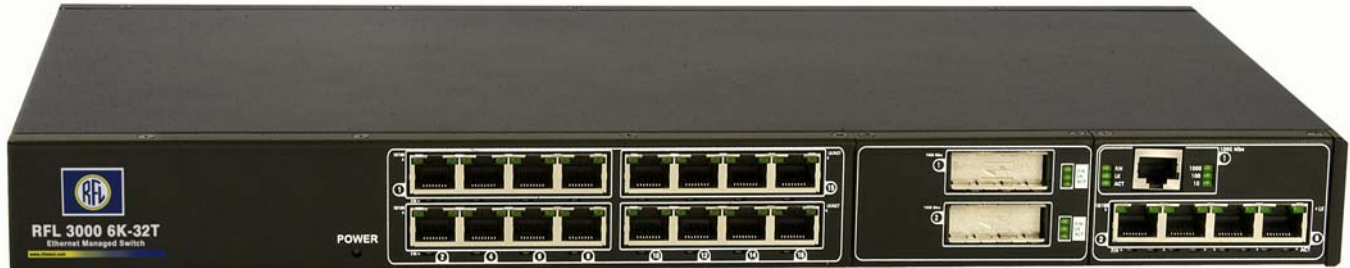




# **RFL 3000 6K-32T**

## **Ethernet Managed Switch**



### **Features**

- Provides 16 fixed copper ports and two modular slots for configuration flexibility of up to 4 GB ports or 32 total ports
- Dense 1U rack-mount package, NEBS compliant member of RFL 3000 6K-32T family
- Two modular slots for combinations of Gigabit, fiber at 100Mb and 10 Mb, and more 10/100 copper ports
- Non-blocking wire speed performance on all ports, 802.1p QoS prioritization
- Options include 24VDC, -48VDC, 125VDC power, dual source, or AC, ETS and 23" Telco rackmount brackets
- IEC 61850 and IEEE 1613 compliant

### **Description**

With the increasing design of Ethernet Communication ports on newer equipment, power utilities are more and more turning to networking solutions for their substations using Industrial Ethernet equipment because of their high reliability and emphasis on standards, which translates into lower cost and more flexibility.

With the modular versions of hardened Ethernet switches such as the RFL 3000 6K-32T that provide a mix of noise-immune fiber and convenient copper ports as well as 10 MB and 100 Mb speeds, Ethernet LAN applications are allowed to be designed into substations where control and instrumentation equipment and connection techniques are evolving and changing rapidly.

The RFL 3000 6K-32T Managed Switch offers up to 32-ports in a 1U rack-mount package, ideal for substation applications that require high-port density. The RFL 3000 6K-32T provides 16 fixed 10/100 Mb copper ports plus two configurable slots. The modular slots provide the flexibility to configure up to sixteen 100 Mb fiber ports, and/or some 10 Mb fiber ports, and/or one to four Gigabit ports, or more copper ports. Standard GBIC ports can be configured for a variety of Gigabit fiber cabling types and distances. A reverse rack-mounting and convection cooling option (6K-32TRC) is available on the RFL 3000 6K-32T.

RFL 3000 6K-32T Managed Switches come with LAN software support including SNMP management, Secure Web Management, redundant LANs support, and many network management security and ease-of-use features.

High performance hardware features include non-blocking wire speed on all ports and 802.1p QoS Traffic Prioritization. RFL 3000 6K-32T Managed Switches are "plug-and-play" ready for use as backbone switches where a mix of bursty data traffic and priority streaming traffic for VoIP and audio/video applications is present.

RFL 3000 6K-32T Managed Switches are ideal for building a switched network infrastructure when used in applications connected to communications computers, routers, hubs, or other switches. Designed for use in Carrier Ethernet and Industrial networks with segments requiring multiple Gigabit backbone interconnections among network centers, the RFL 3000 6K-32T is easy to install and operate. Addresses of attached nodes are automatically learned and maintained, adapting the switching services to network changes and expansions to provide plug-and-play operation.

RFL 3000 6K-32T Managed Switches have rugged metal cases and auto-ranging power supplies for operation with standard AC power worldwide. Internal DC power supplies are optional. The RFL 3000 6K-32T Managed Switches are designed and manufactured in the USA and backed by a three year warranty.



