

AX220xx RS-232 to WiFi Reference Design User Guide

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Revision History

Revision	Date	Description
1.00	2011/03/10	Initial release.
1.10	2011/04/07	1. Replaced Hyper Terminal with Tera Term for demonstration. 2. Added Appendix C performance report.
1.20	2011/07/08	1. Added the WiFi Wizard and firmware upgrade for Boot Loader, MCU, and WCPU image. Updated all the related web page figures. 2. Added the WiFi configuration item for Protection Frame Type. 3. Added section 4-3 RS-232 to WiFi Reference Design Jumpers Setting. 4. Added section 7-1-6 Firmware Upgrade Dialog. 5. Updated two web page figures in section 7-3-3 and 7-3-6-1 to correct the configuration description about the file name length and SSID length.

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1 Introduction

This user guide provides an overview of AX220xx RS-232 to WiFi Reference Design hardware and software components, related setup procedures, supported features and deliverables.

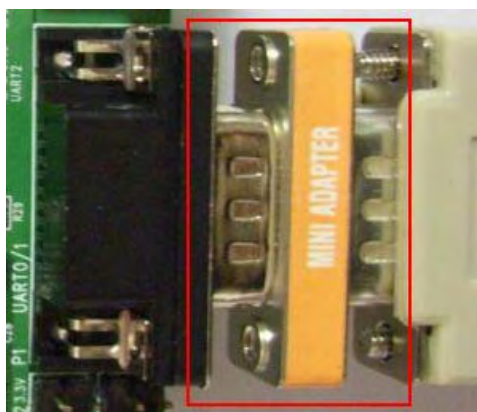
ASIX Electronics provides a complete AX220xx RS-232 to WiFi Reference Design Kit covering all the needed hardware and software components that allow user to quickly implement a Serial to WiFi Device Server application. If user would like to purchase the Reference Design Kit, please contact ASIX's Sales (sales@asix.com.tw) for details.

The AX220xx RS-232-to-WiFi Reference Design consists of 5 hardware components as listed in Table 1-1.

Component	Description
AX22001 802.11b/g Generic Development Board	This consists of one AX220xx Generic Main Board and one AX22001 802.11b/g WiFi Module Board being pre-assembled together.
AX220xx Generic Development Kit CD	
One RS-232 cable with a Null modem converter	
One RJ-45 Ethernet cable	
One 5V/3A AC/DC power adapter	

Table 1-1 AX220xx RS-232 to WiFi Reference Design Kit

Note: The following RS-232 Null modem converter should be connected to the RS-232 cable; otherwise, AX220xx couldn't establish the connection with PC or other RS-232 devices.



1-1 System Architecture Overview

AX220xx RS-232 to WiFi Reference Design adopts AX220xx SoC chip to provide a cost-effective solution for customers to enable existed serial communication of a device to extend virtually over a WLAN network. The solution provides a hardware device connected to the target serial device and the software package needed for the remote PC.

Architecturally speaking, AX220xx RS-232 to WiFi Reference Design consists of 3 components: Device Server (DS, i.e. AX220xx RS-232 to WiFi device), Virtual Serial Port (VSP) driver, and AXR2W Configuration Utility. An architecture diagram describing their relationship is shown in Figure 1-1.

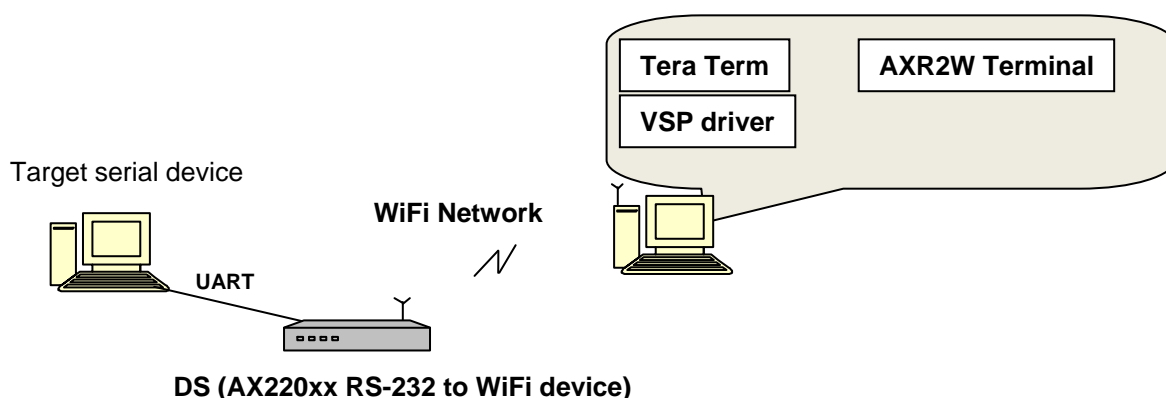


Figure 1-1 Device Server System Architecture Diagram

The serial port data is transmitted over a TCP or a UDP socket connection built between the VSP driver and the DS over a WiFi network. Each VSP driver running on remote PC is a Virtual Serial Port that can handle one serial port's data and make only one socket connection of either TCP or UDP with a DS at a time. In other words, each DS is also connected with a unique VSP driver at a time. However, the remote PC can support multiple VSP driver installations which allow communicating with multiple individual DSs simultaneously.

The AXR2W Configuration Utility running on remote PC is a Windows dialog-based program used to manage the VSP drivers and their associated DSs remotely via configuration packets over UDP socket connection.

1-2 User Guide Contents

The manual contains the following chapters:

- Section 1, Introduction, provides an overview of AX220xx RS-232 to WiFi Reference Design solution and this document.
- Section 2, Block Diagram, provides illustration of AX220xx RS-232 to WiFi device block diagram and board photo.
- Section 3, Features, provides the feature list of AX220xx RS-232 to WiFi reference design hardware and software components and the factory default settings of software functions.
- Section 4, Device Server Hardware Setup, introduces the DS hardware related setup.
- Section 5, Network Environment Setup, introduces two network demo scenarios and their setup procedures.
- Section 6, Software Toolkit Setup, provides a Quick Start on how to install the VSP driver and to setup the AXR2W Configuration Utility for a quick test or validation of AX220xx RS-232 to WiFi reference design.
- Section 7, Software Function Description, describes the detailed information of various software functions available, such as AXR2W Configuration Utility, Web Server remote configuration and Command Line Interface (CLI) on UART0 console.
- Section 8, Flash Programming, describes the on-chip Flash memory partition of the DS and the Flash memory programming tool and programming procedures.
- Section 9, Software Modules, introduces the supported software modules of DS and the software architecture.
- Section 10, Software Development Tools, introduces the software tool chains being used to develop or debug the firmware of DS.

1-3 Additional Resources

You can check available up-to-date documentation on the ASIX Electronics' web site at www.asix.com.tw.

2 Block Diagram

The AX220xx RS-232 to WiFi device block diagram is shown in Figure 2-1. The AX220xx RS-232 to WiFi Reference Design board photo is shown in Figure 2-2.

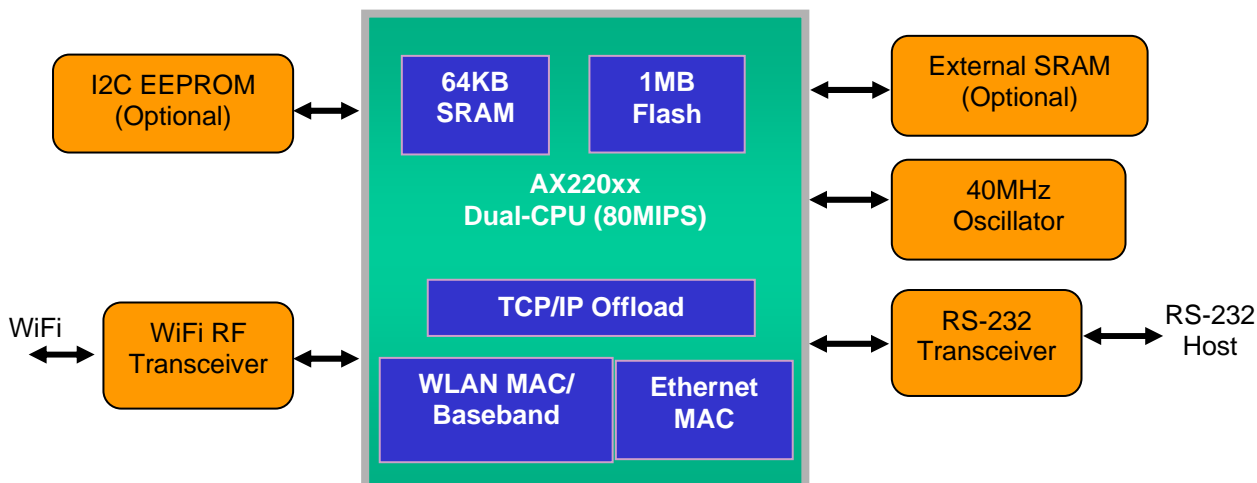


Figure 2-1 AX220xx RS-232 to WiFi Block Diagram

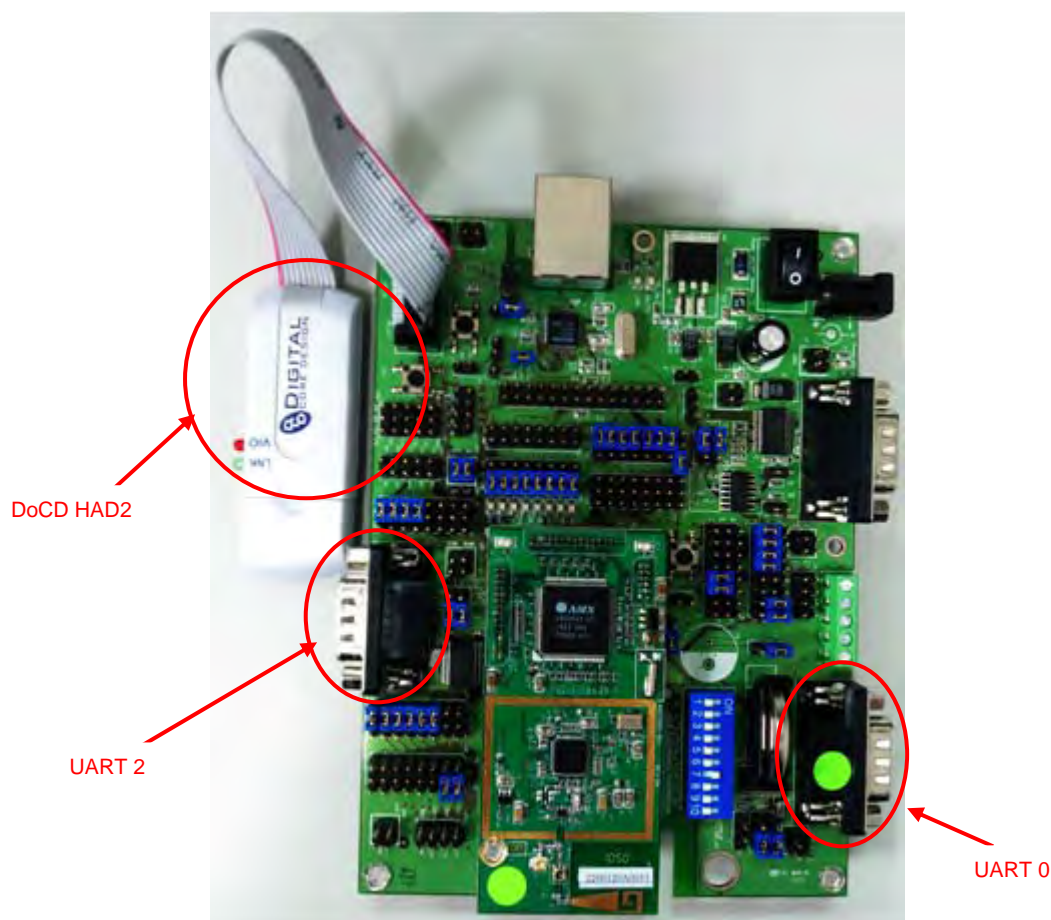


Figure 2-2 AX220xx RS-232 to WiFi Reference Design Board with DoCD HAD2

3 Features

Table 3-1 lists the major hardware and software features of AX220xx RS-232 to WiFi Reference Design.

Items	Features	Specification
Architecture	Dual CPU	1T 8051/80390 MCU, 80 MHz 1T 8051/80390 WCPU, 80 MHz
	Memory	Embed 64KB SRAM as data memory for MCU. 1MB shared Flash memory for MCU and WCPU program code and configuration data storage
Serial Interface	Interface	RS-232 interface
	Connector	DB-9 male
	Baud Rate	1200 to 921,600 bps
	Data Bits	5, 6, 7, 8
	Parity	None, Even, Odd
	Stop Bits	1, 1.5, 2
	Control Signals	TxD, RxD, RTS, CTS, DTR, DSR, DCD, RI
	Flow Control	Hardware RTS/CTS, software XON/XOFF, None.
	Remote Wakeup	UART2 received character or ring event
Network Supported	Protocols Supported	ARP, IP, ICMP, UDP, TCP
	Network Services	DHCP Client/Server, DNS Client, PPPoE, BOOTP, TFTP, HTTP, Telnet Server, SMTP Client, UDP Broadcasting
Software Supported	VSP Driver	Windows 7/Vista/XP/2000 32-bit Windows 7/Vista/XP 64-bit
	Web Server	Remote configuration from Web browser
	Firmware Upgrade	Upgradeable via TFTP or serial port
	AXR2W Configuration Utility	Windows 7/Vista/XP/2000 32-bit Windows 7/Vista/XP 64-bit
WLAN Supported	WiFi Operation Mode	Infrastructure or Ad-Hoc network topology
	802.11b/g RF/Baseband	DSSS and CCK: 1, 2, 5.5, and 11 Mbps OFDM: 6, 9, 12, 18, 24, 36, 48, and 54 Mbps Supports TX rate auto fall-back mechanism
	802.11i Security	64/128 WEP, TKIP (WPA-PSK), and AES (WPA2-PSK)
	802.11e QoS	1 TX queue but selectable AC for user's application data
	WiFi Power Saving	Supports 3 WiFi power saving modes in normal operation of Infrastructure mode with auto-wakeup timer for upcoming Beacon frame reception. - Typical Power Saving Mode - Fast Power Saving Mode - Maximum Power Saving Mode
Operating Temperature		0°C to 70°C

Table 3-1 AX220xx RS-232 to WiFi Reference Design Features

Table 3-2 lists the software features and their factory default settings. User can change these settings to device server(s) with the configuration functions supported.

Feature		Description	Factory Default Setting	
RS-232 Serial Port	UART 0	Used as command or debug console	Baud rate	9600
			Data bits	8
			Parity	None
			Stop bits	1
			Flow control	None
	UART 2	Used as data transmission	Baud rate	115200
			Data bits	8
			Parity	None
			Stop bits	1
			Flow control	None
Connection Mode		Client / Server	Mode	Server
Data Packet	TCP	-	Type	TCP
	UDP		Listening port	5000
Management Packet	UDP Broadcast	For communication with DS manager	Enable/Disable	Enable
	UDP Multicast		Listening port	25122*
			Enable/Disable	Disable
			Listening port	25123*
	UDP Unicast		Enable/Disable	Enable*
			Listening port	25124*
	DHCP Client	If disabled or failed to acquire IP address from network DHCP server, DS will use this default settings of static IP address, subnet mask, and default gateway.	Enable/Disable	Enable
			Static IP address	192.168.2.3
			Subnet mask	255.255.255.0
Default gateway			192.168.2.1	
DNS Client		-	Enable/Disable	Disable
			DNS Server IP	168.95.1.1
Web Server		To remotely configure DS.	http://Device Server IP (e.g. http://192.168.2.3)	
SMTP Client	Send the warning message if the event was triggered.		Domain name	asix.com.tw
			From address	ds@asix.com.tw
			To 1 st address	to1@asix.com.tw
			To 2 nd address	to2@asix.com.tw
			To 3 rd address	to3@asix.com.tw
			Event enable flag	0x0000
DHCP Server**		If enabled, to assign IP address to other Station(s) connected to same BSS as DS.	Enable/Disable	Enable
			Start address	192.168.2.4
			End address	192.168.2.10
			Subnet mask	255.255.255.0
			Default gateway	0.0.0.0
			Lease time	1440
WLAN Settings			RF/Baseband mode	1 (b/g mode)
			Operation mode	1 (Ad-Hoc mode)

		Channel	11
		SSID	R2WiFi
		SSID length	6
		Transmission rate	0 (auto)
		Transmission power level	0 (auto)
		Preamble	1 (auto)
		Beacon interval	100 ms
		RTS threshold	2432
		Auto power control	1 (enable)
		Encryption mode	0 (open-system)
		WEP key index	0
		WEP key length	0
	WEP-64 key	WEP-64 key 0	0x12,0x34,0x56,0x78,0x90
		WEP-64 key 1	0x09,0x87,0x65,0x43,0x21
		WEP-64 key 2	0xA1,0xB2,0xC3,0xD4,0xE5
		WEP-64 key 3	0x01,0x23,0x45,0x67,0x89
	WEP-128 key	WEP-128 key 0	0x01,0x02,0x03,0x04,0x05,0x06,0x07,0x08,0x09,0x0a,0x0b,0x0c,0x0d
		WEP-128 key 1	0x0e,0x0f,0x10,0x11,0x12,0x13,0x14,0x15,0x16,0x17,0x18,0x19,0x1a
		WEP-128 key 2	0x1b,0x1c,0x1d,0x1e,0x1f,0x20,0x21,0x22,0x23,0x24,0x25,0x26,0x27
		WEP-128 key 3	0x28,0x29,0x2a,0x2b,0x2c,0x2d,0x2e,0x2f,0x30,0x31,0x32,0x33,0x34
		Pre-shared key	12345678
		Pre-shared key length	8
		Protection Frame Type	0 (RTS)

Table 3-2 AX220xx RS-232 to WiFi Reference Design Software Features

Note:

*: These settings are fixed and can't be changed in current software package.

**: If the DHCP Client service is enabled and has acquired IP address from network DHCP server, the DHCP Server service will be disabled automatically; If the DHCP Client service failed to acquire IP address after 5 seconds, the DS will assign its own IP address using the default settings of static IP address, subnet mask, and default gateway and also activate the DHCP Server service automatically.

4 Device Server Hardware Setup

This chapter introduces the AX220xx RS-232 to WiFi Reference Design board (Device Server) hardware related setup. Figure 4-1 shows the SW1 DIP switch position on AX220xx RS-232 to WiFi Reference Design board. The SW1 is used to set AX220xx chip configuration pins value during chip reset.

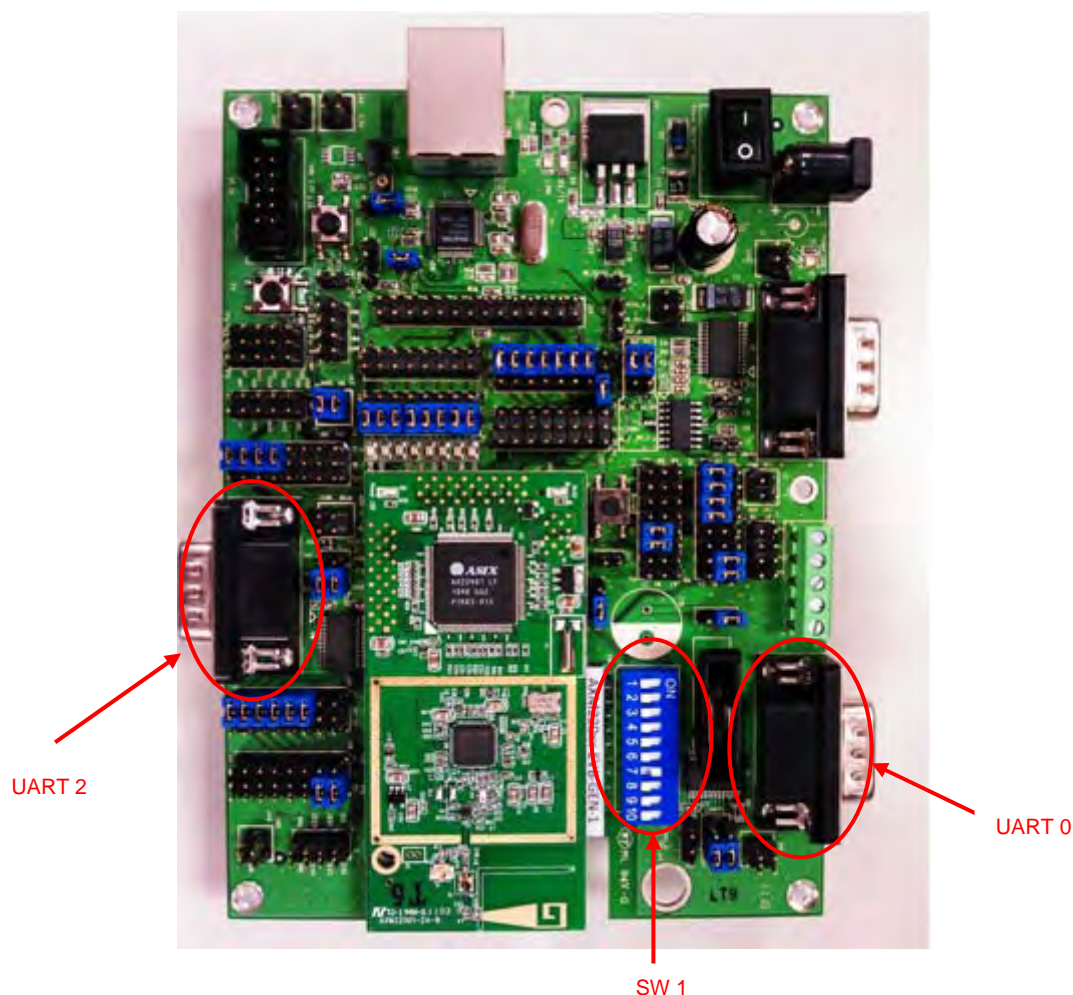


Figure 4-1 SW1 DIP Switch Position on AX220xx RS-232 to WiFi Reference Design Board

4-1 Flash Programming Switch Setting

The SW1 DIP switch setting pertaining to the Flash programming is described below.

