

# **EtherPoll**

## **User's Guide**

Revised May 9, 2001  
Firmware Version 1.0



## **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 1.0

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# Chapter 1

## Introduction

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

Congratulations on the purchase of your new EtherPoll. The EtherPoll is a SCADA communications serial server that allows multi-drop devices to use Ethernet LAN's. The EtherPoll connects any async serial device through a LAN and between LAN's via routers. The EtherPoll is designed specifically to support asynchronous polling protocols, such as Poll Select, Modbus, DNP, etc. These protocols are often error corrected, and the EtherPoll allows these protocols to work through routed LANs and over IP protocol networks. The EtherPoll uses the UDP/IP protocol, allowing the necessary data connection over a local LAN and across routed networks.

The EtherPoll functions independently of the device protocol, allowing most 8 bit asynchronous protocols to be used with no configuration changes.

The EtherPoll 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 using another EtherPoll. Two EtherPolls may be used in “nailed-up” mode to build a “RS-232 path” through the WAN/LAN.

Most EtherPolls are used with multi-drop SCADA RTUs; although a pair of EtherPolls configured for point-to-point operation may be used by any async serial devices such as alarms, access control devices, and Multiplexers.

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

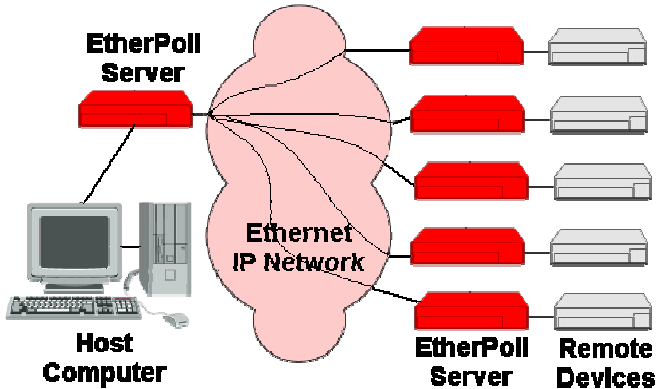
NOTE: A similar product, the EtherPath, uses TCP/IP protocol and may be more appropriate for some installations. If the application is not a polled environment, the EtherPath should be investigated.

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## EtherPoll Functions

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The EtherPoll is usually used in a host-to-multiple remote polled environment.



**Figure 1: Normal Mode of Operation**

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### Normal Operating Mode (Point-to-Multi-Point)

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In this mode, several EtherPolls are used. All are connected to serial RS-232 devices. This is the equivalent to using a multi-drop analog modem network... only it uses ethernet as the medium.

- The "host" EtherPoll will be configured with IP addresses of each "remote" EtherPoll. It is connected to a polling host computer.
- Each "remote" EtherPoll is configured with the IP address of the "host" EtherPoll. These are each connected to a remote terminal unit (RTU).

- Whenever the host computer polls the remotes, a copy of the poll block is sent to each remote in the host Etherpoll's address list.
- The proper remote RTU will respond to the poll through its EtherPoll with a poll response or appropriate data blocks, while other RTUs ignore the poll.

## **Point-to-Point Mode**

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This mode requires one pair of EtherPolls. Each EtherPoll is connected to a serial port device, and to the LAN.

Each EtherPoll has only one IP address in its IP address list (that of the other unit). All data received by the RS-232 port of either EtherPoll is sent to the other EtherPoll and out its RS-232 port.

## **Broadcast Mode (Point-to-Multi-Point)**

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Point-to-multi-point (*broadcast*) operation allows a single EtherPoll to broadcast all incoming data to multiple EtherPolls. Configuration is identical to the normal mode, but since non-polling external devices are used, there is no implicit method to control data being sent back to the host unit. For this reason, it is normally used in “outbound broadcast data only” applications.

## **Normal Mode with Backup Polling Host**

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This mode is also similar to the normal mode, but allows a redundant polling host computer to monitor all data traffic, and take control for fail-safe operation should the master host fail. Configuration changes from normal mode are simple. Each remote EtherPoll would have both the master and backup host EtherPoll IP addresses in its IP address list. The master

host would also have the backup host Etherpoll address in its IP address list.

Each remote EtherPoll sends its data to both the master and backup polling host. If the master host fails, the backup host should be programmed to take over the polling function. It would sense a failure by noting that master host polls are absent.

## **Other Features**

### **UDP/IP Protocol**

The EtherPoll uses the UDP/IP protocol. This is much more efficient for a polling system than TCP/IP. Since most polled SCADA systems use protocols that are error corrected, the transport (EtherPoll IP network) doesn't need to provide an additional layer of error correction overhead.

### **Protocol Independent**

The EtherPoll works well with any byte oriented asynchronous SCADA protocol. It does not require getting "into" the protocol blocks.

