LMX98xx Bluetooth Serial Port Modules - Quick Setup Guide

TEXAS

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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	Ver	sion
Hardware	LMX9830 Antenna is external	LMX9838 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

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Table of Contents

1.1 Install Simply Blue Commander 3 1.2 Install IVT Bluetooth Stack 3 1.3 Setting up Hyperterminal 4 2.0 Setup descriptions 6 2.1 Cable replacement with LMX9830/LMX9838 waiting for incoming connection 6 2.1.1 Connect Hyperterminal to LMX9830/LMX9838 from the Bluetooth USB Dongle 10 2.1.2 Establish Link to the LMX9830/LMX9838 from the Bluetooth USB Dongle 10 2.1.3 Open Hyperterminal session on the virtual serial port 15 2.1.4 Use Hyperterminal for simple chat 17 2.1.5 Transfer a file with ZModem 17 2.1 Start Simply Blue Commander 19 2.2.1 Start Simply Blue Commander 19 2.2.2 Send "Restore to factory settings" and "Reset" 20 2.2.3 Find remote device 20 2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode" 40 2.2.11 Release Link 41	lation
1.2 Install IVT Bluetooth Stack 3 1.3 Setting up Hyperterminal 4 2.0 Setup descriptions 6 2.1 Cable replacement with LMX9830/LMX9838 waiting for incoming connection 6 2.1.1 Connect Hyperterminal to LMX9830/LMX9838. 6 2.1.2 Establish Link to the LMX9830/LMX9838 from the Bluetooth USB Dongle 10 2.1.3 Open Hyperterminal for simple chat. 17 2.1.4 Use Hyperterminal for simple chat. 17 2.1.5 Transfer a file with ZModem 17 2.2.1 Start Simply Blue Commander 19 2.2.2 Send "Restore to factory settings" and "Reset" 20 2.2.3 Find remote device. 20 2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port. 32 2.2.7 Receiving Data in Simply Blue Commander. 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode". 40 2.2.11 Release Link. 41	Install Simply Blue Commander
1.3 Setting up Hyperterminal 4 2.0 Setup descriptions 6 2.1 Cable replacement with LMX9830/LMX9838 waiting for incoming connection 6 2.1.1 Connect Hyperterminal to LMX9830/LMX9838 6 2.1.2 Establish Link to the LMX9830/LMX9838 from the Bluetooth USB Dongle 10 2.1.3 Open Hyperterminal session on the virtual serial port 15 2.1.4 Use Hyperterminal for simple chat 17 2.1.5 Transfer a file with ZModem 17 2.2 Initiate a Link with LMX9830/LMX9838 using Simply Blue Commander 19 2.2.1 Start Simply Blue Commander 19 2.2.2 Send "Restore to factory settings" and "Reset" 20 2.2.3 Find remote device 20 2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port 32 2.2.7 Receiving Data in Simply Blue Commander 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode" 40 2.2.11 Release Link 41	Install IVT Bluetooth Stack
2.0 Setup descriptions 6 2.1 Cable replacement with LMX9830/LMX9838 waiting for incoming connection 6 2.1.1 Connect Hyperterminal to LMX9830/LMX9838 6 2.1.2 Establish Link to the LMX9830/LMX9838 from the Bluetooth USB Dongle 10 2.1.3 Open Hyperterminal session on the virtual serial port 15 2.1.4 Use Hyperterminal for simple chat 17 2.1.5 Transfer a file with ZModem 17 2.1.5 Istart Simply Blue Commander 19 2.2.1 Start Simply Blue Commander 19 2.2.2 Send "Restore to factory settings" and "Reset" 20 2.2.3 Find remote device 20 2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port 32 2.2.7 Receiving Data in Simply Blue Commander 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode" 40 2.2.11 Release Link 41	Setting up Hyperterminal4
2.1 Cable replacement with LMX9830/LMX9838 waiting for incoming connection 6 2.1.1 Connect Hyperterminal to LMX9830/LMX9838 6 2.1.2 Establish Link to the LMX9830/LMX9838 from the Bluetooth USB Dongle 10 2.1.3 Open Hyperterminal session on the virtual serial port 15 2.1.4 Use Hyperterminal for simple chat 17 2.1.5 Transfer a file with ZModem 17 2.2 Initiate a Link with LMX9830/LMX9838 using Simply Blue Commander 19 2.2.1 Start Simply Blue Commander 19 2.2.2 Send "Restore to factory settings" and "Reset" 20 2.2.3 Find remote device 20 2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port 32 2.2.7 Receiving Data in Simply Blue Commander 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode" 40 2.2.11 Release Link 41	descriptions
2.1.1 Connect Hyperterminal to LMX9830/LMX983862.1.2 Establish Link to the LMX9830/LMX9838 from the Bluetooth USB Dongle102.1.3 Open Hyperterminal session on the virtual serial port152.1.4 Use Hyperterminal for simple chat172.1.5 Transfer a file with ZModem172.1 Initiate a Link with LMX9830/LMX9838 using Simply Blue Commander192.2.1 Start Simply Blue Commander192.2.2 Send "Restore to factory settings" and "Reset"202.2.3 Find remote device202.2.4 Get remote RFComm Port for SPP242.2.5 Establish SPP Link282.2.6 Create Hyperterminal connection for incoming virtual serial port322.2.7 Receiving Data in Simply Blue Commander352.2.8 Send Data by using "Send Data"352.2.9 Switching to transparent mode on the LMX9830/LMX9838372.2.10 "Generate BREAK" to leave "Transparent Mode"402.2.11 Release Link41 3.0 Bibliography42	Cable replacement with LMX9830/LMX9838 waiting for incoming connection
2.1.2 Establish Link to the LMX9830/LMX9838 from the Bluetooth USB Dongle 10 2.1.3 Open Hyperterminal session on the virtual serial port 15 2.1.4 Use Hyperterminal for simple chat 17 2.1.5 Transfer a file with ZModem 17 2.1.6 Transfer a file with ZModem 17 2.1.7 Example 17 2.1.8 Transfer a file with ZModem 17 2.1.9 Transfer a file with ZModem 17 2.1.1 Start Simply Blue Commander 19 2.2.2 Send "Restore to factory settings" and "Reset" 20 2.2.3 Find remote device 20 2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port 32 2.2.7 Receiving Data in Simply Blue Commander 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode" 40 2.2.11 Release Link 41	2.1.1 Connect Hyperterminal to LMX9830/LMX98386
