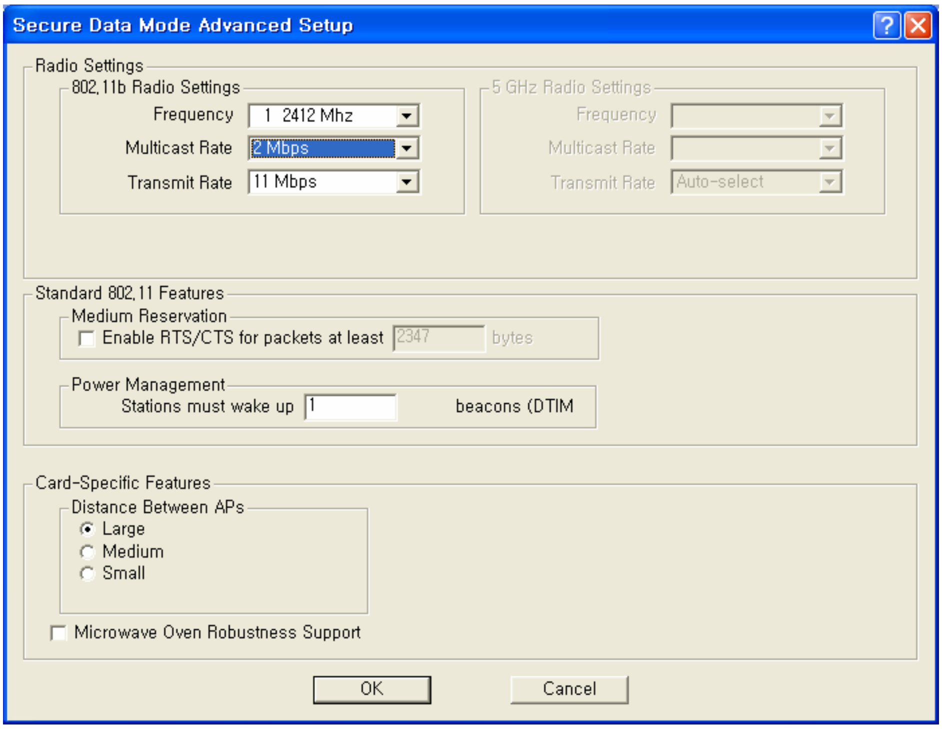
Figure 4-38
Hotspot Mode Advanced Setup window



Secure Data Mode Advanced Setup

Radio Settings

802.11b Radio Settings
Frequency: 1 2412 Mhz
Multicast Rate: 2 Mbps
Transmit Rate: 11 Mbps

5 GHz Radio Settings
Frequency:
Multicast Rate:
Transmit Rate: Auto-select

Standard 802.11 Features

Medium Reservation
☐ Enable RTS/CTS for packets at least 2347 bytes

Power Management
Stations must wake up 1 beacons (DTIM

Card-Specific Features

Distance Between APs
● Large
○ Medium
○ Small

☐ Microwave Oven Robustness Support

Channel/Frequency-- Select the channel and frequency for the remote device from the drop-down list. See Frequency Channels for a more detailed explanation of the frequency channels.

Radio Transmit Rate-- Select the radio bit rate used to transmit. Your choices are:

- Auto-select (IEEE 802.11 only)
- Low (1 Mbps)
- Standard (2 Mbps)
- Medium (5.5 Mbps)
- High (11 Mbps)

Multicast Rate-- Select one of the following values:

- 1 Mbps
- 2 Mbps
- 5.5 Mbps
- 11 Mbps

Note that for data communication with wireless clients in its vicinity, the 802.11 device is able to determine the appropriate Transmit Rate for each client individually.

However, for "anonymous data traffic" such as Multicast messages that must be transmitted to all stations simultaneously, the LAN Administrator must identify the correct Multicast Rate.

Warning: Selecting the 5.5 Mbits/sec or 11 Mbits/sec values in network environments that do not satisfy these requirements may result in Multicast messages getting lost.

Enable RTS/CTS - Select this checkbox to enable the Medium Reservation mechanism.

When you enable Medium Reservation, the APU will use the Request to Send/Clear to Send (RTS/CTS) protocol to control wireless data transmissions, based on the length of the data frame that is to be transmitted.

RTS/CTS Threshold-- Enter a Medium Reservation Threshold value. Valid values are any decimal value in the range of 0 to 2347. The default value of 2347 indicates that Medium Reservation is disabled.

Note: Most vendors recommend using a threshold of around 500.

DTIM Period-- The Delivery Traffic Indication Map (DTIM) parameter influences the handling of Multicast messages that need to be transmitted to the wireless medium.
Valid values are any digit in the range of 1 through 65535. The recommended value is 1. Note that the default value of "0" indicates the default used by the manufacturer of the radio card, not "0" milliseconds.

Distance between access points—This selection impacts the multicast rate. ALL stations connected to an AP need to receive broadcasts/ multicasts or some protocols (e.g. IP ARP) will not work, therefore, the distance between the multiple AP multicasts without negatively impacting performance. The value set (Small, Medium, Large) should be the value that guarantees that all stations will receive the broadcasts.

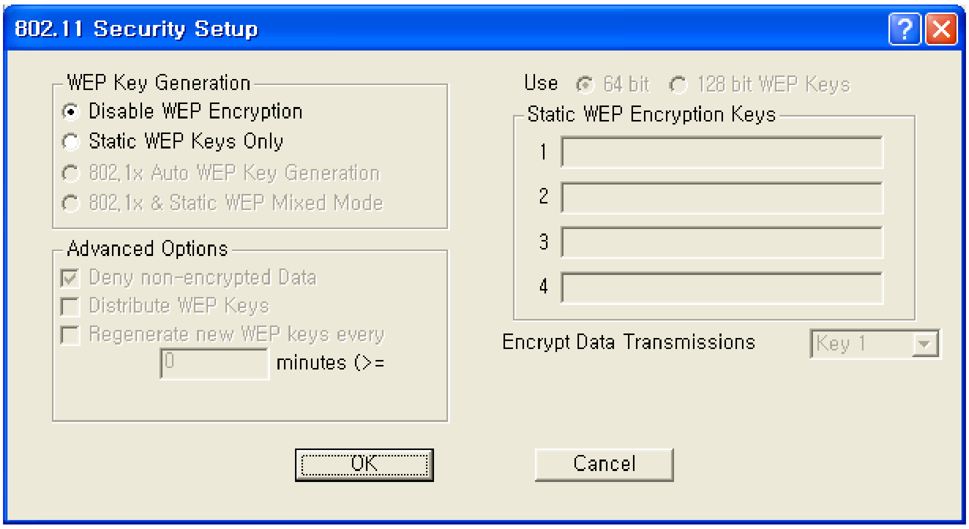
The following table explains the relationship between these two fields:

Multicast Rate	Then Set Distance Between APs to ...
1 Mbps	Large
2 Mbps	Medium
5.5 Mbps	Medium
11 Mbps	Small

802.11b Security Setup

Clicking the Security button on the 802.11b Setup screen displays the 802,11b Security Setup screen, which allows you to set up security for your 802.11b devices. Note that the fields shown in the screenshot below will vary depending on the version of the Configurator you are using and the options contained in the .bin file. The screen below shows all available options.

Figure 4-39
802.11 Security Setup window



802.11 Security Setup

WEP Key Generation
- ● Disable WEP Encryption
- ○ Static WEP Keys Only
- ○ 802.1x Auto WEP Key Generation
- ○ 802.1x & Static WEP Mixed Mode

Advanced Options
- ☑ Deny non-encrypted Data
- □ Distribute WEP Keys
- □ Regenerate new WEP keys every 0 minutes (>=

Use ● 64 bit ○ 128 bit WEP Keys

Static WEP Encryption Keys
1
2
3
4

Encrypt Data Transmissions: Key 1

Disable WEP Encryption-- Select this button if you wish to disable Wired Equivalent Privacy (WEP) encryption.
If you are not concerned about security (for example, home users using this device only to browse the Internet), and if you are not concerned your AP is used by others, then select this checkbox.

Note: For simple security, you can disable WEP encryption and select the Closed Wireless System checkbox.

Static WEP Keys Only-- Select this button if you wish to enter Wired Equivalent Privacy (WEP) keys identically on each access point/station and Secure Data Mode unit in the network. When you select this button, the four Static EP Encryption key fields are enabled on the right side of the screen.

802.1x Auto WEP Key Generation-- Select this option if you wish to automatically create Wired Equivalent Privacy (WEP) keys using the 802.1x protocol. Selecting this option prevents you from creating static WEP keys.

802.1x & Static WEP Mixed Mode-- Select this option if you wish to automatically create Wired Equivalent Privacy (WEP) keys using the 802.1x protocol and also allow static keys.

Deny Non-Encrypted Data-- Select this checkbox if you want to deny all received data that is not encrypted. When this checkbox is selected, any packet received that is not encrypted using one of the four WEP Encryption keys listed above will be dropped. When this checkbox is not selected, unencrypted packets will be accepted and/or forwarded.

Warning: You should always select this checkbox if WEP is enabled in any form. If disabled, clients without WEP can access your network!

Distribute WEP Keys-- If auto key generation is done in any form (auto-only or mixed mode), then the keys must be distributed to the stations. If you have 802.1x enabled on the interface, and STATIC generation ONLY, then the statically defined keys can still be distributed to 802.1x stations. However, if you do not have 802.1x, you cannot distribute WEP keys; and you must use Static keys and enter them manually.

Regenerate New WEP Keys Every n Minutes-- When generating keys, change them every n minutes and send them to the access point/station.

Note: This option is only available for 802.1x devices.

Note: This option only applies if you have selected Auto WEP Key Generation.

Use n-bit WEP Keys-- Select either 64-bit (silver) or 128-bit (gold) encryption keys. The higher bit count provides somewhat higher security.

Static WEP Encryption Keys-- If you use static encryption keys, you must enter each key in the Static WEP Encryption Keys fields. Note that these keys must be entered identically on each access point/station and Secure Data Mode unit in the network.

Encrypt Data Transmission Using Key n-- Enter the key number that should be used to encrypt data on this interface. Note that you can receive using any key, but will generally always transmit using a single key. Unicast transmissions to an 802.1x station with dynamic keys will use that’s station’s dynamic key, but all broadcasts, multicasts, and other unicasts will be encrypted using the key identified in this field.

Closed Wireless System-- Select this checkbox if you wish to require 802.11 stations to have the 802.11 Service Set Identifier/Network Name entered on their system. Stations without the correct network name will be denied access. Selecting this option indicates that you do not want the AP to broadcast the SSID. For example, if you select this checkbox, then Windows XP will not be able to see the AP.

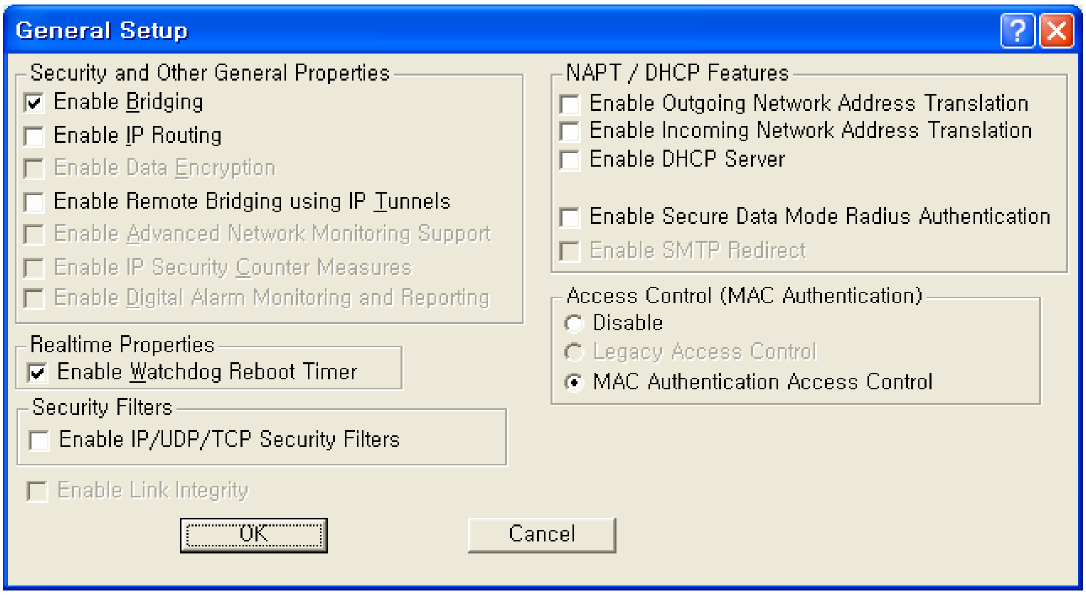
Note: For simple security, you can disable WEP encryption and select the Closed Wireless System checkbox. Note, however, the Closed Wireless System checkbox applies only to Orinoco radios.

Configure the APU for Basic MAC Authentication

Advanced Authentication allows you to restrict access to an 802.11 access point by specifying the MAC Addresses of stations that can use the wireless bridge

1. Select the Setup Tab, and then click the General Setup button. The General Setup screen is displayed, as shown below.
2. Select the MAC Authentication Access Control radio button, as shown in the screenshot, then click OK to close the General Setup screen.
3. Click the Advanced Authentication button. The Advanced Authentication Setup screen is displayed, as shown in Figure 4-40.

Figure 4-40
General Setup Window



General Setup

Security and Other General Properties
☑ Enable Bridging
□ Enable IP Routing
□ Enable Data Encryption
□ Enable Remote Bridging using IP Tunnels
□ Enable Advanced Network Monitoring Support
□ Enable IP Security Counter Measures
□ Enable Digital Alarm Monitoring and Reporting

Realtime Properties
☑ Enable Watchdog Reboot Timer

Security Filters
□ Enable IP/UDP/TCP Security Filters

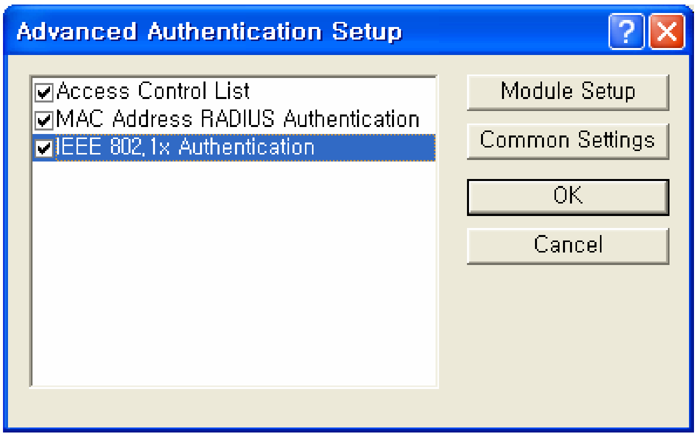
□ Enable Link Integrity

NAPT / DHCP Features
□ Enable Outgoing Network Address Translation
□ Enable Incoming Network Address Translation
□ Enable DHCP Server

□ Enable Secure Data Mode Radius Authentication
□ Enable SMTP Redirect

Access Control (MAC Authentication)
○ Disable
○ Legacy Access Control
● MAC Authentication Access Control

Figure 4-41
Advanced Authentication Setup Window



Advanced Authentication Setup
☑ Access Control List
☑ MAC Address RADIUS Authentication
☑ IEEE 802.1x Authentication
Module Setup
Common Settings
OK
Cancel

When a station tries to connect to the hardware device (via Ethernet, 802.11, etc.), the AP can decide whether or not to forward packets to or from that station based on authorization criteria. There are three authentication modules that comprise MAC authentication, but the network administrator determines which of those three modules are used.

- Access Control List (ACL)
- MAC RADIUS Authentication (with optional WARP support)
- 802.1x

These modules are enabled on a per-interface basis. This provides greater control for the network administrator. In essence, the administrator decides whether there will be more or less (or no) authentication on an interface-by-interface basis.
For example, an administrator can permit MAC addresses entered as part of the ACL only on 802.11b, but can permit MAC addresses entered through RADIUS Setup for both the Ethernet and 802.11b interfaces.

The modules are checked in the order in which they appear on the Advanced Authentication Setup screen, and the options that have been selected (checked) determine how authentication is carried out. Assuming that all options are selected, the first method used is the Access Control List, followed by MAC Address Radius, followed by 802.1x authentication. If no options are selected, then no authentication takes place. Zero to three of the modules can be enabled, but at least one module must be enabled for advanced authentication to take place.

The process by which authentication takes place is as follows:

- The first module in the list (for example, ACL) checks the source address of the incoming packet to see if it is permitted to send packets on the selected interfaces.
- The module will designate the address as one of the following:

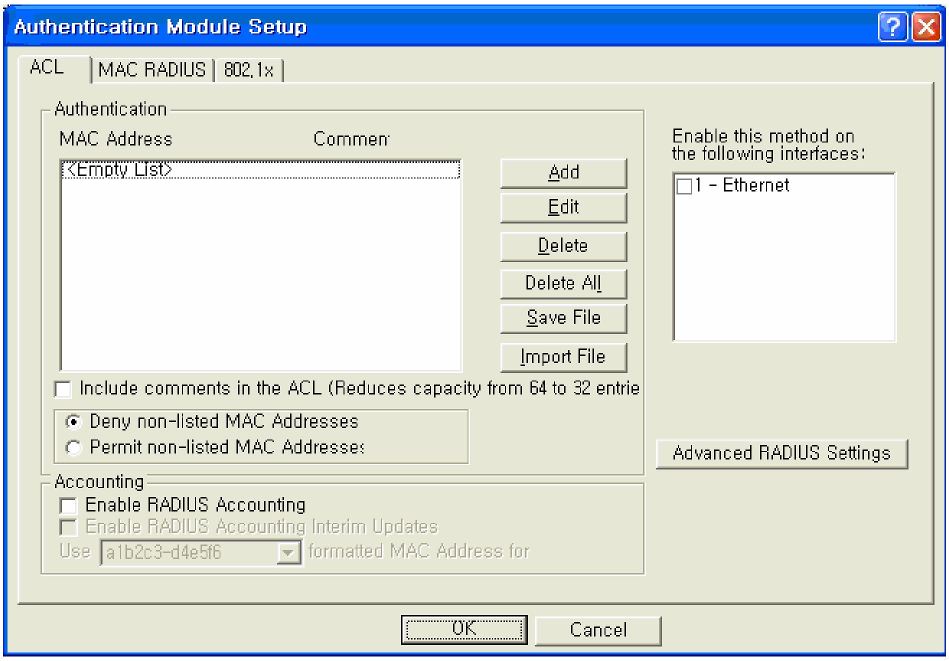
  - **Permit** -- the MAC address is permitted on this interface, and packets are forwarded
  - **Deny** - the MAC address is denied on this interface, and the packets are not sent
  - **Unknown** - the MAC address is not known on this interface, and is passed to the next authentication module

- If the designation is unknown, then it is passed to the next module in the list (for example, from the ACL to MAC RADIUS Authentication), and the process starts again.

- Ensure that the MAC Address RADIUS Authentication checkbox is enabled, and then click the Setup button. The Authentication Module Setup screen is displayed as shown below.

Note: The number of tabs displayed on this screen will vary depending on which Advanced Authentication options you have selected on the Advanced Authentication Setup screen. In the screenshot below, all Advanced Authentication options have been enabled.

Figure 4-42
Authentication Module Setup Window



□ 1 - Ethernet

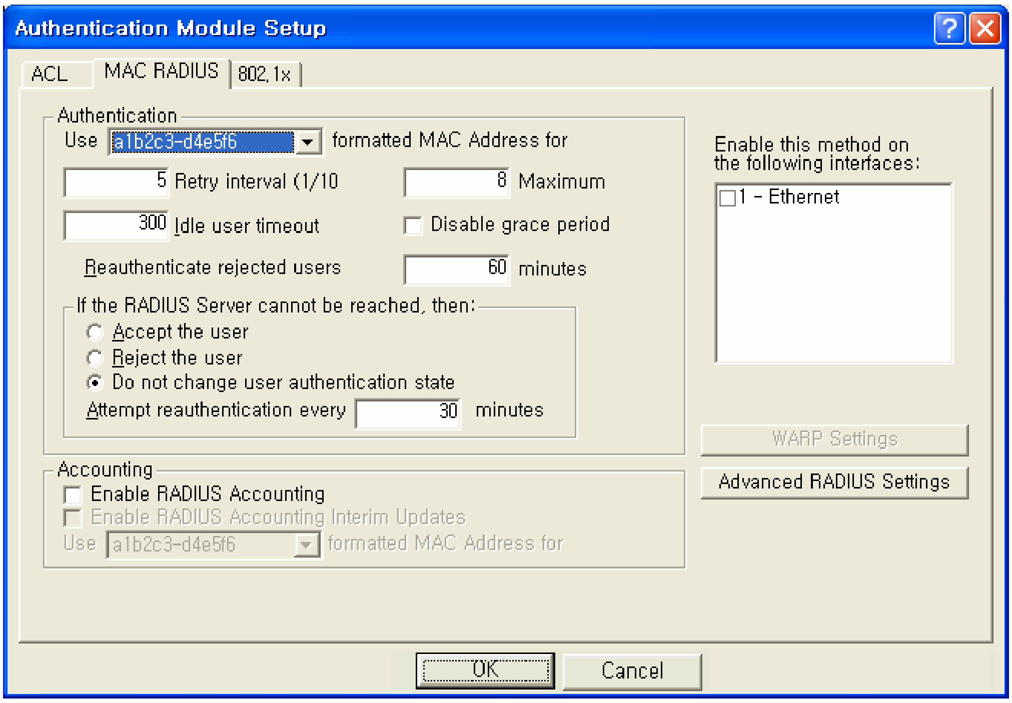
□ Include comments in the ACL (Reduces capacity from 64 to 32 entrie

● Deny non-listed MAC Addresses
○ Permit non-listed MAC Addresses

□ Enable RADIUS Accounting
□ Enable RADIUS Accounting Interim Updates
Use a1b2c3-d4e5f6 formatted MAC Address for

4. Click the MAC RADIUS tab. The MAC RADIUS Setup screen is displayed, as shown below.

Figure 4-43
Authentication Module Setup Windows



Authentication

Use a1b2c3-d4e5f6 formatted MAC Address for

5 Retry interval (1/10 — 8 Maximum

300 Idle user timeout — □ Disable grace period

Reauthenticate rejected users — 60 minutes

If the RADIUS Server cannot be reached, then:

○ Accept the user
○ Reject the user
● Do not change user authentication state

Attempt reauthentication every 30 minutes

Accounting

□ Enable RADIUS Accounting
□ Enable RADIUS Accounting Interim Updates

Use a1b2c3-d4e5f6 formatted MAC Address for

Enable this method on the following interfaces:

□ 1 - Ethernet

The MAC RADIUS Setup screen is used to define advanced authentication and accounting options for clients that are authenticated via RADIUS using the client's MAC Address as the RADIUS username. RADIUS authentication and accounting server IP addresses and port numbers are set up using the MAC RADIUS Setup screen. Note that this particular MAC RADIUS module applies only to Ethernet and 802.11 access point interfaces.

This screen is used in conjunction with the RADIUS Server Setup screen to define various authentication options. If you wish to use accounting, you must first set up accounting parameters on the RADIUS Server Setup screen.

5. Enter values in the RADIUS Server Setup screen to configure your RADIUS server. Each field on the screen is explained in more detail below.

Use formatted MAC Address for username-- Select “A1-2B-3C-45-CD-EF” if you wish to use all uppercase formatting for MAC address accounting. This format corresponds to the new RFC RADIUS standards.

Select a1b2c3-d4e5f6 if you wish to use the older formatting of MAC addresses. Select the EAP packet username if you wish to use the EAP packet username (802.1x Authentication only).

Enable this method on the following interfaces.

Select the interfaces used for MAC RADIUS authentication.

Note: You can select either the Ethernet or 802.11b interface if you wish to use WARP.

Retry Interval-- The retry interval for authentication, in tenths of a second. The default value is 5, or a retry interval of .5 seconds. You can set the retry interval to any value between 3 (.3 seconds) and 30 (3 seconds).

Maximum Retries-- The number of times the access point will retry to connect with the server. The default value is 8(eight), and the range for retries is between 1(one) and 10(ten).

Idle User Timeout **(**sec**)**
Enter a value in this field if you wish to disconnect users after a period of inactivity. The value entered will be the number of seconds that must pass without activity before users are disconnected.
The default value is 300 seconds (or five minutes). The range of accepted values is between 0 and 3825.

Disable Grace Period -- The grace period allows a client to roam between access points without losing open TCP connections. Select this checkbox if you wish to disable the grace period. If selected, the user does not receive a grace period; if unselected, the user receives a grace period.

Note: The Grace Period must be enabled (unchecked) if you wish to use WARP.

Re-authenticate Rejected Users Every n Minutes -- Select the interval at which users who have not been authenticated will be allowed to re-authenticate. The default interval is 60 minutes.

Accept the User-- Select this radio button if you wish to allow network access to the user if the RADIUS server is down.

Reject the User -- Select this radio button if you wish to deny network access to the user if the RADIUS server is down.

Do not change user authentication state-- Select this checkbox if you wish to keep the user authentication state the same as that before the RADIUS server went down. When this checkbox is selected, if the user was authenticated before the server went down, then the user will remain authenticated. If the user was not authenticated before the RADIUS server went down, then the user will remain unauthenticated.

Note: This field is used in conjunction with the "After n Failed Authentication Attempts and "Make users wait n seconds" fields.

Attempt Re-authentication Every n Minutes -- If the RADIUS server cannot be reached, the access point will attempt to authenticate all clients via the RADIUS server according to the interval specified here. The re-authentication interval must be specified in increments of 15 minutes. Valid values are 15, 30, 45, etc.

Enable RADIUS Accounting --Select this button if you wish to enable RADIUS accounting. Accounting keeps track of the number of bytes and packets sent by a client. It also keeps track of the amount of time a client has been authenticated. You will want to select this button if you wish to monitor the amount of traffic a client passes, or the amount of time a user is logged on. Typically, you will do this if you wish to bill the client based on time or traffic.

Note: Accounting must be used with authentication. You cannot use accounting without authentication.

Enable RADIUS Accounting Interim Updates -- Select this checkbox if you wish to allow RADIUS accounting updates. If this feature is enabled, the number of bytes and packets sent by a client will be updated according to the update interval defined on the Advanced RADIUS Setup screen.

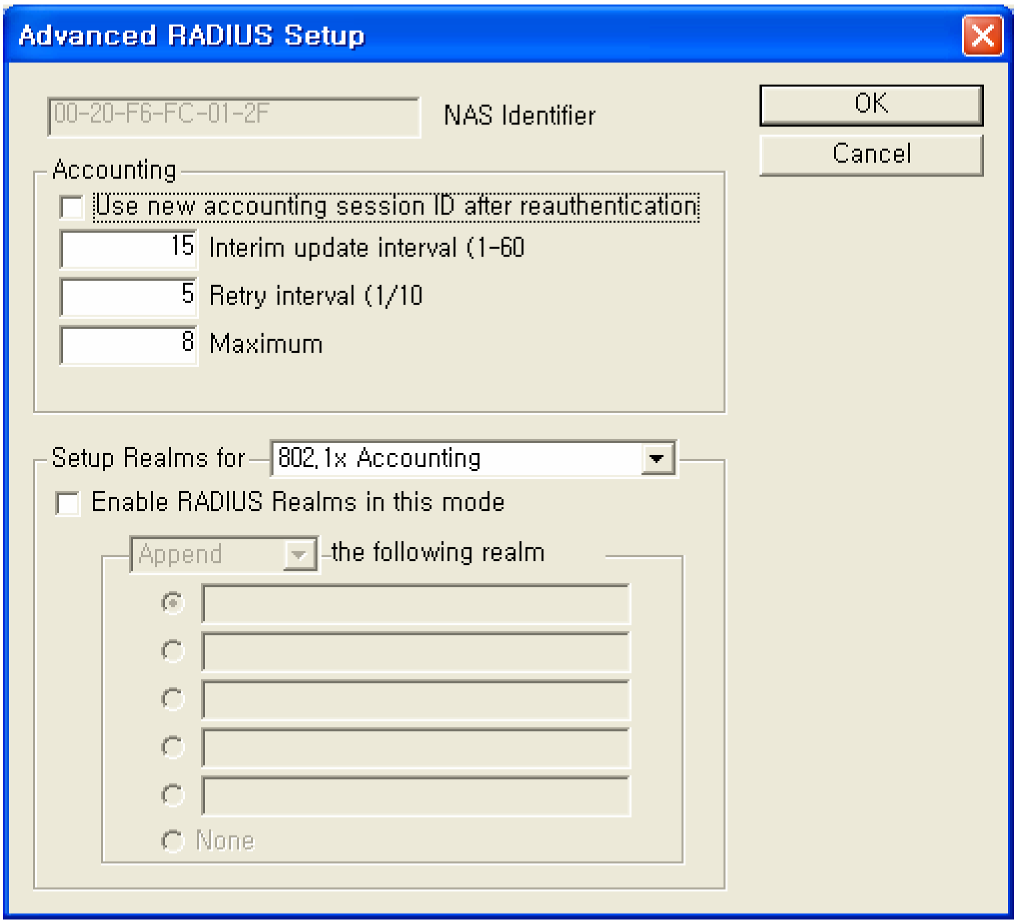
WARP Settings Button -- Clicking this button displays the WARP Settings screen, which allows you to define various IP addresses and ports that will be used for Wireless Authentication and Registration Protocol (WARP).

Advanced RADIUS Settings Button -- Clicking this button displays the Advanced RADIUS Settings screen, which enables you to define more advanced RADIUS parameters.

Configure the APU for Advanced RADIUS MAC Authentication

1. From the MAC RADIUS Setup screen, click the Advanced RADIUS Settings button. The Advanced RADIUS Setup screen is displayed, as shown below.

Figure 4-44
Advanced RADIUS Setup Window



00-20-F6-FC-01-2F NAS Identifier

Accounting

☐ Use new accounting session ID after reauthentication

15 Interim update interval (1-60

5 Retry interval (1/10

8 Maximum

Setup Realms for 802.1x Accounting

☐ Enable RADIUS Realms in this mode

Append the following realm

●

○

○

○

○

○ None

The Advanced RADIUS Setup screen is used to configure optional RADIUS-related parameters.

2. Enter values in the Advanced RADIUS Setup screen, as indicated by the field descriptions below.

NAS Identifier - This field displays your Network Access Server (NAS) name. The access point's SNMP System Name is used as the NAS Identifier, and is shown here for your convenience.

Note: The NAS ID takes the place of the IP address that would normally be used to identify the AP.

Use New Accounting Session ID After Authentication -- Select this checkbox if you wish to use another ID for accounting after authentication has taken place.

Interim Update Interval -- Set the interval (in minutes) between interim updates.The interim update is used to send information in between normal "start/stop" packets. Interim updates are useful because they provide a log of network traffic at a regular interval.

The default value for the interim update interval is 15 minutes. The interim update must be between 1 - 60 minutes.

Retry Interval (1/10 sec) -- The retry interval for accounting, in tenths of a second. The default value is 5 (or a retry interval of .5 seconds). You can set the retry interval to any value between 3 and 30.

Maximum Retries -- The number of times the access point will retry to connect with the server. The default value is 8, and the range for retries is between 1 and 10.

Set Up Realms for -- When an access client sends user credentials, a user name is often included. Within the user name are two elements:

- Identification of the user account name
- Identification of the user account location

For example, for the user name user1@microsoft.com, user1 is the user account name and microsoft.com is the location of the user account. The identification of the location of the user account is known as a realm.

With RADIUS, a realm is used to separate one name space from another. This allows you to create a login such as user@dom1.com and another login such as user@dom2.com. RADIUS realms also allow Internet Service Providers (ISPs) to segment customer logins, so authentications go to the appropriate RADIUS server(s).

A domain is registered with the InterNIC, and used for mapping servers and services to IP addresses, such as Web, e-mail, etc. Typically, a RADIUS realm corresponds to a domain name (e.g., microsoft.com; yahoo.com). However, there is no requirement to do so, and in fact ISPs often assign realms with no top-level domain (for example, user@dom1 -- without a .com extension).

From the dropdown list, select the accounting or authorization feature for which to provide special handling of <RADIUS realms>. Options currently include:

- 802.1x Accounting
- 802.1x Authorization
- Access Control List (ACL) RADIUS Accounting
- MAC RADIUS Accounting
- MAC RADIUS Authorization

For each of the above Authentication/Accounting types, special handling of RADIUS Realms can be enabled or disabled using the "Enabled RADIUS Realms in this mode" checkbox. Depending on the selected Authentication/Accounting type, different options are available for how to handle RADIUS realms.

Following Realm Name -- Select the type of behavior that will be used for the realm. The behavior determines how the access point handles the realm. Select one of the following realm types:

Append -- Takes the user supplied user name, and appends the realm name onto it (for example, if the user name is smith and the realm name is microsoft.com, then the append action produces smith@microsoft.com)

Supply -- Supplies the selected realm name if the user does not already have one selected. If the user provided a realm name, then use the provided realm name, and do not use the one provided.

- Example #1: User provided smith, Behavior is set to Supply, and user did not provide a realm name. The supply action produces jsmith@microsoft.com.
- Example #2: User provided smith, Behavior is set to Supply, and user provided the realm name yahoo.com. The supply action produces jsmith@yahoo.com).

Require -- Requires the user to use the selected realm name (or none, if none is selected). If there is a realm name in the realm name field, the user must have the realm name indicated by the radio button. If the user does not, then he or she is not authenticated. If none is selected, then the user is required not to have a realm name.

- Example #1: User provided smith, Behavior is set to require, user has the realm name microsoft.com, but yahoo.com is entered in the realm name field. The user is not authenticated.
- Example #2: User provided smith, Behavior is set to require, user has the realm name microsoft.com and microsoft.com is entered in the realm name field. The user is authenticated.)

Force -- Replaces any realm name supplied by the user with the selected realm name, or strips off the realm name supplied by the user in the case of none.

- Example: User provided smith, Behavior is set to Force, user provides the realm name microsoft.com, but yahoo.com is entered in the realm name field. The user is authenticated as jsmith@yahoo.com)

Note: The available behaviors vary depending on the type of accounting or authorization realm selected. The following table shows the types of behaviors available for each type of accounting or authorization realm.

