DragonWave

Sales - Quick Reference

Horizon Compact

Applications

- 3G & 4G Cellular Backhaul
- Leased Line Replacement
- IP Evolution
- Last Mile Fiber Extension

Horizon Compact Radio Link

Key Product Features

- Zero-footprint, integrated all out-door option
- Cost leading, native Gigabit Ethernet Platform
- Increased reach with dynamic modulation
- Full flex bandwidth control from 10 – 800 Mbps full duplex remote scaleability
- Interference free, guaranteed SLAs
- Ultra low latency < 0.2 ms, triple play applications

Mechanical

Radio/Modem (no antenna)	12 x 23.6 x 23.6 cm; 5.2 kg	4.75 in x 9.3 in x 9.3in; 11.5 lbs
Antenna Wind Loading	112 kph (70 mph) Operational	200 kph (125 mph) Survival
Antenna Mount Adjustment	+/- 45° Azimuth; +/- 22° Elevation	

Power, Connections, Payload

Operating Temperature (SP) With heat shield	-40°C to + 50°C (-40°F to +122° F) -40°C to + 60°C (-40°F to +140° F)
Humidity	100 % Condensing
Input Power	-36 VDC to -60 VDC (-48 VDC nominal), 110/240 VAC (Opt.)
Consumption (per link end)	25 Watts (40 Watts High Power)
Power Cable	-48V, Power on Ethernet (PonE)
Interface (+ Inband NMS)	RJ45 or optical LC, 1000/100/10 BaseT
NMS (when out-of-band)	RJ45
Latency 100 BT / GigE	**FastE:** <400µs, Typical <200µs **GigE**:<200µs, Typical 120µs
Frame Size	64 to 1600 Bytes, up 9600 (GigE Mode)
Flow Control	Yes (GigE mode only)
QoS	Yes, 8 levels served by 4 queues 802.1p or DSCP WRR Priority Queuing
802.1q	Yes
Modulation Shifting (AAM)	Current to Lowest – 100 ms (Rel. 1.0) User Defined Shifting – 100 ms (Rel. 1.2)
ATPC	Yes (-50dB RSL maintained), increments of 5dB
Remote Software Scaleable	Yes, 10 mbps increments

Network Management (NMS)

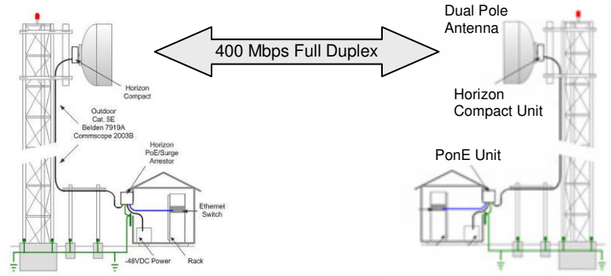
SNMP	SNMP Traps, Enterprise MIB, SNMP v1, v2c and v3
EMS	Web Based Management System, SSL, HTTP,SSH, Radius

Frequencies

Frequencies	Regulatory Body	Channel Spacing
6/7/8 GHz	FCC/IC/ETSI/ITU/NZ	7, 10, 14, 28, 29.65, 30, 40 MHz
11 GHz	FCC/IC/ETSI/ITU/NZ	30, 40 MHz
13 GHz	ETSI/AUS/NZ/ITU	7, 14, 28 MHz
15 GHz	IC/ETSI/AUS/NZ/MX/ITU	7, 14, 28, 40, 56 MHz
18 GHz	FCC/IC/ETSI/AUS/NZ/ITU/BR/FR	7, 13.75, 27.5, 40, 50, 55 MHz
23 GHz	FCC/IC/ETSI/AUS/NZ/ITU/MX	7, 14, 28, 50, 56 MHz
24 GHz UL	FCC/IC/ETSI	40 MHz
24 GHz DEMS	FCC/IC	10, 20, 40 MHz
26 GHz	ETSI	7, 14, 28, 56 MHz
28 GHz	FCC/ETSI	7, 14, 28, 50, 56 MHz
38 GHz	FCC/ETSI/AUS/NZ/MX/ITU/BR/IC	7, 14, 28, 50, 56 MHz

Please refer to Horizon Compact Tuning Ranges document on DW Partner site for the detailed HC Band Plans (channels supported by a given band).

