

MICRO R A P T O R[®]

iMR 320 SERIES

Compact Layer 2 & Layer 3 Substation Switch



**128
BIT
ENCRYPTION** CE FC

* Concept module shown is subject to change *

Product Overview

The *MicroRAPTOR*[®] is an Intelligent Cyber Secure Platform running the iBiome OS. The iBiome[®] is an all encompassing operating system that supports switching and routing on a single platform. *MicroRAPTOR* is available as a base unit with 8-ports 10/100/1000TX, and has a factory configurable second module which supports an additional 8-ports 10/100/1000TX or 100/1000Base-X SFP.

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.

Features and Benefits

Table 1. Features and Benefits of *MicroRAPTOR*®

FEATURE	BENEFIT
FLEXIBLE COMPACT LAYER 3 SWITCH	<p>The compact layer 3 switch supports up to 16-ports 10/100/1000TX RJ45</p> <p>The <i>MicroRAPTOR</i> may also be ordered with support for 8-ports 10/100/1000TX and 8-ports for SFPs</p> <p>All configurations are factory configured</p>
SIMPLIFIED GUI - EASY TO USE	<p>Allows easy configuration and monitoring with a web-based User Interface</p> <p>Eliminates the need for more complex terminal emulation programs</p> <p>Reduced cost of deployment; one platform—multiple functions</p>
ROBUST INDUSTRIAL DESIGN	<p>-40°C to +85°C (-40°F to 185°F) operating temperature</p> <p>No fans needed</p> <p>Ingress Protection rating of IP40</p>
IEEE 1588 TRANSPARENT CLOCK	<p>All Ethernet ports on the <i>MicroRAPTOR</i> support the IEEE 1588v2 Power Profile for Transparent Clock operation.</p>

Table 2. Common Specification

DESCRIPTION	
<i>MicroRAPTOR</i>	<p>All <i>MicroRAPTOR</i> units come with 8-ports 10/100/1000TX with RJ45 interfaces. They are factory configurable with up to 8 additional ports:</p> <p>Option 1) 8-ports 10/100/1000TX with RJ45 interfaces</p> <p>Option 2) 8-ports 100/1000 Mbps SFP (transceivers not included)</p>
PORTS	
SERIAL CONSOLE PORT	RS-232 with an RJ45 interface for console cable. 115200bps, 8, N, 1
USB PORT	USB 3.0 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 to carry capacity of 1A at 24VDC
WARNING / MONITORING SYSTEM	<p>Relay output for fault event alarming</p> <p>Syslog client to record and Syslog Relay to forward Syslog messages</p> <p>SMNP</p>

Product Specifications

TECHNOLOGY	
MAC TABLE	16K
PRIORITY QUEUES	8
PROCESSING	Store-and-Forward
SWITCH PROPERTIES	Switching latency : 7 μ s Switching bandwidth: 128 Gbps Max. number of available VLANs: 4K
JUMBO FRAME	Up to 9.2K Bytes
PHYSICAL CHARACTERISTICS	
ENCLOSURE	IP-40 Galvanized steel
DIMENSIONS	89.83 (W) x 191.32 (D) x 184.75 (H) mm (3.54 x 7.53 x 7.27 inch)
WEIGHT	2.5 kg (5.5 lbs)
POWER	
REDUNDANT INPUT POWER	Dual Power Supplies available in any combination of 48VDC (36-72VDC) and 24VDC (9-36VDC). The power supplies are redundant and load sharing
AC POWER SUPPLY	Single supply 88-300VDC or 85-264VAC (Voltage range is still under test)
POWER CONSUMPTION	30 Watts
OVERLOAD CURRENT PROTECTION	Fast Acting Fuse 3.15A (can only be replaced in the factory)
INSTALLATION CATEGORY	OVERVOLTAGE CATEGORY II, POLLUTION DEGREE II

