

User's Guide

RS232 Bluetooth Adapter

Version: 2.8

www.SmartModular.de



Table of Contents

1. Introduction	4
2. Products and Firmware	4
3. Physical Product Features	4
3.1. ADAPTER	4
4. Changing Settings	5
4.1. Configuration features at a glance	5
4.2. Accessing the configuration menus	5
5. Configuration Menu	6
5.1. Navigation	6
5.2. Main Menu	6
5.3. Communications Parameters	7
5.3.1. Baud Rate	7
5.3.2. Entering your own baud rate	8
5.3.3. Data bits	9
5.3.4. Parity	9
5.3.5. Stop Bits	9
5.3.6. Handshaking	10
5.3.7. Applying Communications Settings	10
5.4. Bluetooth Parameters	10
5.4.1. Discoverability	11
5.4.2. Security Mode	11
5.4.3. Encryption	13
5.4.4. PIN	13
5.4.5. Partner Device	15
5.4.6. Client Server	16
5.4.7. Local Device Name	17
5.4.8. Device Class	18
5.5. Display Factory Settings	19
5.5.1. Updating Factory Settings	19
5.6. Restoring Factory Settings	20
5.7. Disabling Interactive Menu	21
5.8. Resetting ADAPTER	22
6. Physically connecting to your RS232 device	22
6.1. Configuring the communications parameters	22
6.2. Physically connecting your device to ADAPTER via the RS232 cable	22
7. Connecting adapters over Bluetooth	23

7.1. Client/Server Pair: “ Cable Replacement”	23
7.2. Server : Connecting TO ADAPTER from a remote Bluetooth device	25
7.2.1. Configure and connect	25
7.2.2. Bluetooth Enable your PC	25
7.2.3. Discover the device	26
7.2.4. Secure the relationship	26
7.2.5. Connect to the Serial Port profile	26
7.2.6. Connect your application to the new COM port	26
7.3. Client: ADAPTER is the Bluetooth device which initiates the connection	26
8. Upgrading	26
9. Troubleshooting	27
10. Technical Specifications	28
10.1. Storage and Operating Environment	28
10.1.1. Storage	28
10.1.2. Operational	28
10.2. Power requirements	28
10.2.1. Input Voltage Requirements	28
10.2.2. Measured current consumption	28
10.3. Antenna Characteristics	28
10.3.1. Gain	28
11. Agency and Regulatory Body Approvals.....	29
11.1. Exposure to Radio Frequency Radiation	30
11.2. FCC Part 15 Radio Frequency Interference Statement	30
11.3. Industry Canada ICES-003 Emission Compliance Statement	31
11.4. European Radio Approval Information	31
11.5. Europe – EU Declaration of Conformity	31
11.6. Rest of World	31

1. Introduction

SMART's RS232 Bluetooth adapters are fully embedded, stand-alone Bluetooth solutions, which will Bluetooth enable any device with an RS232 port. The adapters do not require any additional Bluetooth software.

For many applications, a Bluetooth adapter used in combination with another Bluetooth product (e.g. SMART's USB adapter connected to a PC with SMART's BlueOpal Bluetooth Software, or a second adapter) essentially replaces the serial cable, freeing the device from the limits imposed by the cable specification and in many applications removes the need for expensive cable installation and maintenance. The connection uses Bluetooth security to ensure that sensitive data is not "sniffed" by any unauthorized source, although this feature can be turned off.

The products described by this document are designed as cable replacement products. It's primary function is to offer "point-to-point" Bluetooth capabilities to devices which otherwise do not have the capacity for such behavior. This capability is configured by a "set and forget" interface, which is not designed to cater for multiple device connection scenarios. At the time of publication, the adapters are only capable of connecting to one other Bluetooth device at a time.

The adapter is user configurable at baud rates between 244 and 1.3Mbaud in steps of 244, with none, odd, or even parity, and with 1 or 2 stop bits. Its default factory settings are 115,200 baud, no parity, 8 data bits and 1 stop bit and Hardware Handshaking.

A convenient reset button can be used to restore various functions of the device including a restore of last saved settings.

We trust that if you adhere to the following procedures you will enjoy many years of useful service from your SMART RS232 Bluetooth Adapter.

2. Products and Firmware

This document covers Product Names BT RS232 DCE CLASS 2, Model ASY90178-1 and BT RS232 DTE CLASS 2 Model ASY90178-2. The Product Numbers are STBTIOBxXXPARSM, where the x represents whether the adapter is a DCE or DTE device and the XX, which power supply is included. Any features that apply to a specific part number will be clearly identified.

3. Physical Product Features

3.1. P/N's STBTIOBxXXPARSM

Reset button

See "5.10 Resetting STBTIOBxXXPARSM" for details of this feature

2 LED's – both Green

a) LED1: This is used to indicate the "Power" status of the adapter. When power is applied at the specified voltage and current the LED turns ON.

b) LED2: Indicates transmitted/received data activity.

4. Changing Settings

This device contains a comprehensive set of Bluetooth and COM port features which can be changed from an easy to use “bulletin board” type configuration menu. This section gives full details about the changes that can be made, how to make them, and the implications the changes will have on the manner in which your adapter behaves.

4.1. Configuration features at a glance

Below is a quick list of the configuration options that are available from the interactive menu. They will be covered in more detail later in this section.

View/Set local COM port settings (baud rate, parity, stop bits)

View/Set Discoverability, Security mode and PIN number

View/Set Pairing options (including pairing to another adapter)

View/Set Client/Server configuration (Client connects to Server – important if “pairing” 2 adapters)

View/Set Local Device Name and Device Class

View all “factory” and modified settings plus local Bluetooth Address

Disable/enable configuration menu

Permanently update “factory” settings

Upgrade Device Firmware

4.2. Accessing the configuration menus

The adapters configuration menus are available at any time that there is *no Bluetooth radio connection established* with another device (unless of course you have selected the option to disable the menu). As soon as a Bluetooth connection is made, the data sent to the adapter will be sent over the radio link to the remote device. A short time after the Bluetooth connection is broken, the configuration menu's become available again.

Sending a single “Carriage Return” character to the adapter while no Bluetooth connection exists will activate the initial main menu.

The example given below to connect to the configuration menus is performed using HyperTerminal, a terminal application that ships with Windows. If you are using a different operating system, you will need a similar “terminal” or “tty” type application (e.g. minicom), which talks directly to a serial port in that operating system. If you are using a different version of Windows, the specific steps to invoke and use the HyperTerminal application may be slightly different – please refer to your operating system documentation if you need further help in this respect.

First, connect the adapter, along with a ‘null modem gender changer’, if you have the DTE version, to an available serial port on your computer. In this example, the COM1 port on the PC has been used.

