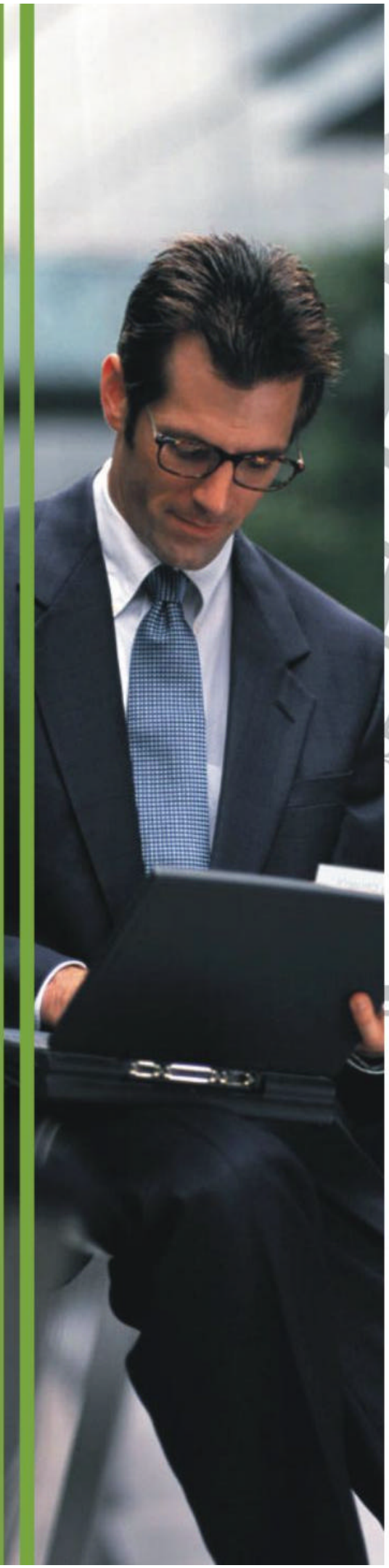

WLAN Outdoor Radio

3000 Series

User's Manual

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About This Manual

The purpose of this manual is for the setup of the 11Mbps Wireless LAN ODU. This manual, revised as version 4.0.3 in 2004, includes procedures assisting you in avoiding unforeseen problems.

Technical Support

If you have difficulty resolving the problem while installing or using the Wireless LAN ODU, please contact the supplier for support.

FCC Certified Declaration:

This device complies with part 15 of the FCC rules. 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.

Reminder:

To comply with FCC part 15 rules, the ODU must only be used as a system as FCC certified. The system must also be professionally installed to ensure compliance with the Part 15 certification. It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in where FCC rules apply. Further, according to FCC Part 15 regulations, Section 15.247(b)(3)(iii), the installer must ensure that the high-gain directional antenna used in this system is used exclusively for fixed, point-to-point operations and that multiple co-located intentional radiators transmitting the same information are not used. For further information, please see Appendix B.

IMPORTANT NOTE:

To comply with the FCC RF exposure compliance requirements, no change to the antenna or the device is permitted. Any change to the antenna or the device could result in the device exceeding the RF exposure requirements and void user's authority to operate the device.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment when installed as directed. This equipment should be installed and operated with fix-mounted antennas that are installed with a minimum of 2 meters of separation distance between the antenna and all persons' body during normal operation.

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Chapter 1 Introduction

The Outdoor wireless LAN device – 11Mbps Wireless Outdoor Unit, are specially designed for Point-to-Point applications, offering long distance connections between buildings at a speed of up to 11Mbps. Fully compliant with IEEE802.11b standard, the Outdoor Unit (ODU) provides powerful features such as the Windows-based configuration utility, MAC address filtering, WEP security and more.

1-1 Features and Benefits

- Creates a Point-to-Point connection linking two LANs, using 2 Indoor Units or Indoor and Outdoor total solutions.
- Integrated antenna allows you for easy installing the Outdoor bridge.
- With a data rate of 11Mbps and 5.5Mbps, the system is faster than an E1/T1 data link.
- Features 11Mbps data rate by incorporating Direct Sequence Spread Spectrum technology.
- Fully IEEE 802.11b compatible. Allow inter-operation among multiple vendors.
- Technique operating in the unlicensed 2.4 GHz ISM band.
- Seamless roaming within the 802.11 & 802.11b wireless LAN infrastructure.
- Provides user authentication to enforce tight security.
- MAC address Access Control.
- Bandwidth control
- Advanced Security — 802.1x authentication (EAP)
- Provides Window-based configuration utility.
- Waterproof housing

1-2 Applications

The 11Mbps Wireless LAN ODU offers a fast, reliable, cost-effective solution for wireless client access to the network in applications like these:

1. **Remote Access to Corporate Network Information**
   E-mail, file transfer and terminal emulation.

2. **Difficult-to-Wire Environments**
   Historical or old buildings, asbestos installations, and open area where wiring is difficult to deploy.

3. **Frequently Changing Environments**
   Retailers, manufacturers and those who frequently rearrange the workplace and change location.

4. **Temporary LANs for Special Projects or Peak Time**
   C1- Trade shows, exhibitions and construction sites where a temporary network will be practical.
   C2- Retailers, airline and shipping companies need additional workstations during peak period.
   C3- Auditors requiring workgroups at customer sites.

5. **Access to Database for Mobile Workers**
   Doctors, nurses, retailers, accessing their database while being mobile in the hospital, retail store or office campus.

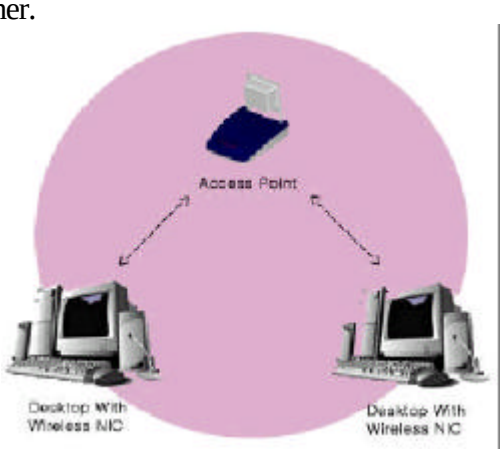
6. **High Security Connection**
   The secure wireless network can be installed quickly and provide flexibility. (Please refer to page 17 for more information on encryption configuration.)

1-3 System Configurations

The 11Mbps Wireless LAN ODU can be configured in a variety of network system configurations.

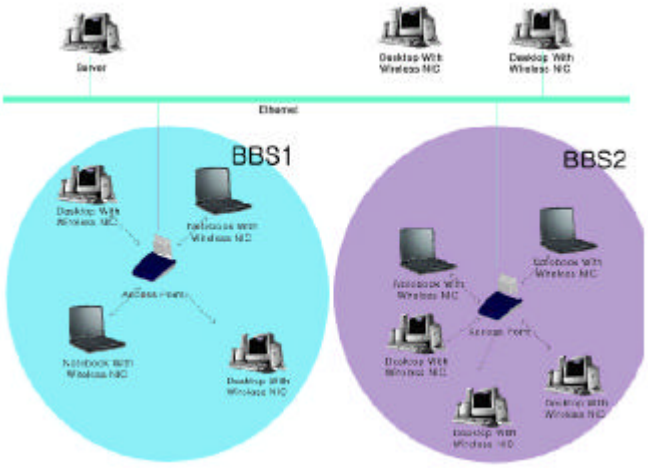
Wireless Infrastructure

In a wireless infrastructure, the ODU can act as a bridge. The ODU connects the wireless clients together. The ODU acts as a center point for all wireless communications. This would increase efficiency of the communications since the wireless adapters do not need to be within direct range of each other.



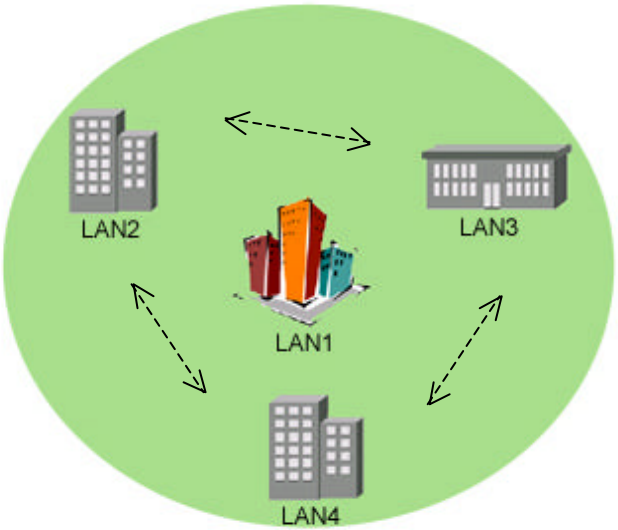
Wireless Infrastructure with Stations Attaching to a Wired LAN

The 11Mbps Wireless LAN ODU will provide an access to the local LAN. An integration of wireless and wired LAN is called an Infrastructure configuration. A group of wireless LAN PC users and an ODU construct a Basic Service Set (BSS). Each wireless PC in this BSS can talk to each other on your network via the ODU.



Point-to-Point

The 11Mbps Wireless ODU provides ideal bridging solution for inter-building LANs connection. In an inter-building application, the 11Mbps ODU acts as a repeater, thus expanding and connecting corporate LANs with reliable and high speed connection.



Chapter 2 Hardware Installation

This chapter describes initial setup of the Wireless LAN ODU subsystem.

2-1 Product Kit

Before installation, make sure that you the following items:

- **11Mbps Wireless LAN ODU Kit**……..……..……..x 1
- **Power over Ethernet**…….……x 1
- **Power Adapter**…….……..……x 1
- **Power Cord**……x 1
- **Mounting kit**…….……...x 1
- **Product CD**……x 1
- **Quick Installation Guide**…….……x 1

NOTE: If any of the above items are missing or damaged, please contact your local dealer for support.

2-2 System Requirements

Installation of the 11Mbps Wireless LAN ODU requires:

1. A DC 12V adapter which supplies the power for the PoE (Power over Ethernet).
2. A 10/100 Base-T (UTP) Ethernet cable drop.
3. Operating system support: Windows 98/Me/NT4.0(SP4 or above)/2000/XP

2-3 Mechanical Description

ODU:

LED Indicator

Product type	LED Indicator
2.4GHz 0.1W	Power
2.4GHz 0.5W/1W	Power、Tx、Rx

Waterproof RJ-45 connector

Connect to the POE with SFTP cable.

SFTP Cable

This cable is attached to the ODU. The default SFTP cable length is 25 meter.

2-4 Hardware Installation

Take the following steps to set up your ODU.

