ZBA Bluetooth 2.0 Module with on-board antenna.

Assembly No. BT44 – 191C

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1 Document Status

Date	Comments
June 6, 2006	First draft
April 2007	Add AT command set
June 2007	http://www.bluetoothmodules.net publication
August 2007	Update current measurements
October 2007	Added recommended mating connector & application & NCONN circuit, Fixed typos in bind & INQ commands
November 2007	Expanded explanation of Fig 3 & 4
June 2008	Updated contact info
September 2008	Corrected typo in application circuit.
November 2008	Added PNs for additional profiles
May 2009	Update information on the Mating header
June 2009	Updated the dimension to two decimal places
January 2010	Update PIO information
March 2010	Corrected some Mounting hole dimensions
April 2010	Added Additional commands (V6.30___)
Feb 2012	Updated commands for (Ver 6.32)
July 2012	Update for Android app (Ver 6.35)

To make a request for change, correction, additions or information on references, please contact:

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2 Scope

The intention of this specification is to provide general guidelines on the integration of the **BT44-191C** Bluetooth assembly. This product, which complies with Bluetooth Specification 2.0, is designed to help companies offer Bluetooth enabled products by speeding their development processes with a ready to integrate Bluetooth assembly with an on board ceramic antenna.

3 Bluetooth Assembly Description:

The **BT44-191C** is a general purpose Bluetooth module with an integral on-board ceramic antenna designed to be incorporated into an end product. The BC04 Bluetooth Module is a Class 2 Bluetooth module using BlueCore4-External chipset from Cambridge Silicon Radio, a leading Bluetooth chipset supplier. It provides a fully compliant Bluetooth system for data and voice communications. It interfaces with a host via UART (USB optional) and supports EDR data rate up to 3Mbps modulation modes. The module and device firmware are fully compliant with the Bluetooth specification V2.0.

The Bluetooth assembly is available in four different variants:
1) UART transport with serial port emulation (Serial Port Profile)
2) UART transport with HCI interface
3) UART transport with HID interface
4) UART transport with OBEX and FTP profiles
Modules with profiles corresponding to variants 2, 3 and 4 are available upon special request.

4 Features

- Operating Frequency Band 2.40 GHz~2.48GHz unlicensed ISM Band
- Bluetooth Spec. v2.0 Compliant + Enhanced Data Rate (EDR)
  - EDR compliant with v2.0.E.2 of specification for both 2Mbps and 3Mbps modulation modes
- Class 2 type Output Power
- RF Shielding can is constructed of a non-ferrous metal.
- Firmware Upgrade Support (via the UART)
- 12 pin 2mm board to board connector (top or bottom connections)
  - The module can be mounted from either direction (top or bottom)
- Active Bluetooth Connections signal
- On board ceramic antenna
- Built-in Power control for turning off the Module
- Piconet Support
- Low Voltage Power Supply, 2.7V to 3.6V (3.3 Volt preferred)
- Built-in 8Mbit Flash Memory
- Low Power Modes Available: Park, Sniff, Hold and Deep Sleep
- Dimensions: 30mm X 17.5mm X 3.15 mm
- Development board available.

5 Applications

- PCs, PDAs
- Computer Accessories (CF Cards, USB Dongles, PCMCIA, RS232 Adaptors, etc.)
- Mice, Keyboards, Joysticks
- Cordless Phones
- FAX Machines, Printer Adaptors
- Digital Cameras
- Access Points to LAN and/or Dial-up networks

