gridconnect™

NET232
Serial to Ethernet
Adapter

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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 Grid Connect will void the user's authority to operate this device.

The information in this guide may change without notice. The manufacturer assumes no responsibility for any errors that may appear in this guide.

Date	Rev.	Author	Comments
11/23/04	A	GR	Preliminary Release
03/07/06	B	GR	Update for XPort-03 firmware 6.1.0.0
07/25/08	C	GR	Update for changes to firmware and OEM pins
08/18/09	D	GR	Update for changes to firmware.
10/19/09	E	GR	Remove NET232-USB

Declaration of Conformity

This declaration provides supporting data for the Grid Connect RS232 Serial to Ethernet Adapter to satisfy the Electromagnetic Compatibility (EMC) requirements for Information Technology Equipment (ITE). This testing is used to support compliance with the European EMC Directive, 89/336/EEC as amended by 93/68/EEC and after 20 July 2007, compliance with 2004/108/EC.

Part Numbers: GC-NET232-DTE, GC-NET232-DCE, NET232, and all other extensions of GC-NET232-xxx.

The tests were performed by L F Research at the L F Research EMC laboratory and are fully documented in File Reference 2006-148.

LF Research
12790 Route 76
Poplar Grove, Illinois 61065 USA

All tests were performed by: Derek N. Walton, NARTE Certified EMC Engineer, #438. Tests completed on August, 2006.

Manufacturer:
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Specifically, the EUT was assessed using harmonized product standard EN 55024 (including Amendment 3), using the harmonized test standards as follows:

- EN 61000-4-2: 2001 "Electromagnetic Discharge immunity test."
- EN 61000-4-3: 2005 "Radiated, radio frequency, electromagnetic field immunity."
- EN 61000-4-4: 2005 "Electrical Fast Transient/burst immunity test."
- EN 61000-4-5: 2001 "Surge immunity test."
- EN 61000-4-6: 2005 (Incorporating through Amendment No. 3) "Immunity to Conducted disturbances, induced by radio-frequency fields."
- EN 61000-4-11: 2001 "Voltage dip and interrupt test."

In addition, the emissions from the EUT were measured using the following standard:

- EN 55022: 2006, "Information technology equipment. Radio disturbance characteristics. Limits & methods of measurement."

Requirement	Associated EN	Requirement	Result
Electrostatic Discharge	EN 61000-4-2	Class B	Pass Class A&B
Radiated Immunity	EN 61000-4-3	Class A	Pass Class A
Electrical Fast Transients	EN 61000-4-4	Class B	Pass Class A&B
Surge	EN 61000-4-5	Class B	Pass Class A
Conducted Immunity	EN 61000-4-6	Class A	Pass Class A
Voltage Disturbances	EN 61000-4-11	Class B	Pass Class A
Conducted Emissions	EN 55022	Class B	Pass Class B
Radiated Emissions	EN 55022	Class B	Pass Class B

Manufacturer Representative: Glenn Rodgers, Engineering Manager.

Warranty

Grid Connect warrants each product to be free from defects in material and workmanship for a period of ONE YEAR after the date of shipment. During this period, if a customer is unable to resolve a product problem with Grid Connect Technical Support, a Return Material Authorization (RMA) will be issued. Following receipt of a RMA number, the customer shall return the product to Grid Connect, freight prepaid. Upon verification of warranty, Grid Connect 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 Grid Connect 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.

Grid Connect warrants the media containing software and technical information to be free from defects and warrants that the software will operate substantially for a period of 60 DAYS after the date of shipment.

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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.

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Table of Contents

Contents

List of Figures

List of Tables

1. Overview

Many electronic devices with an RS232 serial interface are connected to their host controller through an RS232 serial cable. In the drawing below, a serial device is connected to a computer using an RS232 cable. RS232 Serial cables have limitations so that the serial device must be close to the control point, generally within 100 feet.

Serial Device   Computer

To overcome the serial cable limitations, you can use a NET232 to make a serial to Ethernet link. Now you can connect the host controller to the serial device over the Internet. The software on the host controller does not have to be changed. The port used by the host controller is redirected to a virtual Ethernet port.

Ethernet

NET232
Serial to Ethernet
Adapter
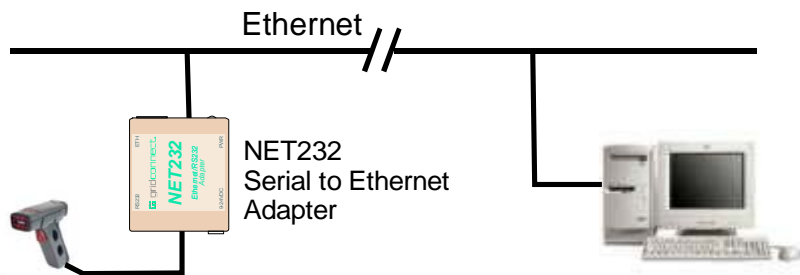
Serial Device   Computer

In some cases, the host controller cannot use redirector software or the system engineer simply wants to replace the short RS232 serial cable with an infinitely long serial link. In this case, two NET232's are linked together to form a serial tunnel over an Ethernet link.

