# SPP CONNECTION WITH A STANDARD PC

*Quick Start Guide* *v1.5*

## INTRODUCTION

The Laird BT900 is a dual mode Bluetooth v4.0 module. This Quick Start Guide illustrates how to make Serial Port Profile (SPP) connections with a standard Bluetooth-enabled PC using classic Bluetooth.

The BT900 series utilises Laird's robust, field proven *smart*BASIC programming language, specifically designed for resource constrained environments, to control and configure the module.

## REQUIREMENTS

- DVK-BT900-Sx loaded with v9.1.2.0 or later firmware
  - Firmware folder including X-Compiler (found in the Software Downloads tab of the BT900 page)
- A PC with built-in Bluetooth OR Laird BT820 USB Bluetooth adapter
- Windows 7 or later
- *smart*BASIC sample applications from GitHub
- Laird UWTerminal serial program:
  - Laird UW Terminal v7.0.0 (found in the Software Downloads tab of the BT900 page)

*Figure 1: BT900-SA Module*

The development board includes a USB port to provide power as well as serial communication to the BT900 via the on-board FTDI USB chip. This allows a user to quickly get started and load *smart*BASIC applications into the BT900 using our terminal emulator program, UWTerminal.

## SETUP PREPARATION

To prepare your setup, follow these steps:

1. Plug the BT900 development board into a USB port on the Windows PC. Windows should install the driver automatically for the FTDI USB chip. If this fails, the driver is also available from the FTDI website.
2. Locate the COM port in Windows Device Manager. The COM port number varies for different computers (Figure 2).

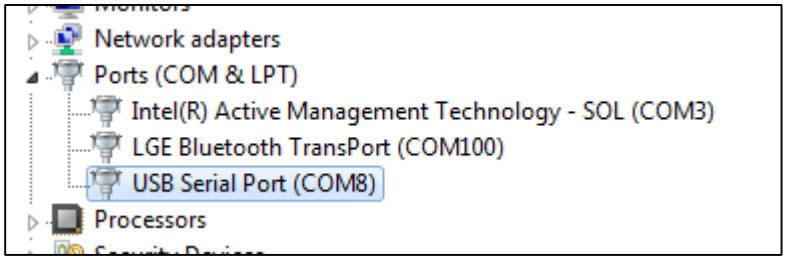


*Figure 2: Device manager*

3. Download the *smart*Basic sample applications zip file from GitHub and unzip it to a folder on your PC (such as C:\Laird\BT900). – The best practice is to maintain the same file hierarchy as is present in the original zip file, as most of the sample applications rely on the included lib folder.
4. Download the X-Compiler and UWTerminal from the software downloads tab of the BT900 webpage.
5. Place the X-Compiler and UWTerminal in the same *smart*BASIC sample application folder.

