



SB700EX User's Manual

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1. Overview



The NetBurner SB700EX can be used in two ways:

1. The SB700EX is preprogrammed at the factory to provide dual serial to Ethernet functionality using UDP, TCP or SSH. Use the IPSetup utility to configure the device for DHCP or static IP addressing, then connect to the device's web server using your web browser to configure the serial and Ethernet settings. In this mode of operation, the SB700EX provides two serial ports that can be configured as two RS-232 ports, or one RS-232 port and one RS-422/485 port with half or full duplex. The remainder of this users guide describes how to use the SB700EX with the factory Serial-to-Ethernet program.
2. The SB700EX is a very fast 32-bit single board network computer that can be customized to suit any task. With the purchase of the NetBurner Network Development Kit (NNDK-SB700EX-KIT) you have the ability to write custom applications for networking, custom web pages, custom baud rates, real-time clock functions, and access to the Micro SD card and flash file system.

2. Initial Configuration

Before you can begin using your SB700EX, three areas of configuration are required to tell your SB700EX what type of serial interface you want to use, the network IP address network port number, and the serial data baud rate.

- Hardware configuration
- Network configuration
- Operational configuration

2.1 Hardware Configuration

The SB700EX has two asynchronous UART type serial ports, referred to as Port 0 and Port 1. The ports can be configured as two RS-232 ports, or one RS-232 port and one RS-422/485 port (half or full duplex). Port 0 can be configured for either RS-232 or RS-422/485 operation (the factory default is RS-232), while Port 1 is always used as RS-232.

To configure the SB700EX for RS-422/485 operation you must:

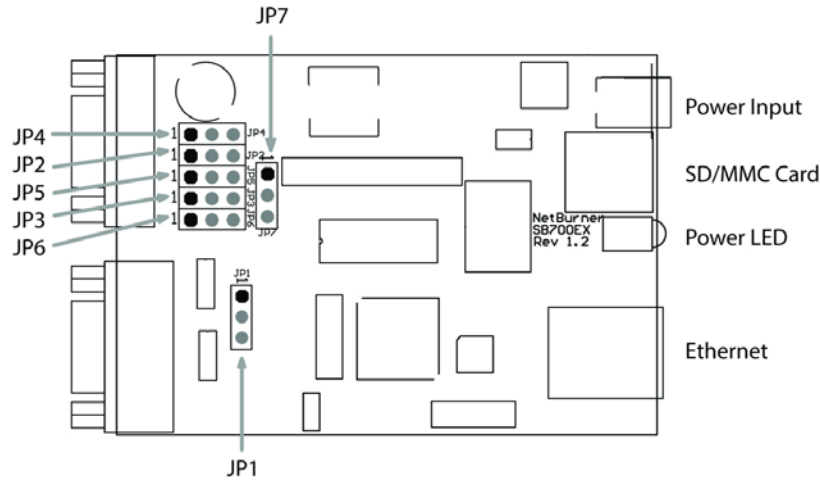
1. Open the SB700EX case and set the jumpers for Port 0 to RS-422/485 mode.
2. Configure the software setting in the Serial tab of the web page configuration to RS-422/485 mode.

The “Debug Serial Port”, or Debug Port for short, is used to display status messages from the application. If your application needs only a single serial port, we recommend setting the other serial port to “Debug” rather than RS-232 (which would make it a data channel instead of a debug channel).

If your application requires a single RS-232 connection, we recommend using Port 1 as the data port and Port 0 as the debug port. If your application requires a single RS-422/485 connection, we recommend configuring Port 1 as the debug port.



2.1.1 Jumper Layout and Configuration



Mode	JP1	JP2	JP3	JP4	JP5	JP6
RS-232	[1 - 2]	[1 - 2]	[1 - 2]	[1 - 2]	[1 - 2]	---
RS-422/485	[2 - 3]	[2 - 3]	[2 - 3]	[2 - 3]	[2 - 3]	---
Enable RS-485 HD Echo	---	---	---	---	---	[2 - 3]
Disable RS-485 HD Echo	---	---	---	---	---	[1 - 2]

- JP6[2-3] should be used when using RS-485 full-duplex mode.
- JP7 selects the slew-rate limit and has three configurations:
 - [1-2] = 500 kbps communication rate
 - [2-3] = 16 Mbps communication rate
 - [No Jumper] = 250 kbps communication rate (default)

2.1.2 DB9 Connector Pinouts

NetBurner SB700EX Port 0-1 Signal Descriptions

Pin	Port 0		Port 1
	RS-232 ¹	RS-485 ¹	RS-232
1	CD	-	CD
2	RX	HD- / FD TX-	RX
3	TX	HD+ / FD TX+	TX
4	DTR	-	DTR
5	GND	GND	GND
6	DSR	FD RX-	DSR
7	RTS	FD RX+	RTS
8	CTS	-	CTS
9	RI	-	RI

Note:

