

USER MANUAL

MODEL 2155 CopperLink Ethernet Extender



Part# 07M2155
Doc# 032111U Rev. A
Revised 2/12/03

SALES OFFICE
(301) 975-1000
TECHNICAL SUPPORT
(301) 975-1007

An ISO-9001 Certified
Company

CONTENTS

1.0	Warranty Information	3
1.1	Radio and TV Interference.....	3
1.2	CE Notice.....	3
1.3	Service.....	4
2.0	General Information.....	5
2.1	Features.....	5
2.2	Description.....	5
3.0	Installation.....	7
3.1	Connecting the Twisted-Pair Line Interface.....	7
3.2	Connecting 10Base-T Ethernet Port to PC (DTE)	8
3.3	Connecting 10Base-T Ethernet Port to Hub (DCE)	8
3.4	Connecting Power	9
3.5	Power Input Connector.....	9
	External AC universal power supply.....	9
	External 48 VDC power supply.....	10
4.0	Operation.....	11
4.1	Front Panel LED Status Monitors	11
4.2	Test Modes	13
	Remote Digital Loopback (RDL)/V.52 (BER).....	13
A	Specifications	14
A.1	General Characteristics	14
A.2	WAN Characteristics	14
A.3	Ethernet	14
A.4	Distance	14
A.5	Diagnostics	14
A.6	LED Status Indicators	14
A.7	Connectors	15
A.8	Power Supply	15
A.9	Temperature Range	15
A.10	Altitude	15
A.11	Humidity	15
A.12	Dimensions	15
A.13	Weight	15
B	Models 2155 Factory Replacement Parts and Accessories.....	16
C	Models 2155 Interface Pin Assignment	17
C.1	10Base-T Interface	17
	RJ-45.....	17
C.2	CopperLink Interface	17
	RJ-45.....	17

1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model 2155 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 under the appropriate product page.

1.1 RADIO AND TV INTERFERENCE

The Model 2155 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 2155 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 2155 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 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**

Technical support is available from **8 AM to 5 PM EST (8:00 to 17:00 UTC-5), Monday through Friday.**

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

2.0 GENERAL INFORMATION

Thank you purchasing this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for one year for parts and labor. If questions arise while installing or using this product, contact **CopperLink Technical Support** at **+1 (301) 975-1007**.

2.1 FEATURES

- Easy-to-install Ethernet Extenders—*no configuration required*
- Auto-rate adaption ensures the highest rate possible for each extension distance
- Data rates to 144 kbps
- Half-duplex 10Base-T Ethernet
- Extends network connections up to 5 miles (8 km) over 2-wire 24-AWG unconditioned lines (see Appendix A on page 14)
- Transparent operation to higher level protocols such as TCP/IP, DECnet, NETBIOS, IPX, etc.
- LED indicators for Link, Status, No Signal, ER, and Test Mode
- Made in the USA

2.2 DESCRIPTION

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

Operating in pairs, a Model 2155/L (local) located at one end of the LAN extension and a Model 2155/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 Ethernet Extenders. They operate as learning bridges and 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 2155/L and 2155/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 CopperLink Ethernet Extender requires no configuration, it can be installed quickly. Installation consists of the following:

- Connect the line interface between the units (refer to section 3.1, “Connecting the Twisted-Pair Line Interface” on page 7)

Note See Figure 2 for the rear-panel connectors locations.

- Connect the Ethernet interface (refer to section 3.2, “Connecting 10Base-T Ethernet Port to PC (DTE)” on page 8 or section section 3.3, “Connecting 10Base-T Ethernet Port to Hub (DCE)” on page 8).
- Connect the power plug (refer to section 3.4, “Connecting Power” on page 9).

