USER MANUAL

MODEL 2158

CopperLink Ethernet Extender

PATTON Electronics Co.

Part# 07M2158-B
Doc# 058092UB
Revised 6/7/02

ISO 9001 CERTIFIED

An ISO-9001Certified Company

CONTENTS

1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model 2158 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 performs 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 under the appropriate product page.

1.1 RADIO AND TV INTERFERENCE

The Model 2158 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 Model 2158 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 Model 2158 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).

1.2 CE NOTICE

The CE symbol on your Patton Electronics equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the European Union (EU). A Certificate of Compliance is available by contacting Technical Support.

1.3 INDUSTRY CANADA NOTICE

NOTICE: This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, IC, before the registration number signifies that registration was performed based on a Declaration of conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

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.

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

- Easy to install standalone CopperLink Ethernet Extenders—*no configuration required*
- Auto-sensing full or half-duplex Ethernet
- Auto-sensing 10/100Base-T
- Extends network connections up to 4,652 ft (1,418 m) over 2-wire 24-AWG unconditioned lines
- 12.5 Mbps symmetric line rate; 10 Mbps data rate
- Transparent operation
- LED indicators for Power, Ethernet Link & Activity, CopperLink connection & Quality of Line (QOL)
- Surge suppression up to 20 kA (8/20 µs)
- Available in rack-mount or standalone configurations
- Made in the USA

2.2 DESCRIPTION

The Patton Electronics Model 2158/L and 2158/R Ethernet Extenders provide high-speed LAN connections between peered Ethernet LANs, remote PC's, or any other network enabled 10/100Base-T device.

Operating in pairs, a Model 2158/L (local) located at one end of the LAN extension and a Model 2158/R (remote) at the other end, 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 2158s. The 2158s automatically add and delete MAC addresses, only passing packets across the CopperLink line that are meant for the remote peered LAN.

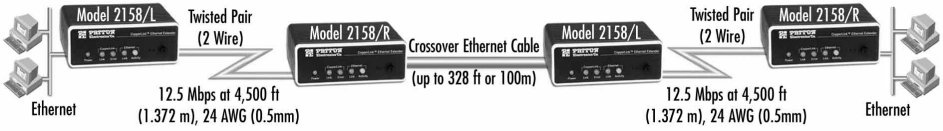

Figure 1. Typical application

The 2158/L and 2158/R work together to create a transparent extension between two peered Ethernet LANs. Figure 1 shows a typical point-to-point application.

3.0 INSTALLATION

Because the Model 2158 requires no configuration, it can be installed quickly. If you are installing a standalone unit, refer to section 3.1 “Standalone unit installation”. Otherwise, refer to section 3.2 “Rack card installation”.

3.1 STANDALONE UNIT INSTALLATION

Do the following:

1. Connect the line interface between the units (refer to section 3.3, “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 3.4, “Connecting the 10/100Base-T Ethernet Interface” on page 10).

3. Connect the power plug (refer to section 3.5, “Connecting Power” on page 11).

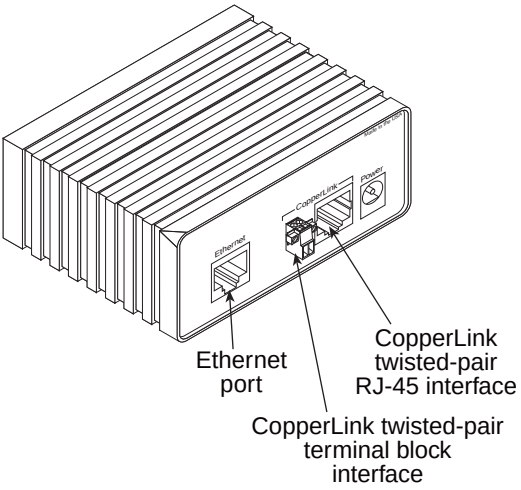

Figure 2. Model 2158 standalone rear panel

3.2 RACK CARD INSTALLATION

The Model 2158 rack card version comprises a front card and a rear card. Do the following to install the cards into the rack chassis:

1. Slide the rear card into the back of the chassis along the metal rails.

2. Secure the rear card using the supplied metal screws.

3. Slide the front card into the chassis until you feel resistance as the front card engages the rear card. When that happens, *gently* push the front card forward until it is fully seated in the card-edge receptacle of the rear card (it should *click* into place).

4. Secure the front card using the captive fasteners.

Note The Model 1001R14 chassis supports “hot swapping” of cards, so it is not necessary to power down the rack when you install or remove a Model 2158 rack card.

