# LMX98xx Bluetooth Serial Port Modules - Quick Setup Guide

Texas Instruments
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## Introduction

The Texas Instruments Simply Blue modules are highly integrated radio, baseband controller and memory devices. All hardware and firmware is included to provide a complete solution from antenna through the complete lower and upper layers of the Bluetooth stack, up to the application including the Generic Access Profile (GAP), the Service Discovery Application Profile (SDAP), and the Serial Port Profile (SPP). The module includes a configurable service database to fulfil service requests for additional profiles on the host.

The LMX9830/LMX9838 is optimized to handle the data and link management processing requirements of a Bluetooth node. The firmware supplied within this device offers a complete Bluetooth stack including profiles and command interface. This firmware features point-to-point and point-to-multipoint link management supporting data rates up to the theoretical maximum over RFComm of 704 kbps. The internal memory supports up to 7 (3 for LMX9820A) active Bluetooth data links and 1 active SCO link.

This document will give a quick introduction into different usage scenarios of the LMX9830/LMX9838 Simply Blue Module. The guide refers to the deliverables you have received with the LMX9830DONGLE or LMX9838DONGLE.
This document is based on:

**Table 0-1. Part types and versions**

| Item | Version | |
|---|---|---|
| Hardware | **LMX9830**<br>Antenna is external | **LMX9838**<br>Antenna is internal |
| Firmware | V1.06 or later | v2.12 or later |
| Actual Firmware Release in production | V2.12 | v2.12 |

**FCC/IC Regulatory Compliance:**
FCC Part 15 Class A Compliant
IC ICES-003 Class A Compliant

## Table of Contents

# 1.0 Installation

## 1.1 INSTALL SIMPLY BLUE COMMANDER

The Simply Blue Commander is an easy to use application which enables you to send single commands to the LMX9830/LMX9838 Evalboard. The built-in command and event interpreter generates an easy to read log of the UART traffic between the application and the LMX9830/LMX9838.
For the installation of the program please refer to the “Simply Blue Commander User Guide”. After installation please make sure the connection between PC and Board is set up and working. The screen should come up like shown in Figure 1-1 (screens shown are for LMX9838).

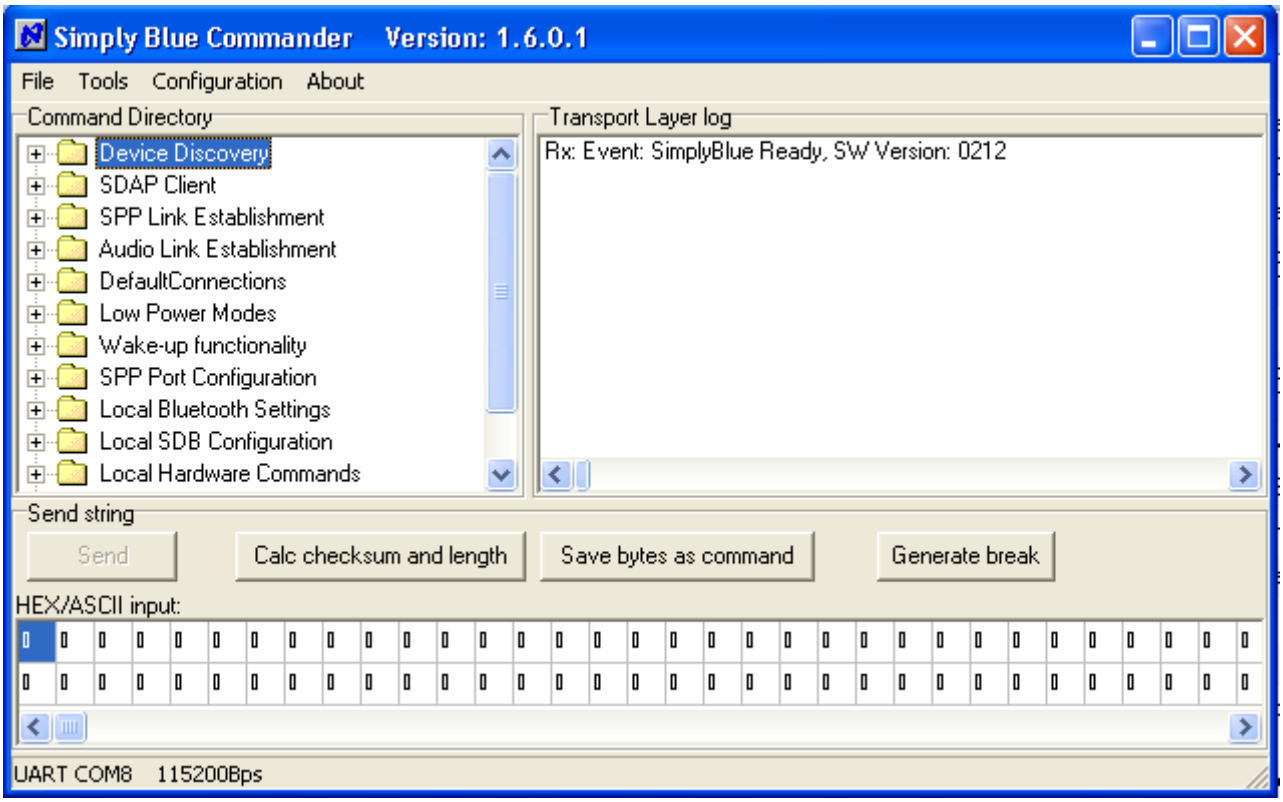


**Figure 1-1. Simply Blue Commander**

## 1.2 INSTALL IVT BLUETOOTH STACK

In case you do not have any other Bluetooth device for testing, each LMX9830/LMX9838 Evaluation board includes one BT USB Dongle. This dongle is a standard Bluetooth USB dongle.

In order to be able to work with a HCI based dongle, a host stack (windows stack) has to be installed on your PC. The dongle is shipped with the IVT Windows stack.

Please insert the CD delivered with the BT USB Dongle and follow the instructions of the setup. After the installation please plug the dongle into an available USB port. The PC should detect the dongle and install the necessary drivers.

Afterwards the stack is ready and should show up as the picture below. The task bar should include a blue/white colored Bluetooth sign.

**NOTE**: The IVT Stack is only necessary in combination with the Bluetooth USB Dongle. which can be used as counter-part for the LMX9830/LMX9838. It is not necessary to drive the LMX9830/LMX9838.

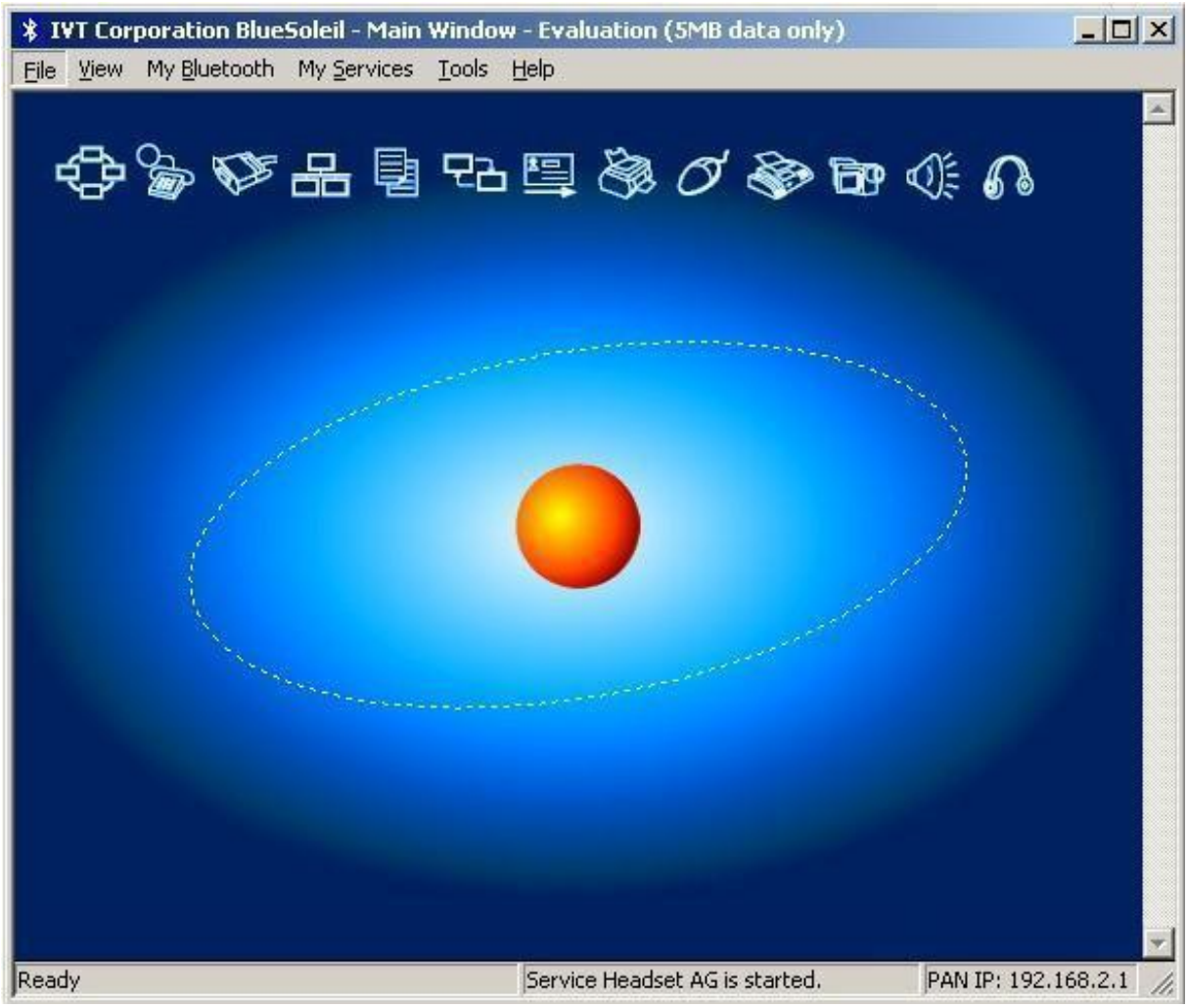


**Figure 1-2. IVT Stack Startwindow**

## 1.3 SETTING UP HYPERTERMINAL

Simple serial port data transfers can be done by using a standard serial port terminal program like the Microsoft Hyperterminal. The program is part of Windows XP.

Some of the demonstrations later on are based on hyperterminal. For this, please make sure Hyperterminal or a similar terminal program is available on the system.

You'll find hyperterminal within the Windows environment within the Start Menu under "Start/All Programs/Accessories/ Communication". Please see Figure 1-3 where to find "Hyperterminal".

Hyperterminal is not any longer offered with new operating systems like Windows Vista, 7 or 8. In such a case putty or some other free terminal programs can be used.


**Figure 1-3. Check availability of Hyperterminal**

# 2.0 Setup descriptions

The LMX9830/LMX9838 is a full Bluetooth node, by default configured to listen for incoming links. The command interface also offers the ability to configure the device and actively setup links.

The following examples shall give an quick introduction into the different functionalities of the LMX9830/ LMX9838.

## 2.1 CABLE REPLACEMENT WITH LMX9830/LMX9838 WAITING FOR INCOMING CONNECTION

By default the LMX9830/LMX9838 is configured to be visible (discoverable) and connectable for other devices. The service database offers one “Serial Port Profile” (SPP) service called “COM1”.
In case the LMX9830/LMX9838 is connected by a remote device it will indicate the incoming link by a short event on the UART and then switch to transparent meaning it will not try to interpret incoming data on the UART directly to the Bluetooth interface. Incoming data on the Bluetooth interface are directly routed to the UART interface without framing them into Simply Blue command packets.

The demo is based on using Hyperterminal on both sides to create a simple serial port connection between two devices using the USB dongle as connecting device and LMX9830/LMX9838 as ‘passive’ waiting device.

### 2.1.1 Connect Hyperterminal to LMX9830/LMX9838

Since the LMX9830/LMX9838 is waiting for an incoming connection automatically, no specific action has been taken on this side. In order to monitor the incoming data on the UART any terminal program able to talk to a serial port can be used. This example uses the Hyperterminal application.

The following steps should be followed to connect “Hyperterminal” to the LMX9830/LMX9838 Evaluation Board.

#### 2.1.1.1 Start Hyperterminal

Start Hyperterminal as described in Section 1.3. Please make sure no other application (e.g. Simply Blue Commander) is using the same port as the LMX9830/LMX9838 Evaluation Kit.

#### 2.1.1.2 Create new connection

Create a new connection by typing a connection name like “SBDemo LMX9838”.


**Figure 2-1. Create New Connection in Hyperterminal**

#### 2.1.1.3 Choose correct comport

Since Hyperterminal is physically talking to a serial port, please choose the serial port the LMX9830/LMX9838 Evaluation Board is connected to, e.g. COM8 of your PC.


**Figure 2-2. Choose correct comport**

#### 2.1.1.4 Choose comport settings

Choose the correct comport settings for your LMX9830/LMX9838 Evaluation board. For example, we configure the UART setting on the board and the PC to 115200 bit/s, No Parity, 1 Stop bit. Please make sure Hardware Flow Control is selected in the dialog.

The LMX9830 UART setting is done by configuring pins OP3, OP4 and OP5. The setting for 115200 bit/s is OP3=1, OP4=1 and OP5=0

The LMX9838 UART setting is done by configuring pins OP4 and OP5. The setting for 115200 bit/s is OP4=1 and OP5=0

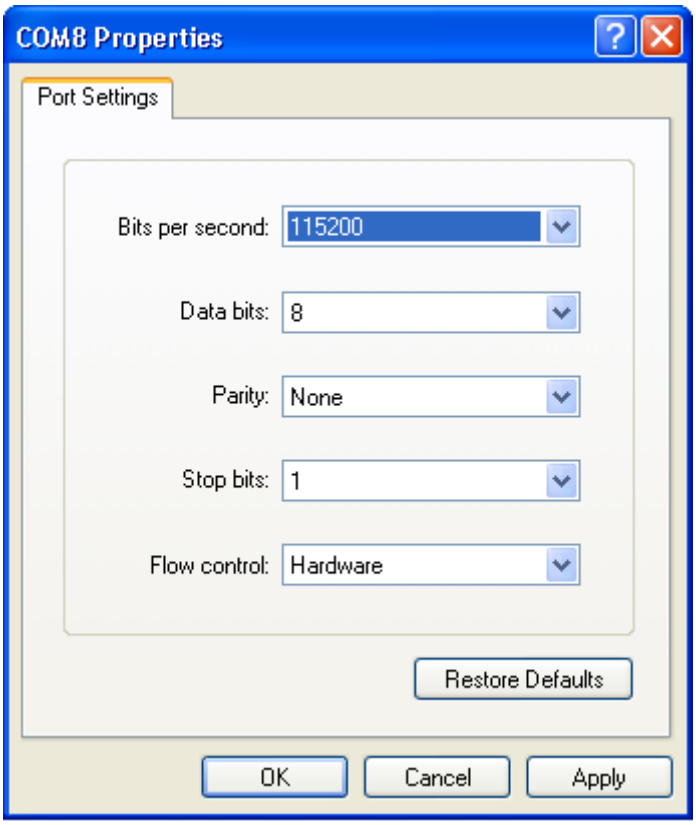


**Figure 2-3. Choose comport settings**

#### 2.1.1.5 Reset the LMX9830/LMX9838 Evaluation Board

Once the correct speed is chosen “Hyperterminal” should connect to the selected comport. Afterwards a hardware reset of the LMX9830/LMX9838 Evaluation board should cause a response as shown in Figure 2-4. The cryptic characters are specific hex values which are part of the Simply Blue interface event. The “0212” indicates the firmware version which might be different to your board. Please refer to “LMX9830 or LMX9838 Software Users Guide” for a detailed description of this event.
If this event is received the communication between “Hyperterminal” and the LMX9830/LMX9838 Evaluation board is confirmed.

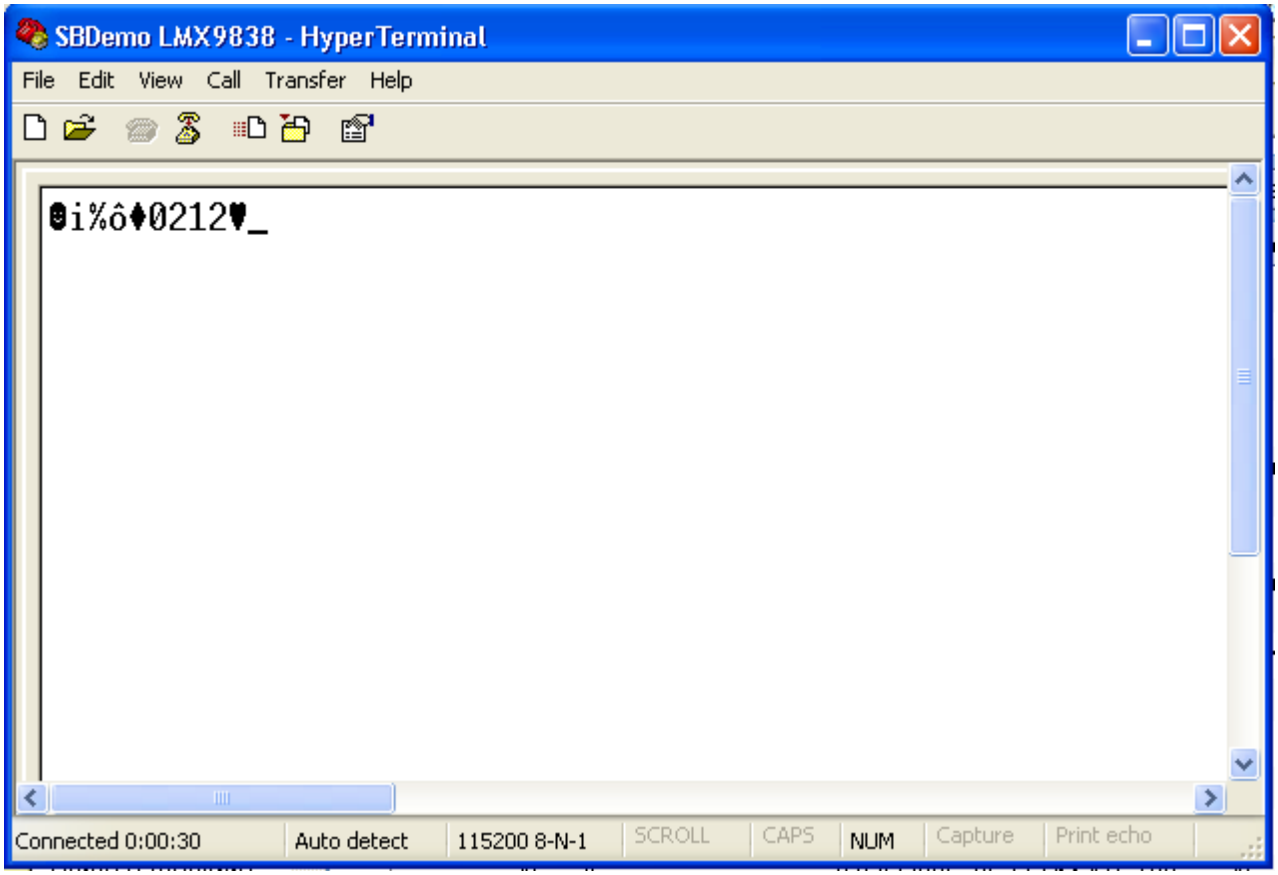


**Figure 2-4. Firmware Response after Reset**

IMPORTANT: Please do not close the Hyperterminal window during the whole demonstration procedure.