### **Protocol Conversion**

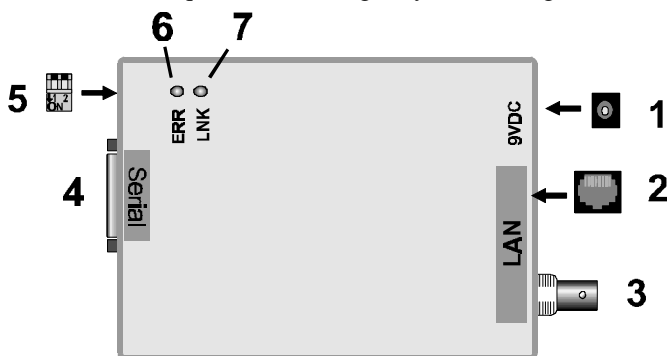
The RS-232 device at the client end and the device at the server end of a link do not have to use the same communications parameters on the RS232 link (speed, parity, flow control). The EtherPolls will convert the data to the correct parameters at each end.

## **Upgradeable Firmware**

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

## Physical Details

The EtherPoll is quite small, being only 12 cm long.



**Figure 1: EtherPoll**

<b>1</b>	<b>Power port</b>	Connect the power adapter here.
<b>2</b>	<b>10Base-T port</b>	Connect 10Base-T cabling here.
<b>3</b>	<b>10Base2 port</b>	Connect 10Base2 cabling here.
<b>4</b>	<b>Serial Port</b>	Connect the serial port device to this port.
<b>5</b>	<b>DIP switches</b>	Used to set the device mode. See the following <i>Dip Switches</i> table for more details.
<b>6</b>	<b>Error LED</b>	See page 9 for details.
<b>7</b>	<b>Link LED</b>	See page 9 for details.

## DIP Switch Table

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

Sw1	SW2	Description
off	off	NORMAL operation
off	on	Use default IP Address (192.168.1.1)
on	on	N/A
on	off	Terminal Configuration Mode

## Modes Configured by Switches

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### Normal Mode

Any time the EtherPoll is not in Terminal Configuration Mode or Default IP Address Mode.

### Terminal Configuration Mode

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

### Use Default IP Address

If the 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. When the switches are reset, the unit will power up with its configured IP address.



## LED Indicators

- The red LED is the Status/Error indicator.
- The green LED is the Power/Link indicator.
- The different LED indications 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	Normal operation 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 the LAN, OR Pin 6 is OFF and “From Interface” is configured for Pin 6.
Flashing	Solid ON	Telnet configuration session is active.
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 EtherPoll:

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

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

## **Software Requirements**

The EtherPoll supports the following protocols.

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

It may be configured using any terminal or terminal emulation software on a PC. Any standard telnet program may be used to telnet to the EtherPoll for configuration, or any standard web browser may be used for configuration once the EtherPoll has a valid IP address configured.

# Chapter 2

# Installation

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

## 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 switches according to Normal. Refer to the DIP switch table on page 8.

### 2. Connect the Network Cable

---

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



**Only use the power adapter provided with the EtherPoll. 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 EtherPoll. **If connecting to a PC 9-pin port, a cross-over (null modem) cable is required.** See the Appendix for wiring details.

Then connect the power lead to the serial port device.

# Chapter 3

## Terminal/Telnet Configuration

*This Chapter describes how to configure the EtherPoll using Terminal, or Telnet mode. Web Browser mode configuration is detailed in Chapter 4.*

### Overview

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

- **Web Browser** - After installing the EtherPoll 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 EtherPoll a compatible IP Address prior to installation in your network.
- **Telnet Mode** - After installing the EtherPoll 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 EtherPoll. See the Appendix for cable requirements. A Crossover (null modem) cable is required when using a 9 pin PC port.

### Procedure

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

Setting	Value
Flow control protocol	None
Speed	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 EtherPoll 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 17 for details on using the configuration program.

## Telnet Configuration

**NOTE: For telnet to work, there MUST be compatible IP addresses in both the PC and the EtherPoll!**

1. Install the EtherPoll into your LAN as described in Chapter 2. Ensure that the EtherPoll is powered on.
2. Connect to the EtherPoll with the command:

```
telnet IP_Address Port_number
```

Where:

IP\_Address is the IP address of the EtherPoll

**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 EtherPoll does not respond, check the following:

- The EtherPoll 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 EtherPoll 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 *EtherPoll* to use. This address must be within the address range used by your LAN.

**Hardware\_address** is the hardware address of the *EtherPoll*. 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 SCnnnnnnn (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 *EtherPoll*, using the IP Address you assigned in the arp table.
- The *EtherPoll* 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.

```
EtherPoll  V1.0
-----
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.

