PacketWave

Fixed Wireless Broadband Access System

PacketWave 200 Series Subscriber Equipment

Installation and Operation Manual

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Regulatory Information

Part 15

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- this device may not cause harmful electromagnetic interference, and
- this device must accept any interference received including interference that may cause undesired operations.

FCC Notice: Radio and Television Interference

The PacketWave 200 Series Subscriber Equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used according to the instructions, 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 is found by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment or device.
- Connect the equipment to an outlet other than the receiver's.
- Consult a dealer or an experienced radio/TV technician for assistance.

RF Exposure Notice

The installer shall mount all transmit antennas so as to comply with the limits for human exposure to radio frequency (RF) fields per paragraph 1.1307 of FCC regulations. The FCC requirements incorporate limits for Maximum Permissible Exposure (MPE) in terms of electric field strength, magnetic field strength, and power density.

CAUTION:	5.8 GHz ISM — To comply with FCC RF exposure requirements, antennas used for this device must be installed to provide a separation distance of at least 1.5m from all persons to satisfy RF exposure compliance.

CAUTION:	2.5 GHz MMDS — To comply with FCC RF exposure requirements in section 1.1307, a minimum separation distance of 20 cm is required between this antenna and all persons.

Canadian Standards Compliance

This Class B digital apparatus complies with Canadian ICES-003

Cet appareil numérique de la classe B est conforme
à la norme NMB-003 du Canada

CE Notice

Declaration of Conformity

Aperto Networks Inc. of 1637 S. Main Street, Milpitas CA 95037, USA, declare under our sole responsibility that the product PacketWave 3.5 GHz system (3.4-3.7 GHz operation) to which this declaration relates, is in conformity with the following standards and/or other normative documents.

- EN 301 753
- EN301 489-4
- EN60950

We hereby declare that all essential radio test suites have been carried out and that the above named product is in conformity to all the essential requirements of Directive 1999/5/EC.

The conformity assessment procedure referred to in Article 10 and detailed in Annex [III] or [IV] of Directive 1999/5/EC has been followed with the involvement of the following Notified Body: Compliance Certification Services, 561F Monterey Road, Morgan Hill, CA 95037

CE 0984 ⓘ

The PacketWave 3.5 GHz system is approved in the following countries:

Country	Lower band	Upper band
Austria	3,510 - 3,549	3,560 - 3,599
Belgium	3,450 - 3,500	3,550 - 3,600
Denmark	3,410 - 3,490	3,510 - 3,590
Finland	3,410 - 3,500	3,510 - 3,600
France	3,465 - 3,495	3,565 - 3,595
Germany	3,410 - 3,580	
Greece	3,410 - 3,438 3,459 - 3,473 3,476.5 - 3,497.5	3,510 - 3,538 3,559 - 3,573 3,576.5 - 3,597.5
Iceland	3,400 - 3,600	
Ireland	3,410 - 3,4353,475 - 3,500	3,510 - 3,5353,575 - 3,600
Netherlands	3,500 - 3,530	3,550 - 3,580
Norway	3,413.5 - 3,500	3,513.5 - 3,600
Portugal	3,410 - 3,4383,600 - 3,800	3,510 - 3,538
Spain	3,400 - 3,460	3,500 - 3,560
Sweden	3,400 - 3,600	
Switzerland	3,410 - 3,500	3,510 - 3,600
UK	3,480 - 3,500	3,580 - 3,600

UL Information

CAUTION:	For the CATV system, the CATV installer should install in accordance with Article 820-40 of the NEC which provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close as possible to the point of cable entry as practical.

CAUTION:	The external exposed (outdoor) run of the cables, from the exit of the building to the antenna/radio assembly, should be less than 140ft, while the total cable run is as described in this manual.

CAUTION:	For the Model 1xx, the Subscriber Unit and its power supply is intended to be installed indoors in a dry location only. Only the Radio/Antenna assembly is intended to be installed outdoors.

CAUTION:	For the Model 2xx system, the Interface Box and its power supply is intended to be installed indoor only. Only the Radio/Antenna assembly is intended to be installed outdoors

Waste Electrical and Electronic Equipment (WEEE) Directive Compliance

Aperto Network products sold within the European Union (EU) are subject to the requirements of the Waste Electrical and Electronic Equipment (WEEE) Directive; as implemented by national legislation in each EU country. The objectives of the Directive are to reduce the environmental impacts of WEEE by promoting re-use and recycling, as an alternative to disposal.

From 13 August 2005, product placed on the EU market is required to be marked with the symbol shown below. This symbol indicates that end-of-life electronic equipment generated within the EU should not be mixed with other types of waste or placed in the general waste stream; but should be segregated for the purpose of re-use or recycling.

Preface

This manual is part of the documentation for the PacketWave broadband wireless system for delivering high-speed subscriber services. The PacketWave documentation set includes:

- PacketWave 1000 Base Station Unit Installation, Configuration, and Operation Manual: part number 10002690.
- PacketWave 100 Series Subscriber Equipment Installation and Operation Manual: part number 10002689.
- PacketWave 200 Series Subscriber Equipment Installation and Operation Manual: part number 10004880.

Scope of This Manual

This manual documents the installation and operation of the PacketWave 200 Series subscriber equipment with software version 4.1.

This manual provides the following information:

- A *QuickStart* section for rapidly placing PacketWave 200 Series subscriber equipment in operation.
- Descriptions of the PacketWave 200 Series hardware components.
- Complete site planning and installation instructions for PacketWave 200 Series subscriber equipment, including the indoor bridge/router unit and the outdoor radio/antenna unit.
- Descriptions of the PacketWave 200 Series software components, including the Web GUI and the Aperto Installation Manager, and instructions for using them.
- IP addressing guidelines for the local PC(s).
- Procedures for initializing the PacketWave 200 Series subscriber equipment.

Complete descriptions of the PacketWave System, its components, the installation of the cell site equipment, and overall system configuration and operation are provided in the *PacketWave 1000 Base Station Unit Installation, Configuration, and Operation* manual.

Conventions Used in This Manual

PacketWave manuals represent special kinds of text as follows:

- Files names and URLs are represented in italics, with variables described inside angle brackets. For example, if the URL http://<IP address>/bsu.htm is referenced, you will replace the variable <IP address> with the appropriate real IP address.
- Management interface text is represented in a bold font: for example, the Generate Config File button.
- Labels on equipment are represented in a bold font: for example, the Control connector.

WARNING: This format is used to indicate the possibility of personal injury or damage to equipment.

CAUTION: This format is used to indicate the possibility of system or equipment operation problems.

Items of special importance will be marked by a pointing-hand icon, as this paragraph is.

Intended Audience for this Manual

This manual is intended primarily for subscriber equipment installers. It also presents information of use to subscribers, including a discussion of the Web GUI.

Installation of radio equipment involves numerous factors requiring considerable expertise. It is assumed that equipment installers are professionals with a full understanding of the principles and standard practices and procedures of cell site installation, with all relevant safety requirements, and with applicable local building codes.

General Cautions and Warnings

Observe the following when installing or operating any PacketWave System components.

Carefully follow all local building and electrical codes, especially the latest revision of the National Electrical Code (NEC) and standard safety procedures for installing and working with this type of equipment. Improper procedures or installation can result in damage to the equipment or the building, and injury or death. If you are not sure about whether the installation follows these codes, contact a licensed building inspector or electrician in the area for assistance.

Always use quality components—including cables, connectors, mounts, etc.—specifically rated for your particular environmental conditions and system performance requirements.

Always use appropriate tools, and follow the instructions of the tool manufacturers.

All outdoor installation, including equipment mounting and cabling, should be performed by trained microwave radio technicians familiar with usual and customary practices and procedures.

Take extreme care to avoid contacting any overhead power lines, lights, and power circuits while you are installing the Outdoor Unit. Contact with any of these objects could cause injury or death. Do not install the Outdoor Unit near power lines.

Make sure that the outdoor radio/antenna is grounded in accordance with local, state, federal, and National Electrical Code (NEC) requirements. Pay special attention to NEC sections 810 and 820. See the instructions in Chapter 4 of this manual.

For the PacketWave 200 Series Interface Box, use an outlet that contains surge protection and ground fault protection, or use a surge protection device. This will protect the PacketWave 200 Series equipment connected to it from damage resulting from AC current surges, lightning, etc. For complete protection, all connections to the Interface Box (i.e., from radio/antenna and PC/hub) should be connected to a surge protection device. To ensure the best signal, use surge protectors designed for the specific application.

Because Aperto Networks cannot be responsible for improper installation or use of its equipment, failure to follow these and other published cautions and warnings may void your equipment warranty.

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QuickStart Guide

This chapter outlines the basic procedure for installing PacketWave 200 Series Subscriber Equipment and putting it into operation. It identifies the minimal requirements for getting the equipment up and running, and assumes that configuration using DHCP and WaveCenter™ Configuration Manager has been performed as described in the PacketWave 1000 Base Station Unit manual.

WARNING: Outdoor installation procedures should be performed by qualified professionals following all safety and other requirements and acting in accordance with standard practices and procedures. Failure to meet safety requirements and/or non-standard practices and procedures could result in personal injury and/or damage to equipment.

Step 1. Prepare for Installation

A. Before visiting the subscriber's site:

i. Make sure that the necessary system configuration has taken place (as described in the *PacketWave 1000 Base Station Unit* manual).

ii. Verify that the Subscriber Unit configuration file has been created using Configuration Manager and either saved on the BSU's TFTP server, or (for local configuration mode) saved on a disk and provide to the installer.

iii. Verify that the DHCP server has been configured with the Subscriber Equipment's IP and MAC addresses and its configuration file name. Make a note of the IP address for use during installation.

iv. Verify that the DHCP and TFTP servers have the appropriate route to the Subscriber Unit installed.

v. To perform PC-less installation using the auto-alignment feature, use the Aperto Installation Manager (AIM) utility in Provision mode to pre-configure the Subscriber Unit. For local configuration mode (see step ii above), click on Import CM database and specify the configuration file location and name.

B. At the subscriber's site:

i. Identify the location for the Interface Box, close to an AC power source.

ii. Identify an appropriate location for mounting the Outdoor Unit (ODU). In most cases, the unit should be pointed at the base station with the least possible obstruction.

iii. Determine the cable path between the Interface Box and the Outdoor Unit. Maximum cable length is 50 m (165 ft) or 100 m (330 ft), depending on cable type (see Table 3-A).

Step 2. Install the Interface Box

A. Run the Ethernet cable from the location for the ODU to the location for the Interface Box. Leave plenty of slack. Place the protective rubber boot at the outdoor end. Terminate both ends with shielded RJ-45 connectors.

It is highly recommended that the cable is verified using a cable tester before connection and power-up.

B. Plug the power supply attached to the Interface Box into an AC power outlet.

C. Connect the cable from the ODU into the RJ-45 jack labeled **ODU**.

Step 3. Install the Outdoor Unit (ODU)

A. If a mounting pole or other support is to be employed, install it in the chosen location, following standard procedures and local building codes. The Outdoor Unit's standard mounting bracket accommodates pole diameters of 1.5 or 2 inches (3.8 or 5.1 cm).

B. Mount the Outdoor Unit to the pole or other support or to the building.

WARNING: Lightning protection is recommended for subscriber equipment. Instructions and an example are contained in the document titled *Surge Protection for PacketWave Products*, included on the CD that accompanies the equipment. (If the CD or document were not provided, contact Aperto Customer Service.) Lightning damage is not covered by the product warranty.

C. Connect the cable from the Interface Box into the RJ-45 jack on the ODU. (See Appendix E for cable details.) Make sure the boot is properly seated in the mating flange cutout. The boot should be flush with the radio housing. Secure the boot to the radio housing with the screws provided. Secure the exit point of the cable from the boot with a cable tie.

WARNING: There is DC power on the Interface Box's ODU port. Connecting this port to a PC or switch will cause permanent damage to the device.

Step 4. Align the Antenna

A. Verify that the Ethernet cable from the Interface Box to the Outdoor Unit is properly connected.

B. If the PacketWave 200 has been pre-provisioned as described in Step 1, the Outdoor Unit will begin beeping, indicating that it is in auto-alignment mode. (If beeping does not occur, the PacketWave 200 has not been pre-provisioned, and you will need to use the AIM to align the antenna as described in Chapter 5.)

C. Initially, the audio signal will alternate between a long beep and a long silence. The beep is an audio indication of the strength of the signal being received from the base station. As signal reception gets stronger, the beeps increase in pitch and frequency, becoming a continuous tone when the signal is optimal.

D. Adjust the position of the ODU for the highest pitch and frequency of the beeping, ideally finding a position which results in a continuous tone. Secure the ODU in that position.

E. When the ODU receives a continuously strong signal for one minute (specifically, when the signal-to-noise ratio is higher than 16 dB and the signal strength is greater than -88 dB without varying by more than 2 dB for one minute), the PacketWave 200 will become operational with an audio tone similar to a telephone ringing.

F. If such a signal is not obtained, auto-alignment mode will last until power is removed, and the PacketWave 200 will not become operational. Antenna alignment will have to be performed using the Aperto Installation Manager as described in Chapter 4.

Step 5. Configure Subscriber Hosts

A. Connect the subscriber's hub/switch or computer to the RJ-45 jack labeled **LAN** on the Interface Box.

- Use a straight Ethernet cable for connection to a hub/switch or a crossover Ethernet cable for connection directly to a computer.

B. The Subscriber Unit has a built-in DHCP server when it is in NAT or router mode (PacketWave 120 and 130). The DHCP server is enabled by default and can support a maximum of 100 users on the subscriber's LAN. If the DHCP server will be used, configure this feature using the Configuration Manager, and configure the host's TCP/IP to obtain its IP address using DHCP.

C. Alternatively, the host may be statically configured with an IP address, default gateway, and DNS server. If the Subscriber Unit is in bridge mode, the default gateway could be the IP address of the Base Station's Wireless Subsystem (WSS) that the Subscriber Unit connects to. For a Subscriber Unit in NAT or router mode, the default gateway for the subscriber's hosts is the Subscriber Unit's LAN IP address.

NOTE: To fully remove a Subscriber Unit from deployment, the configuration file must be removed from all TFTP servers. DHCP server must download configuration information before it becomes operational. This is performed by TFTP proto-

col, which is routed. Two IP addresses may be given for the TFTP server to provide for redundancy.

Overview

As part of Aperto Networks' PacketWave Broadband Multiservice Wireless Access System, PacketWave 200 Series Subscriber Units delivers high-speed, always-on Internet access to small and medium-sized businesses, small offices/home offices (SOHO), and residences.

Models and Functionality

There are three models in the PacketWave 200 Series:

- The PacketWave 210 operates in bridging mode, supporting up to 5 hosts and 4 service flows. It is ideal for residential subscribers.
- The PacketWave 220 operates in bridging and NAT modes, supporting up to 20 hosts and 4 service flows. It is ideal for small office/home office (SOHO) subscribers.
- The PacketWave 230 operates in bridging, NAT, and IP routing modes, supporting up to 254 hosts and 16 service flows. It is ideal for small and medium enterprises.

Figure 2-1 graphically illustrates the applications of the three PacketWave 200 models.

VLAN and PPPoE/PPP

All PacketWave 200 models support VLAN mode, essentially a variation of bridging mode. In bridging mode, VLAN-tagged frames are transmitted and received transparently (VLAN pass-through). In VLAN mode, the PacketWave 200 functions as a bridge, but with the ability to tag untagged frames from the Ethernet port with VLAN ID and user priority and to strip tags from VLAN-tagged frames received at the wireless interface.

In NAT mode, the PacketWave 220 and 230 can be configured to support PPP over Ethernet (PPPoE). These PacketWave models include a built-in PPPoE client, eliminating the need for each host to have a PPPoE client and to originate connections by logging in.

For more about VLAN and PPPoE, see the PacketWave 1000 Base Station Unit Manual.

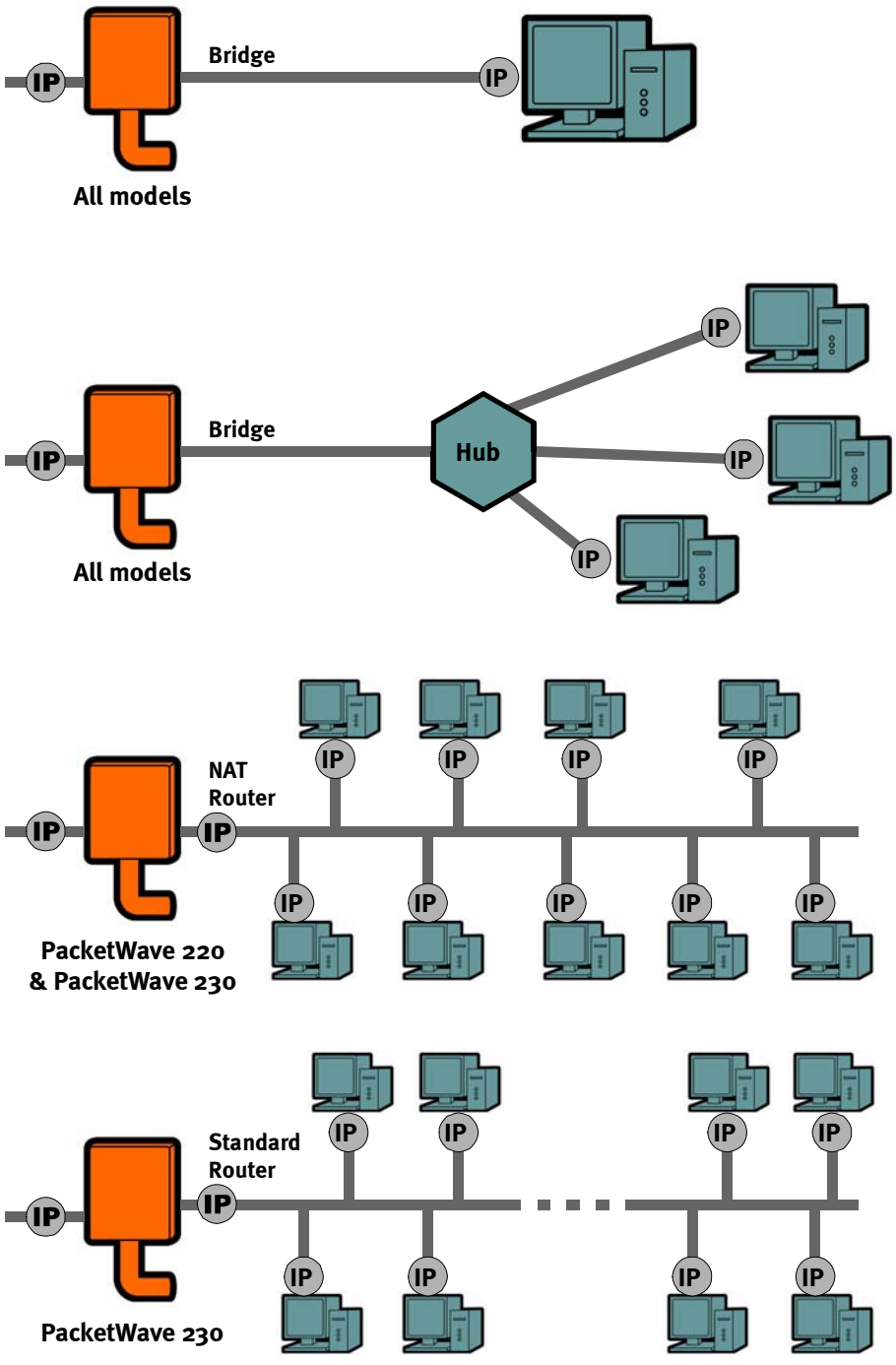

Figure 2-1 PacketWave 200 Series Operating Modes

Subscriber Equipment

PacketWave 200 Series subscriber equipment consists of a main Outdoor Unit (ODU) and a small indoor Interface Box, as shown in Figure 2-2.

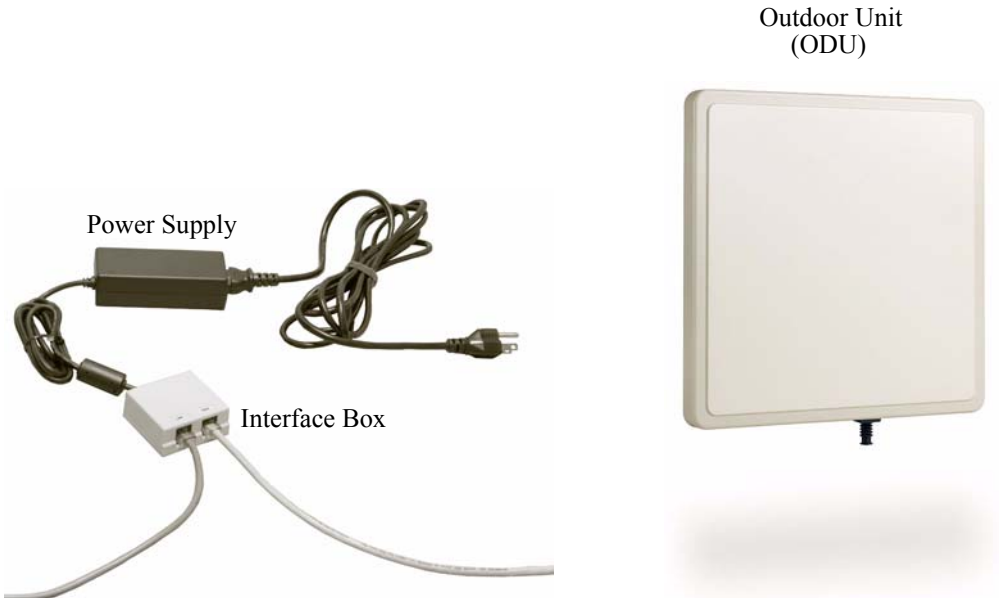

Figure 2-2 PacketWave 200 Series Subscriber Equipment

Outdoor Unit

The outdoor portion of the subscriber equipment consists of a single unit, approximately 9 inches square, containing the radio, antenna, and bridge/router. Different versions support various frequency bands:

- 2.5 GHz MMDS
- 3.5 GHz FWA
- 5.3 GHz
- 5.8 GHz ISM

The ODU must match the frequency band employed at the base station.

ODUs mount easily on a home or office roof, under the eave, or even in a properly-situated window. Depending on distance, a line-of-sight path may not be required for establishment of a wireless link between the subscriber and the base station. PacketWave's OptimaLink technology minimizes the effects of obstructions in the path between the subscriber's antenna and the base station antenna.

The ODU antennas are directional, with a beam width of 17° to 20° horizontally and vertically depending on frequency. The width of this beam, combined with the width of the base station antenna beam (90° or 60°), means that only rough alignment of the antenna is needed for establishing a wireless link, though accurate alignment is important for maximum signal quality.

Automatic Frequency Selection

The PacketWave 200 Series supports Automatic Frequency Selection (AFS), which helps to ensure optimal performance in less-than-optimal conditions. A total of up to 20 frequencies within the unit's frequency band can be selected. With AFS, when interference degrades performance on the primary frequency, the BSU will automatically shift the link to a frequency providing satisfactory performance using QPSK.

Indoor Unit

The Indoor Unit (IU) is a power injection box for the Aperto 200 series. It is an intelligent device that insures power will only be injected towards the Outdoor Unit (ODU) and not to a computer or router. The IU is marked LAN and ODU ports to avoid confusion while connecting the IU, ODU, and computer or router. Also, IU uses standard power-over-Ethernet cabling and therefore is limited to a maximum of 100 meters. The amount of power required for the long-range radios is higher. Further, IU provides 36 V at 1.11 Amps yielding 40 Watts of power. Please do not attempt to use third part power injectors with the PacketWave 200 series products.

If the resistance that shows the unit connected to the ODU port is not correct, no power will be put on the CAT-5 cable. When the power is put on the cable, the IU will display a green LED signifying power is being transmitted. The LED is not a link status light. An orange LED shows there is an error in the connection.

Interface Box

The Interface Box is a small, free-standing unit which can be placed virtually anywhere within the subscriber's premises, subject to the following basic requirements:

- The unit must have access to AC power.
- The cable run to the Outdoor Unit can be up to 100 m (330 ft) with proper cable. See Appendix E for cable details.

The Interface Box has two RJ-45 connectors for connecting to the Outdoor Unit (ODU) and the hub, switch, or PC on subscriber's LAN.

NOTE: These connectors are extensions of the Ethernet port on the ODU. The Interface Box does not regenerate Ethernet signals as an Ethernet hub does. In

addition, the ODU port on the Interface Box provides power to the ODU via the Ethernet cable connecting the units.

WARNING: There is DC power on the Interface Box's ODU port. Connecting this port to a PC or switch will cause permanent damage to the device.

The Interface Box comes with an external power supply and power cord that plugs into a standard AC wall plug (120 or 220 volts).

On PacketWave 100, and 200 series there is no serial interface. If the Ethernet port of the computer or router connected to the 100 or 200 series cannot auto-negotiate (standard practice) and requires static setting, it cannot be performed if the wireless link is down. This rarely happens because the 100/200 will set the Ethernet interface to theslowest possible value (10 Mbits, half-duplex). This should allow enough flexibility and communication to change the static setting.

Management, Configuration, and Diagnostics

The PacketWave 200 includes a number of features which provide management, configuration, and diagnostic functions. They range from LEDs to a Web-based graphical user interface, and include:

- LEDs — LED indicators on the Outdoor Unit and Interface Box show status of the LAN and wireless interfaces as well as power to the unit.
- Audio Auto-Alignment - Simplifies antenna.
- Installation Manager — This utility initializes newly-installed subscriber equipment and allows antenna alignment for optimal wireless communication. Use of the Installation Manager is described in Chapter 5.
- Web GUI — Each PacketWave 200 includes a graphical user interface (GUI) which can be accessed via a standard Web browser, either directly or through the Base Station Unit's Web GUI. Use of the Web GUI for configuration, status, and performance monitoring is described in Chapter 6.
- SNMP Agent — Each PacketWave 200 includes an SNMP agent which can be accessed via a standard SNMP manager, either directly or through the Base Station Unit's proxy agent.
- Diagnostic Manager — This utility provides diagnostic testing of the subscriber equipment. Use of the Diagnostic Manager is described in Appendix C.
- Command Line Interface — For basic diagnostics, a limited command line interface (CLI) to the PacketWave 200 can be accessed via telnet. Use of the CLI is described in Appendix D.

