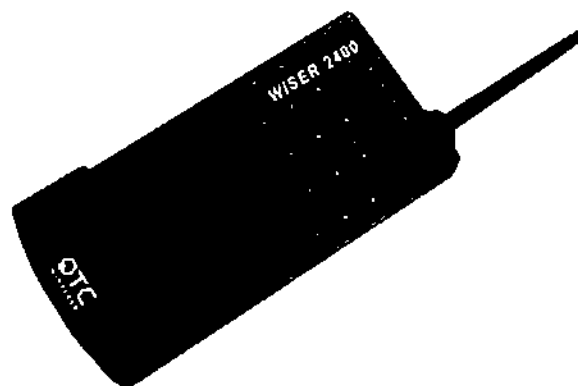




WiSER2400.PLUS

802.11b Wireless Serial Port Adapter

Technical Manual



www.otcwireless.com



WiSER2400.PLUS

Wireless Serial Port Adapter

Technical Manual

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Chapter 1 - INTRODUCTION

Note: The terms WiSER2400 and WiSER2400.PLUS are used interchangeably throughout this document

WiSER2400.PLUS is an IEEE 802.11b compliant radio with an RS232 serial interface.

The WiSER2400.PLUS radio takes serial data from the equipment or computing device connected via its RS232 port, converts the serial data into 802.11-compliant data packets*, and transmits these packets with the RF modulation that is compliant with the specifications of the 802.11b physical layer. On the receiving end, the radio demodulates the RF signal, removes the Ethernet (802.11) headers, unpacks the packet and delivers the data byte-by-byte to the destination equipment/device through the RS232 serial port.

Each WiSER2400.PLUS radio acts as a "Station" and operates in either infrastructure or ad-hoc mode in accordance to the IEEE 802.11 standards. As such, this radios enables RS232-interfaced devices to participate in a wireless Ethernet network. In this capacity, the radio, in addition to eliminating the RS232 cables, functions as a media converter for RS232-interfaced equipment and computing-devices.

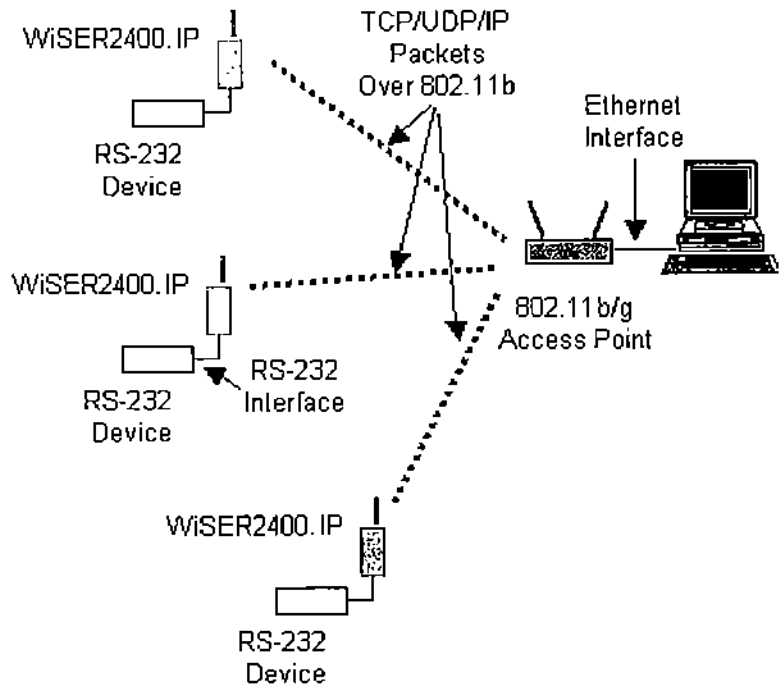
WiSER2400.PLUS supports TCP/UDP/IP-based communication protocol. Each WiSER2400.PLUS unit has an IP address for itself. The IP address is programmable by the user using the provided utility software. WiSER2400.PLUS can therefore function as an IP proxy for many "dumb" RS-232 devices that do not support IP-based communication. WiSER2400.PLUS enables the dumb RS-232 device connected to it to participate in an Ethernet/IP network and link to, for example, an 802.11b wireless access point.

The radio is fully self-contained in performing the conversion between serial data and wireless-Ethernet packets. That is, no device driver needs to be installed on the hosting equipment or computing device the radio is connected to. True Plug & Play feature therefore is achieved with any equipment or computing devices with an RS232 port. This also means the radio can be used on equipment and /or computing-devices with any Operating Systems. This is particularly useful for instruments/equipment where the use of RS232 interface is utilized. Examples include cash registers, electronic whiteboards and navigation instruments.

WiSER2400 has a compact form-factor that blends easily into an office/ classroom environment. It also lends particularly well to portable applications. The specifications are given on the next page.

User configurable parameters such as Start Frame Byte(s), End Frame Byte, etc. are used to properly group the serial data string into the 802.11 packets. Please refer to Chapter 3 for details.

The utility program can be used to monitor the communication condition and it is simple to install and easy to use through its graphic user interface. However, the radio runs self-sufficiently without the aid of any driver program in the host equipment or computer connected to the radio. This utility program therefore is intended to be, in most cases, just a tool for the network operators. The utility is also needed to configure the WiSER2400.PLUS for both wireless and TCP/UDP/IP parameters.



