USERNAME: admin
PASSWORD: resmith

ETHERNET SERIAL SERVER
Model XPCOM1
RS232-RS485-RS422
Software Version 3.0 (2-25-2006)
Manual Updated: 3-4-2006

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Overview

The XPCOM1 unit is a general purpose Ethernet To Serial Server that supports RS-232, RS-485 and RS-422 serial standards. The XPCOM1 can be configured remotely through the web interface or through various configuration utilities.

The XPCOM1 unit can be made to allow the uploading of user custom Java Applications that can perform many useful custom tasks.

The XPCOM1 unit has three setup sections: Communications Specification, TCP/IP Setup, and Operating Mode. These sections will be described below in that order. There are four operating modes, the Server mode, the Master mode, the Target mode and the Client Mode, these modes will be discussed in the Operating Mode section. The Master/Target mode is sometimes referred to as the Stand-Alone mode. This mode allows two units to communicate without any additional software, allowing two serial devices to be connected over virtually any distance through the Internet.

Communications Specification:

This section allows the user to setup the serial port on the XPCOM1 unit, typical serial port parameters can be found in this section including Baud or data rate, Data Bits, Parity, Stop bits, and Flow control. These parameters should be set to match the device, which this unit is connected to. See figure 1 below.

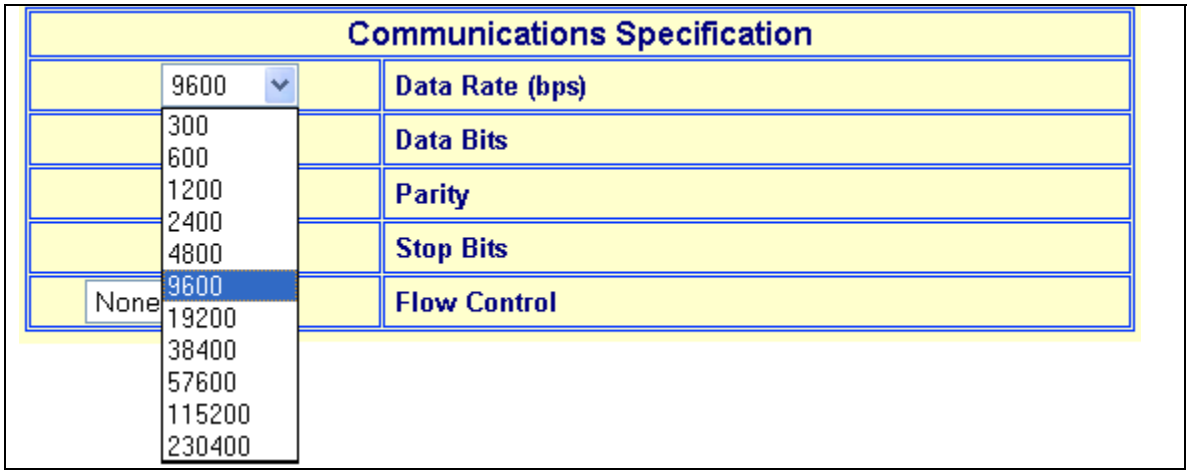

Figure 1: Baud Rate Configuration

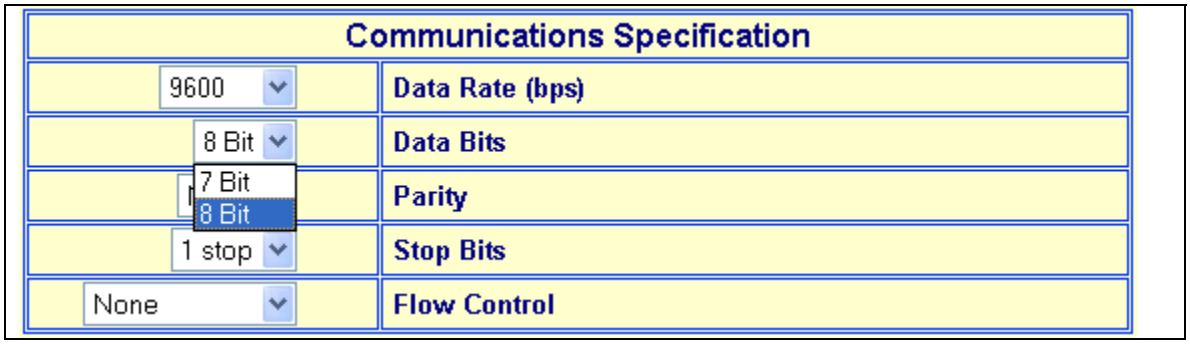

Figure 2: Data Bits Configuration

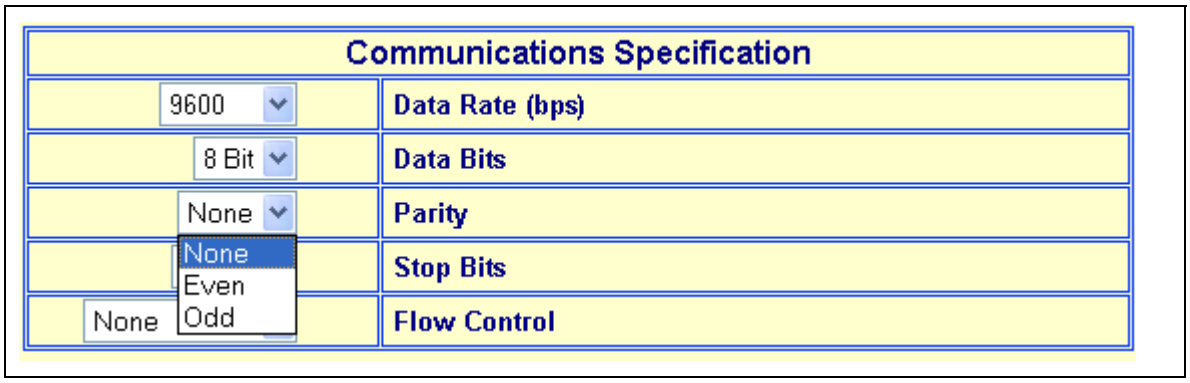

Figure 3: Parity Configuration

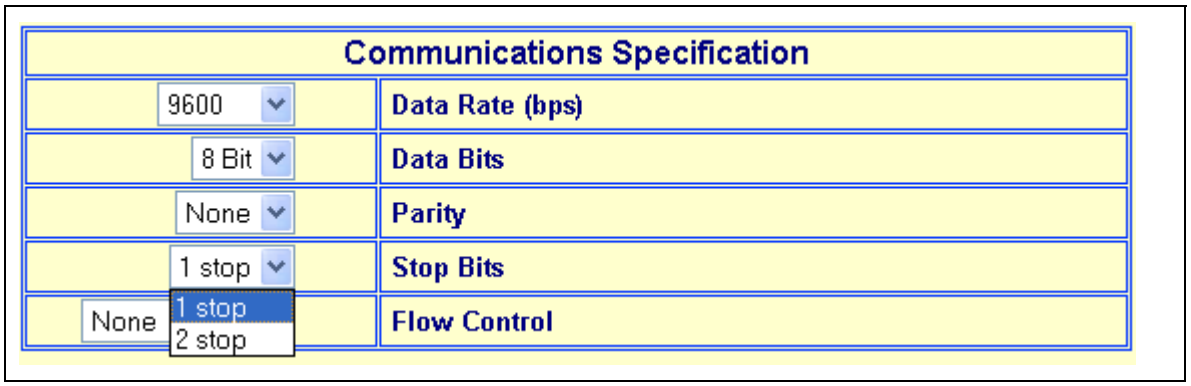

Figure 4: Stop Bits Configuration

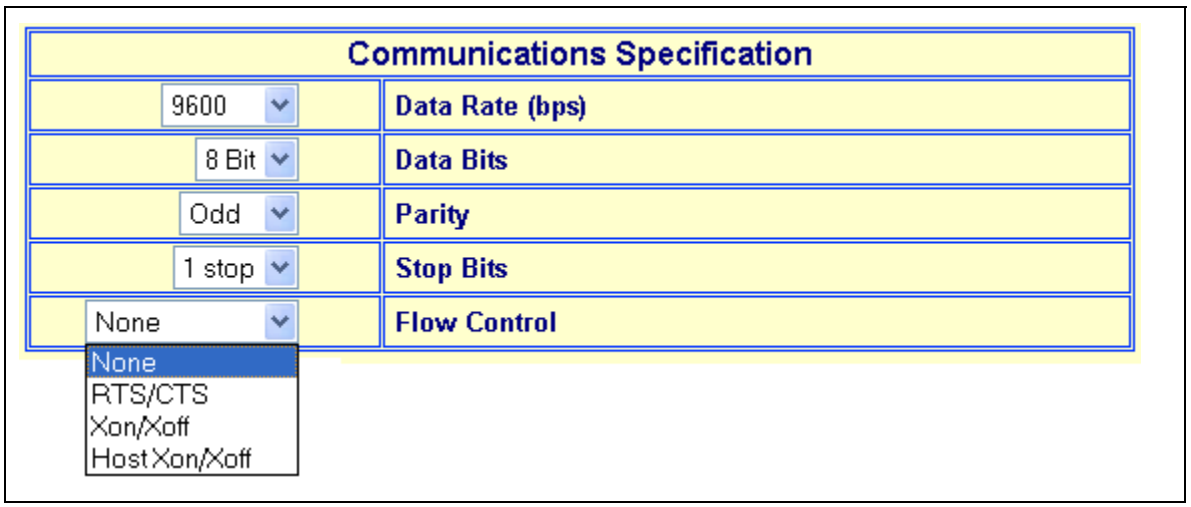

Figure 5: Flow Control Configuration

TCP/IP Setup:

This section defines the XPCOM1 TCP/IP setup, which includes the IP address of the unit, the network subnet mask or "NETMASK" and the Gateway if it is necessary for the unit to access or be accessed from Internet.

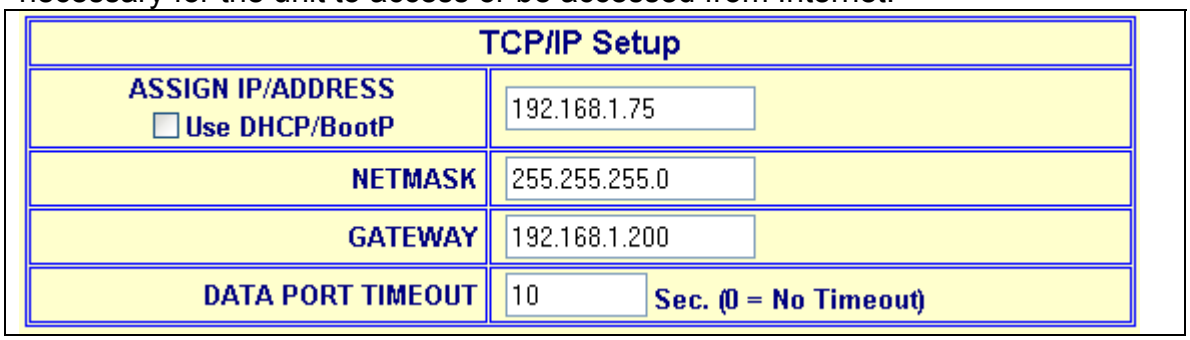

Figure 6: TCP/IP Parameters Setup

IP/ADDRESS: Every Ethernet device has to have an IP/ADDRESS, Subnet MASK "NETMASK", and/or GATEWAY. The IP/ADDRESS can be static otherwise known as "user defined" or dynamically defined, with dynamic IP addressing a DHCP or BOOTP server automatically assigns the address using the DHCP or BOOTP protocol.

For the device to be configured for BOOTP or DHCP address assignment a BOOTP or DHCP server must be present on the network and the IP/ADDRESS field has to be set to 0.0.0.0. The default factory setting of the IP/ADDRESS should be 192.168.1.99.

