

# **EtherPath**

## **User's Guide**

Revised April 18, 2002  
Firmware Version 4.0



## **FCC Statement**

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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**

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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.

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Version 4.0

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# Chapter 1

## Introduction

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

**C**ongratulations on the purchase of your new EtherPath. The EtherPath is a versatile product that enables serial communications devices to operate via Ethernet. It is designed to easily connect a serial port device to your network. A remote PC or other serial device can then be used to monitor, configure, manage and send or receive data to the serial port device through the LAN/WAN.

The EtherPath can receive data from any Serial device, convert the data to a valid IP packet, and transmit that data over the LAN/WAN. Serial devices can then be accessed from anywhere on your LAN/WAN by any workstation computer running telnet, dedicated software, or COM: port redirection software. Two EtherPaths may be used in “nailed-up” mode to build a “RS-232 path” through the WAN/LAN. Multiple EtherPaths may be connected via Ethernet by using them in Point-to-Multiple point "AT Dial " mode.

Some serial port devices in common use are Bar Code Readers, UPSs, SCADA RTUs, security alarms, access control devices, time clocks, POS terminals, and multiplexers.

For easy connection to your LAN, the EtherPath supports both 10BaseT and 100BaseT connections.

## EtherPath Functions

The EtherPath can be used in several modes – simple *Client/Server* or *Server*, as illustrated below, point-to-multiple-point (*EtherModem*) *Client/Server*, and reverse telnet *Client*. These modes are described below.

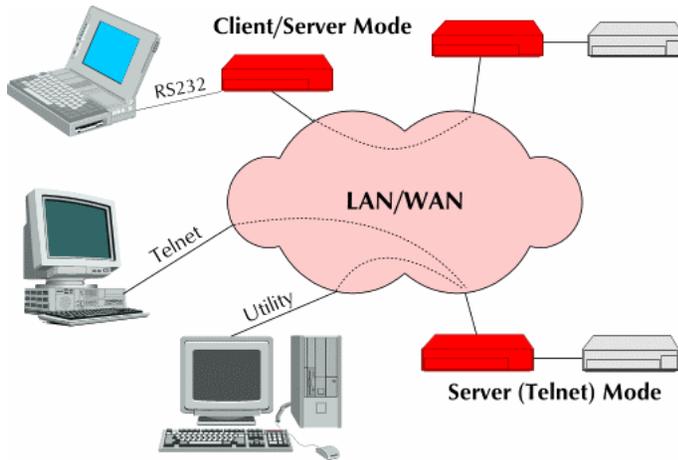


Figure 1: Modes of Operation

### Client/Server Mode

In this mode, two EtherPaths are used. Both are connected to serial RS-232 devices. This is termed a “Nailed-Up” connection.

- The "Client" EtherPath will automatically establish a connection to the "Server" EtherPath upon power-up.
- The device on one EtherPath communicates with the other serial port device as if it was directly connected via a serial port cable.

- The EtherPaths and the LAN are completely transparent to PC application and serial port device.

### **Server Mode**

---

This mode requires only a single EtherPath. The EtherPath is connected to the serial port device, and to the LAN.

Users on the LAN can then connect to the serial port device and communicate with it via Telnet, using any assigned serial port address. Many serial port devices provide support for communication via Telnet.

A special-purpose utility program or port redirector program may be used instead of Telnet, or the user may create custom software using Visual Basic, C++, or other network programming tools. By using port redirection, the EtherPath may function as a remote serial port on a PC.

### **Point-to-Multiple-Point (*EtherModem*) Mode**

---

Point-to-multiple-point (*EtherModem*) operation allows a single EtherPath running in client mode to connect to multiple server-mode EtherPaths, one at a time, under the control of the attached RS-232 device. The client operates similar to a modem with “AT” dialing enabled. The attached device treats the EtherPath as if it was a modem, using remote IP addresses instead of telephone numbers.

### **Reverse Telnet (Telnet Client) Mode**

---

This mode requires only a single EtherPath. The EtherPath is connected to the serial port device, and to the LAN.

The EtherPath will connect to most remote telnet servers under user control by using “reverse telnet” or telnet client operation. The

EtherPath will connect to any port number under user control with either hardware (pin6) dialing or AT dialing.

By using the "AT Dial" commands, the connected device can direct the EtherPath to connect to multiple remote devices, one at a time.

## **Other Features**

### **Automatic Connection**

When used in Client/Server mode, the "Client" EtherPath will automatically establish a connection to the "Server" EtherPath on power-up, or under the control of an RS-232 control signal.

### **AT Commands**

The EtherPath responds to most common AT commands when in the Client mode. Commands are listed in the Appendix.

### **Connection Recovery**

The EtherPath uses a proprietary protocol to ensure the client/server session always exists on TCP/IP. When data hasn't been transferred through the connection for some time, the EtherPath will communicate with the other device (either EtherPath or PC) to ensure that the connection is still open.

If there is no response, the device will reset to the initial state, and attempt to reconnect.

Also, if the RS-232 link is broken, it will be reconnected automatically if possible (when in Hardware-connect mode).

This operation is described in the Appendix.

### **Protocol Conversion**

The RS-232 device at the client end and the device at the server end of a link do not have to use the same communications protocols on

the RS232 link (speed, parity, flow control). The EtherPaths will convert the data to the correct protocol.

### **Upgradeable Firmware**

Firmware upgrades are downloadable to the EtherPath. The utility program required for this, and the actual firmware upgrades, are available from your dealer.

## Physical Details

The EtherPath front and rear panels are shown below.

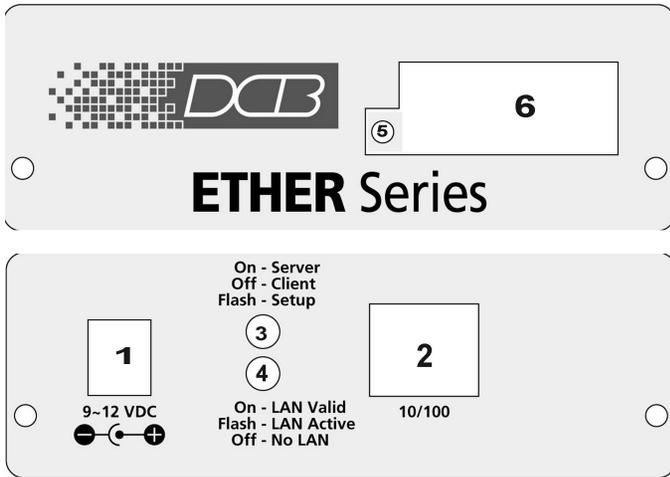


Figure 1: EtherPath

<b>1 Power port</b>	Connect the power adapter here.
<b>2 10/100Base-T port</b>	Connect lan cabling here.
<b>3 Red LED</b>	Client/Server/Setup Indicator
<b>4 Red LED</b>	LAN Activity Indicator.
<b>5 Green LED</b>	Connection Indicator.
<b>6 RS-232 Port</b>	DE-9 (DB-9) RS-232 Interface.

---

## **Configuration Switch**

There is a momentary action push button switch on the right side of the unit behind a small hole. Pressing this switch places the unit in configuration mode and is used only when configuring the EtherPath **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 two red LED indicators on the rear panel adjacent to the LAN connector and one green LED indicator on the front panel between the 9-pin serial connectors.

### **Rear Panel LED Indicators**

---

- The lower red LED is the Ethernet Status indicator. It is lit when there is a valid 10/100BaseT Ethernet connection. This LED flashes with activity on the Ethernet (even if the activity isn't directly to this unit).
- The upper red LED is multi-function indicator. The different states indicated by these LED are described below.

<b>Red LED Indication</b>	<b>Status Description</b>
OFF	Client Mode
ON	Server Mode
Rapid Flashing	Setup Mode
Irregular Flashing	Power On Self Test -or- Firmware Download

---

## Front Panel LED Indicators

---

- There is one front panel green LED indicator. This corresponds to Port 1 status.
- This LED is a multi-function indicator. The different states indicated are described below.