Ensure the power adapter is connected and switched on (the leftmost green LED on the adapter should light. Start HyperTerminal by clicking “Start, All Programs, Accessories, Communications, HyperTerminal”. Create a new HyperTerminal session connect to your COM port with the defaults of 115200, 8, none, 1, Hardware.

5. Configuration Menu

5.1. Navigation

As a general principle, from any menu screen hitting the “Enter” key refreshes the current menu and hitting 0 returns the user to the previous menu. Menu selection is performed by pressing the number on your keyboard that corresponds to the number listed on the menu item you wish to view/configure. Reminder: The configuration menu is not available while a radio (Bluetooth) connection is established.

5.2. Main Menu

```
=====
===== MAIN MENU =====
===== Version 3.02 =====
=====

Key [1] - Modify COMM Settings
Key [2] - Modify Bluetooth Settings
Key [3] - Display Current Settings
Key [4] - Restore Factory Settings
Key [5] - Disable Interactive Menu
Key [6] - Upgrade DFU
```

5.3. Communications Parameters

Selecting option 1 from the “Main Menu” menu displays the Communications settings menu. It is from this menu that all available serial port settings can be changed. The available options are detailed below.

```
=====
===== MAIN MENU =====
===== Version 3.02 =====
=====
Key [1] - Modify COMM Settings
Key [2] - Modify Bluetooth Settings
Key [3] - Display Current Settings
Key [4] - Restore Factory Settings
Key [5] - Disable Interactive Menu
Key [6] - Upgrade DFU
```

The factory set communications parameters for your ADAPTER are as follows...

```
Baud Rate:      115,200
Data Bits:      8 (non-configurable)
Parity:         None
Stop Bits:      1
Flow Control    Hardware
```

You can alter these settings by using the configuration menu options shown below.

5.3.1. Baud Rate

```
=====
===== Modify COMM Settings =====
=====
Key [0] - MAIN MENU
Key [1] - Set Baud Rate
Key [2] - Set Parity
Key [3] - Set Stop Bits
Key [4] - Apply COMM Settings
```

Select option 1 to access the baud rate menu below) to change baud rate.

```
=====
===== Set Baud Rate =====
=====
Key [0] - PREVIOUS MENU
Key [1] - 921600
Key [2] - 460800
Key [3] - 230400
```

Any changes made in this menu will be remembered when leaving, and will be applied by selecting option 4 “Apply COMM Settings” From the previous “Modify COMM Settings” menu. Selecting any other option will store the appropriate configuration selection.

A range of popular pre-set baud rates is offered in this menu along with an option for you to set your own. Due to some technical limitations, it is not possible for the product to achieve all of these baud rates exactly, although most of them are available within 1%. Normal RS232 operation is not affected by such small differences in data rates unless long streams of continuous data are being used. The actual baud rate achieved will be displayed next to your selection.

5.3.2. Entering your own baud rate

```
=====
===== Set Baud Rate =====
Key [0] - PREVIOUS MENU
Key [1] - 921600
Key [2] - 460800
Key [3] - 230400
Key [4] - 115200
Key [5] - 57600
Key [6] - 38400
Key [7] - 19200
Key [8] - 9600
Key [9] - 4800
Key [a] - 2400
Key [b] - 1200
Key [c] - 300
Key [d] - Enter your own baud rate

Baud rate: 115200 (actual 115168) - applied
```

Selecting option (d) from the “Set Baud Rate” Menu allows the user to configure the product to operate at any baud rate the user desires between 244 baud and 1.3M baud. The adapter will calculate the nearest actual baud rate it is able to achieve and display it next to your selection, as shown in the configuration menu's below.

```
Enter the new baud rate:
```

Enter the baud rate value you want, followed by hitting the return (ENTER) key.

```
Enter the new baud rate: 12345676
Error: The baud rate must be 7 digits or less

Enter the new baud rate:
```

The value you enter must be between 244 and 1382400 otherwise an error will be shown. You will be given a further opportunity to enter a valid value.

```
Enter the new baud rate: 15000
```

Entering a valid number here such as shown left results in your selection being accepted and your baud rate selection being displayed at the bottom of the menu.

Selecting 0 immediately returns you to the previous menu storing any changes you have made; selecting any other option will store the appropriate configuration selection. As shown below, your configuration selection will not actually be applied at this point.

The Menu identifies this new selection as being unapplied. To apply this selection, select the “Apply COMM Settings” from the previous menu. This can be reached by selecting option “0”.

Unapplied settings are discarded during a re-boot of the adapter.

5.3.3. Data bits

Unfortunately this setting cannot be changed. The adapter only supports the 8 data bit format. Thus there is not a configuration menu option for this setting.

5.3.4. Parity

```
=====
===== Modify COMM Settings =====
=====
Key [0] - MAIN MENU
Key [1] - Set Baud Rate
Key [2] - Set Parity
Key [3] - Set Stop Bits
Key [4] - Apply COMM Settings
```

Selecting option 2 from the “Modify COMM Settings” menu enters the Set Parity menu.

```
=====
===== Set Parity =====
=====
Key [0] - PREVIOUS MENU
Key [1] - NO parity
Key [2] - ODD parity
Key [3] - EVEN parity

Parity: NO parity - unapplied
```

The Set Parity menu is displayed. Selecting 0 immediately returns you to the previous menu storing any changes you have made; selecting any other option will store the appropriate configuration selection. As shown below, your configuration selection will not actually be applied at this point.

Configuration changes are only applied when option 4 (Apply COMM settings) is selected from the previous “Modify COMM Settings” Menu.

5.3.5. Stop bits

```
=====
===== Modify COMM Settings =====
=====
Key [0] - MAIN MENU
Key [1] - Set Baud Rate
Key [2] - Set Parity
Key [3] - Set Stop Bits
Key [4] - Apply COMM Settings
```

Option 3 from the “Modify COMM Settings” menu allows the user to change the Stop Bit setting.

```
=====
===== Set Stop Bits =====
=====
Key [0] - PREVIOUS MENU
Key [1] - 1 stop bit
Key [2] - 2 stop bits

Stop Bits: 1 stop bit - applied
```

Selecting 0 immediately returns you to the previous menu storing any changes you have made; selecting any other option will store the appropriate configuration selection. As shown below, your configuration selection will not actually be applied at this point. Configuration changes are only applied when option 4 (Apply COMM settings) is selected from the previous “Modify COMM Settings” Menu. Unapplied settings are discarded during a reboot of the ADAPTER.

5.3.6. Handshaking

Handshaking is discussed in more detail in the section entitled “Handshaking Options” as it is not an option directly available from the menu.