1. Port 0 can be configured as either RS-232 or RS-485

Network Configuration

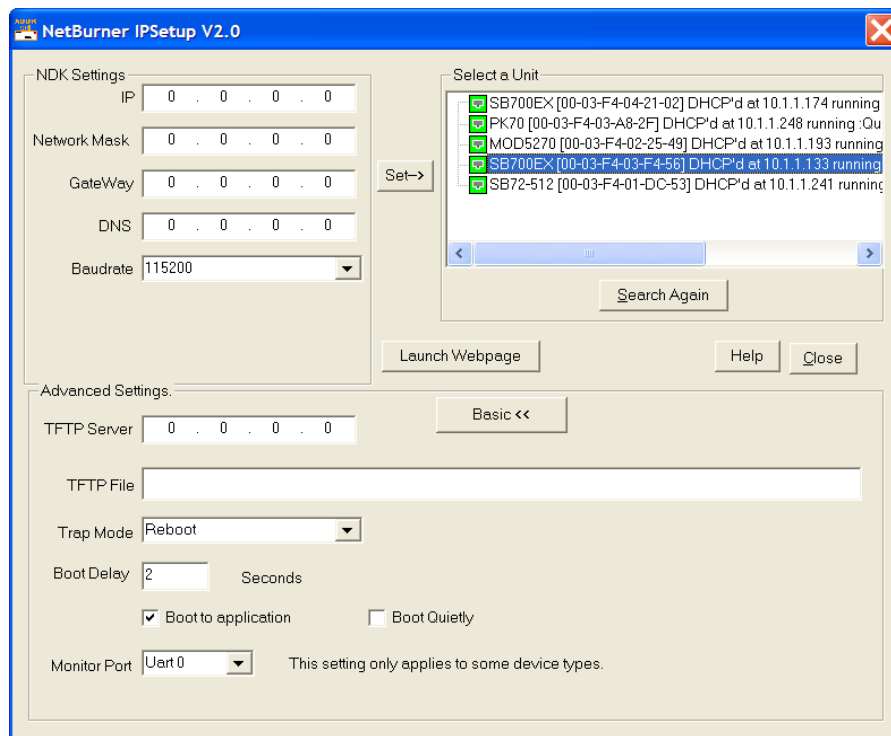
1. Run the IPSetup utility, which should be located in your NetBurner program group from the Windows Start menu. To view the Advance Settings, click on the Advanced button.
2. Locate your SB700EX in the "Select a Unit" pane by matching its MAC address. The MAC address is located on the bottom of your SB700EX. If your SB700EX device does not appear in the list box, verify the power, speed, and link LEDs are illuminated, and click the Search Again button. If you are still unable to see your SB700EX, remove power, correct any cabling errors, reapply power, and click the Search Again button. Note: IP Setup uses a UDP broadcast protocol and will not operate through a router.
3. If your network supports DHCP the assigned IP Address will appear in the "Select a Unit" pane. If your network does not support DHCP, you can configure a static IP Address and Network Mask fields appropriate for your network. Static addresses usually reside in an address space set aside for private networks. Some common values are:

Class A: 10.0.0.0 to 10.255.255.255

Class B: 172.16.0.0 to 172.31.255.255

Class C: 192.168.0.0 to 192.168.255.255

4. After you have entered all of your values, click the **Set** button in the center of the IP Setup window to configure your SB700EX with its new parameters.



2.2 Operational Configuration

Once the network parameters are set, you can use the web server interface to modify the settings of your SB700EX. To access the web page, click on the Launch Webpage button in IP Setup, or you can open your web browser, and enter the numeric IP Address in the address field (e.g. <http://10.1.1.79>).

3. Web Page Configuration

Once you have configured the IP address of your device you can connect to the SB700EX web server to configure your serial and network settings.

3.1 Network Settings



Network			
Protocol	TCP/SSL ▾ (Changing will terminate all existing connections)		
Device Name (for DHCP)	SB700EXSX-E9E		
NetBIOS Name	SB700EXSX-E9B0		
Version	01.12.0000		
	Static Settings	DHCP Assigned Values	Address Mode
Device IP Address	<input type="text" value="0.0.0.0"/>	(10.1.1.136)	Dynamic IP (DHCP) ▾
Device Subnet Mask	<input type="text" value="0.0.0.0"/>	(255.255.255.0)	
Device Gateway	<input type="text" value="0.0.0.0"/>	(10.1.1.1)	
DNS Server	<input type="text" value="0.0.0.0"/>	(66.75.160.15)	
NTP Server	<input type="text" value="pool.ntp.org"/>	(current:) (204.235.61.9)	Valid NTP Time
system Time:	NTP: AUG 12 2011 day: 223 (FRI) 21:59:35 UTC (When page was loaded)		
<input type="button" value="Reset To Factory Defaults"/>		<input type="button" value="Submit New Settings"/>	

Protocol	Selects the network protocol: SSH, TCP or UDP. Selecting a mode will enable the navigation links that apply to that protocol, and disable navigation links that do not apply. For example, if you select SSH, then the TCP and UDP configuration screens are disabled.
Device Name	Specifies the device name to be sent to your DHCP server, and is also used as the NETBIOS name. Note that NETBIOS names are limited to 14 characters and no spaces.
Version	Software version number
Address Mode	Select between DHCP and Static IP address settings.
Device IP Address Device Subnet Mask Device Gateway DNS Server	If Address Mode is set to DHCP, your DHCP server will provide these values and they will be displayed in the DHCP Assigned Values column. If you wish to specify these values yourself set the Address Mode to "static" and type the values in the appropriate fields. Note that if you do not specify a Gateway or DNS server you will not be able to communicate outside your LAN.
NTP Server	This specifies the network time protocol (NTP) server name or address that will be used to set the system time.

System Time	The date and time (int UTC) when the web page was last loaded. This information is updated with every web page refresh.
-------------	---

3.2 UDP Configuration

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UDP

Settings	Port 0	Port 1
Incoming port:	<input type="text" value="0"/>	<input type="text" value="23"/>
Outgoing port:	<input type="text" value="1000"/>	<input type="text" value="1000"/>
Send output to this address:	<input type="text" value="(Enter IP Address)"/>	<input type="text" value="(Enter IP Address)"/>
Learn outbound address from last incoming packet	<input type="checkbox"/>	<input type="checkbox"/>
Number of characters to accumulate before sending UDP packet:	<input type="text" value="32"/>	<input type="text" value="32"/>
Number msec to wait for accumulated characters: 0 waits forever.	<input type="text" value="100"/>	<input type="text" value="100"/>
Send UDP frame when this character is received: (Enter NA to disable)	<input type="text" value="NA"/>	<input type="text" value="NA"/>

Device Name: SB700EXSX-F456 | Version: 01.00.0000

Only available if the UDP Protocol is selected in Network Configuration. The column headings Port 0 and Port 1 refer to the serial ports and associated UARTs 0 and 1.