Product Specifications

Table 3. *MicroRAPTOR® iBiome®*

L2/L3 - BASIC FEATURES - *MicroRAPTOR iBiome*

- SNMP (v1, v2c, and v3) agent and MIB support
- CLI (Console, Telnet, and SSH)
- WebUI (HTTP and HTTPS / SSL)
- TCP/IP stack for IPv4
- Configuration Save and Restore in the form of MIB OIDs
- Debug Logging Ability, Backup/Restore configuration (when copying the configuration file from a flash drive to external TFTP server & vice versa)
- Software and configuration upgrade through TFTP or SFTP
- SNTP, Syslog, RADIUS, TACACS+ Client (IPv4)
- DHCP (Client, Server & Relay) for IPv4
- SSH v2.0 support on 128-bit
- Port Mirroring
- System Resource Monitoring (temperature and CPU speed)
- Multiple Level User Management (Admin, Tech, Guest), Syslog Server/Client
- MIB support (standard/proprietary), Routing MIB (standard and proprietary MIBs as specified in the product specification)
- Jumbo Frame support
- VLAN-aware bridging (Port Based VLAN, Protocol based VLAN)
- RSTP (IEEE 802.1D, 2004) /MSTP/PVRST+
- RSTP: BPDU load/attack prevention mechanism, verbose logs on the screen up for debugging level
- IGMP v1, v2, v3 snooping – explicit Host Tracking and Fast Leave, Multicast Statistics (for control plane messages only)
- DHCP—Support for Option 82
- RMONv1
- Link Aggregation with LACP
- 802.1x authentication (Port Based Authentication)
- Link Layer Discovery Protocol (LLDP)
- ACLs (Access Control Lists) for Traffic Filtering – L2ACL, L3ACL
- QoS (Classification based on ACL and Priority Map Table, Traffic Shaping, Scheduling and Queueing)
- QoS—pre-Marking Support for IP, DSCP, Metering TRTCM, Frames for IP, DSCP, Metering and Priority Marking of Frames for IP, DSCP, Egress Port Scheduler and Shaper
- Rate Limiting and Storm Control, Flow Control
- Supports configuring of static MAC addresses up to 16K, MAC Learning Limit per port & per VLAN,
- Ethernet: Layer 3
 - Unicast Routing: IPv4 (Static, RIPv1/v2, OSPF), Route redistribution between protocols
 - VRRP v2/v3
- Unicast
 - Proxy ARP
 - DHCP relay IPv4
- Multicast
 - IGMP (v1/v2/v3)
 - IPv4 multicast—PIM-SSM

Table 4. Compliance Specification

DESCRIPTION	SPECIFICATION	LEVEL
PRODUCT SAFETY TESTS		
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	2kV on auxilliary power supply and digital inputs 0.5kV on station bus ports
INSULATION RESISTANCE	IEC 60255-27 clause 10.6.4.4	500VDC
PROTECTIVE BONDING	IEC 61850-3 clause 6.6.5	less than 0.1 Ohms
FLAMMABILITY	IEC 61850-3 clause 6.6.6	V1
SINGLE FAULT CONDITION	IEC 61850-3 clause 6.6.7	5VDC, 12VDC
PRODUCT SAFETY STANDARDS	IEC 62368-1	Product Safety Standard for Europe and North America
ELECTROMAGNETIC COMPATIBILITY (EMC) TESTS		
EMISSION		
RADIATED EMISSION	IEC 61850-3 clause 6.7.4 CISPR22 table 5/7	class A
CONDUCTED EMISSION	IEC 61850-3 clause 6.7.4 CISPR22 table 1/3	class A
IMMUNITY		
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	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

Product Specifications

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; cont. 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 3s
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)
CLIMATIC ENVIRONMENTAL TESTS		
DRY HEAT OPERATIONAL	IEC 61850-3 clause 6.9.3.1 IEC 60068-2-2, test Bd	+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 60068-2-78 test Db IEEE 1613 clause 3.1.3	+25°C; 55°C 97%; 93% 6 cycles + 55°C
MECHANICAL ENVIRONMENTAL TESTS		
VIBRATION RESPONSE	IEC 61850-3 clause 6.10.1 IEC 60255-21-1	class 1 0.5g, 10Hz - 150Hz, 1 Octave/min, 1 sweep cycle in each axis, 8min per perpendicular axis
VIBRATION ENDURANCE	IEC 61850-3 clause 6.10.1 IEC 60255-21-1	class 1 1g, 10 - 150Hz, 1 Octave/min, 20 sweep cycles in each axis, 160min per perpendicular axis
SHOCK RESPONSE	IEC 61850-3 clause 6.10.2 IEC 60255-21-2	class 1 5g, 11ms, half-sine, 3 shocks/direction/axis (18 total)

