AirPair™ 100-UL

High-Capacity 24 GHz Unlicensed Band Wireless Ethernet System Product Manual

Version 1.0

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NOTICE

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Table of Contents

List of Procedures

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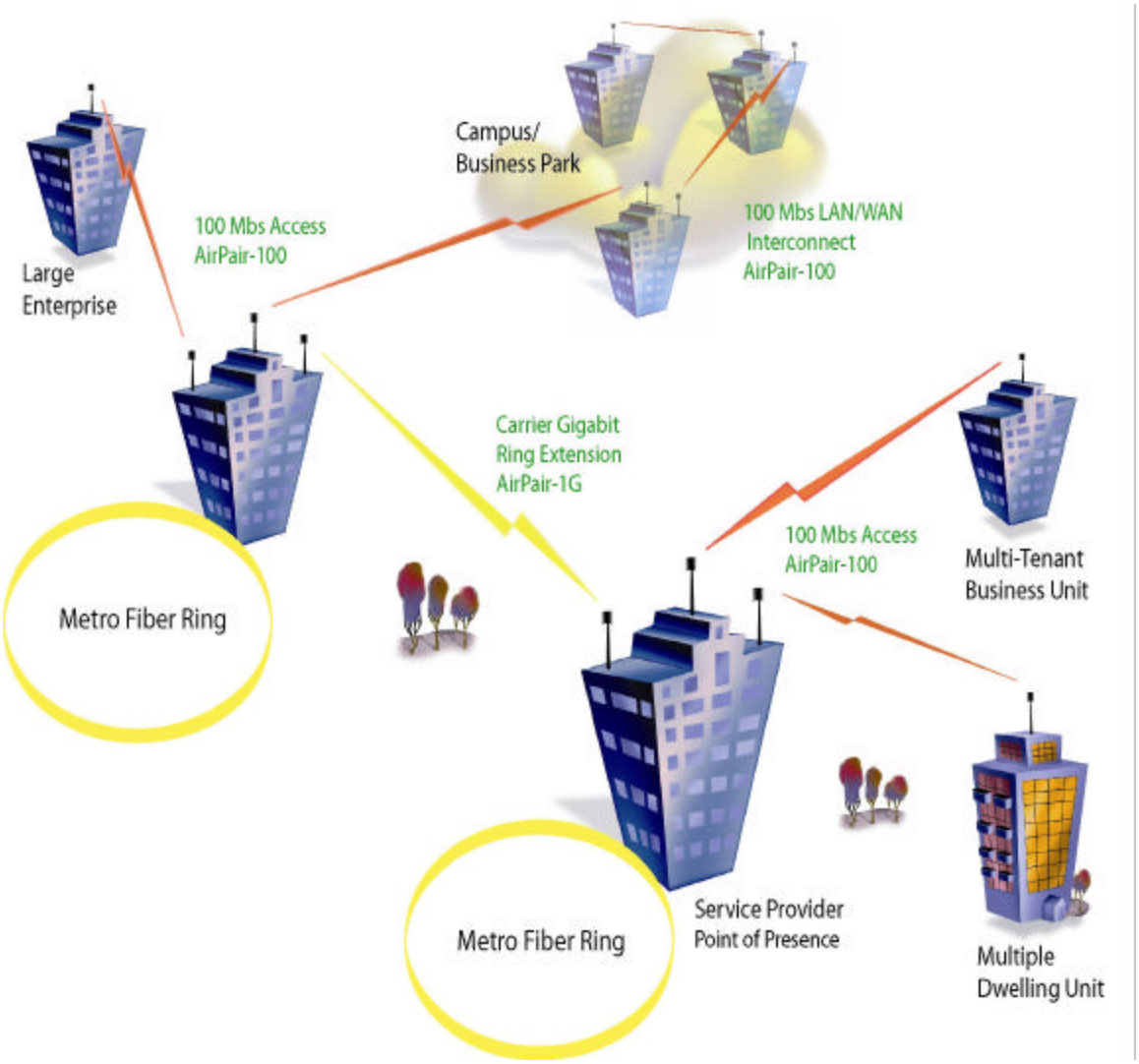
1. Introduction

This manual describes both the DragonWave AirPair™ 50 system and the AirPair™ 100 system. Use this manual to learn how to install and configure the DragonWave AirPair™ 50 and AirPair™ 100 systems.

This document refers to the AirPair 50 and AirPair 100 systems as the AirPair™.

Figure 1-1
DragonWave AirPair Systems



1.1. References

This document refers to the following documents:

- Cleveland, Robert F., Jr., David M. Sylvar and Jerry L. Ulcek. OET Bulletin 65.*Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields,* Edition 97-01, August 1997.
- ET Docket No. 96-8, RM8165. April 10, 1997. *Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters***.** FCC.
- Institute of Electrical and Electronics Engineers (1992). *IEEE Standard for safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz.* ANSI Standard C95.1-1991. New York, NY.
- Institute of Electrical and Electronics Engineers (2002). *IEEE Standard 802.1Q Virtual Bridged Local Area Networks: Multiple Spanning Trees*. New York, NY.
- National Electrical Code (NEC), Chapter 800, Article 810, *Radio and Television Equipment.*
- Radio Waves Inc. *Mounting Instructions for 1 ft, 1.5 ft and 2ft Antenna.*
- Radio Waves Inc. *Mounting Instructions for 90 cm and 120 cm.*

1.2. Icons

The following icons appear in this manual and highlight areas of special interest and importance.

	**Warning** **Cause Bodily Harm**
	**Caution** **Cause damage to equipment or service outage**
	**Information or Note** Important Information

2. Safety and Regulatory Compliance

This section details safety issues and regulatory compliance.

2.1. Safety Information

2.1.1. Safety Information for DragonWave's AirPairTM

The Federal Communications Commission (FCC), with its action in ET Docket 96-8, has adopted a safety standard for human exposure to radio frequency (RF) electromagnetic energy emitted by FCC-certified equipment. DragonWave AirPairTM meets the uncontrolled environmental limits found in OET-65 and ANSI C95.1, 1991. Proper operation of this radio according to the instructions found in this manual and the users guide for the DragonWave AirPairTM product will result in user exposure that is substantially below the FCC recommended limits.

- Do not touch or move antenna(s) while the unit is transmitting or receiving.
- While transmitting, do not hold any component containing the radio in such a way that the antenna is very close to or touching any exposed parts of the body, especially the face or eyes.
- Do not operate a portable transmitter near unshielded blasting caps or in an explosive environment unless it is a type especially qualified for such use.

The design of the high-gain mast mount antennas is such that professional installation is required.

2.1.2. Installations

DragonWave AirPair^{TM} devices require professional installation. It is the responsibility of the installer to be sure that all building and safety codes are met and that the installation is complete and secure.

For Canadian installations, the entire equipment installation must comply with Canadian Standard CSA 22.2, No. 60950, Safety of Information Technology Equipment. For installations in the United States, the entire equipment installation must be in accordance with Article 810 of the United States National Electrical Code.

2.1.3. Lightning Protection

When installed, this equipment is to be connected to a Lightning/Surge Protection Device that meets all applicable national safety requirements.

2.1.4. Electrocution Hazard

	**Warning** **Electrocution Hazard**

This product is intended to be connected to a –48v dc power source (supplied by DragonWave Inc.), which must be electrically isolated from any ac sources and reliably connected to Earth ground. Do not install DragonWave products near any type of power line. Should your antenna or related hardware come in contact with power lines, **severe bodily harm or death could result!**

2.2. Regulatory Compliance Information

This section contains information regarding regulatory compliance with the Federal Communication Commission, Department of Communications and the European Telecommunications Standards Institute applies to the DragonWave AirPair™ Radio Link.

2.2.1. Federal Communication Commission Declaration of Conformity Statement

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits of a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates 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 interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures.

- Reorient or relocate the receiving antenna
- Increase the separation 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 experienced radio/TV technician for help

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Warning

The Part 15 radio device operates on a non-interference basis with the other devices operating at this frequency. Any changes or modification to said product not expressly approved by DragonWave Inc. could void the user's authority to operate this device.

2.2.2. Professional Installation

As per the recommendation of the FCC, the installation of high-gain directional antennas to the system, which is intended to operate solely as a point-to-point system and whose total power exceeds the +36 dBm Effective Isotropic Radiated Power (EIRP), requires professional installation. It is the responsibility of the installer and the end user that the high power systems are operated strictly as a point-to-point system.

Systems operating as a point-to-multipoint system or using non-directional antennas cannot exceed +2500 mV/m measured at 3 meters under any circumstance and do not require professional installation.

3. Warranty

This section describes the warranty.

3.1. General Terms

(a) All Definitions contained in DragonWave Inc.'s Terms and Conditions of Sale apply to the Warranty.

(b) This Warranty applies to all original purchases of DragonWave Inc. manufactured equipment and accessories (collectively "Equipment").

(c) This Warranty applies to the specifications contained in the most recent version of the manual for the model of Equipment purchased.

(d) This Warranty does not apply to the following items of Equipment:

i. cables and connectors;

ii. visual alignment tool;

iii. fine adjust alignment tool; or

iv. non-DragonWave Inc. equipment or equipment that is not listed in DragonWave Inc.'s price book.

(e) The Customer acknowledges that DragonWave Inc. does not represent or warrant that the services provided by DragonWave Inc. under this Warranty will ensure uninterrupted or error-free operation of the Equipment.

(f) The effective period of this Warranty shall start on the date of shipment of the Equipment and shall end twelve (12) months later.

