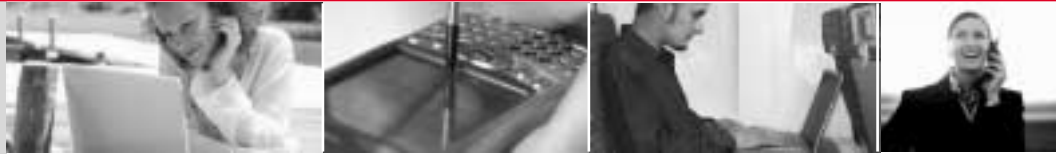




# FibeAir<sup>®</sup> 1500P

## Wireless Ethernet Solutions



- **Gigabit & Fast Ethernet**
- **Native Ethernet System**
- **Upgradeable Capacities**
- **Ultra-low Latency**
- **Built-in Layer 2 Switch**
- **QoS Support**
- **Optimized for IP Applications**

### **High-Capacity Carrier-Class Wireless Ethernet**

FibeAir's comprehensive Ethernet solutions offer Fast and Gigabit Ethernet wireless transmission with fiber-like quality.

With the highest available throughput on the market, this native Ethernet solution with ultra-low latency is optimized for IP based applications including IP-DSLAM connectivity for triple play services, WiMAX backhauling and any delay sensitive application.

With upgradeable capacities starting from 50 to 400 Mbps per radio carrier, FibeAir 1500P's carrier class solution provides a pay as you grow, simple and scalable migration path to meet increasing demand for data-rich services.

Packed with powerful and sophisticated features, FibeAir's Ethernet solutions meet your present and future networking requirements.





# Highest available throughput on the market

## Optimized for IP based applications

### Intelligent Networking Advantages

**Gigabit or Fast Ethernet native solution with user-selectable throughput capacity**  
Full duplex throughput up to 800 Mbps over a single channel

**Pay as you grow, with simple migration path**  
Starting with 50 Mbps throughput and easily upgradeable to higher capacities

**Ultra low Latency (< 0.5 ms)**  
Suitable for delay-sensitive applications, such as VoIP and Video over IP

**Built in Layer 2 switch**  
Provides Fast Ethernet traffic aggregation

**Quality of Service (QoS) support**  
Enables packet queuing and priority

**Maximize your Ethernet throughput capacity**  
Using dynamic allocation between interfaces

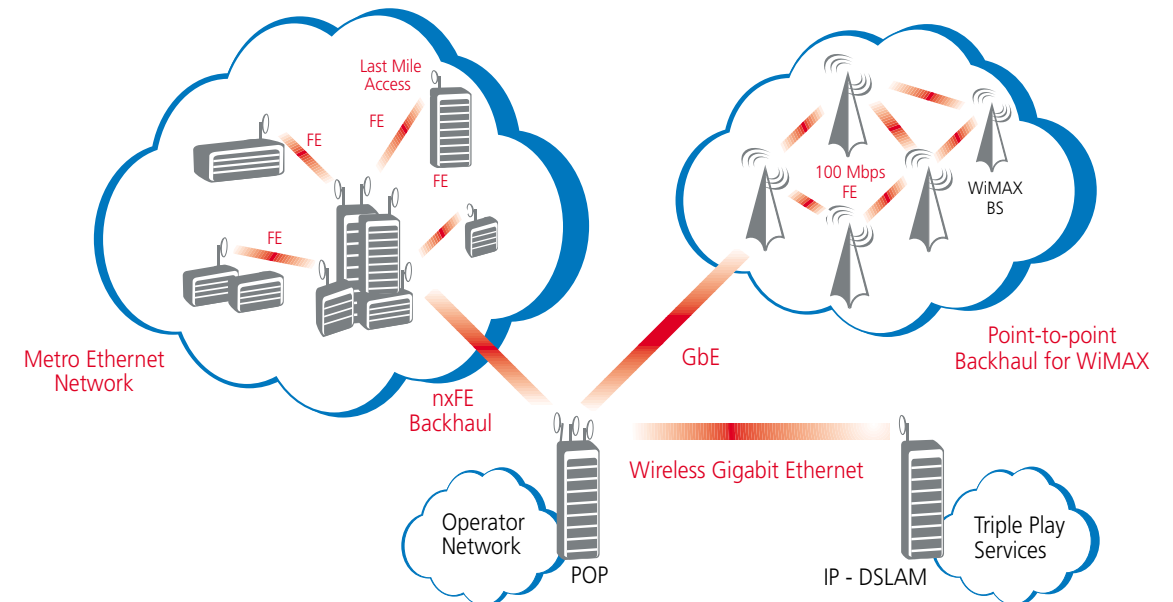
**Multi-service transport**  
GbE or nx10/100BaseT Ethernet data, with nxE1/DS1 voice interfaces over a single radio carrier

