CHAPTER 12
Introducing the SMT

This chapter describes how to access the SMT and provides an overview of its menus.

12.1 Introduction to the SMT

The NOA-3570's SMT (System Management Terminal) is a menu-driven interface that you can access from a terminal emulator through the console port or over a telnet connection. This chapter shows you how to access the SMT (System Management Terminal) menus, how to navigate the SMT and how to configure SMT menus.

12.2 Accessing the SMT via the Console Port

Make sure you have the physical connection properly set up as described in the Quick Start Guide.

When configuring using the console port, you need a computer equipped with communications software configured to the following parameters:

- VT100 terminal emulation.
- 9600 Baud.
- No parity, 8 data bits, 1 stop bit, flow control set to none.

12.2.1 Initial Screen

When you turn on your NOA-3570, it performs several internal tests.

After the tests, the NOA-3570 asks you to press [ENTER] to continue, as shown next.

Figure 67 Initial Screen

```
Bootbase Version: V1.03 | 08/30/2004 16:28:56
RAM:Size = 64 Mbytes
FLASH: Intel 128M

ZyNOS Version: V3.50(HV.0)b4 | 01/21/2005 14:25:43

Press any key to enter debug mode within 3 seconds.
.....................................................
..
     (Compressed)
     Version: NOA-3570, start: 5012c030
     Length: 46312C, Checksum: 4F98
     Compressed Length: 161B28, Checksum: ED83


Copyright (c) 1994 - 2005 ZyXEL Communications Corp.
initialize ch =0, ethernet address: 00:A0:C5:62:B0:DB
initialize ch =1, ethernet address: 00:A0:C5:62:B0:DB
initialize ch =2, ethernet address: 00:A0:C5:62:B0:DC
initialize ch =3, ethernet address: 00:A0:C5:62:B0:DB
initialize ch =4, ethernet address: 00:A0:C5:62:B0:DB
initialize ch =5, ethernet address: 00:A0:C5:62:B0:DB
initialize ch =6, ethernet address: 00:A0:C5:62:B0:DB
initialize ch =7, ethernet address: 00:A0:C5:62:B0:DB
initialize ch =8, ethernet address: 00:A0:C5:62:B0:DC
initialize ch =9, ethernet address: 00:A0:C5:62:B0:DC
initialize ch =10, ethernet address: 00:A0:C5:62:B0:DC
initialize ch =11, ethernet address: 00:A0:C5:62:B0:DC
initialize ch =12, ethernet address: 00:A0:C5:62:B0:DC
Press ENTER to continue...
```

12.2.2 Entering the Password

The login screen appears after you press [ENTER], prompting you to enter the password, as shown below.

For your first login, enter the default password "1234". As you type the password, the screen displays an "X" for each character you type.

Please note that if there is no activity for longer than five minutes after you log in, your NOA-3570 will automatically log you out and display a blank screen. If you see a blank screen, press [ENTER] to bring up the login screen again.

Figure 68 Password Screen

```
Enter Password : XXXX
```

12.3 Accessing the SMT via Telnet

The following procedure details how to telnet into your NOA-3570.

1. In Windows, click **Start** (usually in the bottom left corner), **Run** and then type "telnet 192.168.1.2" (the default IP address) and click **OK**.
2. For your first login, enter the default password "1234". As you type the password, the screen displays an asterisk "*" for each character you type.

Figure 69 Login Screen

```
Password : xxxx
```

3. After entering the password you will see the main menu.

Please note that if there is no activity for longer than five minutes (default timeout period) after you log in, your NOA-3570 will automatically log you out. You will then have to telnet into the NOA-3570 again. You can use the web configurator or the CI commands to change the inactivity time out period.

12.4 Navigating the SMT Interface

The SMT (System Management Terminal) is the interface that you use to configure your NOA-3570.

Several operations that you should be familiar with before you attempt to modify the configuration are listed in the table below.

Table 43 Main Menu Commands NOA-3570

OPERATION	KEYSTROKE	DESCRIPTION
Move down to another menu	[ENTER]	To move forward to a submenu, type in the number of the desired submenu and press [ENTER].
Move up to a previous menu	[ESC]	Press [ESC] to move back to the previous menu.
Move to a "hidden" menu	Press [SPACE BAR] to change **No** to **Yes** then press [ENTER].	Fields beginning with "Edit" lead to hidden menus and have a default setting of **No**. Press [SPACE BAR] once to change **No** to **Yes**, then press [ENTER] to go to the "hidden" menu.
Move the cursor	[ENTER] or [UP]/ [DOWN] arrow keys.	Within a menu, press [ENTER] to move to the next field. You can also use the [UP]/[DOWN] arrow keys to move to the previous and the next field, respectively. When you are at the top of a menu, press the [UP] arrow key to move to the bottom of a menu.
Entering information	Type in or press [SPACE BAR], then press [ENTER].	You need to fill in two types of fields. The first requires you to type in the appropriate information. The second allows you to cycle through the available choices by pressing [SPACE BAR].

Table 43 Main Menu Commands NOA-3570

OPERATION	KEYSTROKE	DESCRIPTION
Required fields	<?> or **ChangeMe**	All fields with the symbol <?> must be filled in order to be able to save the new configuration. All fields with **ChangeMe** must not be left blank in order to be able to save the new configuration.
N/A fields	<N/A>	Some of the fields in the SMT will show a <N/A>. This symbol refers to an option that is Not Applicable.
Save your configuration	[ENTER]	Save your configuration by pressing [ENTER] at the message "Press ENTER to confirm or ESC to cancel". Saving the data on the screen will take you, in most cases to the previous menu. Make sure you save your settings in each screen that you configure.
Exit the SMT	Type 99, then press [ENTER].	Type 99 at the main menu prompt and press [ENTER] to exit the SMT interface.

After you enter the password, the SMT displays the main menu, as shown next.

Figure 70 SMT Main Menu

```
            Copyright (c) 1994 - 2005 ZyXEL Communications Corp.

                          NOA-3570 Main Menu

        Getting Started                       Advanced Management
         1. General Setup                      22. SNMP Configuration
         3. LAN Setup                          23. System Security
                                               24. System Maintenance

        Advanced Applications
        14. Dial-in User Setup
        16. VLAN Setup

                                               99. Exit

                          Enter Menu Selection Number:
```

12.4.1 System Management Terminal Interface Summary

Table 44 Main Menu Summary NOA-3570

#	MENU TITLE	DESCRIPTION
1	General Setup	Use this menu to set up your general information.
3	LAN Setup	Use this menu to set up your LAN and WLAN connection.
14	Dial-in User Setup	Use this menu to set up local user profiles on the NOA-3570.
16	VLAN Setup	Use this menu to set up your VLAN ID.
22	SNMP Configuration	Use this menu to set up SNMP related parameters.

Table 44 Main Menu Summary NOA-3570

#	MENU TITLE	DESCRIPTION
23	System Security	Use this menu to change your password and enable network user authentication.
24	System Maintenance	This menu provides system status, diagnostics, software upload, etc.
99	Exit	Use this to exit from SMT and return to a blank screen.

12.4.2 SMT Menus Overview

The following table gives you an overview of your NOA-3570's various SMT menus.

Table 45 SMT Menus Overview NOA-3570

MENUS	SUB MENUS	
1 General Setup		
3 LAN Setup	3.1 LAN Port Filter Setup	
	3.2 TCP/IP Setup	
	3.5 Wireless LAN Setup	3.5.1 WLAN MAC Address Filter
		3.5.4 Bridge Link Configuration
14 Dial-in User Setup	14.1 Edit Dial-in User Setup	
16 VLAN Setup		
22 SNMP Configuration		
23 System Security	23.1 Change Password	
	23.2 RADIUS Server	
	23.4 IEEE802.1x	
24 System Maintenance	24.1 System Status	
	24.2 System Information and Console Port Speed	24.2.1 System Information
		24.2.2 Console Port Speed
	24.3 Log and Trace	24.3.1 View Error Log
		24.3.2 Syslog Logging
		24.3.4 Call-Triggering Packet
	24.4 Diagnostic	
	24.5 Backup Configuration	
	24.6 Restore Configuration	
	24.7 Upload Firmware	24.7.1 Upload System Firmware
		24.7.2 Upload System Configuration File
	24.8 Command Interpreter Mode	
	24.10 Time and Date Setting	

12.5 Changing the System Password

Change the NOA-3570 default password by following the steps shown next.

1. From the main menu, enter 23 to display **Menu 23 – System Security**.
2. Enter 1 to display **Menu 23.1 – System Security – Change Password** as shown next.
3. Type your existing system password in the **Old Password** field, and press [ENTER].

Figure 71 Menu 23.1 System Security: Change Password

```
            Menu 23.1 – System Security – Change Password
               Old Password= ****
               New Password= ?
               Retype to confirm= ?
                Enter here to CONFIRM or ESC to CANCEL:
```

4. Type your new system password in the **New Password** field (up to 30 characters), and press [ENTER].
5. Re-type your new system password in the **Retype to confirm** field for confirmation and press [ENTER].

Note that as you type a password, the screen displays an asterisk "*" for each character you type.

CHAPTER 13
General Setup

The chapter shows you the information on general setup.

13.1 General Setup

Menu 1 – General Setup contains administrative and system-related information (shown next). The **System Name** field is for identification purposes. It is recommended you type your computer's "Computer name".

The **Domain Name** entry is what is propagated to the DHCP clients on the LAN. While you must enter the host name (System Name) on each individual computer, the domain name can be assigned from the NOA-3570 via DHCP.

13.1.1 Procedure To Configure Menu 1

Enter 1 in the main menu to open **Menu 1 – General Setup** as shown next.

Figure 72 Menu 1 General Setup

```
                        Menu 1 - General Setup

                System Name= NOA-3570
                Domain Name=


                First System DNS Server= From DHCP
                  IP Address= N/A
                Second System DNS Server= None
                  IP Address= N/A
                Third System DNS Server= None
                  IP Address= N/A
```

Fill in the required fields. Refer to the following table for more information about these fields.

Table 46 Menu 1 General Setup

FIELD	DESCRIPTION
System Name	Choose a descriptive name for identification purposes. This name can be up to 30 alphanumeric characters long. Spaces are not allowed, but dashes "-" and underscores "_" are accepted.
Domain Name	This is not a required field. Leave this field blank or enter the domain name here if you know it.
First/Second/Third System DNS Server	Press [SPACE BAR] to select **From DHCP**, **User-Defined** or **None** and press [ENTER]. These fields are not available on all models.
IP Address	Enter the IP addresses of the DNS servers. This field is available when you select **User-Defined** in the field above.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to Confirm…" to save your configuration, or press [ESC] at any time to cancel.	

CHAPTER 14
LAN Setup

This chapter shows you how to configure the LAN on your NOA-3570.

14.1 LAN Setup

This section describes how to configure the Ethernet using **Menu 3 – LAN Setup**. From the main menu, enter 3 to display menu 3.

Figure 73 Menu 3 LAN Setup

```
                    Menu 3 - LAN Setup

            2. TCP/IP Setup

            5. Wireless LAN Setup

                    Enter Menu Selection Number:
```

14.2 TCP/IP Ethernet Setup

Use menu 3.2 to configure your NOA-3570 for TCP/IP.

To edit menu 3.2, enter 3 from the main menu to display **Menu 3-LAN Setup**. When menu 3 appears, press 2 and press [ENTER] to display **Menu 3.2-TCP/IP Setup**, as shown next:

Figure 74 Menu 3.2 TCP/IP Setup

```
                        Menu 3.2 - TCP/IP Setup
                  IP Address Assignment= Static
                    IP Address= 192.168.1.2
                    IP Subnet Mask= 255.255.255.0
                    Gateway IP Address= 0.0.0.0
```

Follow the instructions in the following table on how to configure the fields in this menu.

Table 47 Menu 3.2 TCP/IP Setup NOA-3570

FIELD	DESCRIPTION
IP Address Assignment	Press [SPACE BAR] and then [ENTER] to select **Dynamic** to have the NOA-3570 obtain an IP address from a DHCP server. You must know the IP address assigned to the NOA-3570 (by the DHCP server) to access the NOA-3570 again. Select **Static** to give the NOA-3570 a fixed, unique IP address. Enter a subnet mask appropriate to your network and the gateway IP address if applicable.
IP Address	Enter the (LAN) IP address of your NOA-3570 in dotted decimal notation
IP Subnet Mask	Your NOA-3570 will automatically calculate the subnet mask based on the IP address that you assign. Unless you are implementing subnetting, use the subnet mask computed by the NOA-3570.
Gateway IP Address	Type the IP address of the gateway. The gateway is an immediate neighbor of your NOA-3570 that will forward the packet to the destination. On the LAN, the gateway must be a router on the same network segment as your NOA-3570.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to Confirm…" to save your configuration, or press [ESC] at any time to cancel.	

14.3 Wireless LAN Setup

Use menu 3.5 to set up your NOA-3570 as the wireless access point. To edit menu 3.5, enter 3 from the main menu to display **Menu 3 – LAN Setup**. When menu 3 appears, press 5 and then press [ENTER] to display **Menu 3.5 – Wireless LAN Setup** as shown next.

Figure 75 Menu 3.5 Wireless LAN Setup

```
                    Menu 3.5 - Wireless LAN Setup

WLAN Adapter= WLAN 1
Operating Mode= Access Point
Name (SSID)= ZyXEL
Hide Name (SSID)= No                  Edit MAC Address Filter= No
Channel ID= CH06 2437MHz              Edit Roaming Configuration= No
RTS Threshold= 2432                  Edit Bridge Link Configuration= N/A
Frag. Threshold= 2432                 Preamble= Long
WEP Encryption= Disable               802.11 Mode= Mixed
  Default Key= N/A                    Max. Frame Burst= 650
  Key1= N/A                           VLAN ID= 1
  Key2= N/A                           Block Intra-BSS Traffic= No
  Key3= N/A                           Output Power= 21dBm
  Key4= N/A
  Authen. Method= N/A


              Press ENTER to Confirm or ESC to Cancel:
```

The following table describes the fields in this menu.

Table 48 Menu 3.5 Wireless LAN Setup NOA-3570

FIELD	DESCRIPTION
WLAN Adapter Index	Press [SPACE BAR] and select a wireless LAN adapter to configure.
Operating Mode	Press [SPACE BAR] and select **Access Point**, **Multiple ESS**, **Bridge / Repeater** or **AP + Bridge**.
Name (SSID)	The SSID (Service Set IDentity) identifies the AP to which the wireless stations associate. Wireless stations associating to the AP must have the same ESSID. Enter a descriptive name of up to 32 printable 7-bit ASCII characters. This field is only available when you select **Access Point** or **AP + Bridge** in the **Operating Mode** field.
Hide Name (SSID)	Press [SPACE BAR] and select **Yes** to hide the ESSID in the outgoing data frame so an intruder cannot obtain the ESSID through passive scanning.
RTS Threshold	Setting this attribute to zero turns on the RTS/CTS handshake. Enter a value between 0 and 2432.
Frag. Threshold	This is the maximum data fragment size that can be sent. Enter a value between 800 and 2432.
WEP Encryption	Select **Disable** to allow wireless stations to communicate with the access points without any data encryption. Select **64-bit WEP** or **128-bit WEP** to enable data encryption.
Default Key	Enter the key number (1 to 4) in this field. Only one key can be enabled at any one time. This key must be the same on the NOA-3570 and the wireless stations to communicate.

Table 48 Menu 3.5 Wireless LAN Setup NOA-3570

FIELD	DESCRIPTION
Key 1 to Key 4	The WEP keys are used to encrypt data. Both the NOA-3570 and the wireless stations must use the same WEP key for data transmission. If you chose **64-bit WEP** in the **WEP Encryption** field, then enter any 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F"). If you chose **128-bit WEP** in the **WEP Encryption** field, then enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F"). **Note:** Enter "0x" before the key to denote a hexadecimal key. Don't enter "0x" before the key to denote an ASCII key.
Authen. Method	Press [SPACE BAR] to select **Auto**, **Open System Only** or **Shared Key Only** and press [ENTER]. This field is **N/A** if WEP is not activated. If WEP encryption is activated, the default setting is **Auto**.
Edit MAC Address Filter	Press [SPACE BAR] to select **Yes** and press [ENTER] to display **Menu 3.5.1 - WLAN MAC Address Filter**.
Edit Roaming Configuration	Press [SPACE BAR] to select **Yes** and press [ENTER] to display **Menu 3.5.2 - Roaming Configuration**.
Edit Bridge Link Configuration	Use [SPACE BAR] to choose **Yes** and press [ENTER] to go to **Menu 3.5.4 - Bridge Link Configuration**.
Preamble	Select a preamble type from the drop-down list menu. Choices are **Long**, **Short** and **Dynamic**. The default setting is **Long**. See the section on preamble for more information.
802.11 Mode	Select **802.11b Only** to allow only IEEE 802.11b compliant WLAN devices to associate with the NOA-3570. Select **802.11g Only** to allow only IEEE 802.11g compliant WLAN devices to associate with the NOA-3570. Select **Mixed** to allow either IEEE802.11b or IEEE802.11g compliant WLAN devices to associate with the NOA-3570. The transmission rate of your NOA-3570 might be reduced.
Max. Frame Burst	Enable Maximum Frame Burst to help eliminate collisions in mixed-mode networks (networks with both IEEE 802.11g and IEEE 802.11b traffic) and enhance the performance of both pure IEEE 802.11g and mixed IEEE 802.11b/g networks. Maximum Frame Burst sets the maximum time, in microseconds, that the NOA-3570 transmits IEEE 802.11g wireless traffic only. Type the maximum frame burst between 0 and 1800 (650, 1000 or 1800 recommended). Enter 0 to disable this feature.
VLAN ID	The NOA-3570 supports IEEE 802.1 tagged VLAN for partioning a physical network into multiple logical networks. Enter a number from 1 to 4094 to set the VLAN ID tag that the NOA-3570 adds to the Ethernet frames that this WLAN adapter receives from wireless clients or other APs.
Block Intra-BSS Traffic	Press [SPACE BAR] to select **Yes** to only allow wireless stations to communicate with the wired network, not with each other. Press [SPACE BAR] to select **No** to allow wireless stations connected to the NOA-3570 to communicate with each other.
Output Power Level	Press [SPACE BAR] to select the amount of power you want the NOA-3570 to use for the wireless signal. If there is a high density of APs within an area, decrease the output power of the NOA-3570 to reduce interference with other APs. The options are 21**dBm**, 19**dBm**, 17**dBm** or 15**dBm**.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to confirm or ESC to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

14.3.1 Configuring MAC Address Filter

Your NOA-3570 checks the MAC address of the wireless station device against a list of allowed or denied MAC addresses. However, intruders could fake allowed MAC addresses so MAC-based authentication is less secure than EAP authentication.

Follow the steps below to create the MAC address table on your NOA-3570.

1. From the main menu, enter 3 to open **Menu 3 – LAN Setup**.
2. Enter 5 to display **Menu 3.5 – Wireless LAN Setup**.

Figure 76 Menu 3.5 Wireless LAN Setup

```
                        Menu 3.5 - Wireless LAN Setup

    Operating Mode= Access Point
    Name (SSID)= ZyXEL
    Hide Name (SSID)= No                  Edit MAC Address Filter= Yes
    Channel ID= CH06 2437MHz              Edit Roaming Configuration= No
    RTS Threshold= 2432                  Edit Bridge Link Configuration= N/A
    Frag. Threshold= 2432                 Preamble= Long
    WEP Encryption= Disable               802.11 Mode= Mixed
      Default Key= N/A                    Max. Frame Burst= 650
      Key1= N/A                           Block Intra-BSS Traffic= No
      Key2= N/A                           Output Power Level= 4
      Key3= N/A
      Key4= N/A
      Authen. Method= N/A



                    Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

3. Press [SPACE BAR] to select **Access Point** or **AP + Bridge** in the **Operating Mode** field and press [ENTER].
4. In the **Edit MAC Address Filter** field, press [SPACE BAR] to select **Yes** and press [ENTER]. **Menu 3.5.1 – WLAN MAC Address Filter** displays as shown next.

Figure 77 Menu 3.5.1 WLAN MAC Address Filter

```
                    Menu 3.5.1 - WLAN MAC Address Filter

                  Active= No
                  Filter Action= Allowed Association
------------------------------------------------------------------------------
   1=   00:00:00:00:00:00   13=   00:00:00:00:00:00   25=   00:00:00:00:00:00
   2=   00:00:00:00:00:00   14=   00:00:00:00:00:00   26=   00:00:00:00:00:00
   3=   00:00:00:00:00:00   15=   00:00:00:00:00:00   27=   00:00:00:00:00:00
   4=   00:00:00:00:00:00   16=   00:00:00:00:00:00   28=   00:00:00:00:00:00
   5=   00:00:00:00:00:00   17=   00:00:00:00:00:00   29=   00:00:00:00:00:00
   6=   00:00:00:00:00:00   18=   00:00:00:00:00:00   30=   00:00:00:00:00:00
   7=   00:00:00:00:00:00   19=   00:00:00:00:00:00   31=   00:00:00:00:00:00
   8=   00:00:00:00:00:00   20=   00:00:00:00:00:00   32=   00:00:00:00:00:00
   9=   00:00:00:00:00:00   21=   00:00:00:00:00:00
  10=   00:00:00:00:00:00   22=   00:00:00:00:00:00
  11=   00:00:00:00:00:00   23=   00:00:00:00:00:00
  12=   00:00:00:00:00:00   24=   00:00:00:00:00:00
------------------------------------------------------------------------------
                      Enter here to CONFIRM or ESC to CANCEL:
```

The following table describes the fields in this menu.

Table 49 Menu 3.5.1 WLAN MAC Address Filter NOA-3570

FIELD	DESCRIPTION
Active	To enable MAC address filtering, press [SPACE BAR] to select **Yes** and press [ENTER].
Filter Action	Define the filter action for the list of MAC addresses in the MAC address filter table. To deny access to the NOA-3570, press [SPACE BAR] to select **Deny Association** and press [ENTER]. MAC addresses not listed will be allowed to access the router. The default action, **Allowed Association**, permits association with the NOA-3570. MAC addresses not listed will be denied access to the router.
MAC Address Filter	
1..32	Enter the MAC addresses (in XX:XX:XX:XX:XX:XX format) of the client computers that are allowed or denied access to the NOA-3570 in these address fields.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to confirm or ESC to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

14.3.2 Configuring Roaming

Follow the steps below to configure roaming on your NOA-3570.

1. From the main menu, enter 3 to open **Menu 3 – LAN Setup**.
2. Enter 5 to display **Menu 3.5 – Wireless LAN Setup**.

Figure 78 Menu 3.5 Wireless LAN Setup

```
                    Menu 3.5 - Wireless LAN Setup

  Operating Mode= Access Point
  Name (SSID)= ZyXEL
  Hide Name (SSID)= No                  Edit MAC Address Filter= No
  Channel ID= CH06 2437MHz              Edit Roaming Configuration= No
 RTS Threshold= 2432                   Edit Bridge Link Configuration= N/A
  Frag. Threshold= 2432                 Preamble= Long
  WEP Encryption= Disable               802.11 Mode= Mixed
    Default Key= N/A                    Max. Frame Burst= 650
    Key1= N/A                           Block Intra-BSS Traffic= No
    Key2= N/A                           Output Power Level= 4
    Key3= N/A
    Key4= N/A
    Authen. Method= N/A



              Press ENTER to Confirm or ESC to Cancel:
```

3 In the **Operating Mode** field, press [SPACE BAR] to select **AP** or **AP + Bridge** and press [ENTER].

4 Move the cursor to the **Edit Roaming Configuration** field. Press [SPACE BAR] to select **Yes** and press [ENTER]. **Menu 3.5.2 – Roaming Configuration** displays as shown next.

Figure 79 Menu 3.5.2 - Roaming Configuration

```
                  Menu 3.5.2 - Roaming Configuration

               Active= No
               Port #= N/A
```

The following table describes the fields in this menu.

Table 50 Menu 3.5.2 - Roaming Configuration NOA-3570

FIELD	DESCRIPTION
Active	Press [SPACE BAR] to select **Yes** from the drop-down list box to enable roaming on the NOA-3570 if you have two or more NOA-3570s on the same subnet. **Note:** All APs on the same subnet and the wireless stations must have the same SSID to allow roaming.
Port	Type the port number to communicate roaming information between access points. The port number must be the same on all access points. The default is 3517. Make sure this port is not used by other services.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to confirm or ESC to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

14.3.3 Configuring Bridge Link

Follow the steps below to configure bridge link on your NOA-3570.

1. From the main menu, enter 3 to open **Menu 3 – LAN Setup**.
2. Enter 5 to display **Menu 3.5 – Wireless LAN Setup**.

Figure 80 Menu 3.5 Wireless LAN Setup

```
                        Menu 3.5 - Wireless LAN Setup

    Operating Mode= Bridge / Repeater
    Name (SSID)= N/A
    Hide Name (SSID)= N/A                Edit MAC Address Filter= N/A
    Channel ID= CH06 2437MHz             Edit Roaming Configuration= N/A
    RTS Threshold= 2432                 Edit Bridge Link Configuration= Yes
    Frag. Threshold= 2432                Preamble= Long
    WEP Encryption= Disable              802.11 Mode= Mixed
      Default Key= N/A                   Max. Frame Burst= 650
      Key1= N/A                          Block Intra-BSS Traffic= No
      Key2= N/A                          Output Power Level= 4
      Key3= N/A
      Key4= N/A
      Authen. Method= N/A



                    Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

3. In the **Operating Mode** field, press [SPACE BAR] to select **Bridge / Repeater** or **AP + Bridge** and press [ENTER].

