

R A P T O R[®]

iMX350

Intelligent Cyber Secure Platform



128
BIT
ENCRYPTION

CE FC

Product Overview

iMX350 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. The iMX350 has been designed for future scalability. Its modular system of field replaceable modules, hot-swappable power supplies, and its ability to run third party software applications makes it a very flexible platform for today and the future.

The RAPTOR iMX350 has been specifically designed to protect and secure critical infrastructures in the harsh environments found in utility and substation applications. It meets or exceeds the standards set out in IEC 61850-3 and IEEE 1613 for utility communication equipment in substation environments.

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Features and Benefits

Table 1. Common Specification

DESCRIPTION	
NUMBER OF SLOTS	Up to 4 slots
PORTS	
ETHERNET NETWORK PORTS	Slot #1- 3—supports up to 8 x 10/100/1000 RJ45s, or 8 x 100/1000 SFPs, up to 24-ports may be configured to support PoE, see below for details Slot #4—supports up to 4 x 10GB Base-X or 4x1GB Base-X Uplinks
SERIAL CONSOLE PORT	RS-232 in RJ-45 connector with console cable. 115200bps, 8, N, 1
USB PORT / SD CARD	USB 2.0 for software and configuration update
OTHER HARDWARE FEATURES	Modular chassis with hot-swappable modules Redundant hot-swappable power supplies

PRODUCT SPECIFICATIONS

TECHNOLOGY	
MAC TABLE	16K
PRIORITY QUEUES	8
PROCESSING	Store-and-Forward
SWITCH PROPERTIES	Switching latency : 7 μ s Switching bandwidth: 128 Gbps
JUMBO FRAME	Up to 9216 bytes

PHYSICAL CHARACTERISTICS	
ENCLOSURE	IP40 Satin Coat Steel
DIMENSIONS	486.15 (W) x 446.65 (D) x 44.36(H) mm (19.14 x 17.58 x 1.75 inches)
WEIGHT	9.8 kg (21.6 lbs.)

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)

POWER OVER ETHERNET (AVAILABLE ON PoE CONFIGURED iMX350)	
MAX PoE POWER FROM iMX350 SWITCH	720 Watts
MAXIMUM PoE POWER FROM 8GRJ45P LINE MODULE	240 Watts
POWER LEVELS AVAILABLE PER PORT	Default up to 30 Watts per port Two adjacent RJ45 ports may draw up to 60 Watts. For 60 Watt PoE, disable PoE on the neighboring port.
SLOTS WHERE POE IS SUPPORTED	Slots 1, 2, and 3
NOTES	Power over Ethernet is a factory configured option on the iMX350. It requires an external power supply to supply the power to PoE ports.

WARRANTY	
WARRANTY	5 years, (extendable option with additional terms)

Product Specifications

Table 2. RAPTOR® iBiome®

RAPTOR iBIOME FEATURES

- 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 time synchronization, Syslog, RADIUS authentication (IPv4), TACACS+ Authentication (IPv4)
- DHCP (Client, Server & Relay) for IPv4
- SNMP Proxy
- SSH v2.0 support on 128-bit
- Port Mirroring (Port Level Only)
- System Resource Monitoring (temperature and CPU speed)
- Multiple Level User Management (Admin, Guest, Tech), Syslog Server/Client
- MIB support (standard/proprietary), Routing MIB (standard and proprietary MIBs as specified in the product specification)
- Jumbo Frames support
- RSTP (IEEE 802.1D, 2004) /MSTP/PVRST+
- RSTP: BPDU load/attack prevention mechanism, verbose logs on the screen up for debugging level
- DHCP—Support for Option 82
- RMONv1
- IGMP v1, v2, v3 snooping—explicit Host Tracking and Fast Leave, Multicast Statistics (for control plane messages only)
- 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, RIPv2, OSPF)
 - VRRP v2/v3
- Unicast
 - OSPF
 - Proxy ARP
 - DHCP relay IPv4
- Multicast
 - IGMP (v1/v2/v3)
 - IPv4 multicast—PIM-SM
- IGMP Query
- Power over Ethernet, factory configurable option.

Product Specifications

Table 3. 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	Overtoltage 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		
EUROPE	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	
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	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

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; 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)
BURDEN FOR DC POWER SUPPLY	IEC 61850-3, clause 6.8.2	60W
INRUSH CURRENT	IEC 61850-3, clause 6.8.1.2/6.8.2.2	100VAC peak 15.4A ≤5ms 240VAC peak 32.4A ≤5ms 100VDC peak 19.4A ≤1ms 240VDC peak 52.8A ≤1ms 24VDC peak 131A ≤1ms 48VDC peak 262A ≤1ms
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.