## Performance

**RJ-45 Ports:** 100 or 10 Mb speed, full- or half-duplex mode, per port, individually determined, 10/100 auto-negotiating & auto-cross, 32 ports maximum

**Gigabit Ports, 1000 Mb:** Configurable, std.

**Fiber Ports, 100 Mb (multi-mode and single-mode):**

Configurable in the module, SFF (Small Form Factor) featured for high fiber port density, up to 8 total per module, each FDX or HDX, default is FDX mode

**Fiber Ports, 10 Mb:** Configurable, up to 4 ST ports max. per module, multi-mode or single-mode. Each port may be FDX or HDX, default is HDX

**All Ports non-blocking**

**Processing type:** Store and Forward with IEEE 802.3x full-duplex flow control System aggregate forward and filter rate: 8.3Mpps (16 ports @ 100Mb speed FDX and 4 ports @ Gb speed FDX)

**Address table:** 4K nodes, self-learning, with address aging

**Packet buffers:** 960KB

**Latency:** 6 $\mu$ s + packet time max (TX - TX, TX - FX, FX - FX, TX-G, G-G)

## Network Standards

**IEEE 802.3z, 802.3ab, 802.1p:** 100BASE-TX, -FX, 1000BASE-SX, -LX

Auto-negotiation and auto-crossover on TP, IEEE 802.3u.

## Operating Environment

**UL 60950 "Component Parts" temperature rating:** 130°F (55°C)

**IEC 60068 "Type Test" rating:** -40° to 185°F (-40° to 85°C)

**Storage:** -40° to 185°F (-40° to 85°C),

**Ambient relative humidity:** 5% to 95% (non-condensing)

**Altitude:** -200 to 13000ft (-60 to 4000m)

## Relay Contacts for Alarms (optional)

Form C, one NC indicating internal power, one NC software controllable

## Network Cable Connectors

**1000 Mb ports:** standard GBICs supported

**100 Mb Copper:** Category 5 UTP/STP; 10 Mb: Cat. 3,4, 5 UTP/STP

**100 Mb Fiber ports connector options:** multi-mode FX-MTRJ, LC, ST, SC; single-mode LC, 20Km SC, and 40Km "long reach" single-mode SC

**10 Mb Fiber port connector:** multi-mode and single-mode ST

## Power Supply (internal)

**AC Power Connector:** IEC-type, male recessed, ON/OFF switch (optional)

**Power Input, AC:** 100 to 240 VAC, 47 to 63 Hz (auto ranging)

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**Power Consumption:** 45 watts typical with two fully-loaded fiber modules, 30 watts typical for a copper-only 24-port model

## DC Power Supply Options

**-48VDC:** Input -36 to -70VDC

**24VDC:** Input 20 to 40VDC

**125VDC and 110VDC nominal:** Input 88 to 300VDC

**Std. Terminal Block:** "-", GND, "+"

**Power Consumption:** Same as AC

## DC Dual Power Source (optional)

RFL 3000 6K-32T model may be ordered with optional Dual DC power input, for continuity of operation when either one of the DC input sources is interrupted. Available for -48VDC, 24VDC, or 125VDC

## Mechanical

**Enclosure:** Rugged high-strength sheet metal. Suitable for 1U rack-mounting or stand-alone.

**Rack-mounting brackets:** 19" included; ETSI and 23" Telco optional.

**Cooling Method:**

6K-32T Fan cooled, internal @ 25cfm

6K-32TRC Convection Cooling (*optional*)

**Dimensions:** 1.70 in. H x 17.0 in. W x 9.0 in. D (4.32 cm H x 43.2 cm W x 22.9 cm D)

**Weight:** rack-mount 5.0 lbs. (2.0 kg)

## LED Indicators Per RJ-45 Port

**LK:** On when twisted-pair link is operational

**ACT:** Blinking with port activity

LK and ACT combined on fixed ports

**FDX/HDX:** ON = full-duplex mode, OFF = half-duplex mode

100/10 ON = 100Mb speed, OFF = 10Mb

## LED Indicators (100Mb and 10Mb Fiber Ports)

**LK:** Steady on when fiber link is operational

**ACT:** On with port activity, FDX/HDX

## Port Specific Settings

Port-specific user settings (such as FDX or HDX, and copper 10/100 speed) can be set using software commands

