Simply Blue Smart User's Guide

Software For the LMX98xx Bluetooth® Serial Port Modules

Texas Instruments Inc.

August, 2006

Revision 1.7
Revised February 2013

TEXAS INSTRUMENTS

1.0 Introduction

The Simply Blue Smart host-side software provides a Windows interface for demonstrating and using the LMX98xx serial port modules. This User's Guide provides software installation procedures, explains the user interface of the software, and provides examples for exercising the module.

The Simply Blue Smart software includes the following profiles:

- *SPP*—Serial Port Profile (emulates serial connection)
- *DUN Terminal*—Connecting to a DUN GW (allows connecting to DUN modem)
- *DUN*—Dial-Up Networking gateway (emulates modem)
- *Voice Gateway*—Gateway implementation of headset profile (mobile phone side)
- *Headset*—Headset profile (emulates bluetooth headset)

2.0 Installation

2.1 Requirements

Hardware required:

- LMX9830DONGLE Kit or LMX9838DONGLE Kit
- PC with serial port

Software required (either one is acceptable):

- Microsoft Windows XP
- Microsoft Windows 7

2.2 Software Installation

The software is included in the software package for the kits described in 2.1. The installation files are on the CD included in the kit.

To install the software:

1. **Insert the kit CD.** If the installation does not start automatically, double-click **Setup.exe** on the root of the CD drive to run the installation program.
2. **Click the Install Software button.** This will install documentation, SB Smart, and Simply Blue Commander. Please browse the CD.
3. **Run the SBSmart software.** Shortcuts are installed in the Start -> Programs -> Simply Blue 2.0 menu. From this menu, select the SB Smart command.

2.3 Hardware Setup

The hardware configuration for running the Simply Blue Smart software is shown in Figure 1.
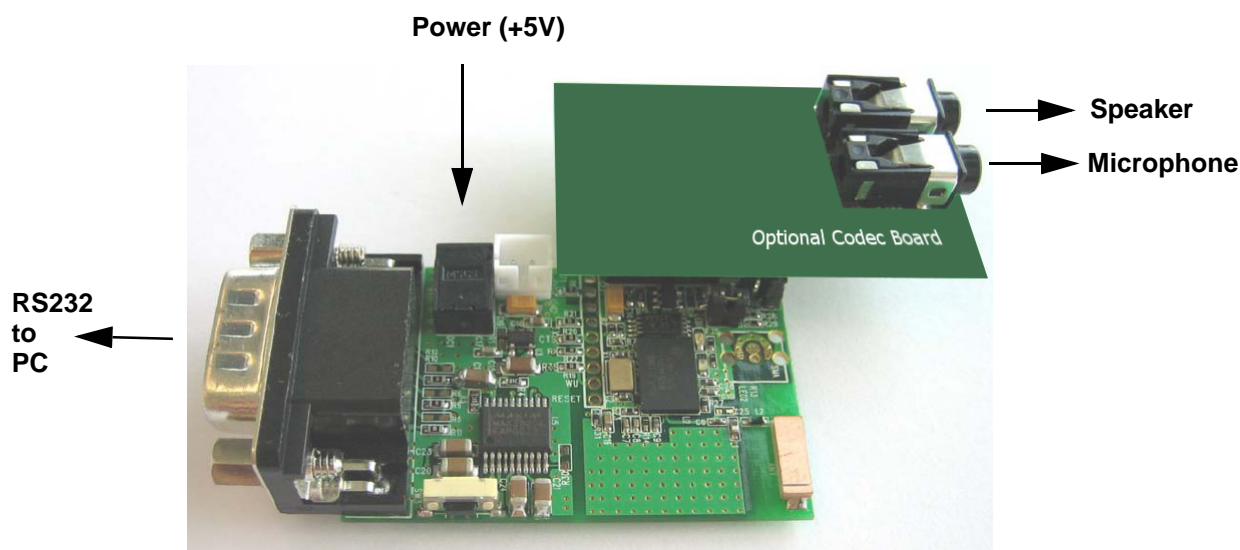The codec board shown is not a part of the kits.

Power (+5V)

Speaker

Microphone

RS232 to PC

Optional Codec Board

Figure 1. LMX9830DONGLE Hardware Configuration

3.0 The SBSmart Dialog

This SBSmart application is based on a single dialog, allowing to configure the basic settings of the device and combining the support for 4 different profiles: SPP, DUN, Voice Gateway and Headset. A detailed explanation of the profiles can be found in Section 5.0.

Figure 2. SBSmart Dialog

3.1 Connect

The communication between the Simply Blue Evaluation Board and the PC is done via the serial port. To start the communication, the COM Port setting needs to be set to the appropriate COM Port and the UART baudrate needs to be selected. In case the Speed setting is left blank, the default of 115.2kbit/s will be used.

In case of the LMX9830 is used, please select "no EEPROM" if no EEPROM is used and "Autobaudrate", if the OP pins are configured for Autobaudrate. SBSmart will configure the LMX9830 to the setting selected in "Speed".

Figure 3. SBSmart ComPort Settings

3.2 Status log

The Status log at the bottom of the dialog is one of the most important items, since it gives the current status of the module. The window shows any event reported back by the LMX98xx module and for some events also gives further information on error codes.

Figure 4. Status window

3.3 Patching

SBSmart also offers the ability to patch the device. Please follow the steps in the next chapters to apply a patch.

3.3.1 Select Patch

As the first step, please select the patch to apply, using the "Select Patch" Button. The directory and name will apply in the text field at the left, in case the Patch is initialized successfully.
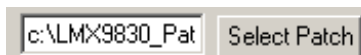

Figure 5. Selecting the Patch

3.3.2 Patch now

This option is only available for LMX9838 and in case the LMX9830 is used with an EEPROM. By pressing the button, the Patch will be supplied to the chip and is stored within the EEPROM.

In case "no EEPROM" is selected (LMX9830 only), this option is disabled and the patch will be applied on each Reset.

Figure 6. Select Patch now if EEPROM is used

3.4 General Init

The default configuration of the LMX98xx Modules is optimized for single point-to-point data link setup, just offering one SPP service to the remote device. To be able to use the modules for multiple links including audio support, the LMX98xx needs to be configured to specific settings.

By pressing the General Init button, the module settings will be restored to factory settings and prepared for the use with SBSmart. See also Section "SBSmart Command Reference" (6.0).

Important: General Init needs to be performed on LMX9830 with EEPROM, or LMX9838, in case the device is used with SBSmart the first time.

In case "no EEPROM" is selected (LMX9830 only) this Button is disabled. In this case the LMX9830 will be initialized whenever a Reset is recognized.

3.5 Reset

The Reset Button just initiates a standard software Reset to the device. The Reset confirmation will be shown as "Simply Blue Ready, vxxxx" in the Status log.

3.6 Local SDB Settings

All Simply Blue Modules include a service database in their non-volatile memory which is the EEPROM both for the LMX9830 and LMX9838. The Service Database is initialized by "General Init" (3.4).

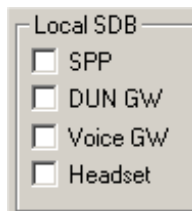The Local SDB configuration box at the right top enables or disables the services chosen.

Figure 7. Local SDB configuration

3.7 Class of Device

The Class of Device is reported as answer to Inquiry requests from other devices. By some applications and implementations it may also be used to differentiate between different device categories, e.g. Mobile Phone searching for a headset.

SBSmart offers a couple of different application examples, to be able to be categorized correctly.
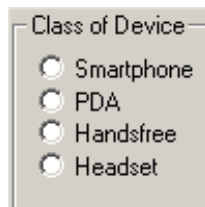

Figure 8. Class of Device Configuration

3.8 Set Bluetooth Device Address (BDADDR)

This option allows to modify the BDADDR of the device. Usually the LMX9838 already include a unique BD_Addr, programmed by Texas Instruments. The LMX9830 does not include the BD_Addr as it needs to be stored in the external EEPROM. If no EEPROM is used with LMX9830, the address needs to be provided on each reset.
SBSmart will check the BD_Addr of the device on connect. If no address is found (FF:FF:FF:FF:FF:FF), it is automatically programmed to 00:00:00:00:00:00. A no EEPROM device will be programmed on each reset.

If a LMX9830 is used without no EEPROM the BD_Addr change requires a software reset to get active.

To apply a new BDAddr, please provide the address in correct order, **without colon ":"** as shown in
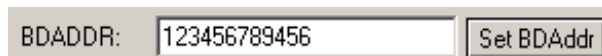

Figure 9. Set new BD_Addr

Storing BD_Addr FF:FF:FF:FF:FF:FF at LMX9830 causes the device to stay in Initialization mode after a reset or on bootup. This behavior is also used by SBSmart to reapply a patch on a software reset.

Do not store BD_Addr FF:FF:FF:FF:FF:FF at LMX9838 as the pre-programmed address by Texas Instruments will be definitely erased and is not restored automatically.

3.9 Set Name

By default the local name is configured to "Serial Port Device". On Connect the field is updated with the current name of the device. To change it, just fill in the new name into the edit box and press the "Set Name" button.

3.10 Set Pin

The LMX98xx by default stores a pincode, which it will automatically use for pairing. The pin will be read back on "Connect" (3.1) and displayed in the text box. To change the pin, just edit the text box and click on "Set Pin".

It is also possible to configure the pincode to zero length, by erasing the content of the textbox and pressing "Set Pin". If that's done, SBSmart will bring up a Pin request dialog box, to enter the pin, any time an incoming or outgoing link requires pairing.
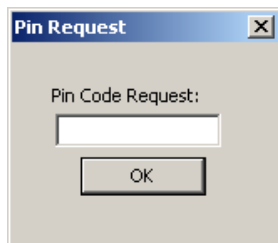

Figure 10. Pin Code request

3.11 Set Scan Mode

Set the scanning mode allows to make the device connectable or discoverable for other devices. By default this is configured to "Both". Both for the LMX9830 or LMX9838, the Bluetooth 1.2/2.0 feature "Interlaced" can be used. Interlaced scanning allows faster connection setups and a discovering by basically doubling the "Listening Window". In real applications this of course also means doubling the power consumption for the scanning activity.

Activating one of the interlaced options will therefore lead into faster reaction time on incoming links or to searching devices.
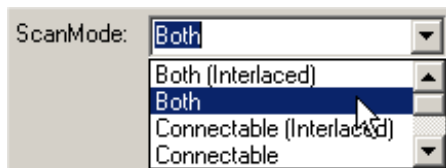

Figure 11. Set Scan Mode

3.12 Force Master

The Force Master option configures the LMX98xx modules to request to be Bluetooth Master for any incoming or outgoing link. This option gets valuable for multipoint connections, in which the device needs to handle multiple connections as a Master/Slave scenario could cause problems for the existing links, e.g. on an ongoing audio link.

The LMX98xx will reject incoming links, which are not able to accept the role switch.

Activating or deactivating Force Master requires a software reset of the module, which will cause all active links to drop. Therefore the option should only be used when there's no active link in place.

3.13 Active ACLs

An ACL (Asynchronous Connectionless Link) is the physical wireless connection between two devices. To create a full SPP Bluetooth link, the bluetooth modules will first create a physical connection (which basically can be compared with the wired connection between a printer and PC) and use this connection to transport the higher layer protocol, which in case of bluetooth could be for example the service discovery or the serial port connection.

In case at least one ACL has been established, the Blue LED will turn on. The counter will show the actual number of ACLs.
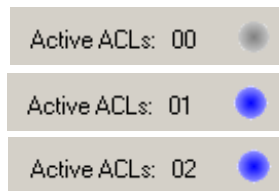
Figure 12. Active ACL indicator

3.14 UART Break

This button generates a Break on the COM port selected for the communication to the evaluation board.

The Break function is usually used to force the LMX98xx to leave "Transparent mode". During "General initialization" (see Section 3.4) SBSmart configures the device to Automatic off / Command Mode, so the device will never switch automatically to Transparent mode.

However, "Transparent mode" can be enabled manually after establishing a SPP link (seeSection 5.2) and using the "Transparent Mode" button. The Break will bring the LMX98xx back to normal mode.

NOTE: SBSmart automatically sends a BREAK, in case transparent mode has been activated before.

Figure 13. UART Break

3.15 Inquiry and Get Names

Pressing the Inquiry button initiates the discovery of the bluetooth addresses of remote devices and their Class of Device. The inquiry is configured to search for about 12 seconds and to stop at 32 responses. Since one device will answer several times to the same request, this number will usually never be reached.

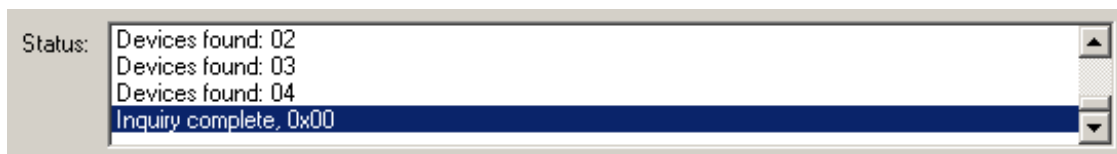The progress of the Inquiry procedure can be followed in the"Status log" (3.2).

Figure 14. Wait until Inquiry process is complete

Once the Inquiry procedure is finished, the drop-down menu will be updated with the result.
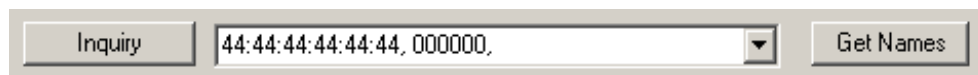

Figure 15. Inquiry Results are shown in the Drop-down

Since an Inquiry just delivers the Bluetooth address and the device class, the Get Names will start a sequence, which will create a short connection to each of the devices in the drop-down list and request the friendly name. The end of the procedure is indicated by counter status "00" in the Remote Name Request event in the "Status log" (3.2).
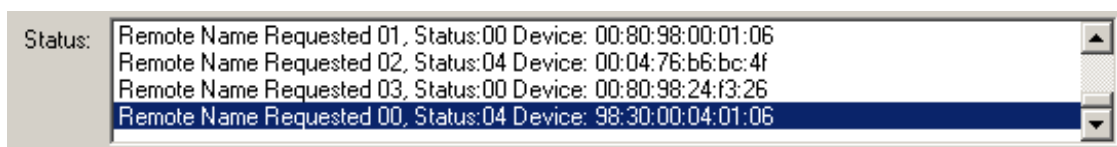

Figure 16. Wait until the counter right after "Remote Name Requested" gets 00

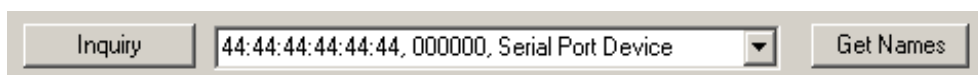The Name Request result will finally update the Device list in the Drop-down list.

