

# 産業用イーサネットスイッチ

## ハイライト

- 過酷な産業環境と-40℃～75℃の高温下での運用をサポートする高耐久性スイッチ
- DINレール、ウォールマウント、ラックマウントオプションの各モデルを用意
- DINレールマウントスイッチ用の堅牢なIP30エンクロージャ
- DINレールスイッチとラックマウントスイッチの両方でファンレス動作
- IEEE 802.3af、802.3at、一部モデルで最大90W PoEを提供する802.3btを搭載し、PoEを柔軟にサポート
- すべてのスイッチモデルでサポートされるデュアルDC電源入力
- レジリエンス（回復力）の高いLACP、スパンニングツリーSTP、RSTP、MSTP、高速リングフェイルオーバー、G.8032 ERPSプロテクションオプションを備えたフルワイヤースピードレイヤ2
- Extreme Fabric Connectサービスへのセキュアで自動化された接続を実現する統合Fabric Attach機能
- CLIおよびウェブベースの設定サポート
- ExtremeCloud IQ - Site Engineベースのモニタリング



## 産業用ネットワークング

Extreme産業用スイッチは、過酷な環境や長時間の温度条件下でも動作するよう設計された、堅牢なレイヤ2スイッチファミリーです。継続的な稼働時間、管理性、運用効率を提供します。柔軟なIEEE 802.3af、802.3at、802.3btのPoEオプションは、ポートあたり最大90WのPoEをサポートし、各スイッチは、今日の電力消費の多い監視装置やWLANアクセスポイントに必要なパフォーマンスを提供します。

Extreme産業用スイッチは、インテリジェント交通システム、公共施設、スマートシティなどの産業環境に最適です。完全冗長リング技術により、業界標準技術に基づく高可用性でフォールト・トレラントなネットワークを構築します。

仮想化されたFabric Connectサービス内のエンドポイントとしてスイッチを迅速にマッピングできるFabric Attachソフトウェアベース機能により、Fabric Connect ネットワークに自動的に接続できます。

## インテリジェントで回復力のあるレイヤ2サービス

ISWスイッチは、スパンニングツリー（STP、RSTP、MSTP）、回復力のあるLACP、高度なイーサネットリングプロテクションプロトコルを含むインテリジェントなレイヤ2スイッチングを提供します。デュアルホーミングやバランシングチェーン機能とともに、シングル/デュアルリングなどの複数のリングトポロジーをサポートし、柔軟性と回復力の高い導入オプションを可能にします。信頼性の高いネットワークは、イーサネットアプリケーション、特に産業用ドメインにおいて非常に重要です。ISWシリーズ産業用マネージドイーサネットスイッチは、高速フェイルオーバーリングプロテクションを提供し、リンクロスやネットワークデバイスエラーが発生した場合でも、秒単位でのコンバージェンスを可能にし、シームレスなネットワーク運用を実現します。

## Fabric Attach

ISWシリーズのFabric Attach機能は、ExtremeのキャンパスベースのFabric Connectソリューションへの接続を自動化します。Fabric Attach機能により、ゼロタッチでエッジのプロビジョニングが可能になり、ISWスイッチはExtreme Fabric Connectインフラストラクチャの仮想化サービスと固有のセキュリティ機能を活用できます。

## フレキシブルPoE

ISWシリーズは、標準規格に準拠したIEEE 802.3af、802.3at、一部のモデルではIEEE 802.3btを搭載し、ポートあたり15W/30W/60W/90Wの柔軟なPoE（Power over Ethernet）機能を実現します。PoEは、産業用IoTデバイスや無線APに電力を供給するために必要な追加の電気配線や回路を不要にします。

## QoS

QoS（Quality of Service）機能により、時間遅延やネットワーク輻輳などの影響を受けにくいアプリケーションを犠牲にして、ミッションクリティカルなアプリケーションにネットワークリソースを割り当てることができます。特定の種類のトラフィックに優先順位を付け、それぞれのトラフィックに適切なQoSレベルが適用されるようにネットワークを設定できます。ISWスイッチは、ポートごとに8つの出力サービスクラス（CoS）キューを持つように設定でき、重み付けラウンドロビン（WRR）と絶対優先（Strict Priority）を組み合わせたスケジューリングをサポートします。

