> **WARNING** All health and safety procedures and recommendations must be followed as detailed in the Product User Manual. This product is to be installed and maintained by experienced telecommunications personnel only. Installations must adhere to specifications listed in the Product User Manual. DragonWave Eband systems must be installed with proper grounding, and lightning/surge protection as detailed in the Product User Manual.

DESCRIPTION

The Harmony Eband Link is DragonWave's high capacity, packet-microwave solution, operating in the 70/80GHz spectrum. The Eband system delivers industry leading capacity and system gain in an integrated outdoor unit (zero-footprint), eliminating rack congestion and minimizing collocation space. Equipped with DragonWave's Bandwidth Accelerator+ technology, the Harmony Eband achieves the highest degree of spectral efficiency, delivering more capacity per channel with a longer reach than any other 70/80GHz, all-outdoor microwave systems. Harmony Eband delivers industry leading capacities up to 4Gbps in a single radio link configuration (2.5Gbps uncompressed).

MECHANICAL

ODU dimension (no antenna)	19cm x 24.9cm x 8.1cm (7.5in x 9.8in x 3.2in)
ODU weight (no antenna)	3.1kg (6.8lbs)

POWER, CONNECTIONS, PAYLOAD

Operating Temperature	-40°C to + 55°C (-40°F to +135° F)
Humidity	100 % Condensing
Power Input Options:	
Port 1	PonE/ PoE++, -48 VDC Nominal (-40.5 VDC to -57.5 VDC) at injector
Port 4	P+E, -48 VDC Nominal (-40.5 VDC to -57.5 VDC) at injector
Direct DC Port	-48 V Nominal (-30 VDC to -57.5 VDC at radio) at radio
Ethernet Cable Diameter	Min Diameter: 6.1mm (0.240")
Spec *(cable enclosure)*	Max Diameter: 7.11mm (0.280")
Consumption (per link end)	46W Typical
Payload (+ Inband NMS)	Shielded RJ45 or optical LC (SFP)
Interface	2 x Dedicated GigE copper (P1/P4) + 2 x GigE SFP (P2/P3)
Latency GigE	< 40µs, Typical 35µs GigE (one-way latency)
Base Capacity	Variable: 10Mbps to 2.7Gbps full duplex CIR (uncompressed)
MTU Size	64 to 1600 Bytes, up to 9600 (GigE Mode)
Prioritization	SP + WFQ/WRR. 8 queues; 802.1p/q, MPLS, DSCP ToS mapping
Hitless Modulation Shifting	Yes

NETWORK MANAGEMENT (NMS)

Alarm Management	SNMP Traps, Enterprise MIB
NMS Compatibility	NetViewer NMS (v1, v2c); any SNMP based NMS (v1, v2c)
Authentication	2 Level (RADIUS, Internal)
EMS	Web Based Management System (LinkView), CLI, SNMP
Local Management	Web Based MGMT System, SSL/HTTP, SSH/HTTPS, Radius
Standard EOAM	802.1ag, 802.3ah, Y.1731

TYPICAL INSTALLATION EQUIPMENT LIST

1 x 6 AWG grounding cable per ODU
4 x RJ45 connectors per Cat5e cable run
1 x AC/DC power converter and cables for AC installing per ODU
1 x surge arrestor per ODU

INSTALLATION

PRE-INSTALLATION REQUIREMENTS

NOTE: With respect to the antenna mount, make sure that the horizontal and vertical positioning bolts are centered prior to installation to ensure that the full alignment range is available once the antenna has been mounted (equal left/right, up/down adjustment range)

EBAND ODU INSTALLATION TOOLS

Installation Tool List: 11/16" socket or wrench for antenna mount adjustments * Phillips screw driver to remove the PoE+ lid & Eband cable enclosure * Small flathead screwdriver for power injector (PonE) DC terminal block connections.

> **WARNING** Device must be properly grounded / earthed in order to protect against lightning strikes and surges

GROUNDING, POWER AND LIGHTNING PROTECTION

There is one grounding point available on the Harmony Eband chassis. (see diagram under "Ports"). Use 6 AWG wire (minimum) to connect the casing to lightning protection system (LPS) grounding conductors, or structure ground. Use shortest length, avoiding loops and sharp bends.