SU Configuration

SU configuration can be done in server mode or in local mode:

- In local mode, the SU's configuration is performed using the Aperto Installation Manager (AIM). No configuration file is downloaded from the BSU's TFTP server.
- In server mode, subscriber equipment is provisioned using the WaveCenter Configuration Manager, as described in the *PacketWave 1000 Base Station Unit Installation, Configuration, and Operation* manual. On boot-up, after getting address and file information from its assigned DHCP server, the PacketWave 200 downloads its configuration file from the base station's TFTP server.

PacketWave 200 should be appropriately be configured in Server mode. They receive their IP address and configuration information from a DHCP server. DHCP entries should be reserved to the MAC address of the deployed/provisioned Aperto equipment. PacketWave 200 should be configured with infinite leases. This is highly appropriate since you never want to give this IP address to another device in the network.

Some configuration of the PacketWave 200 can be performed via the Web GUI and SNMP. If desired, these configuration changes can be made permanent by uploading them to the SU configuration file on the TFTP server. (If configuration changes are made via the Web GUI or SNMP but not uploaded, they will be lost when the PacketWave 200 is reset or re-powered.) Uploading configuration changes made via the Web GUI or SNMP is a convenient way to modify the configuration file of an in-service PacketWave 200.

Configuration uploads from the Web GUI and SNMP require that the TFTP server be configured to accept uploads.

NOTE: Advanced Installation Manager (AIM) will allow the installer to configure a Subscriber Unit (SU) in local mode by providing appropriate IP addresses and configuration parameters. It always uses the default configuration file for the unit. Aperto highly suggests only using server mode for the Subscriber Unit.

Built-In Server, Client, Agent, and Router Functions

Servers, agent/client, and router functions are built into PacketWave 200:

- DHCP Client — All PacketWave Series 200 models include a Dynamic Host Configuration Protocol (DHCP) client for local address management by the Base Station Unit's assigned DHCP server.
- DHCP Server — PacketWave 220 and 230 models include a Dynamic Host Configuration Protocol (DHCP) server for local address management.
- NAT Server — PacketWave 220 and 230 models include a built-in NAT (Network Address Translation) server.
- IP Router — PacketWave 230 models include a built-in IP router.
- SNMP Agent — All PacketWave Series 200 models include an SNMP agent for integration of the PacketWave network into an SNMP management system.

- PPPoE Client — PacketWave 220 and 230 models include a built-in PPPoE (PPP over Ethernet) server.

PacketWave 200 LEDs

The LEDs on the Outdoor Unit and Interface Box provide operational information as described in Table 2-A.

Table 2-A PacketWave 200 LEDs

LED		Indications
Outdoor Unit	Left	Wireless Tx: *Blinks* on Wireless transmit activity.
	Middle	Wireless Rx: *Blinks* on Wireless receive activity.
	Right	*On* when Ethernet link is up; *Off* when it is down.
Interface Box	ODU Port, left	*On* when the Interface Box is powered on.
	ODU Port, Right	*On* when power is provided to the Outdoor Unit.
LEDs for the LAN port on the Interface Box are always off.		

SNMP

Each PacketWave 200 includes an SNMP agent supporting the following MIBs:

- SNMP MIB (RFC 1157)
- MIB II (RFC 1213)
- Aperto private MIB

The complete MIBs are provided on the PacketWave CD, and are available on the Aperto Web site, *www.apertonet.com*.

SNMP can be used to read configuration, status, and performance data from Subscriber Units. In addition, SNMP can be used to change some configuration parameters (those which can be changed via the Web GUI), and to upload the configuration changes to the TFTP server (if the TFTP server is configured to accept uploads).

The SNMP agents support trap reporting. Trap-reporting parameters can be specified via the Configuration Manager and the Web GUI as well as via SNMP.

Event Reporting

The PacketWave 200 offers several means of reporting subscriber equipment events:

- E-mail messages — The PacketWave 200 can be configured (via the Configuration Manager, the Web GUI, or SNMP) to report events via e-mail to specified addresses.
- SNMP traps — The PacketWave 200 SNMP agent supports trap reporting. Trap-reporting parameters can be specified via the WaveCenter Configuration Manager, the Web GUI, or SNMP.
- Syslog — The PacketWave 200 supports logging of event messages to a designated server according to the Syslog protocol. If Syslog is employed, the Syslog server must be identified in the Subscriber Unit configuration file created using the WaveCenter Configuration Manager.

Use of Syslog is strongly recommended as a means of providing a record of system events for performance management and troubleshooting.

- Event log — A historical event log can be displayed on request via the Web GUI.

For information about specific PacketWave 200 events which can be reported, see Appendix B.

Site Planning

There are three basic site-planning issues which must be decided before you begin installation:

- Location of the Interface Box.
- Location and mounting method of the Outdoor Unit.
- Cable path between the Interface Box and the Outdoor Unit.

Location of the Interface Box

Typically, the Interface Box is located near the subscribers hub or computer. However, the Ethernet cable to the local computer or hub can be up to 100 m (330 ft) in length.

Location of the Outdoor Unit (ODU)

For optimal wireless channel performance, it is advantageous to locate the PacketWave 200 Outdoor Unit where it has the least-obstructed path to the base station antenna. If a line-of-site path is available, locate the Outdoor Unit where the path is least likely to be affected by such obstructions as blowing branches, seasonally changing foliage, etc. If a clear line-of-site path is not available, choose a path that minimizes obstructions.

Fine-tuning of the antenna alignment is performed using the Aperto Installation Manager utility, as described in Chapter 4 of this manual.

Other factors to consider when choosing a location for the Outdoor Unit include:

- Distance to the Interface Box — Locate the Outdoor Unit so that cables to the Interface Box will be within the maximum cable length limit as described in Table 3-A.
- Cable routing — Consider how cables from the Outdoor Unit will enter the building.

- Accessibility — If possible, choose a location that is relatively accessible, which will simplify installation and any adjustment or repair in the future.
- Mounting method — The Outdoor Unit's standard mounting bracket supports mounting on a pole that is 1.5 inches (3.8 cm) or 2 inches (5.1 cm) in diameter. For other mounting options (under an eave or on a chimney, for example), mounting hardware may be adapted or replaced as necessary. Any alternate mounting method should allow adequate adjusting of the antenna direction, both horizontally and vertically.

Cables and Cable Path

For PacketWave 200 installation, you will need the cables indicated in Table 3-A. See Appendix for additional details about the cable from the Interface Box to the ODU.

Table 3-A Subscriber Site Cable Requirements

Connection	Qty	Cable Type	Max. Length	Connectors
Interface Box to ODU	1	Shielded outdoor-rated Cat 5	50 m (165 ft)	RJ45 male (2)
		Shielded outdoor-rated Cat 5E	100 m (330 ft)	RJ45 male (2)
Ethernet to Computer/Hub	1	Cat 5 Ethernet cable: crossover for computer, straight-through for hub	Per cable specifications	RJ45 male (2)

Specific models of cable are listed in a document titled **Cables for PacketWave Products**, included on the PacketWave CD that accompanies the equipment.

Choose the path along which the cable will run between the Interface Box and the Outdoor Unit. Carefully consider both the outdoor and indoor portions of the cable run. Decide how the cable run will be secured, how it will enter the building, and whether it will include wall jacks. Consider all local building codes and standard construction practices when planning the cable path.

Subscriber LAN/Computer

If the PacketWave 200 is functioning in NAT mode, addresses on the local subnet (i.e., LAN) will not be visible beyond the subscriber's subnet. The PacketWave 200 can become a DHCP server for hosts on the subscriber's subnet. In addition, in the default setting, the PacketWave 200's DHCP server will use the DNS server address supplied by the system's DHCP server to resolve network addresses.

4

Subscriber Equipment Installation

Installing the PacketWave 200 Series Subscriber Equipment consists of the following steps:

1. Determining the locations for the Interface Box and Outdoor Unit (ODU).
2. Mounting and grounding the ODU.
3. Installing the Ethernet cable between the Interface Box and ODU.
4. Optimizing the direction of the antenna using the audio auto-alignment mode.
5. Connecting the Interface Box to the subscriber's computer or LAN, and to AC power.
6. Configuring the subscriber's PC or LAN.
7. If the audio auto-alignment mode was not used or was not successful, using the Aperto Installation Manager utility to optimize the direction of the antenna.

Connectors on the Interface Box and Outdoor Unit are shown in Figure 4-1 and Figure 4-2, respectively.

NOTE: Connectors and/or markings on some units may be slightly different in appearance from those shown in the figures.

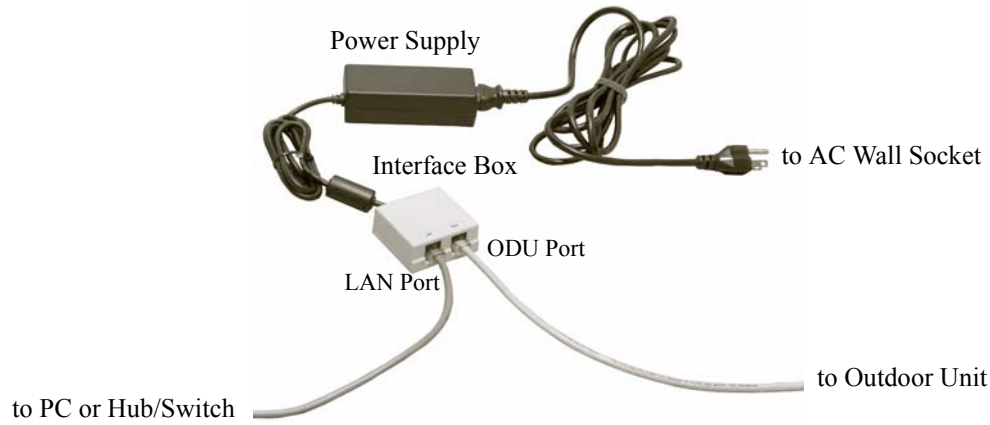

Figure 4-1 Interface Box Connections

Figure 4-2 Outdoor Unit Connector

Installation Requirements

You will need the following tools and supplies when installing the PacketWave 200:

- Drill (for cable entry through walls, etc.)
- Phillips screwdriver
- Wrench (7/16 inch)
- Cabling tools
- Cable tester (capable of testing 10Base-T and EIA/TIA 568B)
- Cable ties, staples, or clamps for dressing cables
- Silicone sealant

You will also need the following cables and connectors:

- Shielded Cat 5 or Cat 5E cable (outdoor rated), long enough to run between the Interface Box and the Outdoor Unit, with rubber connector boot and two shielded RJ45 male connectors. See Appendix for cable details.
- Ethernet cable with RJ45 male connectors (straight-through for connection to hub, or crossover for connection to computer).

You may also need a PC (laptop highly recommended) with the Aperto Installation Manager utility installed. The Installation Manager can be used for configuration and to fine-tune the alignment of the antenna (Outdoor Unit) for optimal communication with the base station. If the PacketWave 200 is pre-provisioned, however, the audio auto-alignment mode can be used for antenna alignment, and a PC connection will not be required for installation.

Mounting the Outdoor Unit

The Outdoor Unit (ODU) includes a rear-mounted bracket as shown in Figure 4-3. This standard mounting bracket allows the ODU to be mounted on a pole or antenna mast with a diameter of 1.5 or 2 inches (3.8 or 5.1 cm). Aperto also offers an alternate bracket, as illustrated in Figure 4-4.

Other mounting options, such as under an eave or in a window, can also be employed. In such cases, appropriate mounting hardware must be obtained.

WARNING: Outdoor installation procedures should be performed by qualified professionals following all safety and other requirements and acting in accordance with standard practices and procedures. Failure to meet safety requirements and/or non-standard practices and procedures could result in personal injury and/or damage to equipment.

To mount an Outdoor Unit on a pole using the standard bracket shown in Figure 4-3:

1. Locate the mounting holes for the standard bracket on the back of the ODU. There are two sets of holes, allowing the mounting bracket to be oriented vertically or at 45 degrees. Choose the best orientation, making sure the RJ45 connector will be at the bottom of the ODU when it is mounted.
2. Attach the L-bracket to the back of the ODU using the three screws provided.
3. Remove the bolt that holds the clamp closed.
4. Position the clamp around the pole in the desired location. Install and tighten the clamp bolt to secure the clamp to the pole.
5. Position the ODU with attached L-bracket so that two bracket bolts on the clamp fit through the mounting hole and slot on the L-bracket. Using the washers and nuts provided, secure the L-bracket to the clamp.
6. Adjust the azimuth and elevation orientation of the radio/antenna as necessary by loosening the appropriate nuts, repositioning the ODU, and tightening the nuts.

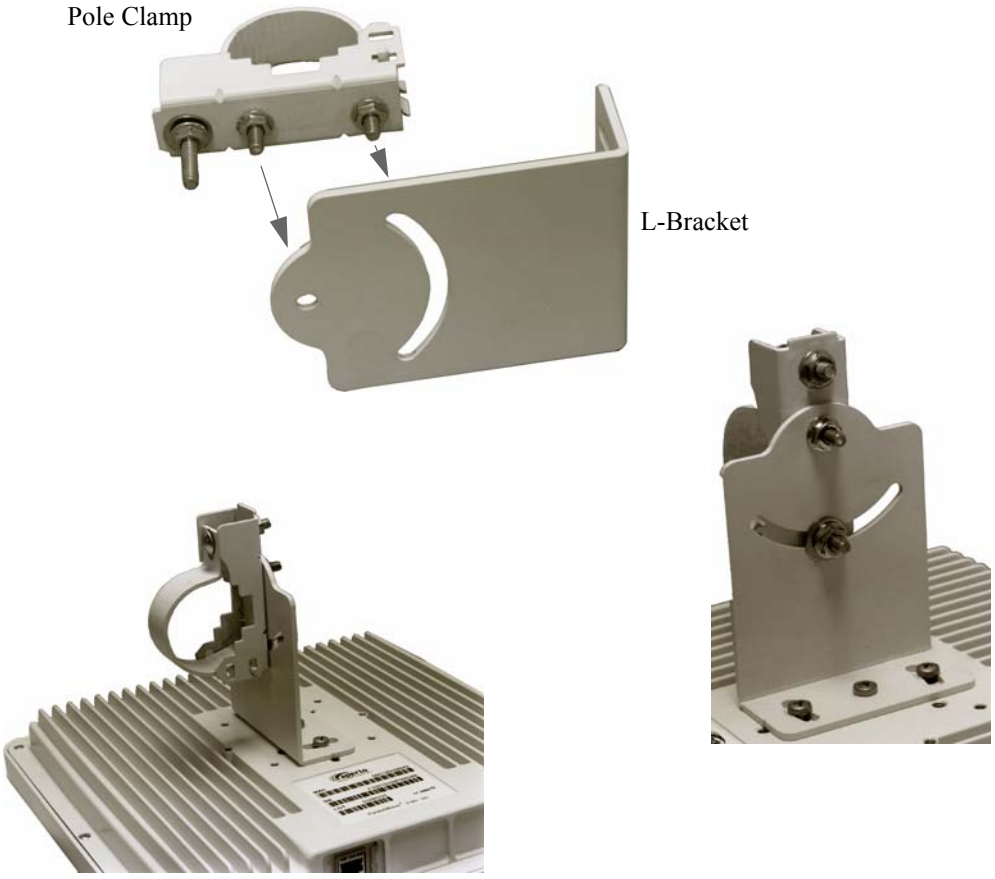

Figure 4-3 Standard ODU Mounting Bracket

To mount an Outdoor Unit on a pole using the alternate bracket shown in Figure 4-4:

1. Locate the appropriate mounting holes for the alternate bracket on the back of the ODU.
2. Attach the mounting bracket to the ODU using the four screws provided.
3. Remove the two bolts that hold the pole clamp closed.
4. Position the clamp around the pole in the desired location. Install and tighten the clamp bolts to secure the clamp to the pole.
5. Adjust the azimuth and elevation orientation of the radio/antenna as necessary by loosening the appropriate nuts, repositioning the ODU, and tightening the nuts.

Figure 4-4 Alternate ODU Mounting Bracket

Grounding the Outdoor Unit

Grounding of the outdoor radio/antenna is an essential part of the installation process. A proper grounding circuit is illustrated in Figure 4-5.

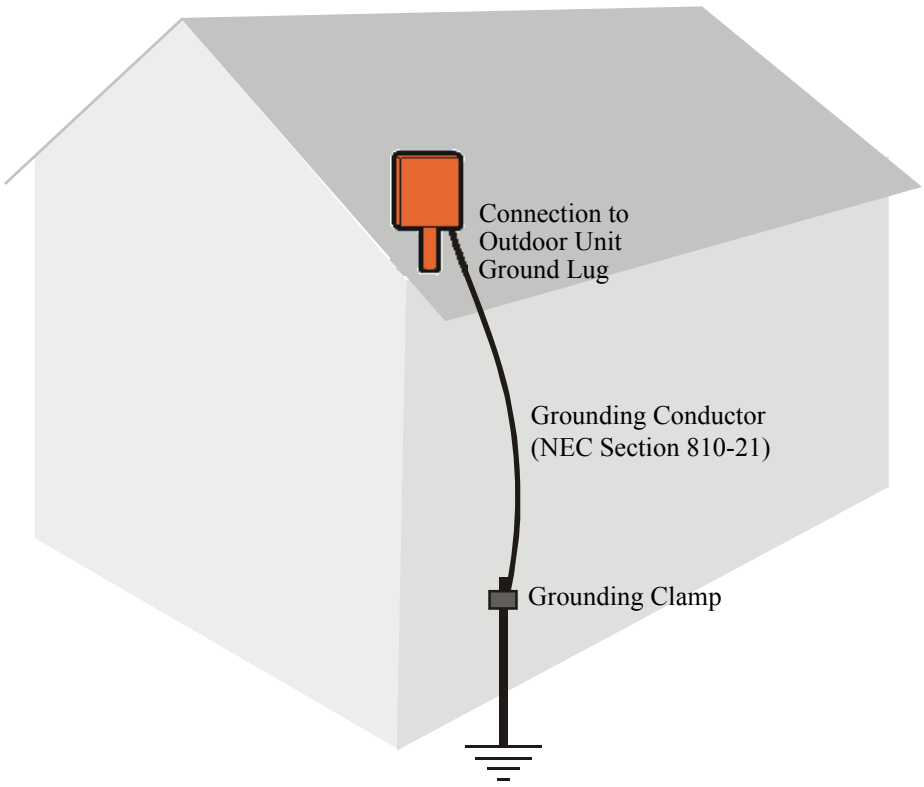

Figure 4-5 Grounding the Outdoor Unit

WARNING: Lightning protection is recommended for subscriber equipment. Instructions and an example are contained in the document titled *Surge Protection for PacketWave Products*, included on the PacketWave CD that accompanies the equipment. (If the CD or document were not provided, contact Aperto Customer Service.) Lightning damage is not covered by the product warranty.

To properly ground the Outdoor Unit:

1. Locate the grounding lug on the ODU, as illustrated in Figure 4-6.
2. Provide a proper grounding conductor (NEC Section 810-21) long enough to reach from the Outdoor Unit to the earth ground.
3. Attach one end of the conductor to the lug on the ODU.
4. Connect the other end of the grounding conductor to an appropriate earth ground using a grounding clamp.

If you install a grounding electrode separate from the power service grounding electrode system, connect the separate electrode to the grounding system in accordance with the National Electrical Code (NEC) and local electrical codes.

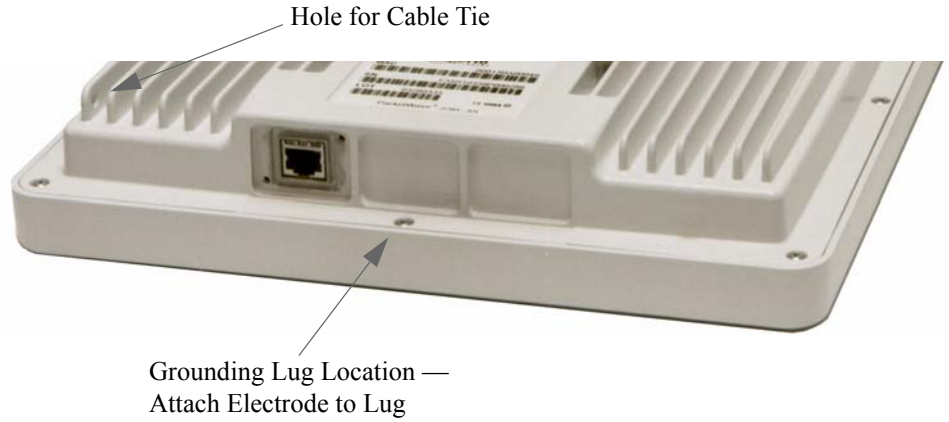

Figure 4-6 Location of Grounding Lug on Outdoor Unit

Positioning the Interface Box

Position the Interface Box in a suitable location (typically an out-of-the-way location near the subscriber's computer or LAN hub/switch) within reach of an AC wall socket.

Connecting the ODU to the Interface Box

A single cable connects the Outdoor Unit to the Interface Box, providing an Ethernet link as well as power from the Interface Box to the ODU. The cable should be shielded outdoor-rated Cat 5 or Cat 5E with an RJ45 male connector (plug) at each end, and can be up to 50 m (165 ft) in length with Cat 5 cable, or up to 100 m (330 ft) with Cat 5E. See Appendix for cable details.

NOTE: For outdoor-to-indoor connections, the order of the steps in the installation procedure will vary depending on a number of factors, including site particulars and installers' preferred practice. For example, in some cases it may be best to run unterminated cable and then attach connectors; in others it may be more efficient to attach one or both connectors to the cable before running it, or to use a pre-assembled cable. Also, cable dressing at various locations may be best performed at different points in the procedure. Therefore, the procedures given for these connections should be taken as a list of necessary steps and a suggested order, and modified as appropriate for your particular circumstances.

1. Obtain an appropriate length of cable, and run it from the Interface Box to the Outdoor Unit. Include a service/drip loop as appropriate.
2. Place the supplied rubber boot over the outdoor end of the cable.
3. Install a shielded RJ45 male connector on each end of the cable, making sure to connect the cable shield to the RJ45 ground shell.
4. Plug the cable into the RJ45 socket on the Outdoor Unit as shown in Figure 4-7.
5. Make sure the boot is properly seated in the mating flange cutout. The boot should be flush with the radio housing. Secure the boot to the radio housing with the screws provided. Secure the exit point of the cable from the boot with a cable tie.
6. Dress the conductor using a cable tie through the hole illustrated in Figure 4-6, ensuring that the cable does not hang unsupported from the connector.
7. Attach the cable to the ODU connector on the Interface Box as shown in Figure 4-8.

WARNING: There is DC power on the Interface Box's ODU port. Connecting this port to a PC or switch will cause permanent damage to the device.

8. Seal the entry of the cable to the building as appropriate.

Figure 4-7 Connection to the Outdoor Unit

Figure 4-8 Interface Box Connection from Outdoor Unit

Connecting to the Local Computer or LAN

To connect the Interface Box to the subscriber's computer(s):

1. Provide an appropriate Cat 5 Ethernet cable with an RJ45 male connector at each end. Use a straight-through cable for connection to a hub or switch. Use a crossover cable for connection directly to a computer. (See Table 4-A for pinouts.)
2. Plug one end of the Ethernet cable into the RJ45 socket labeled LAN on the Interface Box, as illustrated in Figure 4-9.
3. Plug the other end of the Ethernet cable into the socket on the local hub, switch, or computer.

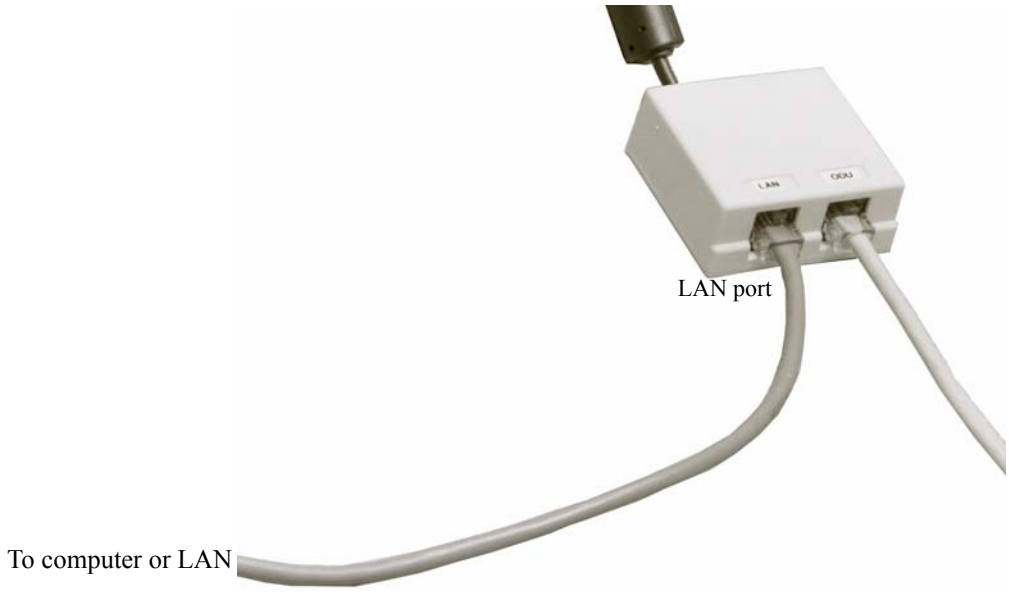

Figure 4-9 Subscriber Ethernet Connection

Table 4-A Ethernet Cable Pinouts

Straight Cable (to Hub or Router)		Crossover Cable (to PC)	
Pin 1: Tx+	Pin 1: Rc+	Pin 1: Rc+	Pin 3: Tx+
Pin 2: Tx-	Pin 2: Rc-	Pin 2: Rc-	Pin 6: Tx
Pin 3: Rc+	Pin 3: Tx+	Pin 3: Tx+	Pin 1: Rc+
Pin 6: Rc-	Pin 6: Tx-	Pin 6: Tx-	Pin 2: Rc-

Powering Up the PacketWave 200

WARNING: For the PacketWave 200, use an outlet that contains surge protection and ground fault protection, or use a surge protection device. This will protect the PacketWave 200 and equipment connected to it from damage resulting from AC current surges, lightning, etc. For complete protection, all connections to the PacketWave 200 should be connected to a surge protection device. To ensure the best signal, use surge protectors designed for the specific application.