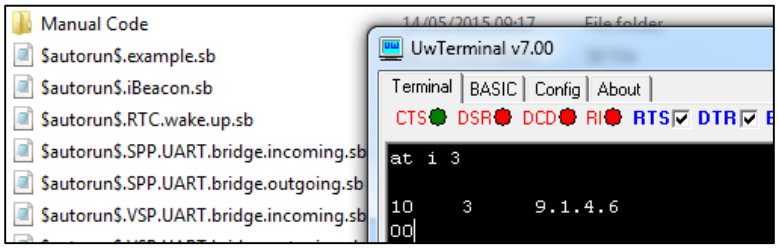


*Figure 3: smartBASIC sample application folder*

6. Open UWTerminal with the COM port number found in Step 2, at the BT900 default settings of **115200 bps 8-N-1.**

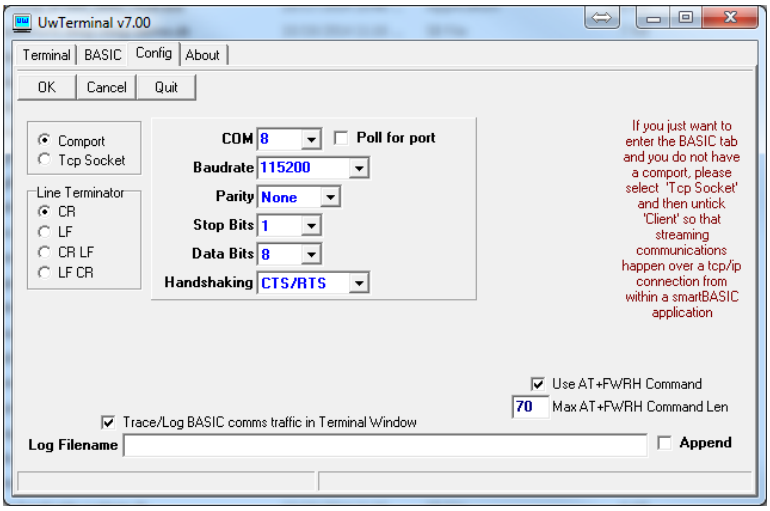


*Figure 4: UWTerminal configuration page*

7. Type **AT I 3** and press **Enter** to confirm the module is accessible. This mode allows basic configuration, as well as loading and running *smart*BASIC applications.

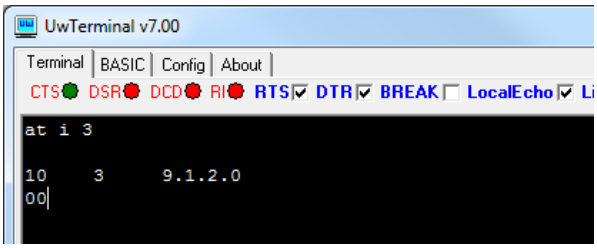


*Figure 5: BT900 firmware version*

8. Check the Windows Device Manager to determine whether or not the PC is equipped with Bluetooth.

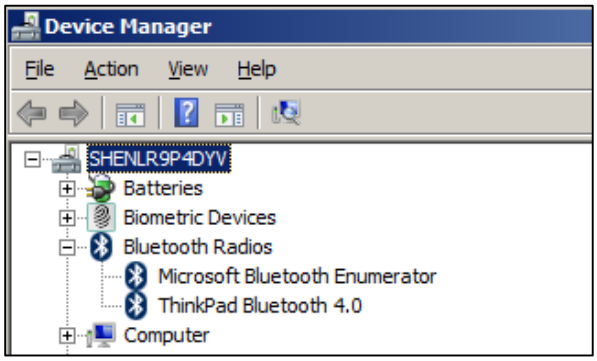


*Figure 6: Windows Device Manager displays Bluetooth devices*

9. Plug in the BT820 if the computer is not equipped with Bluetooth.

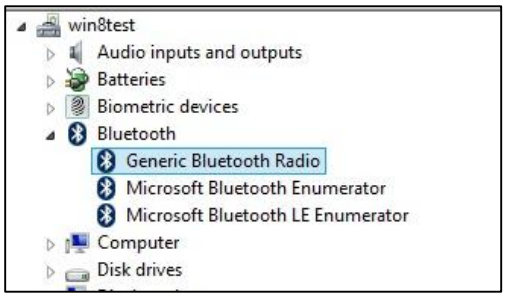


*Figure 7: Computer is BT equipped*

# LOADING A SAMPLE *SMART*BASIC APPLICATION

## Compiling and Downloading

As *smart*BASIC is designed for resource constrained environment it is necessary to compile the applications into a form the module can understand. To ease setup time, UWTerminal provides an easy one-click solution to loading sample applications described below;

