

**HDA800 User Manual**

# **Users Manual**

**HDA800 Evaluation Kit**

**SPB800 Serial to WiFi solution**



## Revision History

Revision	Revision date	Description
PA1	2010-11-30	First Issue
PA4	2010-12-17	Updated for revision R2B of PC Connection Board
PA5	2011-01-12	Added XPLAIN example
PB1	2011-02-04	Updates for release 1.1.3
PC1	2011-06-09	Updates for release 1.2
PC2	2012-02-01	Channel range updated

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**CONTENTS**

<b>1</b>	<b>EVALUATION KIT CONTENT .....</b>	<b>4</b>
<b>2</b>	<b>PREPARATIONS .....</b>	<b>4</b>
2.1	<b>USB driver installation.....</b>	<b>4</b>
<b>3</b>	<b>CONNECTING THE KIT .....</b>	<b>5</b>
<b>4</b>	<b>SPB800 FIRMWARE .....</b>	<b>6</b>
<b>5</b>	<b>COMMANDS.....</b>	<b>6</b>
5.1	<b>Serial Port Commands .....</b>	<b>9</b>
<b>6</b>	<b>EXAMPLE 1, SERIAL PORT WIRELESS LAN ADAPTER .....</b>	<b>11</b>
6.1	<b>Web Configuration .....</b>	<b>14</b>
<b>7</b>	<b>FIRMWARE UPGRADE.....</b>	<b>16</b>
<b>8</b>	<b>KNOWN ISSUES .....</b>	<b>17</b>

## 1 Evaluation Kit Content

- SPB800-E, SPB800 Evaluation board with a 10pos. header socket, to allow easy plug in.
- PC connection board
- USB cable
- USB Flash memory with documentation and reference code

## 2 Preparations

To communicate with the SPB800E from a PC you need the PC connection board that convert the SPB800E's UART signal to USB or RS-232 and provide 3.3V power to the module.

On the PC you need a serial communications application, such as TeraTerm or HyperTerm. TeraTerm can be downloaded from <http://www.ayera.com/teraterm/download.cfm>

### 2.1 USB driver installation

If you are running Windows 7, it usually recognize the serial to USB chip and installs the drivers at first connection. For other operating system there are driver software provided on the USB memory under the directory called "USB\_driver"

If you cannot find the appropriate driver for your system or having other problems with the USB driver please seek more information at <http://www.ftdichip.com/Drivers/VCP.htm>

Remember to set the two jumpers on the PC connection in their right position to enable USB as serial port. If you rather use the RS-232 port the jumpers should be in the left position. See Figure 2-1.