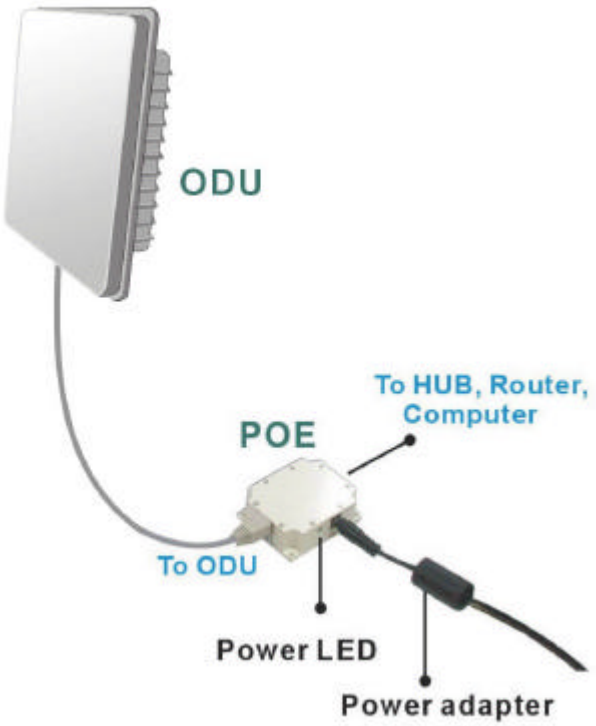
- **Connect the Ethernet Cable**

  The 11Mbps Wireless LAN ODU supports 10/100M Ethernet connection. Connect the SFTP cable from the ODU to the RJ-45 connector of PoE (marked "To ODU") for ODU connection. Then connect the other end of the POE with straight RJ-45 cable to a hub or a switch. **Please note that, use the cross-over cable when you desire to connect the PoE of ODU to a PC.**

- **Connect the Power Cable**

  Connect DC 12V adapter to the PoE, and plug the other end of the adapter into an electrical outlet.

NOTE: Only use the power adapter supplied with the PoE of ODU. Otherwise, the product may be damaged.



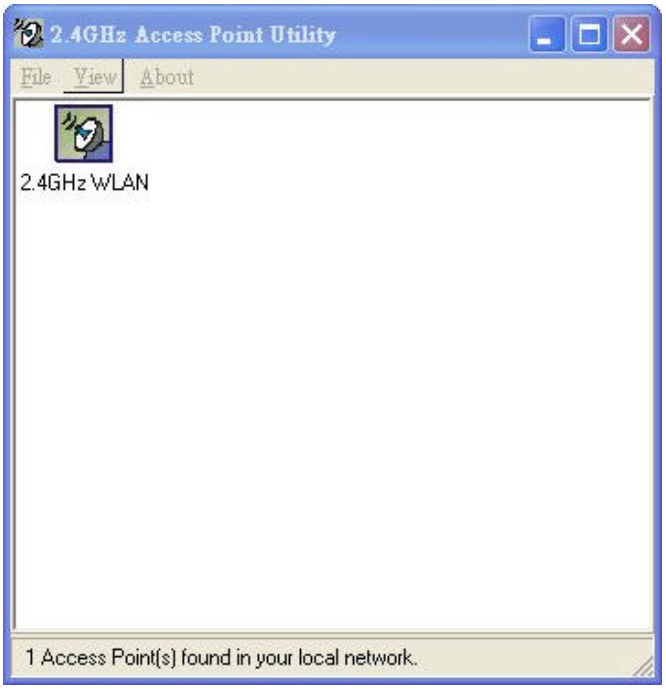
Chapter 3 Configuring the ODU

The 11Mbps Wireless LAN ODU is shipped with default parameters, which will be suitable for the typical **Point-to-Point**. You can still adjust configuration settings depending on how you would like to manage your wireless network. The 11Mbps Wireless ODU allows for configuration either via the configuration utility, known as Access Point Manager, TCP/IP (Telnet) connection or Web Management.

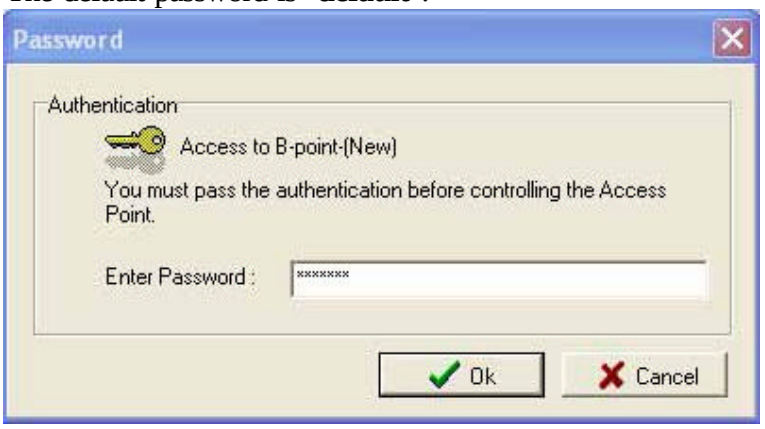
3-1 Configuration

Installed on your Windows 95/98/NT/ME/2000/XP desktop computer, the Windows-based utility "***Access Point Utility***" provides a user-friendly interface. The ODU Utility enables you to configure all of your ODUs on the network more easily than ever before. The following gives instructions guiding you through the installations of the ODU Utility.

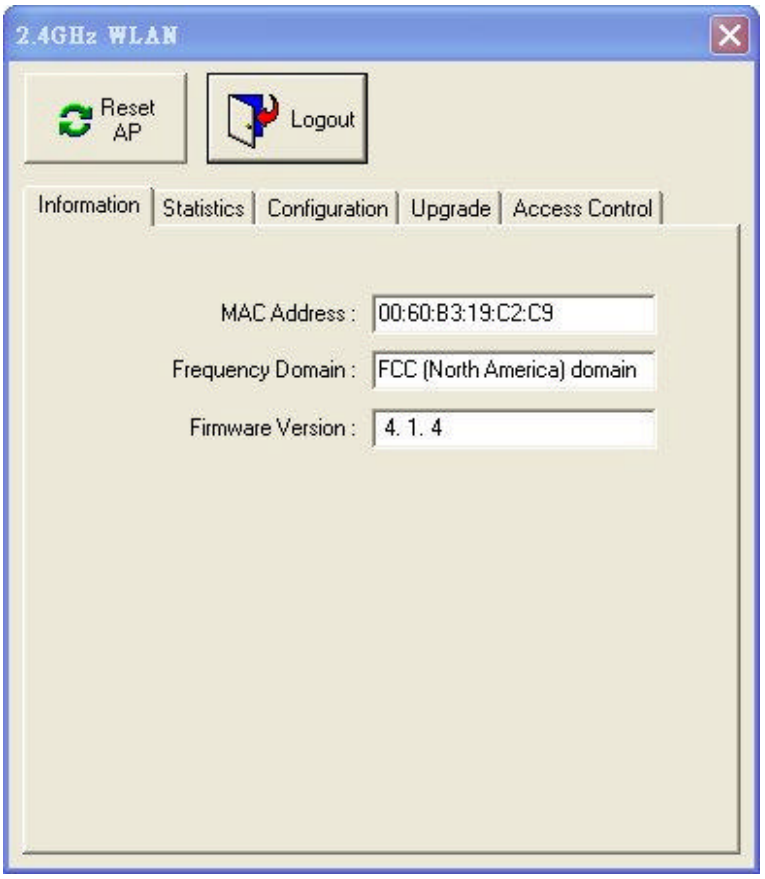
1. Insert the Product CD-ROM disk that came with your product kit into the corresponding drive on your computer.
2. From the **Start** menu on the Windows desktop, choose **Run**.
3. In the **Run** dialog box, type the path where the utility is located, then click **OK**.
4. Follow the on-screen instructions to install the Access Point Utility.
5. Upon completion, go to **Program Files** and execute the Access Point Utility. It will begin to browse all the ODU available on the network.



6. Double click Access Point icon to access its property dialog box. Enter the password in the entry field. The default password is "**default**".



7. After entering the correct password, a configuration window appears. You will see the basic information of the ODU, such as MAC Address, Frequency Domain and Firmware Version.



MAC Address: It is a hardware identification number that distinguishes the unit from others.

Frequency Domain: The regulated operating frequency per country.

Firmware Version: Displays the firmware version that is equipped with your hardware.

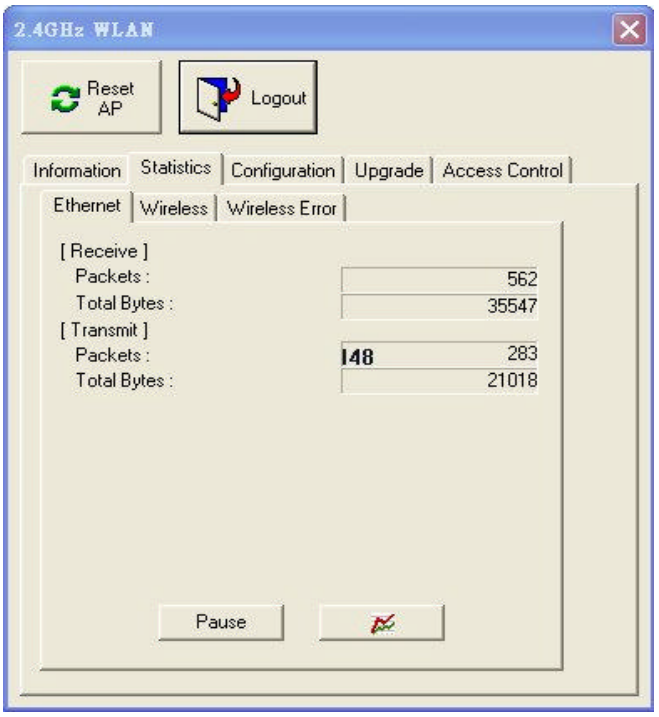
Statistics

The statistics tab contains three of the following items for you to monitor the Ethernet and

Wireless network traffic.

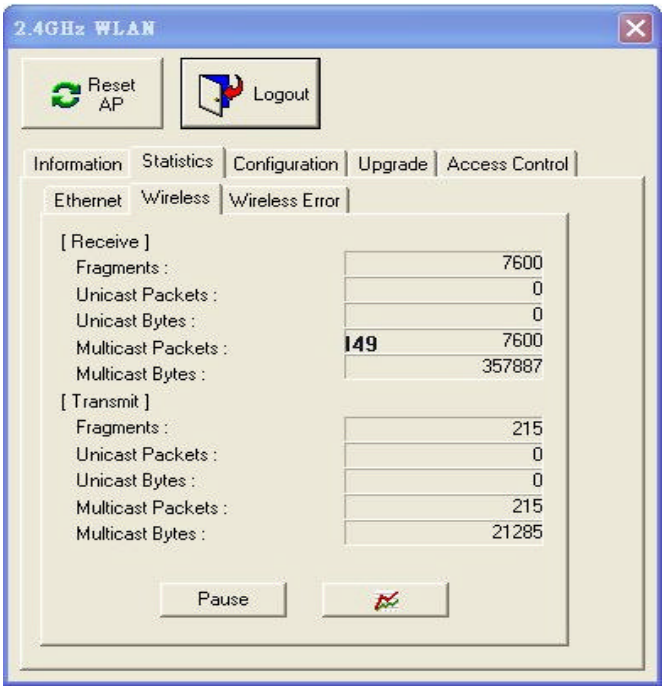
Ethernet:

You may monitor the TX/RX on the wired network.