The Netmask for the unit should be defined to be compatible with the existing network configuration, check with your network administrator to determine the appropriate subnet mask or "Netmask". Typical values for the netmask are 255.255.255.0 or 255.255.0.0. Simple networks with less than 256 nodes usually have the netmask of 255.255.255.0.

In some special cases the unit needs to be able to communicate with the internet or from the internet, in this case you will need to provide a Gateway Address, this is the address of a gateway or router device which connects directly to the internet.

Some special address settings can control the methods the unit will be able to get an address.

The switches are bit positions within the 3rd Octet of the IP address (x.x.x.x)
The 1 position controls AutoIP - So 0.0.1.0 turns off AutoIP
The 2 position controls DHCP - So 0.0.2.0 turns off DHCP
The 4 position controls BOOTP - So 0.0.4.0 turns off BOOTP
So if you want to turn off DHCP and BOOTP enter 0.0.6.0 as the IP, then only AutoIP will work. Enter 0.0.7.0 to turn off everything. To only enable BOOTP protocol for address assignment then set the address to 0.0.3.0.
If you only want to use AutoIP for the address then set the address to 0.0.6.0.

The user can setup a timeout for connections to the data port when the XPCOM1 is operating in the server mode. Setting the value 0 disables the timeout.

Operating Modes:

This section allows the user to setup the operating mode of the XPCOM1 unit. There are four operating modes available Server, Master, Target, and Client. Each will be described in the order listed.