4 Move the cursor to the **Edit Bridge Link Configuration** field. Press [SPACE BAR] to select **Yes** and press [ENTER]. **Menu 3.5.4 – Bridge Link Configuration** displays as shown next.

Figure 81 Menu 3.5.4 - Bridge Link Configuration

```
                  Menu 3.5.4 - Bridge Link Configuration

        Enable Link 1= No              Peer MAC Address= 00:00:00:00:00:00
         PSK= N/A
        Enable Link 2= No              Peer MAC Address= 00:00:00:00:00:00
         PSK= N/A
        Enable Link 3= No              Peer MAC Address= 00:00:00:00:00:00
         PSK= N/A
        Enable Link 4= No              Peer MAC Address= 00:00:00:00:00:00
         PSK= N/A
        Enable Link 5= No              Peer MAC Address= 00:00:00:00:00:00
         PSK= N/A


                        Enable WDS Security= No


                    Press ENTER to Confirm or ESC to Cancel:
```

The following table describes the fields in this menu.

Table 51 Menu 3.5.4 Bridge Link Configuration NOA-3570

FIELD	DESCRIPTION
Enable Link 1-6	Press [SPACE BAR] to select **Yes** or **No** and press [ENTER].
Peer MAC Address	Type the MAC address of a wireless bridge in valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.
Enable WDS Security	A Wireless Distribution System (WDS) is a wireless connection between two or more APs. Press [SPACE BAR] to select **Yes** to use TKIP to encrypt traffic on the WDS between APs. When you enable WDS security, type a Pre-Shared Key (PSK) for each link. **Note:** Other wireless bridges must use the same encryption method to enable WDS security.
PSK	When you enable WDS, type a Pre-Shared Key (PSK) for each link. The pre-shared key can be from 8 to 63 case-sensitive ASCII characters (including spaces and symbols).
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to confirm or ESC to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

CHAPTER 15
Dial-in User Setup

This chapter shows you how to create user accounts on the NOA-3570.

15.1 Dial-in User Setup

By storing user profiles locally, your NOA-3570 is able to authenticate wireless users without interacting with a network RADIUS server.

Follow the steps below to set up user profiles on your NOA-3570.

From the main menu, enter 14 to display **Menu 14 - Dial-in User Setup**.

Figure 82 Menu 14- Dial-in User Setup

```
                    Menu 14 - Dial-in User Setup

1. _________        9. _________        17. _________       25. _________
2. _________       10. _________        18. _________       26. _________
3. _________       11. _________        19. _________       27. _________
4. _________       12. _________        20. _________       28. _________
5. _________       13. _________        21. _________       29. _________
6. _________       14. _________        22. _________       30. _________
7. _________       15. _________        23. _________       31. _________
8. _________       16. _________        24. _________       32. _________

                  Enter Menu Selection Number:
```

Type a number and press [ENTER] to edit the user profile.

Figure 83 Menu 14.1- Edit Dial-in User

```
            Menu 14.1 - Edit Dial-in User
            User Name= test
            Active= Yes
            Password= ********
            Press ENTER to Confirm or ESC to Cancel:
            Leave name field blank to delete profile
```

The following table describes the fields in this screen.

Table 52 Menu 14.1- Edit Dial-in User NOA-3570

FIELD	DESCRIPTION
User Name	Enter a username up to 31 alphanumeric characters long for this user profile. This field is case sensitive.
Active	Press [SPACE BAR] to select **Yes** and press [ENTER] to enable the user profile.
Password	Enter a password up to 31 characters long for this user profile.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to confirm or ESC to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

CHAPTER 16
VLAN Setup

This chapter explains VLAN setup menu 16. Refer to the web configurator VLAN chapter for background information on VLAN.

16.1 VLAN Setup

To setup VLAN, select option 16 from the main menu to open Menu 16 – VLAN Setup as shown next.

Figure 84 Menu 16 VLAN Setup

```
                    Menu 16 - VLAN Setup

                VLAN Tagging= Yes
                Native VLAN ID= 1
```

The following table describes the fields in this menu.

Table 53 Menu 16 VLAN Setup

FIELD	DESCRIPTION
VLAN Tagging	To enable VLAN tagging, press [SPACE BAR] to select Yes and press [ENTER].
Native VLAN ID	This field is activated only when you select Yes in the VLAN Tagging field. Enter a number from 1 to 4094 to specify the ID of the management VLAN. Your management computer must belong to this VLAN group in order to manage the NOA-3570. This can be done in the following ways: • The management computer could be a wireless client of the NOA-3570 if the NOA-3570's WLAN adapter is set to add the add the management VLAN ID tag to Ethernet frames received from wireless clients. • The management computer could be on the wired network, behind a VLAN-aware switch that is configured to add the management VLAN ID tag to Ethernet frames from the computer before sending them to NOA-3570. **Note:** Mail and FTP servers must have the same management VLAN ID to communicate with the NOA-3570.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to confirm or ESC to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

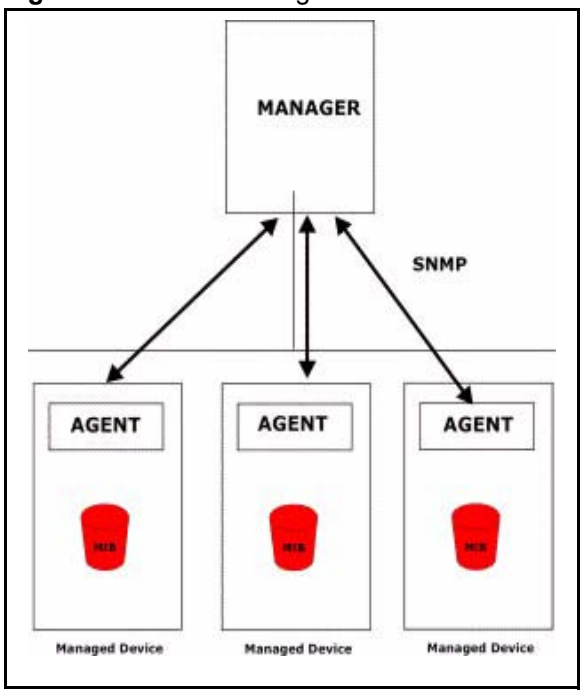
CHAPTER 17
SNMP Configuration

This chapter explains SNMP Configuration menu 22.

17.1 About SNMP

Simple Network Management Protocol is a protocol used for exchanging management information between network devices. SNMP is a member of the TCP/IP protocol suite. Your NOA-3570 supports SNMP agent functionality, which allows a manager station to manage and monitor the NOA-3570 through the network. The NOA-3570 supports SNMP version one (SNMPv1) and version two c (SNMPv2c). The next figure illustrates an SNMP management operation. SNMP is only available if TCP/IP is configured.

Figure 85 SNMP Management Model



An SNMP managed network consists of two main components: agents and a manager.

An agent is a management software module that resides in a managed device (the NOA-3570). An agent translates the local management information from the managed device into a form compatible with SNMP. The manager is the console through which network administrators perform network management functions. It executes applications that control and monitor managed devices.

The managed devices contain object variables/managed objects that define each piece of information to be collected about a device. Examples of variables include the number of packets received, node port status etc. A Management Information Base (MIB) is a collection of managed objects. SNMP allows a manager and agents to communicate for the purpose of accessing these objects.

SNMP itself is a simple request/response protocol based on the manager/agent model. The manager issues a request and the agent returns responses using the following protocol operations:

- Get - Allows the manager to retrieve an object variable from the agent.
- GetNext - Allows the manager to retrieve the next object variable from a table or list within an agent. In SNMPv1, when a manager wants to retrieve all elements of a table from an agent, it initiates a Get operation, followed by a series of GetNext operations.
- Set - Allows the manager to set values for object variables within an agent.
- Trap - Used by the agent to inform the manager of some events.

17.2 Supported MIBs

The NOA-3570 supports RFC-1215 and MIB II as defined in RFC-1213. The focus of the MIBs is to let administrators collect statistic data and monitor status and performance.

17.3 SNMP Configuration

To configure SNMP, select option 22 from the main menu to open **Menu 22 – SNMP Configuration** as shown next. The "community" for Get, Set and Trap fields is SNMP terminology for password.

Figure 86 Menu 22 SNMP Configuration

```
Menu 22 - SNMP Configuration

SNMP:
  Get Community= public
  Set Community= public
  Trusted Host= 0.0.0.0
  Trap:
    Community= public
    Destination= 0.0.0.0

Press ENTER to Confirm or ESC to Cancel:
```

The following table describes the SNMP configuration parameters.

Table 54 Menu 22 SNMP Configuration NOA-3570

FIELD	DESCRIPTION
SNMP:	
Get Community	Type the **Get Community**, which is the password for the incoming Get- and GetNext requests from the management station.
Set Community	Type the **Set Community**, which is the password for incoming Set requests from the management station.
Trusted Host	If you enter a trusted host, your NOA-3570 will only respond to SNMP messages from this address. A blank (default) field means your NOA-3570 will respond to all SNMP messages it receives, regardless of source.
Trap:	
Community	Type the trap community, which is the password sent with each trap to the SNMP manager.
Destination	Type the IP address of the station to send your SNMP traps to.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to confirm or ESC to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

17.4 SNMP Traps

The NOA-3570 will send traps to the SNMP manager when any one of the following events occurs:

Table 55 SNMP Traps NOA-3570

TRAP #	TRAP NAME	DESCRIPTION
1	coldStart (*defined in RFC-1215*)	A trap is sent after booting (power on).
2	warmStart (*defined in RFC-1215*)	A trap is sent after booting (software reboot).
3	linkUp (*defined in RFC-1215*)	A trap is sent when the port is up.
4	authenticationFailure (*defined in RFC-1215*)	A trap is sent to the manager when receiving any SNMP get or set requirements with wrong community (password).
6	linkDown (*defined in RFC-1215*)	A trap is sent when the port is down.

The following table maps the physical port and encapsulation to the interface type,

Table 56 Ports and Interface Types NOA-3570

PHYSICAL PORT/ENCAP	INTERFACE TYPE
WLAN 1	enet0
Ethernet port	enet1
WLAN 2	enet2

CHAPTER 18
System Security

This chapter describes how to configure the system security on the NOA-3570.

18.1 System Security

You can configure the system password, an external RADIUS server and 802.1x in this menu.

18.1.1 System Password

Figure 87 Menu 23 System Security

```
                          Menu 23 - System Security

                       1. Change Password
                       2. RADIUS Server

                       4. IEEE802.1x

             Enter Menu Selection Number:
```

You should change the NOA-3570's management password. Refer to the section on changing the system password in the *Introducing the SMT* chapter for details. If you forget your password you have to restore the default configuration file. Refer to the section on resetting the NOA-3570 in the *Introducing the Web Configurator* chapter.

18.1.2 Configuring External RADIUS Server

Enter 23 in the main menu to display **Menu 23 – System Security**.

Figure 88 Menu 23 System Security

```
                          Menu 23 - System Security

                       1. Change Password
                       2. RADIUS Server

                       4. IEEE802.1x

             Enter Menu Selection Number:
```

From **Menu 23- System Security**, enter 2 to display **Menu 23.2 – System Security – RADIUS Server** as shown next.

Figure 89 Menu 23.2 System Security: RADIUS Server

```
             Menu 23.2 - System Security - RADIUS Server

             Authentication Server:
                Active= No
                Server Address= 0.0.0.0
                Port #= 1812
                Shared Secret= ********

            Accounting Server:
                Active= No
                Server Address= 0.0.0.0
                Port #= 1813
                Shared Secret= ********

             Press ENTER to Confirm or ESC to Cancel:
```

The following table describes the fields in this menu.

Table 57 Menu 23.2 System Security: RADIUS Server NOA-3570

FIELD	DESCRIPTION
Authentication Server	
Active	Press [SPACE BAR] to select **Yes** and press [ENTER] to enable user authentication through an external authentication server.
Server Address	To use an external authentication server, enter its IP address in dotted decimal notation. Enter **127.0.0.1** to use the internal authentication server.
Port	The default port of the RADIUS server for authentication is **1812**. You need not change this value unless your network administrator instructs you to do so with additional information.
Shared Secret	To use an external authentication server, specify a password (up to 31 alphanumeric characters) as the key to be shared between the external authentication server and the access points. The key is not sent over the network. This key must be the same on the external authentication server and NOA-3570. Enter **1234** to use the internal authentication server.
Accounting Server	
Active	Press [SPACE BAR] to select **Yes** and press [ENTER] to enable user authentication through an external accounting server.
Server Address	Enter the IP address of the external accounting server in dotted decimal notation.
Port	The default port of the RADIUS server for accounting is **1813**. You need not change this value unless your network administrator instructs you to do so with additional information.

Table 57 Menu 23.2 System Security: RADIUS Server NOA-3570

FIELD	DESCRIPTION
Shared Secret	Specify a password (up to 31 alphanumeric characters) as the key to be shared between the external accounting server and the access points. The key is not sent over the network. This key must be the same on the external accounting server and NOA-3570.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to confirm or ESC to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

18.1.3 802.1x

The IEEE 802.1x standards outline enhanced security methods for both the authentication of wireless stations and encryption key management.

Follow the steps below to enable EAP authentication on your NOA-3570.

1 From the main menu, enter 23 to display **Menu23 – System Security**.

Figure 90 Menu 23 System Security

```
                Menu 23 - System Security

             1. Change Password
             2. RADIUS Server

             4. IEEE802.1x

             Enter Menu Selection Number:
```

2 Enter 4 to display **Menu 23.4 – System Security – IEEE802.1x**.

Figure 91 Menu 23.4 System Security: IEEE802.1x

```
            Menu 23.4 - System Security - IEEE802.1x

     Wireless Port Control= Authentication Required
     ReAuthentication Timer (in second)= 1800
     Idle Timeout (in second)= 3600

     Key Management Protocol= 802.1x
     Dynamic WEP Key Exchange= 128-bit WEP
     PSK= N/A
     WPA Mixed Mode= N/A

     WPA Group Key Update Timer= N/A

     Authentication Databases= Local User Database Only

                                Press ENTER to Confirm or ESC to Cancel:
            Press Space Bar to Toggle.
```

The following table describes the fields in this menu.

Table 58 Menu 23.4 System Security: IEEE802.1x NOA-3570

FIELD	DESCRIPTION
Wireless Port Control	Press [SPACE BAR] and select a security mode for the wireless LAN access. Select **No Authentication Required** to allow any wireless stations access to your wired network without entering usernames and passwords. This is the default setting. Selecting **Authentication Required** means wireless stations have to enter usernames and passwords before access to the wired network is allowed. Select **No Access Allowed** to block all wireless stations access to the wired network. The following fields are not available when you select **No Authentication Required** or **No Access Allowed**.
ReAuthentication Timer (in second)	Specify how often a client has to re-enter username and password to stay connected to the wired network. This field is activated only when you select **Authentication Required** in the **Wireless Port Control** field. Enter a time interval between 10 and 9999 (in seconds). The default time interval is **1800** seconds (or 30 minutes).
Idle Timeout (in second)	The NOA-3570 automatically disconnects a client from the wired network after a period of inactivity. The client needs to enter the username and password again before access to the wired network is allowed. This field is activated only when you select **Authentication Required** in the **Wireless Port Control** field. The default time interval is **3600** seconds (or 1 hour).
Key Management Protocol	Press [SPACE BAR] to select **802.1x**, **WPA** or **WPA-PSK** and press [ENTER].

Table 58 Menu 23.4 System Security: IEEE802.1x NOA-3570

FIELD	DESCRIPTION
Dynamic WEP Key Exchange	This field is activated only when you select **Authentication Required** in the **Wireless Port Control** field. Also set the **Authentication Databases** field to **RADIUS Only**. Local user database may not be used. Select **Disable** to allow wireless stations to communicate with the access points without using Dynamic WEP Key Exchange. Select **64-bit WEP** or **128-bit WEP** to enable data encryption. Up to 32 stations can access the NOA-3570 when you configure Dynamic WEP Key Exchange.
PSK	Type a pre-shared key from 8 to 63 case-sensitive ASCII characters (including spaces and symbols) when you select **WPA-PSK** in the **Key Management Protocol** field.
WPA Mixed Mode	Select **Enable** to activate WPA mixed mode. Otherwise, select **Disable** and configure **Data Privacy for Broadcast/Multicast packets** field.
WPA Group Key Update Timer	The **WPA Broadcast/Multicast Key Update Timer** is the rate at which the AP (if using **WPA-PSK** key management) or RADIUS server (if using **WPA** key management) sends a new group key out to all clients. The re-keying process is the WPA equivalent of automatically changing the WEP key for an AP and all stations in a WLAN on a periodic basis. Setting of the **WPA Broadcast/ Multicast Key Update Timer** is also supported in WPA-PSK mode. The NOA-3570 default is 1800 seconds (30 minutes).
Authentication Databases	The authentication database contains wireless station login information. The local user database is the built-in database on the NOA-3570. The RADIUS is an external server. Use this field to decide which database the NOA-3570 should use (first) to authenticate a wireless station. Before you specify the priority, make sure you have set up the corresponding database correctly first. When you configure **Key Management Protocol** to **WPA**, the **Authentication Databases** must be **RADIUS Only**. You can only use the **Local User Database** with **802.1x Key Management Protocol**. Select **Local User Database Only** to have the NOA-3570 just check the built-in user database on the NOA-3570 for a wireless station's username and password. Select **RADIUS Only** to have the NOA-3570 just check the user database on the external RADIUS server for a wireless station's username and password. Select **Local first, then RADIUS** to have the NOA-3570 first check the user database on the NOA-3570 for a wireless station's username and password. If the user name is not found, the NOA-3570 then checks the user database on the external RADIUS server. Select **RADIUS first, then Local** to have the NOA-3570 first check the user database on the external RADIUS server for a wireless station's username and password. If the NOA-3570 cannot reach the RADIUS server, the NOA-3570 then checks the local user database on the NOA-3570. When the user name is not found or password does not match in the RADIUS server, the NOA-3570 will not check the local user database and the authentication fails.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to confirm or ESC to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

Once you enable user authentication, you need to specify an external RADIUS server or create local user accounts on the NOA-3570 for authentication

CHAPTER 19
System Information and Diagnosis

This chapter covers the information and diagnostic tools in SMT menus 24.1 to 24.4.

These tools include updates on system status, port status, log and trace capabilities and upgrades for the system software. This chapter describes how to use these tools in detail.

Type 24 in the main menu and press [ENTER] to open **Menu 24 – System Maintenance**, as shown in the following figure.

Figure 92 Menu 24 System Maintenance

```
                    Menu 24 - System Maintenance

                   1.  System Status
                   2.  System Information and Console Port Speed
                   3.  Log and Trace
                   4.  Diagnostic
                   5.  Backup Configuration
                   6.  Restore Configuration
                   7.  Upload Firmware
                   8.  Command Interpreter Mode

                   10. Time and Date Setting

                    Enter Menu Selection Number:
```

19.1 System Status

The first selection, System Status gives you information on the status and statistics of the ports, as shown next. System Status is a tool that can be used to monitor your NOA-3570. Specifically, it gives you information on your Ethernet and Wireless LAN status, number of packets sent and received.

To get to System Status, type 24 to go to **Menu 24 – System Maintenance.** From this menu, type 1**. System Status**. There are two commands in **Menu 24.1 – System Maintenance – Status**. Entering 9 resets the counters; pressing [ESC] takes you back to the previous screen.

The following table describes the fields present in **Menu 24.1 – System Maintenance – Status** which are read-only and meant for diagnostic purposes.