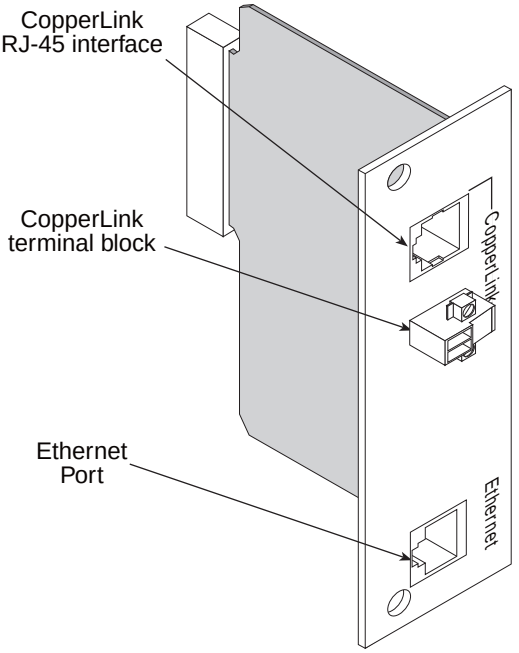

Figure 3. Model 2158 rack cards

5. Connect the line interface between the units (refer to section 3.3, “Connecting the Twisted-Pair Line Interface” on page 9)

Note See Figure 3 for the rack card’s panel arrangements.

6. Connect the Ethernet interface (refer to section 3.4, “Connecting the 10/100Base-T Ethernet Interface” on page 10).

3.3 CONNECTING THE TWISTED-PAIR LINE INTERFACE

The Model 2158 supports communication between two peer Ethernet LAN sites over a distance of up to 4,652 ft (1,418 m) 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 2158 CopperLink Interfaces.

> **Note** The Model 2158 units work in pairs. One of the units must be a Model 2158/L (Local), and the other unit must be a Model 2158/R (Remote). The link is always initiated by the 2158/R. As long as the 2158/L is powered on, the 2158/R can establish a link by being powered on or by having its power reset.

1. To function properly, the two Model 2158s 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 2158 is equipped with two interface jacks that can be used on the CopperLink interface, an RJ-45 or a terminal block. These CopperLink interfaces are a two-wire interface. Observe the signal/pin relationships on the Model 2158's CopperLink interface jacks.

The RJ-45 connector on the Model 2158's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationship is shown in Figure 4.

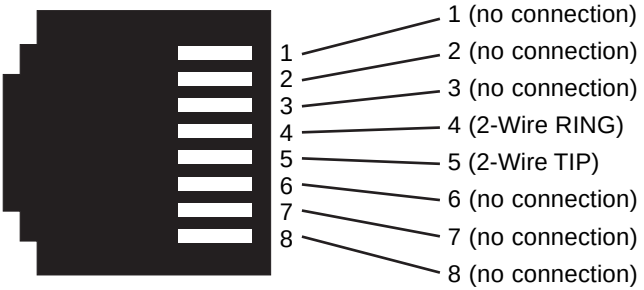

Figure 4. Model 2158 (RJ-45) twisted pair line interface.

The terminal block connector on the Model 2158's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationships is shown in Figure 5.

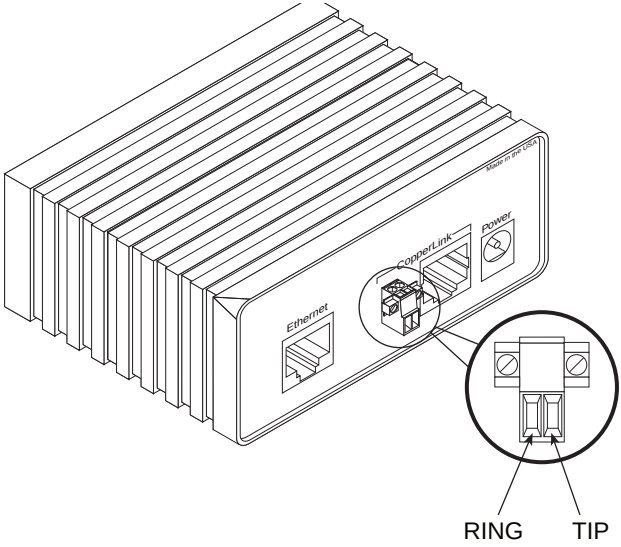

Figure 5. Model 2158 (Terminal Block) twisted pair line interface.

