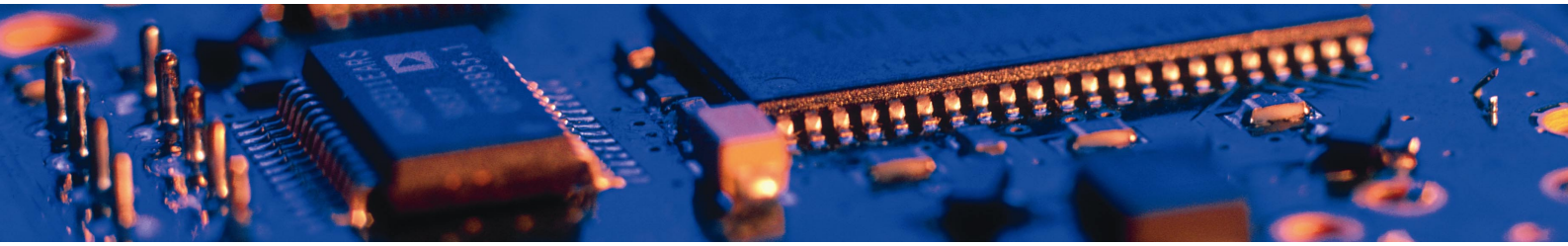

Serial Port Adapter™

2nd Generation

User Manual 2.11

connectBlue

Serial Port Adapter™ 2nd Generation

User Manual

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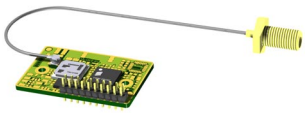
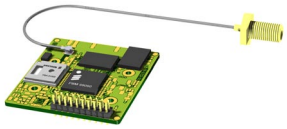
Contents

1 Introduction

Congratulations on your purchase of a connectBlue Serial Port Adapter™. The Serial Port Adapter can be used as a component in many types of systems allowing them to communicate wirelessly with other Bluetooth products such as PC-cards, laptops, handheld computers, mobile phones and other Serial Port Adapters. The Serial Port Adapter is a suitable component in new products as well as in existing products. A wide range of models is available to cover a wide range of usage areas.

This manual covers the models OEM Serial Port Adapter 13i, OEM Serial Port Adapter 13x, OEM Serial Port Adapter 33i, OEM Serial Port Adapter 33x, Serial Port Adapter 12i, Serial Port Adapter 32i, Serial Port Adapter 33i, Serial Port Adapter 33c, and Rugged Serial Port Adapter 32s.

Brief overview of the features of the different Serial Port Adapter models:

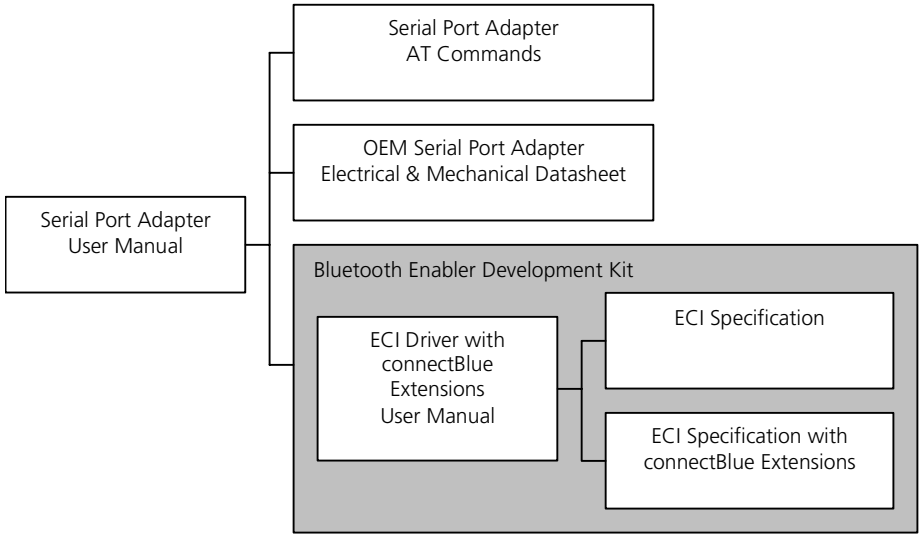
OEM Serial Port Adapter 13i	No housing, short range (0 dBm), logic-level UART and RS232, internal antenna, 3.3-6 VDC power supply.	
OEM Serial Port Adapter 13x	No housing, short range (0 dBm), logic-level UART and RS232, external antenna, 3.3-6 VDC power supply.	
OEM Serial Port Adapter 33i	No housing, long range (20 dBm), logic-level UART and RS232, internal antenna, 3.3-6 VDC power supply.	
OEM Serial Port Adapter 33x	No housing, long range (20 dBm), logic-level UART and RS232, external antenna, 3.3-6 VDC power supply.	
Serial Port Adapter 12i	Plastic housing, short range (0 dBm), RS232 (DSUB), internal antenna, 5 VDC power supply.	
Serial Port Adapter 32i	Plastic housing, long range (20 dBm), RS232 (DSUB), internal antenna, 5 VDC power supply.	

Serial Port Adapter 33i	Plastic housing, long range (20 dBm), RS232/RS422/RS485 (terminal block), internal antenna, 8-30 VDC power supply.	
Serial Port Adapter 33c	Plastic housing, long range (20 dBm), RS232/RS422/RS485 (terminal block), antenna on a cable, 8-30 VDC power supply.	
Rugged Serial Port Adapter 32s	Aluminum housing (IP65), long range (20 dBm), RS232/RS422/RS485 (DSUB), stub antenna, 8-30 VDC power supply.	

Please read the chapter "Guidelines for Efficient and Safe use" before using your Serial Port Adapter.

1.1 Related Documents

- The **Serial Port Adapter User Manual**, this document, contains information on how to use the Serial Port Adapter. Study this document before moving on to the others.
- The **Serial Port Adapter AT Commands** document contains a description of the AT commands supported in the Serial Port Adapter. It also contains information on how to use the AT commands to create Bluetooth applications.
- The **OEM Serial Port Adapter Electrical & Mechanical Datasheet** contains important information about the OEM Serial Port Adapter. Read this document if you are using the OEM Serial Port Adapter.
- The **Bluetooth Enabler Development Kit** is required when using the ECI functionality embedded in the Serial Port Adapter.
    - The **ECI Driver with connectBlue Extensions User Manual** contains a description of the ECI functionality available in the Serial Port Adapter. It also contains information on how to use the ECI Driver to create Bluetooth applications. If you are going to use the ECI protocol in your application, study this document.
    - The **ECI Specification** and the **ECI Specification with connectBlue Extensions** contain detailed descriptions of the ECI protocol. These documents should be used as a reference when reading the ECI Driver with connectBlue Extensions User Manual.



Picture 1. Serial Port Adapter documents

1.2 What is Bluetooth Wireless Technology?

Bluetooth allows compatible portable and stationary communications devices to communicate without using cables. The technology is based on a radio link that offers fast and reliable transmission of voice and data information. It doesn't require a line-of-sight connection in order to establish and maintain communication. The Bluetooth wireless technology uses a globally available frequency range intended to ensure communication compatibility worldwide. Bluetooth is available in mobile phones, laptops, handheld computers, industrial devices, cars, and more.

