

## **Operation Manual for DBM01 Module**

This document demonstrates how to use AT commands of DBM01 modules with USB-to-TTL board DAC02 through computer and test the basic communication with Android / iPhone/iPad.

# 1. PREPARATION



Figure 1: DBM01 Pin Names



Figure 2: DAC02 Pin Names

Considering the Bluetooth module works under 3.6V, we choose 3.3V version of USB board DAC02-3. In order to demonstrate the functions of AT commands, the CTRL pin should be connected to logic low so we connect the CTRL pin of DBM01 to the GND pin. For the first use of DAC02 board, the USB driver should be installed in advance. Certainly users also can



choose other 3.3V USB-to-TTL board to test the modules. After connecting the five pins (GND, VCC, TXD, RXD, CTRL) with USB board correctly, users then connect the kit to computer and run the popular serial port tool SecureCRT<sup>®</sup> from VanDyke Software to use AT commands.

## 2. AT COMMAND MODE

### • Practice AT COMMANDS With Computer

Users can download 30 days free version of SecureCRT<sup>®</sup> from VanDyke Software or purchase it for long-term use. After connecting the USB board with DBM01 module to computer, users can check which COM port the board uses by right-clicking my computer, choosing device manager and clicking the Ports (COM and LPT). After that users can run the software and click "File" from the menu and choose "Quick Connect" from the drop-down list and make the selection showed in the picture below:

🛅 not connected - Se	cureCRT	
File Edit View C	Deptions Transfer Script Tools Help Enter host <alt+r> Quick Connect Protocol: Serial Port: COM3 • Flow Control Baud rate: 38400 • Flow Control Data bits: 8 • Flow Control Data bits: 8 • Control Stop bits: 1 • •</alt+r>	
	Show quick connect on startup Save session Open in a tab Connect Cancel	
Ready	1, 1 24 Rows, 80 Cols VT100	CAP NUM

Figure 3: Configuring SecureCRT Software

The COM port used here is COM3. Because the default baud rate of DBM01 module is 38400, we choose the same setting and the protocol is Serial. After clicking "Connect" button, the software window will display the data format at the bottom of the tool.

### ADW1009



🕞 seri	al-com	n <mark>3 (3)</mark> -	SecureCR	Т										23
File	Edit	View	Options	Transfer	Script	Tools	Help							
<b>1</b> 0 8	96	() 🕺	Enter ho	st <alt+r></alt+r>		þ í	1 <b>A</b> A	6	4 🞒	8	81	0		÷
< seri	al-com	13 <mark>(</mark> 3)												4 ک
														н
I														
														*
														*
														Ŧ
Ready				Serial: C	OM3, 38	400	1, 1	24 Ro	ws, 80 (	Cols	VT100		CAP	IUMi

### Figure 4: Data Format Setting With Correct COM Port

serial-Session Options - serial-con	n3 (3)	X	1 <u>83</u>
File       E         Category:       □         Connection       □         - Logon Actions       □         - Serial       □         □       Emulation         □       Emulation         □       Advanced         □       Appearance         □       Window         - Log File       Printing         □       X/Y/Zmodem	Advanced Emulation         Advanced terminal options         Answerback:         Terminal type:         Display tab as:         Other         Local echo         Strip 8th bit         Ignore window title change requests         Copy translates ANSI line-drawing characters         Translate incoming CR to CR/LF         Send delay options         Line send delay:       5         Character send delay:       0         Other		
Ready			NUM

## Figure 5: Advanced Emulation in Session Options



Now we come to the right place and start the journey by inputting "AT" command and pressing "Enter" key on the keypad, the module will respond with "OK" at the second line in the tool window.

senal	-com	o - sec	urecki	_				
File E	dit	View	Options	Transfer	Script	Tools	Help	
2 S	G	43 <b>X</b>	Enter ho	st <alt+r></alt+r>	_			3 53
؇ serial	-com	3						4 Þ
AT OK								
								E

### Figure 6: Using the First AT Command

Congratulation! You know how to use AT commands. Let us move to the next step to see what AT commands are supported by the module. Continuing to input AT+HELP and press ENTER key, a list of AT commands will be showed in the windows For some systems which the 38400 baud rate is not supported, we can use AT command to change the rate to the targeted values by using AT command AT+UART. Firstly we can type AT+UART? and press ENTER to check the default baud rate.



