Part V:

SMT CONFIGURATION

This part contains SMT (System Management Terminal) configuration and background information for features only configurable by SMT.

See the web configurator parts of this guide for background information on features configurable by web configurator and SMT.

Chapter 10
Introducing the SMT

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

10.1 Connect to your ZyAIR Using Telnet

The following procedure details how to telnet into your ZyAIR.

Step 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**.

Step 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.

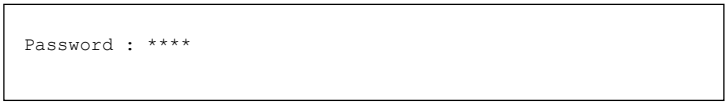


Figure 10-1 Login Screen

Step 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 ZyAIR will automatically log you out. You will then have to telnet into the ZyAIR again. You can use the web configurator or the CI commands to change the inactivity time out period.

10.2 Changing the System Password

Change the ZyAIR default password by following the steps shown next.

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

Step 2. Enter 1 to display **Menu 23.1 – System Security – Change Password** as shown next.

Step 3. Type your existing system password in the **Old Password** field, and press [ENTER].

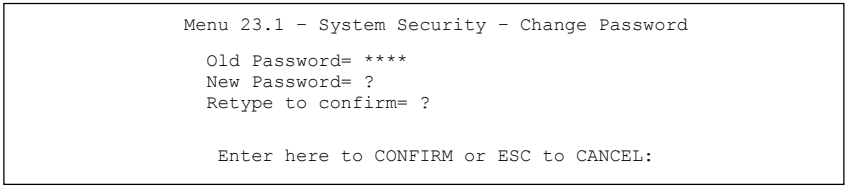


Figure 10-2 Menu 23.1 System Security : Change Password

Step 4. Type your new system password in the **New Password** field (up to 30 characters), and press [ENTER].

Step 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.

10.3 ZyAIR SMT Menu Overview Example

The following figure gives you an example overview of the various SMT menu screens for your ZyAIR.

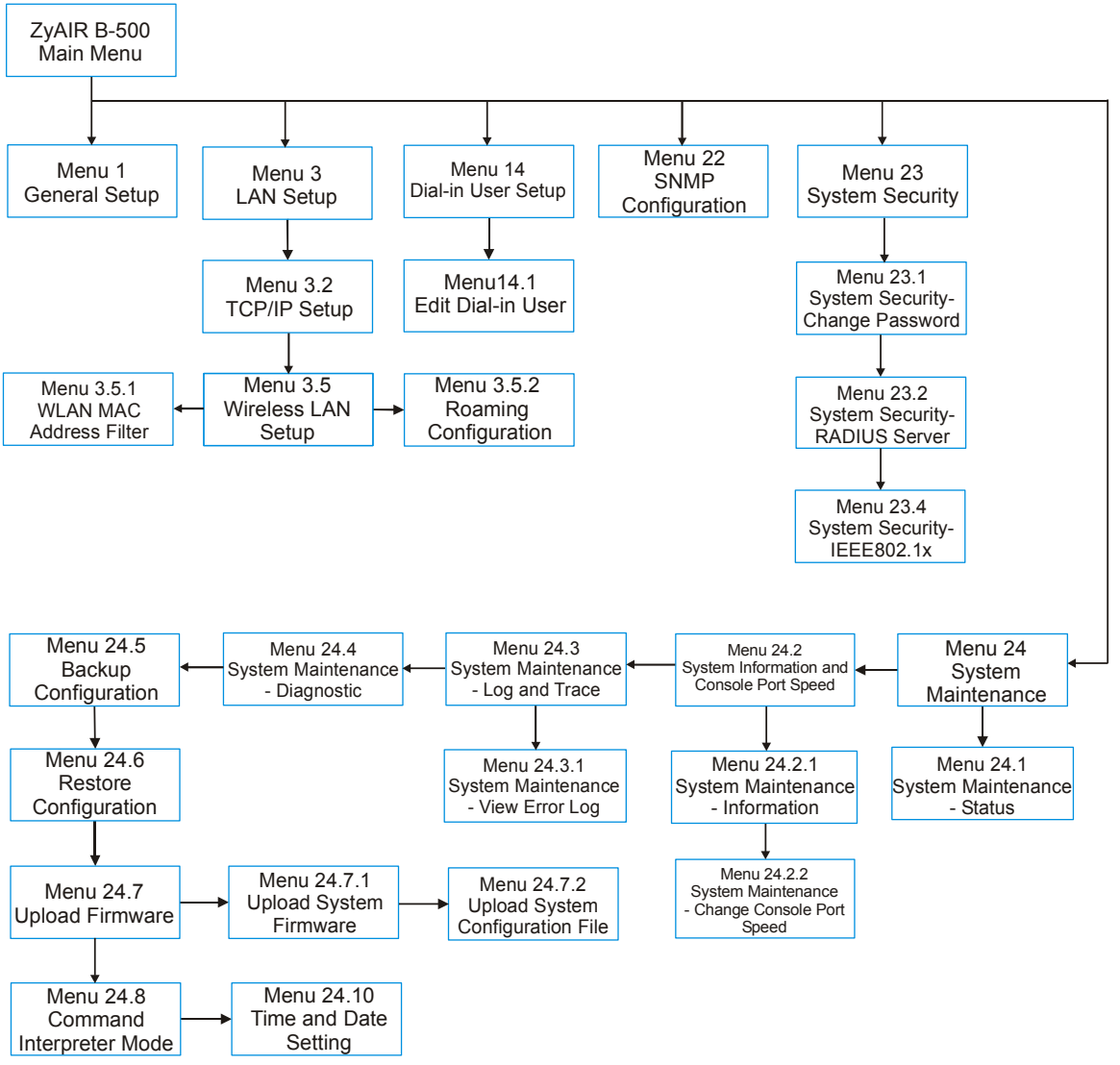


Figure 10-3 ZyAIR B-500 SMT Menu Overview Example

10.4 Navigating the SMT Interface

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

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

Table 10-1 Main Menu Commands

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.
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].
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.
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.

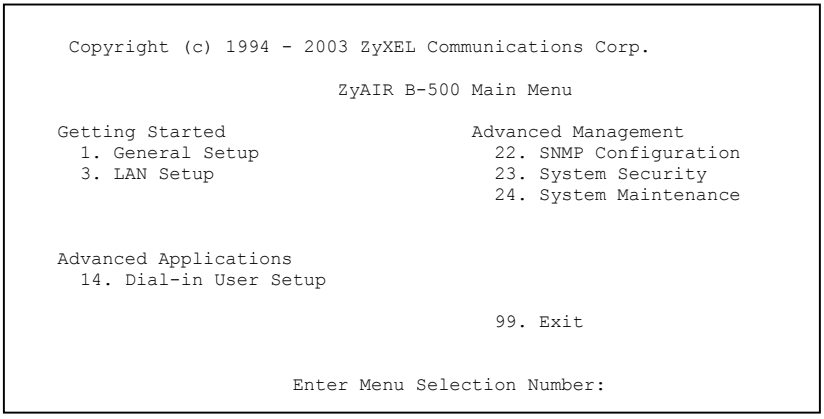


Figure 10-4 ZyAIR B-500 SMT Main Menu

10.4.1 System Management Terminal Interface Summary

Table 10-2 Main Menu Summary

#	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 ZyAIR.
22	SNMP Configuration	Use this menu to set up SNMP related parameters.
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.

Chapter 11
General Setup

The chapter shows you the information on general setup.

11.1 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. This is not a required field. Leave this field blank or enter the domain name here if you know it.

11.1.1 Procedure To Configure Menu 1

Step 1. Enter 1 in the Main Menu to open **Menu 1 – General Setup** as shown next.

```
                Menu 1 - General Setup

System Name= B-500
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



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

Figure 11-1 Menu 1 General Setup

Step 2. Fill in the required fields. Refer to the following table for more information about these fields.

Table 11-1 Menu 1 General Setup

FIELD	DESCRIPTION	EXAMPLE
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.	B-500
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.	**From DHCP**
IP Address	Enter the IP addresses of the DNS servers. This field is available when you select **User-Defined** in the field above.	**N/A**
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 12
LAN Setup

This chapter shows you how to configure the LAN on your ZyAIR..

12.1 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.

```
                        Menu 3 - LAN Setup

                2. TCP/IP Setup

                5. Wireless LAN Setup


                     Enter Menu Selection Number:
```

Figure 12-1 Menu 3 LAN Setup

12.2 TCP/IP Ethernet Setup

Use menu 3.2 to configure your ZyAIR 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.

