P–Com AirPro Gold®

Wireless Router
Hardware Installation Guide

P-Com AirPro Gold® Wireless Router

Hardware Installation Guide

P▶COM

STATEMENT OF WARRANTY

This product, except as stated otherwise in an applicable price list, is warranted against defects in workmanship and material for a period of three (3) years from date of delivery as evidenced by the manufacturer's packing slip or other transportation receipt.

The manufacturer's sole responsibility under this warranty shall be to either repair or replace, at its option, any component which fails during the applicable warranty period because of a defect in workmanship and material, provided PURCHASER has promptly reported same to the manufacturer in writing. All replaced Products or parts shall become property of the manufacturer.

P-Com shall honor the warranty at its repair facility in Campbell, California. It is PURCHASER's responsibility to return, at its expense, the allegedly defective Product to the manufacturer. PURCHASER must obtain a Return Materials Authorization (RMA) number and shipping instructions from the manufacturer prior to returning any Product under warranty. Transportation charges for the return of the Product to PURCHASER shall be paid by the manufacturer within the United States. For all other locations, the warranty excludes all costs of shipping, customs clearance and other related charges. If the manufacturer determines that the Product is not defective within the terms of the warranty, PURCHASER shall pay to the manufacturer all costs of handling, transportation and repairs at the then prevailing repair rates.

All the above warranties are contingent upon proper use of the Product. These warranties will not apply (i) if adjustment, repair or parts replacement is required because of accident, unusual physical, electrical or electromagnetic stress, negligence of PURCHASER, misuse, failure of electric power, environmental controls, transportation, not maintained in accordance with manufacturer's specifications, or abuses other than ordinary use (ii) if the Product has been modified by PURCHASER or has been repaired or altered outside the factory, unless the manufacturer specifically authorizes such repairs or alterations; (iii) where manufacturer serial numbers, warranty data or quality assurance decals have been removed or altered.

P-Com also reserves the right to make product improvements without incurring any obligation or liability to make the same changes in Products previously manufactured or purchased. In no event shall the manufacturer be liable for any breach of warranty in an amount exceeding the net selling price of any defective Product. No person, including any dealer, agent or representative of P-Com is authorized to assume for P-Com any other liability on its behalf except as set forth herein. Nonpayment of any invoice rendered within the stated payment terms automatically cancels any warranty or guarantee stated or implied. If any payment is due to the manufacturer for services performed hereunder, it shall be subject to the same payment terms as the original purchase.

P-COM HEREBY DISCLAIMS ALL IMPLIED WARRANTIES ON PRODUCTS INCLUDING WITHOUT LIMITATION, ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The warranties expressly stated herein are the sole obligation or liability on the part of P-COM arising out of or in connection with the sale or performance of the products.

Products Manufactured by Others - For products not manufactured by P-COM, the original manufacturer's warranty shall be assigned to PURCHASER to the extent permitted and is in lieu of any other warranty, express or implied. For warranty information on a specific product, a written request should be made to the manufacturer.

IN NO EVENT WILL P-COM BE LIABLE TO PURCHASER FOR (i) REPROCUREMENT COSTS; (ii) SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES; (iii) ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT, OR THE USE OR PERFORMANCE OF P-COM PRODUCTS, REGARDLESS OF WHETHER THE CAUSE OF ACTION IS IN CONTRACT, TORT, INCLUDING NEGLIGENCE, OR ANY OTHER FORM.

No action, whether in contract or tort, including negligence, arising out of or in connection with this Agreement, may be brought by either party more than eighteen (18) months after the cause of action has accrued, except that an action for nonpayment may be brought within eighteen (18) months of the date of last payment.

PRODUCT COMPATIBILITY

While every effort has been made to verify operation of this product with many different communications products and networks, P-Com Corporation makes no claim of compatibility between its products and other vendors' equipment. It is assumed that users have thoroughly evaluated this product's performance in the communications environment in which it will be used.

SAFETY

The following general safety precautions must be observed during all phases of operation and service of this product. Failure to comply with these precautions or with specific warnings elsewhere in this Manual willfully violates standards of design, manufacture, and intended use of the product. P-Com Corporation assumes no liability for the customer's failure to comply with these requirements.

This product must be grounded. In the event of a short circuit, grounding reduces the risk of electrical shock by providing an escape wire for the current.

We recommend that you use preferred power—a dedicated power circuit with an assigned circuit breaker.

The product's AC power cord ends in a three-pole grounding plug. Do not use a three-pole to two-pole adapter with the plug. Verify that the outlet you intend to use is properly installed and grounded; the outlet used must comply with the National Electric Code (NEC) NFPA70 (1990) in U.S.A. or other local and national or international applicable code.

Do not install or operate this product in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

No user maintained or adjustable components are present within this product. Do NOT attempt to open this unit. Do not attempt to service this unit except under the direction of Customer Service. Only P-Com-authorized service personnel should service this equipment. The potential for electrical shock exists within the enclosures at all times unless they are unplugged.

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to the factory for service and repair to ensure that safety features are maintained. Prior to returning any product(s) for repair, contact P-Com at the telephone numbers or address located in this Manual, and obtain a Return Material Authorization (RMA) number.

Changes or modifications not expressly approved by P-Com Corporation can void the user's authority to operate this equipment.

SYSTEM GROUNDING

Direct grounding of the antenna, mast, and tower serves as protection from lightning strikes and static buildup. A direct electrical connection should be made to a suitable grounding rod at the base of the tower or mast using at least #10 AWG ground wire, or its equivalent, and non-corrosive hardware. For details and safety standards, consult the appropriate local Electrical Codes or a similar document. Use lightning arresters in appropriate places.

TOWER CONSTRUCTION

Compliance with local zoning and tower construction regulations is recommended when AirPro Gold® systems require a tower. These regulations generally mandate that permits be obtained before any tower construction begins. Check with local zoning and aviation authorities for more information.

FCC NOTICE TO USERS

This device complies with Part 15.247. Assigned FCC Registration Number (FRN) is 0005-8888-70.

This equipment has been tested and found to comply with the limits for a class B 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 in accordance with 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 interfernce to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the seperation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experinced radio/TV technician for help.

IN ACCORDANCE WITH FCC PART 15
OPERATION IS SUBJECT TO THE FOLLOWING CONDITIONS:

USER

1.) Professional installation required.

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

INSTALLER

1.) Professional installation required.

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

 3.)The maximum peak outdoor power of the intentional radiator shall not exceed 1 watt (+30dBm). In addition, this system operating in the 2400-2483.5 Mhz band may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak outdoor power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Product Output Power selection setting instructions:

a.) Connect a PC (serial port) to the unit's front panel Computer Port. This port is a standard RS-232 inerconnection. (See section A-7 of the installation manual)

b.)Configure Output Power setting via:

    1.) Hyper-Terminal

- Baud Rate	115200
- Data Bits	8
- Parity	None
- Stop Bits	1
- Flow Control	Hardware

Establish a terminal session, at the Command Line Interface; enter Pwr and the Power Selection. Reboot the system by entering BOOT, then ENTER. It is not necessary to power down the unit.

    2.) P-Com's proprietary installation software-Site Manager

        See Site Manager instuction manual for Output Power Setting configuration.

ETSI NOTICE TO USERS

This device complies with ETSI 300-328 and ETSI 300-326 ETSI rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device may not cause any interference that may cause undesired operation.

Changes or modifications not expressly approved by P-Com Inc. can void the user's authority to operate the equipment.

ETSI regulations require that this device be professionally installed by a person knowledgeable in electronics and trained in the correct installation of this device.

All interface cables must be shielded.

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Before You Begin

PURPOSE OF THIS GUIDE

This *P-Com AirPro Gold® Hardware Installation Guide* is directed to persons who must perform or coordinate the tasks associated with the process of installing a AirPro Gold® wireless router in a local area network (LAN).

PRIOR KNOWLEDGE

This *Installation Guide* assumes that you are knowledgeable about basic hardware installation concepts and practices. If you are not, the information in this *Installation Guide* may be difficult for you to understand and implement.

HOW THIS GUIDE IS ORGANIZED

This *Installation Guide* is organized in chapters and appendix material in the following manner:

- Chapter 1 - provides a product overview of the AirPro Gold wireless router
- Chapter 2 - describes different wireless network topologies
- Chapter 3 - tells you how to perform a basic radio configuration and hardware installation
- Chapter 4 - provides instructions for mounting the AirPro Gold in an equipment rack
- Appendix A - provides AirPro Gold specifications

HOW TO USE THIS GUIDE

Before beginning the installation process, review all the chapters so that you have a sense of what each chapter provides. Verify that you have selected the proper installation procedure to meet site-specific needs.

Read through an entire procedure before you begin performing the step-by-step instructions. By doing this, you will be prepared with the appropriate information, equipment, or tools.

