

# C37.94-over-IP Gateway

# TC3846-2 w/ Security

- 2 Channels of IEEE C37.94
- Supports Multimode and Single Mode Fiber
- Extremely Low Latency
- Temperature & Power Consumption Monitoring
- Extreme Temp (-40°C to +80°C) Optional
- Meets or Exceeds IEC 61850-3, IEC 60834, IEEE1613 & NEMA TS-2 Standards
- Member of JumboSwitch® Product Family



TC3846-2 C37.94-over-IP Gateway

The TC3846-2 links or extends up to 2 channels of C37.94 circuits across Layer 2/3 Ethernet/IP, CE, or MPLS networks. It is easy to configure, offers extremely low latency, and supports point-to-point and point-to-multipoint topologies.

Available as a standalone product or JumboSwitch® interface card, the TC3846-2 is specifically designed to meet stringent real-time requirements for protective relay communications in the power utility industry. This C37.94 interface card can perform at less than 5ms latency, end-to-end, through an Ethernet network. This extremely low latency is irrespective of the protocol used and is unaffected by the number of nodes in between.

Each C37.94 channel is independent and transparent to protocols and signaling used. Clear channel and octet aligned modes are supported.

VLAN and QoS for packet prioritization ensure reliable communications. AAA, RADIUS and TACACS+ support, and NTP Authentication are some of the added security features for enhanced protection. Diagnostics include LED indicators, and local and remote loop back.

The TC3846-2 is available in industrial hardened versions (-40°C to +80°C) and exceeds all pertinent industry and environmental standards including IEC 61850-3, IEEE 1613 & NEMA TS-2.

Setup, diagnostics, and management are accessed via Web, SNMP, Serial Console, and Telnet/SSH. The TC3846-2 fits any JumboSwitch® chassis option including 2S standalone chassis and 1U/2U/4U card cages. Power supply options are 12VDC, 24VDC, -48VDC, 125VDC (available on 1U/2U/4U card cages only) or 115/230VAC.

## Applications

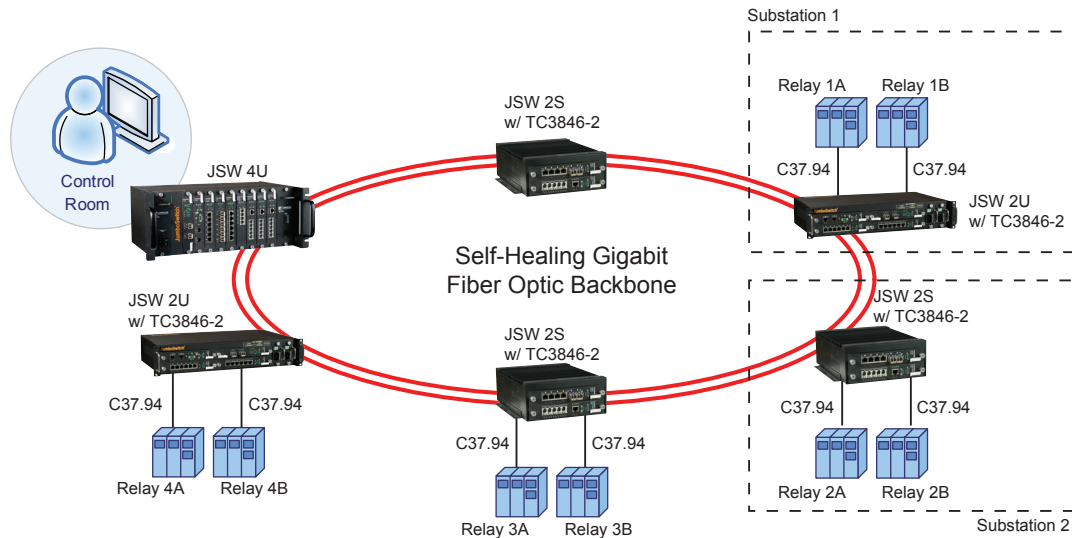
Typical applications include extending C37.94 circuits across Ethernet/IP, CE, or MPLS networks.

For example, the TC3846-2 is often used to extend C37.94 signals from one protection relay to another over an Ethernet/IP network

## Environmental & EMI Compliance

The JumboSwitch product family meets all pertinent industry-specific standards for environmental, performance and security requirements including IEC 61850-3, IEC 60834, IEEE 1613, NEMA TS-2 and NERC CIP. Furthermore, future JumboSwitch family products will continue to be compliant with both existing and emerging industry standards and requirements, including developing Ethernet standards. Please refer to the charts below for specific standards compliance information.