6 Block Diagram

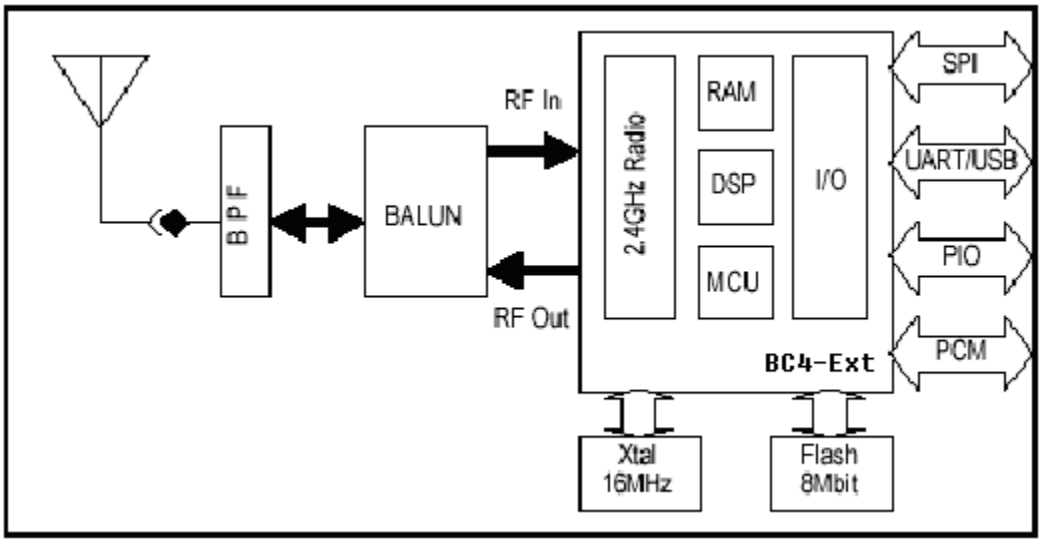


Figure 1 Block Diagram of the BT Module

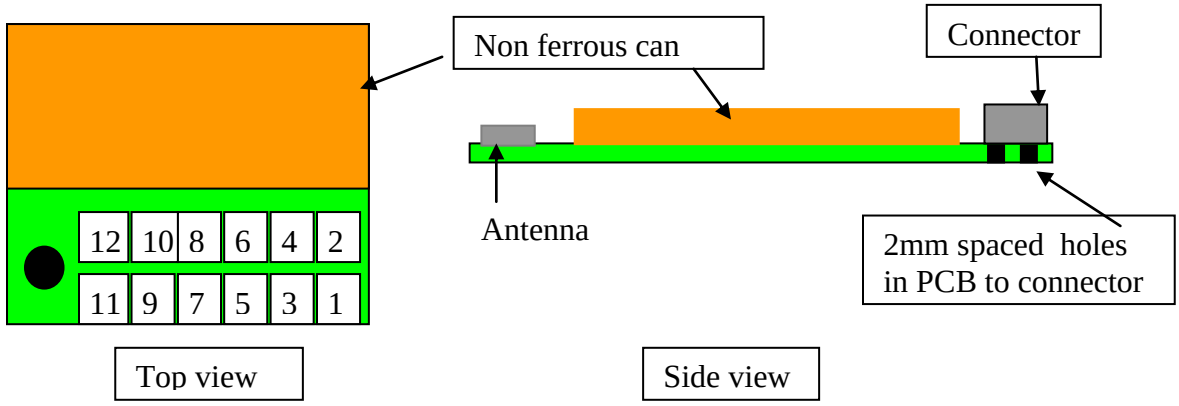
7 Pin-out and Mechanical Specifications

7.1 Pin Configurations & Dimensions

1) **Pin-out 12 pin 2mm dual row connector** (SAMTEC CLT106-02-L-D or equiv (the following is a link to the Samtec connector http://www.samtec.com/ftppub/pdf/CLT.PDF)

Pin 1 = Vcc (3.3 Volts regulated)
Pin 2 = GND
Pin 3 = RxD (input to module)
Pin 4 = TxD (output from module)
Pin 5 = CTS (input to module)
Pin 6 = RTS (output from module)
Pin 7 = GND Zero (0) ohm jumper internal to module to GND (pin 2)
Pin 8 = Reserved (connected to PIO1 for future use)
Pin 9 = NCONN (PIO2) Output from module indicating the module is connected (low = active Bluetooth connection)
Pin 10 = NPWR - PFET-gate w/10K resistor to GND. (Module is powered-on if left floating)
Pin 11 = Reserved (connected to PIO5 for future use)
Pin 12 = Reserved (connected to PIO3 for future use)

2) **Pin outline**:

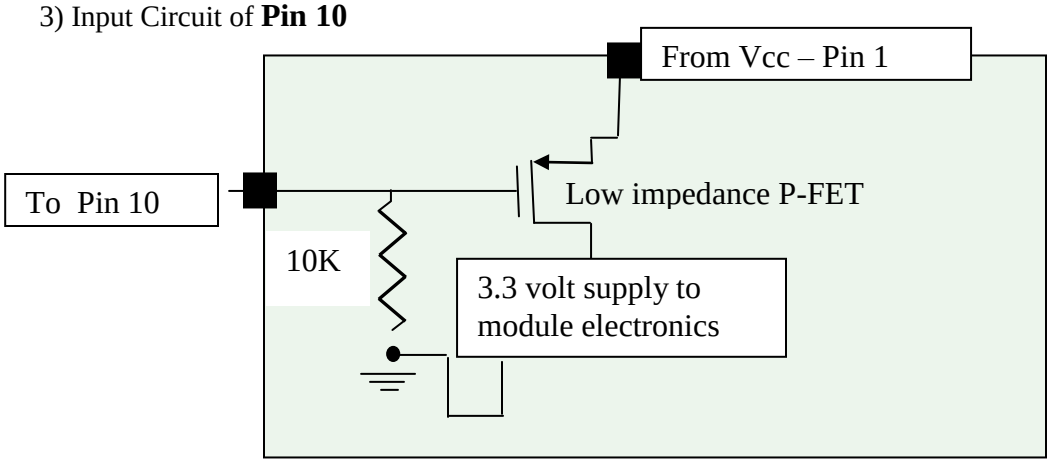


Note 1: The PCB board has 12 holes to accommodate connecting the module via 2mm dual row pins through the PCB from the bottom.
Note 2: The recommended mating connector is SAMTEC TMM106-02-L-D (link to Samtec Thru-hole header data sheets http://www.samtec.com/ftppub/pdf/TMM_TH.PDF) or equiv for thru hole assembly and SAMTEC TMM106-05-L-D-SM or equiv for surface mount assembly (link to Samtec SMT header data sheets http://www.samtec.com/ftppub/pdf/TMM_SM.PDF). Molex also makes equivalent mating connectors.