The Pole #5 (Burn Flash Enable) of SW1 switch should be set to ON for enabling COM port Flash programming; or it should be set to OFF for AX220xx Boot Loader Flash programming or for normal operation.

If COM port Flash programming mode is chosen, the Pole #6 (Burn Flash 921K) of SW1 switch should be set to ON for normal speed of 115.2Kbps (i.e., the UART 0 or UART 2 interface baud rate); or it can be set to OFF if user's PC UART (RS-232) supports high speed UART mode of 921.6Kbps.

The Port #7 should be set to ON for normal operation since the I2C Configuration EEPROM is usually not needed for this reference design. However, if user would like to use the I2C Configuration EEPROM for inventory storage purpose, Port #7 can be set to OFF.

SW1 Pole #	Function	ON	OFF
5	Burn Flash Enable	Enable Flash Programming	Disable Flash Programming
6	Burn Flash 921.6Kbps	UART mode (115.2Kbps)	High Speed UART mode
7	I2C Boot Disable	Normal	Disable


SW1	Description
	<ol style="list-style-type: none"> Set Pole #5 (Burn Flash Enable) to ON Set Pole #6 to OFF for high speed UART mode (921.6Kbps)

Figure 4-2 SW 1 DIP Switch Setting for 921.6Kbps Burn Flash Operation


SW1	Description
	<ol style="list-style-type: none"> Set Pole #5 (Burn Flash Enable) to ON Set Pole #6 to ON for normal UART mode (115.2Kbps)

Figure 4-3 SW 1 DIP Switch Setting for 115.2Kbps Burn Flash Operation

4-2 COM Port Setting

For normal device server operation, the UART 0 is used for console while the UART 2 is used for RS-232 to WiFi serial data port. The default setting of each UART port is shown as below.

COM Port Interface	Baud Rate	Comments
UART 0	9600 bps	UART Debugging Console
UART 2	115.2Kbps	RS-232 to WiFi Serial Data Port

4-3 RS-232 to WiFi Reference Design Jumpers Setting

This section indicates some jumpers setting related to RS-232 to WiFi Reference Design on the Development Board. Other jumpers might need to be adjusted according to user's needed interface functions. Please refer to section 4 of **AX220xxx Generic Development Kit User Guide** for detailed Development Board jumpers setting information.






Jumper	Setting	Description																																																																							
SW1		Set pole # 7 of SW1 DIP switch to ON and set other poles to OFF (User can adjust the switch setting according to his needed configuration if necessary)																																																																							
J9		Select the DB9 connector (P3) as UART0.																																																																							
J11																																																																									
J36																																																																									
J44		Select the DB9 connector (P5) for UART2 and enable MCPU UART2 interface.																																																																							
J10/J37	<div><div>J10</div><table><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>1</td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td></tr><tr><td>7</td><td></td><td></td><td></td></tr><tr><td>8</td><td></td><td></td><td></td></tr></table></div> <div><div>J37</div><table><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>1</td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td></tr><tr><td>7</td><td></td><td></td><td></td></tr><tr><td>8</td><td></td><td></td><td></td></tr></table></div>			A	B	C	1				2				3				4				5				6				7				8					A	B	C	1				2				3				4				5				6				7				8		
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Figure 4-4 RS-232 to WiFi Reference Design Jumpers Setting

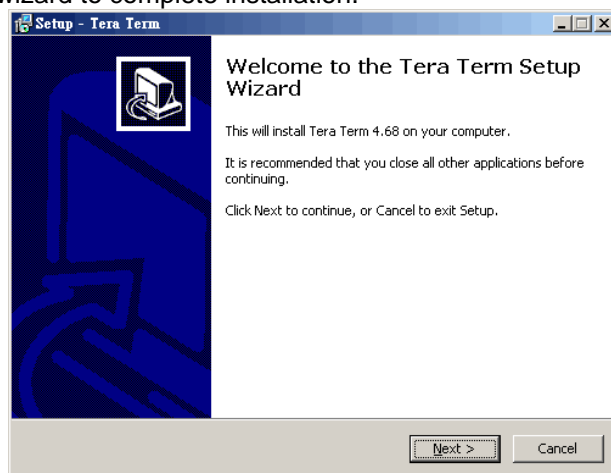
5 Network Environment Setup

5-1 How to Setup Tera Term

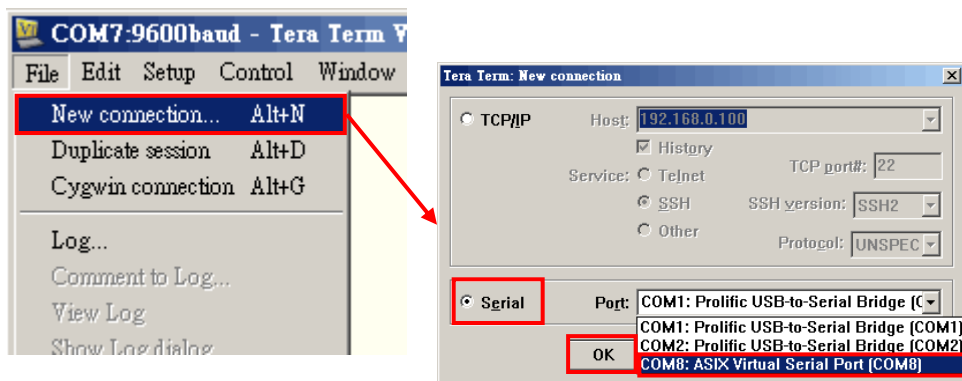
In this user guide we use the “Tera Term” to be our terminal emulator to demonstrate the reference design. Tera Term is open source software under BSD license and can be downloaded from: <http://ttssh2.sourceforge.jp/>.

The following procedures introduce how to setup Tera Term.

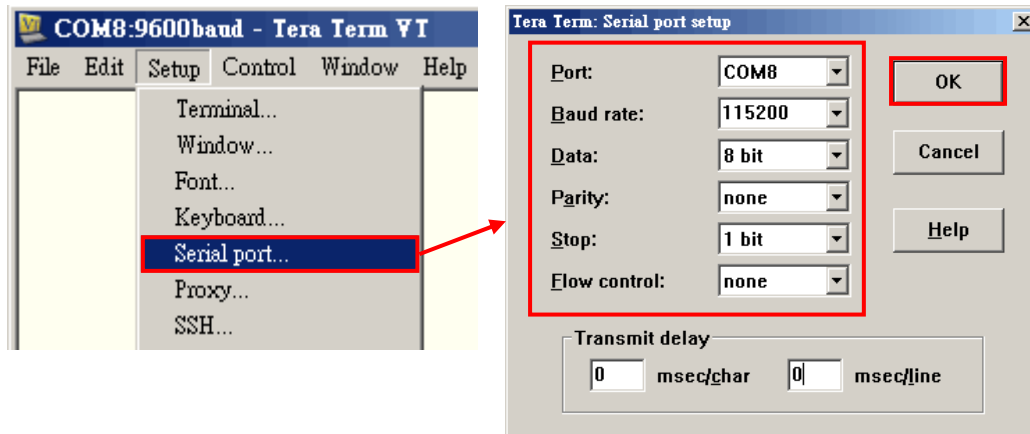
Step 1: Follow the setup wizard to complete installation.



Step 2: Run the Tera Term. Select **File** tab and then choose “**New connection...**” to create a new serial port connection. In the pop-up dialog, select **Serial** and COM port to be connected, and then click **OK**.



Step 3: After the serial port is created, select **Setup** tab and then choose “**Serial port...**” to set the serial port configuration, and then click **OK**.



5-2 Device Server Demo Scenario

Firstly, a single device server scenario is provided to demonstrate a simple system application. The demo scenario requires following equipments:

- (1) Two PCs and an Ad-Hoc BSS (IBSS) environment are required.
- (2) A Tera Term running on PC 1 is used as the console to communicate with the target serial device.
- (3) A Tera Term running on PC 2 is used as the target serial device.

Figure 5-1 shows the demo system diagram.

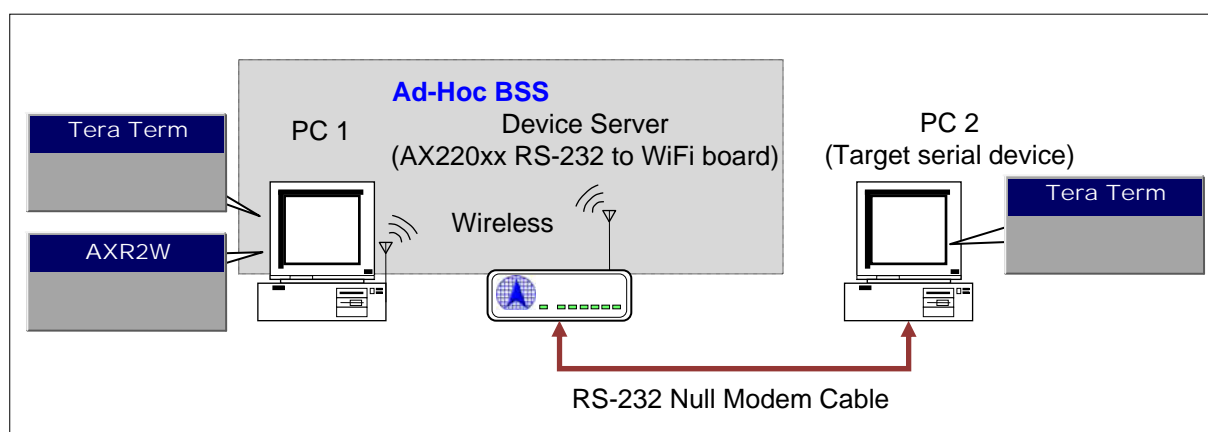


Figure 5-1 Device Server Demo System Diagram

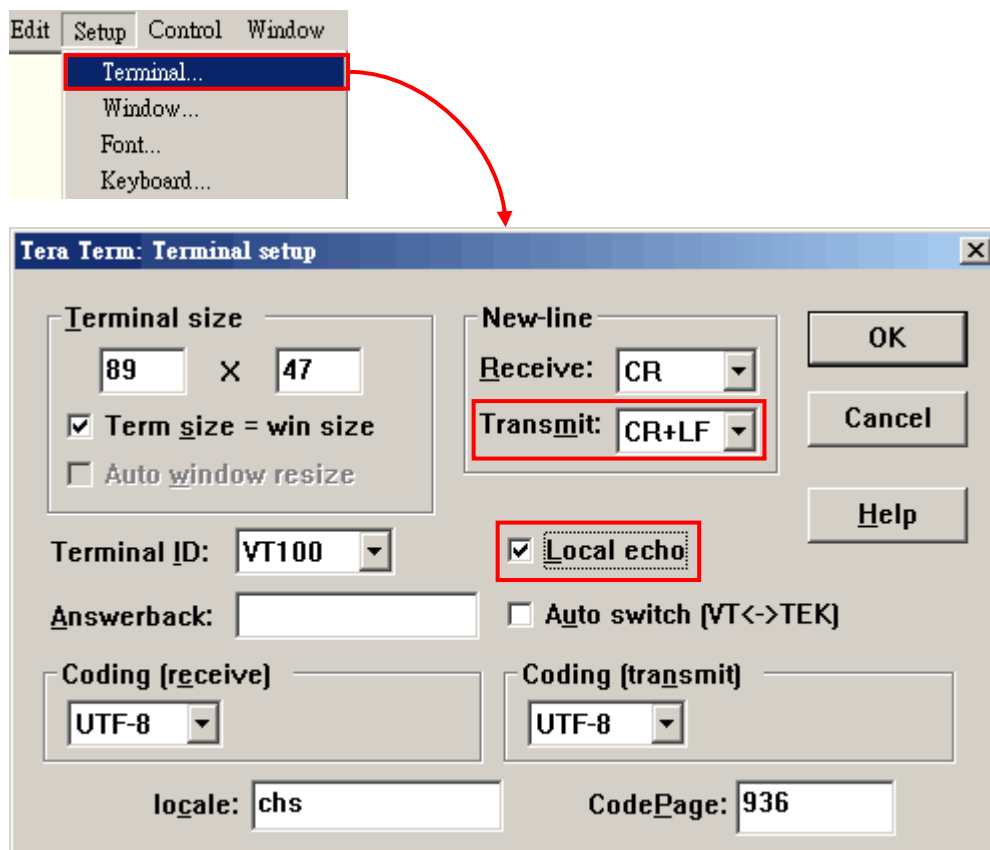
The demo scenario allows the two Tera Term console running on separate PC to communicate with each other over WLAN network. The input data on PC 1's Tera Term console will be transmitted to PC 2's Tera Term console, or vice-versa.

The following describes the setup procedures for building such device server system.

- Step 1: Power PC 1, PC 2, and Device Server (DS).
- Step 2: Follow section 6-1 description to install software package on PC 1.
- Step 3: Connect one end of RS-232 cable (with a Null modem converter) to PC 2's COM port and the other end to DS's UART-2 port. Then open a Tera Term with appropriate serial port settings.
- Step 4: On PC 1, use the Wireless Network Connection window application to look for WiFi network with SSID, said R2WiFi, and then press **Connect** to connect to DS. Then, PC 1's wireless NIC card will acquire an IP address assigned by DS (assuming that the DHCP Server service on DS is enabled and that PC 1 is set to automatic IP address setting in the "Internet Protocol (TCP/IP) Properties" window by checking the "Obtain an IP address automatically" box). For how to establish a connection to DS, please refer the section 5-4.
- Step 5: Follow section 6-2-1 description to invoke the AXR2W Configuration Utility. Then follow section 6-3 description to search for available DS.
- Step 6: Follow section 6-4 description to add a Virtual Serial Port on PC 1 and establish a connection with DS.

Step 7: Open a Tera Term on PC 1 with appropriate serial port settings.

Step 8: Now, user can input data on PC 1's Tera Term and the data will be displayed on PC 2's Tera Term, or vice-versa. For best viewing in Tera Term during the test, user can select **Setup** tab and then choose "**Terminal...**" to bring up the Terminal Setup window in Tera Term, then select "**Transmit: CR+LF**" and check "**Local echo**" box on both PC 1 and PC2, respectively.



Note that above setup procedures are provided for user to quickly set up a device server application in an Ad-Hoc (IBSS) WLAN network topology for test or validation. Once connected, user can use the AXR2W Configuration Utility to re-configure the device server to connect to an AP and operate in Infrastructure WLAN network.

5-3 Pair Connection Demo Scenario

Secondly, a pair connection demo scenario with two device servers working as a pair of client and server mode is provided. The pair connection demo system diagram is shown in Figure 5-2.

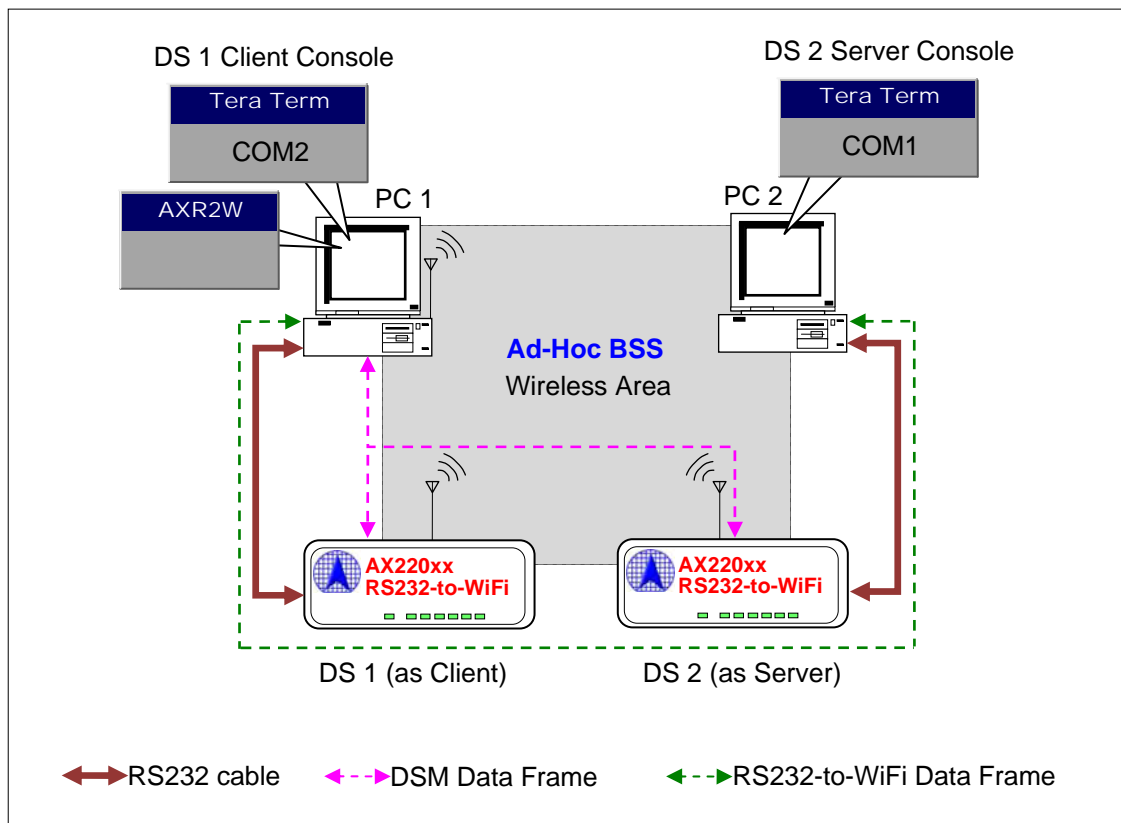


Figure 5-2 Pair Connection Demo System Diagram

In Figure above, AXR2W running on PC 1 with wireless card is used to configure DS 1 and DS 2. In this demo scenario, DS 1 will be configured as a client and DS 2 is configured as a server. One Tera Term runs on PC 1's COM2 as the client console to send/receive serial data to/from UART-2 of DS 1, and the other Tera Term runs on PC 2's COM1 as the server console to send/receive serial data to/from UART-2 of DS 2.

Ideally, the DHCP Server service on the two DS is default to enable and the first DS that gets powered on first will act as DHCP Server while the 2nd DS will act as DHCP Client, if the IBSS network has no DHCP Server present previously.

5-3-1 Server Mode Setup

DS 2 will be "Server" mode by default.

5-3-2 Client Mode Setup

The default setting of connection type is "Server" mode, so before starting the testing procedure, DS 1 has to be configured to "Client" mode. Follow is the procedures to do so:

- Step 1: Power on DS 1.
- Step 2: Establish a WiFi connection between DS 1 and PC 1 for configuration purpose (assuming PC 1 should have software package installed already per section 6-1 description).
- Step 3: Use AXR2W Configuration Utility to connect DS 1.
- Step 4: Use AXR2W's [Device Setup] function to change DS 1 to Client mode and enter the valid settings of destination IP address and port number. For above demo scenario, the destination IP is the IP address of DS 2 and the destination port is the listening port number of DS 2.
- Step 5: After DS 1 is rebooted successfully, then power off DS 1 temporarily.

5-3-3 Test Procedure

- Step 1: Power on DS 2 (Server) first. If DS 2's DHCP Server service is enabled by default and the IBSS network has no DHCP Server present previously, the DS 2 will act as DHCP Server accordingly.
- Step 2: Establish a WiFi connection between PC 1 and DS 2 for configuration purpose. Then, PC 1's wireless NIC card will acquire an IP address assigned by DS 2 (assuming that the DHCP Server service on DS 2 is enabled and that PC 1 is set to automatic IP address setting in the "Internet Protocol (TCP/IP) Properties" window by checking the "Obtain an IP address automatically" box)
- Step 3: Use AXR2W's **Search** function to find DS 2 successfully.
- Step 4: Power on DS 1 (Client).
- Step 5: If not already connected, establish a WiFi connection between DS 1 and DS 2 by following the procedures described in section 5-4. Then, DS 1 will acquire an IP address assigned by DS 2.
- Step 6: Use AXR2W's **Search** function to find DS 1 successfully. Check the status field of both device servers in Device List which should display "Connected".
- Step 7: Send some test data from either console. Test data generated on Client console on PC 1 will be displayed on Server console on PC 2 or vice-versa. For best viewing in Tera Term during the test, user can select **Setup** tab and then choose "**Terminal...**" to bring up the Terminal Setup window in Tera Term, then select "**Transmit: CR+LF**" and check "**Local echo**" box on both PC 1 and PC2, respectively.

5-4 How to Make a Connection?

