

EtherPath

User's Guide

Revised June 14, 2000
Firmware Version 2.2

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.

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Version 2.1

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Chapter 1

Introduction

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

Congratulations on the purchase of your new EtherPath. The EtherPath is designed to make it easy to 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.

Some serial port devices in common use are Bar Code Readers, UPSs, SCADA RTUs, alarms, access control devices, and Multiplexers.

For easy connection to your LAN, the EtherPath supports both BNC (10 Base 2) and RJ45 (10 Base T) 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.

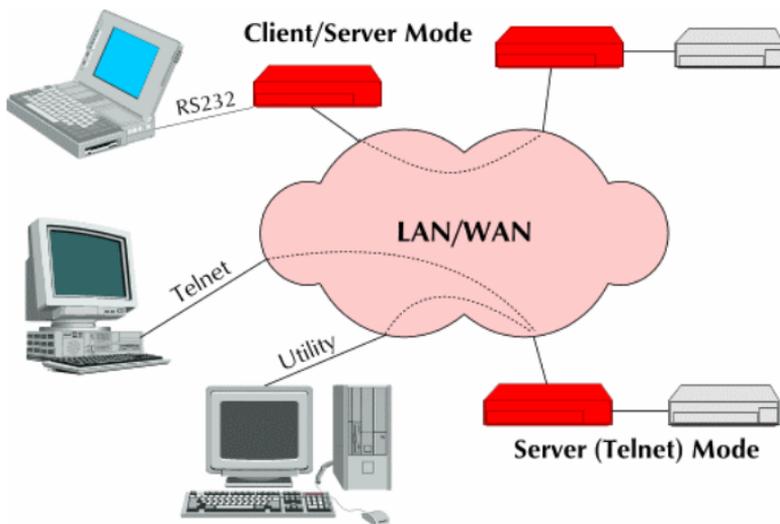


Figure 1: Modes of Operation

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.

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 either “Hardware” or “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 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.

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.

Connection Recovery

The EtherPath uses a proprietary protocol to ensure the 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.

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 is quite small, being only 12 cm long.

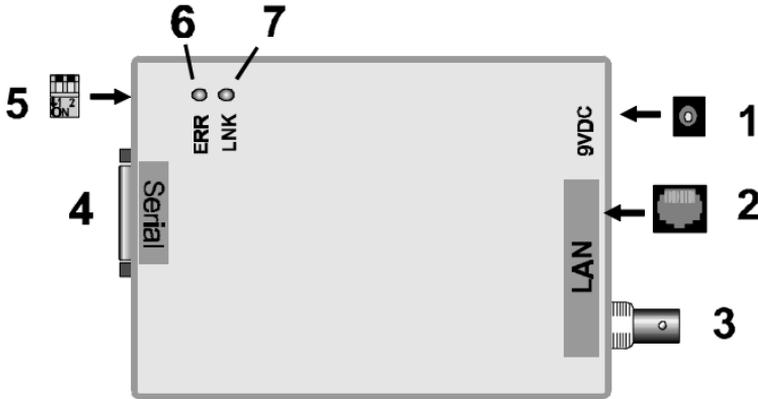


Figure 1: EtherPath

1	Power port	Connect the power adapter here.
2	10Base-T port	Connect 10Base-T cabling here.
3	10Base2 port	Connect 10Base2 cabling here.
4	Serial Port	Connect the serial port device (Server mode) or PC (client mode) to this port.
5	DIP switches	Used to set the device mode. See the following <i>Dip Switches</i> table for more details.
6	Error LED	See page 8 for details.
7	Link LED	See page 8 for details.

DIP Switch Table

The following table shows the various settings for the 2 DIP switches on the EtherPath.

Sw1	SW2	Description
off	off	Client Mode
off	on	Use default IP Address (192.168.1.1)
on	on	Server Mode
on	off	Configuration Mode

Modes Configured by Dip Switches

Client Mode

Use this setting if the EtherPath is being used in "Client" mode (Either in a client/server connection or a point-to-multiple-point connection).

Server Mode

The EtherPath is being used in "Server" mode.

Configuration Mode

This is only used when configuring the EtherPath via the serial port, as explained in *Chapter 2 - Configuration*.

Restore Default IP Address

If the DIP switches are set to this position, when the device is next powered up, the default IP Address of 192.168.1.1 will be used. Use this setting to connect to the device over the LAN if the IP Address is lost.

LED Indicators

- The red LED is the Status/Error indicator.
- The green LED is the Power/Link indicator.
- The different states indicated by these LED are described below.
- Note that each LED can have 3 states - ON, OFF, or Flashing.