🕞 serial-com3 - S	SecureCRT		_ 0	23
File Edit Viev	w Options Transfer	Script Tools	Help	
19 <b>2</b> C 43	Enter host <alt+r></alt+r>		L #A   🕞	- Se -
< serial-com3				۵ ۵
AT+HELP Commands: E HELP SEND CFG SAVE LOAD LOADDEFT NAME UART FLOW ROLE PAIRM PAIRC PAIRA FORCEK FORCEC CONN DISC SCAN DEVLIST AUTOSCAN NOTIFY ADDR TXPOWER ADDR TXPOWER ADDR TXPOWER BTPARAM2 SLEEP SLEEPOS RSSI RESET VER				
Ready	Serial: COM3, 38400	38, 1 38 Row	vs, 50 Cols	VT10

Figure 7: AT Commands Set



Figure 8: AT Command for Baud Rate

Some systems hate the data rate of 38400 bps so we change the value to 9600 bps to make them happy. We can easily do it by inputting "AT+UART=9600,N,8,1" and pressing ENTER. The tool quickly responds with OK. After typing inquiry command AT+UART?, the windows shows the right value. It seems everything is ok, isn't it?

🕞 seria	al-con	13 - Sec	ureCRT					Σ	3
File	Edit	View	Options	Transfer	Script	Tools	Help		
<b>1</b> 5 3	] (;	I 🕷	Enter ho	st <alt+r></alt+r>		b ii	A   7	9 59	⊨ ∓
؇ seri	al-con	13						4	⊳
AT+UA OK AT+UA 9600, OK	RT=9 RT? n,8,	600,N 1	,8,1						*
									4 M
									*
Ready		S	erial: COM	3, 38400	6, 1	17 Row	s, 50 Cols	VT10	▼ 

### Figure 9: Changing the Baud Rate

The testing results go toward what we expect. Hold on! Something seems to be abnormal. The baud rate of DBM01 module is 9600 bps now but the baud rate of serial port of computer is set to 38400 bps. How could the tool still communicate with the DBM01 module at mismatched data rates? Let us be back to the AT COMMAND SET section of DBM01 datasheet:

Some commands of DBM01 module come into effect after executing **AT+SAVE** command but for other commands they need to execute another command **AT+RESET** after using command **AT+SAVE** in order to reset the module and let it work in new parameters.

Unfortunately the command AT+UART belongs to the second category in the table 5 so the execution of this command only means the DBM01 module stores the new parameters into the buffer area. We input AT+SAVE and press ENTER; then input AT+RESET and press ENTER again. Now DBM01 module works at 9600 bps and the serial port of computer works at 38400 bps. If you continue to input other commands, the windows will display strange characters (Maybe be used in Mars). In order to continue the testing, we should match the baud rate of DBM01 module with the data rate of serial port by right-clicking the Serial-COM3(or other COM number according to your computer) in the tool window and choosing "session option" to change the data rate of the latter to 9600 bps.



