LANTRONIX®

XPort™

User Manual and Development Kit

Part Number 900-270
Revision B 7/03

Copyright and Trademark

XPort, with its patent-pending technology, is a trademark of Lantronix.

Ethernet is a trademark of XEROX Corporation. UNIX is a registered trademark of The Open Group. Windows 95, Windows 98, Windows 2000, Windows NT, and Windows XP are trademarks of Microsoft Corp. Netscape is a trademark of Netscape Communications Corporation.

15353 Barranca Parkway,
Irvine, CA 92618, USA,
Phone: 949-453-3990
Fax: 949-453-3995

Technical Support

Phone: 800-422-7044 or 949-453-7198
Fax: 949-450-7226
On-line: www.lantronix.com/support

Sales Offices

For a current list of our domestic and international sales offices, go to the Lantronix web site at http://www.lantronix.com/about/contact/index.html

Disclaimer and Revisions

Operation of this equipment in a residential area is likely to cause interference in which case the user, at his or her own expense, will be required to take whatever measures may be required to correct the interference.

> ***Attention:*** *This product has been designed to comply with the limits for a Class B digital device pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with this guide, may cause harmful interference to radio communications.*

Changes or modifications to this device not explicitly approved by Lantronix will void the user's authority to operate this device.

> ***Attention:*** *With the purchase of XPort™, the OEM agrees to an OEM firmware license agreement that grants the OEM a non-exclusive, royalty-free firmware license to use and distribute the binary firmware image provided, only to the extent necessary to use the XPort™ hardware. For further details, please see the XPort OEM firmware license agreement.*

Date	Rev.	Comments
3/03	A	
7/03	B	

Declaration of Conformity

(According to ISO/IEC Guide 22 and EN 45014)

Manufacturer's Name & Address:

Lantronix 15353 Barranca Parkway, Irvine, CA 92618 USA

Declares that the following product:

Product Name Model: XPort™ Embedded Device Server

Conforms to the following standards or other normative documents:

Electromagnetic Emissions:

EN55022: 1998 (IEC/CSPIR22: 1993) Radiated RF emissions, 30MHz-1000MHz

Conducted RF Emissions – Telecom Lines – 150KHz – 30MHz

FCC Part 15, Subpart B, Class B

IEC 1000-3-2/A14: 2000

IEC 1000-3-3: 1994

Electromagnetic Immunity:

EN55024: 1998 Information Technology Equipment-Immunity Characteristics

Direct ESD, Contact Discharge

Indirect ESD

Radiated RF Electromagnetic Field Test

Electrical Fast Transient/Burst Immunity

RF Common Mode Conducted Susceptibility

Power Frequency Magnetic Field Test

Manufacturer's Contact:

Director of Quality Assurance, Lantronix

15353 Barranca Parkway, Irvine, CA 92618 USA

Tel: 949-453-3990

Fax: 949-453-3995

Warranty

Lantronix warrants each Lantronix product to be free from defects in material and workmanship for a period of ONE YEAR. During this period, if a customer is unable to resolve a product problem with Lantronix Technical Support, a Return Material Authorization (RMA) will be issued. Following receipt of a RMA number, the customer shall return the product to Lantronix, freight prepaid. Upon verification of warranty, Lantronix will -- at its option -- repair or replace the product and return it to the customer freight prepaid. If the product is not under warranty, the customer may have Lantronix repair the unit on a fee basis or return it. No services are handled at the customer's site under this warranty. This warranty is voided if the customer uses the product in an unauthorized or improper way, or in an environment for which it was not designed.

Lantronix warrants the media containing its software product to be free from defects and warrants that the software will operate substantially according to Lantronix specifications for a period of 60 DAYS after the date of shipment. The customer will ship defective media to Lantronix. Lantronix will ship the replacement media to the customer.

In no event will Lantronix be responsible to the user in contract, in tort (including negligence), strict liability or otherwise for any special, indirect, incidental or consequential damage or loss of equipment, plant or power system, cost of capital, loss of profits or revenues, cost of replacement power, additional expenses in the use of existing software, hardware, equipment or facilities, or claims against the user by its employees or customers resulting from the use of the information, recommendations, descriptions and safety notations supplied by Lantronix. Lantronix liability is limited (at its election) to:

1) refund of buyer's purchase price for such affected products (without interest)

2) repair or replacement of such products, provided that the buyer follows the above procedures.

There are no understandings, agreements, representations or warranties, expressed or implied, including warranties of merchantability or fitness for a particular purpose, other than those specifically set out above or by any existing contract between the parties. Any such contract states the entire obligation of Lantronix. The contents of this document shall not become part of or modify any prior or existing agreement, commitment or relationship.

For details on the Lantronix warranty replacement policy, go to our web site at http://www.lantronix.com/support/warranty/index.html

Contents

List of Figures

List of Tables

1. Introduction to XPort™

The XPort™ device server connects serial devices such as those listed below to Ethernet networks using the IP protocol family.

- ATM Machines
- CNC Controllers
- Data Collection Devices
- Universal Power Supply (UPS) Management Units
- Telecommunications Equipment
- Data Display Devices
- Security Alarms and Access Control Devices
- Handheld Instruments
- Modems
- Time/Attendance Clocks and Terminals

The XPort™ connects devices through a TCP data channel or through a Telnet connection to computers or another Device Server. Datagrams can be sent by UDP.

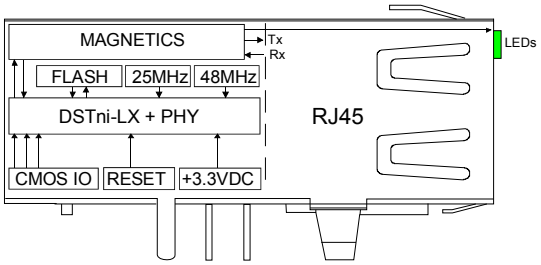
The XPort™ contains a web [http] server that allows presentation of custom content and can be easily configured through the server.

The XPort™ has 3 programmable IO pins that can be used to monitor or control attached devices.

1.1 Features

The XPort™ device server is a miniaturized version of a modular serial-to-Ethernet converter based in principle on an existing Lantronix Modular Serial-to-Ethernet module. The XPort™ device server package contains a DSTni-LX controller, with 256K bytes of SRAM, 2K bytes of boot ROM, and integrated AMD 10/100 PHY.

The package also contains a 3.3-volt serial interface, 4-Mbit flash memory, Ethernet magnetics, power supply filters, reset circuit, +2.5V regulator, a 25-MHz crystal (Ethernet), 48-MHz crystal (DSTni-LX) and Ethernet LEDs. The XPort™ requires +3.3-volt power and is designed to operate in an extended temperature range (see technical data).



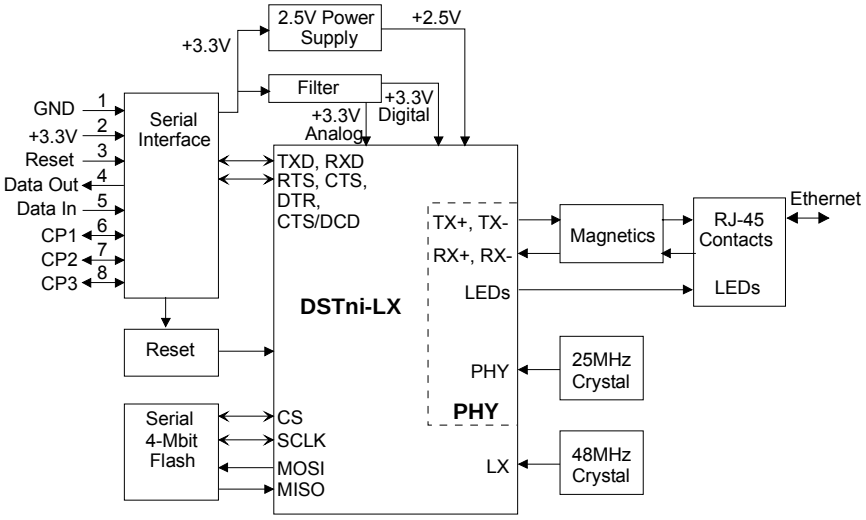
1.2 Protocol Support

The XPort™ uses the Internet Protocol (IP) for network communications and the Transmission Control Protocol (TCP) to assure that no data is lost or duplicated, and that everything sent to the connection arrives correctly at the target.

Other supported protocols are listed below:

- ARP, UDP, TCP, ICMP, Telnet, TFTP, AutoIP, DHCP, HTTP, and SNMP for network communications and management.
- TCP, UDP, and Telnet for connections to the serial port.
- TFTP for firmware and web page updates.
- IP for addressing, routing, and data block handling over the network.
- User Datagram Protocol (UDP) for typical datagram applications in which devices interact with other devices without maintaining a point-to-point connection.
- SMTP for e-mail transmission.

1.3 XPort™ Block Diagram



1.4 Serial Interface

The unit has a serial port that supports RS-232 serial standards (software selectable) up to 230Kbps. The serial interface also provides the +3.3V power, ground, and external reset signals. The serial signals (pins 4 – 8) are 3.3V CMOS logic level. (NOT 5V tolerant) The serial signals would normally be connected to an internal device, such as a UART. For prototype and evaluation work, where an external cable running with RS-232 voltage levels is required, the XPort™ must be interfaced to a serial transceiver chip. An RS-232 transceiver is supplied on the XPort™ Evaluation board for this purpose.

Table 1 - Serial Interface Signals

SIGNAL NAME	XPort™ Pin #	PRIMARY FUNCTION
GND	1	Circuit Ground
VCC	2	+3.3V Power In
Reset-	3	External Reset In
Data Out	4	Serial Data Out (connects to RX of attached DTE device)
Data In	5	Serial Data In (connects to TX of attached DTE device)
CP1 (Configurable Pin 1)	6	Configurable Pin 1 can be configured as: Flow control – connects to CTS of attached DTE device Programmable Digital Input or Output Status LED 1
CP2 (Configurable Pin 2)	7	Configurable Pin 2 can be configured as: Modem control – connects to DCD of attached DTE device Programmable Digital Input or Output
CP3 (Configurable Pin 3)	8	Configurable Pin 3 can be configured as: Flow control – connects to RTS of attached DTE device Modem control – connects to DTR of attached DTE device Programmable Digital Input or Output Status LED 3

1.5 Ethernet Interface

The Ethernet interface magnetics, RJ-45 connector, and Ethernet status LEDs are all integrated into the device server shell.

Table 2 - Ethernet Interface Signals

Signal Name	DIR	Contact	Primary Function
TX+	Out	1	Differential Ethernet Transmit Data +
TX-	Out	2	Differential Ethernet Transmit Data -
RX+	In	3	Differential Ethernet Receive Data +
RX-	In	6	Differential Ethernet Receive Data -
Not Used		4	(Terminated)
Not Used		5	(Terminated)
Not Used		7	(Terminated)
Not Used		8	(Terminated)
SHIELD			Chassis Ground

1.6 LEDs

The device contains the following LEDs:

- 10 Mbps Link/Activity (Bi-color, Left LED)
- 100 Mbps Link/Activity (Bi-color, Right LED)

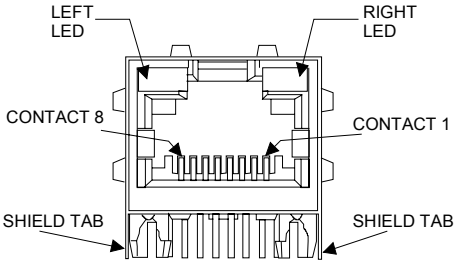
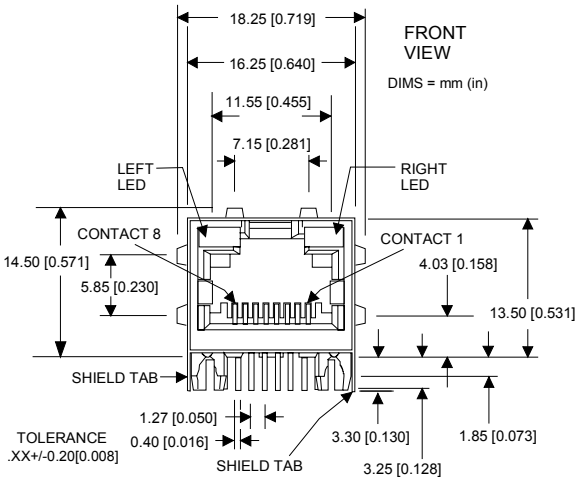


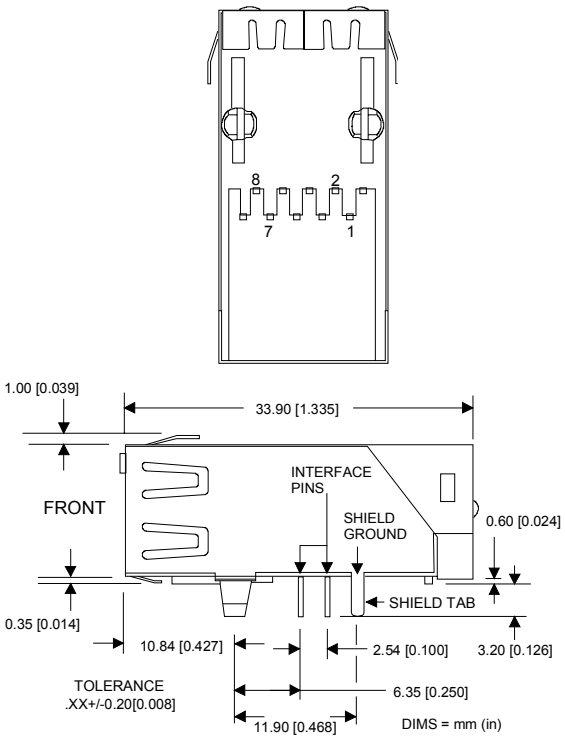
Table 3 - XPort™ LED Functions

Left LED	Right LED	Meaning
Off	Off	No Link
Off	Solid Amber	100BASE-T Half Duplex Link
Off	Blinking Amber	100BASE-T Half Duplex; Activity
Off	Solid Green	100BASE-T Full Duplex Link
Off	Blinking Green	100BASE-T Full Duplex; Activity
Solid Amber	Off	10BASE-T Half Duplex Link
Blinking Amber	Off	10BASE-T Half Duplex; Activity
Solid Green	Off	10BASE-T Full Duplex Link
Blinking Green	Off	10BASE-T Full Duplex; Activity

1.7 Dimensions

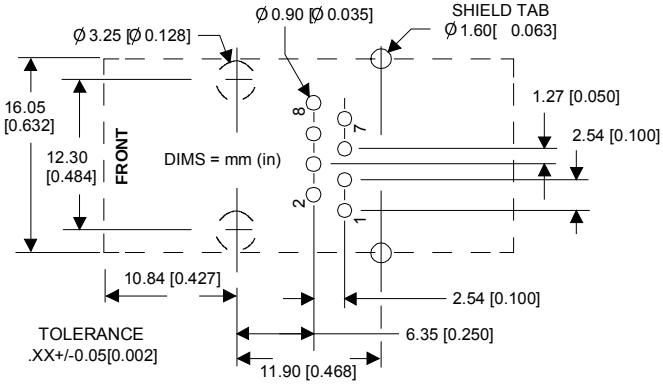
The XPort™ dimensions are shown in the following drawing.





1.8 Recommended PCB Layout

The hole pattern and mounting dimensions for the XPort™ device server are shown in the following drawing.



1.9 Product Information Label

The product information label contains important information about your specific unit.

1.10 Technical Specifications

Table 4 - Technical Specs

Category	Description
CPU, Memory	Lantronix DSTni-LX 186 CPU, 256 KB zero wait state SRAM 512Kbytes Flash, 2KB Boot ROM
Firmware	Upgradeable via TFTP and serial port
Reset Circuit	200msec power up/down reset pulse. Reset triggered at 3.08V Manual reset input supplies a 200msec reset.
Serial Interface	CMOS (Asynchronous) 3.3V-level signals. (Not 5V tolerant) Baud rate software selectable (300 to 230400bps)
Serial Line Formats	7 or 8 data bits, 1-2 Stop bits, Parity: odd, even, none
Modem Control	DTR, DCD, CTS, RTS
Flow Control	XON/XOFF (software), CTS/RTS (hardware), None
Programmable I/O	3 PIO pins (software selectable) Sink or source 8ma max.
Network Interface	RJ45 Ethernet 10Base-T or 100Base-TX (Auto-sensing)
Compatibility	Ethernet: Version 2.0/IEEE 802.3
Protocols Supported	ARP, UDP/IP, TCP/IP, Telnet, ICMP, SNMP, DHCP, BOOTP, TFTP, Auto IP, SMTP, and HTTP
LEDs	10Base-T & 100Base-TX Activity, Full/half duplex. Pins 6 & 8 can also drive external LEDs for XPort™ status & diagnostics.
Management	Internal web server, SNMP (read only) Serial login, Telnet login
Security	Password protection, Locking features, optional Rijndael 128-bit encryption
Internal Web Server	Serves static web pages and Java applets Storage capacity: 384KBytes
Weight	0.34 oz (9.6 grams)
Material	Metal shell, thermoplastic case
Temperature	Operating range: -40°C to +85°C (-40°F to 185°F)
Relative Humidity	Operating: 5% to 95% non-condensing
Shock/Vibration	Non-operational shock: 500 g's, Non-operational vibration: 20 g's
Warranty	1-year limited warranty
Included Software	Windows™ 98/NT/2000/XP based XPort™ Installer configuration software and Windows™ based Comm Port Redirector
EMI Compliance	Radiated & conducted emissions - complies with Class B limits of EN 55022:1998 Direct & Indirect ESD - complies with EN55024:1998 RF Electromagnetic Field Immunity - complies with EN55024:1998 Electrical Fast Transient/Burst Immunity - complies with EN55024:1998 Power Frequency Magnetic Field Immunity - complies with EN55024:1998 RF Common Mode Conducted Susceptibility - complies with EN55024:1998

2. Development Kit

The development kit contains the following items:

1. XPort™ Evaluation Board
2. XPort™ Device Server
3. +5VDC Universal Power Supply with snap-fit plugs for different countries.
4. RS-232 Cable, DB-9M/F
5. CAT5e UTP RJ-45M/M Ethernet Cable
6. CD with software utilities, and documentation in PDF format.
7. Serial Adaptor, 25-pin to 9-pin

2.1 Introduction

The XPort™ Evaluation Board provides a test or evaluation platform for the Lantronix XPort™ device server.

The XPort™ Evaluation Board supplies an RS232 serial interface to 3.3V CMOS level interface connection for the XPort™ server. It also supplies the required XPort™ device server with +3.3V. A programmable Logic Device (PLD), reset push button switch, DIP switch, timer circuit and reset circuit are provided as Evaluation Board controls.

In addition to the status LEDs on the XPort™, the evaluation board contains multiple LEDs. A red LED is driven by the power supply. The remaining LEDs are driven by the PLD and in the basic mode of operation, indicate whether the RS232 interface is valid, the serial interface transmit data is active, the serial interface receive data is active, and the state of the three configurable pins CP1, CP2, and CP3.

The PLD and a 6-position DIP switch control the Evaluation Board mode of operation. The switch outputs are used as inputs to the PLD to select the desired mode of operation.

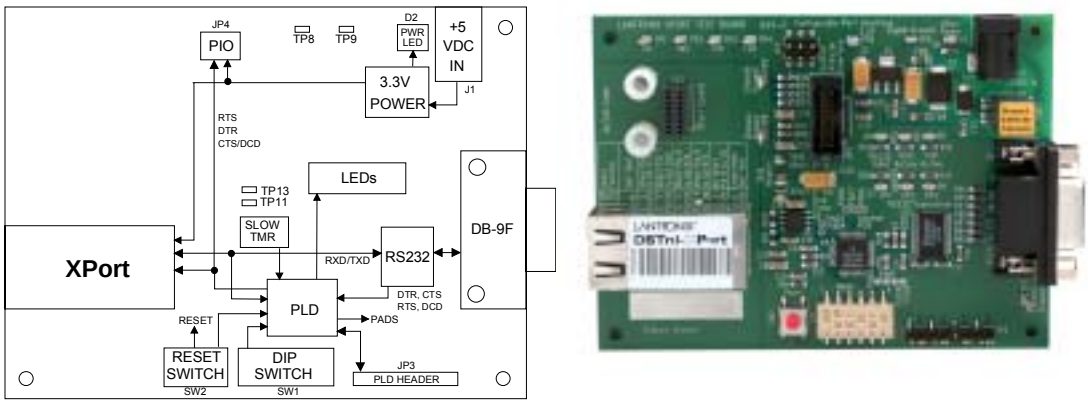


Figure 2-1 - Evaluation Board Block Diagram

2.1.1 Major Components

The major components of the evaluation board include:

- RS232 Transceiver
- Universal Power Adapter
- Reset Switch
- DIP Switch
- DB-9 Interface Connector
- Test points to monitor all XPort™ pins.
- 6 pin header (JP4) for connecting user devices or circuits to CP1, CP2, and CP3.
- Power, signal ground, and reset inputs are also available on JP4.

2.2 Serial RS232 Interface

The RS232 level serial interface is implemented with a transceiver that converts from the XPort™ 3.3V CMOS levels to RS-232 levels. A straight-through serial cable with 9-pin connectors (M/F) is all that is required to connect to a DTE device such as a PC.

The table below lists the RS232 Signals. Note that XPort™ signal pins 6, 7, and 8 are configurable pins and can be set for functions other than RS-232 control. A configuration DIP switch determines if the XPort™ configurable pins are routed to the RS-232 converter.

Table 5 - RS232 Signals

XPort™ Signal	XPort™ Pin	Direction	DB-9 Pin #
DCD	pin 7 configured as DCD	Out	1
Data Out	pin 4	Out	2
Data In	pin 5	In	3
DTR	pin 8 configured as DTR	In	4
Ground	pin 1		5
RTS	pin 8 configured as RTS	In	7
CTS	pin 6 configured as CTS	Out	8

2.3 RS232 Port

The Evaluation Board uses a Maxim MAX3238 IC to convert all RS232 interface signals to 3.3V CMOS level XPort™ signals.

The MAX3238 IC was selected because of it capability of true RS232 level performance from a +3.3V input power source and for its 15kV ESD protection. The part also includes a RS232 valid output that is used to light an LED via the PLD circuit.

2.4 Power Supply

The Evaluation Board contains a +3.3V regulator that receives input power via a 2.5mm input power jack. The input power should be 5VDC from a regulated DC source. A +5VDC power module is provided with the evaluation kit.

It is recommended that the evaluation board should also be connected to an earth ground. It can be connected to earth ground via the chassis ground rectangle (copper tape), TP7, or the shell of the DB9 connector.

2.5 General Control PLD

The purpose of the PLD is to provide general Evaluation Board mode control and LED signal level monitoring. The PLD works in conjunction with the 6-position mode control switch (SW1) and the Timer and Reset circuits to provide mode control.

The PLD is a Lattice ISPLSI2032VE part, which is contained in a 48-pin TQFP package. This part contains 32 I/O and 32 microcells and is in-circuit programmable. A 1x8-pin header (JP3) is also provided for standard Lattice in-circuit programming.

2.6 Configuration Switch Bank

Switch module SW1 contains 6 independent switches. It is used to configure the PLD on the evaluation board. The PLD controls how the signals from the XPort™ are routed on the evaluation board. Positions 1 and 6 are for self-test. Positions 2 through 5 are for configuring XPort™ pins for various operations.

Three XPort™ pins are designated as Configurable Pins and these pins can be configured for hardware flow control or handshaking, or as LED status indicators. To configure the Configurable Pins CP1, CP2, and CP3, see *Configuring the Unit* on page *4-1*.