Figure 2 Top and Side View of Module indicating the Pin locations

NOTES on mating header: The above part numbers are guidelines only. The end user specific application would dictate the lead lengths for the mating header, as determined by whether the BT44-191C is mounted with the Can facing away from or towards the main PCB.

3) Input Circuit of **Pin 10**



Note 1: Pin 10 = Open or Low → Module is operational
Pin 10 = High → Bluetooth module electronics are OFF

Figure 3 Input Circuit on Module for Power Control (pin10)

4) LED connection indicator

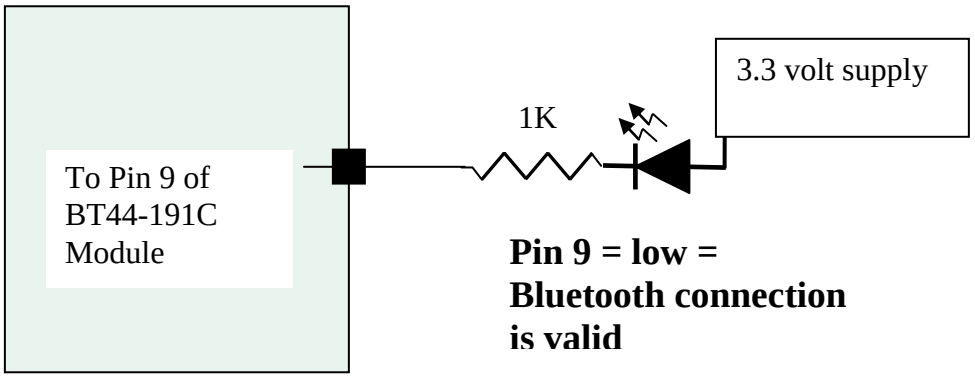


Figure 4 Example Circuit of Visual indicator if Slave Module is connected to a Master