Figure 17. Inquiry Results after Name Request sequence has been completed

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3.16 Profile sections

The four boxes in the middle of the application can be used to establish or accept incoming links for different profiles. Please see "Bluetooth Link Setup" (5.0) for details.

Figure 18. SBSmart profiles section

3.17 Load / Save Configuration

The "Load Config" and "Save Config" buttons offer the ability to store the current status of the SBSmart settings in a configuration file. Loading a file tries to program apply the device configuration, therefore please connect to your device BEFORE loading the configuration file.

Figure 19. Load / Save Config

The following information is stored on "Save" and restored on "Load":

- Local SDB configuration
- Class of Device configuration
- Scan Mode
- Force Master
- DUN Gateway Modem Port
- Inquiry List with Names
- Paired device information for Voice Gateway (BD_Addr, RFCOMM Port)
- Paired device information for Headset (BD_Addr)

3.18 Creating a logfile

In SBSmart versions later 1.3.0.5 it is possible to create a logfile of all traffic captured on the UART interface. Creating a log allows easily to understand, which commands need to be sent and how they look in hex.

The log can be activated by selecting the Checkbox at the bottom of the dialog. Activating the checkbox will first ask for the filename for the log and open the file. Deactivating the checkbox will close the file.
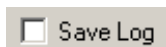
Figure 20. Create a log file using the "Save Log" checkbox

Each log file entry has the following information:

- Time between previous and this command in milliseconds
- Hex string of the command or event
- Informative translation of the opcode and the type

The following 3 lines show an example of an Inquiry log.

1522:   02 52 00 03 00 55 0A 20 00 03   - GAP_INQUIRY, Request
311:       02 69 01 09 00 73 87 6C 81 0E 04 00 04 01 10 03   - GAP_DEVICE_FOUND, Indicator
12518:   02 43 00 01 00 44 00 03   - GAP_INQUIRY, Confirm

How to read the log:
The Inquiry has started 1522ms after the last event has been captured. 311ms after the Inquiry command has been sent the first device has been found. The Inquiry is confirmed as completed 12518ms after the device has been found. Therefore Inquiry lasted about 12829ms.

4.0 Initializing the LMX98xx

The SBSmart software assumes specific settings on the device, which have to be configured before use with the software. Therefore the device needs to be configured with the following steps.
For LMX9830, it is assumed that the device uses an EEPROM and Clock, Baudrate and Bluetooth Address are configured.

4.1 Connect to the LMX98xx module

4.1.1 LMX9830 with EEPROM

Select the COM Port from the drop-down menu shown in Section 3.1 "Connect". Select the Speed from the drop-down menu. (The speed will default to 115200 baud, if nothing is selected.) In case the device is configured by the OP pins to "Autobaudrate", activate the "Autobaudrate" checkbox in the dialog box. Click the Connect button. When the connection is made, the device settings for the BDADDR and Name should appear.

In case the device just responds with "Await Initialization", press "Reset" to set the basic parameters of the LMX9830.

If no response appears, click the Disconnect button, then dick the Connect button to try again.

4.1.2 LMX9830 without EEPROM

Select the COM Port from the drop-down menu shown in Section 3.1 "Connect". Select the Speed from the drop-down menu. (The speed will default to 115200 baud, if nothing is selected.). Activate the "no EEPROM" checkbox.

In case the device is configured by the OP pins to "Autobaudrate", activate the "Autobaudrate" checkbox in the dialog-box. Click the Connect button. When the connection is made, the device settings for the BDADDR and Name should appear.

In case the device just responds with "Await Initialization",press "Reset" to set the basic parameters of the LMX9830.

If no response appears, click the Disconnect button, then click the Connect button to try again.

4.1.3 LMX9838

Select the COM Port from the drop-down menu shown in Section 3.1 "Connect". Select the Speed from the drop-down menu. (The speed will default to 115200 baud, if nothing is selected.) In case the device is configured by the OP pins to "Autobaudrate", activate the "Autobaudrate" checkbox in the dialog box. Click the Connect button. When the connection is made, t4.1.3 LMX9830 without EEPROMhe device settings for the BDADDR and Name should appear.

In case the device just responds with "Await Initialization", press "Reset" to set the basic parameters of the LMX9830.

If no response appears, click the Disconnect button, then dick the Connect button to try again.

4.2 Click on "General initialization"

As in any typical application the Simply Blue Module needs to be configured to the correct parameters. For this click "General Init" (3.4) to initialize the SDP entries and all other parameters. The name is set to "Serial Port Device". The default PIN is set to "0000".

See also Section 6.0 for a detailed list of settings.

In case the "no EEPROM" checkbox has been selected, this button is disabled. The settings will be applied each time SBSmart detects a Reset.

4.3 Select the profiles to be activated and class of device

After a "General Init" (3.4), the module will not offer any services. The "General Init" (3.4) stores the SDP entries but does not activate them. To enable the services, just select the check boxes in the "Local SDB Settings" (3.6) and "Class of Device" (3.7) section. The entries are activated immediately by clicking the check boxes. To follow the examples in this document, please select the SPP, DUN GW, and Voice GW check boxes as shown in Figure 21 on Page 11. The Class of Device indicates the device type on inquiries. Select the "Smartphone" in the Class of Device region.
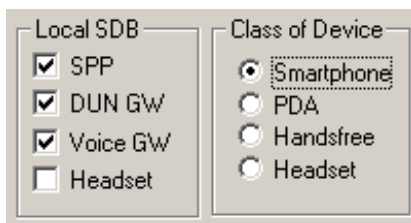

Figure 21. Configuring the Local SDB and the Class of Device

4.4 Set the device name and PIN.

Optionally, the device name can be changed to any value as described in Section 3.9 and Section 3.10.

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5.0 Bluetooth Link Setup

5.1 General Usage

For outgoing links, as the SPP/DUN Connect or Voice Gateway Pairing, the program will use the device chosen from the Inquiry List. For Voice Gateway, if the "use stored device" box is checked, a previously stored connection will be used.

The Dial-Up Networking Gateway (DUN GW) only waits for incoming connections, without active link setup.

The Headset profile will act like a headset waiting for an incoming connection request. It will store the latest incoming device and uses it for an outgoing connection when the switch hook is pressed without any link established (to simulate Voice dialing). The "Pairing Mode" checkbox allows to activate the storage of the BD_Addr of the next incoming link as the remote device for the headset profile.

Please note that Voice Gateway and Headset profile require codec board that is not delivered with the kits.

5.2 Serial Port Emulation

After performing an Inquiry, a serial port connection can be made to any of the devices listed in the drop-down menu that support the SPP profile.

5.2.1 Establish an outgoing connection

To make an outgoing serial connection using SPP Profile follow the following steps:

5.2.1.1 Select a device from the drop-down menu

5.2.1.2 Click the Connect button in the SPP profile section

The program will automatically search for a SPP port on the remote device and connect to it. Once established, the link indicator (the red bar below the SPP region) will appear and the Connect button turns into the Disconnect button.

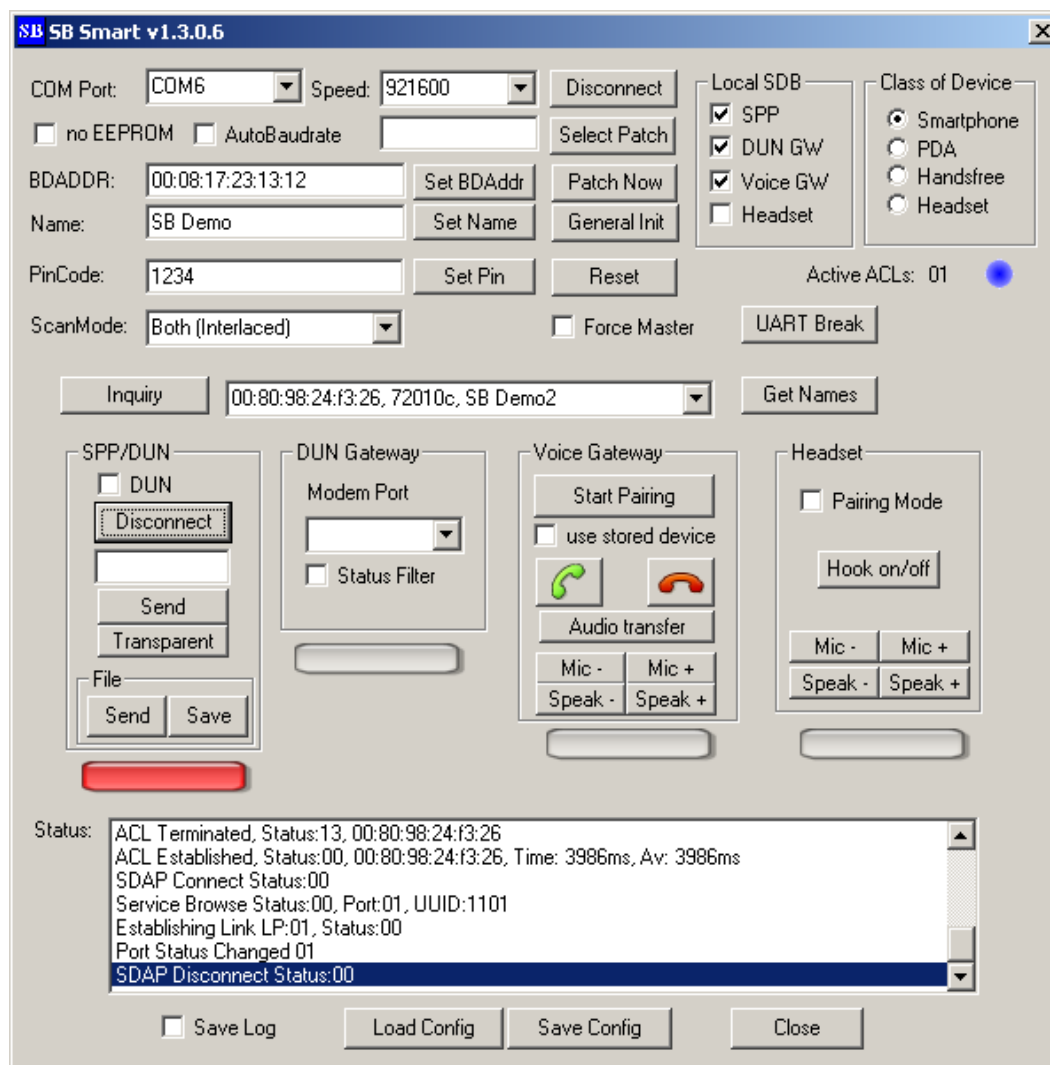The Active ACL LED will indicate the single physical link.

Figure 22. Establishing a SPP link

5.2.2 Sending data

5.2.2.1 Chatting

To send data as on a chat, type data into the box in the SPP region and click the Send button. Data received from the remote device over SPP will be displayed in the Status box.
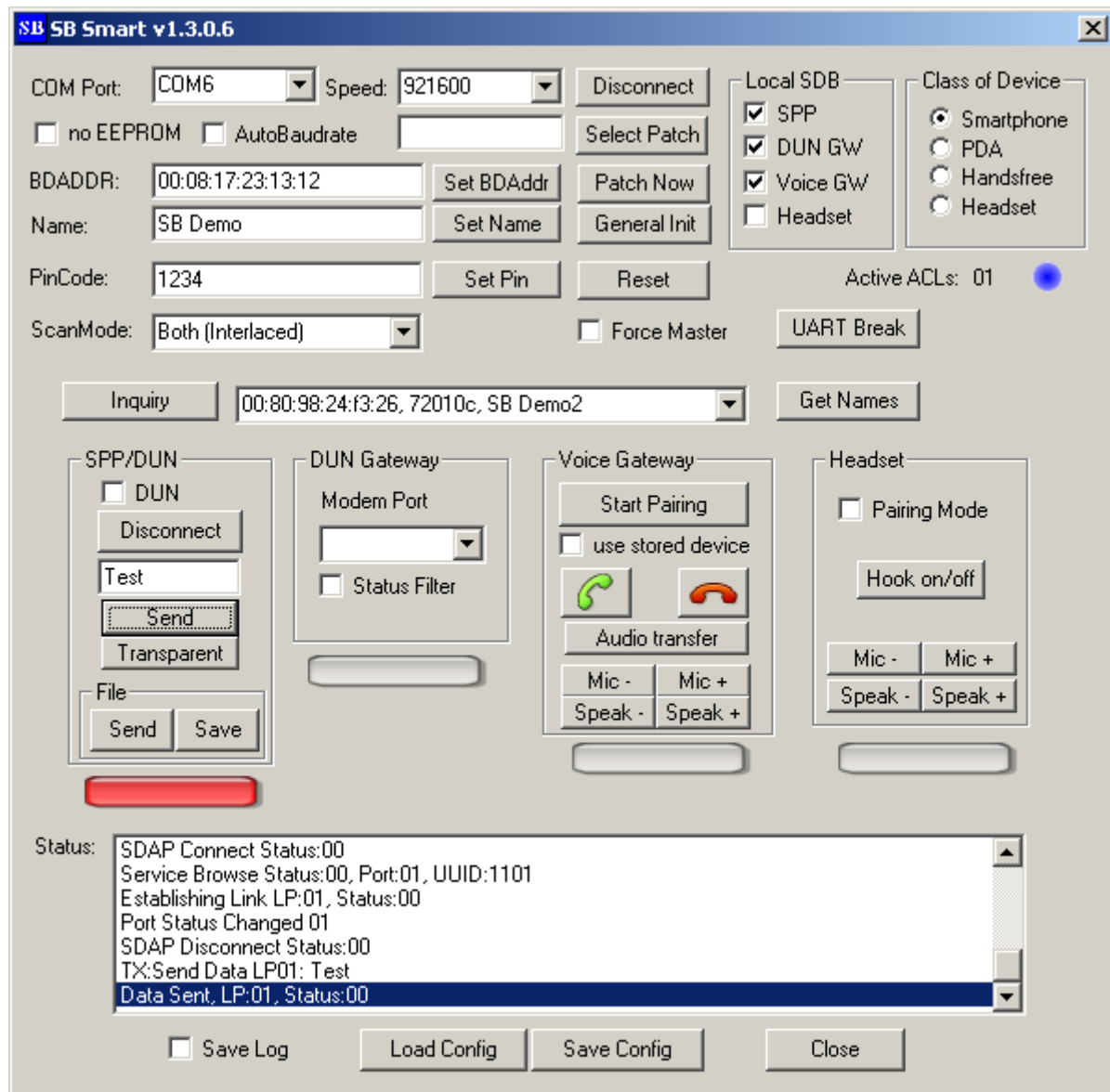

Figure 23. Sending Data using the "Send Data" Button

5.2.2.2 Send a file over SPP

The SPP profile can also be used to send a file to another device. To send a file select "Send" Button in the File section. The dialog will ask for the file to send and bring up the dialog in Figure 24.
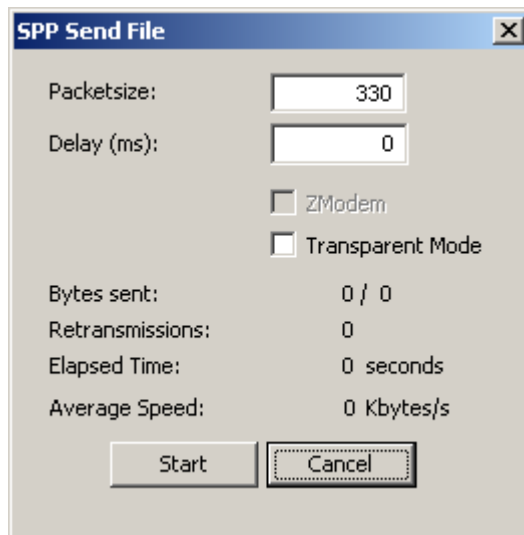
Figure 24. Send File Dialog

The dialog allows to configure the packet size and the delay of the data packets sent.