TYPOGRAPHIC CONVENTIONS

Notes, Cautions, and Warnings are shown as:

NOTE *A note gives you information of special interest.*

A caution gives you information that you need so that you will not damage the equipment or lose data.

A warning gives you information that you need so that you do not cause harm to yourself or any other person, and so that you do not damage or interfere with the network application.

CUSTOMER SERVICE

P-Com distributors are authorized local service providers and are responsible for immediate customer support. If problems are not resolved, you can contact P-Com Customer Service for assistance.

E-MAIL SERVICE

P-Com Customer Service provides the following e-mail address for customer assistance:

customer_service@p-com.com

TELEPHONE AND FAX SERVICE

P-Com Customer Service maintains a 24-hour answering service for emergency telephone support. Customer Service responses to emergency calls consist of over-the-phone troubleshooting and assistance in obtaining distributor support.

See Table A for Customer Service telephone numbers.

Table A Customer Service Telephone Numbers

If you are in this location	Call this number
Within the USA	1-800-500-PCOM
United Kingdom	44.1527.62229
Singapore	65.223.6883
China	86.10.6467.1905
India	91.1246.3646.14/15/16
Pakistan	9221.582.2401
Any other country outside the USA	1-408-866-3666

SERVICE AND REPAIR CENTERS

Service and repair centers are located in the United States, Brazil, China, and India.

UNITED STATES SERVICE AND REPAIR CENTER

Address:
P-Com, Inc.
3175 S. Winchester Blvd.
Campbell CA 95008 USA

Telephone and fax:
1.408.866.3666
1.408.866.3161 (fax)

BRAZIL SERVICE AND REPAIR CENTER

Address:
Mapra
Rue Caio Graco, 798-lapa
CEP 05044-000 Sao Paulo

Telephone and fax:
55.11.3861.5036
55.11.3861.5031 (fax)

CHINA SERVICE AND REPAIR CENTER

Address:
Airlink Wireless
Room 227, Towercrest Place
No. 3 Mai Zi Dian Xi Road
Beijing 100016 PRC

Telephone and fax:
86.10.6467.1905
86.10.6467.1906 (fax)

INDIA SERVICE AND REPAIR CENTER

Address:
P-Com India
A27/4
DLF QUTAB Enclave-I
Gurgoan 122002 India

Telephone and fax:
91.1246.3646.14/15/16
91.1246.3587.43 (fax)

RETURN MATERIAL AUTHORIZATION (RMA)

Before you return equipment to a Service/Repair Center, you need a Return Material Authorization (RMA) number.

To get the RMA number:

1   Gather the following information:

•   unit model number

•   unit serial number

•   address to where unit was sold, billed, or shipped

•   purchase order number (if unit not under warranty)

•   whether credit or service is required

•   description of unit failure (no sync, no output, etc.)

2   From within the USA, call Customer Service at 1-800-500-PCOM
From outside the USA, call Customer Service at 408-866-3666, or contact one of the Service and Repair centers (see page xv).

3   Provide Customer Service with the information gathered in Step 1.

NOTE   When returning equipment, be sure to write the RMA number on the outside of the shipping carton.

INTERNATIONAL SALES OFFICES

P-Com, Inc. international sales offices are located throughout the world. See Table B.

Table B International Sales Offices

Country	Telephone	FAX
United Kingdom	44.1527.62229	44.1527.66436
Singapore	65.223.6883	65.223.6228
China	86.10.6467.1905	86.10.6467.1906
India	91.1246.3646.14/15/16	91.1246.358743
Pakistan	9221.582.2401	9221.583.8724
Russia	7095.182.45.03	7095.182.68.15
Latin America	408.866.3666	408.874.4205
Dubai	971.4.394.7810	971.4.394.7812

PRODUCT OVERVIEW
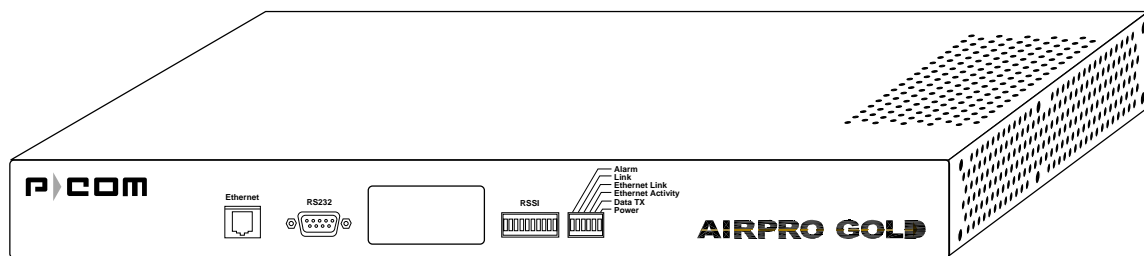
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Figure 1-1 AirPro Gold®Wireless Access Router

AirPro Gold® is a wireless remote access router based on direct sequence spread spectrum technology. It operates in the 2400 MHz to 2483.5 MHz RF band.

AirPro Gold is a single unit wireless system with an RF module built in the IDU (Indoor Unit Module). It uses the following modulations to provide access to the wireless media.:

• DS-SS BPSK (Direct Sequence-Spread Spectrum Binary Phase Shift Keying)

• DS-QPSK (Direct Sequence-Quadrature Phase Shift Keying)

• 8-CCK (8 level-Compliment Code Keying)

• 64-CCK (64 level-Compliment Code Keying)

The Media Access Control (MAC) protocol is implemented by hardware, providing high performance throughput without software intervention.

The wireless network applications covered by this platform includes:

• **Wireless Remote Access Router -**
  Provides bi-directional communcations for up to 30 wide area

Network (WAN) nodes with minimum assigned data for each node equal to 9.6 kbps. Each remote node provides wireless extension for Ethernet 10/100 Based-T.

The AirPro Gold platform provides advanced network management features using SNMP and HTTP protocols for control and monitoring, supports remote configuration by means of BOOT/DHCP (Dynamic Host Configuration Protocol) along with TFTP (Trivial File Transferring Protocol) for downloading .

PRODUCT DESCRIPTION

AirPro Gold is easy to install and configure. All software controls are included for network administration. Initial configuration is implemented via

- a switch bank of twelve DIP switches, or

- a Command Line Interface running on a terminal, or

- the Site Manager application running on a PC connected to the AirPro Gold unit through a local area network (LAN) or through the public telephone network

AirPro Gold offers wide area network connectivity when cables cannot be used due to distance, physical obstructions, or price constraints. The wireless network can be dynamically reconfigured to provide new permanent or temporary services. Adding or removing nodes does not affect network operation.

AirPro Gold lowers networking costs by combining routing and wireless transceiver functions in a single unit. It provides remote downloading of firmware and provides password and hard-coded serial number protected management. The Ethernet 10/100 base-T port connects to the LAN.

TOPOLOGIES

AirPro Gold provides bi-directional communication for multiple WAN nodes. The wireless network can be configured to one of three network topologies:

- Point-to-point—where two nodes are communicating directly with each other (see section *Point-to-Point Topology* on page 2-1)

- Peer-to-peer—where all nodes in a network communicate directly with one another (see section *Peer-to-Peer Topology* on page 2-2)

- Centralized (Star base)—where the node at the center of the network acts as a switching device for communication between remote nodes (see section *Centralized (Star) Topology* on page 2-3)

- Centralized (Star remote)—for remote stations in centralized topology.Star remote can send the Data frame only when it gets the permission from Star base.(see section *Centralized (Star) Topology* on page 2-3)

FRONT PANEL
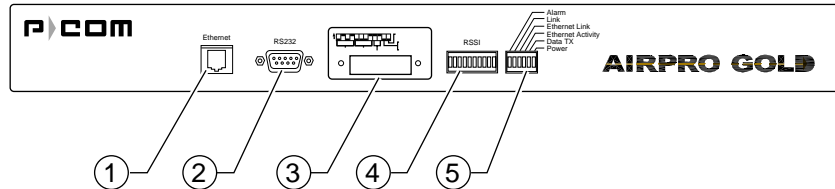
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Figure 1-2 AirPro Gold Front Panel

The AirPro Gold front panel (see Figure 1-2) includes:

①**ETHERNET**—RJ-45 jack for Ethernet connection (10/100 base-T); illuminated green LED indicates unit sees Ethernet connection, OFF indicates no connection; illuminated yellow LED indicates no traffic on the Ethernet bus, flashing indicates traffic on the bus

②**RS232**—RS-232 port for direct connection to a terminal or external telephone modem

③**DIP SWITCHES**—12 up/down (ON/OFF) toggle switches for manual RF configuration (under removable metal plate)

④**RSSI**—7-element LED bar that illuminates during normal operation to indicate the quality of the receive signal; sequential illumination of each LED during startup indicates that the initialization self-test is in progress; no illumination of the LEDs at the end of startup indicates successful completion of self-test

⑤**Front Panel LED Indicators**

ALARM—Red LED illuminates when major events in the link (including remote units fail).

