



## 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 FCC 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 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 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.

Specifications		6 GHz Lower	6 GHz Upper	11 GHz	18 GHz	23 GHz	38 GHz
<b>Maximum Capacity</b>	<b>TDM</b>	1xDS3, 4xDS3, 1-2xOC3, 16xT1/E1, 8xT1/E1, and 4xT1/E1 in various configurations					
	<b>Ethernet</b>	187 Mbps	126 Mbps	252 Mbps	315 Mbps	315 Mbps	276 Mbps
<b>Frequency (GHz)</b>		5.925-6.425	6.525-6.875	10.700-11.700	17.700-19.700	21.200-23.610	38.600-40.000

## Specifications EX-s Series GigE FCC

System	
<b>IDU Models<sup>1</sup></b>	
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	0.5 dB
Step Size	
<b>Maximum RSL</b>	
64QAM	-25 dBm error-free
128QAM	-27 dBm error-free
256QAM	-30 dBm error-free
Error Floor	10 <sup>-12</sup>
Power Control	20 dB
Range	
ATPC	Yes
Adaptive Modulation	QPSK - 256QAM; Selectable, fully configurable with prioritization
Latency	<100µs at full throughput (GigE)
Data Security	NIST FIPS-197 128-bit AES and 256-bit AES <sup>1</sup> or 96 bit proprietary encryption
Path Protection	Space diversity with errorless switching
Capacity aggregation	N+0 link aggregation
T1/E1 Cross-connect	Built-in, software controlled T1/E1 port cross-connection between endpoints
T1/E1 Prioritization	Software controlled T1/E1 prioritization
Spectrum management	Built-in spectrum analyzer
Installation and Management Manual	Embedded in radio, accessible via HTTP GUI
<b>Management</b>	
In-band and out-of-band management	
Security	SSL/SSH and secure, encrypted SNMP v3
HTTP	Embedded web server GUI (Internet Explorer, Firefox)
CLI/Telnet	10/100/1000BaseT or serial craft port
SNMP	v1, v2c, and secure v3
MIB support	MIB I, MIB II, Exalt MIB
XML	XML configuration file
<b>Compliance</b>	
RF	FCC Part 101; IC SRSP-305.9, SRSP-306.4
EMI	FCC Part 15; IC RSS-210; CISPR 22
Environmental	IDU: based on GR-63-CORE ODU: NEMA4/IP56, EN 301 126-1
Safety	IEC 60950-1, EN 60950-1, UL 60950-1
<b>Physical</b>	
<b>Dimensions (H x W x D)</b>	
IDU	1 RU 1.7 x 17 x 11 in / 44 x 483 x 280 cm
ODU	10.9 x 9.4 x 3.6 in / 27.7 x 23.9 x 9 cm
Weight	IDU: 9 lbs/4 kg ODU: ≤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)	OC3	DS3	T1	E1
Connector	SFP, Single Mode LC Transceiver	2x BNC Female (x1); Native	RJ48C/RJ45 Female (x16)	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	1310 nm (15 km) Rx:-31 to -7 dBm Tx:-15 to -8 dBm	-	-	-
	1310 nm (40 km) Rx:-35 to 0 dBm Tx:-5 to 0 dBm	-	-	-
Loopback Modes	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 <sup>1</sup>	802.1q, transparent, trunk, and management only; over 4,000 VLAN IDs			
QoS <sup>1</sup>	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 kbps resolution			
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	Dual 3-pin barrier strip			
Input Voltage	-48 VDC, ±20 to 60 VDC optional			
Consumption	<115W (48V<2.5A, 24V<5A)			
AC Power Adapter (optional accessory)	EIC-to-NEMA 5-15			
Input	100-240VAC, 2.5A			
Output	48VDC, 3A, 150W			

