``

# Ether Series

## DNP-3 Gateway

## EDNP-3

## User's Guide

Revised June 2025

Firmware Version 3.x

## FCC Statement

This device complies with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

## CE Marking Warning

This is a class B product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## RoHS Compliant

This product is RoHS Compliant.

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Version 3.x

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# Chapter 1
# Introduction

*This chapter provides an overview of the features and capabilities.*

Congratulations on the purchase of your new EtherSeries DNP-3 Ethernet Gateway. Interfaces include one 10/100BaseT Ethernet interface and two RS-232/422/485 serial9-pin interfaces. A version is also available with two opto-isolated RS-422/485 interfaces.

The gateway allows serial DNP-3 RTUs to communicate and interoperate with DNP/IP (either TCP or UDP) based controllers. The DNP-3 standard protocol is an asynchronous protocol designed to connect directly to computer asynchronous ports. DNP-3 has been extended to operate over Ethernet using the IP protocol suite. This gateway converts between the DNP-3 IP protocol and DNP-3 Serial protocols transparently.

Normal operation would consist of one or more Ethernet based computers functioning as DNP-3 Host and one or more DNP-3 slave devices (usually RTUs) connected serially to the gateway.

By using RS-485, multiple DNP-3 slave devices may be connected to each of the two serial ports on the EDNP-3. If using RS-232, one DNP-3 slave device may be connected to each serial port.

The EDNP-3 is designed for mounting on a standard DIN rail, or for direct mounting on a wall. For easy connection to your

LAN, the gateway supports 10BaseT or 100BaseT , half or full duplex with auto-sensing or pre-configuration.

## EtherSeries EDNP-3 Functions

The gateway allows serial DNP-3 RTUs to communicate and interoperate with DNP-3/IP (either TCP or UDP) based controllers. The DNP-3 standard protocol is an asynchronous protocol designed to connect directly to computer asynchronous ports. DNP-3 has been extended to operate over Ethernet using the IP protocol suite. This gateway converts between the DNP-3 IP protocol and DNP-3 serial protocols transparently.

The EDNP-3 enables one or more DNP-3 Ethernet based controllers to communicate with DNP-3 based serial RTUs. It will not allow DNP-3 IP RTUs to operate with a serial DNP-3 controller.

## Other Features

### Dual Serial Ports

The EDNP-3 contains two serial ports. The two serial ports are independent, and may be used with different hosts and different serial protocol speeds as well as different DNP-3 address ranges and timeouts.

### Multiple Hosts

The EDNP-3 may communicate with multiple host controllers.

### Upgradeable Firmware

Firmware upgrades are downloadable to the gateway. The utility program required for this, and the actual firmware

upgrades, are available from your dealer. A Windows workstation is required to run the download software.

# Physical Details

The EDNP-3 front panel is shown below.

**EtherSeries EDNP-3 without and with Opto-isolation**

| | | |
|---|---|---|
| **1** | **Power port** | Connect the power adapter here. |
| **2** | **10/100Base-T port** | Connect LAN cabling here. |
| **3** | **RUN LED** | RUN Indicator |
| **4** | **LAN LED** | LAN Indicator. |
| **5** | **COM1 Tx** | Serial Port Transmit Indicator |
| **6** | **COM1 Rx** | Serial Port Receive Indicator |
| **7** | **COM2 Tx** | Serial Port Transmit Indicator |
| **8** | **COM2 Rx** | Serial Port Receive Indicator |

## Configuration Switch

There is a momentary action push button switch on the rear of the unit behind a small hole. Pressing this switch places the unit in configuration mode and is used only when configuring the unit **via the serial port**, as explained in *Chapter 3 - Configuration.* Return from configuration mode by exiting the configuration menu or by power cycling the unit. This switch may be depressed with a tiny screw driver or stiff wire. (A straightened paper clip works nicely).

## LED Indicators

There are six red LED indicators on the top panel.

## LED Indicators

- The LAN LED is the Ethernet Status indicator. It is lit when there is a valid 10/100BaseT Ethernet connection.
- This LED flickers off and on with activity on the Ethernet (even if the activity isn't directly to this unit).
- The RUN LED flickers off and on with Ethernet transmit activity from the EDNP-3.
- The COM port Tx and Rx LEDs flicker off and on with characters being transmitted or received through the appropriate serial port.

## Package Contents

You should find the following items packaged with your EtherSeries product:

- The EtherSeries Unit
- Power Adapter (or power supply)
- This User's Guide

If any of the above are missing, contact your dealer immediately.

## Software Requirements

The EDNP-3 supports DNP-3 (either TCP or UDP) on the Ethernet interface and DNP-3 serial protocol on the serial ports.

It may be configured using any terminal or terminal emulation software on a PC via serial port one. Any standard telnet program may be used to telnet to the unit for configuration, or any standard web browser may be used for configuration once the unit has a valid IP address configured. Since any terminal program (including Microsoft Hyperterm) or web browser may be used when configuring the unit, there is no supplied configuration software.

# Chapter 2
# Installation

*This Chapter details the LAN installation process for the EtherSeries product.*

## Overview

The EtherSeries products may be configured via a serial port, telnet, or web browser. Initially, the configuration of an IP address must be performed using the serial port unless the default IP address of 192.168.1.1 is appropriate for your Ethernet network.

To use LAN based configuration, either *Telnet or Web Browser based,* an IP address must be configured. The default value of 192.168.1.1 may not work with your network.

*Terminal Mode* configuration may be performed at any time, and no IP address is required. See Chapter 3 for details.

## Quick Start

Quick start instructions are on the next page. Installation is an easy process that is basically… ***plug it in, configure IP, configure DNP-3, and configure the serial ports***.

# Installation

## 1. Connect the Network Cable

The EtherSeries network interface is auto-sensing. Simply connect your network cable to the appropriate connector on the rear panel. If you wish to configure Ethernet options, that may be performed later.