LINK— Green LED illuminates when the link with the far end unit/units is established.

ETHERNET LINK—Green LED illuminates when the unit indicates that connection with the Ethernet segment is established.

ETHERNET ACTIVITY—Yellow LED illuminates when there is activity with the Ethernet segment.

DATA TX—Yellow LED illuminates when the unit transmits the Data frame (the Control frames are not indicated).

POWER—Yellow LED illuminates when unit power is ON.

REAR PANEL

APG2_010
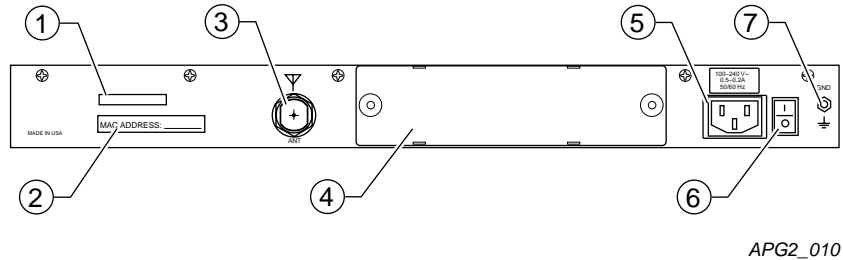
Figure 1-3 AirPro Gold Rear Panel

The AirPro Gold rear panel (see Figure 1-3) includes:

① **Regulatory label**

② **MAC Address Label**

③ **ANT**— Connector for the antenna.

④**I/O MODULE**—I/O slot supports different data interfaces.

⑤ **AC Power cord connector**— For AC power cord

⑥ **AC power ON/OFF rocker switch**

⑦ **GND**—Grounding stud

PRODUCT FEATURES

AirPro Gold interconnects computer LANs at geographically dispersed offices, warehouses, and other sites. Using robust spread spectrum technology that resists noise and interference, AirPro Gold can be deployed quickly, since no license is required in many countries. Where wired WAN solutions are costly or not available, AirPro Gold provides a solution to support geographically dispersed enterprises and network service providers.

FEATURES AND BENEFITS

Features	Benefits
Wireless solution	Works where wired connectivity is not available or practical; one-time capital expense; no ongoing service charges, cost competitive with wired-WAN services
Router functionality; network layer IP routing	Interconnects networks at dispersed sites over a wide area; maintains independent networks on the WAN
2.4 GHz spread spectrum transmission;	Robust, reliable, secure; resists noise and interference; unlicensed operation in most countries
Wired WAN-like data throughput; approaches T1 performance	Faster performance than POTS, X.25, ISDN
Range to 50 km (30 miles) per hop; supports multiple hops	Covers metropolitan, suburban, rural, and isolated areas
User-selectable physical topologies (star, peer-to-peer, point-to-point)	Flexibility in WAN design
Ethernet and antenna ports	Fully self-contained wireless router
DIP switches for initial RF setup	Field-ready for configuration download through Windows-based Site Manager application
RJ-45 connector	For Ethernet 10/100 base-T
RS-232 connector	For direct connection to PC terminal or remote connection to Site Manager over public telephone network
Internal computing engine	Fully self-contained
End-to-end SNMP support	Monitor network and radio performance remotely
Selectable transmitter output power	From -4 dBm to 26dBm
Remote test utilities	Full management and control of network
Support for TCP/IP	Provides flexibility
Support for RIP v1/v2 IP,	Provides automated method of updating of the network reachability information
Support for SNMP, TFTP and BOOTP/DHCP protocols	Provides complete network management
Unique Ethernet interface MAC address and cluster ID	Password protection for application level protocols

2

WIRELESS NETWORK DESIGN

The term *network topology* refers to the logical layout of a network. It defines how the network elements will communicate with each other, how the information will be transmitted, and how the information will be routed through the network.

PACKET-BASED NETWORKS

Packet-based networks are most suitable for networks that involve large-scale data transmissions for multiple users at the same time. There is a guaranteed minimum throughput for a packet-based network, but the actual throughput realized by a packet-based network node will depend on

- the number of users in the network, and
- how much traffic is being generated by each node at any given time

The advantage of a packet-based network is that multiple transmissions can travel along the network at the same time, using whatever path is appropriate to the routing from the source to the destination.

The most significant characteristic of packet-based networks is the wireless interface access protocols they use, such as CSMA/CA (Carrier Sense Multiple Access/Collision Avoidance), which can result in more efficient use of the aggregate bandwidth by dynamically allocating throughput to nodes based on demand.

AirPro Gold® supports Point-to-Point, Peer-to-Peer, and Centralized (Star) packet-based network topologies. Each topology has its own optimized wireless protocol.

POINT-TO-POINT TOPOLOGY

In a packet-based point-to-point topology, two nodes are linked directly. The most common application for this topology is the interconnection of

two LANs. In Figure 2-1, the LANs are connected via a pair of AirPro Gold wireless routers.

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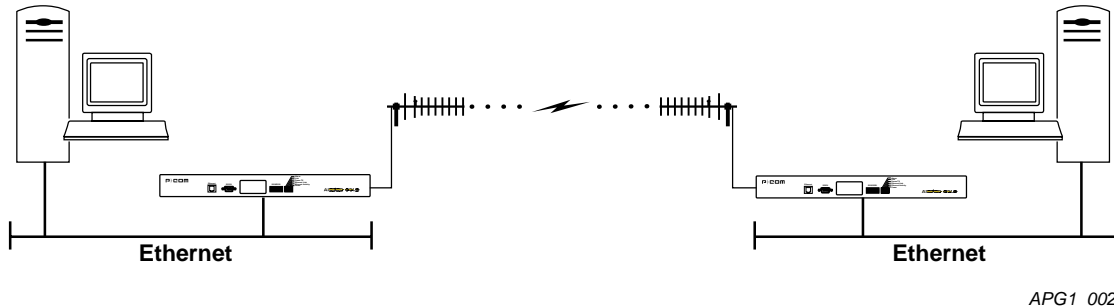
Figure 2-1 Point-to-Point Topology

The range and interference immunity that can be achieved with packet-based point-to-point topology is maximized by the use of highly directional antennas on both sides of the link.

PEER-TO-PEER TOPOLOGY

In peer-to-peer topology (unique to packet-based networks), there are three or more nodes, any one of which can communicate directly with any other node. Since each node has direct access to every other node, the time delay for transferring data between nodes is the least for this type of topology, unless WAN traffic is very high. However, this also implies that each node must have a clear communication path to every other node, that is, there must be clear line of sight.

An example of a three node peer-to-peer topology is shown in Figure 2-2 on page 2-3.
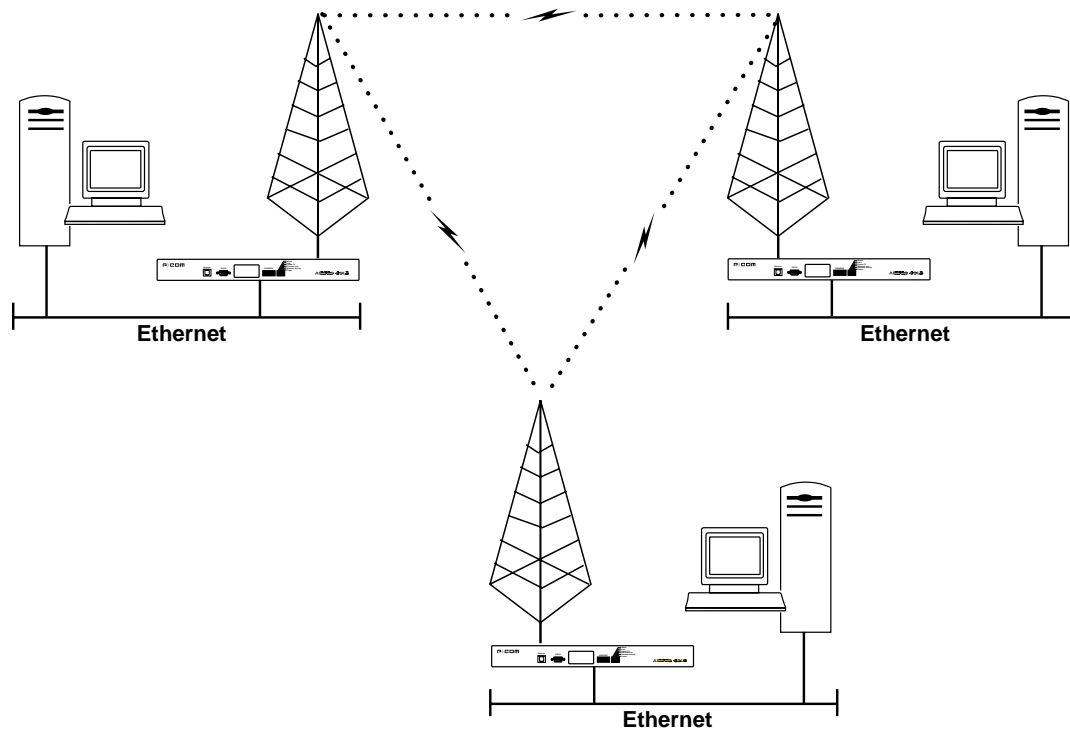
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Figure 2-2 Peer-to-Peer Topology

In peer-to-peer topology, since all nodes need to talk to each other, the range depends on the type of antennas used and the local terrain. Longer ranges can be achieved by using directional antennas with power splitters to connect to all sites.