Figure 93 Menu 24.1 System Maintenance: Status

```
                  Menu 24.1 - System Maintenance - Status          00:38:42
                                                          Sat. Jan. 01, 2000

Port   Status       TxPkts      RxPkts    Cols    Tx B/s    Rx B/s     Up Time
Ethernet Down             0          0       0         0         0     0:00:00
WLAN1          54M       1161          0       0        64         0     0:38:40
WLAN2          54M       1161          0       0        64         0     0:38:40

Port   Ethernet Address        IP Address           IP Mask       DHCP
Ethernet  00:A0:C5:62:B0:DB       192.168.1.2     255.255.255.0       None
WLAN1     00:A0:C5:62:B0:DB
WLAN2     00:A0:C5:62:B0:DC

     System up Time:     0:38:45
     ZyNOS F/W Version: V3.50(HV.0)b4 | 01/21/2005
     Name: NOA-3570.`


                                  Press Command:
```

The following table describes the fields present in this menu.

Table 59 Menu 24.1 System Maintenance: Status NOA-3570

FIELD	DESCRIPTION
Port	This identifies the port or WLAN adapter.
Status	This shows the status of the remote node.
TxPkts	This is the number of transmitted packets to this remote node.
RxPkts	This is the number of received packets from this remote node.
Cols	This is the number of collisions on this connection.
Tx B/s	This shows the transmission rate in bytes per second.
Rx B/s	This shows the receiving rate in bytes per second.
Up Time	This is the time this channel has been connected to the current remote node.
Ethernet Address	This shows the MAC address of the port or WLAN adapter.
IP Address	This shows the IP address of the network device connected to the port.
IP Mask	This shows the subnet mask of the network device connected to the port.
DHCP	This shows the DHCP setting (None or Client) for the port.
System Up Time	This is the time the NOA-3570 is up and running from the last reboot.
ZyNOS F/W Version	Refers to the ZyNOS (ZyXEL Network Operating System) system firmware version. ZyNOS is a registered trademark of ZyXEL Communications Corporation.
Name	This displays the device name.

19.2 System Information

To get to the System Information:

1. Enter 24 to display **Menu 24 – System Maintenance**.
2. Enter 2 to display **Menu 24.2 – System Information and Console Port Speed**.
3. From this menu you have two choices as shown in the next figure:

Figure 94 Menu 24.2 System Information and Console Port Speed

```
Menu 24.2 - System Information and Console Port Speed
       1. System Information
       2. Console Port Speed

            Please enter selection:
```

Note: The NOA-3570 also has an internal console port for support personnel only. Do not open the NOA-3570 as it will void your warranty.

19.2.1 System Information

Enter 1 in menu 24.2 to display the screen shown next.

Figure 95 Menu 24.2.1 System Information: Information

```
            Menu 24.2.1 - System Maintenance - Information

               Name: NOA-3570
               Routing: BRIDGE
               ZyNOS F/W Version: V3.50(HV.0)b4 | 01/21/2005
               Country Code: 255

               LAN
                 Ethernet Address: 00:A0:C5:62:B0:E3
                 IP Address: 192.168.1.2
                 IP Mask: 255.255.255.0
                 DHCP: None




                     Press ESC or RETURN to Exit:
```

The following table describes the fields in this menu.

Table 60 Menu 24.2.1 System Maintenance: Information NOA-3570

FIELD	DESCRIPTION
Name	Displays the system name of your NOA-3570. This information can be changed in **Menu 1 – General Setup**.
Routing	Refers to the routing protocol used.
ZyNOS F/W Version	Refers to the ZyNOS (ZyXEL Network Operating System) system firmware version. ZyNOS is a registered trademark of ZyXEL Communications Corporation.
Country Code	Refers to the country code of the firmware.
LAN	
Ethernet Address	Refers to the Ethernet MAC (Media Access Control) of your NOA-3570.
IP Address	This is the IP address of the NOA-3570 in dotted decimal notation.
IP Mask	This shows the subnet mask of the NOA-3570.
DHCP	This field shows the DHCP setting of the NOA-3570.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to confirm or ESC to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

19.2.2 Console Port Speed

You can set up different port speeds for the console port through **Menu 24.2.2 – System Maintenance – Console Port Speed**. Your NOA-3570 supports 9600 (default), 19200, 38400, 57600 and 115200 bps console port speeds. Press [SPACE BAR] and then [ENTER] to select the desired speed in menu 24.2.2, as shown in the following figure.

Figure 96 Menu 24.2.2 System Maintenance: Change Console Port Speed

```
  Menu 24.2.2 – System Maintenance – Change Console Port Speed

            Console Port Speed: 9600

         Press ENTER to Confirm or ESC to Cancel:
```

After you changed the console port speed on your NOA-3570, you must also make the same change to the console port speed parameter of your communication software.

19.3 Log and Trace

Your NOA-3570 provides the error logs and trace records that are stored locally.

19.3.1 Viewing Error Log

The first place you should look for clues when something goes wrong is the error log. Follow the procedures to view the local error/trace log:

1. Type 24 in the main menu to display **Menu 24 – System Maintenance**.
2. From menu 24, type 3 to display **Menu 24.3 – System Maintenance – Log and Trace**.

Figure 97 Menu 24.3 System Maintenance: Log and Trace

```
            Menu 24.3 - System Maintenance - Log and Trace
                     1. View Error Log
            Please enter selection:
```

3. Enter 1 from **Menu 24.3 – System Maintenance – Log and Trace** and press [ENTER] twice to display the error log in the system.

After the NOA-3570 finishes displaying the error log, you will have the option to clear it. Samples of typical error and information messages are presented in the next figure.

Figure 98 Sample Error and Information Messages

```
 55 Sat Jan  1 00:00:00 2000 PP05  ERROR Wireless LAN init fail, code=-1
   56 Sat Jan  1 00:00:01 2000 PP07  INFO  LAN promiscuous mode <1>
   57 Sat Jan  1 00:00:01 2000 PINI  INFO  Last errorlog repeat 1 Times
   58 Sat Jan  1 00:00:01 2000 PINI  INFO  main: init completed
   59 Sat Jan  1 00:00:02 2000 PP05 -WARN  SNMP TRAP 3: link up
   60 Sat Jan  1 00:00:30 2000 PSSV -WARN  SNMP TRAP 0: cold start
   61 Sat Jan  1 00:01:38 2000 PINI  INFO  SMT Session Begin
   62 Sat Jan  1 00:06:44 2000 PINI  INFO  SMT Session End
   63 Sat Jan  1 00:11:13 2000 PINI  INFO  SMT Session Begin
 Clear Error Log (y/n):
```

19.4 Diagnostic

The diagnostic facility allows you to test the different aspects of your NOA-3570 to determine if it is working properly. Menu 24.4 allows you to choose among various types of diagnostic tests to evaluate your system, as shown in the following figure.

Figure 99 Menu 24.4 System Maintenance: Diagnostic

```
                  Menu 24.4 - System Maintenance - Diagnostic


                   TCP/IP
                     1. Ping Host
                     2. DHCP Release
                     3. DHCP Renewal


                   System
                     11. Reboot System




                     Enter Menu Selection Number:


                     Host IP Address= N/A
```

Follow the procedure next to get to display this menu:

1. From the main menu, type 24 to open **Menu 24 – System Maintenance**.
2. From this menu, type 4. Diagnostic to open **Menu 24.4 – System Maintenance – Diagnostic**.

The following table describes the diagnostic tests available in menu 24.4 for your NOA-3570 and the connections.

Table 61 Menu 24.4 System Maintenance Menu: Diagnostic

FIELD	DESCRIPTION
Ping Host	Ping the host to see if the links and TCP/IP protocol on both systems are working.
DHCP Release	Release the IP address assigned by the DHCP server.
DHCP Renewal	Get a new IP address from the DHCP server.
Reboot System	Reboot the NOA-3570.
Host IP Address	If you typed 1 to Ping Host, now type the address of the computer you want to ping.

CHAPTER 20
Firmware and Configuration File Maintenance

This chapter tells you how to backup and restore your configuration file as well as upload new firmware and configuration files using the SMT screens.

20.1 Filename Conventions

The configuration file (often called the romfile or rom-0) contains the factory default settings in the menus such as password and TCP/IP Setup, etc. It arrives from ZyXEL with a rom filename extension. Once you have customized the NOA-3570's settings, they can be saved back to your computer under a filename of your choosing.

ZyNOS (ZyXEL Network Operating System sometimes referred to as the "ras" file) is the system firmware and has a "bin" filename extension. With many FTP and TFTP clients, the filenames are similar to those seen next.

```
ftp> put firmware.bin ras
```

This is a sample FTP session showing the transfer of the computer file " firmware.bin" to the NOA-3570.

```
ftp> get rom-0 config.cfg
```

This is a sample FTP session saving the current configuration to the computer file config.cfg.

If your [T]FTP client does not allow you to have a destination filename different than the source, you will need to rename them as the NOA-3570 only recognizes "rom-0" and "ras". Be sure you keep unaltered copies of both files for later use.

The following table is a summary. Please note that the internal filename refers to the filename on the NOA-3570 and the external filename refers to the filename not on the NOA-3570, that is, on your computer, local network or FTP site and so the name (but not the extension) will vary. After uploading new firmware see the **ZyNOS F/W Version** field in **Menu 24.2.1 – System Maintenance – Information** to confirm that you have uploaded the correct firmware version.

Table 62 Filename Conventions

FILE TYPE	INTERNAL NAME	EXTERNAL NAME	DESCRIPTION
Configuration File	Rom-0	*.rom	This is the configuration filename on the NOA-3570. Uploading the rom-0 file replaces the entire ROM file system, including your NOA-3570 configurations, system-related data (including the default password), the error log and the trace log.
Firmware	Ras	*.bin	This is the generic name for the ZyNOS firmware on the NOA-3570.

20.2 Backup Configuration

Option 5 from **Menu 24 – System Maintenance** allows you to backup the current NOA-3570 configuration to your computer. Backup is highly recommended once your NOA-3570 is functioning properly. FTP is the preferred method, although TFTP can also be used.

Please note that the terms "download" and "upload" are relative to the computer. Download means to transfer from the NOA-3570 to the computer, while upload means from your computer to the NOA-3570.

20.2.1 Backup Configuration Using FTP

Enter 5 in **Menu 24 – System Maintenance** to get the following screen.

Figure 100 Menu 24.5 Backup Configuration

```
Menu 24.5 – Backup Configuration

To transfer the configuration file to your workstation, follow the procedure below:

1. Launch the FTP client on your workstation.
2. Type "open" and the IP address of your router. Then type "root" and
   SMT password as requested.
3. Locate the 'rom-0' file.
4. Type 'get rom-0' to back up the current router configuration to your workstation.

For details on FTP commands, please consult the documentation of your FTP
client program. For details on backup using TFTP (note that you must remain in the menu
to back up using TFTP), please see your router manual.

                                  Press ENTER to Exit:
```

20.2.2 Using the FTP command from the DOS Prompt

1. Launch the FTP client on your computer.
2. Enter "open" and the IP address of your NOA-3570.
3. Press [ENTER] when prompted for a username.
4. Enter your password as requested. The default is 1234.
5. Enter "bin" to set transfer mode to binary.
6. Use "get" to transfer files from the NOA-3570 to the computer, for example, "get rom-0 config.rom" transfers the configuration file on the NOA-3570 to your computer and renames it "config.rom". See earlier in this chapter for more information on filename conventions.
7. Enter "quit" to exit the FTP prompt.

Figure 101 FTP Session Example

```
331 Enter PASS command
Password:
230 Logged in
ftp> bin
200 Type I OK
ftp> get rom-0 zyxel.rom
200 Port command okay
150 Opening data connection for STOR ras
226 File received OK
ftp: 327680 bytes sent in 1.10Seconds
297.89Kbytes/sec.
ftp> quit
```

The following table describes some of the commands that you may see in third party FTP clients.

Table 63 General Commands for Third Party FTP Clients NOA-3570

COMMAND	DESCRIPTION
Host Address	Enter the address of the host server.
Login Type	Anonymous. This is when a user I.D. and password is automatically supplied to the server for anonymous access. Anonymous logins will work only if your ISP or service administrator has enabled this option. Normal. The server requires a unique User ID and Password to login.
Transfer Type	Transfer files in either ASCII (plain text format) or in binary mode.
Initial Remote Directory	Specify the default remote directory (path).
Initial Local Directory	Specify the default local directory (path).

20.2.3 Backup Configuration Using TFTP

The NOA-3570 supports the up/downloading of the firmware and the configuration file using TFTP (Trivial File Transfer Protocol) over Ethernet.

To use TFTP, your computer must have both telnet and TFTP clients. To backup the configuration file, follow the procedure shown next:

1. Use telnet from your computer to connect to the NOA-3570 and log in. Because TFTP does not have any security checks, the NOA-3570 records the IP address of the telnet client and accepts TFTP requests only from this address.
2. Put the SMT in command interpreter (CI) mode by entering 8 in **Menu 24 – System Maintenance**.

3 Enter command "sys stdio 0" to disable the SMT timeout, so the TFTP transfer will not be interrupted. Enter command "sys stdio 5" to restore the five-minute SMT timeout (default) when the file transfer is complete.

4 Launch the TFTP client on your computer and connect to the NOA-3570. Set the transfer mode to binary before starting data transfer.

5 Use the TFTP client (see the example below) to transfer files between the NOA-3570 and the computer. The file name for the configuration file is `rom-0` (rom-zero, not capital o).

Note that the telnet connection must be active and the SMT in CI mode before and during the TFTP transfer. For details on TFTP commands (see following example), please consult the documentation of your TFTP client program. For UNIX, use "get" to transfer from the NOA-3570 to the computer and "binary" to set binary transfer mode.

20.2.4 Example: TFTP Command

The following is an example TFTP command:

```
TFTP [-i] host get rom-0 config.rom
```

where "i" specifies binary image transfer mode (use this mode when transferring binary files), "host" is the NOA-3570 IP address, "get" transfers the file source on the NOA-3570 (rom-0 name of the configuration file on the NOA-3570) to the file destination on the computer and renames it config.rom.

The following table describes some of the fields that you may see in third party TFTP clients.

Table 64 General Commands for Third Party TFTP Clients NOA-3570

COMMAND	DESCRIPTION
Host	Enter the IP address of the NOA-3570. 192.168.1.2 is the NOA-3570's default IP address when shipped.
Send/Fetch	Use "Send" to upload the file to the NOA-3570 and "Fetch" to back up the file on your computer.
Local File	Enter the path and name of the firmware file (*.bin extension) or configuration file (*.rom extension) on your computer.
Remote File	This is the filename on the NOA-3570. The filename for the firmware is "ras" and for the configuration file, is "rom-0".
Binary	Transfer the file in binary mode.
Abort	Stop transfer of the file.

20.2.5 Backup Via Console Port

Back up configuration via console port by following the HyperTerminal procedure shown next. Procedures using other serial communications programs should be similar.

1 Display menu 24.5 and enter "y" at the following screen.

Figure 102 System Maintenance: Backup Configuration

```
Ready to backup Configuration via Xmodem.
Do you want to continue (y/n):
```

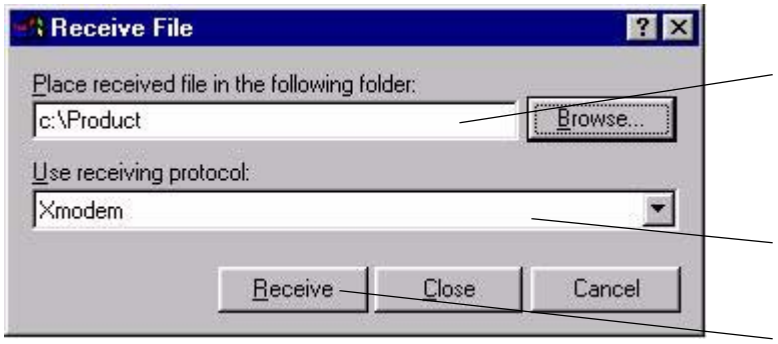
2 The following screen indicates that the Xmodem download has started.

Figure 103 System Maintenance: Starting Xmodem Download Screen

```
You can enter ctrl-x to terminate operation any time.
Starting XMODEM download...
```

3 Run the HyperTerminal program by clicking **Transfer**, then **Receive File** as shown in the following screen.

Figure 104 Backup Configuration Example



4 After a successful backup you will see the following screen. Press any key to return to the SMT menu.

Figure 105 Successful Backup Confirmation Screen

```
** Backup Configuration completed. OK.
### Hit any key to continue.###
```

20.3 Restore Configuration

Menu 24.6 — System Maintenance – **Restore Configuration** allows you to restore the configuration via FTP or TFTP to your NOA-3570. The preferred method is FTP. Note that this function erases the current configuration before restoring the previous backup configuration; please do not attempt to restore unless you have a backup configuration stored on disk. To restore configuration using FTP or TFTP is the same as uploading the configuration file, please refer to the following sections on FTP and TFTP file transfer for more details. The NOA-3570 restarts automatically after the file transfer is complete.

20.3.1 Restore Using FTP

For details about backup using (T)FTP please refer to earlier sections on FTP and TFTP file upload in this chapter.

Figure 106 Menu 24.6 Restore Configuration

```
                    Menu 24.6 – Restore Configuration
To transfer the firmware and the configuration file, follow the procedure
below:
1. Launch the FTP client on your workstation.
2. Type "open" and the IP address of your router. Then type "root" and
   SMT password as requested.
3. Type “put backupfilename rom-0” where backupfilename is the name of
   your backup configuration file on your workstation and rom-spt is the
   Remote file name on the router. This restores the configuration to your
   router.
4. The system reboots automatically after a successful file transfer.

For details on FTP commands, please consult the documentation of your FTP
client program. For details on restoring using TFTP (note that you must
remain in the menu to back up using TFTP), please see your router manual.

                          Press ENTER to Exit:
```

20.4 Uploading Firmware and Configuration Files

Menu 24.7 – System Maintenance – Upload Firmware allows you to upgrade the firmware and the configuration file.

Note: WARNING! PLEASE WAIT A FEW MINUTES FOR THE NOA-3570 TO RESTART AFTER FIRMWARE OR CONFIGURATION FILE UPLOAD. INTERRUPTING THE UPLOAD PROCESS MAY PERMANENTLY DAMAGE YOUR NOA-3570.

Figure 107 Menu 24.7 System Maintenance: Upload Firmware

```
      Menu 24.7 - System Maintenance - Upload Firmware

          1. Upload System Firmware
          2. Upload System Configuration File

                Enter Menu Selection Number:
```

The configuration data, system-related data, the error log and the trace log are all stored in the configuration file. Please be aware that uploading the configuration file replaces everything contained within.

20.4.1 Firmware Upload

FTP is the preferred method for uploading the firmware and configuration. To use this feature, your computer must have an FTP client.

When you telnet into the NOA-3570, you will see the following screens for uploading firmware and the configuration file using FTP.

Figure 108 Menu 24.7.1 System Maintenance: Upload System Firmware

```
            Menu 24.7.1 - System Maintenance - Upload System Firmware

To upload the system firmware, follow the procedure below:
1. Launch the FTP client on your workstation.
2. Type "open" and the IP address of your system. Then type "root" and
   SMT password as requested.
3. Type "put firmwarefilename ras" where "firmwarefilename" is the name of your
   firmware upgrade file on your workstation and "ras" is the remote file name on the
   system.
4. The system reboots automatically after a successful firmware upload.

For details on FTP commands, please consult the documentation of your FTP
client program. For details on uploading system firmware using TFTP (note
that you must remain on this menu to upload system firmware using TFTP), please see
your manual.

                                  Press ENTER to Exit:
```

20.4.2 Configuration File Upload

You see the following screen when you telnet into menu 24.7.2.

Figure 109 Menu 24.7.2 System Maintenance: Upload System Configuration File

```
         Menu 24.7.2 - System Maintenance - Upload System Configuration File

To upload the system configuration file, follow the procedure below:
1. Launch the FTP client on your workstation.
2. Type "open" and the IP address of your system. Then type "root" and SMT    password
   as requested.
3. Type "put configurationfilename rom-0" where "configurationfilename" is the name of
   your system configuration file on your workstation, which will be transferred to the
   "rom-0" file on the system.
4. The system reboots automatically after the upload system configuration file process
   is complete.

For details on FTP commands, please consult the documentation of your FTP client
program. For details on uploading system firmware using TFTP (note that you must
remain on this menu to upload system firmware using TFTP), please see your manual.

Press ENTER to Exit:
```

To transfer the firmware and the configuration file, follow these examples:

20.4.3 Using the FTP command from the DOS Prompt Example

1. Launch the FTP client on your computer.
2. Enter "open" and the IP address of your NOA-3570.
3. Press [ENTER] when prompted for a username.
4. Enter your password as requested. The default is 1234.
5. Enter "bin" to set transfer mode to binary.
6. Use "put" to transfer files from the computer to the NOA-3570, e.g., put firmware.bin ras transfers the firmware on your computer (firmware.bin) to the NOA-3570 and renames it "ras". Similarly "put config.rom rom-0" transfers the configuration file on your computer (config.rom) to the NOA-3570 and renames it "rom-0". Likewise "get rom-0 config.rom" transfers the configuration file on the NOA-3570 to your computer and renames it "config.rom." See earlier in this chapter for more information on filename conventions.
7. Enter "quit" to exit the FTP prompt.

Figure 110 FTP Session Example

```
331 Enter PASS command
Password:
230 Logged in
ftp> bin
200 Type I OK
ftp> put firmware.bin ras
200 Port command okay
150 Opening data connection for STOR ras
226 File received OK
ftp: 327680 bytes sent in 1.10Seconds
297.89Kbytes/sec.
ftp> quit
```

More commands that you may find in third party FTP clients are listed earlier in this chapter.

20.4.4 TFTP File Upload

The NOA-3570 also supports the up/downloading of the firmware and the configuration file using TFTP (Trivial File Transfer Protocol) over Ethernet.

To use TFTP, your computer must have both telnet and TFTP clients. To transfer the firmware and the configuration file, follow the procedure shown next:

1. Use telnet from your computer to connect to the NOA-3570 and log in. Because TFTP does not have any security checks, the NOA-3570 records the IP address of the telnet client and accepts TFTP requests only from this address.
2. Put the SMT in command interpreter (CI) mode by entering 8 in **Menu 24 – System Maintenance**.

3. Enter the command "sys stdio 0" to disable the SMT timeout, so the TFTP transfer will not be interrupted. Enter command "sys stdio 5" to restore the five-minute SMT timeout (default) when the file transfer is complete.
4. Launch the TFTP client on your computer and connect to the NOA-3570. Set the transfer mode to binary before starting data transfer.
5. Use the TFTP client (see the example below) to transfer files between the NOA-3570 and the computer. The file name for the firmware is "ras" and the configuration file is "rom-0" (rom-zero, not capital o).