5.3.7. Applying Communications Settings

```
=====
===== Modify COMM Settings =====
=====
Key [0] - MAIN MENU
Key [1] - Set Baud Rate
Key [2] - Set Parity
Key [3] - Set Stop Bits
Key [4] - Apply COMM Settings
```

Changes to COM port settings are activated only by actively choosing to apply those settings. This is to minimize the disruption to the device configuration by having to reconfigure the terminal application after changing each setting.

```
=====
===== Apply COMM Settings =====
=====
Baud rate:    115000 - UNAPPLIED (Currently 115200)
Parity:       ODD parity - UNAPPLIED (Currently NO parity)
Stop Bits:    2 stop bits - UNAPPLIED (Currently 1 stop bit)

Key [0] - PREVIOUS MENU
Key [1] - Apply these settings
```

After selecting option 4 from the “Modify COMM Settings” menu, the following menu is displayed. Obviously the values displayed are dependant on your own individual configuration.

Selecting 0 immediately returns you to the previous menu storing any changes you have made.

Selecting “1” will immediately apply any new communications parameters you have selected from the other COMM menu’s.

```
Apply the new COMM settings...
Please reconfigure the terminal application if necessary_
```

If you have changed any communications parameters, and wish to continue to access the configuration menu, you will need to update your terminal applications settings. The easiest method of performing this in HyperTerminal is to close and re-start the application, setting the new parameters during the initial application configuration.

5.4. Bluetooth Parameters

```
=====
===== MAIN MENU =====
===== Version 3.02 =====
=====
Key [1] - Modify COMM Settings
Key [2] - Modify Bluetooth Settings
Key [3] - Display Current Settings
Key [4] - Restore Factory Settings
Key [5] - Disable Interactive Menu
Key [6] - Upgrade DFU
```

Selecting option 2 from the “Main Menu” menu displays the following Bluetooth settings menu.

```
=====
===== Modify Bluetooth Settings =====
=====
Key [0] - MAIN MENU
Key [1] - Set Discoverability
Key [2] - Set Security Mode
Key [3] - Set Encryption
Key [4] - Set PIN
Key [5] - Set Partner Device
Key [6] - Set Client/Server
Key [7] - Set Local Name
Key [8] - Set Class of Device
```

After selecting option “1” from the “Modify Bluetooth Settings” menu, the following menu is displayed.

It is from this menu that all available Bluetooth settings can be changed. The available options are detailed below.

Selecting 0 immediately returns you to the previous menu storing any changes you have made

5.4.1. Discoverability

```
=====
===== Set Discoverability =====
=====
Key [0] - PREVIOUS MENU
Key [1] - On
Key [2] - Off

Discoverability: On
```

Selecting option “1” will immediately render adapter “Discoverable”. This means that any other Bluetooth device can see adapter when it performs a device discovery.

Selecting option “2” immediately renders the adapter “non-discoverable”. No other Bluetooth devices will be able to see the adapter when they perform a device discovery. However, in this mode, your adapter is still “connectable”. This means that any other Bluetooth device that knows about your specific adapter (i.e. it knows the Bluetooth address of the individual unit) can still connect to it. You may wish to set this option to avoid confusion when many adapters exist in close proximity to each other.

Unlike the communications settings, this Bluetooth setting is applied with immediate effect.

5.4.2. Security Mode

```
=====
===== Set Security Mode =====
=====
=====
Key [0] - PREVIOUS MENU
Key [1] - 1 (Low)
Key [2] - 2 (Medium)
Key [3] - 3 (High)

Security Mode: 3 (High)
```

After selecting option “2” from the “Modify Bluetooth Settings” menu, the following menu is displayed.

The factory set security mode is 3 (Highest) Selecting 0 immediately returns you to the previous menu storing any changes you have made.

Selecting option “1” will immediately place your ADAPTER into security mode 1. This is the lowest security mode that the ADAPTER can be configured to. Connections, including service discovery, can take place without the need for “pairing” or “bonding”. In mode 1, the Security Manager automatically accepts all access requests without initiating authentication, encryption, or authorization procedures. Any attempt by a remote application to perform authentication or encryption procedures will be rejected.

Selecting option “2” will immediately place your ADAPTER into security mode 2. This mode allows remote Bluetooth devices to search for and retrieve the services on your ADAPTER, but will not allow them to connect unless the 2 devices are paired.

Selecting option “3” will immediately place your ADAPTER into security mode 3. This is the highest security mode available. Connections of any kind from a remote Bluetooth device are only allowed after a successful “pairing” has been performed. No services will be shown to other Bluetooth devices unless the 2 devices are successfully paired.

Unlike the communications settings, this Bluetooth setting is applied with immediate effect.

The tables below show some more information with regards to the application of the security settings

Security modes for adapter as Client (initiates Connections):

Security:	Who can Pair?	Who can it connect to?	Possible use:
High (Mode 3)	Adapter will only pair with device entered in the ‘ Set Partner’ menu. Other device must have identical PIN number	Only device entered in the ‘ Set Partner’ Menu, after pairing.	Secure connection between the Adapter and a preset device (Link level enforced security – can see device but not services unless paired)
Medium (Mode 2)	Adapter will only pair with device entered in the ‘ Set Partner’ menu. Other device must have correct link key	Only device entered in the ‘ Set Partner’ Menu, after pairing.	Secure connection between the Adapter and a preset device (Service level security – can see services but not connect unless paired)
Low (Mode 1)	N/A	Only device entered in the ‘ Set Partner’ Menu.	When users who do not want to spend time pairing and do not require a secure connection

Security mode for adapter as Server (receives connections)

Security:	Who can Pair?	Who can Connect?	Possible Use:
High (Mode 3)	Any Device with correct PIN.	Any device	Secure connection between the ADAPTER and a preset device. (Link level enforced security – can see device but not services unless paired)
Medium (Mode 2)	Any Device with correct PIN.	Any device	Secure connection between the ADAPTER and a preset device. (Service level security – can see services but can not connect unless paired)
Low (Mode 1)	N/A	Any device	When users who do not want to spend time pairing and do not require a secure connection

5.4.3. Encryption

```
=====
===== Modify Bluetooth Settings =====
=====
Key [0] - MAIN MENU
Key [1] - Set Discoverability
Key [2] - Set Security Mode
Key [3] - Set Encryption
Key [4] - Set PIN
Key [5] - Set Partner Device
Key [6] - Set Client/Server
Key [7] - Set Local Name
Key [8] - Set Class of Device
```

After selecting option 3 from the “Modify Bluetooth Settings” menu, the following menu is displayed.

```
=====
===== Set Encryption =====
=====
Key [0] - PREVIOUS MENU
Key [1] - Disabled
Key [2] - Point to Point
Key [3] - Point to Point & Broadcast

Encryption: Disabled
```

The factory set Encryption mode is “Disabled”. This can be changed to enable “Point to Point” or “Point to Point & Broadcast”.