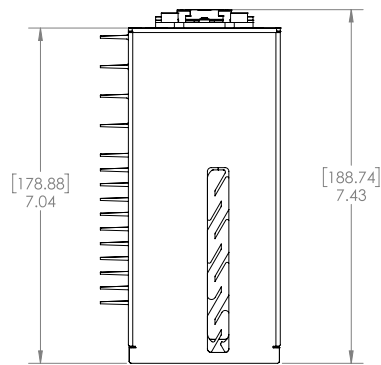
DESCRIPTION	SPECIFICATION	LEVEL
SHOCK WITHSTAND	IEC 61850-3 clause 6.10.2 IEC 60255-21-2	class 1 15g, 11ms, half-sine, 3 shocks/direction/axis (18 total)
BUMP	IEC 61850-3 clause 6.10.2 IEC 60255-21-2	class 1 10g, 16ms, half-sine, 1000 pulses
SEISMIC (SINGLE AXIS SWEEP)	IEC 61850-3 clause 6.10.3 IEC 60255-21-3	class 1, Freq range: Nominal Range 5-35Hz, Cross Over: 8-9Hz Peak Displacement: Below cross-over frequency: 3.5mm[x] x 1.5mm [y] Sweep: 1 Cycle/Axis (x,y,z), 1 Octave/min
VIBRATION	IEEE 1613 clause 9	V.S.3
SHOCK	IEEE 1613 clause 9	100 mm
ALTITUDE		
ALTITUDE	IEC 61850-3 section 4, table 1 IEC 61850-3 section 7.2, table 25	less than or equal to 2000m 86 kPa to 106 kPa

Product Specifications

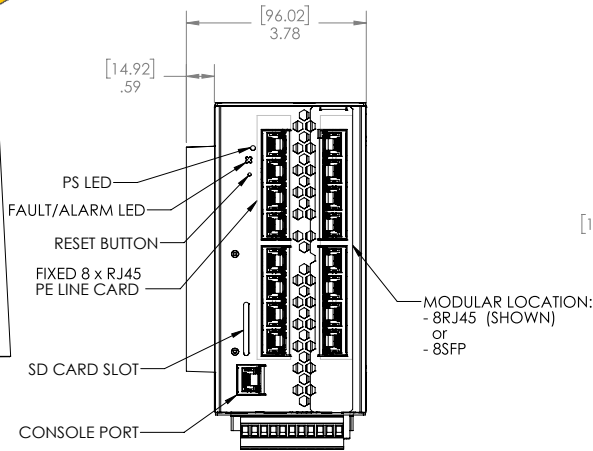
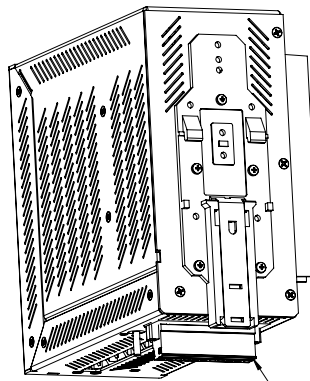
Table 5. Standards and Management

DESCRIPTION	SPECIFICATION		
IEEE STANDARDS	IEEE 802.3 for 10Base-T IEEE 802.3u for 100Base-TX and 100Base-FX IEEE 802.3ab for 1000Base-T IEEE 802.z for 1000Base-X IEEE 802.3ae for 10Gigabit Ethernet 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)		
RFC COMPLIANCE	RFC 768: UDP RFC 783: TFTP RFC 791: IPv4 protocol RFC 792: ICMP RFC 793: TCP RFC 826: ARP RFC 854: Telnet RFC 951: BOOTP RFC 959: FTP RFC 1157: SNMPv1	RFC 1901,1902-1907 SNMPv2 RFC 2273-2275: SNMPv3 RFC 2571: SNMP Management RFC 1166: IP Addresses RFC 1643: Ethernet Interface MIB RFC 1757: RMON RFC 2068: HTTP	RFC 2131, 2132: DHCP RFC 2236: IGMP v2 RFC 3376: IGMP v3 RFC 2474: DiffServ Precedence RFC 3046: DHCP Relay Agent Information Option RFC 3580: 802.1x RADIUS RFC 4250-4252 SSH Protocol