**Multiple network topology support**  
Mesh / Ring / Chain / Point-to-point

**Large installed base with years of experience in high-capacity IP radios**  
Field proven seamless integration with all standard IP equipment vendors

**Double the capacity per given bandwidth**  
Using XPIC, for co-channel, dual polarization configuration

**Longer transmission distances and smaller antennas**  
Ultra high output power with our High-Power RF Unit (RFU) for lower frequencies



### Applications

The FibeAir 1500P Ethernet solutions offer cost-effective high-capacity connectivity for private networks and carriers in the fixed and cellular operator markets. The FibeAir platform supports multi-service and converged networking requirements for the latest data-rich applications and services.

#### Campus Connectivity

Easy to install and operate, the FibeAir 1500P Ethernet solutions provide transparent high-capacity connection of enterprise LAN and PBX systems. Users can buy capacity starting from 50 Mbps and can easily expand as needed, using software upgradeable capacity. Hardware optimization significantly reduces communication costs, operating expenses and maintenance requirements. Ceragon's wireless connectivity is ideal for a variety of private networks, such as corporate enterprises, education campuses, governments, municipalities, hospitals, banks and others.

#### Backhaul for DSL Triple Play Networks

With the highest available throughput on the market, FibeAir provides operators with wireless GbE connectivity of IP-DSLAMs for economical introduction of triple play services including VoIP, Internet services and IPTV/HDTV over DSL. IP-DSLAM connectivity via wireless links is essential where there is no fiber reach or as a cost-effective alternative to leased lines.

#### WiMAX Infrastructure Backhauling

Provides a robust and cost-effective alternative to expensive leased lines, for connectivity between WiMAX base stations expanding network reach.

#### High-Speed Internet Wireless Backbone

Wireless Internet Service Providers (WISPs) use backhaul to connect their Point of Presence (POP). By deploying Ceragon's wireless Ethernet solutions, WISPs receive Fast/Gigabit Ethernet connectivity and upgradeability paths for higher capacities, with the same cost-effective system.

#### IP Backhaul for Point-to-Multipoint Networks

Delivers the high-capacity necessary for broadband-rich applications, using the same hardware package. FibeAir networks can be implemented in mesh, ring and star topologies for full redundancy and flexibility.

#### Cellular Network Backhaul and Access

FibeAir provides TDM for cellular backhaul and Ethernet for data access, within the same compact package. The system is suitable for 3G/UMTS and "All-IP" networks, where carrier-grade Ethernet services are required.

## System Overview

Ceragon's broadband Ethernet solutions enable native Ethernet transmission with multiple frequencies, software selectable capacities, modulation schemes and configurations for various network requirements using the same hardware and state-of-the-art technology. The system supports high-capacity data services as well as traditional voice services, with both Ethernet and TDM interfaces.

This innovative platform uses an "on-the-fly" upgrade method, meaning that network operators only buy capacity as needed, benefiting from savings on initial investments and OPEX.

The FibeAir 1500P IDU (Indoor Unit) can host up to two carriers, each delivering up to 400 Mbps, optimizing the solution for different network topologies and configurations.