### 2.1.2 Establish Link to the LMX9830/LMX9838 from the Bluetooth USB Dongle

Since the LMX9830/LMX9838 is by default connectable and discoverable, it can be connected from any other Bluetooth device. To establish the link from the BT USB Dongle, the IVT Stack needs to be started. Therefore please start the "Bluesoleil" application. You should see the screen as demonstrated in Figure 1-2 on page 4. The Bluetooth icon in the taskbar needs to be blue and white. In case the background is grey instead of blue, the USB dongle has not been installed correctly.

#### 2.1.2.1 Start Inquiry - Search for devices in range

The first to be done is to search for the devices in range. To do so, please click on the yellow "sun" in the middle of the window, which initiates the Bluetooth "Inquiry". The LMX9830/LMX9838 Evaluation board should appear as "Serial Port Device".

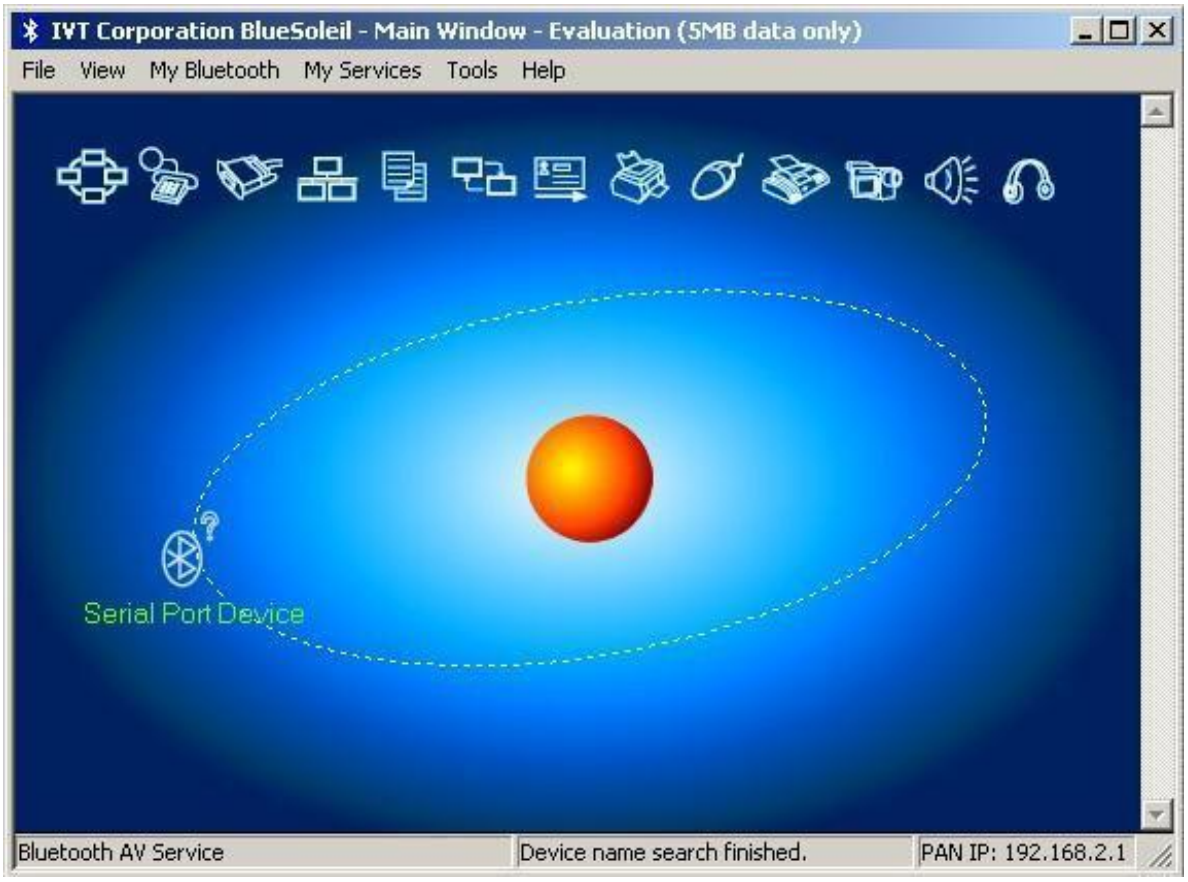


**Figure 2-5. Result of Inquiry procedure**

#### 2.1.2.2 Service Discovery - Get Services of the LMX9830/LMX9838

Once the “Serial Port Device” is detected, double click on the icon or the name of the device to start the service discovery on this device. If successful, the stack will indicate the available services by surrounding the specific icons with rectangles. The service discovery should result in the screen as shown in Figure 2-6, indicating a “Serial Port service”.

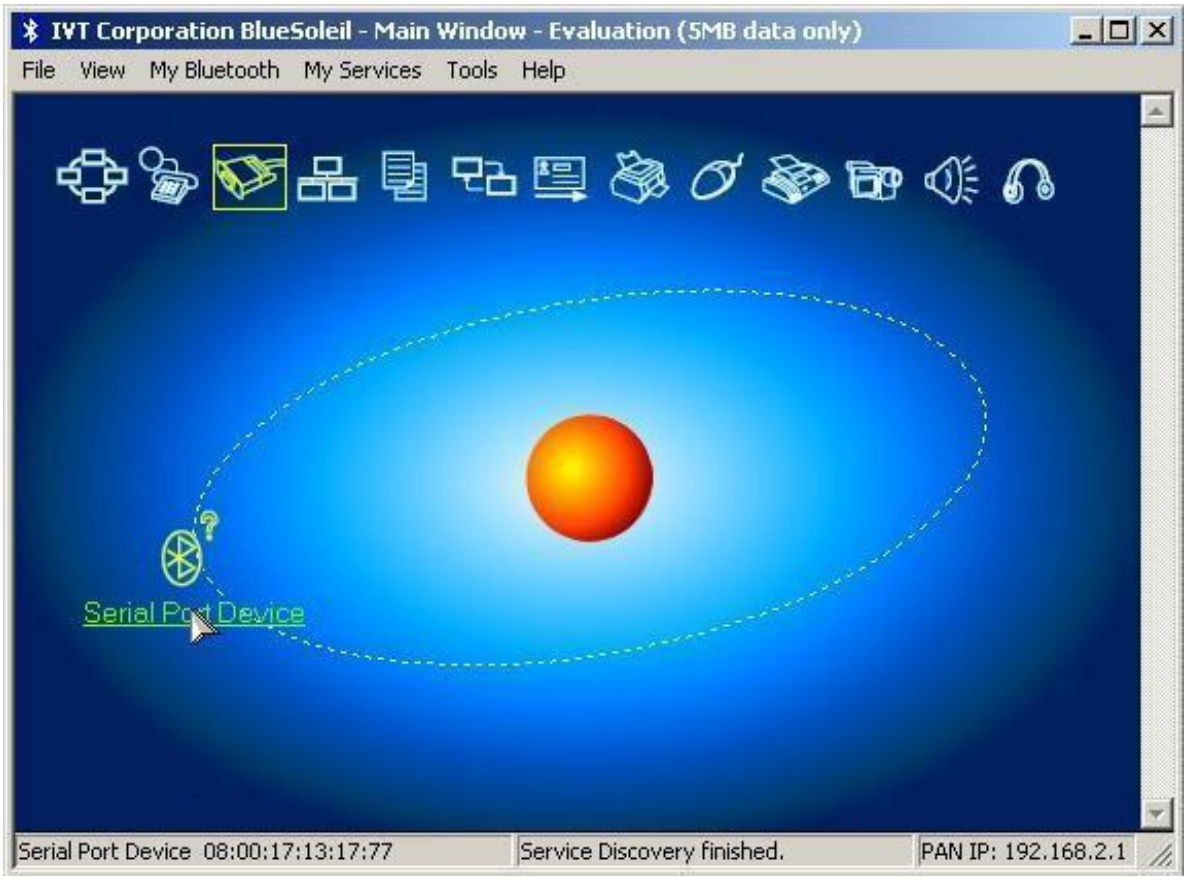


**Figure 2-6. Service Discovery result**

#### 2.1.2.3 Establish Link to the LMX9830/LMX9838

To finally connect to the LMX9830/LMX9838 Evaluation board, double click on the “Serial Port” icon if “Serial Port Device” has been selected. This will start the connection establishment process.

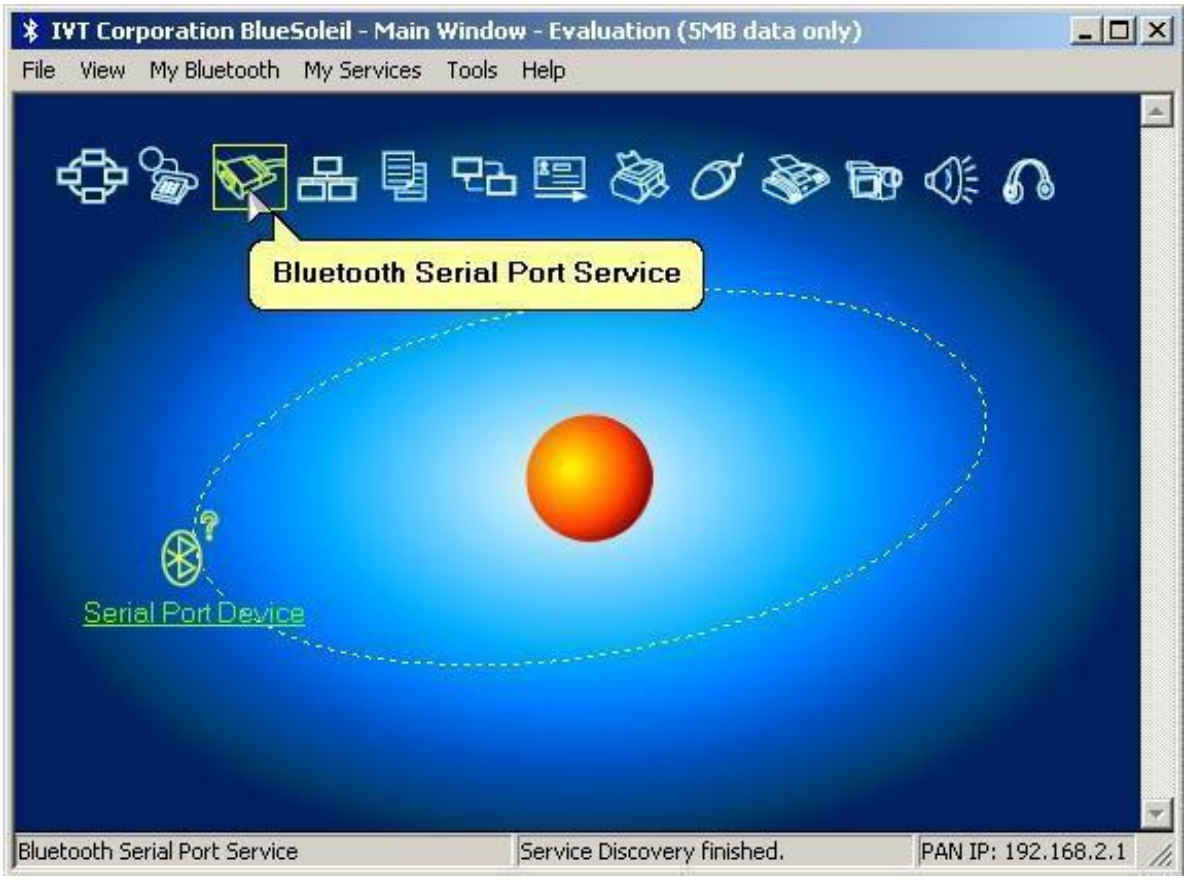


**Figure 2-7. Connect to the Bluetooth serial port**

As result the stack will report the virtual serial port, which will be used for this serial port connection. In this example "COM4" will be used. This means, any data sent to this COMPort will be sent over the Bluetooth link to the LMX9830/ LMX9838.

If the dialog is answered with Yes, the stack will automatically open the Bluetooth link to the LMX9830/LMX9838 as soon as any application opens "COM4".

Please confirm with "Yes" if that's desired. Otherwise the assignment of COM4 to the LMX9830/LMX9838 will be temporary.

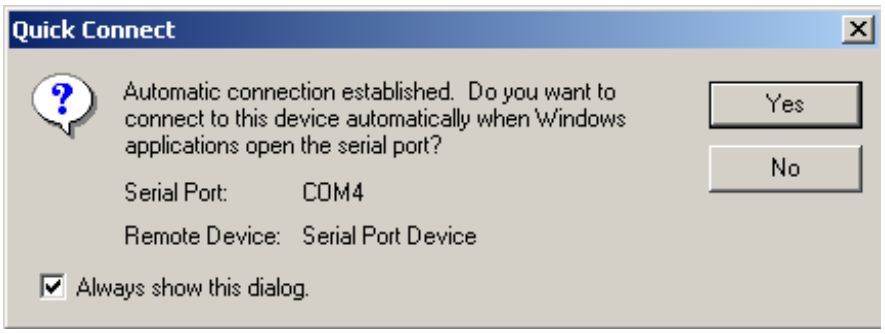


**Figure 2-8. Virtual Serial Port used for this connection**

#### 2.1.2.4 Enter PIN for LMX9830/LMX9838

By default the LMX9830/LMX9838 asks for a PIN if the local SPP service is connected from a remote device. Therefore the following dialog will appear from the IVT Stack. Please type “0000”, which is the default PIN stored in the LMX9830/LMX9838 and press OK.

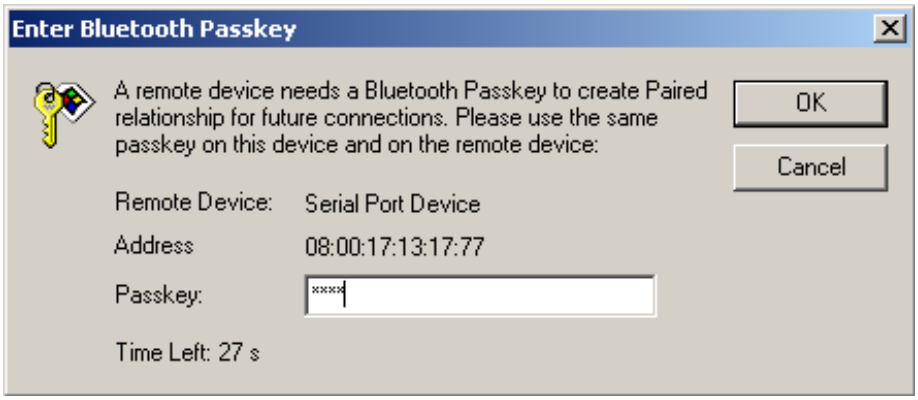


**Figure 2-9. Enter PIN for LMX9830/LMX9838**

Afterwards the Link between the two devices is established. The IVT Stack indicates the link by showing a line between the “sun” and the “Serial Port Device” icon.

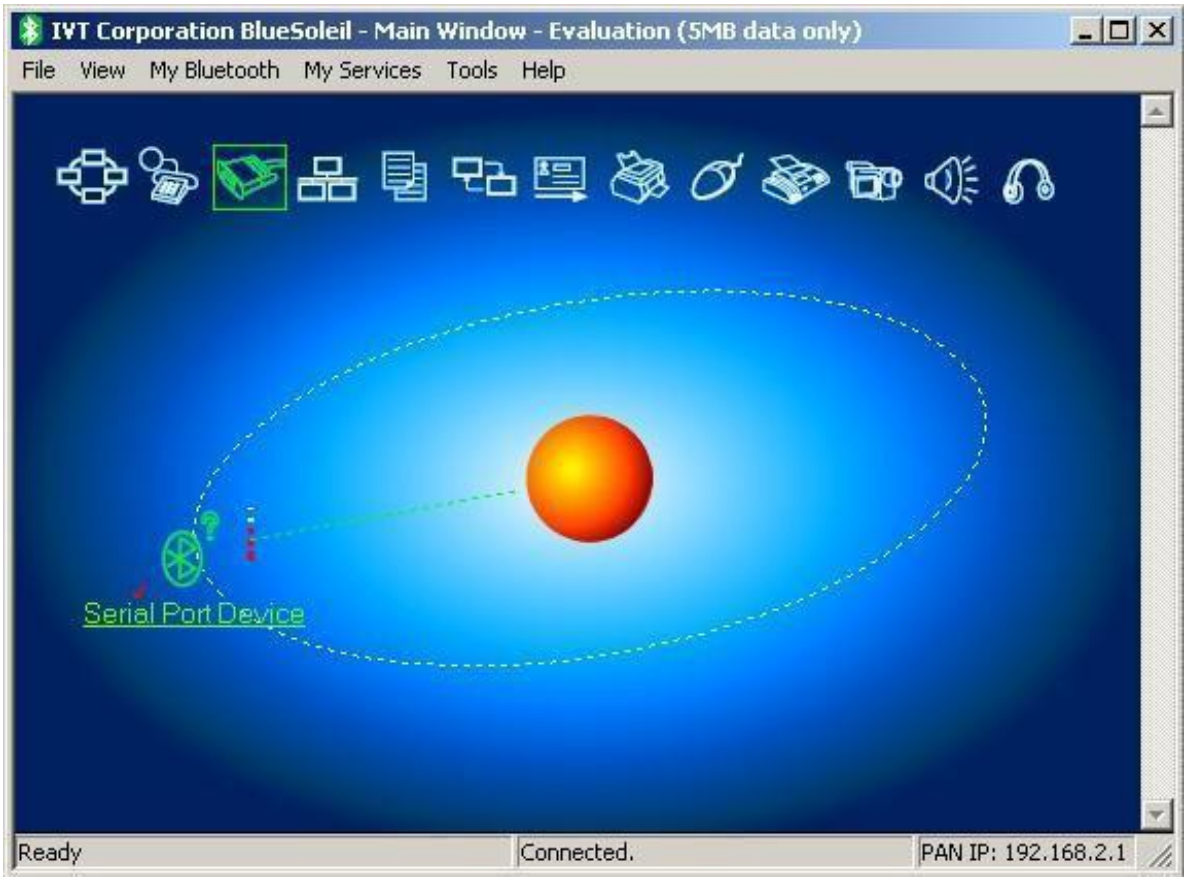


**Figure 2-10. Bluetooth Connection Established**

Once the link is established, the Hyperterminal window of the LMX9830/LMX9838 should indicate a message similar to Figure 2-11. The cryptic data show again an event reported by the LMX9830/LMX9838 command interface. The data comply to a specific packet format which is not readable in ASCII.

