



EX-i Series GigE



All-Indoor, Carrier-Class, Upgradeable Licensed-Band Trunk Radio Systems for Medium and High Capacity TDM and Ethernet Backhaul Applications

The EX-i Series GigE long-haul microwave radios are carrier-class, fully software configurable systems featuring combinations of 3xGbE, 4-16xT1/E1, 1-4xDS3 or 1xOC3 interfaces in a single unit. The system is designed to natively support any combination of TDM and Ethernet traffic, making it ideal for reliable, efficient transport of both legacy voice and IP-based multimedia traffic for any application, including Long Term Evolution (LTE) of mobile networks.

Unique “1.5+0” Semi-protected Configuration. The EX-i Series GigE systems are available with Exalt Transmit and Receive Availability (E~~X~~tra™), enabling semi-protected operation that maximizes reliability without the expense of traditional 1+1. With integrated transmit fail-safe switching and dual receivers for optional space diversity or receiver protection, E~~X~~tra provides for receiver and power amplifier protection in a single system.

The Native Difference. Like all Exalt radio systems, the EX-i Series GigE radios deliver true carrier-class capability with native TDM and native Ethernet. That means rock-solid TDM performance regardless of IP traffic behavior and a future-proof migration path from TDM-based networks to LTE, WiMAX or other all-IP network alternatives.

Adaptive Modulation for Selectable TDM and Ethernet Availability. Exalt’s adaptive modulation technology allows links to simultaneously support different availability levels for TDM (99.999%, for example) and Ethernet (99.9%, for example). 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.

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.

Interference Cancellation. Exalt E~~X~~tra brings single and cross-polarization interference cancellation to licensed microwave for

the first time. A known coordinated or non-coordinated interfering signal source in either polarization can be effectively cancelled using the system’s built-in second receiver to reduce the overall system noise and maximize reliability. Signals from the interfering source are subtracted from the main receive signal to maintain error-free performance.

Advanced Data Networking. The EX-i Series 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 multilevel 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.

Advanced Management. All Exalt radios offer both in-band and out-of-band management to support any network topology. Multiple management interfaces are available, including CLI/Telnet, HTTP, HTTPS (SSL/SSH), XML, RS232 console, and SNMP v1, v2c, and v3. SNMP v3 provides the most secure SNMP access with encryption and authentication.

Capacity Aggregation. The EX-i Series GigE radios can aggregate capacity across multiple licensed and license-exempt microwave links and polarizations to deliver a single, high speed connection of up to 2 Gbps aggregate (or 1 Gbps full-duplex) over a Gigabit Ethernet interface.

Advanced Spectrum Diagnostics. Exalt is the first to offer built-in spectrum analysis in a licensed radio. The spectrum provides site survey analysis and aids in antenna alignment, installation and RSL optimization.

Single Radio Sparring and Operational Simplicity. Featuring field-installable diplexer modules, the same EX-i Series GigE terminal can be used at either end of the link or for any link in the network. Software-controlled channel selection means the same unit can be moved easily from site to site as needed.



Specifications		6 GHz Lower	6 GHz Upper	11 GHz
Maximum Capacity	TDM	4xDS3, 16xT1/E1, 1xOC3	1xDS3, 16xT1/E1, 1xOC3	4xDS3, 16xT1/E1, 1xOC3
	Ethernet (full-duplex)	187 Mbps	187 Mbps	252 Mbps
Frequency (GHz)		5.925–6.425	6.525–6.875	10.700–11.700