2.1.3 Open Hyperterminal session on the virtual serial port152.1.4 Use Hyperterminal for simple chat172.1.5 Transfer a file with ZModem172.1.5 Transfer a file with ZModem172.2 Initiate a Link with LMX9830/LMX9838 using Simply Blue Commander192.2.1 Start Simply Blue Commander192.2.2 Send "Restore to factory settings" and "Reset"202.2.3 Find remote device202.2.4 Get remote RFComm Port for SPP242.2.5 Establish SPP Link282.2.6 Create Hyperterminal connection for incoming virtual serial port322.2.7 Receiving Data in Simply Blue Commander352.2.8 Send Data by using "Send Data"352.2.9 Switching to transparent mode on the LMX9830/LMX9838372.2.10 "Generate BREAK" to leave "Transparent Mode"402.2.11 Release Link41 3.0 Bibliography42	2.1.2 Establish Link to the LMX9830/LMX9838 from the Bluetooth USB Dongle
2.1.4 Use Hyperterminal for simple chat172.1.5 Transfer a file with ZModem172.2 Initiate a Link with LMX9830/LMX9838 using Simply Blue Commander192.2.1 Start Simply Blue Commander192.2.2 Send "Restore to factory settings" and "Reset"202.2.3 Find remote device202.2.4 Get remote RFComm Port for SPP242.2.5 Establish SPP Link282.2.6 Create Hyperterminal connection for incoming virtual serial port322.2.7 Receiving Data in Simply Blue Commander352.2.8 Send Data by using "Send Data"352.2.9 Switching to transparent mode on the LMX9830/LMX9838372.2.10 "Generate BREAK" to leave "Transparent Mode"402.2.11 Release Link41	2.1.3 Open Hyperterminal session on the virtual serial port
2.1.5 Transfer a file with ZModem.172.2 Initiate a Link with LMX9830/LMX9838 using Simply Blue Commander192.2.1 Start Simply Blue Commander192.2.2 Send "Restore to factory settings" and "Reset"202.2.3 Find remote device.202.2.4 Get remote RFComm Port for SPP242.2.5 Establish SPP Link.282.2.6 Create Hyperterminal connection for incoming virtual serial port.322.2.7 Receiving Data in Simply Blue Commander.352.2.8 Send Data by using "Send Data"352.2.9 Switching to transparent mode on the LMX9830/LMX9838372.2.10 "Generate BREAK" to leave "Transparent Mode".402.2.11 Release Link.41 3.0 Bibliography42	2.1.4 Use Hyperterminal for simple chat
2.2 Initiate a Link with LMX9830/LMX9838 using Simply Blue Commander 19 2.2.1 Start Simply Blue Commander 19 2.2.2 Send "Restore to factory settings" and "Reset" 20 2.2.3 Find remote device 20 2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port 32 2.2.7 Receiving Data in Simply Blue Commander 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode" 40 2.2.11 Release Link 41	2.1.5 Transfer a file with ZModem
2.2.1 Start Simply Blue Commander 19 2.2.2 Send "Restore to factory settings" and "Reset" 20 2.2.3 Find remote device 20 2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port 32 2.2.7 Receiving Data in Simply Blue Commander 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode" 40 2.2.11 Release Link 41	nitiate a Link with LMX9830/LMX9838 using Simply Blue Commander
2.2.2 Send "Restore to factory settings" and "Reset" 20 2.2.3 Find remote device. 20 2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link. 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port. 32 2.2.7 Receiving Data in Simply Blue Commander. 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode". 40 2.2.11 Release Link. 41	2.2.1 Start Simply Blue Commander
2.2.3 Find remote device. 20 2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link. 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port. 32 2.2.7 Receiving Data in Simply Blue Commander. 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode". 40 2.2.11 Release Link. 41	2.2.2 Send "Restore to factory settings" and "Reset"
2.2.4 Get remote RFComm Port for SPP 24 2.2.5 Establish SPP Link 28 2.2.6 Create Hyperterminal connection for incoming virtual serial port 32 2.2.7 Receiving Data in Simply Blue Commander 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode" 40 2.2.11 Release Link 41	2.2.3 Find remote device
2.2.5 Establish SPP Link 26 2.2.6 Create Hyperterminal connection for incoming virtual serial port. 32 2.2.7 Receiving Data in Simply Blue Commander. 35 2.2.8 Send Data by using "Send Data" 35 2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode". 40 2.2.11 Release Link 41	2.2.4 Get remote RFComm Port for SPP
2.2.8 Create Hyperterminal connection for incoming virtual serial port	2.2.5 ESTADIISTI SPP LINK
2.2.7 Receiving Data in Simply Bide Commander	2.2.6 Create Hyperterminal connection for incoming virtual serial port
2.2.9 Switching to transparent mode on the LMX9830/LMX9838 37 2.2.10 "Generate BREAK" to leave "Transparent Mode"	2.2.7 Receiving Data in Simply Dide Commander
2.2.9 Switching to transparent mode on the EMX3030/EMX3030 37 2.2.10 "Generate BREAK" to leave "Transparent Mode"	2.2.0 Serie Data by using Serie Data
2.2.10 Contrate DRL/RC to leave Transparent Mode	2.2.9 Switching to transparent mode on the EWA9050/EWA9050
3.0 Bibliography	2.2.11 Release Link
3.0 Bibliography	
	graphy
3.1 LMX9830 or LMX9838 software users Guide,42	∠MX9830 or LMX9838 software users Guide,42
3.2 Simply Blue Commander Users Guide Version 1.0	Simply Blue Commander Users Guide Version 1.0
4.0 Revision History	ion History

