# Serial Tunneling with SB70LC, SB700EX and CB34EX

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Revision 1.0

1. Introduction

This application note applies to the SB70LC, SB700EX and CB34EX devices running the factory standard Serial-to-Ethernet application. Throughout this document the term "S2E" will be used to represent any of these devices.

Two S2E devices can be used to create "serial tunnel" that enables two serial devices to communicate over an IP network, even if both of your serial devices have no network capabilities. The IP connection between the two S2E devices will be transparent to the serial devices. The serial connection between the S2E and your serial device can be RS-232, RS-422 or RS-485. A common configuration is shown below:
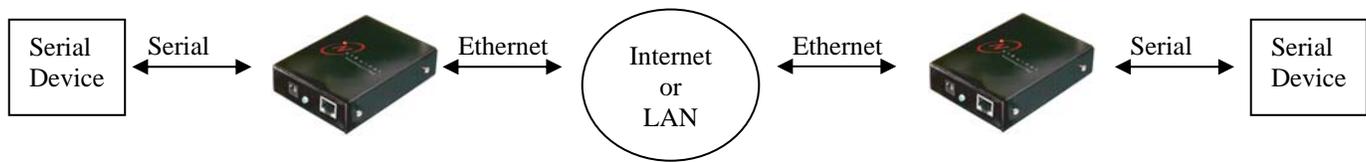
2. Software Configuration Overview

Serial tunneling is usually done using TCP, but you can also use UDP. Although some S2E devices support SSH server mode, they do not support SSH client mode, therefore you cannot create a serial tunnel using SSH.

When using TCP, the Serial-to-Ethernet application can be configured to be a TCP Server or a TCP Client.

- **TCP Server mode (default)**: The S2E will wait for an incoming TCP connection. Once a connection has been made, serial and network data can flow in both directions.

- **TCP Client mode**: The S2E creates an outgoing TCP connection to a TCP server. The connection can be established at power-up, which keeps a TCP connection active at all times. Or, a TCP connection can be made only when serial data is available (i.e. serial data is received by the S2E serial port).

In order to enable serial tunneling:
- Configure one S2E as a Server, and the other as a Client. An analogy would be a telephone call in which one device (the Client) needs to "call" the other device who is listening for the call (the Server).
- Specify the device name or IP Address of the Server in the Client configuration

3. TCP Server Configuration for Incoming Connections

The TCP Server is the first of the two devices that must be configured. Use your web browser to access the web server of the S2E device that will be the Server. If the IP address is not known, run the NetBurner IPSetup utility to determine the IP address and type the IP address into the URL field of your web browser, or click on the IPSetup **Launch Webpage** button. In this example we will use serial Port 1 as the data port, and leave serial Port 0 as the debug/status port.

3.1. *Network Device IP Settings*

The first section of the web page specifies the settings for the device's IP address, mask, gateway and DNS server. The S2E TCP Client must always know the IP address of the S2E TCP Server (this device), so the Address Mode must be set to "Static", and values for the IP address, mask, gateway and DNS server have been entered. These values can also be entered using the IPSetup utility.

3.2. *TCP Server Settings for Incoming Connections*

The TCP Server settings section of the web page are outlined in the red rectangle in the screen shot on the next page. Each setting is described below:

Listen for incoming network connections	Enable Server mode to listen for incoming connections by checking the checkbox for the serial port to be used. Any data received by the network connection will be sent to this serial port. Although both Port 0 and Port 1 are listening, Port 1 will be the data port in this example.
Listening network port	The network port number to listen on for incoming network connections. The defaults are 23 and 24, but any network port number can be used as long as the S2E Client device network destination port number is set to the same number.
Disconnect timeout	If no serial or network data is received or transmitted within the specified number of seconds, the TCP connection will be closed. A value of 0 will disable this feature, which is the recommended setting for tunneling.
Override timeout	When the specified number of seconds expires, a new incoming network connection will cause any existing network connection to be closed, and the new connection will become the active one. This feature is very useful in case the S2E Client device is reset so that a new TCP connection can be established with the S2E server. Do not use a value of 0 for this field.