Incoming Port	The UDP port to listen on for incoming network data that will be sent out the associated serial port.
Outgoing Port	The UDP port used for outgoing serial data.
Send output to this address	The destination IP address for outgoing serial data.
Learn outbound address from last incoming packet	Send outbound serial to the IP address from the last received UDP packet. Useful for clients that may have changing IP addresses.
Number of characters to accumulate before sending UDP packet	Maximum number of characters to accumulate from received UDP packets before sending them out the serial port. This setting will be overridden if the accumulation delay time setting is used and the delay time expires.
Number msec to wait for accumulated characters (0 waits forever)	Specified maximum wait time for received UDP character accumulation setting.

Send UDP frame when this character is received: (Enter NA to disable)	If a character is specified, a UDP frame will be sent upon receipt of that character from the serial port.
---	--

3.3 TCP Configuration



TCP		Port 0	Port 1
Listen for incoming network connections	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Listening network port:	<input type="text" value="23"/>	<input type="text" value="24"/>	<input type="text" value="24"/>
Timeout and disconnect after this many seconds of inactivity.	<input type="text" value="60"/>	<input type="text" value="60"/>	<input type="text" value="60"/>
Allow new connection if the existing connection has been idle for this many seconds.	<input type="text" value="30"/>	<input type="text" value="30"/>	<input type="text" value="30"/>
When to begin making outgoing tcp connections:	Never	Never	Never
Connect on network port:	<input type="text" value="1000"/>	<input type="text" value="1000"/>	<input type="text" value="1000"/>
Connect to this address:	<input type="text" value="(Enter IP Address)"/>	<input type="text" value="(Enter IP Address)"/>	<input type="text" value="(Enter IP Address)"/>
Alternate address:	<input type="text" value="(Enter IP Address)"/>	<input type="text" value="(Enter IP Address)"/>	<input type="text" value="(Enter IP Address)"/>
Timeout and disconnect after this many seconds of inactivity.	<input type="text" value="60"/>	<input type="text" value="60"/>	<input type="text" value="60"/>
Retry failed outgoing connections after this many seconds.	<input type="text" value="360"/>	<input type="text" value="360"/>	<input type="text" value="360"/>
Use custom packetization logic (below)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Number of characters to accumulate before sending TCP packet:	<input type="text" value="32"/>	<input type="text" value="32"/>	<input type="text" value="32"/>
Number msec to wait for accumulated characters: 0 waits forever.	<input type="text" value="100"/>	<input type="text" value="100"/>	<input type="text" value="100"/>
Flush TCP frame when this character is received (Enter NA to disable):	<input type="text" value="NA"/>	<input type="text" value="NA"/>	<input type="text" value="NA"/>
USE SSL rather than TCP for connections:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Always Save Serial Chars regardless of connection status:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DTR will reflect current connection status:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Network Settings on Serial Port - Advanced Serial Settings			
<input type="button" value="Submit New Settings"/>			

Only available if the TCP Protocol is selected in Network Configuration. The column headings Port 0 and Port 1 refer to the serial ports and associated UARTs 0 and 1.

In TCP protocol mode you can configure the device to be a TCP Server, which listens for incoming connections, or a TCP Client, which makes outgoing connections. In TCP Client mode, you can choose to make an outgoing connection on device power-up, or you can choose to only connect when serial data is available to send. You cannot be a TCP Client and TCP Server at the same time.

3.3.1 TCP Server Mode

Listen for incoming network connections	Select checkbox to enable the port to listen for incoming TCP connection requests. Checking this box will override the TCP Client mode.
Listening network port	Port number to listen on. The default port is 23 (telnet). The listen port numbers for Port0 and Port1 must be different.
Timeout and disconnect after this many seconds of inactivity.	Terminate TCP connection if no incoming network data or outgoing serial data has occurred. This is useful because there is no way to detect if a client has crashed or abnormally terminated unless unacknowledged data exists and times out. A value of 0 disables this feature.
Allow new connection if the existing connection has been idle for this many seconds.	Similar to the disconnect timeout, but does not disconnect a connection until a new connection is requested. A value of 0 disables this feature.

3.3.2 TCP Client Mode


When to begin making outgoing serial connections	Selects between connect on power-up and connect on serial data available.
Connect on network port	Specifies destination TCP port number
Connect to this address	Specifies destination IP address
Timeout and disconnect after this many seconds of inactivity.	Terminate TCP connection if no incoming network data or outgoing serial data has occurred. This is useful because there is no way to detect if a client has crashed or abnormally terminated unless unacknowledged data exists and times out. A value of 0 disables this feature.
Retry failed outgoing connections after this many seconds.	Number of seconds to wait before retrying an outgoing connection.

3.3.3 TCP Packetization Options, valid for TCP Sever or Client Modes

Use custom packetization logic	Enables/disables custom packetization settings
Number of characters to accumulate before sending TCP packet	Maximum number of characters to accumulate from received TCP connection before sending them out the serial port. This setting will be overridden if the accumulation delay time setting is used and the delay time expires.

Number msec to wait for accumulated characters (0 waits forever)	Specified maximum wait time for received TCP character accumulation setting.
Flush TCP frame when this character is received (Enter NA to disable)	Send all accumulated serial data upon receipt of this character from the serial port.
Use SSL rather than TCP for connections	Checking this box enables the SSL protocol for the port connection used; unchecking the box reverts back to regular TCP connections.
Always save serial chars regardless of connection status	Checking this box allows received serial chars to be stored, whether the connection is established or not; unchecking the box discards any incoming serial characters.
DTR will reflect current connection status	When checked, the DTR output signal will toggle high or low depending on whether a serial-Ethernet connection is established for the associated port. If there is an active connection, the DTR signal will go high; a closed connection will cause DTR to go low.
Network Settings on Serial Port - Advanced Serial Settings	Link to advanced network settings that enable serial messages to be sent upon specific network events.