Product Specifications

DESCRIPTION	SPECIFICATION	LEVEL
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
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 4. 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, Transparent Clock Operation with Power Profile IEEE 802.3af PoE Support - 15.4 Watts IEEE 802.3at PoE+ Support - 30 Watts IEEE 802.3bt PoE++ Support - 60 Watts		
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 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 3580: 802.1x RADIUS RFC 4250-4252 SSH Protocol

Front/Back Panel Elements

FRONT VIEW



1. SD CARD
2. Management Port
(Factory Disabled)
3. RJ-45 Serial Console Port
4. USB Port
5. Power Status LED
6. Power Supply 2 (PS2)
7. Power Supply 1 (PS1)

SD Cover is not shown

BACK VIEW

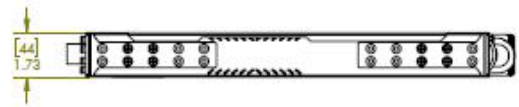
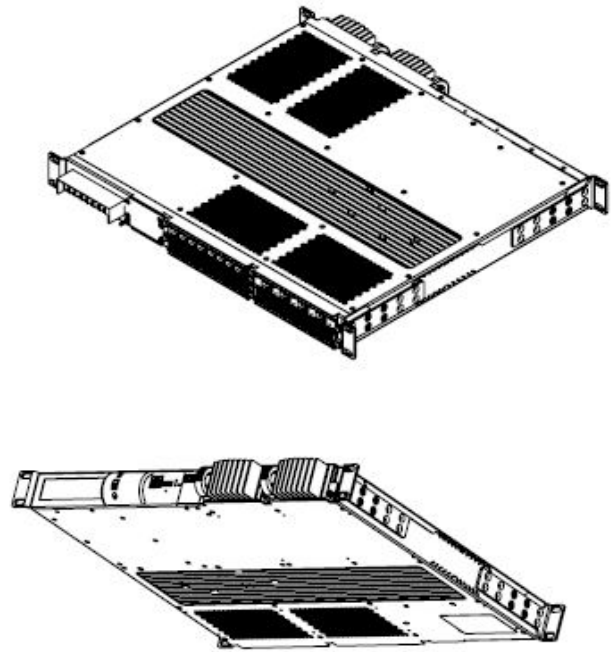
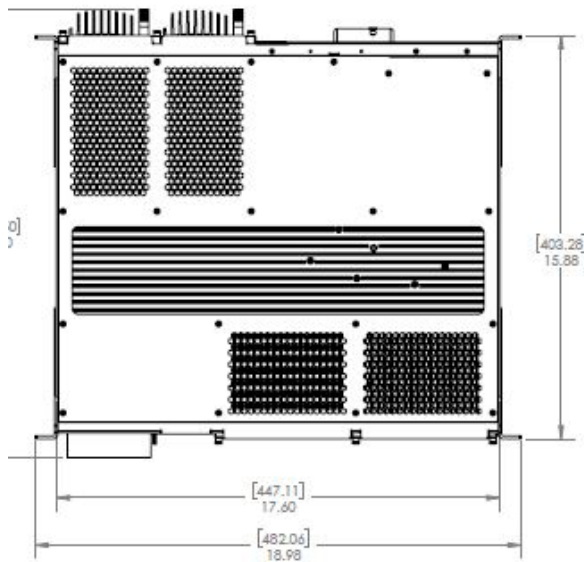


- Terminal Block
- Line Module 1
- Line Module 2
- Line Module 4

Line Module 3 is located underneath line module 4 and is not shown

Dimensions

All dimensions are shown in inches [millimeters].



SUPPORTED SFPs FOR THE iMX350

ORDER CODE	DESCRIPTION	WORKS WITH	
		iRM-8GSFP	iRM-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	●	
SFP100-SGMII-MM	SFP 100Mbps SGMII, 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	●	●

