BRADATECH

# Bluetooth Serial Adapter for RS-232


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# 1 Introduction

The btBlueSerial Bluetooth serial port adapter makes it easy to turn any device with an RS232 compatible serial port into a Bluetooth device.

The adapter 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 btBlueSerial Bluetooth serial port adapter.

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

# 2 Getting Started

## 2.1 Box content

The following items are included with your btBlueSerial adapter:

- btBlueSerial Bluetooth adapter for DTE (or DCE) serial port
- CD containing the configuration software
- *No Hardware Handshaking* adapter
- *Programming adapter* (for DCE (Male) adapter version only)
- This user manual

## 2.2 Standard Configuration

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

- Operating mode: Bluetooth slave, visible, connectable.
- No authentication.
- Serial port 115kBit / second, 8 data bits, 1 stop bit, hardware handshaking enabled

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

### 2.3 Status Indicator

An LED (blue) provides monitoring of the btBlueSerial adapter operation mode.

| LED Indication | Mode | Bluetooth Connection |
|---|---|---|
| Single flash | DATA | NONE |
| Slow Flash (1Hz) | COMMAND | NONE |
| Quick Flash (2Hz) | COMMAND | ACTIVE |
| LED Off Steady | DATA | NONE |
| LED On Steady | DATA | ACTIVE |

# 3 Adapter Configuration

The configuration software included with the btBlueSerial adapter allows you to change operating modes. The program runs on any standard PC with a Windows operating system (Windows 95 or higher).

The installation of the software should begin automatically when inserting the CD or double click the setup.exe program. The configuration of the adapter must be performed via an available serial port.

### 3.1 Starting the Configuration over a Serial Port

If you have purchased the **DTE model** of the btBlueSerial adapter, connect the port dongle labelled "*No Hardware Handshake*" and ensure the arrow near the Bluetooth logo points towards the BlueSerial adapter.

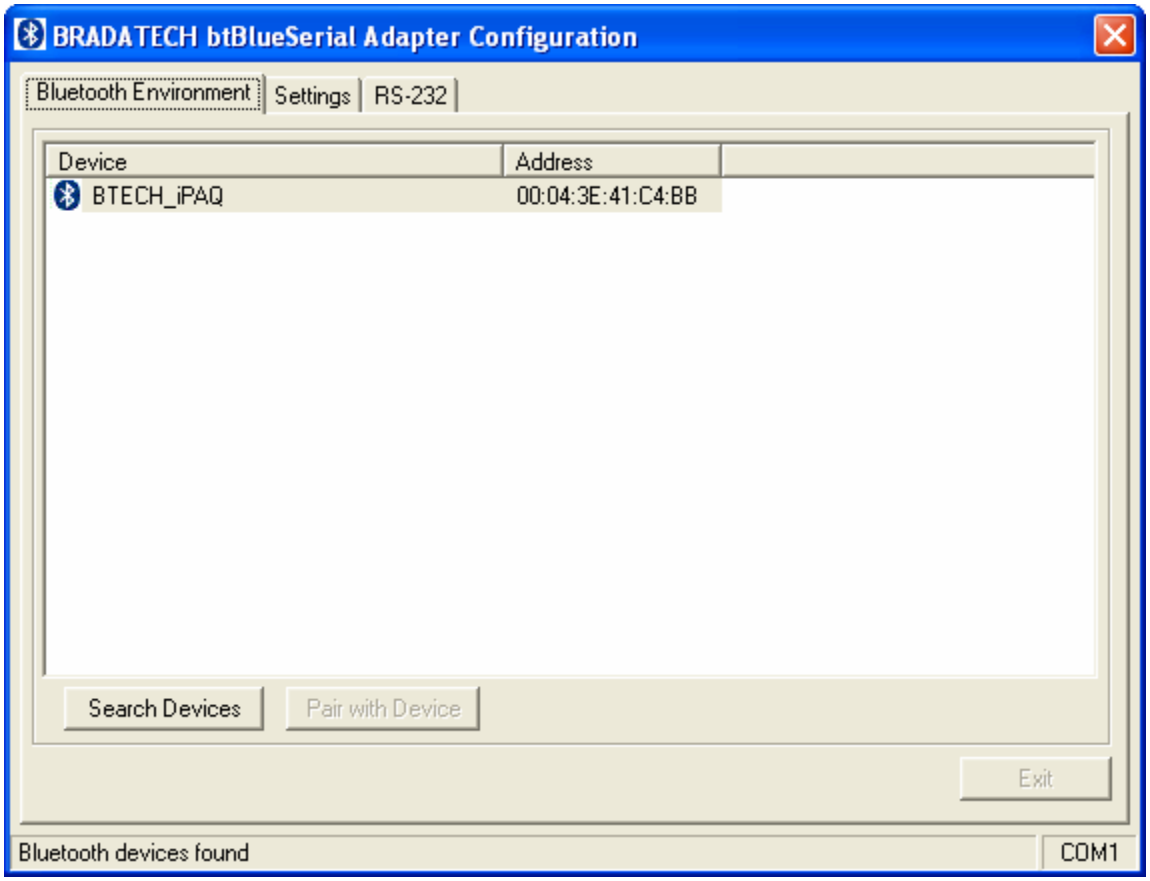
If you have purchased the **DCE model** of the btBlueSerial adapter, connect the port dongle labelled "*PC Programming Adapter*" and ensure the arrow near the Bluetooth logo points towards the BlueSerial adapter.