1. Right click within the UWTerminal window and select **XCompile + Load**.

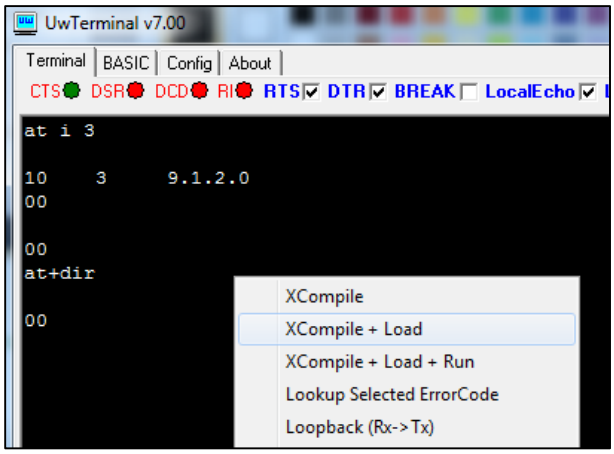


*Figure 8: Compile and download inside UWTerminal*

2. Select **$autorun$.SPP.UART.bridge.incoming.sb** from the sample applications folder downloaded previously.

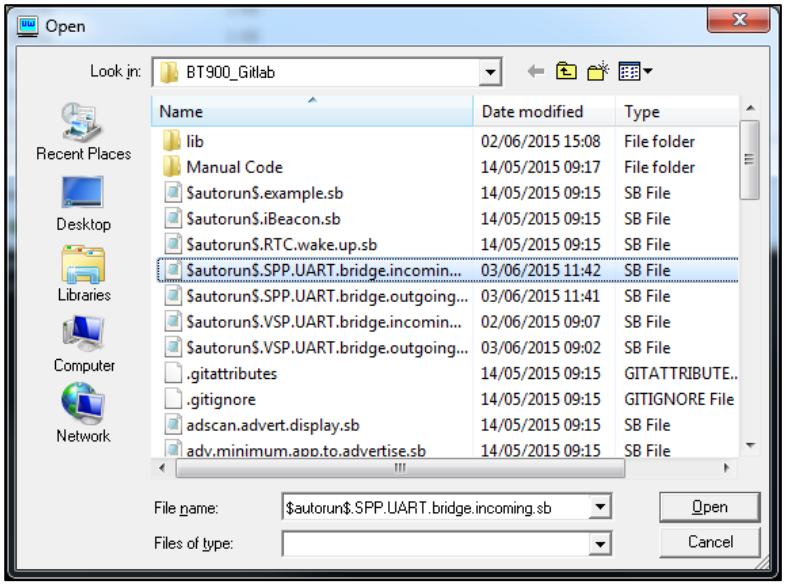


*Figure 9: Select $autorun$.SPP.UART.bridge.incomingsb*

3. Click **Open**. The *smart*BASIC application is now compiled and downloaded to the module (Figure 10).

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**Note:** The application on the module is renamed *$autorun$*

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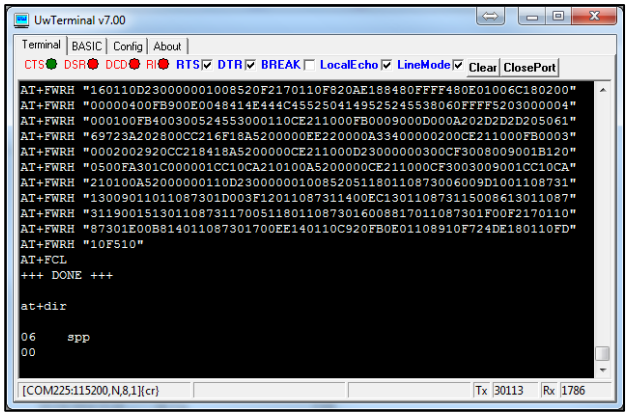


*Figure 10: Compiled and downloaded application*

## Launching the Application

Now that the module has been loaded, the application needs to be started and an SPP port needs to be opened on the module.

Running the application can be achieved by typing **at+run "$autorun$"** and pressing **enter** (see Figure 11).

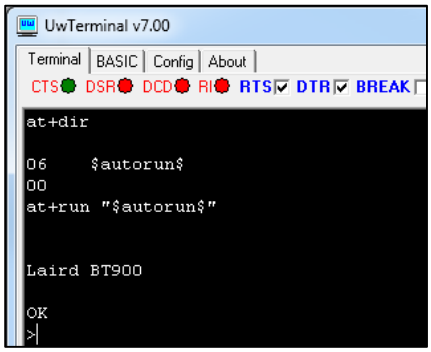


*Figure 11: Launched SPP application*

The sample application automatically initiates discoverability for a limited time, 120 seconds.

The pairing steps must be performed while the device is discoverable. If the device notifies the user that it is no longer discoverable and pairing has not been completed, the user must restart discoverability by performing one of the following:

- Enter **setdiscoverable 1 0** and press **enter**.
- Restart the module via checking and un-checking the **BREAK** tick box in UWTerminal and restarting the application, detailed in step 1.

## PAIRING WITH A COMPUTER

To engage in communication with a PC over SPP, the PC and the BT900 must be paired first. Your computer must install the drivers for two ports called "Standard Serial over Bluetooth link".

### Pairing from a PC

**Note:** The following example was performed using Windows 8 with a BT820 USB Bluetooth dongle operated by a Windows Bluetooth stack.