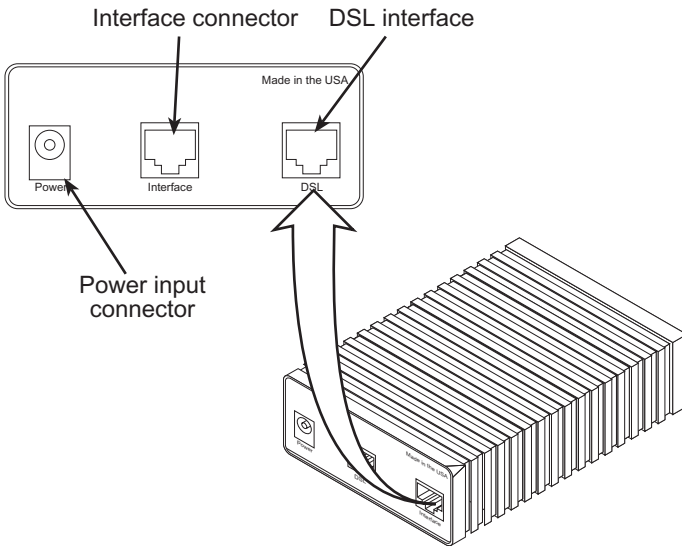


Figure 2. CopperLink Ethernet Extender rear panel

3.1 CONNECTING THE TWISTED-PAIR LINE INTERFACE

The Model 2155 supports communication between two peer Ethernet LAN sites over a distance greater than 5 miles (8 km) over 24 AWG (0.5 mm) twisted-pair wire.

Follow the steps below to connect the CopperLink interfaces.

Note Model 2155 units work in pairs. One of the units must be a Model 2155/L (local) and the other unit must be a Model 2155/R (remote).

1. To function properly, two Ethernet Extenders 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 Models 2155 are equipped with an RJ-45 interface. The CopperLink interfaces are a two-wire interface. Observe the signal/pin relationships on the CopperLink interface jack.

The RJ-45 connector on the Model 2155's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationships are shown in Figure 3 below.

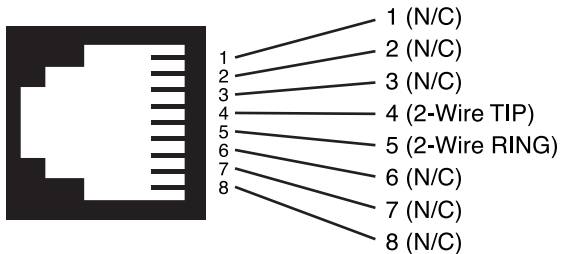


Figure 3. Model 2155 twisted pair line interface

3.2 CONNECTING 10BASE-T ETHERNET PORT TO PC (DTE)

The 10Base-T interface is configured as DTE (Data Terminal Equipment). If the Model 2155 is to connect to another DTE device such as a 10Base-T network interface card, construct a 10Base-T crossover cable and connect the wires as shown in Figure 4.

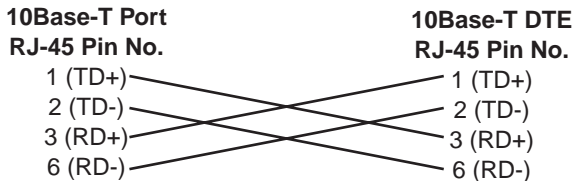


Figure 4. Connecting 10Base-T Ethernet port to PC

3.3 CONNECTING 10BASE-T ETHERNET PORT TO HUB (DCE)

The 10Base-T interface is configured as DTE (Data Terminal Equipment), just like a 10Base-T network interface card in a PC. Therefore, it "expects" to connect to a 10Base-T Hub using a straight-through RJ-45

cable. Figure 5 shows how to construct a cable to connect the 10Base-T interface to a 10Base-T Hub.

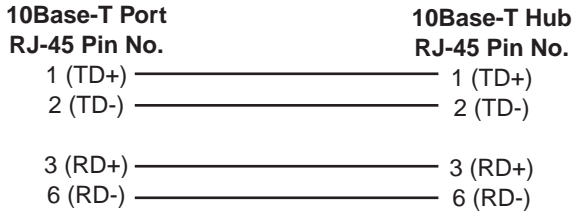


Figure 5. Connecting the 10Base-T interface to a 10Base-T Hub

3.4 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 2155. No configuration is necessary for the power supply (See Appendix B on page 16 for domestic and international power supply and cord options).

3.5 POWER INPUT CONNECTOR

The 2155 comes with an AC or DC power supply.

- The supplies connection to the CopperLink Ethernet Extender is a 2.5 mm barrel receptacle with the center conductor positive (see Figure 6).

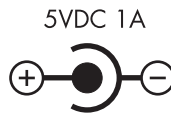


Figure 6. Power connection barrel receptacle

- CopperLink Ethernet Extender's rated voltage: 5.0 VDC
- CopperLink Ethernet Extender's rated current: 1 A DC

External AC universal power supply

- Output from power supply: 5 VDC, 2A
- Input to power supply: universal input 100–240 VAC 50/60 Hz 0.3A



Caution

An approved external power supply that incorporates a disconnect device must be used and positioned within easy reach of the operator's position.