Green LED	Red LED	Status Description
Solid ON	Solid OFF	Normal operation
Flashing	Solid OFF	Device is transmitting or receiving packets from the network.
Solid OFF	Flashing	IP address not assigned.
Solid ON	Solid ON	Hardware error.
Solid OFF	Solid OFF	No power .
Flashing or Solid ON	Flashing	No connection to either the RS-232 (serial) port or the LAN.
Flashing	Solid ON	Configuration mode.
Concurrent flashing.	Concurrent flashing	MAC address not assigned.
Alternate flashing.	Alternate flashing	Download mode (used only when updating the firmware).

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

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.

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

LAN Installation

1. Set the DIP Switches

Set the DIP switches according to whether the EtherPath is being used as a “Client” or a “Server”. Refer to the DIP switch table on page 7.

2. Connect the Network Cable

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

- Thin Ethernet (10Base-2, BNC connector)

- Twisted Pair Ethernet (10Base-T, RJ45 connector)



Note!

Use only ONE connector. Do not change the LAN connection while the EtherPath is powered on.

3. Connect Power Adapter Cable

Plug in the power adapter cable. Check the Power and Status LED indicators on the top of the unit. When the Red Status indicator LED goes out and the Green Power indicator LED remains lit or flashes, the EtherPath is ready.



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

4. Connect the Serial Port Device

Connect the serial port device to the serial port on the EtherPath.

Then connect the power lead to the serial port device.

Chapter 3

Terminal/Telnet Configuration

This Chapter describes how to configure the EtherPath's using Terminal mode, Web Browser mode, or Telnet mode.

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.

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.

Procedure

1. Set the DIP switches on the EtherPath to the “Configuration” position. (SW1=ON, SW2=OFF).
2. Connect the EtherPath to your PC or terminal.
3. Configure the terminal program with the following settings.

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

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

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 *Terminal/Telnet Interface* on page 16 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.
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 Windows, 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 add an entry for the EtherPath to the arp table, as follows:

- Go to the command prompt or the *Run* dialog box.
- Enter the following command:

```
arp -s ip_address hardware_address
```

Where:

ip_address is the IP Address you wish the EtherPath to use. This address must be within the address range used by your LAN.

Hardware_address is the hardware address of the EtherPath. This can be derived from the default name shown on the sticker on the base of the device.

The default name is in the form SCnnnnnn (SC followed by 6 digits). The hardware address is formed by joining the digits to 00-c0-02 in the form 00-c0-02-nn-nn-nn

For example, if the default name is SC123456, then the hardware address is 00-c0-02-12-34-56

- Once the above entry has been added to the arp table, you should be able to connect to the EtherPath, using the IP Address you assigned in the arp table.
- The EtherPath configuration should be changed to use the same IP Address you used in the arp table.

3. Refer to the following section for details on using the configuration program.

Terminal/Telnet Interface

The Signon screen displays the version number.

```
EtherPath  V2.2
-----
Device Name: SSA94600
Physical Location: Head Office

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 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 Address: 205.166.054.212          Serial  
NO: 00:C0:02:A9:46:00  
Remote Address: (Invalid)  
Gateway Address: (Invalid)  
Subnet Mask: 255.255.255.000  
Name of Contact Person: Supervisor  
Device Name: SSA94600  
Physical Location: Head Office  
Remote Port: 3000
```

LOCAL UNIT SETUP:

- 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
0 -- Return to previous menu

EXAMPLE:

to set local IP address to 128.100.90.57
=> 1 128.100.90.57
to set the device name to SS00001
=> 6 SS00001

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.

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.

Serial Port Configuration:

```
Flow Control: XON/XOFF
Baud Rate: 9600
Parity Bit: NONE
Data Bits: 8 Bits
Stop Bits: 1 Bit
Pin 6 Control: FROM INTERFACE
Client Dial Mode: ATD
```

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.

For **Server** Mode, consult the documentation of your serial port device to determine what settings to use.

For **Client** Mode, use the settings you will be using for your Terminal or Terminal (VT100) emulation program.

Note that the “Client” EtherPath- connected to the PC/Terminal - does not have to use the same settings as the “Server” EtherPath.

Flow Control

The choices are “None”, “XON/XOFF”, and “RTS/CTS”.

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.

Stop Bits

The choices are 1 or 2.

Dial Mode

The choices are “ATD” or “Hardware”. Configures the client EtherPath to connect to a remote server when it receives an asserted hardware (pin 6) signal or when it receives an “ATD” command. See Chapter 5, Point-to-Multiple-Point-Mode.

