HighPerTec
High Performance Technology

BlueSerial

BlueSerial™ Bluetooth RS-232
Serial Port Adapters & Modules

User Manual

Rev. 4.10

Table of Contents

1   Introduction

The BlueSerial Bluetooth serial port adapter makes it easy to turn any device with an RS232 compatible serial port into a Bluetooth device. BlueSerial enables wireless communication with other Bluetooth devices like personal computers, PDAs, cell phones and many more. This User Manual describes the installation and usage of your BlueSerial Bluetooth serial port adapter. Please take some time to read this manual. If you don't want to read the whole manual, read at least the sections marked important.

If you are not familiar with the operation of Bluetooth devices we encourage you to read the chapter *Bluetooth Basics* before you start using the BlueSerial adapter.

2   Getting Started

2.1   Box content

Items included when you receive your BlueSerial adapter:

- BlueSerial Bluetooth adapter for serial ports.

- Wall box power supply* (230 Volt or 110 Volt depending on sales area)

- Stub antenna (removeable, MMCX or SMA connector)

- CD containing the configuration software

- This user manual on CD

    * Optional depending on sales area. No power supply for OEM versions.

Important

Please use the BlueSerial adapter only with the power supply delivered with the device. If you have to use another power supply, please make sure its voltage rating falls within the range indicated in the technical specification. Using a power supply voltage outside of the specified range will void any warranty.

2.2   Standard Configuration

When you receive the BlueSerial adapter the device is configured as follows

- Operating mode: Bluetooth Slave, Visible, Connectable.

- No authentication, no encryption.

- Serial port 115kBit / second, 8 data bits, 1 stop bit, automatic detection of port type, accepts port settings from a remote device over Bluetooth RFCOMM protocol.

A detailed description of the configuration parameters can be found in the *Configuration* section.

2.3   Status Indicators

Two LEDs provide monitoring of the BlueSerial adapter operation mode.

- The green LED flashes once followed by a long interval (~ 3 seconds)
  The BlueSerial adapter is operational, but no device has been detected on the serial port.

- The green LED flashes once followed by a short interval (~ 1 second)
  The BlueSerial adapter is operational and a device has been detected on the serial port.

- The green LED flashes twice, followed by a short interval (~ 1 second)
  A Bluetooth connection to a remote device is active.

- The red and the green LED both flash simultaneously
  The BlueSerial adapter is in configuration mode.

3   Quick Start

3.1   Connect from a Windows PC

Here the BlueSerial adapter will act as a slave device. For most application no special configuration is required. Just connect it to your peripheral and power it up. Make sure that your peripheral is detected by examining the green LED. It should blink at a rate of approximately 1 second.

The next steps depend on the Bluetooth Software installed on your PC. The examples given here use the Microsoft Bluetooth Software on Windows XP SP2. If you are using a different Bluetooth software please consult the documentation which comes with your software.

Start the Bluetooth Add Device Wizard by clicking the Bluetooth Symbol in the task bar.

Click Next. Windows will search for Bluetooth Devices This will take a moment.
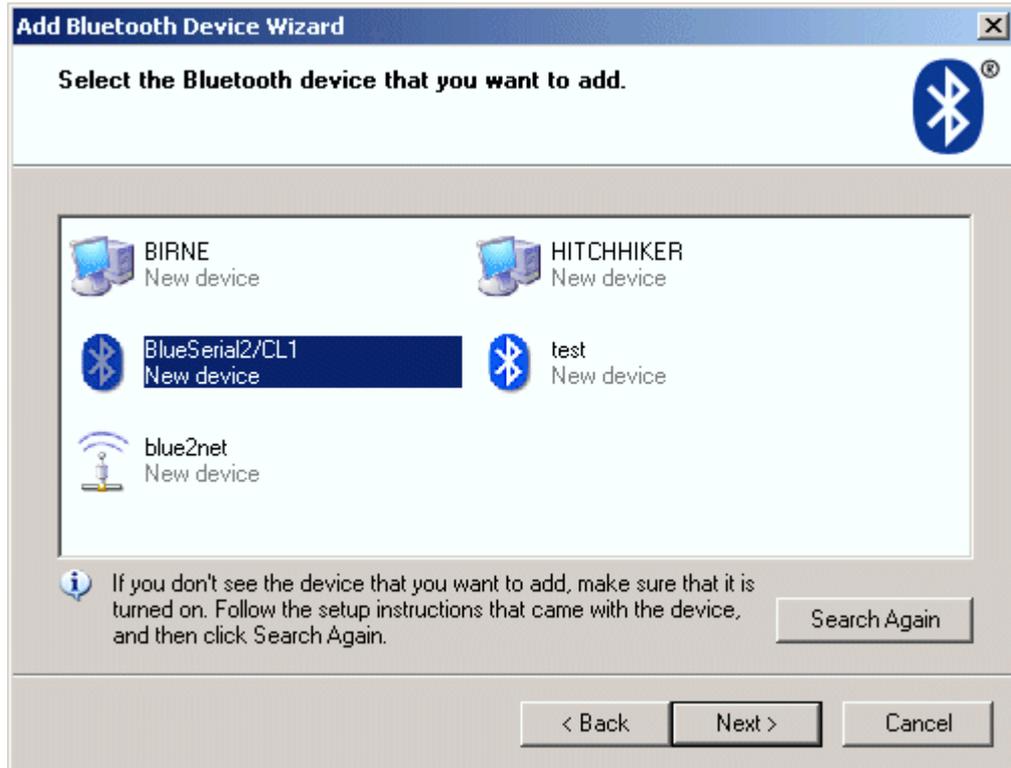
You'll get a list of devices. Select the device you want t o connect to and click next.
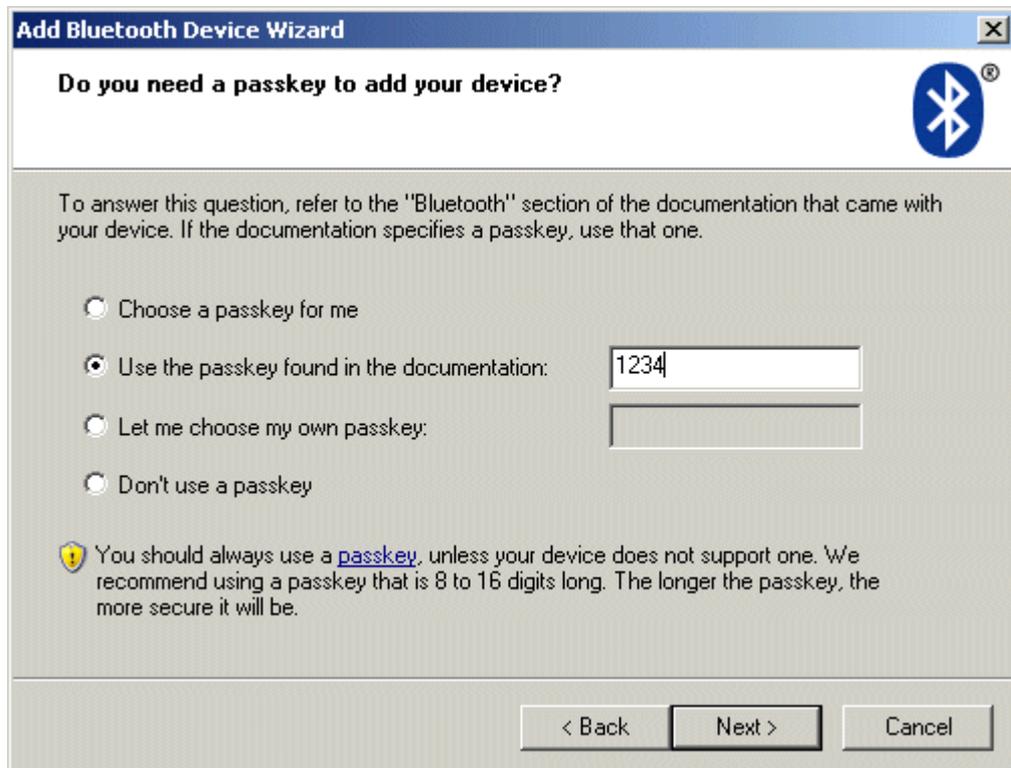
Select the type of passkey as shown above. The default Passkey (PIN) for the BlueSerial device is "1234". If you have configured a different passkey use this. Click Next.

