PowerFlow-2

Managed Ruggedized Ethernet Switch with Power over Ethernet

- Compact Industrial and ruggedized Ethernet switches with up to 16 10/100/1000BaseT, and 8x100/1000BaseFX SFPs

- Flexible deployment scenarios using xSTP, ERPS and ultra-fast recovery with PF-Ring and PF-chain

- Advanced L2 functionality like policing and traffic management, as well as security features to assure User Authentication and Device Connection Control

- Variety of input voltage and POE feeding options including POE++

- Wide Operating Temperature

PowerFlow-2 are managed and unmanaged industrial grade Gigabit Ethernet switches designed to build packet-based operational networks of Critical Infrastructure verticals.

MARKET SEGMENTS AND APPLICATIONS

PowerFlow-2 applications include power utilities, railways, traffic controllers, and safe city applications, which require advanced Layer 2 functionality and in many cases are PoE intensive. PowerFlow-2 provide a variety of redundant functions to increase the reliability and deployment flexibility of the communications system, including variety of Ethernet functions, such as xSTP, G.8032 and ultra-fast recovery using PS-ring and PF-chain unique features. Dual DC inlets and variety of isolated power supply options address a wide range of installation scenarios.

Housed in rugged DIN rail or wall mountable enclosures, these switches are designed for harsh environments, such as industrial networking and intelligent transportation systems (ITS) and are also suitable for many military and utility market applications where environmental conditions exceed commercial product specifications. The wide operating temperature range models (-40°C to 75°C) fulfill the special needs of industrial applications.

INTEROPERABILITY

PowerFlow-2 is compatible with SecFlow-2 (RSTP, ERPS), Airmux, and PowerFlow-2-10G.

RESILIENCY

Ethernet Ring Protection

PowerFlow-2 supports STP, RSTP, MSTP, ITU-T G.8032 Ethernet Ring Protection Switching (ERPS), and PF-Ring for redundant cabling.

PowerFlow-2 provides five Ring instances, while each can support G.8032, PF-Ring, PF-Chain or Sub-Ring type for flexible uses. (Refer to *Installation and Operation manual* for more details).

PF-Ring can be established for Redundant Ethernet Ring, having recovery time <10ms with up to 250 units.

MANAGEMENT AND SECURITY

PowerFlow-2 can be managed using user-friendly web interface and CLI with textual database. It supports SNMPv3 and SSH using IPv4 or IPv6. Advanced L2 Ethernet functions (IGMP, VLAN, QoS) and security features (ACL, 802.1X) provide reliable secure communication. PowerFlow-2 can be conveniently managed centrally by RADview or other third-party SNMP managers.