In command mode ("Transparent Mode" not activated), the packet size indicates the length of the payload in each "Send Data" command. The maximum size for command mode is 330bytes.
The delay indicates the time between two Send data packets. If set to 0, the data will be sent as fast possible.

NOTE: Due to the windows driver structure the throughput in command mode might be limited to about 33kBytes/s.

In case "Transparent Mode" is activated, the packet size can be configured up to 5000 bytes. Since in this mode, the data are pushed directly to the LMX98xx, this value reflects the buffer size used by the Windows driver.

To get highest throughput, use Transparent mode with minimum 4000 bytes packet size.

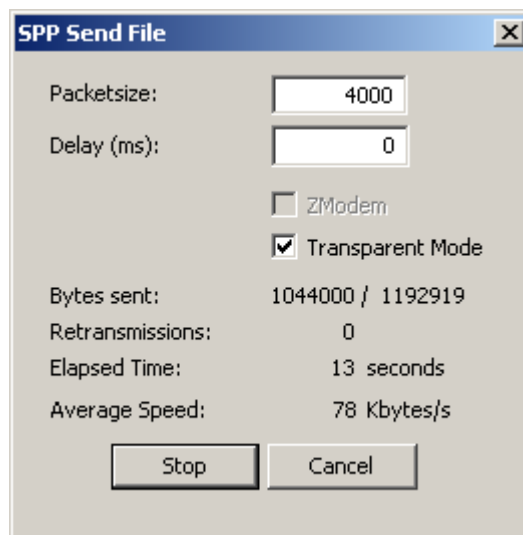**Transparent data will not be stored in the log file.**

Figure 25. Send data progress

The transmission of the file can be stopped anytime by pressing "Stop" or Cancel. In case the transmission will be started again after a Stop, the transmission will be continued from the last position.

IMPORTANT: Please we aware that the file is sent as RAW SPP data. The receiver of this file needs to be able to handle them appropriately, e.g. another SBSmart (see Section 5.2.3.2). It's not possible to push the data to a OBEX profile like Object Push or File Transfer.

5.2.3 Receiving data

In normal case, any incoming data on SPP will just be pushed to the Status log window. In case the remote device pushes a file to this device, SBSmart is able to push those data into a file on the disk.

5.2.3.1 Chat

Chatting means, just a few data is received. As any other event, incoming data will be indicated in the Status log window.

5.2.3.2 Saving incoming data into a file

To save incoming data into a file from another device or simply log all incoming data to a file, select "Save" in the File section of SBSmart. This will route the data into a file instead of sending them into the status window box.

Receiving can either be done transparent or in command mode.

If "Transparent Mode" is checked, the incoming data are not shown in the log file.

IMPORTANT: Pressing Stop will just stop pushing the data into the file, the data stream will still be received and shown in the Status log.
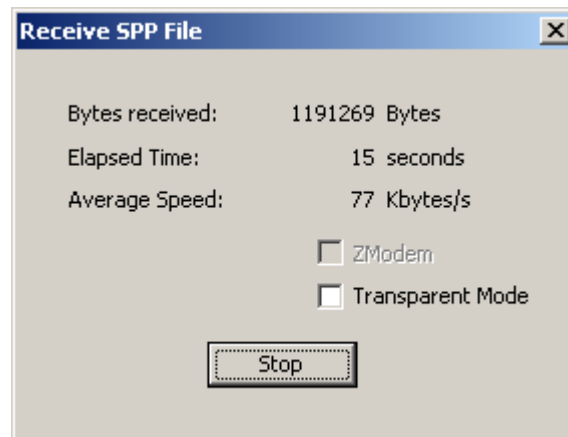
Figure 26. Receiving a file

5.2.4 Incoming Connection

An incoming connection is handled similarly to an outgoing connection. The link indicator will appear, and the Connect button will turn into the Disconnect button.The Status log will show the event "Incoming Link Established", the local port it connected to and the Bluetooth Address of the remote device.
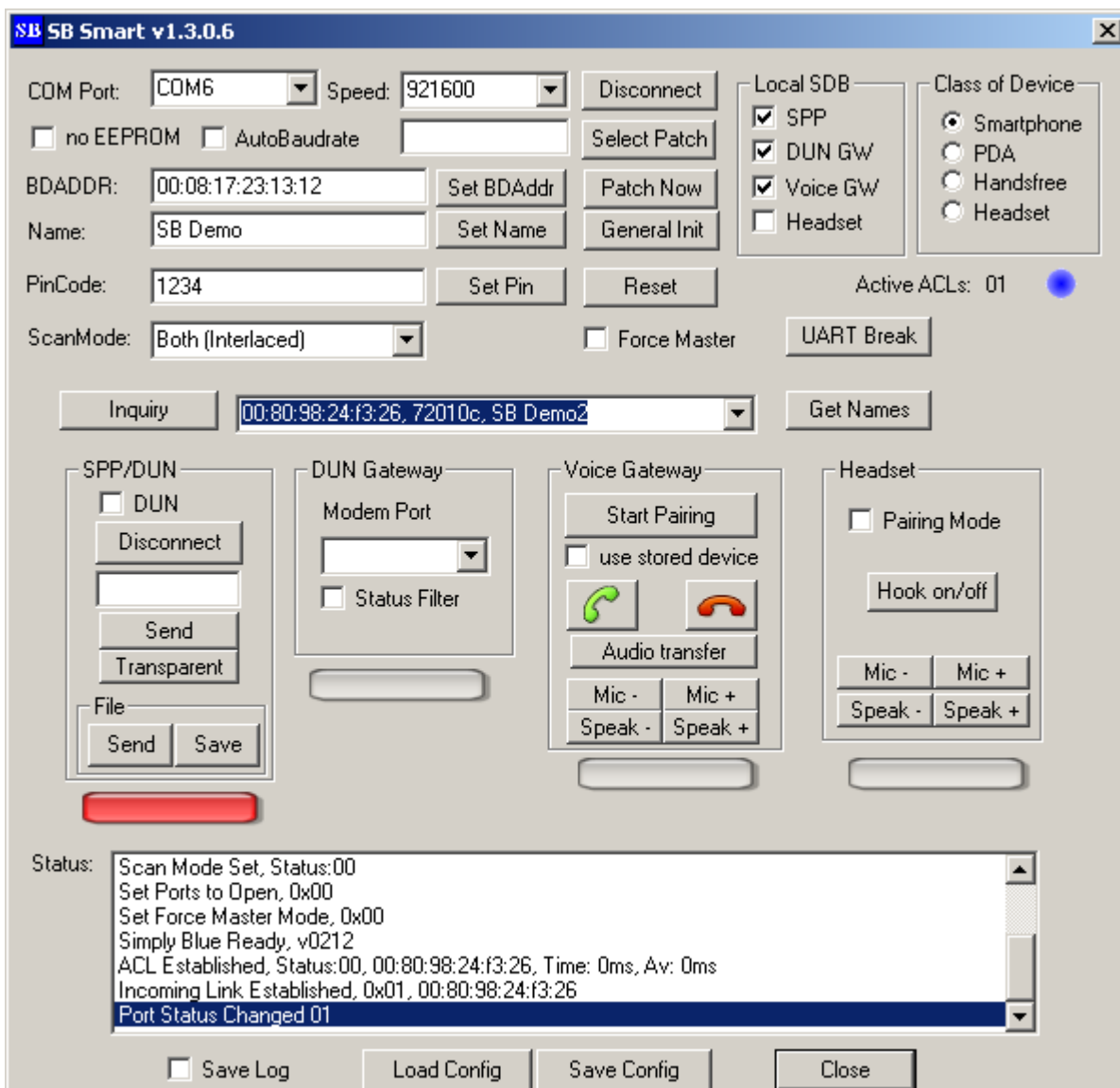
Figure 27. Incoming Link at the SPP profile

5.2.5 Transparent Mode

In case a SPP link has been established and only link is active, the LMX98xx UART can be set to "Transparent Mode". In this mode the device does not interpret any command anymore and will send them as data.

The feature is intended to use SBSmart just to create a SPP/DUN link to another device. After link establishment and entering "Transparent mode", the SBSmart UART connection can be closed and the LMX98xx can e used by another application like a cable.

To leave transparent mode, just press the "UART Break" button (seeSection 3.14).

NOTE: In case transparent mode is active, SBSmart automatically sends a UART Break, in case another profile or command is sent by pressing a button. Sending data with the chat window will be done transparent.

5.3 Dial-Up Networking Terminal

SBSmart can be used to connect to a Dial-Up Networking Gateway, e.g. a mobile phone, to simply test the interface.

Since DUN does not need a special service entry, the SPP profile port can be used.

5.3.1 Select Device in Inquiry list

Same as for SPP, select the device to connect to in the Inquiry list.

5.3.2 Select DUN

To establish a DUN link instead a SPP link, simply activate the DUN check box in the SPP profile section. This forces SBSmart to browse and connect to the DUN service instead of the SPP service on the remote device.

Figure 28. Connecting to DUN instead of SPP

5.3.3 Connect

On "Connect" SBSmart starts the link establishment with "SDAP Connect" and will browse for the DUN entry. Afterwards it creates the link to the RFComm port reported by the remote device.
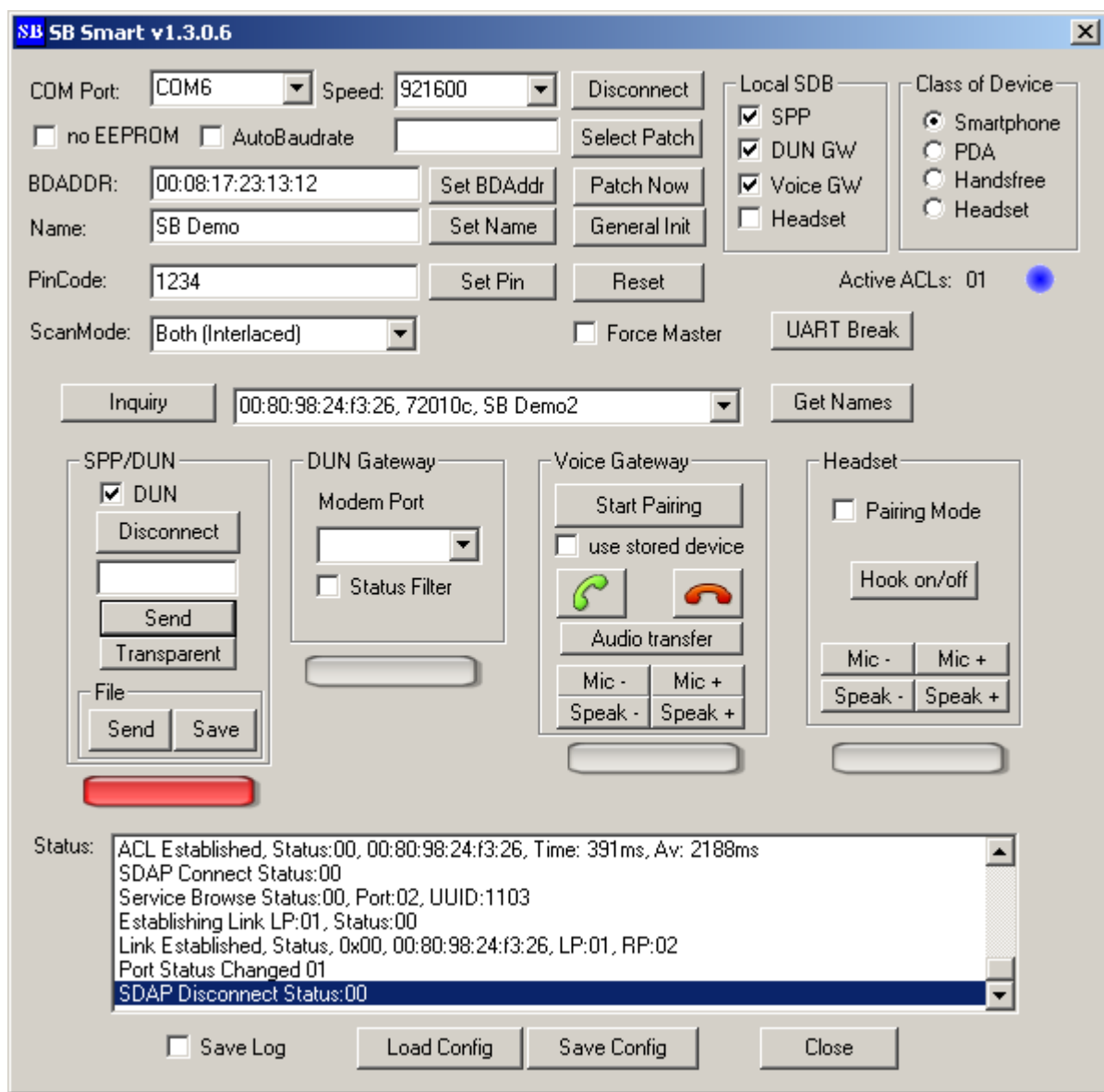
Figure 29. Create DUN link to a remote user

5.3.4 Sending AT Commands

Once the link is established, DUN Commands can be sent using the "Send" Button and the text field above. SBSmart automatically adds the required end character "0x0D" to the string.

The AT commandset can easily be tested by sending "AT" to the remote device as shown inFigure 30. The remote device should respond with an OK. Depending on the remote configuration, the string might be repeated before the "OK".

Other commands to test when connecting to a DUN GW:

Table 1. Examples for AT Commands to send to a DUN GW

Command	Expected response	Description
AT	OK	standard command, no action
ATDxxx	CONNECTED or NO CARRIER or NO DIALTONE	Command to dial number xxx in case of mobile phone message might be connected or NO DI-ALTONE/NO CARRIER in case no line is found.

