EX-s Series GigE FCC



Split-Mount, Carrier-Class, Upgradeable Licensed-Band Systems for Medium and High Capacity TDM and Ethernet Backhaul Applications

The EX-s Series GigE split-mount microwave radios are carrier-class, point-to-point systems for the entire 6 to 40 GHz licensed spectrum. Featuring native TDM and native Gigabit Ethernet transport with up to 315 Mbps full-duplex capacity per radio carrier, EX-s Series GigE systems are available with software configurable PDH or SDH/SONET interfaces up to 2xOC-3 and up to 4x10/100/1000 BaseT ports available in the same 1RU IDU. The EX-s Series GigE systems are designed to support any mix of TDM and IP/Ethernet traffic, allowing risk-free network migration for both private and operator networks, including 3G to LTE evolution.

The Native Difference. The EX-s GigE systems deliver true carrier-class capability, made possible by running TDM and Ethernet natively. That means rock-solid TDM performance regardless of IP traffic behavior. It also means that when T1/E1 ports are added, TDM throughput is traded bit-for-bit for Ethernet throughput and vice versa, so there's never a question about available user throughput for either transport.

Adaptive Modulation. Exalt's adaptive modulation technology is both errorless and jitterless and allows links to simultaneously support different availability levels for TDM and Ethernet. This optimizes range and performance for the most sensitive TDM traffic while ensuring high performance for inherently resilient Ethernet traffic. Links can be engineered for longer distances and Ethernet transport will respond elastically to changing link conditions without affecting TDM availability.

Capacity Aggregation. The EX-s GigE radios can aggregate capacity across multiple licensed and license-exempt microwave links to deliver a single, high speed connection of up to 1 Gbps full-duplex across a single Gigabit Ethernet interface.

Advanced Data Networking. The EX-s GigE radios offer a rich set of advanced data networking features, including a built-in Gigabit Ethernet layer 2 switch with 802.1q VLAN (single and double tag) up to 4094 VLAN IDs, plus multi-level QoS featuring 8 priority levels and 8 individual queues. Traffic can be prioritized based on 802.1p tags, VLAN ID, MAC source address or MAC destination address as required.

High Security. The EX-s GigE systems allow network managers to support the most stringent security requirements, with optional FIPS-197 compliant AES 128-bit and 256-bit encryption for data traffic protection and support for both encrypted SNMP v3 and SSL/SSH to ensure management security.

Advanced Spectrum Diagnostics. Exalt is the first to offer built-in spectrum analysis in a licensed radio. The spectrum analyzer simplifies site survey analysis and aids in antenna alignment, installation and RSL optimization. Once the link is commissioned, the spectrum analyzer is a useful troubleshooting tool to ensure no interference issues exist and to verify that the link is performing at optimum.

Primary Specifications		6 GHz Lower	6 GHz Upper	11 GHz	18 GHz	23 GHz	28 GHz	38 GHz
Maximum Capacity	TDM	1xDS3, 4xDS3, 1-2xOC3, 16xT1/E1, 8xT1/E1, and 4xT1/E1 in various configurations						
	Ethernet	187 Mbps	187 Mbps	252 Mbps	315 Mbps	315 Mbps	315 Mbps	315 Mbps
Frequency (GHz)		5.925–6.425	6.525–6.875	6.525–6.875	17.700–19.700	21.200–23.610	27.500–28.350	38.600–40.000