```
                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


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

Figure 12-2 Menu 3.2 TCP/IP Setup

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

Table 12-1 Menu 3.2 TCP/IP Setup

FIELD	DESCRIPTION	EXAMPLE
IP Address Assignment	Press [SPACE BAR] and then [ENTER] to select **Dynamic** to have the ZyAIR obtain an IP address from a DHCP server. You must know the IP address assigned to the ZyAIR (by the DHCP server) to access the ZyAIR again. Select **Static** to give the ZyAIR 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 ZyAIR in dotted decimal notation	192.168.1.2
IP Subnet Mask	Your ZyAIR 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 ZyAIR.	255.255.255.0
Gateway IP Address	Type the IP address of the gateway. The gateway is an immediate neighbor of your ZyAIR that will forward the packet to the destination. On the LAN, the gateway must be a router on the same network segment as your ZyAIR.	
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.		

12.3 Wireless LAN Setup

Use menu 3.5 to set up your ZyAIR 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.

```
            Menu 3.5 - Wireless LAN Setup

        ESSID= Wireless
        Hide ESSID= No
        Channel ID= CH06 2437MHz
        RTS Threshold= 2432
        Frag. Threshold= 2432
        WEP Encryption= Disable
          Default Key= N/A
          Key1= N/A
          Key2= N/A
          Key3= N/A
          Key4= N/A
          Authen. Method= N/A
        Edit MAC Address Filter= No
        Edit Roaming Configuration= No
        Block Intra-BSS Traffic= No
        Number of Associated Stations= 32
        Output Power= 17dBm
        Press ENTER to Confirm or ESC to Cancel:
```

Figure 12-3 Menu 3.5 Wireless LAN Setup

The following table describes the fields in this menu.

Table 12-2 Menu 3.5 Wireless LAN Setup

FIELD	DESCRIPTION	EXMAPLE
ESSID	The ESSID (Extended Service Set IDentity) identifies the AP the wireless station is to associate to. Wireless stations associating to the AP must have the same ESSID. Enter a descriptive name up to 32 printable 7-bit ASCII characters.	Wireless
Hide ESSID	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.	**No**
Channel ID	Press [SPACE BAR] to select a channel. This allows you to set the operating frequency/channel depending on your particular region.	**CH01 2412MHz**
RTS Threshold	Setting this attribute to zero turns on the RTS/CTS handshake. Enter a value between 0 and 2432.	**2432**
Frag. Threshold	This is the maximum data fragment size that can be sent. Enter a value between 256 and 2432.	**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.	**Disable**

Table 12-2 Menu 3.5 Wireless LAN Setup

FIELD	DESCRIPTION	EXMAPLE
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 ZyAIR and the wireless stations to communicate.	1
Key 1 to Key 4	The WEP keys are used to encrypt data. Both the ZyAIR 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"). **Enter "0x" before the key to denote a hexadecimal key. Don't enter "0x" before the key to denote an ASCII key.**	0x12345abcde
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**.	**Auto**
Edit MAC Address Filter	Press [SPACE BAR] to select **Yes** and press [ENTER] to display menu 3.5.1. See the section on MAC address filter for more information.	**No**
Edit Roaming Configuration	Press [SPACE BAR] to select **Yes** and press [ENTER] to display menu 3.5.2. See the section on roaming configuration for more information.	**No**
Block Intra-BSS Traffic	Press [SPACE BAR] to select **Yes** or **No** and press [ENTER].	**No**
Number of Association Stations	Enter the number of association stations. The number should be from 1 to 32.	**32**
Output Power	Press [SPACE BAR] to select **11dBm**, **14dBm** or **17dBm** and press [ENTER].	**17dBm**
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.		

12.3.1 Configuring MAC Address Filter

Your ZyAIR 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 ZyAIR.

Step 1. From the main menu, enter 3 to open **Menu 3 – LAN Setup**.

Step 2. Enter 5 to display **Menu 3.5 – Wireless LAN Setup**.

```
            Menu 3.5 - Wireless LAN Setup

        ESSID= Wireless
        Hide ESSID= No
        Channel ID= CH06 2437MHz
        RTS Threshold= 2432
        Frag. Threshold= 2432
        WEP Encryption= Disable
          Default Key= N/A
          Key1= N/A
          Key2= N/A
          Key3= N/A
          Key4= N/A
          Authen. Method= N/A
        Edit MAC Address Filter= Yes
        Edit Roaming Configuration= No
        Block Intra-BSS Traffic= No
        Number of Associated Stations= 32
        Output Power= 17dBm
        Press ENTER to Confirm or ESC to Cancel:
```

Figure 12-4 Menu 3.5 Wireless LAN Setup

Step 3. 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.

```
                    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:
```

Figure 12-5 Menu 3.5.1 WLAN MAC Address Filter

The following table describes the fields in this menu.

Table 12-3 Menu 3.5.1 WLAN MAC Address Filter

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 ZyAIR, press [SPACE BAR] to select **Deny Association** and press [ENTER]. MAC addresses not listed will be allowed to access the ZyAIR. The default action, **Allowed Association**, permits association with the ZyAIR. MAC addresses not listed will be denied access to the ZyAIR.
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 ZyAIR 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.	

12.3.2 Configuring Roaming

Enable the roaming feature if you have two or more ZyAIRs on the same subnet. Follow the steps below to allow roaming on your ZyAIR.

Step 1. From the main menu, enter 3 to display **Menu 3 – LAN Setup**.

Step 2. Enter 5 to display **Menu 3.5 – Wireless LAN Setup**.

```
            Menu 3.5 - Wireless LAN Setup

        ESSID= Wireless
        Hide ESSID= No
        Channel ID= CH06 2437MHz
        RTS Threshold= 2432
        Frag. Threshold= 2432
        WEP Encryption= Disable
          Default Key= N/A
          Key1= N/A
          Key2= N/A
          Key3= N/A
          Key4= N/A
          Authen. Method= N/A
        Edit MAC Address Filter= No
        Edit Roaming Configuration= Yes
        Block Intra-BSS Traffic= No
        Number of Associated Stations= 32
        Output Power= 17dBm
        Press ENTER to Confirm or ESC to Cancel:
```

Figure 12-6 Menu 3.5 Wireless LAN Setup

Step 3. Move the cursor to the **Edit Roaming Configuration** field. Press [SPACE BAR] to select **Yes** and then press [ENTER]. **Menu 3.5.2 – Roaming Configuration** displays as shown next.

```
              Menu 3.5.2 - Roaming Configuration

            Active= Yes
            Port #= 16290


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

Figure 12-7 Menu 3.5.2 Roaming Configuration

The following table describes the fields in this menu.

Table 12-4 Menu 3.5.2 Roaming Configuration

FIELD	DESCRIPTION
Active	Press [SPACE BAR] and then [ENTER] to select **Yes** to enable roaming on the ZyAIR if you have two or more ZyAIRs on the same subnet.
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 **16290**. 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.	

Chapter 13
Dial-in User Setup

This chapter shows you how to create user accounts on the ZyAIR.

13.1 Dial-in User Setup

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

Follow the steps below to set up user profiles on your ZyAIR.

Step 1. From the main menu, enter 14 to display **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:
```

Figure 13-1 Menu 14- Dial-in User Setup

Step 2. Type a number and press [ENTER] to edit the user profile.

```
                     Menu 14.1 - Edit Dial-in User

                    User Name= test
                    Active= Yes
                    Password= ********

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

Figure 13-2 Menu 14.1- Edit Dial-in User

The following table describes the fields in this screen.

Table 13-1 Menu 14.1- Edit Dial-in User

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 14
SNMP Configuration

This chapter explains SNMP Configuration menu 22.

14.1 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 ZyAIR supports SNMP agent functionality, which allows a manager station to manage and monitor the ZyAIR through the network. The ZyAIR 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.

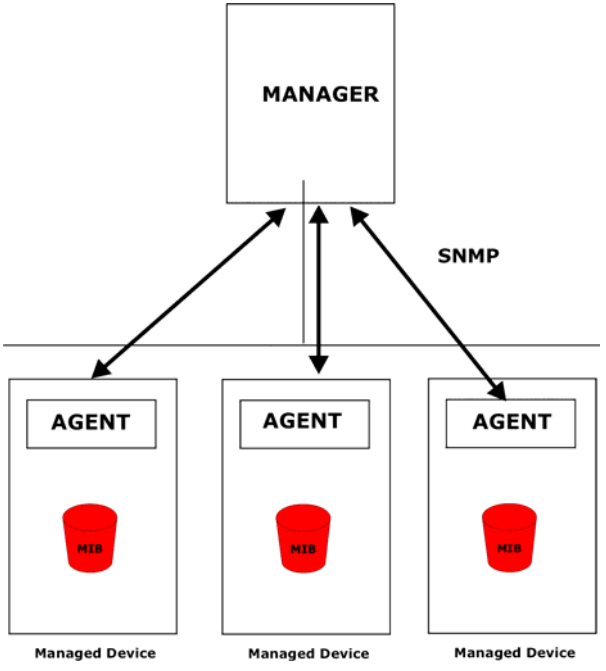


Figure 14-1 SNMP Management Model

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 ZyAIR). 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.

14.2 Supported MIBs

The ZyAIR 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.

14.3 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.