To apply power to the PacketWave 200:

1. Plug the power cord into the connector on the transformer connector to the Interface Box.
2. Plug the power cord into a surge-protected AC outlet.

The PacketWave 200 does not have an on/off switch; to turn the unit off, disconnect power at the power outlet.

NOTE: The ODU receives power from the Interface Box via the Ethernet cable.

Aligning the Antenna Using Audio Auto-Alignment Mode

For the audio auto-alignment mode to function, the PacketWave 200 must be pre-provisioned prior to installation using the Aperto Installation Manager (AIM) in Provision mode, as described in Chapter 5. If preconfiguration has not been performed, use the AIM for antenna alignment as detailed in Chapter 5

When power is applied to a pre-configured PacketWave 200, the ODU will begin slowly beeping. The beep is an audio indication of the strength of the signal received from the base station. As reception gets stronger (within the range from -50 dBm to -100 dBm), beeping increase in pitch and frequency, becoming a continuous tone when the signal is optimal.

To optimize antenna alignment using the audio auto-alignment mode:

1. Adjust the position of the ODU for the highest pitch and frequency of the beeping, ideally finding a position which results in a continuous tone. Secure the ODU in that position.
2. When the ODU receives a continuously strong signal for one minute (specifically, when the signal-to-noise ratio is higher than 16 dB and the signal strength is greater than -88 dB without varying by more than 2 dB for one minute), the PacketWave 200 will become operational with an audio tone similar to a telephone ringing.
3. If such a signal is not obtained, the audio signal will continue until power is removed, and the PacketWave 200 will not become operational. Antenna alignment will need to be performed using the Aperto Installation Manager as described in Chapter 5.

Connection to the PacketWave Network

When the PacketWave 200 goes operational at the end of the antenna alignment, it performs an initialization procedure that brings it up as part of the PacketWave network. During this procedure:

- The PacketWave 200 requests an IP address from the system's DHCP server. (The DHCP request is passed along by the BSU's DHCP relay agent.)
- The DHCP server responds with the IP address and other information, including the name of the PacketWave 200's configuration file. The Base Station Unit and the PacketWave 200 both learn the new IP address.
- The PacketWave 200 downloads its configuration file (as previously created using the WaveCenter Configuration Manager) from the TFTP server.

  NOTE: For information about the WaveCenter Configuration Manager software, see the PacketWave 1000 Base Station Unit Installation, Configuration, and Operation manual.

- The PacketWave 200 configures itself according to the received configuration file and activates for subscriber traffic.
- If the PacketWave 200 is functioning in NAT mode, the IP addresses of its attached computers are obtained from the PacketWave 200's internal DHCP server.

Setting Up the Local Computer(s)

Whether the subscriber's computers are connected to a Subscriber Unit functioning in bridge or NAT mode, each host needs an IP address. The simplest solution is to configure each computer to obtain its IP address using DHCP. It is also possible to manually enter the IP addresses. For larger subscriber LANs, a local DHCP server may be preferable.

The PacketWave AIM

This chapter provides instructions for using the Aperto Installation Manager (AIM) utility. The AIM can be used to perform any of the following functions:

- Initially configure the PacketWave 200 and optimize antenna alignment.
- Re-align the antenna of a previously-installed PacketWave 200.
- View wireless link status.
- Perform ping and throughput tests of the wireless link between the PacketWave 200 and the base station.
- Pre-provision (preconfigure) a PacketWave 200 for later installation using the audio auto-alignment procedure.

Aperto products have adaptive modulation and error correction. The system starts with the highest error correction and the lowest throughput modulation. As data is transferred without error, the system will automatically adjust. It will take about 1 Mbit of data transfer to achieve the maximum throughput.

AIM automatically transfers data following antenna alignment and reports the actual throughput values attained which will be less than actual since the system is adjusting for the best throughput values.

Installing the AIM Software on the PC

To load the Aperto Installation Manager (AIM) software onto the computer to be used in the procedures described in this chapter:

1. Obtain the PacketWave CD distributed with your PacketWave Series 200 equipment, which includes the PacketWave Aperto Installation Manager (AIM) software plus Java software from SUN Microsystems.

2. If the Java Runtime Environment is not present on the PC, install it from the PacketWave CD (bsu/Software/Application/Support directory) or the java.sun.com web site.
3. Install the Aperto Installation Manager (AIM) software by running the file *setup.exe* from the /Software/Application/ApertoInstallationManager/‹OS› directory of the PacketWave CD (where ‹OS› is the operating system being used, such as win32). At the end of this installation, an AIM icon will be placed on the Windows desktop.

Connecting to the PacketWave 200

Connect the computer on which the Aperto Installation Manager (AIM) is loaded:

1. Ensure that the Interface Box is connected to the Outdoor Unit as described under Connecting the ODU to the Interface Box on page 4-8.
2. Connect the computer to the Interface Box LAN port using a crossover Ethernet cable.

   NOTE: Aperto recommends a laptop PC with 256 MB RAM, 10 GB disk drive, Pentium processor, and Ethernet LAN connection. Systems as small as 128 MB RAM and a 386 processor have been used, but their performance is not satisfactory.

3. Ensure that there is only one active Ethernet interface on the computer. (If there are multiple active Ethernet interfaces, the AIM cannot determine which to use.)
4. Ensure that the computer has a fixed IP address, and not one set by a DHCP server. Figure 5-1 gives an example of setting a fixed IP address on Windows 2000; be sure to select Use the following IP address. It does not matter what IP address, network mask, and gateway are used.

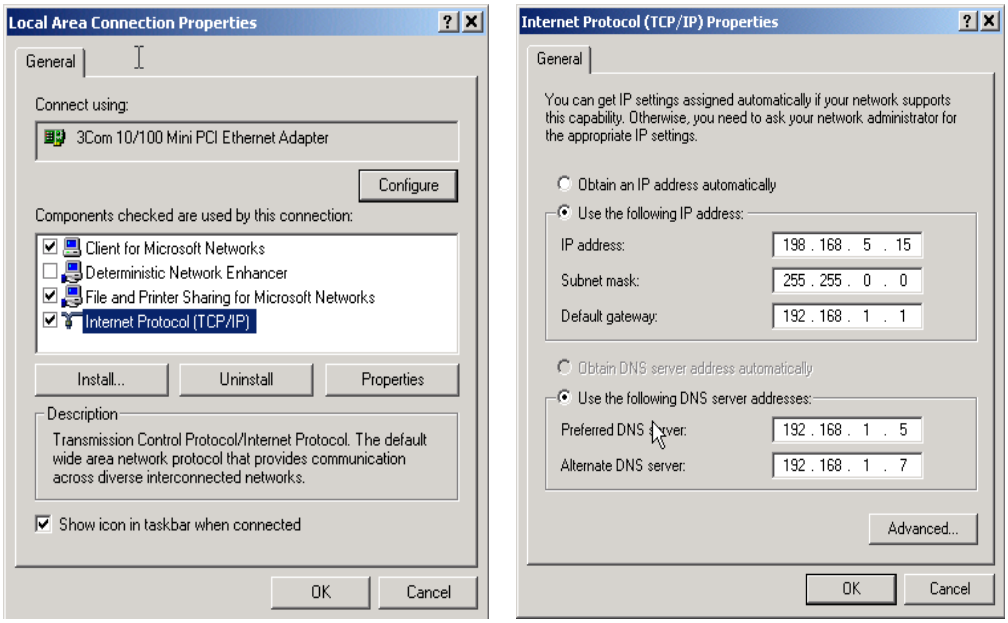

Figure 5-1 Windows 2000 IP Address Setting

Using the Aperto Installation Manager

The perform any of the AIM functions, use the following procedure:

1. Connect a PC with AIM software installed to the PacketWave 200 as described in the previous sections of this chapter.
2. Double-click on the Aperto Installation Manager icon on the PC's desktop. This will cause the Authentication window to be displayed, as shown in Figure 5-2. Note the buttons at the bottom of the window.

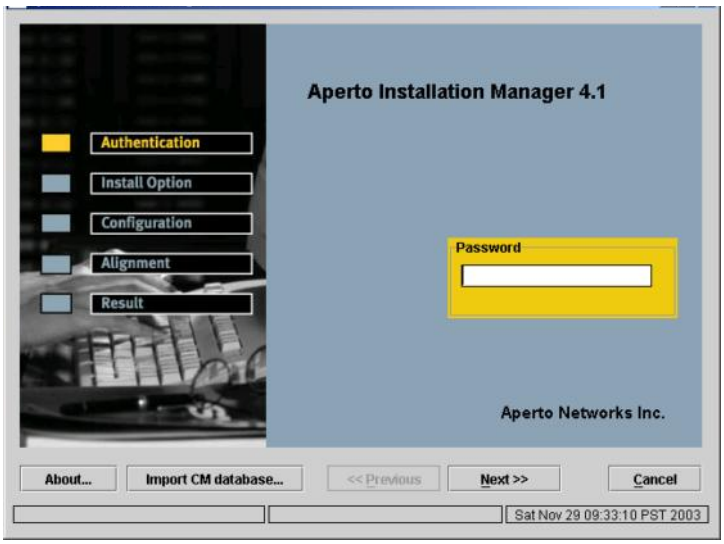

Figure 5-2 AIM Authentication Window

3. Enter the AIM password. The default is isp.
4. Click on the Next›› button at the bottom of the window. The AIM will begin communications with the PacketWave 200.

NOTE: You will get an error message if the AIM cannot establish a connection to the PacketWave 200. Verify that you are using a crossover cable, that the PacketWave 200 is receiving power, that the computer has just one Ethernet interface enabled, and that it is properly configured with a fixed IP address. As with most windows applications, double-double clicking on buttons which are single action, will cause two occurences of the same request. This is true of the next buttin in AIM. When the next buttin is double-clicked on the screen requesting the password, two tasks do the password checking. In completing with one another, the process does not complete successfully and the error, "too many errors" is displayed. Be Patient and single click on the next button. It will take a few seconds to retrieve teh password from the Subscriber init and verify it.

5. The Installation Option Window will be displayed, as shown in Figure 5-3. This window presents five AIM modes:

   - **Setup** provides the complete AIM functionality: basic configuration, antenna alignment, and throughput testing. To use this option, proceed to the next section, Basic Configuration.
   - **Continue with Setup** is used for antenna alignment when basic configuration has already been completed. (Use this option if antenna alignment was not successfully completed for a preconfigured PacketWave 200.) To use this mode, follow the instructions under Re-aligning the Antenna (Continue with Setup Mode) on page 5-15.
   - **Link Status** displays graphs of the status of the wireless link. To use this mode, follow the instructions under Viewing Status of the Wireless Link (Link Status Mode) on page 5-16.
   - Test only provides direct access to the ping and throughput tests. To use this mode, follow the instructions under Running a Non-Destructive Test (Test Mode) on page 5-18.
   - Provision provides access to the basic configuration without proceeding to antenna alignment; it allows pre-provisioning of the unit prior to installation, and enables the audio auto-alignment feature described in Chapter 4. To use this mode, follow the instructions under Pre-provisioning a PW200 for Later Installation (Provision Mode) on page 5-19.

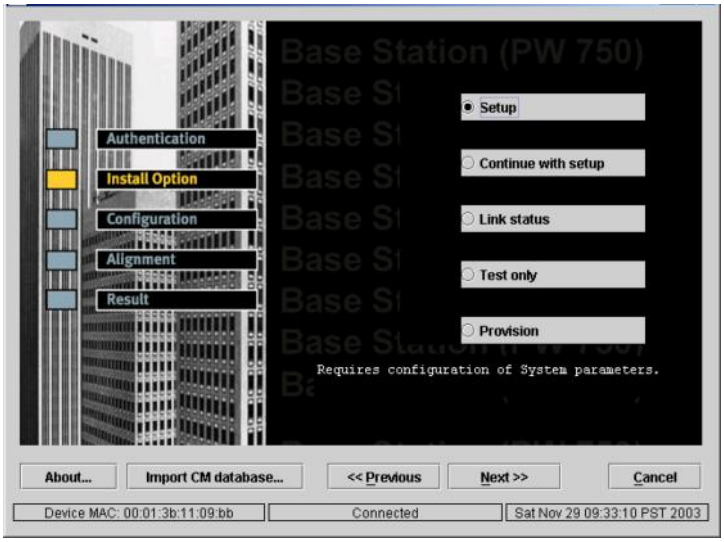

Figure 5-3 Install Option Window

Downloading the BSU's IM.DAT File

When BSU configuration is performed using the Configuration Manager (CM), the IM.DAT database file is generated. This file records basic parameters for all configured BSUs:

- BSU config file name
- BSU name
- Sector name
- Channel width
- Channel frequency
- Broadcast polarization
- BSU diversity
- SR ratio
- Frequency band

The Configuration Manager has an option to copy the IM.DAT file to a diskette.

The Installation Manager allows the IM.DAT file to be downloaded from the computer to the PacketWave 200. The PacketWave 200 will then load all of its configuration parameters automatically from the IM.DAT file once the SU's BSU and sector are selected.

To download the IM.DAT file to the PacketWave 200:

6. Click on the Import CM database button in either the Install Option or Configuration window.
7. The Import CM Database window shown in Figure 5-4 will appear. Specify the Database file path (the location of the IM.DAT file) and click on Import.
8. Wait for the indication that the file has been downloaded.

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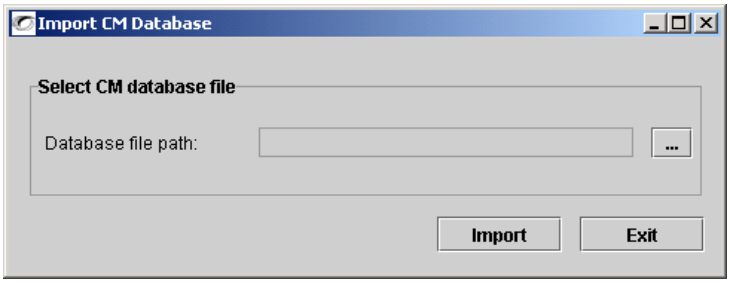

Figure 5-4 Import CM Database Window

Basic Configuration

9. In the Install Option window, select Setup; then click on the Next›› button. The Configuration Window will be displayed, as shown in Figure 5-5. The Configuration Window shows the configuration retrieved from the PacketWave 200. The MAC address should be the same as recorded on the label on the unit.

If the IM.DAT file has been downloaded as described under Downloading the BSU's IM.DAT File on page 5-6, the only parameters you need to configure are the BSU's WSS number and the BSU ID (name); the others will be determined automatically using the IM.DAT file. Steps 10 to 13 may be skipped.

10. In the Configuration Window, select the frequency band of the wireless link from the drop-down menu. (This selection must match the frequency band of the PacketWave 200.)

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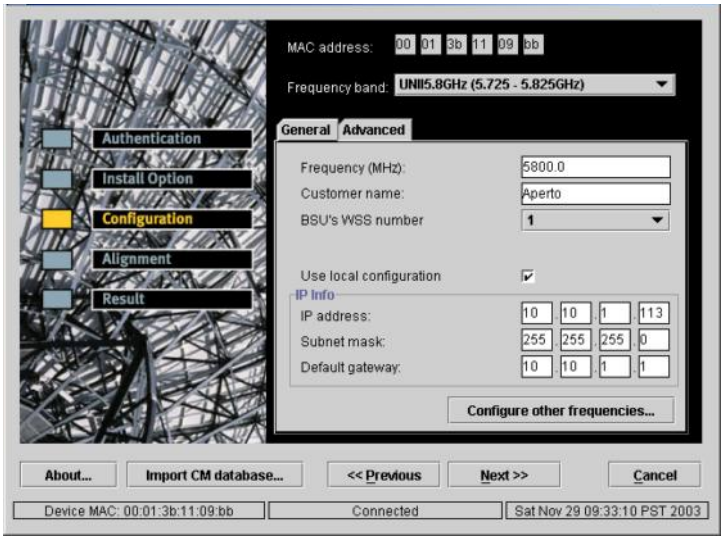

Figure 5-5 Configuration Window: General

11. With the **General** tab selected in the Configuration Window as shown in Figure 5-5, configure the following parameters as appropriate:

    a. In the Frequency (MHz) field, select the center frequency for the wireless link from the pull-down menu.

You will need to determine an appropriate center frequency prior to performing this configuration. Aperto has no way of suggesting a default value appropriate to your area. As soon as you finish configuring the PacketWave 200, it will begin transmitting on the selected frequency.

    b. In the Customer name field, enter a name to identify the PacketWave 200.

c. In the BSU's WSS number field, select the wireless port with which the SU will communicate.

d. If local IP configuration is chosen, specify the appropriate IP address, Subnet mask, and Default gateway for the PacketWave 200. Alternatively, uncheck the Use local configuration box to enable the PacketWave 200 to receive IP configuration from the BSU using DHCP.

12. If Automatic Frequency Selection (AFS) is desired, you can click on the Configure other frequencies button to open the AFS Frequencies window shown in Figure 5-6. AFS will be enabled if you specify at least one alternate frequency. To make antenna aligning easier, however, Aperto recommends that you specify additional frequencies for the PacketWave 200 via the Web GUI after antenna alignment has been performed. (See Wireless Interface Configuration on page 7-13.)

CAUTION: Enabling AFS during initial setup using the AIM will mean that the PacketWave 200 will be likely to switch frequencies every 2 minutes during antenna alignment, making the procedure very difficult.

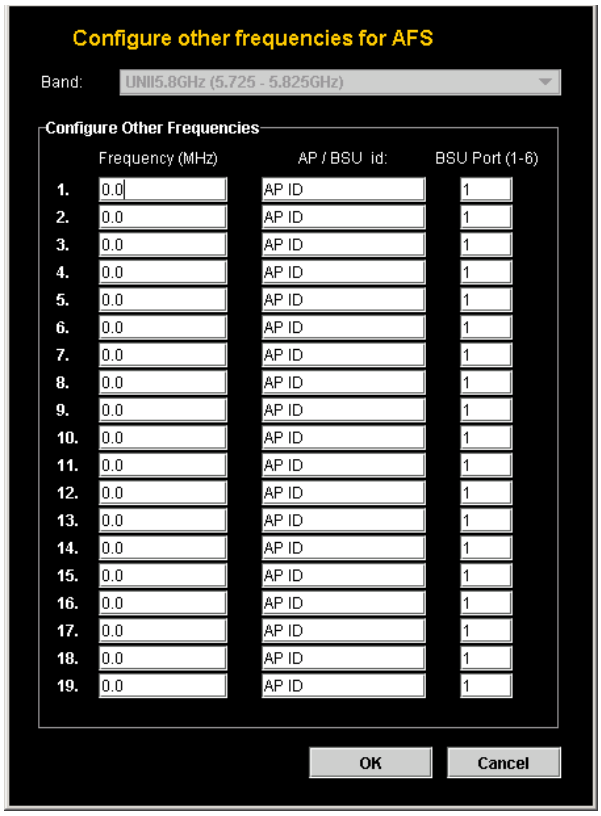

Figure 5-6 Configure Other Frequencies Window

13. In the Configuration Window, click on the **Advanced** tab to view additional configuration options as shown in Figure 5-7. Configure the following parameters as appropriate:

    a. In the BSU ID field, enter the name of the PacketWave 200's Base Station Unit, as specified in the configuration of the BSU. Remember that the BSU ID is case-sensitive.

CAUTION: Since the BSU and SU both use the BSU name and wireless port in the signal scrambling algorithm, the BSU and SU will not be able to communicate if the BSU name is not entered correctly.

    b. Select the Polarization/Antenna Diversity from the drop-down menu.

NOTE: If you are unsure about what to select, the default (Vertical) will probably be an appropriate choice.

    c. Use the drop-down menu to select the Channel Width. If you are unsure, stick with the default selection.

    d. For VLAN applications, specify the Management VLAN ID and Management VLAN priority. Usually, the Management VLAN ID should be the same for the SU and BSU. If you leave the value at the default of 0, the SU will automatically learn and use the BSU's Management VLAN ID.

NOTE: VLAN configuration is performed primarily using the Configuration Manager. Only the VLAN management ID and priority can be set locally using the AIM.

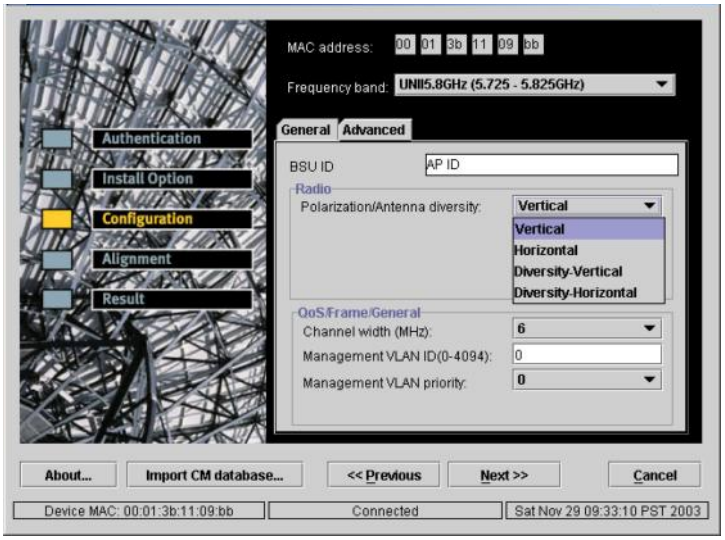

Figure 5-7 Configuration Window: Advanced

14. When you have finished specifying configuration parameters, click on the Next›› button.

15. If you logged on using the default password, the AIM will prompt for a more secure password as shown in Figure 5-8.

WARNING: Once the new password has been selected, there will be no default password for emergency access. Therefore, be careful not to lose the password.

If you are ready to specify the permanent AIM password, enter the new password. Otherwise, enter isp to retain the default password. Then click OK.

NOTE: If you retain the default password by entering isp, the Change Password window will be displayed again the next time the AIM Setup mode is used.

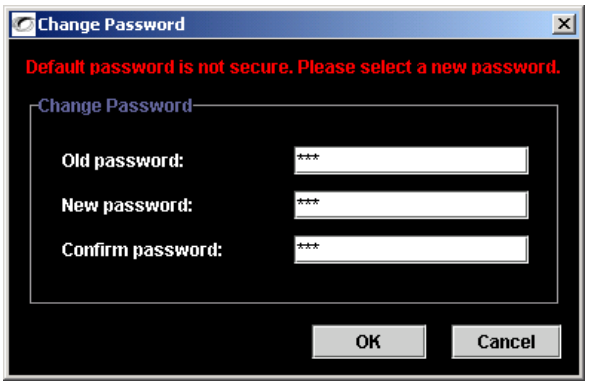

Figure 5-8 Change Password Window

16. After you click Next›› in the Configuration Window (and specify a new password is necessary), the AIM will send the configuration choices to the PacketWave 200, then reset the device. The status windows shown in Figure 5-9 will be displayed, the one on the left first followed by the one on the right.

17. When the restart is finished, the AIM will go into antenna alignment mode, displaying the Alignment Window shown in Figure 5-10.

AIM will change the password of a Subscriber Unit (SU) at initial setup. This was done for security reasons. If this was not true and the AIM software was to fall into the wrong hands, it might be possible to cause significant problems in the service offering of the

SU. For this reason, please be sure to correctly enter the password when AIM requests that the password be changed.

AIM checks for the default password to determine that a password requires changing. If you wish to continue using the default password, simply re-enter the default password when prompted to make a password entry change.

If the password is forgotten or not entered correctly, there is a possibility of using the WEB interface to correct the problem. Please contact Aperto customer support for instructions on using the debug password to correct the problem.

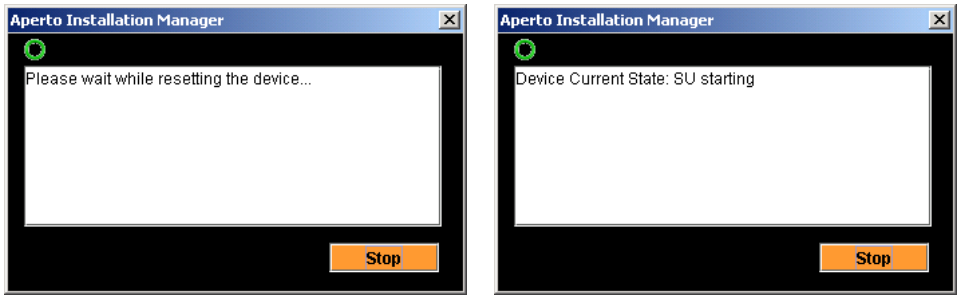

Figure 5-9 Restart Status Windows

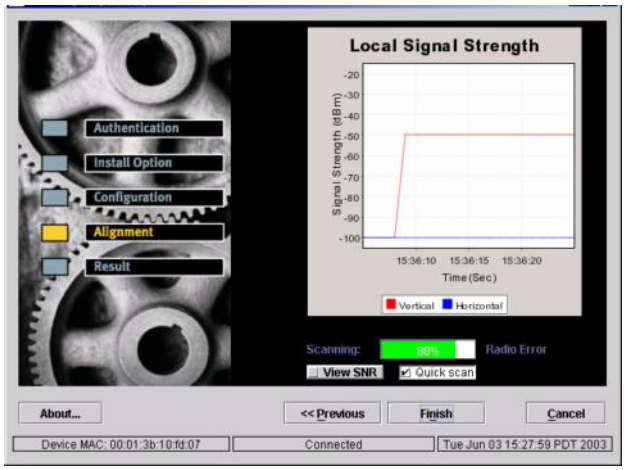

Figure 5-10 Alignment Window — Local Signal Strength Graph

Aligning the Antenna

When the Alignment Window is displayed (Figure 5-10), the ODU will begin slowly beeping. The beep is an audio indication of the strength of the signal received from the base station. As reception gets stronger (within the range from -50dBm to -100dBm), beeping increase in pitch and frequency, becoming a continuous tone when the signal is optimal.