3.3.4 TCP Advanced Serial Network Settings



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Advanced Serial

Port 0: Serial Data Notification Settings

Send serial message when TCP connection is established.
Message to send:

Send serial message when TCP connection is lost.
Message to send:

[Message Formatting Codes](#)

Send serial break when incoming TCP connection is established.
Break interval (in tenths of a second):

Send serial break when incoming character is received (2-digit hex, i.e. "02"):

Port 1: Serial Data Notification Settings

Send serial message when TCP connection is established.
Message to send:

Send serial message when TCP connection is lost.
Message to send:

[Message Formatting Codes](#)

Send serial break when incoming TCP connection is established.
Break interval (in tenths of a second):


Send serial break when incoming character is received (2-digit hex, i.e. "02"):



Message Formatting Codes	
Character	Data Item
%%	Prints "%"
%r	Line feed (ASCII 10)
%n	Carriage return (ASCII 13)
%x	Any hex value is %X20 (ASCII space)

[Return to Setup Page](#)

4. SSH Configuration



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SSH

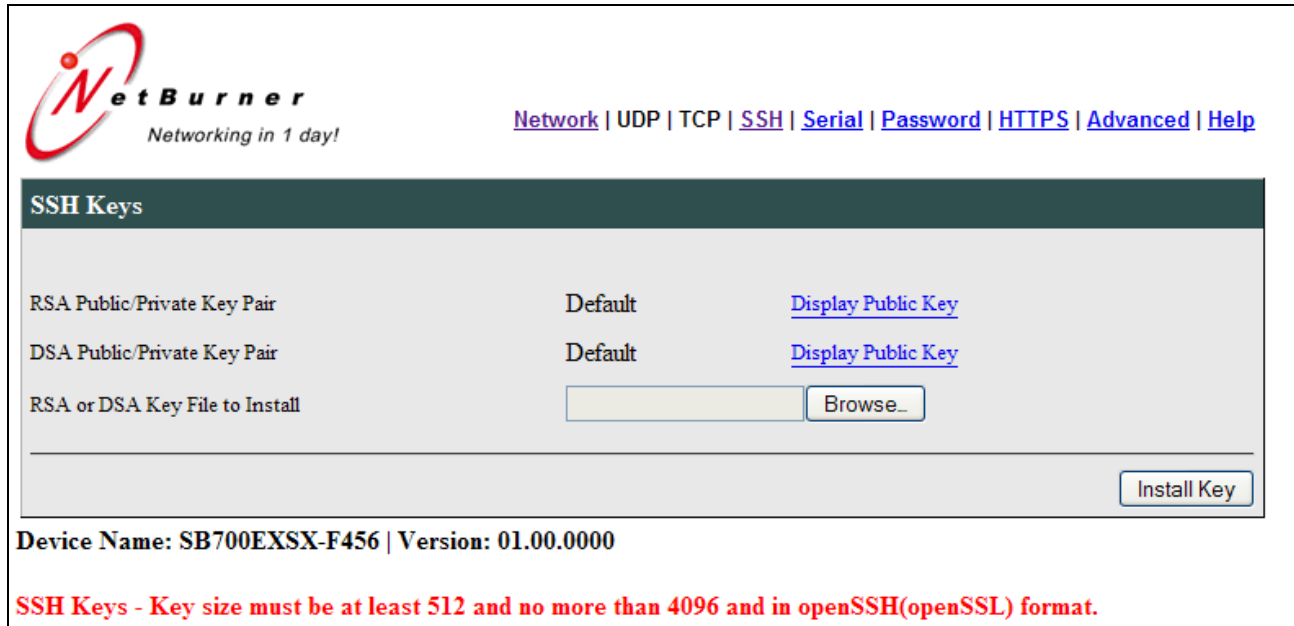
	Port 0	Port 1
Listen for incoming network connections	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Listening network port:	<input type="text" value="0"/>	<input type="text" value="22"/>
Timeout and disconnect after this many seconds of inactivity.	<input type="text" value="180"/>	<input type="text" value="180"/>
Allow new connection if the existing connection has been idle for this many seconds.	<input type="text" value="360"/>	<input type="text" value="360"/>
Use custom packetization logic (below)	<input type="checkbox"/>	<input type="checkbox"/>
Number of characters to accumulate before sending TCP packet:	<input type="text" value="32"/>	<input type="text" value="32"/>
Number msec to wait for accumulated characters: 0 waits forever.	<input type="text" value="100"/>	<input type="text" value="100"/>
Flush TCP frame when this character is received (Enter NA to disable):	<input type="text" value="NA"/>	<input type="text" value="NA"/>
SSH Keys SSH Keys Network Settings on Serial Port - Advanced Serial Settings		
<input type="button" value="Submit New Settings"/>		

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Only available if the SSH Protocol is selected in Network Configuration. The column headings Port 0 and Port 1 refer to the serial ports and associated UARTs 0 and 1.

Listen for incoming network connections	Select checkbox to enable the port to listen for incoming SSH connection requests.
Listening network port	Port number to listen on. The default SSH port is 22. The listen port numbers for Port0 and Port1 must be different.
Timeout and disconnect after this many seconds of inactivity.	Terminate SSH connection if no incoming network data or outgoing serial data has occurred. This is useful because there is no way to detect if a client has crashed or abnormally terminated unless unacknowledged data exists and times out. A value of 0 disables this feature.
Allow new connection if the existing connection has been idle for this many seconds.	Similar to the disconnect timeout, but does not disconnect a connection until a new connection is requested. A value of 0 disables this feature.
Use custom packetization logic	Enables/disables custom packetization settings
Number of characters to accumulate before sending TCP packet	Maximum number of characters to accumulate from received SSH connection before sending them out the serial port. This setting will be overridden if the accumulation delay time setting is used and the delay time expires.
Number msec to wait for accumulated characters (0 waits forever)	Specified maximum wait time for received SSH character accumulation setting.
Flush TCP frame when this character is received (Enter NA to disable)	Send all accumulated serial data upon receipt of this character from the serial port.
SSH Keys	Link to the SSH key management page.
Network Settings on Serial Port - Advanced Serial Settings	Link to advanced network settings that enable serial messages to be sent upon specific network events.

