ports will fail.

> ⚠ **CAUTION**   **If PoE power is applied to the Local Ethernet Extender's Ethernet port, equipment damage may occur.**

Power-across-link application
The Local Customer Endpoint has no power on the Ethernet port.

The Local Ethernet Extender is powered using a PoE voltage external power source (approximately 54VDC). This power supply's positive and negative leads are internally connected to data wires through some circuitry. The chassis is not directly connected to the power supply so it is possible to use positive, negative, and isolated voltage sources.[1] Power is sent to the Remote Ethernet Extender without any detection or negotiation. It is completely passive.

When choosing to transmit non-isolated voltage, great care must be taken. There is no isolation in the system besides the power supply.

Unit Definitions   **13**

WARNING

If the RCE's input power is grounded in any way, it will short out the power being sent which could cause equipment damage or personal injury.

The Remote Ethernet Extender receives power. Shortly after it is powered, it will provide power using an IEEE 802.3at/af port.

The Remote Customer Endpoint will receive negotiated 802.3at/af PoE power (see figure 3).
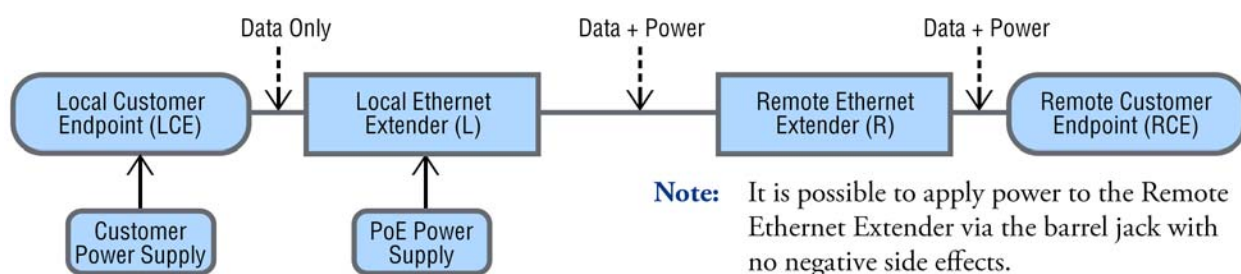
Figure 3. Power supply and data paths for power-across-link application

Remote-power application

The Local Customer Endpoint has no power on the Ethernet port.

> **Note** It is possible to apply power to the Remote Ethernet Extender via the barrel jack with no negative side effects.

The Local Ethernet Extender is powered by a 12 VDC power supply. It is not used to transmit power across the extension link.

The Remote Ethernet Extender is powered using a PoE voltage external power source (approximately 54 VDC). Shortly after it is powered, it will provide power using an IEEE802.3at/af port.

The Remote Customer Endpoint will receive negotiated 802.3at/af PoE power (see figure 4).
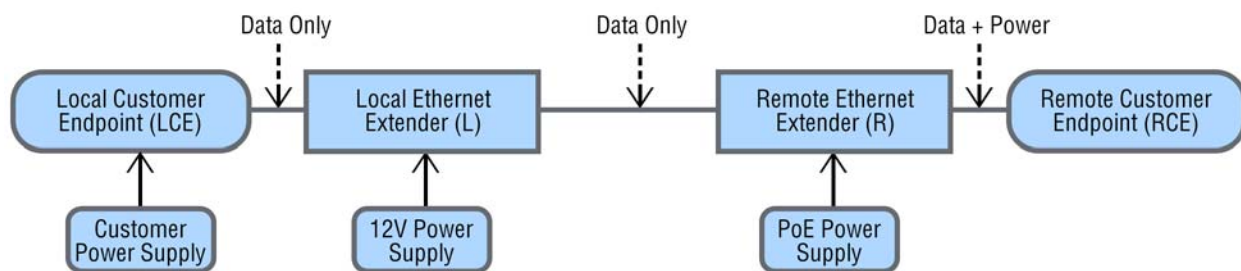
Figure 4. Power supply and data paths for remote-power application

1. For coaxial products, the negative input of the power supply is tied to the chassis. This means negative voltage would short to the chassis and possibly cause damage to devices or human injury. This is due to the nature of the coaxial cable (the outer conductor is exposed and must be used for GND). For this reason, only positive or isolated voltages are recommended when using coaxial.