3.4 CONNECTING THE 10/100BASE-T ETHERNET INTERFACE

The shielded RJ-45 port labeled *Ethernet* is the 10/100Base-T interface. This port is designed to connect directly to a 10/100Base-T network. Figure 6 shows the signal/pin relationships on this interface. You may connect this port to another Ethernet device via a Type 4 or Type 5 cable that is up to 328 ft long.

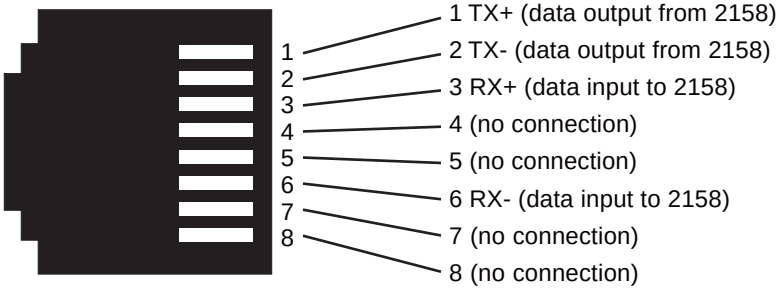

Figure 6. Model 2158 10/100Base-T RJ-45 Connector Pinout.

Connecting the 10/100Base-T Ethernet Port to a Hub

The Model 2158 10/100Base-T interface is configured as DTE (Data Terminal Equipment), just like a 10/100Base-T network interface card in a PC. Therefore, it “expects” to connect to a 10/100Base-T Hub using a

straight-through RJ-45 cable. Figure 7 diagrams the cable wiring for connecting the Model 2158 to a 10/100Base-T hub.

2158 10/100Base-T Port RJ-45 Pin No.		10/100Base-T Hub RJ-45 Pin No.
1 (TX+)	----------	1 (RX+)
2 (TX-)	----------	2 (RX-)
3 (RX+)	----------	3 (TX+)
6 (RX-)	----------	6 (TX-)

Figure 7. Wiring diagram for connecting the Model 2158 to a 10/100Base-T hub

Connecting the 10/100Base-T Ethernet Port to a PC (DTE)

The Model 2158 10/100Base-T interface is configured as DTE (Data Terminal Equipment). If you wish to connect the 2158 to another DTE devices such as 10/100Base-T network interface card in a PC (or 2158s in a back-to-back arrangement), you must construct a 10/100Base-T crossover cable as shown in Figure 8.

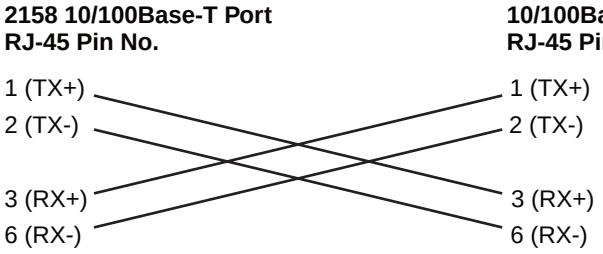

Figure 8. 10/100Base-T crossover cable

3.5 CONNECTING POWER

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 2158. No configuration is necessary for the power supply (See Appendix B on page 15 for domestic and international power supply and cord options).

DC power (supplied via the power supply jack to the 2158) must meet the following requirements; DC power supplied must be regulated +5VDC ±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.

The Model 2158 does not have a power switch, so it powers up as soon as it is plugged in.

4.0 OPERATION

Once the Model 2158s are properly installed, they should operate transparently. No user settings required. This section describes reading the LED status monitors.

4.1 POWER UP

Before applying power to the Model 2158, review section 3.5, “Connecting Power” on page 11 to verify that the unit is connected to the appropriate power source.

4.2 FRONT PANEL LED STATUS MONITORS

The Model 2158 features five front panel LEDs that monitor power, the Ethernet signals, and the CopperLink connection. Figure 9 (standalone version) and Figure 10 on page 13 (rack card version) show the front panel location of each LED. Table 1 on page 13 describes the LED functions.