Table 4-3

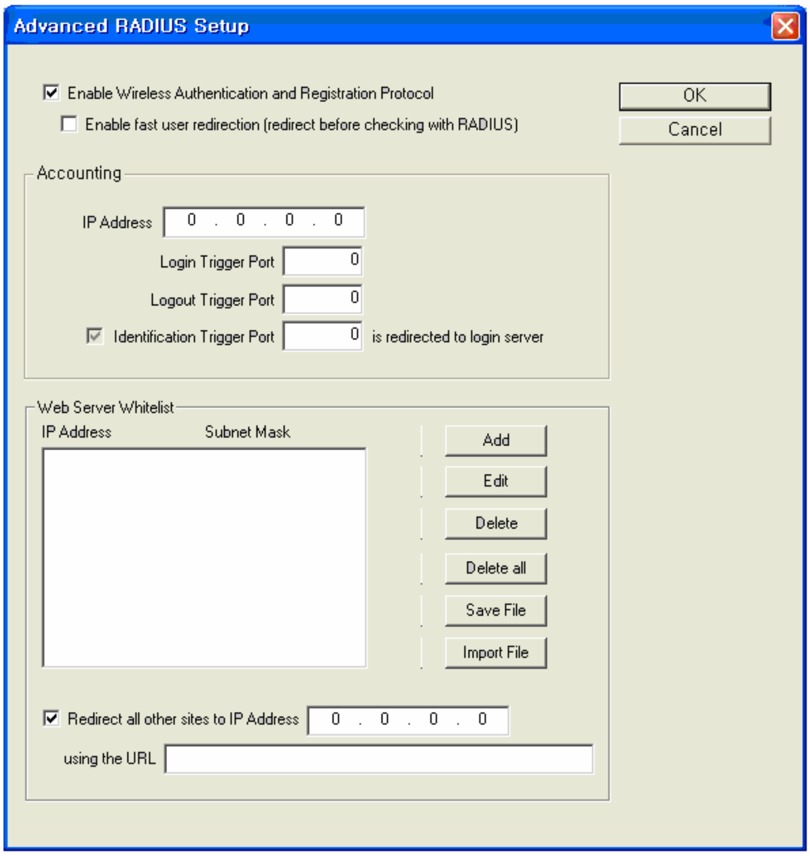
Type of Accounting/Authorization Realm	**Behavior(s) Available**
802.1x Accounting	• Append
802.1x Authentication	• Append • Supply • Require • Force
ACL Radius Accounting	• Append
MAC RADIUS Accounting	• Append
MAC RADIUS Authentication	• Append

Set Up HotSpot Functionality

You are now ready to set up HotSpot functionality.

1. From the MAC RADIUS Setup screen, click the WARP Settings button. The WARP Settings screen is displayed, as shown below. Enter the HotSpot configuration information on this screen, as explained below.

Figure 4-45
WARP Settings Window



Advanced RADIUS Setup

☑ Enable Wireless Authentication and Registration Protocol

□ Enable fast user redirection (redirect before checking with RADIUS)

Accounting

IP Address 0 . 0 . 0 . 0

Login Trigger Port 0

Logout Trigger Port 0

☑ Identification Trigger Port 0 is redirected to login server

Web Server Whitelist

IP Address	Subnet Mask

☑ Redirect all other sites to IP Address 0 . 0 . 0 . 0

using the URL

The WARP Settings screen is used to set up parameters for Wireless Authentication and Registration Protocol (WARP).
The WARP feature enables the creation of Hotspots for wireless access. This allows wireless users to access the Internet from their laptops or PDAs, typically on a pay-per-use basis. When WARP is enabled, all traffic is redirected to a login web server, and users will be unable to access other web pages until they have successfully logged in.

Each of the fields and buttons on the WARP Setup screen are explained below.

Enable Wireless Authentication and Registration Protocol -- Select this checkbox to enable the Wireless Authentication and Registration Protocol (WARP) feature. Note that once this checkbox is selected, the other fields on the screen become available.

Enable fast user redirection (redirect before checking with RADIUS) -- Select this checkbox if you wish to provide immediate access to the Internet without going through the RADIUS authentication process.

When enabled, this option redirects all users without consulting the RADIUS server. Users who have an account with time left do not have to repeat the login process. This is particularly useful for roaming, recovery from idle timeouts, and fast Internet access. It is also useful if you wish to show a "splash screen" to all users.

If unselected, users will be redirected to the login server or their home page. The AP is put in a "grace period" and a request is sent to the RADIUS server. Established TCP connections may continue while the request is pending (supports roaming without re-login at each AP). When the response is received, the AP is either redirected to login, or allowed full access to the Internet. Users with time remaining are given a link that bypasses the registration process, and proceed directly to the redirect through the login trigger port. Note that users with no account go through the normal login procedure.

Authentication Web Server IP Address -- Enter the IP address of the web server that should be used for WARP. When WARP is enabled, all traffic will be redirected to this login web server, and users will be unable to access other web pages until they have successfully logged in on a pay-per-use basis.

Authentication Web Server Login Trigger Port -- Enter the number of the port used in conjunction with the IP address of the login web server for WARP. The login server directs successful logins to the trigger port, which makes the access point attempt a second RADIUS authentication. This authentication should be successful because the login updated the RADIUS server client list. The second RADIUS request is done by the access point when it sees traffic to the trigger port.

Note: The login trigger port cannot be the same port as the port used for the login page or the logout trigger port.

Authentication Web Server Logout Trigger Port -- Enter the number of the port used in conjunction with the IP address of the logout web server for WARP. The logout server directs successful logouts to the trigger port, which attempts a second RADIUS authentication. This authentication should fail because the logout updated the RADIUS server client list. The second RADIUS request is done by the access point when it sees traffic to the logout trigger port.

Note: The logout trigger port cannot be the same port as the port used for the login page or the login trigger port.

Identification Trigger Port n is redirected to Login Server –
Enter the port number that the client will be redirected to when the web server needs to obtain the client's identification information. When the Access Point sees the client attempting to connect to the Identification Trigger Port, the client will be redirected to the login server at port 80 and the URL will be filled in with the client's MAC Address by the Access Point.

Note: The Identification URL is independent of the White list URL displayed at the bottom of the WARP Settings screen.

Web Server White list -- The Web Server White list allows you to add or edit IP address/subnet mask pairs that correspond to websites that can be accessed before the user is authenticated. For example, if HotSpot access is being used in a coffee shop, the coffee shop might provide access to its own web site without requiring authentication.

These IP address/subnet mask appear in the Web Server White list window once they have been created.

Clicking the Add button displays the IP Address White list Entry screen, and allows you to add new IP address/subnet mask pairs to your white list.

Selecting an IP address/subnet mask pair in your white list and clicking the Edit button also displays the IP Address White list Entry screen, and allows you to edit one or both of the IP address/subnet mask entries for a particular website.

Selecting an IP address/subnet mask pair in your white list and clicking the Delete button deletes that entry from your white list. You are prompted before the delete occurs.

Clicking the Delete All button deletes every entry in your white list. You are prompted before the delete occurs.

Clicking the Save File button allows you to save the IP address/subnet mask entries in your white list to an external file, which can then be imported at a later time.

Clicking the Import File button displays the standard Windows Open File dialog, and allows you to navigate to the directory where a previously saved white list can be selected and imported into the configurator.

Redirect all other sites to IP Address -- Enter the IP address that will be used to redirect all other sites. The IP address should be associated with the URL entered in the field below.

Using the URL -- Enter the URL (using format http://www.sitename.extension) to which all other sites will be redirected. The URL **must** be associated with an IP address entered in the web server white list or the WARP login server, or the AP will be redirected forever.

If no URL is given, APs will be redirected to "http://<server-IP>/login". This URL is useful to hide the IP, to change the location of the login page, or to redirect to a non-login home page. Note that you must enable the Identification Trigger Port to complete the login process.

Configure the RADIUS Server for Hotspot Service

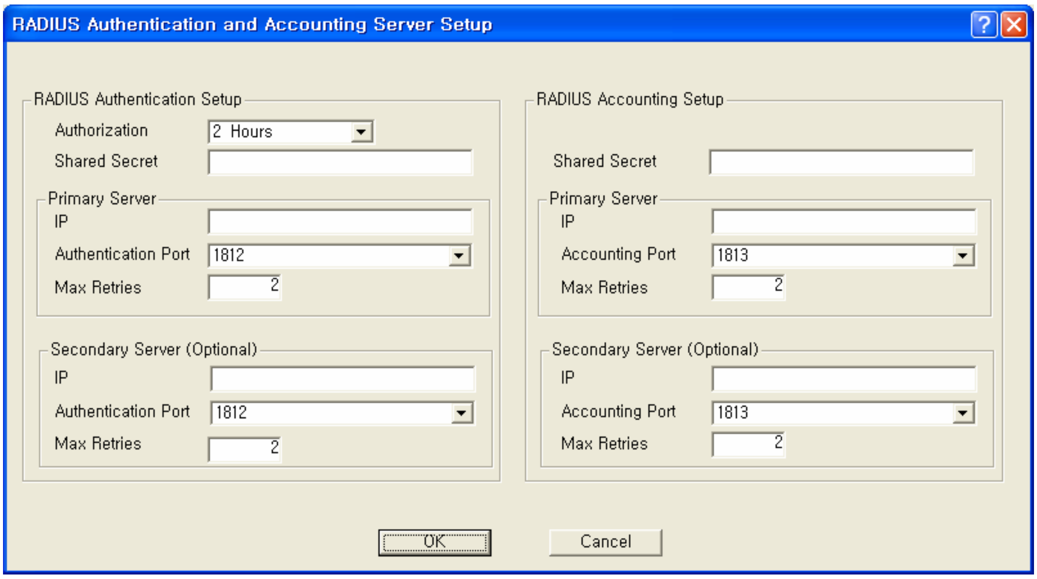
Once the AP has been configured for basic operation, you are ready to configure the device for HotSpot Mode and Firewall functionality.
This is a four-step process:

- Configure the RADIUS Server for Authentication (and, optionally, Accounting)
- Configure the APU for Basic RADIUS MAC Authentication.
- Configure the APU for Advanced RADIUS MAC Authentication.
- Set up HotSpot Functionality

Each step is explained in more detail below. Note that this section assumes that you have launched the AP Configurator and that you have completed all steps in Configure the Access Point for Basic Operation section.

1. From the Setup tab on the Configurator, click the RADIUS Server button. The RADIUS Authentication and Accounting Server Setup screen is displayed, as shown below.

Figure 4-46
RADIUS Setup Window



RADIUS Authentication and Accounting Server Setup

RADIUS Authentication Setup

Authorization: 2 Hours
Shared Secret:

Primary Server
IP:
Authentication Port: 1812
Max Retries: 2

Secondary Server (Optional)
IP:
Authentication Port: 1812
Max Retries: 2

RADIUS Accounting Setup

Shared Secret:

Primary Server
IP:
Accounting Port: 1813
Max Retries: 2

Secondary Server (Optional)
IP:
Accounting Port: 1813
Max Retries: 2

The RADIUS Server Setup screen is used to configure authentication and accounting parameters for terminal servers that speak the RADIUS protocol.
RADIUS is the de-facto standard protocol for authenticating users and for recording accounting information. Accounting keeps track of the number of bytes and packets sent by a client. It also keeps track of the amount of time a client has been authenticated. It is commonly used by Terminal Servers or Network Access Servers (NASs) whenever a user logs on and off a dialup Internet service.

Note: This screen is only available if the MAC Authentication Access Control button on the General Setup screen has been selected.

There are two main sections in the RADIUS server setup dialog:

RADIUS Authentication Setup and RADIUS Accounting Setup. In most cases you will want to set up both, although you do not have to set up Accounting. The two are almost identical except for the Authorization Lifetime, which appears only with Authentication.

To set up RADIUS authentication and accounting:

1. Enter values in the RADIUS Authentication and Accounting Server Setup screen to configure your RADIUS server. Each field on the screen is explained in more detail below.

Authorization Lifetime -- Authorization lifetime is the length of time the authorization is valid. Users will need to be-authenticated/re-authorized after this time expires. You should set this value to the maximum time you wish a user to be able to use your service without the need to be re-authenticated.

Shared Secret -- The client file for your RADIUS server contains the IP address and password for the base station you are setting up. You must add the IP address and password (shared secret) from this file in the RADIUS Server Setup screen.

Note: There are separate shared secrets (passwords) for authentication setup and accounting setup. The shared secret is an ASCII string that should be between 2 - 32 characters and should not start with a space.

Primary Server IP Address -- In the RADIUS dialog, enter the IP address for the RADIUS server (the host).

Primary Server Authentication Port -- In the RADIUS dialog, enter the authentication port (default = 1812) for the RADIUS server (the host).

Secondary Server IP Address -- If you are using a second RADIUS server for network robustness, enter the IP address of that RADIUS server.

Primary Server Accounting Port -- In the RADIUS dialog, enter the accounting port (default = 1812) for the RADIUS server (the host).

Secondary Server Authentication Port -- If you are using a second RADIUS server for network robustness, enter the authentication port (default = 1812) for that RADIUS server (the host).

Secondary Server Accounting Port -- If you are using a second RADIUS server for network robustness, enter the accounting port (default = 1812) for that RADIUS server (the host).

Procedure 3-6
Advanced and Optional Configuration

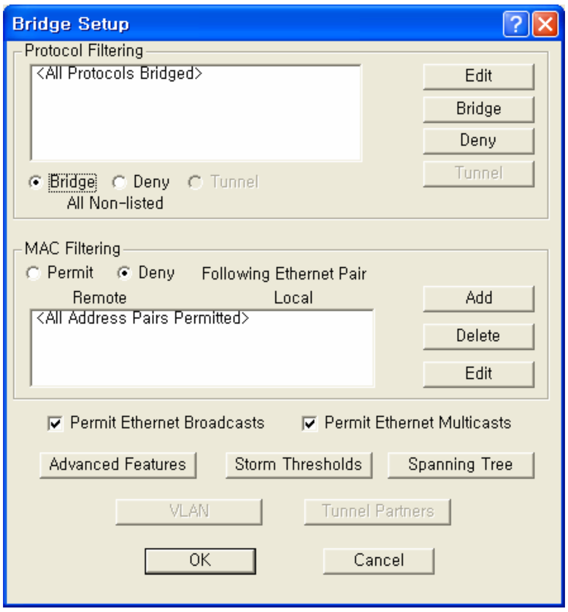
Once you have set up the basic network configuration, you may choose to set up one or more optional or advanced configuration components. This chapter describes how to configure the following optional and advanced components:

Set Up the Bridge

The Bridge Setup screen is used to set up the bridge. In addition, you may use the following screens to set up optional bridge components: The Bridge Setup screen is used to set up the parameters used for bridging. In most cases you will not need to modify the factory configured Bridge Setup. If you are working with an extensive network environment, however, and if you are an experienced network administrator, you may want to modify some of the parameters to fit specific network requirements.
The top half of the screen allows you to define different handling options based on different protocols. The bottom half of the screen allows you to define different handling options based on individual MAC addresses.

Note: This screen is only available when the Enable Bridging checkbox has been selected on the General Setup screen.

Figure 4-47
Bridge Setup window



Bridge Setup

Protocol Filtering

<All Protocols Bridged>

● Bridge ○ Deny ○ Tunnel
All Non-listed

MAC Filtering

○ Permit ● Deny Following Ethernet Pair

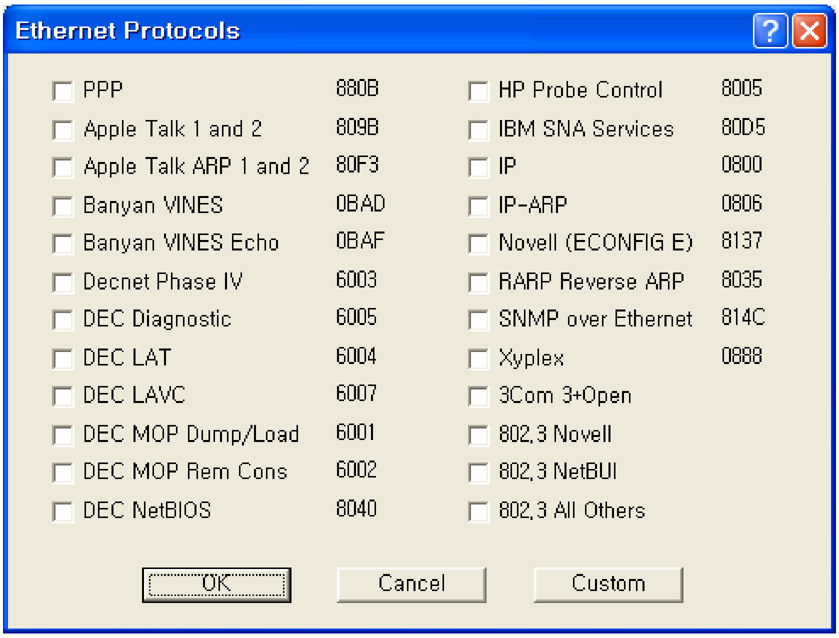
Remote	Local
<All Address Pairs Permitted>	

☑ Permit Ethernet Broadcasts ☑ Permit Ethernet Multicasts

Protocol Filtering

The Protocol Filtering section of the Bridge Setup screen allows you to select a handling method (Bridge, Deny, or Tunnel) for the most common protocols.

Figure 4-48
Protocol Filtering Setup window



□ PPP	880B	□ HP Probe Control	8005
□ Apple Talk 1 and 2	809B	□ IBM SNA Services	80D5
□ Apple Talk ARP 1 and 2	80F3	□ IP	0800
□ Banyan VINES	0BAD	□ IP-ARP	0806
□ Banyan VINES Echo	0BAF	□ Novell (ECONFIG E)	8137
□ Decnet Phase IV	6003	□ RARP Reverse ARP	8035
□ DEC Diagnostic	6005	□ SNMP over Ethernet	814C
□ DEC LAT	6004	□ Xyplex	0888
□ DEC LAVC	6007	□ 3Com 3+Open	
□ DEC MOP Dump/Load	6001	□ 802.3 Novell	
□ DEC MOP Rem Cons	6002	□ 802.3 NetBUI	
□ DEC NetBIOS	8040	□ 802.3 All Others	

1. Select the protocols from the list that you wish to handle separately, or click the Custom button to add an unlisted protocol. Click the OK button when finished to re-display the Bridge Setup screen. Note that the protocols you have selected are listed in the Protocol Filtering window, and that all protocols are denied by default.
2. If you wish to Bridge or Tunnel any of the protocols in the list, select the protocol, then click either the Bridge or Tunnel buttons
3. At the bottom of the Protocol Filtering list, click the Bridge, Deny, or Tunnel button to define how all other non-listed protocols should be handled.

Note: You can add new protocols to the list at any time by clicking the Edit button and checking additional protocol check boxes.

Tunnel Button--The Tunnel button is used in conjunction with the protocols listed in the Protocol Filtering list. Select a protocol from the list and click the Tunnel button to indicate that the selected protocol should be tunneled.

Deny Button-- the Deny button is used in conjunction with the protocols listed in the Protocol Filtering list. Select a protocol from the list and click the Deny button to indicate that the selected protocol should be denied.

Bridge Button-- the Bridge button is used in conjunction with the protocols listed in the Protocol Filtering list. Select a protocol from the list and click the Bridge button to indicate that the selected protocol should be bridged.

Bridge MAC Address Filtering Overview

You can specify static MAC Address filters in Bridge Setup to optimize the performance and increase security on your wireless (and wired) network. You can permit or deny access to individual stations by specifying their particular MAC Addresses, or to multiple stations by using an X as a wildcard character. You can also permit or deny Ethernet multicast address all traffic that does not match one of the pairs explicitly listed in the Ethernet pair list will be permitted or denied based on your selection.

Table 4-4
Traffic Filtering

Selection	Traffic Matching Listed Pairs	Traffic Not Matching Listed Pairs
Permit Following Ethernet Pair	Permit	Deny
Deny Following Ethernet Pair	Deny	Permit

Stations to be filtered are identified by their MAC Address and whether they are on a remote or local interface. The Interface parameter indicates whether the station with the specified MAC Address is located on the wired or wireless interface of the base station. Use the Add, Delete, and Edit buttons to modify the entries of the list.

Permit Ethernet Broadcasts-- If you wish to deny broadcast traffic in your bridged network, deselect this option. Normally, however, you will select this option to permit Ethernet broadcasts.

Note: This option applies to all Ethernet interfaces, and not simply to Ethernet traffic.

Permit Ethernet Multicasts-- If you wish to deny multicast traffic in your bridged network, deselect this option. Normally, however, you will select this option to permit Ethernet multicasts.

Note: This option applies to all Ethernet interfaces, and not simply to Ethernet traffic.

Advanced Bridging Features

The Advanced Bridge features can be accessed by clicking the Advanced Features button on the Bridge Setup screen.

MAC Layer (Ethernet) Filters allow you to filter Ethernet traffic due to bad or unknown

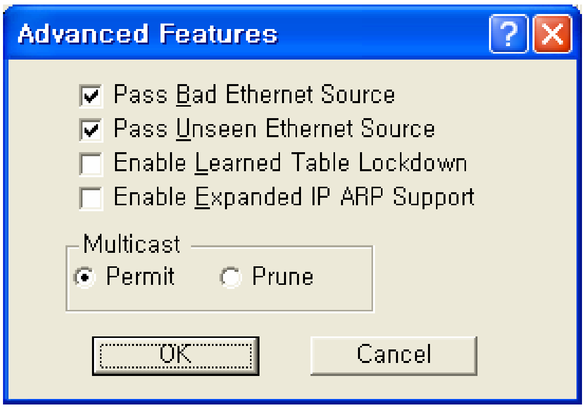
DHCP Filtering allows you to limit DHCP responses to a particular DHCP server.

IP/ARP Filtering allows you to prevent unnecessary IP/ARP packets from being sent over the wireless link.

Incoming Broadcast Filters allow you to prevent broadcast and multicast packets arriving from the remote interface(s) from being transmitted on the local interface(s).

Outgoing Broadcast Filters allow you to prevent broadcast and multicast packets sent from the local interface(s) from being transmitted out the remote interface(s).
Miscellaneous Statistics Gathering allows you to enable some miscellaneous advanced bridging features.

Figure 4-49
Advanced Bridging Setup window



Advanced Features

☑ Pass Bad Ethernet Source
☑ Pass Unseen Ethernet Source
☐ Enable Learned Table Lockdown
☐ Enable Expanded IP ARP Support

Multicast
● Permit ○ Prune

Permit Multicast Button-- Select this checkbox if you wish to permit multicast.

Prune Multicast Button-- Select this checkbox if you wish to prune multicast.

Enable Learned Table Lockdown--A standard Bridge/Router watches the source addresses of each packet it receives on any of its interfaces.
As new addresses are seen, entries are added in the “learned table” that contain the particular source address and the interface number that address was received on. If that source address is later seen on a different interface, the Bridge will immediately change the interface number in the learned entry table. This condition could happen in a correctly functioning network if someone moved the computer to a different part of the network.
This could also happen if someone was trying to capture network packets by spoofing the Bridge. Enabling learned table lockdown will prevent the interface number from being changed once the source address has been seen.

A standard Bridge will also time-out the learned table records every ten (10) minutes. If learned table lockdown is enabled, these records will not be timed-out. Once a record is learned, it will not be changed or deleted until either the Secure Data Mode station reboots or the learned table becomes completely filled and needs to be reset.

Note: A typical Secure Data Mode learned table can contain over 12,000 records.

Enable Expanded IP/ARP Support

Enabling this feature will cause the Secure Data Mode station to watch the IP/ARP packets that occur on the network. Normally, no action is taken in response to an IP/ARP packet that is not destined for a host that is being Proxy ARPed by the Secure Data Mode station. When this function is selected, the Secure Data Mode station will add the IP address to its IP/ARP table when it sees an ARP packet from another source. This feature is helpful on an ARP network because it will build a database of MAC layer address to IP address pairs.

Note: The IP/ARP table is never timed out in this mode.

Storm Threshold Setup

The Storm Thresholds screen is used to set threshold values for broadcast and multicast messages.

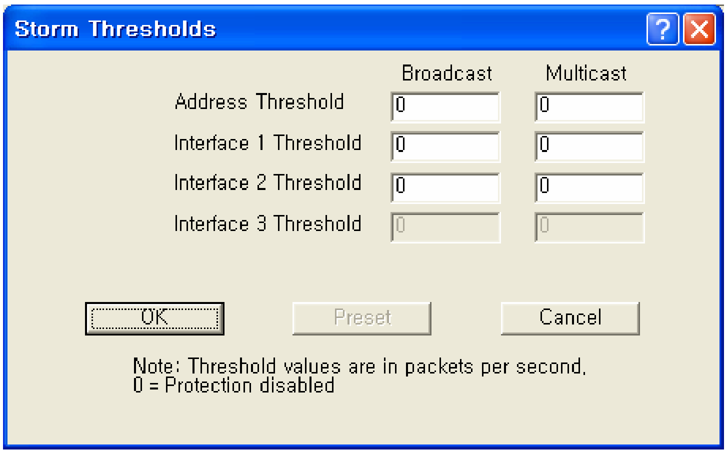
In most situations, you will not need to set the Storm Thresholds. However, if intensive multicast or broadcast messaging is typical of the network protocols used in your network environment, you may wish to control the maximum number of broadcast and multicast messages. If the maximum value of broadcast or multicasts per second is exceeded, the Secure Data Mode Station will ignore all subsequent messages issued by the particular network device, or ignore all messages of that type coming on that particular interface.

You can use the Storm Threshold screen to:

- Specify a maximum value as received from a single network device (identified by its MAC address).
- Specify an absolute maximum of messages per second per Interface.

You can specify a set of thresholds for each Interface of the Secure Data Mode Station access point, identifying separate values for the number of Broadcast messages/second and Multicast messages/second.

Figure 4-50
Broadcast Storm Setup window



	Broadcast	Multicast
Address Threshold	0	0
Interface 1 Threshold	0	0
Interface 2 Threshold	0	0
Interface 3 Threshold	0	0

Note: Threshold values are in packets per second.
0 = Protection disabled

Broadcast Address Threshold

Enter the maximum number of broadcast messages per second that will be received from a single network device (identified by its MAC address).

Multicast Address Threshold-- Enter the maximum number of multicast messages per second that will be received from a single network device (identified by its MAC address).

Broadcast Interface 1 Threshold-- Enter the maximum number of broadcast messages per second that will be received on Interface 1 (typically Ethernet).

Multicast Interface 1 Threshold-- Enter the maximum number of multicast messages per second that will be received on Interface 1 (typically Ethernet).

Broadcast Interface 2 Threshold-- Enter the maximum number of broadcast messages per second that will be received on Interface 2 (typically 802.11b).

Multicast Interface 2 Threshold-- Enter the maximum number of multicast messages per second that will be received on Interface 2 (typically 802.11b).

Broadcast Interface 3 Threshold-- Enter the maximum number of broadcast messages per second that will be received on Interface 3 (typically 802.11a).

Multicast Interface 3 Threshold-- Enter the maximum number of multicast messages per second that will be received on Interface 3.

Preset Button-- Clicking the Preset button sets all broadcast and multicast rates to their default values. The default values are as follows:

Table 4-5
Default Threshold values

Item	Broadcast	Multicast
Address Threshold	30	30
Interface1 Threshold	60	60
Interface2 Threshold	60	60
Interface3 Threshold	60	60

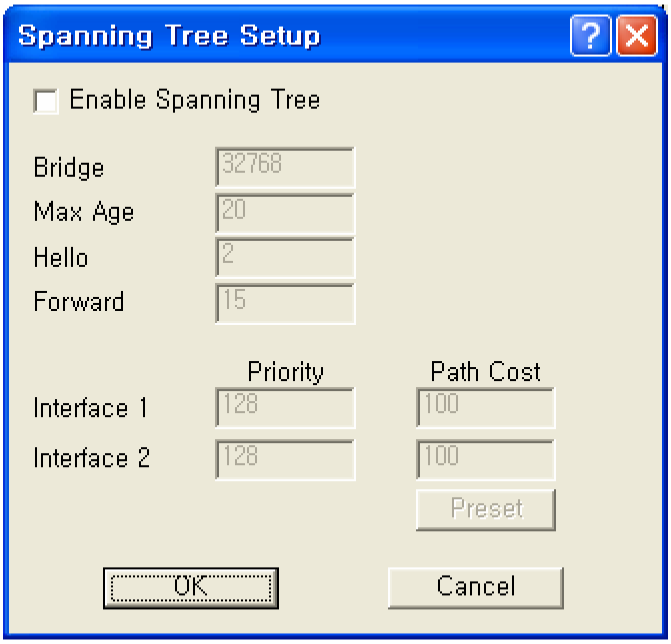
Spanning Tree Setup

The Spanning Tree Setup screen allows you to configure your bridges so that they will dynamically discover a loop-free subset of the LAN topology (a tree), that provides the most efficient level of connectivity between every pair of physically connected Local Area Network segments. See Spanning Tree for more information about how the spanning tree algorithm works. The default settings for the Spanning

Tree Algorithm will provide satisfactory performance for most Local Area Network (LAN) topologies.

Enable Spanning Tree -- Select this checkbox if you wish to enable Spanning Tree capabilities.

Figure 4-51
VLAN Spanning Tree Setup window



□ Enable Spanning Tree

Bridge	32768
Max Age	20
Hello	2
Forward	15

	Priority	Path Cost
Interface 1	128	100
Interface 2	128	100

Bridge Priority -- The Bridge Priority parameter allows you to influence the choice of the Root Bridge and Designated Bridge as calculated by the Spanning Tree Algorithm.

Valid Values:	0 - 65000
Default:	32768

A low numerical value makes the bridge more likely to become the designated bridge or root bridge (typically 0).
The recommended value is 32768.

You may assign a duplicate priority value to multiple bridges, provided that it is a non-zero value. Bridges that have an identical Bridge Priority level are typically not intended to function as the root bridge.

Max Age -- The Max Age parameter identifies the maximum age of received Spanning Tree protocol information.

When the bridge receives protocol information that exceeds the Max Age value, the bridge will discard the information and start the Forward Delay timer to allow other bridges to forward updated topology information (for example, that another bridge has become the Root Bridge).

Note: Recommended Value (20 seconds)

A low Max Age value occasionally may cause the Spanning Tree to reconfigure unnecessarily, resulting in temporary loss of connectivity throughout the network.
A high Max Age value will cause the LAN to take longer than necessary to rebuild the Spanning Tree whenever a link or bridge unit breaks down or becomes available again.

Hello Time -- The Spanning Tree Hello Time parameter identifies the time interval between Configuration PBDU transmitted by a root bridge, or a bridge that is attempting to become the root bridge.

Note: Recommended Value (2 seconds)

Shortening the Hello Time will make the protocol more robust, especially when the probability of loss of configuration messages is high.

Lengthening the Hello Time will lower the overhead of the algorithm since the interval between the transmissions of configuration messages will be longer.

Forward -- The Forward Delay is a timer that prevents a bridge to forward data packets when:

- The bridge receives information that the active Spanning Tree topology must be updated (for example when a bridge breaks down or when somebody modified the Bridge Priority or Path Cost value of a particular bridge).
- The bridge registers that the protocol information exceeds the specified Max Age value.
- Changes in the Spanning Tree topology must be communicated to all bridges in the bridged network. The Forward Delay timer will compensate for the propagation delays that occur in passing the protocol information, allowing all bridges to close the old data paths, before the new data paths are activated.

Note: Recommended Value (15 seconds)

A lower value may result in temporary loops as the Spanning Tree Algorithm converges.

A higher value may result in longer partitions after the Spanning Tree reconfigures.

Port Priority-- Normally the Bridge Port priority in Spanning Tree topologies is imposed by the Root Bridge and the applicable values of the Path Cost to the Root Bridge.
When concurrent bridge ports of a single bridge unit are connected in a loop, this parameter enables you to influence which port should be included in the Spanning Tree.

Valid Values:	0 - 255
Default:	128

A lower value makes a port more likely to become selected in the Spanning Tree than the concurrent one that has a higher numerical value.
A higher value makes a port less likely to be selected in the Spanning Tree than a port with a lower numerical value.

Path Cost-- The Path Cost value is used to determine the preferred data paths between bridges throughout the network and the root bridge.
The Root Bridge transmits BPDU messages throughout the Local Area Network. When a bridge unit receives a BPDU message at one of its ports, it will add the value in the Path Cost field for that port to the value in the Root Path Cost Field of the BPDU message before forwarding the message again. This will help the other bridges to determine the Total Path Cost to the Root Bridge via this port.

Valid Values:	0 - 255
Default:	100

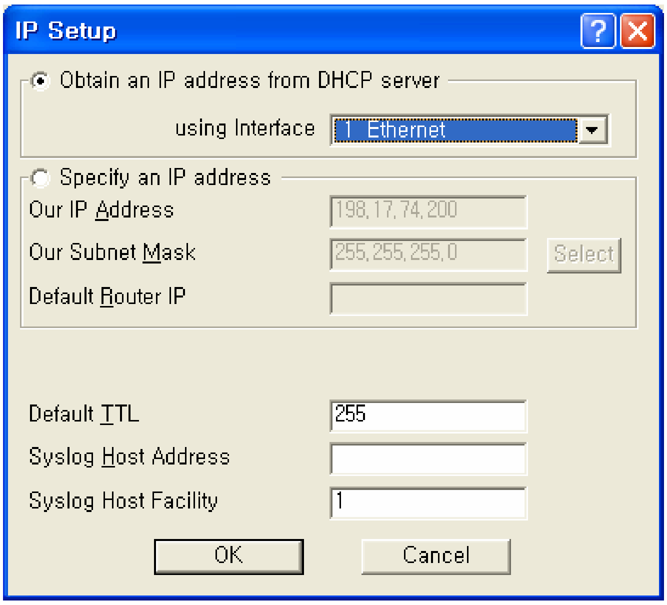
A lower Path Cost value would typically be used for ports to LAN segments closer to the Root Bridge.
A higher Path Cost value would typically be used for ports to LAN segments that are the "leafs" of the Spanning Tree.
For example, when using the Secure Data Mode Station as an access point for wireless stations to the Ethernet, a high Path Cost for the wireless interface will minimize unnecessary use of the bandwidth for the wireless medium (recommended value 255).
When using Secure Data Mode Stations in a wireless point-to-point link to interconnect two LAN segments, a low Path Cost for the wireless interface will prioritize this link as compared to other physical links, such as a leased line or low-bandwidth connections.