1.3 How can I use my Serial Port Adapter?

Your Serial Port Adapter communicates with its host system using RS232, RS422, or RS485. The OEM Serial Port Adapters can also use logic-level UART to communicate with its host system.

Once connected to its host system and configured, the Serial Port Adapter can communicate, using Bluetooth, with a wide range of other Bluetooth enabled devices such as other Serial Port Adapters, mobile phones, handheld computers and laptops.

Picture 2. The Serial Port Adapter connected to the controller communicates wirelessly with a Bluetooth enabled Laptop.

The Serial Port Adapter can initiate as well as accept connections to and from other Bluetooth devices. When initiating a connection to another device, the Serial Port Adapter acts as a client. When accepting a connection from another device, the Serial Port Adapter acts as a server. In most cases the Serial Port Adapter communicates with one Bluetooth device at a time, but it is possible for the Serial Port Adapter to simultaneously communicate with several Bluetooth devices. This feature is called Wireless Multidrop™ and is explained in more detail in section 5.2.

1.4 Getting Started

Before using your Serial Port Adapter you must:

- Install your Serial Port Adapter. For more information, see chapter 2.
- Configure your Serial Port Adapter. For more information, see chapter 4.

2 Installation

Before using your Serial Port Adapter it must be connected to its host system and it must be connected to a power supply. The installation differs slightly from model to model.

This chapter describes how to install your Serial Port Adapter.

2.1 OEM Serial Port Adapters

If you are using the OEM Serial Port Adapter please refer to the "Electrical & Mechanical Datasheet" for installation instructions. The latest "Electrical & Mechanical Datasheet" can be downloaded from www.connectblue.se.

2.2 Serial Port Adapter 12i, Serial Port Adapter 32i

2.2.1 Mounting

Picture 3. The Serial Port Adapter can be mounted using the mounting holes.

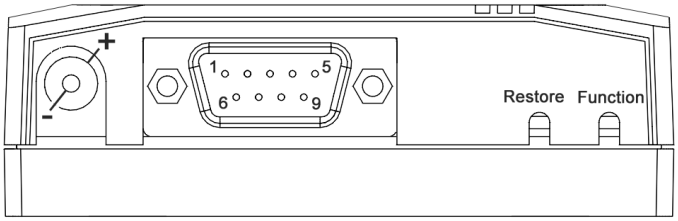
Note that these Serial Port Adapter models have internal antennas. Therefore they cannot be mounted inside a shielded enclosure.

2.2.2 Power Supply

Use the power adapter provided with the product.

If you are not using the power adapter provided with the product you must use a DC plug 2,1 mm centerpin (-) connector.

The product shall have a supply voltage of 5 VDC on the power connector.



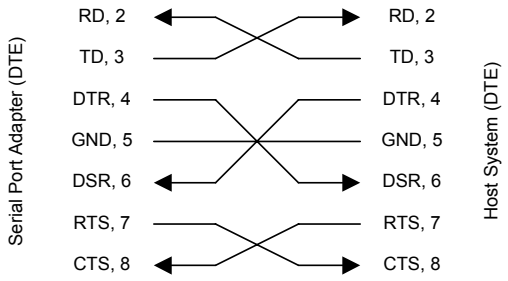
Picture 4. DC plug 2,1 mm centerpin (-) and 9-pin DSUB male.

2.2.3 RS232

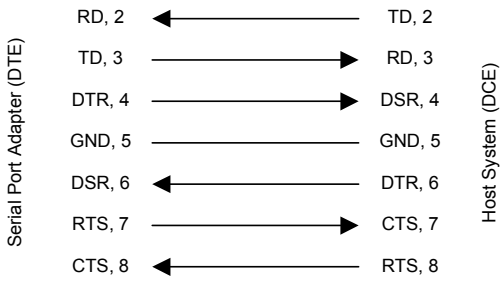
RS232 male 9-pin DSUB:

- Pin 1: NC, no connect
- Pin 2: RD, input, receive data
- Pin 3: TD, output, transmit data
- Pin 4: DTR, output, data terminal ready
- Pin 5: GND, ground
- Pin 6: DSR, input, data set ready
- Pin 7: RTS, output, request to send
- Pin 8: CTS, input, clear to send
- Pin 9: NC, no connect

These models are designed to operate as a DTE (Data Terminal Equipment). When connecting the Serial Port Adapter to a DCE (Data Communication Equipment), e.g. a modem, a regular modem cable, straight cable, shall be used. When connecting the Serial Port Adapter to another DTE, e.g. a PC, a crossover serial cable must be used. The crossover cable must have TD and RD crossed (pins 2-3 and 3-2), RTS and CTS crossed (pins 7-8 and 8-7) and optionally DTR and DSR crossed (pins 4-6 and 6-4).



Picture 5. Crossover cable

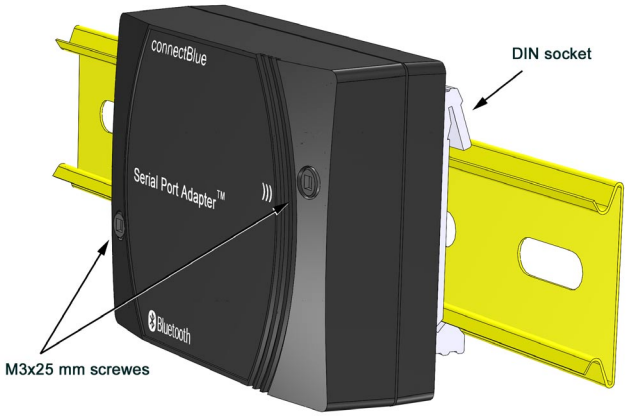


Picture 6. Straight cable

2.3 Serial Port Adapter 33i, Serial Port Adapter 33c

2.3.1 Mounting

Picture 7. The Serial Port Adapter can be mounted using the mounting holes.

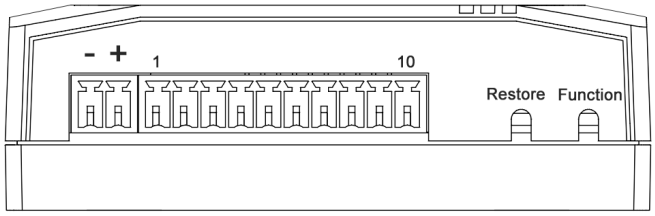


Picture 8. The Serial Port Adapter can be mounted on a DIN socket using the mounting holes.

Note that the Serial Port Adapter 33i has an internal antenna. Therefore it cannot be mounted inside a shielded enclosure.

Serial Port Adapter 33c must only be used with the antenna provided with the product. Using another antenna will violate the regulatory type approval. The antenna cannot be mounted inside a shielded enclosure.

2.3.2 Terminal Block



Picture 9. COMBICON 3.5 mm pitch header

2.3.3 Power Supply

The product shall have a supply voltage of 8-30 VDC on pin marked with + and – in the picture above.

2.3.4 RS232

When connecting the Serial Port Adapter to a host system:

- RD shall be connected to TD of the host system and vice versa.
- CTS shall be connected to RTS of the host system and vice versa.
- Optionally, DSR shall be connected to DTR of the host system and vice versa.