Windows will install 3 COM Ports for the BlueSerial device. Click finish.
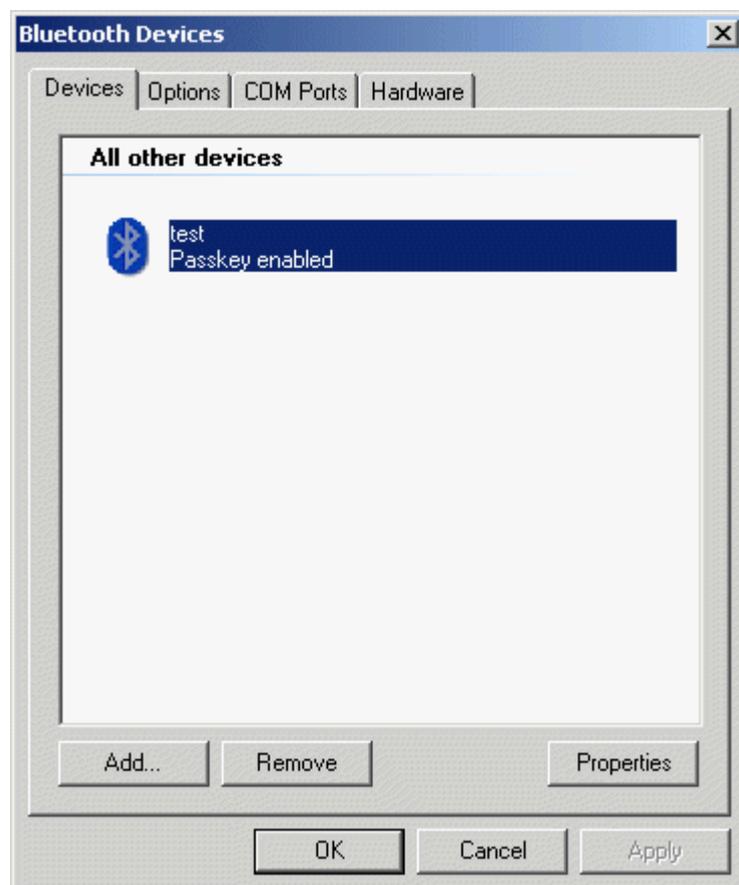
Select the COM Ports Tab to see which COM Port is used for which service.
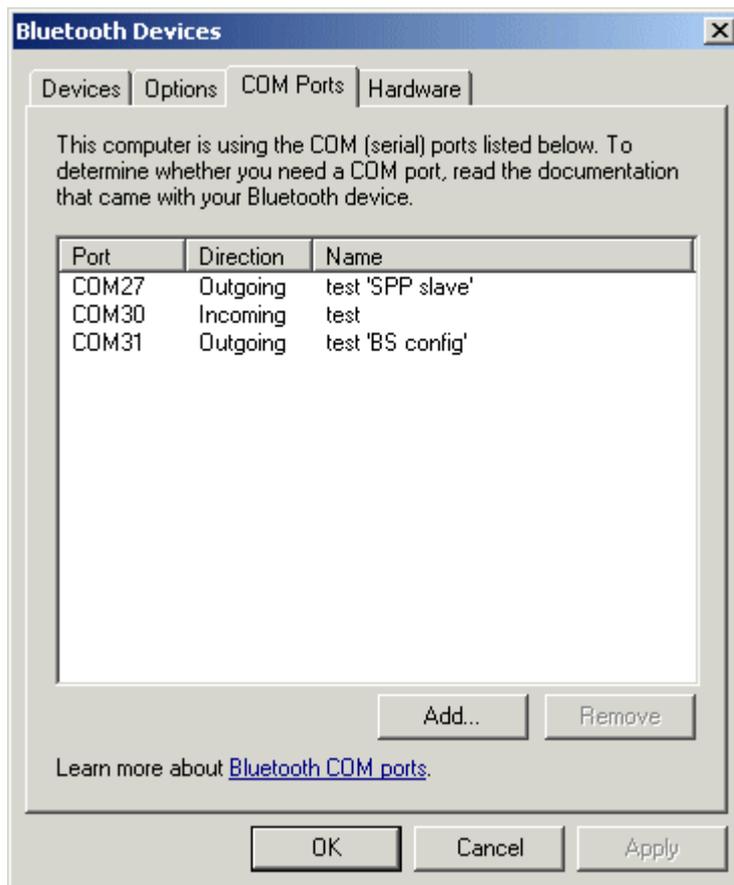
In this example COM27 is used for connecting to the SPP Slave Service. This is the service used for normal data communication. You will use this COM Port for your application

COM 30 allows incoming connections from the BlueSerial Adapter. This will normaly not be used.

COM31 can be used to configure the BlueSerial Adapter over Bluetooth. See the configuration chapter on how this is done.

3.2   Connection between two BlueSerial adapters

Using two BlueSerial adapters it is possible to replace a serial cable without the need for a computer. To do so the two adapters must be configured differently. One adapter as the slave device and the other as the master.

3.2.1   Configuring the slave device

For the slave device only the serial port settings need to be configured. Please refer to section configuration for a detailed description of the configuration tool and options.

3.2.2   Configuring the master device

The master device always starts the Bluetooth connection. To be able to do so it must know to which slave device it shall connect.

Start the configuration program and select the Bluetooth Environment tab. Make sure the slave device is powered up and visible. Click Search Devices.
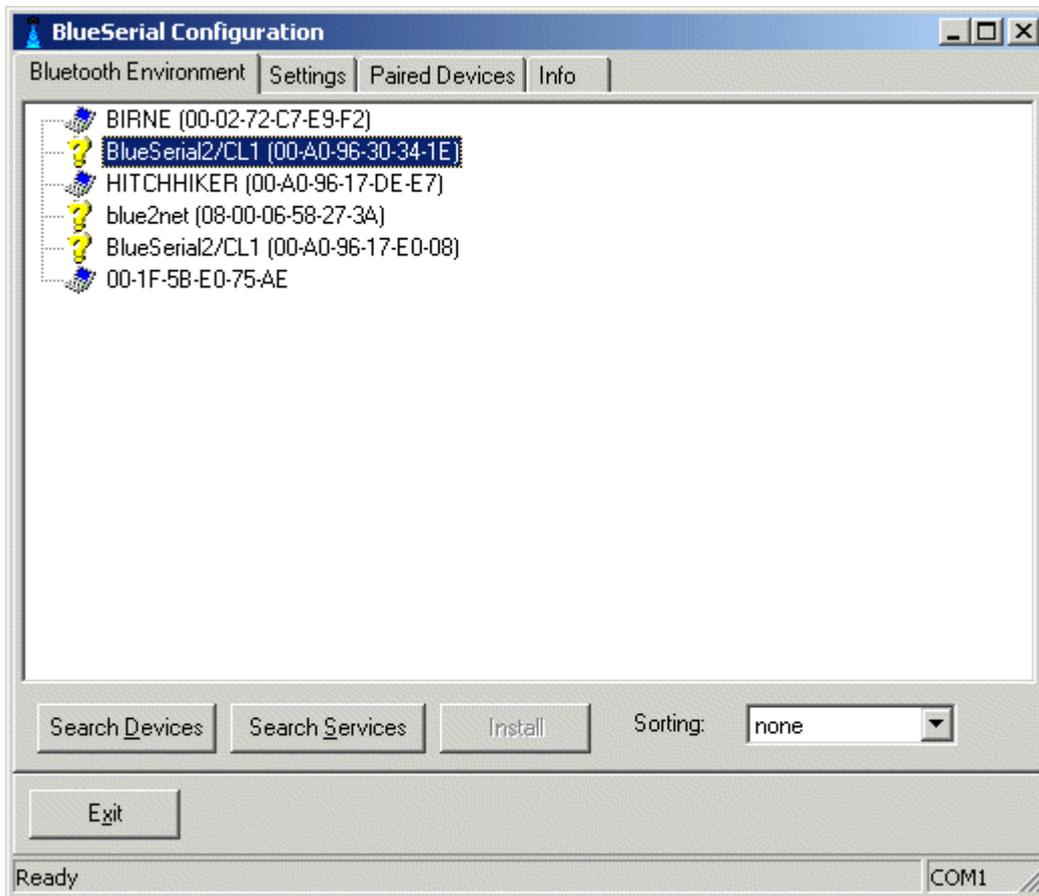
Select the slave device you want to connect to and click Search Services. Select the service SPP slave on the remote device.
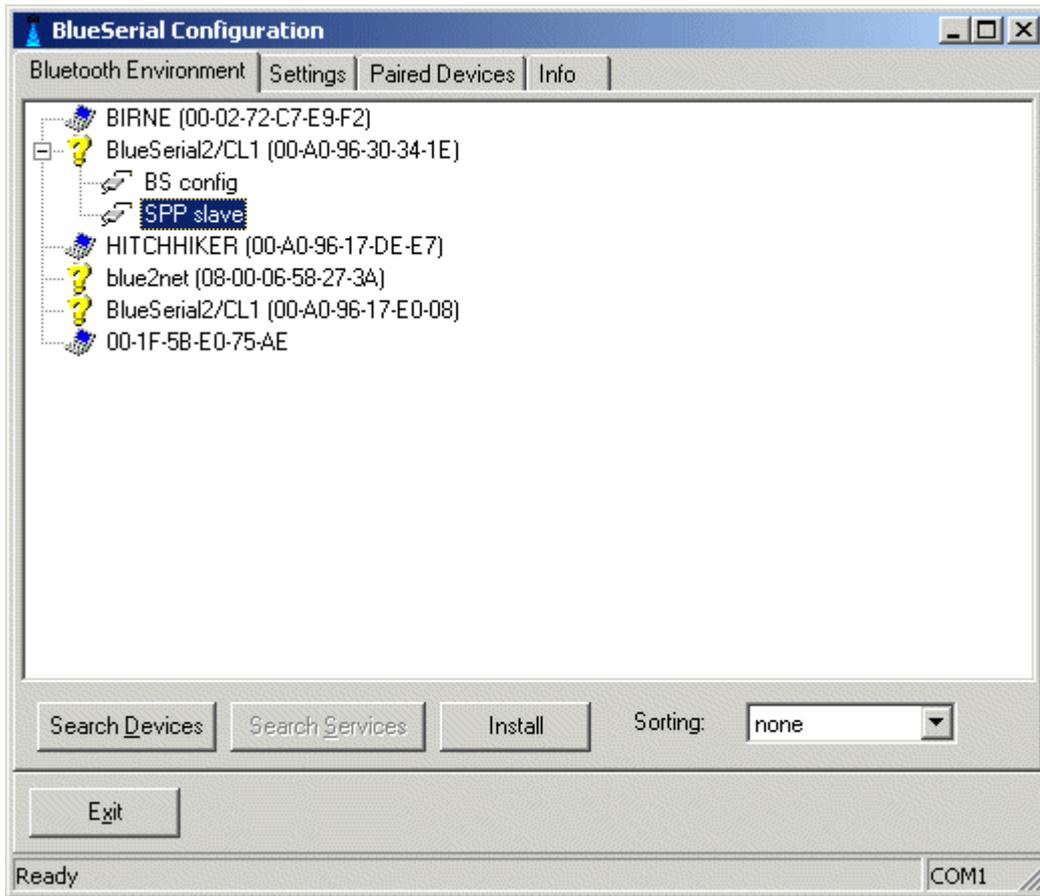
Click Install.
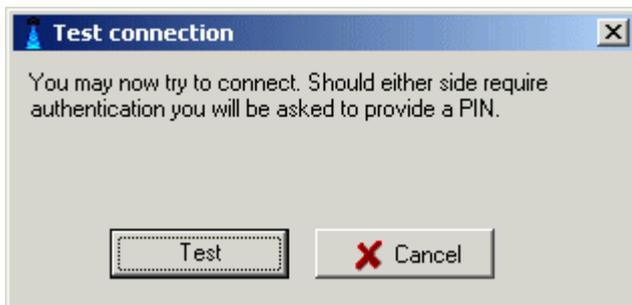
You now can test the connection. Click Test.

