

# MICRO R A P T O R<sup>®</sup>

## iMR320 SERIES

Compact Ethernet Layer 2 & Layer 3 Switch



128  
BIT  
ENCRYPTION



\* Concept module shown is subject to change \*

## Product Overview

The *MicroRaptor*<sup>®</sup> is an Intelligent Cyber Secure Platform running the iBiome OS. The iBiome<sup>®</sup> is an all encompassing operating system that supports switching and routing on a single platform. *MicroRaptor* is a factory configurable switch which supports up to 16-ports Ethernet. Ethernet interfaces available are 10/100/1000BaseTX RJ45 and 100/1000BaseX SFP. The *MicroRaptor* can optionally support up to 8-ports serial.

*MicroRaptor* supports Layer 2 and Layer 3 Switching and offers industry specific features such as IEEE 1588v2 precision timing support.

*MicroRaptor* has been specifically designed to protect and secure critical infrastructure and substation applications in the harshest of environments. It is compliant with IEC 61850 Ed. 2, and IEEE 1613 standards.

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# Features and Benefits

Table 1. Features and Benefits of *MicroRAPTOR*®

FEATURE	BENEFIT
SIMPLIFIED GUI - EASY TO USE	Allows easy configuration and monitoring with a web-based User Interface Eliminates the need for more complex terminal emulation programs Reduced cost of deployment; one platform—multiple functions
ROBUST INDUSTRIAL DESIGN	-40°C to +85°C (-40°F to 185°F) operating temperature No fans needed Ingress Protection rating of IP40
IEEE 1588 TRANSPARENT CLOCK	All Ethernet ports on the <i>MicroRAPTOR</i> support the IEEE 1588v2 Power Profile for Transparent Clock operation

Table 2. Common Specification

DESCRIPTION	
<i>MicroRAPTOR</i>	<p><b>The compact layer 3 switch supports up to 16-ports Ethernet.</b></p> <p>Slot 1 supports: 8-ports Ethernet</p> <p>Slot 2 supports: 8-ports Ethernet or up to 8-ports Serial</p> <p><b>Ethernet Modules available (Slot 1 or 2):</b></p> <ol style="list-style-type: none"> <li>1) 8-ports 100/1000Base-X SFP</li> <li>2) 8-ports 10/100/1000BaseTX RJ45</li> <li>3) 4-ports 100/1000Base-X SFP plus 4-ports 10/100/1000BaseTX RJ45</li> </ol> <p><b>Serial Modules available (Slot 2 only):</b></p> <ol style="list-style-type: none"> <li>1) 4-ports DB9 Interfaces RS232/422/485</li> <li>2) 8-ports RJ45 Interfaces RS232/422/485</li> </ol> <p><b>All configurations are factory configured.</b></p>
PORTS	
SERIAL CONSOLE PORT	RS-232 with an RJ45 interface for console cable. 115200bps, 8, N, 1
USB PORT	USB 2.0 for software updates, downloading syslog files and configuration backup/restore
IEEE 1588v2 SUPPORT	IEEE 1588v2 Transparent Clock Support for all Ethernet ports
ALARM	Fault Contact: Relay output carries up to 1A at 24VDC and 200mA at 125VDC
WARNING / MONITORING SYSTEM	Relay output for fault event alarming Syslog client to record and Syslog Relay to forward Syslog messages SNMP