Set Up IP for APU and CSU

The IP Setup screen allows you to set the Secure Data Mode Station's IP Addressing information. The Secure Data Mode Station must have an IP address assigned to it if you wish to connect to it using the Configuration tool, which makes use of SNMP to connect to the Secure Data Mode Station.

Note: This screen is only available when the Enable IP Routing, Enable Outgoing Network Address Translation, and Enable Incoming Network Address Translation checkboxes been de-selected on the General Setup screen.

Figure 4-52
IP Setup window



IP Setup

● Obtain an IP address from DHCP server

using Interface: 1 Ethernet

○ Specify an IP address

Our IP Address: 198.17.74.200

Our Subnet Mask: 255.255.255.0

Default Router IP:

Default TTL: 255

Syslog Host Address:

Syslog Host Facility: 1

You can choose to set up the base station to obtain an IP address from DHCP server. If you select this option, you must also choose the interface on which you would like the base station to send the request. This option causes your base station to send a broadcast request for its IP address, subnet mask, and default router over the given interface at base station startup time. If you select the DHCP option, it is recommended (though not required) that you set up your DHCP server to always provide the same IP address to this Secure Data Mode Station system.

You can also manually specify an IP Address to set the IP Address for the base station yourself:

You can set the life expectancy for packets originating from this Secure Data Mode Station using the Default TTL (Time to Live) field.

You can use syslog messages to log information such as logins, service errors and general configuration information. Since there is no storage on a base station, a general purpose computer is needed to log these messages. To set the syslog host that will accept syslog messages, use the Syslog Host Address and Syslog Host Facility fields.

Obtain an IP Address from DHCP Server-- Select this radio button if you wish to obtain an IP address from the DHCP Server.

If you select this option, you must also choose the interface on which you would like the base station to send the request. This option causes your base station to send a broadcast request

For its IP address, subnet mask, and default router over the given interface at base station startup time. If you select the DHCP option, it is recommended (though not required) that you set up your DHCP server to always provide the same IP address to this Secure Data Mode Station system.

Using Interfaces-- Select the interface for which you wish to obtain an IP address. A base station has several network interfaces to which it may be connected. The network interfaces are numbered (1, 2, 3...), and the interface numbers may be found by selecting Interface Setup from the Setup Menu.

Specify an IP Address-- Select this radio button if you wish to enter an IP address manually.

Our IP Address-- This is the address of the Secure Data Mode Bridge/Router itself. If you wish to configure or monitor your Secure Data Mode Bridge/Router, or if your network supports IP and you wish to enable the Ping support and IP/SNMP support of the Secure Data Mode Bridge/Router, set this to a valid IP address. After setting this address to 0.0.0.0, enter the IP address of the base station.
Please note that unless you enable IP Routing on the IP Router Setup screen, the Bridge/Router is not an IP router. It has only one IP address, and that address applies to both the remote and local networks (i.e., both sides of the Bridge). Having two Ethernet interfaces with the same IP address is different than a standard IP host, but is appropriate for a Transparent Bridge. The Ethernet address of both interfaces is also the same.

Note: This field is only enabled when the Specify an IP Address radio button has been selected.

Our Subnet Mask-- Enter the subnet mask for the base station.

Note: This field is only enabled when the Specify an IP Address radio button has been selected.

Default Router IP-- Enter the IP address of the router.

Note: This field is only enabled when the Specify an IP Address radio button has been selected.

Select Button-- Clicking this button displays the IP Mask List screen, which allows you to select a particular IP mask.

IP Mask List-- The IP Mask List window displays a list of common IP subnet masks for a given size IP subnet.

Default TTL-- The Time To Live (TTL) counter avoids endless forwarding of message frames with incorrect addressing by defining a maximum number of hops a packet can take. Each time the frame is forwarded by a router, the TTL counter decreases by one.
When the TTL = 0, the frame is rejected.

Syslog Host Address-- Syslog messages can be used to log information such as logins, service errors and general configuration information. Since there is no storage on a base station, a general purpose computer is needed to log these messages.
The Syslog Host Address is the IP Address of the system which accepts "syslog" system logging packets from the base station.

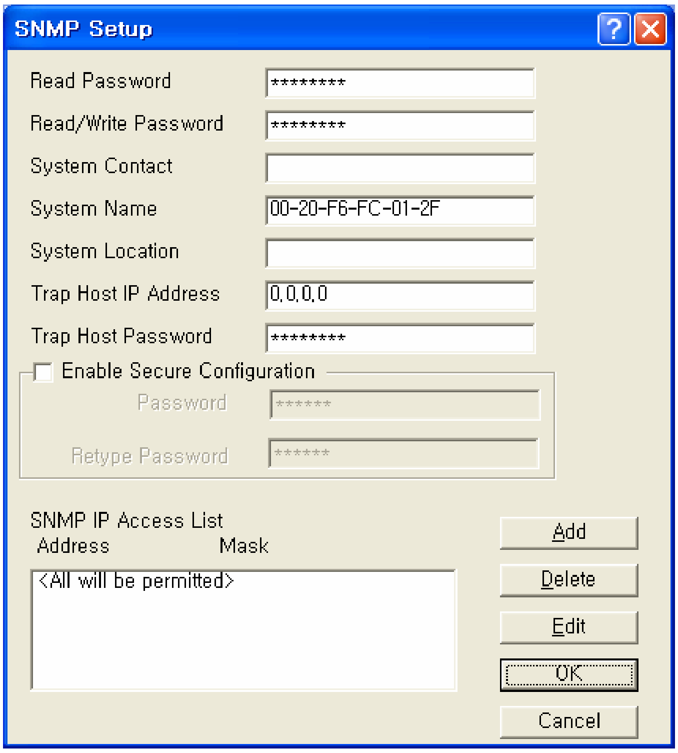
Syslog Host Facility

Syslog messages can be used to log information such as logins, service errors and general configuration information. Since there is no storage on a base station, a general purpose computer is needed to log these messages.
The Syslog Host Facility describes the part of the system generating the syslog message, and in UNIX-based systems usually uses one of the following keywords: auth, authpriv, cron, daemon, kern, lpr, mail, mark, news, syslog, user, uucp, and local0 through local7.
The base station is capable of sending messages using the local0-local7 facilities. Enter the correct syslog facility number (0-7) that corresponds to the local facility type on your syslog host.

Set Up SNMP

The SNMP Setup screen allows you to manage a network environment that includes multiple base stations where you can use the Simple Network Management Protocol (SNMP).
SNMP setup allows you to create multiple authorization levels for network management that are password protected.

Figure 4-53
SNMP Setup window



SNMP Setup

Read Password	*********
Read/Write Password	*********
System Contact	
System Name	00-20-F6-FC-01-2F
System Location	
Trap Host IP Address	0.0.0.0
Trap Host Password	*********

□ Enable Secure Configuration

Password	******
Retype Password	******

SNMP IP Access List

Address	Mask
<All will be permitted>	

Read Password-- This password enables you to create a network management level where a local LAN Administrator can view, but not modify, the SNMP parameters.

Read/Write Password-- This password enables you to create a network management level where only a Network Supervisor knowing the right Read/Write password will be able to view or modify the SNMP parameters.

Contact-- Optionally, enter the name or address of the Network Administrator.

System Name-- Optionally, enter the logical location of a base station (for example, the network segment to which the base station has been connected).

System Location-- The optional field to identify the physical location of a base station. For example, the building or room where the base station is located at

Trap Host IP Address-- The IP Address of the network management station that collects the SNMP Trap messages.

The Trap Host is the station in an SNMP managed network where SNMP trap messages are collected. Trap messages are sent to the trap host when certain events occur, such as rebooting.

Trap Host Password-- The Trap Host is the station in a SNMP managed network where SNMP trap messages are collected. Trap messages are sent to the trap host when certain events occur, such as rebooting.

Enter a password that corresponds to the password set at the Trap Host to filter unsolicited or unauthorized SNMP Trap messages at the Trap Host.

The Trap Host IP Password will be embedded in the SNMP Trap messages sent by this base station. If the Trap Host receives a message without or with an unknown password, the Trap message will be ignored.

SNMP IP Access List-- The SNMP IP Access List displays the IP addresses and subnet masks of those stations that you have designated as stations that will manage networks using SNMP.

In addition to the Read and Read/Write passwords, you can use the SNMP Access List to prevent unauthorized users from modifying the SNMP setup of your base stations.

The SNMP IP Access List enables you to authorize SNMP management to a restricted group of SNMP Management stations identified by:

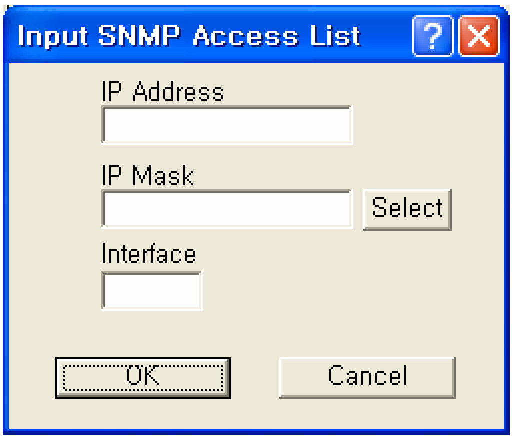
- The unique IP address of the Management Station(s)
- The interfaces via which the base station will be accessed.

Click the Add button to display the Input SNMP Access List to add new IP addresses to the list.

Input SNMP Access List Dialog - Overview

Clicking the Add button displays the SNMP Access List Dialog, which allows you to enter the IP addresses and subnet masks of those stations that you have designated as stations that will manage networks using SNMP.

Figure 4-54
Input SNMP Setup window



IP Address-- The unique IP address of the SNMP management station you wish to add or edit.

IP Mask-- Enter the Subnet mask, or clicks the Select button to display the IP Mask List and select a mask from the list.

Note: A subnet mask value of 255.255.255.255 will authorize only the station with the address specified in the IP address. A subnet mask value of 255.255.255.0 will authorize all stations that have an IP address within the range of that particular subnet (the IP address field will display the value xxx.xxx.xxx.0).

Warning: The subnet mask value 0.0.0.0 will authorize any station to view or modify SNMP IP setup of the base station via the interface identified in the Interface field.

Interface-- The number of the interfaces over which packets on this route is sent.

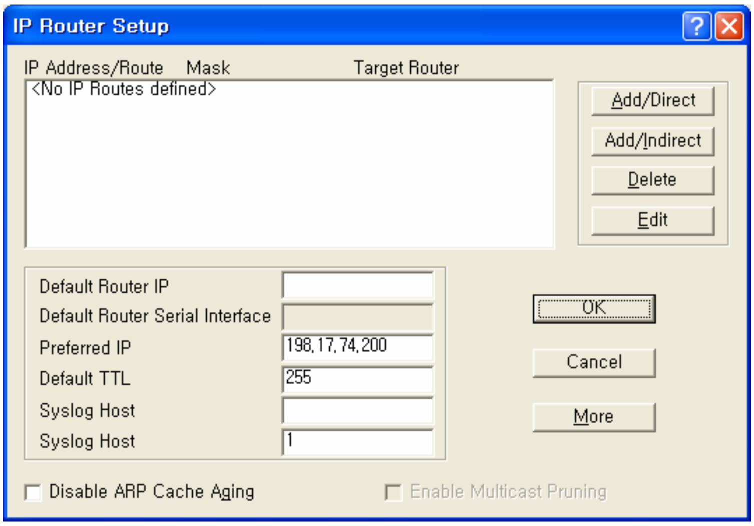
Select Button-- Clicking this button displays the IP Mask List screen, which allows you to select a particular IP mask.

Set Up IP Routing

The IP Router Setup screen is used to set up IP Routing. This enables the base station to send IP packets to the appropriate subnet or router. Once you have set up the basic IP Router configuration, you may also want to set up the following optional components:

Note: This option is only available if the Enable IP Routing checkbox on the General Setup screen has been selected.

Figure 4-55
IP Router Setup window



IP Address/Route Mask Target Router

<No IP Routes defined>

Default Router IP

Default Router Serial Interface

Preferred IP 198.17.74.200

Default TTL 255

Syslog Host

Syslog Host 1

□ Disable ARP Cache Aging

□ Enable Multicast Pruning

IP Route List

This pane displays the list of IP Routes that this Router has been configured to use. To add additional direct or indirect routes, click on the Add/Direct or Add/Indirect buttons.

Table 4-6
IP Route List

IP Route List	This pane displays the list of IP Routes that this Router has been configured to use. To add additional direct or indirect routes, click on the Add/Direct or Add/Indirect buttons.
Mask	The Subnet Mask of the IP Address, which shows which addresses should be routed using this route.
Target	For a Direct Route, the word Direct appears in this field. For an Indirect Route, this field shows the Default Router.
Interface/Cost	For direct routes, the interface to use when sending packets using this route. For indirect routes, the cost metric of using this route (used to determine the best route to use for a given packet).

Default Router IP Address-- Enter the IP Address of the router that the base station should use to communicate with networked devices outside its current subnet.

Default Router Serial Interface-- The Secure Data Mode station has several network interfaces to which it may be connected. An interface number is required for the Secure Data Mode station to know which interface to use to send packets addressed to a given destination. This field displays the serial interface that the router will use by default.

Preferred IP Address-- From time to time, the Secure Data Mode Bridge/Router will transmit unsolicited IP packets such as SNMP traps, Syslog, RIP, or IP/ARP packets. Most routers randomly use one of the IP addresses from one of the router interfaces as the source IP address for these packets. However, in the Preferred IP Address field, you can specify the source IP address that you prefer to use for these packets.

Default TTL-- The Time To Live (TTL) counter avoids endless forwarding of message frames with incorrect addressing by defining a maximum number of hops a packet can take. Each time the frame is forwarded by a router, the TTL counter decreases by one. When the TTL = 0, the frame is rejected.

Syslog Host Address-- Syslog messages can be used to log information such as logins, service errors and general configuration information. Since there is no storage on a base station, a general purpose computer is needed to log these messages.

The Syslog Host Address is the IP Address of the system that accepts "syslog" system logging packets from the base station.

Syslog Host Facility-- Syslog messages can be used to log information such as logins, service errors and general configuration information. Since there is no storage on a base station, a general purpose computer is needed to log these messages.
The Syslog Host Facility describes the part of the system generating the syslog message, and in UNIX-based systems usually uses one of the following keywords: auth, authpriv, cron, daemon, kern, lpr, mail, mark, news, syslog, user, uucp, and local0 through local7.

The base station is capable of sending messages using the local0-local7 facilities. Enter the correct syslog facility number (0-7) that corresponds to the local facility type on your syslog host.

Disable ARP Cache Aging-- Select this checkbox to stop the Address Resolution Protocol (ARP) table from removing entries after a certain period of time. The IP ARP table relates each (wired or wireless) station's IP address to its physical MAC Address so the base station knows how to address Ethernet messages bound for a particular IP Address. If you disable (uncheck) ARP cache aging, the base station will not remove entries from this table, and it may fill up over time. The base station can hold up to 10,000 entries in the ARP table.

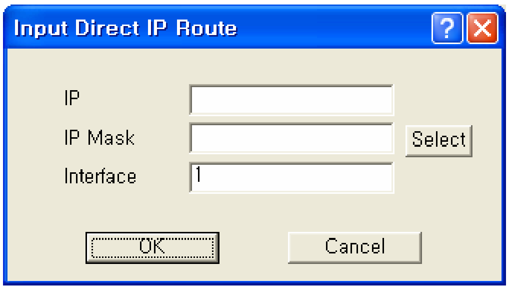
Enable Multicast Pruning-- Select this checkbox if you want to enable multicast pruning.

IP multicast is a bandwidth-conserving technology that reduces traffic by simultaneously delivering a single stream of information to potentially thousands of corporate recipients and homes.
Without multicast pruning, multicast traffic is treated in the same manner as broadcast traffic. That is, it is forwarded to all ports. However, with multicast pruning, you choose to permit only the packets that are a part of multicast group in your network. Multicast pruning generates no additional network traffic, allowing you to significantly reduce multicast traffic passing through your switch.

Add Direct IP Routes

Clicking the Add/Direct button displays the Add Direct IP Route screen, which allows you to add new direct IP routes.
When the Secure Data Mode station has two or more IP subnets directly attached to its different interfaces, it can route IP packets between those subnets using a direct route. This screen is used to specify the direct routes for each of the interfaces on the Secure Data Mode Bridge/Router. A direct route consists of an IP address, which specifies the basic IP address to route, a Subnet Mask which defines the basic class of IP addresses that will be routed, and an interface number which specifies where the IP subnet is attached. When IP packets addressed to a system arrives at the Secure Data Mode station, the Secure Data Mode station will send it directly to the target machine on the interface specified.

Figure 4-56
Direct IP Route Setup window



Input Direct IP Route

IP
IP Mask
Interface 1

IP Address-- The IP address specifies the basic IP address to route.

IP Mask-- The Subnet Mask which defines the basic class of IP addresses that will be routed. Clicking the Select button displays the IP Mask List, which the shows the IP Masks that can be used as public or private IP masks for IP routing. The list consists of all possible subnet masks, and represents the range of addresses that will be translated.

Interface-- An interface number specifies where the IP subnet is attached.

Add Indirect IP Routes

The Add Indirect IP Route screen is used to add indirect IP routes.

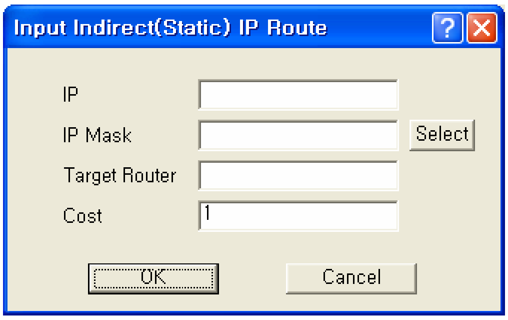
When the base station needs to send IP packets between IP subnets which are not directly connected to one of its interfaces (i.e., not on the same network segment), it must have an indirect route for sending those packets.

An indirect route consists of:

- An IP Address which specifies the basic IP address to route,
- A Subnet Mask which defines the class of IP addresses that will be routed,
- A Target Router that will relay the IP packet, and
- A Cost value, which specifies the number of "hops" required for the indirect route.

When an IP packet addressed to a system on the indirectly routed subnet arrives at the base station, the base station will route it over the interface specified to the Target Router to be further routed.

Figure 4-57
Indirect IP Route Setup window



Cost 1

IP Address-- The IP Address which specifies the basic IP address to route.

IP Mask-- Enter the IP subnet mask for the IP address to be routed, or click the Select button and choose a subnet mask from the list. Clicking the Select button displays the IP Mask List, which the shows the IP Masks that can be used as public or private IP masks for IP routing. The list consists of all possible subnet masks, and represents the range of addresses that will be translated.

Target Router-- Enter the IP address of the router that you wish to use as the target router.

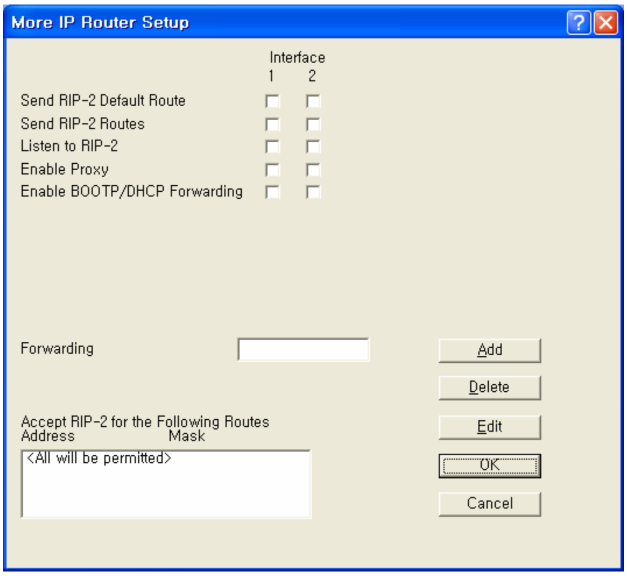
A target router is the IP address of the router that knows how to handle the IP packet that is being routed. When used in indirect routes, it could specify the router that is attached directly to the subnet of the packet's final destination, or a router that knows where to send it.

Cost-- The cost value reflects the number of "hops" required for the connection. The default value of 1 indicates that only one "hop" is required. The lower the cost value, the more likely that route will be chosen.

Advanced IP Routing Setup

The More IP Router Setup screen is used to set up advanced IP router interfaces.

Figure 4-58
Advanced IP Routing Setup window



More IP Router Setup

	Interface 1	Interface 2
Send RIP-2 Default Route	□	□
Send RIP-2 Routes	□	□
Listen to RIP-2	□	□
Enable Proxy	□	□
Enable BOOTP/DHCP Forwarding	□	□

Forwarding

Accept RIP-2 for the Following Routes

Address	Mask
<All will be permitted>	

Send RIP-2 Default Route-- If the base station sends the Routing Information Protocol (RIP) default route (0.0.0.0) to other routers and hosts attached to a particular interface, select that interface's checkbox on the Send RIP Default Route line. By default, the base station will not send the Default Route on a particular interface unless this box is checked.

In the example shown in the screenshot, the base station will send RIP routes only on interfaces 1 and 2.

Send RIP-2 Routes -- If the base station should SEND Routing Information Protocol (RIP) Routes for routes of which it has knowledge to other routers on a particular interface, select that interface's checkbox on the Send RIP Routes line. By default, the base station will not send RIP Routes on a particular interface unless this box is checked.
For the given example, the base station will send RIP Routes only on interface 1.

Listen to RIP-2-- If the base station should ACCEPT Routing Information Protocol (RIP) routes from other routers on a particular interface, select that interface's checkbox on the Listen to RIP line. By default, the Secure Data Mode Station will not accept RIP Routes from other routers, so you must select the interfaces if you wish to listen to RIP. For the given example, the Secure Data Mode Station will listen to RIP Routes on Interfaces 1 and 2, but will not accept RIP routes sent to it on interface 3.

Enable Proxy ARP-- Enabling Proxy ARP for a particular interface tells the base station that when it receives an ARP request for a particular client connected by that interface, that the base station itself should respond to the ARP Request, fulfilling the request with information that is in its IP ARP Table.

For example, Proxy ARP is enabled on interface 2. The IP ARP Table contains (among others) the following entry:

Table 4-7
IP ARP Table

Interface	**Physical Address**	**IP Address**	**Media Type**
2	00:60:1d:04:4d:88	10.7.3.5	dynamic

Since Proxy ARP is enabled for interface 2, when the base station receives a broadcast ARP Request for 10.7.3.5, instead of passing the ARP on to 10.7.3.5, the base station will answer the request with information its own IP ARP table, that is: IP Address 10.7.3.5 -> MAC Address 00:60:1d:04:4d:88.

Proxy ARP is useful in many situations to reduce unnecessary network traffic, but is especially useful when you have clients in power-save mode, to prevent them from being 'woken up' whenever an ARP is done.

Enable BOOTP/DHCP Forwarding -- Select the interfaces for which you would like the base station to forward BOOTP and DHCP requests on to the BOOTP/DHCP server, which is specified in 'Forwarding Host’. Forwarding BOOTP and DHCP requests is necessary when the BOOTP/DHCP clients are not on the same IP subnet as the BOOTP/DHCP server.

If you are using BOOTP/DHCP, forwarding should most likely be DISABLED for the interface through which the BOOTP/DHCP server is located, and ENABLED for the other interfaces.

In the displayed screen, the BOOTP/DHCP Server is located via interface 1, so forwarding is enabled for interfaces 2 and 3, since clients on interfaces 2 and 3 have no other way of accessing the BOOTP/DHCP server.

Forwarding Host -- If you have enabled BOOTP/DHCP forwarding for one or more interfaces, enter the IP address of the BOOTP/DHCP server or relay agent to which you should forward BOOTP/DHCP requests.

In this example, the BOOTP/DHCP Forwarding host is 10.2.3.1.

Accept RIP-2 for the Following Routes-- In addition to the other Advanced IP Router features which allow you to accept RIP routes from particular interfaces, you can specify which RIP Routes you would like to accept. You are also able to specify the interfaces from which you would like to accept those particular RIP Routes.

The base station will accept RIP only for three particular routes. In the More IP Router Setup screen, it was specified that the base station should listen to RIP Routes on interfaces 1 and 2. This section further specifies that the base station should listen to the following RIP Routes ONLY:

- 10.17.42.0 (mask 255.255.255.0) only if it comes from interface 1
- 10.20.24.0 (mask 255.255.248.0) only if it comes from interface 2
- 10.220.23.0 (mask 255.255.255.0) on any interface

All other RIP routes will be ignored.

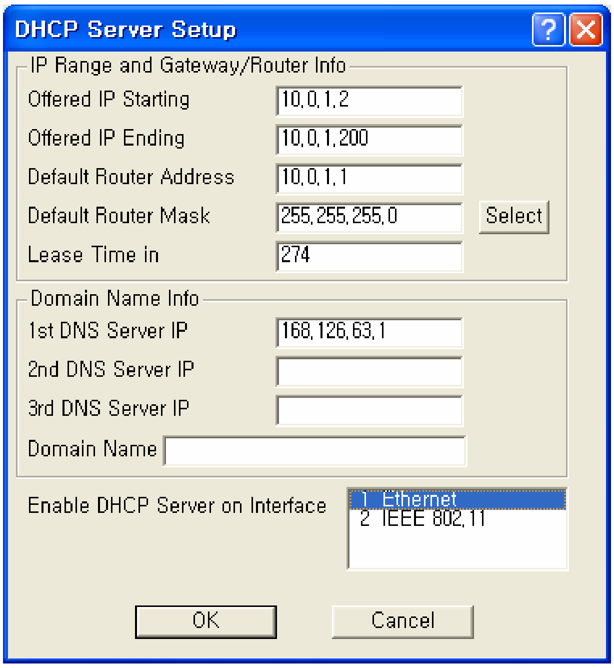
DHCP Server Setup

The DHCP Server Setup screen is used to set up the base station's Dynamic Host Configuration Protocol (DHCP) Server feature. The DHCP Server feature is a basic DHCP Server that can enable any and all wireless (or other) clients that connect to the base station to obtain their IP Address information from this Secure Data Mode.

Warning: If you have set up the base station to Obtain IP Address from DHCP Server on the IP Host Setup screen, do not enter anything in the Domain Name Info section of this screen. When the base station gets its own IP Address by DHCP, it will automatically determine the correct Domain Name information. You should, however, set up the IP Range and Gateway/Router Info section and select the correct interface.

Note: This screen is only available when the Enable DHCP Server checkbox has been selected on the General Setup screen.

Figure 4-59
DHCP Server Setup window



DHCP Server Setup

IP Range and Gateway/Router Info

Offered IP Starting: 10.0.1.2

Offered IP Ending: 10.0.1.200

Default Router Address: 10.0.1.1

Default Router Mask: 255.255.255.0

Lease Time in: 274

Domain Name Info

1st DNS Server IP: 168.126.63.1

2nd DNS Server IP:

3rd DNS Server IP:

Domain Name:

Enable DHCP Server on Interface: 1 Ethernet (selected), 2 IEEE 802.11

Offered IP Address-- Enter the beginning and ending IP addresses for the IP address range that the Secure Data Mode Station should offer to DHCP clients. When DHCP requests are received by the Secure Data Mode Station, it will offer the IP Starting Address to the first client, and increment the IP address offered to each consequent DHCP client until it reaches the IP Ending Address. IP Address leases must be renewed by the DHCP client within the given Lease Time, or the IP Address will be made available to another client.

Note: The Secure Data Mode Station does NOT store DHCP address assignments between restarts. If the Secure Data Mode Station is rebooted, it will ARP for each address in the provided address range, recording which client is using which IP address.

Note: Be careful not to include the default router's IP address in the Offered IP Address range.

Default Router Address-- Enter the default router IP address for the Secure Data Mode Station's DHCP clients.

Note: The default router IP address must be outside of the range defined by the Offered IP Starting Address and Offered IP Ending Address.

Default Router Mask-- Enter the subnet mask for the default router, or click the Select button to display the IP Mask List, and select a subnet mask from the list.

Lease Time in Minutes-- A DHCP lease is the amount of time that the DHCP server grants permission to the DHCP client to use a particular IP address. Enter the lease time (in minutes) for your DHCP server.

DNS Server IP Addresses-- Enter the IP address for the DNS server.

Warning: If you have set up the base station to Obtain IP Address from DHCP Server on the IP Host Setup screen, do not enter any DNS server IP addresses or a domain name. When the base station gets its own IP Address by DHCP, it will automatically determine the correct Domain Name information. You should, however, set up the IP Range (IP starting and ending addresses) and Gateway/Router Info section and select the correct interface.

Domain Name-- Enter the name of the domain.

Warning: If you have set up the base station to obtain IP Address from DHCP Server on the IP Host Setup screen, do not enter any DNS server IP addresses or a domain name. When the base station gets its own IP Address by DHCP, it will automatically determine the correct Domain Name information. You should, however, set up the IP Range (IP starting and ending addresses) and Gateway/Router Info section and select the correct interface.

Enable DHCP Server on Interface-- Select the interface on which you wish to enable the DHCP server.

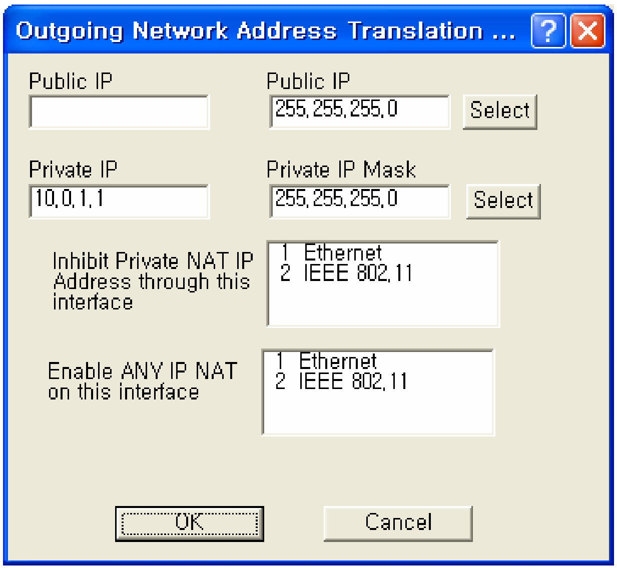
Set Up Outgoing Network Address Translation (NAT)

Outgoing Network Address Translation (NAT) allows multiple computers to share a single IP address to connect to an IP network, including the Internet. This allows homes, small businesses, and Internet Service Providers to have Internet service for all of their computers without having to pay for additional IP addresses. The NAT feature serves as a simple firewall for incoming connections, since only traffic initiated by an interior computer is permitted through the NAT.
In the screen shown below, when the client 10.0.1.1 wants to send data to the Internet, the access point will take the packet, replace the return address of 10.0.1.1 with 140.254.5.147, and then send the packet to the Internet. When a response comes from the Internet, the access point sends it to the correct client in the local address space.

Note: This screen is only available when the Enable Outgoing NAT checkbox has been selected on the General Setup screen.

Note: You do not need to turn on Outgoing NAT if you are using Incoming NAT, and vice versa. Incoming NAT only needs to be configured if servers in the local (private) address space need to connect with clients in the global (public) address space.

Figure 4-60
Outgoing NAT Setup window



Outgoing Network Address Translation ...

Public IP:

Public IP: 255.255.255.0

Private IP: 10.0.1.1

Private IP Mask: 255.255.255.0

Inhibit Private NAT IP Address through this interface:
1 Ethernet
2 IEEE 802.11

Enable ANY IP NAT on this interface:
1 Ethernet
2 IEEE 802.11

Public IP Address-- The IP address/mask seen by the external network.

Note: The IP address and subnet mask must be the same as the one in the IP Setup dialog under the Setup menu.

Public IP Mask-- The IP mask seen by the external network.

Note: The IP address and subnet mask must be the same as the one in the IP Setup dialog under the Setup menu.

Select IP Mask Button-- Clicking this button displays the IP Mask List, which the shows the IP Masks that can be used as public or private IP masks for outgoing NAT. The list consists of all possible subnet masks, and represents the range of addresses that will be translated.

Private IP Address-- The IP address that is seen by the local/internal network.

Note: The IP will be combined with the subnet mask, and the range of addresses that results will be translated. This range of IP set must match the addresses of the clients that connect to the base station.

Private IP Mask-- The IP mask that is seen by the local/internal network.

Note: The IP will be combined with the subnet mask, and the range of addresses that results will be translated. This range of IP set must match the addresses of the clients that connect to the base station.

Inhibit Private NAT IP Address through this interface

This option allows you to select one or more interfaces in which NAT will not be permitted. By default, no interfaces are selected. To select more than one interface, hold down the <Ctrl> key and click the names of the interfaces you wish to inhibit. Typically, you will inhibit the public interfaces because you will generally have users behind the private side (i.e., the private side is NATed to the public side).

Therefore, you must inhibit the interface used on the public side, whichever it may be. For example, in the screen shown below, the Ethernet 10.* network is NATed to the 140.* public wireless network. Therefore, NAT must be inhibited on the public interface, in this case the 802.11b interface. To do this, you would select 802.11b from the list, and click the OK button.

Set Up Incoming Network Address Translation (NAT)

Incoming Network Address Translations (NAT) is used to redirect requests to servers in the local address space based on the port of the request. If, for example, the client at local address 10.0.1.2 is serving web pages, and a request comes to the access point on that port for a web session, then the request will be forwarded to the web server on 10.0.1.2. The server will respond with the web page to the address of the original request.

