VALIANT COMMUNICATIONS

VCL-TP, Teleprotection Equipment & Trip Counter & Alarm Display Unit

With 8 Binary Command Inputs and 8 Binary Command Outputs

Product Overview

VCL-TP, Teleprotection (Protection Signaling Equipment / DTPC) Equipment is an extremely reliable and flexible product which offers up to 8 independent Binary Command Input and 8 independent Binary Command Output channels which can be operated selectively or simultaneously over a wide choice and a variety of network side transmission interfaces.

The VCL-TP, Teleprotection (Protection Signaling Equipment / DTPC) Equipment offers a choice of network interfaces which include:

a) E1 (2.048 Mbps)
b) Redundant, 1+1 E1 with link failure detection and automatic failover
c) IEEE C37.94 Optical
d) E1 plus IEEE C37.94 Optical with link failure detection and automatic failover.

VCL-TP, Teleprotection Equipment may be used independently, in a standalone point-to-point application over E1 (2.048Mbps), over IEEE C37.94 or as an integrated part of the VCL-MX Version 6, E1 Voice and Data Multiplexer solution over SDH / PDH E1 networks.

The **"Trip Counter & Alarm Display"** unit shows the total number of "Trip Input / Trip Receive" and "Trip Output / Trip Send" commands on each of the 8 Teleprotection channels. A manual display counter reset option is also provided which may be enabled or disabled by the system administrator.

Trip Counter Display and Alarm Extension Unit is designed to function as an optional extension of the Teleprotection Equipment to provide 8 Channels, Digital Trip Counter Display in addition to providing up to 8 External Relay Alarm outputs.

The Trip Counter Display and Alarm Extension Unit may be either powered from the Teleprotection Equipment, or directly from a 48V DC, 110V DC, 220V DC or 250V DC power source. 1+1 Redundant Power is also offered as an option.

Command Transfer Time (including relay operating time)

E1 (2.048 Mbps)	<6ms (5ms typical)
E1 plus E1 (1+1 redundant)	<6ms (5ms typical)
C37.94 Optical	<6ms (5ms typical)
E1 (2.048Mbps) plus C37.94 (1+1)	<6ms (5ms typical)
C37.94 plus C37.94 (1+1)	<6ms (5ms typical)

Teleprotection Transmission interface options include:

- VCL-TP, Teleprotection over E1 (2.048 Mbps)
- VCL-TP, Teleprotection over 1+1 redundant E1 interfaces with link failure detection and automatic failover for transmission link redundancy
- VCL-TP, Teleprotection over IEEE C37.94 optical fiber interface
- VCL-TP, Teleprotection over E1 plus IEEE C37.94 (Optical) interfaces with link failure detection and automatic failover for transmission link redundancy

Other Teleprotection Transmission interface options:

- VCL-TP, Teleprotection over IP/MPLS / MPLS-TP interface
- VCL-TP, 8 Binary Commands plus IEC-61850 GOOSE over E1 plus IEEE C37.94 interfaces
- VCL-TP, IEC 61850 GOOSE over IP/MPLS / MPLS-TP Interface
- VCL-TP, 8 Binary Commands plus IEC-61850 GOOSE over E1 plus IP/MPLS / MPLS-TP (1+1 redundant) interfaces

Features and Benefits:

- Unrivaled Speed, Security and Reliability
- Bi-directional transmission of 8 Binary Command Inputs and 8 Binary Command Outputs
- Dual Direction Teleprotection with Teleprotection Command Distribution
- 8 Channels Trip Counter Display and Alarm Extension Unit
- Compact, standard 19-Inch Rack-mountable chassis
- Use in a Standalone, Point-To-Point Application over E1 (2.048Mbps) and IEEE C37.94 transmission links.
- Use as an integrated part of the VCL-MX Version-6 E1 Voice and Data Multiplexer solution over a SDH or PDH data network.
- Full Duplex Operation, Automatic loop test facility
- User programmable for Direct Tripping, Permissive Tripping and Blocking Protection Schemes (Distance Teleprotection).
- Compliant with IEC 60834-1 and all applicable sections of IEC 60834-2 standards
- SNMPv2 management protocol for management and monitoring
- Network interface option
  - E1, 2.048Mbps interface over an E1 / SDH link
  - IEEE C37.94 optical fiber interface
- 1+1 redundant path protection / route protection option
  - E1, 2.048Mbps and IEEE C37.94 (1+1 redundant) interfaces
  - E1, 2.048Mbps and E1, 2.048Mbps (1+1 redundant) interfaces
- IEEE C37.94 compliant Multi-Mode optical link interface option for short reach optical links
- IEEE C37.94 compliant (modulation only) Single Mode optical link interface option for long reach optical links (≤ 40 KM, ≤ 80 KM, ≤ 120 KM, ≤ 150 KM, ≤ 180 KM)
- Available in 24 VDC, 48V DC, 110V DC, 220V DC, 250V DC, 110V AC and 220V AC configurations.