In order to pair with the BT900 from the PC, follow these steps:

1. With the application running, type *spp open* on the module and press **Enter**.
2. Type *setpairable 1* on the module and press **Enter.**
3. Access **Devices and Printers** from the start menu.
4. Click **Add a device** (Figure 12).

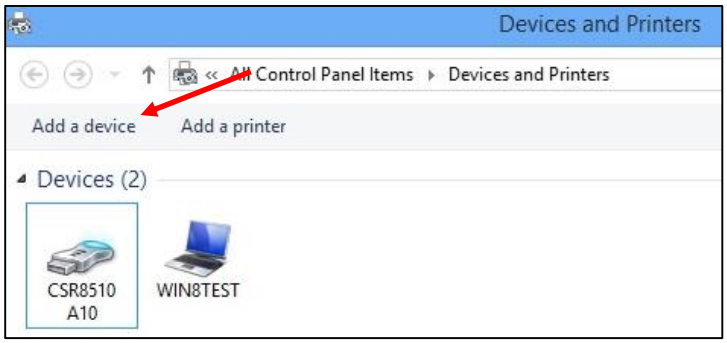


*Figure 12: Device and Printers window*

5. Select **Laird BT900**.

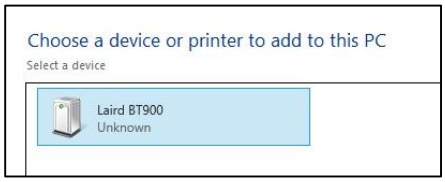


*Figure 13: Select BT900*

6. On the BT900, type **y** and press **Enter** to accept the pairing request.

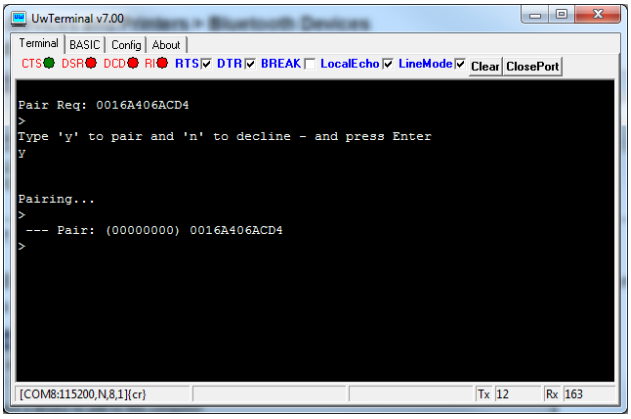


*Figure 14: Enter 'y' to accept pairing request*

If you opened a SPP port on the BT900 prior to pairing, your computer recognises the BT900 as a device with the Serial Port Profile and installs drivers for two Bluetooth serial ports, one for incoming connections and one for outgoing connections. If not:

a. In the Devices and Printers window, right-click **Laird BT900** and click **Properties**.
b. From the Services tab, select the Serial port (SPP) 'Serial Port' checkbox.
c. Click **Apply** and then **OK**. See Figure 15.

The Bluetooth serial ports are then installed automatically.

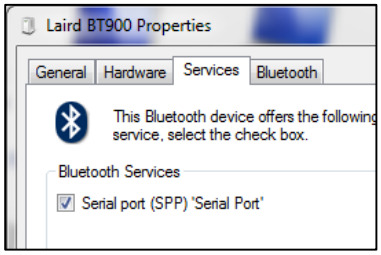


*Figure 15: Installing Bluetooth Serial Port Drivers*

7. Expand Ports in the Device Manager. Two newly-added serial ports appear.

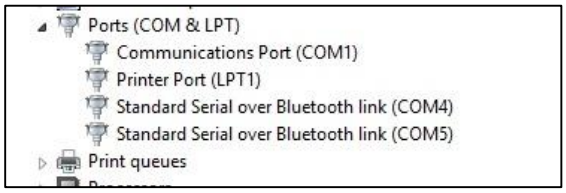


*Figure 16: Ports in Device Manager*

One of the ports is for an incoming SPP connection and the other one is for an outgoing SPP connection.

8. Access Devices and Printers and right-click **Laird BT900** and select the Hardware tab.

9. The displayed COM port number is the outgoing SPP COM port. As an example, in the figure below, SPP COM4 is the outgoing SPP COM port. Bluetooth serial ports vary from computer to computer.


