

WARNING All health and safety procedures and recommendations must be followed as detailed in the Horizon Compact + User Manual. This product is to be installed and maintained by experienced telecommunications personnel only. Installations must adhere to specifications listed in the Horizon Compact+ User Manual. Horizon Compact+ is to be installed with proper grounding, Horizon PonE surge arrestor and 48 v power connected through the Horizon PonE according to instructions in the Horizon Compact+ User Manual

MECHANICAL

Radio/Modem (no antenna) 10.2 cm x 24.3 cm x 22.1 cm; 3.4 kg / 4 in x 9.6 in x 8.7 in; 7.5 lbs

POWER, CONNECTIONS, PAYLOAD

Operating Temperature -40°C to +50°C (-40°F to +122° F)
 With Heat Shield -40°C to +60°C (-40°F to +140° F)
 Humidity 100 % Condensing
 Input -40.5 VDC to -56 VDC (-48 VDC nominal), 110/240 VAC (Opt.)
 Consumption (per link end) 43 - 80 Watts depending on RF frequency
 Power -48V, PonE, or Direct DC
 Payload (+ Inband NMS) Shielded RJ45 or optical LC, 1000/100/10 BaseT
 Interface 2x10/100/1000bT, or 4x10/100bT, or 1x10/100/1000bT plus 2x 10/100bT

Latency GigE <200µs, Typical 120µs GigE
 Base Capacity Variable: 10 to 800 Mbps full duplex CIR
 Frame Size 64 to 9600 Bytes
 Flow Control Yes
 Prioritization 8 levels with 8 queues ; 802.1p/q, MPLS, DSCP ToS Bits
 Modulation Shifting Yes, Hitless

NETWORK MANAGEMENT (NMS)

SNMP SNMP Traps, Enterprise MIB, SNMP v1, v2c and v3
 EMS DragonVision, SSL, HTTP,SSH, Radius
 LLDP Supported by DragonVision Element Manager

CHANNEL BW, THROUGHPUT, Tx POWER, Rx SENSITIVITY

The table below shows examples for two 18 GHz Radio Bands.

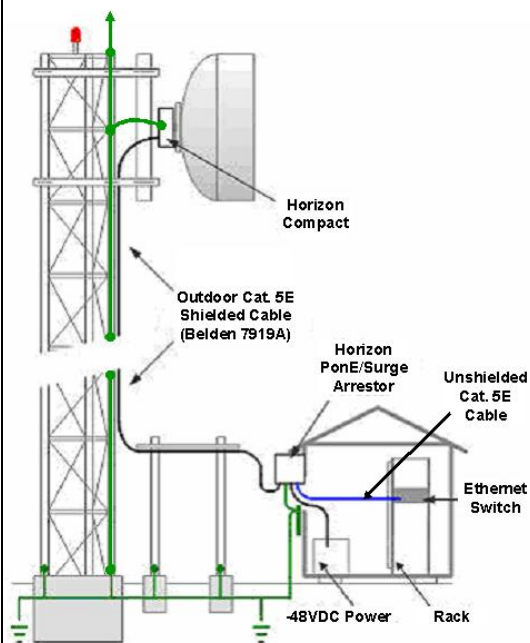
18 GHz FCC/IC Radio Band					
Bandwidth	Modulation	Throughput	Tx Power	Rx Sensitivity	Rx Saturation
50 MHz	QPSK PTCM2	66	23.7	-83.2	-13.1
	64QAM PTCM2	241	20.0	-69.4	-20.0
	256QAM PTCM2	329	19.5	-53.4	-23.0
	256QAM 1	351	19.5	-61.0	-24.3
40 MHz	QPSK PTCM2	52	23.7	-84.2	-13.1
	64QAM PTCM2	192	20.0	-70.4	-20.0
	256QAM PTCM2	262	19.5	-64.4	-23.0
	256QAM 1	279	19.5	-62.0	-24.3
20 MHz	QPSK PTCM2	39	23.7	-85.5	-13.1
	64QAM PTCM2	144	20.0	-71.7	-20.0
	256QAM PTCM2	196	19.5	-65.7	-23.0
	256QAM 1	209	19.5	-63.2	-24.3
10 MHz	QPSK PTCM2	26	23.7	-87.3	-13.1
	64QAM PTCM2	94	20.0	-73.5	-20.0
	256QAM PTCM2	129	19.5	-67.5	-23.0
	256QAM 1	137	19.5	-65.0	-24.3
18 GHz ETSI/ITU Radio Band					
55/56 MHz	QPSK PTCM2	71	23.7	-82.9	-13.1
	64QAM PTCM2	261	20.0	-69.1	-20.0
	256QAM PTCM2	356	19.5	-63.1	-23.0
	256QAM 1	380	19.5	-60.6	-24.3
28/27.5 MHz	QPSK PTCM2	38	23.7	-85.7	-13.1
	64QAM PTCM2	138	20.0	-71.9	-20.0
	256QAM PTCM2	188	19.5	-65.9	-23.0
	256QAM 1	201	19.5	-63.4	-24.3
14/13.75 MHz	QPSK PTCM2	19	23.7	-88.7	-13.1
	64QAM PTCM2	68	20.0	-74.9	-20.0
	256QAM PTCM2	93	19.5	-68.9	-23.0
	256QAM 1	99	19.5	-66.5	-24.3
7 MHz	QPSK PTCM2	9	23.7	-91.7	-13.1
	64QAM PTCM2	34	20.0	-77.9	-20.0
	256QAM PTCM2	47	19.5	-71.9	-23.0
	256QAM 1	50	19.5	-69.5	-24.3

