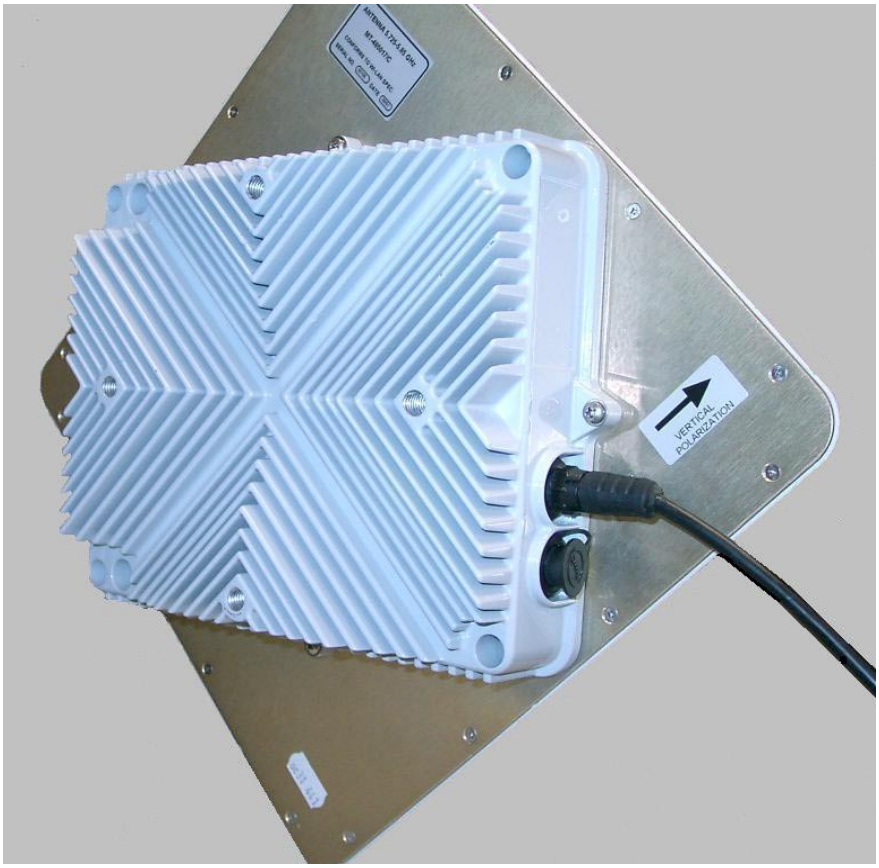
AWE 120-58
Advanced Wireless Ethernet Bridge

User Guide



APR 2002 Rev 3

Important

You can obtain the latest customer documentation for this product by visiting our web site at www.wi-lan.com**. Click on** Support ➔ Customer Documentation**. Updated information will be posted regularly on this site and can be downloaded via the Internet.**

Contents

Important Information

Please be aware of the following information about the AWE 120-58.

- Tx power of remote units can be monitored and adjusted automatically.
- Center frequency is typed into a data field (rather than selected from a list). Available center frequencies range from 5.7410 GHz to 5.8338 GHz in 400 kHz steps.
- Indoor antennas are not supplied. To test and configure units you need to purchase a Bench Test Kit (9000-0034). For bench testing, antennas must be separated by at least 2 meters.

Safety Considerations

This documentation must be reviewed for familiarization with the product, instructions, and safety symbols before operation.

Verify that a uninteruptable safety earth ground exists from the mainpower source and the product's ground circuitry.

Verify that the correct AC power source is available for the AC adapter to produce TBD Vdc output from the adapter.

Disconnect the product from operating power before cleaning.

Warning Symbols Used in this Book

⚠ WARNING: Bodily injury or death may result from failure to heed a WARNING. Do not proceed beyond a WARNING until the indicated conditions are fully understood and met.

! CAUTION: Damage to equipment may result from failure to heed a caution. Do not proceed beyond a CAUTION until the indicated conditions are fully understood and met.

Important: Indicates important information to be aware of which may affect the completion of a task or successful operation of equipment.

⚠ WARNING

All antennas and equipment must be installed by a knowledgeable and professional installer.

! CAUTION

Never operate a unit without an antenna, dummy load, or terminator connected to the antenna port.
Operating a unit without an antenna, dummy load, or terminator connected to the antenna port can permanently damage a unit.

Important

Antennas must be selected from a list of Wi-LAN approved antennas.
See *Wi-LAN Approved Antennas*, page 144 for list.

Notices

Copyright Notice

This guide and the application and hardware described herein are furnished under license and are subject to a confidentiality agreement. The software and hardware can be used only in accordance with the terms and conditions of this agreement.

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While every effort has been made to ensure that the information contained in this guide is correct, Wi-LAN, Inc. does not warrant the information is free of errors or omissions.

Information contained in this guide is subject to change without notice.

Regulatory Notice

The AWE 120-58 product presented in this guide complies with the following regulations and/or regulatory bodies.

- RSS-210 of Industry Canada (www.ic.gov.ca)
- FCC Part 15 (www.fcc.gov)

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
- Selecting and testing different channels, if employing 5.8 GHz equipment

As the AWE 120-58 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.

Other 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.
- 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.
- Use only a power adapter approved by Wi-LAN.

Warranty & Repair

Please contact the party from whom you purchased the product for warranty and repair information. Wi-LAN provides no direct warranty to end users of this product.

Customer Support Contacts

Users of Wi-LAN equipment who require technical assistance must contact their reseller or distributor. For information on distributors in your area, please visit www.wi-lan.com/channel.

Distributor Technical Support

Distributors may contact Wi-LAN's Technical Assistance Center (TAC) for technical support on Wi-LAN products. When requesting support, please have the following information available:

- Description of the problem
- Configuration of the system, including equipment models, versions and serial numbers.
- Antenna type and transmission cable lengths
- Site information, including possible RF path problems (trees, buildings, other RF equipment in the area)
- Configuration of units (base, remote, channels used, etc.) and Link Monitor statistics

Contact Wi-LAN's Technical Assistance Center at the numbers listed below.

Canada and USA	Call toll free: 1-800-258-6876 Business hours: 7:30 a.m. to 4:30 p.m. Mountain Standard Time (GMT-7:00)
International	Call: 1-403-204-2767 Business hours: 7:30 a.m. to 4:30 p.m. Mountain Standard Time (GMT-7:00)
All locations	Send an e-mail message to: techsupport@wi-lan.com

Wi-LAN Product Information

To obtain information regarding Wi-LAN products, contact the Wi-LAN distributor in your region, call 1-800-258-6876 to speak with a Wi-LAN sales representative or visit our web site at www.wi-lan.com.

Publication History

Revision	Date	Description
Rev 1	APR 2002	Initial release of manual.

Description

Features

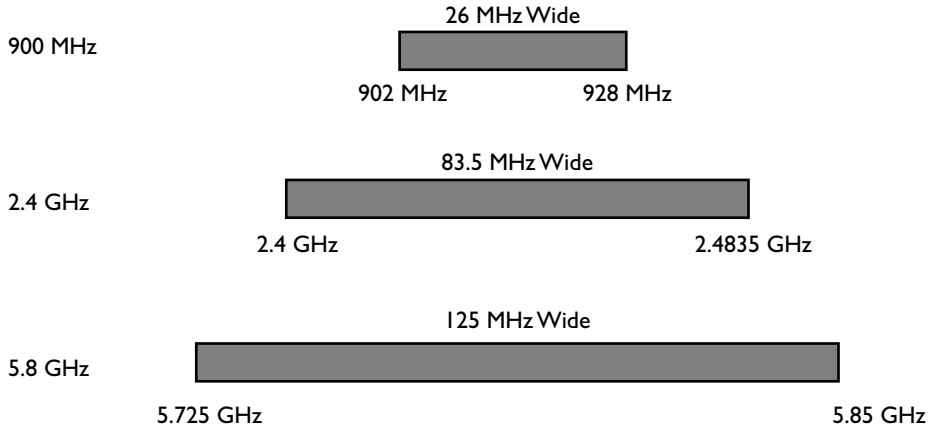
The AWE 120-58 advanced wireless Ethernet bridge provides high-speed, wireless connectivity at a fraction of the cost of wired solutions. It operates over the 5.7250 – 5.8500 GHz ISM radio band and has a maximum raw wireless data rate of 12 Mbps.

- Provides wireless connectivity at speeds up to eight times faster than regular T1 lines, making the AWE 120-58 ideal for providing high-speed Ethernet access or for wirelessly extending existing communications infrastructures.
- Supports point-to-point, point-to-multipoint, and multipoint-to-multipoint networks (if all remotes have clear line of sight to the base station and to each other). Contentionless polling ensures efficient access to remote data networks.
- Is self-contained and easy to use. Simply connect an AWE unit to each LAN segment, and the unit automatically learns where nodes are located on the network and performs dynamic packet filtering to ensure the local LAN traffic does not overload the wireless connection.
- Uses Wi-LAN's patented Multi-Code Direct Sequence Spread Spectrum (MC-DSSS) technology, which makes the unit spectrally efficient and resistant to interference. MC-DSSS technology increases data throughput by as much as ten times compared to traditional spread spectrum technology.
- Other features include automatic Tx power level adjustment, IP address filtering, throughput throttling and monitoring, high security and reliability, and a flash-code upgrade path. SNMP, telnet and RS-232 management enable users to manage, configure and monitor their wireless network with ease.
- VLAN compliant—supports transparent forwarding of VLAN-tagged frames (increased frame size supported) and remote management of units within a VLAN environment (i.e. units connected via trunk links). Supports VLAN tag insertion/removal and VLAN supporting protocols (802.1D, 802.1P, GVRP).

About Spread Spectrum

Three frequency bands (called the ISM bands) are allocated in Canada and the United States to a radio technique known as spread spectrum communication. The bands are located at 900MHz, 2.4 GHz, and 5.8 GHz (shown in the following illustration). The AWE 120-58 operates with spread spectrum technology over the 5.7250 – 5.850 GHz band.

License-Free ISM Bands



Direct Sequence Spread Spectrum (DSSS) technology converts a data stream into packets and spreads the packets across a broad portion of the RF band. The particular spread pattern depends upon a code. With multi-code DSSS (MC-DSSS), multiple codes and spread patterns are employed. A spread spectrum receiver reconstructs the signal and interprets the data.

Some advantages of DSSS are as follows:

- Resistant to interference: DSSS overcomes medium levels of interference and multipath problems.
- Security: There must be a decoder at the receiving end to recover data (an AWE can only talk to another AWE). Data is transmitted at irregular time intervals.
- Low probability of detection: Due to a low amplitude signal and wide bandwidth.
- No license fee: A license fee is not required if used in the specified radio bands and the transmitter power is limited.

About AWE Units

AWE 120-58 units can function as base stations, remote units or repeater bases.

Base Station: One unit in your wireless network must be a base station. A base station acts as the central control unit of the wireless network. The base station polls all remote units and controls how traffic is routed to and from remotes. The base usually connects to a major access point of the wired network. The antenna of the base station must be capable of transmitting and receiving radio signals to and from all the remote units in a system. If remotes are spread over a large area, an omni-directional antenna is usually required. See *Configuring a Base Station* , page 15 for information about setting up a base station.

Remote Units: Remote units receive and transmit wireless data to the base station. You need at least one remote unit for each wireless link. Remotes can limit the amount of data passed by the remote (a function called throttling), and they can filter data packets based on their IP address. If remote units communicate only with the base station, their antennas can be more directional and have higher gains than base antennas. See *Configuring a Remote Unit* , page 18 for information about setting up a remote unit.

Repeater Base: A base station can be configured as a repeater base. A repeater is needed when remote units cannot communicate directly with each other, but direct transfers of data between them are necessary (as in a true WAN). When configured as a repeater, the base station passes data packets between remote stations based on the remote group status and a list of MAC (Media Access Control) addresses that the base station automatically builds. A single repeater uses a method called "store and forward" to receive data from the originating remote and to pass data to the destination remote. See *Setting a Base to Repeater Mode (Base Station Only)* , page 102 for more information. Two units can also be employed as a dual unit repeater (back-to-back) configuration that maximizes data throughput.

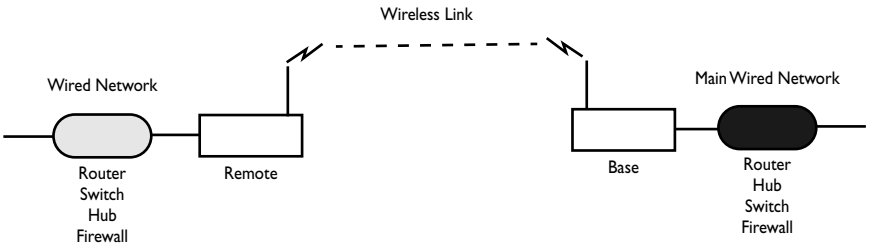
Some System Applications

You can build a wireless network from AWE units and various other components such as cables and antennas. The following section shows some simple examples of AWE applications.

Making a Simple Wireless Bridge

The simplest example of using a AWE 120-58 is a point-to-point wireless bridge that connects two wired network segments or LANs. Two AWE units are required: a base station and a remote unit.

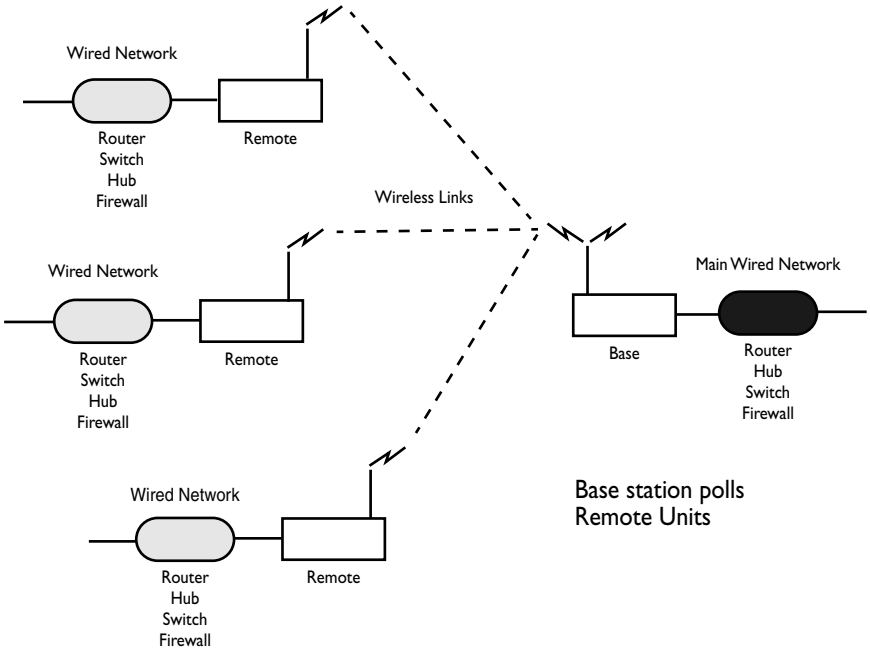
Point-to-Point Wireless Bridge



Creating a Simple Wireless Network

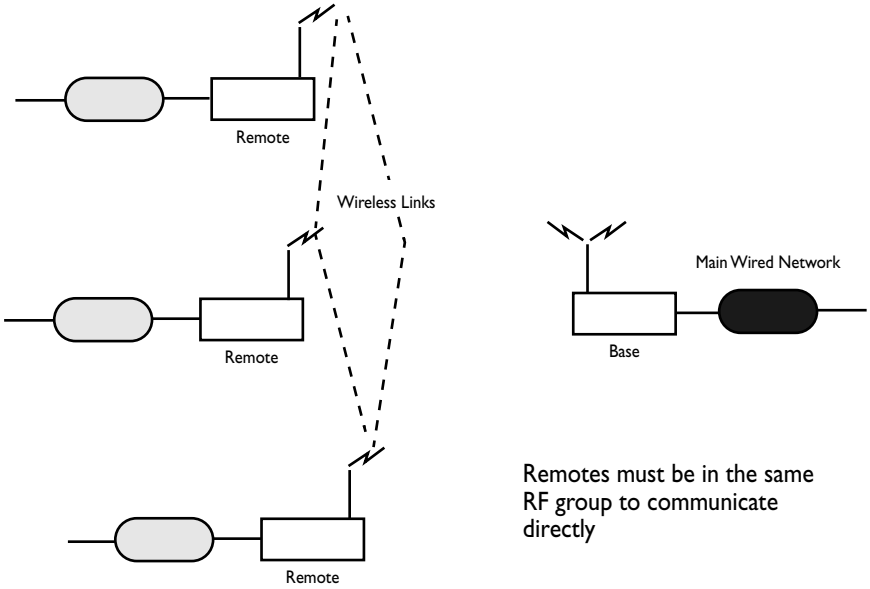
You can create a point-to-multipoint wireless network by adding several remote units to a base station. A base station can support up to 1000 remotes, however, Wi-LAN recommends no more than 225 remotes per base station to ensure high levels of data throughput. See *Determine the Number of Remotes* , page 135 for more information.

Point-to-Multipoint Wireless Network



Direct remote-to-remote communication can occur if a direct RF link can be established between remotes, and if remotes are in the same RF group.

Remote-to-Remote Communication

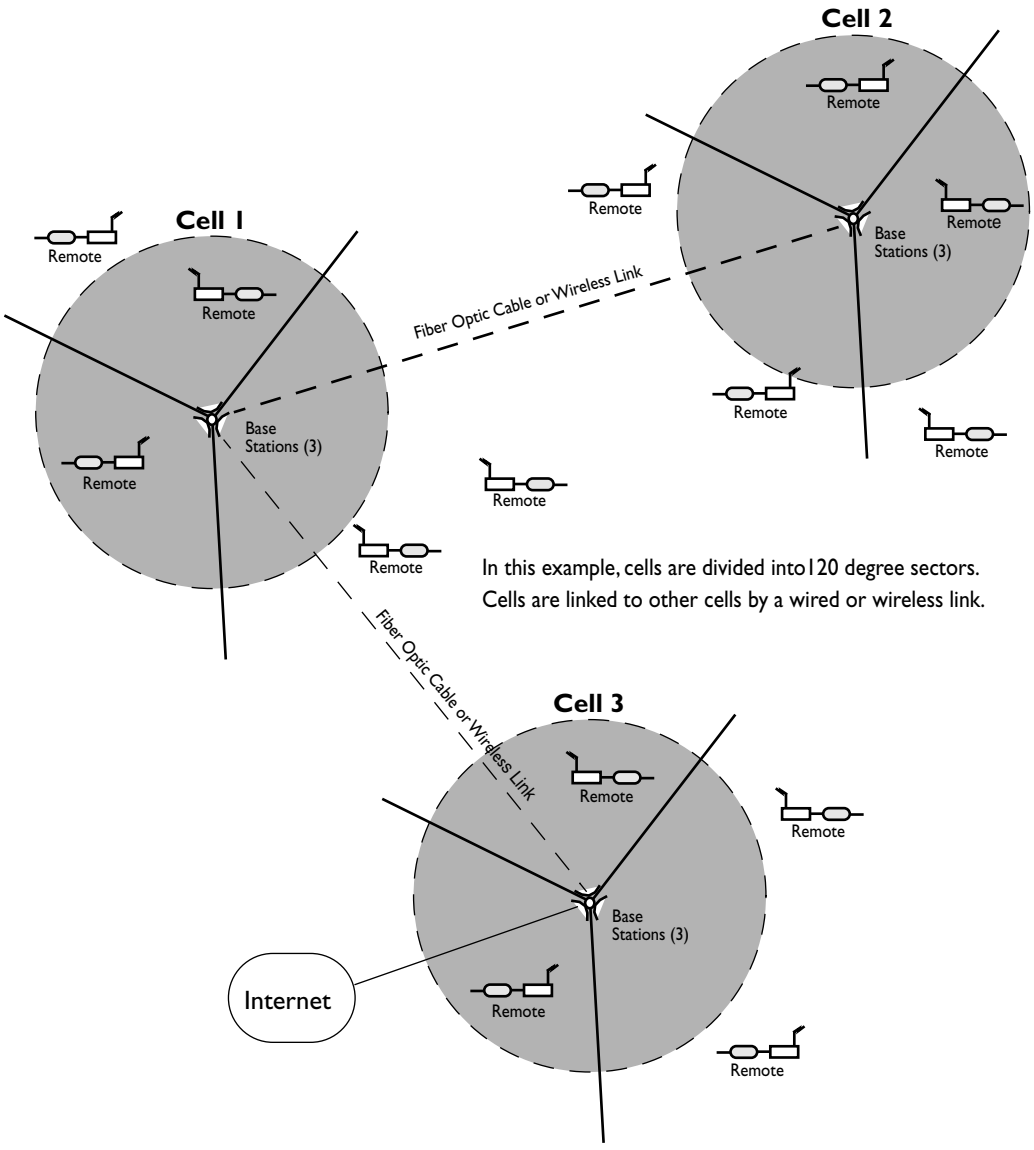


Creating a Network with Cells

Cells or data nodes can be created with AWE units to maximize coverage, minimize interference, and increase data throughput. Directional antennas are mounted on a mast to divide cells into sectors.Each sector is connected to an antenna and a base station. Directional antennas increase signal gain within the sector and increase the distance possible between base stations and remotes. Center frequency, acquisition code and antenna polarization techniques are used to isolate sectors.The increase in data rate depends on the number of sectors. For example, the data rate of Cell 1 in the diagram below is 36 Mbps (12 Mbps x 3 sectors). Cells are distributed across a service area and can be linked to each other via a wireless link or a fiber optic cable.

Implementing a network with cells requires comprehensive network planning and site preparation. Please contact Wi-LAN for information about creating a network with cells.

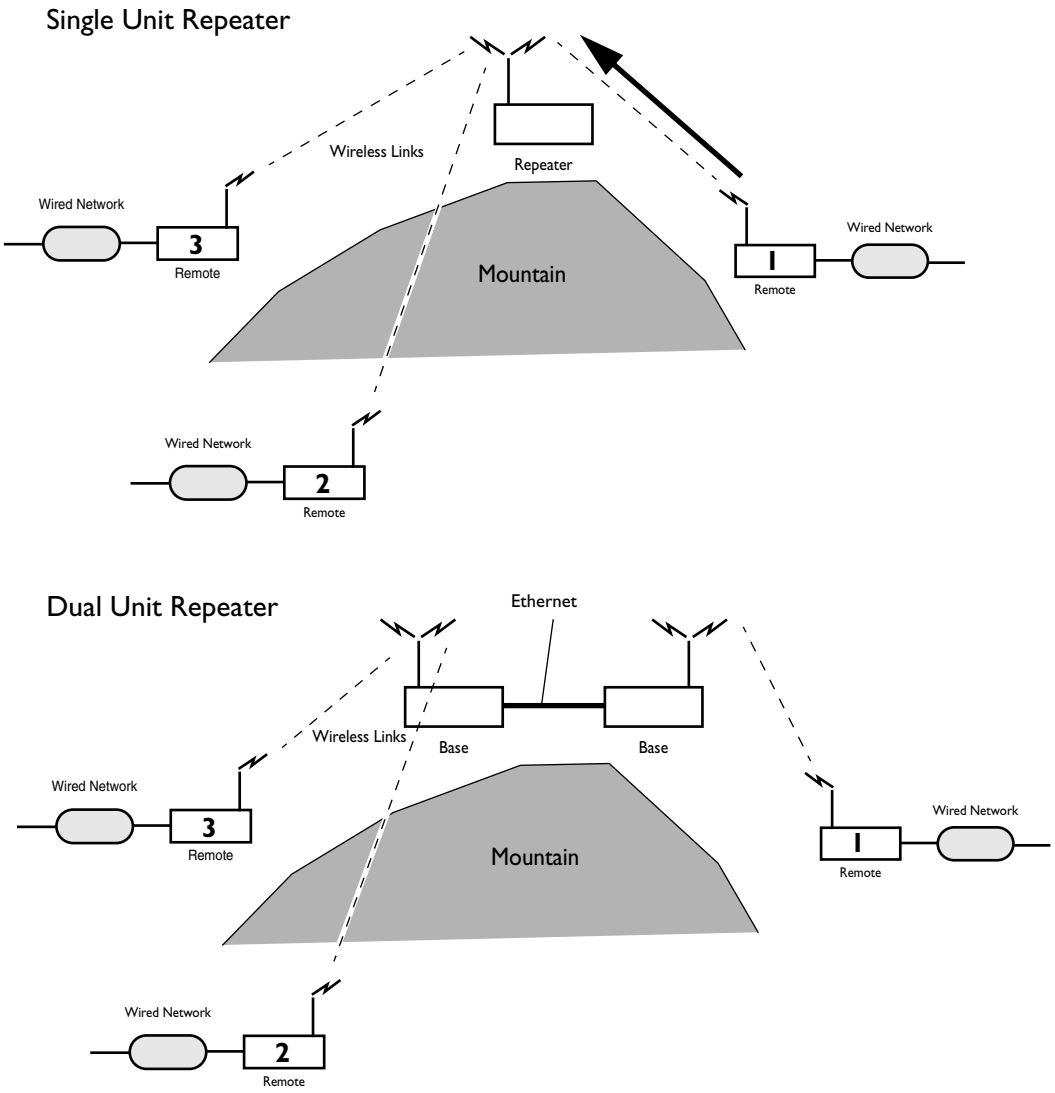
LAN with Cells and Sectors



Using a Repeater Base

A base station can function as a repeater to enable wireless data communication around physical obstacles such as tall buildings or mountains. The repeater passes data around the obstacle to any remote in the same RF group. The single unit repeater slows data throughput due to the "store and forward" process where each packet is handled twice. A dual unit repeater does not slow data throughput.

Base Station as a Repeater



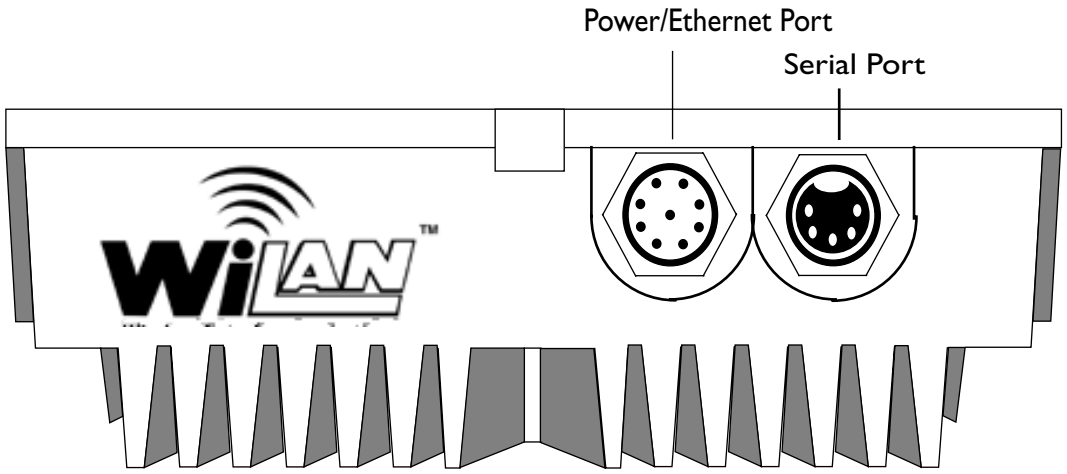
Building a WAN

LAN segments can be linked with AWE units to build a WAN (Wide Area Network). Wi-LAN networks are installed in many locations around the world. You can contact Wi-LAN for help designing your network.

Hardware Description

The AWE 120-58 unit has two connector ports located on the access panel. One port receives Power and Ethernet via a special connector cable (see below). The second port provides Serial management access.

Access Panel

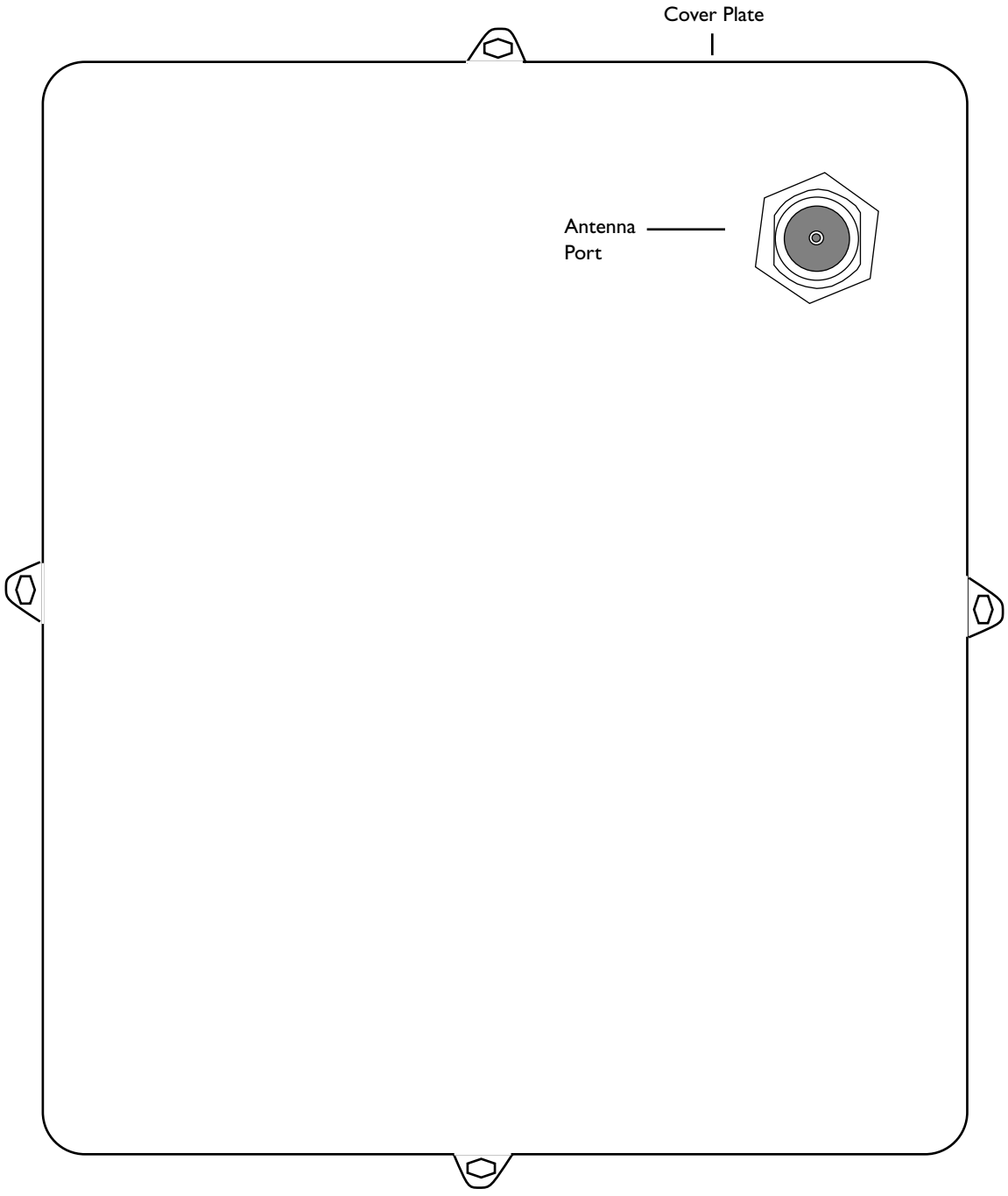


The access panel connectors are further described below

Power/Ethernet Port	8-pin male connector. A matching connector cable is provided with your shipping package
Serial Port	5-pin female connector. A matching connector cable is available separately (not provided with your shipping package)

The top panel for a unit with a separate antenna connection is shown below. It contains a cover plate with an N-type antenna connector. An integrated antenna may alternatively replace this cover plate, providing a direct RF connection.

Top Panel



Antenna	N-type female connector antenna port is located at the top right of the top panel. This port may be connected to an antenna directly or through a 50 ohm coaxial cable

AWE 120–58 Specifications

General Specifications	
Modulation Method:	Multi-Code Direct Sequence Spread Spectrum (MC-DSSS), time division duplexing (TDD)
Wireless Data Rate:	12 Mbps raw data rate/up to 10.2 Mbps operational
RF Frequency Range:	5.725 - 5.850 MHz (unlicensed ISM band)
Power Requirements:	TBD Vdc (via 110/240 VAC 50/60 Hz adaptor) 15W maximum power consumption
Physical (for units with integrated antenna):	Size (W x L x H): 30.5 x 30.5 x 8.4 centimeters (12 x 12 x 3.3 inches) Weight: 3.6kg (7.9 lb.)
Physical (for units with separate antenna):	Size (W x L x H): 8.6 x 10.3 x 8.1 centimeters (8.6 x 10.3 x 3.2inches) Weight: 3 kg (6.6 lb.)

Radio Specifications	
Antenna Connector:	N-type female (for units with separate antenna)
Max. Transmit Output Power:	+21 dBm +/– 1 dBm (after unit temperature is settled)[1]
Receiver Sensitivity:	Better than – 80 dBm (1×10^{-6} BER) mid-channel[1]
Processing Gain:	>10 dB
System Gain	Better than 101 +/– 1 dB
Center Frequency	5.7410 GHz–5.8338 GHz in 400 kHz steps
Bandwidth	33 MHz null to null
	[1] Transmit Power and Sensitivity specifications are for mid-channel and room temperature. Across frequency and temperature range, these specifications are within +/– 2 dBm

Network Support	
Packet Format:	IEEE 802.3 and Ethernet II (High-level protocol transparent)
LAN Connection:	10/100BaseT (auto negotiates)
Bridge Functionality:	Local Packet Filtering (self-learning) Static IP address filtering Dynamic polling of remotes User configurable data rate (throttling) Software is upgradeable online via ftp

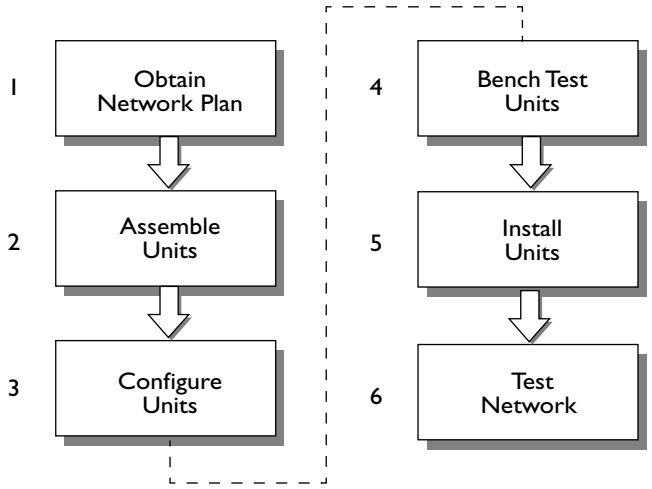
Wireless Networking Protocols	
Network Topologies:	Point-to-Point, Point-to-Multipoint, Multipoint-to-Multipoint
Repeater Mode:	User Configurable
Private Network	User configurable using repeater and RF Group
RF Collision Management:	Dynamic Polling with Dynamic Time Allocation
Security	
Data Scrambling:	User Configurable
Data Security Password:	Security password of up to 20 bytes in length (10^{48} combinations)
Configuration, Management, and Diagnostics	
Configuration Methods:	Web, SNMP, telnet and RS-232 Serial Port
SNMP:	Version 1 compliant (RFC 1157), MIB standard and enterprise (RFC 1213)
Management Port Functionality:	Supports system configuration, security, access control, wireless LAN diagnostics and management, menu-driven ASCII interface via RS-232 DB-9 connector
Environment	
	Units are fully weather proof. The operating ambient temperature range is from -40° to 60° Celsius.

Installation

Overview

This section explains how to install AWE units. You will first assemble, configure and test units in a controlled environment so that any problems can be solved easily, and then install units in the field. By going through this process, you will ensure a successful installation, save time spent on-site, and reduce travel from site to site.

The following basic process should be followed.



1. Obtain your network plan (see *Appendix G: Network Plan Template on page 179*), equipment and tools.
2. Assemble units.
   —Check the contents of each AWE shipping package to ensure that you have received the required parts.
   —Connect an indoor antenna or dummy load, connect the power supply unit and check the power.
3. Configure units—Set unit parameters according to the network plan.
4. Bench test units—Test basic RF and network operation of units in a controlled environment.
5. Install units—Place the tested units in their field locations and connect them to antennas, the wired network, and power. Install the ferrite block around the 10/100BaseT Ethernet cable.
6. Test Network—Test the operation of the installed network.

Checking the Shipping Contents

Check the contents of each AWE shipping package to ensure that you have received all the materials. Note that there are two possible packages available for units shipped with or without an integrated antenna. Verify the package type you ordered and refer to the appropriate list(s) below.

Common items for both shipping packages include:

- AWE unit
- Power supply (includes one (1) Power Inserter Unit and one (1) Power/Ethernet cable)
- Unit mounting accessories (includes four (4) lock washers, four (4) lock nuts, four (4) flat washers, four (4) threaded rods, and two (2) clamping plates)
- Two (2) end caps
- Installation and Configuration Guide (CDROM or hardcopy)
- Warranty Card

If you ordered the integrated antenna shipping package, the following additional item(s) should be included:

- TilTek 23 dBi integrated antenna

Otherwise, the following additional item(s) should be included:

- Cover plate

If any of the above items are not included in the AWE 120-58 shipping package, contact Wi-LAN customer support.

You may also require the following items.

- Cable, straight-through Ethernet RJ45, when connecting a unit to a hub
- Cable, crossover Ethernet cable RJ45, when connecting directly to the Ethernet port of a PC
- AWE 120-58 Serial cable (DB9 female connector to AWE 120-58 5-pin male connector)
- DB9 to DB25 serial adaptor

You can purchase these items and other parts from Wi-LAN or any authorized supplier.

Tools and Equipment

Ensure that you have all the required parts and equipment specified in the network plan. You will require a laptop PC with HyperTerminal® or other terminal emulation software and RS-232 cable to install and configure units. You may require a spectrum analyzer, Site Master® communication test set, digital multimeter, 2-way radios, binoculars, strobe lights, ladder, and weatherproof caulking.

If your unit contains a separate antenna connection, additional equipment is required to perform RF link bench tests. The following examples and illustrations assume a separate antenna is used. If your unit contains an integrated antenna, additional equipment may be required for antenna mounting.

1 Obtain Network Plan

The network plan describes the network in detail, including the following.

- Type and number of units
- Physical layout
- Configuration settings for each unit
- Site names, IP addresses and links
- Antenna types, RF cables and cable lengths, surge suppressors, terminators
- Network cable types and lengths
- Grounding kits and backup power requirements
- Link budget
- Floor plans and equipment cabinet requirements

A plan should be completed before any equipment is installed in the field. See *Appendix A: Planning Your Wireless Link* , page 135 and Appendix G: Network Plan Template on page 179 for more information about network plans.

2 Assemble Units

To assemble a unit and check the power

1. Connect the indoor antenna to the Antenna port on the top panel of the unit.

   Note: Indoor antenna may be different from the illustration.

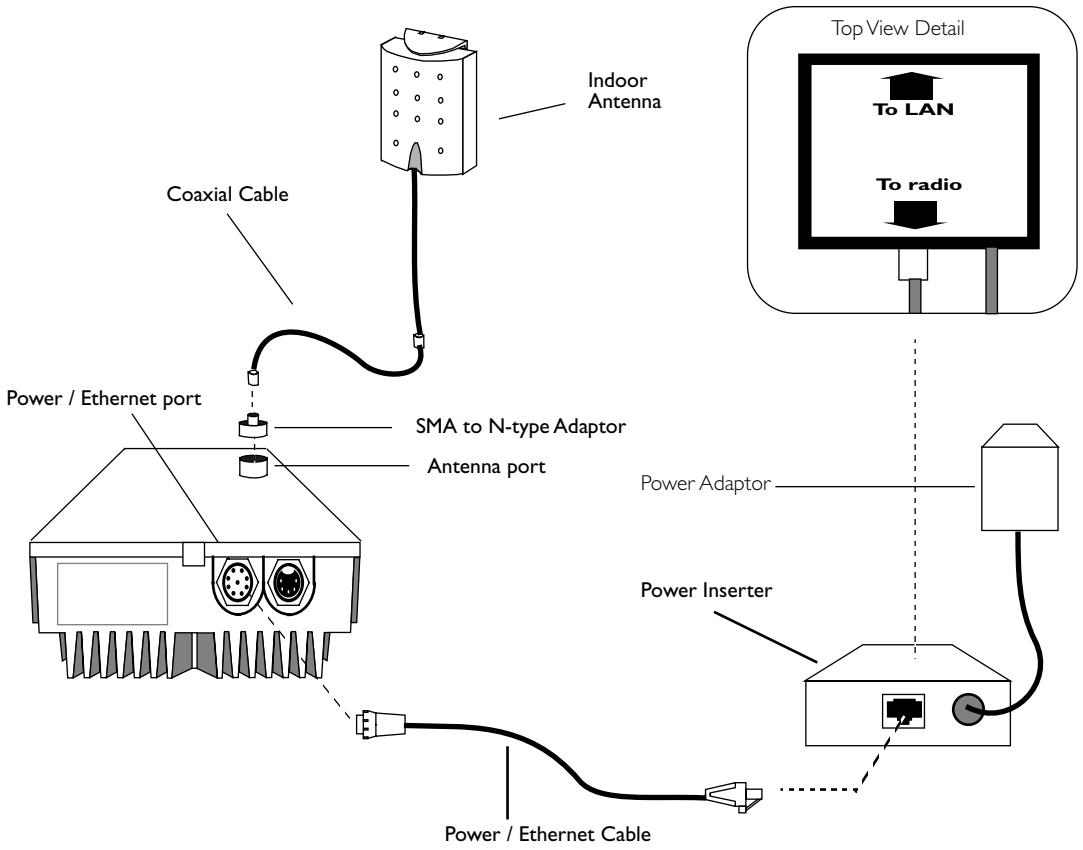
! CAUTION

Never operate a unit without an antenna, dummy load, or terminator connected to the antenna port.
Operating a unit without an antenna, dummy load, or terminator connected to the antenna port can permanently damage a unit.

! CAUTION

The AWE 120-58 must be connected only to a Wi-LAN Power Inserter Unit to provide appropriate power (and Ethernet)

Antenna and Power Connections



2. Check the power

   a) Plug the 8-pin female connector on the Power/Ethernet cable into the unit's Power/Ethernet port

   b) Plug the RJ45 connector on the Power/Ethernet cable into the Power Inserter Unit's RJ45 port labelled "**To radio**" (see above diagram)

   c) Plug the TBD VDC Power Adaptor on the Power Inserter Unit into the AC power outlet.

   The Power LED on the Power Inserter Unit displays GREEN if power is correctly supplied to the unit. Otherwise, the LED displays ORANGE.

   If the Power LED does not display GREEN, check your AC power source and the power supply unit. Verify the Power/Ethernet cable is connected to the correct RJ45 port on the Power Inserter Unit and that a secure connection is made with the 120-58 Power/Ethernet port.

3 Configure Units

This section describes how to configure a base station and a remote unit, which are the basic units required for a point-to-point wireless link. Once you have configured and tested this basic equipment, you can configure and test all remaining units. See *Configuration* , page 29 for detailed information about configuration settings.

Configuring a Base Station

When you configure a unit as a base station, you need to perform the following tasks.

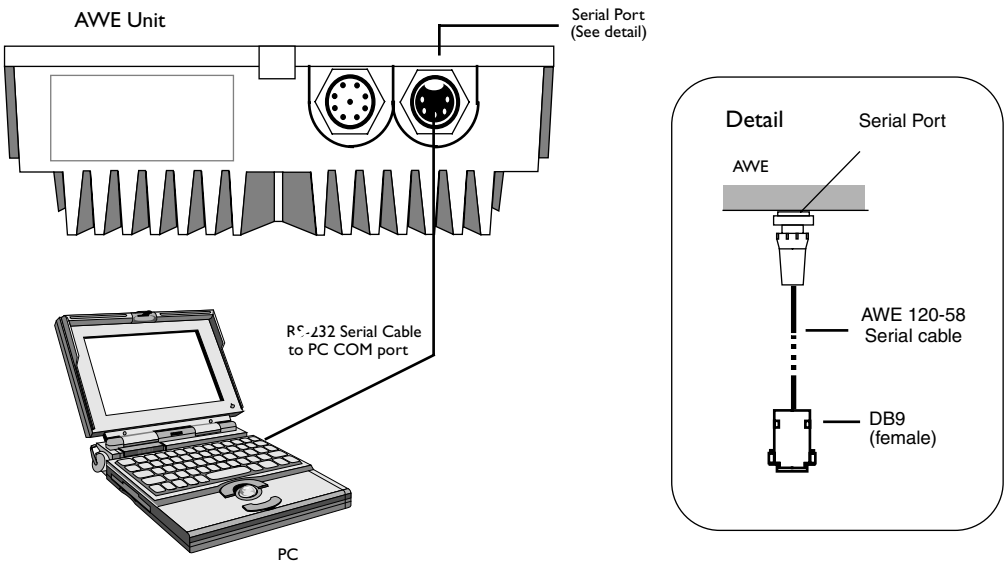
- Check the Network Configuration information of the unit
- Set the Station Type of the unit to "Base Station"
- Assign the Station Rank (# equal to or greater than the number of remote units)
- Choose a Center Frequency (must be the same for all units in network)
- Select an Acquisition Code (must be the same for all units in network)
- Set Tx Power Level Adjust initially to "0 dB"
- Set the security passwords (must be the same for all units in network)
- Change the default menu passwords

These tasks are described below in detail.

To configure a unit as a base station

1. Connect a PC to the AWE unit that will be the base station. Connect the COM port of the PC to the serial port of the AWE via an AWE 120-58 Serial cable.

Connecting PC to Serial Port



2. Start HyperTerminal® (see *Appendix B: Using HyperTerminal* , page 149 for details) or another terminal emulation program such as Tera Term™. Use the following communication settings: **9600 bps, 8 bits, no parity, 1 stop bit, no flow control**.
3. Press **Enter**. The AWE 120-58 Login window is displayed.

```
Wi-LAN AWE 120-58 Login

S/N:            Serial-Number
MAC Address:    001030000000
Software:       Rev 4.0.0 (Apr 20 2002 10:13:37)
Hardware:       Rev 4.0.0 (4MB SDRAM, 2MB Intel Flash)

Enter Password:
```

4. Type the default password (`supervisor`) and press **Enter**. The Main Menu is displayed.

Note: `supervisor` enables you to change the configuration settings with the Main Menu. See *Setting Menu Passwords* , page 117 for more information about menu passwords.

