Embedded Bluetooth

Module – FB151AX

Firmtech

ABOUT FB151AX:

18 PINs Header type

Class 1 / Compact Size

SPP Profile Support

AT Command provided

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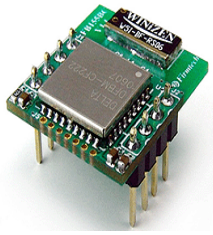
BM series & FB Series

	FB151AX	BM2001	FB151AS	FB151AC	FB155BC
Bluetooth Serial Adapter					
Description	Bluetooth Serial adapter	Bluetooth USB Adapter	Embedded bluetooth module	Embedded bluetooth module	Embedded bluetooth module
Power Class	Class1	Class1	Class1	Class1	Class2
RF Range	Up to 100m	Up to 100m	Up to 100m	Up to 100m	Up to 30 m
Power Connector	DC plug or DB9	USB port	Header 2.54mm	Header 2.54mm	Header 2.54mm
Power Voltage	DC 5V ~12V	DC 5V	DC 3.3V	DC 3.3V	DC 3.3 V
Signal Interface	Female DB9	USB	Header 2.54mm 1X 9X2	Header 2.54mm 1X 9X2	Header 2.54mm 1X4X2
Serial Interface	RS232	RS232	UART	UART	UART
Flow Control	RTS,CTS,DTR,DSR Support	RTS,CTS,DTR,DSR Support	RTS,CTS,DTR,DSR Support	RTS,CTS,DTR,DSR Support	RTS,CTS Support
DIP Switch	Support	Support	No	No	No
Bluetooth Profile	Serial Port Profile	Serial Port Profile	Serial Port Profile	Serial Port Profile	Serial Port Profile
Bluetooth Version	1.2	1.2	1.2	1.2	1.2
Applicable Antenna	Stub Antenna Dipole Antenna Patch Antenna	Stub Antenna Dipole Antenna Patch Antenna	Stub Antenna Dipole Antenna Patch Antenna	Included Chip Antenna	Included Chip Antenna
Certification	FCC,CE,MIC	FCC,CE,MIC	MIC	MIC	MIC
Dimension	68 X 21 X 16	70 X 23 X 11.5	36.5 X 23 mm	37.5 X 23 mm	18 X 20 mm

Accessories

Antennas				
Part No	**FBA001DA** 	**FBA003DA** 	**FBA004DA** 	**FBA008PA** 
RF Gain	1 dBi	3 dBi	4 dBi	8.5 dBi
Dimension	30 X 8 mm	105 X 11 mm	170 X 13.5 mm	150 X 150 mm
Connector	SMA male	SMA male	SMA male	SMA male
Hand direction	Right Hand	Right Hand	Right Hand	Right Hand
Distance	100 M	150 M	200 M	800 M
Extension Cable				
Part No	**FBA015EC** 	**FBA100REC** 		
Length	150 mm	1 M		
Power Supply				
Part No	**FBA001PA** 	**FBA001UPC** 		
Input Voltage	Free	From USB port		
Output Voltage	DC 5V	DC 5 V		

Table of Contents

1. About FB151AX

Embedded Bluetooth module, FB151AX is a product that is developed, designed and produced by Firmtech Co, ltd. (formerly BTnetworks Inc.). It is for replacement of standard RS232 cable perfectly, with standard TTL interface, so can be easily adopted for industrial machines with TTL interface.

Strong Security

Security of Bluetooth wireless communication is very strong because it uses the frequency hopping and 128bit encryption in 2.4Ghz frequency range.

Enhanced Frequency Hopping

FB151AX is supported Bluetooth version 1.2 for AFHS.

Simple Using

Hardware setting is very easy and simple.

- The maintenance is very convenience.
- One pair of FB151AX will try to connect automatically whenever powered up.

It does not require extra software for operation.

- No installation of driver and application software.

Simple Configuration

User may set the parameter of FB151AX with HyperTerminal on PC.

Flow control support

FB151AX provides RTS, CTS, DTR, and DSR basically.

AT Command

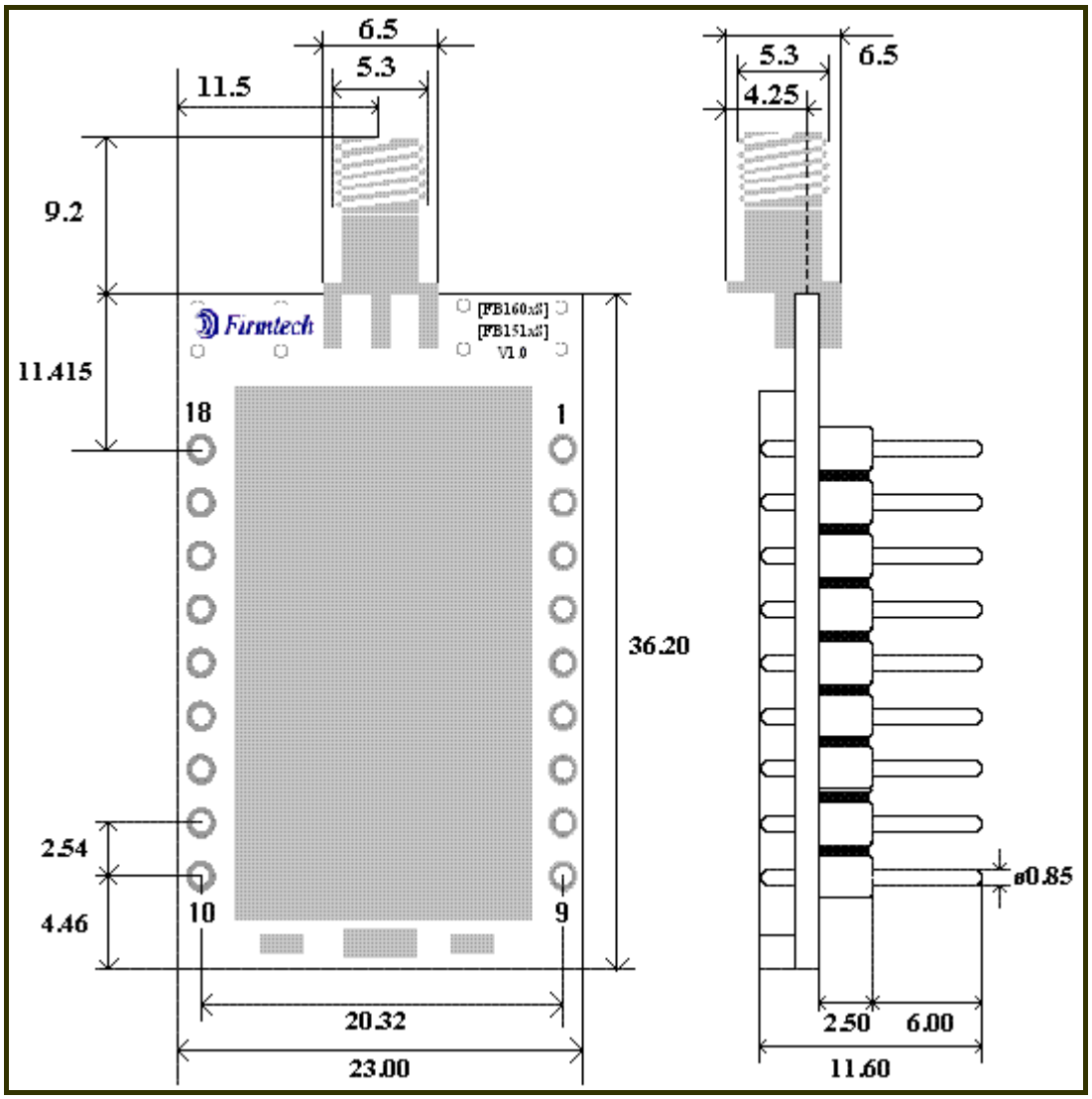
User can control FB151AX with typical AT command like a dial-up modem.