The connection test should complete within a few seconds. Click OK.

The configuration tool will switch to the Settings Tab and give you a message that the slave device has been installed.
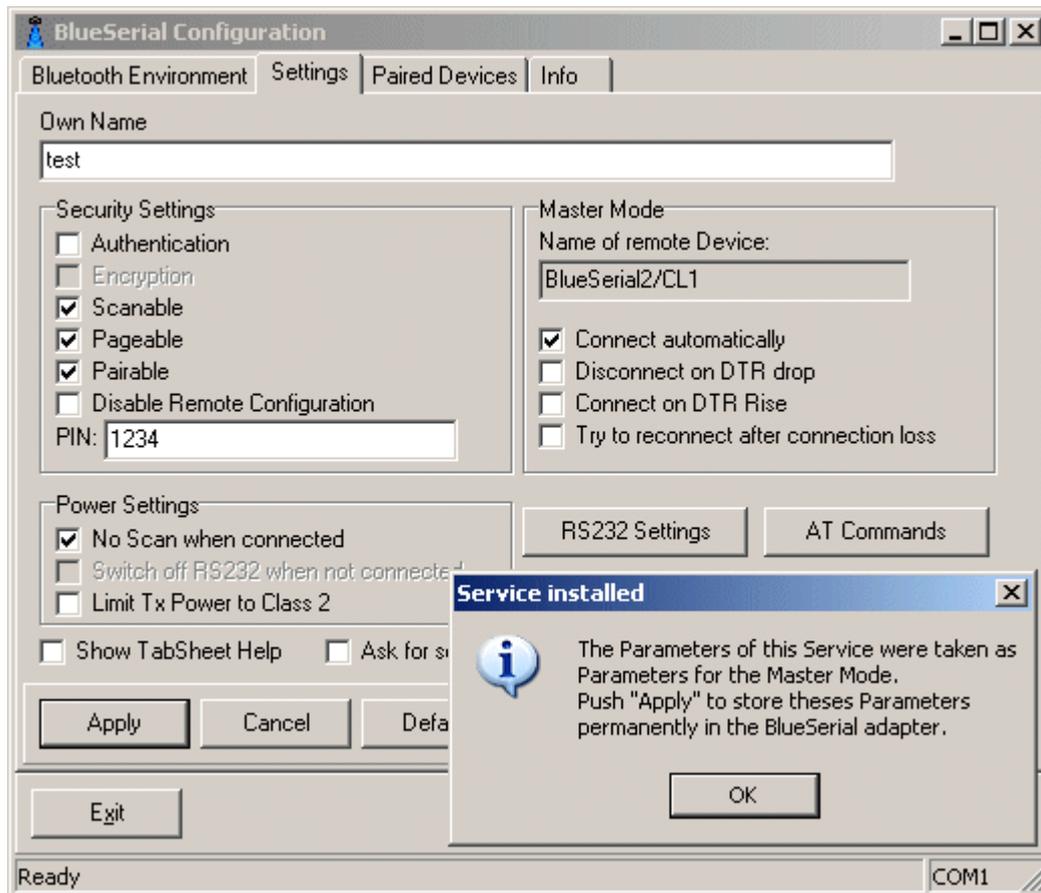
Click OK.
To make sure your master device always connects to the slave device you should check "Try to reconnect after connection loss". Than click Apply.
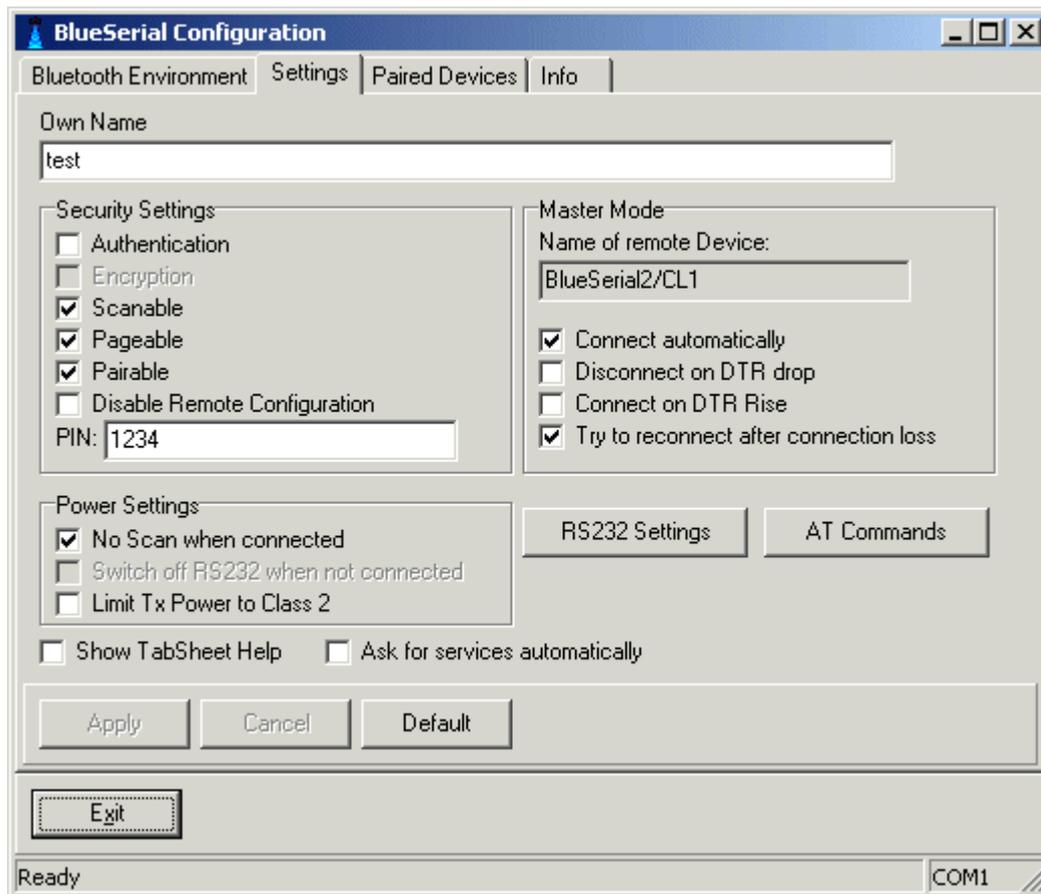
Now you can configure RS232 Settings as needed. When finished click Exit.