## 2. Connect the Power Adapter Cable

Plug in the power adapter cable. After about a 4 second boot process the unit is ready for operation. Some configurations require wiring to a screw-terminal block.

## 3. Configure IP Address Information

Using the default address and telnet or a web browser OR using a serial port and terminal emulation, configure the IP and DNP-3 Ethernet information. At a minimum, the IP address and port number must be configured.

## 4. Configure a Serial Port

Configure the appropriate serial ports for the proper DNP-3 protocol, slave address range, and timeouts.

## 5. Configure the DNP-3 Host.

You are now ready to use the EtherSeries Gateway. Configure the DNP-3 host computer and the serial RTUs for proper operation and start using it!

# Chapter 3
# Terminal/Telnet Configuration

*This Chapter describes how to manage the EtherSeries product using Terminal, or Telnet mode. Web Browser mode management is detailed in Chapter 4.*

## Overview

The EtherSeries unit may be managed using any of the following methods:

- **Web Browser** - After installing the unit in your LAN, use your Web Browser for management. See *Chapter 4 - Browser Configuration* for details.
- **Terminal Mode** - Use a serial cable connection and a communication program. This is often required prior to other modes in order to configure a compatible IP address into the unit.
- **Telnet Mode** - After installing the unit in your LAN, manage it using Telnet.

Both ***Terminal*** and ***Telnet*** modes provide the same user interface.

# Terminal Configuration

Terminal configuration requires the following:

- PC with terminal emulation program, or a dumb terminal.
- Serial cable to connect the PC to the unit. See the Appendix for cable requirements. A Crossover (null modem) cable is required when using a 9-pin PC port.
- Serial port 1 must be configured as an RS-232 port. This is the factory default configuration.

## Procedure

1. Connect the unit to your PC or terminal.
2. Connect the unit to the power supply.
3. Press the configuration setup switch momentarily. It is located to the side of the power connector and accessed through a small hole. Use a small pen or paper clip to access the switch.
4. Configure the terminal program with the following settings.

| Setting | Value |
|---|---|
| Flow control protocol | None |
| Speed | 9600 |
| Data | 8 bits |
| Parity | None |
| Stop Bit | 1 |

5. Configure your terminal program to the appropriate port (e.g. COM 1).

6. The configuration program should now start and after a few seconds display a sign-on screen.

   If nothing appears on your screen, press ESC.

   Refer to the Terminal/Telnet Interface chapter for details on using the configuration program.

## Telnet Management

**NOTE: To use telnet, there MUST be compatible IP addresses in both the PC and the unit!**

1. Install the unit into your LAN as described in Chapter 2. Ensure that the unit is powered on.
2. Connect to it with the telnet program on your workstation. A typical command is:

   ```
   telnet IP_Address 8000
   ```

   Where:
   `IP_Address` is the IP address of the unit.
   8000 is the management port number. For example, if the default IP address has not been changed, then you would enter the command:

   ```
   telnet 192.168.1.1 8000
   ```

### If you can't connect

If the unit does not respond, check the following:

- It is properly installed, LAN connections are OK, and it is powered ON.
- Check that your PC is using a compatible *IP Address* and *Network Mask*.
  In Windows, using Control Panel-Network to examine the Properties for the TCP/IP protocol can check the IP

Address and Network Mask. If your PC is NOT using an IP Address within the range 192.168.1.2 to 192.168.1.254, with a Network Mask of 255.255.255.0, then it will not connect to the default IP address.

3. Refer to the following section for details on using command line management.

# Terminal/Telnet Interface

The banner screen displays the version number.

```
DNP Server Gateway  V3.0
--------------------------------
 Device Name: GW00479E
 Physical Location: Head Office

 Configuration setup.

[Press any key to continue]
```

Pressing any key will then take you to the Main Menu.

```
Main Menu
-----------------------------------------
 1  Set Local IP Address,
     Subnet Mask, and Gateway Address
 2  Set Manager/Telnet IP Address
 3  Serial Port 1 Configuration
 4  Serial Port 2 Configuration
 5  DNP LAN Configuration
 6  DNP Serial Configuration
 7  Security Configuration
 8  SNMP Configuration
 9  Display Configuration Settings
 R  Reset Configuration to Default
 S  Save and Exit
 0  Exit without Saving
Choose a Number =>
```

Each of these menu options is explained in the following pages.

# Entering Data

Enter the number of the field you wish to change, followed (on the same line) by a space and the data for that field.

**Example**

On screen one, to set the IP address (field 1) to 192.168.1.10

```
=>1 192.168.1.10
```

# Menu Options

## Main Menu Option 1. Setting IP Addresses

Selecting 1 (`1  Local IP Address`) from the Main Menu will result in a screen which is similar to the following.

```
LOCAL UNIT CONFIGURATION:
 Local Address: 205.166.54.137       Serial NO:
00:60:E9:00:47:9E
 Gateway Address: (NOT SET)          Subnet Mask:
255.255.255.0
 IP Fragmentation: ALLOWED
 Ethernet Mode: Auto

SET LOCAL UNIT CONFIGURATION:
 1  Local IP Address
 2  Subnet Mask
 3  Gateway IP Address
 4  IP Fragmentation [0=ALLOWED, 1=NOT ALLOWED]
 5  Ethernet Mode [0=Auto, 1=100Mb-Full, 2=100Mb-
Half, 3=10Mb-Full, 4=10MB-Half]
 0  -- Return to previous menu

EXAMPLE: To set local IP address to 192.168.0.100
   => 1 192.168.0.100

Enter Command =>
```

### 1. Local IP Address

The IP address of this unit on your LAN. The default IP Address is 192.168.1.1

### 2. Subnet Mask

The network mask indicates what class of TCP/IP network you have. The default value is for a class "C" network, with up to 255 users. This value should work in small networks. If in doubt, consult your network administrator .