7.2 Dimensional drawing

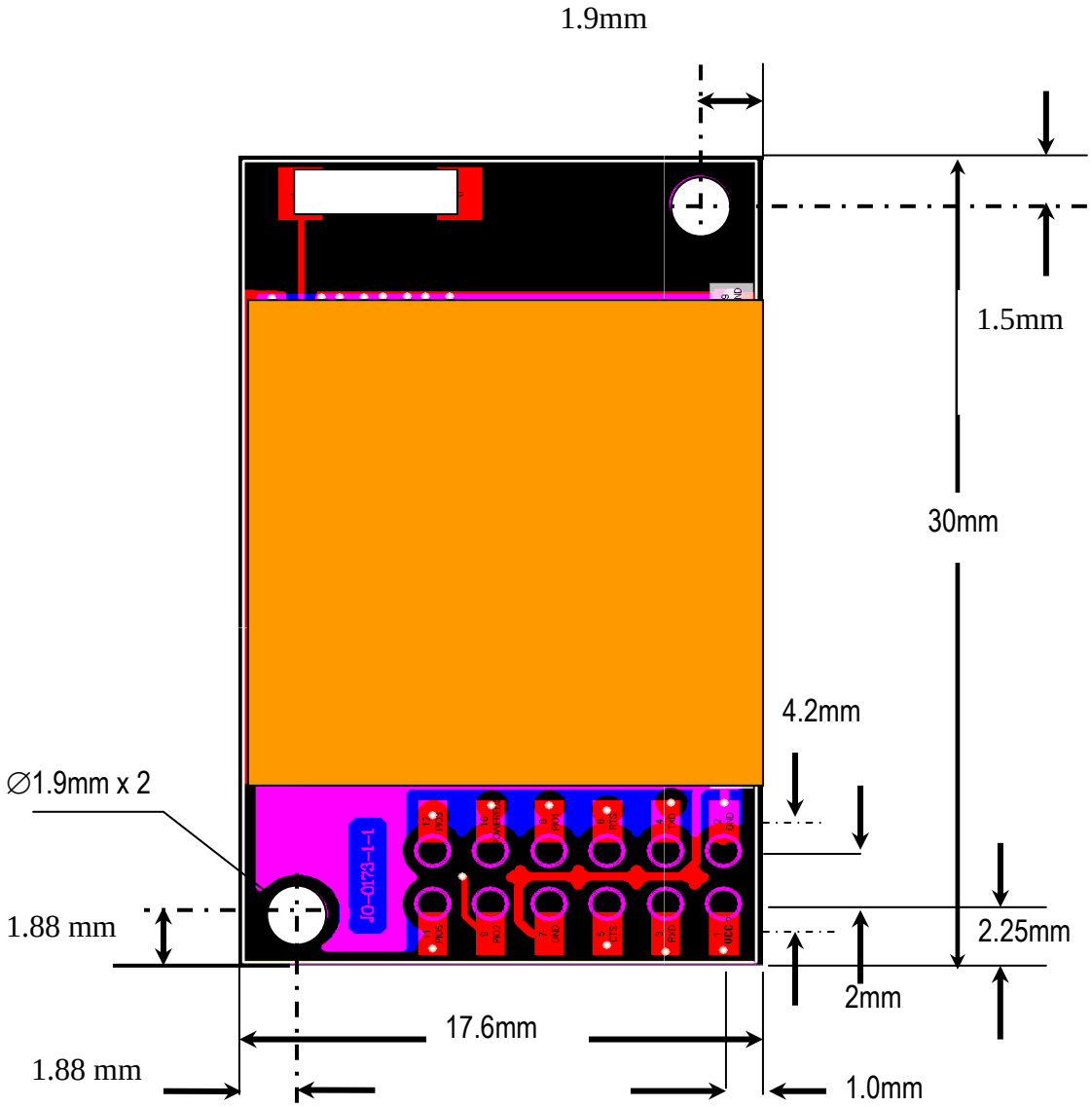


Figure 5 Dimensional drawing of the BT44-191C

8 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 : 3 Mbps
Output Interface	Full speed UART
Power Supply	3.3V ±10%
Operating Temperature Range	-20°C to 85°C
Storage Temperature Range	-40°C to 85°C
Dimensions	30mm X 17mm X 3.15 mm
Antenna	Ceramic

8.1 Electrical Characteristics

8.1.1 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	2.7 to 3.6V
Voltage Range –Digital Pins	-0.3V to 3.6V
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

8.1.2

8.1.3 Radio Characteristics

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

BER	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 (1)(2)	2.402	0	2.5	4	-6 to +4 (3)	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
$\Delta f1_{avg}$ "Maximum Modulation"		-	165	-	$140<\Delta f1_{avg}<175$	KHz
$\Delta f2_{avg}$ "Minimum Modulation"		-	150	-	115	KHz
Notes : (1) BlueCore4 firmware maintains the transmit power to be within the Bluetooth v2.0 + EDR specification limits (2) Measurement made using a PSKEY_LC_MAX_TX_POWER setting corresponds to a PSKEY_LC_POWER_TABLE power table entry of 63. (3) Class 2 RF transmit power range, Bluetooth v2.0 + EDR specification.						
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
$\Delta f1_{avg}$ "Maximum Modulation"		-	165	-	$140<\Delta f1_{avg}<175$	kHz
$\Delta f2_{avg}$ "Minimum Modulation"		-	150	-	115	kHz
C/I co-channel		-	10	11	≤ 11	dB
Adjacent channel selectivity C/I $f=f_0 \pm 1MHz$		-	-4	0	≤ 0	dB
Adjacent channel selectivity C/I $f=f_0 \pm 2MHz$		-	-35	-30	≤ -30	dB
Adjacent channel selectivity C/I $f \geq f_0+3MHz$		-	-45	-	≤ -40	dB
Adjacent channel selectivity C/I $f \leq f_0-3MHz$		-	-45	-	≤ -40	dB
Adjacent channel selectivity C/I $f=f_{image}$		-	-18	-9	≤ -9	dB
Adjacent channel transmit power $f=f_0 \pm 2MHz$		-	-35	-20	≤ -20	dBc
Adjacent channel transmit power $f=f_0 \pm 3MHz$		-	-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
$\Delta f1_{avg}$ "Maximum Modulation"	-	165	-	$140<\Delta f1_{avg}<175$	kHz
$\Delta f2_{avg}$ "Minimum Modulation"	-	150	-	115	kHz

8.1.4 **Power Consumption**

8.1.4.1 Current measurements on the BT44-191C

Description	**Value**	**Units**	**Comments**
I_{pd}	300	uA	Power down- NPWR= hi, Mode: not connectable
I_{dis}	24	mA	Mode Discovery & connecting, Average current
$I_{conn-ps}$	1.32	mA	Connected, Mode park & sniff, no data transmitted, No LED indicator (Nconn= hi)
I_{conn-t}	24	mA	Connected Mode= Slave, transmitting data Comm = 9600,N,8,1
I_{conn-r}	23.5	mA	Connected: Mode= Slave; Receiving data Comm = 9600,N,8,1

Note 1: For measurement above the distance between the master and slave = 1 meter

8.1.4.2 CSR Datasheet specification of the BC04 External Module

Operation Mode	**Connection Type**	**UART Rate (kbps)**	**Average**	**Unit**
Page scan	----	115.2	- 0.42	mA
Inquiry and page scan	-	115.2	0.76	mA
ACL No traffic	Master	115.2	4.60	mA
ACL With file transfer	Master	115.2	10.3	mA
ACL No traffic	Slave	115.2	17.0	mA
ACL With file transfer	Slave	115.2	24.7	mA
ACL 40ms sniff	Master	38.4	2.40	mA
ACL 1.28s sniff	Master	38.4	0.37	mA
SCO HV1	Master	38.4	39.2	mA