COMBICON 3.5 mm pitch header:

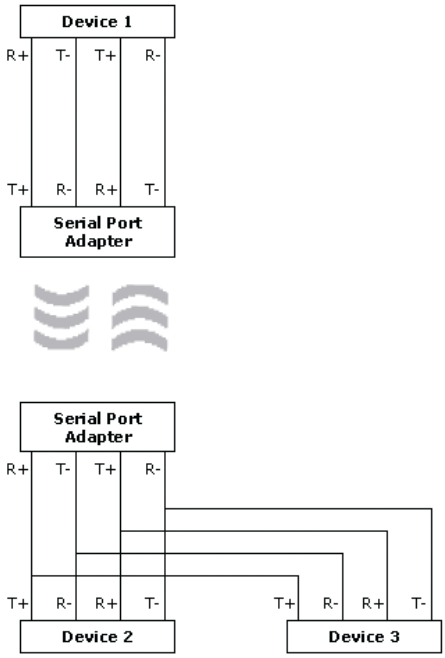
- Pin 1: GND, ground
- Pin 2: UART 1, TD, output, transmit data
- Pin 3: UART 1, RD, input, receive data
- Pin 4: not used
- Pin 5: UART 1, DSR, input, data set ready
- Pin 6: UART 1, CTS, input, clear to send
- Pin 7: UART 1, RTS, output, request to send
- Pin 8: UART 1, DTR, output, data terminal ready
- Pin 9: UART 2, not used
- Pin 10: UART 2, not used

2.3.5 RS422

COMBICON 3.5 mm pitch header:

- Pin 1: GND, ground
- Pin 2: not used
- Pin 3: T-
- Pin 4: R-
- Pin 5: R+
- Pin 6: T+
- Pin 7: not used
- Pin 8: not used
- Pin 9: not used
- Pin 10: not used

For four-wire RS422 multidrop, the following connection setup shall be used:

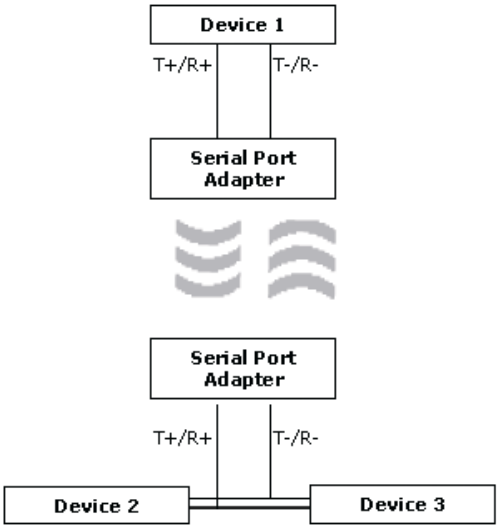


Picture 10. Four-wire RS422 connection setup

Note: The definition of R+/R-, T+/T-may vary between manufacturers.

2.3.6 RS485

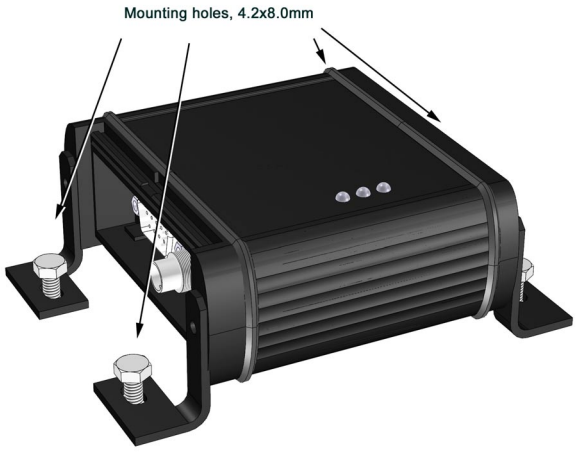
In the case of RS485, the same pinning as for RS422 is used, except that pins T- and R- must be connected externally and pins T+ and R+ must be connected externally to produce the signals T-/R- and T+/R+. For two-wire RS485 multidrop, the following connection setup shall be used:



Picture 11. Two-wire RS485 connection setup

2.4 Rugged Serial Port Adapter 32s

2.4.1 Mounting

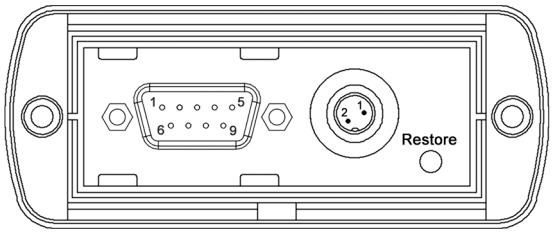


Picture 12. The Serial Port Adapter can be mounted using the mounting holes.

Rugged Serial Port Adapter 32s must only be used with the antenna provided with the product. Using another antenna will violate the regulatory type approval. The product cannot be mounted inside a shielded enclosure.

2.4.2 Power Supply

The product shall have a supply voltage of 8-30 VDC on pin 1 (-) and 2 (+) on the power connector. Use a female power connector 712 series from Binder.



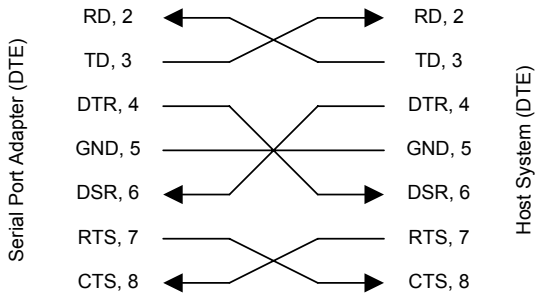
Picture 13. DSUB serial connector (male).

2.4.3 RS232

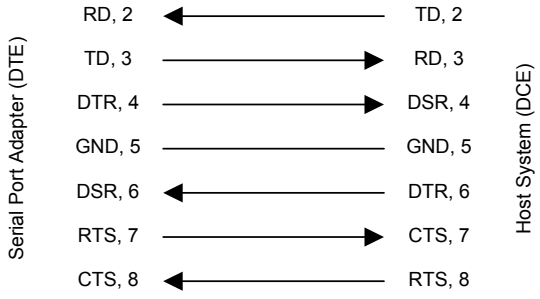
This model supports RS232 with a male 9-pin DSUB:

- Pin 1: NC, no connect
- Pin 2: RD, input, receive data
- Pin 3: TD, output, transmit data
- Pin 4: DTR, output, data terminal ready
- Pin 5: GND, ground
- Pin 6: DSR, input, data set ready
- Pin 7: RTS, output, request to send
- Pin 8: CTS, input, clear to send
- Pin 9: NC, no connect

These models are designed to operate as a DTE (Data Terminal Equipment). When connecting the Serial Port Adapter to a DCE (Data Communication Equipment), e.g. a modem, a regular modem cable, straight cable, shall be used. When connecting the Serial Port Adapter to another DTE, e.g. a PC, a crossover serial cable must be used. The crossover cable must have TD and RD crossed (pins 2-3 and 3-2), RTS and CTS crossed (pins 7-8 and 8-7) and optionally DTR and DSR crossed (pins 4-6 and 6-4).