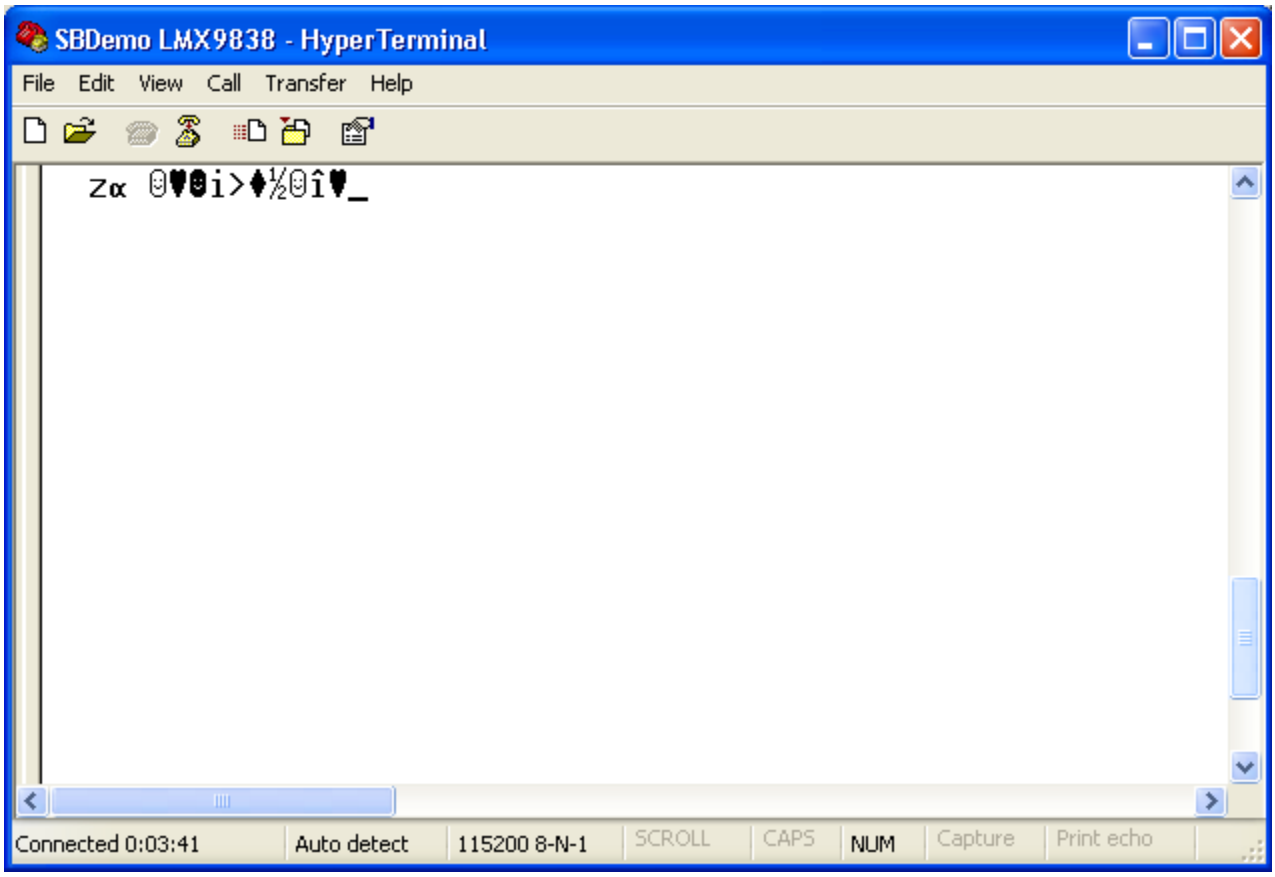


**Figure 2-11. Incoming Link Established in Hyperterminal**

### 2.1.3 Open Hyperterminal session on the virtual serial port

In order to exchange data now between the LMX9830/LMX9838 and the USB Dongle/IVT stack, another terminal window can be used. For this, create another Hyperterminal connection, directly connected to the COMPort reported in Section 2.1.2.3 on page 11.

#### 2.1.3.1 Start Hyperterminal

Start Hyperterminal as described in Section 1.3 on page 4.

#### 2.1.3.2 Create new connection

Create a new connection by typing a connection name like “SBDemo USBDongle”.

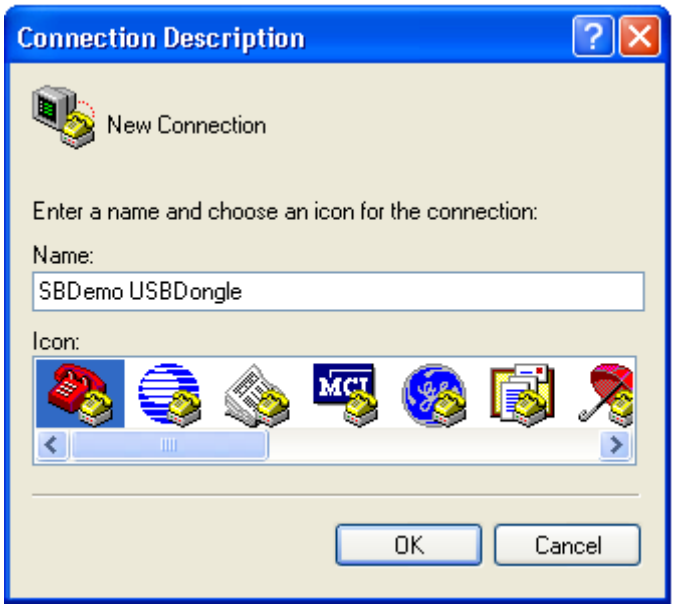


**Figure 2-12. Create New Connection**

#### 2.1.3.3 Choose correct Comport

In order to talk to virtual serial port of the stack, choose the COMPort reported by the stack as described in Section 2.1.2.3, Figure 2-8 on page 12. In this example “COM4” needs to be used.


**Figure 2-13. Choose correct COMPort**

#### 2.1.3.4 Select correct comport settings

The comport settings for the virtual serial port should be the same as chosen for the LMX9830/LMX9838 (see Section 2.1.1.4 on page 8).

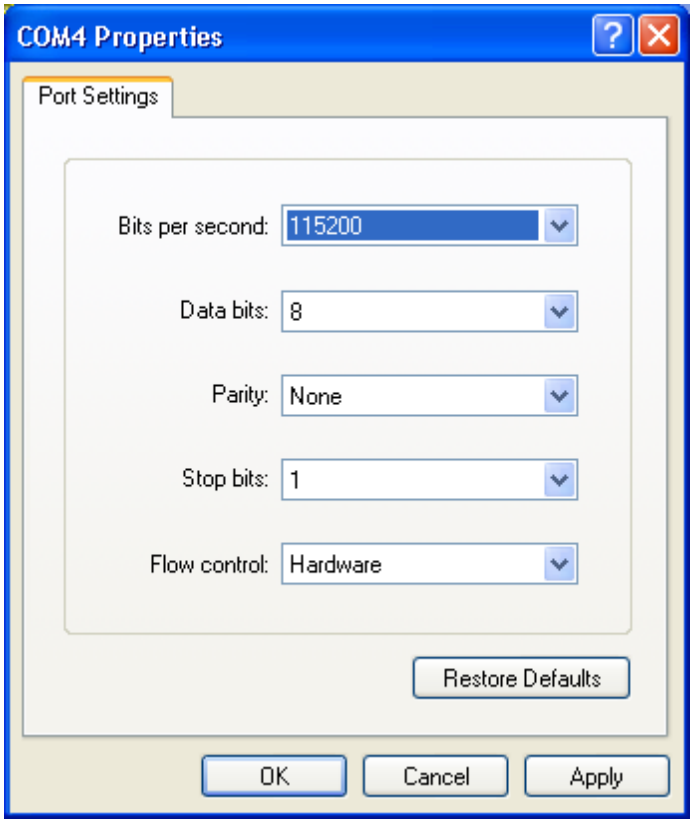


**Figure 2-14. Select correct comport settings**

Afterwards the Hyperterminal window comes up and should be connected to the selected COMPort.

### 2.1.4 Use Hyperterminal for simple chat

Once both Hyperterminal windows are opened, each character typed or data sent will be transferred to the other device and will show up in the other Hyperterminal. Since the LMX9830/LMX9838 switches automatically to “Transparent Mode” after being connected from outside, any character sent to it will be forwarded to the Bluetooth device connected to it.

### 2.1.5 Transfer a file with ZModem

Hyperterminal can also be used to send a file to the other side.

To do so, please select “Transfer/Send File” from the menu.

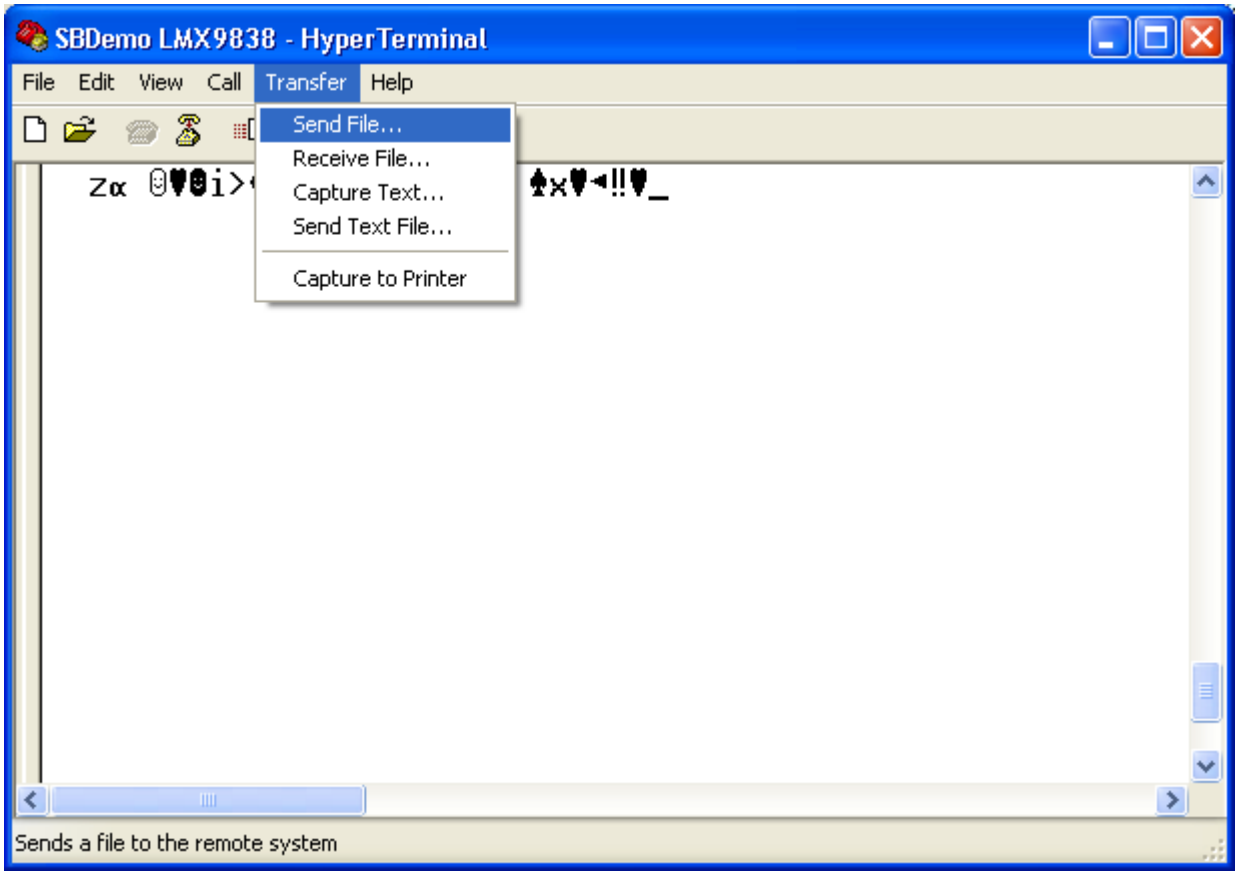


**Figure 2-15. Choose “Send File...” with Hyperterminal**

Afterwards please select the file you want to send, choose “Zmodem” in the Protocol section and press “Send”.

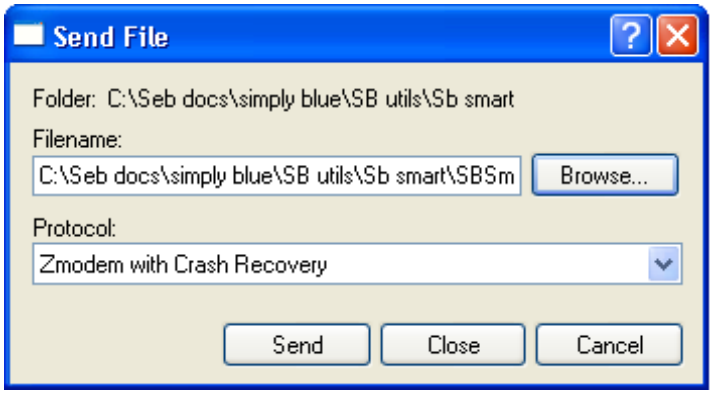


**Figure 2-16. Choose File and protocol**

Once done, receiving and transmitting Hypterterminal show the progress of the transmission, together with the average speed of the link.

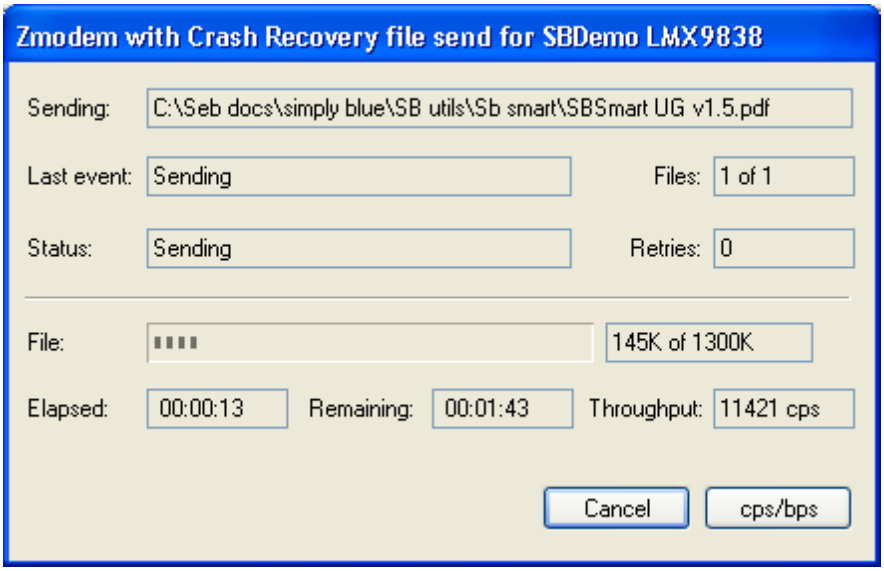


**Figure 2-17. Progress window for sending a file with ZModem**

## 2.2 INITIATE A LINK WITH LMX9830/LMX9838 USING SIMPLY BLUE COMMANDER

The LMX9830/LMX9838 command interface offers full Bluetooth capabilities. The Simply Blue Commander software gives an easy to use interface to send commands to the LMX9830/LMX9838 and interprets incoming events.

Please see also “Simply Blue Commander Users Guide” for a detailed description on the usage of Simply Blue Commander.

The following demonstration shows how to use Simply Blue Commander to establish a standard Serial Port Profile (SPP) Link to another device. The counterpart of the link will be the BT USB Dongle, controlled by the IVT Stack.

Please make sure the devices are connected to the PC and the IVT stack at the PC detected the USB Dongle correctly.

### 2.2.1 Start Simply Blue Commander

Start Simply Blue Commander as described inSection 1.1 on page 3. Please make sure no other device is using the Comport the LMX9830/LMX9838 Evaluation board is connected to.

Once the program is up and running, press the RESET button on the Evaluation board. This will cause the LMX9830/LMX9838 to reboot and bring up the “SimplyBlue Ready” Event, followed by the firmware version.

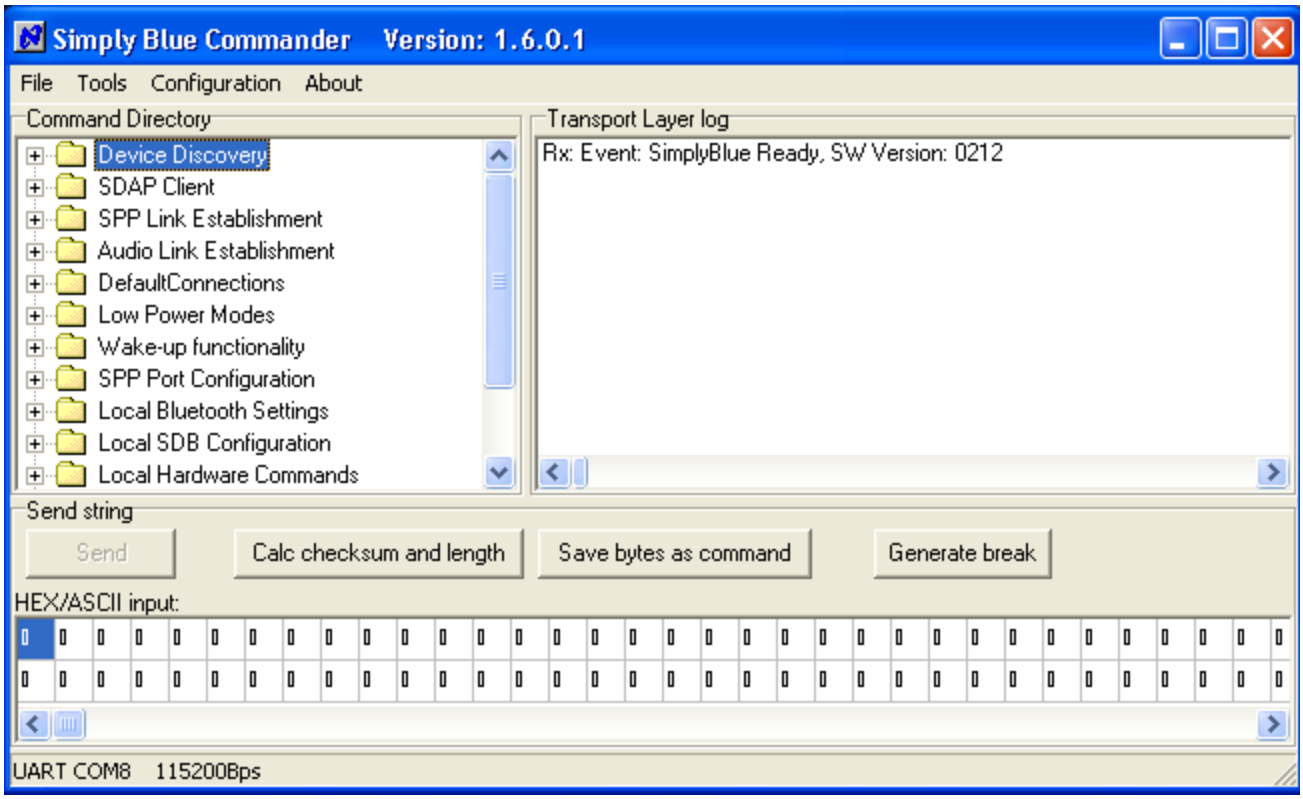


**Figure 2-18. Simply Blue Commander Start Window**

### 2.2.2 Send “Restore to factory settings” and “Reset”

To make sure all settings are reset to expected values, the “Restore to factory settings” can be used before first initialization. This is not required for general use, it is just necessary for this demo to make sure all parameters are set as expected.