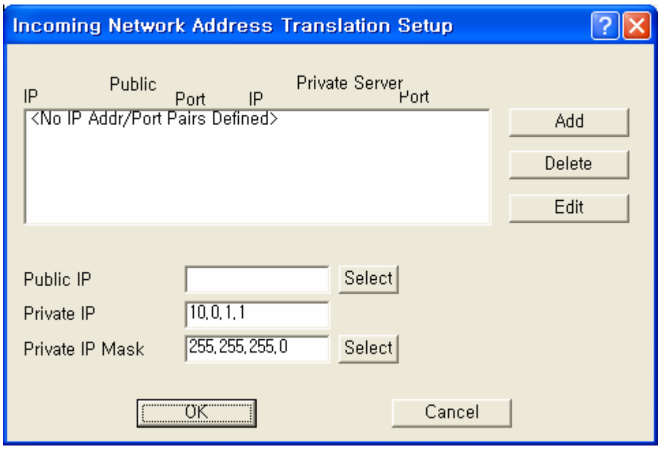
Note: This screen is only available when the Enable Incoming NAT checkbox has been selected on the General Setup screen.

Note: Incoming NAT only needs to be configured if servers in the local (private) address space need to connect with clients in the global (public) address space. You do not need to turn on Incoming NAT if you are using Outgoing NAT, and vice versa.

To set up incoming NAT:

1. From the Setup tab, select General Setup. The General Setup screen is displayed.
2. Make sure that the Enable IP Routing checkbox is unchecked.
3. Select the Enable Incoming Network Address Translation checkbox, and then click OK to close the General Setup screen.
4. Click the Incoming NAT button on the Setup tab. The Incoming Network Address Translation Setup screen is displayed, and any public and private IP address/port pairs that you have previously defined are displayed in the window.

Figure 4-61
Incoming NAT Setup window



<No IP Addr/Port Pairs Defined>

Public IP

Private IP 10.0.1.1

Private IP Mask 255.255.255.0

IP Addresses/Ports-- This window displays the public and private IP address/port pairs that you have previously defined.

Public IP Mask-- The public subnet mask for your local (internal) servers in the dialog. The public IP mask is paired with the Public IP address on the Input IP Address screen, as shown in the screens below.

Note: The public IP Mask must be the same subnet mask that was used in the setup of the external (or global) address of the base station.

Private IP Address-- The private IP address for your local (internal) servers in the dialog.

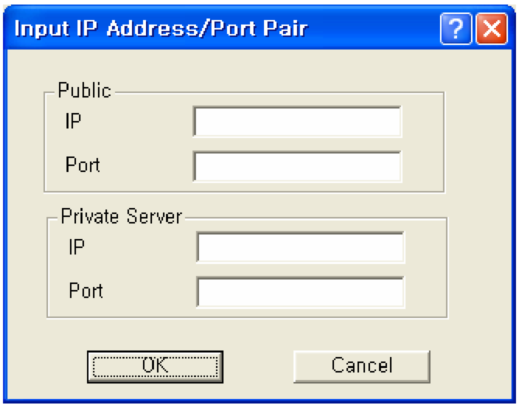
Note: The Private IP Address must be the same as the address and subnet mask that was selected for your internal network.

Private IP Mask-- The private subnet mask for your local (internal) servers in the dialog.

Note: The private IP Mask must be the same as the subnet mask that was selected for your internal network.

Add IP Address/Port Pairs-- Clicking the Add button displays the Add IP Address/Port Pair screen is used to add new pairs of incoming ports, and the IP address to which they should be directed.

Figure 4-62
Input IP address/Port (NAT) Setup window



Public IP Address-- The public IP address for the service you wish to use. On the incoming NAT, there can only be one public address. You can map ports to specific local servers, but you must use the same public IP address, as configured on the incoming NAT screen.

Note: The Public IP address is paired with the Public IP mask on the Incoming Network Address Setup screen, as shown in the screenshots below.

Public Port-- The public port for the service you wish to use. For a discussion of the ports on which well known services run, see http://www.tatanka.com/doc/technote/tn0081.htm.

Note: The public IP address must be the same for different local servers, but the port will be different (e.g. different ports for SMTP, FTP, web servers, etc.).

Private Server IP Address-- The local (private) IP address of the server to which the request should be forwarded.

Private Server Port-- The local (private) port on the server to which the request should be forwarded.

Set up IP/UDP/TCP Filters-- Select the Firewall option from the Setup Tab to set up the IP TCP/UDP firewall (filtering) features.

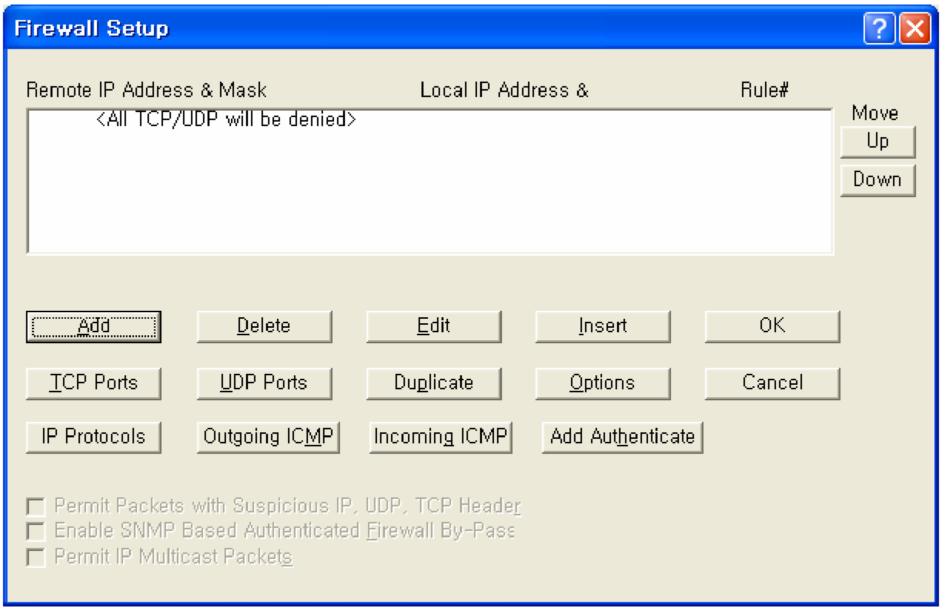
IP Firewalls are used to restrict access between (sub) networks to certain IP hosts, types of IP packets, or connections to certain ports. You can set up the firewall to completely block all external IP traffic, or restrict access to certain machines, ports, or packet types.

Note: You must select the Enable IP/TCP/UDP Security Filters checkbox on the General Setup screen in order to access this screen.

Remote IP Address and Mask-- This column of the TCP/UDP Filter List displays the IP Address and Subnet Mask of the (un-trusted) remote sub network or machine for which you have chosen to set up this IP UDP/TCP filter.

Local IP Address and Mask-- This column of the TCP/UDP Filter List displays the IP Address and Subnet Mask of the local sub network or machine that is being protected by this particular firewall filter.

Figure 4-63
Firewall Setup window



<All TCP/UDP will be denied>

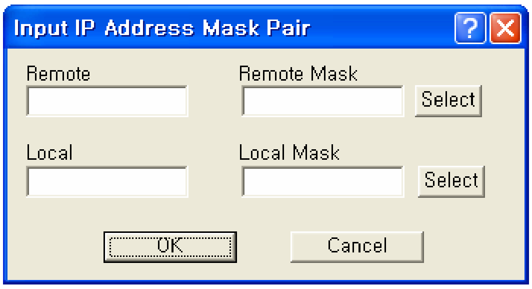
☐ Permit Packets with Suspicious IP, UDP, TCP Header
☐ Enable SNMP Based Authenticated Firewall By-Pass
☐ Permit IP Multicast Packets

Add/Edit IP Address Mask Pair

The Add/Edit IP Address Mask Pair screen is used to enter both the IP Address and Subnet Mask of both the local network (or machine) you would like to protect and the remote network (or host) you would like to protect it from.

A particular filter is applied only to traffic between the specific local and remote networks (or hosts) shown in the list. If you wish to filter all traffic, set the Remote IP Address and Subnet Mask both to '0.0.0.0'.

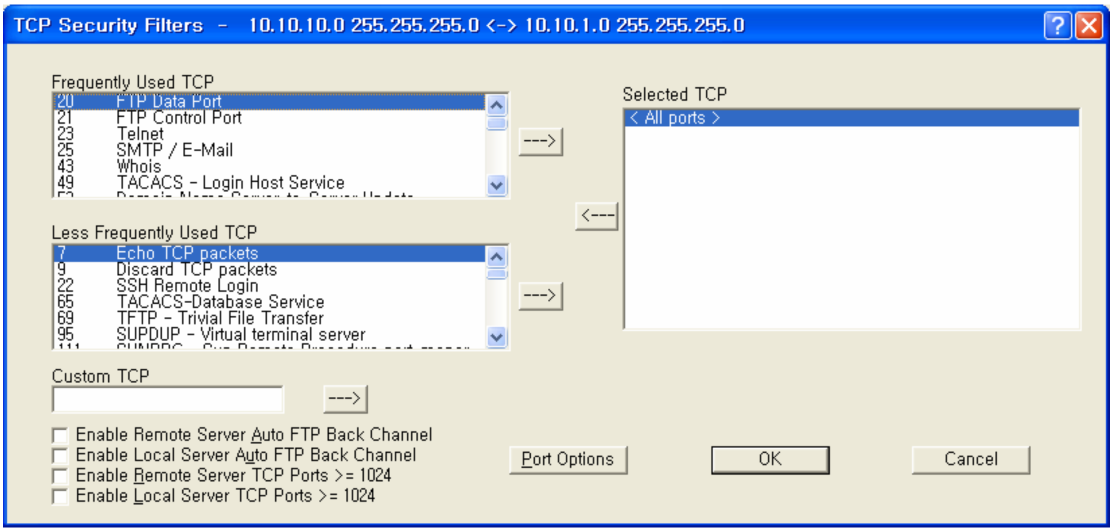
Figure 4-64
Input IP address (Firewall) Setup window



TCP Security Filters

To set the TCP ports to which a given filter will be applied, select the filter you want to modify in the TCP/UDP Filter List and click the TCP Ports button.

Figure 4-65
TCP Security Filter Setup window



TCP Security Filters - 10.10.10.0 255.255.255.0 <-> 10.10.1.0 255.255.255.0

Frequently Used TCP

20	FTP Data Port
21	FTP Control Port
23	Telnet
25	SMTP / E-Mail
43	Whois
49	TACACS - Login Host Service

Less Frequently Used TCP

7	Echo TCP packets
9	Discard TCP packets
22	SSH Remote Login
65	TACACS-Database Service
69	TFTP - Trivial File Transfer
95	SUPDUP - Virtual terminal server

Selected TCP

< All ports >

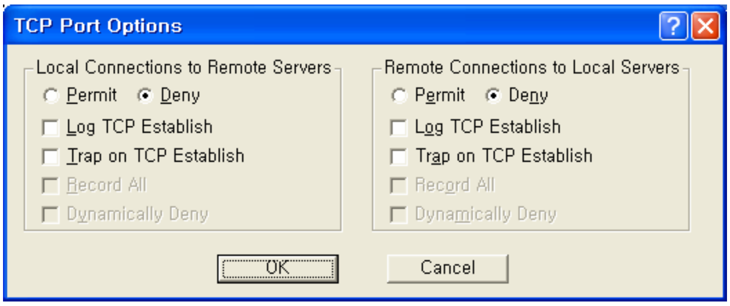
Custom TCP

☐ Enable Remote Server Auto FTP Back Channel
☐ Enable Local Server Auto FTP Back Channel
☐ Enable Remote Server TCP Ports >= 1024
☐ Enable Local Server TCP Ports >= 1024

TCP Port Options

Clicking the Port Options button on the TCP Security Filter screen displays the TCP Port Options screen. To set how the firewall filter is applied for a given port, select the port (or the line labeled 'All other ports') from the Selected TCP Ports list, and click on the 'Port Options' button. This will display the window below, which you can click on for more information. If you select the line 'All Other Ports' and then click the 'Port Options' button, you will see a screen similar to the one described in the UDP Port Options screen.

Figure 4-66
TCP Port Options Setup window



TCP Port Options

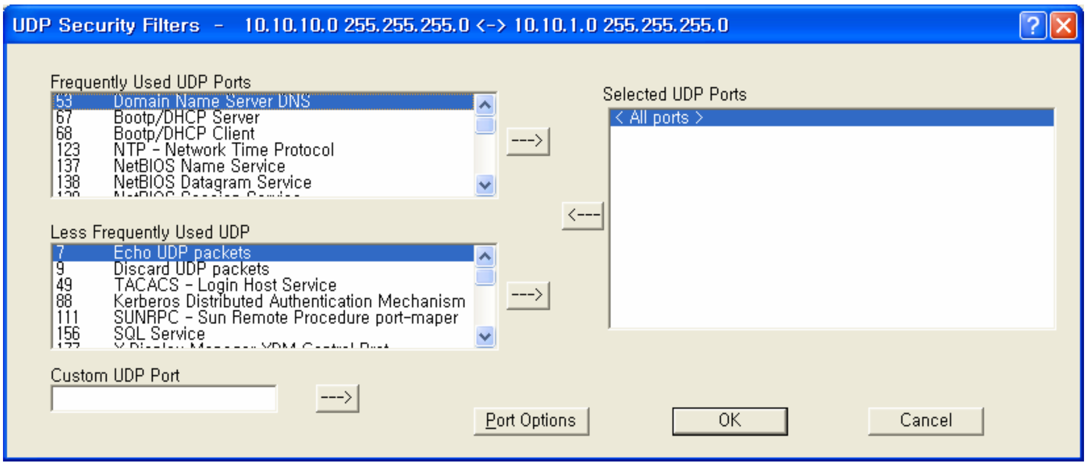
Local Connections to Remote Servers
○ Permit ● Deny
☐ Log TCP Establish
☐ Trap on TCP Establish
☐ Record All
☐ Dynamically Deny

Remote Connections to Local Servers
○ Permit ● Deny
☐ Log TCP Establish
☐ Trap on TCP Establish
☐ Record All
☐ Dynamically Deny

UDP Port Filters

To set the UDP ports to which a given filter will be applied, select the filter you want to modify in the TCP/UDP Filter List and click the 'UDP Ports' button.

Figure 4-67
UDP Port Options Setup window



UDP Security Filters - 10.10.10.0 255.255.255.0 <-> 10.10.1.0 255.255.255.0

Frequently Used UDP Ports

53	Domain Name Server DNS
67	Bootp/DHCP Server
68	Bootp/DHCP Client
123	NTP - Network Time Protocol
137	NetBIOS Name Service
138	NetBIOS Datagram Service

Less Frequently Used UDP

7	Echo UDP packets
9	Discard UDP packets
49	TACACS - Login Host Service
88	Kerberos Distributed Authentication Mechanism
111	SUNRPC - Sun Remote Procedure port-maper
156	SQL Service

Selected UDP Ports

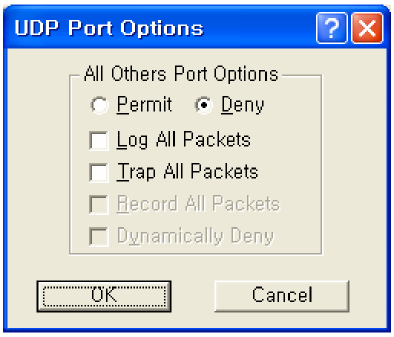
< All ports >

Custom UDP Port

UDP Port Options

Clicking the Portion Options button on the UDP Security Filters screen displays the UDP Port Options screen. To set how the firewall filter is applied for a given port, select the port (or the line labeled 'All other ports') from the Selected UDP Ports list, and click on the 'Port Options' button. The window displayed below is for the 'All Other Ports' line, which sets the filter settings for all ports not explicitly listed in the Selected UDP Ports list. See TCP Port Options for an example using a specific port.

Figure 4-68
UDP Port Options Setup window



UDP Port Options

All Others Port Options

○ Permit ● Deny

□ Log All Packets

□ Trap All Packets

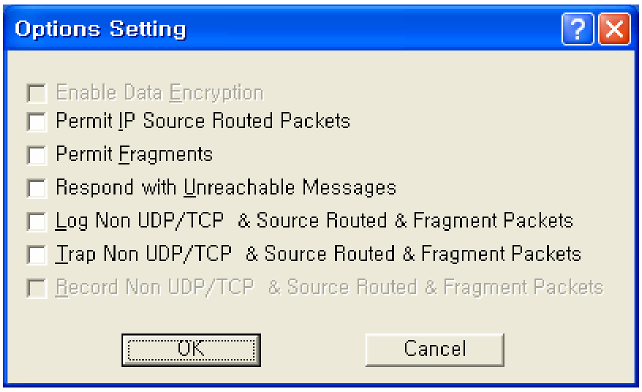
□ Record All Packets

□ Dynamically Deny

Firewall Setup Options

The Firewall Setup Options screen allows you to set handling options for a particular filter. Select the filter from the list on the Firewall Setup screen, and then click the Options button to display the following options. Alternately, you can simply double click the filter in the list to display the Firewall Setup Options screen.

Figure 4-69
Firewall Option Setup window



Options Setting

☐ Enable Data Encryption
☐ Permit IP Source Routed Packets
☐ Permit Fragments
☐ Respond with Unreachable Messages
☐ Log Non UDP/TCP & Source Routed & Fragment Packets
☐ Trap Non UDP/TCP & Source Routed & Fragment Packets
☐ Record Non UDP/TCP & Source Routed & Fragment Packets

Enable Data Encryption-- Select this option if you wish to enable the data in packets sent between the IP hosts or subnets specified in this filter to be encrypted/decrypted by the Secure Data Mode Station. This option is not available if Data Encryption is not enabled on the General Setup screen.

Permit Non UDP/TCP Packets-- Select this option if you would like the Secure Data Mode Station to allow IP packets that are neither TCP nor UDP, such as ICMP. The firewall does not have specific filters for IP protocols other than TCP, UDP, and ICMP. If you want to deny other relatively rare protocols, do not select this checkbox.

Permit IP Source Routed Packets-- Select this option if you want the Secure Data Mode Station to allow Source-Routed IP packets to the local hosts protected by this filter. Source-Routed packets contain routing information inside the packet headers, instead of allowing network routers to decide the best route for the packet. They are primarily used in network troubleshooting, but may be used to 'fool' the firewall that the packets are coming from a trusted host. We strongly recommend that you do not permit source routed packets.

Permit Fragments-- Select this option if you would like the Secure Data Mode Station to permit fragmented IP packets to be passed through the firewall. IP packets may be incorrectly fragmented, creating security problems for hosts that may not properly handle incorrectly fragmented IP packets.

Respond with Unreachable Messages-- Select this option if you want the Secure Data Mode Station to respond to remote hosts attempting to connect to local machines with Destination Unreachable messages when the connection is denied by this security filter.

Log Non UDP/TCP & Source Routed & Fragment Packets-- Select this option if you want to log to the syslog for all packets that are not UDP/TCP, are source-routed, or are fragmented.

Trap Non UDP/TCP & Source Routed & Fragment Packets-- Select this option if you want the Secure Data Mode Station to SNMP Trap messages whenever a non-TCP or non-UDP, Source Routed, or Fragmented IP packet is received by the Secure Data Mode Station. SNMP Traps are sent to the SNMP Trap Host specified in SNMP Setup.

Record Non UDP/TCP & Source Routed & Fragment Packets-- Select this option if you want the Secure Data Mode Station to record all packets that are not UDP/TCP, are source-routed, or are fragmented.

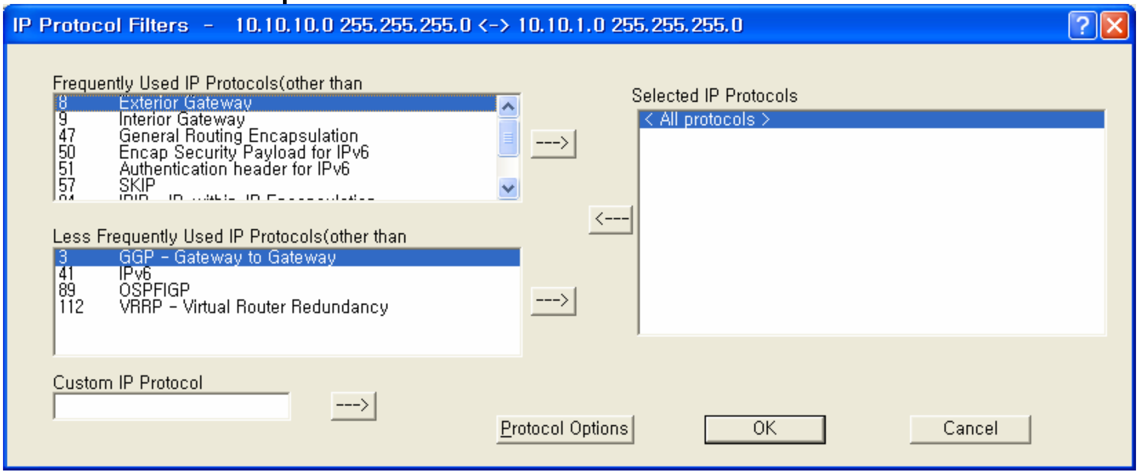
IP Protocol Filters

Clicking the IP Protocols button displays the IP Protocol Filters screen, which allows you to set the IP protocols to which a given filter will be applied. Select the filter you want to modify on the Firewall Setup screen, and click the IP Protocols button.

Less Frequently Used IP Protocols-- This list displays some of the less commonly used protocols that run over IP If you wish to filter one of these protocols, select it and click the [->] button. Then set the action to take using the Protocol Options button.

Selected IP Protocols-- Select one of the protocols added to the list and then click the Protocol Options button to set the action for this protocol. Select “All Protocols" or "All Other Protocols" to set a default action when a packet is received from a protocol for which no action has been defined.

Figure 4-70
IP Protocol Filter Setup window



IP Protocol Filters - 10.10.10.0 255.255.255.0 <-> 10.10.1.0 255.255.255.0

Frequently Used IP Protocols(other than

8 Exterior Gateway
9 Interior Gateway
47 General Routing Encapsulation
50 Encap Security Payload for IPv6
51 Authentication header for IPv6
57 SKIP

Less Frequently Used IP Protocols(other than

3 GGP - Gateway to Gateway
41 IPv6
89 OSPFIGP
112 VRRP - Virtual Router Redundancy

Custom IP Protocol

Selected IP Protocols

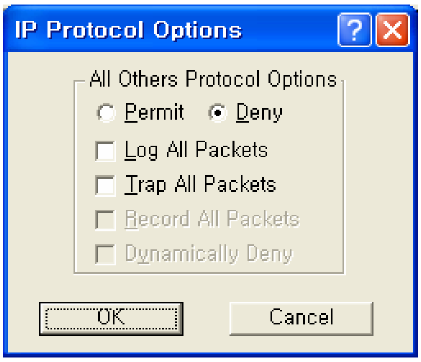
< All protocols >

Custom IP Protocol-- If you wish to explicitly allow or deny access to a given IP protocol not listed in the two panels above, you can add that protocol to the list by simply typing it in the Custom IP Protocol field and clicking on the right arrow button [->] next to the text field. You do not need to add a protocol to the list unless you have specific requirements for that particular protocol.

IP Protocol Options

Clicking the Protocol Options button displays the IP Protocol Options screen, which allows you to define an action to take when data using that protocol is sent or received. When you select a protocol to filter, you will need to define an action to take when data using that protocol is sent or received. Initially, you will need to indicate whether you wish to permit or deny that protocol. In addition, you can optionally choose to log, trap, or record all packets, and to dynamically deny all other protocols.

Figure 4-71
IP Protocol Option Setup window



All Others Protocol Options

○ Permit ● Deny

□ Log All Packets

□ Trap All Packets

□ Record All Packets

□ Dynamically Deny

Permit All Other Protocols Button-- Select this button if you wish to permit all other protocols.

Deny All Other Protocols Button-- Select this button if you wish to deny all other protocols.

Log All Packets-- Select this checkbox if you wish to log all packets.

Trap All Packets-- Select this checkbox if you wish to trap all packets.

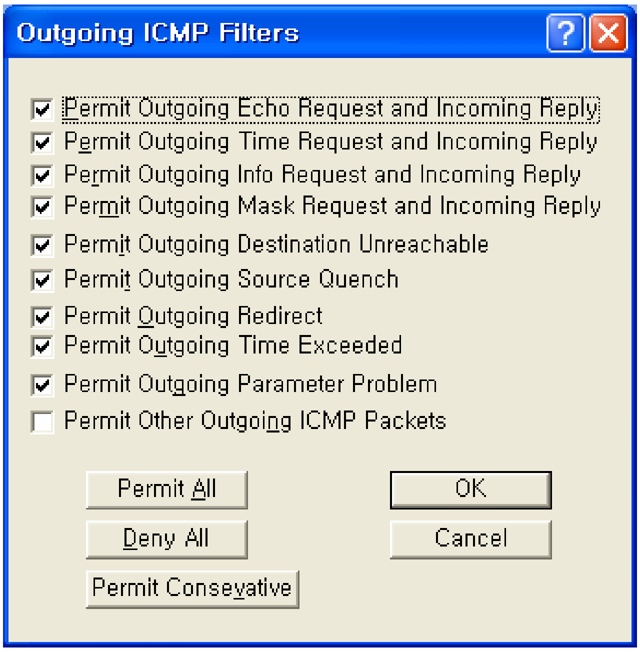
Record All Packets-- Select this checkbox if you wish to record all packets.

Dynamically Deny All Other Protocols-- Select this checkbox if you wish to dynamically deny all other protocols.

Outgoing ICMP Filters

Clicking on the Outgoing ICMP button on the Firewall Setup screen displays the Outgoing ICMP Filters screen, which allows you to permit or deny ICMP packets from going out from the local to remote interfaces. This allows you to deny diagnostic messages requested by internal (private) sources in this filter from being sent to external (un-trusted) machines.

Figure 4-72
Outgoing ICMP Filter Setup window



Outgoing ICMP Filters

☑ Permit Outgoing Echo Request and Incoming Reply
☑ Permit Outgoing Time Request and Incoming Reply
☑ Permit Outgoing Info Request and Incoming Reply
☑ Permit Outgoing Mask Request and Incoming Reply
☑ Permit Outgoing Destination Unreachable
☑ Permit Outgoing Source Quench
☑ Permit Outgoing Redirect
☑ Permit Outgoing Time Exceeded
☑ Permit Outgoing Parameter Problem
☐ Permit Other Outgoing ICMP Packets

Permit Outgoing Echo Request and Incoming Reply-- Permit Echo (ping) Requests sent from local stations to remote stations, and the remote stations' replies.

Permit Outgoing Time Request and Incoming Reply-- Permit local stations' Time Requests sent to remote stations and the replies from remote machines.

Permit Outgoing Info Request and Incoming Reply-- Permit local stations' Information Request packets sent to remote stations, and the remote stations' replies.

Permit Outgoing Mask Request and Incoming Reply-- Permit local stations' Mask Request packets sent to remote stations, and the remote stations' replies.

Permit Outgoing Destination Unreachable-- Permit Destination Unreachable packets generated on the (private) local network to be sent to external machines
Permit Outgoing Source Quench-- Permit Source Quench messages generated by gateways on the local network to be sent to remote machines sending packets to that gateway.

Permit Outgoing Redirect-- Permit Redirect messages generated by gateways on the local network to be sent to remote machines sending packets to that gateway.

Permit Outgoing Time Exceeded-- Permit Time Exceeded messages generated by gateways on the local network to be sent to remote machines sending packets to that gateway.

Permit Outgoing Parameter Problem-- Permit the local network to send Parameter Problem messages to the remote network when there was a problem with the header parameters of a packet.

Permit Other Outgoing ICMP Packets-- Permit other ICMP packets not listed above to be sent from the local network to the remote network.

Permit All Button-- Clicking this button selects all checkboxes on the Outgoing ICMP Filters screen.

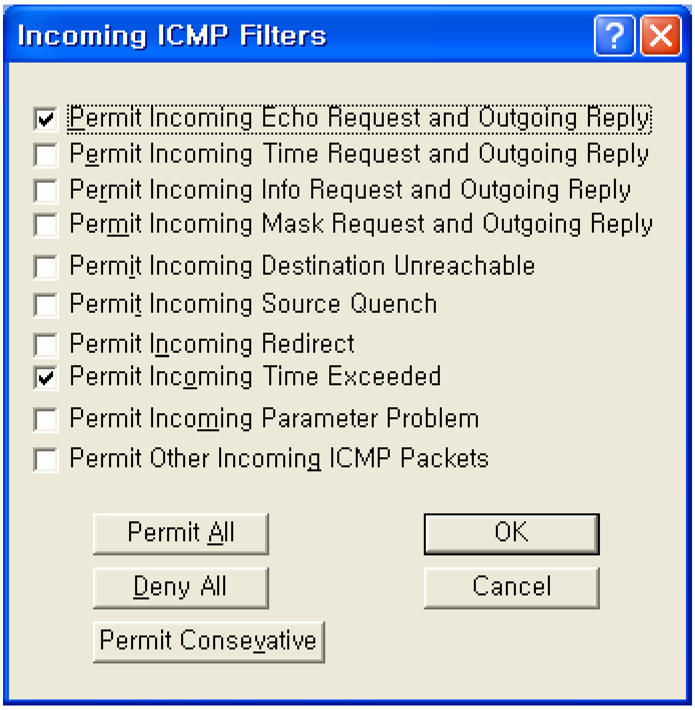
Deny All Button-- Clicking this button de-selects (un-checks) all checkboxes on the Outgoing ICMP Filters screen.

Permit Conservative Button-- Clicking this button automatically selects all checkboxes on the Outgoing ICMP Filters screen except for the Permit Other Outgoing ICMP Packets checkbox.

Incoming ICMP Filters

Clicking on the Incoming ICMP button on the Firewall Setup screen displays the Incoming ICMP Filter screen, which allows you to permit or deny ICMP packets from coming in from 'remote' to 'local' interfaces. This allows you to deny diagnostic messages requested from external (untrusted) sources in this filter from being sent to your local (private) machines.

Figure 4-73
Incoming ICMP Filter Setup window



☑ Permit Incoming Echo Request and Outgoing Reply
□ Permit Incoming Time Request and Outgoing Reply
□ Permit Incoming Info Request and Outgoing Reply
□ Permit Incoming Mask Request and Outgoing Reply
□ Permit Incoming Destination Unreachable
□ Permit Incoming Source Quench
□ Permit Incoming Redirect
☑ Permit Incoming Time Exceeded
□ Permit Incoming Parameter Problem
□ Permit Other Incoming ICMP Packets

Permit Incoming Echo Request and Outgoing Reply-- Permit Echo Requests sent from remote (un-trusted) computers to be sent to machines on the local (private) network, and allow the local machine to reply to them.
Permit Incoming Time Request and Outgoing Reply-- Permit Timestamp Requests sent from remote (un-trusted) computers to be sent to machines on the local (private) network, and allow the local machine to reply to them.

Permit Incoming Info Request and Outgoing Reply-- Permit Information Request packets sent from remote (un-trusted) computers to be sent to machines on the local (private) network, and allow the local machine to reply to them.

Permit Incoming Mask Request and Outgoing Reply-- Permit Mask Request packets sent from remote (un-trusted) computers to be sent to machines on the local (private) network, and allow the local machine to reply to them.

Permit Incoming Destination Unreachable-- Permit Destination Unreachable messages generated by remote computers to be sent to machines on the local network.

Permit Incoming Source Quench-- Permit Source Quench packets generated by gateways on the remote network to be sent to gateways on the local network.

Permit Incoming Redirect-- Permit ICMP Redirect packets generated by gateways on the remote network to be sent to machines on the local network.

Permit Incoming Time Exceeded-- Permit Time Exceeded messages generated by machines on the remote network to be sent to machines on the local network.

Permit Incoming Parameter Problem-- Permit Parameter Problem messages generated by machines on the remote network to be sent to machines on the local network.

Permit Other Incoming ICMP Packets-- Permit other ICMP packets not listed above to be sent from the (un-trusted) remote network to the (private) local network.

Permit All Button-- Clicking this button automatically selects all checkboxes on the Incoming ICMP Filters screen.

Deny All Button-- Clicking this button automatically de-selects (un-checks) all checkboxes on the Incoming ICMP Filters screen.

Permit Conservative Button-- Clicking this button automatically selects the following checkboxes on the Incoming ICMP Filters screen:

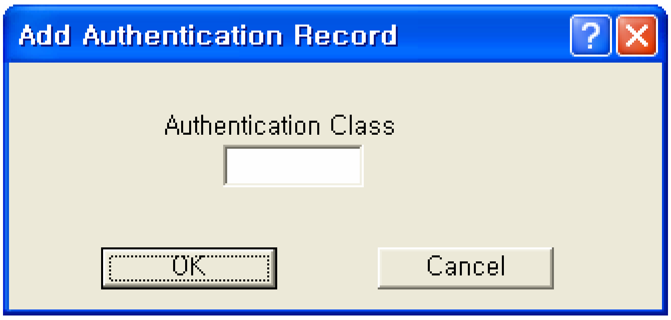
- Permit Incoming Echo Request and Outgoing Reply
- Permit Incoming Destination Unreachable

All other checkboxes are automatically de-selected (unchecked).

Add Authentication Record

The Add Authentication Record screen is used to add an SNMP-based username/password firewall authentication bypass class. The Authentication class works much like a UNIX user group does; you can specify what types of packets a person in this authentication class can pass through the firewall when logged in with the approved username and password.

Figure 4-74
SNMP Authentication Record Setup window



Authentication Class Number-- Enter a number for an SNMP-based username/password firewall authentication bypass class. The Authentication class works much like a UNIX user group does; you can specify what types of packets a person in this authentication class can pass through the firewall when logged in with the approved username and password.