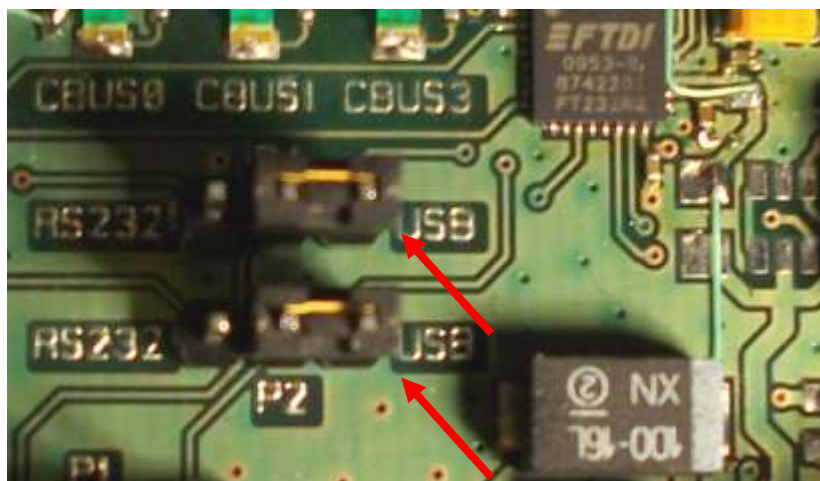


Figure 2-1: Port selection jumpers

### 3 Connecting the Kit

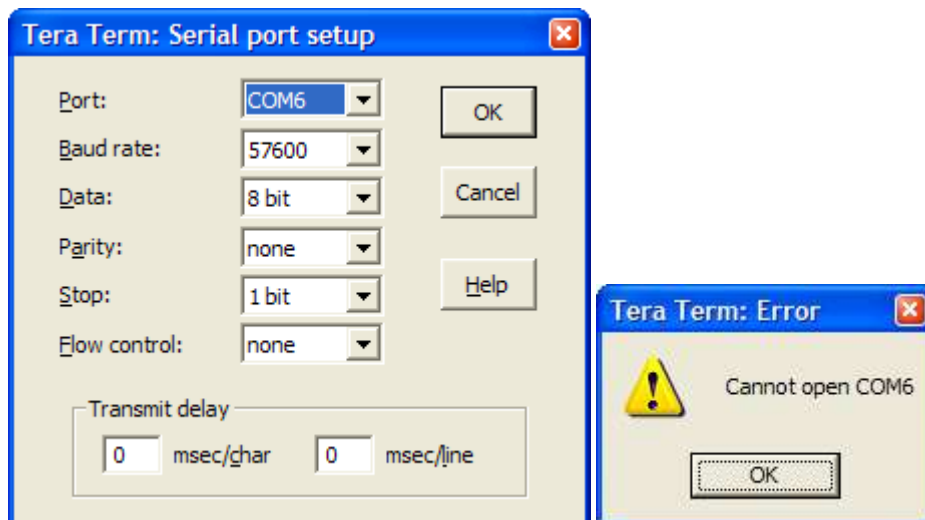
Connect the Evaluation Kit as follows:

1. Plug in the SPB800E into the 10-pin header.
2. Connect the PC Connection board with the USB cable to a USB port on a PC. The USB powers the board so no other power source is required.

*Or alternatively:*

Power the PC Connection board from an AC/DC adapter with between 5V – 9V DC output and plus on the sleeve and negative on the centre pin. Connect with a serial cable to the PC.

3. Start a serial communications application such as TeraTerm on PC1.  
In TeraTerm, select “Setup->Serial Port...” in the menu and configure the serial port according to the figure below.



Note that the port number used to communicate with the SPB800E (COM6 in the figure above) might be different in some environments, so make sure to try another one if COM6 fails (see figure below)

The assigned port can also be found in the Windows Device Manager, under Ports (COM & LPT).

4. Press the reset button on the PC Connection Card to restart the SPB800E
5. In the TeraTerm window a series of dots appears one every second
6. Hit “Return” in the TeraTerm terminal within 5 seconds from the first dot to keep the SPB800E in configuration mode. A \$ prompt should show in the terminal.

Now you are ready to configure the SPB800E for one of the examples

## 4 SPB800 Firmware

The SPB800 can be programmed with two different firmwares for different modes.

- One where the host is unaware of the SPB800, which forwards the data it receives on the serial port onto a TCP socket. The firmware for this mode is called `spb800-serial_to_wifi_rxxx.hlf`. This is the firmware on the SPB800 when it is delivered in the HDA800 kit.
- The other, where the host is aware of the SPB800 and uses the oWL-pico API to configure and control the SPB800, called `spb800-pserver_rxxx.hlf`, where xxx is the build version corresponding to a release, e.g. 1.2

The firmware can be swapped between the versions the same way as described for upgrades in chapter 7

## 5 Commands

The following commands are available for the SPB800 in configuration mode. For (o)WL-pico API command please see the (o)WL-pico API Specification.

db	Read/write database
upgrade	fw upgrade xmodem
reset	reset device
help	print a list of available commands
test_mode	sets the unit in test mode (do NOT use without the proper software tools)
nvdiag	onboard non volatile memory check

The db (data base) command splits in several commands

db reset [path]	reset param(s) to default (need to be followed by a db store)
db get [path]	list parameter(s) in the edit list.
db set <path> [args ...]	set single parameter
db load	read parameters from non-volatile memory (flash)
db store	write parameters to non-volatile memory (flash)

