



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 Harmony Radio Lite™ systems must be installed with proper grounding, and lightning/surge protection as detailed in the Product User Manual.

## DESCRIPTION

The Harmony Radio Lite is DragonWave's sub-6GHz, small-cell backhaul solution. This point to point product utilizes OFDM and MIMO technology, making it ideal for LOS, nLOS and NLOS packet microwave and microcell backhaul applications. The Lite system is an all-outdoor solution that combines high capacity packet microwave, with an integrated antenna in an optimized form factor. The aesthetic design and physical specifications of the Harmony Radio Lite ensure compliance with strict city-zoning regulations and ensure that the unit blends perfectly into the urban landscape

## MECHANICAL

With 19cm integrated antenna	21.8 cm x 22.3 cm x 9.7 cm; 1.8 kg
With external antenna cover	21.8 cm x 22.3 cm x 9.45 cm; 2.03 kg
Wind Loading	160 kph Operational 220 kph Survival
Mount Adjustment	190mm antenna +50°/-65° Elevation, +/- 360° Azimuth 305mm antenna +/- 48° Elevation, +/- 360° Azimuth

## ENVIRONMENTAL

Operating Temperature	-40°C to +55°C (-40°F to +140° F)
Humidity	100 % Condensing
Altitude	4500 m (14,760 ft)
Water Tightness	IP66
Operational Shock	ETSI 300-019-1-4; 5g 11ms
Operational Vibration	ETSI 300-019-1-4 Class 4m5, NEBS GR-63
Earthquake	NEBS GR-63

## NETWORK MANAGEMENT (NMS)

Alarm Management	SNMP Traps, Enterprise MIB
NMS Compatibility	Netviewer NMS; any SNMP based NMS; SNMPv2c
Ethernet OAM Support	802.3ah, 802.1ag, Y.1731
Security	3 Level Authentication
EMS	SNMP
Local Management	Web Based MGMT System, HTTP

## CONNECTIONS

ETH1 – Data/Mgmt/Power	-48V, P+E/PoE+ input (RJ45) 100/1000Base-T Electrical Ethernet
ETH2 – Data/Mgmt	100/1000Base-T Electrical Ethernet (RJ45)

## POWER

Input	-48VDC nominal (-36 to -60V P+E, -42.5 to 57 PoE+)
Consumption (per link end)	17W (max)

## SUPPORTED FREQUENCY BANDS

4.9 – 5.8GHz (5GHz)  
3.4 – 3.8GHz (3GHz)  
2.3 – 2.7GHz (2GHz)

## SUPPORTED MODULATIONS

The Lite system supports BPSK, QPSK, 16QAM and 64QAM modulation schemes with forward error correction (FEC) coding with rates of 1/2, 2/3, 3/4, 5/6. 20MHz & 40MHz channel bandwidth options are available.

## FEATURES

Antenna	Integrated 190mm & 305mm External 305mm to 1800mm
Base Capacity	230Mbps aggregate throughput
Interface	2 x 10/100/1000Base-T Electrical Ethernet (RJ45)
Power Source	-48VDC – P+E or PoE+ (802.3at)
DFS	Yes – Channel availability check supported
DCS	Yes – In service monitoring supported
QoS Prioritization	8 levels served by 8 hardware queues, based on 802.1p/q, DSCP ToS Bits
Modulation Shifting	ACM allows for link optimization based on RF performance
TPC	Automatic Transmit Power Control supported
Synchronization	SyncE & 1588v2 transparent clock support (future release) Co-site synchronization support
Retransmission	Supported

## HARDWARE OPTIONS

DragonWave offers both integrated and external antenna options with the Lite radio. Integrated, flat panel antennas are offered in 190mm and 305mm sizes. Larger external antenna options are available for applications that require additional antenna gain (see chart below). External antennas will require the "external plate" option on the radio.