2. External View

2.1 FB151AS

This needs the external dipole antenna. Its SMA connector is right threaded.

User can choice the external antenna as one like it.

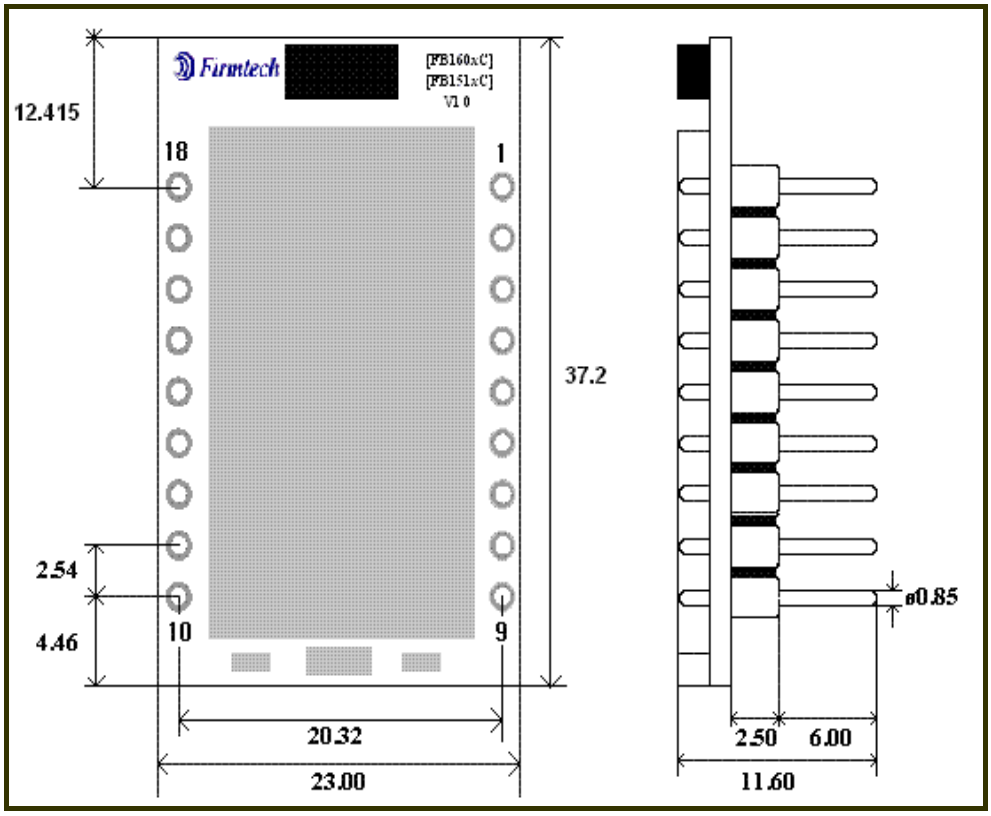


Dimension (W x V) : 23 X 36.2 mm **Header pitch: 2.54 mm**

<Fig 2.1 FB151AS Dimension >

2.2 FB151AC

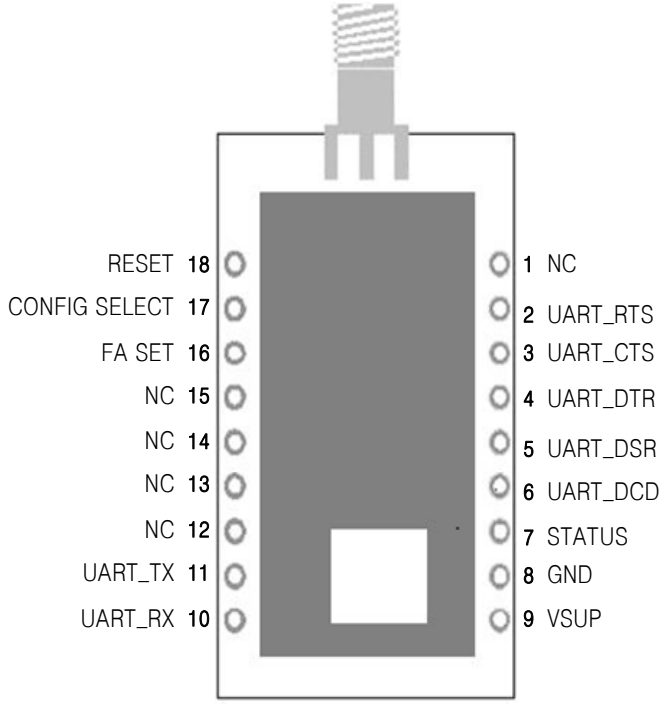
This is included Chip antenna. So it doesn't need the external antenna.



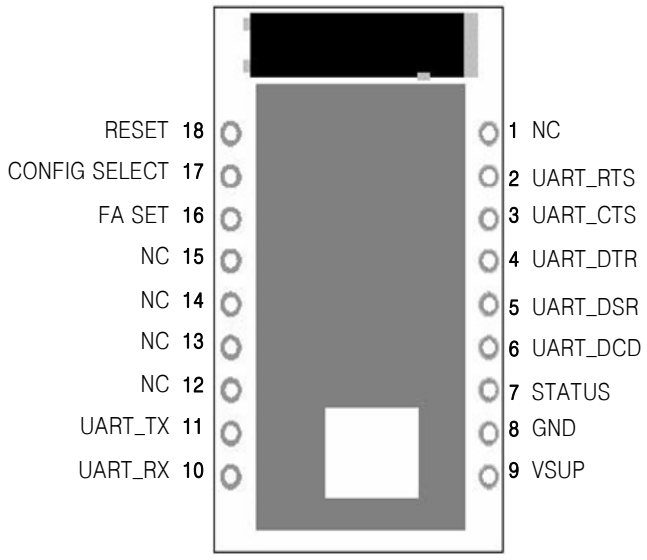
Dimension (W X V) : 23 X 37.2 mm **Header Pitch : 2.54 mm**

<Fig 2.2 FB151AC External view >

2.3 FB151AS PIN Assign



2.4 FB151AC PIN Assign



FB151AS and FB151AC have same properties. It is different only the antenna.