After a few seconds your newly configured master should connect to your slave device. You can verify this by examining the LED blink rate.

4 Configuration

The configuration software that comes with the BlueSerial adapter allows you to change operating modes. The program runs on any standard PC with a Windows operating system (Windows 95 or higher). The program can be started directly from the CD, or you can copy it to a folder on your hard drive. The configuration can be carried out directly over a serial port or over a Bluetooth connection.

4.1 Starting the Configuration over a Serial Port

Connect the BlueSerial adapter to a serial port on your PC and connect the power supply before you start the program BlueSerialConfig.exe. When the program starts it searches for a BlueSerial adapter connected to a serial port (either COM 1 or COM 2). If the BlueSerial adapter cannot be found you can manually select the appropriate port.

4.2 Starting the Configuration over a Bluetooth Connection

To start the configuration over a Bluetooth link you need a Bluetooth adapter for your PC which supports the Serial Port Profile (SPP). If you use the Microsoft Bluetooth Software follow the example in chapter 3.1. You need to connect to BS config service, installed as COM31 in the example.

Start the configuration software normally. When it doesn't find the BlueSerial adapter on COM1 or COM 2 it will asked for the COM port to use. Select the appropriate Port and enable the checkbox Bluetooth Virtual COM.
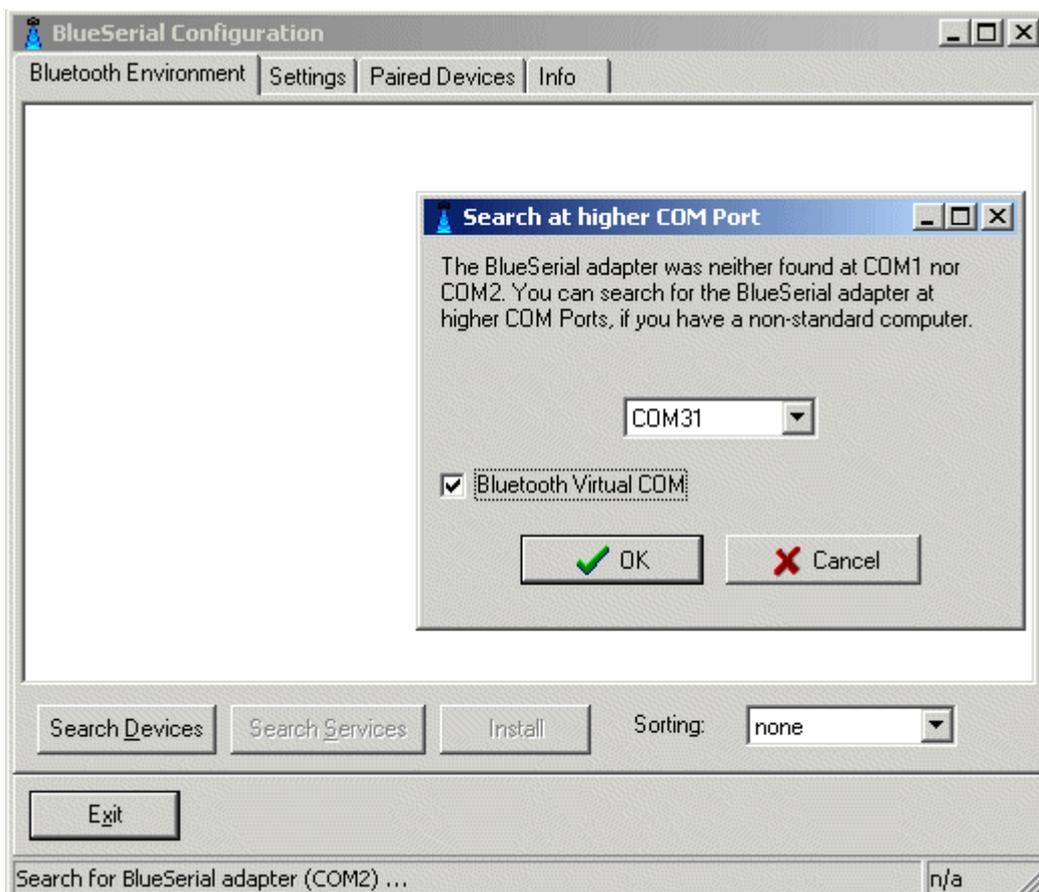
4.3   Using the Configuration Software

After starting the software, the *Bluetooth Environment* tab sheet will be displayed. In the status line the currently active operation and the serial port used to communicate with the BlueSerial adapter will be displayed (COM1 in the example below).

You may search for Bluetooth devices within range. You can also query the services these devices offer. This is only required if you want to use the BlueSerial adapter as a Bluetooth Master (see section *Bluetooth Master Operation*).
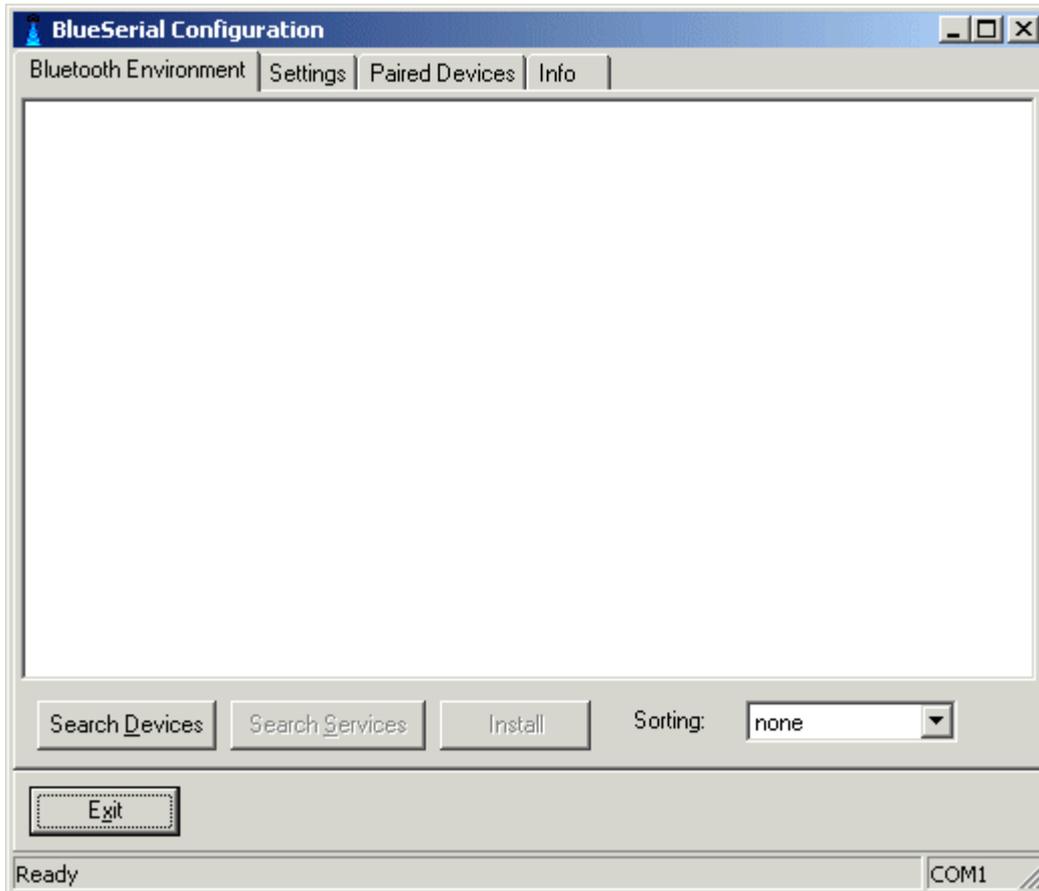
If you want to check or modify the configuration settings of your BlueSerial adapter click the *Setting*s tab sheet. Please note that any changes to the configuration only become effective when you clicked the *Apply* button before leaving the configuration program.
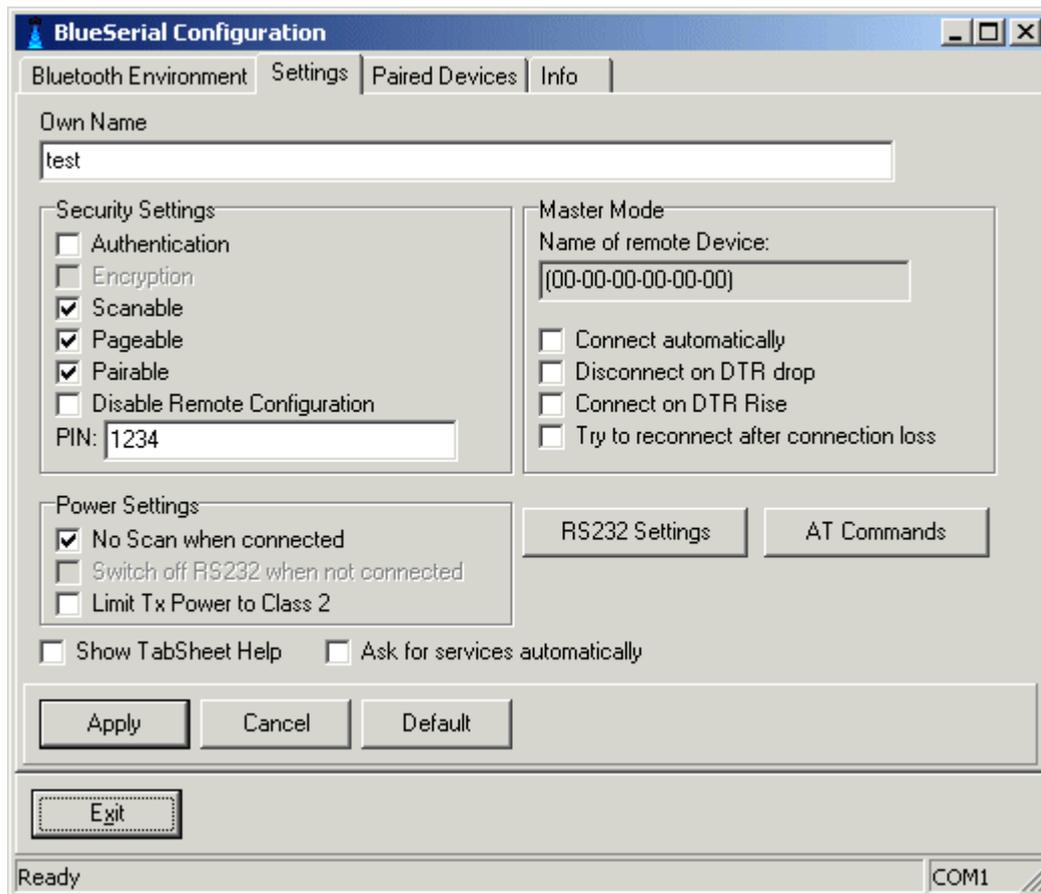
Own Name
The name of your BlueSerial adapter that is displayed on a remote device querying your BlueSerial adapter. This could be any name. Standard is showing the Adapters specs number.