To do so, open the “Local Hardware Commands” Folder within the Command Directory and double-click on “Restore to Factory Settings”. Afterwards double-click on “Reset”, which will complete the activation of the settings.

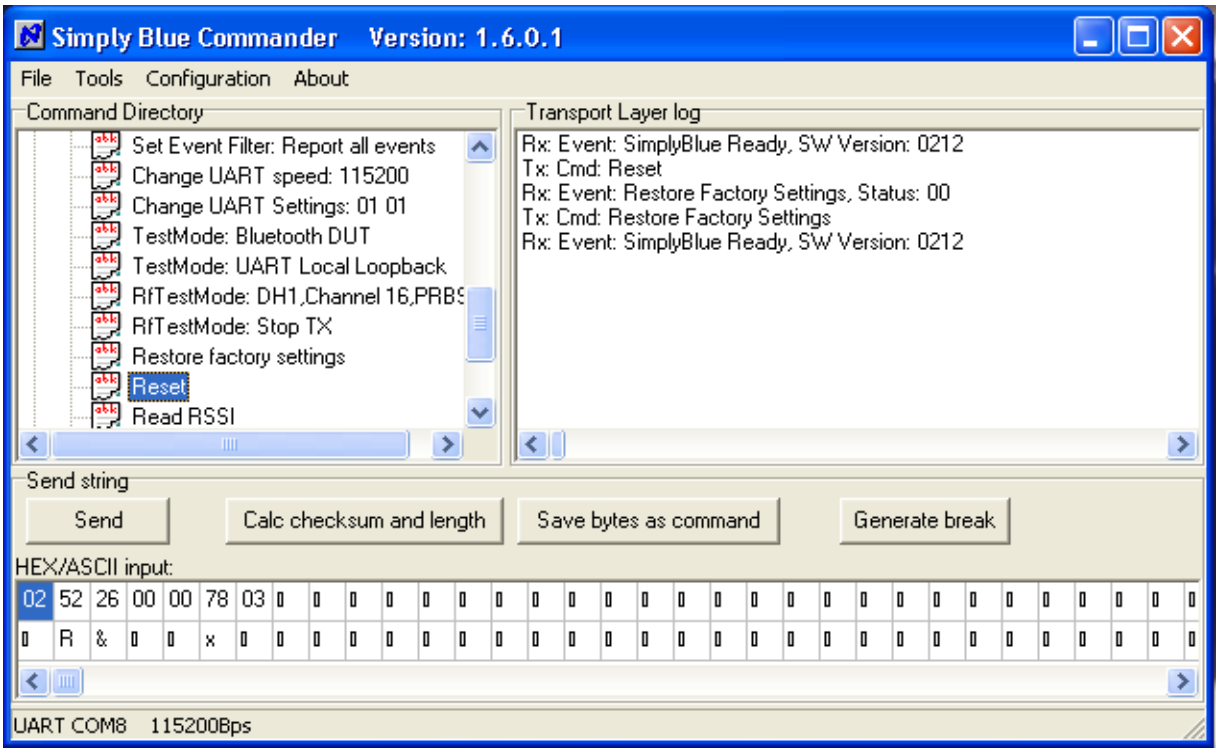


**Figure 2-19. Restore to factory settings**

### 2.2.3 Find remote device

To be able to connect to another device the connecting device needs to know the Bluetooth Device Address and the Remote RFComm Port to connect to.

#### 2.2.3.1 Device Discovery - Send “GIAC Inquiry”

The first step therefore is to start the “Inquiry” Process. This process can be started using the “GIAC Inquiry” Command in the “Device Discovery” section of the Command Directory. On “GIAC Inquiry” (General Inquiry Access Code Inquiry) the device will show any device scanning in normal mode. “LIAC” (Limited Inquiry Access Code) will search for devices in the “Limited Inquiry scan mode” which is only used in special applications.

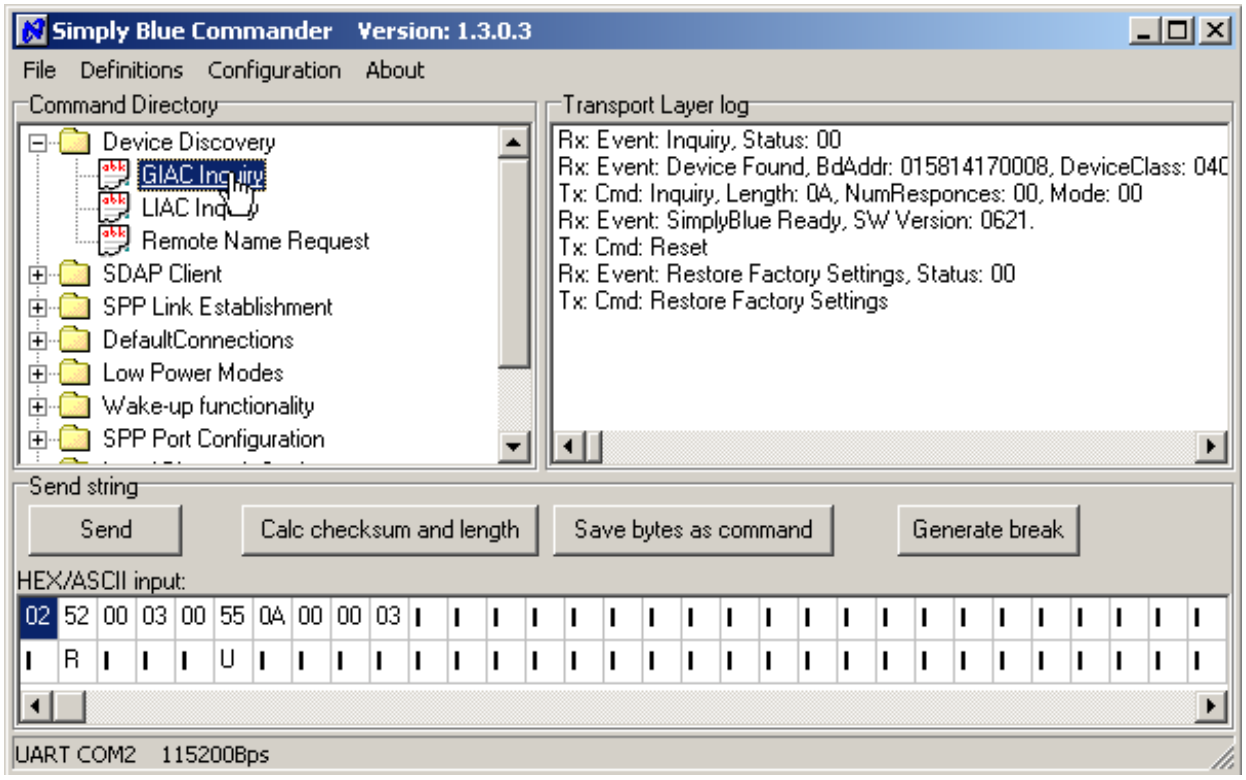


**Figure 2-20. General Inquiry to get the Bluetooth address of a remote device**

#### 2.2.3.2 Get remote name (optional)

In case more than one device has been found, each of the devices can be asked for it's "Friendly Name". As seen in Section 2.1.2.1 on page 10, the LMX9830/LMX9838 by default appeared as "Serial Port Device". To get the remote name of the device in our example, the device needs to be contacted and asked for it's name.

The name request is initiated by the "Remote Name Request" Command within the Command Directory. Since the command needs to be modified for each specific device, the following procedure needs to be followed for each device.

##### 2.2.3.2.1 Single Click "Remote Name Request"

By single clicking the Remote Name Request Command, the "HEX/ASCII input" line is updated with the complete hex string to be sent to the LMX9830/LMX9838.

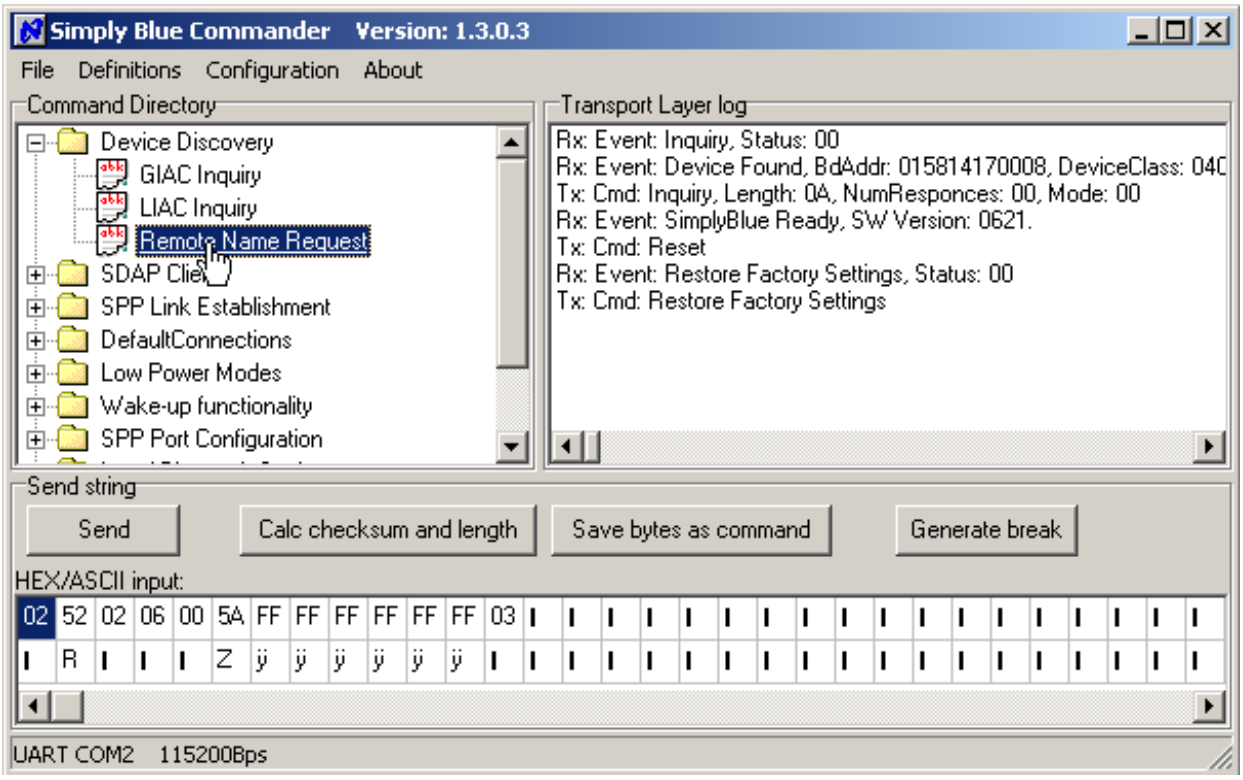


**Figure 2-21. Activate Remote Name Request**

#### 2.2.3.2.2 Replace payload by device Bluetooth address

After activating the command in the command directory, the HEX/ASCII input now shows the complete structure of the command. Each command is built out of a 6-byte header, the payload and a 1-byte delimiter. The payload of the command by default is filled with FF as placeholder for the remote Bluetooth device address.

To initiate the remote name request, the Bluetooth device address from the previous inquiry result needs to be filled in. The address can be found within Transport Layer log, reported as

“RX:Event: Device Found, BdAddr: **015814170008**, Device Class: 040112”

In this example the inquiry just indicates one device with address 015814170008.

To complete the request this address has to be filled into the HEX/ASCII input link, by replacing the FFs with this address. See Figure 2-22 on page 23 as an example.

If a Bluetooth device wants to connect to the serial port service of another device, it first has to ask for this specific RFCOMM port. This

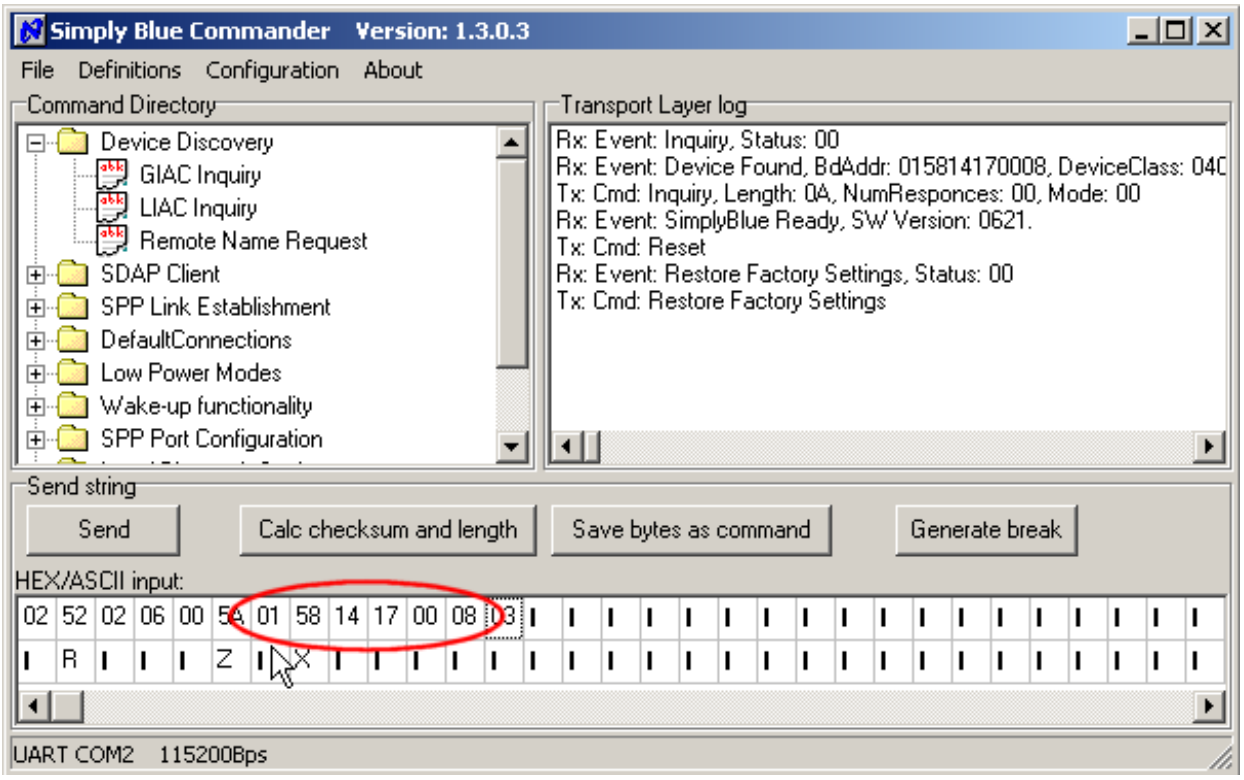


**Figure 2-22. Fill in the Bluetooth address of the device found**

#### 2.2.3.2.3 Press "Send"

To finally send the command to the LMX9830/LMX9838, just press the "Send" button. The LMX9830/LMX9838 will respond to the request by the appropriate "Remote Device Name" Event, including the status and the device name. In this example the name "DCDL38" has been detected. In case the status is different from 0x00, the physical connection establishment might have been failed. In that case just try again until the status 00 is reported.

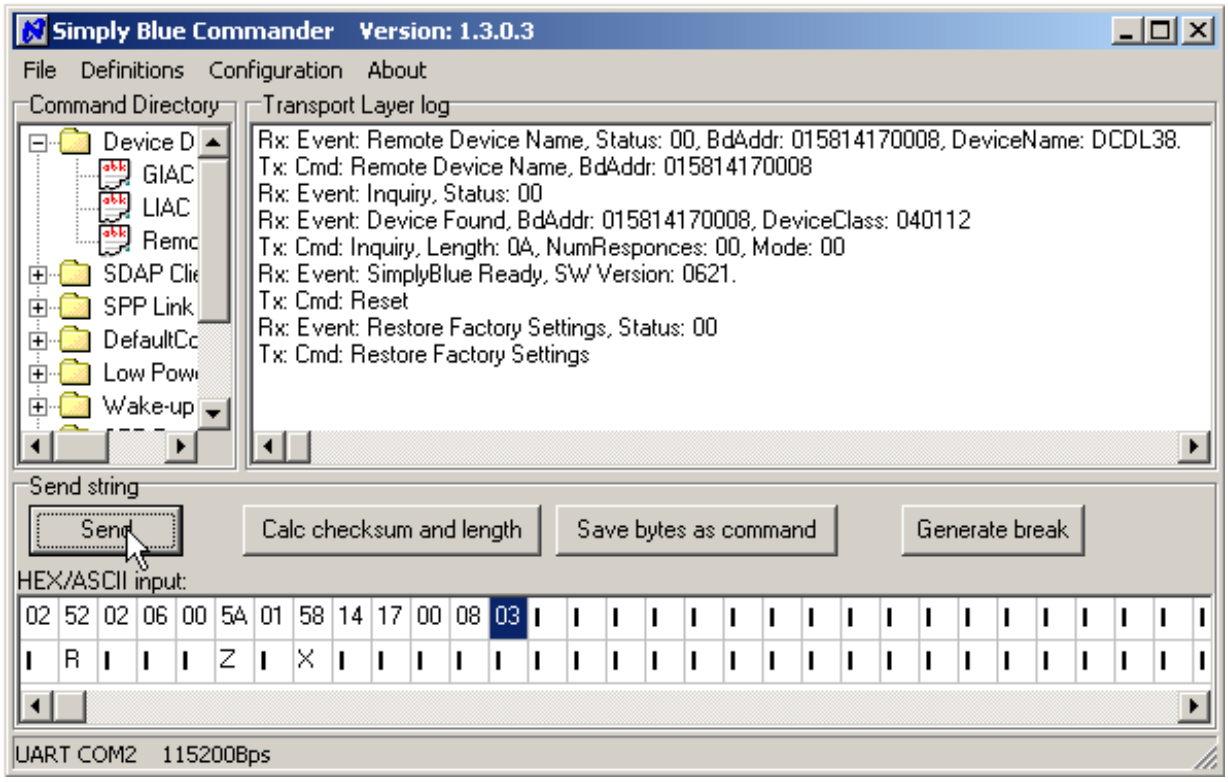


**Figure 2-23. Remote Name Request Response**

### 2.2.4 Get remote RFComm Port for SPP

A serial port profile communication between two devices is based on the "RFCOMM" layer. This layer basically offers a virtual serial port environment to the application. Each SPP based service like "Serial Port" or "Dial Up Networking" is registered to a specific RFCOMM port, like e.g. a modem driver on a PC is using a specific COMport.