No	Pin Name	I/O	Description
1	NC	-	-
2	UART_RTS	O	UART Ready To Send (TTL)
3	UART_CTS	I	UART Clear To Send (TTL)
4	UART_DTR	O	UART Data Set Ready (TTL)
5	UART_DSR	I	UART Data Terminal Ready (TTL)
6	UART_DCD	O	UART Data Carrier Detect (TTL)
7	STATUS	O	STATUS LED
8	GND	I	Ground
9	VSUP	I	3V3 for RF circuit (Vcc)
10	UART_RX	I	UART data input (TTL)
11	UART_TX	O	UART data out (TTL)
12	NC	-	Don't Use
13	NC	-	Don't Use
14	NC	-	Don't Use
15	NC	-	Don't Use
16	FA SET	I	Go back default setting **(Full-up)**
17	CONFIG SELECT	I	Configuration select **(Full-down)**
18	RESET	I	Reset if high (Over 4 msec)

<Table 2.1 Pin Assign >

1. **Hard Reset**

   If user wants to get back the default setting, input the low signal (Active low) to pin16 for 3 seconds when pin 17 is full up.

2. **Soft Reset**

   To do soft reset, input the active high for 4m sec to pin 18.

   ***Caution: if keep the active high condition at pin 18, FB151 cannot run.**

3. **Status port**

   This port output the signal to Host.

   Connected: output the active low

   Disconnect or try to connect: output the active Low and high

4. **CTS/RTS, DTR/DSR**

   If user doesn't need flow control feature, don't connect this port.

3. Specification & Current consumption

Part	Specification
Bluetooth Spec	**Bluetooth Specification V1.2**
Communication distance	**100 M**
Frequency Range	**2.4 GHz ISM Band**
Sensitivity	**-83dBm (Typical)**
Transmit Power	**10dBm (Typical)**
Support Bluetooth Profile	**SPP**
Input Power	**3.3V**
Current Consumption	**Max 100 mA**
Operating Temperature	**-20℃ ~ 70℃**
Communication Speed	**1200 bps ~ 115,200 bps**
Antenna	**Dipole or Chip Antenna**
Interface	**UART (TTL Level)**

<Table 3.1 FB151AX Specifications >

Status	Current Consumption MAX (mA)
Standby	6
Device searching	50
Inquiry scan & Page scan	46
After Connection	26
Data Transferring	40
Power save mode	6

<Table 3.2 Power consumption >

Test Environment

Baud rate: 9600 bps, Input Voltage: DC 3.3V

The power consumption is different depend on the transferring speed.

4. Default Setting

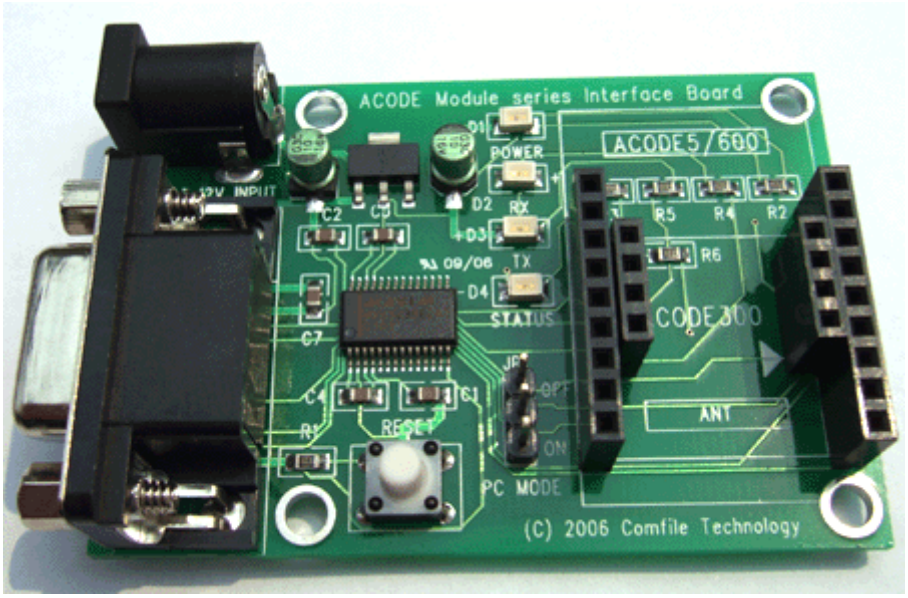
FB151AX's default setting is below table.
Check on the setting of FB151AX before using it.

MENU NO	MENU ITEM	VALUE
0	DEVICE NAME	FB151AX
1	AUTHENTICATION	DISABLE
2	REMOTE BD ADDRESS	000000000000
3	CONNECTION MODE	MODE4
4	UART CONFIG	9600bps 8-N-1
5	STATUS MESSAGE	ENABLE
6	POWER SAVE MODE	DISABLE
7	ROLE	SLAVE

<Table 5.1 default setting>

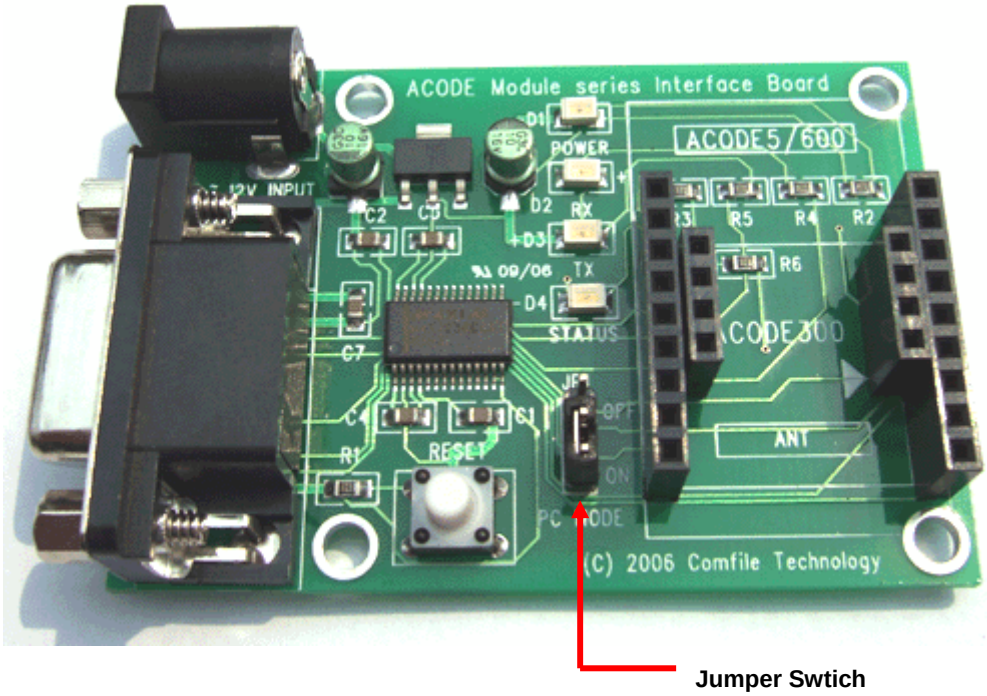
5. Interface Board

To change the parameter of FB151AX, user needs the interface board.
The interface board converts from TTL to RS232.