Main Menu

```
   Wi-LAN AWE 120-58 Main Menu


-> Unit Identification
   Hardware/Software Revision
   System Software ROM Images
   Current System Status
   Network Configuration
   IP Filter Configuration
   VLAN Configuration
   RF Station Configuration
   Radio Module Configuration
   RF/Ethernet Statistics
   System Security
   System Commands
   Link Monitor Display

   Logout
```

How to Use the Main Menu

- To select an item from the Main Menu or a sub-menu, press the keyboard arrow keys ↑ ↓ to move the cursor –> next to the item.

  Press the Enter key ↵ Enter to open the data entry field.
- To scroll through items in the data entry field, press ↑ ↓ .

  Press ↵ Enter to select an item from the field.
- To exit from a menu, press the **Esc** key. Esc

5. Select `Network Configuration`. Check the network configuration information, the IP address and subnet mask settings. If necessary, change settings to match the network plan.

6. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration window is displayed.

```
 H - Help            Radio Module Configuration
                                      New         Current        Flash
Station Type                    -> Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)              1             1             1
Center Frequency (57410-58338)     5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)         1             1             1
Security Password 2  (Hex)         10            10            10
Security Password 3  (Hex)         100           100           100
Security Password 4  (Hex)         1000          1000          1000
Security Password 5  (Hex)         10000         10000         10000
Scrambling Code      (Hex)         0             0             0
Acquisition Code     (0-15)        1             1             1
Config Test Minutes  (1-120)       30            30            30
Tx Power Level Adjust              0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                      off           off           off
System Symmetry Type               Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)      1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)        0             0             0

Reboot New RF configuration        Press Enter to Execute
Save Current Config to Flash       Press Enter to Execute
```

   - Select `Station Type`. Choose `Base Station`.
   - Select `Station Rank`. Enter the total number of remote units in your wireless network. For example, if you have only one remote unit, enter "1". If there are 20 remote units, enter "20".
   - Choose a `Center Frequency`. Enter the value of the center frequency (range is 57410–58338 in 400 kHz steps). All wireless units must be set to the same center frequency.
   - Select `Security Password x`. Enter security passwords (each password can be up to eight digits long in hexadecimal) for the unit. All units in the same network must have the same set of security passwords.
   - Select `Scrambling Code`. Enter a hexadecimal value or leave the default at "0". All units in the same network must have the same scambling code.
   - Select `Acquisition Code`. Enter a value from 0–15. (All units in the same network must have the same acquisition code.)
   - Select `Config Test Minutes`. Enter a time in minutes, for example, 10. The unit will automatically reboot when this time period expires, and uses the settings stored in flash memory instead of current settings.
   - Select `Tx Power Level Adjust`. Choose an initial value of 0 dB, which means no Tx power attenuation.
   - Select `Reboot New RF configuration` and press **Enter**. The unit reboots and the Login window is displayed.
7. Log in to the unit. (Type `supervisor` for the password). The Main Menu is displayed.
8. Select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration window is displayed.

- Select **Save Current Config to Flash** and press **Enter**. The new settings are stored in flash memory and displayed on the menu. The word `Success` appears on the screen.

9. Press **Esc** to go back to the Main Menu.
10. Select `Logout` to exit *or* press **Esc**.

Note: At this time you may want to finish configuring the base station according to the network plan. See *Configuration*, page 29 for instructions about viewing and changing various settings.

Configuring a Remote Unit

When you configure a unit as a remote unit, you need to do the following tasks.

- Check the Network Configuration information of the unit
- Set the Station Type of the unit to "Remote Unit"
- Assign the Station Rank (polling ID # of the remote unit)
- Select a Center Frequency (must be the same for all units in network)
- Select an Acquisition Code (must be the same for all units in network)
- Set Tx Power Level Adjust initially to "0 dB"
- Set the security passwords (must be the same for all units in network)
- Change the default menu passwords

These tasks are described below in detail.

To configure a unit as a remote unit

1. Connect a PC to a AWE remote unit. Connect the COM port of the PC to the Serial port of the remote unit via an AWE 120-58 Serial cable. See *Configuring a Base Station*, page 15 for cabling diagram.
2. Start HyperTerminal® or other terminal emulation program (see *Appendix B: Using HyperTerminal*, page 149). Use the following communication settings: 9600 bps, 8 bits, no parity, 1 stop bit, no flow control.
3. Press **Enter**. The AWE 120-58 Login window is displayed.
4. Type the default password `supervisor` and press **Enter**. The Main Menu is displayed.
5. Select `Network Configuration`. Check the IP settings. If necessary, change the settings to match the network plan.
6. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration window is displayed.

```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                    -> Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)              1             1             1
Center Frequency (57410-58338)     5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)         1             1             1
Security Password 2  (Hex)         10            10            10
Security Password 3  (Hex)         100           100           100
Security Password 4  (Hex)         1000          1000          1000
Security Password 5  (Hex)         10000         10000         10000
Scrambling Code      (Hex)         0             0             0
Acquisition Code     (0-15)        1             1             1
Config Test Minutes  (1-120)       30            30            30
Tx Power Level Adjust              0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                      off           off           off
System Symmetry Type               Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)      1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)        0             0             0

Reboot New RF configuration        Press Enter to Execute
Save Current Config to Flash       Press Enter to Execute
```

- Select `Station Type`. Choose `Remote Unit`.
- Select `Station Rank`. Enter the rank number of the remote unit. Enter a number from 1–1000.
- Choose a `Center Frequency`. Enter the value of the center frequency (range is 57410–58338 in 400 kHz steps). All wireless units must be set to the same center frequency.
- Select `Security Password x`. Enter security passwords (each password can be up to eight digits long in hexadecimal) for the unit. All units in the same network must have the same set of security passwords.
- Select `Scrambling Code`. Enter a hexadecimal value or leave the default at "0". All units in the same network must have the same scambling code.
- Select `Acquisition Code`. Enter a value from 0–15. (All units in the same network must have the same acquisition code.)
- Select `Config Test Minutes`. Enter a time in minutes, for example, 10. The unit will automatically reboot when this time period expires, and uses the settings stored in flash memory instead of current settings.
- Select `Tx Power Level Adjust`. Choose an initial value of 0 dB, which means no Tx power attenuation.
- Select `Remote Unit RF Group`. Enter a value from 0–63. (For testing purposes, you may leave the value = 0.)
- Select `Reboot New RF configuration` and press **Enter**. The unit reboots and the Login window is displayed.

7. Log in to the unit. (Type `supervisor` for the password). The Main Menu is displayed.
8. Select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration window is displayed. The settings under Current change to values that were in the `New` column.
9. Select `Save Current Config to Flash` and press **Enter**. The new settings are stored in flash memory and displayed on the menu. The word `Success` appears on the screen.

10. Press **Esc** to go back to the Main Menu .
11. Select `Logout` to exit.

Note: At this time you may want finish configuring the unit according to your network plan. See *Configuration* , page 29 for instructions about viewing and changing various settings.

4 Bench Test Units

In this section, you will perform the following tasks:

- Ensure that a basic RF link exists between a base station and a remote unit.
- Test the basic link with Link Monitor and adjust Tx power level.
- Perform some simple network tests.

Establishing a Basic RF Link

This test ensures that a basic RF link exists between a base station and a remote unit.

Important

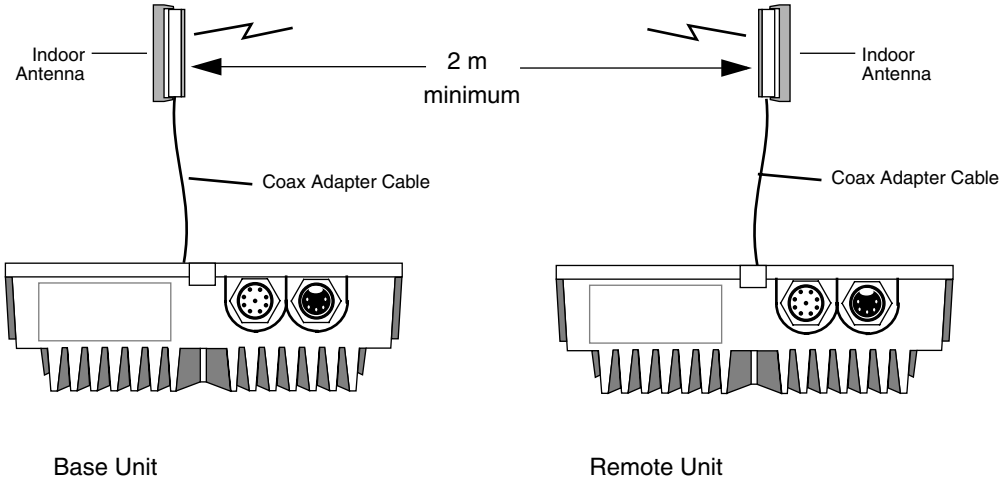
The quality of your digital data transmission depends greatly on the quality of your RF link. **Always try to establish a high-quality RF link first**. A high-quality RF link will result in high-quality data transmissions and a low BER. A low-quality RF link will result in low-quality data transmissions and a high bit error rate (BER). Digital data can always be sent across a high-quality RF link. If the RF link is of poor quality, data either cannot be sent at all or will contain too many errors to be useful.

Tip: First configure one unit as a base station, and then use it to test all the remote units.

To establish a basic RF link

1. Ensure that one unit is configured to a base station, select a center frequency and set the test minutes. See *Configuring a Base Station* , page 15.
2. Ensure that the other unit(s) are configured as remote units with the center frequency the same as the base station. See *Configuring a Remote Unit* , page 18.
3. Place the base station and a remote unit at least two meters apart with a clear line of sight between antennas. Point the antennas toward each other.

Basic Test Setup



4. Power up the base station. The power LED on the Power Inserter Unit should be GREEN.
5. Power up the remote unit. The power LED on the Power Inserter Unit should be GREEN.

Next, you will test the link with the Link Monitor test and adjust the Tx power level to obtain a fade margin of 15–30 dB.

Testing the Link and Adjusting Tx Power

A basic RF link is established when the base station and remote unit can receive and transmit data to each another. Once you have established a basic RF link, you test the link by running the Link Monitor test and viewing the link statistics, and you adjust the Tx Power of the base and remote units to obtain a 15–30 dB fade margin.

To test the RF link and adjust Tx power

1. Connect the test PC to the serial port of the base station or remote unit. See *Connecting PC to Serial Port* , page 15.
2. Log in to the unit and go to the Main Menu.
3. Select `RF Station Configuration` and press **Enter**. The RF Station Configuration window is displayed.

```
H - Help            RF Station Configuration

   Operating Mode                        -> Normal Mode
   RF Transmit Status                       unblocked
   Link Monitor Period (0=OFF, 1-10000)     0
   Test Mode Timer Minutes (1-1000)         5

   Base Station Only Parameters

   Maximum Remote Distance                  5 Km
   Link Monitor Remote Station Rank         1

   Remote Station Only Parameters
   Throttle Enable                          off
   Throttle Level (1-100)                   1
   Output Power Control Mode                off
   User Output Power Adjust Ceiling         -5  dB
   Signal Margin (6-31) dB                  15

   Current Output Power Level Adjust        -21
```

- Select `Operating Mode`. Press the arrow keys to select `Normal` mode.
- Select `RF Transmit Status`. Select `unblocked`.
- Select `Link Monitor Remote Station Rank`. Enter the rank of the unit that you want to link test. (The rank is the identification number of the unit. The rank of a remote can be any number from 1 – 1000. The rank number of the base station equals the number of remote units. See *Setting the Station Rank* , page 94.)
- Select `Output Power Control Mode`. Choose `off`.
- Select `Signal Margin` and enter an initial value of 15.
- Select `Link Monitor Period`. Enter a link monitor period of **1**. (A value of 1 means that 50% of available data packets will carry test data. The higher the period number, the fewer the number of data packets that will carry test data. See *Setting the Link Monitor Period* , page 78 for more

information.) **The Link Monitor test starts as soon as a non-zero value is entered in the field.**

4. From the Main Menu select `Link Monitor Display` and press **Enter**. The RF Background Link Monitor Statistics window is displayed.

```
                    RF Background Link Monitor Statistics

Link Monitor Rank                    1
Base to Remote BER                   0.0E+00
Remote to Base BER                   0.0E+00
Missed Packet Count                  0
Base to Remote Env Power             27
Base to Remote Corr Power            28
Remote to Base Env Power             29
Remote to Base Corr Power            30
```

5. Check for the following statistics:
   - Base to Remote BER = 0.0E+00
   - Remote to Base BER = 0.0E+00
   - Missed Packets = 0
   - Base to Remote Corr Power between 15 – 50 dB
   - Remote to Base Corr Power between 15 – 50 dB
6. If the Corr Power is <15 dB the receive signal is probably too weak to be useful. If the power is >55 dB the receiving unit is probably being saturated. You can perform one of the following:
   - decrease Tx power to achieve a Corr Power of 15 – 30 (see *Adjusting the Tx Power Level* , page 101).
   - set Tx power automatically. See *Setting Tx Power Automatically (Remote Station Only)* , page 83.
   - move the antennas further apart or adjust the antenna orientation to reduce the power level.
7. When you are finished viewing link monitor statistics, disable Link Monitor to remove the overhead test data from the wireless link. To disable Link Monitor, select `RF Station Configuration` from the Main Menu and press **Enter**. The RF Station Configuration window is displayed.
8. Select `Link Monitor Period` and press **Enter**. The field is highlighted.
9. Type 0 in the field and press **Enter**. The link monitor test ends.
10. Press **Esc** to exit.

You have now established an RF link between two units, tested the ability of the link to carry test data, and adjusted the Tx power level. Next, you connect the units to a network and perform some simple network tests.

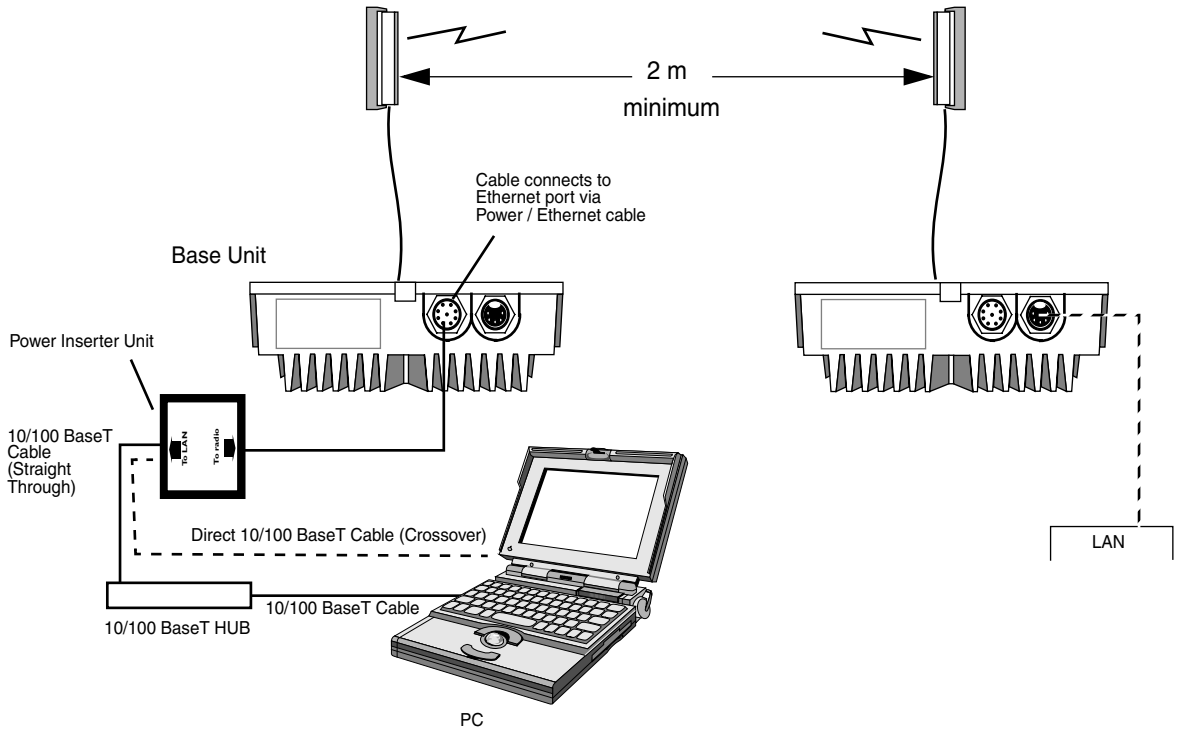
Performing Simple Network Tests

To test units within a simple network you require two AWE 120-58 units, a LAN connection, a PC and a crossover Ethernet cable or hub connection.

To perform a simple network test

1. Connect the Ethernet port of the PC to the base station's Power Inserter Unit "**To LAN**" port. You can either connect via a network hub or connect directly using an RJ45 crossover Ethernet cable.
2. Connect the remote unit to the network as described in Step 1.

Simple Network Test Setup



3. Power up both AWE units. The power LEDs on both the base station and remote unit Power Inserter Units should be GREEN.
4. Configure the AWE units within your network. See *Network Configuration* , page 40 for information about AWE Internet addresses. See *Appendix C: Configuring a Simple Data Network* , page 151 for information about configuring simple peer-to-peer networks.
5. Create some network traffic to test the wireless link. For example, use **ping** or **ftp** *put* and *get* to transfer large test files, in both directions, across the link. When the file transfer is done, **ftp** displays the size of the file and the time it took to transfer the file. This information can be used to measure the data throughput of the wireless link, and is very useful for troubleshooting.

Using ping and ftp

ping

From the command line prompt, type:
C:> ping *IP Address*

Example:

ping 192.163.2.88

ftp

To connect to the node, from the DOS prompt, type:
C:> ftp *IP Address*

For instructions about using ftp, type “help”
at the ftp prompt.

ftp> help

Follow the instructions.

6. Test all units in the network.

5 Install Units

This section provides some guidelines about installing units in the field.

⚠ WARNING

All antennas must be professionally installed following accepted safety, grounding, electrical, and civil engineering standards.

! CAUTION

Never operate a unit without an antenna, dummy load, or terminator connected to the antenna port.
Operating a unit without an antenna, dummy load, or terminator connected to the antenna port can permanently damage a unit.

- Install the units at locations identified in the network plan.
- Verify that there is no interference at the site by performing spectrum sweeps with a spectrum analyzer. Perform sweeps at various times of the day (for example, 9AM, noon, and 3 PM are peak telephone traffic times.) If there are problems, contact the network planner, who may need to change the system configuration or design.
- If test equipment is available, sweep antennas and cables with the Site Master® communications test set before securing antennas and cables to towers, while they are on the ground and easy to access. Sweeping helps to ensure that antennas and cables will operate as expected.
- Initially install equipment with flexibility—do not tie down cables, antennas should be free to move, allow some slack in cables, avoid drilling and do not seal connections.
- Align antennas*. (Two people are required, one at the base station and one at the remote unit. When in the field, you may require binoculars and 2-way radios to communicate.) When aligning antennas, adjust the orientation of the remote antenna while running a link monitor test between the remote and the base station. Adjust the antenna until you achieve the highest fade margin with no bit errors (BER = 0). See *Performing Link Monitor Test (Normal Mode)* , page 72 for instructions. Repeat the antenna alignment procedure for each remote.
- When antennas are aligned and cables are secured, sweep the antennas with the Site Master test set a final time before connecting to AWE.
- Perform diagnostic tests on the installed system. Compare field results to bench test results using ping, ftp, fade margins, etc. Document your results (these results will be very useful when troubleshooting and monitoring the system's performance).
- When the system works as specified, lock down and weatherproof all equipment and connections.

* The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 2 metres from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Point-to-Multipoint Installation

The procedure for installing a point-to-multipoint system is the same as the procedure for installing a point-to-point system. Treat each link in a point-to-multipoint system as a single, point-to-point wireless link.

Co-Location Installation

When you install a system with sectors and co-located base stations (see *Creating a Network with Cells* , page 5 for an example), you install and test sectors as if they were point-to-point systems; however, in this case you must ensure that individual sectors are not interfering with each other. Please contact Wi-LAN for information about planning and installing co-located units.

- Align and test the first sector. Measure the fade margin and run the link monitor test. Document your results, then turn off the radio in the first sector.
- Align and test the second sector. Measure the fade margin and run the link monitor test. Leave the link monitor test running in the second sector.
- Turn on the radio in the first sector again and run the continuous transmit test. See *Performing Transmit and Receive Tests* , page 75.
- Observe the BER and fade margin of the second sector radio. Look for changes to determine if the first sector is interfering with the second sector.
- Repeat the tests for all sector/pair combinations.

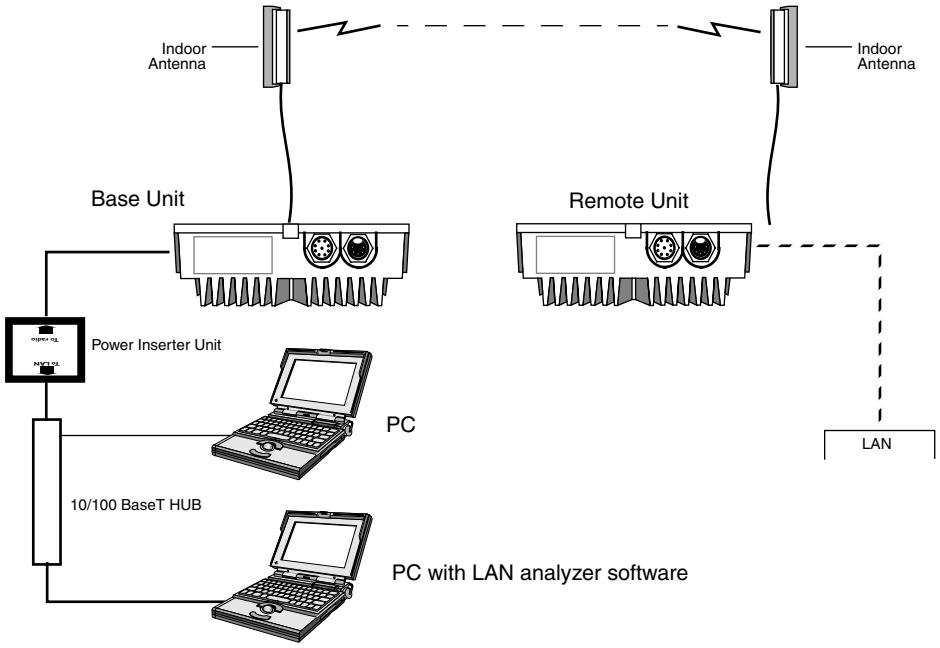
6 Test Network

Run the link monitor test and other tests such as ping and ftp file transfers to verify network operation when the units are installed in the field. See *Performing Link Monitor Test (Normal Mode)* , page 72.

Adding to a Network

Always add to your network one link or device at a time, working from a known base network. Measure and document changes to the system and changes in performance. For example, you can transfer files with **ftp** and measure the performance with LAN analyzer software. The key to a successful network is to proceed one step at a time and to understand your network!

Network Test Setup



Preventative Maintenance and Monitoring

You should set up a preventative maintenance schedule for your network. Wi-LAN recommends that the following preventative maintenance be performed at least semi-annually.

- Regularly run link monitor tests across the network and measure BER and fade margin. You can also test the network with ping, ftp and file transfers. Other resources are available on the Internet that can help you monitor the performance of your link.
- If you have SNMP application software, you can check unit operation from a remote location. See *Appendix D: SNMP* , page 157 for more information.

If you have SNMP application software, you can check unit operation remotely. See *Appendix D: SNMP* , page 157 for more information.

You should periodically perform a physical inspection of each site.

- Check that antennas and cables are secure and have not become loose.
- Check for physical obstructions in the line-of-sight radio path, such as trees and buildings.
- Sweep antennas and cables to ensure that antennas and cables are intact and operating properly.
- Check that there are no water leaks in cabinets.
- Check weatherproofing.
- Check for new sources of electromagnetic interference.

Configuration

Overview

This section explains how to use the Main Menu to configure and test your AWE unit, and to obtain useful statistical and maintenance information.

Main Menu

In this section, each item in the Main Menu is described in the order that it appears in the menu. Use the Main Menu and your keyboard keys to select, view or change settings. Some items in the menu simply display information, while others ask you to enter data or make a selection from a list.

Main Menu

```
            Wi-LAN AWE 120-58 Main Menu


                 -> Unit Identification
                    Hardware/Software Revision
                    System Software ROM Images
                    Current System Status
                    Network Configuration
                    IP Filter Configuration
                    VLAN Configuration
                    RF Station Configuration
                    Radio Module Configuration
                    RF/Ethernet Statistics
                    System Security
                    System Commands
                    Link Monitor Display

                    Logout
```

Accessing the Main Menu

You can access the Main Menu of a AWE unit with a HyperTerminal® session (via the Serial port) or a *telnet* session. Most instructions provided in this chapter assume that you have opened a HyperTerminal session.

You can also configure the AWE 120-58 remotely using a standard web browser (see Appendix I: Web page Configuration) or with SNMP (Simple Network Management Protocol) client. See *Appendix D: SNMP* , page 157 for information about SNMP.

Accessing the Main Menu with HyperTerminal®

To access the Main Menu with HyperTerminal

1. Disconnect power from the AWE unit.
2. Connect an AWE 120-58 Serial cable from a DB9 serial port on the PC to the Serial port on the AWE. See *Configuring a Base Station* , page 15.
3. Start HyperTerminal or other a terminal emulation program on the PC. See *Appendix B: Using HyperTerminal* .
4. Set the terminal emulation program to emulate a VT100 terminal with the following settings.
   - COM port PC serial port connected to AWE unit
   - Bits per second: 9600
   - Data bits: 8
   - Parity: none
   - Stop bits: 1
   - Flow control: none
5. Reconnect the power to the AWE unit.
6. Press **Enter**. The Wi-LAN AWE 120-58 Login menu is displayed.

```
Wi-LAN AWE 120-58 Login

S/N:           Serial-Number
MAC Address:   001030000000
Software:      Rev 4.0.0 (Apr 20 2000 10:13:37)
Hardware:      Rev 4.0.0 (8MB SDRAM, 2MB Intel Flash)
```

7. Type a default password (`user` or `supervisor`) or type your personal password if already have one.

Login Account	Default Password	Privileges
User	`user`	Read Only
Supervisor	`supervisor`	Read and Write

The Main Menu is displayed.

Accessing Units via *telnet*

To access units via *telnet*

1. Ensure that the unit's Internet IP address has been configured, the unit has a working Ethernet connection, and wire and remote access has been enabled (see *Allowing Remote Access and Configuration* , page 119).
2. Ensure that the VT100 Arrows feature in your telnet session is enabled. See *Setting VT100 Arrows* , page 32.
3. From the DOS prompt, type
   `C:>telnet <IP address>`
   where <IP address> is the IP address of the unit that you want to configure.
4. Press **Enter**. The Login menu is displayed.

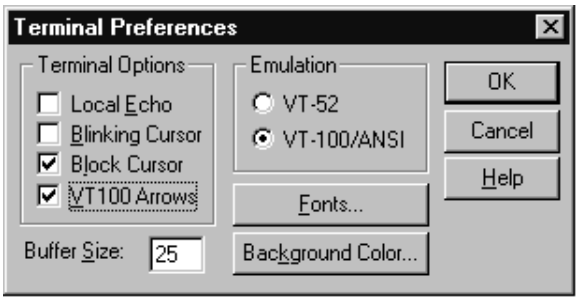
```
Wi-LAN AWE 120-58 Login

S/N:           Serial-Number
MAC Address:   001030000000
Software:      Rev 4.0.0 (Apr 20 2000 10:13:37)
Hardware:      Rev 4.0.0 (8MB SDRAM, 2MB Intel Flash)
```

5. Type the default password (`user` or `supervisor`) or type your personal password.
   The Main Menu is displayed.

Setting VT100 Arrows

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 is displayed.



2. Click the **VT100 Arrows** checkbox.
3. Click **OK**. The VT100 arrows are enabled in the telnet session.

You can now use the keyboard arrow keys to navigate the configuration menus.

Configuring with the Main Menu

This section describes how to configure units with the Main Menu. Menu items are presented in the order they appear in the menu shown below.

Main Menu

```
   Wi-LAN AWE 120-58 Main Menu


-> Unit Identification
   Hardware/Software Revision
   System Software ROM Images
   Current System Status
   Network Configuration
   IP Filter Configuration
   VLAN Configuration
   RF Station Configuration
   Radio Module Configuration
   RF/Ethernet Statistics
   System Security
   System Commands
   Link Monitor Display

   Logout
```

How to Use the Main Menu

- To select an item from the Main Menu or a sub-menu, press the keyboard arrow keys ↑ ↓ to move the cursor –> next to the item.

  Press the Enter key ↵ Enter to open the data entry field.
- To scroll through items in the data entry field, press ↑ ↓ .

  Press ↵ Enter to select an item from the field.
- To exit from a menu, press the **Esc** key. Esc

Accessing Help

On-screen help is available for items listed in the Main Menu.

To access help

1. From the Main Menu, select an item from the list and press **Enter**. The screen for the item is displayed.
2. Press the "**H**" key on the keyboard . The **`Help Menu`** for the screen is displayed.
3. Place the cursor next to an item on the **`Help Menu`** and press **Enter**. The help text available for that item is displayed.

   Note: To navigate to the next page or to the previous page, press the up or down arrow keys on the keyboard or follow instructions given at the top of the screen.
4. Press **Esc** to exit to the Main Menu.

Example:

1. From the Main Menu place the cursor -> next to **`RF Station Configuration`** and press **Enter**. The RF Station Configuration menu is displayed.

```
H - Help            RF Station Configuration

   Operating Mode                        -> Normal Mode
   RF Transmit Status                       unblocked
   Link Monitor Period (0=OFF, 1-10000)     0
   Test Mode Timer Minutes (1-1000)         5

   Base Station Only Parameters

   Maximum Remote Distance                  5 Km
   Link Monitor Remote Station Rank         1

   Remote Station Only Parameters
   Throttle Enable                          off
   Throttle Level (1-100)                   1
   Output Power Control Mode                off
   User Output Power Adjust Ceiling         -5  dB
   Signal Margin (6-31) dB                   15

   Current Output Power Level Adjust        -21
```

2. Press the "**H**" key on the keyboard. The Help screen for the menu is displayed.

```
Esc - Exit Help

            RF Station Configuration Help Menu

                  Operating Modes
               -> RF Transmit Status
                  Link Monitor Period
                  Test Mode Timer Minutes
                  Maximum Remote Distance
                  Link Monitor Remote Station Rank
                  Throttling
                  Output Power Control Mode
                  User Output Power Adjust Ceiling
                  Signal Margin
                  Current Output Power Level Adjust
```

3. Place the cursor next to an item on the **`Help Menu`** and press **Enter**. The help text for the item is displayed on the screen.
4. Press **Esc** to exit to the Main Menu.

Unit Identification

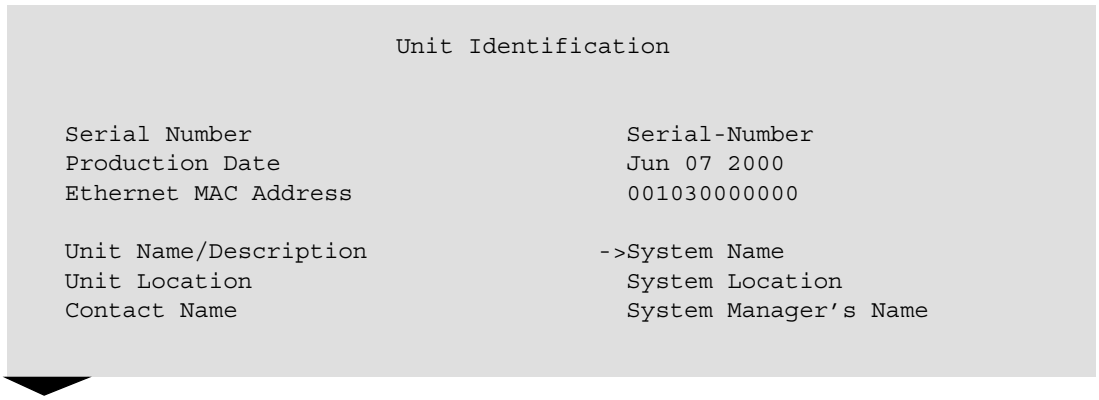
Viewing Unit Identification

You can view a unit's serial number, production date, and MAC address with the Unit Identification menu. The fields are view only and are set at the factory.

You can also view the Unit Name/Description, Unit Location, and Contact Name. These fields are optional and can be changed.

To view unit identification information

1. From the Main Menu, select `Unit Identification` and press **Enter**. The Unit Identification menu is displayed.



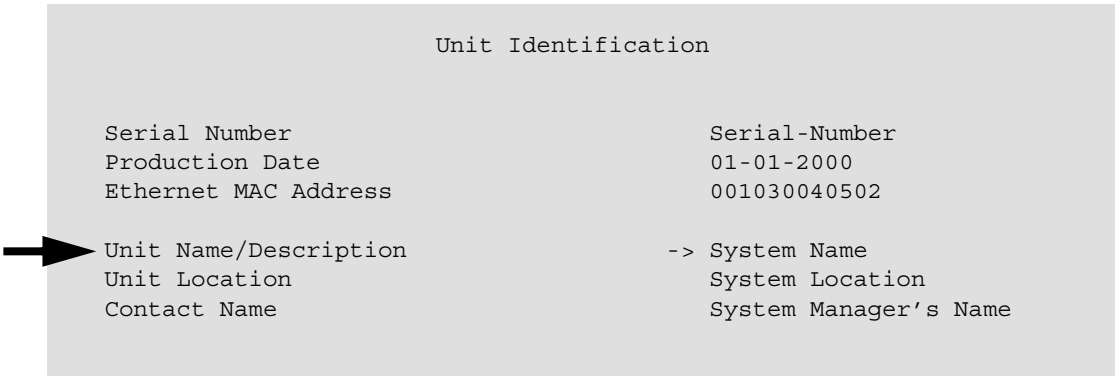
`Serial Number`	Unique serial number of unit (Read Only)
`Production Date`	Date unit was produced (Read Only)
`Ethernet MAC Address`	Unique Ethernet MAC (Media Access Control) address of the unit (Read Only)
`Unit Name/Description`	Name of unit (optional)
`Unit Location`	Location of unit (optional)
`Contact Name`	Name of contact person (optional)

Assigning Unit Identification Information

You can assign a name, location and contact name to units. This information will help you to distinguish units by physical location or by meaningful names rather than station rank only. Unit identification information is optional.

To assign or change unit identification information

1. From the Main Menu, select `Unit Identification` and press **Enter**. The Unit Identification menu is displayed.



2. Select `Unit Name/Description` and press **Enter**. The data field highlights.
3. Type in a new name or description.
4. Press **Enter**. The new name or description is displayed in the data field.
5. Select `Unit Location` and press **Enter**. The data field highlights.
6. Type the location of the unit.
7. Press **Enter**. The new location appears in the data field.
8. Select `Contact Name` and press **Enter**. The data field highlights.
9. Type a contact or manager name.
10. Press **Enter**. The new name appears in the entry field.
11. Press **Esc** to exit to the Main Menu.

Hardware/Software Revision

Viewing System Revision Information

The System Revision Information window shows the revision information of the unit including memory revision number, memory size, and software revision number.

To view system revision information

1. From the Main Menu, select `Hardware/Software Revision` and press **Enter**. The System Revision Information window is displayed. The menu is view only.

```
              System Revision Information

Hardware      Rev 4.0.0 (4MB SDRAM, 4MB Intel Flash)
ROM Size      0x200000
RAM Size      0x800000

Software      Rev 4.0.0 (Wi-LAN AWE 120-58 WEBII)
              Apr 20 2000 10:13:37
              329868 Bytes
File Name     FACTORY-IMAGE
```

Hardware	Revision number of the unit, and the amount SDRAM and FLASH memory available in the unit
ROM Size	Amount of Flash read-only memory in the unit = 2 MB
RAM Size	Amount of random-access memory in the unit = 8 MB
Software	Revision number of the system image running on the unit, the date of the revision, and the size of the image file (in this example FACTORY-IMAGE is about 318 Kbytes)
File Name	File name of the system image running on the unit

2. Press **Esc** to exit to the Main Menu.

System Software ROM Images

Viewing System Software ROM Images

A ROM image is the software that a unit uses to operate. The System Software ROM Images window lists software images currently available in the unit. New images can be loaded into a unit's Flash ROM from an outside source such as a PC. The example below shows that only the "Factory-Image" is available, however, in the future other images may be available. If required, you can obtain a new image file from the Wi-LAN–see Appendix F: Upgrading Software on page 175 for instructions. See *Setting Default System Image* , page 122 for instructions about selecting a default image.

To view system software ROM images

1. From the Main Menu, select `System Software ROM Images` and press **Enter**. The System Software ROM Images window is displayed. The window is view only.

```
                    System Software ROM Images

     File Name      Revision    Date      Time     Size  Default Image
-------------------- -------- ----------- -------- ------ -------------

FACTORY-IMAGE        4.0.0    Apr 20 2002 10:13:37 306524    Current
```

`File Name`	Name(s) of system image file(s) stored in the unit. To add or delete images you must use ftp. See *Downloading Image Software* , page 175
`Revision`	Revision number of the system image file.
`Date`	Date image file was last revised
`Time`	Time image file was last revised
`Size`	Size of image file in bytes
`Default Image`	Indicates which image file is the default. Default Image is used at power up. See *Setting Default System Image* , page 122 to modify default image

2. Press **Esc** to exit to the Main Menu.

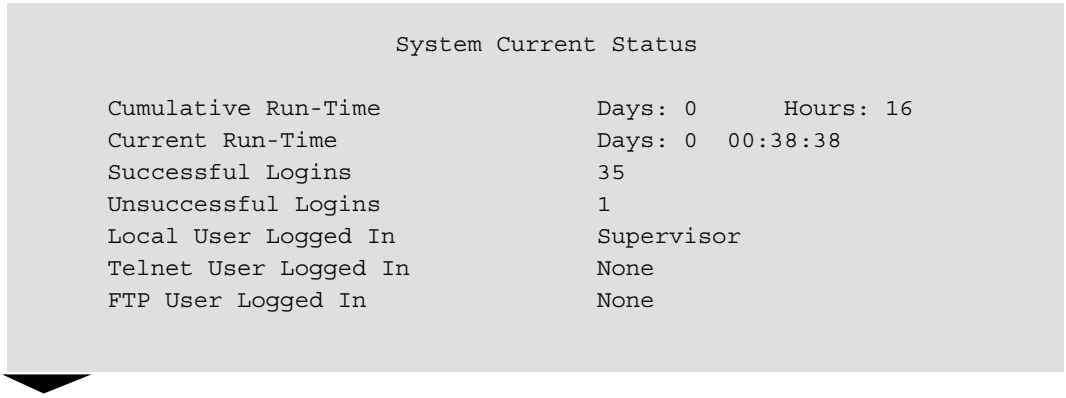
System Current Status

Viewing System Current Status

The System Current Status window provides administration information such as the amount of time a unit has been running and login statistics.

To view system current status

1. From the Main Menu, select `System Current Status` and press **Enter**. The System Current Status window is displayed. The window is view only.



`Cumulative Run-Time`	Number of hours the system has been running since it was manufactured Information is required for maintenance purposes
`Current Run-Time`	Time duration that has passed since the unit was last reset or power cycled
`Successful Logins`	Number of times that the configuration menus have been successfully accessed
`Unsuccessful Logins`	Number of times that access to the configuration menus has failed
`Local User Logged In`	Access level of the user currently logged into the configuration menus via the RS-232
`Telnet User Logged In`	Access level of the user currently logged into the configuration menus via a telnet session
`FTP User Logged In`	Access level of the user currently logged into the host FTP server

2. Press **Esc** to exit to the Main Menu.

Network Configuration

Each AWE 120-58 unit in a system must have a valid Internet IP address and subnet mask to communicate via TCP/IP. You will need to know this information to remotely manage units.

Viewing Internet IP Addresses and Subnet Mask

To view the Internet IP addresses and subnet mask

1. From the Main Menu, select `Network Configuration` and press **Enter**. The Network Configuration menu is displayed.

```
H - Help            Network Configuration


   Internet IP Address                          192.168.1.100
   New IP Address (Reboot Reqd)              -> 192.168.1.100
   Internet IP Subnet Mask                      255.255.255.0
   Default Gateway IP Address                   0.0.0.0
   SNMP NMS Trap IP Address                     0.0.0.0
   MAC Filter Entry Age Time Minutes (1-60)     5
   MAC Address Filtering                        On

   Ethernet Link Parameters (Read-only)

   Link Status                                  Established
   Duplex Mode                                  Half-duplex
   Speed                                        10 Mbps
   Autonegotiation                              Complete
```

`Internet IP Address`	IP address of unit
`New Internet IP Address (Reboot Reqd)`	New IP address of unit Required when changing IP address
`Internet IP Subnet Mask`	Number used to determine if a node is part of LAN or whether a transmission must be handled by router (the subnet mask is logically ANDed with the IP address)
`Default Gateway IP Address`	Address of the main entry point into the network
`SNMP NMS Trap IP Address (future)`	NMS (network management system) trap address Collects alarms and events and passes them to the network administrator
`MAC Filter Entry Age Time Minutes`	Number of minutes after which the MAC (Media Access Control) filter entry will expire

`MAC Address Filtering`	If enabled, the unit will not transmit packets received from the Ethernet connection over the RF channel if the destination is local
`Link Status`	Integrity status for the Ethernet connection. Reported status may be: Failure, or Established
`Duplex Mode`	Current duplex type for the Ethernet connection. For normal operation, Half-duplex is shown
`Speed`	Current link speed for the Ethernet connection. Reported status may be: 10 Mbps, or 100 Mbps
`Autonegotiation`	Link negotiation status for the Ethernet connection. Reported status may be: In Progress, or Complete.

2. Press **Esc** to exit to the Main Menu.

Setting the Internet IP Address

To set the new Internet IP address

1. From the Main Menu, select `IP Network Configuration` and press **Enter**. The Network Configuration menu is displayed.

```
H - Help            Network Configuration


   Internet IP Address                        192.168.1.100
   New IP Address (Reboot Reqd)            -> 192.168.1.100
   Internet IP Subnet Mask                    255.255.255.0
   Default Gateway IP Address                 0.0.0.0
   SNMP NMS Trap IP Address                   0.0.0.0
   MAC Filter Entry Age Time Minutes (1-60)   5
   MAC Address Filtering                      On

   Ethernet Link Parameters (Read-only)

   Link Status                                Established
   Duplex Mode                                Half-duplex
   Speed                                      100 Mbps
   Autonegotiation                            Complete
```

2. Select `New IP Address` and press **Enter**. The data field highlights.
3. Type the unique Internet IP address for the unit.
4. Press the **Enter** key. The new Internet IP address appears in the `New IP Address (Reboot Reqd)` field, but the old address remains in the upper field.
5. To save the changes, reboot the unit or power the unit down and up.

Setting the IP Subnet Mask

To set the default IP subnet address

1. From the Network Configuration menu, select `Internet IP Subnet Mask` and press **Enter**. The data field highlights.
2. Type the Internet IP subnet mask for the unit.
3. Press **Enter**. The Internet IP subnet mask appears in the field and is assigned to the unit.
4. Press **Esc** to exit to the Main Menu.

Setting the Default Gateway IP Address

You can define the IP address of the system gateway. This address designates the main entry point into the network and is usually in the same subnetwork as the unit IP address.

To set the default gateway IP address

1. From the Network Configuration menu, select `Network Configuration`. The Network Configuration menu is displayed.
2. Select `Default Gateway IP Address` and press **Enter**. The data field highlights.
3. Type the default gateway IP address for the unit.
4. Press **Enter**. The default gateway IP address for the unit appears in the field.
5. Press **Esc** to exit to the Main Menu.

Setting the SNMP NMS Trap IP Address (future)

The SNMP (System Network Management Protocol) NMS (Network Management System) Trap IP address identifies the IP address of the network manager. This address passes alarms or events from the unit 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 Network Configuration menu, select `SNMP NMS Trap IP Address` and press **Enter**. The data field highlights.
2. Type the SNMP NMS Trap IP address for the unit.
3. Press **Enter**. The SNMP NMS Trap IP address appears in the entry field and is applied to the unit.
4. Press **Esc** to exit to the Main Menu.

Setting the MAC Filter Entry Age Time Minutes

The MAC Filter Entry Age Time Minutes setting enables you to control the number of minutes after which the MAC (Media Access Control) filter will expire. This feature enables you to set the MAC time period of a unit to a value that is most compatible with the MAC time period of other devices on a network.

To set the MAC Filter minutes

1. From the Network Configuration menu, select `MAC Filter Entry Age Time Minutes` and press **Enter**. The data field highlights.
2. Type a value from 1–60 and press **Enter**. The number of minutes appears in the entry field and is applied to the unit.
3. Press **Esc** to exit to the Main Menu.

Enabling MAC Address Filtering

To enable MAC address filtering

1. From the Network Configuration menu, select `MAC Address Filtering` and press **Enter**. The data field highlights.
2. Scroll to choose `on` or **`off`** and press **Enter** to enable or disable address filtering.
3. Press **Esc** to save the setting and exit to the Main Menu.

1. From the Main Menu, select `IP Filter Configuration` and press **Enter**.
   The IP Filter Configuration menu is displayed.