Note that the telnet connection must be active and the SMT in CI mode before and during the TFTP transfer. For details on TFTP commands (see following example), please consult the documentation of your TFTP client program. For UNIX, use "get" to transfer from the NOA-3570 to the computer, "put" the other way around, and "binary" to set binary transfer mode.

20.4.5 Example: TFTP Command

The following is an example TFTP command:

```
TFTP [-i] host put firmware.bin ras
```

where "i" specifies binary image transfer mode (use this mode when transferring binary files), "host" is the NOA-3570's IP address, "put" transfers the file source on the computer (firmware.bin – name of the firmware on the computer) to the file destination on the remote host (ras - name of the firmware on the NOA-3570).

Commands that you may see in third party TFTP clients are listed earlier in this chapter.

20.4.6 Uploading Via Console Port

FTP or TFTP are the preferred methods for uploading firmware to your NOA-3570. However, in the event of your network being down, uploading files is only possible with a direct connection to your NOA-3570 via the console port. Uploading files via the console port under normal conditions is not recommended since FTP or TFTP is faster. Any serial communications program should work fine; however, you must use the Xmodem protocol to perform the download/upload.

20.4.7 Uploading Firmware File Via Console Port

Select 1 from **Menu 24.7 – System Maintenance – Upload Firmware** to display **Menu 24.7.1 – System Maintenance – Upload System Firmware**, then follow the instructions as shown in the following screen.

Figure 111 Menu 24.7.1 as Seen Using the Console Port

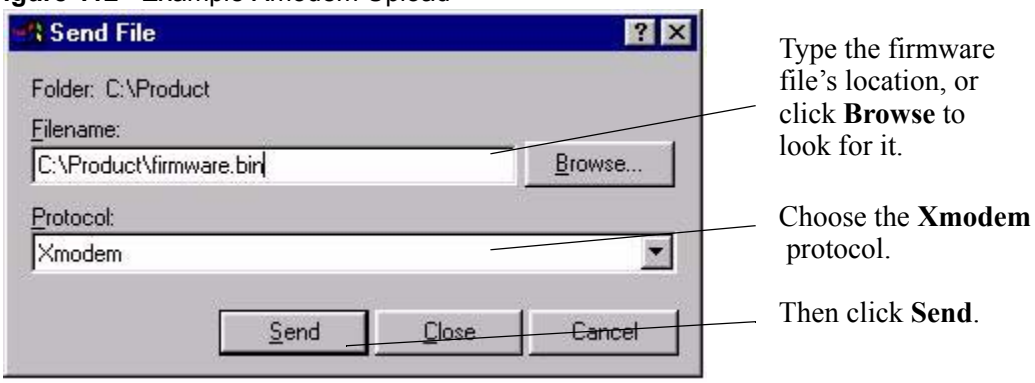
```
            Menu 24.7.1 - System Maintenance - Upload System Firmware
          To upload system firmware:
          1. Enter "y" at the prompt below to go into debug mode.
          2. Enter "atur" after "Enter Debug Mode" message.
          3. Wait for "Starting XMODEM upload" message before activating
             Xmodem upload on your terminal.
          4. After successful firmware upload, enter "atgo" to restart the
             router.
          Warning: Proceeding with the upload will erase the current system
          firmware.
Do You Wish To Proceed:(Y/N)
```

After the "Starting Xmodem upload" message appears, activate the Xmodem protocol on your computer. Follow the procedure as shown previously for the HyperTerminal program. The procedure for other serial communications programs should be similar.

20.4.8 Example Xmodem Firmware Upload Using HyperTerminal

Click **Transfer**, then **Send File** to display the following screen.

Figure 112 Example Xmodem Upload



After the firmware upload process has completed, the NOA-3570 will automatically restart.

20.4.9 Uploading Configuration File Via Console Port

1 Select 2 from **Menu 24.7 – System Maintenance – Upload Firmware** to display **Menu 24.7.2 – System Maintenance – Upload System Configuration File**. Follow the instructions as shown in the next screen.

Figure 113 Menu 24.7.2 as Seen Using the Console Port

```
Menu 24.7.2 - System Maintenance - Upload System Configuration File

      To upload system configuration file:
      1. Enter "y" at the prompt below to go into debug mode.
      2. Enter "atlc" after "Enter Debug Mode" message.
      3. Wait for "Starting XMODEM upload" message before activating
         Xmodem upload on your terminal.
      4. After successful firmware upload, enter "atgo" to restart the
         system.

      Warning:
      1. Proceeding with the upload will erase the current
         configuration file.
      2. The system's console port speed (Menu 24.2.2) may change
         when it is restarted; please adjust your terminal's speed
         accordingly. The password may change (menu 23), also.
      3. When uploading the DEFAULT configuration file, the console
         port speed will be reset to 9600 bps and the password to
         "1234".
                        Do You Wish To Proceed:(Y/N)
```

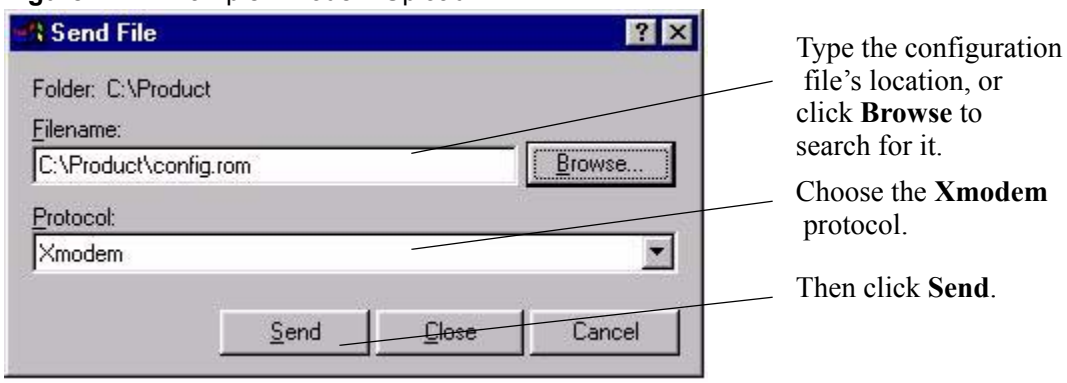
2 After the "Starting Xmodem upload" message appears, activate the Xmodem protocol on your computer. Follow the procedure as shown previously for the HyperTerminal program. The procedure for other serial communications programs should be similar.

3 Enter "atgo" to restart the NOA-3570.

20.4.10 Example Xmodem Configuration Upload Using HyperTerminal

Click **Transfer**, then **Send File** to display the following screen.

Figure 114 Example Xmodem Upload



After the configuration upload process has completed, restart the NOA-3570 by entering "atgo"

CHAPTER 21
System Maintenance and Information

This chapter leads you through SMT menus 24.8 and 24.10.

21.1 Command Interpreter Mode

The Command Interpreter (CI) is a part of the main system firmware. The CI provides much of the same functionality as the SMT, while adding some low-level setup and diagnostic functions. Enter the CI from the SMT by selecting menu 24.8. See the included disk or the zyxel.com web site for more detailed information on CI commands. Enter 8 from **Menu 24 – System Maintenance**. A list of valid commands can be found by typing `help` or `?` at the command prompt. Type "exit" to return to the SMT main menu when finished.

Figure 115 Menu 24 System Maintenance

```
                    Menu 24 - System Maintenance

                  1.  System Status
                  2.  System Information and Console Port Speed
                  3.  Log and Trace
                  4.  Diagnostic
                  5.  Backup Configuration
                  6.  Restore Configuration
                  7.  Upload Firmware
                  8.  Command Interpreter Mode

                  10. Time and Date Setting


                    Enter Menu Selection Number:
```

Figure 116 Valid CI Commands

```
Copyright (c) 1994 - 2004 ZyXEL Communications Corp.
NOA-3570> ?
Valid commands are:
sys             exit            ether           wlan
ip              bridge          certificates    8021x
radius          radserv
NOA-3570>
```

21.2 Time and Date Setting

The NOA-3570 keeps track of the time and date. There is also a software mechanism to set the time manually or get the current time and date from an external server when you turn on your NOA-3570. Menu 24.10 allows you to update the time and date settings of your NOA-3570. The real time is then displayed in the NOA-3570 error logs.

1. Select menu 24 in the main menu to open **Menu 24 – System Maintenance**.
2. Then enter 10 to go to **Menu 24.10 – System Maintenance – Time and Date Setting** to update the time and date settings of your NOA-3570 as shown in the following screen.

Figure 117 Menu 24.10 System Maintenance: Time and Date Setting

```
           Menu 24.10 - System Maintenance - Time and Date Setting

        Time Protocol= Manual
        Time Server Address= N/A

        Current Time:                          00 : 57 : 07
        New Time (hh:mm:ss):                   00 : 56 : 57

        Current Date:                          2000 - 01 - 01
        New Date (yyyy-mm-dd):                 2000 - 01 - 01

        Time Zone= GMT

        Daylight Saving= No
        Start Date (mm-dd):                          01 - 01
        End Date (mm-dd):                            01 - 01


                  Press ENTER to Confirm or ESC to Cancel:
```

The following table describes the fields in this menu.

Table 65 System Maintenance: Time and Date Setting NOA-3570

FIELD	DESCRIPTION
Time Protocol	Enter the time service protocol that your time server sends when you turn on the NOA-3570. Not all time servers support all protocols, so you may have to check with your ISP/network administrator or use trial and error to find a protocol that works. The main differences between them are the format. **Daytime (RFC 867)** format is day/month/year/time zone of the server. **Time (RFC-868)** format displays a 4-byte integer giving the total number of seconds since 1970/1/1 at 0:0:0. **NTP (RFC-1305)** is similar to **Time (RFC-868)**. **None** The default, enter the time manually.
Time Server Address	Enter the IP address or domain name of your time server. Check with your ISP/ network administrator if you are unsure of this information.
Current Time	This field displays an updated time only when you reenter this menu.
New Time	Enter the new time in hour, minute and second format.
Current Date	This field displays an updated date only when you re-enter this menu.
New Date	Enter the new date in year, month and day format.
Time Zone	Press [SPACE BAR] and then [ENTER] to set the time difference between your time zone and Greenwich Mean Time (GMT).
Daylight Saving	If you use daylight saving time, then choose **Yes**.
Start Date	If using daylight saving time, enter the month and day that it starts on.
End Date	If using daylight saving time, enter the month and day that it ends on
Once you have filled in this menu, press [ENTER] at the message "Press ENTER to Confirm or ESC to Cancel" to save your configuration, or press [ESC] to cancel.	

21.2.1 Resetting the Time

The NOA-3570 resets the time in three instances:

1. On leaving menu 24.10 after making changes.
2. When the NOA-3570 starts up, if there is a timeserver configured in menu 24.10.
3. 24-hour intervals after starting.

CHAPTER 22
Troubleshooting

This appendix covers potential problems and possible remedies. After each problem description, some instructions are provided to help you to diagnose and to solve the problem.

22.1 Problems Starting Up the NOA-3570

Table 66 Troubleshooting the Start-Up of Your NOA-3570

The power injector's **POWER** and **ACTIVE** LEDs are off.	Make sure the power cord is connected to an adequate power supply and that the power supply is turned on. Disconnect and reconnect the power supply. If the error persists, you may have a hardware problem. In this case, you should contact your vendor.
The **ACTIVE** LED on the power injector is off.	Check the cable connection to the NOA-3570's special Ethernet port. The outdoor Ethernet cable must be straight-through and no longer than 80 m.
The NOA-3570 reboots automatically sometimes.	The supplied power to the NOA-3570 is too low. Check that the NOA-3570 is receiving enough power. Make sure the power source is working properly.

22.2 Problems with Console Port Access

Table 67 Troubleshooting Console Port Access

PROBLEM	CORRECTIVE ACTION
I cannot access the NOA-3570 via the console port.	1. Check to see if the NOA-3570 is connected to your computer's console port.
	2. Check to see if the communications program is configured correctly. The communications software should be configured as follows: VT100 terminal emulation. 9,600 bps is the default speed on leaving the factory. Try other speeds in case the speed has been changed. No parity, 8 data bits, 1 stop bit, data flow set to none.

22.3 Problems with the Ethernet Interface

Table 68 Troubleshooting the Ethernet Interface

PROBLEM	CORRECTIVE ACTION
Cannot access the NOA-3570 from the LAN.	If all of the LEDs on the inline power injector are on, check the Ethernet cable connection between your NOA-3570 and the computer connected to the **DATA IN** port on the inline power injector. Use a cross-over Ethernet cable to connect the power injector to a computer. Use a straight through Ethernet cable to connect the power injector to a switch or router. Check for faulty Ethernet cables. Make sure the computer's Ethernet adapter is installed and working properly. If directly connected to the NOA-3570, verify that the IP addresses and the subnet masks of the NOA-3570 and the computer are on the same subnet.
	Ping the NOA-3570. Make sure your computer's Ethernet card is installed and functioning properly. In the computer, click **Start**, (**All) Programs**, **Accessories** and then **Command Prompt**. In the **Command Prompt** window, type "ping" followed by the NOA-3570's IP address (192.168.1.2 is the default) and then press [ENTER]. The NOA-3570 should reply.
Cannot access the web configurator.	You must connect to the NOA-3570's current IP address and your computer's IP address must be in the same subnet as the NOA-3570's IP address. If you don't know the NOA-3570's IP address, you can check the IP address in the System Management Terminal (SMT). Use the included console cable to connect the NOA-3570's console port to a computer running a terminal emulation program set to VT100 terminal emulation, no parity, 8 data bits, 1 stop bit, no flow control and 9600 bps port speed. If the NOA-3570 is set to get an IP address via DHCP, you can check the DHCP server to see which IP address it assigned to the NOA-3570.
	You may also need to clear your Internet browser's cache. In Internet Explorer, click **Tools** and then **Internet Options** to open the **Internet Option**s screen. In the **General** tab, click **Delete Files**. In the pop-up window, select the **Delete all offline content** check box and click **OK**. Click **OK** in the **Internet Options** screen to close it. If you disconnect your computer from one device and connect it to another device that has the same IP address, your computer's ARP (Address Resolution Protocol) table may contain an entry that maps the management IP address to the previous device's MAC address). In Windows, use **arp -d** at the command prompt to delete all entries in your computer's ARP table.
I cannot ping any computer on the LAN.	If the LEDs on the inline power injector are on, check the Ethernet cable connection between your NOA-3570 and the computer connected to the **DATA IN** port on the inline power injector. Verify that the IP addresses and the subnet masks of the NOA-3570 and the computers are on the same subnet.

22.4 Problems with the Password

Table 69 Troubleshooting the Password

PROBLEM	CORRECTIVE ACTION
I cannot access the NOA-3570.	The **Password** and **Username** fields are case-sensitive. Make sure that you enter the correct password and username using the proper casing. If you forget your password or cannot access the NOA-3570, you will need to reload the factory-default configuration file. Uploading this configuration file replaces the current configuration file with the factory-default configuration file. This means that you will lose all configurations that you had previously and the speed of the console port will be reset to the default baud rate of 9,600 bps, with 8 data bit, no parity, one stop bit and flow control set to none. The password will be reset to '1234', also.

22.5 Problems with Telnet

Table 70 Troubleshooting Telnet

PROBLEM	CORRECTIVE ACTION
I cannot access the NOA-3570 through Telnet.	Refer to Section 22.3 on page 186" section for instructions on checking your Ethernet connection.

22.6 Problems with the WLAN Interface

Table 71 Troubleshooting the WLAN Interface

PROBLEM	CORRECTIVE ACTION
I cannot ping any computer on the WLAN.	Make sure the wireless adapter on the wireless station is working properly. Check that both the NOA-3570 and wireless station(s) are using the same SSID, channel and WEP keys (if WEP encryption is activated).

APPENDIX A
Specifications

General Specifications

Table 72 Device Specifications

Default IP Address	192.168.1.2
Default Subnet Mask	255.255.255.0 (24 bits)
Default Password	1234

Table 73 Performance NOA-3570

WLAN Connection Distance	IEEE 802.11g, up to 500 m IEEE 802.11g, up to 5 km

Table 74 Firmware Features NOA-3570

System Management	Embedded Web Configurator (HTTP) Menu-driven SMT (System Management Terminal) management CLI (Command Line Interpreter) Remote Management via Telnet or Web Diagnostic tool (built-in) SNMP Manageable Firmware Upgrade (web configurator, TFTP/FTP) RADIUS client
Wireless	IEEE 802.11b Compliant IEEE 802.11g Compliant Can support simultaneous IEEE 802.11b and IEEE 802.11g connections or can be configured to only use one or the other. 2 ESSID/VLANs of for the WLANs (one for each WLAN card) Frequency Range: 2.4 GHz Roaming (IAPP) support based on IEEE 802.11f (can't roam across subnets, without re-authentication) Advanced Orthogonal Frequency Division Multiplexing (OFDM) 64/128-bits WEP support, dynamic WEP key exchange included WPA (Wi-Fi Protected Access), WPA-PSK support, IEEE 802.1x security (EAP-MD5, EAP-TLS, EAP-TTLS, PEAP) Mixed WEP & WPA mode (support both 802.1x/WEP & WPA clients) Built-in RADIUS server (MD5 / PEAP, 32 entries) Backup RADIUS server RADIUS client MAC address filtering through WLAN (support 32 entries) Access point and Bridge/Repeater mode (concurrent) WDS (including Bridge/Repeater mode configurable per link individually & support simultaneously) Auto scan for channel with least interference Configurable WLAN adapter output power Intra-BSS traffic blocking
Logging/Monitoring	Logs System status monitoring Syslog
Other Protocol Support and Standards Compliance	IEEE 802.3 and 802.3u 10Base-T and 100Base-TX physical layer specification IEEE 802.1d Rapid Spanning Tree Protocol IPSec, PPTP and L2TP pass through SIP pass through Transparent bridging for unsupported network layer protocols DHCP Client/Relay SNMP v1 and v2c with MIB II support (RFC 1213)

Table 75 Environmental Conditions

	TEMPERATURE RANGE IN DEGREES CELSIUS
Operation	+15 ~ +35
Normal	~ +35
Extreme	~ +70
Storage	-40 to +80

HUMIDITY (non-condensing): 5% to 95% RH (typical)

Table 76 Inspection Channel (CH1, CH7, CH13)

	TX/RX FREQUENCY MHZ	1ST LO FREQUENCY MHZ	2ND LO FREQUENCY MHZ
CH1	2412	2038	
CH7	2442	2068	
CH13	2472	2098	
VCO			748
IF			374

Hardware Specifications

Table 77 Hardware Specifications NOA-3570

Ethernet Interface	One MIL-C-5015 style Ethernet port
Ethernet Interface (Power Injector)	Two RJ-45 Ethernet ports
Console Port	One MIL-C-5015 style RS-232 console port
WLAN Adapters	Two embedded IEEE 802.11g wireless LAN cards
Antenna Connectors	Three standard-N type (female) jacks
Access Protocol	CSMA/CA
Roaming	IAPP compliant (based on IEEE 802.11f)
Radio Data Rate	54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2 and 1 Mbps, Auto Fall-Back
Regulatory & Safety Certifications	FCC Part 15, Class BR&TTE Directive 1999/5/ECEN 300 328-2EN 301 489-1EN 301 489-17EN 60950IP68
Compatibility	Fully interoperable with IEEE802.11g and IEEE802.11b compliant products
Power Supply (for the Power Injector)	Input 100 ~ 240 VAC, 2 A, 50/60 Hz. Output 800 mA at -48 VDC

Table 77 Hardware Specifications NOA-3570

Dimensions	246(L) x 202(D) x 73(H) mm
Weight	NOA-3570 without accessories, 2.6 kg

Radio Specifications

Table 78 Radio Specifications NOA-3570

FREQUENCY BAND	**2.4 ~ 2.4835 (GHZ)**
RADIO TYPE	Direct Sequence Spread Spectrum (DSSS)\
MODULATION TYPE	(Mbps)
CCK	11, 5.5
DQPSK	2
DBPSK	1
OPERATION CHANNELS	(CH)
North American (FCC)	11
European Community (ETSI)	13
RF OUTPUT POWER	(dBm)
FCC (Excluding antenna gain)	21
ETSI (Excluding antenna gain)	14
BAND EDGE	(dBc)
FCC	>30
ETSI	>30

Table 79 Rx Sensitivity (@ FER = 0.08)

MBPS/ MODULATION	54 OFDM	48 OFDM	36 OFDM	18 OFDM	12 OFDM	9 OFDM	6 OFDM	11 CCK	5.5 CCK	2 QPSK	1 QPSK
FCC (dBm)	-68	-68	-75	-82	-84	-87	-88	-82	-85	-86	-89
ETSI (dBm)	-68	-68	-75	-82	-84	-87	-88	-82	-85	-86	-89

System Test

Table 80 Transmitting System NOA-3570

PARAMETER	TEST CONDITION	SPECIFICATION	TEMP. DEG. C.
Tx Power	Modulation: OFDM Data Rate: 54 Mbps	FCC:21 dBm ± 1 dB 21dBm ± 2 dB	25-20 ~ +70
		ETSI:14 dBm ± 1 dB 14dBm ± 2 dB	25-20 ~ +70
Spectrum Mask	±11MHz ~ 22MHz±22MHz ~ 33MHz	< -30 dBr< -45 dBr	-20 ~ +70
Frequency Error	Modulation: Carrier Only	± 60 KHz± 120 KHz	25-20 ~ +70
Power Ramp On	Tx power on 90% of Pmax	3 us	-20 ~ +70
Power Ramp Off	Tx power off 10% of Pmax	3 us	-20 ~ +70
Carrier Suppression	Modulation: Carrier Suppression	20 dBr	-20 ~ +70
Spurious Emission	1 GHz ~ 16 GHz	-41 dBm	25

Table 81 Receiving System NOA-3570

PARAMETER	TEST CONDITION	SPECIFICATION	TEMP. DEG. C.
Rx Sensitivity (FER)	FER 8%	Pin -85 dBmPin -83 dBm	25-20 ~ +70
Rx Sensitivity (Throughput)	THP 3 Mbps	Pin -83 dBmPin -80 dBm	25-20 ~ +70
RSSI	Pin -80 dBm	16 (CR62)	25
Adjacent Channel Rejection	Carrier -80 dBmTHP 3 Mbps	35 dB	25
Spurious Emission	1 GHz ~ 16 GHz	-46 dBm	25

Table 82 Current Consumption NOA-3570

PARAMETER	TEST CONDITION	SPECIFICATION	TEMP. DEG. C.
Tx Current	Tx continue	150 mA (-48V)	25
Rx Current	Rx continue	80 mA (-48V)	25
Standby Current	Standby	50 mA (-48V)	25

