MANNSYS

All-Outdoor, Carrier-Class, Tri-Band 5 GHz TDD Radio System
for Low, Medium and High Capacity Ethernet and TDM Applications

The EX-5r series of all-outdoor digital microwave radios is the first family of carrier-class, tri-band TDD radios available in the 5.2 – 5.8 GHz license-exempt bands. Radios in the EX-5r line support capacities ranging from 27 Mbps to an industry-leading 440 Mbps of aggregate user throughput, from zero to four T1/E1s and both 100BaseT and GbE interfaces. Featuring native TDM and native Ethernet transport and full software configurability and upgradeability, the EX-5r series was designed to meet demanding backhaul requirements of enterprise organizations and service providers seeking the performance benefits of an all-outdoor configuration.

Carrier-class TDD. The EX-5r series radios combine native TDM and native Ethernet transport with low, fixed latency to deliver guaranteed throughput and service quality. Capacity can be allocated variably between TDM and Ethernet via software, while the selectable throughput symmetry control feature enables radio capacity to efficiently match asymmetric traffic requirements.

Industry-leading Spectrum Management. The EX-5r radios include selectable channel bandwidth and 1 MHz tuning resolution,

yielding up to 54 non-overlapping frequency channels and up to 415 center frequencies of operation. These capabilities, combined with selectable modulation and superior system gain, provide unparalleled interference avoidance and transmission resiliency. A built-in spectrum analyzer is even included to accelerate deployment and simplify troubleshooting.

Synchronization. The Sync technology embedded with in the EX-5r series radios allows multiple radio systems to be collocated in close proximity without self-interference, minimizing antenna separation and ensuring reuse of scarce spectrum across all collocated systems.

Security, Management and Data Networking. The EX-5r radios deliver the highest data and management security available with optional 128- and 256-bit AES encryption and secure SNMP v3 management, together with enhanced fault management and diagnostic features. The 802.1Q VLAN option provides built-in network administration and security flexibility.

EX-5r series radios are available in both integrated antenna and external antenna (connectorized) versions.

Primary Specifications		EX-5r Lite / EX-5r-c Lite	EX-5r v3 / EX-5r-c v2	EX-5r GigE / EX-5r-c GigE
Maximum Capacity[1]	TDM	4xT1/E1		
	Ethernet (Aggregate)	100 Mbps	200 Mbps	440 Mbps
Frequency (GHz)		Tri-band: 5.250-5.350, 5.470-5.725, 5.725-5.850		
Range[2]		> 30 miles at 99.999% throughput availability		

[2] Distance based upon FCC regulations, average climate and terrain, 6' dish antennas, 3 dB transmission system losses at each end. Longer or shorter distances will apply for alternative antennas, country regulations, transmission system losses, path topologies and radio configurations.

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Specifications	EX-5r Series

System

Frequency Bands[1] (GHz)	5.250-5.350, 5.470-5.725, 5.725-5.850
Tuning Resolution	1 MHz
Output Power (full power)	
5725-5850 MHz band	+24 dBm QPSK;+21 dBm 16QAM
5250-5350 MHz band[2]	+13 dBm
5470-5725 MHz band[2]	+13 dBm
Output Power (min power)	Full power minus 20 dB
Power Control Step Size	0.5 dB
Receiver Threshold (BER=10[-6])	

Channel Bandwidth[3]	8/10 MHz	16/20 MHz	32/40 MHz	64 MHz
QPSK	-86	-83	-80	-77
16QAM	-78	-75	-72	-69

Non-overlapping Channels				
5.250-5.350 GHz	10	5	2	1
5.470-5.725 GHz	29	14	7	3
5.725-5.850 GHz	15	7	3	1

Maximum RSL	-25 dBm error-free
	0 dBm no damage
Throughput Symmetry Control	5 modes
	20/80, 80/20, 35/65, 65/35, 50/50
Error Floor	10^{-12}
Latency (T1/E1)	1ms, typical
Maximum Packet Size	All 1916 bytes except GigE 9728 bytes

System (continued)