Integrated	External Plate	Harmony Radio Lite External Antenna Options
		305mm external dual-pol flat antenna for 2,3 & 5GHz Lite
		371mm external dual-pol flat antenna for 2,3 & 5GHz Lite
		60cm, 5.25-5.85 GHz External Dual-Polarized Antenna
		90cm, 5.25-5.85 GHz External Dual-Polarized Antenna
		120cm, 5.25-5.85 GHz External Dual-Polarized Antenna
		180cm, 5.25-5.85 GHz External Dual-Polarized Antenna

## INSTALLATION

### PRE-INSTALLATION REQUIREMENTS

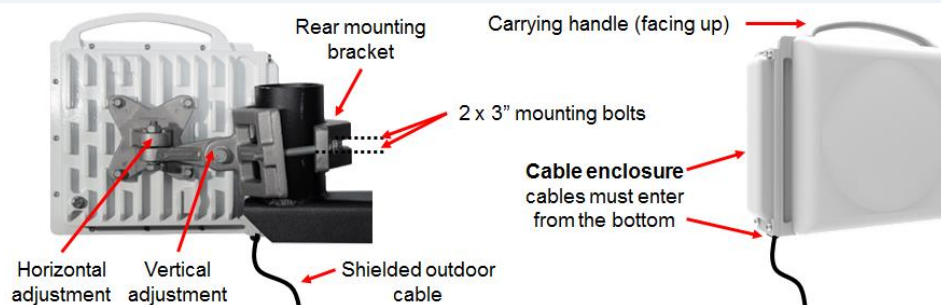
Outdoor mounting kits are provided for both the Lite radio and POE device. Some basic assembly is required. Instructions are included with each hardware kit



**NOTE:** With respect to the ODU/radio mounting kit, make sure that the horizontal and vertical adjustment bolts are tightened prior to the installation to ensure that the radio will be in a stable position while being attached to the mast.

### LITE ODU INSTALLATION

**Installation Tool List:** 1/2" socket or wrench for antenna mount adjustments \* Phillips screw driver to remove the P+E lid & Lite cable enclosure \* Small flathead screwdriver for P+E DC terminal block connections.



When attaching the Lite ODU to the mast, ensure that it is positioned with the radio carrying handle pointed upwards and the cable enclosure entry points are at the bottom.

To attach the radio to the mast, simply thread the 3" screws through the **rear mounting bracket** into the mating bracket that is attached to the radio. Make sure that the radio is oriented in the general direction of the desired path and tighten the screws with a 1/2" socket or wrench.

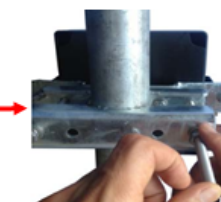
**NOTE:** The standard radio mounting kit can be used on mast sizes up to 3 inches in diameter; however, the radio mount can also accommodate a **hose clamp or metal strapping** for applications where the mast size exceeds 3 inches.



## P+E INSTALLATION



**POE Mounting Bracket**  
The POE device can be attached to the mast using the supplied outdoor mounting kit, which can accommodate mast sizes up to 5" in diameter

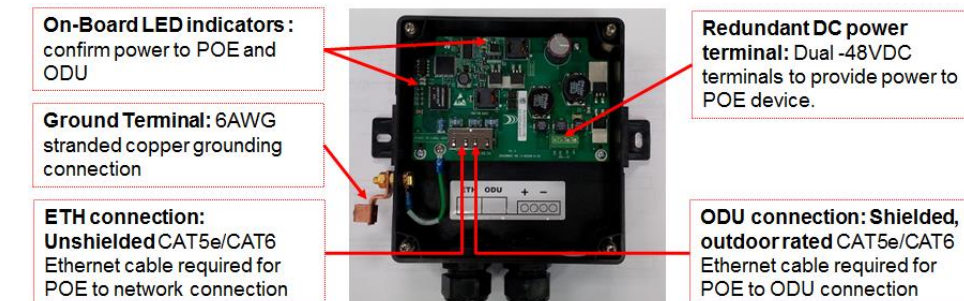


**NOTE:** Ensure that the P+E device is installed with the cable glands pointed down

## DEVICE INTERFACES

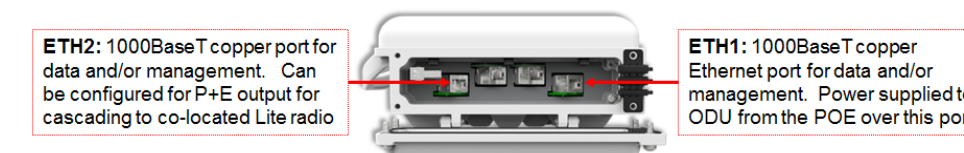
### POWER INJECTOR (P+E) INTERFACE & CONNECTIONS

In addition to providing surge protection for downstream network equipment, the P+E device also provides power to the Lite ODU using a proprietary P+E power sourcing method. The P+E comes equipped with on-board LED indicators to confirm P+E and ODU power connections.