Unlike the communications settings, this Bluetooth setting is applied with immediate effect.

5.4.4. PIN

```
=====
===== Modify Bluetooth Settings =====
=====
Key [0] - MAIN MENU
Key [1] - Set Discoverability
Key [2] - Set Security Mode
Key [3] - Set Encryption
Key [4] - Set PIN
Key [5] - Set Partner Device
Key [6] - Set Client/Server
Key [7] - Set Local Name
Key [8] - Set Class of Device
```

The PIN (Personal Identification Number) is used to create a secure and trusted connection between 2 Bluetooth devices during a process called pairing or bonding.

```
=====
===== Set PIN =====
=====
Key [0] - PREVIOUS MENU
Key [1] - “ADAPTER”
Key [2] - “1234”
Key [3] - “01234567”
Key [4] - Enter your own pin

PIN Code: RS232
```

After selecting option 4 from the “Modify Bluetooth Settings” menu, the following menu is displayed.

The PIN can be any combination of printable characters. The PIN is only used when the adapter is configured to be in security mode 2 or 3 (High or Medium security). The factory set PIN is “1234”. This can be changed to a range of pre-selected values, or you may enter your own combination up to a maximum of 8 characters. Selecting 0 immediately returns you to the previous menu storing any changes you made.

```
=====
===== Set PIN =====
=====
Key [0] - PREVIOUS MENU
Key [1] - "ADAPTER"
Key [2] - "1234"
Key [3] - "01234567"
Key [4] - Enter your own pin

PIN Code:
```

Selecting option 4 from the "Set PIN" menu will display the following menu below.

```
Enter the new pin:
```

In this field, you can enter your desired PIN code. This can be any printable alphanumeric character or symbol, but you should take care to choose a PIN appropriately remembering that some Bluetooth devices (e.g. cell phones) only have limited input mechanisms and may not have a full range of characters available.

```
Enter the new pin:
5555555555
Error: The pin must be 8 characters or less

Enter the new pin:
```

Due to memory considerations the length of the PIN code is restricted to 8 characters. If you try to create a PIN code that is larger than this, an error message is generated and you will be given another opportunity to enter your own PIN

```
Enter the new pin:
RS232
```

Once you have entered the PIN you want, you should complete your request by hitting the "ENTER" key, whereupon the original menu is displayed, showing your new PIN selection.

```
=====
===== Set PIN =====
=====
Key [0] - PREVIOUS MENU
Key [1] - "ADAPTER"
Key [2] - "1234"
Key [3] - "01234567"
Key [4] - Enter your own pin

PIN Code: 1234
```

If your ADAPTER is to be configured into Client mode, this is the PIN that will be used by ADAPTER to initiate pairing with the remote device before any connection is made. If your remote device is another ADAPTER in Server mode, you will need to ensure that "both" devices are configured to use the same PIN number. Unlike the communications settings, this Bluetooth setting is applied with immediate effect.

5.4.5. Partner Device

This feature serves 2 purposes.

In Server mode it shows the address of the last device to successfully bond and connect.

In Client mode, it shows the device to which the product will attempt to pair/connect.

A remote device address must first be entered into the “partner device” section before the product, configured in Client mode, will be able to initiate any connections to that remote device.

```
=====
===== Modify Bluetooth Settings =====
=====
Key [0] - MAIN MENU
Key [1] - Set Discoverability
Key [2] - Set Security Mode
Key [3] - Set Encryption
Key [4] - Set PIN
Key [5] - Set Partner Device
Key [6] - Set Client/Server
Key [7] - Set Local Name
Key [8] - Set Class of Device
```

Adding a partner device using this feature does not stop remote devices bonding with ADAPTER while it is in Server Mode.

Once a remote device has successfully partnered with ADAPTER, no other Bluetooth device will be able to connect until the pairing has been cleared. The pairing can be expired either by interacting with this menu option, or by invoking a “short” reset by pressing the reset button.

```
=====
===== Set Partner Device =====
=====
Key [0] - PREVIOUS MENU
Key [1] - Add partner device

Partner Device: 000a-4f-00082d (not paired)
```

After selecting option 5 from the “Modify Bluetooth Settings” menu, the following menu is displayed.

Selecting 0 immediately returns you to the previous menu storing any changes you have made.

If a remote Bluetooth device has previously paired to the ADAPTER then this menu will display the first time the “Set Partner Device” menu is access.

Selecting option “1” brings up the following menu.

```
=====
===== Set Partner Device =====
=====
Key [0] - PREVIOUS MENU
Key [1] - Add partner device

Enter the address of the partner device: 000a-4f-00082d (not paired)
```

You should enter here the Bluetooth Address (BD_ADDR) of the remote device you wish to pair to followed by ENTER. This should be in the same format as indicated on the products label (NAP-UAP-LAP, for those of you who know)

This will now refresh the menu with the address just entered and changes the option to allow removal of the entered device.

The option to remove this newly entered device exists at this point should you have made a mistake.

Once ADAPTER has successfully paired with the remote device (or vice-versa) the menu will update to give the user the option to expire the pairing. This can also be achieved by performing a “short” reset using the reset button.

Enter the address of the partner device:

Enter the address of the partner device: **000a-4f-00082d**


```
=====
===== Set Partner Device =====
=====

Key [0] - PREVIOUS MENU
Key [1] - Remove partner device
Key [2] - Expire pairing

Partner device: 000a-4f-00082d (paired)
```

This expiration only deletes the Link Key created during pairing and doesn't remove the device itself.

Selecting the option to remove the partner device as below will remove both the link key created during the pair, and it will remove the partner device itself from the memory of ADAPTER.

All the settings in this section are applied with immediate effect.

```
Pairing expired...
=====
===== Set Partner Device =====
=====

Key [0] - PREVIOUS MENU
Key [1] - Remove partner device
Key [2] - Expire pairing

Partner device: 000a-4f-00082d ( not paired)
```

5.4.6. Client/Server

```
=====
===== Modify Bluetooth Settings =====
=====

Key [0] - MAIN MENU
Key [1] - Set Discoverability
Key [2] - Set Security Mode
Key [3] - Set Encryption
Key [4] - Set PIN
Key [5] - Set Partner Device
Key [6] - Set Client/Server
Key [7] - Set Local Name
Key [8] - Set Class of Device
```

After selecting option 6 from the "Modify Bluetooth Settings" menu, the following menu is displayed.

Selecting 0 immediately returns you to the previous menu storing any changes; selecting any other option will store the appropriate configuration selection.