Main Menu Option 4. Advanced Configuration Screen

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

```
Advanced Configuration:
  Transmit Timer: 1000 ms
  Block Size: 512 Bytes
  Flow OFF Buffer Level: 80%
  Flow ON Buffer Level: 20%
  Line Terminator Character: 13 (Dec)
  Transmit on LT Char: ON
  Transmit Mode Filter: OFF
  Client Local Character Echo: OFF
```

ADVANCED CONFIGURATION:

```
1 Transmit Timer [min=1ms, max=10000ms]
2 Block Size      [min=1bytes, 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 Transmit Mode 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 an built-in buffer to store data, and most of these settings affect the operation of the buffer. The default values should normally be satisfactory.

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

1. Transmit Timer

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).

2. Block Size

The maximum ethernet packet buffer size. The minimum value is 1 byte, the maximum 4096 bytes (4 K).

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.

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.

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:

- 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. Transmit Mode 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.

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.

Main Menu Option 5. Display Settings

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

```
Local Address: 205.166.054.212          Serial
NO: 00:C0:02:A9:46:00
Remote Address: (Invalid)
Gateway Address: (Invalid)
Subnet Mask: 255.255.255.000
Name of Contact Person: Supervisor
Device Name: SSA94600
Physical Location: Head Office
Remote Port: 3000
```

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

```
Serial Port Configuration:
Flow Control: XON/XOFF
Baud Rate: 9600
Parity Bit: NONE
Data Bits: 8 Bits
Stop Bits: 1 Bit
Pin 6 Control: FROM INTERFACE
Client Dial Mode: ATD
```

```
[Press any key to continue]
Advanced Configuration:
Transmit Timer: 1000 ms
Block Size: 512 Bytes
Flow OFF Buffer Level: 80%
Flow ON Buffer Level: 20%
Line Terminator Character: 13 (Dec)
```

Transmit on LT Char: ON
Transmit Mode Filter: OFF
Client Local Character Echo: OFF

Current Statistics of EtherPath:

Packets In Network: 313
Packets Out Network: 283
Error Packets: 0
Characters In Serial Port: 0
Characters Out Serial Port: 1

Current Configuration of EtherPath:

Switch Setting: SW1=OFF(UP), SW2=OFF(UP) (CLIENT
Mode-IP Dial)
Connected to IP Address: (NO ACTIVE CONNECTION)

[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

Packets In Network

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

Packets Out Network

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

Error Packets

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

Characters In Serial Port

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

Characters Out Serial Port

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 use the default IP Address of 192.168.1.1 or change the EtherPath IP address 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 may be lost when the EtherPath reboots. 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

Configuration

This Chapter describes how to configure the EtherPath using a Web Browser.

Overview

This configuration method uses your Web Browser to configure the EtherPath. This provides a more 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.
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, if the default IP address had not been changed, then you would enter the command:

```
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 Windows, 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 add an entry for the EtherPath to the arp table, as follows:

- Go to the command prompt or the *Run* dialog box.
- Enter the following command:

```
arp -s ip_address hardware_address
```

Where:

ip_address is the IP Address you wish the EtherPath to use. This address must be within the address range used by your LAN.

Hardware_address is the hardware address of the EtherPath. This can be derived from the default name shown on the sticker on the base of the device.

The default name is in the form SCnnnnnn (SC followed by 6 characters). The hardware address is

formed by joining the digits to 00-c0-02 in the form 00-c0-02-nn-nn-nn

For example, if the default name is SC123456, then the hardware address is 00-c0-02-12-34-56

- Once the above entry has been added to the arp table, you should be able to connect to the EtherPath, using the IP Address you assigned in the arp table.
- The EtherPath configuration should be changed to use the same IP Address you used in the arp table.

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.