4.1 SSH Key Configuration



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SSH Keys

RSA Public/Private Key Pair	Default	Display Public Key
DSA Public/Private Key Pair	Default	Display Public Key
RSA or DSA Key File to Install	<input type="text"/>	<input type="button" value="Browse..."/>

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SSH Keys - Key size must be at least 512 and no more than 4096 and in openSSH(openSSL) format.

Only available if the SSH Protocol is selected in Network Configuration. RSA and DSA are algorithms for public-key cryptography and involve a public key and a private key. The public key can be known to everyone and is used for encrypting messages. Messages encrypted with the public key can only be decrypted using the private key. For detailed information on the NetBurner SSH implementation, please refer to the NetBurner SSH product datasheet at www.netburner.com.

This configuration screen is used to display the current key configuration and provide the ability to upload your own key. Each private key also contains the public key, so uploading your own private key will also upload the public key. You can use the Display Public Key link to copy the public key and provide it for encryption purposes.

There are 3 possible key configurations. The first two are present so the system is functional if you have not uploaded your own user created keys.

1. The NetBurner factory key, designated by the name “NetBurner”. This key is built into the SSH library and will be active if no other keys are present.
2. The SSH application key, designated by the description “Default”. This key is compiled into the SSH application and will be used if no user created keys have been uploaded.
3. A key you have created and uploaded.

IMPORTANT: When creating your own keys the key size must be at least 512 bits and no more than 4096 bits and in openSSH(openSSL) format.

RSA Public/Private Key Pair	Displays current RSA key in use.
DSA Public/Private Key Pair	Displays current DSA key in use.
RSA or DSA Key File to Install	Use this field to select a user created key file to upload. Once selected, click on “Install Key” to upload.

4.2 SSH Advanced Serial Settings

These are the same as with TCP. Please refer to the TCP Advanced Serial Settings section.

5. Serial Settings

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Serial

	Port 0	Port 1
Data Port Settings (If both are DEBUG, defaults to Port 0):	DEBUG	RS-232
Data Baud Rate:	115200	115200
Data Bits:	8	8
Data Parity:	None	None
Stop Bits:	1	1
Flow Control:	None	None

[Submit New Settings](#)

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The SB700EX provides two serial port, Port 0 and Port 1. Port 0 can be configured for RS-232 or RS-422/485 (need to set hardware jumpers to match), and Port 1 is configured as RS-232.

Data Port Settings (If both are DEBUG, defaults to Port 0)	Select serial mode RS-232, RS-485 or DEBUG.
Data Baud Rate	Set serial baud rate
Data bits	Serial data bits
Data parity	Serial parity
Stop bits	Number of stop bits
Flow control	Set to None for no flow control. If using RS-232, valid selections are None, Xon/Xoff software flow control, or RTS/CTS hardware flow control.

6. Password Settings

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Password

Administrator

User Name:

Password: (Leave blank for no password)

Repeat Password:

SSH User

User Name:

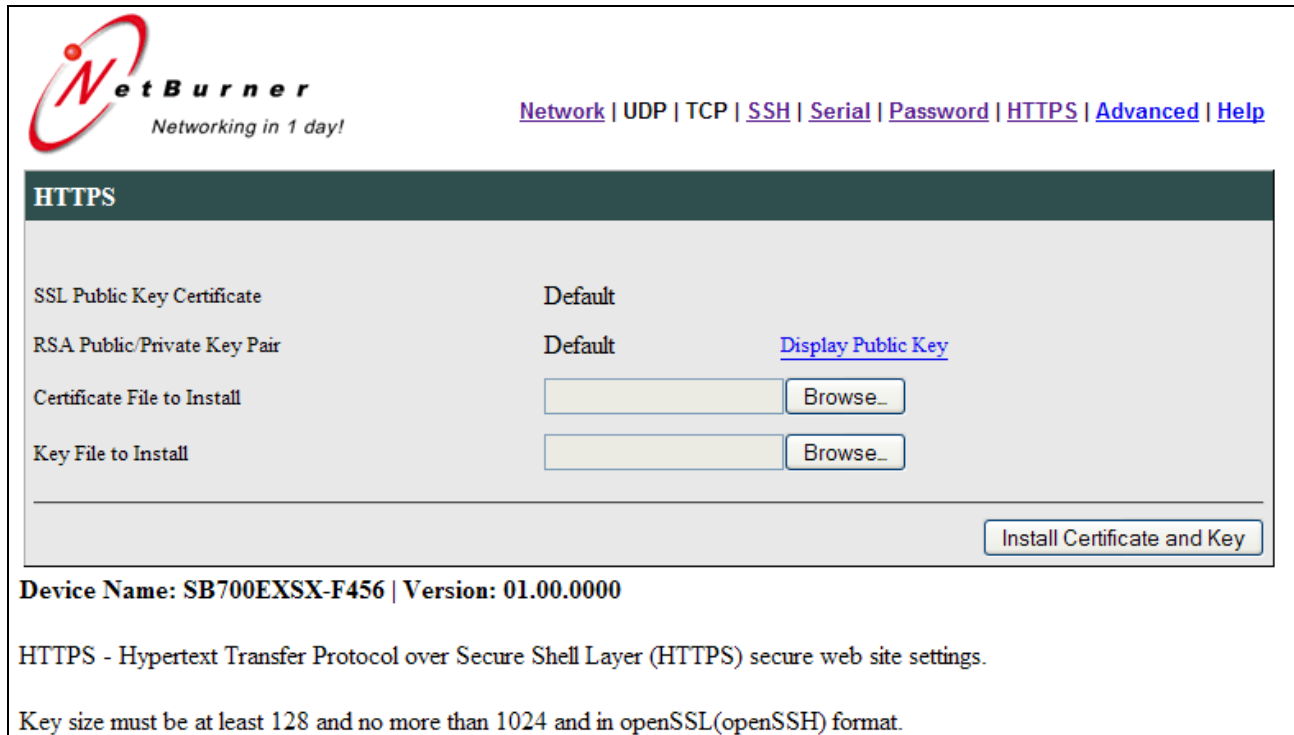
Password: (Leave blank for no password)

