



## 802.11b Wireless Serial Port Adapter

# WiSER2400 User Guide

Version 1.01



**WiSER2400**  
**Wireless Serial Port Adapter**  
**User Guide**  
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## Chapter 1

# INTRODUCTION

WiSER2400 is an 802.11b compliant, or WiFi, radio with a RS232 serial interface.

The radio takes serial data from the equipment or computing device connected to it 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.

The radio can be configured either as a “Station” or as an “Access Point” in accordance to the 802.11 standards. It can operate either in the *ad hoc* or the *infrastructure* mode defined by the 802.11 standards. As such, this radios enables RS232-interfaced devices to participate in an 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.

Due to the fact that most existing RS232 applications involve RS232 interfaces on both ends of a communication link, standard WiSER2400 radios are currently shipped in pairs. However, a single WiSER2400 radio is perfectly capable of connecting RS232-interfaced equipment wirelessly to another non-RS232-interfaced 802.11b radio as long as software exists on the other end to properly receive the data in Ethernet packets. For such single-radio applications, please contact OTC for more information.

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 a 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 widespread. 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.

A Utility program is needed to pre-configure WiSER2400 prior to putting the radio in operation. And the Utility program can be used to monitor the communication condition once the radio is in operation. Once configured, 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. An end user simply plugs the pre-configured radio into a host equipment or computer equipped with a RS232 receptacle without ever being expose to this Utility program. The Utility program is simple to install and easy to use through its graphic user interface. The details are described in Chapter 3.

## WiSER2400 WiFi Radio

### Key Features

- ❑ Configurable as either an Access Point or a Station
- ❑ Configurable as a dedicated pair of radios to replace a RS232 cable connection
- ❑ 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 98/2000/ME, Linux, Unix, embedded, etc.), as long as a RS232 port is properly supported
- ❑ Automatic clear channel selection when configured to operate as a dedicated radio pair
- ❑ Supports 64-bit and 128-bit encryption for secured communication
- ❑ Industry standard IEEE 802.11b-compliant wireless interface; Interoperable with AP and Client radios from other vendors)
- ❑ Enable a RS232-interfaced equipment to participate in an Ethernet network via an 802.11b-compliant Access Point
- ❑ 11Mbps data rate and automatic selection of lower data rate (5.5, 2 and 1 Mbps) in degraded RF

### Applications

- ❑ Standard-compliant wireless networking for computers and equipment with a RS232 interface
- ❑ Where Plug & Play is essential
  - As rental Internet-access devices in public space—Hotels, motels, cyber-café, airport lounges, etc
  - As rental Internet-access devices at trade shows, large meetings and other one-time events
  - As shared Internet-access devices for visitors to an office
- ❑ 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

<b>Model</b>	WiSER2400
<b>Standard</b>	802.11 and 802.11b
<b>Host Interface</b>	RS232
<b>Frequency</b>	2.4GHz – 2.495GHz
<b>RF Channels</b>	11 channels (US, Canada), 13 channels (Europe), 14 channels (Japan)
<b>Transmission power</b>	14dBm at antenna input typical
<b>Receiver sensitivity</b>	-80dBm @1e-5 BER typical
<b>Antenna</b>	Integrated dipole antenna with ~2dBi gain
<b>Data Rate</b>	11, 5.5, 2 or 1 Mbps fixed rate, or configured to automatic rate selection
<b>Modulation</b>	CCK, Direct Sequence Spread Spectrum
<b>Link Distance</b>	~1200 ft in open space
<b>Network Types</b>	Support dedicated point-to-point link, the ad hoc mode and the infrastructure mode
<b>Data Encryption</b>	Support the standard 64-bit and the 128-bit WEP
<b>Network Security</b>	MAC-address-based access control
<b>AC adapter</b>	Output: 5V, 1A; Input: 100-120V, 50-60Hz, ~0.3A
<b>Current consumption</b>	<480mA (max. reached in transmit-mode)
<b>LED Indicators</b>	4: Power, Transmission, Receiving, Link
<b>Operating Temperature</b>	-10°C – 50°C
<b>Regulation Compliance</b>	FCC part 15, Class B CE ( ETSI EN 300 328-1, ETSI EN 301 489-17)

## Chapter 2

# INSTALLATION OF WiSER2400

### Installation of WiSER2400 Hardware

#### **Standard Hardware Items**

- 2 WiSER2400 radios
- 1 2-foot RS232 cable
- 1 3-foot RS232 cable (option –S, or –N, or –P)
- 1 ac-dc adapter
- 1 USB power adapter
- 1 pair of Velcro mounting pads

#### **Power**

This radio connected to your equipment draws power from an AC adapter that plugs into a wall outlet. The radio connected to your computer draws the power from a USB power adapter cable that plugs into the USB port of a notebook or desktop computer.