Ethernet

NET232
Serial to Ethernet
Adapters
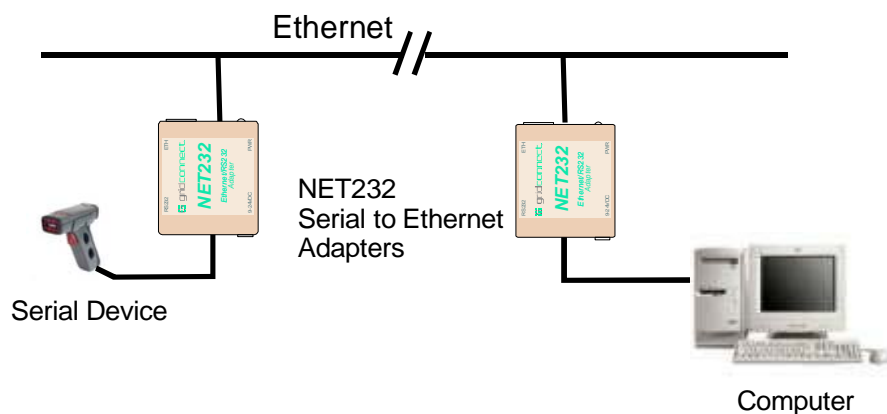
Serial Device

Computer

The NET232 connects serial devices to Ethernet networks using the IP protocol family. Configuration of the NET232 can be done from the serial port connection, a web page, or a Telnet connection.

1.1 Additional Documentation

The following guides are available on the product CD. You can browse the folders on the CD for various technical publications and application notes.

Title	Description	File Name
NET232 User Guide	This manual in PDF format.	NET232_UM_800232.pdf
Device Installer User Guide	Information about installing and using Device Installer Utility.	Dev_Inst_UG_800233.pdf
Quick Start Guide	Quick steps to get the unit up and running.	QuickStart_800234.pdf
Comm Port Redirector Guide	Provides information on using the Windows based utility to create a virtual com port.	Redirector_UG_800235.pdf
UDP Configuration Guide	How to use UDP to configure the unit. How to acquire and use setup records to configure a unit.	UDPconfig_800238.pdf
Tech Notes	Additional information to aid in using the NET232.	Tech_Notes_800239.pdf
Application Note	Serial Tunneling	AN_SerTun_800304.pdf
Technical FAQ	Frequently Asked Questions	Technical FAQ.pdf

2. Introduction

2.1 Procedures for setup

The NET232 is a device for connecting a serial device to the Ethernet. You will therefore have to know some technical facts about the serial device you are trying to connect. You can generally find that information in the manufacturer's technical manual or from a set of schematics for the product.

This section of the user manual has detailed information about the RS232 signals provided by the NET232 and how they should be connected to another RS232 serial device. See Table 1 - RS232 Signals.

You will have to provide an IP address for the NET232. Using DHCP protocol, the NET232 can get a temporary IP address from your server but a fixed IP address is required for permanent installation. The port used to transfer data is called the Local Port and has a default setting of 10001.

The software CD contains a program called Device Installer, which is used to locate the NET232 on your network. You can use it to assign the IP address and port number, setup the serial port parameters, and view all the configuration information.

We highly suggest using the Quick Start Guide to get your unit quickly configured. The User Manual has more detailed information about all the options available. Almost all the configuration settings are already configured for best performance so all you need to do is supply the IP address and setup the serial port parameters.

If you have problems, please review the steps in the Quick Start Guide, review the information in the User Manual, or give our Technical Support team a call.

2.2 Tips from Tech Support

We would like to believe you can connect the NET232 to any RS232 device. We have a track record of being able to connect to almost any RS232 device, however, there are some that just can't or won't work. So here are some things to think about before you start trying to connect a NET232 to your device. If you are not sure, give us a call.

What are the RS232 signals on the target device?

Typically you will have TXD for transmit, RXD for receive, and GND for ground. If you have a schematic or a user manual, find the specifications for the serial port and note the signals being used. You will need to know if the target device has a male or female connector, and which pins are used for each signal name.

Does the target device use Hardware Flow Control?

Hardware flow control requires the use of two signal pins, RTS and CTS. One unit sends a Request to Send and the other sends a Clear to Send. These are old modem control signals that are now used to control the flow of data between two devices that may not be able to maintain a fast data transfer. Most modern devices can easily transfer high speed data but some still require the use of flow control. You will have to enable these signals on the NET232 since they are turned off at the factory.

Does the target device require the use of a DTR signal?

Some devices need to see the DTR signal to indicate they are connected. DTR is not enabled on the NET232 but there are ways to provide the signal so you can make it work. Devices that use DTR may also have a DSR signal that can be tied to the DTR line to simulate a DTR active signal.

Do any of the pins on the target device provide power?

Some target devices have a pin dedicated to power in or power out. Power pins are sometimes used to power other RS232 devices attached to the target device. RS232 specifications do not allow power on any pins but that does not stop a designer from applying power to an unused pin. You should know about any power pins before connecting the NET232 to a target device.

What is the Baud Rate, Data Bits, Parity and number of Stop Bits required by the target device?

You must know the communication parameters to setup the NET232 properly. In a typical device, you might see the baud rate set to 9600, the data bits set to 8, the parity set to none, and the stop bits set to 1. This is the default setting for the NET232 serial port. If your target device has something different, you will have to change the serial port configuration.

Do you want your software application to run like it does when your PC is connected to the target device with an RS232 cable?

Since the NET232 will be using an Ethernet connection to connect your PC to a target device, you will need some way for your software application to think it is still using a COM port instead of an Ethernet application. This is done with a software package called COM Port Redirector. It redirects a virtual com port to an Ethernet port.