When utilizing the Power-on-Ethernet (PonE) powering option, the PonE must also be grounded using the same methods described above. Once properly grounded, the PonE device will provide surge protection to all downstream network equipment (Ethernet) as well as the power source equipment.

Note: Radio ground, and tower ground & -48 DC power ground must all be tied togethre to provide a proper grounding environment.

E-Band

The grounding points can be found on the bottom of the ODU chassis (below the black expansion port) and on the side of the PonE/P+E unit
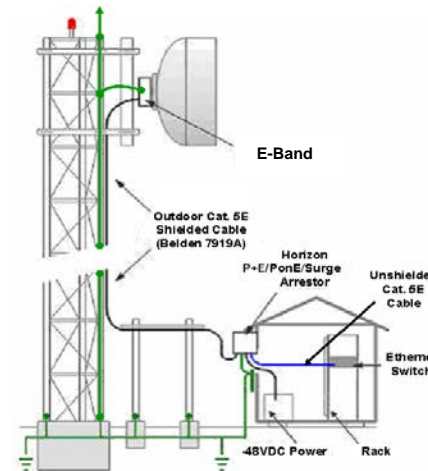
DEVICE INTERFACES

There are four methods to power the Harmony Eband:

- PonE - Note that the ODU PonE implementation is a DragonWave proprietary PSE and does not follow IEEE standards. Used to power an Eband device over Ethernet via port 1
- PoE++ - New IEEE standard PoE powering method – powers Eband via port 1
- P+E – Proprietary power source method. Used to power an Eband device via port 4
- Direct DC – Eband chassis is equipped with an on board DC terminal allowing for direct power connections in applications where PonE/P+E powering methods are not available
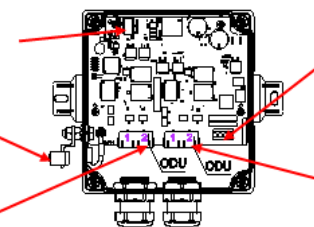
POWER INJECTOR (PONE) INTERFACE & CONNECTIONS

In addition to providing surge protection for downstream network equipment, the PonE device also provides power to the Eband ODU using a proprietary power sourcing method. The PonE is equipped with an on-board LED indicator that allows the user to confirm power to the PonE/PoE++/P+E device and when connected, whether the appropriate power is being provided to the ODU.

On-board LED indicators: Confirm power to PonE and ODU

Ground Terminal: 6AWG stranded copper grounding connection

Network connections ports: 2 x Unshielded CAT5e/CAT6 cable required for PonE to network connections
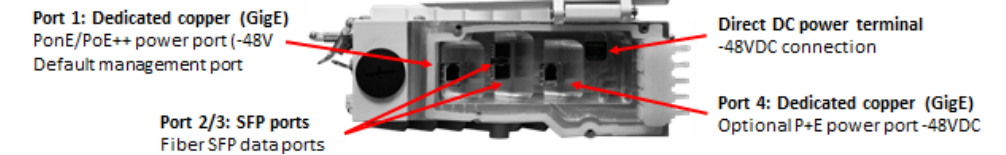
Redundant DC power terminal: Dual -48VDC terminals to provide power to PonE

ODU connection ports: 2 x shielded, outdoor rated, CAT5e/CAT6 cabling required for PonE to ODU connections.

Dual-port Outdoor DC Power Injector

EBAND (ODU) INTERFACE & CONNECTIONS

The Eband ODU is equipped with 2 dedicated 1000BaseT copper Ethernet ports (P1/P4), and two SFP ports (P2/P3). All 4 ports can be configured as data and/or management ports.

Port 1: Dedicated copper (GigE) PonE/PoE++ power port (-48V Default management port

Port 2/3: SFP ports Fiber SFP data ports

Direct DC power terminal -48VDC connection

Port 4: Dedicated copper (GigE) Optional P+E power port -48VDC

POWER OPTIONS – ISOLATED OR COMMON DC RETURN

In installations where an isolated DC return (in a Single Point Connection or Isolated Mesh Bonding Network) the DC jumper must be removed as shown below. For 2 pin terminal please refer to the Installation Manual. Reference ITU Rec K.27.
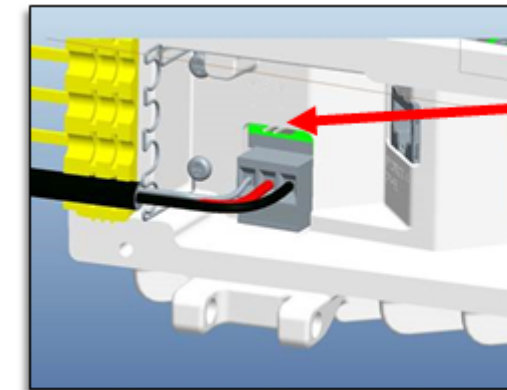
ISOLATED DC RETURN: Jumper removed