Note: ***SW1*** *switch positions are designated SW1-1 through SW1-6. Configurable Pins are shown as CP1, CP2, CP3.*

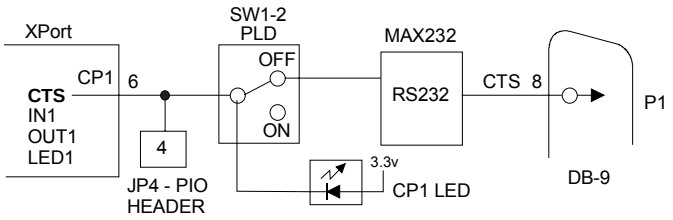
Table 6 - Configuration Switch Settings

SW1	POS	FUNCTION
1	ON	SW1-1 & SW1-6 ON for self-test mode. (Factory Test)
	OFF	Normal mode.
6	ON	SW1-1 & SW1-6 ON for self-test mode. (Factory Test)
	OFF	Normal mode.
2	OFF	XPort™ CP1 (pin 6) connected to RS232 transceiver, which connects to CTS of an attached DTE device through DB-9 pin 8. Use this if CP1 is set up for hardware flow control.
	ON	XPort™ CP1 (pin 6) not connected to RS232 transceiver. Use this if CP1 is set up as a IN1, OUT1, or LED1.
3	OFF	XPort™ CP2 (pin 7) is connected to the RS232 transceiver, which connects to DCD of an attached DTE device through DB9 pin 1. Use this if CP2 is set up for hardware handshaking.
	ON	CP2 (pin 7) is not connected to the transceiver. Use this if CP2 is set up as a IN2 or OUT2.
4	OFF	Use this when XPort™ CP3 (pin 8) is set up for hardware handshaking. With SW1-5 configured appropriately, XPort™ CP3 will be connected to DTR of an attached DTE device.
	ON	Use this when XPort™ CP3 (pin 8) is set up for hardware flow control. With SW1-5 configured appropriately, XPort™ CP3 will be connected to RTS of an attached DTE device.
5	OFF	XPort™ CP3 (pin 8) is connected to the RS232 transceiver, which connects to either DTR (DB9 pin 4) or RTS (DB9 pin 7) of an attached DTE device, depending on the setting on SW1-4. Use this if CP3 is set up for hardware flow control or handshake.
	ON	CP3 (pin 8) is not connected to the transceiver. Use this if CP3 is set up as a IN3, OUT3, or LED3.

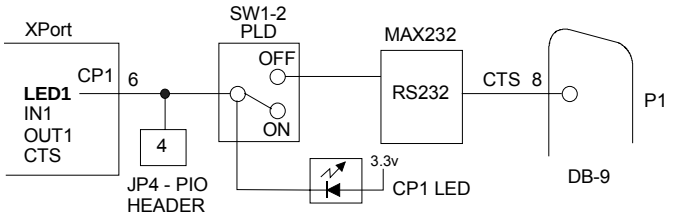
2.6.1 SW1-2 Options

SW1-2 controls the routing of the CP1 (Configurable Pin 1) signal from the XPort™. CP1 is connected to pin 6 of the XPort™ and can be software configured as CTS, IN1, OUT1, or LED1. SW1-2 is an input to the PLD which does the actual switching. The drawings represent the logical switching function.

In this drawing, SW1-2 is OFF, which connects XPort™ pin 6 to the RS232 transceiver. The XPort™ Configurable Pin 1 (CP1) is configured for CTS.



In the next drawing, SW1-2 is ON, which disconnects pin 6 from the RS232 transceiver. The XPort™ Configurable Pin 1 (CP1) is configured for LED1.



When Configurable Pin 1 is configured for LED1, it will function as a status indicator for the serial port.

Condition	CP1 LED State
Idle Channel	Solid on
Connected to network	4 Blinks every 4 seconds

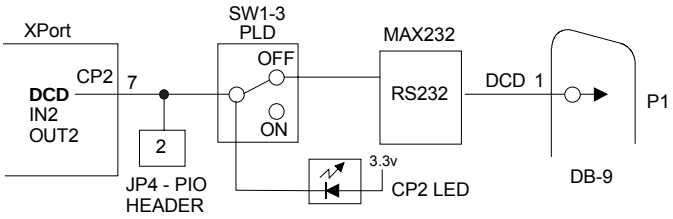
CTS and RTS work together for hardware flow control. Configurable Pin 3 (CP3) should be configured as RTS when Configurable Pin 1 (CP1) is configured as CTS. Select hardware flow control as described in *Flow* on page *4-12*.

See *OEM Configurable Pins* on page *6-13* for configuring CP1 as IN1 or OUT1.

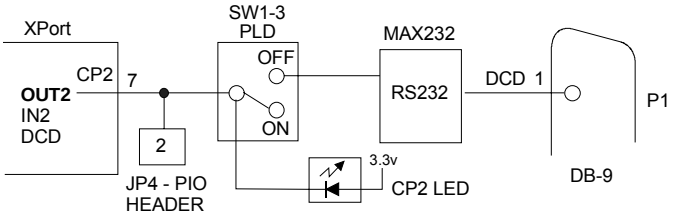
2.6.2 SW1-3 Options

SW1-3 controls the routing of the CP2 (Configurable Pin 2) signal from the XPort™. CP2 is connected to pin 7 of the XPort™ and can be software configured as DCD, IN2, or OUT2. SW1-3 is an input to the PLD which does the actual switching. The drawings represent the logical switching function.

In this drawing, SW1-3 is OFF, which connects XPort™ pin-7 to the RS232 transceiver. The XPort™ Configurable Pin 2 (CP2) is configured for DCD.



In this drawing, SW1-3 is ON, which disconnects XPort™ pin-7 from the RS232 transceiver. The XPort™ Configurable Pin 2 (CP2) is configured for OUT2.



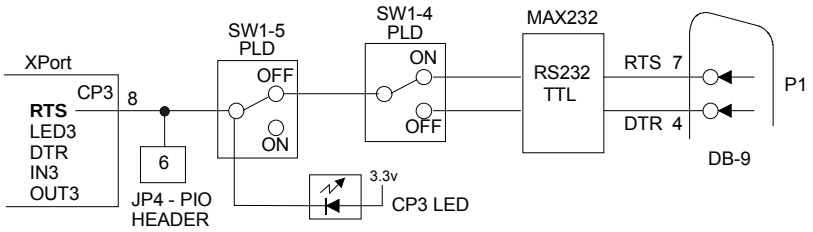
See *OEM Configurable Pins* on page *6-13* for configuring CP2 as IN2 or OUT2.

2.6.3 SW1-4, SW1-5 Options

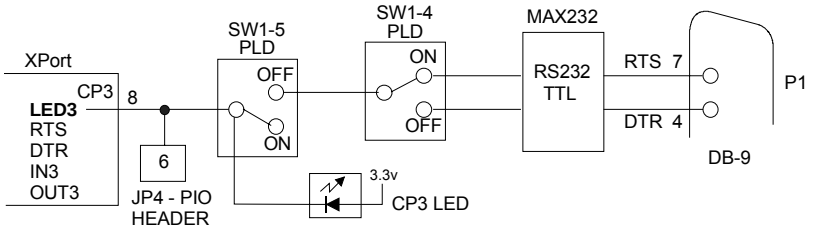
SW1-5 controls the routing of the CP3 (Configurable Pin 3) signal from the XPort™. CP3 is connected to pin 8 of the XPort™ and can be software configured as RTS, LED3, DTR, IN3, or OUT3. With SW1-5 in the OFF position, the CP3 signal is routed to SW1-4.

SW1-4 and SW1-5 are inputs to the PLD which does the actual switching. The drawings represent the logical switching functions.

CP3 options are a little more complicated because both SW1-4 and SW1-5 are used in the configuration setup. In this drawing, SW1-5 is OFF, which connects XPort™ pin-8 to the RS232 transceiver. The XPort™ Configurable Pin 3 (CP3) is configured for RTS. SW1-4 is ON, which will route the signal from XPort™ pin-8 to P1 pin-7 (RTS).



In the next drawing, SW1-5 is ON, which disconnects XPort™ pin-8 from reaching the RS232 transceiver. The XPort™ Configurable Pin 3 (CP3) is configured for LED3.



When Configurable Pin 3 is configured for LED3, it functions as a diagnostic indicator. The LED3 signal in combination with the LED1 signal will indicate diagnostic information as shown in the following table.

Note: *CP1 must be configured for LED1 and CP3 must be configured for LED 3 for diagnostic mode.*

Table 7 - LED States

Condition	CP3 LED (LED3)	CP1 LED (LED1)
No Errors	OFF	ON
Network controller error	ON	Blink 3x / 4 sec OFF
Duplicate IP address present	ON	Blink 5x / 4 sec OFF
No DHCP response	Blink 2x /sec	Blink 5x / 4 sec OFF
Setup menu active	Blink 2x / sec	See Note

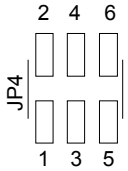
Note: During a Telnet connection, CP1 LED (LED1) will be ON. For a serial port connection, CP1 LED (LED 1) is blinking for 2 sec, then OFF for two seconds. (It appears as 4 blinks, then OFF for 2 seconds)

CTS and RTS work together for hardware flow control. Configurable Pin 3 (CP3) should be configured as RTS when Configurable Pin 1 (CP1) is configured as CTS. Select hardware flow control as described in *Flow* on page *4-12*.

See *OEM Configurable Pins* on page *6-13* for configuring CP3 as IN3 or OUT3.

2.6.4 Configurable Pins Interface Header JP4

JP4 can be used to monitor XPort™ pins 6 (CP1), 7 (CP2), and 8 (CP3). It can also be used to connect external circuitry or LEDs to the evaluation board.



JP4 Pin #	Connects To
1	3.3V
2	XPort™ Pin 7, CP2
3	Signal Ground
4	XPort™ Pin 6, CP1
5	External Reset – XPort™ Pin 3
6	XPort™ Pin 8, CP3

2.7 Timer

The timer circuit is a National LMC555 IC. The purpose of the timer is to generate a timer clock (approximately 10 counts per second). This clock is routed to the input clock pin of the PLD to be used for state machine and counter functions.

2.8 Board Layout

2.8.1 Component Identification

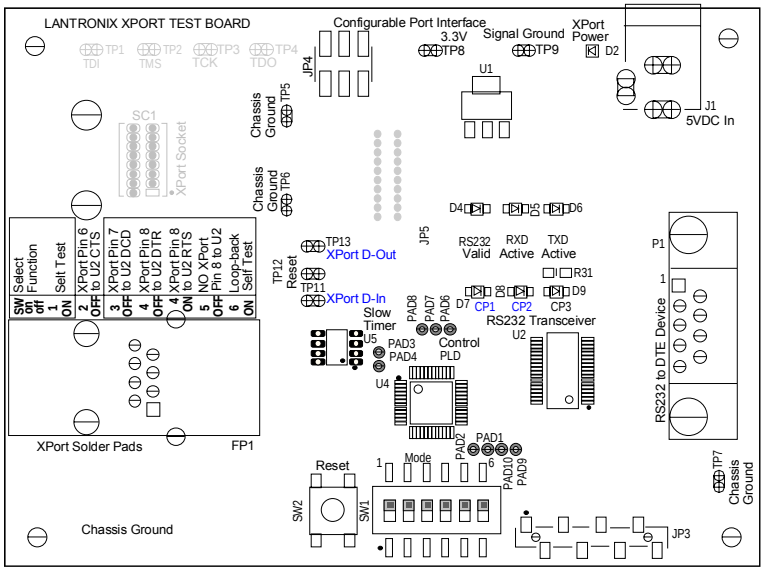


Table 8 - Component Identifier

Label	Function	Label	Function
P1	RS232 Interface. DB-9F Connector	TP1	NA
J1	+5VDC Input Connector	TP2	NA
SC1	NA	TP3	NA
SW1	Mode Switch	TP4	NA
SW2	Reset Switch	TP5	Chassis Ground
D2	XPort™ Power (Red) (LED)	TP6	Chassis Ground
D4	RS232 Valid (Green) (LED)	TP7	Chassis Ground
D5	RXD Active (Green) (LED)	TP8	XPort™ 3.3VDC (3V3)
D6	TXD Active (Green) (LED)	TP9	Signal Ground
D7	CP1- XPort™ pin 6 goes low (LED)		
D8	CP2- XPort™ pin 7 goes low (LED)	TP11	XPort™ Pin 5, Data In
D9	CP3- XPort™ pin 8 goes low (LED)	TP12	XPort™ pin 3, Reset
JP3	Programming for PLD	TP13	XPort™ Pin 4, Data Out
JP4	Configurable Pins Interface Header Connector	FP1	XPort™ Solder Pads
JP5	Factory Test – NO connector		

3. Getting Started

This chapter covers the required steps to get the XPort™ device server on-line and working. There are two basic methods used to log into the Device Server and setup the IP address:

- Network Port Login: Make a Telnet connection to the network port (9999).
- Serial Port Login: Connect a terminal or a PC running a terminal emulation program to the Device Server's first serial port (CH 1).

It is important to consider the following points before logging into and configuring the XPort™:

- The XPort™ IP address must be configured before a network connection is available.
- Only one person at a time may be logged into the network port. This eliminates the possibility of several people simultaneously attempting to configure the Device Server.
- Network port logins can be disabled. The system manager will not be able to access the unit. This port can also be password protected.

3.1 Addresses and Port Number

The Ethernet address is also referred to as the hardware address or the MAC address. The first three bytes of the Ethernet Address are fixed and read 00-20-4A, identifying the unit as a Lantronix product. The fourth, fifth, and sixth bytes are unique numbers assigned to each unit.

00-20-4A-14-01-18 or 00:20:4A:14:01:18

Every device connected to an IP network must have a unique IP address. This address is used to reference the specific unit.

Every TCP connection and every UDP datagram is defined by a destination IP address and a port number. For example, a Telnet application commonly uses port number 23. A port number is similar to an extension on a PBX system.

The unit 's serial channel (port) can be associated with a specific TCP/UDP port number. Port number 9999 is reserved for access to the unit's Setup (configuration) Mode window.

3.2 Physically Connecting the Unit

The following diagram shows an XPort™ development kit properly connected.

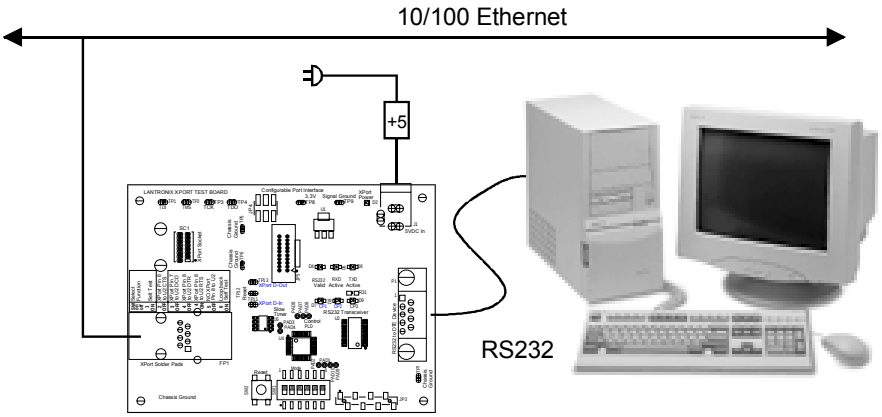


Figure 3-1 - Evaluation Board Connected to Serial Device and Network

1. Connect a serial device to your unit.
2. Connect an Ethernet cable to the XPort™ Ethernet port.
3. Supply power to your unit using the power supply that was included in the packaging.

Note: *The required input voltage for the XPort™ Evaluation Board is 5VDC (3 W maximum).*

4. Supply power to the serial device.

3.3 Methods of Assigning the IP Address

The unit's IP address must be configured before a network connection is available. You have several options for assigning an IP to your unit, however, we recommend *XPort™ Installer* on page *3-5*.

Method	Description
DHCP	A DHCP server automatically assigns the IP address and network settings. See *DHCP* on page *3-3*.
XPort™ Installer	You manually assign the IP address using a PC attached to the network. See *XPort™ Installer* on page *3-5*.
ARP and Telnet	You manually assign the IP address and other network settings at a command prompt using a UNIX or Windows-based system. Only one person at a time can be logged into the configuration port (port 9999). This eliminates the possibility of several people simultaneously attempting to configure the unit. See *ARP and Telnet* on page *3-9*.
AutoIP	This automatic method is appropriate when you have a small group of hosts rather than a large network. This method allows the hosts to negotiate with each other and assign addresses, in effect creating a small network. See *AutoIP* on page *3-4*.
Serial Port Login	You initially configure the unit through a serial connection. See *Serial Port Login* on page *3-9*.

These methods are described in the remaining sections of this chapter.

Note: *In most installations, a fixed IP address is desirable. The systems administrator generally provides the IP address. Obtain the following information before starting to set up your unit:*
IP Address: _____ _____ _____ _____

Subnet Mask: _____ _____ _____ _____

Gateway: _____ _____ _____ _____

3.3.1 DHCP

The unit ships with a default IP address of 0.0.0.0, which automatically enables DHCP.

Provided a DHCP server exists on the network, it will provide the unit with an IP address, gateway address, and subnet mask when the unit boots up.

You can use the XPort™ Installer software to search the network for the IP address your unit has been assigned by the DHCP server and add it to the managed list. See *XPort™ Installer* later in this chapter.

Note: *This DHCP address will **not** appear in the unit's standard configuration screens. You can, however, determine your unit's DHCP-assigned IP address in Monitor Mode. When you enter Monitor Mode from the serial port with network connection enabled (see Monitor Mode in the Troubleshooting chapter) and issue the **NC** (Network Communication) command, you will see the unit's IP configuration. Monitor Mode may not be available in some firmware versions.*

3.3.2 AutoIP

The unit ships with a default IP address of 0.0.0.0, which automatically enables Auto IP within the unit. AutoIP is an alternative to DHCP that allows hosts to automatically obtain an IP address in smaller networks that may not have a DHCP server. A range of IP addresses (from 169.254.0.1 to 169.254.255.1) has been explicitly reserved for AutoIP-enabled devices. The range of Auto IP addresses is not to be used over the Internet.

If your unit cannot find a DHCP server, and you have not manually assigned an IP address to it, the unit automatically selects an address from the AutoIP reserved range. Then, your unit sends out a (ARP) request to other nodes on the same network to see whether the selected address is being used.

If the selected address is not in use, then the unit uses it for local subnet communication.

If another device is using the selected IP address, the unit selects another address from the AutoIP range and reboots itself. After reboot, the unit sends out another ARP request to see if the selected address is in use, and so on.

AutoIP is not intended to replace DHCP. The unit will continue to look for a DHCP server on the network. If a DHCP server is found, the unit will switch to the DHCP server-provided address and reboot.

Note: *If a DHCP server is found, but it denies the request for an IP address, the unit does not attach to the network, but waits and retries.*

AutoIP can be disabled by setting the unit's IP address to 0.0.1.0. This setting enables DHCP but disables AutoIP.

3.4 XPort™ Installer

You can manually assign the IP address using XPort™ Installer software, which is on the product CD. If you want to use a serial connection instead of an Ethernet connection to configure the device, go to *Serial Port Login* on page *3-9*.

3.4.1 Install XPort™ Installer

1. Insert the product CD into your CD-ROM drive. The CD will automatically start and display the main window.

   If the CD does not launch automatically:

   a) Click the Start button on the Task Bar and select Run.

   b) Enter your CD drive letter, colon, backslash, Launch.exe (e.g., D:\Launch.exe).

Figure 3-2 - XPort™ Developer Kit Window

2. Click the **XPort Installer** button. The installation wizard window displays.
3. Respond to the installation wizard prompts.
4. Restart your system.

3.4.2 RUN XPort™ Installer

Click the Start button on the Task Bar and select **Programs\XPort Installer\XPort Installer**. The XPort™ Installer main dialog box displays.

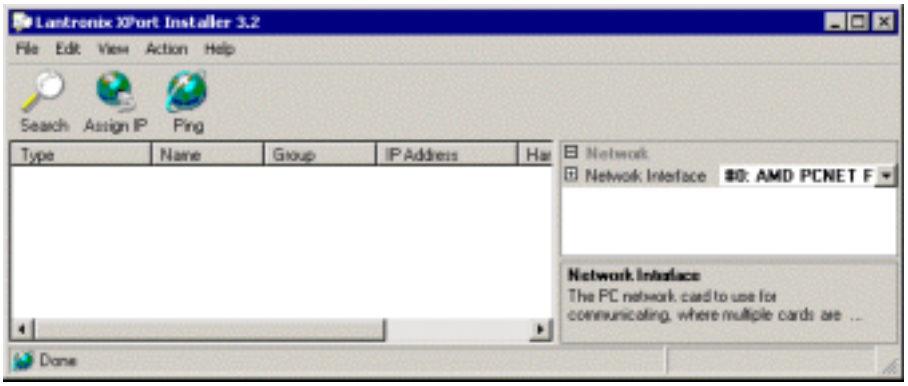


Figure 3-3 - XPort™ Installer Dialog Box

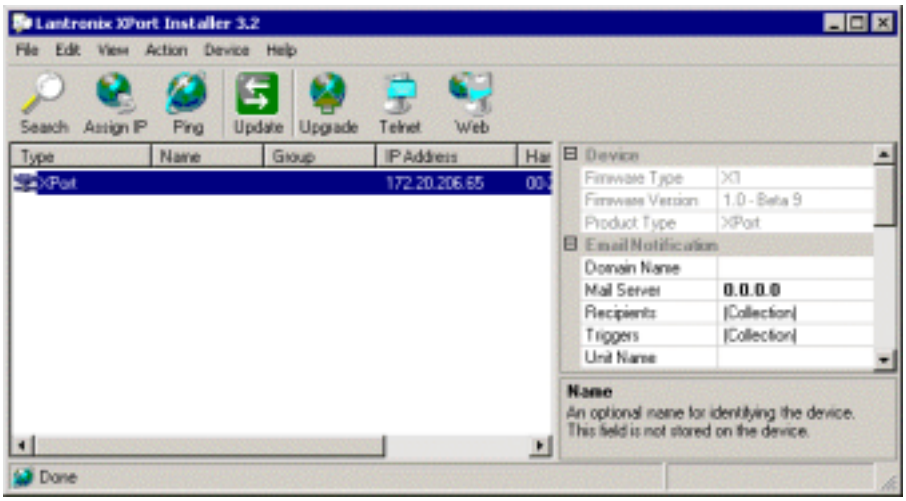
To search for devices, click the **Search** icon  or select **Search Network** from the Action menu.

3.4.3 Assign IP Address

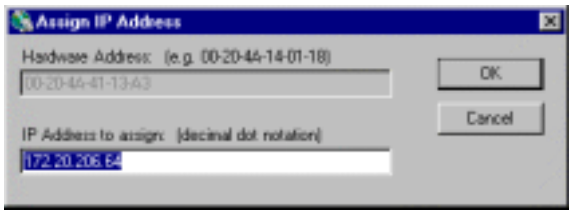
The following dialog box shows a device found on the network, with the IP addresses assigned by the DHCP server. The device IP Address is normally set to 0.0.0.0 at the factory. The Hardware Address is an individual permanent address assigned to a particular device on the network. The Hardware Address can be found on the product label.

If a device doesn't show up after searching, then the device might not have a valid IP address assigned. Use the Assign IP Address feature to set a specific IP address on the device. To do this, you need to specify the device's Ethernet address (also referred to as Hardware Address), which is usually found on the device.

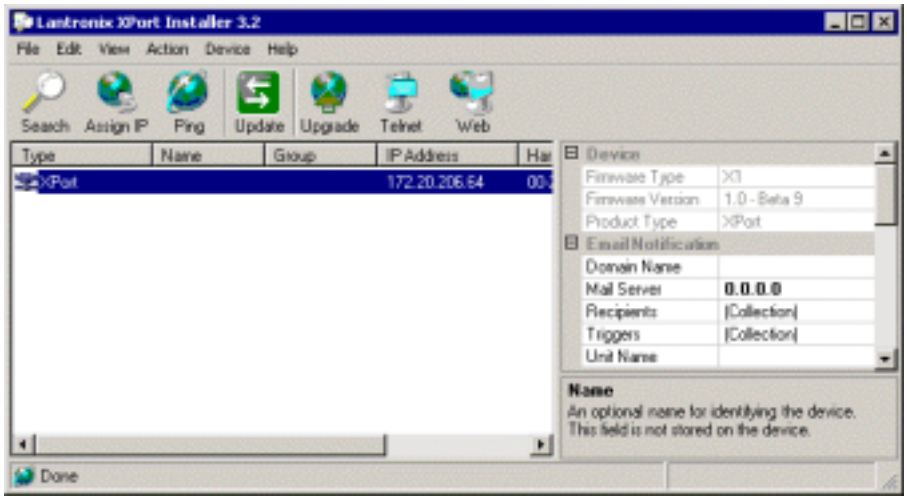
Note: *Click on a device to view its attributes.*



To change the IP address, first select the device from the list, then click the **Assign IP** icon  or select **Assign IP Address** from the Action menu. The hardware address and IP address are loaded into the Assign IP Address dialog box.