A TCP/UDP/IP over 802.11b wireless LAN for RS-232 devices using WiSER2400.PLUS

WiSER2400.PLUS 802.11b Radio

Key Features

- Plug & Play operation—
 - No driver on the host device is required for radio operation
 - Radio operation is independent of the operating system on the host equipment or device (Windows 98/NT/2000/ME/XP, Linux, Unix, embedded, etc.), as long as an RS232 port is properly supported
- Supports 64-bit and 128-bit WEP encryption for secured communication
- Industry standard IEEE 802.11b-compliant wireless interface
- 11Mbps data rate and automatic selection of lower data rate (5.5, 2 and 1 Mbps) in degraded RF environment
- Integrated omni-directional-antenna to provide best tradeoff between link-quality and mobility
- Microsoft-Windows-based configuration utility
- Protocols supported: TCP, UDP, ICMP, IGMP, ARP

Applications

- Standard-compliant wireless networking for computers and equipment with an RS232 interface
- Embedded devices, tools, instruments, equipment and appliances that can benefit from the re-configurability of wireless link yet are unfriendly to the installation of device-drivers
 - POS equipment for stores where re-configuration is frequent
 - Control/monitor equipment where mobility is required

Specifications

Model	WiSER2400.PLUS
Standard	802.11 and 802.11b
Host Interface	RS232
Frequency	2.4GHz – 2.497GHz
RF Channels	11 channels (US, Canada), 13 channels (Europe), 14 channels (Japan)
Transmission power	16dBm at antenna input typical
Receiver sensitivity	-80dBm @1e-5 BER typical
Antenna	Integrated dipole antenna with ~2dBi gain
Data Rate	11, 5.5, 2 or 1 Mbps fixed rate, or configured to automatic rate selection
Modulation	CCK, Direct Sequence Spread Spectrum
Link Distance	~1200 ft in open space
Network Types	Support infrastructure and ad-hoc modes
Data Encryption	Support the standard 64-bit and the 128-bit WEP
Network Security	MAC-address-based access control
AC adapter	Output: 5VDC, 1A
Current consumption	<480mA (max. reached in transmit-mode)
LED Indicators	4: Power, Transmission, Receiving, Link
Operating Temperature	-10°C – 50°C
Regulation	FCC part 15, Class B
Compliance	CE (ETSI EN 300 328-1, ETSI EN 301 489-17) IC

Chapter 2 - INSTALLATION OF WISER2400.PLUS

Installation of WISER2400.PLUS Hardware

Standard Hardware Items

- 1 WISER2400.PLUS radio
- 1 RS232-P cable
- 1 RS232-C cable
- 1 ac-dc power adapter
- 1 pair of Velcro mounting pads

Power

This radio connected to your equipment draws power from the provided AC-DC power adapter that plugs into a wall outlet.

RS232 Connection

The WISER2400.PLUS radio is shipped with two RS232 cables:

1. The RS-232-P cable is intended for connecting the WISER2400.PLUS to the RS232 DCE equipment (whiteboard, instrument, etc.) during communication. It terminates in a male DB-9 connector and is labeled "Board" on the cable.
2. The RS-232-C cable is intended for connecting the WISER2400.PLUS to a computer or DTE equipment during configuration using the utility software. It terminates in a female DB-9 connector and is labeled "Computer" on the cable

Connect the modular plug (which resembles an over-sized telephone plug) of the RS232 cable to the modular jack (which resembles an over-sized telephone jack) on the WISER2400 radio. Connect the DB-9 (9-pin, can be female or male depending on the equipment) connector of the RS232 cable to the RS232 port in the client equipment or computer.

Status LEDs

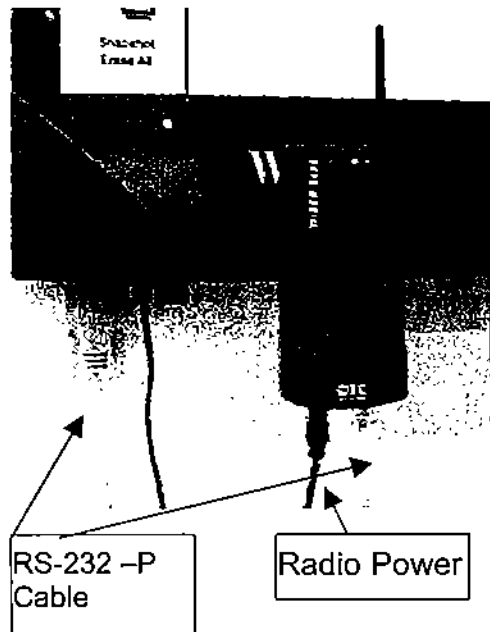
Power on the WISER2400 Radio, the LEDs on the front panel should exhibit the following patterns:

<i>LED</i>	<i>Color</i>	<i>Light Blinking Pattern</i>	<i>Indication</i>
ON	RED	Steady on	Proper power is supplied
RX	GREEN	Steady on	Unit is linked to a wireless system
		Steady blink	Unit is not linked to any wireless system
TX	RED	Flickering	Unit is transmitting RF signal
LINK	YELLOW	Blinking	<i>Serial Mode</i>

The WiSER2400.PLUS radio is a client Station. As a station, one of the most useful diagnostic tools may be the green RX LED: a blinking green RX LED indicates the absence of a useful communication link while running under infrastructure mode. However, when the WiSER2400.PLUS running under Ad-Hoc mode, the Rx LED will be solid on regardless the wireless connection status.

Once the hardware is checked out to work properly with the intended host device or equipment, the radio can be secured in the desired location by the pair of Velcro pads supplied.

On the right is an installation example where the WiSER2400.PLUS is connected to an RS232 equipment (whiteboard)



Installation of WiSER2400.PLUS Utility Software

System Requirements

For using the WiSER2400.PLUS Wireless Ethernet Adapter's utility software, your computer must meet the following minimum requirements:

- ✓ Windows®98 (SE)/ NT/ ME/ 2000/ XP
- ✓ One COM port (with a DB-9 male connector or an appropriate adapter to connect to a DB-9 female connector)
- ✓ (Optional) A TCP/IP Wireless/Ethernet network which connects the PC running the Utility program AND the WiSER2400.PLUS radio unit.

Installation

To install the utility program, simply insert the provided utility CD-ROM to the CD-ROM drive. Copy the "wauti_nnnn.exe" file to the desired location on your PC. (Where 'n' is a number)

Note that to use the WiSER2400.PLUS in a TCP/IP network, the user must configure the IP settings of WiSER2400.PLUS radio so that it matches that of the intended network.