**COMMON DC RETURN:** Jumper not removed

ETHERNET CABLING

To ensure proper grounding, shielded, outdoor rated CAT5E/CAT6 Ethernet cable is required for the PonE/P+E to Eband ODU connection. Power can only be applied over Ethernet on port 1 (PonE/PoE++) or Port 4 (P+E). Refer to the product manual for cable length specifications and ordering options.

CONFIGURATION

LOGGING IN

The Eband system comes equipped with the following default management settings. The diagram below lists these addresses and provides an example of the static IP requirements for a connecting laptop

192.168.xxx.xxx	192.168.10.100
255.255.0.0	255.255.0.0
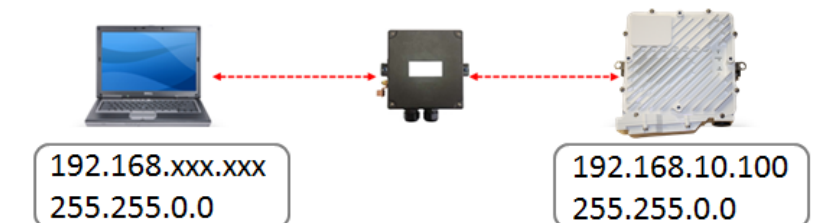
Logging In
Super User: Default username is **admin**   Default password is **sysManager**.
Default IP Address**: 192.168.10.100**   subnet mask 255.255.0.0
By default, Harmony Eband management interface is accessible via Port 1 (in-band) or port4 (out-of-band)

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COMMAND LINE INTERFACE (CLI) OVERVIEW

The majority of commands begin with either **configure** or **show**.

Context sensitive help: enter a partial command followed, or preceded, by "?".

Example **"show radio ?"** returns a list of all commands that start with **show radio**

Partial words (first letter or letters) are accepted by the system, provided enough letters have been entered to make the word unique in the command options.

Example: **"sh sw v"** will be accepted as "show switch vlan". Where 2 letters have been entered, other command options began with that first letter, so a second letter was required to make it unique.

Pressing the Tab key after entering a partial word will complete that word (not required, but useful)

The up and down arrows (↑ and ↓) will recall previously input command lines (up to 20).

An unrecognized CLI entry will be acknowledged with **Invalid command**.

Configuration changes are applied dynamically but the "**save running-config**" command must be issued to ensure that the changes are retained in the event of a power cycle/system reset.

CLI BASIC CONFIGURATION STEPS

1. Configure Radio Parameters
   Eband# configure <enter>
   Eband(config)# radio profile ?
   Eband(config)# radio profile etsi 500 he500_2172_32qam
   Eband(config)# radio frequency 73500000 83500000
   Eband(config)# radio transmit power 5
   Eband(config)# radio transmit state enable
2. Configure IP parameters
   Eband# configure
   Eband(config)# management ip 192.168.10.101 netmask 255.255.0.0 gateway192.168.10.1

WARNING: *The above commands may be used to change the radio configuration of an existing working link. If management of the far end Harmony Eband is only accessible via the radio link, then configure the far end radio first. Otherwise, if you configure the near end radio first, you may lose the link to the far end radio and be unable to configure it. If you change IP settings you may have to reconfigure your management device (e.g.PC) in order to communicate with Harmony Eband.*