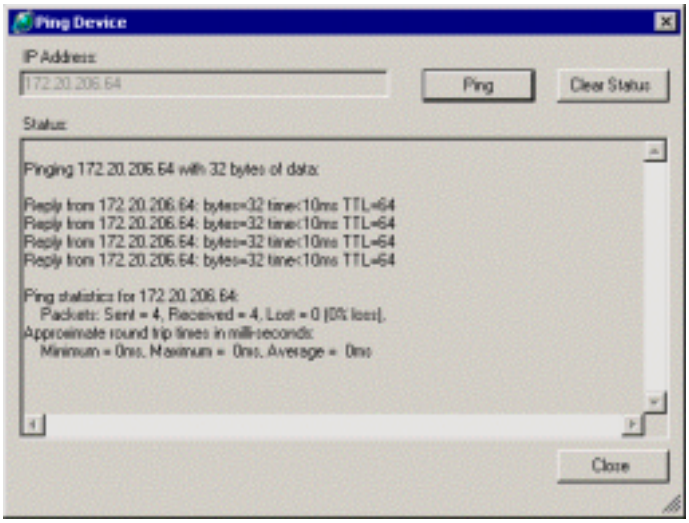


Enter the new IP Address and click OK. The new IP Address will appear in the main window.



3.4.4 Test the IP Address

1. To test the IP Address, select the device from the main window list, then click the **Ping** icon  or select **Ping** from the Action menu. The Ping Device dialog box shows the IP Address of the selected device. Click the Ping button and the results will be displayed in the Status window. Use the Clear Status button to clear the window so you can Ping the device again. Click the Close button to close the dialog box and return to the main window.



Note: *If you do not receive "Reply" messages, make sure the unit is properly attached to the network and that the IP address assigned is valid for the particular network segment you are working with. If you are not sure, check with your systems administrator.*

3.4.5 Opening a Configuration Window

1. Do ***one*** of the following:

Note: *To assign Expert settings and Security settings, you must use the Setup Mode window in a Telnet session.*

To configure the unit via a Web browser, first click on one of the devices listed in the window, then click the **Web** icon 

. The Lantronix Web-Manager window displays in your browser. For Web Configuration, see *Web Manager Page* on page *4-2*.

To configure the unit via a Telnet session, first click on one of the devices listed in the window, then click the **Telnet** icon 

. The Setup Mode window displays. For Telnet Configuration, see *Using a Telnet Connection* on page *4-7*.

2. Continue with the appropriate configuration procedure described in the next chapter.

3.5 ARP and Telnet

The unit's IP address must be configured before a network connection is available. If the unit has no IP address, you can use Address Resolution Protocol (ARP) method from UNIX and Windows-based systems to assign a temporary IP address. If you want to initially configure the unit through the network, follow these steps:

1. On a UNIX or Windows-based host, create an entry in the host's ARP table using the intended IP address and the hardware address of the unit, which is found on the product label on the bottom of the unit.

   arp -s 191.12.3.77 00:20:4a:xx:xx:xx

Note: *For the ARP command to work on Windows 95, the ARP table on the PC must have at least one IP address defined other than its own.*

2. If you are using Windows 95, type ARP -A at the DOS command prompt to verify that there is at least one entry in the ARP table. If the local machine is the only entry, ping another IP address on your network to build a new entry in the ARP table; the IP address must be a host other than the machine on which you are working. Once there is at least one additional entry in the ARP table, use the following command to ARP an IP address to the unit:

   arp -s 191.12.3.77 00-20-4a-xx-xx-xx

3. Open a Telnet connection to port 1. The connection will fail quickly, but the unit will temporarily change its IP address to the one designated in this step.

   telnet 191.12.3.77 1

4. Finally, open a Telnet connection to port 9999, and press Enter within three seconds to go into Setup Mode. If you wait longer than three seconds, the unit will reboot.

   telnet 191.12.3.77 9999

5. Set all required parameters

Note: *The IP address you just set is temporary and will revert to the default value when the unit 's power is reset unless you log into the unit and store the changes permanently. Refer to Configuring the Unit on page 4-1 for instructions on permanently configuring the IP address.*

3.6 Serial Port Login

If you want to initially configure the unit through a serial connection, follow these steps:

1. Connect a console terminal or PC running a terminal emulation program to your unit's serial port. The default serial port settings are 9600 baud, 8 bits, no parity, 1 stop bit, no flow control.
2. To enter Setup Mode, cycle the unit's power (power off and back on). After power-up, the self-test begins. **You have one second** to enter three lowercase x characters.

Note: *The easiest way to enter Setup Mode is to hold down the **x** key at the terminal (or emulation) while powering up the unit.*

3. At this point, the screen display is the same as when you use a Telnet connection. To continue with a serial port login, go to *Using a Telnet Connection* on page *4-7*.

4. Configuring the Unit

You must configure the unit so that it can communicate on a network with your serial device. For example, you must set the way the unit will respond to serial and network traffic, how it will handle serial packets, and when to start or close a connection. You can configure your unit locally or remotely using the following procedures:

- Use XPort™ Installer to configure the unit. Some features are only available through the XPort™ Installer menus.
- Use a standard Web browser to access the unit's internal Web pages and configure the unit over the network. This is the easiest and preferred method.
- Use a Telnet connection to configure the unit over the network.
- Use a terminal or terminal emulation program to access the serial port locally.

The unit's configuration is stored in nonvolatile memory and is retained without power. You can change the configuration at any time. The unit performs a reset after the configuration has been changed and stored.

Note: *The menus in this section show a typical device. Your device may have different configuration options.*

4.1 Configuring via Web Browser

Open your JAVA enabled web browser and enter the IP address. The Lantronix Web Manager page will display. Go to *Web Manager Page* on page *4-2* for a summary of the menu selections.

4.2 Using XPort™ Installer

XPort™ Installer is a powerful software utility for configuring device servers from a network connection. This section uses the utility to demonstrate the various methods of configuring a device.

To use XPort™ Installer, follow the instructions in *RUN XPort™ Installer* on page *3-6* to search the network and verify your device is active.

1. To configure the unit via a Web browser, select the device from the main window list, then click the **Web** icon  or select **Web Pages** from the Device menu.. The Lantronix Web-Manager window displays in your browser. For Web Configuration, see *Web Manager Page* on page *4-2*.

2. To configure a device using Telnet, select the device from the main window list, then click the **Telnet** icon  or select **Telnet** from the Device menu. Verify the IP Address and Port number and click OK. The configuration menu will appear. For Telnet Configuration, see *Using a Telnet Connection* on page *4-7*.

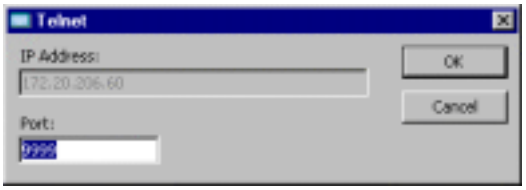


Figure 4-1 - Telnet

4.3 Web Manager Page

You can start a web browser for configuration by opening your JAVA enabled web browser and entering the IP address or by clicking the Web button on the XPort™ Installer toolbar. The Lantronix Web Manager page will display.

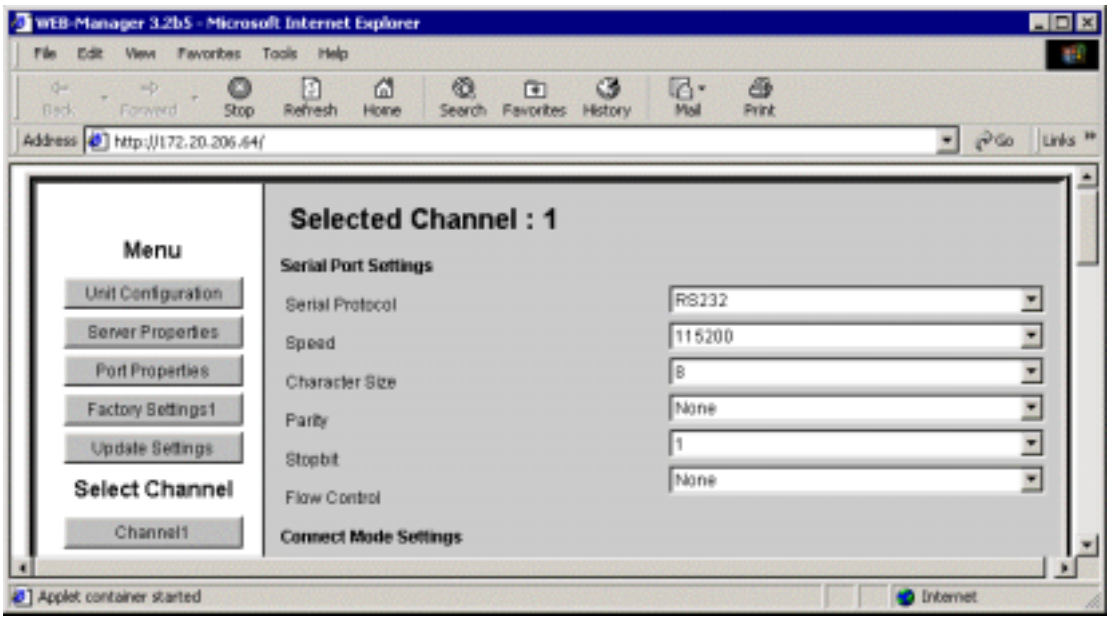


Figure 4-2 - Lantronix Web-Manager

- Web Manager has the following buttons:
- Unit Configuration
- Server Properties
- Port Properties
- Factory Settings1
- Update Settings
- Channel1

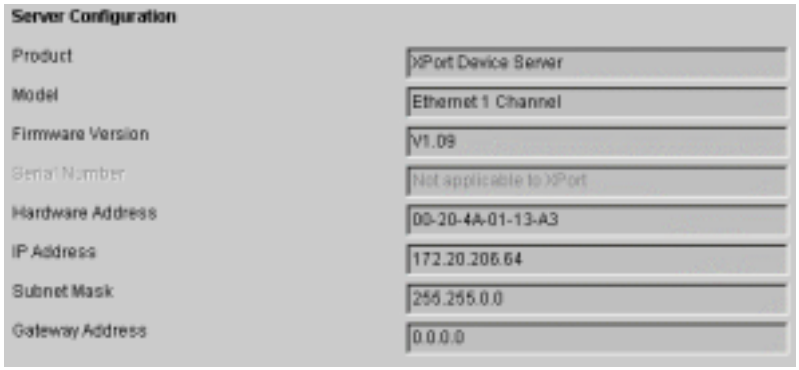
1. Use the menu (pushbuttons) to navigate to sub pages where you can configure server settings. See explanations of the configuration parameters later in this chapter.
2. When you are finished, click the **Update Settings** button to save your settings.

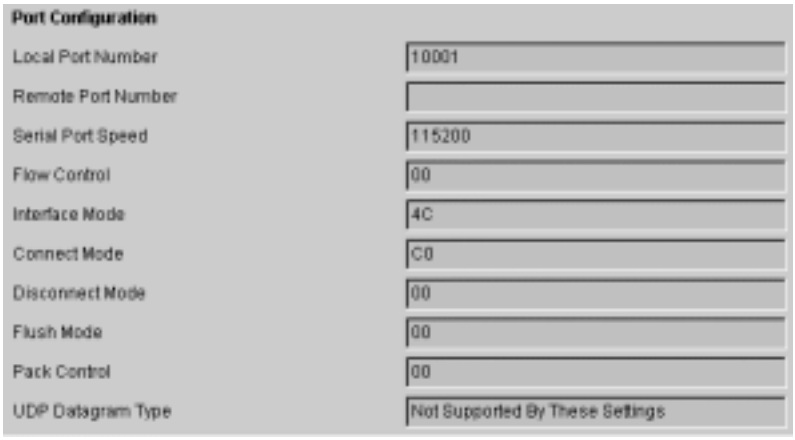
4.3.1 Unit Configuration

Click the **Unit Configuration** button to display the following dialog box. This page contains the Server Configuration and the Port Configuration settings. These are static settings read from the device.

Note: *The following screen shots represent typical web pages. See the Lantronix web page for the latest version.*

The following two pictures show the information available in the above screen shot.





4.3.2 Server Properties

You can change the server properties by editing any of the fields. Lingering over one of the fields will display help messages. Changing the IP address will require you to enter the new IP address in the browser to reload the page.

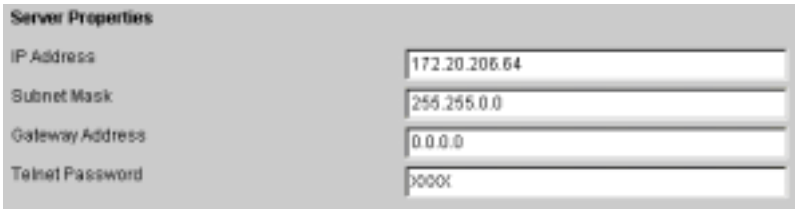


Figure 4-3 - Server Properties Configuration on the Web Browser

4.3.3 Telnet Password

In the Telnet Password field, enter a password to prevent unauthorized access to the Setup Mode via a Telnet connection to port 9999. The password is limited to 4 characters. (An enhanced password setting of 16 characters is available under Security Settings on the Telnet Setup Mode window.)

Note: *No password is required to access the Setup Mode window via a serial connection.*

4.3.4 Port Properties

Serial Protocol: RS232

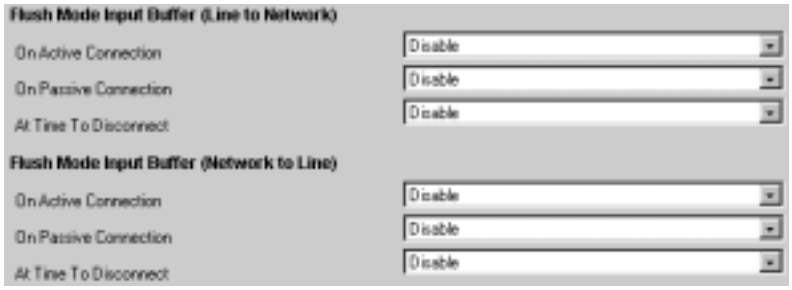
Note: *RS-232 is the only available option for XPort™.*

Speed: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400

Character Size: 8, 7
Parity: None, Even, Odd
Stop Bit: 1,2
Flow Control: None, XON/XOFF, XON/XOFF Pass Characters to Host, CTS/RTS (Hardware)

UDP Datagram Mode: Enable, Disable
UDP Datagram Type: (User selectable)
Incoming Connection: Accept unconditional, Accept Incoming/DTR, Never accept incoming
Response: Nothing (quiet), Character Response
Startup: No Active Connection startup, With Any Character, With CR (0x0D) Only, Manual Connection, Autostart, Modem Mode, With Active DTR

Remote IP Address: (user selectable)
Remote Port: (user selectable)
Local Port: 10001 (default 10001, user selectable)



On Active Connection: Enable, Disable
On Passive Connection: Enable, Disable
At Time To Disconnect: Enable, Disable

Packing Algorithm: Enable, Disable
Idle Time: Force transmit 12 ms, Force transmit 52 ms, Force Transmit 250 ms, Force Transmit 5000 ms
Trailing Characters: None, One, Two
Send Immediate After Sendchars: Enable, Disable
Sendchar Define2-Byte Sequence: Enable, Disable
Send Character 01: (User Selectable)
Send Character 02: (User Selectable)

Disconnect Mode: Ignore DTR, With DTR Drop
Check for CTRL-D to Disconnect: Enable, Disable
Port Password: Enable, Disable
Telnet Mode: Enable, Disable
Inactivity Timeout: Enable, Disable
Inactivity Timer: (User Selectable)
Port Password: (User Selectable. Port Password must be enabled)

4.3.5 Factory Settings1

Click this button to set Channel1 to the factory default settings.

4.3.6 Update Settings

Click the **Update Settings** button to send all changed settings to the device.

4.4 Configuring via the Setup Mode Window

4.4.1 Using a Telnet Connection

To configure the unit over the network, establish a Telnet connection to port 9999.

Note: *If you use the **Telnet** icon on the XPort™ Installer toolbar **OR** a serial port login to establish the connection, skip steps 1and 2.*

1. From the Windows Start menu, click **Run** and type the following command, where x.x.x.x is the IP address and 9999 is the unit's fixed network configuration port number.

   telnet x.x.x.x 9999

Note: *Be sure to include a space between the IP address and 9999.*

2. Click **OK**.
3. The **Setup Mode** window displays.

   MAC address 00204A4113A3
   Software version 01.0b9 (021219) XPT

   Press Enter to go into Setup Mode

4. To enter the Setup Mode, **you must press Enter within 5 seconds**. The configuration settings will appear.
5. Select an option on the menu by entering the number of the option in the **Your choice** ? field and pressing **Enter**.
6. To enter a value for a parameter, type the value and press **Enter**, or to confirm a current value, just press **Enter**.
7. When you are finished, save the new configurations (option **9**). The unit will reboot.

```
*** basic parameters
Hardware: Ethernet TPI
IP addr 0.0.0.0/DHCP/BOOTP/AutoIP, no gateway set
DHCP device name : not set

****************** Security ******************
SNMP is              enabled
SNMP Community Name: public
Telnet Setup is      enabled
TFPT Download is     enabled
Port 77Feh is        enabled
Web Server is        enabled
ECHO is              disabled
Encryption is        disabled
Enhanced Password is disabled

****************** Channel 1 ******************
Baudrate 9600, I/F Mode 4C, Flow 00
Port 10001
Remote IP Adr: --- none ---, Port 00000
Connect Mode : C0 Disconn Mode: 00
Flush   Mode :00

****************** Expert ******************
TCP Keepalive     : 45s
ARP cache timeout : 600s

****************** E-mail ******************
Mail server: 0.0.0.0
Unit       :
Domain     :
Recipient 1:
Recipient 2:

*** Trigger 1
Serial Sequence: 00,00
CP1: X
CP2: X
CP3: X
Message :
Priority: L
Min. notification interval: 1 s
Re-notification interval  : 0 s

*** Trigger 2
Serial Sequence: 00,00
CP1: X
CP2: X
CP3: X
Message :
Priority: L
Min. notification interval: 1 s
Re-notification interval  : 0 s
```

```
*** Trigger 3
Serial Sequence: 00,00
CP1: X
CP2: X
CP3: X
Message :
Priority: L
Min. notification interval: 1 s
Re-notification interval  : 0 s

Change Setup:
  0 Server configuration
  1 Channel 1 configuration
  3 E-mail settings
  5 Expert settings
  6 Security
  7 Factory defaults
  8 Exit without save
  9 Save and exit              Your choice ?
```

Figure 4-4 - Setup Mode Window

4.4.2 Using the Serial Port

If you want to initially configure the unit through a serial connection, follow these steps:

1. Connect a console terminal or PC running a terminal emulation program to your unit's serial port. The default serial port settings are 9600 baud, 8 bits, no parity, 1 stop bit, no flow control.
2. To enter Setup Mode, reset the unit, either by pushing the red reset button, or cycling the unit's power (power off and back on). The self-test will begin. **You have one second** to enter three lowercase **x** characters (**xxx**).

Note: *The easiest way to enter Setup Mode is to hold down the **x** key at the terminal (or emulation) while resetting the unit.*

3. At this point, the screen display is the same as when you use a Telnet connection. To continue with a serial port login, go to *Using a Telnet Connection* on page *4-7*.

4.5 Server Configuration (Network Configuration)

These are the unit's basic network parameters. The following parameters are displayed when you select **Server configuration**.

```
IP Address : (000) .(000) .(000) .(000)
Set Gateway IP Address (N)
Netmask: Number of Bits for Host Part (0=default)  (0)
Change telnet config password (N)
```

4.5.1 IP Address

The IP address must be set to a unique value in your network. See *IP Addresses* on page *11-1* for more information about IP addressing.

4.5.2 Set Gateway IP Address

The gateway address, or router, allows communication to other LAN segments. The gateway address should be the IP address of the router connected to the same LAN segment as the unit. The gateway address must be within the local network.

4.5.3 Netmask: Number of Bits for Host Part

A netmask defines the number of bits taken from the IP address that are assigned for the host section.

Note: *Class A: 24 bits; Class B: 16 bits; Class C: 8 bits.*

The unit prompts for the number of host bits to be entered, then calculates the netmask, which is displayed in standard decimal-dot notation when the saved parameters are displayed (for example, 255.255.255.0).

Table 9 - Standard IP Network Netmasks

Network Class	Host Bits	Netmask
A	24	255.0.0.0
B	16	255.255.0.0
C	8	255.255.255.0

Table 10 - Netmask Examples

Netmask	Host Bits
255.255.255.252	2
255.255.255.248	3
255.255.255.240	4
255.255.255.224	5
255.255.255.192	6
255.255.255.128	7
255.255.255.0	8
255.255.254.0	9
255.255.252.0	10
255.255.248.0	11
...	...
255.128.0.0	23
255.0.0.0	24

4.5.4 Change Telnet configuration password

Setting the Telnet configuration password prevents unauthorized access of the setup menu via a Telnet connection to port 9999 or via Web pages. The password is limited to 4 characters. An enhanced password setting of 16 characters is available under Security Settings for Telnet access only.

Note: *No password is required to access the Setup Mode window via a serial connection.*

4.5.5 DHCP Naming

There are 3 methods for assigning DHCP names to these products.

1) Default DHCP name. If you do not change the DHCP name, and you are using an IP of 0.0.0.0, then the DHCP name will default to CXXXXXX (XXXXXX is the last 6 digits of the MAC address shown on the label on the bottom/side of the unit). For example, if the MAC address is 00-20-4A-12-34-56, then the default DHCP name is C123456.

2) Custom DHCP name. You can create your own DHCP name on these products. If you are using an IP address of 0.0.0.0, then the last option in "Server configuration" will be "Change DHCP device name". The "Change DHCP device name" option will allow you to change the DHCP name to an alpha numeric name.

```
Change DHCP device name (not set) ? (N) Y
Enter new DHCP device name : LTX
```

3) Numeric DHCP name. You are able to change the DHCP name by specifying the last octet of the IP address. When you use this method, the DHCP name will be LTXYY where YY is what you chose for the last octet of the IP address. If the IP address you specify is 0.0.0.12, then the DHCP name will be LTX12. This method will only work with 2 digit numbers (0-99).

4.6 Channel 1 Configuration (Serial Port Parameters)

Using this option, define how the serial port will respond to network and serial communications.

```
Baudrate (9600)
I/F Mode (4C)
Flow (00)
Port No (10001)
ConnectMode (C0)
Remote IP Address : (000).(000).(000).(000)
Remote Port (00000)
DisConnMode (00)
FlushMode   (00)
DisConnTime (00:00) :
SendChar 1  (00)
SendChar 2  (00)
```

4.6.1 Baudrate

The unit and attached serial device, such as a modem, must agree on a speed or baud rate to use for the serial connection. Valid baud rates are 300, 600, 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200, and 230400 bits per second.

4.6.2 I/F (Interface) Mode

The Interface (I/F) Mode is a bit-coded byte that you enter in hexadecimal notation.

*Note: See **Table 29 - Binary to Hexadecimal Conversion Table** on page 10-1.*

Table 11 - Interface Mode Options

I/F Mode Option	7	6	5	4	3	2	1	0
RS-232C (1)							0	0
7 Bit					1	0		
8 Bit					1	1		
No Parity			0	0				
Even Parity			1	1				
Odd Parity			0	1				
1 Stop bit	0	1						
2 Stop bit (1)	1	1						

(1) 2 Stopbits are implemented by software. This might have influence on performance.

If you attempt to select an I/F Mode bit that pertains to RS-422/485, a warning message will appear. WARNING: RS-422/485 I/F Modes not supported.