Traffic capacity throughput and spectral efficiency are optimized with the desired channel bandwidth. For maximum user choice flexibility, channel bandwidths can be selected together with a range of modulations, from QPSK to 256 QAM. Two independent hot-swappable Indoor unit modules (IDM) can be used for hot-standby HW protection, diversity, East-West configuration or double capacity (2+0).

High spectral efficiency is ensured by choosing the same bandwidth for double the capacity, via two carriers with vertical and horizontal polarizations. This feature is implemented by a built-in XPIC mechanism.

*TDM Voice Transmission with Dynamic Allocation*  
With nxE1/DS1 option, only enabled E1/DS1 ports are allocated with capacity. The remaining capacity is dynamically allocated to the FE/GbE ports to ensure maximum Ethernet capacity.

*Fast Recovery Time to Support RSTP* - When combined with a switch/router that supports RSTP (Rapid Spanning Tree Protocol), this feature enables fastest recovery time.

*Highest Priority Level for BPDUs* - to support optimal operation of spanning tree protocols.

*By implementing Ethernet flexibility into FibeAir's transmission platform, operators can better meet the ever-changing demands of today's dynamic and complex networks*

### Fast Ethernet Indoor Modules (FE IDM)

Fast Ethernet IDM are hot-swappable modules that fit into the FibeAir 1500P IDU providing a configurable high-capacity Fast-Ethernet wireless transmission with quality-of-service controls. Each Fast Ethernet IDM contains 2xFE ports or 2xFE with 8xE1/DS1 ports and one radio interface.

Wire-speed FE IDMs are available with a single FE port (100 or 50 Mbps throughput) or 2xFE ports with 200 Mbps full-duplex throughput.

Capacity upgrades using software-licensed keys with specific serial numbers are available from 50 to 100 Mbps throughput and from 100 to 200 Mbps throughput.



*Physical Port Priority* - If both Fast Ethernet ports are used, total Ethernet capacity is dynamically allocated between the two ports, or priority can be given to one port over the other.

*Built-in Quality of Service* - Provides priority support allowing user's different classes of service, according to VLAN priority (802.1p) and DiffServ / IPv4 TOS or IPv6 TC bits values. All use 4 levels of prioritization with user selectable options between strict priority queuing or weighted fair queuing with 8:4:2:1 strict weights.

*Layer 2 Switch* - Enables two separate LAN connections while ensuring security between them.

### Gigabit Ethernet Indoor Modules (GbE IDM)

Gigabit Ethernet IDMs are hot-swappable modules that fit into the FibeAir 1500P IDU providing Gigabit Ethernet wireless transmission.

Each GbE IDM contains a GbE port or GbE with 8xE1/DS1 ports and one radio interface. GbE IDMs are available with traffic throughput of up to 400 Mbps full duplex per single radio carrier.



*Maximum Throughput* - of 800 Mbps over a single 56 MHz channel is available, using co-channel & dual polarization (CCDP) with XPIC and only one IDU (two IDMs with two carriers and two different GbE physical interfaces).

*Super Jumbo Frame Support* - Gigabit IDM supports frame sizes of up to 12,000 bytes. With this feature, FibeAir 1500P is ready to support next generation Ethernet networks. In heavily loaded networks, where continuous data transfer is required, jumbo frames can significantly enhance the efficiency of Ethernet servers and networks. Jumbo frames enable the reduction of the packet processing by the server and thereby increase end-to-end throughput.

### End-to-End Network Management

Ceragon provides state-of-the-art management based on SNMP. Our management applications are written in Java code and enable management functions at both the element and network levels. The applications run on Windows 2000/2003/XP and Sun Solaris.

CeraView® is Ceragon's SNMP-based EMS (Element Management System) that enables the operator to perform element configuration, RF and SDH performance monitoring, remote diagnostics, alarm reports and more. CeraView integrates with different 3<sup>rd</sup> party NMS (Network Management System) platforms to provide end-to-end system management.