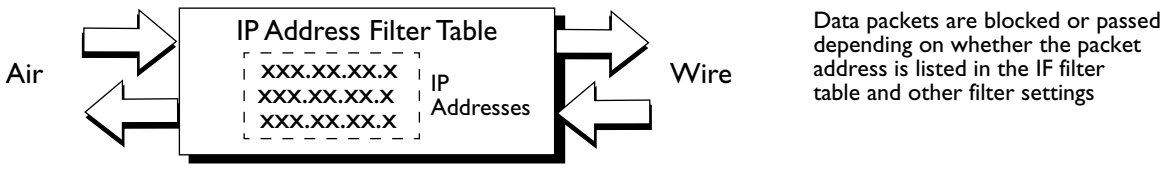
```
 H - Help             IP Filter Configuration

IP Packet Filtering             -> Off
IP Address Filtering               On
Default IP Address Filtering       Pass

Filter Entry     Range (0-255)     Base Address     State
--------------   --------------   --------------   --------------
      1              10           123.110.1.1        Pass
      2              0            0.0.0.0            Pass
      3              0            0.0.0.0            Pass
      4              0            0.0.0.0            Pass
      5              0            0.0.0.0            Pass
      6              0            0.0.0.0            Pass
      7              0            0.0.0.0            Pass
      8              0            0.0.0.0            Pass
```

IP Filter Configuration

IP Packet Filtering	off (disabled)	All packets are passed
	on (enabled)	Only IP (Internet Protocol) packets and ARP packets can pass
IP Address Filtering	off (disabled)	Packets from all LAN-side IP addresses can pass
	on (enabled)	Packets from all LAN-side IP addresses are subject to IP filter
Default IP Address Filtering	Pass Block	If IP Address Filtering is off, this item is inactive. If IP Address Filtering is on, this item specifies the action to take when either no filter entry applies or where there is a conflict between filters.
Filter Entry	*n= 1–8*	Entry number of the filter. Up to eight filters can be created.
Range	*n* = 0–255	Defines how many contiguous IP addresses are in the filter's list of addresses
Base Address	*n* = lowest IP Address	Lowest numbered address on the filter's list of IP addresses
State	Pass Block Disabled	Shows state of an individual filter. "Pass" allows packets to pass. "Block" stops packets from passing. "Disabled" enables you to make a particular filter inactive.

Two different IP filters are available: a packet filter, and an address filter. The IP packet filter determines which type of packets are allowed to pass through a unit. If the IP Packet Filter is OFF, the unit passes all packets. If the IP Packet Filter is ON, the unit passes only IP and ARP (Address Resolution Protocol) packets.

IP address filters are actually tables that contain lists of IP addresses. Data packets are either passed or blocked depending on whether the packet IP address is listed in the table, the setting of "Default IP Address Filtering" (pass or block), and the "State" setting of each filter.



Each IP address filter is defined by a range and a base value. IP address filtering improves system security and helps manage data throughput.

Viewing IP Filter Configuration

To view current IP filter configuration

Two sample configurations below show how IP address-filtering works.

Example 1:

```
 H - Help             IP Filter Configuration

IP Packet Filtering              -> off
IP Address Filtering                on
Default IP Address Filtering        Pass

Filter Entry   Range (0-255)  Base Address   State
------------------     -----------------      -----------------     ------------------

1              100            192.168.1.1    Block

2              10             192.168.1.51   Pass
```

Filter 1 blocks all packets containing a LAN-side IP address in the range 192.168.1.1 to 192.168.1.100 inclusive.

Filter 2 passes all packets containing a LAN-side IP address in the range 192.168.1.51 to 192.168.1.60. Note that this range partially overlaps the range of Filter 1, resulting in a conflict between filters. When a conflict occurs, the action specified by Default IP Address Filtering takes precedent, which is "Pass". Therefore all packets with IP addresses that "overlap" will be passed.

All packets containing a LAN-side IP addresses not within either filter range are subject to the action specified by Default IP Address Filtering (passed).

Example 2:

.

```
 H - Help             IP Filter Configuration

IP Packet Filtering             -> off
IP Address Filtering               on
Default IP Address Filtering       Block

Filter Entry   Range (0-255)  Base Address    State
------------     ----------     ----------      ----------

1              50             192.168.1.1     Pass
2              10             192.168.1.21    Block
3              10             192.168.1.101   Pass
4              2              192,168.1.105   Block
5              10             192.168.1.150   Disabled
```

All packets containing a LAN-side IP addresses not within either filter range are subject to the action specified by Default IP Address Filtering (blocked).

Filter 1 passes all packets containing a LAN-side IP address in the range 192.168.1.1 - 192.168.1.50 (except for those IP addresses in the range specified in Filter 2).

Filter 2 blocks all packets with a LAN-side IP address in the range of 192.168.1.21 - 192.168.1.30,

Filter 3 passes all packets containing a LAN-side IP address in the range 192.168.1.101 - 192.168.1.110 (except for those IP addresses in the range specified in Filter Entry 4).

Filter 4 blocks all packets with a LAN-side IP address in the range of 192.168.1.105 – 192.168.1.106.

Filter 5 is disabled (not used).

All packets containing a LAN-side IP address for which no filter entry applies will be blocked.

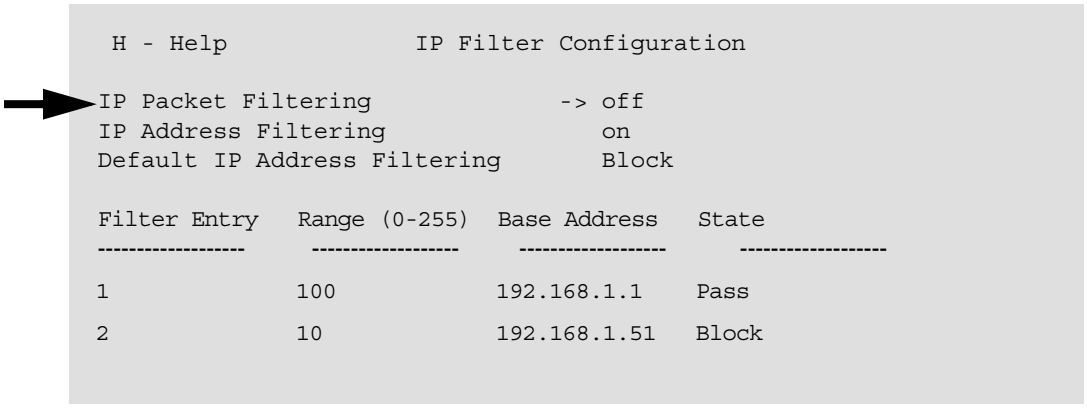
Note: LAN-side IP address—If a packet arrives at the RF port, the LAN-side IP address is the destination IP address contained within the packet. If a packet arrives on the Ethernet port, the LAN-side IP address is the source IP address contained within the packet.

Enabling IP Packet Filtering

IP Packet filtering should initially be set to `off` so you can start from a known state and observe changes that result from using the IP packet filter.

To enable or disable IP packet filtering

1. From the IP Filter Configuration menu, select `IP Packet Filtering` and press **Enter**. The data field highlights.



2. Scroll to choose `on` or **`off`** and press **Enter** to enable or disable packet filtering.
3. Press **Esc** to save the setting and exit to the Main Menu.

Enabling IP Address Filtering

To enable IP address filtering

1. From the IP Filter Configuration menu, select `IP Address Filtering` and press **Enter**. The data field highlights.
2. Scroll to choose `on` or **`off`** and press **Enter** to enable or disable address filtering.
3. Press **Esc** to save the setting and exit to the Main Menu.

Setting Default IP Address Filtering

This setting is inactive unless IP Address filtering has been enabled.

To set default IP address filtering

1. From the IP Filter Configuration menu, select `Default IP Address Filtering` and press **Enter**. The data field highlights.
2. Scroll to choose **`Pass`** or **`Block`** and press **Enter**.
3. Press **Esc** to save the setting and exit to the Main Menu.

Setting Up IP Address Filter

To set up an IP address filter

1. From the IP Filter Configuration menu, select **Range** in the Filter Entry **1 row** and press **Enter**. The data field in the Range column highlights.

```
 H - Help             IP Filter Configuration

IP Packet Filtering              -> off
IP Address Filtering                on
Default IP Address Filtering        Pass

Filter Entry   Range (0-255)  Base Address     State
------------     ----------     ----------      ----------

     1          -> 100        0.0.0.0          Pass
     2             0          0.0.0.0          Pass
     3             0          0.0.0.0          Pass
     4             0          0.0.0.0          Pass
     5             0          0.0.0.0          Pass
     6             0          0.0.0.0          Pass
     7             0          0.0.0.0          Pass
     8             0          0.0.0.0          Pass
```

2. Type the **Range** (a number from 0–255) of the filter and press **Enter** to close the data field.
3. Press the down arrow key to select **Base Address** and press **Enter**. The data field highlights.
4. Type the IP base address and press **Enter**.
5. Press the down arrow key to select **State** and press **Enter**.
6. Scroll through the list and choose **Pass**, **Block** or **Disable**. Press **Enter** to save the setting.
7. To add another filter, press the down arrow key to go to the next filter entry number and fill in the data fields.
8. Press **Esc** to save the filter settings and exit to the Main Menu.

VLAN Configuration

The VLAN Configuration menu provides links to sub-menus, each managing a subset of configurable VLAN parameters. These sub-menus include: Port Configuration, VLAN Registration Configuration, MAC Address Filter Configuration, Traffic Class Configuration, and Spanning Tree Configuration. A description of each sub-menu is provided below.

Viewing VLAN Configuration

To view the main VLAN configuration menu

1. From the Main Menu menu, select `VLAN Configuration` and press **Enter**. The VLAN Configuration menu is displayed.

```
                    VLAN Configuration

                -> Port Configuration
                   VLAN Registration Configuration
                   MAC Address Filter Configuration
                   Traffic Class Configuration
                   Spanning Tres Configuration
```

Port Configuration

The Port Configuration menu enables you to specify a default VLAN ID for this unit and port-specific parameters that help define how this unit interacts with other VLAN-aware devices in the network. The following parameters are configurable for each port (Ethernet port and RF port): Link Type, Priority, Acceptable Frames, Ingress Filtering, and Egress Filtering. A description of each feature is provided below.

To view the Port configuration menu

1. From the VLAN Configuration menu, select `Port Configuration` and press **Enter**. The Port Configuration menu is displayed.

```
H - Help             Port Configuration

Default VLAN ID (1-4094)     -> 1

Port Settings            Ethernet Port          RF Port
-------------            -------------       -------------

Link Type                Access              Access
Priority (0-7)           0                   0
Acceptable Frames        All                 All
Ingress Enabled          Off                 Off
Egress Enabled           Off                 Off
```

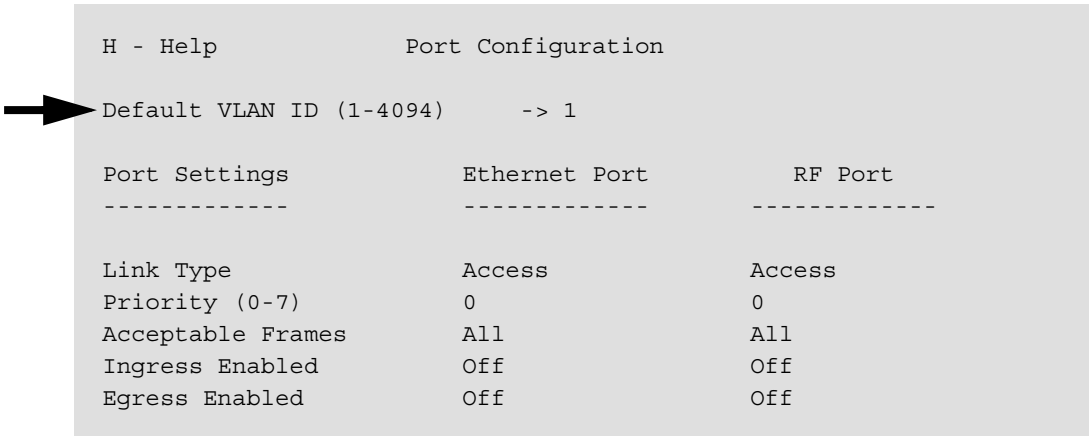
`Default VLAN ID`		All untagged and priority tagged inbound packets are considered members of this VLAN
`Link Type`	Access	All packets forwarded onto an access link are untagged
	Trunk	All packets forwarded onto a trunk link are VLAN-tagged
	Hybrid	Packets forwarded onto a hybrid link can be either tagged or untagged, depending on the VLAN ID associated with the packet. A registration table (described below) is used to determine the tagging status for each outbound packet
`Priority`		The default priority of untagged packets. If an inbound packet is untagged, this priority is assigned to it. Packet priority is used during the forwarding process to determine the order in which packets are transmitted
`Acceptable Frames`	All	All inbound packets are processed
	Tagged Only	Only inbound packets that are VLAN-tagged are processed. Untagged packets are dropped
`Ingress Enabled`	Off	All inbound packets are processed
	On	Only inbound packets containing a registered VLAN (with the inbound port) are processed. Registration configuration (described below) enables you to define which VLANs are registered with each port
`Egress Enabled`	Off	All outbound packets are transmitted
	On	Only outbound packes containing a registered VLAN (with the outbound port) are transmitted

Press **Esc** to exit the menu

Setting the Default VLAN ID

To set the default VLAN ID

1. From the Port Configuration menu, select **`Default VLAN ID`** in the Port Configuration menu and press **Enter**. The data field in the Range column highlights.



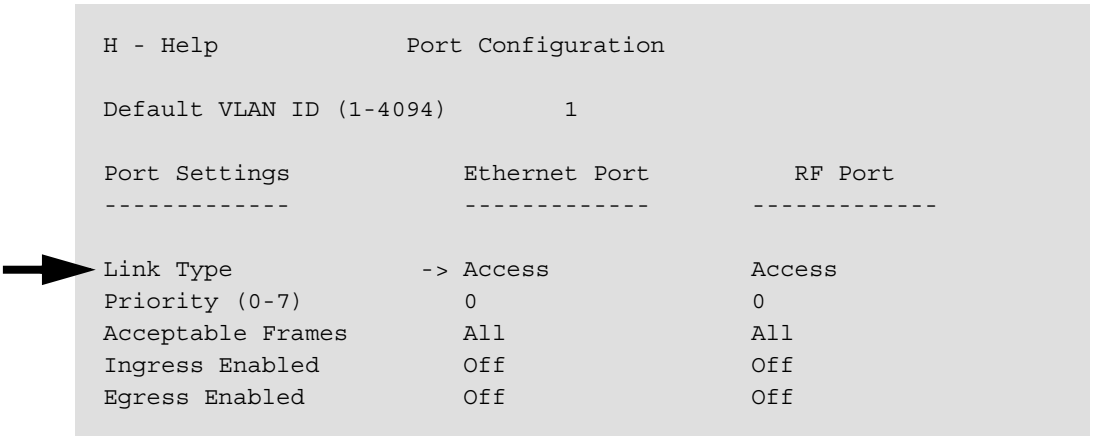
```
H - Help             Port Configuration

Default VLAN ID (1-4094)     -> 1

Port Settings            Ethernet Port          RF Port
-------------            -------------       -------------

Link Type                Access              Access
Priority (0-7)           0                   0
Acceptable Frames        All                 All
Ingress Enabled          Off                 Off
Egress Enabled           Off                 Off
```

2. Type the **`VLAN ID`** (a number from 1-4094) and press **Enter** to close the data field.
3. Press **Esc** to exit to the VLAN Configuration Menu.

Setting the Port Link Type

To set a port link type

1. From the Port Configuration menu, select **`Link Type`** for the desired port and press **Enter**.



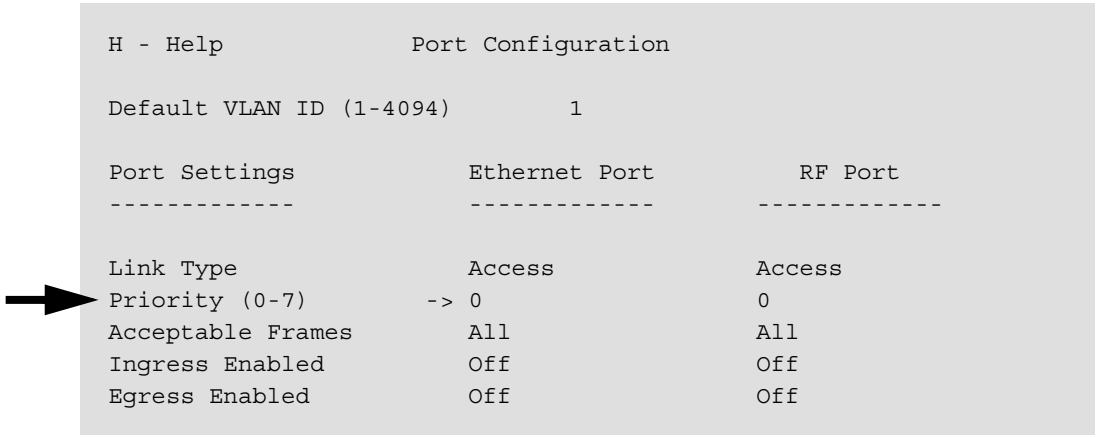
```
H - Help             Port Configuration

Default VLAN ID (1-4094)        1

Port Settings            Ethernet Port          RF Port
-------------            -------------       -------------

Link Type             -> Access              Access
Priority (0-7)           0                   0
Acceptable Frames        All                 All
Ingress Enabled          Off                 Off
Egress Enabled           Off                 Off
```

2. Select a setting from the list provided (*Access* , *Trunk* , or *Hybrid*) and press **Enter**.
3. Press **Esc** to exit to the VLAN Configuration Menu.

Setting the Port Priority

To set a port priority

1. From the Port Configuration menu, select **`Priority`** for the desired port and press **Enter**.



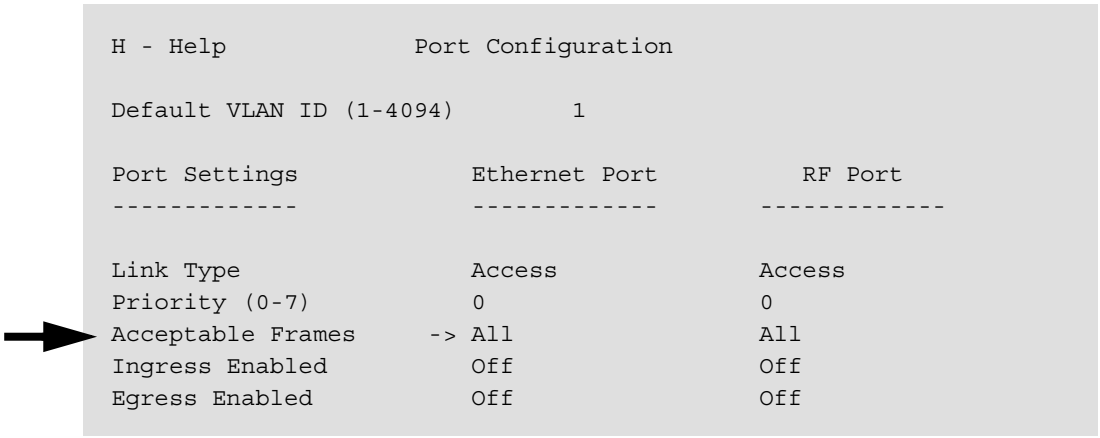
```
H - Help             Port Configuration

Default VLAN ID (1-4094)        1

Port Settings            Ethernet Port          RF Port
-------------            -------------       -------------

Link Type                Access              Access
Priority (0-7)        -> 0                   0
Acceptable Frames        All                 All
Ingress Enabled          Off                 Off
Egress Enabled           Off                 Off
```

2. Type the priority setting (0-7) and press **Enter.**
3. Press **Esc** to exit to the VLAN Configuration Menu.

Setting the Port Acceptable Frame Type

To specify the acceptable frame types for a port

1. From the Port Configuration menu, select **`Acceptable Frames`** for the desired port and press **Enter**.



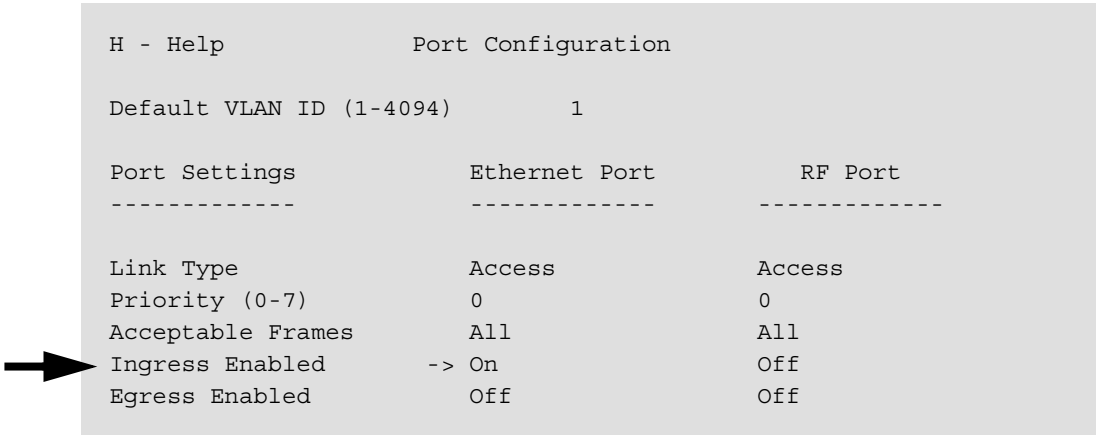
```
H - Help             Port Configuration

Default VLAN ID (1-4094)        1

Port Settings            Ethernet Port          RF Port
-------------            -------------       -------------

Link Type                Access              Access
Priority (0-7)           0                   0
Acceptable Frames     -> All                 All
Ingress Enabled          Off                 Off
Egress Enabled           Off                 Off
```

2. Select a setting from the list provided (*All* , *Tagged Only*).
3. Press **Esc** to exit to the VLAN Configuration Menu.

Enabling Port Ingress Filtering

To enable ingress filtering on a port

1. From the Port Configuration menu, select **`Ingress Enabled`** for the desired port and press **Enter**.

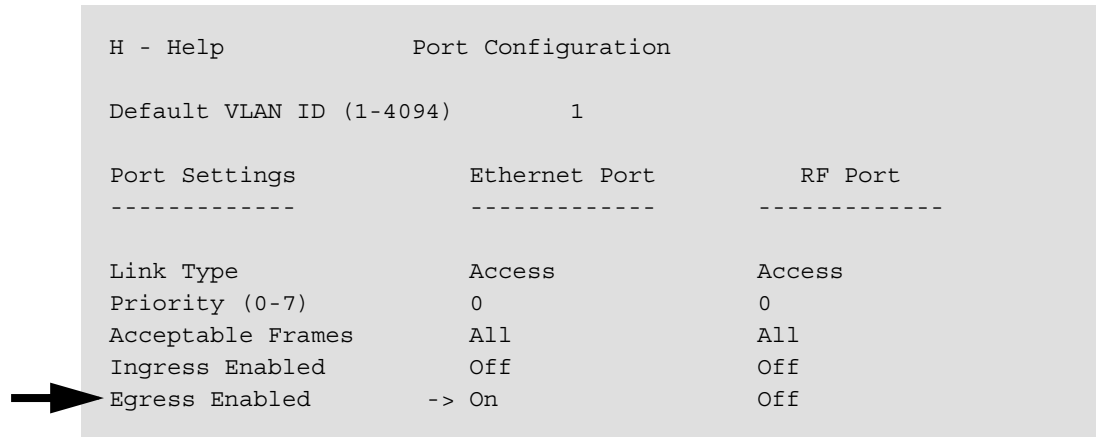


2. Scroll to **On** and Press **Enter**.
3. Press **Esc** to exit to the VLAN Configuration Menu.

Enabling Port Egress Filtering

To enable egress filtering on a port

1. From the Port Configuration menu, select **`Egress Enabled`** for the desired port and press **Enter**.



2. Scroll to **On** and Press **Enter**.
3. Press **Esc** to exit to the VLAN Configuration Menu.

VLAN Registration Configuration

The VLAN Registration Configuration menu enables you to create, modify or delete entries in the VLAN Registration table as well as to specify this unit's participation in the GARP VLAN Registration Protocol (GVRP).

The VLAN Registration table is used to define the sets of VLANs that can be reached (or alternatively cannot be reached) through individual ports of the unit. It is referenced by the following processes:

1. **Ingress/Egress Filtering:** If Ingress (Egress) filtering is enabled, the Registration Table is referenced to determine whether a packet is processed or filtered on reception (transmission) based on the registration status of the VLAN associated with it on the inbound (outbound) port.
2. **Packet Forwarding on Hybrid Links:** For hybrid links, the Registration Table determines for each outbound packet whether VLAN tagging information is included with the packet, based on the destination VLAN for the packet.
3. **GARP VLAN Registration Protocol (GVRP):** If GVRP is enabled, the Registration Table is referenced to determine the registration status for a particular VLAN on each port. GVRP is explained in more detail below.

To view the VLAN Registration Configuration menu

1. From the VLAN Configuration menu, select `VLAN Registration Configuration` and press **Enter**. The following menu is displayed:

```
H - Help                   Registration Configuration

GARP VLAN Registration Status     -> Off

Create or Modify a VLAN              Press Enter To Execute
Delete VLAN(s)                       Press Enter To Execute
Show all VLANs                       Press Enter To Execute
```

`GARP VLAN Registration Status`	Off	The unit does not participate in the GARP VLAN Registration Protocol (GVRP)
	On	The unit participates in GVRP. This protocol allows GVRP-aware devices to dynamically create and update their knowledge of the sets of VLANs that can be reached through individual ports
`Create or Modify a VLAN`		Create a new entry in the VLAN Registration Table or modify an existing one. A reboot is required to update the active configuration
`Delete VLAN(s)`		Remove a single entry or all entries from the VLAN Registration Table. A reboot is required to update the active configuration
`Show all VLANs`		Displays the VLAN Registration Table stored in the permanent database. On startup, this table is used to create the active configuration

Creating/Modifying a VLAN Registration Entry

To create or modify an entry in the VLAN Registration Table

1. From the VLAN Registration Configuration menu, select **Create or Modify a VLAN** and press **Enter**.

```
H - Help                    Registration Configuration

GARP VLAN Registration Status         Off

Create or Modify a VLAN            -> Press Enter To Execute
Delete VLAN(s)                        Press Enter To Execute
Show all VLANs                        Press Enter To Execute
```

2. Specify the entry settings desired from the menu displayed:

```
H - Help                  Create/Modify a VLAN

VLAN ID (1-4094)                  -> 1

Ethernet Port Registration           Normal
Ethernet Port Tagging                Untagged
RF Port Registration                 Normal
RF Port Tagging                      Untagged

Create/Modify VLAN                   Press Enter to Execute
```

`VLAN ID (1-4094)`		The VLAN ID of the entry to create or modify
`Ethernet/RF Port Registration`	Fixed	The specified VLAN is registered on the given port. A packet with this VLAN classification is always processed (on the port specified)
	Forbidden	The specified VLAN is not registered on the given port. A packet with this VLAN classification is filtered if either Ingress or Egress Filtering is enabled (on the port specified)
	Normal	The registration status of the VLAN is to be determined by the GVRP. If the protocol is enabled, this unit will communicate with other GVRP-aware devices to determine if the specified VLAN is connected via the given port
`Ethernet/RF Port Tagging`	Untagged	Packets associated with the specified VLAN are transmitted untagged (on the port specified)
	Tagged	Packets associated with the specified VLAN are transmitted tagged (on the port specified)
`Create/Modify VLAN`		Update the Registration Table in the permanent database. A reboot is required to update the active configuration

3. Select **Create/Modify VLAN** and press **Enter**. A status field will display indicating whether the entry was created.

```
H - Help                 Create/Modify a VLAN

VLAN ID (1-4094)               -> 1

Ethernet Port Registration        Normal
Ethernet Port Tagging             Untagged
RF Port Registration              Normal
RF Port Tagging                   Untagged

Create/Modify VLAN             -> Press Enter to Execute
```

4. Press **Esc** to exit to the VLAN Configuration Menu.

Deleting a VLAN Registration Entry

To delete one or more entries in the VLAN Registration Table

1. From the VLAN Registration Configuration menu, select **Delete VLAN(s)** and press **Enter**.

```
H - Help                   Registration Configuration

GARP VLAN Registration Status        Off

Create or Modify a VLAN              Press Enter To Execute
Delete VLAN(s)                    -> Press Enter To Execute
Show all VLANs                       Press Enter To Execute
```

2. Specify the VLAN ID of the entry to delete if only one VLAN is to be removed:

```
                        Delete VLAN(s)

VLAN To Delete (1-4094)         -> 1

Delete VLAN                        Press Enter To Execute
Delete All VLANs                   Press Enter To Execute
```

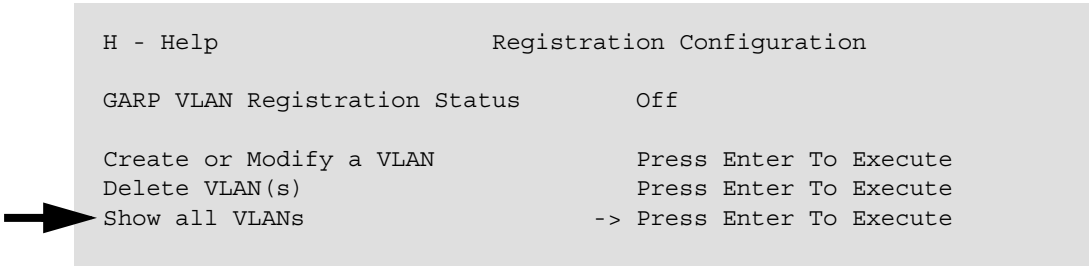
`VLAN ID (1-4094)`	The VLAN ID of the entry to delete
`Delete VLAN`	A query into the VLAN Registration Table in the permanent database is made for the specified VLAN. If an entry is found, it is removed
`Delete All VLANs`	All VLAN Registration entries in the permanent database (if any) are removed, regardless of the VLAN ID specified above

3. Select **Delete VLAN** and press **Enter** if only one VLAN is to be removed. Otherwise, select **Delete All VLANs** and Press **Enter**. A status field will display, indicating the status of the request issued
4. Press **Esc** to exit to the VLAN Configuration Menu.

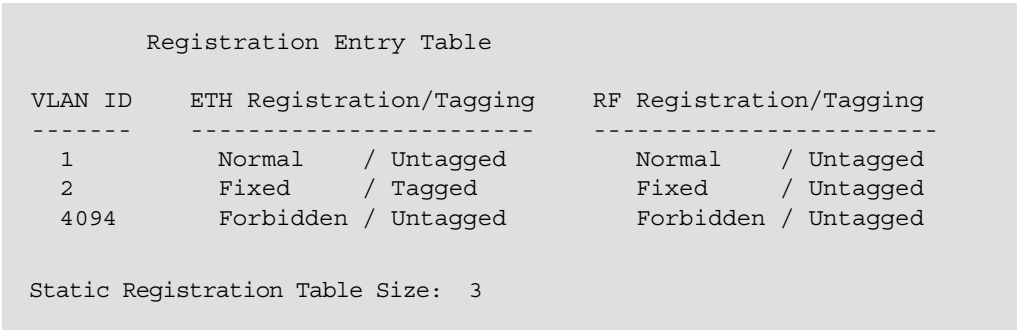
Displaying the VLAN Registration Table

To view the current VLAN Registration Table

1. From the VLAN Registration Configuration menu, select **Show all VLAN(s)** and press **Enter**.



Below is a sample table:



MAC Address Filter Configuration

The MAC Address Filter Configuration menu enables you to create, modify or delete entries in the MAC Address Filter Table.

By creating a MAC address filter, you control whether this MAC address gains access to the network. The filter you specify contains a control element for each port which defines the access level of the MAC address for that port.

One example filter may be to block the relay of particular bridge protocol packets that use a known multicast address. By specifying "Filter" access for each port, you can restrict these packets to the local LAN(s) from which they originate.

To view the MAC Address Filter Configuration menu

1. From the VLAN Configuration menu, select `MAC Address Filter Configuration` and press **Enter**. The following menu is displayed:

```
H - Help                    MAC Address Filter Configuration

Create or Modify a MAC Address Filter     Press Enter To Execute
Delete MAC Address Filter(s)              Press Enter To Execute
Show All MAC Address Filters              Press Enter To Execute
```

`Create or Modify a MAC Address Filter`	Create a new entry in the MAC Address Filter Table or modify an existing one. A reboot is required to update the active configuration.
`Delete MAC Address Filter(s)`	Remove a single entry or all entries from the MAC Address Filter Table. A reboot is required to update the active configuration
`Show all MAC Address Filters`	Displays the MAC Address Filter Table stored in the permanent database. On startup, this table is used to create the active configuration

Creating/Modifying a MAC Address Filter Entry

To create or modify an entry in the MAC Address Filter Table

1. From the MAC Address Filter Configuration menu, select **Create or Modify a VLAN** and press **Enter**.

```
H - Help                    MAC Address Filter Configuration

Create or Modify a MAC Address Filter  -> Press Enter To Execute
Delete MAC Address Filter(s)              Press Enter To Execute
Show All MAC Address Filters              Press Enter To Execute
```

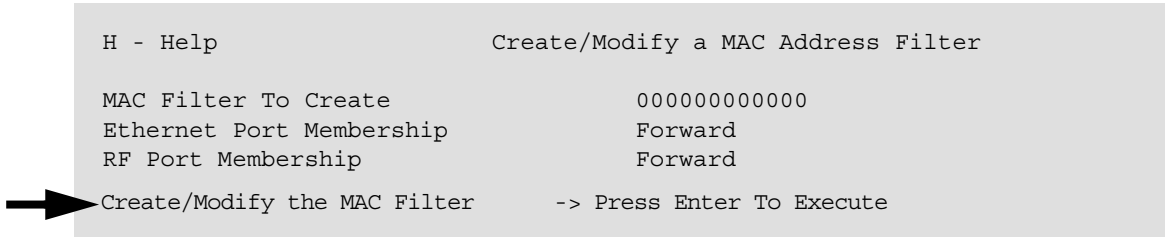
2. Specify the filter settings desired from the menu displayed:

```
H - Help                    Create/Modify a MAC Address Filter

MAC Filter To Create              -> 000000000000
Ethernet Port Membership             Forward
RF Port Membership                   Forward

Create/Modify the MAC Filter         Press Enter To Execute
```

`MAC Filter To Create`	The MAC address of the entry to create or modify (HEX format). The destination MAC address for each outbound packet is used to search through the MAC Address Filter table. If an entry is found, the appropriate port control element determines forwarding status

Port Membership (Ethernet/RF)	Forward	Packets with a destination MAC address matching the MAC filter address are forwarded on the given port
	Filter	Packets with a destination MAC address matching the MAC filter address are filtered on the given port
Create/Modify the MAC Filter		Update the MAC Filter Table in the permanent database. A reboot is required to update the active configuration

3. Select **Create/Modify the MAC Filter** and press **Enter**. A status field will display indicating whether the entry was created.

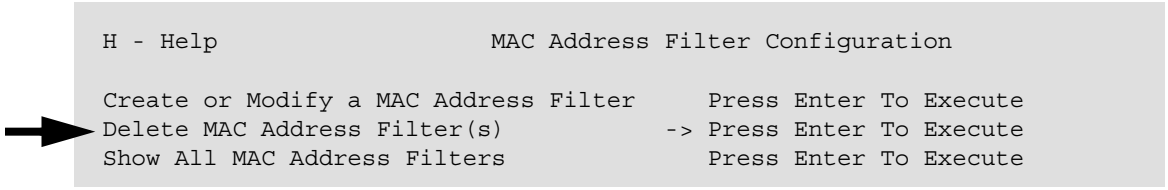


4. Press **Esc** to exit to the VLAN Configuration Menu.

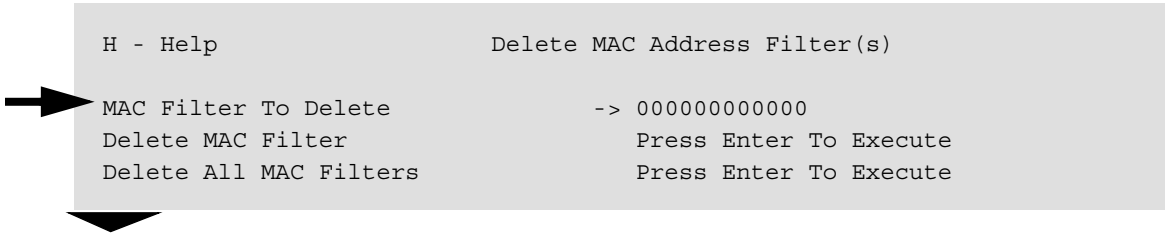
Removing a MAC Address Filter Entry

To remove one or more entries in the MAC Address Filter Table

1. From the MAC Address Filter Configuration menu, select **Delete MAC Address Filter(s)** and press **Enter**.



2. Specify the MAC address of the entry to delete if only one entry is to be removed:



MAC Filter To Delete	The MAC Address of the entry to remove
Delete MAC Filter	A query into the MAC Address Filter Table in the permanent database is made for the specified MAC address. If an entry is found, it is removed

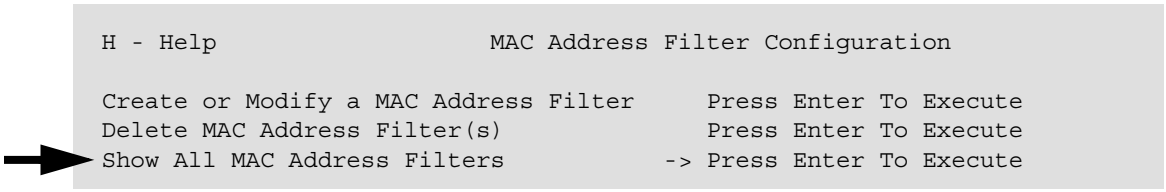
`Delete All MAC Filters`	All MAC Address Filter entries in the permanent database (if any) are removed, regardless of the MAC Address specified above

3. Select **Delete MAC Filter** and press **Enter** if only one entry is to be removed. Otherwise, select **Delete All MAC Filters** and Press **Enter**. A status field will display, indicating the status of the request issued
4. Press **Esc** to exit to the VLAN Configuration Menu.

Displaying the MAC Address Filter Table

To view the current MAC Address Filter Table in the permanent database

1. From the MAC Address Filter Configuration menu, select **Show All MAC Address Filters** and press **Enter**.



Below is a sample table:

```
                  MAC Address Filter Table

       MAC Address     Ethernet Port        RF Port
      -------------    -------------     -------------
      12345679ABC         Forward           Forward
      DEF12345678         Filter            Filter

 Static Filter Table Size:  2
```

Traffic Class Configuration

The Traffic Class Configuration menu enables you to specify the order in which outbound frames are transmitted based on packet priority.

Two "traffic classes" are supported for each port, one class for "High" priority packets, another for "Low" priority packets. Outbound packets placed into the "High" traffic class are transmitted before "Low" priority packets during the forwarding process.

Through the configuration interface provided, you are able to assign different packet priorities to one of the traffic classes supported. This process is further explained below.

To view the Traffic Class Configuration menu

1. From the VLAN Configuration menu, select `Traffic Class Configuration` and press **Enter**. The following menu is displayed:

```
H - Help                  Traffic Class Configuration

          User Priority     Ethernet Port       RF Port
          -------------     -------------     ------------
               0              -> Low              Low
               1                 Low              Low
               2                 Low              Low
               3                 Low              Low
               4                 High             High
               5                 High             High
               6                 High             High
               7                 High             High
```

`User Priority`	The packet priority. An inbound packet may contain a priority in the range 0-7. If the packet is priority-tagged on reception, the priority carried within the packet is used to determine which traffic class it will be placed during the forwarding process. For untagged inbound packets, the default priority (see Port Configuration) is used
`Ethernet Port/ RF Port (Traffic Classes)`	The traffic class assignment is specified here

Assigning Packet Priority to Traffic Classes

To assign a packet priority to a traffic class

1. In the Traffic Class Configuration menu, scroll to the particular packet priority for the desired port and press **Enter**
2. Select the appropriate traffic class from the list provided and press **Enter**
3. Press **Esc** to exit to the VLAN Configuration Menu.

Spanning Tree Configuration

The Spanning Tree Configuration menu enables you to specify parameters that define this unit's role in the Spanning Tree Protocol.

The Spanning Tree Protocol is a link management protocol that enables path redundancy in a network while preventing the occurrence of broadcast loops. Participants in the Spanning Tree Protocol communicate with one another, together dynamically managing the network topology to ensure a loop-free configuration.

In most cases, this unit need not be a participant in the Spanning Tree Protocol. This is further explained below.

To view the Spanning Tree Configuration menu

1. From the VLAN Configuration menu, select `Spanning Tree Configuration` and press **Enter**. The following menu is displayed:

```
H - Help                    Spanning Tree Configuration

  Spanning Tree Status                -> Off

  Bridge Priority (0-65535)              32768

  Ethernet Port Priority (0-255)         128
  Ethernet Port Path Cost (1-65535)      128

  RF Port Priority (0-255)               128
  RF Port Path Cost (1-65535)            128

  Read-only Parameters

  Ethernet Port State                    Forwarding
  RF Port State                          Forwarding

  Root MAC Address                       00103000000
```

`Spanning Tree Status`	Off	This unit does not participate in the Spanning Tree Protocol; Spanning Tree protocol packets are transparently bridged
	On	This unit is a participant in the Spanning Tree Protocol. Only enable this if a redundant RF link is added to the network
`Bridge Priority`		Specifies the bridge priority to be used by this unit in communication with other Spanning Tree participants. This parameter is used in part to determine the forwarding status of each port
`Port Priority (Ethernet/RF)`		Specifies the port-specific priority to be used by this unit in communication with other Spanning Tree participants (on the port specified). This parameter is used in part to determine port forwarding status
`Port Path Cost (Ethernet/RF)`		Specifies the port-specific path cost to be used by this unit in communication with other Spanning Tree participants (on the port specified). This parameter is used in part to determine port forwarding status
`Port State`	Blocking	This port does not transmit any packets
	Learning	This port "learns" local traffic addresses, but does not transmit any packets

	Forwarding	This port learns and transmits packets on this port. If this unit does not participate in the Spanning Tree Protocol, each port state is set to this value
`Root MAC Address`		This is the "root" bridge in the existing network (if this unit is a participant). The root bridge is responsible (among other things) for broadcasting notification messages to all other participants to ensure a loop-free network configuration

If this unit participates in the Spanning Tree Protocol, the configurable parameters mentioned above, Bridge Priority, Port Priority and Port Path Cost, are communicated to all other participants in the bridged network in a Spanning Tree Protocol packet. Similarly, all other participants broadcast their parameters to this unit. Based on this unit's parameters and those received by other bridges, the network topology is created, possibly with some ports on some devices (maybe one on this unit) being disabled to prevent the occurrence of broadcast loops

If a change in topology is detected by any device, a notification message is broadcasted and the network, if required, is re configured. This feature is particularly useful for critical links in which redundant paths exist. If one link should go down, a change in topology is detected and a second "backup" link is brought online.

Enabling Spanning Tree

To enable the Spanning Tree Protocol

1. From the Spanning Tree Configuration menu, select **Spanning Tree Status** and press **Enter**. The data field highlights.

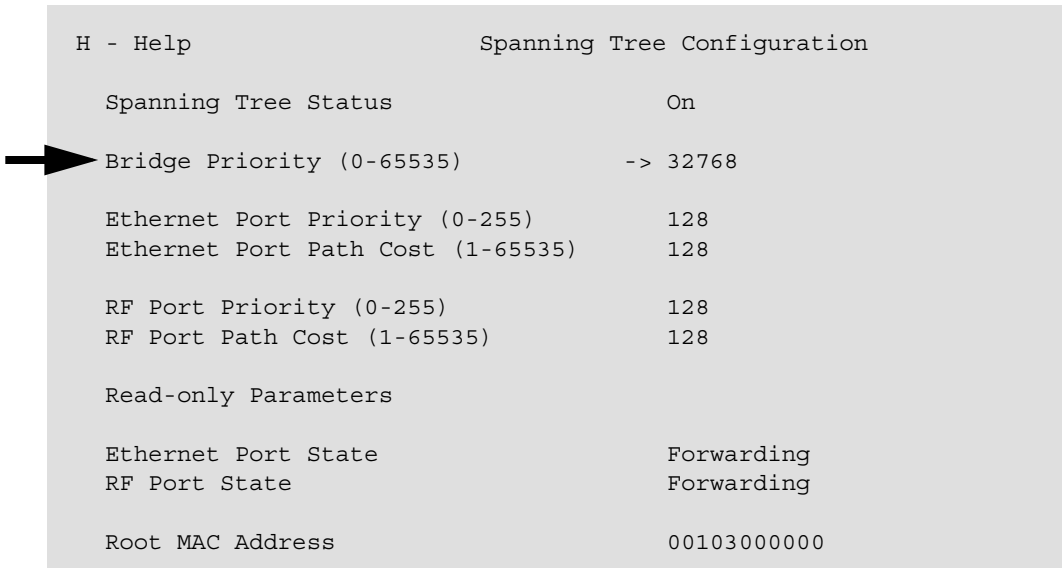
```
H - Help                    Spanning Tree Configuration

  Spanning Tree Status                -> On

  Bridge Priority (0-65535)              32768

  Ethernet Port Priority (0-255)         128
  Ethernet Port Path Cost (1-65535)      128

  RF Port Priority (0-255)               128
  RF Port Path Cost (1-65535)            128

  Read-only Parameters

  Ethernet Port State                    Forwarding
  RF Port State                          Forwarding

  Root MAC Address                       00103000000
```

2. Press the arrow key until the "On" option is displayed and press **Enter**.
3. Press **Esc** to exit to the VLAN Configuration Menu.