The following table demonstrates how to build some common Interface Mode settings:

Table 12 - Common Interface Mode Settings

Common I/F Mode Setting	Binary	Hex
RS-232C, 8-bit, No Parity, 1 stop bit	0100 1100	4C
RS-232C, 7-bit, Even Parity, 1 stop bit	0111 1000	78

4.6.3 Flow

Flow control sets the local handshaking method for stopping serial input/output. Generally, flow control is not required if the connection is used to pass a blocked protocol with block sizes less than 1k (ACK/NAK) and/or speeds of 19200 or less. Use the following table to select Flow Control options:

Table 13 - Flow Control Options

Flow Control Option	Hex
No flow control	00
XON/XOFF flow control	01
Hardware handshake with RTS/CTS lines	02
XON/XOFF pass characters to host	05

4.6.4 Port Number

The setting represents the source port number in TCP connections, and is the number used to identify the channel for remote initiating connections. Default setting for Port 1 is 10001. Range: 1-65535 except for the following reserved port numbers:

Port Numbers	Reserved for
1 – 1024	Reserved (well known ports)
9999	Telnet setup
14000-14009	Reserved
30718	Reserved (77FEh)
10000-10999	Recommended ports, should be used for DeviceComm Manager (COM1-COM256) or raw socket connections

The port number functions as the TCP/UDP source port number for outgoing packets. Packets sent to the unit with this port number are received to this channel. The port number selected is the Incoming TCP/UDP port and Outgoing TCP/UDP source port. Port 0 is used when you want the outgoing source port to change with each connection.

If the port number is set to 0, the initial value of 5000 will be used to actively establish a connection. Each subsequent connection will increment the number by 1. When the port number reaches 7999, it will wrap back to 5000.

The automatic port increment feature must only be used when this device is the one initiating a connection using TCP. The port must be set to a non-zero value when this is a passive device or when UDP is being used instead of TCP.

4.6.5 Connect Mode

Connect Mode defines how the unit makes a connection, and how it reacts to incoming connections over the network. Enter Connect Mode options in hexadecimal notation.

Note: *If you do not want to convert the binary numbers to hexadecimals yourself, look up the values in* ***Table 29 - Binary to Hexadecimal Conversion Table*** *on page 10-1.*

Table 14 - Connect Mode Options

Connect Mode Option	7	6	5	4	3	2	1	0
Incoming Connection								
Never accept incoming	0	0	0					
Accept with DTR Active	0	1	0					
Always Accept	1	1	0					
Response								
Nothing (quiet)				0				
Character response (C=connect, D=disconnect, N=unreachable)				1				
Active Startup								
No active startup					0	0	0	0
With any character					0	0	0	1
With DTR Active					0	0	1	0
With Carriage Return (0x0D) only					0	0	1	1
Manual connection					0	1	0	0
Autostart					0	1	0	1
Hostlist	0	0	1	0				
Datagram Type								
Directed UDP					1	1	0	0
Modem Mode								
Full Verbose				1	0	1	1	0
Without Echo				0	0	1	1	0
1-character Response				1	0	1	1	1

INCOMING CONNECTION:

Never Accept Incoming: rejects all external connection attempts.

Accept with DTR Active: accept external connection requests only when the DTR input is asserted. Cannot be used with Modem Mode.

Always Accept: accept any incoming connection when a connection is not already established. This is the default setting.

RESPONSE:

Character Response: a single character is transmitted to the serial port when there is a change in connection state: C = connected, D = disconnected, N = host unreachable. This option is overridden when the Active Start Modem Mode or Active Start Host List is in effect. Default setting is Nothing (quiet).

ACTIVE STARTUP:

No Active Startup: no attempt to initiate a connection under any circumstance. This is the default setting.

With Any Character: attempts to connect when any character is received from the serial port.

With DTR Active: attempts to connect when the DTR input changes from not asserted to asserted.

With Carriage Return: attempts to connect when a carriage return character is received from the serial port.

Manual Connection: attempts to connect when directed by a command string received from the serial port. The first character of the command string must be a C (ASCII 0x43), and the last character must be either a carriage return (ASCII 0x0D) or a line feed (0x0A). No blanks or space characters in the command string. Between the first and last command string characters must be a full or partial destination IP address and may be a destination port number.

The IP address must be presented in standard dot-decimal notation and may be a partial address, representing the least significant 1, 2 or 3 bytes of the remote IP address. The period is required between each pair of IP address numbers.

If present, the port number must follow the IP address, must be presented as a decimal number in the range 1-65535 and must be preceded by a forward slash (ASCII 0x2F). The slash separates the IP address and the port number. If the port number is omitted from a command string, the internally stored remote port number is used to start a connection.

For Active Start options requiring internally stored destination IP address and port number, the unit will not attempt a connection if this information is not configured (all zeros).

If a partial IP address is presented in a command string, it will be interpreted to be the least significant bytes of the IP address and will use the internally stored remote IP address to provide the most significant bytes of the IP address.

For example, if the remote IP address already configured in the unit is 129.1.2.3, then an example command string would be C3/7. (This would connect to 129.1.2.3 and port 7.) You may also use a different ending for the connection string. For example, C50.1/23 would connect you to 129.1.50.1 and port 23.

Table 15 - Manual Connection Address Example

Command String	Result if remote IP is 129.1.2.3 and remote port is 1234
C121.2.4.5/1	Complete override; connection is started with host 121.2.4.5, port 1
C5	Connect to 129.1.2.5, port 1234
C28.10/12	Connect to 129.1.28.10, port 12

Autostart (Automatic Connection): If autostart is enabled, the unit automatically connects to the remote IP address and remote port specified when the firmware starts.

Hostlist: If you enable this option, the Lantronix unit scrolls through the hostlist until it connects to a device listed in the hostlist table. Once it connects, the unit stops trying to connect to any others. If this connection fails, the unit continues to scroll through the table until it is able to connect to another IP in the hostlist.

Hostlist supports a minimum of 1 and a maximum of 12 entries. Each entry contains the IP address and the port number.

The host list will be disabled for Manual Mode and for Modem Mode. The unit will not accept a data connection from a remote device when the host list option is enabled.

```
Change Setup  :0 Server configuration
              1 Channel 1 configuration
              5 Expert settings
              6 Security
              7 Factory defaults
              8 Exit without save
              9 Save and exit              Your choice ?
Baudrate (9600)
I/F Mode (4C)
Flow (00)
Port No (10001)
ConnectMode (21)

Hostlist :
01. IP : 010.010.010.001  Port : 00023
02. IP : 010.010.010.002  Port : 00023
03. IP : 010.010.010.003  Port : 00023

Change Hostlist ? (N)
Hostlist Retrycounter   (3)
Hostlist Retrytimeout   (250)
DisConnMode (00)
FlushMode   (00)
DisConnTime (00:00) :
SendChar 1  (00)
SendChar 2  (00)
```

Figure 4-5 - Hostlist Option

To use the Hostlist option, follow these steps:

1. To enable the hostlist, enter a Connect Mode of 0x20 (**2X**). The menu shows you a list of current entries already defined in the product.
2. To delete, modify, or add an entry, select **Yes**. If you enter an IP address of 0.0.0.0, that entry and all others after it are deleted.
3. After completing the hostlist, repeat the previous step if necessary to edit the hostlist again.
4. For Retrycounter, enter the number of times the Lantronix unit should try to make a good network connection to a hostlist entry that it has successfully ARPed. The range is 1-15, with the default set to 3.
5. For Retrytimeout, enter the number of seconds the unit should wait before failing an attempted connection. The time is stored as units of milliseconds in the range of 1-65535. The default value is 250.

DATAGRAM TYPE:

Datagram Type: When selecting this option, you will be prompted for the Datagram type. Enter **01** for directed or broadcast UDP.

When the UDP option is in effect, the unit will never attempt to initiate a TCP connection because it will use UDP datagrams to send and receive data.

MODEM MODE:

Modem (Emulation) Mode: In Modem Mode, the unit presents a modem interface to the attached serial device. It accepts AT-style modem commands, and handles the modem signals correctly.

Normally there is a modem connected to a local PC and a modem connected to a remote machine. A user must dial from the local PC to the remote machine, accumulating phone charges for each connection. Modem Mode allows you to replace modems with XPort™s, and to use an Ethernet connection instead of a phone call, without having to change communications applications and make potentially expensive phone calls.

To select Modem Mode, set the Connect Mode to **C6** (no echo), **D6** (echo with full verbose), or **D7** (echo with 1-character response).

Note: *If the unit is in Modem Mode and the serial port is idle, the unit can still accept network TCP connections to the serial port if Connect Mode is set to C6 (no echo), D6 (echo with full verbose), or D7 (echo with 1-character response).*

In Modem Mode, echo refers to the echo of all of the characters entered in command mode; it does not mean to echo data that is transferred. Quiet Mode (without echo) refers to the modem not sending an answer to the commands received (or displaying what was typed).

Full Verbose means the unit will echo modem commands and will respond to a command with a message string shown on the following table:

Message	Meaning
OK	Command was executed without error.
CONNECT	A network connection has been established.
DISCONNECT	A network connection has been closed.
RING n.n.n.n.	A remote device, having IP address n.n.n.n, is connecting to this device.

1-Character Response means the unit will echo modem commands and will respond to a command with a single character response:

Message	Meaning
0	OK
1	Connected
2	Ring
3	No Carrier
4	Error

Received commands must begin with the two-character sequence AT and must be terminated with a carriage return character. Any character sequence received not starting with AT will be ignored. The unit will only recognize and process single AT-style commands. Compound AT commands shall be treated as unrecognized commands.

If the Full Verbose option is in effect, an unrecognized command string that is otherwise formatted correctly (begins with AT and ends with carriage return) will be responded to with the OK message and no further action will be taken.

If the 1-Character Response option is in effect, unrecognized command strings that are otherwise formatted correctly will be responded to with OK and no further action will be taken.

When an active connection is in effect, the unit will be transferring data and will not process commands received from the serial interface.

When a connection is terminated or lost, the unit will revert to command mode.

When an active connection is in effect, the unit will terminate the connection if the following sequence is received from the attached serial device:

1. No serial data is received for one second.
2. The character sequence +++ is received, with no more than one second between each two characters.
3. No serial data is received for one second after the last + character. At this time the unit will respond affirmatively per the selected echo/response mode.
4. The character string **ATH** is received, terminated with a carriage return. The unit will respond affirmatively per the selected echo/response mode and drop the network connection. The serial interface will revert to accepting command strings.

If the above sequence is not followed as described, the unit will remain in data transfer mode.

Table 16 - Modem Mode Commands

Modem Mode Command	Function
ATDTx.x.x.x,pppp or ATDTx.x.x.x/pppp	Makes a connection to an IP address (x.x.x.x) and a remote port number (pppp).
ATDTx.x.x.x	Makes a connection to an IP address (x.x.x.x) and the remote port number defined within the unit.
ATD0.0.0.0	Forces the unit into monitor mode if a remote IP address and port number are defined within the unit.
ATD	Forces the unit into monitor mode if a remote IP address and port number are not defined within the unit.
ATDx.x.x.x	Makes a connection to an IP address (x.x.x.x) and the remote port number defined within the unit.
ATH	Hangs up the connection (Entered as +++ATH).
ATDTx.x.x.x,pppp or ATDTx.x.x.x/pppp	Makes a connection to an IP address (x.x.x.x) and a remote port number (pppp).
ATS0=n	Enables or disables connections from the network going to the serial port. n=0 disables the ability to make a connection from the network to the serial port. n=1-9 enables the ability to make a connection from the network to the serial port. n>1-9 is invalid.
ATEn	Enables or disables character echo and responses. n=0 disables character echo and responses. n=1 enables character echo and responses.
ATVn	Enables 1-character response or full verbose. n=0 enables 1-character response. n=1 enables full verbose.

Note: *These AT commands are only recognized as single commands like ATE0 or ATV1; compound commands such as ATE0V1 are not recognized. All other AT commands with Modem Mode set to full verbose acknowledge with an OK, but no action is taken.*

4.6.6 Remote IP Address

This is the destination IP address used with an outgoing connection.

4.6.7 Remote Port

The remote TCP port number must be set for the unit to make outgoing connections. This parameter defines the port number on the target host to which a connection is attempted.

Note: *To connect an ASCII terminal to a host using the unit for login purposes, use the remote port number 23 (Internet standard port number for Telnet services).*

4.6.8 DisConnMode

This determines the conditions under which the unit will cause a network connection to terminate.

In DisConnMode (Disconnect Mode), DTR drop either drops the connection or is ignored.

Note: *See* ***Table 29 - Binary to Hexadecimal Conversion Table*** *on page 10-1.*

Table 17 - Disconnect Mode Options

Disconnect Mode Option	7	6	5	4	3	2	1	0
Disconnect with DTR drop (6)	1							
Ignore DTRa	0							
Telnet mode and terminal type setup (1)		1						
Channel (port) password (2)				1				
Hard disconnect (3)					0			
Disable hard disconnect					1			
State LED off with connection (4)								1
Disconnect with EOT (^D) (5)			1					

1. The XPort™ will send the "Terminal Type" upon an outgoing connection.
2. A password is required for a connection to the serial port from the network.
3. The TCP connection will close even if the remote site does not acknowledge the disconnection.
4. When there is a network connection to or from the serial port, the state LED will turn off instead of blink.
5. When Ctrl D or Hex 04 is detected, the connection is dropped. Both Telnet mode and Disconnect with EOT must be enabled for Disconnect with EOT to function properly. Ctrl D will only be detected going from the serial port to the network.
6. When DTR transitions from a high state to a low state, then the network connection to or from the serial port will drop.

4.6.9 Flush Mode (Buffer Flushing)

Using this parameter, you can control line handling and network buffers with connection startup and disconnect. You can also select between two different packing algorithms.

Note: *See* ***Table 29 - Binary to Hexadecimal Conversion Table*** *on page 10-1.*

Table 18 - Flush Mode Options

Function	7	6	5	4	3	2	1	0
Input Buffer (Serial to Network)								
Clear with a connection that is initiated from the device to the network				1				
Clear with a connection initiated from the network to the device			1					
Clear when the network connection to or from the device is disconnected		1						
Output Buffer (Network to Serial)								
Clear with a connection that is initiated from the device to the network								1
Clear with a connection initiated from the network to the device							1	
Clear when the network connection to or from the device is disconnected						1		
Alternate Packing Algorithm (Pack Control)								
Enable	1							

4.6.10 Pack Control

Two firmware-selectable packing algorithms define how and when packets are sent to the network. The standard algorithm is optimized for applications in which the unit is used in a local environment, allowing for very small delays for single characters while keeping the packet count low. The alternate packing algorithm minimizes the packet count on the network and is especially useful in applications in a routed Wide Area Network (WAN). Adjusting parameters in this mode can economize the network data stream.

Pack control settings are enabled in Flush Mode. Set this value to 00 if specific functions are not needed.

Note: *See* ***Table 29 - Binary to Hexadecimal Conversion Table*** *on page 10-1.*

Table 19 - Pack Control Options

Option	7	6	5	4	3	2	1	0
Idle Time								
Force transmit: 12ms							0	0
Force transmit: 52ms							0	1
Force transmit: 250ms							1	0
Force transmit: 5sec							1	1
Trailing Characters								
None					0	0		
One					0	1		
Two					1	0		
Send Characters								
2-Byte Send Character Sequence				1				
Send Immediately After Send chars			1					

Idle Time: Idle time to "Force transmit" defines how long the unit should wait before sending accumulated characters. This wait period is between characters. If there is an idle period between characters equal to the force transmit set, then the unit will package up the serial data currently in the buffer and send it to the network. For Alternate Packing, the default idle time is 12ms.

Trailing Characters: In some applications, CRC, Checksum, or other trailing characters follow the end-of-sequence character; this option helps to adapt frame transmission to the frame boundary.

Send Characters: If 2-Byte Send Character Sequence is enabled, the unit interprets the sendchars as a 2-byte sequence; if not set, they are interpreted independently.

If **Send Immediately After Characters** is not set, any characters already in the serial buffer are included in the transmission after a "transmit" condition is found. If set, the unit sends immediately after recognizing the transmit condition (sendchar or timeout).

Note: *A transmission might occur if status information needs to be exchanged or an acknowledgment needs to be sent.*

4.6.11 DisConnTime (Inactivity Timeout)

Use this parameter to set an inactivity timeout. The connection is dropped if there is no activity on the serial line before the set time expires. Enter time in the following format: **mm:ss**, where **m** is the number of minutes and **s** is the number of seconds. To disable the inactivity timeout, enter **00:00**. Range is 0 (disabled) to 5999 seconds (99 minutes, 59 seconds). Default setting is 0.

4.6.12 Send Characters

You can enter up to two characters in hexadecimal representation in the parameters "sendchar." If a character received on the serial line matches one of these characters, it is sent immediately, along with any awaiting characters, to the TCP connection. This minimizes the response time for specific protocol characters on the serial line (for example, ETX, EOT, etc.). Setting the first sendchar to **00** disables the recognition of the characters. Alternatively, the two characters can be interpreted as a sequence (see *Pack Control* on page *4-21*).

4.6.13 Telnet Terminal Type

This parameter appears only if the terminal type option is enabled in Disconnect Mode (see *DisConnMode* on page *4-20* above). If this option is enabled, you can use the terminal name for the Telnet terminal type. Enter only one name.

If the terminal type option is enabled, the unit also reacts to the EOR (end of record) and binary options, which can be used for applications like terminal emulation to IBM hosts.

4.6.14 Channel (Port) Password

This parameter appears only if the channel (port) password option is enabled in Disconnect Mode (see *DisConnMode* on page *4-20*). If set, you can set a password on the serial port.

4.7 E-mail Settings

Note: *You can change these settings via Telnet or serial connections only, not on the Web-Manager.*

An e-mail can be sent to multiple recipients when a specific trigger event occurs. There are three separate triggers, based on any combination of the configurable pins (PIO) when selected as user I/O functions. A two-byte serial string can also be used to initiate a trigger. To configure e-mail settings via XPort™ Installer, see *E-mail Notification* on page *6-10*.

```
***************** E-mail *****************
Mail server: 0.0.0.0
Unit      :
Domain    :
Recipient 1:
Recipient 2:

*** Trigger 1
Serial Sequence: 00,00
CP1: X
CP2: X
CP3: X
Message :
Priority: L
Min. notification interval: 1 s
Re-notification interval  : 0 s

*** Trigger 2
Serial Sequence: 00,00
CP1: X
CP2: X
CP3: X
Message :
Priority: L
Min. notification interval: 1 s
Re-notification interval  : 0 s

*** Trigger 3
Serial Sequence: 00,00
CP1: X
CP2: X
CP3: X
Message :
Priority: L
Min. notification interval: 1 s
Re-notification interval  : 0 s
```

4.7.1 E-mail Setup

E-mail setup requires you to set up the e-mail server location as follows:

Mail server: The IP address in decimal-dot notation.

Unit : The user name used by the XPort™ to send e-mail messages

Domain : The Domain name of your e-mail server

Recipient 1: Full e-mail address of the recipient.

Recipient 2: Full e-mail address of the second recipient.

4.7.2 Trigger Setup

A trigger event can occur by receiving two bytes of a specified sequence on the serial port, or by a specified combination of conditions on the configurable pins. If the serial sequence is set to 00,00 then it is disabled. At the **Serial Sequence** prompt, enter the ASCII Hex value. Example: A two byte sequence of 12 would be 0x31, 0x32.

If the configurable pins are all set to X (Don't Care) then they are disabled. If both the serial sequence and the configurable pins are disabled, the trigger is disabled.

The configurable pins can be set to A = active, I = Inactive, or X = Don't Care. Active can mean Active Low or Active High. The configurable pins' setting can only be changed using XPort™ Installer.

Message : Enter the subject line of the e-mail.

Priority: L is for normal priority, H is for High Priority.

Min. notification interval: The minimum time allowed between individual triggers. If a trigger event occurs faster than the minimum interval, the trigger will be ignored.

Re-notification interval : If a single trigger event stays asserted, then an e-mail message will be sent at this time interval.

Each trigger is independent from the others. Each condition within an individual trigger must be met before the e-mail will be sent.

4.8 Expert Settings

Note: *You can change these settings via Telnet or serial connections only, not on the Web-Manager.*

```
These parameters should only be changed if you are an expert
and definitely know the consequences the changes might have.

TCP Keepalive time in s (1s – 65s; 0s=disable): (0)
ARP Cache timeout in s (1s – 600s) : (600) ?
```

4.8.1 TCP Keepalive time in seconds

This option allows you to change how many seconds the unit will wait during a silent connection before attempting to see if the currently connected network device is still on the network. If the unit then gets no response, it will drop that connection.

4.8.2 ARP Cache timeout in seconds

Whenever the unit communicates with another device on the network, it will add an entry into its ARP table. The ARP Cache timeout option allows you to define how many seconds (1-600) the unit will wait before timing out this table.

4.9 Security Settings

Note: *You can change these settings via Telnet or serial connections only, not on the Web-Manager. We recommend that you set security over the dedicated network or over the serial setup. If you set parameters over the network (Telnet 9999), someone else could capture these settings.*

Disable SNMP (N)
SNMP Community Name (public):
Disable Telnet Setup (N)
Disable TFTP Firmware Update (N)
Disable Port 77FEh (N)
Disable Web Server (N)
Disable ECHO ports (Y)
Enable Encryption (N)
Enable Enhanced Password (N)

4.9.1 Disable SNMP

This setting allows you to disable the SNMP protocol on the unit for security reasons.

4.9.2 SNMP Community Name

This option allows you to change the SNMP Community Name on the unit. This allows for ease of management, and possibly some security. If someone tries to violate security but doesn't know what community to connect to, that person will be unable to get the SNMP community information from the unit. The name is a string of 1 to 13 characters plus a null-terminator (14 bytes total). The default setting is **public**.

4.9.3 Disable Telnet Setup

This setting defaults to the N (No) option. The Y (Yes) option disables access to this Configuration Menu by Telnet (port 9999). It only allows access locally via the Web pages and the serial port of the unit.

4.9.4 Disable TFTP Firmware Upgrade

This setting defaults to the N (No) option. The Y (Yes) option disables the use of TFTP to perform network firmware upgrades. With this option, firmware upgrades can be downloaded over the serial port using XPort™ Installer's Recover Firmware procedure.

4.9.5 Disable Port 77FE (Hex)

Port 77FE is a setting that allows XPort™ Installer, Web Pages, and custom programs to configure the unit remotely. You may wish to disable this capability for security purposes.

The default setting is the N (No) option, which enables remote configuration. You can configure the unit by using XPort™ Installer, Web pages, Telnet, or serial configuration. The Y (Yes) option disables remote configuration and Web pages.

Note: *The Yes option disables many of the GUI tools for configuring the Device Server, including the embedded Web Page Configuration tool.*

4.9.6 Disable Web Server

This setting defaults to the N (option). The Y (Yes) option disables web server.

4.9.7 Disable ECHO Ports

Controls whether the serial port will echo characters it receives.

4.9.8 Enable Encryption

This option displays **only** if you purchased the encrypted version of the Lantronix XPort Device Server.

You can enable or disable (default) Rijndael encryption (described below). If you enable encryption, you must select the key length (128, 192 or 256 bits) and enter the encryption key in hexadecimals.

Rijndael is the block cipher algorithm recently chosen by the National Institute of Science and Technology (NIST) as the Advanced Encryption Standard (AES) to be used by the US government .

The following export agreement is required for the optional encryption:

> *I agree that I will not export or re-export this software file to a national resident of Cuba, Iran, Iraq, Libya, North Korea, Sudan, Syria or any other country to which the United States has embargoed goods; or to anyone on the US Treasury Department's list of Specially Designated Nationals and Blocked Persons, US Commerce Department's Table of Denial Orders and Entitles List, or the US State Department's Debarred List. By receiving this software, I am agreeing to the foregoing and I am representing and warranting that I am not located in, under the control of, or a national or resident of any such country or on any such list.*

4.9.9 Enable Enhanced Password

This setting defaults to the N (option), which allows you to set a 4-character password that protects the Configuration Menu via Telnet and Web pages. The Y (Yes) option allows you to set an extended security password of 16-characters for protecting Telnet access.

4.10 Factory Defaults

Select **7** to reset the unit's Channel 1 configuration, E-mail settings, and Expert settings to the factory default settings. The server configurations (IP address information) remain unchanged.

4.11 Exit Configuration Mode

Select **8** to exit the configuration mode without saving any changes or rebooting. Select **9** to save all changes and reboot the device. All values are stored in nonvolatile memory.

5. Updating Firmware

5.1 Obtaining Firmware

You can obtain the most up-to-date firmware and release notes for the unit from the Lantronix Web site (www.lantronix.com) or by using anonymous FTP (ftp.lantronix.com).