### LITE (ODU) INTERFACE & CONNECTIONS

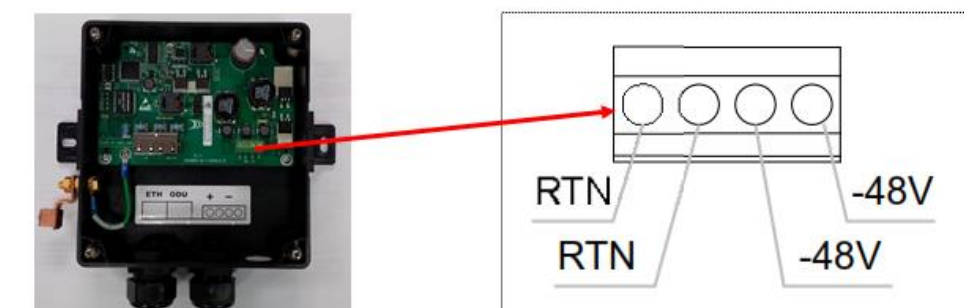
The Lite ODU is equipped with two 1000BaseT copper Ethernet ports which are used to provide the power, data and management connections from the P+E to the radio, however, power can only be applied (over Ethernet) on the ETH1 port.



## POWER, CABLING & GROUNDING

### DC POWER

The P+E is equipped with a terminal block to allow for the -48VDC power connection. Attach the -48VDC feed to one of the "-48V" terminals and the return feed to one of the "RTN" terminals.