Performance:

- Less than 2ms command transfer time.
- Less than 4ms relay operating time.
- Less than 5ms back-to-back operating time (including relay operating time) over IEEE C37.94 Optical Interface.
- Less than 5ms back-to-back operating time (including relay operating time) over 2.048Mbps, E1 Interface.

Flexibility and User Programmability:

- User programmable input command sampling time for error resistant command inputs.
- User programmable output command relay deactivation time.

Maintenance

- **Manual Loop Test:** This feature initiates a "Manual Loop-Test" of the transmission link that interconnects the "Local" Teleprotection Terminal and the "Remote" Teleprotection Terminal.
- **Automatic Loop Test:** The Automatic Link Test feature automatically initiates "Periodic Loop Tests" at user programmed intervals of the transmission link that interconnects the "Local" Teleprotection Terminal and the "Remote" Teleprotection Terminal.
- **Delay Measurement:** This feature automatically initiates an end-to-end "Delay Measurement Test" between the "Local" and the "Remote" Teleprotection Terminal through the interconnecting transmission link.

Event and Alarm Logging

- Time-Stamped Alarm Logging
- Time-Stamped Event Logging
- IRIG-B time synchronization option to synchronize time-stamp with GPS.
- NTP time synchronization option to synchronize time-stamp with NTP Server.

Management and Monitoring

- Serial RS232 and USB interfaces for local terminal access
- 10/100BaseT Ethernet Interface for remote access over an IP network
- Encrypted Password Protection
- Telnet - Remote access over IP links
- Web Interface
- SSH - Secured remote access using Secure Shell Protocol over IP links
- SNMP Traps and NMS for real time remote monitoring.
- Centralised NMS option for remote monitoring and management of more than 1000 units from central site over an IP network.
- Automatic Link Test feature – link testing at user programmable periodical intervals
- Visual I/O status – LED Display.
- Dry contact external alarm relay to connect an external alarm on an annunciator panel, which can be wired up for either NO or NC condition.

Error Detection and Coding

- Link Loss Detection
- LOS Detection
- Line Code Violation Detection
- Block Command Encoding as per IEEE C37.94 (for C37.94 optical links).

Reliability

- Advanced Communication Protocols to ensure reliable transmission of commands.
- Power Supply Immunity to withstand impulse surges and transients of up to 10,000 Volts.
- High Quality Relays – withstands voltage 10 kV between coil and contacts (1.2 × 50 µps).
- 2.5kV RMS - Contact Input / Output Hi-port dielectric strength.
- Maximum Switching Voltage: 400V AC or 300V DC.
- Optoisolated Command Inputs.
- Optoisolated Relay Outputs.
- Relays compliant with IEC-255-0-20 / VDE 0435, 0631, 0700, 40013847 standards.
- Relays - Mechanical: 10,000,000 operations min. (at 18,000 operations / hour).

Technical Specification

2.048Mbps, G.703 E1 Interface:

Number of Interfaces	1
Conformity (Electrical)	G.703 (E1)
Frame Structure	As per ITU (CCITT) G.704
PCM Sampling Rate	8000 Samples/sec
Bit Rate	2048 Kbps ± 50 ppm
Code	HDB3
Nominal Impedance	120 Ohms balanced / 75 Ohms un-balanced (any one option only)
Peak Voltage of a mark For 120 Ohms Balanced interface, 75 Ohms Unbalanced interface	 3.0 V ± 0.3 V 2.37 V ± 0.237 V
Nominal Pulse Width	244 ns
Pulse Mask	As per ITU (CCITT) Rec. G.703
Output Jitter	< 0.05 UI (in the frequency range of 20Hz to 100 Khz)
Permissible Attenuation	6 dB at 1 MHZ
Return Loss at: 51.2 KHz to 102.4 Khz 102.4 KHz to 2048 Khz 2048 KHz to 3072 Khz	 > 12dB > 18dB > 14dB
Jitter Tolerance	As per ITU (CCITT) G.823
Loss and recovery of frame alignment	As per clause 3 of ITU (CCITT) G.732
Connector	RJ45 / BNC (only one option)