```
EtherPoll 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
   Z  Zero IP Activity Counts
6  Reset Configuration to Default
7  Save and Exit
0  Exit without Saving

Choose a Number => 1
```

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: 205.166.54.212	Serial NO:
00:C0:02:A9:46:00	
Gateway Address: 205.166.54.33	Subnet Mask:
255.255.255.0	
Name of Contact Person: Supervisor	
Device Name: SSA94600	
Physical Location: Head Office	
Listen on Port: 3000	
IP Fragmentation: ALLOWED	

SET LOCAL UNIT CONFIGURATION:

- 1 Local IP Address
- 2 Show Remote IP Addresses
- A Add Remote IP Address

```
D  Delete 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]
0  -- Return to previous menu
```

Enter Command => 0

## 1. Local IP Address

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

## 2. Show Remote IP Address List

Display a list of all configured remote Etherpoll IP addresses.

### A. Add Remote IP Address

Add a remote IP address to the address list.

### D. Delete Remote IP Address

Delete a remote IP address from the address list.

## 3. Gateway IP Address

If the remote EtherPoll 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 the location of the device.

### **8. Port Number**

This is the UDP/IP port number the EtherPoll listens on when in server mode. The default is port 3000.

### **9. IP Fragmentation**

Allow IP fragmentation [0=ALLOWED, 1=NOT ALLOWED] sets the EtherPoll to either allow or disallow the IP network to fragment packets. If set to "NOT ALLOWED", the EtherPoll will not fragment incoming blocks.

---

## 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 EtherPoll. (All users on the LAN can still access the EtherPoll, but not configure it.)

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

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

## Main Menu Option 3. Serial Port Configuration

---

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

PORT CONFIGURATION:

Flow Control: RTS/CTS

Baud Rate: 9600

Data: 8 Bits    Parity: NONE    Stop: 1 Bit

Pin 6 Control: FORCED ON

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]
0  -- Return to previous menu.
```

EXAMPLE: To set the baud rate to 19200

```
=> 2 4
```

Enter Command => 0

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 EtherPoll.

**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.

**Pin 6 Control**

The choices are [0=From Interface, 1=Forced ON]. If 1, Pin 6 is forced on within the firmware. If 0, the Pin 6 signal is read from the interface.

## Main Menu Option 4. Advanced Configuration Screen

---

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

ADVANCED CONFIGURATION:

```
Transmit Timer: 20 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
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]
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 => 0
```



The EtherPoll 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.

## **1. Transmit Timer**

If set to “Transmit Timer mode”, this is the time period for which data will be stored in the buffer before being sent. It is a free running clock. Upon every “tic” of the clock, if there is data in the buffer, a packet is sent out the ethernet port.

If set to “Idle Timeout mode”, this is an idle timer. Any data in the buffer is sent out the ethernet port after the EtherPoll detects this length of time with no incoming data on the RS-232 port.

Allowable values range from 1msec to 10,000msec (10 seconds) for both timers. Only one is used at a time. Default value is 20 msec.

## **M. Timer Mode**

When set = 0, the transmit timer is used. If set = 1, the idle timeout mode is used.

## **2. Block Size**

The maximum ethernet packet buffer size. The minimum value is 1 byte, the maximum 4096 bytes (4 K). Note that a minimum ethernet packet is 64 bytes, so extremely small values may be inefficient. The timer (above) usually overrides this value. When “block size” characters are in the buffer, a packet is sent out the ethernet port even if timer criteria has not been met, so the block size should be large enough to prevent fragmentation if data blocks should not be fragmented.

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

If the amount of data stored in the buffer reaches this point, and the EtherPoll is unable to transmit the data, then no further input will be accepted (the port will flow off).

Under normal operation, this will not happen.

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

Once the Flow Control OFF buffer level has been reached, the “no-input accepted” mode will continue until the EtherPoll 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 when the character is received, provided 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.

**This is usually set OFF for SCADA applications.**

### **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.

**This is usually set OFF for SCADA applications.**

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

If ECHO is ON, the EtherPoll will locally echo all incoming characters.

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

**This is usually set OFF for SCADA applications.**

## Main Menu Option 5. Display Settings

---

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

### LOCAL UNIT CONFIGURATION:

```
Local Address: 205.166.54.212      Serial NO:
00:C0:02:A9:46:00
Gateway Address: 205.166.54.33    Subnet Mask:
255.255.255.0
Name of Contact Person: Supervisor
Device Name: SSA94600
Physical Location: Head Office
Listen on 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: RTS/CTS
Baud Rate: 9600
Data: 8 Bits   Parity: NONE   Stop: 1 Bit
Pin 6 Control: FORCED ON
```

### ADVANCED CONFIGURATION:

```
Transmit Timer: 20 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
Client Local Character Echo: OFF
```

CURRENT ETHERPOLL STATISTICS:

Network RX packet count: 0  
Network TX packet count: 0  
Network error count: 0  
Serial Port RX count: 20  
Serial Port TX count: 5517

REMOTE IP ACTIVITY COUNTS

205.166.54.213: 0  
205.166.54.214: 0

CURRENT ETHERPOLL CONFIGURATION:

Switch Setting: SW1=ON(DOWN), SW2=OFF(UP) (CONFIG Mode)

[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 RX packet count: 0**

Packets received from the ethernet interface.

### **Network TX packet count: 0**

Packets transmitted to the ethernet interface.