To align the antenna, perform the steps in this section.

18. For most situations, verify that Quick scan in the Alignment window is checked as shown in Figure 5-10. This will cause the PacketWave 200 to scan through frequencies and transmission variables such as gain more quickly than it would otherwise do. Generally, Quick scan should be unchecked only when there are multiple frequencies (AFS) or the SU will be connected to more than one BSU/WSS for backup.
19. To use the audio signal for antenna alignment:
    a. Adjust the position of the ODU for the highest pitch and frequency of the beeping, ideally finding a position which results in a continuous tone. Secure the ODU in that position.
    b. When the ODU receives a continuously strong signal for one minute (specifically, when the signal-to-noise ratio is higher than 16 dB and the signal strength is greater than -88 dBm without varying by more than 2 dB for one minute), the PacketWave 200 will become operational with an audio tone similar to a telephone ringing.
20. To use the AIM graphs for antenna alignment:
    a. While viewing the graph shown in Figure 5-10, move the antenna to maximize the signal strength as shown on the graph. Values greater than -82 dBm will work in 16QAM. Values greater than -89 dBm will work in QPSK.

       If the signal does not move up from the bottom of the Local Signal Strength graph (i.e., shows -100 dBm), do the following:

       - Verify that the frequency and BSU ID were correctly configured.
       - If the link has line-of-sight between the antennas, you should know the general direction to align the antenna. Start in that direction. Move the antenna every few seconds until the Local Signal Strength line rises at lease once. Once it rises, slow the movement of the antenna. If the Signal Indicator line has not risen after 2 to 3 minutes, it is best to click the Previous and then the Next buttons to reset sequence.
       - If the installation is not line-of-sight, either search for a first synchronization (as indicated by the rise of the Signal Indicator line) or just pick a direction to align the antenna.

    b. Once the Local Signal Strength value is maximized, click on the View SNR button to display the full window as shown in Figure 5-11. SNR (signal-to-noise ratio) values in the red area are not good; values in the yellow area are acceptable; values in the green area are best. (However, the unit can operate reliably to an SNR level of 12 dB in QPSK.)
    c. Adjust the antenna again until Local Signal Strength and SNR are maximized.

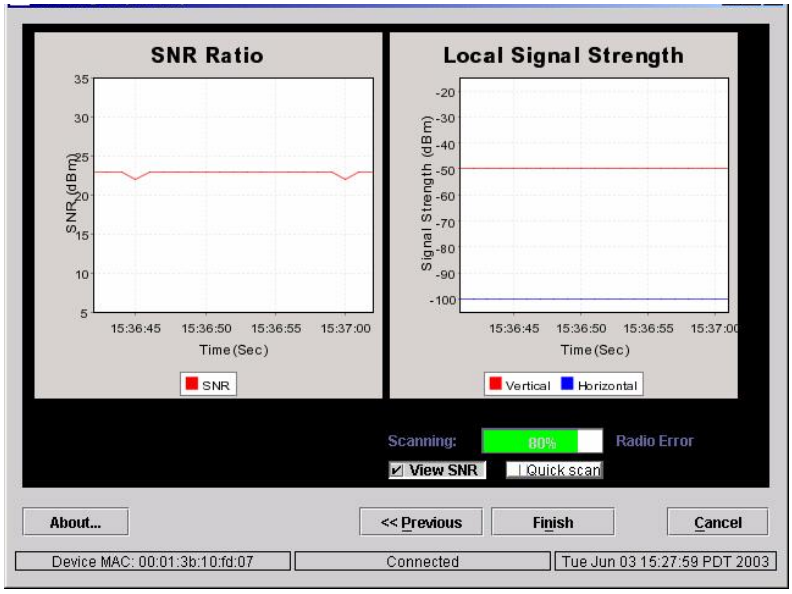

Figure 5-11 Alignment Window with SNR Graph

NOTE: Quick scan is a mode for frequency scanning in AIM. In quick scan the signal alignment is rapidly adjusted for minor differences. Quick scan will not change frequencies even if there are multiple configured frequencies in the AIM AFS table. This may cause a problem where the target frequency is not the appropriate BSU frequency for the Subscriber Unit (SU) because no signal strength will be reported. Once the user selects the finish button, the SU will scan all frequencies and become operational. If there are multiple frequencies you would like AIM to select, de-select the quick scan option on AIM.

21. Click on the Finish button in the Alignment window.

22. A series of pop-up windows will display, showing the progress of the application. The PacketWave equipment must perform automatic transmission strength and radio gain adjustment, become operational, and perform IP stability testing before the application is complete.

    a. First, parameters are sent to the PacketWave 200; then the unit is reset and the antenna alignment flag is set. This takes a few minutes of time, during which the window shown in Figure 5-12 will be displayed.

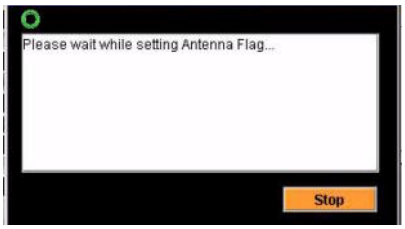

Figure 5-12 Setting Antenna Flag Window

b. When the PacketWave 200 has reset, the window shown in Figure 5-13 is displayed. This window shows the current state of the unit, the radio gain, and transmit attenuation, and is refreshed periodically.

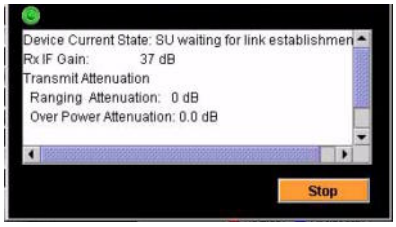

Figure 5-13 Device State Window

c. Next, the AIM performs a standard ping test with the BSU, displaying the window shown in Figure 5-14.

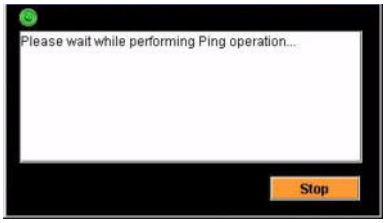

Figure 5-14 Performing Ping Test Window

NOTE: At the completion of the AIM cycle, a throughput test is performed. It is important to note that this value is performed at Best Effort. Therefore the value may be skewed if other Subscriber Units are currently sending traffic. Also, it is most likely that when the throughput test is started, the forward error correction and modulation is at its most robust value. This causes the initial portion of the throughput to possibly be slower at the beginning of the test, once again skewing the throughput speed. A more accurate value may be obtained by re-running the throughput test.

d. After the ping test, the AIM performs a throughput test (an FTP transfer of 1 megabyte of data up and down the wireless link), displaying the window shown in Figure 5-15.

Figure 5-15 Performing Throughput Test Window

e. This test may take a few minutes to complete, depending upon the signal characteristics. If you are not interested in the throughput test, or if the throughput test takes more than 10 minutes, click on the Stop button.

f. When the throughput test is finished or stopped, the window shown in Figure 5-16 is displayed, showing results of the ping and throughput tests.

These results and RF transmission results are recorded in a text file with the name of the IP address, in the directory in which the AIM application is loaded (normally C:\aim). Each time the Setup or Test function successfully executes, this file is updated.

.

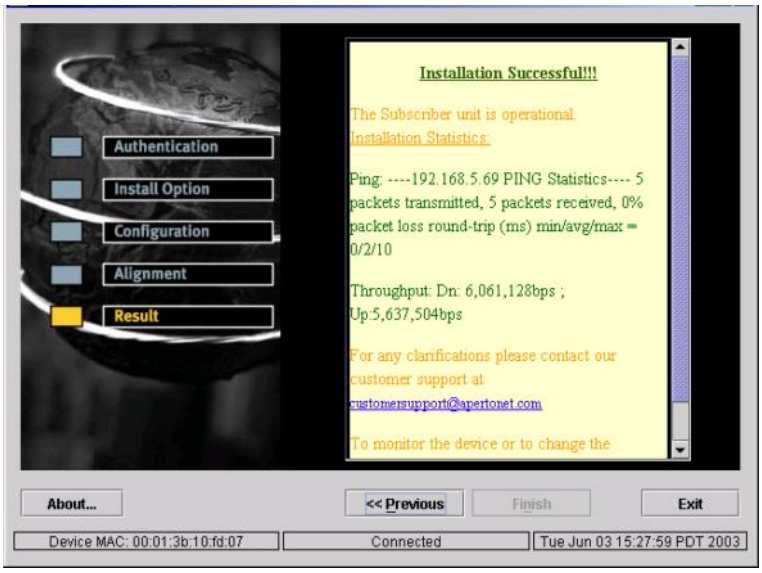

Figure 5-16 Installation Results Window

23. It is important to check the RF and IP transmission results to see if you have the best possible wireless connection. If the results are not acceptable, perform the steps described under Re-aligning the Antenna (Continue with Setup Mode) to repeat the alignment process:

24. If you are ready to close the AIM, click on the Exit button of the Installation Results window. The AIM will prompt for confirmation that you really want to exit.

NOTE: Advanced Installation Manager (AIM) performs radio checks following the antenna alignment. This will allow the installer to check radio cables during alignment testing if no signal or a weak signal is being shown on the alignment screen. This may cause confusion in detecting the difference between a radio not properly connected and no coverage. Click on the finish button from the antenna alignment screen, if in any doubt. The radio will be checked and the user will be informed about the radio connectivity.

Viewing Status of the Wireless Link (Link Status Mode)

To view link status:

1. Go to the Install Option window (Figure 5-3) in one of two ways:
   - Perform steps 1 through 5 under Using the Aperto Installation Manager on page 5-4.

- After completing an AIM mode, click on the Previous button until the Install Option window is displayed.

2. Select Link Status and click on the Next›› button.
3. The Link Status window shown in Figure 5-17 will be displayed, showing local signal strength (as received by the SU) and remote signal strength (as received and reported by the BSU) over time.
4. Click on the Next›› button when you are finished viewing the link status. The Install Options window (Figure 5-3) will be displayed.

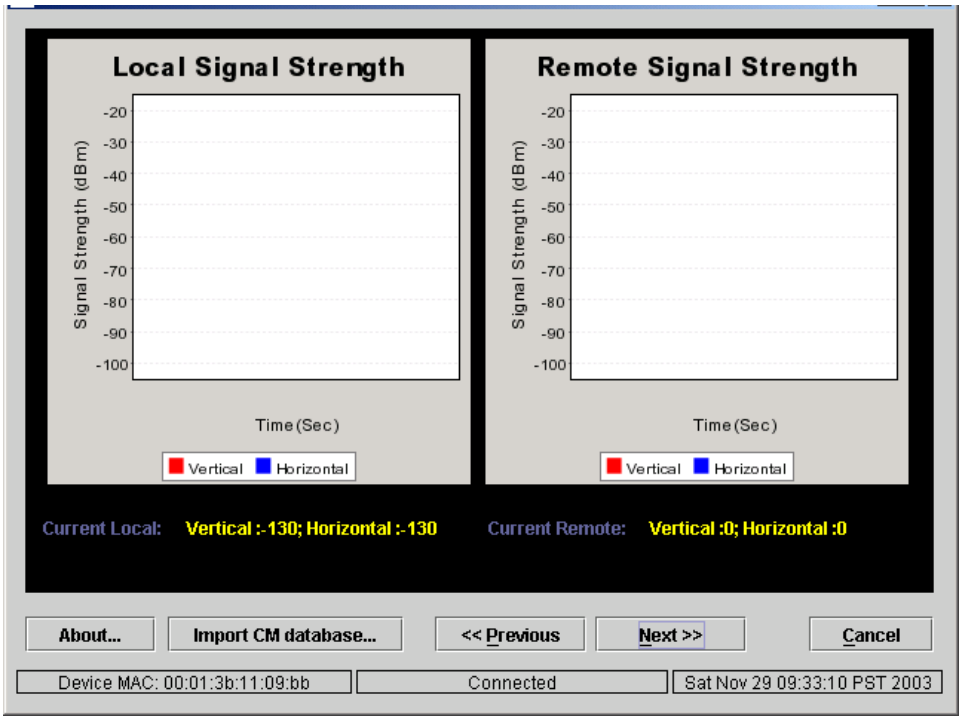

Figure 5-17 Link Status Window for PacketWave 200

NOTE: In scanning mode of AIM, the Subscriber Unit also adjusts the synchronization. The synchronization is necessary to match that of the Base Station. It is normally carried in the wireless frame. Since it is possible that the SU has not yet found the appropriate signal as it is scanning, it is possible that the synchronization adjustment may be misaligned. To ensure proper antenna alignment, do not spend more than 10 minutes in the alignment phase of AIM. Use the previous and next buttons to restart the process at least every 10 minutes.

Running a Non-Destructive Test (Test Mode)

You can run a non-destructive test of the wireless link at any time. To run a test:

1. Go to the Install Option window (Figure 5-3) in one of two ways:
   - Perform steps 1 through 5 under Using the Aperto Installation Manager on page 5-4.
   - After completing an AIM mode, click on the Previous button until the Install Option window is displayed.
2. Select Test only and click on the Next›› key.
3. The Test Configuration window shown in Figure 5-18 will be displayed. Choose the number of megabytes to be transferred; then click on the Next›› button.

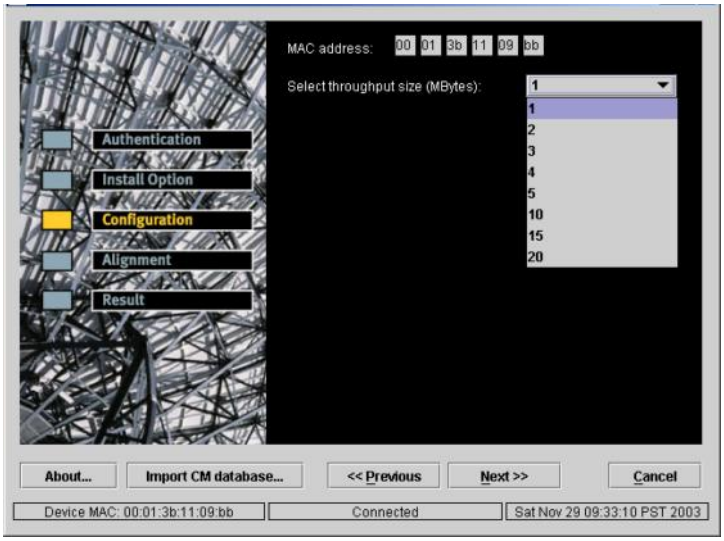

Figure 5-18 Test Configuration Window

4. The Test Results window shown in Figure 5-19 will be displayed, and the test results text file will be updated.

   NOTE: This window is the same as the Installation Results window shown in Figure 5-16 on page -16.

5. If you are ready to close the AIM, click on the Exit button of the Installation Results window. The AIM will prompt for confirmation that you really want to exit.

   Otherwise, use the ‹‹Previous buttons to return to the window you choose.

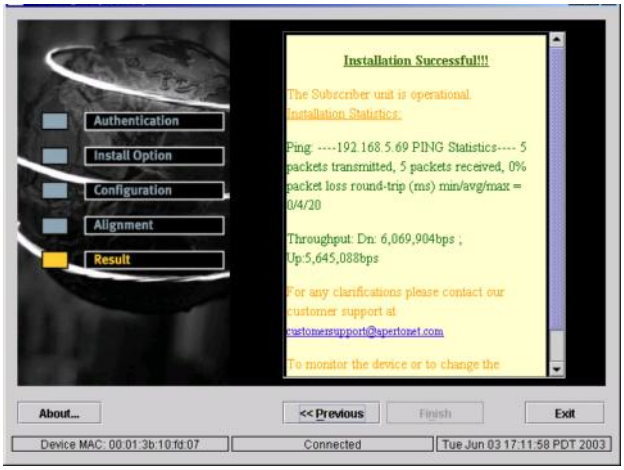

Figure 5-19 Test Results Window

Pre-provisioning a PW200 for Later Installation (Provision Mode)

The Provision mode is typically used to provision a PacketWave 200 in the lab prior to installation. This enables the audio auto-alignment feature, described in Chapter 4.

> NOTE: The Provision mode can also be used to re-enable the audio auto-alignment feature, should that be desired. After Provision mode, the PacketWave 200 is configured to go directly into audio alignment mode at power-up. If the audio auto-alignment feature has not been enabled by using the AIM Provision mode, alignment can be performed only using the AIM.

To use the Provision mode:

1. Go to the Install Option window (Figure 5-3) in one of two ways:
   - Perform steps 1 through 5 under Using the Aperto Installation Manager on page 5-4.
   - After completing an AIM mode, click on the Previous button until the Install Option window is displayed.
2. Select Provision and click on the Next›› key. The Configuration Window will be displayed, as shown in Figure 5-5.
3. Configure the PacketWave 200 as described in steps 8 through 14 under Basic Configuration on page 5-7.
4. After configuration has been completed, the AIM will reset the PacketWave 200, enable audio auto-alignment, and display the Provisioning Results window similar to that shown in Figure 5-19.

Aperto Installation Manager Troubleshooting

This section offers solutions for problems related to the use of the Aperto Installation Manager (AIM) utility.

Problems Connecting to the Subscriber Unit

If the Aperto Installation Manager fails to connect with the PacketWave 200 after MAC address/frequency configuration, a "Host unreachable" message will result. Possible causes and solutions include the following:

- Cabling problem — Verify that a crossover cable is being used, and that it is securely connected at both ends.
- No power to the PacketWave 200 — Make sure that the Interface Box is properly connected to an AC outlet and to the Outdoor Unit (ODU), and that the Interface Box ODU Port' LEDs indicate that power is on.
- Incorrect MAC address — Check the MAC address entered against the MAC address on the PacketWave 200 ODU, and correct if necessary.
- Computer does not have fixed IP addresses — On the computer running the AIM, ensure that the Ethernet connection is configured with a fixed IP address, subnet mask, and gateway.
- Multiple Ethernet connections enabled — On the computer running the AIM, verify that only the Ethernet connection to the PacketWave 200 is enabled. If multiple Ethernet connections are enabled, the AIM will not be able to determine the correct connection to use.
- Another application using the port — Close any application that might be using the computer port employed by the AIM. Use the Windows task manager or LINUX/UNIX process status as appropriate, and remove the task or reboot the computer as necessary. (Sometimes Windows will have an extra Java task that is using the port.)

Problems Communicating with the Base Station Unit

After antenna alignment is finished, the Aperto Installation Manager (AIM) establishes communication with the Base Station Unit, downloads configuration and IP information, and performs ping and throughput tests with the Base Station Unit. The SU state during establishment of the communication link and initialization of the SU is indicated by messages in a pop-up window. If the Aperto Installation Manager hangs at a particular state, that state will help identify the nature of the problem.

If establishment of the communication link and initialization of the SU succeed, but the ping and throughput tests are not successfully completed, the Aperto Installation Manager indicates installation failure in the Results Window.

Possible causes and solutions for a failure in communication with the Base Station Unit include the following:

- Incorrect frequency entered — Verify that the frequency information specified for the SU matches the BSU. (Typically, the AIM will have hung at the “searching for sync” or “link establishment” state.)
- Incorrect BSU ID entered — Verify the BSU ID, which is case-sensitive and must match the ID as entered on the BSU.
- Incorrect WSS port number entered — Verify that the SU is in the correct sector and that the correct port number is being used.
- Cable problems — Ensure that the Cat 5 cable between the Interface Box and the Outdoor Unit is properly and securely connected; that the cable meets the requirements given in this manual; and that the cable does not exceed 100 m (330 ft) in length if Cat 5E, or 50 m (165 ft) if Cat 5. (Typically, the AIM will have hung at the “searching for sync” or “link establishment” state.)
- Incorrect antenna alignment — Try re-running the AIM and aligning the antenna again, making sure to secure the Outdoor Unit in the position where the strongest signal is being received. (Typically, the AIM will have hung at the “searching for sync” or “link establishment” state.)
- BSU wireless failure — Confirm that the BSU’s wireless interface to the SU is operating correctly. (Typically, the AIM will have hung at the “searching for sync” or “link establishment” state.)
- DHCP failure — If the Installation Manager hangs in the “DHCP request sent” state, the communication link has been successfully established but there has been a problem with DHCP or configuration downloading. Ensure that:
  - The DHCP server has a proper entry for the SU’s MAC address.
  - The DHCP server has an established route to the SU.
  - The TFTP server has a valid configuration file for the SU.
- Noisy or bad communication link — If the throughput test is inordinately slow, the communication link’s error rate may make it inappropriate to put the SU into service. Experience has shown that the test can take up to ten minutes and still be completed without errors. If the throughput rate is not appropriate, try aligning the antenna in its current location or relocating the antenna. If this does not solve the problem, perhaps the sensitivity of the antenna at the base station should be adjusted (depending on performance of other SUs in the sector).
- Signal too strong — If the base station antenna is adjusted for communication with distant SUs, an SU near the base station may not be able to turn its transmit power low enough to avoid overdriving its signal to the base station. (Typically, the AIM will have hung at the “searching for sync” or “link establishment” state.) If this occurs, align the subscriber antenna for the maximum signal; then adjust the antenna alignment upward (“detuning” the antenna to decrease transmit power), keeping the signal strength below -40 dBm.

NOTE: Please be sure to have the correct frequency, BSU ID, sector number, and channel width when running AIM. Without these correct entries, the unit will not be able to synchronize with the Base Station and you will not be able to align the antenna. The lack of signal will appear the same as a non-covered area. Either use a

"Have Disk" file generated by the Configuration Manager or use the correct WSS number.

The Web GUI

The PacketWave 200 Series Subscriber Unit includes a Java-based graphical user interface (GUI) which runs on a standard Web browser (Netscape 4.74 or Internet Explorer 5.0). Functions which can be performed using the Web GUI include:

- Viewing network connectivity.
- Monitoring status and performance.
- Reviewing configuration.
- Making basic configuration changes.
- Uploading configuration changes to the Subscriber Unit's configuration file on the TFTP server.
- Resetting the PacketWave 200.

ISP and Subscriber Logon Levels

The Packet SU Web GUI features different logon levels for ISPs and subscribers, each protected by a different user-set password. (There is also a Debug logon level, reserved for Aperto use.) The ISP logon level provides access to all areas of SU configuration, status reporting, performance monitoring, and operating commands. The Subscriber logon level is limited to:

- The site connectivity view of the SU home page.
- Password Configuration page (subscriber password only).
- Configuration pages for DHCP, NAT, and routing functions
- Read-only PPPoE/PPP Configuration page.
- Configuration Upload utility.
- System Status and PPPoE/PPP Status pages.

Accessing the Web Interface

To access the Web GUI:

1. On a computer with IP access to the PacketWave 200 (via either the LAN or wireless interface), open Netscape 4.74 or Internet Explorer 5.0.

   NOTE: Other browsers could show some anomalies.

Enter the URL, http://‹*PW200* IP address›/. The logon page will appear, as shown in Figure 6-1.

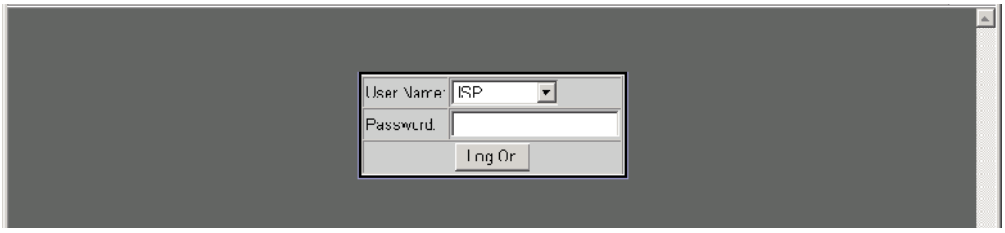

Figure 6-1 SU Web GUI Logon Screen

2. Select the ISP or Subscriber user name.
3. Enter the correct password. (The password is case-sensitive.)

   NOTE: The default passwords are isp and subscriber. For security, different passwords should be defined. (Passwords can be specified via the Web GUI, SNMP, and the Configuration Manager.)

4. Click on the Logon button.
5. If the browser prompts that it needs to load a plug-in, allow it to do so.
6. Wait for the Web interface home page to open, as shown in Figure 6-2.

Figure 6-2 Web GUI Home Page

Features of the Web Interface

The Web interface pages share the basic elements identified in Figure 6-3.

Home Page: Connectivity View

As shown in Figure 6-2, the home page provides a graphical representation of base station-to-subscriber connectivity. The arrow pointing to the PacketWave 200 icon indicates

wireless channel status: green if good or red if down. Operating mode, IP network, and MAC address information are presented in a table below the graphical representation.

Status indications on the connectivity view are updated dynamically every 30 seconds.