Security Settings

Authentication
When this options is enabled the BlueSerial adapter will only accept connections from a remote device it has been paired with. This means you once connected using a PIN.

Encryption
All data transfers will be encrypted. This will only work if Authentication is enabled.

Scanable
The BlueSerial Adapter is visible to other Bluetooth devices.

Pageable
The BlueSerial adapter can be connected by other Bluetooth devices. If this option is deactivated the BlueSerial adapter only works as a Bluetooth Master.

Pairable
If this option is deactivated the BlueSerial adapter cannot be paired with other devices. However, it is still possible to connect to the BlueSerial adapter from devices it has been already paired with.

Disable Remote Configuratiom
Disables the BS config service.

PIN
This code must be entered on a remote device that wants to pair with the BlueSerial adapter.
The default pin is 1234.

<u>Master Mode</u>

Name of remote Device
The name of the device the BlueSerial adapter tries to connect to as a master. It is only displayed if the installed device is in range. If not, only its Bluetooth address will be displayed.

Connect automatically
The BlueSerial adapter only tries to connect to a remote device as a master when this option is activated. When you have installed a remote device but do not want the BlueSerial adapter to connect to it, then deactivate this option.

Disconnect on DTR Drop / Connect on DTR Rise
Enabling these two options allows you to control the connect / disconnect using the DTR signal of the serial port.

Try to reconnect after connection loss
The BlueSerial adapter normally only connects as a master when it has some data to send. When this option is enabled it always tries to connect to the remote device.

<u>Power Settings</u>

No scan when connected
When this option is disabled the BlueSerial adapter is visible to other Bluetooth devices even if a connection exists. When this option is checked the BlueSerial adapter is invisible to other Bluetooth devices as long as a connection exists. Beside saving power this may also reduce interference from other Bluetooth devices.

Limit Tx Power to Class 2
Will limit the maximum transmit power used to 10 mW. This will save some power but reduce range as well.

RS232 Settings

To configure the serial port settings click the RS232Settings button. The BlueSerial Adapter will use the port settings defined here as default settings. The port settings may be overwritten from a remote device (unless ignore from remote is checked).
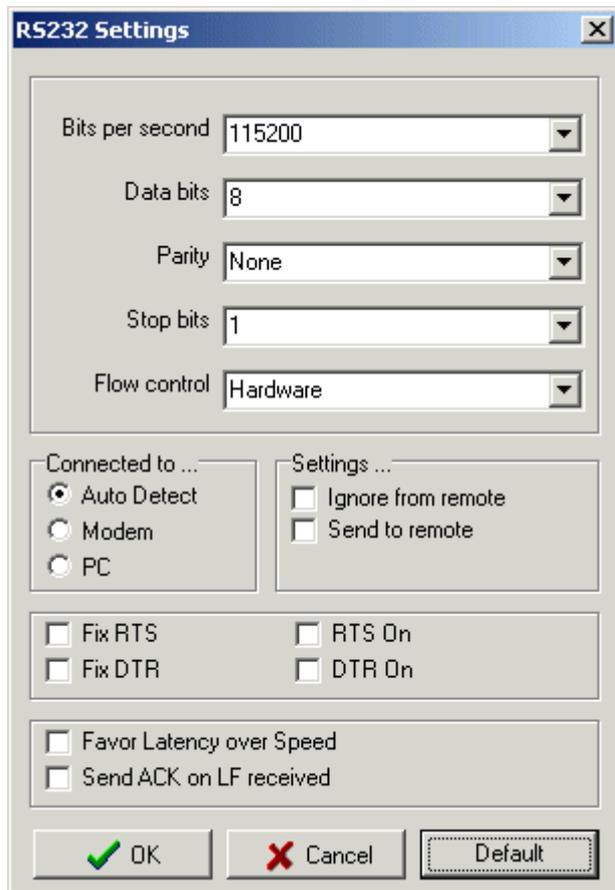
Bits per second (up to 230K)
The port speed to use.
Data bits (7 or 8)
Number of data bits, 7 or 8. Please note that 7 bits are not supported by the hardware but emulated by software. There for 7 bit communication may reduce communication speed. If ever possible use 8 bit here. In most cases it is possible to use 8 data bits / parity none instead of 7 data bits / parity even or odd. To use 7 bits, the firmware version needs to be 2.5.0 R1 and the configuration utility should be
Parity (Odd, None, Even)
Parity to use. See Data Bits for comments on using parity.
Stop bits (1 or 2)
Number of stop bits to use.
Flow Control (Hardware, None, XON / XOFF)
Either hardware or none. Note that high data rates usually require hardware (RTS/CTS) flow control. XON / XOFF flow control is handled transparently by the BlueSerial adapter. If your system uses XON/XOFF flow control selecting none here is the right choice in most cases.

Connected to...

Automatic Mode
The BlueSerial adapter automatically detects the type of device (DTE or DCE) it is connected to.

Modem
The BlueSerial adapter will configure its serial port to operate when connected to a modem (DCE device) only. If this option has been selected you must connect the BlueSerial adapter to the PC **before** applying power if you need to use the configuration program again.

PC
The BlueSerial adapter will configure its serial port to operate when connected to a PC (DTE device) only.

Settings

The Serial Port Profile allows port settings to be sent over the Bluetooth link. These options define how the BlueSerial adapter will handle those requests.

Ignore from remote
If this option is activated the BlueSerial adapter will ignore any port settings received from a remote device and always use its own settings.
If this option is deactivated it will change its port setting when it receives such a request from a remote device.