📑 seria	al-con	13 - Sea	cureCRT				_ 0	23	2
File	Edit	View	Options	Transfer	Script	Tools I	Help		
<b>%</b> 3	] (;	I 🕷	Enter hos	t <alt+r></alt+r>		Þ L	#1 -	53	÷ ₹
؇ seri	al-con	13						4	Þ
AT+UA OK 9600, OK AT+SA OK AT+RE 订約导领导	RT=9 RT? n,8, VE SET 编	600,N 1	,8,1						•
									-
									*
Ready		S	erial: COM	3. 38400	9 8	17 Rows	50 Cols	VT10	

Figure 10: UART Command Demonstration

Ports COM3		
Baud rate: 9600 Data bits: 8 Parity: None Stop bits: 1 Serial break length: 10	Flow control DTR/DSR RTS/CTS V V Image: State of the stat	
	Data bits: 8 Parity: None Stop bits: 1 Serial break length: 10	Data bits: 8  Parity: None  Stop bits: 1  Serial break length: 100  milliseconds

Figure 11: Changing Data Rate of Serial Port

### Communicate With IPAD/IPHONE

We are happy to live in the ages with so many geniuses who create so wonderful software and share with others selflessly. LIGHTBLUE is a very smart tool for testing the basic communication between IPAD/IPHONE system and other Bluetooth devices. It can be downloaded from the APP STORE of APPLE as free and can be installed easily.

About		LightBlue	
Scanning for Periph	erals	Services	Characteristics
DBM BLE Service: Unknown («fff0»)	>		
DBM BLE TX Power Levelt 4 Local Name DBM BLE Service: Unknown (4805) Manufacturer Data: <01125	>		

Figure 12: LightBlue with DBM01 Module

Because the CTRL pin of DBM01 is still connected to GND, the communication with IOS is tested in AT COMMAND MODE as peripheral device (ROLE pin is floated). Assuming the USB board with module is still connected to computer, the tool LIGHTBLUE will find it after scanning.

💼 seri	al-con	n3 - Sea	cureCRT						23
File	Edit	View	Options	Transfer	Script	Tools	Help		
<b>*</b> 5	90	C 🔏	Enter ho	st <alt+r></alt+r>		b	1 AA   🕞	5	<b>3</b>   ;
< ser	ial-con	13							4 ⊳
+CONN AT+SE 5 dat OK	ND=4 ASS	44F52 ent	4A49						E
									-
									*
									-
Ready		S	erial: COM	3, 38400	6, 1	21 Row	vs, 53 Cols	VT10	0

Figure 13: Sending Data in AT COMMAND MODE

Considering the module is in AT COMMAND MODE, the data sent by DBM01 module must be started with the AT command: AT+SEND and the full format is: AT+SEND=X,

among which X is the data package (<22 bytes). We check the ASCII character list and find the corresponding Hex codes for ASCII characters DORJI is 444F524A49. We input the AT command AT+SEND=444F524A49 in the window of SecureCRT and press ENTER. The tool will display how many bytes are sent.

		1: 1: 3:41		
About		LightBlue		
Scanning for Pe	ripherals	Bervices		Characteristics
		> 0x1800	>	OxFFF6 UURD FFF6 Properties flead Write
DBM BLE	Contraction of the second s	0x1801	>	0xFFF2 UUID FFF2 Properties Read
TX Penetic University 4 University Penetic Penetics Represent University (2000)		> Device Information		0xFFF3 UUID FFF3 Properties: Write
Maradiacherae Daha sebitides		OXFFFO UUID: FFFO	•	OxFFF7 UUID FFF7 Properties Notify
				OxFFF5 Properties Read
				0xFFF1 Voperties Write
				OxFFF4
	ASCII	DORJI		
	ASCII Hex	DORJI 0x444F524A49		
	ASCII Hex Decimal	DORJI 0x444F524A49		
	ASCII Hex Decimal Date	DORJI 0x444F524A49 2014/02/24 15:40:05:555		
	ASCII Hex Decimal Date	DORJI 0x444F524A49 2014/02/24 15:40:05:555 Read		
	ASCII Hex Decimal Date	DORJI 0x444F524A49 2014/02/24 15:40:05:555 Read I mode lets you connect to p	eripherals a	around you.