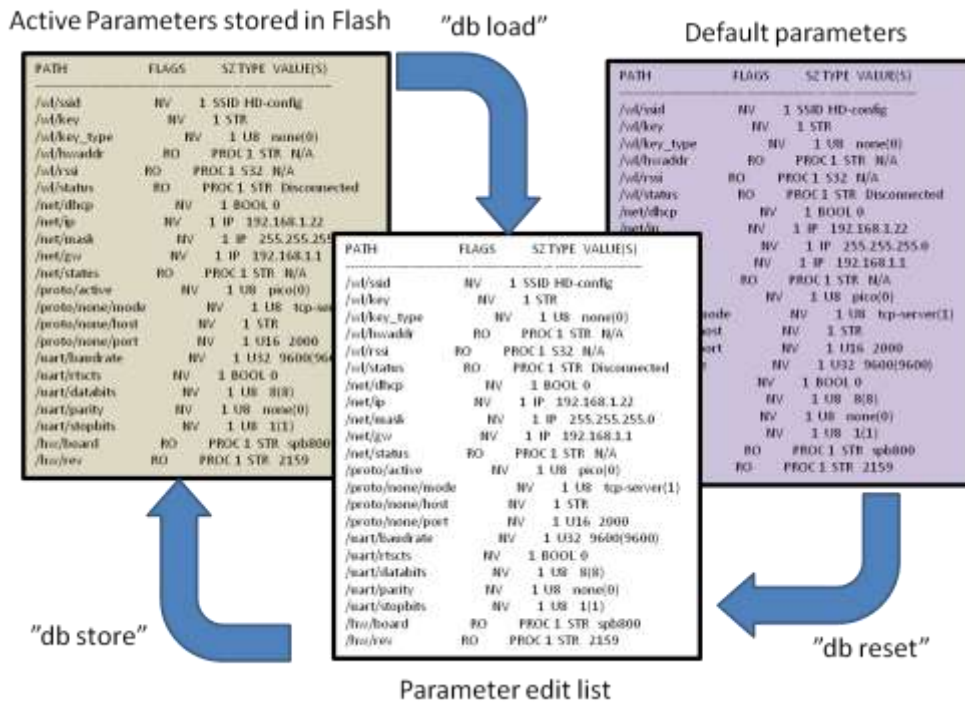


Figure 5-1: Parameter data base

At start up the SPB800 read the parameters from the non-volatile memory, see Figure 5-1. To change a parameter value it needs to be changed in the edit list and then stored in non-volatile memory with the db store command. "db store" stores all the values in the edit list at the same time. The current parameters in non-volatile memory can be retrieved with the command "db load". Factory default setting can be retrieved with the command "db reset". Please not that to restore the active settings to factory default the parameters also have to be stored with "db store".

```

COM27:57600baud - Tera Term VT
File Edit Setup Control Window Resize Help
:
$
$ db get
-----
PATH                FLAGS          SZ  TYPE  VALUE(S)
-----
/wl/ssid            NV             1  SSID  HD-config
/wl/key             NV             1  STR   M/A
/wl/key_type       NV             1  U8    none(0)
/wl/huaddr         RO            PROC 1  STR   M/A
/wl/rssi           RO            PROC 1  S32   M/A
/wl/status         RO            PROC 1  STR   Disconnected
/net/dhcp          NV             1  BOOL  0
/net/ip            NV             1  IP    192.168.1.22
/net/mask          NV             1  IP    255.255.255.0
/net/gw            NV             1  IP    192.168.1.1
/net/status       RO            PROC 1  STR   M/A
/proto/active     NV             1  U8    pico(0)
/proto/none/node  NV             1  U8    tcp-server(1)
/proto/none/host  NV             1  STR   M/A
/proto/none/port  NV             1  U16   2000
/uart/baudrate    NV             1  U32   9600(9600)
/uart/rtscts      NV             1  BOOL  0
/uart/databits    NV             1  U8    8(8)
/uart/parity      NV             1  U8    none(0)
/uart/stopbits   NV             1  U8    1(1)
/uart/node        NV             1  U8    rs232(0)
/uart/duplex      NV             1  U8    half(0)
/shell/nodots     NV             1  BOOL  0
/hu/board         RO            PROC 1  STR   spb800
/hu/rev           RO            PROC 1  STR   2238
$

```

Figure 5-2: Sample of db get listing

- With “db set” you can set all parameters for the HDA800 to connect to a WiFi Network as well as configure the serial port settings.
- Typing an erroneous command will list the available command as a help

Table 5-1: Data base parameters

Parameter	Values	Command
<b>IP Network parameters</b>		
IP address	IPv4 address	db set /net/ip <ip>
Default Gateway	IPv4 address	db set /net/gw <gw>
Netmask	IPv4 address	db set /net/mask <mask>
Enable DHCP client	Boolean	db set /net/dhcp <0 or 1>
DNS server	IPv4 address	db set /net/dns <dns>
Disable DHCP server (AP mode only)	Boolean	db set /dhcpcd/enable <0 or 1>
http server port	0 – 65535	db set /httpd/port <80>
<b>Wireless LAN parameters</b>		
SSID	String	db set /wl/ssid <ssid>
Type of key used	none, wep, wpa	db set /wl/key_type <none, wep, or wpa>
WEP, WPA/WPA2 key	String	db set /wl/key <key>