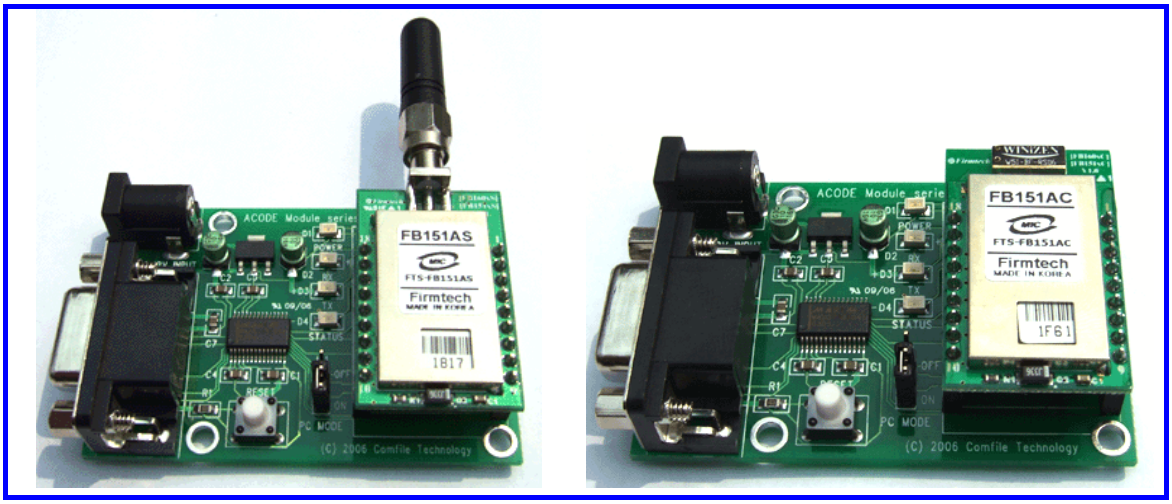
Refer to **6.PC configuration mode** to change the parameter of FB151AX.

There are two modes according to the Jumper setting.



Jumper Swtich

Jumper Switch	Description
OFF	Operation Mode
ON	PC configuration Mode



<The interface board with FB151AX>

6. Set parameters of FB151AX

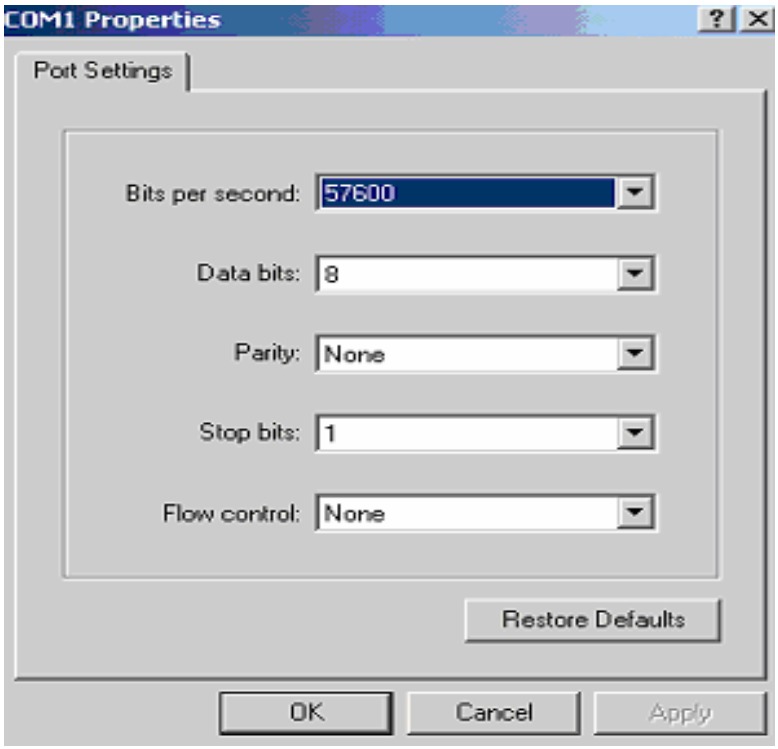
6.1 Prepare for PC Configuration mode

You should do below procedures in order to use the PC Configuration mode before turn on the FB151AX.

[1] In order to use PC Configuration Mode, you need the serial communication software.
Here we explain the usage scenario with HyperTerminal of Windows.

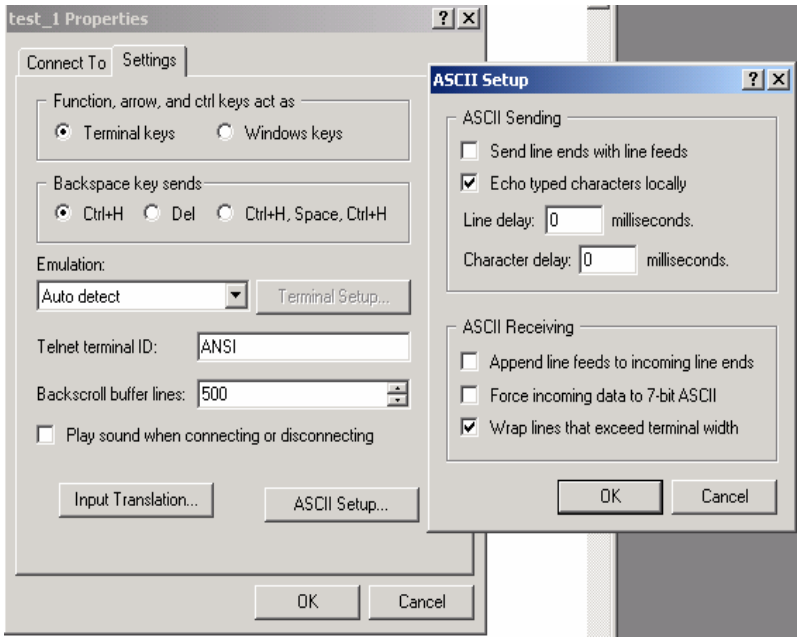
[2] Find the COM port of Computer that is attached to FB151AX.
Computer has 2 COM port, COM1 and COM2.
If you use the USB to serial converter, find its COM port number.

[3] Run HyperTerminal program and select COM port.
COM port's properties window will be displayed.



[4] Set the Values as below.
Bit per second: 9600 bps
Data bits : 8, Parity : None, Stop bit : 1, Flow control : None
[5] Push the OK button.

[6] Open the menu [File➔Property➔Configuration] at Menu Bar.



[7] Click to “ASCII Setup” button of Settings tab in the properties to into ASCII setup mode. Check the “Echo typed characters locally” box in the ASCII Sending.

[8] Afterward above set up and turn on the FB151AX.