```
                    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:
```

Figure 14-2 Menu 22 SNMP Configuration

The following table describes the SNMP configuration parameters.

Table 14-1 Menu 22 SNMP Configuration

FIELD	DESCRIPTION	EXAMPLE
SNMP:		
Get Community	Type the **Get Community**, which is the password for the incoming Get- and GetNext requests from the management station.	public
Set Community	Type the **Set Community**, which is the password for incoming Set requests from the management station.	public
Trusted Host	If you enter a trusted host, your ZyAIR will only respond to SNMP messages from this address. A blank (default) field means your ZyAIR will respond to all SNMP messages it receives, regardless of source.	0.0.0.0
Trap:		
Community	Type the trap community, which is the password sent with each trap to the SNMP manager.	public
Destination	Type the IP address of the station to send your SNMP traps to.	0.0.0.0
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.		

14.4 SNMP Traps

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

Table 14-2 SNMP Traps

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 14-3 Ports and Interface Types

PHYSICAL PORT/ENCAP	INTERFACE TYPE
LAN port(s)	enet0
Wireless port	enet1
PPPoE encap	pppoe
1483 encap	mpoa
Ethernet encap	enet-encap
PPPoA	ppp

Chapter 15
System Security

This chapter describes how to configure the system security on the ZyAIR.

15.1 System Security

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

15.1.1 System Password

```
Menu 23 - System Security

    1. Change Password
    2. RADIUS Server

    4. IEEE802.1x
```

Figure 15-1 Menu 23 System Security

You should change the default password. If you forget your password you have to restore the default configuration file. Refer to the section on changing the system password in the *Introducing the SMT* chapter and the section on resetting the ZyAIR in the *Introducing the Web Configurator* chapter.

15.1.2 Configuring External RADIUS Server

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

```
Menu 23 - System Security

    1. Change Password
    2. RADIUS Server

    4. IEEE802.1x
```

Figure 15-2 Menu 23 System Security

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

```
                Menu 23.2 - System Security - RADIUS Server

                 Authentication Server:
                   Active= No
                   Server Address= 10.11.12.13
                   Port #= 1812
                   Shared Secret= ?

                 Accounting Server:
                   Active= No
                   Server Address= 10.11.12.13
                   Port #= 1813
                   Shared Secret= ?

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

Figure 15-3 Menu 23.2 System Security : RADIUS Server

The following table describes the fields in this menu.

Table 15-1 Menu 23.2 System Security : RADIUS Server

FIELD	DESCRIPTION	EXAMPLE
Authentication Server		
Active	Press [SPACE BAR] to select **Yes** and press [ENTER] to enable user authentication through an external authentication server.	**No**
Server Address	Enter the IP address of the external authentication server in dotted decimal notation.	10.11.12.13
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.	**1812**
Shared Secret	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 ZyAIR.	
Accounting Server		
Active	Press [SPACE BAR] to select **Yes** and press [ENTER] to enable user authentication through an external accounting server.	**No**
Server Address	Enter the IP address of the external accounting server in dotted decimal notation.	10.11.12.13

Table 15-1 Menu 23.2 System Security : RADIUS Server

FIELD	DESCRIPTION	EXAMPLE
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.	**1813**
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 ZyAIR.	
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.		

15.1.3 802.1x

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 ZyAIR.

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

```
Menu 23 - System Security

 1. Change Password
 2. RADIUS Server

 4. IEEE802.1X
```

Figure 15-4 Menu 23 System Security

Step 2. Enter 4 to display **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

        Authentication Databases= Local User Database Only


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

Figure 15-5 Menu 23.4 System Security : IEEE802.1x

The following table describes the fields in this menu.

Table 15-2 Menu 23.4 System Security : IEEE802.1x

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.
ReAuthentica-tion Timer (in seconds)	Specify how often a wireless station 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	The ZyAIR automatically disconnects a wireless station from the wired network after a period of inactivity. The wireless station 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).

Table 15-2 Menu 23.4 System Security : IEEE802.1x

FIELD	DESCRIPTION
Authentication Databases	This field is activated only when you select **Authentication Required** in the **Wireless Port Control** field. The authentication database contains wireless station login information. The local user database is the built-in database on the ZyAIR. The RADIUS is an external server. Use this field to decide which database the ZyAIR should use (first) to authenticate a wireless station. Before you specify the priority, make sure you have set up the corresponding database correctly first. Select **Local User Database Only** to have the ZyAIR just check the built-in user database on the ZyAIR for a wireless station's username and password. Select **RADIUS Only** to have the ZyAIR just check the user database on the specified RADIUS server for a wireless station's username and password. Select **Local first, then RADIUS** to have the ZyAIR first check the user database on the ZyAIR for a wireless station's username and password. If the user name is not found, the ZyAIR then checks the user database on the specified RADIUS server. Select **RADIUS first, then Local** to have the ZyAIR first check the user database on the specified RADIUS server for a wireless station's username and password. If the ZyAIR cannot reach the RADIUS server, the ZyAIR then checks the local user database on the ZyAIR. When the user name is not found or password does not match in the RADIUS server, the ZyAIR 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 ZyAIR for authentication.

Chapter 16
System Information and Diagnosis

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

16.1 Overview

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.

```
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 16-1 Menu 24 System Maintenance

16.2 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 ZyAIR. 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.

```
                  Menu 24.1 - System Maintenance - Status          00:01:51
                                                              Sat. Jan. 01, 2000

Port     Status        TxPkts     RxPkts    Cols    Tx B/s    Rx B/s     Up Time
Ethernet 100M/Full         38        128       0       268       128     0:01:42
Wireless   16.5M           70          0       0         0         0     0:01:42


Port      Ethernet Address         IP Address           IP Mask       DHCP
Ethernet  00:A0:C5:00:00:04       192.168.1.2     255.255.255.0       None
Wireless  00:A0:C5:00:00:04


     System up Time:     0:01:55


                              Press Command:
                    COMMANDS: 9-Reset Counters   ESC-Exit
```

Figure 16-2 Menu 24.1 System Maintenance : Status

The following table describes the fields present in this menu.

Table 16-1 Menu 24.1 System Maintenance : Status

FIELD	DESCRIPTION
Port	This is the port type. Port types are: Ethernet and Wireless
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.
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.

Table 16-1 Menu 24.1 System Maintenance : Status

FIELD	DESCRIPTION
System Up Time	This is the time the ZyAIR is up and running from the last reboot.

16.3 System Information

To get to the System Information:

Step 1. Enter 24 to display **Menu 24 – System Maintenance**.

Step 2. Enter 2 to display **Menu 24.2 – System Information and Console Port Speed**.

Step 3. From this menu you have two choices as shown in the next figure:

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


              Please enter selection:
```

Figure 16-3 Menu 24.2 System Information and Console Port Speed

The ZyAIR has an internal console port for support personnel only. Do not open the ZyAIR as it will void your warranty.

16.3.1 System Information

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

```
Menu 24.2.1 - System Maintenance - Information

   Name: B-500
   Routing: BRIDGE
   ZyNOS F/W Version: V3.50(HL.0)b1 | 09/19/2003
   Country Code: 255

   LAN
     Ethernet Address: 00:A0:C5:00:00:04
     IP Address: 192.168.1.2
     IP Mask: 255.255.255.0
     DHCP: None

        Press ESC or RETURN to Exit:
```

Figure 16-4 Menu 24.2.1 System Information : Information

The following table describes the fields in this menu.

Table 16-2 Menu 24.2.1 System Maintenance : Information

FIELD	DESCRIPTION
Name	Displays the system name of your ZyAIR. 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 ZyAIR.
IP Address	This is the IP address of the ZyAIR in dotted decimal notation.
IP Mask	This shows the subnet mask of the ZyAIR.
DHCP	This field shows the DHCP setting of the ZyAIR.
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.	

16.3.2 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 ZyAIR 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.

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

                Console Port Speed: 9600

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

Figure 16-5 Menu 24.2.2 System Maintenance : Change Console Port Speed

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

16.4 Log and Trace

Your ZyAIR provides the error logs and trace records that are stored locally.