Table 1. Examples for AT Commands to send to a DUN GW

Command	Expected response	Description
ATH	OK	Hang up
AT&V	(Many characters)	Lists the status of the modem, complete list of features and settings will be responded.

Figure 30. Sending AT Commands using the "Send" button

5.4 Dial-Up Networking Gateway

The DUN Gateway supports a gateway for receiving connections from remote devices. The gateway routes all incoming data (AT Commands and later PPP packets) to a modem connected to another serial port on the PC, e.g. the built-in modem of a laptop. The data received from the modem will be sent back to the DUN Terminal.

5.4.1 Select the COM port for the AT-compatible modem

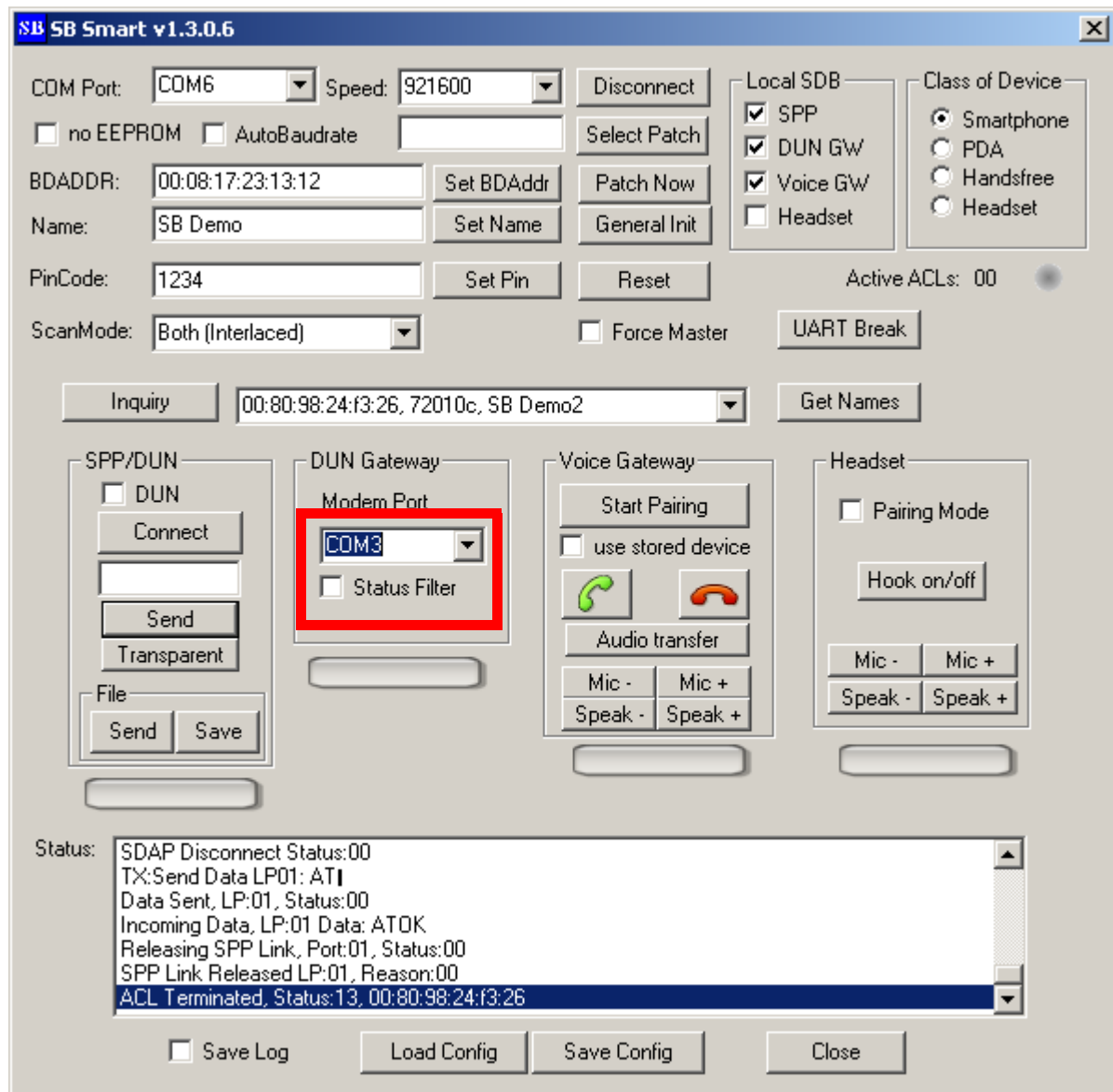**Important***: Please make sure the correct port is chosen otherwise the program could hang up.

Figure 31. Select COMPort to which the modem is connected to

5.4.2 Initiate the link from a remote device

The remote device might be any PC or PDA which supports the Dial-up Networking profile. Any service normally used over a modem can be chosen. For example, if an internet connection is established, a standard ISP number with a login and password should be available. The LMX98xx module will accept the incoming link and forward all data to the modem. The Status box shows the routing of the AT commands. The modem should dial out and send all information back to the Terminal. The Status Filter check box in the DUN Gateway region can be used to enable filtering the PPP data in the Status box.

Figure 33 on Page 22 gives an example of the SBSmart window, showing the incoming and outgoing traffic between the modem on COM3 and the bluetooth link. The data are indicated as incoming or outgoing data. This examples shows that the remote device sends the dialing command ATDT12345 (incoming data over Bluetooth), and the modem responds NO DIALTONE (forwarded by SBSmart to the remote device by using "Send Data" Command).
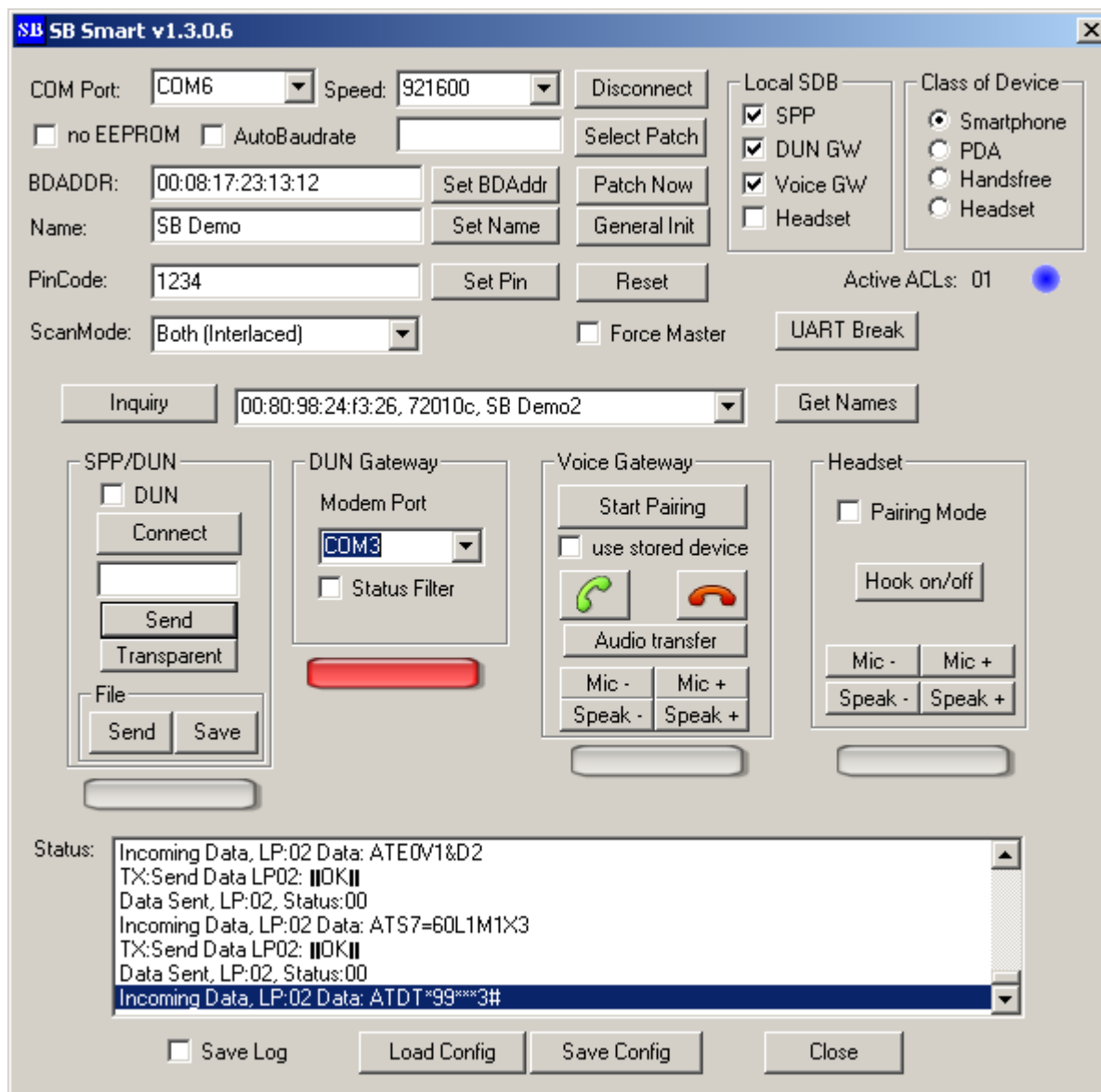

Figure 32. DUN GW link established, Data just routed between modem and Bluetooth link

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5.5 Voice Gateway

Voice Gateway (also called Headset Audio Gateway) is part of the Headset profile, representing the Mobile Phone side of the connection. The implementation in SBSmart tries to simulate a mobile phone scenario, in which it is possible to accept an incoming call or do an outgoing call by using the [ ] button. The call will be released by the [ ] button.

The Pairing procedure, which is usually done with some menu functions on the mobile phone, can be done by using the "Start Pairing" procedure. This stores the details of the headset in the application.

The audio codec settings are set to the OKI codec settings and stored during the "General Init" procedure (Section 3.4)

5.5.1 Pairing

The Pairing procedure is basically the process to exchange the keys and to include the device in the headset device list on the Mobile phone. SBSmart simulates this behavior by offering a Pairing button, just making a short link to the headset and dropping it right after it successfully connected. The Pairing is done by two steps:

5.5.1.1 Choose a device from the Inquiry Scan drop-down menu.

If there's no device listed just click on the Inquiry, followed by the Get Name Request as described in Section 3.15 "Inquiry and Get Names".

5.5.1.2 Click the Start Pairing button

This initiates a SDAP link to the device chosen from the list and store the port number for the headset profile. If successful, the "use paired device" check will appear.
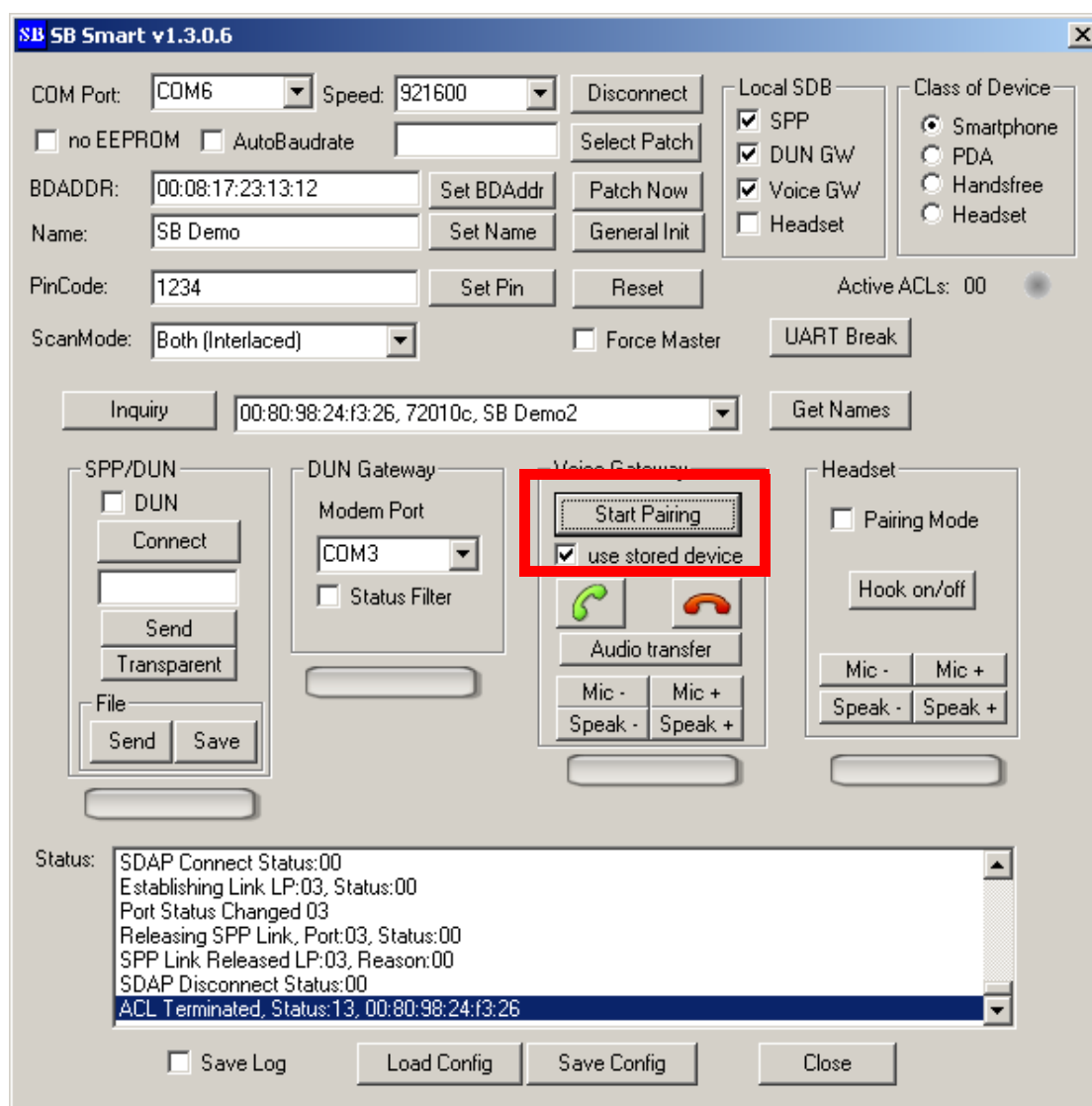

Figure 33. Configure the Voice Gateway to a specific headset using "Start Pairing"

5.5.2 Connecting to the headset

A Mobile Phone usually connects to a headset on either in incoming link or if the user starts calling out. In SBSmart pressing the [icon] just starts the simulation of an incoming call, sending the RING to the headset.

