

BLE-Nano operating manual V.1.1





Revised Version Of History

Date	Version	Description	Author
2019-1-29	V. 1. 0	Create	Ken. chen
2019-4-9	V.1.1	Perfect AT Command	Ken. chen



Catalogue

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Introduct

Ble - Nano bluetooth 4.0 protocol is based on perfect combination Arduino Nano by emakefun to create customer research and development of a revolutionary product, function and the pin is fully compatible with traditional Arduino Nano motherboard, scope of work frequency of 2.4 GHZ, modulation mode for the GFSK, maximum transmitted power of 0 db, the largest launch distance of 50 meters, USES the import original TI CC2540 chip design, support user through AT commands to modify to check the device name, service UUID, transmission power, such as matching password instructions, convenient use and flexible.The size of the product is very small, suitable for many applications where there are severe restrictions on the size.

We provide Android and IOS mobile phone demo, you can quickly develop a communication with the phone hardware device.Just like the popular wearable mobile phone peripheral devices, all of them can be developed with the Ble Nano platform. You can connect the Ble Nano with the bluetooth 4.0 device, realize the wireless transmission between the two bluetooth devices, and set the master and slave.Even establish bluetooth HID connection with PC.AT the same time, we provide developers with a great degree of freedom and support, the user can not only by the AT command debugging Ble - Nano, you can also add on Ble - Nano controller Arduino compatible extension board, sensor, motor and servo drive, emakefun exclusive research and development of bluetooth host mode automatic connection from the machine function, and support for more than 20 bytes to send, it is more convenient to use.

Product Parameter

- It is fully compatible with the Arduino nano-v3.0 pin and its usage method
- ♦ BLE chip :TI CC2540
- ♦ Work channel : 2.4G
- Transmission distance: 50m
- Supports AT directive to configure BLE
- Support USB virtual serial port, hardware serial port, BLE three-way transparent transmission
- Support master and slave switch
- Supports sending over 20byte.
- Supports iBeacons
- Interface:Mircor-Usb
- ◆ Input voltage: Usb power supply, Vin6~12V, 5V
- ◆ MCU: ATmega328P-MU QFN32
- Bootloader: Newest Arduino1.8.8



- Pin: Two Lines 2.54mm-15Pin
- Size: 48mm x 19mm x 12mm
- ♦ Weight: 18g

Pin define





Indicator LED description



- When the bluetooth is not connected, the blue light will flicker, and the blue light will always be on
- The green light flashes when the module communicates with other bluetooth data, or when usb has data, or when ATmega328P sends serial data
- The green light flashes when the module communicates with other bluetooth data, or when usb has data, or when ATmega328P sends serial dataWhen the USB data cable is connected successfully, the USB light will be on. If only the power light is on after connecting the USB cable, but the USB indicator light is not on, it means that the usb-micro cable is broken, please replace it

Ble-Nano driver install

 Right-Click "Computer" → "attribute" → "Device manager" → check "port (COM<) ", If you look at this figure 1.1





Figure 1.1 Drive the successful installation interface

2) The driver has been installed successfully. Then we open the IDE and select the corresponding development board model and port in the toolbar. If it appears as shown in figure 1.2, the computer does not recognize the development board and needs to install the driver.





Figure 1.2 The driver failed to install the interface

3) Right-click the USB serial port and select the update driver software option, as shown in figure 1.3.





Figure 1.3 Update successful

4) Click "browse the computer to find driver software" as shown in figure 1.4, and click "browse" as shown in figure 1.5



ြေ 🕼 Update Driver Software - 🗤 ၊ နိုင်ငံပြားဆိုကြေးဆိုကြောင်းခြင်းခြင်းခြင်းခြင်းခြင်းခြင်းခြင်းခြ	× 濟瀅∀蕭舘₀灸갉궂
How do you want to search for driver software?	
Search automatically for updated driver software Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.	
Browse my computer for driver software Locate and install driver software manually.	
	Cancel