Your application will change from a physical port, like COM2, to a virtual comm port like COM20. Your application does not know the difference. Instead of sending your program data to a physical port, your program data now goes to a virtual port. The virtual port is an Ethernet port assigned by Comm Port Redirector software. You tell Comm Redirector the IP address and the port number of the NET232 and it takes care of routing the data from your application to the Ethernet port.

2.3 Protocol Support

The NET232 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 include:
- 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.

2.4 Addresses and Port Number

Hardware Address

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 manufacturer of the 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

Note: The MAC address is printed on the ID label.

IP Address

Every device connected to an IP network must have a unique IP address. This address is used to reference the specific unit. The NET232 is automatically assigned an IP address on DHCP-enabled networks, as it is DHCP-enabled by default. However, you must assign it a permanent IP address during the configuration process.

Port Numbers

Every TCP connection and every UDP datagram is defined by a destination IP address and a port number.

The units serial channel (port) can be associated with a specific TCP/UDP port number. The default port setting is 10001.

Port number 9999 is reserved for access to the unit's Setup (configuration) Mode window. For more information on reserved port numbers, see Table 9 - Reserved Ports on page 4-10.

2.5 Serial RS232 Interface

The table below lists the RS232 signals for the NET232. The RS232 interface is a 9-pin D-style connector. Male connectors are wired as DTE and female connectors are wired as DCE.

Table 1 - RS232 Signals

NET232 Signal	Direction	DTE DB-9 Male Pin #	DCE DB-9 Female Pin #
Data Out (TXD)	Out	3	2
Data In (RXD)	In	2	3
Ground		5	5
RTS	In	8	7
CTS	Out	7	8
No Connection		1,4,6,9	1,4,6,9

The NET232-DCE kit includes a 9-pin Male/Male Gender Changer if you need a male connector. The NET232-DTE kit includes a 9-pin Female/Female Null Modem Adapter.

*Note: RTS and CTS control lines are not enabled at the factory. See Error! Reference source not found. on page **Error! Bookmark not defined.** and **Flow** on page 4-10.*

The DB9 connector can be used to power the NET232 through one of the unused pins. Please contact the factory for more information.

2.6 OEM Module

The NET232 circuit board can be supplied as an OEM module. The module has two headers that are used to secure the module to a motherboard. One hole on the edge of the board can be used for mounting to a standoff.

Note: OEM Modules must be ordered in quantities of 25 or more.
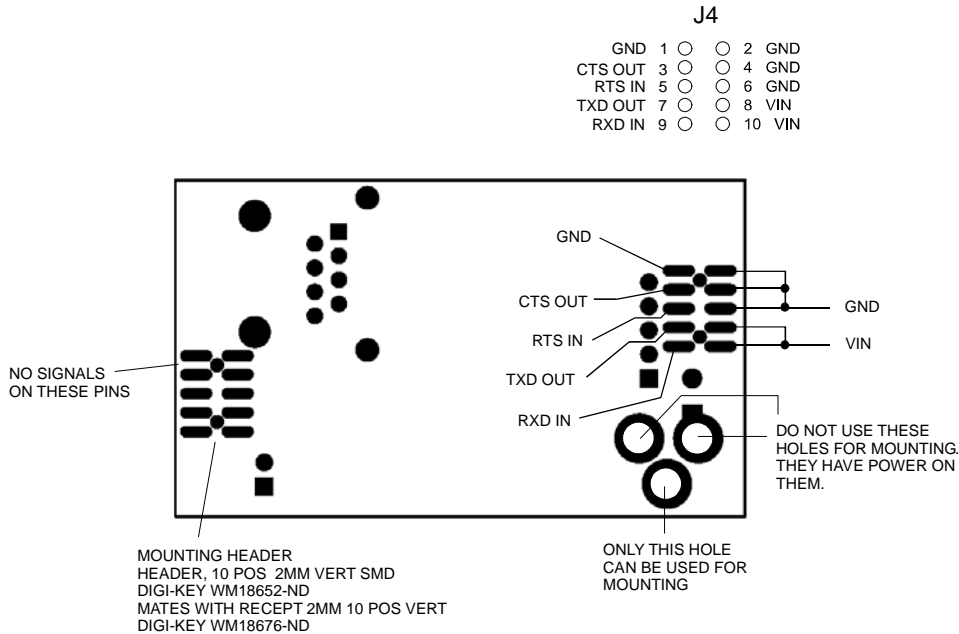
2.7 Power Supply

The NET232 can use any DC power source from 5VDC to 24VDC. A typical power cube sent with the unit can supply 9VDC at 500 mA. However, there are other units that can be used as long as they are in the range of 5-24VDC and supply the proper wattage. At 9VDC, the NET232 will draw approximately 110mA (.99W) so a 2 Watt power source (9V at 200mA) should be adequate.

Note: Grid Connect can supply a special cable adapter to connect the NET232 to a USB jack for +5VDC power.

The NET232 power adapter is a 2.1mm, positive center power jack. The jack is equivalent to a CUI Inc. PJ-002A power jack.

You can also order the NET232 with a Phoenix right angle power connector. The unit is supplied with a mating Phoenix terminal block plug.