Green LED Indication	Status Description
OFF	Pin 6 input is low and there is no telnet connection
ON	Pin six is high and there is no telnet connection
Rapid Flashing	Telnet session is active
Slow Flashing	Pin 6 is tied high via Software and there is no telnet connection

## **Package Contents**

You should find the following items packaged with your EtherPath:

- The EtherPath Unit
- Power Adapter
- This User's Guide

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

## **Software Requirements**

The EtherPath supports the following protocols.

- TCP/IP
- UDP
- ARP
- ICMP
- TELNET

The EtherPath has been tested to work with:

- All versions of Windows
- Unix - SCO, Sun, AIX, Linux, etc.
- Macintosh
- Most serial devices such as scanners, RTUs, SCADA hosts, alarm controllers, POS devices, PCs, terminals, etc.

# Chapter 2

## Installation

*This Chapter details the LAN installation process for the EtherPath.*

### Overview

For *Telnet Mode* or *Web Browser Mode* configuration, LAN installation is performed before configuration. There must also be a valid IP address in the unit prior to configuration with these methods. The default value may not work with your network.

If you use *Terminal Mode* configuration, then the configuration should be performed prior to LAN installation. See Chapter 3 for details.

### LAN Installation

#### 1. Connect the Network Cable

---

- The EtherPath network interface is auto-sensing. Simply connect your network cable to the appropriate connector on the EtherPath panel.

#### 2. Connect the Power Adapter Cable

---

Plug in the power adapter cable. After about a 4 second boot process the EtherPath is ready for operation.



**Only use the power adapter provided with the EtherPath. Using a different one may cause hardware damage.**

### **3. Connect the Serial Port Device**

---

Connect the serial port device to the serial port on the EtherPath. **If connecting to a PC 9-pin port, a cross-over (null modem) cable is required.** See the Appendix for wiring details.

Then apply power lead to the serial port device.

## Chapter 3

# Terminal/Telnet Configuration

*This Chapter describes how to configure the EtherPath's using Terminal configuration mode or Telnet configuration mode. Web Browser mode is covered in the next chapter.*

### Overview

The EtherPath can be configured using any of the following methods:

- **Web Browser** - After installing the EtherPath in your LAN, use your Web Browser for configuration. See *Chapter 4 - Browser Configuration* for details.
- **Terminal Mode** - Use a serial cable connection and a communication program. The advantage of this method is that you give the EtherPath a compatible IP Address prior to installation in your network.
- **Telnet Mode** - After installing the EtherPath in your LAN, connect to it using Telnet for configuration.

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 EtherPath. See the Appendix for cable requirements. A Crossover (null modem) cable is required when using a 9 pin PC port.

### Procedure

1. Connect the EtherPath to your PC or terminal using a null-modem cable.
2. Press the configuration setup switch momentarily. It is located on the side of the EtherPath and accessed through a small hole. Use a small pen or paper clip to access the switch.
3. Start the terminal program and configure the terminal program with the following settings.

Setting	Value
Flow control protocol	None
Baud rate	9600
Data	8 bits
Parity	None
Stop Bit	1

4. Connect your terminal program to the appropriate port (e.g. COM 1).

5. 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 *Terminal/Telnet Interface* on page 17 for details on using the configuration program.

## Telnet Configuration

1. Install the EtherPath into your LAN as described in Chapter 2. Ensure that the EtherPath is powered on. **The EtherPath must have an IP address appropriate for YOUR network.**
2. Connect to the EtherPath with the command:

```
telnet IP_Address Port_number
```

Where:

IP\_Address is the IP address of the EtherPath

**Port\_number (for configuration) is 8000.**

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

```
telnet 192.168.1.1 8000
```

### If you can't connect

If the EtherPath does not respond, check the following:

- The EtherPath 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 Windows9x variations, the IP Address and Network Mask can be checked by using *Control Panel-Network*

to examine the *Properties* for the TCP/IP protocol.

- 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 you must either change the EtherPath's IP address using a directly connected terminal or change your PC to an address in the above range and reboot. Once the PC will communicate with the EtherPath, the EtherPath address may be changed, and the PC reconfigured to its proper address.
3. Refer to the following section for details on using the configuration program.

## Terminal/Telnet Interface

The Signon screen displays the version number.

```
EtherPath V4.0
-----
Device Name: GW403930
Physical Location: Head Office

Operational Mode: SERVER
Configuration setup.

[Press any key to continue]
```

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

```
EtherPath Main Menu
-----
 1 Set Local & Remote IP Address,
   Subnet Mask, and Gateway Address
 2 Set Manager/Telnet IP Address
 3 Serial Port Configuration
 4 Advanced Configuration
 5 Display Configuration Settings
 6 Reset Configuration to Default
 7 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. Set Local & Remote IP Address, Subnet Mask, Gateway Address ) from the Main Menu will result in a screen which looks like the following.

```
LOCAL UNIT CONFIGURATION:
Local Address: 205.166.54.215   Serial NO: 00:09:AA:00:15:11
Remote Address: 205.166.54.221
Gateway Address: (NOT SET)     Subnet Mask: 255.255.255.0
Name of Contact Person: john
Device Name: SS001511
Physical Location: champaign
Server Mode - Listen on Port: 3000
IP Fragmentation: ALLOWED

SET LOCAL UNIT CONFIGURATION:
1 Local IP Address
2 Remote IP Address
3 Gateway IP Address
4 Subnet Mask
5 Name of Contact Person
6 Device Name
7 Physical Location
8 Port Number
9 IP Fragmentation [0=ALLOWED, 1=NOT ALLOWED]
10 Operational Mode [0=Server, 1=Client]
0 -- Return to previous menu

Enter Command =>
```

### **1. Local IP Address**

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

### **2. Remote IP Address**

In “Client” mode, this is the IP address of the remote “Server” device which this client will automatically connect to when powered up (if RS-232 PIN 6 is high or forced) and configured for hardware dialing. This is also the default server that will be used for AT dialing when in PMP mode.

In “Server” mode, this value is not required, and will be ignored.

### **3. Gateway IP Address**

If the remote EtherPath (in “Client/Server” mode) is not on the same LAN, then the gateway to the other LAN must be entered here.

### **4. 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.

### **5. Name of Contact Person: Supervisor**

This is a text field. It can be used to store the name of the person responsible for the Serial Port Device.

### **6. Device Name**

This is a text field. It can be used to store a descriptive name for the device.

## **7. Physical Location**

This is a text field. It can be used to store a the location of the device.

## **8. Port Number**

This is the TCP/IP port number the EtherPath listens on when in server mode. The default is port 3000. When in client mode, this is the port on the remote server that a connection is attempt with. This value may be overridden when in *Ethermodem* mode by including a port number in the ATD command.

## **9. IP Fragmentation**

If set to ZERO, IP blocks sent from this EtherPath may be fragmented in transit, and blocks may be fragmented by the EtherPath. If set to ONE, the 'DONTFRAG' bit is set in IP packets, and all blocks are transmitted intact. This is normally set to 0 , but is set to 1 for some SCADA applications. The default is 0.

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

---

Selecting (2) from the Main Menu will result in the following screen.

```
Entry  Manager_IpAddr
****  *****
  1.   000.000.000.000
  2.   000.000.000.000
  3.   000.000.000.000
  4.   000.000.000.000
```

```
MANAGER SETUP:
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
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 configure the EtherPath. (All users on the LAN can still access the EtherPath, but not configure it.)