图 1.4

•	Update Driver Software - ₂	 2
	Browse for driver software on your computer	
	Search for driver software in this location:	
	E\CC2540_Driver Browse	
	✓ Include subfolders	
	Let me pick from a list of device drivers on my computer This list will show installed driver software compatible with the device, and all driver software in the same category as the device.	
	Next	ancel

1.5

Driver path: "CC2540_Driver $\ ccxxxx_usb_cdc.inf"$ click "next", as shown in figure 1.6



Training The Person Street Concern	×
G Update Driver Software - → ADDD時胎後空缀ED 879A類D→4D [∞] 薂戎芪莫→ 瓺¥ 鋼閘D适軩辂≈坑砰g∞薂戎擠瀅U	藟舘□炃갉궂
Browse for driver software on your computer	
Search for driver software in this location:	
E\CC2540_Driver Browse	
✓ Include subfolders	
Let me pick from a list of device drivers on my computer This list will show installed driver software compatible with the device, and all driver software in the same category as the device.	
Next	Cancel

Figure 1.6 choose the driver file



5) Click "always install this driver software" in the popup window as shown in figure 1.7



Figure 1.7



Figure 1.8 Driver installation successful

At this point, we have the driver installed. Next, we will install the Arduino IDE.



Ble-Nano downloads programs through the arduion IDE

BLE-Nano burns the latest version of Bootloader, so you need to use the latest IDE (version 1.8.8 or above) to burn the program :<u>https://www.arduino.cc/en/Main/Software</u> download latest Arduino IDE

💿 sketch_apr24a /	Arduino 1.8.8		
File Edit Sketch T	ools Help		
sketch_apr24a	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T	
void setup() { // put your se }	Manage Libraries Serial Monitor Serial Plotter WiFi101 / WiFiNINA Firmware 9	Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L Updater	
void loop () (// put your ma	Board: "Arduino Nano" Processor: "ATmega328P" Port Get Board Info		Boards Manager Arduino AVR Boards Arduino Yún Arduino/Genuino Uno Arduino Duemilanove or Diecimila
	Burn Bootloader		 Arduino Nano Arduino/Genuino Mega or Mega 2560 Arduino Mega ADK Arduino Leonardo Arduino Leonardo ETH Arduino/Genuino Micro Arduino Esplora



sketch_apr24a	Auto Format Archive Sketch Fix Encoding & Beload	Ctrl+T			Q •
nid setup() { // put your se	Manage L <mark>i</mark> braries Serial Monitor	Ctrl+Shift+I Ctrl+Shift+M			
id loop () (WiFi101 / WiFiNINA Firmware U	Ctrl+Shitt+L pdater			
/ put your ma	Processor: "ATmega328P"		•	ATmega328P	
4	Port Get Board Info	1		ATmega328P (Old Bootloader) ATmega168	
	Programmer: "AVRISP mk <mark>I</mark> I" Burn Bootloader	*			-

💿 sketch_apr24a | Arduino 1.8.8

File Edit Sketch	Tools Help		_		
sketch_apr24a	Auto Format Ctr Archive Sketch Fix Encoding & Reload	+T			0
void setup () {	Manage Libraries Ctr	+Shift+I			*
// put your se	Serial Monitor Ctr	+Shift+M			
1	Serial Plotter Ctrl	+Shift+L			
4. 	WiFi101 / WiFiNINA Firmware Updater				
// put your ma	Board: "Arduino Nano"	•			
	Processor: "ATmega328P"	•			
3	Port: "COM36"		-	Serial ports	
	Get Board Info		1	COM36	
	Programmer: "AVRISP mkII"	•	-		
	Burn Bootloader				
					-

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_ D _X



© СОМ36	
AT	Send
+ок	1
step2	step3
	step 1
Autoscroll 🔲 Show timestamp	Both NL & CR 👻 9600 baud 👻 Clear output

Ble-Nano Connect to your phone

1) Open the Arduino IDE, connect the serial port as shown in figure 1.9, and open the serial port monitor as shown in figure 1.10.