Picture 14. Crossover cable



Picture 15. Straight cable

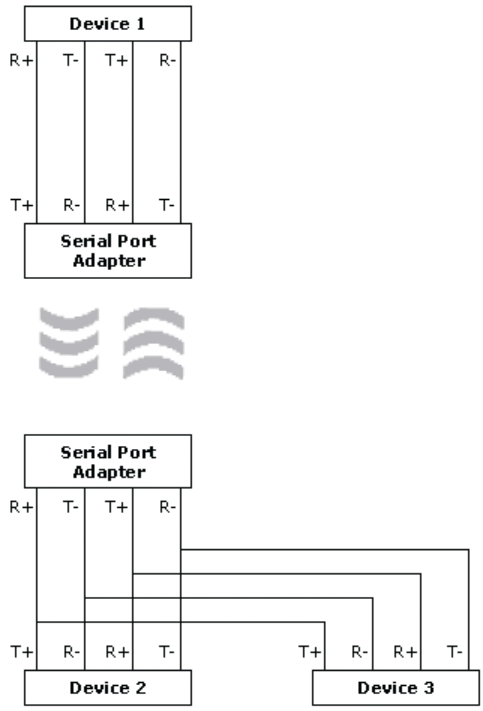
2.4.4 RS422

In this model, the same DSUB connector is used when using RS232, RS422 and RS485. However, in the case of RS422 and RS485, the pins have different meanings compared to RS232.

In the RS422 case, the following pinning is used:

- Pin 1: R-, input, receiver
- Pin 2: T-, output, transmitter
- Pin 3: NC, no connect
- Pin 4: NC, no connect
- Pin 5: NC, no connect
- Pin 6: R+, input, receiver
- Pin 7: NC, no connect
- Pin 8: T+, output, transmitter
- Pin 9: NC, no connect

For four-wire RS422 multidrop, the following connection setup shall be used:

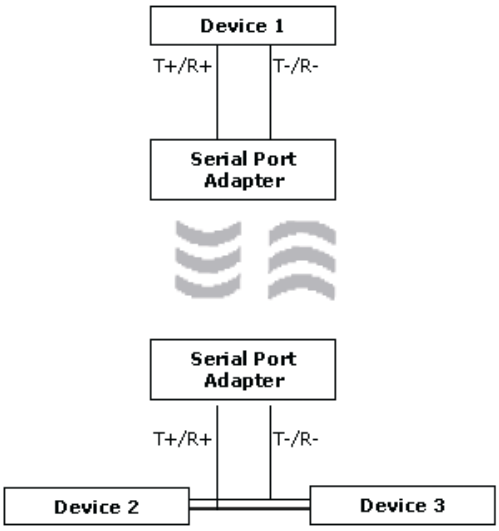


Picture 16. Four-wire RS422 connection setup

Note: The definition of R+/R-,T+/T- may vary between manufacturers.

2.4.5 RS485

In the case of RS485, the same pinning as for RS422 is used, except that pins T- and R- must be connected externally and pins T+ and R+ must be connected externally to produce the signals T-/R- and T+/R+. For two-wire RS485 multidrop, the following connection setup shall be used:



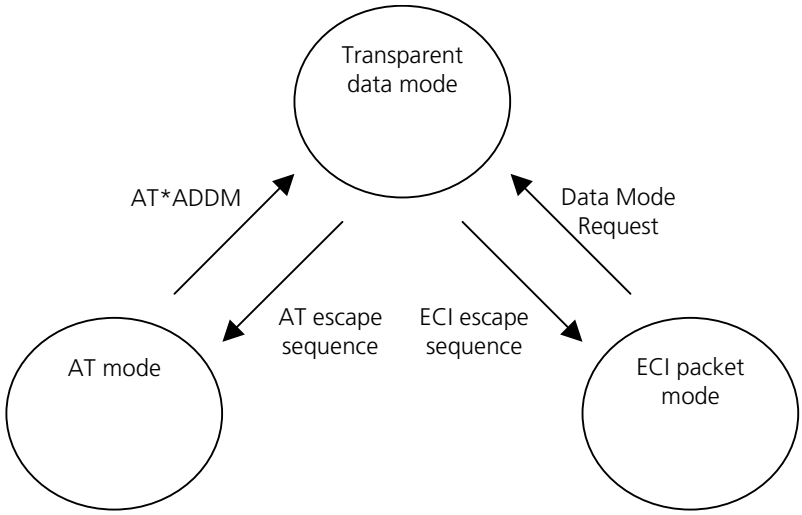
Picture 17. Two-wire RS485 connection setup

3 Modes

The Serial Port Adapter can operate in three different modes:

- **Transparent data mode**. In this mode, data sent to the Serial Port Adapter from the host system via the serial interface is forwarded to the connected remote device. Data received from the connected remote device is forwarded to the host system via the serial interface. In this mode the LED indicator is green if no connection exists, blue if there is a connection and purple if there is an ongoing connection attempt.
- **AT mode**. In this mode the host system is able to configure and control the Serial Port Adapter using AT commands. In this mode the LED indicator is orange if no connection exists, blue if there is a connection and purple if there is an ongoing connection attempt.
- **ECI packet mode**. In this mode the Serial Port Adapter is configured and controlled using the ECI protocol. The configuration wizard is an example of a host application using the ECI protocol. In this mode the LED indicator is orange if no connection exists, blue if there is a connection and purple if there is an ongoing connection attempt. For more information on the ECI protocol, see section 4.3.

The Serial Port Adapter starts in transparent data mode.



Picture 18. Serial Port Adapter modes

4 Configuration

Before using your Serial Port Adapter it must be configured. Three different methods can be used to configure the Serial Port Adapter:

- Using the PC-based configuration wizard.
- Using AT commands.
- Using the ECI protocol and the Bluetooth Enabler Developers Kit.

All three methods can be used via the serial interface (UART) and via Bluetooth.

4.1 Using the Configuration Wizard

4.1.1 Installation

You must install the configuration wizard from the Serial Port Adapter CD onto your hard disk on your PC; you cannot run the program from the CD.

How to install the software:

1. Insert the Serial Port Adapter CD in your computer. If the installation program does not start automatically run the setup.exe file from the Serial Port Adapter CD.
2. Follow the instructions in the installation utility and when finished press Finish.

When the installation has finished successfully you find the configuration wizard in the program menu under **Start/Programs/connectBlue/Serial Port Adapter Wizard – 2nd Generation**.

4.1.2 Starting and Exiting the Configuration Wizard

After installing the configuration wizard, it can be started by selecting the program icon under **Start/Programs/connectBlue/Serial Port Adapter Wizard – 2nd Generation**.

When starting the configuration wizard you are requested to select which COM-port to use when configuring your Serial Port Adapter. The selected COM-port must be configured before you can proceed with the configuration. The Serial Port Adapter uses the serial interface settings it was last configured to use. Make sure that you use the same settings when configuring the COM-port.

If you are uncertain of which settings to use you can restore the default serial interface settings. For more information see 4.5.