CENTRALIZED (STAR) TOPOLOGY

In a Star topology, there is one AirPro Gold at a central location designated as a Base Station or Star Base, and several remotes designated as Remote Stations or Star Remotes. The Star Base acts as a switching device. The Star Remotes communicate with each other through the Star Base.

An AirPro Gold wireless network with Star topology can connect up to 255 wireless nodes. The MAC protocol used combines random and polling MAC protocols, with positive Data Link acknowledgment that improves the reliability of frame delivery.

Figure 2-3 on page 2-4 shows AirPro Gold wireless router nodes in a star topology.

BASE STATION

REMOTE STATIONS
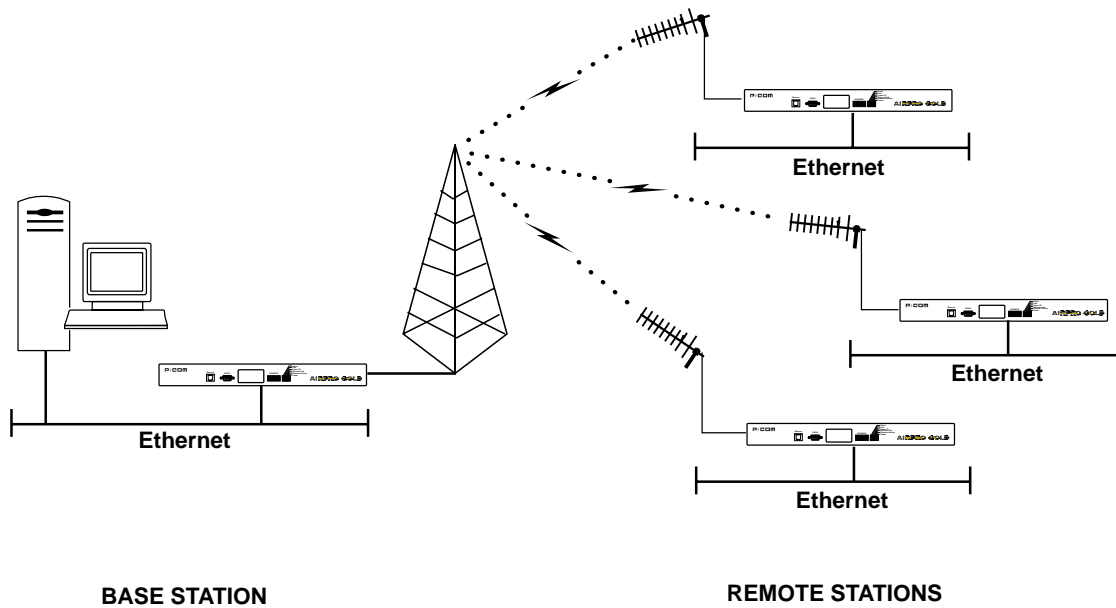
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Figure 2-3 Star Topology

A directional antenna can be used for the central site if all of the nodes fall in the main lobe of the antenna pattern. Since the remote sites need only communicate with the central site, directional, high gain antennas can be used.

The range of a Star topology network can be increased if the remote nodes are all located within a confined sector from the central site. Communication between two remote sites must be relayed through the central node.

Medium access contention on the Star Base is resolved by the specific Star Base MAC protocol. Each Star Remote sends a data frame only after it gets permission from the Star Base. Each frame transmitted by Star Base contains a PID (polling ID) for the wireless cluster. If a polled Star Remote has a frame to transmit, it explicitly sends the frame to the Star Base. The Star Base relays this frame to itself or on to Star Remotes indicated by the DID (destination ID) of the original frame. A polled Star Remote does not reply to a PID if it has no frame to transmit.

HARDWARE INSTALLATION

At each wireless node, the AirPro Gold® unit connects to a LAN, where it functions as a wireless remote access router, connecting LANs through the wireless WAN (wide area network).

Each radio is shipped in a carton that contains:

- one P-Com AirPro Gold wireless router
- 0 dbi test antenna
- AC power cord
- mounting brackets and hardware for optional rack mounting
- *Site Manager* application software
- *P-Com AirPro Gold Installation Guide*
- *P-Com AirPro Gold Site Manager Reference*

After unpacking the shipping carton:

1   Compare the materials in the shipping carton with items listed on the packing list to make sure that you have received everything. If something is not included in the shipping carton, or if there is shipping damage, contact the distributor.

2   Save the shipping cartons and packing materials. You may need them if you locate the equipment elsewhere.

WIRELESS ROUTER INSTALLATION

Before you can install the AirPro Gold unit in the network, you must provide power for the unit by connecting the AC power cord. Before making any cable connections, however, you need to properly ground the unit.

GROUND CONNECTION

The P-Com AirPro Gold unit should be grounded at the ground nut on the back of the unit before you connect any other cables. After the unit is grounded, make sure that any other equipment that you connect to the unit is also properly grounded.

To ground the AirPro Gold unit:

1   Loosen the **GND** nut on the back of the unit.

2   Attach a #12 AWG minimum wire from the grounding stud to a safe ground. See Figure 3-1 on page 3-2.

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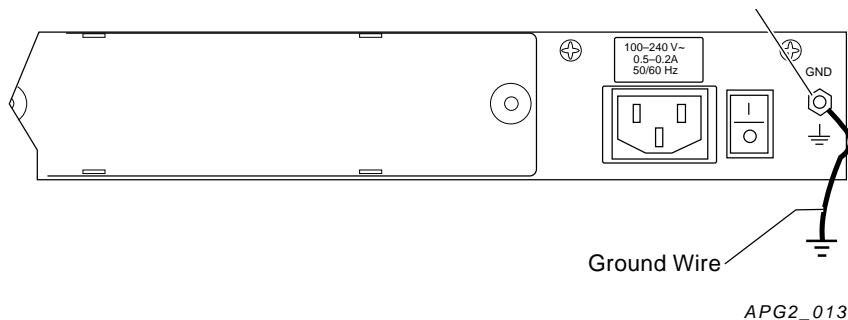
Figure 3-1 Ground Wire on AirPro Gold Unit

LAN CONNECTION

To connect the AirPro Gold to the LAN:

1   Plug one end of an RJ-45 cable into the RJ-45 **ETHERNET** port on the front of the unit.

2   Plug the other end of the RJ-45 cable into the RJ-45 port on the Ethernet Hub.

NOTE   If you are connecting the unit directly to a PC via the RJ-45 port, use a cross-over cable (not a straight-through cable), plug one end into the RJ-45 port on the AirPro Gold unit and the other end into the RJ-45 port of the Ethernet card on the PC.

ANTENNA CONNECTION

The type of antenna you use should be a semi-parabolic or solid parabolic directional antenna. You can purchase the antenna from P-Com or its distributors.

The indoor antenna connects to the rear of the AirPro Gold unit through the N-type connector labeled **ANT** on the back of the radio. See Figure 3-2. The outdoor antenna is connected through coaxial cable.
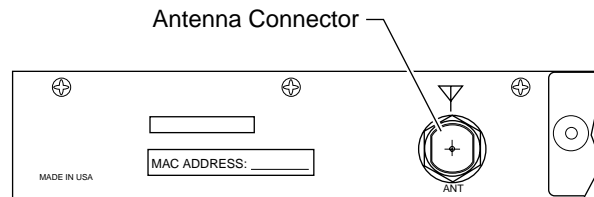
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Figure 3-2 ANT Connector

To connect an indoor antenna to the AirPro Gold unit:

1   Plug the antenna connector firmly into the N-type antenna connector on the back of the unit.

2   Hand-tighten the connector shell onto the jack connector collar.

3   Verify that the connector is fixed firmly in place.

To connect an outdoor antenna to the AirPro Gold unit:

1   Plug the coaxial antenna cable into the N-type antenna connector on the back of the unit, making sure there are no sharp bends in the cable.