*Figure 17: COM port number*

## Pairing From the BT900

**Note:** The following example was performed using Windows 8 with a BT820 USB Bluetooth dongle operated by a Windows Bluetooth stack.

In order to pair with a Bluetooth device from the BT900, follow these steps:

1. Ensure that the PC Bluetooth/BT820 is discoverable.

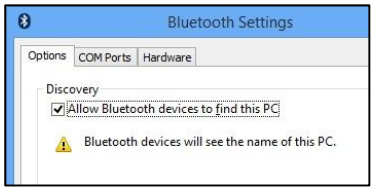


*Figure 18: Device is discoverable*

2. Press the development board's reset button to reset the BT900.
3. Issue **at I 3**. The module returns the module firmware version. This ensures that the SPP application is not running.
4. Issue **at+btd*** to erase the bonding table.
5. Issue **spp** to launch the SPP *smart*BASIC application.
6. Enter **setpairable 1**, on the module and press **enter**.
7. Issue **at+bti** to trigger a Bluetooth inquiry scan for the PC.

```
>at+bti

INQ: 7CE9D3E82A24 -78   HONGLR9WGV2N
INQ: 0016A406ACD4 -49   WIN8TEST
OK
>
```

*Figure 19: Issue at+bti*

The PC Bluetooth address is retrieved. This address is unique for every Bluetooth device.

8. Append the Bluetooth address to the pairing command **at+btw**. Note the space between the command and the Bluetooth address. This command is shown in Figure 20.

9. On the BT900, enter **y** to confirm the pairing request.

```
>at+btw 0016A406ACD4

OK
>
Pair Req: 0016A406ACD4
>
Type 'y' to pair and 'n' to decline - and press Enter
y


Pairing...
>
 --- Pair: (00000000) 0016A406ACD4
>
```

*Figure 20: Enter y to confirm pairing*

You may need to confirm the pairing on the PC as well. The PC then automatically completes the pairing and the two Bluetooth serial ports are installed. If not:

In the Devices and Printers window, right-click "Laird BT900" and click properties.

Go to the "Services" tab and click the checkbox next to "Serial port (SPP) 'Serial Port'". (Figure 21)

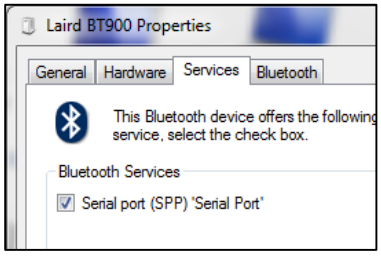


*Figure 21: Installing Bluetooth Serial Port Drivers*

# SPP CONNECTION

## Making an Outgoing SPP Connection from PC

UwTerminal, the Terminal Emulator from Laird can be used to make an outgoing SPP connection. It is used in this example. To make an outgoing SPP connection from the PC to the BT900, follow these steps:

1. If you didn't open an SPP port before on the BT900, or if your device has been reset since the pairing was completed, enter **spp open** and press enter.

2. Access Devices and Printers and right-click **Laird BT900** and select the Hardware tab.

3. The displayed COM port number is the outgoing SPP COM port. This COM port is used in UwTerminal to make the outgoing SPP connection. (Figure 22)

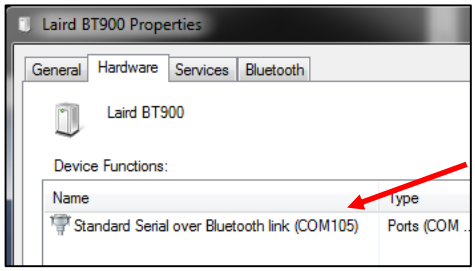


*Figure 22: Outgoing SPP COM port number*

4. Open another instance of UwTerminal, go to the Config tab and select the COM port seen in the previous step.

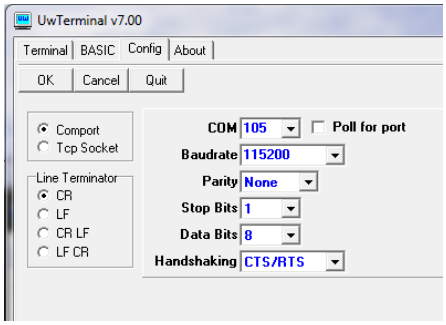


*Figure 23: Selecting COM port*

5. Press OK. The PC makes an outgoing connection to the BT900. The BT900 accepts the SPP connection.

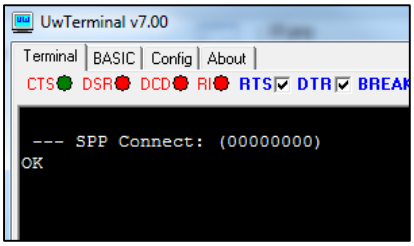


*Figure 24: SPP connection accepted*

The CTS signal is asserted in the PC's UwTerminal window indicating a successful connection.