After you have finished the configuration of your Serial Port Adapter you must exit the configuration wizard. When exiting the configuration wizard the Serial Port Adapter exits configuration mode and becomes ready to send and receive data. The LED indicator on the Serial Port Adapter will then become green.

Note: The COM-port you select is only used while the configuration wizard is running. Once configured your Serial Port Adapter can be used with any COM-port or moved to another host system.

4.1.3 Configuring the Serial Interface

In the configuration wizard you can select baud rate, number of data bits, parity, stop bits, flow control and serial interface type (RS232/RS422/RS485). Once configured, your Serial Port Adapter remembers these serial interface settings, even if the Serial Port Adapter is powered down.

Note: When selecting 5, 6, or 7 data bits the new serial settings are not applied until the Serial Port Adapter is restarted. After selecting 5, 6, or 7 data bits exit the configuration wizard and restart the Serial Port Adapter. After 5, 6, or 7 data bits have been selected the configuration wizard cannot be used. This is because the configuration wizard can only be used with 8 data bits. To use the configuration wizard again, restore the default serial interface settings and enter the configuration wizard using the default settings. For more information see 4.5.

Note: When selecting a baud rate higher than 115200 baud the new serial settings are not applied until the Serial Port Adapter is restarted. The reason for this is that many PCs do not support baud rates higher than 115200. After selecting a baud rate higher than 115200, exit the configuration wizard and restart the Serial Port Adapter.

Note: When selecting RS422 or RS485 as serial interface type, this will not be applied until the Serial Port Adapter is re-powered. After selecting RS422 or RS485, exit the configuration wizard and restart the Serial Port Adapter.

4.1.4 Configuring Bluetooth Settings

Settings related to Bluetooth can be controlled in this part of the configuration wizard.

- **Bluetooth Security Mode**. Select no security or high security (Bluetooth authentication and encryption enabled). If high security is selected, pairing with the remote device must first be performed in order to be able to establish a connection.
- **Device Name**. Each Bluetooth device has a device name. This name is seen when other devices are searching for your Serial Port Adapter.
- **Operation Mode**. Select if the device should be non-connectable, connectable, or connectable and discoverable. If a device is in connectable mode other devices can connect to it. If a device is in discoverable mode, it can be found when other devices are performing searches.

- **Automatic disconnect**. It is possible to configure the Serial Port Adapter to automatically disconnect the connection after a specific time of no data activity. It is also possible to disable this feature.
- **Configuration via Bluetooth**. It is possible to configure the Serial Port Adapter via Bluetooth. This feature can be turned on or off. For more information see 4.4.

4.1.5 Connections

The Serial Port Adapter is able to initiate as well as accept connections. When the Serial Port Adapter initiates connections it operates as a client device. When it accepts connections it operates as a server device. The Serial Port Adapter can be configured to simultaneously operate as a client and a server.

- **Wireless Multidrop™**. Specify whether or not this feature shall be enabled. If enabled, your Serial Port Adapter will be able to communicate with more than one remote Bluetooth device simultaneously. For more information about Wireless Multidrop™, see 5.2.
- **Server configuration**. If you would like other devices to be able to connect to your Serial Port Adapter it must be configured as a server. If other devices are not supposed to be able to connect to you Serial Port Adapter, disable the server functionality.
- **Client configuration**. If you would like your Serial Port Adapter to establish a connection to a remote device, a server device, it must be configured to operate as a client. A client device must know which server device to connect to*. Three different methods can be used to select which server device to connect to:
    - Search for server devices. Make sure that the device you are searching for is in discoverable mode.
    - Manually specify the server device. Enter the Bluetooth device address of the server device to connect to.
    - Select the server device from your list of favorite devices.

If configured as a client, the Serial Port Adapter can connect to the selected server device based on three different events:

- **On data activity**. The Serial Port Adapter will try to connect to the selected server device when data activity is detected on the serial interface.
- **Always connected**. Once the configuration wizard is exited the Serial Port Adapter will try to connect and stay connected to the selected server device. Note that if two devices are supposed to communicate only one of the devices shall have the Always Connected feature turned on.
- **On external signal/button**. When the signal is triggered/button is pressed, a connection attempt to the selected server device will be carried out. For information about the external signal on the OEM Serial Port Adapters please study the Electrical and Mechanical Data Sheet that can be downloaded from www.connectblue.se. On Serial Port Adapter 12i and Serial Port Adapter 32i the button to activate this option is the Function button. The Function button is not available on Rugged Serial Port Adapter 32s, the Serial Port Adapter 33i, and the Serial Port Adapter 33c.

Another feature in the Serial Port Adapter, **Select server device on incoming connections**, makes it possible to let the Serial Port Adapter automatically change server

device every time a remote device connects the Serial Port Adapter. This means that if this feature is selected and a new device, DevA, connects to the Serial Port Adapter, DevA will be selected as the server device. The next time the Serial Port Adapter tries to connect it will try to connect to DevA. Note that for this feature to function correctly the Serial Port Adapter must be configured to operate both as a client and a server.

**If configured as a client and if the Wireless Multidrop™ feature has been enabled, several server devices may be selected.*

4.1.6 Performing Bluetooth Pairing

If you have selected high Bluetooth security you must pair your device with your remote peer before communicating with it. Also, the remote device might require pairing before communication can be established. In this case pairing will be required independently of whether or not you have selected high Bluetooth security. Before pairing can be performed, you must enter a passkey (e.g. a PIN code) to be used during pairing. There are two ways of perform pairing in the configuration wizard:

- Your Serial Port Adapter initiates pairing.
- The remote device initiates pairing. Your device accepts pairing.

If you are pairing two Serial Port Adapters, one device must initiate pairing and the other device must accept pairing.

Note: It is possible to perform pairing using the configuration wizard, but in fact the Serial Port Adapter is always able to perform pairing, even if the configuration wizard is not used. Pairing will be carried out automatically when a remote device connects to the Serial Port Adapter or if the Serial Port Adapter connects to a remote device and high security has been selected on either device. The passkey that was entered when the security mode was selected will be used during the pairing procedure.

4.1.7 Using Favorites

Your Serial Port Adapter has the ability to store up to 10 favorite devices in its memory. The favorites list can be used when frequently changing server devices. This will speed up the selection of the server device.

4.2 Using AT Commands

All the settings that the configuration wizard is able to control are also available via AT commands. Around 50 easy to use AT commands can be used by the host system to configure and control the Serial Port Adapter.

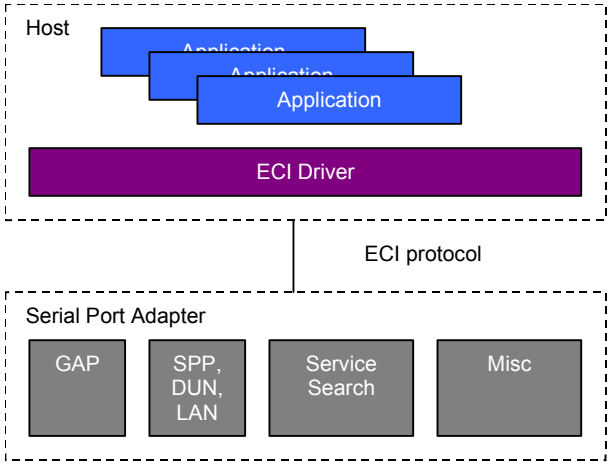
Before sending an AT command to the Serial Port Adapter, the host system must request the Serial Port Adapter to move from transparent data mode to AT mode. This is done by sending an escape sequence to the Serial Port Adapter. The default escape sequence is '///'. The escape character can be changed using the ATS2 command. The default escape sequence can be selected by restoring the default serial settings, for more information see 4.5.