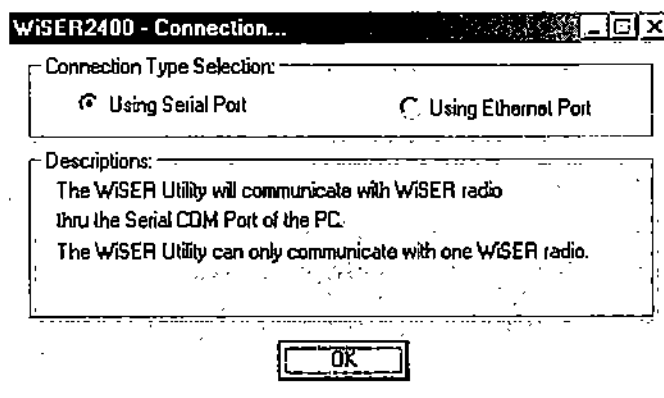
Note: For the utility program to configure or monitor the WiSER2400 radio through a COM port, there must be no other serial (RS232) program that also accesses or controls the same COM port.

Chapter 3 - Diagnostic and Configuration Utility

Overview

This chapter describes the functionalities and operations of *WiSER2400.PLUS Diagnostic and Configuration Utility* program. The utility program can be used to configure and monitor *WiSER2400.PLUS* radios. The *WiSER2400.PLUS* utility program is supported on Microsoft Windows® 98(SE), NT, Millennium, 2000, and XP.

The Utility program can monitor and configure the *WiSER2400.PLUS* through either Serial connection or TCP/IP Wireless/ Ethernet network connection. A connection selection window will pop up as shown on the right when the Utility program starts.



Once the connection selection is chosen, the Utility program will display different interface according to the selection. Figure 1 below is *WiSER2400.PLUS* Utility start-up windows of Ethernet mode (right) and serial mode (left).

Warning: The Utility program in serial mode will not work simultaneously with another RS232 application program if they are both set to use the same COM port.

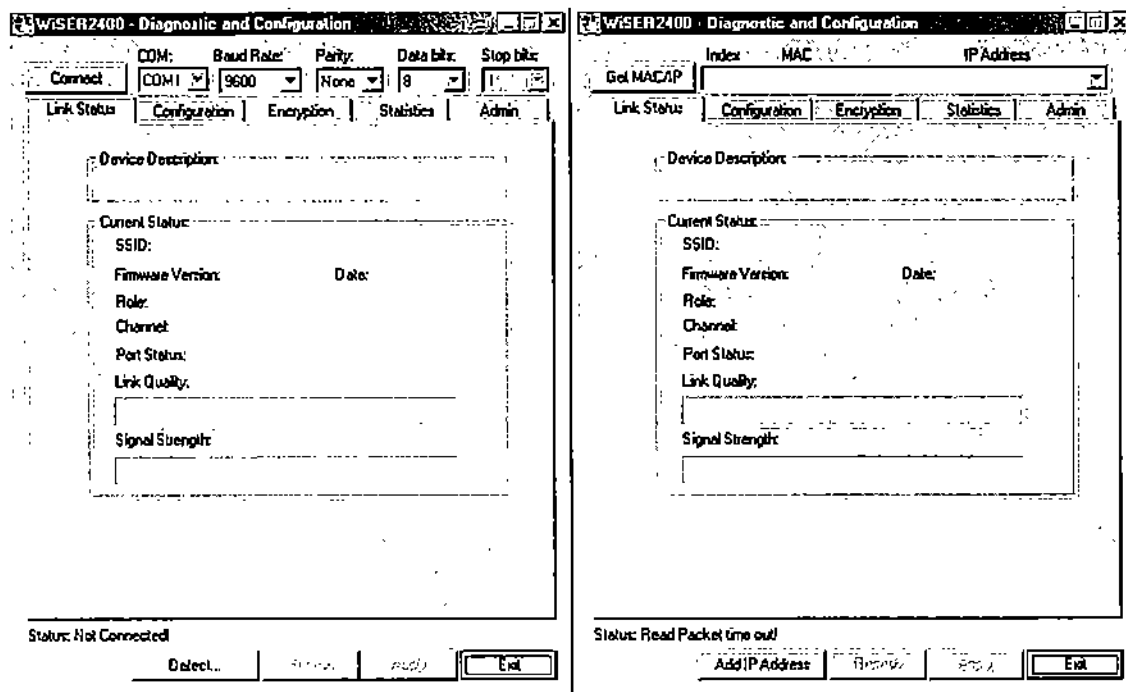


Figure 1. Start-Up Window of *WiSER2400.PLUS* Utility Program

To connect to the *WiSER2400.PLUS* when the Utility program is running the Ethernet mode, users first have to make sure that the *WiSER2400.PLUS* unit has an active

connection with a TCP/IP Wireless/Ethernet network. The PC which runs the Utility program must also be part of the same Wireless/Ethernet network. The Utility program, when first started, will automatically scan for all available WiSER2400.PLUS units on the network. The user can also force a scan by clicking the "Get MAC/IP" button. The scan result will be displayed in the pull-down menu at the top of the Utility program. To configure a WiSER2400 radio, the users simply select the MAC/IP of that particular unit from the scan list pull-down menu.

To connect to the WiSER2400.PLUS when the Utility program is running in Serial mode, users first have to use the pull-down menu to select the COM port and its baud rate, byte size, and parity to match those of WiSER2400 unit. Then click on the "Connect" button to establish communication link between the utility and the WiSER2400 unit. To disconnect from the WiSER2400 unit, simply click on the "Disconnect" button which was previously the "Connect" button. The "Detect..." button at the bottom of the utility can be used to detect the RS232 parameters settings of the WiSER2400 unit at a given COM port and automatically connect to the WiSER2400 unit if it finds the correct parameters settings of WiSER2400 unit.

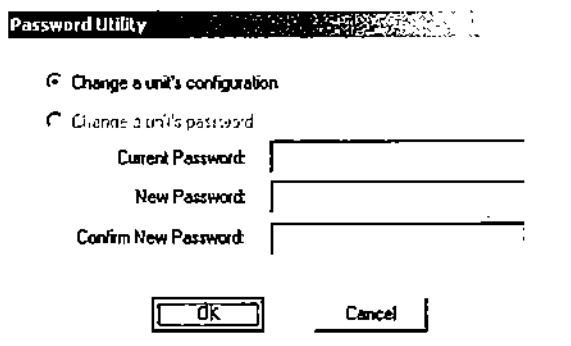
NOTE: Currently, the WiSER2400 does not support 2-stop bit setting.