3.2. Hardware

(a) DragonWave Inc. warrants that the Equipment, which is hardware, will be free from defects in material and will comply with DragonWave Inc.'s normal standards of workmanship, for a period of twelve (12) months from the date of shipment.

(b) DragonWave Inc. shall incur no liability under the foregoing warranty unless:

i. the allegedly defective Equipment is returned, prepaid, to DragonWave Inc. within fifteen (15) days of the date of discovery of the alleged defect, in accordance with DragonWave Inc.'s then current repair procedures; and

ii. DragonWave Inc.'s tests disclose that the alleged defect is due solely to defects in material or workmanship.

(c) The liability of DragonWave Inc. under this hardware warranty shall in any event be limited, at DragonWave Inc.'s option and expense, to either the repair or replacement of the defective Equipment, or the reimbursement of the purchase price by the Customer to DragonWave Inc. for the defective Equipment.

(d) In no event will DragonWave Inc. be liable for damage to the Equipment resulting from improper handling during or after shipment, misuse, neglect, improper installation, operation or repair (other than by authorized DragonWave Inc. personnel), alteration, accident, or for any other cause not attributable to defects in materials or workmanship on the part of DragonWave Inc.

3.3. Software

(a) DragonWave Inc. warrants that any software supplied as a Product or as part of a Product will function substantially in accordance with the functional description set out in the software documentation provided to the Customer for a period of ninety (90) days from the date of shipment to the Customer.

(b) DragonWave Inc.'s sole obligation and the Customer's sole remedy for a breach of this warranty shall be DragonWave Inc.'s good faith efforts to rectify the non-conformity, or, if after reasonable efforts, DragonWave Inc. is unable to rectify the non-conformity, DragonWave Inc. shall accept return of the software and refund to Customer the purchase price thereof.

This warranty is available only once in respect of each licensed software program. DragonWave Inc. shall have no obligation under this warranty if the software is modified or if the software is used with hardware or software not supplied or approved by DragonWave Inc.

(c) In no event shall DragonWave Inc.'s liability to the Customer or to any other party for breach of any of the foregoing warranties exceed the purchase price paid by the Customer to DragonWave Inc. for the defective hardware or software product.

(d) The express warranties set out in this warranty statement are in lieu of all other warranties, representations or conditions, expressed or implied, including implied warranties of merchantability or fitness for a particular purpose, or those arising from statute or usage of trade. The Customer shall not make any representations or warranties of any kind whatsoever relating to the Equipment or to DragonWave Inc. which exceed those made by DragonWave Inc. in this warranty statement.

3.4. Return of Equipment Under Warranty

(a) If an item of Equipment malfunctions or fails in normal intended usage and maintenance within the applicable Warranty Period:

i. the Customer shall promptly notify DragonWave Inc. of the problem and the serial number of the defective item; and

ii. DragonWave Inc. shall, at its sole option, either resolve the problem over the telephone or provide the Customer with a Returned Materials Authorization (RMA) number and the address of the location to which the Customer can ship the defective item.

(b) If the problem is not resolved over the telephone, the Customer shall attach a DragonWave Repair and Return Form to each returned item describing the fault and the Customer's return address. The Customer shall, at its cost, properly pack the item to be returned, prepay the insurance and shipping charges, and ship the item to the specified location.

(c) If the DragonWave Inc. equipment shall prove to be defective in material or workmanship upon examination by DragonWave Inc., DragonWave Inc. shall either repair or replace the returned item at its sole option. The replacement item can be new or refurbished; if refurbished, it shall be equivalent in operation to new Equipment. If a returned item is replaced by DragonWave Inc., the Customer agrees that the returned item shall become the property of DragonWave Inc.

(d) DragonWave Inc. shall, at its cost, ship the repaired item or replacement to any destination within the United States of America (USA) or within Canada by carrier and method of delivery chosen by DragonWave Inc. If the Customer has requested some other form of conveyance, such as express shipping, or is located beyond the borders of the USA or Canada, then the Customer shall pay the cost of return shipment.

3.5. Default and Termination

(a) DragonWave Inc. can immediately terminate this Warranty and all of its performance under this Warranty, upon notification to the Customer, if the Customer:

i. makes any unauthorized modifications to the Equipment;

ii. violates or allows others to violate, the protection afforded DragonWave Inc. under applicable Canadian and international copyright laws. Violation of copyright shall include, but not be limited to, copying, translating, modifying, creating derivative works, reverse engineering, decompiling or otherwise using the Equipment except as expressly permitted by written consent from DragonWave Inc.;

iii. assigns or transfers the Customer's rights or obligations under this Warranty without the written consent of DragonWave Inc.:

1. Becomes bankrupt or insolvent, or is put into receivership; or

2. Has not paid DragonWave Inc. all amounts for the Equipment, services or other additional charges within thirty (30) days' receipt of written notice from DragonWave Inc.

(b) If this Warranty is terminated by DragonWave Inc., the Customer shall remain liable for all amounts due DragonWave Inc.

3.6. Force Majeure

(a) DragonWave Inc. shall not be liable if its performance of the Terms and Conditions of Sale becomes commercially impractical due to any contingency beyond DragonWave Inc.'s reasonable control, including acts of God, fires, floods, wars, sabotage, civil unrest, accidents, labour disputes or shortages, government laws, rules and regulations, whether valid or invalid, inability to obtain material, equipment or transportation, incorrect, delayed or incomplete specifications, drawings or data supplied by Customers or others (collectively "Force Majeure"). In no event of Force Majeure shall DragonWave be required to purchase goods from others to enable it to deliver the Equipment under the Terms and Conditions of Sale.

(b) DragonWave Inc. shall not be responsible for failure to discharge its obligations under this Warranty due to Force Majeure.

3.7. Engineering and System Design

(a) The Customer is solely responsible for the engineering, design, integration and normal preventative and remedial maintenance of the Customer's system for which DragonWave Inc. supplies Equipment.

(b) DragonWave Inc. is not responsible for the satisfactory operation of the Equipment in conjunction with other manufacturer's equipment, nor for any losses, which can occur as a result of a failure of the Equipment to operate in conjunction with another manufacturer's equipment.

4. Description

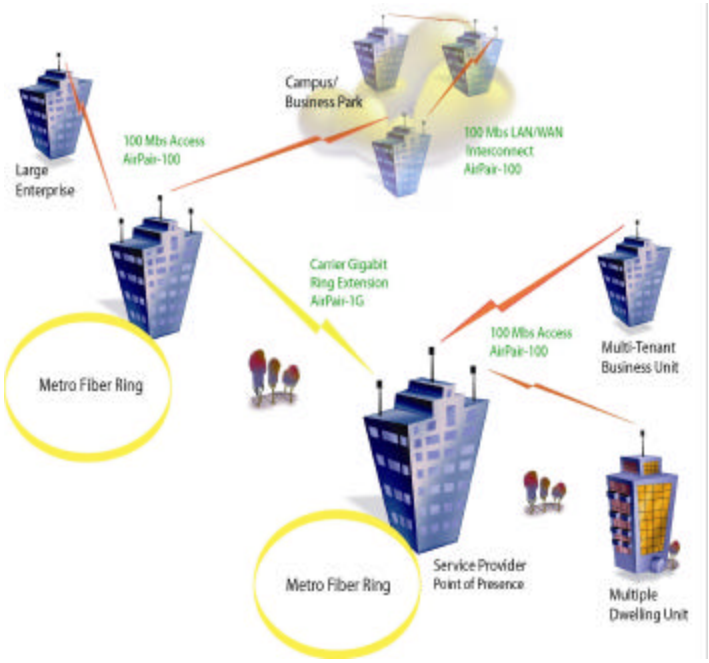
DragonWave's AirPair product family provides system integrators with a point-to-point broadband radio that delivers wireless Ethernet IP-based services.

Requiring no server room installation, the all-outdoor ready AirPair installs quickly and delivers the lowest cost per Mbit/s wireless solution in the industry. AirPair is the ideal choice wherever rapid deployment of Carrier-grade Ethernet service is required.

The DragonWave AirPair 100-UL is an unlicensed, wireless Ethernet bridge. The 100-UL avoids the uncertainity of service with the congested 2.4 GHz ISM and 5.8 GHz U-NII bands. Due to its narrow beam widths and the natural propagation of 24 GHz radio waves, AirPair 100-UL is able to operate virtually interference-free without a license up to 5 kms.

Figure 4-1 illustrates the capabilities of the DragonWave AirPair system.

Figure 4-1
AirPair System



4.1. AirPair 100-UL Specifications

The AirPair 100-UL specifications are:

- Network Ready
  - Wirespeed 100 Mbps full duplex
  - SNMP-, HTTP-based network management
- Carrier Grade
  - As high as 99.999% availability to meet or exceed wireline standards
  - Secure encryption standard
  - Designed for rugged outdoor use
  - 24 GHz Unlicensed Band
  - Compliant with FCC Standards
- Cost Effective
  - Engineered for rapid installation with no indoor space requirements
  - No cable trenching required
- Target Applications
  - Inter-building LAN extension
  - Wireless ISP backhaul
  - Fiber Path Redundancy
  - Homeland Security
  - Disaster Recover
- Packaging
  - Pole, tower or rooftop mast mounts
  - Antennas offered in 12” to 48” formats
  - Horizontal or vertical mounting
  - Intended for outdoor use with wide range environmental specifications

4.2. Calculating the Link Budget

To ensure that the point-to-point radio system works properly, with the expected availability and performance, you need to perform some path loss calculations and prepare a link budget. A link budget is an accounting of all the gains and losses in the “over air” part of the system and allows the planner to establish the locations and separations of each terminal in the link.