Administration

The WLAN Cable Access Point 6220 (APU, CSU) has the following management and operational features listed below:

Save Configuration

Load new Configuration

Load new License

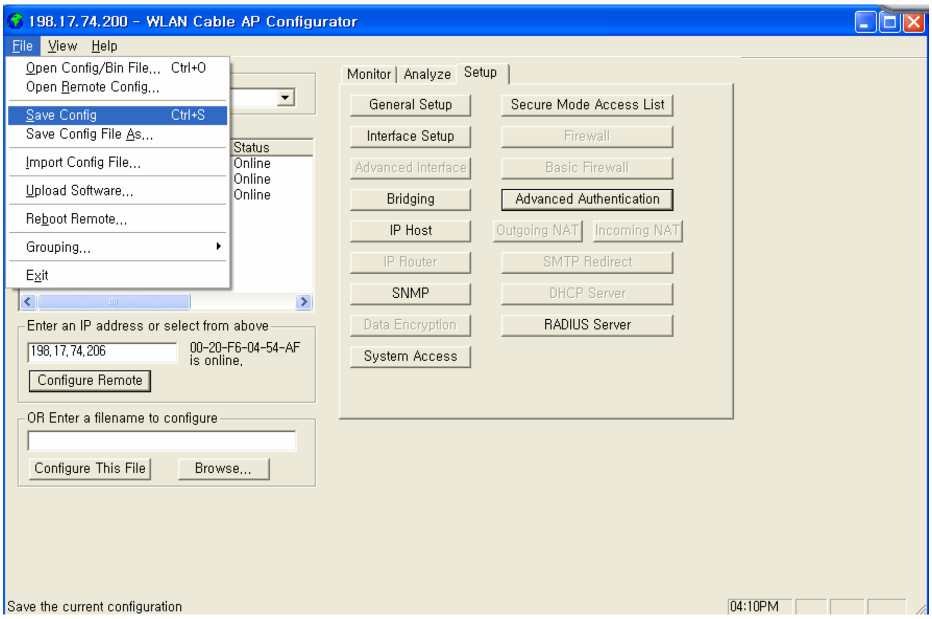
Save configuration

Saving the current configuration settings to the hardware device is a one-step process:

Use this File Menu option to save the base station configuration parameters to the location from which they were read. If the configuration was read from a base station, it will be saved to the APU and CSU from which it was read. If the configuration was read from a file, the modified configuration will be saved back to that file.
To import a saved configuration to an APU or CSU, first connect to the base station using Open Remote Config, then use Import Config File.

1. From the File Menu, select Save Config.

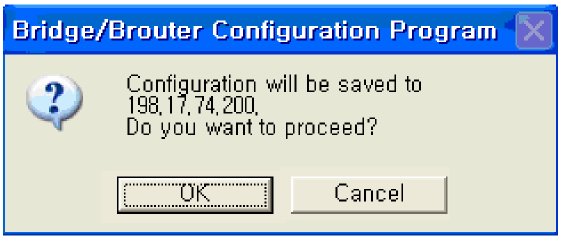
Figure 5-1
Save Config Menu



Save the current configuration

2. Click on the ‘Yes’ button

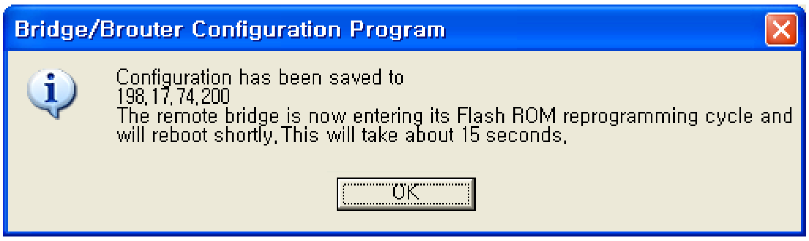
Figure 5-2
Confirm Save Config Window



Configuration will be saved to 198.17.74.200.
Do you want to proceed?

3. The message box will be displayed, as shown below, and then left click on the OK button.

Figure 5-3
Reboot Message Dialog Box



Bridge/Brouter Configuration Program

Configuration has been saved to
198.17.74.200
The remote bridge is now entering its Flash ROM reprogramming cycle and will reboot shortly. This will take about 15 seconds.

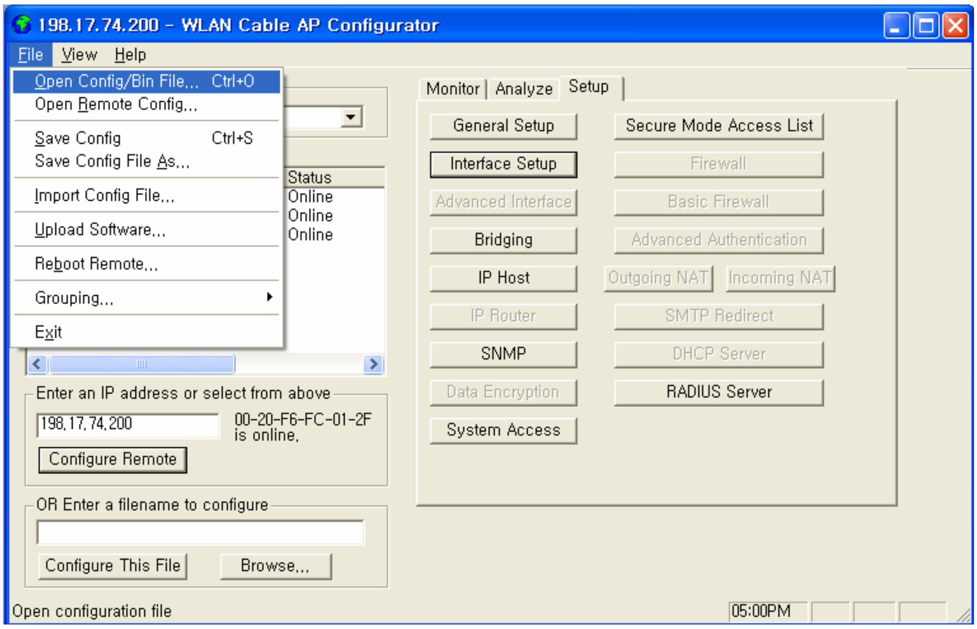
4. Just after this saving, APU or CSU will be restarting automatically.

Load new configuration

The 'import config file' option enables you to 'copy' the parameter values that you entered to configure the first Secure Data Mode Station to the other units. The “import config file” option enables you to 'copy' the parameter values that you entered to configure the first Secure Data Mode Station to the other units.

1. From the File menu, select Open/Config Bin File.

Figure 5-4
Open Config/Bin File Menu



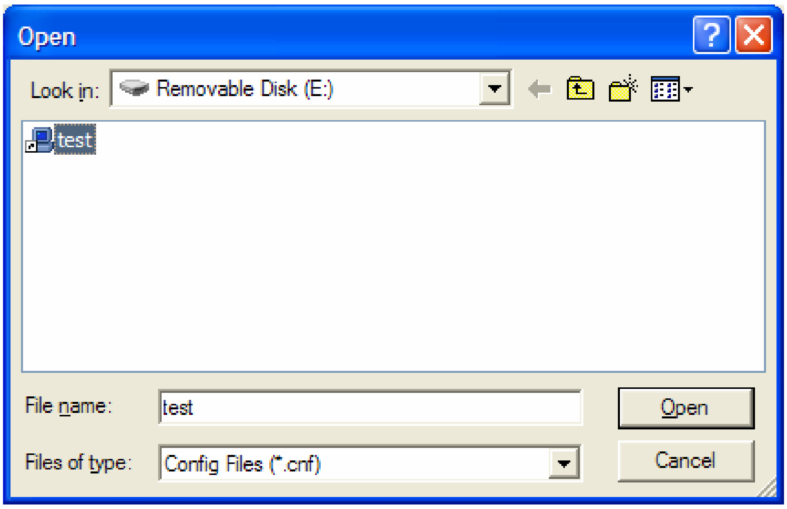
198.17.74.200 - WLAN Cable AP Configurator

198.17.74.200
00-20-F6-FC-01-2F is online.

Open configuration file

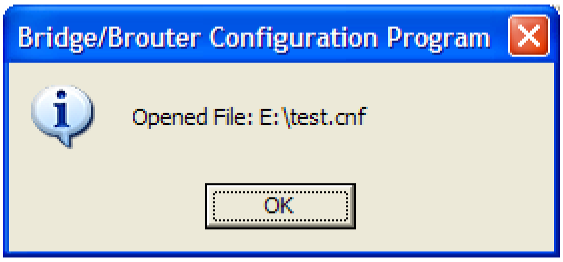
2. And the browse window will appear.

Figure 5-5
Open Config File Window



3. Select the configuration file in the specific folder, and Click ‘Open’ button,
4. Then, bridge/brouter Configuration Program” screen will appear.

Figure 5-6
Confirm Open Config File Dialog Box



Opened File: E:\test.cnf

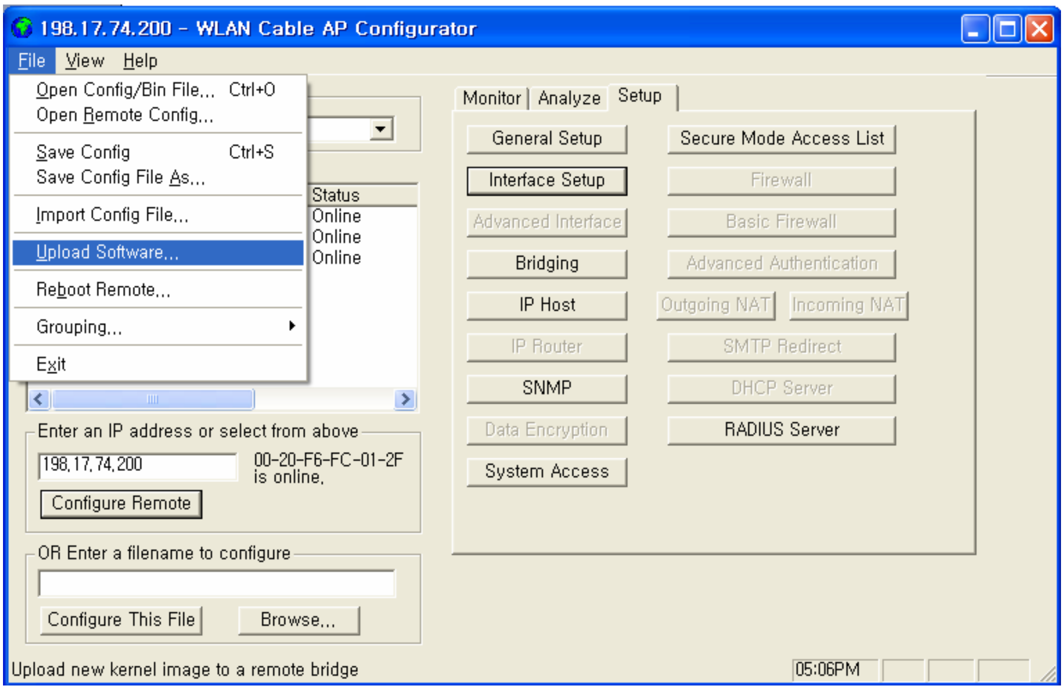
5. Left click on the OK button.

Load new license

There are ten steps that must be done to import the .bin file and its corresponding license file. Be sure you have downloaded and know the location of your files before you start.

1. From the File menu, select Upload Software, and the browse window will appear.

Figure 5-7
Upload Software Menu



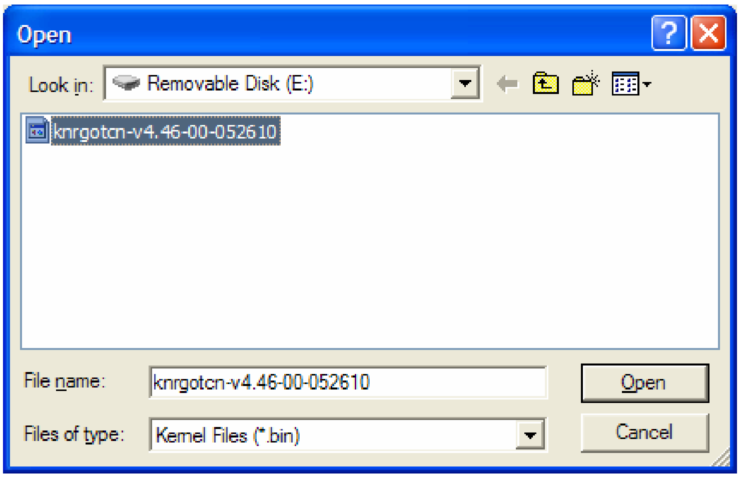
Enter an IP address or select from above: 198.17.74.200

00-20-F6-FC-01-2F is online.

Upload new kernel image to a remote bridge

2. Browse to the location of your .bin file, and select it.

Figure 5-8
Open binary Window



Look in: Removable Disk (E:)

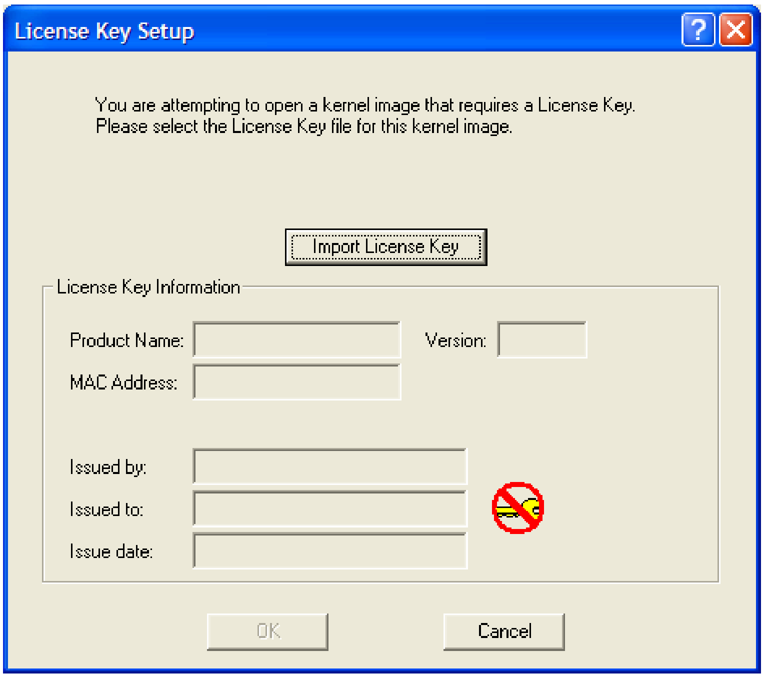
knrgotcn-v4.46-00-052610

File name: knrgotcn-v4.46-00-052610

Files of type: Kernel Files (*.bin)

3. Click on the ‘Open’ button, and the "License Key Setup" screen will appear:

Figure 5-9
License Key Setup Window

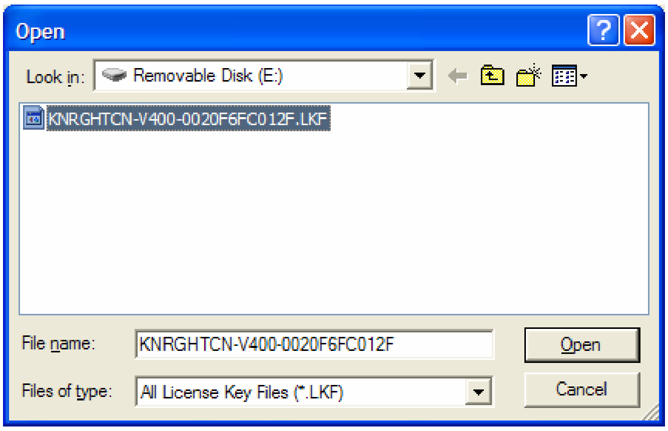


License Key Setup

You are attempting to open a kernel image that requires a License Key.
Please select the License Key file for this kernel image.

4. Click on the "Import License Key" button, and an "Open" dialog box will appear:

Figure 5-10
Open License Key Window



Open

Look in: Removable Disk (E:)

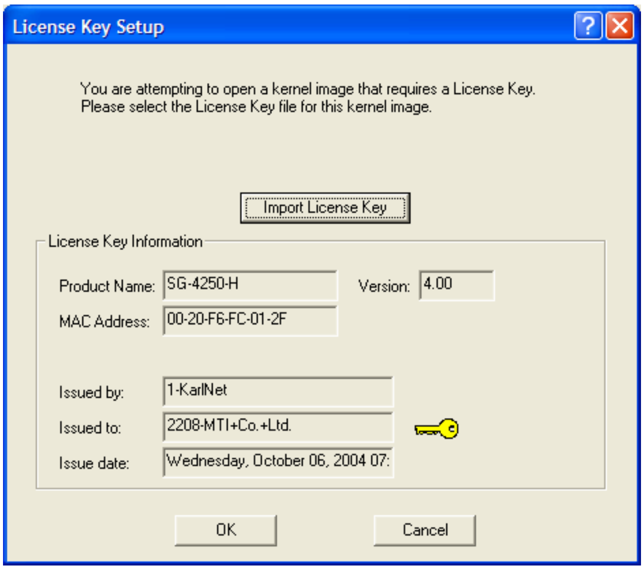
KNRGHTCN-V400-0020F6FC012F.LKF

File name: KNRGHTCN-V400-0020F6FC012F

Files of type: All License Key Files (*.LKF)

5. Select the license file that corresponds to the Ethernet MAC of the unit you are working with. (If you have "Licenses for this MAC address" selected in the file type drop box, only the licenses for the MAC of the current unit will appear.)
6. Click on the ‘Open’ button

Figure 5-11
License key setup window



License Key Setup

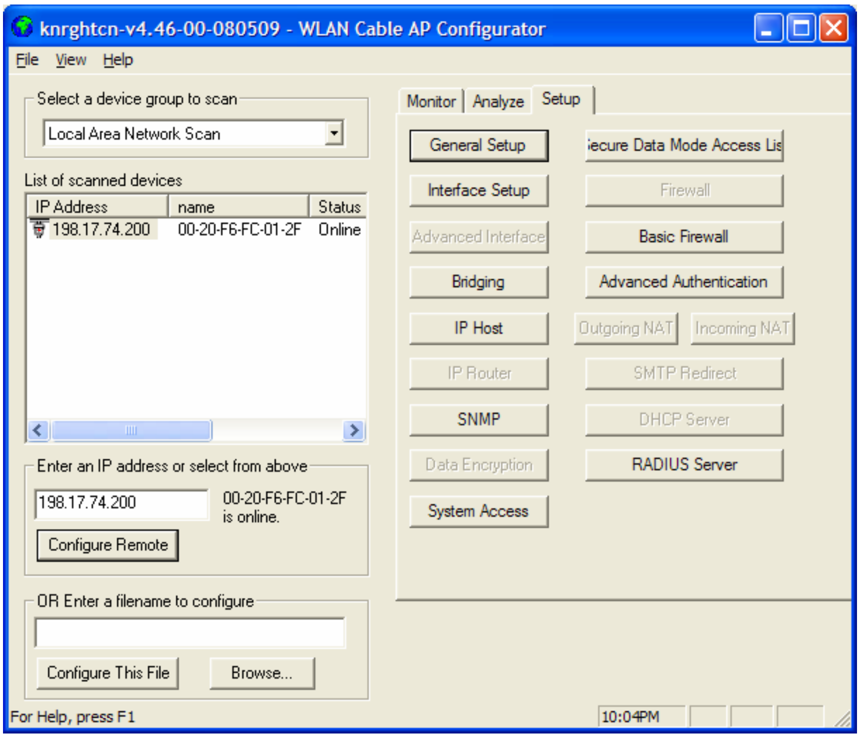
You are attempting to open a kernel image that requires a License Key.
Please select the License Key file for this kernel image.

License Key Information

Product Name:	SG-4250-H
Version:	4.00
MAC Address:	00-20-F6-FC-01-2F
Issued by:	1-KarlNet
Issued to:	2208-MTI+Co.+Ltd.
Issue date:	Wednesday, October 06, 2004 07:

7. Click on the 'OK' button

Figure 5-12
Setup window



knrghtcn-v4.46-00-080509 - WLAN Cable AP Configurator

Select a device group to scan: Local Area Network Scan

List of scanned devices

IP Address	name	Status
198.17.74.200	00-20-F6-FC-01-2F	Online

Enter an IP address or select from above: 198.17.74.200

00-20-F6-FC-01-2F is online.

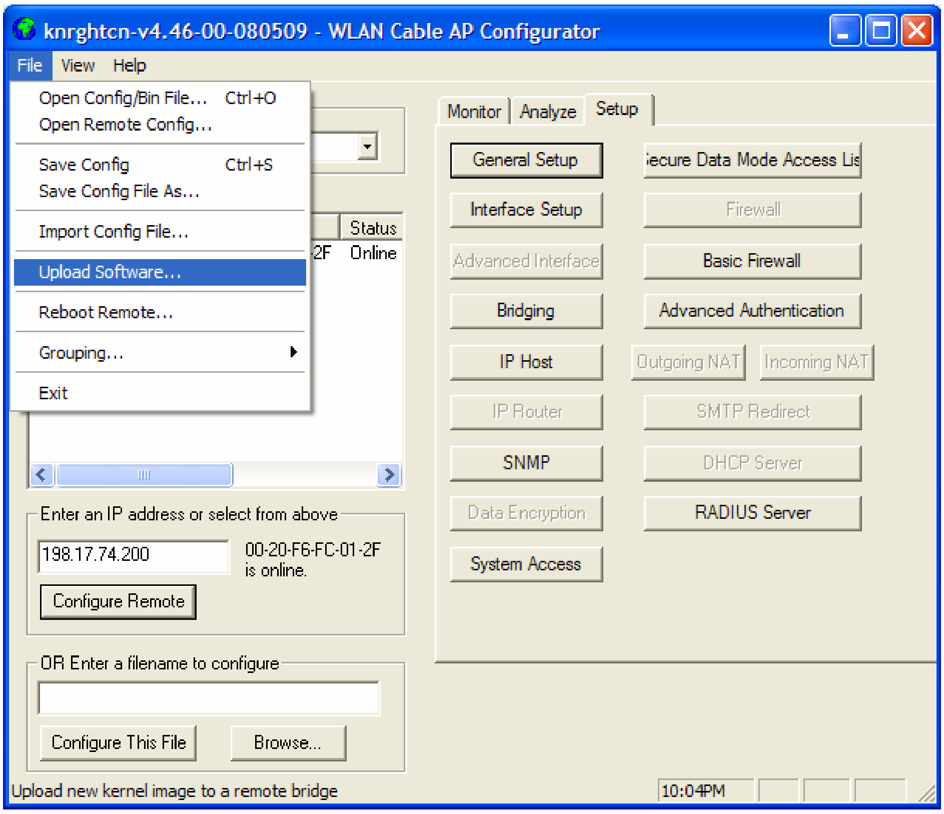
OR Enter a filename to configure

For Help, press F1

10:04PM

8. You can see an initial setup windows and then, From the File menu, select upload software as below.

Figure 5-13
Selecting Upload Software



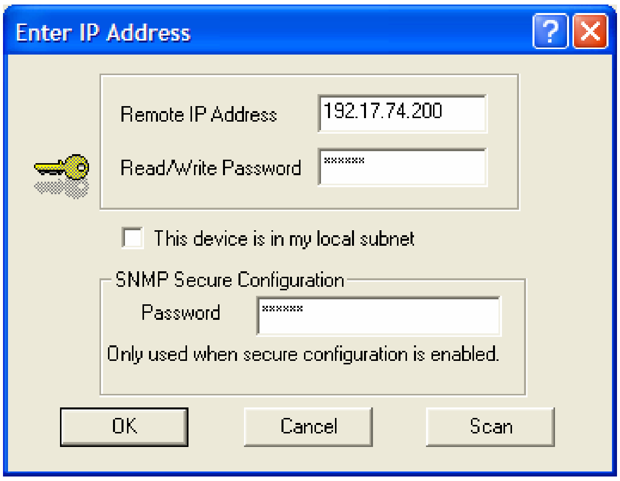
Enter an IP address or select from above

198.17.74.200 — 00-20-F6-FC-01-2F is online.

OR Enter a filename to configure

Upload new kernel image to a remote bridge

Figure 5-14
Enter IP address dialog



Remote IP Address: 192.17.74.200

Read/Write Password: ******

☐ This device is in my local subnet

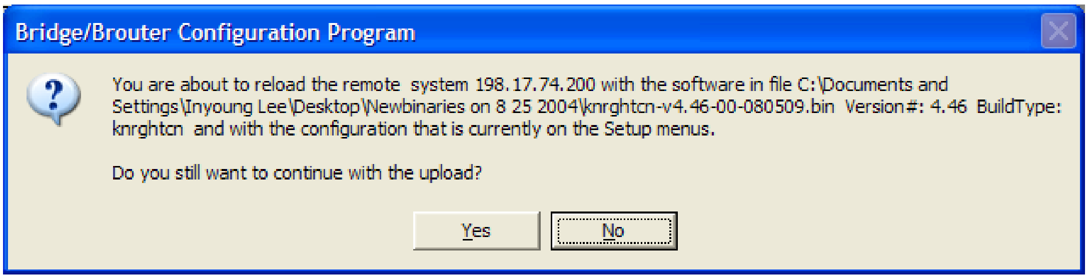
SNMP Secure Configuration

Password: ******

Only used when secure configuration is enabled.

9. Enter the IP address of the unit to upload new software binary and Click on the ‘OK’ button.

Figure 5-15
Uploading Confirmation Dialog 1



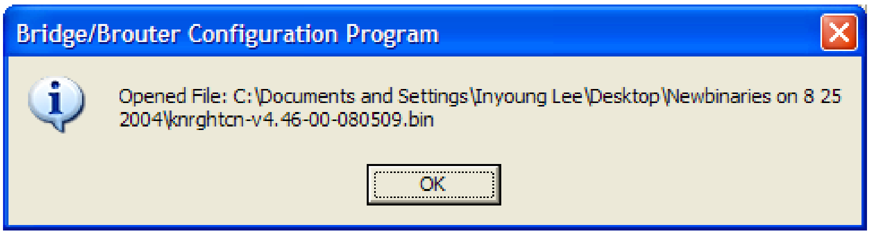
Bridge/Brouter Configuration Program

You are about to reload the remote system 198.17.74.200 with the software in file C:\Documents and Settings\Inyoung Lee\Desktop\Newbinaries on 8 25 2004\knrghtcn-v4.46-00-080509.bin Version#: 4.46 BuildType: knrghtcn and with the configuration that is currently on the Setup menus.

Do you still want to continue with the upload?

10. Click on the ‘OK’ button

Figure 5-16
Uploading Confirmation Dialog 2

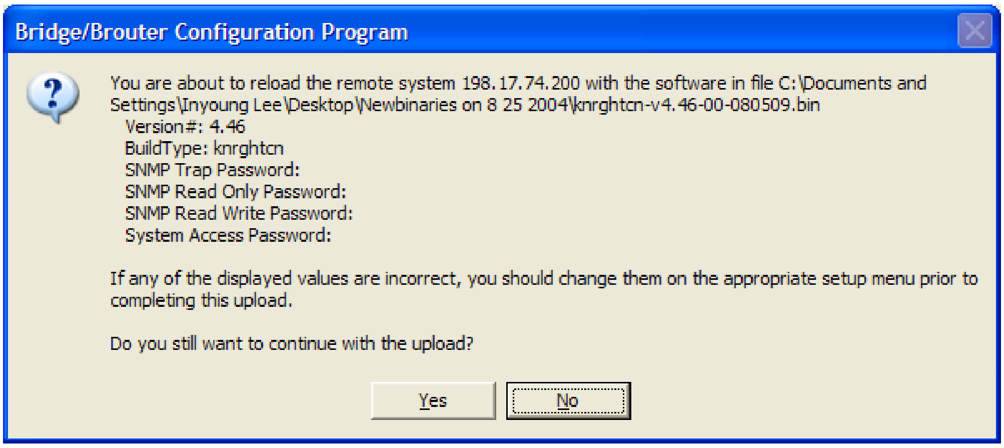


Bridge/Brouter Configuration Program

Opened File: C:\Documents and Settings\Inyoung Lee\Desktop\Newbinaries on 8 25 2004\knrghtcn-v4.46-00-080509.bin

11. Click on the ‘OK’ button

Figure 5-17
Uploading Binary Information Dialog Box



Bridge/Brouter Configuration Program

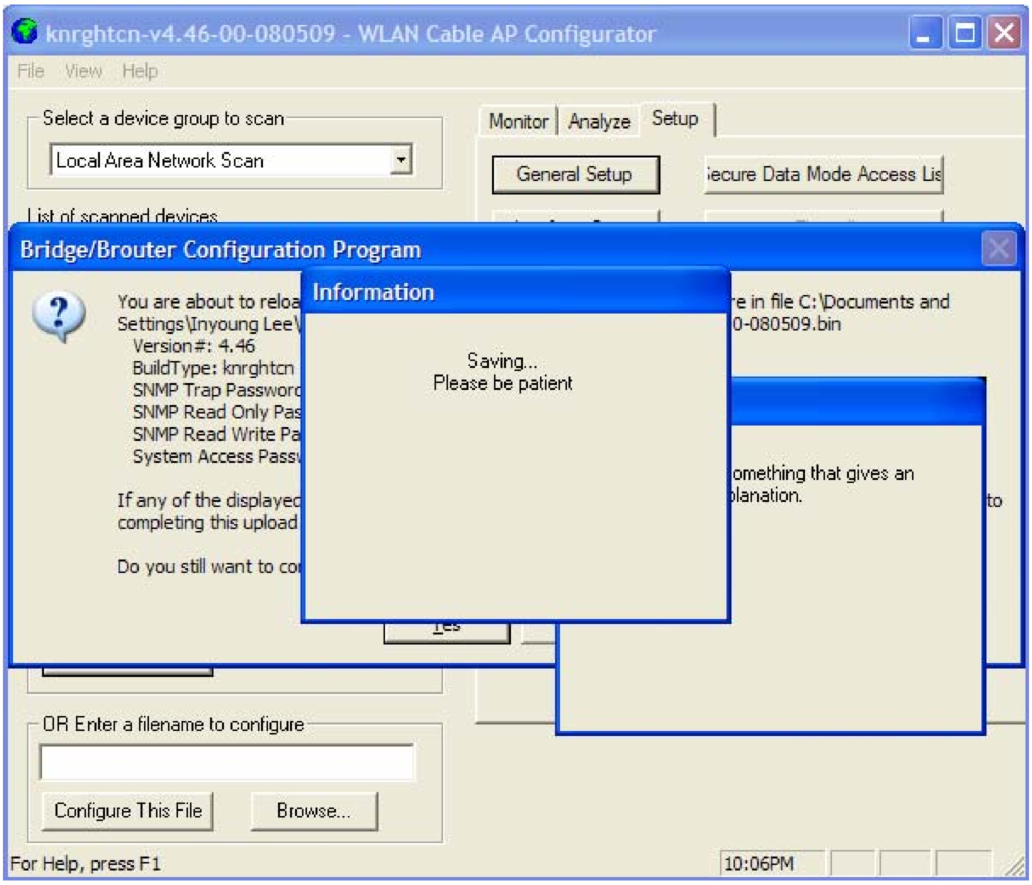
You are about to reload the remote system 198.17.74.200 with the software in file C:\Documents and Settings\Inyoung Lee\Desktop\Newbinaries on 8 25 2004\knrghtcn-v4.46-00-080509.bin
Version#: 4.46
BuildType: knrghtcn
SNMP Trap Password:
SNMP Read Only Password:
SNMP Read Write Password:
System Access Password:

If any of the displayed values are incorrect, you should change them on the appropriate setup menu prior to completing this upload.

Do you still want to continue with the upload?

12. Click on the ‘OK’ button
13. “Saving ….Please be patient” screen will appear as below

Figure 5-18
Saving software uploading window


knrghtcn-v4.46-00-080509 - WLAN Cable AP Configurator
File View Help
Select a device group to scan
Local Area Network Scan
List of scanned devices
Monitor
Analyze
Setup
General Setup
ecure Data Mode Access Lis
Bridge/Brouter Configuration Program
Information
Yes
OR Enter a filename to configure
Configure This File
Browse...
For Help, press F1
10:06PM

You are about to reloa... re in file C:\Documents and Settings\Inyoung Lee\... 0-080509.bin
Version#: 4.46
BuildType: knrghtcn
SNMP Trap Passwor...
SNMP Read Only Pas...
SNMP Read Write Pa...
System Access Pass...

If any of the displaye... completing this upload...

Do you still want to co...

...omething that gives an ...planation.

...to

Saving...
Please be patient

14. Click on the ‘OK’ button

Figure 5-19
Reboot Message Dialog Box

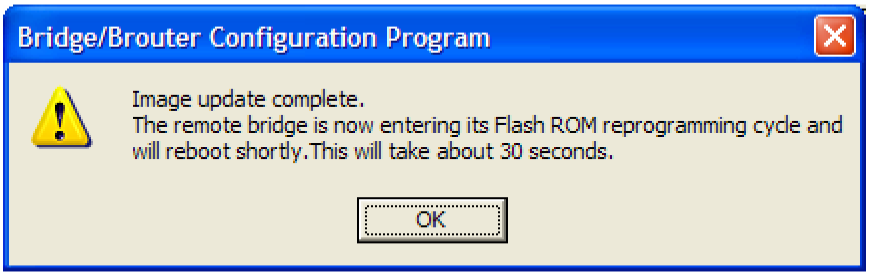


Image update complete.
The remote bridge is now entering its Flash ROM reprogramming cycle and will reboot shortly.This will take about 30 seconds.

15. Click on the ‘OK’ button
16. Software Uploading complete.

Troubleshooting

1. **APU Power cannot be Turned ON.**

   Check that the CATV Power (45VAC ~ 95VAC) is supplied thorough the coaxial line by measuring the AC Voltage Level.
   If no power signal is detected at the end of the coaxial cable, you should search a problem point on the CATV Network while moving up toward the ONU and UPS Power supply.

2. **LED 2(Link 1) is continuously blinking after running a long time and all network entity including APU cannot receive IP address from DHCP server.**

   Measure the RF signal level at the end of the coaxial cable or monitoring port in the APU enclosure. Also check whether or not the RF signal level is beside the range of required signal. If so, adjust the power level by tuning all related network facility to meet the requirements for the operation of the Cable Modem.
   * Normal Power level (DOCSIS): +15 to -15 dBmV

3. **LED 3(Link 2)/LED 4(Radio Link) are turned off.**

   In the AP Configurator, select and click the setup tap, move to “interface” to see whether or not Ethernet 2 and 802.11 is enabled. If disabled, check each interface. If the LED lights are still turned off in spite of this work, the APU system may have failed. If so, contact the Nortel local representative or technical support center.

4. **How do I see and configure a setup parameter of the CSU without a radio connection to the APU?**

   The only devices that will display in the Configurator local scan window are the units in the same subnet as your management computer. If the device in question is not displayed in your local scan window, change the IP address (Client PC) to any one of the subnet IP address groups “198.17.74.XXX” and then, you can find out the CSU entity with the IP address “198.17.74.254”.