*** Interface board’s mode is PC configuration mode.**

6.2 Using PC configuration Mode

Start PC configuration Mode, user can see below menu in HyperTerminal window.

```
|=============== BTWIN ==============|
|        Model name : FB151xx         |
|        Version    : 2.0             |
|=====================================|

==================== TOP MENU ============
0 => DEVICE NAME           : FB151v2.0
1 => AUTHENTICATION        : DISABLE
2 => REMOTE BD ADDRESS     : 000000000000
     LOCAL BD ADDRESS      : 0011B1A11F61
3 => CONNECTION MODE       : MODE4
4 => UART CONFIG           : 9600bps 8-N-1
5 => STATUS MESSAGE        : ENABLE
6 => POWER SAVE MODE       : DISABLE
7 => ROLE                  : SLAVE
=========================================
[ Back Spcae : Input data Cancel
[ t : Move top menu
=========================================
Select Menu(0~7) >
```

How to use the menu

Select the menu that is user want to change in the menu list.
Input the number of menu to select the menu.

Ex) If you want to change DEVICE NAME
At select menu, Input "0" and "Enter" key. [**0 ↵**]

1) Input the number of menu and then input "Enter" key.
2) Small "**t**" always moves to TOP MENU.
3) To cancel current input character use the "🡐" Back Space key and "**ESC**" key.
4) If the entered character is wrong, "**Retry >** " message will be displayed.
5) You can enter the character until maximum 12 characters.
   If the entered characters exceed than 12 characters, it will display "**Overflow buffer**" message. And then it will display "**Retry >** " message.

***If you want to get the factory setting, do hard reset button on PC configuration mode.**

6) After change the configuration, to take effect FB151AX's power off and on.
7) Change the mode to the operation mode.

6.3 Explain the **MENU**

6.3.0. Device Name

NO	Menu	Default Value
0	Device Name	FB151 V2.0

[0.1] Bluetooth device's name

User can change the device name within 12 characters.

[0.2] Afterward input the name then press the enter key.

Appear "Change Complete!!" message and then move to TOP MENU.

6.3.1. Authentication

To connect other bluetooth devices it needs an authentication, pin code, encryption. User may set them in this menu.

NO	Menu	Default Value
1	Authentication	Disable

Sub Menu

No	Menu	Default Value
1	Authentication	Disable
2	PIN CODE	BTWIN
3	Encryption	Disable

1.1 Authentication

[1-1-1] User may set to request the authentication procedure.

[1-1-2] When it is disable, the encryption feature is disable too.

[1-1-3] The default setting is disable.

1.2 PIN CODE

[1-2-1] It is like a password.

[1-2-2] To connect between two devices, they have to have a same pin code.

[1-2-3] You can enter the pin code within 12 characters.

[1-2-4] After enter the pin code, "Change complete !!" message will be displayed. And then move to AUTHENTICATION SUB MENU.

1.3 Encryption

[1-3-1] This encrypt the data between two bluetooth devices.

[1-3-2] The default setting is disable.

[1-3-3] If the authentication is disable, this is disable too.

6.3.2. Remote BD ADDRESS / Local BD Address

NO	Menu	Default Value
2	REMOTE BD ADDRESS / Local BD Address	000000000000

2.1 Local BD Address

[2-1] This is a MAC address of Bluetooth Device. It is fixed parameter. You can't change it.

2.2 Remote BD ADDRESS

[2.2.1] This is the latest paired bluetooth device address.

[2.2.2] If you want to connect new bluetooth device, delete the latest paired bluetooth device address and then enter new bluetooth address. (In mode3)

[2.2.3] If you want to write the Remote BD Address directly, "Connection Mode" has to be Mode3.

[2.2.4] If you input the Remote BD address as twelve zeros "000000000000", FB151AX will be connect the first bluetooth device has same pin code around it.

6.3.3. Connection Mode

NO	Menu	Default Value
3	Connection Mode	Mode4

[3.1] There are 4 modes.

Mode1 / Mode 2 / Mode 3 / Mode 4

[3.1.2] MODE 1

in this mode, FB151AX always connect the latest paired bluetooth device.

If FB151AX has not the Remote BD address, try to connect the first bluetooth device is searched. At this time, two bluetooth devices must have same PIN code.

[3.1.3] MODE 2

1) In MASTER Case

FB151AX can search the bluetooth devices have same PIN code round it.

And the bluetooth devices list will be displayed.

User can select one among the bluetooth devices list.

Operation

FB151AX search for the bluetooth devices round it.

Keep searching mode until search for 7 slave devices.

```
Start Inquiry....
========== Key Operation ==========
[ 1~7 : Choice  slave device       ]
[ s   : Stop inquiry               ]
[ r   : Restart inquiry            ]
[ Back space : Input Cancle        ]
====================================
Num  BD ADDRESS    LOCALNAME            CoD
 1   000A94029702  BHBAIK               1c010c
 2   0011B1A10A35  BM2001v3.2           001f00
============================================
Choice slave device >
```

Menu	Description
1~7	Search for 7slave devices.
S	Stop search
R	Restart search
Back Space	Cancel the input character

If you want to terminate searching mode, input “s”.
Input the number of device and FB151AX tries to connect with it.
If fail to connect, it will be displayed message “The selected device is not connectable!!”

2) In SLAVE case

FB151AX is **inquiry scan** and **page scan mode**.
When it received the connection request from the Master has same PIN code, it connect the master.

After pairing, FB151AX’s connection mode should be Mode1.
If you don’t it, whenever powered up FB151AX will search for the bluetooth device round it.

[3.1.4] MODE 3

If you know the Remote BD address, you can change the Remote BD address directly.
Input the BD address of Remote device to “Remote BD Address”.

If you input twelve zero”000000000000” to Remote BD address, FB151AX will be connect the first bluetooth device has same pin code around it.

[3.1.5] Mode 4

Waiting for AT Command.
User can control FB151AX with AT command only.
Refer to AT Command list.

6.3.4. UART CONFIG

NO	Menu	Default Value
4	UART Configure	9600 bps
		Data bit: 8bit
		Parity bit: None
		Stop bit: 1

SUB MENU

No	Menu	Default Value
1	Parity Bit	None
2	Stop Bit	1
3	Baud Rate	1200 ~ 115,200 bps

[4.1] RS-232 (Parity Bit)

Parity Bit is NONE, ODD and EVEN.

[4.2] RS-232 (Stop Bit)

STOP Bit is 1 Bit and 2 Bit.

[4.3] Baud Rate

User select the baud rate of FB151AX.

6.3.5.Status Message

NO	Menu	Default Value
5	Status Message	Enable

Status Messages

No	Messages	Description
1	“BTWIN Master Mode Start	Working start FB151AX as Master mode
2	“BTWIN Slave Mode Start”	Working start FB151AX as Slave mode
3	“ Connection OK”	Connected with remote device
4	“Disconnection”	Disconnected with remote device

If you don’t want these messages, set the status message as disable.

6.3.6. Power Save Mode

NO	Menu	Default Value
6	Power Save Mode	Disable

[6.1] FB151AX provide power save feature.

If you use this option, FB151AX needs wake-up time about 3 seconds.

[6.2] If you don’t need this feature, set the power mode as disable.

6.3.7. Role

NO	Menu	Default Value
7	Role	Slave

Bluetooth device should be one of the Master and Slave.
If one is the master mode, opposite side should be Slave.

7. Pairing

Pairing

To communicate between bluetooth devices, they have to do pairing.
The pairing defends the hacking from unknown bluetooth device.