### **Network error count: 0**

Errored packets received from the ethernet interface.

### **Serial Port RX count: 20**

Characters received into the RS-232 port.

### **Serial Port TX count: 5517**

Characters transmitted out the RS-232 port.

### **Remote IP Activity counts**

Displays IP address and packet count for each remote that has exchanged data with this EtherPoll. If data has been received from a remote that is not in the IP address list, that information is also displayed along with the IP address of the first un-listed IP address. (These packets are discarded.)

## **Current Configuration**

---

---

### **Switch Status**

Current setting of the DIP Switches.

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

---

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

If using Telnet or web browser configuration, the connection will be lost when the EtherPoll reboots. To reconnect, you must use the default IP Address of 192.168.1.1 or change the EtherPoll IP address before rebooting with main menu option 7. The preferred method is to restore defaults with menu item 6, and then ***BEFORE REBOOTING***, change the IP information using submenu 1 so your PC will still be able to connect to the EtherPoll when it reboots.

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

---

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

If using Telnet, the connection may be lost when the EtherPoll 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 EtherPoll using a Web Browser.*

## Overview

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

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

## Connection Procedure

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

1. Install the EtherPoll in your LAN as described in Chapter 2.
2. Ensure that the EtherPoll is powered on.
2. Start your Web browser.



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

`http://IP_Address`

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

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

`Http://192.168.1.1`

### If you can't connect

If the EtherPoll does not respond, check the following:

- The EtherPoll 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 EtherPoll 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 EtherPoll to use. This address must be within the address range used by your LAN.

**Hardware\_address** is the hardware address of the EtherPoll. 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 S?nnnnnn (S followed by 7 characters). The hardware address is formed by joining the digits to 00-c0-02 in the form 00-c0-02-nn-nn-nn

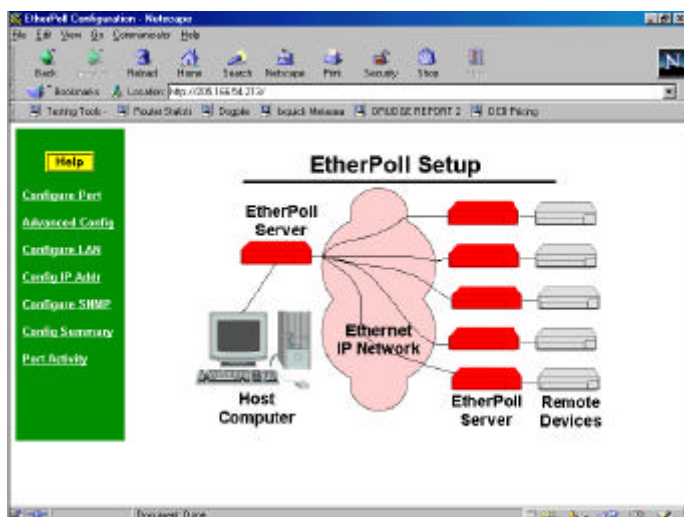
For example, if the default name is SC123456, then the hardware address is 00-c0-02-12-34-56

- Once the above entry has been added to the arp table, you should be able to connect to the EtherPoll, using the IP Address you assigned in the arp table.
- The EtherPoll 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

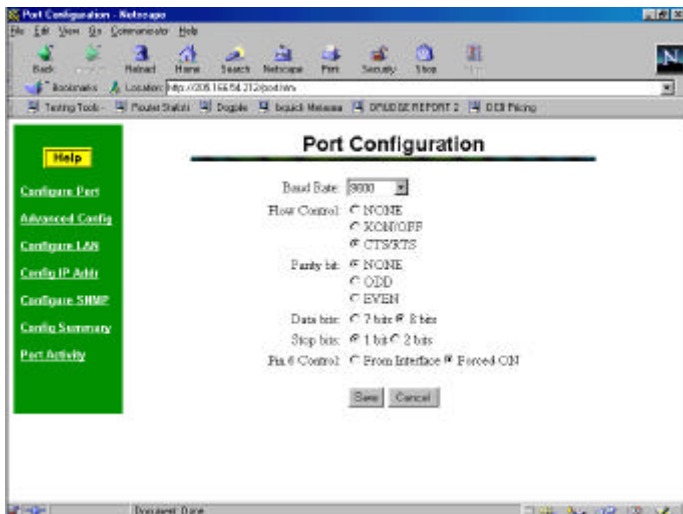
The first screen is similar to Figure 2.