Specifications		EX-i Series GigE		Interfaces																						
System	6 GHz	11 GHz																								
Indoor Unit (IDU)	1xDS3 + 16xT1/E1 + 3xGbE	1xDS3 + 16xT1/E1 + 3xGbE	Antenna SMA Female, impedance 50 ohm																							
Models ¹	4xDS3 + 4xT1/E1 + 3xGbE 1xOC3 + 4xT1/E1 + 3xGbE	4xDS3 + 4xT1/E1 + 3xGbE 1xOC3 + 4xT1/E1 + 3xGbE	RF Duplexers Field-installable. Single reversible diplexer for high or low band operation.																							
IDU Model Types	+30 dBm, 6 GHz Lower or Upper Non-protected 1+0 terminal upgradeable to +33 dBm Semi-protected 1.5+0 terminal upgradeable to +33 dBm +27 dBm, 6 GHz Lower or Upper Non-protected 1+0 terminal	+29 dBm Non-protected 1+0 terminal Semi-protected 1.5+0 terminal	<table border="1"> <thead> <tr> <th>6 GHz</th> <th>11 GHz</th> </tr> </thead> <tbody> <tr> <td>6 GHz Lower, 252.04 MHz</td> <td>490 / 500 MHz TR</td> </tr> <tr> <td>Band 1 6177–6284 MHz / 5925–6032 MHz</td> <td>Band 1 10700–10900 / 11200–11400 MHz</td> </tr> <tr> <td>Band 2 6249–6356 MHz / 5997–6104 MHz</td> <td>Band 2 10850–11050 / 11350–11550 MHz</td> </tr> <tr> <td>Band 3 6321–6428 MHz / 6069–6176 MHz</td> <td>Band 3 11000–11200 / 11500–11700 MHz</td> </tr> <tr> <td>6 GHz Upper 160 / 170 / 180 MHz</td> <td></td> </tr> <tr> <td>Band 1 6700–6770 MHz / 6535–6605 MHz</td> <td></td> </tr> <tr> <td>Band 2 6750–6820 MHz / 6590–6660 MHz</td> <td></td> </tr> <tr> <td>Band 3 6805–6875 MHz / 6645–6715 MHz</td> <td></td> </tr> <tr> <td colspan="2">Non-standard T/R spacings available</td> </tr> </tbody> </table>				6 GHz	11 GHz	6 GHz Lower, 252.04 MHz	490 / 500 MHz TR	Band 1 6177–6284 MHz / 5925–6032 MHz	Band 1 10700–10900 / 11200–11400 MHz	Band 2 6249–6356 MHz / 5997–6104 MHz	Band 2 10850–11050 / 11350–11550 MHz	Band 3 6321–6428 MHz / 6069–6176 MHz	Band 3 11000–11200 / 11500–11700 MHz	6 GHz Upper 160 / 170 / 180 MHz		Band 1 6700–6770 MHz / 6535–6605 MHz		Band 2 6750–6820 MHz / 6590–6660 MHz		Band 3 6805–6875 MHz / 6645–6715 MHz		Non-standard T/R spacings available	
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Power Control Step Size	0.5 dB		TDM Native, 1-4xDS3, 16xT1 / E1, 1xOC3 software configurable																							
Maximum RSL			DS3 2 or 8 x BNC Female; Native																							
64 QAM	-30 dBm error-free		Impedance 75 ohms, unbalanced																							
128 QAM	-32 dBm error-free		Line Code B3ZS																							
256 QAM	-32 dBm error-free		Clocking Speed 44.736 Mbps																							
Error Floor	10 ⁻¹²		Compliance ANSI T1.102-1993; GR-499-CORE																							
Power Control Range	20 dB		T1/E1 T1 E1																							
ATPC	Yes		Connector RJ48C / RJ45 Female (x16) : RJ48C/RJ45 Female (x16)																							
Adaptive Modulation ²	QPSK - 256 QAM; Selectable, fully configurable with prioritization		Impedance 100 ohms, balanced																							
Latency	<100µs at full throughput (GigE)		Line Code AMI, B8ZS, selectable per channel : HDB3																							
Data Security	NIST FIPS-197 128-bit AES and 256-bit AES ³ or 96-bit proprietary encryption		Data Rate 1.544 Mbps : 2.048 Mbps																							
Transmit Protection (1.5+0 terminal only, 256 QAM)	6 GHz Transmit fail-safe switching to +26 dBm	11 GHz Transmit fail-safe switching to +20 dBm	Compliance ANSI T1.102-1987; ITU-T; G.823; GR-499-CORE																							
Receive Protection ² (1.5+0 terminal only)	Dual receiver configurations; 1.5+0 terminal XPIC or space diversity via second diplexer Receiver protection via single diplexer and receiver protection kit																									
Equipment Configurations ¹	Non-protected 1+0 Semi-protected 1.5+0 with dual receiver and transmit fail-safe switching Protected 1+1 Protected 1+1 with space diversity (11 GHz only) Protected 1.5+1 with space diversity and transmit fail-safe switching Protected 1.5+1.5 with dual space diversity and dual transmit fail-safe switching		TDM (Native) OC3 DS3 T1 E1																							