Power can also be injected from the WiSER2400 over the RS232 cable (Option –S and –N) to the equipment connected to the radio.

#### **RS232 Connection**

A pair of WiSER2400 radios is shipped with two RS232 cable. One of the cables is 2 feet long and always has a female DB-9 connector at one end. This 2-foot RS232 cable is used to connect a computer in a standard configuration. The 3-foot cable is intended for use with any RS232 equipment (whiteboard, instrument, etc.) and comes in one of the options listed below:

- Option –S—terminates in a female DB-9 connector, when connected to a powered-on radio, pin 1 supplies 5V, up to 350mA DC power
- Option –N—terminates in a male DB-9 connector, when connected to a powered-on radio, pin 7 supplies 5V, up to 350mA DC power
- Option –P—terminates in a male DB-9 connector, no dc-power is available from this 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) at the bottom panel of 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.

Standard WiSER2400 radios operate at a data rate of 9600 baud. WiSER2400-M operates at data rate of 19,200 baud. The WiSER2400 radio, however, is inherently capable of supporting data rate up to 115K baud. Contact OTC for applications that require customized or utility-configurable data rate.

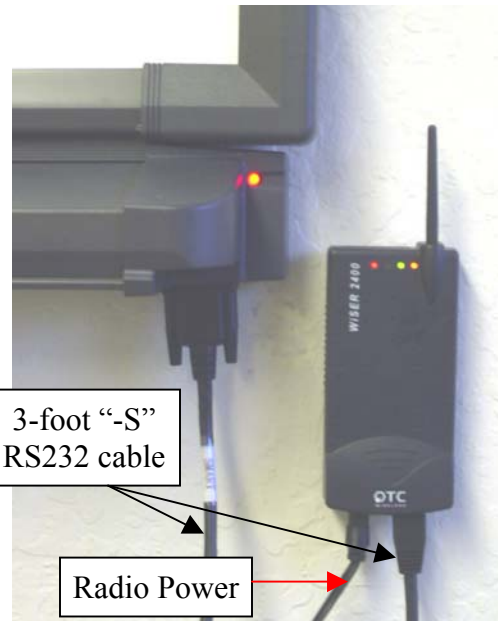
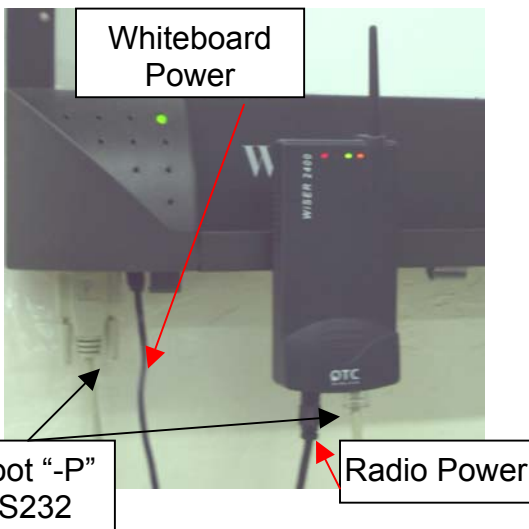
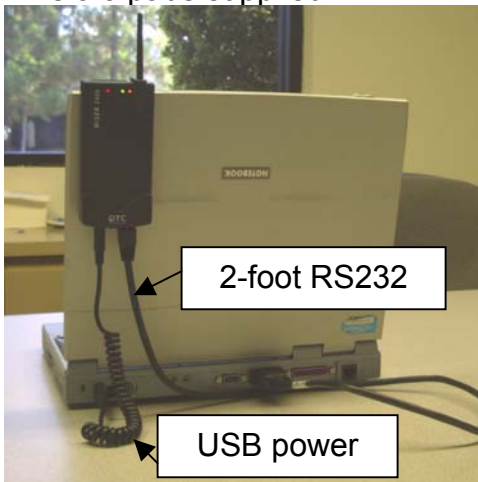
## Status LED's