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).

Simply Blue Commander Version: 1.6.0.1	
File Tools Configuration About	
Command Directory	J
🕀 🔁 Device Discovery 💦 🖪 🗛	ue Ready, SW Version: 0212
🗄 🛅 SDAP Client	
🗄 🛄 SPP Link Establishment	
🕀 🛄 Audio Link Establishment	
E Cow Power Modes	
Wake-up functionality	
Encal Bluetooth Settings	
+ Discal SDB Configuration	
🗄 🔂 Local Hardware Commands 🛛 🔽	
Send string	
Send Calc checksum and length Save bytes as con	mmand Generate break
HEX/ASCII input:	
	>
UART COM8 115200Bps	

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 counterpart 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.



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.

Connect To
SBDemo LMX9838
Enter details for the phone number that you want to dial:
Country/region: Germany (49)
Area code: 89
Phone number:
Connect using: COM8
<u>N</u> K Cancel

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

COM8 Properties	? 🛛
Port Settings	
Bits per second:	115200
Data bits:	8
Parity:	None
Stop bits:	1
Flow control:	Hardware
	Restore Defaults
	K Cancel Apply

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 char-

acters 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.



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 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.



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.

Enter Bl	uetooth Passkey	Y		×
? *	A remote device r relationship for fut passkey on this d Remote Device: Address Passkey: Time Left: 27 s	needs a Bluetooth Passkey to create Paired ure connections. Please use the same evice and on the remote device: Serial Port Device 08:00:17:13:17:77	OK Cancel	

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.



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

LMX 98xx Bluetooth Serial Port Modules - Quick Setup Guide

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".

Connection Description	?×
New Connection	
Enter a name and choose an icon for the connection:	
Name:	
SBDemo USBDongle	
Icon:	
💫 📚 🥸 🧐 🤇	8
OK Cano	;el

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.

Connect To	USBDongle
Enter details for	the phone number that you want to dial:
Country/region:	Germany (49) 💌
Ar <u>e</u> a code:	08141
<u>P</u> hone number:	
Connect using:	СОМ4 💌
	OK Cancel
Eigure 2	OK Cancel

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).

COM4 Properties	? 🔀
Port Settings	
Bits per second:	115200
Data bits:	8
Parity:	None
Stop bits:	1
Flow control:	Hardware
	Bestore Defaults
0	K Cancel Apply

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.