Path Protection	Space diversity with errorless switching Space diversity with linear combining (3 dB system gain improvement)		Connector 1xSFP : 2 or 8 x BNC Female : RJ48C / RJ45 Female (x16) : RJ48C / RJ45 Female (x16)																							
Capacity Aggregation ²	Polarization aggregation with XPIC n+0 link aggregation 6 GHz + 5 GHz link aggregation		Impedance - : 75 ohms, unbalanced : 100 ohms, balanced : 120 ohms, balanced																							
Interference Cancellation ²	Spatial or polarization (XPIC) interference cancellation		Line Code Binary : B3ZS : AMI, B8ZS, HDB3 Scrambled NRZ : CMI : selectable per channel																							
T1/E1 Cross-connect ²	Built-in, software controlled T1/E1 port cross-connection between endpoints		Clocking Speed 155.52 MHz : 44.736 MHz : 1.544 MHz : 2.048 MHz																							
T1/E1 Prioritization	Software controlled T1/E1 prioritization		Compliance ITU-T G.957 : ANSI G.703 : ANSI T1.102-1993; T1.102-1993; 1987; ITU-T; ITU-T-G.703 GR-253-CORE : GR-499-CORE : GR-499-CORE																							
Spectrum Management ²	Built-in spectrum analyzer																									
Installation and Management Manual	Embedded in radio, accessible via HTTP GUI		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																							
Management	In-band and out-of-band management		Loopback Modes Remote Internal; Remote External; Local Line																							
Security	SSL/SSH ² and secure, encrypted SNMP v3		Ethernet (native) RJ45 Female (x2), auto-MDIX : SFP (x1)																							
HTTP	Embedded web server GUI (Internet Explorer, Firefox)		Interface Speed 10/100/1000BaseT : 1000BaseT/X																							
CLI/Telnet	10/100/1000BaseT or serial craft port		Duplex Half, Full, Auto : Half, Full, Auto																							
SNMP	v1, v2c, and secure v3		Compliance 802.3 : 802.3																							
MIB support	MIB I, MIB II, Exalt MIB		Maximum Packet Size 9728 bytes : 9728 bytes																							
XML	XML configuration file		VLAN² 802.1q, transparent, trunk, and management only; over 4,000 VLAN IDs																							
Compliance			QoS² 8 priority levels, 8 queues; 802.1p, 802.1q (VLAN ID), Source MAC address, Destination MAC address																							
RF	FCC Part 101; IC SRSP-305.9		Ethernet Rate Limiting Configurable per port via software, 1 Kbps resolution																							
EMI	FCC Part 15; IC RSS-210; CISPR 22		1+1 Protection Port 1x RJ48C/RJ45, proprietary control																							
Environmental	GR-63 CORE		Expansion Port 1x RJ48C/RJ45																							
Safety	IEC 60950-1, EN 60950-1, UL 60950-1		Proprietary control (except EX-6i-DS3-GigE models)																							
Physical			Console (Serial) 9-pin Sub-D (F)																							
IDU Dimensions	2RU		Speed 9600 bps																							
(H x W x D)	3.5 x 17 x 16.5 in / 9 x 43.2 x 42 cm including external diplexer		Compliance EIA-574 (RS-232)																							
IDU Weight	17 lbs / 8 kg		Alarm 9-pin Sub-D (F); Inputs (2) TTL/Closure; Outputs (2) Relay (Form C)																							
Full Specification	0 to +50 °C / 32 to +122 °F		DC Power Dual 3-pin barrier strip for power source redundancy																							
Temperature			Input Voltage ±20–60 VDC																							
Operating Temperature	-25 to +50 °C / -13 to +122 °F		Consumption 6 GHz : 11 GHz																							
Altitude	15,000 ft / 4.6 km		<160 W (48V, <4A, 24V, <8A) : <150 W (48V, <3.1A, 24V, <6.5A)																							
Humidity	95% non-condensing		30/33 dBm operation : +29 dBm operation <100 W (48V, <2A, 24V, <4A) : +26 dBm operation																							