# Product Specifications

TECHNOLOGY	
MAC TABLE	16K
PRIORITY QUEUES	8
PROCESSING	Store-and-Forward
SWITCH PROPERTIES	Switching latency : 7 $\mu$ s Switching bandwidth: 128 Gbps Max. number of available VLANs: 4K
JUMBO FRAME	Up to 9216 bytes
PHYSICAL CHARACTERISTICS	
ENCLOSURE	Aluminum and steel enclosure
DIMENSIONS	82.72 (W) x 197.12 (D) x 188.39 (H) mm (3.26 x 7.42 x 7.76 inch)*
WEIGHT	1.9 kg (4.2 lbs)
POWER	
REDUNDANT DC POWER OPTION	Dual Power Supplies available in any combination of: 24VDC Nominal / 10-36VDC Operational 48VDC Nominal / 36-72VDC Operational Redundant DC power supplies are load sharing
AC POWER OPTION	Single Power Supply 100-240 VAC/VDC Nominal 88-300VDC or 85-264VAC Operational
POWER CONSUMPTION	50 Watts
OVERLOAD CURRENT PROTECTION	Fast Acting Fuse 3.15A (can only be replaced in the factory)
INSTALLATION CATEGORY	Oversvoltage Category II, Pollution degree II
WARRANTY	
WARRANTY	5 years, (extendable option with additional terms)

\* Dimensions given are for DIN mount with lug screw terminal block configuration.

## iROC Network Connections on iMR320

The iROC on the iMR320 supports up to two network connections through its backplane and one on its faceplate. The interfaces are 1Gbps, however they will have an effective throughput of less than 1Gbps based on factors such as CPU load, operating system, and other system demands.

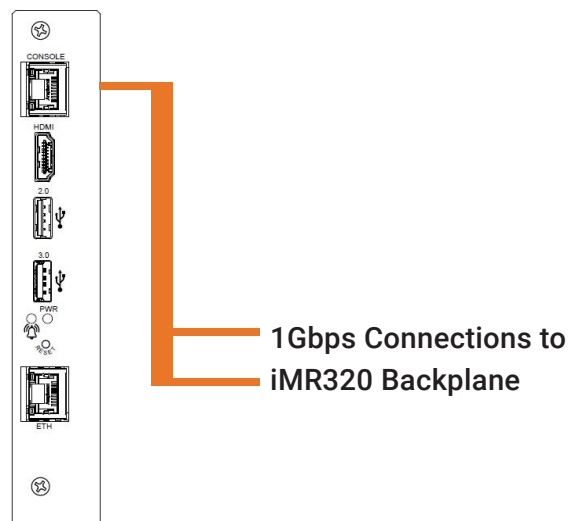


Table 3. *MicroRAPTOR*® *iBiome*®

DESCRIPTION	SPECIFICATION
<b>MANAGEMENT FEATURES</b>	SNMP (v1, v2c, and v3) agent and MIB support SNMP Proxy CLI (Console, Telnet, and SSH) SSH v2.0 support TLS 1.2 and 1.3 support WebUI (HTTP and HTTPS / SSL) Configuration Save and Restore in the form of MIB OIDs Configuration Save and Restore in the form of text file Software and configuration upgrade through TFTP or SFTP Debug Logging Ability, Backup/Restore configuration SNTP Syslog Port Mirroring System Resource Monitoring Multiple Level User Management Syslog Server/Client MIB support RMONv1 Power Supply Alarms, on redundant power supply failure.
<b>L2 - FEATURES</b>	TCP/IP stack for IPv4 Proxy ARP DHCP (Client, Server & Relay) for IPv4 DHCP—Support for Option 82 SSH v2.0 support on 128-bit Jumbo Frame support VLAN-aware bridging RSTP (IEEE 802.1D, 2004) /MSTP/PVRST+ RSTP: BPDU load/attack prevention mechanism IGMP v1, v2, v3 snooping Link Aggregation with LACP Link Layer Discovery Protocol (LLDP) QoS <ul style="list-style-type: none"> <li>• Traffic Shaping</li> <li>• Scheduling</li> <li>• Queueing</li> <li>• Classification based on ACL and Priority Map Table</li> <li>• pre-Marking Support for IP</li> <li>• DSCP</li> <li>• Egress Port Scheduler and Shaper</li> </ul> Rate Limiting and Storm Control, Flow Control MAC Learning Limit per port & per VLAN
<b>L3 - FEATURES</b>	VRRP Unicast Routing <ul style="list-style-type: none"> <li>• Static</li> <li>• RIPv1/2</li> <li>• OSPF</li> <li>• BGP</li> <li>• route redistribution between protocols</li> </ul>
<b>OTHER PROTOCOLS</b>	Multicast <ul style="list-style-type: none"> <li>• IGMP (v1/v2/v3)</li> <li>• IPv4 multicast - PIM-SM</li> </ul> Serial <ul style="list-style-type: none"> <li>• Modbus Server/Client</li> <li>• Raw Socket</li> </ul> Media Redundancy Protocol (MRP) HSR/PRP
<b>SECURITY FEATURES</b>	RADIUS Authentication TACACS+ Authentication SSH v2.0 support on 128-bit 802.1x authentication (Port Based Authentication) ACLs (Access Control Lists) for Traffic Filtering – L2ACL, L3ACL