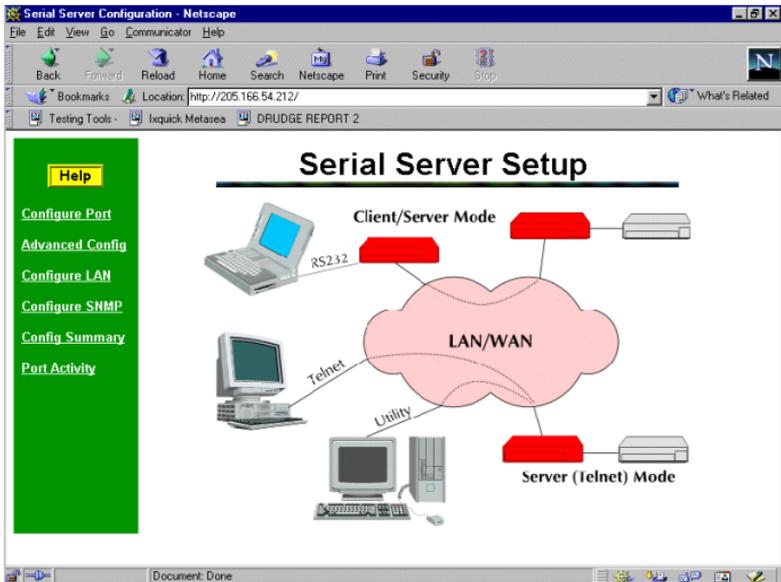


Figure 2: Sign on Screen

- 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

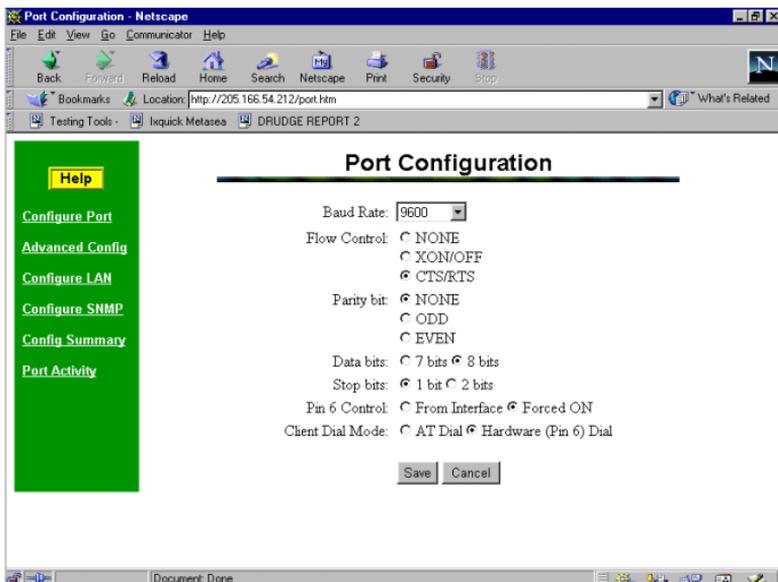


Figure 3: Port Configuration Screen

This screen allows you to configure the Serial Port on the EtherPath. The settings used should match the device connected to the serial port of the EtherPath.

- Consult the documentation of your serial port device to determine what settings to use.
- For **Client Mode**, use the settings you will be using for your Terminal or Terminal (VT100) emulation program
- Pin 6 Control Mode, See Section 5. Operation for details on how to set this. Normally “From Interface”.
- Client Dial Mode, See Section 5. Operation for details on how to set this. Normally set for “Hardware (Pin 6)”