Setting the Bridge Priority

To set the Bridge Priority

1. From the Spanning Tree Configuration menu, select **Bridge Priority** and press **Enter**. The data field highlights.



2. Enter a value in the range 0-65535 and press **Enter**.
3. Press **Esc** to exit to the VLAN Configuration Menu.

Setting Port Priority

To set the priority of a port

1. From the Spanning Tree Configuration menu, select **(Ethernet/RF) Port Priority** and press **Enter**. The data field highlights.

```
H - Help                    Spanning Tree Configuration

  Spanning Tree Status                    On

  Bridge Priority (0-65535)               32768

  Ethernet Port Priority (0-255)      -> 128
  Ethernet Port Path Cost (1-65535)       128

  RF Port Priority (0-255)                128
  RF Port Path Cost (1-65535)             128

  Read-only Parameters

  Ethernet Port State                     Forwarding
  RF Port State                           Forwarding

  Root MAC Address                        00103000000
```

2. Enter a value in the range 0-255 and press **Enter**.
3. Press **Esc** to exit to the VLAN Configuration Menu.

Setting Port Path Cost

To set the path cost for a port

1. From the Spanning Tree Configuration menu, select **(Ethernet/RF) Port Path Cost** and press **Enter**. The data field highlights.

```
H - Help                    Spanning Tree Configuration

  Spanning Tree Status                    On

  Bridge Priority (0-65535)               32768

  Ethernet Port Priority (0-255)          128
  Ethernet Port Path Cost (1-65535)   -> 128

  RF Port Priority (0-255)                128
  RF Port Path Cost (1-65535)             128

  Read-only Parameters

  Ethernet Port State                     Forwarding
  RF Port State                           Forwarding

  Root MAC Address                        00103000000
```

2. Enter a value in the range 1-65535 and press **Enter**.
3. Press **Esc** to exit to the VLAN Configuration Menu.

RF Station Configuration

The RF Station Configuration menu enables you to choose the operating mode, run some tests and optimize the RF link. Four tests can be run from this menu: link monitor test, transmit test, and receive test. You can optimize a link by setting the maximum remote distance to a remote and by controlling the rate of data throughput (throttling). You can also block a unit so that it cannot pass any data.

Viewing Current RF Station Configuration

To view the current RF station configuration

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.

```
H - Help            RF Station Configuration

   Operating Mode                        -> Normal Mode
   RF Transmit Status                       unblocked
   Link Monitor Period (0=OFF, 1-10000)     0
   Test Mode Timer Minutes (1-1000)         5

   Base Station Only Parameters
   Maximum Remote Distance                  5 Km
   Link Monitor Remote Station Rank         1

   Remote Station Only Parameters
   Throttle Enable                          off
   Throttle Level (1-100)                   1
   Output Power Control Mode                off
   User Output Power Adjust Ceiling         -5  dB
   Signal Margin (6-31) dB                   15

   Current Output Power Level Adjust        -21
```

`Operating Mode`	Three modes are available: Normal Mode, Receive Test, and Transmit Test
`RF Transmit Status`	Determines if data transmissions through the unit will be blocked or passed
`Link Monitor Period`	Period determines the amount of test data that is used to test the link. The smaller the number, the larger the amount of test data and test data overhead. A non-zero value starts the link monitor test

`Test Mode Timer Minutes`	Maximum time in minutes that a unit will be allowed to stay in test mode
`Maximum Remote Distance`	Distance value compensates for polling delay due to large distances
`Link Monitor Remote Station Rank`	Rank (or ID number) of the remote that you want to test
`Throttle Enable`	Turns throttling (data throughput control) on or off
`Throttle Level`	Determines the data rate of a remote unit. When throttling is enabled, the data rate passed is equal to the throttling level times 64 kbps
`Output Power Control Mode`	Used to choose the output power mode: off, Auto Output Power or Dynamic Output Power mode.
`User Output Power Adjust Ceiling`	Used to limit the maximum transmit power output for a remote unit
`Signal Margin (6-31) dB`	Amount of dB of extra power at the receiver desired above the noise floor
`Current Output Power Adjust`	Displays real-time adjustments to output power in dB while an Output Power Control Mode test mode is running

2. Press **Esc** to exit to the Main Menu.

Setting the Operating Mode

Three modes are available: Normal Mode (Link Monitor), Receive Test, and Transmit Test.

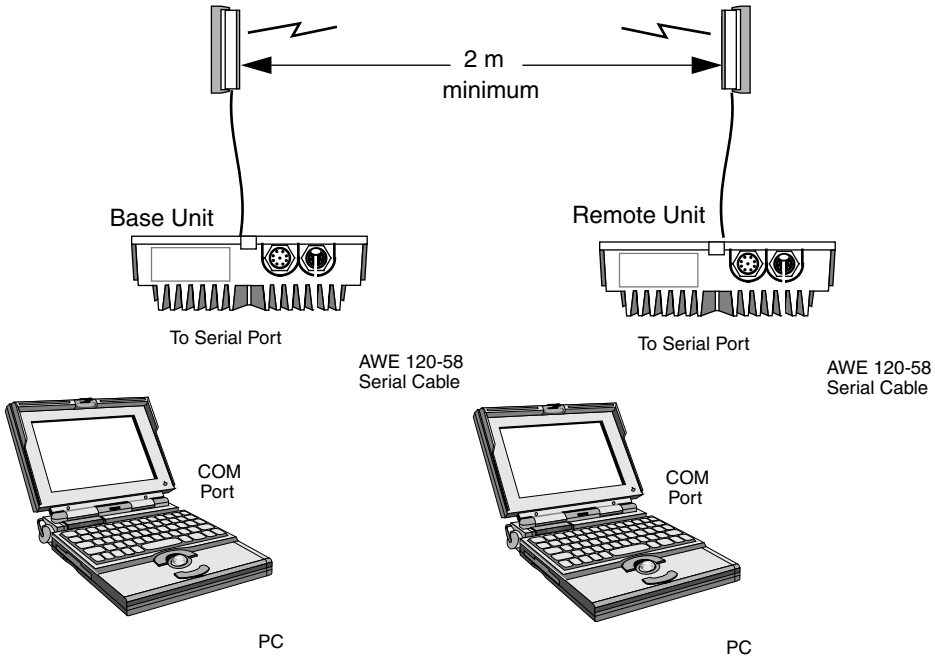
`Normal Mode`	Normal operating mode of a unit. Unit transmits and receives data in both directions across the RF link. You can view the link statistics using Link Monitor Display. (Link Monitor is run with the unit set to Normal mode and Output Power Control Mode set to "off".)
`Receive Test`	Receives test data only. Processes expected packet data and displays statistics on RS-232 monitor. Use this mode to test a unit's ability to receive data.
`Transmit Test`	Transmits test data only. Sends known packet data to the receiving unit. Use this mode to test a unit's ability to transmit data.

General Equipment Setup

The general equipment setup is shown below. The actual setup depends on which test you want to run and how you want to run it. You will need at least one PC to perform the Link Monitor, Transmit, and Receive tests.

- To perform the Link Monitor (Normal Mode) test you will connect a PC to either the base station or a remote unit and run the Link Monitor test. You may then read the link statistics on the PC screen.
- To perform the Transmit Test, start the test from the PC.
- To perform the Receive Test you will connect a PC to the receiving unit and start the Transmit test at the transmitting unit (using either a PC). Receive statistics are displayed on the PC screen.

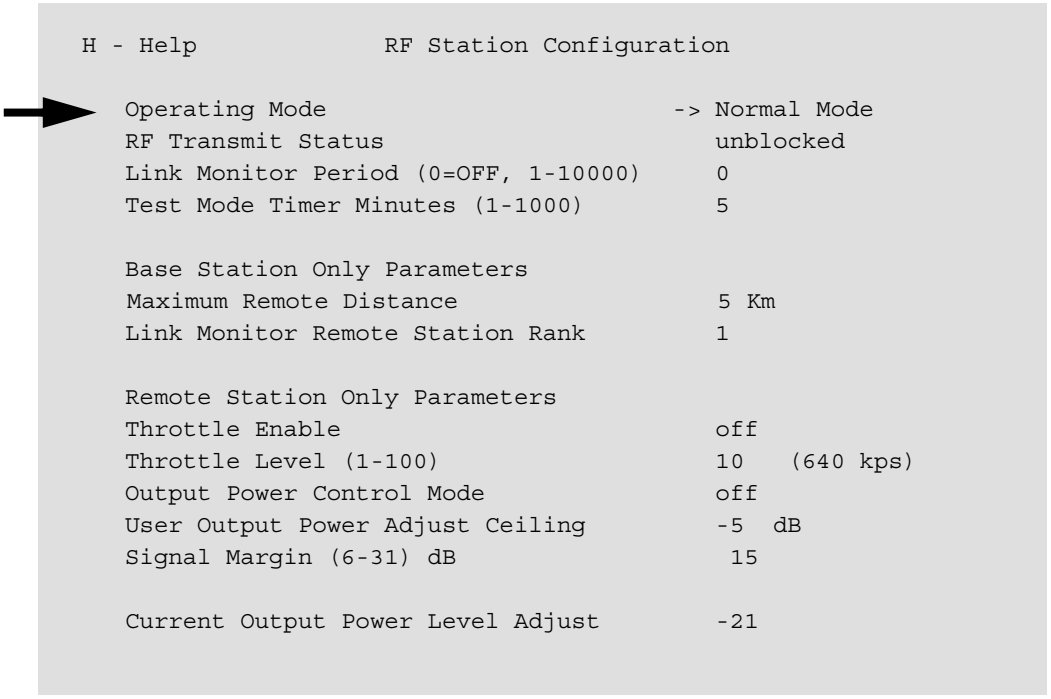
General Equipment Setup



Before you run the LInk Monitor, Receive or Transmit tests, you should set the number of test minutes, as described in *Setting Test Mode Timer Minutes* , page 71.

To set the operating mode

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.



2. Select `Operating Mode` and press **Enter**. The data field highlights.
3. Press the arrow keys to select the desired mode: Normal mode, Transmit mode, or Receive mode and Press **Enter**.

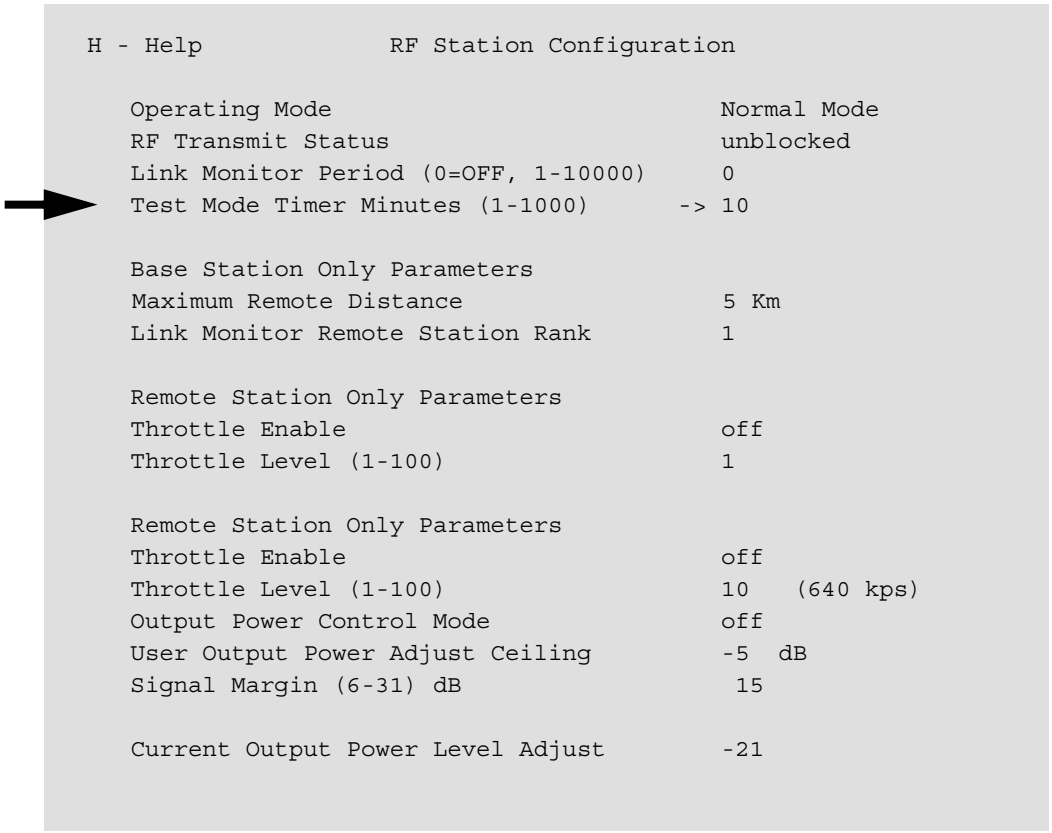
Setting Test Mode Timer Minutes

Before you run any of these tests, you should set the maximum time, in minutes, that a unit will be allowed to stay in test mode. When this time period expires, the AWE unit performs an automatic software reboot and returns to Normal mode. (Test mode timer minutes setting applies only to Transmit Test and Receive Test modes.)

Note: The test mode timer minutes can be changed only with this menu. This time period does not apply to Normal mode or the Link Monitor test. See *Command Line Interface* , page 128.

To set test mode timer minutes

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.



2. Select `Test Mode Timer Minutes` and press **Enter**. The data field highlights.
3. Type the desired time in minutes (1-1000). (20 minutes is a suggested starting value.)
4. Press **Enter**.
5. Press **Esc** to exit to the Main Menu.

Performing Link Monitor Test (Normal Mode)

The link monitor test can be run from either a base station or a remote unit that is set to Normal Mode. The test operates in parallel with the message stream, so it consumes some of the link's total data capacity. You can control the ratio of test data to message data (and thereby control the amount of test data overhead) by setting the link monitor period. See *Setting the Link Monitor Period* , page 78 for more information.

Note: Link monitor test stays in effect even if you power cycle or reboot units, so you must turn it off using the Link Monitor Period (0 = OFF) setting.

To perform Link Monitor test from a base station

1. Connect the test PC to the Serial port of the base station. See *General Equipment Setup* , page 69.
2. Log in to the unit and go to the Main Menu.
3. Select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.

```
H - Help            RF Station Configuration

   Operating Mode                        -> Normal Mode
   RF Transmit Status                       unblocked
   Link Monitor Period (0=OFF, 1-10000)     0
   Test Mode Timer Minutes (1-1000)         5

   Base Station Only Parameters
   Maximum Remote Distance                  5 Km
   Link Monitor Remote Station Rank         1

   Remote Station Only Parameters
   Throttle Enable                          off
   Throttle Level (1-100)                   10   (640 kps)
   Output Power Control Mode                off
   User Output Power Adjust Ceiling         -5  dB
   Signal Margin (6-31) dB                   15

   Current Output Power Level Adjust        -21
```

4. Select `Operating Mode` and press **Enter**. The data field highlights.
5. Press the arrow keys to select `Normal` mode and press **Enter**.
6. Select `RF Transmit Status` and press **Enter**. The data field highlights.
7. Press the arrow keys to select `unblocked` and press **Enter**.
8. Select `Output Power Control Mode` and press **Enter**. Set it to `off`.
9. Select `Link Monitor Period` and press **Enter**. The data field highlights.
10. Type a link monitor period (1) and press **Enter**. Link Monitor starts as soon as a non-zero value is entered in the field. (A setting of 1 means that 50% of all data is test data.)

11. View the link statistics. From the Main Menu select `Link Monitor Display` and press **Enter**. The RF Link Monitor Statistics window is displayed.

```
H - Help          RF Link Monitor Statistics

   Link Monitor Rank                    1
   Base to Remote BER                   0.0E+00
   Remote to Base BER                   0.0E+00
   Missed Packet Count                  0
   Base to Remote Env Power             27
   Base to Remote Corr Power            28
   Remote to Base Env Power             29
   Remote to Base Corr Power            30
```

12. Check for BER = 0.0E+00 and `Corr Power` between 15 – 50 dB. If the `Corr Power` is <15 dB the receive signal is probably too weak. If the power is >55 dB the receiving unit is probably saturated. See *Viewing Link Monitor Statistics* , page 126 for more information about Link Monitor Statistics.

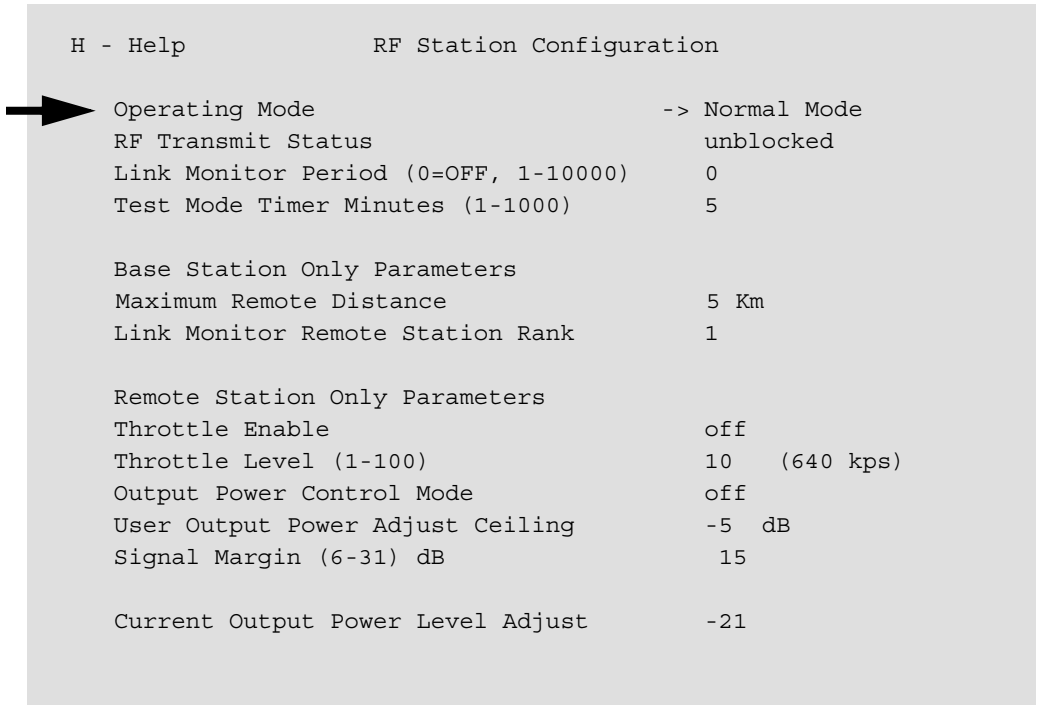
    If you have problems, ensure that the unit is configured to its basic default settings (see *Restoring Factory Configurations* , page 124) and reconfigure the unit, or contact Wi-LAN Technical Assistance Center.

13. When finished viewing link monitor statistics, disable Link Monitor to remove the test overhead data from the RF link. Select `RF Station Configuration` from the Main Menu and press **Enter**. The RF Station Configuration menu is displayed.
14. Select `Link Monitor Period` and press **Enter**. The field is highlighted.
15. Type 0 in the field and press **Enter**. The link monitor test ends.
16. Press **Esc** to exit.

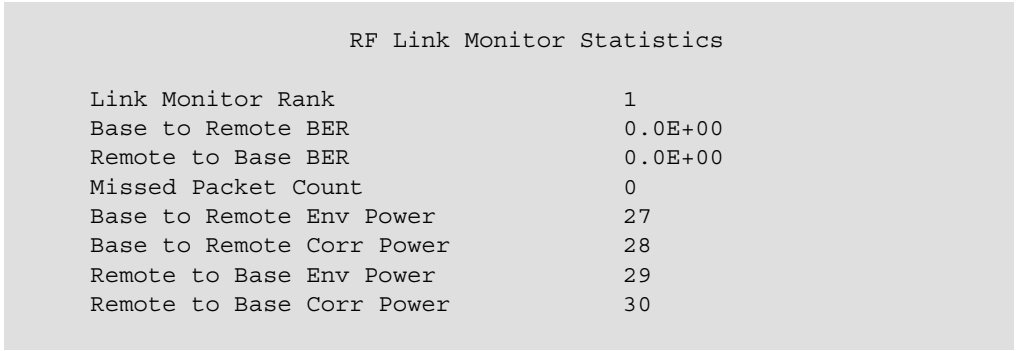
To perform Link Monitor test from a remote unit

1. Connect the test PC to the Serial port of the remote unit. See *General Equipment Setup* , page 69.
2. Log in to the unit and go to the Main Menu.

3. Select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.



4. Select `Operating Mode` and press **Enter**. The data field highlights.
5. Press the arrow keys to select `Normal` mode and press **Enter**.
6. Select `RF Transmit Status` and press **Enter**. The data field highlights.
7. Press the arrow keys to select `unblocked` and press **Enter**.
8. Select `Output Power Control Mode` and press **Enter**. Set it to `off`.
9. Select `Link Monitor Period` and press **Enter**. The data field highlights.
10. Type a link monitor period (1) and press **Enter**. Link Monitor starts as soon as a non-zero value is entered in the field. (A setting of 1 means that 50% of all data is test data.)
11. View the link statistics. From the Main Menu select `Link Monitor Display` and press **Enter**. The RF Link Monitor Statistics window is displayed.



12. Check for BER = 0.0E+00 and `Corr Power` between 15 – 50 dB. If the `Corr Power` is <15 dB the receive signal is probably too weak. If the power is >55 dB the receiving unit is probably saturated. See *Viewing Link Monitor Statistics* , page 126 for more information about Link Monitor Statistics.

    If you have problems, ensure that the unit is configured to its basic default settings (see *Restoring Factory Configurations* , page 124) and reconfigure the unit or contact Wi-LAN customer support.
13. When you finish viewing link monitor statistics, disable Link Monitor to remove the test overhead data from the RF link. Select `RF Station Configuration` from the Main Menu and press **Enter**. The RF Station Configuration menu is displayed.
14. Select `Link Monitor Period` and press **Enter**. The field is highlighted.
15. Type 0 in the field and press **Enter**. The link monitor test ends.
16. Press **Esc** to exit.

Note: When testing, it is possible to run the link monitor in both directions over one link by enabling link monitor on the base and the remote at the same time. This situation should be avoided during normal operation because it causes needless overhead.

Performing Transmit and Receive Tests

When performing transmit or receive tests, one unit is set up to operate in Transmit Test mode and the other unit is set up to operate in Receive Test mode. The transmitting unit sends packets of known data to the receiving unit. The receiving unit analyzes the data and displays link statistics on the PC connected to the Serial port.

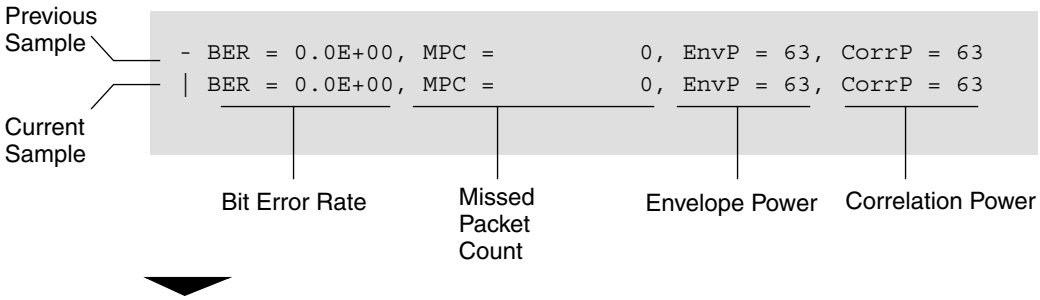
To set up the transmit unit

1. Connect a PC to the Serial port of the unit.
2. Log in to the unit and go to the Main Menu.
3. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.
4. Select `Operating Mode` and press **Enter**. The field highlights.
5. Select `Transmit Test` and press **Enter**.

To set up the receive unit

1. Connect a PC to the Serial port of the unit.
2. Log in to the unit and go to the Main Menu.
3. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.
4. Select `Operating Mode` and press **Enter**. The field highlights.
5. Select `Receive Test` and press **Enter**. The screen clears and link statistics are displayed (if test packets are received). Pressing the space bar switches the display between the menu interface and the statistics update.

Link Statistics Example



BER	Bit Error Rate
MPC	Missed Packet Count
EnvP	Envelope Power—the power of the received signal including noise, measured in dB (0–63)
CorrP	Correlation Power—the power of the received signal, excluding noise, measured in dB (0–63)

6. Check for BER = 0.0E+00 and CorrP between 15 – 50 dB. If the CorrP is <15 dB the receive signal is probably too weak. If the power is >55 dB the receiving unit is probably saturated.

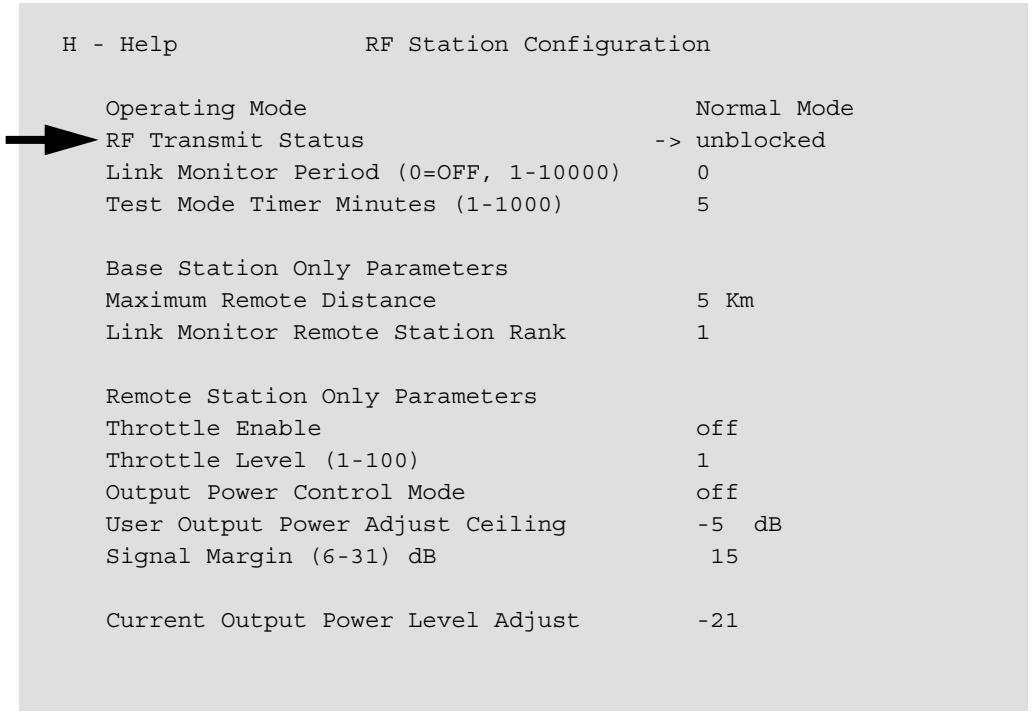
   If you have problems ensure that the unit is configured to its basic default settings (see *Restoring Factory Configurations* , page 124) and reconfigure the unit, or contact Wi-LAN customer support.

Setting the RF Transmit Status

This setting can block a unit (or link) from carrying data traffic. It is used to disable units and to discontinue service to customers, if necessary.

To set RF transmit status

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.



2. Select `RF Transmit Status` and press **Enter**. The data field highlights.
3. Select a setting.

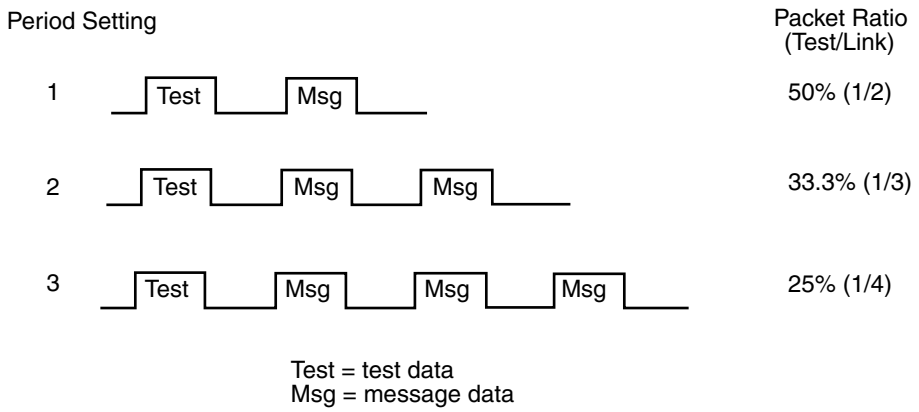
`unblocked`	Unit passes data in both directions (default setting)
`blocked`	Does not pass data in either direction

4. Press **Enter**.
5. Press **Esc** to exit to the Main Menu.

Setting the Link Monitor Period

The Link Monitor Period determines the ratio of test data to message data that is sent when you run the link monitor test. The higher the period number, the smaller the ratio of test data to message data. The following diagram shows the ratios of test data to link data

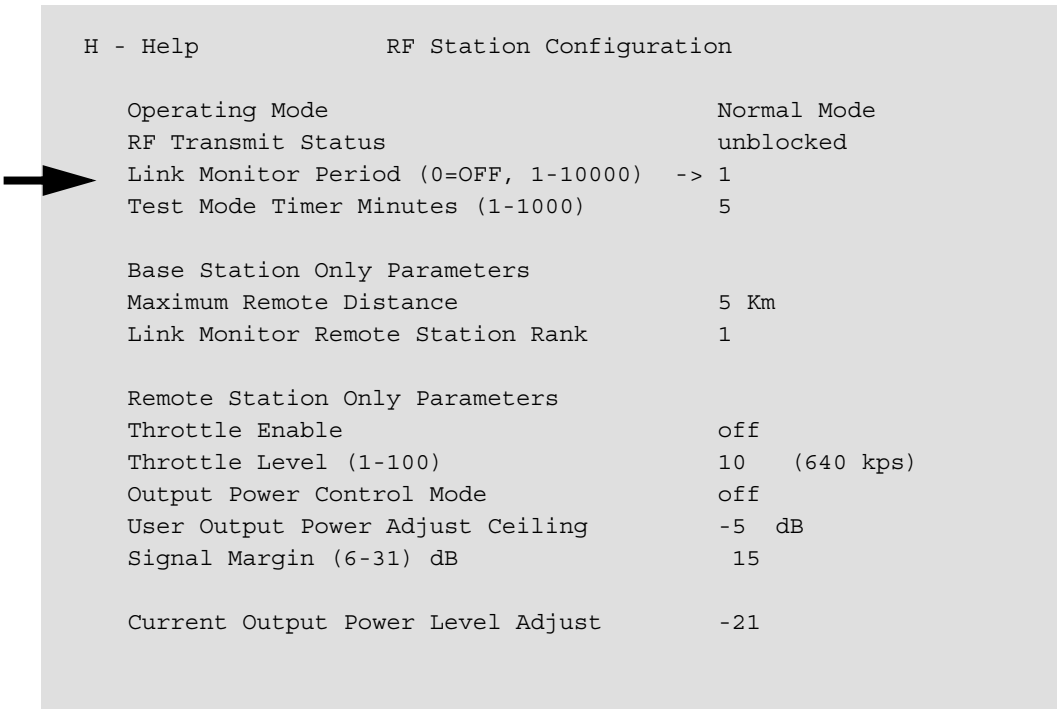
Link Monitor Period Settings



See *Performing Link Monitor Test (Normal Mode)* , page 72 for information about running the Link Monitor test.

To set link monitor period

1. From the Main Menu, select `RF Station Configuration` and press **Enter.** The RF Station Configuration menu is displayed.



```
H - Help            RF Station Configuration

   Operating Mode                           Normal Mode
   RF Transmit Status                       unblocked
   Link Monitor Period (0=OFF, 1-10000)  -> 1
   Test Mode Timer Minutes (1-1000)         5

   Base Station Only Parameters
   Maximum Remote Distance                  5 Km
   Link Monitor Remote Station Rank         1

   Remote Station Only Parameters
   Throttle Enable                          off
   Throttle Level (1-100)                   10   (640 kps)
   Output Power Control Mode                off
   User Output Power Adjust Ceiling         -5  dB
   Signal Margin (6-31) dB                   15

   Current Output Power Level Adjust        -21
```

2. Select `Link Monitor Period` and press **Enter.** The data field highlights.
3. Type the period setting (0=OFF, 1-10000)
4. Press **Enter.** **The test starts as soon as a non-zero value is entered.**
5. Press **Esc** to exit to the Main Menu.

Setting Maximum Remote Distance (Base Station Only)

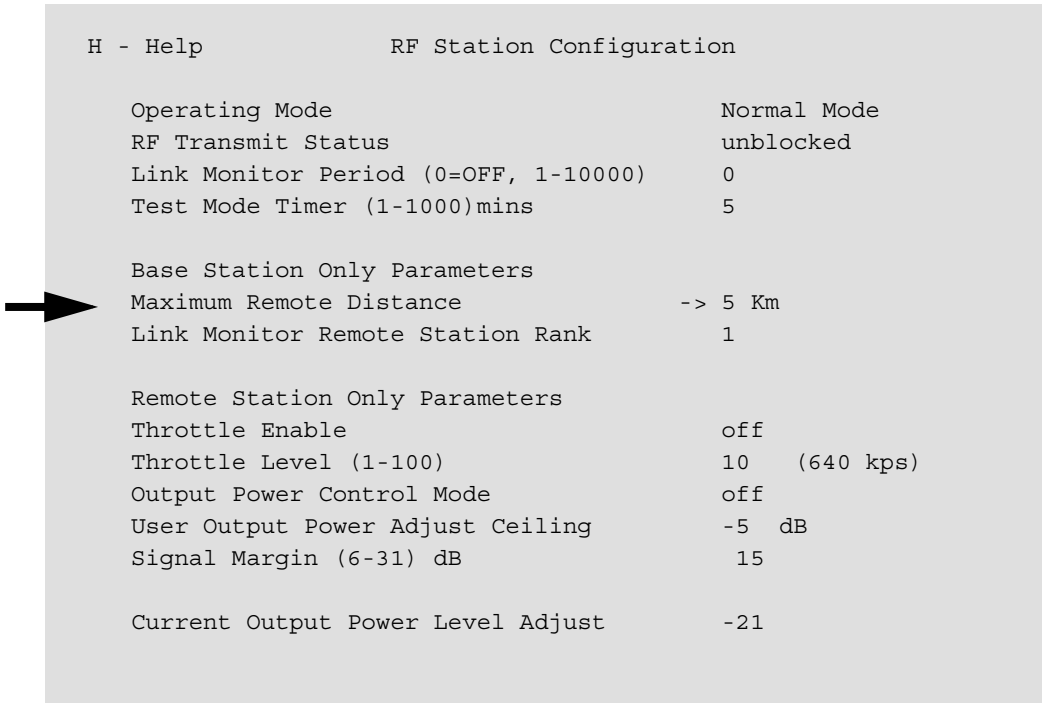
The Maximum Remote Distance setting is used to optimize dynamic polling by compensating for time delays caused by long distances between the sending unit and the receiving unit.

Important

In the base unit, the Maximum Remote Distance should always be set to the distance between the base and the farthest remote

To set the maximum remote distance

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.



```
H - Help            RF Station Configuration

   Operating Mode                           Normal Mode
   RF Transmit Status                       unblocked
   Link Monitor Period (0=OFF, 1-10000)     0
   Test Mode Timer (1-1000)mins             5

   Base Station Only Parameters
   Maximum Remote Distance               -> 5 Km
   Link Monitor Remote Station Rank         1

   Remote Station Only Parameters
   Throttle Enable                          off
   Throttle Level (1-100)                   10   (640 kps)
   Output Power Control Mode                off
   User Output Power Adjust Ceiling         -5  dB
   Signal Margin (6-31) dB                   15

   Current Output Power Level Adjust        -21
```

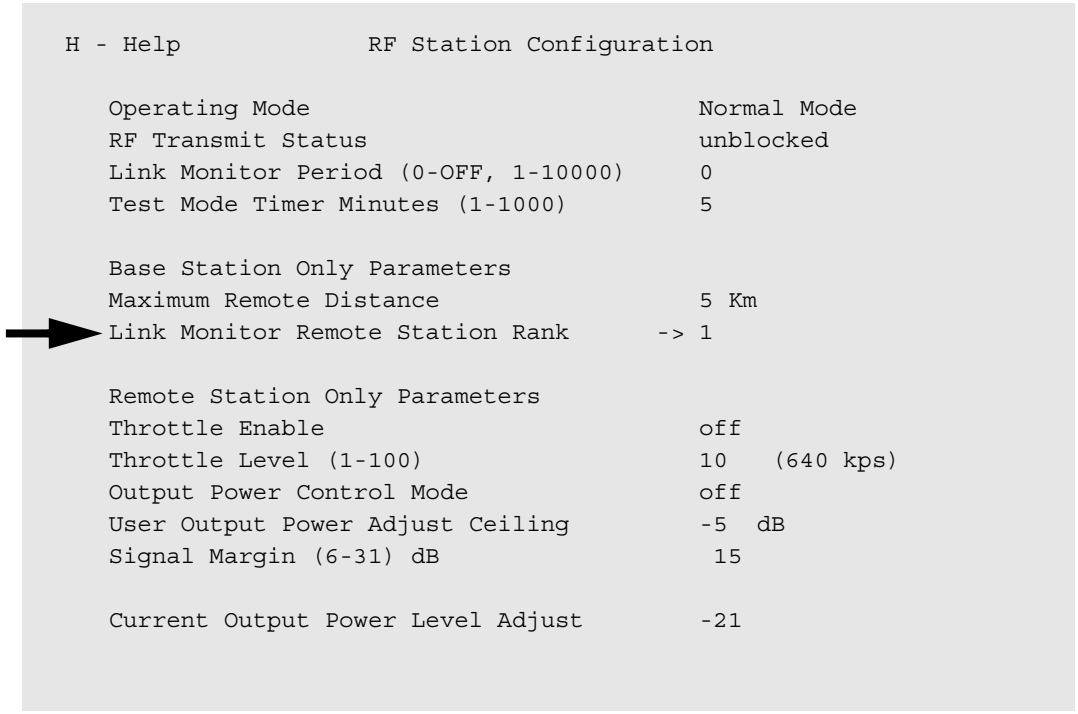
2. Select `Maximum Remote Distance` and press **Enter**. The data field highlights.
3. Press the arrow keys to set the distance of the furthest remote unit (5 km increments are used).
4. Press **Enter**.
5. Press **Esc** to exit to the Main Menu.

Setting Link Monitor Remote Station Rank

When you run the Link Monitor Test from a base station, you need to specify the rank (ID number) of the remote that you want to test. When you run the link monitor test from a remote, there is only one base, so the rank number does not need to be entered.

To set the link monitor remote station rank

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.



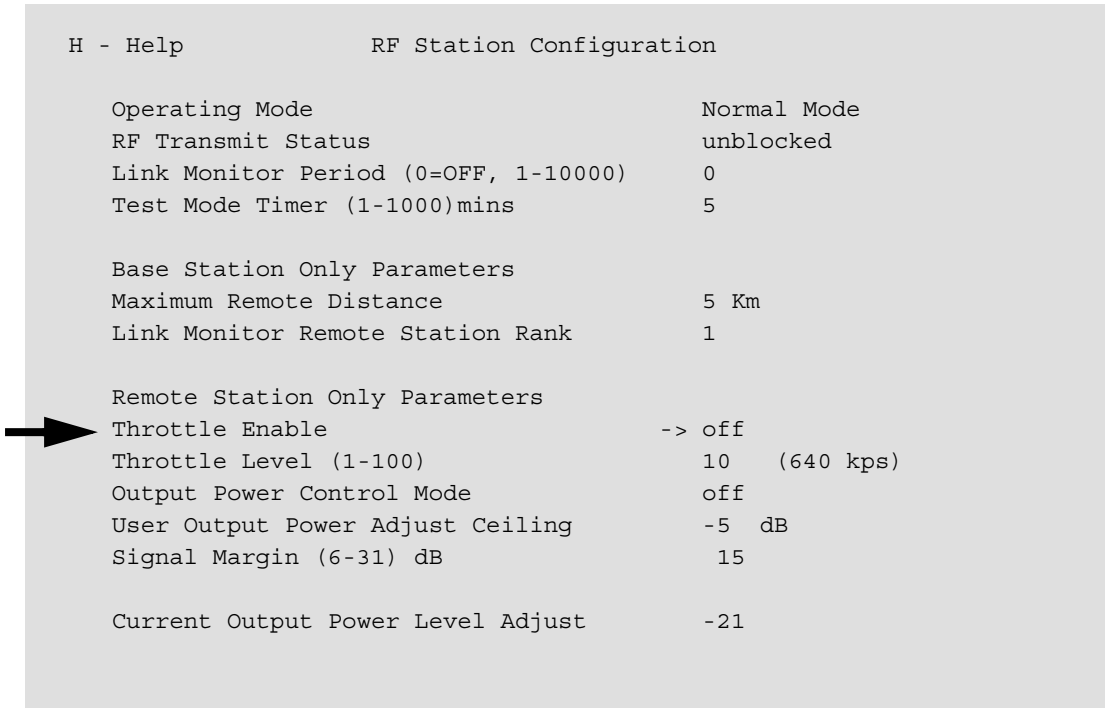
2. Select `Link Monitor Remote Station Rank` and press **Enter**. The data field highlights.
3. Type the station rank (ID#) of the remote to test.
4. Press **Enter**.
5. Press **Esc** to exit to the Main Menu.

Adjusting Throttling (Remote Station Only)

Throttling enables you to control the rate that data passes though a remote, so data throughput can be adjusted to make the data rate compatible with the rest of the system. Throttling restricts the flow of data from air to wire or from wire to air. When throttling is enabled, the amount of data passed is equal to the throttling level times 64 kbps, to a maximum of 6.4 Mbps. Throttling applies to both down link and up link traffic, so a throttle level of 1 means the unit will pass 64 kbps in each direction. A throttle level of 100 means that 100 x 64 kbps will be passed. When throttling is disabled, the unit uses the maximum available bandwidth. The default setting is to disable throttling.

To enable throttling

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.



```
H - Help            RF Station Configuration

   Operating Mode                          Normal Mode
   RF Transmit Status                      unblocked
   Link Monitor Period (0=OFF, 1-10000)    0
   Test Mode Timer (1-1000)mins            5

   Base Station Only Parameters
   Maximum Remote Distance                 5 Km
   Link Monitor Remote Station Rank        1

   Remote Station Only Parameters
   Throttle Enable                      -> off
   Throttle Level (1-100)                  10   (640 kps)
   Output Power Control Mode               off
   User Output Power Adjust Ceiling        -5  dB
   Signal Margin (6-31) dB                  15

   Current Output Power Level Adjust       -21
```

2. Select `Throttle Enable` and press **Enter**. The data field highlights.
3. Scroll to select `on` or `off`, and press **Enter**.
4. Press **Esc** to exit to the Main Menu.

To set the throttle level

1. Set Throttle Enable to on, then select `Throttle Level` from the RF Configuration menu and press **Enter**. The data field highlights.
2. Type a value from 1–100 to select the data throughput rate (where 1 = 1 x 64 kbps, 50 = 50 x 64 kbps) and press **Enter**.
3. Press **Esc** to exit to the Main Menu.

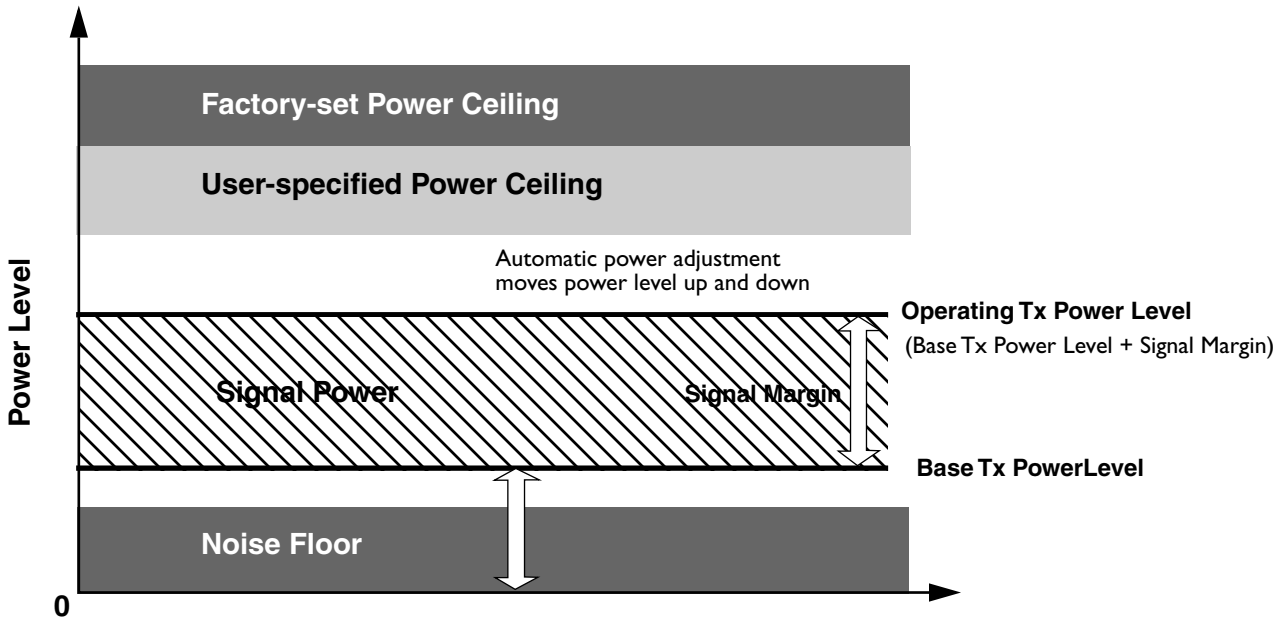
Setting Tx Power Automatically (Remote Station Only)

Output Power Control Mode can be used to adjust a remote unit's Tx power automatically. Three different modes are available: *off* mode is selected to run Link Monitor in the usual manner (where Link Monitor tests the link and collects statistical information). *Automatic Output Power* mode tests the link (with Link Monitor) and automatically adjusts Tx power up or down based on measurements taken when the mode is selected. *Dynamic Output Power* mode runs Link Monitor in the background and periodically adjusts Tx power in response to the current radio conditions and environment. The amount of bandwidth (test overhead) used for all modes is set with *Link Monitor Period*. (See *Setting the Link Monitor Period*, page 78).

How Automatic Output Power Adjustment Works

Link Monitor tests a link by sending test packets and measuring the link's performance (in terms of BER and power). The results of the test can be used to automatically adjust Tx power. Automatic power level adjustment is explained below.

The maximum Tx power output (*factory-set power ceiling*) of a unit is set at factory and cannot be changed with configuration menus (for more information see *Viewing Unit Identification*, page 35). A *user-specified power ceiling* or limit can be set by the user using `User Output Power Adjust Ceiling` on the RF Station Configuration screen. The user-specified ceiling is the maximum Tx power level with which the user allows the unit to operate.