C37.94 Optical Fiber Interface

	Option 1	**Option 2**
Optical Module Type	SFP	1x9
Connector	LC	ST
Fiber	Multi-mode 850 nm, 1310 nm	Multi-mode
Distance	≤ 500 m, ≤ 2 Km	≤ 2 Km
Type	Laser	LED
IEEE C37.94	Fully Compliant	Fully Compliant

Command Voltage Options:

48V DC	110V DC	220V DC	250V DC

Number of Commands:

Number of Input Commands	8	Type - Binary
Number of Output Commands	8	Type - Potential Free

Technical Specification

C37.94 Modulation Compliant Optical Fiber Interface

Optical Module Type	SFP
Connector	LC
Fiber	Single-mode, 1310 nm, 1550 nm
Distance	≤40 Km, ≤80 Km, ≤120 Km, ≤150 Km
Type	Laser
IEEE C37.94	Modulation Only

Teleprotection Outputs Commands:

Maximum Switching Voltage	400V AC or 300V DC
Closing Ability (W/VA)	91W / 1,000VA
Short time current (0.5 sec.)	20A
Crossing a continuous-current (A)	5A
Maximum breaking current at 220V DC	8A
Surge protection arrestor module	Built-in / Integrated, MOV Protected @ > 350 VDC

Teleprotection Inputs Commands

Command	48V DC, 110V DC, 220V DC, 250V DC
Minimum Operating Command Voltage	41V DC, 75V DC, 172V DC, 172V DC
Maximum Operating Command Voltage	72V DC, 140V DC, 290V DC, 290V DC
Sense Off	<25V DC,<60V DC,<140V DC,<140V DC
Consumption on a digital input (W)	≤ 5mA @ 48V DC; < 0.24W ≤ 5mA @ 110V DC; < 0.55W ≤ 5mA @ 220V DC; < 1.1W ≤ 5mA @ 250V DC; < 1.25W

Input / Output Commands Combination Options:

off	When all 8 inputs are independent
and	When two adjacent inputs are used logically, **"and-ed"**
or	When two adjacent inputs are used logically, **"or-ed"**

Command Transfer Time:

- Less than 2ms command transfer time

Relay Operating Time:

- Less than 4ms relay operating time

Back-to-Back Switching Time (including command transfer and relay operating time):

- Less than 5ms back-to-back operating time (including relay operating time) over IEEE C37.94 Interface.
- Less than 5ms back-to-back operating time (including relay operating time) over G.703 E1, 2.048Mbps interface.

Time Clock:

- Built-in real time clock (RTC)
- IRIG-B / NTP / IEEE-1588v2 Time synchronization options.

Operations and Maintenance Interfaces:

- RS232 serial interface for local terminal access
- USB serial interfaces for local terminal access
- 10/100BaseT Ethernet Interface for remote access over an IP network.

Configuration and Access Command Language:

- Command Line Interface (English text commands).

Transmission Standards and Compliances:

- Electrical: ITU-T, G.703 for 2.048Mbps interface
- Optical: IEEE 37.94 compliant Multi-Mode optical interface
- Optical: IEEE 37.94 compliant (modulation only) 1310nm Single-Mode optical interface
- Laser: Class I (for Single-Mode Optical Interface) - Eye-safe as per EN 60825-1 specifications.

Teleprotection Standards and Compliances:

- IEC 60834-1 and IEC 60834-2 (Teleprotection Command Systems)

Power Supply Options:

- 24V DC, range 18V DC ~ 32V DC
- 48V DC, range 36V DC ~ 70V DC
- 110V DC / 125V DC, range 80V DC ~ 140V DC
- 220V DC / 250V DC, range 80V DC ~ 300V DC
- 110V AC / 220V AC, range 80V AC ~ 264V AC
- Voltage Withstand: Meets and exceeds IEC 834-1 and IEC 255 requirements.
- Dual / redundant power supply inputs and power supplies are also offered as an option.
- Short circuit protection
- Reverse power input protection.