Once configured the Serial Port Adapter must be moved to transparent data mode. This is done using the AT*ADDM command.

A complete specification containing descriptions of all supported AT commands and general rules regarding AT commands can be downloaded from www.connectblue.se.

4.3 Using the ECI Protocol

The ECI protocol is provides the host with an interface towards all the Bluetooth functionality embedded in the Serial Port Adapter. The ECI protocol is a lightweight protocol. It provides access to the profiles GAP, SPP, DUN, and LAN as well as some other miscellaneous functions.



Picture 19. ECI protocol

With ECI, the host is able to:

- Configure the Serial Port Adapter.
- Set up and close Bluetooth connections.
- Send and receive data on independent connections.
- Perform multiple operations simultaneously.
- Have several applications utilizing the Serial Port Adapter simultaneously.

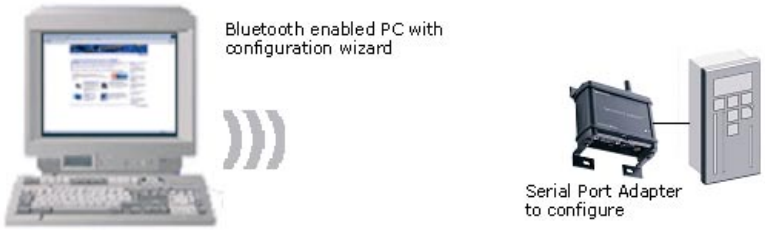
The Bluetooth Enabler Developers Kit must to be used to utilize the ECI protocol. The kit contains:

- ECI Driver, generic C-code for the ECI protocol.
- User manual for the ECI Driver.
- Sample application.
- ECI specification.
- ECI Toolbox, a PC program with a graphical user interface used to evaluate and learn about the ECI protocol.

For more information please visit connectblue at www.connectblue.se.

4.4 Configuration via Bluetooth

It is possible to configure a remote Serial Port Adapter via Bluetooth. On the PC side another Serial Port Adapter or another Bluetooth product (such as a PC-card) can be used to connect to the remote Serial Port Adapter.



Picture 20. Configuration of remote Serial Port Adapter via Bluetooth

For this feature to be functional the remote Serial Port Adapter must be configured to operate as a server device (see 4.1.5) and it must be configured to allow configuration via Bluetooth (see 4.1.4).

4.4.1 Using the Configuration Wizard

To configure a remote Serial Port Adapter:

- Establish a Bluetooth connection from your PC to the remote Serial Port Adapter or configure your Bluetooth device to connect to the remote Serial Port Adapter when the COM-port is opened. If you are not using a Serial Port Adapter from connectBlue to connect to the remote Serial Port Adapter, consult the manual of your Bluetooth device to find out how to configure it.
- Start the configuration wizard.
- Select "Configure a remote Serial Port Adapter over Bluetooth" and click "Next".

Once you have entered the configuration wizard it can be used as described in 4.1.

4.4.2 Using AT Commands

Consult the AT commands specification on how to use AT commands over Bluetooth. The AT commands specification can be downloaded from www.connectblue.se.

4.4.3 Using the ECI Protocol

Consult the user's manual in the Bluetooth Enabler Development kit for information on how to use ECI over Bluetooth.

4.5 Restoring the Default Serial Settings

In some situations it is necessary to restore some settings to their default values. The following settings can be restored using the procedure described below:

- **Serial settings**: 57600 baud, 8 data bits, no parity, 1 stop bit, hardware flow control.
- **Serial interface type**: RS232.
- **AT escape sequence**: '///'.
- **Escape sequence timing**: 1000 ms of no data transmission required before and after the escape sequence for the escape sequence to be valid.

Procedure:

1. Remove power from the Serial Port Adapter.
2. Press and hold the default settings button on the Serial Port Adapter.
3. Apply power to the Serial Port Adapter. When powered up the default settings will be stored in the Serial Port Adapter.

5 Operation

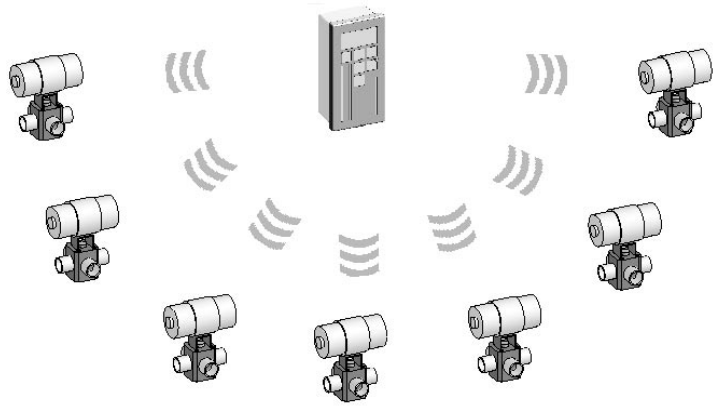
5.1 Data Transfer

The Serial Port Adapter forms a virtual cable between your host system and the remote Bluetooth device. Your host system can send and receive data to and from the remote device as if there was a cable between the devices.

5.2 Wireless Multidrop™

This unique feature allows the Serial Port Adapter to simultaneously communicate with up to seven remote devices. Wireless Multidrop™ makes use of a Bluetooth feature called point to multi-point communication.

When data is sent from the host system to the Serial Port Adapter via the serial interface it will be forwarded to *all* connected remote devices. Data received from a remote device will be forwarded *only* to the host system via the serial interface. This functionality creates a wireless mutlidrop network similar to a RS422 or RS485 network.



Picture 21. In the Wireless Multidrop™ network the controller can communicate with seven remote devices simultaneously.

The Wireless Multidrop™ feature can be used if the Serial Port Adapter has been configured as a server as well as if it has been configured as a client. When configured as a server several devices are able to connect to your Serial Port Adapter and join the wireless multidrop network. If configured as a client you must tell the Serial Port Adapter which devices to connect to. For more information see 4.1.

5.3 Setting up Connections

Three methods can be used to establish connections:

- Configure the Serial Port Adapter to act as a server. Other devices will be able to connect to your Serial Port Adapter. For more information see 4.1.
- Configure the Serial Port Adapter to act as a client. The Serial Port Adapter will attempt to connect to the selected server device. For more information see 4.1.
- Use AT commands to establish connections.
    1. Move from transparent data mode to AT mode.
    2. Use the AT command AT*ADCP to establish one or several connections.
    3. Move back to transparent data mode.
    4. Send data to and from the connected remote devices.

More information about AT commands can be found in the AT commands specification that can be downloaded from www.connectblue.se.

5.4 Startup Sequence

When the Serial Port Adapter is powered up its DTR pin is moved from non-active (low RS232 level) to active (high RS232 level). When the DTR pin is active the host system is allowed to send data to the Serial Port Adapter via the serial interface.