5. **Why can CSU setup a radio connection to the APU?**

   Such situations are caused by various reasons as below:
   - Mismatching between the radio setup parameter of APU and that of CSU
     + Radio Channel
     + Network ID (NWID)
     + WEP Encryption Key
   - Radio Link Designing Problem(Link Distance, Antenna Direction and so on)

6. **How many CSU subscribers can connect to a single WLAN Cable Access Point (APU Secure Data mode)?**

   Eight CSU subscribers can connect to a single WLAN Cable Access Point in secure data mode.

7. **How does the number of CSU Secure Data modes affect wireless throughput?**

   As more CSU Secure Data modes are added, the APU Secure Data mode Base Station mode is still able to effectively manage the throughput of the overall wireless link. Just as on any shared medium, each station's throughput is determined by the overall usage of the wireless link. The more stations transmitting on the link at a time, the lower each individual station's throughput goes. However, Secure Data mode performs in such a way that up to a point, the more heavily loaded the network becomes, the higher the overall throughput becomes.
   For example, due to the intricacies of our Adaptive Dynamic Polling algorithms and Secure Data mode 'fairness' principles, a single-user FTP session does not use all of the possible wireless bandwidth. But when performing several different transfers to and from different CSU Secure Data modes, the actual overall bandwidth of the Secure Data mode network increases. In general, the heavier a Secure Data mode network is loaded, the higher the total bandwidth used becomes.

8. **How do I check throughput?**

   Network throughput can be tested and analyzed using the Ping Fill test. This test dynamically fills the network connection with ICMP Echo (ping) packets and waits for the responses from the target station. Since each packet sent is echoed back to the sender, this tests the overall wireless throughput in both directions. Choosing the correct parameters is crucial to obtaining accurate Ping Fill test results. The speed at which the target station responds to the ICMP Echo packets is crucial to correctly assess the speed of the wireless link.
   The IP stacks in some PC operating systems, such as Microsoft Windows, often do not respond quickly enough to the ICMP Echo packets to obtain an accurate assessment of your network throughput. When running the Ping Fill test to a Microsoft Windows system, your results may be slightly lower than normal throughput.

9. **How do I read the configuration from a device if I cannot see the unit in the local scan window?**

   The only devices that will display in the Configurator local scan window are the units in the same subnet as your management computer. For example your PC has an IP address 64.22.33.13 with a subnet mask of 255.255.255.0 and your

device has an IP address of 65.23.11.2 with a subnet mask of 255.255.0.0. The device in question would not display in your local scan window.
Even though you may be able to ping the unit it may not be visible in the local scan window. In the Configurator, select the file menu, and then open remote config and then type in the IP and the password. It may be necessary to select the "this device is in my local subnet" check box to actually read the configuration from the unit. Attempt to read the configuration with it un-checked first. If the configuration cannot be read try with this box checked.

10. **I seem to have lost or forgotten the read/write password to manage my product.**
    How can I get back in to manage the unit?

    If the read/write password has been lost or forgotten, there is only one thing that can be done about this in order to be able to manage the unit again. The unit must be put into force reload mode and the firmware must be reloaded. All configuration settings will be lost. Physical access to the unit is required in order to accomplish this procedure.

11. **I am performing a wireless link test from a CSU Secure Data mode and one of my CSU Secure Data modes on the other side of my base station is showing up, is this a problem?**

    It is a normal function to be able to see the other units in the wireless link test this way. This shows you what devices are within range so that the radio can "hear”. As long as the units are set as Secure Data mode CSU Secure Data modes, there is no way they will actually be communicating with each other. They are receiving radio signals from each other that they have to interpret and dump. This is not an optimal solution and should be changed when it is practical to do so by isolating antennas, changing polarity or reducing output power if possible.

12. **Please provide the list of parameters for the different levels of signal strengths i.e. No Connection, Poor, Acceptable, Good, and Excellent. How do I determine what is good and bad?**

    What these values will mean, is somewhat specific to the environment being worked under. For example, a Signal to Noise Ratio of 15 may be fine for one area and 15 may not work very well in a high noise area. So here are some general guidelines. Keep in mind all the information below is related to Secure Data mode, for 802.11b mode replaces retransmit with dropped packets:

    There are some further items to note:
    Link planning should be done in your general geographic area and your links should be set up with an extra margin that your company determines.
    Links are best performed when possible with high gain antennas as opposed to

low gain amplified antennas

Noise is typically introduced by failing amplifiers and problems with connectors and defective radios. Signal typically drops with bad cabling, connectors or antenna misalignment, radio power issues Network ID and Channel values being the same, may help stability in marginal links.

Marginal (sporadic links) typically occur in SNR ranges from 5-9, 10-15 usually will keep association with retransmits or some packet loss. SNR from 16 and up usually are acceptable for every day operation.

If SNR is over 25 and throughput is poor, overdriving or multi-path may be the cause of the problems.
Secure Data Mode Station Entries - Provides information on octal packet, retransmitted packets and failed packets. A value other than 0 under failed packets typically points to a link issue. Keep in mind TC retransmits a packet 9 times, (with the initial packet 10 total).

This has occurred and the packet has been dropped when a failure occurs. Retransmits should be 15% or less of total transmits, this may indicate signal, noise or antenna alignment issues.

Remote Statistics - Check each Ethernet Interface, any errors or collisions may be signs of link speed or greater network related issues.

Check each wireless interface. Specifically, compare the Frame Check Sequence errors to the bytes in values. Typically FCS occurs on any wireless connection. This should only be a concern if the value exceeds approximately 10% of the bytes in value. This may be an indicator of signal/multi-path issues.

13. Can I block unwanted MAC addresses from the Ethernet interface?

It is possible to set an Access Control List to set all of your allowable MAC's on the Ethernet (everything else on the Ethernet will be denied) by reading the configuration from the unit with the WLAN Cable AP Configurator. Go to the Setup tab -- General Setup -- Select the Mac Authentication Access control radio button and click OK. Then select the Setup tab -- Advanced Authentication -- check the Access Control List and then click the Setup button. Add all your allowable MAC's and select the Ethernet interface to apply the ACL.

Appendix

A. Specification
B. DOCSIS Specification
C. Antenna Type
D. Enclosure Dimension
E. Site Survey
F. Wireless Network Planning
G. SNMP MIB List & Example Values

Appendix A. Specification

Access Point Unit(APU)

General

- Case: Aluminum alloy steel (Waterproof, EMI protection, Vibration Robust)
- Size: 300 (W) x 232.6 (L) x 112 (D) (mm)
  11.81 (W) x 9.157 (L) x 4.40 (D) (inch)
- Weight(without antenna): 3.14 Kg / 6.9234 lbs
- Elements: Access Point, Cable Modem, HFC Signal Filter, Power Supply Unit
- Ports: Coaxial Cable Port, Monitoring Port, Antenna Port (N-type)
- LED Panel: Power, Cable Modem Link, LAN, WLAN, CM-AP Link
- Temperature: -40 ~ 65 ºC (Operating)
- Power supply: Input Power 45 ~ 95VAC (Supplied by CATV UPS)
  Output Power 3.3VDC (3A), 9VDC (1.5A)
- Power Consumption : MAX 12W (Current < 0.5A)

Hardware

Radio Card

- Operation Frequency: 2.4 ~ 2.4835GHz (ISM Band; a/b/g ready with radio upgrade)
- Wireless LAN standard: IEEE 802.11b (a/b/g ready w/ radio upgrade)
- Frequency: 2.4GHz ISM band(North America 11 Channels)
- Modulation: Direct Sequence Spread Spectrum (DBPSK, DQPSK, CCK)
- Data rate: 1M, 2M, 5.5M, 11Mbps with auto fall-back
- Receive sensitivity: Min. -83dBm at 11Mbps

HFC Filter

- Input Signal : HFC Signal(-15dBmV ~ +15dBmV), AC Power (45VAC ~ 95VAC/ Max: 135VAC)
- Output : AC Power, HFC Signal, Monitoring Signal(Attenuated by 20dB)

Power Converter (AC-DC)

- Input Voltage Range: 45 VAC ~ 135VAC
- Output Voltage/Current: +3.3Vdc(3A), +9V(1.5A)

Software

- Firmware : APU Secure Data Mode(Base Station), Wi-Fi Access Point
- Wireless Service Protocol : Secure Data Mode, Dynamic Polling
- 802.1x - MD5, TLS, TTLS, PEAP over EAP (SDM mode)
- MAC access control – 32 local MAC Address Table (SDM mode)*
- Standard RADIUS server support
- Wired Equivalent Privacy encryption - 64, 128
- Firewall(ICMP/UDP/TCP/IP Protocol Filtering)
- Layer 2 Protocol Filtering
- BOOTP/DHCP(Server, Relay, Client), Static IP
- NAT(Incoming/Outgoing)
- Routing Protocol(RIP v2, Static)
- Restriction of Broadcast Storm
- SNMP v1, Software upgrade via TFTP
- GUI Program : Windows Based
- Throughput Analysis: Ping Fill
- Radio Performance Testing Tool: Antenna Alignment
- Remote Statistics Monitoring
- SNMP Traps
- MIB II

(*) There is a limit of 32 if you use MAC address and comment per entry. However each APU can support 64 CSU's associating with it in SDM mode if you use only MAC address per entry. If you use a RADIUS server for this setup, there is no limitation.

Cable Modem Specification (Hardware / Software)

- Standard : DOCSIS 2.0 compliant
- Frequency : 5~42MHz (Upstream), 88~860MHz (Downstream)
- Modulation : QPSK/16QAM/64QAM/128QAM(Upstream),
  64QAM/256QAM (Downstream)
- Data Rate: 5.12Mbps/QPSK, 30.34Mbps / 64QAM (Upstream)
  30.34Mbps/64QAM, 42.88Mbps / 256QAM (Downstream)
- Channel Bandwidth
  Upstream: 200 KHz, 400 KHz, and 800 KHz, 1.6 MHz, 3.2 MHz, 6.4 MHz
  Downstream: 6MHz
- Error correction : Reed-Solomon (Upstream), Reed-Solomon Trellis(Downstream)
- Signal Level : + 8dBmV ~ + 53dBmV(All Modulation),
  -15dBmV ~ + 15dBmV
- Input Impedance: 75 Ohm

- Interface: RJ 45 Ethernet port, USB 1.1 port
- SNMP v1, Software upgrade via TFTP

Corporate service unit (CSU)

General

- Case: Aluminum alloy steel (Body), RADOME
- Size: 180 (W) x 239 (L) x 81 (D) (mm)
  7.08 (W) x 9.40 (L) x 3.19 (D) (inch)
- Weight: 1.3 Kg / 2.8659 lbs
- Elements: Access Point, POE Splitter, Built-in Antenna in CSU body, RADOME
- Ports: POE Ethernet Port(RJ-45/CAT5), 12V DC Jackk
- Temperature: -40 ~ 65 ºC (Operating)
- Power supply(Option): 802.3af compliant POE Injector(45V DC, 315 mA)
- Power Consumption : MAX 10W (Current < 0.4A)

Hardware

Radio Card

- Operation Frequency: 2.4 ~ 2.4835GHz (ISM Band; a/b/g ready with radio upgrade)
- Wireless LAN standard: IEEE 802.11b (a/b/g ready w/ radio upgrade)
- Frequency: 2.4GHz ISM band(North America 11 Channels)
- Modulation: Direct Sequence Spread Spectrum (DBPSK, DQPSK, CCK)
- Data rate: 1M, 2M, 5.5M, 11Mbps with auto fall-back
- Receive sensitivity: Min. -83dBm at 11Mbps

POE Splitter

- IEEE 802.3af Compatible
- Input Signal : DC Power (48V DC, Max 315mA), Base-band Signal(Ethernet)
- Output : DC Power(3.3V DC), Base-band Signal(Ethernet)

POE Injector

- IEEE 802.3af Compatible
- Input Signal : AC Power (90~264V), Base-band Signal(Ethernet)
- Output : POE Signal(DC Power(48V), Base-band Signal(Ethernet))

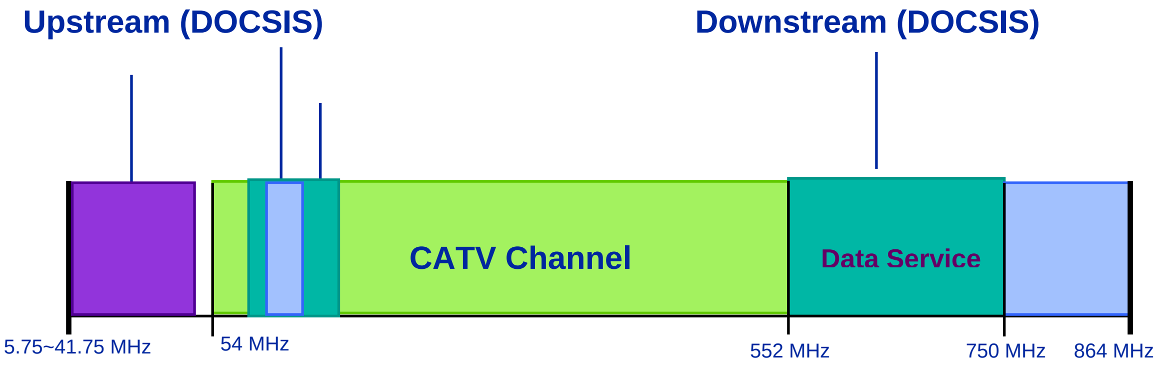
Software

- Firmware : CSU Secure Data Mode(Subscriber Station), Wi-Fi Access Point
- Wireless Service Protocol : Secure Data Mode, Dynamic Polling
- Standard RADIUS server support
- Wired Equivalent Privacy encryption - 64, 128
- Firewall(ICMP/UDP/TCP/IP Protocol Filtering)
- Layer 2 Protocol Filtering

- BOOTP/DHCP(Server, Relay, Client), Static IP
- NAT(Incoming/Outgoing)
- Routing Protocol(RIP v2, Static)
- Restriction of Broadcast Storm
- SNMP v1, Software upgrade via TFTP
- GUI Program : Windows Based
- Throughput Analysis: Ping Fill
- Radio Performance Testing Tool: Antenna Alignment
- Remote Statistics Monitoring
- SNMP Traps
- MIB II

Appendix B. DOCSIS Specification

Figure A.1
CATV Frequency Range



CATV: UPSTREAM 5-42(30) MHz, DOWNSTREAM 50-750(550) MHz
DATA: UPSTREAM 5-65MHz, DOWNSTREAM 88-750(550) MHz

Figure A.2
DOCSIS Reference System Diagram

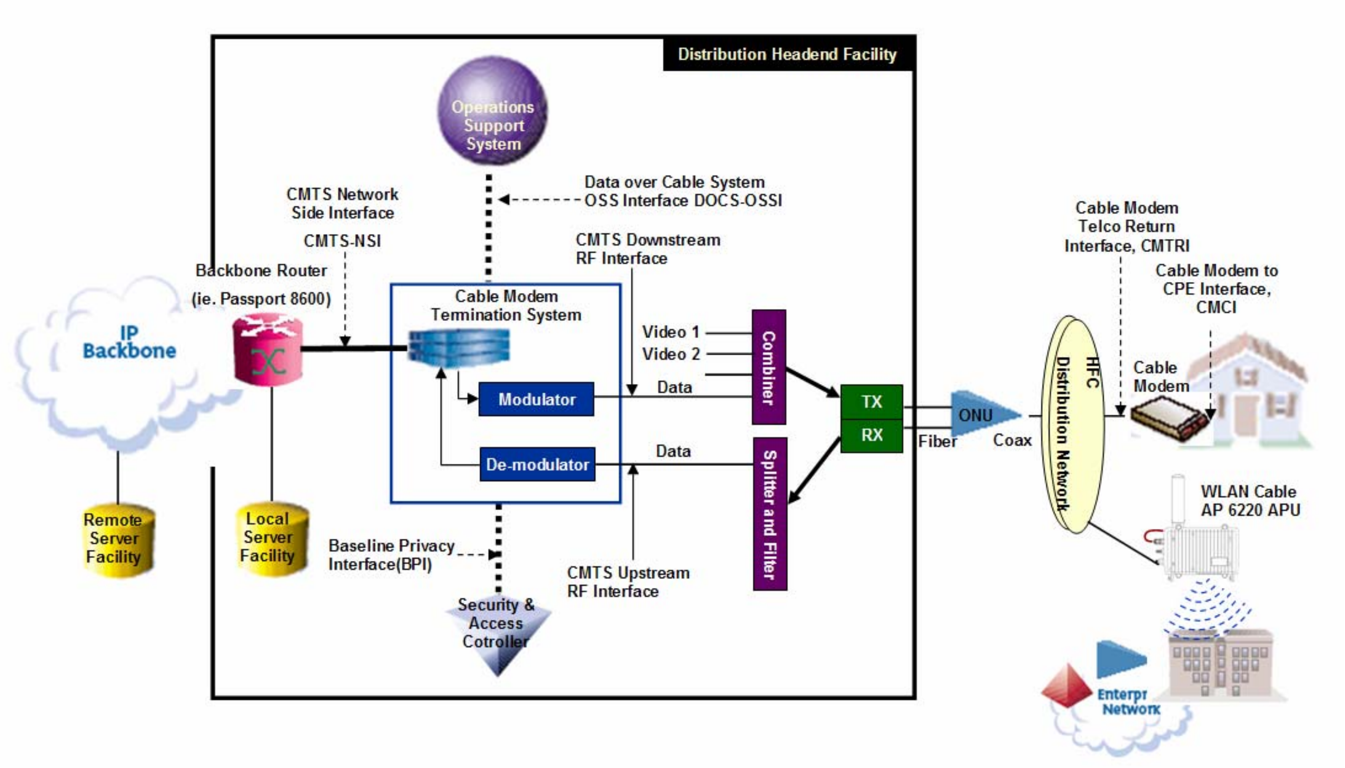
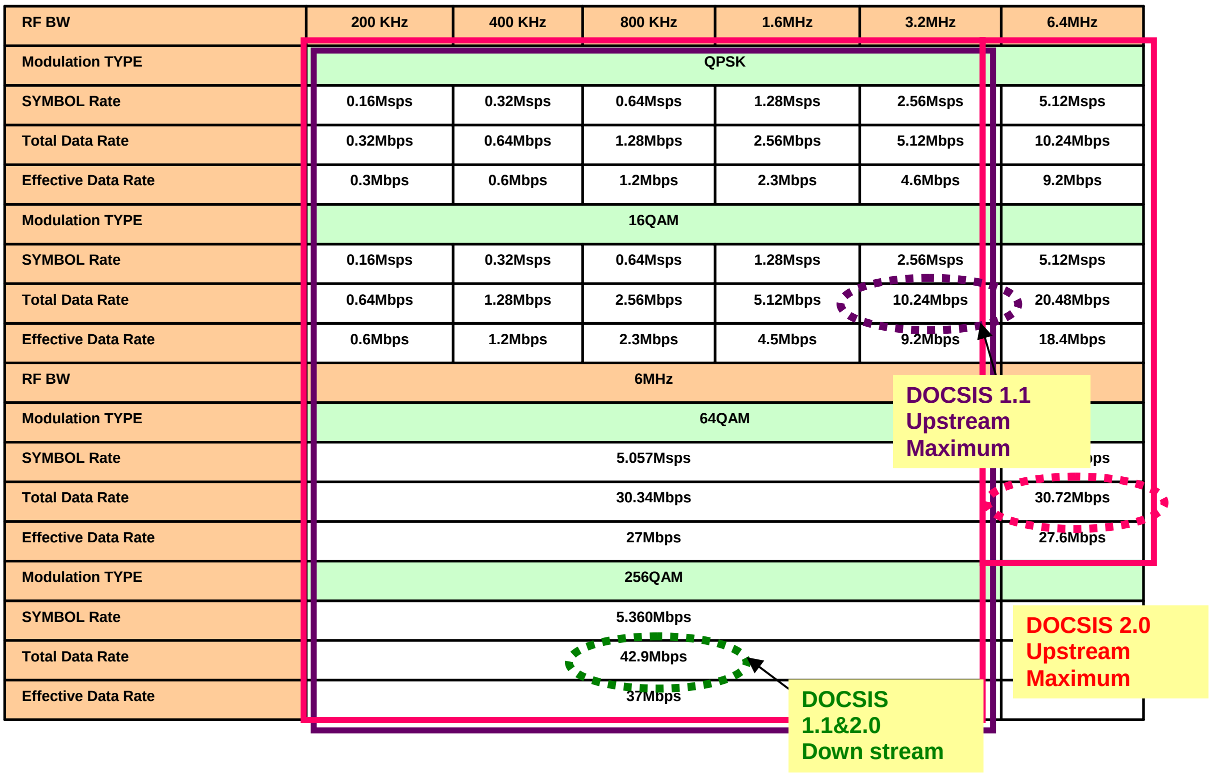

Distribution Headend Facility
Operations Support System
Data over Cable System OSS Interface DOCS-OSSI
CMTS Network Side Interface
CMTS-NSI
CMTS Downstream RF Interface
Backbone Router (ie. Passport 8600)
IP Backbone
Cable Modem Termination System
Modulator
De-modulator
Video 1
Video 2
Data
Data
Combiner
Splitter and Filter
TX
RX
ONU
Fiber
Coax
HFC Distribution Network
Cable Modem Telco Return Interface, CMTRI
Cable Modem to CPE Interface, CMCI
Cable Modem
WLAN Cable AP 6220 APU
Remote Server Facility
Local Server Facility
Baseline Privacy Interface(BPI)
CMTS Upstream RF Interface
Security & Access Cotroller
Enterpr Network

Table A.1
DOCSIS RF Specification Table

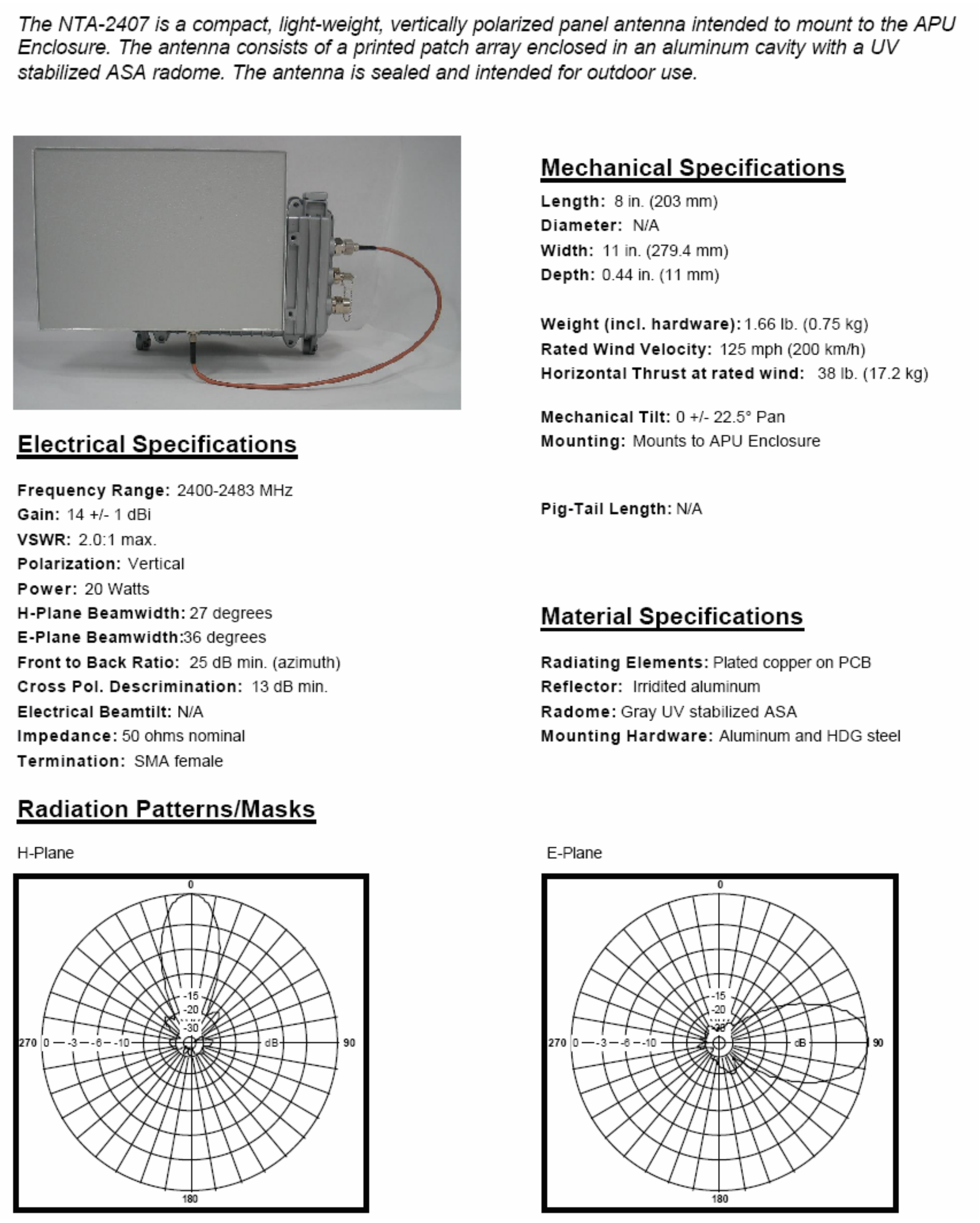


RF BW	200 KHz	400 KHz	800 KHz	1.6MHz	3.2MHz	6.4MHz
Modulation TYPE	QPSK					
SYMBOL Rate	0.16Msps	0.32Msps	0.64Msps	1.28Msps	2.56Msps	5.12Msps
Total Data Rate	0.32Mbps	0.64Mbps	1.28Mbps	2.56Mbps	5.12Mbps	10.24Mbps
Effective Data Rate	0.3Mbps	0.6Mbps	1.2Mbps	2.3Mbps	4.6Mbps	9.2Mbps
Modulation TYPE	16QAM					
SYMBOL Rate	0.16Msps	0.32Msps	0.64Msps	1.28Msps	2.56Msps	5.12Msps
Total Data Rate	0.64Mbps	1.28Mbps	2.56Mbps	5.12Mbps	10.24Mbps	20.48Mbps
Effective Data Rate	0.6Mbps	1.2Mbps	2.3Mbps	4.5Mbps	9.2Mbps	18.4Mbps
RF BW	6MHz					
Modulation TYPE	64QAM					
SYMBOL Rate	5.057Msps					ps
Total Data Rate	30.34Mbps					30.72Mbps
Effective Data Rate	27Mbps					27.6Mbps
Modulation TYPE	256QAM					
SYMBOL Rate	5.360Mbps					
Total Data Rate	42.9Mbps					
Effective Data Rate	37Mbps					

DOCSIS 1.1 Upstream Maximum
DOCSIS 2.0 Upstream Maximum
DOCSIS 1.1&2.0 Down stream

Appendix C. Antenna Type

NTA.2407 Panel Antenna



The NTA-2407 is a compact, light-weight, vertically polarized panel antenna intended to mount to the APU Enclosure. The antenna consists of a printed patch array enclosed in an aluminum cavity with a UV stabilized ASA radome. The antenna is sealed and intended for outdoor use.

Mechanical Specifications

Length: 8 in. (203 mm)
Diameter: N/A
Width: 11 in. (279.4 mm)
Depth: 0.44 in. (11 mm)

Weight (incl. hardware): 1.66 lb. (0.75 kg)
Rated Wind Velocity: 125 mph (200 km/h)
Horizontal Thrust at rated wind: 38 lb. (17.2 kg)

Mechanical Tilt: 0 +/- 22.5° Pan
Mounting: Mounts to APU Enclosure

Pig-Tail Length: N/A

Electrical Specifications

Frequency Range: 2400-2483 MHz
Gain: 14 +/- 1 dBi
VSWR: 2.0:1 max.
Polarization: Vertical
Power: 20 Watts
H-Plane Beamwidth: 27 degrees
E-Plane Beamwidth: 36 degrees
Front to Back Ratio: 25 dB min. (azimuth)
Cross Pol. Descrimination: 13 dB min.
Electrical Beamtilt: N/A
Impedance: 50 ohms nominal
Termination: SMA female

Material Specifications

Radiating Elements: Plated copper on PCB
Reflector: Irridited aluminum
Radome: Gray UV stabilized ASA
Mounting Hardware: Aluminum and HDG steel

Radiation Patterns/Masks

NTA.2412 Bidirectional Antenna

The NTA-2412 is a vertically polarized birdirectional antenna intended to mount to the APU Enclosure. The antenna consists of a printed dipole array enclosed in a UV stabilized ASA radome for superior weatherability. It is designed for wireless data in the ISM band and is at DC ground to aid in lightning protection.

Electrical Specifications

Frequency Range: 2400-2483 MHz
Gain: 9 dBi (peak)
VSWR: 1.5:1 max.
Polarization: Vertical
Power: 5 Watts
H-Plane Beamwidth: 60 degrees
E-Plane Beamwidth:28 degrees
Front to Back Ratio: N/A
Cross Pol. Descrimination: 20 dB min.
Electrical Beamtilt: N/A
Impedance: 50 ohms nominal
Termination: N male

Mechanical Specifications

Length: 10.5 in. (267 mm)
Diameter: 3 in. (76 mm)
Width: N/A
Depth: N/A

Weight (incl. hardware): 2 lb. (0.9 kg)
Rated Wind Velocity: 125 mph (200 km/h)
Horizontal Thrust at rated wind: 9 lb. (4 kg)

Mechanical Tilt: N/A
Mounting: Mounts to APU Enclosure

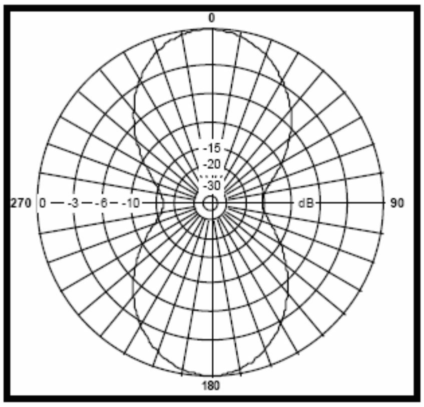
Pig-Tail Length: 12 in. (304.8mm)

Material Specifications

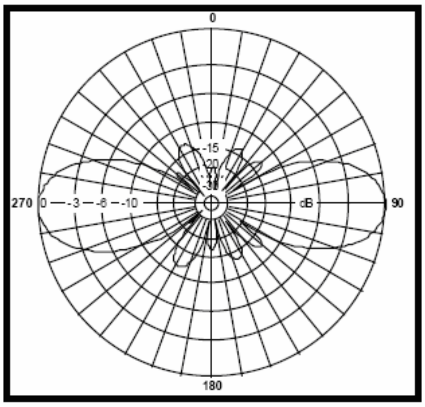
Radiating Elements: Plated copper on PCB
Reflector: Irridited aluminum
Radome: Gray UV stabilized ASA
Mounting Hardware: Aluminum and HDG steel

Radiation Patterns/Masks

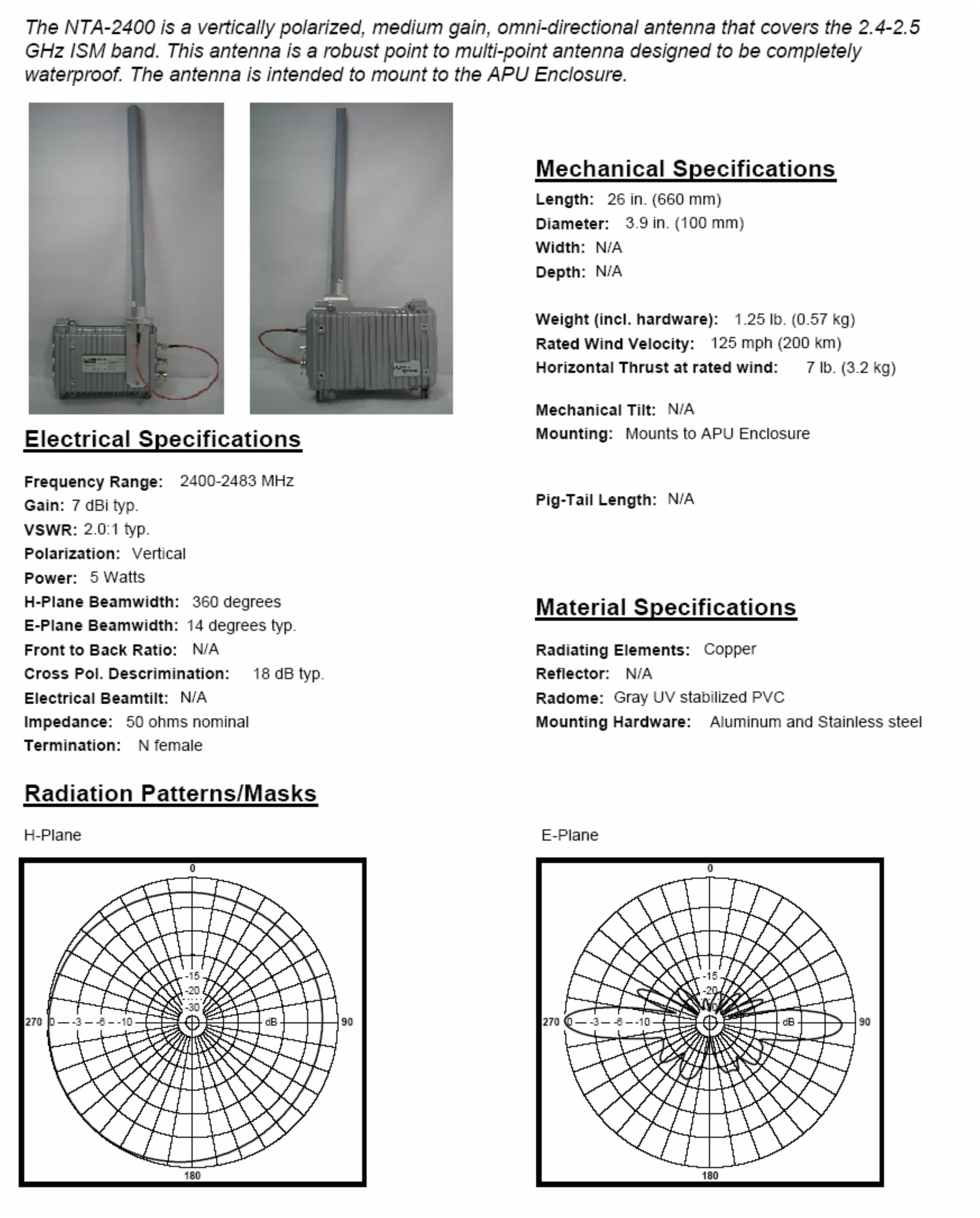
H-Plane



E-Plane



NTA.2400 Omni directional Antenna



The NTA-2400 is a vertically polarized, medium gain, omni-directional antenna that covers the 2.4-2.5 GHz ISM band. This antenna is a robust point to multi-point antenna designed to be completely waterproof. The antenna is intended to mount to the APU Enclosure.