Wireless:

You may monitor the TX/RX of the wireless network.



Wireless Error:

This item offers detailed information on error wireless packets that the ODU receives and transmits.

Receive:

Packet FCS Errors: The number of wireless packets that fail during FCS transmission (Frame Check Status when accessing the wired network.

No Buffer: The number of wireless packets that the ODU ignores due to insufficient memory.

Received WEP Errors: The number of wireless packets that have WEP encryption errors.

Transmit:

Deferred Transmission: The number of packets that have deferred transmission due to the fact that the medium is busy.

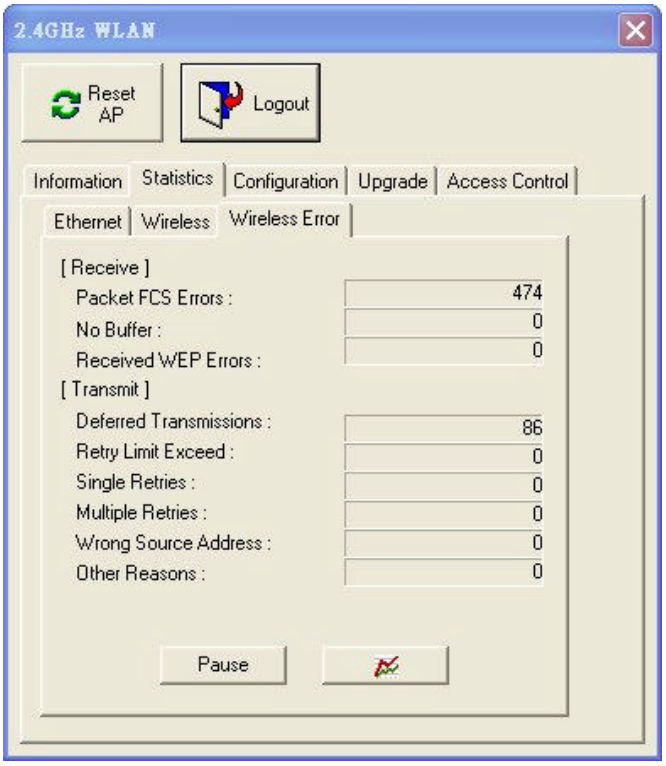
Retry Limit Exceed: The number of packets that are not sent due to the reason that the packets exceed the retry limits.

Single Tries: The number of packets that are successfully sent on the first retry.

Multiple Retries: The number of packets that are successfully sent after several retries.

Wrong Source Address: The number of packets that are ignored by the ODU because the source client is not in its BSS.

Other reasons: Other reasons that cause errors.

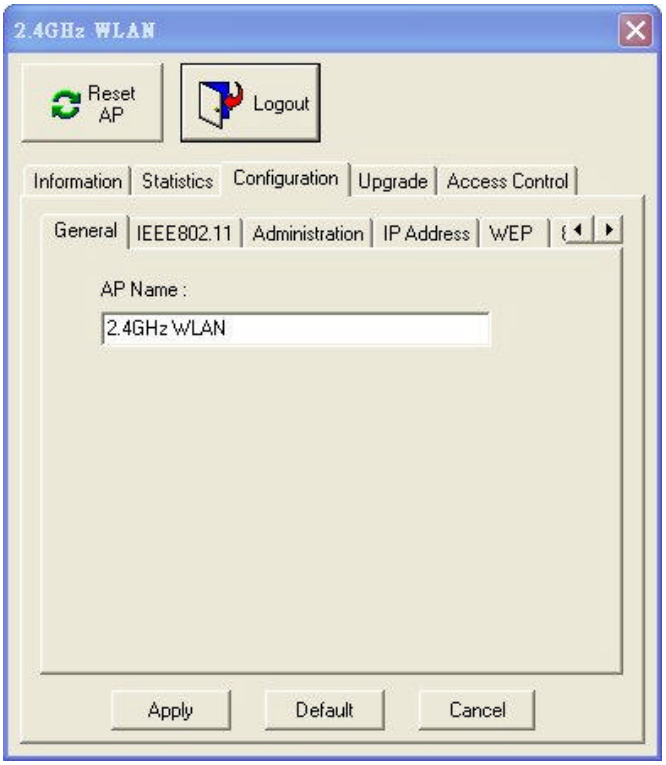


Configuration

The configuration tab contains 5 following items for you to make changes for the ODU.

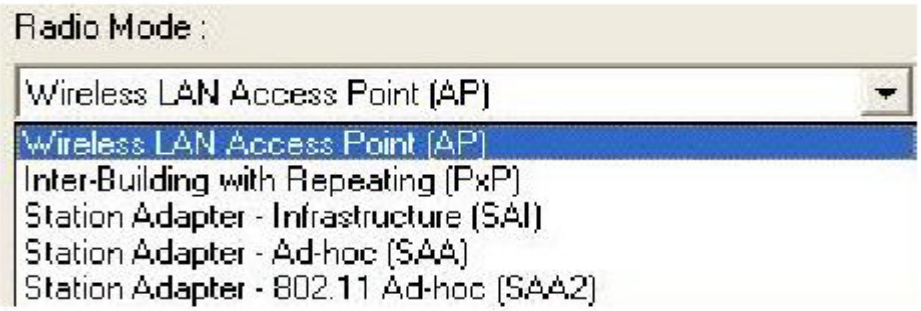
General:

AP name: In this entry field, you may enter any name. This will enable you to manage your ODU with more ease if you have multiple ODU on the network.



IEEE802.11:

Radio Mode: The Wireless LAN ODU can operate total of 5 radio modes:

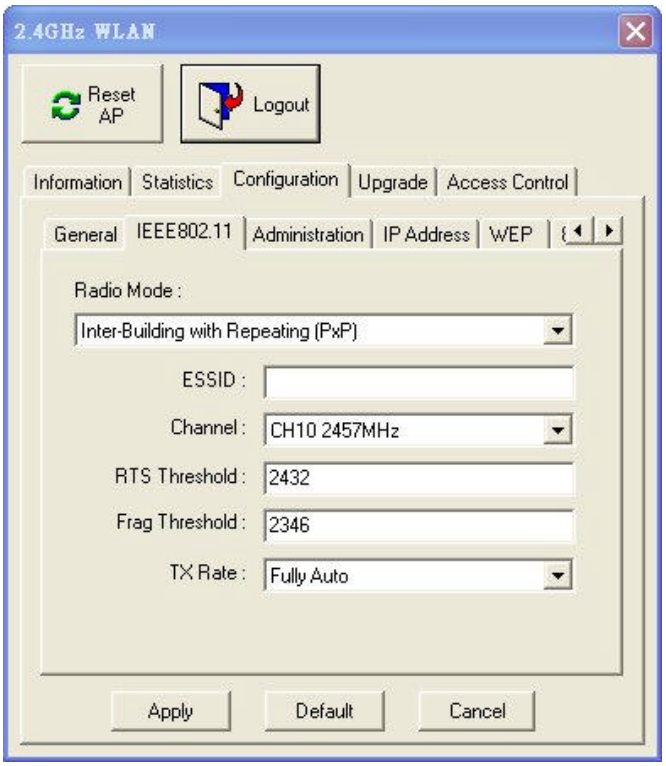


- ***Wireless LAN Access Point (AP)***: Enables the ODU to act as a wireless bridge connecting to your network backbone.
- ***Inter-building with Repeating (PxP)***: Allows for multi-point connection among LANs (default setting).
- ***Station Adapter – Infrastructure (SAI)***: Served as a wireless station (infrastructure).

Connect the ODU (SAI) to a PC with a cross over RJ-45 cable, and it is able to access the network via ODU.

- ***Station Adapter – Ad-Hoc (SAA)***: Served as a wireless station (Ad-hoc). Connecting to a PC with a cross-over RJ-45 cable, the station adapter along with other wireless stations can establish a small wireless network without ODUs.
- ***Station Adapter – 802.11 Ad-Hoc (SAA2)***: Similar to SAA, the ODU acts as a wireless stations (Ad-Hoc). The only difference is that this Ad-Hoc mode complies with 802.11 standard.

NOTE: When setting the operation mode to either **PxP** or **SAA**, you need to set the ODU with the ***same channel***. ESSID however can be ignored. When the **SAA2** is selected, you need to set the ODU the ***same ESSID and channel***.



ESSID: The ESSID is a unique ID given to the ODU. Wireless clients associating to the ODU must have the same ESSID. The ESSID can have up to ***32*** characters.

Channel: You may select any of the available channels as an operational channel for your ODU. You may use the **Site Survey** tool came with the wireless PC Card utility to monitor each channel and choose a channel with good quality.

RTS Threshold: RTS Threshold is a mechanism implemented to prevent the "Hidden Node" problem. "Hidden Node" is a situation in which two stations are within range of the same ODU, but are not within range of each other. Therefore, they are hidden nodes for each other. When a hidden station starts data transmission with the ODU, it might not notice

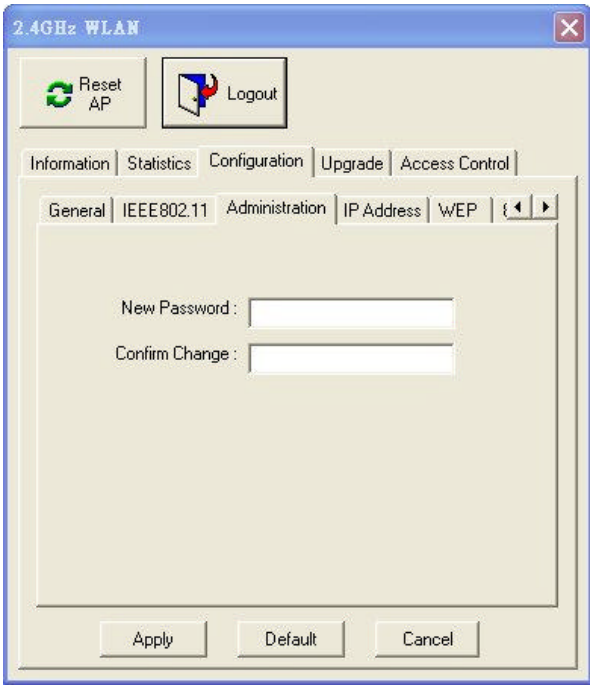
that another station is already using the wireless medium. When these two stations send data at the same time, they might collide when arriving simultaneously at the ODU. The collision will most certainly result in a loss of messages for both stations. Thus, the RTS Threshold mechanism will provide the solution to prevent data collisions. When the RTS is activated, the station and its ODU will use a Request to Send/Clear to Send protocol (RTS/CTS). The station will send an RTS to the ODU, informing that it is going to transmit the data. Upon receipt, the ODU will respond with a CTS message to all station within its range to notify all other stations to defer transmission. It will also confirm to the requesting station that the ODU has reserved the channel for transmission.