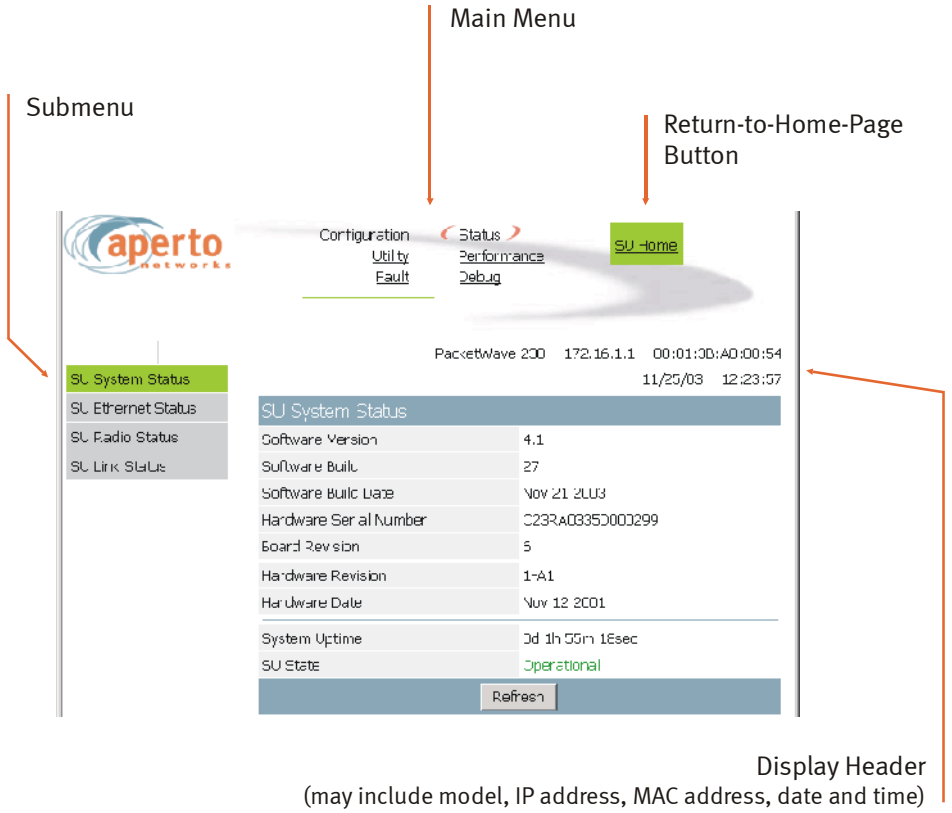

Figure 6-3 Basic Elements of Web GUI

Main Menu and Submenu

The Main Menu lists the various categories of functions available via the Web GUI. The ISP logon level provides the five Main Menu categories shown in Figure 6-3. For the Subscriber logon level, the Main Menu lists Configuration and Status categories only. To select an item from the Main Menu, click on it. Orange crescents will bracket the menu item to show that it has been selected (see the Configuration item in Figure 6-3).

The Submenu is context-sensitive, changing as different Main Menu items are selected. The Submenu lists the pages available under the selected Main Menu category. Click on the appropriately-labeled box in the Submenu to display the desired page. Figure 6-3 shows the page displayed when the System option is selected in the Submenu.

Submitting and Uploading Changes

Pages on which configuration changes can be entered include a Submit button at the bottom. Any change entered on the page does not take effect until the Submit button is clicked.

Clicking Submit affects only the operating configuration of the SU. The SU's configuration file located on the BSU's TFTP server is not altered; therefore, the configuration change will be lost if the SU is reset or re-powered (after which the SU reverts to the configuration specified in its configuration file).

To update the SU's configuration file on the TFTP server with changes made via the Web GUI, use the Upload Configuration button on the Device Control Utility page (page 6-30). Clicking the Upload Configuration button will cause all configuration changes currently in effect to be written into the SU's configuration file on the TFTP server.

Cancel and Refresh Buttons

Some pages include Cancel and/or Refresh buttons at the bottom.

- Clicking on the Cancel button cancels any changes made on the page; altered fields will return to their original contents.
- Clicking on the Refresh button refreshes all fields with configuration parameters downloaded from the TFTP server.

Hyperlinks

Some Web GUI pages include hyperlinks to related pages. For example, the Routing Table page includes hyperlinks to pages for adding and deleting routes. Hyperlinks are indicated in the method defined in your browser configuration.

In some cases, hyperlinks are implemented using buttons similar to the Submit button. For example, the Routes Configuration page includes buttons which serve as hyperlinks to pages for adding and deleting routes.

Overview of SU Web GUI Functions

Table 6-A summarizes the functions available for each of the Main Menu and Submenu selections.

Table 6-A Summary of the SU Web GUI

Main Menu	Submenu	Functions
Configuration	System	Show general SU information and status; set customer name and network access.
	Administration	Set contact, location, and cell name.
	Password *	Set password(s) for ISP and/or Subscriber access levels.
	Ethernet	Show/set configuration of subscriber Ethernet link.
	SNMP	Configure SNMP management of SU.
	VLAN	Show VLAN configuration. Read-only.
	Wireless	Show/set radio and antenna configuration.
	Up/Downstream Default Best Effort	Show configuration of upstream or downstream default best effort service flow (ID=0). Read-only.
	Routes *	Allows SU routing table to be viewed and built.
	NAT *	Allows configuration of SU's internal NAT routing.
	DHCP *	Allows configuration of SU's internal DHCP server.
	IP Filter	List of all defined IP filters for wireless or Ethernet port. Hyperlinks to contents of individual filters. Read-only.
	PPPoE/PPP *	Show/set PPPoE/PPP parameters.
Utility	Device Control *	Reset SU (ISP only); Upload Configuration.
Fault	Event logs	List of logged SU events.
	E-mail	Configure e-mail alert reporting.
Status	SU System Status *	SU software and hardware info, operational status.
	Ethernet Status	Subscriber Ethernet link status.
	Radio Status	SU radio information and status.
	SU Link Status	Transmit and receive details for wireless link.
	PPPoE/PPP Status *	Show/set PPP user name and password.
Performance	SU System Statistics	Basic Transmit and Receive counts. Read-only.
	PPPoE Statistics	Shoe PPPoE packet counts.
	RF Signal Quality	Wireless link performance counters. Read-only.
	SU Filter Statistics	Passed and blocked packets for wireless or Ethernet port.
	SU Flow Statistics	List of service flows supported by the SU; hyperlink to service flow details.
Debug	CPE	Access to performance displays and debug commands.
* Available at Subscriber level.		

Configuration Pages

The Web GUI displays SU configuration in numerous individual pages, as indicated by the Configuration Submenu. In addition, many configuration parameters can be changed via the Configuration pages.

System Configuration

As shown in Figure 6-4, the system configuration page provides an overview of the Subscriber Unit's network and operating parameters. All parameters are read-only except:

- **Network Access** enables or disables connection to the wireless network.
- **Customer Name** is a text field identifying the subscriber.

Click on the Submit button to activate any changes made to these two parameters.

A change to the Customer Name field will take effect immediately, without a reboot. An event will be logged indicating the change (see Figure 6-29). The customer name will also be changed on the BSU's SU Inventory page when it is changed at the SU.

This page is available only at the ISP logon level.

Administration Configuration

The Administration Configuration page, shown in Figure 6-5, allows SNMP name, contact, and location information to be entered for the subscriber site. Any text entry is acceptable, subject to length limitations for each field.

Click on the Submit button to activate any changes made on this page.

This page is available only at the ISP logon level.

Password Configuration

Passwords for the ISP and Subscriber logon levels are specified on the Password Configuration page, shown in Figure 6-6. Passwords which can be defined depend on the current logon level; if logon is at the Subscriber level, only the Subscriber password fields will be displayed. The passwords are used for the Web GUI, SNMP, CLI, and FTP.

The password must be entered exactly the same (including case) in the two password fields to be accepted. After specifying the desired password, click Submit. The Web GUI will prompt that password storage is temporary, and that the Upload Configuration function (page 6-30) is required for making the password permanent.

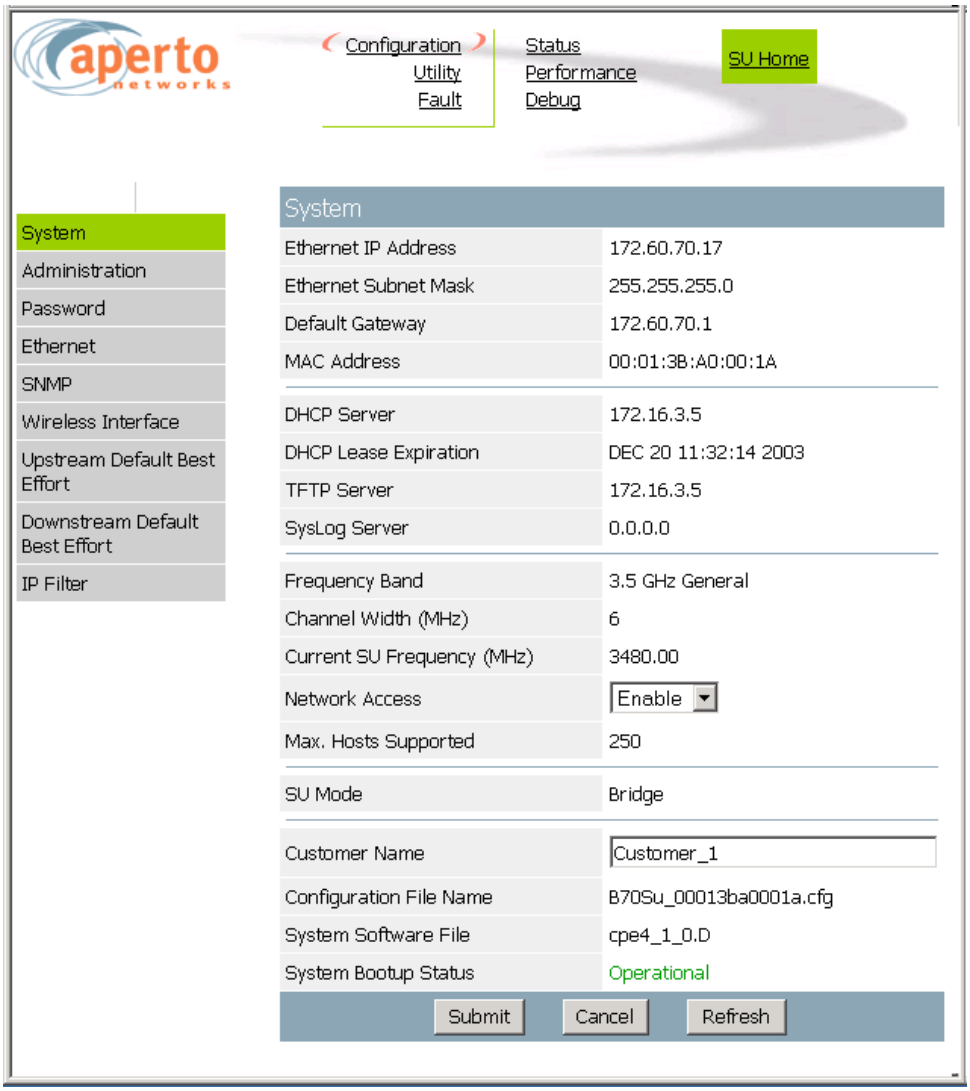

Figure 6-4 System Configuration Page

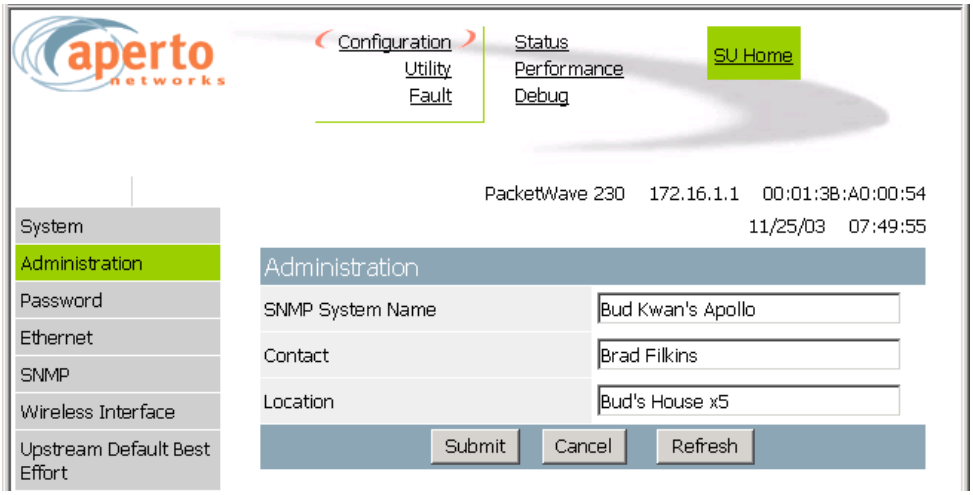

Figure 6-5 Administration Configuration Page

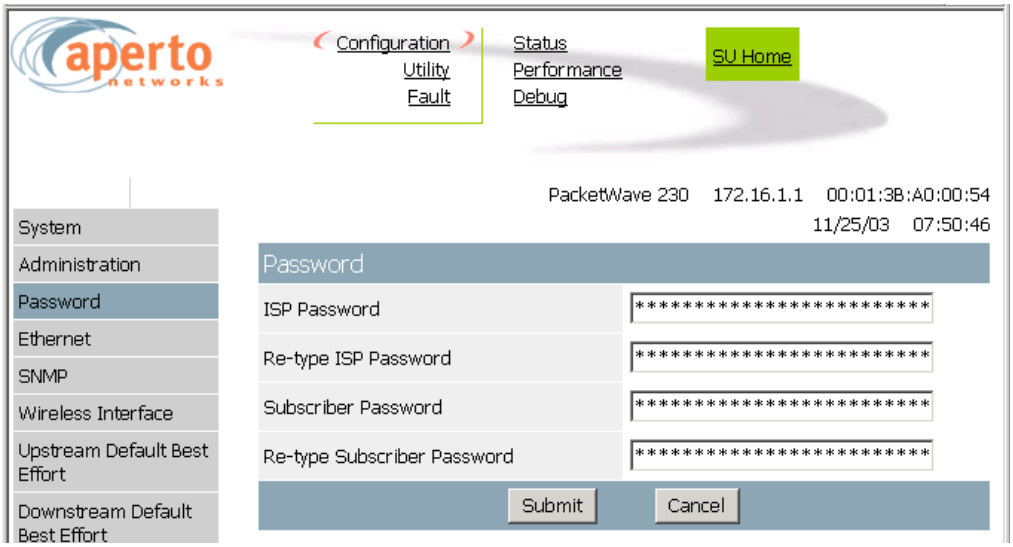

Figure 6-6 Password Configuration Page

Ethernet Configuration

The Ethernet Configuration page, shown in Figure 6-7, allows the Ethernet link to the subscriber's computer or network to be specified as full or half duplex, 10 or 100 Mbps, as well as auto-detecting. The page also shows current status of the Ethernet link.

Click on the Submit button to activate any changes made on this page.

This page is available only at the ISP logon level.

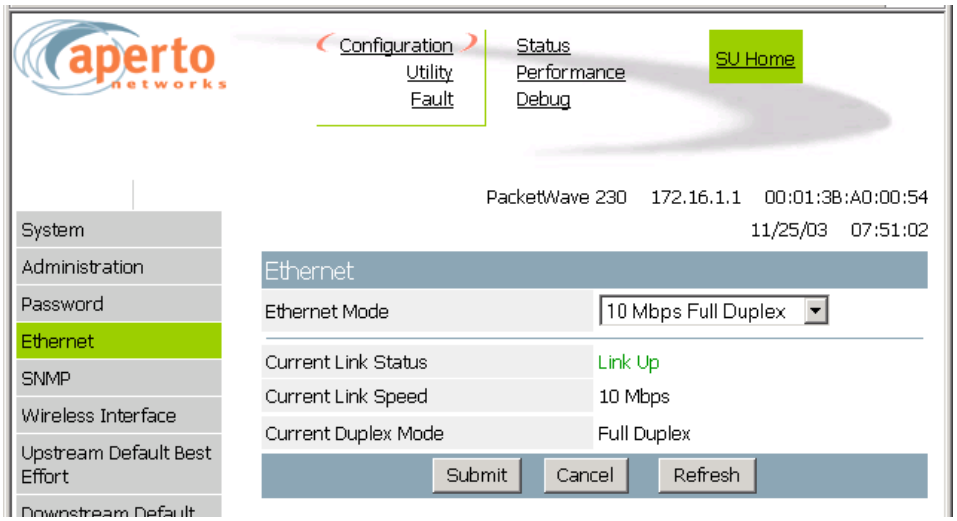

Figure 6-7 Ethernet Configuration Page

SNMP Configuration

As shown in Figure 6-8, the SNMP configuration page allows the viewing and altering of SNMP parameters for one or two SNMP managers:

- Whether traps will be generated.
- What SNMP manager(s) will be recognized, what access rights they will have, and the read and write community names.

Click on the Submit button to activate any changes made on this page.

NOTE: This page does not support deletion of SNMP managers.

This page is available only at the ISP logon level.

Figure 6-8 SNMP Configuration Page

VLAN Configuration

The VLAN Configuration option is available only when the PacketWave 200 is configured for VLAN operation via the Configuration Manager (or CLI). As shown in Figure 6-9, the VLAN Configuration page shows read-only configuration for VLAN operation.

For an explanation of these VLAN parameters, see the PacketWave 1000 Base Station Unit Manual.

This page is available only at the ISP logon level.

Figure 6-9 VLAN Configuration Page

VLAN Classifier Configuration

The VLAN Classifier Configuration option is available only when the PacketWave 200 is configured for VLAN operation and VLAN classifiers are enabled via the Configuration Manager (or CLI). As shown in Figure 6-10, the VLAN Classifier Configuration page shows read-only configuration for VLAN operation.

Use the Classifier Reference drop-down menu to select the VLAN classifier for which you want to display configuration.

For an explanation of VLAN classifiers and the parameters on this page, see the PacketWave 1000 Base Station Unit Manual.

This page is available only at the ISP logon level.

Figure 6-10 VLAN Classifier Configuration Page

Wireless Interface Configuration

As shown in Figure 6-11, the Wireless Interface Configuration allows an operator to view and in some cases change a variety of wireless link parameters:

- **Frequency Band** — Unit's frequency band; read-only.
- **Channel Width** — Unit's channel width; read-only.
- **SU Frequency** — The frequency currently being used by the SU; read-only.
- **Target BSU ID** — The identifier for the SU's BSU (case-sensitive).
- **Target Port ID** — The number of the SU's BSU wireless port.
- **Polarization** — Antenna polarization: **Vertical**, **Horizontal**, **Vertical with diversity,** or **Horizontal with diversity**.
- **Frequency Table** — Multiple frequencies for the Automatic Frequency Selection (AFS) feature. To enable up to 19 different alternate frequencies (which may link to the same or different BSUs and/or wireless ports), enter the desired BSU and Port IDs and frequencies in the appropriate fields. (The specified frequencies must also be in the AFS tables for the BSU wireless ports.) AFS will be enabled whenever at least one frequency is defined in the table.

  NOTE: In most cases, no more than 4 or 5 frequencies will be needed. A frequency can be specified more than once to increase its likelihood of being selected. For optimum performance, AFS frequencies tables for the BSU and SUs should include the same frequencies in the same order unless the SU includes frequencies from multiple BSUs and/or wireless ports.

CAUTION: Configurable parameters on this page can significantly affect the performance of the wireless link. Do not change any of these parameters unless you have a solid understanding of their purpose and why they should be changed.

Click on the **Submit** button to activate any changes made on this page.

This page is available only at the ISP logon level.

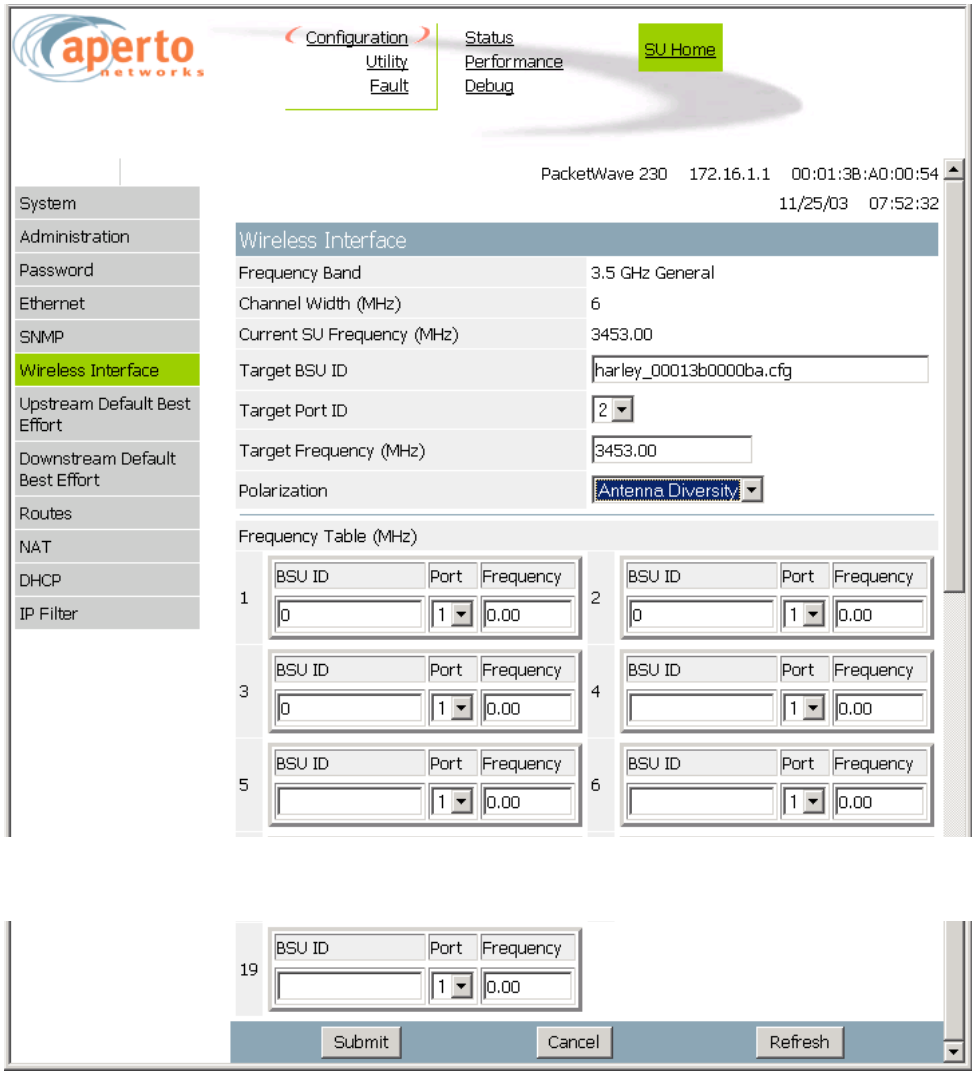

Figure 6-11 Wireless Interface Configuration Page

Default Best Effort Configuration

All Subscriber Units have at least one service flow in each direction: a Best Effort service flow with an ID of 0. Any traffic which does not meet a defined classifier (if there are any) will be assigned to these service flows. Performance parameters of the default upstream and downstream service flows are configurable using the WaveCenter Configuration Manager, but the Service Flow ID (0) and class (Best Effort) cannot be altered.

Configuration pages for default Best Effort service flows are shown in Figure 6-12 and Figure 6-13. All fields are read-only.

NOTE: If all traffic will be transmitted using the default Best Effort service flows, no classifiers need to be defined.

These pages are available only at the ISP logon level.

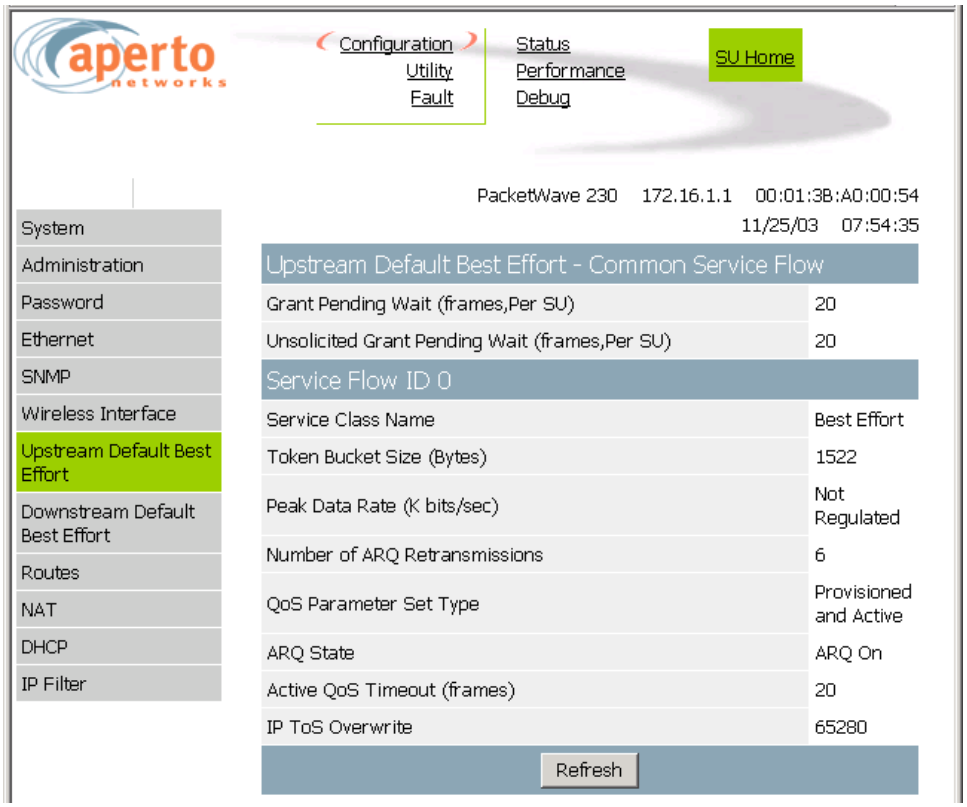

Figure 6-12 Upstream Default Best Effort Configuration Page

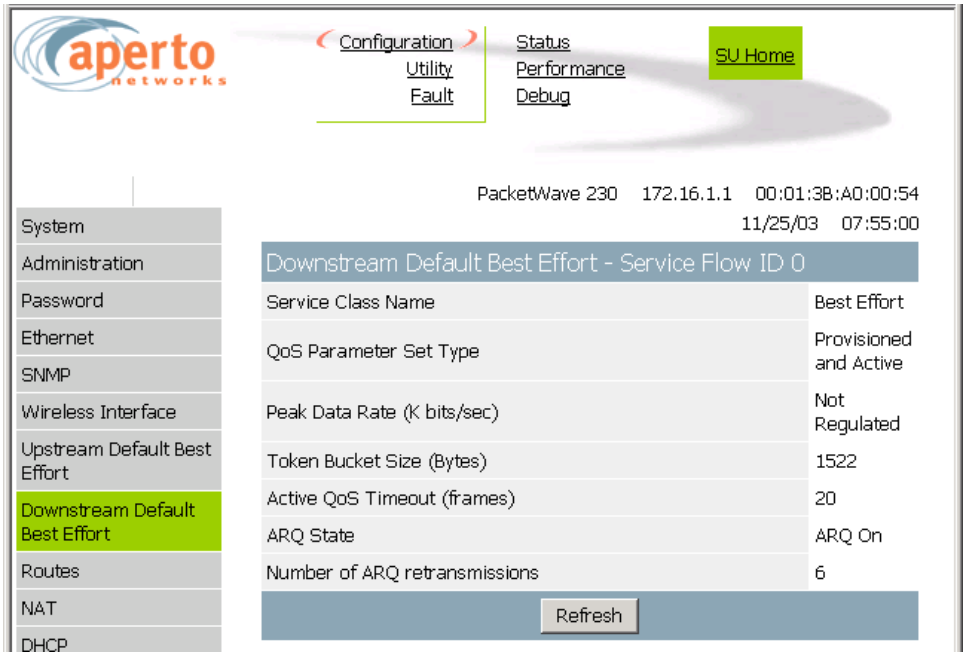

Figure 6-13 Downstream Default Best Effort Configuration Page

Routes Configuration

If the Subscriber Unit supports routing, the Routes Configuration pages allow subscribers to construct a routing table for the Subscriber Unit. These pages are accessible only when the Subscriber Unit is in routing mode, and are fully configurable at the Subscriber and ISP logon levels.