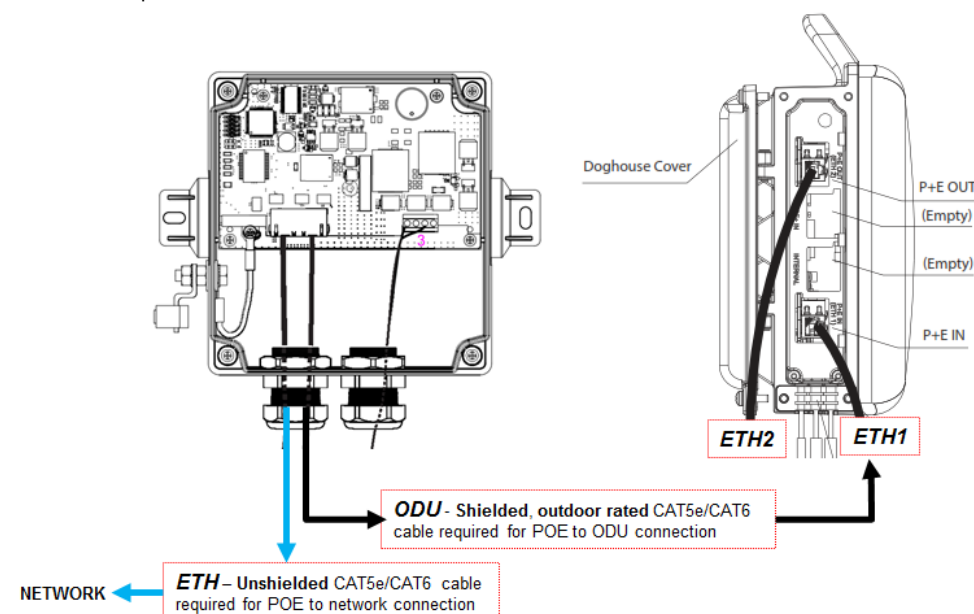




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## ETHERNET CABLING

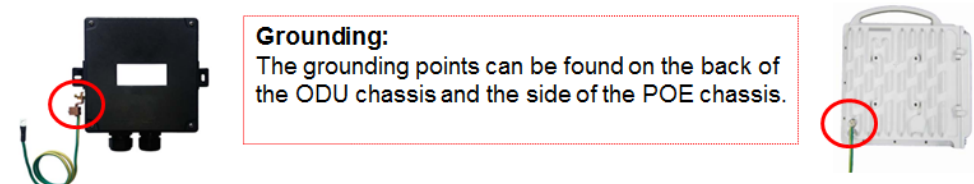
To ensure proper grounding, shielded, outdoor rated CAT5E/CAT6 Ethernet cable is required for the P+E to Lite ODU connection. Although the Lite is equipped with two Ethernet ports, both capable of carrying management and data traffic, all of the power, data and management can be provided to the Lite ODU over a single Ethernet cable. NOTE: Power (over Ethernet) can only be applied to the ODU on the ETH1 port.



NOTE: The P+E device IS NOT an Ethernet repeater. The total cable distance from the network to P+E and P+E to ODU cannot exceed 100m or 320ft.

## GROUNDING

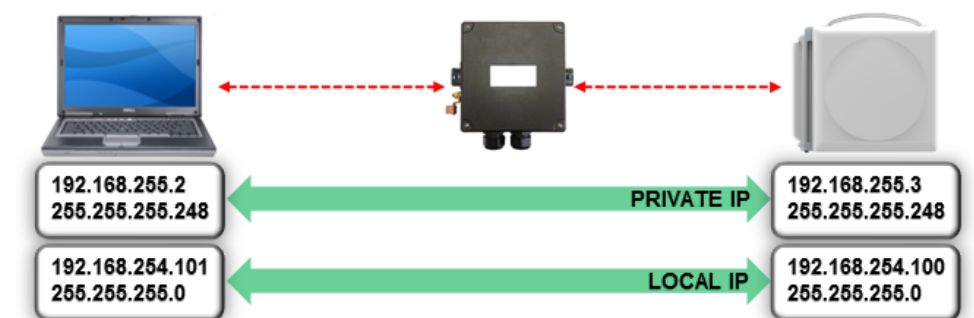
The Lite ODU and P+E both come with a 6 gauge, stranded copper grounding cable. This cable must be installed to ensure that the devices are protected from potential electrical surges.



## CONFIGURATION

### LOGGING IN

The Lite system is pre-configured with two default IP addresses. A configurable, "LOCAL" IP address, and a non-configurable "PRIVATE" or "maintenance" IP address. The diagram below lists these addresses and provides an example of the static IP requirements for a connecting laptop



## WEB INTERFACE ACCESS

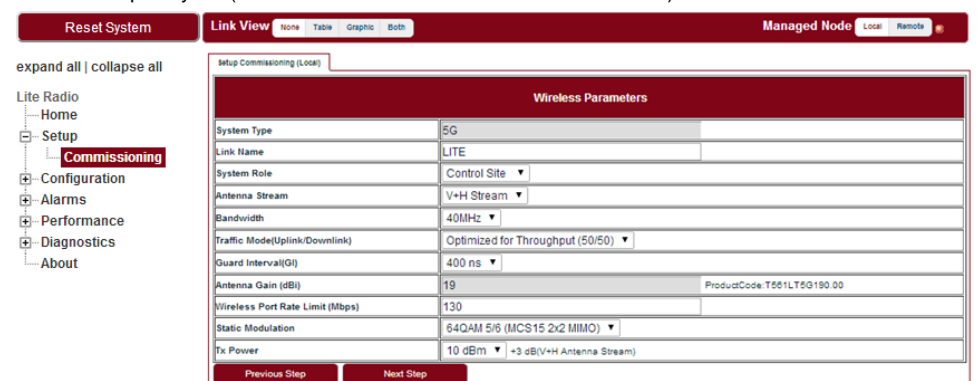
To access the Lite embedded web interface, open a web browser, enter the Lite IP address in the URL window and hit "enter". You will be prompted with a login screen. Default UN & PW are:

USERNAME: energetic PASSWORD: wireless

## CONFIGURATION STEPS

All standard RF configuration changes can be issued using the "commissioning tool" option under the Setup Menu (as shown below). **Important:** Ensure that one side of the link is configured as the "control site" and the partner side is configured as the "passive site". All other configuration settings available under the commissioning tool should be the same on both endpoints.