Password Protection

When the user tries to change/modify the configuration of the WiSER2400 unit, he will be asked to provide a password before these commands can be executed.

After typing in the password(s), and clicking "OK" button, the user specifies that the command will be executed with the provided password.

If user clicks the "Cancel" button, he specifies that he does not want the command to be executed.



The screenshot shows a dialog box titled "Password Utility". It has two radio buttons: "Change a unit's configuration" (which is selected) and "Change a unit's password". Below these are three text input fields: "Current Password", "New Password", and "Confirm New Password". At the bottom of the dialog are two buttons: "OK" and "Cancel".

NOTE: The default password of WiSER2400.PLUS is none.

There are five tabs at the top leading to five panels where the user can configure settings of the WiSER2400 unit. Descriptions of these panels are given in the following sections.

Link Status Panel

The **Link Status** Panel becomes active by clicking on the Link Status tab (see figure 2)

In general, the Link Status panel displays wireless link information such as SSID, the firmware version and release date, role of the radio, RF channel, port status, link quality, and signal strength.

To retrieve/update the Link Status panel, the user must click on the **Refresh** button.

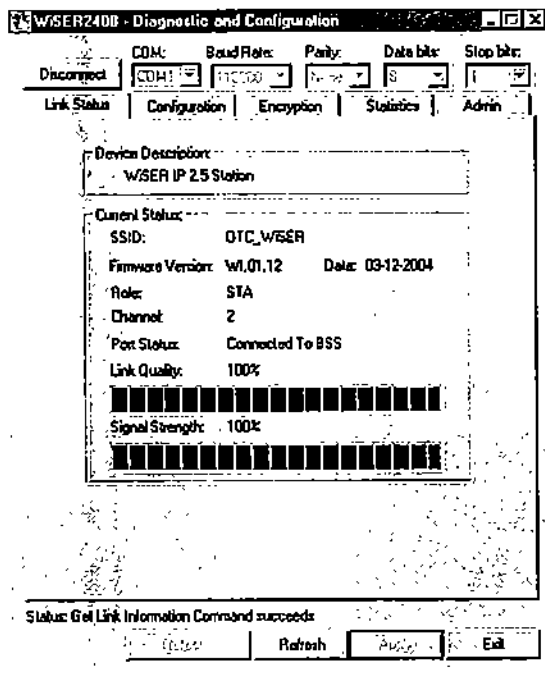


Figure 2. Radio Link Status Panel

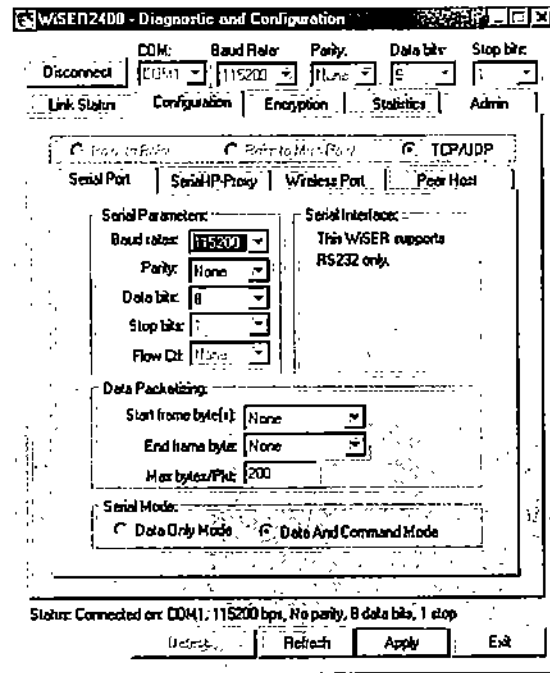


Figure 3. Configuration Panel

Configuration Panel

This panel, activated by clicking on the Configuration tab shown in Figure 3, includes three sub-sections under "TCP/UDP" section: Wireless settings, RS232 settings, and IP settings. "Point to Point" section is not available for this version of WISER2400.PLUS. To retrieve the settings, click on the **Refresh** button at the bottom of the utility. The "Apply" button sends the "Config" command to the radio unit and configure the WISER2400 radio according to the values on the panel.

The followings are the detailed descriptions of each sub-panel under the TCP/UDP mode:

A. Serial Port

Serial Parameter

Baud rate: user-configurable. This is the baud rate the radio unit will use to transmit and receive RS232 data. Supported values: 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, and 115200 bps. Default value: 9600 bps.

Parity Bit: Error checking bit. Supports "None", "Even", and "Odd"

Data Bit: number of bits in the data section. Supports 7 and 8 data bit.

Stop Bit: supports only 1 stop bit.

Flow Control: local flow control option for the serial (RS232) connections. It supports XON/XOFF and Hardware flow control.

Serial Interface

The WiSER2400-IP supports only RS232 serial mode.

Data Packetizing

Start Frame Byte(s): This value specifies a special character that signals the start of a command (or data). Range from 0x00 to 0x1F and options of "None" and "Other". If "none" is selected, there would be no Start Frame Byte. If "Other" is selected, the user can click on "Other" and open a window where the users can configure Start Frame Byte up to 6 bytes of their choice. Default value: none.

End Frame Byte: This value specifies a special character that signals the end of a command (or data), and the command (or data) would be sent to the destination unit right after the radio receives this special character. Range 0x00 to 0x1F. Default value: 0x0D = Carriage Return. Note that user can choose 'None' value which means he would not use any special character in any case.

Max Bytes/Pkt: This value specifies the maximum number of bytes a TCP/UDP packet can contain. Range: 1 to 200. Default value: 200.