Local (L) Ethernet Extender   **Remote (R) Ethernet Extender**

Power port

Ethernet port

RJ-45 Line port

Switch selectable
• Forced 10 or 100 line rate
• Legacy or 802.3at/af power mode
• Number of pairs used

Terminal Block
and
Coaxial port
also available

Grounding stud

PoE Level
Meter (LED)

Individual Pair
Link Status (LED)
(Supports up to 4 pair)
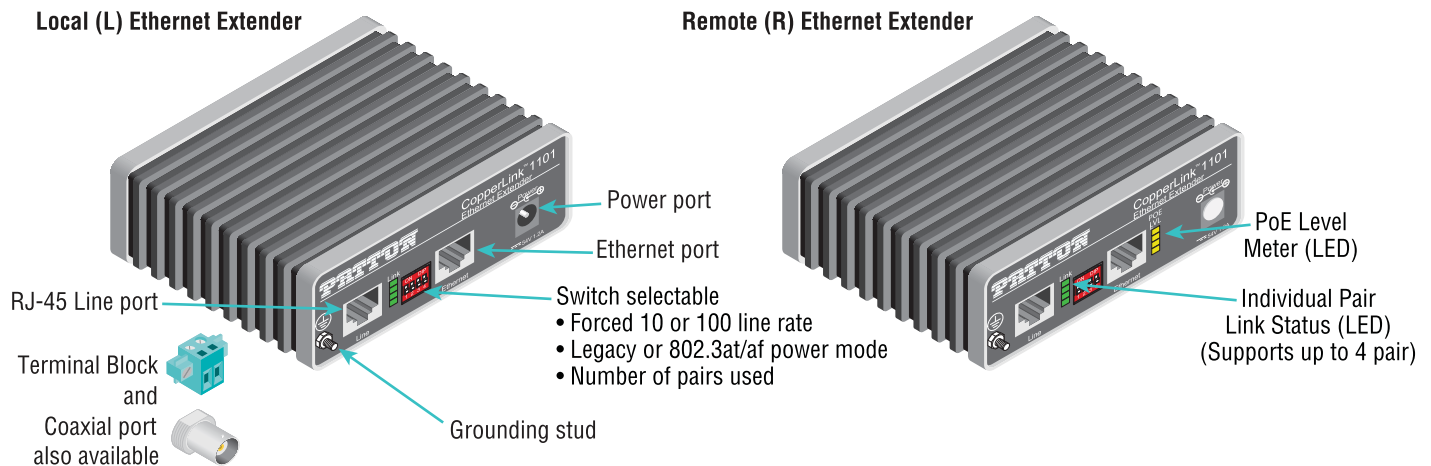
Figure 5. CL1101 front panels

Front panel description

The following describes the ports, indicators, and grounding stud for the CL1101 (see figure 5):

• **Grounding stud**—Prevents high voltage surges from reaching human accessible components (the shielded connector). This has a minimum effect on protecting internal circuitry. The exception is for coax where the negative input is directly connected to this ground stud.

• **Line**—The extension interface used for sending data and power.

  ⁄ **RJ-45**—Interface for two, four, six or eight wires—pin-out to TIA/EIA T568A/B (see section "RJ-45" on page 40 for more information).

  ⁄ **Terminal Block**—Interface for a single pair of wires; 16–28 AWG (see section "Terminal Block" on page 40 for more information).

  ⁄ **Coaxial**—Interface for a single pair of wires; 75-ohm BNC connection; outer conductor tied to negative input of Local Ethernet Extender's power input as well as grounding stud (see section "BNC (Coaxial)" on page 41 for more information).

• **DIP Switch**—The DIP switch configures the line rate, power mode, and number of wire pairs used (see section "Configuring the DIP Switch" on page 24 for more information)

• **Ethernet**—10/100 Full duplex port. Left LED (green) indicates link (solid) and activity (blinking). Right LED (yellow) indicates connection rate, 10 Mb (off) and 100Mb (solid). See section "10/100Base-T Interface" on page 39 for more information.

> **Note** Remote unit only: If this is a unit that can transmit power, it will do so as an 802.3at/af compliant port.

• **Power**—Power input jack; center positive.

> **Note** Power supply can be installed on remote unit even if the unit is receiving power across the line.

- Used for data extension only mode. The power supply provided is 12 VDC center positive.

- For Power Across Link, this jack can be used to supplement power available at the PoE port.

> ⚡ **CAUTION**
> Ensure that the barrel jack cap is installed when barrel jack is not used to minimize risk of electrostatic discharge events into the unit.

