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Notices

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User's Notice

The device presented in this guide complies with:

- RSS-139 of Industry Canada
  Note: The user must apply for a site license in Canada for outdoor operation. The operational frequency range of 2450-2483.5MHz is recommended for approval. Use Industry Canada license application form: **IC-2365**, and consult Radio Standard Procedure: **RSP-101**, issued by Industry Canada. (Part III of RSP-101 is not required as equipment is RSS-139 certified).
- FCC part 15
- CEPT/ERC Recommendations, ETS 300-328, ETS 300-826, and EN 60950

The specifications and parameters of the device described in this document are subject to change without notice. Operation is subject to the following two conditions:

- this device may not cause interference
- this device must accept any interference, including interference that may cause undesired operation of the device.

This equipment generates, uses, and radiates radio frequency and, if not installed and used in accordance with this guide, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following methods:

- reorient or relocate the receiving antenna
- increase the separation between the equipment and receiver
- connect equipment to an outlet on a circuit different from that to which the receiver is connected
- consult the dealer or an experienced radio/TV technician for help

As the 300-24 is used on a license-exempt, non-frequency coordinated, unprotected spectrum allocation, and thus can be subject to random unidentified interference, applications must not be those of a primary control where a lack of intercommunication could cause danger to property, process, or person. An alternative fail-safe should be designed into any system to ensure safe operation or shut down, should communication be lost for any reason.

Important Notices

- Changes or modifications to the equipment not expressly approved by Wi-LAN, Inc., could void the user’s authority to operate the equipment.
- Appropriately shielded remote I/O serial cable with the metal connector shell and cable shield properly connected to chassis ground shall be used to reduce the radio frequency interference.
- FCC radio frequency exposure limits may be exceeded at distances closer than 23 centimeters from the antenna of this device.
- All antenna installation work shall be carried out by a knowledgeable and professional installer.

Welcome

Overview of the I.WiLL™ 300-24 Access Point

The I.WiLL™ 300-24 Access Point (300-24) is the first Wi-LAN product based on the Wide-band Orthogonal Frequency Division Multiplexing (W-OFDM) technology. With a peak data rate of 30 Mbps in 25 MHz of bandwidth, the 300-24 demonstrates the industry's most efficient use of bandwidth. The Dynamic Time Allocation technique allocates variable time slots to busy stations when needed. Valuable bandwidth is not wasted allocating time to idle stations.

The 300-24 operates in the 2.4-2.4835 GHz license-exempt ISM band allowing you to provide wireless networking connectivity at a fraction of the wire, cable, or fibre networking costs. You can manage, configure, and monitor the entire wireless network through the RS-232 management port, SNMP, or telnet.

About this Guide

This guide provides instruction on how to install and configure your 300-24. The guide is intended for individuals with basic experience installing and configuring telecommunications and networking equipment. For assistance installing and configuring the 300-24 contact Wi-LAN support. See *Customer Support* on page 3 for information about contacting Wi-LAN.

What's in this Guide

The following table shows the information in each section of this guide:

This section...	Contains this information...
Welcome	An overview of the 300-24, identifying who should use this guide, how to obtain customer support, and introducing the terms used in this guide.
Get Started	An introduction to the 300-24 front and back panels, and a description of the LEDs and connectors on the panels.
Completing Pre-Installation	A list of the installation requirements, instruction on how to complete preliminary layout of your 300-24 system, including working with antennas and fade margins, and pre-configuring the unit.

This section...	Contains this information...
Determining the RF Link	Instruction on how to plan your RF link, calculate the link budget, and an example of a link budget calculation.
Installing Base and Remote Stations	Instruction on how to install the base and remote stations, including antenna installation, rack installation, and working with the fade margin.
Configuring Using the Menus	Step-by-step instruction on configuring the 300-24 using the configuration menus.
Using SNMP	A detailed description of the Wi-LAN SNMP MIB object identifier nodes specific to the 300-24.
Appendix A: Product Specifications	Specific technical details of the 300-24.
Appendix B: Monitor Link Mode	Details about how to monitor the link mode including monitoring the RSSI, null depth, and fade margin.
Appendix C: Upgrading Software	Instruction on how to upgrade the board software using FTP.
Glossary	An alphabetical list of the terms used in this guide.
Index	A detailed alphabetical index of this guide.

Conventions Used in this Guide

This guide uses specific typographic conventions to help you work with the guide when you install and configure the 300-24. The following conventions are used:

This...	Indicates...	For example...
italic text	A configuration menu screen.	*Main System* menu
bold arial	A menu item you select or a key you press on the keyboard.	Select **System Commands** or Press the **Enter** key
bold serif	Text that you type into a configuration menu.	On the command line, type **telnet <IP address>**
Select	To move the arrow cursor (->) beside the menu item in the configuration menu.	Select **System Commands**
Press	To press a key on your keyboard.	Press the **Enter** key

This...	Indicates...	For example...
Entry field	A field beside a menu item into which you can type or select a configuration option.	The OFDM Station Type entry field
Scroll	To press the up and down arrow keys to move through items in an active entry field.	In the OFDM Station Type entry field, scroll to select Base Unit
menu	A configuration screen where you can select and apply a configuration setting.	The *Main System* menu
window	A configuration screen where you can only view information. You cannot select any configuration settings from the menu.	The *System Software ROM Images* window

Customer Support

You can contact Wi-LAN's applications engineers to help you troubleshoot your Wi-LAN products and your wireless network applications. Our applications engineers are also available to help you identify the most cost-effective solutions or configurations for your applications.

Contacting Customer Support

You can contact Wi-LAN customer support by:

For this location...	Contact support by...
Canada and USA	Calling toll free: +1-800 258 6876 Available from: 6:00 a.m. to 5:00 p.m. (GMT-7:00)
Outside North America	Calling: +1-403 273 9133 Available from: 6:00 a.m. to 5:00 p.m. (GMT-7:00)
All locations	Sending an e-mail message to: techsupport@wi-lan.com

You can also contact the Wi-LAN dealer or representative in your region. Call Wi-LAN at the support numbers indicated above for the dealer in your area, or send an e-mail message to techsupport@wi-lan.com.

Get Started

Overview

The I.WiLL™ 300-24 Access Point (300-24) is a multi-point product that allows wireless connection of remote computers or LAN segments at signaling rates up to 30 Mbps. The unit is self-contained and easy to use. You do not need installation disks or software drivers to get started. You simply connect the 300-24 to each LAN segment.

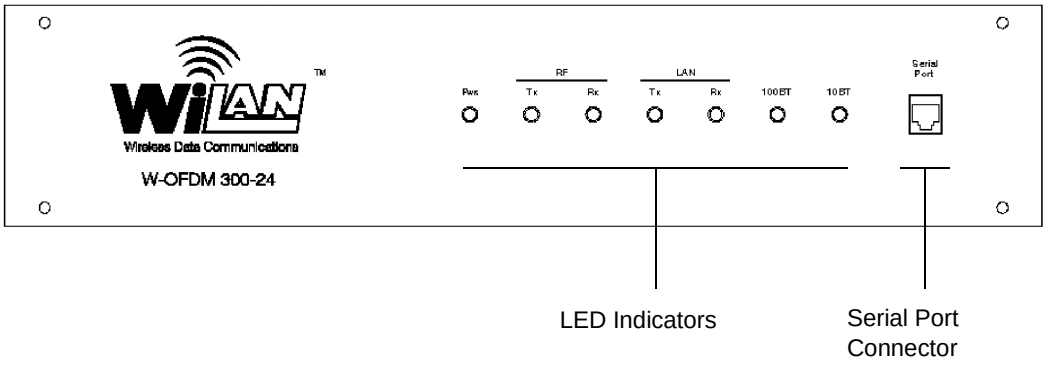
This section introduces you to the front and back panels of the 300-24 and describes the connectors and LEDs on the panels.

Understanding the Front and Back Panels

The 300-24 has connectors on the back and front panels that you need to be familiar with before you install and configure the unit. You should also understand the color states of the LEDs on the front panel.

The Front Panel

Following is an illustration of the front panel:



Front Panel Description

Following is a description of the connector on the panel:

Connector Type	Description
RJ11 Serial Port Connector	Enables you to configure the 300-24 using the RS-232 Serial Port Interface. Only Data Transmit, Data Receive, and Ground are used (pins 2, 3, and 5 respectively). **Note:** You may have to use a male DB9 adaptor to connect to the PC.

Front Panel LEDs

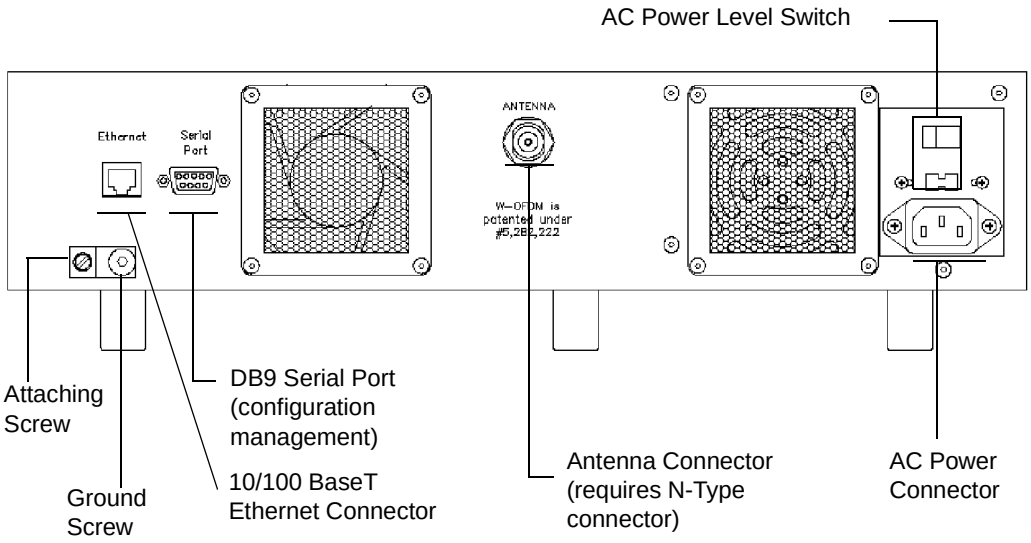
During normal operation, the Tx and Rx LEDs blink.

The front panel has seven LEDs (Light Emitting Diodes) that indicate the normal operational status of the transceiver. Following are the LED color states and their associated status:

LED Type	Color	Status
Link - 10BT	Green	Active 10BaseT ethernet connection
	Off	Inactive 10BaseT ethernet connection
Link - 100BT	Green	Active 100BaseT ethernet connection
	Off	Inactive 100BaseT ethernet connection
LAN - Tx	Green	Transmitting to the wire (ethernet)
	Off	Inactive LAN Tx
LAN - Rx	Green	Receiving from the wire (ethernet)
	Off	Inactive LAN Rx
RF - Tx	Green	Transmitting to the air
	Off	Inactive RF Tx
RF - Rx	Green	Receiving from the air
	Off	Inactive RF Rx
Power	Green	Power is connected to the transceiver
	Orange	Power on self test
	Off	No power is connected to the transceiver

The Back Panel

Following is an illustration of the back panel:



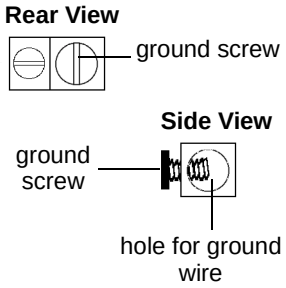
Back Panel Description

Following are descriptions of the items on the back panel:

Item	Description
10/100 BaseT Ethernet Connector (RJ45 connector)	The RJ45 connector uses a standard 10/100BaseT pin out. The connector auto-negotiates the level requirements; it automatically sets the network media support level. **Note:** Cabling between 10/100baseT nodes is usually through a network hub. To make a direct 10/100baseT connection between a 300-24 and a PC, use a standard ethernet crossover cable.
DB9 Serial Port (configuration management)	Enables you to configure the 300-24 using the RS-232 Serial Port Interface. Only Data Transmit, Data Receive, and Ground are used (pins 2, 3, and 5 respectively) - straight-through cable.
Antenna Connector	Enables you to connect an antenna to the 300-24. You must use an N-Type connector for all antennas. **Note:** All antenna installation work shall be carried out by a knowledgeable and professional installer.
Ground Screw	Enables you to attach a bared 18 gauge or better ground wire to ground the unit. You would use this grounding when the ground provided by the power cable is not adequate or does not meet the user's installation requirements.

Grounding the 300-24

If the power cable used in your installation does not have adequate grounding, or if the grounding does not meet your installation requirements, you will need to ground the unit using the ground screw located on the back of the unit. This might occur if you you are installing the unit on a rack, where solid chassis grounds are mandated by the installation specialists. The ground wire should be 18 gauge or better and the other end of the wire should be connected to the rack in the case of a rack mounted installation, or to the customer's facility grounding system. Following is an enlarged view of the ground screw identified in *The Back Panel* on page 7:



When you ground the unit, you need to insert the ground wire into the hole for the ground wire and then tighten the ground screw to secure the wire.

With a separate ground installed, the 300-24 may have a better earth ground than the local AC power outlets; an isolation transformer or laptop PC may be required if ground loop noise becomes troublesome. Proper electrostatic precautions must be followed.

Completing Pre-Installation

Overview

Before you install the I.WiLL™ 300-24 Access Point (300-24) you must perform certain preliminary steps to ensure an effective and reliable wireless link. These steps include:

- gathering your required installation tools, accessories, and power supplies
- determining the physical layout of your planned link
- planning your antenna and fade margin requirements
- pre-configuring the stations
- bench testing the units in a controlled environment

Each of these steps is described in this section.

Installation Requirements

Before you install the 300-24, you should have the following tools and accessories available:

- 10-32 x 3/4 Phillips oval head screws with plastic cup washers (Hammond P/N 1421 A for rack mount)
- 50 ohm coaxial cable (outdoor installation site)
- Allen Hex Driver/Allen Key 5/64"
- Robertson No. 0 screwdriver
- EPROM extractor for PLCC package
- EPROM extractor for DIP package
- Nut driver 3/16"

Ensure that the 300-24 shipping package contains the following items:

- rubber duck antenna
- N-Type male to TNC female adaptor (for installing the rubber duck antenna)
- DB9 adaptor (F) to 6 cond (RJ11)
- power supply cord
- straight-through ethernet cable (RJ45)
- crossover ethernet cable (RJ45)
- DB9 (M) to DB25 (F) adaptor
- RJ11 serial port cable (14’ modular plug)
- RS-232 DB9 serial cable

- I.WiLL™ 300-24 Access Point Installation and Configuration Guide
- Wi-LAN Documentation CD
- Warranty Card

If any of the above items are not included in the 300-24 shipping package, please contact Wi-LAN customer support. See *Customer Support* on page 3 for information on how to contact Wi-LAN.

Planning the Physical Layout

Before you install the units, you must determine the physical locations for each component of your 300-24 system. When you plan the physical layout, you will need to:

- use a GPS, map, or other distance measurement method to determine the physical distance between each unit

You must have a professional installer assess and calculate the following:

- the antenna mast height requirements and fade margins
- the cable requirements including routing, between antenna and unit
- the fade margin to determine the reliability of your wireless link
- the weatherproofing requirements

Determining the Physical Distance Between Sites

Due to the high frequency and low output powers permitted in the ISM band, no obstructions can be tolerated between two antennas.

Before you install the units, use a mapping method to determine the distance between your sites. When you determine the distance, you must check the radio path to identify any obstructions in the site path between radio locations. You can contact a Wi-LAN applications engineer to confirm that you have planned an effective radio layout. See *Customer Support* on page 3 for more information about contacting Wi-LAN.

Working with Antennas

If you are installing the unit in an indoor setting, the antenna packaged with the unit will be sufficient for indoor wireless communications. If you are installing the unit in an outdoor location, a professional installer must calculate the required mast height to ensure effective communication between your radio links. When installing an outdoor antenna, the professional installer should consider:

You should use lightening arrestors to ground your outdoor antenna, cables, and support structures.