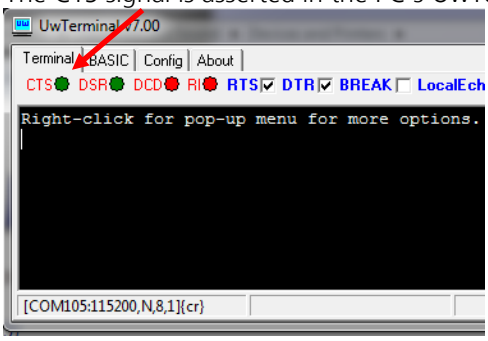


*Figure 25: Successful outgoing SPP connection from PC*

## Making an Outgoing SPP Connection from the BT900

To make an outgoing SPP connection from the BT900, follow these steps:

1. In earlier steps you have seen two "Standard Serial over Bluetooth link" COM ports in the Device Manager. The first one is most likely used for outgoing connections so we use the second one for the PC to listen for SPP connections. Open another instance of UwTerminal, go to the Config tab and select this COM port.

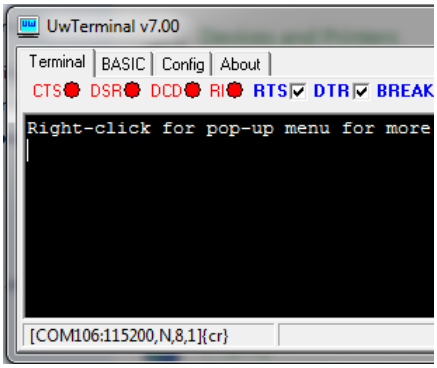


*Figure 26: Opened incoming SPP COM port*

2. On the BT900, append the PC Bluetooth address to the SPP command **atd**. Note the space between the command and the Bluetooth address. Local Echo is enabled to show the command syntax.

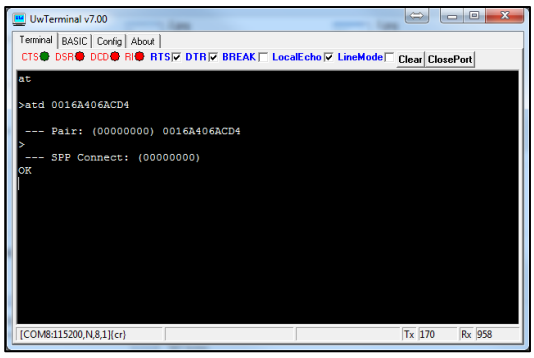


*Figure 27: Appended PC Bluetooth address*

The CTS signal in the PC's UwTerminal window is asserted when the PC accepts the SPP connection from the BT900.

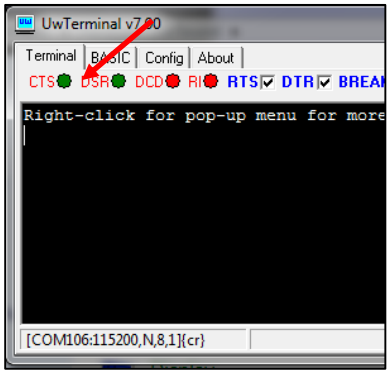


*Figure 28: SPP Connection accepted*

## Sending and Receiving Serial Data

Once the BT900 is in a connection the application automatically enters Bridge mode. Any data sent to the BT900's serial port (Data sent from UwTerminal for example) is sent over the SPP connection to the device on the other end, and vice versa.

To send and receive serial data, follow these steps:

1. On the UWTerminal, unselect the LocalEcho and LineMode checkboxes (Figure 29).

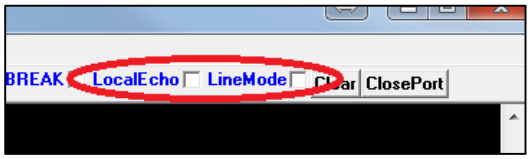


*Figure 29: LocalEcho and LineMode checkboxes*

Anything typed on the BT900 serial port is sent to the PC Bluetooth serial port as serial data. The BT900 is sending serial data.