SCO HV3	Master	38.4	20.3	mA
SCO HV3 30ms sniff	Master	38.4	19.8	mA
ACL 40ms sniff	Slave	38.4	2.11	mA
ACL 1.28s sniff	Slave	38.4	0.42	mA
Parked 1.28s beacon	Slave	38.4	0.20	mA
SCO HV1	Slave	38.4	39.1	mA
SCO HV3	Slave	38.4	24.8	mA
SCO HV3 30ms sniff	Slave	38.4	19.0	mA
Standby Host connection(a)	-	38.4	40	uA
Reset (RESETB low)(a)	---	---	34	uA

(a) Low power mode on the linear regulator is entered and exited automatically when the chip enters/leaves Deep Sleep mode.

9 Serial Port Profile

When shipped with the pre-programmed Serial Port Profile (SPP), the module's firmware emulates the function of a serial port. When connected to the host microprocessor via the UART transport, the module appears as a COM port. This makes it easy for designers to write software to utilize Bluetooth wireless communication. The SPP profile embedded within the module provides a menu for making configuration changes utilizing AT commands described below in section 9.2:

9.1 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.
- Entering the Command Mode → via ESC at power up
- Partner pairing is dropped at power off or un-pairing by master.

9.2 Configuration Commands Set-up & Procedures

PC interface: If you wish to connect the module to a PC's comm. port it is necessary to include a level shifter between the module and the PC. A recommended interface IC would be the MAX3232 RS232 driver IC (or equiv.) and a 3.3 Volt voltage regulator. Please contact ZBA for details on purchasing an evaluation board to ease the interface the module to the PC.

Microcontroller Interface: The UART of the Bluetooth module can directly connect to the microprocessors UART. The Microprocessor must have an I/O that will operate from 0 to 3.3 Volts or the appropriate level shifter circuitry must be used as to not overstress the I/O of either device.

Entering Command (Set-up) Mode:
Staring with Versions 6.30xxx and all versions after there are three (3) options in getting into the command mode. The three modes of operation are described below:

1) Entering the command (set-up mode) via Entering <ESC> Default mode

For modules to enter in the command mode, the host must send a single character **ESC <0x1B>** at approximately **1** second after power up and within **5** second after the unit has been powered on. If the **ESC <0x1B>** character is not sent within the specified 5 second window then the module 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 modules will only respond to the host set-up commands after the module has entered the command mode.

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

The following items are for Firmware version 3.22 or later

2) Entering the Command (Set-up) mode via UART data sequence

After the device has been running and you are in the SPP mode it is possible to jump to the command mode by sending a specific sequence of characters to the module. If this function is enabled then the Default characters are three (3) ^ in a row i.e. ^^^. The number and specific sequence of characters is programmable and may be up to 15 characters in length. It is recommended that the characters and or character sequence that are chosen for this function are not part of your data sequence. If this function is enabled then the BT44-191x firmware constantly interrogates any sequence of data transmitted to the module and if the specific sequence occurs then the module will jump to the command mode.

NOTE1: The default mode of the module has this function disabled.

NOTE2: Should you do an AT+RESET the above command will revert to disable therefore you should restore the software command mode before exiting the command mode.

3) Entering the Command (Set-up) mode via PIO Control

It is possible to enter the command mode by simply controlling an IO port. For the BT44-191C this function is controlled via PIN12. By keeping Pin 12 low the module will operate in SPP mode. Once Pin 12 is switched to a high level (3.3V) then the module will jump to the command mode.

NOTE1: The default mode of the module has this function disabled.

NOTE2: Should you do a AT+RESET the above command will revert to disable therefore you should restore the software command mode before exiting the command mode.

Exiting the Command Mode

After running any set-up commands then there are two ways to exit the command mode

a) Disconnect the 3.3 Volts supply to the module then re-power the module and **DO NOT** send the **ESC <0x1B>** character or send the <ESC> command. After 5 seconds the module will be in the SPP operation mode. The same result can be accomplished by toggling the NPWR pin high then low or simply by removing power and then reapplying power to the module.

b) From the Set-up mode type: **AT+EXIT.** NOTE: If you have entered the command mode via toggling PIN 12 (item #3 above, PIO control) then you must return Pin 12 to ground to get to the running (SPP) mode**.**
The module will respond with: **OK.**
The module is now in SPP operation mode.

The following is a list of commands supported by the BT44-191C in no particular order.

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

9.2.1 Entering the Set-up Mode (Default mode)

Command	Response	Parameter
ESC (within 5 seconds of power up)	<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 module 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 BT44-xxx module is bound to the companion device whose address is saved in the + RADDR variable.

For setting up the module to allow the module to enter the command mode via a character sequence or a PIO pin see sections 9.2.27 and 9.2.28 below.