### 3. Gateway IP Address

If the remote host is not on the same LAN, then the gateway to the other LAN must be entered here.

### 4.IP Fragmentation

The unit may be instructed to not fragment any outgoing Ethernet packets. If this is turned on, then the DoNotFragment bit is also set in all IP packets. Note that all routers do not abide by this directive, and the packets may be fragmented in transit.

### 5. Ethernet Mode

The Ethernet interface may be forced in either Half or Full Duplex, and 10Mbps or 100Mbps speeds, or these values auto-negotiated with the connected switch/hub. Normally set for AUTO, this field allows the unit to force one of the modes for compatibility with Ethernet switches that negotiate incorrectly.

## Main Menu Option 2.
## Set Manager/Telnet IP Address

Selecting (2) from the Main Menu will result in the following screen. Caution! If these addresses are set, only those nodes will be allowed to configure the unit.

```
MANAGER CONFIGURATION:
 Entry  Manager_IP_Addr
 *****  ***************
   1.   0.0.0.0
   2.   0.0.0.0
   3.   0.0.0.0
   4.   0.0.0.0

SET MANAGER CONFIGURATION:
 set Entry_Number IP_Address
 clear Entry_Number
 0   --Return to main menu.

EXAMPLE: To set entry #3 to IP address=138.239.0.24,
   => set 3 138.239.0.24
EXAMPLE: To clear entry #2 IP address,
   => clear 2

Enter Command =>
```

This screen shows a table containing four (4) entries. By default, all entries are blank. These entries provide a security feature. Only a user at one of the IP addresses shown can manage the unit. (All users on the LAN can still use the gateway, but not configure it.)

**If the entries are blank, then any user on the LAN can configure the gateway.**

Entries in the table cannot be edited, but commands are provided to insert (SET) and delete (CLEAR) entries.

## Main Menu Options 3 & 4. Serial Port Configuration

Selecting (3) from the Main Menu will result in the following screen for port 1. Selecting (4) from the Main Menu will result in a similar screen for port 2.

```
PORT 1 CONFIGURATION:
 Baud Rate: 9600
 RS485:     4-wire  [RS232 selected]
 TX Delay after RTS Active:    0 ms

SET PORT CONFIGURATION:
 1  Baud Rate  [0=230400, 1=115200, 2=57600, 3=38400,
4=19200,
               5=9600, 6=4800, 7=2400, 8=1200,
9=600, 10=300]
 2  RS485 Mode [0=4-wire, 1=2-wire]
 3  TX Delay after RTS Active [0 - 5000 ms]
 0 -- Return to previous menu.

EXAMPLE: To set the baud rate to 9600
   => 1 5

Enter Command =>
```

This screen configures the settings for the serial ports. The settings used should match the device connected to the serial ports of the gateway.

### Baud Rate

Speeds between 300 bps and 230.4Kbps are supported.

### RS-232/422/485 Mode

Configure the port for either RS-422/485 4-wire, RS-485 2-wire, or RS-232.

### Tx Delay after RTS Active

This parameter sets the minimum amount of time to delay after asserting RTS before sending data. Set to a value between 1 and 5000 msec (5 seconds).

## Main Menu Option 5. DNP LAN Configuration

Selecting (5) from the Main Menu will result in the following screen:

```
DNP LAN CONFIGURATION:
 LAN Protocol: TCP
 TCP/UDP Port: 19968
 TCP Connection Timeout: 120 seconds

SET DNP LAN CONFIGURATION:
 1  LAN Protocol [0=TCP, 1=UDP]
 2  TCP/UDP Port [0 - 65535]
 3  TCP Connection Timeout [10 - 3600 seconds]
 0  -- Return to previous menu

EXAMPLE: To set the Connection Timeout to 120 seconds
   => 3 120

Enter Command =>
```

Use this screen to configure DNP-3 TCP/UDP configuration values.

### LAN Protocol

Set to either TCP or UDP. This must match the protocol used by your polling host computer.

### TCP/UDP Port

This is the TCP/IP port number used by the gateway. Default is normally set to port 20000.

### TCP Connection Timeout

This parameter sets the amount of time the Gateway will hold an idle TCP connection open before closing it. Default is 120 seconds.

## Main Menu Option 6.
## DNP Serial Configuration

```
Selecting (6) from the Main Menu will
result in the following screen:

DNP SERIAL CONFIGURATION:
 Port 1 DNP Address Low:     256 (0100 hex)
 Port 1 DNP Address High:  65527 (FFF7 hex)
 Port 2 DNP Address Low:     256 (0100 hex)
 Port 2 DNP Address High:  65527 (FFF7 hex)

SET DNP SERIAL CONFIGURATION:
 1  Port 1 DNP Address Low  [0 - 65534]
 2  Port 1 DNP Address High [0 - 65534]
 3  Port 2 DNP Address Low  [0 - 65534]
 4  Port 2 DNP Address High [0 - 65534]
 0  -- Return to previous menu

EXAMPLE: To set the Port 1 low address limit to 200
   => 1 200

Enter Command =>
```

Use this screen to configure DNP serial configuration values. For each of the ports (1 or 2) configure the following…

### RTU DNP Address Low

Configures the lowest address of an RTU on this port.

### RTU DNP  Address High

Configures the highest address range of an RTU on this port. If the ranges of port one and port two overlap, addresses in the overlap will be sent to port one.

.