¹ Consult your Exalt sales representative for availability of specific models and configurations.

² Software upgrade required.

³ Software license key option.

Specifications EX-i Series GigE

	6L	6U	11 GHz
Frequency Bands			
Frequency Range (GHz)	5.925–6.425	6.525–6.875	10.700–11.700
TR Spacing (MHz)	252.04 ¹	160, 170, 180 ¹	490 / 500
Channel Bandwidth (MHz)	5, 10, 30	5, 10 ²	10, 30, 40
Maximum System Capacity (Ethernet Mbps) - full duplex³			
64 QAM / TCM-2³ / TCM-4³			
5 MHz	23 / - / -	23 / - / -	-
10 MHz	46 / - / -	46 / - / -	46 / - / -
20 MHz	92 / - / -	92 / - / -	-
30 MHz	140 / 130 / 118	140 / 120 / 118	140 / 130 / 118
40 MHz	-	-	186 / 173 / 157
128 QAM / TCM-2³ / TCM-4³			
5 MHz	27 / - / -	27 / - / -	-
10 MHz	54 / - / -	54 / - / -	54 / - / -
20 MHz	108 / - / -	108 / - / -	-
30 MHz	164 / 153 / 141	164 / 153 / 141	164 / 153 / 141
40 MHz	-	-	218 / 204 / 188
256 QAM / TCM-2³ / TCM-4³			
5 MHz	31 / - / -	31 / - / -	-
10 MHz	62 / - / -	62 / - / -	62 / - / -
20 MHz	114 / - / -	114 / - / -	-
30 MHz	187 / 176 / 165	187 / 176 / 165	187 / 176 / 165
40 MHz	-	-	252 / 234 / 220
Maximum System Capacity (TDM: OC3, xDS3 + xT1 or xE1)			
64 QAM			
5 MHz	0xDS3 + 15xT1 or 11xE1	0xDS3 + 15xT1 or 11xE1	-
10 MHz	1xDS3 + 1xT1 or 1xE1	1xDS3 + 1xT1 or 1xE1	1xDS3 + 1xT1 or 1xE1
20 MHz	2xDS3 or 1xDS3 + 16xT1/E1	2xDS3 or 1xDS3 + 16xT1/E1	-
30 MHz	3xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1	3xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1	3xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1
40 MHz	-	-	1xOC3 + 4xT1/E1, 4xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1
128 QAM			
5 MHz	0xDS3 + 16xT1 or 13xE1	0xDS3 + 16xT1 or 13xE1	-
10 MHz	1xDS3 + 6xT1 or 4xE1	1xDS3 + 6xT1 or 4xE1	1xDS3 + 6xT1 or 4xE1
20 MHz	2xDS3 + 11xT1 or 8xE1, 1xDS3 + 16xT1/E1	2xDS3 + 11xT1 or 8xE1, 1xDS3 + 16xT1/E1	-
30 MHz	1xOC3 + 4xT1/E1, 4xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1	1xOC3 + 4xT1/E1, 4xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1	1xOC3 + 4xT1/E1, 4xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1
40 MHz	-	-	1xOC3 + 4xT1/E1, 4xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1
256 QAM			
5 MHz	0xDS3 + 16xT1 or 15xE1	0xDS3 + 16xT1 or 15xE1	-
10 MHz	1xDS3 + 11xT1 or 8xE1	1xDS3 + 11xT1 or 8xE1	1xDS3 + 11xT1 or 8xE1
20 MHz	2xDS3 + 15xT1 or 11xE1, 1xDS3 + 16xT1/E1	2xDS3 + 15xT1 or 11xE1, 1xDS3 + 16xT1/E1	-
30 MHz	1xOC3 + 4xT1/E1, 4xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1	1xOC3 + 4xT1/E1, 4xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1	1xOC3 + 4xT1/E1, 4xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1
40 MHz	-	-	1xOC3 + 4xT1/E1, 4xDS3 + 4xT1/E1, 1xDS3 + 16xT1/E1
Receiver Threshold with 3 dB linear combining 1.5+0 configuration (dBm)⁴ (guaranteed over temperature BER 10⁻⁶)			
64 QAM / TCM-2³ / TCM-4³			
5 MHz	-82 / - / -	-82 / - / -	-
10 MHz	-79 / - / -	-79 / - / -	-79 / - / -
20 MHz	-76 / - / -	-76 / - / -	-
30 MHz	-74 / -77 / -79	-74 / -77 / -79	-74 / -77 / -79
40 MHz	-	-	-73 / -76 / -78
128 QAM / TCM-2³ / TCM-4³			
5 MHz	-79 / - / -	-79 / - / -	-
10 MHz	-76 / - / -	-76 / - / -	-76 / - / -
20 MHz	-73 / - / -	-73 / - / -	-
30 MHz	-71 / -74 / -76	-71 / -74 / -76	-71 / -74 / -76
40 MHz	-	-	-70 / -73 / -75
256 QAM / TCM-2³ / TCM-4³			
5 MHz	-76 / - / -	-76 / - / -	-76 / - / -
10 MHz	-73 / - / -	-73 / - / -	-73 / - / -
20 MHz	-70 / - / -	-70 / - / -	-
30 MHz	-68 / -71 / -73	-68 / -71 / -73	-68 / -71 / -73
40 MHz	-	-	-67 / -70 / -72
Output Power (dBm)			
1.5+0 Semi-protected			
64 QAM	30 / 33 ⁵	30 / 33 ⁵	29
128 QAM	30 / 33 ⁵	30 / 33 ⁵	27
256 QAM	30 / 31.5 ⁵	30 / 31.5 ⁵	25
1+0 Non-protected			
64 QAM	27, 30 / 33 ⁵	27, 30 / 33 ⁵	29
128 QAM	27, 30 / 33 ⁵	27, 30 / 33 ⁵	27
256 QAM	27, 30 / 31.5 ⁵	27, 30 / 31.5 ⁵	25
Emission Designators			
5 MHz	5M00W7D	5M00W7D	-
10 MHz	10M0W7D	10M0W7D	10M0W7D
20 MHz	20M0W7D	20M0W7D	20M0W7D
30 MHz	30M0W7D	-	30M0W7D
40 MHz	-	-	40M0W7D

¹ Non-standard TR spacings also available. Consult Exalt for availability.