Fragmentation Threshold: Fragmentation mechanism is used for improving the efficiency when there is high traffic within the wireless network. If you transmit large files in a wireless network, you can enable the Fragmentation Threshold and specify the packet size.
The mechanism will split the packet into the packet size you set.

TX Rate: When the ODU is under PXP, SAI, SAA, and SAA2, it provides various data rate options for you to select. Data rates options include **Fully Auto, Fixed 1Mb/s, Fixed 2Mb/s, Auto Select 1M or 2M, Fixed 5.5Mb/s**, and **Fixed 11Mb/s**. In most networking scenarios, you will see that the factory-set default "**Fully Auto**" will prove the most efficient. This setting will allow your 11Mbps Wireless LAN ODU to operate at the maximum data rate as possible. When the communications quality drops below a certain level, the ODU will automatically switch to a lower data rate. Transmission at lower data speeds is usually more reliable. However, when the communications quality improves again, the 11Mbps Wireless LAN ODU will gradually increase the data rate again, until it has reached the highest available transmit rate.

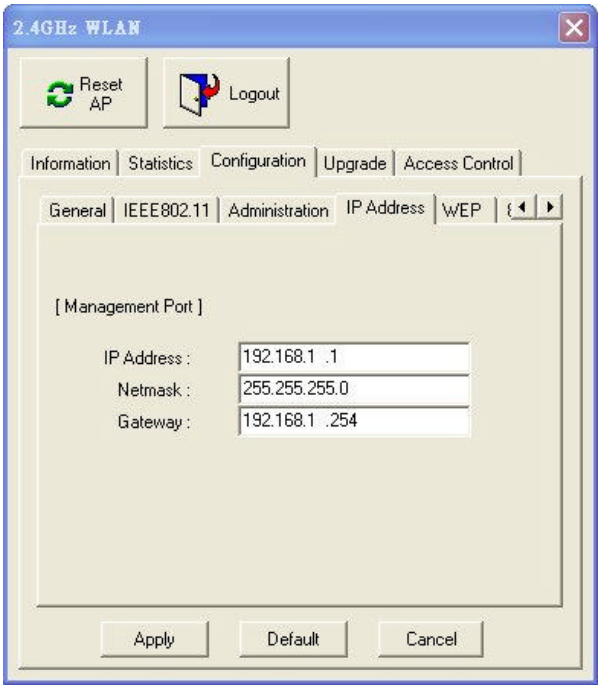
Administration:

You may change the default password by entering the new password. Enter the new password in the Confirm Change field to make the new setting take affect.



IP Address:

To enable remote access to the ODU using Telnet or Web Management, you must assign an IP address to the ODU. You may also assign other related Internet addressing options, such as subnet mask or gateway address. Consult your network administrator to obtain an available IP address. ***(Default setting is 192.168.1.1)***



WEP:

If data transmission with high security is required on your network, it is recommended that the WEP encryption be used. To activate the WEP encryption, select Configuration, go to the WEP tab, and do the following:

Pull down the WEP Encryption menu and select WEP64 or WEP128.

You may identify up to 4 different encryption keys and select one of them to encrypt your transmission data. The key value of your choice may either be:
From the 4 Key entry field, enter the corresponding key value for each encryption method.

For WEP64 data encryption:

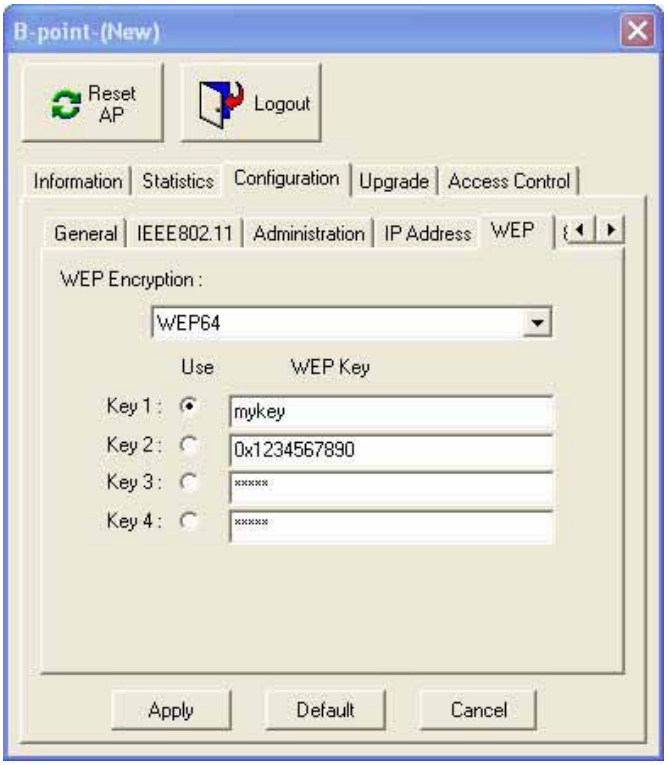
-- 5 alphanumeric characters in the range of “a-z”, “A-Z” and “0-9” (e.g. MyKey).

-- 10 digit hexadecimal values in the range of “A-F” , “a-f” and “0-9”, preceded by the characters “0x” values (e.g. 0x11AA22BB33).

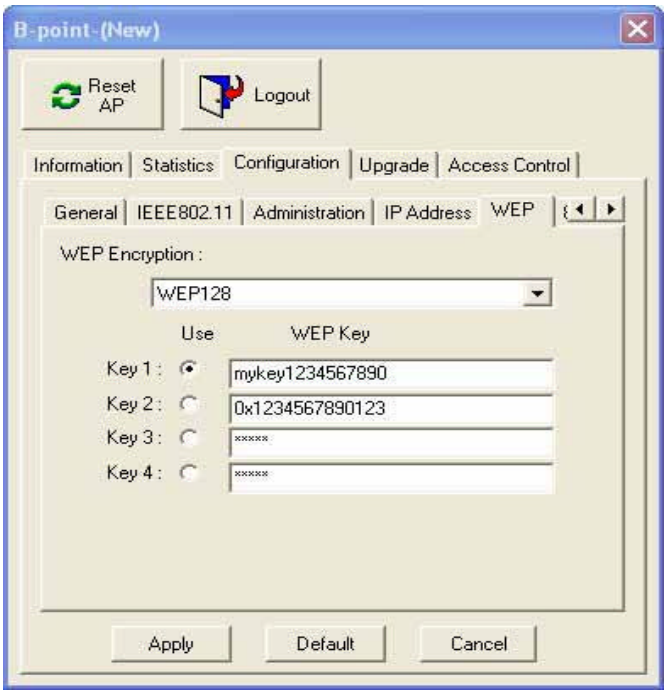
For WEP128 data encryption:

-- 13 alphanumeric characters in the range of “a-z”, “A-Z” and “0-9” (e.g. MyKey12345678).

-- 26 digit hexadecimal values in the range of “A-F” , “a-f” and “0-9”, preceded by the characters “0x” values (e.g. 0x00112233445566778899AABBCC).



WEP64 Key Setting

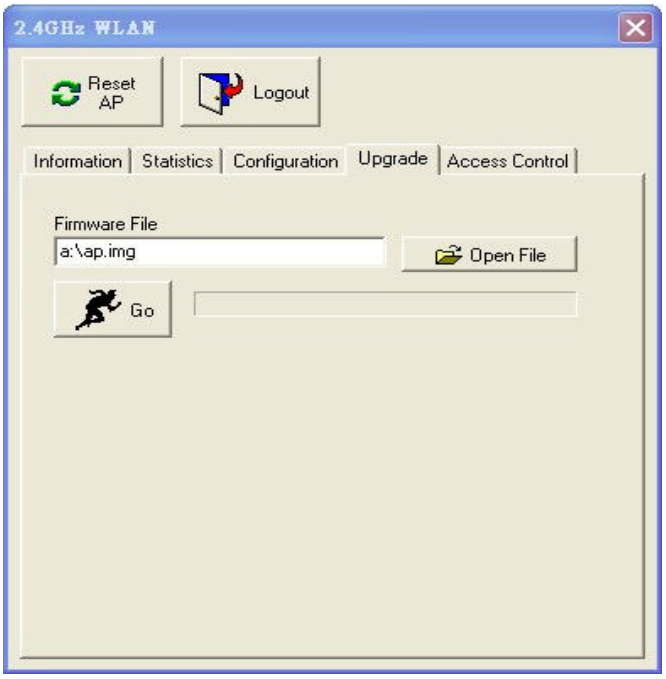


WEP128 Key Setting

NOTE: The WEP key must be set up exactly the same on the ODU as they are on other wireless client stations. For example, if you set "MyKey" for the ODU, the same WEP Key "MyKey" must be assigned to other client stations.

Upgrade

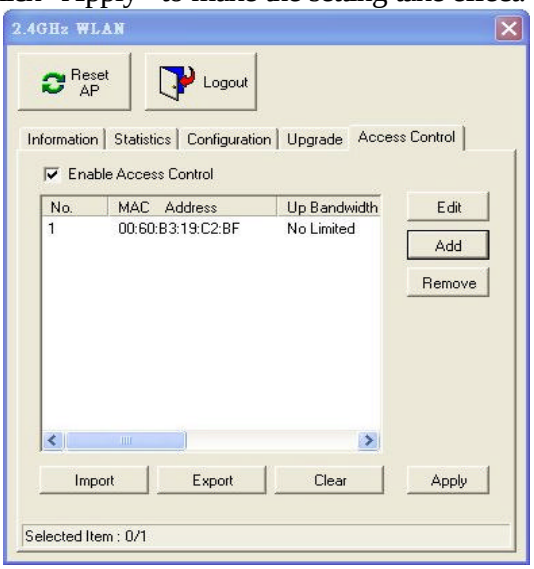
This item is used for uploading the newest firmware of the ODU. You may either enter the file name in the entry field or browse the file by clicking the **Open File** button. For information about the release of the newest firmware, contact your local reseller.

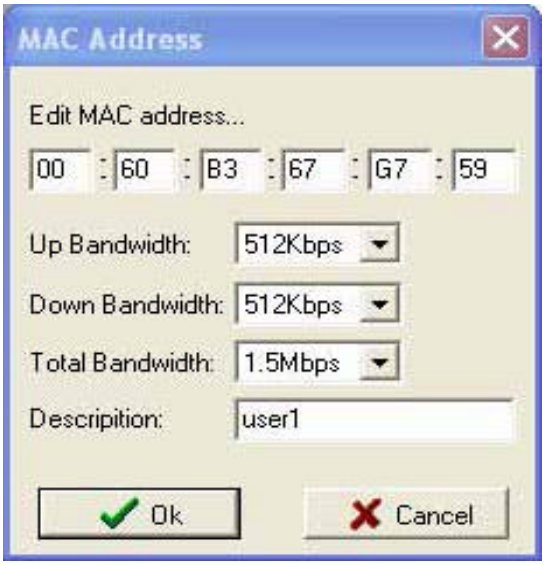


Access Control:

With the Access Control enabled, you can authorize wireless units to access the Access Point by identifying the MAC address of the wireless devices that are allowed access to transmit data. Further more, the Bandwidth control function allows you to control the upstream/downstream bandwidth per client basis. Note that, only when the MAC addresses of the wireless stations are in the Access Control Table, they will be able to access network via Access Point. To create or edit the Access Control Table, do the following:

- Go to the Access Control tab and check "Enable Access Control".
- Click the "Add" button and enter the MAC addresses of the wireless stations you allow to access.
- Set "Up bandwidth", "Down bandwidth" and "Total bandwidth" if needed. Specify the desired bandwidth or unlimited if you do not need the bandwidth control.
- Click "Apply" to make the setting take effect.