Power on the WiSER2400 Radio, the LED's on the front panel should exhibit the following patterns:

<u>LED</u>	<u>Color</u>	<u>Light Blinking Pattern</u>	<u>Indication</u>
ON	RED	Steady on	Proper power is supplied
RX	GREEN	Steady on	Unit linked to another unit or Unit is configured as an AP
		Steady blink	Unit not linked to any unit
TX	RED	Flickering	Unit transmitting RF signal
LINK	YELLOW	Steady on	<i>Not in use</i>

When the radio is configured 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. If you are using a pair of the radios in a dedicated point-to-point link, good radio communication is expected only if the green RX LED's on both radios are steadily on.

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



An installation example where the power for the RS232 equipment (whiteboard) is supplied by the radio over the RS232 cable

An installation example where separate power supplies are used for the RS232 equipment (whiteboard) and the radio

## **Installation of WiSER2400 Software**

### **System Requirements**

To use the WiSER2400 Wireless Ethernet Adapter's utilities software, your computer must meet the following minimum requirements:

Windows® 95 (OSR2)/ 98 (SEC)/ME/2000/XP

One COM port (with a DB-9 male connector or an appropriate adapter to connect to a DB-9 female connector)

### **Installation**

To install the utility program, simply insert the CD-ROM provided copy the "WiSERUti.exe" file to the desired location on your PC.

Notice that the operation of the WiSER2400 radio is independent of the Utility Program. Therefore, it is NOT necessary to install the Utility on the RS232 equipment/computer that connects to a WiSER2400 radio. For example, if you connect an electronic whiteboard wirelessly to a network using a pair of WiSER2400 radios, you need not to install Utility Program on the whiteboard and you will not be able to! You can configure the WiSER2400 radio on a PC installed with the Utility Program, disconnect it from the PC, and then connect it to the whiteboard. While the Utility program must run on a computer equipped with Microsoft Windows, the radio can operate with computers/equipment of any OS.

***Also, notice that to configure or monitor the radio with the Utility program, the computer cannot be running another program that also access the same COM port.***

## Chapter 3

# Diagnostic and Configuration Utility

### Overview

This chapter describes the functionalities and operations of *WiSER2400 Diagnostic and Configuration Utility* program. The utility program can be used to configure, monitor, WiSER2400 radios. The WiSER2400 utility program is supported on Microsoft Windows® 95(OSR2), 98(SEC), Millennium, 2000, and XP. Figure 1 below is WiSER2400 utility main window.

**Warning:** *The utility program may not work simultaneously with another RS232 application program since both programs compete for the access to the same COM port (RS232 serial port) connecting the WiSER2400 radio.*

