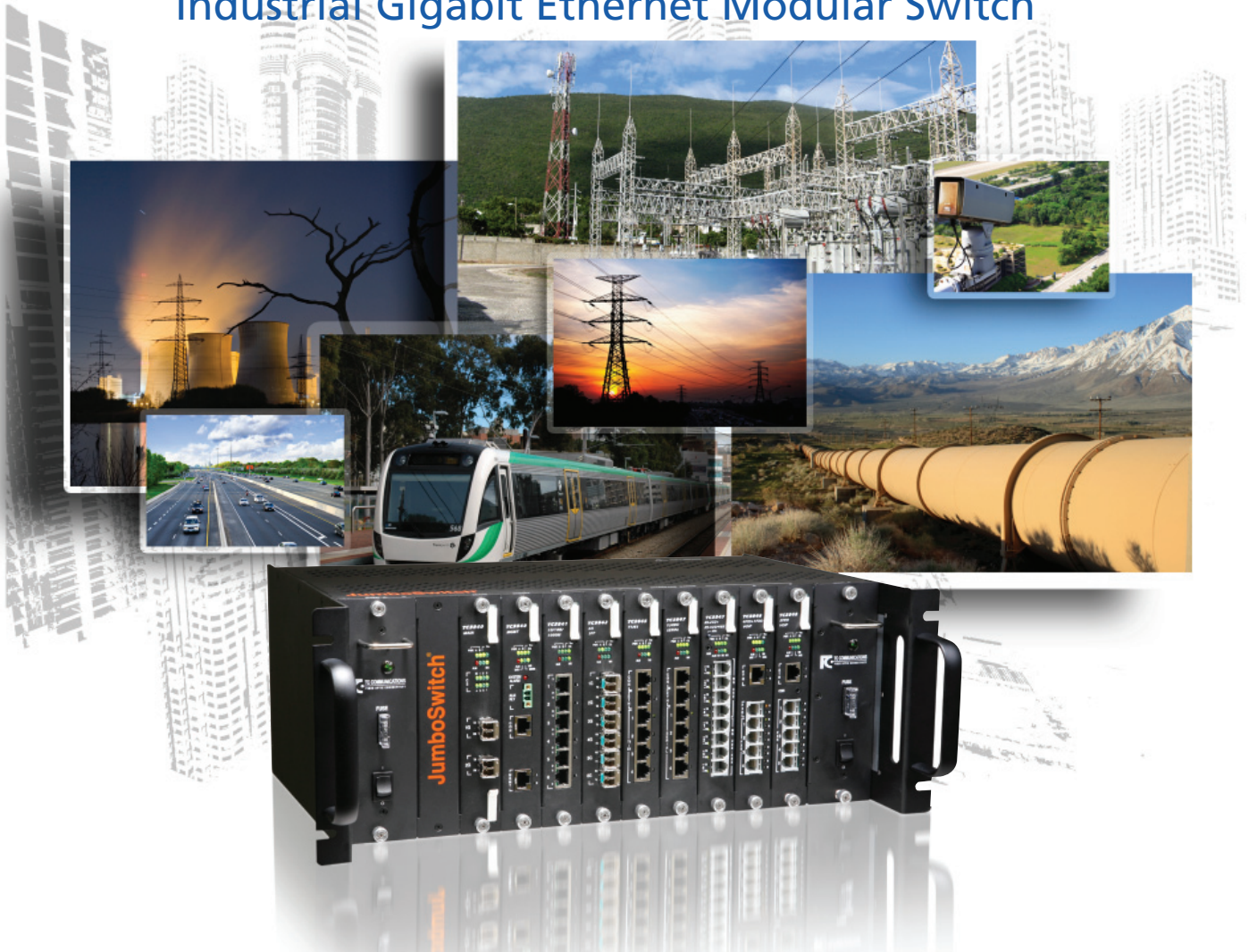


JumboSwitch®

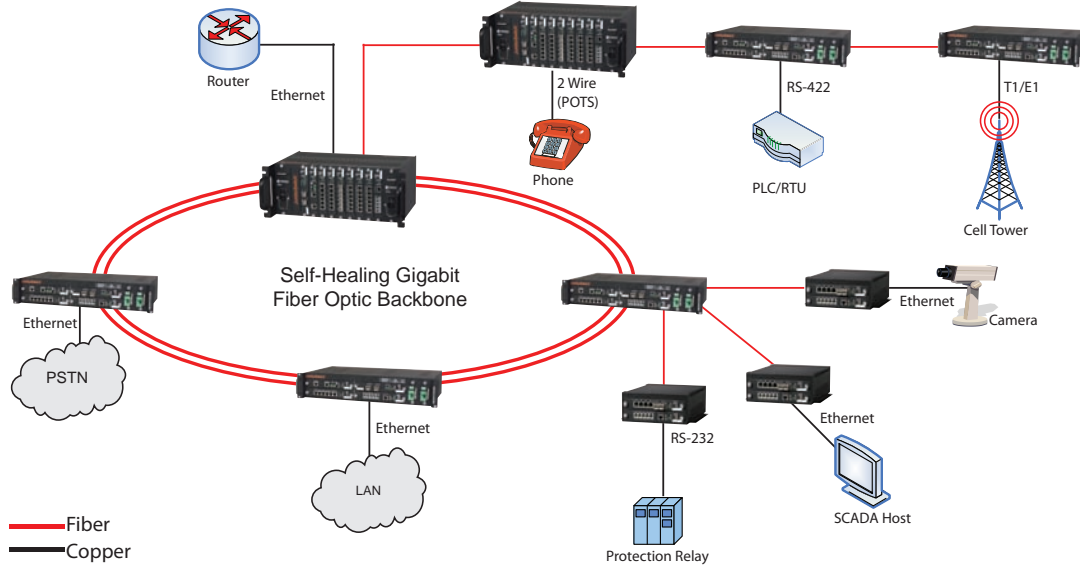
Industrial Gigabit Ethernet Modular Switch



- ➔ Designed for the Harshest Industrial Environments
- ➔ Integrates Data, Voice and Delay-Sensitive Serial Traffic over Ethernet
- ➔ Provides a Viable Migration from TDM to Ethernet
- ➔ Reliability of SONET/SDH with Simplicity of Ethernet
- ➔ Comprehensive Standards-Based Network Management

JumboSwitch - Overview

The JumboSwitch® is a full-featured Layer 2 Switch that is designed to support virtually any network topology configuration including string, star, self-healing ring and ring variations. Based on the most advanced Ethernet, VoIP and TDM-over-IP technologies, the JumboSwitch® Industrial Gigabit Ethernet Modular Switch integrates traditionally separate industrial applications such as Ethernet, voice and serial connections over a simplified, reliable and cost effective GigE IP platform. It offers backward compatibility with legacy devices and forward compatibility with developing Ethernet standards and Industrial Standards such as IEC61850-3, IEEE1613 for the power industry; and, NEMA TS-2 for the transportation industry.



Multiple Industrial Applications Supported over Flexible JumboSwitch Network Topologies

The JumboSwitch® provides numerous user benefits including three “industry first” interface cards:

- an Industrial grade VoIP+ Virtual PBX card removing the need for external SIP server or Call Manager
- a TDM-over-IP card that can transmit and receive T1, E1 or ISDN primary signals at zero bit-error or frame slips consecutively
- a “Turbo” Serial-over-IP card for Teleprotection with less than 3msec latency, end-to end

The JumboSwitch® also offers important administrative and maintenance features typically not available on traditional Industrial Switches: These features include:

- Remote Software/Firmware download capability
- Extensive Asset Management including ongoing collection of part/serial numbers and version numbers/upgrade dates for precise inventory management
- Remote Monitoring for “live” operating temperatures/power consumption of each interface card

Because of its sophisticated real time technology, it is particularly well-suited for Industrial Automation, SCADA and Process Control networks. It is currently the only Industrial Gigabit Ethernet Modular Switch that provides hot-swappable universal interface card slots to support Voice with IP PBX, T1/E1 or Primary ISDN circuits, serial interfaces (RS-232, RS-422/485), near Stratum II clock precision, and delay-sensitive teleprotection applications.