ⓘ	**Note** You may wish to use the AirPal Link Budget tool provided on the AirPair Toolkit CD ROM or the Link Budget Tool included with the PDA software.

4.2.1. Power Output

The Output Power (P_{out}) and the Effective Isotropic Radiated Power (EIRP) are located on the Transmit path. The P_{out} is at the radio flange. The radio flange connects to the antenna waveguide. EIRP is at the antenna output.

Table 4-1 shows output power (P_{out}) in both dBm and mw for the UL AirPair 50 and AirPair 100 radios.

Table 4-1
Power Output

	12" Antenna	**24" Antenna**	**36" Antenna**
Power output from radio	8 dBm	6 dBm	4 dBm
Antenna Gain	36.5 dBi	41.5 dBi	44.5 dBi
EIRP	44.5 dBm	47.5 dBm	48.5 dBm

4.3. Command Line Interface

A Command Line Interface (CLI) is available through the modem serial port. The CLI is accessed through a terminal emulation package such as HyperTerminal®. The user may also use an intuitive Graphic Unit Interface (GUI).

4.3.1. Configuring the Serial Port using the CLI

This section describes how to connect the AirPair to a PC using a straight-through DB9 serial cable.

Procedure 4-1
Configuring the Serial Port using the CLI

Follow the steps below to access the AirPair CLI using a terminal emulation program such as HyperTerminal. ®

1. Connect the serial cable from the DB9 serial port on a PC to the Serial port on AirPair UL-100. The DB9 connector on AirPair is female; the cable from the PC is male. A straight-through cable is required.
2. Start HyperTerminal or another terminal emulation program.
3. Set the terminal emulation program to emulate a VT100 terminal with the following settings:

Parameter	Value
Bits per second	19200
Data bits	8
Parity	none
Stop bits	1
Flow control	none

4. Press **<Enter>.**
   The AirPair™ UL-100 Login menu is displayed.

4.3.2. Create Login Account

Before you may use the AirPair system, you need to activate the Administrator and Network Operations Center (NOC) accounts. The system is shipped with default settings for each account, but until you change the username and the password, these accounts are not activated.

ⓘ	**Information** For security reasons, no prompt is displayed until a user account has been established. The default accounts do not permit use of CLI commands – they can only be used to create new user accounts. Default Administrator Account username =oam&p Default Administrator Account password = setup Default NOC Account username = d&wave Default NOC Account password= worthit Default usernames and passwords are case sensitive. **Once the accounts have been activated, the default account settings cannot be used again.**

An Administrator Network account must be created to use the CLI commands. The default safety account is used to create new user accounts. Only one user account can be active at a time. Creating a new administrator user account deletes the previous administrator user account.

Procedure 4-2
Create Login Account

Use this procedure to create a new administrator user account.

Required Action	Steps
Create Login Account	**Notes:** • As a security measure prior to setup of initial account, no user prompt appears. • The default account can only set up a user account. No other commands will work. • Only one account can be setup. Each new account setup overwrites the older account. Sequence to activate the Administrator account: Log in for the first time using the default safety account: press Enter to get the modem Enter the oam&p username: username: **oam&p** press Enter Enter the default password: password: **setup** press Enter Create a new Administrator account: press Enter to get the modem Enter your username (Maximum of 10 characters): username: **<username>** press Enter Confirm you username: username: **<username>** press Enter Enter your password (Maximum of 10 characters): password: **<password>** press Enter Enter your password again password: **<password>** press Enter Log out: **lo** press Enter Log in using the new account. Press Enter to get the modem

Required Action	Steps
	Enter your username: username: **<username>** press Enter Enter your password: password: **<password>** press Enter
Change NOC username and password	Changes the NOC username and password for security reasons. The default NOC username is d&wave. The default NOC password is worthit. Sequence: Enter the NOC Safety User username: username: **d&wave** press Enter Enter the NOC Safety User password: password: **worthit** press Enter Enter the new NOC username (Maximum of 10 characters): username: **<username>** press Enter Confirm the username: username: **<username>** press Enter Enter the new NOC password (Maximum of 10 characters): password: **<password>** press Enter Enter the password again password: **<password>** press Enter
Lo	Logs out of the system. Sequence: **lo** press Enter The system responds: *goodbye*

4.4. Set AirPair Frequency

This section describes how to set the radio frequency and transmit power using the CLI. Before setting the frequency or transmitting power, ensure that the radio is connected to the modem through a serial port.

Note: One must be GO and the other must be Return. Vertical and horizontal polarizations are completed during install.

Procedure 4-3
Set AirPair Frequency available and Transmit Power

Follow this procedure to set the 24 GHz AirPair frequency channels for pre-defined frequency pairs (coupled frequencies) and to set the gain.

Note: To perform this procedure, you must have NOC user rights.

Required Action	Steps
login as an NOC user	Logs in as an NOC user. Sequence: Enter an NOC username: Username <**username>** press Enter Enter an NOC password: Password: <**password>** press Enter
get radio band	Displays the type (band) of radio that the user expects to connect to the modem. Sequence: **get radio band** press Enter The system responds: *Currently selected Radio Band: [none/un24].* Radio bands available in the system: none fcc18a fcc18b fcc18c ic18a ic18b ic18c fcc23a fcc23b fcc23c fcc23d ic23a ic23b fcc28a fcc28b china23 un24
set radio band [none / un24]	Sets the band of radio to which the user expects to connect the modem. Sequence: **set radio band [band]** press Enter where band is none / un24 The system responds: *Radio band Selected [none/un24].*

<table>
<tr><th>Required Action</th><th>Steps</th></tr>
<tr><td>get frequency bank</td><td>Displays the frequency bank.
Sequence:
get frequency bank press Enter

The system responds:

un24
go FREQUENCIES(Selected)

<table>
<tr><th>Index</th><th>TX IF</th><th>RX IF</th><th>TX RF</th><th>RX RF</th></tr>
<tr><td>UNL1</td><td>670</td><td>2000</td><td>24080</td><td>24150</td></tr>
<tr><td>UNL2</td><td>660</td><td>1990</td><td>24090</td><td>24160</td></tr>
<tr><td>UNL3</td><td>650</td><td>1980</td><td>24100</td><td>24170</td></tr>
<tr><td>UNL4</td><td>640</td><td>1970</td><td>24110</td><td>24180</td></tr>
<tr><td>UNL5</td><td>630</td><td>1960</td><td>24120</td><td>24190</td></tr>
<tr><td>UNL6</td><td>620</td><td>1950</td><td>24130</td><td>24200</td></tr>
<tr><td>UNL7</td><td>610</td><td>1940</td><td>24140</td><td>24210</td></tr>
<tr><td>UNL8</td><td>600</td><td>1930</td><td>24150</td><td>24220</td></tr>
</table>

return FREQUENCIES

<table>
<tr><th>Index</th><th>TX IF</th><th>RX IF</th><th>TX RF</th><th>RX RF</th></tr>
<tr><td>UNL'1</td><td>600</td><td>2070</td><td>24150</td><td>24080</td></tr>
<tr><td>UNL'2</td><td>590</td><td>1990</td><td>24160</td><td>24090</td></tr>
<tr><td>UNL'3</td><td>580</td><td>2050</td><td>24170</td><td>24100</td></tr>
<tr><td>UNL'4</td><td>570</td><td>2040</td><td>24180</td><td>24110</td></tr>
<tr><td>UNL'5</td><td>560</td><td>2030</td><td>24190</td><td>24120</td></tr>
<tr><td>UNL'6</td><td>550</td><td>2020</td><td>24200</td><td>24130</td></tr>
<tr><td>UNL'7</td><td>540</td><td>2010</td><td>24210</td><td>24140</td></tr>
<tr><td>UNL'8</td><td>530</td><td>2000</td><td>24220</td><td>24150</td></tr>
</table>

Note: All Frequencies in MHz.</td></tr>
<tr><td>set frequency bank</td><td>Sets the frequency bank to coupled (paired) or decoupled (unpaired or CUSTOM) frequencies.

Sequence:
set frequency bank [go/return] press Enter

The system responds:
Frequency Bank selected: [go/return]</td></tr>
</table>

<table>
<tr><th>Required Action</th><th>Steps</th></tr>
<tr><td>get available frequency</td><td>Displays the frequency bank. This will show the frequencies for the direction programmed using the set frequency bank command. If the frequency bank was selected to GO, then the GO bank of frequencies is displayed, and similarly the RETURN bank of frequencies is displayed if the RETURN frequency bank was selected. .

Sequence:
get available frequency press Enter

The system responds:
(“go” frequencies shown. “return” frequencies will be displayed if the return bank was programmed).
go Frequencies
Index TX IF RX IF TX RF RX RF
UNL1 670 2000 24080 24150
UNL2 660 1990 24090 24160
UNL3 650 1980 24100 24170
UNL4 640 1970 24110 24180
UNL5 630 1960 24120 24190
UNL6 620 1950 24130 24200
UNL7 610 1940 24140 24210
UNL8 600 1930 24150 24220

Note: All Frequencies in MHz.</td></tr>
<tr><td>set programmed frequency [frequency index]</td><td>Sets the programmed frequency.
Sequence:
set programmed frequency [frequency index] press Enter

The system responds: (example uses set programmed frequency UNL1)
Index TX IF RX IF TX RF RX RF
UNL1 670 2000 24080 2415
Note: All Frequencies in MHz.</td></tr>
<tr><td>get programmed frequency</td><td>Displays the programmed frequency.
Sequence:
get programmed frequency press Enter

The system responds: (example uses set programmed frequency UNL1)
Index TX IF RX IF TX RF RX RF
UNL1 670 2000 24080 24150

Note: All Frequencies in MHz.</td></tr>
</table>

Required Action	Steps
get antenna diameter	Displays the programmed antenna diameter. Sequence: **get antenna diameter** press Enter The system responds: *Antenna Diameter:* *12 inch* *24 inch* *36 inch - Programmed* **Note:** The antenna diameter affects the radio Tx power for radio band un24 only.
Set antenna diameter [index]	Displays the programmed antenna size. Sequence: **Set antenna diameter [index]** press Enter where index is 1,2,3 The system responds: *Programmed Antenna Diameter: [12 inch /24 inch /36 inch]* **Note:** The antenna diameter affects the radio Tx power for radio band un24 only.

