

BLE 4.0 Module Software User Manual BLE0402C2P

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I. Brief Introduction

There are 2 wireless modes in Bluetooth 4.0: Basic Rate (BR/EDR) and Bluetooth Low Energy (BLE). Different from BR/EDR (traditional Bluetooth) and Bluetooth 3.0, BLE is used to transfer little data rather than audio and massive data. This is because its low power consuming character. In order to keep consuming low power, it simplified hand-in-hand protocol and shortened awaking time. In short time and little data transportation, it only consumes 10% power of traditional Bluetooth. But if in long time and massive data transportation, its low power consuming character won't show its advantage.

JINOU Bluetooth 4.0 module used the TI chip and support BLE mode. It can be used in medical device, mobile attachment, sports and healthcare application.

II. Functions Description

JINOU Bluetooth 4.0 module achieved transferring data via far-end Bluetooth and UART port. When it powers on, it will enter communication mode or setting mode based on power level of ModeSW.

Communication mode: the module works as slave Bluetooth, the master Bluetooth on far-end device can find and connect with the module, and then transfer data.

Setting mode: User can set parameter such as device name, baud rate, power management mode and so on. In this status, the module can not be found and connected, and it is always in awaking status.

The module has two kinds of power management: automatic dormancy and close down. Under setting mode, no matter this two functions are stated or not, they will be closed.

Under automatic dormancy mode, the mode shows its character of low power consuming while ensure the reliable communication, so we suggest user to turn on this function. But when this function turned on, the awaking maintain pin also begin to work. So before sending data to the module, user should set this awaking maintain pin in high electrical level, and set it back to low electrical level after finish transferring data.

If the application is not sensitive to save power, the user can turn off automatic dormancy function. At this time, the module is in full-functioned working status, it would consume more power. But user don't need to control awaking maintain pin when transferring data.

When user closes down the module, the shut-down control pin begins to work. The shutdown control pin is in low power level in normal time. When the power level jump, the module close down, and the connection of Bluetooth disconnected. While the pin go back to low electrical lever, the module will be awaken and keep to stay working status.

III. Parameter Index

Name	BLE Data Transfer Bluetooth Module		
Standard	Bluetooth Standard 4.0 Low Power Consuming Bluetooth Mode (BLE)		
Working Frequency	ISM Band: 2.402~2.480GHz		
Antenna	Build-in antenna or eternal antenna		
Distance	10 Meter or 100 Meter		
Protocol	LL、SMP、L2CAP、ATT、GAP、GATT		
Communication Port	UART Standard		
UART Standard	Automatic power saving mode, support low power consuming working mode.		
Maximum Transfer Rate *1	Master→Slave	2.8Kbytes/Sec	
	Slave → Master	2.3Kbytes/Sec	
Baud Rate	1200、2400、4800、9600、19200、38400、57600、115200、230400bps		
Power Consumption	Radiofrequency Class	Class 2（10M）	Class 1（100M）
	Soft-off Power	0.5uA	0.6uA
	No Connection（Broadcasting interval 1S, open BLE mode, close indicate light)	100uA	190uA
	No Connection（Broadcasting interval 2S, open BLE mode, close indicate light)	55uA	93uA
	No Connection（Broadcasting interval 1S, close BLE mode, open indicate light)	7.8mA	8mA
	Connecting（open BLE mode）*2	0.4mA	0.5mA
	Connecting（Full-speed transfer data）*3	8.3mA	9mA

*1: Here means transfer rate between two modules. The rate is relating to connecting parameter. If use different phones to transfer date with module, the rate may be different.

*2、*3: The value differs for different connecting parameter. Different master device has different rate. So if use different phone to connect module, power consumption will be different.

IV. Function Pins Description

1. Status Indicator Pin

STATE_LED、RUN_LED、LINK indicate working status, STATE_LED、RUN_LED pin can be linked with LED by user and set the LED light to work under the high-level.