- For Remote Power, the power is a PoE level isolated power supply. This means a -54 VDC isolated power supply.
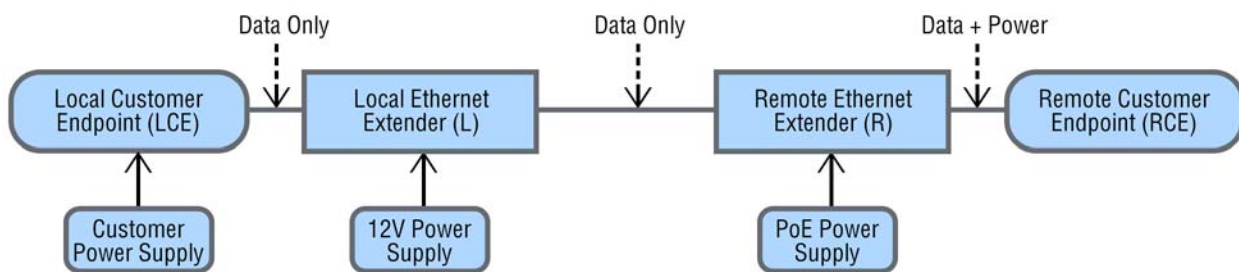
Figure 6. Power supply and data paths for remote-power application

- **Link**—The four stacked Link LEDs indicate line status (see section "Front Panel LED Status Indicators" on page 27 for more information).

- **PoE LVL (remote unit only)**—Indicates how much power is available out of the PoE port (to apply to the Remote Customer Endpoint). See section "Front Panel LED Status Indicators" on page 27 for more information.

Power Transmission

> ⚠ **IMPORTANT**
> The following is intended for educational purposes only; consult with a licensed electrician before applying this information in practice.

This section details generic information on power transmission and how it affects the CL1101. The following is basically a crash course on the theory and application.

General Background

There are several important factors to consider when dealing with power transmission to a remote load. The factors that should be understood are ampacity (current carrying capability of the wire), insulation of the wire, voltage being transmitted, current being transmitted, resistance of the wire, and resistance of the load (endpoint).

The physical limitations of the wire are ampacity and insulation of the wire. The maximum current is the amount of current that can be safely per regional electrical codes. The insulation of the wire will determine

what voltage the wire can tolerate before it breaks down. This information is provided by the wire manufacturer.

Given a certain power consumption of a remote unit and given a certain voltage being applied, it's possible to calculate the amount of current that the unit should expect to receive. Unfortunately, sending any current (at all) will cause the voltage to sag by the time it reaches the remote device (due to the voltage drop along the wire). This in turn increases the current draw (to overcome the drop in voltage) causing the voltage to drop even further! So this is a bit of a self-defeating cycle. It does balance out, but in the end it means there is a maximum amount of power that can be transmitted given a voltage being applied and the resistance of the wire. This is why relatively high (though still safe) voltage is chosen for use in PoE applications.

As a result, when transmitting power over long distances, it is the voltage being applied and the resistance of the wire that limits the maximum power that can be transmitted.

Wire Specifics

Wire comes in all shapes and sizes. It can be thick and made from copper (good wire for power transmission) or thin and made from aluminum (poor wire for power transmission).

There is also a hybrid sometimes used called copper clad aluminum. This is aluminum wire that is surrounded by a layer of copper. This is reasonable for some data transmission because high frequency signals tend to travel on the outer surface of the wire (skin effect), but DC power uses the entire wire. As a result, this makes for a rather poor power conductor.

Additionally, hotter environments typically increase the resistance.

Some figures at room temperature (-20 °C, 68 °F) follow:

- 24 AWG solid copper wire: ~0.09 ohms per meter

- 28 AWG solid copper wire: ~0.21 ohms per meter

- 24 AWG CCA (copper clad aluminum) wire: ~0.13 ohms per meter

- 28 AWG CCA wire: ~0.32 ohms per meter

Since the circuit must complete a round trip, the values actually double. Although some of the numbers don't appear too different, the effect can be significant.

A real world example:

An endpoint consumes 10W (including the extender) of power. If you are sending 54 VDC, what is the maximum distance this power can be sent?

For transmitting the maximum amount of power across a particular medium, the maximum power transfer theorem suggests that half of the power is lost in the endpoint while the other half is lost in the wire. This effectively means seeing a 27 V drop across the wire (when using the Patton PoE power supply) when it is sending the maximum amount of power. We also need to take into account the (2x) resistance for completing the loop. This is also a best case result. If we account for approximately 30% inefficiency (and applying algebra on Ohm's law equations), we get the following equation:

Max distance in meters = 0.7 x (voltage sent)2/(2 x one way wire Ohms/m x power needed)

Or more concretely for 24 AWG solid copper, (0.7 x 27 x 27)/(2 x 0.09 x 10) = 284 meters

If you had more wire pairs, then further distances are possible, just multiply by the number of wire pairs.