Route configuration should be performed by a network administrator.

Figure 6-14 shows the Routing Table page, which list all routes defined for the Subscriber Unit.

To add a route, click on the Add Routes button; enter the route information on the Add Routes page (Figure 6-15), and click the Submit button.

To delete one or more routes, click on the Delete Routes button; on the Delete Routes page (Figure 6-16), click the Delete box for each route to be deleted, and click the Submit button.

To make the routes configuration part of the Subscriber Unit's permanent configuration, use the Upload Configuration function (page 6-30).

Figure 6-14 Routing Table Page

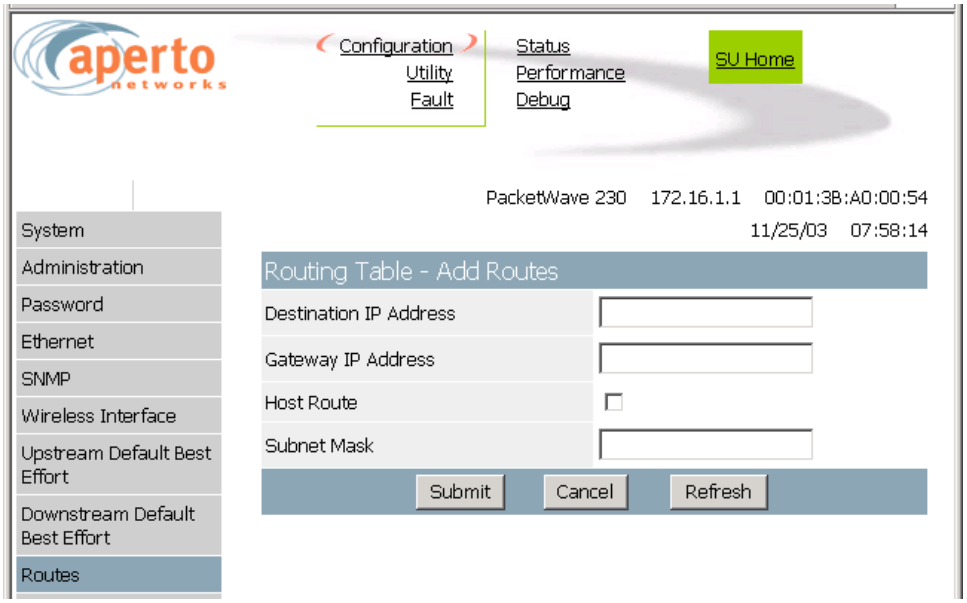

Figure 6-15 Add Routes Page

Figure 6-16 Delete Routes Page

NAT Configuration

As shown in Figure 6-17, Figure 6-18, Figure 6-19, and Figure 6-20, there are four pages that allow subscribers to configure NAT (Network Address Translation) routing for the subscriber's LAN. These pages are accessible only when the Subscriber Unit is in NAT mode, and are fully configurable at the Subscriber and ISP levels. Use these pages to configure NAT parameters as appropriate for the local network. To move between the NAT pages, click on the hyperlinks at the top of the pages.

NAT configuration should be performed by a network administrator.

On the NAT General page, specify the LAN IP Address and LAN Subnet Mask (required fields), and any other parameters as desired. Then click Submit to implement the configurations. Two prompts will appear: to perform DHCP configuration; and to use the Upload Configuration function (page 6-30) to make the NAT configuration permanent.

If you specify a port in the Divert HTTP to SU via port field, you will need to close your browser and log on again using the URL with port—e.g., http://10.10.16.2:5002.

Figure 6-17 NAT General Page

If the WEB HTTP interface is used to change the NAT IP address, please reset the Subscriber Unit for it to take effect.

Use the NAT Configuration page to define local servers. All fields are required. After specifying the parameters for a particular server, click Add. The NAT Configuration page can then be used to define another server.

Once a server has been added, it will be included in the list on the NAT Servers page. From this page, servers can be deleted if desired. To delete a server, click on the box at the beginning of the row describing the server; then click Submit.

The NAT Static Mappings page can be used to build a table of static mappings of local IP addresses to global IP addresses. To add a static address mapping, click on the Add Mapping button and specify the local and global IP addresses. To remove a mapping from the table, select the mapping in the table and click on the Delete Mapping button.

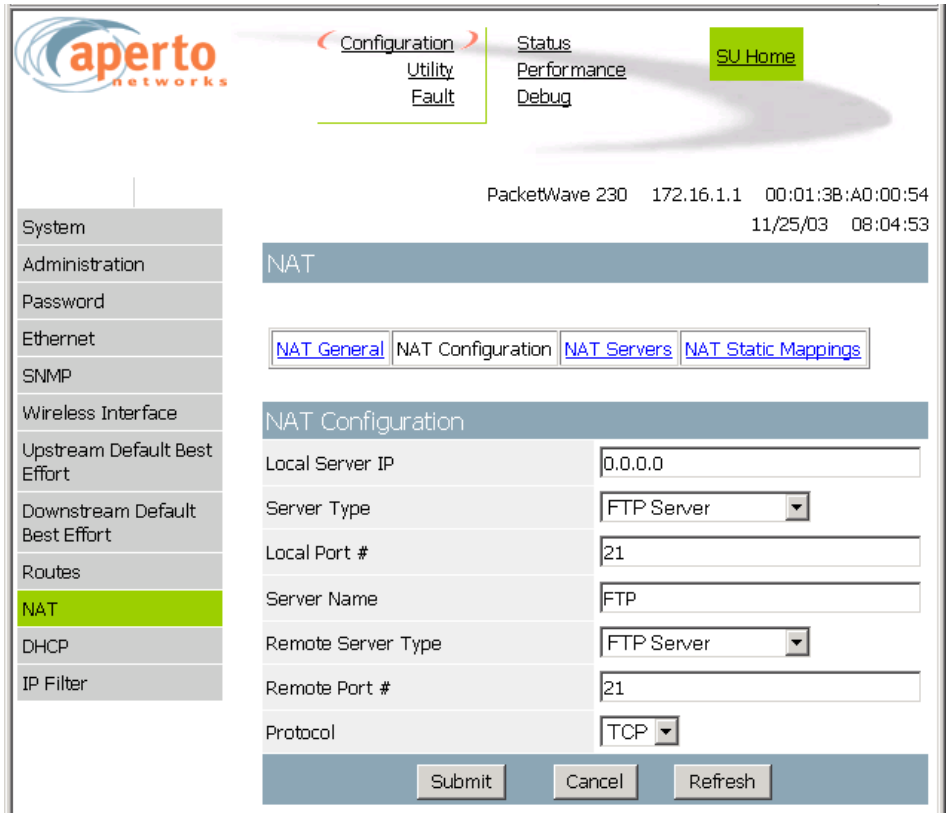

Figure 6-18 NAT Configuration Page

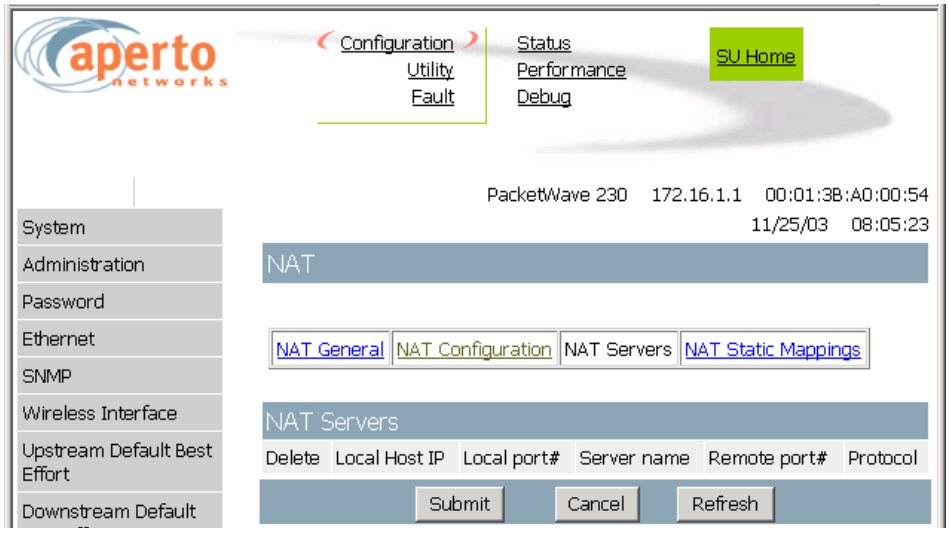

Figure 6-19 NAT Servers Page

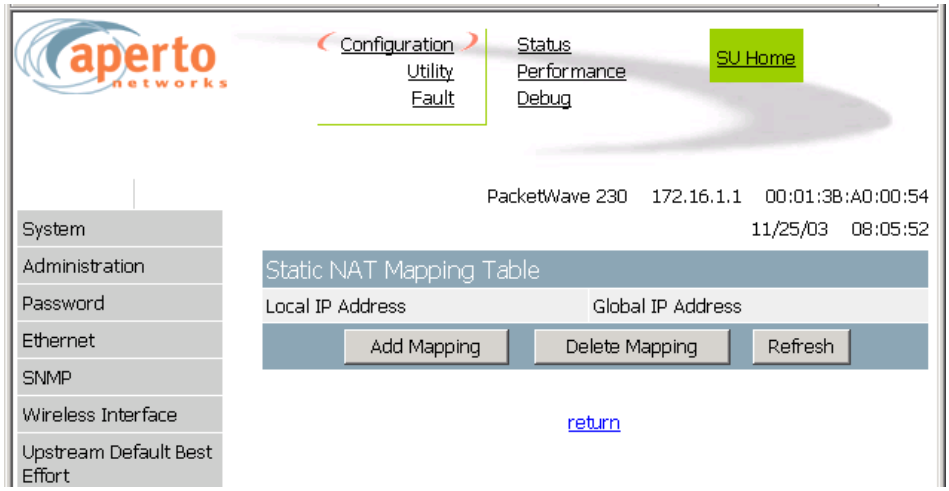

Figure 6-20 NAT Static Mappings Page

DHCP Configuration

As shown in Figure 6-21 and Figure 6-22, there are two pages that allow subscribers to configure the Subscriber Unit's DHCP (Dynamic Host Configuration Protocol) server. These pages are accessible only when the Subscriber Unit is in NAT or router mode, and are fully configurable at the Subscriber and ISP levels.

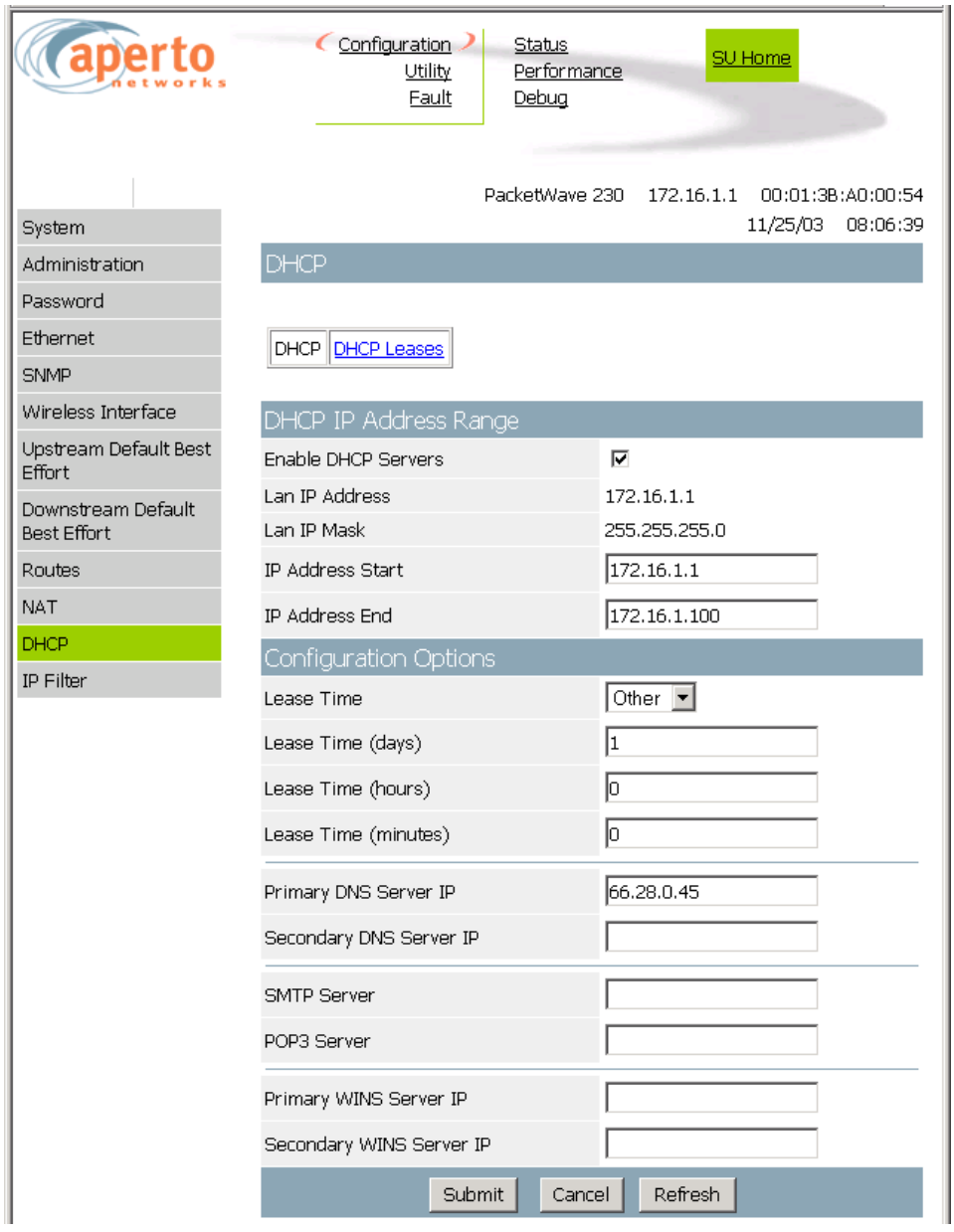

Figure 6-21 DHCP General Configuration Page

Use these pages to configure DHCP parameters as appropriate for the subscriber's LAN. To move between the DHCP configuration pages, click on the hyperlinks at the top of the pages.

DHCP configuration should be performed by a network administrator.

On the DHCP Configuration page, specify IP Address Start and IP Address End which will define the DHCP address range (required), and any other configuration parameters as desired; then click Submit.

On the DHCP Records page, assign and configure any individual IP address(es) as desired; then click Submit.

To make the DHCP configuration part of the Subscriber Unit's permanent configuration, use the Upload Configuration function (page 6-30).

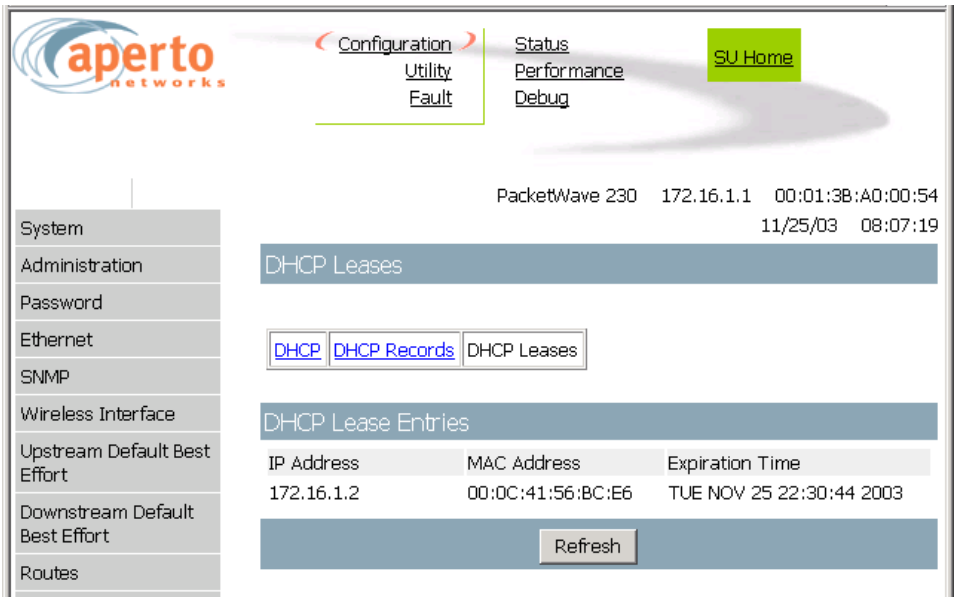

Figure 6-22 DHCP Leases Page

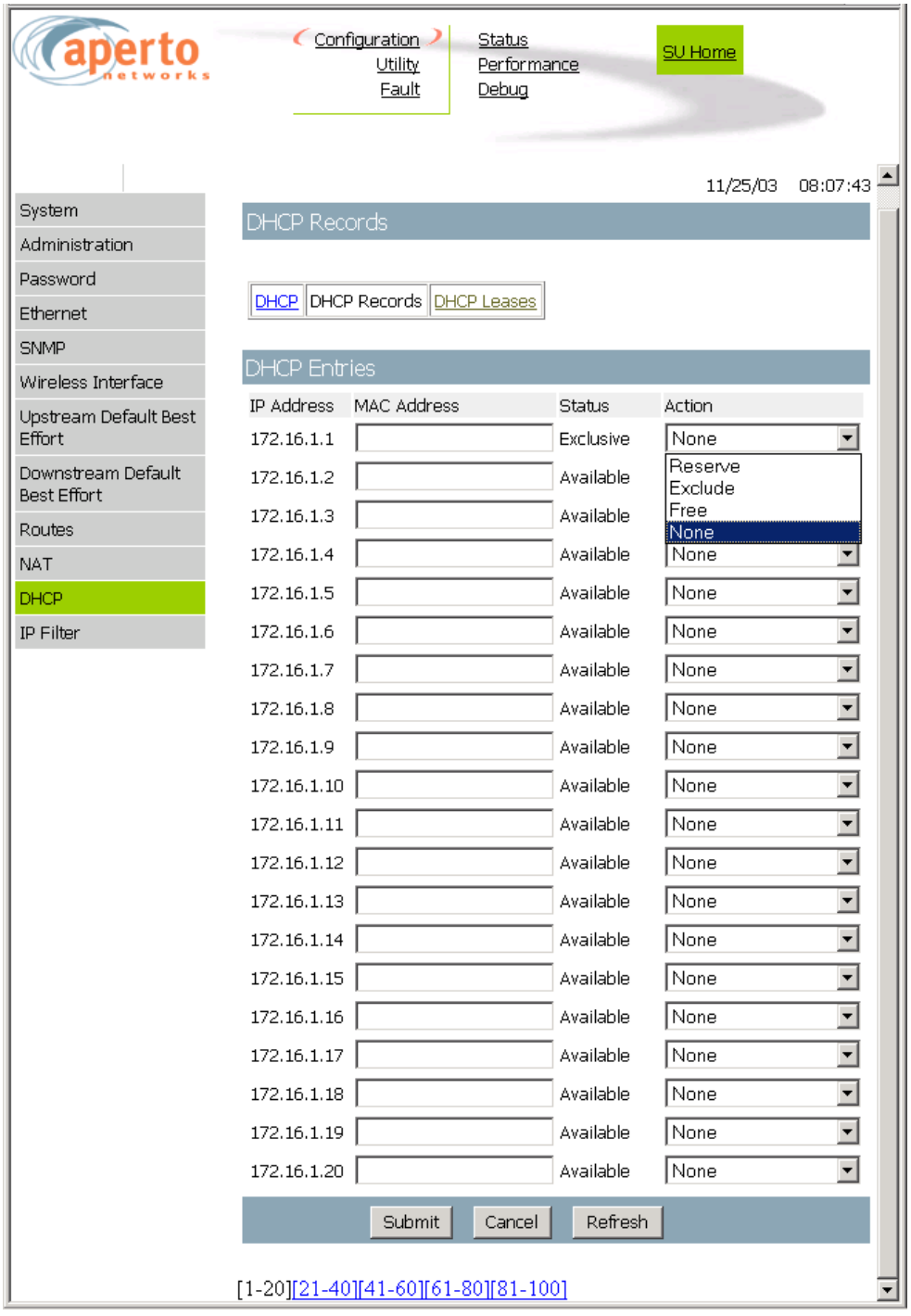

Figure 6-23 DHCP Records Page

IP Filter Configuration

IP Filter Configuration pages show any IP filters configured for the Subscriber Unit's wireless and Ethernet interfaces. IP Filter List pages list all filters configured for a particular interface, as shown in Figure 6-24. Hyperlinks at the top of the page allow either the Ethernet or the wireless interface filters to be listed.

Each filter listed has an identifier number which also functions as a hyperlink to an IP Filter Contents page. As illustrated in Figure 6-25, the IP Filter Contents page identifies the Layer 2 or Layer 3 parameters used in this particular filter. Hyperlinks at the top of the page allow selection of Ethernet or wireless interface filter contents.

All IP Filter Configuration parameters are read-only. These pages are available only at the ISP logon level.

Figure 6-24 IP Filter List Page (Ethernet)

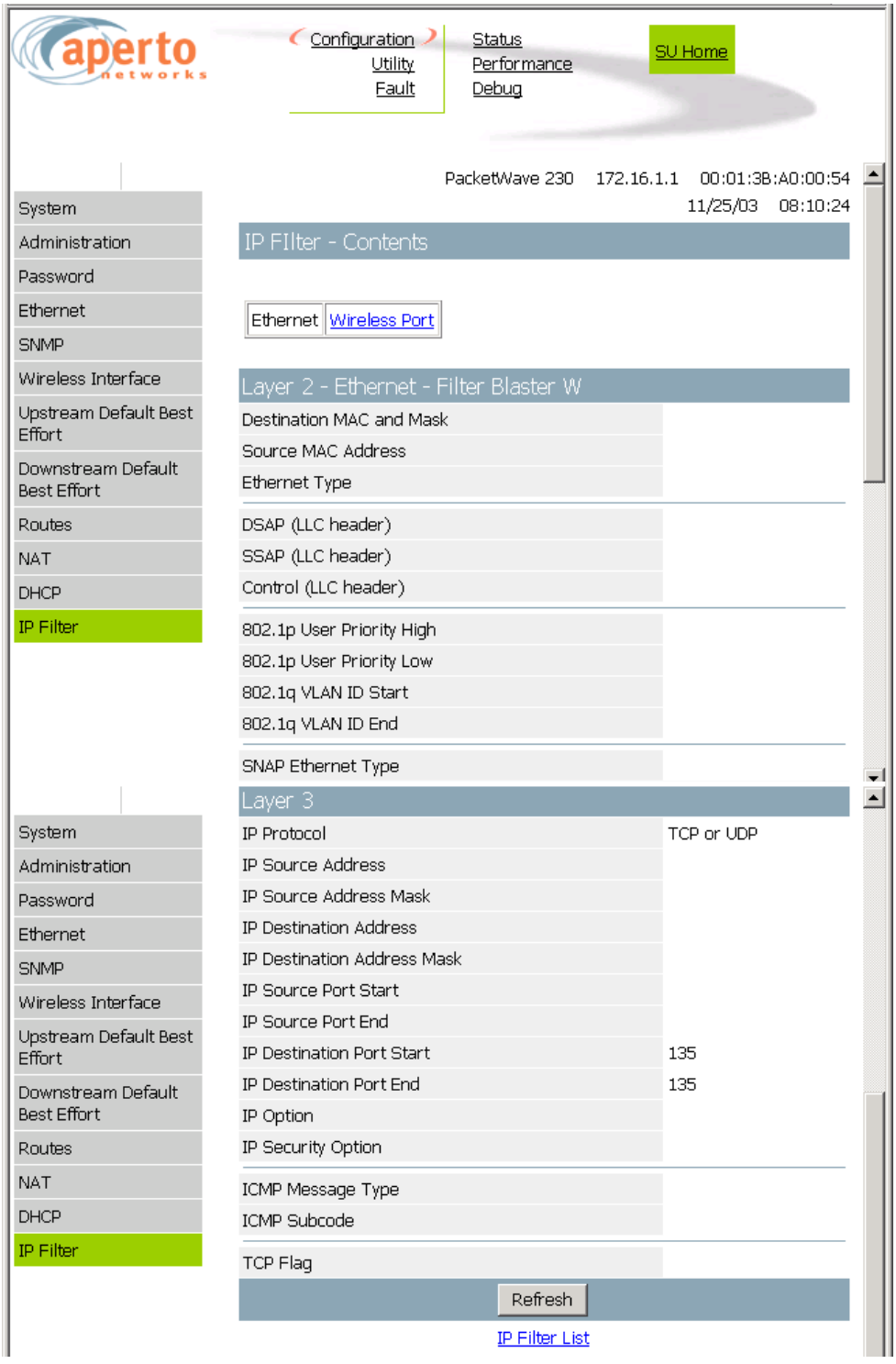

Figure 6-25 IP Filter Content Page

PPPoE/PPP Configuration

The PPPoE/PPP Configuration page shown in Figure 6-26 is available at the ISP access level when PPPoE is enabled. It is available only at the ISP logon level.