The *noise floor* is the power level below which signal quality deteriorates rapidly due to random radio interference causing the link to not function properly. Base Tx Power level is the starting power level or "base" from which the adjustment is made. The *operating Tx Power level* is the sum of the base power level and the *signal margin* (fade margin)—the signal margin is added to the Tx base power level and moves with it. Both the base power level and the signal margin can be adjusted to reach the operating power level,

When a unit adjusts the power level, it begins at the base power level and runs Link Monitor. If no bit errors occur and the power level is satisfactory, the unit automatically drops the Tx power level by one dB and runs Link Monitor again. If no bit errors occur again and power level is adequate, it once again drops the Tx power

level by one dB and runs Link Monitor. This process repeats until a power level occurs where no bit errors occur and power level is lowest. This level is the minimum power level required for operation and is displayed numerically by `Current Output Power Level Adjust` on the screen. When the unit reaches this level, Tx Power (seen on the Radio Module Configuration screen) is automatically reset to the new level. (Below this level, BER and power levels are unsatisfactory for data communication). If the intitial base Tx power level is below the noise floor, a unit will automatically increment the power level by one dB until the BER and power level become satisfactory.

In short, two modes of automatic power level adjustment are available: automatic and dynamic.

Automatic Output Power mode: Power is monitored and automatically adjusted **once** when the automatic output power mode is activated. The resulting output power value is saved and Output Power Control Mode automatically returns to "off".

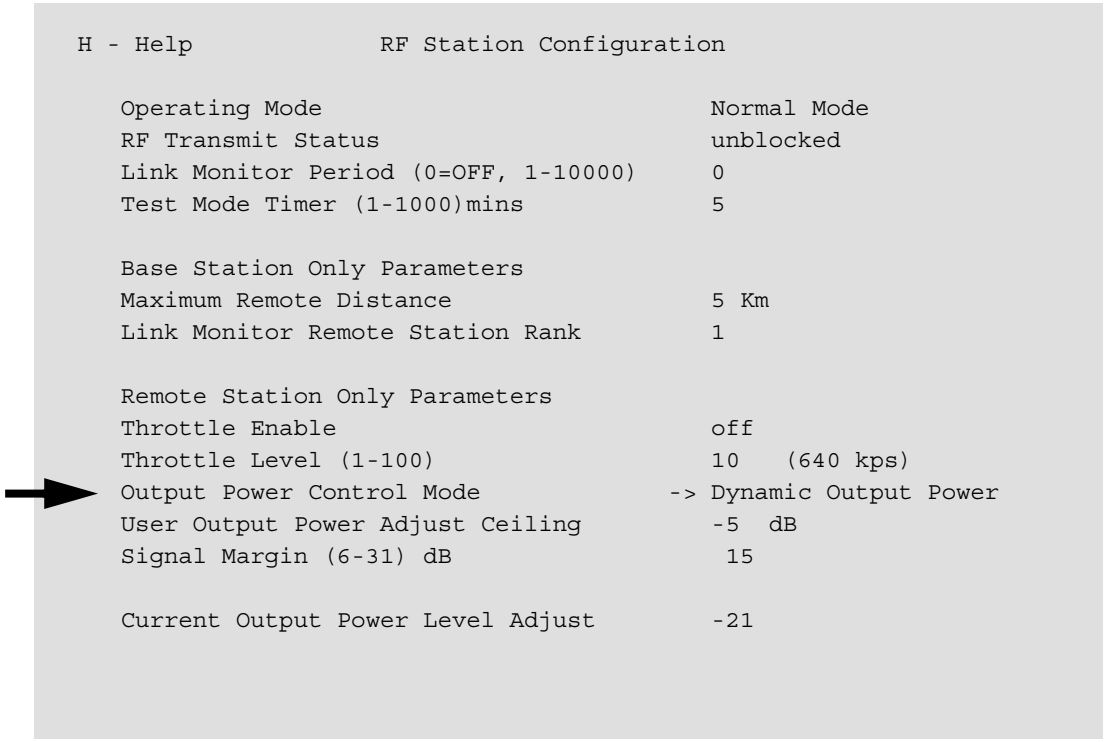
Dynamic Output Power mode: Power is monitored and automatically adjusted **periodically** during regular operation. Some bandwidth for data is lost due to test packet overhead—the amount of overhead is determined by setting the *Link Monitor Period (see* *Setting the Link Monitor Period* , page 78*)*. Dynamic Output Power mode is not recommended in co-location situations.

Note: A unit will adjust the power output to compensate for noise problems, however if the noise floor is too high the unit will not be able to establish an RF link. In this case, an RF spectrum analysis should be performed to determine the cause of the problem.

Tx Power Adjust on the Radio Module Configuration screen is used to set the initial or base Tx power level. After the level is set automatically, this value is automatically reset by the unit. The reset value can be read by viewing Current Output Power Level Adjust on the RF Station Configuration screen, or by viewing Tx Power Level Adjust on the Radio Module Configuration screen.

To set the output power mode

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.



2. Select `Output Power Control Mode` and press **Enter**. The data field highlights.
3. Scroll to choose **`off`**, **`Auto Power Output`** or **`Dynamic Output Power`** and press **Enter** where

`off`	This setting should be set to "off" when running Link Monitor. If a (non-zero) Link Monitor Period is specified, test packets are sent and received across an RF link and link statistics are displayed (view with Link Monitor Statistics screen). This mode can be used for both base and remote units.
`Automatic Output Power`	Remote-only mode in which a remote unit's transmit power is adjusted when the mode is selected. While in this mode, Link Monitor statistics display "N/A". Once the transmit power is determined, the unit automatically goes back to "off" mode. A Link Monitor Period of 5 is automatically used.
`Dynamic Output Power`	Remote-only mode in which a remote unit's transmit power is continuously monitored and adjusted to accommodate RF link disturbances. While in this mode, Link Monitor statistics display "N/A". Link Monitor Period must be specified by the user.

4. Press **Esc** to exit to the Main Menu.

Adjusting User Output Power Ceiling (Remote Station Only)

The output power ceiling is used to limit the maximum output transmit power of a remote unit. The value entered cannot exceed the factory-set default value.

To adjust the user output power ceiling

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed..

```
H - Help            RF Station Configuration

   Operating Mode                          Normal Mode
   RF Transmit Status                      unblocked
   Link Monitor Period (0=OFF, 1-10000)    0
   Test Mode Timer (1-1000)mins            5

   Base Station Only Parameters
   Maximum Remote Distance                 5 Km
   Link Monitor Remote Station Rank        1

   Remote Station Only Parameters
   Throttle Enable                         off
   Throttle Level (1-100)                  10   (640 kps)
   Output Power Control Mode               off
   User Output Power Adjust Ceiling     -> -5  dB
   Signal Margin (6-31) dB                  15

   Current Output Power Level Adjust       -21
```

2. Select `User Output Power Adjust Ceiling` and press **Enter**. The data field highlights.
3. Press the down arrow key to scroll through the list. Select a values from 0 db (no power attenuation) to –31 dB (maximum power attenuation) and press **Enter**.
4. Press **Esc** to exit to the Main Menu.

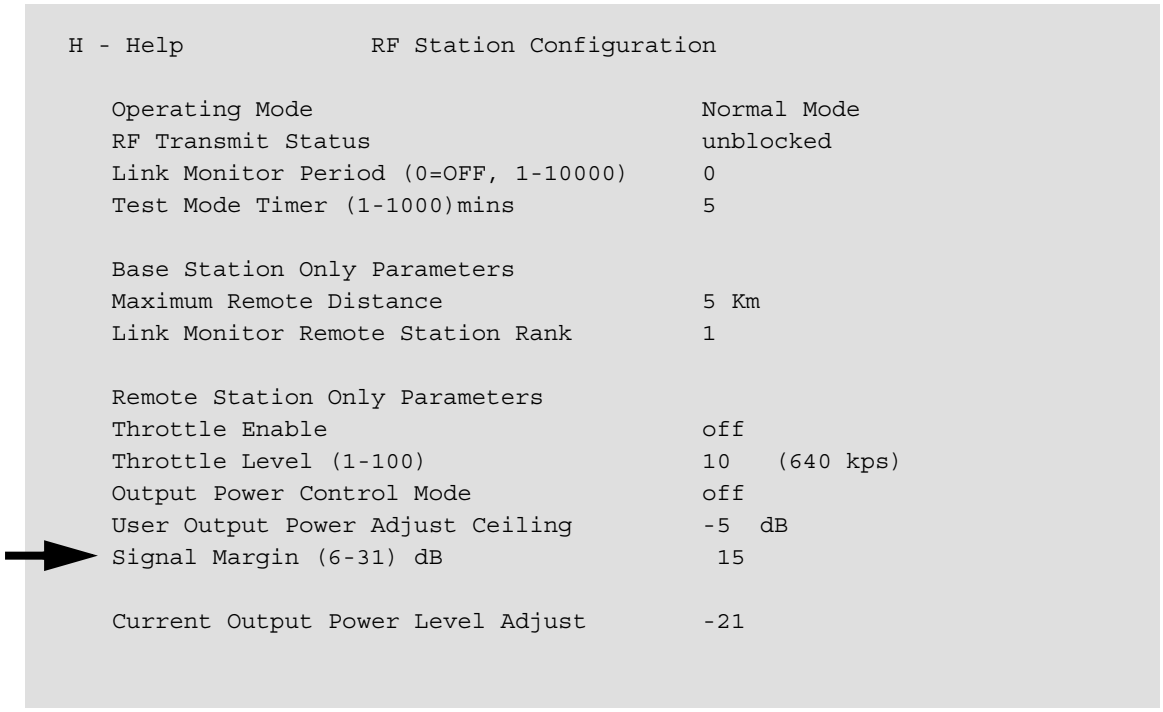
Setting Signal Margin (Remote Station Only)

The signal margin is the extra transmit power (measured in dB) desired for a remote unit with respect to the base station noise floor. This value is used by Output Power Control test modes to set the transmit power.

For example, if set to 10 dB, an Output Power Control test mode will attempt to adjust the output transmit power to a level at which the received signal at the base station is 10 dB greater than receiver sensitivity threshold.

To set the signal margin

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.



2. Select `Signal Margin` and press **Enter**. The data field highlights.
3. Enter the ceiling value (from 6 to 31 dB) and press **Enter**.
4. Press **Esc** to exit to the Main Menu.

Viewing Current Output Power Level Adjust

`Current Output Power Level Adjust` is a view-only information. It displays the current power level adjustment, which was initially set using Tx Power Level Adjust. See *Adjusting the Tx Power Level* , page 101. This power level will be adjusted automatically when running one of the automatic power adjustment modes. See *Setting Tx Power Automatically (Remote Station Only)* , page 83.

To view the current output power

1. From the Main Menu, select and press **Enter**. The RF Station Configuration menu is displayed.

.

```
H - Help            RF Station Configuration

   Operating Mode                          Normal Mode
   RF Transmit Status                      unblocked
   Link Monitor Period (0=OFF, 1-10000)    0
   Test Mode Timer (1-1000)mins            5

   Base Station Only Parameters
   Maximum Remote Distance                 5 Km
   Link Monitor Remote Station Rank        1

   Remote Station Only Parameters
   Throttle Enable                         off
   Throttle Level (1-100)                  10   (640 kps)
   Output Power Control Mode               off
   User Output Power Adjust Ceiling        -5  dB
   Signal Margin (6-31) dB                  15

   Current Output Power Level Adjust       -21
```

2. Read the current power level.
3. Press **Esc** to exit to the Main Menu.

Radio Module Configuration

The Radio Module Configuration menu is used to change several key parameters, including station type, station rank, and security passwords. Because these settings can affect service, they are changed in three progessive stages: new, current, and flash. (New and current are for temporary storage, while flash is for long-term storage.) The general procedure for changing settings with the Radio Module Configuration menu follows.

1. View the current Radio Module Configuration menu. See *Viewing the Radio Module Configuration* , page 89.
2. Select `Config Test Minutes`. To begin, enter a time of 15–20 minutes. See *Setting Config Test Minutes* , page 92.
3. Select a parameter and, if necessary, change the value in the "`New` column.
4. After making changes, select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the "`New`" settings become the "`Current`" settings of the unit. See *Rebooting and Saving RF Module Configurations* , page 109.
5. If the unit operates as expected, you can save the current settings to "`Flash`". See *Rebooting and Saving RF Module Configurations* , page 109.

   If current settings *do not* operate as expected, do not save them to "`Flash`". Either change the current settings or wait for the `Config Test Minutes` time period to expire. At expiry, the unit will automatically reboot and revert to the last-saved flash memory settings. See *Rebooting and Saving RF Module Configurations* , page 109.

Viewing the Radio Module Configuration

To view the current radio module configuration

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.

```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                     -> Remote Unit   Remote Unit    Remote Unit
Station Rank (1-1000)               1             1             1
Center Frequency (57410-58338)      5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)          1             1             1
Security Password 2  (Hex)          10            10            10
Security Password 3  (Hex)          100           100           100
Security Password 4  (Hex)          1000          1000          1000
Security Password 5  (Hex)          10000         10000         10000
Scrambling Code      (Hex)          0             0             0
Acquisition Code     (0-15)         1             1             1
Config Test Minutes  (1-120)        30            30            30
Tx Power Level Adjust               0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                       off           off           off
System Symmetry Type                Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)       1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)         0             0             0

Reboot New RF configuration         Press Enter to Execute
Save Current Config to Flash        Press Enter to Execute
```

`Station Type`	Defines unit as either a base station or a remote station
`Station Rank`	For a base station, the number of remotes that the base polls For a remote, the polling ID # of the remote
`Center Frequency`	Defines the channel the unit uses to transmit and receive
`Security Password n`	Password(s) for the unit. A password up to eight digits long in hexadecimal may be entered in each field
`Scrambling Code`	Code used to scramble messages
`Acquisition Code`	Code used to reduce system-induced interference in a multi-sector system
`Config Test Minutes`	Amount of time before unit returns to its pre-configuration state
`Tx Power Level Adjust`	Reduces the power below maximum Tx power by the specified amount in dB.
`Repeater Mode`	Sets up a base station to pass data between remotes as well as function as a control unit
`System Symmetry Type`	Defines the amount of priority the base unit has when polling the remotes
`Dynamic Polling Level`	Number of polling cycles that inactive remote units are ignored by the base station

`Remote Unit RF Group`	Identifies the group number of the remote unit Remote units with same RF group number can communicate directly with each other
`Reboot new RF configuration`	Reboots unit to save New settings as Current settings
`Save Current Config to Flash`	Stores current settings in flash memory

2. Press **Esc** to exit to the Main Menu.

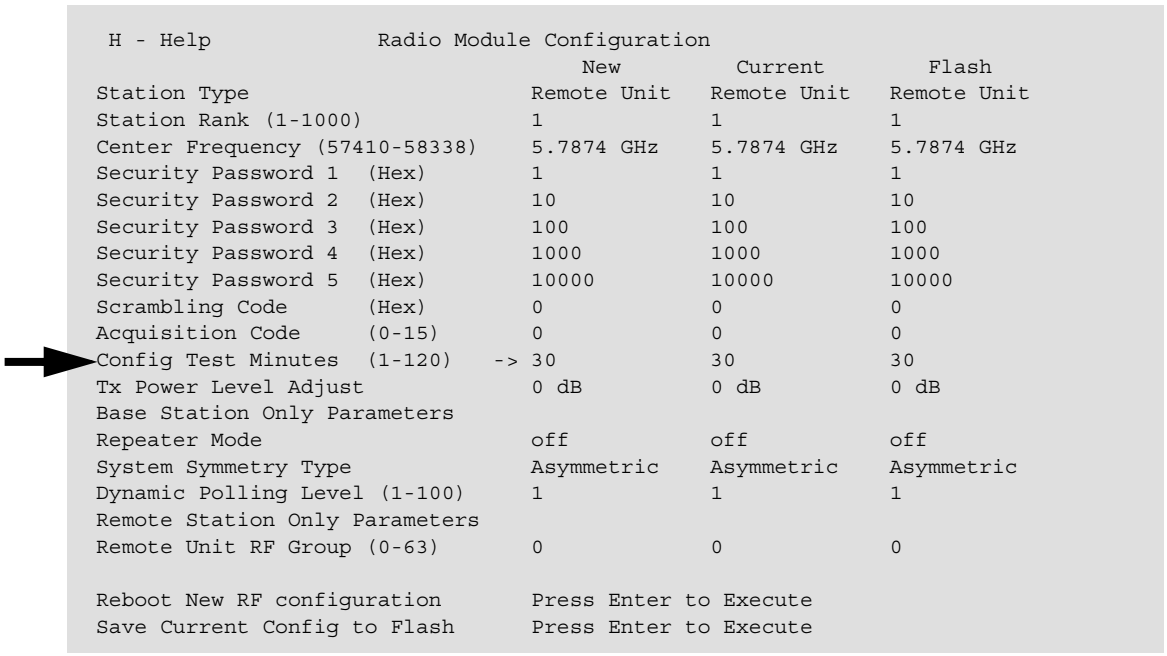
Setting Config Test Minutes

When changing Radio Module Configuration settings, you may enter settings that cause a unit or system to not function as expected. If this happens, you can return to the last-saved settings *if you first set the Config Test Minutes test period* . When this test period expires, the unit automatically reboots and returns to its last-saved flash memory settings. The time period can be fixed from 1 to 120 minutes.

Tip: To begin, enter a time period of 30 minutes. If the time period is too short, you will not have enough time to make configuration changes and save them to flash ROM. If the time period is long, you will have to wait a long time before the unit automatically reboots and restores the settings to the original flash ROM state.

To set the config test timeout period

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.



```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit    Remote Unit    Remote Unit
Station Rank (1-1000)             1              1              1
Center Frequency (57410-58338)    5.7874 GHz     5.7874 GHz     5.7874 GHz
Security Password 1  (Hex)        1              1              1
Security Password 2  (Hex)        10             10             10
Security Password 3  (Hex)        100            100            100
Security Password 4  (Hex)        1000           1000           1000
Security Password 5  (Hex)        10000          10000          10000
Scrambling Code      (Hex)        0              0              0
Acquisition Code     (0-15)       0              0              0
Config Test Minutes  (1-120)   -> 30             30             30
Tx Power Level Adjust             0 dB           0 dB           0 dB
Base Station Only Parameters
Repeater Mode                     off            off            off
System Symmetry Type              Asymmetric     Asymmetric     Asymmetric
Dynamic Polling Level (1-100)     1              1              1
Remote Station Only Parameters
Remote Unit RF Group (0-63)       0              0              0

Reboot New RF configuration       Press Enter to Execute
Save Current Config to Flash      Press Enter to Execute
```

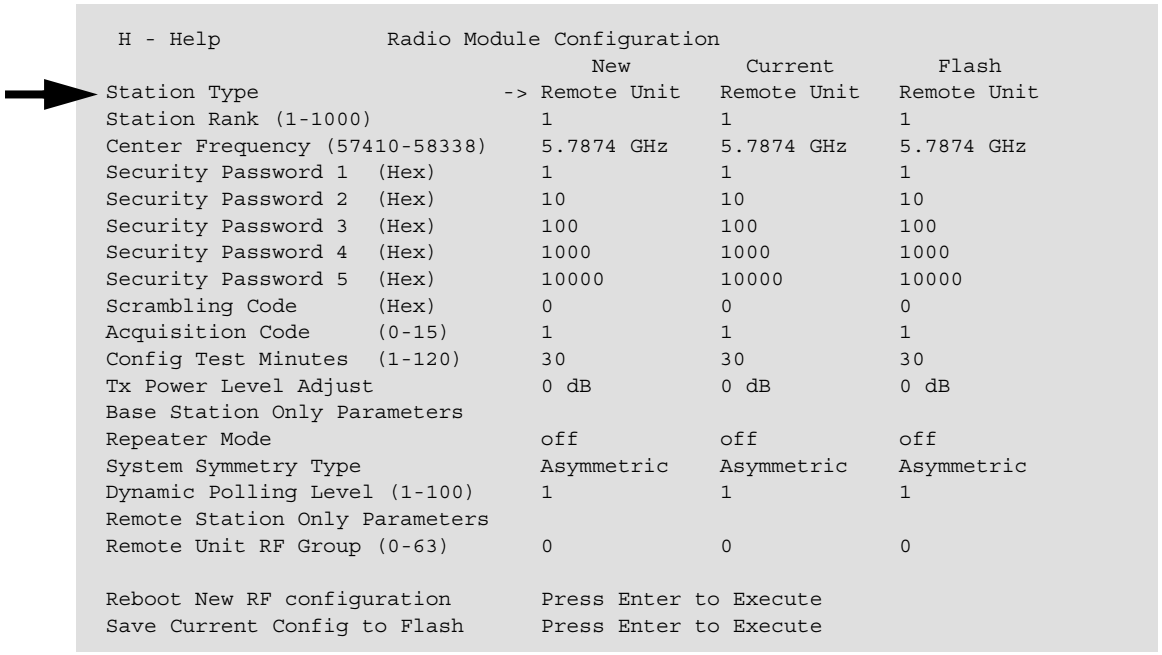
2. Select `Config Test Minutes` and press **Enter**. The data field highlights.
3. Type the number of minutes (1-120) and press **Enter**. The number of minutes is stored in the `New` state.
4. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit will now use the current settings to operate, for the length of time specified by `Config Test Minutes`.
5. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
6. Press **Esc** to exit to the Main Menu.

Setting the Station Type

Each unit must be set up as either a base station or a remote station. In a given system there is only one base station, but there can be numerous remote stations. (A base station can also be set up as a repeater base.) You define the unit as a base station or remote unit by setting the Station Type.

To set the station type

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.



```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                    -> Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)              1             1             1
Center Frequency (57410-58338)     5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)         1             1             1
Security Password 2  (Hex)         10            10            10
Security Password 3  (Hex)         100           100           100
Security Password 4  (Hex)         1000          1000          1000
Security Password 5  (Hex)         10000         10000         10000
Scrambling Code      (Hex)         0             0             0
Acquisition Code     (0-15)        1             1             1
Config Test Minutes  (1-120)       30            30            30
Tx Power Level Adjust              0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                      off           off           off
System Symmetry Type               Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)      1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)        0             0             0

Reboot New RF configuration        Press Enter to Execute
Save Current Config to Flash       Press Enter to Execute
```

2. Select `Station Type` and press **Enter**. The data field highlights.
3. Scroll to select the Station Type (base station or remote unit).
4. Press **Enter**. The new setting is displayed in the "`New` column.
5. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit now runs using the "`Current`" station type for the amount of time specified by `Config Test Minutes`.
6. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
7. Press **Esc** to exit to the Main Menu.

Setting the Station Rank

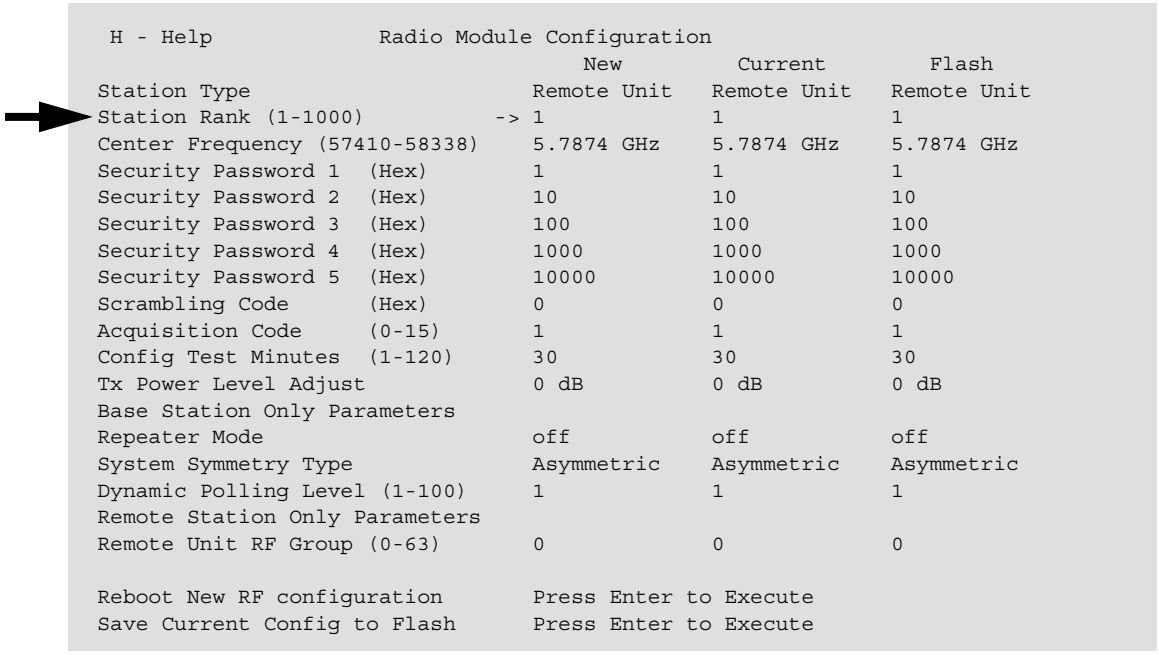
Station Rank is defined two different ways, which depend on the station type: For a base station, rank is the *total number of remotes* that a base will poll. For a remote unit, rank is a unique *polling ID number* that identifies a remote to a base station.

When it polls remotes, the base station begins polling at the remote with rank number 1, then proceeds to the remote with rank number 2, then goes to the remote with rank number 3, and so on. The base continues polling remotes until it reaches the remote with the highest rank number. The base then repeats the polling cycle.

Note: Dynamic polling gives you some control over the polling process. See *Setting Dynamic Polling Level (Base Station Only)*, page 105.

To set the station rank

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.



```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit    Remote Unit    Remote Unit
Station Rank (1-1000)          -> 1              1              1
Center Frequency (57410-58338)    5.7874 GHz     5.7874 GHz     5.7874 GHz
Security Password 1  (Hex)        1              1              1
Security Password 2  (Hex)        10             10             10
Security Password 3  (Hex)        100            100            100
Security Password 4  (Hex)        1000           1000           1000
Security Password 5  (Hex)        10000          10000          10000
Scrambling Code      (Hex)        0              0              0
Acquisition Code     (0-15)       1              1              1
Config Test Minutes  (1-120)      30             30             30
Tx Power Level Adjust             0 dB           0 dB           0 dB
Base Station Only Parameters
Repeater Mode                     off            off            off
System Symmetry Type              Asymmetric     Asymmetric     Asymmetric
Dynamic Polling Level (1-100)     1              1              1
Remote Station Only Parameters
Remote Unit RF Group (0-63)       0              0              0

Reboot New RF configuration       Press Enter to Execute
Save Current Config to Flash      Press Enter to Execute
```

2. Select `Station Rank (1-1000)`.
3. Type the rank (a number from 1–1000) of the station.
4. Press **Enter**. The new setting is displayed in the "`New` column.
5. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit now runs using the "`Current`" rank for the amount of time specified by `Config Test Minutes`.
6. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations*, page 109.
7. Press **Esc** to exit to the Main Menu.

Setting the Center Frequency

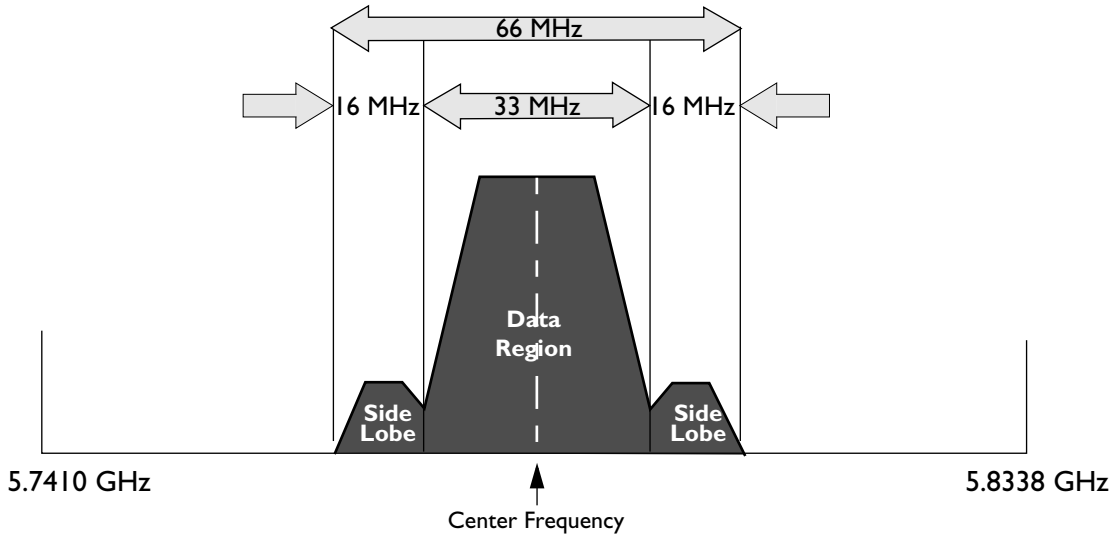
A center frequency defines the RF channel that a unit uses to transmit and receive. The AWE 120-58 can operate at a center frequency ranging from 5.7410 GHz to 5.8338 GHz, in 400 kHz steps. All units in the same system must be set to the same center frequency.

If you plan to co-locate AWE 120-58 systems, you will need to use more than one center frequency. You will choose center frequencies that are well-separated from each other. The following section *Choosing Center Frequencies* explains how to choose center frequencies.

Choosing Center Frequencies

A simplified diagram of the spectrum around a center frequency (when transmitting) is shown below.

Center Frequency Spectrum

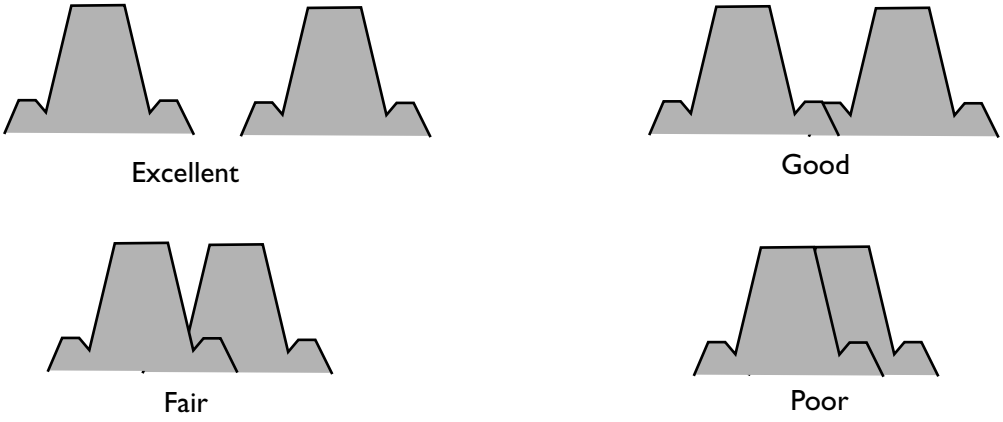


Only the 33 MHz data region of the 66 MHz spectrum contains data; the remaining 16 MHz side lobes contain no useful information (frequency ranges given are approximate). The side lobes operate at a much lower power than the data region.

If only one center frequency is required, simply choose a frequency between 5.7410 GHz and 5.8338 GHz (in 400 kHz increments). You will probably choose a center frequency where the 5.8 GHz ISM band is cleanest, meaning a frequency where no other people are transmitting.

If two or more AWE 120-58 systems must be co-located, center frequencies are selected that have as much separation as possible so different systems do not interfere with each other. It is very important that the 33 MHz data regions of adjacent systems do not overlap. System performance is also better if the side lobes of one system do not overlap the data region of another system. It does not matter if the side-lobes of two systems overlap.

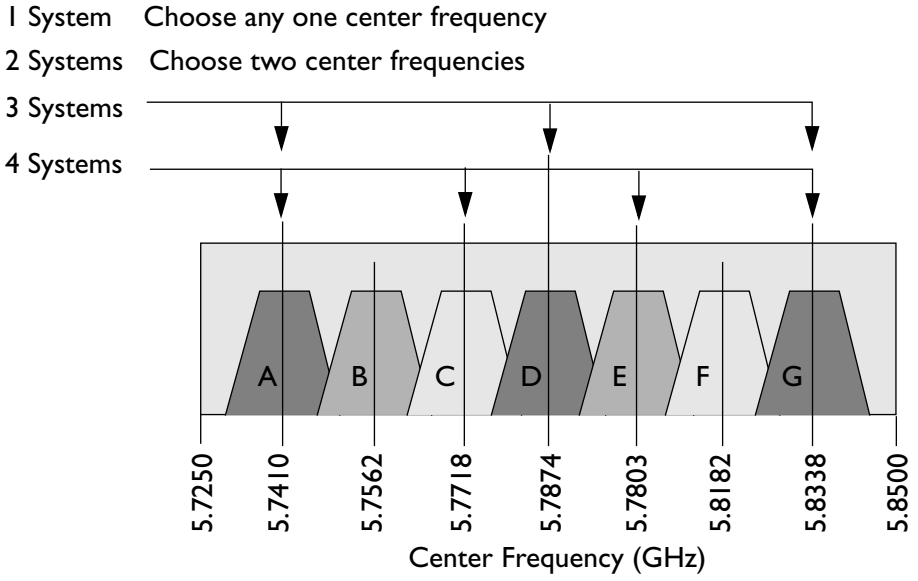
Some examples of center frequency separation and performance ratings are provided below.



These examples show that there is no benefit to separating the center frequencies of adjacent systems by more than 66 MHz. 48 MHz of center frequency separation is more than adequate in most cases. Separation of 33MHz is adequate for strong RF links, but weak signals will be degraded by the overlap of the side-lobes into the data region. Overlapping of data regions is not recommended and will cause problems.

The following diagram shows seven different center frequencies in the 5.8 GHz ISM band that are spaced as far apart as possible. You can choose your center frequencies from these sample schemes.

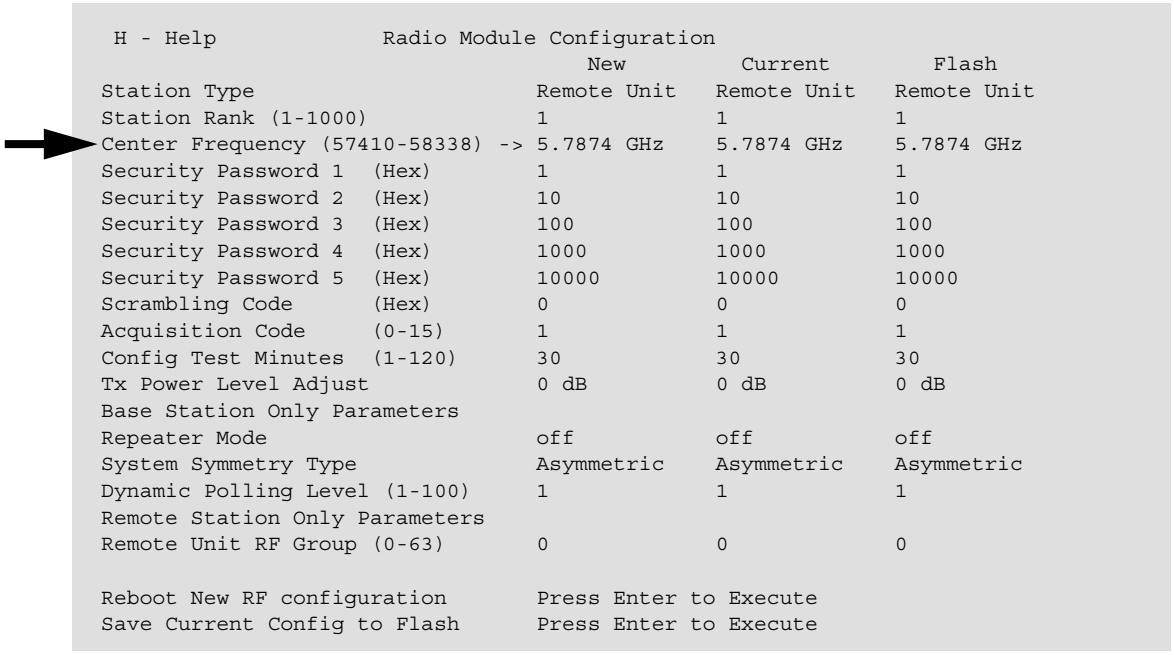
Sample Center Frequency Schemes for Co-located Systems



For best performance, choose center frequencies that are separated as much as possible and non-overlapping. Three co-located system could use the A,D and G center frequencies. Frequencies B, D and F would probably work equally as well. Four co-located systems could use the A, C, E and G frequencies. Having more than four co-located systems would require careful radio network planning to ensure the proper operation of each system.

To set the center frequency

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.



```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)             1             1             1
Center Frequency (57410-58338) -> 5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)        1             1             1
Security Password 2  (Hex)        10            10            10
Security Password 3  (Hex)        100           100           100
Security Password 4  (Hex)        1000          1000          1000
Security Password 5  (Hex)        10000         10000         10000
Scrambling Code      (Hex)        0             0             0
Acquisition Code     (0-15)       1             1             1
Config Test Minutes  (1-120)      30            30            30
Tx Power Level Adjust             0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                     off           off           off
System Symmetry Type              Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)     1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)       0             0             0

Reboot New RF configuration       Press Enter to Execute
Save Current Config to Flash      Press Enter to Execute
```

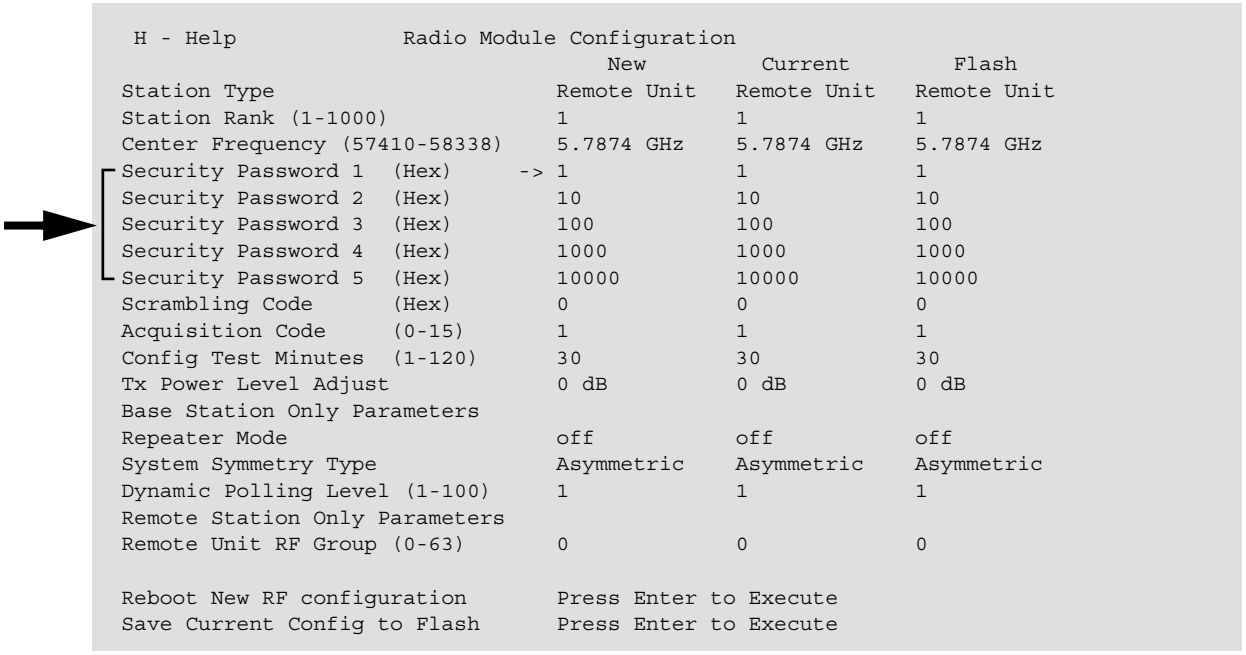
2. Select `Center Frequency` and press **Enter**. The data field highlights.
3. Type the value of the RF center frequency. The value can range from 5.7410 GHz to 5.8338 GHz in steps of 400 kHz. (Numbers are automatically rounded down to the nearest step.) All units in a system must have the same center frequency.
4. Press **Enter**. The new setting is displayed in the "`New` column.
5. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit now runs using the "`Current`" center frequency for the amount of time specified by `Config Test Minutes`.
6. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
7. Press **Esc** to exit to the Main Menu.

Setting Security Passwords

Passwords are always exchanged between units when they communicate with each other. A set of five security passwords is assigned to each unit. Each password may be up to 8 digits long in hexadecimal. The set of passwords must be exactly the same for all units in a system. (A convenient, but non-secure option is to set all passwords to "0".) The more password levels you use, the greater the security of your system. For example, using a set of five different passwords will result in a highly secure system. All units in the same network must use the same set of security passwords.

To set security passwords

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.



```
 H - Help             Radio Module Configuration
                                      New          Current         Flash
Station Type                        Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)               1             1             1
Center Frequency (57410-58338)      5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)      -> 1             1             1
Security Password 2  (Hex)         10            10            10
Security Password 3  (Hex)         100           100           100
Security Password 4  (Hex)         1000          1000          1000
Security Password 5  (Hex)         10000         10000         10000
Scrambling Code      (Hex)         0             0             0
Acquisition Code     (0-15)        1             1             1
Config Test Minutes  (1-120)       30            30            30
Tx Power Level Adjust              0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                      off           off           off
System Symmetry Type               Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)      1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)        0             0             0

Reboot New RF configuration        Press Enter to Execute
Save Current Config to Flash       Press Enter to Execute
```

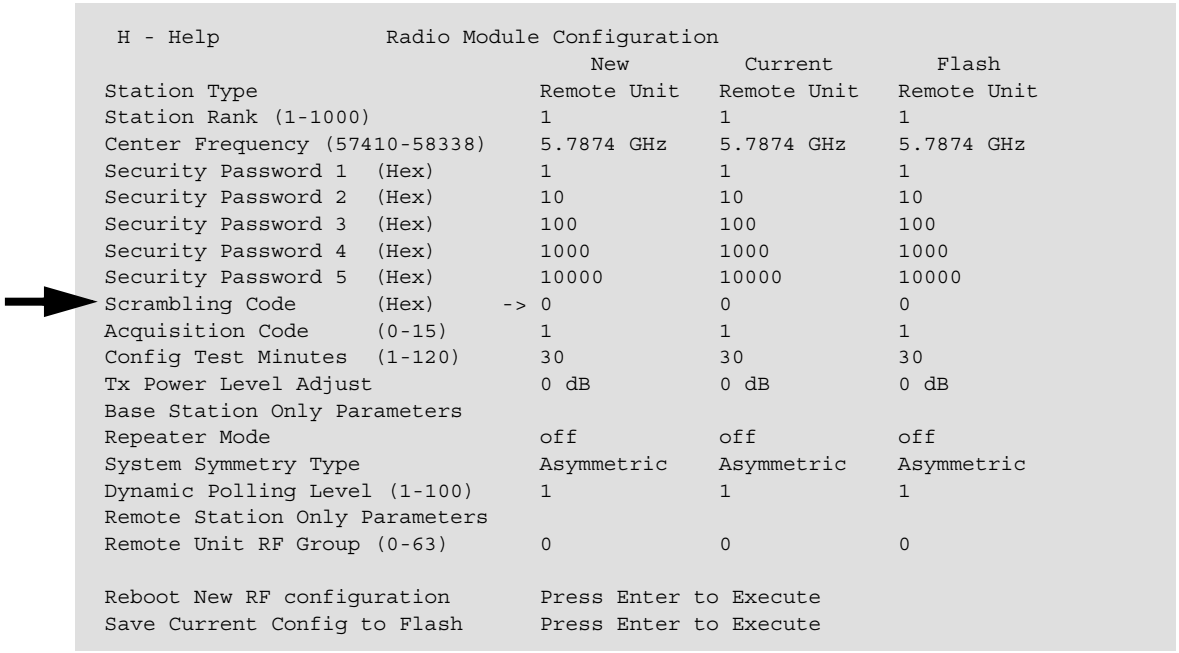
2. Select `Security Password 1` and press **Enter**. The data field highlights.
3. Enter a password in Hex code and press **Enter**. The password is stored in the `New` state.
4. Select `Security Password 2` and press **Enter**. The data field highlights.
5. Enter a different password in Hex code and press **Enter**. The password is stored in the `New` state.
6. Repeat this process until you complete all five password levels.
7. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit now runs using the "`Current`" set of passwords for the amount of time specified by `Config Test Minutes`.
8. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
9. Press **Esc** to exit to the Main Menu.

Setting the Scrambling Code

To protect the privacy of a wireless link, units can scramble messages—the message content is rearranged so that messages are difficult to read by unintended receivers. The scrambling code determines how messages are scrambled by a unit. Only units with the same scrambling code as the originating unit can de-scramble and read the message. The scrambling code can be 0-32 bits long. All units in the same wireless network must have this setting set to the same value.