Server Mode:

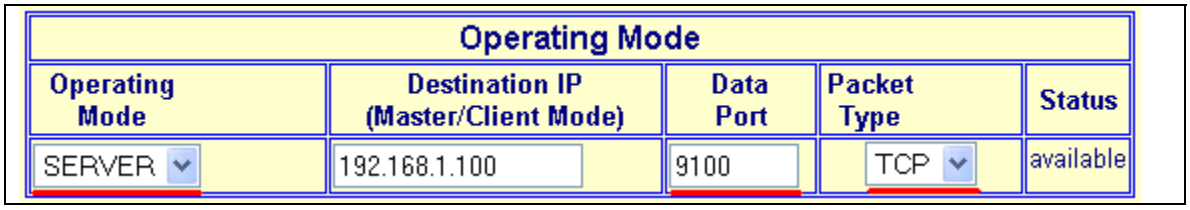

Figure 7: Server Mode Parameters

The fields, which are underlined in red in Figure 7, are applicable to the server mode; the field labeled Destination IP is not used in any way and can have any dotted decimal value in the form x.x.x.x.

The Data Port field is the TCP/IP port number (1-65535) the user wants to use when connecting to the unit. Typically the server mode is used to allow many users to access a serial device using a TCP/IP application such as telnet or custom TCP/IP program to perform some type of task.

Commonly you will find the server mode is used to allow multiple computers to connect to a single printer one at a time. Once a computer submits its data for printing it relinquishes control of the server to allow other computers a chance to connect and print their data.

To test the server mode configuration the user can from any windows computer from the START, RUN menu enter “telnet 192.168.1.75 9100” a window will open and the user can from within this window type, and the characters typed will be transmitted to the XPCOM1 server. There are LEDS, which show TX/RX transmit/receive – Red/Green respectively, while typing the user can observe activity on the Red LED. If there is a Loop back plug on the XPCOM1 serial port then each character typed will be transmitted back to the telnet application. Note! The “telnet” is a windows program the IP/ADDRESS that is used in our example is found in Figure 2 TCP/IP Setup section above in the field labeled “IP/Address” and 9100 is the port defined in the “Data Port” field of the Operating Mode section shown in figure 3 above.

Master Mode:

Operating Mode				
Operating Mode	**Destination IP (Master/Client Mode)**	**Data Port**	**Packet Type**	**Status**
MASTER	192.168.1.100	9100	TCP	available

Figure 8: Master Mode Parameters

The fields which are underlined in red in Figure 8 are applicable to the Master mode.

The Master/Target (Stand-Alone) mode is used when a pair of XPCOM1 units is used to create an Ethernet/internet extension cord of a RS232/RS485 or RS422 network see Figure 9. Always, one unit is configured as the Master and a second unit is configured as the target of a master. The targets IP ("Destination IP") is defined in the same named field under the Operating Mode section. The destination target's Data Port must also be defined and set in the same named field on the Operating Mode section; the data port defined is used to receive incoming connections.

The Master mode establishes and maintains a **continuous** connection with the remote Target device.

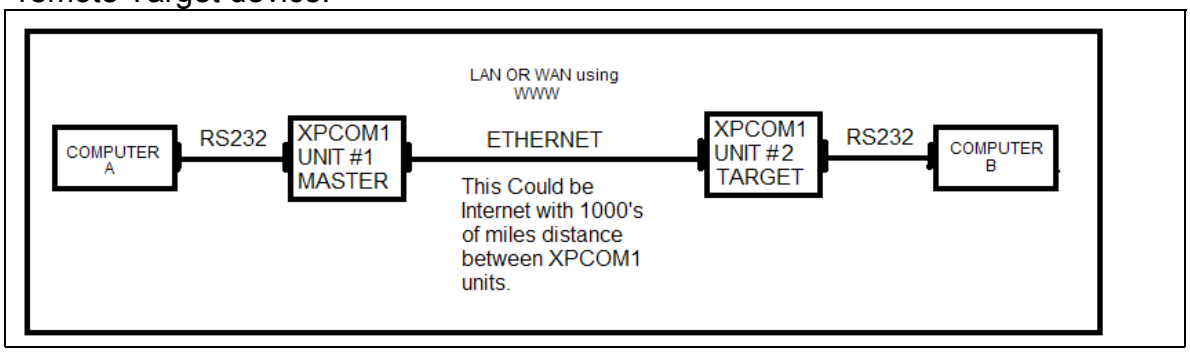

Figure 9: Typical Master / Target Configuration

Target Mode:

Operating Mode				
Operating Mode	**Destination IP (Master/Client Mode)**	**Data Port**	**Packet Type**	**Status**
TARGET	192.168.1.100	9100	TCP	available

Figure 10: Target Configuration Parameters

The fields, which are underlined in red in Figure 10, are applicable to the Target mode. The Target Mode is similar to the Server mode in that the Destination IP field is not used and can be set to 0.0.0.0. In fact, currently the Target mode is a form of server mode which will have eventually 128 bit encryption on the data so that as secure connection which will be practically impossible to ease drop on the data being transmitted.