PolyView™ is Ceragon's NMS server that includes CeraMap™, its friendly yet powerful client graphical interface. PolyView can be used to update and monitor network topology status, provide statistical and inventory reports, define end-to-end traffic trails, download software and configure elements in the network. In addition, it can integrate with Northbound NMS platforms, to provide enhanced network management.



PolyView and CeraView screens

## Features

- Available capacities: from 50 to 800 Mbps
- Operates in millimeter wave frequencies of 6-38 GHz
- Software configurable modulation schemes: QPSK, 16, 32, 64, 128, 256 QAM
- Single or dual carriers, each up to 400 Mbps, over multiple channels of 10 to 56 MHz
- Supported interfaces: 10/100BaseT Ethernet or GbE data ports and 8xE1/DS1 voice ports, dynamic allocation
- Modular compact IDU (1U) with hot-swappable modules and SFP pluggable port
- Rapid and easy installation
- Configurations: 1+0, 2+0, East & West, 1+1 HW protection, hitless/errorless frequency and space diversity configuration
- Built-in XPIC (Cross Polarization Interference Canceller) mechanism
- Available auxiliary channels, per each carrier
- Compliant with standards and frequency plans for worldwide operation
- Split-mount or all-indoor installations



# Technical Specifications

## General

GbE IDM (Indoor Module) Configurations, Single Carrier					
	Interface	Traffic Throughput	Modulation	Channel Bandwidth (MHz)	Standard
400 Mbps	GbE with up to 8xE1/DS1	400 Mbps (365-445 Mbps)	256 QAM	56 / 80	ETSI / FCC
		300 Mbps (310-375 Mbps)	256 QAM	50	FCC
300 Mbps	GbE with up to 8xE1/DS1	300 Mbps (310-375 Mbps)	128 QAM	56 / 80	ETSI / FCC
		150 Mbps (150-185 Mbps)	128 QAM	28 / 30	ETSI / FCC
150 Mbps	GbE with up to 8xE1/DS1	150 Mbps (150-185 Mbps)	64 QAM	40	ETSI / FCC
		150 Mbps (150-185 Mbps)	16 QAM	56 / 50	ETSI / FCC

Note: Effective traffic throughput depends on packet size.

FE IDM (Indoor Module) Configurations, Single Carrier					
	Interface	Traffic Throughput	Modulation	Channel Bandwidth (MHz)	Standard
150-200 Mbps	2xFE with up to 8xE1/DS1	200 Mbps	256 QAM	30	FCC
		200 Mbps	32 QAM	56 / 50	ETSI / FCC
		150 Mbps	128 QAM	28 / 30	ETSI / FCC
		150 Mbps	16 QAM	56 / 50	ETSI / FCC
100 Mbps	FE with up to 8xE1/DS1	100 Mbps	32 QAM	28 / 30	ETSI / FCC
		100 Mbps	32 QAM	25	FCC
50 Mbps	FE with up to 8xE1/DS1	57 Mbps	32 QAM	14	ETSI
		45 Mbps	64 QAM	10	FCC
		45 Mbps	16 QAM	20	FCC
		41 Mbps	QPSK	28	ETSI

