

# USER MANUAL

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## MODEL 2172 CopperLINK™ High Speed Ethernet Extenders



**PATTON**  
**Electronics Co.**



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Rev. A  
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## 1.0 WARRANTY INFORMATION

**Patton Electronics** warrants all Model 2172 components to be free from defects, and will—at our option—repair or replace the product should it fail within one year from the first date of the shipment.

This warranty is limited to defects in workmanship or materials, and does not cover customer damage, abuse or unauthorized modification. If this product fails or does not perform as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall **Patton Electronics** be liable for any damages incurred by the use of this product. These damages include, but are not limited to, the following: lost profits, lost savings and incidental or consequential damages arising from the use of or inability to use this product. **Patton Electronics** specifically disclaims all other warranties, expressed or implied, and the installation or use of this product shall be deemed an acceptance of these terms by the user.

**Note** Conformity documents of all Patton products can be viewed online at [www.patton.com](http://www.patton.com) under the appropriate product page.

### 1.1 COMPLIANCE

#### **EMC Compliance:**

- FCC Part 15, Class A
- EN55022, Class A
- EN55024

#### **Safety Compliance:**

- IEC/EN 60950-1
- AS/NZS 60950-1

### 1.2 RADIO AND TV INTERFERENCE (FCC PART 15)

This equipment 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. This equipment has been tested and found to comply with the limits for a Class A computing device in accordance with the 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 equipment causes interference to radio or

television reception, which can be determined by disconnecting the cables, 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).

### **1.3 DECLARATION OF CONFORMITY**

We certify that the apparatus identified in this document conforms to the requirements of Council Directive 1999/5/EC on the approximation of the laws of the member states relating to Radio and Telecommunication Terminal Equipment and the mutual recognition of their conformity.

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

### **1.4 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>**

**Note** Packages received without an RMA number will not be accepted.

## 1.5 SAFETY WHEN WORKING WITH ELECTRICITY



- This device contains no user serviceable parts. The equipment shall be returned to Patton Electronics for repairs, or repaired by qualified service personnel.
- **Mains Voltage:** Ensure that the external power adapter is 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. Ensure that the power cable used meets all applicable standards for the country in which it is to be installed, and that it is connected to a wall outlet which has earth ground.
- Hazardous network voltages are present in WAN ports regardless of whether power to the unit is ON or OFF. To avoid electric shock, use caution when near WAN ports. When detaching the cables, detach the end away from the device first.
- Do not work on the system 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.

## **2.0 GENERAL INFORMATION**

Thank you for your purchase of 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 +1 (301) 975-1007.

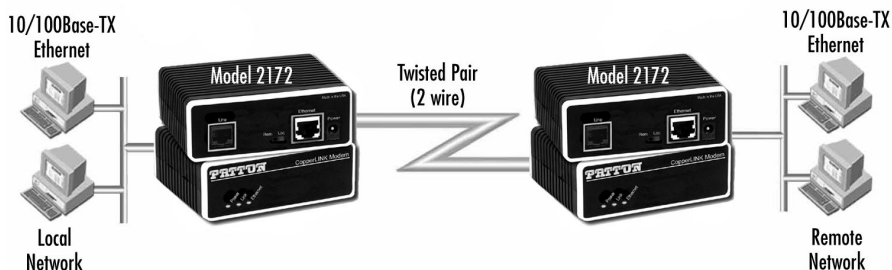
### **2.1 FEATURES**

- Variable rate CopperLINK extender - Easy to configure
- Auto-MDIX Ethernet
- Configurable 10/100, Full/Half, and Auto-Negotiating Ethernet
- Extends network connections up to 6,000 ft (1.8 km) over 2-wire 24-AWG unconditioned lines
- Switch selectable line rates up to 50 Mbps
- 6 symmetric or asymmetric settings via DIP switch
- Transparent operation
- LED indicators for Power, Link, and Ethernet Link & Activity
- Surge suppression up to 20 kA (8/20  $\mu$ s)
- Made in the USA

### **2.2 DESCRIPTION**

The Patton Electronics Model 2172 CopperLink modems provide high-speed LAN connections between peered Ethernet LANs, remote PC's, or any other network enabled 10/100Base-T device.