Ethernet Standards:

- IEEE 802.1x
- IEEE 802.1w
- IEEE 802.1s
- IEEE 802.3x
- IEEE 802.1D
- IEEE 802.1p
- IEEE 802.1Q
- IEEE 802.3
- IEEE 802.3u
- IEEE 802.3z
- IEEE 802.3ab
- IEEE 802.3ad
- IEEE 802.3ah
- 10/100/1000Base-T
- 100Base-FX
- 1000Base-SX/LX

Legacy/TDM Interfaces:

- Gigabit Ethernet
- Gigabit SFP Ethernet
- DCS/SCADA
- Teleprotection
- Serial (RS-232/422/485)
- VoIP Distributed and Integrated PABX
- Dry Contact
- T1/E1-over-Ethernet
- T3/E3-over-Ethernet
- Ethernet-over-PDH(T1/E1, T3/E3, STS-1/3, STM-1)
- 2W/4W 600 Ω Analog
- G.703/64k
- C37.94

JumboSwitch - Features & Benefits



Various JumboSwitch® Chassis Styles



Ruggedized Design

- Industrial hardened (-40°C to +80°C), conformal coating, no moving parts, vibration and shock tested
- Industrial standards compliance: IEC 61850-3, IEEE 1613, NEMA TS-2

Benefits:

JumboSwitch® is substation and industrial hardened making it operational in the harshest of environments.

Flexibility

Flexible Topology support:

- Dual counter-rotating ring
- String/Bus
- Point-to-Point
- Full mesh

Benefits:

Self-healing rings provide protection against fiber cuts and loss of nodes with less than 30 ms recovery time. Point-to-Point, Mesh & String/Bus topologies offer the ultimate in flexible and efficient network designs.

Scalability

- Hot-swappable modular design
- Multiple size chassis
- Migration path to 10GigE

Benefits:

Modular design offers pay-as-you-grow scalability. With multiple chassis options, JumboSwitch® networks can be efficiently custom tailored to the customer's needs.

Ethernet design offers scalable, future proof migration to 10GigE.

VoIP+

Voice-over-IP (Distributed, Internal PABX)

Benefits:

The VoIP+™ eliminates the need for a central PABX. It supports all major features of a PABX without an external SIP server or call manager. The PABX features include: Caller ID hot-line, call transfer, call forwarding, 3-way calling, internal address book and more. A distributed virtual PABX eliminates the need for a central PABX and it eliminates a single point of failure for mission critical applications.

Network Management

- Web Based (Graphical User Interface)
- Telnet
- Serial Port
- TCView™ (Graphical SNMP-based management)

Benefits:

A flexible standards-based network management provides comprehensive Fault Management, easy Configuration, Administration, Asset Management and Security. Users have the ability to remotely monitor optical Tx & Rx power and temperature conditions.

GigE Technology

GigE backbone with migration to 10GigE

Benefits:

The Ethernet-based design of the JumboSwitch® provides a migration path and future growth without fork-lift upgrades. Any customer's investment in chassis, interface modules, power supply & NMS cards is protected.

Interface Types

Large selection of interface types for industrial applications:

- Gigabit Ethernet
- Gigabit SFP Ethernet
- DCS/SCADA
- Teleprotection
- Serial (RS-232/422/485)
- VoIP Distributed and Integrated PABX
- Dry Contact
- T1/E1-over-Ethernet
- T3/E3-over-Ethernet
- Ethernet-over-PDH(T1/E1, T3/E3, STS-1/3, STM-1)
- 2W/4W 600 Ω Analog
- G.703/64k
- C37.94

Benefits:

JumboSwitch® offers convergence of data, voice and delay-sensitive industrial applications over a single, cost-effective full-featured GigE IP network.