## Payload

GbE IDM (Indoor Module), Single Carrier	
Throughput Capacity	Variable 150-400 Mbps per IDM (up to 800 Mbps per IDU)
Interface Type	Optical 1000Base-LX (1310 nm) or SX (850 nm)
Latency	< 100 µsec, for 400 Mbps traffic throughput
Number of Ports	1 per IDM (Up to 2 per IDU)
Connector Type	SFP
VLAN (802.1p,q) support	Transparent
Super Jumbo Frame Size	Up to 12000 bytes
Compatible Standards	IEEE802.3, IEEE802.3u, IEEE802.3z
FE IDM (Indoor Module), Single Carrier	
Throughput Capacity	Variable 50-200 Mbps per IDM (up to 400 Mbps per IDU)
Interface Type	10/100BaseT Fast Ethernet, Auto-negotiation, Full/Half duplex
Latency	< 370 µsec, Typical <200 µsec, for 200 Mbps traffic throughput
Number of Ports	1 or 2 per IDM (Up to 4 per IDU)
Connector Type	RJ-45
QoS Features	VLAN (802.1p) & DiffServ/IPv4 TOS or IPv6 TC bits
Packet Queuing	Strict priority queuing or weighted fair queuing with 8:4:2:1
Packet Size	up to 1535 bytes, for 1 x FE per IDM up to 1531 bytes, for 2 x FE per IDM
Compatible Standards	IEEE802.3, IEEE802.3u, IEEE802.3ac, IEEE802.1p, IPv6 & IPv4 framing support, Diffserv (RFC 2474)
8xE1/DS1 Port Description (available with GbE IDM and with FE IDM)	
Interface Type	E1/DS1
Number of ports	8 per IDM (up to 16 per IDU)
Connector Type	SCSI 36-pin
Framing	Unframed (full transparency)
Coding	E1: HDB3 DS1: AM/B8ZS
Line Impedance	120 ohm/100 ohm balanced. Optional module for 75 ohm unbalanced
Compatible Standards	ITU-T G.703, G.736, G.775, G.783, G.823 G.824, G.828, ITU-T I.432, ETSI ETS 300 147, ETS 300 417, ANSI T1.105, T1.102-1993, T1.231, Bellcore GR-253-core, TR-NWT-000499

## RF Specifications

Band	6 GHz	7/8 GHz	11 GHz	13 GHz	15 GHz	18 GHz	23 GHz	24-26 GHz	28 GHz	32 GHz	38 GHz
Standards	ETSI; FCC	ETSI	ETSI; FCC	ETSI	ETSI	ETSI; FCC	ETSI; FCC	ETSI; FCC	ETSI; FCC	ETSI; FCC	ETSI; FCC
Operating Frequency Range	5.925-6.425 6.425-7.1	7.1-8.5	10.7-11.7	12.75-13.25	14.5-15.35	17.7-19.7	21.2-23.6	24.25-26.5	27.5-29.5	31.8-33.4	37-38.4, 38.6-40, 37-39.5
Tx/Rx Spacing (MHz)	240, 252.04, 260, 266, 340, 300	119, 154, 161, 168, 182, 196, 245, 311.32	430, 490, 520, 530	266	315, 420, 490, 728	1010, 1120; 1560	1008, 1232; 1200	1008, 800, 1009, 900	1008; 350, 500	812	1000, 1260; 700
Frequency Stability	+0.001%										
Frequency Source	Synthesizer										
RF Channel Selection	Via NMS										
System Configurations	Non-Protected (1+0), Protected (1+1), Hitless/ Errorless Space & Frequency Diversity, Co-Channel Dual Polarization (2+0 XPIC)										
Receiver Overload (BER=10)	Better than -20 dBm										
Unfaded BER	Less than 10 <sup>-13</sup>										
Tx Range (Manual/ATPC)	Manual: -10 dBm to max Tx Power. Automatic: for ODU, up to 30 dB, for HP RFU, up to 20 dB										

### 400 Mbps, 256 QAM, Single Carrier

RF Channel Spacing (MHz) 256 QAM	-	-	-	-	56	55, 80	56	56	56	56	56
Tx Power (dBm) 256 QAM	-	-	-	-	20	18	17	17	17	17	16
Rx Sensitivity (BER=10 <sup>-6</sup> ) (dBm) 256 QAM	-	-	-	-	-60.5	-60.5	-60	-60	-59	-59	-58.5

### 300 Mbps, 128/256 QAM, Single Carrier

RF Channel Spacing (MHz) 128/256 QAM	-	-	-	-	56/-	55, 80/-	56/50	56/-	56/50	56/50	56/50
Tx Power (dBm) 128/256 QAM	-	-	-	-	20/-	18/-	17/17	17/-	17/17	17/17	16/16
Rx Sensitivity (BER=10 <sup>-6</sup> ) (dBm) 128/256 QAM	-	-	-	-	-65/-	-65/-	-65/-61	-65/-	-64/-60	-62/-60	-63/-56