2	SBDemo LMX983	8 - HyperTerminal		×
Fi	le Edit View Call) 🖆 <i></i> 🔏 ∷[Ζα Θ♥₿i≻4	Transfer Help Send File Receive File Capture Text Send Text File Capture to Printer	∳ ×♥⊲‼♥_	
<]			>
Se	nds a file to the remote	e system		



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

🖬 Send File 🛛 💽 🔀
Folder: C:\Seb docs\simply blue\SB utils\Sb smart Filename: C:\Seb docs\simply blue\SB utils\Sb smart\SBSm Browse
Zmodem with Crash Recovery
Send Close Cancel



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

Zmodem w	rith Crash Recovery file send for SBDemo LMX9838
Sending:	C:\Seb docs\simply blue\SB utils\Sb smart\SBSmart UG v1.5.pdf
Last event:	Sending Files: 1 of 1
Status:	Sending Retries: 0
File:	145K of 1300K
Elapsed:	00:00:13 Remaining: 00:01:43 Throughput: 11421 cps
	Cancel cps/bps

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 in Section 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.

Simply Blue Commander Version: 1.6.0.1	
File Tools Configuration About	
Command Directory	
🕀 🔂 Device Discovery 💦 🛛 🗛 🗛 🗛	
E SDAP Client	
🗄 🛅 SPP Link Establishment	
🗄 🛄 Audio Link Establishment	
E DefaultConnections	
Tere Wake-up functionality	
En Configuration	
	>
Send Calc checksum and length Save bytes as command Generate break	
HEX/ASCII input:	
	0 0
	0 0
	>
UART COM8 115200Bps	11

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.

Simply Blue Commander Version: 1.6.0.1
File Tools Configuration About
Command Directory Transport Layer log
Set Event Filter: Report all events Change UART speed: 115200 Change UART Settings: 01 01 TestMode: Bluetooth DUT TestMode: UART Local Loopback RfTestMode: Stop TX Restore factory settings Restore factory settings
Send string
Send Calc checksum and length Save bytes as command Generate break
HEX/ASCII input:
02 52 26 00 00 78 03 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 R & 0 0 x 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
UART COM8 115200Bps

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.

Simply Blue Commander Version: 1.3.0.3 File Definitions Configuration About Command Directory Device Discovery GIAC Ingliny ULAC Ingliny Bemote Name Request SDAP Client SPP Link Establishment DefaultConnections Low Power Modes Wake-up functionality SPP Port Configuration	Transport Layer log Rx: Event: Inquiry, Status: 00 Rx: Event: Device Found, BdAddr: 015814170008, DeviceClass: 040 Tx: Cmd: Inquiry, Length: 0A, NumResponces: 00, Mode: 00 Rx: Event: SimplyBlue Ready, SW Version: 0621. Tx: Cmd: Reset Rx: Event: Restore Factory Settings, Status: 00 Tx: Cmd: Restore Factory Settings
Send Calc checksum and length	Save bytes as command Generate break
IEX/ASCII input:	
02 52 00 03 00 55 0A 00 00 03 I I I I I	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
I R I I U I I I I I I I I I	I I I I I I I I I I I I I I I I I I I
JART COM2 115200Bps	

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.

File -Co		ply efin De B SD SD Lov Wa SP	Blu bition Dire Vice GI/ LIA P Lii fault v Pc ake-i P Pc	e Co s ctory Dis Dis Clie Clie Con Con Con Diver Con Diver Con	Conf Conf cove nquir nquir Stat necl Mor uncti	nar igur ery y me lishi ions des iona gura	nder ratio Reg men s lity tion	r V n (Abo	ut	: 1.3	3.0.3 •	3	Tra Rx: Rx: Tx: Rx: Tx: Tx:	nspo Ever Cmd Ever Cmd Ever Cmd	nt L nt: I : Inc nt: S : Re nt: F : Re	ayer nqui Quiry Simp eset Restor	log ry, 9 , Le lyBli ore Fa	itatu ioun ngth ue R Fact	is: C d, E lead ory sy S	10 }dAd A, Ni dy, S Sett ettin	ddr: umF ₩ \ ings gs	0158 lesp /ersi	31 41 onci on: atus:	1700 es: 0 062	108, № 10, №	Dev	iceC x: OO	- IC	1 ×
Se	nd s S	end	J			Ca	lc cł	neck	sum	n ani	d ler	ngth		Sa	ive t	oyte	sas	сог	nmai	nd			Ge	nera	ate b	reak				
02	52	02	06	00	5A	FF	FF	FF	FF	FF	FF	03	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
I	R	I	I	I	Z	ÿ	ÿ	ÿ	ÿ	ÿ	ÿ	I	I	I	I	I	I	I	I	I	I	T	I	I	I	T	I	I	I	I
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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.