Link Security	96-bit proprietary encryption
	128-bit and 256-bit AES encryption[3]
Spectrum Analyzer	Embedded
VLAN	802.1Q
QoS	802.1p (GigE)
Management	HTTP GUI
	CLI/Telnet
	SNMP v1, 2c, v3
Compliance	FCC 15.247, FCC 15.407
	EN 301-893, EN 302-502
	EN 60-950, EN 301-489
	IC RSS-210

System Components

Complete Link	Two terminals, each with AC adapter & accessory kit
Single Terminal	One terminal with AC adapter & accessory kit
Accessory Kit	DC power connector, rack and grounding hardware (spare)
AC Adapter	AC adapter (spare)
Mounting Kits	Available for each product (spare)
Sync GPS Sync Kit	GPS receiver and mounting bracket (optional)

Specifications	EX-5r Lite	EX-5r-c Lite	EX-5r v3	EX-5r-c v2	EX-5r GigE	EX-5r-c GigE

Physical

	EX-5r Lite	EX-5r-c Lite	EX-5r v3	EX-5r-c v2	EX-5r GigE	EX-5r-c GigE
Physical Configuration	Outdoor Unit (ODU)					
Dimensions (H x W x D)	14 x 14 x 3.8 in	14 x 14 x 2.5 in	14 x 14 x 3.8 in	14 x 14 x 2.5 in	14 x 14 x 3.8 in	14 x 14 x 2.5 in
	35.6 x 35.6 x 9.7 cm	35.6 x 35.6 x 6.4 cm	35.6 x 35.6 x 9.7 cm	35.6 x 35.6 x 6.4 cm	35.6 x 35.6 x 9.7 cm	35.6 x 35.6 x 6.4 cm
Antenna	Integrated	2x Type-N (F) Connector	Integrated	2x Type-N (F) Connector	Integrated	2x Type-N (F) Connector
Integrated Antenna						
Gain/3 dB Beamwidth	23 dBi / 9 degrees	-	23 dBi / 9 degrees	-	23 dBi / 9 degrees	-
Operating Temperature	-40 to +65 °C; -40 to +149 °F					
Full Spec Temperature	-40 to +60 °C; -40 to +140 °F					
Weight	14 lbs/6.4 kg	12 lbs/5.5 kg	14 lbs/6.4 kg	12 lbs/5.5 kg	14 lbs/6.4 kg	12 lbs/5.5 kg
Environmental	NEMA 4/IP56					
Altitude	15,000 ft; 4.6 km					
Humidity	100% condensing					

Interfaces

	EX-5r Lite	EX-5r-c Lite	EX-5r v3	EX-5r-c v2	EX-5r GigE	EX-5r-c GigE
RF	-	2x N-type (F), 50 ohm	-	2x N-type (F), 50 ohm	-	2x N-type (F), 50 ohm
TDM T1/E1 Interfaces	RJ48C/RJ45 (F) (x4)					
T1 Impedance	100 ohms, balanced					
T1 Line Code	AMI, B8ZS, selectable per channel					
T1 Data Rate	1.544 Mbps					
T1 Compliance	ANSI T1.102-1987; ITU-T; G.823; GR-499-CORE					
E1 Impedance	120 ohms, balanced					
E1 Line Code	HDB3					
E1 Data Rate	2.048 Mbps					
E1 Compliance	CEPT-1; G.703; ITU-T-G.703					
Loopback Modes	Remote Internal; Remote External; Local Line					
Ethernet	RJ45 (F)				RJ45 Female (x2)	
Interface Speed	10/100BaseT (POE)				10/100/1000BaseT (1xPOE)	
Duplex	Half, Full, Auto-MDIX				Half, Full, Auto-MDIX	
Compliance	802.3				802.3	
Synchronization	RJ45 (F)				RJ45 Female (x2)	
	Input: 1pps (GPS)				Input: 1pps (GPS); Output: Sync out	
DC Power	48VDC, <50W				48VDC, <70W	
AC Power Adapter						
Input	100-240VAC, 1.5A					
Output	48VDC, 1.5A, 72W (via power injector)				48VDC, 2.08A, 100W (via power injector)	

[1] Not all frequency bands are authorized or available for use in all countries.

[2] +24 dBm output power available in EX-5r v3 and EX-5r Lite.

[3] FCC: 8, 16, 32, 64 MHz; ETSI: 10, 20.40 MHz

[4] Software license key upgrade.