The Target mode like to server mode needs to define the Data Port, which will be used to receive incoming connections from the remote Master.

Client Mode:

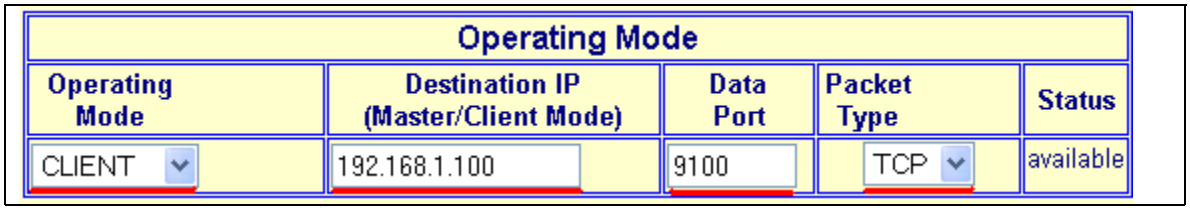

Figure 11: Client Mode Configurations Parameters

The fields, which are underlined in red in Figure 11, are applicable to the Client mode.

The Client mode is a special mode, which allows a temporary connection to be established between a server device and the XPCOM1 configured as a Client device when data arrives at the serial port of the Client XPCOM1. The field labeled Destination IP is used to define the address of a remote server device, which is interested in receiving serial data from any number of Client devices. The data is buffered in the Client device and a temporary connection is made to the Destination IP and Data Port of the server defined in the Data Port field of figure 7. Data is transferred and a connection is maintained from the Client to the Server as long as data is received with less than two seconds between serial data bytes. If more than 2 seconds of delay between bytes occurs then the connection between the Client and the server is terminated until the next serial reception.

The Client mode is a one-way connection passing data received at the client's serial port to the TCP/IP address and Port combination of the remote server device.

A typical application for this could be a card access system where entry to a facility could be granted if the remote server received valid card swipe data from a Client device.