You can also configure the Access Control by using web-based management.

NOTE: Be aware that, when you enable the Access Control Table without any MAC address in the table, no access is allowed to communicate with the Access Point.

Use the following buttons to manage the Access Control Table:

Add – to enter MAC addresses of authorized wireless devices one at a time.

Edit – to change the entries in the table if you enter the incorrect MAC address.

Remove – to remove MAC addresses one at a time.

Clear – to remove all MAC addresses in the table.

Import – to import an existing Access Control Table.

Export – to save the current Access Control Table to a location on your computer. You may save the file as a text document.

Advanced Security

The 802.1x authentication (EAP) is designed to enhance the security of wireless networks. The 802.1x provides an authentication framework for wireless LANs, allowing a user to be authenticated by a central authority. For wireless LANs, it also provides centralized, server-based authentication of end users. The standard is flexible enough to allow multiple authentication algorithms, and because it is an open standard, multiple vendors can innovate and offer enhancements.

For wireless LANs, the 802.1x authentication has three main components: The supplicant (usually the client software, such as zero configuration in window XP), the authenticator (usually the access point), and the authentication server (usually a Remote Authentication Dial-In User Service server, although RADIUS although 802.1X does not specify it).

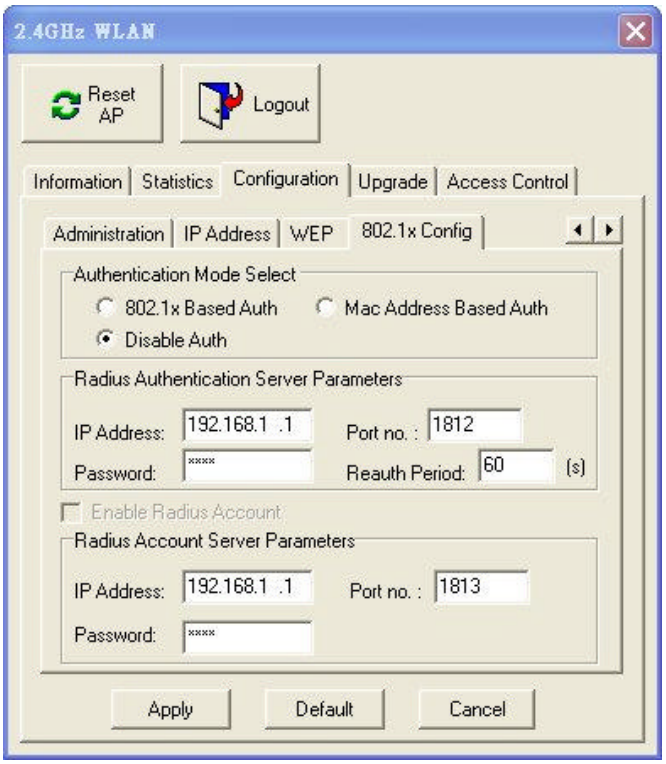
The advanced security describes how to control authorized access to the Access Point with Authentication Dial-In User Service (RADIUS). There are many ways to enhance your wireless security: 802.1x Based Auth mode or MAC Address Based Auth mode. To enable 802.1x based authentication, please select 802.1x Based Auth mode. Moreover, you may enable the radius account function by check Enable Radius Account in the check box. To configure the Authentication and Account Server function, the parameter of Radius Authentication Server and Radius Account Server must set to the same with the Authentication Server and Account Server. Before you enable RADIUS account, you have select 802.1x Based Auth mode first.

Note: The Password is up to 16 bytes.

If you want to use MAC Address Based authentication, you should select MAC Address Based Auth mode. However, the RADIUS account server will not be supported here.

Most likely, the MAC Address Based authentication is less secure than 802.1x (EAP) authentication. MAC Address Based authentication provides an alternative for wireless 10 network security that does not support 802.1x capability.

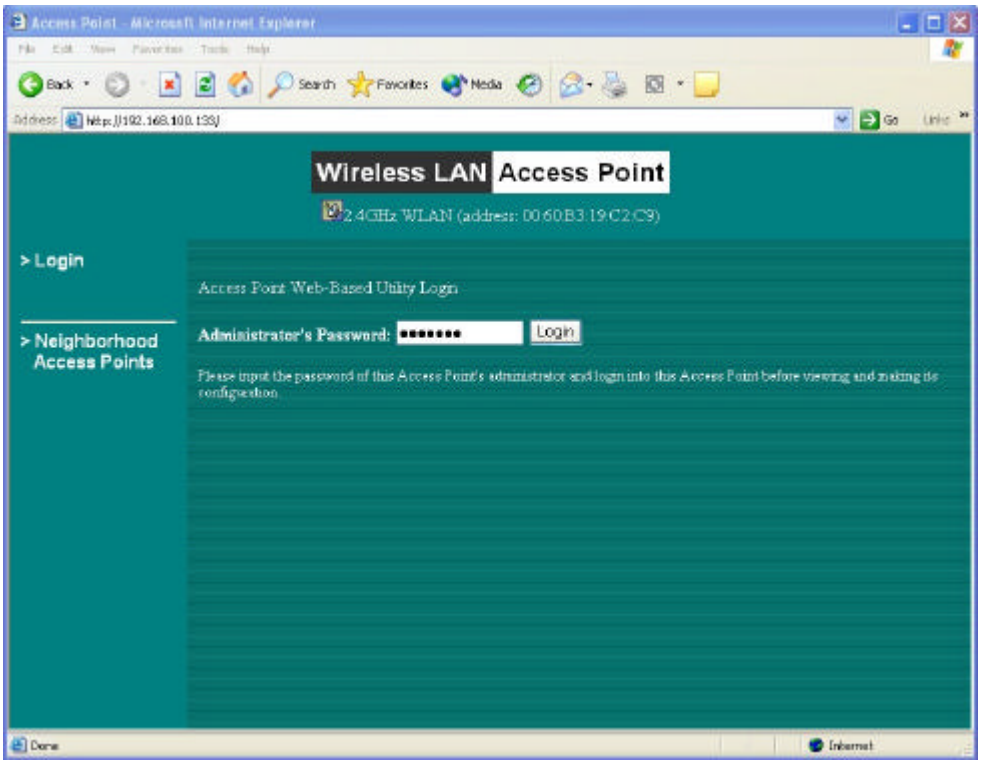
Otherwise, you may select disable auth mode that adjusts to the 802.11 legacy network. For setting 802.1x Based Auth:


2.4GHz WLAN
Reset AP
Logout
Information
Statistics
Configuration
Upgrade
Access Control
Administration
IP Address
WEP
802.1x Config
Authentication Mode Select
802.1x Based Auth
Mac Address Based Auth
Disable Auth
Radius Authentication Server Parameters
IP Address:
192.168.1 .1
Port no. :
1812
Password:
Reauth Period:
60
(s)
Enable Radius Account
Radius Account Server Parameters
IP Address:
192.168.1 .1
Port no. :
1813
Password:
Apply
Default
Cancel

3-2 Using the Web Management

The built-in Web Management provides you with a user-friendly graphical user interface (web pages) to manage your ODU. An ODU with an assigned IP address (e.g. ***http://192.168.1.1***) will allow you to monitor and configure the ODU.

1. Open your web browser.
2. Enter the available IP address of your ODU in the Address field (e.g. http://192.168.1.1). You will have access to the **Wireless LAN Access Point Web Pages** of the ODU.

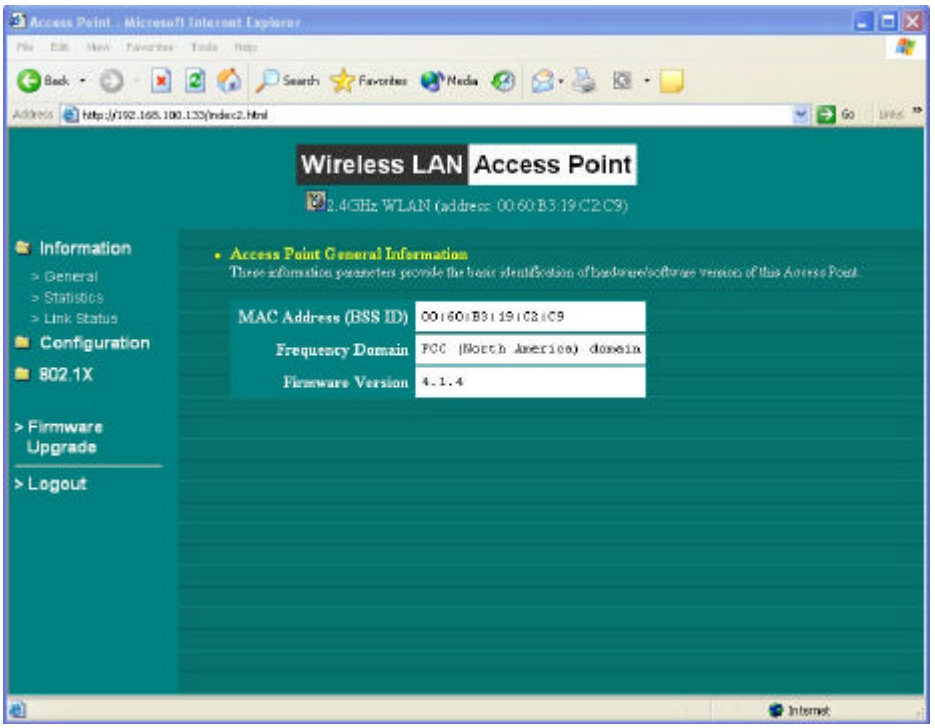


3. Enter the password to login to the ODU. The default password is **default**. The main page will show up. The ODU main page contains three items for you to manage your ODU.