5.5.2.1 Press the hook button

Click the [icon] button. The SBSmart software will connect to the headset and send a ring indication. Off-the-shelf headsets will indicate this ring with their self generated ring tone.
In this situation the Voice Gateway waits for the headset to press the button to accept the call. To interrupt this operation just click on [icon] and the link will be dropped.
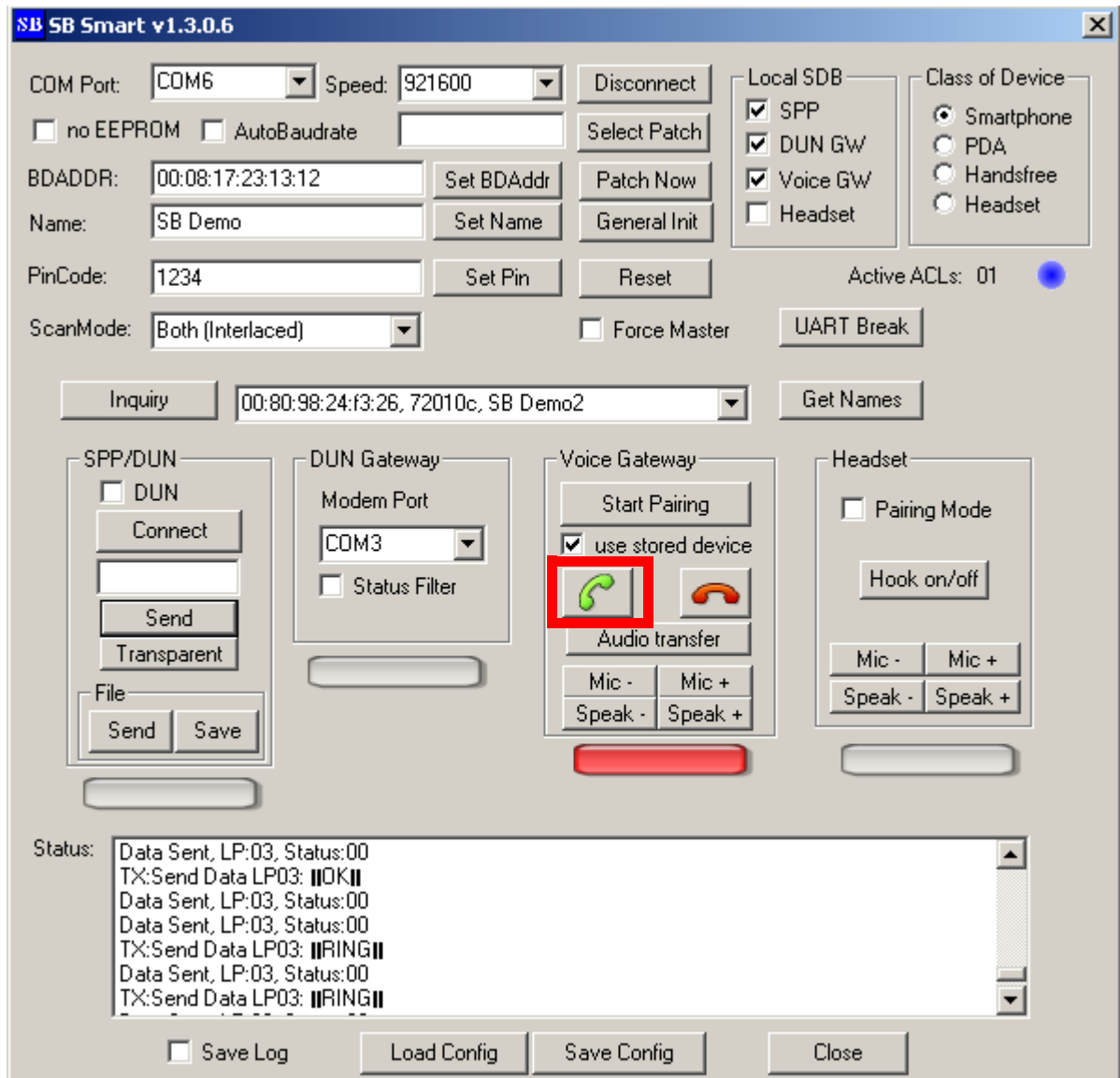
Figure 34. Press the Green Hook to start the Ringing on the headset

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5.5.2.2 Press the button on the headset to accept the link

The headset will send out the AT+CKPD=200 command. The Simply Blue Smart software detects this command and establishes the audio link.
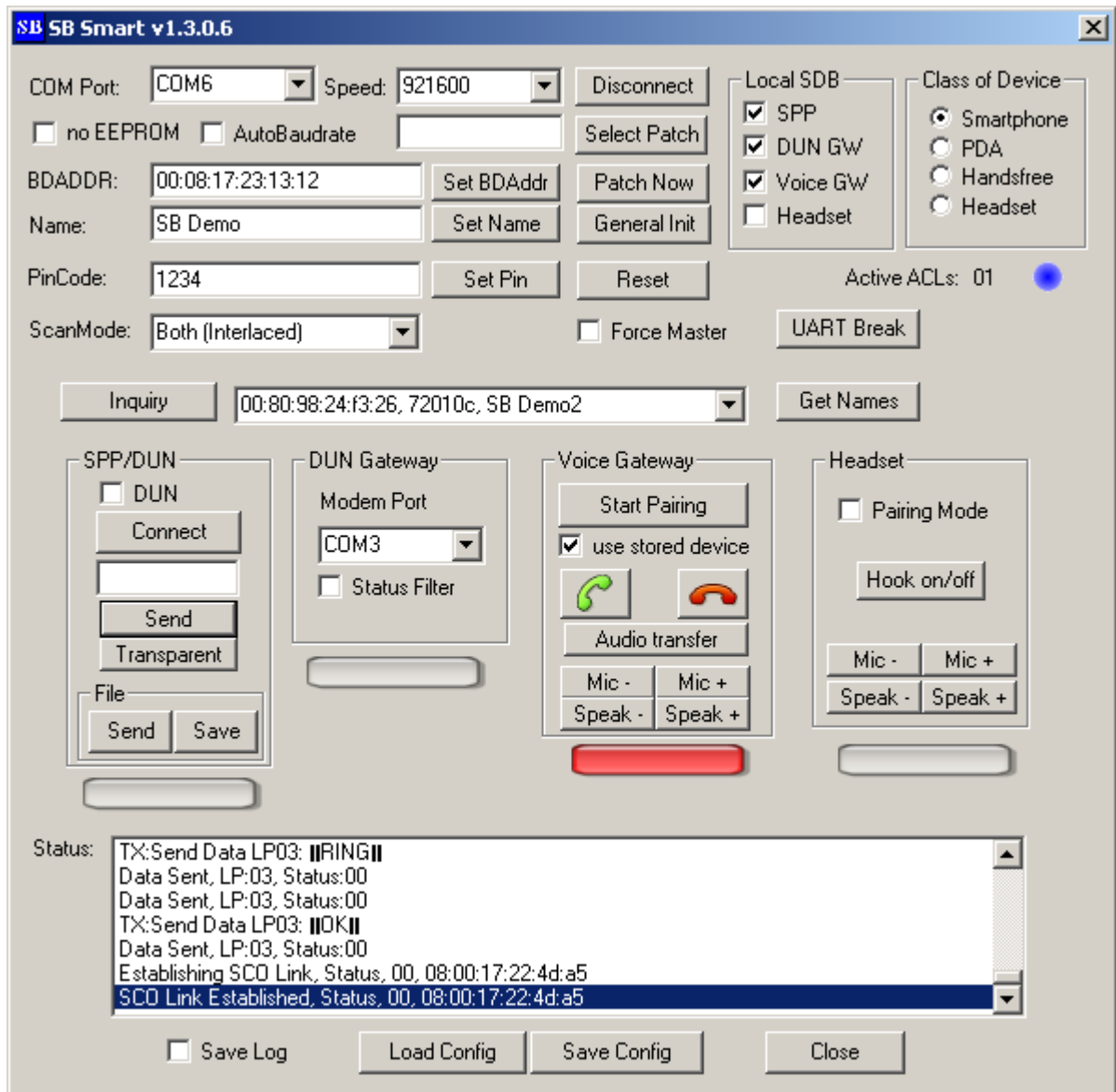
Figure 35. Once the headset pressed the button, the Voice Gateway establishes the SCO link

5.5.3 Audio transfer

Audio transfer is a specific function used on Mobile Phones, allowing to switch off the SCO link during a conversation and to route the audio data to another system, e.g. the internal load speaker and microphone. By pressing the "Audio transfer" the Bluetooth link (also called "Service link") is kept alive, only the SCO link is removed. SBSmart will indicate this just in the log window by the SCO Link Released Event.

To re-enable the SCO link, just press the SCO link again.
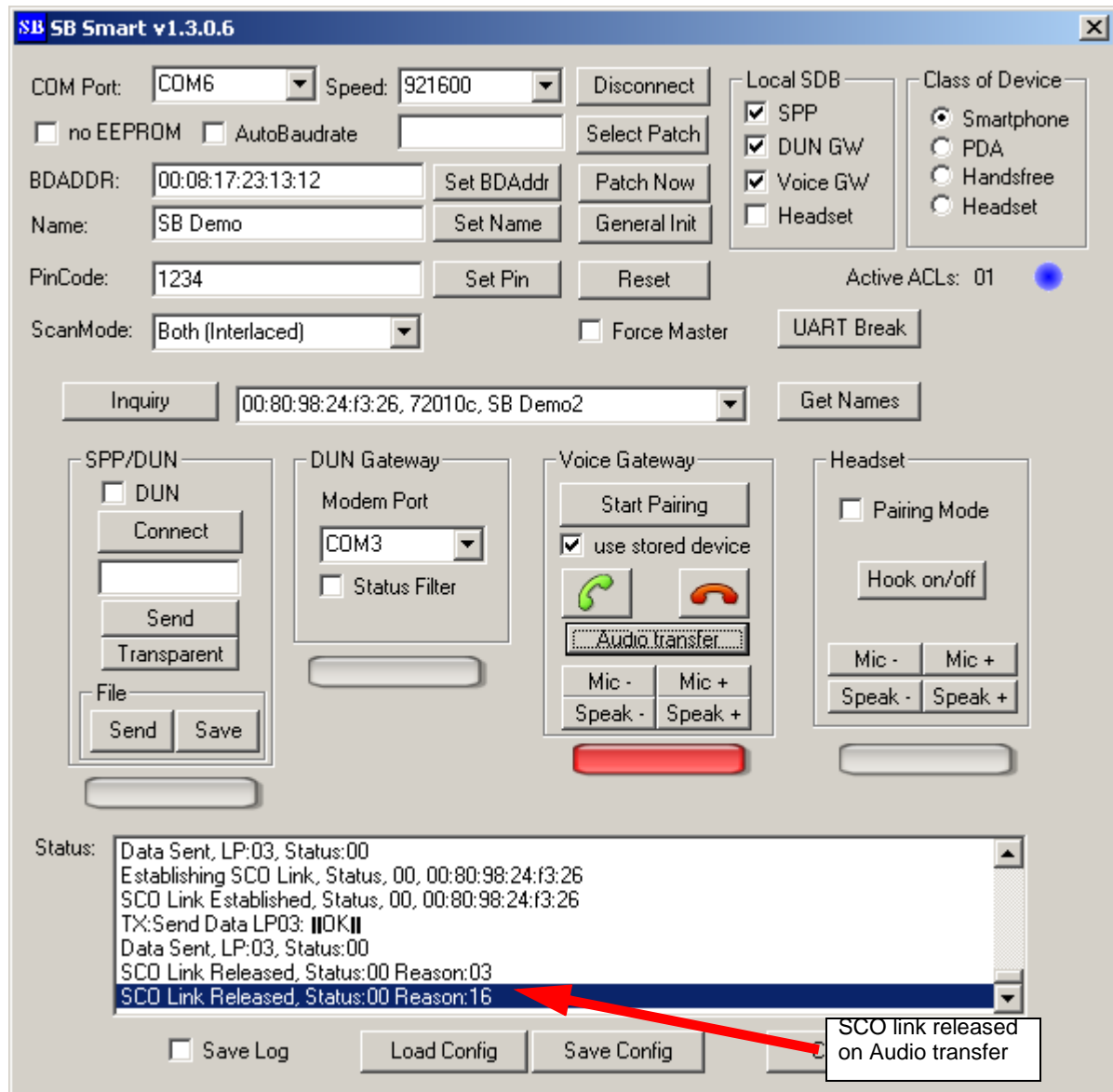
Figure 36. Audio Transfer, releasing the SCO link to the headset

5.5.4 Releasing the call by the Voice Gateway

Releasing the call releases the SPP link. A headset link can either be stopped by the Voice Gateway or by the Headset side. To simulate the Voice Gateway release, simply click the ☎ button. SBSmart will also automatically release the link in case the Hook button is pressed on the headset..
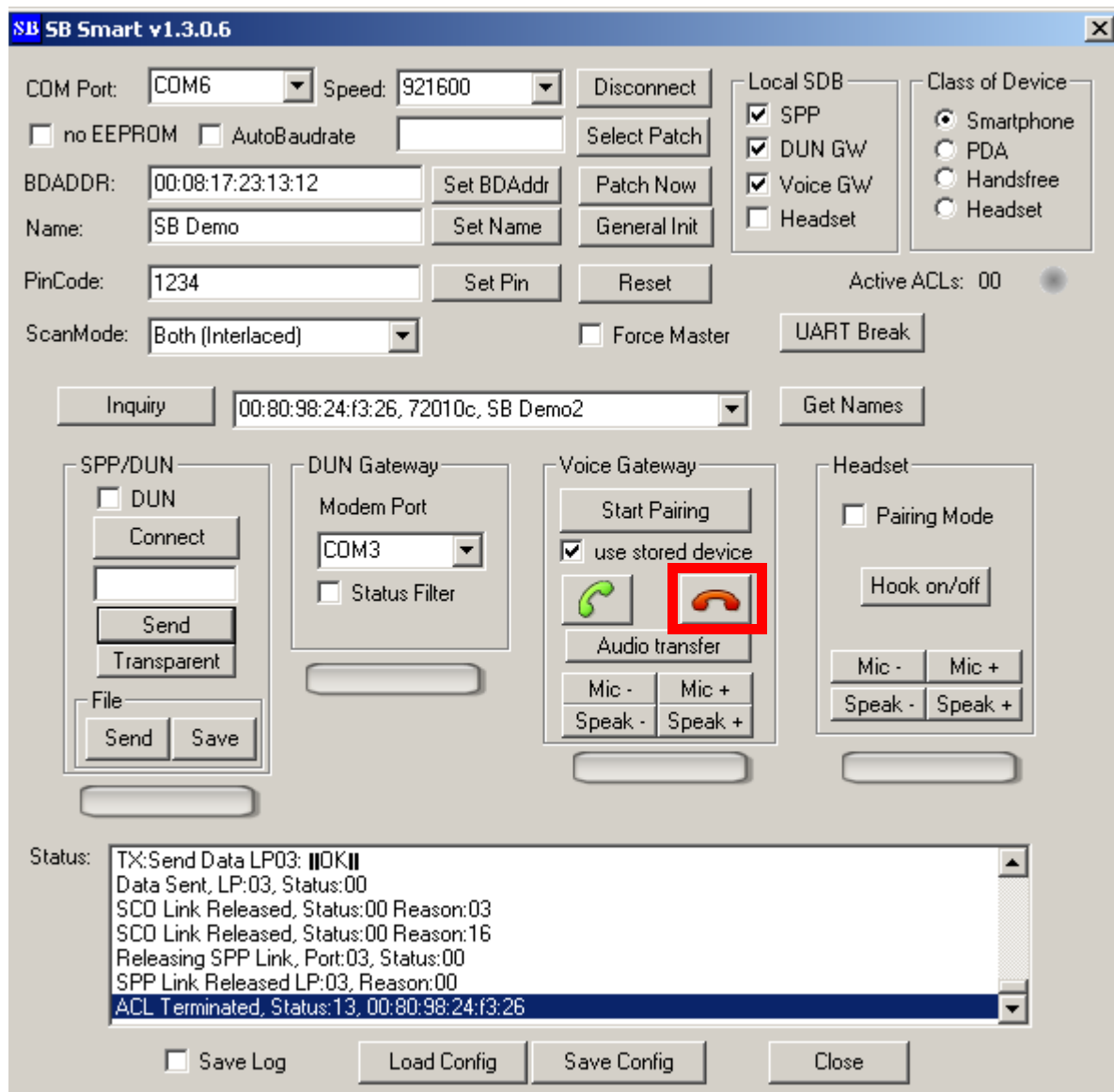
Figure 37. Releasing the Voice Gateway Link