Power Consumption:

- < 18 Watts.

EMI, EMC, Surge Withstand and other Compliances:

EN 50081-2	EN 50082-2	IEC 60068-2-29
IEC 61000-4-6 (Conducted Immunity)	IEC 60068-2-6	IEC 60068-2-2
IEC 60068-2-78	IEC 60068-2-1	IEC 60068-2-14
CISPR 22 / EN55022 Class B (Conducted Emission and Radiated Emission)		
IS 9000 (Part II Sec. 1-4, Part III Sec. 1-5, Part IV, Part 14 Sec. 1-3)		
IEC 60870-2-1	IEC 61000-4-5	IEC 61000-4-12
IEC 61000-4-3 (Radiated Immunity)	IEC 61000-4-8	IEC 61000-4-16
IEC 61000-4-2	IEC 61000-4-10	Telcordia GR-1089 Surge and Power Contact
IEC 61000-4-4	IEC 61000-4-11	

- ESD, Voltage and Surge Withstand: Meets and exceeds IEC 61000-4-2, IEC 61000-4-4, IEC 61000-4-5, Level 4 specifications.
- Immunity to Voltage Dips, Short Power Supply Interruptions and Voltage Variations meets and exceeds IEC 61000-4-11, Level 1 specifications.

Electromagnetic Standards Compliance:

- EN 50081-2, EN 50082-2
- IEC 61000-6-2 (immunity)
- IEC 610000-6-4 (emission)
- Complies to IEEE and IEC standards

CE Compliance:

- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility 2014/30/EU

Technical Specification

Environmental:

Operating Temperature	-20 C to +60 C
Maximum Operating Humidity	95% R.H., Non-Condensing
Maximum Operating Altitude	Up to 3,000 meters above sea level
Operation	Complies with ETS 300 019 Class 3.2
Storage Temperature	-40 C to +70 C
Storage	Complies with ETS 300 019 Class 1.2
Maximum Storage Humidity	98% R.H., Non-Condensing
Maximum Storage Altitude	Up to 3,000 meters above sea level
Transportation	Complies with ETS 300 019 Class 2.3

Other Regulatory Compliances:

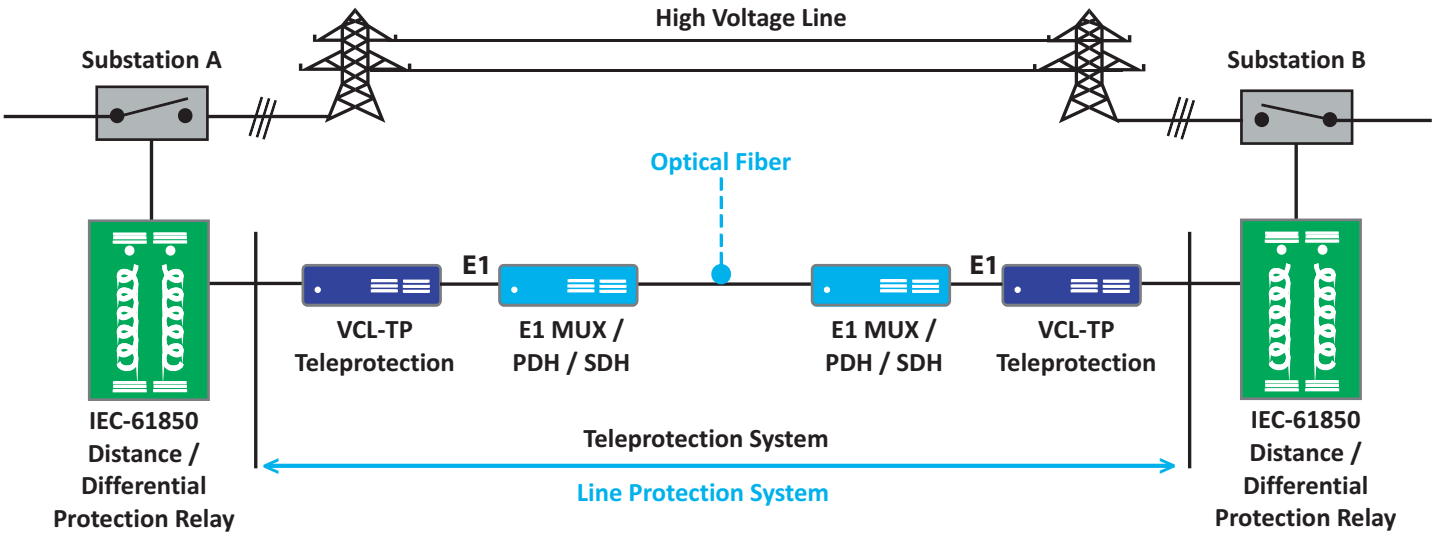
- RoHS
- CE Marking
- Complies with FCC Part 68 and EMC FCC Part 15
- Telcordia GR-1089 Surge and Power Contact