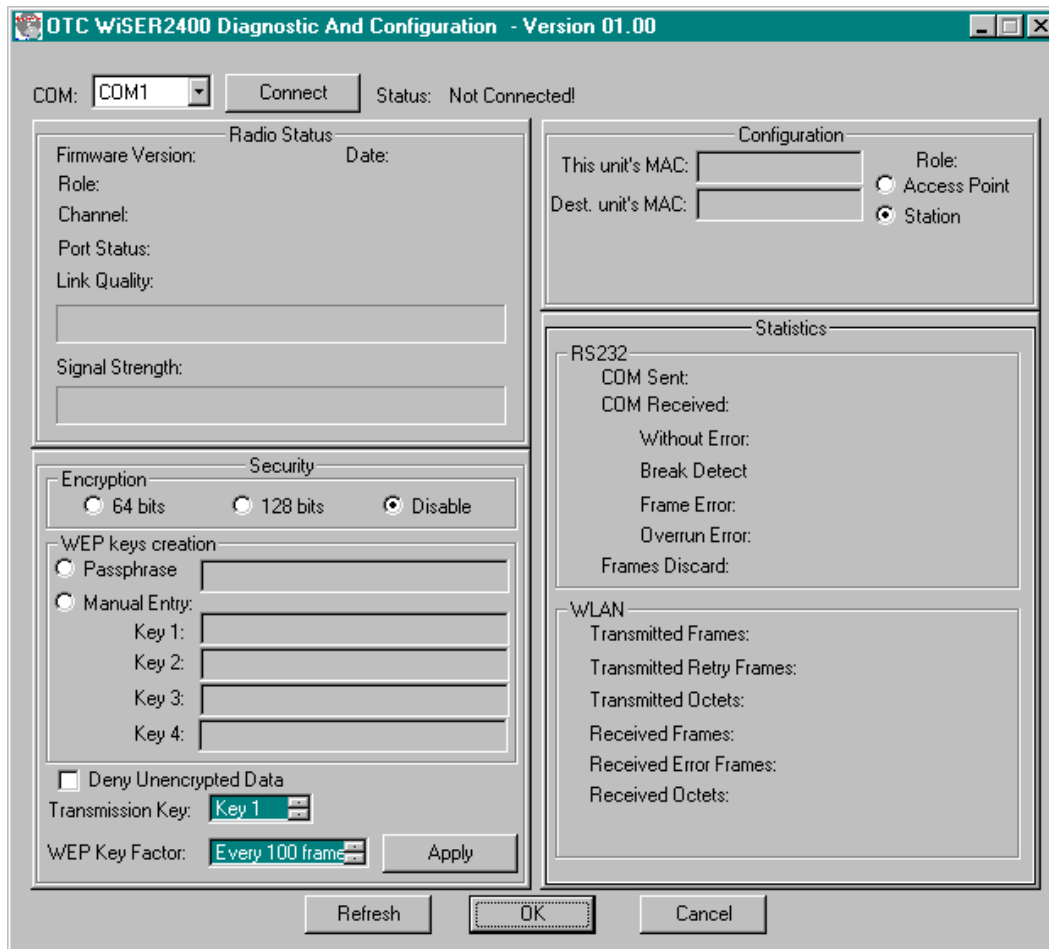


Figure 1. Main Window of WiSER2400 Utility Program

In general, the main window consists of five panels: *Connection and Overall Status, Radio Status, Configuration, Security, and RS232 and WLAN Statistics.*

## Connection and Overall Status Panel

The *Connection and Overall Status* panel, shown in figure 2, controls and maintains the serial connection, and displays up-to-date connection status. It has a pull down menu for choosing COM ports, a **Connect** button, and a text field displaying connection status.

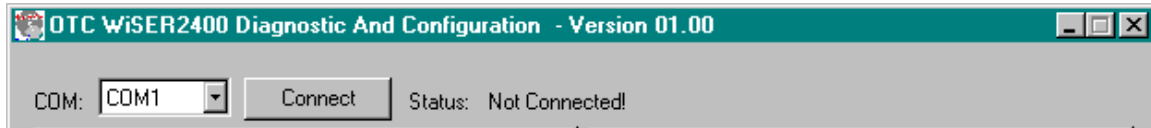


Figure 2. Connection and Overall Status Panel

The pull-down menu allows users to select COM ports (RS232 serial port) so that the utility program knows where to connect to WiSER2400 radio unit. The pull-down menu becomes inactive and inaccessible when the connection between the WiSER2400 radio and the utility program is active.

After appropriate COM port is selected from the pull-down menu, click **Connect** button to have the utility program claim the COM port. If a COM port is successfully claimed by the utility, the **Disconnect** will be displayed on the button instead of **Connect**. Click **Disconnect** button to release the control of the COM port from the utility program.

**Warning:** When the COM port is claimed by the Utility program, it is not guaranteed that the link between the WiSER2400 radio and the utility program is established. The utility program simply takes control of a specific COM port which can be connected to any device.

**Note:** Other panels in the main window stay inactive unless a COM port is claimed by the utility program.

The status text field displays connection status and all command information moving back and forth between WiSER2400 utility program and the radio unit.

## Radio Status Panel

The **Radio Status** Panel has two modes, STA mode and AP mode, shown in figure 3.