2.8 Ethernet Interface

2.8.1 LEDs

The device contains the following LEDs:
- 10BaseT/100BaseTX (Bi-color, Left LED)
- Full/Half Duplex (Bi-color, Right LED)
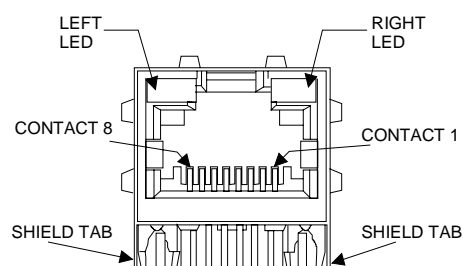
Table 2 - NET232 LED Functions

Left LED	Right LED	Meaning
Solid Amber		10BASE-T
Solid Green		100BASE-Tx
	Blinking Amber	Half Duplex Activity
	Blinking Green	Full Duplex Activity

2.9 Product CD

The product CD sent with the NET232 contains Device Installer software, Com Port Redirector software, Application Notes, user guides and other technical documents.

2.10 Technical Specifications

Table 3 - Technical Specs

Category	Description
CPU	DSTni-EX 186 CPU
Firmware	Upgradeable via TFTP and serial port
Reset Circuit	200msec power up/down reset pulse. Reset triggered at 3.08V
Serial Interface	RS232. Baudrate software selectable (300 to 230400bps in standard mode, 460800 and 921600 in high performance mode)
Serial Line Formats	7 or 8 data bits, 1-2 Stop bits, Parity: odd, even, none
Modem Control	CTS, RTS
Flow Control	XON/XOFF (software), CTS/RTS (hardware), None
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.
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
Weight	2.2oz
Material	Case: Flame Retardant
Power	2 W. See Power Supply section. +5 to +24VDC.
Temperature	Operating range: -40°C to +85°C (-40°F to 185°F) High performance mode has an upper temperature limit of 75°C.
Relative Humidity	Operating: 5% to 95% non-condensing
Warranty	1-year limited warranty
Included Software	Windows™ 98/NT/2000/XP based Device Installer configuration software, Windows™ based Comm Port Redirector.
EMI Compliance	See Declaration of Conformity

3. Getting Started

This chapter covers the required steps to get the NET232 Serial to Ethernet adapter on-line and working. The NET232 contains a complete device server that controls the network communications.

Note: See the Quick Start Guide for a quick setup procedure.

3.1 Quick Rundown

For the unit to operate correctly on a network, it must have a unique IP address on the network. There are three basic methods for logging into the device server and assigning the IP address:

- **DHCP**: By default, Dynamic Host Configuration Protocol (DHCP) is enabled on the device server. DHCP allows a DHCP server to automatically assign an IP address to the device server. If you use DHCP, the device server is assigned a new IP address each time it boots.
- **Device Installer**: You can manually assign the IP address using a graphical user interface (GUI) on a PC attached to a network.
- **Serial Port Login**: With this method, you connect a terminal or a PC running a terminal emulation program to the unit's serial port.

All of the methods for assigning an IP address will be discussed in *Methods of Assigning the IP Address* on page 3-2.

It is important to consider the following points before logging into and configuring the device server:

- The device server's 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.

For the unit to operate correctly with your device, you must configure the serial port properties. See Channel 1 Configuration (Serial Port Parameters) on page 4-9.

3.2 Physically Connecting the Unit

1. Connect an active network Ethernet cable to the NET232's Ethernet port.
2. Supply power to your unit using the power supply that was included in the packaging.

Note: If you are using a NET232 unit with a Phoenix Connector, the input power is +5 to +24VDC.

You can connect the serial cable to your PC serial port, if you want to configure the NET232 over a serial link. This method is reliable, but more difficult than using the web browser method. If you have a NET232-DTE (DB9Male), use a null modem adapter to connect the serial cable to a COM port on your PC. If you have a NET232-DCE (DB9Female), connect the serial cable to a COM port on your PC.

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** *Device Installer* on page *3-3***.**

Method	Description
Device Installer	You manually assign the IP address using a Graphical User Interface on a PC attached to the network. See *Device Installer* on page *3-3*.
Serial Port Login	You initially configure the unit through a serial connection. See *Configuration Using Telnet or Serial Port* on page 4-4.
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 *Using a Telnet Connection* on page *4-4*.

3.3.1 Hardware Address

You need to know the unit's hardware address (also known as MAC address), which is on the manufacturers ID label on the bottom of the unit. It is in the format: 00-20-4a-XX-XX-XX, where the XXs are unique numbers assigned to the product.

Hardware Address: 00-20-4a- ____ - ____ - ____

3.3.2 IP Address

Your NET232 must have a unique IP address on your network. The systems administrator generally provides the IP address and corresponding subnet mask and gateway. The IP address must be within a valid range, unique to your network, and in the same subnet as your PC.

IP Address: _____ _____ _____ _____

Subnet Mask: _____ _____ _____ _____

Gateway: _____ _____ _____ _____

3.3.3 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 **Device 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 *Device Installer* later in this chapter.

3.3.4 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. 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 Device Installer

Device Installer is a Windows-based utility for configuring embedded device servers found in products such as the NET232, NET232jr and NET485 Serial to Ethernet adapters. Device Installer supports several functions such as setting network parameters, pinging a network device, and changing baud rate. The first operation you must do is to locate the device on your network and assign the device a fixed IP address. Once the unit has a fixed IP address, you can use several methods to setup the unit for your specific application.

Please locate and read the **Device Installer User Guide** found on the product CD. The manual can be read by clicking the **Device Installer Manual** button on the software page of the product CD. You can also browse the CD to find the manual. Locate the **doc** folder and double-click on DevInst_UG_800233.pdf.