INSTALLATION REQUIREMENTS

Installation kits include the following:

- 2 x PonE power/surge units
- 2 x Grounding Kits with cable and bolts
- AC option – 2 x AC/DC power converter and cables
- AC/DC Option – 1 x AC power adapter
- 2 x weather caps for unused physical port
- 2 x Ethernet cable splitter/combiner

CABLES



Shielded, outdoor rating, Cat5E cables are required on the unprotected side (to Horizon). Recommended cable: Belden 7919A. Shield must be connected to metal shell of RJ45 connectors at both ends of cable!

Unshielded Cat5E cables and/or RJ45 connectors are required on protected side of PonE unit (to Network). Cat5E cables may be supplied by the customer, or ordered from DragonWave.

Power cable: 2-wire 16 AWG

MOUNTING MASTS AND TWIST & SWAY

Minimum 2 3/8" OD thick walled (SKD-80) mast for 30 cm and 60 cm antennas.

Minimum 3" OD thick walled mast for 90 cm and 120 cm.

Minimum 4" OD thick walled mast for 180 cm.

Maximum angular twist is 1/2 of the beamwidth.

GROUNDING, POWER AND LIGHTNING PROTECTION



Device must be effectively grounded / earthed in order to protect against lightning strikes and surges

There is one grounding point available on the Horizon Compact casing (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

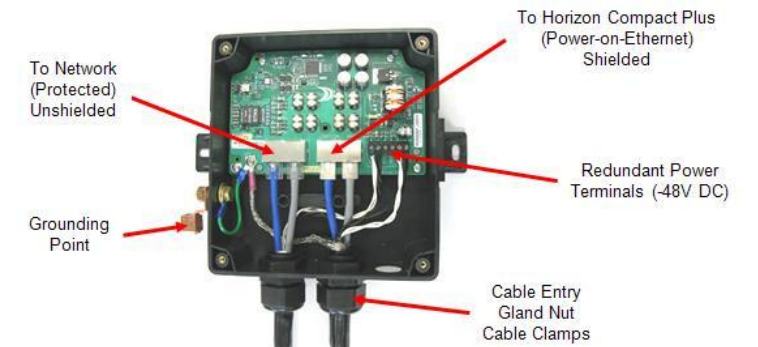
loops and sharp bends.