The RJ-45 copper ports are auto-negotiating and auto-crossover, there are no user controls for auto-crossover

## Agency Approvals/Standard Compliance

UL Listed (UL60950), cUL, CE, Emissions meet FCC Part 15, Class A

RFL 3000 6K-32T

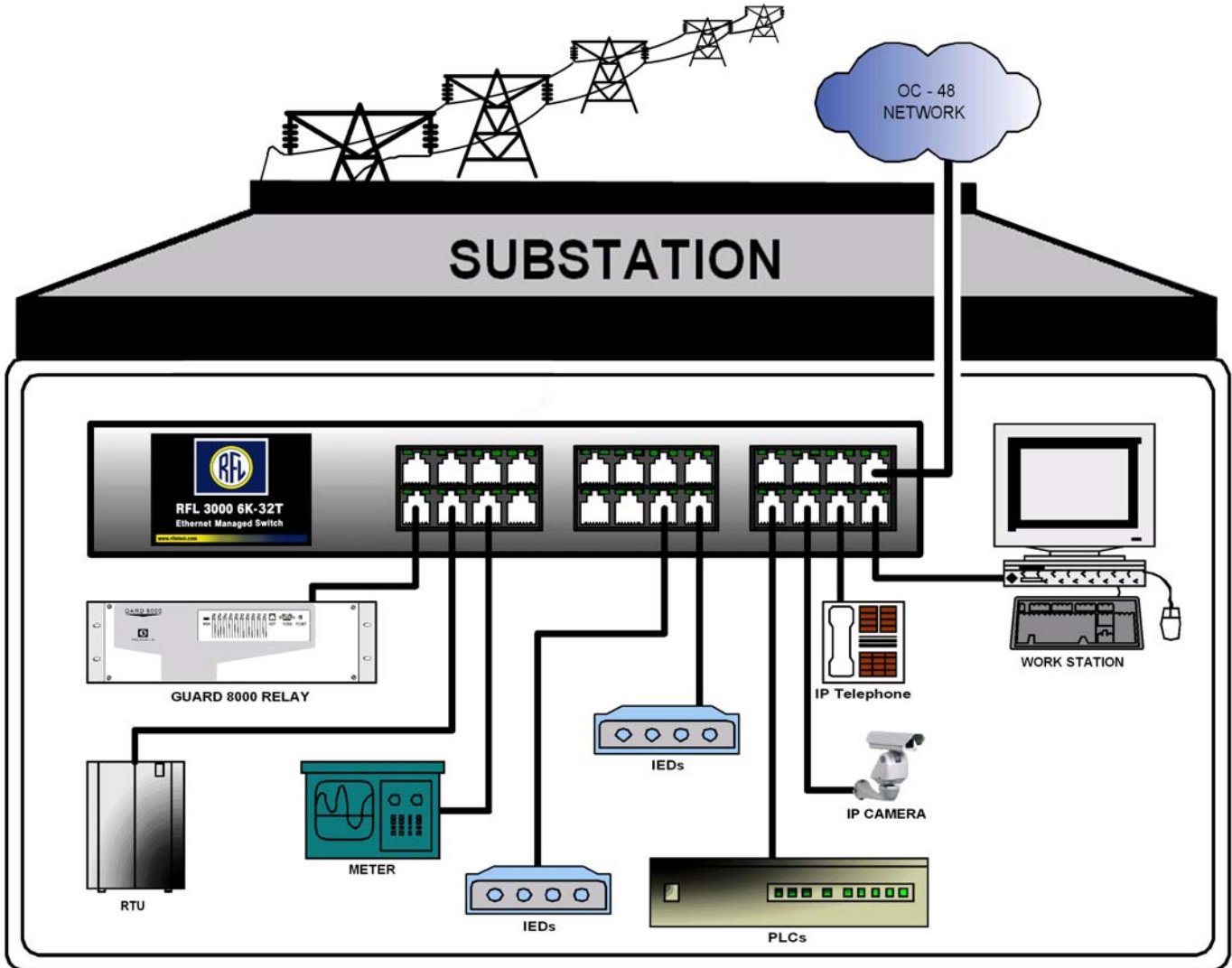


## Agency Approvals/Standard Compliance (cnt'd)

NEBS Level 3 and ETSI Compliant for Carrier Central Offices

IEEE 1613 Environmental Standard for Electric Power Substations

IEC 61850 EMC and Operating Conditions Class C for Power Substations



## Application Notes

Above is an example of a typical Ethernet communications application in the substation. Ethernet communications for equipment such as RTUs, Meters, Relays, IP Telephones and IP Cameras, (which requires high reliability, dual DC power supplies for redundancy and Ethernet media configuration flexibility) are currently being deployed into new and existing substations for the control and communications workhorse of each substation.

