

# MICRO R A P T O R<sup>®</sup>

## iMR350 SERIES

Rack Mount 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* iMR350 is available with four factory configurable slots which will support up to 32-ports Ethernet. 10Gbps and serial options are also supported.

The iMR350 *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*<sup>®</sup>

FEATURE	BENEFIT
FLEXIBLE RACK MOUNT LAYER 3 SWITCH	The <i>MicroRAPTOR</i> iMR350 supports four factory configurable slots for communication interfaces Slot options include, 8-port 100Mbps/1Gbps SFP, 8-port 10/100/1000TX RJ45, 4-port 232/422/485 DB9 or 8-port RJ45 serial, 4-port 1/10Gbps SFP, 2 Redboxes HSR/PRP
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

Table 2. Common Specification

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 1588 precision timing protocol v2 with Power Profile, in transparent clock mode. Supported in slots 1, 2 and 3 for Ethernet Line modules. Supported in all slots for HSR/PRP line modules.
ALARM	Fault Contact: relay output to carry capacity of: <ul style="list-style-type: none"> <li>• 30VDC, 2A</li> <li>• 110VDC, 0.3A</li> <li>• 220VDC, 0.27A</li> <li>• 125VAC, 0.5A</li> <li>• 250VAC, 0.25A</li> </ul>
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	443.56 (W) x 414.95 (D) x 44.20 (H) mm (17.46 x 16.34 x 1.74) inches
WEIGHT	12.6lbs, 5.72kg
POWER	
REDUNDANT INPUT POWER	Dual Power Supplies available in any combination of 24VDC (Nom.), 48VDC (Nom.), and 100-240VAC/VDC (Nom.)
POWER CONSUMPTION	60 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)

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>	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

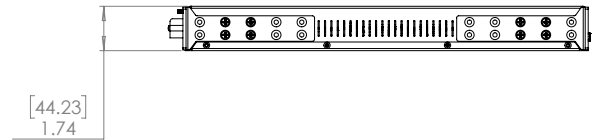
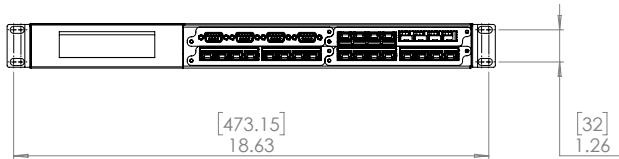
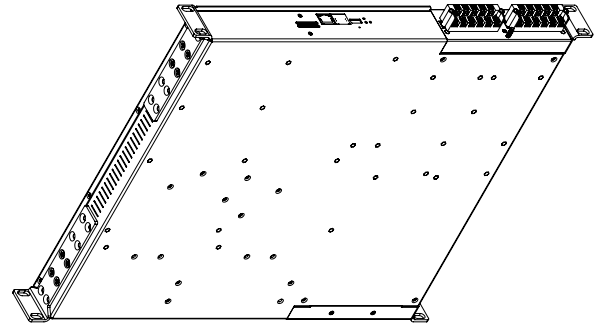
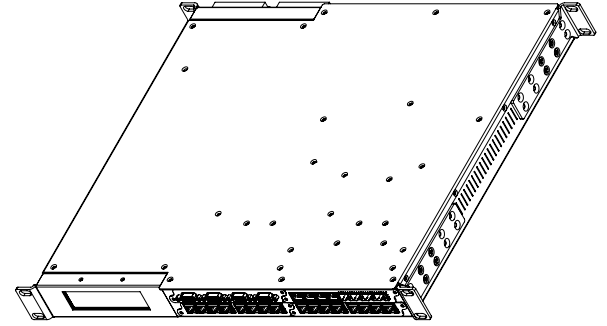
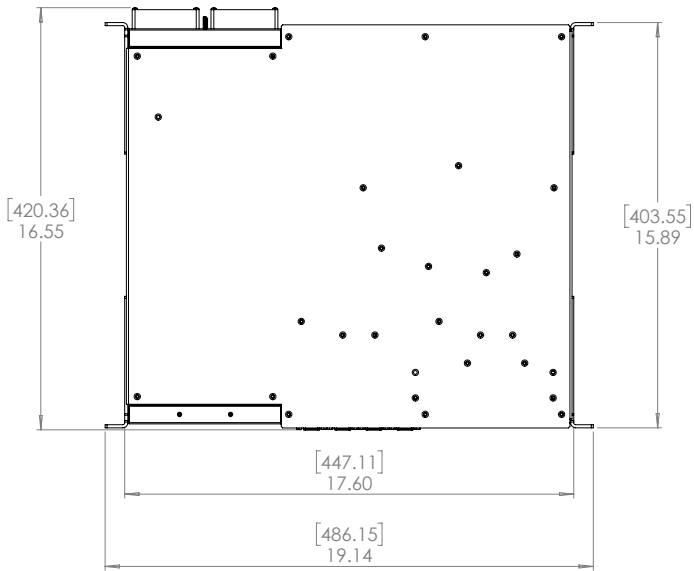
Table 5. Standards and Management