Operating in pairs, one Model 2172 is configured as the (L) Local unit located at one end of the LAN extension and the other Model 2172 is configured as the (R) Remote unit at the other end. The Model 2172 is configured as a L or R via the switch on the rear panel. These units can automatically forward LAN broadcasts, multicasts, and frames across a 2-wire voice-grade twisted-pair link. The data is passed transparently (unmodified) through the 2172s. The 2172s automatically add and delete MAC addresses, only passing packets across the CopperLINK link that are meant for the remote peered LAN.



**Figure 1.** Typical application

The pair of 2172 models work together to create a transparent extension between two peered Ethernet LANs. Figure 1 shows a typical point-to-point application.

### 3.0 INSTALLATION

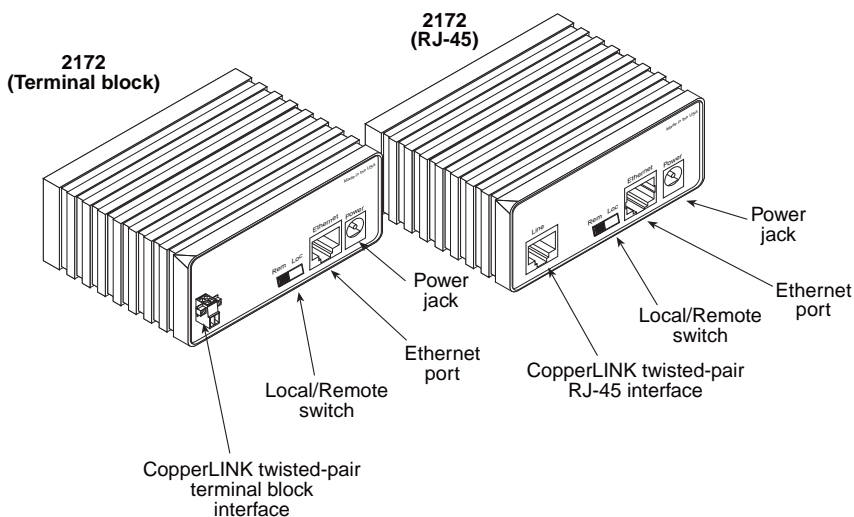


**The Interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.**

To install the 2172 Ethernet Extender, do the following:

1. Connect the line interface between the units (refer to section 3.1, "Connecting the Twisted-Pair Line Interface" on page 9)  
**Note** See Figure 2 for the standalone unit's rear panel arrangements.
2. Connect the Ethernet interface (refer to section 3.2, "Connecting the 10/100Base-T Ethernet Interface" on page 11).
3. Connect the power plug (refer to section 3.3, "Connecting Power" on page 12).





**Figure 2.** Model 2172 standalone rear panel

### 3.1 CONNECTING THE TWISTED-PAIR LINE INTERFACE



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 Model 2172 supports communication between two peer Ethernet LAN sites over a distance of up to 6,000 ft (1.8 km) over 24 AWG (0.5 mm) twisted-pair wire.

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

Follow the steps below to connect the Model 2172 CopperLINK Interfaces.

**Note** The Model 2172 units work in pairs. One of the units must be configured as a (L) Local unit, and the other unit must be configured as a (R) Remote unit. It does not matter which end is the L and which is the R. The link is always initiated by the R unit. As long as the L unit is powered on, the R unit can establish a link by being powered on or by having its power reset.

1. To function properly, the two Model 2172s must be connected together using twisted-pair, unconditioned, dry, metal wire, between

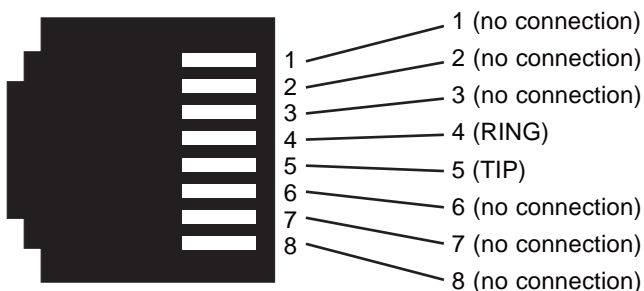
19 (0.9mm) and 26 AWG (0.4mm). Leased circuits that run through signal equalization equipment are not acceptable.