Physical Dimensions

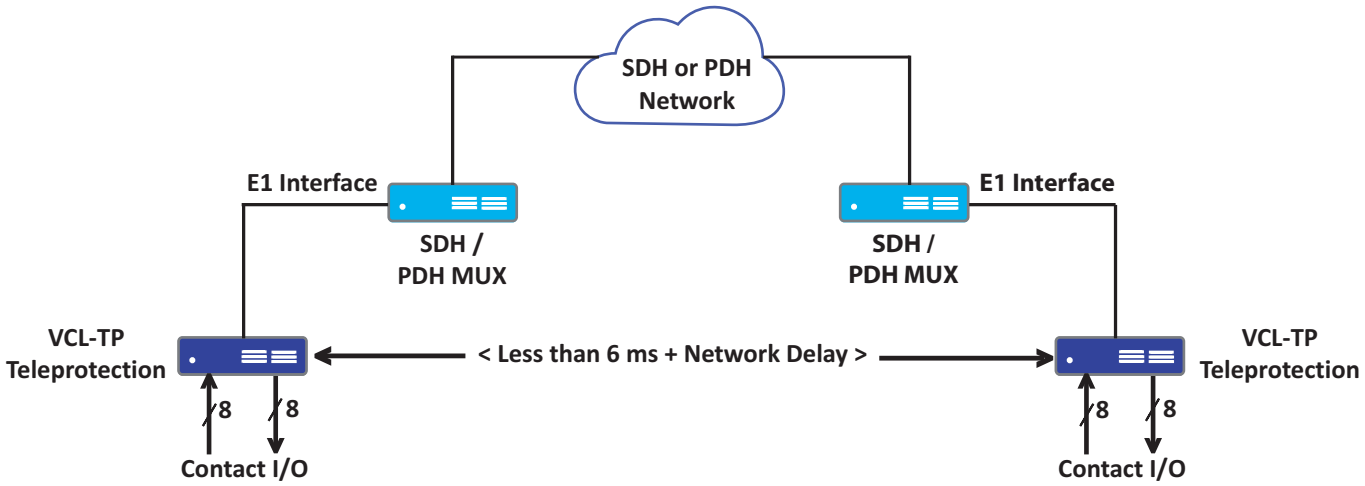
Dimensions	Teleprotection Unit	Trip Counter Display
Rack mounting	Standard 19-Inch. DIN Rack	
Height	85 mm / 133mm – standard 2U high	85 mm. standard 2U high
Depth	298 mm.	240 mm
Width	482 mm.	482 mm
Weight	4 kg	2 kg