The default configuration of your ADAPTER is set to "Server" operation. This means that the ADAPTER will wait for devices to connect to it. Changing this setting to "Client" will put the ADAPTER into a state where it will attempt to connect to the device contained in its internal database. This remote device is entered into ADAPTER using the previous menu option, or by pairing with the ADAPTER from the remote device while ADAPTER is in server mode.

```
=====
===== Set Client/Server =====
=====

DEVICE MUST BE REBOOTED IN ORDER TO APPLY THIS SETTING

Key [0] - PREVIOUS MENU
Key [1] - Server (accepts incoming connections)
Key [2] - Client (initiates connections)

Client/Server: Server (accepts incoming connections)
```

It is this option that requires interaction if you wish to configure 2 ADAPTER's to communicate to each other to create a "true" cable replacement scenario.

Unlike most other Bluetooth settings, the ADAPTER requires re-booting before this option will be enabled, although it is recommended that the modification of this setting is left until all other configuration changes have been made.

5.4.7. Local Device Name

===== Modify Bluetooth Settings =====

Key [0] - MAIN MENU
 Key [1] - Set Discoverability
 Key [2] - Set Security Mode
 Key [3] - Set Encryption
 Key [4] - Set PIN
 Key [5] - Set Partner Device
 Key [6] - Set Client/Server
Key [7] - Set Local Name
 Key [8] - Set Class of Device

In scenario's where more than 1 ADAPTER is to be used in the same geographical location (i.e. they are all in range of each other/the controlling device), it may be pertinent to change the name of each device to more easily identify each individual device.

After selecting option 7 from the "Modify Bluetooth Settings" menu, the following menu is displayed.

===== Set Local Name =====

Key [0] - PREVIOUS MENU
 Key [1] - "SMBT-178 RS232 SPA1"
 Key [2] - "SMBT-178 RS232 SPA2"
 Key [3] - "SPA_1"
 Key [4] - "SPA_2"
 Key [5] - Enter your own local device name

Local Device Name: SMBT RS232 Adapter

The Factory setting for the local device name is "SMBT RS232 Adapter". Selecting 0 immediately returns you to the previous menu storing any changes; selecting any other option will store the appropriate configuration selection. Selecting options 1-4 configure the ADAPTER to use one of the pre-configured name options.

===== Set Local Name =====

Key [0] - PREVIOUS MENU
Key [1] - "SMBT-178 RS232 SPA1"
 Key [2] - "SMBT-178 RS232 SPA2"
 Key [3] - "SPA_1"
 Key [4] - "SPA_2"
 Key [5] - Enter your own local device name

Local Device Name: SMBT-178 RS232 SPA1

As an example we will choose '1'

After making the selection the devices local name immediately updates.

Enter the new local name:

Enter your own local device name:
 aa
 Error: The local name must be 31 characters or less

Enter the new local name:

If you wish to use a name other than those listed, you'll need to select option 5.

Enter the name you'd like your ADAPTER to display. Memory constraints mean that you must ensure that your desired name is less than 31 characters. You cannot use the "delete" key as this will be interpreted as part of the name.

Enter the new local name: **RS232 Test Adapter**

Press ENTER when you are satisfied with your name.

=====
===== Set Local Name =====
=====

The menu will now update with your chosen name selection.

Key [0] - PREVIOUS MENU
Key [1] - "SMBT-178 RS232 SPA1"
Key [2] - "SMBT-178 RS232 SPA2"
Key [3] - "SPA_1"
Key [4] - "SPA_2"
Key [5] - Enter your own local device name

Local Device Name: RS232 Test Adapter

5.4.8. Device Class

=====
===== Modify Bluetooth Settings =====
=====

The Factory setting for the Class of device is "Peripheral".

Key [0] - MAIN MENU
Key [1] - Set Discoverability
Key [2] - Set Security Mode
Key [3] - Set Encryption
Key [4] - Set PIN
Key [5] - Set Partner Device
Key [6] - Set Client/Server
Key [7] - Set Local Name
Key [8] - Set Class of Device

Selecting 0 immediately returns you to the previous menu storing any changes; selecting any other option will store the appropriate configuration selection.

This menu option allows the selection of a number of different device types as defined by the Bluetooth specification.

IMPORTANT NOTE: Changing this Class of Device setting does not alter the published functionality of the product. It will continue to offer **ONLY** One Serial port profile connection.

=====
===== Set Class of Device =====
=====

This option does not take effect until ADAPTER is rebooted (power switched off and then on again).

DEVICE MUST BE REBOOTED IN ORDER TO APPLY THIS SETTING

Key [0] - PREVIOUS MENU
Key [1] - Peripheral
Key [2] - Desktop
Key [3] - Laptop
Key [4] - Imaging
Key [5] - Phone/Modem
Key [6] - LAN

Class of Device: Peripheral

5.5. Display Factory Settings

```
=====
===== MAIN MENU =====
===== Version 3.02 =====
=====

Key [1] - Modify COMM Settings
Key [2] - Modify Bluetooth Settings
Key [3] - Display Current Settings
Key [4] - Restore Factory Settings
Key [5] - Disable Interactive Menu
Key [6] - Upgrade DFU
```

Selecting option 3 from the “Main Menu” menu displays the following Current settings menu.

```
=====
===== Display Current Settings =====
=====

Baud rate:      115200 (Actual: 115168)
Parity:         NO parity
Stop Bits:      1 stop bit
Local Device:    0002-5B-00A5A5
Local Device Name: SMBT RS232 Adapter
Discoverability: On
Security Mode:   3 (High)
Encryption:      Disabled
PIN Code:        1234
Partner Device:  None
Client/Server:   Server (accepts incoming connections)
Class of Device: Peripheral

Key [0] - MAIN MENU
Key [1] - Save current settings as factory default settings
```

The picture left shows the original factory settings for the product. The one item that will be different for each individual product will be the local device setting. This setting is unique for each individual Bluetooth device in existence and cannot be changed.

5.5.1. Updating Factory Settings

```
=====
===== Display Current Settings =====
=====

Baud rate:      115200 (Actual: 115168)
Parity:         NO parity
Stop Bits:      1 stop bit
Local Device:    0002-5B-00A5A5
Local Device Name: SMBT RS232 Adapter
Discoverability: On
Security Mode:   3 (High)
Encryption:      Disabled
PIN Code:        1234
Partner Device:  None
Client/Server:   Server (accepts incoming connections)
Class of Device: Peripheral

Key [0] - MAIN MENU
Key [1] - Save current settings as factory default settings
```

Selecting option 1 from this Current settings menu allows any user settings to be used to update the “factory” settings, providing some level of protection from losing application configuration settings during a device reset when the reset button is activated.

