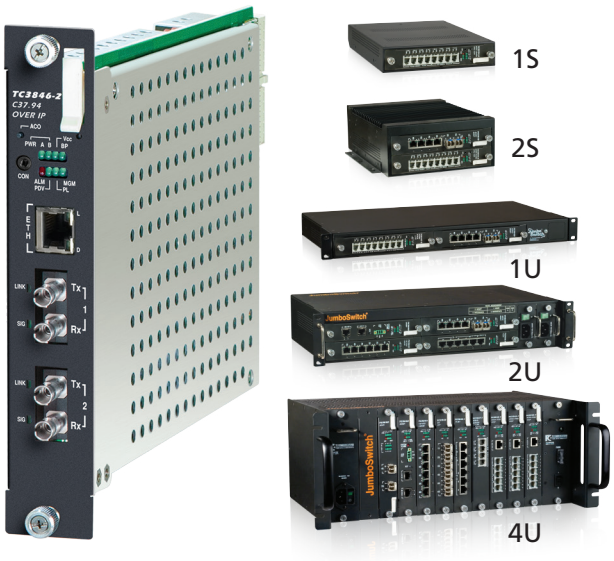
C37.94-over-IP Gateway

TC3846-2

- **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

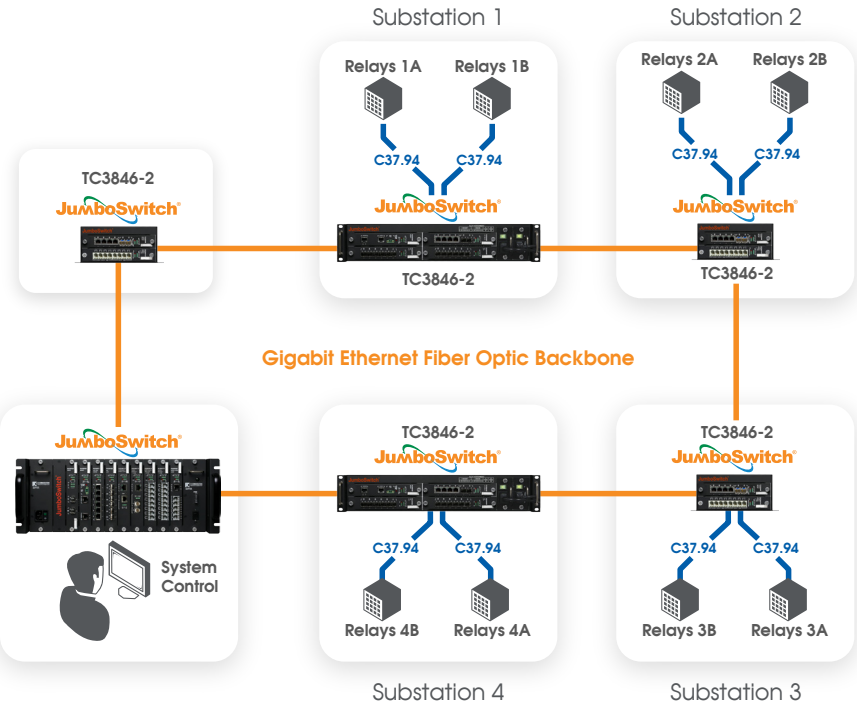
Typical applications include extending C37.94 circuits across Ethernet/IP, CE, or MPLS networks.

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
GigabitEthernet ..... 1 Port
FastEthernet ..... 1 Port

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
Serial 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), Vcc, BP ..... ALM, PDV, PL, MGM
C37.94 ..... Signal, Link
Ethernet ..... Link, Duplex

Power

Standard 12VDC
Optional .... 24VDC, -48VDC, 125VDC 100-240VAC 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

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

TC COMMUNICATIONS®

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TAA Compliant

TC Communications Quality Management System is certified as being in conformity with ISO 9001:2015 by Intertek

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