# Product Specifications

Table 4. Compliance Specification

DESCRIPTION	SPECIFICATION	LEVEL
<b>PRODUCT SAFETY TESTS</b>		
IP RATING	IEC 61850-3 clause 6.6.2 IEC 60529 clause 6.11 ISO 20653:2013	IP40
CLEARANCE AND CREEPAGE	IEC 61850-3 clause 6.6.1 IEC 62368-1, clause 5.4.2 & 5.4.3	Overvoltage Category II, Pollution Degree II
IMPULSE VOLTAGE	IEC 61850-3 clause 6.6.3 IEEE 1613 clause 5.3	5kV on auxilliary power supply and digital inputs 1kV on station bus ports"
DIELECTRIC VOLTAGE	IEC 61850-3 clause 6.6.4 IEEE 1613 clause 5.2	2.8kV DC on auxilliary power supply and digital inputs 0.5kV AC on station bus ports
INSULATION RESISTANCE	IEC 61850-3, clause 6.9.2.2	≥550 MΩ at 500 Vdc
PROTECTIVE BONDING	IEC 61850-3 clause 6.6.5	less than 0.1Ω
FLAMMABILITY	IEC 61850-3 clause 6.6.6, IEC 60255-27, subclause 10.6.5.2	V-1
SINGLE FAULT CONDITION	IEC 61850-3 clause 6.6.7	12VDC
PRODUCT SAFETY STANDARDS	IEC 62368-1	Product Safety Standard for Europe and North America
<b>ELECTROMAGNETIC COMPATIBILITY (EMC) TESTS</b>		
<b>EMISSIONS AND IMMUNITY COMPLIANCE</b>		
EUROPEAN	EN 55032:2012, CISPR 32:2012, Multimedia	Class A Equipment
	EN 55024:2010, CISPR 24:2010 , Multimedia	
NORTH AMERICA	FCC Part 15 Subpart B:2017, Multimedia	Class A Equipment
	ICES-003:2017, Multimedia	
<b>IMMUNITY</b>		
1 MHZ DAMPED OSCILLATORY WAVE	IEC 61850-3 clause 6.7.3 IEC 61000-4-18 IEEE 1613 clause 6 IEEE 1613.1 clause 5	2.5 kV CM, 1.0kV DM HV/Telec. 2.5 kV CM, 2.5kV DM Zone A
ELECTROSTATIC DISCHARGES	IEC 61850-3 clause 6.7.3 IEC 61000-4-2 IEEE 1613 clause 8 IEEE 1613.1 clause 8	8kV contact, 15kV air
RADIATED RADIO FREQUENCY MAGNETIC FIELD	IEC 61850-3 clause 6.7.3 IEC 61000-4-3 IEEE 1613 clause 7 IEEE 1613.1 clause 7	20 V/m
FAST TRANSIENT/BURST	IEC 61850-3 clause 6.7.3 IEC 61000-4-4 IEEE 1613 clause 6 IEEE 1613.1 clause 5	4kV
SURGE	IEC 61850-3 clause 6.7.3 IEC 61000-4-5 IEC 1613.1 clause 6	Signal Ports ± 2kV LE ± 1kV LL
		D.C Power Ports ± 4kV LE ± 2kV LL
		A.C Power Ports ± 4kV LE ± 2kV LL
CONDUCTED DISTURBANCE INDUCED BY RF FIELDS	IEC 61850-3 clause 6.7.3 IEC 61000-4-6 IEEE 1613.1 clause 9	0.15-80MHz at 10V 27, 68 MHz at 10V