PIN Code

Two bluetooth devices have same pin code for pairing.
If you want to pair with other bluetooth device, refer to its users manual.

Fix the PIN Code

FB151AX's pin code is "BTWIN".
If other bluetooth device's pin code is different, change the pin code.

Search for bluetooth device around

FB151AX has to be master mode to search for bluetooth device.
When FB151AX is slave mode, it can only inquiry scan and page scan mode.

Connection Mode

FB151AX has 4 connection modes. The default mode is **MODE4**.

Mode 1

FB151AX will try connection with the last paired bluetooth device.
FB151AX memory BD address of the last paired bluetooth device.
If FB151AX has not the Remote BD address, try to connect the first bluetooth device is searched. At this time, two bluetooth devices must have same PIN code.

Mode 2

Search for bluetooth device around FB151AX, and user can choice one of them.
FB151AX will try connecting with it.

Mode 3

If you know the bluetooth address, you can change the Remote BD address directly.
Input the BD address of Remote device to "Remote BD Address".
If you input twelve zero"000000000000" to Remote BD address, FB151AX will be connect the first bluetooth device has same pin code around it.

Mode 4

Waiting for AT Command. User can control and set FB151AX with AT command.

7.2 Pairing on each connection mode

Check FB151AX's setting.
If you don't know the setting of FB151AX, do hard reset FB151AX on PC configuration mode.

7.2.1 MODE1

FB151AX has not the remote BD address to do pairing on Mode1.
Delete the Remote BD address on PC configuration mode.
If you feel it is difficult, reset FB151AX on PC configuration mode.

[1] There are two FB151AXs.
One should be Master mode and opposite side should be Slave mode.
[2] Change the connection mode to MODE1 on PC configuration mode.
[3] Power OFF.
[4] Change the mode to DIP Switch Mode.
[5] Set the baud rate of FB151AX. Two devices have to set as same baud rate.
[6] FB151AX is powered on.
[7] FB151AX will try connect with the first bluetooth device has same pin code.
When the status LED is flashing until make pairing.
[8] After paired, the status LED is stable.
[9] After the first pairing, FB151AX will connect with the paired device whenever powered on.

*** Notice**
If there are a lot of bluetooth device nearby, this way is not good.

7.2.2 MODE2

[1] Change the connection mode to MODE2 on PC configuration mode.
[2] Power off and change the mode to Operation mode.
[3] Power on.
[4] **Master Mode**
Search for the Bluetooth device around it.
When this time the searched bluetooth devices are slave mode.
Display the bluetooth devices list and information.
Slave Mode
FB151AX is the inquiry scan and page scan mode.
It can not search for the bluetooth device nearby.
[5] Choice one bluetooth device of them.
[6] FB151AXtry connect with the bluetooth device.
[7] If fail to connect, it will display " can't connect with selected device"
[8] After pairing, change the connection mode of FB151AX to MODE1.
If you don't change the connection mode of FB151AX, whenever FB151AX is powered on it will search for bluetooth device.

7.2.3 MODE3

[1] Change the connection mode to MODE3 on PC configuration mode.
[2] Input the Remote BD address which is you have known.
[3] Change the connection mode to MODE1.
[4] Power OFF.
[5] Change the mode to DIP switch mode.
[6] Power ON.
[7] If FB151AX can connect with the remote bluetooth device, responds the connection ok message.
[8] If fail, responds error massage.

7.2.4 MODE4

AT Command controls FB151AX.
Refer to AT command manual.
AT command is used only **on Operation Mode.**

[1] Change the connection mode to Mode4 on PC configuration mode.
[2] Power off.
[3] Change the mode to **Operation mode**.
[4] Power on.
[5] FB151AX is waiting the AT command from host.
[6] Input "AT+BTINFO? ↵" to FB151AX.
FB151AX respond its status information to host.
[7] Change the role of FB151AX as master.
Input "AT+BTROLE=m↵" to FB151AX.
If you want to change the role as slave, input "AT+BTROLE=s↵".
[8] To do soft reset, input "ATZ↵" to FB151AX.
[9] To search for the bluetooth devices that are slave mode, input "AT+BTINQ?↵".
FB151AX will give the information of the bluetooth devices.
If you want to terminate searching task, input "AT+BTCANCEL↵".
[10] To connect with the bluetooth device, input "ATD 123456789012↵".
123456789012 is the bluetooth device address.
[11] If FB151AX is paired, it respond "Connection "remote device address" message.

8. Communication with FB151AX

Communication test at 9,600 bps

To connect between 2 FB151AXes, one should be Master and opposite side should be slave. Set the parameter on PC configuration mod.

Master Mode	Slave Mode
Master 9600 bps Mode1	Slave 9600 bps Mode1

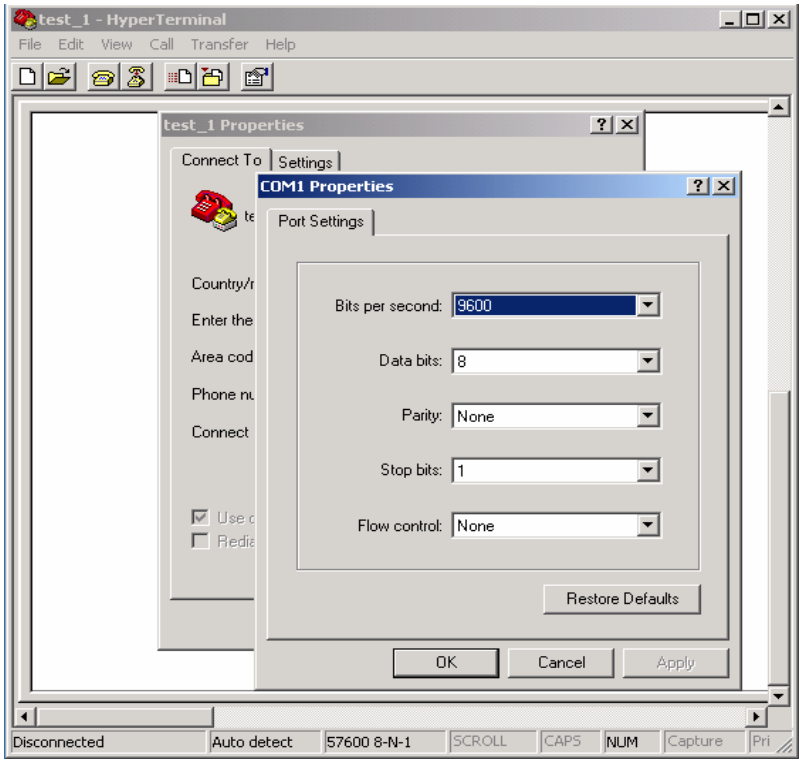
Follow these procedures.

[1] Attach FB151AX to RS232 port of each PC.
- Using the interface board.
- Mode jumper is set as operation Mode.