- the required height of the antenna to ensure a clear line-of-site between the RF links
- regulatory restrictions, such as height, on antenna mast usage in the identified location
- obtaining permission from building owners if you intend to install your antenna on a rooftop
- potential wind load and ice loading impact on the antenna
- grounding requirements. The antenna must be properly grounded for lightening in accordance with the relevant electrical code for the installation location.

See *Working with Antenna Gain* on page 19 or see the *300-24 Product Specification* for more information about installing and selecting antennas in outdoor locations.

Determining Cable Requirements

If you are installing the antenna in an outdoor location, you will require 50 ohm coaxial cable to connect the unit to the antenna. You must minimize the length of the cable between the unit and antenna; the longer the cable length the greater the dB loss. You must calculate the required cable lengths before you install the 300-24.

Notes:

- You should use surge suppressors at the point of cable entry into the building.
- All cabling work must be carried out by a professional installer.

Working with Fade Margins

Once you've identified the physical locations of your antennas, the height of the antennas, and the cable length required, you can calculate the fade margin for your wireless link. The fade margin enables you to predict the reliability of your wireless link. See *Calculating Path Loss* on page 22 for more information about fade margins.

Note: The fade margin work must be carried out by a professional installer.

Assessing the Weatherproofing Requirements

Use surge suppressors at the point of cable entry into your building.

All 300-24 units must be located in a weatherproof environment with an ambient temperature between 0º and 30º Celsius. You must consider the building, heating, and air conditioning requirements to ensure that the unit operates within these conditions.

Pre-configuring the Stations

Typically, the physical layout of a 300-24 system involves significant distances between units. To ensure the efficiency of your wireless links you must pre-configure the following:

- a base station
- remote stations
- the polling list

You must assign each 300-24 unit a unique RF Station ID and configure the polling list before the unit will function properly. These steps must be completed and verified before you install any units.

Pre-configuring Stations

See *Configuring Using the Menus* on page 31 for instruction on using all of the configuration menus.

You must designate each 300-24 unit as a base or remote station and assign each 300-24 unit with a unique RF Station ID.

Differences Between the Remote and Base Station Menus

The options that appear in the *Main System* menu vary depending whether you configured the 300-24 unit as a base station or as a remote station. Following are the differences in the *Main System* menu:

For this station type...	This option appears...	This option does not appear...
Remote Station	IP Filter Configuration	Remote Station Configuration
Base Station	Remote Station Configuration	IP Filter Configuration

To configure a 300-24 unit as a base or remote station

1. Connect a computer to the 300-24 unit via the RS-232 serial port.
   Note: The computer should be powered down when you connect it to the 300-24.
2. Power up the computer.
   The *Login* menu appears.
3. At the Enter Password prompt, type your User Password.
   Note: When you start the 300-24 unit for the first time, the following user names and passwords apply:

User Name	Password	Access Level
user	user	Read-only access
supervisor	supervisor	Read/write access

4. Press the **Enter** key.
   The *Main System* menu appears:

IP Filter Configuration only appears in the *Main System* menu for units configured as remote stations.

```
      Main System Menu
 -> System Revision Information
    System Software ROM Images
    System Current Status
    System Security
    System Commands
    Network Configuration
    Radio Configuration
    IP Filter Configuration
    MAC Layer Statistics
```

Use the up and down arrow keys on the keyboard to select a menu item.

5. Select **Radio Configuration**.
6. Press the **Enter** key.
   The *Radio Configuration* menu appears:

```
         Radio Configuration
OFDM Station Type               -> Remote Unit
RF Station Id [0..1023]            2
RF Network Id [0..1023]            0
RF Center Frequency                2.440 GHz
```

7. Select **OFDM Station Type**.
8. Press the **Enter** key.
   The OFDM Station Type entry field is highlighted.
9. Complete the following steps depending on the type of station you are configuring:

To configure a...	Do this...
Base Station	In the OFDM Station Type entry field, scroll to select **Base Unit**.
Remote Station	In the OFDM Station Type entry field, scroll to select **Remote Unit**.

10. Press the **Enter** key.
    The unit is configured to the selected unit type.
11. Leave the *Radio Configuration* menu open.

To assign the base station or remote station an RF Station ID

1. In the *Radio Configuration* menu, select **RF Station ID [0..1023]**.

```
         Radio Configuration
OFDM Station Type                  Remote Unit
RF Station Id [0..1023]         -> 2
RF Network Id [0..1023]            0
RF Center Frequency                2.440 GHz
```

2. Press the **Enter** key.
   The RF Station ID entry field is highlighted.
3. Type a unique number for the RF Station ID.

Every unit you configure *must* have a unique RF Station ID. No two units can have the same ID.

4. Press the **Enter** key.
   The unit is assigned the RF Station ID.
5. Make a note of the RF Station ID you assigned to the unit.

6. Press the **Esc** key until you exit the *Configuration* menu.
7. Power down the computer.
   You have completed the pre-configuration for the unit.
8. Repeat the steps in *To configure a 300-24 unit as a base or remote station* and *To assign the base station or remote station an RF Station ID* for each unit you need to pre-configure.

Pre-configuring the Polling List

You pre-configure the polling list for *only* the base station.

1. Connect a computer to the 300-24 unit you configured as a base station via the RS-232 serial port.
   Note: The computer should be off when you connect it to the 300-24.
2. Power up the computer.
   The *Login* menu appears.
3. At the Enter Password prompt, type your User Password.
   Note: When you start the 300-24 unit for the first time, the following user names and passwords apply:

User Name	Password	Access Level
user	user	Read-only access
supervisor	supervisor	Read/write access

4. Press the **Enter** key.
   The *Main System* menu appears:

Remote Station Configuration only appears in the *Main System* menu for units configured as the base station.

```
      Main System Menu
-> System Revision Information
   System Software ROM Images
   System Current Status
   System Security
   System Commands
   Network Configuration
   Radio Configuration
   Remote Station Configuration
   MAC Layer Statistics
```

5. Select **Remote Station Configuration**.
   The *Remote Station Configuration* menu appears:

The *Remote Station Configuration* menu is two pages. The polling list can contain up to 100 stations.

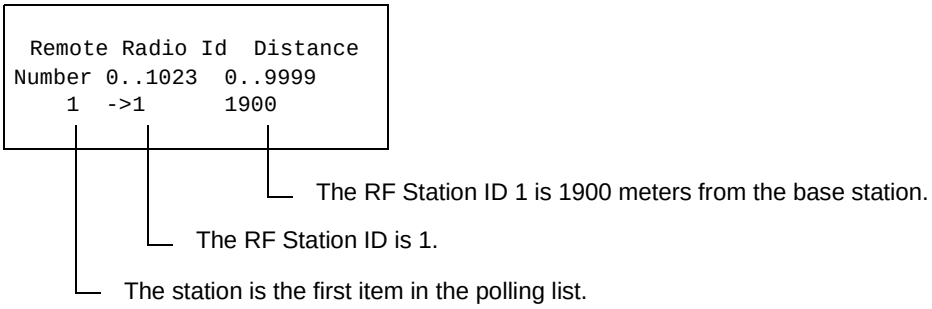
```
     Remote Station Configuration    - Page 1

Remote Radio Id  Distance Remote Radio Id  Distance Remote Radio Id  Distance

Number 0..1023  0..9999  Number 0..1023  0..9999    Number 0..1023  0..9999

    1  ->1      1900         2    2      1900           3    0      0
    4    0      0            5    0      0              6    0      0
    7    0      0            8    0      0              9    0      0
   10    0      0           11    0      0             12    0      0
   13    0      0           14    0      0             15    0      0
   16    0      0           17    0      0             18    0      0
   19    0      0           20    0      0             21    0      0
   22    0      0           23    0      0             24    0      0
   25    0      0           26    0      0             27    0      0
   28    0      0           29    0      0             30    0      0
   31    0      0           32    0      0             33    0      0
   34    0      0           35    0      0             36    0      0
   37    0      0           38    0      0             39    0      0
   40    0      0           41    0      0             42    0      0
   43    0      0           44    0      0             45    0      0
   46    0      0           47    0      0             48    0      0
   49    0      0           50    0      0             51    0      0
   52    0      0           53    0      0             54    0      0
   55    0      0           56    0      0             57    0      0
```

6. In the Radio Id field, type the Radio Station ID for the station (you must identify a unique Radio Id for all remotes and the base station).
   Note: The order in which you enter the IDs determines the polling sequence of the units.
7. In the Distance field, type the distance, in meters, from the Radio ID to the base station.
   Following is an example of a completed polling list entry:



8. Once you have entered the ID and distance for each remote station and the base station, press the **Esc** key until you exit the *Configuration* menu.
9. Power down the computer.
   You have pre-configured the polling list.

Bench Testing the 300-24

Before you deploy the 300-24 unit into a network configuration, you should familiarize yourself with the equipment by bench testing the unit in a controlled environment.

The receiver portion of the 300-24 unit is extremely sensitive, and the high sensitivity of the radio receiver can make testing in small environments difficult. Close proximity of the transmitter will overwhelm the radio's receiver. When you conduct your bench test, ensure that there is five feet between the two units.

You will need the following equipment to bench test the unit:

- 2 x portable or laptop computers with functioning 10/100 Ethernet adaptors
- 1 x 5 feet RG58 cables (terminated N Male x SMA Female)
- 1 x 5 feet RG58 cables (terminated N Male x SMA Male)
- 1 x 60 dB attenuation @ 2.44 Ghz (can be accommodated by 2 x 30 attenuators)
- 1 x straight-through RS232 cable DB9 x DB9
- 2 x Ethernet crossover cable

To bench test the 300-24

1. Use one of the Ethernet crossover cables to set up a peer-to-peer network between the two PCs.
2. Verify network operation by transferring a file between the two PCs.
3. Pre-configure each of the 300-24 units. Refer to *Pre-configuring the Stations* on page 11 for instructions on pre-configuring the units.
4. Insert the attenuation between the two RG58 cables.
5. Connect the opposite ends of the cables to each 300-24 unit. This creates a controlled path between the units of a known path loss.
6. Perform the link test between the two units. Refer to *Viewing the MAC Layer Statistics* on page 39 and *Appendix B: Monitor and Test Links* on page 75 for information about link tests.
   Using the required cables and attenuation for this bench test, the fade margin should be 32 dB (± 3 dB).
7. Finally, connect each PC to the 300-24 devices via the Ethernet cables.
8. Transfer a file using the same file transfer protocol used in step 2.
   The systems are now tested and configured for deployment into the network system.

Determining the RF Link

Overview

This section provides details about how to obtain the maximum range from your RF link. The effectiveness and reliability of your RF link depends on the following:

- antenna gain
- distance between antennas and obstructions in the RF path
- above-ground height of the antennas
- length and type of coaxial cable connecting the 300-24 and the antenna

The above factors are used to calculate your link budget. The link budget calculation indicates if your radio link is feasible over a given distance and path and if your RF link meets regulatory requirements. Link budgets are typically expressed in decibel (dB) format.

Calculating the Link Budget

Specific calculations must be completed to determine your link budget. This section describes the calculations and includes definitions of the terms and variables used in the calculations. The following dB terms are used in this section:

Term	Description
dB	Decibel. A relative measure of power used to specify power gains and losses. The difference in power P1 and P2 expressed in dB is: $dB = 10 \times \log\left(\frac{P1}{P2}\right)$
dBd	The gain or loss of an antenna reference to a standard dipole. Gain of a Standard Dipole = 2.14 dBi.
dBi	The gain or loss of an antenna referenced to an isotropic (theoretical point source) radiator. This measure is used with only antennas, as it quantifies gain or loss of a physical radiator with respect to a theoretical one.
dBm	A power measurement referenced to one milli-Watt. This is an absolute measure of power rather than a relative measure such as a gain or a loss.

Link Budget Variables

You will use the following variables when you calculate the link budget:

Variable	Description
System Gain	The maximum path loss that the system can support for usable data transmission.
ERP (Effective Radiated Power)	The power radiating from an antenna taking into account the output power from the transmitter, connector losses, cable losses, and the antenna gain.
Sensitivity	The minimum signal strength required for usable performance. Expressed in dBm.
Antenna Gain	Gain of the antenna over a dipole (dBd) or theoretical (dBi).
Propagation Loss	The signal loss experienced as it travels through the air. Expressed in dB.
Cable Loss	The signal loss experienced as it passes through the coax cable. Expressed in dB.
Path Loss	The total loss from one end of the path to the other. This includes propagation losses, cable losses, and any other losses that impact the system performance.

Working with System Gain

Proper path planning ensures that each end of the RF link receives sufficient signal power to maintain a desired Bit Error Rate (BER). The system gain of a radio system is the difference between the transmitted power and the receiver's sensitivity threshold. See *Link Budget Variables* on page 18 for definitions of these terms. Using this relationship, the system gain of the 300-24 is:

Formula:	System Gain = Tx Power - Rx Sensitivity		
Variables:	Tx Power	=	15dBm
	Receiver Sensitivity	=	-78dBm nominal for quasi-error free (BER 10^{-9}) operation
Calculation:	93dB = 15dBm - -78dBm		
More info:	To ensure reliable communications, the system gain plus all antenna gains must be greater than the sum of all losses. For a reliable link it is recommended that the system gain plus all antenna gains be greater than the sum of all losses by a factor of 13dB. This factor is known as the Fade Margin.		

Calculating ERP (Effective Radiated Power)

Unlike the Tx output power of the devices, ERP is subject to *both* antenna gain and cable losses.

ERP is the power radiating from an antenna taking into account the output power from the transmitter, the connector and cable losses, and the antenna gain. Because many antennas can provide a directional gain, the effective radiated power can increase. Losses, such as cable losses can subtract from this amount. You calculate the ERP as follows:

Formula:	ERP = Tx Power (dBm) - Cable Losses (dBm) - Connector Losses (dBm) + Antenna Gain (dB)
Note:	The FCC regulatory body has set the ERP limit to +36dBm for fixed point-to-point applications per FCC 15.247(b)(3)(i).
	Industry Canada RSS-139, Annex B specifies the maximum transmitter output at +30dBm, with a maximum EIRP (Equivalent Isotropically Radiated Power) at +36dBm for multi-point configurations and a maximum EIRP of +53dBm only for licensed point-to-point applications.
	In accordance with ETS 300-328 for 2.4GHz RLANs, the maximum EIRP shall not exceed +20dBm, with a maximum SPD (Spectral Power Density) not exceeding +10dBm/MHz. Confirmation is required with the relevant European national radio communications local authority for deviations from this specification.

Note: All ERP work must be completed by a professional installer.

Working with Antenna Gain

To ensure the best range and interference suppression, the external antenna should be directional, focusing the radio energy in one direction (toward the other end of the link). The direction can be azmuthal or a horizontal radiation angle. A directional antenna focuses the RF energy to the intended station rather than omni-directionally. This reduces interference from other systems that are operating at the same frequency.

Note: In some situations, you may want to use an omni-directional antenna in your system design. For example, you would use an omni-directional antenna for a base station with remote sites situated in a 360º path around it.

When you select an antenna, pay particular attention to the gain specification. When you select an antenna for a remote station, select an antenna with a gain that provides at least 13dB Fade Margin.

Antenna gain is specified in either dBi or dBd. When an antenna is specified in dBd, add 2.14dB to the value to convert it to dBi.

Note: All antenna gain work must be completed by a professional installer.

Calculating Propagation Loss

The propagation loss is the attenuation (reduction) in RF signal energy as it travels through space. In most wireless systems, losses through space are the major contributor to signal attenuation. When you know the intended installation locations of the base and remote stations, determine the physical line of sight distance and then calculate the RF attenuation as follows:

Formula:	Attenuation (dB) = 100dB + 20log(d_{km}) **where:** d_{km} = Distance in Kilometers 100dB = Pathloss Constant
Note:	The FCC regulatory body has set the ERP limit to +36dBm for fixed point-to-point applications per FCC 15.247(b)(3)(i). Industry Canada RSS-139, Annex B specifies the maximum transmitter output at +30dBm, with a maximum EIRP (Equivalent Isotropically Radiated Power) at +36dBm for multi-point configurations and a maximum EIRP of +53dBm only for licensed point-to-point applications. In accordance with ETS 300-328 for 2.4GHz RLANs, the maximum EIRP shall not exceed +20dBm, with a maximum SPD (Spectral Power Density) not exceeding +10dBm/MHz. Confirmation is required with the relevant European national radiocommunications local authority for deviations from this specification.