CL1101 specifics

The above example is completely hypothetical but is realistic. Unfortunately, it is often difficult to determine the resistance of pre-existing cables. To make things easier, the unit has the ability to approximate the resistance of the wire and determine what the maximum amount of power could be available on extender's PoE port. This information is only available on the Remote unit however. The Local unit merely states how much total power is being sent down the line.

Chapter 2 Installation

Chapter contents

Planning the Installation

> ⚠️ **CAUTION** The Interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

To install the CL1101 Ethernet Extender, do the following:

1. Connect a data & power cable to the *Line* interface (see section "Connecting the Line Interface")

2. Connect an Ethernet cable to the *Ethernet* interface (see section "Connecting the 10/100Base-T Ethernet Interface" on page 22)

3. Connect a ground wire to the grounding stud (see section "Connecting the Grounding Stud" on page 23)

4. Connect the power supply cable to the *Power* port (see section "Connecting Power" on page 24)

5. Configuring the DIP switch (see section "Configuring the DIP Switch")

Connecting the Line Interface

> ⚠️ **CAUTION** The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

The CL1101 supports communication between two peer Ethernet LAN devices over a distance of up to 3300 ft (1 km) over 24 AWG (0.5 mm) twisted-pair wire, Cat5+, or 75-ohm BNC. The CL1101 will be equipped with one of the following interfaces:

*   RJ-45 (see section "Connecting the RJ-45 Line Interface")

*   Terminal block (see section "Connecting the Terminal Block Line Interface" on page 22)

*   BNC (Coaxial) (see section "Connecting the BNC (Coaxial) Line Interface" on page 22)

> **Note** The CL1101 units work in pairs. The CL1101/L connects to the CL1101/R.

> **Note** Actual distance and link performance may vary depending on the environment and type/gauge of wire used.

> ⚠️ **IMPORTANT** Power is **NOT** transmitted as on traditional PoE. PoE pin-out assumes that the same polarity is on a single pair of wires, but in order to accommodate 1 pair mode, the polarity is alternated within the pair.

⚠ **CAUTION** Never connect the Line interface to a PoE port because equipment damage may occur.

Connecting the RJ-45 Line Interface

Do the following to connect the *Line* interface.

1. To function properly, the two CL1101s must be connected together using twisted-pair, unconditioned, dry, metal wire, between 19 (0.9mm) and 26 AWG (0.4mm). Leased circuits that run through signal equalization equipment are not acceptable.

2. The CL1101 is equipped with an RJ-45 interface jack (see figure 7)
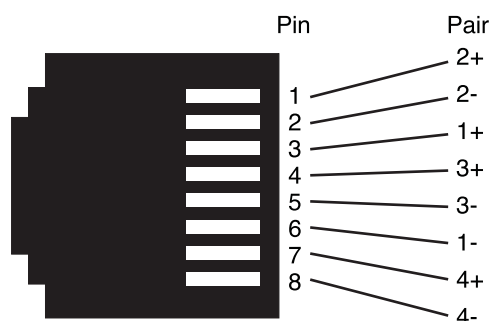
Figure 7. RJ-45 pin-out

3. The RJ-45 connector on the CL1101's twisted pair interface is polarity insensitive, and is wired for two, four, six or eight wires—pin-out to TIA/EIA T568A/B (see table 4).

Table 1. RJ-45 wire modes

Pair	Pin	Voltage
1+	3	+
1-	6	–
2+	1	+
2-	2	–
3+	4	+
3-	5	–
4+	7	+
4-	8	–

Note

- **2-wire mode**—non-standard pin-out

- **4-wire mode**—802.3i/802.3u wired compatible pin-out

- **8-wire mode**—802.3ab/802.3an wired compatible pin-out

Connecting the Terminal Block Line Interface

Do the following to connect the *Line* interface:

1. To connect the line interface of the CL1101/TB simply use a single pair of 16–28 AWG wires to connect the pair of CL1101s (see table 2).

Table 2. Terminal block wire modes

Pair	Pin	Voltage
1+	Left	+
1-	Right	–

Connecting the BNC (Coaxial) Line Interface

Do the following to connect the *Line* interface:

1. To connect the line interface of the CL1101/BNC simply use a coaxial cable with a BNC connector at each end to connect the pair of CL1101s (see table 3).

Table 3. Coaxial (BNC) wire modes

Pair	Pin	Voltage
1+	Inner	+
1-	Outer	–

Connecting the 10/100Base-T Ethernet Interface

Do the following to connect the 10/100Base-T *Ethernet* interface:

1. The RJ-45 *Ethernet* port is an Auto-MDIX 10/100Base-T that connects to a 10/100Base-T device or network. Figure 8 shows the signal/pin relationships on this interface. You may connect this port to a hub or PC using a straight-through or crossover cable (see Appendix 4 on page 23) that is up to 328 ft long.