Specifications EX-s Series GigE FCC

System	
IDU Models[1]	
1000F	4xGbE (-48 VDC)
8-1000F	8xT1/E1 + 4xGbE (-48 VDC)
DS3/8-1000F	1xDS3 + 8xT1/E1 + 4xGbE (-48 VDC)
DS3/16-1000F	1xDS3 + 16xT1/E1 + 4xGbE (±20 to 60 VDC)
4DS3/4-1000F	4xDS3 + 4xT1/E1 +4xGbE (±20 to 60 VDC)
2OC3/4-1000F	2xOC3 +4xT1/E1 +4xGbE (±20 to 60 VDC)
Power Control Step Size	0.5 dB
Maximum RSL	
QPSK-64QAM	-25 dBm error-free
128QAM	-27 dBm error-free
256QAM	-30 dBm error-free
Error Floor	10^{-12}
Power Control Range	20 dB
ATPC[3]	Yes
Adaptive Modulation	QPSK - 256QAM; Selectable, errorless and jitterless; fully configurable with prioritization
TDM Latency	250µs typical
Ethernet Latency	22–125µs (<100µs typical) at full throughput (GigE) with AES encryption enabled
Data Security	Optional NIST FIPS 197-compliant 128-bit AES and 256-bit AES[2]
Link Security	96-bit security key
Path Protection	Space diversity with errorless switching Frequency diversity
Equipment Configurations	1+0, 1+1, 1+1 SD, 1+1 SD/FD N+0
Capacity Aggregation	Polarization aggregation with XPIC[1] N+0 link aggregation
T1/E1 Cross-connect	Built-in, software controlled T1/E1 port cross-connection between endpoints
T1/E1 Prioritization	User configurable
Spectrum management[3]	Built-in spectrum analyzer
Installation and Management Manual	Embedded in radio, accessible via HTTP GUI
Management	In-band and out-of-band management
Security	SSL/SSH and secure, encrypted SNMP v3
Web GUI	Embedded web server GUI (Internet Explorer, Firefox)
CLI	10/100/1000BaseT or serial craft port
SNMP	v1, v2c, and secure v3
MIB	MIB I, MIB II, Exalt MIB
XML	XML configuration file
Compliance	
RF	FCC Part 101; IC SRSP-305.9
EMI	FCC Part 15; CISPR 22
Environmental	ETS-300-019-2-4 class 4 ETS-300-019-2-1 ETS-300-019-2-2
Safety	IEC 60950-1, EN 60950-1, UL 60950-1

Physical	
IDU Dimensions (H x W x D)	1 RU 1.7 x 17 x 11 in / 44 x 483 x 280 cm
ODU Dimensions (H x W x D)	10.9 x 9.4 x 3.6 in / 27.7 x 23.9 x 9 cm
IDU Weight	9 lbs / 4 kg
ODU Weight	≤9.5 lbs / 4.3 kg
Full Specification Temperature	IDU: -5 to +50 °C / 23 to +122 °F ODU: -33 to +50 °C / -27 to + 122 °F
Operating Temperature	IDU: -10 to +55 °C / 14 to +131 °F ODU: -40 to +55 °C / -40 to +131 °F
Altitude	15,000 ft / 4.6 km
Humidity	IDU: 95% non-condensing ODU: 100% non-condensing

Interfaces				
IDU to ODU	N-type Female, impedance 50 ohm			
TDM (Native)				
Connector	OC3 SFP, Single Mode LC Transceiver	DS3 2x BNC Female; Native	T1 RJ48C/RJ45 Female (x16)	E1 RJ48C/RJ45 Female (x16)
Impedance	-	75 ohms, unbalanced	100 ohms, balanced	120 ohms, balanced
Line Code	Binary Scrambled NRZ; CMI	B3ZS	AMI, B8ZS, selectable per channel	HDB3
Clocking Speed	155.52 MHz	44.736 MHz	1.544 MHz	2.048 MHz
Compliance	ITU-T G.957; G.703; GR-253-CORE	ANSI T1.102-1993; GR-499-CORE	ANSI T1.102-1987; ITU-T; G.823; GR-499-CORE	CEPT-1; G.703; ITU-T-G.703
RxTx	1310nm single mode (2km, 15 km) Rx:-31 to -8 dBm Tx:-15 to -8 dBm	-	-	-
	850nm multi-mode Rx: -30 to -14 dBm Tx: -19 to -14 dBm	-	-	-
Loopback Mode	Remote Internal; Remote External; Local Line			