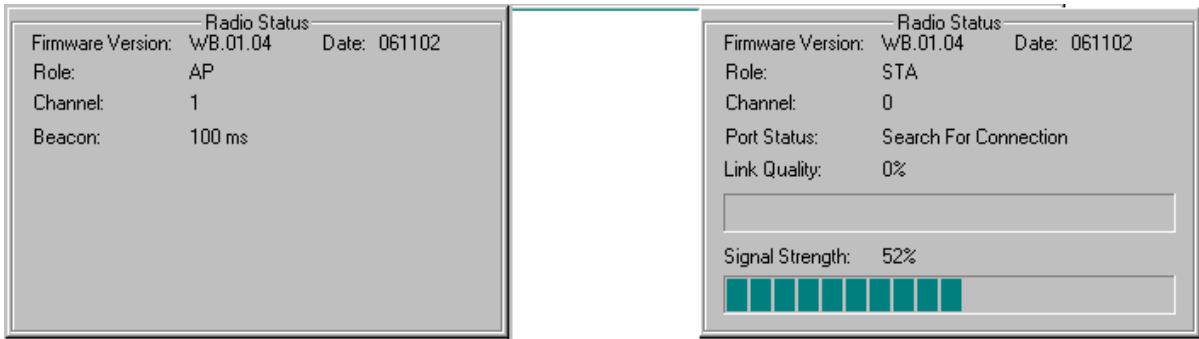


Figure 3. Radio Status Panels (AP: left; Station: right)

The modes switch automatically depending on the role of the WiSER2400 radio unit connected to the COM port. When the radio unit acts as an AP, the radio status panel is shown in AP mode. Likewise, when the radio unit acts as a station, the radio status panel is shown in STA mode. To retrieve or update the Radio Status Panel, click **Refresh** button at the bottom of the main window.

In general, the Radio Status Panel of both modes displays the firmware version, firmware release date, role, and communication channel used by the radios. In AP mode, the panel displays additional information such as Beacon interval. In station mode, the panel displays additional radio signal information such as the Port Status, Link Quality, and Signal strength.

### **Configuration Panel**

The **Configuration** panel is used to display MAC addresses, role of the radio unit, the radio channel in use. The Configuration panel has AP mode and station mode shown in Figure 4.

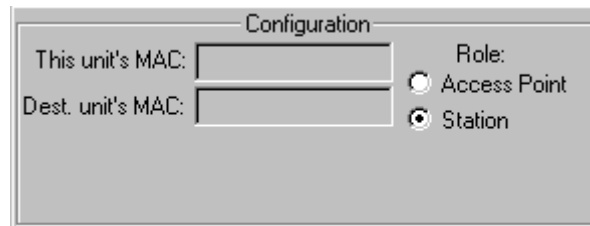


Figure 4. Configuration Panel

**NOTE:** The firmware is embedded with the “Auto Channel Scan” feature. This means the Access Point automatically detects in-use channels and selects the one that is not in-use. Therefore, users cannot manually change the channel number.

To retrieve the configuration setting of the connected WiSER2400 radio unit, click **Refresh** button located at the bottom of on the utility main window. If the settings are retrieved successfully, the information such as MAC addresses and the

channel in use is automatically displayed in the appropriate fields in the Configuration panel.

### **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 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)

## Security Panel

This panel shown in Figure 5 enables users to configure security options for the WiSER2400 radios. WiSER2400 supports Wired Equivalent Privacy (WEP) encryption both 64bits and 128bits. The Security panel contains two sub-panels, *Encryption* sub-panel and *WEP Keys Creation* sub-panel.

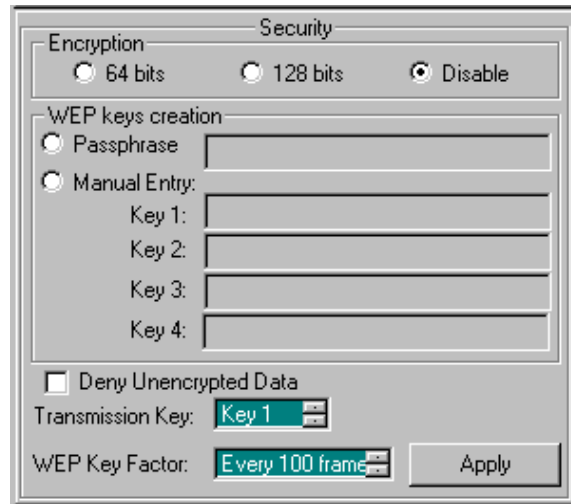


Figure 5 Security Panel

### **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:

- 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 and WEP Keys Creation sub-panel becomes active.
- 128-bits:** if checked, the WEP is turned on using 128-bit encryption and WEP Keys Creation sub-panel becomes active.

Before applying the WEP 64 or 128-bit 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 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 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.