Mechanical Specifications

Length: 26 in. (660 mm)
Diameter: 3.9 in. (100 mm)
Width: N/A
Depth: N/A

Weight (incl. hardware): 1.25 lb. (0.57 kg)
Rated Wind Velocity: 125 mph (200 km)
Horizontal Thrust at rated wind: 7 lb. (3.2 kg)

Mechanical Tilt: N/A
Mounting: Mounts to APU Enclosure

Pig-Tail Length: N/A

Electrical Specifications

Frequency Range: 2400-2483 MHz
Gain: 7 dBi typ.
VSWR: 2.0:1 typ.
Polarization: Vertical
Power: 5 Watts
H-Plane Beamwidth: 360 degrees
E-Plane Beamwidth: 14 degrees typ.
Front to Back Ratio: N/A
Cross Pol. Descrimination: 18 dB typ.
Electrical Beamtilt: N/A
Impedance: 50 ohms nominal
Termination: N female

Material Specifications

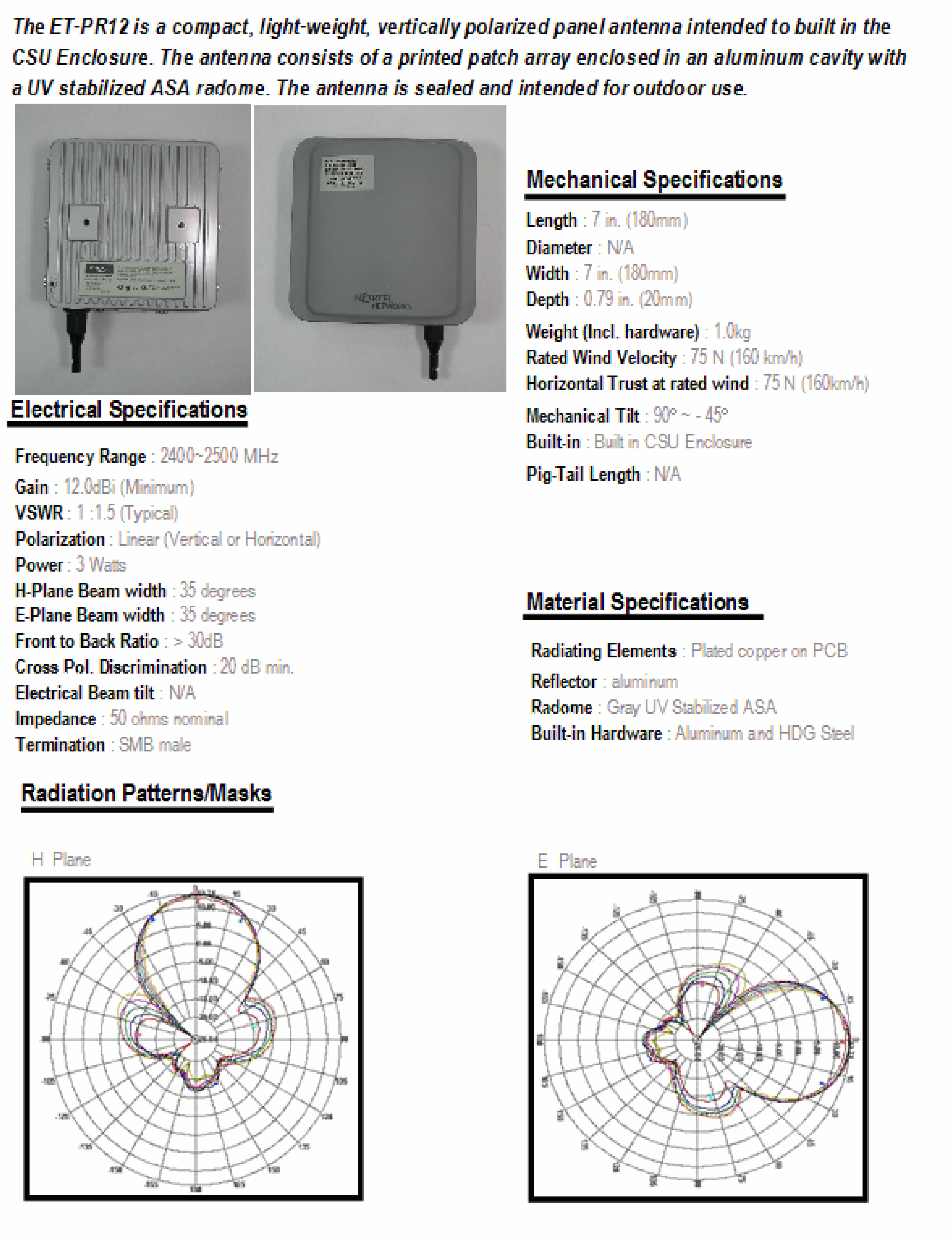
Radiating Elements: Copper
Reflector: N/A
Radome: Gray UV stabilized PVC
Mounting Hardware: Aluminum and Stainless steel

Radiation Patterns/Masks

H-Plane

E-Plane

ET-PR12 Built-in Panel Antenna



The ET-PR12 is a compact, light-weight, vertically polarized panel antenna intended to built in the CSU Enclosure. The antenna consists of a printed patch array enclosed in an aluminum cavity with a UV stabilized ASA radome. The antenna is sealed and intended for outdoor use.

Electrical Specifications

Frequency Range : 2400~2500 MHz
Gain : 12.0dBi (Minimum)
VSWR : 1 :1.5 (Typical)
Polarization : Linear (Vertical or Horizontal)
Power : 3 Watts
H-Plane Beam width : 35 degrees
E-Plane Beam width : 35 degrees
Front to Back Ratio : > 30dB
Cross Pol. Discrimination : 20 dB min.
Electrical Beam tilt : N/A
Impedance : 50 ohms nominal
Termination : SMB male

Mechanical Specifications

Length : 7 in. (180mm)
Diameter : N/A
Width : 7 in. (180mm)
Depth : 0.79 in. (20mm)
Weight (Incl. hardware) : 1.0kg
Rated Wind Velocity : 75 N (160 km/h)
Horizontal Trust at rated wind : 75 N (160km/h)
Mechanical Tilt : 90° ~ - 45°
Built-in : Built in CSU Enclosure
Pig-Tail Length : N/A

Material Specifications

Radiating Elements : Plated copper on PCB
Reflector : aluminum
Radome : Gray UV Stabilized ASA
Built-in Hardware : Aluminum and HDG Steel

Radiation Patterns/Masks

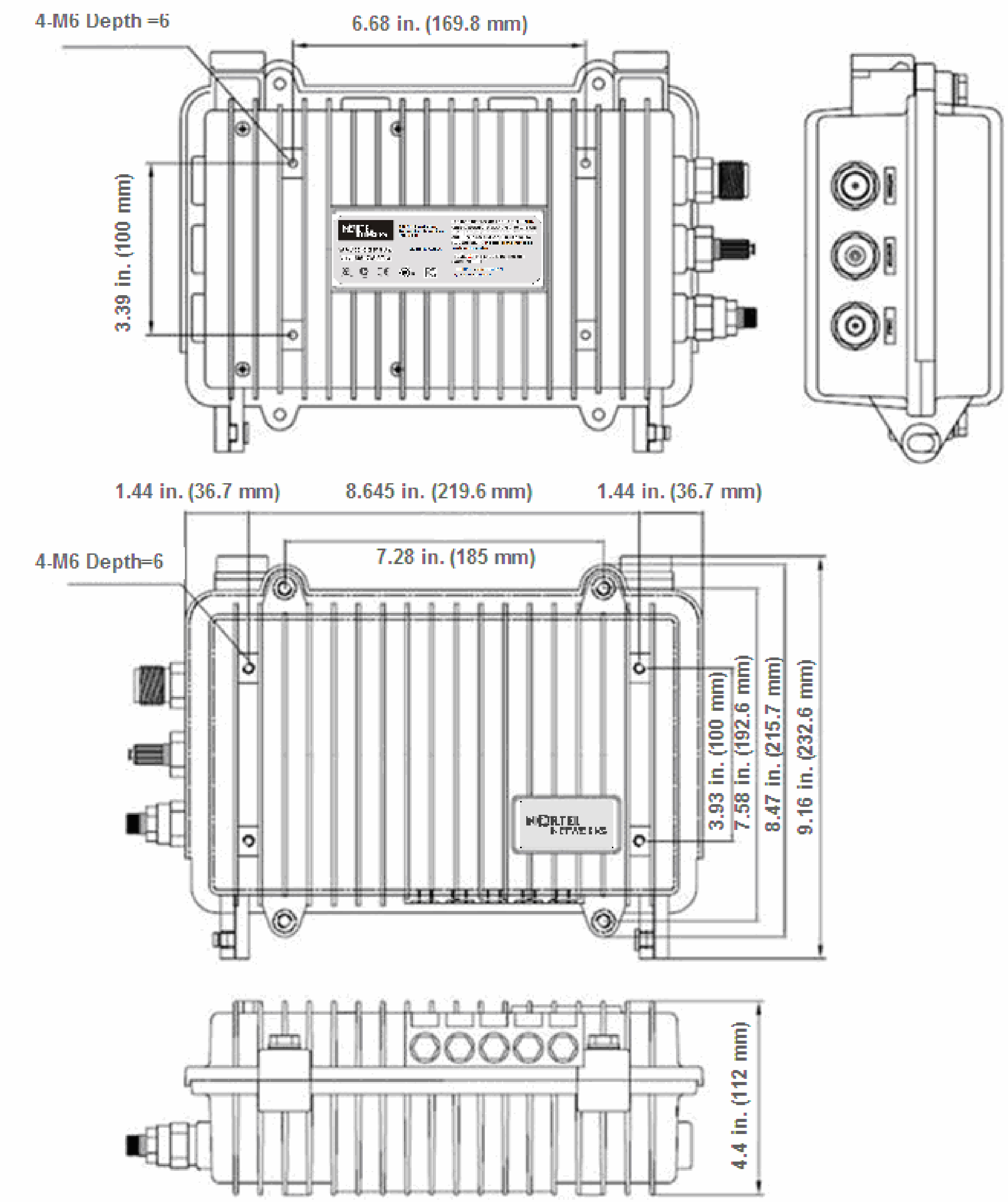
H Plane

E Plane

Appendix D. Enclosure Dimension

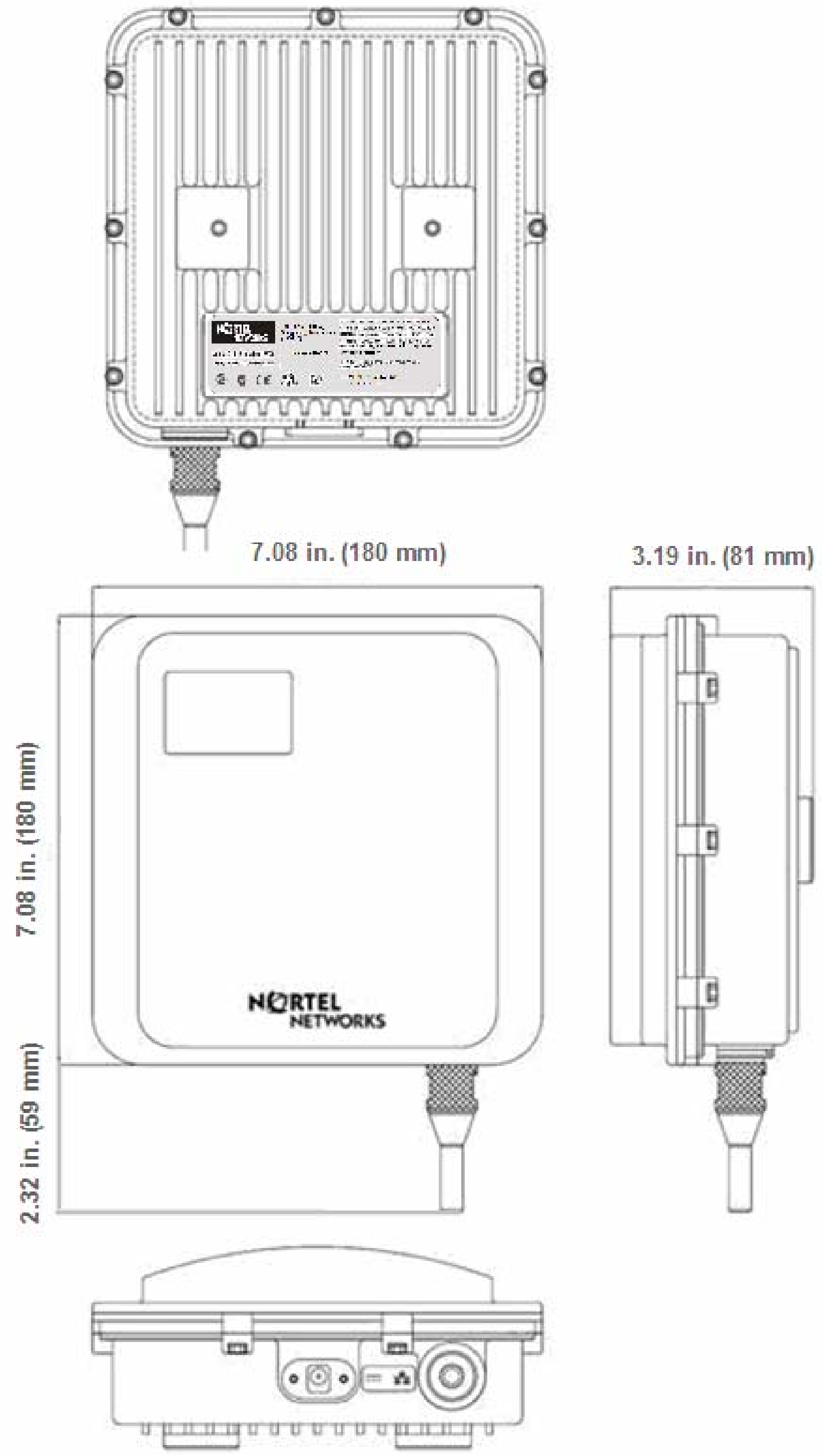
Access Point Unit(APU)

Figure A.3
APU Dimension



Corporate service unit(CSU)

Figure A.4
CSU Dimension



Appendix E. Site Survey

Calculating the system parameters

Free Space

Microwave signal will be attenuated as it travels through space according to the following equation

Gs = Ptx + Gtx + Grx – (RS)

Gs : System Gain
Ptx : Transmit power level in dBm
Gtx : Transmit antenna gain in dBi
FSL: Free space loss attenuation in dB
Grx : Receive antenna gain in dBi
RS : Receiver Sensitivity in dBm

Lt = FSL + Mp

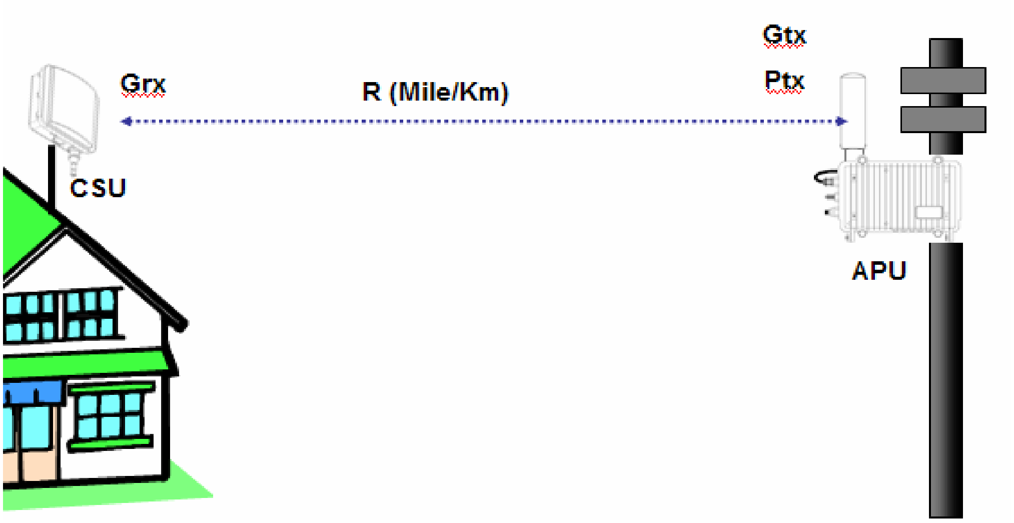
Lt : Transmission Loss
FSL : Free Space Loss
FM : Fade Margin + Other Loss(Cable)

FSL : 92.4 + 20Log(F) + 20Log(R)

F: Frequency (MHz)
R: Range (Km)

The Radio Signal transmitted can reach the other end only when the system gain is equal or larger than the Transmission Loss.
An installation engineer should determine the antenna gain to meet the above condition with EIRP, the summation of the antenna gain and the output power not exceeding FCC Radio Regulations.

Figure A.5
Radio Link Analysis



Determining the Distance between both sites

Gs = Lt = Ptx + Gtx + Grx –(RS) = (92.4 + 20Log(F) + 20Log(R))+10

Gs = Constant = (36.6 + 20Log(F) + 20Log(R))+10

Calculating Distance (R) between both sites

Case Study
Transmitter: APU, Receiver: CSU

Ptx : 15dBm
Gtx : 7dBi(Omni-directional)
Grx : 18dBi
RS : - 83dBm
F : 2.4 GHz
R: 5 mile
FM: 12 dB (Conventional Setting Value)

Gs = Ptx + Gtx + Grx – (RS)
Gs(Flat Panel) = 15 + 15 + 18 - (-83) = 131

FSL : 36.6 + 20Log(F) + 20Log(R)
FSL = 36.6 + 20Log(2400) + 20Log(5) = 118.2 dB

Lt = FSL + FM
Lt = 118.2 + 12 = 130.2

FRESNEL ZONE

For a link to truly be line-of-sight, no objects such as buildings, cars, etc. or the ground may be within a certain height perpendicular to the line of sight path called the first fresnel (pronounced fray-nell) zone.

This height of the fresnel zone H (in feet) is specified by the equation below.

H = 43.3 x sqrt (D/ (4xF))

D: distance in miles between antennas
F: Frequency in GHz

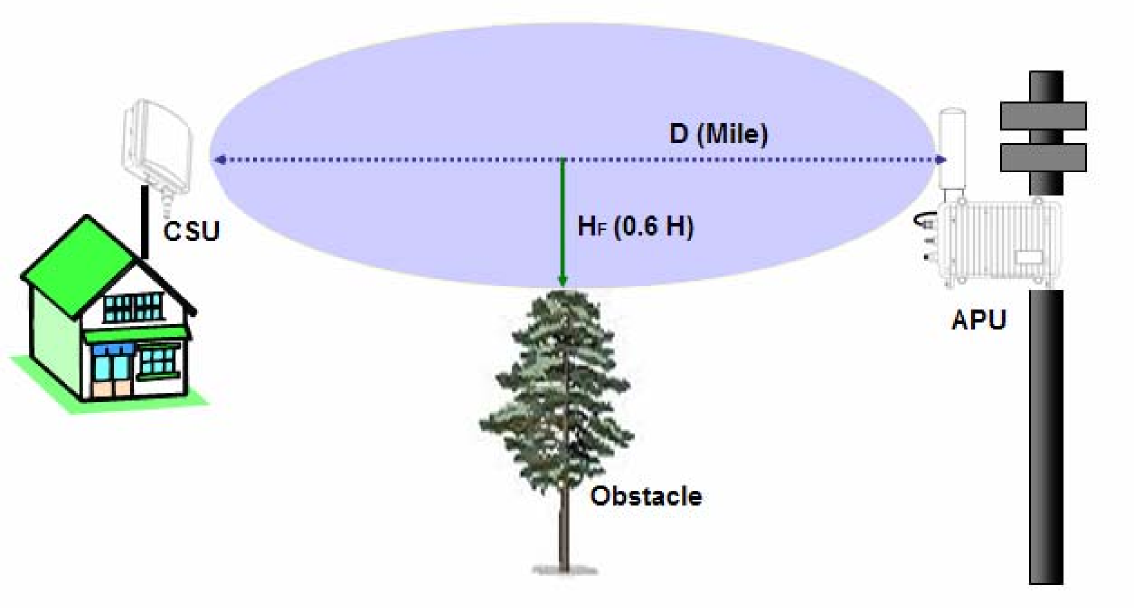
Case Study

D: 10
F: 2.4

H = 43.3 x sqrt (10/ (4x2.4))
H = 44.19 feet
HF = 44.19 * 0.6 = 26.5 feet

If 60 percent of the FRESNEL ZONE is free from obstructions the link will generally behave as LOS (Line of sight).

Figure A.6
FRESNEL ZONE



Earth bulge

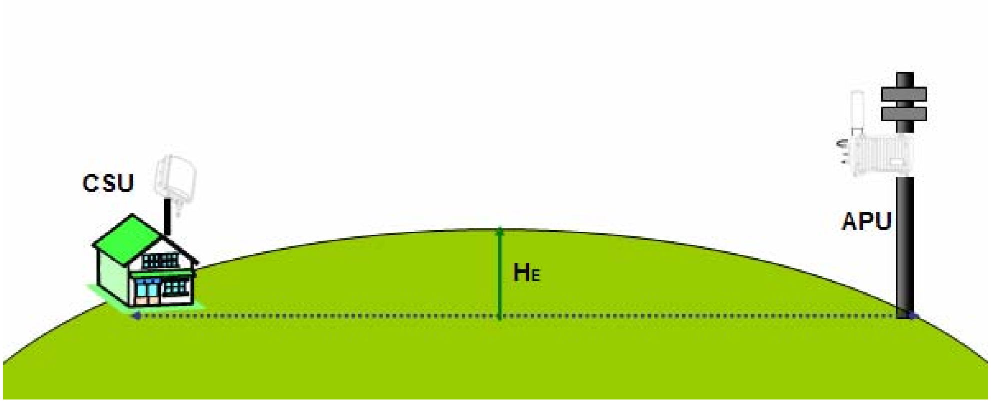
For long links the curvature of the earth will may block the line of sight path unless the antennas at both ends of the link are positioned high enough above the ground. This height must be added to the FRESNEL ZONE height for each antenna.

H_E = D^2/8

H = Earth bulge height in feet
D=distance between antennas in miles

Case Study
D: 10 mile
H_E = D^2/8 = 10^2/8 = 12.5 feet

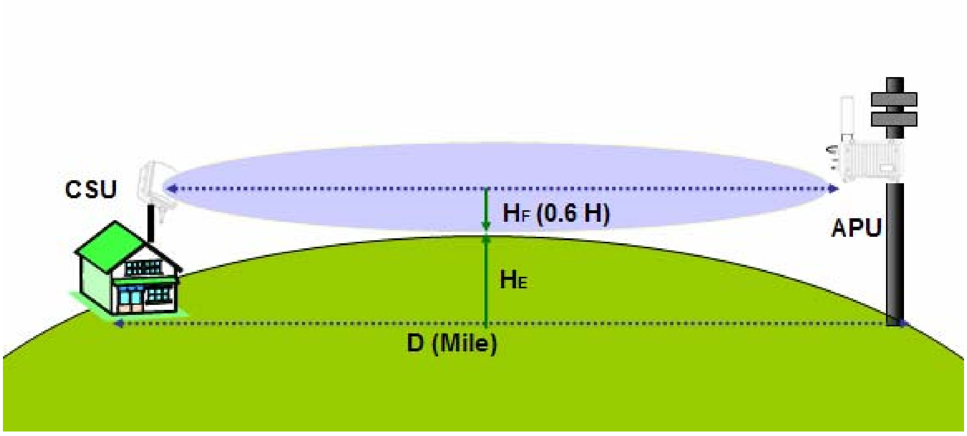
Figure A.7
Earth Bulge



Total height required at midpoint

$H_T = H_F + H_E$

Figure A.8
Total height



Appendix F. Wireless Network Planning

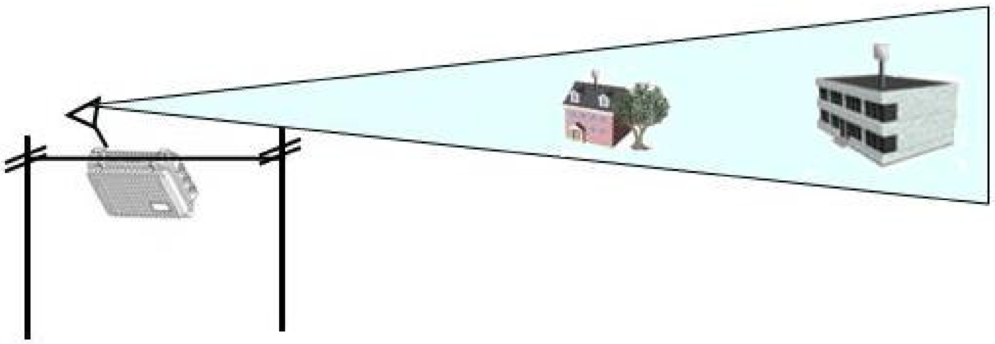
This section provides a general concept and designing tips about typical Point to Multi-Point (PMP) and Point to Point (PTP) network configuration.

Selecting Antenna Type

Directional Antenna (NTA 2407)

Flat panel antennas have a directional gain and are ideally suited for short and medium range bridging. For example, two office buildings that are across the street from one another and need to share a network connection would be a good scenario to use flat panel (directional) antennas.

Figure A.9
Directional Antenna concept (Flat Panel Antenna)

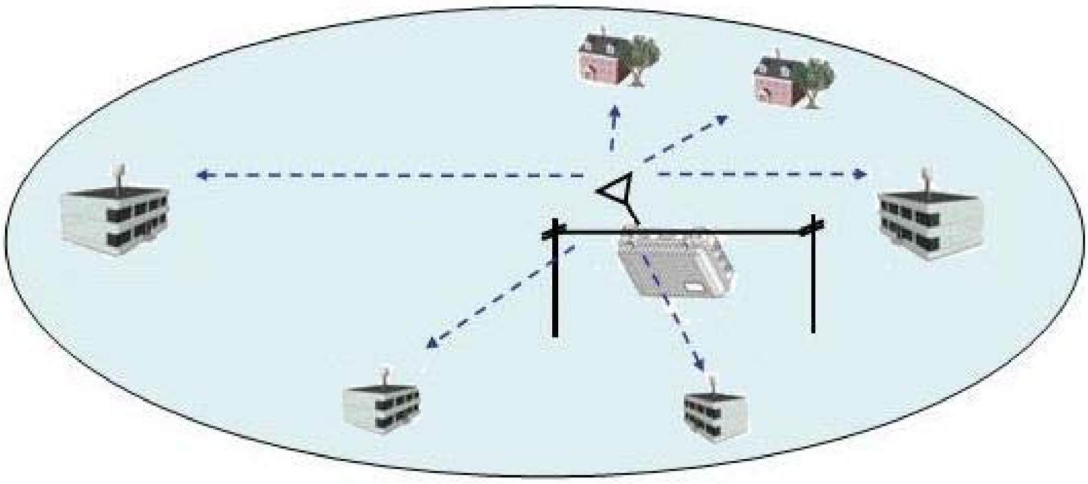


Omni-Directional Antenna (NTA 2412)

Omni-directional antennas are used when coverage in all directions around the horizontal axis of the antenna is required. Omni-directional antennas are most effective where large coverage areas are needed around a central point, they commonly used for point-to-multipoint designs with a star topology.

The antenna should be placed on top of a structure (such as a building) in the middle of the coverage area. For example, in a college campus the antenna might be placed in the centre of the campus for the greatest coverage area.

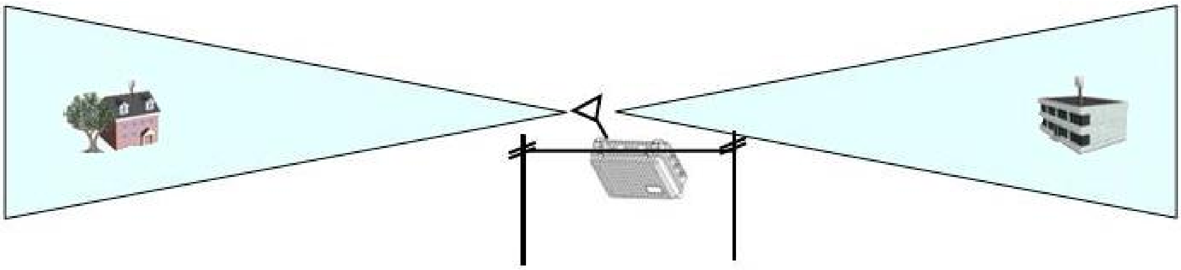
Figure A.10
Omni-directional Antenna concept



Bi-directional Antenna (NTA 2400)

Bi-directional antennas are used when coverage is required in a selected horizontal axis of the antenna is required. Bi-directional antennas are most effective where a particular coverage area is needed around a central point. For example, placing a bi-directional antenna along a street would provide coverage on each side of the street. The antenna pattern is similar to a Figure A.10 pattern.

Figure A.11
Bi-directional Antenna concept



Selecting Radio Channel

Direct-Sequence Channel Layout

Most locations are deploying 802.11 products based on direct-sequence technology because the WLAN products are based on direct-sequence technologies. Direct Sequence underlies both the 2-Mbps DS PHY and the 11-Mbps HR/DSSS PHY. Both standards use identical channels and power transmission requirements.

Direct-sequence products transmit power across a 25-MHz band. Any access points must be separated by five channels to prevent inter-access point interference. Selecting frequencies for wireless LAN operation is based partly on the radio spectrum allocation where the wireless LAN is installed. See Table A.2

Table A.2
Radio channel usage in different countries

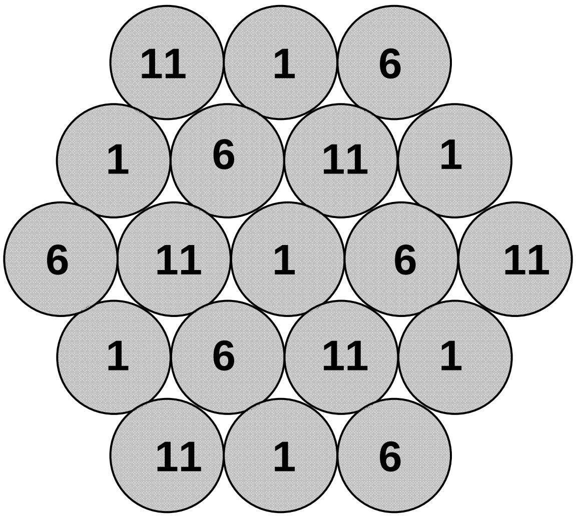
Channel number	Channel frequency (GHz)	US/Canada	ETSI[b]	France
1	2.412	•	•	
2	2.417	•	•	
3	2.422	•	•	
4	4.427	•	•	
5	2.432	•	•	
6	2.437	•	•	
7	2.442	•	•	
8	2.447	•	•	
9	2.452	•	•	
10[c]	2.457	•	•	•
11	2.462	•	•	•
12	2.467		•	•
13	2.472		•	•

Access points can have overlapping coverage areas with full throughput, provided the radio channels differ by at least five. Only wireless LANs in the U.S., Canada, and Europe that have adopted the ETSI recommendations can operate access points with overlapping coverage areas at full throughput.

After locating the access points, make sure that any access points with overlapping coverage are separated by at least five channels. The cellular-telephone industry uses the “hex pattern” shown Figure A.11 to cover large area.

Part of the site survey is to establish the boundaries of access point coverage to prevent more than three access points from mutually overlapping, unless certain areas use multiple channels in a single area for greater throughput.

Figure A.12
Frequency planning



Limitations of direct-sequence channel layout

One of the problems with 802.11 direct-sequence networks and 802.11b Direct-sequence networks is that there are only three no overlapping channels. Four channels are required for no overlapping coverage in two dimensions, and more channels are required for three dimensions. When laying out frequency channels in three dimensions, always keep in mind that radio signals may penetrate the floor and ceiling.