Figure 118 Inspection Cosmetic and Function

TEST ITEM	TEST	CONDITION	CRITERIA
High Temperature Operation	Temp. Storage Test Spec.	+70 Deg. C 24 hours Operation mode in the chamber The same as +25 Deg. C	No Damage In Cosmetics or Error In Function
Low Temperature Operation	Temp. Storage Test Spec.	-20 Deg. C 24 hours Operation mode in the chamber The same as +25 Deg. C	No Damage In Cosmetics or Error In Function
High Temperature Storage	Temp. Storage Test Spec.	+80 Deg. C2 4 hours Operation mode in room temperature 4 hours after the storage The same as +25 Deg. C	No Damage In Cosmetics or Error In Function
Low Temperature Storage	Temp. Storage Test: Spec.	-40 Deg. C 24 hours Operation mode in room temperature 4 hours after the storage The same as +25 Deg. C	No Damage In Cosmetics or Error In Function
High Temperature High Humidity	Temp. Humidity Storage Test Spec.	+40 Deg. C 95%RH (non-condensing) 72 hours Operation mode in room temperature 4 hours after the storage The same as +25 Deg. C	No Damage In Cosmetics or Error In Function
Temperature Recycle	Temp. Cycle Test	+20->0->-20->0->+20->40->+60->+40->+20 Operation in the chamber 1 hour after arriving at the test temperature	No Damage On Electrical or Error In Function
ESD	Discharge By Air Discharge By Contact	±15KV (Each polarity 10 times) ±8KV (Each polarity 10 times)	No Damage On Electrical Performance

Approvals

Table 83 Approvals

SAFETY	North America	ANSI/UL-1950 3rdCSA C22.2 No. 950 3rd
	European Union (CE mark)	EN60950 (1992+A1+A2+A3+A4+A11)IEC 60950 3rd

Table 83 Approvals

EMI	North America	FCC Part 15 Class B
	European Union (CE mark)	EN55022 Class BEN61000-3-2EN61000-3-3
EMS	European Union (CE mark)	
ELECTROSTATIC DISCHARGE		EN61000-4-2
RADIO-FREQUENCY ELECTROMAGNETIC FIELD		EN61000-4-3
EFT/BURST		EN61000-4-4
SURGE		EN61000-4-5
CONDUCTED SUSCEPTIBILITY		EN61000-4-6
POWER MAGNETIC		EN61000-4-8
VOLTAGE DIPS/ INTERRUPTION		EN61000-4-11
EM FIELD FROM DIGITAL TELEPHONES		ENV50204
LAN COMPATIBILITY		SmartBit
FOR WIRELESS PC CARD		FCC Part15C, Sec15.247
		ETS300 328ETS300 826
		CE mark

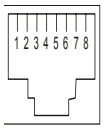
APPENDIX C
Power over Ethernet Specifications

You can use a power over Ethernet injector to power this device. The injector must comply to IEEE 802.3af.-7

Table 86 Power over Ethernet Injector Specifications

Power Output	15.4 Watts maximum
Power Current	400 mA maximum

Table 87 Power over Ethernet Injector RJ-45 Port Pin Assignments



PIN NO	RJ-45 SIGNAL ASSIGNMENT
1	Output Transmit Data +
2	Output Transmit Data -
3	Receive Data +
4	Power +
5	Power +
6	Receive Data -
7	Power -
8	Power -

APPENDIX D

Setting up Your Computer's IP Address

All computers must have a 10M or 100M Ethernet adapter card and TCP/IP installed.

Windows 95/98/Me/NT/2000/XP, Macintosh OS 7 and later operating systems and all versions of UNIX/LINUX include the software components you need to install and use TCP/IP on your computer. Windows 3.1 requires the purchase of a third-party TCP/IP application package.

TCP/IP should already be installed on computers using Windows NT/2000/XP, Macintosh OS 7 and later operating systems.

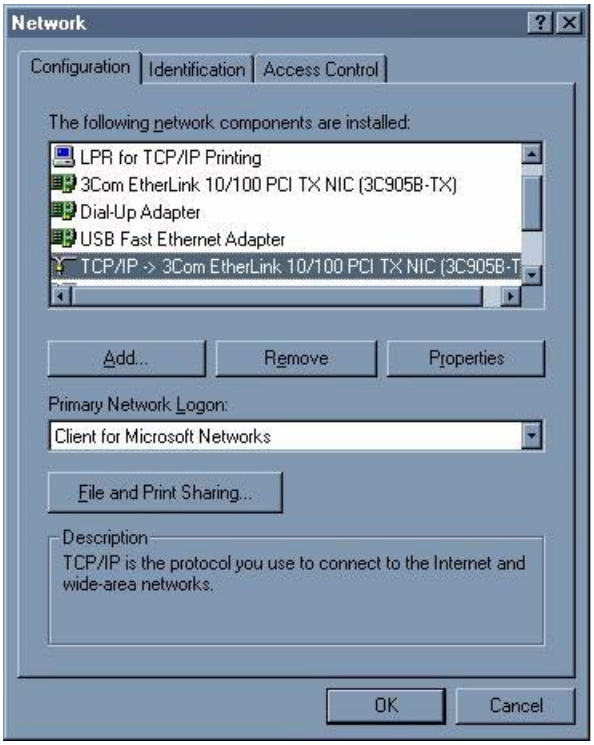
After the appropriate TCP/IP components are installed, configure the TCP/IP settings in order to "communicate" with your network.

If you manually assign IP information instead of using dynamic assignment, make sure that your computers have IP addresses that place them in the same subnet as the NOA-3570's LAN port.

Windows 95/98/Me

Click **Start**, **Settings**, **Control Panel** and double-click the **Network** icon to open the **Network** window.

Figure 119 WIndows 95/98/Me: Network: Configuration



Installing Components

The **Network** window **Configuration** tab displays a list of installed components. You need a network adapter, the TCP/IP protocol and Client for Microsoft Networks.

If you need the adapter:

1. In the **Network** window, click **Add**.
2. Select **Adapter** and then click **Add**.
3. Select the manufacturer and model of your network adapter and then click **OK**.

If you need TCP/IP:

1. In the **Network** window, click **Add**.
2. Select **Protocol** and then click **Add**.
3. Select **Microsoft** from the list of **manufacturers**.
4. Select **TCP/IP** from the list of network protocols and then click **OK**.

If you need Client for Microsoft Networks:

1. Click **Add**.
2. Select **Client** and then click **Add**.

3 Select **Microsoft** from the list of manufacturers.

4 Select **Client for Microsoft Networks** from the list of network clients and then click **OK**.

5 Restart your computer so the changes you made take effect.

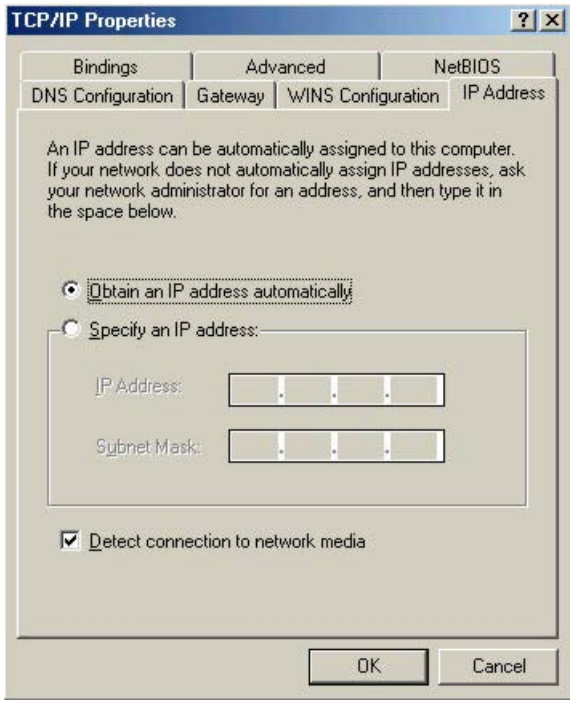
Configuring

1 In the **Network** window **Configuration** tab, select your network adapter's TCP/IP entry and click **Properties**

2 Click the **IP Address** tab.

- If your IP address is dynamic, select **Obtain an IP address automatically**.
- If you have a static IP address, select **Specify an IP address** and type your information into the **IP Address** and **Subnet Mask** fields.

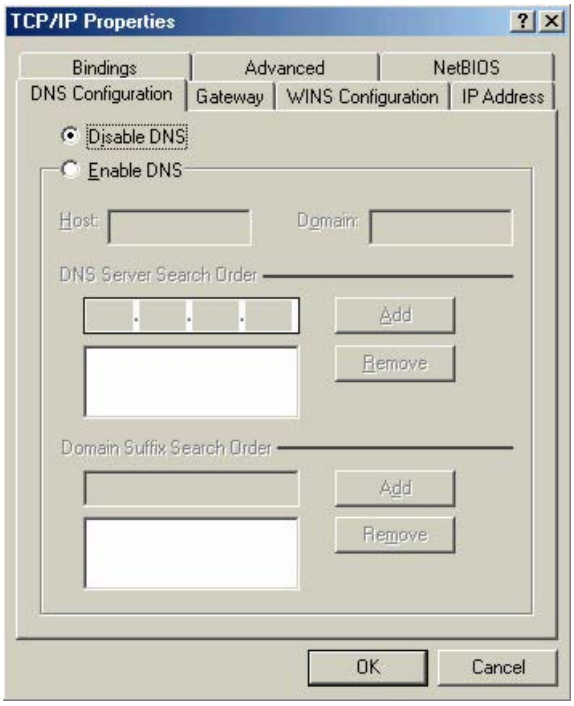
Figure 120 Windows 95/98/Me: TCP/IP Properties: IP Address



3 Click the **DNS** Configuration tab.

- If you do not know your DNS information, select **Disable DNS**.
- If you know your DNS information, select **Enable DNS** and type the information in the fields below (you may not need to fill them all in).

Figure 121 Windows 95/98/Me: TCP/IP Properties: DNS Configuration



4 Click the **Gateway** tab.

- If you do not know your gateway's IP address, remove previously installed gateways.
- If you have a gateway IP address, type it in the **New gateway field** and click **Add**.

5 Click **OK** to save and close the **TCP/IP Properties** window.

6 Click **OK** to close the **Network** window. Insert the Windows CD if prompted.

7 Turn on your NOA-3570 and restart your computer when prompted.

Verifying Settings

1 Click **Start** and then **Run**.

2 In the **Run** window, type "winipcfg" and then click **OK** to open the **IP Configuration** window.

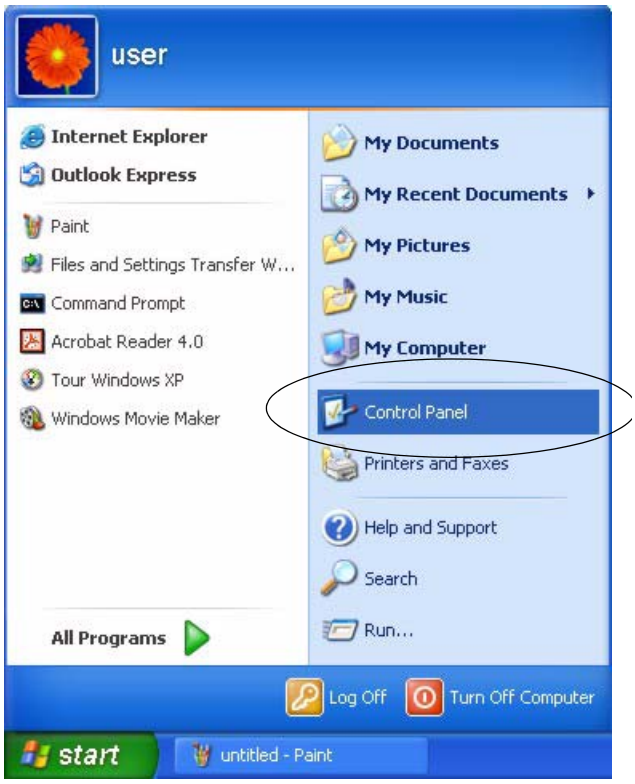
3 Select your network adapter. You should see your computer's IP address, subnet mask and default gateway.

Windows 2000/NT/XP

The following example figures use the default Windows XP GUI theme.

1 Click **start** (**Start** in Windows 2000/NT), **Settings**, **Control Panel**.

Figure 122 Windows XP: Start Menu

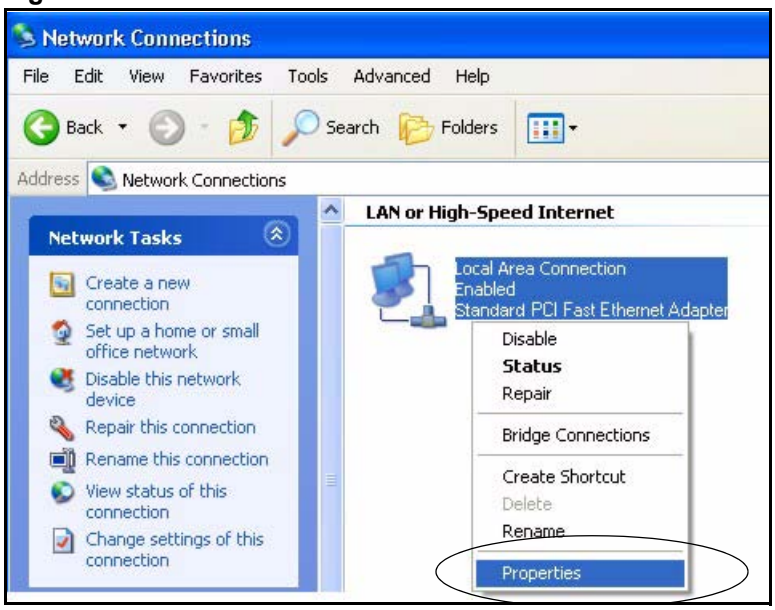


2 In the **Control Panel**, double-click **Network Connections** (**Network and Dial-up Connections** in Windows 2000/NT).

Figure 123 Windows XP: Control Panel

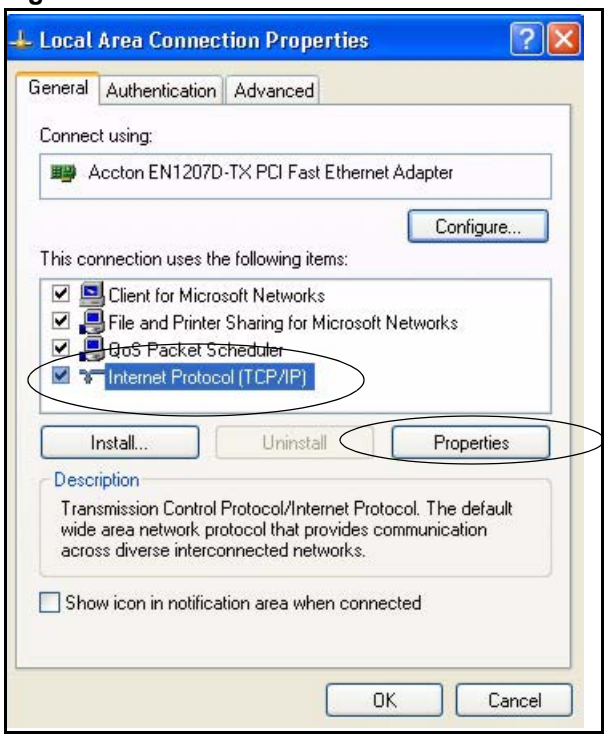
3 Right-click **Local Area Connection** and then click **Properties**.

Figure 124 Windows XP: Control Panel: Network Connections: Properties



4 Select **Internet Protocol (TCP/IP)** (under the **General** tab in Win XP) and then click **Properties**.

Figure 125 Windows XP: Local Area Connection Properties

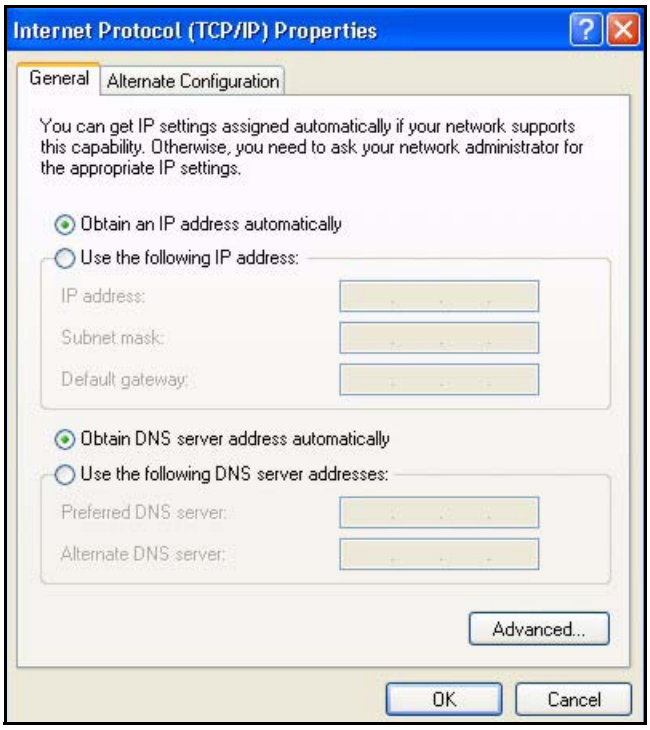


5 The **Internet Protocol TCP/IP Properties** window opens (the **General tab** in Windows XP).

- If you have a dynamic IP address click **Obtain an IP address automatically**.

- If you have a static IP address click **Use the following IP Address** and fill in the **IP address**, **Subnet mask**, and **Default gateway** fields.
- Click **Advanced**.

Figure 126 Windows XP: Internet Protocol (TCP/IP) Properties

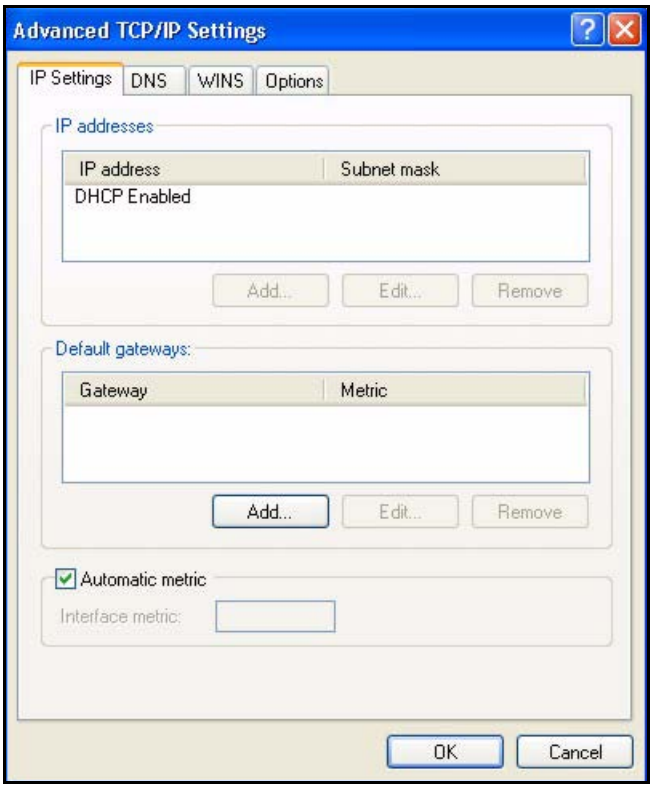


6 If you do not know your gateway's IP address, remove any previously installed gateways in the **IP Settings** tab and click **OK**.

Do one or more of the following if you want to configure additional IP addresses:

- In the **IP Settings** tab, in IP addresses, click **Add**.
- In **TCP/IP Address**, type an IP address in **IP address** and a subnet mask in **Subnet mask**, and then click **Add**.
- Repeat the above two steps for each IP address you want to add.
- Configure additional default gateways in the **IP Settings** tab by clicking **Add** in **Default gateways**.
- In **TCP/IP Gateway Address**, type the IP address of the default gateway in **Gateway**. To manually configure a default metric (the number of transmission hops), clear the **Automatic metric** check box and type a metric in **Metric**.
- Click **Add**.
- Repeat the previous three steps for each default gateway you want to add.
- Click **OK** when finished.

Figure 127 Windows XP: Advanced TCP/IP Properties

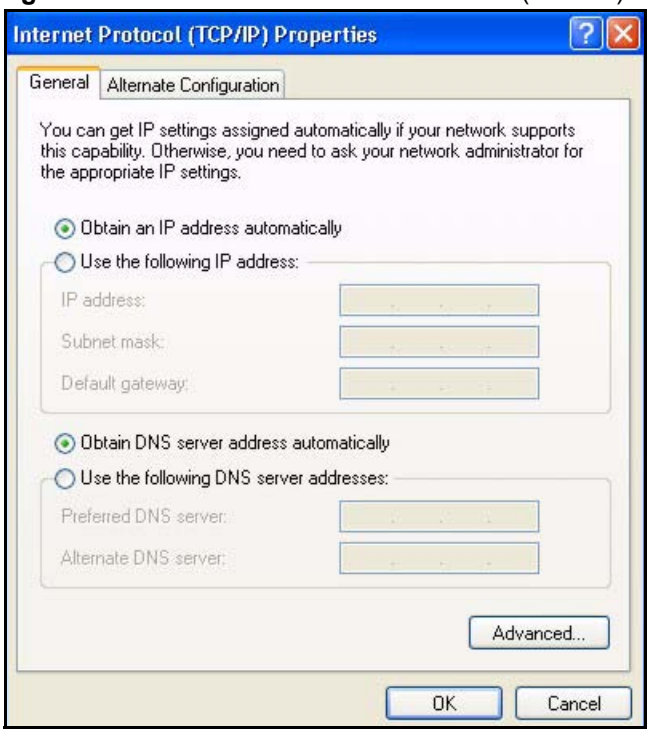


7 In the **Internet Protocol TCP/IP Properties** window (the **General tab** in Windows XP):

- Click **Obtain DNS server address automatically** if you do not know your DNS server IP address(es).
- If you know your DNS server IP address(es), click **Use the following DNS server addresses**, and type them in the **Preferred DNS server** and **Alternate DNS server** fields.

  If you have previously configured DNS servers, click **Advanced** and then the **DNS** tab to order them.