The following are procedures to make a connection with DS.

```

username: admin
password:
uart> sisrvy
Please wait...
INDEX BSSID SSID TYPE CH RSSI SECURITY
00 00-22-b0-b2-6d-00 aeap987 ap 003 10 2 yes
01 00-90-cc-de-1f-9c aeap02 ap 003 11 0 no
02 da-5d-95-95-ec-cc 6.5 sta 001 1f 0 no
03 5c-d9-98-1d-d6-f0 apRichard ap 001 2f 2 yes
04 00-60-b3-35-92-55 MISVOIP ap 001 10 1 yes
05 48-5b-39-bc-86-34 R2WAP64 ap 003 54 0 no
06 00-22-75-fd-77-f8 Belkin_N ap 001 0d 0 no
07 02-d3-ac-28-46-d9 aaasss sta 003 1c 0 no
08 00-19-70-40-fc-f6 ZyXEL ap 006 23 2 yes
09 00-22-15-26-bd-10 aeap12 ap 007 24 0 no
10 02-16-70-d0-49-9c wifispeaker sta 007 2a 0 no
11 00-19-70-27-dc-6e 1523-2-8 ap 007 25 0 no
12 00-0a-79-6e-0b-a5 aeap07 ap 009 10 0 no
13 00-07-40-f5-05-36 AirStation ap 011 23 2 yes
14 02-9f-64-b0-a7-1d r2w_len sta 011 15 0 no
15 00-90-cc-ed-e7-97 aeap06 ap 011 38 2 yes
16 00-1f-1f-1d-94-08 MIS-AP3 ap 011 27 2 yes
17 00-19-cb-e5-25-54 ZyXEL_1 ap 011 1a 2 yes
18 4c-e6-76-25-fd-78 4CE67625FD78-1 ap 011 23 0 no
Ok
uart> jboss 5
Please wait...
Join BSS successful!
Update base band|1= 802.11b/g mode
Update network mode|3= infrastructure
Update channel= 3
Update ssid= R2WAP64
Authentication type|0: open system
Update encryption type|0=no security
Update Tx Rate|0= Auto
Save WiFi config to flash ROM
Ok
IP: 192.168.0.10
uart> ping 192.168.0.40
Pinging from 192.168.0.40: with 32 bytes of data:

Reply from 192.168.0.40: bytes=32 time<20ms TTL=128
Reply from 192.168.0.40: bytes=32 time<10ms TTL=128
Reply from 192.168.0.40: bytes=32 time<10ms TTL=128
Reply from 192.168.0.40: bytes=32 time<10ms TTL=128

Ping statistics for 192.168.0.40:
    Packets: Sent=4, Received=4, lost=0

Ok
uart>
  
```

Figure 5-3 Console Captured

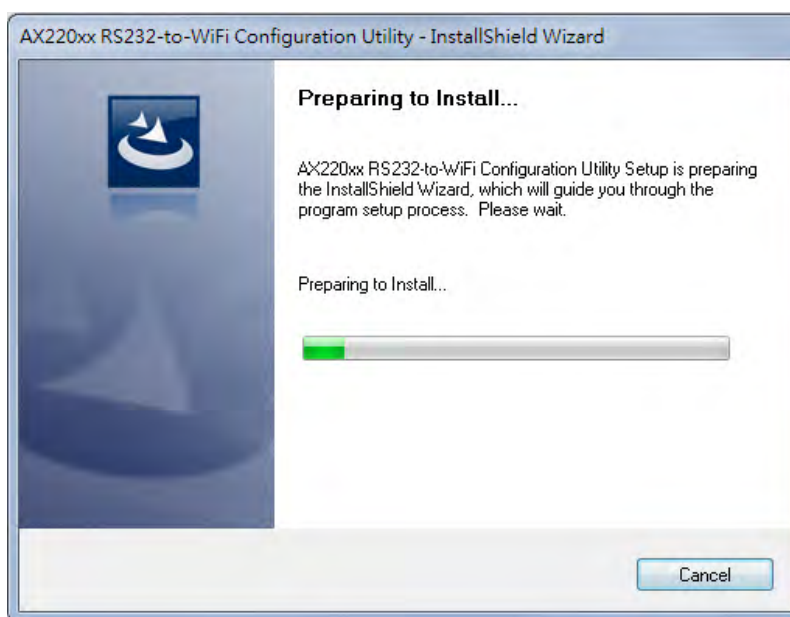
- Step 1: Use another Tera Term as console to login to DS. Default username/password is admin/admin.
- Step 2: Enter "sisrvy" command to do site survey and it will display a list of BSSs being found.
- Step 3: Enter "jboss" command to join to the specific BSS, note that the argument must be an index in the site survey result list. In this example, DS joins to BSS with SSID = R2WAP64.
- Step 4: Finally, enter "ping" command to check if the connection is built successfully.

6 Software Toolkit Setup

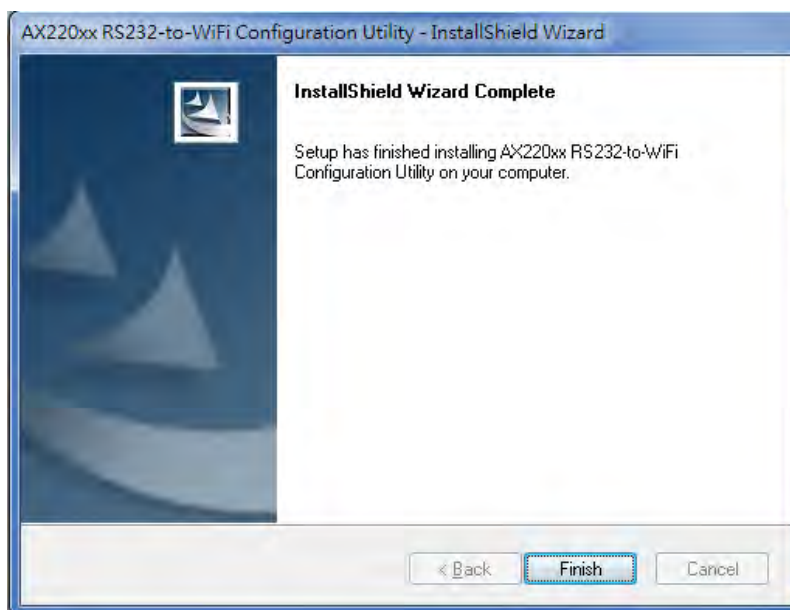
AX220xx RS-232 to WiFi Toolkit includes the VSP (Virtual Serial Port) driver and the AXR2W Configuration Utility. This section provides a brief overview of the software package installation and frequently used functions.

6-1 Software Package Installation

Step 1: Run AX220xx RS-232 to WiFi Toolkit setup program and the installation wizard will appear on the screen



Step 2: Wait for setup wizard to finish installation and then click **Finish**.



6-2 Quick Start

This section provides a brief "getting started" guide of the AXR2W Configuration Utility. User can refer to next section for detailed description of each function supported.

The AXR2W Configuration Utility is a Windows program. It consists of necessary tools that user can use to manage AX220xx RS-232 to WiFi device server application.

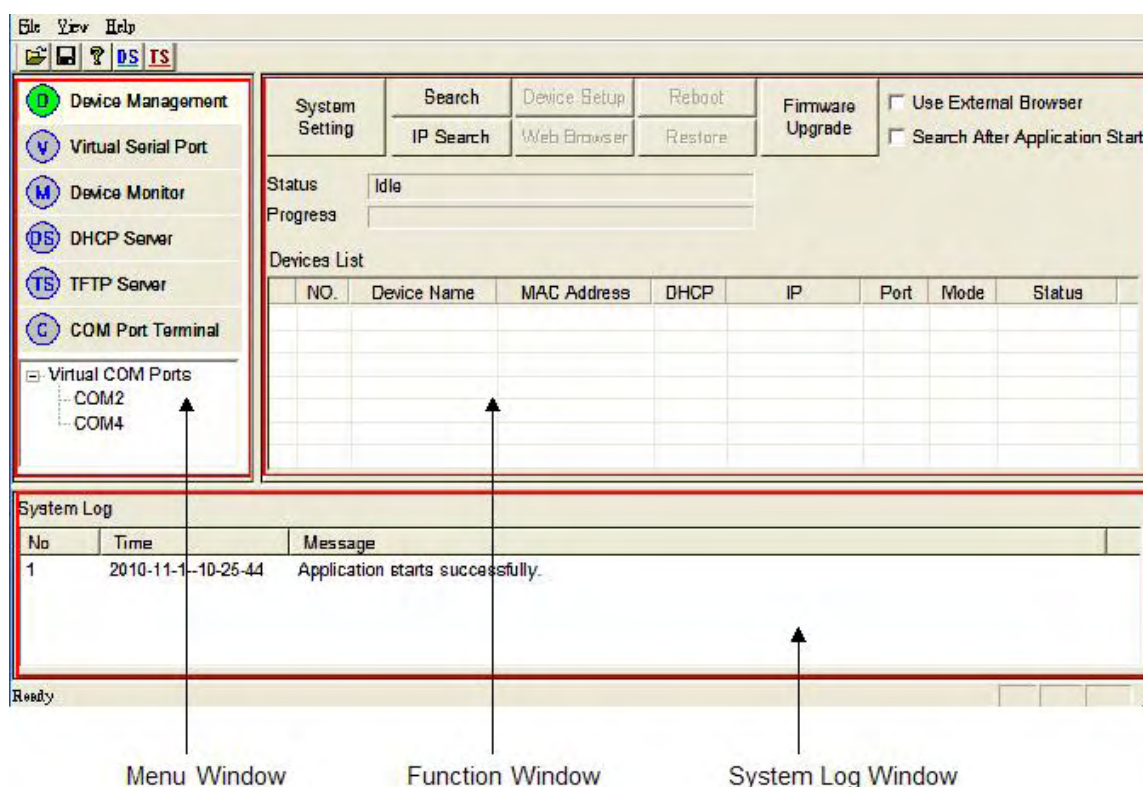
The AXR2W Configuration Utility contains the following tools:

Field	Description
Device Management tool	Enables you to remotely manage AX220xx RS-232 to WiFi device servers.
Virtual Serial Port tool	Enables you to manage Virtual Serial Ports on the host PC.
Device Monitor tool	Enables you to monitor the status of AX220xx RS-232 to WiFi device servers.
DHCP Server tool	Enables an AX220xx RS-232 to WiFi device server to get a dynamic IP address from it when operating at the DHCP-enabled mode.
TFTP Server tool	Enables an AX220xx RS-232 to WiFi device server to download the new firmware from the TFTP server.
COM Port Terminal tool	Supports two RS-232 port terminals to make it easier for you to develop or test your AX220xx RS-232 to WiFi device server application.

6-2-1 Invoke AXR2W Configuration Utility

Step 1: Go to the folder where software package was installed.

Step 2: On the 32-bit Windows environment, run AXR2W_x86.exe, and then the main window will appear as below figure. (Note: on a 64-bit Windows environment, user should run AXR2W_x64.exe)



The main window divides the display into three functional areas: Menu Window, Function Window and System Log Window.

- **Menu Window:** displays supported tools.
- **Function Window:** displays supported functions of the selected tool.
- **System Log Window:** displays system log messages or uses as the built-in web browser window in Device Management tool.

6-2-2 Menu and Toolbar of AXR2W Configuration Utility

The Menu of AXR2W Configuration Utility supports the following commands:

File menu introduction

Item	Description
Open Log	Open an existed system log file
Save Log	Save system log messages into a specified log file.
Exit	Close the AXR2W configuration utility program.

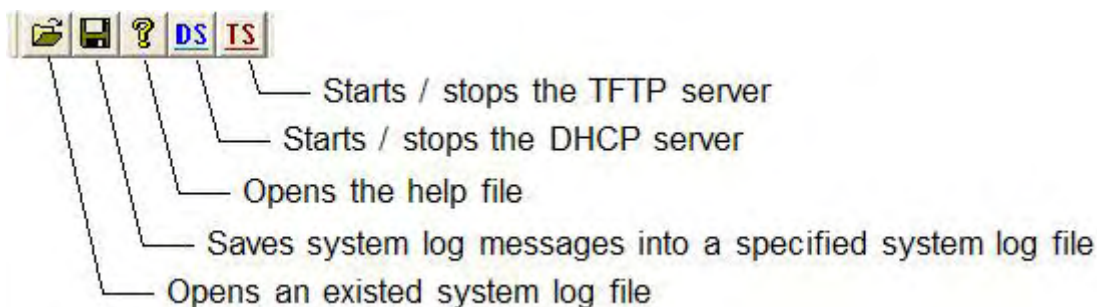
View menu introduction

Item	Description
Tool bar	Hide/Unhide the toolbar.
Status bar	Hide/Unhide the Status bar.

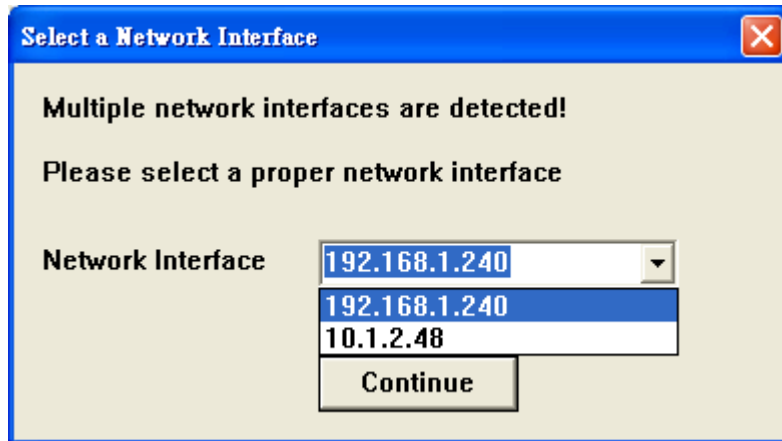
Help menu introduction

Item	Description
Contents	The help file.
About AXR2W	Access copyright information.

The Toolbar of AXR2W Configuration Utility supports the following commands:



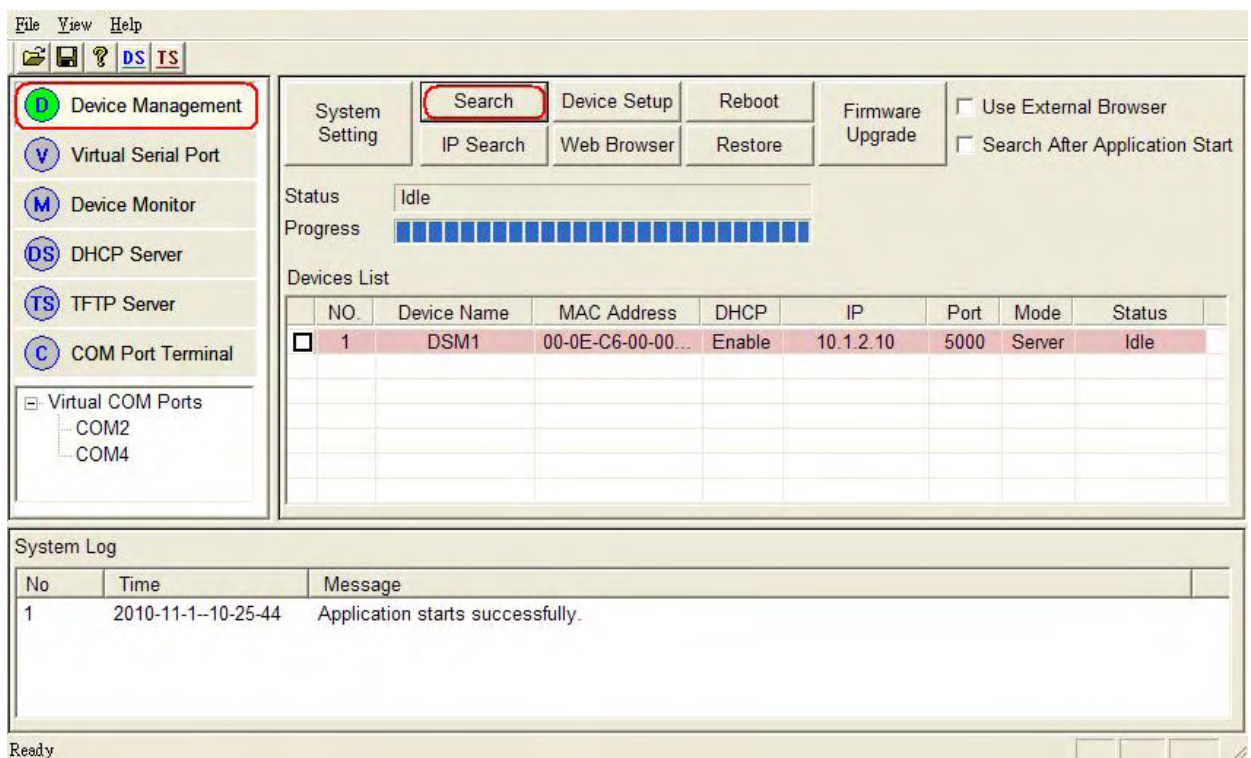
Note: When AXR2W Configuration Utility detects multiple network interfaces at startup and no any Virtual Serial Port is connected or opened, the following "Select a Network Interface" dialog will appear and prompt user to select a desired network interface.



6-3 Device Search Operation

User can use the Device Management tool to search for all the AX220xx RS-232 to WiFi device servers present on a WLAN network. Note that the device servers should first join and connect to the same BSS as the PC's wireless NIC's.

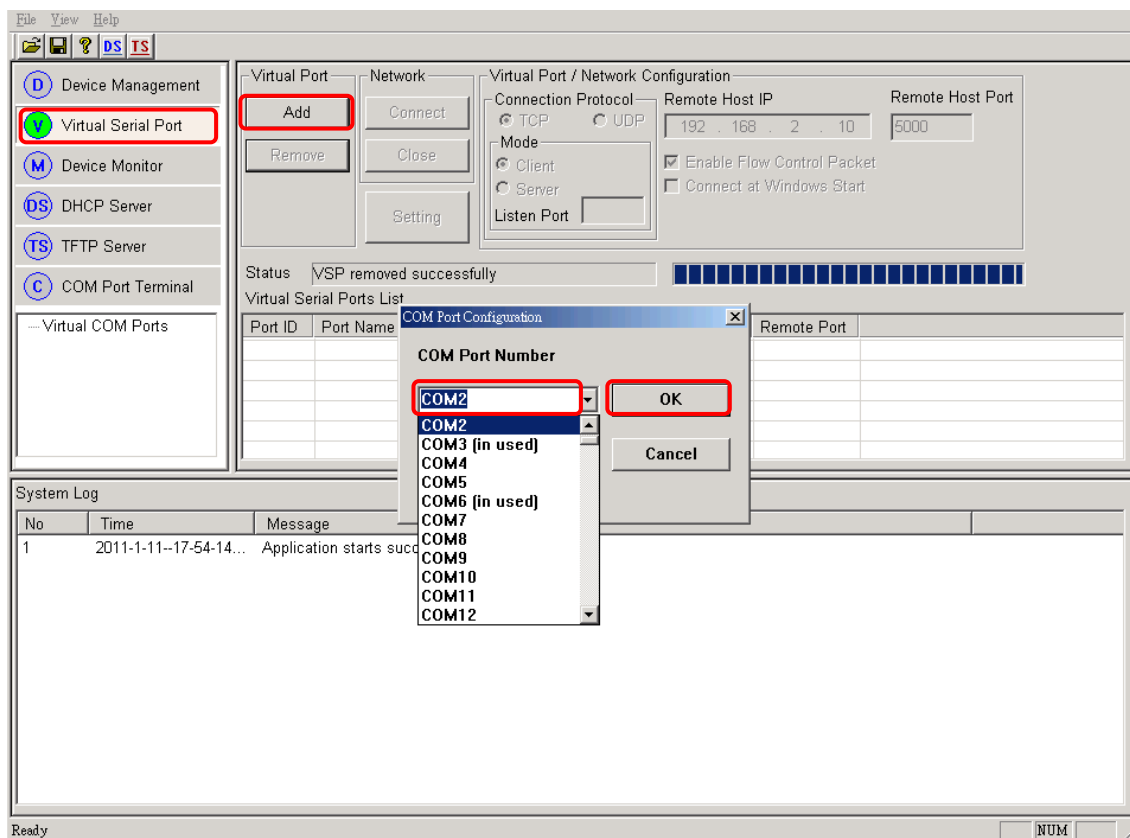
- Step 1: In Menu Window, select Device Management tool.
- Step 2: Click **Search** to search available device servers on WLAN. Below figure shows an example that one device server is found.
- Step 3: Device servers that were found will be shown in Devices List. On the list the device server's settings including connection type, IP address, and port number, etc. information are available.



6-4 Virtual Serial Port Operation

User can use Virtual Serial Port tool to add or remove a Virtual Serial Port on the host PC.