Mode station, AP	sta, ap	db set /wl/mode <sta, ap>
Channel (only in AP mode)	1,2,3,4,5,6,7,8,9,10,11	db set /wl/channel <1-11>
<b>Serial port parameters</b>		
Baud rate	9600, 38400, 57600, 115200, 230400	db set /uart/baudrate <rate>
Data bits	5, 6, 7 or 8 bit	db set /uart/databits <5,6,7 or 8>
Parity	even, odd, none	db set /uart/parity <even, odd or none>
Stop bits	1, 2	db set /uart/stopbits <1 or 2>
Flow Control	Boolean	db set /uart/rtscts <0 or 1>
RS-232/RS-485	rs232, rs485	db set /uart/mode <rs232, rs485>
UART duplex	half, full	db set /uart/duplex <half,full>
<b>Application parameters</b>		
Protocol mode	None	db set /proto/active none (should always be set to none for BOX800M)
TCP socket	String	db set /proto/none/port
Server/Client	tcp-server, tcp-client	db set /proto/none/mode
Server IP address	String DNS/IP	db set /proto/none/host <ip>
No dots (turn off initial dots)	Boolean	db set /shell/nodots <0,1>
<b>Security</b>		
Username	String	db set /auth/username <username>
Password	String	db set /auth/password <password>
Http authentication	Basic, digest	db set /httpd/auth <basic,digest>

## 5.1 Serial Port Commands

All serial ports command is in lower case characters.

### 5.1.1 db command

The “db” command is used to read, modify and store parameters in the data base. The command expression is

*db operation <path> [argument]*

Depending on the operation the parameter path and argument may be optional.

### 5.1.2 db reset <path>

“db reset” resets the parameter indicated in <path> to default. If <path> is omitted all parameters in the edit set is restored to their default values. To restore the unit completely to its default settings the edit set has to be stored in non volatile memory with the command “db store”

### 5.1.3 db get <path>

“db get” shows the parameter indicated in <path> from the edit list. If <path> is omitted all parameters are listed.

### 5.1.4 db set <path> [args ...]

“db set” sets the parameter give in <path> to the value given in [args]

### 5.1.5 db set /wl/mode

“db set /wl/mode (ap|sta) is the setting for if the SPB800 should function as a Soft AP or in Station (client) mode. If this parameter is set there will be an additional delay at reset to change mode.

### 5.1.6 db load

“db load” retrieve the parameters from the active set to the edit list.

### 5.1.7 db store

“db store” stores the parameters in the edit list into non-volatile memory.

### 5.1.8 Reset

The “reset” command restarts the BOX800M which loads the parameters from the active set in the data base at start up.

### 5.1.9 Upgrade

The upgrade command set the device ready to receive new firmware via XMODEM. See **Fel! Hittar inte referenskälla.** page **Fel! Bokmärket är inte definierat.** for more information.

### 5.1.10 Test Mode

To set the device in RF test mode the command test\_mode is given. Warning, do not use this mode unless you have the required software tools. To exit the mode type “quit” in the terminal window. Please note that the typing when in test mode is not echoed on the terminal.

### 5.1.11 Help

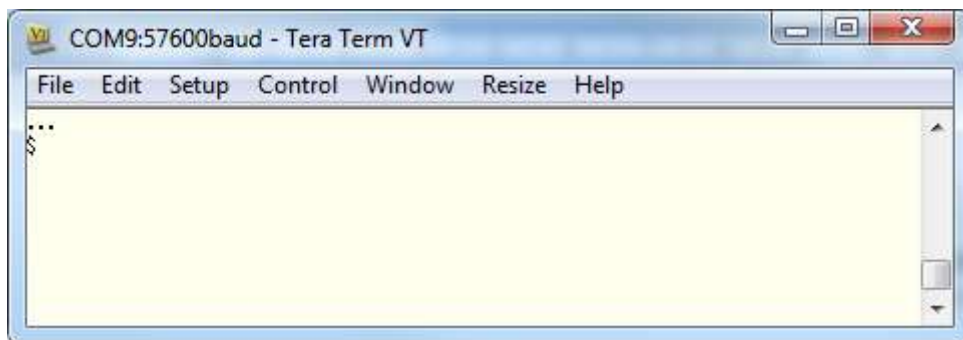
“help” lists the available commands.