### 200 Mbps, 32/256 QAM, Single Carrier

RF Channel Spacing (MHz) 32/256 QAM	-/30	-/30	-/30, 40	-	56/-	55, 80/-	56, 50/-	56/-	56, 50/-	56, 75/-	56, 50/-
Tx Power (dBm) 32/256 QAM	-/25	-/23	-/19	-	23/-	23/-	20/-	20/-	21/-	20/-	19/-
HP Tx Power (dBm) 32/256 QAM	-/28	-/28	-/26	-	-	-	-	-	-	-	-
Rx Sensitivity (BER=10 <sup>-6</sup> ) (dBm) 32/256 QAM	-/63	-/63	-/63	-	-/72/-	-/72/-	-/71/-	-/71/-	-/70/-	-/70/-	-/70/-
HP Rx Sensitivity (BER=10 <sup>-6</sup> ) (dBm) 32/256 QAM	-/64	-/64	-/64	-	-	-	-	-	-	-	-

### 150 Mbps, 16/64/128 QAM, Single Carrier

RF Channel Spacing (MHz)	16 QAM	-	-	-	56	55, 80	56, 60	56	56, 50	56	56, 60
	64 QAM	40	40	40	40	40	-	40	-	-	-
	128 QAM	28, 29, 29.65, 30	28, 29, 29.65, 30	28, 29, 29.65, 30, 40	28	28	27.5, 40	28, 50	28	28, 50	28
Tx Power (dBm) 16/64/128 QAM	-/26/26	-/25/24	-/23/22	-/22/22	23/22/22	21/20/20	20/-/20	20/20/20	20/-/19	20/-/17	19/-/16
HP Tx Power (dBm) 16/64/128 QAM	-/30/29	-/30/29/-	-/28/27	-	-	-	-	-	-	-	-
Rx Sensitivity (BER=10 <sup>-6</sup> ) (dBm) 16/64/128 QAM	-/70/-68	-/70/-68	-/70/-68	-/70/-68	-/75/-70/-68	-/75/-70/-68	-/75/-70/-68	-/75/-70/-68	-/74/-67	-/74/-67	-/73/-66
HP Rx Sensitivity (BER=10 <sup>-6</sup> ) (dBm) 16/64/128 QAM	-/71/-69	-/71/-69	-/71/-69	-	-	-	-	-	-	-	-

### 100 Mbps, 32 QAM, Single Carrier

RF Channel Spacing (MHz) 32 QAM	28, 29, 29.65, 30, 25	28, 29, 29.65, 30	28, 29, 29.65, 30, 40	27.5, 28	27.5, 28	27.5, 40	28, 50	28	28, 50	28	28, 50
Tx Power (dBm) 32 QAM	26	26	22	23	23	21	20	20	20	20	19
HP Tx Power (dBm) 32 QAM	29	29	27	-	-	-	-	-	-	-	-
Rx Sensitivity (BER=10 <sup>-6</sup> ) (dBm) 32 QAM	-74	-74	-74	-74	-74	-74	-74	-74	-73	-73	-72
HP Rx Sensitivity (BER=10 <sup>-6</sup> ) (dBm) 32 QAM	-75	-75	-75	-	-	-	-	-	-	-	-