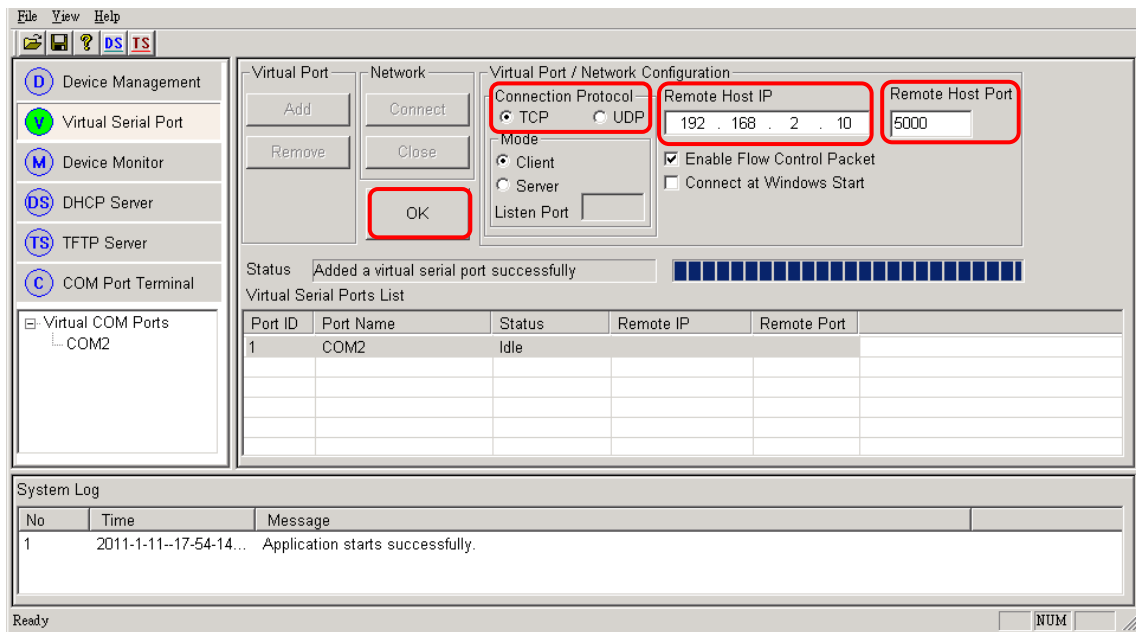
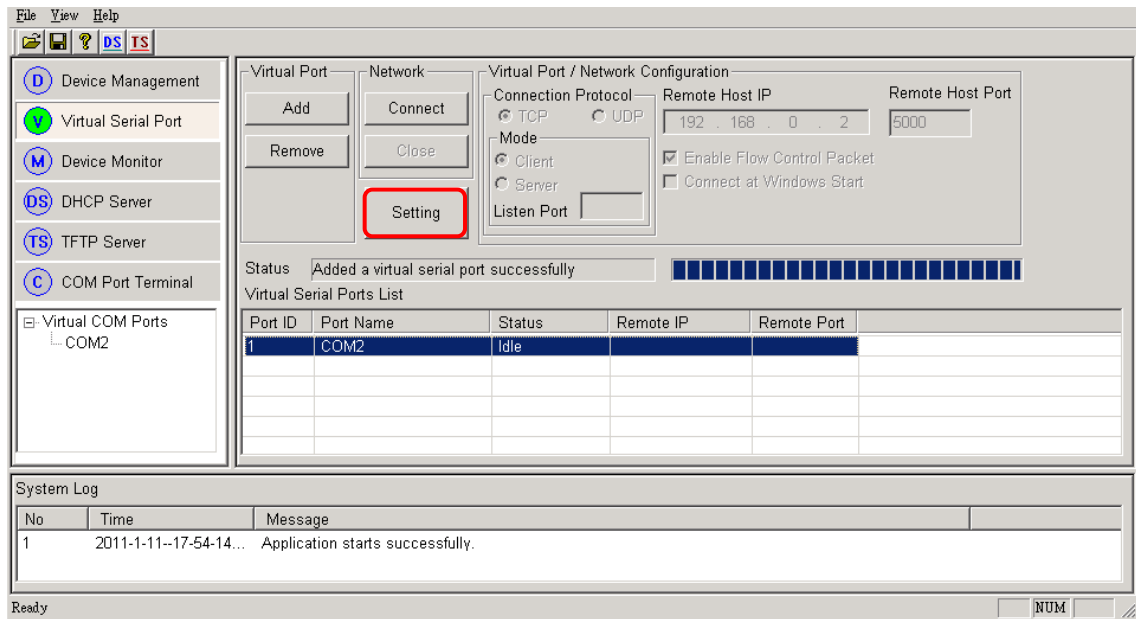
- Step 1: In Menu Window, select **Virtual Serial Port** tool.
- Step 2: Click **Add** to add a Virtual Serial Port. The COM Port Configuration dialog will appear.
- Step 3: On the COM Port Configuration dialog, select an unused port number to assign to the new Virtual Serial Port. Then click **OK** to complete the add operation.



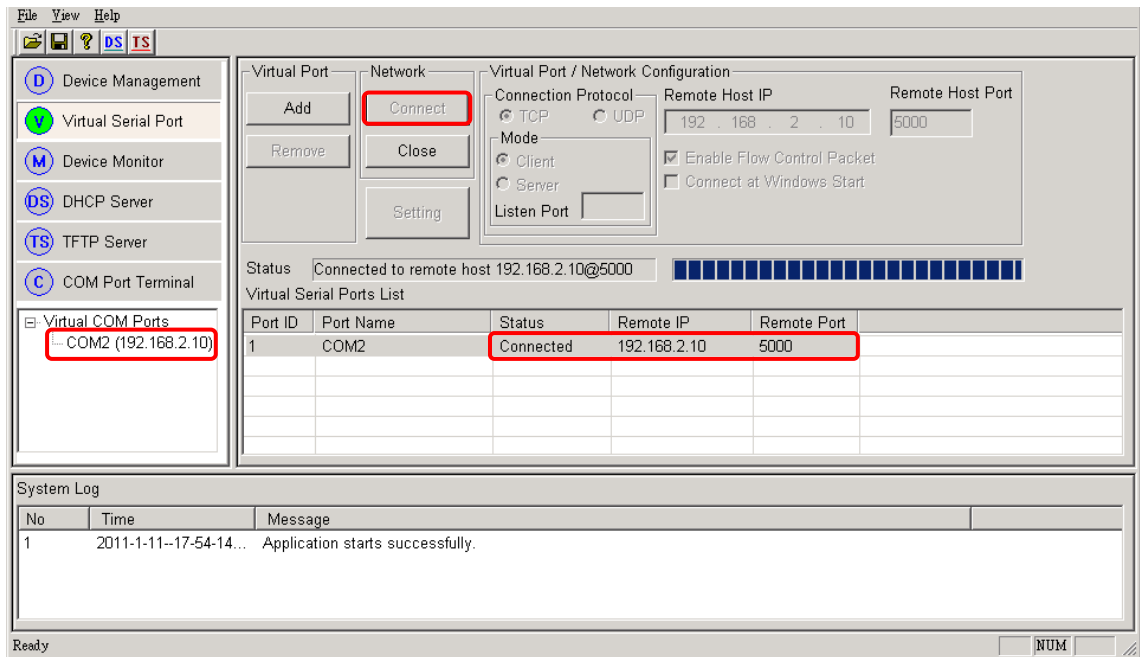
- Step 4: Click **Setting** to configure settings of the connection type, IP address, and listening port according to configuration of the targeted device. Here assumes the settings are as follows:

Field	Setting
Connection Protocol	TCP
Remote Host IP	192.168.2.10
Remote Host Port	5000
Enable Flow Control Packet	Enabled
Connect at Windows Start	Disabled
Mode	Client

- Step 5: Click **OK** to complete the setting operation.

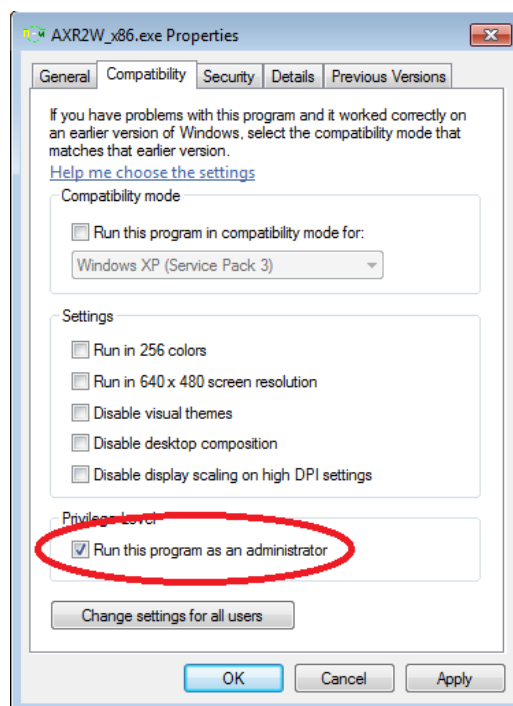
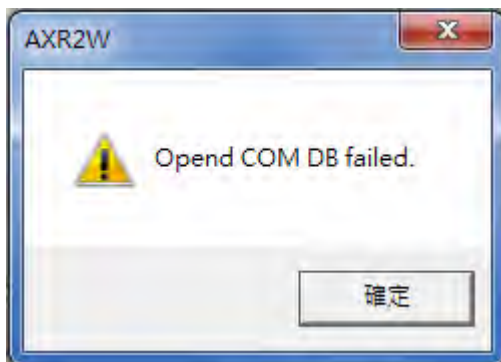


Step 6: Click **Connect** to make a TCP connection with the remote device server. You will see the update of the Virtual Serial Port's status in both the Function Window and the Menu Window.



Note: When you click **Add** to add a Virtual Serial Port, if a warning message appears as in below figure, you need to enable the administrator authority. Below shows how:

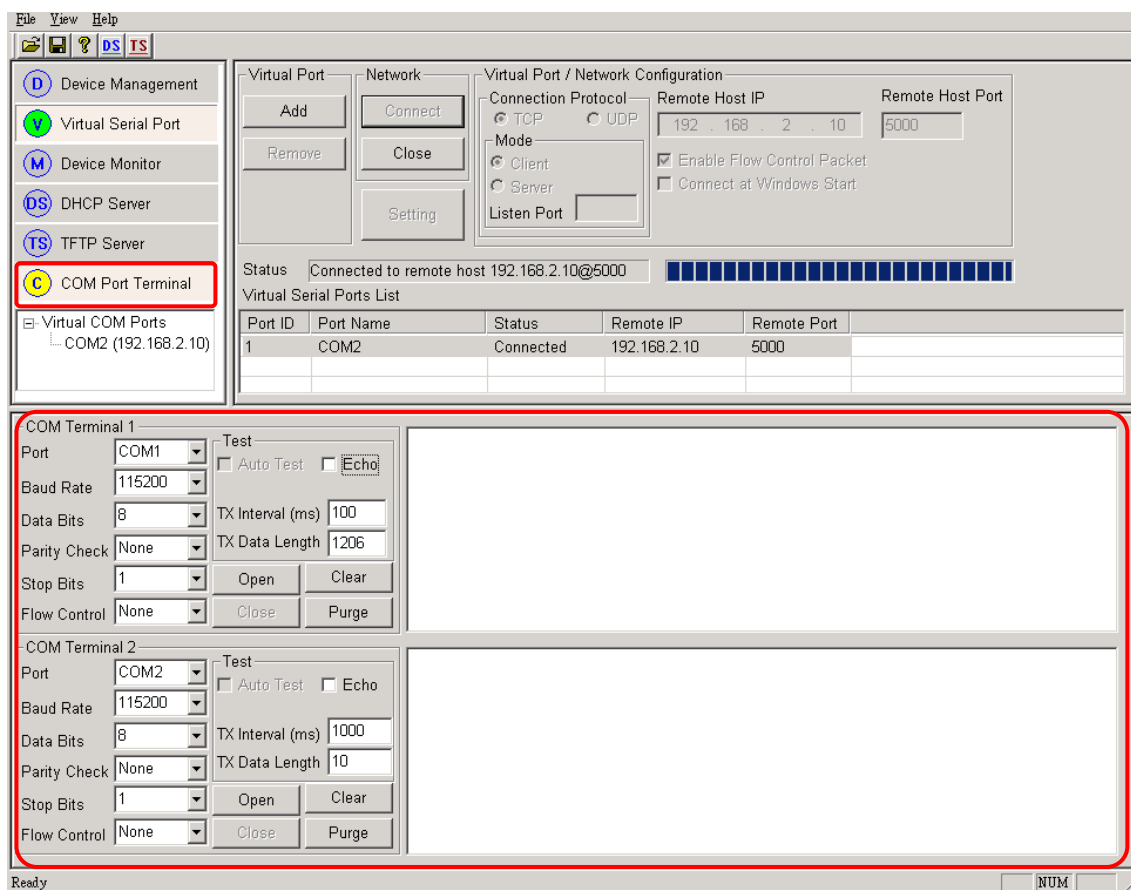
1. Select the AXR2W_x86.exe or AXR2W_x64.exe from Program File → AX220xx RS232-to-WiFi Configuration Utility folder.
2. Right-click on the file and select Properties.
3. Check the "Run this program as an administrator" checkbox from Compatibility page.



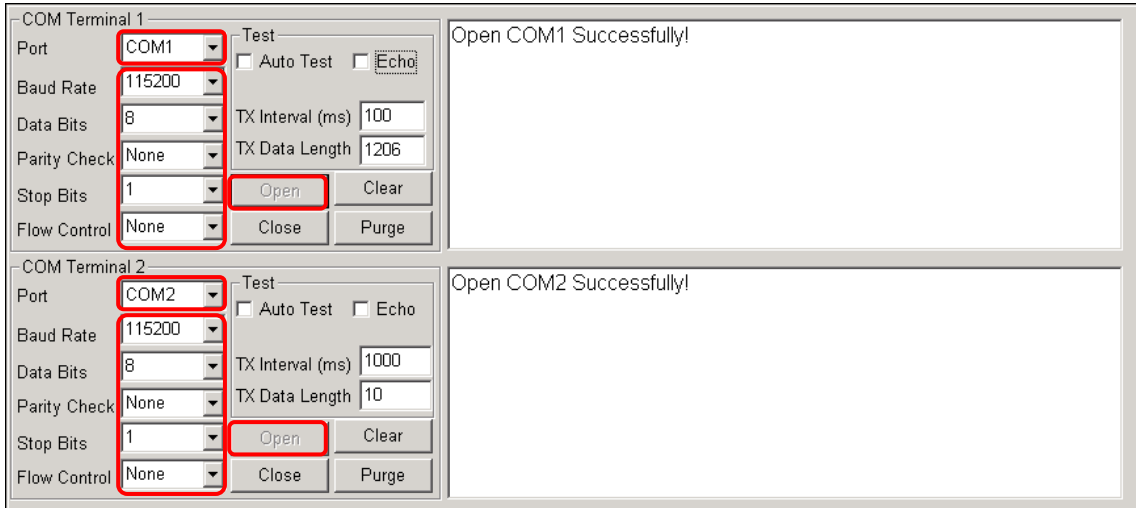
6-5 Virtual Serial Port Operation Example

Note: The following example assumes the AX220xx device server's UART2 port is connected to the COM1 port on PC1. And this device server has established a TCP connection with the Virtual Serial Port COM2 on the same PC1.

Step 1: In Menu Window, select COM Port Terminal tool. You will see the System Log Window being switched to the Function Window of COM Port Terminal tool.



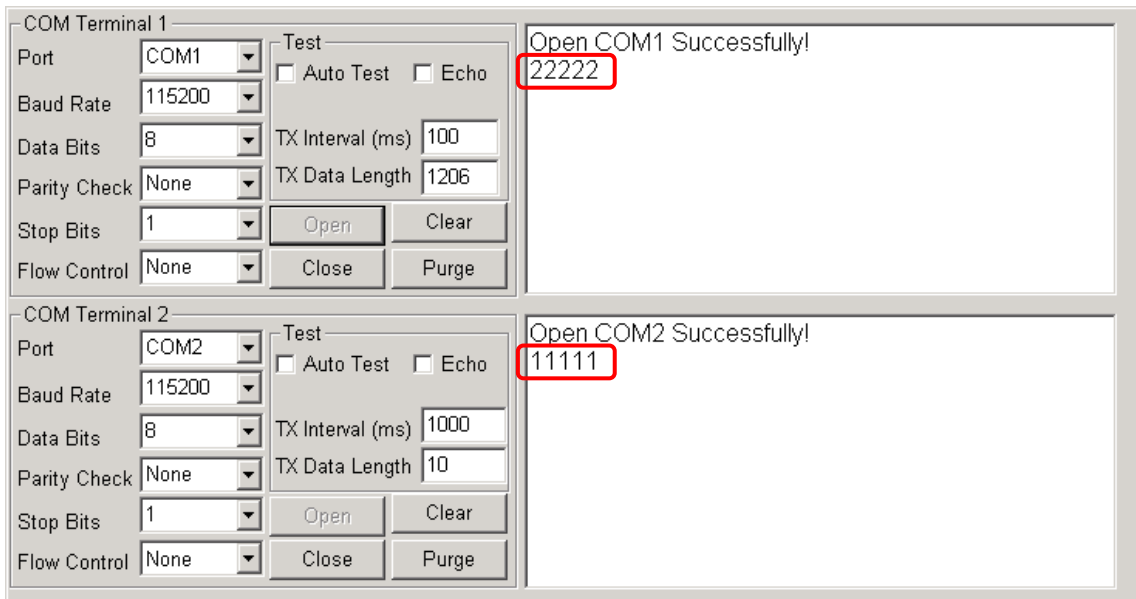
Step 2: Use COM Terminal 1 to open COM1 and use COM Terminal 2 to open COM2. Here assumes the AX220xx device server's serial port settings are 115200 baud rate, 8 data bits, no parity check, 1 stop bit and no flow control.



The screenshot shows a software interface for configuring two COM terminals. For COM Terminal 1, the Port is set to COM1, Baud Rate to 115200, Data Bits to 8, Parity Check to None, Stop Bits to 1, and Flow Control to None. The 'Open' button is highlighted with a red box. The status message on the right says 'Open COM1 Successfully!'. For COM Terminal 2, the Port is set to COM2, Baud Rate to 115200, Data Bits to 8, Parity Check to None, Stop Bits to 1, and Flow Control to None. The 'Open' button is also highlighted with a red box. The status message on the right says 'Open COM2 Successfully!'.

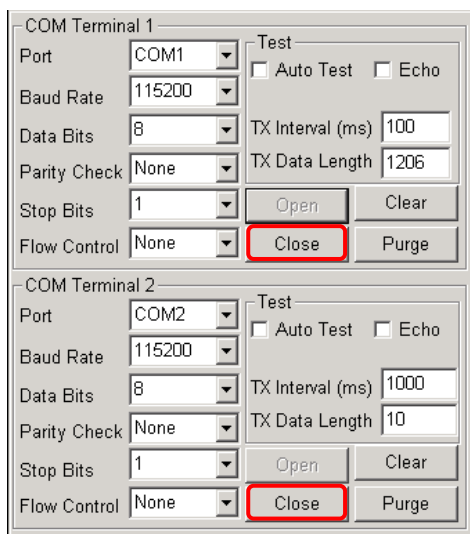
Step 3: Input some text data (e.g., “11111”) in the console of COM Terminal 1, and then you should see the data appear in the console of COM Terminal 2.

Step 4: Input some text data (e.g., “22222”) in the console of COM Terminal 2, and then you should see the data appear in the console of COM Terminal 1.



This screenshot shows the same interface as before, but now with data transfer. In the COM Terminal 1 console, the text '22222' is displayed and highlighted with a red box. In the COM Terminal 2 console, the text '11111' is displayed and highlighted with a red box. The status messages remain 'Open COM1 Successfully!' and 'Open COM2 Successfully!'.

Step 5: Click **Close** of COM Terminal 1 and COM Terminal 2 to close COM1 and COM2 ports.



COM Terminal 1

Port: COM1

Baud Rate: 115200

Data Bits: 8

Parity Check: None

Stop Bits: 1

Flow Control: None

Test: ☐ Auto Test ☐ Echo

TX Interval (ms): 100

TX Data Length: 1206

Open Clear

Close Purge

COM Terminal 2

Port: COM2

Baud Rate: 115200

Data Bits: 8

Parity Check: None

Stop Bits: 1

Flow Control: None

Test: ☐ Auto Test ☐ Echo

TX Interval (ms): 1000

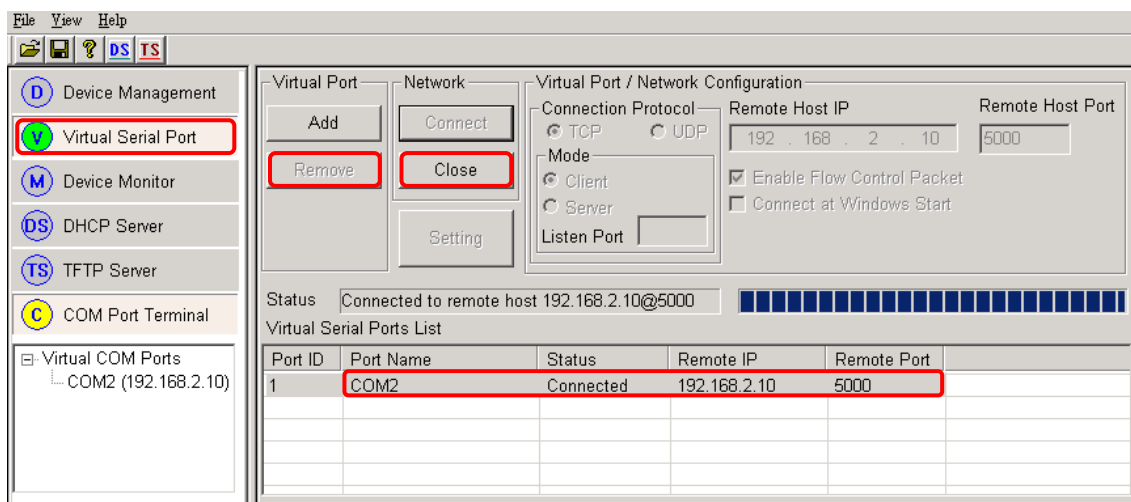
TX Data Length: 10

Open Clear

Close Purge

Step 6: In Menu Window, select Virtual Serial Port tool. Select the Virtual Serial Port COM2 from the Virtual Serial Ports List and then click **Close** to close the connection between the Virtual Serial Port driver and the AX220xx device server.

Step 7: Click **Remove** to remove the Virtual Serial Port driver from PC1.