## セキュリティ

エッジセキュリティは、サードパーティのデバイスやホストをスイッチに接続する際に重要です。ISWシリーズは、ポート単位でMAC認証と802.1X EAP認証メカニズムの両方をサポートしています。ISWスイッチは、アクセス制御用にRADIUSとTACACS+の両方をサポートしています。

ACL（Access Control List）機能は、MACアドレス、IPアドレス、レイヤ4ポート、Type of Serviceに対するアクセス制御セキュリティをサポートします。拒否、許可、キューマッピング、CoS(Class of Service)マーキング、コピーフレームの5つのアクションがあります。デフォルトのACLルールは、許可または拒否に設定できます。

## External Interfaces

Part Number	Product Description	Interfaces
16801	ISW 4-10/100P, 2-10/100T, 2-SFP	4 x 10/100BASE-T PoE+ ports 802.3at (30W) ports 2 x 10/100BASE-T ports <ul style="list-style-type: none"> <li>• Full / Half Duplex (autosensing)</li> </ul> 2 x 100/1000BASE-X SFP uplink ports 1 x serial console Port (RJ45) Dual DC power input DIN rail mount
16802	ISW 8-10/100P, 4-SFP	8 x 10/100BASE-T PoE+ ports 802.3at (30W) ports 4 x 100/1000BASE-X SFP uplink ports 1 x serial console port (RJ45) Dual DC power input DIN rail mount
16803	ISW 4Gbp, 2Gbt, 2-SFP	2 x 10/100/1000BASE-T ports <ul style="list-style-type: none"> <li>• Full / Half Duplex (autosensing)</li> </ul> 4 x 10/100/1000BASE-T PoE+ ports 802.3at (30W) ports 2 x 100/1000BASE-X SFP uplink ports 1 x serial console Port (RJ45) Dual DC power input DIN rail mount
16804	ISW 8 GbP, 4-SFP	8 x 10/100/1000BASE-T PoE+ ports 802.3at (30W) ports 4 x 100/1000BASE-X SFP uplink ports 1 x Serial Console Port (RJ45) Dual DC power input DIN rail mount
ISW-4W-4WS-4X	ISW-12 802.3bt 4Gbp 4 Combo 4 SFP+	4 x 10/100/1000BASE-T Hi PoE+ ports 802.3bt (90W) ports 4 x 10/100/1000BASE-T Hi PoE+ ports 802.3bt (90W) ports shared with 4 x 100/1000BASE-X SFP ports 4 x 100/1000/10GBASE-X SFP+ uplink ports 1 x serial console port (RJ45) 1 x USB 2.0 Dual DC power input DIN rail mount
ISW-24W-4X	ISW-28 802.3bt 24Gbp 4 SFP+ 1RU	24 x 10/100/1000BASE-T Hi PoE+ ports 802.3bt (90W) 4 x 1000/10GBASE-X SFP+ uplink ports 1 x Serial Console Port (RJ45) 1 x 10/100/1000BASE-T out-of-band management port 1 x USB 2.0 Dual DC power input Rack mount

## Switch Technical Specifications

Specifications	16801, 16802, 16803, 16804	ISW-4W-4WS-4X	ISW-24W-4X
Operating Temperature	-40°C to +75°C	-40°C to +75°C	-40°C to +75°C
Mounting	DIN Rail, Wall Mount	DIN Rail, Wall Mount	Rack Mount*
Power Supply	Dual DC Input**, External PSU	Dual DC Input**, External PSU	Dual DC Input**, External PSU
Rated Input	12-56VDC (46-56V for IEEE 802.3af/at)	46-57VDC, max. 7.5A (52-57V for IEEE 802.3bt)	46-57VDC, max. 15A (52-57V for IEEE 802.3bt)
Qualified PSUs***	240W (16807) 480W (16920)	240W (16807) 480W (16920) 960W (ISW-AC-DC-PS-960W)	240W (16807) 480W (16920) 960W (ISW-AC-DC-PS-960W)
Fans	Fanless	Fanless	Fanless

\* Refer to Hardware Install Guide for required space clearances for installing rack mounted switch

\*\* Dual DC input offers power supply redundancy only and cannot be used for additive PoE power

\*\*\* ISW switches can also be powered by direct DC input available at deployment site, which match the rated input of the switches