Serial Mode

Data Only Mode: When this mode is activated, the WiSER2400-IP radio would ignore the configuration command from the serial connection. This mode is useful when the serial traffic contains data pattern similar to the configuration command and causing the communication disruption. This mode would however stop the communication between the configuration utility and the WiSER2400 radio. To regain the access to the WiSER2400 radio, go to the Troubleshooting Section for recovering instructions.

Data and Command Mode: When this mode is active, the WiSER2400 radio would take the configuration command from the serial port.

B. Serial-IP-Proxy

MAC Address: the MAC address of WiSER2400.PLUS radio. This field is not modifiable.

DHCP Enable: Allows the WiSER2400.PLUS radio to obtain IP address from the DHCP server.

IP Address: The configurable IP address of the WiSER2400.PLUS radio.

Listen Port: The port number that this radio uses to communicate. This port number is the source Port in TCP/UDP packets sent from this WiSER2400 radio. Default value: 8002

Subnet Mask: Used to configure subnet mask settings

Gateway: Used to specify the IP address of the Gateway

Protocol

TCP (Client): enables the WiSER2400.PLUS to run as a TCP Client.

TCP (Server): enables the WiSER2400.PLUS to run as a TCP server.

UPD: enables the WiSER2400.PLUS to run UDP protocol.

Receive Broadcast Packet: Optional operation mode which enable WiSER2400 radio to receive UDP broadcast packet.

Send Serial Data Broadcast: Optional operation mode which allows the data from the serial interface being transmitted as UDP broadcast.

Note: each protocol is running exclusively. For example, while running UDP mode, the WiSER2400 radio will not accept connections for either TCP Server or Client.

C. Wireless Port

Wireless Settings

SSID: The SSID that this WiSER2400 radio wants to be associated with and, in most cases, it would be the SSID of an Access Point. 32 characters maximum. An empty entry is acceptable but note that the radio would interpret it as 'ANY' which means the radio would try to join an open wireless network regardless of its SSID.

Network Type: This is the 802.11b mode the radio unit is running on. It can be either "Ad hoc" or "Infrastructure". For the WiSER2400.PLUS to connect with a normal AP, "Infrastructure" must be selected mode Please refer to IEEE 801.11 documentation for more information of the Network Type. Default value: Infrastructure.

Channel: this field appears only when the "Ad-Hoc" mode is selected in the Network Type. Users can change RF channel used by the WiSER2400 radio here. Supported values: 1 – 11 channels.

Advanced Wireless Settings

Transfer Rate: The RF environment sometimes can be hostile to the highest data rate available in WiSER2400 Radio. That gives rise to the need for trading off between data rate and link robustness. The six choices in the pull-down list allow the network manager to select that optimum trade off.

Fragmentation Threshold: In the presence of hostile RF environment, such as interference, frames longer than this threshold numbers in bytes are divided prior to transmission into one or more fragments equal in length to the fragmentation threshold. The default value is set at 2346 bytes, the maximum 802.11 data frame size, such that no frames are ever fragmented.

RTS Threshold: To minimize the potential packet collision associated with hidden nodes in a wireless network, 802.11 standard has the option to complete a "Request to Send(RTS)" and "Clear to Send(CTS)" two-frame exchange prior to sending the real data. This reduces the throughput of the real data. Since the probability of packet collision increases with the size of the packets transmitted, an optimum trade-off between data-throughput and data-integrity may be reached by turning on the two-frame exchange only for data packets exceeding a certain size. The number entered in this field is that threshold packet size in Bytes. For example, if "500" is entered, data packets with sizes less than 500 bytes are transmitted without being preceded by the RTS-CTS exchange and thereby taking a small risk of getting corrupted by packet collisions. If "2346" (the maximum 802.11 data frame size) or a larger number is entered, then every data packet is transmitted without being preceded by the RTS-CTS exchange and thereby maximizing the data throughput.

D. Peer Host

Destination Unit

MAC Address: The MAC address of the destination device. The radio unit learns the MAC address of the destination unit from ARP response packets sent from the device with associated IP address.

IP Address: The configurable IP address of the device which this WiSER2400 radio is set to communicate with. For TCP server and UDP modes, the IP Address can be left as 0.0.0.0. However, for TCP client mode, there must be a valid IP address filled here.

Listen Port: The port number the destination device listens on to get the TCP/UDP packet. This port number should be the destination Port on TCP/UDP packets destined to this radio.

Encryption Panel

This panel shown in the Figure 4 enables users to configure security options for the WiSER2400 radios. The WiSER2400 supports Wired Equivalent Privacy (WEP) encryption on both 64bits and 128bits. The Security panel contains two sub-panels, *Encryption* and *WEP Keys Creation* sub-panel.

Encryption sub-panel

This sub-panel allows user to adjust the security level as needed. There are three radio buttons to select the encryption levels, and only one radio button can be selected at a time. The function of each radio button is described below:

The screenshot shows the 'Encryption' sub-panel. At the top, there are three radio buttons: '64 bits', '128 bits', and 'Disable'. The 'Disable' button is selected. Below this is the 'WEP keys creation' sub-panel. It has two radio buttons: 'Passphrase' and 'Manual Entry'. The 'Manual Entry' button is selected. There are four input fields labeled 'Key 1:', 'Key 2:', 'Key 3:', and 'Key 4:'. Below these is a checkbox labeled 'Deny Unencrypted Data' which is unchecked. At the bottom, there is a 'Transmission Key:' dropdown menu set to 'Key 1' and a 'WEP Key Factor:' dropdown menu set to 'Every 100 frames'.

Figure 4 Encryption Panel

The screenshot shows the 'Encryption' sub-panel. At the top, there are three radio buttons: '64 bits', '128 bits', and 'Disable'. The '64 bits' button is selected. Below this is the 'WEP keys creation' sub-panel. It has two radio buttons: 'Passphrase' and 'Manual Entry'. The 'Passphrase' button is selected, and the text 'olc-encryption' is entered in the adjacent text field. There are four input fields labeled 'Key 1:', 'Key 2:', 'Key 3:', and 'Key 4:'. Below these is a checkbox labeled 'Deny Unencrypted Data' which is unchecked. At the bottom, there is a 'Transmission Key:' dropdown menu set to 'Key 1' and a 'WEP Key Factor:' dropdown menu set to 'Every 100 frames'.