Ethernet (Native)	RJ45 Female (x2), auto-MDIX	SFP (x2)
Interface Speed	10/100/1000BaseT	1000BaseT/X
Duplex	Half, Full, Auto	Half, Full, Auto
Compliance	802.3	802.3
Maximum Packet Size	9728 bytes	9728 bytes
VLAN	802.1q, transparent, trunk, and management[3] only; over 4,000 VLAN IDs	
QoS	8 priority levels, 8 queues 802.1p, 802.1q (VLAN ID), Source MAC Address, Destination MAC Address	
Ethernet Rate Limiting	Configurable per port via software	
1+1 Protection Port	1x RJ48C/RJ45 Female, proprietary control	
Expansion Port	1x RJ48C/RJ45 Female, proprietary control	
Console (Serial)	9-pin Sub-D (F)	
Speed	9600 bps	
Compliance	EIA-574 (RS-232)	
Alarm	9-pin Sub-D (F) Inputs (2) TTL/Closure Outputs (2) Relay (Form C)	
DC Power	3-pin (±20 to 60 VDC) or 2-pin (-48 VDC) barrier strip	
Input Voltage	-48 VDC or ±20 to 60 VDC (based on model)	
Consumption	<115W (48 V : <2.5 A, 24 V : <5 A)	
AC Power Adapter (optional accessory)	EIC-to-NEMA 5–15	
Input	100–240 VAC, 2.5 A	
Output	48V DC, 3 A, 150 W	
Warranty	Two years[4]	

Specifications EX-s Series GigE FCC

Frequency Bands	6 GHz Lower	6 GHz Upper	11 GHz	18 GHz	23 GHz	28 GHz	38 GHz
Frequency Range (GHz)	5.925–6.425	6.425–6.815	10.700–11700	17.700–19700	21.200–23.610	27.500–28.350	38.595–40.100
TR Spacing (MHz)	252.04	160	490, 500	1560	1200	1008	700
Channel Bandwidth (MHz)	5,10, 20, 30	5, 10, 30	5, 10, 30, 40	5,10, 20, 30, 40, 50	5,10, 20, 30, 40, 50	20, 30, 40, 50, 56[5]	20, 30, 40, 50
Antenna interface	Non-standard	Non-standard	WR-75	WR-42	WR-42	WR-28	0.219" dia
Output Power (dBm)[7]			Std / Power Upgrade[8]				
QPSK	-	-	-	22.5	22.5	22.5	20.5
16QAM	-	-	24.5 / 28	19	19	19	16.5
32QAM	-	-	20.5 / 28	19	19	19	16.5
64QAM	24	24	17.5 / 27	17	16	16	14
128QAM	24	24	17.5 / 26	17	16	16	14
256QAM	22	22	15.5 / 25	15	14	14	11.5
Receiver Threshold (dBm) (guaranteed over temperature BER 10-6)[7]							
QPSK 5 MHz	-	-	-	-	-	-	-
10 MHz	-	-	-	-87	-86	-	-
20 MHz	-	-	-	-84	-83	-83	-81
30 MHz	-	-	-	-82	-81	-81	-79
40 MHz	-	-	-	-81	-80	-80	-80
50 MHz	-	-	-	-80	-79	-79	-79
56 MHz	-	-	-	-	-	-77	-
16QAM 5 MHz	-	-	-	-	-	-	-
10 MHz	-	-	-	-81	-80	-80	-80
20 MHz	-	-	-	-78	-77	-77	-75
30 MHz	-	-	-78	-76	-75	-75	-73
40 MHz	-	-	-77	-75	-74	-74	-74
50 MHz	-	-	-	-74	-73	-73	-73
56 MHz	-	-	-	-	-	-71	-
32QAM 5 MHz	-	-	-82	-	-	-	-
10 MHz	-	-	-79	-78	-77	-77	-77
20 MHz	-	-	-	-75	-74	-74	-72
30 MHz	-	-	-74	-73	-72	-72	-70
40 MHz	-	-	-73	-72	-71	-71	-71
50 MHz	-	-	-	-71	-70	-70	-70
56 MHz	-	-	-	-	-	-68	-
64QAM 5 MHz	-78	-78	-80	-78	-77	-77	-
10 MHz	-75	-75	-77	-75	-74	-74	-74
20 MHz	-	-	-	-72	-71	-71	-69
30 MHz	-70	-70	-72	-70	-69	-69	-67
40 MHz	-	-	-71	-69	-68	-68	-68
50 MHz	-	-	-	-68	-67	-67	-67
56 MHz	-	-	-	-	-	-65	-
128QAM 5 MHz	-75	-75	-76	-75	-74	-74	-
10 MHz	-72	-72	-73	-72	-71	-71	-71
20 MHz	-69	-	-	-69	-68	-68	-66
30 MHz	-67	-67	-68	-67	-66	-66	-64
40 MHz	-	-	-67	-66	-65	-65	-65
50 MHz	-	-	-	-65	-64	-64	-64
56 MHz	-	-	-	-	-	-62	-
256QAM 5 MHz	-71	-71	-	-	-	-	-
10 MHz	-68	-68	-	-68	-67	-67	-67
20 MHz	-	-	-	-65	-64	-64	-64
30 MHz	-62	-62	-65	-63	-62	-62	-62
40 MHz	-	-	-64	-62	-61	-61	-61
50 MHz	-	-	-	-61	-60	-60	-60
56 MHz	-	-	-	-	-	-58	-
Emission Designators							
5 MHz	5M00W7D	5M00W7D	5M00W7D	5M00W7D	5M00W7D	5M00W7D	-
10 MHz	10M0W7D	10M0W7D	10M0W7D	10M0W7D	10M0W7D	10M0W7D	-
20 MHz	-	-	-	20M0W7D	20M0W7D	20M0W7D	20M0W7D
30 MHz	30M0W7D	30M0W7D	30M0W7D	30M0W7D	30M0W7D	30M0W7D	30M0W7D
40 MHz	-	-	40M0W7D	40M0W7D	40M0W7D	40M0W7D	40M0W7D
50 MHz	-	-	-	50M0W7D	50M0W7D	50M0W7D	50M0W7D