File View Help

Device Management

Virtual Serial Port

Device Monitor

DHCP Server

TFTP Server

COM Port Terminal

Virtual COM Ports

COM2 (192.168.2.10)

Virtual Port

Add

Remove

Network

Connect

Close

Setting

Virtual Port / Network Configuration

Connection Protocol: ☒ TCP ☐ UDP

Mode: ☒ Client ☐ Server

Listen Port:

Remote Host IP: 192.168.2.10

Remote Host Port: 5000

☒ Enable Flow Control Packet

☐ Connect at Windows Start

Status: Connected to remote host 192.168.2.10@5000

Virtual Serial Ports List

Port ID	Port Name	Status	Remote IP	Remote Port
1	COM2	Connected	192.168.2.10	5000

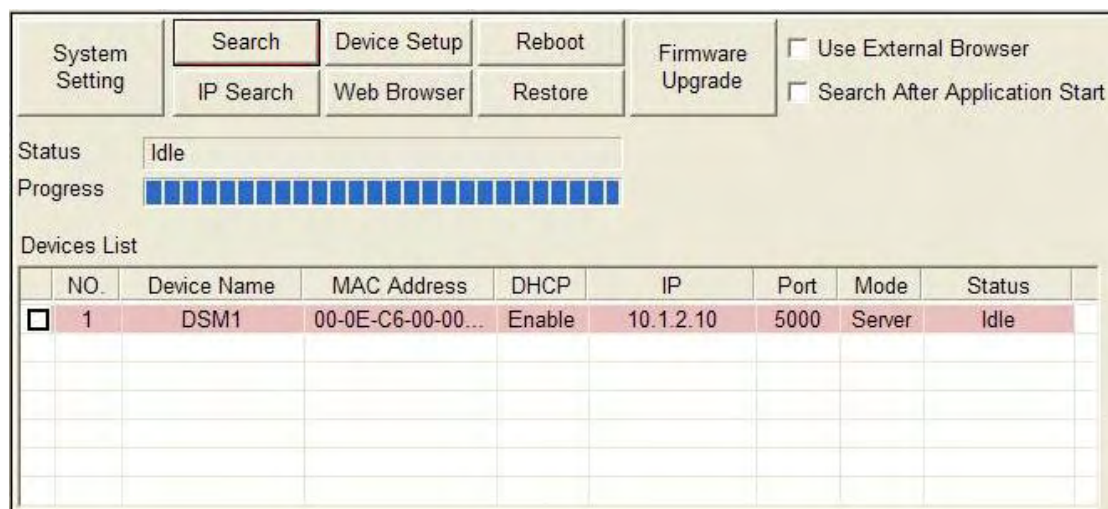
7 Software Function Description

This section describes the detailed information of various software functions available, such as AXR2W Configuration Utility, Web Server Remote Configuration and Command Line Interface (CLI) on UART0 console.

7-1 Device Management Tool

This section describes the detailed functions of Device Management tool in AXR2W Configuration Utility.

7-1-1 Function Window



NO.	Device Name	MAC Address	DHCP	IP	Port	Mode	Status
1	DSM1	00-0E-C6-00-00...	Enable	10.1.2.10	5000	Server	Idle

The Device Management tool provides following functions:

- **System Setting:** configures the Search, Reboot, and Reset period.
- **Search:** searches for available AX220xx device(s) on the wireless LAN network.
- **IP Search:** searches the AX220xx device with a specified IP address.
- **Device Setup:** configures the settings of the selected AX220xx device.
- **Web Browser:** opens remote configuration web server of the selected AX220xx device.
- **Reboot:** restarts the selected AX220xx device.
- **Restore:** configures the selected AX220xx device back to factory default settings and restarts it.
- **Firmware Upgrade:** upgrades the firmware code of the selected AX220xx device.

The function window supports two parameters:

Field	Description
Use External Browser	Enables to bring up a separate browser window for accessing the device server's web pages; disables and uses System Log Window area to display the browser.
Search After Application Start	Enables/disables the device search operation after application starts.

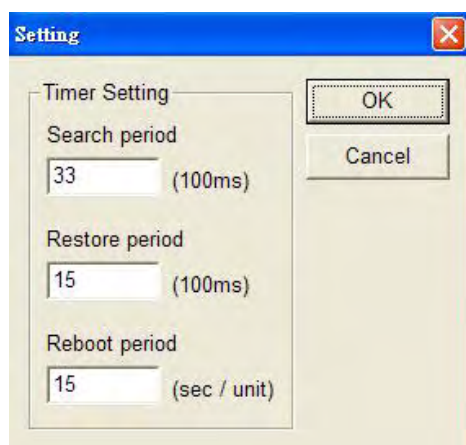
After clicking **Search**, any device server being found on network will be shown on the **Device List** with following information:

Field	Description
NO	Device server index in the list
Device Name	Device server name string up to 16 bytes maximum
MAC Address	Device server MAC address
DHCP	Enable or disable
IP	If DHCP is enabled, dynamic IP is acquired from the DHCP server. Or, static IP is assigned as dynamic IP.
Port	Server mode: data packet listening port Client mode: destination port
Mode	Client or Server
Status	Idle: no connection. Connected: the device server has a TCP or UDP connection.

If a device server shows “Connected” in Status field, it indicates that data transmission task is in progress. To avoid any unexpected interrupts during data transmission, the Device Management tool prohibits user operations of device setup, reset, reboot and upgrade for those device servers with “Connected” status.

7-1-2 System Setting Dialog

When clicking **System Setting**, the Setting dialog will appear,



The Setting dialog provides two functions:

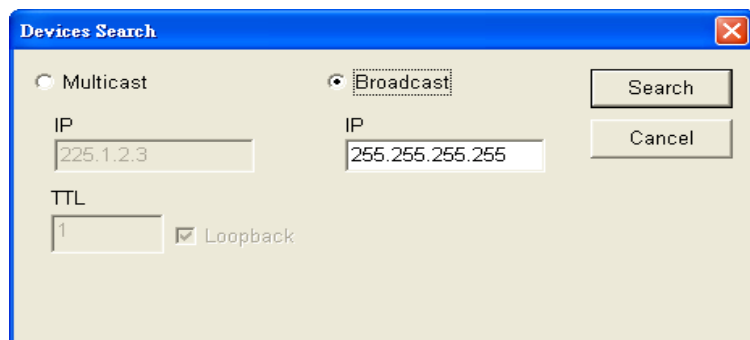
Action	Behavior
Press OK	Enables the new period setting.
Press Cancel	Cancels the new period setting.

The Setting dialog provides following parameters:

Field	Description
Search period	Set the search timeout period.
Reset period	Set the reset timeout period.
Reboot period	Set the reboot timeout period.

7-1-3 Search Dialog

When clicking **Search**, the Device Searching dialog will appear,



The Devices Searching dialog provides two functions:

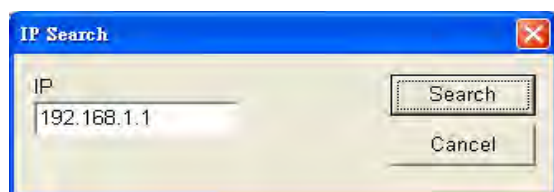
Action	Behavior
Press Search	Starts the search operation.
Press Cancel	Cancels the search operation.

The Devices Searching dialog provides following parameters:

Field	Description
Multicast	Search via UDP multicast packet
IP	Multicast IP address
TTL	Time to live
Loopback	Enable/Disable loopback of outgoing multicast packets
Broadcast	Search via UDP broadcast packet
IP	Broadcast IP address

7-1-4 IP Search Dialog

When clicking **IP Search**, the IP Search dialog will appear,



The IP Search dialog provides two functions:

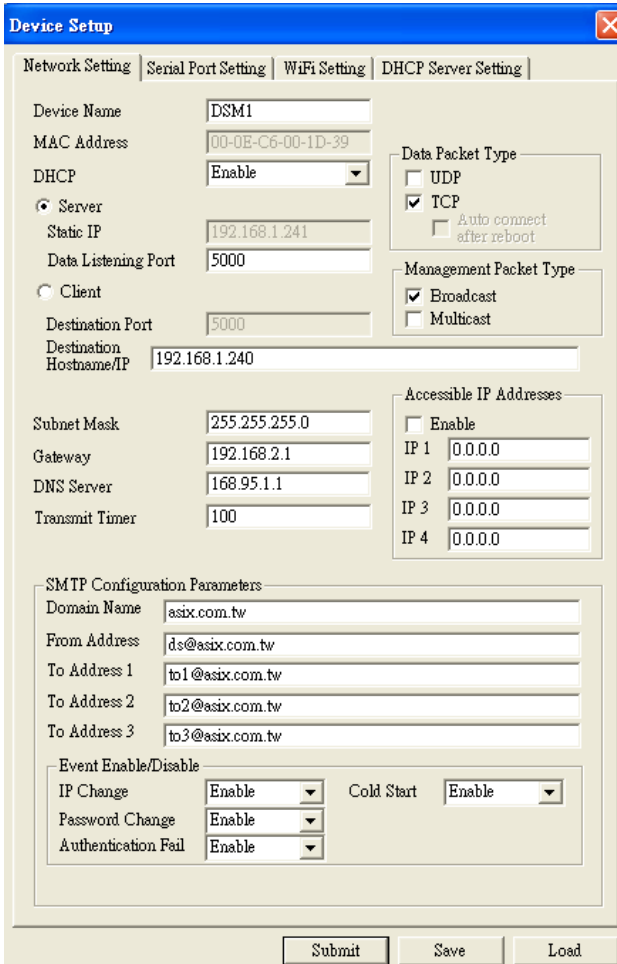
Action	Behavior
Press Search	Starts the search operation.
Press Cancel	Cancels the search operation.

The IP Search dialog provides following parameters:

Field	Description
IP	The device server's IP address

7-1-5 Device Setup Dialog

When clicking **Device Setup**, the Device Setup dialog will pop up with 4 tabs: **Network Setting**, **Serial Port Setting**, **WiFi Setting**, and **DHCP Server Setting**.



Device Setup

Network Setting | Serial Port Setting | WiFi Setting | DHCP Server Setting

Device Name: DSM1

MAC Address: 00-0E-C6-00-1D-39

DHCP: Enable

☒ Server

Static IP: 192.168.1.241

Data Listening Port: 5000

☐ Client

Destination Port: 5000

Destination Hostname/IP: 192.168.1.240

Subnet Mask: 255.255.255.0

Gateway: 192.168.2.1

DNS Server: 168.95.1.1

Transmit Timer: 100

Data Packet Type

☐ UDP

☒ TCP

☐ Auto connect after reboot

Management Packet Type

☒ Broadcast

☐ Multicast

Accessible IP Addresses

☐ Enable

IP 1: 0.0.0.0

IP 2: 0.0.0.0

IP 3: 0.0.0.0

IP 4: 0.0.0.0

SMTP Configuration Parameters

Domain Name: asix.com.tw

From Address: ds@asix.com.tw

To Address 1: to1@asix.com.tw

To Address 2: to2@asix.com.tw

To Address 3: to3@asix.com.tw

Event Enable/Disable

IP Change: Enable


Password Change: Enable

Authentication Fail: Enable

Cold Start: Enable

Submit Save Load

Network Setting



Device Setup

Network Setting | Serial Port Setting | WiFi Setting | DHCP Server Setting

Baud Rate: 115200

Data Bits: 8

Parity: None

Stop Bits: 1

Flow Control: None

RS-485 Mode: 0

0: Sleep

1: Single Twisted Pair Half-Duplex

2: Single Twisted Pair Half-Duplex or Double Twisted Pair Full-Duplex (Slave)

3: Double Twisted Pair Full-Duplex (Master)

Submit Save Load

Serial Port Setting

Device Setup

Network Setting | Serial Port Setting | **WiFi Setting** | DHCP Server Setting

System Settings

Wireless Mode: 802.11b/g

Network Mode: Infrastructure

Channel: 6

Service Area Name/SSID: RT-G32

Security Mode: WEP 64

WEP Encryption Key Settings

Key Length: 64 bits

Key Index Select: Key Index 0

Key Index 0: 1234567890

Key Index 1: 0987654321

Key Index 2: A1B2C3D4E5

Key Index 3: 0123456789

(Please enter 10 or 26 Hex digits for 64 or 128 bits key length.)

AES/TKIP Encryption Key Settings

AES/TKIP Passphrase (8 ~ 63 digits): 12345678

WiFi Advanced Settings

TX Data Rate: Auto

Transmission Power Level: 100%

Preamble Mode: Auto

Beacon Interval (20ms ~ 1000ms): 100 ms

RTS Threshold (0 ~ 2432): 2432

Auto Power Control Mode: Enable

Protection Frame Type: RTS

Submit Save Load

WiFi Setting

Device Setup

Network Setting | Serial Port Setting | WiFi Setting | **DHCP Server Setting**

IP Pool Start Address: 192 . 168 . 2 . 4

IP Pool End Address: 192 . 168 . 2 . 10

Subnet Mask: 255 . 255 . 255 . 0

Default Gateway: 0 . 0 . 0 . 0

Lease Time: 1440 minutes

Status: Enable

Submit Save Load

DHCP Server Setting

The Device Setup dialog provides following functions:

Action	Behavior
Press Submit	Submits new setting to device.
Press Save	Saves the new setting to a file.
Press Load	Reads a set of setting from a file.

7-1-5-1 Network Setting

The **Network Setting** tab provides following parameters:

Field	Description
Device Name	Device identification string
MAC Address	The MAC address of the device server
DHCP	Enable / disable DHCP client function
Server	Enable Server mode
Static IP	IP address of device server in Server mode
Data Listening Port	Server data packet listening port
Client	Enable Client mode
Destination IP	Remote host IP address for Client mode
Destination Port	Remote host listening port
TCP	Transmit serial data via TCP connection
UDP	Transmit serial data via UDP connection
Multicast	Transmit management data via multicast packet
Broadcast	Transmit management data via broadcast packet
Subnet Mask	Subnet mask of device server
Gateway	Gateway IP address of device server
DNS Server	DNS server IP address of device server
Transmit Timer	Time interval to send out serial data packet
Accessible IP Addresses Configuration Parameters	
Enable	Enable / disable accessible IP addresses
IP 1	Accessible IP address 1
IP 2	Accessible IP address 2
IP 3	Accessible IP address 3
IP 4	Accessible IP address 4
SMTP Configuration Parameters	
Domain Name	The SMTP client's domain name.
From Address	The sender's IP address.
To Address 1	The 1st recipient's IP address
To Address 2	The 2nd recipient's IP address
To Address 3	The 3rd recipient's IP address
IP Change	Enable / disable the IP Change event.
Password Change	Enable / disable the Password Change event.
Authentication Fail	Enable / disable the Authentication Fail event.
Cold Start	Enable / disable the Cold Start event.

7-1-5-2 Serial Port Setting

The **Serial Port Setting** tab provides following parameters:

Field	Description
Baud rate	Data transfer rate per second
Data bits	Data bits
Parity	Parity check
Stop bits	Stop bits
Flow control	Flow control
RS-485 Mode	RS-485 mode

7-1-5-3 WiFi Setting

The **WiFi Setting** tab provides following parameters:

Field	Description
Wireless Mode	The mode 802.11 b/g is supported only.
Network Mode	Either Ad-Hoc or Infrastructure mode
Channel	Channel number
Service Area Name/SSID	Service Set Identifier
Security Mode	The WiFi data can be encrypted with option of open-system, WEP 64/128, TKIP and AES.
Key Length	If WEP encryption is selected, this selects the key length, either WEP-64 or WEP-128 to be used.
Key Index Select	Select the key index to be used for WEP encryption.
Key Index 0	WEP key value of index 0.
Key Index 1	WEP key value of index 1.
Key Index 2	WEP key value of index 2.
Key Index 3	WEP key value of index 3.
AES/TKIP Passphrase	AES/TKIP key value.
TX Data Rate	Transmission data rate of WiFi connection.
Transmission Power Level	Transmission power.
Preamble Mode	Preamble will be either Long Preamble, or Auto.
Beacon Interval	Periodic time to send Beacon in ms, if in Ad-Hoc mode.
RTS Threshold	The threshold of number of bytes to send RTS signal.
Auto Power Control Mode	Enable/disable Auto Power Control.
Protection Frame Type	Protection frame type will be either RTS or Self-CTS.

7-1-5-4 DHCP Server Setting

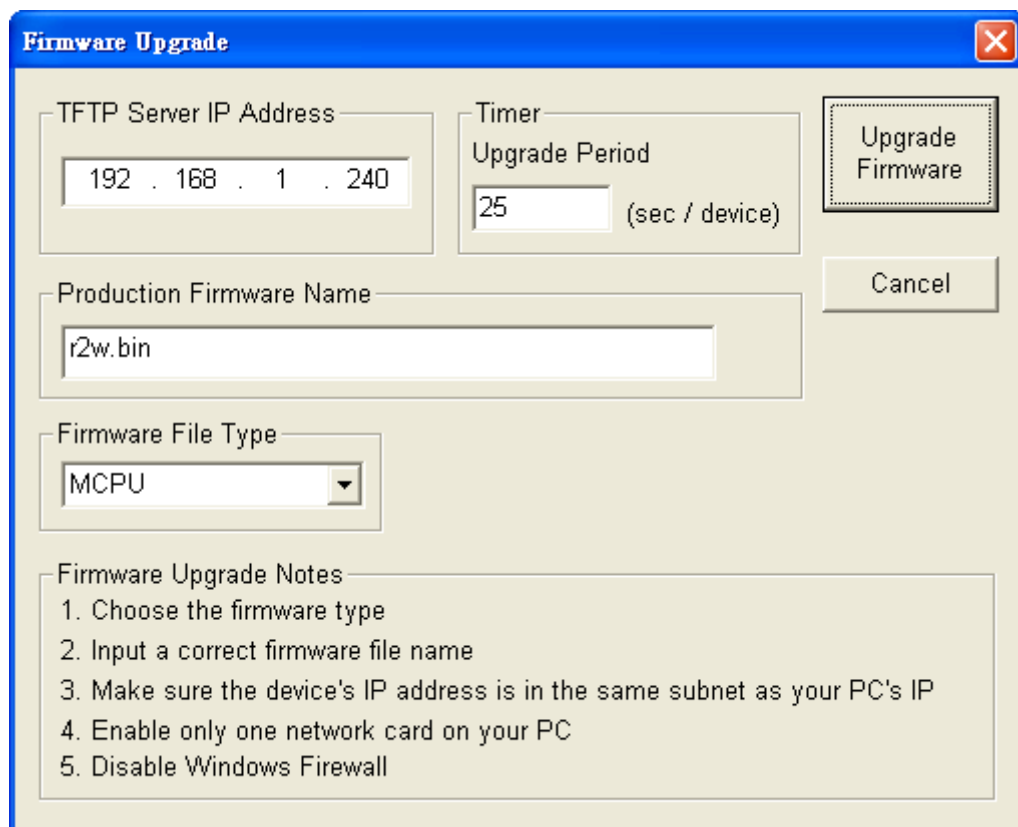
The **DHCP Server Setting** tab provides following parameters:

Field	Description
IP Pool Start Address	The start IP address to offer to DHCP client.
IP Pool End Address	The end IP address to offer to DHCP client.
Subnet Mask	The subnet mask to offer to DHCP client.
Default Gateway	The default gateway to offer to DHCP client.
Lease Time	The time period that the offered IP address is valid.
Status	Enable/disable DHCP server service.

7-1-6 Firmware Upgrade Dialog

Note that before user performs the firmware upgrade, one should start DHCP Server and TFTP Server tools first. Please refer to section 7-5 and section 7-6 for details.

- (1) Select the target AX220xx RS-232 to WiFi device from the Devices List.
- (2) Click **Firmware Upgrade** to bring up the Firmware Upgrade dialog.
- (3) Choose the firmware file type.
- (4) Input a correct AX220xx RS-232 to WiFi firmware file name.
- (5) Input the TFTP server IP address.
- (6) Click **Upgrade Firmware** to start upgrading the new AX220xx firmware code.



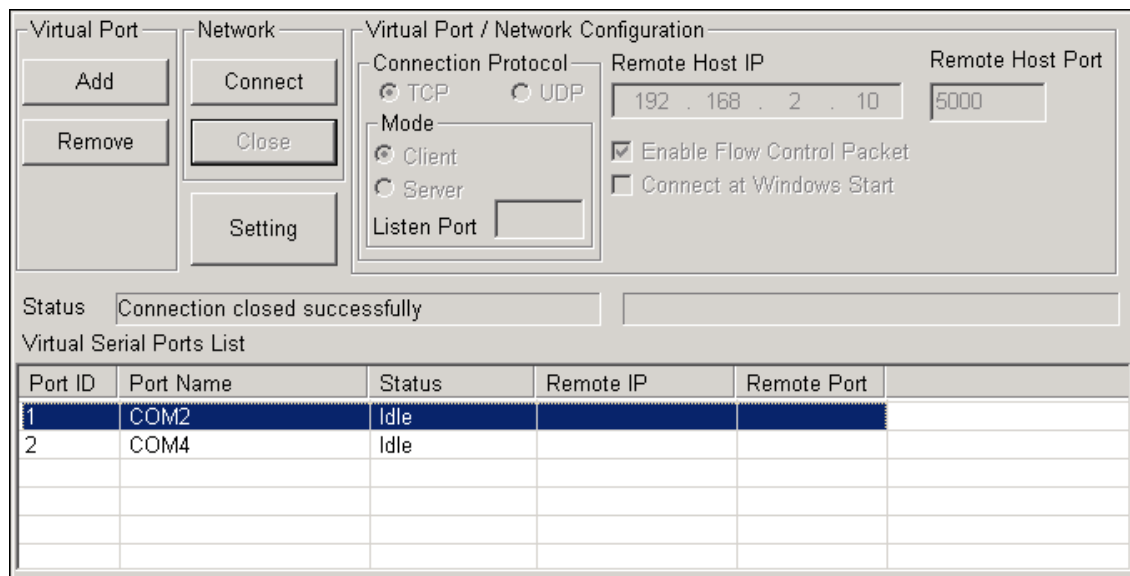
The Firmware Upgrade dialog box contains the following fields and controls:

- TFTP Server IP Address:** A text field with the value "192 . 168 . 1 . 240".
- Timer Upgrade Period:** A text field with the value "25" and the label "(sec / device)".
- Upgrade Firmware:** A button with a dashed border.
- Cancel:** A button.
- Production Firmware Name:** A text field with the value "r2w.bin".
- Firmware File Type:** A dropdown menu with "MCP" selected.
- Firmware Upgrade Notes:** A text area containing a list of instructions:
 1. Choose the firmware type
 2. Input a correct firmware file name
 3. Make sure the device's IP address is in the same subnet as your PC's IP
 4. Enable only one network card on your PC
 5. Disable Windows Firewall

7-2 Virtual Serial Port Tool

This section describes the detailed functions of Virtual Serial Port tool in AXR2W Configuration Utility.