2. The Model 2172 is equipped with either an RJ-45 or a terminal block interface jack that can be used on the CopperLINK interface. These CopperLINK interfaces are a two-wire interface. Observe the signal/pin relationships on the Model 2172's CopperLINK interface jacks.



**The Line port has been classified as TNV-1 and is approved for connection to a PSTN TNV-1 circuit.**

The RJ-45 connector on the Model 2172's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationship is shown in Figure 3.



**Figure 3.** Model 2172 (RJ-45) twisted pair line interface.

The terminal block connector on the Model 2172's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationships is shown in Figure 4.

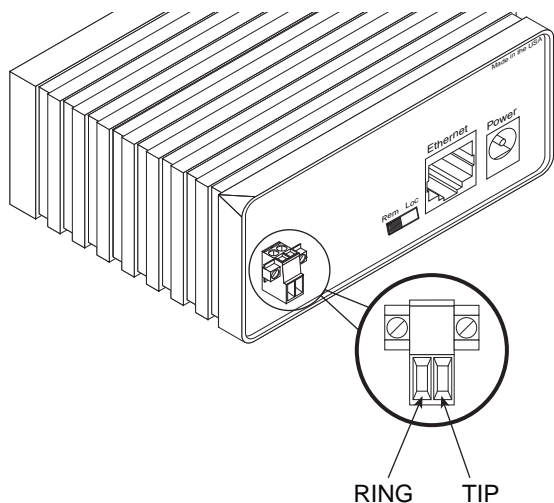


Figure 4. Model 2172 (Terminal Block) twisted pair line interface.

### 3.2 CONNECTING THE 10/100BASE-T ETHERNET INTERFACE



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 shielded RJ-45 port labeled *Ethernet* is the Auto-MDIX10/100Base-T interface. This port is designed to connect directly to a 10/100Base-T network. Figure 5 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 that is up to 328 ft long.

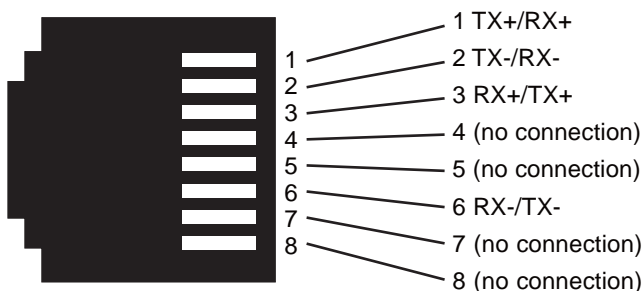


Figure 5. Model 2172 10/100Base-T RJ-45 Connector Pinout.

### 3.3 CONNECTING POWER



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 Model 2172 does not have a power switch, so it powers up as soon as it is plugged in.

An external AC or DC power supply is available separately. This connection is made via the barrel jack on the rear panel of the Model 2172. No configuration is necessary for the power supply (See Appendix B for domestic and international power supply and cord options).

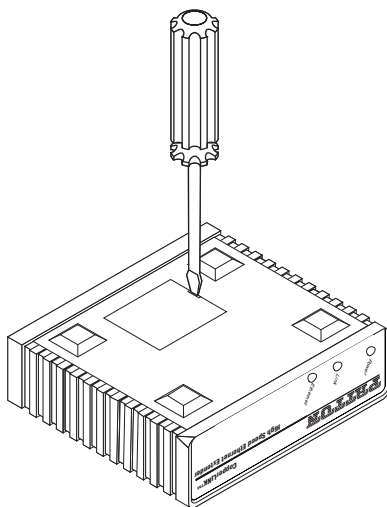
DC power (supplied via the power supply jack to the 2172) must meet the following requirements; DC power supplied must be regulated +5VDC  $\pm 5\%$ , 1.0A minimum. Center pin is +5V. The barrel type plug has a 2.5/5.5/10mm I.D./O.D./Shaft Length dimensions.

## 4.0 CONFIGURATION

The Model 2172 has eight DIP switches for configuring the unit for a wide variety of applications. This section describes switch locations and explains the different configurations.