5.5.5 Incoming Headset Link

Once a headset has been paired and stored the information of the Voice Gateway, it usually automatically initiates the link to that device, once the Hook button is pressed. The SBSmart Voice Gateway implementation accepts an incoming headset link and initiates the SCO link automatically.
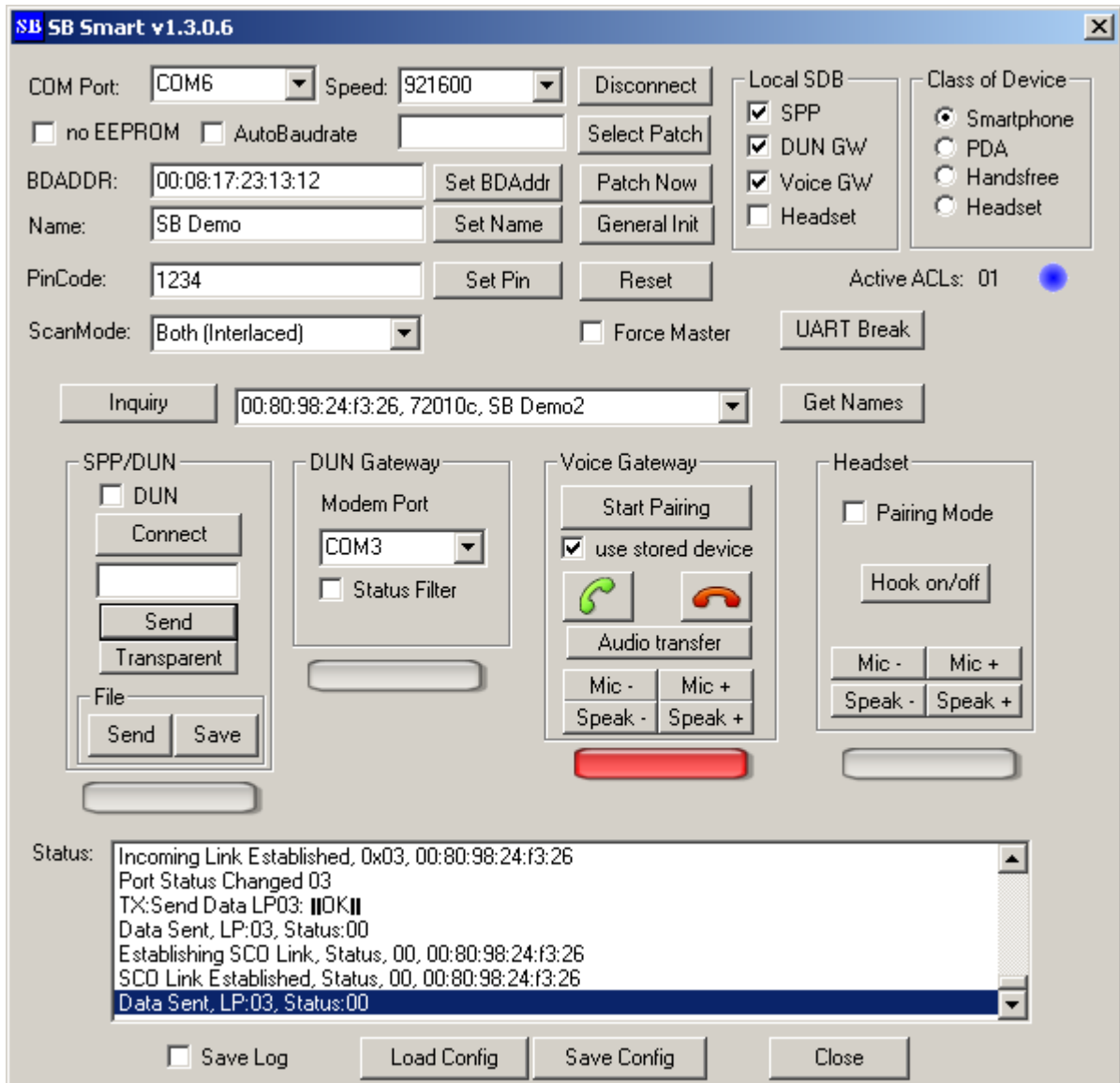
Figure 38. Voice Gateway, automatically accepting an incoming headset link

5.5.6 Sending Volume Control commands

A Voice Gateway is able to control the volume for microphone and speaker at the headset. The Mic +/- and Speak +/- buttons in SBSmart will send the "+VGS" or "+VGM" to indicate the change to the headset, which then is able to set it's codec settings accordingly.
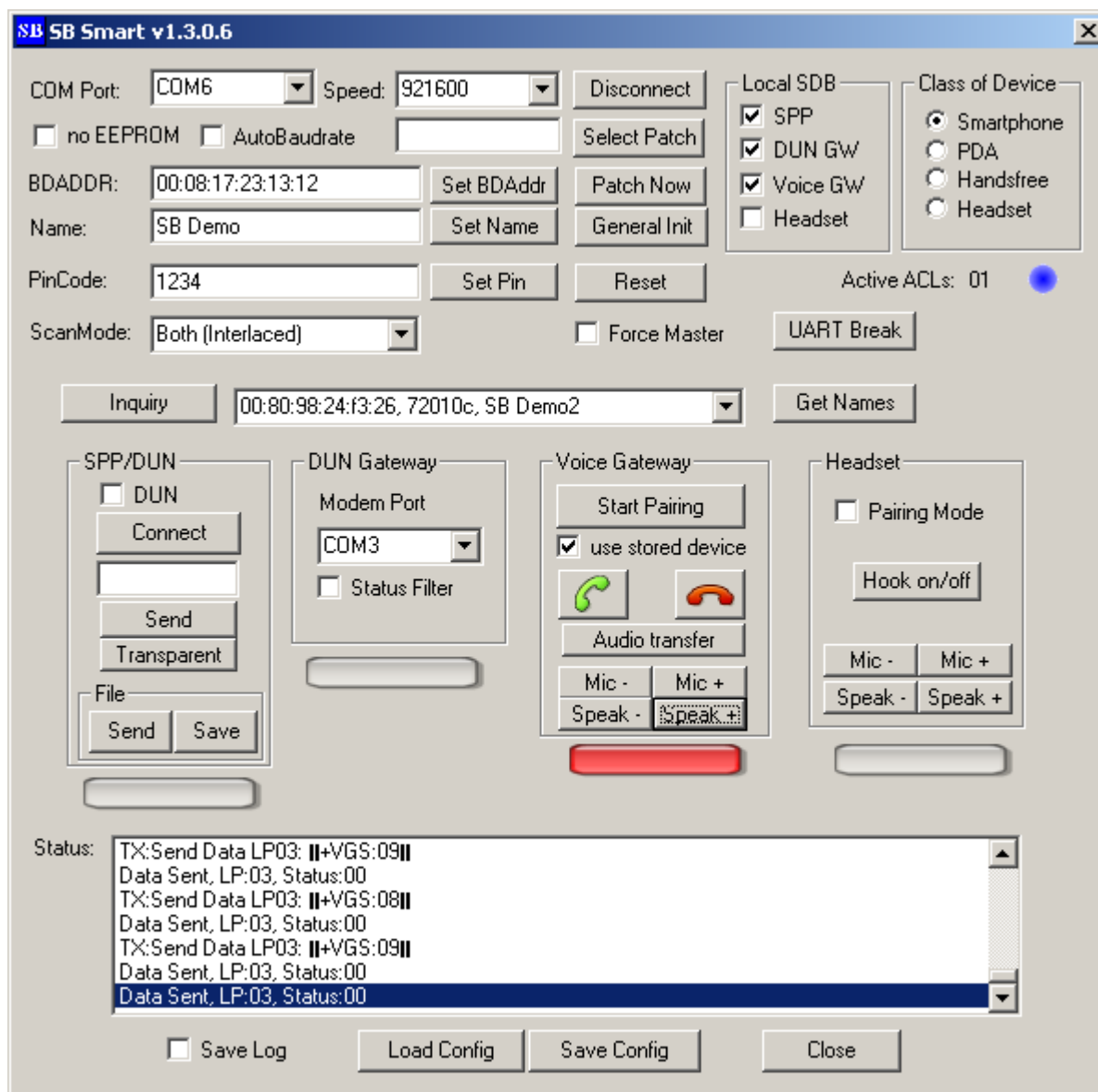
Figure 39. Sending Volume control commands to the headset

5.6 Headset Profile

The headset section simulates a usual headset implementation, allowing to pair/store a remote gateway device by activating the "Pairing Mode" checkbox. This will store the BD_Addr of the next incoming link and use it as remote device information. The Hook on/off button simulates the multipurpose button usually used at off-the-shelf headsets. The Mic and Speaker buttons allow to send volume control or mute commands.

As a headset requires the Voice Gateway to establish the link first, ill will report an error message, if the Hook button is used without previously being paired with a gateway.

The audio codec settings are set to the OKI codec settings and stored during the "General Init" procedure Section 3.4)

5.6.1 Pairing

A common headset requires first to be paired with the mobile phone it is intended to be used with. Usually a headset first needs to be set into "Pairing Mode" to allow incoming pairing requests and service requests. Once a mobile phone has successfully connected to the headset, it will use this device as default for the outgoing connection.

In SBSmart, this "Pairing Mode" can be activated by the corresponding Checkbox in the headset section. This forces SBSmart to store the BD_Addr of the next incoming ACL link as default Voice Gateway device.

Activation Pairing Mode also sets the ScanMode to "Both" to ensure the device is visible and connectable for other devices. Once the Pairing succeeded, the ScanMode is set to "Connectable" only, as a headset does also. With this the device is only by the devices which already know the BD_Addr of this device.

For both the LMX9830 and LMX9838, SBSmart will automatically use Interlaced scanning, so "Both (Interlaced)" and "Connectable (Interlaced)".
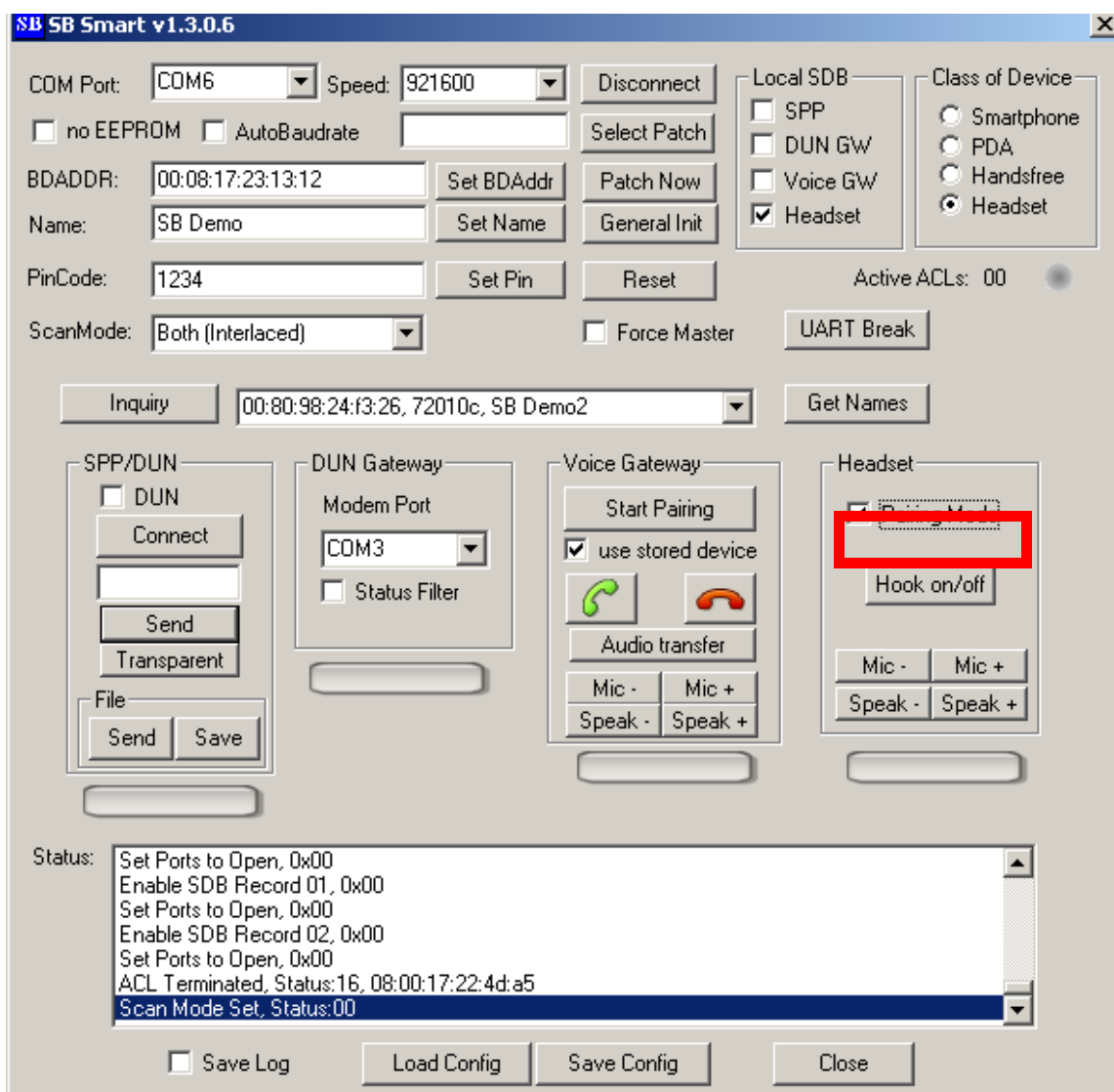
Figure 40. Enabling Pairing Mode

5.6.2 Incoming Link

5.6.2.1 Incoming SPP Link

The Voice Gateway will start the headset communication by establishing a SPP Link to the headset. This link is also called "Service Link". SBSmart will report this incoming link as "Incoming Link Established"

5.6.2.2 Incoming call indicator

In case a SPP Link exists, the Voice Gateway is able to send the AT Command "RING", which indicates an incoming call to the headset. Usually the headset will start to generate a RING tone to the loadspeaker.