To set scrambling codes

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.



```
 H - Help             Radio Module Configuration
                                      New          Current         Flash
Station Type                       Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)              1             1             1
Center Frequency (57410-58338)     5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)         1             1             1
Security Password 2  (Hex)         10            10            10
Security Password 3  (Hex)         100           100           100
Security Password 4  (Hex)         1000          1000          1000
Security Password 5  (Hex)         10000         10000         10000
Scrambling Code      (Hex)      -> 0             0             0
Acquisition Code     (0-15)        1             1             1
Config Test Minutes  (1-120)       30            30            30
Tx Power Level Adjust              0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                      off           off           off
System Symmetry Type               Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)      1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)        0             0             0

Reboot New RF configuration        Press Enter to Execute
Save Current Config to Flash       Press Enter to Execute
```

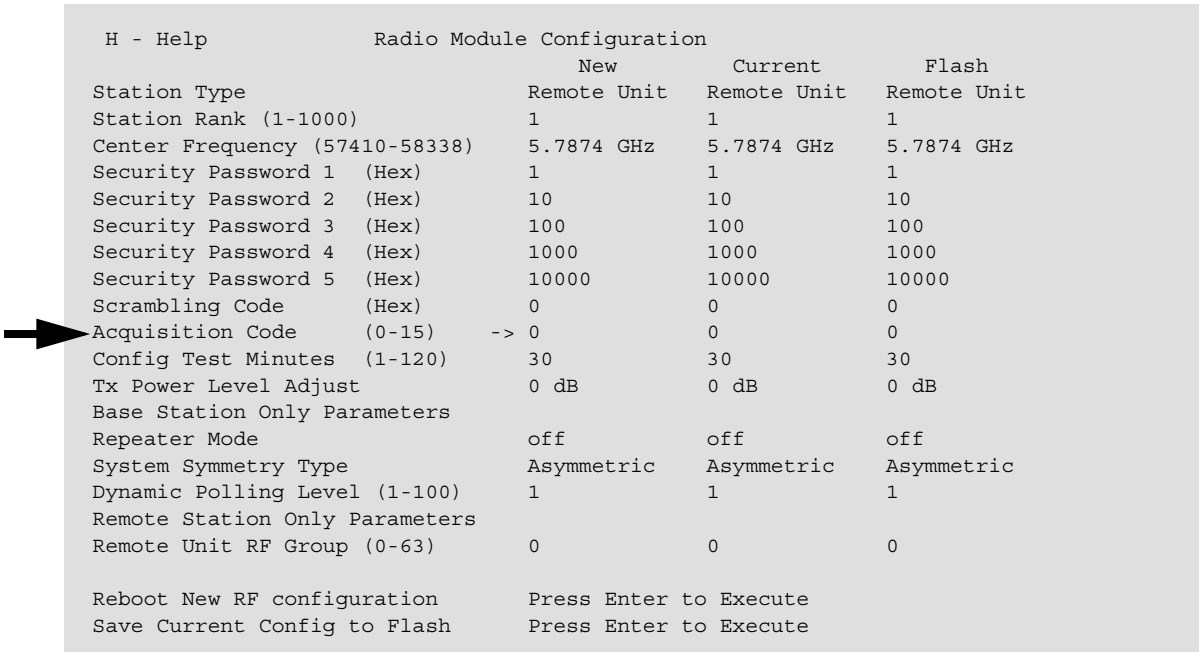
2. Select `Scrambling Code` and press **Enter**. The data field highlights.
3. Type the code (hexidecimal number).
4. Press **Enter**. The new setting is displayed in the "`New` column.
5. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit now runs using the "`Current`" scrambling code for the amount of time specified by `Config Test Minutes`.
6. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
7. Press **Esc** to exit to the Main Menu.

Setting the Acquisition Code

An acquisition code is a unique code contained within the preamble of a transmitted message. Units search the air for messages that begin with a particular acquisition code. Messages without the correct code are treated as interference and are rejected by a unit. Messages with the correct code are accepted and processed. Acquisition codes serve to isolate units from each other, especially when several units operate in close proximity or at the same frequency in a multiple-sector or multi-cell environment. All units in the same network must have the same acquisition code in order to communicate with each other.

To set the acquisition code

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.



```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)             1             1             1
Center Frequency (57410-58338)    5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)        1             1             1
Security Password 2  (Hex)        10            10            10
Security Password 3  (Hex)        100           100           100
Security Password 4  (Hex)        1000          1000          1000
Security Password 5  (Hex)        10000         10000         10000
Scrambling Code      (Hex)        0             0             0
Acquisition Code     (0-15)    -> 0             0             0
Config Test Minutes  (1-120)      30            30            30
Tx Power Level Adjust             0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                     off           off           off
System Symmetry Type              Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)     1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)       0             0             0

Reboot New RF configuration       Press Enter to Execute
Save Current Config to Flash      Press Enter to Execute
```

2. Select `Acquisition Code` and press **Enter**. The data field highlights.
3. Type the Acquisition code (0-15).
4. Press **Enter**. The new setting is displayed in the "`New` column.
5. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit now runs using the "`Current`" acquisition code for the amount of time specified by `Config Test Minutes`.
6. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
7. Press **Esc** to exit to the Main Menu.

Adjusting the Tx Power Level

Tx Power Level Adjust enables you to reduce the transmit power output level by up to 31 dB. For example, selecting a value of 0 sets the transmit power to maximum power, while selecting a value of –31 sets the transmit power to 31 dB below maximum power. The Tx power you set is the initial value only if you decide to set Tx power automatically–the power level resets automatically during the test. See *Setting Tx Power Automatically (Remote Station Only)* , page 83.

To adjust the Tx power output level

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.

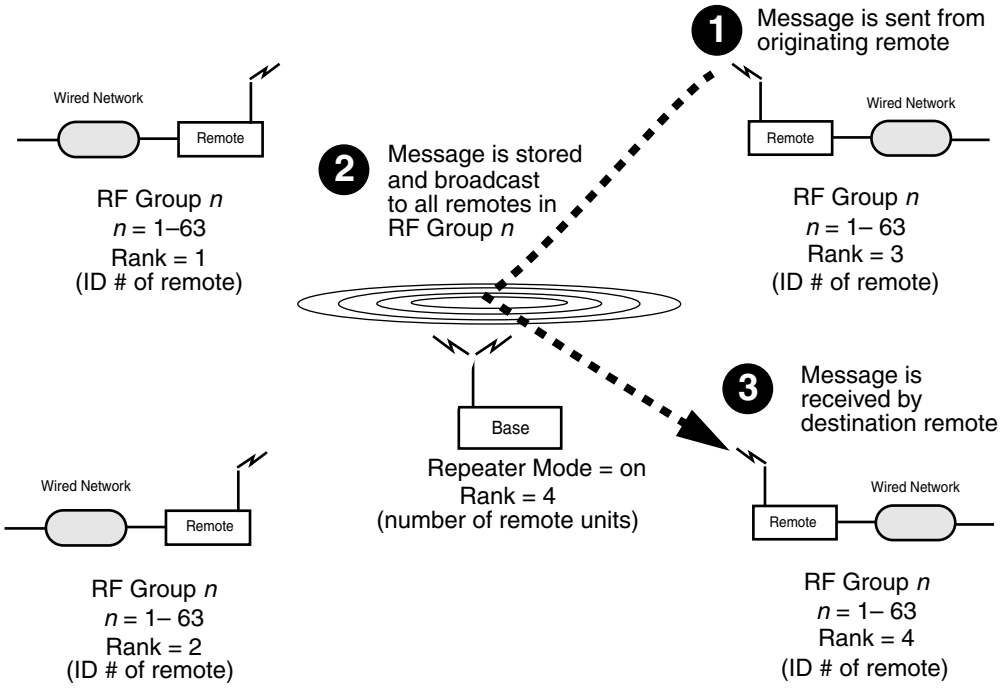
```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)             1             1             1
Center Frequency (57410-58338)    5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)        1             1             1
Security Password 2  (Hex)        10            10            10
Security Password 3  (Hex)        100           100           100
Security Password 4  (Hex)        1000          1000          1000
Security Password 5  (Hex)        10000         10000         10000
Scrambling Code      (Hex)        0             0             0
Acquisition Code     (0-15)       0             0             0
Config Test Minutes  (1-120)      30            30            30
Tx Power Level Adjust          -> 0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                     off           off           off
System Symmetry Type              Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)     1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)       0             0             0

Reboot New RF configuration       Press Enter to Execute
Save Current Config to Flash      Press Enter to Execute
```

2. Select `Tx Power Level Adjust` and press **Enter**. The data field highlights.
3. Scroll through the list and press **Enter** to select a power attenuation level. Choose a value between 0 and –31, where 0 means no Tx power attenuation and –31 means Tx power is attenuated by 31 dB.
4. Press **Enter**. The new setting is displayed in the "`New` column.
5. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit now runs using the "`Current`" acquisition code for the amount of time specified by `Config Test Minutes`.
6. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `g, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
7. Press **Esc** to exit to the Main Menu.

Setting a Base to Repeater Mode (Base Station Only)

When repeater mode is enabled at a base station (Repeater Mode = on), the base acts as a repeater in addition to performing its normal base station functions. As a repeater, the base station receives incoming messages from remotes, stores them and broadcasts them to all remotes within RF range. Remotes belonging to the same RF group (with the same RF Group number) can communicate via the repeater. (See *Setting Remote Unit RF Group* , page 106 for information about RF groups.) The diagram below explains the process.

Repeater Mode



When repeater mode is disabled (Repeater Mode = off), the base station functions normally (it polls remotes and links the various segments of the network). By definition, Repeater Mode does not apply to units of RF Group = 0.

To set base to repeater mode

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.

```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit   Remote Unit    Remote Unit
Station Rank (1-1000)             1             1              1
Center Frequency (57410-58338)    5.7874 GHz    5.7874 GHz     5.7874 GHz
Security Password 1  (Hex)        1             1              1
Security Password 2  (Hex)        10            10             10
Security Password 3  (Hex)        100           100            100
Security Password 4  (Hex)        1000          1000           1000
Security Password 5  (Hex)        10000         10000          10000
Scrambling Code      (Hex)        0             0              0
Acquisition Code     (0-15)       0             0              0
Config Test Minutes  (1-120)      30            30             30
Tx Power Level Adjust             0 dB          0 dB           0 dB
Base Station Only Parameters
Repeater Mode                  -> off           off            off
System Symmetry Type              Asymmetric    Asymmetric     Asymmetric
Dynamic Polling Level (1-100)     1             1              1
Remote Station Only Parameters
Remote Unit RF Group (0-63)       0             0              0

Reboot New RF configuration       Press Enter to Execute
Save Current Config to Flash      Press Enter to Execute
```

2. Select `Repeater Mode` and press **Enter**. The data field highlights.
3. Scroll to select the desired setting where:

`off`	Base unit does not re-transmit messages Default setting
`on`	Base unit re-transmits messages received from one remote to other remotes in the same RF group

4. Press **Enter**. The new setting is displayed in the "`New` column.
5. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AVVE 120-58 Login menu is displayed. The unit now runs using the "`Current`" repeater mode for the amount of time specified by `Config Test Minutes`.
6. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
7. Press **Esc** to exit to the Main Menu.

Setting System Symmetry Type (Base Station Only)

System symmetry type fixes the priority of the base unit when it polls remotes. The default "asymmetric" setting allots the base one time slot for each time a remote is polled—this setting is useful when the base is the access point to a large network. The "symmetric" setting allots the base one time slot per *polling cycle* . A symmetric system gives the base station the same polling priority as a remote unit.

To set system symmetry type

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.

```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)             1             1             1
Center Frequency (57410-58338)    5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)        1             1             1
Security Password 2  (Hex)        10            10            10
Security Password 3  (Hex)        100           100           100
Security Password 4  (Hex)        1000          1000          1000
Security Password 5  (Hex)        10000         10000         10000
Scrambling Code      (Hex)        0             0             0
Acquisition Code     (0-15)       0             0             0
Config Test Minutes  (1-120)      30            30            30
Tx Power Level Adjust             0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                     off           off           off
System Symmetry Type           -> Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)     1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)       0             0             0

Reboot New RF configuration       Press Enter to Execute
Save Current Config to Flash      Press Enter to Execute
```

2. Select `System Symmetry Type` and press **Enter**. The data field highlights.
3. Scroll to the desired setting where:

`asymmetric`	Base unit has higher priority than remotes: the base unit has one time slot after every remote time slot Default setting
`symmetric`	Base unit has the same priority as all remotes: the base unit has one time slot for every polling cycle

4. Press **Enter**. The new setting is displayed in the "`New` column.
5. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit now runs using the "`Current`" symmetry type for the amount of time specified by `Config Test Minutes`.
6. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
7. Press **Esc** to exit to the Main Menu.

Setting Dynamic Polling Level (Base Station Only)

Dynamic polling improves system performance by reducing overhead due to idle remote units. A base station automatically learns which remote stations are active and which are idle. The base station waits a brief time period for a remote to respond to a poll. The remote either does not respond to the poll, or it responds with a negative acknowledgement. The base then considers the remote to be idle. (This process is called dynamic time allocation or DTA.) Idle remote units are ignored by the base station for the number of polling rounds entered in the Dynamic Polling Level field. The higher the dynamic polling level, the more efficient the throughput and the longer it takes to move a subscriber from an inactive state to an active state. Dynamic Polling improves system performance whenever there is more than one remote. When there are a large number of remotes system performance improves significantly.

Note: Polling level is set only at the base station.

To set the dynamic polling level

1. From the Main Menu, select `RF Station Configuration` and press **Enter**. The RF Station Configuration menu is displayed.

```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit    Remote Unit    Remote Unit
Station Rank (1-1000)             1              1              1
Center Frequency (57410-58338)    5.7874 GHz     5.7874 GHz     5.7874 GHz
Security Password 1  (Hex)        1              1              1
Security Password 2  (Hex)        10             10             10
Security Password 3  (Hex)        100            100            100
Security Password 4  (Hex)        1000           1000           1000
Security Password 5  (Hex)        10000          10000          10000
Scrambling Code      (Hex)        0              0              0
Acquisition Code     (0-15)       0              0              0
Config Test Minutes  (1-120)      30             30             30
Tx Power Level Adjust             0 dB           0 dB           0 dB
Base Station Only Parameters
Repeater Mode                     off            off            off
System Symmetry Type              Asymmetric     Asymmetric     Asymmetric
Dynamic Polling Level (1-100)  -> 1              1              1
Remote Station Only Parameters
Remote Unit RF Group (0-63)       0              0              0

Reboot New RF configuration       Press Enter to Execute
Save Current Config to Flash      Press Enter to Execute
```

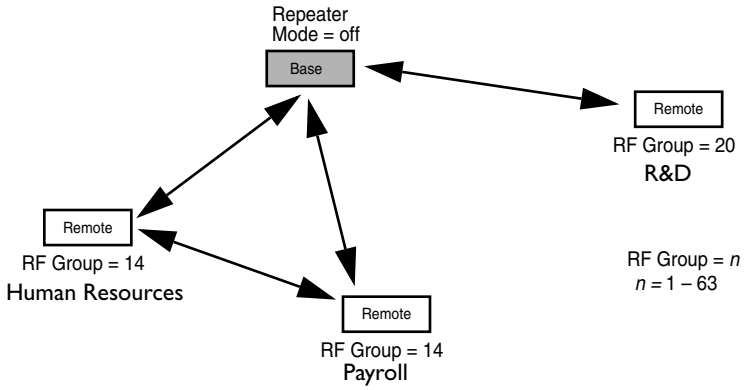
1. Select `Dynamic Polling Level` and press **Enter**. The data field highlights.
2. Type the desired polling level (1-100).
3. Press **Enter**. The new setting is displayed in the "`New` column.
4. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit now runs using the "`Current`" dynamic polling level for the amount of time specified by `Config Test Minutes`.
5. To save the current setting(s) to flash memory, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
6. Press **Esc** to exit to the Main Menu.

Setting Remote Unit RF Group

The RF Group setting enables you to determine which units in a system can communicate with each other. For example, in a system consisting of a base station and associated remotes, you can: 1) assign units to different groups so that only members of the same group can communicate with each other and the base (an open system); 2) isolate remotes so they cannot talk to other remotes, but can talk only to the base (a closed system); 3) assign remote units to groups and configure the base station as a repeater (a closed system); and 4) combine closed units with open units in the same system. These configurations are explained below.

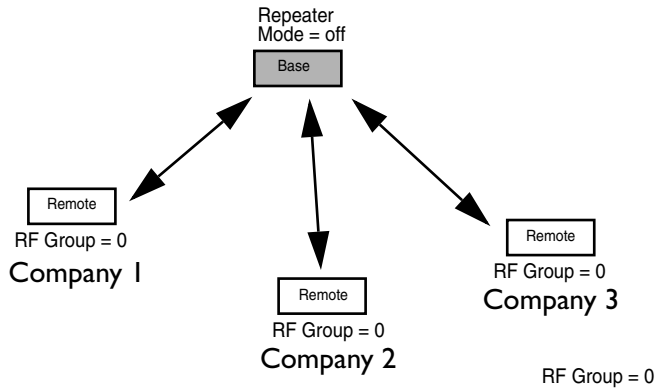
Remote units with the same RF group number (RF Group = 1– 63) can communicate directly with each other and with the base station (if there is a line-of-sight RF path between units and base station Repeater Mode = off.) An example is a company where the Human Resources department needs direct access to the Payroll department, but the two departments must be isolated from other departments. Since HR and Payroll are in the same RF group 14, they can talk directly to each other, but they cannot talk directly to other groups such as R&D, which belongs to RF Group 20.

Example 1: Open System



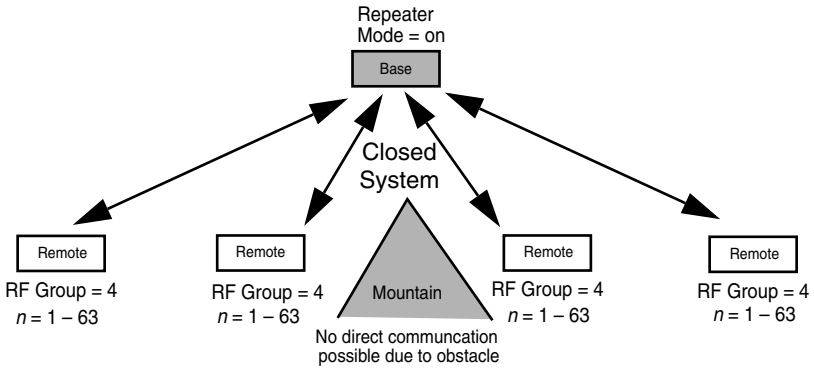
Remote units configured as RF Group = 0 are independent, closed units. Closed units cannot talk directly to each other, they can only talk directly to the base station. This setup acts to isolate remote units and the associated LANs from each other. Example 2 shows a situation where independent companies are connected wirelessly to a single base station and communication between the companies is prevented.

Example 2: Closed System



A repeater is used to bypass obstacles that block the RF path (for example, a mountain). When a base station is set to repeater mode (Repeater Mode = on), it can pass data from remotes in an RF group to other remotes in the same group. A system with a repeater is a closed system. Example 3 shows a repeater with four remotes. All the remotes are in the same RF Group 4, so they can talk to each other via the repeater base.

Example 3: Repeater Configuration (Closed System)



Closed remote units (RF Group = 0) can be combined with open remote units (RF Group = non-zero) within the same system. In this case each group in the system behaves according to its RF Group characteristics: closed remotes could communicate only with the base, remotes with the same (non-zero) group number could communicate with each other, and remotes with different (non-zero) group numbers could not communicate with each other. A base or repeater would not pass packets originating from a closed remote.

The following table summarizes the first three situations.

Repeater Mode (Base only)	RF Group (Remote only)	System Type	System Characteristics
Repeater Mode = off	1–63	Open	Remotes can communicate directly with the base and each other if remotes that have the same non-zero RF group number (if a LOS RF path can be established)
Repeater Mode = off	0	Closed	Remotes can communicate only with the base station—they cannot talk to each other
Repeater Mode = on	1–63	Open	Remotes cannot communicate directly with each other, they can only communicate via the repeater base with other remotes that have the same RF group number

In a mixed system, each RF group behaves according to the RF Group characteristics assigned to it (0 = closed, 1–63 = open; same non-zero group number = communication, different non-zero group number = no communication).

To set remote unit RF group

1. From the Main Menu, select `RF Module Configuration` and press **Enter**. The menu is displayed.

```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit    Remote Unit    Remote Unit
Station Rank (1-1000)             1              1              1
Center Frequency (57410-58338)    5.7874 GHz     5.7874 GHz     5.7874 GHz
Security Password 1  (Hex)        1              1              1
Security Password 2  (Hex)        10             10             10
Security Password 3  (Hex)        100            100            100
Security Password 4  (Hex)        1000           1000           1000
Security Password 5  (Hex)        10000          10000          10000
Scrambling Code      (Hex)        0              0              0
Acquisition Code     (0-15)       1              1              1
Config Test Minutes  (1-120)      30             30             30
Tx Power Level Adjust             0 dB           0 dB           0 dB
Base Station Only Parameters
Repeater Mode                     off            off            off
System Symmetry Type              Asymmetric     Asymmetric     Asymmetric
Dynamic Polling Level (1-100)     1              1              1
Remote Station Only Parameters
Remote Unit RF Group (0-63)    -> 0              0              0

Reboot New RF configuration       Press Enter to Execute
Save Current Config to Flash      Press Enter to Execute
```

2. Select `Remote Unit RF Group` and press **Enter**. The data field highlights.
3. In the Remote Unit RF Group entry field, type the RF group number, using the following table as a guide.
4. Press **Enter**. The new setting is displayed in the "`New` column.
5. Select `Reboot New RF Configuration` and press **Enter**. The unit reboots and the AWE 120-58 Login menu is displayed. The unit now runs using the "`Current`" remote unit RF group for the amount of time specified by `Config Test Minutes`.
6. To save the current setting(s) to FLASH, log in, go to the Main Menu, and select `Radio Module Configuration, Save Current Config to Flash`. See *Rebooting and Saving RF Module Configurations* , page 109.
7. Press **Esc** to exit to the Main Menu.

Rebooting and Saving RF Module Configurations

Because changes to radio module configuration settings can affect service in a wireless system, changes are made in three progessive stages: new, current, and flash.

New	Intended configuration changes. Temporary memory storage.
Current	Configuration actually running on the unit. Temporary memory storage.
Flash	Configuration stored in FLASH memory. Long-term memory storage.

A reboot of a unit is required to save `New` settings as `Current` settings. If Current settings are valid (and do not disrupt the system), they can be saved to `Flash` memory. If the changes disrupt the system, the original configuration will be restored automatically when the Config Test Minutes period expires.

To reboot a unit

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.

```
 H - Help             Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)             1             1             1
Center Frequency (57410-58338)    5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)        1             1             1
Security Password 2  (Hex)        10            10            10
Security Password 3  (Hex)        100           100           100
Security Password 4  (Hex)        1000          1000          1000
Security Password 5  (Hex)        10000         10000         10000
Scrambling Code      (Hex)        0             0             0
Acquisition Code     (0-15)       1             1             1
Config Test Minutes  (1-120)      30            30            30
Tx Power Level Adjust             0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                     off           off           off
System Symmetry Type              Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)     1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)       0             0             0

Reboot New RF configuration    -> Press Enter to Execute
Save Current Config to Flash      Press Enter to Execute
```

2. Select `Reboot New RF configuration` and press **Enter**. The unit reboots with the with new settings and with the Config Test Minutes timeout period in effect. The new settings can be viewed in the "`Current`" column of the Radio Module Configuration menu. The old, last-saved configuration remains in Flash memory.

   If the configuration is the one you want and the unit operates as intended, you can save the current changes to "permanent" flash memory by selecting `Save Current Config to Flash` from the Radio Module Configuration menu. When you save the current settings to "Flash" the new settings overwrite the old flash memory settings.

To save current configuration to FLASH

1. From the Main Menu, select `Radio Module Configuration` and press **Enter**. The Radio Module Configuration menu is displayed.

```
 H - Help            Radio Module Configuration
                                    New          Current         Flash
Station Type                      Remote Unit   Remote Unit   Remote Unit
Station Rank (1-1000)             1             1             1
Center Frequency (57410-58338)    5.7874 GHz    5.7874 GHz    5.7874 GHz
Security Password 1  (Hex)        1             1             1
Security Password 2  (Hex)        10            10            10
Security Password 3  (Hex)        100           100           100
Security Password 4  (Hex)        1000          1000          1000
Security Password 5  (Hex)        10000         10000         10000
Scrambling Code      (Hex)        0             0             0
Acquisition Code     (0-15)       1             1             1
Config Test Minutes  (1-120)      30            30            30
Tx Power Level Adjust             0 dB          0 dB          0 dB
Base Station Only Parameters
Repeater Mode                     off           off           off
System Symmetry Type              Asymmetric    Asymmetric    Asymmetric
Dynamic Polling Level (1-100)     1             1             1
Remote Station Only Parameters
Remote Unit RF Group (0-63)       0             0             0

Reboot New RF configuration       Press Enter to Execute
Save Current Config to Flash   -> Press Enter to Execute
```

2. Select `Save Current Config to Flash`.
3. Press **Enter**. The current configuration is saved to flash memory. A reboot is not required. The new flash memory values are displayed in the "`Flash`" column of the menu.

RF/Ethernet Statistics

Ethernet and RF statistics are useful for troubleshooting, monitoring link performance, and measuring throughput. Ethernet and RF statistics are cumulative and increment until reset. The window is view only. See *Resetting Radio and Ethernet Statistics* , page 125 for information about resetting RF/Ethernet statistics.

Viewing RF/Ethernet Statistics

To view RF and Ethernet statistics

1. From the Main Menu, select `RF/Ethernet Statistics` and press **Enter**. The RF/Ethernet Statistics window is displayed. The window is view only.

```
 H - Help            RF/Ethernet Statistics

Ethernet Receive Statistics          Ethernet Transmit Statistics
Total Packets Received      0        Total Packets Transmitted    0
Packets For Local Host      0        Packets From Local Host      0
Receive Errors              0        Packets Dropped              0
Packets Dropped             0        Total KBytes Transmitted     0
Packets Discarded           0        Broadcast KBytes Transmitted 0
Total KBytes Received       0
Broadcast KBytes Received   0

RF Receive Statistics                RF Transmit Statistics
Total Packets Received      0        Total Packets Transmitted    0
Packets For Local Host      0        Frames From Local Host       0
Packets Dropped             0        Packets Dropped              0
Packets Discarded           0

RF Super Frame Rx Statistics         RF Super Frame Tx Statistics
Super Frames Received       0        Super Frames Transmitted     0
Receive Overrun Errors      0
Frame Control Word Errors   0
Header Checksum Errors      0        Throughput Statistics
Packet Control Word Errors  0        Ethernet-to-RF Throughput    0
Super Frame Length Errors   0        RF-to-Ethernet Throughput    0
```

.

Ethernet Receive	Total Packets Received	Number of Ethernet packets from the Ethernet connection
	Packets For Local Host	Number of Ethernet packets received from the Ethernet connection which were destined for the AWE 120-58 unit's TCP/IP stack
	Receive Errors	Number of Ethernet packets received with errors, for example, runt (smaller than 64 bytes), jabber (larger than 1518 bytes), or overflow error
	Packets Dropped	Number of Ethernet packets dropped because the wireless link is at capacity
	Packets Discarded	Number of Ethernet packets discarded as the result of filtering
	Total KBytes Received	Total number of kbytes received from the Ethernet port (broadcast and non-broadcast packets)
	Broadcast KBytes Received	Number of kbytes received from the Ethernet port (broadcast packets only)
RF Receive	Total Packets Received	Number of Ethernet packets received over RF
	Packets For Local Host	Number of Ethernet packets received over RF and destined for the local host
	Packets Dropped	Number of Ethernet packets dropped because the wireless link is at capacity
	Packets Discarded	Number of Ethernet packets discarded as the result of filtering
RF Super Frame Rx	Super Frames Received	Number of super frames received
	Receive Overrun Errors	Number of errors caused by receive buffer overrun
	Frame Control Word Errors	Number of errors caused by frame control word problems
	Header Checksum Word Errors	Number of errors caused by receiving an invalid header checksum
	Packet Control Word Errors	Number of errors caused by packet control word problems
	Super Frame Length Errors	Number of errors caused by receiving an invalid super frame length

Ethernet Transmit	`Total Packets Transmitted`	Number of Ethernet packets transmitted onto the Ethernet connection
	`Packets From Local Host`	Number of Ethernet packets transmitted onto the Ethernet connection which originated from the AWE unit's TCP/IP stack
	`Packets Dropped`	Number of Ethernet packets not transmitted due to some error, for example, unable to transmit within 15 retries or underflow error
	`Total KBytes Transmitted`	Total number of kbytes transmitted from the Ethernet port (broadcast and non-broadcast packets)
	`Broadcast KBytes Transmitted`	Number of kbytes transmitted from the Ethernet port (broadcast packets only)
RF Transmit	`Total Packets Transmitted`	Number of Ethernet packets transmitted over RF
	`Frames From Local Host`	Number of Ethernet packets transmitted to RF from the local host
	`Packets Dropped`	Number of packets dropped because of RF problems
RF S. F. Tx	`Super Frames Transmitted`	Number of super frames transmitted
Throughput	`Ethernet-to-RF Throughput`	Current data rate measured from wire to air Resolution = 1 second
	`RF-to-Ethernet Throughput`	Current data rate measured from air to wire Resolution = 1 second

2. Press **Esc** to exit to the Main Menu.

System Security

The System Security menu is used to control access to a AWE unit, including the following:

- Restrict access to a unit's Main Menu with passwords
- Restrict SNMP read and write access with SNMP Community Name
- Enable or disable remote access via Ethernet
- Enable or disable remote access via a wireless link
- Determine the amount of time that a unit remains idle before it automatically logs out.

Viewing System Security

To view system security settings

1. From the Main Menu select `System Security` and press **Enter**. The System Security menu is displayed.

```
H - Help              System Security


SNMP Community Name 1          -> public
SNMP Community Name 2             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

Ethernet Access to Local Host     on
Wireless Access to Local Host     on

Auto Logout Minutes (1-120)       10
```

`SNMP Community Name 1`	Controls SNMP access to the AWE Read access only
`SNMP Community Name 2`	Controls SNMP access to the AWE Read and write access
`Change User Password`	Changes user password to enable access to main menu Read access only
`Change Supervisor Password`	Changes supervisor password to enable access to main menu. Read and write access
`Ethernet Access to Local Host`	Allows remote access to unit to change configuration settings via wire link with telnet or SNMP

`Wireless Access to Local Host`	Allows remote access to unit to change configuration settings via RF link with telnet or SNMP
`Auto Logout Minutes`	Maximum time the system can remain idle before the configuration menus close and the Login menu reappears

2. Press **Esc** to exit to the Main Menu.

Assigning Community Names

Community names can be used to control SNMP access to the AWE. Community Name 1 has read only access, and Community Name 2 has both read and write access. An SNMP manager can access and configure any AWE unit on the network as long as the unit has the correct community names and remote access is enabled (see *Allowing Remote Access and Configuration* , page 119)

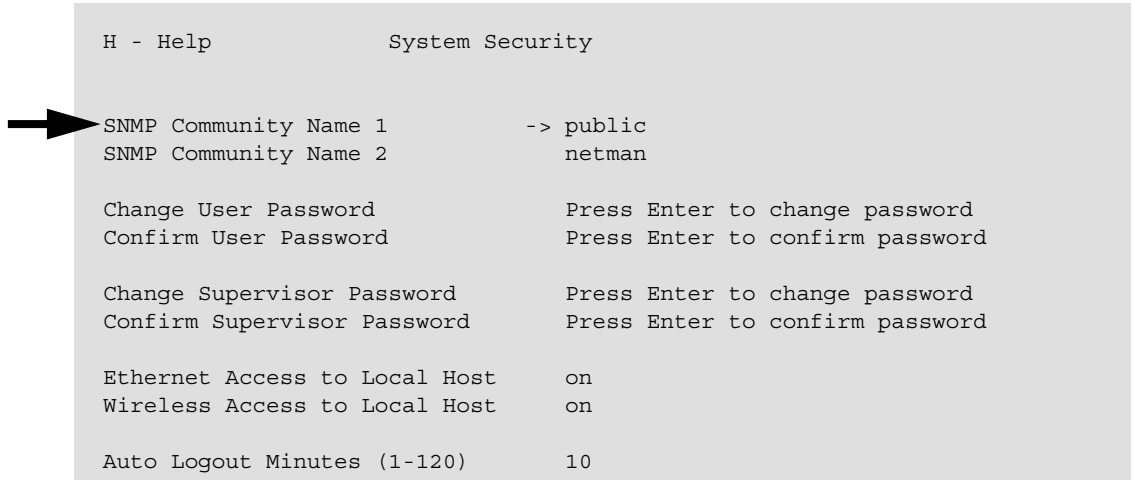
! CAUTION

Default community names are presented in all Installation and Configuration guides distributed by Wi-LAN. It is the responsibility of the customer to ensure that default community names are changed to unique names at installation. Record all community name changes

Community name	Privileges	Default value
SNMP Community Name 1	Read	public
SNMP Community Name 2	Read and Write	netman

To assign community names

1. From the Main Menu, select `System Security` and press **Enter**. The System Security menu is displayed.



2. Select `SNMP Community Name 1`.
3. Type in name. (Valid community names are assigned using SNMP software.)
4. Press **Enter**. The new name appears in the entry field.
5. Select `SNMP Community Name 2`.
6. Type in name. (Valid community names are assigned using SNMP software.)
7. Press **Enter**. The new name appears in the entry field.
8. Press **Esc** to exit to the Main Menu.

Setting Menu Passwords

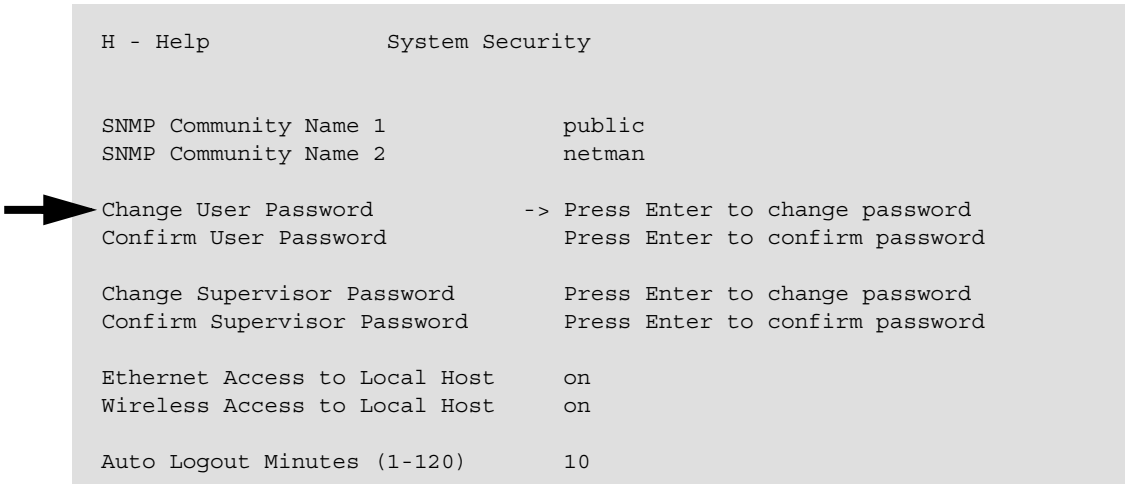
You can use passwords to control access to the Main Menu. The default passwords are `user`, which allows you to read configuration settings and `supervisor`, which allows you to change configuration settings.

! CAUTION

The default passwords are printed in all customer documents distributed by Wi-LAN. It is the responsibility of the customer to change the default passwords to unique passwords during installation. Record all password changes. When you restore factory configurations, the login passwords revert to the defaults.

To change the user password

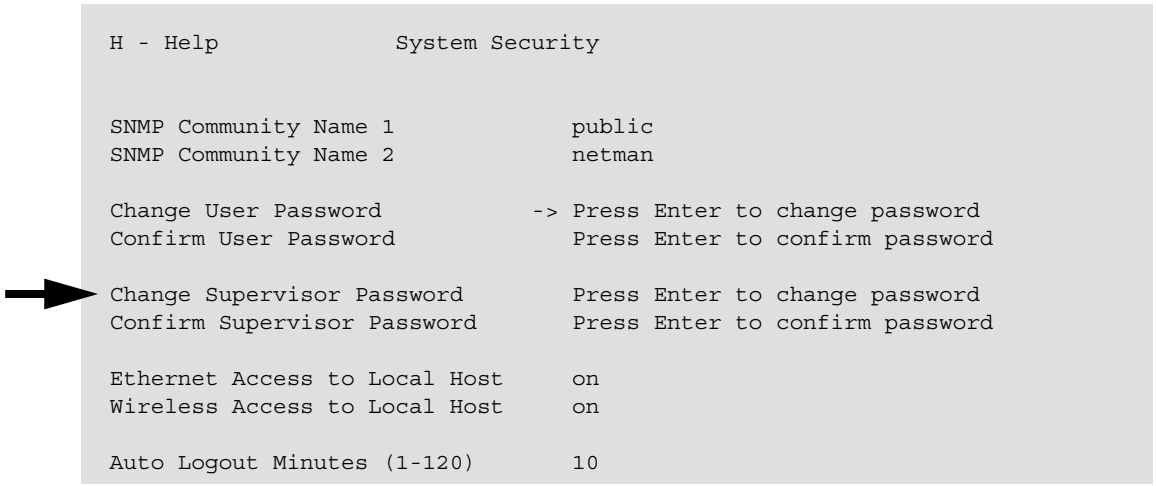
1. From the Main Menu, select `System Security` and press **Enter**. The System Security menu is displayed.



2. Select `Change User Password` and press **Enter**. The data field highlights.
3. Type the new password and press **Enter**.
4. Select `Confirm User Password` and press **Enter**. The data field highlights.
5. Re-type the new password and press **Enter**. The change is saved when `Success` appears beside the confirmation field.
6. Press **Esc** to exit to the Main Menu.

To change the supervisor password

1. From the Main Menu, select `System Security` and press **Enter**. The System Security menu is displayed.



```
H - Help             System Security


SNMP Community Name 1             public
SNMP Community Name 2             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

Ethernet Access to Local Host     on
Wireless Access to Local Host     on

Auto Logout Minutes (1-120)       10
```

2. Select `Change Supervisor Password` and press **Enter**. The data field highlights.
3. Type the new password and press **Enter**.
4. Select `Confirm Supervisor Password` entry field and press **Enter**.
5. Re-type the new password and press **Enter**. The change is saved when `Success` appears beside the confirmation field.
6. Press **Esc** to exit to the Main Menu.

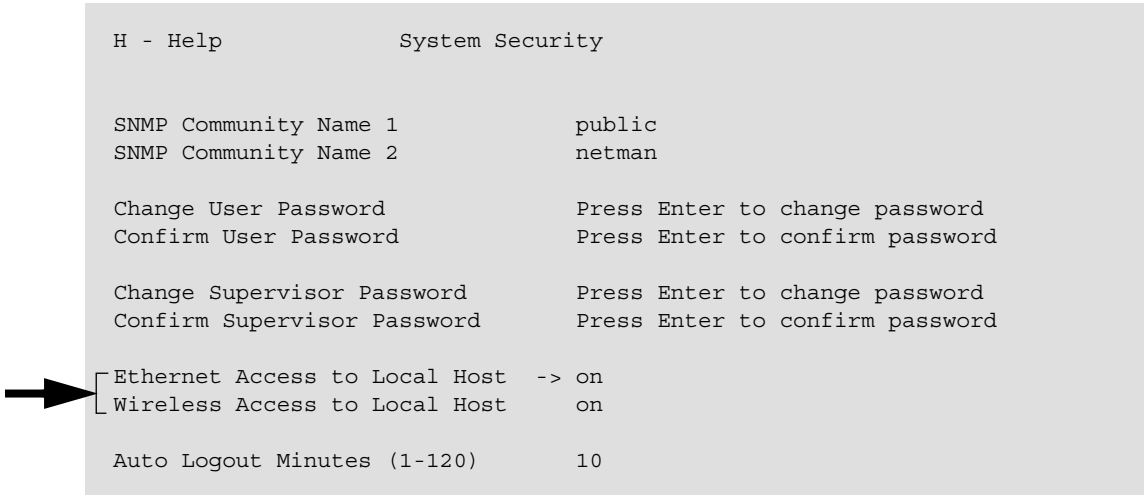
Allowing Remote Access and Configuration

One way to control remote access to a unit's configuration menu is by restricting the *type of link* that can be used to make remote configuration changes. The default setting is to allow remote configuration changes with both wired and wireless links using telnet or SNMP. However, you can enable or disable the type of link independently with two settings: Ethernet Access to Local Host and Wireless Access to Local Host.

Note: Data will pass as usual between both units. These two settings only restrict remote access to the unit's configuration menu, depending on the type of link that exists between the remote terminal and the unit–wired or wireless. Also, you cannot "ping" a unit if the link is disabled.

To enable Ethernet and wireless access

1. From the Main Menu, select `System Security` and press **Enter**. The System Security menu is displayed.



2. Select `Ethernet Access to Local Host` and press **Enter**. The data field highlights.
3. Select the desired setting, where:

`on`	Enable configuration changes to the unit via the Ethernet
`off`	Disable configuration changes to the unit via the Ethernet

4. Press **Enter**. The new value appears in the field.
5. Select `Wireless Access to Local Host and` press **Enter**. The data field highlights.
6. Select the desired setting where:

`on`	Enable configuration changes to the unit via the air
`off`	Disable configuration changes to the unit via the air

7. Press **Enter**. The new value appears in the field.
8. Press **Esc** to exit to the Main Menu.

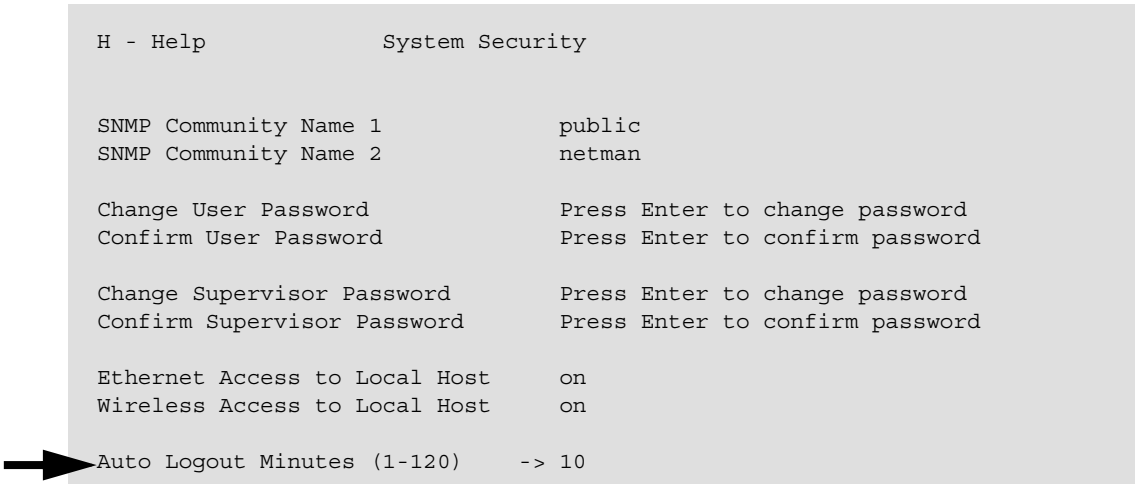
Setting the Auto Logout Minutes

You can specify the maximum time the system can remain idle before the configuration menus close and the Login menu reappears. This feature ensures that the configuration menus close if a user forgets to exit.

Note: When the menus automatically timeout, the system may appear to be frozen. Press **Enter** to view the Login menu, where you can login to the Main Menu.

To set the automatic logout timeout period

1. From the Main Menu, select `System Security` and press **Enter**. The System Security menu is displayed.



2. Select `Auto Logout Minutes` and press **Enter**. The data field highlights.
3. Type the maximum idle time period in minutes that can pass before the configuration menus close.
4. Press **Enter**. The new value appears in the field.
5. Press **Esc** to exit to the Main Menu.

System Commands

System image files contain the software that runs the unit. When you first power up the AWE unit, it runs from the factory-image. With the System Commands menu you can choose the image file that a unit uses to power up, and the image file that a unit uses when rebooted.

Viewing System Command Menu

To view system security settings

1. From the Main Menu, select `System Commands` and press **Enter**. The System Commands menu is displayed.

```
H - Help                System Commands


    Default System Image                -> FACTORY-IMAGE
    Reboot a System Image                  FACTORY-IMAGE

    Reboot Current Image                   Press Enter to Execute
    Restore Factory Config and Reboot      Press Enter to Execute
    Reset Radio Statistics                 Press Enter to Execute
    Reset Ethernet Statistics              Press Enter to Execute
```

`Default System Image`	Default image file used at power up
`Reboot a System Image`	Choose the image from which to reboot
`Reboot Current Image`	Reboot unit from the current image
`Restore Factory Config and Reboot`	Restore unit to default factory configuration and reboots unit
`Reset Radio Statistics`	Reset RF statistics
`Reset Ethernet Statistics`	Reset Ethernet statistics

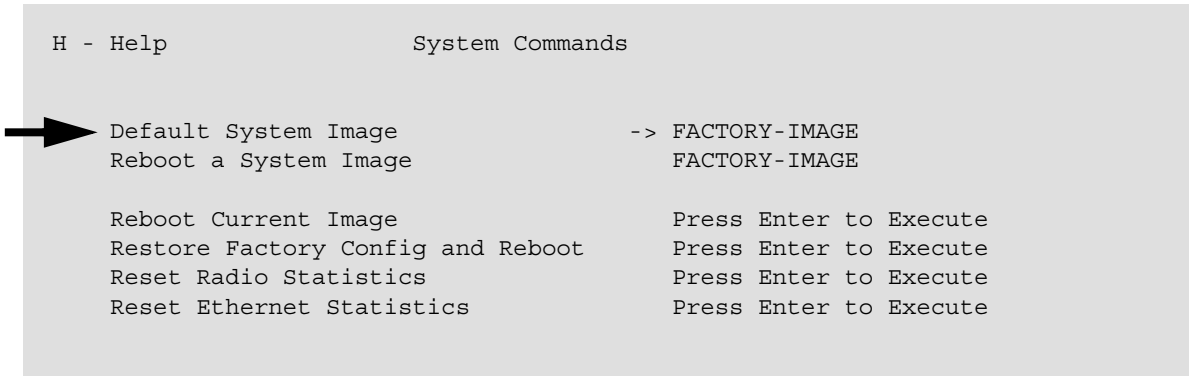
2. Press **Esc** to exit to the Main Menu.

Setting Default System Image

The default image is the image file that a unit uses when it powers up. If you have more than one image saved on a unit, you can choose the default power up file.