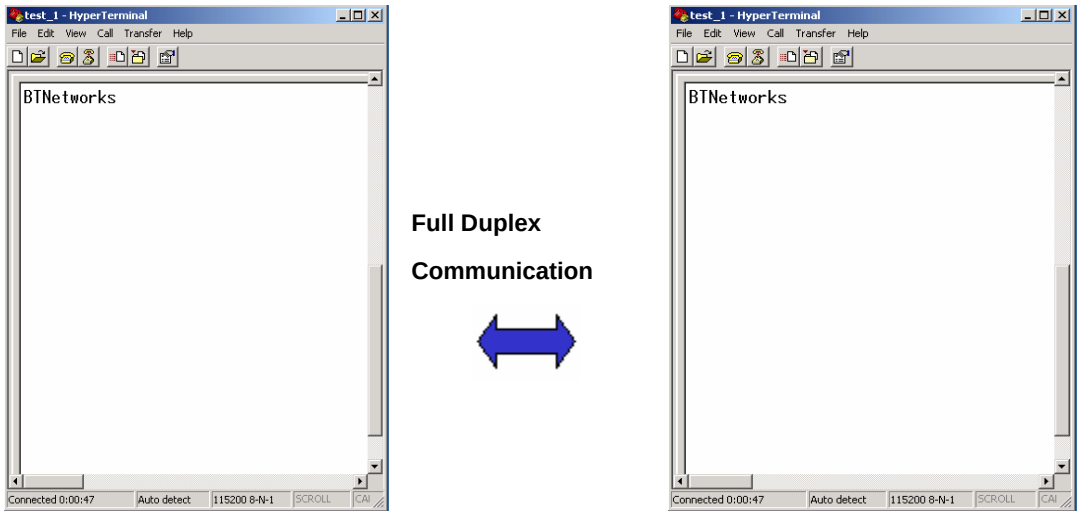
[2] Turn on the power switch.
Turn on the power switch and FB151AX will start working

[3] Run the hyper terminal at each PC. And then set the parameters as below picture.

9600 bps / 8 bit / None / 1 /None



[6] Enter the characters via keyboard at each PC in order to transmit the data between two PCs.



PC1

PC2

[7] If users may see the characters on both windows, it means data communication both way through FB151AXs and setup is successful.

9. AT Command

Device

"HOST" is side to control the bluetooth device with AT Command.

"Bluetooth module" is bluetooth device.

AT command

Bluetooth module provides the extended AT command set to control and configure the serial parameters and bluetooth connection.

AT Response

Bluetooth module replies to AT commands with some messages,

"OK" , "ERROR" , "CONNECT", "DISCONNECT" , "STANBY", "PENDING".

Connection MODE

FB151AX is waiting for AT Command on **MODE4.**

Operation Status

Standby: Waiting for AT Commands

Pending: Executing Tasks

Connect: Connected with the remote bluetooth device

Bypass: Transmitting data

Security

Authentication: PIN Code

Encryption: Data encryption

Symbols

The symbols are used for the description of command syntax as follows.

Symbol	Meaning	ASCII Code
↵	**Carriage return**	**OXOD**
¶	**Line feed**	**OXOA**
∠	**Carriage return + Line feed**	
123456789012	**Bluetooth device address**	
N	**One digit decimal number**	
T0	**Timeout in second**	

Command Category

Command Category	Index	AT Commands
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Setting AT commands need soft reset after change the setting of FB151AX.

9.1 Description of AT COMMAND

1. AT ↵

Feature	Check the connection status with host device
Response	∠ **OK** ∠
Description	Check if the connection to host device is normal. The serial parameters of FB151AX must be same as those of host device. If not bluetooth module is none or 'ERROR'

2. ATZ ↵

Feature	Software reset
Response	∠ OK ∠
Description	This is the same effect as power off and on. This command disconnects bluetooth module and stop ongoing task. Some AT commands need this command to take effect.

3.AT&F↵

Feature	Hardware reset
Response	∠OK∠
Description	This is the same effect as initialization by reset button. All parameters are initialized to factory defaults.

4. AT+BTINQ? ↵

Feature	Search for bluetooth devices around
Response	∠ <Bluetooth address>,<Device name>,<Cod> ∠
Description	The bluetooth devices in inquiry scan mode nearby are displayed with their BD address, Device name and Class of device. Maximum 8 devices are scanned for 30 seconds. After searching, response the 'OK' message.

5.AT+BTINFO?n ↵

Feature	FB151AX respond its settings information according to n	
Response	∠<Device Name>∠ ∠<Pin Code>,Authentication,Encryption ∠ ∠<Remote Addr>∠ ∠<Connection MODE>∠ ∠<Baud rate>∠ ∠<Status message>∠ ∠<Power save mode>∠ ∠<Role>∠ ∠<DB addr>∠	
Description	Respond FB151AX's setting information according to n	
	N=0	Device name (Friendly name)
	N=1	PIN code , Authentication and Encryption setting
	N=2	The latest paired bluetooth device address
	N=3	Operation Mode (MODE1 ~ 4)
	N=4	FB151AX's baud rate setting
	N=5	Status message on, off
	N=6	Power save mode on, off
	N=7	FB151AX's Role < master or slave >
	N=8	FB151AX's local BD address
	N=9	Link supervisor time out
	Ex)	AT+BTINFO?0↵ (Respond device name)
		AT+BTINFO? ↵ (Respond the operation status)

6. ATD123456789012 ↵

Feature	FB151AX try to connect to the bluetooth device has BD address “123456789012 “
Response	∠ OK ∠ ∠ CONNECT ∠ (success make connection with “123456789012”) ∠ ERROR ∠ (fail to make connection)
Description	FB151AX try to connect to the bluetooth device has BD address “ 123456789012”. The bluetooth device must be in page scan mode to make successful connection. If it fails to make connection, FB151AX respond ‘ERROR’ message.

7. ATD ↵

Feature	Connect to the last connected bluetooth device
Response	∠ OK ∠ ∠ CONNECT ∠ (Success make connection with the last connected bluetooth device) ∠ ERROR ∠ (fail to make connection)
Description	FB151AX memory the BD address of the bluetooth device most recently connected. ATD can make connection to it without its BD address. If it fails to make connection, FB151AX respond ‘ERROR’ message. If FB151AX has not Remote device BD address, it will respond “error” message.

8. AT+BTSCAN ↵

Feature	Wait for inquiry and connection from other bluetooth devices.
Response	∠ OK ∠ ∠ CONNECT ∠ (Success make connection with other bluetooth device)
Description	This command allows the inquiry and connection from the other bluetooth devices. The operation status will be in ‘Pending” after this command. When connection is made and released, the operation status is back to ‘Pending’. To convert the operation status to ‘Standby” AT+BTCANCEL must be used. This has the same effect as AT+BTSCAN,3,0.

9.AT+BTSCAN,n,t0 ↵

Feature	Wait for inquiry and connection from other bluetooth devices for t0 seconds.	
Response	∠ OK ∠ ∠ CONNECT ∠ (Success make connection with other bluetooth device)	
Description	FB151AX allow the inquiry or connection according to n.	
	N=1	Allows inquiry scan. This option, FB151AX can't connect with other bluetooth device.
	N=2	Allow page scan. Other bluetooth devices can't search FB151AX. But Other bluetooth devices can connect with FB151AX.
	N=3	Allows both of inquiry scan and page scan.
	For the given t0, FB151AX is waiting for the inquiry and connection from other Bluetooth devices. If the t0 is 0, it will wait forever.	