Caution

Connect the equipment to a 5 VDC source that is electrically isolated from the AC source. The 5 VDC source is to be reliably connected to earth.

External 48 VDC power supply

- **Input**

- Rated voltage: 36–60 VDC
- Rated current: 0.25 A DC at nominal 48 VDC
- 3-pin locking connector, 3.5 mm pitch
- Reverse polarity protection
- Transient over-voltage protection, 100 VDC at 2 ms

- **Output**

- Rated voltage: 5 VDC \pm 5%, 5W
- Rated current; 1 A DC
- 6-inch cable terminated with 2.5 mm barrel plug, center positive

4.0 OPERATION

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

4.1 FRONT PANEL LED STATUS MONITORS

The Model 2155 features six front-panel LEDs that monitor connections on the DSL and 10Base-T links, signaling, error and test modes. Figure 7 shows the front panel location of each LED. Table 1 describes the LED functions.

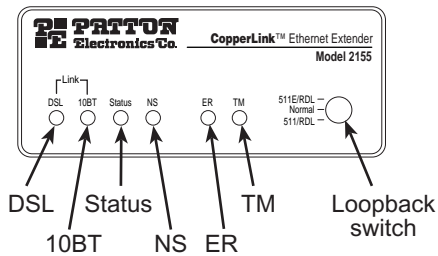


Figure 7. CopperLink Ethernet Extender standalone unit front panel

Table 1: LED status monitor indications

LED	Description
DSL Link	(Active Green) Solid green (On) indicates that the end to end DSL Framer Link is up, signifying that the link across the DSL span is active. The DSL Link LED is Off when the link is down.
Status	<p>Blinks yellow from one to eleven times to indicate system status. Each pulse pattern is separated by a 2 second "off" period. Greater pulse patterns have higher priority (buffer saturation has greater priority than an empty MAC table). Valid system statuses are:</p> <ul style="list-style-type: none"> • 1 pulse—system status is okay • 2 pulses—no MAC entries in the MAC Address Table • 3 pulses—Clear to Send (CTS) or Carrier Detect (DCD) from base unit are not asserted • 4 pulses—IM1/I buffer is saturated • 5 pulses—WAN receive frame(s) too large • 6 pulses—WAN receive frame(s) not octet aligned • 7 pulses—WAN receive frame(s) aborted • 8 pulses—Detected WAN receive frame(s) with CRC • 9 pulses—Detected LAN receive frame(s) too large • 10 pulses—Detected LAN receive frame(s) not octet aligned • 11 pulses—Detected LAN receive frame(s) with bad CRC
10BT Link	(Active green) Solid green indicates that the 10Base-T Ethernet interface has detected a valid SQE heartbeat, signifying a valid 10Base-T connection
NS	(Active red) Solid red indicates that the Digital Signal Processors (DSPs) are not linked
ER	<p>(Active red) Flashing red indicates CRC errors on DSL (framer) side if DSL Link is active or if bit errors are received during loop/BER test</p> <p>ER flashes once, to indicate a CRC error (during normal operation) or bit errors (during Remote Loopback 511/511E tests)</p>
TM	(Active yellow) Solid yellow indicates an Active Test Mode. The unit may be placed in test mode by the local user or by the remote user.

4.2 TEST MODES

The Model 2155 has a built-in proprietary loopback test mode, plus a built-in V.52 BER test pattern generator, for evaluating the communication link. These tests can be activated from the front panel of the Model 2155 Ethernet Extenders.

Remote Digital Loopback (RDL)/V.52 (BER)

The Remote Digital Loopback (RDL) test checks the communication link between two Model 2155s.

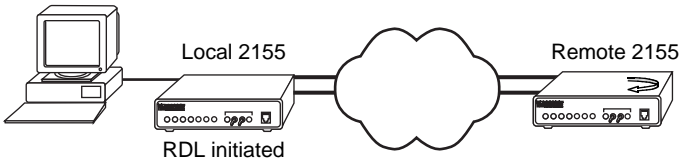


Figure 8. Remote digital loop

To use the Remote Digital Loopback tests, do the following:

1. Locate the 511/RDL toggle switch on the front panel of the 2155 and move it DOWN. This initiates the RDL and sends a 511 pattern into the loop. If any errors are present, the local modem's red "ER" LED will blink.
2. If the above test indicates no errors are present, move the toggle switch UP, activating the 511E/RDL test (with errors present). If the test is working properly, the local modem's red "ER" LED will blink approximately once per second. A successful 511E/RDL test will confirm that the link is in place, and that the Model 2155's built-in "511" error generator and detector are working properly.