**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

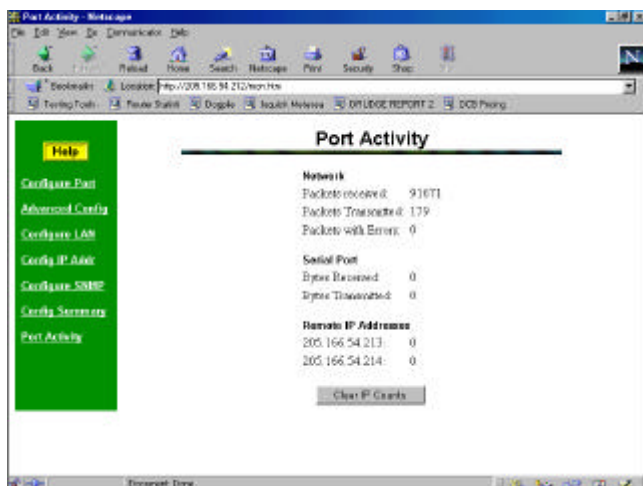


**Figure 3: Port Configuration Screen**

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

- Consult the documentation of your serial port device to determine what settings to use.
- Pin 6 Control Mode, See Section 5. Operation for details on how to set this. Normally “From Interface”.

## 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

Packets received:	Number of packets received by the EtherPoll through the LAN connection.
Packets Transmitted	Number of packets transmitted by the EtherPoll through the LAN connection.
Packets with Errors	Number of packets transmitted or received by the EtherPoll through the LAN connection which contained errors. (Should be zero)

### **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).

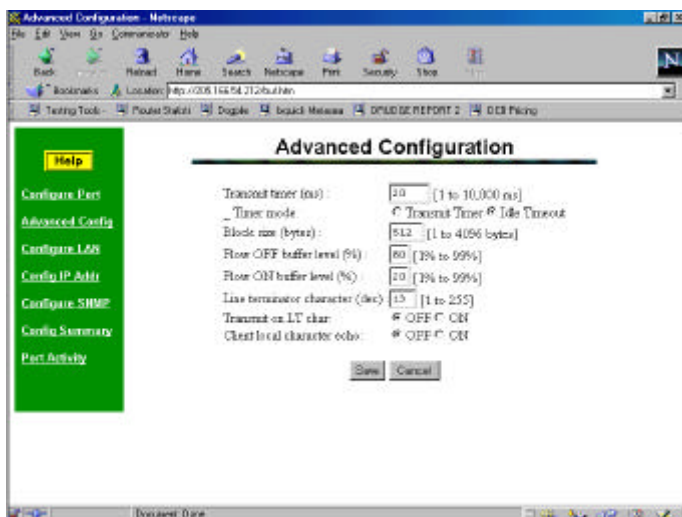
### **Data – Remote IP Addresses**

Remote IP Address	Number of bytes transmitted to that address
-------------------	---

### **Data- Un-Listed Remote IP addresses**

Unlisted Remote IP Address	If data has been received from a remote that is not in the IP address list, that count is also displayed along with the IP address of the first un-listed IP address. (The incoming packets are discarded.)
----------------------------	---

## Advanced Configuration Screen



**Figure 5: Advanced ConfigurationScreen**

These settings affect the Etherpoll'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

Transmit Timer (msec)	<p>When in Timer Mode, the maximum time period data will be stored in the buffer before being sent.</p> <p>When in Idle Timeout Mode, the time that the RS-232 port must be idle before data in the buffer is transmitted to the ethernet port.</p> <p>Allowable values range from 1ms to 10,000ms (10 seconds). Default is 20 ms.</p>
Timer Mode	<p>When set for Transmit Timer, a free-running clock triggers the EtherPoll to send a packet of data at every tic if there is any data its buffer.</p> <p>When set for Idle Timeout a packet of data is transmitted to the ethernet when there is not RS-232 data received for the specified idle time and any data is in the buffer.</p>
Block Size (bytes)	<p>The size of the ethernet packet buffer. The minimum value is 1 byte, the maximum 4096 bytes (4 K). ). Note that ethernet packets are at least 64 bytes long, so extremely small values are quite inefficient.</p>
Flow OFF buffer level (%)	<p>If the amount of data stored in the buffer reaches this point, and the EtherPoll is unable to transmit the data, then no further input will be accepted from the serial port. The RS-232 port will be “flowed off”. Under normal operation, this will not happen.</p>
Flow ON buffer level (%)	<p>Once flow control has stopped input characters, the "no-input accepted" mode will continue until the EtherPoll has transmitted enough data to reduce the buffer contents to this point.</p>



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 the following setting (Transmit on LT Char) is ON. The 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. This should normally be set to OFF for SCADA networks.
Transmit filter mode	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. If this setting is OFF, then no conversion is done. It is normally OFF for SCADA networks.
Local character echo	If ECHO is ON, all characters received from the serial port are echoed back out that port when connected. If ECHO is OFF, the EtherPoll will not echo input characters. This mode should be used if any messages from the EtherPoll would create interference with other software.