5.5 Power Save Modes

The Serial Port Adapter is optimized to consume as little power as possible.

However, the deepest power save mode, called stop mode, is not turned on by default. Instead an AT command (AT*AMPM) and an ECI command (WriteControllerPowerSaveMode) are available to allow the host system to turn on the stop mode feature.

When the Serial Port Adapter is in stop mode:

- It can accept incoming connections over Bluetooth.
- The host system cannot send data to the Serial Port Adapter.

The Serial Port Adapter will only enter stop mode if:

- The stop mode feature has been turned on using the AT*AMPM AT command or the WriteControllerPowerSaveMode ECI request.
- The DSR pin on the Serial Port Adapter is not active (low RS232 level).
- If there is no Bluetooth connection.
- If the "Always connected" feature has not been turned on.

The Serial Port Adapter will exit mode if:

- A Bluetooth connection is established from a remote device.

- The host system moves the DSR pin from non-active (low RS232 level) to active (high RS232 level).

Note: The Serial Port Adapter needs 10 ms to leave stop mode. As a consequence the host system must not send data to the Serial Port Adapter until 10 ms after the host system has activated the DSR pin.

5.5.1 How to Use the Stop Mode Feature

If your device only acts as a server (accepts incoming connections), the stop mode feature can be used without the host having to toggle the DSR pin before sending data to the Serial Port Adapter. The reason for this is that while in stop mode, the Serial Port Adapter can accept incoming connections. In addition, when the Bluetooth connection is established the Serial Port Adapter automatically leaves stop mode and only returns to stop mode after the Bluetooth connection has been disconnected. However, in this scenario, it is important that the host system keeps the DSR pin in the non-active state at all times. Otherwise the Serial Port Adapter will not enter stop mode at all.

If your device acts as a client (establishes connections) or client and server, the stop mode feature cannot be used without the use of the DSR pin. The reason for this is that once in stop mode, the Serial Port Adapter has to be told to leave stop mode before the host system can send data to the Serial Port Adapter. When the host system has nothing to send to the Serial Port Adapter, it may set the DSR pin to the non-active state to tell the Serial Port Adapter that it may enter stop mode if it is able to.

6 Regulatory Information

For regulatory information regarding the OEM Serial Port Adapters please refer to the "Electrical & Mechanical Datasheet". The latest version of the "Electrical & Mechanical Datasheet" is available for download at www.connectblue.se.

6.1 FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

6.1.1 RF-Exposure Statement

Only applicable to Serial Port Adapter 32i, Serial Port Adapter 33i, Serial Port Adapter 33c, Rugged Serial Port Adapter 32s: Do not use this equipment if the separation distance between the antenna and the body of the user or nearby persons is smaller than 2.5cm, excluding hands, wrists, feet, and ankles.

6.1.2 Antenna

The antenna is fixed and cannot be removed or replaced by the user.

6.1.3 Caution

Any changes or modifications NOT explicitly APPROVED by connectBlue AB could cause the module to cease to comply with FCC rules part 15,and thus void the user's authority to operate the equipment.

6.2 Declaration of Conformity

We, **connectBlue AB**, of
Stora Varvsgatan 11 N:1
SE-211 19 Malmö, Sweden

declare under our sole responsibility that our products:

Serial Port Adapter 12i, Serial Port Adapter 32i, Serial Port Adapter 33i, Serial Port Adapter 33c, Rugged Serial Port Adapter 32s, and OEM Module Adapter II

to which this declaration relates, conforms to the following product specifications:

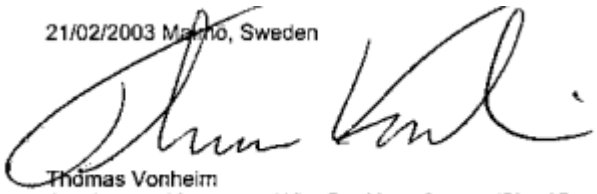
R&TTE Directive 1999/5/EC
EN 300 328-2 V1.1.1 (2000-07)

EMC Directive:89/336/EEC
EN 301 489-1 V1.3.1 (2001-09)
EN 301 489-17 V1.1.1 (2000-09)

Low Voltage Directive:73/23/EEC
EN 61131-2

Medical Electrical Equipment
IEC 60601-1-2

21/02/2003 Malmö, Sweden



Thomas Vonheim
Development Manager and Vice President of connectBlue AB

7 Bluetooth Qualification

All Serial Port Adapter models have been qualified according to Bluetooth 1.1, specification, QPLN reference GRA 001 03, qualification date 2003-01-31.

The following Bluetooth profiles are supported (covered functionality):

- Generic Access Profile
- Serial Port Profile
- Dial-up Networking Profile
- LAN Access Profile

When creating end products based on the Serial Port Adapter the following applies:

- The end product does not have to be re-qualified.
- The end product or the end product documentation shall make the following information available: "This product contains a Bluetooth qualified product (QPLN reference GRA 001 03)".
- The Bluetooth Trademark may be placed on the end product (requires Bluetooth SIG membership, for more information see www.bluetooth.com).
- The Bluetooth Trademark may be used in material related to the end product (requires Bluetooth SIG membership, for more information see www.bluetooth.com).

For more information please visit www.connectblue.se.

8 Additional Information

8.1 Guidelines for Efficient and Safe Use

Read this information before using your Serial Port Adapter.

For any exceptions, due to national requirements or limitations, when using your Serial Port Adapter, please visit www.bluetooth.com.

Note: Changes or modifications to the product not expressly approved by connectBlue AB will void the user's authority to operate the equipment.

8.1.1 Product Care

- Do not expose your product to liquid or moisture.
- Do not expose you product to extreme hot or cold temperature (see Technical Specification for further information)
- Do not expose your product to lit candles, cigarettes, cigars, open flames, etc.
- Do not drop, throw or try to bend your product since rough treatment could damage your product.
- Do not attempt to disassemble your product. Doing so will void warranty. The product does not contain consumer serviceable or replaceable components. Service should only be performed by connectBlue AB.
- Do not paint your product as the paint could prevent normal use.
- If you will not be using your product for a while, store it in a place that is dry, free from damp, dust and extreme heat and cold.

8.1.2 Radio Frequency Exposure

The Serial Port Adapter contains a small radio transmitter and receiver. During communication with other Bluetooth products the Serial Port Adapter receives and transmits radio frequency (RF) electromagnetic fields (microwaves) in the frequency range 2400 to 2500 MHz. The output power of the radio transmitter is very low.

When using the Serial Port Adapter, you will be exposed to some of the transmitted RF energy. This exposure is well below the prescribed limits in all national and international RF safety standards and regulations.

8.1.3 Electronic Equipment

Most modern electronic equipment, for example, in hospitals and cars, is shielded from RF energy. However, certain electronic equipment is not. Therefore:

Note: This equipment emits RF energy in the ISM (Industrial, Scientific, Medical) band. Please insure that all medical devices used in proximity to this device meet appropriate susceptibility specifications for this type of RF energy.