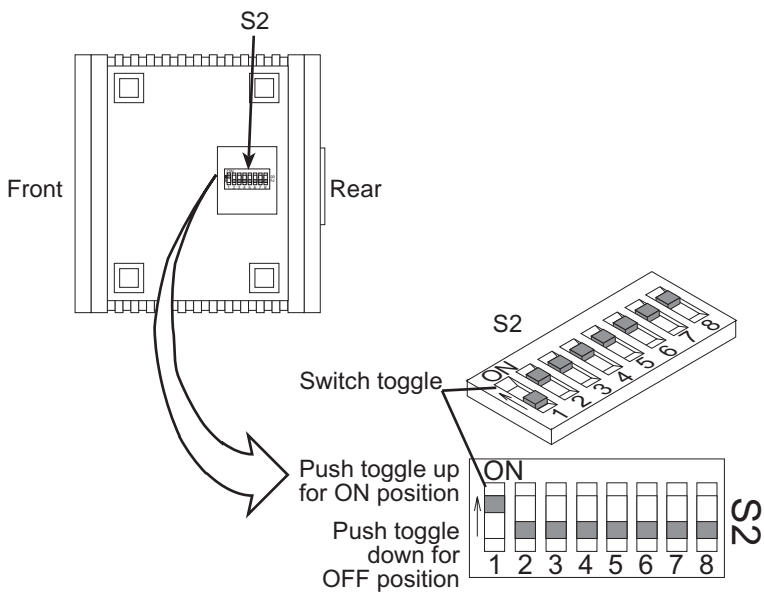
### 4.1 CONFIGURING THE HARDWARE DIP SWITCHES

Using a small flat-tip screwdriver, remove the protective cover located on the underside of the Model 2172 (see Figure 6).



**Figure 6.** Removing protective cover

Figure 7 on page 13 shows the orientation of the DIP switches in the On and Off positions.



**Figure 7.** DIP switch orientation

## 4.2 CONFIGURING DIP SWITCH S2

DIP switch S2 is where you configure the CopperLINK line rate, symmetric or asymmetric, Ethernet, and Ethernet Shutdown. Table 1 summarizes default positions of DIP switches S2-1 through S2-8. Detailed descriptions of each switch follow the table.

**Table 1:** S2 Summary

Position	Description
S2-1	Symmetric/Asymmetric
S2-2	Line Rate
S2-3	Line Rate
S2-4	Ethernet configuration
S2-5	Ethernet configuration
S2-6	Ethernet configuration
S2-7	Ethernet Shutdown
S2-8	Remote Configuration

### Switch S2-1: Symmetric/Asymmetric Operation

Use switch S2-1 to configure the unit for symmetric or asymmetric operation..

**Table 2:** Ethernet Auto Sense Selection Chart

S2-1	Setting
ON	Symmetric Operation
OFF	Asymmetric Operation

### Switches S2-2 and S2-3: Data Rate

Use switches S2-1, S2-2 and S2-3 to configure the CopperLINK line rates.

**Table 3:** Symmetric CopperLINK Line Rates Selection Chart

S2-2	S2-3	Symmetric Line Rate
OFF	ON	50 Mbps
ON	OFF	25 Mbps
OFF	OFF	10 Mbps

**Table 4:** Asymmetric CopperLINK Line Rates Selection Chart

S2-2	S2-3	Asymmetric Line Rates DS/US
ON	ON	50 Mbps/2 Mbps
ON	OFF	16 Mbps/2 Mbps
OFF	OFF	4 Mbps/1 Mbps

### Switches S2-4, S2-5 and S2-6: Ethernet Configuration

Use switches S2-4, S2-5 and S2-6 to configure Ethernet settings.

**Table 5:** Ethernet configurations

S2-4	S2-5	S2-6	Ethernet Configurations
ON	ON	ON	Auto-Negotiate
ON	ON	OFF	100Mb Full Duplex
ON	OFF	ON	100Mb Half Duplex
ON	OFF	OFF	10Mb Full Duplex
OFF	ON	ON	10Mb Half Duplex

### Switch S2-7: Ethernet Shutdown

Use switch S2-7 to enable or disable Ethernet Shutdown. When Ethernet Shutdown is enabled, the 2172 will disable the Ethernet interface when there is no CopperLINK link detected. When Ethernet Shutdown is disabled, the Ethernet interface will always be enabled.