Required Action	Steps
set transmit power [power in dBm]	Sets the transmit power, if required. Sequence: **set transmit power [power in dBm]** press Enter where [power in dBm] is a multiple of 10 value, i.e. 132 represents 13.2 dBm, 94 represents 9.4 dBm. The system responds: *System is programmed and transmitting at [powerLevel] dBm.* If the radio is not connected, the system responds: *System programmed to [powerLevel] dBm. Radio communication has failed. System not transmitting.* If the radio transmit calibration table is not programmed into the radio, the system responds: *System programmed to [powerLevel] dBm.* **Note:** Radio requires calibration tables in order to set the transmit power level. [powerLevel] dBm will **NOT** be used.
reset system	Resets the system to save the settings to FLASH and restart the system with the new settings taking effect. If you do not want to restart the system, use the command save MIB to save the settings to FLASH. Sequence: **reset system** press Enter The system responds: system reset

4.5. Set AirPair Custom Frequency Settings

This section details how to set the frequency channels for user-defined custom frequency pairs, i.e., decoupled frequencies, and how to set the gain.

Procedure 4-4
Setting the 24GHz AirPair Frequency channels for user-defined custom frequency pairs

Perform this procedure to set the 24 GHz AirPair frequency channels for user-defined custom frequency pairs (decoupled frequencies) and to set the gain.

Notes:

1. The system must first be programmed with coupled frequencies (pre-defined frequency pairs) before it may be changed to CUSTOM frequency.
2. It is recommended you use the pre-defined coupled frequency pairs for 24 GHz. The custom frequency combinations are available to address potential future interference issues.
3. To perform this procedure, you must have NOC user rights.

Required Action	Steps
login as a NOC user	Logs in as an NOC user. Sequence: Enter an NOC username: username: **<username>** press Enter Enter an NOC password: password: **<password>** press Enter
get radio band	Displays the type (band) of radio that the user expects to connect to the modem. Sequence: **get radio band** press Enter The system responds: Selected Radio Band: [None/un24]
set radio band [None/ un24]	Sets the band of radio to which the user expects to connect the modem. Sequence: **set radio band UNL24** press Enter The system responds: *Radio Band Selected: [None/ un24]*

Required Action	Steps
get programmed frequency	Displays the programmed frequency. Sequence: **Get programmed frequency** press Enter The system responds: (example uses programmed frequency UNL1) *Index TX IF RX IF TX RF RX RF* *UNL1 670 2000 24080 24150* **Note:** All Frequencies in MHz.
get unlicensed frequencies Rx	Displays the bank of CUSTOM receive (Rx) frequencies available for use. Sequence: **get unlicensed frequencies rx** press Enter The system responds: (example uses rx frequencies) Index RX IF RX RF *CUSTOM1 2070 24080* *CUSTOM2 2060 24090* *CUSTOM3 2050 24100* *CUSTOM4 2040 24110* *CUSTOM5 2030 24120* *CUSTOM6 2020 24130* *CUSTOM7 2010 24140* *CUSTOM8 2000 24150* *CUSTOM9 1990 24160* *CUSTOM10 1980 24170* *CUSTOM11 1970 24180* *CUSTOM12 1960 24190* *CUSTOM13 1950 24200* *CUSTOM14 1940 24210* *CUSTOM15 1930 24220* **Note:** All Frequencies in MHz.

Required Action	Steps
set unlicensed frequencies rx [index]	Sets the frequency to CUSTOM (decoupled) frequencies for receive (Rx) direction. **Note: the transmit (Tx) and receive (Rx) frequencies must differ by at least 70 MHz.** Sequence: **set unlicensed frequencies Rx [index]** press Enter where Rx is the receive direction. Index is the index number of the frequency. The system responds: (example uses custom unlicensed frequencies) *Index TX IF RX IF TX RF RX RF* *CUSTOM 670 1980 24080 24170* **Note:** All Frequencies in MHz.
get unlicensed frequencies Tx	Displays the bank of CUSTOM transmit (Tx) frequencies available for use. Sequence: **get unlicensed frequencies Tx** press Enter The system responds: (example uses Tx frequencies) *Index TX IF TX RF* *CUSTOM1 670 24080* *CUSTOM2 660 24090* *CUSTOM3 650 24100* *CUSTOM4 640 24110* *CUSTOM5 630 24120* *CUSTOM6 620 24130* *CUSTOM7 610 24140* *CUSTOM8 600 24150* *CUSTOM9 590 24160* *CUSTOM10 580 24170* *CUSTOM11 570 24180* *CUSTOM12 560 24190* *CUSTOM13 550 24200* *CUSTOM14 540 24210* *CUSTOM15 530 24220* **Note:** All Frequencies in MHz.

Required Action	Steps
set unlicensed frequencies Tx [index]	Sets the frequency to CUSTOM (decoupled) frequencies for the transmit (tx) direction **Note: the transmit (Tx) and receive (Rx) frequencies must differ by at least 70 MHz.** Sequence: **set unlicensed frequencies Tx [index]** press Enter where Tx is the transmit direction. Index is the index number of the frequency. The system responds: (example uses custom unlicensed frequencies) *Index TX IF RX IF TX RF RX RF* *CUSTOM 660 1980 24090 24170* **Note:** All Frequencies in MHz.
get programmed frequency	Displays the programmed frequency: Sequence: **get programmed frequency** press Enter The system responds: (example uses custom programmed frequencies) *Index TX IF RX IF TX RF RX RF* *CUSTOM 670 2000 24080 24150* **Note:** All Frequencies in MHz.
get programmed frequency	Displays the programmed frequency: Sequence: **get programmed frequency** press Enter The system responds: (example uses custom programmed frequencies) *Index TX IF RX IF TX RF RX RF* *CUSTOM 670 2000 24080 24150* **Note:** All Frequencies in MHz.

Required Action	Steps
get antenna diameter	Displays the programmed antenna diameter. Sequence: **get antenna diameter** press Enter The system responds: Antenna Diameter: *12 inch* *24 inch* *36 inch - Programmed* **Note:** The antenna diameter affects Tx power for radio band un24 only.
Set antenna diameter [index]	Sets the programmed antenna size. Sequence: **Set antenna diameter [index]** press Enter where index is 1,2,3 The system responds: *Programmed Antenna Diameter: [12 inch /24 inch /36 inch]* **Note:** The antenna diameter affects Tx power for radio band un24 only.

Required Action	Steps
set transmit power [power in dBm]	Sets the transmit power, if required. Sequence: **set transmit power [power in dBm]** press Enter where [power in dBm] is a multiple of 10 value, i.e., 132 represents 13.2 dBm, 94 represents 9.4 dBm. The system responds: *System is programmed and transmitting at [powerLevel] dBm.* If the radio is not connected, the system responds: *System programmed to [powerLevel] dBm. Radio communication has failed. System not transmitting.* If the radio transmit calibration table is not programmed into the radio, the system responds: *System programmed to [powerLevel] dBm.* **Note:** Radio requires calibration tables in order to set the transmit power level. [powerLevel] dBm will NOT be used.
reset system	Resets the system to save the settings to FLASH and restart the system with the new settings taking effect. If you do not want to restart the system, use the command save MIB to save the settings to FLASH. Sequence: **reset system** press Enter The system responds: *system reset.*

4.6. Set IP address

You can use Telnet to access the AirPair system from your PC using an Internet Protocol (IP) address. An IP address is a number given to a device so that a network can identify it. The IP address format is a 32-bit numeric address written as four numbers separated by periods. For example, 192.168.0.1 could be an IP address. If you assign an IP address to your radio, you can access the radio from your network.

Procedure 4-5
Setting the IP Address

Perform this procedure to set the IP address for the system so you can access the AirPair from your desktop.

Required Action	Steps
Login	Log in as a NOC user. Only the NOC user is allowed to set the IP address. Sequence: Enter an NOC username: username: **<username>** press Enter Enter an NOC password: password: **<password>** press Enter
set ip address	Set the IP address used for the system. Sequence: **set ip address [123.123.123.123]** press Enter where [123.123.123.123] is in decimal dot notation. The system responds: *System IP address: [123.123.123.123]]*
set subnet mask	Sets the subnet mask used for the system. Sequence: **set subnet mask [123.123.123.123]** press Enter where [123.123.123.123] is in decimal dot notation. The system responds: *System subnet mask:[123.123.123.123]*
set default gateway	Sets the default gateway parameter for the system. The default router must be an IP address specified in decimal-dot notation, e.g., 192.168.0.1. Sequence: **set default gateway [123.123.123.123]** press Enter where [123.123.123.123] is in decimal dot notation.

Required Action	Steps
	The system responds: *NAK'* if request cannot be processed, otherwise returns the following which acknowledges completion of the request: System default gateway: 123.123.123.123
reset system	Resets the system to save the setting to FLASH and restart the system with the new settings taking effect. Sequence: **reset system** press Enter The system responds: *system reset.*

4.7. VLAN tagging

A Local Area Network (LAN) is a single-broadcast domain. If a user broadcasts information on the LAN, every other user on the LAN receives the broadcast. A router prevents broadcast messages from leaving a LAN, which reduces collisions and improves performance.