16.4.1 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:

Step 1. Type 24 in the main menu to display **Menu 24 – System Maintenance**.

Step 2. From menu 24, type 3 to display **Menu 24.3 – System Maintenance – Log and Trace**.

```
Menu 24.3 - System Maintenance - Log and Trace

        1. View Error Log


           Please enter selection:
```

Figure 16-6 Menu 24.3 System Maintenance : Log and Trace

Step 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 ZyAIR 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.

```
  13 Sat Jan  1 00:00:00 2000 PP0d  INFO  LAN promiscuous mode <1>
  14 Sat Jan  1 00:00:00 2000 PINI  INFO  Last errorlog repeat 1 Times
  15 Sat Jan  1 00:00:00 2000 PINI  INFO  main: init completed
  16 Sat Jan  1 00:00:02 2000 PP05 -WARN  SNMP TRAP 3: link up
  17 Sat Jan  1 00:00:02 2000 PP13  INFO  sending request to NTP server(6)
  20 Sat Jan  1 00:00:30 2000 PSSV -WARN  SNMP TRAP 0: cold start

Clear Error Log (y/n):
```

Figure 16-7 Sample Error and Information Messages

16.5 Diagnostic

The diagnostic facility allows you to test the different aspects of your ZyAIR 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.

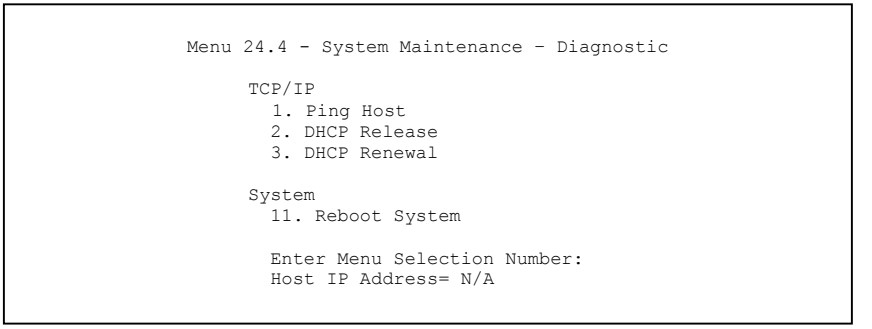


Figure 16-8 Menu 24.4 System Maintenance : Diagnostic

Follow the procedure next to get to display this menu:

Step 1. From the main menu, type 24 to open **Menu 24 – System Maintenance**.

Step 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 ZyAIR and the connections.

Table 16-3 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 ZyAIR.
Host IP Address	If you typed 1 to Ping Host, now type the address of the computer you want to ping.

Chapter 17
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.

17.1 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 ZyAIR'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 ZyAIR.

```
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 ZyAIR 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 ZyAIR and the external filename refers to the filename not on the ZyAIR, 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 17-1 Filename Conventions

FILE TYPE	INTERNAL NAME	EXTERNAL NAME	DESCRIPTION
Configuration File	Rom-0	*.rom	This is the configuration filename on the ZyAIR. Uploading the rom-0 file replaces the entire ROM file system, including your ZyAIR 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 ZyAIR.

17.2 Backup Configuration

Option 5 from **Menu 24 – System Maintenance** allows you to backup the current ZyAIR configuration to your computer. Backup is highly recommended once your ZyAIR 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 ZyAIR to the computer, while upload means from your computer to the ZyAIR.

17.2.1 Backup Configuration Using FTP

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

```
                    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:
```

Figure 17-1 Menu 24.5 Backup Configuration

17.2.2 Using the FTP command from the DOS Prompt

Step 1. Launch the FTP client on your computer.

Step 2. Enter "open" and the IP address of your ZyAIR.

Step 3. Press [ENTER] when prompted for a username.

Step 4. Enter "root" and your SMT password as requested. The default is 1234.

Step 5. Enter "bin" to set transfer mode to binary.

Step 6. Use "get" to transfer files from the ZyAIR to the computer, for example, "get rom-0 config.rom" transfers the configuration file on the ZyAIR to your computer and renames it "config.rom". See earlier in this chapter for more information on filename conventions.

Step 7. Enter "quit" to exit the FTP prompt.

```
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
```

Figure 17-2 FTP Session Example

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

Table 17-2 General Commands for Third Party FTP Clients

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.

Table 17-2 General Commands for Third Party FTP Clients

COMMAND	DESCRIPTION
Initial Remote Directory	Specify the default remote directory (path).
Initial Local Directory	Specify the default local directory (path).

17.2.3 Backup Configuration Using TFTP

The ZyAIR supports the up/downloading of the firmware and the configuration file using TFTP (Trivial File Transfer Protocol) over LAN. Although TFTP should work over WAN as well, it is not recommended.

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

Step 1. Use telnet from your computer to connect to the ZyAIR and log in. Because TFTP does not have any security checks, the ZyAIR records the IP address of the telnet client and accepts TFTP requests only from this address.

Step 2. Put the SMT in command interpreter (CI) mode by entering 8 in **Menu 24 – System Maintenance**.

Step 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.

Step 4. Launch the TFTP client on your computer and connect to the ZyAIR. Set the transfer mode to binary before starting data transfer.

Step 5. Use the TFTP client (see the example below) to transfer files between the ZyAIR 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 ZyAIR to the computer and "binary" to set binary transfer mode.

17.2.4 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 ZyAIR IP address, "get" transfers the file source on the ZyAIR (rom-0 name of the configuration file on the ZyAIR) 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 17-3 General Commands for Third Party TFTP Clients

COMMAND	DESCRIPTION
Host	Enter the IP address of the ZyAIR. 192.168.1.2 is the ZyAIR's default IP address when shipped.
Send/Fetch	Use "Send" to upload the file to the ZyAIR 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 ZyAIR. 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.

17.3 Restore Configuration

Menu 24.6 -– System Maintenance – Restore Configuration allows you to restore the configuration via FTP or TFTP to your ZyAIR. 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 ZyAIR restarts automatically after the file transfer is complete.

```
                    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:
```

Figure 17-3 Menu 24.6 Restore Configuration

17.4 Uploading Firmware and Configuration Files

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

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

```
      Menu 24.7 - System Maintenance - Upload Firmware

          1. Upload System Firmware
          2. Upload System Configuration File



                Enter Menu Selection Number:
```

Figure 17-4 Menu 24.7 System Maintenance : Upload Firmware

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.

17.4.1 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 ZyAIR, you will see the following screens for uploading firmware and the configuration file using FTP.

```
            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:
```

Figure 17-5 Menu 24.7.1 System Maintenance : Upload System Firmware

17.4.2 Configuration File Upload

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

```
          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:
```

Figure 17-6 Menu 24.7.2 System Maintenance : Upload System Configuration File

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

17.4.3 Using the FTP command from the DOS Prompt Example

Step 1. Launch the FTP client on your computer.

Step 2. Enter "open" and the IP address of your ZyAIR.

Step 3. Press [ENTER] when prompted for a username.

Step 4. Enter "root" and your SMT password as requested. The default is 1234.

Step 5. Enter "bin" to set transfer mode to binary.

Step 6. Use "put" to transfer files from the computer to the ZyAIR, e.g., put firmware.bin ras transfers the firmware on your computer (firmware.bin) to the ZyAIR and renames it "ras". Similarly "put config.rom rom-0" transfers the configuration file on your computer (config.rom) to the ZyAIR and renames it "rom-0". Likewise "get rom-0 config.rom" transfers the configuration file on the ZyAIR to your computer and renames it "config.rom." See earlier in this chapter for more information on filename conventions.

Step 7. Enter "quit" to exit the FTP prompt.

```
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
```

Figure 17-7 FTP Session Example

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

17.4.4 TFTP File Upload

The ZyAIR also supports the up/downloading of the firmware and the configuration file using TFTP (Trivial File Transfer Protocol) over LAN. Although TFTP should work over WAN as well, it is not recommended.

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:

Step 1. Use telnet from your computer to connect to the ZyAIR and log in. Because TFTP does not have any security checks, the ZyAIR records the IP address of the telnet client and accepts TFTP requests only from this address.

Step 2. Put the SMT in command interpreter (CI) mode by entering 8 in **Menu 24 – System Maintenance**.

Step 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.

Step 4. Launch the TFTP client on your computer and connect to the ZyAIR. Set the transfer mode to binary before starting data transfer.

Step 5. Use the TFTP client (see the example below) to transfer files between the ZyAIR 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 ZyAIR to the computer, "put" the other way around, and "binary" to set binary transfer mode.

17.4.5 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 ZyAIR'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 ZyAIR).

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

Chapter 18
System Maintenance and Information

This chapter leads you through SMT menus 24.8 and 24.10.

18.1 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.