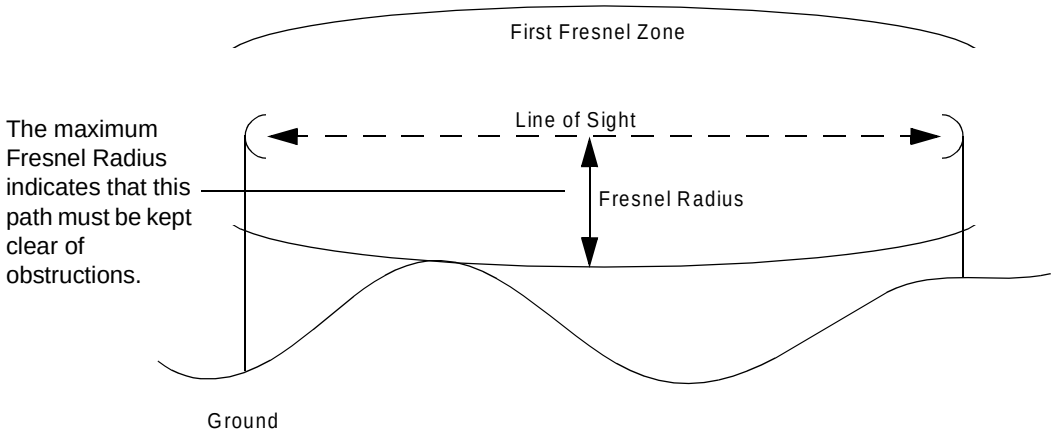
Note: All propagation loss work must be completed by a professional installer.

Working with the Fresnel Zone

It is essential to locate your antennas at maximum above-ground height to ensure the most effective and reliable link. Achieving maximum above-ground antenna height means that:

- all ground-based obstructions are cleared from the line-of-sight path
- the Fresnel Zone is clear of obstructions

The Fresnel Zone is the expansion of the RF signal radio angles in the vertical plane near the middle of the RF path. Following is a basic illustration of the Fresnel Zone concept:



The Fresnel radius is calculated as follows:

Formula:

$$\text{Fresnel Zone Radius} = 3.4 \times \sqrt{d_{km} + \left(\frac{d}{8.12}\right)^2} \text{ metres}$$

Calculating Cable Loss

Installations involving cable runs longer than a few feet must use high-quality, low loss shielded coax.

The wireless link is subject to implementation losses such as cable and connector losses. The two primary coaxial cable specifications for the 300-24 are:

- cable must be 50 ohms nominal impedance
- cable must be of a low loss type

Generally, cable losses are specified in dB/foot or dB/meter. Following is an example of cable loss ratings:

Cable Type	dB/foot	dB/meter
LMR400	0.0684	0.220
LMR600	0.0441	0.142

Notes:

- When you calculate path loss, you should add 1dB at each end of the link to compensate for connector losses in addition to the cable loss value.
- All cable loss work must be completed by a professional installer.

Calculating Path Loss

Path loss describes the total RF attenuation throughout the system from Tx antenna to Rx antenna. This includes the losses as the RF signal travels through space plus Tx and Rx cable loss, and Tx and Rx connector loss. Use the following formula to calculate path loss:

Formula: Path Loss = Tx and Rx Cable Loss + Tx and Rx Connector Loss + Propagation Loss

Once you know the path loss, you can compare the value to the system gain value. If the system gain value is greater than the path loss, the link is feasible. See *Working with System Gain* on page 18 for more information about system gain.

Note: All path loss work must be completed by a professional installer.

Working with the Fade Margin

Total antenna gain is:
Tx Antenna Gain + Rx Antenna Gain

The amount that the system gain plus the total antenna gain exceeds the path loss is called the Fade Margin. The Fade Margin is calculated as the number of dB that the received signal strength exceeds the minimum receiver sensitivity. You require some level of Fade Margin for any wireless system. The Fade Margin compensates for RF path fading due to weather conditions or nearby objects that induce multi-path signaling.

The Fade Margin for the 300-24 is a minimum of 13dB. The sum of the cable losses, connector losses, propagation losses, and the 13dB required Fade Margin should be less than the system gain value of 93dB.

Note: All fade margin work must be completed by a professional installer.

Link Budget Example

Putting everything together, you must satisfy the following equation to have a successful link:

The values for cable and connector losses in this example are *only* for illustration. You will need to work these out for your specific installations.

Formulas:

System Gain + Antenna Gain ≥ Propagation Loss + Fade Margin + Cable Losses + Connector Losses

or

Fade Margin ≥ System Gain + Antenna Gain - Propagation Loss - Cable Losses - Connector Losses

where:

System Gain = Tx Power - Rx Sensitivity
Antenna Gains = Tx Antenna Gain + Rx Antenna Gain
Cable Losses = Base Cable Losses + Remote Cable Losses
Connector Losses = Base System Connector Losses + Remote System Connector Losses

Variables:

Desired Fade Margin	=	13dB
Tx Power	=	15dBm
Rx Sensitivity	=	-78dBm
Tx Antenna Gain	=	9dB
Rx Antenna Gain	=	15 dB
Propagation Loss for desired range of 1km	=	$100 + 20 \times \log\langle 1 \rangle = 100\,\mathrm{dB}$
Tx Cable Losses (2m LMR400)	=	.44dB
Rx Cable Losses (2m LMR 400)	=	.44dB
Tx Connector Losses	=	.5dB
Rx Connector Losses	=	.5dB

Variable Calculations:

System Gain = 15dBm - -78dBm = 93dBm
Antenna Gains = 9dB + 15dB = 24dB
Cable Losses = .44dB + .44dB = .88dB
Connector Losses = .5dB + .5dB = 1dB

Fade Margin Calculation:

Fade Margin = 93dB + 24dB - 100dB - .88dB - 1dB = 15.12dB

Analysis:

We have achieved the goal of a Fade Margin ≥ 13dB.

Verifying a Link Budget

You need to verify the link budget in both directions: base station to remote station and remote station to base station.

To verify the link budget calculations, from the 300-24 user interface, measure the Received Signal Strength Indicator (RSSI), Null Depth, and the Fade Margin.

Note: The effects of multi-path are not the same in both directions of a link and you need to verify the link budget in both directions.

Following are descriptions of the link statistics you need to measure:

Term	Description
Null Depth	The difference in strength between the strongest and weakest OFDM carriers. A Null Depth of more than a few dB indicates the receiver is experiencing multi-path effects which are partially canceling the signal. If the Null Depth is more than 3dB, it should be compensated by moving the receiving antenna or increasing the antenna gain.
RSSI	A numeric indication of the received signal strength in dBm.

Reviewing the Link Statistics

See *Viewing the MAC Layer Statistics* on page 39 for more information about the *MAC Layer Statistics* window.

Once you set up the link and select the *Mac Layer Statistics* window in the user interface, you can measure the RSSI, Null Depth, and Fade Margin to ensure that the link is functioning properly. See *Appendix B: Monitor and Test Links* on page 75 for more information about monitoring link statistics after the system installation is complete.

You need to measure:

- Null Depth
- Bit Error Rate (BER)

Interpreting the Null Depth

When you interpret the link statistics, you need to subtract the Null Depth from your budgeted Fade Margin. For example, if you budgeted a 13dB Fade Margin, and you have an indicated Null Depth of 3dB and an indicated Fade Margin of 10dB, then your calculations were correct.

Budgeted Fade Margin = Indicated Null Depth + Indicated Fade Margin

where:

13dB = 3dB + 10dB

For small Null Depths, you will typically proceed with a reduced Fade Margin as long as the number of uncorrected errors is zero, or is incrementing very slowly during peak traffic periods.

Interpreting Bit Error Rate (BER)

The BER after Reed-Solomon Forward Error Correction (RS FEC) can be computed from the number of uncorrected byte errors and the total number of frames received. The following constants are used in the calculation:

- 1536 bytes per frame
- 8 bits per byte
- 1.25 bit errors per uncorrected byte error (on average)

From these values, the following formula is structured:

BER = 1.25 x Uncorrected Bytes / (Number of Frames x 1536 x 8)

You need to accumulate approximately 80 byte errors, or 100 bit errors, to receive statistically significant results. The final test of a good link, is when the BER on the monitoring computer is 10^{-9} or better.

Installing Base and Remote Stations

Overview

Once you have determined the RF link and configured the units, you can install the 300-24 units at the site locations.

Installing the Antenna

If your antennas will be located on a support structure, or on top of a tower, you should have a professional tower worker complete the antenna installation. When you install the antenna, ensure that:

If you are using rubber duck or rubber dipole antennas, they should be pointed vertically (up).

- the antennas for the system have the same polarity (vertical or horizontal).
- all connectors attaching the coaxial cable to the antenna are properly weatherproofed.
- a drip loop is formed at the building entrance, to prevent water flowing down the coaxial cable from entering the installation building.
- the coaxial cable is secured to the supporting structure at one meter intervals. This will prevent wind damage and frost loading problems.
- the antenna is firmly attached to the mast to prevent it from falling, yet has some flexibility so that you can move the antenna to fine-tune antenna position.
- the coaxial cable is connected to the antenna and to the antenna port on both sides of the link (base and remote stations).

Note: All antenna installation work must be completed by a professional installer.

Powering Up the Units

Before you power up the units, ensure that the AC Power Level Switch on the back panel of the unit is set correctly. An incorrect power level setting can cause serious damage to the unit when it is powered up.

When you successfully power up the unit, the Power LED on the front panel will initially be orange, and then change to green. See *Front Panel LEDs* on page 6 for more information about the LED display.

You need to verify that your hardware and software revision numbers match those on the data list shipped with the unit. If the numbers do not match, contact Wi-LAN customer support. See *Contacting Customer Support* on page 3 for more information about contacting Wi-LAN.

To verify the revision numbers

1. Access the Configuration menus using Telnet or RS-232.
   See *Accessing the Menus* on page 31 for more information about accessing the Configuration menus and logging into the system.
2. Access the *System Revision Information* window and verify that the hardware and software revision numbers shown in the window match those on the data list shipped with the unit.
   See *Viewing System Revision Information* on page 35 for more information about viewing the *System Revision Information* window.

Verifying the RF Port

You can connect two units together back to back via an RF cable to verify the RF port. You need to ensure that:

- you have at least 70dB of RF attention between the RF ports of the two units.
- the units are at least 10 meters apart.
- you connect a 30dB attenuator directly to each RF port to minimize cross-talk between units.
- the attenuators have at least a 20dBm power rating.
- you add another 10dB of attenuation between the units, either at one end or in between the units.

To verify the RF port

1. Access the Configuration menus and verify the following:

Verify that...	For more information see...
The IP addresses are unique for each unit.	*To set the Internet IP address* on page 52.
The IP Masks are the same for both units.	*To set the Internet IP mask* on page 52.
The MAC addresses are unique for both units.	*To set the ethernet MAC address* on page 53.
One unit is a base station and all others are remotes.	*To set the OFDM station type* on page 57.
All units are included in the Base Station's Remote Poll Configuration.	*To configure the polling list* on page 61.
There is both ethernet and wireless access to the unit's TCP/IP stack.	*To set ethernet and wireless access* on page 42.
The host computers connected to the unit are on the same subnet.	*Setting the Internet IP Address* on page 52.

Verify that...	For more information see...
The host computers connected to the units have unique IP addresses with respect to themselves and the units.	*Setting the Internet IP Address* on page 52.

2. From each end of your two unit connection, ping the unit from the wire and wireless sides.
3. From each end of your two unit connection, telnet to the unit from the wire and wireless sides.

If you can successfully communicate to all units through ping and telnet, your RF port is verified.

Fine-tuning Antennas

The link statistics display in real time. Any changes to the antenna position are immediately represented in the link monitoring screen.

You can fine-tune the antennas by generating consistent steady traffic through the 10/100BaseT port at one end and then, at the receiving end, connecting a PC via the RS-232 to monitor the link statistics. You can ping the computer to create steady traffic. Ensure that the link statistics show an adequate Fade Margin and that the Null Depth is less than 4dB. See *Appendix B: Monitor and Test Links* on page 75 for information about monitoring the link statistics.

Reposition the antennas until the required link statistics values are achieved. Once the antennas have been adjusted to maximize performance, you can secure them properly to the support structures.

Note: All antenna fine-tuning must be completed by a professional installer.

Completing the Installation Connections

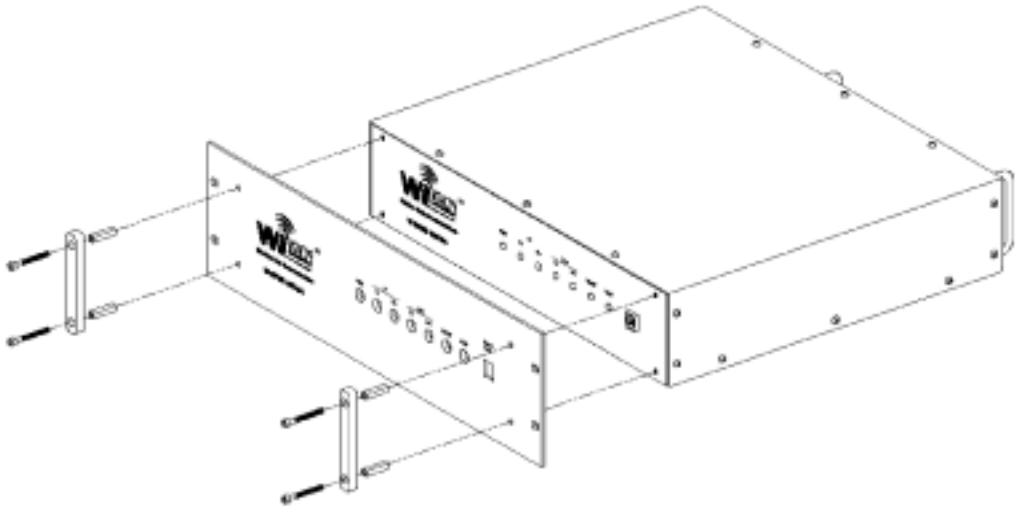
Once the antennas are properly positioned, you need to connect the 300-24 to its LAN segment. You complete this connection as you would connect a PC to a LAN segment.

Note: Cabling between 10/100baseT nodes is usually through a network hub. To make a direct 10/100baseT connection between a 300-24 and a PC, use a standard crossover cable. You must swap pins 1 & 3 and 2 & 6.

Once the connection is complete, the 300-24 unit is ready for network traffic.

Installing the Units on a Rack

You can mount the 300-24 unit in a rack. The face plate and hardware for rack installations is included in the 300-24 shipping package. Following is an illustration of how to attach the face plate to the 300-24:



The unit is designed for installation in a 19 inch rack that is 3U high.

Configuring Using the Menus

Overview

This section includes some general information about:

- accessing and modifying the configuration settings
- working with the configuration menus to define your 300-24 system settings

You can use the following methods to access and configure the 300-24 units:

- Telnet
- RS-232 Management Port
- SNMP

See *Using SNMP* on page 65 for information about using SNMP.

You can configure any unit as a base or a remote station. Each system configuration includes only one base station, however it can include multiple remote stations. If you need a true wide area network where all sites pass all data packets, the base and remote stations need to communicate directly with each other. Every station will receive and decode all packets and a true LAN/WAN network is created from individual segments.

Navigating the Configuration Menus

You use the keyboard keys to highlight and apply configuration options in the configuration menus. See *Conventions Used in this Guide* on page 2 for descriptions of the menu selection conventions used in this guide.