A network manager can create smaller broadcast domains and reduce network broadcasts by logically segmenting a LAN into different broadcast domains. These broadcast domains are called Virtual Local Area Networks (VLANs). Workstations on a VLAN do not have to be located together because they are segmented logically, not physically.

VLANs offer a number of advantages over traditional LANs including:

- Performance
- Security
- formation of virtual workgroups
- cost reduction

All ports on a switch are configured for a default VLAN (usually VLAN1). When a switch receives data from a workstation, it tags the data with a VLAN identifier indicating the originating VLAN. The switch sends the data to the ports inside the VLAN where it originated. It also sends the data to a trunking port if one is available.

Network Administrators create VLAN groups and place backbone network devices into the VLAN group to simplify administration and increase security of the devices. VLAN tagging allows network administrators to add AirPair nodes to the administrative network. VLAN tagging restricts administrative access to devices that are members of the VLAN group.

If you program an AirPair node with an IP address but do not enable VLAN tagging, the node responds to Ping, Telnet and SNMP commands from any device on the network. Telnet and SNMP require a username and password, the proper IP address and community string, respectively.

If you enable VLAN tagging, the AirPair nodes respond to ping commands but do not respond to Telnet and SNMP commands unless the packet has the correct VLAN tag. The Telnet and SNMP requests must have the correct VLAN tag and come from a device within the VLAN domain.

The Institute of Electrical and Electronic Engineers (IEEE) is working on a draft standard 802.1Q for VLANs. Currently, most products are proprietary and anyone wanting to install VLANs has to purchase all products from the same vendor. DragonWave implements AirPair VLAN Tagging using the 802.1Q standard. For more information on the Standard, see the web page:

http://grouper.ieee.org/groups/802/1/pages/802.1Q.html

Procedure 4-6
Setting VLAN Tag

ⓘ	**Note** If you set the VLAN tag to the incorrect value, you can lose remote access to the AirPair. Make sure the VLAN tag matches your administrative network tag.

Perform this procedure to enable VLAN tagging for the AirPair.

Note: To perform this procedure, you must have NOC user rights.

Required Action	Steps
login	Log in as an NOC user. Sequence: Enter an NOC username: username: **<username>** press Enter Enter an NOC password: password: **<password>** press Enter
get vlan tagging	Displays the VLAN tagging operational state for the system. Sequence: **get vlan tagging** press Enter The system responds: *VLAN tagging is [off | on]*
set vlan tagging [on/off]	Sets VLAN tagging on for the system. Sequence: **set vlan tagging** on press Enter The system responds: *VLAN tagging is on.*
set vlan tag [8100XXXX]	Enables or disables VLAN tagging for the system. VLAN tagging is enabled when you enter the hex characters 8100 immediately followed by the 2-byte tag control information field. **Note: If you set the VLAN tag to the incorrect value, you can lose remote access to the AirPair. Make sure the VLAN tag matches your administrative network tag.** Sequence:

Required Action	Steps
	set vlan tag [8100XXXX] press Enter where XXXX is the two byte tag control The system responds: *VLAN tagging is [off | on using 8100XXXX]*
get vlan tag	Displays that the VLAN tagging information for the system is correct. If you have entered an incorrect VLAN tag, you cannot communicate remotely with the AirPair. Sequence: **get vlan tag** press Enter The system responds: *VLAN tagging is [off | on using tag 8100XXXX]*
Reset system	Resets the system to save the settings to FLASH and restart the system with the new settings taking effect. If you do not want to restart the system, use the command save MIB to save the settings to FLASH. Sequence: **reset system** press Enter The system responds: *system reset.*

5. Installation

This section describes how to install the DragonWave AirPair. Perform the procedures in this section in sequence presented.

5.1. Before you begin

Caution

DragonWave Inc. recommends to connect the AirPair system to an Uninterruptable Power Supply (UPS) or an equivalent system in order to withstand power interruptions.

Before installation, preset each DragonWave radio to the desired channel within the frequency band allocated to this particular installation.

5.2. Mounting Specifications

Caution

The mounting poles must be capable of providing sufficient stability.

The mounting pole, tripod, mast or tower mount, must be able to provide sufficient stability to prevent movement or vibration. You must take into account wind loading, twist, sway and vibration. Table 5-1 shows the mounting pole details.

Table 5-1
Mounting Pole Specifications for SKED 80 Steel Pipe

Antenna Diameter	Steel Pipe Nominal Diameter	Max. Distance Above Last Rigid Attachment Point
12”	3 “	3 ft
12”	4”	4 ft
24”	3”	2 ½ ft
24”	4”	3 ft
36”	4”	3 ft
48”	4”	3 ft

Caution

Refer to local safety standards and building codes for installation, grounding and lightning protection requirements prior to planning installation.

DragonWave Inc. recommends at least one crew member at each end of the link during the installation.

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6. Installation of Radio and Modem

This section describes how to install the radio and modem. The steps in the installation are:

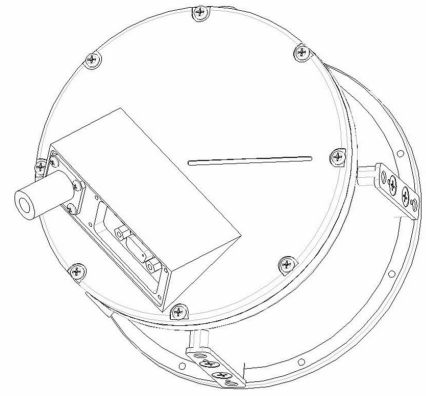
- install mounting bracket onto mast or tower
- mount the radio and antenna onto the mounting bracket
- perform visual alignment of radio
- attach modem onto mounting bracket
- connect the low-loss RF cable and the RS-232 cable between the modem and the radio
- install grounding and lightning protection
- connect power to the modem by connecting the power cable between the power pack and the modem
- perform fine-adjust alignment of the radios using the PDA
- perform data test
- connect the LAN to the modem

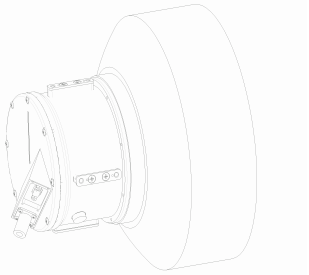
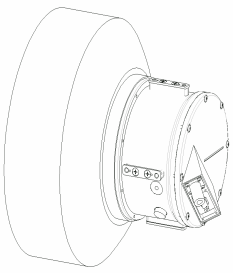
6.1. Mounting the Radio and Antenna onto the Mounting Bracket

Procedure 6-1
Mounting the 12^2 and 18^2 antennas

	**Caution** **The endpoints MUST be cross-polarized radios/antennas in order for the system to properly function. One end must be set to vertical polarization and the other end to horizontal.**

Perform this procedure to mount the 12″ and 18″ antennas and radios.

	**Vertical Polarization:** Groove on back plate is in vertical orientation. Cables point down and to the right.
	**Horizontal Polarization:** Groove on back plate is in horizontal orientation. Cables point down and to the left.

		
One end MUST be **Vertical** Polarization (backplate groove is vertical)		The other end MUST be **Horizontal** Polarization (backplate groove is horizontal)

6.2. Visually-aligning Radios

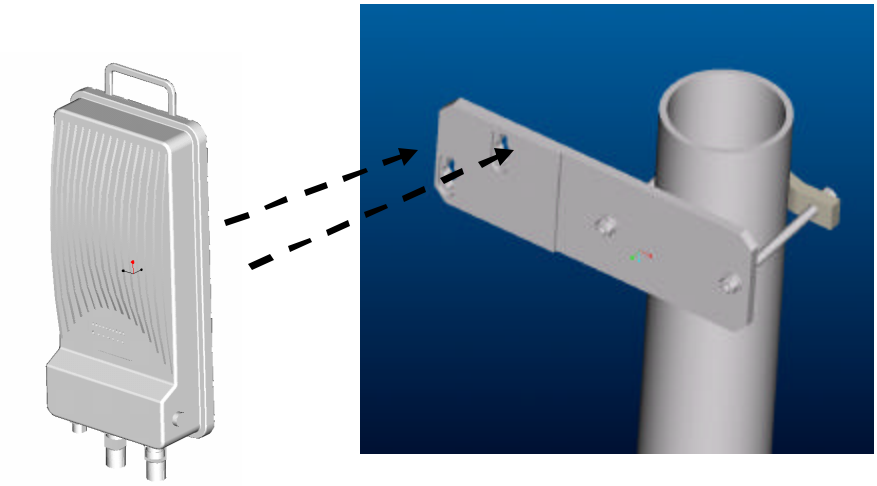
This section describes how to visually align the radios.

Procedure 6-2
Visually align the radios

Perform this procedure to visually align the radios.

1. Visually align the radios to each other. Be as accurate as possible.
2. Visually align one end of the point-to-point link. Repeat this procedure for the other end.
3. Place a mark on the radio bracket to identify the starting point before you begin to fine-tune the radio alignment.

Figure 6-1
Modem on Mounting Bracket



Procedure 6-3
Attaching the Modem to Mounting Bracket

Perform this procedure to attach the modem to the mounting bracket:

1. Install the mounting bracket onto the mast.
2. Install the modem onto the bracket. Make sure the modem is mounted above the antenna so there is sufficient cable length.
3. Ensure all hardware is tightened according to the following torque specifications.