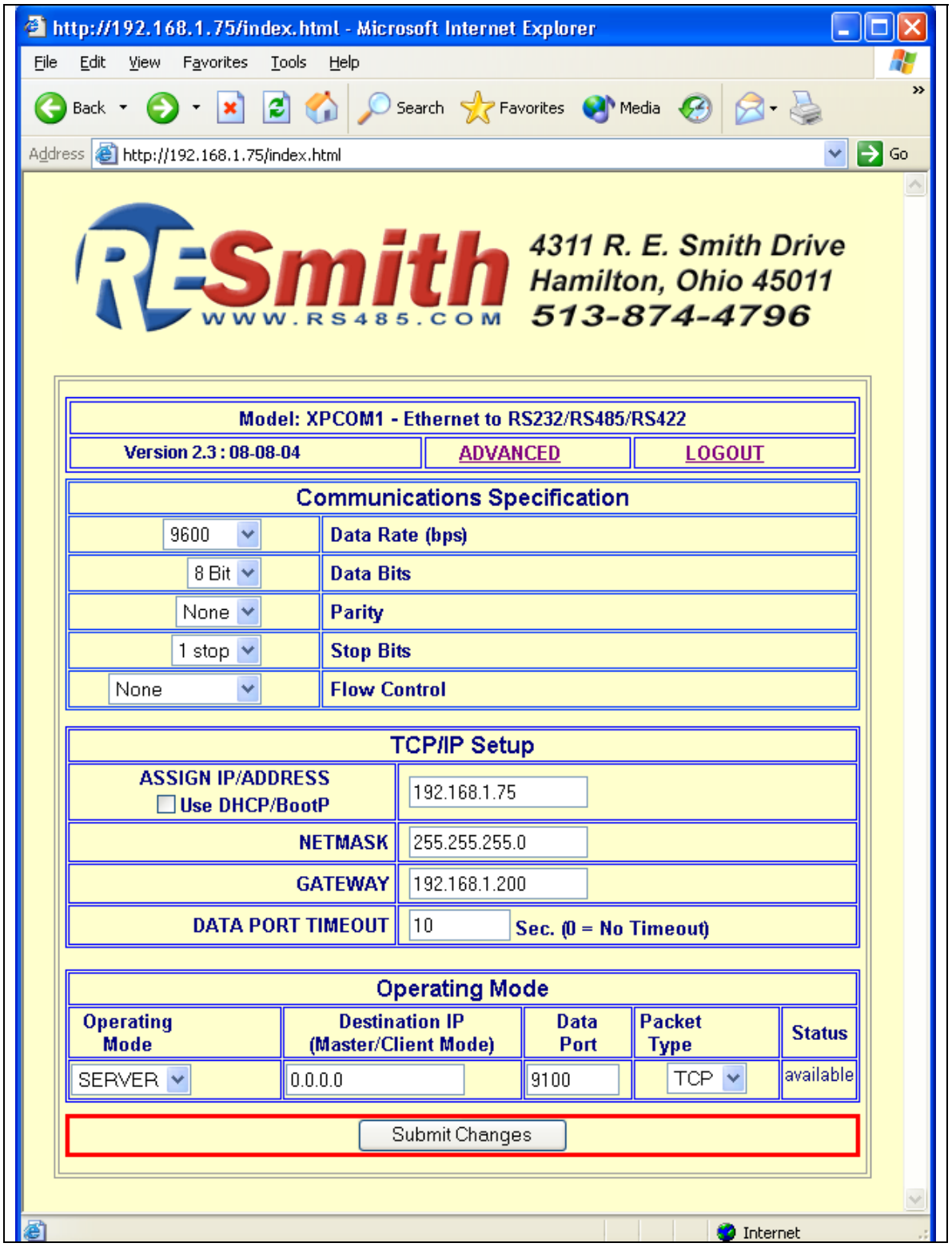

Figure 12: Typical Web Page Settings For Server Configuration

Resetting the XPCOM1 to factory defaults

The XPCOM1 is equipped with a push button that will reset factory defaults if it is depressed while power is applied. It is necessary to hold in the button for 5 seconds after power is applied. The factory default IP address is 0.0.0.0, which enables DHCP/BOOTP/AUTOIP. The configuration utility will be able to find the board even if a DHCP/BOOTP/AUTOIP server are not present, use the XPCONFIG utility to set static address if necessary.

During normal operation if the push button is depressed for 2 seconds the current IP address and netmask will be transmitted out the serial port.
Example output:

```
IP Address 192.168.1.75
Netmask 255.255.255.0
```

Ethernet Virtual 485 Network Configuration

The XPCOM1 can be configured to communicate with other XPCOM1 units to create a very large RS485/422 network. The network created can actually be virtually unlimited in size, however when using public Internet communications delays can be expected and should be managed. The Virtual485/422 network could conceptually look like the following diagram.