Name	Description	
STATE_LED	Setting Mode	Light Off
	Unconnected	Wink every other seconds
	Connected	Light Off
RUN_LED	Setting Mode	Light Off
	Slave Mode	Wink every other 2 seconds
	Master Mode	Wink every other 5 seconds
LINK	Unconnected	Low-level
	Connected	High-level

2. Operating Mode Switch Mode

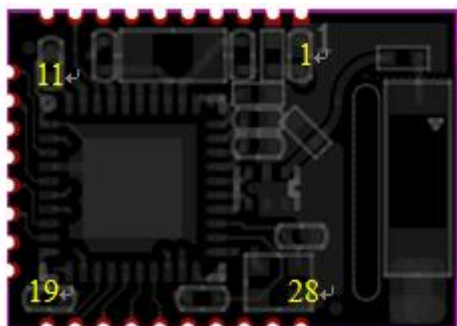
Name	Description	
ModeSW	Setting Mode	High-level
	Communication Mode	Low-level

3. Power Management Pin

Name	Description
HOLDWAKE	Start the automatic dormancy, when is in low-level the module goes into dormant state. When in high-level, the module keeps waking status.
POWER OFF	After dormancy, when power level rises, the module goes into soft-off. And when power level declines, the module is awaked.

V. Pins Description

PCB:JO-0506-1-1



JO-0506-1-1

No.	Name	Pin Type	Description
1	GND	Ground	Connect to GND
2	Vcc	Power Supply	+3.3V Power Supply
3	NC		
4	NC		
5	P2.2	Digital I/O	Spare IO
6	P2.1	Digital I/O	Spare IO
7	ModeSW(P2.0)	Digital I/O	Mode switch pin, input port, high-level for parameter settings state, and low-level for normal working state.
8	POWEROFF(P1.7)	Digital Input	Rising to soft-off and decline to awaken.
9	HOLDWAKE(P1.6)	Digital Input	In low-level, the module goes into automatic dormancy. In high-level, the module goes into awaken state.
10	I2C_SCL	Digital I/O	I2C bus SCL line
11	I2C_SDA	Digital I/O	I2C bus SDA line
12	P1.5	Digital I/O	Spare IO
13	STATE_LED(P1.4)	Digital Output	State Indicator Pin
14	P1.3	Digital I/O	Spare IO
15	P1.2	Digital I/O	Spare IO
16	P1.1	Digital I/O	Spare IO
17	RUN_LED(P1.0)	Digital Output	Operating Indicator Pin
18	P0-7	Digital I/O	Spare I/O, can be set as simulation port.
19	Link(P0.6)	Digital Output	Bluetooth connection indicator,

			low-level means unconnected, high-level means connected.
20	UART_RTS(P0.5)	Digital Output	UART request to send, when low-level, the outside can send to module.
21	UART_CTS(P0.4)	Digital Input	UART request to send, when in low-level, the module can send data to outside.
22	UART_TX(P0.3)	Digital Output	UART data send
23	UART_RX(P0.2)	Digital Input	UART data receive
24	P0.1	Digital I/O	Spare I/O, can be set as simulation port.
25	NC		
26	NC		
27	P0.0	Digital I/O	Spare I/O, can be set as simulation port.
28	RST	Digital input	Reset, active-low

VI. Parameter Setting

Get into parameter setting status when module ModeSW pin is in high-level.

Default: 9600bps, 8-N-1, no CTS/RTS flow control.

The follow <CR>、<LF> means ENTER and TAB in ASCII table Every command send to the module must end with <CR>、<LF>, or it can not be recognized.

<> symbol which write out side parameter is use for convenient reading. When writing command, do not add <> symbol.

1. Test Instruction

Command	Answer	Parameter
AT<CR><LF>	<CR><LF>OK<CR><LF>	None

2. Instruction for Entering Parameter Setting

Command	Answer	Parameter
无	<CR><LF>+OPEN:<status><CR><LF>	Status: remote address statuses 0 : not configure remote address 1: configured remote address If set the module into master mode and configured remote address, then after powered the module, it will automatically connect slave device of the address.

3. Inquire /Set Device Name

Command	Answer	Parameter
AT+NAME=<name><CR><LF>	<CR><LF>OK<CR><LF>	name: device name Default: BLE0102C2P
AT+NAME?<CR><LF>	<CR><LF>OK<CR><LF> <CR><LF>+NAME:<name><CR><LF>	

4. Inquire Local Bluetooth IP

Command	Answer	Parameter
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AT+LADDR? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF>+LADDR:<bdaddr><CR><LF>	bdaddr : Device IP
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5. Inquiry/Set Remote Bluetooth Address

Command	Answer	Parameter
AT+RADDR? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF>+RADDR:<bdaddr><CR><LF>	bdaddr : If set the BT address when the device as the master, the module will connect the slave device automatically.
AT+RADDR= <bdaddr><CR><LF>	<CR><LF> OK <CR><LF>	