## RFL 3000 6K-32T Ethernet Managed Switch Ordering Information

		Slot A	Slot B	Slot A	Slot B	Slot A	Slot B	Slot A	Slot B
RFL Smart Number Description (fill in blanks)	<b>6K32T</b>								
<b>RFL 3000 6K-32T Ethernet Managed Switch Base Unit w/ 16 fixed 10/100 Mb RJ-45 Ports</b>									
6K32T 1U Chassis with Auto Ranging 100 - 240 VAC Power Supply	A								
6K32TRC (Rear Ports & Convection Cooling) 1U Chassis with 100 - 240 VAC P.S.	B								
6K32T-24VDC 1U Chassis with 24 VDC P. S.	C								
6K32TRC-24VDC (Rear Ports & Convection Cooling) 1U Chassis with 24 VDC P.S.	D								
6K32T-48VDC 1U Chassis with 48 VDC P. S.	E								
6K32TRC-48VDC (Rear Ports & Convection Cooling) 1U Chassis with 48 VDC P.S.	F								
6K32T-125VDC 1U Chassis with 125 VDC P. S.	G								
6K32TRC-125VDC (Rear Ports & Convection Cooling) 1U Chassis with 125 VDC P.S.	H								
<b>Optional Redundant DC P.S.</b>									
None	0								
24 VDC Redundant Power Supply	1								
48 VDC Redundant Power Supply	2								
125 VDC Redundant Power Supply	3								
<b>Optional Alarm Terminal Block</b>									
None	0								
ALARM TERMBLK: Alarm Contacts Two NC Form C, 1 for Power & 1 Software Controlled	1								
<b>10/100/1000 Port Modules Selection for slot A &amp; B</b>									
None		A							
6KP8-MTRJ SFF Fiber Module w/ eight 100Mb 2km Multi-mode FX MT-RJ Conn.		B							
6KP8-MLC SFF Fiber Module w/ eight 100Mb 2km Multi-mode FX LC Conn.		C							
6KP8-SLC SFF Fiber Module w/ eight 100Mb 15km Single-mode FX LC Conn.		D							
6KP8-RJ45 TP Module w/eight 10/100Mb Auto-negotiating RJ-45 Ports		E							
6KP8-45-2MT "6+2" module w/ six 10/100 RJ-45 and two 100 Mb 2km M.M. MTRJ Conn.		F							
6KP8-45-2SLC "6+2" module w/ six 10/100 RJ-45 and two 100 Mb 15km S.M. FX LC Conn.		G							
6KP8-45MT "4+4" module w/ four 10/100 RJ-45 and four 100 Mb 2km M.M. MTRJ Conn.		H							
6KP8-45MLC "4+4" module w/ four 10/100 RJ-45 and four 100 Mb 2km M.M. FX LC Conn.		I							
6KP8-45SLC "4+4" module w/ four 10/100 RJ-45 and four 100 Mb 15km S.M. FX LC Conn.		J							
6KP6-RJMST "4+2" module w/ four 10/100 RJ-45 and two 100 Mb 2km M.M. FX ST Conn.		K							
6KP6-RJMSC 4+2" module w/ four 10/100 RJ-45 and two 100 Mb 2km M.M. FX SC Conn.		L							
6KP6-RJSSC 4+2" module w/ four 10/100 RJ-45 and two 100 Mb 20km S.M. FX SC Conn.		M							
6KP6-RJSSCL 4+2" module w/ four 10/100 RJ-45 and two 100 Mb 40km S.M. FX SC Conn.		N							
6KP6-MT10ST 4+2" module w/ four 10/100 MTRJ fiber and two 10 Mb 2km FL ST Conn.		O							
6KP6-RJ10ST 4+2" module w/ four 10/100 RJ-45 fiber and two 10 Mb 2km FL ST Conn.		P							
6KP4-FXSC "2+2" 100Mb Fiber Module w/ four 100 Mb 2km FX SC Conn.		Q							
6KP4-FXST "2+2" 100Mb Fiber Module w/ four 100 Mb 2km FX ST Conn.		R							
6KP4-F10ST "2+2" 10Mb Fiber Module w/ four 100 Mb 2km FL ST Conn.		S							
6KP4-FLSTFX "2+2" ST Fiber Module w/ two 10 Mb FL and two 100 Mb FX Ports		T							
