



ZBA, Inc.

**ZBA Class 2 Bluetooth USB-Serial Adapter With
On Board Antenna.**

Assembly No.: ZBS44-721-USB



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1 Document Status

Date	Comments
August 1, 2007	First draft
February 14, 2008	Update to programming commands
November 25, 2008	Update Image and programming table

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2 Scope

The intention of this specification is to provide general guidelines on the use, operation and capabilities of the ZBA Bluetooth USB Serial adapter **ZBS44-721-USB**.

3 Bluetooth Assembly Description:

The **ZBS44-721-USB** is a general purpose Bluetooth USB Serial port adapter with a built in antenna. The ZBA **ZBS44-721-USB** USB Serial Bluetooth adapter combines the functionality of a serial port profile device with that of a USB serial port cable adapter all in one convenient package. The ZBA **ZBS44-721-USB** USB Serial Bluetooth adapter can be used in a wide variety of equipment especially when a direct cable replacement application is desired. When used as a cable replacement product one USB Serial adapter will act as the “master” the other the slave. After two device have been configured as cable replacement and after they are powered (simply inserting into a USB port will power the unit) the two Serial devices they will pair with each other and commence communications. The master and the slave can be paired as matched set in which they will retain its respective partners communication address (Bluetooth address) for fast pairing and seamless connections.

The USB Serial adapter can also be used as an independent Slave or Master and it may connect to any other Bluetooth enabled device that supports the SPP profile.

The Serial Bluetooth adapter has a rich set of commands that will allow easy use of this device in many applications. Unlike other USB Bluetooth adapters the **ZBS44-721-USB** will generate one (1) virtual com port. That port will remain with that device.

The ZBA **ZBS44-721-USB** USB Serial Bluetooth adapter is based on the BC02 Bluetooth Module is a Class 2 Bluetooth module using BlueCore2-External chipset from Cambridge Silicon Radio, a leading Bluetooth chipset supplier. It provides a fully compliant Bluetooth system for data. The adapter will interface with a host PC via a Standard USB port. The Adapter firmware is fully compliant with the Bluetooth specification V1.2.

4 Features

- Operating Frequency Band 2.40 GHz~2.48GHz unlicensed ISM Band
- Bluetooth Spec. v2.0 Compliant
- Class 2 type Output Power
 - Standard Effective distance 30m
- Built-in 8Mbit Flash Memory
- Support Firmware Upgrade (via The USB port)
- No external power source is required Power is supplied from the USB port
- Multiple baud rates supported
- Simple cable replacement
- Easy programming commands
- Automatic low power mode supported
- Dimensions = 5.9cm x 2.1 cm X 1.4 cm (Class 2 internal antenna)



- Weight = 12g

4.1 General Specifications

Item	Specification
Carrier Frequency	2400MHz to 2483.5MHz
Modulation	GFSK, 1Mbps, 0.5BT Gaussian
Channel Intervals	1MHz
Number of Channels	79
Frequency Hopping	1600hops/sec, 1MHz channel space
Receive Sensitivity	-82 dBm typ. @0.1% BER
Transmission Power	+4dBm max.
Maximum Data Throughput	Asynchronous : 721 Kbps
Output Interface	Full speed USB
Operating Temperature Range	-20°C to 85°C
Storage Temperature Range	-40°C to 150°C
Dimensions	5.9cm x 2.1 cm X 1.4 cm
Antenna	Ceramic (internal)

4.2 Electrical Characteristics

4.2.1 Absolute Maximum Ratings

Absolute maximum ratings for supply voltage and voltages on digital and analog pins of the Module are listed below; exceeding these values will cause permanent damage

Voltage	
Voltage Range -Power Pins	4.5 to 5.5V
Storage Conditions	
Storage Temperature	-40°C to 150°C (ambient)
Storage Humidity	0-90% RH
Operating Conditions	
Temperature Range	-20°C < T _A < 95°C
Peak Power supply current	75 mA

4.2.2 Radio Characteristics

Temperature = -20°C						
Receiver	Frequency (GHz)	Min	Typ	Max	Bluetooth Specification	Unit
Sensitivity at 0.1% BER	2.402	-	-84	-80	≤-70	dBm
	2.441	-	-84	-80		dBm



	2.480	-	-84	-80		dBm
Maximum received signal at 0.1% BER		0	10	-	≤-20	dBm
Transmitter	Frequency (GHz)	Min	Typ	Max	Bluetooth Specification	Unit
RF transmit power	2.402	0	2.5	4	-6 to +4	dBm
	2.441	0	2.5	4		dBm
	2.480	0	2.5	4		dBm
RF power control range		-	35	-	≥16	dB
RF power range control resolution		-	1.8	-	-	dB
20 dB bandwidth for modulated carrier		-	800	-	1000	KHz
Initial carrier frequency tolerance		-	±25	-	≤ ±75	KHz
Drift		-	±15	-	≤ ±25	KHz
Drift Rate		-	±20	-	400	Hz/μs
Δf _{1avg} "Maximum Modulation"		-	165	-	140<Δf _{1avg} <175	KHz
Δf _{2avg} "Minimum Modulation"		-	150	-	115	KHz
.						