LMX 98xx Bluetooth Serial Port Modules - Quick Setup Guide

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

Command Directo				Era IBx:	nsport Eivent:	Layei Ingu	r log irv, S	tatu:	: 00								
GIACI	Inquiry nquiry te Name Reque nt Establishment nnections er Modes functionality	est		Rx: Tx: Rx: Tx: Rx: Tx:	Event: Cmd: I Event: Cmd: F Event: Cmd: F	Devi nquiry Simp leset Rest lesto	ice F I, Ler IyBlu Iore F re Fa	ound ngth: ie Re Facto ictory	i, Bd4 OA, I eady, ory Sett	Addr: NumF SW atting:	0158 Resp Versi s, Sta	31 41 once on: atus:	700 es: 0 0621	08, (10, M I.	Devi lode	ceC : 00	lass:
E Contraction SPP Port (Configuration		•	┛	<u> </u>												
Send string	Configuration	cksum and] ave but			man			Ge	nera	ite h	reak	1		
Send string Send string	Configuration	cksum and	 I length	Sa] ave byl	es as	com	nman	d		Ge	nera	ite bi	reak]		
Send string Send string Send IEX/ASCII input: 02 52 02 06 00	Calc che	cksum and	I length	Sa	ave byl	es as	com	ıman	d 	1	Ge	nera I	ite bi	reak I		1	1
Send string Send string IEX/ASCII input: 02 52 02 06 00 I R I I I	Calc che Calc che 56 01 58 1 Z	cksum and 4 17 00	I length	Sa I	ave byl	es as	com I	nman I	d 1 1		Ge	nera I	ite bi	reak I		 	1

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.

Simply Blue Commander Version: 1.3.0.3	_ 🗆 ×
File Definitions Configuration About	
Command Directory Transport Layer log	
Bevice D Bevice D Bevice D Bevice D Bevice D Bevice D Bevice B Bevice B)CDL38.
Sent Calc checksum and length Save bytes as command Generate break	
HEX/ASCII input:	
02 52 02 06 00 5A 01 58 14 17 00 08 03 I I I I I I I I I I I I I I I I I I	1 1 1
	1 1 1
	I• I•I
UART COM2 115200Bps	

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.

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1EX7 02 P	52	32 06							· ·		00	•	1.	11	_ I I -			1.1										-12

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.

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File D	Defini	tions	Con	figurati	on	Abou	ıt																				
Comm	and l	Directo	ry—					-T	rans	por	t La	yer l	og –														_
	SD SD SD SD SP SP	vice Di AP Clie SDAP SDAP SDAP SDAP SDAP SDAP P Link	scov nt Con Serv Serv Attri Disc Estal	ery vice Bro vice Bro vice Sea bute Re connect blishmer	wse wse arch ques	SPF Pub st	•	R: T: R: T: R: T: R: T: R: T: R: T:		ven ven ven wen wen md: ven	t R Rer t In t D Res t R Res	emol note quiry evic uiry, imply set estore store	te D Der St E Fo Bluk Fac	evic vice atus ound gth: e Re acto xtory	e N Na (00 (,Bo (0A) eady (Se	lame me, l IAdd Nur , SW ietting:	, Sta 3dA r: 01 nRe / Ve gs, 1 s	atus ddr: 1581 spoi srsio Stat	: 00 01! nce n: 0 us:), Bd 5814 7000 s: 00 621, 00	Add 170 18, D), M	r: 01 008)evia ode:	581 ceCl 00	417) ass:	000	3, De 112	evii
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02 52	32	06 00	1 8A	01 58	14	17	00	08	03	I	T	I	T	L	I	I	T	I	I	I	I	T	I	I	I	T	I
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LMX 98xx Bluetooth Serial Port Modules - Quick Setup Guide

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.

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The full response of the device in the cent is shows, that the remote device offer 2 Serial Port services: Sonse to this request includes the status and, in case a valid the requested service. The full response of the device in the cent is shows, that the remote device offer 2 Serial Port services: Sonse to this request includes the status and, in case a valid the requested service. 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Tx: Cmd: Reset DefaultConnections Tx: Cmd: Reset Send Calc checksum and length Save bytes as command Generate break Calc checksum and length Save bytes as command Generate break Calc checksum and length Save bytes as command Generate break Calc checksum and length Save bytes as command Generate break Calc checksum and length Save bytes as command Figure 2-27. Send SDAP Service Browse for SPP TrocM2 115200Bps	Image: Second Status Calc checksum and length Save bytes as command Generate break VASCII input: 52 35 02 00 83 01 11 03 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

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.

