IO Expansion Shield User Manual

1 Features

- 3-pin & 4-pin sensor interfaces, supports connecting sensors directly without complicate custom connections
- XBee module connector
- WIFI-LPT100 wireless module connector

2 What's on Board

- 1. XBee module connector
- 2. IIC interface
- 3. SPI interface
- 4. 3-pin sensor interface
 - VCC : power positive
 - o GND : ground
 - D : digital pin, correspond to the Arduino board
- 5. WIFI-LPT100 connector
- 6. 4-pin sensor interface
 - VCC : power positive
 - o GND : ground
 - A : analog pin, correspond to the Arduino board
 - D : digital pin, correspond to the Arduino board
- 7. VCC configuration : for selecting sensor interfaces power voltage
- 8. Debugging/Communication selection jumper
 - when connecting TXD and TX, RXD and RX respectively, the Arduino board may debug/config the XBee module or WIFI-LPT100 through serial port
 - when connecting TXD and RX, RXD and TX respectively, the Arduino board may communicate with the XBee module or WIFI-LPT100 through serial port



- 9. Power indicator
- 10. WIFI-LPT100 state indicator
- 11. XBee module state indicator
- 12. WIFI-LPT100 RELOAD button : for restoring to factory setting
- 13. XBee module and WIFI-LPT100 RESET button
- 14. XBee module EASYLINK button

3 Getting started with IO Expansion Shield

3.1 Preparations

- One WIFI-LPT100 module
- Two Arduino development boards
- Two XBee modules
- Two IO Expansion Shields
- TCP232 serial software

3.2 How to use with WIFI-LPT100 module

WIFI-LPT100 is a Wi-Fi wireless communication module developed by Waveshare. It adopts LPT100 wireless technology. This module features with Wi-Fi to serial conversion function, making it possible to be operated as a serial port and providing good user experience in MCU communication.

- 1) Insert the WIFI-LPT100 module into the WIFI-LPT100 interface of IO Expansion Shield, and set the jumpers of IO Expansion Shield:
 - Connect TXD toTX;
 - Connect RXD to RX.
- 2) Connect IO Expansion Shield to Arduino development board.
- Power up Arduino development board, and connect it to a PC via a USB cable.
 Waiting a few seconds, the READY LED indicator will light up.
- 4) Open Wi-Fi on your PC, and check the wireless network status (Usually, there will be a symbol in stair-step shape appears on the right of the taskbar. Clicking this symbol, you will see the available Wi-Fi connection(s)). Select WIFI-LPT100 and Connect.





- Start the software TCP232, and select corresponding COM port. Then, set the Baud rate: 115200, and click the button **OPEN**. Configure the parameters in option NetSettings :
 - Protocol->TCP Client
 - Server IP->10.10.100.254
 - Server Port->8899

And click the button **Connect**.

6) Enter a message in the data transmission box on the button left, and click the button Send nearby. You can find that the message will be received by the network data receive box. Similarly, when you input a message in the data transmission box on the button right, and click the button Send nearby, you can see that the message you inputted will be received by the COM port data receive

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	22 to Falson at Convert to at	-			
Clark-ICP252-Test K52	52 to Ethernet Convert teste	r			
COMSettings	COM port data receive		Network data receive		NetSettings
Dentilings	Sand from TCPTP		Receive from 10 10 100 25	4 · 8899 1 ·	(1) Protocol
	Della LI ON TOTAL		Send from RS232		TCP Client
BaudR 115200 -					(0) 0
DPaity NONE 💌					(2) Server IP
DataB 8 bit 🔻					10.10.100.254
					(3) Server Port
StopB I Dit					8899
💓 Close					🔅 Disconnect
Recv Options	1				Recv Options
Receive to file					Receive to file
Add line return					Add line return
Receive As HEX					Receive As HEX
Receive Pause					Receive Pause
Save Clear					Save Clear
Send Options					Send Options
□ Data from file					Data from file
Auto Checksum					Auto Checksum
Auto Clear Input					Auto Clear Input
Send As Hex				_	Send As Hex
Send Recycle			LocalHost 10.10.100.15	0 Port 51986	□ Send Recycle
Interval 1000 ms	Send from RS232	Grad	Send from TCPIP	Card	Interval 1000 ms
Load Clear		Send		Send	Load Clear
💣 Ready!	Send: 15 Recv	: 15 Reset	💓 Ready!	Send: 15	Recv: 15 Reset

Figure 1: Setting TCP232

- 7) If you need to use the Arduino development board to deal with the data received by WIFI-LPT100, you should set the jumpers of IO Expansion Shield:
 - Connect TXD to RX;
 - Connect RXD to TX.

Now, you can transmit data between WIFI-LPT100 and the MCU of Arduino development board.

3.3 How to use with XBee module

XBee of MaxStream is a wireless communication module based on ZigBee technology. In an easy-to-use design, it can automatically transmit the inputted data to another XBee module by wireless connection. And it also supports AT commands for advance configuration.

- Prepare two XBee modules, two IO Expansion Shields and two Arduino development boards. In this document, we will divide them into two groups: Group A and Group B, of which Group A includes XBee-A, IP Expansion Shield-A and Arduino development board-A, and Group B includes XBee-B, IP Expansion Shield-B and Arduino development board-B.
- Insert the XBee-A into the XBee interfaces of IO Expansion Shield-A, and insert the XBee-B into the XBee interfaces of IO Expansion Shield-B respectively.
- 3) Connect the IO Expansion Shield-A to the Arduino development board-A, and connect the IO Expansion Shield-B to the Arduino development board-B respectively. And power up the Arduino development boards, and connect them to your PC via USB cables.
- 4) Set IO Expansion Shield jumpers:

- Connect TXD to TX
- Connect RXD to RX

Notices: The USB interface, TX and RX pins of Arduino development board should be used in the processes described below, so please make sure that the projects running on the Arduino development board will not occupy any serial port. If necessary, you can remove the AVR chip from Arduino development board before performing the following operations.