Information

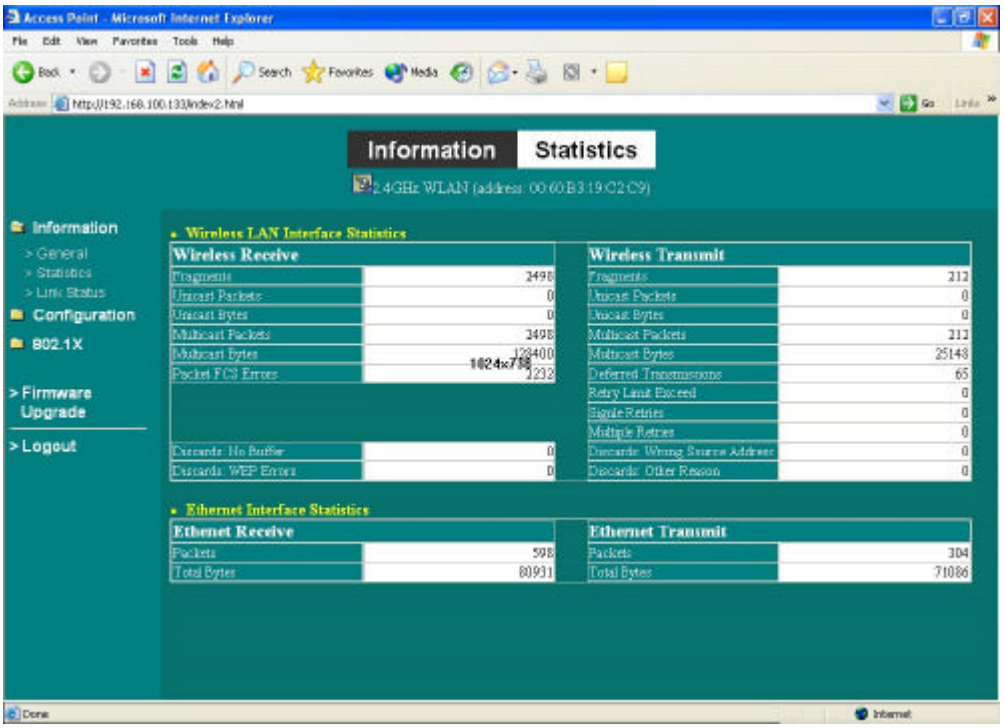
General

This item displays the general information of the ODU such as the MAC address, Frequency Domain, and Firmware Version.



Statistics

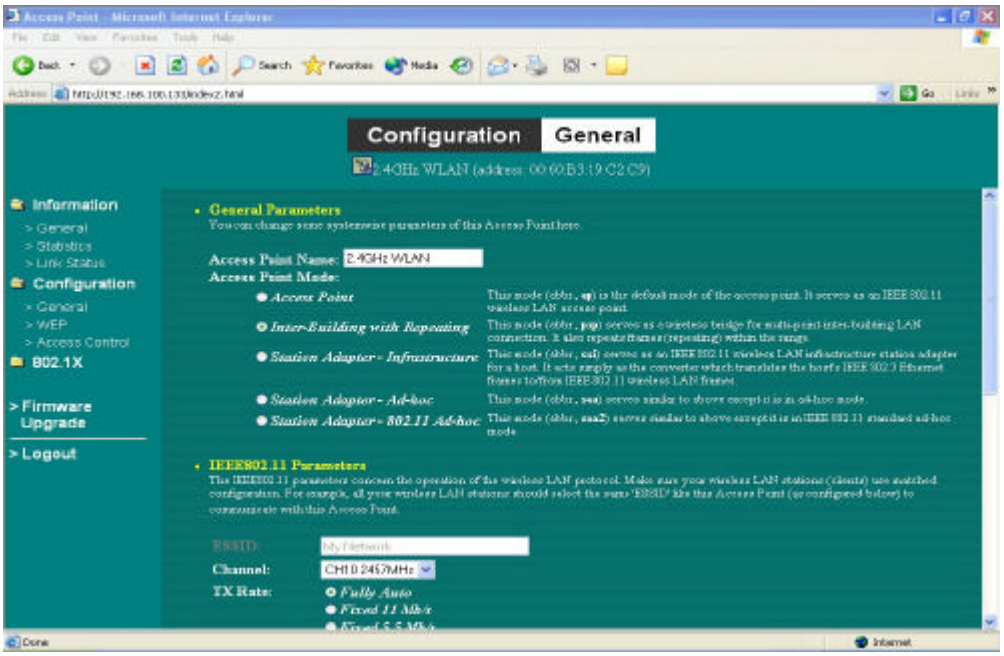
This item displays the Ethernet and wireless network traffic.



Configuration

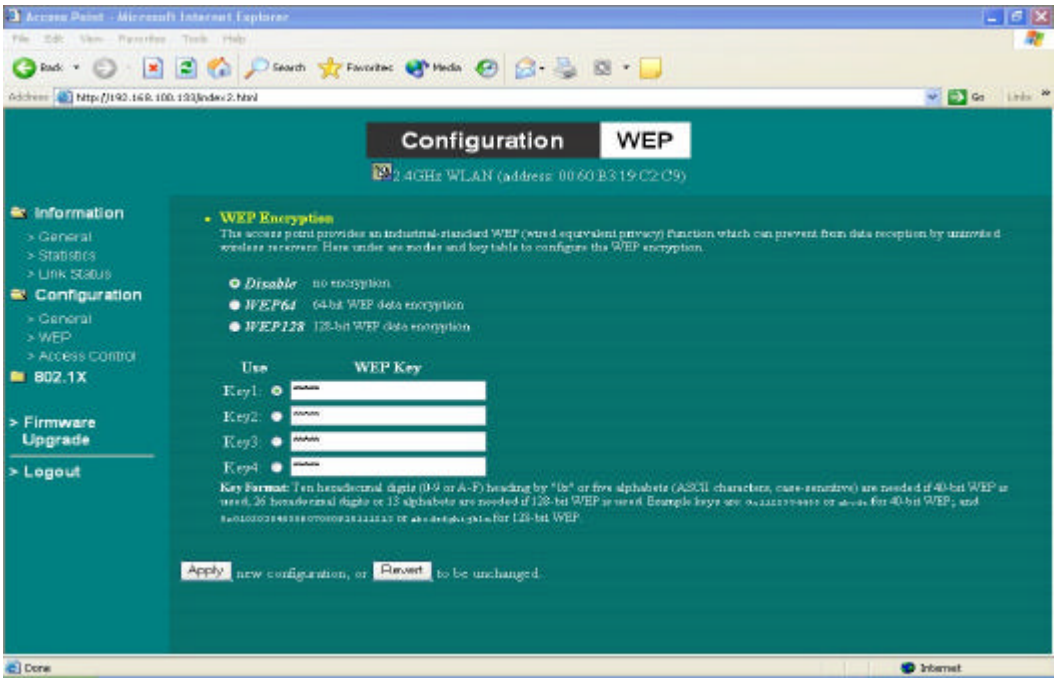
General

You may make the settings on the ODU such as AP Name, AP Mode, ESSID, Channel, RTS Threshold, Fragment Threshold, TX Rate and Password.



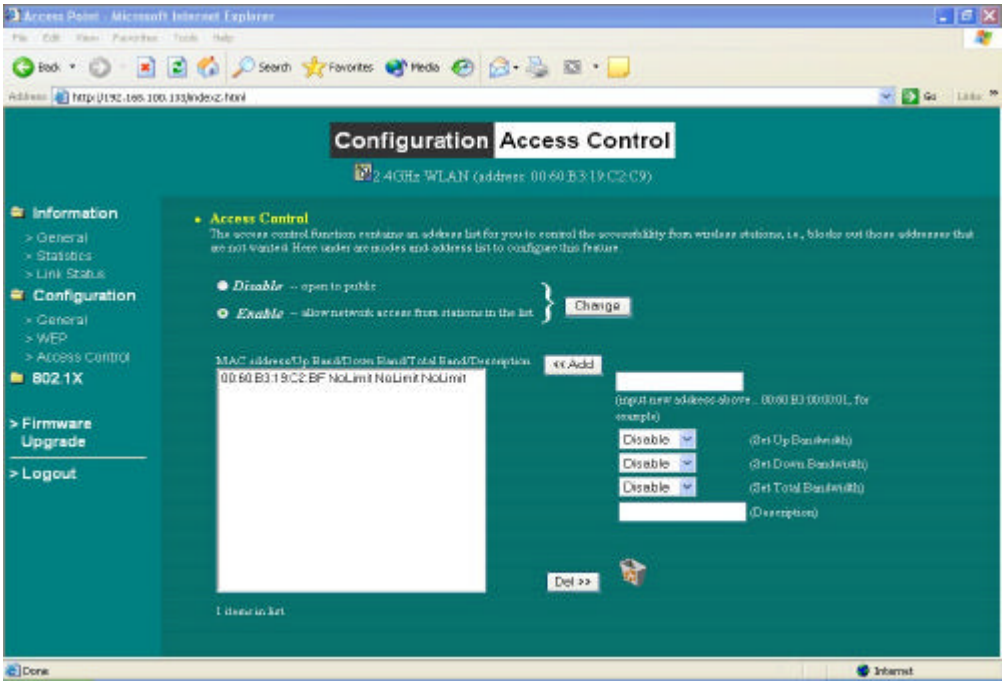
WEP

To prevent unauthorized wireless stations from accessing data transmitted over the network, the 11Mbps Wireless LAN ODU offers WEP (Wired Equivalency Privacy). You can set up 4 encryption keys but choose one key to encrypt your data.



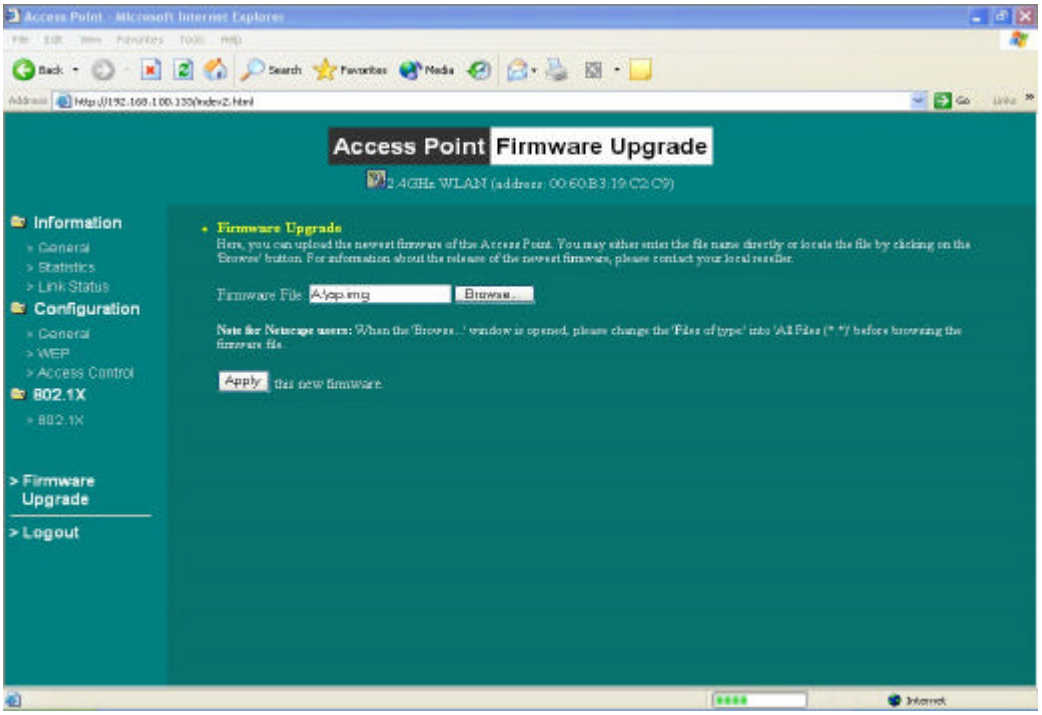
Access Control

The Access Control Table enables you to restrict wireless stations accessing the ODUs by identifying the MAC address of the wireless devices.