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Specifications

CAPACITY

Max. Frame Size

Jumbo Frame: 9.6 KB

MAC Address Table

8K

ETHERNET

VLAN

IEEE 802.1q VLAN, up to 4094 ID

IEEE 802.1q VLAN, up to 4094 Groups

IEEE 802.1ad Q-in-Q

MAC-based VLAN, up to 256 entries

IP Subnet-based VLAN, up to 128 entries

Protocol-based VLAN (Ethernet, SNAP, LLC), up to 128 entries

VLAN Translation, up to 256 entries

MVR (Multiple VLAN Registration)
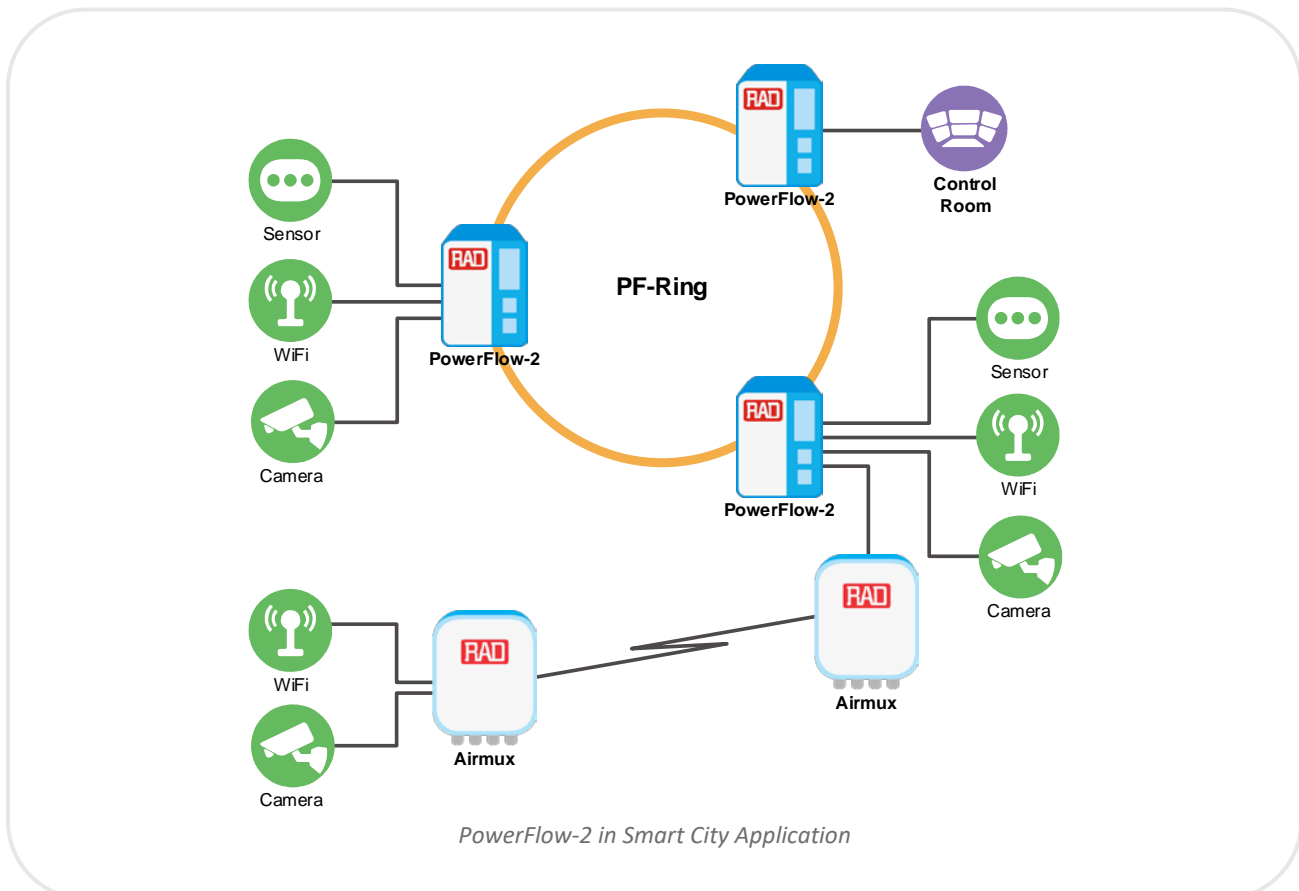
GVRP (GARP VLAN Registration Protocol)

MANAGEMENT

Control Port

RS -232 (RJ-45)

Management Options

- CLI
- Web-based
- SNMP
- Modbus/TCP

PowerFlow-2 in Smart City Application

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SECURITY

(Not applicable for PF-2/ETR/WRDC/ 1UTP/1PU ordering option)

RADIUS, TACAS+

HTTPS, HTTP

SSL / SSH v2

IEEE 802.1X

- Port-based
- MAC-based

ACL

- L2: MAC address SA/DA/VLAN
- L3: IP address SA/DA, Subnet
- L4: TCP/UDP

TIMING

(Not applicable for PF-2/ETR/WRDC/1UTP/1PU ordering option)

NTP, SNTP client

IEEE1588 PTP V2

Transparent Clock

POWER OVER ETHERNET (POE)

PoE: 802.3af

PoE+: 802.3at

RESILIENCY

Ethernet Ring Protection Switching (ERPS v2)