Figure 128 Windows XP: Internet Protocol (TCP/IP) Properties



8 Click **OK** to close the **Internet Protocol (TCP/IP) Properties** window.

9 Click **Close** (**OK** in Windows 2000/NT) to close the **Local Area Connection Properties** window.

10 Close the **Network Connections** window (**Network and Dial-up Connections** in Windows 2000/NT).

11 Turn on your NOA-3570 and restart your computer (if prompted).

Verifying Settings

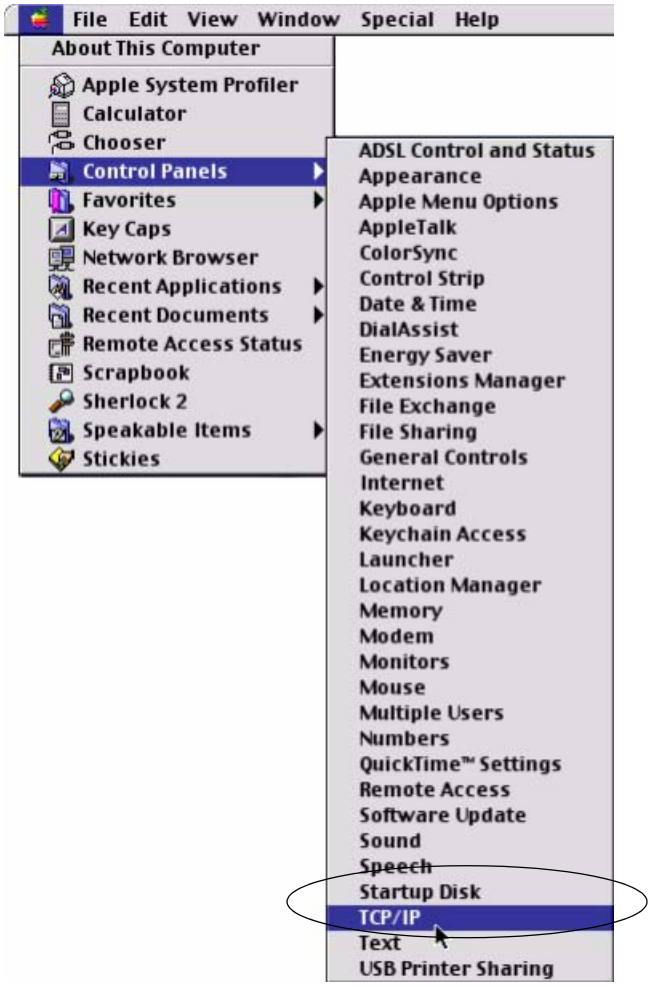
1 Click **Start**, **All Programs**, **Accessories** and then **Command Prompt**.

2 In the **Command Prompt** window, type "ipconfig" and then press [ENTER]. You can also open **Network Connections**, right-click a network connection, click **Status** and then click the **Support** tab.

Macintosh OS 8/9

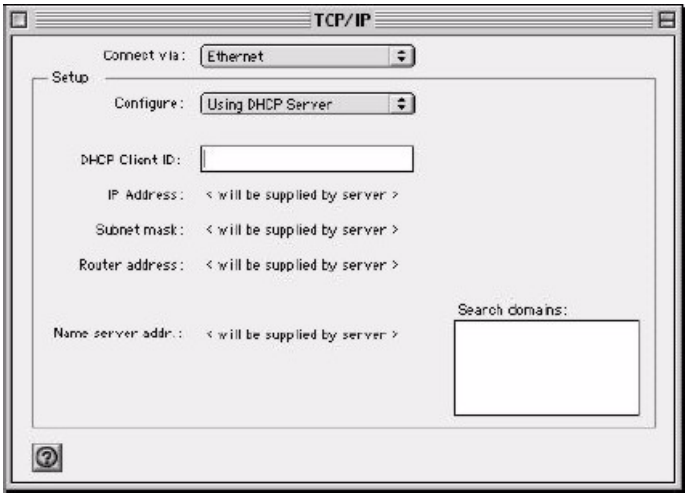
1 Click the **Apple** menu, **Control Panel** and double-click **TCP/IP** to open the **TCP/IP Control Panel**.

Figure 129 Macintosh OS 8/9: Apple Menu



2 Select **Ethernet built-in** from the **Connect via** list.

Figure 130 Macintosh OS 8/9: TCP/IP



3 For dynamically assigned settings, select **Using DHCP Server** from the **Configure:** list.

4 For statically assigned settings, do the following:

- From the **Configure** box, select **Manually**.
- Type your IP address in the **IP Address** box.
- Type your subnet mask in the **Subnet mask** box.
- Type the IP address of your NOA-3570 in the **Router address** box.

5 Close the **TCP/IP Control Panel**.

6 Click **Save** if prompted, to save changes to your configuration.

7 Turn on your NOA-3570 and restart your computer (if prompted).

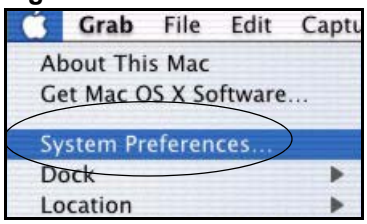
Verifying Settings

Check your TCP/IP properties in the **TCP/IP Control Panel** window.

Macintosh OS X

1 Click the **Apple** menu, and click **System Preferences** to open the **System Preferences** window.

Figure 131 Macintosh OS X: Apple Menu

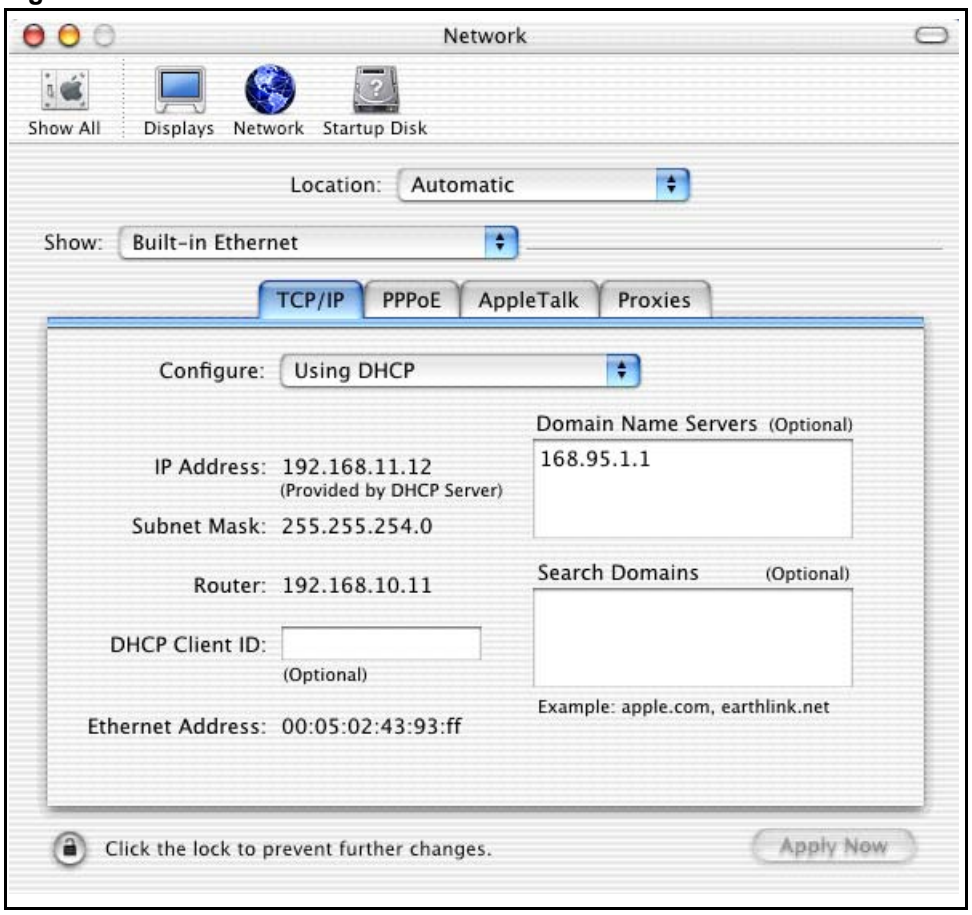


2 Click **Network** in the icon bar.

- Select **Automatic** from the **Location** list.
- Select **Built-in Ethernet** from the **Show** list.
- Click the **TCP/IP** tab.

3 For dynamically assigned settings, select **Using DHCP** from the **Configure** list.

Figure 132 Macintosh OS X: Network



4 For statically assigned settings, do the following:

- From the **Configure** box, select **Manually**.
- Type your IP address in the **IP Address** box.
- Type your subnet mask in the **Subnet mask** box.
- Type the IP address of your NOA-3570 in the **Router address** box.

5 Click **Apply Now** and close the window.

6 Turn on your NOA-3570 and restart your computer (if prompted).

Verifying Settings

Check your TCP/IP properties in the **Network** window.

APPENDIX E
IP Subnetting

IP Addressing

Routers "route" based on the network number. The router that delivers the data packet to the correct destination host uses the host ID.

IP Classes

An IP address is made up of four octets (eight bits), written in dotted decimal notation, for example, 192.168.1.1. IP addresses are categorized into different classes. The class of an address depends on the value of its first octet.

- Class "A" addresses have a 0 in the left most bit. In a class "A" address the first octet is the network number and the remaining three octets make up the host ID.
- Class "B" addresses have a 1 in the left most bit and a 0 in the next left most bit. In a class "B" address the first two octets make up the network number and the two remaining octets make up the host ID.
- Class "C" addresses begin (starting from the left) with 1 1 0. In a class "C" address the first three octets make up the network number and the last octet is the host ID.
- Class "D" addresses begin with 1 1 1 0. Class "D" addresses are used for multicasting. (There is also a class "E" address. It is reserved for future use.)

Table 88 Classes of IP AddressesNOA-3570

IP ADDRESS:		OCTET 1	OCTET 2	OCTET 3	OCTET 4
Class A	0	Network number	Host ID	Host ID	Host ID
Class B	10	Network number	Network number	Host ID	Host ID
Class C	110	Network number	Network number	Network number	Host ID

Note: Host IDs of all zeros or all ones are not allowed.

Therefore:

A class "C" network (8 host bits) can have 2^8 –2 or 254 hosts.

A class "B" address (16 host bits) can have 2^{16} –2 or 65534 hosts.

A class "A" address (24 host bits) can have 2^{24} –2 hosts (approximately 16 million hosts).

Since the first octet of a class "A" IP address must contain a "0", the first octet of a class "A" address can have a value of 0 to 127.

Similarly the first octet of a class "B" must begin with "10", therefore the first octet of a class "B" address has a valid range of 128 to 191. The first octet of a class "C" address begins with "110", and therefore has a range of 192 to 223.

Table 89 Allowed IP Address Range By ClassNOA-3570

CLASS	ALLOWED RANGE OF FIRST OCTET (BINARY)	ALLOWED RANGE OF FIRST OCTET (DECIMAL)
Class A	**0**0000000 to **0**1111111	0 to 127
Class B	**10**000000 to **10**111111	128 to 191
Class C	**110**00000 to **110**11111	192 to 223
Class D	**1110**0000 to **1110**1111	224 to 239

Subnet Masks

A subnet mask is used to determine which bits are part of the network number, and which bits are part of the host ID (using a logical AND operation). A subnet mask has 32 is a "1" then the corresponding bit in the IP address is part of the network number. If a bit in the subnet mask is "0" then the corresponding bit in the IP address is part of the host ID.

Subnet masks are expressed in dotted decimal notation just as IP addresses are. The "natural" masks for class A, B and C IP addresses are as follows.

Table 90 "Natural" MasksNOA-3570

CLASS	NATURAL MASK
A	255.0.0.0
B	255.255.0.0
C	255.255.255.0

Subnetting

With subnetting, the class arrangement of an IP address is ignored. For example, a class C address no longer has to have 24 bits of network number and 8 bits of host ID. With subnetting, some of the host ID bits are converted into network number bits. By convention, subnet masks always consist of a continuous sequence of ones beginning from the left most bit of the mask, followed by a continuous sequence of zeros, for a total number of 32 bits.

Since the mask is always a continuous number of ones beginning from the left, followed by a continuous number of zeros for the remainder of the 32 bit mask, you can simply specify the number of ones instead of writing the value of each octet. This is usually specified by writing a "/" followed by the number of bits in the mask after the address.

For example, 192.1.1.0 /25 is equivalent to saying 192.1.1.0 with mask 255.255.255.128.

The following table shows all possible subnet masks for a class "C" address using both notations.

Table 91 Alternative Subnet Mask NotationNOA-3570

SUBNET MASK IP ADDRESS	SUBNET MASK "1" BITS	LAST OCTET BIT VALUE
255.255.255.0	/24	0000 0000
255.255.255.128	/25	1000 0000
255.255.255.192	/26	1100 0000
255.255.255.224	/27	1110 0000
255.255.255.240	/28	1111 0000
255.255.255.248	/29	1111 1000
255.255.255.252	/30	1111 1100

The first mask shown is the class "C" natural mask. Normally if no mask is specified it is understood that the natural mask is being used.

Example: Two Subnets

As an example, you have a class "C" address 192.168.1.0 with subnet mask of 255.255.255.0.

Table 92 Two Subnets ExampleNOA-3570

	NETWORK NUMBER	HOST ID
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	00000000
Subnet Mask	255.255.255.	0
Subnet Mask (Binary)	11111111.11111111.11111111.	00000000

The first three octets of the address make up the network number (class "C"). You want to have two separate networks.

Divide the network 192.168.1.0 into two separate subnets by converting one of the host ID bits of the IP address to a network number bit. The "borrowed" host ID bit can be either "0" or "1" thus giving two subnets; 192.168.1.0 with mask 255.255.255.128 and 192.168.1.128 with mask 255.255.255.128.

Note: In the following charts, shaded/bolded last octet bit values indicate host ID bits "borrowed" to form network ID bits. The number of "borrowed" host ID bits determines the number of subnets you can have. The remaining number of host ID bits (after "borrowing") determines the number of hosts you can have on each subnet.

Table 93 Subnet 1NOA-3570

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	**0**0000000
Subnet Mask	255.255.255.	128
Subnet Mask (Binary)	11111111.11111111.11111111.	**1**0000000
Subnet Address: 192.168.1.0	Lowest Host ID: 192.168.1.1	
Broadcast Address: 192.168.1.127	Highest Host ID: 192.168.1.126	

Table 94 Subnet 2NOA-3570

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	128
IP Address (Binary)	11000000.10101000.00000001.	**1**0000000
Subnet Mask	255.255.255.	128
Subnet Mask (Binary)	11111111.11111111.11111111.	**1**0000000
Subnet Address: 192.168.1.128	Lowest Host ID: 192.168.1.129	
Broadcast Address: 192.168.1.255	Highest Host ID: 192.168.1.254	

The remaining 7 bits determine the number of hosts each subnet can have. Host IDs of all zeros represent the subnet itself and host IDs of all ones are the broadcast address for that subnet, so the actual number of hosts available on each subnet in the example above is $2^7 - 2$ or 126 hosts for each subnet.

192.168.1.0 with mask 255.255.255.128 is the subnet itself, and 192.168.1.127 with mask 255.255.255.128 is the directed broadcast address for the first subnet. Therefore, the lowest IP address that can be assigned to an actual host for the first subnet is 192.168.1.1 and the highest is 192.168.1.126. Similarly the host ID range for the second subnet is 192.168.1.129 to 192.168.1.254.

Example: Four Subnets

The above example illustrated using a 25-bit subnet mask to divide a class "C" address space into two subnets. Similarly to divide a class "C" address into four subnets, you need to "borrow" two host ID bits to give four possible combinations of 00, 01, 10 and 11. The subnet mask is 26 bits (11111111.11111111.11111111.**11**000000) or 255.255.255.192. Each subnet contains 6 host ID bits, giving 2^6-2 or 62 hosts for each subnet (all 0's is the subnet itself, all 1's is the broadcast address on the subnet).

Table 95 Subnet 1NOA-3570

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	**00**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.0	Lowest Host ID: 192.168.1.1	
Broadcast Address: 192.168.1.63	Highest Host ID: 192.168.1.62	

Table 96 Subnet 2NOA-3570

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	64
IP Address (Binary)	11000000.10101000.00000001.	**01**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.64	Lowest Host ID: 192.168.1.65	
Broadcast Address: 192.168.1.127	Highest Host ID: 192.168.1.126	

Table 97 Subnet 3NOA-3570

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	128
IP Address (Binary)	11000000.10101000.00000001.	**10**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.128	Lowest Host ID: 192.168.1.129	
Broadcast Address: 192.168.1.191	Highest Host ID: 192.168.1.190	

Table 98 Subnet 4NOA-3570

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	192
IP Address (Binary)	11000000.10101000.00000001.	**11**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.192	Lowest Host ID: 192.168.1.193	
Broadcast Address: 192.168.1.255	Highest Host ID: 192.168.1.254	

Example Eight Subnets

Similarly use a 27-bit mask to create 8 subnets (001, 010, 011, 100, 101, 110).

The following table shows class C IP address last octet values for each subnet.

Table 99 Eight SubnetsNOA-3570

SUBNET	SUBNET ADDRESS	FIRST ADDRESS	LAST ADDRESS	BROADCAST ADDRESS
1	0	1	30	31
2	32	33	62	63
3	64	65	94	95
4	96	97	126	127
5	128	129	158	159
6	160	161	190	191
7	192	193	222	223
8	224	225	254	255

The following table is a summary for class "C" subnet planning.

Table 100 Class C Subnet PlanningNOA-3570

NO. "BORROWED" HOST BITS	SUBNET MASK	NO. SUBNETS	NO. HOSTS PER SUBNET
1	255.255.255.128 (/25)	2	126
2	255.255.255.192 (/26)	4	62
3	255.255.255.224 (/27)	8	30
4	255.255.255.240 (/28)	16	14
5	255.255.255.248 (/29)	32	6
6	255.255.255.252 (/30)	64	2
7	255.255.255.254 (/31)	128	1

Subnetting With Class A and Class B Networks.

For class "A" and class "B" addresses the subnet mask also determines which bits are part of the network number and which are part of the host ID.

A class "B" address has two host ID octets available for subnetting and a class "A" address has three host ID octets (see Table 88 on page 213) available for subnetting.

The following table is a summary for class "B" subnet planning.

Table 101 Class B Subnet PlanningNOA-3570

NO. "BORROWED" HOST BITS	SUBNET MASK	NO. SUBNETS	NO. HOSTS PER SUBNET
1	255.255.128.0 (/17)	2	32766
2	255.255.192.0 (/18)	4	16382
3	255.255.224.0 (/19)	8	8190
4	255.255.240.0 (/20)	16	4094
5	255.255.248.0 (/21)	32	2046
6	255.255.252.0 (/22)	64	1022
7	255.255.254.0 (/23)	128	510
8	255.255.255.0 (/24)	256	254
9	255.255.255.128 (/25)	512	126
10	255.255.255.192 (/26)	1024	62
11	255.255.255.224 (/27)	2048	30
12	255.255.255.240 (/28)	4096	14
13	255.255.255.248 (/29)	8192	6
14	255.255.255.252 (/30)	16384	2
15	255.255.255.254 (/31)	32768	1

Appendix F
Wireless LAN

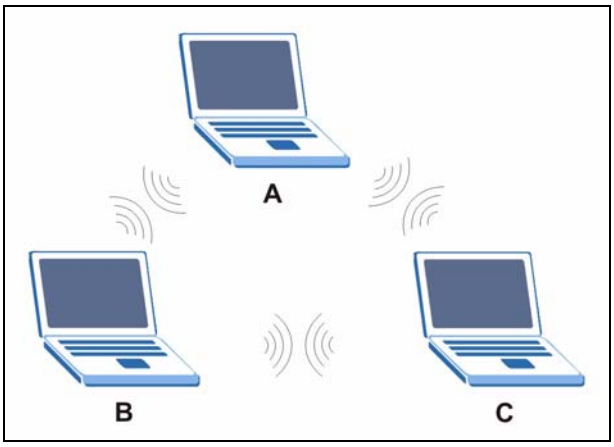
Wireless LAN Topologies

This section discusses ad-hoc and infrastructure wireless LAN topologies.

Ad-hoc Wireless LAN Configuration

The simplest WLAN configuration is an independent (Ad-hoc) WLAN that connects a set of computers with wireless stations (A, B, C). Any time two or more wireless adapters are within range of each other, they can set up an independent network, which is commonly referred to as an Ad-hoc network or Independent Basic Service Set (IBSS). The following diagram shows an example of notebook computers using wireless adapters to form an Ad-hoc wireless LAN.

Figure 133 Peer-to-Peer Communication in an Ad-hoc Network

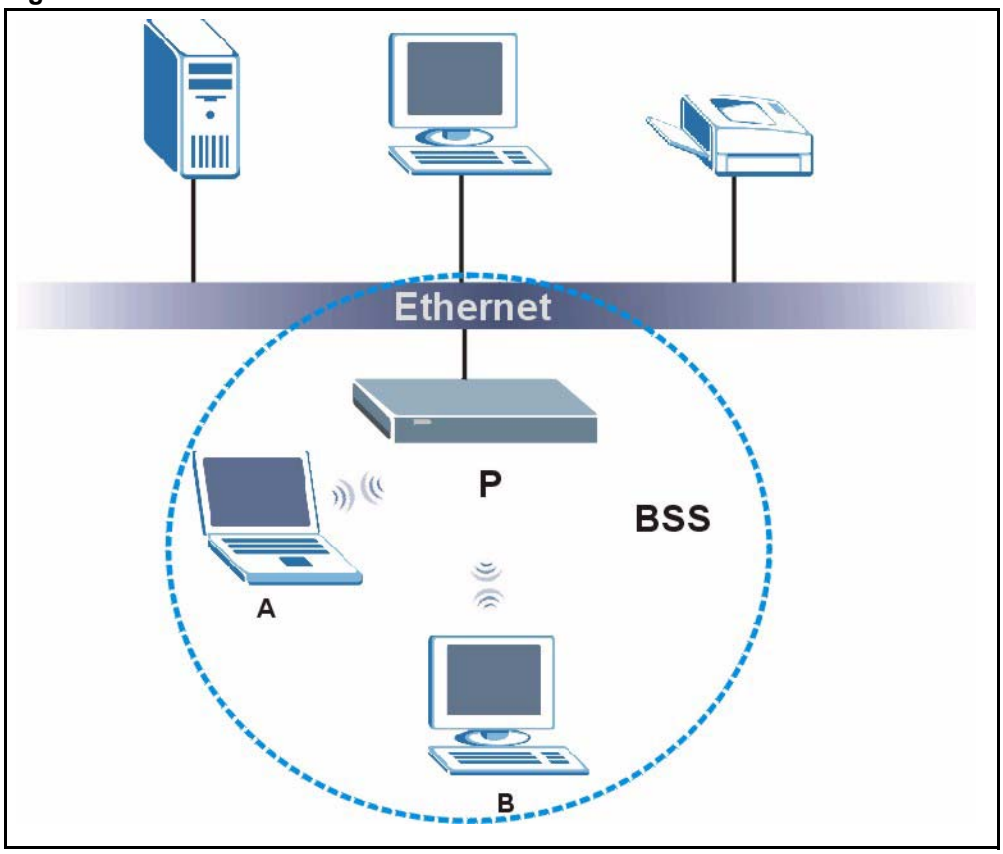


BSS

A Basic Service Set (BSS) exists when all communications between wireless stations or between a wireless station and a wired network client go through one access point (AP).