Upgrade

Here, you can upload the newest firmware of the ODU. You may either enter the file name in the entry field or browse the file by clicking the **Browse** button.

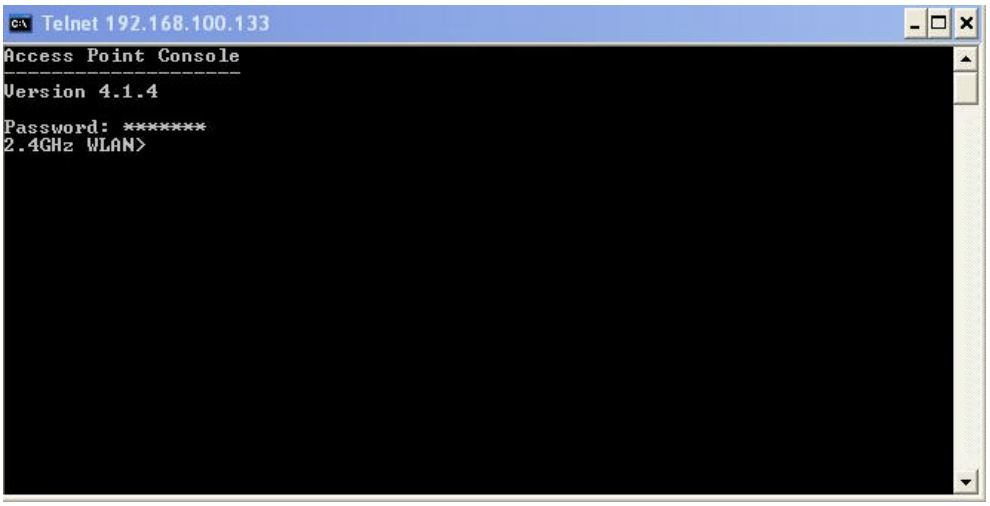


3-3 Using the Telnet

The ODU can be configured via the command prompt console with TCP/IP:

Telnet (TCP/IP) Connection: Assign an available IP address to your ODU through the RS232 connection or Access Point Utility and then telnet into the ODU anywhere to get access to the ODU console. Thus, you will be able to make the configuration via the TCP/IP connection.

1. Telnet to your ODU. A window will show up.
2. Enter the password. The default password is "**default**".



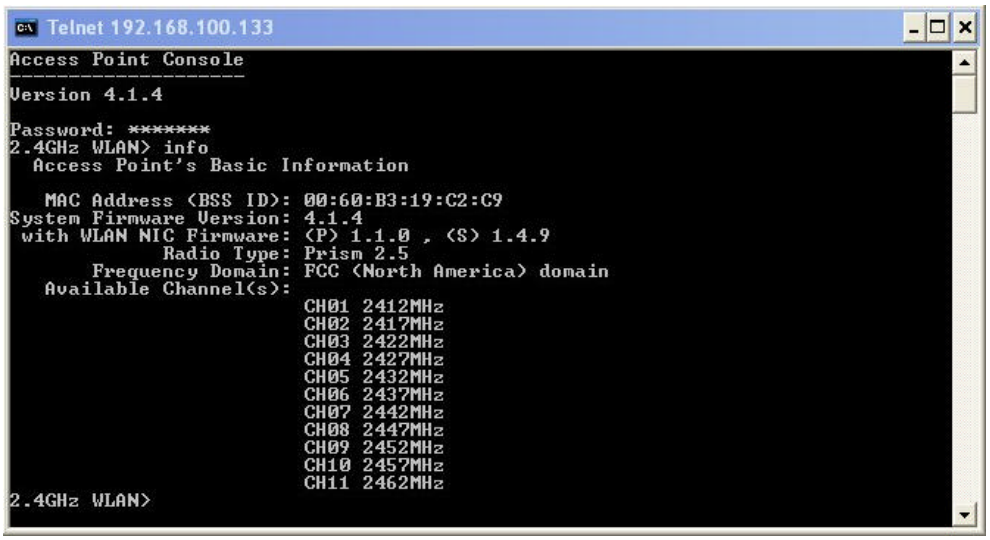
3-3-1 Basic Commands

The following are the commands provided for configuring the ODU. In loader mode, i.e., no valid firmware in the ODU, only the commands with an asterisk (*) are provided.

NOTE: [xxx] stands for optional arguments.

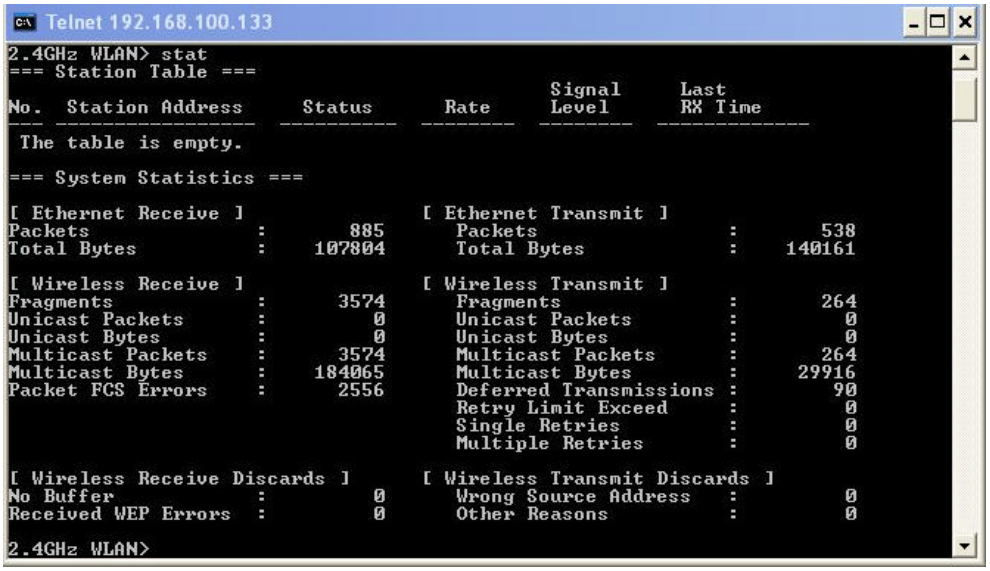
*info**

Display some basic information of the ODU, for example, firmware version, frequency domain, etc.



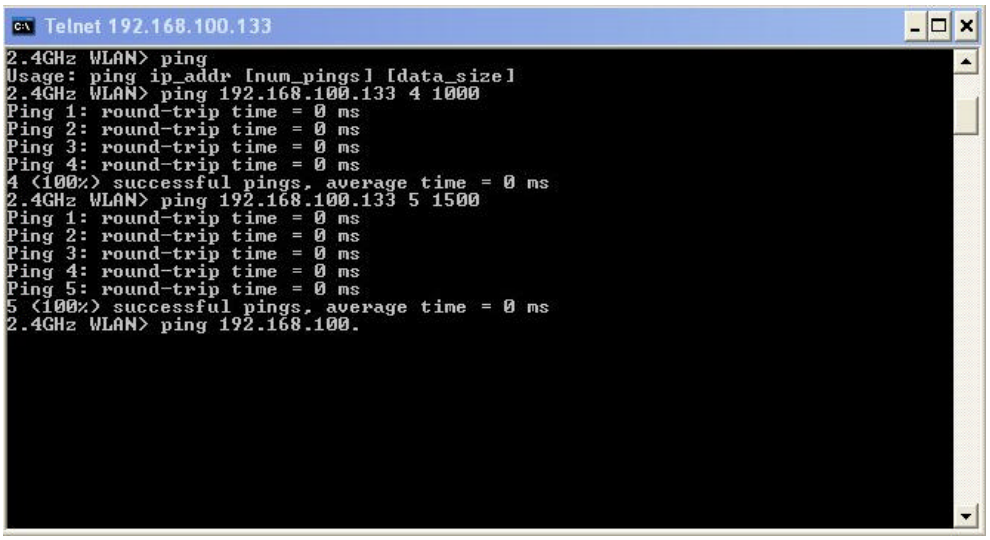
stat

Display the statistical values of the operation of the ODU, for example, association status, LAN/WLAN interface load, etc.



ping ip_addr [num_pings] [data_size]

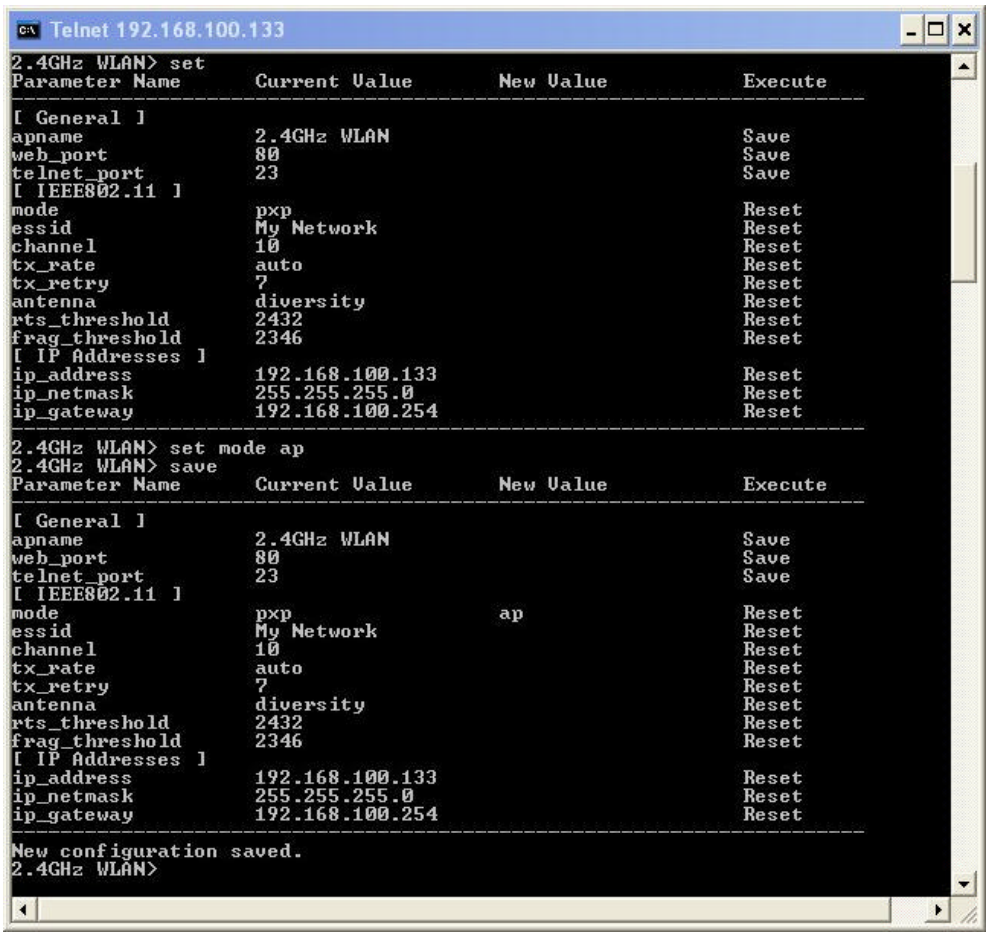
Ping (ICMP echo) to an *ip_addr* host with optional *num_pings* times with optional data size in a length of *data_size*.