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
! This option changes the factory settings                !
! The settings cannot be restored by the reset button    !
! Type PROCEED to apply changes                        !
! Type any other character sequence to abort              !
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

This is not something you really want to do unless you're sure you have the settings as you want them and are sure you can remember them, as there is no way back from here...

Aborting...

Entering any character other than that required will abort the update. The PROCEED command is case sensitive and must be followed by <ENTER>.

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
! This option changes the factory settings                !
! The settings cannot be restored by the reset button    !
! Type PROCEED to apply changes                        !
! Type any other character sequence to abort              !
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
PROCEED_
```

Storing new factory settings...Complete

All the settings in this section are applied with immediate effect.

5.6. Restoring Factory Settings

```
=====
=====  MAIN MENU  =====
=====  Version 3.02  =====
=====
Key [1] - Modify COMM Settings
Key [2] - Modify Bluetooth Settings
Key [3] - Display Current Settings
Key [4] - Restore Factory Settings
Key [5] - Disable Interactive Menu
Key [6] - Upgrade DFU
```

Selecting option 4 from the main menu displays the following restore factory settings menu.

```
=====
===== Restore Factory Settings =====
=====
Baud rate:      115200 (Actual: 115168)
Parity:         NO parity
Stop Bits:      1 stop bit
Local Device Name: ADAPTER BB RS232 Converter
Discoverability: On
Security Mode:   3 (High)
Encryption:      Disabled
PIN Code:        1234
Partner Device:  None
Client/Server:   Server (accepts incoming connections)
Class of Device: Peripheral

Key [0] - MAIN MENU
Key [1] - Restore these factory settings
```

Be sure to take a note of, or print these settings, as you will need to ensure that the next time you attempt to communicate with your ADAPTER you use these new settings.

Remember that the original factory settings may have been updated using the previous menu. All the settings in this section are applied with immediate effect.

5.7. Disabling Interactive Menu

```
=====
===== MAIN MENU =====
===== Version 3.02 =====
=====
Key [1] - Modify COMM Settings
Key [2] - Modify Bluetooth Settings
Key [3] - Display Current Settings
Key [4] - Restore Factory Settings
Key [5] - Disable Interactive Menu
Key [6] - Upgrade DFU
```

Some RS232 devices (GPS devices for example) emit a continuous stream of data regardless of whether a cable is connected. When no Bluetooth connection exists, this data can actually appear as commands to the menu and change settings that render the adapter inoperable. Disabling the menu, stops the adapter being unwontedly re-configured in this manner.

Selecting option 5 from the main menu displays the following Disable Interactive menu.

```
=====
===== Disable Interactive Menu =====
=====
Key [0] - MAIN MENU
Key [1] Disable menu (re-enable by restoring default with a long reset)
```

Selecting option 1 from this menu means that no further interaction with the menu will be possible until the device has been completely reset to it's factory defaults by performing a "long" reset from the reset button.

Disabling now...

5.8. Resetting ADAPTER

The ADAPTER has a “reset button” located on the side of the case as shown in section 3.1 ADAPTER above. This button performs 2 different functions.

a) Resets Paired Devices.

A short press (less than 3 seconds) of the reset button causes any paired device information to be deleted. When the device is in low security mode, this will not have any effect on the devices operation, but while in high security mode, this will mean that another device can pair with ADAPTER, or that the original device must expire its bond in order to reconnect.

b) Resets ADAPTER to factory defaults.

A long press (more than 3 seconds) of the reset button causes all factory defaults to be restored. Care should be taken here to remember that these “factory” settings can actually be updated via the interactive menu and thus may not be the same as the device was shipped with. The user should also remember that ADAPTER is likely to need it's parameters re-configuring to ensure communications can be re-established with either the local serial device, or remote Bluetooth device.

6. Physically connecting to your RS232 device

6.1. Configuring the communications parameters

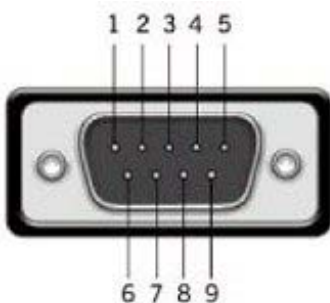
The adapters do not have the ability to auto-detect the communications parameters (e.g. baud rate) so they must be configured to match the data rate used in the application to which they are connected. Please refer to section 5.3 Communications Parameters above, for details on how to do this.

It is possible, if a little confusing, to “pair” two adapters and have them physically connected to RS232 devices which use totally different communications parameters.

6.2. Physically connecting your device to ADAPTER via the RS232 cable

ADAPTERS are supplied with either a 9-pin male (DTE) or a 9-pin female (DCE) ‘D’ type connector. The DTE (Data Terminal Equipment) configuration has been chosen to allow for easy connection to DCE (Data Communication Equipment) e.g. serial printers, medical sensors etc. RS232 devices that would normally connect directly to the RS232 port on a computer, choose the (DCE) version. When connecting a DTE adapter to a computer you will need an appropriately wired gender changer and null-modem adapter that allows the adapter to behave as a DCE device.

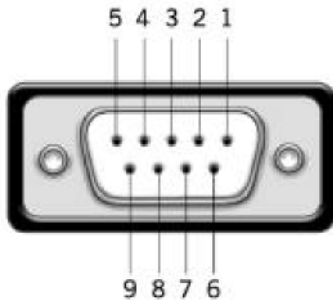
Connector Pin-Outs for the integral DTE cable (Male 9 Pin D Type) are...



Pin	Signal	Pin	Signal	Pin	Signal
1	N/C	4	DTR - N/C	7	RTS
2	RxD	5	Ground	8	CTS
3	TxD	6	DSR - N/C	9	Auto-detect Pwr

As the RS232 standard allows for many different cable configurations, your device may need additional cable work with the adapter, such as a cross-over or null-modem cable. Please refer to your devices documentation for specific details.

With a DCE adapter or a DTE when a “gender changer/null-modem” is connected, the (Female 9 pin D Type) Pin-Outs are...



Pin	Signal	Pin	Signal	Pin	Signal
1	N/C	4	DSR - N/C	7	CTS
2	TxD	5	Ground	8	RTS
3	RxD	6	DTR - N/C	9	Auto-detect Pwr

The female connector is designed so that it can be plugged directly into a PC's motherboard COM port. If you are connecting it directly to a different device you may need an additional cable, such as a “cross-over” or “null-modem” cable. Please refer to your device's documentation for further details.

7. Connecting adapters over Bluetooth

There are 3 ways ADAPTER can be connected via Bluetooth.

- Client/Server Pair:** 2 ADAPTER's, configured to perform a “true” cable replacement.
- Server:** Connecting TO ADAPTER from a remote Bluetooth device (Factory Default)
- Client:** ADAPTER is the Bluetooth device which initiates the connection

This section details all 3 methods.

7.1. Client/Server Pair: “Cable Replacement”

One of the strongest features of ADAPTER is that 2 of them can be configured to connect to each other and thus behave almost exactly as a cable. This configuration is very straightforward, does not require any Bluetooth software and is detailed below.

For ADAPTER's to connect as a pair, one of the devices needs to be configured as a client device, and one as a server. As the factory settings for ADAPTER are “Server” it follows then that only 1 of the ADAPTER pair needs any alternate configuration from that supplied.

It is advisable that you first configure the communications settings (baud rate etc) for each ADAPTER so that they are suitable for the devices into which you are plugging them. When configuring a pair of ADAPTER's the Communications parameters of each adapter do not have to match each other's, only that of the devices into which they are connected.

Each ADAPTER has a unique Bluetooth Address (BD_ADDR). This is printed on a label on the base of every product, but is also accessible from the “View Current Settings” menu detailed above.

For our example here, we will use an ADAPTER with a BD_ADDR of 000A-4F-00082D, which we'll call the Server, and a second, with a BD_ADDR of 000A-4F-0013BB, which we'll call the Client. We'll leave all other settings for this example as factory defaults. As explained above we only need to change the settings of the Client device...