Figure 6-26 PPPoE/PPP Configuration Page, ISP Level

The PPPoE/PPP section includes the following PPPoE read-only client parameters:

- PPPoE Client Support Enable — Always enabled when this page is available.
- PPPoE Service Name and Access Concentrator Name — Optional fields set using the Configuration Manager that can be used to identify an Access Concentrators.

The PPPoE/PPP section also includes Start and Stop buttons; use these buttons to start or stop a PPPoE session.

The PPP section includes the following PPP client parameters:

- User name for authentication and Password for authentication — Specify the user name and password for login to a remote ISP network
- Interval for LCP echo request — Specify how often Echo-Request messages are sent on idle links to check the viability and integrity of the link.

- Maximum LCP echo failure retry — Specify the maximum number of times to retry sending the LCP echo request if no replying packet is received.
- Maximum Transmit Unit (MTU) — Specify the maximum transmit size for a PPP packet.
- Van Jacobson compression — Disable or enable Van Jacobson TCP/IP header compression. (By reducing the size of the TCP/IP headers to as few as three bytes, Van Jacobson compression can be a significant improvement on slow serial lines, particularly for interactive traffic.)

At the Subscriber level, the read-only PPPoE/PPP Configuration page shown in Figure 6-27 is available.

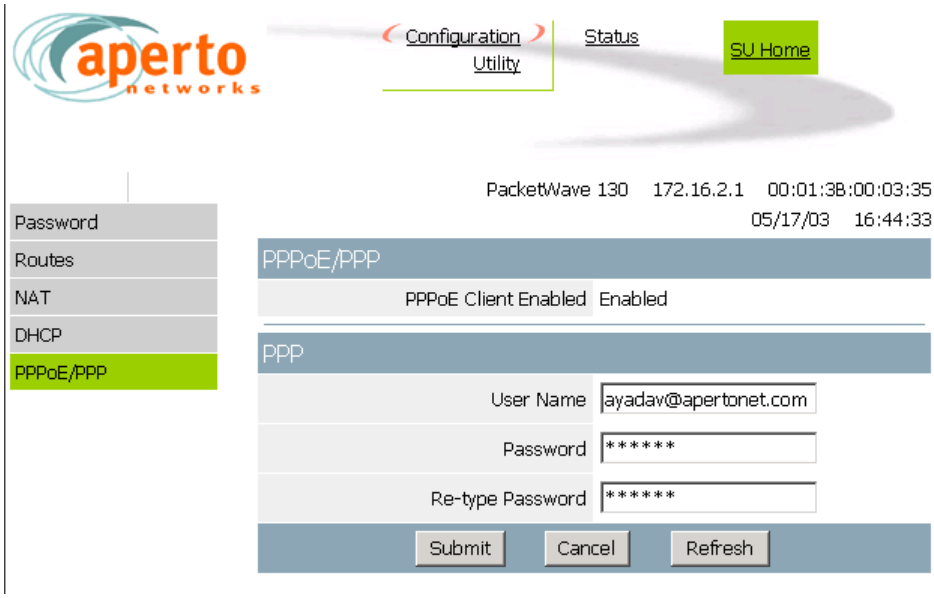

Figure 6-27 PPPoE/PPP Configuration Page, Subscriber Level

Device Control Utility

The Device Control page, illustrated in Figure 6-28, provides access to a pair of functions:

- Resetting the PacketWave 200.
- Uploading configuration changes entered via the Web interface to the Subscriber Unit's configuration file on the TFTP server, making the changes part of the Subscriber Unit's permanent configuration.

The interface will prompt for confirmation before performing a selected function.

The full Device Control page is available only at ISP logon level. At the Subscriber logon level, only the Upload Configuration function is available.

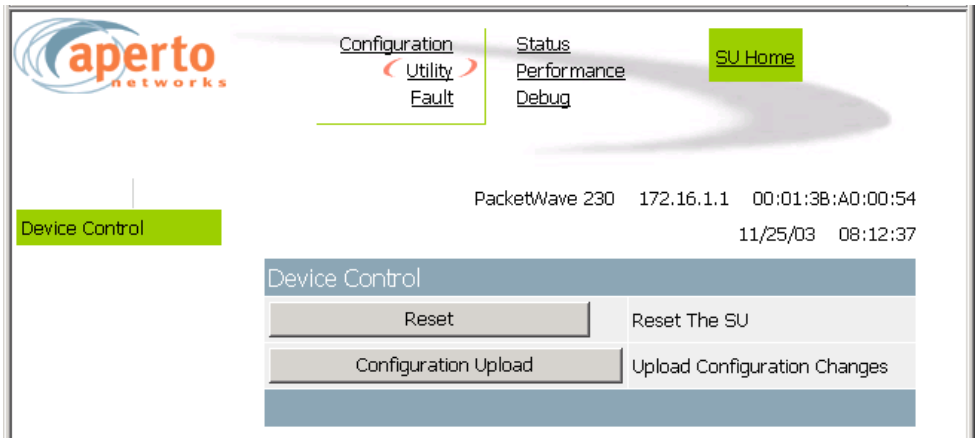

Figure 6-28 Device Control Page

Fault Reporting Pages

The subscriber fault reporting functions include an event log and E-mail configuration, as shown in Figure 6-29 and Figure 6-30. These functions are available only at the ISP logon level.

Event Log Page

The Event Log page, shown in Figure 6-29, includes all logable events reported by the PacketWave 200. You can empty the log by clicking on the Clear All Events button.

NOTE: The data base used to generate the log is updated in real time. However, the pages do not update dynamically; you must click on the Refresh button to see later status.

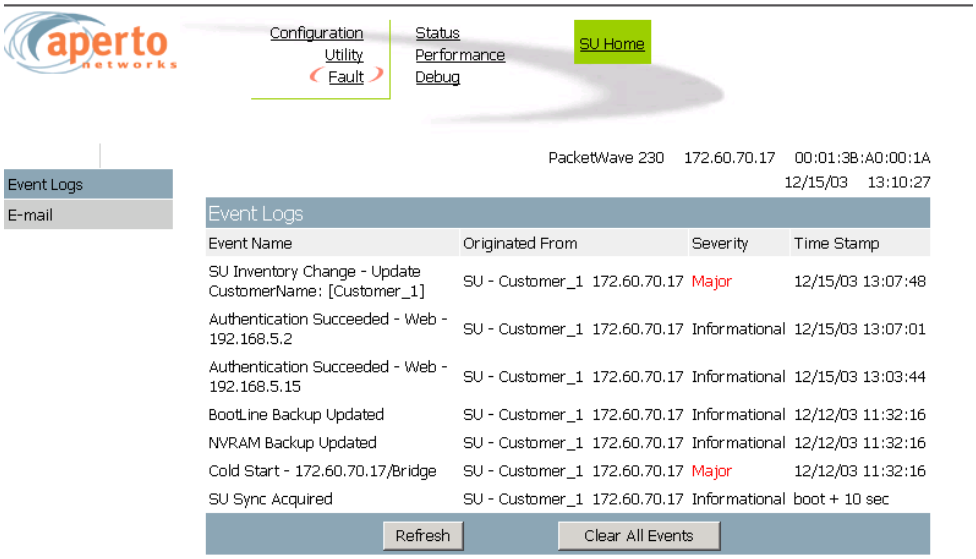

Figure 6-29 Event Log Page

E-mail Configuration Page

The E-mail Configuration page, shown in Figure 6-30, allows the viewing and altering of E-mail event reporting parameters:

- Whether event reporting via E-mail is enabled or disabled.
- The address of the SMTP server.
- The E-mail domain name.
- Reply-to and receiver E-mail addresses.
- Whether a test E-mail will be sent when the Submit button is clicked on.

Click on the Submit button to activate any changes made on this page.

Figure 6-30 Email Page

Status Pages

The Web GUI include the following status pages:

- The System Status page, shown in Figure 6-31, identifies the PacketWave 200, its software and hardware, and its current operational status.
- The Ethernet Status page, shown in Figure 6-32, shows the status, speed, and duplex mode of the Ethernet link to the subscriber's computer or network.
- The Radio Status page, shown in Figure 6-33, provides information and status regarding the PacketWave 200 radio.
- The Link Status page, shown in Figure 6-34, provides information about the wireless link between the subscriber equipment and the base station.
- The PPPoE/PPP Status page, shown in Figure 6-35, provides information about the PPPoE/PPP session. This page will only be available only if NAT and PPPoE have been enabled.

System Status and PPPoE/PPP Status are available at both ISP and Subscriber levels; Ethernet, Radio, and Link Status are available at the ISP level only.

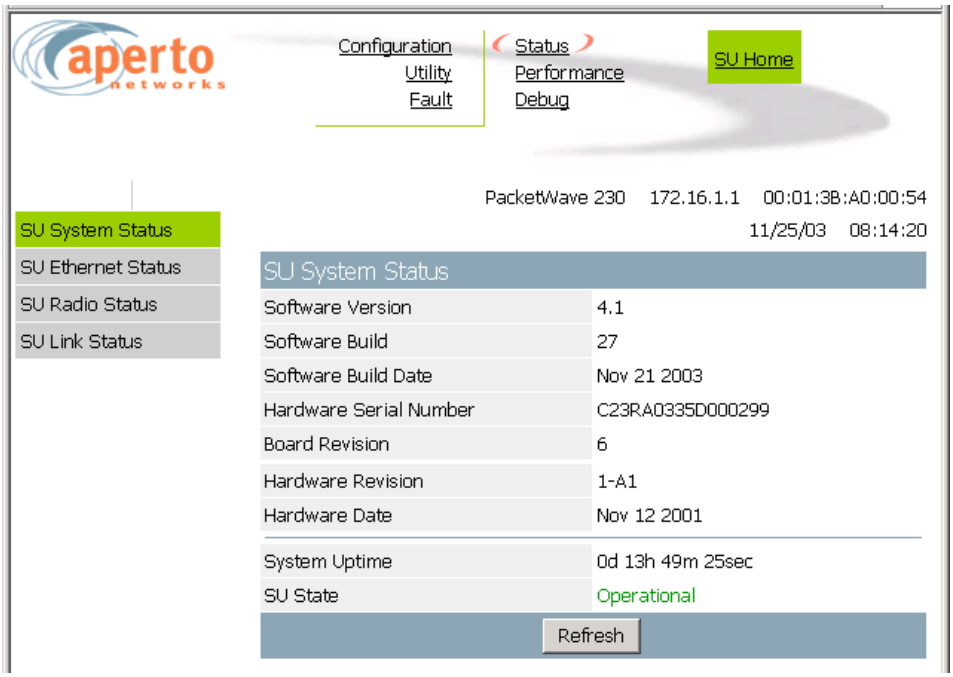

Figure 6-31 System Status Page

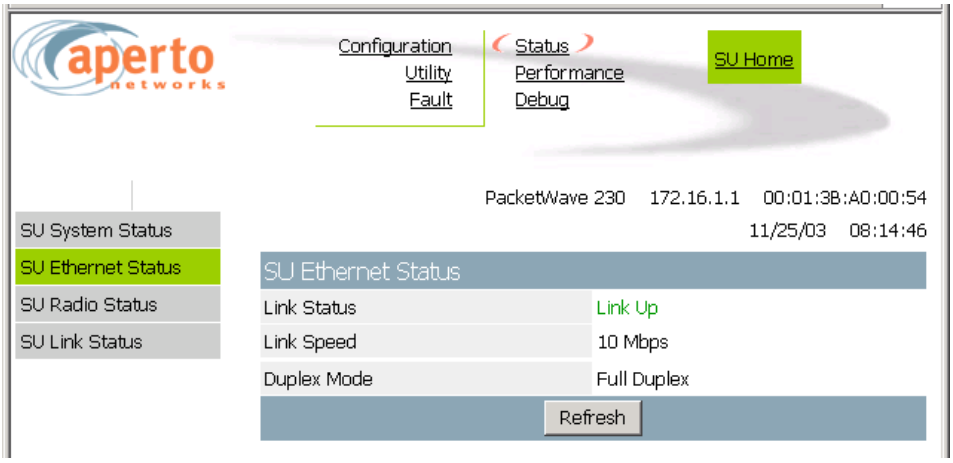

Figure 6-32 Ethernet Status Page

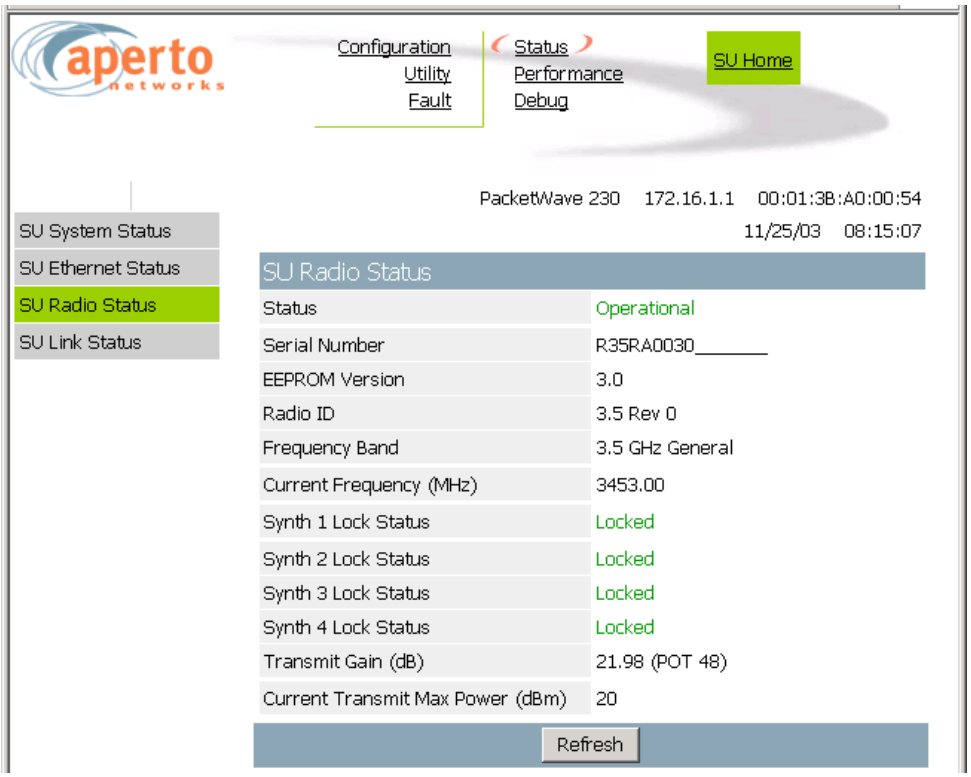

Figure 6-33 Radio Status Page

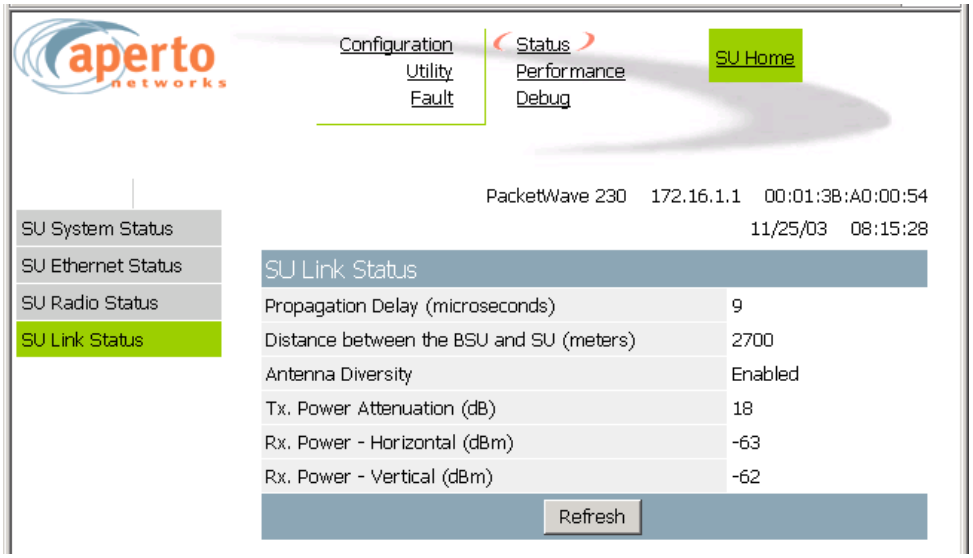

Figure 6-34 Link Status Page

Figure 6-35 PPPoE/PPP Status Page

Performance Pages

There are four performance pages:

- The SU System Statistics page (Figure 6-36) includes counts of packets and bytes transmitted and received on the wireless link.
- The PPPoE Statistics page (Figure 6-37) shows PPPoE packet counts. This page will only be available only if PPPoE and NAT have been enabled.
- The RF Signal Quality page (Figure 6-38) provides various measures of the quality of the wireless signal. counters can be reset to o by clicking on the Reset Signal Quality Counters button.
- The SU Filter Statistics page (Figure 6-39) provides counts of passed and blocked packets. Hyperlinks allow selection of Ethernet or wireless interface statistics.
- The SU Flow Statistics page (Figure 6-40) provides upstream, downstream, and upstream dropped packet counts for all defined service flows. Each Service Flow ID serves as a hyperlink to a Service Flow Details page (Figure 6-41) providing detailed flow statistics about the particular service flow. A hyperlink at the bottom of the Service Flow Details page leads back to the Service Flow Summary page.

Performance pages are available at the ISP level only.

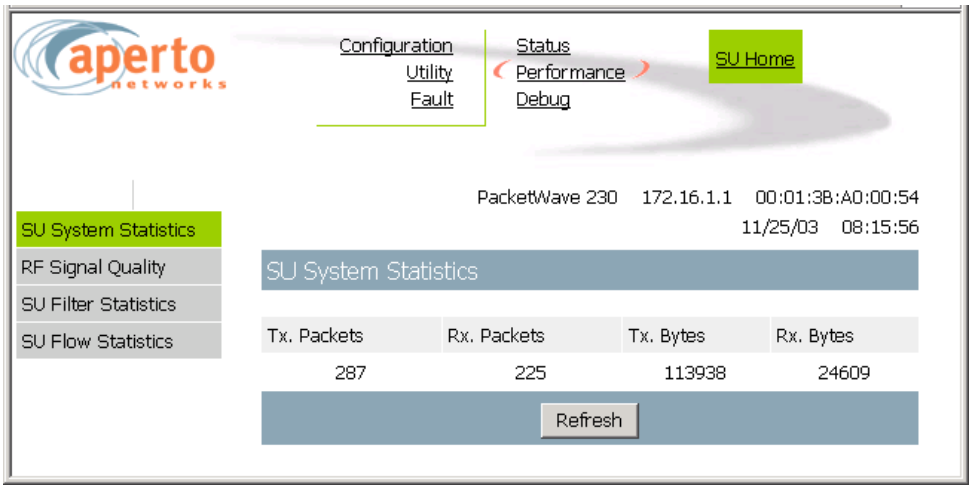

Figure 6-36 System Statistics Page

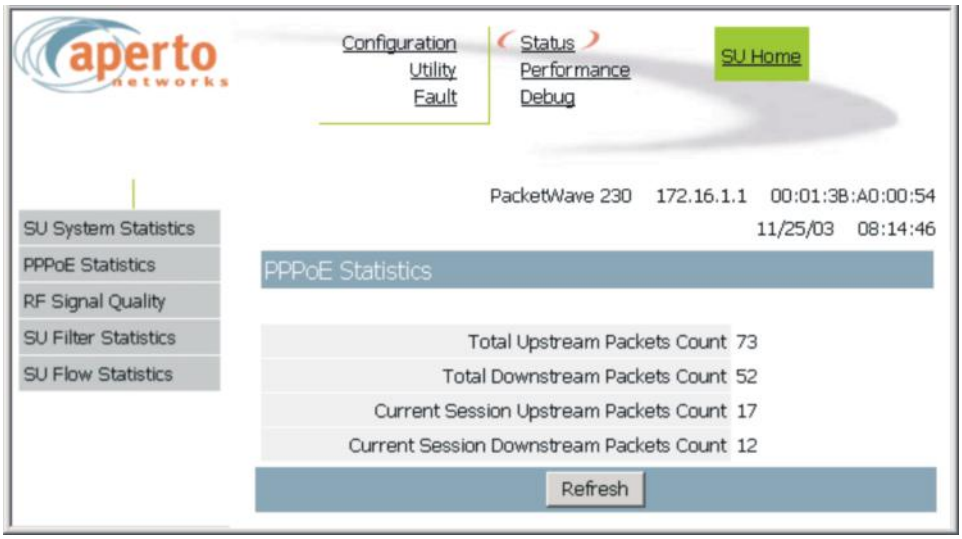

Figure 6-37 PPPoE Statistics Page

Figure 6-38 RF Signal Quality Page

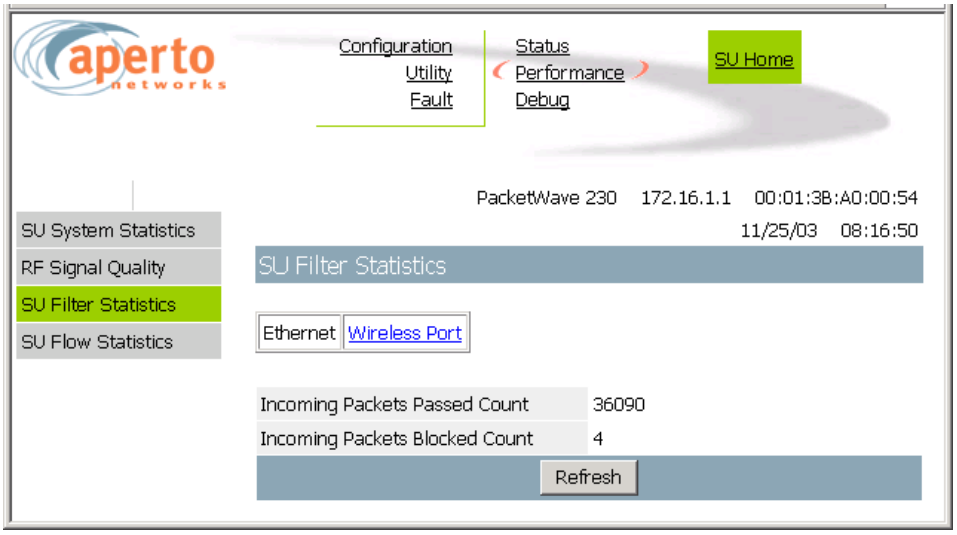

Figure 6-39 Filter Statistics Page

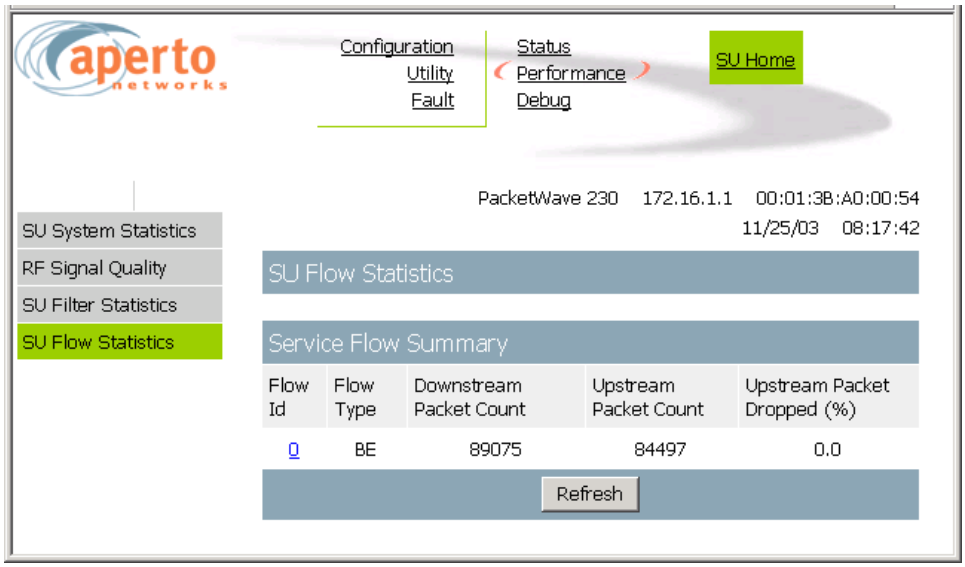

Figure 6-40 Service Flow Summary Page

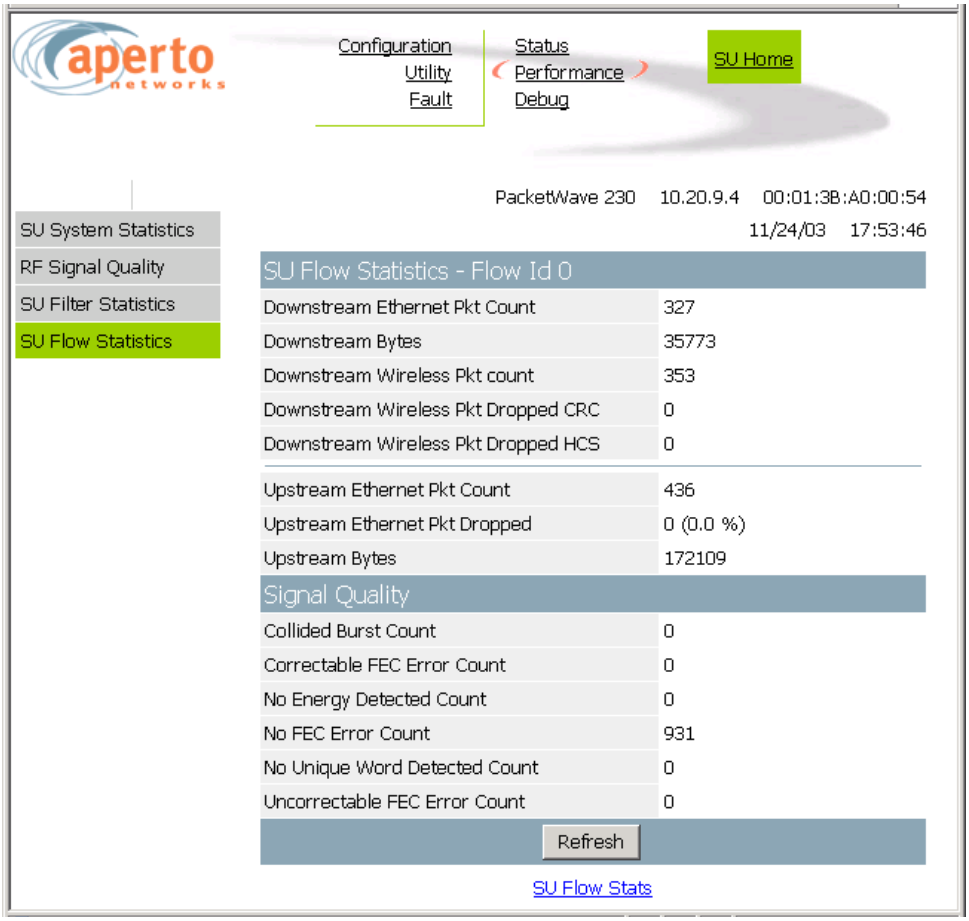

Figure 6-41 Service Flow Details Page

Debug Page

The Debug CPE Page, illustrated in Figure 6-42, provides access to a wide range of performance data and debug commands. It is available at the ISP level only, and provides advanced troubleshooting capabilities for dealing with unusual installation or operation problems.