Convergence time <50ms

Single Ring, Sub-Ring, and Multiple ring topology network

Up to 5 instances of PF-Ring. PF-Chain or Sub-Ring

Link Aggregation

Static (Hash with SA, DA, IP, TCP/UDP port), up to 5 trunk group

Dynamic (IEEE 802.3ad LACP), up to 5 trunk group

DIAGNOSTICS

Alarm Relay

Relay outputs with current carrying capacity of 1 A @24VDC

Indicators

LED indicators

QUALITY OF SERVICE (QOS)

(Not applicable for PF-2/ETR/WDC/1UTP/1PU ordering option)

Class of Service

IEEE802.1p 8 active priorities queues for per port

Traffic Classification QoS

IEEE802.1p based CoS

IP Precedence based CoS

IP DSCP based CoS

QCL (QoS Control List): Frame Type, Source/Destination MAC, VLAN ID, PCP, DEI

QCE (QoS Control Entry): Protocol, Source IP, IP Fragment, DSCP, TCP/UDP port number

Bandwidth Control

Ingress

- Rate in steps: 1 kbps / Mbps / fps / kfps
- Range: 100 kbps to 1Gbps / 1fps to 3300kfps
- Rate Unit: bit or frame

Egress

- Rate in steps: 1 kbps / Mbps
- Range: 100 kbps to 1Gbps
- Rate Unit: bit
- Per queue / Per port shaper

DiffServ (RF 2474) Remarking

Storm Control

Unicast, Broadcast, Multicast

GOOSE Message

(for PF-2/ETR/WR/ 3SFP/8UTP/H)

Complies with IEC61850 standard to achieve zero packet loss

IGMP/MLD Snooping

(Not applicable for PF-2/ETR/WDC/1UTP/1PU ordering option)

- IGMP Snooping v1, v2, v3
- MLD Snooping v1, v2
- Port Filtering Profile
- Throttling
- Fast Leave

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Table 1. PowerFlow-2 Features

Specifications		PF-2/ETR/48VDC/ 3SFP/8PH PF-2/ETR/WDC/ 3SFP/8PH	PF-2/ETR/48VDC/ 3SFP/4PH4PAM	PF-2/ETR/48VDC/ 2SFP/4PU	PF-2/ETR/48VDC/ 8SFP/8UTP/8PH	PF-2/ETR/WR/ 3SFP/8UTP/H
Interfaces	10/100/1000Base-T interfaces	+	+	4	16	8
	FE/GbE SFP interfaces	3	3	2	8	3
	10/100/1000Base-T PoE+	8	8	+	8	-
	POE++ (60W per port)	-	-	4	-	-
	Airmux support	-	+	+	-	-
OAM and Diagnostics	Event Syslog	Syslog server	Syslog server	Syslog server	Syslog server	Syslog server
	Port Mirroring	+	+	+	+	+
	RMON I, RMON II	+	+	+	+	+
	Modbus/TCP	+	+	+	+	-
Manage-ment	CLI	+	+	+	+	+
	Web-based	+	+	+	+	+
	IPv6 Management	Telnet Server/ICMP v6, SNMP, HTTP, SSH, NTP/SNTP, TFTP, QoS, ACL				

Table 1. PowerFlow-2 Features *(Cont.)*

Specifications		PF-2/ETR/48VDC/ 1UTP/1PAM	PF-2/ETR/WDC/ 1UTP/1PU
Interfaces	10/100/1000Base-T interfaces	1	1
	FE/GbE SFP interfaces	-	-
	10/100/1000Base-T PoE+	1	+
	Airmux support	+	-
	POE++ (60W)	-	1
OAM and Diagnostics	Event Syslog	-	-
	Port Mirroring	-	-
	RMON I, RMON II	-	-
	Modbus/TCP	-	-
Manage-ment	CLI	-	-
	Web-based		
	IPv6 Management	-	-

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Table 2. Power, Physical, and Environmental Specifications