Exalt™

Specifications EX-s Series GigE FCC

Throughput (Mbps full-duplex) (Max system layer 1/Max Ethernet layer 2)[6]						
	QPSK	16QAM	32QAM	64QAM	128QAM	256QAM
5 MHz	15 / 11	28 / 21	36 / 27	43 / 32	49 / 37	58 / 43
10 MHz	19 / 15	38 / 30	47 / 38	57 / 46	66 / 53	76 / 61
20 MHz	38 / 30	76 / 61	95 / 76	114 / 92	133 / 107	152 / 123
30 MHz	57 / 46	114 / 92	143 / 115	172 / 139	201 / 162	229 / 185
40 MHz	76 / 61	153 / 124	192 / 155	230 / 186	269 / 217	307 / 249
50 MHz	96 / 77	192 / 155	241 / 195	289 / 234	337 / 273	385 / 312
56 MHz[5]	116 / 86	230 / 171	288 / 214	345 / 257	429 / 318	493 / 366

Dispersive Fade Margin* (dB)						
	256 QAM	128 QAM	64 QAM	32 QAM	16 QAM	QPSK
10 MHz	62	65	68	71	74	80
20 MHz	55	58	62	65	67	73
30 MHz	50	53	57	60	63	69
40 MHz	48	51	54	57	60	66
50 MHz	46	49	52	55	57	64

1. Consult your Exalt sales representative for availability.
2. Software license key option.
3. Software upgrade required. Consult your Exalt sales representative for availability.
4. Terms and conditions apply. Consult your Exalt sales representative for more information.
5. 28 GHz only. Requires 1000E IDU version
6. Maximum layer 1 throughput as measured with 64-byte packets and maximum layer 2 Ethernet measured with 1522-byte packets. In both cases throughput includes source address, destination address and CRC overhead.
7. ±1 dB over temperature
8. Power upgrade is a license key option to improve system gain when required. Requires software release version 2.0.0 or later and E11HR0490XX ODUs.

* Bellcore BER 10^{-3}

© 2011 Exalt Communications, Inc. All rights reserved. Exalt and the Exalt logo are trademarks of Exalt Communications, Inc. Specifications subject to change without notice.

World Headquarters
Exalt Communications Inc.
580 Division Street
Campbell, CA 95008 USA

Phone:+1 (408) 871-1804
Toll free: (888) 91EXALT
sales@exaltcom.com

www.exaltcom.com