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MICRORAPTOR®

iMR920 SERIES
Compact Ethernet Layer 2 & Layer 3 Switch

256 BIT ENCRYPTION CE FC

* Concept module shown is subject to change *

Product Overview

The *Micro*RAPTOR® 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. *Micro*RAPTOR 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 *Micro*RAPTOR can optionally support up to 8-ports serial, up to 2 HSR/PRP RedBoxes, or an iROC industrial computer.

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

*Micro*RAPTOR 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.

In addition to the switching and routing software capabilities found in the iMR320, the iMR920 supports a stateful firewall, NAT and IPSec capabilities. The iMR920 may be used to create VPNs between networks.

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Features and Benefits

Table 1. Features and Benefits of *Micro*RAPTOR®

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 IP20
IEEE 1588 TRANSPARENT CLOCK	All ports on Ethernet modules support the IEEE 1588v2 Power Profile for Transparent Clock operation

Table 2. Common Specification

DESCRIPTION	
*Micro*RAPTOR	**The compact layer 3 switch supports up to 16-ports Ethernet.** Slot 1 supports: 8-ports Ethernet Slot 2 supports: 8-ports Ethernet or up to 8-ports Serial **Ethernet Modules available (Slot 1 or 2):** 1) 8-ports 100/1000Base-X SFP 2) 8-ports 10/100/1000BaseTX RJ45 3) 4-ports 100/1000Base-X SFP plus 4-ports 10/100/1000BaseTX RJ45 **Serial Modules available (Slot 2 only):** 1) 4-ports DB9 Interfaces RS232/422/485 2) 8-ports RJ45 Interfaces RS232/422/485 **Other Modules (Slot 2 only):** 1) HSR/PRP supporting up to 2 RedBoxes 2) iROC industrial computer **All configurations are factory configured**
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 ports on Ethernet modules HSR/PRP module supports IEEE1588v2 for PRP protocol only
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 μs 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	Overvoltage 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 iMR920

The iROC on the iMR920 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.
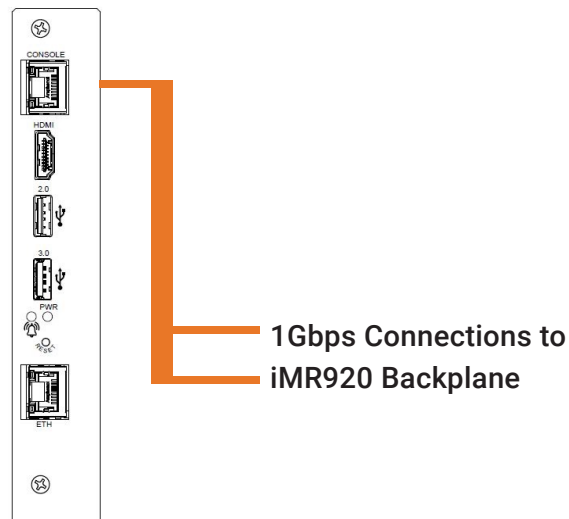

1Gbps Connections to iMR920 Backplane

Table 3. *Micro*RAPTOR® iBiome®

DESCRIPTION	SPECIFICATION
MANAGEMENT FEATURES	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 (Ethernet and Serial) System Resource Monitoring Multiple Level User Management Syslog Server/Client MIB support RMONv1 Power Supply Alarms, on redundant power supply failure Audit Logging (CLI and WebUI)
L2 - FEATURES	TCP/IP stack for IPv4 Proxy ARP DHCP (Client, Server & Relay) for IPv4 DHCP—Support for Option 82 Jumbo Frame support VLAN-aware bridging RSTP (IEEE 802.1D, 2004) /MSTP/PVRST+ RSTP: BPDU load/attack prevention mechanism • STP Root Guard • BPDU Guard IGMP v1, v2, v3 snooping Link Aggregation with LACP Link Layer Discovery Protocol (LLDP) QoS • Traffic Shaping • Scheduling • Queueing • Classification based on ACL and Priority Map Table • pre-Marking Support for IP • DSCP • Egress Port Scheduler and Shaper Rate Limiting and Storm Control, Flow Control MAC Learning Limit per port & per VLAN
L3 - FEATURES	VRRP Unicast Routing • Static • RIPv1/2 • OSPF • BGP • Route Redistribution between Protocols
OTHER PROTOCOLS	Multicast • IGMP (v1/v2/v3) • IPv4 multicast - PIM-SM Serial • Modbus Server/Client • Raw Socket Media Redundancy Protocol (MRP) HSR/PRP
SECURITY FEATURES	RADIUS Authentication TACACS+ Authentication SSH v2.0 support on 256-bit 802.1x authentication (Port Based Authentication) ACLs (Access Control Lists) for Traffic Filtering – L2ACL, L3ACL Stateful Firewall NAT GRE over IPSec IPSec, site-to-site implementations Port Security