Figure 14: Read Data in IPAD/IPHONE

We then switch back to LIGHTBLUE and check if the data is received by clicking DBM BLE, "0xFFF0" and choosing the READ command "0xFFF4". The data sent by DBM01 will be displayed on the screen of IPAD/IPHONE. If we want to send data to DBM01 module, we can click the DBM BLE, "0xFFF0" and choose the WRITE command "0xFFF1". We choose to input ASCII data "DORJI" directly in the pop-up window and click the SEND key on the screen





Figure 15: Send Data By IPAD/IPHONE

If you still keep the SecureCRT tool running, the DBM01 module will receive the data sent by IPAD/IPHONE and display it in the window.



serial-com	3 - Sec	ureCRT						23
File Edit	View	Options	Transfer	Script	Tools	Help		
19 20 Co	ł] 🗶	Enter hos	t <alt+r></alt+r>		Þ B	#1 -	3	<b>3</b>   📜
؇ serial-com	3							4 ⊳
AT+SEND=44 5 datas se OK +DATA: 444	4F524 ent IF524/	1A49 A49						
								E
								-
								*
								*
Ready	Se	erial: COM	3, 38400	5, 1	21 Rows	s, 53 Cols	VT100	

Figure 16: Receiving Data from IPAD/IPHONE

## Communicate With Android System

DBM01 module also can work with Android system. Because Android OS is very different from IOS, some parameters of DBM01 module need to be refined in order to get the best performance. We can use Working Parameter List Command: AT+BTPARAM=Lis1 to adjust the system parameters of DBM01 module. The default parameter list for DBM01 is: (35,18,37,0,200) which is optimized for IOS system and the Central-to-peripheral communication mode..

AT+BTPARAM=List1	ОК	The command is used to change the response
		speed and power consumption of DBM01.
		List1 refers to the parameters list. Wrong
		parameters might cause the module out of
		service so users can use the parameters lists
		recommended by DORJI.
AT+ BTPARAM?	35,18,37,0,200	
	ОК	

Table 1: Configure Working Parameter List1 Command



🕞 serial-co	m3 - Sea	cureCRT						83
File Edit	View	Options	Transfer	Script	Tools	Help		
10 SI G	I 🕄 🔏	Enter ho	st <alt+r></alt+r>		la 🖺	#1 😼	54 🗄	)   <del> </del>
< serial-co	m3						4	⊳
OK	am <i>?</i> ,0,200							
								-
								*
								~
Ready	S	erial: COM	3, 38400	1, 1	21 Row	s, 53 Cols	VT100	

Figure 17: Default Working Parameter List1

For Android OS, we need to change the working parameter list to one of the recommended parameters in the table below:

	AT+BTPARAM=35,100,800,0,200
Working Parameter List1	AT+BTPARAM=800,100,800,0,200
	AT+BTPARAM=3200,100,800,0,200

 Table 2: Working Parameter List1 For Android OS

Smaller values mean higher response speed so we can choose the first line of parameters for testing. Assuming the DBM01 is still in AT Command Mode, we continue to input the AT command (AT+BTPARAM=35,100,800,0,200) and press ENTER. The new parameters will be saved into buffer temporarily so we need to execute other commands: AT+SAVE and AT+RESET to make the parameters come into effect.



🕞 seri	ial-con	n3 - Sea	ureCRT						23	3
File	Edit	View	Options	Transfer	Script	Tools	Help			
<b>1</b>	90	C) 🔏	Enter ho	st <alt+r></alt+r>		h 🕻		6 5	₿	++ ∓
؇ ser	ial-con	n3							4	⊳
AT+B1 35,18 OK AT+B1 OK AT+S/ OK AT+R8	TPARA 8,37, TPARA AVE ESET	M? 0,200 M=35,	100,800	,0,200						•
										-
										*
										Ŧ
Ready		S	erial: COM	3, 38400	9, 1	21 Row	/s, 53 Col	s VT1	.00	

Figure 18: Changing Working Parameter List1

Now we download the demonstration APP--- BluetoothLeGatt.apk from Android website or click **HERE** for direct downloading. The tool only can run at Android 4.3 or higher version and the testing below is undergoing in SAMSUMG NOTE 2. The interface of this apk only provides the READ operation so we only test the sending data function of DBM01 module with SECURECRT tool. As soon as the DBM01 module is still connecting to computer and the SECURECRT tool is still running, this APK tool will find the module after it runs in the mobile phone.