Temperature = +20°C

Receiver	Frequency (GHz)	Min	Typ	Max	Bluetooth Specification	Unit
Sensitivity at 0.1% BER	2.402	-	-82	-80	≤-70	dBm
	2.441	-	-84	-80		dBm
	2.480	-	-84	-80		dBm

Maximum received signal at 0.1% BER		0	-	-	≥-20	dBm
Transmitter	Frequency (GHz)	Min	Typ	Max	Bluetooth Specification	Unit
RF transmit power	2.402	0	2.5	4	-6 to +4	dBm
	2.441	0	2.5	4		dBm
	2.480	0	2.5	4		dBm
RF power control range		-	35	-	≥16	dB
RF power range control resolution		-	1.8	-	-	dB



20 dB bandwidth for modulated carrier	-	800	-	1000	kHz
Initial carrier frequency tolerance	-	±25	-	≤ ±75	kHz
Drift	-	±15	-	≤ ±25	kHz
Drift Rate	-	±20	-	400	Hz/μs
Δf _{1avg} "Maximum Modulation"	-	165	-	140<Δf _{1avg} <175	kHz
Δf _{2avg} "Minimum Modulation"	-	150	-	115	kHz
C/I co-channel	-	10	11	≤ 11	dB
Adjacent channel selectivity C/I f=f ₀ ±1MHz	-	-4	0	≤ 0	dB
Adjacent channel selectivity C/I f=f ₀ ±2MHz	-	-35	-30	≤ -30	dB
Adjacent channel selectivity C/I f≥f ₀ +3MHz	-	-45	-	≤ -40	dB
Adjacent channel selectivity C/I f≤f ₀ -3MHz	-	-45	-	≤ -40	dB
Adjacent channel selectivity C/I f=f _{image}	-	-18	-9	≤ -9	dB
Adjacent channel transmit power f=f ₀ ±2MHz	-	-35	-20	≤ -20	dBc
Adjacent channel transmit power f=f ₀ ±3MHz	-	-35	-40	≤ -40	dBc

Maximum received signal at 0.1% BER		0	-	-	≥-20	dBm
Transmitter	Frequency (GHz)	Min	Typ	Max	Bluetooth Specification	Unit
RF transmit power	2.402	0	1	4	-6 to +4	dBm
	2.441	0	1	4		dBm
	2.480	0	1	4		dBm
RF power control range		-	35	-	≥16	dB
RF power range control resolution		-	1.8	-	-	dB
20 dB bandwidth for modulated carrier		-	800	-	1000	kHz
Initial carrier frequency tolerance		-	±25	-	≤ ±75	kHz
Drift		-	±15	-	≤ ±25	kHz
Drift Rate		-	±20	-	400	Hz/μs
Δf _{1avg} "Maximum Modulation"		-	165	-	140<Δf _{1avg} <175	kHz
Δf _{2avg} "Minimum Modulation"		-	150	-	115	kHz



5 Serial Port Profile

The Serial port adapter is shipped with the on-board Serial Port Profile (SPP). The SPP profile embedded within the module provides a menu for making configuration changes utilizing AT commands described below in section 8.2:

5.1 Default Configuration

- UART Baud Rate: 9600 baud
- Number of Bits: 8
- Stop bit: One
- Parity: None
- H/W Flow Control: Disable
- PIN: 1111
- Device Name: ZBA-SPP
- Mode: Slave
- Sleep Mode: Deep sleep whenever possible.
- Partner pairing is dropped at power off or un-pairing by master.

5.2 Configuration Commands Set-up & Procedures

Entering Command Mode:

. For adapters to enter in the command mode, the host must send a single character **ESC** **<0x1B>** within **5** second after the unit has been powered on. If the **ESC** character is not sent within the specified 5 second window then the adapter will automatically enter the SPP mode and any information sent to the UART will be treated as data to be transmitted over a Bluetooth link. Please note. The adapter will only respond to the host set-up commands after the adapter has entered the command mode

Entering the SPP mode

After running any set-up commands then there are two ways to enter the **SPP mode**

- a) With the Adapter un-plugged simply plug in the adapter into any USB port. **DO NOT** hit the **<ESC>** key or send the **<ESC>** command. After 5 seconds the adapter will be in the SPP operation mode.
- b) From the Set-up mode type: **AT+EXIT**
The adapter will respond with: **OK**



The adapter is now in SPP operation mode.