```
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 18-1 Menu 24 System Maintenance

```
Copyright (c) 1994 - 2003 ZyXEL Communications Corp.
B-500> ?
Valid commands are:
sys             exit            device          ether
config          wlan            ip              ppp
bridge          hdap            cnm             radius
8021x
B-500>
```

Figure 18-2 Valid CI Commands

18.2 Time and Date Setting

The ZyAIR 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 ZyAIR. Menu 24.10 allows you to update the time and date settings of your ZyAIR. The real time is then displayed in the ZyAIR error logs and firewall logs.

Step 1. Select menu 24 in the main menu to open **Menu 24 – System Maintenance**.

Step 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 ZyAIR as shown in the following screen.

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

Use Time Server when Bootup= NTP (RFC-1305)
Time Server Address= 128.105.39.21

Current Time:                          05 : 47 : 19
New Time (hh:mm:ss):                   05 : 47 : 17

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:
```

Figure 18-3 Menu 24.10 System Maintenance : Time and Date Setting

The following table describes the fields in this menu.

Table 18-1 Menu 24.10 System Maintenance : Time and Date Setting

FIELD	DESCRIPTION
Use Time Server when Bootup	Enter the time service protocol that your time server sends when you turn on the ZyAIR. 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 savings time, then choose **Yes**.
Start Date	If using daylight savings time, enter the month and day that it starts on.
End Date	If using daylight savings 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.	

18.2.1 Resetting the Time

The ZyAIR resets the time in three instances:

i. On leaving menu 24.10 after making changes.

ii. When the ZyAIR starts up, if there is a time server configured in menu 24.10.

iii. 24-hour intervals after starting.

Part VI:

APPENDICES

This part provides troubleshooting and background information about setting up your computer's IP address, wireless LAN, 802.1x and IP subnetting. It also provides information on the command interpreter interface, NetBIOS commands and logs.

Appendix A 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.

Problems Starting Up the ZyAIR

Chart A-1 Troubleshooting the Start-Up of Your ZyAIR

PROBLEM	CORRECTIVE ACTION
None of the LEDs turn on when I plug in the power adaptor.	Make sure you are using the supplied power adaptor and that it is plugged in to an appropriate power source. Check that the power source is turned on. If the problem persists, you may have a hardware problem. In this case, you should contact your local vendor.
The ZyAIR reboots automatically sometimes.	The supplied power to the ZyAIR is too low. Check that the ZyAIR is receiving enough power. Make sure the power source is working properly.

Problems with the Ethernet Interface

Chart A-2 Troubleshooting the Ethernet Interface

PROBLEM	CORRECTIVE ACTION
Cannot access the ZyAIR from the LAN.	If the **ETHN** LED on the front panel is off, check the Ethernet cable connection between your ZyAIR and the Ethernet device connected to the **ETHERNET** port. Check for faulty Ethernet cables. Make sure your computer's Ethernet adapter is installed and working properly. Check the IP address of the Ethernet device. Verify that the IP address and the subnet mask of the ZyAIR, the Ethernet device and your computer are on the same subnet.

Chart A-2 Troubleshooting the Ethernet Interface

PROBLEM	CORRECTIVE ACTION
I cannot ping any computer on the LAN.	If the **ETHN** LED on the front panel is off, check the Ethernet cable connections between your ZyAIR and the Ethernet device. Check the Ethernet cable connections between the Ethernet device and the LAN computers. Check for faulty Ethernet cables. Make sure the LAN computer's Ethernet adapter is installed and working properly. Verify that the IP address and the subnet mask of the ZyAIR, the Ethernet device and the LAN computers are on the same subnet.

Problems with the Password

Chart A-3 Troubleshooting the Password

PROBLEM	CORRECTIVE ACTION
I cannot access the ZyAIR.	The **Password** and **Username** fields are case-sensitive. Make sure that you enter the correct password and username using the proper casing. Use the **RESET** button on the top panel of the ZyAIR to restore the factory default configuration file (hold this button in for about 10 seconds or until the link LED turns red). This will restore all of the factory defaults including the password.

Problems with Telnet

Chart A-4 Troubleshooting Telnet

PROBLEM	CORRECTIVE ACTION
I cannot access the ZyAIR through Telnet.	Refer to the *Problems with the Ethernet Interface* section for instructions on checking your Ethernet connection.

Problems with the WLAN Interface

Chart A-5 Troubleshooting the WLAN Interface

PROBLEM	CORRECTIVE ACTION
Cannot access the ZyAIR from the WLAN.	Make sure the wireless adapter on the wireless station is working properly. Check that both the ZyAIR and your wireless station are using the same ESSID, channel and WEP keys (if WEP encryption is activated).