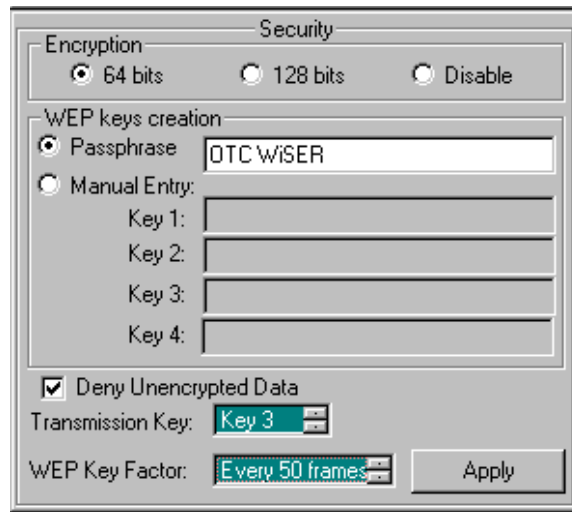


Figure 6 Create WEP Keys with Passphrase

To manually input 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.

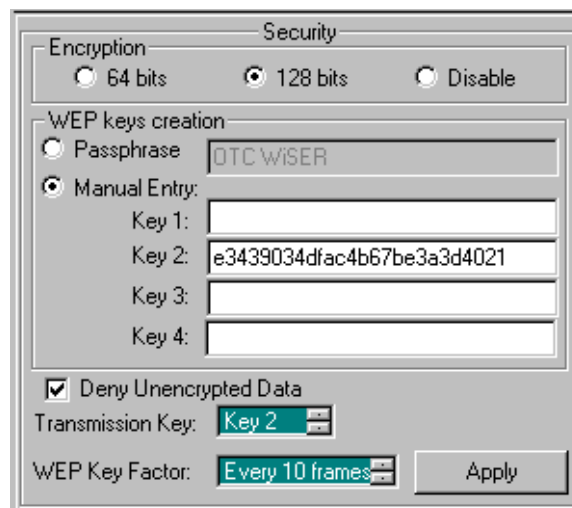


Figure 7 Create WEP Keys with Manual Entries

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.

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.

## Chapter 4

### Troubleshooting

#### **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 Overall Status* field next to the **Connect** button. Press the **Connect** button again to see if the status indicates “Connected.” If not, check to see if you have another running program that access 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 a target radio, an AP or a Station, is turned on and operating properly by checking LED's on the radio.
- 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 radio (an AP or another Station) may be too far. Decrease the distance between the radio pair to see if the radio link can be established.
- If two WiSER2400 radios are meant to operate as a dedicated point-to-point link, make sure that one radio in the pair has the role of AP and the other has the role of Station. No link can be established if both radios are set up as the same role.
- 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 radios 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.

### 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 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, either re-arrange the Stations in question such that the RF signals are mutually sensible by all Stations, or turn-on the RTS/CTS protocol by setting the “[RTS threshold](#)” on the “Station” sub-tab to a reasonably small value (500, for example). There is no guarantee that the packet collision can be entirely eliminated by invoking RTS/CTS protocol, 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.

**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**

**E-mail: [techsupport@otcwireless.com](mailto:techsupport@otcwireless.com)**

## Appendix A:

### Limited Warranty

#### **WiSER2400 Hardware**

The seller warrants to the end user ("Customer") that this hardware 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.

#### **WiSER2400 Software**

The seller warrants to Customer that each software program licensed from it, except as noted below, will perform in substantial conformance to its program specifications, for a period of one (1) year from the date of purchase from the seller or its authorized reseller. The seller warrants the media containing software against failure during the warranty period. No updates are provided. The seller's sole obligation under this express warranty shall be, at the seller's option and expense, to refund the purchase price paid by Customer for any defective software product, or to replace any defective media with software which substantially conforms to applicable seller published specifications. Customer assumes responsibility for the selection of the appropriate application programs and associated reference materials. The seller makes no warranty or representation that its software products will meet Customer's requirements or work in combination with any hardware or software applications products provided by third parties, that the operation of the software products will be uninterrupted or error free, or that all defects in the software products will be corrected. For any third party products listed in the seller software product documentation or specifications as being compatible, the seller will make reasonable efforts to provide compatibility, except where the non-compatibility is caused by a defect in the third party's product or from use of the software product not in accordance with the seller's published specifications or user manual.