Single Horizon Compact Radio Link



The Horizon Compact is a single, outdoor, compact, weatherproof unit requiring zero indoor footprint.

Ordering Horizon Compact

The following components are required to purchase a Horizon Compact link (2 endpoints):

Radio Link

Qty	Order Code	Description
1	HC-aaa-bb-cc-dd-ee-f-gg	Horizon Compact integrated modem/radio units (1 x TxH & 1 x TxL), order codes will vary with specific product variant required.

HC - Horizon Compact
aaa - Full Duplex Throughput Speed: purchased in increments of 10 Mbps up to system maximum OR 10, 20, 30, 40, 50, 100, 150, 200, 300, 350, 400 Mbps
bb - Refers to the radio power setting: will be either SP (standard power) or HP (high power):
cc - Refers to the frequency setting: 11, 13, 15, 18, 23, 24, 26, 28, 38
dd - Identifies the specific Band of radio required: B1, B2, B3 or B4
ee - Antenna requirement for the link in inches: 00 (no antenna), 12(1ft), 24(2ft), 30(2.5ft), 36(3ft), 48(4ft) or 60(6ft)
f- Interface required on the Horizon Compact: "C" for Copper or "O" for Optical
gg - Hardware release required "R" then the release #

Installation Kit

1	A-INK-HCa-bb-cc-dd	Installation kits include: 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 (plus connectors and cable glands if required)

HC - Horizon Compact
a - Refers to the Cat5e connector requirement: "N" for No Cat5e connectors or glands, "C" for Yes
Note: If DragonWave cables are ordered directly, they are shipped with Cat5e connectors and glands.
bb - Power requirements: "AC", "DC" or "AD" (one link end AC and the other DC)
cc - Power adapter connection requirement: "NA" North America, "EU" Europe, "GL" Global
dd - Hardware release required "R" then the release #

Cable

1	A-CAB-HCa-bbb-cc	Single strand of cable (connects between PonE and Horizon Compact Unit)

HC - Horizon Compact
a - Refers to the cable type: "C" for Copper or "O" for Optical
bbb – Cable length in meters: "30", "60", "100"
cc - Hardware release required "R" then the release #

DragonWave recommends Belden 7919A Cat5E cables if sourced locally. If cables are not ordered via DragonWave please ensure the installation kit selected includes connectors and weatherproof cable glands.

Throughput, Channel BW, Tx Power, Rx Sensitivity

Note: add 3 dB to HP TX power shown in table for 6-8 GHz products products

Modulation	50 MHz Throughput	50 MHz TX Power	50 MHz RX Sensitivity	40 MHz Throughput	40 MHz TX Power	40 MHz RX Sensitivity	30 MHz Throughput	30 MHz TX Power	30 MHz RX Sensitivity
QPSK	67	17/27	-81	57	17/27	-81			
16 QAM	110	14.5/24.5	-77	111	15/25	-76			
32 QAM	171	14/24	-72	142	13/23	-73	107	13/23	-75
64 QAM	215	12.5/22.5	-68	181	10.5/20.5	-69			-72
128 QAM	271	11/21	-62	212	10/20	-67	165	10/20	-68
256 QAM	322	11.5/21.5	-59						
256 QAM	371	9.5/	-59	277	9.5/19.5	-60	212	9.5/19.5	-62
256 QAM	364	/19.5	-59						

Modulation	20 MHz Throughput	20 MHz TX Power	20 MHz RX Sensitivity	10 MHz Throughput	10 MHz TX Power	10 MHz RX Sensitivity	56/55 MHz Throughput	56/55 MHz TX Power	56/55 MHz RX Sensitivity
QPSK				14	27	-87			
16 QAM	28	27	-84	22	24.5	-84	65	17/27	-80
32 QAM	54	23	-80				111	14.5/24.5	-76
64 QAM	71	23	-77	48	21.5	-74	216	11/21	-70
128 QAM	108	20.5	-70				290	10.5/20.5	-62
256 QAM	142	19.5	-64	65	21	-68	385	9.5/19.5	-59