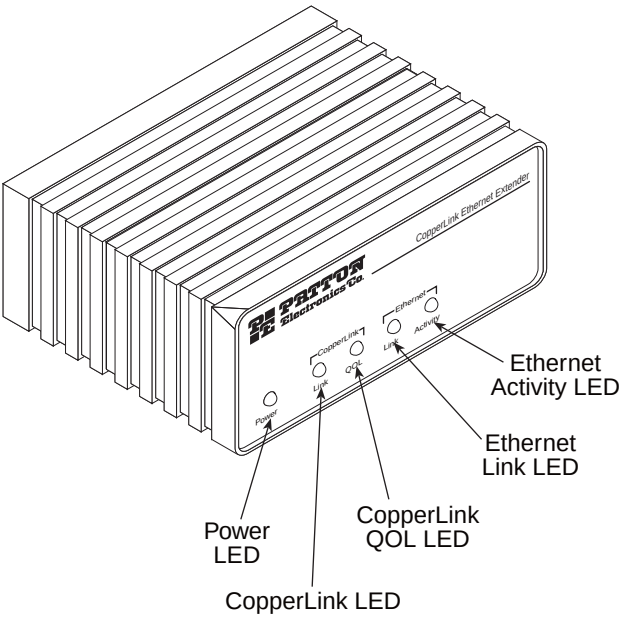

Figure 9. Model 2158 standalone unit front panel

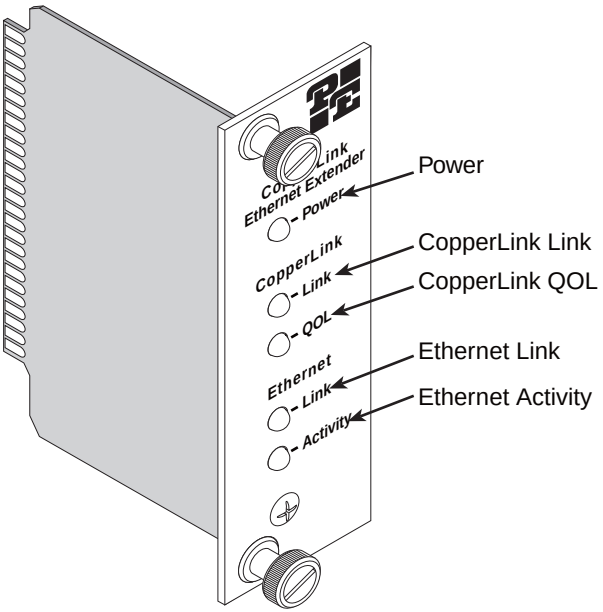

Figure 10. Model 2158 rack card front panel

Table 1: Front panel LED description

LED	Description
Power	Solid GREEN to indicate the unit is powered on.
CopperLink Link	(Active Green) Solid green (ON) to indicate that the end-to-end CopperLink line between the Model 2158s is established. The CopperLink LED is OFF when the link is down.
CopperLink QOL	(Active Yellow) Flashes YELLOW to indicate the processor is correcting an error in the data thus preventing the transmission of corrupted data to the Ethernet port. The more error corrections, the more often the LED blinks. If the light remains lit continuously, it means that the CopperLink line is noisy—although the data at the Ethernet port remains uncorrupted. Further impairment of the line however, risks having the line fail, as indicated by the green CopperLink Link LED extinguishing.
Ethernet Link	(Active Green) Solid Green indicates that 10/100Base-T Ethernet link has been established.
Ethernet Activity	(Active Yellow) Flashes yellow to indicate Ethernet activity on the Model 2158's 10/100Base-T Ethernet port.

APPENDIX A
SPECIFICATIONS

A.1 LAN CONNECTION

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

A.2 TRANSMISSION LINE

Two-wire unconditioned twisted pair.

A.3 COPPERLINK LINE RATE

12.5 Mbps, symmetric upstream/downstream.

A.4 ACTUAL DATA RATE

10 Mbps, symmetric.

A.5 COPPERLINK DISTANCE

4,000 ft (1,219 m)

A.6 COPPERLINK SURGE SUPPRESSOR

Gas tube with maximum current surge: 20 kA (8120 μs).

A.7 LED STATUS INDICATORS

- Power (Green)
- CopperLink: Link (Green) & Error (Red)
- Ethernet: Link (Green) & Activity (Yellow)

A.8 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.9 TEMPERATURE RANGE

0–50°C

A.10 HUMIDITY

Up to 90% non-condensing.

A.11 DIMENSIONS

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

APPENDIX B

MODEL 2158 SERIES FACTORY
REPLACEMENT PARTS AND ACCESSORIES

Patton Model #	Description
Base Models	
2158/L	CopperLink Ethernet Extender; Line: RJ-45 & TB (Local)
2158/R	CopperLink Ethernet Extender; Line: RJ-45 & TB (Remote)
2158-2PK	CopperLink Ethernet Extender Kit: includes one local (L) and one remote (R) Model 2158
2158RC/L	Local Ethernet Extender, Rack Card
2158RC/R	Remote Ethernet Extender, Rack Card
07M2158	User Manual
Power Supplies	
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
Power Cords*	
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 2158 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

See Figure 5 on page 10.