9.2.2 Testing the Communication Link

Command	Response	Parameter

AT	OK	None

9.2.3 Command list

Command	Response	Parameter
ATZ?	List of Commands	None

9.2.4 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>	

Example setting the baud rate to 115200 Send → AT+BAUD=115200:
Note: The default baud rate is 9600bps

9.2.5 Set/inquired UART Parameters

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

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

9.2.6 Set Authentication

Command	Response	Parameter
AT+AUTH=<Para1>	OK	Para1 = Authentication 0 = disable 1= enable 2=Simple pairing mode (see note below) Default mode: Authentication enabled=1
AT+AUTH?	OK +AUTH:<Para1>	

Note: The default authentication mode is Authentication enabled.

Note: For firmware version 6.35 or later the AT+AUTH= __2__ command will put the module into what is known as simple pairing mode. This mode is useful on some versions of ANDROID devices**.** Be aware when using this setting in most circumstances this value should **not** be set to __2__.

9.2.7 Set Password

Command	Response	Parameter
AT+PASSWORD= < Para1>	OK	Para1 Password Default = 1111
AT+PASSWORD?	OK +PASSWORD: < Para1>	

Note: The default authentication password = 1111.

9.2.8 Set Device Name

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

Note: The default Device name = ZBA-SPP.

9.2.9 Set Device Type

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

9.2.10 Set Master/Slave Mode

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

Note: The default mode is Slave.

9.2.11 Set Sniff Power Saving Mode

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

Note: Default = 1024, 512, 1024, 512 number in decimal mode

9.2.12 Set Sniff Power Saving Mode—Extended

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

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

9.2.13 Reset to Factory Default

Command	Response	Parameter
AT+RESET	OK	None

9.2.14 Set/Inquire Scan Time

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

AT+SCANTIME?	OK +SCAN :<Para1>,<Para2>, <Para3>,<Para4>	

Note: The Default Values (in decimal = N* 625 us)
Para1 = 2048
Para2 = 18
Para3 = 2048
Para4 = 18

9.2.15 Set/Inquire Paired Device

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

Note: The default mode is to **drop pair**. The drop pair function occurs when the module (slave or master mode) 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 module (slave) device.

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

If a module has been operated with bind=1 and then subsequently the bind function is set to 0, the module 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.

9.2.16 Clear Paired Device Address

Command	Response	Parameter
AT+CLEARADDR	OK	None

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

9.2.17 Inquire Version

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

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

9.2.18 Inquire Remote Device Address

Command	Response	Parameter
AT+INQ	OK + BT address, Device name	

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.

An example of the response to the above command is: **+INQRESU:0005164801E6,**

ZBA-SPP where the data following the colon is one example of the Bluetooth address of one of the devices in the neighborhood and the data following the comma is the name of the discovered device.

9.2.19 Set/Inquire Paired Device Address

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

Example of how to pair using the BT44-191 as the Master
Example to set-up the Module to communicate with one specific BT device whose BT address is currently unknown.
First type: **AT+INQ** which causes the Module to return the BT addresses of the devices in the BT neighbourhood. Then the module will return **+INQCOMP.** This response will indicate that the Inquiry process has terminated.
To terminate the **AT+INQ** command early, please type the command **AT+CANCEL**

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

.

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

9.2.20 Cancel Inquiry

Command	Response	Parameter
AT+CANCEL?	OK **+INQCOMP**	

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

9.2.21 Inquire Device BD Address

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

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

9.2.22 Software Reset

Command	Response	Parameter
AT+ RESTART	OK	None

9.2.23 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>	

Note: the default value for Low power =0

9.2.24 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>	

Note: the default value for Datamode =0

9.2.25 Set/Inquire about Flow control mode (Handshaking)

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

Note: the default value for Flowcontrol =0

9.2.26 Exiting the Set-up Mode

Command	Response	Parameter
AT+EXIT	OK	None

Note: This command returns the module to SPP mode.

The following commands are valid for firmware versions 6.30_xxxxx and later.

9.2.27 Set the Command mode interface mode

Command	Response	Parameter
AT + CMD = x, y, z	OK	The three values are in sequence x,y,z and they independently control the method of entering the command mode **x**: setting this value to 1 will enable the use of the ESC <0x1B> command within 5 seconds of power up to enter the command mode Setting this value to 0 will disable the above command. **y**: setting this value to 1 will enable the use of the Character Sequence via the UART to enter the command mode Setting this value to 0 will disable the above command. **z**: setting this value to 1 will enable the use of the PIO (Pin 12) to enter the command mode. Setting this value to 0 will disable the above command. Default Value 1,0,0
AT + CMD?	OK +CMD:x,y,z	

Note: the default value for the CMD mode is 1,0,0. In this mode the only way to enter the command mode is by sending the ESC command within 5 seconds of powering the unit up.

NOTE: UNDER NO CIRCUMSTANCES SHOULD YOU SEND AT+CMD=0,0,0 AS THIS WILL DISABLE THE COMMAND MODE!!!!!!