Figure 5 Create WEP Keys with Passphrase

- Disable:** if checked, the WEP is turned off and WEP Keys Creation sub-panel becomes inactive.
- 64-bits:** if checked, the WEP is turned on using 64-bit encryption with Shared key and WEP Keys Creation sub-panel becomes active.
- 128-bits:** if checked, the WEP is turned on using 128-bit encryption with Shared key and WEP Keys Creation sub-panel becomes active.

Before applying 64-bit or 128-bit WEP encryption to the radios, the user must complete the key settings in WEP Keys Creation sub-panel first.

WEP Keys Creation Sub-panel

This sub-panel allows user to generate users' own WEP encryption keys and can be made active only when either 64 bits or 128 bits radio button in the Encryption sub-panel is selected.

There are two methods to generate WEP encryption keys. One is to use the auto key generation through the *Passphrase* field, and the other method is to manually input a set of keys in the *Manual Entry* fields.

To auto-generate the WEP encryption keys, select the radio button next to the *Passphrase* label and then the users can enter up to any 64 characters in the *Passphrase* field. Click the **Apply** button to apply the encryption key setting. Notice that when this method is selected the Manual Entry fields are "grayed out" to disallow manual entries of WEP keys.

To manually input the keys, select the radio button next to the *Manual Entry* and then enter hexadecimal numbers to the fields next to Key 1 to Key 4. Click the **Apply** button to apply the encryption key setting. Notice that when this method is selected the *Passphrase* field is "grayed out" to disallow any input to the passphrase field.

The *Manual Entry Key 1/2/3/4* fields accept hexadecimal inputs as the encryption keys. If 64 bits encryption is enabled, each key field allows the user to enter up to 10 hexadecimal characters. If 128 bits encryption is enabled, each of the key field allows up to 26 hexadecimal characters.

The remaining fields in the Security Panel are described below.

- a. *Deny Unencrypted Data Frames*: if checked, the firmware will block unencrypted data frames from being received.
- b. *Transmission key*: This allows user to choose from key 1 to key 4 for transmission. The default key is set to Key 1.
- c. *WEP key factor*: this list box allows user to choose how many frames the Initialize Vector (IV) is reused. It contains four options: every frame, every 10 frames, every 50 frames, and every 100 frames. The default key factor is Every 100 frames.

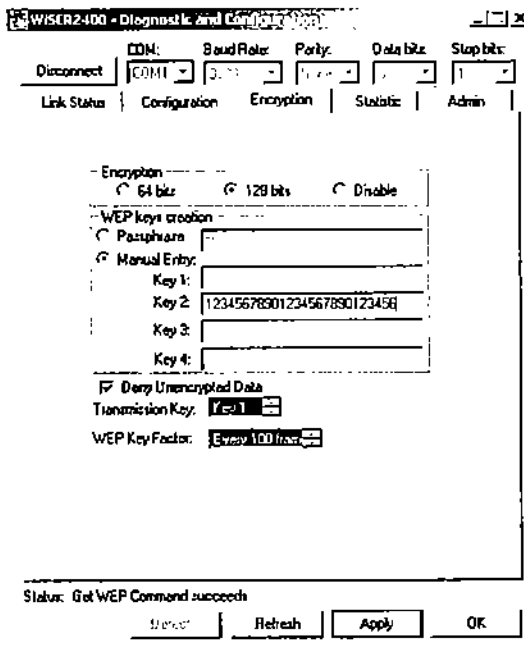


Figure 6 Create WEP Keys with Manual Entries

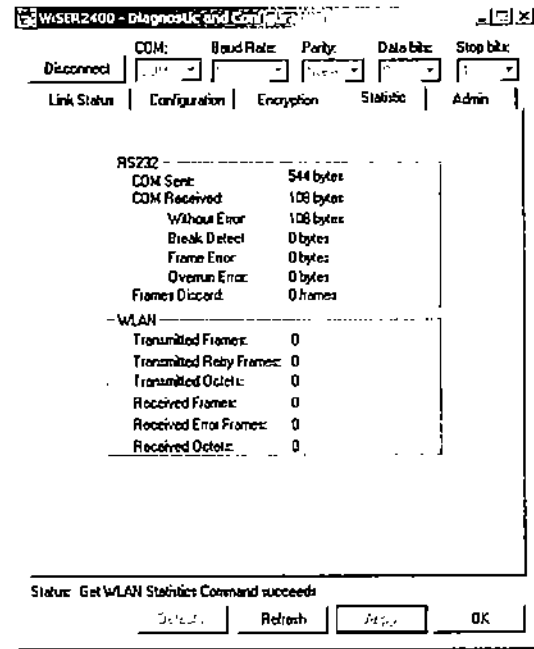


Figure 7 Statistics Panel

When the **Apply** button is pressed, the program validates all entered data and prompts the user to re-enter the data if any of the input data is invalid. If all data is valid, the entered data will be applied to the radio unit. When the **Cancel** button is clicked, all entered data under *Security Panel* is discarded.

RS232 and WLAN Statistics Panel

The transmission statistics of the RS232 (COM port) and Wireless Local Area Network (WLAN) is shown in this panel. To retrieve the statistics, click **Refresh** button located at the bottom of the main window of the utility program. The following explains the statistics shown in the panel:

1. RS232 Statistics:

- a. COM Sent: This number is the total bytes that the Unit sends through the connected COM port.
- b. COM Received: This number is the total bytes that the Unit received through the connected COM port. This value is the sum of the following values:
 - i. Without error: Total bytes received without error.
 - ii. Break Detect error: Total bytes received as break detect error.
 - iii. Frames error: Total bytes received with frame error.
 - iv. Overrun error: Total bytes received with overrun error.
- c. Frames Discard: This number is the total number of frames that were discarded while the firmware tried to en-queue them to WLAN queue (send to MAC). Lacking of memory is the main reason for a frame to be discarded.