Specifications		PF-2/ETR/48VDC/3SFP/8PH PF-2/ETR/WDC/3SFP/8PH PF-2/ETR/48VDC/3SFP/4PH4PAM	PF-2/ETR/48VDC/8SFP/8UTP/8PH	PF-2/ETR/48VDC/2SFP/4PU	PF-2/ETR/WRDC/1UTP/1PU	PF-2/ETR/48VDC/1UTP/1PAM	PF-2/ETR/WR/3SFP/8UTP/H
Power	Power Supply	Dual inlet 48 VDC or WDC			Dual inlet 12/24/48VDC	Single inlet 48VDC	Wide range dual inlet 48VDC or single 110/220VAC/VDC
	Power Consumption	See Table 6			See Table 3	See Table 5	See Table 4
	Negative voltage power input support 1.1	+	+	+	+		-
Size	Height / cm(inch)	15.2 (5.9)	15.7 (6.2)	13.5 (5.3)	14.2 (5.6)	10.3 (4.1)	15.2 (5.9)
	Width / cm(inch)	7.2 (2.9)	9.1 (3.6)	6.25 (2.5)	3.16 (1.24)	3.0 (1.2)	8.2 (3.2)
	Depth / cm(inch)	10.6 (4.2)	11.6 (4.6)	10.6 (4.2)	10.6 (4.17)	7.0 (2.8)	10.6 (4.17)
	Weight / kg (lb)	0.86 (1.9)	1.38 (3.03)	0.7 (1.54)	0.425 (0.93)	0.215 (0.48)	1.085 (2.39)
Storage Temperature		-40 to +85°C (-40 to 185°F)					
Operating Temperature		-40 to +75°C (-40 to 167°F)*					
Humidity		5% to 95% (non-condensing)					

* Up to +85°C for model PF-2/ETR/WR/3SFP/8UTP/H for up to 12 hours

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Table 3.   PF-2/ETR/WRDC/1UTP/1PU Power Consumption

Input Voltage	Mode	Input Power Consumption	Device Power Consumption	PoE Power Budget	Boost Efficiency
24VDC	30W (2 Pair)	33W	1.4W	30W	94.90%
48VDC	30W (2 Pair)	33.2W	1.9W	30W	95.80%
24VDC	60W (4 Pair)	65.2W	1.4W	60W	94.10%
48VDC	60W (4 Pair)	64.7W	1.9W	60W	95.50%

Table 4.   PF-2/ETR/WR/ 3SFP/8UTP/H Power Consumption

Input Voltage	Consumption
110VAC	9.3W
220VAC	9.2W
24VDC	9.6W
48VDC	11.1W

Table 5. PF-2/ETR/48VDC/1UTP/1PAM Power Consumption

Input Voltage	Consumption
48VDC (2 pairs)	1.1W
48VDC (4 pairs)	2.8W

Ordering

RECOMMENDED CONFIGURATIONS

PF-2/ETR/48VDC/3SFP/8PH
Dual inlet 48VDC, three 100/1000Base-X SFP ports, eight 10/100/1000Base-T PoE+(240W)

PF-2/ETR/48VDC/8SFP/8UTP/8PH
Dual inlet 48VDC, eight 100/1000Base-X SFP ports, eight 10/100/1000Base-T ports, eight 10/100/1000Base-T PoE+ (240W) ports

PF-2/ETR/48VDC/2SFP/4PU
Dual inlet 48VDC, two 100/1000Base-X SFP ports, four 10/100/1000Base-T ports, per port configuration for PoE++ 60W (total 240W) or PoE+ support in AM (120W)

PF-2/ETR/WR/3SFP/8UTP/H
Wide range dual inlet 48VDC or single 110/220 VAC/VDC, three 100/1000Base-X SFP ports, eight 10/100/1000Base-T ports, compliant IEC61850-3 and IEEE1613

PF-2/ETR/WDC/3SFP/8PH
Dual inlet 24/48VDC, three 100/1000Base-X SFP ports, eight 10/100/1000Base-T PoE+(180W)

PF-2/ETR/48VDC/3SFP/4PH4PAM
Dual inlet 48 VDC, three 100/1000Base-X SFP ports, four 10/100/1000Base-T PoE+ ports, four 10/100/1000BaseT Airmux PoE (240W) ports

PF-2/ETR/WRDC/1UTP/1PU
Unmanaged, 12/24/48 VDC, one 10/100/1000Base-T port, one 10/100/1000Base-T PoE++ (72W) port