Product Specifications

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	IP20
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
ELECTROMAGNETIC COMPATIBILITY (EMC) TESTS		
EMISSIONS AND IMMUNITY COMPLIANCE		
EUROPEAN	EN 55032:2012, CISPR 32:2012, Multimedia EN 55024:2010, CISPR 24:2010 , Multimedia	Class A Equipment
NORTH AMERICA	FCC Part 15 Subpart B:2017, Multimedia ICES-003:2017, Multimedia	Class A Equipment
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	Power Input ± 4kV, 5kHz HSR/PRP and iROC I/O Lines ± 2kV, 5kHz Other I/O Lines ± 4kV, 5kHz

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)
CLIMATIC ENVIRONMENTAL TESTS		
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
MECHANICAL ENVIRONMENTAL TESTS		
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 cyles 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
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

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 802.3z 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)		
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 3164: Syslog RFC 2474: DiffServ Precedence RFC 3046: DHCP Relay Agent Information Option RFC 3580: 802.1x RADIUS RFC 4250-4252 SSH Protocol RFC 5424-5425: Syslog

Dimensions

Table 5. Standards and Management

PANEL MOUNT

DINRAIL MOUNT
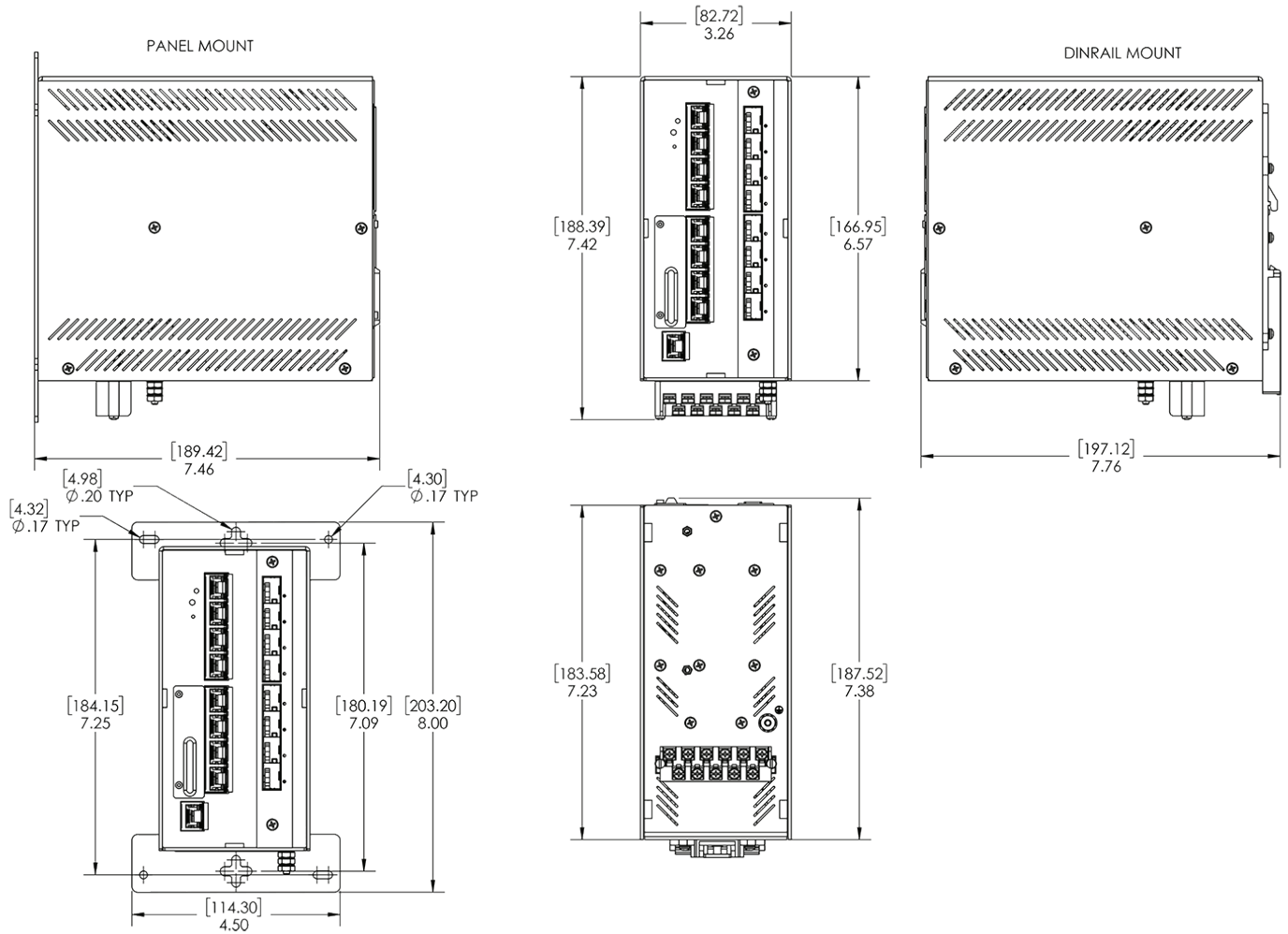
Terminal Block Options
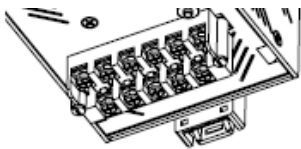
Lug Terminated Wire, Screw Terminal Block
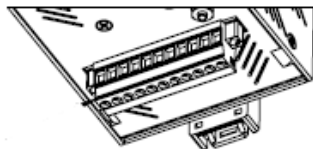
Raw Wire, Screw Terminal Block