DESCRIPTION	SPECIFICATION	LEVEL
MAIN FREQUENCY VOLTAGE, COMMON-MODE DISTURBANCES	IEC 61850-3 clause 6.7.3 IEC 61000-4-16 IEEE 1613.1 clause 12	30V; 60s. 300V; 1s
POWER FREQUENCY MAGNETIC FIELD	IEC 61850-3 clause 6.7.3 IEC 61000-4-8 IEEE 1613.1 clause 10	100 A/m cont.; 1000 A/m 1s
D.C. VOLTAGE DIPS	IEC 61850-3 clause 6.7.3 IEC 61000-4-29	60%; 0.1s 30%; 0.1s
A.C. VOLTAGE DIPS	IEC 61850-3 clause 6.7.3 IEC 61000-4-11	60%; 50 c 30%; 1c
D.C. VOLTAGE INTERRUPTIONS	IEC 61850-3 clause 6.7.3 IEC 61000-4-29	100%; 0.05s
A.C. VOLTAGE INTERRUPTIONS	IEC 61850-3 clause 6.7.3 IEC 61000-4-11	100%; 5/50c
D.C. RIPPLE	IEC 61850-3 clause 6.7.3 IEC 61000-4-17 IEEE 1613 clause 4.2	10% Ur_dc 5% content (different calculation method)
DAMPED OSCILLATORY MAGNETIC FIELD	IEEE 1613.1 clause 11 IEC 61000-4-10	100 A/m (peak)
<b>CLIMATIC ENVIRONMENTAL TESTS</b>		
DRY HEAT OPERATIONAL	IEC 61850-3 clause 6.9.3.1 IEC 60068-2-2, test Be	+85°C; 16 hours
	IEEE 1613 clause 3.1.1	+85°C
COLD OPERATIONAL	IEC 61850-3 clause 6.9.3.2 IEC 60068-2-1, test Ad	-40°C; 16 hours
	IEEE 1613 clause 3.1.1	-40°C
DRY HEAT STORAGE	IEC 61850-3 clause 6.9.3.3 IEC 60068-2-2, test Bb	+85°C; 16 hours
	IEEE 1613 clause 3.1.2	+85°C
COLD STORAGE	IEC 61850-3 clause 6.9.3.4 IEC 60068-2-1, test Ab	-40°C; 16 hours
	IEEE 1613 clause 3.1.2	-40°C
CHANGE OF TEMPERATURE	IEC 61850-3 clause 6.9.3.5 IEC 60068-2-14 test Nb	-40°C; +85°C 3 hours; 5 cycles
DAMP HEAT, STEADY STATE	IEC 61850-3 clause 6.9.3.6 IEC 60068-2-78 test Cab	+40°C; 93%, 10 days
DAMP HEAT, CYCLIC	IEC 61850-3 clause 6.9.3.7 IEC 60068-2-30 test Db IEEE 1613 clause 3.1.3	+25°C; 55°C 97%; 93% 6 cycles + 55°C
<b>MECHANICAL ENVIRONMENTAL TESTS</b>		
VIBRATION RESPONSE	IEC 61850-3 clause 6.10.1 IEC 60255-21-1	0.5g, 1 sweep cycle/axis, 3 axis, freq range 10-150Hz
VIBRATION ENDURANCE	IEC 61850-3 clause 6.10.1 IEC 60255-21-1	1g, 20 sweep cycles/axis, 3 axis, freq range 10-150Hz
SHOCK RESPONSE	IEC 61850-3 clause 6.10.2 IEC 60255-21-2	5g, 11ms duration/pulse, 6 pulses/axis, 3 axis.
SHOCK WITHSTAND	IEC 61850-3 clause 6.10.2 IEC 60255-21-2	15g, 11ms duration/pulse, 6 pulses/axis, 3 axis.
BUMP	IEC 61850-3 clause 6.10.2 IEC 60255-21-2	10g, 16ms duration/pulse, 2000 pulses/axis, 3 axis.
SEISMIC (SINGLE AXIS SWEEP)	IEC 61850-3 clause 6.10.3 IEC 60255-21-3	Freq Range: 1-35Hz, Cross-over frequency 8-9Hz, Displacement 3.5mm [x], 1.5mm [y], Acceleration: 1.0g [x], 0.5g [y], Number of sweep cycles per axis 1, number of axis 3