## Main Menu Option 7. Security Configuration

Selecting (7) from the Main Menu will result in the following screen:

```
SECURITY CONFIGURATION:

 Web Configuration:    ENABLED
 Telnet Configuration: ENABLED
 SNMP Agent:           ENABLED

 Index UserName Password
 ----- -------- --------
    1:
    2:
    3:

SET SECURITY CONFIGURATION:
 1  Disable Web Configuration [0=ENABLED, 1=DISABLED]
 2  Disable Telnet Configuration [0=ENABLED,
1=DISABLED]
 3  Disable SNMP Agent [0=ENABLED, 1=DISABLED]
 4  Set User ID and Password [index userid password]
 5  Clear User ID and Password
 0  -- Return to previous menu

EXAMPLE: To set User ID 1 to root, password toor
   => 4 1 root toor

Enter Command =>
```

This product uses industry standard IP protocols. Since IP is a well-known standard, its security vulnerabilities are also well known and may be exploited. Several options are available to enhance the inherent security of your network. However, since network security is a moving target and absolute security is never achievable, every network installation should be

designed and implemented with care to minimize security risks in a way that is appropriate for the application and perceived risks.

A full description of the configuration security options is presented in Chapter 7 and should be fully understood before implementation on an insecure network.

In this section, the following options are configured:

### Web Configuration

The ability to configure the gateway using a web browser may be enabled or disabled.

### Telnet Configuration

The ability to configure the gateway using a telnet client may be enabled or disabled.

### SNMP Client functionality

The ability to communicate with the gateway using a SNMP may be enabled or disabled.

### Set User ID and Password

Configure the configuration user name and password, if enabled.

### Clear User ID and Password

Clear (turn off) the configuration user name and password, if enabled.

## Main Menu Option 8.
## SNMP Configuration

Selecting (8) from the Main Menu will result in the following screen:

```
SNMP CONFIGURATION:
 Name of Contact Person: Supervisor
 Device Name: GW00479E
 Physical Location: Head Office
 SNMP Community: public


SET SNMP CONFIGURATION:
 1  Name of Contact Person
 2  Device Name
 3  Physical Location
 4  SNMP Community
 0  -- Return to previous menu

Enter Command =>
```

This information may be ignored if SNMP is not used.

These are text fields, commonly used in SNMP (Simple Network Management Protocol) Programs to identify this device when browsing or managing the network.

These values have no effect on the functional operation of the unit. Other standard MIB values are returned to the SNMP manager along with this information. The gateway may not be remotely configured using SNMP.

The MIB file is available from the DCB website.

## Main Menu Option 9. Display Configuration Settings

Selecting (9) from the Main Menu will display the following information:

```
DNP Server Gateway: V1.0

LOCAL UNIT CONFIGURATION:
 Local Address: 205.166.54.137       Serial NO:
00:60:E9:00:47:9E
 Gateway Address: (NOT SET)          Subnet Mask:
255.255.255.0
 IP Fragmentation: ALLOWED
 Ethernet Mode: Auto

SNMP CONFIGURATION:
 Name of Contact Person: Supervisor
 Device Name: GW00479E
 Physical Location: Head Office
 SNMP Community: public


MANAGER CONFIGURATION:
 Entry  Manager_IP_Addr
 *****  ***************
   1.   0.0.0.0
   2.   0.0.0.0
   3.   0.0.0.0
   4.   0.0.0.0

[Press any key to continue]



PORT 1 CONFIGURATION:
 Baud Rate: 9600
 RS485:     4-wire  [RS232 selected]
 TX Delay after RTS Active:    0 ms

PORT 2 CONFIGURATION:
 Baud Rate: 9600
 RS485:     4-wire
```

```
 TX Delay after RTS Active:    0 ms

[Press any key to continue]
DNP LAN CONFIGURATION:
 LAN Protocol: TCP
 TCP/UDP Port: 19968
 TCP Connection Timeout: 120 seconds

DNP SERIAL CONFIGURATION:
 Port 1 DNP Address Low:     256 (0100 hex)
 Port 1 DNP Address High:  65527 (FFF7 hex)
 Port 2 DNP Address Low:     256 (0100 hex)
 Port 2 DNP Address High:  65527 (FFF7 hex)

CURRENT STATISITCS:
 LAN packets sent:        343
 LAN packets rcvd:      13598
 LAN packet errors:         0
 DNP no path errors:        0
 DNP no path errors:        0
 DNP broadcasts:            0

 SERIAL PORT:               1       2
                      ------- -------
 Port bytes sent:           0       0
 Port bytes rcvd:           0       0
 Port packets sent:         0       0
 Port packets rcvd:         0       0
 Port Receive errors:       0       0
 Dest addr errors:          0       0
 Source addr errors:        0       0

TCP Host List

[Press any key to continue]
```

This option displays the configuration and some operational counters. A list of TCP hosts recently contacted is also included.

"Receive Errors" counts the number of serial packets with CRC errors and the number of packets where there was a time-out receiving the DNP3 header. There is a 100ms idle timeout on

receiving the header.

"Destination Address Error" - When sending a serial packet to the network, the device doesn't what IP address to send the packet to. This mapping is learned by peeking into packets DNP3 packets as they go from the network side to the serial side. A map is built by associating the source IP address with the source DNP3 address.

"Source Address Error" - When the serial ports are configured, a range of DNP3 addresses are directed to each port. Source Address Errors indicate that a DNP3 packet received from the serial port had a source address that did not fall within the range of DNP3 addresses defined for that port. In other words, say the port was configured for addresses 10 – 20. If a serial packet is received with a source address of 21, it would increment this counter.

## Main Menu Option R.
## Reset Configuration to Default

Selecting (R) from the Main Menu will restore all values to their default values.

If using Telnet or web browser configuration, the connection will be lost when the hardware reboots. To reconnect, you must use the default IP Address of 192.168.1.1 or change the IP address before rebooting with main menu option 6. The preferred method is to restore defaults with menu item 8, and then ***BEFORE REBOOTING***, change the IP information by using submenu 1 so your PC will still be able to connect to the gateway when it reboots.

## Main Menu Option S. Save and Exit

Selecting (S) from the Main Menu will store the configuration details in the gateway and exit the configuration program.

If using Telnet, the connection will be lost when rebooting. If you have changed the IP Address, you must use the new IP Address when you reconnect.