Intra-BSS traffic is traffic between wireless stations in the BSS. When Intra-BSS is enabled, wireless station A and B can access the wired network and communicate with each other. When Intra-BSS is disabled, wireless station A and B can still access the wired network but cannot communicate with each other.

Figure 134 Basic Service Set



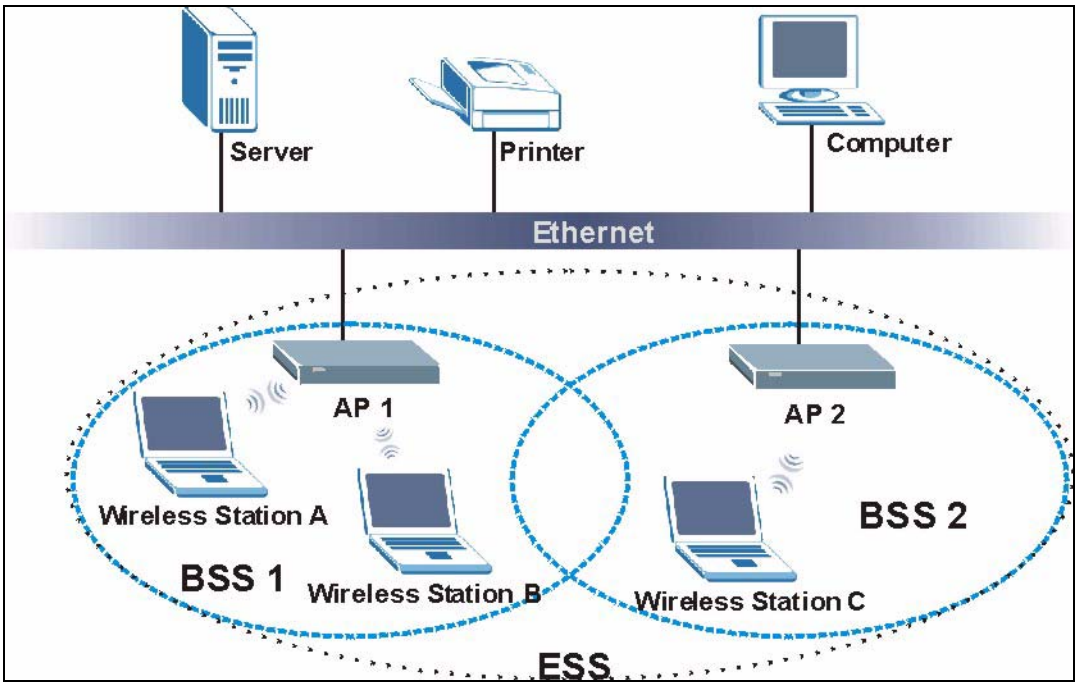
ESS

An Extended Service Set (ESS) consists of a series of overlapping BSSs, each containing an access point, with each access point connected together by a wired network. This wired connection between APs is called a Distribution System (DS).

This type of wireless LAN topology is called an Infrastructure WLAN. The Access Points not only provide communication with the wired network but also mediate wireless network traffic in the immediate neighborhood.

An ESSID (ESS IDentification) uniquely identifies each ESS. All access points and their associated wireless stations within the same ESS must have the same ESSID in order to communicate.

Figure 135 Infrastructure WLAN



Channel

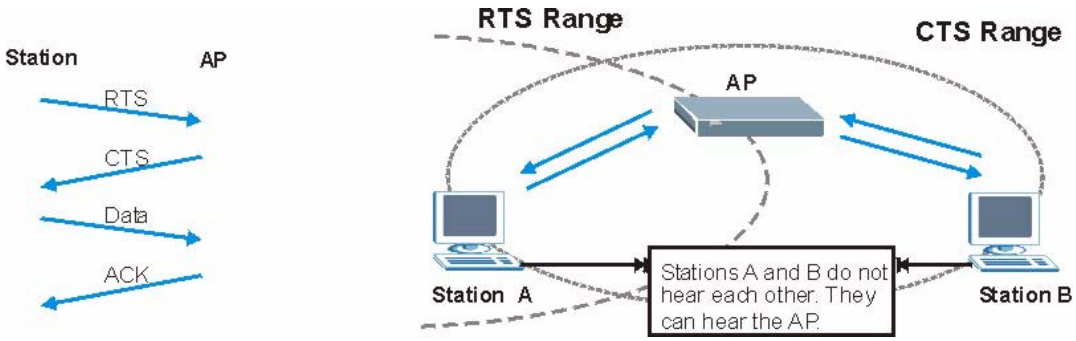
A channel is the radio frequency(ies) used by IEEE 802.11a/b/g wireless devices. Channels available depend on your geographical area. You may have a choice of channels (for your region) so you should use a different channel than an adjacent AP (access point) to reduce interference. Interference occurs when radio signals from different access points overlap causing interference and degrading performance.

Adjacent channels partially overlap however. To avoid interference due to overlap, your AP should be on a channel at least five channels away from a channel that an adjacent AP is using. For example, if your region has 11 channels and an adjacent AP is using channel 1, then you need to select a channel between 6 or 11.

RTS/CTS

A hidden node occurs when two stations are within range of the same access point, but are not within range of each other. The following figure illustrates a hidden node. Both stations (STA) are within range of the access point (AP) or wireless gateway, but out-of-range of each other, so they cannot "hear" each other, that is they do not know if the channel is currently being used. Therefore, they are considered hidden from each other.

Figure 136 RTS/CTS



When station A sends data to the AP, it might not know that the station B is already using the channel. If these two stations send data at the same time, collisions may occur when both sets of data arrive at the AP at the same time, resulting in a loss of messages for both stations.

RTS/CTS is designed to prevent collisions due to hidden nodes. An **RTS/CTS** defines the biggest size data frame you can send before an RTS (Request To Send)/CTS (Clear to Send) handshake is invoked.

When a data frame exceeds the **RTS/CTS** value you set (between 0 to 2432 bytes), the station that wants to transmit this frame must first send an RTS (Request To Send) message to the AP for permission to send it. The AP then responds with a CTS (Clear to Send) message to all other stations within its range to notify them to defer their transmission. It also reserves and confirms with the requesting station the time frame for the requested transmission.

Stations can send frames smaller than the specified **RTS/CTS** directly to the AP without the RTS (Request To Send)/CTS (Clear to Send) handshake.

You should only configure **RTS/CTS** if the possibility of hidden nodes exists on your network and the "cost" of resending large frames is more than the extra network overhead involved in the RTS (Request To Send)/CTS (Clear to Send) handshake.

If the **RTS/CTS** value is greater than the **Fragmentation Threshold** value (see next), then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size.

Note: Enabling the RTS Threshold causes redundant network overhead that could negatively affect the throughput performance instead of providing a remedy.

Fragmentation Threshold

A **Fragmentation Threshold** is the maximum data fragment size (between 256 and 2432 bytes) that can be sent in the wireless network before the AP will fragment the packet into smaller data frames.

A large **Fragmentation Threshold** is recommended for networks not prone to interference while you should set a smaller threshold for busy networks or networks that are prone to interference.

If the **Fragmentation Threshold** value is smaller than the **RTS/CTS** value (see previously) you set then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size.

Preamble Type

A preamble is used to synchronize the transmission timing in your wireless network. There are two preamble modes: **Long** and **Short**.

Short preamble takes less time to process and minimizes overhead, so it should be used in a good wireless network environment when all wireless stations support it.

Select **Long** if you have a 'noisy' network or are unsure of what preamble mode your wireless stations support as all IEEE 802.11b compliant wireless adapters must support long preamble. However, not all wireless adapters support short preamble. Use long preamble if you are unsure what preamble mode the wireless adapters support, to ensure interpretability between the AP and the wireless stations and to provide more reliable communication in 'noisy' networks.

Select **Dynamic** to have the AP automatically use short preamble when all wireless stations support it, otherwise the AP uses long preamble.

Note: The AP and the wireless stations MUST use the same preamble mode in order to communicate.

IEEE 802.11g Wireless LAN

IEEE 802.11g is fully compatible with the IEEE 802.11b standard. This means an IEEE 802.11b adapter can interface directly with an IEEE 802.11g access point (and vice versa) at 11 Mbps or lower depending on range. IEEE 802.11g has several intermediate rate steps between the maximum and minimum data rates. The IEEE 802.11g data rate and modulation are as follows:

Table 102 IEEE802.11g

DATA RATE (MBPS)	MODULATION
1	DBPSK (Differential Binary Phase Shift Keyed)
2	DQPSK (Differential Quadrature Phase Shift Keying)
5.5 / 11	CCK (Complementary Code Keying)
6/9/12/18/24/36/48/54	OFDM (Orthogonal Frequency Division Multiplexing)

IEEE 802.1x

In June 2001, the IEEE 802.1x standard was designed to extend the features of IEEE 802.11 to support extended authentication as well as providing additional accounting and control features. It is supported by Windows XP and a number of network devices. Some advantages of IEEE 802.1x are:

- User based identification that allows for roaming.
- Support for RADIUS (Remote Authentication Dial In User Service, RFC 2138, 2139) for centralized user profile and accounting management on a network RADIUS server.
- Support for EAP (Extensible Authentication Protocol, RFC 2486) that allows additional authentication methods to be deployed with no changes to the access point or the wireless stations.

RADIUS

RADIUS is based on a client-server model that supports authentication, authorization and accounting. The access point is the client and the server is the RADIUS server. The RADIUS server handles the following tasks:

- Authentication

  Determines the identity of the users.

- Authorization

  Determines the network services available to authenticated users once they are connected to the network.

- Accounting

  Keeps track of the client's network activity.

RADIUS is a simple package exchange in which your AP acts as a message relay between the wireless station and the network RADIUS server.

Types of RADIUS Messages

The following types of RADIUS messages are exchanged between the access point and the RADIUS server for user authentication:

- Access-Request

  Sent by an access point requesting authentication.

- Access-Reject

  Sent by a RADIUS server rejecting access.

- Access-Accept

  Sent by a RADIUS server allowing access.

- Access-Challenge

  Sent by a RADIUS server requesting more information in order to allow access. The access point sends a proper response from the user and then sends another Access-Request message.

The following types of RADIUS messages are exchanged between the access point and the RADIUS server for user accounting:

- Accounting-Request

  Sent by the access point requesting accounting.

- Accounting-Response

  Sent by the RADIUS server to indicate that it has started or stopped accounting.

In order to ensure network security, the access point and the RADIUS server use a shared secret key, which is a password, they both know. The key is not sent over the network. In addition to the shared key, password information exchanged is also encrypted to protect the network from unauthorized access.

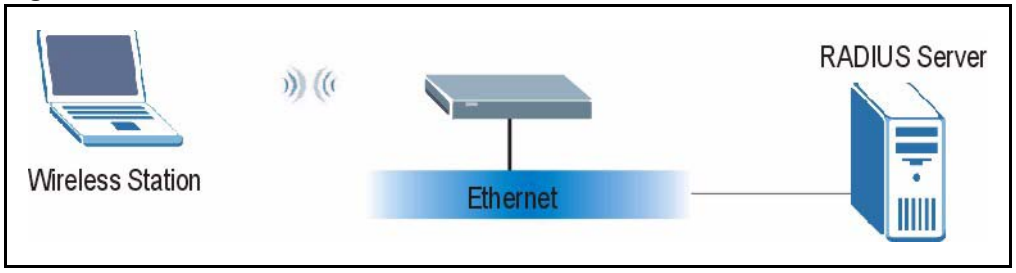
EAP Authentication

EAP (Extensible Authentication Protocol) is an authentication protocol that runs on top of the IEEE802.1x transport mechanism in order to support multiple types of user authentication. By using EAP to interact with an EAP-compatible RADIUS server, the access point helps a wireless station and a RADIUS server perform authentication.

The type of authentication you use depends on the RADIUS server or the AP.

The following figure shows an overview of authentication when you specify a RADIUS server on your access point.

Figure 137 EAP Authentication



The details below provide a general description of how IEEE 802.1x EAP authentication works. For an example list of EAP-MD5 authentication steps, see the IEEE 802.1x appendix.

1. The wireless station sends a "start" message to the device.
2. The device sends a "request identity" message to the wireless station for identity information.

3 The wireless station replies with identity information, including username and password.

4 The RADIUS server checks the user information against its user profile database and determines whether or not to authenticate the wireless station.

Types of Authentication

This section discusses some popular authentication types: **EAP-MD5**, **EAP-TLS**, **EAP-TTLS**, **PEAP** and **LEAP**.

The type of authentication you use depends on the RADIUS server or the AP. Consult your network administrator for more information.

EAP-MD5 (Message-Digest Algorithm 5)

MD5 authentication is the simplest one-way authentication method. The authentication server sends a challenge to the wireless station. The wireless station 'proves' that it knows the password by encrypting the password with the challenge and sends back the information. Password is not sent in plain text.

However, MD5 authentication has some weaknesses. Since the authentication server needs to get the plaintext passwords, the passwords must be stored. Thus someone other than the authentication server may access the password file. In addition, it is possible to impersonate an authentication server as MD5 authentication method does not perform mutual authentication. Finally, MD5 authentication method does not support data encryption with dynamic session key. You must configure WEP encryption keys for data encryption.

EAP-TLS (Transport Layer Security)

With EAP-TLS, digital certifications are needed by both the server and the wireless stations for mutual authentication. The server presents a certificate to the client. After validating the identity of the server, the client sends a different certificate to the server. The exchange of certificates is done in the open before a secured tunnel is created. This makes user identity vulnerable to passive attacks. A digital certificate is an electronic ID card that authenticates the sender's identity. However, to implement EAP-TLS, you need a Certificate Authority (CA) to handle certificates, which imposes a management overhead.

EAP-TTLS (Tunneled Transport Layer Service)

EAP-TTLS is an extension of the EAP-TLS authentication that uses certificates for only the server-side authentications to establish a secure connection. Client authentication is then done by sending username and password through the secure connection, thus client identity is protected. For client authentication, EAP-TTLS supports EAP methods and legacy authentication methods such as PAP, CHAP, MS-CHAP and MS-CHAP v2.

PEAP (Protected EAP)

Like EAP-TTLS, server-side certificate authentication is used to establish a secure connection, then use simple username and password methods through the secured connection to authenticate the clients, thus hiding client identity. However, PEAP only supports EAP methods, such as EAP-MD5, EAP-MSCHAPv2 and EAP-GTC (EAP-Generic Token Card), for client authentication. EAP-GTC is implemented only by Cisco.

LEAP

LEAP (Lightweight Extensible Authentication Protocol) is a Cisco implementation of IEEE 802.1x.

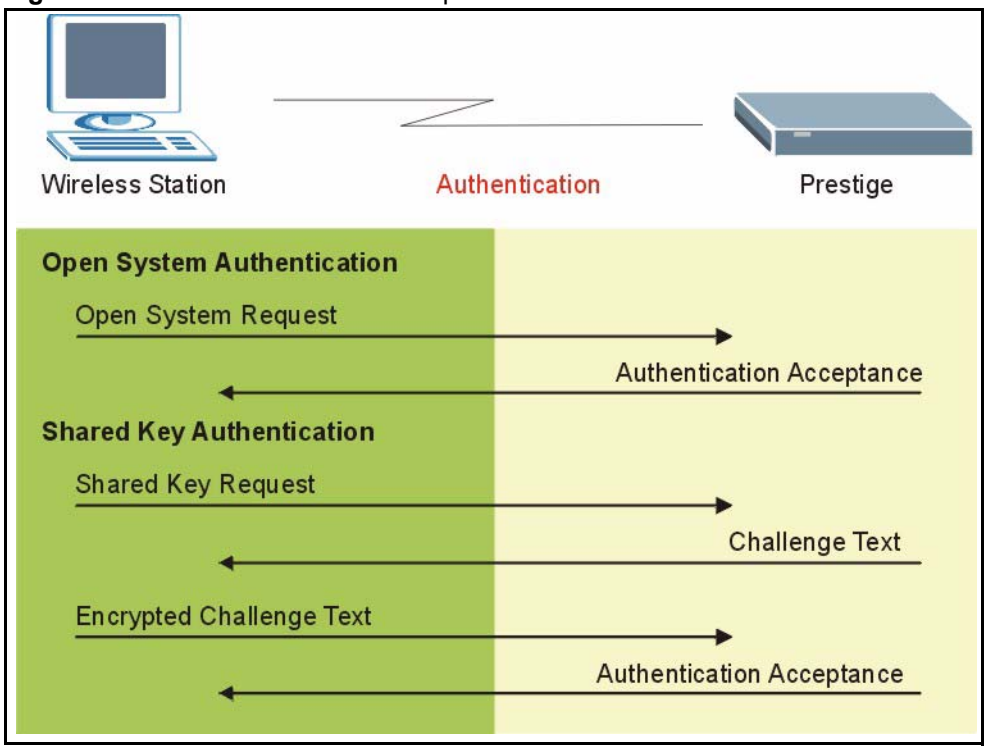
WEP Encryption

WEP encryption scrambles the data transmitted between the wireless stations and the access points to keep network communications private. It encrypts unicast and multicast communications in a network. Both the wireless stations and the access points must use the same WEP key.

WEP Authentication Steps

Three different methods can be used to authenticate wireless stations to the network: **Open System**, **Shared Key**, and **Auto**. The following figure illustrates the steps involved.

Figure 138 WEP Authentication Steps



Open system authentication involves an unencrypted two-message procedure. A wireless station sends an open system authentication request to the AP, which will then automatically accept and connect the wireless station to the network. In effect, open system is not authentication at all as any station can gain access to the network.

Shared key authentication involves a four-message procedure. A wireless station sends a shared key authentication request to the AP, which will then reply with a challenge text message. The wireless station must then use the AP's default WEP key to encrypt the challenge text and return it to the AP, which attempts to decrypt the message using the AP's default WEP key. If the decrypted message matches the challenge text, the wireless station is authenticated.

When your device authentication method is set to open system, it will only accept open system authentication requests. The same is true for shared key authentication. However, when it is set to auto authentication, the device will accept either type of authentication request and the device will fall back to use open authentication if the shared key does not match.

Dynamic WEP Key Exchange

The AP maps a unique key that is generated with the RADIUS server. This key expires when the wireless connection times out, disconnects or reauthentication times out. A new WEP key is generated each time reauthentication is performed.

If this feature is enabled, it is not necessary to configure a default encryption key in the Wireless screen. You may still configure and store keys here, but they will not be used while Dynamic WEP is enabled.

Note: EAP-MD5 cannot be used with Dynamic WEP Key Exchange

For added security, certificate-based authentications (EAP-TLS, EAP-TTLS and PEAP) use dynamic keys for data encryption. They are often deployed in corporate environments, but for public deployment, a simple user name and password pair is more practical. The following table is a comparison of the features of authentication types.

Table 103 Comparison of EAP Authentication Types

	EAP-MD5	EAP-TLS	EAP-TTLS	PEAP	LEAP
Mutual Authentication	No	Yes	Yes	Yes	Yes
Certificate – Client	No	Yes	Optional	Optional	No
Certificate – Server	No	Yes	Yes	Yes	No
Dynamic Key Exchange	No	Yes	Yes	Yes	Yes
Credential Integrity	None	Strong	Strong	Strong	Moderate
Deployment Difficulty	Easy	Hard	Moderate	Moderate	Moderate
Client Identity Protection	No	No	Yes	Yes	No

WPA

User Authentication

WPA applies IEEE 802.1x and Extensible Authentication Protocol (EAP) to authenticate wireless stations using an external RADIUS database.

Encryption

WPA improves data encryption by using Temporal Key Integrity Protocol (TKIP) or Advanced Encryption Standard (AES), Message Integrity Check (MIC) and IEEE 802.1x.

TKIP uses 128-bit keys that are dynamically generated and distributed by the authentication server. It includes a per-packet key mixing function, a Message Integrity Check (MIC) named Michael, an extended initialization vector (IV) with sequencing rules, and a re-keying mechanism.

TKIP regularly changes and rotates the encryption keys so that the same encryption key is never used twice.

The RADIUS server distributes a Pairwise Master Key (PMK) key to the AP that then sets up a key hierarchy and management system, using the PMK to dynamically generate unique data encryption keys to encrypt every data packet that is wirelessly communicated between the AP and the wireless stations. This all happens in the background automatically.

AES (Advanced Encryption Standard) also uses a secret key. This implementation of AES applies a 128-bit key to 128-bit blocks of data.

The Message Integrity Check (MIC) is designed to prevent an attacker from capturing data packets, altering them and resending them. The MIC provides a strong mathematical function in which the receiver and the transmitter each compute and then compare the MIC. If they do not match, it is assumed that the data has been tampered with and the packet is dropped.

By generating unique data encryption keys for every data packet and by creating an integrity checking mechanism (MIC), TKIP makes it much more difficult to decrypt data on a Wi-Fi network than WEP, making it difficult for an intruder to break into the network.

The encryption mechanisms used for WPA and WPA-PSK are the same. The only difference between the two is that WPA-PSK uses a simple common password, instead of user-specific credentials. The common-password approach makes WPA-PSK susceptible to brute-force password-guessing attacks but it's still an improvement over WEP as it employs an easier-to-use, consistent, single, alphanumeric password.

Security Parameters Summary

Refer to this table to see what other security parameters you should configure for each Authentication Method/ key management protocol type. MAC address filters are not dependent on how you configure these security features.