7-2-1 Function Window



Port ID	Port Name	Status	Remote IP	Remote Port
1	COM2	Idle		
2	COM4	Idle		

The Virtual Serial Port tool provides following functions:

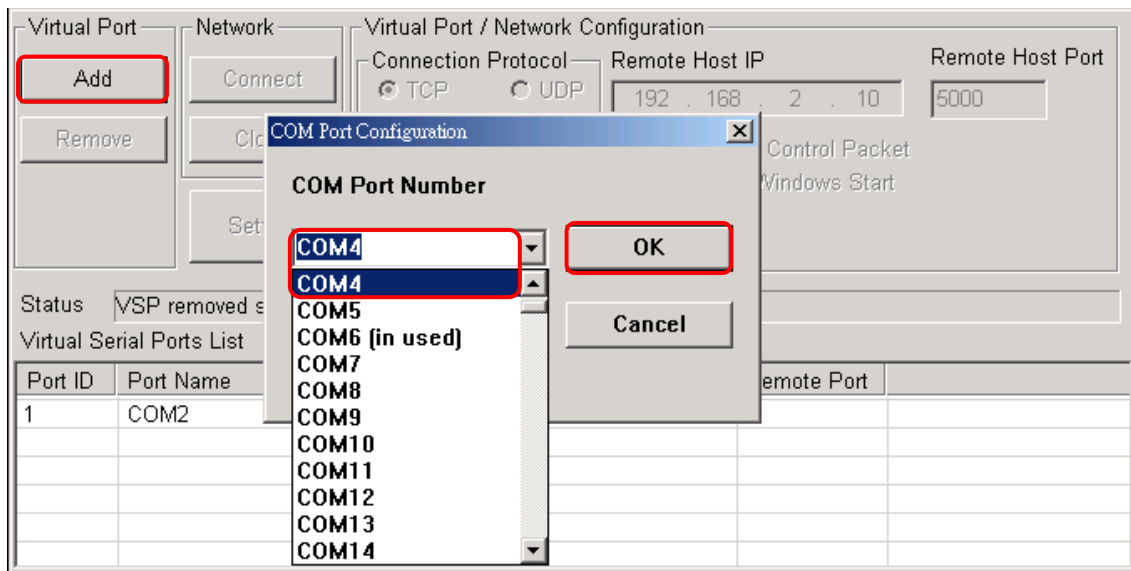
Action	Behavior
Press Add	Adds a Virtual Serial Port.
Press Remove	Removes the selected Virtual Serial Port.
Press Connect	Makes a TCP or UDP connection with the selected device server.
Press Close	Closes the selected TCP/UDP connection.
Press Setting	Configures settings of the selected Virtual Serial Port.

When a Virtual Serial Port is added successfully, it will be shown on the Virtual Serial Ports List with following information:

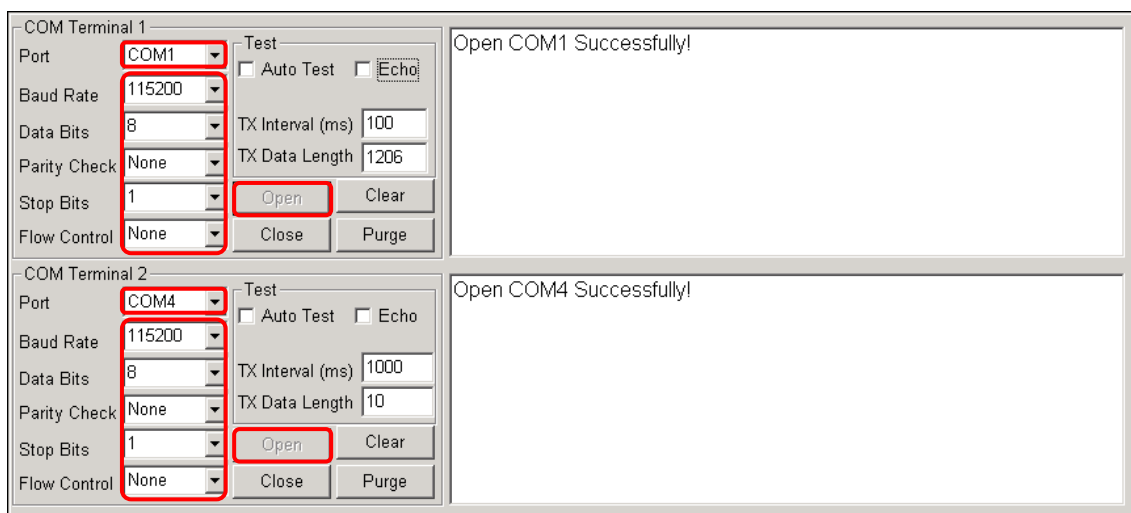
Field	Description
Port ID	The identification value of the Virtual Serial Port
Port Name	The name of the Virtual Serial Port
Status	The status of the Virtual Serial Port
Remote IP	The IP address of the device server that connects with this Virtual Serial Port
Remote Port	The port number of the device server that connects with this Virtual Serial Port

7-2-2 Add a Virtual Serial Port

Step 1: Click **Add** to add a Virtual Serial Port. Below example shows a COM4 Virtual Serial Port being added.



Step 2: Use COM Terminal 1 to open the COM1 and use COM Terminal 2 to open COM4. Here assumes the AX220xx device server's serial port settings are 115200 baud rate, 8 data bits, no parity check, 1 stop bit and no flow control.



Note: In general, the first and second Virtual Serial Ports should be added successfully in 10 seconds. For additional Virtual Serial Ports, the Virtual Serial Port tool may take longer time up to 20 seconds to complete the addition procedure.

7-2-3 Remove a Virtual Serial Port

Step 1: Select the to-be-removed Virtual Serial Port from the List.

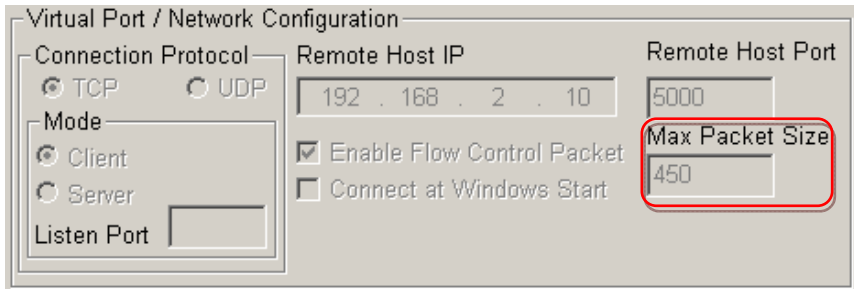
Step 2: Click **Remove** to remove the selected Virtual Serial Port.

7-2-4 Set a Virtual Serial Port

Step 1: Select the Virtual Serial Port from the List.

Step 2: Click **Setting** to configure the Virtual Serial Port.

The Virtual Port/Network Configuration supports following parameters:

Field	Description
Connection Protocol	TCP or UDP connection type
Remote Host IP	The target device server's IP address
Remote Host Port	The target device server's port number
Enable Flow Control Packet	Enable / disable the Virtual Serial Port sending and receiving flow control packets. This function is dependent on the flow control function of AX220xx RS-232 to WiFi firmware. If this function is enabled on Virtual Serial Port driver and the firmware, both sides will prepend a 3-byte header in each egress WiFi packet and will strip off the 3-byte header in each ingress WiFi packet.
Connect at Windows Start	Enable / disable the automatic connection function at Windows start. When this function is enabled, the Virtual Serial Port will automatically connect to the target device server after VSP COM port is opened.
Mode	Virtual port can run either on Client or Server mode. If the Server mode is selected, Listen Port field must be configured a port number accordingly. And the port number larger than 2000 is recommended.
Max Packet Size	<p>The maximum payload size of each egress TCP or UDP packet. The default setting of maximum payload size is 450 bytes. By default this field is not allowed to configure and is gray out.</p>  <p>You can enable the configuration of this field by editing the setting item 11 in AXR2W's setting file, AxR2w.dat.</p> <pre>// (11) (VSP) Maximum Network TX Packet Size Setting 0:disable 1:enable</pre>

7-2-5 Make a Connection and Close a Virtual Serial Port

- Step 1: Select the Virtual Serial Port from the List.
- Step 2: Check **Settings** to configure the remote device, if it is not valid.
- Step 3: Click **Connect** to connect to the remote device.
- Step 4: Run application, such as Tera Term, to send data to the remote device.
- Step 5: Close application, and then click **Close** to close the connection.

Note:

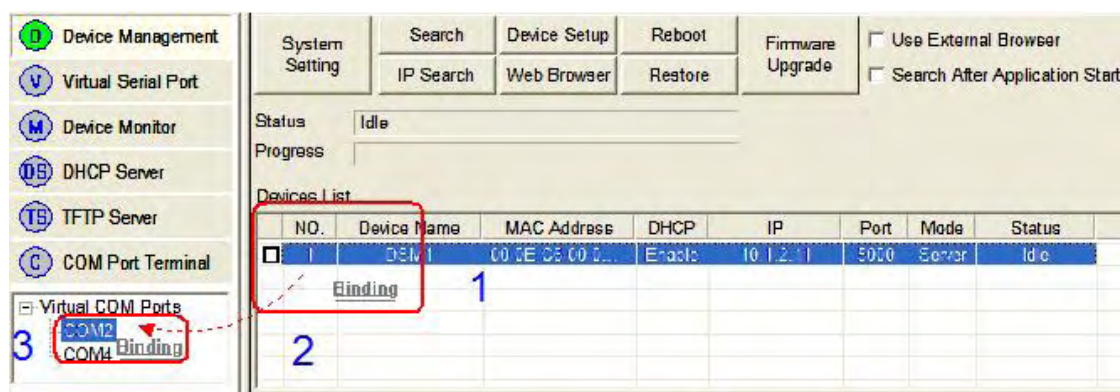
- (1) Before clicking **Close**, you must close Tera Term or serial port application program first.
- (2) Before configuring the remote host IP address and port, you must select a Virtual Serial Port.

7-2-6 Auto-Binding Function

The auto-binding function enables you to connect a Virtual Serial Port with a device server easier and faster. Before using this function, you must make sure the target Virtual Serial Port's "Enable Flow Control Packet" setting is correct. (i.e., it must be same as the device server's setting)

Below example illustrates how to use the auto-binding function to connect the Virtual Serial Port COM2 with the DSM1 device server

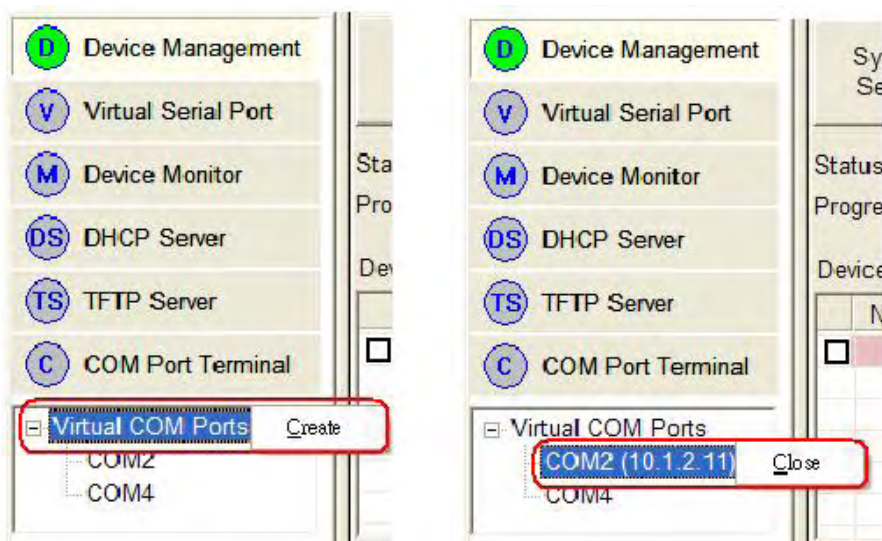
- Step 1: In the Function Window of Device Management tool, select the DSM1 device server from the Devices List.
- Step 2: Drag the selected device server from the Function Window to the Menu Window.
- Step 3: Drop the selected device server on the "COM2" tree item in the Virtual COM Ports tree area.



In addition to the auto-binding function, you can also remove a connected Virtual Serial Port or add a Virtual Serial Port via the Virtual COM Ports tree's context menu.

To add a Virtual Serial Port, you can move the mouse cursor onto the "Virtual COM Ports" tree item and then right click the mouse button. Then select the "Create" menu item.

To close a connected Virtual Serial Port, you can move the mouse cursor onto that Virtual Serial Port's tree item and then right click the mouse button. Then select the "Close" menu item.



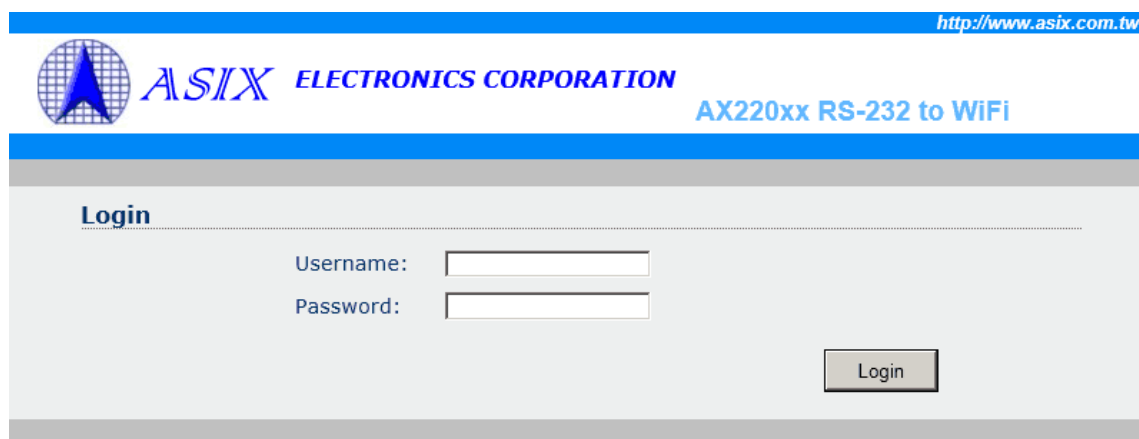
7-3 Web Server Remote Configuration

This section describes the detail functions of AX220xx RS-232 to WiFi Web Server Remote Configuration.

7-3-1 Login Authentication Page

There are two ways to open the web page of an AX220xx device server.

- 1: From AXR2W Configuration Utility, user can select the target device on Device List and click **Web Browser**. The tool will open a browser and connect to the web server of selected device automatically. The below Login page will appear.
- 2: User can manually open a web browser and type in <http://xxx.xxx.xxx.xxx> (e.g. <http://192.168.2.3>). This is the target AX220xx device server's IP address. The below Login page will appear.




The screenshot shows the login page of the AX220xx RS-232 to WiFi web server. At the top, there is a blue header bar with the URL <http://www.asix.com.tw> on the right. Below the header, the ASIX Electronics Corporation logo is on the left, and the text "AX220xx RS-232 to WiFi" is on the right. The main content area has a light gray background. On the left, the word "Login" is underlined. To the right of "Login", there are two input fields: "Username:" and "Password:". Below these fields is a "Login" button.

User must enter correct username and password and click **Login** before one can browse the device server. The default username is "admin" and default password is "admin". The HTTP server will redirect to **Basic** page if the authentication is successful.

7-3-2 Basic Page

<http://www.asix.com.tw>


AX220xx RS-232 to WiFi

[Logout](#)

Basic	Advanced	Security	WiFi	WiFi Wizard	Status
-------	----------	----------	------	-------------	--------

Serial Settings

Device Name:
Device name can be up to 16 characters.

Data Baud Rate:

Data Bits:

Data Parity:

Stop Bits:

Flow Control:

Rs485:

Network Settings

DHCP Client:

Static IP Address:

Static Subnet Mask:

Static Default Gateway:

Static DNS Server:

Connection Type:

Transmit Timer (ms):
Please enter an integer between 10~65535.

Server/Client Mode:

Server Listening Port:
Please enter an integer between 1024~65535.

Client Destination Host Name/IP:
Please enter host name or IP address(e.g. asix.com.tw or 10.4.1.100).

Client Destination Port:
Please enter an integer between 1024~65535.

On this page, the Client Destination Host Name/IP field can accept either host name or IP address format; for example, you can enter “asix.com.tw” or “10.1.4.100” in this field.


This page supports 4 command buttons:

- (1) **Apply**: submits the current settings on this page to the device server.
- (2) **Cancel**: cancels the changed settings on this page.
- (3) **Restore_Default**: restores the device server back to factory default settings. When clicking it, a warning dialog will appear. You can press **OK** to continue the operation, or press **Cancel** to cancel the operation.
- (4) **Reboot**: restarts the device server.

When clicking **Apply** or **Reboot**, a confirmation window will appear. User can click **OK** to continue the operation, or click **Cancel** to cancel the operation.

7-3-3 Advanced Page

<http://www.asix.com.tw>



ASIX ELECTRONICS CORPORATION
 AX220xx RS-232 to WiFi

[Logout](#)

Basic
Advanced
Security
WiFi
WiFi Wizard
Status

Boot Loader Firmware Upgrade

TFTP Server IP:

File Name:

File name can be up to 63 characters.

MCPU Firmware Upgrade

TFTP Server IP:

File Name:

File name can be up to 63 characters.

WCPU Firmware Upgrade

TFTP Server IP:

File Name:

File name can be up to 63 characters.

E-mail & Auto Warning Report Settings

E-mail Server Address/IP:
Please enter host name or IP address(e.g. asix.com.tw or 10.4.1.100).

From E-mail Address:

To E-mail Address 1:

To E-mail Address 2:

To E-mail Address 3:

Cold Start:

Authentication Failure:

Local IP Address Changed:

Password Changed:

DHCP Server Settings

DHCP Server: ☐ Disable ☒ Enable

IP Pool Starting Address:

IP Pool Ending Address:

Default Gateway:

Subnet Mask:

Note that the end pool must be larger than start pool, and their net ID must be equal.

This page supports 3 firmware upgrade buttons. Note that before user performs the firmware upgrade, one should start DHCP Server and TFTP Server tools in AXR2W Configuration Utility first. Please refer to section 7-5 and section 7-6 for details.

- (1) **Upgrade_Bootldr**: upgrades the Boot Loader firmware and then reboots the device server.
- (2) **Upgrade_MCPU**: upgrades the MCU firmware and then reboots the device server.
- (3) **Upgrade_WCPU**: upgrades the WCPU firmware and then reboots the device server.

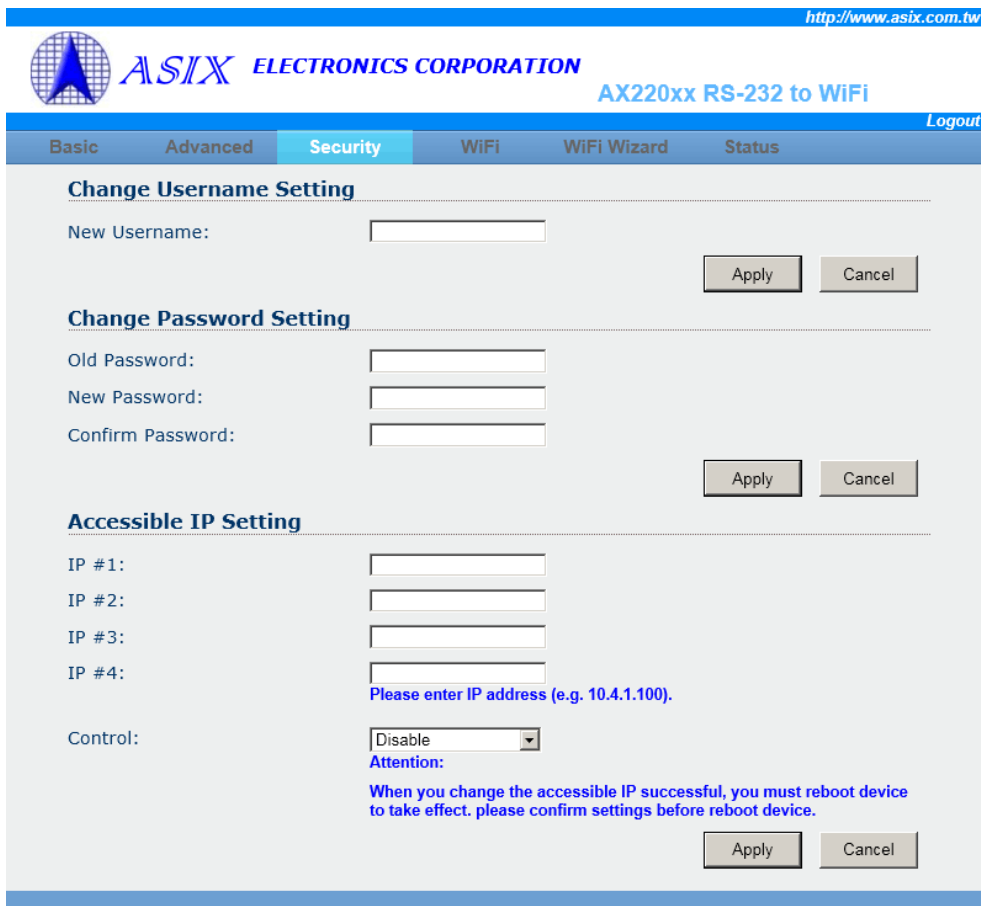
User should enter correct TFTP Server IP address and the firmware file name (without file path is fine) for upgrade before clicking these buttons.

When clicking **Apply** or any firmware upgrade button, a confirmation window will appear. User can press **OK** to continue the operation, or press **Cancel** to cancel the operation.

The **E-mail Server Address/IP** field can accept host name or IP address format, for example, you can enter "asix.com.tw" or "10.1.4.100" in this field.

The device server supports the DHCP server service and user can setup the settings of DHCP server and press **Apply** to change the current settings.