Accessing the Menus

As discussed earlier in this section, you can access the configuration menus using the following two methods:

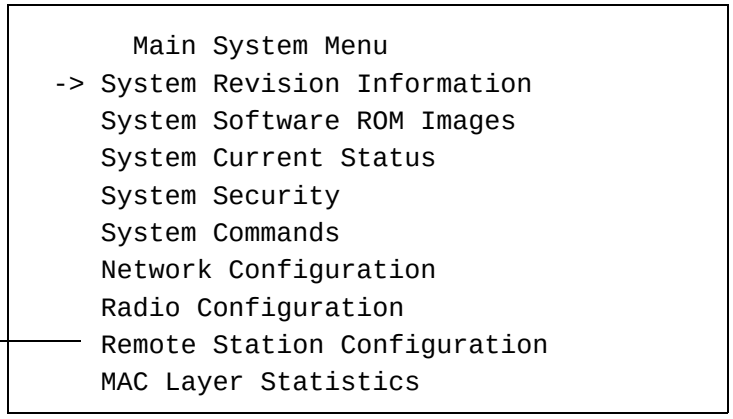
- RS-232 Management Port
- Telnet

Using the Console

You can access the configuration menus by connecting a PC to the unit through the RS-232 Serial Port Interface. Typically, you will use this access method to complete pre-installation configuration and to initially set up your 300-24 system.

To access the configuration menus through the console

1. Disconnect the power from the 300-24.
2. Connect a serial cable from a DB9 serial port on the PC to the RS-232 serial port on the 300-24.
   Note: You can access the RS-232 serial port through the RJ11 connection on the front of the unit, or through the DB9 connection on the back panel. Adaptors to complete these connections are shipped with the 300-24.
3. Start a terminal emulation program on the PC.
4. Set the terminal emulation program to emulate a VT100 terminal at:
   - 9600 baud
   - 8 data bits
   - no parity
   - 1 stop bit
5. Set the terminal program to use the PC serial port that is connected to the 300-24 unit.
6. Power up the unit.
7. Press the spacebar on the keyboard.
   The *Login* menu appears.
8. At the Enter Password prompt, type your User Password.
   The *Main System* menu appears:



Remote Station Configuration only appears in the *Main System* menu for units configured as the base station.

You can now start configuring the unit.

Using Telnet

Typically, you will use telnet to access the configuration menus once you have already completed the initial unit configuration. Because you telnet to the unit's IP address, you must have already defined the address before you can telnet to it.

This configuration method is effective when you need to configure a unit from a remote location.

To use the keyboard up and down arrow keys to navigate the configuration menus, ensure that the VT100 Arrows feature in your telnet session is enabled.

To access the units through telnet

1. From a VT100 terminal, or emulation, type **telnet <IP address>**.
   Where <IP address> is the address of the unit that you want to configure.
   Note: If you are using Microsoft Telnet 1.0 as your terminal emulation application, see *To set the VT100 arrows in Microsoft Telnet* below for instruction on setting the VT100 arrows.
2. Press the **Enter** key.
   The *Login* menu appears.
3. At the Enter Password prompt, type your User Password.
   The *Main System* menu appears:

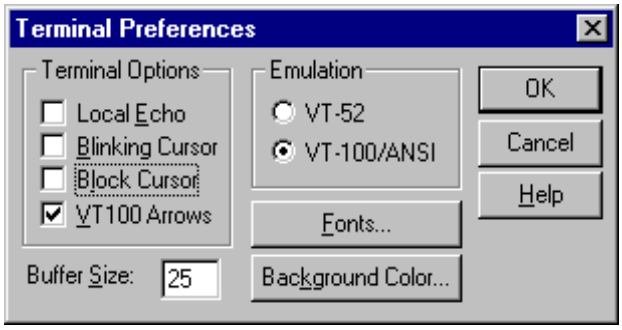
IP Filter Configuration only appears in the *Main System* menu for units configured as remote stations.

```
      Main System Menu
-> System Revision Information
   System Software ROM Images
   System Current Status
   System Security
   System Commands
   Network Configuration
   Radio Configuration
   IP Filter Configuration
   MAC Layer Statistics
```

You can now start configuring the unit.

To set the VT100 arrows in Microsoft Telnet

1. In the active Microsoft Telnet 1.0 session, select **Terminal, Preferences** from the menu bar.
   The *Terminal Preferences* window appears:



2. Click to select the **VT100 Arrows** checkbox.
3. Click **OK**.
   The VT100 arrows are enables in the telnet session, and you can use the keyboard arrow keys to navigate the configuration menus.

Exiting the Configuration Menus

Once you have configured the unit, you must exit the menus before disconnecting the unit from the PC.

To exit the configuration menus

1. Press the **Esc** key on the keyboard until you exit the configuration menus.
2. Power down the computer.

Viewing System Information

You can use the *Main System* menu to view the following system information:

- system revision information
- system software ROM images
- current system status
- MAC (Media Access Control) layer statistics

Viewing System Revision Information

The system revision information shows details about the system including the:

- version of the 300-24 hardware
- RAM and ROM size
- version number of the system image file on the unit
- version date of the system image file on the unit
- name of the image file running on the 300-24

To view system revision information

1. From the *Main System* menu, select **System Revision Information**.
   The *System Revision Information* window appears:

You can only view information in this window. You cannot select or apply any configuration settings.

```
              System Revision Information

Hardware      Rev 0.0.0 (4MB RAM, 512K AMD Flash)
ROM Size      0x80000
RAM Size      0x400000

Software      Rev 0.0.0 (Wi-LAN Ethernet/OFDM)
File Date     Oct  8 1999 18:28:33
File Name     FACTORY-IMAGE
```

2. Following is a description of the fields in the window:

This field...	Shows this...
Hardware	The revision number of the 300-24 unit, and the RAM and AMD Flash installed in the unit.
ROM Size	The amount of read-only memory in the unit.
RAM Size	The amount of random-access memory in the unit. This value also appears in the Hardware field.
Software	The revision number of the system image running on the unit.
File Date	The revision date and time of the system image running on the unit.
File Name	The file name of the system image running on the unit.

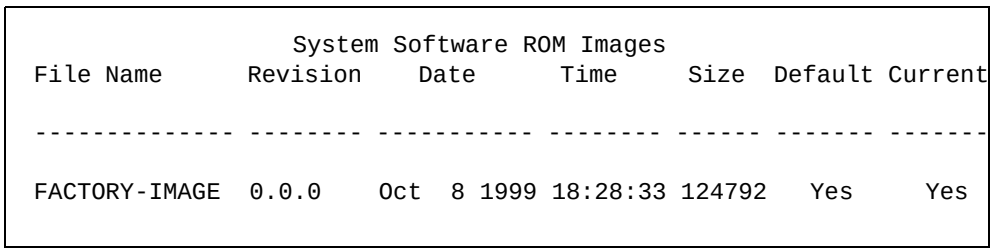
Viewing System Software ROM Images

The *System Software ROM Images* window shows a list of all images that are available on the unit. Initially, only the Factory-Image is available, however as new images are developed, Wi-LAN will place them on their web site where you can download the system image files.

To view system software ROM images

1. From the *Main System* menu, select **System Software ROM Images**.
   The *System Software ROM Images* window appears:

You can only view information in this window. You cannot select or apply any configuration settings.



System Software ROM Images

File Name	Revision	Date	Time	Size	Default	Current
FACTORY-IMAGE	0.0.0	Oct 8 1999	18:28:33	124792	Yes	Yes

2. Following is a description of the fields in the window:

This field...	Shows this...
File Name	The names of all system image files stored in the unit.
Revision	The revision number of the system image file. Each time the system image is modified, the revision number increases by 1 unit. For example, the first revision to the file would make the revision number 0.0.1.
Date	The date the image file was last revised.
Time	The time the image file was last revised.
Size	The size of the image file in bytes.
Default	Indicates if the image file starts when the 300-24 is powered up.
Current	Indicates if the image file is currently operating on the unit.

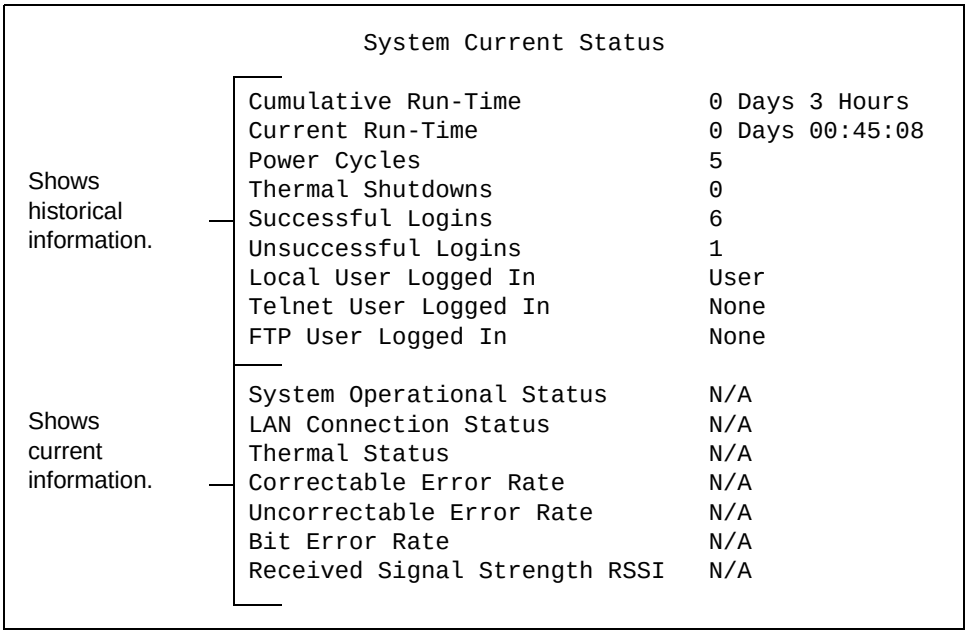
Viewing Current System Status

The *Current System Status* window shows historical and current information about the unit. This information enables you to view the current state of the system and, if you are troubleshooting system problems, provides historical information that can help you monitor and troubleshoot your system.

To view current system status

1. From the *Main System* menu, select **System Current Status**.
   The *System Current Status* window appears:

You can only view information in this window. You cannot select or apply any configuration settings.



2. Following is a description of the fields in the window:

You can reset these statistics to 0. See *Resetting the Statistics* on page 50 for more information.

This field...	Shows this...
Cumulative Run-Time	The number of hours the system has been running since purchase. This information is required for maintenance purposes.
Current Run-Time	The time duration that has passed since the unit was last reset.
Power Cycles	The number of times that the unit has been powered down and repowered up.
Thermal Shutdowns	The number of times that the unit has automatically powered down due to overheating.
Successful Logins	The number of times that the configuration menus have been successfully accessed.
Unsuccessful Logins	The number of times that access to the configuration menus has failed.

This field...	Shows this...
Local User Logged In	The access level of the user currently logged into the configuration menus via the RS-232.
Telnet User Logged In	The access level of the user currently logged into the configuration menus via a telnet session.
FTP User Logged In	The access level of the user currently logged into the configuration menu via an FTP session.
System Operational Status	Not implemented in this release.
LAN Connection Status	Not implemented in this release.
Thermal Status	Not implemented in this release.
Correctable Error Rate	Not implemented in this release.
Uncorrectable Error Rate	Not implemented in this release.
Bit Error Rate	Not implemented in this release.
Received Signal Strength RSSI	Not implemented in this release.

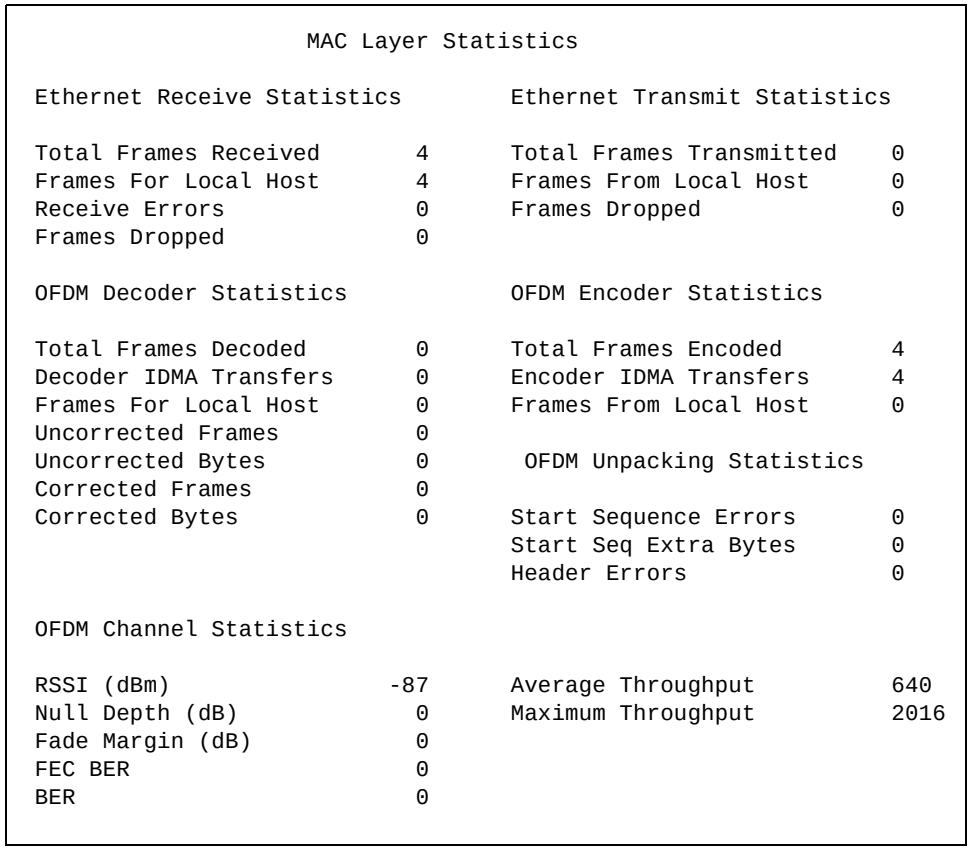
Viewing the MAC Layer Statistics

The MAC layer statistics show the performance of the unit in the 300-24 system. Information such as ethernet transmit and receive statistics, and OFDM encoder, decoder and unpacking statistics enable you to view how the system is performing and where there are errors that need to be addressed.

To view the MAC layer statistics

1. From the *Main System* menu, select **MAC Layer Statistics**.
   The *MAC Layer Statistics* window appears:

You can only view information in this window. You cannot select or apply any configuration settings.



2. Following is a description of the fields in the window:

This field...	Shows this...
Total Frames Received	The number of ethernet frames received from the 100Base-T connection.
Total Frames Transmitted	The number of ethernet frames transmitted onto the 100Base-T connection.
Frames For Local Host (Ethernet Receive)	The number of ethernet frames received from the 100Base-T connection which were destined for the 300-24 unit's TCP/IP stack.

This field...	Shows this...
Frames From Local Host (Ethernet Transmit)	The number of ethernet frames transmitted onto the 100Base-T connection which originated from the 300-24 unit's TCP/IP stack.
Receive Errors	The number of ethernet frames received with errors, for example, runt (smaller than 64 bytes), jabber (larger than 1518 bytes), or overflow error.
Frames Dropped (Ethernet Transmit)	The number of ethernet frames not transmitted due to some error, for example, unable to transmit within 15 retries, or underflow error.
Frames Dropped (Ethernet Receive)	The number of ethernet frames dropped because the wireless link is at capacity and all of the queues are full.
Total Frames Decoded	The number of ethernet frames that went through the rs-decoder without uncorrectable errors.
Total Frames Encoded	The number of ethernet frames that went through the rs-encoder.
Decoder IDMA Transfers	The number of RF superframes received by the rs-decoder
Encoder IDMA Transfers	The number of RF superframes produced by the rs-encoder
Frames For Local Host (OFDM Decoder)	The number of ethernet frames that went through the rs-decoder without uncorrectable errors which were destined for the 300-24 unit's TCP/IP stack.
Frames From Local Host (OFDM Encoder)	The number of ethernet frames that went through the rs-encoder which originated from the 300-24 unit's TCP/IP stack.
Uncorrected Frames	The number of RF superframes received by the rs-decoder that have uncorrectable errors.
Uncorrected Bytes	The total number of bytes through the rs-decoder which have uncorrectable errors.
Corrected Frames	For Wi-LAN use only. The number of RF superframes received by the rs-decoder that have correctable errors.
Corrected Bytes	For Wi-LAN use only. The total number of bytes through the rs-decoder which have correctable errors.
Start Sequence Errors	For Wi-LAN use only.
Start Seq Extra Bytes	For Wi-LAN use only.
Header Errors	For Wi-LAN use only.