9.2.28 Set the Command mode character string

Command	Response	Parameter
AT+CMDCODE="xxxxx" Note Ignore the quotes as they are only there to bound the CMDCODE data	OK	The x value represents the specific character string that the module will search for to switch the operational mode of the module to the Command mode. The maximum number of characters is 15 Default Value: ^^^
AT+CMDCODE?	OK +CMDCODE:"<command code character string >" Default value = ^^^	

9.2.29 Query RSSI Value

Command	Response	Parameter
AT+RSSI?	OK +RSSI::<BTADDRESS>,<NAME>,<RSSIVALUE> +RSSI COMP	

Note1: This command will return a RSSI value for every device that is in the vicinity of the querying Bluetooth device.
Note2: RSSI- Return Signal Strength Indicator→ This value is indicative of the relative signal strength of Bluetooth devices in the neighbourhood of the inquiring device. The RSSI value is shown in dBm. A value if -127 is indicative of a device that is at the maximum range of the modules. Typically values at this range do not form a very good connection and it is a good practice to move the devices closer together.

10 Low power modes

10.1 Park & Sniff

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

To save maximum power then it is possible to completely turn-off the power to the module. When operating in this mode the Master/ Slave must then proceed through the Discovery phase (consuming time and energy) before a connection can be re-established. This mode is only recommended if there are very, very long periods of inactivity and the battery power is of the utmost concern.

11 Mounting recommendations

For maximized performance please orient the device with the antenna as close to the outside of the housing as possible. Best performance will occur if the underlying PCB does not have a ground plane under the area where the antenna is located. The nearest ground plane should be at least 3mm away from any point on the antenna.