To set the default image

1. From the Main Menu, select `System Commands` and press **Enter**. The System Commands menu is displayed.



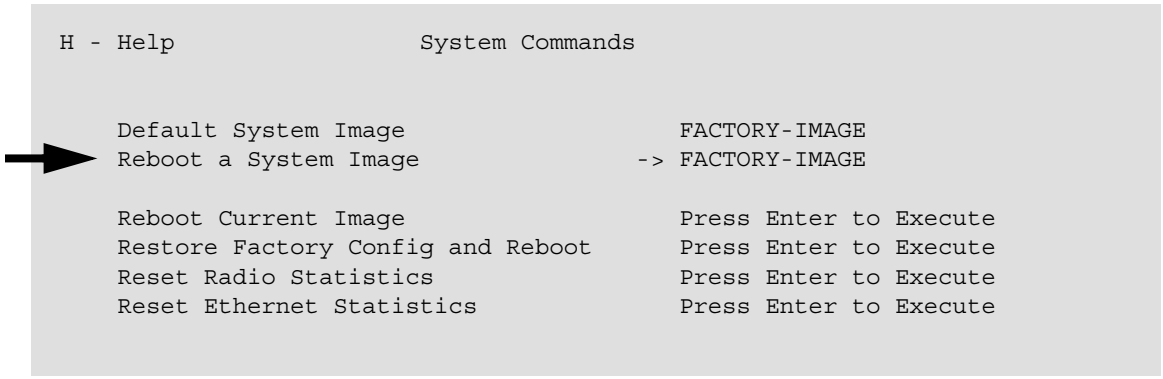
2. Select `Default System Image` and press **Enter**. The data field highlights.
3. Scroll to select the image to use as the default.
4. Press **Enter**. The name of the new image file appears in the field. The image will be used the next time the AWE is powered up.
5. Press **Esc** to exit to the Main Menu.

Setting the Reboot System Image

You can choose the system image that a unit uses when it is rebooted.

To choose the reboot image

1. From the Main Menu, select `System Commands` and press **Enter**. The System Commands menu is displayed.



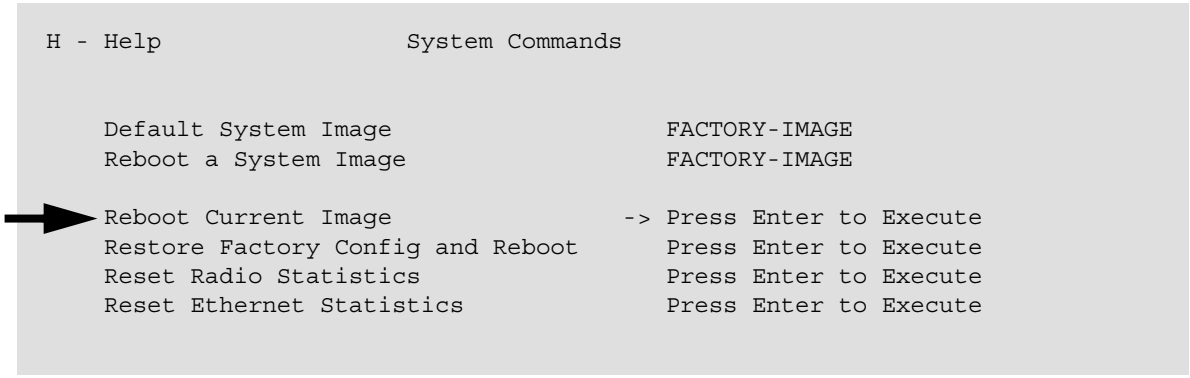
2. Select `Reboot a System Image` and press **Enter**. The data field highlights.
3. Scroll to select the image to use when rebooting.
4. Press **Enter**. The name of the image file appears in the field. This image will be used the next time the AWE is rebooted.
5. Press **Esc** to exit to the Main Menu.

Rebooting the Current Image

The Reboot Current Image command can be used when the IP address is changed. See *Setting the Internet IP Address* , page 42.

To reboot the current image

1. From the Main Menu, select `System Commands` and press **Enter**. The System Commands menu is displayed.



2. Select `Reboot Current Image` and press **Enter**. The AWE reboots using the current image.

Restoring Factory Configurations

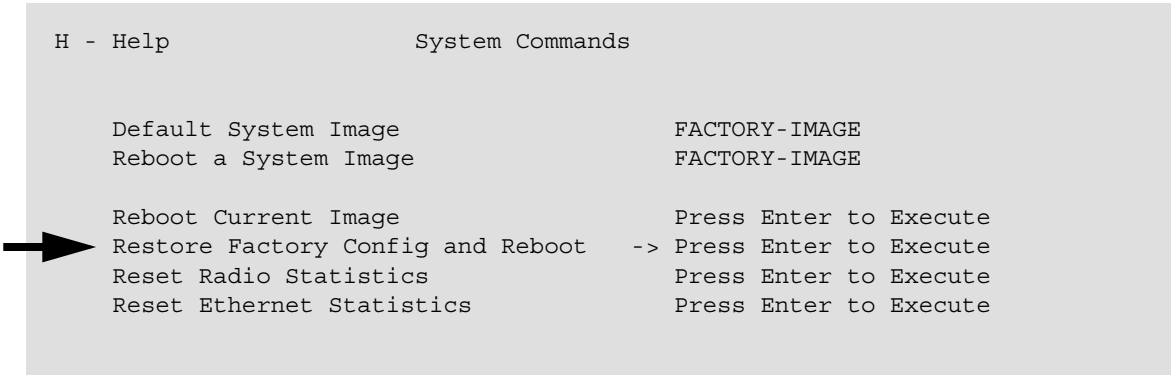
If necessary, you can restore the unit to its original factory configuration. This command puts the unit into a known state, which can help you when troubleshooting, and also provides an easy way to remove custom configuration settings when you deinstall a unit.

Important

When you restore factory configurations, the login passwords reset automatically to default values (`user` and `supervisor`).

To restore the factory configuration

1. From the Main Menu, select `System Commands` and press **Enter**. The System Commands menu is displayed.



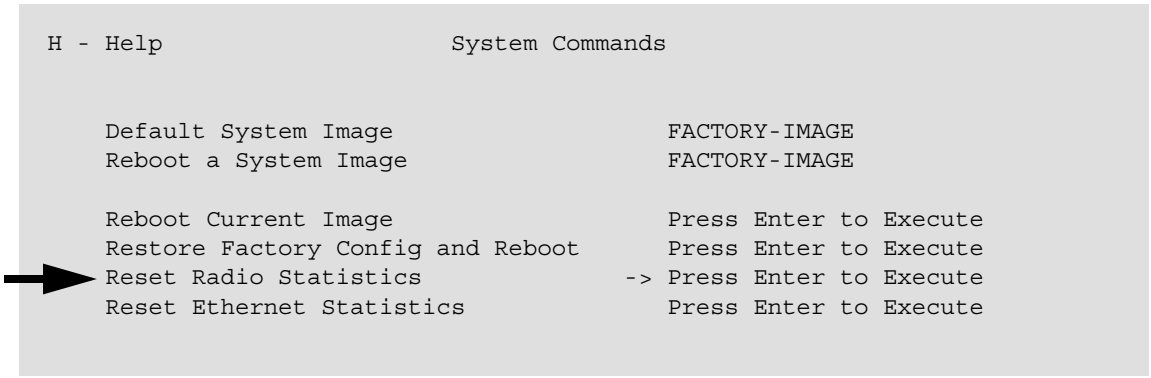
2. Select `Restore Factory Configuration and Reboot` and press **Enter**. The unit's configuration is restored to the original factory settings.

Resetting Radio and Ethernet Statistics

The statistics displayed in the RF/Ethernet Statistics window are cumulative, but can be reset to track specific events and for troubleshooting. (See *Viewing RF/Ethernet Statistics* , page 111 for information about viewing the statistics). For example, a suspected RF problem can be diagnosed by resetting the radio statistics and simulating the situation suspected of causing the problem.

To reset radio statistics

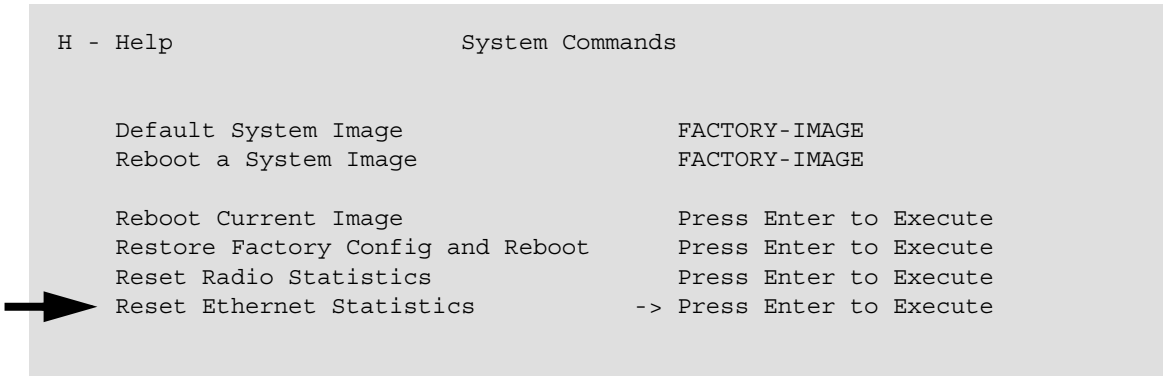
1. From the Main Menu, select `System Commands`. The System Commands menu is displayed.



2. Select `Reset Radio Statistics` and press **Enter**. The radio statistics in the RF/Ethernet Statistics window reset to 0 when `Success` appears beside the enter field.
3. Press **Esc** to exit to the Main Menu.

To reset Ethernet statistics

1. From the Main Menu, select `System Commands`. The System Commands menu is displayed.



2. Select `Reset Ethernet Statistics` and press **Enter**. The Ethernet statistics in the RF/Ethernet Statistics window are reset to 0 when `Success` appears beside the enter field.
3. Press **Esc** to exit to the Main Menu.

Link Monitor Display

Viewing Link Monitor Statistics

Link performance statistics such as envelope power, correlation power and bit error rate can be viewed while the link monitor is running. Statistics are only available on the unit running the link monitor test. The window is view only.

To view link monitor statistics

1. From the Main Menu, select `Link Monitor Display`. The RF Link Monitor Statistics window is displayed. The window is view only.

```
H - Help            RF Link Monitor Statistics

    Link Monitor Rank                   0
    Base to Remote BER                  N/A
    Remote to Base BER                  N/A
    Missed Packet Count                 0
    Base to Remote Env Power            0
    Base to Remote Corr Power           0
    Remote to Base Env Power            0
    Remote to Base Corr Power           0
```

`Link Monitor Rank`	When run from on the base unit, it is the rank number of the remote unit whose link is being tested When run from the remote unit, this field is zero, the rank number of the base
`Base to Remote BER`	Bit error rate from the base to the remote. Displays "N/A" when the link monitor is not running
`Remote to Base BER`	Bit error rate from the remote to the base. Displays "N/A" when the link monitor is not running
`Missed Packet Count`	Number of missed packets
`Base to Remote Env Power`	Envelope power received at the remote (including noise, measured in dB).
`Base to Remote Corr Power`	Correlation power received at the remote (excluding noise, measured in dB).
`Remote to Base Env Power`	Envelope power received at the base (including noise, measured in dB).
`Remote to Base Corr Power`	Correlation power received at the base (excluding noise, measured in dB)

Logout

Logging Out

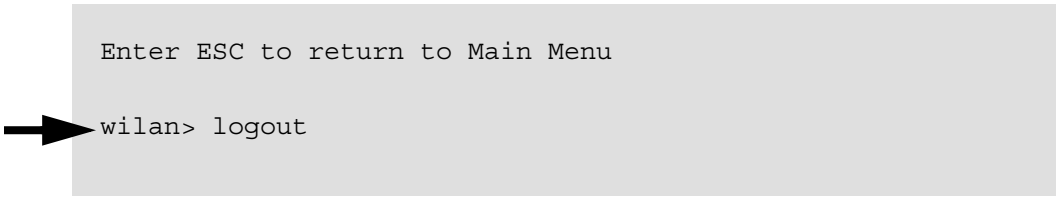
There are two ways to log out of the main menu.

To log out of the Main Menu

From the Main Menu, select `Logout` and press **Enter**.

or

1. Press the **Esc** key on the keyboard until you reach the `wilan` command line.



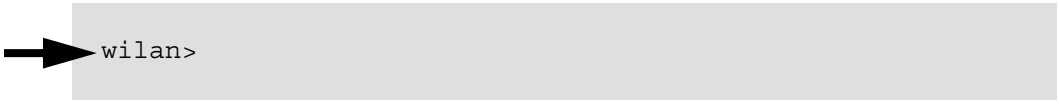
2. Type `logout` at the wilan> prompt.
3. Press **Enter** to log out.

Command Line Interface

You can perform some basic commands with the command line interface. Type commands from the prompt.

To use the command line interface

1. Log in to the AWE unit. The Main Menu is displayed.
2. Press **Esc**. The `wilan>` prompt appears.



3. Type the command after the prompt and press **Enter**.
4. Press **Esc** to return to the Main Menu.

The following are some commands you can run with the command line interface.

Command	Action	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`
`del`	delete a file	`wilan>del sample.txt`
`ping`	ping a remote IP address	`wilan>ping 198.168.200.5`
`logout`	log out of the command line interface or terminate a remote telnet session	`wilan>logout`
`exit`	log out of the command line interface or terminate a remote telnet session	`wilan>exit`
`quit`	log out of the command line interface or terminate a remote telnet session	`wilan>quit`

Troubleshooting

Administrative Best Practices

By performing some administrative best practices and preventative maintenance, you can prevent many problems with your system, or become aware of minor problems before they become serious ones.

Wi-LAN recommends the following practices.

- Maintain the integrity of the system design when adding or changing a system. The introduction of new elements to a system can cause problems unless the network plan is revised to take into account the changes. For example, improper installation of a co-located antenna can add unwanted system interference.
- Measure and document system performance at the time of the original installation.
- Monitor system performance regularly. Environmental change as well as normal wear and tear on components can affect system performance.
- Perform preventative maintenance every 6 months. See *Preventative Maintenance and Monitoring* , page 28 for information.
- After periods of extreme weather, perform link monitor tests to verify the system; inspect towers, antennas, cables and connectors for damage.
- Change menu passwords so that only key personnel can reconfigure the system. See *Setting Menu Passwords* , page 117.
- Keep records of recent changes. Especially document the addition of units, hardware and software changes and changes to configuration settings. Configuration errors often cause other problems. Current records can be compared with original installation records and function as a benchmark to help you troubleshoot.
- Keep a log of past and present problems and solutions. Store the log on-site, if possible. The log identifies common failure points and fixes.
- Before contacting Wi-LAN for customer support, document the symptoms of the problem and the steps taken to diagnose and fix the problem. Record the current configuration of the system.

Troubleshooting Areas

There are five key areas to be aware of when troubleshooting.

Network Integrity: Continued performance and reliability of a network depends upon maintaining the integrity of the network. If you change a network's design, you will affect its operation. Be aware of recent changes to your network.

Quality of RF link: Data communication depends first on the quality of the RF link. If you can establish and maintain a high-quality RF link, then you can be sure the link will carry high-speed data. If the quality of the RF link is degraded for some reason, the quality of the transmitted data will also degrade.

Radio Hardware: There are three basic parts to a AWE: radio unit, antenna feed (cable, connectors, surge suppressors, patch cables etc.) and antenna. You can isolate faulty hardware using measurement and/or replacement methods.

- Verify the radio unit with diagnostic tests (such as RSSI and link monitor tests), bench test a unit, or replace a unit.
- Verify the antenna feed with a Site Master test set. Sweep cables, connectors and lightning suppressors, or exchange these parts for known good parts.
- To verify the antenna you can sweep the antenna with the Site Master test set or exchange the antenna.

Correct Unit Configuration: Units must be configured correctly, according to the network plan. Configuration errors can cause an inability to communicate or poor performance. The addition of units or changes to your system may require you to change configuration settings.

Embedded Software: Operate with a proven software image. Download new software if you suspect that a unit's software is corrupted.

The following chart provides answers to some of the more common problems that can occur when installing and using a AWE bridge.

Troubleshooting Chart

Indication	Possible Cause	Suggested Corrective Actions
High BER	Signal strength is too low	Perform RSSI test to determine fade margin Align or change antennas or cables Ensure LOS between antennas
	Signal strength is too high	Adjust antennas Increase distance between units
	Interference	Change center frequency Increase RF power Change polarization of antennas Physically isolate antenna from source of interference or change physical location of antenna
	Bad radio (Tx/Rx)	Bench test radio Exchange radio
	Bad antenna	Visually inspect antenna for damage Sweep antenna Replace antenna
	Bad cable	Visually inspect cable Replace cable
	Bad connectors	Visually inspect connectors Replace cable/connectors
	Noisy power supply	Replace power supply unit
	Temperature	Determine ambient operating temperature is too high or low Increase or reduce ambient temperature.
Low signal strength/ fade margin	Bad radio	Bench test radio Replace radio
	Bad antenna	Visually inspect antenna for damage Sweep antenna Replace antenna
	Poor antenna alignment	Use RF diagnostics to re-align antenna
	Bad cable	Visually inspect cables/connectors Replace cable/connectors
	Bad surge suppressor	Use voltmeter to check for open circuit Replace surge suppressor.
	Incorrect radio configuration	Bench test radio to confirm configuration Reconfigure radio

Indication	Possible Cause	Suggested Corrective Actions
	No Fresnel zone clearance	Increase antenna height to obtain clearance Relocate antenna Remove obstacles to LOS (line of sight) Use repeater base configuration
	Power supply problems	Try a different AC circuit Measure the power at the AC outlet Measure the output from the power supply unit Replace the power supply unit
High packet loss	Signal strength too low	Check for LOS between antennas Check for obstacles in RF path Check for interference Realign antennas Replace antenna
	Interference	Change center frequency Increase RF power Change polarization of antennas Physically isolate antenna from source of interference or change physical location of antenna
	Multipath interference	Clear the Fresnel zone Realign antennas Relocate radio/antenna
	Temperature	Determine if ambient operating temperature is too high or low Increase or reduce ambient temperature
No communication between units	Configuration problems	Check the following configuration settings: Rank number–Each unit must have a unique rank number. Base station rank or remote rank may be incorrect Access code–Only units with same access code can communicate Scrambling code–Base station and remote units must use same scrambling codes to decode messages Acquisition code–All units must have same acquisition code to communicate Center frequency–Units must have same center frequency to communicate

Indication	Possible Cause	Suggested Corrective Actions
		IP address/subnet mask–Incorrectly configured IP addresses will result in units being unable to communicate Check that IP addresses are unique for each unit within a subnet and the correct subnet mask is being used
	Antenna or cable failure or damage	Visually inspect antenna and cables for damage Sweep antenna and cables Replace antenna or cables
Poor link performance	Polling sequence	Check polling round number. Higher polling round number increase the delay between polls for less active units
	Distance	Check the maximum remote distance configuration setting
	No LOS	Check LOS between antennas
	Excessive Bit errors and processing errors	Multipath interference–align or relocate antennas or radio
	Signal absorption	Check LOS for obstacles such as trees
	Throttling level	Check if throttling is correctly configured (Control throttling by enabling or disabling throttling and by modifying the throttling index)
	Center frequency	Set units from different systems in the same geographic area to different center frequencies–overlapping wavelengths from other systems will degrade performance
	Overpowering co-located unit	Output power from one unit can overpower another co-located radio, even if units operate on different channels—lower unit power
SNMP can't be activated	IP filtering configured incorrectly for SNMP	Change IP filtering to enable SNMP
Unable to access main configuration menu	Invalid passwords	Contact Wi-LAN for information about how to re-enter your system Units will need to be reset

Indication	Possible Cause	Suggested Corrective Actions
Unit will not operate	Faulty unit	Bench test unit
	Corrupt unit software	Reload unit software
Point-point link is too slow	Throttling level	Check if throttling is correctly configured
	Center frequency	Set units from different systems in the same geographic area to different center frequencies—overlapping wavelengths from other systems will degrade performance
	Overpowering co-located unit	Output power from one unit can overpower another co-located radio, even if units operate on different channels Lower the power of the unit

Appendix A: Planning Your Wireless Link

To ensure an effective and reliable wireless link, you first need to perform some network planning. This section provides some general guidelines for planning a wireless link, including the following:

- Planning the physical layout of your system
- Determining antenna and cable requirements
- Determining configuration settings for units
- Calculating a link budget

Planning the Physical Layout

You need to plan the physical layout of your wireless system.

- Determine the number of remotes
- Ensure LOS (line-of-sight) exists between units and determine coverage areas
- Measure the distance between the base station and each remote unit
- Consider the need for equipment shelters, electrical power and environmental requirements

Determine the Number of Remotes

Since the 12 Mbps data rate is shared between all units, the fewer the number of remote units, the faster each wireless link. Although a maximum of 1000 remotes is supported per base station, this number would result in low data rates. Instead, to ensure high data rates, Wi-LAN suggests a standard where 75 remotes can maintain constant 128 kbps communication with a base station. Since it is unlikely that all units will be active at the same time, the total number of remotes for planning purposes can be increased by a factor of three, so that a maximum of 225 (3 x 75) remotes per base station is recommended. This should enable all users to easily achieve 128 kbps performance.

Ensure LOS and Determine Coverage Area

Ensure the availability of a clear, LOS (line-of-sight) radio path between base station and all its remotes. Plot the coverage area of each base station on a map, and determine which base station will service which remote unit. Plan some alternate links in case base station coverage areas overlap or if physical obstacles block the radio path to some remotes.

Measure the Distance Between Units

Use a mapping method or GPS (global positioning system) to measure the distance between the base station and each remote, and check the radio path to identify any obstructions in the LOS path between the two antennas. Due to the high frequency and low output power permitted in the ISM bands, no obstructions can exist between the base station and the remote unit.

Determine Shelter, Power and Environmental Requirements

AWE units must be located in a weatherproof environment (a room, EMS cabinet or shelter) with an ambient temperature between 0° and 40° Celsius, and humidity from 0 to 95% non-condensing. Consider building, electrical power, heating and air conditioning requirements.

Determining Antenna and Cable Requirements

The signal from an indoor antenna can penetrate several walls, although metal obstructions or building features such as elevator shafts can deflect or inhibit radio waves. On-site testing is advised because all interiors are unique.

If you plan to install antennas outdoors you need to consider several factors.

- Ensure a clear line-of-sight radio path is available between each remote and its base station.
- Ensure that Fresnel zone clearances are met. Identify obstructions that could degrade link performance now and in the future.
- Obtain permission from building owners if you intend to install the antenna on a rooftop
- Obtain 24-hour access to antennas, cables and equipment
- Determine antenna mounting positions: the final position should be selected to enable physical shielding of the antenna at the back and sides from radio interference in the ISM band.
- Consider potential wind load and ice loading impact on the antenna
- Be aware of possible multipath effects: installing an antenna too close to reflective surfaces can cause signal problems.
- Check local regulatory restrictions, such as height, on antenna mast usage in the identified location
- Ensure that your antenna is properly grounded and installed according to local electrical codes.
- Determine transmission cable lengths and plan cable routes. Minimize the length of the coaxial cable because the longer the cable, the greater the cable losses.
- Calculate the fade margin—a minimum 15 dB fade margin is required to ensure the reliability of your wireless link.
- Determine Ethernet cable lengths and plan cable routes.

⚠ WARNING

Correct antenna installation is critical to the safe operation and performance of your system. Antennas should always be professionally installed.

More information about antennas is provided in *Antenna Basics* , page 142.

Determining Unit Configuration Settings

Configuration settings of units should be determined before installation to ensure easy installation and to reduce installation costs. An information sheet should be prepared for each unit that specifies the basic configuration settings of that unit.

- Unit Name
- IP Address
- Subnet Mask
- Station Type
- Station Rank
- Center Frequency
- Security passwords
- Scrambling Code
- Acquisition Code
- Remote Unit RF Group
- Transmit Power Level

You may also specify other settings such as remote distance, IP filtering and throttling.

Calculating a Link Budget

Proper path planning ensures that each end of the RF link receives sufficient signal power to maintain the desired Bit Error Rate (BER). The effectiveness and reliability of your RF link depends on several factors.

- Antenna gain and other characteristics
- Distance between antennas and obstructions in the RF path
- Location and height of antennas
- Length and type of coaxial cable connecting the unit to the antenna

These factors are considered when you calculate your link budget. The calculation indicates, on paper, 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 decibels (dB).

The following variables are used to calculate the link budget.

Variable	Description
System Gain	Maximum path loss that the system can support for usable data transmission
EIRP (Effective Isotropically Radiated Power)	Power radiating from an antenna taking into account the output power from the transmitter, connector losses, cable losses and antenna gain
Antenna Gain	Gain of the antenna over a dipole (dBd) or theoretical (dBi)
Propagation Loss	Signal loss experienced as it travels through the air, expressed in dB

Variable	Description
Fresnel Radius	Distance around line-of-sight that must be clear of obstacles
Cable Loss	Signal loss experienced as it passes through the coaxial cable, expressed in dB
Path Loss	Total loss from one end of the path to the other. Includes propagation losses, cable losses and any other losses that impact the system performance

Each variable is described below.

System Gain

The system gain of a radio system is the difference between the transmitted power and a receiver's sensitivity threshold. The system gain of the AWE 120-58 is calculated as follows.

Note: For the sake of simplicity, a Tx Power value of 20dBm is used in the following calculations.

Formula: System Gain = Transmission Power - Receiver Sensitivity @ 10^{-6} BER

Variables: Tx Power = 21 dBm
Receiver Sensitivity = –80 dBm (receiver sensitivity @ 10^{-6} BER)

Calculation: 21dBm – (–80) dBm = 101 dB

To ensure reliable communications, the system gain plus all antenna gains must be greater than the sum of all losses. For a reliable link, Wi-LAN recommends that the system gain plus all antenna gains be greater than the sum of all losses by 15 dB. This amount is the fade margin.

EIRP (Effective Isotropically Radiated Power)

EIRP is the power that radiates from an antenna, taking into account the output power from the transmitter, the connector and cable losses, and the antenna gain. Unlike the Tx output power of the devices, EIRP takes account of antenna gain and cable losses. Antennas use directional gain to increase the effective radiated power. Losses such as cable losses reduce the effective radiated power.

You calculate the EIRP as follows.

Formula: EIRP = Tx Power (dBm) - Cable Losses (dB) - Connector Losses (dB) + Antenna Gain (dBi)

Note: The FCC regulatory body has set the EIRP limit to +36 dBm for point-to-multipoint applications per FCC 15.247(b)(3). For point-to-point applications EIRP can be >36 dBm as per FCC 15.247(b)(3)(ii).
Visit www.fcc.gov for the most current information.

Industry Canada specifies the EIRP limit to ≤ 4W (+36 dBm) as per RSS-210, 6.2.2(o)(b) for point-to-multipoint applications and 200W (+23 dBW) for point-to-point applications.
Visit www.ic.gc.ca for the most current information.

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) rather than onmi-directional. Use of a directional antenna also reduces interference from other systems 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 360° path around it.

When you select a Wi-LAN approved 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 15 dB fade margin.

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

Propagation Loss

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) for 5.8 GHz band = 108 dB + 20log(d_{km})

where:

d_{km} = Distance in Kilometers

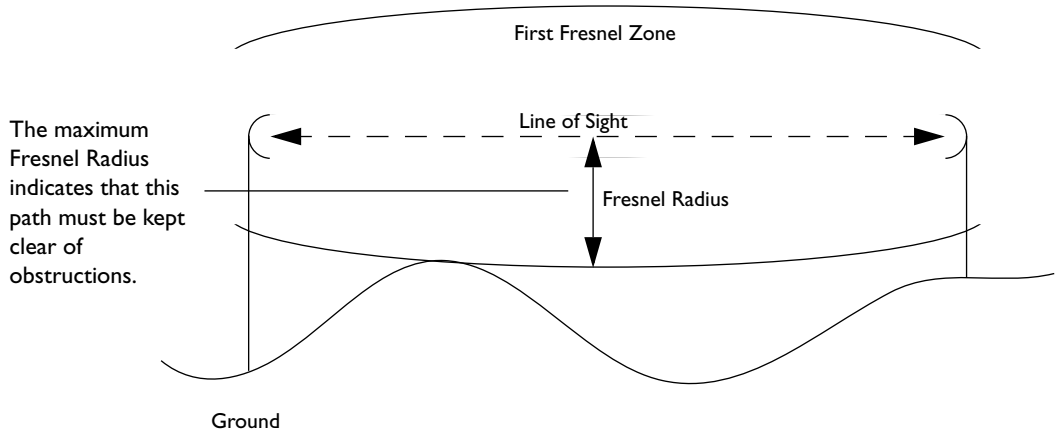
108 dB = Pathloss Constant in the 5.8 GHz band

Fresnel Zone

It is essential that you locate your antennas at maximum above-ground height to ensure that all ground-based obstructions are cleared from the Line of Sight path and the 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.

Fresnel Zone



For the 5.8 GHz band, the approximate Fresnel Radius is calculated as follows.

Formula: Fresnel Radius (meters)= $2.2\sqrt{d_{km}} + (d_{km}/8.12)^2$

Cable Loss

Cable and connector losses affect the operation of the wireless link and therefore should be kept to a minimum by minimizing cable lengths and carefully selecting the type of cable. The two primary coaxial cable specifications for the AWE 120-58 are:

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

The following is an example of cable loss ratings at 5.8 GHz.

Cable Type	LDF2-50	LDF4-50A	LDF4.5-50
Loss (dB/meter)	0.32	0.22	0.16

Note: When you calculate path loss, you will add 1dB at each end of the link to compensate for connector losses in addition to the cable loss value.

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 *System Gain* , page 138 for more information about system gain.

Fade Margin

Fade margin is the amount by which the system gain plus the total antenna gain exceeds the path loss.

Formula: Total antenna gain = Tx Antenna Gain + Rx Antenna Gain

As calculated, the fade margin is 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 to compensate for RF path fading due to weather conditions or multipath interference.

The Wi-LAN recommended fade margin for the AWE 120-58 is a minimum of 15 dB. The sum of the cable losses, connector losses, propagation losses, and the 15 dB required fade margin should be less than the sum of the system gain and antenna gain.

Link Budget Example

Formulas:

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

or

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

and

Actual Fade Margin ≥ Desired Fade Margin

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 = 15 dB
Tx Power = 21 dBm
Rx Sensitivity = –80 dBm
Tx Antenna Gain = 27 dBi
Rx Antenna Gain = 27 dBi
Propagation Loss for desired range of 10km = 108 + 20 x log(10) = 128 dB
Tx Cable Losses (5m LDF2-50) = 5 * 0.32 = 1.6 dB
Rx Cable Losses (5m LDF2-50)= 5 * 0.32 = 1.6 dB
Tx Connector Losses = 1 dB
Rx Connector Losses = 1 dB

Variable Calculations:

System Gain = 21 - (–80) = 101 dB
Antenna Gains = 27 + 27 = 54 dBi
Cable Losses = 1.6 + 1.6 = 3.2 dB
Connector Losses = 1 + 1 = 2 dB

Actual Fade Margin Calculation:

Actual Fade Margin = 101 + 54 – 128 – 3.2 – 2 = 21.8 dB

Analysis:

A goal of Actual Fade Margin ≥ 15 dB is achieved.

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.

Antenna Basics

Antennas focus and absorb radio energy in specific directions, depending on their design. AWE 120-58 antennas must be tuned to 5.7250 – 5.8500 GHz.

This section contains basic information about antenna parameters and how to select and install antennas for use in your wireless system. Antenna characteristics, mounting location, and correct operation of antennas are critical to a wireless link.

Antenna Parameters

Parameter	Description
Gain	• Antennas have a gain associated with them, which is a measure of their ability to amplify signals in their tuned band • Antenna gain is achieved by focusing the signal. A higher gain antenna has a more compressed signal
dBd vs. dBi	• Antenna gain must be measured over a known reference and is often expressed as either dBd or dBi • dBd is antenna gain referenced over a half-wave dipole which is an antenna that has a donut shaped radiation pattern • dBi is antenna gain referenced over an isotropic radiator which is a theoretical antenna that radiates equally in all directions (e.g. the sun) • Wi-LAN references antenna gain in dBi. The conversion factor is 0 dBd = 2.14 dBi
Beamwidth	• Describes how a signal spreads out from the antenna, and the range of the reception area • Beamwidth is measured between the points on the beam pattern at which the power density is half of the maximum power. This is often referred to as the –3 dB points • A high gain antenna has a very narrow beamwidth and may be more difficult to align
Downtilt or uptilt	• Some antennas have either an associated downtilt or an uptilt. The tilt further focuses the signal downward or upward with respect to the horizon • Tilt may be either electrically built into the antenna or achieved mechanically with the mounting gear • Downtilt or uptilt may be required when there is a significant deviation between the elevation of the remote site(s) and the base site
F/B	• Front-to-back ratio • Directional antennas focus the signal in a forward path. Achieved by directing the signal in one direction that reduces the signal in the opposite direction • A higher gain antenna typically has a greater F/B ratio

Parameter	Description
XPD	• Polarity and Cross-Polarization Discrimination (XPD) • Antennas have an associated polarity, which is the orientation of the radiating element with respect to earth • Antennas are usually described as vertical, horizontal, or circularly polarized. The polarity of all antennas used in a system must be the same • Cross-Polarization Discrimination specifies the signal isolation achieved when the receiving element is perpendicular to the radiating element. Can be advantageous when co-locating radio systems
VSWR	• Voltage standing wave ratio • VSWR is the voltage ratio of minimum to maximum across a transmission line • A VSWR of 2.0:1 or less in an antenna is considered effective. Most antennas have a VSWR of 1.5:1 • For example, when using a radio with a 4 W output with an antenna VSWR of 1.5:1, the reflected power will be 160 mW

Implementation Considerations

Some key items to consider when selecting and installing antennas for your wireless network follow.

Item	Description
Absorption	• Antennas mounted too close to "soft" objects, such as trees, may experience a reduction in signal strength due to absorption • Absorption is most often encountered in applications installed during the fall or winter months, and the problem does not become evident until the spring
Diffraction	• Diffraction occurs when a radio signal reflects or bounces off of a solid object • Level of diffraction could lead to connectivity problems if the remaining signal level is too low • Two types of diffraction are *shadowing* and *multipath*
Shadowing	• Shadowing is a form of diffraction that is typically caused when antennas are mounted too close to a structure and they lose a portion of the signal lobe due to reflection. The receive antenna is in a *shadowed* area • To minimize shadowing, ensure that there is adequate height above structures when mounting antenna equipment
Multipath Interference	• Multipath is a form of diffraction in which the reflected signal arrives at the receiver at different times which confuses the receiver • Multipath may be interpreted as interference by the receive antenna and can result in bit errors and processing delays

Wi-LAN Approved Antennas

Antennas must be selected from the following list of Wi-LAN approved antennas. Antennas must be connected using transmission cables having the specified minimum lengths.

Antenna Description	Number	Gain (dBi)
5.8 GHz Cushcraft directional planar	S57212AMP	12
5.8 GHz European 55 degree H-sector [1]	SA17-55H/449[1]	17
5.8 GHz European 55 degree V-sector [1]	SA17-55V/450[1]	17
5.8 GHz MTI directional/flat planar	MT-10010	32
5.8 GHz MTI directional/flat planar	MT-10011	28
5.8 GHz TIL-TEK directional/dish	TA-5224M	28.5
5.8 GHz TIL-TEK directional/dish w/radome	TA-5224MR	28.5
5.8 GHz TIL-TEKdirectional/dish	TA-5248M	34.2
5.8 GHz TIL-TEK directional/dish w/radome	TA-5248MR	34.2
5.8 GHz TIL-TEK directional/dish	TA-5272M	37.5
5.8 GHz TIL-TEK directional/dish w/radome	TA-5272MR	37.5

Note: [1] One of the following cables with the specified minimum length must be connected to the antenna:

LMR400	6 m
LMR600	7 m
LMR900	13 m
LDF4-50A	10 m
LDF4.5-50	13 m

There are several factors to consider when choosing the right antenna for a wireless application. The following are some initial questions you should ask before selecting an antenna.

- What is the operating frequency range?
- Will this be a point-to-point or point-to-multipoint application? Ensure that you consider if the application will change in the future.
- What are the coverage requirements?
- What is the gain requirement?
- What is the elevation of the remote site(s) with respect to the base station and will additional downtilt/uptilt be necessary at either the base or remote site to compensate?
- Will there be any obstructions in the path?
- Will systems be co-located? What polarity will be used?
- What are the regional environmental conditions? For example, is there windloading, salt air, excessive moisture, ice buildup etc.?
- What is the antenna lifetime expectation?
- What are the site and mounting options?
- What are the restrictions in the locale regarding the effective radiated power permitted from the antenna?
- Will antenna appearance be a factor?

Antenna Installation Factors

Some factors you should consider when installing antennas into your wireless system are listed below.

Factor	Description
Maximizing the AWE 120-58's Capabilities	• Minimize obstructions in the radio path • Line Of Sight (LOS) is crucial for reliability • Ensure that equipment is installed correctly • Ensure proper grounding, testing, and alignment of antennas • Install in environmental conditions that are suitable for the AWE unit • Select proper antennas and cable for the application • Ensure sufficient gain for the intended application
Safety	• Proper grounding of antenna apparatus in accordance with respective Electrical Code(s) is crucial • Wi-LAN recommends using a surge arrestor where the antenna cable enters the building • All installations should be completed by a qualified and competent RF technical
EIRP	• Effective Isotropically Radiated Power (EIRP) • EIRP is the amount of power that is transmitted to the air from the antenna • EIRP levels depend on the power of the radio transmitter, the gain of the antenna, and the losses incurred in the antenna cable • EIRP must not exceed 4 W or 36 dBm in Canada and the United States for point-to-multipoint applications. **Note:** *EIRP = Power out of unit – Power lost in cable + Gain in power from Antenna*
Fade Margin	See *Calculating a Link Budget* , page 137
LOS	• Line of Sight (LOS) • LOS is a football shaped pattern known as the Fresnel Zone, which must be kept clear of obstructions. See *Fresnel Zone* , page 139 for more information • Visual line of sight must be achieved. When standing at the antenna position, you must be able to see the remote antenna

Minimal Clearance Above Obstructions

For the AWE 120-58, the absolute minimum clearance above obstructions requirements are as follows (in meters):

$$2.2m \times \sqrt{d_{km}} \qquad @ 5.8 \text{ GHz}$$

Some example clearance requirements for 5.8 GHz links follow.

Distance (km)	Clearance (m)	Distance (miles)	Clearance (ft)
0.5	1.6	0.5	6.5
1	2.2	1	9.3
2	3.2	2	13.3
3	3.9	3	16.7
5	5.2	5	22.6
8	6.9	8	31.3
10	8.0	10	37.3
15	10.8	15	54.3

Note: There is also a correction factor to compensate for curvature of the earth. This correction factor is not required when the correction value is negligible < 10 km.

Installing Antennas

Antennas must be installed professionally to ensure that the antenna operates properly and follows accepted safety, electrical, grounding and civil engineering standards.

Ensure the following conditions.

- Dipole antennas are oriented vertically (point up).
- Antennas for the system have the same polarity (vertical, horizontal or circular).
- 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 and entering the installation building.
- The coaxial cable is secured to the supporting structure at one meter intervals to 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 you can move the antenna to fine-tune its position.
- The coaxial cable is connected to the antenna and to the Antenna port on both sides of the link (base and remote stations).
- The antennas are grounded properly.

Fine-tuning Antennas

You can fine-tune the antennas by physically moving the antenna. When the remote antenna is correctly aligned, the Air LED is orange, indicating communication with the base station. You can use the Receive and Transmit Tests to test the link while adjusting the antennas to minimize BER and lost packets and maximize received power. You can use the RSSI Test to maximize RSSI.

Once antennas are adjusted to maximize performance, secure them properly to the support structures.

Co-locating Units

When AWE antennas are located on the same mast, you must take care to ensure the output power from one radio does not overpower another co-located bridge, even if the units are operating on different channels. You may need to install a signal attenuator to lower transmit power, use antenna polarity to your advantage, or adjust antenna uptilt or downtilt. Contact your distributor for antenna and installation assistance when co-locating units.

Appendix B: Using HyperTerminal

The Windows 95/98 operating system includes a terminal emulation program called HyperTerminal®. You can use this program to access the AWE 120-58 configuration menus through the Serial port on the front of the unit.

Note: Users of the Asian version of Windows can use Tera Term™ shareware (available on the Internet) to configure the AWE 120-58.

Starting HyperTerminal

To start HyperTerminal

1. In Windows 95 or 98, from the **Start** menu, select **Programs**, **Accessories**, **Communications**, **HyperTerminal**. The Connection Description window is displayed.
2. Select an icon for the HyperTerminal session and type a connection name.
3. Click **OK**. The Connect To window is displayed.
4. In the Connect using field, select the appropriate COM port.
5. Click **OK**. The COM Properties window is displayed.
6. Enter the following settings.

Bits per second	9600
Data bits	8
Parity	None
Stop bits	1
Flow control	None

7. Click **OK**. The AWE - HyperTerminal window is displayed.
8. From the File menu, select **Properties**. The Properties window is displayed.
9. Click the **Settings** tab and then click **ASCII Setup**. The ASCII Setup window is displayed.

10. In the ASCII Sending area, choose the following settings.

Send line ends with line feeds	Clear the checkbox
Echo typed characters locally	Clear the checkbox
Line delay	Type 0
Character delay	Type 0

11. In the ASCII Receiving area, do the following.

Append line feeds to incoming line ends	Click to select the checkbox
Force incoming data to 7-bit ASCII	Clear the checkbox
Wrap lines that exceed terminal width	Click to select the checkbox

12. Click **OK**. The ASCII Setup window closes.
13. Click **OK**. The Properties window closes.
14. Use a straight through RS-232 serial cable to connect the communications port of the PC to the DB9 connector on the unit.
15. Power up the unit.
16. Press **Enter**. The Configuration menu is displayed in the HyperTerminal window.

Determining the Communications Port

To set the communications port in the HyperTerminal session, you need to know which communications port you are using on your computer. Most laptops are connected through COM 1, but PCs can use COM 1 through 3.

To determine the communications port

1. Right-click the **My Computer** icon on your desktop and from the shortcut menu, select **Properties**. The System Properties window is displayed.
2. Click the **Device Manager** tab and click **Ports (COM & LPT)**. A list of the available communications ports appears.
3. Select the appropriate port for your HyperTerminal session.

Note: A connection to the Configuration menus will not be established if the wrong port is selected. If this occurs, reconfigure the HyperTerminal to connect using another available communications port.

Appendix C: Configuring a Simple Data Network

This section describes how to set up a simple network to perform file transfers between two computers. You need to perform the following tasks.

- Check the Network Adaptor Installation
- Configure the Network
- Enable the Sharing Feature on the Hard Disk Drive

Checking Network Adaptor Installation

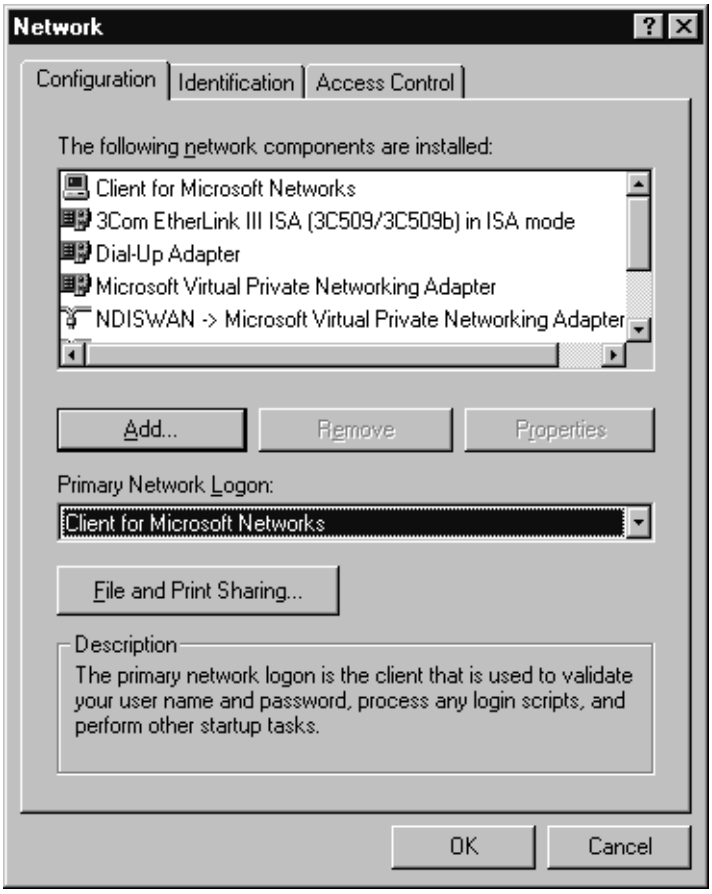
To check the network adaptor installation

1. From Windows® choose the **Start** menu, select **Settings**, **Control Panel**. The Control Panel window is displayed.
2. Double-click the **System** icon. The System Properties window is displayed.
3. Click the **Device Manager** tab.
4. Double-click **Network Adapters**. A list of installed devices is displayed.
5. Check for trouble indicators with the previously installed network adaptor(s).
6. Click **OK**. The Control Panel window is displayed.

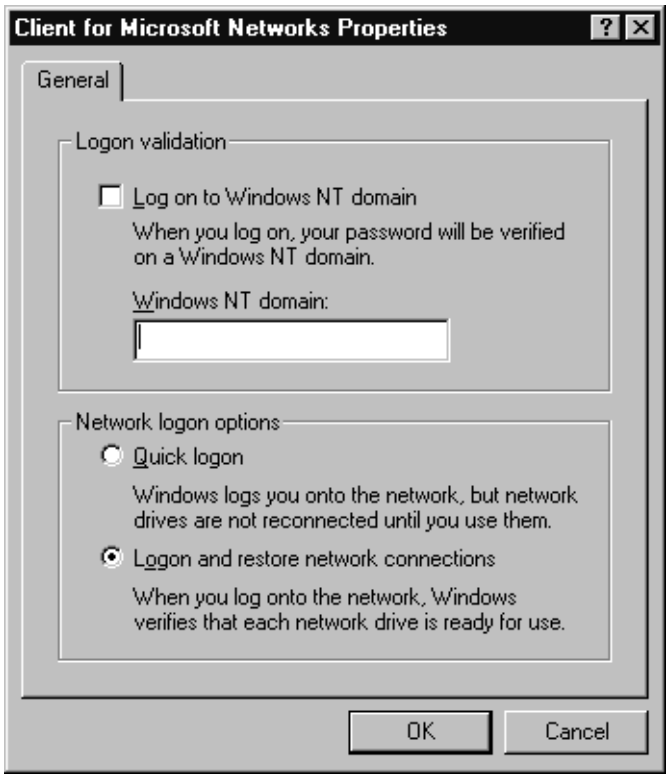
Configuring the Network

To configure the network

1. In the Control Panel window, double-click the **Network** icon. The Network window is displayed.



2. In the list of network components area, double-click **Client for Microsoft Networks**. The Client for Microsoft Networks Properties window is displayed.