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 1643: Ethernet Interface MIB RFC 1757: RMON RFC 1901,1902-1907 SNMPv2 RFC 2068: HTTP RFC 2131, 2132: DHCP RFC 2236: IGMP v2 RFC 2273-2275: SNMPv3 RFC 2474: DiffServ Precedence	RFC 2571: SNMP Management RFC 1166: IP Addresses
	RFC 783: TFTP		RFC 3046: DHCP Relay Agent Information Option
	RFC 791: IPv4 protocol RFC 792: ICMP		RFC 3164: Syslog
	RFC 793: TCP		RFC 3376: IGMP v3
	RFC 826: ARP		RFC 3580: 802.1x RADIUS
	RFC 854: Telnet		RFC 4250-4252 SSH Protocol
	RFC 951: BOOTP		RFC 5424/5425: Syslog over TLS
	RFC 959: FTP		
	RFC 1157: SNMPv1		



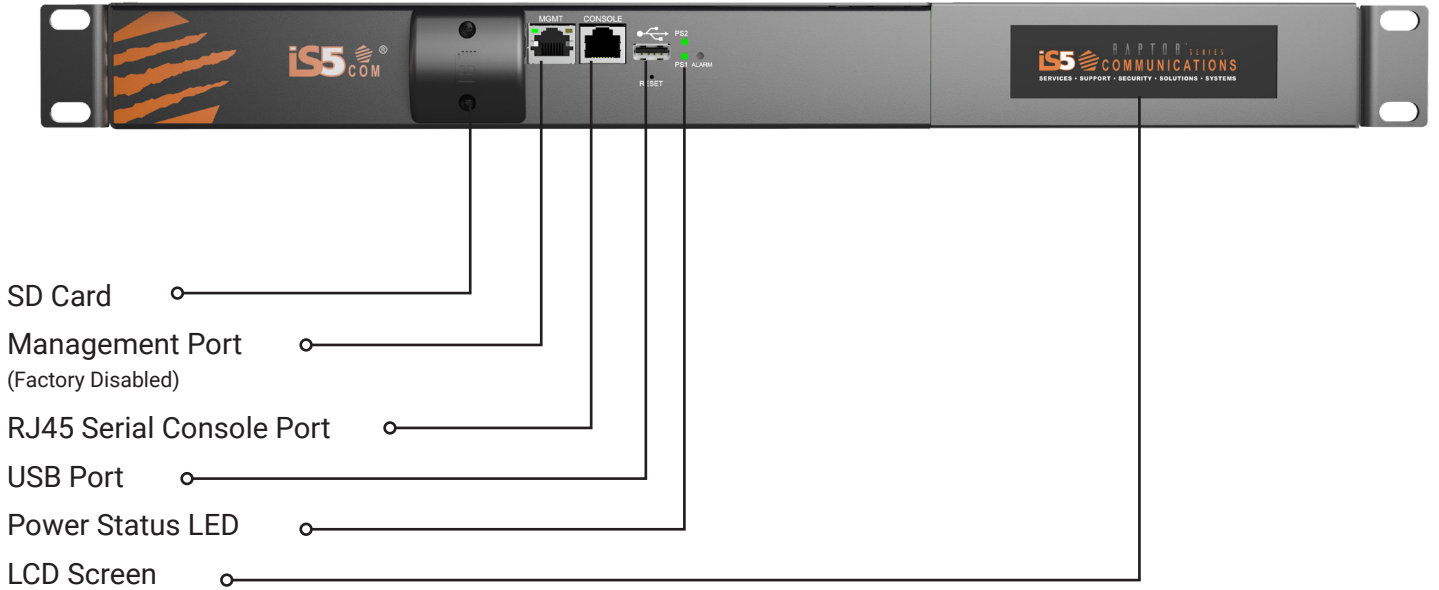
# Dimensions

All dimensions are shown in inches [millimeters].