Figure 19: Bluetooth Tool in Android

We click the device name "DBM BLE" in the interface and tool will enter into next page.





Figure 20: Connection with Android

The State line of this tool shows the module is connected with Android system. The serial tool SecureCRT tool will receive a event notice (+CONN: 1) from DBM01 module to indicate that the connection is established.

🕞 seria	al-con	n3 - Se	cureCRT						23
File	Edit	View	Options	Transfer	Script	Tools	Help		
<b>1</b>	9 (7	£] 🔏	Enter ho	st <alt+r></alt+r>		b	L #1   🖓	5	3   🕈
؇ seri	al-con	n3							4 ⊳
+CONN	: 1								
									H H
									*
Ready		5	erial: COM	3, 38400	2, 1	21 Rov	vs, 53 Cols	VT100	) <sub></sub>

Figure 21: Connection Event Notice

For this Bluetooth tool in Android, it only can demonstrate the READ DATA function. We input the testing data (AT+SEND=444F524A49) in SecureCRT window and press ENTER.



The DBM01 module will respond with data package information after successful sending.

🕞 ser	ial-con	n3 - Se	cureCRT						Σ	3
File	Edit	View	Options	Transfer	Script	Tools	Help			
- <b>1</b>	90	2 🔏	Enter ho	st <alt+r></alt+r>		Þ ľ	a a a a a a a a a a a a a a a a a a a	8	4	
< ser	ial-con	n3							4	⊳
AT+SI 5 da 0K	N: I END=4 tas s	44F52 ent	4A49							ш
										*
										*
										$\overline{\nabla}$
Ready		S	erial: COM	3, 38400	5, 1	21 Row	s, 53 Co	ols VT1	.00	at

Figure 22: Sending Data to Android OS

Let us switch back to the testing tool in Android OS. We need to choose the last line which starts with 0000fff0 and move the next interface.



#### Figure 23: Read Command in Android OS

We scroll down the tool to the bottom and click the command line starting with 0000fff4.



The data sent by DBM01 module will be displayed.



Figure 24: Received Data in Android OS

# 3. TRASPARENT DATA COMMUNICATION

In former sections we discussed about the modules working in the AT command modes. In this section we will demonstrate the communication between two DBM01 modules in transparent data mode. Let us be back to the APPLICATIONS section on the page 5 of DBM01 datasheet and start the testing in Automatic Mode. For this mode, one module must be set to the central module and another must be peripheral module.

DBM01 works as the peripheral module by default. If the PAIRK pin [P0.1] is floated and AT+PAIRM=0, the modules will be in Automatic Mode. We can connect the ROLE pin of one module to logic low to make this module work as central module. If the users have changes the default working parameters by Configure Working Parameters List1 Command in former testing, they should change it back to the default parameters (35,18,37,0,200) to get the best performance. We can enter into AT command mode to check related parameters if the CTRL/P0.6 is still connected to low.



ADW1009

Connection	Serial Opti	ons	
Logon Actions Logon Actions Serial Terminal Modes Emulation Modes Emucs Mapped Keys Advanced Appearance Window	Port: Baud rate: Data bits: Parity: Stop bits:	COM3 <ul> <li>Flow control</li> <li>DTR/DSR</li> <li>RTS/CTS</li> <li>XON/XOFF</li> </ul> <li>None         <ul> <li>T</li> </ul> </li>	
Log File Printing X/Y/Zmodem	Serial break	length: 100 km milliseconds	