PF-2/ETR/48VDC/ 1UTP/1PAM
Unmanaged, 48VDC, one 10/100/1000Base-T port, one 10/100/1000Base-T PoE+ port (30W, Airmux support)

Table 6. Power Consumption for other Options

Device	Input Voltage	Total Power Consumption	Device Power Consumption	PoE Budget
PF-2/ETR/48VDC/3SFP/8PH				
PF-2/ETR/48VDC/8SFP/8UTP/8PH	48 VDC	255.2W	15.2W	240W
PF-2/ETR/48VDC/3SFP/4PH4PAM				
PF-2/ETR/WDC/3SFP/8PH	24 VDC	194.2W	10.8W	180W
	48 VDC	196.0W	11.5W	180W
PF-2/ETR/48VDC/2SFP/4PU	48 VDC	249.6W	9.6W	240W

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SPECIAL CONFIGURATIONS

Please contact your local RAD partner for additional configuration options

SUPPLIED ACCESSORIES

PF-CBL-RJ45-DB9
Console cable RJ-45 to DB-9

PF-2-TB
Terminal block for power input connector as per specific device

Mounting kits for installing PowerFlow devices on a DIN rail (depending on the device type):

PF-2-DIN-RAIL-KIT-50.5x30mm for PF-2/ETR/WRDC/1UTP/1PU

PF-2-DIN-RAIL-KIT-50.5x54mm for PF-2/ETR/48VDC/3SFP/8PH or PF-2/ETR/48VDC/2SFP/4PU

PF-2-DIN-RAIL-KIT-130x52mm for PF-2/ETR/48VDC/8SFP/8UTP/8PH

OPTIONAL ACCESSORIES

PF-CBL-RJ45-DB9
Console cable RJ-45 to DB9 for all devices

PF-2-WALL-MOUNT-KIT-184X30MM
Mounting kit for installing PF-2/ETR/WRDC/1UTP/1PU on a wall – 184 x 30 mm with 2 screws

PF-2-WALL-MOUNT-KIT-184X50MM
Mounting kit for installing PF-2/ETR/48VDC/3SFP/8PH or PF-2/ETR/48VDC/2SFP/4PU on a wall – 184 x 50 mm with 2 screws

PF-2-WALL-MOUNT-KIT-76X75MMX2
Mounting kit for installing PF-2/ETR/48VDC/8SFP/8UTP/8PH on a wall – 2 x 76 x 75 mm with 4 screws

PF-2-DIN-RAIL-KIT-50.5x30mm
Mounting kit for installing a PF-2/ETR/WRDC/1UTP/1PU device on a DIN rail – 50.5 x 30 mm with 3 screws

PF-2-DIN-RAIL-KIT-50.5x54mm
Mounting kit for installing a PF-2/ETR/48VDC/3SFP/8PH or PF-2/ETR/48VDC/2SFP/4PU device on a DIN rail – 50.5 x 54 mm with 3 screws

PF-2-DIN-RAIL-KIT-130x52mm
Mounting kit for installing a PF-2/ETR/48VDC/8SFP/8UTP/8PH device on a DIN rail – 130 x 52mm with 8 screws, Phoenix Contact

RM-DIN-SINGLE
Mounting kit for installing a DIN rail device on a 19/23-inch rack

RM-DIN-19
Mounting kit for installing multiple DIN rail devices on a 19-inch rack

PF-2-TB2
PowerFlow Terminal Block connector 2PIN for PF-2/ETR/WR/3SFP/8UTP/H

PF-2-TB6
PowerFlow Terminal Block connector 6PIN for all DIN rail type devices

PF-2-48V-DUAL-INPUTS-KIT
Terminal Block extension to enable dual-input of -48VDC

SFP Transceivers

SFP-2DH
Fast Ethernet/STM 1, DDM, internal calibration, industrially hardened, 1310 nm, single mode, laser, 15 km (9.3 mi)

SFP-6DH
Gigabit Ethernet, DDM, internal calibration, industrially hardened, 1310 nm, single mode, laser, 10.0 km (6.2 mi)

SFP-30H
Multirate 10/100/1000 copper SFP, industrially hardened, 100m (328 f)

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