Dimensions

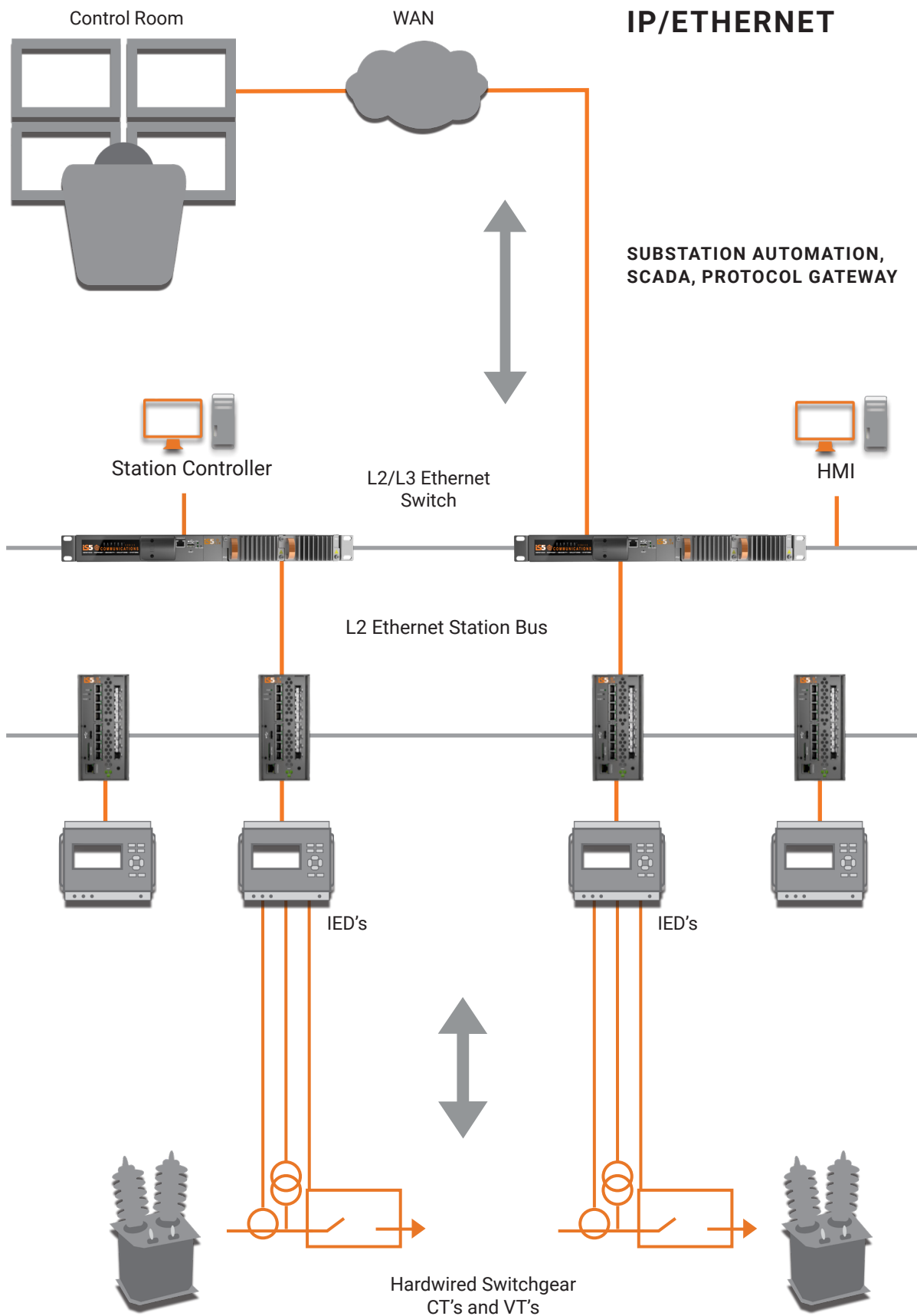


CONCEPT DESIGN - SUBJECT TO CHANGE



DUAL MV &/OR LV POWER SUPPLIES
OR SINGLE HV PS

Network Architecture



Ordering Information

MODEL	POWER SUPPLY 1	POWER SUPPLY 2	SLOT 1	OPTIONS	DESCRIPTION
iMR320	PS1	PS2	SLOT1	OPTION	L2/L3 Software Features. Base Unit includes 8-ports 10/100/1000TX RJ45.
	HV*				Input 88-300VDC or 85-264VAC
	LV	LV			Input 24VDC (9-36VDC)
	MV	MV			Input 48VDC (36-72VDC)
		XX			None
			8GRJ45		8x 10/100/1000 BaseTX RJ45
			8GSFP		8x 100/1000 Base-X SFP (Blank , optical transceivers not included)
			XX		None
				C1	Conformal Coating
				XX	None

Notes: When HV is selected as Power Supply 1, Power Supply 2 must be Blank (XX Option), HV voltage ranges are under test.

Sample Order Codes:

iMR320-HV-XX-8GRJ45-XX

Description: *MicroRAPTOR* iMR320 Layer 3 switch, with 8-ports 10/100/1000TX RJ45, HV power supply, with module for an additional 8-ports 10/100/1000TX RJ45. No conformal coating.

iMR320-MV-LV-8GSFP-XX

Description: *MicroRAPTOR* iMR320 Layer 3 switch, includes redundant MV and LV power supplies, with 8-ports 10/100/1000TX RJ45, with module for an additional 8-ports SFP (no transceivers). No conformal coating.



For more information, visit: is5com.com

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