4. Configuration Using Telnet or Serial Port

You must configure the unit so that it can communicate on a network with your serial device. 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.

4.1.1 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 power-on setup mode serial port settings are 9600 baud, 8 bits, no parity, 1 stop bit, no flow control.

2. To enter Setup Mode, reset the unit by cycling the unit's power (power off and back on). The setup mode self-test will begin and will run for about 5 seconds. **You have 5 seconds** 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 turning the power off and on.

3. At this point, the screen display is the same as when you use a Telnet connection. To continue with a serial port login, skip ahead to *4.1.3 Telnet and Serial Port Messages* on page 4-4.

4.1.2 Using a Telnet Connection

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

Note: If you use the Telnet Configuration tab on Device Installer 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**.

4.1.3 Telnet and Serial Port Messages

At this point, the telnet and serial port messages are the same.

3. The window displays:

```
MAC address 00204AA9E784
Software version V6.5.0.7 (070919) XPTEXE   (Yours may be different)
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
Web Setup is          enabled
ECHO is               disabled
Encryption is         disabled    (Only appears with Encrypted units)
Enhanced Password is disabled
Port 77F0h is         enabled

*** Channel 1
Baudrate 9600, I/F Mode 4C, Flow 00
Port 10001
Connect Mode : C0
Send '+++' in Modem Mode enabled
Show IP addr after 'RING' enabled
Auto increment source port  disabled
Remote IP Adr: --- none ---, Port 00000
Disconn Mode : 00
Flush   Mode : 00

*** Expert
TCP Keepalive      : 45s
ARP cache timeout : 600s
CPU performance : Regular
Monitor Mode @ bootup : enabled
RS485 tx enable   : active low
HTTP Port Number : 80
SMTP Port Number : 25
MTU Size: 1400
Alternate MAC: disabled
Ethernet connection type:  auto-negotiate

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

*** Trigger 1
Serial trigger input: disabled
  Channel: 1
  Match: 00,00
Trigger input1: x
Trigger input2: x
Trigger input3: x
Message :
Priority: L
Min. notification interval: 1 s
Re-notification interval  : 0 s
```

```
        *** Trigger 2
        Serial trigger input: disabled
          Channel: 1
          Match: 00,00
        Trigger input1: x
        Trigger input2: x
        Trigger input3: x
        Message :
        Priority: L
        Min. notification interval: 1 s
        Re-notification interval  : 0 s

        *** Trigger 3
        Serial trigger input: disabled
          Channel: 1
          Match: 00,00
        Trigger input1: x
        Trigger input2: x
        Trigger input3: x
        Message :
        Priority: L
        Min. notification interval: 1 s
        Re-notification interval  : 0 s

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

Figure 1 - Setup Mode Window

4.2 Server Configuration (Network Configuration)

These are the unit's basic network parameters. The following parameters are displayed when you select **Server**(Option 0).

```
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)
Change DHCP device name (not set) ? (N) ?
```

4.2.1 IP Address

DHCP is not used to assign IP addresses, enter the IP address manually. The IP address must be set to a unique value in the network. Enter each octet and press **Enter** between each section. The current value displays in parentheses.

If DHCP is used, the third octet of the IP address sets the BootP/DHCP/AutoIP options. The following table shows the bits you can manually configure to force the XPort to disable AutoIP, DHCP, or BootP. To disable an option, set the appropriate bit.

Options	Bit
AutoIP	0
DHCP	1
BootP	2

For example, if the third octet is 0.0.5.0, the AutoIP and BootP options are disabled; only DHCP is enabled. (The value 5 results from adding the binary equivalents of 0 and 2.) This is the most common setting when using DHCP.

4.2.2 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. The default is **N** (No), meaning the gateway address has not been set. To set the gateway address, type **Y** and enter the address.

4.2.3 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 display (for example, 255.255.255.0).

Table 4 - 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 5 - 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

4.2.4 Change Telnet configuration password

Setting the Telnet configuration password prevents unauthorized access of the setup menu via a Telnet connection to port 9999 or through 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.

4.2.5 DHCP Naming

If a DHCP server has automatically assigned the IP address and network settings, you can discover the unit by using the Device Installer network search feature.

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).

4.3 Channel 1 Configuration (Serial Port Parameters)

This section describes how to setup the serial port. The following parameters are displayed when you select **Channel 1** (Option 1).