## Power Supply Technical Specifications

Specifications	16807	16920	ISW-AC-DC-PS-960W
Operating Temperature	-25°C to +70°C	-25°C to +70°C	-30°C to +70°C
Mounting	DIN Rail	DIN Rail	DIN Rail
Rated Power	240W	480W	960W
Rated Input	100-240VAC, 50/60Hz, 2.6A	100-240VAC, 50/60Hz, 5A	200-240VAC, 50/60Hz, 6A
Rated Output	48VDC, 5A	48VDC, 10A	48 to 55Vdc (Voltage Adjustable), 20A
Derating	> 60°C de-rate power by 2.5%/°C	> 55 °C de-rate power by 1.33%/°C (100VAC) > 60 °C de-rate power by 2%/°C (230VAC)	> 50°C de-rate power by 2%/°C
Derated power @ 70°C	180W	384W	576

\* Same type PSUs must be used for redundancy

Note: It is recommended that the power supply output voltage be adjusted to 54V for best PoE performance.

## Dimensions

Part Number	Product Description	Dimensions (WxHxD) millimeters (mm)	Dimensions (WxHxD) inches (in.)
16801	ISW 4-10/100P, 2-10/100T, 2-SFP	77 x 154 x 128	3.0 x 6.0 x 5.0
16802	ISW 8-10/100P, 4-SFP	77 x 154 x 128	3.0 x 6.0 x 5.0
16803	ISW 4GbP, 2GbT, 2-SFP	77 x 154 x 128	3.0 x 6.0 x 5.0
16804	ISW 8 GbP, 4-SFP	77 x 154 x 128	3.0 x 6.0 x 5.0
ISW-4W-4WS-4X	ISW-12 802.3bt 4 GbP 4 Combo 4 SFP+	86 x 164 x 132	3.39 x 6.46 x 5.20

Part Number	Product Description	Dimensions (WxHxD) millimeters (mm)	Dimensions (WxHxD) inches (in.)
ISW-24W-4X	ISW-28 802.3bt 24Gbp 4 SFP+ 1RU	440 x 43.5 x 381	17.34 x 1.71 x 15.01
16807	ISAC-DS PS 240W	63 x 125.2 x 113.5	2.48 x 4.92 x 4.46
16920	ISAC-DS PS 480W	85.5 x 125.2 x 128.5	3.36 x 4.93 x 5.06
ISW-AC-DC-PS-960W	ISW AC-DC PS 960W DIN Rail	110 x 125.2 x 150	4.33 x 4.93 x 5.91

## Weights

Part Number	Product Description	Weight (kg)	Weight (oz)
16801	ISW 4-10/100P, 2-10/100T, 2-SFP	1.38	48.68
16802	ISW 8-10/100P, 4-SFP	1.44	50.79
16803	ISW 4Gbp, 2GbT, 2-SFP	1.38	48.68
16804	ISW 8Gbp, 4-SFP	1.44	50.79
ISW-4W-4WS-4X	ISW-12 802.3bt 4Gbp 4 Combo 4 SFP+	1.9	67.02
ISW-24W-4X	ISW-28 802.3bt 24Gbp 4 SFP+ 1RU	5.7	201.06

## Power Consumption

Part Number	Product Description	Minimum Power Consumption (W)*	Minimum Heat Dissipation (BTU/hr)	Maximum Power Consumption (W)**	Maximum Heat Dissipation (BTU/hr)
16801	ISW 4-10/100P, 2-10/100T, 2-SFP	15	51	142	75
16802	ISW 8-10/100P, 4-SFP	15	51	265	86
16803	ISW 4Gbp, 2GbT, 2-SFP	15	51	142	75
16804	ISW 8Gbp, 4-SFP	15	51	265	86
ISW-4W-4WS-4X	ISW-12 802.3bt 4Gbp 4 Combo 4 SFP+	31	106	397***	127
ISW-24W-4X	ISW-28 802.3bt 24Gbp 4 SFP+ 1RU	40	136	777***	195

\* Without PoE PD loading

\*\* Includes PoE load on all ports

\*\*\* Includes the power consumption by SFP/SFP+ optics at 1.5W per port

## PoE Budget\*

Part Number	Product Description	PoE Budget with 240W PSU	PoE Budget with 480W PSU	PoE Budget with 960W PSU
16801	ISW 4-10/100P, 2-10/100T, 2-SFP	120W	120W	not supported
16802	ISW 8-10/100P, 4-SFP	177W	240W	not supported
16803	ISW 4Gbp, 2GbT, 2-SFP	120W	120W	not supported
16804	ISW 8Gbp, 4-SFP	177W	240W	not supported
ISW-4W-4WS-4X	ISW-12 802.3bt 4Gbp 4 Combo 4 SFP+	161W	353W	360W
ISW-24W-4X	ISW-28 802.3bt 24Gbp 4 SFP+ 1RU	152W	344W	720W**

\* The table shows PoE budgets on a per PSU basis assuming 20% derating.