<sup>1</sup> Consult your Exalt sales representative for availability

<sup>2</sup> Software license key option



## Specifications (Cont.) EX-s Series GigE FCC

Frequency Bands <sup>1</sup>	6 GHz Lower	6 GHz Upper	11 GHz	18 GHz	23 GHz	38 GHz
Frequency Range (GHz)	5.925–6.425	6.425–6.815	10.700–11700	17.700–19700	21.200–23.610	38.595–40.100
TR Spacing (MHz)	252.04	160	490	1560	1200	700
Channel Bandwidth (MHz)	5, 10, 30	5, 10	5, 10, 30, 40	5, 10, 20, 30, 40, 50	5, 10, 20, 30, 40, 50	20, 30
Antenna interface	Non-standard	Non-standard	WR-75	WR-42	WR-42	0.219" dia
<b>System Capacity (Ethernet Mbps) – full duplex</b>						
<b>QPSK</b>	5 MHz	-	-	-	-	-
	10 MHz	-	-	-	14	14
	20 MHz	-	-	-	30	30
	30 MHz	-	-	-	45	45
	40 MHz	-	-	-	62	62
	50 MHz	-	-	-	78	78
<b>16QAM</b>	5 MHz	-	-	-	-	-
	10 MHz	-	-	-	29	29
	20 MHz	-	-	-	61	61
	30 MHz	-	-	92	92	92
	40 MHz	-	-	125	125	125
	50 MHz	-	-	-	157	157
<b>32QAM</b>	5 MHz	-	19	-	-	-
	10 MHz	-	38	38	38	-
	20 MHz	-	-	78	78	78
	30 MHz	-	-	116	116	116
	40 MHz	-	-	158	158	158
	50 MHz	-	-	-	198	198
<b>64QAM</b>	5 MHz	23	23	23	23	-
	10 MHz	46	46	46	46	-
	20 MHz	94	94	-	94	94
	30 MHz	140	-	140	140	140
	40 MHz	-	-	190	190	190
	50 MHz	-	-	-	238	238
<b>128QAM</b>	5 MHz	27	27	27	27	-
	10 MHz	54	54	54	54	-
	20 MHz	109	109	-	109	109
	30 MHz	164	-	164	164	164
	40 MHz	-	-	220	220	220
	50 MHz	-	-	-	276	276
<b>256QAM</b>	5 MHz	31	31	31	-	-
	10 MHz	62	62	62	62	-
	20 MHz	126	126	-	126	126
	30 MHz	187	-	187	187	187
	40 MHz	-	-	252	252	252
	50 MHz	-	-	-	315	315

<sup>1</sup> Consult your Exalt sales representative for availability

**Specifications (Cont.) EX-s Series GigE FCC**

		6 GHz Lower	6 GHz Upper	11 GHz	18 GHz	23 GHz	38 GHz
<b>Receiver Threshold (dBm) (guaranteed over temperature BER 10<sup>-6</sup>)</b>							
<b>QPSK</b>	5 MHz	-	-	-	-	-	-
	10 MHz	-	-	-	-87	-86	-
	20 MHz	-	-	-	-84	-83	-81
	30 MHz	-	-	-	-82	-81	-79
	40 MHz	-	-	-	-81	-80	-
	50 MHz	-	-	-	-80	-79	-
<b>16QAM</b>	5 MHz	-	-	-	-	-	-
	10 MHz	-	-	-	-81	-80	-
	20 MHz	-	-	-	-78	-77	-75
	30 MHz	-	-	-76	-76	-75	-73
	40 MHz	-	-	-75	-75	-74	-
	50 MHz	-	-	-	-74	-73	-
<b>32QAM</b>	5 MHz	-	-	-81	-	-	-
	10 MHz	-	-	-78	-78	-77	-
	20 MHz	-	-	-	-75	-74	-72
	30 MHz	-	-	-73	-73	-72	-70
	40 MHz	-	-	-72	-72	-71	-
	50 MHz	-	-	-	-71	-70	-
<b>64QAM</b>	5 MHz	-78	-78	-78	-78	-77	-
	10 MHz	-75	-75	-75	-75	-74	-
	20 MHz	-72	-72	-	-72	-71	-69
	30 MHz	-70	-	-70	-70	-69	-67
	40 MHz	-	-	-69	-69	-68	-
	50 MHz	-	-	-	-68	-67	-
<b>128QAM</b>	5 MHz	-75	-75	-75	-75	-74	-
	10 MHz	-72	-72	-72	-72	-71	-
	20 MHz	-69	-69	-	-69	-68	-66
	30 MHz	-67	-	-67	-67	-66	-64
	40 MHz	-	-	-66	-66	-65	-
	50 MHz	-	-	-	-65	-64	-
<b>256QAM</b>	5 MHz	-71	-71	-71	-	-	-
	10 MHz	-68	-68	-68	-68	-67	-
	20 MHz	-65	-65	-	-65	-64	-
	30 MHz	-62	-	-63	-63	-62	-
	40 MHz	-	-	-62	-62	-61	-
	50 MHz	-	-	-	-61	-60	-
<b>Output Power (dBm)</b>							
QPSK	-	-	-	22.5	22.5	22	-
16QAM	-	-	20	18.5	18.5	18	-
32QAM	-	-	20.5	19	19	18.5	-
64QAM	22	18.5	18.5	17.5	16.5	15.5	-
128QAM	21.5	18	18	17	16	15	-
256QAM	20	16.5	16.5	15.5	14.5	-	-
<b>Emission Designators</b>							
5 MHz	5M00D7W	5M00D7W	5M00D7W	5M00D7W	5M00D7W	-	-
10 MHz	10M0D7W	10M0D7W	10M0D7W	10M0D7W	10M0D7W	-	-
20 MHz	-	-	-	20M0D7W	20M0D7W	20M0D7W	-
30 MHz	30M0D7W	30M0D7W	30M0D7W	30M0D7W	30M0D7W	30M0D7W	-
40 MHz	-	-	40M0D7W	40M0D7W	40M0D7W	-	-
50 MHz	-	-	-	50M0D7W	50M0D7W	-	-

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