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

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

---

## Main Menu Option 3. Set Serial Port Data

---

Selecting (3) from the Main Menu will result in the following screen.

```
PORT CONFIGURATION:
Flow Control: NONE
Baud Rate: 9600
Data: 8 Bits Parity: NONE Stop: 1 Bit
Pin 6 Control: FORCED ON
Client Dial Mode: HARDWARE (Pin 6)
```

```
SET PORT CONFIGURATION:
1 Flow Control [0=None, 1=XON/XOFF, 2=RTS/CTS]
2 Baud Rate [0=230400, 1=115200, 2=57600, 3=38400,
4=19200,
5=9600, 6=4800, 7=2400, 8=1200, 9=600,
10=300]
3 Parity bit [0=None, 1=Odd, 2=Even]
4 Data bits [0=7bits, 1=8bits]
5 Stop bits [0=1bit, 1=2bits]
6 Pin 6 Control [0=From Interface, 1=Forced ON]
7 Dial Mode [0=ATD, 1=Hardware (Pin 6)]
0 -- Return to previous menu.
```

EXAMPLE: To set the baud rate to 19200  
=> 2 4

Enter Command =>

This screen allows you to change the settings for the RS232 link. The settings used should match the device connected to the serial port of the EtherPath.

Note that the EtherPath's serial settings must match the device that is plugged into THAT EtherPath. The device at the other end of the Ethernet link may be set differently.

### **Flow Control**

The choices are “None”, “XON/XOFF”, and “RTS/CTS”. It is common to use NONE for installation troubleshooting, then set it correctly to match the connected device. If RTS/CTS is used, the cables must have handshake lines wired correctly.

### **Baud Rate**

Speeds between 300 bps and 230.4Kbps are supported.

### **Parity**

The choices are “None”, “Odd”, or “Even”.

### **Data Bits**

The choices are 7 or 8. This does NOT include the parity bit. The two most common settings are 7 bit PLUS appropriate parity or 8 bit with NO parity. Default is 8 bits.

### **Stop Bits**

The choices are 1 or 2. Commonly use 1.

### **Pin 6 Control**

If Forced On, the EtherPath responds as if interface pin 6 is always high. If From Interface, its condition is a read from the RS-232 cabling must be correct for proper operation.

### **Dial Mode**

The choices are “ATD” or “Hardware”. This configures the EtherPath, when in client mode, to connect to a remote device when it receives an asserted hardware (pin 6) signal or when it receives an “ATD” command. For a full-time *Nailed-up* connection, use *Hardware*. See Chapter 5, Point-to-Multiple-Point-Mode for use of the "AT" setting.

---

## Main Menu Option 4. Advanced Configuration Screen

---

Selecting (4) from the Main Menu will display the following:

```
ADVANCED CONFIGURATION:
  Transmit Timer: 10 ms (Mode: IDLE TIMEOUT)
  Block Size: 512 Bytes
  Flow OFF Buffer Level: 80%          Flow ON Buffer
Level: 20%
  Line Terminator Character: 13 (Dec)  Transmit on LT
Char: OFF
  Server End-of-Line Filter: ON
  Client Local Character Echo: OFF

SET ADVANCED CONFIGURATION:
  1 Transmit Timer [min=1ms, max=10000ms]
    M Timer Mode [0=transmit timer, 1=idle timeout]
  2 Block Size [min=1byte, max=4096bytes]
  3 Flow Control OFF Buffer Level [min=1%, max=99%]
  4 Flow Control ON Buffer Level [min=1%, max=99%]
  5 Line Terminator Character [min=0, max=255]
  6 Transmit on LT Character [0=OFF, 1=ON]
  7 Server End-of-Line Filter [0=OFF, 1=ON]
  8 Client Local Character Echo [0=OFF, 1=ON]
  0 -- Return to previous menu
```

```
EXAMPLE: To set the Flow OFF level to 75%
=> 3 75
```

Enter Command =>

The EtherPath has a built-in buffer to store data. Most of these settings affect the operation of the buffer and how data is buffered and transmitted over the Ethernet. The default values should normally be satisfactory, but they may be "tuned" for optimum operation.

**Note:** Options 5, 6, 7, and 8 apply to *Client Mode* only, and have no effect in *Server Mode*.

## **1. Transmit Timer**

**When in Timer Mode:** The time period for which data will be stored in the buffer before being sent. Allowable values range from 1ms to 10,000ms (10 seconds). A commonly used value is 20 msec.

**When in Idle Timeout Mode:** The time period this unit's port must be idle (after receiving a character) before sending a block of data via the Ethernet. This is used to keep incoming blocks of data intact. It is useful for some protocols such as Modbus RTU. Its setting depends upon the port speed, and should be several character times.. Allowable values range from 1ms to 10,000msec (10 seconds). A typical value for a 9.6 Kbps port is about 3 msec.

## **M. Timer Mode**

**When set to 0,** the timer is a free-running clock and if there is data in the buffer, an IP packet is transmitted every TIMER msec.

**When set to 1,** the timer is a serial port idle time value. If there is data in the buffer and the serial port has been idle for TIMER msec, then an IP packet is transmitted.

## **2. Block Size**

The maximum ethernet packet buffer size. The minimum value is 1 byte, the maximum 4096 bytes (4 K). Typical values are either in a low range of 10-20 characters for polling applications or very large in the range of 500 to 1500 for file transfer applications.

Normally, the timer triggers a packet transmission before the block fills. If the buffer contains BLOCKSIZE characters, an IP packet is transmitted.

## **3. Flow Control OFF Buffer Level**

If the amount of data stored in the buffer reaches this point, and the EtherPath is unable to transmit the data, then no further input will be accepted.

Under normal operation, this will not happen. This is normally left at the default value.

#### **4. Flow Control ON Buffer Level**

Once the High\_Water mark has been reached, the “no-input accepted” mode will continue until the EtherPath has transmitted enough data to reduce the buffer contents to this point. This is normally left at the default value.

#### **5. Line\_Terminator\_Character**

This setting is used to change the Line Terminator Character. The Line Terminator Character causes any data in the buffer to be transmitted immediately the character is received, provided: This is the binary value of the trigger character.

- The EtherPath is being used in “Client” mode.
- The following setting (Transmit\_on\_LT\_Char) is ON.

#### **6. Transmit\_on\_LT\_Char**

When this setting is ON, any data in the buffer will be sent immediately upon receipt of a Line\_Terminator\_Character (see previous setting). When the setting is OFF, the Line\_Terminator\_Character has no effect.

In “Server” mode, this setting has no effect.

#### **7. Server End-of-Line Filter**

This setting can turn the filter function ON or OFF.

If ON, then when a CR/LF (Carriage Return, Line Feed) character pair is received, it is converted to a CR only before it is sent to the serial port output. CR/LF pairs are normally used in the MS-DOS environment to mark the end of a line, but may cause problems in other environments.

CR/NULL character pairs are also converted to a CR only.

- If this setting is OFF, then no conversion is done.
- In "Client Mode", this setting has no effect.

### **8. Client Local Character Echo**

If ECHO is ON, the client EtherPath will locally echo all incoming characters in client mode.

If ECHO is OFF, the client EtherPath will not echo characters or transmit any status messages to the serial port. This mode should be used if any messages from the EtherPath would create interference.

OFF is the most commonly used value.

---

## Main Menu Option 5. Display Settings

---

Selecting (5) from the Main Menu displays a screen like the following example.

```
Local Address: 205.166.54.213      Serial NO:  
00:09:AA:00:4A:9E  
Remote Address: 205.166.54.220  
Gateway Address: (NOT SET)       Subnet Mask:  
255.255.255.0  
Name of Contact Person: Supervisor  
Device Name: GW004A9E  
Physical Location: Head Office  
Client Mode - Remote Port: 3000  
IP Fragmentation: ALLOWED
```

### 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
```

### PORT CONFIGURATION:

```
Flow Control: NONE  
Baud Rate: 38400  
Data: 8 Bits Parity: NONE Stop: 1 Bit  
Pin 6 Control: FORCED ON  
Client Dial Mode: HARDWARE (Pin 6)
```

[Press any key to continue]

### ADVANCED CONFIGURATION:

```
Transmit Timer: 20 ms (Mode: TRANSMIT TIMER)  
Block Size: 512 Bytes  
Flow OFF Buffer Level: 80%          Flow ON Buffer  
Level: 20%  
Line Terminator Character: 13 (Dec) Transmit on LT  
Char: OFF  
Server End-of-Line Filter: OFF  
Client Local Character Echo: OFF
```

CURRENT ETHERPATH STATISTICS:  
Network packets received: 294619  
Network packets transmitted: 291346  
Network packet errors: 0  
Port bytes received: 4  
Port bytes transmitted: 56264576

CURRENT ETHERPATH CONFIGURATION:  
CLIENT Mode-IP Dial  
Connected to IP Address: 205.166.54.220

[Press any key to continue]

Note that no data can be changed. Pressing any key from the above screen will return you to the Main Screen.

All data items except the following have been explained on the preceding pages.

## **Current Statistics**

---

---

### **Network Packets Received**

Number of packets received by the EtherPath through the LAN connection.

### **Network Packets Transmitted**

Number of packets transmitted by the EtherPath through the LAN connection.

### **Network Packet Errors**

Number of packets received through the LAN connection which contained errors.

### **Port Bytes Received**

Number of Characters received through the serial (RS232) connection.

### **Port Bytes Transmitted**

Number of Characters transmitted through the serial (RS232) connection.

### **Current Configuration**

---

---

#### **Switches Status**

Current setting of the DIP Switches.

#### **Current Connection IP Address**

The device (PC, terminal, or remote EtherPath) to which the EtherPath is currently connected through the LAN link. If it is not connected, this field will display “No active connection”.

## **Main Menu Option 6. Reset Configuration to Default**

---

Selecting (6) from the Main Menu will restore all values to their defaults.

If using Telnet, the connection will be lost when the EtherPath reboots. To reconnect, you must connect to the default IP Address of 192.168.1.1 or change the EtherPath IP address to one that is appropriate for your network before rebooting with main menu option 7.

## **Main Menu Option 7. Save and Exit**

---

Selecting (7) from the Main Menu will store the configuration details in the EtherPath, and exit the configuration program.

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

Using option 7 when there were no changes made is one way to effect a cold reboot on a remote EtherPath.

## **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 Configuration

*This Chapter describes how to configure the EtherPath using a Web Browser. The EtherPath must have an IP address appropriate to your network before using this method.*

### Overview

This configuration method uses your Web Browser to configure the EtherPath. This provides the most user-friendly interface than the Telnet/Terminal method.

- The EtherPath must be installed in your LAN before this configuration method can be used.
- Most Browsers will work. The only requirement is that they support HTML tables and forms.

### Connection Procedure

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

1. Install the EtherPath in your LAN as described in Chapter 2. Ensure that the EtherPath is powered on.
2. Start your Web browser.
3. In the *Address* box, enter the following:

`http://IP_Address`

(*IP\_Address* is the IP address of the EtherPath)

For example, <http://192.168.1.1>

### **If you can't connect**

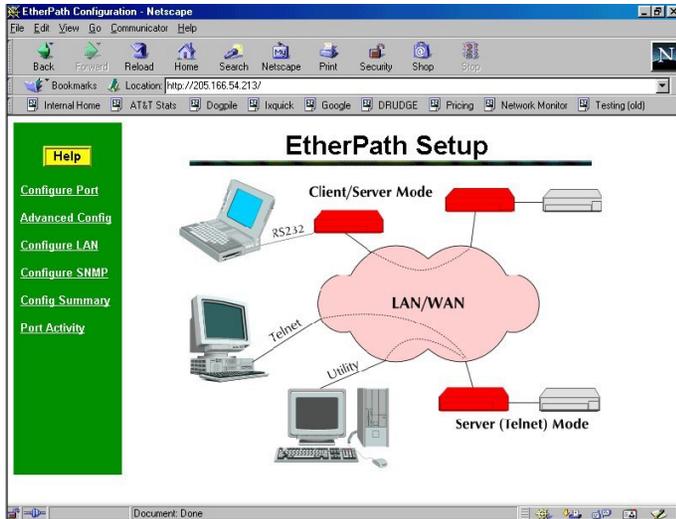
If the EtherPath does not respond, check the following:

- The EtherPath 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 Windows9x variations, the IP Address and Network Mask can be checked by using *Control Panel-Network* to examine the *Properties* for the TCP/IP protocol.
- 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 you must either change the EtherPath's IP address using a directly connected terminal or change your PC to an address in the above range and reboot. Once the PC will communicate with the EtherPath, the EtherPath address may be changed, and the PC reconfigured to its proper address.
- Insure that your browser isn't using a proxy server. If it is, configure the browser to not use the proxy for the EtherPath's IP address. (This may not work in Internet Explorer and you might have to temporarily disable using the proxy server)

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 2: 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.

## Port Configuration Screen

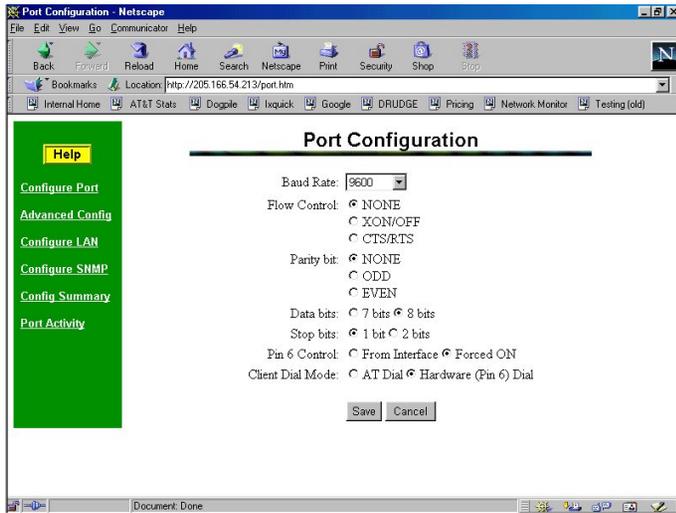


Figure 3: Port Configuration Screen

This screen allows you to change the settings for the RS232 link. The settings used should match the device connected to the serial port of the EtherPath.

Note that the EtherPath's serial settings must match the device that is plugged into THAT EtherPath. The device at the other end of the Ethernet link may be set differently.

### Flow Control

The choices are “None”, “XON/XOFF”, and “RTS/CTS”. It is common to use NONE for installation troubleshooting, then set it correctly to match the connected device. If RTS/CTS is used, the cables must have handshake lines wired correctly.