When configured with a copper interface, power and network connections are fed to the Horizon via a proprietary Power-on-Ethernet (PonE) power injector and surge arrestor



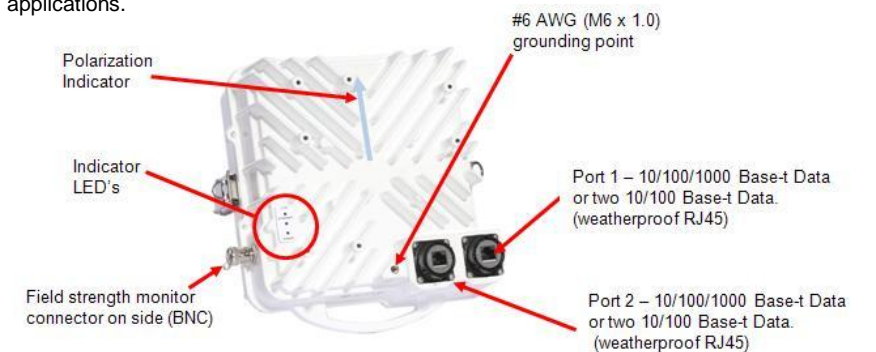
The Power Injector/Surge Arrestor **MUST** be mounted as close as possible to, and above, the building entry point (BEP) and its external grounding lug must be connected to the nearest lightning (LPS) ground with #6 AWG (minimum) grounding wire, avoiding loops and sharp bends.
DO NOT connect the grounding lug to AC power supply wiring ground!
DO NOT mix AC power supply option with site-supplied 48 VDC!
DO NOT connect the network to the RJ-45 connectors marked "TO HORIZON UNPROTECTED". Damage to switches or routers may result

The power injector supports redundant -48 V DC power feeds and **protects the power supply and network from power transients created by lightning or other sources.**



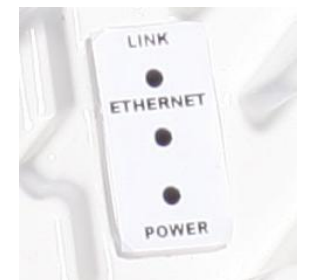
PORTS

Port 1 and **Port 2** may be configured as two 100/10 Base-t (Fast Ethernet) ports, or as single 1000/100/10 Base-t (Gigabit) ports. Any of the 4 possible ports may be configured for in-band or out-of-band management. Power is fed to Port 1 for copper interface or Port 2 for fibre interface. **BNC** Field strength monitoring port is for alignment purposes.. Also used for redundancy switching applications.



LED INDICATORS

LED Status	Description
Power LED	
OFF	No Power Applied
Steady RED	Power applied, Not fully powered up, or internal power rail failure
Steady GREEN	Power applied, all rails OK
Link LED	
OFF	System Boot Up
Steady RED	RF Transmitter and Modem Not Ready
Slow RED Blink	RF Transmitter off, Modem LOS
Steady Green	RF Transmitter ON, Modem OK
Slow Alternate RED/GREEN	RF Transmitter ON, Modem LOS



Ethernet LED	Copper			Fibre			
	P1/P4	P2	P3	P1 Tx	P1	P2	P3
OFF	Down	Down	Down	Off	Down	Down	Down
Steady RED	X	X	X	On	Down	Down	Down
Slow RED Blink	Down	Up	Down	On	Down	Up	Down
Fast RED Blink	Down	Down	Up	On	Down	Down	Up
Steady GREEN	Up	Down	Down	On	Up	Down	Down
Fast GREEN Blink	Up	Up	Down	On	Up	Any one is up	
Slow GREEN Blink	Up	Down	Up	Off	Down	Any one is up	
Slow Alternate RED/GREEN	Down	Up	Up	On	Down	Up	Up
Fast Alternate RED/GREEN	Up	Up	Up	Up	Up	Up	Up



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LOGGING IN

Super User: Default username is **energetic** Default password is **wireless**.
 Default IP Address: **192.168.10.100** subnet mask 255.255.0.0
 By default, management is through Horizon Compact+ Port 1 (in-band).
 Configure your PC with the same IP address range and subnet.