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TCP

	Port 0	Port 1
Listen for incoming network connections	☐	☑
Listening network port:	0	23
Timeout and disconnect after this many seconds of inactivity.	60	60
Allow new connection if the existing connection has been idle for this many seconds.	30	30
When to begin making outgoing serial connections:	Never	Never
Connect on network port:	1000	1000
Connect to this address:	(Enter IP Address)	(Enter IP Address)
Timeout and disconnect after this many seconds of inactivity.	60	60
Retry failed outgoing connections after this many seconds.	360	360
Use custom packetization logic (below)	☐	☐
Number of characters to accumulate before sending TCP packet:	32	32
Number msec to wait for accumulated characters: 0 waits forever.	100	100
Flush TCP frame when this character is received (Enter NA to disable):	NA	NA

Network Settings on Serial Port - Advanced Serial Settings

Submit New Settings

Screen shot of example settings for the TCP Server to process incoming connections

4. TCP Client Settings for Outgoing Connections

This is the second of the two devices that must configured. Use your web browser to access the configuration page of the S2E device that will be the Client (the Client makes the outgoing connection to the S2E Server). If the IP address is unknown, run the NetBurner IPSetup utility to determine the IP address and type it into the URL field of the web browser, or click on the IPSetup **Launch Webpage** button. In this example we will use serial Port 1 as the data port, and serial Port 0 as the debug/status serial port.

4.1. *Network Device IP Settings*

The first section of the web page specifies the settings for the device's IP address, mask, gateway and DNS server. The S2E TCP Client must always know the IP address of the S2E TCP Server, but the IP address of the Client can change. Although a static IP address could be assigned to the Client, in this example the Address Mode is set to "DHCP" to illustrate the operation of DHCP. The values in the edit fields for the IP address, mask, gateway and DNS server are 0.0.0.0. If a DHCP server exists on your network, the DHCP assigned values will be shown in the "DHCP Assigned Values" column.

4.2. *TCP Client Configuration*

The second S2E must be configured to be a TCP Client so it can connect to the S2E TCP Server. The Client settings section of the web page is outlined in the red rectangle in the screen shot on the next page. We will be configuring serial Port 1 to connect to the S2E TCP Server serial Port 1, which is listening at IP address 10.1.1.55 on network port number 24. Each setting is described below:

Listen for incoming network connections	Disable Server mode by unchecking the checkbox for the serial port to be used, in this case serial Port 1. Once this box is unchecked, the server settings will have no effect.
When to make outgoing connections	There are 3 modes: • Never: Used only for TCP Server mode. • On Power Up: Creates a permanent TCP connection to the Server. This setting enables bidirectional communication at any time. • If Serial Data Received: A TCP connection is created whenever serial data is available. Once data has been sent to the Server, the TCP connection is closed.
Connect to this address	The IP address of the TCP Server.
Connect on network port	The network port number that the TCP Server is listening on. In this example, we used the default value of 24 for serial Port 1 of the TCP Server.
Inactivity Disconnect timeout	Set to 0 to disable. This is the Client device, so it is in control of making the outgoing connection.
Retry timeout	Specifies the number of seconds to wait before retrying a failed connection to the TCP Server.

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TCP

	Port 0	Port 1
Listen for incoming network connections	☐	☑
Listening network port:	0	23
Timeout and disconnect after this many seconds of inactivity.	60	60
Allow new connection if the existing connection has been idle for this many seconds.	30	30
When to begin making outgoing serial connections:	Never	Never
Connect on network port:	1000	1000
Connect to this address:	(Enter IP Address)	(Enter IP Address)
Timeout and disconnect after this many seconds of inactivity.	60	60
Retry failed outgoing connections after this many seconds.	360	360
Use custom packetization logic (below)	☐	☐
Number of characters to accumulate before sending TCP packet:	32	32
Number msec to wait for accumulated characters: 0 waits forever.	100	100
Flush TCP frame when this character is received (Enter NA to disable):	NA	NA

Network Settings on Serial Port - Advanced Serial Settings

Submit New Settings

5. Custom Packetization, Serial Settings and Passwords

The focus of this document is the network configuration for serial tunneling. The S2E also has customer packetization to format the serial data stream, many serial port options, and password protection of the configuration web pages. For more information on these topics please refer to the S2E Users Guide.

6. Testing

Once you have completed the software configuration, a simple test is to run two instances of the MTTTY program on one computer with two serial ports. Connect each serial port to the Port 1 serial port of each S2E. Any characters you type in one MTTTY window should be sent to the other MTTY window.