Detailed configuration information for advanced configuration settings can be found in the Harmony Eband Product Manual
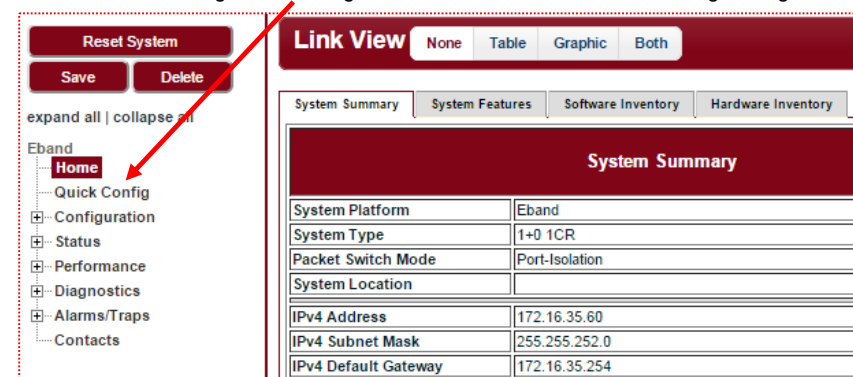
WEB INTERFACE ACCESS

To access the Harmony Eband embedded CLI and webGUI, open a web browser, enter the same default IP address in the URL window and hit "enter". You will be prompted with a login screen. Default UN & PW are:

| USERNAME: admin | PASSWORD: sysManager |

WEBGUI CONFIGURATION STEPS

All standard RF configuration changes can be issued via the "Quick Config" configuration tab

WEBGUI CONFIGURATION STEPS – RADIO PROFILE

WEBGUI CONFIGURATION STEPS – TRANSMITTER SETTINGS

ANTENNA ALIGNMENT PROCEDURE

VISUAL ALIGNMENT & ANTENNA PREP

Loosen the bolts clamping the mounting bracket to the post sufficiently to allow the mounting bracket assembly to be rotated on the post or tower by hand. Visually align with the far end installation. Note - use a compass or landmarks to verify the bearing in situations where the remote end is difficult to identify. Once the link is visually aligned, tighten the mounting assembly to the pole.

ALIGNMENT MONITORING - BNC

The Eband system comes equipped with an external BNC port that can be used (with a digital voltmeter) to monitor the signal quality and strength during alignment. Once the radios have been configured, both radios are transmitting and when the alignment process has been started, the BNC port will provide a voltage output that corresponds directly to the RSL values being reported by the system (1V = 1dBm). The BNC port is always enabled.

ALIGNMENT MONITORING – WEBGUI

Alternatively, the alignment (RSL) can also be monitored from the LinkView page of the WebGUI by selecting the "table" view option.
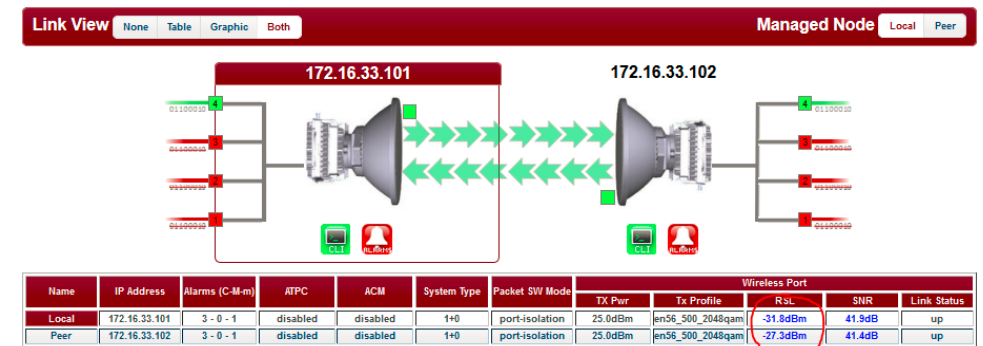
ALIGNMENT
SITE A

Loosen the horizontal adjustment bolt slightly until the antenna can be adjusted by hand. Observing the voltmeter readout (or webGUI interface), adjust the horizontal alignment slowly and gradually over the entire antenna mount range (far left and far right) and ensure that any/all side lobes are identified.

When performing alignment it is important to rotate the fine adjustment nuts *no more than ¼ of a turn at a time* (1/8th recommended). Note: A 360° rotation of the adjustment bolt can skip over the entire main lobe.

Although the BNC and WebGUI track the RF performance in real-time, it is also good practice to allow 1 to 2 seconds settle time between each adjustment.

Tighten the horizontal adjustment bolt and repeat the above process for the vertical alignment.

SITE B – Repeat procedure from Site A

The final received signal strength (RSL) should be within ±3 dB of the link budget figure.

For more detailed information on proper installation techniques, configuration options and troubleshooting methods please refer to the DragonWave Harmony Eband product manual and installation guide.