COMMAND LINE INTERFACE (CLI) OVERVIEW

The majority of commands begin with either **set** or **get**.
 Context sensitive help: enter a partial command followed, or preceded, by "?".
 Example 1: **set radio ?** returns a list of all commands that start with **set radio**
 Example 2: **? radio** returns all commands that include the word "radio"
 Pressing the Tab key after entering a partial command will complete that command
 The up and down arrows (↑ and ↓) will recall previously input command lines (up to 20).
 An unrecognized CLI entry will be acknowledged with **NAK**.
 Once configuration changes have been completed, issue **save mib** command. Some changes require **reset system** to invoke changes. Resetting the system is traffic affecting.

WEB INTERFACE

Enter Horizon Compact+ IP address as the URL in Web browser to access Horizon Web interface.

CONFIGURATION STEPS

1. Configure Radio Parameters
set radio config
 Allows you to configure: radio band, system mode, programmed frequency.
2. **Unlicensed only** – select antenna size (automatically sets the maximum allowed power)
 - a. **get antenna diameter** to display available sizes and associated index
 - b. **set antenna diameter <index>**
3. Configure IP parameters
set ip config (for management of Horizon Compact+)
 Allows you to configure: IP address, subnet mask, default gateway

You have the option of having the changes made effective immediately, or after a system reset.

WARNING:

The above commands may be used to change the radio configuration of an existing working link. If management of the far end Horizon Compact+ is only via the radio link, then configure the far end radio first. Otherwise, if you configure the near end radio first, you will 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 the Horizon Compact+.

ADVANCED CONFIGURATION PARAMETERS

There are a number of parameters that can be configured to provide advanced features:

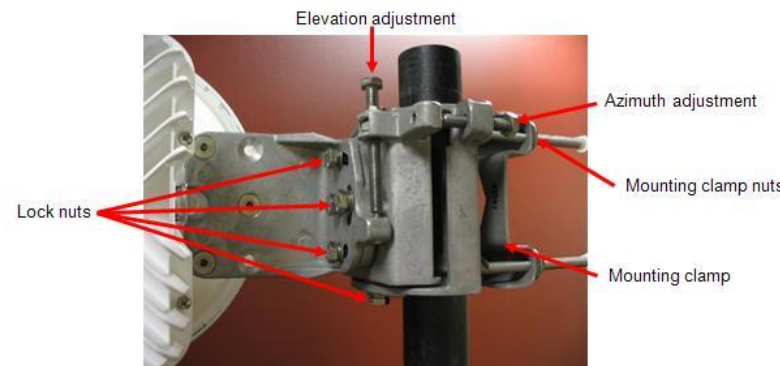
Up/Downgrade Licensed Features*	Adaptive Tx Power Control *	Event and Performance Logs*
Configuring Ethernet Ports 1 and 2 *	Authentication *	Radio and Network Loopback*
RADIUS Server User Authentication *	Threshold Alarms *	Network Management*
Management VLAN Tagging *	Rapid Link Shutdown (RLS) *	Editing System Config Files*
Quality of Service (QoS) *	Configuring (SNTP) *	EOAM **
Pause Frames *	Adaptive Modulation *	LLDP **
Bandwidth Management *	System Management*	ECFM **
System redundancy *	X2 – Bandwidth Doubling *	

Detailed configuration information for each can be found in the Horizon Compact+ Product Manual

* Volume 2 - Advanced Features ** Volume 4 - Networking Features

ANTENNA ALIGNMENT

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. Use a compass or landmarks to verify the bearing where the opposite end is difficult to identify. When visually aligned, re-clamp the mounting assembly to the pole.