```
=====
===== MAIN MENU =====
===== Version 3.02 =====
=====
Key [1] - Modify COMM Settings
Key [2] - Modify Bluetooth Settings
Key [3] - Display Current Settings
Key [4] - Restore Factory Settings
Key [5] - Disable Interactive Menu
Key [6] - Upgrade DFU
```

From the main menu select option 2 “Modify Bluetooth Settings”.

```
=====
===== Modify Bluetooth Settings =====
=====
Key [0] - MAIN MENU
Key [1] - Set Discoverability
Key [2] - Set Security Mode
Key [3] - Set Encryption
Key [4] - Set PIN
Key [5] - Set Partner Device
Key [6] - Set Client/Server
Key [7] - Set Local Name
Key [8] - Set Class of Device
```

The following menu is displayed

Select option 5 “Set Partner Device”. This tells the Client ADAPTER what remote device it is supposed to try to connect to.

```
=====
===== Set Partner Device =====
=====
Key [0] - PREVIOUS MENU
Key [1] - Add partner device
```

Enter the address of the partner device:

Enter the address of the partner device: 000a-4f-00082d

You’ll need to add the Server ADAPTER into this menu option. Select option 1 to display the following menu.

You should enter the Bluetooth Address (BD_ADDR) of the remote device you wish to pair (in our case this is 000A-4F-00082D) followed by ENTER. This should be in the same format as indicated on the products label (NAP-UAP-LAP, for those of you who know)

This will now refresh the menu with the address just entered.

```
=====
===== Set Partner Device =====
=====
Key [0] - PREVIOUS MENU
Key [1] - Remove partner device

Partner device: 000a-4f-00082d (not paired)
```

Select 0 to return to the previous menu and select option 6 “Set Client/Server”


```
=====
===== Modify Bluetooth Settings =====
=====
Key [0] - MAIN MENU
Key [1] - Set Discoverability
Key [2] - Set Security Mode
Key [3] - Set Encryption
Key [4] - Set PIN
Key [5] - Set Partner Device
Key [6] - Set Client/Server
Key [7] - Set Local Name
Key [8] - Set Class of Device
```

After selecting option 6 from the “Modify Bluetooth Settings” menu, the following menu is displayed.

```
=====
===== Set Client/Server =====
=====
DEVICE MUST BE REBOOTED IN ORDER TO APPLY THIS SETTING

Key [0] - PREVIOUS MENU
Key [1] - Server (accepts incoming connections)
Key [2] - Client (initiates connections)