Note: **All Commands** except the first <ESC> command should contain a suffix of <CR><LF>.

5.2.1 Entering the Set-up Mode

Command	Response	Parameter
ESC	<CR> +OPEN:num<CR><LF>	Num= 0: device is not paired Num= 1 Device has a saved BT Address in memory

Note: If the device returns **+open:0** and bind is disabled (bind=0) then the device is not paired or connected and there is no remote device saved in the remote address (+RADDR) variable. If the device returns a **+open:1** and the bind is enabled (bind=1) then the adapter device is operating as a cable replacement function and it will pair with the master Bluetooth device that is saved in the remote address variable ASAP. The ZBS44-xxx adapter is bound to the companion device whose address is saved in the + RADDR variable.

5.2.1 Testing the Communication Link

Command	Response	Parameter
AT	OK	None

5.2.2 Command List

Command	Response	Parameter
ATZ?	List of Commands	None

5.2.3 Set RS232 Baud Rate (bps)

Command	Response	Parameter
AT+BAUD= <Para1>	OK	Para1 = 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400
AT+BAUD?	OK +BAUD <para1>	

Note: The default baud rate is 9600bps



5.2.4 Set/inquired UART Parameters

Command	Response	Parameter
AT+UARTMODE=<Para1>,<Para2>	OK	<Para1>= Stop-bit
AT+ UARTMODE?	OK UARTMODE <Para1>,<Para2>	<Para1> 0 = 1 Stop bit 1 = 2 Stop bits <Para2> Parity- bit 0 = None 1 = ODD 2 = EVEN

Note: the default UARTMODE parameters are N, 8, 1 and the overall comm.
Default Parameters are 9600,N,8,1

5.2.5 Set Authentication

Command	Response	Parameter
AT+AUTH=<Para1>	OK	Para1 = Authentication
AT+AUTH?	OK AUTH<Para1>	0 = disable 1= enable Authentication enabled

Note: The default authentication mode is Authentication enabled.

5.2.6 Set Password

Command	Response	Parameter
AT+PASSWORD= < Para1>	OK	Para1 Password



AT+PASSWORD?	OK +PASSWORD: < Para1>	Default = 1111
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Note: The default authentication password = 1111

5.2.7 Set Device Name

Command	Response	Parameter
AT+NAME= < Para1>	OK	Para1= Device name
AT+NAME?	OK +NAME <Para1>	Default= ZBA-SPP

Note: The default Device name = ZBA-SPP.

5.2.8 Set Device Type

Command	Response	Parameter
AT+CLASS=< Para1>	OK	Para1 Device type (Length must = 6 characters)
AT+CLASS?	OK CLASS<Para1>	default = 000000

5.2.9 Set Master/Slave Mode

Command	Response	Parameter
AT+ROLE=< Para1>	OK	Para1 Slave = 0, Master = 1
AT+ROLE?	OK ROLE <Para1>	Default = 0, Slave

Note: 1 The default mode is Slave.

5.2.10 Set Sniff Power Saving Mode

Command	Response	Parameter
AT+SNIFF=<Para1>,<Para2>,<Para3>,<Para4>	OK	Para1 Maximum Para2 Minimum
AT+SNIFF?	OK +SNIFF<Para1>,<Para2>,<Para3>,<Para4>	Para3 test Para4 Over time

Default = 1024.512,1024,512 number in decimal mode



5.2.11 Set Sniff Power Saving Mode—Extended

Command	Response	Parameter
AT+SNIFFEX=<Para1>,<Para2>,<Para3>,<Para4>	OK	Para1 Maximum Para2 Minimum
AT+SNIFFEX?	OK SNIFF<Para1>,<Para2>,<Para3>,<Para4>	Para3 test Para4 Over time Para5 Sniff timeout

Default = 1024,512,1024,512,10 number in decimal mode

5.2.12 Reset to Factory Default

Command	Response	Parameter
AT+RESET	OK	None

5.2.13 Set/Inquire Scan Time

Command	Response	Parameter
AT+SCANTIME=<Para1>,<Para2>,<Para3>,<Para4>	OK	Para1= Scan interval time Para2=Scan time-out Para3=Inquiry interval Para4=Inquiry time-out
AT+SCANTIME?	OK +SCAN<Para1>,<Para2>,<Para3>,<Para4>	

Note: The default Value (in decimal = N* 625 us)

Para1= 2048,

Para1= 18,

Para1= 2048,

Para1= 18,

5.2.14 Set/Inquire Paired Device

Command	Response	Parameter
AT+BIND=< Para1>	OK	Para1 0 = Drop pair 1 =Always paired
AT+BIND?	OK +BIND<Para1>	Default=0 Drop pairing



Note: The default mode is to **drop pair**. The drop pair function occurs when the adapter is power-off then back on or the master drops pairing. This will allow another master to commence a discovery process and connect to the adapter (slave) device.