This comport assignment is stored within the so called "Service Database" of each device.

If a device wants to create a link to the "Serial Port" service of another device, it has to know the RFComm Port for this service on the other device. Afterwards a link will be established from a Local Port to the appropriate Remote Port.

The RFCOMM Port of a service on the remote device can be found by using a SDAP Request.

#### 2.2.4.1 Create SDAP Connection

To browse for service first a SDAP connection has to be established. For this the "SDAP Connect" Command can be used. Since the command needs to be modified for the correct Bluetooth address, the same procedure as for the Remote Name Request needs to be used.

#### 2.2.4.1.1 Single Click "SDAP Connect" in the Command Directory

By a single click of the command in the directory, the hex string for the command appears in the "HEX/ASCII input:" line.

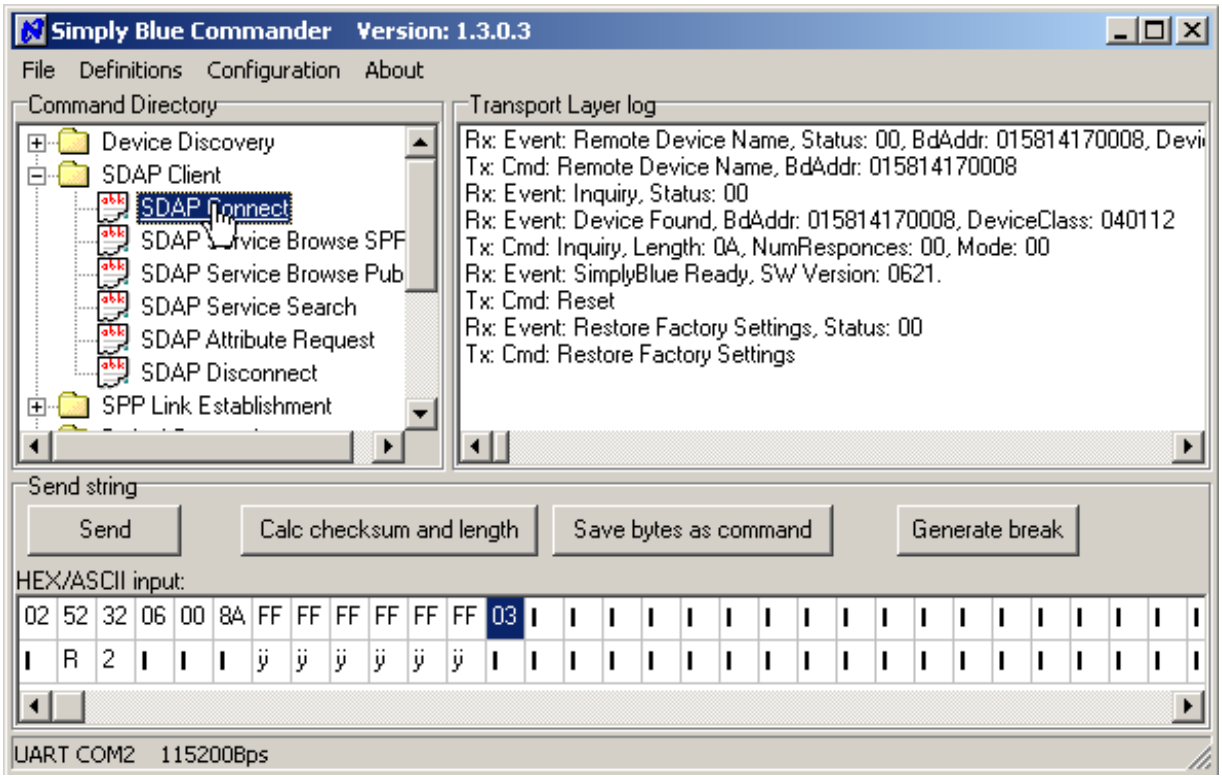


**Figure 2-24. Activate "SDAP Connect"**

#### 2.2.4.1.2 Replace payload by device Bluetooth address

The example SDAP Connect command has FF values as placeholders for the device address. These FFs have to be replaced by the address of the device to be contacted.

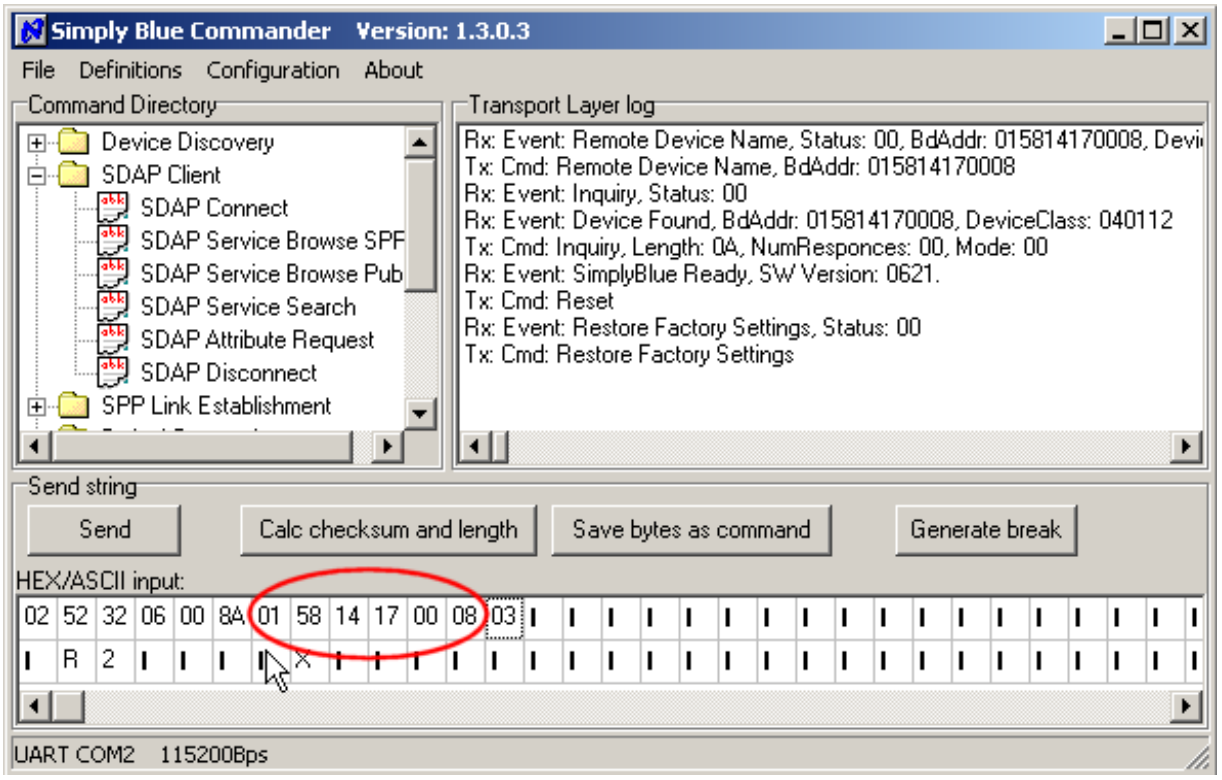


**Figure 2-25. Replace payload by Bluetooth**

#### 2.2.4.1.3 Press “Send”

To finally send the command to the LMX9830/LMX9838, just press the “Send” button. The LMX9830/LMX9838 will confirm the connection establishment including the status. In case the status is 0x00 the connection establishment was successful. Otherwise please retry until the connection is confirmed as success.

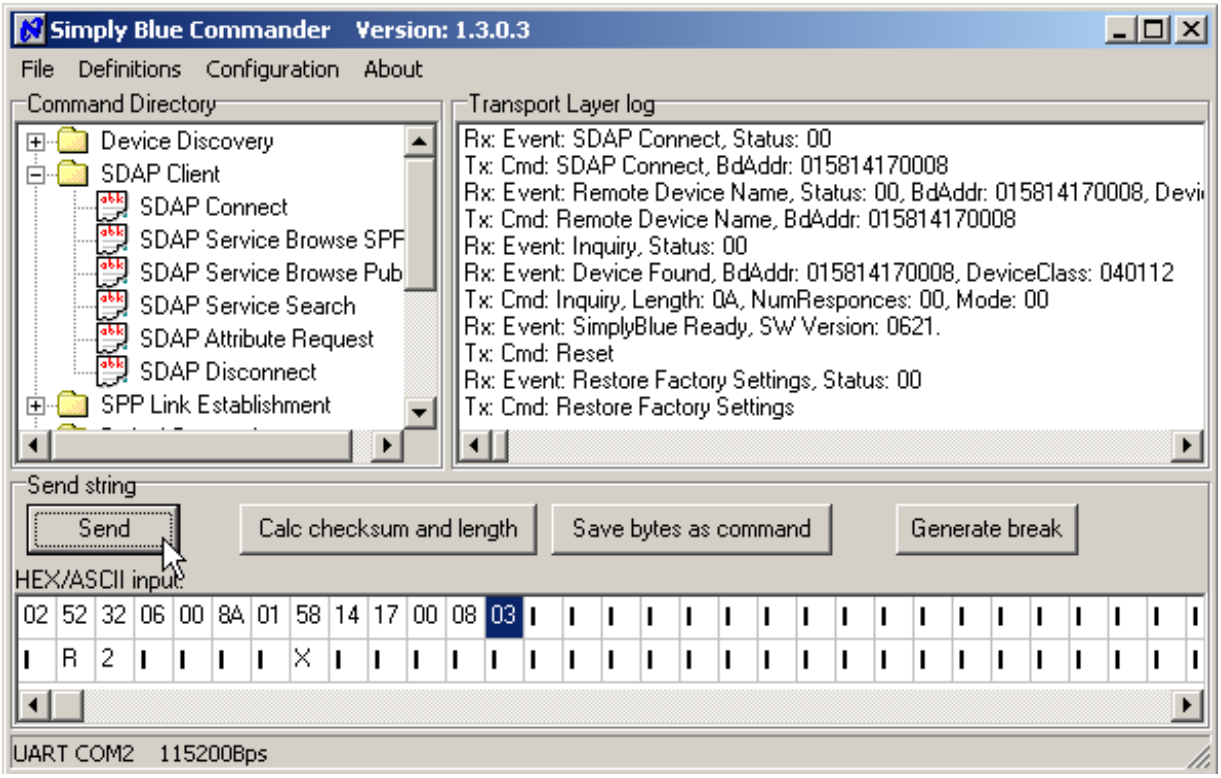


**Figure 2-26. Press “Send” to release the command**

#### 2.2.4.2 Browse for the SPP Service

Once the SDAP Connection is established, the remote database can be asked for the requested service. The prepared “SDAP Service Browse SPP” Command can be used directly to browse for the service by double clicking the command in the command directory.

This request searches specifically for a SPP entry. Please refer to “LMX9830 or LMX9838 Software Users Guide” for details of the command.

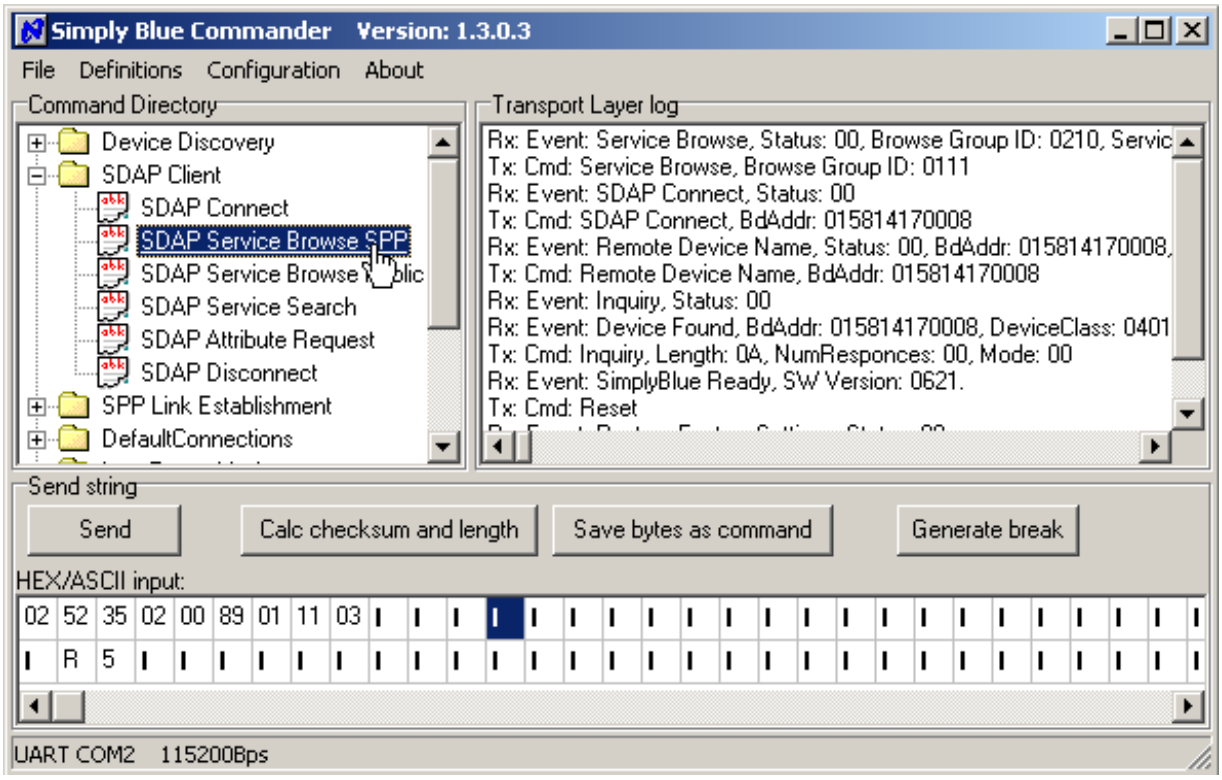


**Figure 2-27. Send SDAP Service Browse for SPP**

The response to this request includes the status and, in case a valid service has been found, the port number and the name of the requested service. The full response of the device in the example looks like this

*Rx: Event: Service Browse, Status: 00, Browse Group ID: 0210, Service ID: 0111, PortNo: 02, Service Name: Serial Port A., Browse Group ID: 0210, Service ID: 0111, PortNo: 03, Service Name: Serial Port B.*

The event shows, that the remote device offer 2 Serial Port services:

- Service 1:
  — RFCOMM Port: “0x02”
  — Service Name: “Serial Port A”

- Service 2:
  — RFCOMM Port: “0x03”
  — Service Name: “Serial Port B”

For a Serial Port connection, one of those ports can be used.

#### 2.2.4.3 Close SDAP Connection

After the successful Service browse, the SDAP connection needs to be closed again. The prepared SDAP Disconnect commands needs no modification and can be used directly.

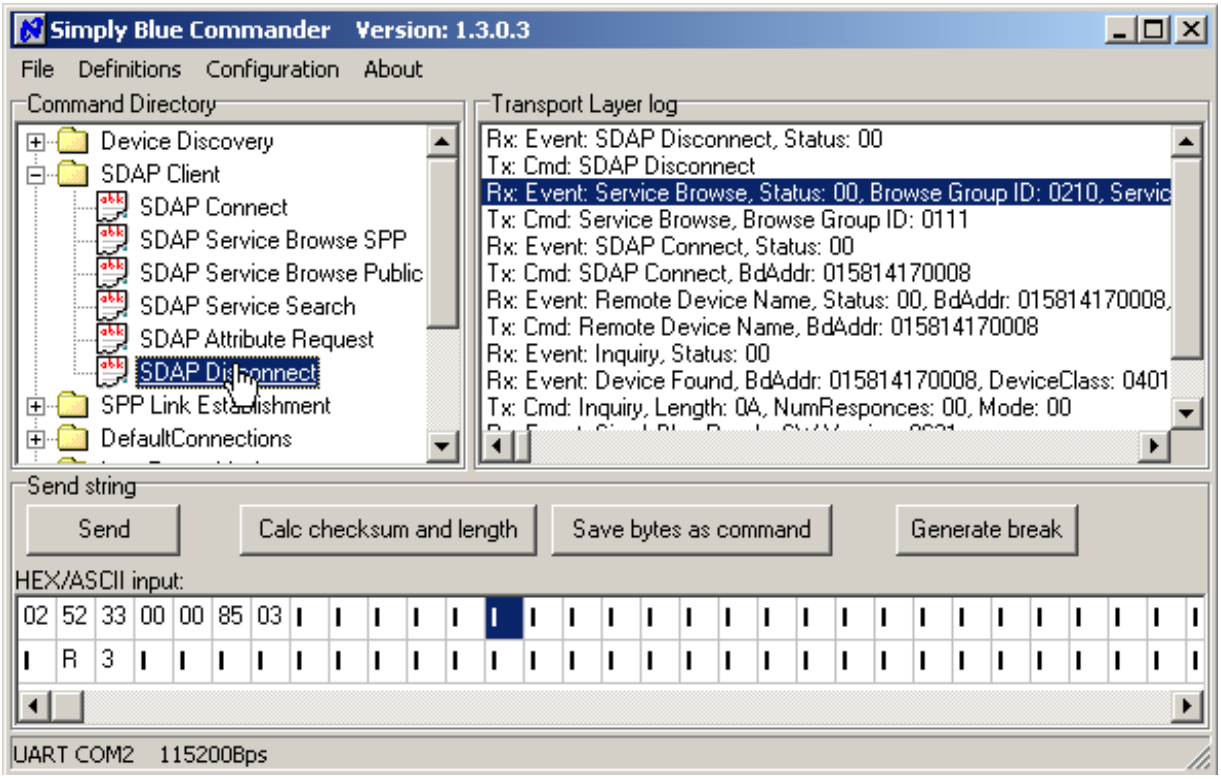


**Figure 2-28. SDAP Disconnect Request**

### 2.2.5 Establish SPP Link

Finally, if the Bluetooth address (BD_Addr) and the remote RFComm port to be addressed are known, an SPP Link can be established to the device.

NOTE: The steps explained in Section 2.2.3.1 to Section 2.2.4.3 are only necessary in case the remote device is not known yet.

#### 2.2.5.1 Select “Establish SPP Link”

The main command to establish a link to another device is “Establish SPP Link”, to be found in the “SPP Link Establishment” section of the command directory.

Select the command to get the HEX string in the “HEX/ASCII input” line.