Figure 25: UART Data Rate

itegory:	
Connection Logon Actions Serial Terminal Emulation Emucs Mapped Keys Mapped Keys Advanced Appearance Window Log File Printing X/Y/Zmodem	Advanced Emulation         Advanced terminal options         Answerback:         Terminal type:         Display tab as:         Display tab as:         Other         Local echo         Strip 8th bit         Ignore window title change requests         Copy translates ANSI line-drawing characters         Image: Translate incoming CR to CR/LF         Send delay options         Line send delay:       5 milliseconds         Character send delay:       0 milliseconds

Figure 26: CR to CR/LF is Enabled in Transparent Data Mode



							57
serial-com3 - S	SecureCRT						25
File Edit View	v Options	Transfer	Script	Tools	Help		
19 19 19 19 19 19 19 19 19 19 19 19 19 1	Enter ho	st <alt+r></alt+r>		b 🕻	1 AA   76	53 6	3 📮
؇ serial-com3							۹ ک
AT+PAIRM?							^
0							
ок							
AT+BTPARAM?							
35,18,37,0,20	00						
ок							
AT+ROLE?							-
0(2)							-
ок							
AT+UART?							
38400,n,8,1							
ок							
							-
							-
Ready	Serial: COM	3, 38400	26, 1	26 Row	rs, 53 Cols	VT100	

#### Figure 27: Checking Related Parameters

In transparent data transmission, the central module needs five pins (VCC,GND, TXD, RXD and ROLE) and the peripheral module needs four pins (VCC,GND,TXD and RXD). As to other unused pins, we can keep them floated. Now we can connect the modules to 2pcs of 3.3V DAC02 board correspondingly as described at the beginning of this document. If the modules are connected correctly and the UART parameters are correctly, the two modules can start to talk now. As soon as the modules are powered on, the paring mechanism between the central module and peripheral module is fulfilled automatically. In the pictures below, central module uses COM14 and peripheral module uses COM3. We can type the data in any of the text input box in one module and press ENTER key, the data will be showed in the display area of another module.



🕞 serial-com3 - Se	ecureCRT		_ 0	23
File Edit View	Options Transfer	Script	Tools H	Help
\$\$ \$\$ C \$\$ \$	Enter host <alt+r< th=""><th>&gt;</th><th>h 🖺</th><th>#A 📋</th></alt+r<>	>	h 🖺	#A 📋
✓ serial-com3				< ▷
Hello, MS. Pe	rıpn			E
Nice to meet	you. Sir.			•
Ready	Serial: COM3, 38400	2, 1	17 Rows,	

Figure 28: Peripheral Module gets Data from Central module

💼 seria	l-com	14 - Se	ecureCRT				53
File	Edit	View	Options	Transfer	Script	Tools I	Help
- <b>1</b>	0	C) 🔏	Enter ho	st <alt+r></alt+r>		ի 🖺	#a [
< seria	l-com	14					4 ⊳
Nice t	:o m	eet y	ou. Sir				-
							Е
							-
							*
							Ŧ
Ready		S	erial: COM	17, 38400	2, 1	17 Rows	45 Co

Figure 29: Central Module Receives Data from Peripheral Module



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In this section we demonstrate the communication between two DBM01 modules in none AT command mode and make the testing in the first one (Automatic Mode) of the four paring mechanism. Considering Ms. Peripheral module accepts the invitation for dinner from Mr. central module, users can use AT commands or the I/O ports to verify the communication in other three paring mechanisms.

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Dorji Applied Technologies	and to discontinue any product or service without
A division of <i>Dorji Industrial Group Co., Ltd</i>	notice. Customers are expected to visit websites for
	getting newest product information before placing
Add.: Xinchenhuayuan 2, Dalangnanlu, Longhua,	orders.
Baoan district, Shenzhen, China 518109	
Tel: 0086-755-28156122	These products are not designed for use in life support
Fax.: 0086-755-28156133	appliances, devices or other products where
Email: sales@dorji.com	malfunction of these products might result in personal
Web: http://www.dorji.com	injury. Customers using these products in such
	applications do so at their own risk and agree to fully
	indemnify Dorji Industrial Group for any damages
	resulting from improper use.