rduino 1.8.8					
ols Help					
Auto Format	Ctrl+T				
Archive Sketch					
Fix Encoding & Reload					
Manage Libraries	Ctrl+Shift+I				
Serial Monitor	Ctrl+Shift+M				
Serial Plotter	Ctrl+Shift+L	1			
WiFi101 / WiFiNINA Firmware Up	dater				
Board: "Arduino/Genuino Uno"		Þ.		e:	
Port: "COM30"		•	Serial ports		
Get Board Info			COM1		· · · · · · · · · · · · · · · · · · ·
Programmer: "ArduinoISP"		v	COM30		
Burn Bootloader					



Figure 1.10

 The test AT instruction is shown in figure 1.11. The USB and bluetooth data transmission mode of BLE-Nano is set as USB serial port data and BLE transmission as shown in figure 1.12



COM00		COMIS	
AT.	[Sent]]	AT+BLEU()R=J	Seet
+OK		*OK OK+UsbBleTransmitMode=3 +SUCCESS	
🖉 Automorali 🔄 Show timestamp	* Brith III. & CR • 9900 hand • Clear surpri-	Zautonerall Stee timestamp	• Both R. & CR. • 9930 Anal • Class surpri-



Figure 1.12

3) Install ble_tool.apk on the phone and open the test APP. The interface is shown in figure 1.13. Find the corresponding bluetooth name (Ble-Nano) and click to connect. After connection, as shown in figure 1.14, four options will appear to test different functions, respectively. Because here we only test whether bluetooth can send and receive data normally, so we select SK Service and select SK_KEYPRESSED as shown in figure 1.14 and 1.15

设备列表	服务列表
Unknow Device 7f0d004405:97:44:EE:D9:10 7f0d005f-71 7f0d0001	GenericAccess occ 1800 0000 1000 8000-00805/hb34tb Instance Id: 1 Type : primery
1EFF06000109200253A38366820588009FF2050FA9A6 D797F855E8F00178380000000000000000000000000 060000000000	GenericAttribute cocoraci coco-soco-cosossebaetb instance kt: 12
Ble-Nano	ships - becauside
7f0d0044A8:10:87:51:99:89 7f0d005f-45 7f0d001 0201060302E0FF0909426C652D4E616E6F0512060006 00020A00000000000000000000000000	Device Information cocorsos couc-coco-cocosecseus-etb instance kl. 16 Type : primary
00000000000000000000000000000000000000	SK Service
mobike 7f0d0044E881-98:33:7F:21 7f2d005542	Instance ki: 35 Type : primary
7f0d0001 02010607096D6F62696B6513FFB3040160EB819B337F 218620737246000000000000000000000000000000000000	

图 1.13

图 1.14



	特征操作	1
	描述列表: 00002902-0000-1000-8000-0080549 00002901-0000-1000-8000-0080549 特征值: 字符串:130 十六进制:313330 虛戰时间:19-04-10 11:50:32	534fb 534fb
	读取 写入	开始通知
	(此处]]服示:潮利的(而)	
特性列表		
SK_KEYPRESSED 0000ffe1-0000-1000-8000-00805f9b34fb Instance ID: 37 Property: 22		
i oportji za	字节数:0 清空 保存	
	(●) 字符串 ○ 十六进制	



Figure 1.16

4) After clicking "sk-keypressed", as shown in FIG. 1.17, we can see that there is a "write" button. Click to enter the interface as shown in FIG. 1.18

述列波: 002902-0000 002901-0000-		3515h34fb 3519b34fb	00002302-0000- 000023001-0000- 000022001-0000-		051903415 151903415
 (1) 字符串 (2) 写入值 	○ 十六进制		 字符串 weertyyts 	◯ 十六进制 dggswdg	
定时发送	100	ma 共:0	定时发送	100	0:#± am
00	01	MLLLM	00 00	01	MLLLM
编辑按键	1的值		编辑按键1	的值	
编辑按键	2的值		编辑按键。	289值 3的值	
编辑按键	3的值				发送
		发送	- 71		

Figure 1.17

Figure 1.18



5) After clicking "send", we can see that the content sent by the mobile phone is printed on the serial port monitor, as shown in figure 1.19, indicating that the bluetooth module can normally send data. Of course, in order to test the accuracy more accurately, we can test it several times and try to test it in different environments.