File Definitions Configuration About Command Directory Device Discovery SDAP Client SPP Link Establishment Send Data Get Link Supervision Timeout Set Link Supervision Timeout Enter Transparent Mode, Loc Release Link LocalPort=01 Release Link LocalPort=01<!--</th--><th>0.3 Transport La Rx: Event: S Ix: Cmd: SD Rx: Event: S Ix: Cmd: SD Rx: Event: S Ix: Cmd: Re Rx: Event: R Rx: Event: Ir Rx: Event: D Ix: Cmd: Ing</th><th>Layer log SDAP Disconnect, DAP Disconnect Service Browse, St ervice Browse, Brow SDAP Connect, St DAP Connect, BdA Remote Device Nam Inquiry, Status: 00 Device Found, Bd4 aquiry, Length: 0A, 1</th><th>Status: 00 atus: 00, Br wse Group atus: 00 ddr: 015814 me, Status: e, BdAddr: Addr: 01581 NumRespor</th><th>rowse Gi ID: 0111 4170008 : 00, Bd4 015814 417000 nces: 00</th><th>roup ID 3 Addr: 01 170008 8, Devi 1, Mode:</th><th>: 021(5814 ; ceCla : 00</th><th>), Se 1700</th><th>U rvic)08, 401</th>	0.3 Transport La Rx: Event: S Ix: Cmd: SD Rx: Event: S Ix: Cmd: SD Rx: Event: S Ix: Cmd: Re Rx: Event: R Rx: Event: Ir Rx: Event: D Ix: Cmd: Ing	Layer log SDAP Disconnect, DAP Disconnect Service Browse, St ervice Browse, Brow SDAP Connect, St DAP Connect, BdA Remote Device Nam Inquiry, Status: 00 Device Found, Bd4 aquiry, Length: 0A, 1	Status: 00 atus: 00, Br wse Group atus: 00 ddr: 015814 me, Status: e, BdAddr: Addr: 01581 NumRespor	rowse Gi ID: 0111 4170008 : 00, Bd4 015814 417000 nces: 00	roup ID 3 Addr: 01 170008 8, Devi 1, Mode:	: 021(5814 ; ceCla : 00), Se 1700	U rvic)08, 401
Send string					rata bra	ak		
Send Calc checksum and len	n;th ∣ Sav	ave bytes as comma	and	Gene	iate pie			
Send Calc checksum and len	gth Sav	ave bytes as comm	and	Gene				
Send Calc checksum and ler HEX/ASCII input: 02 52 0A 08 00 64 01 FF FF FF FF FF	⊒th Sav FF 01 03						1	1
Send Calc checksum and ler HEX/ASCII input: 02 52 0A 08 00 64 01 FF FF FF FF FF R I	FF 01 03						1	1
Send Calc checksum and ler HEX/ASCII input: 02 52 0A 08 00 64 01 FF FF FF FF FF I B I I d I ÿ ÿ ÿ ÿ	pth Sav FF 01 03 ÿ I I							1

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

Press "Send" to connect 2.2.5.3

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).

? >	A remote device r relationship for fut passkey on this d	needs a Bluetooth Passkey to create Paired ure connections. Please use the same evice and on the remote device:	OK Cancel
	Remote Device:	Serial Port Device	
	Address	08:00:17:13:17:77	
	Passkey:		
	Time Left: 25 s		

LMX 98xx Bluetooth Serial Port Modules - Quick Setup Guide

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L II. L I 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 checkbox 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.

* Remote device Serial Port Device(08:00:17:13:17:77) has connected to my Serial Port A(COM6) service!

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.

·	
Simply Blue Commander Version: 1.3.0.3	J
File Definitions Configuration About	
Command Directory Transport Layer log	
Device Discovery SDAP Client SDAP Client SPP Link Establishment Establish SPP Connection Send Data: Test, LocalPort=C Get Link Supervision Timeout Set Link Supervision Timeout Enter Transparent Mode, Loc Release Link LocalPort=01	k A nc iic 8, V
Send Calc checksum and length Save bytes as command Generate break	
HEX/ASCII input:	
02 52 0A 08 00 64 01 01 58 14 17 00 08 02 03 I I I I I I I I I I I I I I I I I I	i i
I R I I I d I I X I I I I I I I I I I I I I	I I
	Þ
UART COM2 115200Bps	

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.

Connect To
SBDemo USBDongle incoming
Enter details for the phone number that you want to dial:
Country/region: Germany (49)
Area code: 89
Phone number:
Connect using: COM6
OK Cancel

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).

Port Settings	
Bits per second: 115200]
Data bits: 8	1
Parity: None]
Stop bits: 1]
Elow control: Hardware]
<u>R</u> estore Defa	aults
OK Cancel	Apply



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.