Modulation	28 MHz Throughput	28 MHz TX Power	28 MHz RX Sensitivity	14 MHz Throughput	14 MHz TX Power	14 MHz RX Sensitivity	7 MHz Throughput	7 MHz TX Power	7 MHz RX Sensitivity
QPSK	37	17/27	-85						
QPSK	48	13.5/23.5	-84	23	13.5/23.5	-87	11	17/27	-88
16 QAM	71	13/23	-80	36	13/23	-84	18	11.5/21.5	-86
32 QAM	100	11/21	-75	47	13/23	-80			
64 QAM							33	10.5/20.5	-78
128 QAM	144	10.5/20.5	-68	70	10.5/20.5	-72	39	10/20	-74
256 QAM	190	9.5/19.5	-64	95	9.5/19.5	-68			

Link Configuration

Horizon Compact links will be factory set to modulation mode closest, but higher than purchased. Modulation can then be set to any mode of the customers choice up to the purchased.

Pricing Examples:

Frequency + Channel Size	Purchased FLEX Key	HC Modulation Setting	Throughput*	Emission Des.
11GHz 30MHz	100	11 GHz 107Mbps 30MHz	100 Mbps	26M2D7W
11GHz 40MHz	250	11 GHz 277Mbps 40MHz	250 Mbps	35M6D7W
18GHz 28MHz	150	18 GHz 190Mbps 28 MHz	150 Mbps	28M0D7W
18GHz 50MHz	350	18 GHz 371Mbps 50 MHz	350 Mbps	49M0D7W
23GHz 56MHz	50	23 GHz 65Mbps 56MHz	50 Mbps	56MOD7W
23GHz 56MHz	400	23 GHz 385Mbps 56MHz	385 Mbps	56MOD7W

A software license key would be purchased if additional user throughput is required in the future. No hardware changes are required to upgrade a DragonWave Horizon Compact link.

**Average packet size quoted for throughput. Expect 20% higher throughput for smaller packet sizes.*

Emission Designators

56/55 MHz	65 Mbps	111 Mbps	216 Mbps	290 Mbps	385 Mbps			
ETSI/ITU(55MHz)		56M0D7W	56M0D7W	56M0D7W	56M0D7W			
ETSI/ITU(55MHz)		55M0D7W	55M0D7W	55M0D7W	55M0D7W			
50 MHz	67 Mbps	110 Mbps	171 Mbps	215 Mbps	271 Mbps	322 Mbps	364 Mbps	371 Mbps
FCC/IC	42M6D7W	45M2D7W	45M5D7W	45M8D7W	47M8D7W	45M8D7W	47M1D7W	49M2D7W
40 MHz	57 Mbps	110/111 Mbps	143 Mbps	181 Mbps	200 Mbps	212 Mbps	277 Mbps	
FCC/IC	36M2D7W	36M2D7W	36M2D7W	35M8D7W	36M3D7W	34M4D7W	36M7D7W	
ETSI/ITU	40M0D7W	40M0D7W	40M0D7W	40M0D7W	40M0D7W	40M0D7W	40M0D7W	
30 MHz	107 Mbps	165 Mbps	212 Mbps					
FCC/IC	27M1D7W	27M5D7W	28M0D7W					
ETSI/ITU	30M0D7W	30M0D7W	30M0D7W					
28/27.5 MHz	37 Mbps	48 Mbps	71 Mbps	100 Mbps	144 Mbps	190 Mbps		
ETSI/ITU(28MHz)	28M0D7W	28M0D7W	28M0D7W	28M0D7W	28M0D7W	28M0D7W		
ETSI/ITU(27.5MHz)	27M5D7W	27M5D7W	27M5D7W	27M5D7W	27M5D7W	27M5D7W		
14 MHz	23 Mbps	36 Mbps	47 Mbps	70 Mbps	95 Mbps			
ETSI/ITU(14MHz)	14M0D7W	14M0D7W	14M0D7W	14M0D7W	14M0D7W			
ETSI/ITU(13.75MHz)	13M75D7W	13M75D7W	13M75D7W	13M75D7W	13M75D7W			