SBSmart will indicate the incoming RING in the status log and by flashing the red status bar for the headset section.
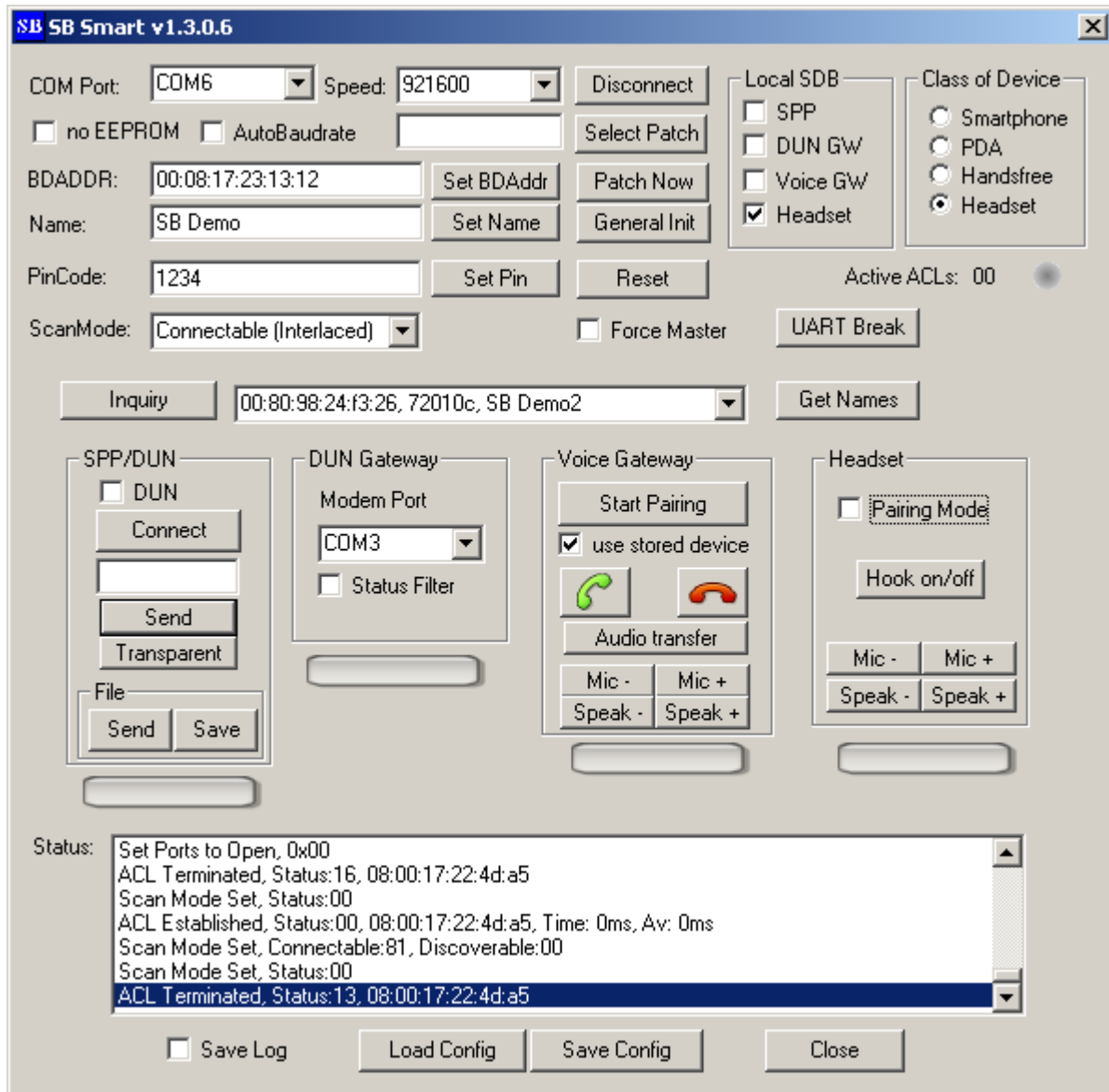
Figure 41. Incoming RING indicator

5.6.2.3 Accept with Hook on/off

The incoming call usually is accepted by pressing the multipurpose button at the headset. In SBSmart the "Hook on/off" button can be used. This will send out the AT Command "AT+CKPD=200" to the voice gateway, which then will establish the SCO link.
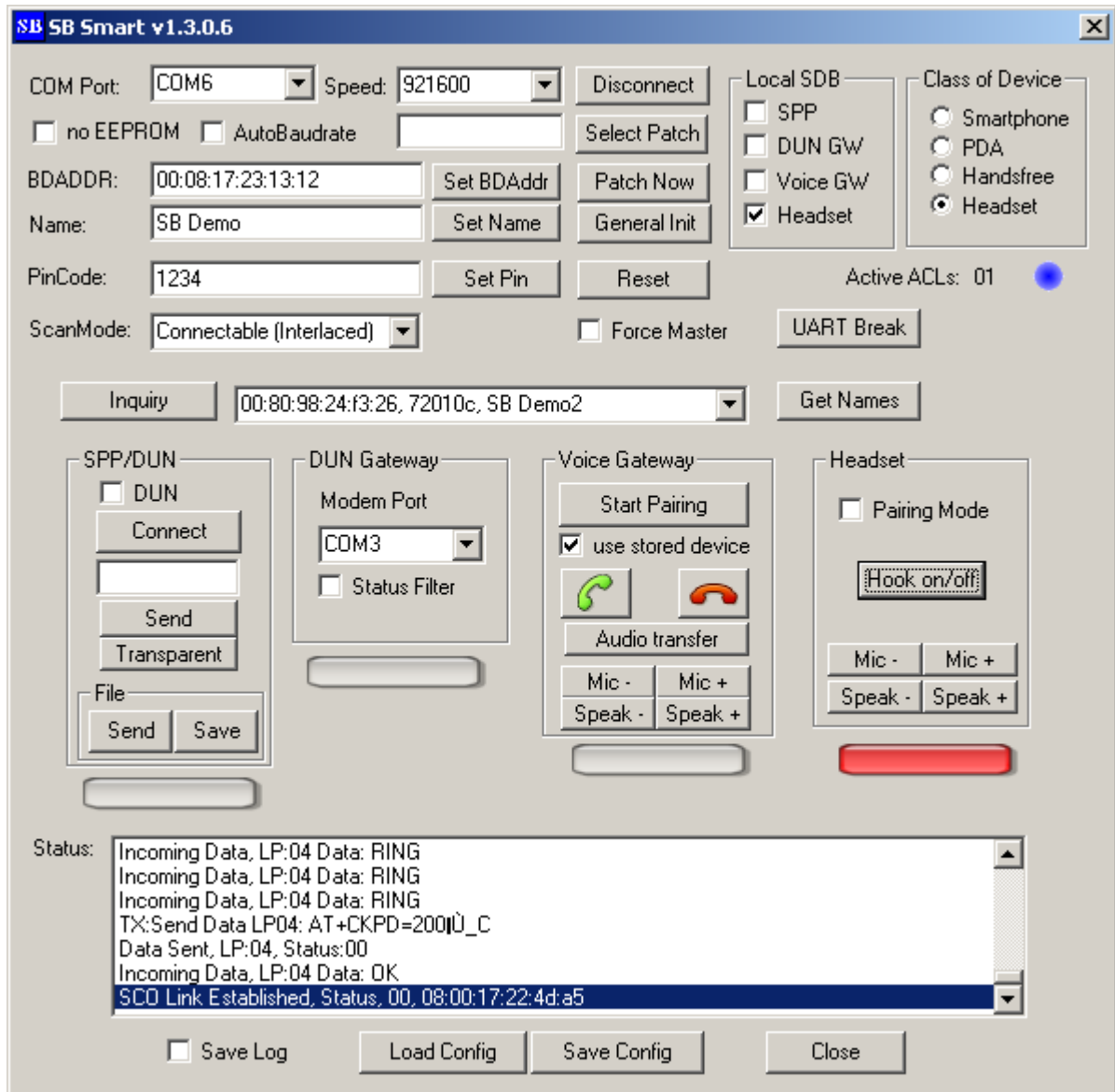
Figure 42. Accepting the incoming call by Hook on/off

5.6.3 Releasing the audio link

As on a normal headset, the audio link (e.g. an ongoing GSM call) can be released by pressing the "Hook on/off". Depending on the Voice Gateway implementation this will either release the full SPP link or just the SCO link.
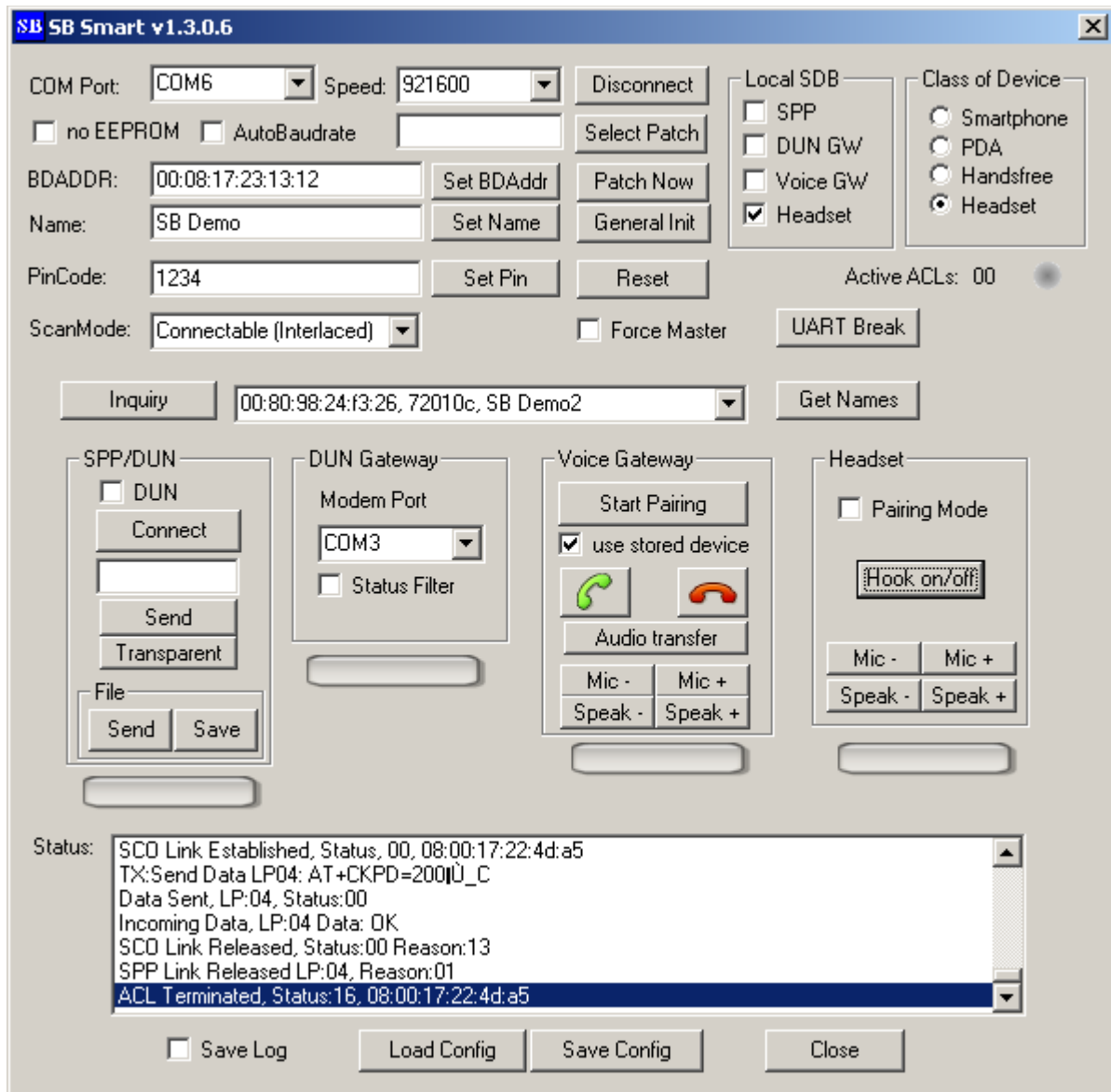
Figure 43. Releasing the Link using Hook on/off