7-3-4 Security Page



The screenshot shows the Security page of the AX220xx RS-232 to WiFi web interface. The page has a blue header with the ASIX logo and the text "ASIX ELECTRONICS CORPORATION" and "AX220xx RS-232 to WiFi". The URL "http://www.asix.com.tw" is visible in the top right corner. The page has a navigation bar with tabs: Basic, Advanced, Security (selected), WiFi, WiFi Wizard, and Status. There is a "Logout" link in the top right corner. The main content area is divided into three sections: "Change Username Setting", "Change Password Setting", and "Accessible IP Setting". Each section has input fields and "Apply" and "Cancel" buttons. The "Accessible IP Setting" section includes a "Control" dropdown menu set to "Disable" and a blue "Attention" message: "When you change the accessible IP successful, you must reboot device to take effect, please confirm settings before reboot device."

On this page, the **Accessible IP Setting** must be used with care. User should enter correct accessible IP address(s) before enabling this function. The new configuration will take effect after the device server reboots.

When clicking **Apply**, a confirmation window will appear. User can press **OK** to continue the operation, or press **Cancel** to cancel the operation.

When clicking **Logout** at the top right corner of the page, the session will be logged out and redirected to the login page.

7-3-5 WiFi Page

<http://www.asix.com.tw>**ASIX ELECTRONICS CORPORATION**

AX220xx RS-232 to WiFi

[Logout](#)

Basic

Advanced

Security

WiFi

WiFi Wizard

Status

System Settings

Network Mode:

Channel:

Service Area Name/SSID:

Security Mode:

WEP Encryption Key Settings

Key Length:

Key Index Select:

Key Index 0:

Key Index 1:

Key Index 2:

Key Index 3:

Please enter 10-digit hex for 64-bit key length or 26-digit hex for 128-bit key length.

AES/TKIP Encryption Key Settings

AES/TKIP Passphrase:

Please enter a string between 8~63 digits in length.

Apply

Cancel

WiFi Advanced Settings

TX Data Rate:

Transmission Power Level:

Preamble Mode:

Beacon Interval (ms):

Please enter an integer between 20~1000.

RTS Threshold:

Please enter an integer between 0~2432.

Auto Power Control Mode:

Protection Frame Type:

Apply

Cancel

The page configures the WiFi settings of device server's WiFi network. Note that the current value of WEP Key Index 0~3 fields will be displayed according to Key Length field being selected, either 64 bits or 128 bits (i.e. WEP-64 or WEP-128).

When clicking **Apply**, a confirmation window will appear. User can press **OK** to continue the operation, or press **Cancel** to cancel the operation.

7-3-6 WiFi Wizard Page

The WiFi Wizard is similar to WiFi page but provides a step by step procedure to help user to configure WiFi network settings and avoid incorrect settings. The WiFi Wizard includes following 6 sub-pages:

1. WiFi Link Settings sub-page
2. Encryption Selection sub-page
3. WEP Key Settings sub-page
4. AES/TKIP Key Settings sub-page
5. Advanced Settings sub-page
6. WiFi Settings Confirmation sub-page

7-3-6-1 WiFi Link Settings Sub-Page

<http://www.asix.com.tw>



ASIX ELECTRONICS CORPORATION
 AX220xx RS-232 to WiFi

[Logout](#)

Basic

Advanced

Security

WiFi

WiFi Wizard

Status

Welcome to the WiFi Setup Wizard

This wizard helps you set up your device to join a WiFi access point or set up its own security-enabled WiFi network.

Network Mode: Infrastructure

Channel: 3

Service Area Name/SSID: R2WAP64
The service area name can be up to 31 characters.

Security Mode: No Security
AES/TKIP is unsupported in Ad-hoc mode.

To prevent outsiders from accessing your network,
we recommend you assign a security mode to your network.

Next
Finish

This sub-page provides basic configuration for device server's WiFi network. The command buttons support:

Action	Behavior
Press Next	Go to Encryption Selection sub-page.
Press Finish	Go to WiFi Settings Confirmation sub-page

7-3-6-2 Encryption Selection Sub-Page

<http://www.asix.com.tw>



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 AX220xx RS-232 to WiFi

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Basic
Advanced
Security
WiFi
WiFi Wizard
Status

Select an Encryption Type for Your WiFi Network

Select an encryption type for your WiFi network,
if you do not modify any encryption key, please select the previous key settings.

☐ WEP encryption key settings

☐ AES/TKIP pre-shared key settings

☒ Use the previous key settings

Next

Back

This sub-page configures the encryption type that will be used. User can select among the 3 options and press **Next**; or, press **Back** to go back to **WiFi Link Settings** sub-page.

Action	Behavior
Check WEP encryption key settings and press Next	Go to WEP Key Settings sub-page
Check AES/TKIP pre-share key settings and press Next	Go to AES/TKIP Key Settings sub-page
Check Use the previous key settings and press Next	Go to Advanced Settings sub-page

7-3-6-3 WEP Key Settings Sub-Page

<http://www.asix.com.tw>



ASIX ELECTRONICS CORPORATION
 AX220xx RS-232 to WiFi

Logout

Basic
Advanced
Security
WiFi
WiFi Wizard
Status

Enter a WEP Key for Your WiFi Network

Please select the key length, key index and enter up to 4 applicable key strings.

Key Length:

Key Index:

The WEP key length must be 10-digit hex for WEP-64 or 26-digit hex for WEP-128.

Key Index 0:

Key Index 1:

Key Index 2:

Key Index 3:

This sub-page configures either WEP-64 or WEP-128 key settings, if WEP encryption is chosen for device server's WiFi network. The Key Index selects the active key to use among the 4 Key Indexes. Note that the key length must be 10 characters for WEP 64 bits or 26 characters for WEP 128 bits. The command buttons support:

Action	Behavior
Press Next	Go to Advanced Settings sub-page.
Press Back	Go back to Encryption Selection sub-page.
Press Finish	Go to WiFi Settings Confirmation sub-page.

7-3-6-4 AES/TKIP Key Settings Sub-Page

<http://www.asix.com.tw>

 **ASIX ELECTRONICS CORPORATION**

AX220xx RS-232 to WiFi

Logout

Basic Advanced Security WiFi **WiFi Wizard** Status

Enter a AES/TKIP Pre-shared Key

Please enter your AES/TKIP key with length between 8~63.

AES/TKIP Pre-shared key:

This sub-page configures AES or TKIP pre-shared key, if AES or TKIP encryption is chosen for device server's WiFi network. Note that the key length of AES/TKIP must be 8~63 characters. The command buttons support:

Action	Behavior
Press Next	Go to Advanced Settings sub-page.
Press Back	Go back to Encryption Selection sub-page.
Press Finish	Go to WiFi Settings Confirmation sub-page.

7-3-6-5 Advanced Settings Sub-Page

<http://www.asix.com.tw>

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[WiFi](#)
[WiFi Wizard](#)
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WiFi Network Advanced Settings

Please determine below settings for your WiFi network.

TX Data Rate:

Transmission Power Level:

Preamble Mode:

You must enter an integer between 20~1000 in the beacon interval field, default is 100 ms.

Beacon Interval (ms):

You must enter an integer between 0~2432 in the RTS threshold field, default is 2432.

RTS Threshold:

Auto Power Control Mode:

Protection Frame Type:

This sub-page provides advanced configuration for device server's WiFi network. Usually, these don't need to be changed in typical WiFi network operation. The command buttons support:

Action	Behavior
Press Next	Go to WiFi Settings Confirmation sub-page.
Press Back	Go back to Encryption Selection sub-page.

7-3-6-6 WiFi Settings Confirmation Sub-Page

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The Wizard Complete Successfully

Your WiFi network settings are as below. You can press "Accept" button to take effect.

Network Setting: infrastructure

Channel: 3

Service Area Name/SSID: R2WAP64

Security Mode: no security

Tx Data Rate: auto

Transmission Power: 100%

Preamble: auto

Beacon Interval: 100 ms

RTS Threshold: 2432

Auto Power Control: enable


Protection Frame Type: RTS

This sub-page displays the new WiFi settings user has configured but not yet saved to AX220xx device. Now, user can review and confirm them. The command buttons support:

Action	Behavior
Press Accept	A confirmation window will pop up. User can press OK to save the new WiFi settings to device and then reboot it with new settings. If user presses Cancel , it will return to this sub-page.
Press Back	Go back to Advanced Settings sub-page.

7-3-7 Status Page

<http://www.asix.com.tw>

 **ASIX ELECTRONICS CORPORATION**

AX220xx RS-232 to WiFi

[Logout](#)

[Basic](#) [Advanced](#) [Security](#) [WiFi](#) [WiFi Wizard](#) [Status](#)

System Status

Device Name:	
Device IP Address:	192.168.0.13
MCPU Firmware Version:	1.1.0
WCPU Firmware Version:	1.2.0
WiFi MAC address(Hex):	0x000ec6001f01
Modem Status(HEX):	0
Protocol Type:	TCP
Connection Status:	Idle
Serial Port TX Count(Byte):	0
Serial Port RX Count(Byte):	0

[RefreshStart](#) [RefreshStop](#)

This page displays the current status of AX220xx device server with auto-refreshing in every 3 seconds. The command buttons support:

- (1) **RefreshStart:** Click **RefreshStart** to enable auto-polling the AX220xx device in every 3 seconds and auto-refreshing this page with latest status.
- (2) **RefreshStop:** Click **RefreshStop** to disable auto-polling and auto-refreshing.

7-4 Device Monitor Tool

This section describes the detailed functions of Device Monitor tool in AXR2W Configuration Utility.

7-4-1 Function Window

Start	Monitor Time Interval <input type="text" value="3"/> (3 ~ 3600 seconds)						
Devices List							
NO.	Query Status	Device Name	IP	Modem Status (Hex)	Firmware Version	Serial Port TX Count	Serial Port RX Count
0	Idle	DSM1	10.1.2.10				

The Device Monitor tool provides following function:

Action	Behavior
Press Start	Starts or stops monitoring the device(s) on Device List. Before starting the monitoring function, user should select at least one device server from the Devices List in the Function Window of Device Management tool.

The main window supports one parameter:

Field	Description
Monitor Time Interval	Set the monitor frequency.

When a device server is selected from the Devices List in the Function Window of Device Management tool, it will be shown in the Devices List with following information:

Field	Description
NO	Device server index in the list
Query Status	The device server's query status
Device Name	Device server name
IP	Device server IP address
Modem Status	The value of device server's UART2 Modem Status register
Firmware Version	The firmware version
Serial Port TX Count	Device server's UART2 TX count in unit of bytes
Serial Port RX Count	Device server's UART2 RX count in unit of bytes

7-5 DHCP Server Tool

7-5-1 Function Window

Start IP Address	192 . 168 . 2 . 100	Gateway (Router)	192 . 168 . 2 . 1								
End IP Address	192 . 168 . 2 . 200	Subnet Mask	255 . 255 . 255 . 0								
Server IP Address	192 . 168 . 2 . 2	Domain Name Server	168 . 95 . 1 . 1								
Boot File	r2w.bin										
<input type="button" value="Start"/>											
MAC to IP Address Mapping List <input type="button" value="Delete"/> <input type="button" value="Delete All"/>		Log									
<table border="1"> <thead> <tr> <th>IP Address</th> <th>MAC Address</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>				IP Address	MAC Address						
IP Address	MAC Address										

The DHCP Server tool provides following functions:

- (1) **Start:** starts / stops the DHCP server function.
- (2) **Delete:** deletes a MAC to IP address mapping record.
- (3) **Delete All:** deletes all MAC to IP address mapping records.

The main window supports seven parameters:

Field	Description
Start IP Address	The first available IP address for clients
End IP Address	The end available IP address for clients
Gateway (Router)	The network gateway's IP address
Subnet Mask	The subnet mask
Domain Name Server	The domain name server's IP address
Server IP Address	The TFTP server's IP address
Boot File	The boot file name on the TFTP server

To start DHCP Server tool:

Step 1: In Menu Window, select DHCP Server tool.

Step 2: Type in proper value in each field for DHCP server configurations. Note that the Boot File field is only applicable to the case of upgrading firmware using Bootp/TFTP. The AX220xx device server will send Bootp request packet to DHCP server to get parameters, such as IP address, TFTP server IP address, and file name. Then, the device server uses these parameters to send TFTP request packet to upgrade the firmware.

Step 3: Click **Start** to start DHCP server.

7-6 TFTP Server Tool

7-6-1 Function Window



The TFTP Server tool provides following functions:

Action	Behavior
Press Start	Starts / stops the TFTP server function.
Press Folder Browser	Opens a folder browse dialog for file path selection.

The main window supports one parameter:

Field	Description
File Path	The file path for TFTP file read requests

To start TFTP Server tool:

Step 1: In Menu Window, select TFTP Server tool.

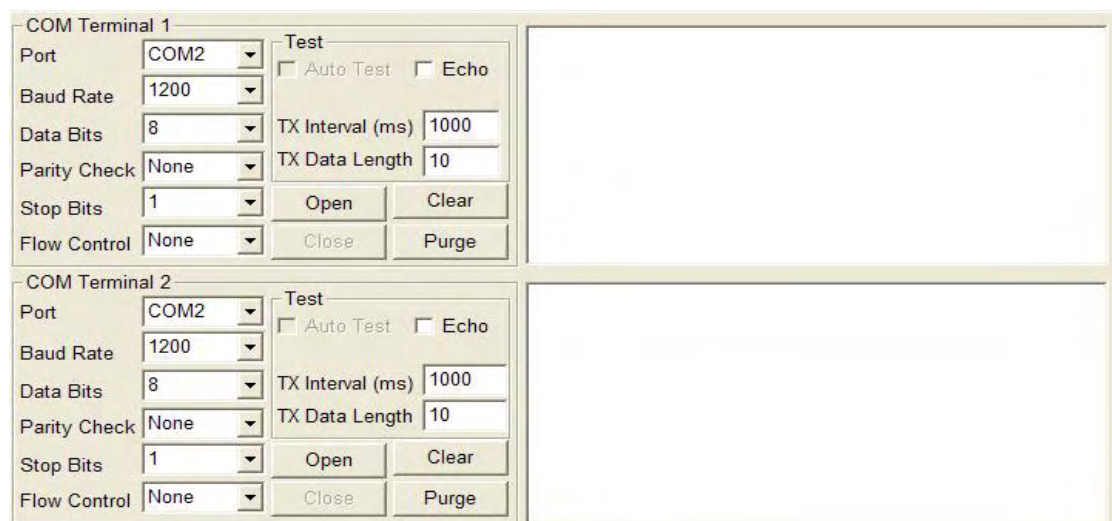
Step 2: Select the file path for which the to-be-upgraded-firmware file is located. This path is applicable to the firmware file name specified by user from the web server page or Firmware Upgrade dialog.

Step 3: Click **Start** to start TFTP server.

7-7 COM Port Terminal Tool

This section describes the detailed functions of COM Port Terminal tool in AXR2W Configuration Utility. The tool supports two terminals, each supporting a simple test function to allow validating user's AX220xx RS-232 to WiFi device server easily.

7-7-1 Function Window



The COM Port Terminal tool contains two terminals. Each terminal provides the same following functions:

Action	Behavior
Press Open	Opens the selected COM port.
Press Close	Closes the selected COM port.
Press Clear	Clears the console data.
Press Purge	Clears the data stored in COM port buffer.

Each terminal supports following general COM port parameters:

Field	Description
Port	COM Port number
Baud Rate	Baud rate
Data Bits	Data bits
Parity Check	Parity check type
Stop Bits	Stop bits
Flow Control	Flow control type

Each terminal supports following parameters for test function:

Field	Description
Auto Test	Enable / disable sending test data
Echo	Enable / disable echoing back received test data
TX Interval (ms)	The time interval to send out a test data
TX Data Length	The test data's length

7-8 Command Line Interface (CLI)

This section describes the command line interface or console to configure the DS. There are many commands supported to configure the DS. User can type **help** to show all the supported commands with verbose messages. These messages also show command arguments definition.

The commands can be classified into two functions, one is to execute command and the other is to set configuration. The commands for setting configuration can be used in 2 ways: one is to display the current settings when no argument is given and the other is to set the configuration with provided arguments.

There are two interfaces to provide the console service: one is through UART0 with appropriate settings and the other is through Telnet client. The following description introduces how to use the console via these two interfaces.

Console via UART0

When user wants to use the console through UART0, one can connect one end of RS-232 cable (with a Null modem converter) to PC's COM port and the other end to the DS UART0 port. Then open a Tera Term with appropriate serial port settings (baud rate 9600, data bit 8, stop bit 1, and none parity). Then user presses enter and the console will show messages such as "username:" or "password:", if user has not logged in yet. User can login by using the default username/password: **admin/admin**.

If login successfully, the prompt message "**uart>**" will show up. That means the console session via UART0 interface is connected. Figure 5-4 is the console screen snapshot.

Console via Telnet

When user wants to use the console through a Telnet client, user must run the Telnet client on PC and the DS must have established the WiFi connection with PC already.

For example, under DOS prompt, user can enter the command "**C:> telnet 192.168.2.3**". Then the Telnet client will establish the connection with the DS's Telnet server and the message "**username:**" will show up, if successful. Follow the steps above to login the console of DS.

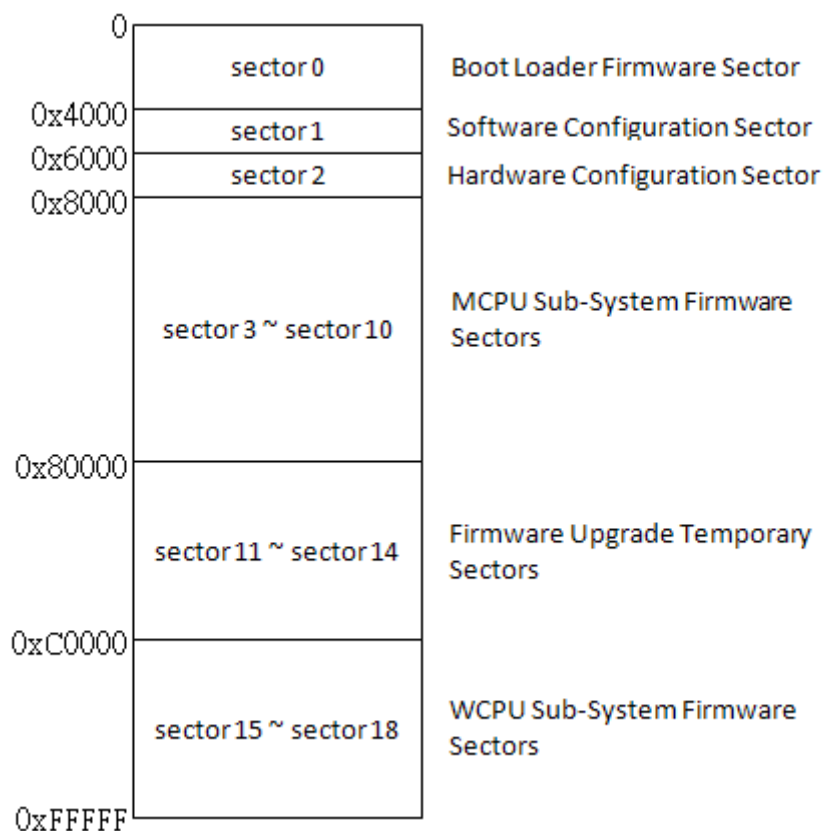
If login successfully, the prompt message "**telnet>**" will display. That means the console session via Telnet interface is connected.

8 Flash Programming

ASIX Electronics provides an application named AX220xxISP.exe to program the firmware of AX220xx RS-232 to WiFi through UART 0 or UART 2 port.

8-1 AX220xx Flash Memory Partitions

There are primarily three firmware partitions on AX22001 on-chip Flash memory, namely, Boot Loader, MCU sub-system firmware and WCPU sub-system firmware. Below describes how the on-chip Flash memory is partitioned for storing the images and the software and hardware configuration data. Due to the shared Flash memory architecture for MCU and WCPU program memory, to make the AX22001 SoC work properly, the three images must be burned into appropriate location on on-chip Flash memory. The start address and size for each firmware in on-chip Flash memory is shown in below Figure. Sector 1 and sector 2 are used to store the software configuration and hardware configuration respectively.



8-1-1 Boot Loader Firmware Sector

This area is used to store AX220xx Boot Loader firmware code and occupies the sector 0 of on-chip Flash memory. The start address is 0x00000 and the code size is 16K bytes.

8-1-2 Software Configuration Sector

This area is used to store the data structure of software configuration parameters and occupies the sector 1 of on-chip Flash memory. The start address is 0x04000 and the data size is up to 8K bytes.

8-1-3 Hardware Configuration Sector

This area is used to store the hardware configuration settings and occupies the sector 2 of on-chip Flash memory. The start address is 0x6000 and the data size is up to 8K bytes.

Please refer to **AX220xx datasheet** Section 3.2.1 Hardware Configuration Sector (in Flash Memory SA2 Sector) Memory Map for detailed description.

8-1-4 MCPU Sub-System Firmware Sectors

This area is used to store the MCPU sub-system firmware code and occupies the sector 3 to sector 10 of on-chip Flash memory. The start address is 0x8000 and the code size is up to 480K bytes.

8-1-5 Firmware Upgrade Temporary Sectors

If user wants to upgrade a new WCPU sub-system firmware via wireless network, AX220xx Boot Loader will store the received new AX220xx WCPU sub-system firmware code in this area temporarily since the current WCPU sub-system firmware is running on the system. After the firmware download operation has been completed and the checksum value of the new downloaded firmware has been verified correct, the AX220xx Boot Loader will overwrite the WCPU sub-system firmware area with the new version of firmware being saved in here.

The area occupies the sector 11 to sector 14 of on-chip Flash memory. The start address is 0x80000 and the code size is up to 256K bytes.