## 6 Example 1, Serial port Wireless LAN adapter

This example describes how to configure the HDA800 Evaluation Kit to a RS-232 – Wireless LAN adapter. It makes use of a direct method changing the parameter database values with commands from a console terminal like TeraTerm or similar. This exemplifies how the SPB800 can be used with a un-aware host.

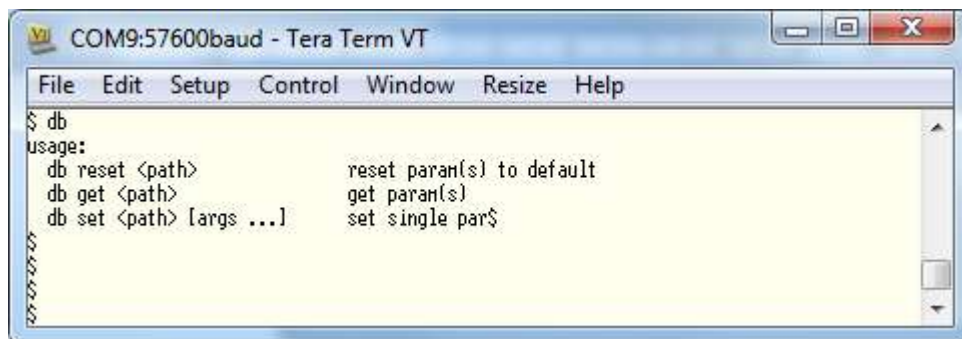
### How to do it:

- Start a serial port terminal on the PC
- Connect the HDA800 to the Serial Port/Serial port adapter on the PC
- Insert the DC plug to power the unit and hit “Return” within 5 seconds. You should read a string of dots .. on the terminal and a \$ prompt once you have hit return. If you are to late in hitting “Return” the terminal won’t do anything.



Example of terminal printout

- The following commands are available



### Configuration Example:

- In this example we want to configure the HDA800 to work as an Access point with the following characteristics
  - SSID = my-wifi-net
  - Encryption = WPA
  - Encryption passphrase =my-secret-key
  - IP address we want to assign = 192.168.2.10
  - Subnet mask = 255.255.255.0
  - Default Gateway 192.168.2.254
- Important! No settings are stored in the flash memory until the command “db store” is given.
- First we need to set the parameter /wl/mode to set the mode to Soft AP.

```
$ db set /wl/mode ap
```

- Then we continue with entering the SSID

```
$ db set /wl/ssid my-wifi-net
```

- Then we enter the security encryption type in this case we are using WPA

```
$ db set /wl/key_type wpa
```

- Enter the key

```
$ db set /wl/key my-secret-key
```

- Then we disable the DHCP client as we want to set a static IP address for the HDA800.

```
$ db set /net/dhcp 0
```

- We enter the IP address we have selected for the HDA800. Make sure that it does not collide with any other static set address or the address range managed by the network's DHCP server.

```
$ db set /net/ip 192.168.2.1
```

- We enter the corresponding network mask.

```
$ db set /net/mask 255.255.255.0
```

- Then we enter the default gateway of the network

```
$ db set /net/gw 192.168.2.254
```

- We then in a similar fashion set the RS-232 parameters, first the baud rate to 9600 kbps

```
$ db set /uart/baudrate 9600
```

- We turn flow control off

```
$ db set /uart/rtscts 0
```

- The number of data bits to 8

```
$ db set /uart/databits 8
```

- The number of parity bits to none

```
$ db set /uart/parity none
```

- The number of stop bits to 1

```
$ db set /uart/stopbits 1
```

- Finally we define the HDA800 as server for the TCP socket

```
$ db set /proto/none/mode tcp-server
```

- And set the port of the TCP socket to 2001

```
$ db set /proto/none/port 2001
```

- To check our parameters we type “db get” to list all parameters to check. We need to double check that the parameter /uart/mode is at its default value rs232.

```
$ db get
```