Table 6-1
Torque Specifications for mounting modem to bracket

Bolt size in inches	Nut torque
3/8	15 ft-lbs
1/4	9 ft-lbs

Figure 6-2
Modem

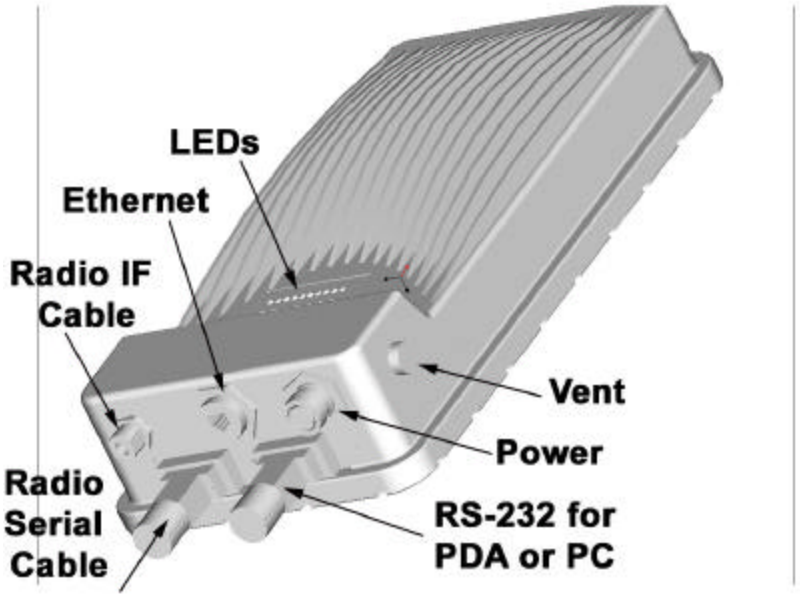


Figure 6-3
Modem connected to Radios and 18², 24² and 36² antennas
24 GHz system with 18” dish

Figure 6-4
24 GHz system with 24” antenna mounted

Figure 6-5
24 GHz system with 36” antenna mounted

Procedure 6-4
Connecting the IF and RS-232 cable to the modem and radio

Perform this procedure to connect the IF and RS-232 cable to the modem and radio.

1. Connect IF cable to the IF connector on the modem and the radio.
2. Connect the RS-232 cable to the serial connector on the modem and the radio.

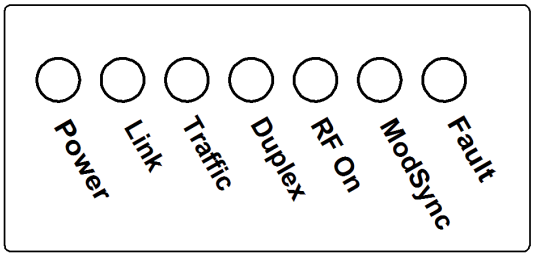
Note: Do **NOT** connect the Power cable or the CAT5 Ethernet cable to LAN equipment at this time.

	**Caution** **Lightning protection is required by the DragonWave Warranty Statement. Failure to provide proper lightning protection can result in the Product Warranty being void.**
	**Caution** **Lightning protection regulations and standards for proper protection are covered under the national or regional electrical safety codes such as the National Electrical Code in the United States. Follow your national or regional electrical safety codes!**
	**Caution** **The outdoor components are to be grounded, and lightning arrestors are to be connected in accordance with local, regional and national codes. All local building and electrical codes specified by local civil authorities must be followed. Standard safety procedures for installing and working with this type of equipment must also be followed.**

Procedure 6-5
Connect the power cable to the modem and the power pack

	Caution **Install the Power cable only after proper grounding and lightning protection has been established**.
	Caution **Connect the Airpair system to an Uninterruptable Power Supply (UPS) or equivalent system in order to withstand power outages**.
	Caution **Cables must have strain-relief support. Ensure cabling is attached to tower or mast in a manner to provide maximum strain relief.**

Figure 6-6
6-LED Panel on Modem



Perform this procedure to connect the power cable between the modem and the power pack.

1. Connect cable between modem and power pack.
2. Plug the power pack into the ac outlet.
3. Ensure the modem is receiving electrical power by viewing the Power LED on the modem.
4. Ensure radio is receiving power. The RF On LED is lit on the modem.
5. Do **NOT** connect the CAT5 Ethernet cable to LAN equipment at this time.

	Caution **Do <u>NOT</u> connect the CAT5 Ethernet cable to LAN equipment at this time**.

6.3. Fine-adjust alignment of the radios

This section describes how to perform fine-adjust alignment of the radios. When you prepare to align the radios, you must consider two important factors:

- Main Lobe and Side Lobes of Radio Waves
- Clear Line of Sight (LOS)

6.3.1. Main Lobe and Side Lobes of Radio Waves

When you align the radios, make sure you align to the Main Lobe of the transmission. If you mistake a Main Lobe for a Side Lobe during installation, there can be a 20-30 dB loss of signal strength. For example, if the Calculated RSSI = -42 dB then the side lobe would be at approximately -62 dB, or 20 dB lower than the calculated level.

The size of the beamwidth for the 24 GHz AirPair systems is approximately 2 degree, which is approximately equivalent to a thumb's width when the arm is fully extended. Align as closely to the centre of the 2-degree beamwidth as possible. It takes very little adjustment to swing past the main lobe, as can be seen in Figure 6-7. A beamwidth of 2 degrees is narrow and alignment errors can occur when you lock on to a Side Lobe instead of onto the Main lobe. If you align to a Side Lobe and miss the Main Lobe, your signal strength is reduced. Make sure you align the antenna to the Main Lobe.

Note: Verify the RSSI is within 2 dB of the calculated value.

Figure 6-7
2 Degree Beamwidth

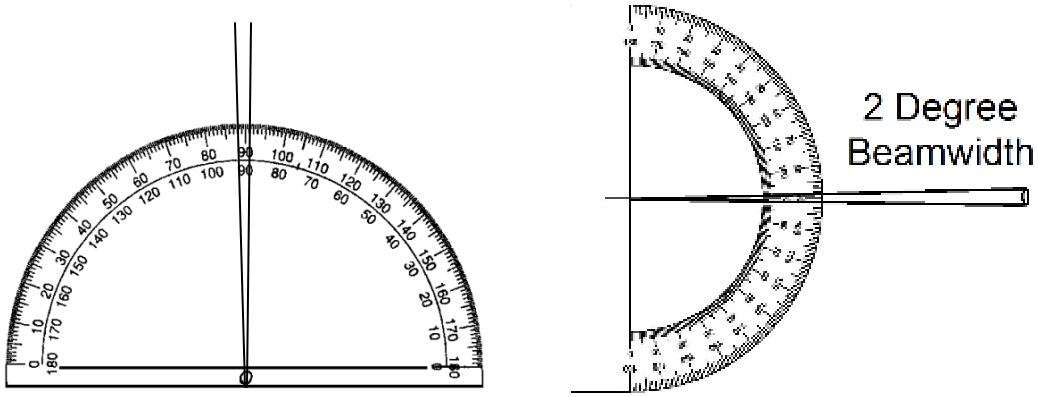
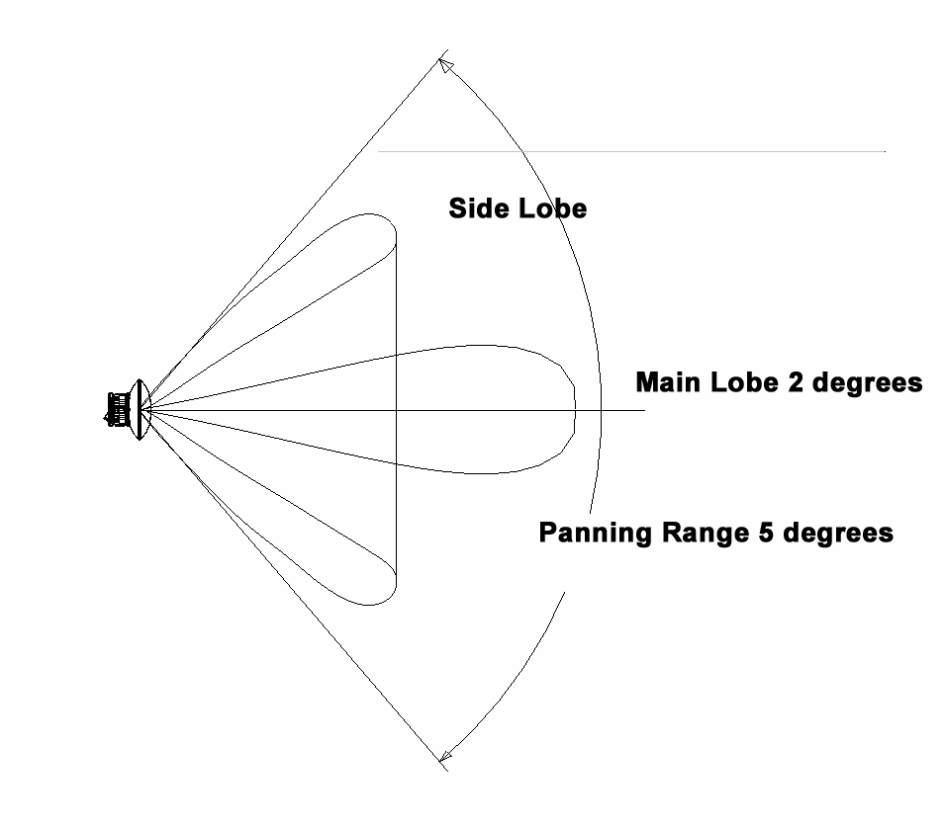


Figure 6-8
Main and Side Lobes - Radio Signal Using 12^2/30 cm Antenna



6.4. Clear Line of Sight

	Caution **There can be no obstructions in the Fresnel zone. If there are obstructions within this broad beam or Fresnel Zone, some of the signal is diffracted off the obstruction, with an accompanying phase shift.**

The AirPair must have a clear line of sight. Use caution and make sure there is proper Fresnel Zone clearance. The size of the beam grows as it propagates towards the destination. The beam must have no obstructions in its path. Obstructions within the path of the beam can decrease the signal quality by diffracting the signal.