## Main Menu Option 0. Exit without Saving

Selecting (0) from the Main Menu will exit the configuration program without saving any data you have entered.

# Chapter 4

# Browser Management

*This Chapter describes how to manage the EtherSeries Gateway using a Web Browser.*

## Overview

This method uses your Web Browser to manage the gateway. This provides a more user-friendly interface than the Telnet/Terminal method.

- The unit must be installed in your **LAN and have a compatible IP address** before this configuration method can be used.
- Most Browsers will work. The only requirement is that they support HTML tables and forms. If your browser uses a proxy, the proxy function may need to be disabled.

## Connection Procedure

To establish a connection to the gateway , follow this procedure:

1. Install the unit in your LAN as described in Chapter 2. Ensure that it is powered on and there is a link light on the hub or Ethernet switch.
2. Start your Web browser.

3. In the *Address* box of your browser, enter the following:

   `http://IP_Address`

   (`IP_Address` is the IP address of the gateway)

   For example, if the default IP address has not been changed, then you would enter the command:

   `http://192.168.1.1`

**If you can't connect**

If it does not respond, check the following:

- The gateway is properly installed, LAN connections are OK, and it is powered ON.
- Check that your PC is using a compatible *IP Address* and *Network Mask*.
  In Windows98, using Control Panel-Network to examine the Properties for the TCP/IP protocol can check the IP Address and Network Mask.
  If your PC is NOT using an IP Address within the range 192.168.1.2 to 192.168.1.254, with a Network Mask of 255.255.255.0, it will not be able to communicate with the gateway.

4. Once connected, you will see the first screen. Refer to the following section for details on using the Web-based interface.

# Web-based Interface

The first screen is similar to Figure 2.

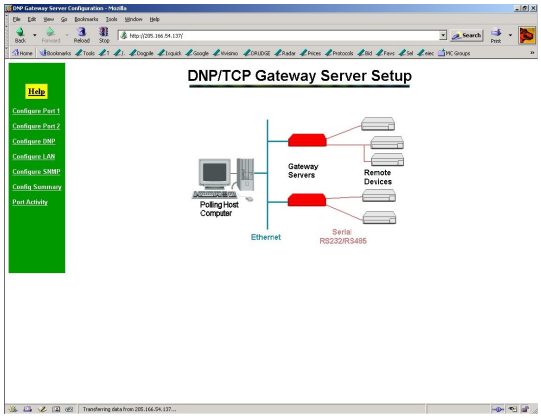



**Figure 1: Sign on Screen**

- Use the menu bar on the left to navigate to the desired screen.
- On-line help is available on each screen.
- Each screen is explained in the following sections.
- Details for each field are given in the previous chapter under similar sections.

## Serial Port Configuration Screen

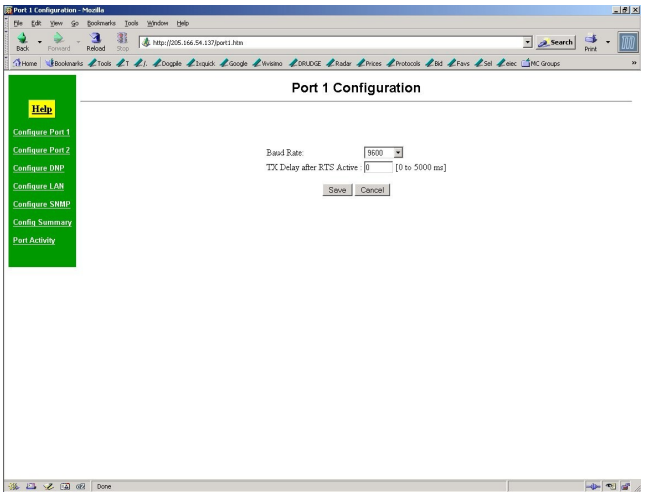



**Figure 2: Serial Configuration Screen**

This screen allows you to configure the Serial Ports one and two. The settings used should match the device connected to this serial port. See Chapter 3 for details on these settings. There will be one screen for each serial port.

## DNP-3 Configuration Screen

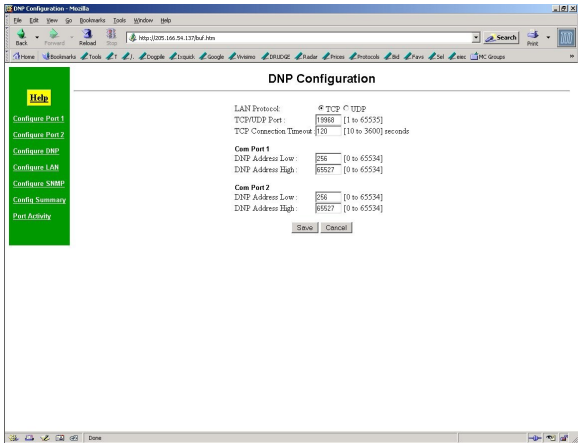



**Figure 3:DNP Configuration**

This screen is used to configure all DNP parameters.

## LAN Configuration Screen

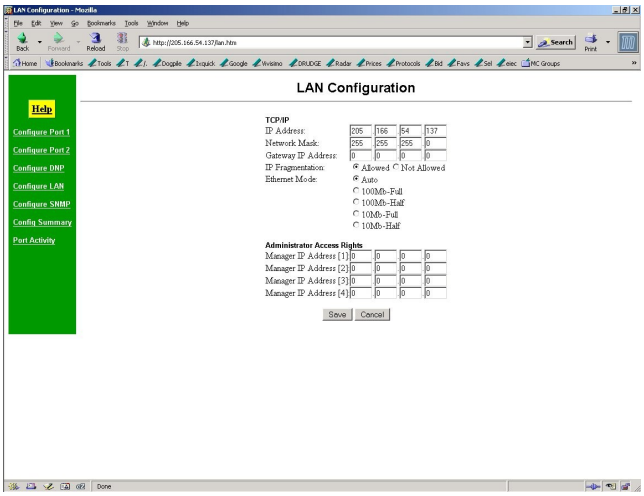



**Figure 4: LAN Configuration Screen**

This screen is used to configure the LAN parameters. See Chapter 3 for details.