⚠ **CAUTION** The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.
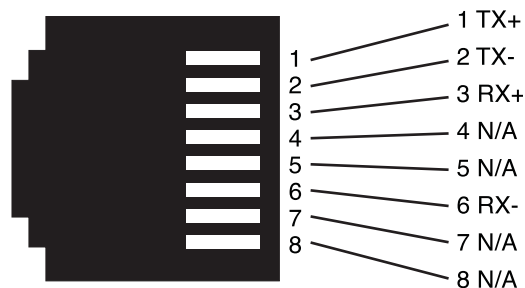
Figure 8. CL1101 10/100Base-T RJ-45 Connector Pin-out

Table 4. RJ-45 wire modes

Pin	Voltage	Function
1	Mode A +	Tx +
2	Mode A +	Tx –
3	Mode A –	Rx +
4	Mode B +*	N/A
5	Mode B +*	N/A
6	Mode A –	Rx –
7	Mode B –*	N/A
8	Mode B –*	N/A

Note * Mode A and Mode B are not configurable, the remote unit requires different hardware.

For Mode **A** order:

- CL1101/PAF**A**/x/EUI-2PK (Ethernet Extender Kit)
- CL1101/PAF**A**/x/EUI (Remote PoE Extender)

For Mode **B** order:

- CL1101/PAF**B**/x/EUI-2PK (Ethernet Extender Kit)
- CL1101/PAF**B**/x/EUI (Remote PoE Extender)

Connecting the Grounding Stud

As a standard safety practice, the chassis of the CL1101 must be properly grounded to protect against any contact with an electrical fault condition.

Do the following to connect to the CL1101 to ground:

1. Use a #4 ring terminal to terminate the CL1101 end of a #18 AWG (minimum) stranded ground wire.

2. Connect the ring terminal to the grounding stud of the CL1101. Do not over-tighten the grounding stud hex-nut.

3. Connect the other end of the ground wire to an electrical ground nearest the CL1101. Often this will be on an electrical panel or sub panel. If you cannot locate a nearby electrical ground, contact Patton Technical Support at (301) 975-1000 to discuss an alternative grounding solution.

   Note Keep the length of the ground wire as short as possible.

4. Verify that the resistance of the ground path is less than 0.5 ohms.

Connecting Power

> ⚠️ **CAUTION**　The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

The CL1101 does not have a power switch, so it powers up as soon as it is connected to a power source.

An external AC to DC adapter is supplied with the units. This connection is made via the barrel jack on the front panel of the CL1101. No configuration is necessary for the power supply.

DC power (supplied via the power supply jack to the CL1101) must meet the following requirements; DC power supplied must be regulated 12 VDC ±5% to 54 VDC ±5%. The barrel type plug has 2.5/5.5/10mm I.D./O.D./Shaft Length dimensions.

> **Note**　A power supply can be installed on the remote unit even if the unit is receiving power across the line.

> ⚠️ **CAUTION**　Verify that the included barrel jack cap is installed on the remote unit when the barrel jack is not used to minimize risk of electrostatic discharge events into the unit.

Configuring the DIP Switch

DIP switch (see figure 9) settings are described in table 5.

Figure 9. 4-position DIP switch

Table 5. DIP switch settings

Switch (left to right)	1	2	3	4
Function	Down: 100 Mb, Up: 10 Mb	Down Down: 2-wire mode Down Up or Up Down: 4-wire mode Up Up: 8-wire mode*		Remote only** Up: Legacy PoE mode Down: IEEE802.3af PoE

*8-wire mode 10 Mb not supported, will default to 10 Mb 4-wire mode
**Switch has no function on Local unit

Chapter 3 Operation

Chapter contents

Introduction

Once the CL1101s are properly installed, they should operate transparently. No user settings required. This section describes reading the LED status monitors.

Front Panel LED Status Indicators

The CL1101 provides the following status indicators:

- **Link**—There are four stacked green LEDs that indicate line status (see table 6).

Table 6. LED status descriptions

Pattern	Status
Fast blinking 1–4 LEDs	The unit is attempting to link using configured wire pairs
Solid 1–4 LEDs	Linked at configured wire pairs

- **Ethernet port**—10/100 Full duplex port. Left LED (green) indicates link (solid) and activity (blinking). Right LED (yellow) indicates connection rate, 10 Mb (off) and 100Mb (solid).

> Note   Remote unit only: If this is a unit that can transmit power, it will do so as a 802.3at/af compliant port.