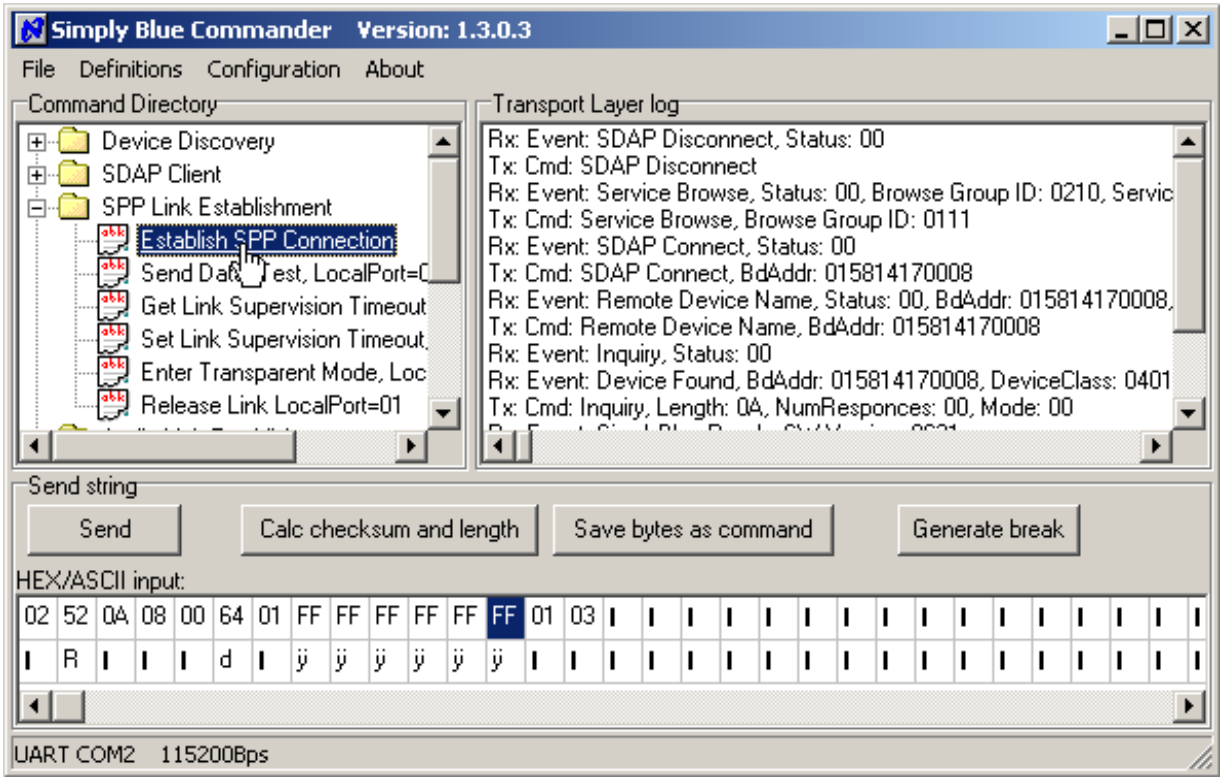


**Figure 2-29. Select "Establish SPP Link"**

### 2.2.5.2 Adapt Link Establishment parameters

The "Establish SPP Connection" command includes 3 parameters in the payload, which have to be adapted to successfully establish a link.

As usual the first 6-bytes of the command are the packet header. The payload of the command in the example consists of:

- The Local RFCOMM Port (1 byte)
  - This is the local RFCOMM port of the LMX9830/LMX9838, which will be assigned to this link. Each data sent to this port after link establishment will be sent to this remote Bluetooth device.
- The BD_Addr of the remote device (6 bytes)
  - In able to connect to the correct device, its BD_Addr has to be filled in (same as used for SDAP, found by Inquiry)
- The Remote RFCOMM Port (1 byte)
  - The remote RFCOMM port is the comport assigned to the Serial port service, as found by the SDAP Service Browse (see Section 2.2.4.2). In this case Port 02 shall be used.

There in this example the payload has to be filled with 01 01 58 14 17 00 08 02.

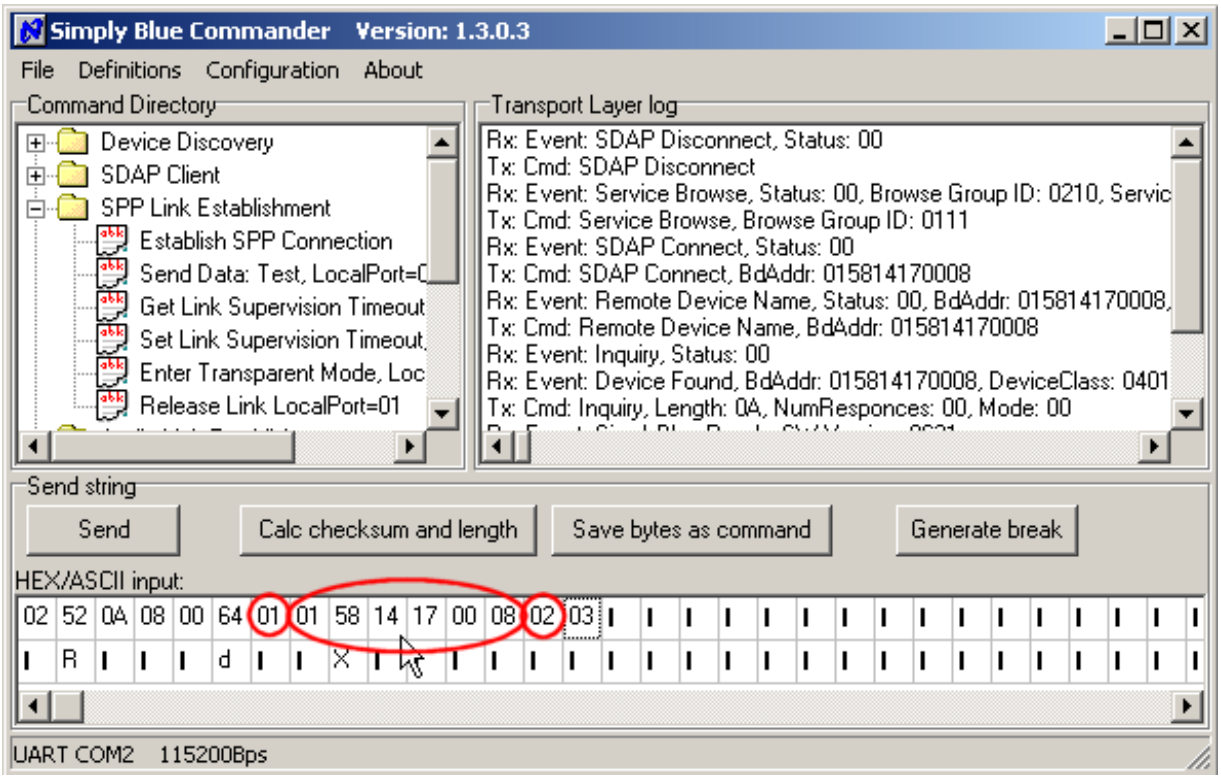


**Figure 2-30. Adapting the "Establish SPP Connection" Command**

#### 2.2.5.3 Press "Send" to connect

By pressing "Send" the command will be sent to the LMX9830/LMX9838.

The Link Establishment is first confirmed by the event

*Rx: Event: Establish Link, Status: 00, Local Port: 01*

which just indicates that the command has been received successfully and the LMX9830/LMX9838 is starting to process the request. If status is different from 00 then please check again the parameters you've entered within the command.

The IVT stack of the USB Dongle will probably alert to the user that another device tries to request the service and will ask for the PinCode. For this the default pincode of the LMX9830/LMX9838 needs to be used (0000).

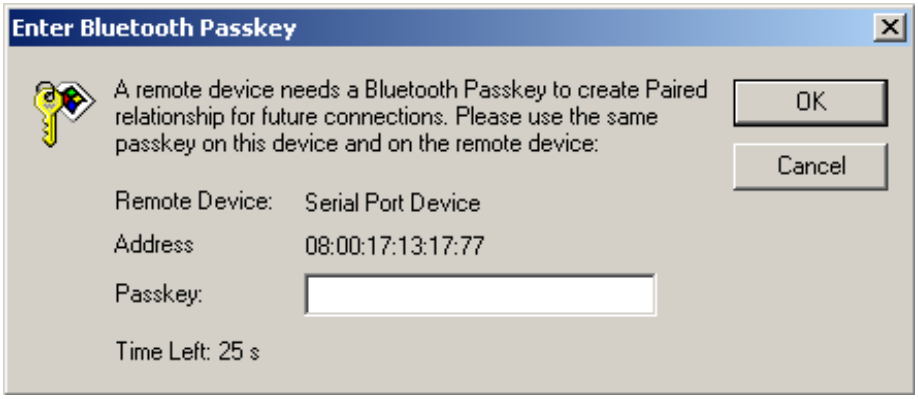


**Figure 2-31. Pincode request on the IVT Stack for the incoming connection**

In case the Pincode has been entered correctly, the stack asks if again on application level if the device is allowed to access the Serial Port Service. The question should be answered with Yes. To avoid this message in the future, the check-box can be checked as well.


**Figure 2-32. Incoming device requesting access to a local service**

Finally the stack reports virtual serial port which can be used to send and receive data for the connected device. This port can now be used by applications like hyperterminal.

NOTE: The IVT stack and most other windows stacks assign different virtual ports for incoming and outgoing connections.

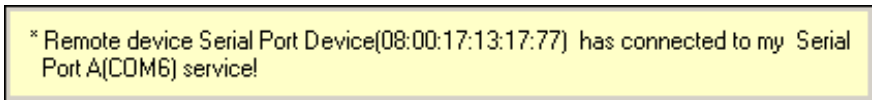


**Figure 2-33. Virtual Serial Port for the incoming link**

Having a final look at the “Simply Blue Commander” it shows the event

*Rx: Event: Link Established, Status: 00, BdAddr: 015814170008, Local Port: 01, Remote Port Number: 02*

with status 00, which indicates the successful link establishment. In case this event reports status 0x03, the link establishment most likely timed out or failed to another reason. The link establishment command should be resent.

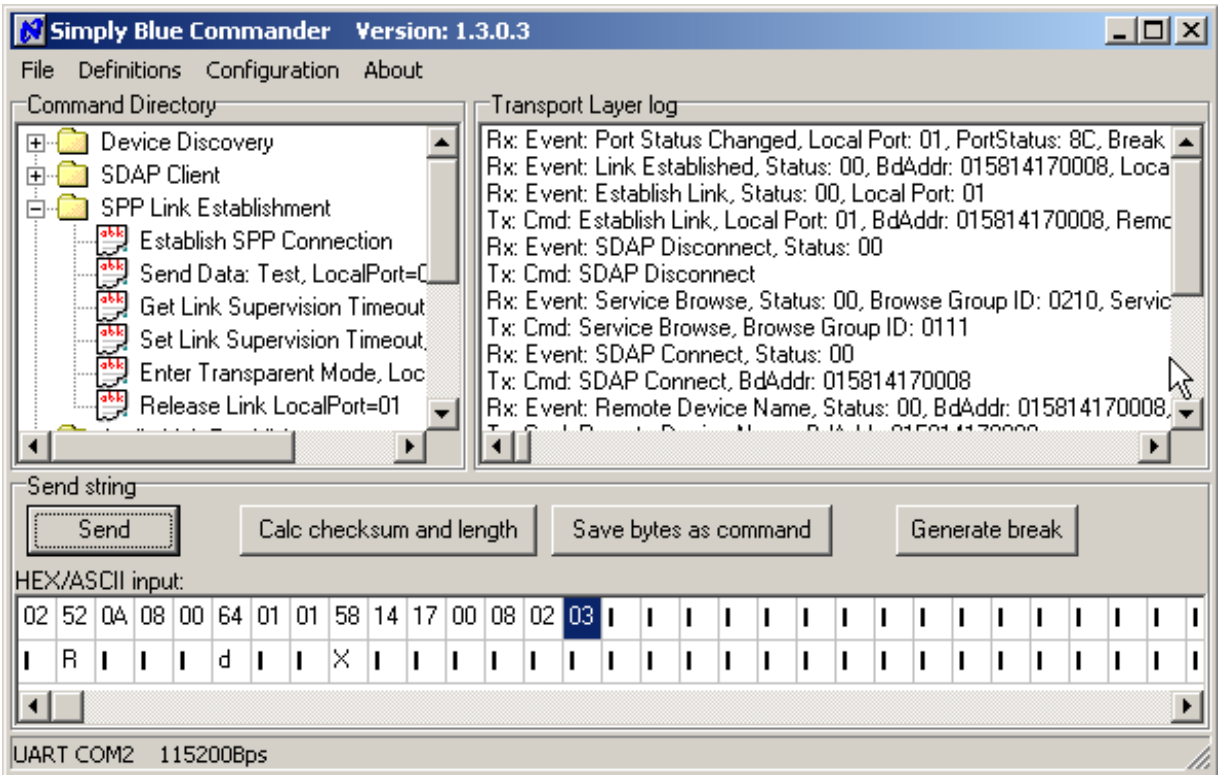


**Figure 2-34. Successful link establishment from the LMX9830/LMX9838**

### 2.2.6 Create Hyperterminal connection for incoming virtual serial port

Once the LMX9830/LMX9838 connects to the Windows Stack of the USB Dongle, the windows stack will assign a virtual serial port to this link as seen in Section 2.2.5.3 on page 30.

This means, any data sent to this virtual serial port will be sent to the LMX9830/LMX9838.

Since we need an application to do this, a Hyperterminal connection needs to be created.

#### 2.2.6.1 Open Hyperterminal Start Hyperterminal

Start Hyperterminal as described in Section 1.3 on page 4.

#### 2.2.6.2 Create new connection

Create a new connection by typing a connection name like “SBDemo USBDongle incoming”.

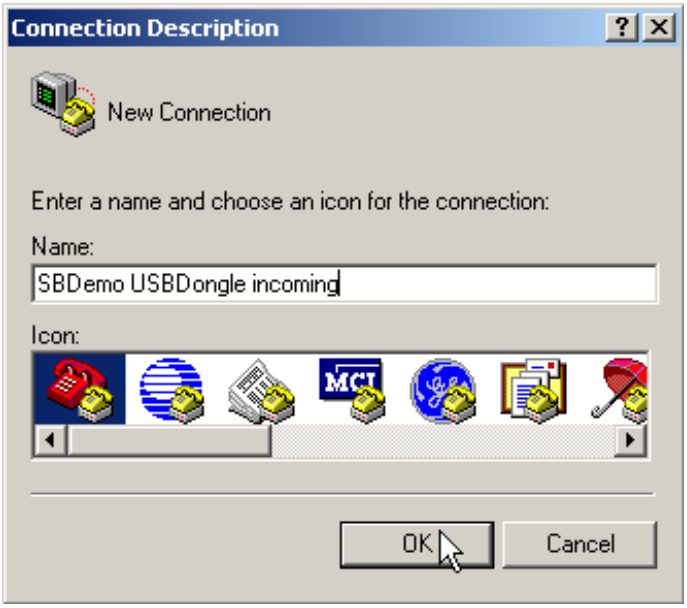


**Figure 2-35. Create new connection**

#### 2.2.6.3 Choose correct Comport

In order to talk to virtual serial port of the stack, choose the COMPort reported by the stack as described inSection 2.2.5.3 on page 30, Figure 2-33 In this example “COM6” needs to be used.

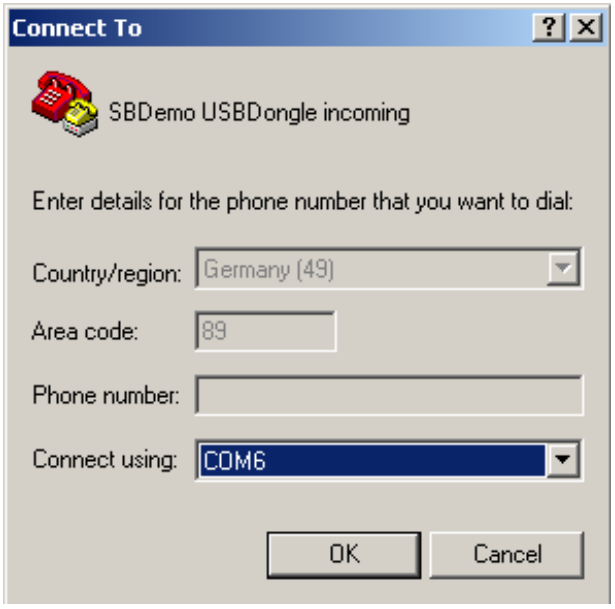


**Figure 2-36. Choose correct comport**

#### 2.2.6.4 Select correct comport settings

The comport settings for the virtual serial port should be the same as chosen for the LMX9830/LMX9838 (see Section 2.1.1.4 on page 8).

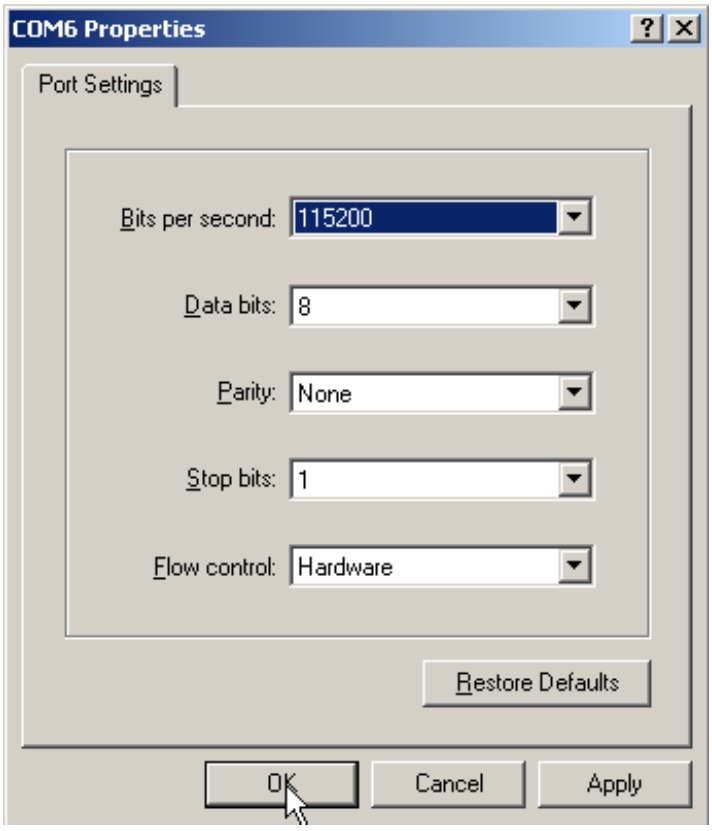


**Figure 2-37. Select correct comport settings**

Afterwards the Hyperterminal window comes up and should be connected to the selected COMPort.

### 2.2.7 Receiving Data in Simply Blue Commander

Once the Hyperterminal shows “Connected” any key typed in that window will appear as incoming data in the Simply Blue Commander. See Figure 2-38 as example for the events sent for the Text “test1234”. The test is displayed in hex.

Since the LMX9830/LMX9838 is still in command mode, meaning, it still is trying to interpret incoming UART data, it indicates incoming data on the Bluetooth link with the “Incoming Data” event on the UART.