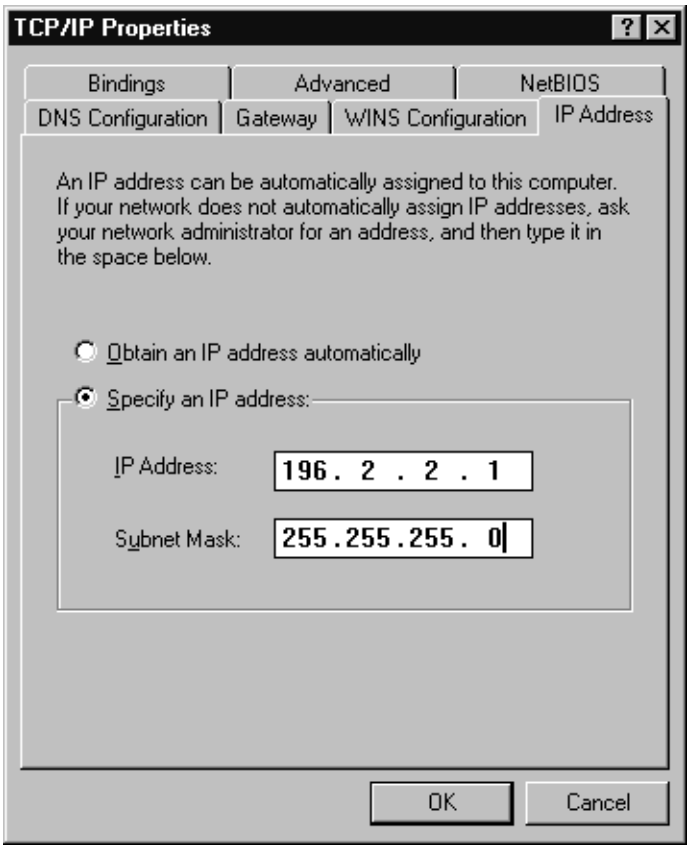
Note: If Client for Microsoft Networks is not listed, click **Add** and select **Client**, **Add**, **Microsoft**, **Client for Microsoft Networks**, and then click **OK**.

3. In the Client for Microsoft Networks Properties window, do the following tasks.

Log on to Windows NT domain	Clear the checkbox
Windows NT domain	Clear the field
Logon and restore network connections	Click the button

4. Click **OK**. The Client for Microsoft Networks Properties window closes.

5. In the Network window, double-click **TCP/IP**. The TCP/IP Properties window is displayed.



Note: If TCP/IP is not listed in the Network window, click Add and select **Protocol**, **Add**, **Microsoft**, **TCP/IP,** and then click **OK**.

6. Click the **IP Address** tab.
7. Click **Specify an IP Address**, and type the following.

IP Address	196.2.2.1 Note: Increment the last digit by 1 (i.e. type 196.2.2.2) when configuring the second computer
Subnet Mask	255.255.255.0 Note: This number is the same for both computers

8. Click **OK**.
9. Click **File and Print Sharing**. The File and Print Sharing window is displayed.
10. Click to select the **I want to be able to give others access to my files** checkbox.
11. Click **OK**.

12. In the Network window, click the **Identification** tab and type the following.

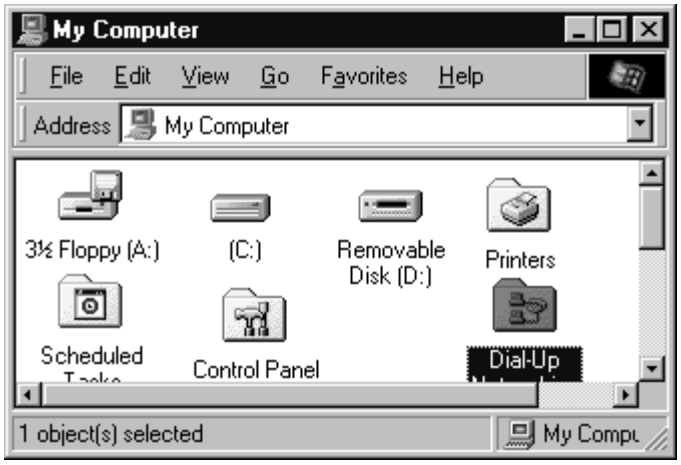
Computer Name	Unique name for each computer. For example, computer 1 and computer 2
Workgroup	Workgroup name. For example, Test Note: All computers in the network must have the same workgroup name
Computer Description	Description of the type of computer used. For example, laptop or desktop

13. In the Network window, click the **Access Control** tab.
14. Click **Share Level Access Control**.
15. Click **OK**.
16. You are prompted to restart your computer.
17. Click **Yes**. Wait for your computer to restart, then proceed with Enabling the Sharing Feature on the Hard Disk Drive.

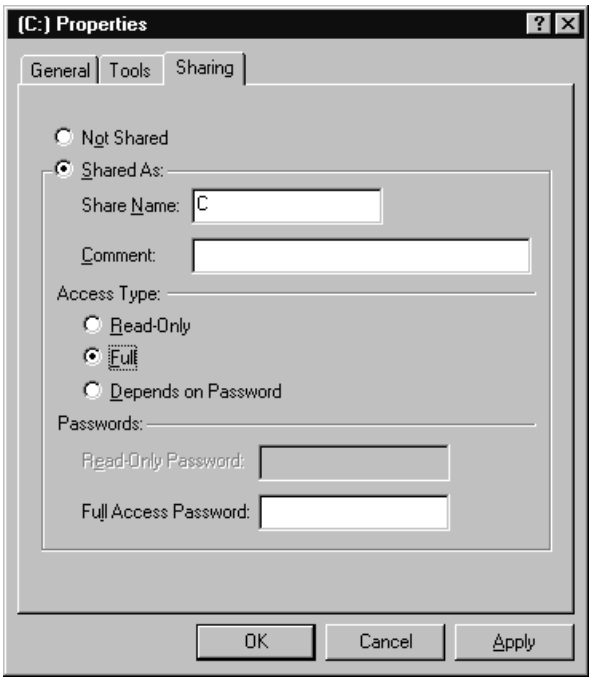
Enabling Sharing on the Hard Disk Drive

To enable the sharing feature on the hard disk drive

1. On the desktop, double-click **My Computer**. The My Computer window is displayed.



2. Right-click the hard disk drive icon (typically drive C:), and select **Open**. The Properties window is displayed.



3. Click the **Sharing** tab, and choose the following:

Shared As	Click the radio button
Share Name	Type C
Comment	Leave this field blank
Access Type	Click to select Full
Passwords	Leave these fields blank

4. Click **OK**.
5. Repeat this procedure for all PCs in the network.

Once all PCs in the network have been shared, you can view the network by double clicking the **Network Neighborhood** icon that appears on each PC desktop.

Appendix D: SNMP

About SNMP MIB

Three elements are required to use SNMP: agent software, management software and a MIB file. SNMP agent software is contained in every AWE unit. Agent software enables a unit to interpret SNMP (Simple Network Management Protocol) MIB (Management Information Block) commands.

SNMP management software is installed on a networked PC or workstation and enables a network administrator to remotely manage AWE units. If you have SNMP manager software installed on a networked PC or workstation, you can configure, monitor and control AWE units via the Ethernet or air. SNMP network management software is available commercially and as shareware (for example, you can download a free evaluation copy from www.mg-soft.com).

MIB is simply a list of objects that SNMP can monitor. You can download a proprietary Wi-LAN MIB file from www.wi-lan.com or obtain a copy through the Wi-LAN Technical Assistance Center. The AWE 120-58 is MIB version 2 compliant. After you download the MIB file, you must compile the file with the SNMP management software compiler.

SNMP Elements

SNMP Element	Description
Manager	Software installed on the network's host computer and operated by the network administrator. From the host, the Manager configures Agents or polls Agents for information
Agent	Software that 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)	A database that is accessed by a specific set of commands and executed 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

Wi-LAN Object Identifier Nodes

The AWE 120-58 uses SNMP version 1, which is MIB 2 compliant. All OID (Object Identifier) nodes in the AWE 120-58 private Wi-LAN MIB are numbered 1.3.6.1.4.1.2686.2.**n** where **n** is a private Wi-LAN MIB node number or branch of nodes.

All nodes containing statistical information are cleared on power up 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.

From	To	Classification
1.3.6.1.4.1.2686.2.1.1	1.3.6.1.4.1.2686.2.1.104	Configuration
1.3.6.1.4.1.2686.2.1.100.1	1.3.6.1.4.1.2686.2.1.100.7	Configuration: System Image List
1.3.6.1.4.1.2686.2.2.1	1.3.6.1.4.1.2686.2.2.7	System Status
1.3.6.1.4.1.2686.2.3.1	1.3.6.1.4.1.2686.2.3.32	Statistics
1.3.6.1.4.1.2686.2.4.1	1.3.6.1.4.1.2686.2.4.7	System Commands

Using SNMP

Refer to the documentation provided with your SNMP application software for instructions about using SNMP. The procedure for changing a unit's configuration with SNMP is described below.

To change a configuration setting with SNMP

1. Change the parameter to a new value using the appropriate SNMP command.
2. Reboot the unit with the new configuration using the **rebootNewRfConfig** node command. See *System Commands* , page 170.
3. Save the new configuration to the unit's flash memory using the **saveConfToFlash** node command. See *System Commands* , page 170.

Using Object Identifier Nodes

The following are descriptions of parameters and node addresses in the AWE 120-58 MIB.

Group	Parameter	Address/Node	Syntax	Access	Description
Configuration	serialNumber	1.3.6.1.4.1.2686.2.1.1	DisplayString (0..15)	Read Only	Unit Serial Number
	productionDate	1.3.6.1.4.1.2686.2.1.2	DisplayString (0..15)	Read Only	Unit Date of Manufacture
	macAddress	1.3.6.1.4.1.2686.2.1.3	PhysAddress	Read Only	Ethernet MAC Address
	systemName	1.3.6.1.4.1.2686.2.1.4	DisplayString (0..31)	Read/Write	Unit System Name
	unitLocation	1.3.6.1.4.1.2686.2.1.5	DisplayString (0..31)	Read/Write	User configurable Unit Location
	contactName	1.3.6.1.4.1.2686.2.1.6	DisplayString (0..31)	Read/Write	User configurable Contact Name
	config7	1.3.6.1.4.1.2686.2.1.7	INTEGER	Read/Write	Spare
	config8	1.3.6.1.4.1.2686.2.1.8	INTEGER	Read/Write	Spare
	config9	1.3.6.1.4.1.2686.2.1.9	INTEGER	Read/Write	Spare
	ipAddress	1.3.6.1.4.1.2686.2.1.10	IpAddress	Read Only	Internet IP Address: default = 192.168.1.100
	ipNewAddress	1.3.6.1.4.1.2686.2.1.11	IpAddress	Read/Write	New Internet IP Address
	ipSubnetMask	1.3.6.1.4.1.2686.2.1.12	IpAddress	Read/Write	IP Subnet Mask: default = 255.255.255.0
	ipGatewayAddr	1.3.6.1.4.1.2686.2.1.13	IpAddress	Read/Write	IP default gateway address (currently not used)
	ipNetmanAddr	1.3.6.1.4.1.2686.2.1.14	IpAddress	Read/Write	SNMP network management station IP address
	ipPacketFiltering	1.3.6.1.4.1.2686.2.1.15	INTEGER)	Read/Write	IP packet filtering: 0 = disabled, 1 = enabled

Group	Parameter	Address/Node	Syntax	Access	Description
	ipAddressFiltering	1.3.6.1.4.1.2686.2.1.16	INTEGER	Read/Write	IP address filtering: 0 = disabled, 1 = enabled
	ipDefaultFiltering	1.3.6.1.4.1.2686.2.1.17	INTEGER	Read/Write	IP default filtering: 1 = pass, 2 = block
	ipConfig	1.3.6.1.4.1.2686.2.1.18			
	ipFilter1Range	1.3.6.1.4.1.2686.2.1.18.1	INTEGER	Read/Write	IP address filter 1 range: 0-255
	ipFilter1Base	1.3.6.1.4.1.2686.2.1.18.2	IpAddress	Read/Write	IP address filter 1 base address
	ipFilter1State	1.3.6.1.4.1.2686.2.1.18.3	INTEGER	Read/Write	IP filter 1 state 0 = disabled, 1 = pass, 2 = block
	ipFilter2Range	1.3.6.1.4.1.2686.2.1.18.4	INTEGER	Read/Write	IP address filter 2 range: 0-255
	ipFilter2Base	1.3.6.1.4.1.2686.2.1.18.5	IpAddress	Read/Write	IP address filter 2 base address
	ipFilter2State	1.3.6.1.4.1.2686.2.1.18.6	INTEGER	Read/Write	IP filter 2 state 0 = disabled, 1 = pass, 2 = block
	ipFilter3Range	1.3.6.1.4.1.2686.2.1.18.7	INTEGER	Read/Write	IP address filter 3 range: 0-255
	ipFilter3Base	1.3.6.1.4.1.2686.2.1.18.8	IpAddress	Read/Write	IP address filter 3 base address
	ipFilter3State	1.3.6.1.4.1.2686.2.1.18.9	INTEGER	Read/Write	IP filter 3 state 0 = disabled, 1 = pass, 2 = block
	ipFilter4Range	1.3.6.1.4.1.2686.2.1.18.10	INTEGER	Read/Write	IP address filter 4 range: 0-255
	ipFilter4Base	1.3.6.1.4.1.2686.2.1.18.11	IpAddress	Read/Write	IP address filter 4 base address
	ipFilter4State	1.3.6.1.4.1.2686.2.1.18.12	INTEGER	Read/Write	IP filter 4 state 0 = disabled, 1 = pass, 2 = block
	ipFilter5Range	1.3.6.1.4.1.2686.2.1.18.13	INTEGER	Read/Write	IP address filter 5 range: 0-255
	ipFilter5Base	1.3.6.1.4.1.2686.2.1.18.14	IpAddress	Read/Write	IP address filter 5 base address
	ipFilter5State	1.3.6.1.4.1.2686.2.1.18.15	INTEGER	Read/Write	IP filter 5 state 0 = disabled, 1 = pass, 2 = block

Group	Parameter	Address/Node	Syntax	Access	Description
	ipFilter6Range	1.3.6.1.4.1.2686.2.1.18.16	INTEGER	Read/Write	IP address filter 6 range: 0-255
	ipFilter6Base	1.3.6.1.4.1.2686.2.1.18.17	IpAddress	Read/Write	IP address filter 6 base address
	ipFilter6State	1.3.6.1.4.1.2686.2.1.18.18	INTEGER	Read/Write	IP filter 6 state 0 = disabled, 1 = pass, 2 = block
	ipFilter7Range	1.3.6.1.4.1.2686.2.1.18.19	INTEGER	Read/Write	IP address filter 7 range: 0-255
	ipFilter7Base	1.3.6.1.4.1.2686.2.1.18.20	IpAddress	Read/Write	IP address filter 7 base address
	ipFilter7State	1.3.6.1.4.1.2686.2.1.18.21	INTEGER	Read/Write	IP filter 7 state 0 = disabled, 1 = pass, 2 = block
	ipFilter8Range	1.3.6.1.4.1.2686.2.1.18.22	INTEGER	Read/Write	IP address filter 8 range: 0-255
	ipFilter8Base	1.3.6.1.4.1.2686.2.1.18.23	IpAddress	Read/Write	IP address filter 8 base address
	ipFilter8State	1.3.6.1.4.1.2686.2.1.18.24	INTEGER	Read/Write	IP filter 8 state 0 = disabled, 1 = pass, 2 = block
	config19	1.3.6.1.4.1.2686.2.1.19	INTEGER	N/A	spare
	config20	1.3.6.1.4.1.2686.2.1.20	INTEGER	N/A	spare
	config21	1.3.6.1.4.1.2686.2.1.21	INTEGER	N/A	spare
	config22	1.3.6.1.4.1.2686.2.1.22	INTEGER	N/A	spare
	config23	1.3.6.1.4.1.2686.2.1.23	INTEGER	N/A	spare
	config24	1.3.6.1.4.1.2686.2.1.24	INTEGER	N/A	spare
	config25	1.3.6.1.4.1.2686.2.1.25	INTEGER	N/A	spare
	config26	1.3.6.1.4.1.2686.2.1.26	INTEGER	N/A	spare
	macFilterEntryAge	1.3.6.1.4.1.2686.2.1.27	INTEGER	Read/Write	MAC Filter Entry Age Time Minutes: 1-60
	outputPowerControl	1.3.6.1.4.1.2686.2.1.28			
	outputPowerControl Mode	1.3.6.1.4.1.2686.2.1.28.1	INTEGER	Read/Write	Output Power Control Mode 0 = off, 1 = dynamic, 2 = auto

Group	Parameter	Address/Node	Syntax	Access	Description
	signalMargin	1.3.6.1.4.1.2686.2.1.28.2	INTEGER	Read/Write	Signal margin (dB)
	userOutputPower AdjustCeiling	1.3.6.1.4.1.2686.2.1.28.3	INTEGER (0 to -31)	Read/Write	User output power upper limit adjust (dB)
	currentTxPowerLevel	1.3.6.1.4.1.2686.2.1.28.4	INTEGER	Read Only	Data Transmit Output Power (dBm)
	config29	1.3.6.1.4.1.2686.2.1.29	INTEGER	Read/Write	Spare
	stationType	1.3.6.1.4.1.2686.2.1.30	INTEGER	Read Only	Current station type: 0 = remote, 1 = base
	stationRank	1.3.6.1.4.1.2686.2.1.31	INTEGER	Read Only	Current station RF rank: 1 to 1000

Group	Parameter	Address/Node	Syntax	Access	Description
	centerFreq	1.3.6.1.4.1.2686.2.1.32	INTEGER	Read Only	Current RF center frequency (57410 to 58338)
	securityWord1	1.3.6.1.4.1.2686.2.1.33	INTEGER	Read Only	Current RF security password 1
	securityWord2	1.3.6.1.4.1.2686.2.1.34	INTEGER	Read Only	Current RF security password 2
	securityWord3	1.3.6.1.4.1.2686.2.1.35	INTEGER	Read Only	Current RF security password 3
	securityWord4	1.3.6.1.4.1.2686.2.1.36	INTEGER	Read Only	Current RF security password 4
	securityWord5	1.3.6.1.4.1.2686.2.1.37	INTEGER	Read Only	Current RF security password 5
	scramblingCode	1.3.6.1.4.1.2686.2.1.38	INTEGER	Read Only	Current RF scrambling code word
	acquisitionCode	1.3.6.1.4.1.2686.2.1.39	INTEGER	Read Only	Current RF acquisition code (0-15)
	configMinutes	1.3.6.1.4.1.2686.2.1.40	INTEGER	Read Only	Current RF configuration test minutes (1-120)
	repeaterMode	1.3.6.1.4.1.2686.2.1.41	INTEGER	Read Only	Current base station repeater mode: 0 = disabled, 1 = enabled
	systemType	1.3.6.1.4.1.2686.2.1.42	INTEGER	Read Only	Current base station symmetry: 0 = asymmetric, 1 = symmetric
	remoteGroup	1.3.6.1.4.1.2686.2.1.43	INTEGER	Read Only	Current RF group identifier: 0 = closed, 1 - 63 = special group
	numOfPollRounds	1.3.6.1.4.1.2686.2.1.44	INTEGER	Read Only	Current Number of Polling Rounds (1-60)
	txPwrLevelAdj	1.3.6.1.4.1.2686.2.1.45	INTEGER	Read Only	Current RF Tx Power Level Adjust (-31 to 0 dB)
	defStationType	1.3.6.1.4.1.2686.2.1.46	INTEGER	Read Only	Default Station type: 0 = remote, 1 = base
	defStationRank	1.3.6.1.4.1.2686.2.1.47	INTEGER	Read Only	Default Station RF Rank

Group	Parameter	Address/Node	Syntax	Access	Description
	defCenterFreq	1.3.6.1.4.1.2686.2.1.48	INTEGER	Read Only	FLASH RF center frequency (57410 to 58338)
	defSecurityWord1	1.3.6.1.4.1.2686.2.1.49	INTEGER	Read Only	Default RF security password 1
	defSecurityWord2	1.3.6.1.4.1.2686.2.1.50	INTEGER	Read Only	Default RF security password 2
	defSecurityWord3	1.3.6.1.4.1.2686.2.1.51	INTEGER	Read Only	Default RF security password 3
	defSecurityWord4	1.3.6.1.4.1.2686.2.1.52	INTEGER	Read Only	Default RF security password 4
	defSecurityWord5	1.3.6.1.4.1.2686.2.1.53	INTEGER	Read Only	Default RF security password 5
	defScramblingCode	1.3.6.1.4.1.2686.2.1.54	INTEGER	Read Only	Default RF scrambling code word
	defAcquisitionCode	1.3.6.1.4.1.2686.2.1.55	INTEGER	Read Only	Default RF acquisition code (0-15)
	defConfigMinutes	1.3.6.1.4.1.2686.2.1.56	INTEGER	Read Only	Default RF configuration test minutes (1-120)
	deRepeaterMode	1.3.6.1.4.1.2686.2.1.57	INTEGER	Read Only	Default base station repeater mode: 0 = disabled, 1 = enabled
	defSystemType	1.3.6.1.4.1.2686.2.1.58	INTEGER	Read Only	Default base station symmetry type: 0 = asymmetric, 1 = symmetric
	defRemoteGroup	1.3.6.1.4.1.2686.2.1.59	INTEGER	Read Only	Default RF group identifier: 0 = closed, 1 - 63 = special group
	defNumOfPollRounds	1.3.6.1.4.1.2686.2.1.60	INTEGER	Read Only	Default Number of Polling Rounds (1-60)
	defTxPwrLevelAdj	1.3.6.1.4.1.2686.2.1.61	INTEGER	Read Only	Default RF Tx Power Level Adjust (-31 to 0 dB)
	newStationType	1.3.6.1.4.1.2686.2.1.62	INTEGER	Read/Write	New station type: 0 = remote, 1 = base
	newStationRank	1.3.6.1.4.1.2686.2.1.63	INTEGER	Read/Write	New station RF rank (1-1000)

Group	Parameter	Address/Node	Syntax	Access	Description
	newCenterFreq	1.3.6.1.4.1.2686.2.1.64	INTEGER	Read/Write	New RF center frequency (57410 to 58338)
	newSecurityWord1	1.3.6.1.4.1.2686.2.1.65	INTEGER	Read/Write	New RF security password 1
	newSecurityWord2	1.3.6.1.4.1.2686.2.1.66	INTEGER	Read/Write	New RF security password 2
	newSecurityWord3	1.3.6.1.4.1.2686.2.1.67	INTEGER	Read/Write	New RF security password 3
	newSecurityWord4	1.3.6.1.4.1.2686.2.1.68	INTEGER	Read/Write	New RF security password 4
	newSecurityWord5	1.3.6.1.4.1.2686.2.1.69	INTEGER	Read/Write	New RF security password 5
	newScramblingCode	1.3.6.1.4.1.2686.2.1.70	INTEGER	Read/Write	New RF scrambling code word
	newAcquisitionCode	1.3.6.1.4.1.2686.2.1.71	INTEGER	Read/Write	New RF acquisition code (0-15)
	newConfigMinutes	1.3.6.1.4.1.2686.2.1.72	INTEGER	Read/Write	New RF configuration test minutes (1-120)
	newRepeaterMode	1.3.6.1.4.1.2686.2.1.73	INTEGER	Read/Write	New base station repeater mode: 0 = disabled, 1 = enabled
	newSystemType	1.3.6.1.4.1.2686.2.1.74	INTEGER	Read/Write	New base station symmetry type: 0 = asymmetric, 1 = symmetric
	newRemoteGroup	1.3.6.1.4.1.2686.2.1.75	INTEGER	Read/Write	New RF group identifier: 0 = closed, 1 - 63 = special group
	newNumOfPollRounds	1.3.6.1.4.1.2686.2.1.76	INTEGER	Read/Write	New Number of Polling Rounds (1-60)
	newTxPwrLevelAdj	1.3.6.1.4.1.2686.2.1.77	INTEGER	Read/Write	New RF Tx Power Level Adjust (-31 to 0 dB)
	stationMode	1.3.6.1.4.1.2686.2.1.78	INTEGER	Read/Write	Operating mode: 0 = normal, 1 = Rx Test, 2 = Tx Test, 3 = RSSI Test
	rfTransmitStatus	1.3.6.1.4.1.2686.2.1.79	INTEGER	Read/Write	RF transmit status: 0 = blocked, 1 = unblocked

Group	Parameter	Address/Node	Syntax	Access	Description
	linkMonitorPeriod	1.3.6.1.4.1.2686.2.1.80	INTEGER	Read/Write	Link monitor period (0-10000): 0 = disabled, 1 - 10,000 = number of data superframes per single test superframe
	testModeTimer	1.3.6.1.4.1.2686.2.1.81	INTEGER	Read/Write	Test mode timer minutes (1-1000)
	remoteDistance	1.3.6.1.4.1.2686.2.1.82	INTEGER	Read/Write	Maximum remote unit distance (km)
	linkMonitorRank	1.3.6.1.4.1.2686.2.1.83	INTEGER	Read/Write	Link monitor remote station rank (1-1000)
	throttleEnable	1.3.6.1.4.1.2686.2.1.84	INTEGER	Read/Write	Throttling enable: 0 = disabled, 1 = enabled
	throttleLevel	1.3.6.1.4.1.2686.2.1.85	INTEGER	Read/Write	RF throttle level (1-50)
	config86	1.3.6.1.4.1.2686.2.1.86	INTEGER	Read/Write	Spare
	config87	1.3.6.1.4.1.2686.2.1.87	INTEGER	Read/Write	Spare
	config88	1.3.6.1.4.1.2686.2.1.88	INTEGER	Read/Write	Spare
	config89	1.3.6.1.4.1.2686.2.1.89	INTEGER	Read/Write	Spare
	communityName1	1.3.6.1.4.1.2686.2.1.90	DisplayString (0..15)	Read/Write	Read-only access community name

Integer	Distance (km)	Integer	Distance (km)
1	5	7	35
2	10	8	40
3	15	9	45
4	20	10	50
5	25	11	50
6	30	12	60

Group	Parameter	Address/Node	Syntax	Access	Description
	communityName2	1.3.6.1.4.1.2686.2.1.91	DisplayString (0..15)	Read/Write	Read-Write access community name
	ethernetAccess	1.3.6.1.4.1.2686.2.1.92	INTEGER	Read Only	Ethernet access to local host: 0 = disabled, 1 = enabled
	wirelessAccess	1.3.6.1.4.1.2686.2.1.93	INTEGER	Read Only	Wireless access to local host: 0 = disabled, 1 = enabled
	config94	1.3.6.1.4.1.2686.2.1.94	INTEGER	Read/Write	Spare
	currentImage	1.3.6.1.4.1.2686.2.1.95	DisplayString (0..15)	Read Only	Current system image file name
	defaultImage	1.3.6.1.4.1.2686.2.1.96	DisplayString (0..15)	Read/Write	Selects specified system image file as default
	prevDefaultImage	1.3.6.1.4.1.2686.2.1.97	DisplayString (0..15)	Read Only	Previous default system image file name
	config98	1.3.6.1.4.1.2686.2.1.98	INTEGER	Read/Write	Spare
	config99	1.3.6.1.4.1.2686.2.1.99	INTEGER	Read/Write	Spare
System Image List	systemImageList	1.3.6.1.4.1.2686.2.1.100	SEQUENCE OF SystemImageEntry	not accessible	System Image List Branch
	systemImageNumber	1.3.6.1.4.1.2686.2.1.100.1	INTEGER	Read Only	System image number
	systemImageName	1.3.6.1.4.1.2686.2.1.100.2	DisplayString(0..15)	Read Only	System image file name
	systemImageRevn	1.3.6.1.4.1.2686.2.1.100.3	DisplayString(0..15)	Read Only	System image revision identifier
	systemImageDate	1.3.6.1.4.1.2686.2.1.100.4	DisplayString(0..15)	Read Only	System image file date
	systemImageTime	1.3.6.1.4.1.2686.2.1.100.5	DisplayString(0..15)	Read Only	Time system image file was last changed

Group	Parameter	Address/Node	Syntax	Access	Description
	systemImageSize	1.3.6.1.4.1.2686.2.1.100.6	INTEGER	Read Only	System image file size
	systemImageText	1.3.6.1.4.1.2686.2.1.100.7	DisplayString(0..15)	Read Only	System image descriptive text
	config101	1.3.6.1.4.1.2686.2.1.101	INTEGER	Read/Write	Spare
	config102	1.3.6.1.4.1.2686.2.1.102	INTEGER	Read/Write	Spare
	config103	1.3.6.1.4.1.2686.2.1.103	INTEGER	Read/Write	Spare
	config104	1.3.6.1.4.1.2686.2.1.104	INTEGER	Read/Write	Spare
System Status	totalHours	1.3.6.1.4.1.2686.2.2.1	Counter	Read Only	Cumulative run-time hours
	systemHours	1.3.6.1.4.1.2686.2.2.2	Counter	Read Only	Current run-time hours since powerup
	loginOkays	1.3.6.1.4.1.2686.2.2.3	Counter	Read Only	Number of successful logins
	loginFails	1.3.6.1.4.1.2686.2.2.4	Counter	Read Only	Number of unsuccessful login attempts
	localUser	1.3.6.1.4.1.2686.2.2.5	INTEGER	Read Only	Local user login status: 0 = none, 1 = user, 2 = supervisor
	telnetUser	1.3.6.1.4.1.2686.2.2.6	INTEGER	Read Only	Telnet user login status: 0 = none, 1 = user, 2 = supervisor
	ftpUser	1.3.6.1.4.1.2686.2.2.7	INTEGER	Read Only	FTP user login status: 0 = none, 1 = user, 2 = supervisor
Statistics	etherRxTotalPkts	1.3.6.1.4.1.2686.2.3.1	Counter	Read Only	Total Ethernet packets received
	etherRxLocalPkts	1.3.6.1.4.1.2686.2.3.2	Counter	Read Only	Ethernet packets received for local host
	etherRxErrorPkts	1.3.6.1.4.1.2686.2.3.3	Counter	Read Only	Ethernet packets received in error
	etherRxDroppedPkts	1.3.6.1.4.1.2686.2.3.4	Counter	Read Only	Number of received Ethernet packets dropped
	etherRxDiscardPkts	1.3.6.1.4.1.2686.2.3.5	Counter	Read Only	Number of received Ethernet packets Discarded
	etherRxTotalKbytes	1.3.6.1.4.1.2686.2.3.6	Counter	Read Only	Total Ethernet KBytes received since last reset
	etherRxBcastKbytes	1.3.6.1.4.1.2686.2.3.7	Counter	Read Only	Ethernet KBytes received since last reset

Group	Parameter	Address/Node	Syntax	Access	Description
	etherTxBTotalPkts	1.3.6.1.4.1.2686.2.3.8	Counter	Read Only	Total Ethernet packets transmitted
	etherTxDroppedPkts	1.3.6.1.4.1.2686.2.3.9	Counter	Read Only	Ethernet transmit packets dropped
	etherTxTotalKbytes	1.3.6.1.4.1.2686.2.3.10	Counter	Read Only	Total Ethernet KBytes transmitted since last reset
	etherTxBcastKbytes	1.3.6.1.4.1.2686.2.3.11	Counter	Read Only	Ethernet broadcast KBytes transmitted since last reset
	rfRxTotalPkts	1.3.6.1.4.1.2686.2.3.12	Counter	Read Only	Total received RF packets
	rfRxLocalPkts	1.3.6.1.4.1.2686.2.3.13	Counter	Read Only	Total received RF packets for local host
	rfRxDroppedPkts	1.3.6.1.4.1.2686.2.3.14	Counter	Read Only	Number of received RF packets dropped
	rfRxDiscardedPkts	1.3.6.1.4.1.2686.2.3.15	Counter	Read Only	Number of received RF packets discarded
	rfTxTotalPkts	1.3.6.1.4.1.2686.2.3.16	Counter	Read Only	Total transmitted RF packets
	rfTxLocalPkts	1.3.6.1.4.1.2686.2.3.17	Counter	Read Only	Number of transmitted local RF packets
	rfTxDroppedPkts	1.3.6.1.4.1.2686.2.3.18	Counter	Read Only	Number of transmitted RF packets dropped
	rfRxSframeCount	1.3.6.1.4.1.2686.2.3.19	Counter	Read Only	Total RF super frames received
	rfRxOverrunErrors	1.3.6.1.4.1.2686.2.3.20	Counter	Read Only	Number of RF overrun errors
	rfRxSFrameErrors	1.3.6.1.4.1.2686.2.3.21	Counter	Read Only	Number of RF super frame control word errors
	rfRxChecksumErrors	1.3.6.1.4.1.2686.2.3.22	Counter	Read Only	Number of RF super frame header checksum errors
	rfRxPacketErrors	1.3.6.1.4.1.2686.2.3.23	Counter	Read Only	Number of RF packet control work errors
	rfRxLengthErrors	1.3.6.1.4.1.2686.2.3.24	Counter	Read Only	Number of RF super frame length errors
	rfTxSuperFrameCnt	1.3.6.1.4.1.2686.2.3.25	Counter	Read Only	Number of RF super frames transmitted
	rfEtoITHroughput	1.3.6.1.4.1.2686.2.3.26	Counter	Read Only	Ethernet to RF throughput
	rfItoEThroughput	1.3.6.1.4.1.2686.2.3.27	Counter	Read Only	RF to Ethernet throughput
	statistics24	1.3.6.1.4.1.2686.2.3.28	Counter		Spare

Group	Parameter	Address/Node	Syntax	Access	Description
	linkMonitorRank1	1.3.6.1.4.1.2686.2.3.29	INTEGER	Read Only	Link monitor remote station rank
	linkMonRtoBber	1.3.6.1.4.1.2686.2.3.30	DisplayString (0..8)	Read Only	Link monitor remote to base bit error rate
	linkMonBtoRber	1.3.6.1.4.1.2686.2.3.31	DisplayString (0..8)	Read Only	Link monitor base to remote bit error rate
	linkMonMissPktCnt	1.3.6.1.4.1.2686.2.3.32	Counter	Read Only	Link monitor missed packet count
	linMonEnvPBtoR	1.3.6.1.4.1.2686.2.3.33	INTEGER	Read Only	Link monitor base to remote envelope power
	linkMonEnvPRtoB	1.3.6.1.4.1.2686.2.3.34	INTEGER	Read Only	Link monitor remote to base envelope power
	linkMonCorrPBtoR	1.3.6.1.4.1.2686.2.3.35	INTEGER	Read Only	Link monitor base to remote correlation power
	linkMonCorrPRtoB	1.3.6.1.4.1.2686.2.3.36	INTEGER	Read Only	Link monitor remote to base correlation power
System Commands	rebootCurrent	1.3.6.1.4.1.2686.2.4.1	INTEGER	Read/Write	Reboot current system image: 1 = reboot
	rebootImage	1.3.6.1.4.1.2686.2.4.2	DisplayString (0..15)	Read/Write	Reboot specified system image: system image file name
	rebootNewRfConfig	1.3.6.1.4.1.2686.2.4.3	INTEGER	Read/Write	Reboot new RF configuration: 1 = reboot
	restFactConfReboot	1.3.6.1.4.1.2686.2.4.4	INTEGER	Read/Write	Restore factory configuration and reboot: 1 = restore
	saveConfToFlash	1.3.6.1.4.1.2686.2.4.5	INTEGER	Read/Write	Save current configuration to flash: 1 = save
	resetRadioStats	1.3.6.1.4.1.2686.2.4.6	INTEGER	Read/Write	Reset radio statistics: 1 = reset
	resetEthernetStats	1.3.6.1.4.1.2686.2.4.7	INTEGER	Read/Write	Reset Ethernet statistics: 1 = reset

Appendix E: Configuration Via the Web

Overview

The AWE 120-58 is remotely configurable via the Web using a standard Web browser. All configuration parameters described in previous sections are configurable through this graphical interface.

This section explains the process of accessing the web pages provided and comments on the layout of these pages, noting the differences between the Web interface and the menu interface.

Accessing the Web Pages

To start a configuration session via the Web

1. On your PC, open a web browser application and specify the IP address of the unit you wish to access in the URL field. For example, if the IP address of the unit is 192.168.1.100, the URL specified is: **http://192.168.1.100**. Press **Enter** to load the page.
2. A login prompt should now appear, requesting for a user name and password. Leave the user name blank. For the password field, enter the same password used to access the menu interface. Click on **Enter** to submit your password.
3. If the password is accepted, the main web interface screen should appear. Follow the instructions provided to continue your configuration session.

Web Interface

Configuration Interface

The layout of Web pages provided mirrors the layout of the menu interface; parameters grouped together in submenus described in previous sections are similarly grouped together in web "subpages". Links to these pages are provided after user authentication is complete via a menu bar.

Unit configuration is achieved by filling out forms provided by each configurable subpage. These pages are accessed by clicking on appropriate links in the menu bar. Pressing a form submit button will send your entry data to the unit for processing. Specified parameters are then updated (pending valid input and access permission), and any requested tasks are run.

Differences Between the Menu Interface

The one appreciable difference between the menu interface and the Web interface is the statistics submenu. For the Web interface, Link Monitor Statistics and RF/Ethernet Statistics, two distinct menus in the menu interface, are combined into one subpage. The link for this page is **Monitor Statistics**, located in the menu bar.

Within this subpage, a link to **Real-Time Statistics** is provided. Accessing this link will load a *JAVA* ™ applet. This applet will query the unit periodically and report back to you via a live-update graphical statistics display.

Note: Depending on the version of your browser, the **Real-Time Statistics** link may prompt you to install a *JAVA*™ Plug-in. If you receive this prompt and wish to load the Plug-in, your computer must have access to the Internet.

Appendix F: Upgrading Software

If necessary, you can upgrade the software of a AWE 120-58. This section explains how to use FTP to download a new software image to a AWE unit.

Before you can download a new software image you need the following items.

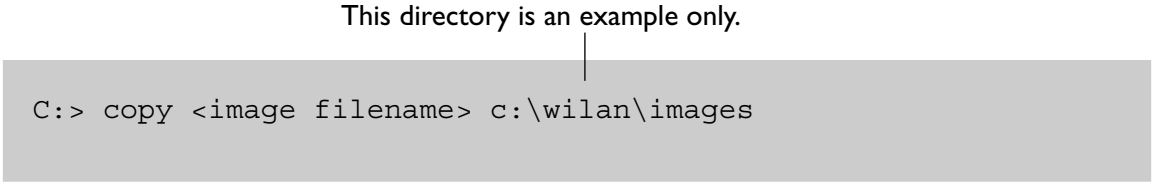
- A copy of the software image file
- A PC connected to the AWE unit via the network
- Basic network software installed on your PC, including ftp, ping, telnet, SNMP manager (optional)

Obtaining New Software Images

New software image files are available from the Wi-LAN support web page at www.wilan.com.

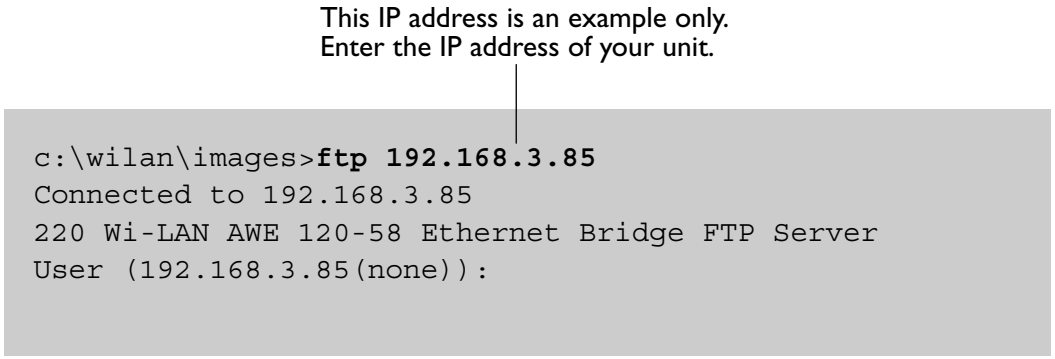
Downloading Image Software

1. Obtain the new image files.
2. Open a DOS session on your PC. From Windows®, choose **Start**, **Programs**, **MS-DOS Prompt**.
3. Copy the new image files to a known directory, for example `c:\wilan\images`. (Create a new directory if a suitable directory does not already exist.)



4. Go to the directory by typing `cd c:\wilan\images` and press **Enter**.
5. List the contents of the directory. Type `dir` and press **Enter**. The names of image files should be listed in the directory.

6. Type `ftp <IP address>` and press **Enter** where the IP address is the address of the AWE unit. The PC connects to the unit.



Note: ftp must be installed on your PC.

7. Type `"awe"` and press **Enter**. The password prompt appears.

```
c:\wilan\images>ftp 192.168.3.85
Connected to 192.168.3.85
220 Wi-LAN AWE 120-58 Ethernet Bridge FTP Server
User (192.168.3.85(none)):awe
331 Password required
Password:
```

8. Type the supervisor password for the unit and press **Enter.** (Supervisor access is required to change unit settings–see *Setting Menu Passwords* , page 117). The `ftp>` prompt appears.

9. After the ftp prompt, type the following "put" command.

```
ftp> put .\<image filename>
```

Note: Leave a single space after "put."

where

.	Current directory that contains the image file (for example, `c:\wilan\images`)
`<image filename>`	Name of the image file

10. Press **Enter**. The image file transfers from the PC to the unit. The status of the transfer, the file size and the transfer time are displayed.

```
ftp>put .\<image 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
```

Tip: If you type `ftp> help`, online instructions for using ftp are displayed.

11. Type `bye` and press **Enter** to exit ftp and return to the DOS window.

12. Activate the new software image. See Activating New Software Images, below.

Activating New Software Images

After you download new image files to a unit, you need to configure the unit to operate from the new image rather than from the current image. If you are on-site, you can use the Main Menu to select the default image. See *Setting Default System Image* , page 122.

If you are at a remote location from the unit, you can use telnet to access the unit's configuration menu or use SNMP manager software (SNMP parameter = defaultImage) to choose the default image file. See *Appendix D: SNMP* , page 157.

Removing Old Software Images

To delete old software images from a AWE unit, you must use ftp to connect to the unit, log in as a "supervisor" and delete images using the "ftp delete" command. Images The amount of flash memory available to store images is limited. To see the amount of memory available, see *Viewing System Revision Information* , page 37.

Appendix G: Network Plan Template

The following template is suitable for planning a simple point-to-point or point-to-multipoint network. Fill out the "Base Station" section once. Make copies and fill out the "Remote Unit and Link Budget" section once for every remote unit.

Base Station Information

Configuration Information

Base Station Name:		Center Frequency:	
IP Address:		Security Passwords:	1_____ 2_____ 3_____ 4_____ 5_____
Subnet Mask:		Scrambling Code:	
Station Type:	Base Station	Acquisition Code:	
Station Rank:	*n* = number of remote units		

Site Information

Environment/shelter	
AC power access	
Grounding	
Ethernet access	
Notes:	

Antenna and Cable Requirements

Antenna type	
Model	
Antenna mounting location	
Transmission cable type	
Length (m)	

Total number of remote units _____

Notes:

Remote Unit Information and Link Budget

Remote Unit Name:		Center Frequency:	
IP Address		Security Passwords:	1_____ 2_____ 3_____ 4_____ 5_____
Subnet Mask:		Scrambling Code:	
Station Type:	Remote Unit	Acquisition Code:	
Rank:	*n* = unit number		

Path Information

LOS Availability	
Distance to Base Station	
Fresnel Clearance Required (m)	
Calculated Fade Margin	
Measured Fade Margin	
Notes	

Site Information

Environment/Shelter	
AC Power	
Grounding	
Ethernet access	
Notes:	

Antenna and Cable Requirements

Antenna Type	
Model	
Antenna Mounting Location	
Transmission Cable Type	
Length (m)	
Notes:	

Link Budget Calculation

Formulas:

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

or

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

and

Actual Fade Margin ≥ Desired Fade Margin

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:

(1) Tx Power = _____ dBm
(2) Rx Sensitivity = –81 dBm
(3) Tx Antenna Gain = _____ dBi
(4) Rx Antenna Gain = _____ dBi
(5) Propagation Loss for desired range of *n* km = ____ dB
(6) Tx Cable Losses = _____ dB
(7) Rx Cable Losses = _____ dB
(8) Tx Connector Losses = 1 dB
(9) Rx Connector Losses = 1 dB

Variable Calculations:

(10) System Gain = **(1)** – **(2)** = _____ dB
(11) Antenna Gains = **(3)** + **(4)** = _____ dBi
(12) Cable Losses = **(6)** + **(7)** = _____ dB
(13) Connector Losses = **(7)** + **(8)** = 2 dB

Actual Fade Margin Calculation:

Actual Fade Margin = **(10)** + **(11)** – **(5)** – **(12)** – **(13)** = _____ dB

Analysis:

A desired Actual Fade Margin ≥ 15 dB should be achieved

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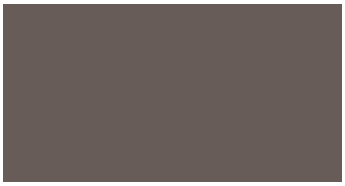
Product Code: 5700-0046-01

We are interested in your comments.

Please contact us by email at docfeedback@wi-lan.com if you have any comments about this user guide.



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