5.2 Reloading Firmware

There are several ways to update the unit's internal operational code (*.ROM): via XPort™ Installer (the preferred way), via TFTP, or via the serial port. You can also update the unit's internal Web interface (*.COB) via TFTP or XPort™ Installer.

Here is a list of *typical* names for those files. Check the Lantronix web site for the latest versions and release notes.

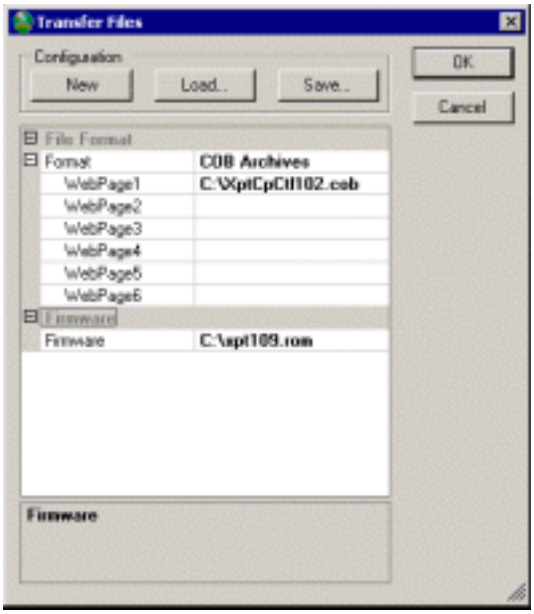
Table 20 - Protocol Firmware

ROM File	COB
Xpt110.rom	genw325.cob (Web Manager)
	XptCpCtl102.cob (Configurable Pins Applet)

5.2.1 Via XPort™ Installer

After downloading the firmware to your computer, you can use XPort™ Installer to install it.

1. Download the updated firmware files from www.lantronix.com or ftp.lantronix.com and store them in a subfolder on your computer. (C:\Program Files\Lantronix\XPort Installer 3.2\Firmware)
2. Start XPort™ Installer and search the network for the device you want to upgrade. See XPort™ Installer on page 3-5 and Search for Device on page 6-1.
3. Select the desired unit and click the **Upgrade** icon  or select **Files** from the Device menu. The Transfer Files dialog box displays.
4. To upgrade firmware, click the firmware field to display the browse button. Click the browse button  to open a search window and locate the firmware file (*.rom). Click OK and the file transfer begins.



5. To upgrade a Web Page, expand the Web Pages selection by clicking the plus sign next to Format. Select the Web Page to upgrade and a browse button will appear on the right side of the field. Use the browse button to locate the web page file (*.cob). Click OK and the file transfer begins. The Web Manager is loaded to WEB6 and the Configurable Pins Applet is loaded to WEB1.

The Configuration buttons allow you to create and select a group of files, comprised of several web pages and firmware files, that can be downloaded with one command. To create a file set, select all of the files to download, then click the **Save** button to open the Save As dialog. The defined set of files is saved to a *.ini file. To Load a file set, click the **Load** button to display a search dialog box. Only the path of the files is stored in the *.ini file. If you change the location of the web pages or firmware, you must edit the corresponding file set to match the new location. Click the **New** button to clear all selections.

5.2.2 Via TFTP

To download new firmware from a computer:

1. Use a TFTP client to send a binary file to the unit (*.ROM to upgrade the unit 's internal operational code and *.COB to upgrade its internal Web interface).

   Note: *TFTP requires the* ***.ROM*** *(binary) version of the unit's internal operational code.*

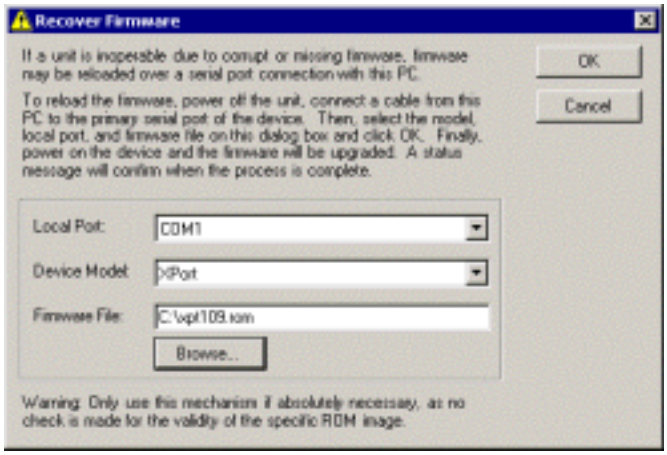
2. In the **TFTP server** field, enter the IP address of the unit being upgraded.
3. Select Upload operation and Binary format.
4. Enter the full path of the firmware file in the **Local file name** field.
5. In the **Remote file name** field, enter the **current** internal operational code or **WEB6** for the internal Web interface. (For XPort™, **X1** = Standard Tunnel)
6. Click the **Upload Now** button to transfer the file to the unit.

Figure 5-1 - TFTP Dialog Box

The unit performs a power reset after the firmware has been loaded and stored.

5.2.3 Serial Port Recovery Procedure

If for some reason the firmware is damaged, you can recover the firmware file by using the serial port to download the *.ROM file. Start XPort™ Installer, select the device, click **Action** and select Advanced/Recover Firmware. The Recover Firmware dialog box appears.



Enter the Local Port on your PC and the location of the Firmware File. The Device Model should indicate XPort™. Click OK to download the file.

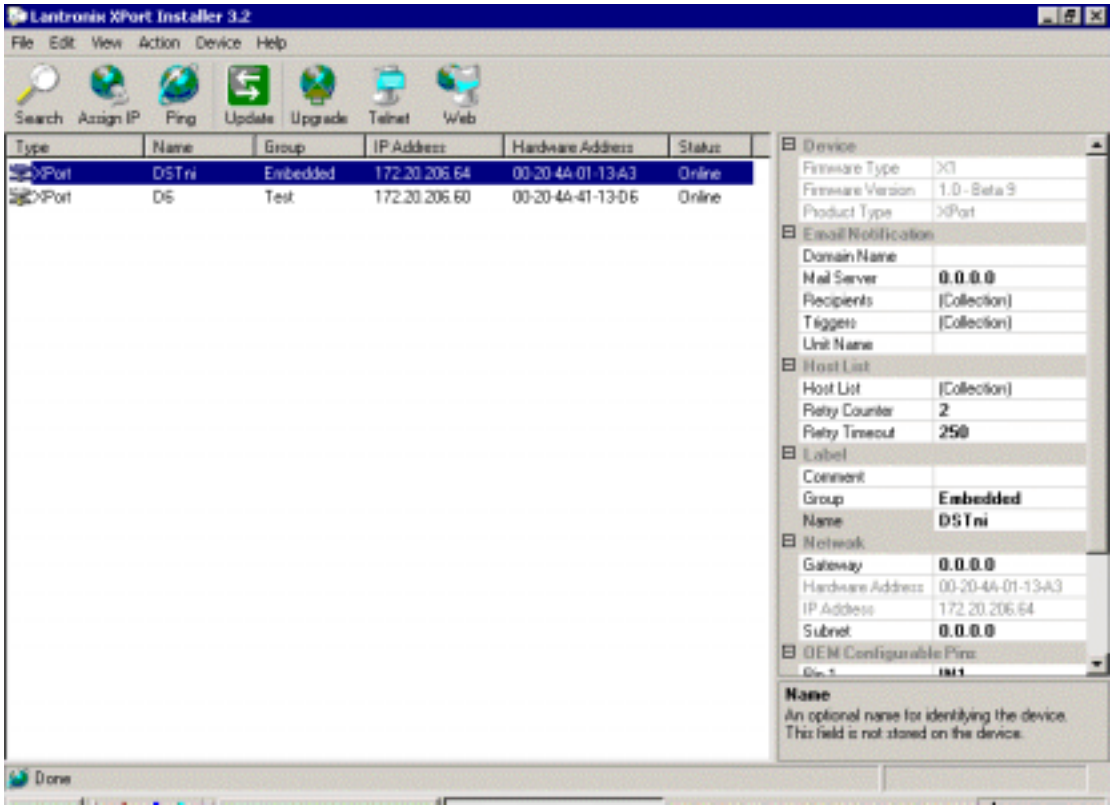
See also *Recovering Firmware* on page *6-8*.

6. Using XPort™ Installer

XPort™ Installer is a Windows-based utility for configuring Lantronix XPort™ devices. It supports several functions such as setting network parameters, upgrading firmware, and uploading web pages.

Note: *Information presented in this section is available in the XPort™ Installer help file.*

The user interface is split into several areas. The List on the left contains devices on the network. The Property Grid on the right displays various settings that can be changed for items selected in the List. The Toolbar at the top includes buttons to perform common tasks. The Status Bar at the bottom indicates the status and progress of any pending tasks.



6.1 Adding Devices to the List

When the program starts up, the List will be blank. In order to configure a device, you need to add it to the List. There are several options for adding items to the list, based on your particular network configuration.

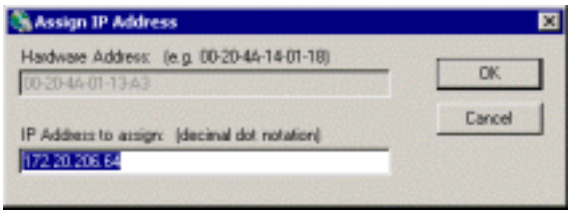
6.1.1 Search for Device

If the devices you are using are within the same local area network as your PC (within the same subnet), use the Search command. Click the Search  button on the Toolbar to find all devices on the local network and add them to the list. It may take several seconds to find all of the devices.

If your PC has more than one network adapter, you can select it from the Property Grid. All commands will use whichever adapter is selected. With nothing selected in the List, click the Network Interface field in the Property Grid, click on the drop-down arrow of the field, and select the appropriate adapter. By clicking on the plus sign to the left of the field, you can view the settings for the selected adapter.

6.1.2 Assign IP Address

If your local network uses static IP address (no DHCP server is present), use the Assign IP Address command to assign a static IP address to a device. Click the Assign IP button on the Toolbar.



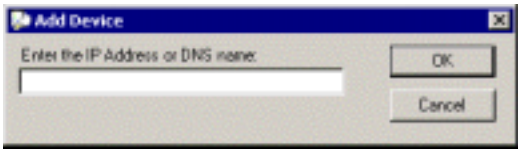
Enter the Hardware Address in the first field (also known as Ethernet Address, Network Address, or Physical Address). The hardware address may be found on the Lantronix product label, and takes the form of six hexadecimal numbers separated by dashes.

Enter the IP Address in the second field. Contact your network administrator to determine a suitable address to use. To make the device use DHCP, enter 0.0.0.0 for the IP address.

Click OK to assign the IP address. It takes approximately 10 seconds for the IP Address to be set on the device and verified, after the unit has rebooted, and then added to the List if not already there.

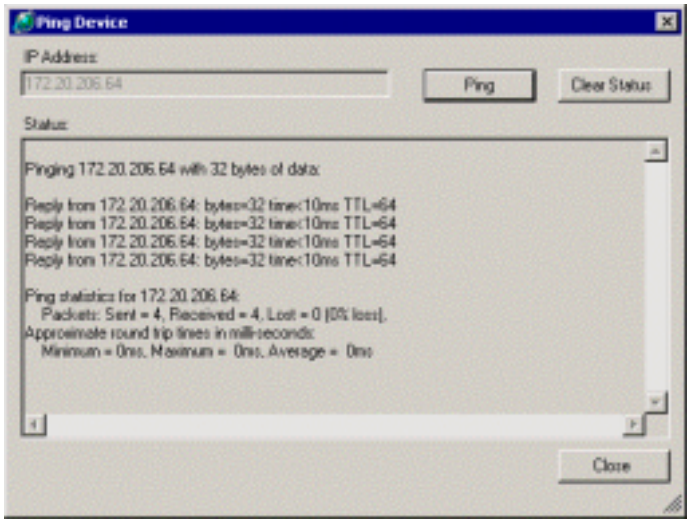
6.1.3 Add Remote Device

To add a remote device (a device that is not within the same subnet), select the Add Remote Device command from the Action menu. A dialog box will prompt for the IP address. Enter the IP address and click OK. If the device was found successfully, it will be added to the list.



6.1.4 Ping

To detect if a device is online and the network is functional, use the Ping command. Click the Ping button on the Toolbar.



A dialog box will prompt for the IP address. Enter the IP address of the device you are trying to reach and click the Ping button. Within several seconds, the Status area will display the results of the ping. Click Clear Status to clear the display. Click Close when you are done, to close the dialog box.

6.2 Setting Parameters

Once one or more devices are present in the List, you may view or edit various settings for each device. See the *Device Configuration Reference* on page *6-10* for information on specific fields.

Click on the device in the List that you wish to edit. The Property Grid will display a list of fields for the device, some of which may be modified. The list of fields may take up more room than there is available on the screen, in which case you'll need to use the scrollbars.

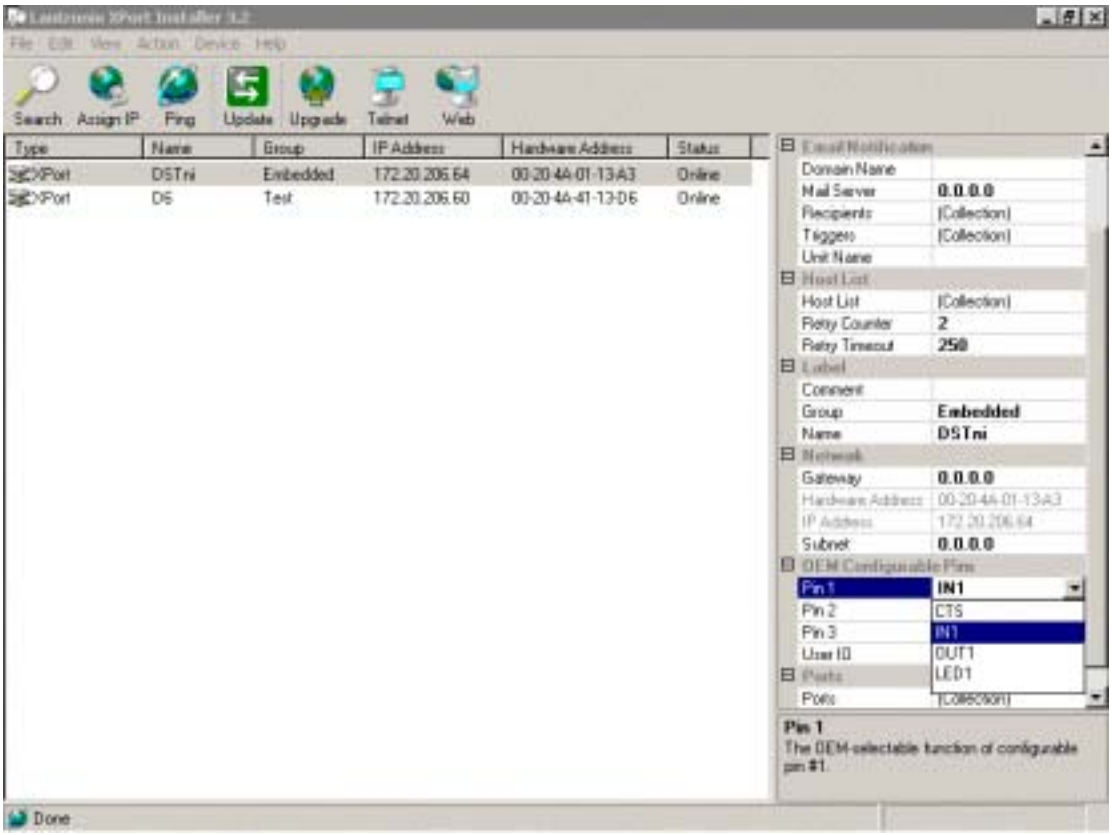
The fields are grouped together into categories, where each category has a gray background. Categories can be expanded and collapsed by clicking on the expansion button (a square containing a plus or minus) to the left of the category name. Some fields also contain expansion buttons and can be expanded to show subsets of information.

If a field is black or empty, it can be changed. If the value of a field is bold, that indicates that the value differs from the factory setting.

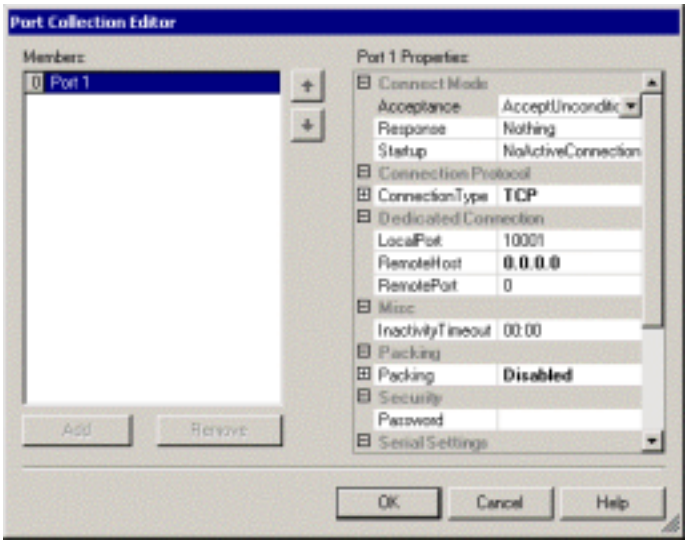
To edit a field, click anywhere on the row of the field.

Simple fields (such as text, numbers, and IP addresses) can be changed by typing directly within the field.

Selection fields allow selection of an option from a list. Click the down-arrow button on the right of the field to present a list of options. Then click on the option from the drop-down list to select it.



Collection fields consist of one or more items that are configured in a separate dialog box. Click the browse button to the right of the field to display a dialog box. The Collection Editor dialog box allows selection of an item from a list on the left, and editing of fields using a Property Grid on the right. Some collections allow re-ordering of items, in which case the up-arrow and down-arrow buttons may be used to change the order of items. Some collections may also allow items to be added or removed by clicking the Add and Remove buttons. If a button is disabled (gray), that indicates that the particular collection does not support modification in that way.



When fields are changed on a device, the changes are not immediately sent to the device, but are cached. Devices are marked in bold in the List to indicate that changes have been made. To commit changes made to devices, select the device(s) in the List and click the Update button on the Toolbar. If any changes have been made, they will be sent to the device. It may take 10 seconds or up to a minute to commit changes, depending on which fields were changed.

When a device is in the process of updating, the Status column of the list will indicate "Busy". The Status Bar at the bottom of the screen will indicate the progress of the update. While a device is being updated, fields may not be modified. The Property Grid will momentarily disappear while such a device is selected.

After sending any pending changes to the device, the program then reads the current configuration back from the device and updates any fields that may have changed. The device is no longer marked bold in the List until a field is changed again.

All fields are stored on devices themselves with the exception of three fields: Name, Group, and Comments. These fields are kept locally on the PC and are stored with saved device lists.

6.3 List View

The List can show devices in the form of a table or as icons. To change the view mode, go to the View menu and select either Icons or Details.

When the List is in Details mode, items can be sorted by particular columns, in ascending or descending order. To sort the list, click on the column that is to be sorted. The first time you click on a column, it will sort in ascending order. To sort in descending order, click on the same column again.

Devices within the List may be selected individually or along with other devices. To select a single device, just click on it. To select a consecutive group of devices, click on the first device, then hold down the Shift key and click on the last device of the group. To select or deselect other devices as part of a multiple selection, hold down the Control key and click on a device.

You may also select multiple devices by clicking and dragging on the background of the List to form a fencing rectangle. Once you release the mouse, all devices overlapping the rectangle become selected.

To select all devices in the list, choose the Select All command from the Edit menu.

To deselect all devices (and show network options instead), click on the background of the list.

When multiple devices are selected at the same time, some options may be limited. The fields listed in the Property Grid become limited to those that are common to all selected devices and support multiple device editing. The Upgrade, Telnet, and Web commands are not available for multiple selections.

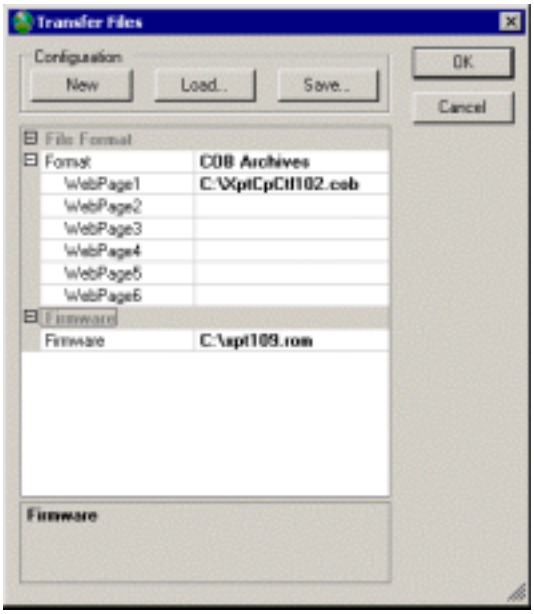
6.4 Upgrade

The firmware of a device (the software running on the device that defines its behavior) may be changed. The files stored on the device (in Flash) may also be changed. Files are primarily used for the web server of the device.

Typical reasons for changing the firmware or files are for using newer functionality that Lantronix may make available since the device was manufactured. Custom applications may also use specific firmware or files.

The file system of a Lantronix device is similar in function to that of a PC, but is divided into several partitions to accommodate the layout of the flash memory. The number of partitions varies depending on the device model. The XPort™ device supports seven. Each partition is 64K in size and includes both file content and directory entries.

Files may be transferred to a device in one of two ways: either by copying a directory over from the PC or by copying pre-formed partitions. These pre-formed partitions are commonly stored in a file format with an extension of ".COB". The COB file is a Lantronix convention, and is similar in concept to a zip file. Most web interface updates published by Lantronix use COB files.To start the Upgrade process, select Files from the Device menu or click the Upgrade  button on the toolbar.



To transfer files, click on the Format field and choose either COB Archives or Directory from the list. If COB Archives is selected as the format, click on one of the partitions to display an browse button. Click the browse button to the right of each field to assign the cob files to use.

If Directory is selected as the format, click on the Directory field to display the browse button. Click the button to specify the directory location. Each file within the directory (plus the size of the corresponding directory entry) must be less than 64K and the total must fit within the available partitions. The files are automatically organized into partitions consecutively.

A firmware file (with a .rom extension) may be specified in the Firmware field.

COB files and ROM files are usually located in Program Files\Lantronix\XPort Installer x.x\Firmware. See the Lantronix web site for the latest files.

To remember a set of files for future use, click the Save button and specify a file in the dialog box that appears. To use a saved file set, click the Load button and browse for the file. Click New to clear the files.

Click OK to proceed with the file transfer.

You can delete the contents of a Web Page partition by loading **blank.cob**, located in Program Files\Lantronix\XPort Installer folder.

6.5 Telnet

You can also configure a device by text-based configuration over Telnet. Select a device in the List and click the Telnet button on the Toolbar. A dialog box will prompt for the port number.

The Port defaults to whatever port the particular device model uses for accessing its configuration interface, though may be changed to any other port that may be supported on the device. Click OK to proceed.

A Telnet window will appear, using the default telnet program of the operating system. Follow the instructions that appear in the window. For detailed information, refer to the Configuring via the Setup Mode Window section within the product documentation.

6.6 Web Interface

To display the web interface for a device, select the device in the List and click the Web button on the Toolbar. By default, most devices will support a web interface that allows the user to change configuration settings. For detailed information, refer to *Configuring via Web Browser* on page *4-1*.

If you have designed your own web page and want to load it to the XPort™, use the Upgrade feature to transfer the files. Click Upgrade, click the Format field and select Directory from the list box on the right. Now click in the Directory field to display the browse button, then locate the folder where the web pages are stored. Click OK to start the transfer. Also see *Upgrade* on page *6-6*. There is a sample file, index.html, located in the firmware\html folder on the CD.

Web pages are converted to .cob files and downloaded to the available partitions.