File Co T		ply efir and De SD SD SD SD SD SD SD SD SD SD SD SD SD	Blu nition Dire vice AP Es Se Se En Re	e Co story ctory Dis Clier nk E tablis t Lin t Lin ter T leas	Conf Conf cove t sh Si stab sh Si k Su k Su rans	igur igur ery PP (<u>Te:</u> iper iper iper	nder atio Conr st, L visio visio ent f	t nection n Ti Mod	ion Port meo e, Lo =01	ion: ut =01 ut ut, oc		B.O.: Tra Rx: Rx: Rx: Rx: Rx: Rx: Rx: Rx:	B Eve Eve Eve Eve Eve Eve Eve Eve	ort L ent : ent : ent : ent : ent : ent : ent : ent :	aye Sen Inco Inco Inco Inco Inco Inco	r log d D Dat min min min min min min Sta) a, Lo g Da g Da g Da g Da g Da g Da g Da	Stal Stal ocal ota, ota, ota, ota, ota, ota,	tus: I Por Loc Loc Loc Loc Loc Loc	00, I t: 01 al Pi al Pi al Pi al Pi al Pi al Pi al Pi al Pi al Pi	Loca , Pa ort: (ort: (ort: (ort: (ort: (ort: (ort: (ort: (al Po ayloa 01,1 01,1 01,1 01,1 01,1 01,1 01,1 Por	ort: (ad D Rec Rec Rec Rec Rec Rec Rec Rec)1 lata: eive eive eive eive eive eive	546 d D a d D a d D a d D a d D a d D a ntSta	6573 ata: ata: ata: ata: ata: ata: ata: ata	374 34 33 32 31 74 73 65 54 : 80	, Bre		
∙Se	nd s	trin	g	1			1			•		•]																Þ	
	S	enc	1			Ca	lc cł	neck	sum	and	d ler	ngth		Sa	vet	oyte	s as	сог	nma	nd			Ge	nera	ate b	real	$\langle $			
HE>	(/A9	SCIL	inpu	it:				_								_	_		_		_	_	_		_				_	
02	52	OF	07	00	68	01	04	00	54	65	73	74	03	I _	I.	L	I.	L	I	1	I	I.	1	1	1	1	1	1	I.	
	R	I	L	L	h	L	I	I	Т	е	s	t	I	I	I	I	L	L	I	I	I	I	I	I	I	I	I	T	I	
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Figure 2-39. Send Data by using "Send Data" command

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

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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".

🔀 Simply Blue Commander 🛛 Version: 1.3.0.3	
File Definitions Configuration About	
Command Directory Transport Layer log	
Device Discovery SDAP Client SPP Link Establishment Establish SPP Connection Send Data: Test, LocalPort=C Get Link Supervision Timeout Set Link Supervision Timeout Set Link Supervision Timeout Enter Trimsparent Mode, LocalPort Release wink LocalPort=C1 Release wink LocalPort=C1	•
-Sena smng	
Send Calc checksum and length Save bytes as command Generate break	
HEX/ASCII input:	
02 52 11 01 00 64 01 03 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1

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.

SBDemo USBDongle File Edit View Call T	incoming - Hy ransfer Help	perTerminal					_	
			k					
	317							
Connected 0:05:36	Auto detect	115200 8-N-1	SCROLL	CAPS	NUM	Capture	Print echo	•

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.

Simply Blue Commander Version: 1.3.0.3	
File Definitions Configuration About	
Command Directory Transport Layer log	
Device Discovery SDAP Client SDAP Client SPP Link Establishment Send Data: Test, LocalPort=C Send String Send Data: Test, LocalPort=C Send String	•
Seng Calc checksum and length Save bytes as command Generate break	
IEX/ASCIT input:	
54 65 73 74 73 74 72 69 6E 67 I I I I I I I I I I I I I I I I I I	1 1 1
Teststring IIIIIIIIIIIIIIIIIII IIIII	1 1 1
JART COM2 115200Bps	//

SBDemo USBDongle File Edit View Call	e incoming - Hyj Transfer Help	perTerminal	N				_	
Test®R≭h®♦T	est♥Tests	tring_						
↓ Connected 0:05:36	Quito detect	115200 8-N-1	SCROU	CAPS	NUM	Capture	Print echo	₽
Connected 0.03.30	Figure	ro 2-44 . Bosoivir	ng the PAW	Datastrin	JINOI I	Jeapeare	Ji fine ocho	
In case, any key is pressed Simply Blue Commander. "1234" have been sent.	d within the Hype The following s	erterminal window creenshot shows	v now, the ind	coming da ge in Sim	ta will b ply Blu	e shown in e Comman	RAW format der in case	within the "test" and