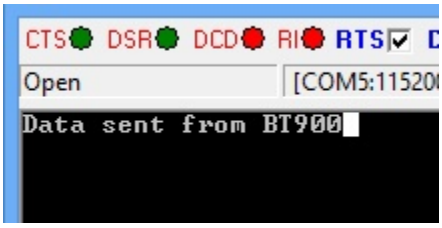


*Figure 30: Data sent from the BT900*

Anything typed on the PC Bluetooth serial port is sent to the BT900 as serial data. The BT900 is receiving serial data.

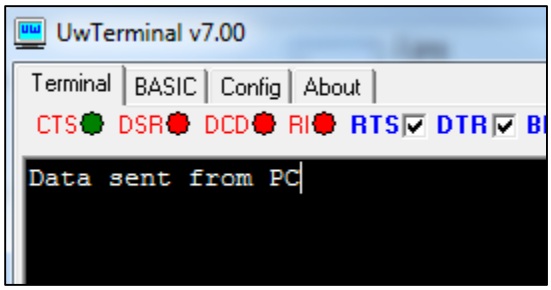


*Figure 31: Data received by BT900*

## Switching between Command and Bridge mode

To switch to command mode so you can issue the commands specified for this application (see $autorun$.SPP.UART.bridge.incoming.sb) follow these steps:

1. In UwTerminal untick DTR, and tick it again within 500 milliseconds. The terminal returns "OK>" indicating that you can send commands to be parsed in the application.

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**Note:** While in command mode, if the BT900 receives any data via SPP, this data is not printed through the serial port (to UwTerminal) until the application is in bridge mode again.

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2. To switch back to bridge mode, issue the command **ato** OR **bridge** in UwTerminal.

## Dropping the SPP Connection

In order to drop the SPP connection, you can either close the Bluetooth serial port on the PC or disconnect from the BT900. The following example shows how to disconnect from the module side.

To disconnect the SPP connection from the module side, follow these steps:

1. Switch to command mode as described above.
   The BT900 responds with "OK>" to indicate the switch is successful.
2. Type **ath** and press **Enter** to drop the SPP connection OR untick DTR and leave it unticked for at least 500 milliseconds.
   To show the command syntax, LocalEcho is enabled temporarily.

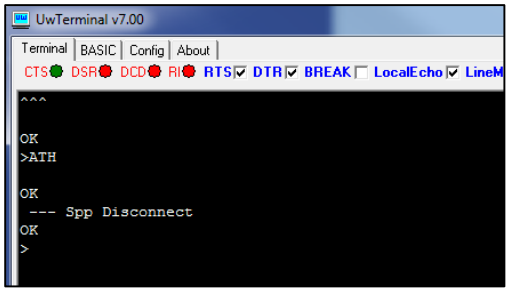


*Figure 32: Disconnecting the SPP connection from the module side*

## ADDITIONAL DOCUMENTATION AND RESOURCES

Laird offers a variety of documentation and ancillary information to support our customers through the initial evaluation process and ultimately into mass production. The following documentation is available from the Laird support site:

- BT900 – Firmware User Guide
- BT900 – Hardware Integration Guide (HIG)
- DVK-BT900 – User Guide
- DVK-BT900 – Schematics

For any additional questions or queries, or to receive local technical support for this Development Kit or for the BT900 module series, use the Laird Embedded Wireless Solutions Support Center: http://ews-support.lairdtech.com

## REVISION HISTORY

| Revision | Date | Description | Approved By |
|---|---|---|---|
| 1.0 | 11 Nov 2014 | Initial Release | Jonathan Kaye |
| 1.1 | 26 Nov 2014 | Updated images. Grammatical revisions | Sue White |
| 1.2 | 22 Jan 2015 | Updated links to new website | Sue White |
| 1.3 | 03 Mar 2015 | Added Revision History | Sue White |
| 1.4 | 22 April 2015 | Updated *Pairing with a Computer* section. | Jonathan Kaye |
| 1.5 | 24 Jun 2015 | Updated filenames | Jamie McCrae |