**Baud Rate**

Speeds between 300 bps and 230.4Kbps are supported.

**Parity**

The choices are “None”, “Odd”, or “Even”.

**Data Bits**

The choices are 7 or 8. This does NOT include the parity bit. The two most common settings are 7 bit PLUS appropriate parity or 8 bit with NO parity.

**Stop Bits**

The choices are 1 or 2. Commonly use 1.

**Dial Mode**

The choices are “ATD” or “Hardware”. This configures the EtherPath, when in client mode, to connect to a remote device when it receives an asserted hardware (pin 6) signal or when it receives an “ATD” command. For a full-time *Nailed-up* connection, use *Hardware*. See Chapter 5, Point-to-Multiple-Point-Mode for use of the "AT" setting.

## Port Activity Screen

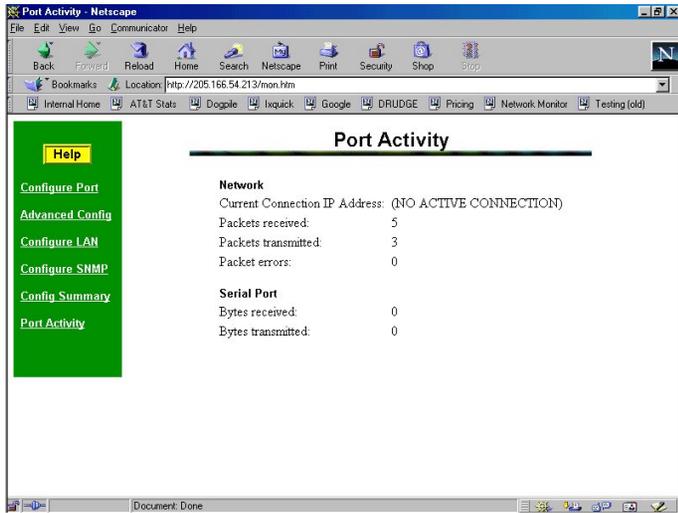


Figure 4:Port Activity Screen

This screen displays details about the data currently being transmitted or received, either through the LAN or Serial port. The display is updated every 10 seconds.

### Data - Network

Current Connection IP Address:	The IP Address of the remote to device to which this EtherPath is currently connected
Packets received:	Number of packets received by the EtherPath through the LAN connection.
Packets	Number of packets transmitted by the EtherPath

*Operation*

Transmitted	through the LAN connection.
Packet Errors	Number of packets containing errors transmitted or received by the EtherPath through the LAN connection.  Under normal conditions, this should be 0.

**Data - Serial Port**

Bytes Received	Number of Bytes received, through the serial (RS232) connection, from the Serial port device
Bytes Transmitted	Number of Bytes transmitted through the serial (RS232) connection to the Serial port device (or PC, if in Client mode).

## Advanced Configuration Screen

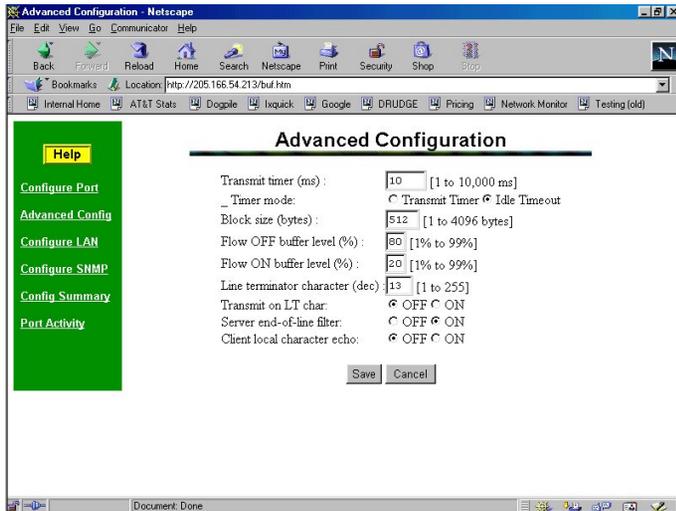


Figure 5: Advanced Configuration Screen

The EtherPath has a built-in buffer to store data. Most of these settings affect the operation of the buffer and how data is buffered and transmitted over the Ethernet. The default values should normally be satisfactory, but they may be "tuned" for optimum operation.

**Note:** Options 5, 6, 7, and 8 apply to *Client Mode* only, and have no effect in *Server Mode*.

### Transmit Timer

**When in Timer Mode:** The time period for which data will be stored in the buffer before being sent. Allowable values range from 1ms to 10,000ms (10 seconds). A commonly used value is 20 msec.

---

**When in Idle Timeout Mode:** The time period this unit's port must be idle (after receiving a character) before sending a block of data via the Ethernet. This is used to keep incoming blocks of data intact. It is useful for some protocols such as Modbus RTU. Its setting depends upon the port speed, and should be several character times.. Allowable values range from 1ms to 10,000msec (10 seconds). A typical value for a 9.6 Kbps port is about 3 msec.

#### **Timer Mode**

**When set to 0,** the timer is a free-running clock and if there is data in the buffer, an IP packet is transmitted every TIMER msec.

**When set to 1,** the timer is a serial port idle time value. If there is data in the buffer and the serial port has been idle for TIMER msec, then an IP packet is transmitted.

#### **Block Size**

The maximum Ethernet packet buffer size. The minimum value is 1 byte, the maximum 4096 bytes (4 K). Typical values are either in a low range of 10-20 characters for polling applications or very large in the range of 500 to 1500 for file transfer applications.

Normally, the timer triggers a packet transmission before the block fills. If the buffer contains BLOCKSIZE characters, an IP packet is transmitted.

#### **Flow Control OFF Buffer Level**

If the amount of data stored in the buffer reaches this point, and the EtherPath is unable to transmit the data, then no further input will be accepted.

Under normal operation, this will not happen. This is normally left at the default value.

### **Flow Control ON Buffer Level**

Once the High\_Water mark has been reached, the “no-input accepted” mode will continue until the EtherPath has transmitted enough data to reduce the buffer contents to this point. This is normally left at the default value.

### **Line\_Terminator\_Character**

This setting is used to change the Line Terminator Character. The Line Terminator Character causes any data in the buffer to be transmitted immediately the character is received, provided: This is the binary value of the trigger character.

- The EtherPath is being used in “Client” mode.
- The following setting (Transmit\_on\_LT\_Char) is ON.

### **Transmit\_on\_LT\_Char**

When this setting is ON, any data in the buffer will be sent immediately upon receipt of a Line\_Terminator\_Character (see previous setting). When the setting is OFF, the Line\_Terminator\_Character has no effect.

In “Server” mode, this setting has no effect.

### **Server End-of-Line Filter**

This setting can turn the filter function ON or OFF.