2. WLAN Statistics:

- a. Transmitted Frames: This number is the total UniCastFrames and MultiCastFrames that the MAC successfully transmitted

- b. Transmitted Retried Frames: This number is the total SingleRetryFrames and MultiRetryFrames that the MAC transmitted.
- c. Transmitted Octets: This number is the total bytes that the MAC successfully transmitted (UnicastOctets and MulticastOctets)
- d. Received Frames: This number is the total UniCastFrames and MultiCastFrames that the MAC successfully received.
- e. Received Error Frames: This number is the total frames that the MAC received with the following errors: DiscardNoBuffer, DiscardsWrongSA, DiscardWepUndecryptable, and Frame-Check-Sequence Errors.
- f. Received Octets: This number is the total bytes that the MAC successfully received (UnicastOctets and MulticastOctets)

Admin

The panel contains buttons that are for Administrative setting and it also reveals the information regarding the utility including its version and release date.

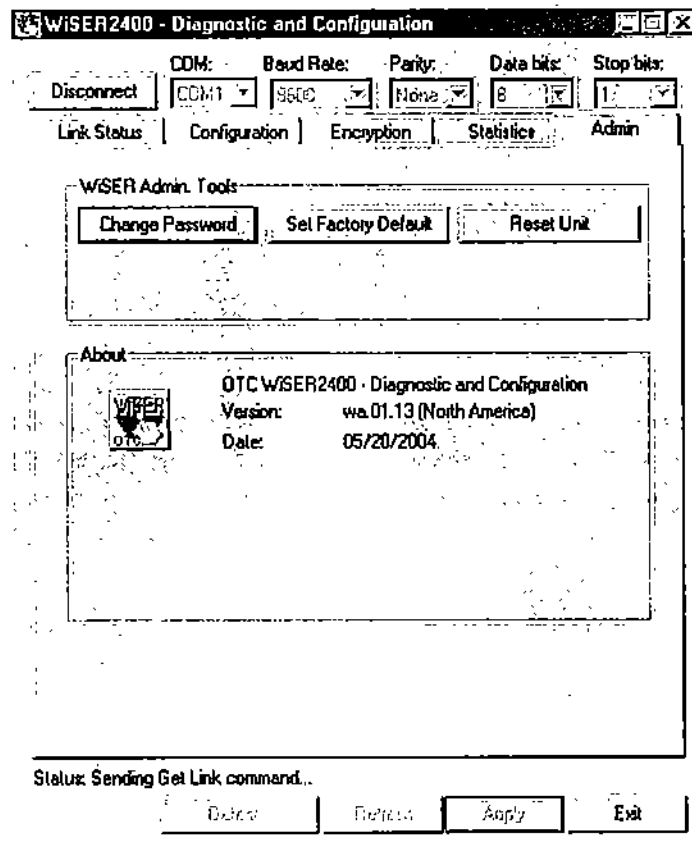


Figure 8 Admin Panel

There are three buttons of interest.

Change Password: This button allows the user to change the current password of the WISER2400 unit to a new one.

Set Factory Default: This button forces all settings in the WISER2400 back to the factory defaults.

Reset Unit: This button forces the WISER2400 to perform software reboot.

Chapter 4 – Trouble Shooting

Blank Pages Appear When Open the Utility Program

It is possibly due to the unavailability of the COM port. Please pay attention to the *Connection* and *Status* field at the bottom of the program's main window. Press the **Connect** button again to see if the status indicates "Connected." If not, check to see if you have another running program that accesses the same COM port.

No Radio Link

If the *Link Quality* indicator in the *Radio Status* panel shows 0%, check the following for possible causes:

- Make sure that the *Signal Strength* indicator under *Radio Status* panel is not zero. A minimum of 20% is recommended. If the "Signal Strength" is less than 20%, the distance between the WiSER2400 and the targeted AP may be too far. Decrease the distance between the radio pair to see if the radio link can be improved.
- Make sure that the encryption keys are entered correctly if WEP encryption is enabled.
- Make sure that there is no RF interference present in the radio network.

No Data Transfer While the Radio Link is Good

If the *Link Quality* indicator shows good link quality, but the host computer/equipment cannot properly exchange data:

- Make sure the RS232 cables are properly connected to the radio and computer/equipment.
- Make sure that the RS232 cables in use are not defective.
- Make sure that the COM port on the computer/equipment is available, not used by another active program/process.
- Retrieve the "Configuration" information of the WiSER2400 by click on "Refresh" button. Make sure the "IP setting" on the "Configuration" tab is correct: IP addresses, port numbers, etc. The very clear indicator that shows there is a connection between the WiSER2400 radio and the intended destination device is the "Dest unit's MAC address" field. After clicking "Refresh" button a few times while the "Configuration" tab is active, this field should show the MAC address of the destination unit. Otherwise, the user must check for the correctness of IP address settings.

Poor Link Quality

If the *Signal Strength* indicator is reasonably high (>20%) and the *Link Quality* is not zero, but the "Link Quality" stays in the Poor range, it could be due to one of the following reasons:

- Make sure that **radio interference** is not present in the radio network.
- Make sure that the radio is not surrounded by many strongly reflecting (metallic) surfaces. With multiple reflecting surfaces between the radio in question and the target radio, a severe **multi-path** problem may introduce high bit error rate despite a strong *Signal Strength*.
- Make sure that there is no severe **packet collision** caused by a "hidden node" problem. A "hidden node" problem is the situation where the RF signal from two or more Station radios cannot reach each other (but can reach the AP). In such situation, multiple Stations may attempt to transmit data packet to the AP at the

same time and therefore cause packet collision. To solve this problem, re-arrange the Stations in question such that the RF signals are mutually sensible by all Stations. There is no guarantee that the packet collision can be entirely eliminated, but the severity can be reduced enough to see visible improvement of the link quality.

Radio Interference

You may be able to minimize RF interference by doing the following:

- Although WiSER2400, when properly configured, seeks a clear channel to use, it cannot avoid interference if too many 2.4GHz interference sources are present. A "clear" channel should be at least 20MHz, but preferably 30MHz, apart from any other channel in use. Find out other usages in this frequency band in the vicinity and try to coordinate the channel assignment with other users.
- Reseat the WiSER2400 radio to a location where the interference is minimized; in general, increasing the distance between the radio pair may cause radio interference.
- Avoid using 2.4GHz cordless phone in the vicinity of the radios
- Keep the computer with the WiSER2400 radio away from the microwave oven and large metal objects.
- Consult the dealer or an experienced radio technician for help and assistance.