Connect the btBlueSerial adapter to a serial port on your PC and connect the battery before running the btBlueSerialConfig software. When the program starts, it searches for a btBlueSerial adapter connected to a serial port (either COM 1or COM2). The software attempts to connect with an 115kbaud rate by default.

You can manually select the appropriate port and baud rate if the btBlueSerial adapter cannot be found.

## 3.3 Using the Configuration Software

After starting the software, the *Bluetooth Environment* tab sheet will be displayed. The status line displays the current mode of the configuration software and the serial port used to communicate with the btBlueSerial adapter will be displayed (COM1 in the example below). The software will automatically retrieve the BlueSerial device's settings. You may choose to search for other Bluetooth devices in range if you want to use the btBlueSerial adapter as a Bluetooth Master (see section *Bluetooth Master Operation*).




If you want to check or modify the configuration settings of your btBlueSerial adapter click the *Setting* tab sheet. Please note that any changes on *Settings* tab only become effective when you exit the configuration program.

## 3.4 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:

**Slave mode**

The btBlueSerial adapter is in "listen" mode and waits for other devices to connect to it. However, if other devices attempt to pair with the btBlueSerial adapter, they must enter the PIN specified on the settings screen as described below.

**Discoverable** (available with 1.16 firmware only)

The btBlueSerial adapter is in "listen" mode, waits for other devices to connect and broadcasts its device name when remote Bluetooth devices browse for other devices within range. If you would like your btBlueSerial adapter to be *unseen* by remote Bluetooth devices, uncheck the "Discoverable" checkbox.

**PIN**

This code must be entered on a remote device that wants to **pair** with the btBlueSerial adapter regardless of the *Use Authentication* setting. With *Use Authentication* set (checked), any attempt to connect by a remote device will require the same PIN to be entered. The default is no PIN (*Use Authentication* unchecked).

**Remote Device Address**

The address of the device the btBlueSerial adapter tries to connect to as a master. It is only displayed if the installed device is in range and connected. If not, "Not Connected" will be displayed. The user must then establish a relationship by searching for other devices (*Bluetooth Environment)* or manually entering the remote device's address.

**Master mode**

The btBlueSerial adapter only tries to connect to a remote device specified with the address mentioned above as a master when in this mode.