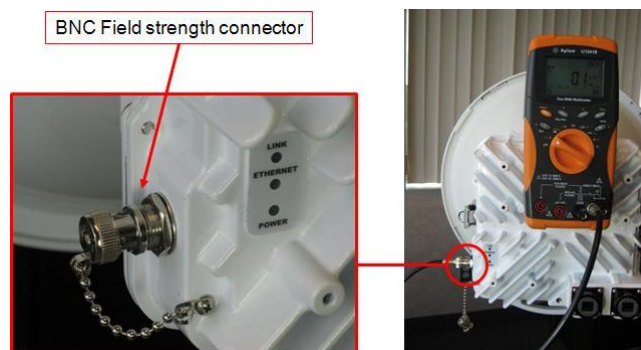


Enable BNC : **set alignment on**
 Enter

Loosen the antenna mount fine azimuth and elevation adjustment lock nuts.

Connect a voltmeter (1 mV = 1 dB) to the field strength monitoring port (BNC) and adjust the fine azimuth and elevation adjustments for a maximum signal.

Identify all side lobes plus the main lobe. Ensure that you are aimed at the main signal lobe.



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

Once alignment is achieved, tighten the lock nuts on the adjustment mechanisms.

Disable BNC : **set alignment off** Enter-

ALIGNMENT ADJUSTMENT SENSITIVITY

When performing fine alignment adjustments it is important to **rotate the adjustment nuts 1/10th of a turn at a time between taking RSL readings.**

The beam width of a Horizon Compact+ system is typically no greater than 2 degrees. **One complete turn of a fine adjustment screw/nut may move the system right through the peak signal position.**

INDICATIONS OF A PROPERLY OPERATING LINK

- | | |
|------------------------------------------|---------------------------------|
| No alarms | – get alarms |
| RSL within ±3 dB of link budget figure | – get modem statistics |
| Eb/No ≥ 19 dB | – get modem statistics |
| Signal to Noise Ratio (SNR) ≥24 dB | – get modem statistics |
| Equalizer Stress typically 30, but < 150 | – get modem statistics |
| Modem Block Error Rate 0.00e+00 | – get traffic statistics |
| All sections operational | – get health |

SYSTEM REDUNDANCY

- Hot stand-by with or without DPRM
- X2 - Bandwidth doubling with or without DPRM.

Please refer to Horizon Compact+ Product Manual for details.

TROUBLESHOOTING

Alarms: Check alarms. No alarms should be present.

- Modem Receiver Loss of Signal = no signal being received from the far end.
- Radio Mismatch = incorrect radio band configured, TxH / TxL reversed, or incorrect radio
- Ethernet Link Down = no connectivity on Ethernet link
- Modem Hardware Fault = replace Horizon unit
- Radio Power Amp = replace Horizon unit if alarm counts are increasing
- Synthesizer Unlock = replace Horizon unit if alarm is consistent

RSL Issues:

- Mismatched RSL between endpoints
 - one endpoint at target RSL, other endpoint low RSL: use RF loopback feature to determine if Transmitter at one end, or Receiver at other end is at fault.
 - Verify both ends are receiving DC power
- Low RSL both endpoints
 - Verify clear LOS exists
 - Verify alignment
 - Verify Transmit power at both ends
 - Link fade?
 - Polarization is the same at both ends?

Poor RF Signal Quality:

- See parameters in "Indications of a Properly Operating Link"

Packet Loss, Poor Throughput, Loss of IP Connectivity:

- check RF signal quality
- check for mismatched modulation between endpoints
- check Ethernet switch traffic statistics at both ends of the link
- verify Ethernet speed and duplex settings
- check COS/QoS settings
- check integrity of Ethernet cables

Merlin Utilities – Contact DragonWave Technical Support

- System diagnostics
- Reset to factory default settings (Super User etc.)
- Serial number retrieval
- Bulk software upgrades