## LAN ConfigurationScreen

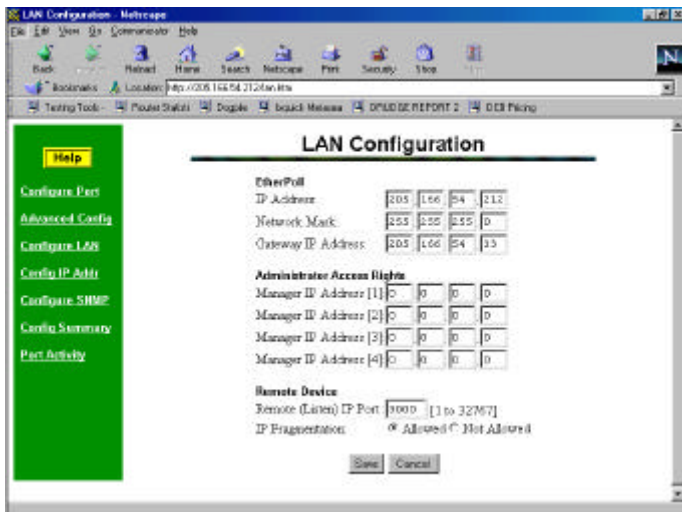


Figure 6: LAN Configuration Screen

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

- **EtherPoll** 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 EtherPoll's configuration data. If any values are entered, then only those PCs will be able to access the EtherPoll and change the configuration.

- **Remote Device Listen Port** is the UDP port number with which this EtherPoll will communicate.
- **IP Fragmentation** may be disallowed based upon this configuration.

### Data - EtherPoll

IP Address:	The IP address of this EtherPoll device on your LAN in dotted decimal format. The default IP Address is 192.168.1.1  <b>Note:</b> If you change the IP Address, the connection will be lost when you "Save". You must reconnect using the new IP Address.
Network Mask:	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.
Gateway IP Address:	If your LAN contains a router, enter the IP Address of the Router. Otherwise, leave this value at 0.0.0.0

### Data - Administrator Access Rights

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

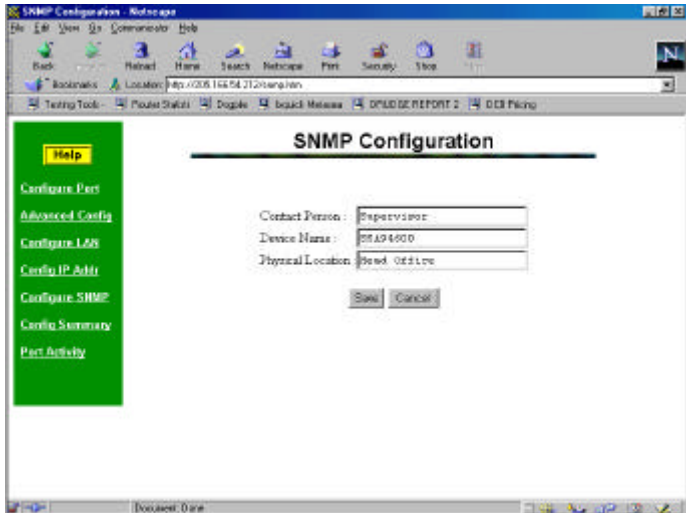
## **Data - Remote Device**

Remote IP Port	This is the port with which the EtherPoll will attempt connections. The default is 3000. Another commonly used value is 23 (telnet).
----------------	--

## **Data – IP Fragmentation**

Remote IP Port	If set to “NOT ALLOWED”, the EtherPoll will not fragment data blocks, and will set the “don’t fragment” bit in ethernet packets. If set to “ALLOWED”, fragmentation is allowed on EtherPoll ethernet packets and the “don’t fragment” bit is not set.
----------------	---

## SNMP Configuration Screen



**Figure 7: SNMP Configuration Screen**

### Overview

This screen may be ignored if SNMP is not used.

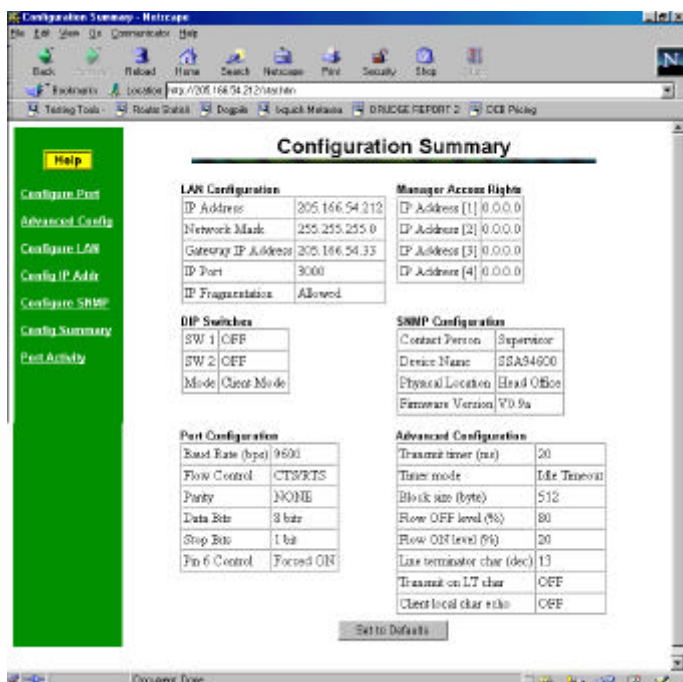
These are text fields, commonly used in SNMP (Simple Network Management Protocol) Programs to identify this device when browsing the network.