\*\* Max PoE load of 240W per group of 8 ports. Refer to the Hardware Installation Guide for more details.

## Performance and Scale

Part Number	Product Description	Port Counts							Aggregate Bandwidth	Forwarding Rate
		10/100 Base-T	10/100 Base-T PoE+	10/100/1000 Base-T	10/100/1000 Base-T PoE+	10/100/1000 Base-T (802.3bt Hi-PoE)	1000Base-X SFP	10GBase-X SFP+		
16801	ISW4-10/100P, 2-10/100T, 2-SFP	2	4				2		5.2Gbps	3.87Mpps
16802	ISW 8-10/100P, 4-SFP		8				4		9.6Gbps	7.14Mpps
16803	ISW 4Gbp, 2GbT, 2-SFP			2	4		2		16Gbps	11.90Mpps
16804	ISW8 Gbp, 4-SFP				8		4		24 Gbs	17.85Mpps
ISW-4W-4WS-4X	ISW-12 802.3bt 4Gbp 4 Combo 4 SFP+					4+[4]	[or 4]	4	96Gbps	71.4Mpps
ISW-24W-4X	ISW-28 802.3bt 24 Gbp4 SFP+ 1RU					24		4	128Gbs	95.2Mpps

## Software Scaling Values

Feature Scaling	16801, 16802, 16803, 16804	ISW-4W-4WS-4X	ISW-24W-4X
VLANs	4K	4K	2K
VLAN IDs	1-4095	1-4094	1-4094
MAC Table	8K	32K	32K
ARP Table	1K	4K	2K

Feature Scaling	16801, 16802, 16803, 16804	ISW-4W-4WS-4X	ISW-24W-4X
IPv4 Route Table	32	128	64
IP Interfaces	8	128	20
Access Control Entries	256	512	256
IGMP Groups	1024	1024	1024
Port Mirroring Groups	1	5	7

## Software Features

### L2 and Multicast

Flow Control IEEE 802.3x (Full Duplex) and Back-Pressure (Half Duplex)

Protocol-based VLANs and Port-based VLANs; MAC-based VLANs; IP Subnet-based VLANs\*

IEEE 802.1Q tag-based VLANs

IEEE 802.1ad Double Tagging (Q in Q)

IGMP v1, v2, v3 with up to 1000 multicast groups

IGMP snooping and querying

Immediate leave and leave proxy

Throttling and filtering

IEEE 802.1ab Link layer Discovery Protocol (LLDP)

\* MAC and subnet VLAN are not supported in the ISW-24W-4X model.

### Network Redundancy

Fast Failover Ring Protection with single and multiple rings, ring coupling, dual homing and chain modes

IEEE 802.1D STP, IEEE 802.1w RSTP, IEEE 802.1s MSTP

Static trunk or Dynamic via LACP (Link Aggregation Control Protocol)

ITU G.8032 Ethernet Ring Protection Switching (ERPS)

### Traffic Management and QoS

Priority - IEEE 802.1p QoS

Queues per port - 8

Scheduling - Strict, Weighted Round Robin

Port-based shaping

### Security

Port Security — IP and MAC-based access control, IEEE 802.1X authentication Network Access Control, RADIUS, and TACACS+ AAA (Authentication, Accounting and Authorization)

Storm Control — Multicast/Broadcast/Flooding Storm Control

### Management

CLI

GUI

SNMP v1, v2c, v3

Telnet

Dual Stack IPv4/ IPv6 for management

Management Security- HTTPS, SSH, RADIUS client for management

FTP/sFTP - Configuration Import/Export, Firmware Upgrade

SYSLOG

Per Port Mirroring

Ethernet Copper Diagnostics

Digital Diagnostics for SFP/SFP+ ports

DHCP- Client, Server, Relay, Snooping, Option 82

NTP

PoE scheduling, power control, PoE PD power consumption

### Supported MIBs

#### Standard MIBs

RFC 1213 MIB II

RFC 1215 A Convention for Defining Traps for Use with the SNMP

RFC 2613 SMON MIB: VLAN statistics and port copy

RFC 2674 VLAN MIB

RFC 2819 RMON (Group 1, 2, 3, and 9)