3 COM30	
	Send
weertyytsdggswdg	<u>^</u>

Figure 1.19

6) As shown in figure 1.20, we can input the content we want to Send on the serial monitor, and then click "Send" to Send the data to the mobile APP via bluetooth, as shown in figure 1.21.

💿 COM30	
qwexzcfsgtryjutrbdfvcdsac	Send
weertyytsdggswdg	

With 130 小进制 313330 With 31330 With 313330 With 31330 With 313300 With 31300 With 31300 With 31300 With 31300 With	4 62 7 9 66 - 1002902-0000-10 1002901-0000-10	200-8000-00805195	34fb
(特単:130 - 六进制:313330 (取動):19-04-10 11:53:18 (調取 写入 开始通知 gwexzcfsgfryjulrbdfvedsac	寺征值:	100 0000 00000120	5410
1版时前:19-04-10 11:53:18 道際 写入 开始通知 gwexzcfagtryjutrbdfvcdsac	(符串:130 ·六进制:313330		
试取 NGA 开始通知 gwexzefsgtryjutrbdfvedsac	t)取时间:19404-10	11:53:18	
gwexzcfagfryjutrbdfvedsac	10.102	斯入	开始通知
	书数: 27 講	空 保存	

Figure 1.20

Figure 1.21

In the above test process, both PC terminal and android terminal can send and receive data normally, indicating that the Ble-Nano communication is normal and achieves the expected effect.



AT instruction set

Users can communicate via a serial port and bluetooth chip, a serial port using Micro - USB cable, baud rate support. 9600192 00384 00576 00115 200. The default baud rate of the serial port is 9600bps. (note: when sending the AT command must be carriage returns, the AT command can only be effective in the module not connected state, once the bluetooth module is connected to the equipment, bluetooth module into data passthrough mode), the AT commands are case sensitive, both ends in return, newline characters: r n

List	Command	Effect	M/S	Work Mode	default
1	AT+ALL	Print all the configuration information for	M/S	/	/
		the BLE configuration			
2	AT+BAUD	Configure serial port baud rate	M/S		9600
3	AT+PARITY	Set the serial port check bit	M/S		0
4	AT+STOPBIT	Set the serial port stop bit	M/S		0
5	AT+NAME	Configure bluetooth device name	M/S		Ble-Nano
6	AT+VER	View the BLE firmware version number	M/S		V1.1
7	AT+MAC	View bluetooth 12-bit MAC address	S		/
8	AT+ROLE	Configure the BLE master-slave mode	M/S		1
9	AT+SCAN	Scan surrounding bluetooth devices	М		/
10	AT+CONN	Connect the scan result to the subscript of	М		/
		bluetooth			
11	AT+CON	Connect the corresponding Mac address to	М		/
		bluetooth			
12	AT+AUTOCON	Automatically connect to the nearest slave	Μ		0
		bluetooth, and restart to take effect			
13	AT+DISCON	Break the current link	Μ		/
14	AT+AUTH	Set whether a password is required for a	S		0
		bluetooth connection			
15	AT+PASS	Set the bluetooth connection password	S		000000
16	AT+ MODE	Set bluetooth working mode	M/S		0
17	AT+ BLEUSB	Set bluetooth USB and bluetooth data	M/S		0
		transfer modes			



- m ma	ke your ideas idii			
18	AT+ TXPOWER	Set bluetooth transmission power	M/S	0
19	AT+MINI_INTE	Set the minimum communication interval	M/S	6
	RVAL	of BLE chip		
20	AT+MAX_INTE	Set the maximum communication interval	M/S	6
	RVAL	of BLE chip		
21	AT+SRVUUID	Get the bluetooth signature UUID	M/S	0xFFE0
	AT+CHARUUID	Gets the character signature	M/S	0xFFE1
21	AT+RXGAIN	Set the BLE receive gain	M/S	1
22	AT+RESETR	Bluetooth device software restart	M/S	/
23	AT+SETTING	system settings	M/S	/