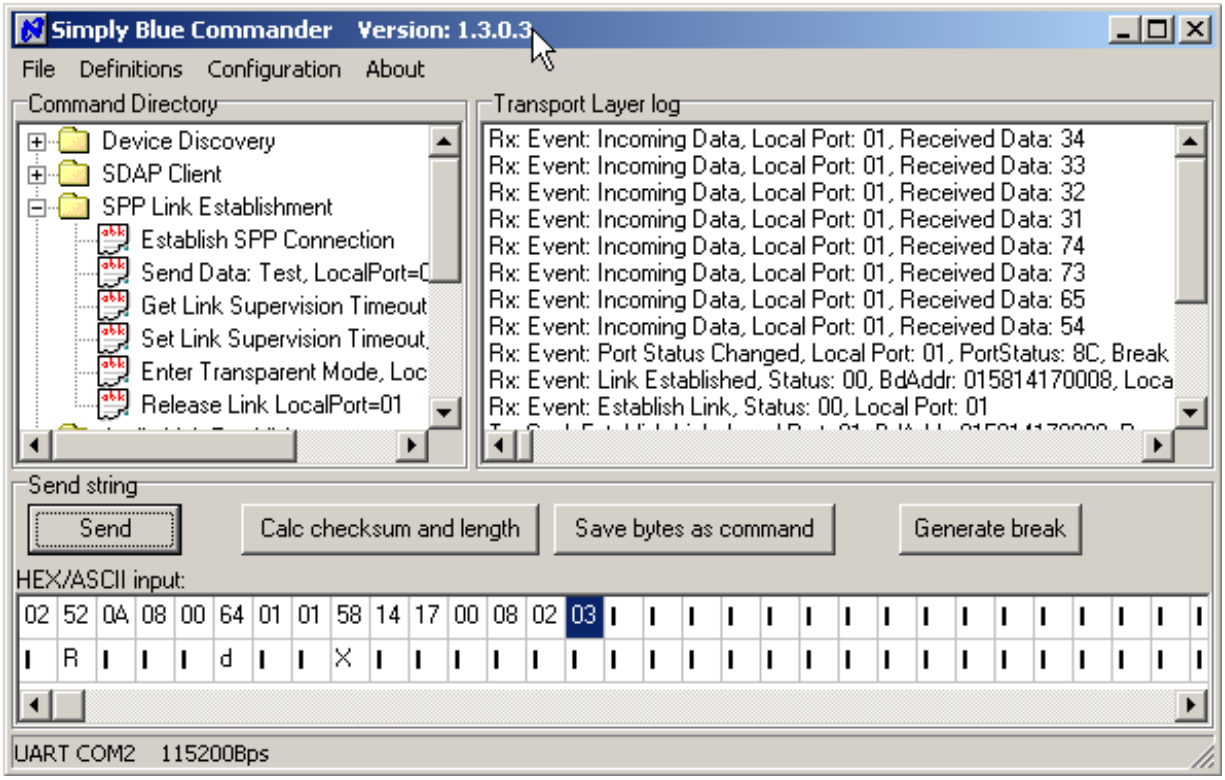


**Figure 2-38. Incoming Data at LMX9830/LMX9838 in command mode**

### 2.2.8 Send Data by using “Send Data”

After actively establishing a link the LMX9830/LMX9838 will stay in command mode for either a second link or other configurations. Therefore any data to be sent to the other device have to be sent via the “Send Data” command. The command is formed out of the 6-byte header and the payload. The payload consists of

- Local RFCOMM Port (1 byte)
  - — The port, to which the package has to be sent to. The port defines the Bluetooth link the data have to be forwarded to. In this example the link has been established on port 01.
- Datalength (2 bytes)
  - — Length of the data to be sent
- Data (‘Datalength’ bytes)
  - — Data to be sent (maximum 330bytes)

The prepared command “Send Data:Test, Local Port=01” in the command directory sends the data “Test” to the remote device.

NOTE: in multiple link setups this command needs to be used to differentiate between different connections.

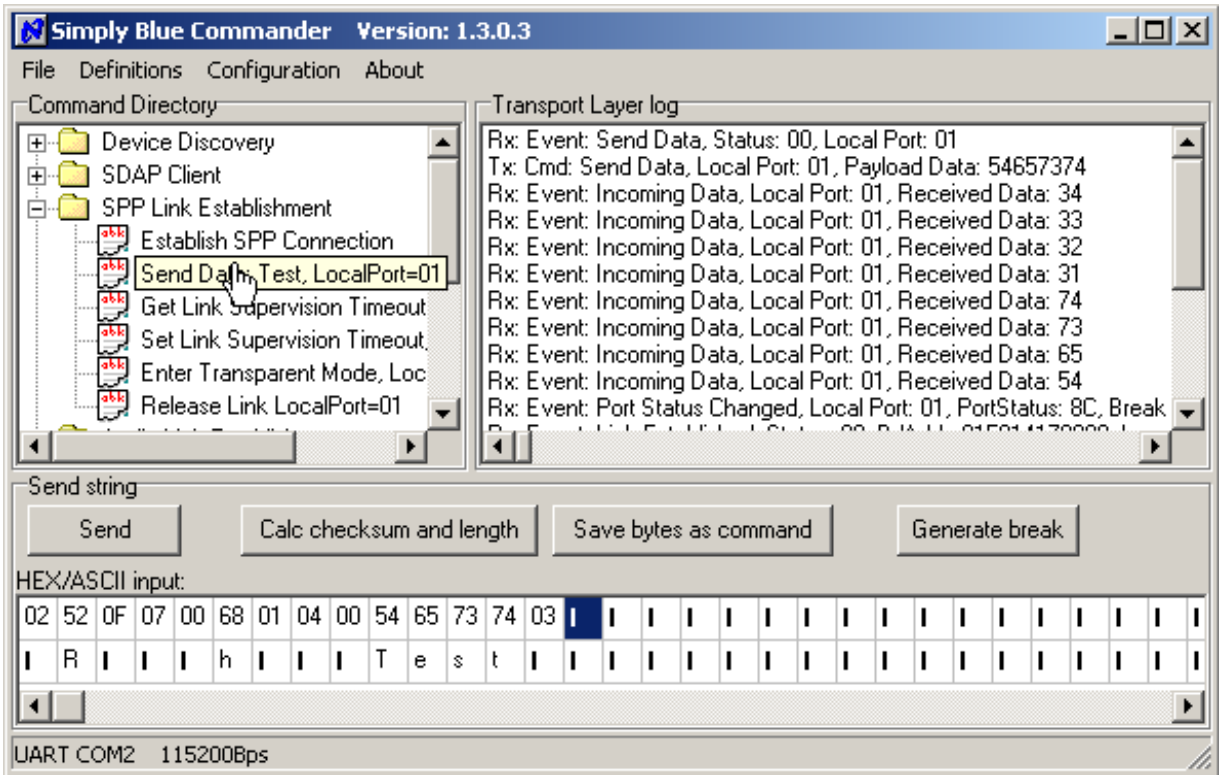


**Figure 2-39. Send Data by using "Send Data" command**

The data will appear in the Hyperterminal window of the USB Dongle after sending.

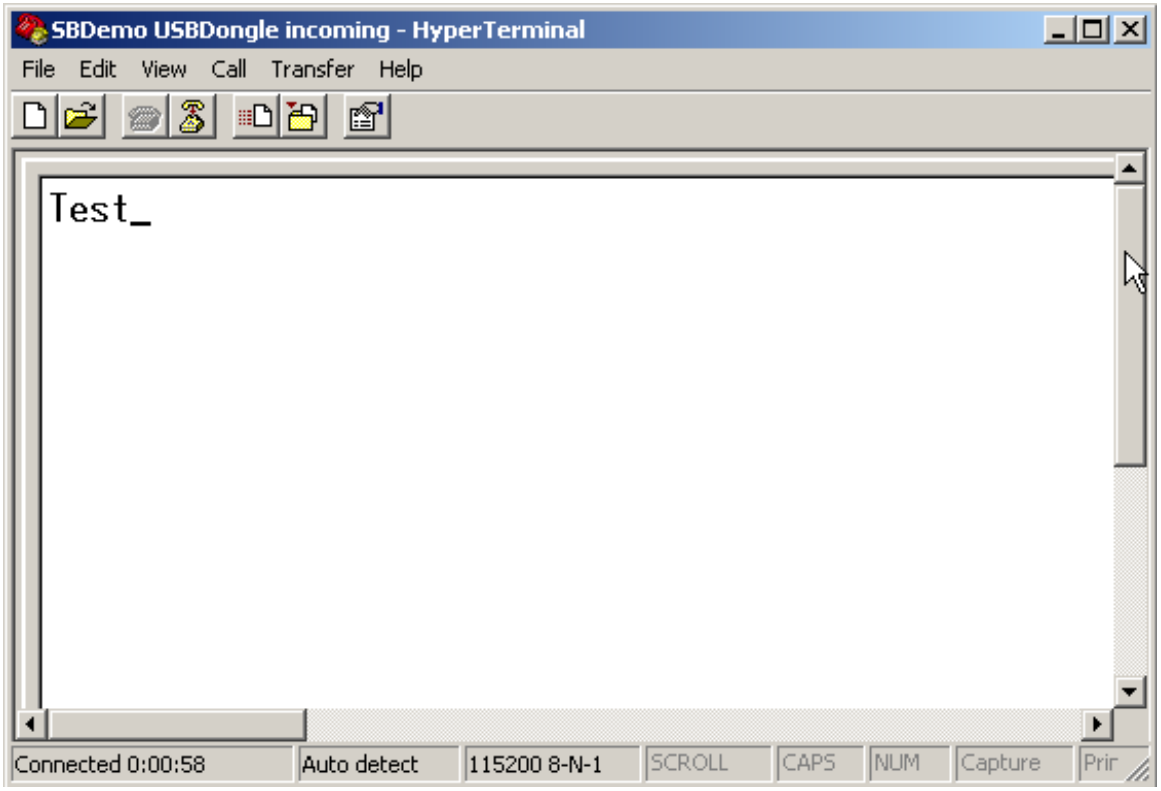


**Figure 2-40. Hyperterminal receiving the data sent by the LMX9830/LMX9838**

### 2.2.9 Switching to transparent mode on the LMX9830/LMX9838

If only one link is established, so no differentiation between different links is necessary, the LMX9830/LMX9838 allows to switch the UART interface to “transparent”. This means, incoming data will not be parsed to be a valid command, instead, all incoming data will be sent to the remote device directly.

Transparent Mode on the local port 1 can be reached by sending the prepared command in the “Command Directory”.

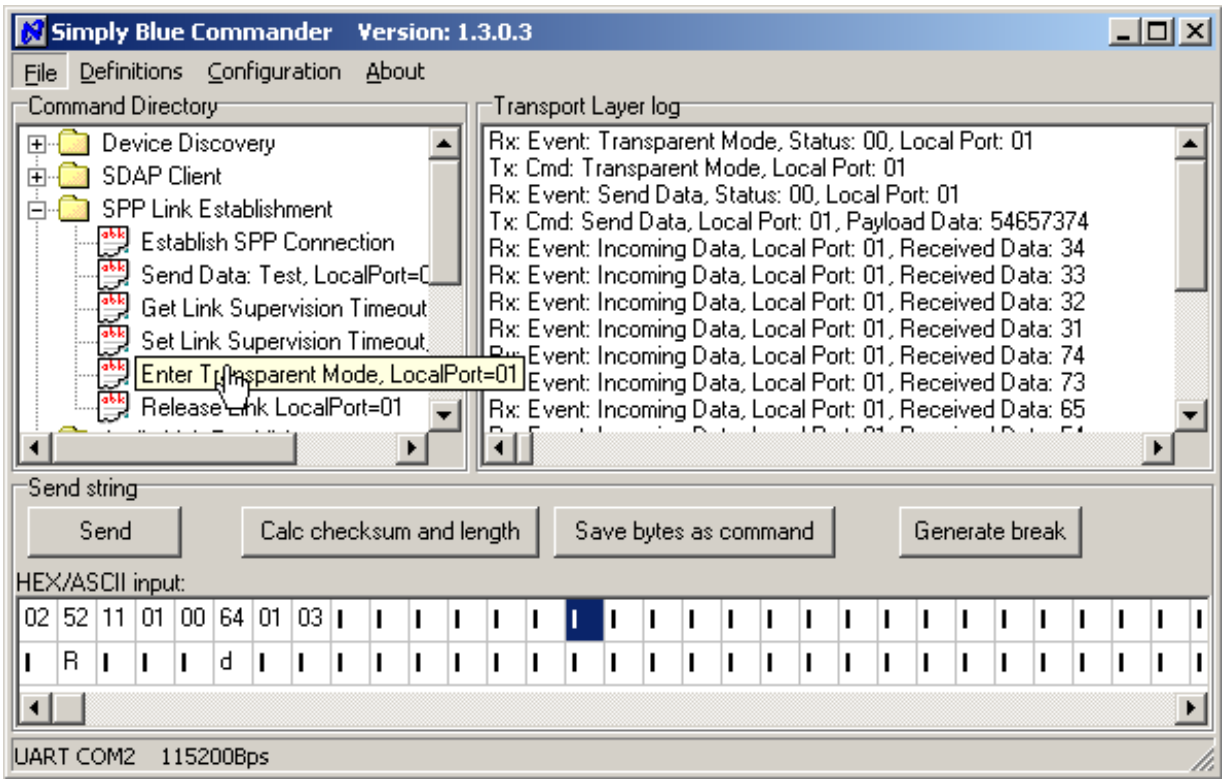


**Figure 2-41. Switch to “Transparent Mode” on the UART**

Afterwards, all data will be sent directly to the other side. This can be simulated by sending “Send Data: Test, LocalPort=01” again. The LMX9830/LMX9838 will now send the complete packet to the other device, not just the “Test” string.

This can be seen at the cryptic characters within the Hyperterminal window.

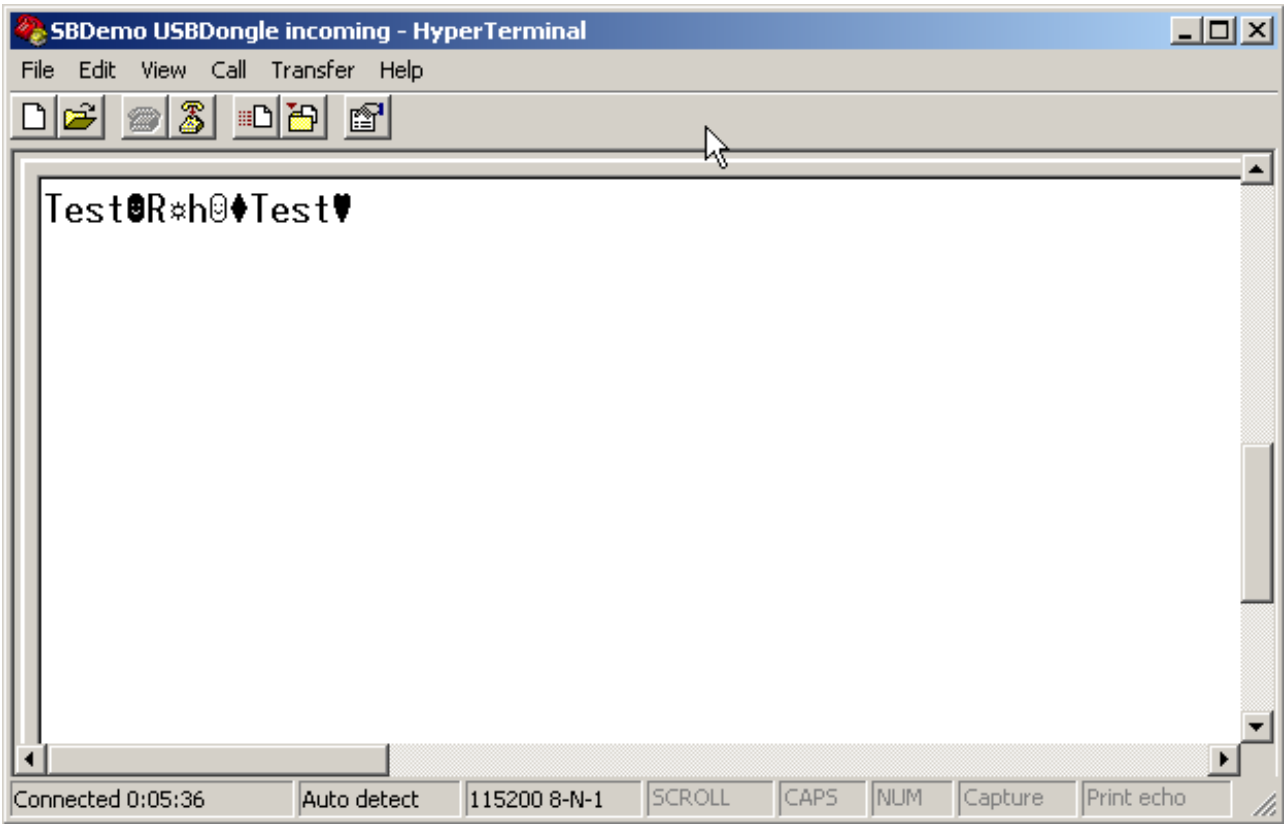


**Figure 2-42. Hyperterminal receiving the complete package from the LMX9830/LMX9838**

In Simply Blue Commander any data can now be sent without using the “Send Data” command. For this just type a string in the “HEX/ASCII input” line and press “Send”. The whole string will be sent.