I cannot ping any computer on the WLAN.	Make sure the wireless adapter on the wireless station(s) is working properly. Check that both the ZyAIR and wireless station(s) are using the same ESSID, channel and WEP keys (if WEP encryption is activated).

Appendix B
Brute-Force Password Guessing Protection

The following describes the commands for enabling, disabling and configuring the brute-force password guessing protection mechanism for the password. See the Command Interpreter appendix for information on the command structure.

Chart B-1 Brute-Force Password Guessing Protection Commands

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.
`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.

By default, the brute-force password guessing protection is turned ON with a 3-minute wait time.

Appendix C
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.

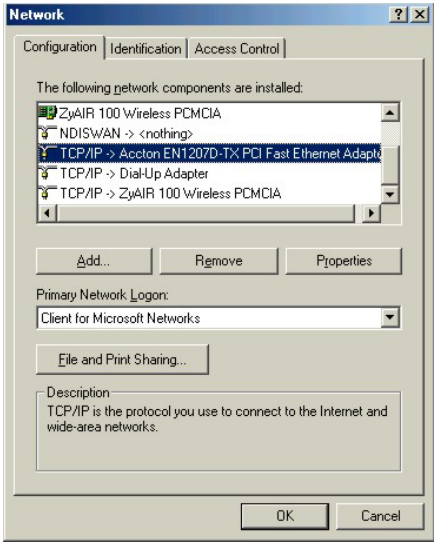
TCP/IP should already be installed on computers using Windows NT/2000/XP, Macintosh OS 7 and later operating systems.

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 ZyAIR's LAN port.

Windows 95/98/Me

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



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:

a. In the **Network** window, click **Add**.

b. Select **Adapter** and then click **Add**.

c. Select the manufacturer and model of your network adapter and then click **OK**.

If you need TCP/IP:

a. In the **Network** window, click **Add**.

b. Select **Protocol** and then click **Add**.

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

d. Select **TCP/IP** from the list of network protocols and then click **OK**.

If you need Client for Microsoft Networks:

a. Click **Add**.

b. Select **Client** and then click **Add**.

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

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

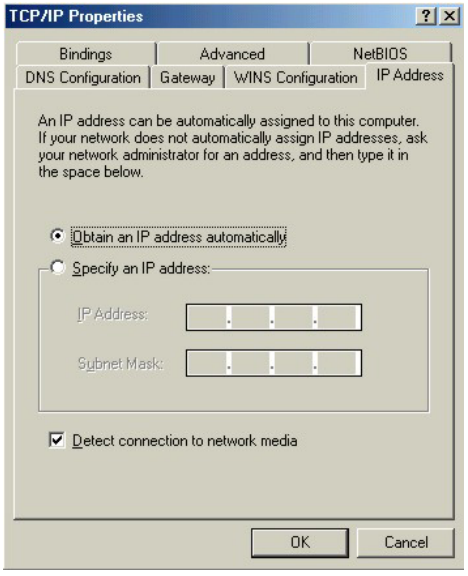
e. Restart your computer so the changes you made take effect.

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

1. Click the **IP Address** tab.

   -If your IP address is dynamic, select **Obtain an IP address automatically**.

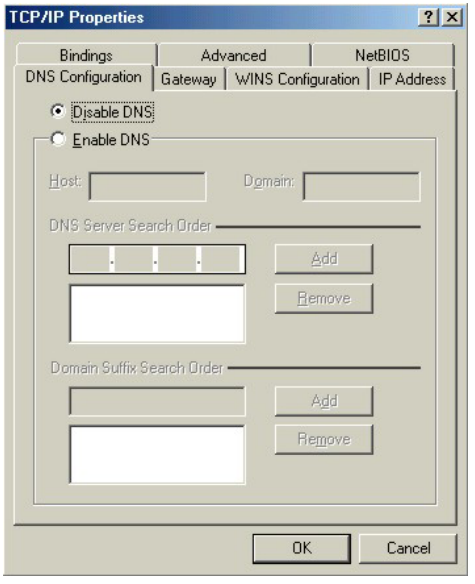
   -If you have a static IP address, select **Specify an IP address** and type your information into the **IP Address** and **Subnet Mask** fields.



2. Click the **DNS** Configuration tab.

   -If you do not know your DNS information, select **Disable DNS**.

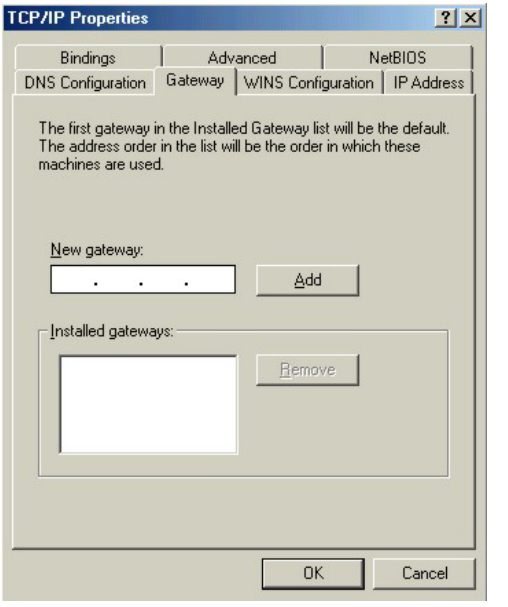
   -If you know your DNS information, select **Enable DNS** and type the information in the fields below (you may not need to fill them all in).



3. 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**.



4. Click **OK** to save and close the **TCP/IP Properties** window.
5. Click **OK** to close the **Network** window. Insert the Windows CD if prompted.
6. Turn on your ZyAIR and restart your computer when prompted.

Verifying Your Computer's IP Address

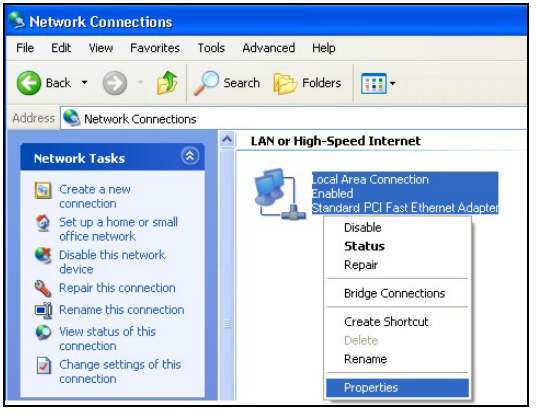
1. Click **Start** and then **Run**.
2. In the **Run** window, type "winipcfg" and then click **OK** to open the **IP Configuration** window.
3. Select your network adapter. You should see your computer's IP address, subnet mask and default gateway.

Windows 2000/NT/XP

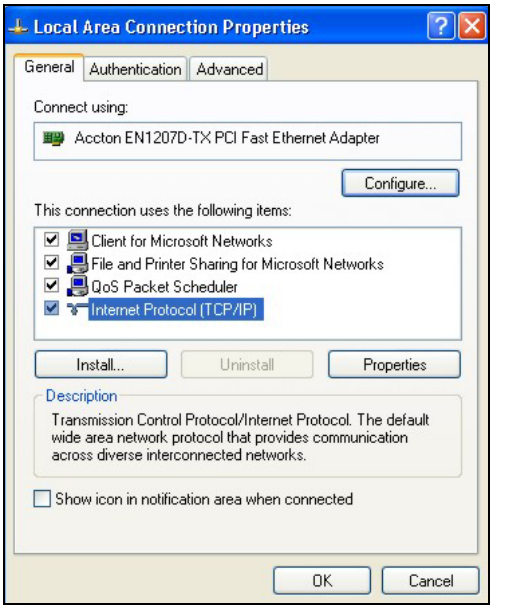
1. For Windows XP, click **start**, **Control Panel**. In Windows 2000/NT, click **Start**, **Settings**, **Control Panel**.

2. For Windows XP, click **Network Connections**. For Windows 2000/NT, click **Network and Dial-up Connections**.

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



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

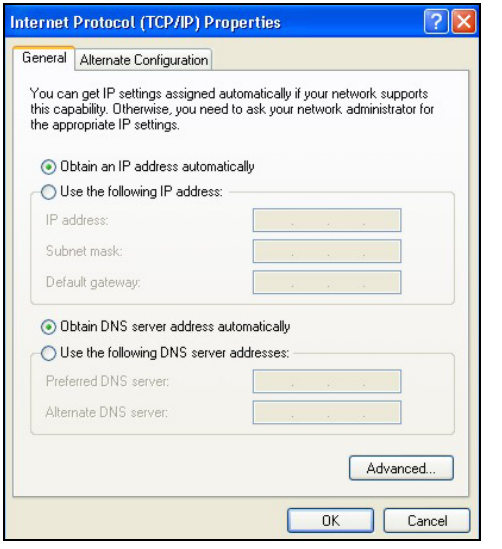


5. The **Internet Protocol TCP/IP Properties** window opens (the **General tab** in Windows XP).

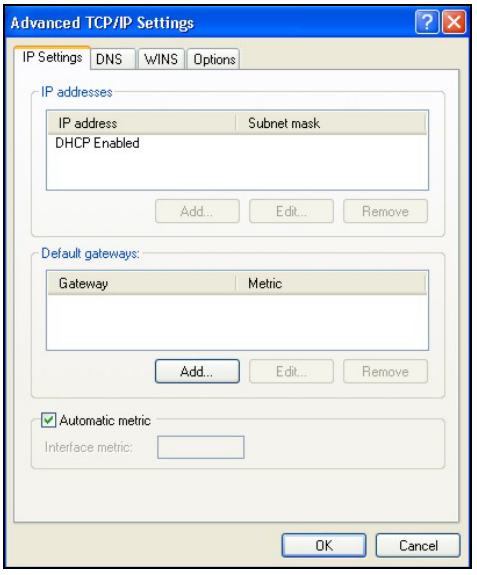
   -If you have a dynamic IP address click **Obtain an IP address automatically**.

   -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**.



6. -If you do not know your gateway's IP address, remove any previously installed gateways in the **IP Setting**s 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.

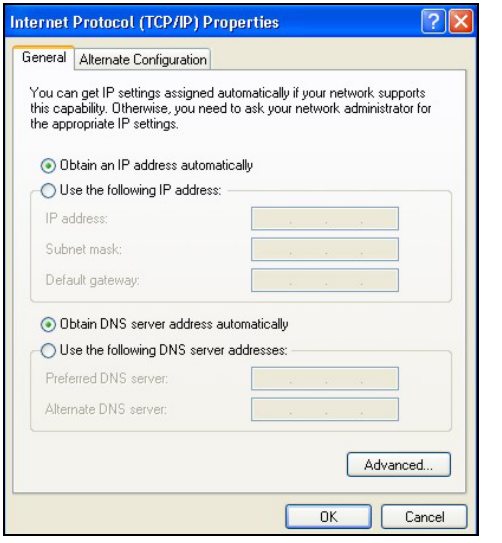
-Click **OK** when finished.

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.



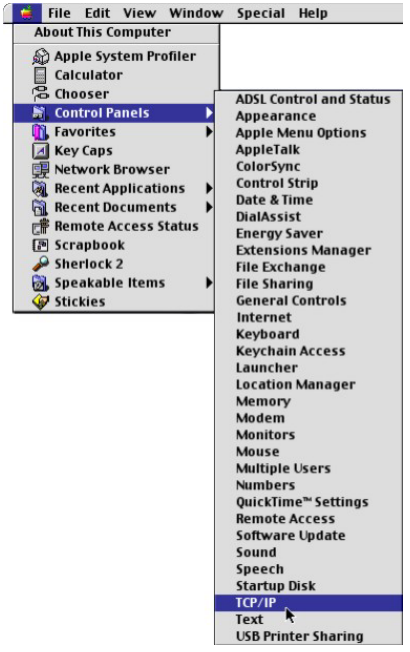
8. Click **OK** to close the **Internet Protocol (TCP/IP) Properties** window.
9. Click **OK** to close the **Local Area Connection Properties** window.
10. Turn on your ZyAIR and restart your computer (if prompted).

Verifying Your Computer's IP Address

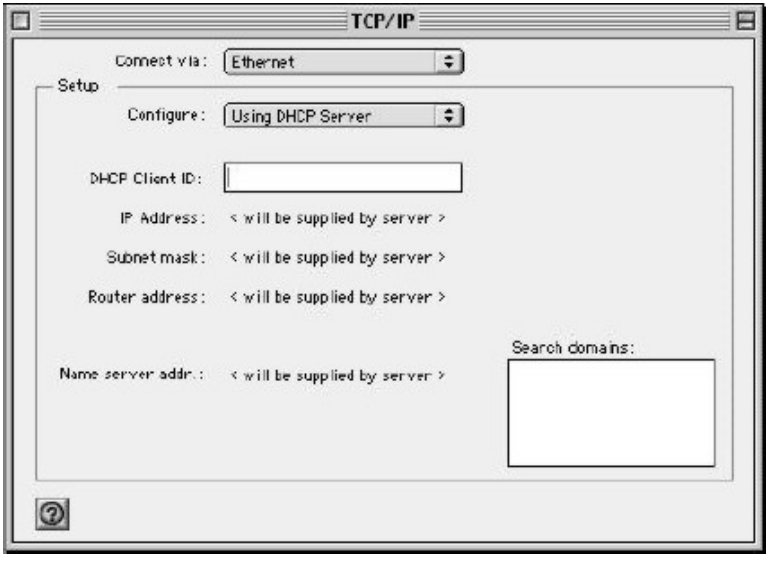
1. Click **Start**, **All Programs**, **Accessories** and then **Command Prompt**.
2. In the **Command Prompt** window, type "ipconfig" and then press [ENTER]. You can also open **Network Connections**, right-click a network connection, click **Status** and then click the **Support** tab.

Macintosh OS 8/9

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



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



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 ZyAIR in the **Router address** box.

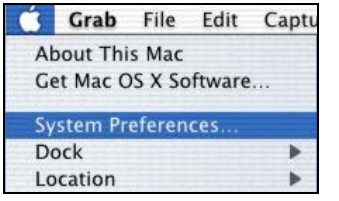
5. Close the **TCP/IP Control Panel**.
6. Click **Save** if prompted, to save changes to your configuration.