```
Baudrate (9600)
I/F Mode (4C)
Flow (00)
Port No (10001)
ConnectMode (C0)
Send '+++' in Modem Mode  (Y) ?
Auto increment source port (N) ?
Show IP addr after 'RING' enabled
Remote IP Address : (000).(000).(000).(000)
Remote Port (00000)
DisConnMode (00)
FlushMode   (00)
DisConnTime (00:00) :
SendChar 1  (00)
SendChar 2  (00)
```

4.3.1 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. XPort-03 and greater units also support high-performance baud rates of 460800 and 921600 bps. See *Expert Settings* on page 4-22.

4.3.2 I/F (Interface) Mode

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

Table 6 - Interface Mode Options

I/F Mode Option	7	6	5	4	3	2	1	0
RS-232C [1]							0	0
RS-422/485							0	1
RS-485 2-wire							1	1
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 stop bits are implemented by software. This might have influence on performance.

Note: RS-422/485 I/F Modes are supported on XPort-03 with firmware 6.1.0.0 and above.

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

Table 7 - 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

4.3.3 Flow

Flow control sets the local handshaking method for stopping serial input/output.

Table 8 - Flow Control Options

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

Note: RTS and CTS control lines are not enabled at the factory. See Device Installer on page 3-3. You must use the web manager to configure the hardware handshake signals.

Note: On the NET232, CP0 should only be set to Clear To Send (CTS) or the default setting. CP1 is not used. CP2 should only be set to Ready To Send (RTS), Data Terminal Ready (DTR) or the default setting.

4.3.4 Port Number

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

Table 9 - Reserved Ports

Port Numbers	Reserved for
1 – 1024	Reserved (well known ports)
9999	Telnet setup
10001	Default Setting
14000-14009	Reserved for Comm Port Redirector
30704	Reserved (77F0h)
30718	Reserved (77FEh)

Warning: We recommend that you not use the reserved port numbers for this setting as incorrect operation may result.

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 50000 will be used to actively establish a connection. Each subsequent connection will increment the number by 1. When the port number reaches 59999, it will wrap back to 50000.

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.

4.3.5 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 the Tech Notes guide.

Table 10 - 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 a specific start character					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								
No Echo			0	0		1	1	
Data Echo and Modem Response (Numeric)			0	1		1	1	1
Data Echo and Modem Response (Verbose)			0	1		1	1	0
Modem Response Only (Numeric)			0	0	1	1	1	1
Modem Response Only (Verbose)			0	0	1	1	1	0

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 a Specific Start Char: Attempts to connect when it receives a specific start character from the serial port. The default start character is carriage return.

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 11 - 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
C0.0.0.0/0	Enter Monitor Mode

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 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.

```
Baudrate (9600)
I/F Mode (4C)
Flow (00)
Port No (10001)
ConnectMode (21)
Send '+++' in Modem Mode (Y) ?
Auto increment source port (N) ?

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 2 - Hostlist Option

To use the Hostlist option, follow these steps:

1. 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 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:

Directed UDP: 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:

In Modem (Emulation) 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 NET232s, 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 **06** (no echo), **16** (echo with full verbose), or **17** (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 06 (no echo), 16 (echo with full verbose), or 17 (echo with 1-character response).

Without Echo:	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).
Data Echo & Modem Response	**Full Verbose**: The unit echoes modem commands and responds to a command with a message string shown in the table below. **Numeric Response**: The unit echoes modem commands and responds to a command with a numeric response.
Modem Responses Only	**Full Verbose:** The unit does not echo modem commands and responds to a command with a message string shown in the table below. **Numeric Response**: The unit does not echo modem commands and responds to a command with a numeric response.

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.

Message	Meaning
OK	Command was executed without error.
CONNECT	A network connection has been established
NO CARRIER	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.
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 will 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 is taken.

If the Numeric Response option is in effect, unrecognized command strings that are otherwise formatted correctly will be responded to with **OK** and no further action is 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, the unit will remain in data transfer mode.

Table 12 - 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).
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.

4.3.6 Send the Escape Sequence (+++) in Modem Mode

Disable or enable the ability to send the escape sequence. The default is **Y** (Yes) (send the escape sequence).

4.3.7 Show IP addr after 'RING'

TBD

4.3.8 Auto Increment Source Port

Y (Yes) auto increment the source port. The NET232 increments the port number used with each new connection

4.3.9 Remote IP Address

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

*Note: This option does not display when Hostlist is enabled from the **ConnectMode** prompt.*

4.3.10 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.

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).

Note: This option does not display when Hostlist is enabled from the ConnectMode prompt.

4.3.11 DisConnMode

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

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

Note: DTR is not factory enabled. It must be enabled with the Configurable Pins option. See Device Installer on page 3-3. You must use the web manager to configure the hardware handshake signals.

Note: There is no State LED on the NET232.

Table 13 - Disconnect Mode Options

Disconnect Mode Option	7	6	5	4	3	2	1	0
Disconnect with DTR drop [6]	1							
Ignore DTR	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 NET232 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.

4.3.12 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.

Table 14 - 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							

4.3.13 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.

Table 15 - Pack Control Options

Option	7	6	5	4	3	2	1	0
Packing Interval								
Interval: 12ms							0	0
Interval: 52ms							0	1
Interval: 250ms							1	0
Interval: 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					

Packing Interval: Packing Interval defines how long the unit should wait before sending accumulated characters. This wait period is between successive network segments containing data. For alternate packing, the default interval is 12 ms.

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 Send 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.

4.3.14 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.

4.3.15 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 *4-19*).

4.3.16 Telnet Terminal Type

This parameter appears only if the terminal type option is enabled in Disconnect Mode (see *DisConnMode* on page *4-17* 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.

4.3.17 Channel (Port) Password

This parameter appears only if the channel (port) password option is enabled in Disconnect Mode (see *DisConnMode* on page *4-17*). If the option is enabled, you can set a password on the serial port.

4.4 E-mail Settings

The configurable pin option for triggering e-mail is NOT used on this product. The configurable pins are used for other purposes.

The only method available for e-mail triggering is to use the two-byte serial string to initiate a trigger.

To configure e-mail settings via DeviceInstaller, see E-mail Notification in the DeviceInstaller User Guide.