## Appendix B:

### Regulatory Compliance

#### **FCC Part 15 Declaration of Conformity (DoC)**

The following equipment:

Product Name: Wireless Ethernet Adapter

Model Number: WiSER2400 is herewith 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: MKZ02072327G

#### **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.

#### **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.

### **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.

## Glossary

**RS232** An EIA standard for serial data communication between equipment and computing devices.

**Access Point** An internetworking device that seamlessly connects wired and wireless networks. Access Points combined with a distributed system support the creation of multiple radio cells that enable roaming throughout a facility.

**Ad Hoc Network** A network composed solely of stations within mutual communication range of each other (no Access Point connected). The Ad Hoc network offers peer-to-peer connections between workstations, allowing communication between computers within range that have an 802.11 DSSS compatible PC card installed.

**BSS** *Basic Service Set.* A set of stations controlled by a single coordination function.

**Channel** A medium used to pass data units that can be used simultaneously in the same volume of space by other channels of the same physical layer, with an acceptably low frame error ratio due to the absence of mutual interference.

**CSMA/CA** *Carrier Sensing Multiple Access/Collision Avoidance* The medium access control method used by the 802.11 standard. Basically, a radio can start transmitting signal only when no carrier from another radio is sensed and after a randomized wait time has expired.

**Encapsulated** An Ethernet address mode that treats the entire Ethernet packet as a whole and places it inside an 802.11 frame along with a new header.

**ESS** *Extended Service Set.* A set of one or more interconnected Basic Service Sets (BSS's) and integrated Local Area Networks (LANs) can be configured as an Extended Service Set.

**Ethernet** The most widely used medium access method, which is defined by the IEEE 802.3 standard. Ethernet is normally a shared media LAN; i.e., all the devices on the network segment share the total bandwidth. Ethernet networks operate at 10Mbps/100Mbps using CSMA/CD to run over 10BaseT/100BaseT cables.

**Hidden Node** The situation where two or more radios in a multiple-radio network fail to detect the RF signals from each other. For example, in a 3-radio network, radio 2 and 3 both have good link to radio 1. Radio 2 and 3, however, are isolated from each other by, say, a metal wall. Radio 2 therefore is a "hidden node" to radio 3, and vice versa. Since an 802.11 network relies on the CSMA/CA protocol to control network access, hidden nodes break down the

Carrier Sensing mechanism of controlling medium access because two or more radios cannot sense the carrier from each other.

**IEEE 802.11** The IEEE 802.xx is a set of specifications for LANs from the Institute of Electrical and Electronic Engineers (IEEE). Most wired networks conform to 802.3, the specification for CSMA/CD-based Ethernet networks or 802.5, the specification for token ring networks. 802.11 defines the standard for wireless LANs encompassing three incompatible (non-interoperable) technologies: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), and Infrared. IEEE standards ensure interoperability between systems of the same type.

**Infrastructure Network** A wireless network centered about an Access Point. In this environment, the Access Point not only provides communication with the wired network but also mediates wireless network traffic in the immediate neighborhood.

**IP *Internet Protocol***. The standard protocol within TCP/IP that defines the basic unit of information passed across an Internet connection by breaking down data messages into packets, routing and transporting the packets over network connections, then reassembling the packets at their destination. IP corresponds to the network layer in the ISO/OSI model.

**LAN *Local Area Network***. A communication network that serves users within a defined geographical area. The benefits include the sharing of Internet access, files, and equipment, such as printers and storage devices. Special network cabling (10BaseT) is often used to connect the PCs together.

**PS Mode *Power Save Mode***. This mode is recommended for devices where power consumption is a major concern, such as battery-powered devices.

**Radio Frequency *RF***, Terms: GHz, MHz, Hz —The international unit for measuring frequency is Hertz (Hz), equivalent to the older unit of cycles per second. One megahertz (MHz) is one Million-Hertz. One gigahertz (GHz) is one Billion-Hertz. The standard U.S. electrical power frequency is 60 Hz, the AM broadcast radio frequency band is 0.55–1.6 MHz, the FM broadcast radio frequency band is 88–108 MHz, and wireless 802.11 LANs operate at 2.4GHz.

**SSID *Service Set ID***. A group name shared by every member of a wireless network.

**Station** The Station is the component that connects a host computer or device to the wireless medium. It may be referred to as the Wireless Network Adapter or the Wireless Network Interface Card.

**WEP *Wired Equivalent Privacy***. The optional cryptographic confidentiality algorithm specified by 802.11 used to provide data confidentiality that is

subjectively equivalent to the confidentiality of a wired LAN medium that does not employ cryptographic techniques to enhance privacy.