When you consider Fresnel Zone clearance, you must consider both the height above and the lateral distance from obstructions Figure 6-9 show trees within the Fresnel zone that obstruct the signal. Do not allow any obstruction of the Fresnel Zone.

Figure 6-9
WRONG! Obstruction of the Fresnel Zone

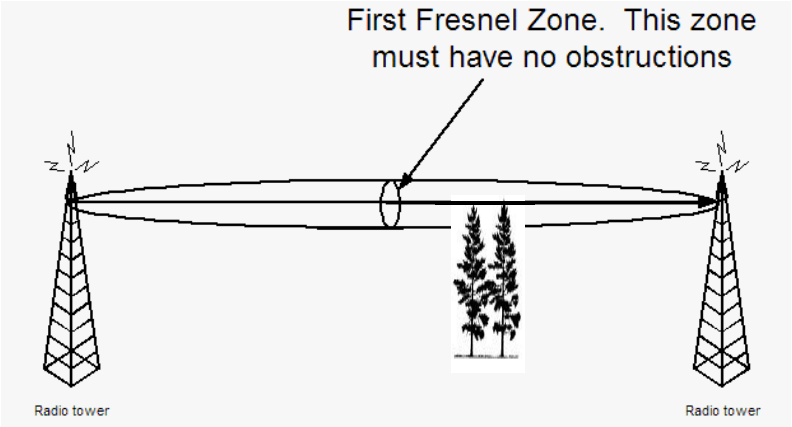
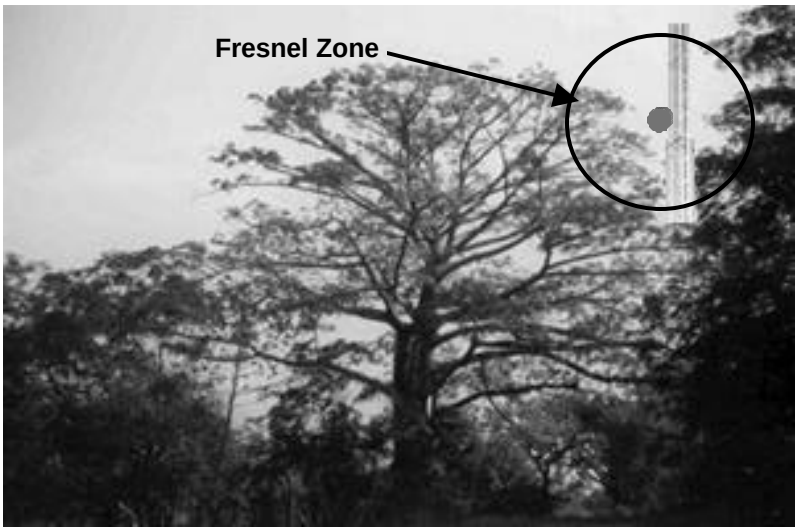


Figure 6-10
WRONG! Trees within the Fresnel Zone Obstruct the Signal

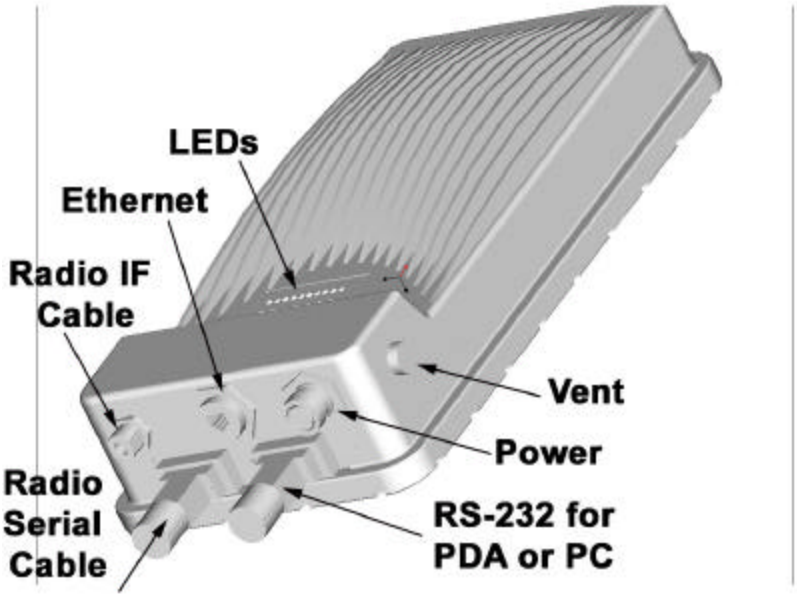


6.5. Fine-adjust align the radios

	**Caution** **Alignment of the radios requires power to be supplied to the modem.**
	**Caution** **Proper alignment results in increased signal quality! Once the radios have been visually aligned, fine adjust alignment can begin. Pan across the entire beamwidth to ensure the alignment corresponds to the Main Lobe and not to a Side Lobe.**
	**Caution** **Transmission of radio signals results in a primary signal (Main Lobe) and secondary signals (Side Lobes) being sent towards the destination. During installation the Side Lobes can be mistaken for the Main Lobe, resulting in a 20-30 dB loss of signal strength. On a 12”/30 cm antenna, the entire beamwidth typically lies within a 5 degree span so it is critical to ensure alignment targets the Main Lobe and not the Side Lobes. Larger antennas have a narrower beam. For a 24”/60 cm antenna, the entire beamwidth lies within a 3 degree span.**

Note: It is recommended that you use the DragonWave’s DragonPair PDA software when aligning 24 GHz AirPair systems. DragonWave’s software runs on a Personal Digital Assistant (PDA) with Palm OS V3.1 or higher. The software provides an Antenna Alignment Indicator that shows relative signal strength. It retains the peak value that was reached. This allows for multiple panning attempts.

Figure 6-11
Modem



Procedure 6-6
Fine-adjust Align Radios

Use this procedure to fine-adjust the alignment of the radios.

At the first end:

(a) Pan or move the antenna horizontally at one end across the entire beamwidth to identify the Main Lobe and the two side lobes. See Figure 6-8. Place a mark on the radio bracket to identify Main Lobe and each of the Side Lobes. The Main Lobe is approximately 2 degrees in width. The two Side Lobes are approximately 5 degrees apart.

(b) Tilt or move the antenna vertically and locate the strongest receive signal reading.

(c) Pan or move the antenna horizontally and locate the strongest receive signal reading.

(d) Tighten the bolt to lock the antenna in place.

At the other end:

(a) Pan or move the antenna horizontally at one end across the entire beamwidth to identify the Main Lobe and the two side lobes.

(b) Tilt or move the antenna vertically and locate the strongest receive signal reading.

(c) Pan or move the antenna horizontally and locate the strongest receive signal reading.

(d) Tighten the bolt to lock the antenna in place.

At the first end:

(a) Pan or move the antenna horizontally at one end across the entire beamwidth to identify the Main Lobe and the two side lobes.

(b) Tilt or move the antenna vertically and locate the strongest receive signal reading.

(c) Pan or move the antenna horizontally and locate the strongest receive signal reading.

(d) Tighten the bolt to lock the antenna in place.

(e) Repeat these steps as necessary to obtain maximum signal strength.

Notes:

1. While Horizontal Alignment is being performed, ensure the Vertical Alignment lockdown bolts are securely tightened to prevent movement, and vice versa for Vertical Alignment.
2. The RSSI level should be within 2 dB of predicted levels. Factors that contribute to low RSSI levels are:
    - incorrect antenna alignment - aligned to side lobe and not main lobe;
    - improper polarization of antennas - horizontal vs. vertical.
    - path issues
    - obstructions such as trees, hills, or buildings within the beamwidth
    - path clearance issues such as diffraction, partial obstruction, earth curvature
3. Ensure alignment corresponds to the Main Signal Lobe and not to the Side Lobes.
4. The connectors (Power cable, IF cable, Serial cable, and Ethernet cable) on the AirPair units are of a weatherproof design. Sealing of connectors is not necessary.
5. Once the radios and modems have been installed and aligned, you need to ensure that the grounding cables at the radio and modem are properly sealed using potting compound, rubberized tape or other waterproof material. Cable corrosion can result in decreased quality of grounding connections, and therefore present greater risk of personal or equipment damage during lightning strikes.

6.5.1. Perform a Data Test

This section describes how to perform a data test.

Procedure 6-7
Perform a data test

Perform this procedure to confirm the network link is working properly. It is assumed that you are using an Ethernet traffic-generating device.

1. Connect the device to the Ethernet cable at either end.
2. Confirm data can be passed within desired error rates. This will ensure the network link is working in a satisfactory manner prior to running applications over the link.

6.5.2. Connect to the LAN

This section describes how to connect the system to the LAN with an Ethernet cable.

	**Caution** **The Ethernet Cable is meant to be connected to a Server and therefore the signal pairs on the cable must be switched in order to connect to a router or a switch.**

Once alignment, sealing of cables and data test have been completed, connect the Ethernet cable to your network device.

Ensure optimum throughput. The Ethernet connection to the modem is intended to operate at 100 Mbps Full Duplex for AirPair 100 and at 50 Mbps Full Duplex for AirPair 50.