Ordering Information

iMX350 SYSTEM

MODEL	POWER SUPPLY 1	POWER SUPPLY 2	PoE SUPPORT	FUTURE USE	SLOT 1	SLOT 2	SLOT 3	SLOT 4	DESCRIPTION
iMX350									RAPTOR L2/L3 Switch
	HV	HV							HV Power Supply 100-240VAC/VDC Nominal, 85-264VAC or 88-300VDC Operational
	MV	MV							MV Power Supply 48VDC Nominal, 36-72VDC Operational
	LV	LV							LV Power Supply 24VDC Nominal, 10-36VDC Operational
		XX							Blank Power Supply Module
			XX						None
			P						PoE Capable chassis, Factory Configured
				XX					None
					8GRJ45	8GRJ45	8GRJ45		8-port 10/100/1000BaseTX, RJ45 Connector
					8GRJ45P*	8GRJ45P*	8GRJ45P*		8-port 10/100/1000BaseTX, RJ45 Connector, PoE Capable
					8GSFP	8GSFP	8GSFP		8-port 100/1000BaseX SFP blank slots, Transceivers not included
					BLK	BLK	BLK		Blank Module
								4TGSFP	4-port 1G/10G BaseX SFP blank slots, Transceivers not included
								BLK	Blank Module

Note: 8GRJ45P Option has a maximum operating temperature of +75°C

iMX350 Sample Order Code

iMX350-HV-XX-XX-XX-8RJ45-BLK-8GSFP-4TGSFP

Description: RAPTOR iMX350 Switch, equipped with a single HV power supply, an 8-port 10/100/1000BaseTX RJ45 module, a blank line module, an 8-port 100/1000BaseX SFP module with no transceivers, and a 4-port 1G/10G Base-X SFP module with no transceivers.

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

iMX350-HV-XX-XX-XX-8RJ45-BLK-8GSFP-4TGSFP-C1

Description: RAPTOR iMX350 Switch, equipped with a single HV power supply, an 8-port 10/100/1000BaseTX RJ45 module, a blank line module, an 8-port 100/1000BaseX SFP module with no transceivers, and a 4-port 1G/10G Base-X SFP module with no transceivers. This system will be conformal coated.

iMX350 Sample Order Code - PoE Example

iMX350-HV-XX-P-XX-8GRJ45P-8GRJ45P-8GRJ45P-4TGSFP

Description: RAPTOR iMX350 Switch with PoE Support, equipped with a single HV power supply, three 8-port 10/100/1000BaseTX RJ45 PoE Capable modules, and a 4-port 1G/10G Base-X SFP module with no transceivers. This switch will need external power supplies to supply power to the PoE line modules.

INDIVIDUAL MODULES

PART #	SLOTS 1 - 3 MODULES DESCRIPTION
iRM-BLK	Blank Module Slot 1-3
iRM-8GRJ45	MODULE - 8 X 10/100/1000Base-T(X) RJ45
iRM-8GRJ45P	MODULE - 8 X 10/100/1000Base-T(X) RJ45, Supports PoE
iRM-8GSFP	MODULE - 8 X 100/1000Base-X SFP (Blank slots, Transceivers not included)
PART #	SLOT 4 MODULES DESCRIPTION
iRM-BLK	Blank Module Slot 4
iRM-4TGSFP	MODULE - 4 X 1000Base-X SFP/10G-X SFP (Blank slots, Transceivers not included)

INDIVIDUAL MODULES FOR POWER SUPPLIES

PART #	POWER SUPPLY MODULES DESCRIPTION
iRM-PS-HV	MODULE – HV Power Supply Nominal Range: 100-240 VAC at 50/60 Hz / 100-240 VDC Operating Range: 85-264 VAC, 88-300VDC
iRM-PS-MV	MODULE – MV Power Supply Nominal Range: 48 VDC Operating Range: 36-72 VDC
iRM-PS-LV	MODULE – LV Power Supply Nominal Range: 24 VDC Operating Range: 10-36 VDC
iRM-PS-BLK	MODULE – Blank Power Supply This is a filler module, used to prevent damage to an otherwise unpopulated power module slot.

PoE EXTERNAL POWER SUPPLIES

PART #	MAX POWER	NOMINAL INPUT VOLTAGE	OUTPUT VOLTAGE	EXTERNAL PoE POWER SUPPLIES DESCRIPTION
1900-0015	240W	24VDC	56VDC	DIN Mount Power Supply
1900-0016	240W	48VDC	56VDC	DIN Mount Power Supply
1900-0017	240W	100-240 VAC 110-250 VDC	56VDC	DIN Mount Power Supply
1900-0018	480W	100-240 VAC 110-250 VDC	56VDC	DIN Mount Power Supply

Notes: PoE External Power Supplies support operating temperatures of -25°C to +70°C. Derating begins above +60°C. Power supplies may be wired in parallel to supply additional power to the PoE line modules.



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