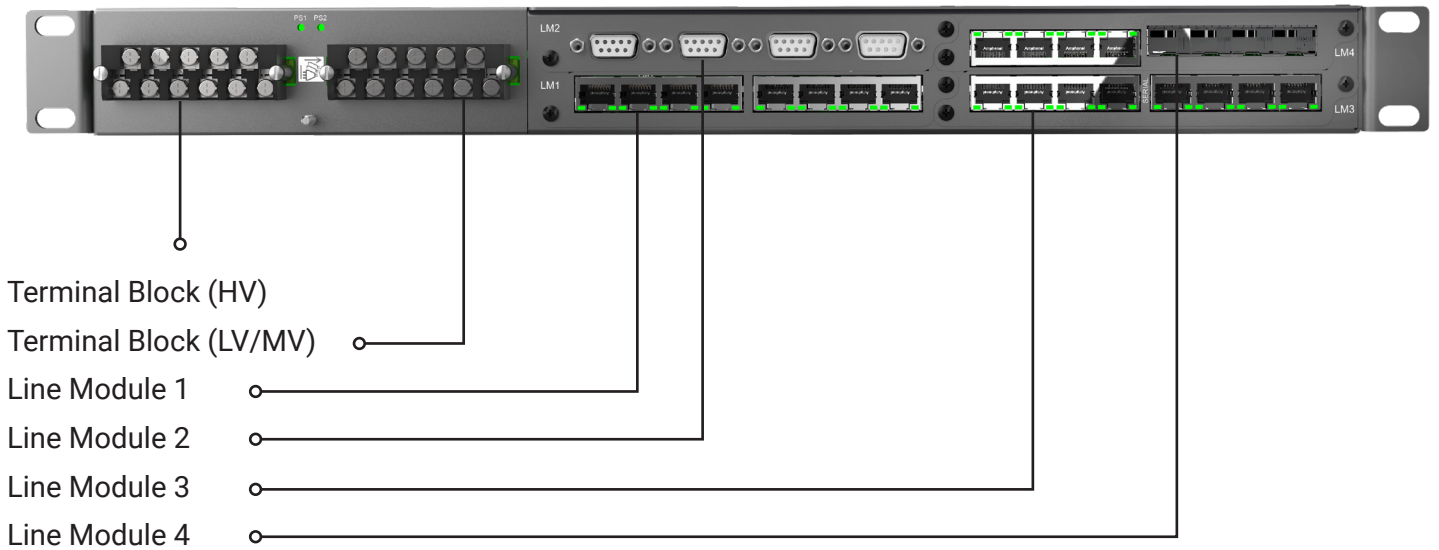


# Front Mount Option – Panel Elements

## CONSOLE PORT VIEW

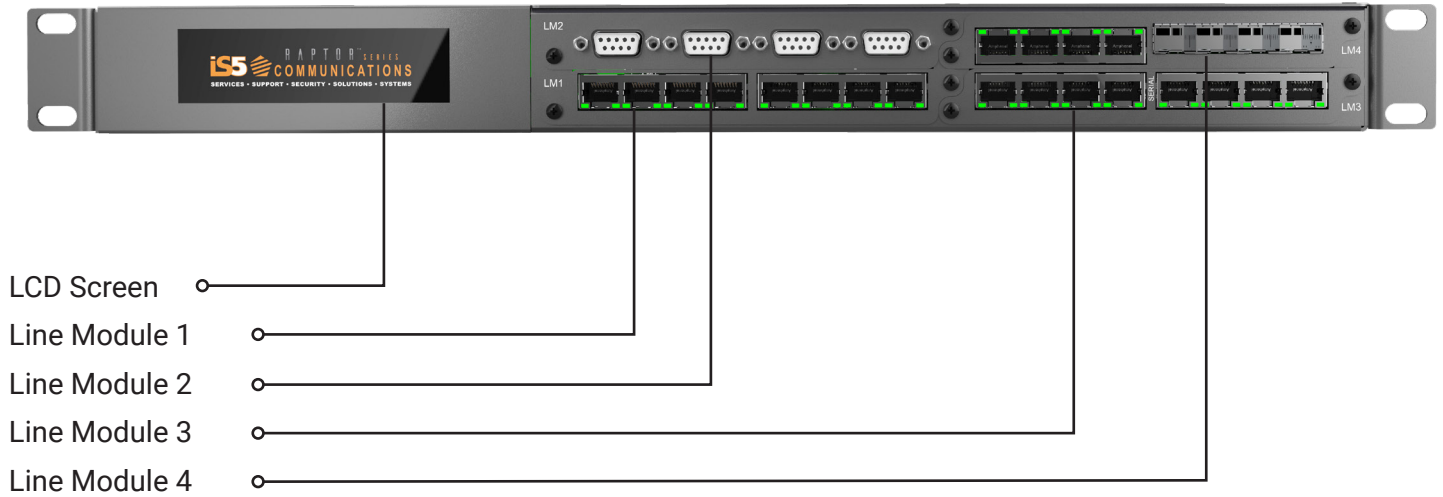


## COMMUNICATION PORT VIEW

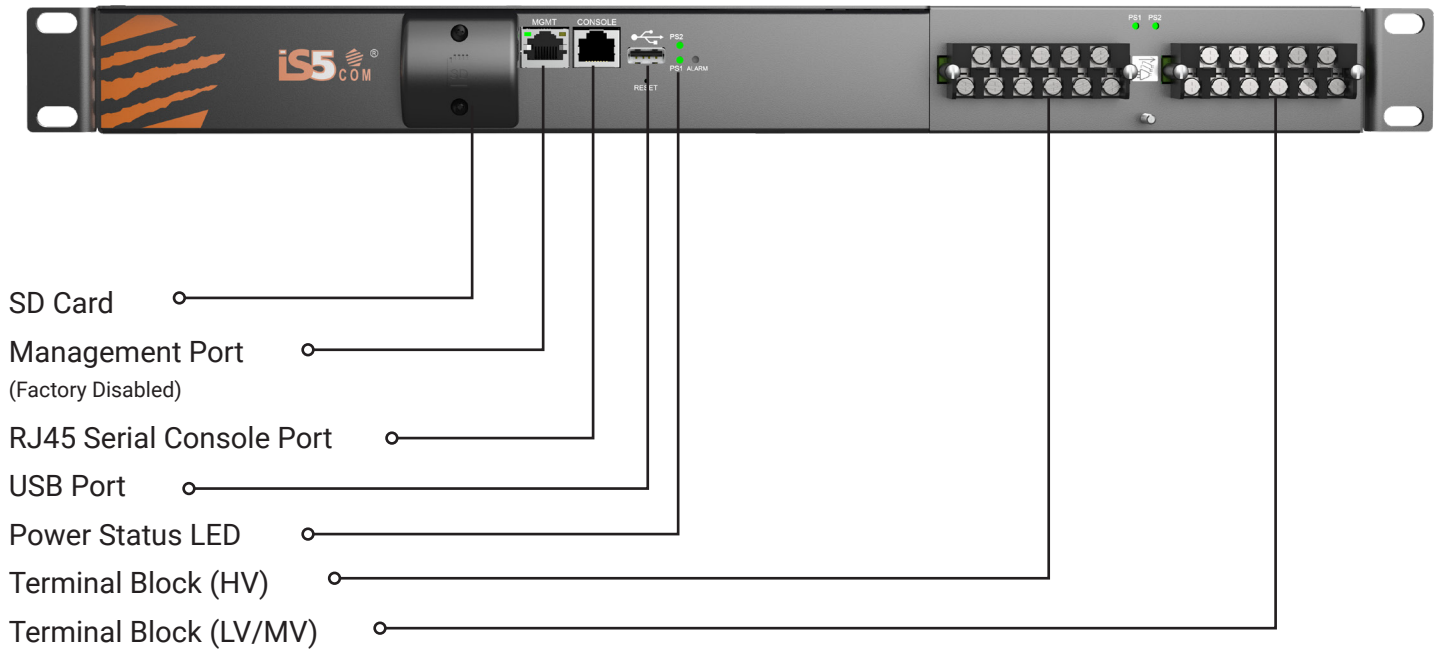


# Rear Mount Option – Panel Elements

## COMMUNICATION PORT VIEW



## CONSOLE PORT VIEW



# Ordering Information

## iMR350 SYSTEM

MODEL	PS 1	PS 2	MINT	LCD MOUNT	TERMINAL BLOCK	SLOT 1	SLOT 2	SLOT 3	SLOT 4	DESCRIPTION
iMR350										L2/L3 Switch
	HV	HV								HV Power Supply 100-240VAC/VDC Nominal
	MV	MV								MV Power Supply 48VDC Nominal, 36-72VDC Operational
	LV	LV								LV Power Supply 24VDC Nominal, 10-36VDC Operational
		XX								None
			R							Rack Mount Brackets
			P							Panel Mount Brackets
			X							None
				R						Rear facing terminal blocks next to management ports LCD Display next to line modules
				F						Front facing terminal blocks next to line modules LCD Display next to management ports
					L					Lug Connector Terminal Block
					W					Raw Wire Terminal Block