PATH	FLAGS	SZ	TYPE	VALUE(S)
/wl/ssid	NV	1	SSID	my-wifi-net
/wl/key	NV	1	STR	my-secret-key
/wl/key_type	NV	1	U8	wpa(2)
/wl/mode	NV	1	U8	ap(1)
/wl/hwaddr	RO PROC	1	STR	N/A
/wl/rssi	RO PROC	1	S32	N/A
/wl/status	RO PROC	1	STR	Disconnected
/net/dhcp	NV	1	BOOL	0
/net/ip	NV	1	IP	192.168.2.10
/net/mask	NV	1	IP	255.255.255.0
/net/gw	NV	1	IP	192.168.2.254
/net/status	RO PROC	1	STR	N/A
/proto/active	NV	1	U8	none(0)
/proto/none/mode	NV	1	U8	tcp-server1)
/proto/none/host	NV	1	STR	
/proto/none/port	NV	1	U16	2001
/uart/baudrate	NV	1	U32	9600(9600)
/uart/rtscts	NV	1	BOOL	0
/uart/databits	NV	1	U8	8(8)
/uart/parity	NV	1	U8	none(0)
/uart/stopbits	NV	1	U8	1(1)
/uart/mode	NV	1	U8	rs232(0)
/uart/duplex	NV	1	U8	half(0)
/shell/nodots	NV	1	BOOL	0
/hw/board	RO PROC	1	STR	spb800
/hw/rev	RO PROC	1	STR	2238

- Satisfied with the result we enter the parameters into the flash with “db store”

```
$ db store
```

- We can now disconnect the HDA800 from the serial port and DC power and connect it to any equipment that communicates with a RS-232 serial port and access that through a TCP socket on port 2001.
- If the equipment we are to connect the HDA800 to is sensitive for incoming characters it is advisable to turn off the printing of the dots at start up by setting the parameter /shell/nodots to 1. Please note that you will still be able to get into configuration mode the first five seconds even though there are no dots printed.
- See also *1543- HDA800 Quick Start Guide* for more information on this example.

## 6.1 Web Configuration

**H&D Wireless SPB800 Device Configuration**

Device Status  
 Serial Proxy Link State: Disconnected  
 Rx Bytes: 0      Tx Bytes: 0

Wi-Fi Configuration  
 Operation Mode:  Station (STA)  Access Point (AP)  
 SSID of new network:   
 Security Type:  None  WEP  WPA/WPA2/RSN  
 Security Key:   
 Channel:

The Security Key is not necessary if Security Type is "None".  
 Channel is only used if operation mode is AP.

IP Configuration  
 Enable DHCP client   
 The three following fields only has to be filled in if DHCP is not used:  
 IP address:   
 Netmask:   
 Gateway:   
 DNS Server:   
 Enable DHCP server

UART Configuration  
 Baud rate:  300  1200  2400  4800  9600  
                    19200  38400  57600  115200  230400  
 Parity:  none  even  odd  mark  space  
 Data bits:  5  6  7  8  
 Stop bits:  1  2  
 RS-232 or RS-485 mode:  rs232  rs485  
 Enable RTS/CTS flow control   
 Duplex mode:  half  full

The RTS/CTS setting is only used in RS-232 mode.  
 The duplex setting is only used in RS-485 mode.

Serial Proxy Configuration  
 Mode:  tcp-client  tcp-server  
 Remote host IP address:   
 Remote host TCP port:

Security Configuration  
 Username:   
 Password:   
 HTTP authentication mode:  basic  digest

The top frame show the status of the device

Select station or AP mode  
 Enter SSID and security type. (only open network currently supported)  
 Security type and Key  
 For AP mode enter desired channel.

Choose if to use DHCP client or not. If not used enter a static IP address, network mask and default gateway

Set up the serial port

- Baudrate
- Parity
- Data Bits
- Stop Bits
- RS232 or RS485 mode
- Flow control RTS/CTS
- Duplex mode (half/full)

If you are to use the BOX800M in proxy mode (cable replacement) enter if the unit should be server or client. For the client you'll need to enter the IP address of the server node. Enter the port to use (default is 2000).

If you want to prevent un-authorized changes to the parameters, enter username and password and authentication mode. Don't forget to write down the username and password as they cannot be recovered from the system.

To simplify the setup an un-configured SPB800 starts in soft AP mode, with the following properties:

- SSID: hdconfig-xx-xx-xx (where xx-xx-xx are the last six digits of the SPB800's MAC address)
- IP address: 192.168.1.1
- DHCP server

This is the most convenient way to configure the SPB800 as it can be done in situ.