7. Turn on your ZyAIR and restart your computer (if prompted).

Verifying Your Computer's IP Address

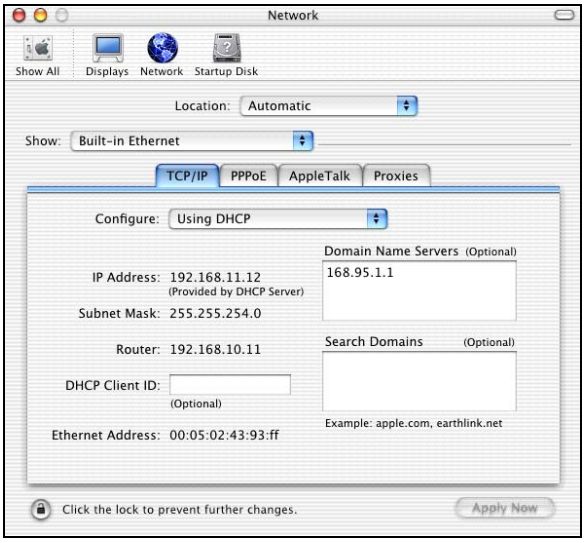
Check your TCP/IP properties in the **TCP/IP Control Panel** window.

Macintosh OS X

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



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.
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 ZyAIR in the **Router address** box.
5. Click **Apply Now** and close the window.
6. Turn on your ZyAIR and restart your computer (if prompted).

Verifying Your Computer's IP Address

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

Appendix D
Wireless LAN and IEEE 802.11

A wireless LAN (WLAN) provides a flexible data communications system that you can use to access various services (navigating the Internet, email, printer services, etc.) without the use of a cabled connection. In effect a wireless LAN environment provides you the freedom to stay connected to the network while roaming around in the coverage area. WLAN is not available on all models.

Benefits of a Wireless LAN

Wireless LAN offers the following benefits:

1. It provides you with access to network services in areas otherwise hard or expensive to wire, such as historical buildings, buildings with asbestos materials and classrooms.
2. It provides healthcare workers like doctors and nurses access to a complete patient's profile on a handheld or notebook computer upon entering a patient's room.
3. It allows flexible workgroups a lower total cost of ownership for workspaces that are frequently reconfigured.
4. It allows conference room users access to the network as they move from meeting to meeting, getting up-to-date access to information and the ability to communicate decisions while "on the go".
5. It provides campus-wide networking mobility, allowing enterprises the roaming capability to set up easy-to-use wireless networks that cover the entire campus transparently.

IEEE 802.11

The 1997 completion of the IEEE 802.11 standard for wireless LANs (WLANs) was a first important step in the evolutionary development of wireless networking technologies. The standard was developed to maximize interoperability between differing brands of wireless LANs as well as to introduce a variety of performance improvements and benefits.

The IEEE 802.11 specifies three different transmission methods for the PHY, the layer responsible for transferring data between nodes. Two of the methods use spread spectrum RF signals, Direct Sequence Spread Spectrum (DSSS) and Frequency-Hopping Spread Spectrum (FHSS), in the 2.4 to 2.4825 GHz

unlicensed ISM (Industrial, Scientific and Medical) band. The third method is infrared technology, using very high frequencies, just below visible light in the electromagnetic spectrum to carry data.

Ad-hoc Wireless LAN Configuration

The simplest WLAN configuration is an independent (Ad-hoc) WLAN that connects a set of computers with wireless nodes or stations (STA), which is called a Basic Service Set (BSS). In the most basic form, a wireless LAN connects a set of computers with wireless adapters. 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). See the following diagram of an example of an Ad-hoc wireless LAN.

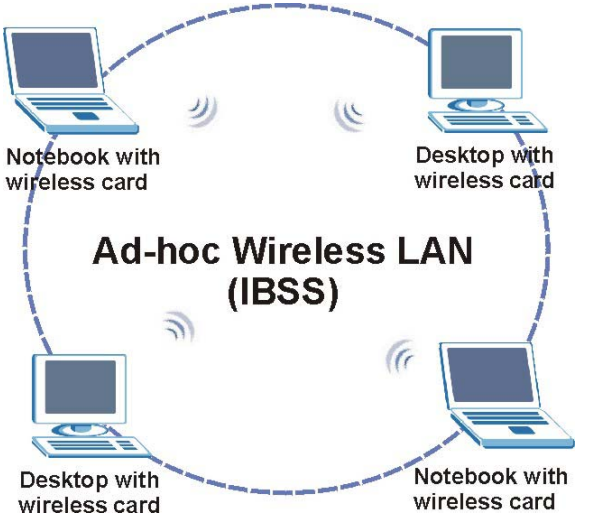


Diagram D-1 Peer-to-Peer Communication in an Ad-hoc Network

Infrastructure Wireless LAN Configuration

For infrastructure WLANs, multiple access points (APs) link the WLAN to the wired network and allow users to efficiently share network resources. The access points not only provide communication with the wired network but also mediate wireless network traffic in the immediate neighborhood. Multiple access points can provide wireless coverage for an entire building or campus. All communications between stations or between a station and a wired network client go through the access point.

The Extended Service Set (ESS) shown in the next figure consists of a series of overlapping BSSs (each containing an Access Point) connected together by means of a Distribution System (DS). Although the DS could be any type of network, it is almost invariably an Ethernet LAN. Mobile nodes can roam between access points and seamless campus-wide coverage is possible.

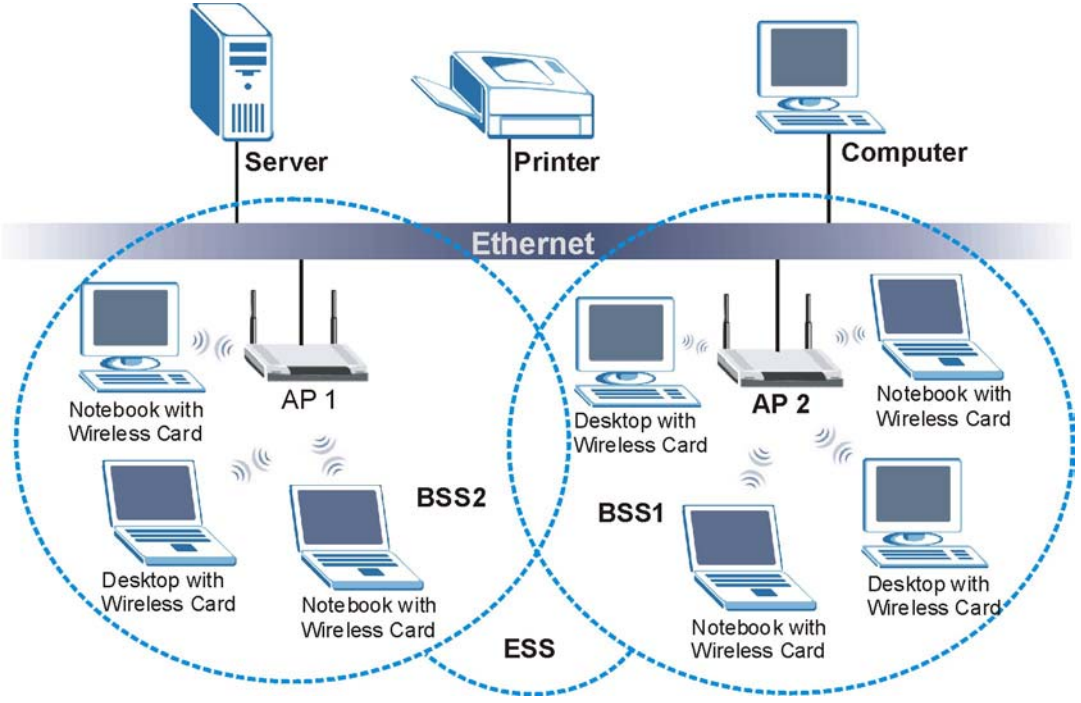


Diagram D-2 ESS Provides Campus-Wide Coverage

Appendix E
Wireless LAN With IEEE 802.1x

As wireless networks become popular for both portable computing and corporate networks, security is now a priority.

Security Flaws with IEEE 802.11

Wireless networks based on the original IEEE 802.11 have a poor reputation for safety. The IEEE 802.11b wireless access standard, first published in 1999, was based on the MAC address. As the MAC address is sent across the wireless link in clear text, it is easy to spoof and fake. Even the WEP (Wire Equivalent Privacy) data encryption is unreliable as it can be easily decrypted with current computer speed

Deployment Issues with IEEE 802.11

User account management has become a network administrator's nightmare in a corporate environment, as the IEEE 802.11b standard does not provide any central user account management. User access control is done through manual modification of the MAC address table on the access point. Although WEP data encryption offers a form of data security, you have to reset the WEP key on the clients each time you change your WEP key on the access point.