•   Install the coaxial cable between the radio and antenna location, making sure there are no sharp bends in the cable.

2   Hand-tighten the connector shell onto the jack connector collar.

3   Verify that the cable is fixed firmly in place.

NOTE   If the antenna coaxial cable is too stiff to bend easily, add a flexible pigtail coaxial cable with a coax barrel (available from P-Com).

POWER CONNECTION

To connect power to the AirPro Gold unit:

1   Plug the AC power cord into the 3-pin connector on the back of the unit. See Figure 3-6 on page 3-8

2   Plug the AC power cord into a grounded electrical outlet.

To avoid electrical shock or power loss, make sure that the power cord is securely connected to the unit. Do not use a 3-pole to 2-pole adapter with the plug. Verify that the outlet you use is properly installed, grounded, and complies with the local electrical code.

3   Turn the AC power switch to ON. See Figure 3-6 on page 3-8.

TELEPHONE MODEM CONNECTION

You can configure the P-Com AirPro Gold wireless router remotely by using a telephone modem and the public telephone network. The AirPro Gold provides an **RS-232** port on the front of the unit for the modem connection. See Figure 3-3 on page 3-4.
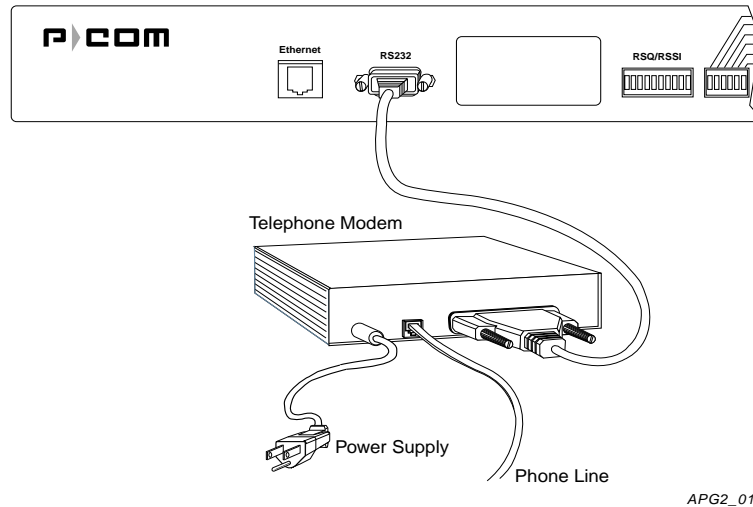
Figure 3-3 Telephone Modem Connection

Telephone modems should be 9600 bps or faster Hayes compatible modems. Refer to the modem documentation for the specific baud rate, and for modem configuration parameters.

To connect the telephone modem:

1 Use a standard RS-232 modem cable, with a female DB-9 connector at the AirPro Gold end and an appropriate connector at the modem end.

2 Connect the telephone modem to the **MODEM** port on the back of the AirPro Gold unit. See Figure 3-3.

3 Connect the telephone modem to the phone line using an appropriate cable.

4 Connect the computer or terminal to the telephone modem using a standard RS-232 modem cable.

BASIC CONFIGURATION SETUP

Before you use a AirPro Gold unit on the WAN, P-Com recommends that you set up a basic unit configuration to make sure the full WAN installation will proceed smoothly.

The basic configuration requires

- RF channel—all units in a common network must use the same RF channel. Separate WANs in the same geographic area may need to use different channels (to eliminate interference). AirPro Gold provides 13 channels.

- Topology—AirPro Gold provides these topologies: peer-to-peer, point-to-point, centralized (star base and star remote)

- Configuration Reset—to install the basic configuration

You can set up a basic radio configuration using one of three methods:

- through DIP switch positions
- through a terminal command line interface
- through the Site Manager software application

DIP SWITCHES

AirPro Gold can be configured through a block of twelve OFF/ON DIP switches located on the front of the unit behind the switch plate. See Figure 3-4.

APG2_022

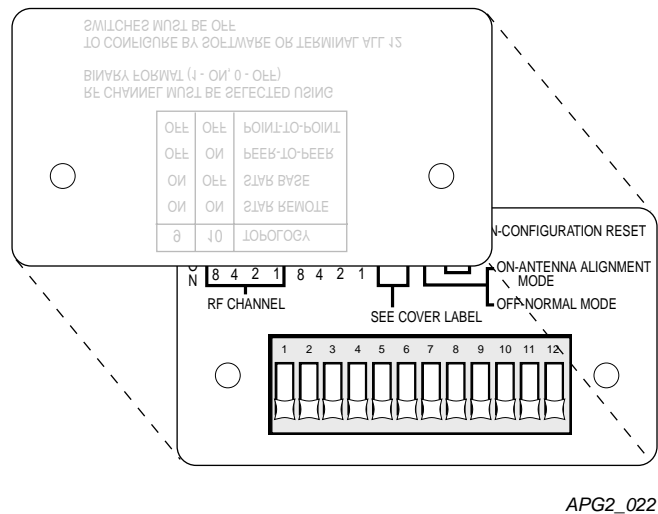*Figure 3-4 DIP Switches*

- To set the switch to the ON position, push the switch up toward the top of the unit.

- To set the switch to the OFF position, push the switch down toward the bottom of the unit.

To set up a basic unit configuration using the DIP switches:

1 Remove the unit from the shipping carton.

2 Place the unit on a flat surface so that the front is easy to reach.

3 Remove the switch plate from the front of the unit.

Set the RF channel switches according to Table 3-1..

Table 3-1 RF Channel Switch Positions (20 MHz)

Channel	Center Frequency (MHz)	Switch			
		1	2	3	4
1	2411.000	OFF	OFF	OFF	ON
2	2416.000	OFF	OFF	ON	OFF
3	2421.000	OFF	OFF	ON	ON
4	2426.000	OFF	ON	OFF	OFF
5	2431.000	OFF	ON	OFF	ON
6	2436.000	OFF	ON	ON	OFF
7	2441.000	OFF	ON	ON	ON
8	2446.000	ON	OFF	OFF	OFF
9	2451.000	ON	OFF	OFF	ON
10	2456.000	ON	OFF	ON	OFF
11	2461.000	ON	OFF	ON	ON
12	2466.000	ON	ON	OFF	OFF
13	2471.000	ON	ON	OFF	ON

Set the topology according to Table 3-2.

Table 3-2 Topology Switch Positions

Topology	Switch	
	9	10
Star Remote	OFF	OFF
Star Base	OFF	ON
Peer-to-Peer	ON	OFF
Point-to-Point	OFF	ON

4 Set Switch 11—Antenna Alignment to OFF.

5 Set Switch 12—Reset Network Configuration to OFF.

NOTE When you move the AirPro Gold unit from one network to another, you will need to reset the moved unit's configuration by setting switch 12 to ON.

ANTENNA ALIGNMENT

Using the DIP switches on the front of the AirPro Gold unit, you can start the antenna alignment utility to align a Star Remote unit antenna.

See the Site Manager Reference, Chapter 8, for instructions on antenna alignment.

COMMAND LINE INTERFACE

AirPro Gold can be configured through a command line interface running on a terminal (or a PC running a terminal emulation program).

Before connecting the terminal to a AirPro Gold unit, configure the terminal with the following settings:

- Baud rate = 115200 bps
- Data bits = 8
- Parity = None
- Stop bits = 1
- Flow control = Hardware

If you are using a PC or laptop computer, refer to the operating system documentation for instructions on how to configure and run the terminal emulation program.

To set up a basic unit configuration using the command line interface:

1   Remove the unit from the shipping carton.

2   Remove the switch plate from the front of the unit. See Figure 3-4 on page 3-5.

3   Make sure ALL the DIP switches are in the OFF position. This is the manufacturing default.

•   To set the switch to the OFF position, push the switch down toward the bottom of the unit.

4   Connect the terminal or PC to the **RS232** port on the front of the unit. See Figure 3-5 on page 3-7.

•   Use a crossover (null modem) cable with a DB-9 male connector on one end to connect to the unit, and an appropriate connector at the computer end.
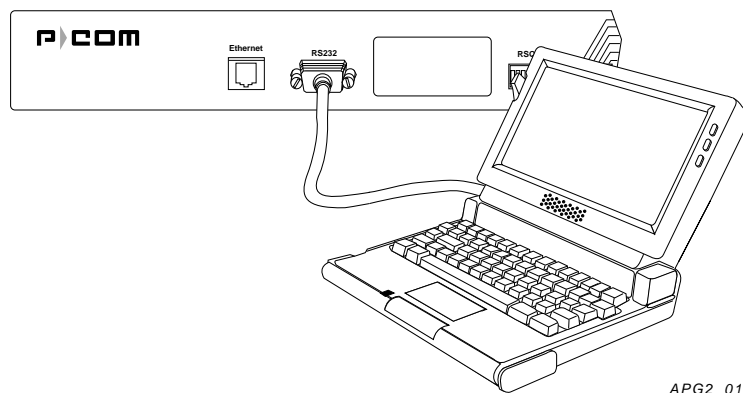

APG2_011

Figure 3-5 Connecting the Terminal or PC

5   Turn on the terminal.

- Or turn on the computer and start the terminal session.