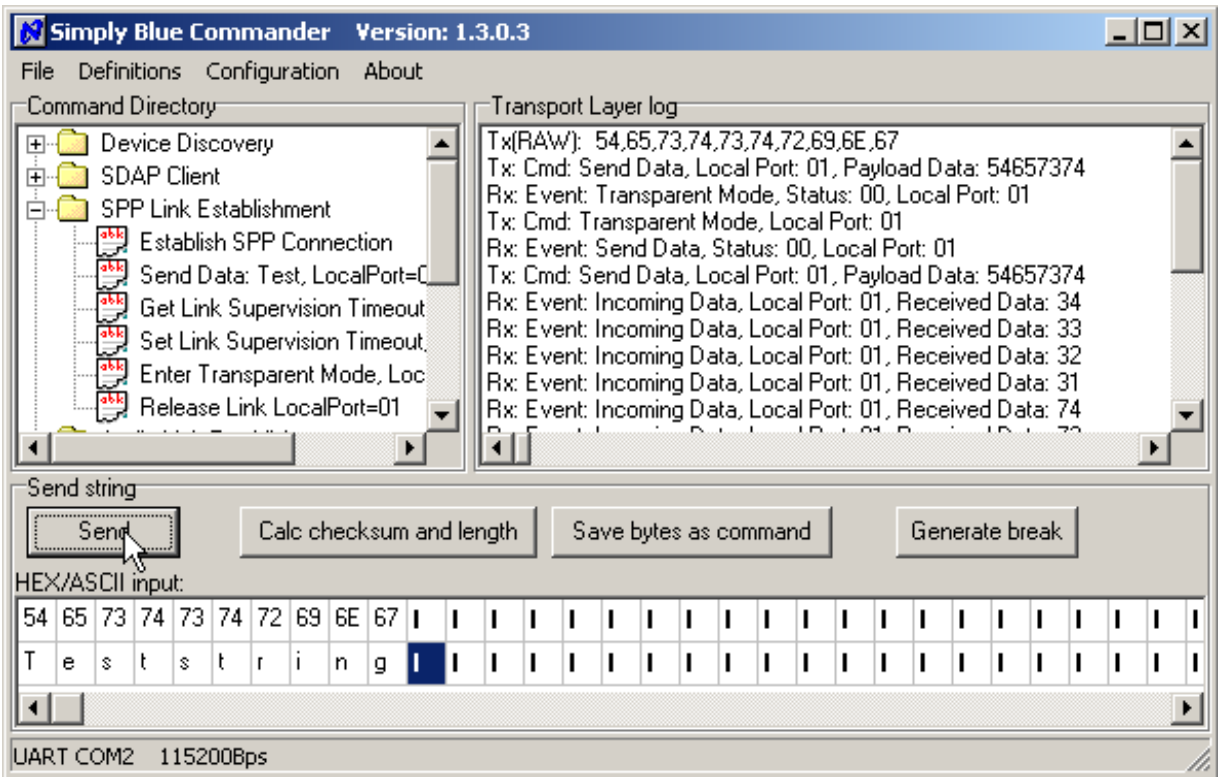


**Figure 2-43. Send “Teststring” over the transparent UART link**

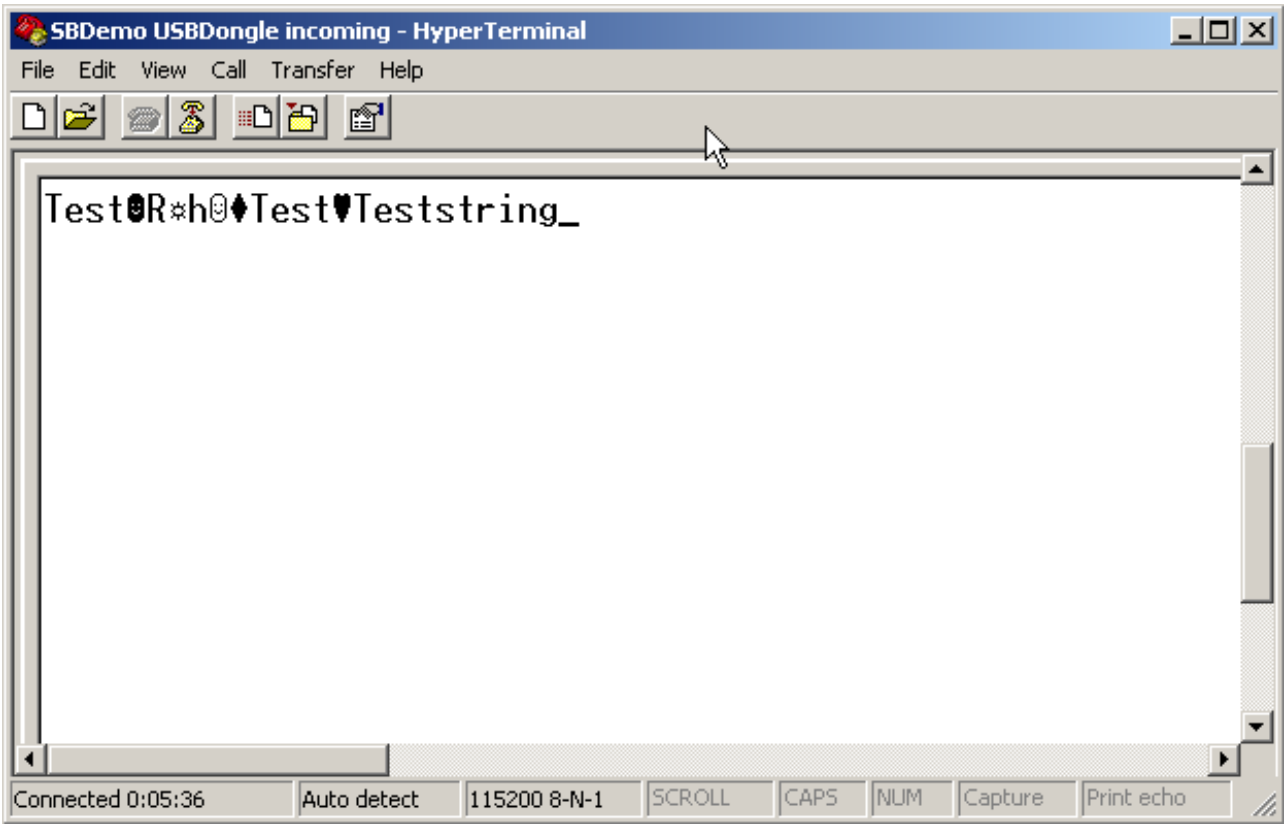


**Figure 2-44. Receiving the RAW Datastring**

In case, any key is pressed within the Hyperterminal window now, the incoming data will be shown in RAW format within the Simply Blue Commander. The following screenshot shows the message in Simply Blue Commander in case “test” and “1234” have been sent.

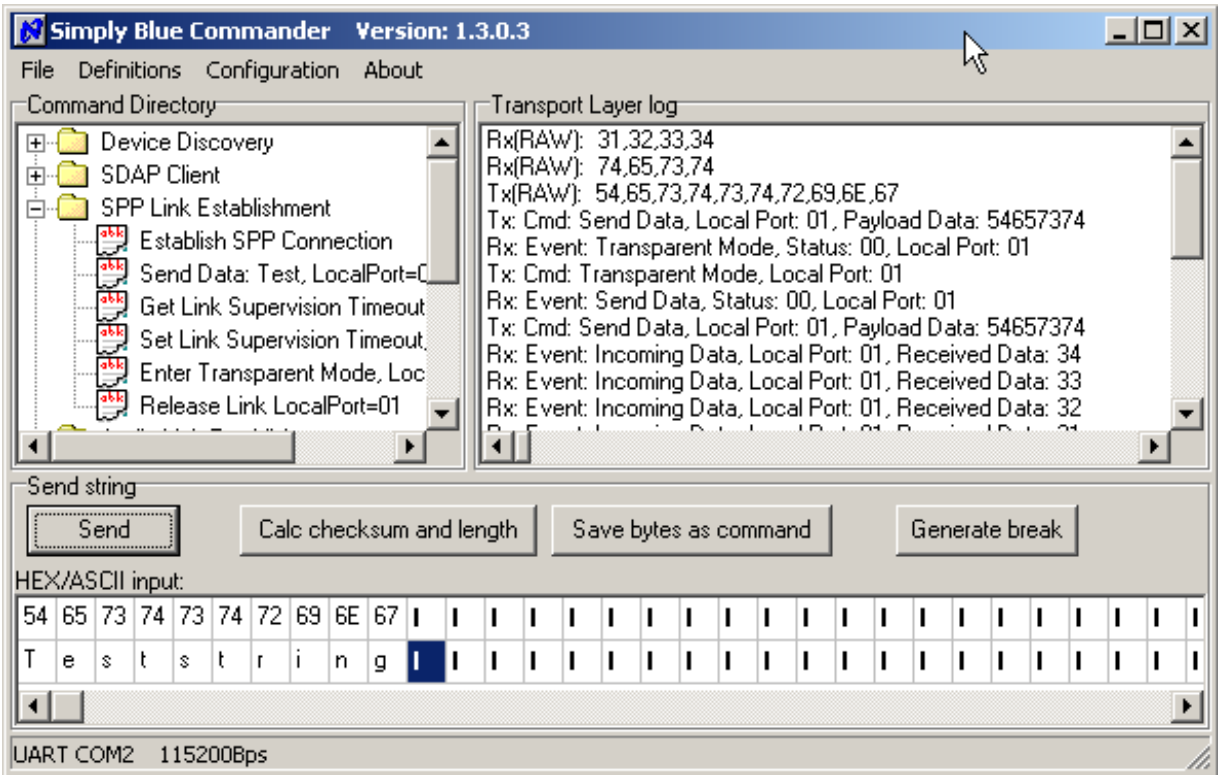


**Figure 2-45. Incoming data in Simply Blue commander with LMX9830/LMX9838 in transparent mode**

### 2.2.10 "Generate BREAK" to leave "Transparent Mode"

Since the LMX9830/LMX9838 does not listen to any commands in transparent mode, the UART Break needs to be used to leave this mode. The BREAK is initiated by clicking on the button "Generate break". Afterwards, data have to be sent again by using the "Send Data" command. Incoming data will be indicated with the "Incoming data" Event.

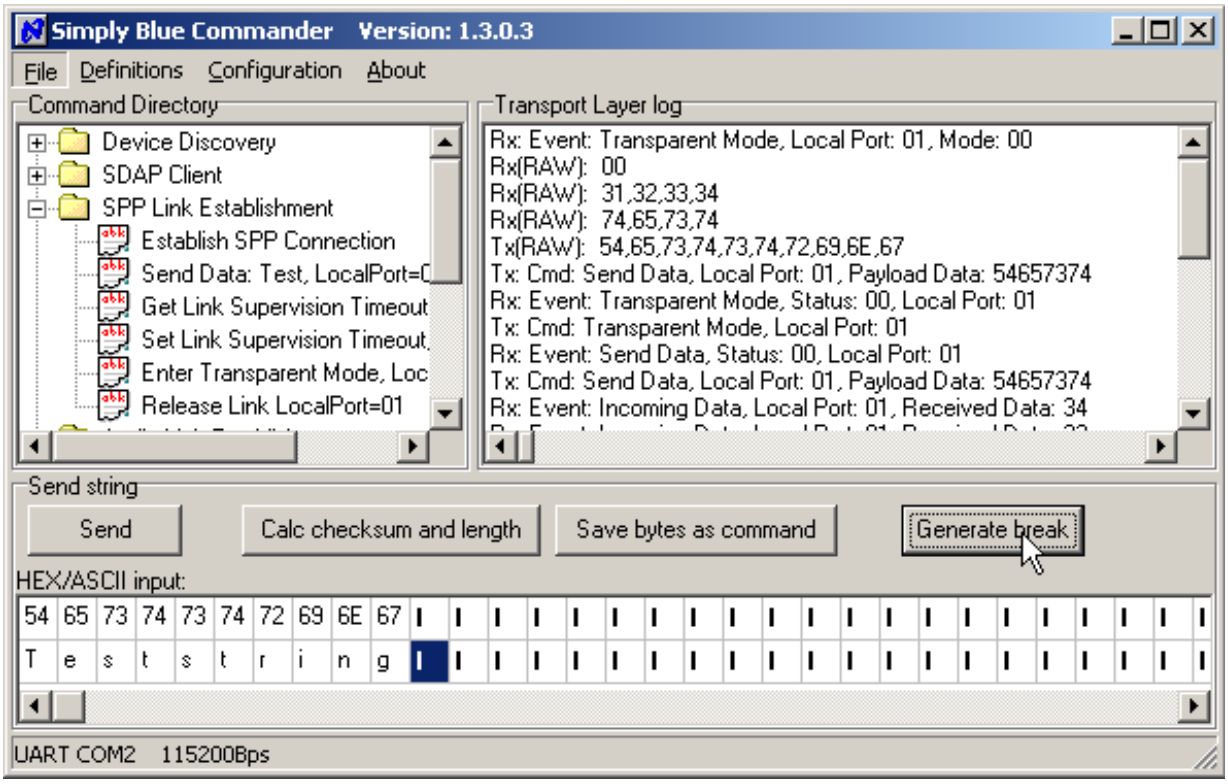


**Figure 2-46. Leaving transparent with UART Break**

### 2.2.11 Release Link

Finally the link can be released by using the prepared “Release Link LocalPort=01” command.

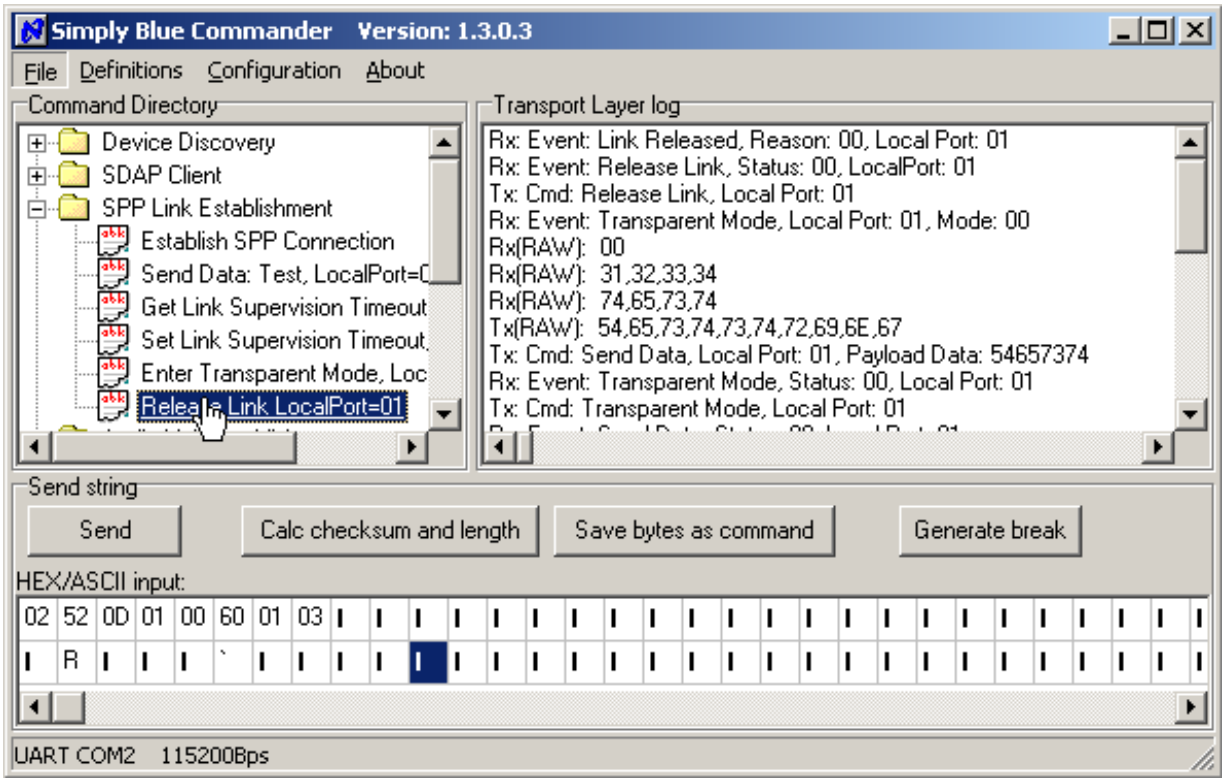


**Figure 2-47. Releasing the link by the LMX9830/LMX9838**

# 3.0 Bibliography

## 3.1 LMX9830 OR LMX9838 SOFTWARE USERS GUIDE

## 3.2 SIMPLY BLUE COMMANDER USERS GUIDE

# 4.0 Revision History

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**Table 4-1. Revision History**

| Revision # (PDF Date) | Revisions / Comments |
|---|---|
| 1.0 | Initial Release |
| 1.1 | LMX9838 added |
| 1.2 | Corrected LMX9820 prod revision to 6.23 |
| 1.3 | LMX9820 and ABE Dongle references removed |

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12. User shall be solely responsible for proper disposal and recycling of EVMs consistent with all applicable federal, state, and local requirements.

**Certain Instructions.** User shall operate EVMs within TI's recommended specifications and environmental considerations per the user's guide, accompanying documentation, and any other applicable requirements. Exceeding the specified ratings (including but not limited to input and output voltage, current, power, and environmental ranges) for EVMs may cause property damage, personal injury or death. If there are questions concerning these ratings, user should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the applicable EVM user's guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using EVMs' schematics located in the applicable EVM user's guide. When placing measurement probes near EVMs during normal operation, please be aware that EVMs may become very warm. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use EVMs.

**Agreement to Defend, Indemnify and Hold Harmless.** User agrees to defend, indemnify, and hold TI, its directors, officers, employees, agents, representatives, affiliates, licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of, or in connection with, any handling and/or use of EVMs. User's indemnity shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if EVMs fail to perform as described or expected.

**Safety-Critical or Life-Critical Applications.** If user intends to use EVMs in evaluations of safety critical applications (such as life support), and a failure of a TI product considered for purchase by user for use in user's product would reasonably be expected to cause severe personal injury or death such as devices which are classified as FDA Class III or similar classification, then user must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

# RADIO FREQUENCY REGULATORY COMPLIANCE INFORMATION FOR EVALUATION MODULES

Texas Instruments Incorporated (TI) evaluation boards, kits, and/or modules (EVMs) and/or accompanying hardware that is marketed, sold, or loaned to users may or may not be subject to radio frequency regulations in specific countries.

**General Statement for EVMs Not Including a Radio**

For EVMs not including a radio and not subject to the U.S. Federal Communications Commission (FCC) or Industry Canada (IC) regulations, TI intends EVMs to be used only for engineering development, demonstration, or evaluation purposes. EVMs are not finished products typically fit for general consumer use. EVMs may nonetheless generate, use, or radiate radio frequency energy, but have not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or the ICES-003 rules. Operation of such EVMs may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

**General Statement for EVMs including a radio**

*User Power/Frequency Use Obligations*: For EVMs including a radio, the radio included in such EVMs is intended for development and/or professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability in such EVMs and their development application(s) must comply with local laws governing radio spectrum allocation and power limits for such EVMs. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by TI unless user has obtained appropriate experimental and/or development licenses from local regulatory authorities, which is the sole responsibility of the user, including its acceptable authorization.

**U.S. Federal Communications Commission Compliance**

**For EVMs Annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant**

**Caution**

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. Changes or modifications could void the user's authority to operate the equipment.

**FCC Interference Statement for Class A EVM devices**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at its own expense.

**FCC Interference Statement for Class B EVM devices**

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

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

**Industry Canada Compliance (English)**

**For EVMs Annotated as IC – INDUSTRY CANADA Compliant:**

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**Concerning EVMs Including Radio Transmitters**

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

**Concerning EVMs Including Detachable Antennas**

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

**Canada Industry Canada Compliance (French)**

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

**Concernant les EVMs avec appareils radio**

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

**Concernant les EVMs avec antennes détachables**

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265


## Important Notice for Users of EVMs Considered "Radio Frequency Products" in Japan

**EVMs entering Japan are NOT certified by TI as conforming to Technical Regulations of Radio Law of Japan.**

If user uses EVMs in Japan, user is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after user obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after user obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless user gives the same notice above to the transferee. Please note that if user does not follow the instructions above, user will be subject to penalties of Radio Law of Japan.

http://www.tij.co.jp

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