This field...	Shows this...
RSSI (dBm)	Received signal strength indicator (in dB relative to 1 milliWatt).
Null Depth (dB)	The difference between the strongest and weakest carriers.
Fade Margin (dB)	Fade Margin.
FEC BER	Bit Error Rate after forward error correction.
BER	Bit Error Rate before forward error correction.
Average Throughput	The total throughput (per second) averaged over 10 seconds.
Maximum Throughput	The highest throughput over 1 second since the last stats reset.

Setting the System Security

You can set the security levels and access settings for the system through the *Main System* menu. These settings enable you to:

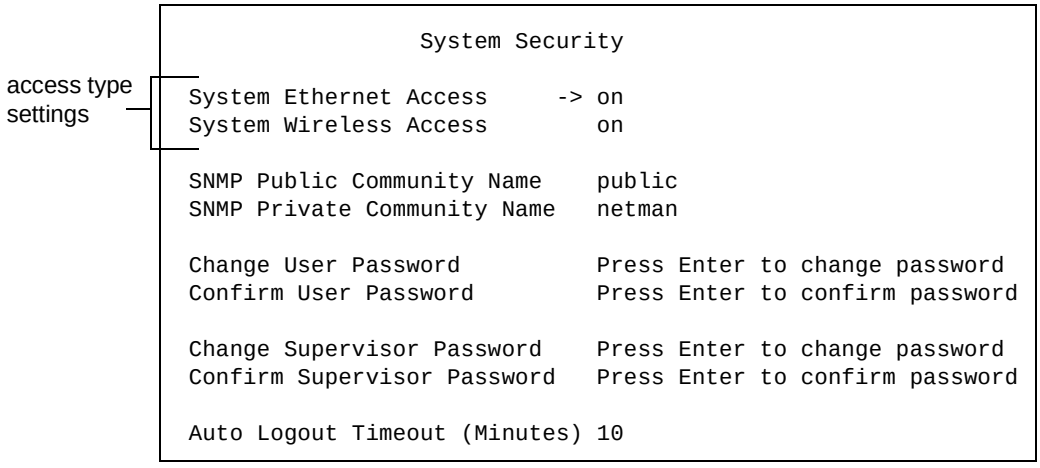
- set the ethernet and wireless access
- set community names which the SNMP Manager uses to access the unit
- define the user and supervisor passwords
- define the auto logout timeout

Setting Access Types

Setting the access types involves enabling or disabling access to the unit via the ethernet and/or via the air. The default setting for access is set to on, for both the ethernet and wireless. Depending on your security requirements, you may want to modify these settings.

To set ethernet and wireless access

1. From the *Main System* menu, select **System Security**.
   The *System Security* window appears:



2. Select **System Ethernet Access**.
   An arrow appears to the left of the System Ethernet Access entry field.
3. In the System Ethernet Access entry field, select an option as follows:

Select...	To...
On	Enable access to the unit via the ethernet
Off	Disable access to the unit via the ethernet.

4. Press the **Enter** key.
5. Select **System Wireless Access**.
   An arrow appears to the left of the System Wireless Access entry field.
6. In the System Wireless Access entry field, select an option as follows:

Select...	To...
On	Enable access to the unit via the air
Off	Disable access to the unit via the air.

7. Press the **Enter** key.

Setting Community Names

Setting a community name enables you to manage your system using an SNMP Manager. The public and private community names identify the unit to the SNMP Manager and, depending on the name SNMP uses to identify the unit, indicates if you can execute commands on the unit.

To set a community name

1. From the *Main System* menu, select **System Security**.
   The *System Security* window appears:

community name settings

```
                  System Security

System Ethernet Access        on
System Wireless Access        on

SNMP Public Community Name -> public
SNMP Private Community Name   netman

Change User Password          Press Enter to change password
Confirm User Password         Press Enter to confirm password

Change Supervisor Password    Press Enter to change password
Confirm Supervisor Password   Press Enter to confirm password

Auto Logout Timeout (Minutes) 10
```

2. Select **SNMP Public Community Name**.
   An arrow appears to the left of the SNMP Community Name entry field.
3. Press the **Enter** key.
   The entry field changes to edit mode.

A field in edit mode appears in reverse colors. The text appears as white, and the field is highlighted in black.

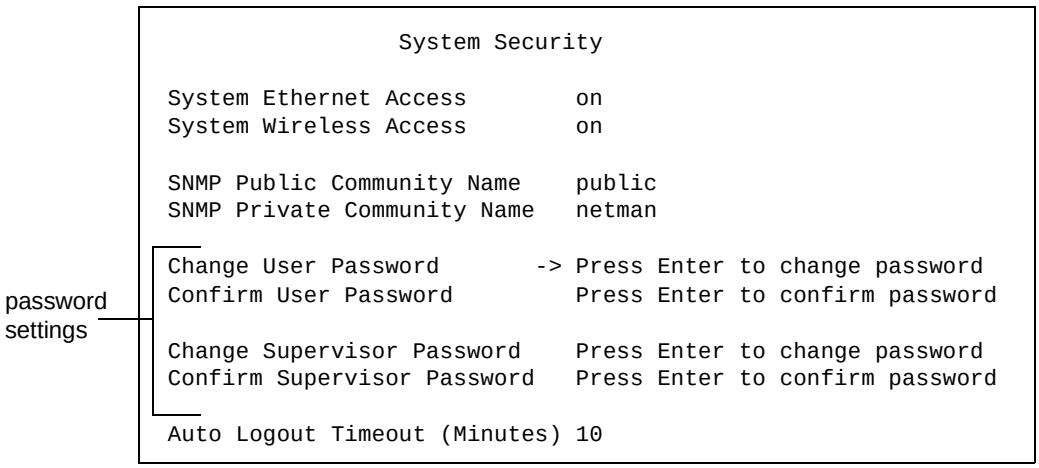
4. Type a name for the Community Name.
5. Press the **Enter** key.
   The name appears in the entry field.
6. Select **SNMP Private Community Name** and then repeat steps 3 to 5.

Setting Passwords

You can control access to the configuration menus by setting passwords for users and supervisors. Typically, users will have read-only access to all menus, while supervisors can modify configuration settings.

To set passwords

1. From the *Main System* menu, select **System Security**.
   The *System Security* window appears:



2. Select **Change User Password**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The entry field changes to edit mode.

A field in edit mode appears in reverse colors. The text appears as white, and the field is highlighted in black.

4. Type the new password.
5. Press the **Enter** key.
   An arrow moves to the left of the Confirm Password entry field.
6. Press the **Enter** key.
   The entry field changes to edit mode.
7. Re-type the password you typed in step 4.
8. Press the **Enter** key.
   The change is saved.
9. Select **Change Supervisor Password** and then repeat steps 3 to 8.

Setting Automatic Timeouts

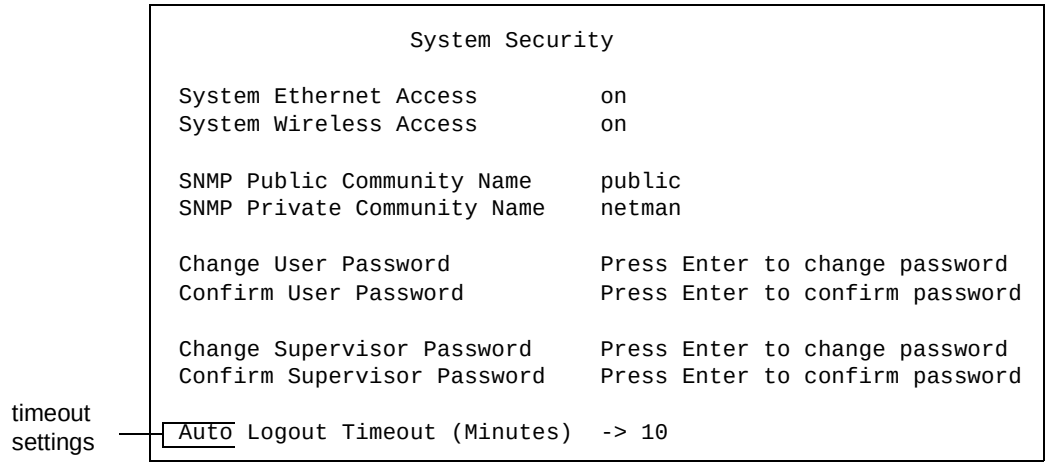
If the menus automatically time out, the system appears frozen.

Press the **Enter** key to view the *Login* window where you can log in to the menus.

You can specify the maximum idle time period that can pass before the configuration menus close and the *Login* menu reappears. This ensures that the system closes if a user forgets to exit out of the configuration menus.

To set the automatic timeout period

1. From the *Main System* menu, select **System Security**.
   The *System Security* window appears:



2. Select **Auto Logout Timeout (Minutes)**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The entry field changes to edit mode.
4. Type the maximum idle time period, in minutes, that can pass before the configuration menus close.
5. Press the **Enter** key.
   The new value appears in the entry field.

Working with System Images

When you first power up the 300-24 unit, it starts with the factory-image. As new images are developed, Wi-LAN will place them on their web site where you can download the image files to the 300-24. Currently, only the factory-image is available. See *Upgrading Software via FTP* on page 79 for more information about downloading new image files.

Setting the Default Image

As discussed above, as new images are developed and released, you will have the option to select from a list of images to use on the 300-24. Once you have more than one image saved on the unit, you can define which image file you want to use as the default each time you power up the 300-24.

To set the default image

1. From the *Main System* menu, select **System Commands**.
   The *System Commands* window appears:

```
                    System Commands

Set Default System Image        -> FACTORY-IMAGE
Reboot Current Image               Press Enter to Execute
Reboot a System Image              FACTORY-IMAGE
Restore Factory Configuration      Press Enter to Execute
Restore Poweron Configuration      Press Enter to Execute
Enter Loopback Mode                Press Enter to Execute
Return to Normal Mode              Press Enter to Execute
Reset Radio Statistics             Press Enter to Execute
Reset MAC Layer Statistics         Press Enter to Execute
```

2. Select **Set Default System Image**.
   An arrow appears to the left of the entry field.

Use the arrow keys on the keyboard to scroll through the field selections.

3. In the Set Default System Image entry field, scroll to select the image to use as the default.
4. Press the **Enter** key.
   The new image file appears in the field and will be used each time the 300-24 is powered up.

Rebooting Images

You can reboot an image to reapply its settings to the unit. You can also choose to reboot the 300-24 using a different image from that which you were originally using. If you make changes to the network configuration, such as changing IP and MAC addresses, you must reboot the current image for the changes to take effect. When you reboot the image, the 300-24 recopies the image from flash memory and runs it. See *Configuring the Internet IP Settings* on page 52 for more information about changing the network configuration.

To reboot the current image

1. From the *Main System* menu, select **System Commands**.
   The *System Commands* window appears:

```
                    System Commands

Set Default System Image           FACTORY-IMAGE
Reboot Current Image            -> Press Enter to Execute
Reboot a System Image              FACTORY-IMAGE
Restore Factory Configuration      Press Enter to Execute
Restore Poweron Configuration      Press Enter to Execute
Enter Loopback Mode                Press Enter to Execute
Return to Normal Mode              Press Enter to Execute
Reset Radio Statistics             Press Enter to Execute
Reset MAC Layer Statistics         Press Enter to Execute
```

2. Select **Reboot Current Image**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The 300-24 reboots using the current image.

To reboot a system image

1. From the *Main System* menu, select **System Commands**.
   The *System Commands* window appears:

If you try to enter loopback mode when you are already in the mode, *failure* appears in the Enter Loopback Mode field.

```
                    System Commands

Set Default System Image           FACTORY-IMAGE
Reboot Current Image               Press Enter to Execute
Reboot a System Image           ->  FACTORY-IMAGE
Restore Factory Configuration      Press Enter to Execute
Restore Poweron Configuration      Press Enter to Execute
Enter Loopback Mode                Press Enter to Execute
Return to Normal Mode              Press Enter to Execute
Reset Radio Statistics             Press Enter to Execute
Reset MAC Layer Statistics         Press Enter to Execute
```

2. Select **Reboot a System Image**.
   An arrow appears to the left of the entry field.
3. In the Reboot a System Image entry field, scroll to select the image you want to use.
4. Press the **Enter** key.
   The 300-24 reboots using the selected system image.

Restoring Configurations

When you make changes to the configuration settings, you can easily restore the default configuration settings without having to reboot the 300-24. You have the option of restoring the factory configuration settings, or you can restore the configuration settings from the image you used when you last powered up the unit.

To restore the factory configuration

1. From the *Main System* menu, select **System Commands**.
   The *System Commands* window appears:

```
                    System Commands

Set Default System Image           FACTORY-IMAGE
Reboot Current Image               Press Enter to Execute
Reboot a System Image              FACTORY-IMAGE
Restore Factory Configuration  ->  Press Enter to Execute
Restore Poweron Configuration      Press Enter to Execute
Enter Loopback Mode                Press Enter to Execute
Return to Normal Mode              Press Enter to Execute
Reset Radio Statistics             Press Enter to Execute
Reset MAC Layer Statistics         Press Enter to Execute
```

2. Select **Restore Factory Configuration**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The factory configuration settings are restored.

To restore the poweron configuration

1. From the *Main System* menu, select **System Commands**.
   The *System Commands* window appears:

```
                    System Commands

Set Default System Image           FACTORY-IMAGE
Reboot Current Image               Press Enter to Execute
Reboot a System Image              FACTORY-IMAGE
Restore Factory Configuration  ->  Press Enter to Execute
Restore Poweron Configuration      Press Enter to Execute
Enter Loopback Mode                Press Enter to Execute
Return to Normal Mode              Press Enter to Execute
Reset Radio Statistics             Press Enter to Execute
Reset MAC Layer Statistics         Press Enter to Execute
```

2. Select **Restore Poweron Configuration**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The configuration settings that were applied when the unit was powered up are restored.

Working with Modes

You can change the mode settings on the 300-24 to loopback mode or normal mode. In loopback mode, the 300-24 communicates with the baseband board. This mode enables you to verify that the 300-24 is transmitting properly; you cannot receive or transmit in this mode. In normal mode, the unit communicates with the RF Interface board and data is transmitted and received to and from the air and wire.

To enter loopback mode

1. From the *Main System* menu, select **System Commands**.
   The *System Commands* window appears:

```
                    System Commands

Set Default System Image           FACTORY-IMAGE
Reboot Current Image               Press Enter to Execute
Reboot a System Image              FACTORY-IMAGE
Restore Factory Configuration      Press Enter to Execute
Restore Poweron Configuration      Press Enter to Execute
Enter Loopback Mode             -> Press Enter to Execute
Return to Normal Mode              Press Enter to Execute
Reset Radio Statistics             Press Enter to Execute
Reset MAC Layer Statistics         Press Enter to Execute
```

2. Select **Enter Loopback Mode**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The 300-24 is now in loopback mode.

To enter normal mode

1. From the *Main System* menu, select **System Commands**.
   The *System Commands* window appears:

```
                    System Commands

Set Default System Image           FACTORY-IMAGE
Reboot Current Image               Press Enter to Execute
Reboot a System Image              FACTORY-IMAGE
Restore Factory Configuration      Press Enter to Execute
Restore Poweron Configuration      Press Enter to Execute
Enter Loopback Mode                Press Enter to Execute
Return to Normal Mode           -> Press Enter to Execute
Reset Radio Statistics             Press Enter to Execute
Reset MAC Layer Statistics         Press Enter to Execute
```

2. Select **Return to Normal Mode**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The 300-24 is operating in normal mode.

Resetting the Statistics

The statistics that appear in the *MAC Layer Statistics* window and the *System Current Status* window are cumulative that is, the values increase over time, until you reset the numbers back to 0. Typically, you would reset the values when you want to track a specific occurrence of an event. For example, a unit has had a thermal shutdown, and you have corrected the cause of the shutdown (a heating/cooling problem). Once the problem is corrected, you might want to reset the statistics. If the unit shuts down again, a 1 appears in the statistic window and you can easily determine that a thermal shutdown has reoccurred.