Repeat Password:

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Administrator Password	<p>This password applies to:</p> <ul style="list-style-type: none"> • Web page access • Autoupdate capability for software updates • Configuration changes with IPSetup • SSH client log-in
SSH Password	<p>Password for SSH clients with no administrative privileges to log in to the web server. Because a SSH log-in is possible with either an Admin or SSH password, an Admin password is required to enable this feature.</p>

7. Hypertext Transfer Protocol over SSL (HTTPS) Configuration



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HTTPS

SSL Public Key Certificate	Default	
RSA Public/Private Key Pair	Default	Display Public Key
Certificate File to Install	<input type="text"/>	<input type="button" value="Browse..."/>
Key File to Install	<input type="text"/>	<input type="button" value="Browse..."/>

Device Name: SB700EXSX-F456 | Version: 01.00.0000

HTTPS - Hypertext Transfer Protocol over Secure Shell Layer (HTTPS) secure web site settings.

Key size must be at least 128 and no more than 1024 and in openssl(openSSH) format.

HTTPS refers to HTTP over a secure SSL connection. To use HTTPS you can simply enter a URL of “https://xxxxx” instead of “http://xxxxx”. Your NetBurner device can simultaneously run both HTTP and HTTPS access to the web server.

HTTPS requires both a Certificate and a RSA public/private Key. The key must match the certificate and if you are creating your own self signed certificate or purchasing a certificate from a certificate authority, both the certificate and key must be uploaded at the same time. If you are creating your own certificate, called a self-signed certificate, anyone accessing the secure web page will first receive a warning message from the web browser asking to confirm whether or not the certificate should be accepted. For detailed information on the NetBurner SSL implementation, please refer to the NetBurner SSL product datasheet at www.netburner.com.

There are 3 possible key/certificate configurations. The first two are present so the system is functional if you have not uploaded your own user created certificate and key.

1. The NetBurner certificate/key built into the SSL library, designated by the name “NetBurner”, which will be used if no other keys are present.
2. The application certificate/key, designated by the description “Default”. This SSL certificate and key are compiled into the application and will be used if no user created certificate and key have been uploaded.
3. A certificate and key you have uploaded.

IMPORTANT: When creating your own key the key size must be at least 128 bits and no more than 1024 bits and in openSSL(openSSH) format.

SSL Public Key Certificate	Displays current certificate in use.
RSA Public/Private Key Pair	Displays the current keys in use.
Certificate file to install	Selects the certificate file to upload (must also upload the key).
Key file to install	Selects the RSA public/private key pair to upload (must also upload certificate).

8. AT Commands

As an alternative to the web page configuration, you can configure the SB700EX over a serial port using an AT command format. The configuration sequence is:

1. Enter command mode
2. Send configuration change commands
3. Save changes and exit

The AT command operation is different for configuration commands versus GPIO pin programming commands. Please refer to “GPIO Server and Analog to Digital Readback” later in this section for additional details.

8.1 *Enter and Exit Command Mode*

AT configuration commands can only be processed when the SB700EX is in “AT Command Mode”.

To enter AT command mode:

1. Pause for 1 second (send no data).
2. Send “+++”.
3. Wait for 1 second.
4. The device will respond with “\r\nOK”.

To exit command mode:

1. Wait 30 seconds for timeout, any changes will be lost.
2. Send “AT&X” or “ATO” to exit and discard any changes.
3. Send “AT&P” to exit and save new settings.
- 4.

How does this work on SB700EX

Send “AT&F” to reset all settings to factory default (does not save).

Returns:

- 1, Returning to active connection
- 2, Returning to listening connection
- 3, Returning to active UDP mode
- 0, Returning to idle

Exiting command mode with any changes terminate all existing TCP connections.

8.2 *Command Syntax*

The format of an AT command is:

```
AT#<command>=<parameter>,<parameter>, ... . <cr>
```

The format of an AT query is:

```
AT#<command>?<cr>
```

Syntax rules:

- All white space outside quotations is ignored
- All commands and queries are terminated by a carriage return <cr> (decimal value 13), if a line feed <lf> follows a <cr>, it will be ignored.

8.3 System/Network Configuration

Example: AT#SYSIP=10.1.1.100<cr>

#SYS

IP=<ip address>

MK=<mask ip>

GW=<gateway ip>

DN=<dns ip>

DH=1 // To enable DHCP, set IP to 0.0.0.0.

NB=<device name>

UN=<string>

PW=<string>

SB700EX Only

GS=<enable/disable gpio server> // 0 = disable, 1 = enable

GP=<gpio server listen port>

SB70LC and SB700EX Only (SB700EX can be set per port)

MD=<T|U|S> Mode T for TCP, U for UDP and S for SSH

#CUR //Get current active values

IP?

MK?

GW?

DN?