If the device is set-up as **always paired** (bind=1) then the adapter will **only** communicate with the **specific master** whose address it has been bonded to even after power off and power-on. This mode is useful for application where a cable replacement function is the required. To communicate to a different master the adapter must have the bonded address cleared. This is accomplished by running the **AT+CLEARADDR** command.

If an adapter has been operated with bind=1 and then subsequently the bind function is set to 0 the adapter will still remember the previous bound address. So if bind is re-enabled then device will re-connect to the previously bound master. To clear the memory please run the **AT+CLEARADDR** command.

5.2.15 Clear Paired Device Address

Command	Response	Parameter
AT+CLEARADDR	OK	None

Note: This command will clear any remote device address that the adapter has been paired to.

5.2.16 Inquire Version

Command	Response	Parameter
AT+VERSION	OK +VERSION<Para1>	Para1 version #

Note: This command will return the firmware version of the adapter.

5.2.17 Inquired Remote Device Address

Command	Response	Parameter
AT+INQ	OK + BT address	

Note: This command commences the discovery process to detect any BT device in the neighborhood. Completion of this command may take up to 30 seconds.

The response to the above command is:

+INQRESU:0005164801E6 Where the data following the colon is one example of the Bluetooth address of one of the devices in the neighborhood.

**5.2.18 Set/Inquired Paired Device Address**

Command	Response	Parameter
AT+RADDR=<Para1>	OK	Para1= Paired device BT address
AT+ RADDR?	OK RADDR<Para1>	

Example to set-up the adapter to communicate with one specific BT device whose BT address is currently unknown.

First type:

AT+INQ What is returned are the BT addresses of the devices in the BT neighborhood.

Then type

AT+RADDR= BT address (the specific device you wish to pair determined from the AT+INQ Command).

Then the adapter will return

+INQCOMP This will indicate that the Inquiry process has terminated.

The adapter will remain bound to this address until the **AT+CLEARADDR** (command 8.2.16) is run or the adapter is powered off and then back on again.

5.2.19 Cancel Inquiry

Command	Response	Parameter
AT+LADDR?	OK LADDR<Para1>	Para1 Device address

Note: This command will cancel the inquiry command (AT+INQ).

5.2.20 Inquired Device BD Address

Command	Response	Parameter
AT+LADDR?	OK LADDR<Para1>	Para1 Device address

Note: This command returns the (local) BT address of the adapter.

5.2.21 Software Reset

Command	Response	Parameter
AT+ RESTART	OK	None

5.2.22 Set/Inquire about Low power mode

Command	Response	Parameter
AT+LOWPOWER=<Para1>	OK	<Para1> : 0 : low power disabled 1 : Low power mode Enabled



AT+ LOWPOWER?	OK +LOWPOWER : <Para1>
---------------	---------------------------

5.2.23 Set/ Inquire Data Processing Mode at BT Disconnect

Command	Response	Parameter
AT+ DATAMODE=<Para1>	OK	<Para1> : 0 : Data is held in buffer, & it will be sent to the other device after successfully connect. 1 : Data will be deleted after the BT devices have been disconnected.
AT+ DATAMODE?	OK + DATAMODE : <Para1>	

5.2.24 Set/ Inquire about Flow control mode

Command	Response	parameter
AT+ FLOWCONTROL=<Para1>	OK	<Para1> : 0: No Flowcontrol 1 : Use hardware Flowcontrol
AT+ FLOWCONTROL?	OK + FLOWCONTROL : <Para1>	

5.2.25 Exiting the Set-up Mode

Command	Response	Parameter
AT+EXIT	OK	None

Note: This command returns the adapter to SPP mode.

6 Low Power Modes

6.1 Park & Sniff

The adapter will automatically go into a reduced power mode if there is no USB activity and no RF activity. The Device will maintain sniff in order to maintain synchronization with the Master.



7 Compatibility

The ZBS44-721-USB is compatible with Windows XP Professional Windows XP Home, Windows 2000 and Windows 98 Second edition.

The ZBS44-721USB uses the CP210 USB-Serial Bridge driver. When Device is installed for the very first time the Windows system will “Find New Hardware”. If there was a serial /RS232 cable previously installed that uses the CP210 drive then windows will automatically generate a Virtual Comm. Port for this device. If this is the first time this driver is needed the windows will prompt you for the driver. The Latest version of the drive may be found at the following link

<https://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx>

8 Ordering Information

Ordering P/N	Description
ZBS44-721-USB	Class 2 USB Serial Bluetooth Adapter

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