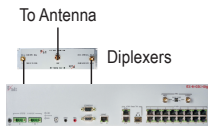
² All 6 GHz lower and upper band IDUs support 5, 10, 20 and 30 MHz channels with software release v1.2.1. 20 and 30 MHz channels in the upper 6 GHz band represent bonded 2x10 MHz and 3x10 MHz channels respectively and should only be used if licensed by the FCC. Consult Exalt for availability of OC3 IDU models in the 6 GHz upper band.

³ Software upgrade required.

⁴ Adjust by 3 dB for 1+0 configurations.

⁵ 33 dBm is a software license key option.

EX-i Series GigE Terminal Configurations



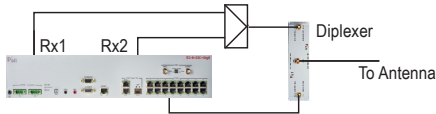
Non-protected 1+0 or semi-protected 1.5+0

Quick and simple installation
 Unique sparing with field installable diplexers
 2RU design



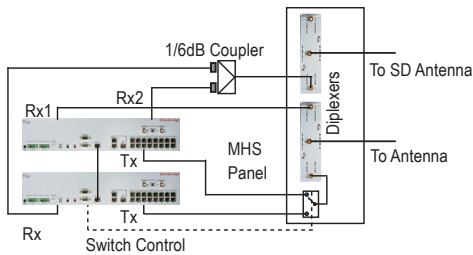
Semi-protected 1.5+0 with space diversity

Built-in transmit protection
 Built-in dual receiver for SD
 Unique sparing with field installable diplexers
 2RU design



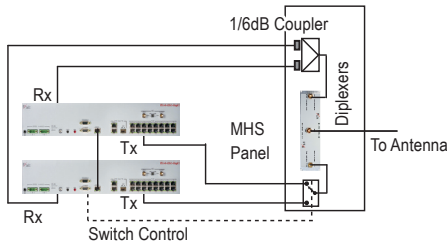
Semi-protected 1.5+0 with receiver protection

Built-in transmit protection
 Built-in dual receiver
 Single diplexer configuration
 Unique sparing with field installable diplexers
 2RU design



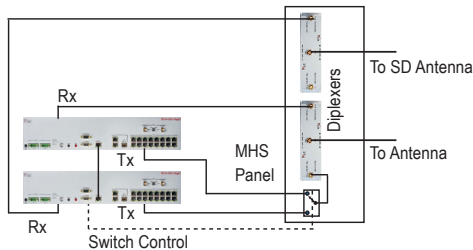
Protected 1.5+1 SD

Built-in transmit protection on primary terminal
 Built-in dual receiver on primary terminal for SD
 Low loss design 1RU protection panel
 1-4xDS3, 16xT1/E1 and GigE protection
 5RU design



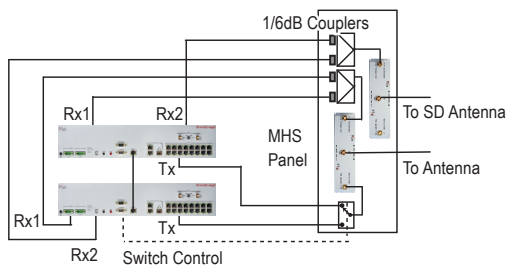
Protected 1+1

Low loss design 1RU protection panel
 Full equipment protection
 Single diplexer configuration
 Unique sparing with field installable diplexers
 5RU design



Protected 1+1 with SD

Low loss design 1RU protection panel
 Full equipment protection with space diversity (license key)
 1-4xDS3, 16xT1/E1 and GigE protection
 Unique sparing with field installable diplexers
 5RU design



Protected 1.5+1.5

Built-in transmit protection per terminal
 Built-in dual receiver per terminal
 Low loss design 1RU protection panel
 Non-protected or protected space-diversity
 1-4xDS3, 16xT1/E1 and GigE protection
 5RU design

Diagrams are for illustration purposes only. Not all configurations are available for all terminal types. Consult your Exalt sales representative for detailed bills of material for the desired configuration



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