ST? // Return port status for current port

S0? // Return port status for port 0

S1? // Return port status for port 1

Return Values:

- Connected to IP xx.xx.xx.xx
- Listening on port xx
- UDP mode with learned send-to IP Address : xx.xx.xx.xx
- UDP mode send to Address : xx.xx.xx.xx
- Idle

8.4 Serial Port Configuration

Example: AT#SER0LN=0<cr>

```
#SERn                // n = serial port number, 0, 1
SM=<R|D|H|F >      // R=RS232, D=debug, H=Half duplex RS485, F=Full duplex RS485
LN=< 0|1 >          // 1 = listen for connection 0= don't listen
BR=<baud rate >
DB=< data bits >    // 7,8
PR=< N|O|E >        // none, odd, even
ST=< stop bits >    // 1,2
FL=< N|S|H >        // none, software or hardware

SP=<listen network port number>
SD=<disconnect timeout in seconds>
SO=<override timeout in seconds>

CM=<N|P|R>          // outgoing connection mode: never (listen mode only),
                    // power-up or upon received serial data
CI=<dest ip name/addr>
CP=<destination port number>
CD=<disconnect timeout in seconds>
CR=<retry timeout in seconds>
```

SB700EX Only

```
NP=< T|U|L >       // network protocol T = tcp, U = udp, L = udp learn
```

SB70LC and SB700EX Only

```
UL=<0|1>           //UDP Learn Mode 0 or 1
```

8.5 Passwords

Available on SB700EX and SB70LC.

8.5.1 Administrator

Example: AT#SYSAUN=BobAdmin<cr>

```
#SYSA
  UN=<name>           // set user name
  PW=<password>       // set password
  UN?                 // query user name
  PW?                 // query password
```

8.5.2 SSH

Example: AT#SYSSUN=BobSsh<cr>

```
#SYSS
  UN=<name>           // set user name
  PW=<password>       // set password
  UN?                 // query user name
  PW?                 // query password
```

8.6 AT Command Examples

The following examples display the full transcript of serial communication including commands sent and replies from the SB700EX. Commands are marked in **red**, responses are marked in **blue**.

8.6.1 Changing the System IP Address

This example first queries the current IP address, and then changes the current IP to 10.1.1.79. Once the IP address change request is made, the settings are saved, and the device reboots.

```
+++  
OK>AT#CURIP?10.1.1.99  
OK>AT#SYSIP=10.1.1.79  
OK>AT&PIP Address Changed Rebooting  
  
Waiting 2sec(s) to start 'A' to abort
```

8.6.2 Configuring the Serial Server Listen Port

This example first queries the current TCP Serial Server listening port number, and then changes the current port number to 30. Once the port number change request is made, the settings are saved. No system restart was required.

```
+++  
OK>AT#SEROSP?23  
OK>AT#SEROSP=30  
OK>AT&P2,Returning to listening connection
```

8.6.3 Configure Outgoing Network Client Connection

This example changes the client connection's IP and port. Once the changes are made, the settings are saved. No system restart was required.

```
+++  
OK>AT#SEROCI=10.1.1.78  
OK>AT#SEROCP=30  
OK>AT&P2,Returning to listening connection
```

8.6.4 Read Analog to Digital Input Channel 1

This example reads the A2D pin 8. The value is immediately returned.

```
+++  
OK>AT#P08?2248
```

8.6.5 Change Pin to GPIO and Set Output to High

This example checks the current pin mode, and finds it in a2d channel 1. The mode is then updated to GPIO, and set to high.

```
+++  
OK>AT#P08M?AD1  
OK>AT#P08M=GPIO  
OK>AT#P08M?GPIO In=1  
OK>AT#P08=1  
OK>
```

9. Development Kit Options

The SB700EX is a high performance 32-bit network computer that you can program to accommodate your specific product requirements. This can range from simple things like web pages and processing the data streams using the source code for the Serial-to-Ethernet application, or you can write a completely different program altogether. For example, data logging or network control of other devices.

9.1 *Real-Time Clock (RTC)*

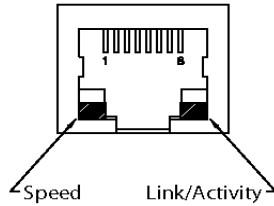
The SB700EX has a Real-Time clock that will keep time when the SB700EX is powered off. The library function calls are documented in the NetBurner Runtime Libraries document located in \nburn\docs. There is also a RTC example program in the \nburn\examples\SB700EX directory.

9.2 *Micro SD Card and Flash File System*

The front panel of the SB700EX has a MicroSD Flash Card connector. The SB700EX support the FAT32 Embedded Flash File System (EFFS). Documentation on the use and function calls of the EFFS can be found in the EFFS Programmers Guide, located in the \nburn\docs\EFFS directory. There is also a EFFS examples located in the \nburn\examples\EFFS directory.

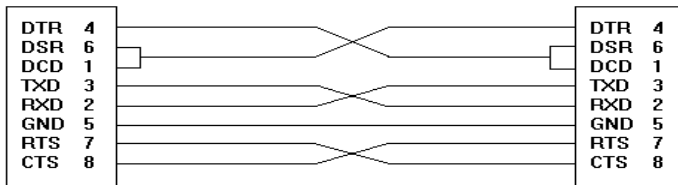
10. LEDs

- Power LED: Illuminated while power is applied.
- LED1 on RJ-45: Ethernet speed – 10 (off) or 100 (on)
- LED2 on RJ-45: Link and data activity



11. RS-232 NULL Modem Wiring

The following table and diagram shows how to create a null modem cable/adapter for RS-232 connections. A null modem cable is required if you are connecting your SB700EX to standard PC type serial port pinout.

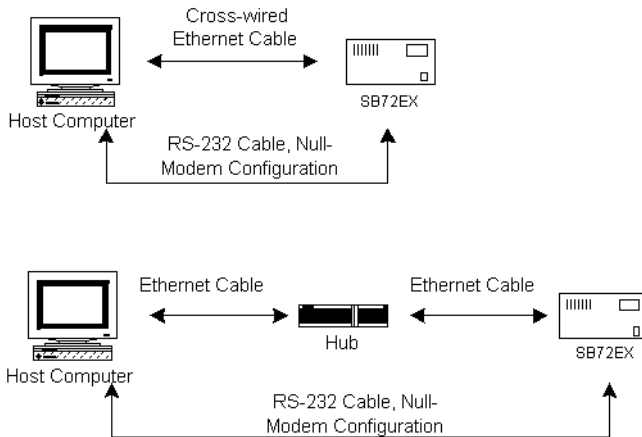


12. Web Browsers and Proxy Servers

If you are working on a corporate LAN that uses a proxy server for Internet web browsing, you will need to exclude the IP Address of your SB700EX in your web browser's proxy server settings/preferences. Otherwise, an attempt to connect to a web page on the LAN will fail because the proxy server will attempt to route the request outside the LAN. For most web browsers, this can be accomplished in the advanced settings for the proxy server configuration. Set the Network Mask for your host computer's network adapter and your SB700EX to 255.255.255.0.