Port Activity Screen

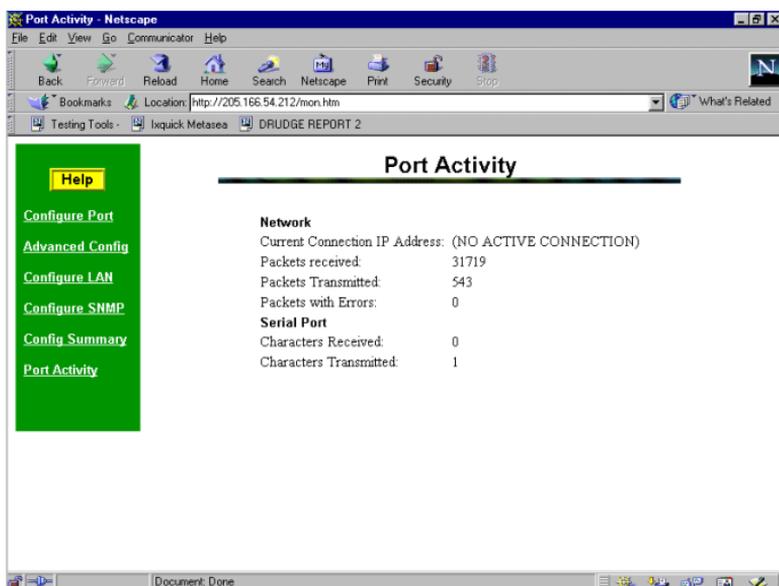


Figure 4:Port Activity Screen

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

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

Data - Serial Port

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

Advanced Configuration Screen

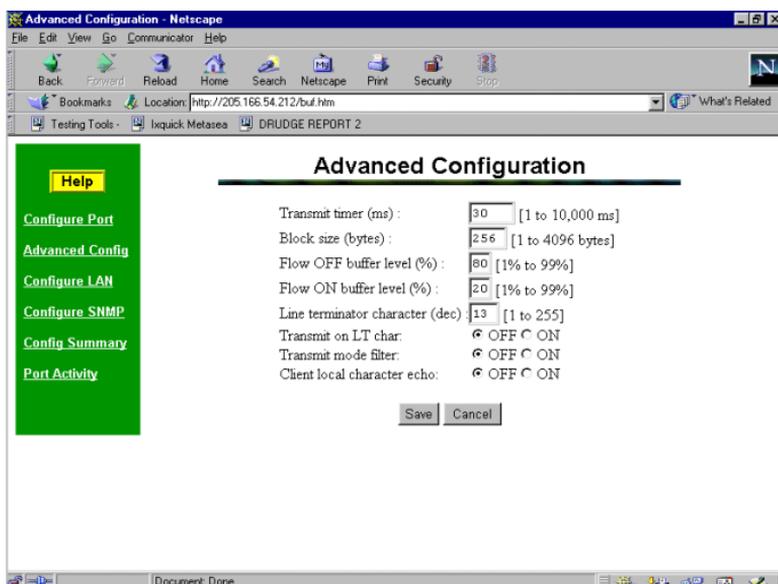


Figure 5: Advanced Configuration Screen

These settings affect the EtherPath's internal buffer, which is used for temporary storage of data, and how some characters are processed. These values strongly affect efficiency and throughput. They may be “tuned” for your application.

Data

Timer (msec)	The maximum time period data will be stored in the buffer before being sent. Allowable values range from 1ms to 10,000ms (10 seconds).
Block Size (bytes)	The size of the ethernet packet buffer. The minimum value is 1 byte, the maximum 4096 bytes (4 K).

Flow 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 from the serial port. Under normal operation, this will not happen.
Flow ON buffer level (%)	Once flow control has stopped input characters, the "no-input accepted" mode will continue until the EtherPath has transmitted enough data to reduce the buffer contents to this point.
Line terminator character (decimal)	Enter the ASCII/ANSI number (1..128) to represent the <i>Line Terminator Character</i> . The <i>Line Terminator Character</i> causes any data in the buffer to be transmitted immediately when the character is received, provided that: <ul style="list-style-type: none">• This EtherPath is being used in "Client" mode.• The following setting (Transmit on LT Char) is ON.• Default value is 0x13, a carriage return character.
Transmit on LT char	When this setting is ON, any data in the buffer will be sent immediately upon receipt of a <i>Line Terminator Character</i> (see above). When this setting is OFF, the <i>Line Terminator Character</i> has no effect.

Transmit filter mode	<p>This setting turns the filter function ON or OFF. If ON, when a CR/LF (Carriage Return, Line Feed) character pair is received, it is converted to a CR only. 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 which expect a CR only. CR/NULL character pairs are also converted to a CR only.</p> <ul style="list-style-type: none">• If this setting is OFF, then no conversion is done.• In "Client Mode", this setting has no effect.
Client local character echo	<p>If ECHO is ON, all characters received from the client mode serial port are echoed back out that port when connected.</p> <p>If ECHO is OFF, the client EtherPath will not echo input characters. This mode should be used if any messages from the EtherPath would create interference.</p>

LAN Configuration Screen

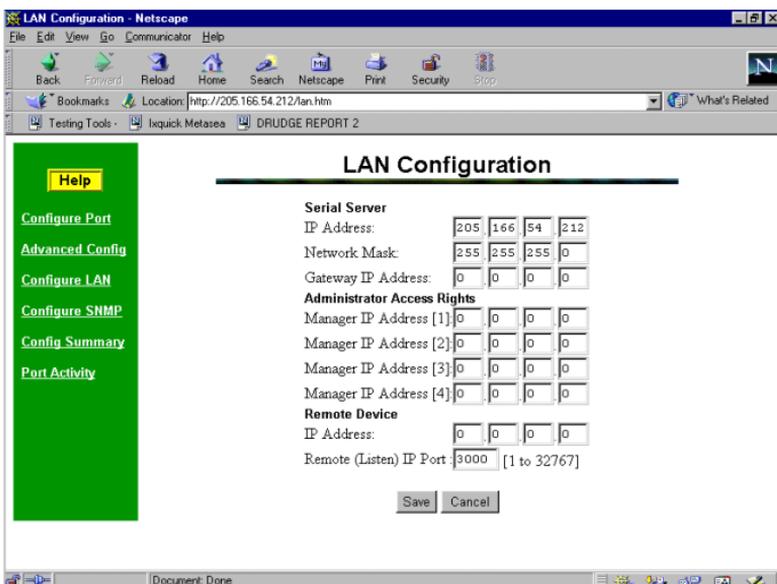


Figure 6: LAN Configuration Screen

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

- **EtherPath IP Address** and network mask are required.
- **Default Gateway** Required if operating through a router.
- **Administrator Access Rights** data is required if you wish to restrict access to the EtherPath's configuration data. If any values are entered, then only those PCs will be able to access the EtherPath and change the configuration.