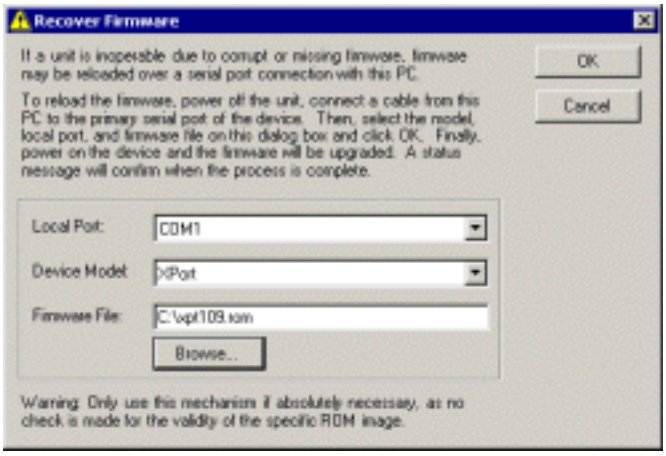
Note: *Each file within the directory (plus the size of the corresponding directory entry) must be less than 64K and the total must fit within the available partitions.*

6.7 Recovering Firmware

In the event that a device is no longer operational, due to corruption or accidental replacement of the firmware, the firmware may be restored by using a serial port connection from the PC to the device.

To recover firmware, connect a serial cable from the PC to the device, taking note which port is used on the PC.

From the Action menu, choose the Advanced sub-menu, and then choose the Recover Firmware command. A dialog box will appear.



In the Local Port field, select the port on the PC.

In the Device Model field, select the particular model of the device. ***Note:*** Ensure that the selected model matches the device exactly; otherwise the device may not operate.

For the Firmware File field, click the Browse button to select the appropriate firmware ROM file.

Click OK to proceed with the firmware recovery.

The Status Bar will indicate the progress of the task. Within a few seconds, it will prompt to reset the device. To reset the device, either unplug the power and plug it back in or press the reset button on the unit if available. On some devices the reset button is recessed and a small pin may be needed. Once the device resets, the firmware recovery will progress.

When the firmware transfer is complete, a message box will appear indicating the status. Click OK on the message box.

Finally, reset the device again, either by re-powering or pressing the reset button. Once the device boots up again, it is ready with the new firmware.

6.8 Loading and Saving

The list of devices may be saved for later use, typically for documenting specific configurations.

To save the list of devices, choose the Save command from the File menu. If the particular list has not been saved before, a dialog box will prompt for a file name.

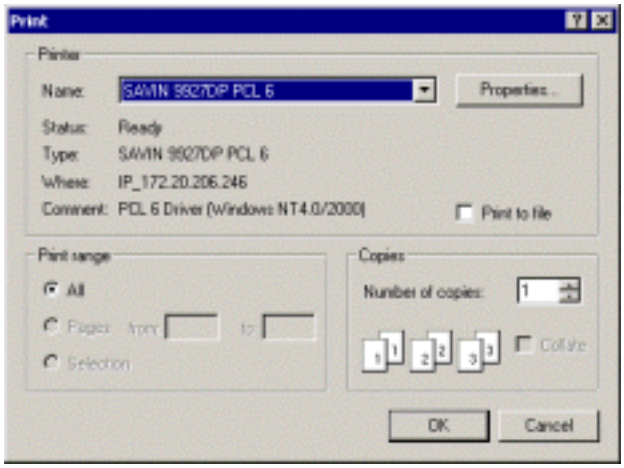
To save the list of devices to a file other than the current one (if any), choose the Save As command from the file menu and specify the file in the dialog box that appears.

To load a previously saved list, choose the Open command from the File menu and specify the file in the dialog box that appears.

To clear the list and disassociate any current file, choose the New command from the File menu.

6.9 Printing

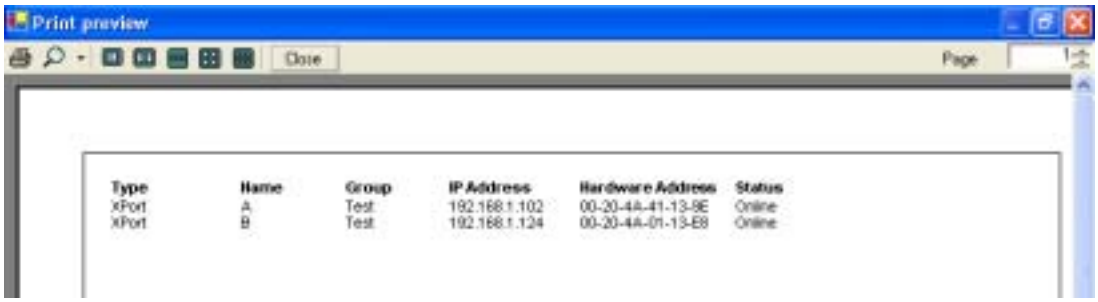
To print out the list of devices, select the Print command from the File menu. A dialog box will appear prompting for selection of a printer.



Click OK to print the list of devices.

6.9.1 Print Preview

A preview of the printed list may be viewed using the Print Preview command. From the File menu, click Print Preview and a window will be displayed.



The scrollbars may be used to scroll through the page to see its entirety. The Toolbar buttons may be used to adjust the size and layout of the preview.

Click the Print button to print the pages.

Click the Zoom button to change the zoom factor.

Click any of the five Page Layout buttons to view multiple pages at the same time.

Click the Close button to close the Print Preview window.

In the event there are multiple pages, you can specify which page to view by adjusting the Page edit box on the right side of the toolbar.

6.10 Device Configuration Reference

Device configuration information is stored in flash memory and is read and displayed in the properties section on the right side of the XPort™ Installer window. This section describes some of those options in detail.

6.10.1 E-mail Notification

E-mail notification setup can be done via Telnet, serial port, or XPort™ Installer. See *E-mail Settings* on page *4-22* for additional information and other methods of e-mail setup.

Domain Name: Domain name of your e-mail server. Example: Lantronix.com

MailServer: The IP address of the mail server.

Recipients: E-mail addresses of the recipients. See

E-mail Recipients Collection on page *6-11*.

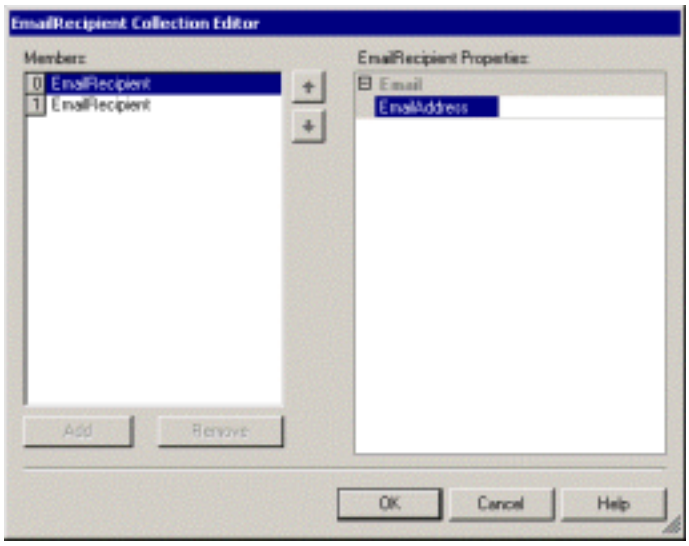
Triggers: Events that trigger an e-mail. See *E-mail Triggers Collection* on page *6-11*.

Unit Name: Name used by the XPort™ to send e-mail messages. This name and the Domain Name are combined to give you the e-mail address of the sender. For example, if the Unit Name is XPort and the Domain Name is Lantronix.com, then the e-mail sender name would be XPort@lantronix.com

To configure e-mail properly, you will need to make entries in the e-mail recipients collection, the e-mail triggers collection, Domain Name, Mail Server, and the Network (see *Network* on page *6-13*).

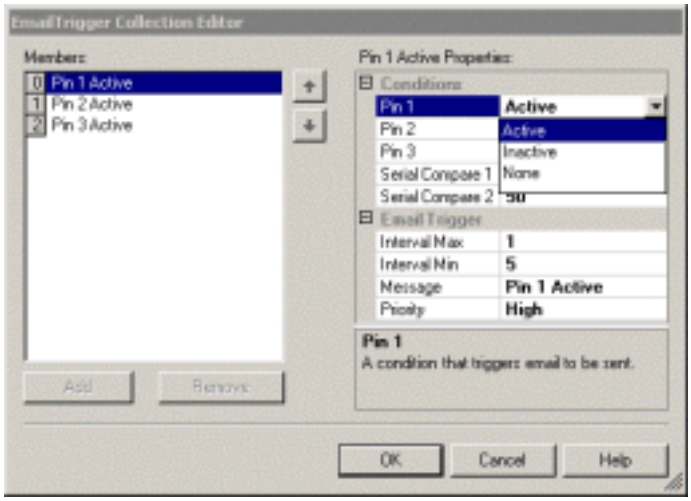
6.10.2 E-mail Recipients Collection

This collection contains the e-mail addresses of the e-mail recipient. When you click on the Recipients field, a browse button appears. Click the button to display the E-mail Recipients collection dialog box. Enter the E-mail address for each recipient.



6.10.3 E-mail Triggers Collection

When you click on the Triggers field, a browse button appears. Click the button to display the E-mail Trigger collection dialog box. For more information see *Trigger Setup* on page *4-23*.



A trigger event can occur by receiving two bytes of a specified sequence on the serial port, or by a specified combination of conditions on the configurable pins. If the serial sequence is set to 0 then it is disabled. In the **Serial Compare** fields, enter the ASCII Hex values. Example: A two byte sequence of 12 would be entered as 31 in Serial Compare 1 and 32 in Serial Compare 2.

If the configurable pins are all set to None then they are disabled. If both the serial sequence and the configurable pins are disabled, the trigger is disabled.

The configurable pins can be set to **Active**, **Inactive**, or **None**. Active means Active Low or Active High (to configure this option, see *OEM Configurable Pins* on page *6-13)*.

Message : Enter the subject line of the e-mail. This entry also appears in the Members list in the left window and becomes the subject line of the e-mail.

Priority: L is for normal priority, H is for High Priority.

Interval Max is the minimum time allowed between individual triggers. If a trigger event occurs faster than the minimum interval, the trigger will be ignored.

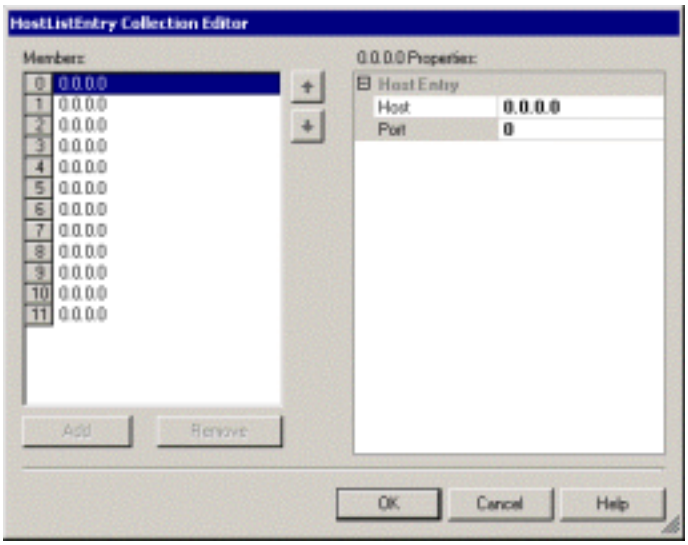
Interval Min : If a single trigger event stays asserted, then an e-mail message will be sent at this time interval.

Each trigger is independent from the others. Each condition within an individual trigger must be met before the e-mail will be sent.

6.10.4 Host List

When you click on the Host List field, a browse button appears. Click the button to display the Host List Entry collection dialog box. Enter the IP address and Port number for each entry in the list. See *Connect Mode* on page *4-14* for additional hostlist information.

The XPort™ scrolls through the hostlist until it connects to a device listed in the hostlist table. Once it connects, the unit stops trying to connect to any others. If this connection fails, the unit continues to scroll through the table until it is able to connect to another IP in the hostlist.

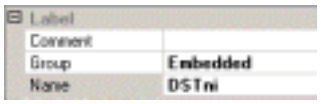


For RetryCounter, enter the number of times the XPort™ should try to make a good network connection to a hostlist entry that it has successfully ARPed. The range is 1-15.

For RetryTimeout, enter the number of seconds the XPort™ should wait before failing an attempted connection. The time is stored as units of milliseconds in the range of 1-65535. The default value is 250.

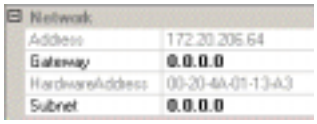
6.10.5 Label

This section allows you to add descriptive labels to each device on the network. Select the label field, type in the new label and press Enter. The field is immediately updated.



6.10.6 Network

This section displays the device IP address and hardware MAC address. To configure e-mail notification properly, you must select the gateway IP address and the Subnet parameters.



6.10.7 OEM Configurable Pins

When you click on one of the pins, a drop-down list button appears. Click the button to display a list of options for that button.

Once you have the pins configured, click the **Update** button on the toolbar. While writing the new configuration information to the XPort™, the property grid will disappear.

Three of the XPort™ serial pins are under software control and may be configured to support different customer requirements. Configurable pin number 1 provides a choice of the following functions: CTS, IN1, OUT1 and LED1. Configurable pin number 2 provides a choice of the following functions: DCD, IN2 and OUT2. Configurable pin number 3 provides a choice of the following functions: RTS, DTR, IN3, OUT3 and LED3.

Signal Name	Pin	Function
CP1	6	Default setting: IN1. Optional settings: CTS, OUT1, LED1. Flow control; to CTS of attached device or Programmable Digital I/O.
CP2	7	Default setting: IN2. Optional settings: DCD, OUT2. Handshake; to DCD of attached device or Programmable Digital I/O
CP3	8	Default setting: IN3. Optional settings: RTS, DTR, OUT3, LED3. Flow control; to RTS of attached device, or Programmable Digital I/O Handshake; to DTR of attached device or Programmable Digital I/O

The function of each configurable pin is configured independently from that of the other two pins. When a pin is configured to be one of the control signals CTS, DCD, RTS or DTR, its state is managed by the serial control logic.

When a configurable pin is configured to be a general input like IN1, IN2 or IN3 that pin will report the current state of the signal connected to it.

When a configurable pin is configured to be a general output like OUT1, OUT2 or OUT3 that pin will drive a signal level on the line or device connected to it.

The UserIO option is used to select the Active state of the pins as Active Low or Active High. The default setting is Active Low. By setting SW1 switches to route XPort™ signals to the LEDs, an active low signal will light the LED.

See *Configuration Switch Bank* on page *2-4* for more information about the configurable pins.

6.10.8 Configurable Pins Control

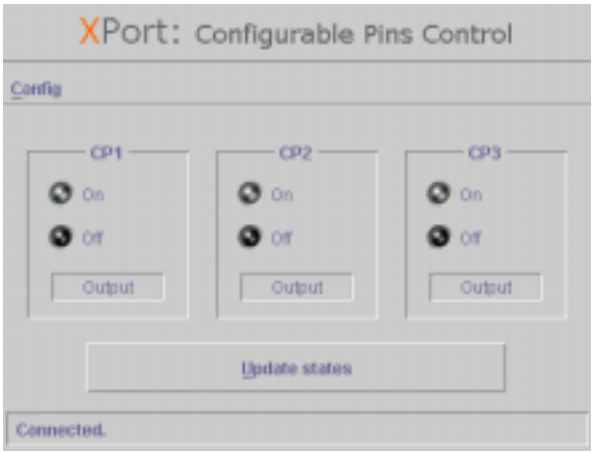
The logic state of the configurable pins, when configured as **Input** or **Output**, can be controlled from a web page. The XptCpCtlxxx.cob file contains a JAVA applet which is downloaded to WEB1. See *Updating Firmware* on page *5-1* for information about loading the demo file.

To access XPort™ web pages, you need IE 5.01 or higher, Netscape 4.8 or higher, and Java Plug-in 1.4.1 or higher. Mozilla (Linux) is not currently supported.

The applet page is accessed with a standard browser using the units IP address and the control page cp_ctl.html. Example: //172.20.206.65/cp_ctl.html.

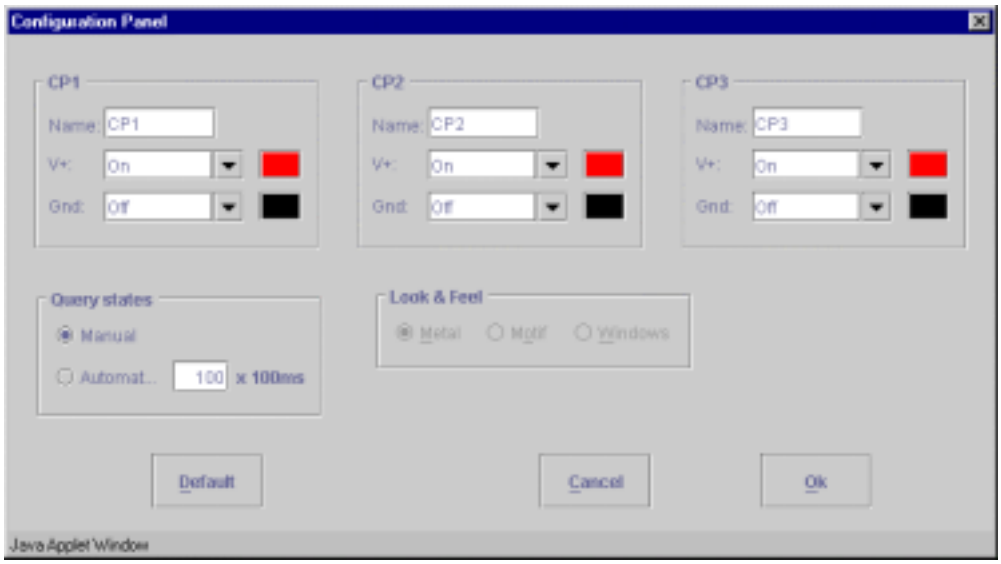
When the cp_ctrl.html page is first opened, a pop-up screen will allow you to download the JAVA plug-in or you can download it from the Sun website at: Http://java.sun.com/j2se/1.4.1/download.html

Once the JAVA Plug-in is installed, point your browser to the control page and the following page will appear.



Note that the configurable pins, in this example, have been configured as Outputs, as shown by the status messages below each group of LEDs. If the pins were configured for something other than input or output, then the **Unavailable** message will appear. By clicking the **Update states** button, the current logic states of the configurable pins are displayed.

You can configure the display panel for your application. Click the **Config** button (top, left corner) and select **Set Config**. The Configuration Panel displays.



Use the text fields, list boxes and color panels to configure the display panel for your application.

You can query the states of the pins manually by selecting **Manual**. This mode requires you to click the **Update States** button on the display panel each time you want an update, whether the pins are configured as Inputs or Outputs. When the configurable pins are set to Inputs, the query can be automatic by selecting **Automat** and entering the amount of time. Note the time is in multiples of 100ms. Click the **Default** button to reset all options to the original states. Click **Ok** to close the configuration panel and return to the control page.

The evaluation board has LEDs that can be tied directly to the configurable pins. See (*Configuration Switch Bank)* for more information. In order to use the LEDs with the applet, you must set the switches on the switch bank properly. For CPI LED, SW1-2 must be in the ON position. For CP2 LED, SW1-3 must be in the ON position. For CP3 LED, SW1-5 must be in the ON position.

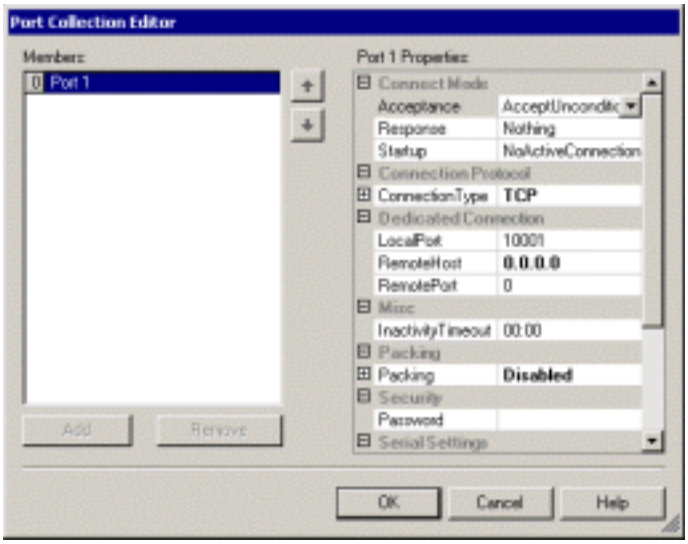
In the above example, the configurable pins have been configured as Outputs. When you return to the control page, you can click on the **On** LED, then click the **Update states** button and the corresponding LED on the evaluation board will turn On. For example, if you click the **On** LED for CP1, then click the **Update states** button, the CP1 LED on the evaluation board will turn On.

You can save the display panel configuration. Click the **Config** button (top, left corner) and select **Save Config**. The next time the control page is opened, the saved configuration is loaded. Use the **Load Config** option to reload the saved configuration.

6.10.9 Ports

The Ports section is used to configure the XPort™ serial port parameters.

When you click on the Ports field, a browse button appears. Click the button to display the Port Collection Editor dialog box.



For Port 1 options, see *Channel 1 Configuration (Serial Port Parameters)* on page *4-11*.

7. Troubleshooting

This chapter discusses how you can diagnose and fix errors quickly without having to contact a dealer or Lantronix.

It helps to connect a terminal to the serial port while diagnosing an error to view summary messages that may be displayed. When troubleshooting, always ensure that the physical connections (power cable, network cable, and serial cable) are secure.

Note: *Some unexplained errors might be caused by duplicate IP addresses on the network. Make sure that your unit's IP address is unique.*

When troubleshooting the following problems, make sure that the XPort™ is powered up. Confirm that you are using a good network connection. See *Table 3 - XPort™ LED Functions* on page *1-4* for a description of the LEDs.

Table 21 - Problems and Error Messages

Problem/Message	Reason	Solution
When you issue the **ARP –S** command in Windows, "The ARP entry addition failed: 5" message displays.	Your currently logged-in user does not have the correct rights to use this command on this PC.	Have someone from your IT department log you in with sufficient rights.
When you attempted to assign an IP address to the Device Server via the ARP method, the "Press Enter to go into Setup Mode" error (described below) displayed. Now when you Telnet to the Server, the connection fails.	When you Telnet into port 1 on the server, you are only assigning a temporary IP address. When you Telnet into port 9999 and do not press Enter quickly, the server will reboot, causing it to lose the IP address.	Telnet back into Port 1. Wait for it to fail, then Telnet to port 9999 again. Make sure you press Enter quickly.
When you Telnet to port 9999, the message "Press Enter to go into Setup Mode" displays. However, nothing happens when you press Enter, or your connection is closed.	You did not press Enter quickly enough. You only have 5 seconds to press Enter before the connection is closed.	Telnet to port 9999 again, but press Enter as soon as you see the message "Press Enter to go into Setup Mode."
When you Telnet to port 1 to assign an IP address to the device server, the Telnet window does not respond for a long time.	You may have entered the Ethernet address incorrectly with the ARP command.	Confirm that the Ethernet address that you entered with the ARP command is correct. The Ethernet address may only include numbers 0-9 and letters A-F. In Windows and usually in Unix, the segments of the Ethernet address are separated by dashes. In some forms of Unix, the Ethernet address is segmented with colons.
	The IP address you are trying to assign is not on your logical subnet.	Confirm that your PC has an IP address and that it is in the same logical subnet that you are trying to assign to the server.
	The server may not be plugged into the network properly.	Make sure that the Link LED is lit. If the Link LED is not lit, then the server is not properly plugged into the network.
When you try to assign an IP with XPort™ Installer, you get the following message: "No response from device! Verify the IP, Hardware address and Network Class. Please try again."	The cause is most likely one of the following: The Hardware address you specified is incorrect. The IP address you are trying to assign is not a valid IP for your logical subnet. You did not choose the correct subnet mask.	Double-check the parameters that you specified. Tip: You cannot assign an IP address to a server through a router.
No LEDs are lit.	The unit or its power supply is damaged.	Change power supplies.
The server will not power up properly, and the LEDs are flashing.	Various	Consult the LEDs section in the Introduction chapter or the Quick Start for the LED flashing sequence patterns. Call Lantronix Technical Support if the blinking pattern indicates a critical error.
The server is not communicating with the serial device it is attached to.	The most likely reason is the wrong serial settings were chosen.	The serial settings for the serial device and the server must match. The default serial settings for the server are RS232, 9600 Baud, 8 Character Bits, No Parity,

Problem/Message	Reason	Solution
		1 Stop Bit, No Flow Control.
When you try to enter the setup mode on the server via the serial port, you get no response.	The issue will most likely be something covered in the previous problem, or possibly you have Caps Lock on.	Double-check everything in the problem above. Confirm that Caps Lock is not on.
You can ping the server, but not Telnet to the server on port 9999.	There may be an IP address conflict on your network You are not Telneting to port 9999. The Telnet configuration port (9999) is disabled within the server security settings.	Turn the server off and then issue the following commands at the DOS prompt of your computer: ARP -D X.X.X.X (X.X.X.X is the IP of the server) PING X.X.X.X (X.X.X.X is the IP of the server). If you get a response, then there is a duplicate IP address on the network (the LEDs on the server should flash a sequence that tells you this). If you do not get a response, use the serial port to verify that Telnet is not disabled.
The server appears to be set up correctly, but you are not communicating with your device attached to the server across the network.	If you are sure that the serial port setting is correct, then you may not be connecting to the correct socket of the server. Another possibility is that the server is not set up correctly to make a good socket connection to the network.	You can check to see whether there is a socket connection to or from the server by looking at the Status LED, if CP1 has been configured for LED1 functionality. If the Status LED 1 is blinking consistently, or is completely off, then there is a good socket connection. If the Status LED 1 is solid green, then the socket connection does not exist. Use the Connect Mode option C0 for making a connection to the server from the network. Use Connect Mode option C1 or C5 for a connection to the network from the server. See the full list of Connect Mode Options in the Binary to Hexadecimal chapter.
When connecting to the Web-Manager within the server, the message “No Connection With The server” displays.	Your computer is not able to connect to port 30718 (77FEh) on the server.	Make sure that port 30718 (77FEh) is not blocked with any router that you are using on the network. Also make sure that port 77FEh is not disabled within the Security settings of the server.