13. Testing with a Telnet Connection

One quick way to test the functionality of your Serial-to-Ethernet connection is with the Telnet program and an RS-232 Serial terminal program (e.g. MTTY). Remember you must use a NULL modem cable able to connect your SB700EX to your host computer. To run this test, configure your system as one of the two examples shown below:



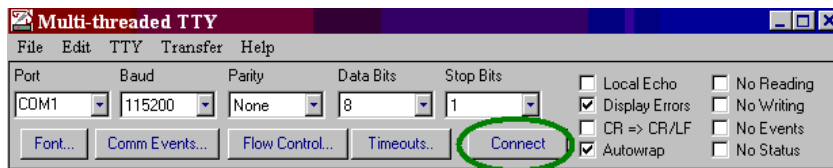
The objective of this example is to use a single host computer running telnet and a serial terminal program to send data in either direction. Therefore, if you type text in the telnet window, it should appear in the serial terminal window and visa versa. For a serial terminal, you can use MTTY (available as a download from the SB700EX product page at www.netburner.com) or HyperTerminal.

In the following example, an IP Address of 10.1.1.79 will be used for the SB700EX. Note: Replace this number with the specific IP Address you assigned (if using a Static IP Address) during configuration.

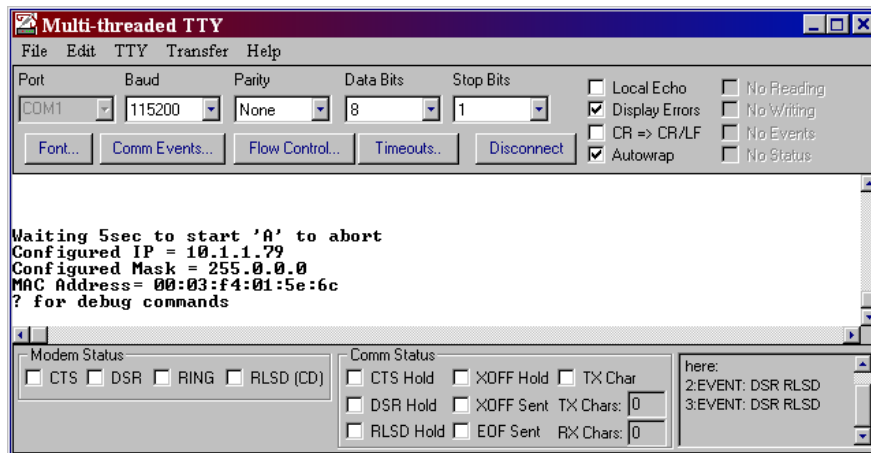
Procedure

1. Connect your hardware in one of the above configurations.
2. Open a command prompt window on your host computer.
3. Verify everything is connected correctly by executing the command `ping 10.1.1.79` and pressing the Enter key on your keyboard. You will see a valid ping response. Remember to substitute your IP Address for our example IP Address (i.e.10.1.1.79).
4. Run either HyperTerminal or MTTY. Set the baud rate to the value you assigned to the SB700EX during configuration. To use MTTY (with the factory default settings):
 - Connect your NULL modem cable from Port 0 on your SB700EX to your host computer's serial port. Remember, a standard serial cable will not work.

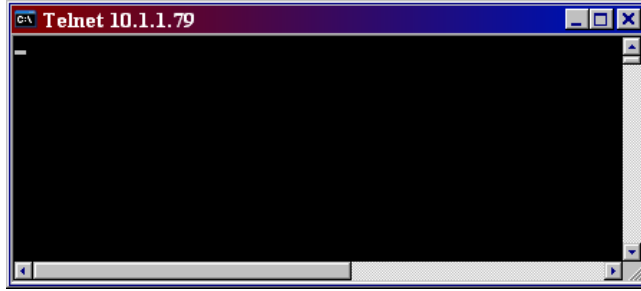
- Run Mttty.exe (by double clicking its icon), available as a download from the SB700EX product page at www.netburner.com. When the MTTTY window appears use the factory default setting shown below:
 - The Port setting is the communication port that you connected the NULL modem cable to on your host computer.
 - The host computer and the attached SB700EX must agree on a speed or baud rate to use for the serial connection.
 - Parity checks whether the data has been lost or written over when transmitted between your host computer and your SB700EX.
 - Data Bits are the number of bits in a transmitted data package.
 - The Stop bit follows the data and parity bits in serial communication. It indicates the end of transmission.
- Click the MTTTY **Connect** button.



- Remove and reapply power to your SB700EX.
- The SB700EX factory application will boot.



5. Run Telnet by typing: telnet 10.1.1.79 24 after the prompt, and press the Enter key. Note: This assumes a port number of 24. You must replace this port number with the listening port number that you assigned in the “Device Connection Settings (TCP mode)” section. Remember to substitute your IP Address for our example IP Address (i.e.10.1.1.79).



6. At this point, anything you type in the Telnet window should appear in the serial terminal window and vice versa.

14. Revision History

Revision	Date	Comments
1.0	10/7/2009	Initial release
1.1	5/5/2010	Added AT command set and improved jumper settings
1.2	8/12/2011	Added new sections to reflect the current revision of the SSH factory application: added the NTP Server and System Time fields to the Network Settings section, and the SSL, Save Serial Chars, and DTR sections to the TCP Packetization Options section.