6. Erase Remote Bluetooth Address

Command	Answer	Parameter
AT+CLEARADDR <CR><LF>	<CR><LF> OK <CR><LF>	None

7. Inquire Software Version

Command	Answer	Parameter
AT+VERSION? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF>+VERSION:<ver><CR><LF>	Ver: The module software version

8. Set/Inquiry Device Type

Command	Answer	Parameter
AT+ROLE? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF>+ROLE:<role><CR><LF>	role : Device Type 0: Slave 1: Master Default: 0
AT+ROLE= <role><CR><LF>	<CR><LF> OK <CR><LF>	

9. Set/Inquire Baud Rate

Command	Answer	Parameter
AT+BAUD= <rate><CR><LF>	<CR><LF> OK <CR><LF>	rate : baud (1200、2400、4800、9600、

AT+BAUD? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF> +BAUD: <rate><CR><LF>	19200 、 38400 、 57600 、 115200 、 230400) Default: 9600
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10. Set/Inquire Data Format of Serial Port

Command	Answer	Parameter
AT+UARTMODE =<databits>,<paritybit>,<stopbit><CR><LF>	<CR><LF> OK <CR><LF>	Data bits: data bit 8: 8 bit 9: 9 bit
AT+UARTMODE? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF> +UARTMODE: <databits>,<paritybit>,<stopbit><CR><LF>	Parity bit: parity bit N: none O: odd E: even Stop bit: stop bit 1: 1 stop bit 2: 2 stop bit Default: 8, N, 1

11. Set/ Inquire Flow Control Mode

Command	Answer	Parameter
AT+FLOWCONTROL =<enable><CR><LF>	<CR><LF> OK <CR><LF>	<enable>: 0: no flow control 1: hardware control flow Default: 1
AT+FLOWCONTROL? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF> +FLOWCONTROL: <enable><CR><LF>	

Strongly recommend hardware flow control for massive data, or the data may lose.

12. Setting/Inquiry Authentication Mode

Command	Answer	Parameter
AT+AUTH =<mode><CR><LF>	<CR><LF> OK <CR><LF>	<mode>: 0: Forbidden Match 1: Passivity Match 2: Automatically Match Default: 1
AT+AUTH? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF> +AUTH: <mode><CR><LF>	

13. Set/Inquiry Matching Code

Command	Answer	Parameter
AT+PASSWORD=<password><CR><LF>	<CR><LF>OK<CR><LF>	<password>: Range 000000 ~ 999999 Default : 000000
AT+PASSWORD?<CR><LF>	<CR><LF>OK<CR><LF> <CR><LF>+PASSWORD: <password><CR><LF>	

14. Scanning Peripheral BLE Device

Command	Answer	Parameter
AT+INQ<CR><LF>	<CR><LF>OK<CR><LF> <CR><LF>+INQRESU:<bdaddr>,<rssi>,<primary service uuid><CR><LF>	<bdaddr>: BT MAC Address <rssi>: Semaphore <primary service uuid>: Statement of the main service UUID from the radio equipment
	<CR><LF>INQCOMP<CR><LF>	Scanning end

15. Stop Scanning

Command	Answer	Parameter
AT+CANCEL<CR><LF>	<CR><LF>OK<CR><LF>	None

16. Inquire/ Set Connection Control Parameter

Command	Answer	Parameter
AT+LINKPLCY=<enable>,<max>,<min>,<latency>,<timeout><CR><LF>	<CR><LF>OK<CR><LF>	Enable: Slave device connect to parameter, update function.
AT+LINKPLCY?<CR><LF>	<CR><LF>OK<CR><LF> <CR><LF>+LINKPLCY: <enable>,<max>,<min>,<latency>,<timeout><CR><LF>	1: update when connected 0: do not update For master deceive, ignore this parameter.

		Max: maxim connect interval (6-3200, unit 1.25mS) Min: minimum connect interval (6-3200 , unit 1.25mS) Latency: slave device latency (0-499) Timeout: timeout of connect (10-3200, unit 10mS) Default: 0, 6, 6, 0, 300
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Max, min, lcy will infect power consumption and data latency when the device is connected.