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.

Advantages of the IEEE 802.1x

- 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 Server Authentication Sequence

The following figure depicts a typical wireless network with a remote RADIUS server for user authentication using EAPOL (EAP Over LAN).

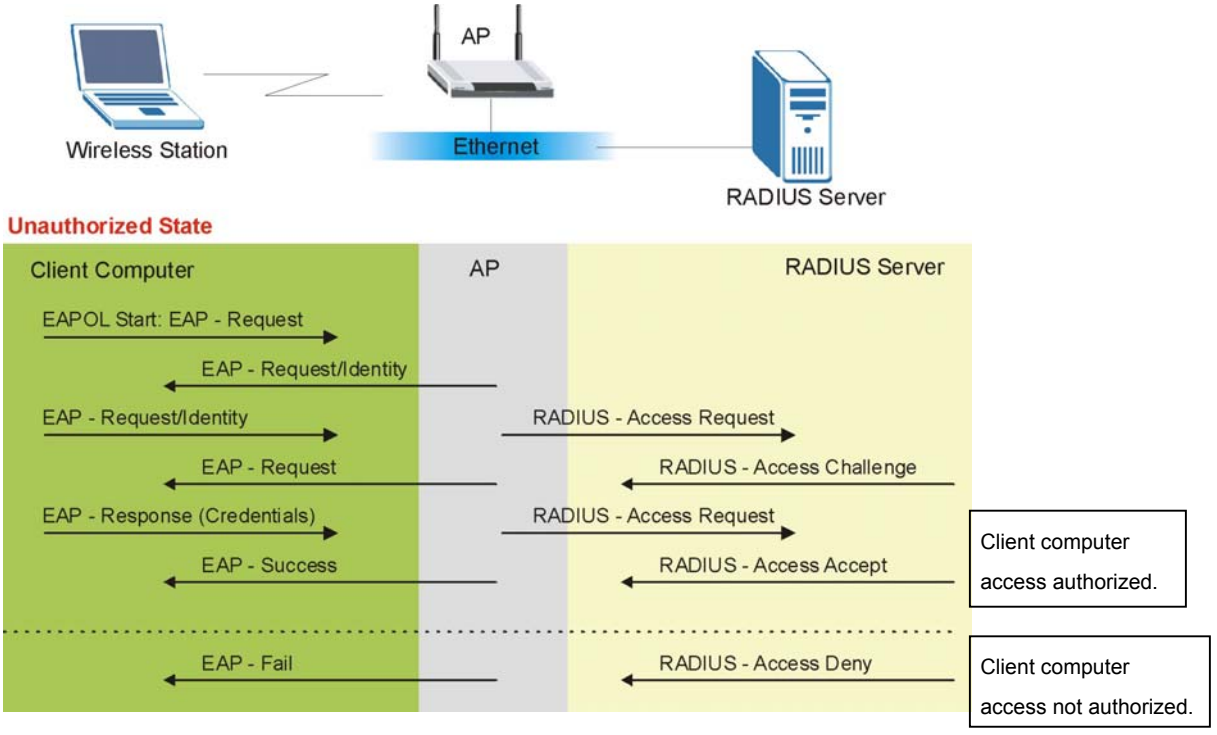


Diagram E-1 Sequences for EAP MD5–Challenge Authentication

Appendix F
Types of EAP Authentication

This appendix discusses the four popular EAP authentication types: **EAP-MD5**, **EAP-TLS**, **EAP-TTLS** and **PEAP**. 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 and EAP-MSCHAPv2, for client authentication.

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, simple user name and password pair is more practical. The following table is a comparison of the features of four authentication types.

Comparison of EAP Authentication Types

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

Appendix G
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.)

Chart G-1 Classes of IP Addresses

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

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.

Chart G-2 Allowed IP Address Range By Class

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 bits; each bit of the mask corresponds to a bit of the IP address. If a bit in the subnet mask 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.

Chart G-3 "Natural" Masks

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.

Chart G-4 Alternative Subnet Mask Notation

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.

	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.

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.

Chart G-5 Subnet 1

	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	

Chart G-6 Subnet 2

	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).

Chart G-7 Subnet 1

	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	

Chart G-8 Subnet 2

	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	

Chart G-9 Subnet 3

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	128
IP Address (Binary)	11000000.10101000.00000001.	**10**000000

Chart G-9 Subnet 3

	NETWORK NUMBER	LAST OCTET BIT VALUE
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	

Chart G-10 Subnet 4

	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.

Chart G-11 Eight Subnets

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	223	254	255

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

Chart G-12 Class C Subnet Planning

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 *Chart J-1*) available for subnetting.

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

Chart G-13 Class B Subnet Planning

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

Chart G-13 Class B Subnet Planning

NO. "BORROWED" HOST BITS	SUBNET MASK	NO. SUBNETS	NO. HOSTS PER SUBNET
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 H
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 www.zyxel.com for more detailed information on these commands.

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 I
Log Descriptions

Chart I-1 System Maintenance Logs

LOG MESSAGE	DESCRIPTION
Time calibration is successful	The ZyAIR has adjusted its time based on information from the time server.
Time calibration failed	The ZyAIR 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 ZyAIR 's SMT interface.
SMT Login Fail	Someone has failed to log on to the ZyAIR s SMT interface.
WEB Login Successfully	Someone has logged on to the ZyAIR 's web configurator interface.
WEB Login Fail	Someone has failed to log on to the ZyAIR 's web configurator interface.
TELNET Login Successfully	Someone has logged on to the ZyAIR via telnet.
TELNET Login Fail	Someone has failed to log on to the ZyAIR via telnet.
FTP Login Successfully	Someone has logged on to the ZyAIR via FTP.
FTP Login Fail	Someone has failed to log on to the ZyAIR via FTP.

Chart I-2 ICMP Notes

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
	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

Chart I-2 ICMP Notes

TYPE	CODE	DESCRIPTION
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

Chart I-3 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 ZyAIR to Log

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

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

Chart I-4 Log Categories and Available Settings

LOG CATEGORIES	AVAILABLE PARAMETERS
8021x	0, 1
access	0, 1, 2, 3
error	0, 1, 2, 3
icmp	0, 1
mten	0, 1
packetfilter	0, 1
remote	0, 1
tcpreset	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 ZyAIR (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 ZyAIR'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 ZyAIR log category.

Use the `sys logs clear` command to erase all of the ZyAIR's logs.

Log Command Example

This example shows how to set the ZyAIR 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
```

Appendix J Index

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