8-1-6 WCPU Sub-System Firmware Sectors

This area is used to store the WCPU sub-system firmware code and occupies the sector 15 to sector 18 of on-chip Flash memory. The start address is 0xC0000 and the code size is up to 256K bytes.

8-2 Burning Firmware via COM Port ISP Mode

User can burn firmware to AX220xx RS-232 to WiFi device server via the UART 0 or UART 2 interface. ASIX Electronics provides a Windows In-System Programming (ISP) tool for customers to program AX220xx on-chip Flash memory through a Windows PC. The Windows ISP tool is a Windows dialog-based software program that communicates through PC's RS-232 COM port with AX220xx.

Environment Setup

Below is an example procedure showing how to run the Windows ISP tool to download related firmware into the Flash memory.

1. Copy the Windows ISP tool onto a Windows PC.
2. Set the AX220xx Development Board to enable Flash Programming mode by following section 4-1 description.
3. Connect the UART 0 or UART 2 interface of the Development Board to the COMx port of Windows PC via a RS-232 NULL modem cable.
4. Run the Windows ISP tool, AX220xxISP.exe.
5. Select the COM port number from the ISP tool.
6. Select the baud rate (115.2K or 921.6K).
7. Click **Connect** to connect the ISP tool with assigned COM port.
8. Use the default settings or click the Checkbox to enable burning related firmware.
9. Click the file path to select the binary file of related firmware.
10. Click **Burn** to write the related firmware into the Flash memory.

After completing the programming operation, the Burn Result box will display and the Status sub-window will show the final result information.

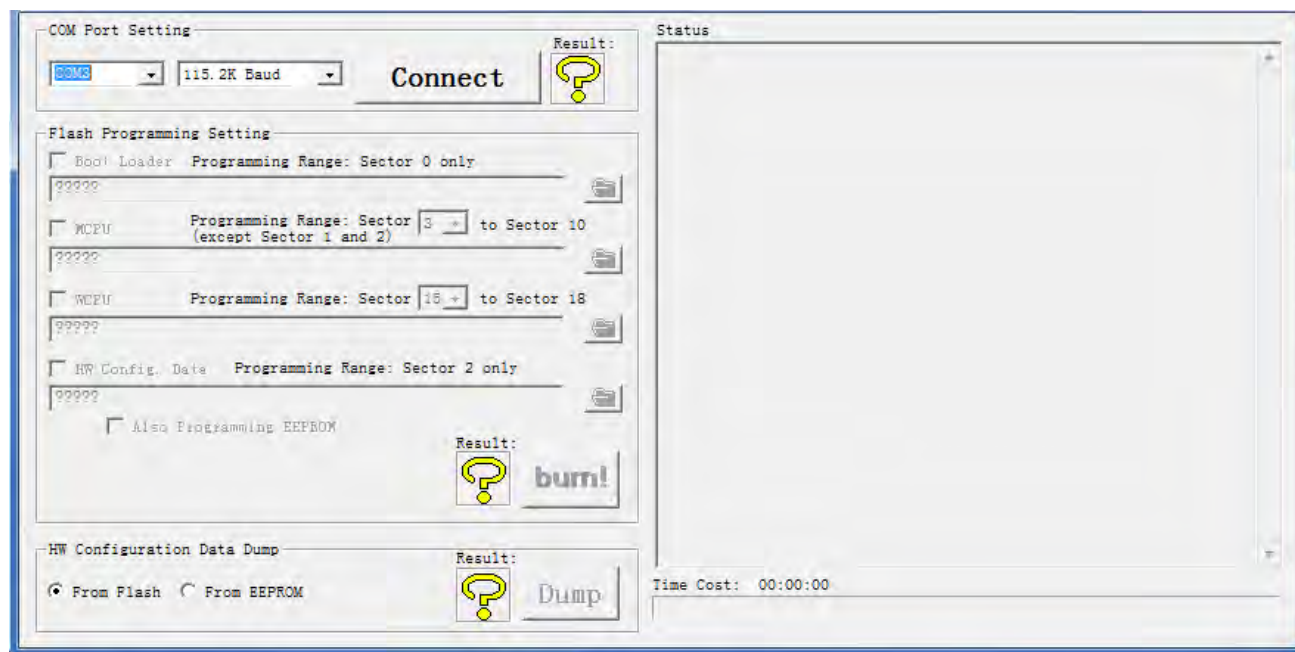


Figure 8-1 Main Window of AX220xx Window ISP Tool

There are 4 checkboxes and 3 buttons on the main window. The **Status** sub-window displays the helpful messages and the **Time Cost** sub-window shows the time elapsed during erasing/programming Flash memory.

Below describes the brief function of the main window.

1. **Connect**: before starting programming, user must press **Connect** to make the connection between the Development Board and PC via COM port. After connected, the button will be toggled to **Disconnect**.
2. **Boot Loader**: select this checkbox to enable burning AX220xx Boot Loader binary file.
3. **MCPU**: select this checkbox to enable burning AX220xx RS-232 to WiFi demo firmware.
4. **WCPU**: select this checkbox to enable burning AX220xx WCPU firmware.
5. **HW Config. Data**: select this checkbox to enable burning Hardware Configuration to sector 2 of on-chip Flash memory. Select the checkbox below, **Also Programming EEPROM**, to enable burning Hardware Configuration to EEPROM.
6. **Burn**: click this button to start programming the Flash memory. The Windows ISP program will program the given binary file into the Flash memory based on user's selected checkboxes.
7. **Dump**: click this button to dump the hardware configuration from either Flash memory (sector 2) or EEPROM and save these data as a file named **HwCfgFromFlash.txt** or **HwCfgFromEeprom.txt**, respectively.

The programming result will be displayed in the *Result* box.

Note:

1. AX220xx Boot Loader is default to sector 0; MCU sub-system firmware default start sector is 3; and WCPU sub-system firmware default start sector is 15.
2. User can select 3 checkboxes on Windows ISP to burn 3 images at once.

9 Software Modules

9-1 Peripheral Software Modules

AX220xx RS-232 to WiFi Reference Design Kit CD provides various working sample codes for AX220xx chip hardware driver modules, such as CPU, Ethernet, S/W DMA, MS Timer, I2C, UART2 and 8051/80390 standard modules (like UART, Timer). Please refer to **AX220xx Software User Guide** for details.

9-2 TCP/IP Stacks

AX220xx RS-232 to WiFi provides the “uIP” TCP/IP stack. The uIP is a TCP/IP protocol stack for 8-bit and 16-bit microcontrollers with very small code footprint and RAM requirements. Below table shows features supported in the original uIP protocol stack and AX220xx uIP TCP/IP module.

Feature	Original uIP	AX220xx uIP TCP/IP Module
IP and TCP checksums	Support by S/W	Support with hardware accelerator
IP fragment reassembly	YES	NO
IP options	NO	NO
Multiple interfaces	NO	YES
UDP	NO	YES
Multiple TCP connections	YES	YES
TCP options	YES	YES
Variable TCP MSS	YES	YES
RTT estimation	YES	YES
TCP flow control	YES	YES
Sliding TCP window	NO	NO
TCP congestion control	No needed	No needed
Out-of-sequence TCP data	NO	NO
TCP urgent data	YES	YES
Data buffered for re-transmission	NO	YES
TCP keep alive timer	NO	YES

9-3 Upper Protocol Modules

AX220xx software developers who need to know the detail of the DS firmware can refer to the **AX220xx RS-232 to WiFi Software Developer's Guide**. The developer's guide describes the details for the entire software architecture, source files, configuration and exported functions for each upper protocol module. Figure 9-1 below shows the software architecture diagram of DS.

The upper protocol modules used in the RS-232 to WiFi device server includes DHCP client/server modules, DNS client module, HTTP server module, Telnet server module, SMTP client module, TCP/IP/uIP module, Adapter module and PPPoE module.

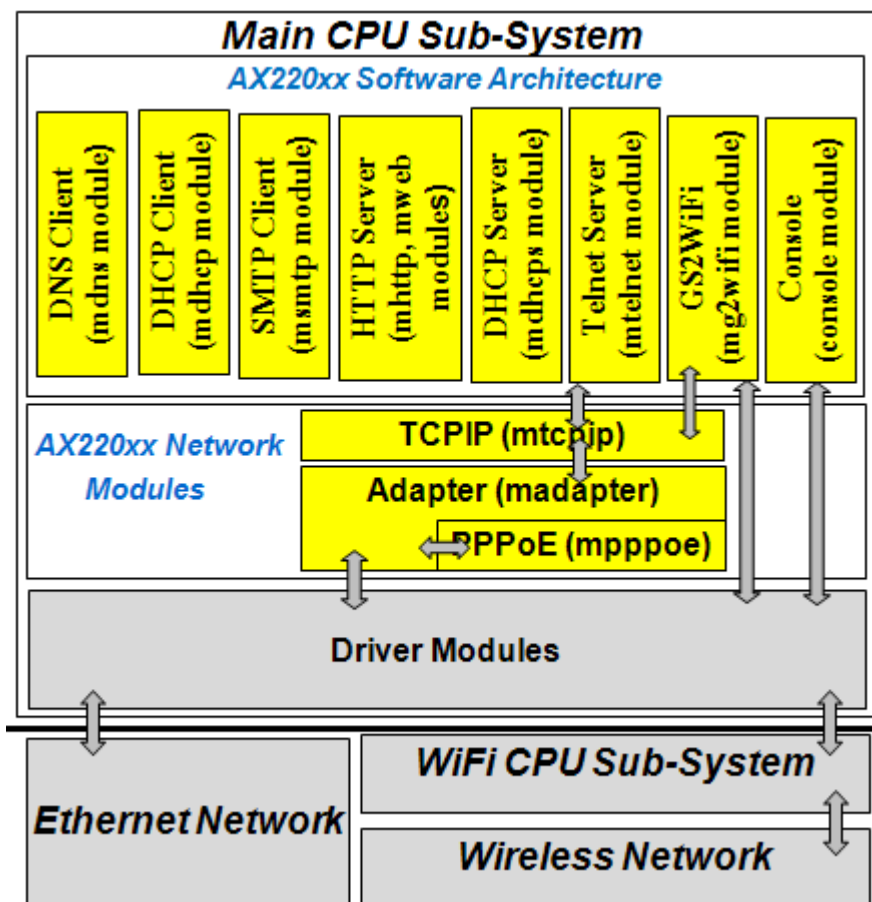


Figure 9-1 Software Architecture Diagram

10 Software Development Tools

10-1 Software Compiler Tool

All the software modules for AX220xx family are developed in C language on Keil IDE development environment. User can purchase the Keil IDE Development Environment from Keil's web site at <http://www.keil.com/c51/selector.asp>. In general, user needs to purchase the PK51 development tool for C-language compiler, debugger and simulator. User can also download the Keil C51 evaluation software for free from Keil's web site, but the evaluation software can only compile the sample codes with less than 2K bytes binary code.

10-2 Software Debugger Tool

AX220xx currently provides two debug tool solutions, one is the UART console debug; the other is the Digital Core Design (DCD)'s DoCD HAD2 debugger. All the AX220xx software modules support some basic UART console debug function by default. If user needs more powerful debug tool like source level debug, AX220xx reference design board supports the DCD's DoCD Hardware Debugger – the HAD2 module. Through the HAD2 module, the software running on AX220xx reference design board can be real-time debugged.

User can purchase the HAD2 module from DCD and download the debugger software from DCD's web site at <http://www.dcd.pl/>. Please refer to DCD's provided DoCD HAD2 debugger documents for procedures to set up the DoCD HAD2 debugger environment.



Note: The DoCD HAD2 Debugger is optional for AX220xx user, and it can be purchased from Digital Core Design's web site (<http://www.dcd.pl/>). If you don't have the DoCD HAD2 Debugger, you can still debug AX220xx software through UART console debug method.

DoCD HAD2 Debugger Key Features:

- AX220xx execution control
- R/W all contents of AX220xx
- Real-time hardware watch-points and breakpoints
- Source Level debugging
- Software watch-points and breakpoints
- AX220xx Flash programming**
- Supports Keil, IAR and others
- Source code tracing



Appendix A Software Availability

AX220xx RS-232 to WiFi provides the following utilities, software modules and TCP/IP stack for customers' reference. Please contact ASIX's support (support@asix.com.tw) for detailed information.

AX220xx RS-232 to WiFi Software	Source Code Release	Need to sign a NDA
CPU Module	YES	NO
S/W DMA Module	YES	NO
MCPU-WCPU Interface Module	YES	NO
TCP/IP Module	NO	NO
DNS Client Module	YES	NO
Telnet Server Module	YES	NO
Console Module	YES	NO
Adapter Module	YES	NO
MAC Module	YES	NO
UART0 Module	YES	NO
HTTP Server Module	YES	NO
UART2 Module	YES	NO
SMTP Client Module	YES	NO
MS Timer Module	YES	NO
DHCP Client Module	YES	NO
DHCP Server Modules	YES	NO
AX220xx Boot Loader Code	NO	NO
RS-232 to WiFi Toolkit	NO	NO
AX220xx Windows ISP	NO	NO
AX220xx Production Test Program	Available upon request	YES

Appendix B I2C EEPROM or Flash SA2 Default Setting

In this reference design, AX22001 I/O pins are being configured to high speed UART mode, so some hardware setting parameters in I2C EEPROM or Flash memory SA2 must be set correctly. Below table lists the recommended values.

EEPROM Offset	Description	Value
0x00	Length	0x32
0x01	Flag	0xBC
0x02	Multi-function Pin Setting 0	0x0F
0x03	Multi-function Pin Setting 1	0x0B
0x04	Multi-function Pin Setting 2	0x88
0x05	Multi-function Pin Setting 3	0xFC
0x06	Multi-function Pin Setting 4	0x01
0x07	Multi-function Pin Setting 5	0x60
0x09~0x08	Programmable Output Driving Strength	0x05 0x02
0x0D~0A	OSC. 40Mhz stable counter value	0x00 0x00 0x00 0x20
0x0F~0x0E	OSC. 32.768Khz stable counter value	0x00 0x40
0x10	Ethernet MAC Interface Control	0x02
0x11	I2S/PCM Mode Select	0x00
0x15~0x12	Local Bus Setting	0x00 0x00 0x86 0x00
0x16	Flash Sector Erase Time Out Value	0x0E
0x17	Flash Programming Time Out Value	0x05
0x1D~0x18	Node ID 5 ~ ID 0 (Note 1)	0x00 0x00 0x00 0x00 0x00 0x01
0x1F~0x1E	Maximum Packet Size	0x05 0xF2
0x20	Primary PHY Type and PHY ID	0x03
0x21	Secondary PHY Type and PHY ID	0xE0
0x22	Pause Frame High Water Mark	0x3A
0x23	Pause Frame Low Water Mark	0x2F
0x25~0x24	TOE TX VLAN Tag 1~0	0x00 0x00
0x27~0x26	TOE RX VLAN Tag 1~0	0x00 0x00
0x28	TOE ARP Cache Timeout	0x10
0x29	Reserved	0x00
0x2D~0x2A	TOE Source IP Address 3~0	0xC0 0xA8 0x00 0x03
0x31~0x2E	TOE Subnet Mask	0xFF 0xFF 0xFF 0x00
0x3F~0x32	Reserved for MCPU HW future use	0xFF ... 0xFF
0x43~0x40	Subsystem ID 3~0	0x58 0x49 0x53 0x41
0x45~0x44	Hardware Type 1~0	0x01 0x01
0x47~0x46	Hardware Type 3~2	0x40 0x01
0x49~0x48	Region Code 1~0	0x00 0x10
0x4F~0x4A	Overwrite PHY register 5~0	0xFF 0xFF 0xFF 0xFF 0x00 0x1B
0x55~0x50	WLAN MAC Address 5~0 (Note 1)	0x00 0x00 0x00 0x00 0x00 0x02
0x59~0x56	Secondary IP Address 3~0	0xC0 0xA8 0x02 0x03
0x5D~0x5A	Secondary Subnet Mask 3~0	0xFF 0xFF 0xFF 0x00
0x5F~0x5E	Reserved	0xFF 0xFF
0x6D~0x60	Max. Integration Value for all data rates for channel # 14~1 (Note 2)	0x00 ... 0x00
0x6E	Passive Scan Map	0x1F
0x6F	Allowed Channel Map	0x20
0x7D~0x70	Max. Set Point Value for CCK modulation for	0x00 ... 0x00

	channel # 14~1 (Note 3)	
0x7F~0x7E	Reserved	0xFF 0xFF
0x8D~0x80	Max. Set Point Value for OFDM 36M modulation for channel # 14~1 (Note 3)	0x00 ... 0x00
0x8F~0x8E	Reserved	0xFF 0xFF
0x9D~0x90	Max. Set Point Value for OFDM 48M modulation for channel # 14~1 (Note 3)	0x00 ... 0x00
0x9F~0x9E	Reserved	0xFF 0xFF
0xAD~0xA0	Max. Set Point Value for OFDM 54M modulation for channel # 14~1 (Note 3)	0x00 ... 0x00
0xAF~0xAE	Reserved	0xFF 0xFF
0xBE~0xB0	Max. Integration Value for all data rates for 802.11a channel #: 165 (offset = 0x0BE), 149, 140, 128, 112, 100, 64, 52, 48, 40, xx, 36, 16, 196, 184 (offset = 0x0B0)	0x00 ... 0x00
0xBF	Reserved	0xFF
0xCE~0xC0	Max. Set Point Value for 36M modulation for 802.11a channel #: 165 (offset = 0x0CE), 149, 140, 128, 112, 100, 64, 52, 48, 40, xx, 36, 16, 196, 184 (offset = 0x0C0)	0xFF ... 0xFF
0xCF	Reserved	0xFF
0xDE~0xD0	Max. Set Point Value for 48M modulation for 802.11a channel #: 165 (offset = 0x0DE), 149, 140, 128, 112, 100, 64, 52, 48, 40, xx, 36, 16, 196, 184 (offset = 0x0D0)	0xFF ... 0xFF
0xDF	Reserved	0xFF
0xEE~0xE0	Max. Set Point Value for 54M modulation for 802.11a channel #: 165 (offset = 0x0EE), 149, 140, 128, 112, 100, 64, 52, 48, 40, xx, 36, 16, 196, 184 (offset = 0x0E0)	0xFF ... 0xFF
0xF3~0xEF	Reserved	0xFF 0xFF 0xFF 0xFF 0xFF
0xFF~0xF4	Serial Number 11~0 (Note 4)	0x00 ... 0x00
0x1FF~0x100	Reserved for WCPU HW future use	0xFF ... 0xFF

Note:

- (1) User should assign a unique Node ID and WLAN MAC address for each device.
- (2) User should set the data after calibration of each channel.
- (3) User should set the data after calibration of each channel for CCK and OFDM.
- (4) User should assign a traceable serial number.

Appendix C Device Server Throughput Report

This throughput report provides the performance data of single device server for customer reference. The following description covers the test environment, test configuration, and throughput data of different configurations.

(1) Test Environment

PC CPU: Intel Core i5 3.3GHz

PC DRAM: 3 GB

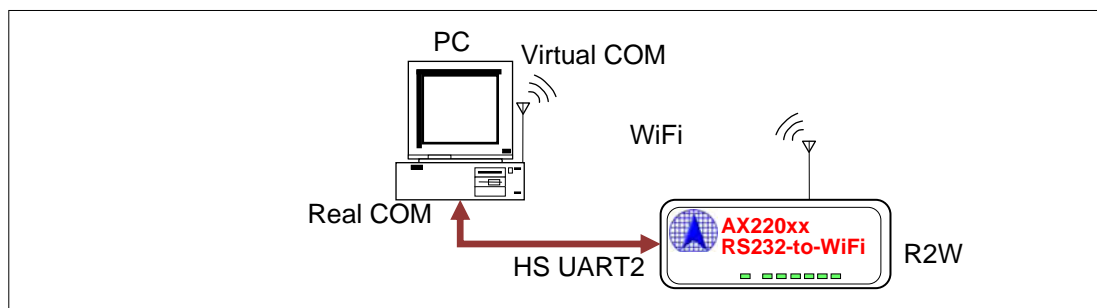
PC OS: Windows XP 32 bits

Tool: exSerialToEthernet_FlowControl v1.1.0.0

USB to RS-232 Adapter: GUSB232H2-B v2.0.0.25

R2WiFi Firmware: v 0.7.0

WCPU Firmware: v 1.1.0



(2) Test Configuration

Device Name	PC		R2W	
Interface	Real COM	Virtual COM	HS UART2	WiFi
Baud rate(bps)	115200, 921600	802.11b/g	115200, 921600	802.11b/g
Data bits(bits)	8	-	8	-
Stop bit(bits)	1	-	1	-
Parity	none	-	none	-
Flow Control	Xon/Xoff, HW, None	Xon/Xoff	Xon/Xoff, HW, None	Xon/Xoff
Protocol	-	TCP,UDP	-	TCP,UDP
Mode	-	Client	-	Server
VSPD version	-	2.2.3.0	-	-

(3) Test Result

Connection Protocol: TCP (Condition: Test data length = 1457 bytes, Pattern compare = disable)						
Data Flow Direction	Real COM to Virtual COM			Virtual COM to Real COM		
Flow Control	Xon/Xoff	HW	None	Xon/Xoff	HW	None
Throughput (Kbps)	115.2Kbps	90.1	90.1	91.1	91.3	91.8
	921.6Kbps	220.1	221.1	219.1	310.2	309.3

Connection Protocol: UDP (Condition: Test data length = 1457 bytes, Pattern compare = disable)						
Data Flow Direction	Real COM to Virtual COM			Virtual COM to Real COM		
Flow Control	Xon/Xoff	HW	None	Xon/Xoff	HW	None
Throughput (Kbps)	115.2Kbps	106.5	106.5	100.9	101.8	101.8
	921.6Kbps	540.6	540.6	540.5	514.2	511.2



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