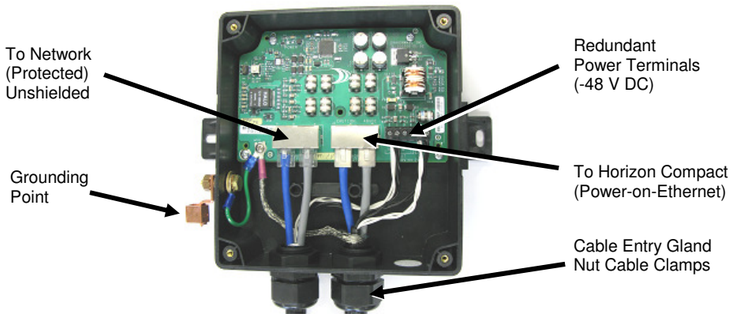
Note: The above is the over the air licensed mode, FLEX configurations may operate with lower data throughput rates.

Power On Ethernet (PonE) Unit

PonE Unit	16 cm x 12.7 cm x 3.8 cm; 0.45Kg	6 ¼in x 5in x 1 ½in; 1.0lbs
Weather Rating	NEMA3R	
Installation Location	Mounted outdoors at building entry point	

The Power On Ethernet (PonE) device is used to inject power on the Ethernet cable that in turn connects to Port 1 on the Horizon Compact Unit. The PonE unit comes with built-in surge protection circuitry that provides protection against cable transients and power surges caused by lightning or other sources. Depending on the strength of the lightning hit the PonE box can handle 100 to 200 lightning strikes.

The power integrator supports redundant -48 V DC power feeds. Additionally for an AC deployment configuration, an AC power option is available and can be ordered from DragonWave.

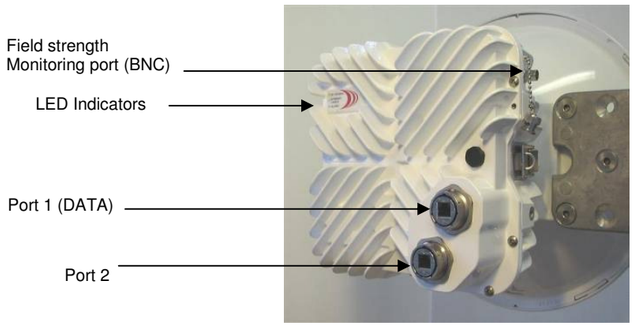


Note: this is a proprietary implementation and other PoE units cannot be used with Horizon. Similarly, the Horizon PonE unit cannot be used with other manufacturer's equipment.

Ports

Port 1 carries traffic and optional in-band management.

Port 2 is for out-of-band management only.
BNC Field strength monitoring port is for alignment purposes and to support 1+1 configurations.



Clear Line of Sight

The DragonWave Horizon Compact requires a clear LoS between the units at each end of the link. Rule of thumb – you must be able to see an unobstructed view of the antennas from each end. If in doubt, please email sales@dragonwaveinc.com to have a link analysis performed.

Bandwidth Doubling and Hardware Redundancy

For either bandwidth doubling or hardware redundancy (1+1), Horizon Compact units can be deployed with separate antenna's (one Horizon Compact radio per antenna) or deployed using a low loss coupler (two Horizon Compact radio's per antenna). For the latter configuration, either the Dual Polarity Radio Mount (DPRM) or the Power Split Radio Mount (PSRM) couplers could be deployed to mount two radio's to a single antenna.

End customer key decision criteria:

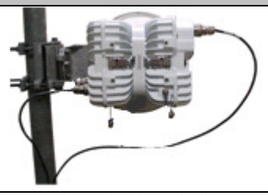
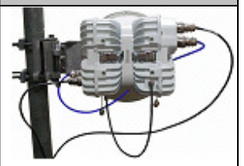
- CAPEX – no difference in equipment costs between two configurations
- OPEX – reduce recurring tower leasing costs by deploying a single antenna config.
- Network Reliability – increase performance by leveraging spatial diversity and antenna redundancy

The **Dual Polarity Radio Mount (DPRM)** allows two Horizon Compact units to mount onto a single antenna, one Horizon Compact is horizontally polarized and the second is vertically polarized.