### 50 Mbps, QPSK /16/32/64 QAM, Single Carrier

RF Channel Spacing (MHz)	QPSK	28, 29, 29.65, 30	28, 29, 29.65, 30	28, 29, 29.65, 30	27.5, 28	27.5, 28	27.5, 28	28	28	28	28
	16 QAM	-	-	-	-	-	20	20	-	20	20
	32 QAM	14, 14.5, 15	14, 14.5, 15	14, 14.5, 15	13.75, 14	13.75, 14	13.75, 14	13.75, 14	14	14	14
Tx Power (dBm) QPSK /16/32/64 QAM	64 QAM	10	-	10	-	-	-	-	-	-	-
	16 QAM	26/-/26/26	26/-/25/-	22/-/22/21	23/-/23/-	23/-/23/-	23/21/21/-	22/20/20/-	22/-/20/-	21/20/20/-	21/-/20/-
	32 QAM	30/-/29/-30	30/-/29/-	28/-/27/28	-	-	-	-	-	-	-
Rx Sensitivity (BER=10 <sup>-6</sup> ) (dBm) QPSK /16/32/64 QAM	-84/-/77/-76	-84/-/77/-	-84/-/77/-76	-84/-/77/-	-84/-/77/-	-84/-80/-77/-	-84/-79/-76/-	-84/-/76/-	-83/-78/-75/-	-83/-/75/-	-82/-78/-75/-
HP Rx Sensitivity (BER=10 <sup>-6</sup> ) (dBm) QPSK /16/32/64 QAM	-84/-/78/-77	-84/-/78/-	-84/-/78/-77	-	-	-	-	-	-	-	-

All values are typical. For additional Tx/Rx schemes, please contact your Ceragon representative.

Stated transmit power is for split-mount installation, whereas High Power (RFU) all-indoor installations deliver additional 3 dBm Tx power.

# Technical Specifications

Auxiliary Channels	
Wayside Channel, per carrier	2 Mbps or 64 Kbps, Ethernet 10BaseT (wayside channel uses 2 Mbps of Ethernet traffic capacity)
Engineering Order Wire	64 Kbps, G.711
Network Management	
Type	SNMP, in compliance with RFC 1213, RFC 1595 (SONET MIB)
Local or Remote	PolyView, CeraView with advanced GUI for Windows 2000/2003/XP and Sun Solaris, integrated with HP OpenView
NMS Interface	Ethernet 10Base-T, RS-232 (PPP, SLIP), built-in Ethernet
Local Configuration & Monitoring	Standard ASCII terminal, serial RS-232
In-Band Management	Uses standard embedded communications channel, dual port built-in Ethernet hub
TMN	Ceragon NMS functions are in accordance with ITU-T recommendations for TMN
External Alarms	5 inputs: TTL-level or contact closure to ground. 3 outputs: Form C contacts, software configurable
Performance Monitoring	Integral with onboard memory according to ITU-T G.828
Environment	
Operating Temperature	ODU/RFU: -35°C to 55°C (31°F - 131°F), IDU: -5°C to 45°C (23°F to 113°F)
Relative Humidity	ODU/RFU: up to 100% (all weather operation), IDU: up to 95% (non-condensing)
Altitude	Up to 4,500 m (15,000 ft)
Power Input	
Standard Input	-48 VDC
DC Input range	-40.5 to -72 VDC (up to -57 VDC for USA market)
Optional Input	110-220 VAC
Power Consumption	
Maximum ODU Power Consumption	1+0: 40W, 1+1: 63W
Maximum RFU (HP) Power Consumption	1+0: 80W, 1+1: 130W
Maximum IDU Power Consumption	1+0: 25W, 1+1/2+0: 40W
Mechanical	
ODU	27 cm diameter x 14 cm depth (10.8" diameter x 4.5" depth), Weight: 8 kg/18 lbs
RFU (HP)	49 cm height x 14.4 cm width x 28 cm depth (19" x 6" x 11"), Weight: 7 kg/16 lbs
IDU	4.4 cm height x 43.2 cm width x 24 cm depth (1.7" x 17" x 9.4"), Weight: 5 kg/11 lbs
IDU-ODU/RFU Coaxial Cable	RG-223 (100 m/300 ft), Belden 9914/RG-8 (300 m/1000 ft) or equivalent, N-type connectors (male)

All values are typical.

All specifications are subject to change without prior notification.



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