8.1.4 Potentially Explosive Atmospheres

Turn off your electronic device when in any area with potentially explosive atmosphere. It is rare, but your electronic device could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas, such as petrol station, below deck on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

8.1.5 Power Supply

- Connect your power supply only to designated power-sources as marked on the product.
- Make sure all cords and cable are positioned so that they will not be stepped on, tripped over or otherwise subject to damage or stress.
- To reduce risk of electric shock, unplug the unit from any power source before attempting to clean it.

8.2 Troubleshooting

This section lists some problems that you might encounter while using your Serial Port Adapter.

1. I cannot connect. The data I send to the Serial Port Adapter does not arrive at the remote device.
    - Make sure that you have connected power to your Serial Port Adapter. The LED indicator should emit a green light when powered up, being ready to send and receive data.
    - Your Serial Port Adapter is not configured to use the same serial settings (e.g. baud rate) as your host system. Use the configuration wizard to set the correct baud rate.
    - You have configured your Serial Port Adapter to act as a client but you have not selected a server device to connect to. Select a server device using the configuration wizard.

- Your Serial Port Adapter is too far away from the selected server device. Move the Serial Port Adapter closer to the server device.
- You are not using the correct Bluetooth profile. Your Serial Port Adapter must be configured to use the same profile as the device you want to communicate with.
- The remote device is not in connectable mode. If the server device is another Serial Port Adapter use the configuration wizard to set the device in connectable mode. If the device is another Bluetooth device, consult the manual for that device to set it in connectable mode.
- Make sure that the Serial Port Adapter is in transparent data mode (green light). Make sure that the Serial Port Adapter is not in configuration mode (orange light). After configuring your Serial Port Adapter, remember to exit the configuration wizard before disconnecting it from the PC.
- If high security mode has been selected on one of the devices wanting to communicate, the two devices have to be paired with each other. Either disable security or perform pairing.

2. The Bluetooth link between my Serial Port Adapter and my selected remote peer disconnects.
    - Your Serial Port Adapter is configured to disconnect if no data is received or sent during a longer period of time. Use the configuration wizard to disable the automatic disconnect or change the value of the timer.
    - Your Serial Port Adapter is too far away from the device it is communicating with. Move the two devices closer to each other.
3. There is no color on the LED indicator.
    - Make sure that power is connected to the Serial Port Adapter.
4. When I search for other devices using the configuration wizard I cannot find the device I'm searching for.
    - The remote device is too far away. Move it closer to your Serial Port Adapter.
    - The remote device is not in discoverable mode. If the remote device is a Serial Port Adapter use the configuration wizard to set it in discoverable mode. If the remote device is another device, consult the manual of that device to set it in discoverable mode.

8.3 Technical Specifications

8.3.1 Environmental

Storage temperature 0 dBm: -40 - +85 °C

Storage temperature 20 dBm: -40 - +85 °C

Recommended operating conditions 0 dBm: -20 - +75 °C

Recommended operating conditions 20 dBm: -30 - +55 °C

Maximum operating temperature 0 dBm: -30 - +75 °C

Maximum operating temperature 20 dBm: -30 - +75 °C

Humidity RH 5-90% non-condensing
Shock and vibration: IEC 61131-2

8.3.2 Certifications and Compliance

EMC compliance: ENV 50081-1, ENV 50081-2
Environment: IEC 61131-2
Medical: IEC 60601-01-2

8.3.3 Type Approval

FCC/CFR 47, part 15
ETS 300 328,300 826

8.3.4 Radio Output Power

Model	**Output Power**
OEM Serial Port Adapter 13i	0 dBm *
OEM Serial Port Adapter 13x	0 dBm *
OEM Serial Port Adapter 33i	20 dBm *
OEM Serial Port Adapter 33x	20 dBm *
Serial Port Adapter 12i	0 dBm *
Serial Port Adapter 32i	20 dBm *
Serial Port Adapter 33i	20 dBm *
Serial Port Adapter 33c	20 dBm *
Rugged Serial Port Adapter 32s	20 dBm *

** 0 dBm = 1 mW, 20 dBm = 100 mW.*

8.3.5 Power Supply

Model	**Power Supply**
OEM Serial Port Adapter 13i	3-6 VDC
OEM Serial Port Adapter 13x	3-6 VDC
OEM Serial Port Adapter 33i	3.3-6 VDC
OEM Serial Port Adapter 33x	3.3-6 VDC
Serial Port Adapter 12i	5 VDC
Serial Port Adapter 32i	5 VDC
Serial Port Adapter 33i	8-30 VDC

Serial Port Adapter 33c	8-30 VDC
Rugged Serial Port Adapter 32s	8-30 VDC

8.3.6 Serial Interface

Model	**Serial Interface**
OEM Serial Port Adapter 13i	Logic-level UART, RS232, 300-921600 baud, CTS/RTS flow control or no flow control.
OEM Serial Port Adapter 13x	Logic-level UART, RS232, 300-921600 baud, CTS/RTS flow control or no flow control.
OEM Serial Port Adapter 33i	Logic-level UART, RS232, 300-921600 baud, CTS/RTS flow control or no flow control.
OEM Serial Port Adapter 33x	Logic-level UART, RS232, 300-921600 baud, CTS/RTS flow control or no flow control.
Serial Port Adapter 12i	RS232, male DSUB-9, 300-921600 baud, CTS/RTS flow control or no flow control.
Serial Port Adapter 32i	RS232, male DSUB-9, 300-921600 baud, CTS/RTS flow control or no flow control.
Serial Port Adapter 33i	RS232/RS422/RS485, terminal block, 300-921600 baud, CTS/RTS flow control or no flow control.
Serial Port Adapter 33c	RS232/RS422/RS485, terminal block, 300-921600 baud, CTS/RTS flow control or no flow control.
Rugged Serial Port Adapter 32s	RS232, male DSUB-9, 300-921600 baud, CTS/RTS flow control or no flow control.

8.3.7 Housing

Model	**Housing**
OEM Serial Port Adapter 13i	No housing.
OEM Serial Port Adapter 13x	No housing.
OEM Serial Port Adapter 33i	No housing.
OEM Serial Port Adapter 33x	No housing.
Serial Port Adapter 12i	Plastic housing, IP20.
Serial Port Adapter 32i	Plastic housing, IP20.
Serial Port Adapter 33i	Plastic housing, IP20.
Serial Port Adapter 33c	Plastic housing, IP20.
Rugged Serial Port Adapter 32s	Aluminum housing, IP65.

8.3.8 Dimensions

Model	Dimensions (with x depth x height)
OEM Serial Port Adapter 13i	23 x 36 x 5 mm
OEM Serial Port Adapter 13x	23 x 36 x 5 mm
OEM Serial Port Adapter 33i	40 x 42 x 5 mm
OEM Serial Port Adapter 33x	40 x 42 x 5 mm
Serial Port Adapter 12i	63 x 80.2 x 25.7 mm
Serial Port Adapter 32i	63 x 80.2 x 25.7 mm
Serial Port Adapter 33i	63 x 80.2 x 25.7 mm
Serial Port Adapter 33c	63 x 80.2 x 25.7 mm
Rugged Serial Port Adapter 32s	75.5 x 84.6 x 34.6 mm