File Co E:		efin De SD SP	ition Dire AP I P Lii Est Ge	ctory Disc Clien nk E ablis nd D t Lin	Config covery at stablis sh SPF lata: T k Sup	hmer Cor est, l	nt necti .ocal	ion Port=I		Tra Rx(Rx(Tx) Tx Rx: Tx: Rx: Tx: Rx: Tx: Tx:	3 RA RA Cm Ev Cm	port I .W): .W): .W): .W):	_ayer 31,3 74,6 54,6 End [Transp Senc end [log 2,33, 5,73, 5,73, Data, spare d Dat Data,	34 74,7 Loc ent N t Mo a, S Loc	'3,74 sal P fode, itatu: sal P	4,72,1 Port: 0 e, Sta Loca s: 00, Port: 0	69,68)1, P atus: al Por Loc)1, P	E,67 aylo 00, l al Pi aylo	ad D Loca 1 ort: (ad D	lata: al Po	546 rt: 01	573 1	74			×
-Se	nd st	rin <u>c</u>	Sel Enl Re	t Lini ter T leas	ransp e Link	arent Loca	Mod IPort	meou e, Loo =01 ▶	-	Rx: Rx: Rx:	Ev Ev	vent: vent: vent:	Incor Incor Incor	ming ming ming	Dat Dat Dat	a, Lo a, Lo a, Lo	ocal f ocal f ocal f	Port: Port: Port:	01, 01, 01,	Reci Reci	eive eive eive	d Da d Da d Da	ita: ita: ita:	34 33 32		Þ	•
-Se	nd st	ring and	Sel Enl Re	t Lini ter T leas	ransp e Link	arent Loca	Mod IPort	meou e, Loc =01 ••	and le	Rx: Rx: Rx:		vent: vent: vent:	Incor Incor	ming ming ming	Dat Dat Dat	a, Lo a, Lo a, Lo	ocal f ocal f ocal f nand	Port: Port: Port:	01, 01, 01,	Reci Reci Ge	eiver eiver eiver	d Da d Da d Da	ita: ita: ita: reak	34 33 32		ŀ	•
-Se -Se -IE> 54	nd st Se (/ASI	ring CII	Sel En Re inpu	t Lini ter T leas	ransp e Link C	arent Loca	Mod IPort	e, Loc =01 	and le	Rx: Rx: Rx: ength		vent: vent: Sa	Incor Incor Incor	ming ming nytes	Dati Dati Dati	a, Lo a, Lo a, Lo	ocal F ocal F ocal F nand	Port: Port: Port: Port:	01, 01, 01,	Reci Reci Ge	eiver eiver nera	d Da d Da d Da	ita: (ita: (ita: (reak	34 33 32	1)	▼

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.

74 73 74 72 69 6E 67 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Calc checksum and length Save bytes as command Generate break
Blue Commander Version: 1.3.0.3 ions Configuration About /irectory Image: Stable

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.

🔀 Simply Blue Commander 🛛 Version: 1	.3.0.3																	×
File Definitions Configuration About																		
Command Directory	Transp	port L	.aye	r log	-													_
Device Discovery SDAP Client SPP Link Establishment Send Data: Test, LocalPort= Get Link Supervision Timeout Set Link Supervision Timeout Enter Transparent Mode, Loc Relea In Link LocalPort=0	Rx: Ev Rx: Ev Rx: Ev Rx(RA Rx(RA Rx(RA Tx(RA) Tx(RA) Tx: Crr Rx: Ev Tx: Crr	ent: I ent: F ent: W): W): W): W): W): M(: Se ent: nd: Tr	Link Rele Trar 00 31,3 74,6 54,6 54,6 end Trar	Rel sase se L ispa 32,3 5,7 5,7 5,7 Dat ispa pare	eas Link ink, rent 3,34 3,74 3,74 a, L rent ent M	ed, S Loc Mo ,73, Docal Mo fod	Rea tatu cal F de, 74,7 Por de, e, L	son: s: 0(Port: Loc 72,6: t: 01 Stat	00,), Lc 01 al Po 3,6E , Pa us: (Port	Loc ocali ort: (,67 ayloa 00, L :: 01	cal F Port: D1, N D1, N ad D	Port: 01 Mode ata: al Po	01 e: 00 546 rt: 0) 573 1	74			•
Send Calc checksum and I	and length Save bytes as command Generate break																	
HEX/ASCII input:																		
02 52 0D 01 00 60 01 03 I I I I I	1 1	T	I	I	I	T	Γ	Т	Т	Γ	Ι	Т	Т	T	Т	Т	Γ	Ī
I B I I I ` I I I I I I	1 1	I	I	I	I	T	T	I	I	T	I	T	I	I	T	I	T	1
• • • • • • • 				1			-	-	1		-		-)
IART COM2 115200Bps																		Ē
			_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	2

3.0 Bibliography

- 3.1 LMX9830 OR LMX9838 SOFTWARE USERS GUIDE
- 3.2 SIMPLY BLUE COMMANDER USERS GUIDE

4.0 Revision History

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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Wireless Connectivity	www.ti.com/wirelessconne	<u>ctivity</u>	

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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

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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)

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Concernant les EVMs avec appareils radio

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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.

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- 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.

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