Recovering from the Data Only Mode

There are two approaches for recovering the WiSER2400 radio from the Data Only Mode. First is to use the Configuration Utility under Ethernet connection since the WiSER2400 radio will still take configuration command from the wireless port even when it is running Data Only Mode. Use the alternative approach if the WiSER2400 can only be linked through serial connection. The instruction for the alternative approach is given below.

- i. Have the WiSER2400 radio connected to the COM port of the PC
- ii. Start the Configuration utility running the serial connection mode
- iii. Power up or power cycle the WiSER2400 radio unit
- iv. There is a 10 second time frame after the radio powered up for the next step
- v. Use the Connect button in the configuration utility to establish the serial link with the WiSER2400 radio
- vi. Once the link between the configuration utility and the WiSER2400 radio is established, the user can start configuring the WiSER2400 radio.

Technical Support

If problems are still not solved, please contact our Technical Support to obtain further assistance.

Call: 1-800-770-6698 in USA

Call: 011-510-490-8288 outside of USA

Email: support@otcwireless.com

Appendix A. WiSER2400.PLUS Cable Configuration

This section describes the serial/RJ-45 cables used for the WiSER2400-IP radio units to connect with RS232 equipments.

The *Figure A.* below is the RS232-C serial cable used for connecting the computer serial/ RS232 connector to the WiSER2400.PLUS radio unit.

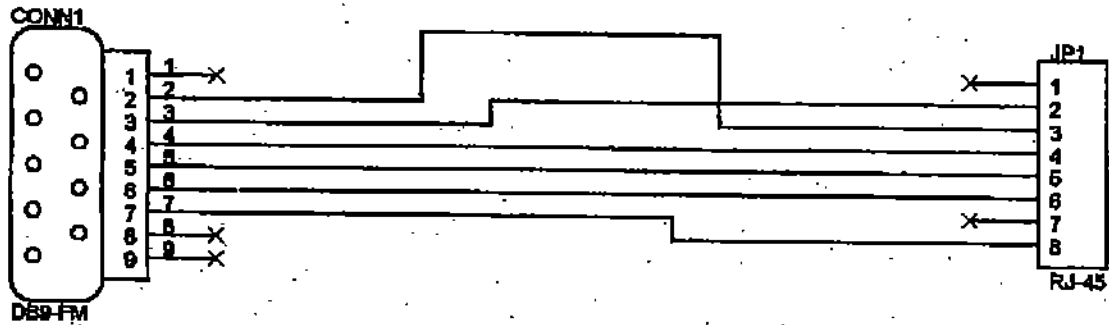


Figure A. RS232-C Serial Cable

The *Figure B.* is the RS232-P serial cable commonly used for connecting a RS232 equipment to a WiSER2400-IP radio unit.

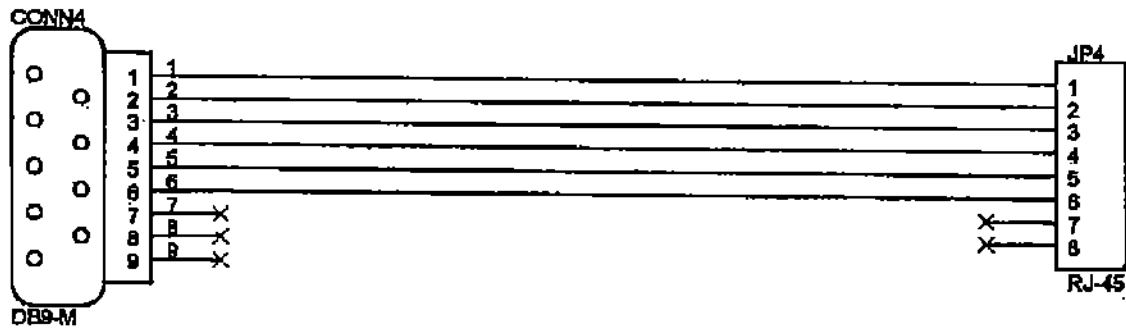


Figure B. RS232-P Serial Cable

Appendix B: Limited Warranty

The seller warrants to the end user ("Customer") that this product will be free from defects in workmanship and materials, under normal use and service, for one (1) year from the date of purchase from the seller or its authorized reseller. The seller's sole obligation under this express warranty shall be, at the seller's option and expense, to repair the defective product or part, deliver to Customer an equivalent product or part to replace the defective item, or if neither of the two foregoing options is reasonably available, The seller may, in its sole discretion, refund to the Customer the purchase price paid for the defective product.

All products that are replaced will become the property of the seller. Replacement products may be new or reconditioned.

Appendix C: Regulatory Compliance

FCC Part 15 Declaration of Conformity (DoC)

The equipment is confirmed to comply with the requirements of FCC Part 15 rules. The operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

FCC ID: MKZ0207232XG

FCC Rules and Regulations - Part 15

Warning: This device has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the Federal Communications Commissions Rules and Regulations. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Relocate your WLAN equipped laptop computer.
- Increase the separation between the WLAN equipped laptop computer and other electronics.
- Connect the WLAN equipped laptop computer into an outlet on a circuit different from that of other electronics.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications not expressly approved by OTC Wireless could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

European Community (EC) Directives Conformity and Restrictions

This product is in conformity with the protection requirements of EC Council directives 89/336/EEC, 73/23/EEC, and 1999/5/EC on the approximation and harmonization of the laws of the Member States relating to electromagnetic compatibility, safety of electrical equipment designed for use within certain voltage limits and on radio equipment and telecommunications terminal equipment.

Compliance is indicated by the CE marking 

This product satisfies the radio spectrum requirements of EN 300 328-1, the EMC requirements of EN 301 489-17 and the safety requirements of EN 60950.