These values have no effect on the operation of the EtherPoll. 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 the location of the device.

## Configuration Summary Screen



**Figure 8: Configuration Summary Screen**

### Operation

- This screen displays all current settings for this EtherPoll
- Clicking the "Set to Defaults" button will restore ALL values to their factory default values.  
When this is done, the EtherPoll will reboot, and the

existing connection will be lost. You must reconnect using the default IP Address of 192.168.1.1.

## **Data**

All values on this screen are described in earlier sections.



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# Chapter 5

## Operation

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

### Normal Mode

- All EtherPolls must be connected as described in Chapter 3. Configuration is complete, and serial port configurations match the associated serial port device (Polling host or RTU). LAN configuration is complete with appropriate IP addressing.
- Power up all EtherPolls and associated hardware.
- Start the polling program on the polling host computer. It should automatically poll each RTU connected to an EtherPoll whose IP address was stored during configuration of the host EtherPoll.
- Pin 6 input must be HIGH or Forced ON for the unit to send and receive packets. When pin 6 is LOW, the serial interface turns OFF the pin 4 (DTR) and 7 (RTS) output signals. In addition, the ERR LED flashes RED as long as pin 6 is LOW. When pin 6 is HIGH or FORCED ON, the ERR LED turns OFF, the serial port control signals turn ON, and the unit will send and receive packets.

---

## Broadcast Mode

- Install and connect the EtherPolls and Serial Port Devices as described above.
- Send some characters from a PC or terminal device connected to the host EtherPoll to its RS-232 port.
- The characters should appear on the RS-232 port of all EtherPolls whose addresses are configured in the host EtherPoll IP address list.
- Pin 6 input must be HIGH or Forced ON for the unit to send and receive packets. When pin 6 is LOW, the serial interface turns OFF the pin 4 (DTR) and 7 (RTS) output signals. In addition, the ERR LED flashes RED as long as pin 6 is LOW. When pin 6 is HIGH or FORCED ON, the ERR LED turns OFF, the serial port control signals turn ON, and the unit will send and receive packets.

## Point-to-Point Mode

- This is similar to the above operations, however only ONE remote IP address is configured into each EtherPoll.
- Pin 6 input must be HIGH or Forced ON for the unit to send and receive packets. When pin 6 is LOW, the serial interface turns OFF the pin 4 (DTR) and 7 (RTS) output signals. In addition, the ERR LED flashes RED as long as pin 6 is LOW. When pin 6 is HIGH or FORCED ON, the ERR LED turns OFF, the serial port control signals turn ON, and the unit will send and receive packets.

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

### Hardware Problems

**Before anything else, check that all cables are wired correctly and properly connected. If connecting to a 9 pin PC port, a crossover (null modem) cable is required.**

**P:** All the EtherPoll's LEDs are off.

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

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

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

## Can't Connect via the LAN

**P:** Can't connect to the EtherPoll using Telnet or Web Browser.

**S:** Check the following:

- Start troubleshooting from a known state. Power the EtherPoll OFF and ON to reboot.
- “Ping” the EtherPoll 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 EtherPoll (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 all EtherPolls. **The most common problem cause is incorrect IP addressing. Make sure the workstation and EtherPolls have compatible IP addresses.**

- If using a LAN without routers, you can connect to the EtherPoll ONLY IF your PC and the EtherPoll are using IP Addresses from the same address block. The EtherPolls 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 *Windows98 WINIPCFG.EXE* . If you are using a different Address block, use *Terminal Mode* configuration to set a compatible IP Address in the EtherPoll. Alternatively, use the procedure described on page 15 to add an entry to your PCs 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 EtherPoll connection problems are due to incorrect RS-232 wiring. The second most common errors are incorrect IP addressing on either the EtherPoll or on the PC used for testing.
- In some cases, "smart" hubs and switches must be power-cycled to clear their internal arp cache. This is often a problem on test bench setups where IP addresses are moved between different equipment or a unit is moved between ethernet switch receptacles.

## Other Problems

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

**S:** Check that:

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

**P:** The "host" EtherPoll doesn't automatically send data to the "RTU" EtherPolls.

**S:** Check that:

- The DIP switches are in the correct position on all EtherPolls.
- A workstation on the host EtherPoll LAN can successfully ping all remotes.
- There must not be a firewall between the EtherPolls that blocks the port in use for UDP.
- The EtherPolls 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 “RTU’s” IP addresses were correctly entered into the “HOST’s” EtherPoll IP Address list.
- The Gateway IP Address is set correctly.
- The Subnet Mask is set correctly.
- The communication parameters between the host computer and the local (“host”) EtherPoll match.
- The communication parameters between the serial port RTU device and the remote (“RTU”) EtherPoll match.