AT Instruction set specification

1、Test instruction

Command	Response	Parameter
AT	+OK	NULL

2、Print all configuration instructions for Ble-Nano

Command	Response	Parameter
AT+ALL	Detailed configuration	Null
	information	

3、Configure serial port baud rate

Command	Response	Parameter
AT+BAUD= <param/>	OK+Baud= <param/>	0:9600
	+SUCCESS	1:19200
		2:38400
		3:57600
		4:115200

4, Configure the check bit for the serial port

Command	Response	Parameter
AT+PARITY= <param/>	OK+Parity= <param/>	0:NULL



+SUCCESS	1: even parity check
	2: Odd Parity Check

5_{5} Configure the stop bit for the serial port

Command	Response	Parameter
AT+STOPBIT= <param/>	OK+StopBit= <param/>	0:1bit
	+SUCCESS	1:2bits

6. Configure bluetooth name

Command	Response	Parameter
AT+NAME= <param/>	OK+Name= <param/> +SUCCESS	Bluetooth Name
	+SUCCESS	

7、Query BLE-Nano firmware version

Command	Response	Parameter
AT+VER	OK+Version= <result></result>	Null

$8\,{\scriptstyle \smallsetminus}\,$ Query the Mac address of bluetooth

Command	Response	Parameter
AT+MAC	OK+Mac= <result></result>	Null

9、Query sets bluetooth master-slave mode

Command	Response	Parameter
AT+ROLE= <param/>	OK+RoleMode= <param/>	0:Master
	+SUCCESS	1:Slave

10, Bluetooth master slave mode scans nearby slave

Command	Response	Parameter
AT+SCAN	OK+Scan	Null
	OK+DISC[0]:xxxx	
	OK+DISC[1]:xxxx	
	OK+SCAN DONE	



11, Connect slave bluetooth by scanning return index

Command	Response	Parameter
AT+CONN= <param/>	OK+CONN= <param/>	Scan slave bluetooth subscript
		Numbers

12. Connect the slave to bluetooth by connecting the master to the slave via bluetooth Mac address

Command	Response	Parameter
AT+CON= <param/>	OK+CON= <param/>	Slave bluetooth address

- OK+Scan
- OK+DISC[0]:3234CFE9D1C3
- OK+DISC[1]:464288AEAB8F
- OK+DISC[2]:3CA5080A62FB
- OK+DISC[3]:30AEA42BF189
- OK+DISC[4]:58803C6EFB0A
- OK+SCAN DONE
- AT+CONN=1 Represents the second bluetooth device scanned by the connectionAT + CON = 464288AEAB8F Connect directly to a device with the Mac address 464288AEAB8F
- 13. Enable bluetooth automatic connection mode

When enabled, the bluetooth module will automatically connect to the device that was successfully connected last time

Command	Response	Parameter
AT+AUTOCON= <param/>	OK+AutoCon= <param/>	0: Close automatic connection
	+SUCCESS	1: Automatic connection at
		startup

14. Disconnect from the current bluetooth device

Command	Response	Parameter
AT+DISCON	OK+Disconnect	Null

15 Set whether a password is required for a bluetooth connection

Command	Response	Parameter
AT+AUTH= <param/>	OK+AuthMode= <param/>	0: Not need Password connection
	+SUCCESS	required



		1: Password connection required
16. Setting the bluetooth conne	ction is a password	
Command	Response	Parameter
AT+ PASS= <param/>	OK+ PassWord= <param/>	
	+SUCCESS	

17、 Set bluetooth working mode

Command	Response	Parameter
AT+ MODE= <param/>	OK+ WorkMode= <param/>	0: unvarnished transmission
	+SUCCESS	1: driving pattern
		2:iBeacon