Send to remote
The BlueSerial adapter will indicate its port settings to a remote device upon connection set-up.

Fixed RTS/DTR
These options allow you to configure the RS232 control lines to fixed levels. Normally these lines are controlled by the remote device using the Bluetooth protocol. We do not recommend to enable any of these option unless you really know what you're doing.

Favor Latency over speed
When this option is checked the BlueSerial adapter tries to optimize the connection latency instead of data throughput.

Send ACK on LF received
Only to be used for special scanner devices.

AT commands

To enable/configure AT command click on AT commands. For more information on AT commands please refer to section *AT Command usage*.
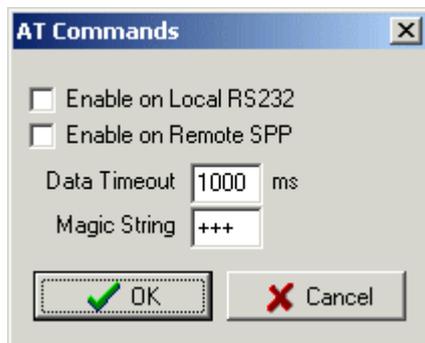
Enable on local RS232
If this option is checked AT commands are possible from the local RS232.

Enable on local RS232
If this option is checked AT commands are possible from a remote bluetooth device.

Data Timeout
This is the time for which there must be no traffic from the UART (or a remote connection) before the escape sequence to switch from data to command mode will be accepted. The default is one second.

Magic String
The escape sequence used to switch from data mode to command mode. Must be three characters long.

5   AT Command usage

AT commands are introduced to configure and control telephone modems. Many users are familiar with AT commands and the are much easier to handle than the native binary configuration commands of the BlueSerial devices.

However, because the BlueSerial device needs to interpret the data stream from the UART (or an active RFCOMM connection) enabling AT commands makes the data transfer slower.

The use of AT commands also implies that the data transfer is not fully transparent anymore. Because an escape sequence is needed to switch between data and command mode. The risk to switch accidently between data and command mode is very low, but it still exists.

Because of this AT command mode is disabled by default.

5.1   General notes about AT commands

All AT commands start with the two characters AT and must be terminated by <cr> (carriage return). All commands are case insensitive, so ati<cr> will be accepted as well as ATI<cr>. Characters send to the device are not echoed back. So if you use a terminal program to enter AT commands you must turn on local echo if you want to see what you type.

All commands will generate a response. The final response will either be

<cr><lf>Ok<cr><lf>   if the command was succesfull

or

<cr><lf>Error<cr><lf>   if the command was not understood or could not
                                          be executed for some reason.

Other responses may be generated depending on the command. All responses are enclosed in <cr><lf> pairs.

5.2   List of available AT commands

Command:	AT
	Does nothing
Responses:	Ok

Command:	ATI
	Get information about the device
Responses:	Firmware Identification, device name and bluetooth address
	Ok
Example:	ATI
	GW_Instruments BlueSerial CI Firmware Revision 1.2.10
	BlueSerial/CL1 00A096130111
	Ok

Command:	ATO
	Switch from command to data mode
Responses:	Ok

Command:	AT+SER=speed[,mode]
	Sets the baud rate and optional mode for the UART. Valid values for speed are 2400 , 4800 , 7200 , 9600 , 19200 , 38400 , 57600 , 115200 , 230400.
	The optional mode is coded by three characters. The first character gives the number of data bits (8), the second the parity (N,E,O) and the third the number of stop bits (1,2).
Responses:	OK
	Because the baud rate is switched immediately it is very likely that this response will not be seen when the command is issued to the local RS232.
	Error
	The requested setting is not supported.
Example:	AT+SER=9600
	will set the uart baud rate to 9600, leaving the mode as it is.
	AT+SER=19200,8E1
	will set the uart baud rate to 19200 and the mode to 8 data bits, even parity, one stop bit.

Command:	AT+SER=?
	Gets the current baud rate and mode settings.
Responses:	BaudRate Mode
	Ok
Example:	ATt+SER=?
	115200 8N1
	Ok

Command:	ATZ
	Resets the device. After responding with Ok the device will reboot. It will be in the default data mode after reboot.
Responses:	Ok

Command: AT+W
                Save current settings to flash. The settings changed by AT+SER, AT+BTPIN,
                AT+BTREMOTE and ATS are only changed for the current session. By
                issuing AT+W the changes are made permanent and are used as the defaults
                after reboot.
Responses: Ok

Command: AT+INQ
                Search for Bluetooth devices in range.
Responses: For each device found its Bluetooth Address and Name enclosed by <cr><lf>
                is send.
                Ok
                When the inquiry is complete.
Example: AT+INQ
                00A09609F9C2 BlueControl
                000272C7E9F2 BIRNE
                000278022EC1 BlueZ (0)
                08000658273A blue2net
                Ok

Command: AT+SDP ADDR
                List services available on the remote device with Bluetooth address ADDR.
Responses: For each usable service found the service type, its server channel number
                (SCN) and name are send.
                Ok
                When service search is complete.
                Error
                When something went wrong (e.g. device could not be connected)
Example: AT+SDP 00A09609F9C2
                SPP 2 BS config
                SPP 1 SPP slave
                Ok

Command: ATD ADDR, SCN
                Connect to the device with the Bluetooth Address ADDR to the service with
                server channel number SCN. Note that this command is only accepted from the
                local RS232.
Responses: Connect
                The connection attempt was successful. The device will switch to data mode
                after the connect message was send.
                Error
                The connection could not be made.
Example: ATD 00A09609F9C2,1
                Connect

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Command: ATH
             Close the Bluetooth connection
Responses: Ok
Example: +++
             Ok
             ATH
             Ok

Command: AT+BTPIN=pin
             Set the local Bluetooth pin (pathkey).
Responses: Ok
             Pin was set.
             Error
             Pin was invalid.

Command: AT+BTPIN=?
             Show local pin
Responses: loacl pin
             OK
Example: AT+BTPIN=123456
             Ok
             AT+BTPIN=?
             123456
             Ok

Command: AT+BTNAME=name
             Set the local name of the device.
Responses: Ok
             Name Set
             Error
             Error in name (e.g. to long)

Command: AT+BTREMOTE=ADDR, SCN
             Set the default remote Bluetooth Address ADDR and channel number SCN for
             auto-connect mode.
Responses: Ok
             Remote device set.
             Error
             ADDR or SCN invalid

Command: AT+BTREMOTE=?
             Show the default remote Bluetooth Address ADDR and channel number SCN
             for autoconnect mode.
Responses: Remote device bluetooth address and scn, both zero if not set (default),
             Ok
Example: AT+BTREMOTE=?
             000000000000,0
             Ok

Command: AT+MAGIC=sss
                Set the three character escape sequence to switch to AT command mode.
Responses: Ok
                Error
                Invalid magic length

Command: AT+MAGIC==?
                Show the escape sequence used to switch to AT command mode.
Responses: magic
                Ok

Command: ATSnn=xx
                Set configuration option nn to value xx
                For possible configuration options see below.
Responses: Ok
                Option set
                Error
                Configuration option number nn or value xx invalid

Command: ATSnn?
                Get configuration option nn
Responses: Configuration option nn value
                Ok
                Error
                Configuration option number nn invalid
Example: ATS3?
                0
                Ok

Configuration Options accessible with ATS

nn = 1 Master Mode
        xx=0   Auto connect disabled
        xx=1   Auto connect enabled

nn = 2 RS2323 Mode   Auto, DRE, DCE (currently read only)

nn = 3 RPN Mode   Configure handling of bluetooth RPN packets.
                      RPN packets are used to tell the remote device the port settings
                      (BaudRate, Parity, Stop Bits) it should use.
        xx = 0   Change local RS232 port settings when RPN received. Don't send own
                      settings to a remote device.
        xx = 1   Ignore RPN received. Don't send own settings to a remote device.
        xx = 2   Change local RS232 port settings when RPN received. Send own
                      settings to a remote device.
        xx = 3   Ignore RPN received. Send own settings to a remote device.

nn = 4   Security mode   Set various security settings.
        xx   This is a bit coded field. However, values must be given as decimal numbers.
        Bit   Name   Description
        0   USE_AUTH   When set, the BlueSerial module requires authorisation
                                        (pairing) to allow a connection.
        1   USE_ENC   When set ,the BlueSerial module uses encrypted data
                                        transfer. Only usable when USE_AUTH is also set.
        2   AUTHORIZE   Not used by the BlueSerial module. Set to 0.
        3   NOT_SCANABLE   When set, the BlueSerial module does not respond to
                                        inquiries and is invisible to other Bluetooth devices.
        4   NOT_PAGABLE   When set, the BlueSerial module can not be connected
                                        by other devices.
        5   NOT_PAIRABLE   When set, no new pairings are accepted. Already paired
                                        devices still can connect.