# Product Specifications

DESCRIPTION	SPECIFICATION	LEVEL
VIBRATION	IEEE 1613 clause 9	V.S.3
SHOCK	IEEE 1613 clause 9	100 mm
<b>ALTITUDE</b>		
ALTITUDE	IEC 61850-3 section 4, table 1	less than or equal to 2000m
	IEC 61850-3 section 7.2, table 25	86 kPa to 106 kPa

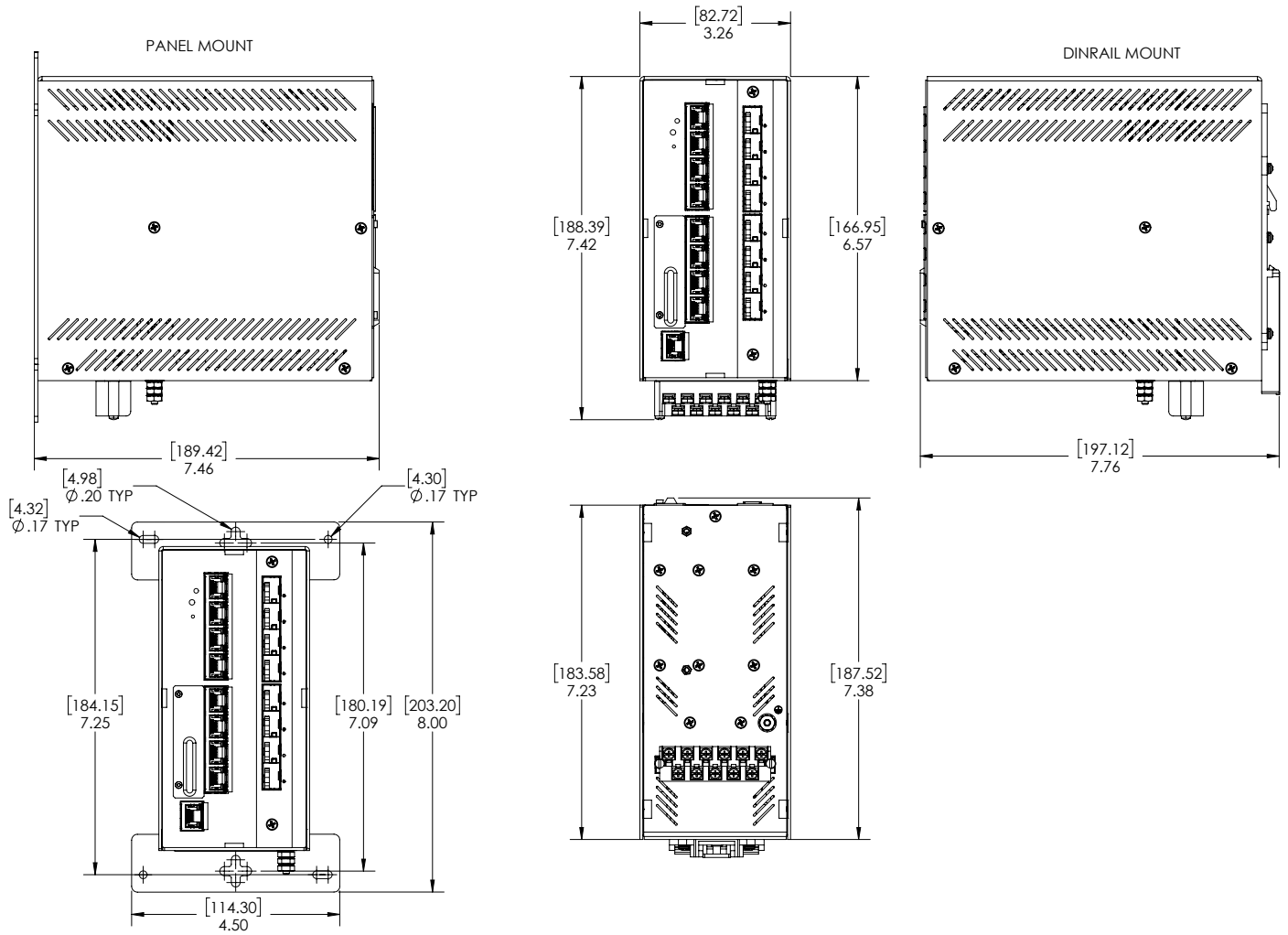
Table 5. Standards and Management

DESCRIPTION	SPECIFICATION		
<b>IEEE STANDARDS</b>	IEEE 802.3 for 10Base-T		
	IEEE 802.3u for 100Base-TX and 100Base-FX		
	IEEE 802.3ab for 1000Base-T		
	IEEE 802.3z for 1000Base-X		
	IEEE 802.3x for Flow control		
	IEEE 802.3ad for LACP (Link Aggregation Control Protocol)		
	IEEE 802.1Q – 2014 Bridged Networks		
	IEEE 802.1-2010 Port Based Network Access Control		
	IEEE 802.1AB – 2016 Station and Media Access Connectivity discovery (LLDP)		
	IEEE 802.1AX Link Aggregation		
IEEE 1588 v2 PTP, One-Step with Power Profile (Transparent Clock only)			
<b>RFC COMPLIANCE</b>	RFC 768: UDP	RFC 1901,1902-1907 SNMPv2	RFC 2131, 2132: DHCP
	RFC 783: TFTP	RFC 2273-2275: SNMPv3	RFC 2236: IGMP v2
	RFC 791: IPv4 protocol RFC 792: ICMP	RFC 2571: SNMP Management RFC 1166: IP Addresses	RFC 3376: IGMP v3
	RFC 793: TCP	RFC 1643: Ethernet Interface	RFC 3164: Syslog
	RFC 826: ARP	MIB RFC 1757: RMON	RFC 2474: DiffServ Precedence
	RFC 854: Telnet	RFC 2068: HTTP	RFC 3046: DHCP Relay Agent Information Option
	RFC 951: BOOTP		RFC 3580: 802.1x RADIUS
	RFC 959: FTP		RFC 4250-4252 SSH Protocol
	RFC 1157: SNMPv1		RFC 5424-5425: Syslog