Ethernet Standards

- IEEE 802.1x
- IEEE 802.1w
- IEEE 802.1s
- IEEE 802.3x
- IEEE 802.1D
- IEEE 802.1p
- IEEE 802.1Q
- IEEE 802.3
- IEEE 802.3u
- IEEE 802.3z
- IEEE 802.3ab
- IEEE 802.3ad
- IEEE 802.3ah
- 10/100/1000Base-T
- 100Base-FX
- 1000Base-SX/LX

JumboSwitch - Security Features

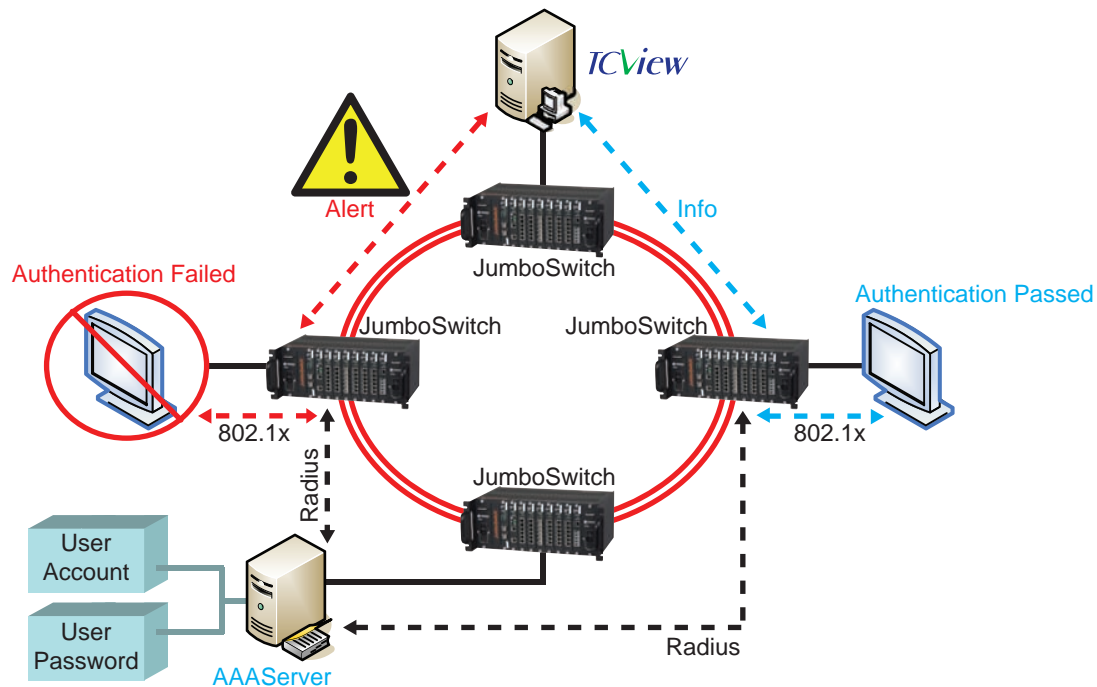
Network security in Industrial environments such as power plants, pipelines, transportation corridors, airports, oil refineries, factory floors, etc. is extremely important. Security laps in these types of environments could potentially have devastating consequences of national proportions.

TC Communications Inc. has provided comprehensive industrial hardened network platforms, including critical security solutions, since 1992. As evidence of this commitment to security, its newly designed JumboSwitch® IP platform complies with the North American Electric Reliability Council (NERC) Critical Infrastructure Protection (CIP) requirements.

The JumboSwitch® supports the following security features:

- **Enable/Disable Ports** – The ability to disable ports to provide physical security
- **MAC Based Port Security** – Enhances Ethernet port security by limiting device access to use the port
- **802.1Q VLAN** – Separates Ethernet traffic into virtual LANs to provide physical security and improve network availability by limiting broadcast storms

- **Passwords** – Multi-Level and strong passwords to prevent unauthorized logins and user access
- **SSH** – Encrypts all transmission data for secure, remote Command-Line Interface (CLI) access over IP networks, such as Telnet
- **SSL** – Encrypts HTTP traffic for secured access to the browser-based JumboSwitch® management GUI
- **802.1x** – Works with RADIUS to only allow authenticated ports.
- **Radius** – Provides centralized user authentication and service authorization through a RADIUS server
- **Bandwidth Rate Limiting** – Enforces Ethernet port controls for traffic monitoring and prioritization to protect against unwanted traffic storm
- **SNMPv3** – Maximizes security by authenticating and encrypting JumboSwitch® management (e.g. TCView) via SNMP protocol