nn = 5   Hardware Handshake
                When changed it is required to save the new setting (AT+W) and reboot (ATZ)
                the device for the new setting to take affect !!
        xx = 0 Do not use Harware handshake
        xx = 1 Use hardware handshake (default)

nn = 6   Disconnect Reason Master
        xx = 0 Do not disconnect when once connected
        xx = 1 Disconnect when a DTR drop (DTR going from active low to inactive high) is
                detected

nn = 7   Low Latency
        xx = 0 Optimize connection for througput (default)
        xx = 1 Optimize connection for latency

nn = 9   Connect Reason only valid if auto connect (Master Mode) is set to 1
        xx = 0 Only connect when data is to be send
        xx = 1 Connect when DTR rise is detected

nn = 10   Reconnect on connection loss , only valid if Master Mode is set
        xx = 0 Do not reconnect on connection loss
        xx = 1 Try to reconnect on connection loss

nn = 11   Config Channel Disable
        xx = 0 Allow remote configuration (default).
        xx = 1 Disable the remote configuration channel.

nn = 12   AT Command local
        xx = 0 Disable AT commands on local RS232
        xx = 1 Enable AT commands on local RS232

nn = 13   AT Command remote
        xx = 0 Disable AT commands on SPP remote port
        xx = 1 Enable AT commands on SPP remote port

nn = 14   AT Command Data Timeout
    xx = 100..32767   Data timeout for AT command escape sequence detection in
                                          milliseconds.

nn = 15   RS232 Disable when not connected (reserved)

nn = 16   Scan Disable
    xx = 0 Allow page / inquiry scan when connected.
    xx = 1 Disable page / inquiry scan when connected

nn = 17   Tx Class 2
    xx = 0 Transmit power Class 1 operation
    xx = 1 Limit transmit power to class 2 (+4 dBm)

Example for AT command usage

Note: because the BlueSerial Adapter does not echo back characters sent in AT command mode you must enable local echo in your terminal application if you want to see what you type. For Hyperterm this can be done under:

File" -> "Properties" -> "Settings" -> "ASCII Setup" -> "Echo typed characters locally"

Start AT command mode:

```
+++
Ok
```

Search for Bluetooth devices:

```
AT+INQ
000272C7E9F2 02010C -40
000B91FFF5D3 0C0102 -68
08000658273A 040300 -67
Ok
```

Note: the last number gives the receive signal strength.

Ask for services and connect to a service:

```
AT+SDP 000B91FFF5D3
SPP 2 BS config
SPP 1 SPP slave
Ok
ATD 000B91FFF5D3,1
Connect
```

You are now in data mode. All data entered locally will be send to the remote device. Go back to command mode:

```
+++
Ok
```

End the connection

```
ATH
Ok
```

6　Bluetooth Basics

Bluetooth is a manufacturer independent standard for the wireless connection of various electronic devices. It supports data transfer for applications like wireless printing or Internet access as well as voice for applications like headsets or phones.

Bluetooth supports connections between just two or between multiple devices. In the latter case one device, the master, can connect to multiple other devices, the slaves, at the same time. Such a configuration is called a "PICO-Net".

6.1　Radio Transmission

Bluetooth utilizes the license free 2.4 GHz ISM radio band. Because this frequency range is also used by other devices like wireless LAN, most wireless phones, or wireless video transmission devices, Bluetooth implements sophisticated techniques for error free operation:

- A frequency hopping scheme with 1600 frequency changes per second.

- Utilization of state of the art coding techniques with forward error correction.

- Low transmission power with automatic power control.

The low transmission power (about 1/1000 of a mobile phone) limits the range of Bluetooth devices. For the lowest power class (class 3) a range of about 10 meters outside buildings can be expected. Inside buildings the range is usually smaller.
For the highest power class (class 1) a range of up to 100 meters outside and about 30 meters inside buildings is achievable in practice.

6.2　Device Properties

All Bluetooth Devices have a unique identification, the Bluetooth Device Address. This is a twelve digit hexadecimal number usually displayed in a notation like 01-23-45-67-89-AB.
Because this device address isn't very handy, Bluetooth devices also have a name and a device code, which identifies their main function, e.g. printer, modem, mobile phone or computer.

These properties can be discovered from other Bluetooth devices and are used to identify a particular Bluetooth device. However, the device code and the device name are only used for informational purposes. To connect to another Bluetooth device, the only thing that is needed is its device address.

Further, all Bluetooth devices have an internal data base which describes all services offered by a particular device. Other devices can query this data base. The protocol used to query the data base is specified as SDP (Service Discovery Protocol) within the Bluetooth standard.

6.3　Protocols and Profiles

The Bluetooth standard defines various protocols and profiles which specify how Bluetooth devices can communicate. In general the protocols define how information is to be exchanged and the profiles define the type of data to be exchanged. For normal users the protocols used are of less interest. Much more important is some knowledge about the profiles, because they are visible at the user interface level. The following table gives an overview of the Bluetooth

profiles. Because new profiles are added to the Bluetooth standard from time to time there may be profiles not listed here. Further, some rarely used profiles have been omitted.

Profile	Applications
Generic Access (GAP)	Describe device discovery and general security aspects. This profile is not related to a special service but is used by all services.
Service Discovery Application (SDAP)	Describes the access to the service database. Like the GAP profile it is used by other services.
Serial Port(SPP)	Basic profile which describes the emulation of a serial port over Bluetooth . Is used by a number of other profiles for data communication.
Headset Hands Free (*)	Used for wireless headsets
Dial Up Networking (DUN)	Used for modems, either analogue or ISDN, as well as mobile phones. Uses the SPP for data communication.
Fax	Used to send and receive Faxes. Often found in combination with DUN. Uses the SPP for data communication.
LAN Access (LAN)	Used for network access over a PPP connection. Uses the SPP for data communication.
Generic Object Exchange (GOEP)	Base profile for OBEX based services. Uses the SPP for data communication.
Object Push	OBEX service used to exchange address book information and business cards, e.g. between a mobile phone and a PC.
File Transfer	OBEX service used to exchange general files.
Synchronization	OBEX service to synchronies address book information, notes, calendar information and messages between, for example, between a PDA and a PC. Often realized by special software supplied by the PDA manufacturer which directly uses the SPP and that will also function over a cable connection.
Hardcopy Cable Replacement (HCRP) (*)	Parallel port emulation over Bluetooth. Mainly intended for printers and scanners.
Personal Area Network (PAN) (*)	Direct (TCP/IP based) network connection over Bluetooth. More flexible than the LAN profile.
Common ISDN Access (*)	Used for ISDN applications over Bluetooth. More flexible than the DUN and FAX profiles.
Human Interface Device (HID) (*)	Used to connect mice, keyboards, joysticks and similar devices.

The profiles marked with an (*) are not part of the original Bluetooth 1.1 specification and partly not finally standardized.

6.4   Establishing a Bluetooth Connection

Even though Bluetooth has a lot of different applications, the basic steps to establish a Bluetooth connection the first time are more or less the same:

- Searching for the device to connect to. This so called inquiry discovers the Bluetooth address, the device code (class) and the name of the device you want connect to.

- Asking for available services and selection of the service to use.

- Pairing of the devices. This step is optional and not required if no security options are enabled. During this step the entry of a PIN code (or passkey) on one or both devices is required. Using this PIN code a so called Link Key is generated. This link key is stored in both devices and used to authenticate the devices on subsequent connections.

The information collected during these three steps are now stored within the devices and used whenever a connection is to be created between them. In most cases, the initial establishment of a Bluetooth connection will be initiated by the device that will create the connection later. This device will be the master of the Bluetooth connection.

Devices which communicate over Bluetooth will always have one of two roles: master or slave.
A master
      - creates a connection (paging).
      - controls which slave is allowed to send data.
      - can create additional connections while others are active.

A slave
      - waits for the connection request from a master.
      - can not create or accept additional connection while a connection is active.

Depending on the application the device roles can be
      a) fixed,
      b) fixed for the duration of a single connection,
      c) dynamically change while a connection is active.

An example for case a) is the connection between a computer and a printer. The computer always creates a connection when some document is to be printed.

An example for case b) is the connection between a mobile phone and a headset. If there is an incoming call, the phone will connect to the headset. as the master. If the user wants to make a call, he will press some button on the headset, which will connect to the phone and allow the user to voice dial a number.