To reset the radio statistics

1. From the *Main System* menu, select **System Commands**.
   The *System Commands* window appears:

```
                    System Commands

Set Default System Image           FACTORY-IMAGE
Reboot Current Image               Press Enter to Execute
Reboot a System Image              FACTORY-IMAGE
Restore Factory Configuration      Press Enter to Execute
Restore Poweron Configuration      Press Enter to Execute
Enter Loopback Mode                Press Enter to Execute
Return to Normal Mode              Press Enter to Execute
Reset Radio Statistics         ->  Press Enter to Execute
Reset MAC Layer Statistics         Press Enter to Execute
```

2. Select **Reset Radio Statistics**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The values in the *System Current Status* window are reset to 0. See *Viewing Current System Status* on page 37 to view the *System Current Status* window.

To reset the MAC Layer statistics

1. From the *Main System* menu, select **System Commands**.
   The *System Commands* window appears:

```
                    System Commands

Set Default System Image           FACTORY-IMAGE
Reboot Current Image               Press Enter to Execute
Reboot a System Image              FACTORY-IMAGE
Restore Factory Configuration      Press Enter to Execute
Restore Poweron Configuration      Press Enter to Execute
Enter Loopback Mode                Press Enter to Execute
Return to Normal Mode              Press Enter to Execute
Reset Radio Statistics             Press Enter to Execute
Reset MAC Layer Statistics     ->  Press Enter to Execute
```

2. Select **Reset MAC Layer Statistics**.
   An arrow appears to the left of the entry field.

3. Press the **Enter** key.
   The values in the *MAC Layer Statistics* window are reset to 0. See *Viewing the MAC Layer Statistics* on page 39 to view the *MAC Layer Statistics* window.

Configuring the Internet IP Settings

When you change the IP or MAC addresses, you must reboot the current image for the changes to take effect. See *Rebooting Images* on page 47 for more information.

To enable the 300-24 unit to communicate with other units, you need to define the Internet IP settings. You can also configure IP masks that you can use to create subnets for your system. These subnets enable you to perform basic multicasting tasks.

Setting the Internet IP Address

You need to indicate the IP address for each 300-24 unit. This address enables communication via TCP/IP.

To set the Internet IP address

1. From the *Main System* menu, select **Network Configuration**.
   The *Network Configuration* window appears:

```
            Network Configuration

Internet IP Address        -> 192.168.3.85
Internet IP Mask              255.255.255.0
Ethernet MAC Address          000203040506
IP Routing Option             Transparent
Default Gateway IP Address    192.168.3.52
SNMP NMS Trap IP Address      192.168.3.52
```

2. Select **Internet IP Address**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The entry field changes to edit mode.
4. Type the unique Internet IP address for the unit.
5. Press the **Enter** key.
   The Internet IP address appears in the field and is assigned to the unit.

To set the Internet IP mask

1. From the *Main System* menu, select **Network Configuration**.
   The *Network Configuration* window appears:

```
            Network Configuration

Internet IP Address           192.168.3.85
Internet IP Mask           -> 255.255.255.0
Ethernet MAC Address          000203040506
IP Routing Option             Transparent
Default Gateway IP Address    192.168.3.52
SNMP NMS Trap IP Address      192.168.3.52
```

2. Select **Internet IP Mask**.
   An arrow appears to the left of the entry field.

3. Press the **Enter** key.
   The entry field changes to edit mode.
4. Type the Internet IP Mask for the unit.
5. Press the **Enter** key.
   The Internet IP Mask appears in the field and is assigned to the unit.

Setting the Ethernet MAC Address

Typically, you will never modify the ethernet MAC address. This address uniquely identifies the 300-24 unit in the system. When you're connected to the internet from your computer, a correspondence table relates your IP address to your computer's physical (MAC) address on the LAN.

If you need to modify the address, you should contact Wi-LAN technical support to discuss the required modifications. See *Customer Support* on page 3 for more information.

To set the ethernet MAC address

1. From the *Main System* menu, select **Network Configuration**.
   The *Network Configuration* window appears:

```
            Network Configuration

Internet IP Address           192.168.3.85
Internet IP Mask              255.255.255.0
Ethernet MAC Address       -> 000203040506
IP Routing Option             Transparent
Default Gateway IP Address    192.168.3.52
SNMP NMS Trap IP Address      192.168.3.52
```

2. Select **Ethernet MAC Address**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The entry field changes to edit mode.
4. Type the ethernet MAC address for the unit.
5. Press the **Enter** key.
   The ethernet MAC address appears in the field and is assigned to the unit.

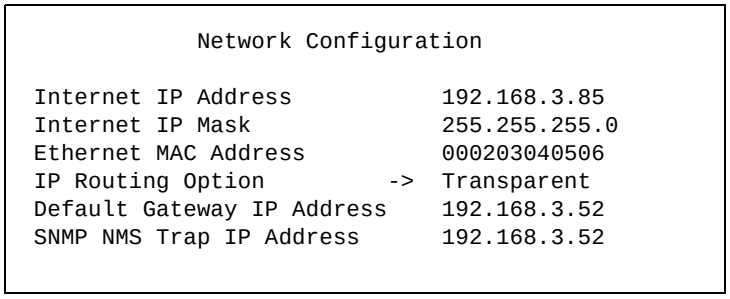
Setting the IP Routing Options

You can set your IP routing to enable all data to route through the unit, or you can set the routing to IP Filtering, which will filter out certain IP ranges that you define in the *IP Filter Configuration* window.

Note: For this release, only transparent mode is available.

To set the IP routing options

1. From the *Main System* menu, select **Network Configuration**.
   The *Network Configuration* window appears:



2. Select **IP Routing Option**.
   An arrow appears to the left of the entry field.
3. In the IP Routing Option entry field, scroll to select the option you want to apply:

Select...	To...
Transparent	Enable all received data to route through the system.
IP Filtering	Prevent data received from a specified range of IP addresses from being routed through the system.

4. Press the **Enter** key.
   The selected option is applied.

Setting the Default Gateway IP Address

You need to define the IP address of the system gateway. This address designates the main entry point into your network.

To set the default gateway IP address

1. From the *Main System* menu, select **Network Configuration**.
   The *Network Configuration* window appears:

```
            Network Configuration

Internet IP Address           192.168.3.85
Internet IP Mask              255.255.255.0
Ethernet MAC Address          000203040506
IP Routing Option             Transparent
Default Gateway IP Address -> 192.168.3.52
SNMP NMS Trap IP Address      192.168.3.52
```

2. Select **Default Gateway IP Address**.
   An arrow appears to the left of the entry field.
3. Press the **Enter** key.
   The entry field changes to edit mode.
4. Type the default gateway IP address for the unit.
5. Press the **Enter** key.
   The default gateway IP address is applied.

Setting the SNMP NMS Trap IP Address

The SNMP NMS Trap IP address identifies the IP address of the network manager. This address basically communicates all alarms or events to the network manager. The network manager can define the types of traps, or alarms, that will be forwarded to the IP address.

To set the SNMP NMS Trap IP address

1. From the *Main System* menu, select **Network Configuration**.
   The *Network Configuration* window appears:

```
            Network Configuration

Internet IP Address           192.168.3.85
Internet IP Mask              255.255.255.0
Ethernet MAC Address          000203040506
IP Routing Option             Transparent
Default Gateway IP Address    192.168.3.52
SNMP NMS Trap IP Address   -> 192.168.3.52
```

2. Select **SNMP NMS Trap IP Address**.
   An arrow appears to the left of the entry field.

3. Press the **Enter** key.
   The entry field changes to edit mode.
4. Type the SNMP NMS Trap IP address for the unit.
5. Press the **Enter** key.
   The SNMP NMS Trap IP address appears in the entry field and is applied to the unit.

Configuring the Radio

You can configure the settings for the radio station type and the RF IDs and frequencies using the *Radio Configuration* window. These settings can be defined for both remote and base stations.

You can also configure settings that are specific to remote stations or to base stations. These settings include:

- IP Filtering, which applies to only remote stations
- Polling Frequencies, which is configured and managed through the base station

Setting the OFDM Station Type

Before you install and start using the 300-24 in a system, you need to define the unit as a base or a remote station.

To set the OFDM station type

1. From the *Main System* menu, select **Radio Configuration**.
2. Press the **Enter** key.
   The *Radio Configuration* window appears:

```
         Radio Configuration
OFDM Station Type               -> Remote Unit
RF Station Id [0..1023]            2
RF Network Id [0..1023]            0
RF Center Frequency                2.440 GHz
```

3. Select **OFDM Station Type**.
   An arrow appears to the left of the entry field.
4. Press the **Enter** key.
5. In the OFDM Station Type entry field, select a station type as follows:

To configure a...	Do this...
Base Station	In the OFDM Station Type entry field, scroll to select **Base Unit**.
Remote Station	In the OFDM Station Type entry field, scroll to select **Remote Unit**.

6. Press the **Enter** key.
   The unit is configured to the selected unit type.

Setting the RF IDs and Center Frequency

You need to identify the RF station and network IDs for the unit, and also set the RF center frequency. All units in a given network should use the same frequency so they can communicate with each other.

To set the RF Station ID

1. From the *Main System* menu, select **Radio Configuration**.
2. Press the **Enter** key.
   The *Radio Configuration* window appears:

```
         Radio Configuration
OFDM Station Type                   Remote Unit
RF Station Id [0..1023]        ->   2
RF Network Id [0..1023]             0
RF Center Frequency                 2.440 GHz
```

3. Select **RF Station Id [0..1023]**.
4. Press the **Enter** key.
   The entry field changes to edit mode.
5. Type a unique number for the RF Station ID.
6. Press the **Enter** key.
   The unit is assigned the RF Station ID.

Every unit you configure *must* have a unique RF Station ID. No two units can have the same ID.

To set the RF Network ID

1. From the *Main System* menu, select **Radio Configuration**.
2. Press the **Enter** key.
   The *Radio Configuration* window appears:

```
         Radio Configuration
OFDM Station Type                   Remote Unit
RF Station Id [0..1023]             2
RF Network Id [0..1023]         -> 0
RF Center Frequency                 2.440 GHz
```

3. Select **RF Network Id [0..1023]**.
4. Press the **Enter** key.
   The entry field changes to edit mode.
5. Type a unique number for the RF Network ID.
6. Press the **Enter** key.
   The unit is assigned the RF Network ID.

To set the RF center frequency

To ensure communication between units, *all* units in the network must have the same center frequency.

1. From the *Main System* menu, select **Radio Configuration**.
2. Press the **Enter** key.
   The *Radio Configuration* menu appears:

```
         Radio Configuration
OFDM Station Type                    Remote Unit
RF Station Id [0..1023]              2
RF Network Id [0..1023]              0
RF Center Frequency               -> 2.440 GHz
```

3. Select **RF Center Frequency**.
4. Press the **Enter** key.
   The entry field is highlighted.
5. Scroll to select the RF center frequency you will apply to all units in the network.
6. Press the **Enter** key.
   The center frequency is applied to the unit.

Configuring the IP Filter for a Remote Station

You can create IP filters to filter the data that is transmitted and received through the 300-24 unit. The remote unit can filter packets received from the wire or air, or both. When you define a filter, you indicate the host and mask IP addresses of the packets that will be received and transmitted to the unit.

To configure the IP filter for a remote station

You can configure IP filters for *only* remote stations.

1. From the *Main System* menu, select **IP Filter Configuration**.
2. Press the **Enter** key.
   The *IP Filter Configuration* window appears:

```
                    IP Filter Configuration         - Page 1
   Filter     Type       Host/Net Address      Host/Net Mask

      1  ->Undefined     0.0.0.0           0.0.0.0
      2    Undefined     0.0.0.0           0.0.0.0
      3    Undefined     0.0.0.0           0.0.0.0
      4    Undefined     0.0.0.0           0.0.0.0
      5    Undefined     0.0.0.0           0.0.0.0
      6    Undefined     0.0.0.0           0.0.0.0
      7    Undefined     0.0.0.0           0.0.0.0
      8    Undefined     0.0.0.0           0.0.0.0
      9    Undefined     0.0.0.0           0.0.0.0
     10    Undefined     0.0.0.0           0.0.0.0
```

3. Select the **Undefined** field in the Filter row you are defining.
   An arrow appears to the left of the field.

4. Press the **Enter** key.
   The entry field changes to edit mode.
5. Scroll to select the IP Filter type you are configuring. You can select from:

Select this filter...	To...
ENET - Wireless (RF)	Filter the packets received from the wireline.
Wireless (RF) - ENET	Filter the packets received from the air.
Undefined	Not filter the packets.

6. Press the **Enter** key.
   The IP Filter Type is defined.
7. Press the right arrow key on the keyboard to move to the Host/Net Address field.
8. Press the **Enter** key.
   The entry field changes to edit mode.
9. Type the IP Address of the Host/Net.
10. Press the **Enter** key.
    The address is defined.
11. Press the right arrow key on the keyboard to move to the Host/Net Mask field.
12. Press the **Enter** key.
    The entry field changes to edit mode.
13. Type the IP Address of the Host/Net Mask.
14. Press the **Enter** key.
    You have configured the IP filter.
15. Repeat steps 3 to 14 to define additional IP filters.

Configuring the Polling List

You can configure the polling list for the base station. When you configure the list, you must include the base station and all remote stations in the list.

To configure the polling list

Remote Station Configuration only appears in the *Main System* menu for units configured as the base station.

1. From the *Main System* menu, select **Remote Station Configuration**.
   The *Remote Station Configuration* menu appears:

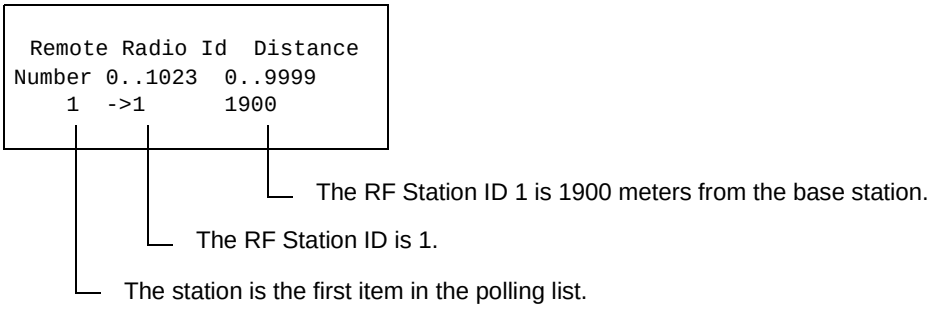
```
     Remote Station Configuration    - Page 1

Remote Radio Id  Distance Remote Radio Id  Distance Remote Radio Id  Distance

Number 0..1023  0..9999  Number 0..1023  0..9999    Number 0..1023  0..9999

    1  ->1      1900          2    2      1900            3    0      0
    4    0      0             5    0      0               6    0      0
    7    0      0             8    0      0               9    0      0
   10    0      0            11    0      0              12    0      0
   13    0      0            14    0      0              15    0      0
   16    0      0            17    0      0              18    0      0
   19    0      0            20    0      0              21    0      0
   22    0      0            23    0      0              24    0      0
   25    0      0            26    0      0              27    0      0
   28    0      0            29    0      0              30    0      0
   31    0      0            32    0      0              33    0      0
   34    0      0            35    0      0              36    0      0
   37    0      0            38    0      0              39    0      0
   40    0      0            41    0      0              42    0      0
   43    0      0            44    0      0              45    0      0
   46    0      0            47    0      0              48    0      0
   49    0      0            50    0      0              51    0      0
   52    0      0            53    0      0              54    0      0
   55    0      0            56    0      0              57    0      0
```

2. In the Radio Id field, type the Radio Station ID for the station (you must identify a unique Radio Id for all remotes and the base station).
   Note: The order in which you enter the IDs determines the polling sequence of the units.
3. In the Distance field, type the distance, in meters, from the Radio ID to the base station.
   Following is an example of a completed polling list entry:



4. Once you have entered the ID and distance for each remote station and the base station, press the **Esc** key until you exit the *Configuration* menu.
5. Power down the computer.
   You have configured the polling list.