In the left section of the above diagram, an unwanted user's attempt to access the network is blocked after it fails authentication by the RADIUS AAA server. In this case, JumboSwitch® sends an alert to TCView and the failed attempted port is disabled. The right section of the diagram depicts a successful attempt by a valid user who is authenticated by the RADIUS AAA server.

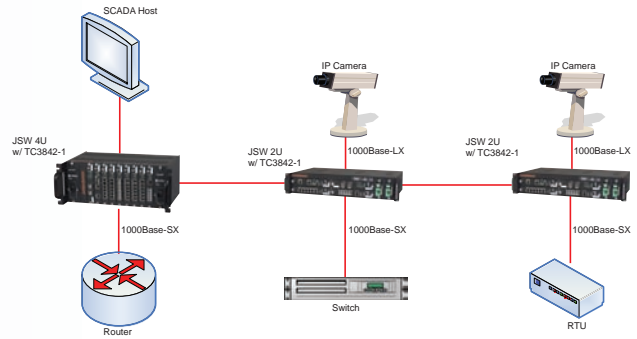
JumboSwitch - Interface Cards

TC3842-1: SFP Ethernet Card

- 6-Port SFP Gigabit Ethernet Switch
- Optional 3 Ports 100Base-FX
- Single Mode, Multimode, Optional One Fiber Bi-Directional Communications
- Ethernet Rate-Limit, VLAN, QoS & More
- Network Manageable Via Web (with TC3840 MGMT card)
- Temperature & Power Consumption Monitoring

Also Available:

- TC3841: 6 Port Gigabit Copper RJ45 Card
- TC3842-2: 3-Port Gigabit SFP + 3-Port 100FX SFP Card
- TC3842-3: 6 Port 100FX SFP Card
- TC3842-4: 1-Port 10BaseFL Card

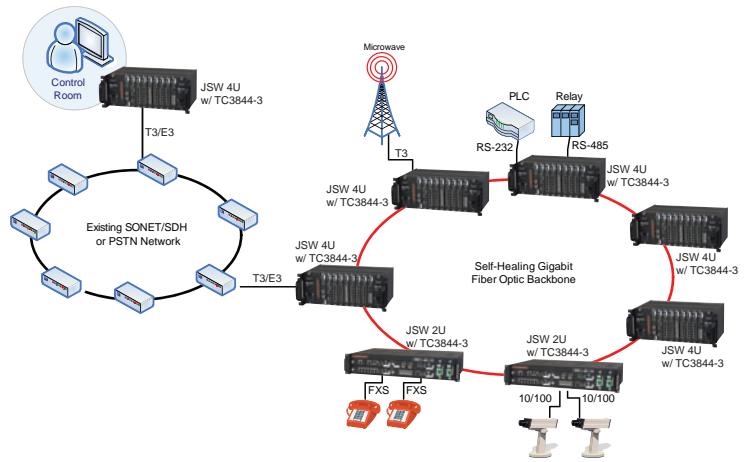


TC3844-3: Ethernet-over-T3/E3

- 1 Port Fast Ethernet Transport over Framed/Unframed T3 or E3 with QoS
- Flexible Fractional T3/E3 Support
- Ethernet and T3/E3 Statistics Monitoring
- VLAN Tagging and Priority Labeling
- Manage Via Web, SNMP, Serial Console, Telnet
- Temperature & Power Consumption Monitoring

Also Available:

- TC3844-1 Ethernet-over-T1/E1,
- TC3844-4: Ethernet-over-STS-1 and
- TC3844-5: Ethernet-over-STS-3