An example for case c) is a network access point for multiple users. The first device connects to the access point as a master. However, if it keeps its master role, no further connections to the access point (now a slave) are possible. To allow other devices to connect to the access point, the devices will change the roles. Now the access point is a master and can accept additional connections.

6.5   Security Aspects

The Bluetooth standard defines various security options. There are options to prevent unauthorized usage of a device and options to prevent monitoring a connection.

The options to prevent unauthorized usage may not be all implemented in a given device. Possible options are:

- Bluetooth devices may be made invisible. This makes it impossible for other devices to get their Bluetooth address. Only devices which already know the Bluetooth address of an invisible device can connect to this device.

- Paring can be disallowed.

- The user must authorize every connection.

- A connection is only accepted from paired devices (authentication).

To prevent monitoring a connection it is also possible to enable encryption for a connection. This is only possible if authentication is enabled, too.

7   FAQ

Question: Windows asks for a driver for my BlueSerial adapter. Where can I get it ?

Answer: No driver is needed for the BlueSerial Adapter. When Windows detects new hardware it always asks for a driver. Just cancel driver installation.

Question: I can connect to the BlueSerial adapter but do not receive any data. What is wrong ?

Answers: Verify that your serial port settings are correct.

Verify that your device supports hardware flow control. Try setting flo control to none.

Sometimes the automatic device detection (connected to... in the serial port settings) does not work reliable. If your device is normally connected by a 1:1 cable try setting the adapter to "connected to modem".

Question: The configuration program does not find my BlueSerial adapter ??

Answers: Make sure you don't have a Bluetooth connection to your adapter. If a Bluetooth connection is active the adapter does not respond to configuration commands.

The adapter is configured as a master and tries to connect to the slave. Retry the adapter search several times.

8   Technical Specifications

Radio Transmission	
Frequency Range	2.402 - 2.480 GHz
Transmit Power	+ 16dBm maximum (Bluetooth Class 1)
Input Sensitivity	better than -80 dBm
Modulation	GFSK Modulation with frequency hopping.
Connectors	
RS232	SUB-D 9 Pin, female automatic DTE/DCE detection 1200 Baud to 230 kBaud Baud rate, Parity, Data Bits fixed or over Bluetooth protocol.
Antenna	MMCX 50 Ohm
Power Supply	1.3 mm power connector, Plus on inner pin 4..10 Volt, 120 mA (max)
Bluetooth	
Version	2.1
Protocols	L2CAP, SDP, RFCOMM
Bluetooth Profiles	Generic Access, Service Discovery, Serial Port, LAN Access, Dial Up Networking, FAX
Device Role	Slave and/or Master
Role Switch	supported
General	
Dimensions	32x57x14mm

8.1   Serial Connector Pin Out (DB9F = Female, DB9M = Male)
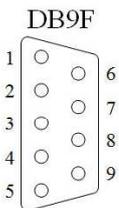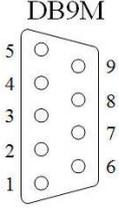
Pin no.	Signal name	Direction when connected to a DTE (PC or Notebook)	Direction when connected to a DCE (Modem or Peripherals)
1	CD	output	input
2	RX	output	input
3	TX	input	output
4	DTR	input	output
5	Ground	-	-
6	DSR	output	input
7	RTS	input	output
8	CTS	output	input
9	RI	Optional power*	Optional Power*

* Pin 9 is used to support the BlueSerial adapters and modules with optional power since versions 2007. Note: PC/Notebooks do not offer power at pin 9 as a standard.

8.2   Mechanical Dimensions Internal Mounting Version
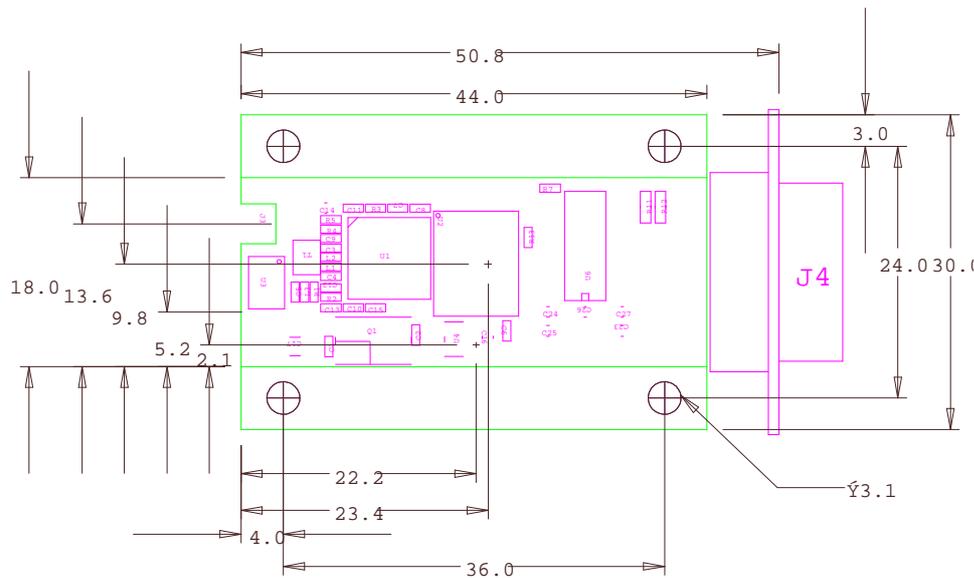
(all dimensions in mm)

8.3   Power Supply through Serial Port Pin 9 (Standard since 2007)

For internal mounting or non standard applications it is possible to supply power to the BlueSerial adapter through pin 9 of the SUB-D connector. This pin is normally used for "Ring Indicator" (RI). If it is used for power supply the RI signal is not available.

RI Option
If R11 (0 Ohm) is installed.
Pin 9 is Signal RI.

Power Option
If R12 (0 Ohm) is installed Pin 9 is power supply. (Standard installed since 2007)
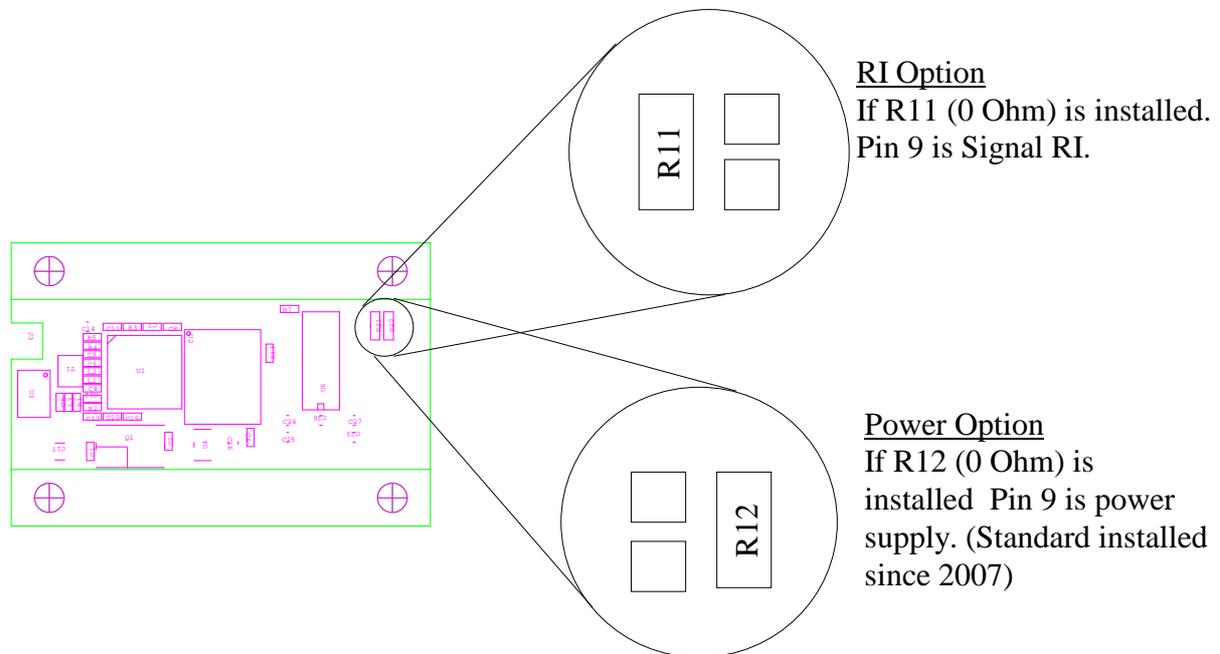
Important

R11 and R12 shall **never** be installed simultaneously.
Since 2007 we deliver the BlueSerial adapters with Pin9 power option installed, because the Ring Indicator signal is used in some rare modem enviroments only.