Note: The configurable pins CP0, CP1 and CP2 CANNOT be used to trigger E-mail.

```
***************** E-mail *****************
Mail server (0.0.0.0) (000) .(000) .(000) .(000)
Unit name ():
Domain name ():
Recipient 1 ():
Recipient 2 ():

- Trigger 1
Enable serial trigger input (N) ?
Trigger input1 [A/I/X] (X) ?
Trigger input2 [A/I/X] (X) ?
Trigger input3 [A/I/X] (X) ?
Message ():
Priority (L):
Min. notification interval (1 s):
Re-notification interval (0 s):

*** Trigger 2
Enable serial trigger input (N) ?
Trigger input1 [A/I/X] (X) ?
Trigger input2 [A/I/X] (X) ?
Trigger input3 [A/I/X] (X) ?
Message ():
Priority (L):
Min. notification interval (1 s):
Re-notification interval (0 s):
```

```
*** Trigger 3
Enable serial trigger input (N) ?
Trigger input1 [A/I/X] (X) ?
Trigger input2 [A/I/X] (X) ?
Trigger input3 [A/I/X] (X) ?
Message ():
Priority (L):
Min. notification interval (1 s):
Re-notification interval (0 s):
```

4.4.1 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 NET232 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.

4.4.2 Trigger Setup

A trigger event can occur by receiving two bytes of a specified sequence on the serial port. 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.

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

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.

4.5 Expert Settings

```
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): (45)
ARP Cache timeout in s (1s – 600s) : (600) ?
CPU Performance (0=Regular, 1=Low, 2=High): (0) ?
Disable Monitor Mode @ bootup  (N) ?
RS485 tx enable active level (0=low; 1=high): (0) ?
HTTP Port Number :  (80) ?
SMTP Port Number :  (25) ?
MTU Size (512 – 1400): (1400) ?
Enable alternate MAC (N) ?
Ethernet connection type: (0) ?
```

4.5.1 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.

4.5.2 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.

4.5.3 Enable High Performance

This option applies to XPort-03 and greater units only. It allows you to increase the CPU performance and utilize the higher baud rates on the serial interface (i.e. 460Kbps and 920Kbps). Increasing CPU performance requires more power and lowers the unit's operating temperature. The standard CPU performance mode supports up to 230400 baud.

Note: If baud rates of 460Kbps or 920Kbps is set and the high performance mode disabled, the operation of the serial channel would be out of the specified error tolerance thereby leading to inconsistent speed settings on the two ends of the serial channel.

4.5.4 Disable Monitor Mode at Bootup

This option allows you to disable the Monitor Mode only during the startup sequence. This prevents all entries into Monitor Mode except thru 'xxx' followed by 'M'. All other Monitor Mode entry sequences, e.g. 'zzz' and 'yyy', are blocked during startup.

4.5.5 RS-485 TX Enable Active Level

This option allows the selection of the active level (either active high or active low) for the RS485_TXEN signal. The default is active low.

This setting only applies if one of the configurable pins for the RS485_TXEN functionality is selected. For the RS-485 interface mode to operate correctly, configure one of the configurable pins to RS485_TXEN. To change the configurable pins' settings, use DeviceInstaller or send setup records to port 77FE. On the NET485, the only valid pin is CP1. See the NET485 manual.

4.5.6 HTTP Port Number

This option allows changing the HTTP port number. The valid range is from 1 - 65535. The default value is 80.

4.5.7 SMTP Port Number

This option allows you to configure the SMTP (email) port number. Valid range is from 1 - 65535. The default value is 25.

4.5.8 MTU Size

The Maximum Transmission Unit (MTU) is the largest physical packet size a network can transmit for TCP and UDP. Enter between 512 and 1400 bytes. The default is 1400 bytes.

4.5.9 Enable Alternate MAC

If necessary, enable the alternate MAC address (if specified in the OEM setup record).

4.5.10 Ethernet Connection Type

The NET232 allows for the Ethernet speed and duplex to be manually configured. Enter 0 for auto-negotiation (default). To select the speed and duplex, enter one of the following: 2 (10Mbit/half duplex), 3 (10Mbit/full duplex), 4 (100Mbit/half duplex), or 5 (100Mbit/full duplex).

4.6 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.

Caution: Disabling both Telnet Setup and Port 77FE will prevent users from accessing the setup menu from the network. Disabling Port 77FE also disables the Web from configuring the device.

```
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 Web Setup (N)
Disable ECHO ports (Y)
Enable Encryption (N)
Enable Enhanced Password (N)
Disable Port 77F0h (N)
```

4.6.1 Disable SNMP

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

4.6.2 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**.

4.6.3 Disable Telnet Setup

Note: If you choose to disable this option, keep in mind that disabling both Telnet Setup and Port 77FE will prevent users from accessing the setup menu from the network.

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.

4.6.4 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 Device Installer's Recover Firmware procedure.

4.6.5 Disable Port 77FE (Hex)

Note: If you choose to disable this option, keep in mind that disabling both Telnet Setup and Port 77FE will prevent users from accessing the setup menu from the network.

Port 77FE is a setting that allows Device Installer, Web-manager, and custom programs to configure the unit remotely. You may want 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 Device Installer, web pages, Telnet, or serial configuration.

The Y (Yes) option disables remote configuration and web sites.

Note: The Y (Yes) option disables many of the GUI tools for configuring the unit, including the embedded Web-Manager tool.

4.6.6 Disable Web Server

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

4.6.7 Disable Web Setup

The Y (Yes) option disables configuration using the Web-Manager. This setting defaults to the N (option).

4.6.8 Disable ECHO Ports

Controls whether the serial port will echo characters it receives.