- **PoE LVL (yellow) (remote unit only)**—Indicates how much power is available out of the PoE port (to apply to the Remote Customer Endpoint). When the unit first turns on, the unit does not power the Remote Customer Endpoint but the LED will display how much power is available on the port. After the Remote Customer Endpoint is turned on, the LED will indicate how much more power could potentially be sent (how close you are to maxing out the wire) (see table 7).

Table 7. Remote unit PoE LVL LED definitions

LEDs on	Power Available*
0	~0W
1	~3W
2	~6W
3	~13W
4	~25W

*If there is no PoE device attached, LED accuracy is greatly reduced.

Chapter 4 Contacting Patton for assistance

Chapter contents

Introduction

This chapter contains the following information:

- "Contact information"—describes how to contact Patton technical support for assistance.

- "Warranty Service and Returned Merchandise Authorizations (RMAs)"—contains information about obtaining a return merchandise authorization (RMA).

Contact information

Patton Electronics offers a wide array of free technical services. If you have questions about any of our other products we recommend you begin your search for answers by using our technical knowledge base. Here, we have gathered together many of the more commonly asked questions and compiled them into a searchable database to help you quickly solve your problems:

- Online support—available at **www.patton.com/returns/**

- E-mail support—e-mail sent to **support@patton.com** will be answered within 1 business day

- Telephone support—standard telephone support is available five days a week—from **8:00 am** to **5:00 pm EST** (**1300** to **2200 UTC**)—by calling **+1 (301) 975-1007**

Warranty Service and Returned Merchandise Authorizations (RMAs)

Patton Electronics is an ISO-9001 certified manufacturer and our products are carefully tested before shipment. All of our products are backed by a comprehensive warranty program.

> **Note**   If you purchased your equipment from a Patton Electronics reseller, ask your reseller how you should proceed with warranty service. It is often more convenient for you to work with your local reseller to obtain a replacement. Patton services our products no matter how you acquired them.

Warranty Coverage

Our products are under warranty to be free from defects, and we will, at our option, repair or replace the product should it fail within one year from the first date of shipment. Our warranty is limited to defects in workmanship or materials, and does not cover customer damage, lightning or power surge damage, abuse, or unauthorized modification.

Out-of-Warranty Service

Patton services what we sell, no matter how you acquired it, including malfunctioning products that are no longer under warranty. Our products have a flat fee for repairs. Units damaged by lightning or other catastrophes may require replacement.

Returns for Credit

Customer satisfaction is important to us, therefore any product may be returned with authorization within 30 days from the shipment date for a full credit of the purchase price. If you have ordered the wrong equipment or you are dissatisfied in any way, please contact us to request an RMA number to accept your return. Patton is not responsible for equipment returned without a Return Authorization.

Return-for-Credit Policy

- Less than 30 days: No Charge. Your credit will be issued upon receipt and inspection of the equipment.

- 30 to 60 days: We will add a 20% restocking charge (crediting your account with 80% of the purchase price).

- Over 60 days: Products will be accepted for repairs only.

RMA Numbers

RMA numbers are required for all product returns. You can obtain an RMA by doing one of the following:

- Completing a request on the RMA Request page in the *Support* section at **www.patton.com/returns/**

- By calling **+1 (301) 975-1007** and speaking to a Technical Support Engineer

- By sending an e-mail to **returns@patton.com**

All returned units must have the RMA number clearly visible on the outside of the shipping container. Please use the original packing material that the device came in or pack the unit securely to avoid damage during shipping.

Shipping Instructions

The RMA number should be clearly visible on the address label. Our shipping address is as follows:

Patton Electronics Company
RMA#: xxxx
7622 Rickenbacker Dr.
Gaithersburg, MD 20879-4773 USA

Patton will ship the equipment back to you in the same manner you ship it to us. Patton will pay the return shipping costs.

Appendix A **Compliance Information**

Chapter contents

Regulatory Information

EMC Directive:

- FCC Part 15, Class A

- EN55022, Class A

- EN55024

- EN50581

Low-Voltage Directive (Safety):

- IEC/EN60950-1, 2nd Edition

- UL60950-1/CSA C22.2 No. 60950-1

PSTN:

- This device is not intended nor approved for connection to the PSTN

Radio and TV Interference (FCC Part 15)

This device generates and uses radio frequency energy, and if not installed and used properly-that is, in strict accordance with the manufacturer's instructions-may cause interference to radio and television reception. The device has been tested and found to comply with the limits for a Class A computing device in accordance with specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the device does cause interference to radio or television reception, which can be determined by disconnecting the unit, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

CE Declaration of Conformity

This device is in compliance with the essential requirements and other relevant provisions of Directive 2004/108/EC relating to electromagnetic compatibility and Directive 2006/95/EC relating to electrical equipment designed for use within certain voltage limits. The Declaration of Conformity may be obtained from Patton Electronics, Inc at www.patton.com/certifications.