6   Connect the power cord to the AirPro Gold unit. See Figure 3-6
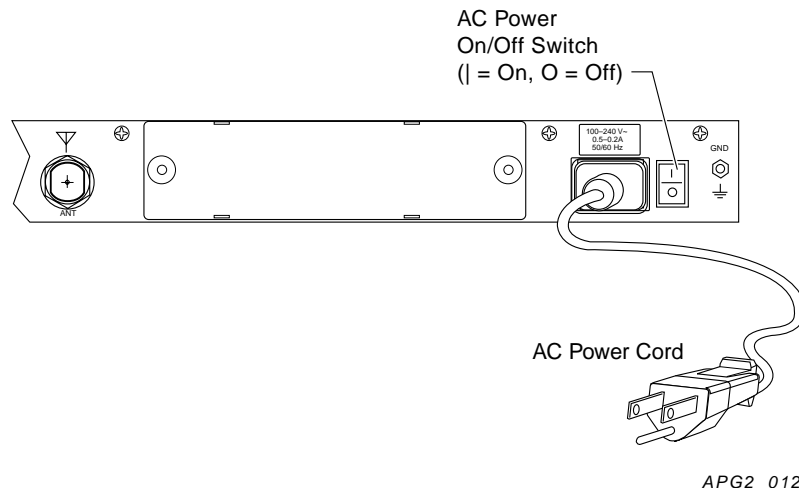

APG2_012

Figure 3-6 Connecting the Power Cord

- Plug the AC power cord into the 3-pin connector.

- Plug the 3-prong end of the AC power cord into a grounded electrical outlet.

To avoid electrical shock or power loss, make sure that the power cord is securely connected to the unit. Do not use a 3-pole to 2-pole adapter with the plug. Verify that the outlet you use is properly installed, grounded, and complies with the local electrical code.

- Turn the AC power switch to ON. See Figure 3-6.

After power-on the unit will run a power-on-self-test (POST). This test takes about 40 seconds to complete. Successful completion of the POST causes the 10-bank **RSSI** LEDs on the front of the radio to flicker before going to a steady state.

If you have successfully connected to the radio, the terminal will display the **AirPro Gold>** prompt and an initial message.

To set up a basic unit configuration:

1   Set the topology. At the prompt, type **TPLG *<n>***

where *<n>* = 1 - Star Remote, 2 - Star Base, 3 - Peer-to-Peer, or 4 - Point-to-Point

2   Set the channel. At the prompt, type **CHAN *<n>***

where *<n>* = 1 through 13 (with 5 MHz step)

3   Set the modulation mode. At the prompt, type **MOD *<n>***

where *<n>* = 1 through 4 (1 = 11CCK, 2 = 5.5CCK, 3 = QPSK, 4 = BPSK)

4   OPTIONAL: Check your settings. At the prompt, type **INFO**. The terminal will display information similar to the following:

AirPro Gold Setup Configuration:
  Equipment: AirPro Gold 20F.Net
  *Ethernet MAC Address: XXXXXXXXXXXX
  Topology: Star Remote (was selected) Point-to-Point (now selected)
  RF Channel: 1 (was selected)   5 (now selected)
  Modulation mode: 4 (was selected)   1 (now selected)
  IP Address:

5   Confirm your settings by resetting by rebooting the unit.

•   Turn Off and On or type Reboot.

•   At the prompt, type **INFO**. This displays the configuration you set in Steps 1, 2, and 3:

AirPro Gold Setup Configuration:
  Equipment: AirPro Gold 20F.Net
  *Ethernet MAC Address: XXXXXXXXXXXX
  Topology: Point-to-Point
 *RF Channel: 5*
  Modulation mode: 1
  IP Address:

SITE MANAGER APPLICATION

AirPro Gold can be configured through a Windows-based software application call Site Manager. Site Manager runs on an external computer connected remotely to the AirPro Gold unit over the LAN through the **ETHERNET** port, or over the public telephone network through the **RS232** port.

Site Manager is generally used by the network administrator for basic configuration of a AirPro Gold unit and advanced configuration of a wireless cluster of units.

If you want to set up the basic configuration using Site Manager, see the *Site Manager Reference*. It will tell you how to install the application, and how to use it.

RACK MOUNTING
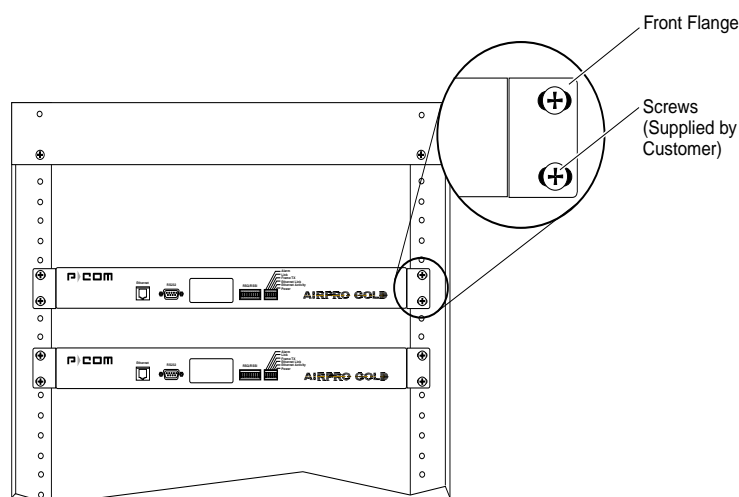
APG2_003

Figure 4-1 Rack Mounted Radios

An AirPro Gold® unit can be mounted in a standard 19 inch or 23 inch equipment rack (see Figure 4-1), using brackets and hardware provided in the shipping carton.

The rack mounting brackets can be installed on the unit chassis in one of three positions: front, center, or rear, depending on how you want the chassis positioned in the rack.

When installing the unit in a rack with other equipment, you must provide 1.75 inches of space above, below, and on each side of the unit to allow proper ventilation.

For a 19 inch rack, short bracket flanges face the front of the unit. See Figure 4-2 on page 4-2. For a 23 inch rack, longer bracket flanges face the front of the unit. See Figure 4-3 on page 4-3.

To mount the unit in a rack, you need:

- two rack-mount brackets (supplied)
- screws and washers to attach the brackets to the unit (supplied)
- 1/4 inch hex nut driver or wrench
- screwdriver

19 INCH RACK MOUNT

Refer to Figure 4-2 when mounting the unit in a 19 inch equipment rack.
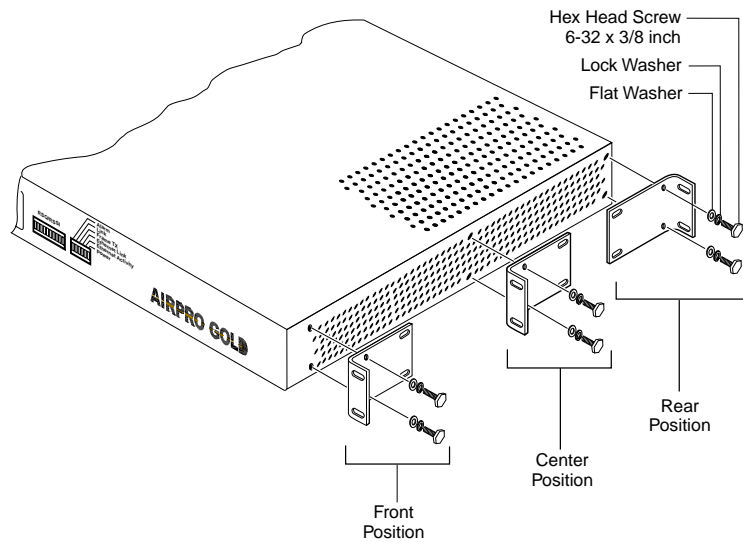
Figure 4-2 Brackets for 19 inch Rack Mount

To mount the unit in a 19 inch rack:

1   Choose the front, center, or rear rack mount position for the unit.

2   Place a bracket on the chassis in the chosen position so that the bracket holes line up with the threaded inserts on the side of the chassis, and the short flange faces the front of the unit for the front or center position mount, or the back of the unit for the rear position mount.

3   Attach the bracket to the chassis.

- Use two of the screws, lock washers, and flat washers supplied with the unit.