18. Set bluetooth USB and bluetooth data transfer modes

Command	Response	Parameter
AT+ BLEUSB= <param/>	OK+UsbBleTransmitMode= <param/>	0:close
	+SUCCESS	1:USB Serial data to BLE
		2:BLE data to USB 串口
		3:USB Serial data and
		BLEunvarnished transmission

19. Set the bluetooth transmission power

Command	Response	Parameter
AT+ TXPOWER= <param/>	OK+TxPower= <param/>	0:4db
	+SUCCESS	1:0db
		2:-6db
		3:-23db

19、Sets the minimum communication interval in milliseconds for the BLE chip

Command	Response	Parameter
AT+MINI_INTERVAL= <param/>	OK+ Mini_Interval= <param/>	For PC and Android, it is
	+SUCCESS	recommended to set it to 10iOS
		device, and it is recommended to
		set it to 20



20、Sets the maximum communication interval in milliseconds for the BLE chip

Command	Response	Parameter
AT+MAX_INTERVAL= <param/>	OK+Max_Interval= <param/>	For PC and Android, it is
	+SUCCESS	recommended to set it to 10iOS
		devices and 40

$21\,{\mbox{\scriptsize s}}$ Set the BLE receive gain

Command	Response	Parameter
AT+RXGAIN= <param/>	OK+RxGain = <param/>	0: Typical Gain
	+SUCCESS	1: HG(high gain)

22、Set the BLE feature code UUID

Command	Response	Parameter
AT+SRVUUID	Servic UUID=0XFFE0	

23, Set the BLE character feature code

Command	Response	Parameter
AT+CHARUUID	Char UUID=0XFFE1	

24, SOftware Reset

NULL

25、系统设置

Command	Response	Parameter
AT+SETTING= <param/>	+SUCCESS	DEFAULT: factory data reset
		PARI_DEFAULT :Clear pairing
		information



FAQ

- Q1: What is the difference between a Ble-Nano and a regular Nano board, and how do I start using this development board
- A1: Ble is the Nano in the original official arduino Nano V3.0 adding CC2540 Mini bluetooth 4.0 interface
 Usb upgraded to a more general Micro Usb interface, pin function is fully compatible with latest
 Bootload Bootload burning need to use the above 1.8.8 IDE can burn, other methods of use please refer to the official arduino Nano usage.
- Q2 : Common problem of abnormal communication between bluetooth 4.0.
- A2: Recommended inspection steps:
 - 1) Update firmware to latest version;
 - 2) Restore factory Settings by AT instruction (AT+SETTING=DEFAULT). (see: configure BLE devices by AT instruction)
 - Check whether the communication baud rate of bluetooth module, program code and other relevant places is consistent; (the control panel with a crystal oscillator frequency of 8MHz supports a baud rate of up to 38400bps.)
 - 4) Whether the bluetooth device supports 4.0 or not, there will be compatibility problems with the bluetooth module of CC2540 and other brands. Please try your best to connect with the bluetooth module of CC25xx

Q3 :Why can't my phone connect to the Ble-Nano, and even if it does, it can't communicate?

A3: Please check whether your mobile phone supports bluetooth 4.0. In addition, please use the Scan button in the APP to Scan the connection of Ble-Nano. No password is required for connection. The bluetooth setting interface and other BLE apps are not supported.

Q4:How to use Ibeacon function?

A4: You can find relevant instructions to turn on/off the Ibeacon function in the AT list, and then download an Ibeacon query software in the app market, and you can query Ibeacon. AT this time, Bluno is an Ibeacon label.

Q5 : Does Ble-Nano support multi - connection? I want to connect many slave machines with one host, how many can I connect at most?

A5: Ble-Nano does not support multi-connection, but the idea of multi-connection can be realized by constantly switching binding slave machines.

Q6 : Why can't the Ble-Nano bluetooth 4.0 products connect to bluetooth 2.0 devices?



A6: In order to achieve very low power consumption, our Bluno series adopts single-mode Bluetooth Smart, which is optimized in both hardware and software, and can only support BLE, but not connected to Bluetooth 2.0 devices.