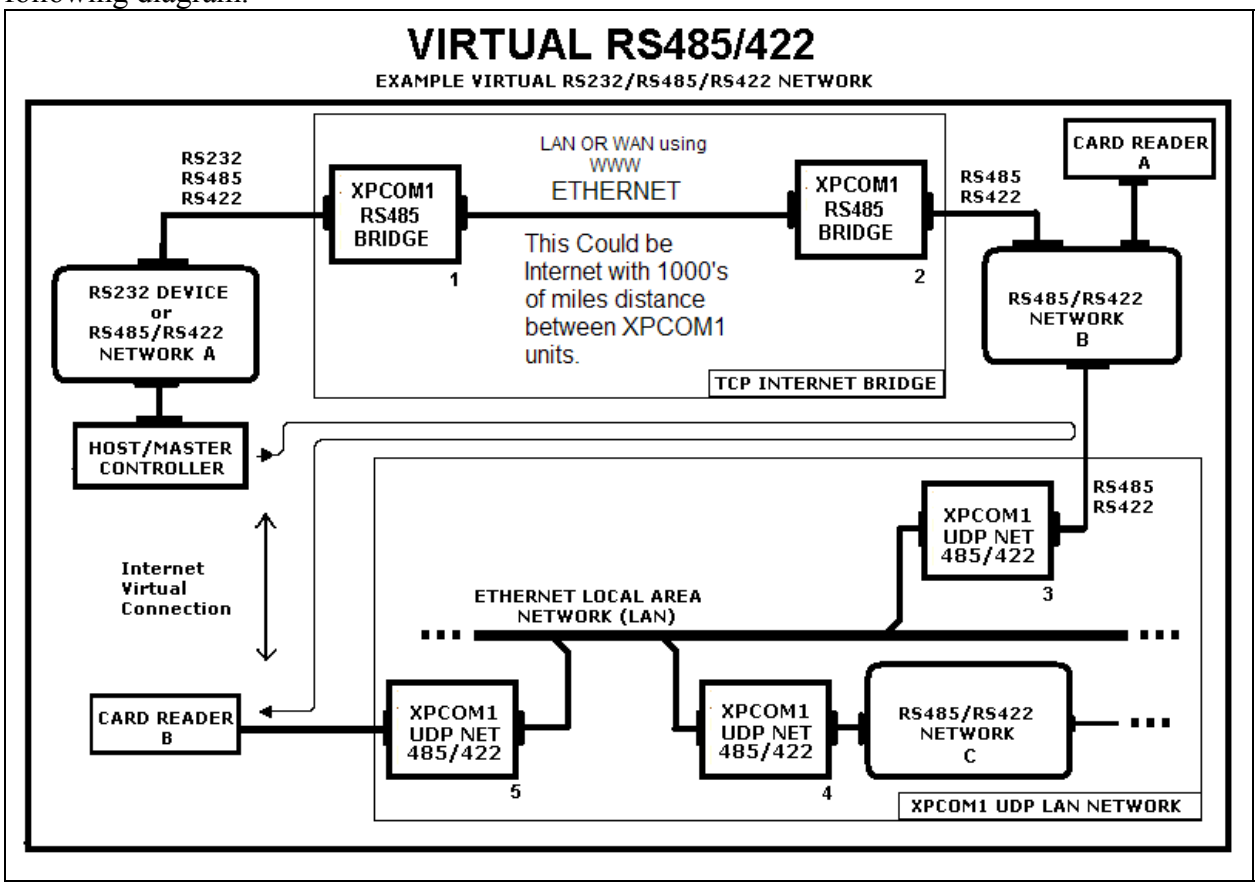

Figure 13 Example Large Virtual RS485/RS422 Network Configuration.

This diagram illustrates the capability of using several XPCOM1 units to connect multiple RS485/422 networks through the Internet or through a local area network. In this example the device labeled “HOST/MASTER CONTROLLER” could interrogate the distant card reader labeled “CARD READER B” by using the R.E.Smith Virtual485/422 network design. In this example the device labeled “HOST/MASTER CONTROLLER” could also access any device on the networks labeled “A”,”B”, or “C”.

This is a very flexible architecture which could easily coexist on a local area network, connect local area networks through the World Wide Web “WWW” or connect RS485/422 networks through the local or wide area networks.

Ethernet Virtual 485 Network Configuration

Configuration of the “TCP INTERNET BRIDGE” is covered in figure 9 under the Master/Target configuration section above.

The units labeled #1 and #2 could be configured as a Master/Target pair maintaining a Ethernet TCP connection to pass data from the Host/Master device connected to the RS485/422 network “A” through the internet to and from the RS485/422 network “B”.

Unit #1

TCP/IP Setup		
ASSIGN IP/ADDRESS ☐ Use DHCP/BootP	0.0.0.0	
NETMASK	255.255.255.0	
GATEWAY	192.168.1.201	
DATA PORT TIMEOUT	0	Sec. (0 = No Timeout)

Operating Mode				
Operating Mode	Destination IP (Master/Client Mode)	Data Port dest:source	Packet Type	Status
MASTER	24.12.151.100	9100	TCP	available

Unit #2

TCP/IP Setup		
ASSIGN IP/ADDRESS ☐ Use DHCP/BootP	0.0.0.0	
NETMASK	255.255.255.0	
GATEWAY	192.168.1.201	
DATA PORT TIMEOUT	0	Sec. (0 = No Timeout)

Operating Mode				
Operating Mode	Destination IP (Master/Client Mode)	Data Port dest:source	Packet Type	Status
TARGET	0.0.0.0	9100	TCP	available

Notice: It is always important to specify the gateway address if the TCP packet is going to the internet, if the gateway address is not specified then the packet will not be able to be transmitted to the net.

XPCOM1 UDP LAN NETWORK Configuration

Units #3, #4, and #5 are configured to allow Ethernet UDP packet transmission of data arriving at each serial port to be retransmitted to each other. This retransmission effectively implements a protocol conversion from serial RS232/485/422 to Ethernet back to serial RS232/485/422 at each XPCOM1 unit configured to receive the UDP traffic.

Some possible configurations include:

To implement a point-to-point UDP transfer between unit #3 and unit #5 the following setup could be used.