- Remote Device:** In "Client" mode, this is the "Server" EtherPath device that this client will automatically connect to when powered up if hardware dialing is enabled and pin 6 is high. This is the default device for ATD or hardware (pin 6) dial mode. . *In "Server" mode, this value will be ignored.*

Data - EtherPath

IP Address:	<p>The IP address of this EtherPath device on your LAN in dotted decimal format. The default IP Address is 192.168.1.1</p> <p>Note: If you change the IP Address, the connection will be lost when you "Save". You must reconnect using the new IP Address.</p>
Network Mask:	<p>The network mask indicates what class of TCP/IP network you have. The default value (255.255.255.0) 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.</p>
Gateway IP Address:	<p>If your LAN contains a router, enter the IP Address of the Router. Otherwise, leave this value at 0.0.0.0</p>

Data - Administrator Access Rights

Manager IP Address [1] to [4]	<p>Enter the IP Addresses of the PCs which you wish to have access to the EtherPath configuration data. If these are left blank (default) then all PCs have access.</p>
----------------------------------	---

Data - Remote Device

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. It is the default remote device in ATD or DTR dial mode. <i>In "Server" mode, this value is not required, and will be ignored.</i>
Remote IP Port	This is the port with which the client mode EtherPath will attempt connections. The default is 3000. Another commonly used value is 23 (telnet).

SNMP Configuration Screen

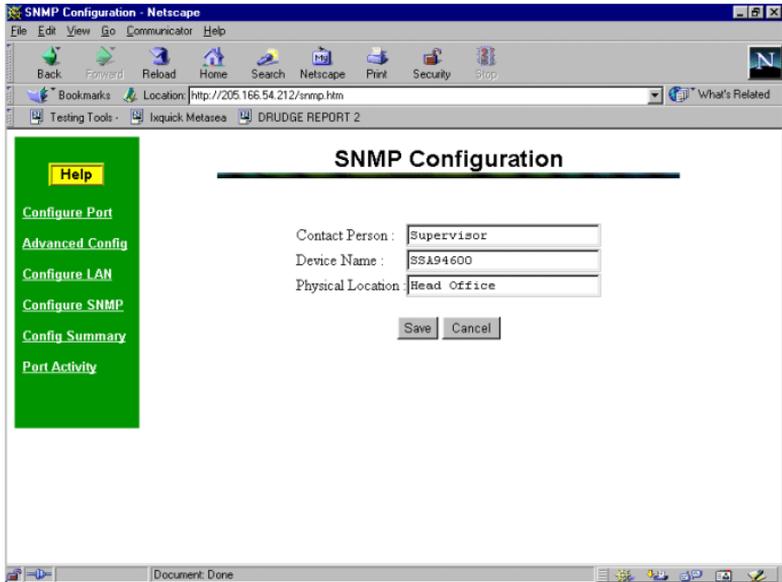


Figure 7: SNMP Configuration Screen

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.

Data

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 a the location of the device.

Configuration Summary Screen

Configuration Summary

LAN Configuration

IP Address	205.166.54.212
Network Mask	255.255.255.0
Gateway IP Address	0.0.0.0
Remote Device IP Address	0.0.0.0
IP Port	3000

Manager Access Rights

IP Address [1]	0.0.0.0
IP Address [2]	0.0.0.0
IP Address [3]	0.0.0.0
IP Address [4]	0.0.0.0

DIP Switches

SW 1	ON
SW 2	ON
Mode	Server Mode

SNMP Configuration

Contact Person	Supervisor
Device Name	SSA94600
Physical Location	Head Office
Firmware Version	V2.2T

Port Configuration

Baud Rate (bps)	9600
Flow Control	CTS/RTS
Parity	NONE
Data Bits	8 bits
Stop Bits	1 bit
Pin 6 Control	Forced ON
Client Dial Mode	Hardware (Pin 6) Dial

Advanced Configuration

Transmit timer (ms)	30
Block size (byte)	256
Flow OFF level (%)	80
Flow ON level (%)	20
Line terminator char (dec)	13
Transmit on LT char	OFF
Transmit mode filter	OFF
Client local char echo	OFF

Set to Defaults

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.

Data

LAN Settings	Displays the current LAN settings for this EtherPath.
Manager Access Rights	If all entries are 0.0.0.0, then anyone can access and change the EtherPath configuration. If any entries are made, then only PCs with a matching IP Address can access the EtherPath's configuration data.
DIP Switches	Displays the current settings of the DIP switches.
SNMP	Displays the current SNMP data.
Port Configuration	Displays the current Serial Port settings.
Buffer Settings	Displays the current settings for the data buffer.

This page was deliberately left blank.

Chapter 5

Operation

This Chapter explains how to use the EtherPath, once it is installed and configured.

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

- Both EtherPaths must be connected as described in Chapter 3. One serial port device is connected to the “Server” EtherPath, and another serial device (usually a workstation) is connected to the “Client” EtherPath.
- 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 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 connected to the serial port of your workstation.