The safety advice in the documentation accompanying this device shall be obeyed. The conformity to the above directive is indicated by CE mark on the device.

Authorized European Representative

D R M Green
European Compliance Services Ltd
Greyfriars Court
Paradise Square
Oxford, OX1 1BE, UK

Service

All warranty and non-warranty repairs must be returned freight prepaid and insured to Patton Electronics. All returns must have a Return Materials Authorization number on the outside of the shipping container. This number may be obtained from Patton Electronics Technical Services at:

- Tel: +1 (301) 975-1007
- Email: **support@patton.com**
- URL: **http://www.patton.com**

Packages received without an RMA number will not be accepted.

Appendix B **Specifications**

Chapter contents

Line Connector

- RJ-45, Terminal Block, or BNC Coaxial

LAN Connectors

- 1 RJ-45, 10/100Base-T, IEEE 802.3 Ethernet (Local)
- IEEE 802.3af/at PoE Ethernet (Remote)

Transmission Line

1 to 4 pairs of 2-wire or coaxial (CL1101/BNC)

LED Status Indicators

- PoE LVL (4 yellow LEDs)
- Status (4 green LEDs)
- Ethernet: Left LED (green) indicates link (solid) and activity (blinking). Right LED (yellow) indicates connection rate, 10 Mb (off) and 100Mb (solid).)

Power Supply

External AC option:
- AC: UI (120–240 VAC)
- DC: 12–54 VDC (54 VDC recommended for optimal performance
- Power consumption: 1.25 A

Physical

Operating Temperature Range
32 to 122°F (0 to 50°C)
For extended temperature option see CL1101E

Humidity
Up to 90% non-condensing.

Dimensions
1.50 H x 4.06 W x 3.50 D in. (3.81 H x 10.31 W x 8.89 D mm)

Weight

0.78 oz (22 g)

Appendix C Factory Replacement Parts and Accessories

Chapter contents

CL1101/CL1101 Factory Replacement Parts and Accessories

Patton Model #	Description
Base Models	
C1101/L/P/RJ45/EUI	CopperLink Power Plus 10/100 Local Power Extender; 1x 10/100; RJ45 Line; 100–240VAC
C1101/R/PAFA/RJ45/E	CopperLink Power Plus 10/100 Remote Extender w/PoE; 1x 10/100; 802.3af (mode A); RJ45 Line; Powered by Local Unit
C1101/PAFA/RJ45/EUI-2PK	CopperLink Power Plus 10/100 Power Extender Kit w/PoE; 802.3af; RJ45 Line; 100–240VAC
C1101/L/P/TB/EUI	CopperLink Power Plus 10/100 Local Power Extender; 1x 10/100; Terminal Block Line; 100–240VAC
C1101/R/PAFA/TB/E	CopperLink Power Plus 10/100 Remote Extender w/PoE; 1x 10/100; 802.3af (mode A); Terminal Block Line; Powered by Local Unit
C1101/PAFA/TB/EUI-2PK	CopperLink Power Plus 10/100 Power Extender Kit; 802.3af; Terminal Block Line; 100–240VAC
C1101/L/P/BNC/EUI	CopperLink Power Plus 10/100 Local Power Extender; 1x 10/100; BNC Coax Line; 100–240VAC
C1101/R/PAFA/BNC/E	CopperLink Power Plus 10/100 Remote Extender w/PoE; 1x 10/100; 802.3af (mode A); BNC Coax Line; Powered by Local Unit
C1101/PAFA/BNC/EUI-2PK	CopperLink Power Plus 10/100 Power Extender Kit w/PoE; 802.3af; BNC Coax Line; 100–240VAC
07MCL1101L-UM	User Manual
Accessories	
PS-03671H1-021	Power Supply, AC/DC,UNIVERSAL INPUT,54V,1.2A,65W,DESKTOP
0805US	IEC320 Power Cord, United States
0805EUR	IEC320 Power Cord, European
0805UK	IEC320 Power Cord, United Kingdom
0805AUS	IEC320 Power Cord, Australia/New Zealand

Appendix D **Interface Pin Assignment**

Chapter contents

10/100Base-T Interface

Ethernet (RJ-45)
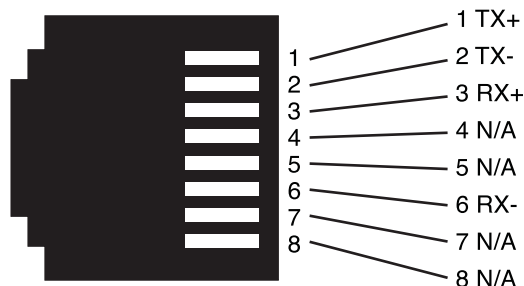
Figure 10. CL1101 10/100Base-T RJ-45 Connector Pin-out

Table 8. RJ-45 wire modes

Pin	Voltage	Function
1	Mode A +	Tx +
2	Mode A +	Tx –
3	Mode A –	Rx +
4	Mode B +*	N/A
5	Mode B +*	N/A
6	Mode A –	Rx –
7	Mode B –*	N/A
8	Mode B –*	N/A

Note * Mode A and Mode B are not configurable, the remote unit requires different hardware.