Using the 300-24 Command Line

The 300-24 has a command line interface that you can use to perform basic commands. The commands are a quick way to perform basic tasks while you remain logged into the configuration menus.

Using the Basic Commands

While you are logged into the configuration menus, you can press the **Esc** key until you exit out of the menus to the command line prompt. The command line prompt appears as:

```
wilan>
```

You can execute all of the 300-24 commands from this prompt.

Following are some of the commands you can execute at the prompt:

Type...	To...	Example...
help	show the following command summary list: `menu cls dir del ping logout exit quit`	`wilan>help menu`
menu	return to the configuration menus	`wilan>menu`
cls	clear the terminal screen	`wilan>cls`
dir	show a file directory	`wilan>dir`
exit	log out of the command line interface or terminate a remote telnet session	`wilan>exit`
logout	log out of the command line interface or terminate a remote telnet session	`wilan>logout`
quit	log out of the command line interface or terminate a remote telnet session	`wilan>quit`
ping	ping a remote IP address	`wilan>ping 198.168.200.5`
del	delete a file	`wilan>del sample.txt`

You can contact Wi-LAN customer support for additional information about the command line interface. See *Customer Support* on page 3 for more information about contacting Wi-LAN.

Using SNMP

Using the Wi-LAN SNMP MIB

Included with each I.WiLL™ Access Point 300-24 unit (300-24), is a Simple Network Management Protocol (SNMP) permitting configuration, monitoring, and control of:

- base stations via the ethernet
- remote units via the air

Units in remote and hard-to-reach locations can be easily configured, and network managers can avoid or reduce downtime by monitoring network throughput, packet collision rates, and interference.

SNMP is a protocol you can use to remotely manage a network element by polling, setting terminal values, and monitoring network statistics and events. It is the de-facto internet work management standard, designed to provide a mechanism for the exchange of management information in a TCP/IP-based internet environment.

SNMP consists of the following three elements:

SNMP Element	Description
Manager	This element is installed on the network's host computer and is controlled by the network administrator. From the host, the Manager configures Agents, or polls Agents for information.
Agent	The Agent runs on each unit. An Agent accepts configuration commands from the Manager and collects network and terminal information specified in the MIB.
Management Information Block (MIB)	The MIB is a database which is accessed by a specific set of commands that you can execute using the SNMP Manager. There is a standard MIB and a Wi-LAN customized MIB that stores information relevant to the operation of a wireless network.

Using the Wi-LAN MIB Object Identifier Nodes

All OID (Object Identifier) nodes in the private Wi-LAN MIB are numbered 1.3.6.1.4.1.2686.**n** where **n** is a private Wi-LAN MIB node number or branch of numbers. This number is used in the nodes in the following pages.

All nodes containing statistical information are cleared on powerup and reset.

Values in all writeable nodes are stored in Flash memory and are retained until overwritten by the administrator, even following power down or reset.

Wi-LAN MIB Object Identifier Nodes

Following are descriptions of the nodes in the MIB for the 300-24:

Node #	Address/Node	Object Type	Syntax	Access	Description
1.1.1	1.3.6.1.4.1.2686.1.1.1	defaultImage	INTEGER	R/W	File descriptor id of Image to boot on hard drive.
1.1.2	1.3.6.1.4.1.2686.1.1.2	ipAddr	IpAddress	R/W	ENET/OFDM bridge IP address.
1.1.3	1.3.6.1.4.1.2686.1.1.3	ipMask	IpAddress	R/W	ENET/OFDM bridge IP mask
1.1.4	1.3.6.1.4.1.2686.1.1.4	macAddr	PhysAddress	R/W	ENET interface MAC address
1.1.5	1.3.6.1.4.1.2686.1.1.5	gatewayIpAddr	IpAddress	R/W	Default Gateway IP address
1.1.6	1.3.6.1.4.1.2686.1.1.6	snmpNmsIpAddr	IpAddress	R/W	SNMP NMS IP Address (Trap Destination)
1.1.7	1.3.6.1.4.1.2686.1.1.7	routingType	INTEGER (1, 3)	R/W	IP Routing Type: Bridge (1), Filter (3)
1.1.8	1.3.6.1.4.1.2686.1.1.8	stationType	INTEGER (1, 2)	R/W	OFDM Station Type: Base-Stn (1) or Remote (2)
1.1.9	1.3.6.1.4.1.2686.1.1.9	radioId	INTEGER (0..1023)	R/W	RF Station Identifier
1.1.10	1.3.6.1.4.1.2686.1.1.10	networkId	INTEGER (0..1023)	R/W	RF Network Identifier
1.1.11	1.3.6.1.4.1.2686.1.1.11	centerFreq	INTEGER	R/W	RF Center Frequency (2.410, 2.415, 2.430, 2.440, 2.450, 2.465, 2.470)
1.1.12- 1.1.21	1.3.6.1.4.1.2686.1.1.12 to 1.3.6.1.4.1.2686.1.1.21	vector1 to vector 10	INTEGER (0..65535)	R/W	RF Randomization Vector 1 to RF Randomization Vector 10
1.1.22	1.3.6.1.4.1.2686.1.1.22	userPassword	DisplayString (Size 0..31)	R/W	System Login User-Level Password
1.1.23	1.3.6.1.4.1.2686.1.1.23	superPassword	DisplayString (Size 0..31)	R/W	System Login Supervisor-Level Password

Node #	Address/Node	Object Type	Syntax	Access	Description
1.1.24	1.3.6.1.4.1.2686.1.1.24	autoLogoutMins	INTEGER	R/W	Input Inactivity Auto-Logout Timeout (minutes)
1.1.25	1.3.6.1.4.1.2686.1.1.25	ethernetAccess	INTEGER (0, 1)	R/W	Enable/Disable Configuration Access Via Ethernet: Disabled (0), Enabled (1)
1.1.26	1.3.6.1.4.1.2686.1.1.26	wirelessAccess	INTEGER (0, 1)	R/W	Enable/Disable Wireless Configuration Access: Disabled (0), Enabled (1)
1.1.27	1.3.6.1.4.1.2686.1.1.27	publicName	DisplayString (Size 0..31)	R/W	SNMP Public Community Name
1.1.28	1.3.6.1.4.1.2686.1.1.28	privateName	DisplayString (Size 0..31)	R/W	SNMP Private Community Name
1.1.29	1.3.6.1.4.1.2686.1.1.29	ipFilterTable	SEQUENCE of IpFilterEntry	NA	The list of IP Filter Table entries.
1.1.29.1	1.3.6.1.4.1.2686.1.1.29.1	ipFilterEntry	IpFilterEntry	NA	An IP Filter entry containing the IP address and mask of the filter.
1.1.29.1.1	1.3.6.1.4.1.2686.1.1.29.1.1	ipFilterIndex	INTEGER	RO	The 1-relative index of the filter in the table.
1.1.28.1.2	1.3.6.1.4.1.2686.1.1.28.1.2	ipFilterAddr	IpAddress	R/W	The IP Filter net or host IP address.
1.1.28.1.3	1.3.6.1.4.1.2686.1.1.28.1.3	ipFilterMask	IpAddress	R/W	The mask applied to the filter host or net address. addr & mask = host or net number. For hosts, the mask should be 255.255.255.255.
1.1.30	1.3.6.1.4.1.2686.1.1.30	remoteTable	SEQUENCE OF RemoteEntry	NA	The remote unit configuration table.
1.1.30.1	1.3.6.1.4.1.2686.1.1.30.1	remoteEntry	RemoteEntry	NA	A Remote Unit Configuration Table entry.
1.1.30.1.1	1.3.6.1.4.1.2686.1.1.30.1.1	remoteIndex	INTEGER	RO	The 1-relative index of a unit in the remote configuration table.
1.1.30.1.2	1.3.6.1.4.1.2686.1.1.30.1.2	remoteRadioId	INTEGER	R/W	The radio id for a unit in the remote configuration table.

Node #	Address/Node	Object Type	Syntax	Access	Description
1.1.30.1.3	1.3.6.1.4.1.2686.1.1.30.1.3	remoteUnits	INTEGER	R/W	The configuration units for a unit in the remote configuration table.
1.2.1	1.3.6.1.4.1.2686.1.2.1	reboot	INTEGER reboot (1)	R/W	System Reboot Command
1.2.2	1.3.6.1.4.1.2686.1.2.2	restFactory	INTEGER restore (1)	R/W	Restore the Factory Configuration Command
1.2.3	1.3.6.1.4.1.2686.1.2.2	restPoweron	INTEGER restore (1)	R/W	Restore the Poweron Configuration
1.3.1	1.3.6.1.4.1.2686.1.3.1	systemStatus	INTEGER down (0), up (1)	RO	Current System Status
1.3.2	1.3.6.1.4.1.2686.1.3.2	networkStatus	INTEGER off-line (0), on-line (1)	RO	Current LAN Connection Status
1.3.3	1.3.6.1.4.1.2686.1.3.3	thermalStatus	INTEGER warning (0), normal (1)	RO	Current System Thermal Status
1.3.4	1.3.6.1.4.1.2686.1.3.4	totalHours	Counter	RO	Cumulative Run-Time Hours
1.3.5	1.3.6.1.4.1.2686.1.3.5	systemHours	Counter	RO	Current Run-Time Hours Since Poweron
1.3.6	1.3.6.1.4.1.2686.1.3.6	powerCycles	Counter	RO	Total Power Cycle Count
1.3.7	1.3.6.1.4.1.2686.1.3.7	thermalFails	Counter	RO	Total Thermal Shutdown Count
1.3.8	1.3.6.1.4.1.2686.1.3.8	loginOkays	Counter	RO	Number of Successful Logins
1.3.9	1.3.6.1.4.1.2686.1.3.9	loginFails	Counter	RO	Number of Unsuccessful Login Attempts
1.3.10	1.3.6.1.4.1.2686.1.3.10	localUser	INTEGER loggedOut(0), loggedIn(1)	RO	Local User Login Status

Node #	Address/Node	Object Type	Syntax	Access	Description
1.3.11	1.3.6.1.4.1.2686.1.3.11	telnetUser	INTEGER loggedOut(0), loggedIn(1)	RO	Telnet User Login Status
1.3.12	1.3.6.1.4.1.2686.1.3.12	ftpUser	INTEGER loggedOut(0), loggedIn(1)	RO	FTP User Login Status
1.3.13	1.3.6.1.4.1.2686.1.3.13	correctError	INTEGER	RO	Correctable Error Rate
1.3.14	1.3.6.1.4.1.2686.1.3.14	uncorrectError	INTEGER	RO	Uncorrectable Error Rate
1.3.15	1.3.6.1.4.1.2686.1.3.15	bitErrorRate	INTEGER	RO	Bit Error Rate
1.3.16	1.3.6.1.4.1.2686.1.3.16	currentRssi	INTEGER	RO	Current Received Signal Strength
1.4.1	1.3.6.1.4.1.2686.1.4.1	etherRxFrames	Counter	RO	Ethernet Frames Received
1.4.2	1.3.6.1.4.1.2686.1.4.2	etherRxDropped	Counter	RO	Ethernet Receive Frames Dropped
1.4.3	1.3.6.1.4.1.2686.1.4.3	etherRxErrors	Counter	RO	Ethernet Receive Errors
1.4.4	1.3.6.1.4.1.2686.1.4.4	etherTxFrames	Counter	RO	Ethernet Frames Transmitted
1.4.5	1.3.6.1.4.1.2686.1.4.5	etherTxDropped	Counter	RO	Ethernet Transmit Frames Dropped
1.4.6	1.3.6.1.4.1.2686.1.4.6	idmaEncodeFrames	Counter	RO	RS-Encoder IDMA Transfers
1.4.7	1.3.6.1.4.1.2686.1.4.7	idmaDecodeFrames	Counter	RO	RS-Decoder IDMA Transfers
1.4.8	1.3.6.1.4.1.2686.1.4.8	rsEncSFrames	Counter	RO	RS-Encoder Super Frames
1.4.9	1.3.6.1.4.1.2686.1.4.9	rsdecSFrames	Counter	RO	RS-Decoder Super Frames
1.4.10	1.3.6.1.4.1.2686.1.4.10	rsDecSseqErrors	Counter	RO	RS-Decoder Start Sequence Errors
1.4.11	1.3.6.1.4.1.2686.1.4.11	rsDecSseqXtra	Counter	RO	RS-Decoder Start Sequence Extra Bytes
1.4.12	1.3.6.1.4.1.2686.1.4.12	rsDecUncFrames	Counter	RO	RS-Decoder Uncorrectable Frames
1.4.13	1.3.6.1.4.1.2686.1.4.13	rsDecUncBytes	Counter	RO	RS-Decoder Uncorrectable Bytes
1.4.14	1.3.6.1.4.1.2686.1.4.14	rsDecCorFrames	Counter	RO	RS-Decoder Correctable Frames

Node #	Address/Node	Object Type	Syntax	Access	Description
1.4.15	1.3.6.1.4.1.2686.1.4.15	rsDecCorBytes	Counter	RO	RS-Decoder Correctable Bytes
1.4.16	1.3.6.1.4.1.2686.1.4.16	upackSseqErrors	Counter	RO	Unpacking Start Sequence Errors
1.4.17	1.3.6.1.4.1.2686.1.4.17	upackSseqXtra	Counter	RO	Unpacking Start Sequence Extra Bytes
1.4.18	1.3.6.1.4.1.2686.1.4.18	upackHeadErrors	Counter	RO	Unpacking Header Errors
1.4.19	1.3.6.1.4.1.2686.1.4.19	throughputMax	INTEGER	RO	Maximum Throughput
1.4.20	1.3.6.1.4.1.2686.1.4.20	throughputAvg	INTEGER	RO	Average Throughput
1.4.21	1.3.6.1.4.1.2686.1.4.21	stackTxEther	Counter	RO	Ethernet Frames Transmitted by Local Host
1.4.22	1.3.6.1.4.1.2686.1.4.22	stackRxEther	Counter	RO	Ethernet Frames Received for Local Host
1.4.23	1.3.6.1.4.1.2686.1.4.23	stackTxOfdm	Counter	RO	OFDM Frames Transmitted by Local Host
1.4.24	1.3.6.1.4.1.2686.1.4.24	stackRxOfdm	Counter	RO	OFDM Frames Received for Local Host

Appendix A: Product Specification

Overview

Following is the specification for the I.WiLL™ 300-24 Access Point (300-24). The specification may change without notice. Contact Wi-LAN technical support to ensure that you are working with the most recent specification. See *Customer Support* on page 3 for information about contacting Wi-LAN.

Specification

General Specifications	
Modulation Method:	Combined Direct Sequence Spread Spectrum & Wide-band Orthogonal Frequency Division Multiplexing (W-OFDM)
Wireless Data Rate:	30.0 Mbps
Wire Data Rate:	21 Mbps
RF Frequency Range:	2.4000 - 2.4835 GHz (unlicensed ISM band)
Number of Channels:	3 (center frequency can be set to any frequency in RF range in 1 MHz increments)
Power Requirements:	110W @ 115VAC/230VAC 50/60 Hz
Physical Dimensions:	43.2 x 37.47 x 9.25 centimeters (14 x 14.75 x 3.75 inches)
Approvals:	Industry Canada, FCC, CE, CEPT Product not available for sale until certification has been obtained.