4   Repeat Step 2 and Step 3 to attach another bracket on the opposite side of the chassis.

5   Attach the bracketed chassis to the rack posts. Refer to Figure 4-1 on page 4-1.

- Align the front flanges of the brackets with the screw holes on the rack posts.

- Hand-tighten the mounting screws to hold the unit and brackets in place on the rack posts.

- Use a screwdriver to firmly attach the unit to the rack posts.

23 INCH RACK MOUNT

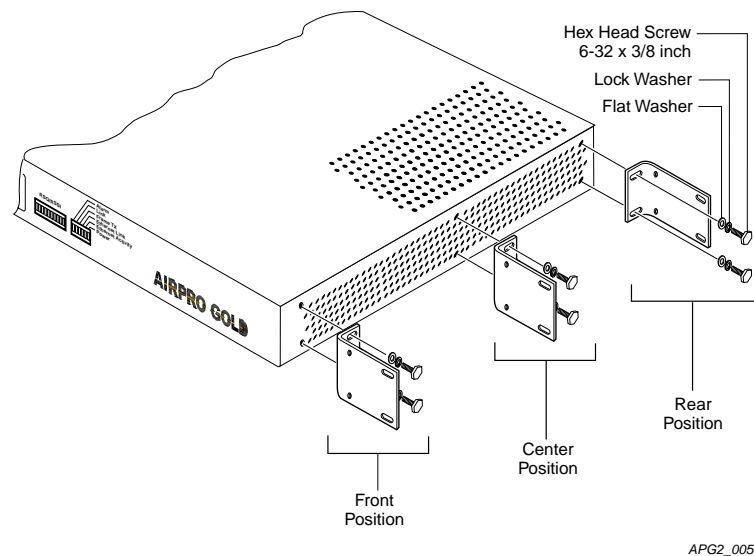Refer to Figure 4-3 when mounting the unit in a 23 inch equipment rack.

Figure 4-3 Brackets for 23 inch Rack Mount

To mount the unit in a 23 inch rack:

1 Choose the front, center, or rear rack mount position for the unit.

2 Place a bracket on the chassis in the chosen position so that the bracket holes line up with the threaded inserts on the side of the chassis, and the short flange faces the front of the unit for the front or center position mount, or the back of the unit for the rear position mount.

3 Attach the bracket to the chassis.

- Use two of the screws, lock washers, and flat washers supplied with the unit.

4 Repeat Step 2 and Step 3 to attach another bracket on the opposite side of the chassis.

5 Attach the bracketed chassis to the rack posts. Refer to Figure 4-1 on page 4-1.

- Align the front flanges of the brackets with the screw holes on the rack posts.

- Hand-tighten the mounting screws to hold the unit and brackets in place on the rack posts.

- Use a screwdriver to firmly attach the radio to the rack posts.

SPECIFICATIONS

GENERAL SPECIFICATIONS

■ ■
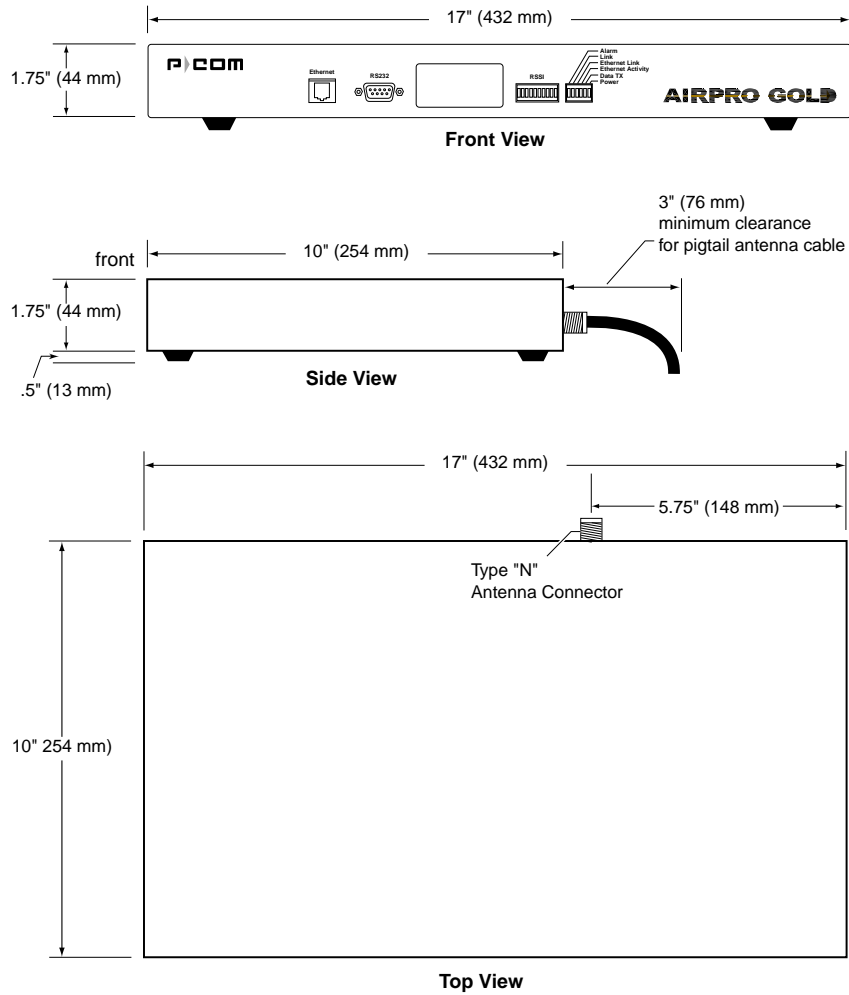
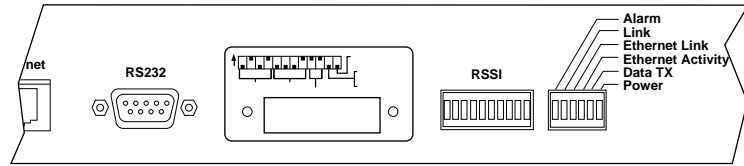*Figure A-1 Radio Dimensions*

Table A-1 Mechanical Specifications

Parameter	Specification
Dimensions	Width: 17 inches (432 mm) Height: 1.75 inches (44 mm) Depth: 10 inches (254 mm)
Weight	10.3 pounds (4.7 kilograms)

Table A-2 Environment Specifications

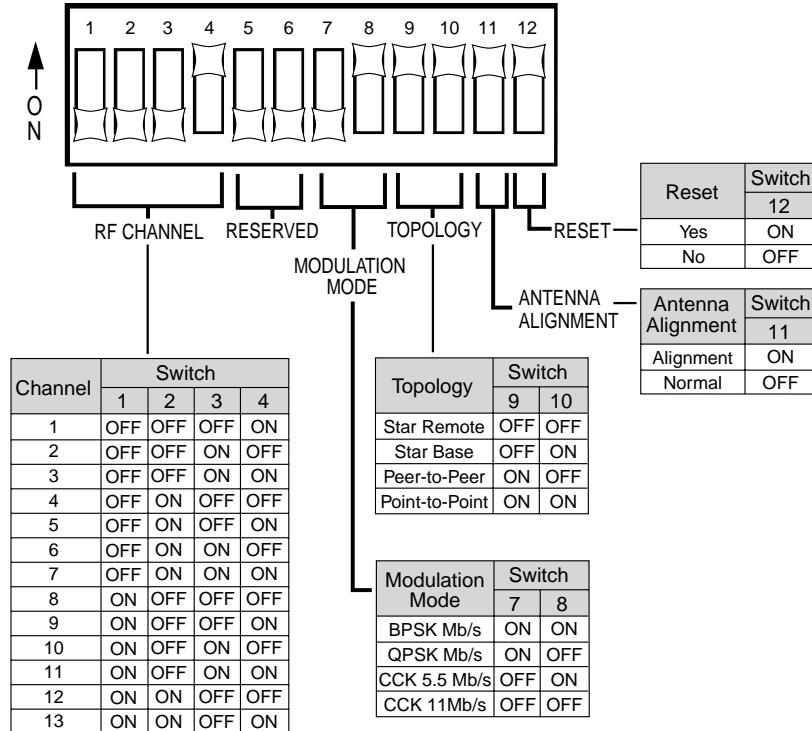| Parameter	Specification
Operating Temperature	-5°C to 55°C (23°F to 131°F)
Storage Temperature	–40°C to 80°C (–40°F to 176°F)
Operating Humidity	10% to 95% RH non-condensing
Storage Humidity	
Elevation	200 feet (61 meters) below sea level to 13000 feet (3943 meters) above sea level
Mechanical Shock, Vibration,Relative Humidity	Verification standard ETSI 300-019-1-3 Class 3.1 (E)
Electromagnetic Compatibility	Comply with FCC part 15.247 Comply with ETSI 300-328 v1.1.1 & 1.2.2 ETSI 300-826