Designing a wireless network

Figure A.13
PMP (Point to Multi-Point)

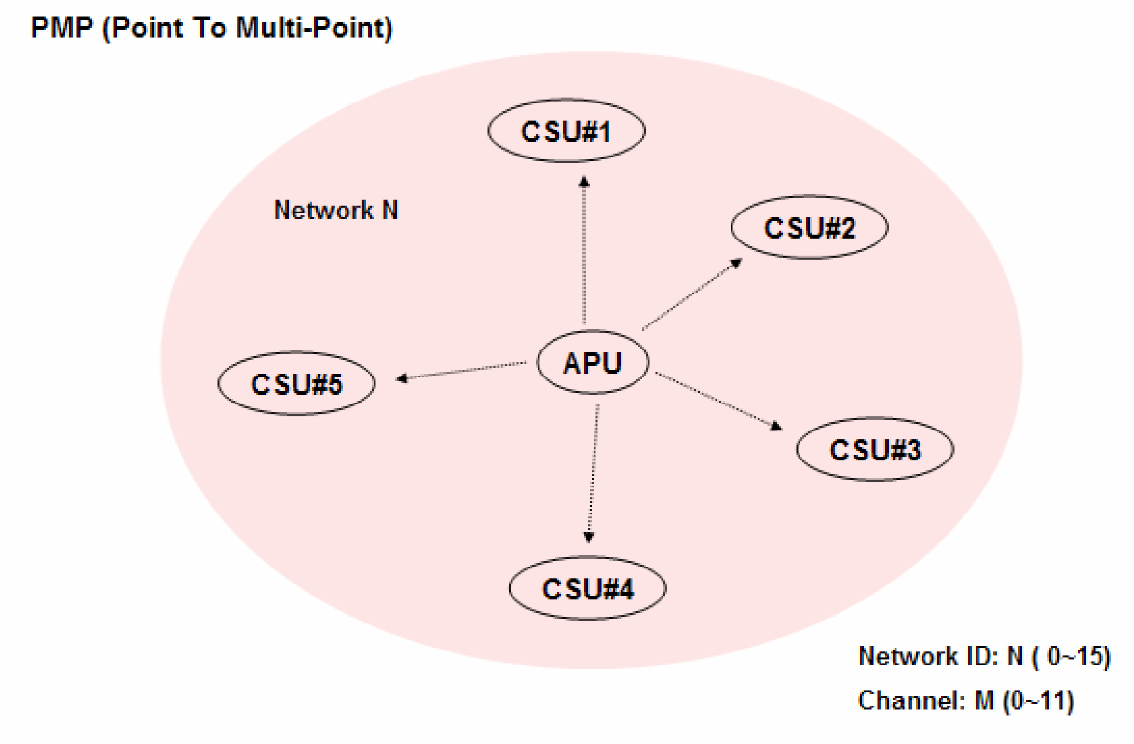
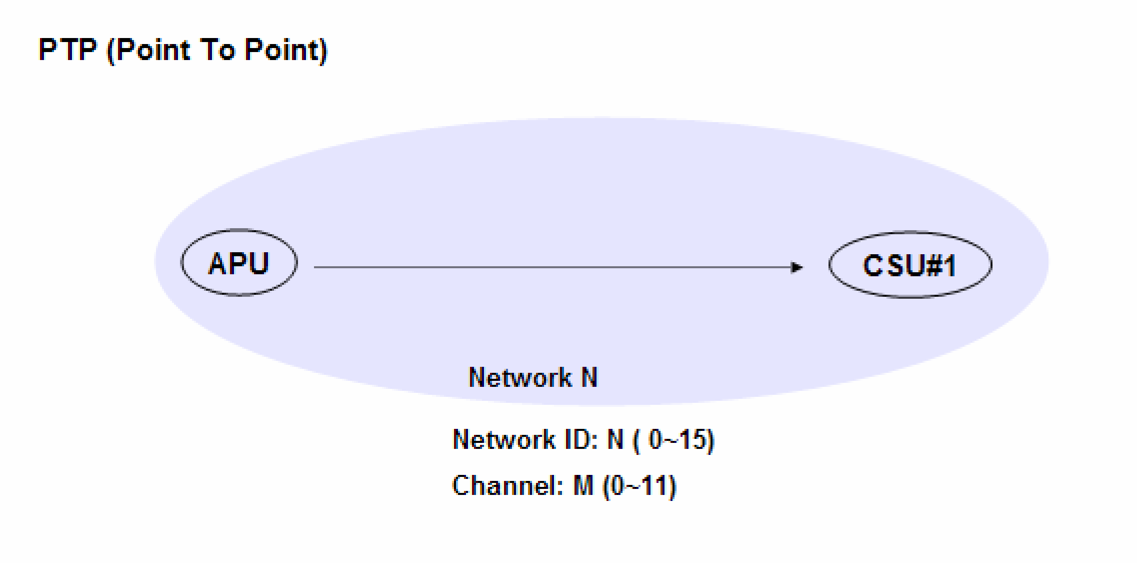


Figure A.14
PTP (Point to Point)



Sample Networks

Figure A.15
PMP Topology

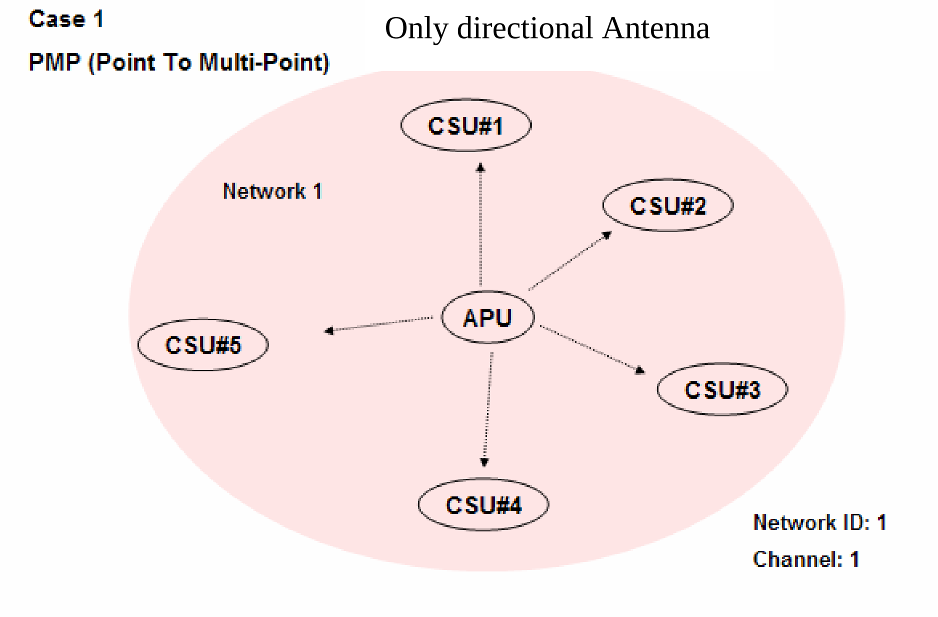
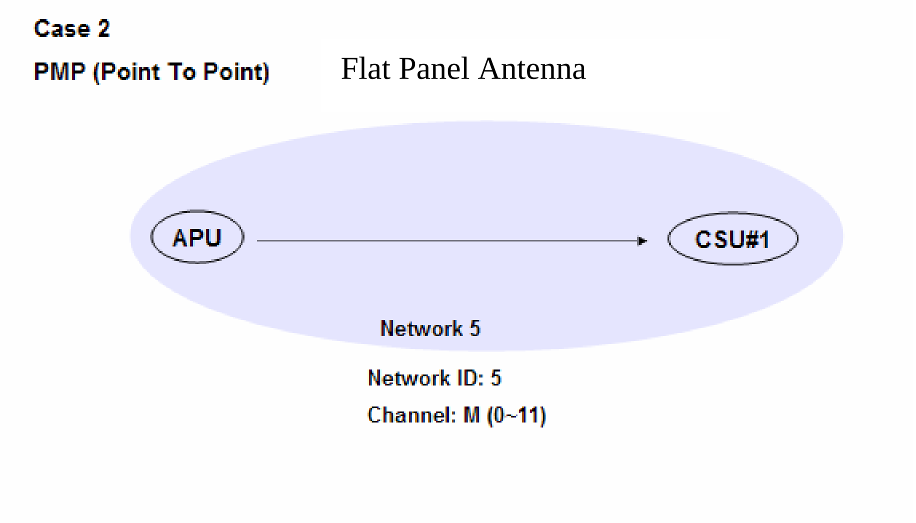


Figure A.16
PTP Topology



⚠ **Even though Network ID and Channel are each different numbering concept, It is convenient that both parameters are set to be the same number. But, these tips can be changed in accordance with RF channel designing.**

Figure A.17
PMP Topology

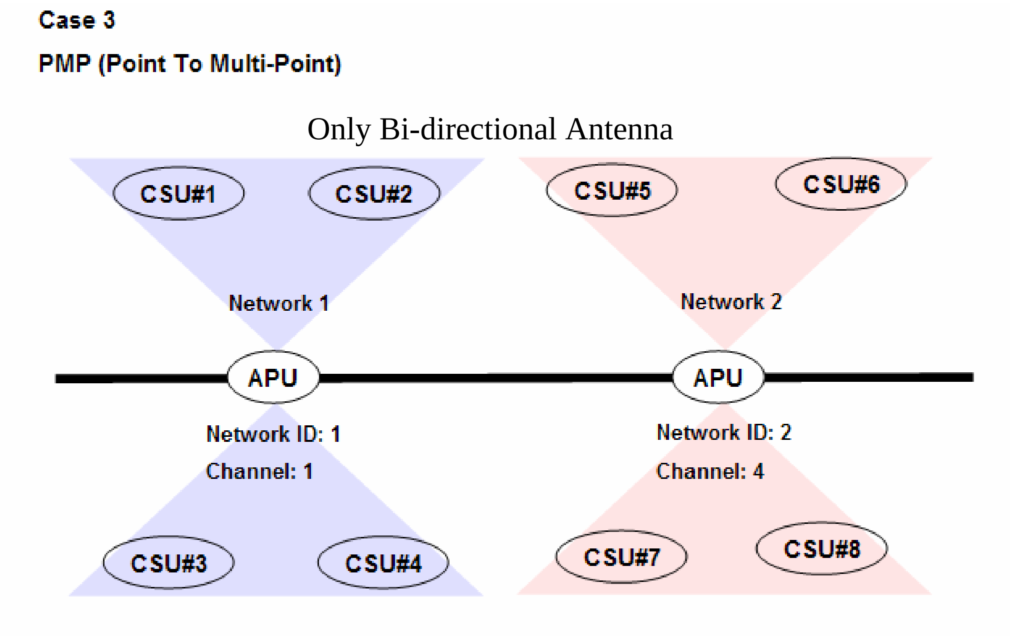
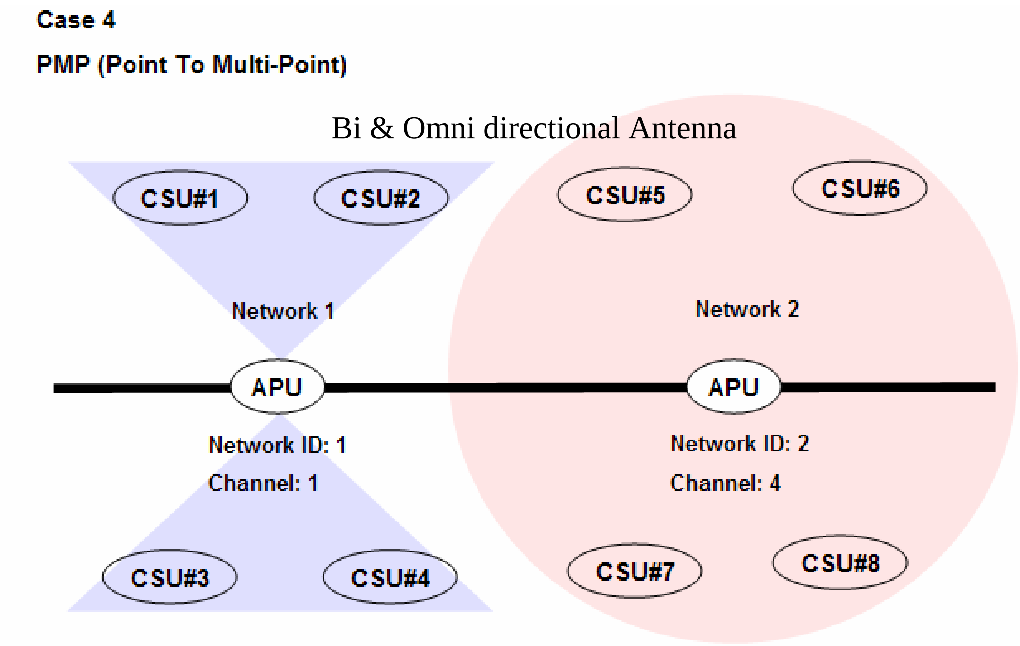


Figure A.18
PMP Topology



⚠ **Even though Network ID and Channel are each different numbering concept, It is convenient that both parameters are set to be the same number. But, these tips can be changed in accordance with RF channel designing.**

Appendix G. SNMP MIB List & Example values

```
1: [Loaded: RFC1213-MIB] sysDescr.0 (octet string) KarlBridge/Router v4.44-00-112900 SN-KNRG+a35CT3020551 V4.35
2: sysObjectID.0 (object identifier) kbridge-mib
3: sysUpTime.0 (timeticks) 6 days 00h:57m:11s.44th (52183144)
4: sysContact.0 (octet string) (zero-length)
5: sysName.0 (octet string) ABG-Proxim_ED
6: sysLocation.0 (octet string) (zero-length)
7: sysServices.0 (integer) 2
8: ifNumber.0 (integer) 2
9: ifIndex.1 (integer) 1
10: ifIndex.2 (integer) 2
11: ifDescr.1 (octet string) MACphyter Fast Ethernet
12: ifDescr.2 (octet string) AR5001-0000-0000 Wireless LAN Reference Card
13: ifType.1 (integer) ethernet-csmacd(6)
14: ifType.2 (integer) ethernet-csmacd(6)
15: ifMtu.1 (integer) 2042
16: ifMtu.2 (integer) 1522
17: ifSpeed.1 (gauge) 10000000
18: ifSpeed.2 (gauge) 54000000
19: ifPhysAddress.1 (octet string) 00.20.F6.04.03.A0 (hex)
20: ifPhysAddress.2 (octet string) 00.20.A6.4C.C7.51 (hex)
21: ifAdminStatus.1 (integer) up(1)
22: ifAdminStatus.2 (integer) up(1)
23: ifOperStatus.1 (integer) up(1)
24: ifOperStatus.2 (integer) up(1)
25: ifLastChange.1 (timeticks) 0 days 00h:00m:00s.00th (0)
26: ifLastChange.2 (timeticks) 0 days 00h:02m:00s.00th (12000)
27: ifInOctets.1 (counter) 1229704
28: ifInOctets.2 (counter) 86674413
29: ifInUcastPkts.1 (counter) 7078
30: ifInUcastPkts.2 (counter) 43463
31: ifInNUcastPkts.1 (counter) 4202
32: ifInNUcastPkts.2 (counter) 548012
33: ifInDiscards.1 (counter) 0
34: ifInDiscards.2 (counter) 41
35: ifInErrors.1 (counter) 0
36: ifInErrors.2 (counter) 2125
37: ifInUnknownProtos.1 (counter) 0
38: ifInUnknownProtos.2 (counter) 0
39: ifOutOctets.1 (counter) 8477301
40: ifOutOctets.2 (counter) 70108529
41: ifOutUcastPkts.1 (counter) 5799
```

```
42: ifOutUcastPkts.2 (counter) 41946
43: ifOutNUcastPkts.1 (counter) 27181
44: ifOutNUcastPkts.2 (counter) 529297
45: ifOutDiscards.1 (counter) 0
46: ifOutDiscards.2 (counter) 1
47: ifOutErrors.1 (counter) 0
48: ifOutErrors.2 (counter) 0
49: ifOutQLen.1 (gauge) 0
50: ifOutQLen.2 (gauge) 0
51: [Loaded: EtherLike-MIB] ifSpecific.1 (object identifier) dot3
52: ifSpecific.2 (object identifier) iso.2.840.10036
53: ipForwarding.0 (integer) not-forwarding(2)
54: ipDefaultTTL.0 (integer) 255
55: ipInReceives.0 (counter) 52133
56: ipInHdrErrors.0 (counter) 0
57: ipInAddrErrors.0 (counter) 0
58: ipForwDatagrams.0 (counter) 0
59: ipInUnknownProtos.0 (counter) 0
60: ipInDiscards.0 (counter) 0
61: ipInDelivers.0 (counter) 34869
62: ipOutRequests.0 (counter) 34856
63: ipOutDiscards.0 (counter) 0
64: ipOutNoRoutes.0 (counter) 0
65: ipReasmTimeout.0 (integer) 0
66: ipReasmReqds.0 (counter) 0
67: ipReasmOKs.0 (counter) 0
68: ipReasmFails.0 (counter) 0
69: ipFragOKs.0 (counter) 0
70: ipFragFails.0 (counter) 0
71: ipFragCreates.0 (counter) 0
72: ipAdEntAddr.192.168.0.2 (ipaddress) 192.168.0.2
73: ipAdEntIfIndex.192.168.0.2 (integer) 1
74: ipAdEntNetMask.192.168.0.2 (ipaddress) 255.255.255.0
75: ipAdEntBcastAddr.192.168.0.2 (integer) 1
76: ipAdEntReasmMaxSize.192.168.0.2 (integer) 0
77: ipRouteDest.0.0.0.0 (ipaddress) 0.0.0.0
78: ipRouteIfIndex.0.0.0.0 (integer) 0
79: ipRouteMetric1.0.0.0.0 (integer) 1
80: ipRouteMetric2.0.0.0.0 (integer) -1
81: ipRouteMetric3.0.0.0.0 (integer) -1
82: ipRouteMetric4.0.0.0.0 (integer) -1
83: ipRouteNextHop.0.0.0.0 (ipaddress) 192.168.0.1
84: ipRouteType.0.0.0.0 (integer) indirect(4)
85: ipRouteProto.0.0.0.0 (integer) local(2)
86: ipRouteAge.0.0.0.0 (integer) 0
87: ipRouteMask.0.0.0.0 (ipaddress) 0.0.0.0
```

```
88: ipRouteMetric5.0.0.0.0 (integer) -1
89: ipRouteInfo.0.0.0.0 (object identifier) (null-oid) 0.0
90: ipNetToMediaIfIndex.2.192.168.0.1 (integer) 2
91: ipNetToMediaIfIndex.2.192.168.0.50 (integer) 2
92: ipNetToMediaPhysAddress.2.192.168.0.1 (octet string) 00.01.24.70.0B.E2 (hex)
93: ipNetToMediaPhysAddress.2.192.168.0.50 (octet string) 00.50.8B.AD.3F.B2 (hex)
94: ipNetToMediaNetAddress.2.192.168.0.1 (ipaddress) 192.168.0.1
95: ipNetToMediaNetAddress.2.192.168.0.50 (ipaddress) 192.168.0.50
96: ipNetToMediaType.2.192.168.0.1 (integer) dynamic(3)
97: ipNetToMediaType.2.192.168.0.50 (integer) dynamic(3)
98: ipRoutingDiscards.0 (counter) 0
99: icmpInMsgs.0 (counter) 33234
100: icmpInErrors.0 (counter) 0
101: icmpInDestUnreachs.0 (counter) 0
102: icmpInTimeExcds.0 (counter) 30928
103: icmpInParmProbs.0 (counter) 0
104: icmpInSrcQuenchs.0 (counter) 19904
105: icmpInRedirects.0 (counter) 2000
106: icmpInEchos.0 (counter) 33234
107: icmpInEchoReps.0 (counter) 0
108: icmpInTimestamps.0 (counter) 0
109: icmpInTimestampReps.0 (counter) 0
110: icmpInAddrMasks.0 (counter) 0
111: icmpInAddrMaskReps.0 (counter) 0
112: icmpOutMsgs.0 (counter) 33234
113: icmpOutErrors.0 (counter) 0
114: icmpOutDestUnreachs.0 (counter) 3
115: icmpOutTimeExcds.0 (counter) 0
116: icmpOutParmProbs.0 (counter) 0
117: icmpOutSrcQuenchs.0 (counter) 30928
118: icmpOutRedirects.0 (counter) 40960
119: icmpOutEchos.0 (counter) 0
120: icmpOutEchoReps.0 (counter) 33234
121: icmpOutTimestamps.0 (counter) 0
122: icmpOutTimestampReps.0 (counter) 0
123: icmpOutAddrMasks.0 (counter) 0
124: icmpOutAddrMaskReps.0 (counter) 0
125: udpInDatagrams.0 (counter) 1699
126: udpNoPorts.0 (counter) 3
127: udpInErrors.0 (counter) 0
128: udpOutDatagrams.0 (counter) 1685
129: udpLocalAddress.0.0.0.0.161 (ipaddress) 0.0.0.0
130: udpLocalPort.0.0.0.0.161 (integer) 161
131: dot3StatsIndex.1 (integer) 1
132: dot3StatsIndex.2 (integer) 2
133: dot3StatsAlignmentErrors.1 (counter) 0
```

```
134: dot3StatsAlignmentErrors.2 (counter) 0
135: dot3StatsFCSErrors.1 (counter) 0
136: dot3StatsFCSErrors.2 (counter) 0
137: dot3StatsSingleCollisionFrames.1 (counter) 1647
138: dot3StatsSingleCollisionFrames.2 (counter) 0
139: dot3StatsMultipleCollisionFrames.1 (counter) 545
140: dot3StatsMultipleCollisionFrames.2 (counter) 0
141: dot3StatsSQETestErrors.1 (counter) 0
142: dot3StatsSQETestErrors.2 (counter) 0
143: dot3StatsDeferredTransmissions.1 (counter) 18
144: dot3StatsDeferredTransmissions.2 (counter) 0
145: dot3StatsLateCollisions.1 (counter) 0
146: dot3StatsLateCollisions.2 (counter) 0
147: dot3StatsExcessiveCollisions.1 (counter) 0
148: dot3StatsExcessiveCollisions.2 (counter) 0
149: dot3StatsInternalMacTransmitErrors.1 (counter) 0
150: dot3StatsInternalMacTransmitErrors.2 (counter) 0
151: dot3StatsCarrierSenseErrors.1 (counter) 0
152: dot3StatsCarrierSenseErrors.2 (counter) 0
153: dot3StatsFrameTooLongs.1 (counter) 0
154: dot3StatsFrameTooLongs.2 (counter) 0
155: dot3StatsInternalMacReceiveErrors.1 (counter) 0
156: dot3StatsInternalMacReceiveErrors.2 (counter) 0
157: snmpInPkts.0 (counter) 1298
158: snmpOutPkts.0 (counter) 1298
159: snmpInBadVersions.0 (counter) 0
160: snmpInBadCommunityNames.0 (counter) 0
161: snmpInBadCommunityUses.0 (counter) 3
162: snmpInASNParseErrs.0 (counter) 0
163: snmpInTooBigs.0 (counter) 0
164: snmpInNoSuchNames.0 (counter) 0
165: snmpInBadValues.0 (counter) 0
166: snmpInReadOnlys.0 (counter) 0
167: snmpInGenErrs.0 (counter) 0
168: snmpInTotalReqVars.0 (counter) 1511
169: snmpInTotalSetVars.0 (counter) 4
170: snmpInGetRequests.0 (counter) 97
171: snmpInGetNexts.0 (counter) 1211
172: snmpInSetRequests.0 (counter) 4
173: snmpInGetResponses.0 (counter) 0
174: snmpInTraps.0 (counter) 0
175: snmpOutTooBigs.0 (counter) 0
176: snmpOutNoSuchNames.0 (counter) 3
177: snmpOutBadValues.0 (counter) 0
178: snmpOutGenErrs.0 (counter) 0
179: snmpOutGetRequests.0 (counter) 0
```

```
180: snmpOutGetNexts.0 (counter) 0
181: snmpOutSetRequests.0 (counter) 0
182: snmpOutGetResponses.0 (counter) 1322
183: snmpOutTraps.0 (counter) 0
184: snmpEnableAuthenTraps.0 (integer) enabled(1)
185: mib-2.17.1.1.0 (octet string) 00.20.F6.04.03.A0 (hex)
186: mib-2.17.1.2.0 (integer) 2
187: mib-2.17.1.3.0 (integer) 2
188: mib-2.17.1.4.1.1.1 (integer) 1
189: mib-2.17.1.4.1.1.2 (integer) 2
190: mib-2.17.1.4.1.2.1 (integer) 1
191: mib-2.17.1.4.1.2.2 (integer) 2
192: mib-2.17.1.4.1.3.1 (object identifier) (null-oid) 0.0
193: mib-2.17.1.4.1.3.2 (object identifier) (null-oid) 0.0
194: mib-2.17.1.4.1.4.1 (counter) 0
195: mib-2.17.1.4.1.4.2 (counter) 0
196: mib-2.17.1.4.1.5.1 (counter) 0
197: mib-2.17.1.4.1.5.2 (counter) 0
198: mib-2.17.4.1.0 (counter) 0
199: mib-2.17.4.2.0 (integer) 300
200: mib-2.17.4.3.1.1.0.1.36.112.11.226 (octet string) 00.01.24.70.0B.E2 (hex)
201: mib-2.17.4.3.1.1.0.32.246.4.3.160 (octet string) 00.20.F6.04.03.A0 (hex)
202: mib-2.17.4.3.1.1.0.32.246.4.12.163 (octet string) 00.20.F6.04.0C.A3 (hex)
203: mib-2.17.4.3.1.1.0.32.246.4.26.159 (octet string) 00.20.F6.04.1A.9F (hex)
204: mib-2.17.4.3.1.1.0.32.246.4.34.23 (octet string) 00.20.F6.04.22.17 (hex)
205: mib-2.17.4.3.1.1.0.32.246.4.34.75 (octet string) 00.20.F6.04.22.4B (hex)
206: mib-2.17.4.3.1.1.0.64.244.114.215.152 (octet string) 00.40.F4.72.D7.98 (hex)
207: mib-2.17.4.3.1.1.0.80.139.173.63.178 (octet string) 00.50.8B.AD.3F.B2 (hex)
208: mib-2.17.4.3.1.1.0.80.186.71.245.19 (octet string) 00.50.BA.47.F5.13 (hex)
209: mib-2.17.4.3.1.2.0.1.36.112.11.226 (integer) 2
210: mib-2.17.4.3.1.2.0.32.246.4.3.160 (integer) 2
211: mib-2.17.4.3.1.2.0.32.246.4.12.163 (integer) 2
212: mib-2.17.4.3.1.2.0.32.246.4.26.159 (integer) 2
213: mib-2.17.4.3.1.2.0.32.246.4.34.23 (integer) 2
214: mib-2.17.4.3.1.2.0.32.246.4.34.75 (integer) 2
215: mib-2.17.4.3.1.2.0.64.244.114.215.152 (integer) 2
216: mib-2.17.4.3.1.2.0.80.139.173.63.178 (integer) 2
217: mib-2.17.4.3.1.2.0.80.186.71.245.19 (integer) 1
218: mib-2.17.4.3.1.3.0.1.36.112.11.226 (integer) 5
219: mib-2.17.4.3.1.3.0.32.246.4.3.160 (integer) 3
220: mib-2.17.4.3.1.3.0.32.246.4.12.163 (integer) 3
221: mib-2.17.4.3.1.3.0.32.246.4.26.159 (integer) 3
222: mib-2.17.4.3.1.3.0.32.246.4.34.23 (integer) 3
223: mib-2.17.4.3.1.3.0.32.246.4.34.75 (integer) 3
224: mib-2.17.4.3.1.3.0.64.244.114.215.152 (integer) 3
225: mib-2.17.4.3.1.3.0.80.139.173.63.178 (integer) 3
```

```
226: mib-2.17.4.3.1.3.0.80.186.71.245.19 (integer) 3
227: mib-2.17.4.4.1.1.1 (integer) 1
228: mib-2.17.4.4.1.1.2 (integer) 2
229: mib-2.17.4.4.1.2.1 (integer) 0
230: mib-2.17.4.4.1.2.2 (integer) 0
231: mib-2.17.4.4.1.3.1 (counter) 11280
232: mib-2.17.4.4.1.3.2 (counter) 29716
233: mib-2.17.4.4.1.4.1 (counter) 29716
234: mib-2.17.4.4.1.4.2 (counter) 11280
235: mib-2.17.4.4.1.5.1 (counter) 0
236: mib-2.17.4.4.1.5.2 (counter) 0
237: karlnet.1.1.0 (integer) 0
238: karlnet.1.2.0 (integer) 32
239: karlnet.1.3.0 (integer) 25
240: karlnet.1.4.0 (integer) 20
241: karlnet.1.5.0 (ipaddress) 198.17.74.250
242: karlnet.1.6.0 (integer) 0
243: karlnet.1.7.0 (integer) 0
244: karlnet.1.8.0 (integer) 0
245: karlnet.1.9.0 (integer) 0
246: karlnet.1.10.0 (integer) 0
247: karlnet.1.11.0 (integer) 0
248: karlnet.1.12.0 (integer) -10000
249: karlnet.1.13.0 (integer) 0
250: karlnet.1.14.0 (integer) 0
251: karlnet.1.15.0 (integer) 0
252: karlnet.1.16.0 (integer) 0
253: karlnet.1.17.0 (integer) 0
254: karlnet.1.18.0 (integer) 0
255: karlnet.1.19.0 (integer) 0
256: karlnet.1.20.0 (integer) 0
257: karlnet.1.21.0 (integer) 0
258: karlnet.1.22.0 (integer) 0
259: karlnet.1.23.0 (integer) 0
260: karlnet.1.24.0 (integer) 0
261: karlnet.1.25.0 (integer) 0
262: karlnet.1.26.0 (integer) 0
263: karlnet.1.27.0 (integer) 0
264: kbWirelessStationNumber.0 (integer) 1
265: kbWirelessStationIndex.1 (integer) 1
266: kbWirelessStationInterfaceNumber.1 (integer) 2
267: kbWirelessStationName.1 (octet string) 5.8 ISP_Base
268: kbWirelessStationExclHellos.1 (counter) 520801
269: kbWirelessStationGoodHellos.1 (counter) 4
270: kbWirelessStationLowHellos.1 (counter) 0
271: kbWirelessStationSignalLevel.1 (integer) 90
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272: kbWirelessStationNoiseLevel.1 (integer) 10
273: kbWirelessStationSignalQuality.1 (integer) 0
274: kbWirelessStationPktTransmits.1 (counter) 49643
275: kbWirelessStationMACAddress.1 (octet string) 00.01.24.70.0B.E2 (hex)
276: kbWirelessStationTransmits.1 (counter) 48696
277: kbWirelessStationBadTransmits.1 (counter) 0
278: kbWirelessStationReTransmits.1 (counter) 179
279: kbWirelessStationIPAddress.1 (ipaddress) 10.0.1.129
280: kbWirelessStationType.1 (integer) tc_Base_Station(3)
281: kbWirelessStationSNR.1 (integer) excellent_SNR(4)
282: kbWirelessStationState.1 (integer) online(1)
283: kbWirelessPoll.1 (counter) 0
284: kbWirelessPollData.1 (counter) 0
285: kbWirelessPollNoData.1 (counter) 0
286: kbWirelessPollMoreData.1 (counter) 0
287: kbWirelessPollTimeouts.1 (counter) 0
288: kbWirelessPollOfflines.1 (counter) 0
289: kbWirelessTestTime.1 (integer) 0
290: kbWirelessTestInterval.1 (integer) 0
291: kbWirelessTestPacketSize.1 (integer) 0
292: kbWirelessTestOurTx.1 (counter) 0
293: kbWirelessTestOurRx.1 (counter) 0
294: kbWirelessTestHisTx.1 (counter) 0
295: kbWirelessTestHisRx.1 (counter) 0
296: kbWirelessTestOurCurSignalLevel.1 (integer) 0
297: kbWirelessTestOurCurNoiseLevel.1 (integer) 0
298: kbWirelessTestOurCurSignalQuality.1 (integer) 0
299: kbWirelessTestOurCurSNR.1 (integer) 0
300: kbWirelessTestOurMinSignalLevel.1 (integer) 0
301: kbWirelessTestOurMinNoiseLevel.1 (integer) 0
302: kbWirelessTestOurMinSignalQuality.1 (integer) 0
303: kbWirelessTestOurMinSNR.1 (integer) 0
304: kbWirelessTestOurMaxSignalLevel.1 (integer) 0
305: kbWirelessTestOurMaxNoiseLevel.1 (integer) 0
306: kbWirelessTestOurMaxSignalQuality.1 (integer) 0
307: kbWirelessTestOurMaxSNR.1 (integer) 0
308: kbWirelessTestHisCurSignalLevel.1 (integer) 0
309: kbWirelessTestHisCurNoiseLevel.1 (integer) 0
310: kbWirelessTestHisCurSignalQuality.1 (integer) 0
311: kbWirelessTestHisCurSNR.1 (integer) 0
312: kbWirelessTestHisMinSignalLevel.1 (integer) 0
313: kbWirelessTestHisMinNoiseLevel.1 (integer) 0
314: kbWirelessTestHisMinSignalQuality.1 (integer) 0
315: kbWirelessTestHisMinSNR.1 (integer) 0
316: kbWirelessTestHisMaxSignalLevel.1 (integer) 0
317: kbWirelessTestHisMaxNoiseLevel.1 (integer) 0
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318: kbWirelessTestHisMaxSignalQuality.1 (integer) 0
319: kbWirelessTestHisMaxSNR.1 (integer) 0
320: kbWirelessTestLinkUp.1 (integer) down(0)
321: kbWirelessTestLostLink.1 (integer) 0
322: kbWirelessTestLostTestPkts.1 (counter) 0
323: kbWirelessStationRadioType.1 (integer) waveLAN_I(0)
324: kbWirelessRecordType.1 (integer) turboCell(2)
325: kbWirelessStationPktReceives.1 (counter) 70964
326: kbWirelessStationReceives.1 (counter) 0
327: kbWirelessStationBytesReceives.1 (counter) 11395282
328: kbWirelessStationBytesTransmits.1 (counter) 4239031
329: kbWirelessRegistrationRecord.1 (octet string)
00.00.00.00.02.00.AE.01.00.01.24.70.0B.E2.07.00.0A.00.00.00.B8.82.00.00.00.08.00.0
0.00.00.00.00.00.00.00.00.E8.03.14.00.6C.BE.6D.BE.00.00.8F.B9.0A.00.01.81.9A.2E.
00.00.35.2E.38.20.49.53.50.5F.42.61.73.65.00.00.00.00.00.00.00.00.00.00.00.00.00.00.
00.00.00.00.00.00.00.00.00.00.6D.BE.00.00.B3.00.00.00.00.00.00.38.15.01.00.22.C
2.00.00.80.E1.AD.00.11.AF.40.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.
00.00.00.00.00.00.00.5A.0A.00.00.62.F2.07.00.04.00.00.00.00.00.00.00.00.00.00.00.00
.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.
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00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.
00.00.00.00.00.00.00.00.00.00.00.00.00.00.00 (hex)
330: kbWirelessStationFragmentDiscards.1 (counter) 0
331: kbWirelessStationFragmentMissings.1 (counter) 0
332: kbWirelessStationFragmentLostFrames.1 (counter) 0
333: kbWirelessStationFragmentErrors.1 (counter) 0
334: kbWirelessLocalInterfaceType.1 (integer) 1
335: kbWirelessLocalInterfaceType.2 (integer) 4
336: kbWirelessTestExploreTime.1 (integer) 0
337: kbWirelessTestExploreTime.2 (integer) 0
338: kbWirelessTestExploreRate.1 (integer) 0
339: kbWirelessTestExploreRate.2 (integer) 0
```