RFC 2863 Interface Group MIB using SMI v2

RFC 3411 SNMP Management Frameworks

RFC 3414 User-based Security Model for SNMPv3

RFC 3415 View-based Access Control Model for SNMP

RFC 3635 Ethernet -like MIB

RFC 3636 802.3 Medium Attachment Unit s (MAUs) MIB

RFC 4133 Entity MIB v3

RFC 4188 Bridge MIB

RFC 4292 IP Forwarding Table MIB

RFC 4293 Management Information Base for the Internet Protocol (IP)

RFC 4668 RADIUS Authentication Client MIB

RFC 4670 RADIUS Accounting MIB

RFC 5519 Multicast Group Membership Discovery MIB

IEEE 802.1MSTP MIB

IEEE 802.1AB LLDP MIB (LLDP MIB included in clause of standard)

IEEE 802.1X MIB (PAE MIB included in clause of standard)

IEEE 802.1Q Bridge MIB 2008

IEEE 802.3ad MIB (LACP MIB included in clause of standard)

#### Private MIBs\*

Access Management MIB

ACL MIB

AGGR MIB  
ARP Inspection MIB  
Authentication MIB  
Daylight Saving MIB  
DDMI MIB  
DHCP6 Client MIB  
DHCP Relay MIB  
DHCP Server MIB  
DHCP Snooping MIB  
DNS MIB  
EEE MIB  
ERPS MIB  
Firmware MIB  
GVRP MIB  
HTTPS MIB  
ICFG MIB  
ICMP MVR MIB  
ICMP Profile MIB  
ICMP Snooping  
IP MIB  
JSON RPC Notification MIB  
LACP MIB  
LLDP MIB  
Loop Protection MIB  
MAC MIB  
MEP MIB  
MSTP MIB  
NAS MIB  
NTP MIB  
POE MIB  
Port MIB  
Privilege MIB  
PSEC MIB  
QOS MIB  
SMI MIB  
SNMP MIB  
SSH MIB  
SYSLOG MIB  
System Utilities MIB  
Textual Convention MIB  
Users MIB  
VLAN MIB  
Voice VLAN MIB

\*Private MIB support varies based on switch model.

## Environmental Specifications

### Operating Temperature Range

-40°C to +75°C (cold startup at -40°C)

### Storage Temperature Range

-40°C to +85°C

### Humidity

5% to 95% relative humidity, non-condensing

### Vibration, Shock and Freefall Certifications

IEC 60068-2-6 (Vibration)

IEC 60068-2-27 (Shock)

IEC 60068-2-32 (Freefall)

### Transportation

NEMA TS 2-2016

### Railway

EN50121-1-2017

EN50121-4-2016

## Regulatory and Safety

### North American ITE

UL 60950-1

UL/CuL 62368-1 Listed

CSA 22.2 No. 60950-1 2nd edition 2014 (Canada)

Complies with FCC 21CFR 1040.10 (U.S. Laser Safety)

### European ITE

EN 62368-1

EN 60825-1 Class 1 (Lasers Safety)

2014/35/ EU Low Voltage Directive

### International ITE

CB Report & Certificate per IEC 60950-1

CB Report & Certificate IEC 62368-1

AS/NZS 60950-1 (Australia /New Zealand)

### EMI/EMC Standards

North American EMC for ITE

FCC CFR 47 part 15 Class A (USA)

ICES-003 Class A (Canada)

### European EMC Standards

EN 55032 Class A

EN 55035

EN 55011

EN 61000-3-2,2014 (Harmonics)

EN 61000-3-3 2013 (Flicker)

EN 300 386 (EMC Telecommunications)

2014/30/EU EMC Directive

### International EMC Certifications



CISPR 32, Class A (International Emissions)

AS/NZS CISPR32

CISPR 24 Class A (International Immunity)