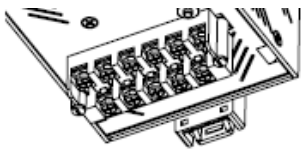


# Dimensions

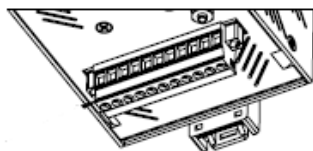
Table 5. Standards and Management



## Terminal Block Options



Lug Terminated Wire, Screw Terminal Block



Raw Wire, Screw Terminal Block

# Ordering Information

## iMR320 SYSTEM

MODEL	PS 1	PS 2	MOUNT	TERMINAL BLOCK	SLOT 1	SLOT 2	DESCRIPTION
iMR320							<b>Compact Ethernet Layer 2/3 Switch</b>
	HV						<b>Input 100-240VAC/VDC Nominal</b>
	MV	MV*					<b>Input 48VDC (36-72VDC)</b>
	LV	LV*					<b>Input 24VDC (10-36VDC)</b>
		XX					<b>None</b>
			D				<b>DIN Mount</b>
			P				<b>Panel Mount</b>
			X				<b>No Mount</b>
				L			<b>Lug Terminated wire, screw terminal block</b>
				W			<b>Raw Wire, screw terminal block</b>
					8GRJ45		<b>8x 10/100/1000BaseTX RJ45</b>
					8GSFP		<b>8x 100/1000Base-X SFP (Blank, optical transceivers not included)</b>
					4RJ4SFP		<b>4x 10/100/1000BaseTX RJ45 plus 4x 100/1000Base-X SFP (Blank, optical transceivers not included)</b>
					8GRJ45		<b>8x 10/100/1000BaseTX RJ45</b>
					8GSFP		<b>8x 100/1000Base-X SFP (Blank, optical transceivers not included)</b>
					4RJ4SFP		<b>4x 10/100/1000BaseTX RJ45 plus 4x 100/1000Base-X SFP (Blank, optical transceivers not included)</b>
					8SRJ45		<b>8x Serial RJ45 Interfaces, RS232/422/485</b>
					4DB09		<b>4x Serial DB9 Interfaces, RS232/422/485</b>
					iROC**		<b>iROC Industrial Computing Module (see system order codes)</b>
					2RBX		<b>HSR/PRP with support for 2 RedBoxes</b>
					XX		<b>None</b>

Note: XX must be selected as the PS2 option if HV has been chosen in PS1.

\*\* The iROC has a maximum operating temperature of +70°C.

### iMR320 Sample Order Code

iMR320-HV-XX-D-L-8GRJ45-8GSFP

Description: *MicroRAPTOR* iMR320 Layer 3 switch, HV power supply, DIN Mount, screw terminals for lug terminated wires, with 8-ports 10/100/1000TX RJ45, with a module for an additional 8-ports 100/1000Base-X SFP (transceivers not included).

The same unit, may be ordered with conformal coating by appending 'C1' to the order code, for example:

iMR320-HV-XX-D-L-8GRJ45-8GSFP-C1

Description: *MicroRAPTOR* iMR320 Layer 3 switch, HV power supply, DIN Mount, screw terminals for lug terminated wires, with 8-ports 10/100/1000TX RJ45, with a module for an additional 8-ports 100/1000Base-X SFP (transceivers not included). The iMR320 will be conformal coated.

## iROC SYSTEM ORDER CODE

The iROC is an industrial computing module that will operate in slot 2 of the iMR320. The order codes below are used for ordering an iROC in an iMR320 system. The iROC is not field replaceable in the iMR320.

MODEL	CPU	OS	STORAGE	SOFTWARE PACKAGE	DESCRIPTION
iRC					iROC Computing Module, HDMI port, USB 2.0, USB 3.0, Console port, 10/100/1000TX RJ45
	1				E3940 Intel Atom, with 8GB of memory
		W1			Windows® 10 Pro Operating System
		C7			CentOS Operating System version 7 (2009)
			2A		256GB Industrial SSD Storage
			5A		512GB Industrial SSD Storage
			1T		1TB Industrial SSD Storage
			2T		2TB Industrial SSD Storage
				XX	None

### iMR320 Sample Order Code – iROC Example

iMR320-HV-XX-D-L-8GRJ45-iRC1C75AAXX

Description: *MicroRAPTOR* iMR320 Layer 3 switch, HV power supply, DIN Mount, screw terminals for lug terminated wires, with 8-ports 10/100/1000TX RJ45, an iROC computing module running Centos7 with 512GB storage.

### SFPs Available for the iMR320

ORDER CODE	DESCRIPTION
SFP-SGMII-TX	100/1000Mbps TX RJ45 Transceiver 100m, -40°C to +85°C
SFP-100-MM-2	SFP 100Mbps Multimode LC Transceiver 2km, 1310nm, -40°C to +85°C
SFP1000-MM-550	SFP 1Gbps Multimode LC Transceiver 550m, 850nm, -40°C to +85°C
SFP1000-MM-2	SFP 1Gbps Multimode LC Transceiver 2km, 1310nm, -40°C to +85°C
SFP1000-SM-10	SFP 1Gbps Singlemode LC Transceiver 10km, 1310nm, -40°C to +85°C



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