## SNMP Configuration Screen

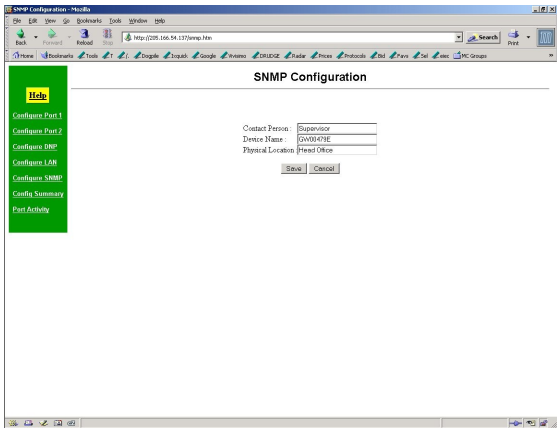



**Figure 5: SNMP Configuration Screen**

### Overview

This screen may be ignored if SNMP is not used.

The text fields, commonly used in SNMP (Simple Network Management Protocol) Programs to identify this device when browsing the network, are required for SNMP operation. The community name should be changed from the default.

## Configuration Summary Screen

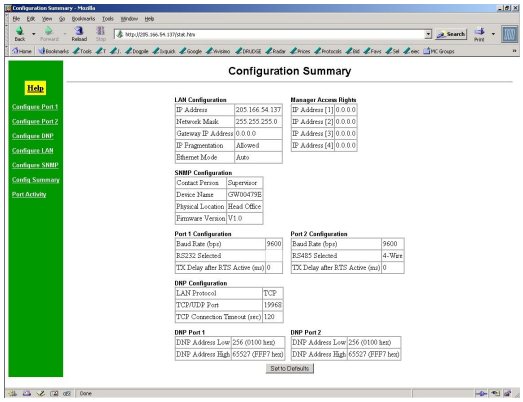



**Figure 6: Configuration Summary Screen (Top portion shown)**

### Operation

- This screen displays all current settings for this gateway.
- Clicking the "Set to Defaults" button will restore ALL values to their factory default values.
  When this is done, the unit will reboot, and the existing connection will be lost. You must reconnect using the default IP Address of 192.168.1.1.

## Port Activity Screen

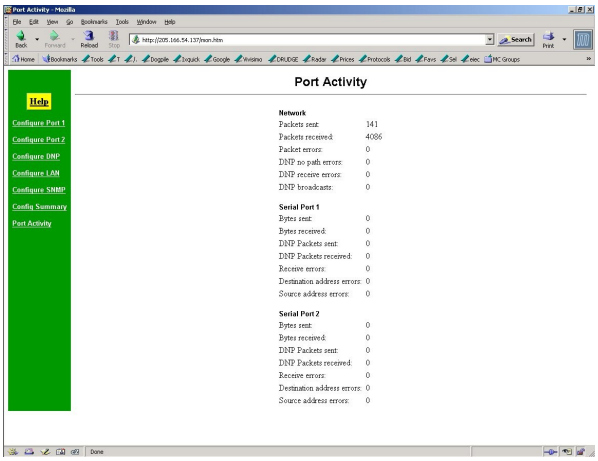



**Figure 7: Port Activity Screen**

### Operation

- This screen displays all current activity for the LAN port and both serial ports.
- Values are described in Chapter 3.

# Chapter 5

# Operation

*This Chapter explains how to use the EtherSeries gateway, once it is installed and configured.*

## Operation

The gateway allows serial DNP-3 RTUs to communicate and interoperate with DNP-3 UDP/TCP based controllers. The DNP-3 standard protocol is an asynchronous protocol designed to connect directly to computer asynchronous ports. DNP-3 has been extended to operate over Ethernet using the IP protocol suite. This gateway converts between the DNP-3 UDP/IP or TCP/IP protocol and DNP-3 serial protocols transparently.

Normal operation would consist of one or more Ethernet based computers functioning as DNP03 Master and one or more DNP03 remote devices (usually RTUs) connected serially to the gateway.

By using RS-485, multiple DNP-3 slave devices may be connected to each of the two serial ports on the gateway. If using RS-232, one DNP03 slave device may be connected to each serial port.

# Chapter 6

# Security Configuration

*This section discusses configuration options that restrict configuration.*

## Overview

The gateway uses the industry standard IP protocols. Since IP is a well-known standard, its security vulnerabilities are also well known and may be exploited. Several gateway options are available to enhance the inherent security of your network. However, since network security is a moving target and absolute security is never achievable, every network installation should be designed and implemented with care to minimize security risks in a way that is appropriate for the application and perceived risks.

The gateway may be configured with several levels of security configuration and authentication. These restrict the ability of an unwanted user from changing the configuration of the gateway. They do *not* restrict the ability of a remote device to deliver packets to the gateway's data port.

At the level 0, any workstation may be used to configure the gateway via either telnet or web browser configuration. Level

1 restricts configuration to workstations claiming to be from one of four IP addresses previously stored in the gateway. Either web-based or telnet configuration is allowed. Level 2 disables remote configuration using web browser, telnet, or SNMP in any combination. Level 3 requires a user name and password for remote configuration. Combinations of Level 2 and Level 3 are possible (ie. One may disable web browser configuration and SNMP and require an username/password for telnet configuration. The most secure method would be to disable all remote configuration.

The gateway may always be configured using the direct connected terminal method. This requires physical access to the hardware, and pressing the configuration button while a terminal (or PC) is connected to the serial port.