For Mode **A** order:

- CL1101/PAF**A**/x/EUI-2PK (Ethernet Extender Kit)
- CL1101/PAF**A**/x/EUI (Remote PoE Extender)

For Mode **B** order:

- CL1101/PAF**B**/x/EUI-2PK (Ethernet Extender Kit)
- CL1101/PAF**B**/x/EUI (Remote PoE Extender)

Line Interface

RJ-45
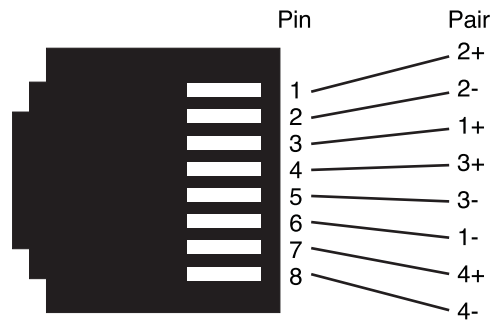
Figure 11. RJ-45 pin-out

Table 9. RJ-45 wire modes

Pair	Pin	Voltage
1+	3	+
1-	6	–
2+	1	+
2-	2	–
3+	4	+
3-	5	–
4+	7	+
4-	8	–

Note These devices are polarity sensitive.

Note

- **2-wire mode**—non-standard pin-out
- **4-wire mode**—802.3i/802.3u wired compatible pin-out
- **8-wire mode**—802.3ab/802.3an wired compatible pin-out

Terminal Block

Table 10. Terminal block wire modes

Pair	Pin	Voltage
1+	Left	+
1-	Right	–

BNC (Coaxial)

Table 11. Coaxial (BNC) wire modes

Pair	Pin	Voltage
1+	Inner	+
1-	Outer	−

Appendix E Line Rate & Reach Chart

Chapter contents

CL1101 Power & Data Performance (Twisted Pair)

Table 12. CL1101 power & data performance over twisted-pair wires

	10 Mbps		100 Mbps		
	2 wire	4 wire	2 wire	4 wire	8 wire
Min. distance feet (meters)	6 (1.83)	131 (39.9)	6 (1.83)	6 (1.83)	6 (1.83)
Max. distance feet (meters)	2500 (762)	3300 (1005)	915 (278.9)	1065 (324.6)	1849 (563.6)
Link time Min. distance	5 sec	157 sec	5 sec	5 sec	5 sec
Link time Max. distance	5–10 sec	8–265 sec	5 sec	6 sec	6 sec
PoE class at Max. distance	Class 1	Class 2	Class 2/3	Class 4	Class 3/4

CL1101 Power Performance (Twisted Pair)

Table 13. CL1101 power performance over twisted-pair wires

PoE Class	2 wire feet (meters)	4 wire feet (meters)	6 wire feet (meters)	8 wire feet (meters)
1 (3.84 watts)	2648 (807)	5453 (1662)	8363 (2549)	11,555 (3521)
2 (6.49 watts)	1587 (484)	3322 (1012)	5041 (1536)	6905 (2104)
3 (12.95 watts)	784 (239)	1587 (484)	2519 (768)	3456 (1052)
4 (25.50 watts)	262 (80)	653 (199)	1196 (365)	1587 (484)

CL1101 Power & Data Performance (RG59)

Table 14. CL1101 power & data performance over RG59 coaxial cable

	10 Mbps	100 Mbps
Min. distance feet (meters)	6 (1.83)	6 (1.83)
Max. distance feet (meters)	4925 (1501)	1225 (323)
Link time Min. distance	5 sec	5 sec
Link time Max. distance	5–10 sec	5 sec
PoE class at Max. distance	Class 2/3	Class 4

CL1101 Power Performance (RG59)

Table 15. CL1101 power performance over RG59 coaxial cable

PoE Class	RG59 feet (meters)
1 (3.84 watts)	4975 (1516)
2 (6.49 watts)	4975 (1516)
3 (12.95 watts)	3925 (1196)
4 (25.50 watts)	1675 (511)