4.6.9 Enable Encryption

Rijndael is the block cipher algorithm chosen by the National Institute of Science and Technology (NIST) as the Advanced Encryption Standard (AES) to be used by the US government. The NET232 supports 128-, 192-, and 256-bit encryption key lengths.

Note: Configuring encryption should be done through a local connection to the serial port of the NET232, or via a secured network connection. Initial configuration information, including the encryption key, is sent in clear text over the network.

To configure AES encryption on the NET232:

1. When prompted to enable encryption, select Y.

2. When prompted, enter the encryption key length. The NET232 supports 128-, 192-, and 256-bit encryption key lengths.

3. When prompted to change keys, select Y.

4. At the Enter Keys prompt, enter your encryption key. The encryption keys are entered in hexadecimal. The hexadecimal values are echoed as asterisks to prevent onlookers from seeing the key. Hexadecimal values are 0-9 and A-F.
   - For a 128-bit key length, enter 32 hexadecimal characters.
   - For a 192-bit key length, enter 48 hexadecimal characters.
   - For a 256-bit key length, enter 64 hexadecimal characters

5. Continue pressing Enter until you return to the Change Setup menu.

6. From the Change Setup menu, select option 9 to save and exit.

Encryption only applies to the port selected for data tunneling (default 10001), regardless of whether you are using TCP or UDP.

Generally, one of two situations applies:
- Encrypted NET232-to-NET232 communication. Be sure to configure both NET232 devices with the same encryption key.
- Third-party application to NET232-encrypted communication: NET232 uses standard AES encryption protocols. To communicate successfully, products and applications on the peer side must use the same protocols and the same encryption key as the NET232.
- Lantronix Secure Com Port Redirector provides an encrypted connection from Windows-based applications to the NET232. Information about SCPR is at http://www.lantronix.com/device-networking/utilities-tools/scpr.html

4.6.10 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 and web page access.

4.6.11 Disable Port 77F0 (Hex)

Port 77F0 is a setting that allows a custom application to query or set the three NET232 configurable pins when they are functioning as general purpose I/O (GPIO). You may want to disable this capability for security purposes. The default setting is the N (No) option, which enables GPIO control. The Y (Yes) option disables the GPIO control interface.

Note: The function of the configurable pins on the NET232 should be changed with caution. Some of the configurable pins are not connected or used for other functions.

4.7 Defaults

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

4.8 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

Your unit was tested and shipped with the latest version of firmware.
Note: Do not upgrade firmware unless directed by Technical Support.

5.1.1 Reloading Firmware

Reloading the firmware of a device will destroy all settings and configurations.

Firmware files are not freely distributed since changing the firmware of a device will change is operational features. This should only be done under the direction of technical support.

5.1.2 Via Device Installer

After copying the firmware to your computer, use Device Installer to install it.

1. Store the firmware in a subfolder on your computer.
2. Start Device Installer and search the network for the device you want to upgrade.

3. Select the desired unit and click the **Upgrade** icon or select **Upgrade** from the Device menu. The Device Upgrade Wizard appears. Follow the instructions on the wizard screens.

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

6. Troubleshooting

This chapter discusses how you can diagnose and fix errors quickly without having to contact tech support.

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 NET232 is powered up. Confirm that you are using a good network connection. See *Table 2 - NET232 LED Functions* on page *2-7* for a description of the LEDs.

Note: For more information about the ARP commands, see the Technical Notes manual, GC-800239.

Table 16 - 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 unit 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.

7. Monitor Mode

7.1 Monitor Mode

Monitor Mode is a command-line interface used for diagnostic purposes (see *Table 17 - Monitor Mode Commands* on page *7-5*. There are two ways to enter Monitor Mode: locally through the serial port or remotely through the network.

Note: Some firmware versions may not support Monitor Mode.

7.1.1 Entering Monitor Mode Using the Serial Port

Note: NET232 Only

To enter Monitor Mode locally:

1. Follow the same principles used in setting the serial configuration parameters.
2. Instead of typing three "x" keys, however:

> Type zzz (or xxl) to enter Monitor Mode with network connections.
> Type yyy (or yy1) to enter Monitor Mode without network connections.
> A 0> prompt indicates that you have successfully entered Monitor Mode.

7.1.2 Entering Monitor Mode Using the Network Port

To enter Monitor Mode using a Telnet connection:

1. 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
```

2. Type M (upper case).

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

7.1.3 Monitor Mode Commands

The following commands are available in Monitor Mode. Some commands have an IP address as an optional (opt) 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 17 - Monitor Mode Commands

Command	Command Name	Function
VS x.x.x.x	Version	Query software header record (16 bytes) of unit with (opt) IP address x.x.x.x
GC x.x.x.x	Get Configuration	Get configuration of unit with (opt) IP address x.x.x.x as hex records (120 bytes)
SC x.x.x.x	Send Configuration (CAUTION)	Set configuration of unit with (opt) IP address x.x.x.x from hex records
PI x.x.x.x	Ping	Pings unit with IP address x.x.x.x to check device status
AT	ARP Table	Show the unit's ARP table entries
TT	TCP Connection Table	Shows all incoming and outgoing TCP connections
NC	Network Connection	Shows the unit's IP configuration
RS	Reset	Resets the unit'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.
GM	Get MAC address	Shows the unit's 6-byte MAC address.
SS	Set Security record	Sets the Security record without the encryption key and length parameters. The entire record must still be written, but the encryption-specific bytes do not need to be provided (they can be null since they are not overwritten).

Responses to some of the commands are given in Intel Hex format.

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

Table 18 -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