Beside, max should no less than min, timeout must longer than effective connect interval. That is: connect interval*(1+ latency). If the device is slave device and enable to be set, then master device will affect parameter update. For example, IOS devices, Apple Company has some range limitation for parameter. If set beyond limitation, the IOS device will refuse updating. Detail limitation, see Apple files.

17. Set/ Inquire Power Management Mode

Command	Answer	Parameter
AT+POWER =<led>,<poweroff>,<sleep><CR><LF>	<CR><LF> OK <CR><LF>	<led>: 0 : disable Operation/ State indicate light 1 : enable Operation/ State indicate light
AT+POWER? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF>+POWER:<led>,<poweroff>,<sleep><CR><LF>	<poweroff>: 0:disable power-off pin 1: enable power-off pin <sleep>: 0: disable automatic dormancy when operating 1: enable automatic dormancy when operating Default: 1,0,0

Module default set to not open automatic dormancy mode, so power consumption stay in high power consumption mode. About 8mA.

If need to set power consumption lower than 1mA, should configure AT+POWER=1,0,1

If no need Operation/ State indicate light, can further reduce power consumption, should configure AT+POWER=0,0,1

Once set automatic dormancy, must set HOLDWAKE pin to high-level to awake module and delay at least 10mS. Then outer MCU can send data. After finished sending data, set HOLDWAKE pin to low-level again, then module back to dormancy.

18. Set/Inquiry Scanning Window

Command	Answer	Parameter
AT+SCANWINDOW =<window>,<interval><CR><LF>	<CR><LF> OK <CR><LF>	<window>: Scanning Start Time <interval>: Scanning Start Time Unit: 0.625 ms Default: 16,16
AT+SCANWINDOW? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF> +SCANWINDOW :<window>,<interval><CR><LF>	

The parameter effects power consumption and sensitivity of master device. Invalid to slave device.

19. Set/Inquire Broadcasting Open/Closed Interval

Command	Answer	Parameter
AT+ADVINT =<interval_time><CR><LF>	<CR><LF> OK <CR><LF>	<interval_time>: Slave device broadcasting interval time range: 160-4800 Unit: 0.625ms Default: 1600
AT+ADVINT? <CR><LF>	<CR><LF> OK <CR><LF> <CR><LF> +ADVINT :<interval_time> <CR><LF>	

Notice: This parameter setting is invalid for master device. If the parameter is set too big, the slave device is not easy to find/connect. Please notice.

20. Reset to Factory Default Parameters

Command	Answer	Parameter
AT+RESET <CR><LF>	<CR><LF> OK <CR><LF>	None

21. Enter Firmware Upgrade Mode

Command	Answer	Parameter
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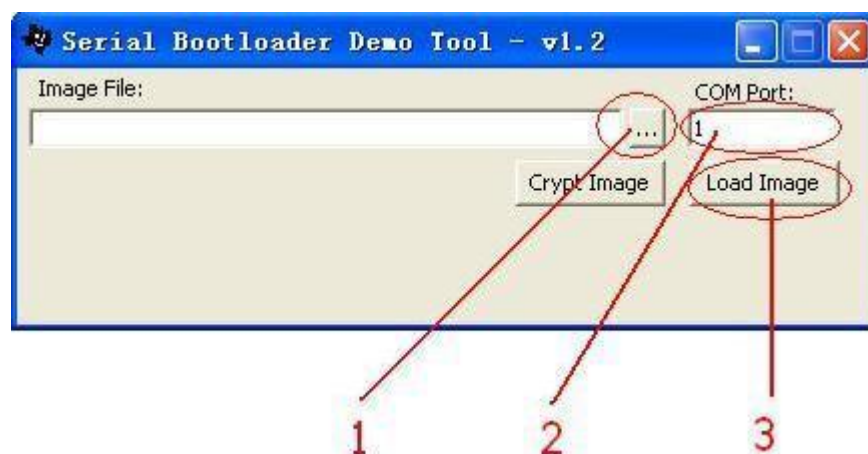
AT+DFU<CR><LF>	<CR><LF>OK<CR><LF>	None
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If user has no right update firmware, do not try this command, or module will not work.