To connect to the BOX800 use a PC or a smart phone with WLAN

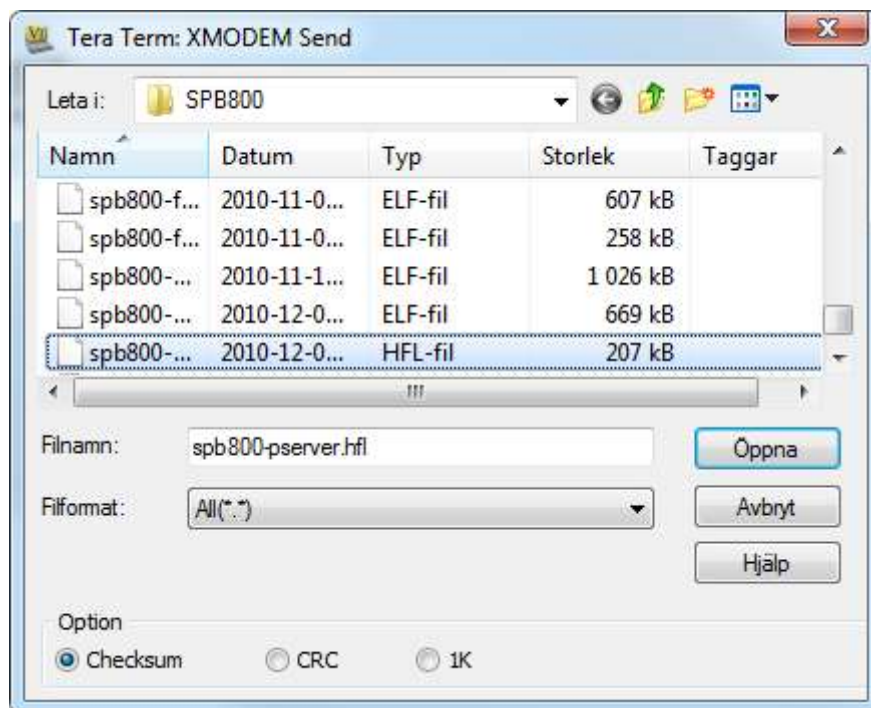
- Scan the available networks and connect to hdconfig-xx-xx-xx
  - Start a web browser and enter 192.168.1.1 in the address field
  - The configuration page opens in the browser
  - Enter all the desired data and click on submit.
- 
- A confirmation page with your settings is shown before the BOX800M restart itself with the new settings.
  - To change settings or to monitor the unit's activity opens the web page at the new IP address.



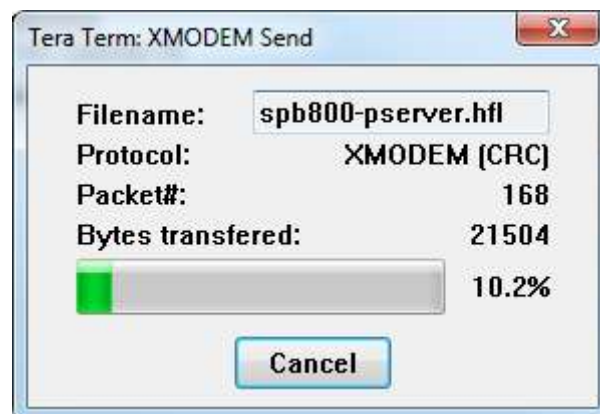
## 7 Firmware Upgrade

To upgrade the firmware of the SPB800E do as follows:

- Connect the SPB800E with the PC Connection board to a Serial port of a PC and start TeraTerm (57600 8N1)
- Power up or power cycle the SPB800E and hit return in TeraTerm within 5 seconds from the first dot is visible in the terminal window.
- Enter configuration mode by pressing <enter>
- Type "upgrade". SPB800 will now wait for a file being transferred using the XMODEM protocol.
- In TeraTerm, select File->Transfer->XMODEM ->send and select the firmware image (SPB800-pserver.hfl). Make sure the "checksum" radio button is selected.



- The transfer should start when OK is pressed. Note that SPB800 will time out after about 20 seconds if not file is sent, in that case restart from typing upgrade and try again.



- When the transfer is complete, the SPB800 will print "completed - rebooting" in the TeraTerm window. Now wait until the dots are printed again.



## 8 Known Issues

- IP address, mask and GW fields needs to be filled with a valid IP address even if DHCP client is selected.