Client/Server: Server (accepts incoming connections)
```

Select the client option. This setting is stored immediately and is not discarded upon a reboot. In fact it requires a reboot in order to activate it. Re-boot. When the Client ADAPTER is switched on, it will connect to the Server device you have entered in the menu above, assuming of course that the server device is also powered up.

That's it – it really is that simple. Connecting to your ADAPTER will vary depending on your application, but will usually consist of 3 Steps.

7.2. Server : Connecting TO ADAPTER from a remote Bluetooth device

- 1 – Configuring the ADAPTER's communications parameters.
- 2 – Physically connecting ADAPTER to your device.
- 3 – Connecting to ADAPTER from a remote device via Bluetooth and transferring data.

There are many different scenarios whereby a connection can be made to an ADAPTER and consequently its attached device. The application scenarios will also depend on what sort of device you have attached to the ADAPTER. One working example is shown here for illustrative purposes, but the principle will be the same regardless of the device you are connecting to except perhaps the cabling arrangements your device might require.

In this example we have connected a Tektronix TDS220 Oscilloscope to an ADAPTER and plugged in the power adapter included. No additional cables or gender changers were used in this application scenario. In order to communicate to the scope/RS232 ADAPTER we have connected a SMART USB adapter to a laptop with SMART's BlueOpal Bluetooth software suite installed. If you are connecting to ADAPTER with a different manufacturers Bluetooth product, please refer to the manufacturers instructions for that product. If you are Bluetooth enabling your laptop with another SMART RS232 ADAPTER you should follow the previous sections instructions.

7.2.1. Configure and connect

Configure the communications and Bluetooth parameters of the adapter as described in the above sections and physically connect it to your RS232 device.

7.2.2. Bluetooth Enable your PC

Any PC based Bluetooth device could be used, but for this example we have used SMART's USB adapter and BlueOpal Bluetooth software for Windows.

7.2.3. Discover the device

Using SMART's Bluetooth Windows software (for controlling the USB adapter) by first opening the "Bluetooth Devices" window and clicking the Search for Devices icon. This sets the software to display all the Bluetooth devices it can find "in range". This software will not operate the adapter products if attached to the PC.

Assuming that your adapter is switched on and in radio range you should see it displayed (perhaps alongside other Bluetooth devices in range) in the main screen.

7.2.4. Secure the relationship

This is where you must "Bond" or "Pair" with the device. This is a feature of Bluetooth, which allows secure communications to take place. It is also used to stop other devices from performing unauthorized connections.

You can start the bonding process by selecting and right clicking on your ADAPTER from the main screen. This brings up a context menu from which you should select the "Bond" option.

7.2.5. Connect to the Serial Port profile

If you have configured your ADAPTER from the menu to use a low security mode (and thus not require bonding) then this step can be skipped and you can jump straight to section "7.2.5 Connect to the Serial Port profile".

You will then be prompted to enter a PIN number. Enter the Pin number (which is 1234, unless you have used the configuration menu to change it). Click OK

The Icon of your ADAPTER in the main window should now change to indicate a "bonded" status as shown below. In order to actually connect to the appropriate function on the ADAPTER you will need to discover it's services. Double-Click the device selected.

This will display a serial port service called "SPP"
Interaction with the menu appears slow and unresponsive, but data does show eventually.

Double clicking this service (or right clicking and selecting the "connect" option), will create a COM port style connection to the ADAPTER.

The screen will show that the port in our example here is listed as e.g. COM11, although yours will most likely be a much lower number than this.

This "COM" port is now available for any application to use to communicate with your device, or in our case, the oscilloscope.

7.2.6. Connect your application to the new COM port

In our initial testing at our labs, we used the HyperTerminal application included in Windows to open the new COM port. Setting HyperTerminal to save data to a file called screen.bmp, and activating the hardcopy feature of the oscilloscope, caused all data to be sent from the scope to the file as listed. This file could then be viewed using any picture editing software and displays an exact screen copy of the oscilloscope. Instructions for using HyperTerminal can be found in section "4.2 Accessing the configuration menus." Above

7.3. Client: ADAPTER is the Bluetooth device which initiates the connection

The instructions in the above section for creating a "cable replacement" connection should be followed to place the ADAPTER into Client Mode in order to initiate a connection to a remote device.

8. Upgrading

If it becomes necessary to upgrade the Firmware of this product in the field, there will be a notice on the Technical Support Page with Firmware, an upgrade utility and instructions.

9. Troubleshooting

In the rare occasion that you experience difficulties using this product, please read and try any suitable suggestions from the table below before contacting our support team.

<u>Symptom</u>	<u>Description</u>	<u>Solution</u>
Data doesn't seem to be received by the product, but seems to be sent by it (e.g. data only traveling in one direction)	This is normally the result of the product being configured as requiring RTS/CTS handshaking, but being plugged into a device which does not support it.	The current version of Firmware shipped with this product supports the disabling Hardware Handshaking but only through an upgrade utility. If there is no way for your device to be configured with pins 7 and 8, RTS/CTS handshaking, please contact Technical Support for information on this procedure.
Interaction with the menu appears slow and unresponsive, but data does show eventually.	This is normal operation when the product is in Client mode. The product is using most of its processor cycles to try and find and connect to a remote device.	Reconfigure the product to Server mode while attempting to configure other options
Cannot interact with the menu	<p>There are a number of scenarios where this might happen</p> <ol style="list-style-type: none"> 1. A Bluetooth connection is made 2. The Product has failed to initialize correctly (perhaps if the power adapter has been attached whilst switched on). 3. Incorrect communication parameters selection. 4. Incorrect Wiring configuration 	<ol style="list-style-type: none"> 1. No interaction with the menu is possible when a Bluetooth connection is present. Break the connection to restore access to the menu. 2. Switch the power off then on again. 3. Change the communication settings in your terminal application to match those of the devices settings. If you have forgotten or lost these settings, then the device can be restored to its factory settings by performing a long reset. 4. Check your devices wiring and handshake configuration requirements

10. Technical Specifications

Class 2 Bluetooth Device

Qualified Output Power: = $> 0 \text{ dBm} < +4.0 \text{ dBm}$ @ 25°C

Receive sensitivity Single Slot = -83 dBm with 0.1% BER

10.1. Storage and Operating Environment

10.1.1. Storage

Temperature: -10°C to $+85^{\circ}\text{C}$

Humidity: 8% to 95% non-condensing

10.1.2. Operational

Temperature: 0°C to 70°C

Humidity: 20% to 75% non-condensing

10.2. Power requirements

10.2.1. Input Voltage Requirements

The product was qualified using a fully rectified AC/DC power supply supplying 550mA @ 5V. To ensure your product performs within the regulatory requirements, it is recommended that you use the AC/DC adapter supplied..

For your information only, the voltage range is given below.

Minimum 5.0 V – Maximum 13.6 V

10.3. Antenna Characteristics

10.3.1. Gain

The antenna is a surface mount component on the printed circuit board with a gain of 0 dBi.

11. Agency and Regulatory Body Approvals

Bluetooth product operating in 2.4GHz band for Home and Office use.

11.1. Exposure to Radio Frequency Radiation

The radiated output power of the BT RS232 DCE CLASS 2 and BT RS232 DTE CLASS 2 Bluetooth wireless radios are far below the FCC, Industry Canada and European Union radio frequency exposure limits. Nevertheless, the wireless radio shall be used in such a manner that the potential for human contact during normal operation is minimized. The internal wireless radio operates within guidelines found in radio frequency safety standards and recommendations which reflect the consensus of the scientific community.

The level of emitted energy emitted is far less than the electromagnetic energy emitted by wireless devices such as mobile phones. However, the use of wireless radios may be restricted in some situations or environments, such as aboard airplanes. If you are unsure of restrictions, you are encouraged to ask for authorization before turning on the wireless radio.

The FCC, Industry Canada and European Union have set a general guideline of 20 cm (8 inches) separation between the device and the body. This device should be used more than 20 cm (8 inches) from the body when wireless devices are on.

11.2. FCC Part 15 Radio Frequency Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on. The user is encouraged to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet that is on a circuit different from the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

11.3. Industry Canada ICES-003 Emission Compliance Statement

This Class B digital apparatus meets the requirement of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du règlement sur le matériel brouiller du Canada.

11.4. European Radio Approval Information

The BT RS232 DCE CLASS 2 and BT RS232 DTE CLASS 2 adapters are low power, wireless communication devices, operating in the 2.4 GHz band, intended for home or office use. The power output of this device is well below the RF exposure limits as set by the European Commission through the R&TTE directive.

The BT RS232 DCE CLASS 2 and BT RS232 DTE CLASS 2 can be operated in the following European Union and European Economic Area countries:

Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

11.5. Europe – EU Declaration of Conformity

This device complies with the R&TTE Directive 1999/5/EC, and the following standards:

EN 301 489-1 EN 301 489-17	Electromagnetic compatibility and radio spectrum matters(EMR); Electromagnetic compatibility (EMC) standard for radio equipment and services.
ETS 300 328-1: ETS 300 328-2:	Electromagnetic compatibility and radio spectrum matters (EMR); Wideband transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using spread spectrum modulation technique.

Low voltage Directive (Safety) 73/23/EEC as per:

EN 60950	Safety of information Technology Equipment
----------	--

11.6. Rest of World

Country restrictions apply for home and office use. <http://www.SmartModular.de>