**Table 6:** Ethernet Shutdown

S2-7	Description
ON	Ethernet Shutdown Enabled
OFF	Ethernet Shutdown Disabled

### Switch S2-8: Remote Configuration

Use switch S2-8 to enable or disable Remote Configuration.

**Table 7:** Ethernet Shutdown

S2-8	Description
ON	Remote Configuration Enabled
OFF	Remote Configuration Disabled

**Note** The S2-8 switch applies to the R unit only. If enabled, the R will follow the dip switch configuration of the L unit. If disabled, the R unit will use its own dip switch setting to determine its Ethernet

operating mode and Ethernet Shutdown mode configuration.  
The S2-8 switch does not affect the data rate. The data rate will always follow the L configuration.

## **5.0 OPERATION**

Once the Model 2172s are properly installed, they should operate transparently. No user settings required. This section describes reading the LED status monitors.

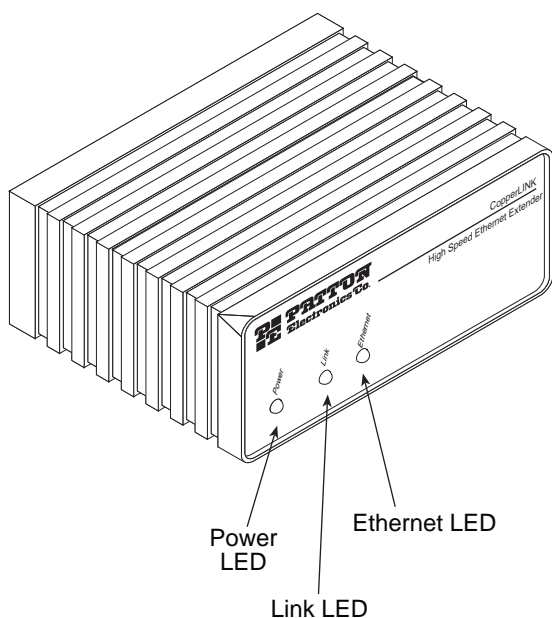
### **5.1 POWER UP**

Before applying power to the Model 2172, please review section 3.3, “Connecting Power” on page 12 to verify that the unit is connected to the appropriate power source.

### **5.2 FRONT PANEL LED STATUS MONITORS**

The Model 2172 features three front panel LEDs that monitor power, the Ethernet signals, and the CopperLINK connection. Figure 8 shows the front panel location of each LED. Table 8 on page 17 describes the LED functions.





**Figure 8.** Model 2172 standalone unit front panel

**Table 8:** Front panel LED description

LED	Description
PWR	Solid GREEN to indicate the unit is powered on.
LINK	Solid GREEN (ON) to indicate that the end-to-end CopperLINK link between the Model 2172s is established. The Link LED is OFF when the link is down.
ETH	Solid GREEN indicates that 10/100Base-T Ethernet link has been established. Flashes to indicate activity.

## **APPENDIX A**

### **SPECIFICATIONS**

#### **A.1 LAN CONNECTION**

- Shielded RJ-45, 10/100Base-T, IEEE 802.3 Ethernet
- CopperLINK Connection: RJ-45 or Terminal Block

#### **A.2 TRANSMISSION LINE**

Two-wire unconditioned twisted pair.

#### **A.3 COPPERLINK LINE RATE AND COPPERLINK DISTANCE**

- Line Rate: 50 Mbps, symmetric upstream/downstream. Additional symmetric and asymmetric rates are available via DIP switch settings.
- Distance: 6,000 ft (1.8 km) at 1 Mbps upstream/4 Mbps downstream

**Note** Distances depend on selected line rate and line conditions. See Appendix D on page 21 for details.

#### **A.4 COPPERLINK SURGE SUPPRESSOR**

SIDACTOR with maximum current surge: 20 kA (8/20  $\mu$ s).