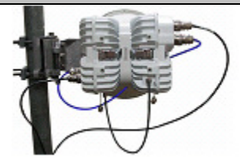
For bandwidth doubling, each Horizon Compact is fed up to 400 Mbps, enabling the wireless link to carry up to 800 Mbps, full duplex, of user traffic. It is recommended that different channels be used for this dual pole configuration.

In a 1+1 HSBY mode, the redundant switching action is performed by:

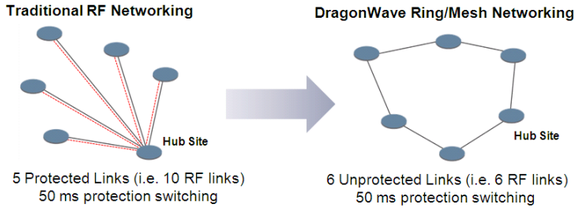
- Release 1.0 - network switch connected to the Horizon Compact. Horizon Compact informs the connected switch of the need to switch to the redundant unit by means of the Rapid Link Shutdown (RLS) feature which occurs within 50 – 100ms.
- Release 1.2 – internal switch within the Horizon Compact unit

Product Release	Release 1.0	Release 1.2
Physical Configuration		
Licensing	2 channels, V & H Polarity	2 channels, V & H Polarity
Coupler Loss	0.5dB per coupler	0.5dB per coupler
Radio Settings	Active, Active	Active, Active
Throughput (mbps)	800	800
1+1 Configuration	Network Switch required	Internal Switching

For user applications where only one channel and polarity are available, the DragonWave Power Split **Radio Mount** (PSRM) would serve as a better configuration option to deliver 1+1 HSBY. In this configuration, one system is configured as the Primary (normally carrying traffic) and the other as the Secondary (in stand-by). Both systems operate in the same polarity (either Horizontal or Vertical), with only one radio active at any given point, therefore only a single license is required.

Product Release	Release 1.1
Physical Configuration	
Licensing	1 channel, 1 Polarity
Coupler Loss	1.9dB Primary, 6bB for Secondary
Radio Settings	Active, Standby
Throughput(mbps)	400
1+1 Configuration	Internal Switching

Architectures – Traditional & Advanced

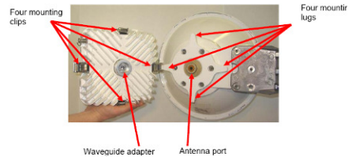


Values of DragonWave Mesh/Ring

- Maintains traditional 50msec protection switching
- Eliminates path fade issues
- Reduced hop lengths -> Higher RF availability and smaller antennas
- Ultra low latency links enable seamless multi-hop restoration

Mounting Horizon Compact to the Antenna

The Horizon Compact unit clip mounts onto all DragonWave antennas (1 to 6ft), providing a variety of gain and range options. The Horizon Compact has four, integral, spring loaded, mounting clips. The antenna port and the waveguide adaptor of the Horizon Compact, push fit together (weather-sealed) requiring no waveguide interface providing a zero loss connection.



Polarity

The radio frequency polarity is indicated by an arrow molded into the Horizon Compact housing. Attach the Horizon Compact to the antenna so that the arrow points either vertically or horizontally, as required, when the assembly is attached to the mounting post or tower. With the arrow horizontal (pointing to the left) – horizontal polarity; with the arrow vertical (pointing upwards) – vertical polarity. The required radio polarity is defined in your licensing documentation.The Horizon Compact

Advance Features

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

- Radius Server User Authentication
- VLAN Tagging
- 802.1P Priority Tagging
- Horizon Throughput Speed
- Adaptive Transmit Power Control (ATPC)
- Modem Authentication
- Threshold Alarms
- Rapid Link Shutdown (RLS)
- Timing Protocol (SNTP)
- Adaptive Modulation
- Radio Redundancy

For more information see the DragonWave Horizon Compact user manuals.

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