10. AT+BTSCAN123456789012,t0 ↵

Feature	Wait for connect by the bluetooth device has BD address "123456789012" for t0 seconds
Response	∠OK ∠ ∠CONNECT∠ (Success make connection with remote device)
Description	For the given t0, FB151AX is waiting for connect by the bluetooth device has BD address "123456789012". If t0 is zero '0', it will wait forever. Not allow the inquire scan mode. Allow the page scan mode only.

11. AT+BTCANCEL ↵

Feature	Terminate a current executing task
Response	∠ OK ∠
Description	This command terminates a current executing task, such as inquiry scan and page scan, then converts the operation status to 'Standby'.

12.+++

Feature	Convert the operation status from 'Bypass' to 'Standby'
Response	∠ OK ∠
Description	In 'connect' status, data from host is transmitted to the other side bluetooth device, and any AT command is not accepted, but this command which is not echoed on the screen. When FB151AX encounters a character '+' from host, it stop the data transmission and waits for next 2 characters. If the next 2 characters aren't both '+', it restart to transmit data including the first '+' as well. If not , it converts the operation status to 'Standby'. If the data from host includes '+++', it will convert the operation status to 'Standby' unexpectedly. Notice that FB151AX holds data transmission when it encounters '+', until receiving next character. '+' is an escape sequence character by default, which is changeable by AT+SETESC.

13. ATO↵

Feature	Converter the operation status of 'Standby' to 'Connect'
Response	∠OK ∠
Description	User can convert the operation status of 'Standby' to 'bypass' ready to transmit data.

14. ATH↵

Feature	Release the current connection
Response	∠ OK ∠ ∠DISCONNECT∠
Description	The current Bluetooth connection is released normally.

15.AT+BTSEC, Authentication, Encryption ↵

Feature	Set authentication and data encryption
Response	∠ OK ∠
Parameters	Authentication=0 (disable), 1 (Enable - default) Encryption= 0 (disable) , 1 (Enable- default)
Description	If the authentication is enable, the pin code must be set by AT+BTKEY command. Data encryption cannot be used when authentication is disabling.
Ex	AT+BTSEC,1,1<cr>

16. AT+BTMODE,n ↵

Feature	Set connection Mode	
Response	∠OK∠	
Description	FB151AX has 4 connection modes. FB151AX's working is different on each connection mode.	
	N=1 **MODE1**	Try connection with the latest paired bluetooth device
	N=2 **MODE2**	Master mode: Search for the bluetooth device has same pin code nearby Slave mode : Inquiry scan and page scan mode
	N=3 **MODE3**	Master mode : try connection with given BD address device Slave mode: Inquiry scan and page scan mode
	N=4 **MODE4**	Wait AT command
	To take effect of this command ATZ or soft reset.	

17. AT+BTNAME=device name ↵

Feature	Change FB151AX's device name
Response	∠ OK ∠
Description	FB151AX can have a user-friendly name to identify easily like "Rocket". The name allows 12 alphanumeric characters maximum.

18. AT+BTKEY=XXXX ↵

Feature	Change PIN code of FB151AX
Response	∠ OK ∠
Description	PIN code is a string, which allows 12 alphanumeric characters maximum. Default value is "BTWIN".

19. AT+BTLPM,n ↵

Feature	Set power save mode
Response	∠OK∠
Parameters	N=1 (Enable the power save mode)
	N=0 (disable the power save mode)
Description	During no data transmission, FB151AX can be in power save mode to save the power consumption. When this option is enabling, it need wake-up time.

20 .AT+SETESC,nn ↵

Feature	Change the escape sequence character
Response	∠OK∠
Description	Escape sequence character set to "+++" (default). The parameter nn must be a printable character.
Ex	AT+SETESC,2B↵

21 AT+BTMSB,n ↵

Feature	Status message on, off
Response	∠OK∠
Parameters	N=1 (Disable the status message) N=0 (Enable the status message)
Description	Whenever FB151AX is powered up, FB151AX respond the status message, "Master mode start", "Slave mode start" and "connect <BD address>". If you don't want them, disable this option.

22.AT+BTROLE=X ↵

Feature	Set FB151AX's role (Master or Slave)
Response	∠OK∠
Parameters	X=m → master mode X=S → Slave mode
Description	If you want to search the bluetooth device, it has to be a master mode. But you want inquiry scan or page scan mode, it has to be a slave mode.
Ex	AT+BTROLE=M<cr>

23. AT+BTUART,baudrate,paritybit,stopbit↵

Feature	Set serial parameters	
Response	∠OK∠	
Parameters	Baud rate range	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
	Parity bit	NONE / EVEN / ODD
	Stop bit	1 or 2
Description	The serial parameters can be set or changed. The default setting is 9600,N,1 To take effect of this command, ATZ or reboot.	
Ex	AT+BTUART,57600,N,1↵	

24. AT+BTLT=xx↵

Feature	Set the link supervisor time out cycle.
Response	∠OK∠
Description	Link manager layer check the connection status cyclic. User can set the cycle time (To) from 1 to 99 sec. Default time is 20 sec.
Ex	AT+BTLT=20 ↵

25. AT+BTADDR=xxxxxxxxxxxx ↵

Feature	Set the Remote bluetooth device address
Response	∠OK∠
Description	If you want to change the remote bluetooth device, you can use this command.
Ex	AT+BTADDR=123456789012 ↵

9.2 Command Validity

NO	AT Command	STANDBY	PENDING	CONNECT	Bypass
1	AT↵	❩	❩	❩	
2	ATZ↵	❩		❩③	
3	AT&F↵	❩			
4	AT+BTINQ? ↵	❩①			
5	AT+BTINFO?n↵	❩	❩	❩	
6	ATD123456789012↵	❩①			
7	ATD↵	❩①			
8	AT+BTSCAN↵	❩②			
9	AT+BTSCAN,n,to↵	❩②			
10	AT+BTSCAN123456789012,to↵	❩			
11	AT+BTCANCEL↵		❩		
12	+++				❩
13	ATO↵			❩	
14	ATH↵			❩	
15	AT+BTSEC,Authentication,Encryption↵	❩			
16	AT+BTMODE,n↵	❩			
17	AT+BTNAME=Device name↵	❩			
18	AT+BTKEY=xxxx↵	❩			
19	AT+BTLPM,n↵	❩			
20	AT+SETESC,nn↵	❩			
21	AT+BTMSG,n↵	❩			
22	AT+BTROLE=x↵	❩			
23	AT+BTUART,b,p,s↵	❩		❩	

① When role is master, can use it.

② When role is slave , can use it.

③ When use AT+BTUART,b,p,s↵ command, can use it.

FB151AX has 4 statuses.

STANDBY: Waiting for AT command from the Host device

PENDING: Executing Task

CONNECT: Connected with remote device

BYPASS: Data transmition between two bluetooth devices

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