Unit #3 IP Address 192.168.1.110

Operating Mode				
Operating Mode	Destination IP (Master/Client Mode)	Data Port dest:source	Packet Type	Status
TARGET	192.168.1.114	9100:9101	UDP	available

Unit #5 IP Address 192.168.1.114

Operating Mode				
Operating Mode	Destination IP (Master/Client Mode)	Data Port dest:source	Packet Type	Status
TARGET	192.168.1.110	9101:9100	UDP	available

Notice unit #3 dest:source port pair are different from unit #5 port pair, this is done by design this allows traffic flowing from each device to it's partner to occur on a pair of UDP data ports. Data received by unit #3 is transmitted in a UDP packet through the network on UDP port 9100 to unit #5, which is waiting for traffic on that data port. Data received by unit #5 is transmitted in a UDP packet through the network on UDP port 9101 to unit #3, which is waiting for traffic on that data port.

Here's another example of UDP configuration, which shows the power of the port pairs.

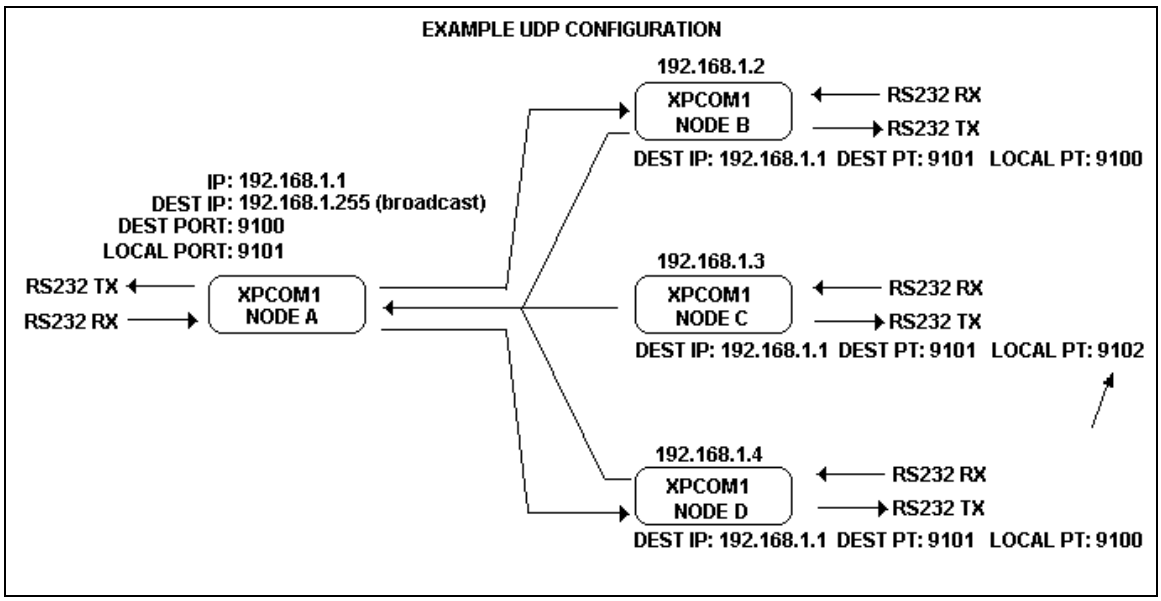

Figure 14 Example XPCOM1 UDP Point-to-Multipoint Configuration

In this example, four XPCOM1 units labeled A, B, C, and D are configured so that when nodes B, C or D receive RS232 data it is transmitted via an Ethernet UDP packet to destination IP address 192.168.1.1 port 9101. Node A is configured to receive Ethernet data on port 9101 and broadcast it's received RS232 data to all units on it's subnet configured to receive Ethernet UDP packets on port 9100, this includes only nodes B and D, node C is configured differently to receive UDP transmissions destined for port 9102.

Using the port pairs enables the user to define multiple point-to-point or point-to-multipoint or multipoint-to-multipoint configurations on the same network.

When using UDP transfer protocol it is up to the user to verify the data is received by the destination device. UDP does not guarantee the receiving device actually gets its message; the application that uses UDP should use his own challenge/response protocol in the data stream to verify receipt of transmitted packets.

When point-to-point configurations are desired, TCP mode can be used, this would cause a connection based channel to be established and would verify the packets are received by the receiving device. The price that is paid for TCP configurations is some extra latency associated with the acknowledgement of packets transmitted.

UDP packets don't guarantee delivery however they to verify packets received are checked for validity by checking the stored checksum of the message. Depending on the network configuration the broadcast address could be different, in our case the subnet mask is 255.255.255.0, this would make the broadcast address 192.168.1.255, if the subnet mask were 255.255.0.0, the broadcast address would be 192.168.255.255.

Usually ISP's will not allow broadcast UDP packets to be sent to the Internet. There exists a special broadcast address 255.255.255.255 which if allowed by the ISP would allow transmission of UDP packets to be sent to every IP address in the Internet.