Radio Specifications	
Antenna Connector:	"N" Male Connector
Mean OFDM Output Power:	+15dBm nominal - see back of unit for measured output power
Peak OFDM Power:	20dBm **Note:** You must use the Peak OFDM Output Power for link budget calculations.
Receiver Sensitivity:	-78dBm nominal for quasi-error free (10^{-9} BER) operation - see back of unit for measured Receiver Sensitivity
Network Support	
Packet Format:	IEEE 802.3 and Ethernet II (High-level protocol transparent)
LAN Connections:	10BaseT and 100BaseTX
Bridge Functionality:	Self-learning packet filtering by MAC address (protocol independent)
Media Support:	10BaseT or 100BaseTX
Wireless Networking Protocols	
Network Topologies:	Point-to-Point, Point-to-Multipoint, Multipoint-to-Multipoint
Repeater Mode:	User Configurable
RF Collision Management:	Polling, with Dynamic Time Allocation
Security	
IP Filtering	
Configuration, Management, and Diagnostics	
Configuration Methods:	SNMP, Telnet, RS-232 Management Port
SNMP:	Version I, Standard and Enterprise MIBs
Management Port:	Menu driven ASCII interface via RS-232, DB-9 connector
Management Port Functionality:	Supports system configuration, security, access control, wireless LAN diagnostics and management

Appendix B: Monitor and Test Links

Overview

You can monitor and test the 300-24 link once it is powered up, has an antenna attached to it, and is receiving data. All link mode statistics appear in the *MAC Layer Statistics* window. See *Viewing the MAC Layer Statistics* on page 39 for detailed information about the window. You need to monitor the following three link mode statistics:

- Received Signal Strength Indicator (RSSI)
- Null Depth
- Fade Margin

Monitoring RSSI

The RSSI is the strength of the received signal in dBm (decibels referenced to a milliWatt). When monitoring the RSSI, ensure that it meets the following statistical criteria:

RSSI Element	Required Measurement
Noise Floor	-95dBm
Signal to Noise Ratio	17dBm for quasi error free operation
Quasi Error Free	1 error in 10^9 bits after forward error correction
RSSI Required for Quasi Error Free Operation	-95dBm + 17dBm = -78dBm
Receiver Sensitivity	-78dBm

In a real application, a fade margin is required to allow for rain fading or other reception anomalies. See *Monitoring Fade Margin* on page 76 for more information.

At the other extreme, the receive signal strength cannot be greater than -45dBm or the receive LNA will saturate. If the RSSI is greater than -45dBm you must add sufficient attenuation at the remote site to bring the RSSI down to an acceptable level.

Note: Check the back of the 300-24 unit for a label identifying that a RSSI Correction Factor has been applied to the unit. If so, apply the following correction factor:

Actual_RSSI = RSSI - RSSI_Correction_Factor

Monitoring Null Depth

The Null Depth is the ratio in dB between the strongest OFDM carrier and the weakest carrier. A Null Depth of greater than 0 dB indicates that there is no multipath reception. Some multipath is usually present in your link, however adjustments to the position or location of the receive antenna at the remote site can minimize the Null Depth. In some cases, you cannot adjust the antenna position and location of the receive antenna at a remote site.

Monitoring Fade Margin

The Fade Margin is the receive power in excess of the minimum required for error free operation. See *Monitoring RSSI* on page 75 for information about receive power.

Fade Margin is computed for you using the following formula:

Formula	Fade Margin = RSSI - Null Depth - Receiver Sensitivity		
Example Variables	RSSI	=	-62dBm
	Null Depth	=	3dB
	Receiver Sensitivity	=	-78dBm
	Fade Margin	=	13dB
Calculation	Fade Margin = -62dBm - 3dB - -78dBm Fade Margin = 13dB		

Thus, we have verified that the correct Fade Margin of 13dB is displayed.

Note: Check the back of the 300-24 unit for a label identifying that a Fade Margin Correction Factor has been applied to the unit. If so, apply the following correction factor:

Actual Fade_Margin = Fade_Margin - Fade_Margin_Correction_Factor

Performing a Link Test

Linktest is a diagnostic tool for setting up and diagnosing links. Typically, you use linktest when you:

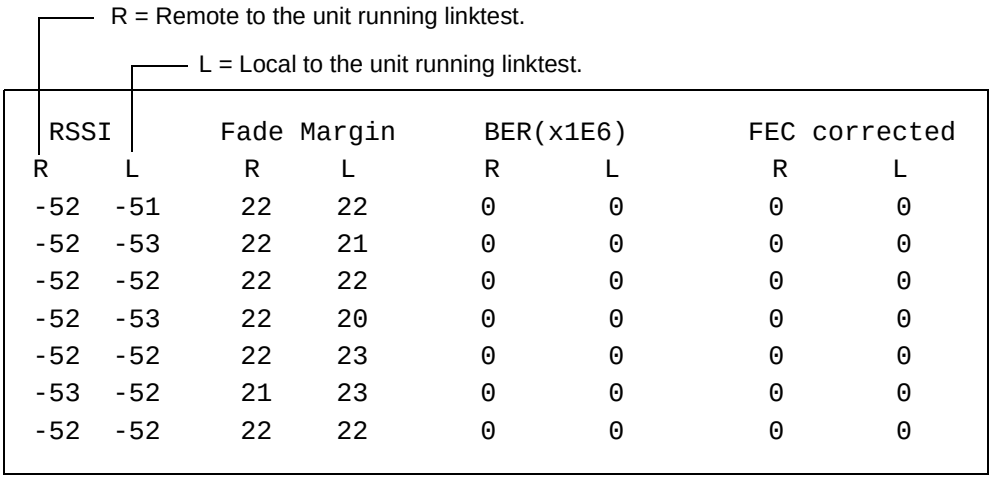
- initially set up a remote
- diagnose a problem link

Linktest generates pseudo-random packets of information that are transmitted to the station ID provided. The unit, or station ID, compares the pseudo-random data and accumulates bit errors, RSSI, Fade Margin, and Forward Error Correction (FEC) statistics. These statistics and regenerated pseudo-random data are sent in a packet back to the originating unit. The originating unit then compares the pseudo-random data and at approximately one second intervals, displays the accumulated statistics in the configuration menus.

Before you start a linktest, you need the station ID of the base station. See *Setting the RF IDs and Center Frequency* on page 58 for information about viewing station ID settings.

To start a linktest

1. At the remote station from which you are performing the linktest, access the configuration menus.
   See *Accessing the Menus* on page 31 for more information about accessing the menus.
2. Press the **Esc** key until you enter the command line mode.
   See *Using the 300-24 Command Line* on page 63 for more information about the command line.
   The following command line appears:
   `wilan>`
3. At the command line prompt, type:
   `linktest <station id of the basestation>`
4. Press the **Enter** key.
   The following linktest results appear:



RSSI		Fade Margin		BER(x1E6)		FEC corrected	
R	L	R	L	R	L	R	L
-52	-51	22	22	0	0	0	0
-52	-53	22	21	0	0	0	0
-52	-52	22	22	0	0	0	0
-52	-53	22	20	0	0	0	0
-52	-52	22	23	0	0	0	0
-53	-52	21	23	0	0	0	0
-52	-52	22	22	0	0	0	0

Following is a description of the information displayed in the linktest results screen:

This...	Indicates...
R	The statistics corresponding to the base station receive. **Note:** This applies if you are running linktest on the remote to the base station.
L	The statistics corresponding to the remote unit receive. **Note:** This applies if you are running linktest on the remote to the base station.
RSSI	The received signal strength indicator.
Fade Margin	The fade margin is calculated as the number of dB that the received signal strength exceeds the minimum receiver sensitivity.
BER(x1E6)	The bit error rate after forward error correction.
FEC Corrected	The byte errors that were corrected by forward error correction.

Note: If the link is bad and packets generated by the linktest are not received at the other end, the following message appears:

```
No packets received
```

5. Press any key to exit linktest and return to the command line prompt.

Appendix C: Upgrading Software

Overview

You can upgrade the software on the 300-24 using one of the following methods:

- upgrading the new software via FTP
- installing the new software EEPROMS in the unit

This section provides instruction on how to upgrade your software via FTP; instructions on how to install new software EEPROMS are including in the shipment of new EEPROMS.

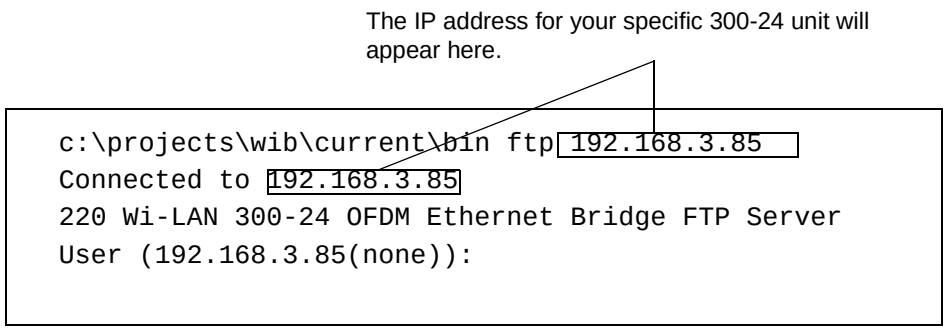
Upgrading Software via FTP

You can download all new software to your 300-24 unit through an FTP connection from your computer. This procedure assumes that you have a copy of the updated software on your computer. Contact Wi-LAN customer support for assistance downloading the updated software from the Wi-LAN FTP server to your local computer. See *Customer Support* on page 3 for information about contacting Wi-LAN support.

This procedure uses the IP address 192.168.3.85 in all steps. The IP address you use should be for your specific 300-24 unit.

To upload software via FTP

1. Start a DOS session on your computer.
   For information about starting a DOS session, refer to your Windows® online help.
2. At the c:\ prompt, type:
   cd \projects\wib\current\bin
   Note: The new software must be saved on your computer in the above directory.
3. Type **ftp <IP address of the 300-24 unit>**
   Note: There is a space between ftp and the IP address. The following example uses the IP address 192.168.3.85 for the 300-24 unit.
   The DOS session window appears as:



4. At the User prompt, type **ofdm**.
5. Press the **Enter** key.
   The password prompt appears.
6. At the Password prompt, type the supervisor password for the 300-24 unit.
   Note: The password is configured in the configuration menus. See *Setting Passwords* on page 44 for more information about setting the password and to view the default password.
7. Press the **Enter** key.
   The DOS session window appears as:

```
C:\projects\wib\current\bin> ftp 192.168.3.85
Connected to 192.168.3.85
220 Wi-LAN 300-24 OFDM Ethernet Bridge FTP Server
User (192.168.3.85(none)):ofdm
331 Password required
Password:
230 Supervisor logged in
ftp>
```

8. At the ftp prompt, type **put ..\<filename>**
   where
   <filename> represents the image file you are downloading.
   Note: There is a space after you type put.
9. Press the **Enter** key.
   The file starts downloading to the 300-24, and when the download is complete the DOS session window appears as:

```
C:\projects\wib\current\bin> ftp 192.168.3.85
Connected to 192.168.3.85
220 Wi-LAN 300-24 OFDM Ethernet Bridge FTP Server
User (192.168.3.85(none)):ofdm
331 Password required
Password:
230 Supervisor logged in
ftp>put ..\<filename>
200 Port set okay
150 Opening binary mode connection
226 Transfer complete
10484 bytes sent in 0.11 seconds (95.31 Kbytes/sec)
ftp>bye
```

10. At the ftp> prompt, type **bye**.
    The prompt returns to c:\projects\wib\current\bin>, and the ftp connection is closed.

Using the Upgraded Software

Once you have uploaded the new software, you need to configure the unit to start using it.

To select the upgraded software

- Use the configuration menus to select the new software.
  Follow the procedures in *Setting the Default Image* on page 46 to select the new software.

Glossary

A

agent

In a SNMP context, the agent runs on each unit. An agent accepts configuration commands from the manager and collects network and terminal information specified in the MIB.

antenna

A device which takes electromagnetic energy from a circuit or wire and radiates it into space rather than confining it.

antenna gain

Gain of the antenna over a dipole (dBd) or theoretical (dBi).

attenuation

Any loss in signal strength, due to resistance, absorption, capacitance, or any characteristic of the medium or design of the system.

B

bandwidth

The span in hertz, that the information-bearing signal occupies or requires, or the difference in hertz between the lowest and highest frequencies of a band.

baud

A measurement unit which defines the number of symbols per second (or signaling units per second).

BER

Bit Error Rate. A percentage of bits per million, showing the number of bits in error compared to the data bits actually sent.

C

cable loss

The signal loss experienced as it passes through the coax cable. Expressed in dB.

channel

The width of the spectrum band taken by a radio signal, usually measured in kilohertz (kHz).

chip rate

Chip rate signifies the time occupied by that single frequency. Also the period of a code clock, or the output of a code generator during one clock interval.

coaxial cable

A type of wire where the inner conductor is surrounded by an outer conductor. The outer conductor serves as an electrical shield.

collision

The situation that exists when two users try to send a signal over the same medium at the same time, and the signal uses the same frequencies.

CRC

Cyclic Redundancy Checksum Code. Based on mathematical theories, the CRC allows a small number of checking bits to show whether the overall stream of bits has any errors in it.

D

dB

Decibel. A relative measure of power used to specify power gains and losses. The difference in power P1 and P2 expressed in dB is:

$$dB = 10 \times \log\left(\frac{P1}{P2}\right)$$

dBd

The gain or loss of an antenna referenced to a standard dipole.

Gain of a Standard Dipole = 2.14 dBi.

dBi

The gain or loss of an antenna referenced to an isotropic (theoretical point source) radiator. This measure is used with only antennas, as it quantifies gain or loss of a physical radiator with respect to a theoretical one.

dBm

A power measurement referenced to one milli-Watt. This is an absolute measure of power rather than a relative measure such as a gain or a loss.

DB9

A D-shaped connector with 9 pins.

E

EEPROM

Electrically Erasable Programmable Read-Only Memory. Non-volatile memory.

ERP

Effective Radiated Power. The power radiating from an antenna taking into account the output power from the transmitter, connector losses, cable losses, and the antenna gain.

ETSI

European Telecommunications Standards Institute.

F

fade margin

The amount that the system gain plus the total antenna gain exceeds the path loss is called the fade margin. The fade margin is calculated as the number of dB that the received signal strength exceeds the minimum receiver sensitivity.

Fresnel Zone

The Fresnel Zone is the expansion of the RF signal radio angles in the vertical plane near the middle of the RF path.

I

IEEE

Institute of Electrical and Electronics Engineers.

interference

Any signal that tends to hamper the normal reception of a desired signal.

ISM

Industrial, Scientific, and Medical. It is the license-exempt radio band in North America and some European countries. It is also referred to as part 15.247 in the FCC regulation that defines the parameters for use of the ISM band in the U.S., including power outputs, spread-spectrum, and noninterference.

M

MAC Address

Media Access Controller Address. Alphanumeric characters that uniquely identify a network-connected device.

Management Information Block

See MIB.

manager

When used in SNMP, this element is installed on the network's host computer and is controlled by the network administrator. From the host, the manager configures agents, or polls agents for information.

MIB

Management Information Block. The MIB is a database which is accessed by a specific set of commands that you can execute using the SNMP Manager. There is a standard MIB and a Wi-LAN customized MIB that stores information relevant to the operation of a wireless network.

O

OID nodes

Object Identifier Nodes. These are the individual nodes in a MIB. See SNMP and MIB.

P

path loss

The total loss from one end of the path to the other. This includes propagation losses, cable losses, and any other losses that impact the system performance.

propagation loss

The signal loss experienced as it travels through the air. Expressed in dB.

R

RF

System of communication employing electromagnetic waves propagated through space. Because of varying characteristics, radio waves of different lengths are employed for different purposes and are usually identified by their frequency.

RS-232/422/423/485

Standards for serial communications, which define the voltages, currents, data rates, and other factors about the signals to be used, as well as single-ended, differential, and multi-drop operation.

S

sensitivity

The minimum signal strength required for usable performance. Expressed in dBm.

SNMP

Simple Network Management Protocol. A protocol you can use to remotely manage a network element by polling, setting terminal values, and monitoring network statistics and events. It is the de-facto internet work management standard, designed to provide a mechanism for the exchange of management information in a TCP/IP-based Internet environment.

spread spectrum

Any of a group of modulation formats in which a RF bandwidth much wider than necessary is used to transmit an information signal so that a signal-to-noise improvement may be gained in the process.

system gain

The maximum path loss that the system can support for usable data transmission.

W

W-OFDM

Wide-band Orthogonal Frequency Division Multiplexing. A modulation scheme that encodes data inside a radio frequency signal. OFDM sends a high-speed signal concurrently on different frequencies. This allows for very efficient use of bandwidth and provides for robust communications that can transmit through interferences, such as occurring noise and stray and reflected signals, that can encumber radio communications.

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