Server Mode

- Install and connect the EtherPath and Serial Port Device as described in Chapter 3.
- 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 remote EtherPath, and `Port_number` (default value) is 3000.

For example, if the default IP address and port number have not been changed, then you would enter the command:

```
telnet 192.168.1.1 3000
```

- You should see a “Connect OK !” 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.

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, the “Client” connects to multiple “Servers”, one at a time.
- All EtherPaths must be connected as described in Chapter 3. One serial port device is connected to each “Server” EtherPath, and another serial device (usually a workstation) is connected to the “Client” EtherPaths.
- The “Client” EtherPath must be configured for “ATD” dialing.
- 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.
- Disconnect from that remote EtherPath with either the “+++” command followed by “ATH” or by lowering the hardware lead on pin six.

Client (Reverse Telnet) Mode

- The EtherPath must be configured for “ATD” dialing.
- 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. “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 is used.
- 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.
- This mode also operates with the “Hardware dial (Pin 6) setting. In this mode, it connects to the configured IP address as soon as RS-232 pin 6 is asserted.

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.

P1: All the EtherPath's LEDs are off.

S1: Check the power supply or power connection.

P2: EtherPath's status light continuously stays lit.

S2: Reset EtherPath by unplugging the power supply and plugging it back in.

P3: When using 10Base-T cabling, the EtherPath unit does not work.

S3: Check the Hub's link LED for the port to which 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.

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 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 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*. If you are using a different Address block, use *Terminal Mode* configuration to set a compatible IP Address in the

EtherPath. Alternatively, use the procedure described on page 14 to add an entry to your PC's arp table.

- It may be that your "arp table" contains invalid entries. You can clear the "arp table" by rebooting, or by typing the following command at the command prompt or *Run* dialog box.: `arp -d`
- Check that you have used the correct port address. The default address is "3000" for normal operation and "8000" for configuration.
- 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:

- The DIP switches are in the correct position.
- 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:

- The DIP switches are in the correct position on both EtherPaths. 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, other than using *Terminal Configuration* mode?

S5: Follow this procedure:

- Power off the EtherPath, and set the DIP switches to use its default IP Address.
(DIP switch 1 OFF, DIP switch 2 ON)
Note that in this mode the "old" IP Address is still stored, but will not be used.
- Connect to the EtherPath, using Telnet and the IP Address 192.168.1.1. (Your PC needs to be using an IP Address which is compatible with 192.168.1.1, and an *Subnet Mask* of 255.255.255.0)
- You can now view the stored IP Address, and change it if required. Save before exiting.
- Switch the power off, and set the DIP switches back to the normal operating position.

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 mintue

period or if hardware pin 6 is lowered.
See Appendix B for more details.

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 DIP switches in their normal position for the operating mode you are using.
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 page 26 for an explanation of each of the data items.

Appendix A

Specifications

EtherPath Specifications

- Flash Memory: 512KBytes
- SRAM: 512KBytes
- NVRAM: 512Bytes
- RS-232: one male DE-9 connector
- Network: Ethernet 10Base-2, 10Base-T
- CPU: Intel 186-25
- Power: 9V
- RS-232 Buffer: 4KB
- LAN Buffer: 16KB
- DIP Switch: 2
- LED: 2

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:

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

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 cable is easily made by combining “PC-Direct” and “Remote PC” adapter hoods with a straight-through line cord.

SS-1 to Modem

Use any commercially available PC-to-modem cable.

Ethernet Cross-Over Cable

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.

Introduction

The document describes how to implement a software application to communicate with serial devices through the EtherPath. Topics covered are:

- EtherPath description and behavior
- Application notes
- Sample code

In addition to user-written software applications, there are several “port redirector” software packages that work quite well with the EtherPath.

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

For Microsoft Windows systems, TCPWedge software is an excellent product. Available from TAL Technologies at <http://www.taltech.com>

Description and Behavior

Ports used by the EtherPath

The EtherPath uses 3 ports, as follows:

Port	Description
3000	'Server Mode' EtherPath listens at port 3000 and offers a raw TCP connection. This port number is configurable
5000	The 'Client Mode' EtherPath uses port 5000 to connect to its Remote Host. Do not use port 5000 in user-written programs.
8000	Provides a telnet configuration service for all modes.

For user-written client application, use a different port number. The "Server" will respond to any port number.

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 Condition

- Timer is up.
- Transmit Buffer full
- LT Character is encountered if Line Terminal Function is ON (Client Only)

Locking Avoidance Mechanism

When two SS 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 **20 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 20 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 should attempt to reconnect as soon as a network path becomes available.