5.6.4 Volume control

The headset section includes 4 buttons (Mic +/- and Speak +/-) to control the local speaker and microphone settings of the codec. By pressing one of the buttons, SBSmart will send the "Set Volume" or "Mute" command to the LMX98xx, to adjust the codec settings accordingly. In addition, SBSmart will send the AT Command "AT+VGM" or "AT+VGS" to report the change to the voice gateway.
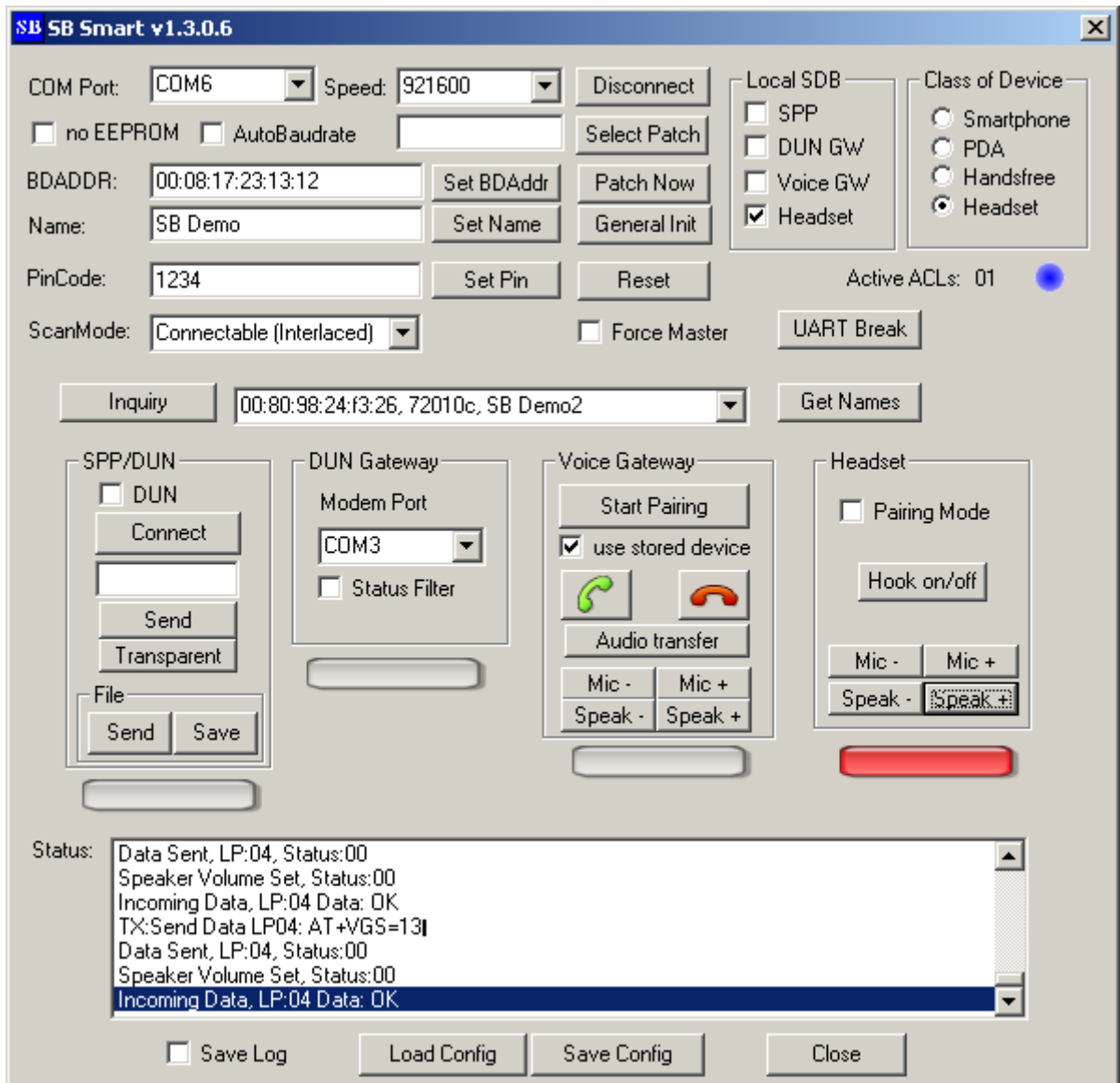
Figure 44. Volume control at the headset using the Speak and Mic buttons

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6.0 SBSmart Command Reference

This chapter shall give a detailed explanation on the different commands, sent by SBSmart to perform the different actions done for the profiles or the initializations. This details will help to understand, which commands are performed for the profiles as well as the initialization and configuration. The tables are shown in state format, allowing to show decisions depending on the incoming data or event status reported by the LMX98xx.

Please refer to [2] for detailed descriptions of the Simply Blue Command Interface.

6.1 General Configuration

6.1.1 UART Connect

State	Command	Next State if successful	Next State if not successful	Description
1	Set Scan Mode	2	0	Set Scan mode to "Both"
2	Read Local Name	2	2	Fill Dialog with Local Name
3	Read Local BD_Addr	3	3	Fill Dialog with Local BD_Addr
4	Reset	0	0	Reset to get Firmware version

6.1.2 General Init

State	Command	Next State if successful	Next State if not successful	Description
1	Restore Factory Settings	2	2	Restores all settings in NVS for controlled environment
2	Delete SDP Records	3	3	Deletes the default entry in the SDB database
3	Change UART Baudrate 0x07 (115.2kbit/s)	5	5	Changes NVS UART Speed to 115.2kbit/s
5	Reset	6	6	
6	Set Default Audio Config 0x02, 0x00 (OKI, CVSD)	7	7	Configuring the audio codec settings to by default using the OKI codec.
7	Store SDP Record SPP, Local Port 1	8	8	Stores SPP Record, assigned to Local Port 1, Database ID 0
8	Store SDP Record DUN GW, Local Port 2	9	9	Stores DUN Record, assigned to Local Port 2, Database ID 1
9	Store SDP Record HSAG, Local Port 3	10	10	Stores HSAG Record, assigned to Local Port 3, Database ID 2
10	Store SDP Record HS, Local Port 4	11	11	Stores HS Record, assigned to Local Port 4, Database ID 3
11	Reset	12	12	
12	Disable SDP Record ID 0	13	13	Disable SPP Record
13	Disable SDP Record ID 1	14	14	Disable DUN Record
14	Disable SDP Record ID 2	15	15	Disable HSAG Record
15	Disable SDP Record ID 3	16	16	Disable HS Record
16	Read Local Name	17	17	Fill Dialog with Local Name
17	Read Local BD_Addr	18	18	Fill Dialog with Local BD_Addr
18	Write Operation Mode, 0x00	19	19	Set Operation Mode: Automatic OFF to prevent Transparent Mode
19	Get Fixed Pin	20	20	Fill Dialog with Fixed Pin
20	Set Event Filter, 0x00	21	21	Set Event Filter to report all events including ACL Events
21	Reset			

6.1.3 Set Name

State	Command	Next State if successful	Next State if not successful	Description
1	Change Local Name, <dialog content>			Configure Local Name stored in device

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6.1.4 Set Pin

State	Command	Next State if successful	Next State if not successful	Description
1	Set Pincode, <dialog content>			Configure fixed Pincode stored in device

6.1.5 Set ScanMode

State	Command	Next State if successful	Next State if not successful	Description
1	Set ScanMode, <dialog setting>			Configures Scanning

6.1.6 Reset

State	Command	Next State if successful	Next State if not successful	Description
1	Reset			Standard Software Reset

6.1.7 Local SDP Select

State	Command	Next State if successful	Next State if not successful	Description
1	Enable SDP Record <SDB Record selected>	2	2	Enables/Disables the Service Record selected in Local SDB
2	Set Ports to Open <SDB Records selected>			Adapts the RFComm ports to be opened to support the SDB entries

6.1.8 Class of Device Select

State	Command	Next State if successful	Next State if not successful	Description
1	Set Class of Device <dialog select>			Sets the class of device

6.1.9 Force Master

State	Command	Next State if successful	Next State if not successful	Description
1	Force Master Mode <dialog select>	2	2	Configures Force Master Mode on/off
2	Reset			

6.1.10 Inquiry

State	Command	Next State if successful	Next State if not successful	Description
1	Inquiry 0x0A, 0x20, 0x00			Starts inquiry for 10x1.28s, max 32 responses, General Inquiry Results will be displayed in dialog

6.1.11 Get Names

State	Command	Next State if successful	Next State if not successful	Description
1	Get Remote Name <Inquiry List>			Requests the name for each device in the inquiry list

6.2 SPP Section

The button actions depend on the profile state. Therefore the states have to be seen as profile status. Status 0 indicates "Profile stopped".

6.2.1 Connect

State	Command	Next State if successful	Next State if not successful	Description
1	SDAP Connect <Inquiry list select>	2	0	Create SDAP Connection to device
2	SDAP Service Browse 0x1101 (SPP)	3	0	Look for SPP SDB Record and extract remote RFComm port
3	Establish SPP Link LocalPort 1, <RemoteBDAddr>, <RemoteRFCommPort>	4	4	Establish SPP Link to the remote device
4	SDAP Disconnect	5 (if SPP Link successful)	0 (if SPP Link not successful)	Disconnect SDAP connection
5				*Connected State, Data can be sent*

6.2.2 Send

State	Command	Next State if successful	Next State if not successful	Description
5	Send Data <dialog content>	5	5	

6.2.3 Disconnect

State	Command	Next State if successful	Next State if not successful	Description
5	Release SPP Link LocalPort 1	0	5	Release SPP Link

6.3 DUN Gateway Section

The DUN Gateway profile just waits for an incoming link and uses the "Send Data command" to forward all data received on the modem port to the bluetooth device. Data received by "Incoming Data" are forwarded to the Modem port.

6.4 Voice Gateway

The button actions also depend on the profile state. Therefore the states have to be seen as profile status. Status 0 indicates "Profile stopped".

6.4.1 Start Pairing

State	Command	Next State if successful	Next State if not successful	Description
1	SDAP Connect <Inquiry list select>	2	0	Create SDAP Connection to device
2	SDAP Service Request 0x1108 (HS)	3	7	Look for HS SDB Record and extract record handle
3	SDAP Attribute Request <Record Handle>	4	7	Get remote RFComm port for headset service, using the handle reported in state 2
4	Establish SPP Link LocalPort3, <Inquiry list select>, <remote RFComm port>	5	7	Establish SPP Link with parameters from dialog and RFComm port result at state 3
5	*Event: Link Established*	6	7	*Connected State*
6	Release Link LocalPort 3	7	7	
7	SDAP Disconnect	0	0	

6.4.2 Start Outgoing Link (Green button)

State	Command	Next State if successful	Next State if not successful	Description
10	Establish SPP Link LocalPort 3, <Paired device Addr>, <Paired device RFComm port>	11	0	Create SDAP Connection to device
11	*Event: Link Established*	12	0	*Connected State*
12	Send Data LocalPort3, "RING"	13	13	Send RING to Headset, repeat until state 13 is successful
13	*Event: Incoming Data "AT+CKPD=200"*	14	13	Wait for the Hook response "AT+CKPD=200" from the headset
14	Send Data LocalPort3, "OK"	15	14	Confirm Hook command
15	Establish SCO Link <Paired Device Addr>	16	33	Try to establish SCO, release SPP Link if not successful
16	*Event: SCO Link Established*	30	33	*SCO Link active*
30	*Event: Incoming Data LocalPort 3, "AT+CKPD=200"*	31	30 (if data not AT+CKPD)	Connected State, Start releasing link in case headset sends "AT+CKPD=200"(Hook off)
31	Send Data LocalPort 3, "OK"	32	31 (retry)	Confirm AT command by Sending OK
32	Release SCO Link <Paired Device Addr>	33	33	Release SCO Link
33	Release SPP Link LocalPort 3	0	33	Release SPP Link

6.4.3 Release Link (Red button)

State	Command	Next State if successful	Next State if not successful	Description
32	Release SCO Link <Paired Device Addr>	33	33	Release SCO Link
33	Release SPP Link LocalPort 3	0	33	Release SPP Link

6.4.4 Audio transfer

State	Command	Next State if successful	Next State if not successful	Description
30	Establish SCO Link <Paired Device Addr>	30	30	Establish SCO if not available
30	Release SCO Link <Paired Device Addr>	30	30	Release SCO if available

6.4.5 Mic +/-

State	Command	Next State if successful	Next State if not successful	Description
	Send Data LocalPort 3, "+VGM=<value>			Change Mic volume according to button and send AT Command "+VGM"

6.4.6 Speak +/-

State	Command	Next State if successful	Next State if not successful	Description
	Send Data LocalPort 3, "+VGS:<value>			Change Speaker volume according to button and send AT Command "+VGS"

6.4.7 Other States (on incoming Link)

State	Command	Next State if successful	Next State if not successful	Description
20	*Event: Incoming Link Established LocalPort 3*	21		Incoming Link Established on LocalPort 3
21	*Event: Incoming Data LocalPort 3, "AT+CKPD=200"*	22		Connected State, Start SCO link in case headset sends "AT+CKPD=200"(Hook on)
22	Send Data LocalPort 3, "OK"	23	22	Confirm Hook request, retry if not successful
23	Establish SCO Link <Incoming Link BDAddr>	24	33 (see 6.4.2)	Establish SCO, Release SPP if not possible
24	*Event: SCO Established*	30 (see 6.4.2)	33 (see 6.4.2)	*Connected State*

6.5 Headset

The button actions also depend on the profile state. Therefore the states have to be seen as profile status. Status 0 indicates "Profile stopped".

6.5.1 "Pairing Mode"

State	Command	Next State if successful	Next State if not successful	Description
	Event: ACL Established remote BD_Addr			BD_Addr of incoming link stored in SBSmart

6.5.2 Hook on/off

6.5.2.1 Incoming Link

State	Command	Next State if successful	Next State if not successful	Description
10	*Event: Incoming Link Established, LocalPort 4*	15		Incoming link established, start sending volume information
15	Send Data LocalPort 4, "AT+VGM=<value>"	17		Send Volume information to Voice Gateway to report initialization value
17	Send Data LocalPort 4, "AT+VGS=<value>"	20		Send Volume information to Voice Gateway to report initialization value
20	*Event: Incoming Data, LocalPort 4, "RING"*	21		Voice Gateway sending RING, start flashing red bar
21	Send Data LocalPort 4, "AT+CKPD=200"	22		Send AT Command in case user pushed Hook on/off
22	*Event: Incoming Data, LocalPort 4, "OK"*	25		
25				*Connected*

6.5.2.2 Outgoing Link

State	Command	Next State if successful	Next State if not successful	Description
1	SDAP Connect <Paired device Addr>	2	0	Create SDAP Connection to device stored in application
2	SDAP Service Request 0x1112 (HSAG)	3	0	Look for HSAG SDB Record and extract record handle
3	SDAP Attribute Request <Record Handle>	4	0	Get remote RFComm port for headset service, using the handle reported in state 2
4	Establish SPP Link LocalPort 4, <Paired device Addr>, <remote RFComm port>	5	0	Establish SPP Link with parameters from dialog and RFComm port result at state 3
5	*Event: Link Established*	6	0	*Connected State*
6	SDAP Disconnect	7	0	
7	Send Data LocalPort 4, "AT+CKPD=200"	15		Send Hook
	Event: Incoming Data, LocalPort 4, "OK"			

6.5.3 Mic +/-

State	Command	Next State if successful	Next State if not successful	Description
	Send Data LocalPort 3, "+VGM=<value>			Change Mic volume according to button and send AT Command "+VGM"
	Mute <value>			Send Microphone volume setting to LMX98xx

6.5.4 Speak +/-

State	Command	Next State if successful	Next State if not successful	Description
	Send Data LocalPort 3, "+VGS:<value>			Change Speaker volume according to button and send AT Command "+VGS"
	Set Speaker Volume <value>			Send Speaker volume setting to LMX98xx

7.0 Bibliography

[1]   Bluetooth SIG: Specification of the Bluetooth System 1.1, Volume 2 / Profiles, Version 1.1, February 22 2001

[2]   LMX9830 /LMX9838 Software Users Guide

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