- 5) Start X-CTU software to configure XBee module on your PC.
 - Select the corresponding COM port in PC Settings bar, and set relative parameters, such as baud rate. The factory default settings of XBee module is as followed:
 - Baud rate: 9600
 - Data Bits: 8
 - Parity: NONE
 - Stop Bits: 1

(To make sure XBee module can operate properly, the relative settings of it should be configured correctly. You can configure the XBee module by X-CTU tool, or by AT commands via a serial terminal. This document will introduce how to use X-CUT tool to configure XBee merely.)

R X-CTU		×						
PC Settings Range Test Terminal Modern Configuration								
Com Port Setup								
Select Com Port								
Arduino Mega 2560 (COM9) 通信端口 (COM14)	Baud	9600	-					
	Flow Control	NONE	•					
	Data Bits	8	•					
	Parity	NONE	•					
	Stop Bits	1	-					
	Te	st / Query						
Host Setup User Com Ports Ethernet Com Ports								
- API								
🗖 Enable API								
□ Use escape characters (ATAP = 2)								

Figure 2: X-CTU operation interface

b) Click the button **Test/Query** to test whether the software is connected to the XBee module properly. Normally, we will see the dialog box popped out, as Figure 3 shows. If it cannot communicate with the XBee module but all the communication parameters are set correctly, please check the USB connection and the jumper settings on the Arduino development board and the XBee expansion board. (The main control chip of Arduino UNO R3 is a DIP

AVR MCU. You can remove it to retry, if necessary.)

Com test / Query Modem		
Communication with modem0K Modem type = XB24-B Modem firmware version = 1020		
	Retry	ОК

Figure 3: Testing the connection to the XBee module

- c) After a successful test, click the option Modem Configuration.
- d) Then, click the button **Read** to get the current parameters of XBee-A.

및 X-CTU [COM9]						
PC Settings Range Test Terminal Modem Configuration						
Modem Parameters and Firmware Parameter View Profile	Versions					
Read Write Restore Clear Screen Save	Download new					
Always update firmware Show Defaults Load	versions					
Modem: XBEE Function Set	Version					
XB24-B ZIGBEE COORDINATOR AT	▼ 1020 ▼					
⊡ 🔄 Networking	A					
🖥 CH - Operating Channel						
📮 (234) ID - PAN ID						
🖢 (0) DH - Destination Address High						
🖢 (0) DL - Destination Address Low	=					
📮 MY - 16-bit Network Address						
🚽 🔄 SH - Serial Number High						
SL - Serial Number Low						
🖬 (0) BH - Broadcast Radius						
📄 🔤 (1FFE) SC - Scan Channels						
📱 (3) SD - Scan Duration						
📕 🔤 (FF) NJ - Node Join Time						
I () NI - Node Identifier						
UJDD - Device Type Identifier						
[30] State Stat						
📔 🔚 📓 [FF] AR - Aggregation Houte Broadcast Time						
(1) PM - Power Level						
Conict United Science						
	T					
Change networking settings						
COM9 9600 8-N-1 FLOW:NONE XB24-B Ver:1220						

Figure 4: Getting the current parameters of XBee-A

e) Select the option ZIBGEE ROUTER/END DEVICE AT under the pull-down menu Function Set of the XBee-A.

Modem: XBEE		Function Set		Version
×B24-B	-	ZIGBEE ROUTER/END DEVICE AT	•	1220 💌
🖂 🚇 Mahural				

Figure 5: Setting the Function Set of XBee-A

- f) Set the read Networking settings: ID: 234, DH: 0, and DL: 0.
- g) Click the button **Write** to download the configured parameters into the XBee-A.
- h) Select the option ZIBGEE ROUTER/END DEVICE AT under the pull-down menu Function Set of the XBee- B.

Modem: XBEE		Function Set		Version
XB24-B	Ŧ	ZIGBEE COORDINATOR AT	•	1020 💌

Figure 6: Setting the Function Set of XBee-B

- i) Set the read Networking settings: ID: 234, DH: 0, and DL: FFFF.
- j) Click the button Write to download the configured parameters into the XBee-B.
- 6) In order to implement a simple P2P network, please configure XBee-A and XBee-B according to the processes described above. Start two X-CTU tools, and select different COM interfaces in the option PC Settings to control Group A and Group B respectively.
- 7) Input the data to be transmitted in the X-CTU Terminal of XBee-A, then, you can find that the inputted data will be sent to XBee-B automatically, and displayed in the X-CTU Terminal of XBee-B. In the X-CTU, data in blue is the data to be sent, and data in red is the received data.



Figure 7: The X-CTU terminal of XBee-A

🖳 X-CTU [COM	19]					
PC Settings Range Test Terminal Modem Configuration						
Line Status Assert Close Close Clear Hide Com Port Packet Screen Hex						
ABCEFG12345	56 41 42	43 45 46	47 31	32 33	34 35 36	
COM9 9600 8-N	I-1 FLOW:NON	E	Bx	: 6 bytes		

Figure 8: The X-CTU terminal of XBee-B

8) Figure 8 shows the normal operating state of XBee module. You can use XBee modules to perform wireless communication in Arduino projects. It is easy to done, transmitting the data to be sent to XBee-A via the serial port of Arduino development board-A, then, receiving the data by XBee-B and reading it out on PC via the serial port of Arduino development board-B.

Notices: In this operation, you should set the jumpers of IO Expansion Shield:

- Connect TXD to RX;
- Connect RXD to TX.

Then, XBee module can communicate with the MCU of Arduino development board via a serial port.