						8GRJ45	8GRJ45	8GRJ45	8GRJ45	8-port 10/100/1000BaseTX, RJ45 interface
						8GSFP	8GSFP	8GSFP	8GSFP	8-port 100/1000BaseX SFP blank slots, Transceivers not included
						4RJ4SFP	4RJ4SFP	4RJ4SFP	4RJ4SFP	4-port 10/100/1000BaseTX, RJ45 interface + 4-port 100/1000BaseX SFP blank slots, Transceivers not included
						8SRJ45	8SRJ45	8SRJ45	8SRJ45	8-port RS232/422/485 serial, RJ45 interface
						4DB09	4DB09	4DB09	4DB09	4-port RS232/422/485 serial DB9 connector type
						2RBX†	2RBX†	2RBX†	2RBX†	HSR/PRP with support for 2 RedBoxes
						XX	XX	XX	XX	Blank plate
									4TGSFP	4-port 10Gbps Base-X SFP blank slots, Transceivers not included

† Maximum one HSR/PRP module is supported per iMR350.

### iMR350 Sample Order Code

iMR350-HV-HV-R-F-L-8GSFP-8GSFP-4DB09-4TGSFP

Description: *MicroRAPTOR* iMR350 Switch, equipped with dual HV power supplies, Rack Mount Brackets, Front facing with the LCD next to the line modules and the terminal blocks next to the management ports, lug connector terminal block, 16-ports 100/1000BaseX SFP blankslots, 4-ports DB9 serial, and 4-ports 10Gbps Base-X SFP blank slots. No SFP transceivers are included.