iMR920 SYSTEM

MODEL	PS 1	PS 2	MOUNT	TERMINAL BLOCK	SLOT 1	SLOT 2	DESCRIPTION
iMR920	|	|	|	|	|	|	**Compact Ethernet Layer 2/3 Switch**
	HV	|	|	|	|	|	**Input 100-240VAC/VDC Nominal**
	MV	MV*	|	|	|	|	**Input 48VDC (36-72VDC)**
	LV	LV*	|	|	|	|	**Input 24VDC (10-36VDC)**
		XX	|	|	|	|	**None**
			D	|	|	|	**DIN Mount**
			P	|	|	|	**Panel Mount**
			X	|	|	|	**No Mount**
				L	|	|	**Lug Terminated wire, screw terminal block**
				W	|	|	**Raw Wire, screw terminal block**
					8GRJ45	|	**8x 10/100/1000BaseTX RJ45**
					8GSFP	|	**8x 100/1000Base-X SFP (Blank, optical transceivers not included)**
					4RJ4SFP	|	**4x 10/100/1000BaseTX RJ45 plus 4x 100/1000Base-X SFP (Blank, optical transceivers not included)**
						8GRJ45	**8x 10/100/1000BaseTX RJ45**
						8GSFP	**8x 100/1000Base-X SFP (Blank, optical transceivers not included)**
						4RJ4SFP	**4x 10/100/1000BaseTX RJ45 plus 4x 100/1000Base-X SFP (Blank, optical transceivers not included)**
						8SRJ45	**8x Serial RJ45 Interfaces, RS232/422/485**
						4DB09	**4x Serial DB9 Interfaces, RS232/422/485**
						iROC**	**iROC Industrial Computing Module (see system order codes)**
						2RBX	**HSR/PRP with support for 2 RedBoxes**
						XX	**None**

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.

iMR920 Sample Order Code

iMR920-HV-XX-D-L-8GRJ45-8GSFP

Description: *Micro*RAPTOR iMR920 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:

iMR920-HV-XX-D-L-8GRJ45-8GSFP-C1

Description: MicroRAPTOR iMR920 Layer 3 switch, HV power supply, DIN Mount , screw terminals for lug terminated wires, with 8-ports 10/100/1000TX RJ45, with a module foran additional 8-ports 100/1000Base-X SFP (transceivers not included). The iMR920 will be conformal coated.

iROC SYSTEM ORDER CODE

The iROC is an industrial computing module that will operate in slot 2 of the iMR920. The order codes below are used for ordering an iROC in an iMR920 system. The iROC is not field replaceable in the iMR920.

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
		W2	|	|	Windows® 11 Pro Operating System
		L1	|	|	Ubuntu Desktop v. 22.04.3 LTS
			2A	|	256GB Industrial SSD Storage
			5A	|	512GB Industrial SSD Storage
			1T	|	1TB Industrial SSD Storage
			2T	|	2TB Industrial SSD Storage
				XX	None

iMR920 Sample Order Code – iROC Example

iMR920-HV-XX-D-L-8GRJ45-iRC1L15AXX

Description: *Micro*RAPTOR iMR920 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 Ubuntu with 512GB storage.

SFPs Available for the iMR920

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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For more information, visit is5com.com

General Inquiries: toll free: +1 844-520-0588 | info@is5com.com
Technical support: +1 844-475-8324   (+1 844-iS5-TECH) | support@is5com.com
Address: 5895 Ambler Drive, Mississauga, Ontario, L4W 5B7, Canada