	Tests	Industrial Standards	TC Communications - JumboSwitch Type Test and Levels	
			Power Supply Unit (PSU)	RJ-45 & Signal
Temperature/Humidity	Low Temperature Use	IEC 61850-3, IEEE 1613, NEMA TS-2	IEC 60068-2-1; Ae; -40°C; 16 hour	
	Low Temperature Storage	IEC 61850-3, IEEE 1613, NEMA TS-2		
	High Temperature Use	IEC 61850-3, IEEE 1613, NEMA TS-2	IEC 60068-2-2; Be; +80°C; 16 hour	
	High Temperature Storage	IEC 61850-3, IEEE 1613, NEMA TS-2	IEC 60068-2-2; Bd; +85°C; 16 hour	
	Damp Heat	IEC 61850-3, IEEE 1613, NEMA TS-2	IEC 60068-2-30; Db; +55°C; 95%; 96 hours	
Mechanical	Vibration	IEC 61850-3, IEEE 1613, NEMA TS-2	IEC 60068-2-6; Fc; 3 - 150 Hz; 7.5 mm; 2 g; 10 sweeps per axis	
	Shock	IEC 61850-3, IEEE 1613, NEMA TS-2	IEC 60068-2-27; Ea; 30g; 11ms	
ElectroMagnetic Compatibility	Electrostatic Discharge Immunity	IEEE 1613	IEC 61000-4-2; 8kV contact; 15 kV air	
	Radiated RF Immunity	IEC 61850-3, IEEE 1613	IEC 61000-4-3; 80 MHz - 1000 MHz; 20 V/m; AM 80% 1 kHz	
	EFT/Burst Immunity	IEC 61850-3, IEEE 1613	IEC 61000-4-4; 4 kV CM	IEC 61000-4-4; 4 kV CM
	Surge Immunity	IEC 61850-3	IEC 61000-4-5; 4 kV LG; 2 kV LL	IEC 61000-4-5; 4 kV LG; 2 kV LL
	Conducted RF immunity	IEC 61850-3	IEC 61000-4-6; 150 kHz - 80 MHz; 10 V; AM 80% 1 kHz	IEC 61000-4-6; 150 kHz - 80 MHz; 10 V; AM 80% 1 kHz
	Magnetic Field Immunity	IEC 61850-3	IEC 61000-4-8; 50 Hz; 100 A/m cont.; 1000 A/m 1 s	
	Damped Oscillatory Magnetic Field Immunity	IEC 61850-3	IEC 61000-4-10; 100 kHz; 30 A/m	
	Damped Oscillatory Magnetic Field Immunity	IEC 61850-3	IEC 61000-4-10; 1 MHz; 30 A/m	
Power Supply Unit (PSU) Variations	AC Voltage Dips	IEC 61850-3	IEC 61000-4-11; 30% & 100%, 0.5s	NA
	DC Voltage Dips	IEC 61850-3	IEC 61000-4-29; 40% & 70%, 0.1s	NA
	Damped Oscillatory Wave	IEC 61850-3	IEC 61000-4-12; 2.5 kV CM, 1.0 kV DM @1MHz	IEC 61000-4-12; 2.5 kV CM, 1.0 kV DM @ 1MHz
	Conducted PF CM Voltage	IEC 61850-3	IEC 61000-4-16; 50 Hz; 30 V cont.; 300 V 1s	IEC 61000-4-16; 50 Hz; 30 V cont.; 300 V 1s
	Conducted Emission	IEC 61850-3	CE/FCC/CISPR22 class A	CE/FCC/CISPR22 class A
	Conducted emission	IEC 61850-3	CE/FCC/CISPR22 class A	CE/FCC/CISPR22 class A
	Radiated emission	IEC 61850-3	CE/FCC/CISPR22 class A	
Dielectric	Dielectric 50 Hz Test	IEEE 1613	IEC 60255-5; 2 kV	IEC 60255-5; 0.5 kV
	Impulse Voltage Test	IEEE 1613	IEC60255-5; 5 kV	IEC 60255-5; 5 kV



Typical Teleprotection Application Using TC3846-2 to Extend C37.94 over an Ethernet Network

**Connection Capacity**

C37.94 .....2 Ports  
 Ethernet.....2 Ports

**Optical (C37.94)**

Transmitter ..... LED/ELED  
 Receiver ..... PIN Diode  
 Wavelength  
 Multimode .....850nm  
 Single Mode..... 1310/1550nm  
 Connector..... ST  
 Loss Budget\* - 850/1300/1550nm  
 Multimode @ 62.5/125µm.....15dB  
 Single Mode @ 9/125µm .....20dB

\*Contact factory for higher requirements

**Electrical**

Ethernet Interface  
 Standards ..... IEEE 802.3, 802.3u  
 Connector ..... RJ45  
 Console Interface  
 Connector .....2.5mm Audio Jack

**Standard Compliance**

CE, FCC Part 15, CISPR (EN55022)  
 CLASS A, IEC 61850-3, IEEE 1613,  
 NEMA TS-2, IEC 60834

**Diagnostic Functions**

Local and Remote Loopback for  
 C37.94

**LEDs**

Unit Status.... PWR (A, B), Alarm, BU,  
 .....PL, Vcc, BP, MGM  
 C37.94..... Signal, Link  
 Ethernet..... Link, Duplex

**Power**

Standard ..... 12VDC  
 Optional ..... 24, -48 VDC  
 ..... 90-260 VAC, 50/60Hz  
 Power Consumption ..... <10W

**Operating Temperature**

High Temp ..... -20°C to 70°C  
 Extreme Temp ..... -40°C to 80°C

**Storage**

Temperature.....-40°C to 90°C  
 Humidity.....95% non-condensing

**Physical (Standalone Unit)**

Height.....(3.89 cm) 1.53"  
 Width.....(18.54 cm) 7.3"  
 Depth.....(24.87 cm) 9.79"  
 Weight.....(0.4 kg) 1.0 lbs



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Note: Information contained in this data sheet is subject to change without prior notice.



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