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7. Setting up the SNMP

Procedure 7-1
Setting up SNMP

Perform this procedure to set up SNMP for the AirPair.

Required Action	Steps
telnet	Telnets to the AirPair.
set snmp access mode [v1/v2c/off]	Selects a mode. Sequence: **set snmp access mode [v1/v2c/off]** press Enter The system responds: *SNMP Mode: [v1 | v2c | off]*
set snmp set request [on/off]	Sets the SNMP access on. This allows SNMP v1 and v2c 'Set' requests. Sequence: **set snmp set request [on/off]** press Enter The system responds: *SNMP Set Requests are [on/off].*
get snmp set request	Displays SNMP requests on. Shows if SNMP v1 and v2c 'Set' requests are enabled. The default is off. Sequence: **get snmp set requests** press Enter The system responds: *SNMP Set Requests are [on | off].*
get snmp managers	Displays a list of managers that can access the system via SNMP. Sequence: **get snmp managers** press Enter The system responds: *Mgr # IpAddress/ CommunityString*

Required Action	Steps
	1 192.168.1.133 example text1 *2 192.168.1.100 example text2* If there are no managers specified, the system responds: *No managers configured for the system.*
set snmp manager [mgr#] [ip address] [enable/disable] [community string]	Specifies the SNMP managers to allow access to the system. Sequence: **set snmp manager [mgr#] [ip address] [enable/disable] [community string]** press Enter The system responds: *Mgr# IpAddress Status CommunityString* *1 192.7.1.1 disabled public* *2 0.0.0.0 disabled public* *3 0.0.0.0 disabled public* *4 0.0.0.0 disabled public* *5 0.0.0.0 disabled public* *6 any disabled public* **Note 1:** Only maximum of 5 managers are allowed. If all the managers are filled in, remove 1 manager by overwriting the particular index. **Note 2:** By setting the IP address of last index to 'any' and 'enable', anybody can have access to the system via SNMP**.**
set SysContact	Sets System contact to allow access MIB objects via an SNMP browser. For example, you can set the sysContact in MIB-II (RFC 1213) using your MIB browser, e.g., HP OpenView Node Manager.
save mib	Saves the MIB to FLASH. Perform this command save setting changes to FLASH. This command does not restart the system and does not put any new settings into effect. Sequence: **save mib** press Enter The system responds: *Mib saved successfully.*

7.1.1. AirPair Enterprise Management Information Base

A Management Information Base (MIB) contains information about a network device that is managed by SNMP. AirPair supports industry standards MIB I and MIB II. In addition, DragonWave provides an enterprise MIB for AirPair. For a list of objects and their definitions refer to the AirPair MIB definition file on the DragonWave Toolkit CD-ROM.

You must load the AirPair MIB onto your own MIB browser or Network Management Station (NMS). HP OpenView is an example of network management software to be used on the NMS. The AirPair Enterprise MIB is provided in a standard MIB format that allows a more direct method of loading the definitions onto the NMS. On some NMS systems, it is as straight-forward as placing the AirPair MIB into the proper NMS directory and then enabling it by adding it to the MIB list. Please consult the instructions provided with your NMS for details on loading the Enterprise MIBs.

7.1.2. Traps

A trap is a message that reports a problem or a significant event. Traps are defined in AirPair MIB definition file. For a complete list of traps, refer to the MIB definition file on the AirPair Toolkit CD-ROM.

Procedure
7-2 Enable traps

Perform this procedure to enable traps.

Required Action	Steps
telnet	Telnet to the AirPair. Note: You may also connect using a serial cable.
get snmp trap hosts	Displays a list of receivers of SNMP traps. Sequence: **get snmp trap hosts** press Enter The system responds: *Host# IpAddress Status CommunityString* *1 0.0.0.0 disabled public* *2 0.0.0.0 disabled public* *3 0.0.0.0 disabled public* *4 0.0.0.0 disabled public* *5 0.0.0.0 disabled public* *Note: A maximum of 5 hosts is allowed. If all the hosts are filled in, remove 1 host by overwriting the particular index.*
set snmp trap host [host #] [ipAddress] [enable/disable]	Adds an SNMP trap host to the list of receivers of SNMP traps. Specify the IP address where the system sends traps.

<table>
<tr><th>Required Action</th><th>Steps</th></tr>
<tr><td>[communityString]</td><td>Sequence:
set snmp trap host [host #] [ipAddress] [enable/disable] [communityString] press Enter

The system responds:
Host# IpAddress Status CommunityString
1 0.0.0.0 disabled public
2 0.0.0.0 disabled public
3 3.3.3.3 enabled new text string here
4 0.0.0.0 disabled public
5 0.0.0.0 disabled public

Note: A maximum of 5 hosts are allowed. If all the hosts are filled in, remove 1 host by overwriting the particular index.</td></tr>
<tr><td>get snmp traps</td><td>Displays the list of traps that are available in the system.

Sequence:
get snmp traps press Enter

The system responds:
Trap# TrapName Enabled(Yes | No)
1 ColdStart No
2 WarmStart No
3 Link down No
4 Link up No
5 Explicit Authentication Failure No
6 AutoNeg Mismatched Duplex No
7 LossOfSignalLockFromDemod No
8 BerThresholdExceeded No
9 Mod PLL lock failure No
10 Mod loss of sync bytes No
11 Mod input FIFO overrun/underrun No
12 Mod input data inactivity No
13 SNR below threshold No
14 PLDRO lost lock No
15 Radio lost comm No
16 Radio mismatch No
17 IF Tx Synth Unlocked No
18 IF Rx Synth Unlocked No</td></tr>
<tr><td>set snmp trap [trapIndex] [enable/disable]</td><td>Sets the SNMP trap and enables or disables it. DragonWave recommends enabling the LossOfSignalLockFromDemod trap. This trap indicates loss of communication with the peer AirPair node.</td></tr>
</table>

Required Action	Steps
	Sequence: **set snmp trap [trapIndex] [enable/disable]** press Enter The system responds: *Trap# TrapName Enabled(Yes | No)* *1 ColdStart No* *2 WarmStart No* *3 Link down No* *4 Link up No* *5 Explicit Authentication Failure No* *6 AutoNeg Mismatched Duplex No* *7 LossOfSignalLockFromDemod No* *8 BerThresholdExceeded No* *9 Mod PLL lock failure No* *10 Mod loss of sync bytes No* *11 Mod input FIFO overrun/underrun No* *12 Mod input data inactivity No* *13 SNR below threshold No* *14 PLDRO lost lock No* *15 Radio lost comm No* *16 Radio mismatch No* *17 IF Tx Synth Unlocked No* *18 IF Rx Synth Unlocked No*
reset system	Resets the system to save the settings to FLASH and restarts the system with the new settings taking effect. If you do not wish to restart the system, use the command **save** MIB to save the settings to FLASH. Sequence: **Reset system** press Enter The system responds: *System reset.*

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8. Technical Support

DragonWave provides technical support on all products shipped to Customers. Our Technical Support centre provides support 7 days a week and 24 hours per day. The centre is staffed by the DragonWave technical support during normal office hours, (Monday – Friday between 9:00 AM and 5:00 PM Eastern Standard Time). After hours the calls are routed to a cell phone / pager to reach the technical support engineer on call.

The contact details for DragonWave Technical Support are as follows:

Telephone: (613) 271 - 7010

Fax: (613) 599 – 4225

Email : Support@Dragonwaveinc.com

Web Site: http://www.dragonwaveinc.com/contactus/support

Or http://support.dragonwaveinc.com

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9. Notice

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9.1. Copyright

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Appendix A – Frequency Channel Plans

This appendix describes frequency channel plans.

Table A- 1 lists the FCC Channel Plans for 24 GHz.

Note: Either of the two radios may be programmed at the GO frequency. The other radio must then be programmed at the matching RETURN frequency for coupled (paired) operation. Therefore, using the table below, if one radio is set to transmit at 24080 MHz, then other radio must be set to transmit at 24150 MHz. Refer to the section below for decoupled (unpaired) operation.

Table A- 1
Available Standard Frequencies

GO Frequency (MHz)	RETURN Frequency (MHz)
24080	24150
24090	24160
24100	24170
24110	24180
24120	24190
24130	24200
24140	24210
24150	24220

Should many 24 GHz systems be deployed in the same small geographical footprint, then DragonWave's 24 GHz system allows full control of the frequencies. Normally, the frequencies are paired according to the table above, however unpaired frequency operation is allowed.

Note the frequencies must differ by a minimum of 70 MHz. For example, if one radio is set to a frequency of 24080 MHz, then the other radio must be set to a minimum offset of 70 MHZ and therefore must be set to 24150 MHz or higher. There are no other restrictions on frequency selection that is to say that any frequency combinations may be selected as long as the spacing is a minimum of 70 MHz. Therefore, if one radio is set to 24150 MHz then the other radio may be set to a frequency of 70 MHz higher (24220 MHz), or 70 MHz lower (24080 MHz).

Table A- 2
Available Customized Frequencies

Frequency (MHz)	DragonWave Channel
24080	UNL1
24090	UNL2
24100	UNL3
24110	UNL4
24120	UNL5
24130	UNL6
24140	UNL7
24150	UNL8
24160	UNL9
24170	UNL10
24180	UNL11
24190	UNL12
24200	UNL13
24210	UNL14
24220	UNL15

Appendix B – Mounting Instructions for 30 CM, 45 CM, 60 CM, 90cm, 120 cm Antennas

See the appropriate Antenna Mounting Instructions Manual. The Mounting Instruction Manual is shipped in the box with the mounting equipment and antenna.

Visit us on the Internet at:
http://www.dragonwaveinc.com/