Select performance displays and debug commands from the Commands drop-down menu as desired. When a selection has been made, the content of the debug window will change appropriately. To update the window, click Submit.

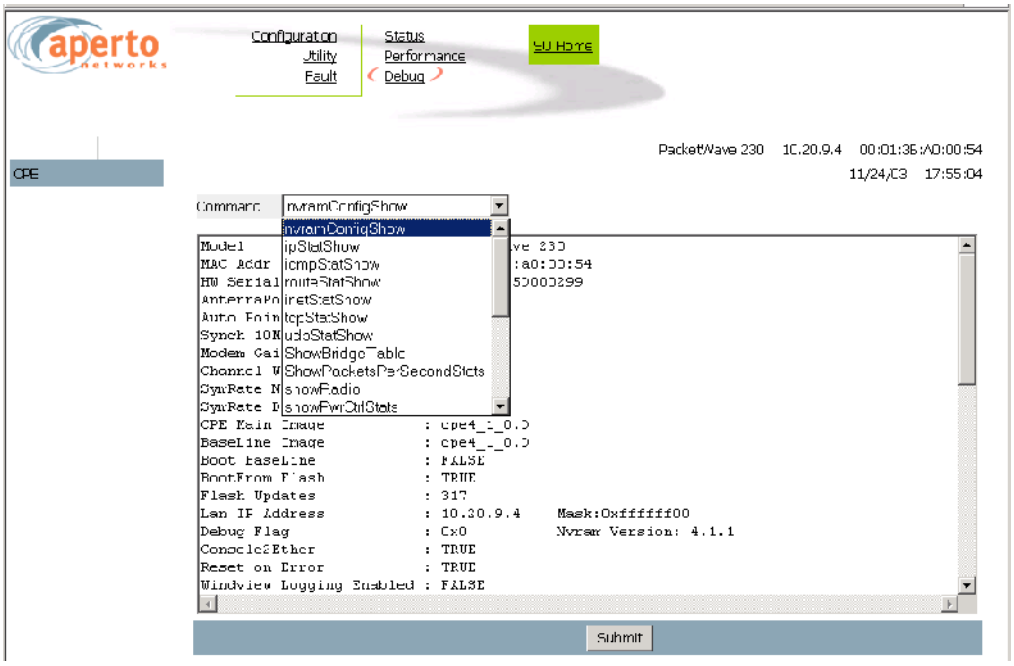

Figure 6-42 Debug CPE Page

Specifications

General Specifications

Models

PacketWave 210 — Bridging mode; up to 5 hosts

PacketWave 220 — Bridging and NAT modes; up to 20 hosts

PacketWave 230 — Bridging, NAT, and IP routing modes; up to 254 hosts

Interfaces

Interface Box to PC/Hub — 10/100Base-T Ethernet, RJ-45 connector, standard Cat 5 Ethernet cable (crossover for connection to computer; straight-through for connection to hub/switch)

Interface Box to Outdoor Unit — Ethernet plus power, shielded RJ-45 connector, shielded Cat 5 or Cat 5E cable (outdoor rated); up to 50 m (165 ft) with Cat 5, or 100 m (330 ft) with Cat 5E

Power

Power Requirement — 100 to 240 V ac, 47 to 63 Hz

Power Consumption — 30 Watts for Indoor and Outdoor Unit

Networking and Protocols

Bridging

DHCP server and client

NAT

VLAN

RF

Data Rates — from 64 kbps with burst mode up to 20 Mbps in a 6 MHz channel

Modulation — QPSK, 16 QAM

Management

Service Provider

- Subscriber provisioning using Java-based WaveCenter Configuration Manager; Windows 98/2000/Pro, Linux, and Sun Solaris 2.8 platforms
- Embedded WaveCenter agent supporting SNMP and web browser
  - SNMP MIB (RFC 1157), MIB II (RFC 1213), Aperto Enterprise MIBs
- Software updates via TFTP

Subscriber

- Web-based interface for subscriber-side
  - DHCP server and NAT configuration

Installation Manager Utility

- Facilitates antenna alignment process

Diagnostic Manager Utility

- Provides diagnostic functions for troubleshooting subscriber equipment

LED Indicators

Interface Box — Power present, Power provided to ODU

Outdoor Unit — Wireless Transmit and Receive, Ethernet Link

Interface Box

Operating Temperature — 32 to 104 °F (0 to 40 °C)

Humidity — 10 to 90%, noncondensing

W x H x D 1x2x2.5 inches (2.5x5.5x6 cm)

Weight 0.5 lbs (0.23 kg)

Regulatory Approvals

FCC Class B

ETSI

Outdoor Unit Specifications

Mounting

Clamping bracket for pole with diameter of 1.5 inch, 2 inches, or 5 cm

Adjustable elevation

Environmental

Operating Temperature — -22 to 140 °F (-30 to 60 °C)

Storage Temperature — -40 to 257 °F (-40 to 125 °C)

Humidity — 0 to 100%

2.5 GHz Outdoor Unit

Frequency Range — 2500 to 2686 MHz; Maximum EIRP * — -35 dBm

Dimensions: W x H x D — 12.6 x 12.6 x 1.9 inches (32.0 x 32.0 x 4.8 cm)

3 dB Beamwidth — Azimuth 20°; Elevation 20°

Polarization — Horizontal and vertical

3.5 GHz Outdoor Unit

Frequency Range — 3300 to 3800 MHz; Maximum EIRP * — -38 dBm

Dimensions: W x H x D — 10.2 x 10.2 x 1.9 inches (25.9 x 25.9 x 4.8 cm)

3 dB Beamwidth — Azimuth 20°; Elevation 20°

Polarization — Horizontal and vertical

5.3 GHz Outdoor Unit

Frequency Range — 5250 to 5350 MHz; Maximum EIRP * — -24 dBm for UNII

Dimensions: W x H x D — 8.1 x 8.1 x 1.9 inches (20.6 x 20.6 x 4.8 cm)

3 dB Beamwidth — Azimuth 17°; Elevation 17°

Polarization — Horizontal and vertical

NOTE: Frequency Scanning with PacketWave 200 3.5 models may have errors if the frequency range is the entire frequency band. Please divide the tests into smaller ranges.

5.8 GHz Outdoor Unit

Frequency Range — 5725 to 5875 MHz; Maximum EIRP * — -38 dBm

Dimensions: W x H x D — 8.1 x 8.1 x 1.9 inches (20.6 x 20.6 x 4.8 cm)

3 dB Beamwidth — Azimuth 17°; Elevation 17°

Polarization — Horizontal and vertical

* The maximum EIRP varies depending on country regulations.
Contact Aperto Networks sales for more information.

Appendix B

Event Reporting

The PacketWave subscriber equipment can be configured to report events by any of several means:

- E-mail event messages.
- SNMP traps.
- Logging to a Syslog server.
- Event log presented on request via the Web GUI.

Reportable events are identified in Table B-A.

Table B-A Events Reported

ID	Fault Event	Severity	Description/Comments
1	AUTHENTICATION_FAIL	Major	Request not properly authenticated. Attached string specifies interface (Web, CLI, or SNMP) and IP Address of requestor.
2	SYSTEM_WARM_START	Major	System has performed a warm start.
3	SYSTEM_COLD_START	Major	SU has received registration acknowledged message from BSU. Attached string specifies IP Address of SU and operating mode (bridge, router, NAT, or VLAN). String can also include: "TxGain Not Calib'ed" (Radio gain is not calibrated) "OvrPwr Not Calib'ed" (Radio Regulatory power is not calibrated)
13	CPE_SYNC_ACQUIRED	Major	SU acquired sync for the first time.
18	DHCP_FAILURE	Major	Attached string: DHCPC:ERROR-No DHCP Offer DHCPC: WARNING-Using Cached Data DHCPC:ERROR - Param Failure DHCPC:INVALID OFFER - no Config File/Server DHCP FAILURE-USING CACHED DATA ERROR adding default Gateway: <IP address> DHCP Failure

Table B-A Events Reported

ID	Fault Event	Severity	Description/Comments
19	CFG_DOWNLOAD_FAILURE	Major	Download or parsing of config file from TFTP server failed. Attached string: Fail download cfg file from primary TFTP server Failed to download config file Failed to parse config file Failed to verify checksum
20	RAM_AVLBL_TOO_LOW	Major	Available RAM has gone below 1.9%. Attached string: Current RAM availability (in 0.1%).
21	RAM_AVLBL_NORMAL	Major	Available RAM has returned to 1.9% or higher. Attached string: Current RAM availability (in 0.1%).
24	RADIO_VOLT_REG_FAILED	Major	Voltage regulator on the radio board failed (non-PW200 radios only).
25	RADIO_VOLT_REG_CLEARED	Major	Voltage regulator failure cleared (non-PW200 radios only).
26	RADIO_SYNTH_NOT_LOCKED	Major	Frequency synthesizer on the radio lost lock. Attached string identifies synthesizer.
27	RADIO_SYNTH_NOT_LOCKED_CLEARED	Major	Frequency synthesizer on the radio regained lock. Attached string identifies synthesizer.
30	DC12V_FAILED	Major	System power supply failed.
31	DC12V_CLEARED	Major	System power supply recovered from failure.
37	FLASH_AVLBL_SPACE_TOO_LOW	Major	Only for RAM0. Available system flash space has gone below 0.4%. Attached string gives availability (in 0.1%).
38	FLASH_AVLBL_SPACE_NORMAL	Major	Only for RAM0. Available system flash space has returned to 0.4% or higher. Attached string gives availability (in 0.1%).
41	FILESYSTEM_CORRUPTED	Major	For RAM0 only. File system has become corrupted.
42	FILESYSTEM_CORRUPTION_CLEARED	Major	For RAM0 only. File system no longer corrupted.
43	EVENT_CODE_SMTP_CONNECT_FAILURE	Major	Connection to SMTP Server cannot be established. Attached string identifies the IP Address of the SMTP Server.
45	SW_WATCHDOG_RESET	Major	Software watchdog task detected an inactive/crashed task and forced the wireless subsystem to reset. Attached string identifies problem by numeric code (0 = System Memory Low; 1 = Daemon Suspended; 2 = Assert Fail; 3 = Calls Stuck; 4 = WMAC stopped.
46	NAT_CONFIG_ERROR	Warning	Error configuring NAT; attached string gives IP address.
47	CURRENT_IMAGE_CORRUPTED	Major	System booted up from the baseline image (since the previous boot process with the original image failed). Attached string identifies image file name.
48	BSC_CPE_FAILED_REGISTRATION	Major	SU failed during registration.
49	DEFAULT_CONFIG_FILE_NOT_FOUND	Major	DFS file is absent in the device.
51	CURRENT_CPE_STATE	Info	For Operational or Standby state only.

Table B-A Events Reported

ID	Fault Event	Severity	Description/Comments
52	MEMORY_BUFFER_TOO_LOW	Major	A memory buffer critical to the system operation is almost full.
53	MEMORY_BUFFER_NORMAL	Major	A memory buffer is no longer almost full.
54	CFG_VERSION_CHECK_FAILURE	Major	"Last_Cfg_Update_Version" defined in config file is later than the current SW version; or "Last_Cfg_Update_Version" is not defined in config file. Attached string may be "Incompatible Config file version" or "Config file version absent".
55	DFS_VERSION_CHECK_FAILURE	Major	"Config_Version" defined in DFS file is different from the current SW version; or "Config_Version" is not defined in DFS file. Attached string may be "Incompatible DFS file version" or "DFS file version absent".
56	CFG_UPLOAD_FAILURE	Major	Upload of config file to TFTP server failed.
57	CFG_UPLOAD_CHECKSUM_FAILURE	Major	Checksum verification failed for the config file upload.
65	MODEL_NUMBER_CHECK_FAILURE	Major	SU's configured model number does not match actual functionality. Attached string gives SU Mac Address and reason ("Model number not supported"; "Model numbers not compatible"; "Incompatible model and mode"; "Model number not configured"; "CPE mode not configured").
66	DHCP_Warning	Warning	DHCP not completely successful. String attached: No IP record bound for <MAC Address> Duplicated MAC address <MAC Address> found Fail to add <MAC Address> to leased table Dynamic Lease <IP Address> overridden. Fail to configure <IP Address> Exclude a reserved entry <IP Address> IP entry <IP Address> not found. Invalid parameter "X"
67	CFG_PARSE_FAILURE	Major or Warning	Config file can't be parsed correctly. String attached: Error parsing config file Unknown TLVs found in config file *[This may happen when a config file generated with the new software is loaded onto a system using relatively older software]* Unknown WSS found in config file *[TLVs that belong to an unknown WSS are found in the config file]*
68	EV_UPDATE_CPE_INVENTORY	Major	Customer name has been changed dynamically. Attached string gives SU customer name.
69	PPP_FAILURE	Major	PPP failed to establish a session (may be a result of LCP negotiation failure or a result of CHAP authentication failure). Attached string: "PPP authentication fails" "PPP LAC call fails"
70	PPP_STATUS	Info	PPP link has gone up or down. Attached string: "PPP link is up" "PPP link is down"
71	FREQUENCY_CHANGE	Major or Info	SU radio frequency has been changed dynamically. Attached string gives new frequency. *Severity is Info if the SU is not operational; Major otherwise.*
74	PPPOE_SESSION_UP	Info	A PPPoE Session has come up. Attached string specifies "SESSION ACTIVE:<SessionId #>"

Table B-A Events Reported

ID	Fault Event	Severity	Description/Comments
75	PPPOE_OFFER_ERROR	Warning	No valid PPPoE Active Discovery Offer (PADO) was received in response to a PPPoE Active Discovery Initiation (PADI) packet; or no valid PPPoE Active Discovery Session-confirmation (PADS) was received in response to a PPPoE Active Discovery Request (PADR) packet. Attached string elaborates: "Invalid Offer: Access Concentrator Name didn't match" "Invalid Offer: Service Name didn't match" "Invalid Offer: No Service Name in offer" "No PPPoE Active Discovery Offer received" "MAX PADI Retries exceeded-giving up" "Timed out waiting for PADS"
76	PPPOE_SESSION_TERMINATE	Warning	A PPPoE Session has terminated. Attached string indicates reason: "Terminating PPPoE Session: PADT From Server" "Terminating PPPoE Session: NMS Initiated" "Terminating PPPoE Session: PPP Initiated"
77	ETH_LINK_AUTO_NEGOTIATE	Major	Ethernet link failed to come up using a fixed speed and duplex setting and has fallen back to Auto-Negotiate.
78	RADIO_INIT_ERROR	Major	SU only. Radio cannot be initialized. Attached string: "Ctrl Error" (ODU interface issues) "Bad Chksum" (incorrect checksum on serial EEPROM) "Cfg Freq Invalid" (mismatch between configured frequency and radio board) "HFDD Not Supported" (configuring FDD mode on non-FDD radio)
79	RADIO_CANNOT_HIT_MAX_POWER	Major	Radio board cannot reach maximum configured power. May be caused by a combination of faulty (or very long) coaxial cable connection, extremely hot weather, and/or bad calibration data.
80	RADIO_CANNOT_HIT_MAX_POWER_CLEARED	Major	Radio board which could not reach maximum configured power can now do so.
81	SODU_AGC_TABLE_NOT_CALIBRATED	Major	The PW200 SU platform relies on accurate calibration of the receive gain throughout the entire receive chain. If the table is not correctly calibrated or gets corrupted, the PW200 will have to fall back on default receive power adjustment algorithm which may be far from optimal. This problem does not stop a PW200 from becoming operational but the downstream link quality may suffer.
82	FREQ_TABLE_NO_VALID_ENTRY	Major	SU's frequency table is configured with invalid frequency/BSU ID.
83	HTML_UNZIP_ERROR	Major	Web GUI files on the flash are either missing or are corrupted. Attached String: "File Not Found" "File Corrupted"
84	BOOTLINE_BACKUP_UPDATED	Info	Backup bootline parameters have been updated to bring them in sync with the actual boot parameters.
85	BOOTLINE_RESTORED_FROM_ BACKUP	Major	Main bootline parameters are corrupted; the system has fallen back to backup boot parameters.
86	NVRAM_BACKUP_UPDATED	Info	Backup copy of NVRAM configuration parameters has been updated to bring them in sync with actual NVRAM configuration.
87	NVRAM_RESTORED_FROM_BACKUP	Major	Main NVRAM configuration data is corrupted; the system has fallen back on backup NVRAM configuration.

Diagnostic Manager

The Diagnostic Manager utility supports a range of diagnostic functions designed to help isolate Subscriber Unit problems under direct supervision by Aperto personnel. It is not intended for general use by subscribers or service providers.

Loading the Diagnostic Manager Software onto the PC

To load the Aperto Installation Manager (AIM) software onto the PC to be used to run the Diagnostic Manager:

1. Obtain the CD distributed with your PacketWave 200 equipment, which includes the Diagnostic Manager (DM) software plus Java software from SUN Microsystems.
2. If the Java Runtime Environment is not present on the PC, install it from the PacketWave distribution CD (bsu/Software/Application/Support directory) or the java.sun.com web site.
3. Run the file *setup.exe* from the /Software/Application/DiagnosticManager/‹OS› directory (where *‹OS›* is the operating system being used, such as *win32*). At the end of this installation, a Diagnostic Manager icon will be placed on the PC's desktop.

NOTE: Diagnostic (DM) is now combined with AIM. It does work with the same interface protocol as AIM and therefore is included in the same package.

Running the Diagnostic Manager

To use the Diagnostic Manager:

1. Connect the PC to the PacketWave 200 as described under Connecting to the PacketWave 200 on page 5-2.

2. Click on the Diagnostic Manager icon on the desktop to launch the utility. The window shown in Figure C-1 will be displayed.
3. Enter the MAC address of the PacketWave 200 as prompted; then click OK.

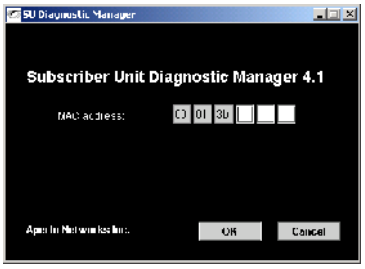

Figure C-1 Opening Diagnostic Manager Window

4. The Diagnostic Manager will open as shown in Figure C-2. The Diagnostic Manager includes numerous diagnostic functions which can be initiated from the main menu bar or from the command list area at the bottom of the window.
5. Execute diagnostic commands as directed by Aperto personnel. Command results will be displayed in the text area below the menu bar.

WARNING: Diagnostic functions can seriously disrupt operation of the PacketWave 200. Use the Diagnostic Manager utility only under direct supervision by Aperto personnel.

Make sure you close Diagnostic Manager (DM) sessions manually when using DM with PacketWave 200 series products. If they are not closed, the data, which remains in the memory will take up space needed by theSystem Upgrade Manager (SUM). SUM will give a warning that there is not enough space and the process will not complete

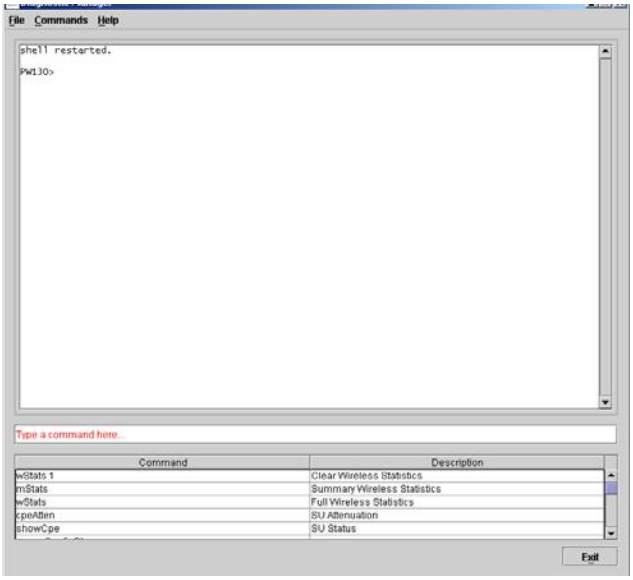

Figure C-2 Diagnostic Manager

Appendix D

Command Line Interface (CLI)

Each Subscriber Unit includes a simple command line interface (CLI) accessible via telnet. The CLI is intended primarily for troubleshooting and debug use under direction of Aperto personnel.

Accessing and Using the CLI

To access and use the Subscriber Unit's command line interface:

1. Telnet to the Subscriber Unit's IP address.
2. At the Login: prompt, enter the desired logon level: ISP or Subscriber. (There is also a Debug logon level, which is reserved for Aperto use.)

   NOTE: All CLI entries, including user name and password, are case-sensitive.

3. At the Password: prompt, enter the correct password for the specified logon level.

   

   The CLI uses the same passwords as the Web interface. The default passwords are isp and subscriber (case-sensitive). Passwords can be changed via the WaveCenter Configuration Manager, the Web GUI, SNMP, and the CLI.

4. When the **CLI#** prompt appears, you are in the CLI.
   a. For a list of commands, type **?** (the **?** will not appear on the screen; pressing [Enter] is not necessary). The CLI will respond with a list of the available commands groups.
   b. To see the specific commands in a group, type the group name followed by **?** (again, the **?** will not appear, and pressing [Enter] is not necessary).
   c. To display information about the use of a specific commands, including command parameters, enter the command followed by **?**.
5. If there is no activity on a connection for 30 minutes, the CLI will disconnect.

6. When you are finished with the CLI, end the Telnet session by entering the killTelnet command or simply closing the Telnet application.

NOTE: One should type the command followed by an enter key. Then type the "?" followed by an enter key. This will produce the desired effect.

Commands

Subscriber Unit CLI commands are defined in Table D-A. All commands are case-sensitive.

Error Messages

Error messages which may be returned by the Subscriber Unit CLI include the following:

- Error: Bad Command — command has been entered incorrectly.
- Error: Invalid Parameter — command has been entered incorrectly.
- Not applicable for SU — command applies to BSU CLI only.
- Passwords are not the same — when setting a password, two password entries do not match.

Table D-A Subscriber Unit CLI Commands

Command	Function
killTelnet	Causes the CLI to terminate all current Telnet sessions connected at port 5000.
reboot	Reboots the Subscriber Unit.
set dhcpServer	Does not apply to Subscriber Unit.
set vlan	Sets vlan parameters.
set debug_passwd set isp_passwd set subs_passwd	These commands set passwords for Debug, ISP, and Subscriber logon. CLI prompts for password to be entered twice (Enter Password:, then Confirm Password:). New password is set only if the two entries are identical, including case. Password cannot be set for higher logon level than current logon.
show dhcp_server	Shows the DHCP parameters, including IP address, subnet mask, and gateway, TFTP servers, and config file name.
show config file	Displays the Subscriber Unit's configuration file in text format. File is displayed one screen at a time; CLI prompts for key to be pressed to display next screen.
show config frequency port 1 show config frequency all	Either command shows the center frequency for the Subscriber Unit's wireless port. The center frequency unit is 100 Hz; add two zeros for frequency in Hz.
show config su_local_cfg	Does not apply to Subscriber Unit.
show config vlan	Shows the management VLAN parameters.
show status system	Displays a broad range of system parameters.

ODU Cables

Table E-A identifies specific cables and cable components that have been verified to meet PacketWave 200 Series Subscriber Unit specifications for connection of the ODU to the Interface Box.

NOTE: You can use other similar cables if you choose. However, only the cables specified in Table E-A have been tested to the maximum lengths specified for PacketWave installations.

Table E-B identifies accessories that will simplify cable installation.

Table E-A Radio Signal and Control Cables

Cable Use	Maximum Length	Cable Type	Connectors
Interface Box to ODU	50 m (165 ft)	RG-6 Commscope 5741 Quad shielded, Copper covered steel center conductor Anixter #CS5741	Thomas & Betts SNS6QS F connector for RG-6 Quad shield Snap and Seal (Environmental) Anixter #182461
	100 m (330 ft)	RG-6 Belden 9290 Quad bare copper shielded, copper center conductor Anixter #B9290	Thomas & Betts SNS6QS F connector for RG-6 Quad shield Snap and Seal (Environmental) Anixter #182461

Table E-B Cable Accessories

Accessory	Description
Modular Plug Crimping Tool TYCO/AMP 2-231652-1 Anixter #143320	Hand crimp tool recommended for crimping modular plugs to Cat5e cables.
Coax Cable Tester Ideal Industries 62-202 Anixter #224414.	This is an example of a coax cable tester. (Many alternatives are also available.)
Cat 5e Cable Tester Ideal Industries 62-200 Linkmaster Cable Tester Anixter #216776	This is an example of a Cat 5e cable tester. (Many alternatives are also available.)

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