NOTE: As part of the frequency/channel selection process, the configuration tool includes a built-in spectral scan utility that allows the user to scan across the entire radio band to identify potential interfering signals. Once the scan has been performed, the user can select one or more channels from the frequency list (user can also select which channel to start on)



## ALIGNMENT

### ALIGNMENT MONITORING - BNC

The Lite system is equipped with a BNC port that can be used (with a digital voltmeter) to monitor signal quality and strength during alignment. Once they've been properly configured and both endpoints are operational, the port will provide a voltage output that corresponds directly to the EVM and RSSI values being reported by the system. Note: Requires a voltmeter capable of displaying 3 decimal points.



### ALIGNMENT MONITORING - WEBGUI

Alternatively, the alignment (RSSI & EVM) can also be monitored from the LinkView page of the WebGUI by selecting the "table" view option.

Link View		None	Table	Graphic	Both	Managed Node									
Name	Connecting Status	Role	IP Address	Alarms			TFC	ACM	Wireless Port				Freq		
				Critical	Major	Minor			Tx Pwr	Modulation	RSSI	EVM			
Local	Run	Control Site	172.16.33.95	1	0			5 dBm	64QAM 5/6 (2x2MIMO)	-47 dBm	-27.05 dB (4.42%)	5510MHz [40MHz]			
Remote	Run	Passive Site	172.16.33.96	1	0			5 dBm	64QAM 5/6 (2x2MIMO)	-47 dBm	-27.66 dB (4.14%)	5510MHz [40MHz]			

## ANTENNA ALIGNMENT TECHNIQUES

Assuming that the radios have been properly configured and a spectrum scan has been performed (to identify any interference), a full pan and tilt alignment can now be performed on both ends of the link. Although the alignment procedure may change slightly depending on the link type (LOS, nLOS or NLOS) and the link environment, it is recommended that both radios/antennas are visually oriented in the general direction of the desired path before beginning with the official alignment procedure.

Each link type will require a slightly different alignment technique. In the case of LOS and nLOS locations, the alignment will typically require minimal antenna adjustments to achieve the best signal; however, it is always recommended that a full horizontal (360°) and vertical adjustment are performed to identify potential superior reflective paths. Listed below are the different alignment techniques that should be used for each link type

### LINK TYPES

#### Line of Sight (LOS)

LOS locations feature both visual line of sight and clear radio line of sight (Fresnel zone). Best signals are typically achieved with minimal alignment from visual line of site



#### Near-Line of Sight (nLOS)

nLOS locations feature clear visual line of sight with partial Fresnel zone blockages. Best signals are typically achieved with minimal alignment from visual line of site but may improve by performing slight up-tilt alignment or searching for reflective paths if area is populated with reflective surfaces.



#### Non-Line of Sight (NLOS) - Diffractive

In Diffractive NLOS locations, both visual line of sight and radio line of sight are blocked. Typically, diffractive links have the antennas directed in the same general direction as the line of site path but it will require some up-tilt for the signal to propagate beyond the obstruction



#### Non-Line of Sight (NLOS) - Reflective

In reflective NLOS locations, both visual line of sight and radio line of sight are blocked. In this case, a full (up to 360°) horizontal adjustment may be required to find the best signal depending on the number of reflective surfaces available



Unless there is a large discrepancy in mounting heights from one end of the link to the other, it is recommended that the horizontal (pan) alignment is performed first, followed by the vertical (tilt) alignment. Pan and tilt should be performed on one side at a time

## ALIGNMENT PROCEDURE

**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). Allow the device to settle for 1 - 2 seconds between each adjustment until the best EVM and RSSI values have been achieved. Tighten the horizontal adjustment bolt and repeat the above process for the vertical alignment.

If necessary, a third and final "horizontal" adjustment can be performed to tweak the alignment on the new optimized vertical plane.

**Site B** - Repeat procedure from Site A

## ALIGNMENT ADJUSTMENT SENSITIVITY

When performing fine alignment adjustments it is important to give the device sufficient time to track the RSSI and EVM changes. Although the BNC and WebGUI track the RF performance in real-time, it is good practice to allow 1 to 2 seconds settle time between each adjustment. This is especially true for nLOS and NLOS links where the OFDM engine is processing signals from multiple paths

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