## Level 0

No specific security configuration is required. Make sure that no IP addresses have been entered in menu item 2, "Set Manager/Telnet IP Address" screen (or the "Administrator Access Rights of the web browser "Configure LAN" screen). Also, any user name/password pairs that may have been entered on the terminal configuration/telnet "Security Configuration" screen should be cleared.

## Level 1

Using any configuration method, configure Administrator Access IP addresses. Enter the IP addresses that should have

the ability to change the gateway configuration. If configuring this remotely, insure that the workstation you are using is one of the valid addresses.

## Level 2

Using telnet or direct connection configuration, selectively enable or disable remote configuration via Telnet, via web browser, and SNMP. This setting may not be performed from the web configuration screen.

## Level 3

Configure Level 1 and Level 2 security as needed. Using the telnet or direct connection configuration, enter up to three user name and password pairs. If there is at least one user name in this list, then a password prompt will be issued upon establishing a telnet configuration session.

There may be up to 3 user names and passwords configured. If no users are configured, password protection is disabled. User names and passwords are limited to 8 characters each. There is a six failed login attempt limit. After six failed attempts in a row, the unit will lock out all logins for a period of about 10 minutes.

Each user name has an associated user ID or index. The user with ID 1 is considered the master user. It has the ability to change the other user names and passwords. The other two user ID's are limited to only changing their own user name and password. All users may modify any other system parameters.

The serial interface is not subjected to user login since it requires physical access to the unit.

```
SECURITY CONFIGURATION:

 Web Configuration:    ENABLED
 Telnet Configuration: ENABLED
 SNMP Agent:           ENABLED
 Index UserName Password
 ----- -------- --------
    1:
    2:
    3:
SET SECURITY CONFIGURATION:
 1  Disable Web Configuration [0=ENABLED, 1=DISABLED]
 2  Disable Telnet Configuration [0=ENABLED, 1=DISABLED]
 3  Disable SNMP Agent [0=ENABLED, 1=DISABLED]
 4  Set User ID and Password [index userid password]
 5  Clear User ID and Password
 0  -- Return to previous menu

EXAMPLE: To set User ID 1 to root, password toor
   => 4 1 root toor
Enter Command =>
```

Security Configuration Screen

# Chapter 7
# Troubleshooting

*This chapter outlines some problems that may occur during installation or operation and some possible solutions to them.*

If you follow the suggested troubleshooting steps and the EtherSeries gateway still does not function properly, please contact your dealer for further advice.

## Hardware Problems

**Before anything else, check that all cables are wired correctly and properly connected.**

***P*:** All the LEDs are off.
**S:** Check the power supply or power connection.

***P:*** When using 10/100Base-T cabling, the unit does not work.
**S:** Check the Hub's link LED for the port to which the gateway is connected. If it is off, make sure the network cable between the unit and hub is in good condition.

## Can't Connect via the LAN

***P*:** Can't connect to the gateway using Telnet or Web Browser.
**S:** Check the following:

- Start troubleshooting from a known state. Power the unit OFF and ON to reboot.
- Is a proper IP address configured?
- "Ping" the unit to see if it responds. From the Windows command prompt or "Run" dialog box, use the command:

  ```
  ping IP_Address
  ```

  Where `IP_Address` is the IP Address of the gateway (e.g. `ping 192.168.1.1` ). If it does not respond, then check all LAN connections. If the LAN connection are OK, the problem is in the LAN addresses or routing. **The most common problem cause is incorrect IP addressing. Make sure the workstation and gateway have compatible IP addresses.**
- It may be that your "arp table" contains invalid entries. You can clear the "arp table" by rebooting, or, on Windows95 , by typing the following command at the command prompt or *Run* dialog box.: `arp -d`
- Check that you have used the correct port address for telnet access. The address is "8000" for configuration.
- MOST connection problems are due to incorrect RS-232 wiring. Remember that there is no "standard" RS-232 wiring between devices. You may need to contact your vendor for appropriately wired cables.
- In some cases, "smart" hubs and switches must be power-cycled to clear their internal arp cache. This is

often a problem on test bench setups where IP addresses are moved between different equipment or a unit is moved between Ethernet switch receptacles.

## Other Problems

***P*:** Can't run the configuration program using a serial cable connection.

**S:** Check that:

- The communication parameters are set properly.
- Disconnect and reconnect the power supply.
- Power is available... a LED is on.
- The terminal program is operating properly. Try a loopback connector at the gateway end of the cable to verify program operation and the proper COM: port.
- The most common problems causing this symptom are incorrect RS-232 wiring or the Windows Hyperterm program not operating correctly.

***P*:** Unable to poll some addresses.

S: Read the section on DNP-3 configuration. If port one and port two addresses overlap, the overlaped addresses are only sent out port one.

***P*:** Unable to poll ANY addresses.

S: Read the section on DNP-3 configuration. Insure that the host computer and gateway are using the same IP protocol (TCP vs. UDP).

## Verify Proper Operation

Once the gateway is installed on your Network, verify proper operation by testing its functionality. SCADA networks vary greatly, so there is no simple way to describe testing all possibilities. Use a scientific method and keep careful records of all installation and troubleshooting steps. For example, consider the following method…

1. Verify that the gateway has a proper LAN connection by pinging it. If it responds to a ping then…
2. Verify the unit's configuration by using telnet to port 8000 or by checking it using a web browser. If it looks good then…
3. Attempt a poll from the DNP-3 polling master computer. If that works correctly, you're ready to continue with DNP03 operation. IF not…
4. Check the gateway's statistics to see if it received the LAN activity and passed the polls to a serial port. If not, there is likely a problem with IP addressing or the host computer is not configured correctly for the gateway's LAN. If the gateway receives the LAN packets and doesn't pass them to the serial port, then check its configuration. If the counters indicate that the poll was passed to the serial port, but there's no response…
5. Verify correct RS-232/RS-485 configuration. Verify cabling to the RTU. One of these is likely incorrect. Or…
6. Verify the RTU configuration. Perhaps it's not correctly configured.