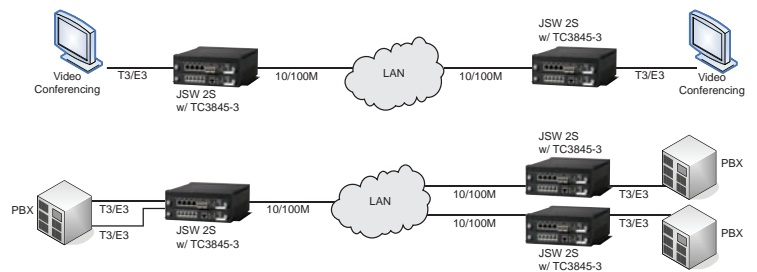


TC3845-3: T3/E3-over-IP

- Transports 4 Ch. T3/E3-over-Ethernet/IP
- Near Stratum-II Clock Precision & Extremely Low Latency
- Point-to-Point & Point-to-MultiPoint Applications
- VLAN and QoS Support
- Manage Via Web, SNMP, Serial Console, Telnet
- Temperature & Power Consumption Monitoring

Also Available:

- TC3845-1: T1/E1-over-IP (1 to 4 Ch.)



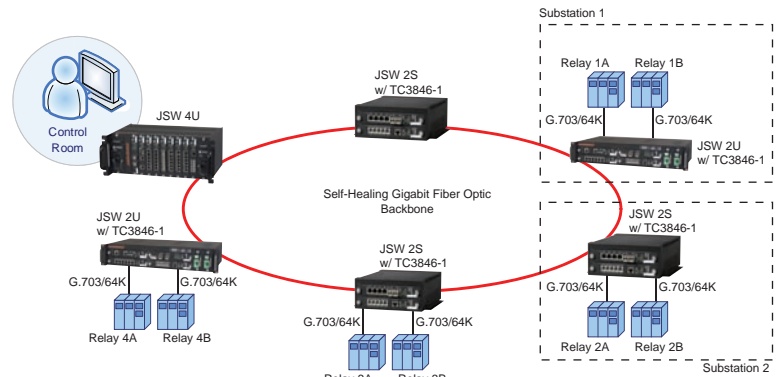
JumboSwitch - Interface Cards

TC3846-1: G.703/64K (Co-Directional)-over-IP

- Extends 2 Ch. G.703/64k Co-directional Interface-over-Ethernet
- Less Than 5 msec. Latency, One Way
- Point-to-Point & Point-to-MultiPoint Applications
- VLAN and QoS Support
- Manage Via Web, SNMP, Serial Console, Telnet
- Temperature & Power Consumption Monitoring

Also Available:

- TC3846-2 C37.94-over-IP
- TC3846-4 600 Ω Analog (2 or 4 Wire)
- TC3846-6 4 Ch. 600 Ω Analog + 4 Ch Dry Contact (2 or 4 Wire)

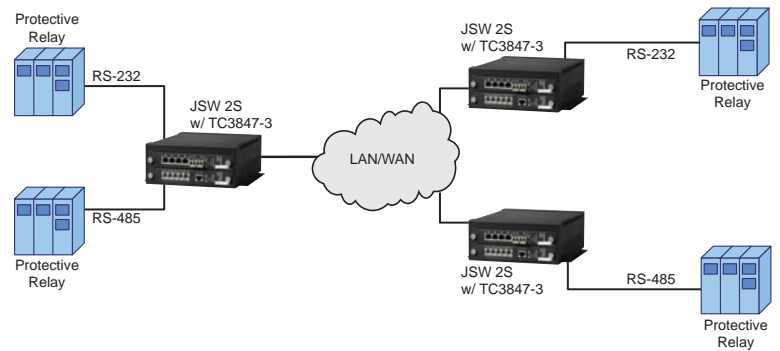


TC3847-3: 8-Ch. Turbo Serial-over-IP Card

- 4 Ch. of RS-232 & 4 Ch. of RS-422 / RS-485
- Extremely Low Latency (Supports Teleprotection Relays)
- RS-232 Ports Support Hardware Handshaking or Synchronous Mode
- Data Rates up to 115kbps
- VLAN & QoS Support
- Temperature & Power Consumption Monitoring

Also Available:

- TC3847-1 4 Ch. RS-232, RS-422/485 Server
- TC3847-5 Dry Contact (4 or 8 Ch.)