IEC 61000-4-2 / EN 61000-4-2 Electrostatic Discharge, 6kV Contact (part# 16801-16804), 8kV Contact (ISW-4W-4WS-4X and ISW-24W-4X), 8kV Air (part# 16801-16804), 15kV Air (ISW-4W-4WS-4X and ISW-24W-4X), Criteria B

IEC 61000-4-3 / EN 61000-4-3 Radiated Immunity 10V/m, Criteria A

IEC 61000-4-4 / EN 61000-4-4 Transient Burst, 1 kV (part# 16801-16804), Criteria B

IEC 61000-4-5 / EN 61000-4-5 Surge, 2 kV L-L, 2 kV L-G, Level 3, Criteria B

IEC 61000-4-6 Conducted Immunity, 0.15-80 MHz, 10V/rms, 80%AM (1kHz), Criteria A

IEC/EN 61000-4-11 Power Dips & Interruptions, >30%, 25 periods, Criteria C

KCC Mark, EMC Approval (Korea)

BSMI (Taiwan)

Anatel (Brazil)

EAC (Russia, Belarus, Kazakhstan)

RoHS and WEEE

RoHS (Pb free) and WEEE compliant

**MTBF**

>25 years

## Country-Specific

ACMA RCM (Australia Emissions)

## Ordering Information

Part Number	Product Description	Product Description Details
16801	ISW 4-10/100P, 2-10/100T, 2-SFP	(8-Port model): 4-Port 30W PoE+ 10/100 2-Port 10/100 w/2-Port SFP dual DC power inputs, fanless
16802	ISW 8-10/100P, 4-SFP	(12-Port model): 8-Port 30W PoE+ 10/100 w/ 4-Port SFP dual DC power inputs, fanless
16803	ISW 4Gbp, 2Gbt, 2-SFP	(8-Port model): 4-Port PoE+ Gigabit, 2-Port Gigabit w/ 2-Port SFP / dual DC power inputs, fanless
16804	ISW 8Gbp, 4-SFP	(12-Port model): 8-Port 30W PoE+ Gigabit w/ 4-Port SFP / dual DC power inputs, fanless
ISW-4W-4WS-4X	ISW-12 802.3bt 4Gbp 4 Combo 4 SFP+	(12-Port model): 4 10/100/1000Base-T 90W 802.3bt ports, 4 combo ports supporting either 4 10/100/1000Base-T 90W 802.3bt OR 4 1000Base-X (SFP), plus 4 10GBase-X SFP+ ports dual DC power inputs, fanless
ISW-24W-4X	ISW-28 802.3bt 24Gbp 4 SFP+ 1RU	(28-Port Model): ISW Industrial Ethernet Switch 24 10/100/1000BASE-T 90W 802.3bt PoE ports, plus 4 10GBASE-X SFP+ ports dual DC power inputs, fanless, 1RU Note: This model does not support DIN Rail or Wall Mount options. It is a 1RU rack-mountable unit
16807	ISAC-DC PS 240W	ISAC-DC Power Supply 240W Output DIN Rail -25°C - 70°C
16920	ISAC-DC PS 480W	ISAC-DC Power Supply 480W Output DIN Rail -25°C - 70°C
ISW-AC-DC-PS-960W	ISW AC-DC PS 960W DIN Rail	ISW AC-DC Power Supply 960W Output DIN Rail -30°C – 70°C

## Warranty

All Industrial Switches and associated Power Supply Units are covered under Extreme Networks' product warranty policy. Universal switches are covered for a period of 5 years and Power Supply Units for a period of 1 year. For warranty details, visit: <http://www.extremenetworks.com/support/policies>

## Maintenance Services

Extreme's maintenance and support services with 100% in-sourced engineering experts and over 90% first-person resolution ensure efficient operation of your business- essential network. 24x7x365 phone support, advanced parts replacement, and on-site support augment your staff with experienced resources that help you mitigate critical network issues fast. Visit [Extreme Maintenance Services](#) for more information.

## Optics/Transceivers

For higher temperature operations, industrial grade optics will be required. For a list of the optics/transceivers supported on the Industrial Switch hardware, refer to our Extreme Optics Compatibility Tool at <https://optics.extremenetworks.com>

## Power Considerations

Industrial Switches and PSUs require field wiring and must be installed in accordance with local electrical codes by a licensed electrician. Please refer to the Safety and Installation Guide manual for more detailed information



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