APPENDIX A

SPECIFICATIONS

A.1 GENERAL CHARACTERISTICS

- Compact low cost plug-and-play router
- 10Base-T Ethernet
- Unlimited host support
- Six front panel LEDs indicate DSL & 10BT Link, No Signal, Error, and test modes status
- Convenient and standard RJ connectors for Ethernet and line
- External UI AC or 48 VDC power supply options
- Standard 1-year warranty

A.2 WAN CHARACTERISTICS

- 144 kbps
- RJ-45 connector
- Uses two-wire unconditioned twisted-pair

A.3 ETHERNET

- Half-duplex 10Base-T Ethernet
- Standard RJ-45
- IEEE 802.1d transparent learning bridge up to 1,024 addresses
- Addresses deleted after 8 minutes of inactivity

A.4 DISTANCE

2-Wire Distance Table in miles (km)				
Data Rate	AWG Wire Gauge (mm)			
	19 (.9)	22 (.6)	24 (.5)	6 (.4)
All rates	10.8 (17.2)	7.2 (11.5)	5.0 (8.0)	3.4 (5.5)

A.5 DIAGNOSTICS

V.52 compliant bit error rate pattern (511/511E pattern) generator and detector with error injection mode; Remote Digital Loopback, activated by front panel switches.

A.6 LED STATUS INDICATORS

DSL, 10Base-T, Status, NS (no signal), ER (error) and TM (test Mode)

A.7 CONNECTORS

RJ-45 on line side; shielded RJ-45 on Ethernet port

A.8 POWER SUPPLY

External 100–240 VAC, 50–60 Hz (universal input option), +5 VDC output; 48 VDC (optional), 5 watts, +5 VDC output

A.9 TEMPERATURE RANGE

32–122°F (0–50°C)

A.10 ALTITUDE

0–15,000 feet (0–4,572 meters)

A.11 HUMIDITY

5–95% non-condensing

A.12 DIMENSIONS

4.125W x 1.625H x 6.0D in. (10.5W x 4.1W x 15.2D cm)

A.13 WEIGHT

2.01 lbs. (1.0 kg)

APPENDIX B
MODELS 2155 FACTORY
REPLACEMENT PARTS AND ACCESSORIES

Patton Model #	Description
2155 Base Models	
2155/L	CopperLink Ethernet Extender; Line: RJ-11 (Local)
2155/R	CopperLink Ethernet Extender; Line: RJ-11 (Remote)
2155-2PK	CopperLink Ethernet Extender Kit: includes one local (L) and one remote (R) Model 2157
User Manual	
07M2155	User Manual
Power Supplies	
08055DCUI	100–240VAC (+5V reg. DC/2A) Universal Input Adapter.
Please Call	48 VDC, -5VDC Power Supply
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)

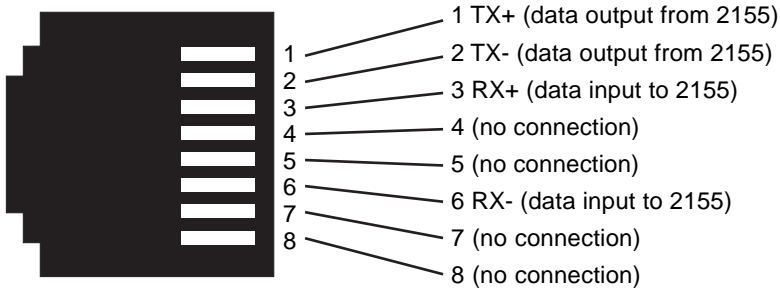
APPENDIX C

MODELS 2155 INTERFACE PIN ASSIGNMENT

C.1 10BASE-T INTERFACE

RJ-45

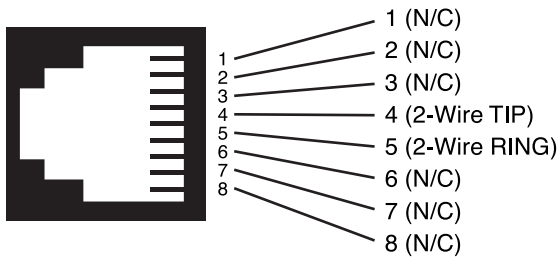
- Pin 1: TX+
- Pin 2: TX-
- Pin 3: RX+
- Pin 6: RX-
- Pins 4, 5, 7, 8: no connection



C.2 COPPERLINK INTERFACE

RJ-45

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



Notes