Table 104 Wireless Security Relational MatrixNOA-3570

AUTHENTICATION METHOD/ KEY MANAGEMENT PROTOCOL	ENCRYPTION METHOD	ENTER MANUAL KEY	ENABLE IEEE 802.1X
Open	None	No	No
Open	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
Shared	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
WPA	WEP	No	Yes
WPA	TKIP	No	Yes
WPA-PSK	WEP	Yes	Yes
WPA-PSK	TKIP	Yes	Yes

Roaming

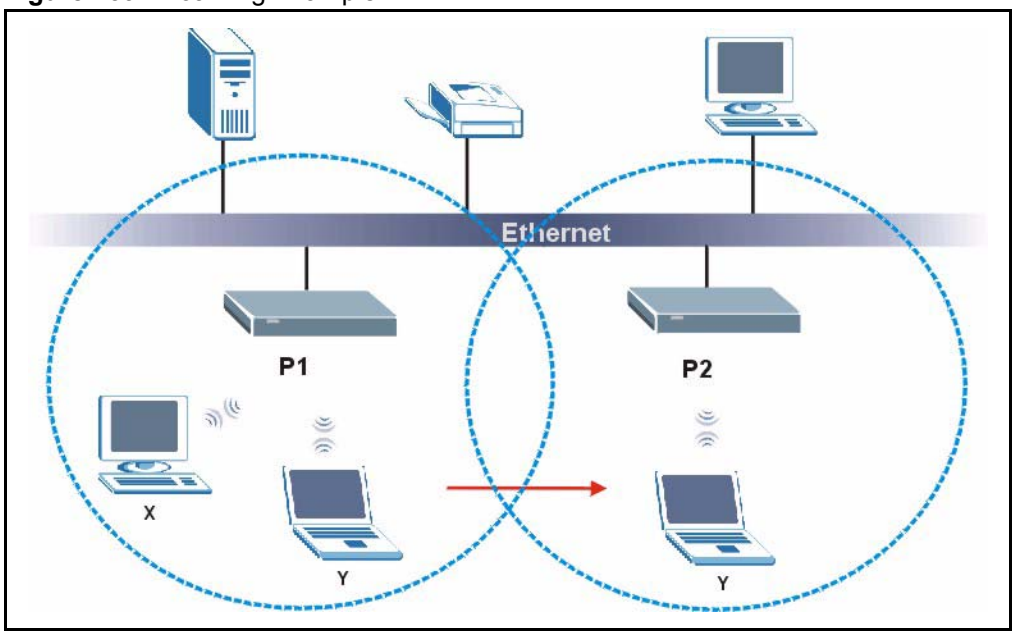
A wireless station is a device with an IEEE 802.11 mode compliant wireless adapter. An access point (AP) acts as a bridge between the wireless and wired networks. An AP creates its own wireless coverage area. A wireless station can associate with a particular access point only if it is within the access point's coverage area.

In a network environment with multiple access points, wireless stations are able to switch from one access point to another as they move between the coverage areas. This is roaming. As the wireless station moves from place to place, it is responsible for choosing the most appropriate access point depending on the signal strength, network utilization or other factors.

The roaming feature on the access points allows the access points to relay information about the wireless stations to each other. When a wireless station moves from a coverage area to another, it scans and uses the channel of a new access point, which then informs the access points on the LAN about the change. The new information is then propagated to the other access points on the LAN. An example is shown in Figure 139.

If the roaming feature is not enabled on the access points, information is not communicated between the access points when a wireless station moves between coverage areas. The wireless station may not be able to communicate with other wireless stations on the network and vice versa.

Figure 139 Roaming Example



The steps below describe the roaming process.

1. As wireless station **Y** moves from the coverage area of access point **P1** to that of access point
2. **P2**, it scans and uses the signal of access point **P2**.
3. Access point **P2** acknowledges the presence of wireless station **Y** and relays this information to access point **P1** through the wired LAN.
4. Access point **P1** updates the new position of wireless station.
5. Wireless station **Y** sends a request to access point **P2** for re-authentication.

Requirements for Roaming

The following requirements must be met in order for wireless stations to roam between the coverage areas.

1. All the access points must be on the same subnet and configured with the same ESSID.
2. If IEEE 802.1x user authentication is enabled and to be done locally on the access point, the new access point must have the user profile for the wireless station.
3. The adjacent access points should use different radio channels when their coverage areas overlap.
4. All access points must use the same port number to relay roaming information.
5. The access points must be connected to the Ethernet and be able to get IP addresses from a DHCP server if using dynamic IP address assignment.

APPENDIX G
Outdoor Site Planning

This appendix provides information on site planning requirements for the installation of your outdoor wireless device.

Introduction

The installation of a wireless network requires some additional planning over a wired network. This planning includes RF (Radio Frequency) path planning, site preparation, and installation of outdoor components such as outdoor units, antennas, lightning protection devices, and cabling suitable for outdoor conditions. Furthermore, you also need to investigate the zoning laws as well as Federal Communications Commission (FCC) and European Telecommunications Standards Institute (ETSI) regulations.

General Considerations

A basic consideration is the physical location outdoor wireless device. Because microwave signals travel in a straight line, a clear line of sight between antennas is ideal. Frequently, however, the locations of the desired links are fixed. When a clear line of sight cannot be achieved, you have to plan accordingly.

Other general site considerations include:

- Is there a structure already in place on which you can mount the outdoor wireless device or would you be required to construct one, for example, a mast for the sole purpose of mounting the outdoor wireless device?
- Would there be permit requirements for this?
- Possibility of future obstructions
    - If trees grow too high will they interfere with the signal?
    - Are there plans to erect buildings between the sites, which may inadvertently obstruct the signal path?
- Availability of grounding, good grounding is important in all areas of the world, but in areas prone to lightning, it is especially critical.
- Whether or not strong RF interference exists in the neighborhood, within or adjacent to the operating frequency.

Specific Considerations

The following information will help you determine site characteristics that are most applicable to your outdoor wireless device and the actions that should be taken.

Weather

It is important to research any unusual weather conditions that are common to the site location. These conditions include extreme

- Rainfall
- Fog
- Wind
- Temperature Ranges.

If extreme conditions exist that may affect the integrity of the radio link, the effects of these conditions should be considered early in the planning process.

Rainfall

Except in extreme conditions, attenuation (weakening of the signal) due to rain does not present a serious problem for frequencies up to the range of 6 to 8 GHz. When microwave frequencies are at 11 GHz and above, attenuation due to rain becomes more of a concern, especially in areas where rainfall is of high density and long duration. If this is the case, shorter paths may be required.

Fog

In most cases, the effects of fog are considered to be much the same as rain.

However, fog can adversely affect the radio link when it is accompanied by atmospheric conditions such as temperature inversion, or very still air accompanied by stratification.

- Temperature inversions and stratification can cause ducting, which may increase the potential for interference between systems that do not normally interfere with each other.
- Stratification along with still air can cause severe refractive or reflective conditions with unpredictable results.

Where either temperature inversion or stratification exists, shorter paths and adequate clearances are recommended.

Wind

Any system components mounted outdoors will be subject to the effects of wind. It is important to know the direction and velocity of the wind common to the site. The mounting structure must be able to withstand these forces as well as protect against damage to the outdoor wireless device components.

Antenna designs react differently to wind forces, depending on the location. This is known as wind loading. Most antenna manufacturers will specify wind loading for each type of antenna manufactured.

Temperature Ranges

Temperature can adversely affect the radio link when phenomena such as temperature inversion or very still air accompanied by stratification occur

See the section on *Fog* for further detail.

Lightning

The potential for lightning damage to radio equipment should always be considered when planning a wireless link. There are a variety of lightning protection and grounding devices, whether located inside or outside the site, which could potentially be damaged by a lightning strike.

Lightning protection requirements are based on the level of site exposure, the cost in the event of a link downtime, local building codes and electrical codes. If the link is critical and the site is in an active lightning area, attention to thorough lightning protection and grounding is critical.

Lightning Protection

To provide adequate lightning protection,

- Install antennas in locations that are unlikely to receive direct lightning strikes.
- Install lightning rods to protect antennas from direct strikes.
- Make sure that cables and equipment are properly grounded to provide low-impedance paths for lightning currents.
- Install surge suppressors on telephone lines and power lines.

Interference

An important part of planning a site for your outdoor wireless device is the avoidance of interference.

Effects within the system or outside the system can cause interference. Good planning for frequencies and antennas can overcome most interference challenges.

Co-Channel and Adjacent Channel Interference

Co-channel interference results when another RF link is using the same channel frequency.

Adjacent-channel interference results when another RF link is using an adjacent channel frequency.

A spectrum analyzer can be used to determine if there is any strong signals present at the site and determine how close they are to the desired frequency. The further away from your proposed frequency, the less likely they are to cause a problem.

Antenna placement and polarization, is the most effective method of reducing this type of interference.

Antennas

Antennas play a key role in reducing the potential for interference. They come in a variety of configurations that have different performance characteristics in the areas of gain and direction. Antennas that transmit/receive in all directions are known as omni-directional, while those that transmit/receive in one specific direction are categorized as directional.

Antennas are tuned to operate on a specific group of frequencies. The manufacturer also fixes other specific attributes such as beam width and gain. Antennas should be selected and placed according to your site and your application.

Antenna Characteristics

- Frequency

  An antenna in the frequency of 2.4GHz (IEEE 802.11b) or 5GHz(IEEE 802.11a) is needed to communicate efficiently in a wireless LAN.

- Radiation Pattern

  A radiation pattern is a diagram that allows you to visualize the shape of the antenna's coverage area.

- Antenna Gain

  Antenna gain, measured in dB (decibel), is the increase in coverage within the RF beam width. Higher antenna gain improves the range of the signal for better communications.

For an indoor site, each 1 dB increase in antenna gain results in a range increase of approximately 2.5%. For an unobstructed outdoor site, each 1dB increase in gain results in a range increase of approximately 5%. Actual results may vary depending on the network environment.

Antenna gain is sometimes specified in dBi, which is how much the antenna increases the signal power compared to using an isotropic antenna. An isotropic antenna is a theoretical perfect antenna that sends out radio signals equally well in all directions. dBi represents the true gain that the antenna provides.

Types of Antennas For WLAN

There are two types of antennas used for wireless LAN applications.

- Omni-directional antennas send the RF signal out in all directions on a horizontal plane. The coverage area is torus-shaped (like a donut) which makes these antennas ideal for a room environment. With a wide coverage area, it is possible to make circular overlapping coverage areas with multiple access points.
- Directional antennas concentrate the RF signal in a beam, like a flashlight does with the light from its bulb. The angle of the beam determines the width of the coverage pattern. Angles typically range from 20 degrees (very directional) to 120 degrees (less directional). Directional antennas are ideal for hallways and outdoor point-to-point applications.

Antenna Polarization

The orientation of the antenna will change the orientation of the signal. The transmitting and receiving antennas should be both polarized either horizontally or vertically. Adjacent antennas on different frequencies can be cross-polarized to help reduce interference between the two, if your operating license permits this.

Towers

When planning antenna placement, it might be necessary to build a freestanding tower for the antenna. Regulations and limitations define the height and location of these towers with respect to airports, runways, and airplane approach paths. The Federal Aviation Administration (FAA) controls these regulations. In some circumstances, the FAA, the FCC, or both, must approve the tower installations.

To ensure compliance, review the current FCC regulations regarding antenna structures. These regulations (along with examples) can be viewed on the FCC web site at http://www.fcc.gov/antenna.

Path Planning

To get the most value from a wireless system, path planning is essential. In addition to the fact that radio signals dissipate as they travel, many other factors operate on a microwave signal as it moves through space. All of these must be taken into account, to avoid attenuation of the signal by path obstruction.

Calculating a Link Budget

A link budget is a rough calculation of all known elements of the link, to determine if the signal will have the proper strength when it reaches the other end of the link.

To make this calculation, consider the following information.

- A signal degrades as it moves through space. The longer the path, the more loss it experiences. This free-space path loss is a factor in calculating the link viability. Free-space path loss is easily calculated for miles or kilometers.
- Availability represents the quality of a link. It is the ratio of the time that the link is available to the total time. This serves as a guide to the service that you can expect, on average, over a period of one year.

Availability

Your application determines what availability is required. A critical application where downtime adversely affects business and revenue requires a high percentage of availability. Somewhat lower availability might be acceptable by an application used to gather data, where occasional outages can be tolerated.

Availability is largely a function of fade margins and the amount of signal fading. Paths obstructed by trees have larger fades than paths with no trees. Longer paths tend to have more fading than shorter paths. Larger fade margins yield better link availability.

The International Telecommunications Union (ITU) publishes a reference for link planning, which is available at http://www.itu.ch/.

ITU Recommendation G.826 contains definitions for "availability" and related terms used to describe link quality. It also contains recommendations for link quality objectives.

ITU Recommendation P.530 contains information on how to plan for high reliability in clear, line-of-sight links.

Availability is much more difficult to predict for non-line-of-sight links. It is best determined by field measurements.

Unlicensed Frequencies (U-NII)

The FCC has identified the frequencies from 5.725 to 5.825 GHz as Unlicensed National Information Infrastructure (U-NII). This band can be used by anyone without having to obtain a license. However, you must use radio equipment that is "type approved" by the FCC for use within the specific band. If you are installing a U-NII band link between two buildings, across a parking lot, or across town, you will find that this type of system is much simpler to implement than licensed systems. By using very directional antennas in the installation, you are not likely to experience interference.

APPENDIX H
Outdoor Installation Recommendations

This appendix provides information on site requirements for the installation of your outdoor wireless device See the Quick Start Guide for more information on site installation.

Mounting

An antenna couples RF signals onto air. A transmitter within a wireless device sends an RF signal to the antenna, which propagates the signal through the air. The antenna also operates in reverse by capturing RF signals from the air.

Positioning the antennas properly increases the range and coverage area of a wireless LAN.

A wall (side) mount allows for mounting an antenna (mast) on the side of a building or on the side of an elevated penthouse. This will provide a convenient mounting location when the roof overhang is not excessive and/or the location is high enough to provide a clear line of sight.

In most situations mounting an antenna directly to the wall will not allow you to properly align the antenna with the corresponding antenna at the opposite end of your wireless link. As poor alignment will typically result in poor performance, you are advised to always mount the outdoor wireless device to a mast.

Antenna Mast/Antenna Requirements

To accommodate the outdoor wireless device, the mast must satisfy the following requirements:

- The construction of the mast must be of a sturdy, weatherproof and non-corrosive material, for example, galvanized or stainless steel construction pipe.
- The diameter of the mast may vary, see the *Hardware Specifications* for details.
- The height of the antenna mast must be sufficient to allow the antenna to be installed at least 1.5 m (5') above the peak of roof. If the roof is metal, then the height of the antenna should be a minimum of 3m (10') above the roof.
- The mast or wall-bracket must be free from any substance that may prevent a good electrical connection with the antenna, for example, paint.

Grounding

A safe grounding system is necessary to protect your outdoor installation from lightning strikes and the build-up of static electricity.

Direct grounding of the antenna mast and outdoor wireless device. The outdoor wireless device should be connected to the same grounding system as the antenna mast and the AC wall outlet.

The grounding system must comply with the National Electrical Code and safety standards that apply in your country. Always check with a qualified electrician if you are in doubt as to whether your outdoor installation is properly grounded.

Lightning Protection

All outdoor electronic equipment is susceptible to lightning damage. Proper grounding to national and local codes is instrumental in providing human safety. Lightning Protection is used when a customer wants to maximize the reliability of the electronic system by diverting the excess energy that can be induced on any transmission lines (data, power) though a series of surge protection devices. The energy is dissipated through heat and is also diverted to the ground.

Additional Protection

Lightning, even with the built-in protection, can still damage the outdoor wireless device. This can occur for any number of reasons, such as an improperly grounded installation or if the amount of transient energy from nearby lightning exceeds what the device can handle.

If the outdoor wireless device fails due to damage from lightning, the link is out-of-service until the unit is replaced or repaired. An external, reverting protection device can provide a higher level of protection, and greater probability of surviving lightning strikes without damage to the outdoor wireless device.

Antenna Alignment

For optimal performance of your wireless link, make sure that the antennas are properly aligned (facing one another "eye-to-eye"). To align the antennas:

- Use a pair of binoculars and/or a map of the area and compass to point the antennas to one another.
- Optimize antenna alignment if required, by making small modifications in the antenna orientation.
- Alternatively, consult a professional Antenna Installation Service to optimize the antenna alignment.

Omni-directional antennas are characterized by a wide radiation pattern. Therefore alignment of this type of antennas is less critical than for directional antennas.

For omni-directional antennas mounted on a table, desk, and so on, point the antenna up. For omni-directional antennas mounted on a wall or ceiling, point the antenna down. For a single AP application, place omni-directional antennas as close to the center of the coverage area as possible.

For directional antennas, point the antenna in the direction of the desired coverage area.

APPENDIX I
Command Interpreter

The following describes how to use the command interpreter. Enter 24 in the main menu to bring up the system maintenance menu. Enter 8 to go to **Menu 24.8 - Command Interpreter Mode**. See the included disk or zyxel.com for more detailed information on these commands.

Note: Use of undocumented commands or misconfiguration can damage the unit and possibly render it unusable.

Command Syntax

- The command keywords are in `courier new` font.
- Enter the command keywords exactly as shown, do not abbreviate.
- The required fields in a command are enclosed in angle brackets <>.
- The optional fields in a command are enclosed in square brackets [].
- The | symbol means or.

  For example,

  ```
  sys filter netbios config <type> <on|off>
  ```

  means that you must specify the type of netbios filter and whether to turn it on or off.

Command Usage

A list of valid commands can be found by typing `help` or `?` at the command prompt. Always type the full command. Type `exit` to return to the SMT main menu when finished.

APPENDIX J
Brute-Force Password Guessing Protection

Brute-force password guessing protection allows you to specify a wait-time that must expire before entering a fourth password after three incorrect passwords have been entered.

The following describes the commands for enabling, disabling and configuring the brute-force password guessing protection mechanism for the password. See Appendix I on page 245 for information on the command structure.

Table 105 Brute-Force Password Guessing Protection CommandsNOA-3570

COMMAND	DESCRIPTION
sys pwderrtm	This command displays the brute-force guessing password protection settings.
sys pwderrtm 0	This command turns off the password's protection from brute-force guessing. The brute-force password guessing protection is turned off by default.
sys pwderrtm N	This command sets the password protection to block all access attempts for N (a number from 1 to 60) minutes after the third time an incorrect password is entered.

Example

```
sys pwderrtm 5
```

This command sets the password protection to block all access attempts for five minutes after the third time an incorrect password is entered.

APPENDIX K
Log Descriptions

This appendix provides descriptions of example log messages.

Table 106 System Maintenance Logs

LOG MESSAGE	DESCRIPTION
`Time calibration is successful`	The router has adjusted its time based on information from the time server.
`Time calibration failed`	The router failed to get information from the time server.
`DHCP client gets %s`	A DHCP client got a new IP address from the DHCP server.
`DHCP client IP expired`	A DHCP client's IP address has expired.
`DHCP server assigns %s`	The DHCP server assigned an IP address to a client.
`SMT Login Successfully`	Someone has logged on to the router's SMT interface.
`SMT Login Fail`	Someone has failed to log on to the router's SMT interface.
`WEB Login Successfully`	Someone has logged on to the router's web configurator interface.
`WEB Login Fail`	Someone has failed to log on to the router's web configurator interface.
`TELNET Login Successfully`	Someone has logged on to the router via telnet.
`TELNET Login Fail`	Someone has failed to log on to the router via telnet.
`FTP Login Successfully`	Someone has logged on to the router via FTP.
`FTP Login Fail`	Someone has failed to log on to the router via FTP.

Table 107 ICMP NotesNOA-3570

TYPE	CODE	DESCRIPTION
`0`		Echo Reply
	`0`	Echo reply message
`3`		Destination Unreachable
	`0`	Net unreachable
	`1`	Host unreachable
	`2`	Protocol unreachable
	`3`	Port unreachable
	`4`	A packet that needed fragmentation was dropped because it was set to Don't Fragment (DF)
	`5`	Source route failed
`4`		Source Quench
	`0`	A gateway may discard internet datagrams if it does not have the buffer space needed to queue the datagrams for output to the next network on the route to the destination network.
`5`		Redirect

Table 107 ICMP NotesNOA-3570

TYPE	CODE	DESCRIPTION
	0	Redirect datagrams for the Network
	1	Redirect datagrams for the Host
	2	Redirect datagrams for the Type of Service and Network
	3	Redirect datagrams for the Type of Service and Host
8		Echo
	0	Echo message
11		Time Exceeded
	0	Time to live exceeded in transit
	1	Fragment reassembly time exceeded
12		Parameter Problem
	0	Pointer indicates the error
13		Timestamp
	0	Timestamp request message
14		Timestamp Reply
	0	Timestamp reply message
15		Information Request
	0	Information request message
16		Information Reply
	0	Information reply message

Table 108 Sys log

LOG MESSAGE	DESCRIPTION
`Mon dd hr:mm:ss hostname src="<srcIP:srcPort>" dst="<dstIP:dstPort>" msg="<msg>" note="<note>"`	This message is sent by the "RAS" when this syslog is generated. The messages and notes are defined in this appendix's other charts.

Log Commands

Go to the command interpreter interface (the *Command Interpreter Appendix* explains how to access and use the commands).

Configuring What You Want the NOA-3570 to Log

Use the `sys logs load` command to load the log setting buffer that allows you to configure which logs the NOA-3570 is to record.

Use `sys logs category` followed by a log category and a parameter to decide what to record

Table 109 Log Categories and Available Settings

LOG CATEGORIES	AVAILABLE PARAMETERS
error	0, 1, 2, 3
mten	0, 1
Use `0` to not record logs for that category, `1` to record only logs for that category, `2` to record only alerts for that category, and `3` to record both logs and alerts for that category.	

Use the `sys logs save` command to store the settings in the NOA-3570 (you must do this in order to record logs).

Displaying Logs

Use the `sys logs display` command to show all of the logs in the NOA-3570's log.

Use the `sys logs category display` command to show the log settings for all of the log categories.

Use the `sys logs display [log category]` command to show the logs in an individual NOA-3570 log category.

Use the `sys logs clear` command to erase all of the NOA-3570's logs.

Log Command Example

This example shows how to set the NOA-3570 to record the error logs and alerts and then view the results.

```
ras> sys logs load
ras> sys logs category error 3
ras> sys logs save
ras> sys logs display access

#  .time              source              destination
notes
    message
  0|11/11/2002 15:10:12 |172.22.3.80:137
|172.22.255.255:137    |ACCESS BLOCK
```

Professional installation instruction

1. Installation personal
   This product is designed for specific application and needs to be installed by a qualified personal who has RF and related rule knowledge. The general user shall not attempt to install or change the setting.

2. Installation location
   The product shall be installed at a location where the radiating antenna can be kept 20 cm from nearby person in normal operation condition to meet regulatory RF exposure requirement.

3. External antenna,
   Use only the antennas which have been approved by SENAO. The non-approved antenna(s) may produce unwanted spurious or excessive RF transmitting power which may lead to the violation of FCC limit and is prohibited.

4. Installation procedure
   Please refer to user's manual for the detail.

5. Warning
   Please carefully select the installation position and make sure that the final output power does not exceed the limit set force in US Rule CFR 47 part 15 section 15.247 & 15.407. The violation of the rule could lead to serious federal penalty.