LED INDICATORS

APG2_007

Figure A-2 Front Panel Indicators

Table A-3 Front Panel Indicators

Name	Color	Function
RSSI	Green	*Steady* illumination of LEDs indicates the strongest/highest quality of the receive signal. *Sequential* illumination of all 10 LEDs indicates radio initialization self-test is in progress. *Blinking* of all 10 LEDs in addition to audible alarm indicates Configuration Reset DIP switch is ON and that the radio initial configuration and manufacturing image are selected for next reboot. *Blinking* of the 1st of the 10 LEDs in addition to audible alarm indicates the wrong RF channel is set on the DIP switches. *Blinking* of the 3rd of the 10 LEDs in addition to audible alarm indicates that digital board initialization has failed.
ALARM	Red	ON = Major event in the link (including remote units fail).
LINK	Green	ON = Link with far end unit/units is established.
ETHERNET LINK	Green	ON = Connection with Ethernet segment is established
ETHERNET ACTIVITY	Yellow	ON = Activity on Ethernet segment
DATA TX	Yellow	ON = Unit tranmits the Data frame (the Control frames are not)
POWER	Yellow	ON = power to the radio is on

DIP SWITCHES

APG2_020

Figure A-3 DIP Switch Positions

NOTE *All DIP switches must be in the OFF position when using the Command Line Interface or Site Manager application to configure a radio.*

The DIP switches become active only after system reboot, which can be done by turning the main power switch off then on.

Channel	Switch			
	1	2	3	4
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON
10	ON	OFF	ON	OFF
11	ON	OFF	ON	ON
12	ON	ON	OFF	OFF
13	ON	ON	OFF	ON

Topology	Switch	
	9	10
Star Remote	OFF	OFF
Star Base	OFF	ON
Peer-to-Peer	ON	OFF
Point-to-Point	ON	ON

Modulation Mode	Switch	
	7	8
BPSK Mb/s	ON	ON
QPSK Mb/s	ON	OFF
CCK 5.5 Mb/s	OFF	ON
CCK 11Mb/s	OFF	OFF

Reset	Switch
	12
Yes	ON
No	OFF

Antenna Alignment	Switch
	11
Alignment	ON
Normal	OFF

EXTERNAL CONNECTORS

AC POWER CONNECTOR

Connector Location: Rear Panel
Connector Type: 3-pin Male

AC Power Connector

APG2_015
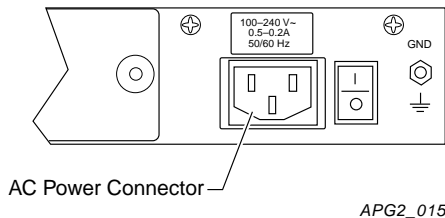
Figure A-4 AC Power Connector

Table A-4 Power Specifications

Parameter	Specification
AC Input Voltage	90 VAC to 240 VAC
AC Input Frequency	47 Hz to 63 Hz
AC Input Current	1A to 3.5A
Maximum Power Consumption	32.25 Watts, AC Power Supply

ANTENNA CONNECTOR

Connector Location: Rear Panel
Connector Type: N-Type Female

Antenna Connector

MAC ADDRESS:

MADE IN USA

ANT

APG2_016
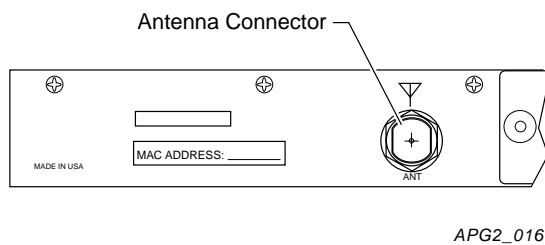
Figure A-5 Antenna Connector

EXTERNAL USER INTERFACES

Table A-5 Network Ports

Port	Local or Remote through PC over LAN	Remote through PC over Public Telephone Network	Local through Terminal
RS232		X	X
Ethernet (10/100 Base-T)	X		

RS232 CONNECTOR

Connector Location: Front Panel
Connector Type: RS-232, DB 9-pin Male

APG2_023
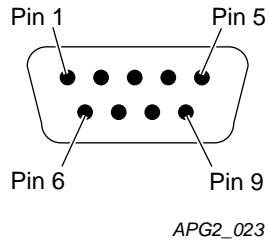
Figure A-6 RS-232 Connector

Table A-6 RS-232 Port Pin Assignments

Pin	Circuit	Description	Function
1	100	Received line signal detect	from terminal
2	104	Received data	from terminal
3	103	Transmitted data	from radio
4	108/2	Data terminal ready	from radio
5	102	Signal common	circuit ground
6	107	Device ready	from terminal
7	105	Request to send	from radio
8	106	Clear to send	from radio
9		not used	

ETHERNET CONNECTOR

Connector Location: Front Panel
Connector Type: RJ-45 Jack
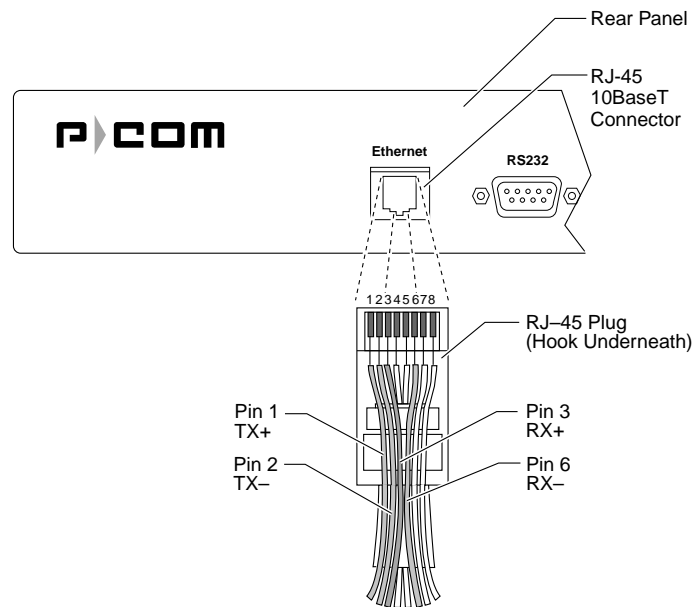
APG2_017

Figure A-7 Ethernet Jack

NOTE *Any pin not shown in Figure A-7 is not connected, i.e., pin 4, pin 5, pin 7, pin 8.*

RADIO SPECIFICATIONS

Table A-7 Radio Specifications

Parameter	Specification
Frequency Range	2400 GHz to 2483.5 GHz (S-Band)
Radio Technology	Spread Spectrum using Direct Sequence
PN Sequence Length	32 bits
Modulation Technique	BPSK (R=1Mb/s), QPSK (R=2Mb/s), CCK (R=5.5Mb/s, R=11Mb/s)
Channel Bandwidth	20.0 MHz
Sync Word Length	16 bits
Processing Gain	>10 dB
Radio Protocol	TDD
Frequency Stability	±5 ppm initial stability over temp with ± 2ppm aging/year, ±10 ppm/10years
System Gain	116 dB (for R=1Mb/s, BPSK mode) 113 dB (for R=2Mb/s, QPSK mode) 111 dB (for R=5.5Mb/s, CCK mode) 108 dB (for R=11Mb/s,CCK mode)
Number of non-overlapping channels	4

Table A-8 Transmitter Specifications

Parameter	Specification
Load Impedance	50 ohms
Power Output	26 dBm Maximum with 38 dB of Dynamic range
Accuracy	±2 dB overall RF channel ±2 dB @ 0 dBm ±2 dB from 0°C to 50°C (32°F to 122°F)
Output Level Control	30 settings, 1 dBm increments
RF Port Protection	None

Table A-9 Receiver Specifications

Parameter	Specification
Sensitivity* (@ 10E^{-6} BER) * typical room temperature	–94 dBm (R =1 Mb/s, BPSK mode) –91 dBm (R =2 Mb/s, QPSK mode) –88 dBm (R =5.5 Mb/s, CCK mode) –85 dBm (R =11 Mb/s, CCK mode)
Noise Figure	5 dB
Input Impedance	50 ohms
RF Input Protection	None
Maximum RF Input Power	–10 dBm
Dynamic Range	70 dB

CENTER FREQUENCIES

Table A-10 RF Channel Center Frequencies

Center Frequency (MHz)	RF Channel
2411.000	1
2416.000	2
2421.000	3
2426.000	4
2431.000	5
2436.000	6
2441.000	7
2446.000	8
2451.000	9
2456.000	10
2461.000	11
2466.000	12
2471.000	13

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