7.1 Technical Support

If you are experiencing an error that is not described in this chapter, or if you are unable to fix the error, you may:
Check our online knowledge base at www.lantronix.com/support
E-mail us at: support@lantronix.com
Call us at:
(800) 422-7044 Domestic
(949) 453-7198 International
(949) 450-7226 Fax

Our phone lines are open from 6:00AM - 5:30 PM Pacific Time Monday through Friday excluding holidays.

Firmware downloads, FAQs, and the most up-to-date documentation are available at: www.lantronix.com/support

Technical Support Europe, Middle East, and Africa
+49 (0) 7720 3016 20/57

eu_techsupp@lantronix.com

When you report a problem, please provide the following information:

- Your name, and your company name, address, and phone number
- Lantronix model number
- Lantronix MAC number
- Software version (on the first screen shown when you Telnet to port 9999)
- Description of the problem
- Status of the unit when the problem occurred (please try to include information on user and network activity at the time of the problem)

8. Monitor Mode

8.1 Monitor Mode

Monitor Mode is a command-line interface used for diagnostic purposes (see

Table 22 - Monitor Mode Commands on page *8-3.* There are two ways to enter Monitor Mode: locally via the serial port or remotely via the network.

Note: *Some firmware versions may not support Monitor Mode.*

8.1.1 Entering Monitor Mode Via the Serial Port

To enter Monitor Mode locally:

1. Follow the same principles used in setting the serial configuration parameters (see *Configuring via the Setup Mode Window* on page *4-7*.
2. Instead of typing three “x” keys, however, type zzz (or xxl) to enter Monitor Mode with network connections.

Type yyy (or yyy) to enter Monitor Mode without network connections.

3. A **0>** prompt indicates that you have successfully entered Monitor Mode.

8.1.2 Entering Monitor Mode Via the Network Port

To enter Monitor Mode using a Telnet connection:

4. First establish a Telnet session to the configuration port (9999). The following message appears:

```
MAC address 00204A0113A3
Software version 01.0b9 (021219)  XPT
Press Enter to go into Setup Mode
```

5. Type M (upper case).

A **0>** prompt indicates that you have successfully entered Monitor Mode.

8.1.3 Monitor Mode Commands

The following commands are available in Monitor Mode. Many commands have an IP address as an optional parameter (xxx.xxx.xxx.xxx). If the IP address is given, the command is applied to another Device Server with that IP address. If no IP address is given, the command is executed locally.

Note: *All commands must be given in capital letters.*

Table 22 - Monitor Mode Commands

Command	Command Name	Function
VS x.x.x.x	Version	Query software header record (16 bytes) of Device Server with IP address x.x.x.x
GC x.x.x.x	Get Configuration	Get configuration of Device Server with IP address x.x.x.x as hex records (120 bytes)
SC x.x.x.x	Send Configuration	Set configuration of Device Server with IP address x.x.x.x from hex records
PI x.x.x.x	Ping	Ping Device Server with IP address x.x.x.x to check device status
AT	ARP Table	Show the Device Server's ARP table entries
TT	TCP Connection Table	Shows all incoming and outgoing TCP connections
NC	Network Connection	Shows the Device Server's IP configuration
RS	Reset	Resets the Device Server's power
QU	Quit	Exit diagnostics mode
G0, G1, ...,Ge, Gf	Get configuration from memory page	Gets a memory page of configuration information from the device.
S0, S1,...,Se, Sf	Set configuration to memory page	Sets a memory page of configuration information on the device.

Responses to some of the commands are given in Intel Hex format (see *The Intel Hex Format* on page *9-4*).

Note: *Entering any of the commands listed above will generate one of the following command response codes:*

Table 23 -Command Response Codes

Response	Meaning
0>	OK; no error
1>	No answer from remote device
2>	Cannot reach remote device or no answer
8>	Wrong parameter(s)
9>	Invalid command

9. Network Configuration using UDP

9.1 UDP Datagrams

The Device Server can also be configured or queried over the network using UDP datagrams. The Device Server has a UDP listener set for port 30718 (77FE Hex). Responses from the Device Server are returned to the source port of the UDP packet.

The first three bytes of the UDP data block should be set to zero. The fourth byte selects the function as described in the following table:

Table 24 - UDP Configuration

Byte	Command	Parameters	Notes
03	Node Reset	2 bytes, software type	These 2 bytes are used to prevent accidental reset of the Device Server. (Value for standard XPort™ firmware: 58 31 [Hex], X1)
F6	Query for Firmware Version	None	The Device Server responds with the F7 block below.
F7	Firmware Information	First 16 bytes of the firmware image, 4 bytes device information and serial number, 6 bytes of MAC address	The first 16 bytes of the firmware image contain the software type (offset 4,5) and checksum (offset 14,15). The last two bytes of the device information contain the serial number. The last six bytes are the MAC address.
F8	Query for Setup Record	None	The Device Server responds with the F9 block below.
F9	Configuration Readback	120 byte setup record (see Setup Records on page E-7)	n/a
FA	Set Configuration	120 byte setup record (see Setup Records on page E-7)	The IP address (byte 0-3) will not be overridden using FA. See FD for this functionality.
FB	Configuration Change Acknowledge	None	This block is sent back to the host requesting a configuration change (FB). After sending out this block, the Device Server resets and uses the new configuration sent with the FA command.

Byte	Command	Parameters	Notes
FC	Set IP Address	First 8 bytes must be set to the string IP-SETUP (Hex 49 50 2D 53 45 54 55 50). Next 2 bytes have to be set to 00. Next 2 bytes must contain the serial number. Next 4 bytes have to be the new IP address.	This block can be sent as a broadcast, because the serial number is unique. It provides one method to set the IP address of the Device Server if is on the local network and the serial number is known. Remember, broadcasts are only 'heard' on the subnet on which they are generated. No reply is sent by the Device Server, which restarts using the new IP address after the block is received. Example (all in Hex): 49 50 2D 63 45 54 55 50 00 00 2A 12 81 00 01 02 IP address of the node with serial number 42-18 set to 129.0.1.2
FD	Set Configuration and IP Address	Same as FA, but changes IP address as well (bytes 0-3).	n/a

9.2 Configuring Multiple Devices

When configuring a number of Device Servers identically, it is useful to create a template setup record. The setup record can then be sent to the "target" Device Servers from a "master" Device Server via "cut and paste" or UDP (see *Network Configuration using UDP* on page *9-1*).

Device Servers use a 120-byte setup record in Intel Hex format. This format facilitates the transfer of binary data using ASCII characters. See Setup Records on page E-7and The Intel Hex Format on page E-5 for information about setup records and converting them to Intel Hex format.

```
:20000010AC10C81D0000100000000000AC10010B4C020000112700000000000C000000011
:2000201000000000000000000000000000000000000000000000000000000000000000B0
:200040104C020000122700000000000C0000000000000000000000000000000000000049
:18006010000000000000000000000000000000000000000000000000000078
:00000001FF
```

Figure 9-1 - Sample Setup Record in Intel Hex Format

9.2.1 Acquiring a Valid Setup Record

There are a number of ways to acquire a valid setup record:
Copy the setup record of a properly configured Device Server via Monitor Mode (easiest method).
Request the setup record of a properly configured Device Server via another Device Server on the network.
Build the setup record in software.
From a host PC, request the setup record of a properly configured Device Server via UDP.

To copy the setup record of a properly configured Device Server:

1. Configure a "master" Device Server with the desired parameters.
2. Enter Monitor Mode on the master Device Server (see Monitor Mode on page B-1).

3. At the prompt, enter GC followed by a carriage return. The Device Server will respond with its setup record in Intel Hex format.
4. Copy the setup record into a text file and save it for future use.

To request the setup record of a properly configured Device Server via another Device Server on the network:

1. Make sure that both units are plugged onto the network properly.
2. Enter Monitor Mode (with network support enabled) on the unit that is not properly configured. (see *Monitor Mode* on page *8-2*)
3. Issue the command GC x.x.x.x followed by a carriage return, where x.x.x.x is the IP address of the properly configured device. The properly configured device will respond by sending its setup record to the unit you are currently on. This configuration will be displayed in Intel HEX format.
4. Copy that HEX string, and then issue the command SC. Now paste the copied string.

The unit will not reboot on its own. You must reboot the unit before the settings take effect.

To build the setup record in software:

1. Create a 120-byte setup record.
2. Convert it to an Intel Hex record (see The Intel Hex Format on page E-5).
3. Copy the setup record into a text file and save it for future use.

To request the setup record of a properly configured Device Server via UDP:

1. Configure a Device Server with the desired parameters and place it on the network.
2. From a host PC, send the F8 datagram to the Device Server (see *Network Configuration using UDP* on page *9-1*). The Device Server responds with the F9 datagram, which includes its setup record.
3. Send a previously saved setup record from a host PC via UDP.

9.2.2 Sending a Setup Record

There are also a number of ways to send a setup record to a Device Server:
Send a previously saved setup record via Monitor Mode (easiest method).
Send the setup record of a properly configured Device Server to another Device Server on the network.
Send a previously saved setup record from a host PC via UDP.

To send a setup record via Monitor Mode:

1. Configure a “master” Device Server with the desired parameters and place it on the network.
2. Place another Device Server (the “target”) on the network.
3. Enter Monitor Mode (with network support enabled) on the master Device Server (see Monitor Mode on page B-1)
4. At the prompt, enter SC x.x.x.x, followed by a carriage return.

5. Send the setup record to the target Device Server.

Note: *For example, using Hyperterminal, copy the setup record and select "Paste to Host" to send it to the Device Server. The Device Server reboots with the new configuration.*

To send a previously saved setup record to a Device Server via UDP, from a host PC, send the **FA** (or **FD**) datagram to the "target" Device Server. (See *Network Configuration using UDP* on page *9-1*)

Note: *The Device Server responds with the **FB** datagram. Refer to the table.*

9.2.3 The Intel Hex Format

With this format, 8-bit binary data can be sent and received as ASCII text. The transmission is blocked in records, and every record has its own checksum.

The record begins with a colon (:) and consists of a block length (2-character Hex), a 16-bit address (4-character Hex), and a block type (2-character Hex). It is built by adding all binary 8-bit values and taking the complement, so adding all byte values (including length, address, and type) should yield zero.

Example:

00000001FF

End record, type 01, length 00, address 00 00, checksum FF.

01002000805F

Data record consisting of one byte (value 80 Hex) for address 0020 (32 decimal).

For communication with the node, the following block types are defined:

Table 25 - Block Types

Option	Hex
Data block program memory (firmware)	00
End record	01
Data block configuration memory	10

To get and set the node configuration, 120 bytes should be exchanged at once in 32-Byte records. The IP address in the record (bytes 0 to 3) will be ignored (unless the UDP FD command is being used).

9.2.4 Calculating the Checksum

As mentioned in *Table 25 - Block Types* above, the last two characters of an Intel Hex setup record represent a checksum of the data in the line. Since the checksum is a two-digit hexadecimal value, it can represent a value from 0 to 255.

The checksum is calculated by summing the value of the data on the line and taking the two's complement of the sum.

Note: *Do not include the leading colon or the checksum byte in the sum.*

Example:

0300300002337A1E

Record length: 03 (3 bytes of data)
Address: 0030 (the 3 bytes will be stored at 0030, 0031, and 0032)
Record Type: 00 (normal data)

Data: 02, 33, 7A
Checksum: 1E

03 + 00 + 30 + 00+ 02 + 33 + 7A = E2

The two's complement of E2 is 1E. See *Calculating the Two's Complement* below.

9.2.5 Calculating the Two's Complement

The two's complement of a number is the value that must be added to the number to reach a Hexadecimal value of 100 (256 in decimal). In the example above, E2 + 1E = 100.

You can also calculate the two's complement by subtracting the sum from 100. Using the example above again, 100 - E2 = 1E. It may help to use a scientific calculator.

9.3 Setup Records

A setup record consists of 120 bytes. They are transmitted at once from and to the node. Unused bytes should be initialized as 00. *Table 26 - Setup Record Construction* defines the structure of a setup record:

Table 26 - Setup Record Construction

Byte(s)	Function
00-03	IP address of the unit (x.x.x.x)
04	Reserved (0)
05	Flag BYTE Bit 7: Reserved (0) Bit 6: Set 1 for AUI, 0 for 10BASE-T (CoBox-Micro only) Bits 5-0: Reserved (0)
06	Number of host bits for subnetting; if 0, matching standard netmask for Class A, B, C is used.
07	Reserved (0)
08-11	Telnet configuration password (0 if not used)
12-15	Gateway IP address (0,0,0,0 if not used)
16-63	48-byte Channel 1 parameters; parameter setup Channel 1 (see Table E-4: Channel Parameters)
64-111	48-byte Channel 2 parameters; parameter setup Channel 2 (see Table E-4: Channel Parameters))
112-119	Reserved (0)

9.3.1 Channel Parameters

Use the following table to select setup record parameters for Channels 1:

Table 27 - Channel Parameters

Byte(s) (Channel 1)	Function
16	Interface Mode (see *Table 11 - Interface Mode Options* on page 4-12)
17	Line Speed Bits 7-5: Reserved Bits 4-0: Baud Rate (see *Table 28 - Baud Rate Settings*)
18	Flow Control (see *Table 13 - Flow Control Options* on page *4-12*)
19	Reserved
20-21	Own TCP port low-byte, high-byte (Intel)
22-23	Remote TCP port low byte, high-byte (Intel)
24-27	Remote IP address (low/high low/high)
28	Connect Mode (see *Table 14 - Connect Mode Options* on page *4-14*)
29	Disconnect Mode (see *Table 17 - Disconnect Mode Options* on page *4-20*)
30	Disconnect w/ inactivity time-out, minutes (00 if unused)
31	Disconnect w/ inactivity time-out, seconds (00 if unused)
32-33	Characters to trigger send immediately (sendchar)
34	Flush mode (see *Table 18 - Flush Mode Options* on page *4-20*)
35	Pack Control (see *Table 19 - Pack Control Options* on page *4-21*)
36-47	Reserved (0)
48-63	a) Terminal name for Telnet terminal type option (15 characters max), 0-terminated. If set and Bit 6 in Disconnect Mode is set, Telnet connection will be assumed. b) Password for Passworded Socket Connection (Bit 4 in Disconnect Mode Set).

9.3.2 Baud Rate

The Device Server and attached serial device must agree on a speed or baud rate to use for the serial connection. Use the following table to select Baud Rate settings:

Table 28 - Baud Rate Settings

Speed (bps)	Hex
38400	00
19200	01
9600	02
4800	03
2400	04
1200	05
600	06
300	07
115200	08
57600	09
230400	0A

Note: *See* ***Table 29 - Binary to Hexadecimal Conversion Table****.*

10. Binary to Hex Conversion

Many of the Device Server's configuration procedures require you to assemble a series of options (represented as bits) into a complete command (represented as a byte). The resulting binary value must be converted to a hexadecimal representation.

Hexadecimal digits have values ranging from 0 to F, which are represented as 0-9, A (for 10), B (for 11), etc. To convert a binary value (for example, 0010 0011) to a hexadecimal representation, the upper and lower four bits are treated separately, resulting in a two-digit hexadecimal number (in this case, 4C).

Use the following table to convert values from binary to hexadecimal.

Table 29 - Binary to Hexadecimal Conversion Table

Decimal	Binary	Hex
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

10.1 Connect Mode Options

Note: *Character response codes are C=connect, D=disconnect, N=unreachable*

In the *Configuring the Unit* chapter, the binary bit fields for options in connect mode, disconnect mode, flush mode, interface mode, and pack control mode are described in detail. The following pages are a summary of the possible hexadecimal entries for each of these options.

Table 30 - Connect Mode Options

Accept Incoming Connections	Serial Response Upon Connection	Active Connection Startup	Hostlist	Hex
Never	None (quiet)	No active startup		N/A
Never	None (quiet)	Any character		1
Never	None (quiet)	Active DTR		2
Never	None (quiet)	CR (0x0D)		3
Never	None (quiet)	Manual connection		4
Never	None (quiet)	Autostart		5
Never	None (quiet)	UDP		C

Accept Incoming Connections	Serial Response Upon Connection	Active Connection Startup	Hostlist	Hex
Never	Character	No active startup		10
Never	Character	Any character		11
Never	Character	Active DTR		12
Never	Character	CR (0x0D)		13
Never	Character	Manual connection		14
Never	Character	Autostart		15
Never	Character	UDP		1C
With DTR	None (quiet)	No active startup		40
With DTR	None (quiet)	Any character		41
With DTR	None (quiet)	Active DTR		42
With DTR	None (quiet)	CR (0x0D)		43
With DTR	None (quiet)	Manual connection		44
With DTR	None (quiet)	Autostart		45
With DTR	None (quiet)	UDP		4C
With DTR	Character	No active startup		50
With DTR	Character	Any character		51
With DTR	Character	Active DTR		52
With DTR	Character	CR (0x0D)		53
With DTR	Character	Manual connection		54
With DTR	Character	Autostart		55
With DTR	Character	UDP		N/A
Unconditionally	None (quiet)	No active startup		C0
Unconditionally	None (quiet)	Any character		C1
Unconditionally	None (quiet)	Active DTR		C2
Unconditionally	None (quiet)	CR (0x0D)		C3
Unconditionally	None (quiet)	Manual connection		C4
Unconditionally	None (quiet)	Autostart		C5
Unconditionally	None (quiet)	UDP		CC
Unconditionally	Character	No active startup		D0
Unconditionally	Character	Any character		D1
Unconditionally	Character	Active DTR		D2
Unconditionally	Character	CR (0x0D)		D3
Unconditionally	Character	Manual connection		D4
Unconditionally	Character	Autostart		D5
Unconditionally	Character	UDP		DC
Never	None (quiet)	No active startup	Hostlist	N/A
Never	None (quiet)	Any character	Hostlist	21
Never	None (quiet)	Active DTR	Hostlist	22
Never	None (quiet)	CR (0x0D)	Hostlist	23
Never	None (quiet)	Manual connection	Hostlist	N/A
Never	None (quiet)	Autostart	Hostlist	25
Never	None (quiet)	UDP	Hostlist	
Never	Character	No active startup	Hostlist	N/A
Never	Character	Any character	Hostlist	31
Never	Character	Active DTR	Hostlist	32
Never	Character	CR (0x0D)	Hostlist	33
Never	Character	Manual connection	Hostlist	N/A
Never	Character	Autostart	Hostlist	35
Never	Character	UDP	Hostlist	N/A

Accept Incoming Connections	Serial Response Upon Connection	Active Connection Startup	Hostlist	Hex
With DTR	None (quiet)	No active startup	Hostlist	N/A
With DTR	None (quiet)	Any character	Hostlist	61
With DTR	None (quiet)	Active DTR	Hostlist	62
With DTR	None (quiet)	CR (0x0D)	Hostlist	63
With DTR	None (quiet)	Manual connection	Hostlist	N/A
With DTR	None (quiet)	Autostart	Hostlist	65
With DTR	None (quiet)	UDP	Hostlist	N/A
With DTR	Character	No active startup	Hostlist	N/A
With DTR	Character	Any character	Hostlist	71
With DTR	Character	Active DTR	Hostlist	72
With DTR	Character	CR (0x0D)	Hostlist	73
With DTR	Character	Manual connection	Hostlist	N/A
With DTR	Character	Autostart	Hostlist	75
With DTR	Character	UDP	Hostlist	N/A
Unconditionally	None (quiet)	No active startup	Hostlist	N/A
Unconditionally	None (quiet)	Any character	Hostlist	E1
Unconditionally	None (quiet)	Active DTR	Hostlist	E2
Unconditionally	None (quiet)	CR (0x0D)	Hostlist	E3
Unconditionally	None (quiet)	Manual connection	Hostlist	N/A
Unconditionally	None (quiet)	Autostart	Hostlist	E5
Unconditionally	None (quiet)	UDP	Hostlist	N/A
Unconditionally	Character	No active startup	Hostlist	N/A
Unconditionally	Character	Any character	Hostlist	F1
Unconditionally	Character	Active DTR	Hostlist	F2
Unconditionally	Character	CR (0x0D)	Hostlist	F3
Unconditionally	Character	Manual connection	Hostlist	N/A
Unconditionally	Character	Autostart	Hostlist	F5
Unconditionally	Character	UDP	Hostlist	N/A

The following connect mode options are for when you use modem emulation:

Table 31 - Connect Mode Options for Modem Emulation

Accept Incoming Connections	Response	Hex
Never	Echo	16
Never	Without echo	6
Never	1-character response	7
With DTR	Echo	56
With DTR	Without echo	46
With DTR	1-character response	47
Unconditionally	Echo	D6
Unconditionally	Without echo	C6
Unconditionally	1-character response	C7

10.2 Disconnect Mode Options

Table 32 - Disconnect Mode Options

Disconnect with DTR Drop	Telnet Mode and Terminal Type Setup	Channel (port) Password	Hard Disconnect	State LED Off with Connection	Disconnect with EOT (^D)	Hex
			Enable			0
		Enable	Enable			10
			Enable		Enable	20
		Enable	Enable		Enable	30
	Enable		Enable			40
	Enable	Enable	Enable			50
	Enable		Enable		Enable	60
	Enable	Enable	Enable		Enable	70
Enable			Enable			80
Enable		Enable	Enable			90
Enable			Enable		Enable	A0
Enable		Enable	Enable		Enable	B0
Enable	Enable		Enable			C0
Enable	Enable	Enable	Enable			D0
Enable	Enable		Enable		Enable	E0
Enable	Enable	Enable	Enable		Enable	F0
			Enable	Enable		1
		Enable	Enable	Enable		11
			Enable	Enable	Enable	21
		Enable	Enable	Enable	Enable	31
	Enable		Enable	Enable		41
	Enable	Enable	Enable	Enable		51
	Enable		Enable	Enable	Enable	61
	Enable	Enable	Enable	Enable	Enable	71
Enable			Enable	Enable		81
Enable		Enable	Enable	Enable		91
Enable			Enable	Enable	Enable	A1
Enable		Enable	Enable	Enable	Enable	B1
Enable	Enable		Enable	Enable		C1
Enable	Enable	Enable	Enable	Enable		D1
Enable	Enable		Enable	Enable	Enable	E1
Enable	Enable	Enable	Enable	Enable	Enable	F1
			Disable			8
		Enable	Disable			18
			Disable		Enable	28
		Enable	Disable		Enable	38
	Enable		Disable			48
	Enable	Enable	Disable			58
	Enable		Disable		Enable	68
	Enable	Enable	Disable		Enable	78
Enable			Disable			88
Enable		Enable	Disable			98
Enable			Disable		Enable	A8
Enable		Enable	Disable		Enable	B8
Enable	Enable		Disable			C8
Enable	Enable	Enable	Disable			D8
Enable	Enable		Disable		Enable	E8