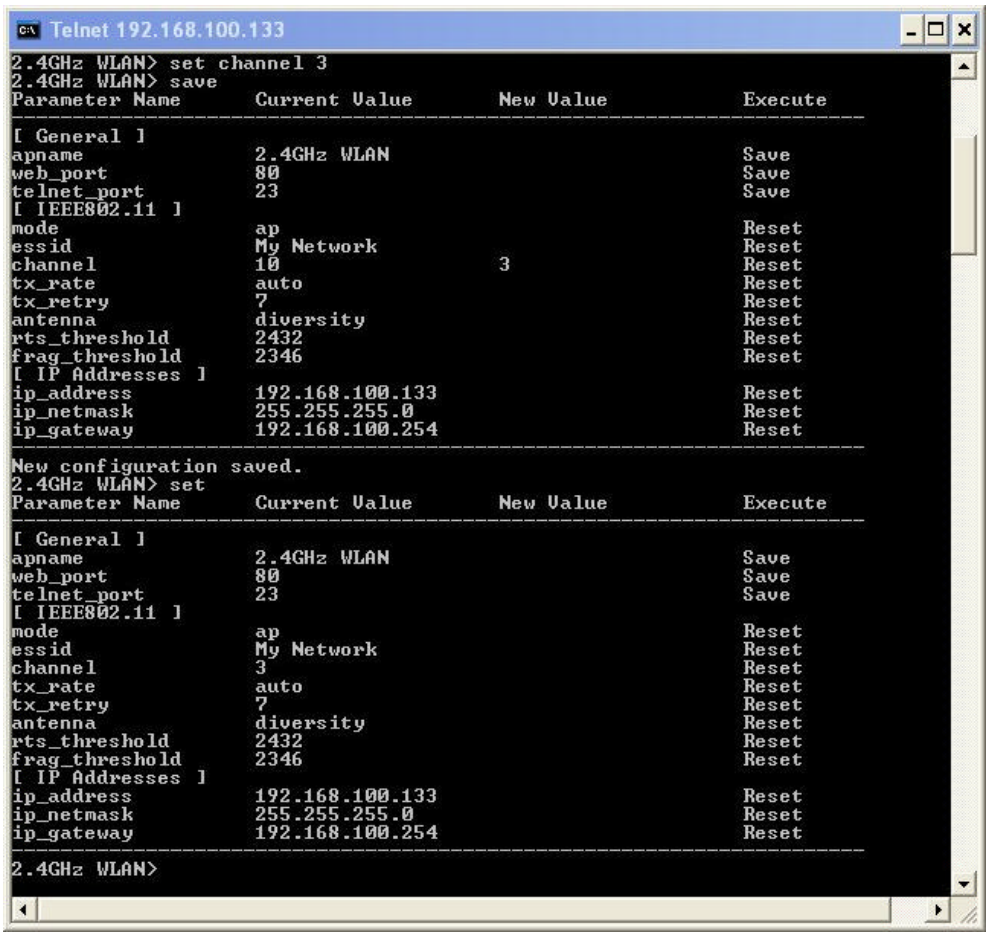
set

List the configuration information.

set apname | web_port | telnet_port | mode | channel | essid | tx_rate | tx_retry | antenna| rts_threshold | frag_threshold | ip_address | ip_netmask | ip_gateway



To change factory default settings, type "set xxx (parameter) xxxx (value). For example, set essid "Your Network" command will set the ESSID as *Your Network*. Remember that, a '**save**' command is required for changes to take effect. Always reset your ODU with the "**reset**" command.



The following is a list of parameters you can make changes on the ODU.

Parameter	Description	Default Value
apname	A textual name for the identification of the ODU.	apXXXXXX *(where XXXXXX is the last six octets of ODU's MAC address)*
web_port	Port number dedicated to WEB	80
telnet_port	Port number dedicated to Telnet	23
mode	Operation mode of the ODU	PxP
channel	The radio channel number.	1
essid	The ESS ID (a.k.a., SSID) of the ODU.	My Network
tx_rate	Transmission Rate	Auto
tx_retry	Number of retries for data transmission	7
rts_threshold	The threshold (number of bytes) for enabling RTS/CTS handshake. Data with its frame size larger than this value will perform the RTS/CTS handshake. Range of value: 0~2432.	2432

frag_threshold	The threshold (number of bytes) for the fragmentation boundary. Data will be transmitted in fragments which its size does not exceed this value. Range of value: 256~2432.	2432
ip_address	The IP address of the ODU.	192.168.1.1
ip_netmask	The subnet mask address of the ODU.	255.255.255.0
ip_gateway	The default gateway address of the ODU.	192.168.1.254

save

Save your new configuration. Remember that the "save" command is required every time you make the new configuration.

set default

Return the factory default settings of the ODU except for the IP addresses. A 'save' command is required for changes to take effect.

*cls**

Clear the console screen.

*exit**

Exit the console.

*? * or help**

Print a help screen.

*reset**

Issue a reset signal. The ODU will be reset if user confirms.

3-3-2 Advanced Settings for Security

This section describes the commands to control the security for ODU. To prevent unauthorized wireless stations from accessing data transmitted over the network, the 11Mbps Wireless LAN ODU offers the following levels of security options.

- Access Control Table restricts wireless stations to access the ODU.
- Data Encryption, known as WEP (Wired Equivalency Privacy), encrypts wireless data transmitted via wireless medium.

Access Control

auth mode | add | del | list| clear

The 'auth' command contains sub-commands that allow you to manage the access control (MAC address filter) of the ODU. The access control table consists of a list for you to control the accessibility of any wireless stations or repeaters. The sub-commands are listed below:

mode open | allow: set the access control mode. The definition of each mode is specified as follows:

- *open*: open to public (default)
- restrict: only allow access of the authorized stations/repeaters in the table (no access is allowed if the list stays empty)

add mac_addr: add an address into the access control table

del mac_addr |index: delete a MAC address, or index an address from the access control table

list [start/end]: display the content of the access control mode and the address list. The optional arguments, start and end, can be affixed to select the range of items to be listed.

clear: clear all the addresses in the access control table.

WEP Keys

wep mode | set | list

The 'wep' command contains sub-commands that allow you to manage the data encryption (WEP, wired equivalent privacy) function provided with the ODU. The sub-commands are listed as follows:

mode disable | wep64: set the access control mode. The following are the definition of each data encryption mode.

- *none*: no encryption (default)
- *wep64*: use 64-bit WEP data encryption
- *wep128*: use 128-bit WEP data encryption

set key1 key_text: set WEP Key#1 as *key_text*. **10 hexadecimal digits** (0-9 or A-F) heading by "0x" or **five alphanumeric** values (ASCII characters, case-sensitive) are required if 64-bit WEP is used.
Example: 0x1122334455, 0x0055AA55AA, abcde, or MyKey.

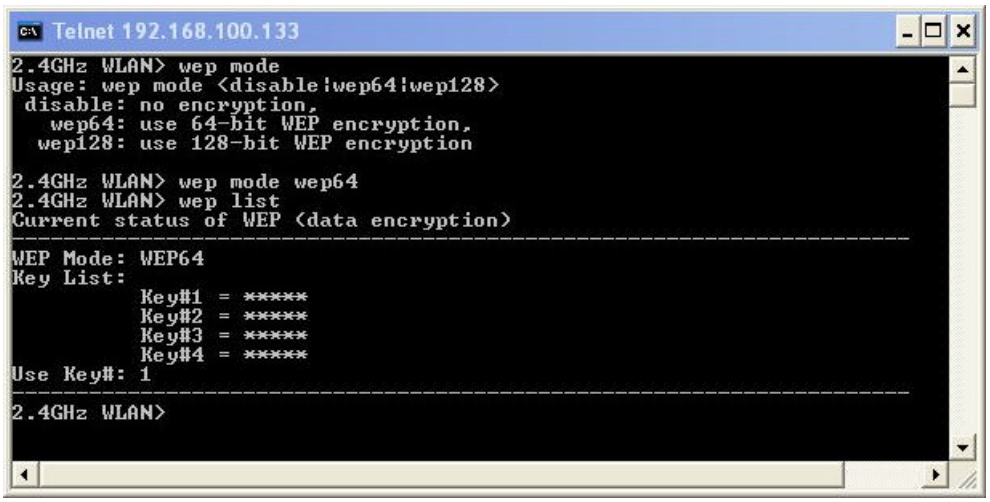
set key2 key_text: set WEP Key#2 as *key_text* with a same format as WEP Key#1.

set key3 key_text: set WEP Key#3 as *key_text* with a same format as WEP Key#1.

set key4 key_text: set WEP Key#2 as *key_text* with a same format as WEP Key#1.

set usekey 1|2|3|4: Select the WEP key to be used for encrypting data transmission. Only one key can be selected at a time.

list: Display current WEP settings.



Note: Your new WEP settings will take effect after resetting the ODU.

Appendix A: Channels

Conversion Table

802.11b Channel	Frequency(MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

Appendix B: FCC Certified Systems

FCC ID#: QZGBL3006F-001

FCC Certified Systems consist of:

- BL3006F WLAN ODU, PoE, Power Adapter, Power Cord, SFTP Cable
- Outdoor Antenna
- UTP RJ-45 Cable

The WLAN ODU has passed the FCC regulations:

FCC part 15, subpart C(2002)

Authorized Antennas

Model	Antenna Type	Antenna Gain(dBi)	Max EIRP(dBm)
KBNT2418-16	Flat Panel	18	Peak output need only be reduced by 1 dB for every 3dB of antenna gain above 6dBi

Note: Cable calculation must be performed using 2.4GHz attenuation values because all signals pass between the ODUs are at a frequency of 2.4GHz.

Appendix C: Troubleshooting

If there is no signal output, please check the following item:

1. Check whether the LED indicator on the PoE and ODU is on. If not, it means there is problem with the power component.
   - **(1)** Check if the power cord is correctly connected with the power adapter and the power outlet.
   - **(2)** Check if there is electricity on power outlet.
2. Check if the connection between antenna and WLAN ODU is correct, or whether the connector is loose or not.
3. Check if the connection between WLAN ODU and PoE is correct, or whether the connector is loose or not.
4. Verify if the transmit power which calculated before is correct.
5. If none of the above measures could solve troubleshooting, please contact the supplier for further support.