6KP2-2GSX Two-port one slot Gigabit 6K module with two Gigabit Fiber SXSC (1000BASE-SX M.M.) ports.		U							
6KP2-2GCU Two-port one slot Gigabit 6K module with two Gigabit Copper (1000BASE-T) ports.		V							
6KP5-1CU4RJ Five-port one slot Gigabit 6K module with one Gigabit Copper (1000BASE-T) ports and four 10/100 RJ-45 Ports.		W							
6KP5-1CU4MT Five-port one slot Gigabit 6K module with one Gigabit Copper (1000BASE-T) ports and four 100Mb MTRJ Fiber FX M.M. Ports.		X							
6KP3-1CU2FXT Three-port one slot Gigabit 6K module with one Gigabit Copper (1000BASE-T) ports and two 100Mb ST Fiber FX M.M. Ports.		Y							
6KM-BLNC Blank Cover for module slot opening		Z							
<b>Gigabit Port Modules Selection for GBIC transceiver for Slot A &amp; B</b>									
None						0			
6KP5-G4RJ "G+4" module to provide one 6K slot for one GBIC transceiver module plus four 10/100Mb copper ports.						1			
6KP3-G2SC "G+2" module to provide one 6K slot for one GBIC transceiver module plus two 100Mb 2 km FX SC fiber ports.						2			
GBP5M-2OTX Two-Port one slot Gigabit 6K module for use with two GBIC transceiver module.						3			
GBP5M-COTX One slot Gigabit 6K module for use with one GBIC transceiver.						4			
<b>GBIC transceiver Module Selection for Slot A &amp; B</b>									
None								A	
GBIC-SXSC Gigabit Transceiver module, one 1000BASE-SX port with mm SC Fiber conn.								B	
GBIC-LXSC10 Gigabit Transceiver module, one 1000BASE-LX/LH port 1310nm S.M. SC 10km								C	
GBIC-LXSC25 Gigabit Transceiver module, one 1000BASE-LX/LH port 1310nm S.M. SC 25km.								D	
GBIC-ZXSC40 Gigabit Transceiver module, one 1000BASE-ZX port 1550nm S.M. SC 40km.								E	
GBIC-ZXSC70 Gigabit Transceiver module, one 1000BASE-ZX port 1550nm S.M. SC 70km.								F	
GBIC-ZXSC120 Gigabit Transceiver module, one 1000BASE-ZX port 1550nm S.M. SC 120km.								G	
GBIC-TP Gigabit Transceiver module, one 802.3ab 1000BASE-T port, RJ-45 Conn.								H	
<b>GBIC transceiver Module Selection for Slot A &amp; B (second module if GBP5M-2TOX is selected above)</b>									
None									A
GBIC-SXSC Gigabit Transceiver module, one 1000BASE-SX port with mm SC Fiber conn.									B
GBIC-LXSC10 Gigabit Transceiver module, one 1000BASE-LX/LH port 1310nm S.M. SC 10km									C
GBIC-LXSC25 Gigabit Transceiver module, one 1000BASE-LX/LH port 1310nm S.M. SC 25km.									D
GBIC-ZXSC40 Gigabit Transceiver module, one 1000BASE-ZX port 1550nm S.M. SC 40km.									E
GBIC-ZXSC70 Gigabit Transceiver module, one 1000BASE-ZX port 1550nm S.M. SC 70km.									F
GBIC-ZXSC120 Gigabit Transceiver module, one 1000BASE-ZX port 1550nm S.M. SC 120km.									G
GBIC-TP Gigabit Transceiver module, one 802.3ab 1000BASE-T port, RJ-45 Conn.									H
<b>6k Managed Network Switch Software and Software Options</b>									
NMS-6K License Licensed software for use on RFL 3000 6K Switches									1
S-RING key S-Ring™ Redundancy Manager Licensed software for redundant ring management.									2

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