# Appendix A
# Specifications

## EtherSeries Gateway Specifications

- Flash Memory: 512 Kbytes
- SRAM: 512 Kbytes
- EEPROM: 512 Bytes
- LAN Buffer: 2 Kbytes
- RS-232 Buffer: 4 Kbytes
- RS-232/485: two male DE-9 connectors (PC DB-9)
- RS-485 Isolated: two screw terminals
- RS-232 speed: Up to 230 Kbps
- Network: Ethernet 10Base-T/ 100Base-T
- CPU: 16 Bit
- Power: 9 to 30 VDC (12VDC @ 260 ma) or Optional power supplies
- Switch: Configuration Mode
- LED indicators: 6 on top panel
- Default IP address: 192.168.1.1
- Telnet management port: 8000
- Operational Temperature -40C to +70C

## RS-232 PIN Assignments

The EtherSeries RS-232 port wiring is identical to a standard PC 9 pin DE-9P COM: port. It operates as a DTE device. The chart below details signal directions and names.

| Serial Port Pin Assignments | | |
|---|---|---|
| **Pin** | **Signal Name** | **Type** |
| 1 | Carrier Detect (CD) | In |
| 2 | Receive (Rx) | In |
| 3 | Transmit (Tx) | Out |
| 4 | Data Terminal Ready | Out |
| 5 | Signal Ground (GND) | Power |
| 6 | Data Set Ready (DSR) | In |
| 7 | Request to Send (RTS) | Out |
| 8 | Clear to Send (CTS) | In |
| 9 | Ring Indicator (RI) **(Not used)** | In |

# Control Signal Operation

### DCD

Input, ignored

### Receive Data

Input, data into the unit

### Transmit Data

Output, Data from the unit. The Etherseries unit only transmits when it has characters to send, and if handshaking is enabled, when the CTS input is asserted.

### DTR

Output. Signal is asserted when the unit is powered on.

### Signal Ground

Common ground

### DSR

Input, ignored.

### RTS

Output. If handshaking is disabled, this signal is always asserted. If handshaking is enabled, it will be asserted when the gateway has a packet to transmit on the serial port and it will be de-asserted when transmission is complete.

### CTS

Input. When handshaking is disabled, this signal is ignored. When handshaking is enabled, the gateway will wait for CTS to be asserted before transmitting a packet on the serial port.

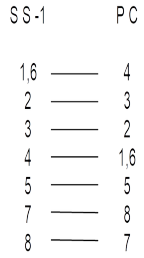
### Ring Indicator

Not used

# CABLES

Commonly used cable connections:

## To PC 9-pin COM: port




This null-modem crossover cable is easily made by combining two "PC-Direct" adapter hoods with a mux-mux crossover cable from DCB. This cable is used for configuration and is available from your dealer. This is commonly called a "PC-to-PC null modem cable".

## Gateway to RTU

Since RTUs vary in pinout configuration, no standard cable may be specified. Since the gateway pinout is similar to a PC COM: port when configured in RS-232 mode, a PC-to-RTU cable may be used that is the same cable that works between YOUR PC and YOUR RTU.

Note that if the RTU has a pinout similar to a PC, then a cross-over (null-modem) cable must be used.

# Appendix B
# RS-422/ RS-485 Interface

*This Appendix describes the RS-422/485 interface. This interface option may be selected during configuration in the field.*

## Introduction

The 9-pin serial connector may be used for either RS-232, RS-422 (4-wire RS-485 point-to-point), or 2-wire RS-485 operation by changing software configuration settings on the Configure Port screens..

## RS-422 / 4-Wire RS-485 Interface Pinout

| Serial Port Pin Assignments | | |
|---|---|---|
| **Pin** | **Signal Name** | **Type** |
| 1 | No Connection | N/A |
| 2 | Transmit Data (TX+) | Out |
| 3 | Receive Data (Rx+) | In |
| 4 | No Connection | N/A |
| 5 | Signal Ground (GND) | N/A |
| 6 | No Connection | N/A |
| 7 | Receive Data (Rx-) | In |
| 8 | Transmit Data (Tx-) | Out |
| 9 | No Connection | N/A |

## 2-Wire RS-485 Interface Pinout

| Serial Port Pin Assignments | | |
|---|---|---|
| **Pin** | **Signal Name** | **Type** |
| 1 | No Connection | N/A |
| 2 | No Connection | N/A |
| 3 | Data + | In/Out |
| 4 | No Connection | N/A |
| 5 | Signal Ground (GND) | N/A |
| 6 | No Connection | N/A |
| 7 | Data - | In/Out |
| 8 | No Connection | N/A |
| 9 | No Connection | N/A |

## RS-485 2-wire Fan-out

Since this unit is most often used as an RS-485 2-wire end-point, it will support 32 devices on the RS-485 line. Use good engineer practice for RS-485 lines. Where applicable, include termination for long lines.

## RS-422 / 4-Wire RS-485 Interface Pinout With Optical Isolation

There is a RS-485/422 only model with optical isolation. This unit does not include RS-232 ports. The Optical Isolated version uses screw terminal connectors.

| Serial Port Pin Assignments | | |
|---|---|---|
| **Pin** | **Signal Name** | **Type** |
| 1 | Transmit Data (TX+) | Out |
| 2 | Transmit Data (Tx-) | Out |
| 3 | Receive Data (Rx+) | In |
| 4 | Receive Data (Rx-) | In |
| 5 | Signal Ground (GND) | N/A |

# RS-422 / 2-Wire RS-485 Interface Pinout With Optical Isolation

| Serial Port Pin Assignments | | |
|---|---|---|
| **Pin** | **Signal Name** | **Type** |
| 1 | | |
| 2 | | |
| 3 | Data + | In/Out |
| 4 | Data - | In/Out |
| 5 | Signal Ground (GND) | N/A |