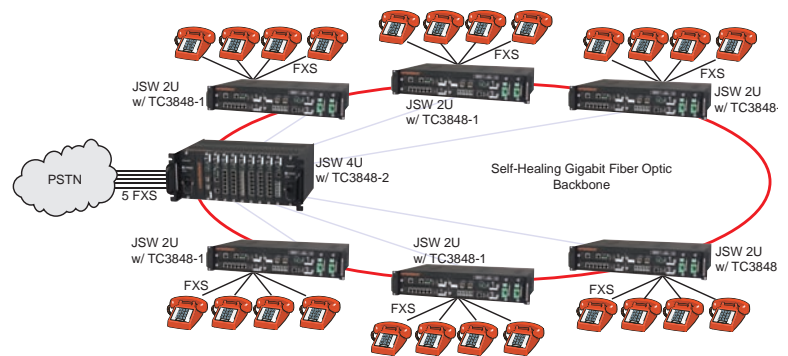


TC3848-1 VoIP+™: Virtual PBX

- 2 or 4 Port FXS + 1 Port FXO
- Call Processing Features: Caller ID, hot-line, call transfer, auto-attendant, group hunting.
- Supports Fax, Dial-up Modem and Phone
- Internal Address Book
- SIP Server
- Manage via Web, SNMP or Telnet
- Remote Firmware Upgrade

Also Available:

- TC3848-2 5 Port FXO



JumboSwitch - Cages & Chassis

JumboSwitch - 4U



- Ruggedized Design for Harsh Environments
- Industry Standard 19" Wide and 4U High
- Designed to Hold 1 Main Card, 1 Management Card and 7 Interface Cards
- Dual Power Supply, Mix and Match
- Power Supply Options are 12VDC, 24VDC, -48VDC, 125VDC, 115VAC, 230VAC and 240VAC (50-60Hz)

JumboSwitch - 2U



- Ruggedized Design for Harsh Environments
- Industry Standard 19" Wide and 2U High
- Designed to Hold 1 Main Card, 1 Management Card and 2 Interface Cards
- Dual Power Supply, Mix and Match
- Power Supply Options are 12VDC, 24VDC, -48VDC, 125VDC, 115VAC, 230VAC and 240VAC (50-60Hz)

JumboSwitch - 1U



- Ruggedized design for Harsh Environments
- Industry Standard 19" Wide and 1U High
- Designed to Hold 1 Main/Management Combo Card and 1 Interface Card
- Standard 12VDC Dual Load-Sharing Power Supply
- Power Supply Options are 24VDC, -48VDC, 125VDC, 115VAC, 230VAC and 240VAC (50-60Hz)

JumboSwitch - 2S



- Ruggedized Design for Harsh Environments
- Standard 12VDC Dual Load-Sharing Power Supply
- Designed to Hold 1 Main/Management Combo Card and 1 Interface Card
- Power Supply Options are 24VDC, -48VDC, 115VAC, 230VAC and 240VAC (via External AC Power Adapter)

Network Management System for TC Networking Devices



Overview:

Provides the integrated and comprehensive management tools needed to simplify the configuration, administration, monitoring, troubleshooting,

and servicing of JumboSwitch® networks and other TC Communications networking devices. Going beyond traditional element manager applications, it delivers a unique platform of cross-functional management capabilities that integrate all TC networking products into one network administration platform.

Key Features:

- Remote Software/Firmware download capability
- Extensive Asset Management capabilities including ongoing collection of system part/serial numbers and version numbers/upgrade dates for precise inventory management
- Remote Monitoring for “live” operating temperatures of each interface card
- Remote Monitoring for “live” power consumption of each interface card
- Remote Monitoring for “live” fiber ports TX RX power of critical fiber links

Management:

- Fault Management
- Configuration Management
- Asset/Administration Management
- Performance Management
- Security Management

Specifications:

Minimum System Hardware:

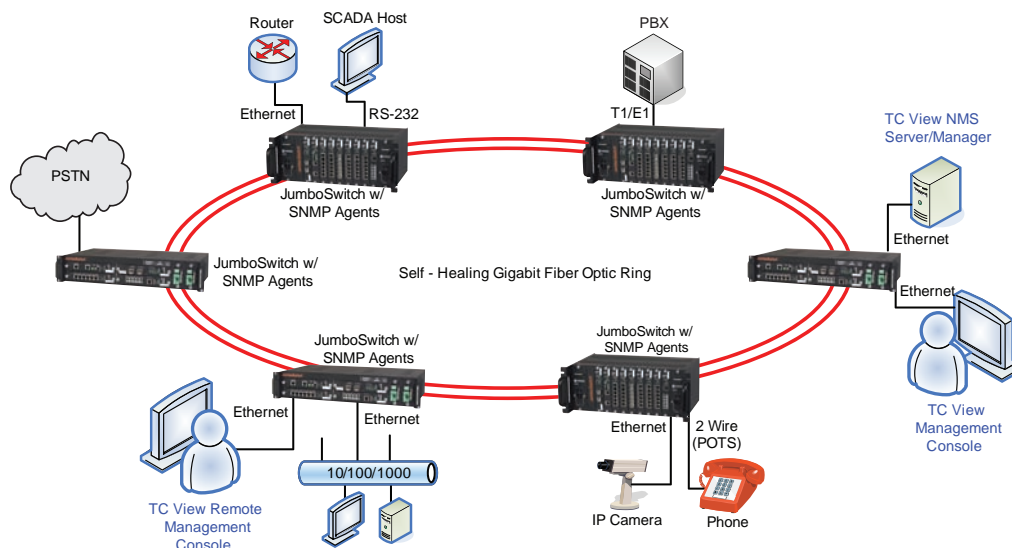
- 3.0 GHz Intel Pentium 4 or equivalent processor
- 3 GB RAM memory
- 100 GB storage
- 1000 Mbit NIC

Supported Software:

- Windows XP Professional or Vista
- Microsoft Windows 2003 or 2008 Server (32-bit)
- Microsoft SQL Server 2005 or 2008

Browser:

Microsoft Internet Explorer version 6.0 or later



About TC Communications



TC Communications takes pride in being the “right” vendor for your application. Customers are guaranteed high quality products and timely, courteous and professional Service.

Established in 1992, TC Communications designs and manufactures Data, Ethernet, Voice, Audio, T1/E1, T3/E3 and Industrial Hardened communications products for Fiber Optic networks. Engineering, manufacturing, technical support, sales & administration are all located in Irvine, California, USA.

Since its inception, TC Communications has focused on designing and manufacturing the most versatile and reliable fiber optic communication products possible to meet the rigorous requirement of industrial, military, government and commercial customers all over the world.

TC Communications has earned its reputation as the most reliable and trustworthy fiber optic communication equipment manufacturer in the industry, with more than 10,000 installed sites around the world and thousands of satisfied customers.



ISO 9001
QMI-SAI Global
#1045959

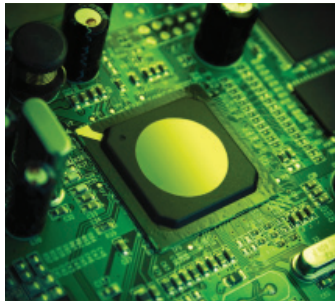
TC Communications, Inc.
17881 Cartwright Road
Irvine, CA 92614 U.S.A.
Factory Tel: (949) 852-1972
Fax: (949) 852-1948

Sales Office
U.S.A. Domestic International:
(800) 569-4736 (949) 852-1973

Web Sites:
www.tccomm.com
www.jumboswitch.com
E-mail:
sales@tccomm.com

6/09

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17881 Cartwright Road, Irvine, Ca 92614 U.S.A.
Tel: +1 (949) 852-1972 • Fax +1 (949) 852-1948
Sales: +1 (800) 569-4736 • E-mail: info@tccomm.com
TCcomm.com • JumboSwitch.com



• All Products are Designed and Manufactured in Irvine, CA, U.S.A. Since 1992