**P:** The EtherPoll's IP Address is unknown. Is there any way of finding it, other than using *Terminal Configuration* mode?

**S:** Follow this procedure:

- Power off the EtherPoll, 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 EtherPoll, 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.



---

## Checking Device Operation

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

1. Leave the EtherPoll DIP switches in their normal position.
2. Use telnet to connect to the EtherPoll with the command:

```
telnet IP_Address 8000
```

Where IP\_Address is the IP Address assigned to the EtherPoll, and 8000 represents the Port number.

- The port number is “8000” for configuration, but “3000” is the default for normal operation. Remember that actual data connections to the EtherPoll on port 3000 are not TCP/IP as used with telnet programs, but are UDP/IP.
  - If the “Manager IP Addresses” have been entered in the EtherPoll, 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 28 for an explanation of each of the data items.

# Appendix A

## Specifications

### EtherPoll 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 (or with external power supplies)
- RS-232 Buffer: 4KB
- LAN Buffer: 16KB
- DIP Switch: 2
- LED: 2

## RS-232 PIN Assignments

The EtherPoll 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 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 EtherPoll

### **Transmit Data**

Output, Data from the EtherPoll The EtherPoll 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 EtherPoll has a valid signal on input pin 6 OR pin 6 (DSR) if forced on by configuration. When pin 6 input is LOW, the serial interface turns OFF the pin 4 (DTR) and 7 (RTS) output signals.

### **Signal Ground**

Common ground

### **DSR**

Input. Used for connection control. If the EtherPoll is configured for “Hardware (Pin 6) from interface” and not “Forced ON”, the EtherPoll only transmits and receives data via the LAN when the signal is asserted. If configured for “Forced ON”, the EtherPoll may send and receive data via the LAN at any time. When pin 6 is LOW, the serial interface turns OFF the pin 4 (DTR) and 7 (RTS) output signals.

## **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. When pin 6 input is LOW, the serial interface turns OFF the pin 4 (DTR) and 7 (RTS) output signals.

## **CTS**

Input. When Flow Control is set for CTS/RTS, lowering this signal will halt data flow from the EtherPoll 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 null-modem crossover cable is easily made by combining “PC-Direct” and “Remote PC” adapter hoods with a straight-through line cord.

### 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

---

## **EtherPoll to Modem**

---

Use any commercially available PC-to-modem cable.

---

## **Ethernet Cross-Over Cable**

---

Used to connect two EtherPoll ethernet connections “back-to-back” without using an ethernet hub for test purposes. Also used to connect a EtherPoll 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

# Advanced Operation Information

*This Appendix explains the EtherPoll's operation in more detail. This information is not needed in most applications.*

### Introduction

The EtherPoll must be configured with proper ethernet addressing and serial port parameters. It has been used successfully with common SCADA protocols such as Modbus ASCII, Modbus RTU, DNP3, and similar 8-bit asynchronous protocols. This section explains how the EtherPoll operates for the technician who needs to understand the internals in more detail.



## Description and Behavior

### Ports used by the EtherPoll

The EtherPoll uses 2 ports, as follows:

Port	Description
Configurable default - 3000	EtherPoll listens at port 3000 and offers a raw UDP connection. This port number is configurable.
8000	Provides a telnet configuration service for all modes.

### Normal Operation Modes

In Normal Mode, the EtherPoll runs under the UDP/IP network protocol. It will listen on a configured port number. The server will wait for incoming data after initialization.

The EtherPoll constantly checks 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 configured to filter) 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 when the buffer is full, when it senses an idle timeout, or on the next tick of the transmit timer.

The data being sent via ethernet is packaged into UDP packets and a separate copy is sent to each IP address in the EtherPoll's IP address list.

## **Point - to - Point Mode**

EtherPolls configured for Point-to-Point mode function the same. The only difference between the “normal” operation and point-to-point is the number of IP addresses in the IP address list. For point-to-point operation, there is only one address in the list (the other unit's).

## **Broadcast Mode**

Broadcast mode is also identical to “normal” mode. There is simply no polling taking place over the network.

## **Transmit Conditions**

The EtherPoll will transmit an ethernet packet of data whenever one of the following conditions is met...

- Timer is up. In Timer Mode, a free running clock triggers a transmission when it ticks if there is data in the buffer.
- Idle time is up. In Idle Timeout mode, a (configured) time period elapses with no incoming data if there is data in the buffer.
- Transmit Buffer full.
- LT Character is encountered if Line Terminal Function is ON.

## **Application Notes**

### **Protocols**

The EtherPoll is protocol-transparent. It has been successfully used with many 8-bit asynchronous protocols. However, some protocols work best with specific settings. If in doubt, call Tech Support for additional information on your application.

### **Quick Set-Up**

An example configuration for a test bench setup is available on the DCB web site at

<http://www.dcbnet.com/notes/0102etherpoll.html> . Other applications notes are available at the same web site at <http://www.dcbnet.com/apnotes.html> .