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

iMR350-HV-HV-R-F-L-8GSFP-8GSFP-4DB09-4TGSFP-C1

## SUPPORTED SFPs FOR THE iMR350

ORDER CODE	DESCRIPTION	WORKS WITH		
		2RBX	4RJ4SFP   8GSFP	4TGSFP
SFP-SGMII-TX	100/1000Mbps TX RJ45 Transceiver 100m, -40°C to +85°C		●	●
SFP100-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	●	●	●
SFP10G-MM-300	SFP 10Gbps Multimode LC Transceiver 300m, 850nm, -40°C to +85°C			●
SFP10G-SM-10	SFP 10Gbps Singlemode LC Transceiver 10km, 1310nm, -40°C to +85°C			●
SFP1000BIDI1-SM-10	SFP 1Gbps Bi-Directional Singlemode LC Transceiver 10km, TX1310nm, RX1550nm, -40°C to +85°C	●	●	●
SFP1000BIDI2-SM-10	SFP 1Gbps Bi-Directional Singlemode LC Transceiver 10km, TX1550nm, RX1310nm, -40°C to +85°C	●	●	●

## ACCESSORIES

PART #	DESCRIPTION
1900-0032	Panel Mount Bracket Kit for the iMR350



**For more information, visit: [is5com.com](http://is5com.com)**

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