#### **A.5 LED STATUS INDICATORS**

- Power (Green)
- CopperLINK: Link (Green)
- Ethernet: Link (Green) & Activity (Flashing Green)

#### **A.6 POWER SUPPLY**

External AC and DC options:

- AC: 120 VAC, 220 VAC, and UI (120–240 VAC)
- DC: 12 VDC, 24 VDC and 48 VDC
- Power consumption: 450 mA at 5 VDC

#### **A.7 TEMPERATURE RANGE**

0–50°C

#### **A.8 HUMIDITY**

Up to 90% non-condensing.

#### **A.9 DIMENSIONS**

1.58H x 4.16W x 3.75D in. (10.6H x 4.1W x 8.8D cm)

**APPENDIX B**  
**MODEL 2172 SERIES FACTORY**  
**REPLACEMENT PARTS AND ACCESSORIES**

<b>Patton Model #</b>	<b>Description</b>
<b>Base Models</b>	
2172/E	CopperLINK Multi Rate 50 Mbps Ethernet Extender; No power supply
2172/E-2PK	CopperLINK Multi Rate 50 Mbps Ethernet Extender Kit (2 units pre-set to local and remote); No power supply
2172/EUI-2PK	CopperLINK Multi Rate 50 Mbps Ethernet Extender Kit (2 units pre-set to local and remote); 110-240VAC
07M2172-UM	User Manual
<b>Power Supplies</b>	
08055DCUI	100-240VAC (+5V reg. DC/2A) Universal Input Adapter.
08055-120-5-1	120 VAC (+5V reg. DC/1A) Input Adapter
12V-PSM	12 VDC Input Adapter
24V-PSM	24 VDC Input Adapter
48V-PSM	48 VDC Input Adapter
<b>Power Cords*</b>	
0805US	American Power Cord
0805EUR	European Power Cord CEE 7
0805UK	United Kingdom Power Cord
0805AUS	Australian Power Cord
0805DEN	Denmark Power Cord
0805FR	France/Belgium Power Cord
0805IN	India Power Cord
0805IS	Israel Power Cord
0805JAP	Japan Power Cord
0805SW	Switzerland Power Cord

\*Only required with optional UI power supply (08055DCUI)

## APPENDIX C

### MODEL 2172 SERIES INTERFACE PIN ASSIGNMENT

#### C.1 10/100BASE-T INTERFACE

##### RJ-45

- Pin 1: TX+
- Pin 2: TX-
- Pin 3: RX+
- Pin 6: RX-
- Pins 4, 5, 7, 8: no connection

#### C.2 COPPERLINK INTERFACE

##### RJ-45

- Pin 4: RING
- Pin 5: TIP
- Pins 1, 2, 3, 6, 7, 8: no connection

##### Terminal Block

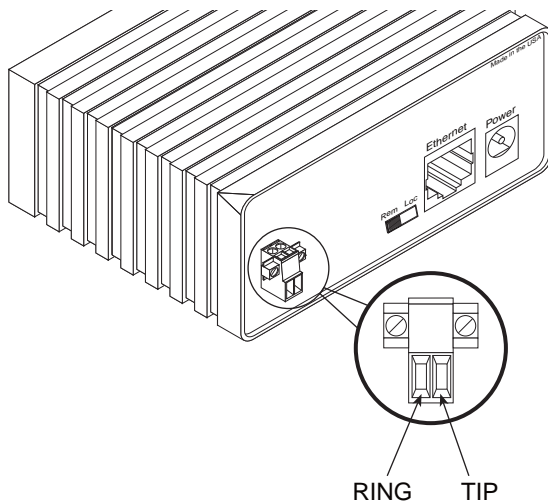


Figure 1. Model 2172 (Terminal Block) twisted pair line interface..

## APPENDIX D

DISTANCE CHART, BASED ON 24 AWG (0.5 MM)

Symm Line Rate	Distance in feet (km)	Throughput at Max Distance
50 Mbps	800 (0.25 km)	48
25 Mbps	2,000 (0.61 km)	24.5
10 Mbps	4,000 (1.22 km)	10

Asymm Line Rate (DS/US)	Distance in feet (km)	Throughput at Max Distance (DS/US)
50 Mbps/2 Mbps	2,000 (0.61 km)	48/2
16 Mbps/2 Mbps	4,000 (1.22 km)	15/2
4 Mbps/1 Mbps	6,000 (1.82 km)	3.75/1

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

**Note** DS = downstream, US = upstream

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