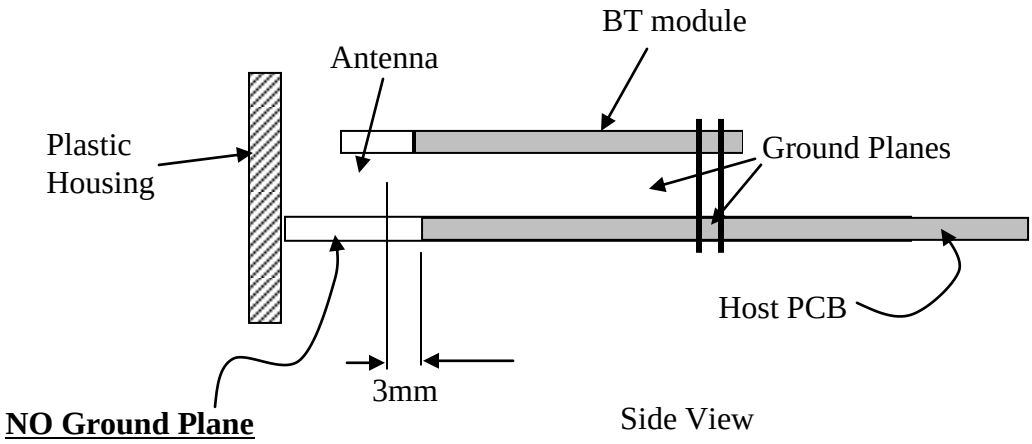


Figure 6 Cross-section of recommended mounting of the BT module

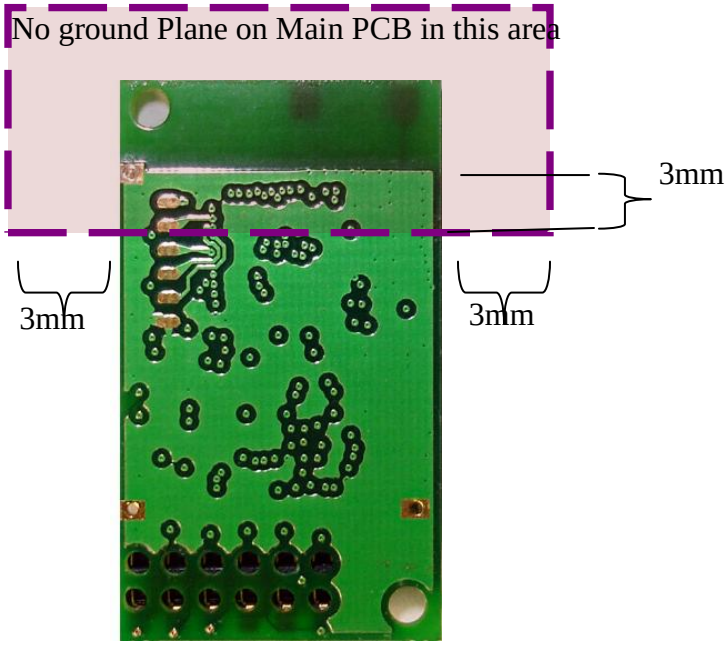


Figure 7 Bottom View of PCB indicating where there should be *NO* Ground Plane

12 Application circuits

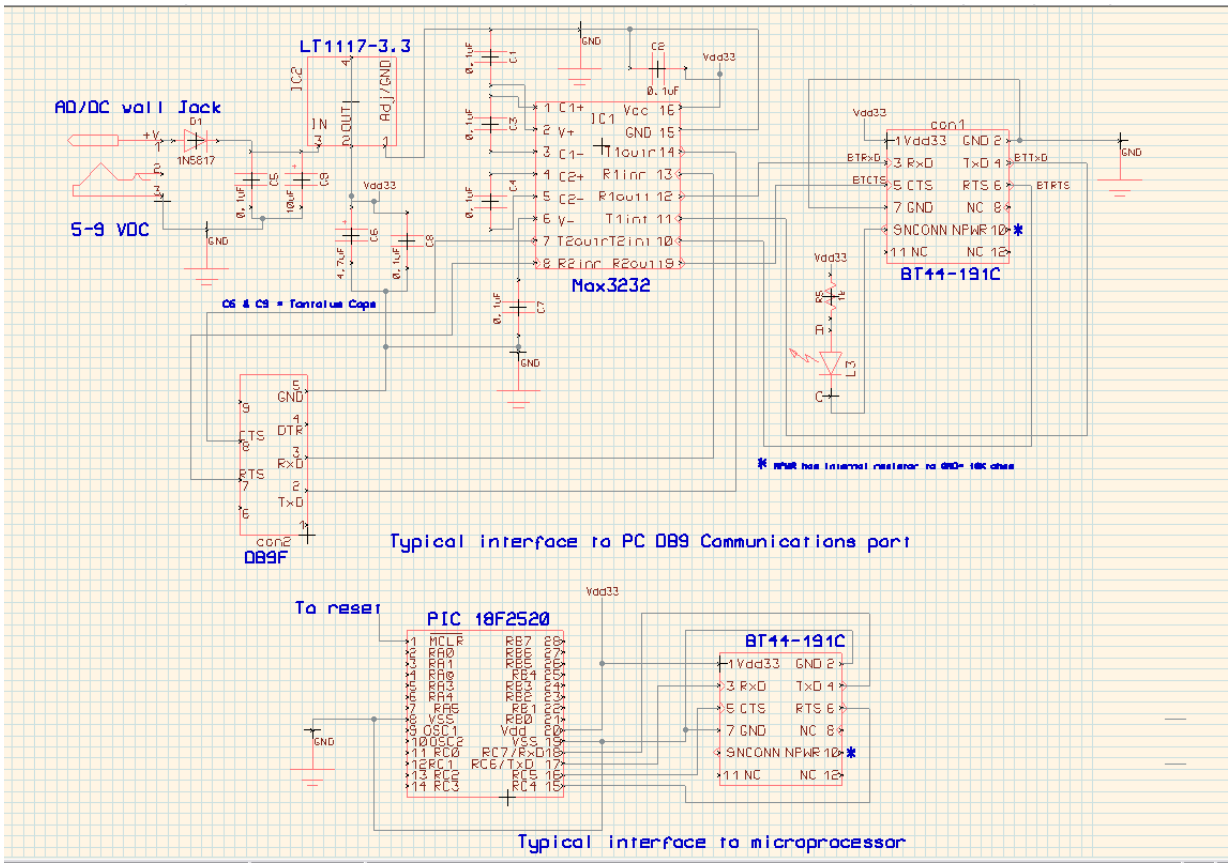


Figure 8 Typical application circuit showing connections to PC comm port & UART

Notes on the application circuit

- L3 is an LED providing a visual indication that the module has successfully been connected. A logic level low will cause the LED to illuminate.
- Any linear regulator can be substituted for LT1117-3.3 providing it has at least 250 mA current handling capability. Linear regulators **<u>are preferred</u>** **as** they tend to be less noisy than switching regulators.
- The AC/DC wall adapter can be unregulated. In the above example, it is followed by a linear voltage regulator.
- Please follow mounting guidelines (section 10) when building this application circuit.
- When connecting directly to a microprocessor UART simply connect the Module's TxD to the uP's UART Rxd and the Module's RxD to the microprocessors TxD. Please be cognizant of the power supplies used on the microprocessor and the BT module; both should be 3.3V. If not then a level shifter is required. A recommended level shifter is the TI SN74LVC1T45 or equivalent.

13 Ordering Information

Ordering P/N	Description
BT44-191C-SPP	Class 2 Bluetooth Module with on board antenna and Serial Port Profile (SPP). & 12 pin 2mm Board-Board Connector
Additional Profiles available	
BT44-191C-HCI	Class 2 Bluetooth Module with on board antenna and HCI access over the UART & 12 pin 2mm Board-Board Connector.
BT44-191C-HID	Class 2 Bluetooth Module with on board antenna and HID profile. & 12 pin 2mm Board-Board Connector.
BT44-191C-SPN	True SPP Piconet MASTER capable of up to 4 simultaneous connections.
BT44-191C-OBX	Class 2 Bluetooth Module with on board antenna and OBEX and FTP profiles & 12 pin 2mm Board-Board Connector.
BT44-PC_Adapter	Adapter board that will allow the BT44-191C to easily connect to the PC. The PCB has LED connection indicators and controls for optional Piconet operation

Please contact ZBA Inc at 908-359-2070 for any other profiles that you may require.

# # # #