Disconnect with DTR Drop	Telnet Mode and Terminal Type Setup	Channel (port) Password	Hard Disconnect	State LED Off with Connection	Disconnect with EOT (^D)	Hex
Enable	Enable	Enable	Disable		Enable	F8
			Disable	Enable		9
		Enable	Disable	Enable		19
			Disable	Enable	Enable	29
		Enable	Disable	Enable	Enable	39
	Enable		Disable	Enable		49
	Enable	Enable	Disable	Enable		59
	Enable		Disable	Enable	Enable	69
	Enable	Enable	Disable	Enable	Enable	79
Enable			Disable	Enable		89
Enable		Enable	Disable	Enable	Enable	99
Enable			Disable	Enable	Enable	A9
Enable		Enable	Disable	Enable	Enable	B9
Enable	Enable		Disable	Enable		C9
Enable	Enable	Enable	Disable	Enable		D9
Enable	Enable		Disable	Enable	Enable	E9
Enable	Enable	Enable	Disable	Enable	Enable	F9

10.3 Flush Mode (Buffer Flushing) Options

Table 33 - Flush Mode Options

Serial to Network Clear input buffer upon:	Network to Serial Clear output buffer upon:	Alternate Packing Algorithm	Hex
None			0
Active connection			10
Passive connection			20
Active connection Passive connection			30
Disconnect			40
Active connection Disconnect			50
Passive connection Disconnect			60
Active connection Passive connection Disconnect			70
		Enable	80
Active connection		Enable	90
Passive connection		Enable	A0
Active connection Passive connection		Enable	B0
Disconnect		Enable	C0
Active connection Disconnect		Enable	D0
Passive connection Disconnect		Enable	E0
Active connection Passive connection Disconnect		Enable	F0
	Active connection		1
Active connection	Active connection		11
Passive connection	Active connection		21
Active connection Passive connection	Active connection		31
Disconnect	Active connection		41
Active connection Disconnect	Active connection		51
Passive connection Disconnect	Active connection		61
Active connection Passive connection Disconnect	Active connection		71
	Active connection	Enable	81
Active connection	Active connection	Enable	91
Passive connection	Active connection	Enable	A1
Active connection Passive connection	Active connection	Enable	B1
Disconnect	Active connection	Enable	C1
Active connection Disconnect	Active connection	Enable	D1
Passive connection Disconnect	Active connection	Enable	E1
Active connection Passive connection Disconnect	Active connection	Enable	F1

Serial to Network Clear input buffer upon:	Network to Serial Clear output buffer upon:	Alternate Packing Algorithm	Hex
	Passive connection		2
Active connection	Passive connection		12
Passive connection	Passive connection		22
Active connection Passive connection	Passive connection		32
Disconnect	Passive connection		42
Active connection Disconnect	Passive connection		52
Passive connection Disconnect	Passive connection		62
Active connection Passive connection Disconnect	Passive connection		72
	Passive connection	Enable	82
Active connection	Passive connection	Enable	92
Passive connection	Passive connection	Enable	A2
Active connection Passive connection	Passive connection	Enable	B2
Disconnect	Passive connection	Enable	C2
Active connection Disconnect	Passive connection	Enable	D2
Passive connection Disconnect	Passive connection	Enable	E2
Active connection Passive connection Disconnect	Passive connection	Enable	F2
	Active connection Passive connection		3
Active connection	Active connection Passive connection		13
Passive connection	Active connection Passive connection		23
Active connection Passive connection	Active connection Passive connection		33
Disconnect	Active connection Passive connection		43
Active connection Disconnect	Active connection Passive connection		53
Passive connection Disconnect	Active connection Passive connection		63
Active connection Passive connection Disconnect	Active connection Passive connection		73
	Active connection Passive connection	Enable	83
Active connection	Active connection Passive connection	Enable	93
Passive connection	Passive connection Active connection	Enable	A3
Active connection Passive connection	Active connection Passive connection	Enable	B3
Disconnect	Active connection Passive connection	Enable	C3
Active connection Disconnect	Active connection Passive connection	Enable	D3
Passive connection Disconnect	Active connection Passive connection	Enable	E3

Serial to Network Clear input buffer upon:	Network to Serial Clear output buffer upon:	Alternate Packing Algorithm	Hex
Active connection Passive connection Disconnect	Active connection Passive connection	Enable	F3
	Disconnect		4
Active connection	Disconnect		14
Passive connection	Disconnect		24
Active connection Passive connection	Disconnect		34
Disconnect	Disconnect		44
Active connection Disconnect	Disconnect		54
Passive connection Disconnect	Disconnect		64
Active connection Passive connection Disconnect	Disconnect		74
	Disconnect	Enable	84
Active connection	Disconnect	Enable	94
Passive connection	Disconnect	Enable	A4
Active connection Passive connection	Disconnect	Enable	B4
Disconnect	Disconnect	Enable	C4
Active connection Disconnect	Disconnect	Enable	D4
Passive connection Disconnect	Disconnect	Enable	E4
Active connection Passive connection Disconnect	Disconnect	Enable	F4
	Active connection Disconnect		5
Active connection	Active connection Disconnect		15
Passive connection	Active connection Disconnect		25
Active connection Passive connection	Active connection Disconnect		35
Disconnect	Active connection Disconnect		45
Active connection Disconnect	Active connection Disconnect		55
Passive connection Disconnect	Active connection Disconnect		65
Active connection Passive connection Disconnect	Active connection Disconnect		75
	Active connection Disconnect	Enable	85
Active connection	Active connection Disconnect	Enable	95
Passive connection	Active connection Disconnect	Enable	A5
Active connection Passive connection	Active connection Disconnect	Enable	B5
Disconnect	Active connection Disconnect	Enable	C5
Active connection Disconnect	Active connection Disconnect	Enable	D5

Serial to Network Clear input buffer upon:	Network to Serial Clear output buffer upon:	Alternate Packing Algorithm	Hex
Passive connection Disconnect	Active connection Disconnect	Enable	E5
Active connection Passive connection Disconnect	Active connection Disconnect	Enable	F5
	Passive connection Disconnect		6
Active connection	Passive connection Disconnect		16
Passive connection	Passive connection Disconnect		26
Active connection Passive connection	Passive connection Disconnect		36
Disconnect	Passive connection Disconnect		46
Active connection Disconnect	Passive connection Disconnect		56
Passive connection Disconnect	Passive connection Disconnect		66
Active connection Passive connection Disconnect	Passive connection Disconnect		76
	Passive connection Disconnect	Enable	86
Active connection	Passive connection Disconnect	Enable	96
Passive connection	Passive connection Disconnect	Enable	A6
Active connection Passive connection	Passive connection Disconnect	Enable	B6
Disconnect	Passive connection Disconnect	Enable	C6
Active connection Disconnect	Passive connection Disconnect	Enable	D6
Passive connection Disconnect	Passive connection Disconnect	Enable	E6
Active connection Passive connection Disconnect	Passive connection Disconnect	Enable	F6
	Active connection Passive connection Disconnect		7
Active connection	Active connection Passive connection Disconnect		17
Passive connection	Active connection Passive connection Disconnect		27
Active connection Passive connection	Active connection Passive connection Disconnect		37
Disconnect	Active connection Passive connection Disconnect		47
Active connection Disconnect	Active connection Passive connection Disconnect		57
Passive connection Disconnect	Active connection Passive connection Disconnect		67

Serial to Network Clear input buffer upon:	Network to Serial Clear output buffer upon:	Alternate Packing Algorithm	Hex
Active connection Passive connection Disconnect	Active connection Passive connection Disconnect		77
	Active connection Passive connection Disconnect	Enable	87
Active connection	Active connection Passive connection Disconnect	Enable	97
Passive connection	Active connection Passive connection Disconnect	Enable	A7
Active connection Passive connection	Active connection Passive connection Disconnect	Enable	B7
Disconnect	Active connection Passive connection Disconnect	Enable	C7
Active connection Disconnect	Active connection Passive connection Disconnect	Enable	D7
Passive connection Disconnect	Active connection Passive connection Disconnect	Enable	E7
Active connection Passive connection Disconnect	Active connection Passive connection Disconnect	Enable	F7

10.4 Interface Mode Options

Table 34 - Interface Mode Options

Interface	Bits	Parity	Stop Bits	Hex
RS-232C	7	No	1	48
RS-232C	7	No	2	C8
RS-232C	7	Even	1	78
RS-232C	7	Even	2	F8
RS-232C	7	Odd	1	58
RS-232C	7	Odd	2	D8
RS-232C	8	No	1	4C
RS-232C	8	No	2	CC
RS-232C	8	Even	1	7C
RS-232C	8	Even	2	FC
RS-232C	8	Odd	1	5C
RS-232C	8	Odd	2	DC
RS-422/485 NOT SUPPORTED				

10.5 Pack Control Options

Table 35 - Pack Control Options

Sendcharacter Defined by a:	Trailing Characters	Idle Time Force Transmit:	Send Immediately after Sendcharacter	Hex
1-Byte Sequence	No	12ms		0
1-Byte Sequence	No	52ms		1
1-Byte Sequence	No	250ms		2
1-Byte Sequence	No	5sec		3
1-Byte Sequence	1	12ms		4
1-Byte Sequence	1	52ms		5
1-Byte Sequence	1	250ms		6
1-Byte Sequence	1	5sec		7
1-Byte Sequence	2	12ms		8
1-Byte Sequence	2	52ms		9
1-Byte Sequence	2	250ms		A
1-Byte Sequence	2	5sec		B
2-Byte Sequence	No	12ms		10
2-Byte Sequence	No	52ms		11
2-Byte Sequence	No	250ms		12
2-Byte Sequence	No	5sec		13
2-Byte Sequence	1	12ms		14
2-Byte Sequence	1	52ms		15
2-Byte Sequence	1	250ms		16
2-Byte Sequence	1	5sec		17
2-Byte Sequence	2	12ms		18
2-Byte Sequence	2	52ms		19
2-Byte Sequence	2	250ms		1A
2-Byte Sequence	2	5sec		1B
1-Byte Sequence	No	12ms	Yes	20
1-Byte Sequence	No	52ms	Yes	21

Sendcharacter Defined by a:	Trailing Characters	Idle Time Force Transmit:	Send Immediately after Sendcharacter	Hex
1-Byte Sequence	No	250ms	Yes	22
1-Byte Sequence	No	5sec	Yes	23
1-Byte Sequence	1	12ms	Yes	24
1-Byte Sequence	1	52ms	Yes	25
1-Byte Sequence	1	250ms	Yes	26
1-Byte Sequence	1	5sec	Yes	27
1-Byte Sequence	2	12ms	Yes	28
1-Byte Sequence	2	52ms	Yes	29
1-Byte Sequence	2	250ms	Yes	2A
1-Byte Sequence	2	5sec	Yes	2B
2-Byte Sequence	No	12ms	Yes	30
2-Byte Sequence	No	52ms	Yes	31
2-Byte Sequence	No	250ms	Yes	32
2-Byte Sequence	No	5sec	Yes	33
2-Byte Sequence	1	12ms	Yes	34
2-Byte Sequence	1	52ms	Yes	35
2-Byte Sequence	1	250ms	Yes	36
2-Byte Sequence	1	5sec	Yes	37
2-Byte Sequence	2	12ms	Yes	38
2-Byte Sequence	2	52ms	Yes	39
2-Byte Sequence	2	250ms	Yes	3A
2-Byte Sequence	2	5sec	Yes	3B

11. IP Addresses

Each TCP/IP node on a network host has a unique IP address. This address provides the information needed to forward packets on the local network and across multiple networks if necessary.

IP addresses are specified as **x.x.x.x**, where each x is a number from 1 to 254; for example, 192.0.1.99. The Device Server must be assigned a unique IP address to use TCP/IP network functionality.

IP addresses contain three pieces of information: the network, the subnet, and the host.

11.1 Network Portion

The network portion of the IP address is determined by the network type: Class A, B, or C.

Table 36 - Network Portion of IP Address

Network Class	Network Portion of Address
Class A	First byte (2nd, 3rd, and 4th bytes are the host)
Class B	First 2 bytes (3rd and 4th bytes are the host)
Class C	First 3 bytes (4th byte is the host)

In most network examples, the host portion of the address is set to zero.

Table 37 - Available IP Addresses

Class	Address Range	Comments
A	1.0.0.1 to 126.255.255.254	126 networks of 16,777,214 hosts
B	128.1.0.1 to 191.254.255.254	16,328 networks of 65,534 hosts
C	192.0.1.1 to 233.255.254.254	2,097,150 networks of 254 hosts
D	224.0.0.0 to 239.255.255.254	Reserved for multicast groups
E	240.0.0.0 to 254.255.255.254	Reserved for experimental and future use

Consider the IP address 36.1.3.4. This address is a Class A address; therefore, the network portion of the address is 36.0.0.0 and the host portion is 1.3.4.

11.2 Subnet Portion

The subnet portion of the IP address represents which **sub-network** the address is from. Sub-networks are formed when an IP network is broken down into smaller networks using a **subnet mask**.

A router is required between all networks and all sub-networks. Generally, hosts can send packets directly only to hosts on their own sub-network. All packets destined for other subnets are sent to a router on the local network.

11.3 Host Portion

The host portion of the IP address is a unique number assigned to identify the host.

11.4 Network Address

A host address with all host bits set to 0 addresses the network as a whole (for example, in routing entries).

192.168.0.0

11.5 Broadcast Address

A host address with all host bits set to 1 is the broadcast address, meaning for “for every station.”

192.168.0.255

Network and broadcast addresses must not be used as a host address; for example, 192.168.0.0 identifies the entire network, and 192.168.0.255 identifies the broadcast address.

11.6 IP Subnet Mask

An IP subnet mask divides IP address differently than the standards defined by the classes A, B, and C. An IP subnet mask defines the number of bits to be taken from the IP address as the network or host sections. The Device Server prompts for the number of host bits to be entered and then calculates the netmask, which is displayed in standard decimal-dot notation (for example, 255.255.255.0) when saved parameters are displayed.

Table 38 - Standard IP Network Netmasks

Network Class	Network Bits	Host Bits	Netmask
A	8	24	255.0.0.0
B	16	16	255.255.0.0
C	24	8	255.255.255.0

Table 39 - Netmask Examples

Netmask	Host Bits
255.255.255.252	2
255.255.255.248	3
255.255.255.240	4
255.255.255.224	5
255.255.255.192	6
255.255.255.128	7
255.255.255.0	8
255.255.254.0	9
255.255.252.0	10
255.255.248.0	11
...	...
255.128.0.0	23
255.0.0.0	24

11.7 Private IP Networks and the Internet

If your network is not and will not be connected to the Internet, you may use any IP address. If your network is connected or will be connected to the Internet, or if you intend to operate the Device Server on an intranet, you should use one of the reserved sub-networks. Consult your network administrator with questions about IP address assignment.

11.8 Network RFCs

For more information about IP addresses, refer to the following documents, which can be located on the World Wide Web using one of the following directories or indices:

RFC 950 Internet Standard Subnetting Procedure
RFC 1700 Assigned Numbers
RFC 1117 Internet Numbers
RFC 1597 Address Allocation for Private Networks

12. Glossary

Address space

A linear array of locations that a thread can access. Simple processors have only one, and these processors are referred to as `linear' addressing.

Block

A block is a variable-size piece of memory that a task can acquire. Blocks are allocated from heaps. [Related: Buffer, heap]

Auto-Negotiate:

Clause 28 of the IEEE 802.3u standard specifies a MAC sublayer for the identification of the speed and duplex mode of connection being supported by a device. Support of this feature is optional for individual vendors.

Auto-sense:

Ability of a 10/100 Ethernet device to interpret the speed or duplex mode of the attached device and to adjust to that rate. Official term is Auto-Negotiation in Clause 28 of the IEEE 802.3u standard.

Baseband LAN:

A LAN that uses a single carrier frequency over a single channel. Ethernet, Token Ring and Arcnet LANs use baseband transmission.

Baud:

Unit of signal frequency in signals per second. Not synonymous with bits per second since signals can represent more than one bit. Baud equals bits per second only when the signal represents a single bit.

Binaries:

Binary, machine readable forms of programs that have been compiled or assembled. As opposed to Source language forms of programs.

BOOTP:

A TCP/IP network protocol that lets network nodes request configuration information from a BOOTP "server" node.

bps:

Bits per second, units of transmission speed.

Bridge:

A networking device that connects two LANs and forwards or filters data packets between them, based on their destination addresses. Bridges operate at the data link level (or MAC-layer) of the OSI reference model, and are transparent to protocols and to higher level devices like routers.

Bus:

A LAN topology in which all the nodes are connected to a single cable. All nodes are considered equal and receive all transmissions on the medium.

Byte:

A data unit of eight bits.

Channel:

The data path between two nodes.

Domain Name:

A domain name is a text name appended to a host name to form a unique host name across internets.

Download:

The transfer of a file or information from one network node to another. Generally refers to transferring a file from a "big" node, such as a computer, to a "small" node, such as a terminal server or printer.

End Node:

A node such as a PC that can only send and receive information for its own use. It cannot route and forward information to another node.

Ethernet:

The most popular LAN technology in use today. The IEEE standard 802.3 defines the rules for configuring an Ethernet network. It is a 10 Mbps, CSMA/CD baseband network that runs over thin coax, thick coax, twisted pair or fiber optic cable.

Firmware:

Alterable programs in semipermanent storage, e.g., some type of read-only or flash reprogrammable memory.

Flash ROM:

See ROM.

Framing:

Dividing data for transmission into groups of bits, and adding a header and a check sequence to form a frame.

FTP:

File Transfer Protocol, a TCP/IP protocol for file transfer.

Full-Duplex:

Independent, simultaneous two-way transmission in both directions, as opposed to half-duplex transmission

Gateway:

A device for interconnecting two or more dissimilar networks. It can translate all protocol levels from the Physical layer up through the Applications layer of the OSI model, and can therefore interconnect entities that differ in all details.

Hardware Address:

See Network Address.

Host:

Generally a node on a network that can be used interactively, i.e., logged into, like a computer.

Host Table:

A list of TCP/IP hosts on the network along with their IP addresses.

IEEE 802.3:

The IEEE (Institute of Electrical and Electronic Engineers) standard that defines the CSMA/CD media-access method and the physical and data link layer specifications of a local area network. Among others, it includes 10BASE2, 10BASE5, 10BASE-FL and 10BASE-T Ethernet implementations.

Internet:

A series of interconnected local, regional, national and international networks, linked using TCP/IP. Internet links many government, university and research sites. It provides E-mail, remote login and file transfer services.

Internetworking:

General term used to describe the industry composed of products and technologies used to link networks together.

IP Address:

See Network Address.

ISO Layered Model:

The International Standards Organization (ISO) sets standards for computers and communications. Its Open Systems Interconnection (OSI) reference model specifies how dissimilar computing devices such as Network Interface Cards (NICs), bridges and routers exchange data over a network. The model consists of seven layers. From lowest to highest, they are: Physical, Data Link, Network, Transport, Session, Presentation and Application. Each layer performs services for the layer above it.

KB

Kilobyte. KBps is Kilobytes per second.

Kbps:

Kilobits per second.

LAN:

Local Area Network, a data communications system consisting of a group of interconnected computers, sharing applications, data and peripherals. The geographical area is usually a building or group of buildings.

Latency:

The delay incurred by a switching or bridging device between receiving the frame and forwarding the frame.

Layer:

In networks, layers refer to software protocol levels comprising the architecture, with each layer performing functions for the layers above it.

Line Speed:

Expressed in bps, the maximum rate at which data can reliably be transmitted over a line using given hardware.

Logical Link:

A temporary connection between source and destination nodes, or between two processes on the same node.

Mbps:

Megabits per second.

MIB:

Management Information Base, a database of network parameters used by SNMP and CMIP (Common Management Information Protocol) to monitor and change network device settings. It provides a logical naming of all information resources on the network that are pertinent to the network's management.

Multicast:

A multicast is a message that is sent out to multiple devices on the network by a host.

Name Server:

Software that runs on network hosts charged with translating (or resolving) text-style names into numeric IP addresses.

Network:

An interconnected system of computers that can communicate with each other and share files, data and resources.

Network Address:

Every node on a network has one or more addresses associated with it, including at least one fixed hardware address such as "ae-34-2c-1d-69-f1" assigned by the device's manufacturer. Most nodes also have protocol specific addresses assigned by a network manager.

Network Management:

Administrative services for managing a network, including configuring and tuning, maintaining network operation, monitoring network performance, and diagnosing network problems.

Node:

Any intelligent device connected to the network. This includes terminal servers, host computers, and any other devices (such as printers and terminals) that are directly connected to the network. A node can be thought of as any device that has a "hardware address."

Open System Interconnect (OSI):

See "ISO."

Packet:

A series of bits containing data and control information, including source and destination node addresses, formatted for transmission from one node to another.

Physical Address:

An address identifying a single node.

Physical Layer:

Layer 1, the bottom layer of the OSI model, is implemented by the physical channel. The Physical layer insulates Layer 2, the Data Link layer, from medium-dependent physical characteristics such as baseband, broadband or fiber-optic transmission. Layer 1 defines the protocols that govern transmission media and signals.

Port:

The physical connector on a device enabling the connection to be made.

Protocol:

Any standard method of communicating over a network.

Remote Access:

Access to network resources not located on the same physical Ethernet. (Physical Ethernet here refers to an entire site network topology.)

Router:

Device capable of filtering/forwarding packets based upon data link layer information. Whereas a bridge or switch may only read MAC layer addresses to filter, routers are able to read data such as IP addresses and route accordingly.

RS232 Signals

RXD	Receive Data
TXD	Transmit Data
RTS	Ready to Send
CTS	Clear to Send
DTR	Data Terminal Ready
CD	Carrier Detect
DSR	Data Set Ready
RI	Ring Indicator

Server:

A computer that provides resources to be shared on the network, such as files (file server) or terminals (terminal server).

Session:

A connection to a network service.

SNMP:

Simple Network Management Protocol, allows a TCP/IP host running an SNMP application to query other nodes for network-related statistics and error conditions. The other hosts, which provide SNMP agents, respond to these queries and allow a single host to gather network statistics from many other network nodes.

Source Code:

Programs in an uncompiled or unassembled form.

Switch:

Multiport Ethernet device designed to increase network performance by allowing only essential traffic on the attached individual Ethernet segments. Packets are filtered or forwarded based upon their source and destination addresses.

TCP/IP:

Transmission Control Protocol (TCP) and Internet Protocol (IP) are the standard network protocols in UNIX environments. They are almost always implemented and used together and called TCP/IP.

Telnet:

Telnet is an application that provides a terminal interface between hosts using the TCP/IP network protocol. It has been standardized so that "telnetting" to any host should give one an interactive terminal session, regardless of the remote host type or operating system. Note that this is very different from the LAT software, which allows only local network access to LAT hosts only.

10BASE-T:

Ethernet running on unshielded twisted pair (UTP) cable. Note that 10BASE-T is a point-to-point network media, with one end of the cable typically going to a repeater/hub and the other to the network device.

100BASE-TX

Specifies 100-Mbps operation using the CSMA/CD protocol over two pairs of category 5 UTP cable.

Terminal Server:

A concentrator that facilitates communication between hosts and terminals.

TFTP:

Trivial File Transfer Protocol. On computers that run the TCP/IP networking software, TFTP is used to quickly send files across the network with fewer security features than FTP.

Throughput:

The amount of data transmitted between two points in a given amount of time, e.g., 10 Mbps.

Topology:

The arrangement of the nodes and connecting hardware that comprises the network. Types include ring, bus, star and tree.

Twisted-Pair Cable:

Inexpensive, multiple-conductor cable comprised of one or more pairs of 18 to 24 gauge copper strands. The strands are twisted to improve protection against electromagnetic and radio frequency interference. The cable, which may be either shielded or unshielded, is used in low-speed communications, as telephone cable. It is used only in baseband networks because of its narrow bandwidth.

UTP:

Unshielded twisted pair, one or more cable pairs surrounded by insulation. UTP is commonly used as telephone wire.

Wide Area Network (WAN):

A network using common carrier transmission services for transmission of data over a large geographical area.