### RS232 Settings Tab

To configure the serial port settings, click the RS232 Settings tab. You must click the *Commit RS-232* button to save changes. Setting the adapter to a baud rate of 230400baud (230kbaud) requires the use of AT style commands performed using HyperTerminal. Since most PC serial ports cannot communicate beyond 115kbaud, our configuration utility cannot be used to set the adapter with the 230kbaud rate. Please refer to the *BlueSerial_Configuration_using_AT_commands.pdf* document on the CD.

# 4 Bluetooth Slave Operation

As a Bluetooth slave, the btBlueSerial adapter will not attempt to connect to a remote device. The serial port settings and the security settings (if you want to enable authentication using a PIN) normally have to be configured.

# 5 Bluetooth Master Operation

The btBlueSerial adapter can connect to only one remote device as a master.

To configure the adapter as Bluetooth Master, click the *Bluetooth Environment* tab. If the device you want to connect to is not displayed click on *Search Devices*. Highlight that device and right-click, select *Pair with This Device* or click the *Pair with Device* button.

This is used to pair with the remote device. If the remote device requires a PIN you must enter the same PIN in the settings window. If no PIN is required, uncheck the *Use Authentication* checkbox. After initiating the *pair with device* function, the configuration program will change to the *Settings* tab sheet and fill-in the *Remote Device Address* entry. The programming of the BlueSerial Adapter in master mode will be made when you exit the configuration software.

The btBlueSerial adapter will try to connect to the device just installed as soon as power is applied to it. The connection, once established, will remain open until the btBlueSerial adapter's power is removed or the connected remote device is turned off. If the remote device is turned on again, the btBlueSerial adapter will attempt to re-initiate the connection.

# 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 remote 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 annotation 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.

Furthermore, all Bluetooth devices have an internal data base which describes all services offered by a particular device. Other devices can query this database. The

protocol used to query the database 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 protocol:

- 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 are 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 are allowed to send data.
- Can create additional connections while others are active.

A slave

- Waits for the connection request from a master.
- Cannot create or accept additional connections while a connection is active.
- Depending on the application, the device roles can be
    - Fixed,
    - Fixed for the duration of a single connection,

- Dynamically change while a connection is active.

An example for *fixed* 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 *fixed for the duration of a single connection* 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 *dynamically change while a connection is active* 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.

## 6.4 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:

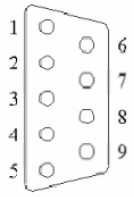
- Pairing can be disallowed.
- The user must authorize every connection.
- A connection is only accepted from paired devices (authentication).

# 7 Technical Specifications

**Technical Specifications**

| | |
|---|---|
| **Radio Transmission** | |
| Frequency Range | 2400MHz to 2483.5MHz |
| Transmit Power | Class 1 (max 20dBm) |
| Input Sensitivity | -84 to –20dBm |
| Modulation | GFSK, 1Mbps, 0.5BT 1600 hops/sec, 1MHz channel |
| **Connectors** | |
| RS232 | SUB-D 9 Pin, female or male (DTE/DCE) connector available<br>1200 Baud to 230 kBaud<br>Baud rate, parity, data bits set using included configuration software |
| Antenna | Internal SMD |
| Power Supply | 9VDC Battery Connector |
| **Bluetooth** | |
| Version | 1.1 |
| Bluetooth Profiles | Generic Access, Service Discovery, Serial Port, SPP compatible |
| Device Role | Slave and/or Master |
| **General** | |
| Dimensions | 45x60x12mm |

**Serial Connector Pin Out**




| Pin no. | Signal name | Direction when connected to a DTE (PC) | Direction when connected to a DCE (Modem) |
|---|---|---|---|
| 1 | CD | no connection | no connection |
| 2 | RX | output | input |
| 3 | TX | input | output |
| 4 | DTR | no connection | no connection |
| 5 | Ground | - | - |
| 6 | DSR | no connection | no connection |
| 7 | RTS | input | output |
| 8 | CTS | output | input |
| 9 | RI | no connection | no connection |