Application Notes

The programmer needs to be concerned about several things if an application is developed under the Windows network environment. When using the Winsock API, you need an understanding of socket event selection and processing, packet data handling, and time.

Winsock API

For 1.1 version, the following API calls must be used.

```
"WSAStartup"  
"socket ("  
"connect "  
"WSAAsyncSelect "  
"send "  
"recv "  
"WSAGETSELECTEVENT "  
"closesocket "  
"WSACleanup"
```

Socket event selection and processing

After the API “connect” is called successfully, the API call `WSAAsyncSelect` must be used to notify `winsock.dll` which events the socket cares about and what function will take care of the events. Then `winsock.dll` will know how to transfer the packets to specific functions.

An important case is the socket connection. The application must call the “`closesocket`” API if it wants to break a connection. Otherwise, the server will not reset the socket and cannot be connected again until after 6 minutes.

Packet data handling

To send data, the return value of the “send” API must match the length parameter in the “send” API. The rest of data must be sent again if the return value is less than the length in the send API.

To read data, the buffer size must be large enough and the parser must wait until data is complete.

Timeout

There is no way to know when the data will be available from the network. The timeout situation must be considered as well as how to know that the peer site is still alive.

Example Code

The following code demonstrates how a client program can connect to the "Server Mode" EtherPath.

```
#define WIN32_LEAN_AND_MEAN
#define FD_SETSIZE      1
#include <winsock2.h>
#include <stdlib.h>
#include <stdio.h>
#include <string.h>

void Usage(char *programe)
{
    fprintf(stderr, "Usage\n%s server port\n",
    programe);
    fprintf(stderr, "\tserver is the IP address
    server\n");
    fprintf(stderr, "\tport is the port to
    connect\n");
    fprintf(stderr, " Hit Ctrl-C to terminate
    it)\n");
    WSACleanup();
    exit(1);
}

int main(int argc, char **argv)
{
    char sendbuf[256], readbuf[2];
    unsigned short port;
```

```
int sendlen, readlen;
struct sockaddr_in server;
WSADATA wsaData;
struct fd_set readfds;
SOCKET sock;
struct timeval timeout = {1, 0};

if (argc != 3)
    Usage(argv[0]);
port = atoi(argv[2]);
if (port == 0)
    Usage(argv[0]);

if (WSAStartup(0x202,&wsaData) ==
SOCKET_ERROR)
{
    fprintf(stderr,"WSAStartup failed with
error %d\n",WSAGetLastError());
    WSACleanup();
    return -1;
}

// Open a socket
sock = socket(AF_INET, SOCK_STREAM, 0);
if (sock < 0)
{
    fprintf(stderr,"Client: Error Opening
socket: Error %d\n",
                WSAGetLastError());
    WSACleanup();
    return -1;
}
// fill sockaddr_in
```

```
    memset(&server,0,sizeof(server));
    server.sin_family = AF_INET;
    server.sin_port = htons(port);
    server.sin_addr.S_un.S_addr =
inet_addr(argv[1]);

    printf("Client connecting to: %s\n",
argv[1]);
    if (connect(sock, (struct
sockaddr*)&server, sizeof(server))
        == SOCKET_ERROR)
    {
        fprintf(stderr,"connect() failed:
%d\n",WSAGetLastError());
        WSACleanup();
        return -1;
    }

    for (;;)
    {
        // read server's response
        readfds.fd_count = 1;
        readfds.fd_array[0] = sock;
        while (select(1, &readfds, NULL, NULL,
&timeout) > 0)
        {
            readfds.fd_count = 1;
            readfds.fd_array[0] = sock;
            readlen = recv(sock, readbuf,
sizeof(readbuf)-1, 0);
            if (readlen == SOCKET_ERROR)
            {
                fprintf(stderr,"recv() failed:
error %d\n", WSAGetLastError());
```

```
        closesocket(sock);
        WSACleanup();
        return -1;
    }
    if (readlen == 0)
    {
        printf("Server closed
connection\n");
        closesocket(sock);
        WSACleanup();
        return -1;
    }
    readbuf[readlen] = '\0';
    printf("%s", readbuf);
}

// get input and send to server
sendbuf[0] = getchar();
// expand 0x0a to 0x0d 0x0a
if (sendbuf[0] == '\n')
{
    sendbuf[0] = '\r';
    sendbuf[1] = '\n';
    sendlen = 2;
}
else
    sendlen = 1;
    if (send(sock, sendbuf, sendlen, 0) ==
SOCKET_ERROR)
    {
        fprintf(stderr, "send() failed:
error %d\n", WSAGetLastError());
        WSACleanup();
    }
```

```
        return -1;
    }
}
closesocket(sock);
WSACleanup();
return 0;
}
```