If ON, then when a CR/LF (Carriage Return, Line Feed) character pair is received, it is converted to a CR only before it is sent to the serial port output. CR/LF pairs are normally used in the MS-DOS environment to mark the end of a line, but may cause problems in other environments.

CR/NULL character pairs are also converted to a CR only.

- If this setting is OFF, then no conversion is done.
- In "Client Mode", this setting has no effect.

### Client Local Character Echo

If ECHO is ON, the client EtherPath will locally echo all incoming characters in client mode.

If ECHO is OFF, the client EtherPath will not echo characters or transmit any status messages to the serial port. This mode should be used if any messages from the EtherPath would create interference.

OFF is the most commonly used value.

### LAN Configuration Screen

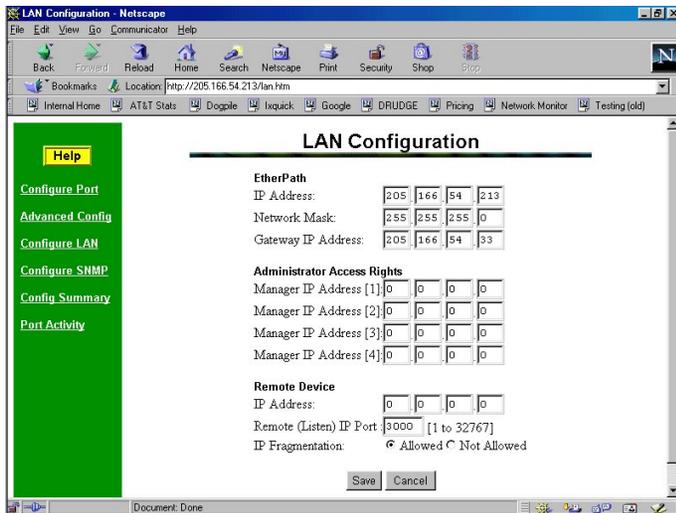


Figure 6: LAN Configuration Screen

This screen allows you to set all data relating to your LAN.

### **Local IP Address**

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

### **Remote IP Address**

In “Client” mode, this is the IP address of the remote “Server” device which this client will automatically connect to when powered up (if RS-232 PIN 6 is high or forced) and configured for hardware dialing. This is also the default server that will be used for AT dialing when in PMP mode.

In “Server” mode, this value is not required, and will be ignored.

### **Gateway IP Address**

If the remote EtherPath (in “Client/Server” mode) is not on the same LAN, then the gateway to the other LAN must be entered here.

### **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.

### **Name of Contact Person: Supervisor**

This is a text field. It can be used to store the name of the person responsible for the Serial Port Device.

### **Device Name**

This is a text field. It can be used to store a descriptive name for the device.

### **Physical Location**

This is a text field. It can be used to store a the location of the device.

### **Port Number**

This is the TCP/IP port number the EtherPath listens on when in server mode. The default is port 3000. When in client mode, this is the port on the remote server that a connection is attempt with. This value may be overridden when in *Ethermodem* mode by including a port number in the ATD command.

### **IP Fragmentation**

If set to ZERO, IP blocks sent from this EtherPath may be fragmented in transit, and blocks may be fragmented by the EtherPath. If set to ONE, the 'DONTFRAG' bit is set in IP packets, and all blocks are transmitted intact. This is normally set to 0 , but is set to 1 for some SCADA applications. The default is 0.

## SNMP Configuration Screen

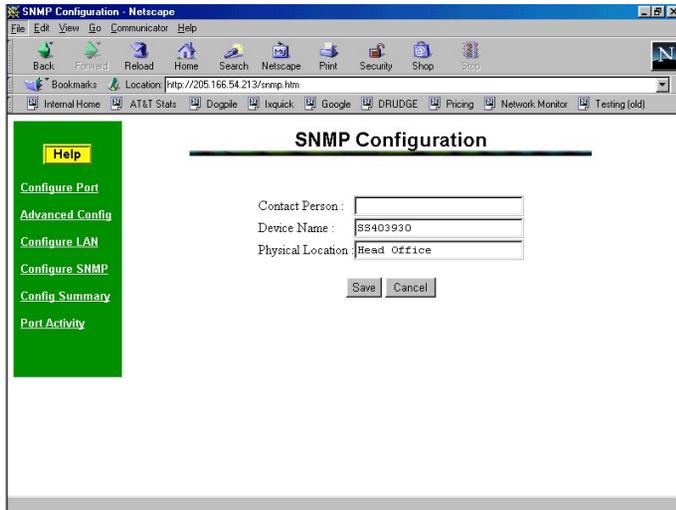


Figure 7: SNMP Configuration Screen

### Overview

This screen 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 the network.

These values have no effect on the operation of the EtherPath. Other standard MIB values are returned to the SNMP manager along with this information.

**Contact Person**

This text field can be used to store the name of the person responsible for the Serial Port Device.

**Device Name**

This can be used to store a descriptive name for the device.

**Physical Location**

This can be used to store the location of the device.

## Configuration Summary Screen

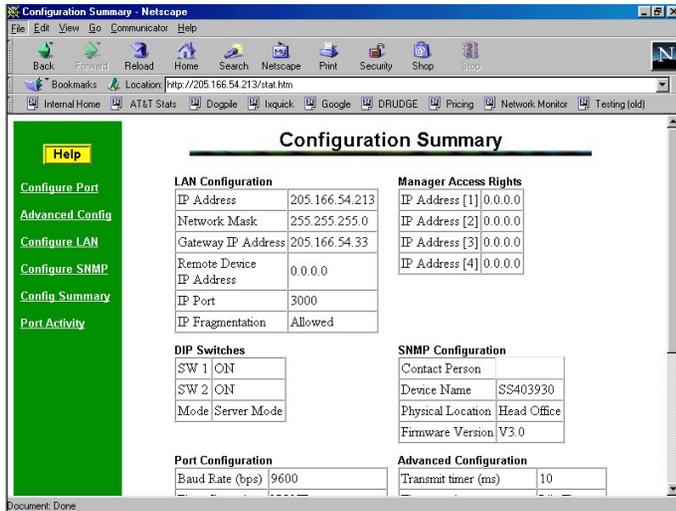


Figure 8: Configuration Summary Screen

### Operation

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

## Chapter 5

# Operation

*This Chapter explains how to use the EtherPath, once it is installed and configured. Although it may be used with automated equipment such as RTUs, POS, or other computer-based devices; the example configurations shown in this chapter use terminals or terminal emulation on a PC for illustrations. It is often useful to set up the EtherPath using this method before connecting other equipment.*

### Client/Server Point-to-Point (Nailed-Up) Mode

- Both EtherPaths must be correctly installed and configured as described in Chapters 3 or 4. One serial port device is connected to the "Server" EtherPath, and another serial device is connected to the "Client" EtherPath. One EtherPath has the operational mode set as a "Server", the other has the operational mode set as a "Client".
- The communication settings for the serial devices must be the same as the values entered into the EtherPath device they each attach to.
- Power up the "server" EtherPath.
- Power up the "client" EtherPath. It will automatically connect to the remote EtherPath whose IP address was stored during

configuration if hardware dialing is enabled and pin 6 is asserted.

- You may now proceed as if the remote serial port device was directly connected to the serial port of your local serial device.
- If *Pin 6 control* is set to *From Interface*, then the serial device must provide a high level signal on pin 6 before the EtherPath will accept or place an Ethernet connection.

---

## Server Mode

- Install and connect the EtherPath and Serial Port Device as described in Chapters 3 and 4.
- Any PC or workstation on the LAN/WAN should now be able to use Telnet to connect to the Serial Port Device with the command:

```
telnet IP_Address Port_number
```

Where *IP\_Address* is the IP address of the EtherPath, and *Port\_number* is the configured value (default value is 3000).

For example, if the default IP address and port number have not been changed (and they are appropriate for your network), then you would enter the command:

```
telnet 192.168.1.1 3000
```

- You should see a “Connected” message from the telnet client when the connection is established. Some telnet clients don’t display this message.
- You may now proceed as if the remote serial port device was connected to the serial port of your PC or workstation.
- If there is a firewall in the link between the EtherPath and your workstation, you may need to configure it to pass packets using the port number configured into the EtherPath.

## Client/Server Point-to-Multiple-Point (*EtherModem*) Mode

- *EtherModem* mode requires multiple EtherPaths configured in “Server” mode and a single EtherPath configured in “Client”

mode. Under user control with "AT" commands, the "Client" connects to multiple "Servers", one at a time similar to the way a dial-up modem would. "Server" and "Client" refer to the operational mode settings of the EtherPath.

- All EtherPaths must be connected as described in Chapters 3 and 4. One serial port device is connected to each "Server" EtherPath, and additional serial devices (usually a workstation) are connected to the "Client" EtherPaths.
- The "Client" EtherPath must be configured for "ATD" dialing. This is the unit that will place the calls to the other EtherPaths.
- At the "Client" end, start the Terminal emulation program (or use a real terminal). The communication settings for this device must be the same as the values entered into the "Client" EtherPath device earlier.
- Power up the local EtherPath. It will be in command mode, awaiting a connection command. Type the command "AT <enter>" to test the RS-232 connection. It should answer with an "OK" message. If not, check the serial port rate and wiring connections. "Dial" a remote EtherPath by using an "ATD" dial command. "ATD1.2.3.4:5555", where 1.2.3.4 is the IP address of the remote EtherPath and 5555 is the optional connection port number configured in the remote EtherPath. The EtherPath will automatically connect to the remote EtherPath. If an address isn't given, the IP address stored during configuration is used. If a port isn't given, the port number stored during configuration is used.
- Upon establishing a connection, a "Connect" message is displayed. If unable to establish a connection a "Busy" message is displayed.
- You may now proceed as if the remote serial port device was connected to the serial port of your workstation.

---

*Operation*

- Disconnect from that remote EtherPath with either the “+++” command followed by “ATH” or by lowering the hardware lead on pin six.
- See the Appendix for a complete list of AT commands and responses.

## **Client (Reverse Telnet) Mode**

### **Method 1 (ATD dial mode)**

- The EtherPath must be configured for “ATD” dialing and set for "client".
- Start the Terminal emulation program (or use a real terminal). The communication settings for this device must be the same as the values entered into the “Client” EtherPath device earlier.
- Power up the local EtherPath. It will be in command mode, awaiting a connection command. Type the command “AT <enter>” to test the RS-232 connection. It should answer with an “OK” message. If not, correct the RS-232 cable miswiring or terminal program problem. “Dial” a remote telnet server by using an “ATD” dial command.. “ATD1.2.3.4:5555”, where 1.2.3.4 is the IP address of the remote telnet server and 5555 is the optional connection port number configured in the remote telnet server. The EtherPath will automatically connect to the remote telnet server. If an address or port number isn’t given, the values stored during configuration are used. See the Appendix for a complete list of "AT" commands and responses.
- If the EtherPath is in “Client - Echo” mode, you should see the message “Connect OK !” from the client mode EtherPath when the connection is established
- You may now proceed as if the remote telnet server was connected to the serial port of your workstation.
- Disconnect from that remote telnet server with either the “+++” command or by lowering the hardware lead on pin six.

**Method 2 (Hardware Dial mode)**

- This mode operates with the “Hardware dial (Pin 6 ) setting. In this mode, the EtherPath connects to the configured IP address as soon as RS-232 pin 6 is asserted.
- The EtherPath must be configured for “Hardware(Pin 6)” dialing and dip switches set for "client".
- Start the Terminal emulation program (or use a real terminal). The communication settings for this device must be the same as the values entered into the “Client” EtherPath device earlier.
- Power up the local EtherPath. The EtherPath will automatically connect to the remote telnet server using the values stored during configuration.
- If the EtherPath is in “Client - Echo” mode, you should see the message “Connect OK !” from the client mode EtherPath when the connection is established
- You may now proceed as if the remote telnet server was connected to the serial port of your workstation.
- Disconnect from that remote telnet server by lowering the hardware lead on pin six.

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## Chapter 6

# 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 EtherPath still does not function properly, please contact your dealer for further advice.

### Hardware Problems

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

**If connecting to a 9 pin PC port, a crossover (null modem) cable is required.**

**P1:** All the EtherPath's LEDs are off.

**S1:** Check the power supply or power connection.

**P2:** When using 10Base-T cabling, the EtherPath unit does not work.

**S2:** Check the Hub's link LED for the port to which the EtherPath is connected. If it is off, make sure the network cable between the EtherPath and hub is in good condition. You may only use one of the LAN connections at a time. Make sure the Hub supports

10BaseT or 100BaseT. Sometimes it helps to move the network cable to a different hub port or power cycle the hub (especially when using smart hubs or Ethernet switches).

## Can't Connect via the LAN

**PI:** Can't connect to the EtherPath using Telnet or Web Browser.

**S1:** Check the following:

- Start troubleshooting from a known state. Power the EtherPath and other equipment OFF and ON to reboot.
- “Ping” the EtherPath 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 EtherPath (e.g. `ping 192.168.1.1`). If it does not respond, then check all LAN connections. If the workstation can not ping the EtherPath, nothing else will work... fix this first. If the LAN connection are OK, the problem is in the LAN addresses or routing. You should be able to ping both EtherPaths in a Client/Server pair.

- If using a LAN without routers, you can connect to the EtherPath ONLY IF your PC and the EtherPath are using IP Addresses from the same address block. The EtherPaths default IP Address (192.168.1.1) requires that your PC is using an address from the address block 192.168.1.2 to 192.168.1.254, and a *Network Mask* of 255.255.255.0. If a router is between the devices, a gateway address must be configured in both devices.

Check your PC's IP Address using *Control Panel - Network - TCP/IP (Adapter) Properties* or similar commands appropriate for your computer. If you are using a different Address block, use *Terminal Mode*

configuration to set a compatible IP Address in the EtherPath.

- Check that you have used the correct port address. The default address is “3000” for normal operation and “8000” for configuration.
- Is there a firewall in the Ethernet path. If so, it must be configured to pass the ports in use by the EtherPath.
- Are you trying to connect to the EtherPath data port with a web browser? That only works for configuration.
- Web Browsers often are configured to use a proxy server. The browser might need to be configured to NOT use the proxy when connecting to the EtherPath, or the proxy server may be configured to pass the requests correctly.
- MOST EtherPath connection problems are due to incorrect RS-232 wiring. The second most common errors are incorrect IP addressing on either the EtherPath or on the PC used for testing.

---

## Other Problems

**P1:** Can't run the configuration program using a serial cable connection.

**S1:** Check that:

- You did press the configuration button.
- The communication parameters are set properly.
- Disconnect and reconnect the power supply to the EtherPath.
- Power is available... a LED is on.
- The most common problems causing this symptom are incorrect RS-232 wiring or the Windows Hyperterm program not operating correctly.

**P2:** The "Client" EtherPath doesn't automatically connect to the "Server" EtherPath.

**S2:** Check that:

- One unit is configured as a client, the other as a server. For troubleshooting, note that the DTR signal is asserted as soon as a connection is active.
- The "Client" is configured for automatic connections. "Hardware (Pin 6) Dial" is the correct setting.
- The "Client" should either be configured for "Pin 6 Control" forced ON or the interface must be wired in such a way that that pin 6 is asserted.
- The "Server's" IP address was correctly entered into the "Client's" EtherPath in the "Remote IP Address" field.
- The Gateway IP Address is set correctly.
- The Subnet Mask is set correctly.

- The communication parameters between the PC/terminal and the local ("Client") EtherPath match.
- The communication parameters between the serial port device and the remote ("Server") EtherPath match.

**P5:** The EtherPath's IP Address is unknown. Is there any way of finding it?

**S5:** Follow this procedure:

- Yes, see the chapter on using *Terminal Configuration*.
- Press the configuration button and use a terminal connection to read the existing configuration.

**P6:** Why does the "Server Mode" EtherPath close the TCP/IP connection to the "Client Mode" EtherPath (or other client program).

**S6:** The "Server Mode" EtherPath will disconnect the link if it does not receive any packets from the "Client Mode" EtherPath (or other client program) within a 3 minute period or if hardware pin 6 is lowered. See Appendix B for more details.

**P7:** The connection works, but is too slow.

**S7:** If in *Transmit timer mode*, lower the transmit timer to send packets more frequently. 20 to 30 msec. is a good range for many users. If in *Idle timeout mode* perhaps the serial data rate may be increased so characters arrive at the EtherPath faster.

## Checking Device Operation

Once the EtherPath is installed on your Network, you can connect to it using Telnet, to verify its operation. The procedure is as follows.

1. Leave the EtherPath in its normal operating mode.
2. Use telnet to connect to the EtherPath with the command:

```
telnet IP_Address 8000
```

Where `IP_Address` is the IP Address assigned to the EtherPath, and 8000 represents the Port number.

- The port number is “8000” for configuration, but “3000” is the default for normal operation.
  - If the “Manager IP Addresses” have been entered in the EtherPath, then only a PC having one of those addresses can change the configuration.
3. Choose item 5 (“Display Settings”) from the Main Menu, and examine the data shown. See Chapter 3 for an explanation of each of the data items.

# Appendix A

## Specifications

### EtherPath Specifications

- Flash Memory: 512 Kbytes
- SRAM: 256 Kbytes
- EEPROM: 512 Bytes
- LAN Buffer: 2 Kbytes
- RS-232 Buffer: 4 Kbytes
- RS-232: one male DE-9 connector
- Network: Ethernet 10Base-T/ 100Base-T
- CPU: 16 Bit
- Power: 9 to 12 VDC (260 ma) or Optional power supplies
- Switch: Configuration
- LED: 3 multi-purpose
- Default IP address: 192.168.1.1
- Default Receive port: 3000

## RS-232 PIN Assignments

The EtherPath 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) (Hardware controlled-connection input. See Section 5)	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 EtherPath

### **Transmit Data**

Output, Data from the EtherPath. The EtherPath only transmits when it has characters to send and it is not flowed-off with XON/XOFF or RTS/CTS flow control.

### **DTR**

Output. Signal is enabled when the EtherPath has a valid LAN connection to another device. This signal is low when powered on. It goes high when a valid LAN connection is established, and returns to low when that connection is disconnected.

### **Signal Ground**

Common ground

### **DSR**

Input. Used for connection control. If the EtherPath is configured for "Hardware (Pin 6) Dial" and not "Forced ON", the EtherPath connects to a remote device via the LAN when the signal is asserted. If configured for "Forced ON" and "Hardware (Pin 6) Dial", the EtherPath connects to the remote device upon power up. If configured for "AT Dial", and "From Interface", the input must be asserted before the AT Dial command will create a connection. On units configured as a server, DTR must be high before an incoming connection will be established.

**RTS**

Output. Input flow control. When the internal buffer reaches the “Flow Off” buffer level, this signal is lowered. When the buffer level decreases to the “Flow ON” buffer level, this signal is raised.

**CTS**

Input. When Flow Control is set for CTS/RTS, lowering this signal will halt data flow from the EtherPath RS-232 port.

**Ring Indicator**

Not used

## CABLES

Commonly used cable connections:

### To PC 9-pin COM: port

SS-1		PC
1,6	—	4
2	—	3
3	—	2
4	—	1,6
5	—	5
7	—	8
8	—	7

This is a relatively common null-modem PC crossover cable

### SR Mux Composite or Access Switch Input Port

RJ-45		DE-9S
1	— BLU —	N/C
2	— ORG —	N/C
3	— BLK —	4,1,6
4	— RED —	5
5	— GRN —	2
6	— YEL —	3
7	— BRN —	8
8	— WHT —	7

---

## SS-1 to Modem

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Use any commercially available PC-to-modem cable.

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## Specialty Cables

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For special devices (RTUs, POS terminals, etc. contact technical support or check the DCB web site technical support section. DCB will assist in designing special cables at no cost, or provide proven cable solutions at a reasonable cost.

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## Ethernet Cross-Over Cable

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Used to connect two EtherPath Ethernet connections “back-to-back” without using an Ethernet hub for test purposes. Also used to connect a EtherPath directly to a PC’s LAN connection for testing.

RJ-45		RJ-45
1	WHT / ORG	3
2	ORG / WHT	6
3	WHT / GRN	1
4	BLU / WHT	N/C
5	WHT / BLU	N/C
6	GRN / WHT	2
7	WHT / BRN	N/C
8	BRN / WHT	N/C

## Appendix B

# Programming

*This Appendix explains the EtherPath's remote programming interface. This is not used in most applications. The information is for those writing programs to access the EtherPath via the Ethernet.*

### Introduction

It is rather straightforward to implement a software application to communicate with serial devices through the EtherPath. Topics covered in this appendix are:

- EtherPath description and behavior
- Application notes
- Links to sample code

In addition to user-written software applications, there are “port redirector” software packages that work quite well with the EtherPath. If you are not a “network programmer”, then port redirector may be the quickest way to get an application on-line.

For UNIX systems (AIX, Linux, SCO5, FreeBSD, OSF), Termnet works quite well. It is GNU'd freeware available from <http://www.dcbnet.com> or <http://www.linuxlots.com>

For Microsoft Windows systems, Serial/IP is an excellent low-cost program, also available from <http://www.dcbnet.com>.

## Description and Behavior

### Ports used by the EtherPath

The EtherPath uses 3 ports, as follows:

Port	Description
Data Port	'Server Mode' EtherPath listens at the port and offers a raw TCP connection. This port number is configurable. Default is 3000.
From Port 5000	The 'Client Mode' EtherPath uses sending port 5000 to connect to its Remote Host. To prevent keep-alive packets, do not use port 5000 in user-written programs.
8000	Provides a telnet configuration service for all modes. Do not use port 8000 in user-written programs.

For user-written client application, avoid port numbers 5000 and 8000. The "Server" will respond to any configured port number other than those.

### Server Mode

In Server mode, the EtherPath runs under the TCP/IP network protocol. It will listen on a configured port number. The server will wait for connection after initialization.

After a connection is established, the server always keeps checking for data on both Ethernet and Serial Ports.

If data from the Ethernet network is received, it will first check for a special control symbol, filter it if found and then send the rest of the data to the serial port.

If data from the serial port is received, it will read the data from the serial buffer, move the data into the network buffer and send it by Ethernet to the application when the buffer is full or on the next tick of the transmit timer.

### **Transmit Conditions**

The EtherPath will transmit an Ethernet packet when any of these conditions are met:

- Transmit Timer is up and running in *Transmit Timer Mode*
- Idle Timer is up and running in *Idle Timeout Mode*.
- Transmit Buffer full
- LT Character is encountered and *Transmit on Line Terminator* Function is ON ( Client Only )

## Locking Avoidance Mechanism

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When two EtherPaths are used to emulate a direct serial connection over the network as described previously, the 'Server Mode' EtherPath could be locked if its connecting 'Client Mode' SS dies abnormally. If this situation happens, no connection to the 'Server Mode' EtherPath is possible, and it should be reset. To solve this problem, the following system is used.

1. A "Keep-Alive" message is defined as a 21-byte string:  
sErIaLsErVeRkEePaLiVe
2. This string "sErIaLsErVeRkEePaLiVe" is sent out by the 'Client Mode' EtherPath if the time since the previous transmission exceeds **60 sec**. It tells the 'Server Mode' EtherPath that 'I am still alive and do not close the connection'. It keeps sending out this string every 60 seconds if there is no data to send.
3. The 'Server Mode' EtherPath will disconnect the link if it does not receive any package from the 'Client Mode' EtherPath within a **3 minute** period.
4. The 'Server Mode' EtherPath will then initialize and accept a new connection. The 'Client Mode' EtherPath will attempt to reconnect as soon as a network path becomes available.
5. User-written programs can avoid this operation by not using the listen port number 3000 **and** the transmit port number 5000. If a user-written program uses these two ports, the program must handle the keep-alive packet properly.

## Application Notes

There are a number of application notes available from the DCB web site at <http://www.dcbnet.com> . These cover port redirection, selecting the proper product (EtherPath vs. EtherPoll), SNMP, middleware for the EtherPath, a demonstration client-server software system, and other issues.

A complete copy of the SNMP MIB is available from the same site along with a free port redirector program (along with source code) for various UNIX workstations. A trial port redirector program for Windows is also available. A demonstration program for a Windows workstation is printed in the next section.

These and more are available in the Education section of that web site.

## **Example Code**

In addition to the UNIX port redirector program, a client program which connects to a EtherPath configured in server mode is available on the DCB website in source code form. It is written for Microsoft Windows in Microsoft C. This is located at <http://www.dcbnet.com> under the support section.

## Appendix C

# AT Command Summary

*This Appendix explains the EtherPath's AT command set operation and responses.*

### AT Commands

The EtherPath recognizes the following AT commands (when AT Dialing is enabled):

ATD <IP>	connect to <IP_address>
ATDT <IP>	connect to <IP_address>
ATH[0/1]	on/off hook (ATH<cr> == ATH0)
ATO[0/1]	return to data mode from command mode, if connected
ATE[0/1]	echo off/on (ATE<cr> == ATE0)
ATS0=[0/1]	switch to Client(0) or Server(1) mode, if not connected
ATV[0/1]	terse/verbose response (ATV<cr> == ATV0)
ATZ	reset EtherPath (DOES NOT restore factory defaults)
AT&W	save current settings, including ATE and ATV
AT&Z	reset EtherPath (Same as ATZ)
+++	escape to command mode when connected

## AT Command Responses

The serial port responses depend on the ATE setting:

<b>Verbose</b>	<b>Terse</b>
OK	0
CONNECT	1
CARRIER	3
ERROR	4
BUSY	7

## AT Command Operation

When ATE1 is in effect, there are some addition error messages such as "Invalid IP address" and "Invalid Entry"

The ATE and ATV settings are saved in non-volatile memory when the AT&W command is entered, and those settings are restored when the EtherPath is reset. The Factory Default setting (main menu, option 6) for both is ON.

Connections are only allowed when Pin 6 is HIGH or FORCED HIGH. If not FORCED HIGH, the Pin 6 can be used to drop a connection. One can also use "+++" then ATH<cr> to drop a connection.

## **Appendix D**

# **RS-422/ RS-485**

## **Interface**

*This Appendix describes the EtherPath's 4-2843 RS-422/485 interface. This interface option may be jumper configured in the field or pre-configured at the factory.*

### **Introduction**

The 9-pin serial connector on the EtherPath may be for either RS-232 or RS-422 (4-wire RS-485 point-to-point) operation using internal jumpers.

### **Changing the Setting**

Remove the main board from the case by removing two screws from the rear panel. There is a row of jumpers and three rows of pins adjacent to the serial connector.

### **RS-232 Setting**

ALL jumpers should be placed in the positions nearest the board edge.

### **RS-422/4-Wire RS-485 Setting**

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*Specifications*

ALL jumpers should be placed in the positions furthest from the board edge.

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

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