VII. Firmware Upgrade

1. Send AT+DFU, then module into upgrade mode.
2. Use PC to update software.

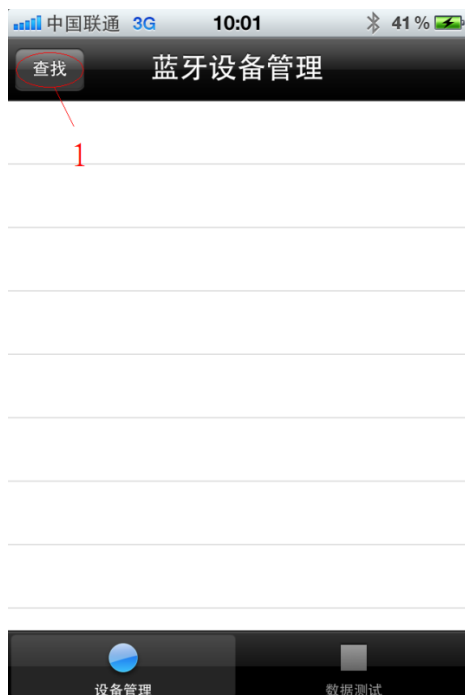


- 1 Choose firmware (*.bin file)
- 2 Choose the COM port that connected module and PC. If use COM1, then write 1.
- 3 Press this button to start upgrade. If succeed, will notice “Download completed successfully”
- 4 After updated, in order to avoid parameter disorder, must use AT+RESET to reset to factory default.

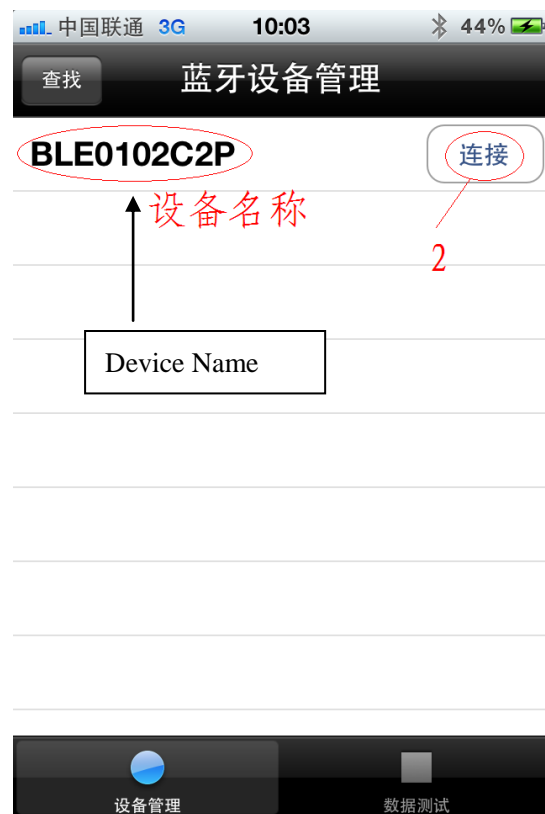
VIII. Application Example

Now many devices begin to support Bluetooth 4.0, such as mobile phone, PC, PDA and so on. Taking iPhone 4S as example, JINOUE offered a demo program named BTDemo which can works on iPhone 4S. This program can help iPhone 4S transfer and receive data with JINOUE Bluetooth 4.0 module.

1. Keep this 4.0 module in default parameter, connect with PC via serial port, electrify and set it in communication mode. (default baud 9600)
2. Open BTDemo



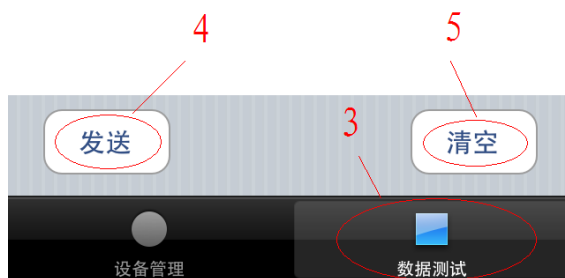
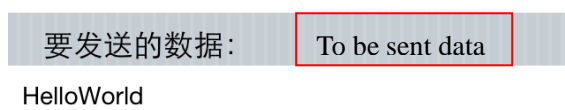
3. Click search bottom (1) to search surrounding device to find JINOUE Bluetooth 4.0 module—BLE0102C2P.



4. Click bottom (2) to connect. When it is successfully connected, the Link pin of the module will turn to high level and the winking STATE_LED will extinguish.



5. Choose data testing (3), write *Hello World* in blank area, click send (4) to send this text data to the module. And after the module received this data, it will send this data to the PC.



PC serial sends *Hello World* to the module; the phone will receive the data and show in the blank area.

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