Application Diagrams

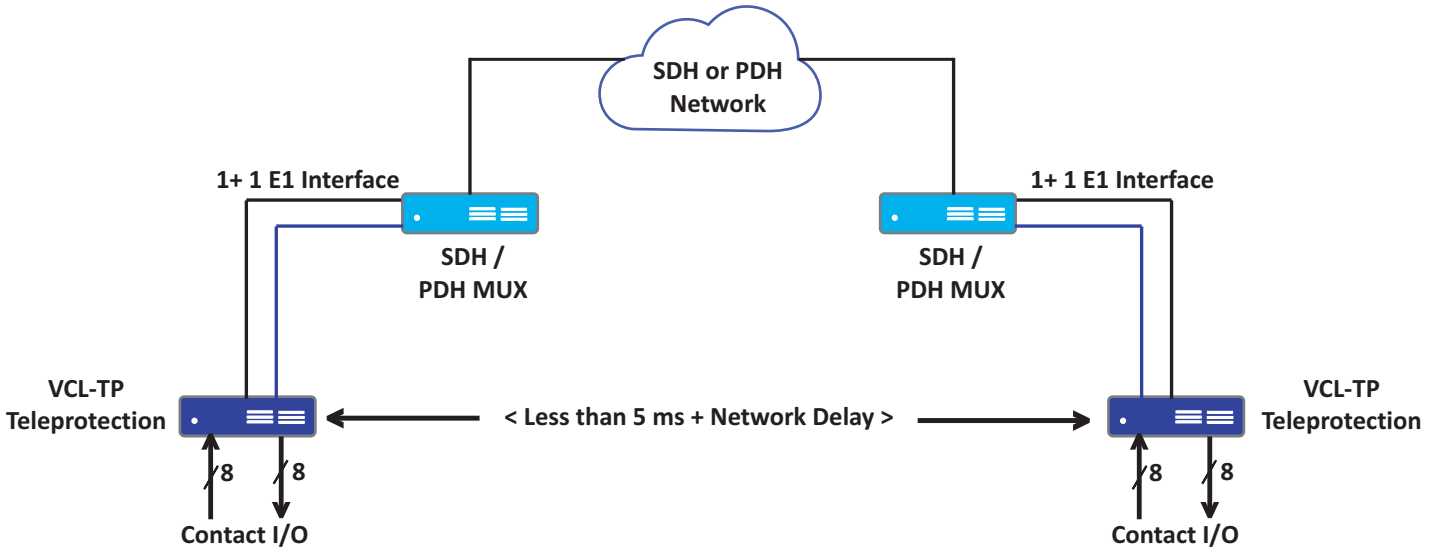
Teleprotection over SDH / E1 PDH Network



Teleprotection over E1 (2.048Mbps) Interface

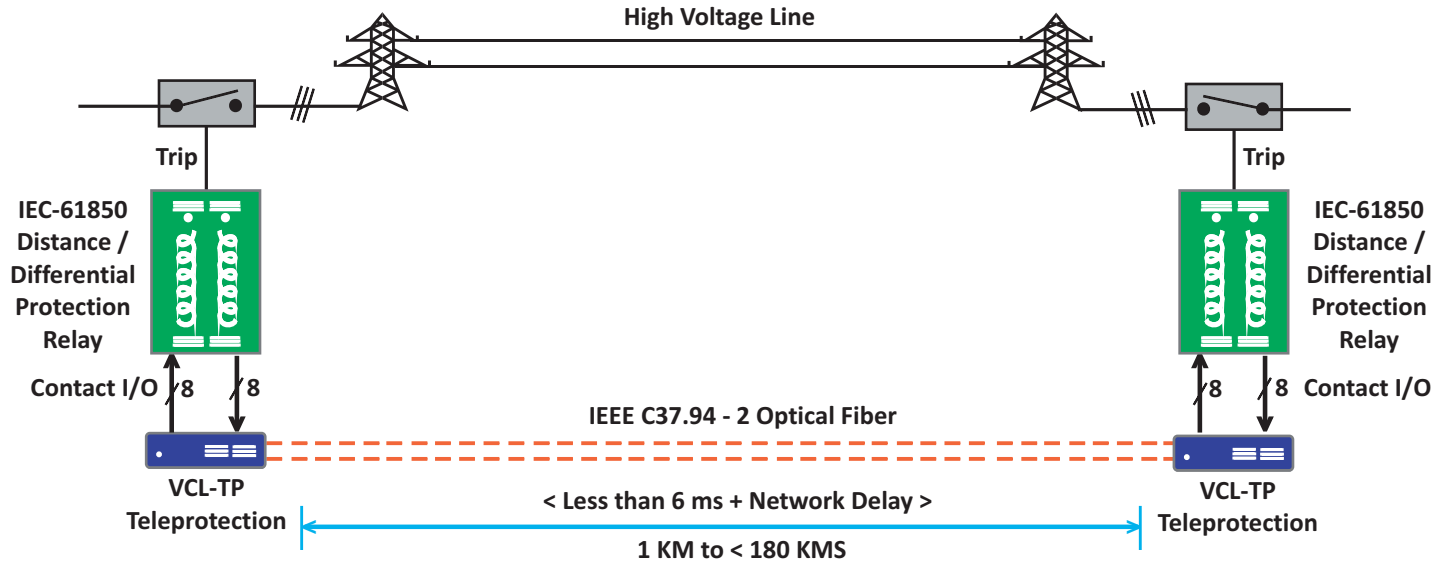


Teleprotection over E1 plus E1 (1+1 redundant) Interface

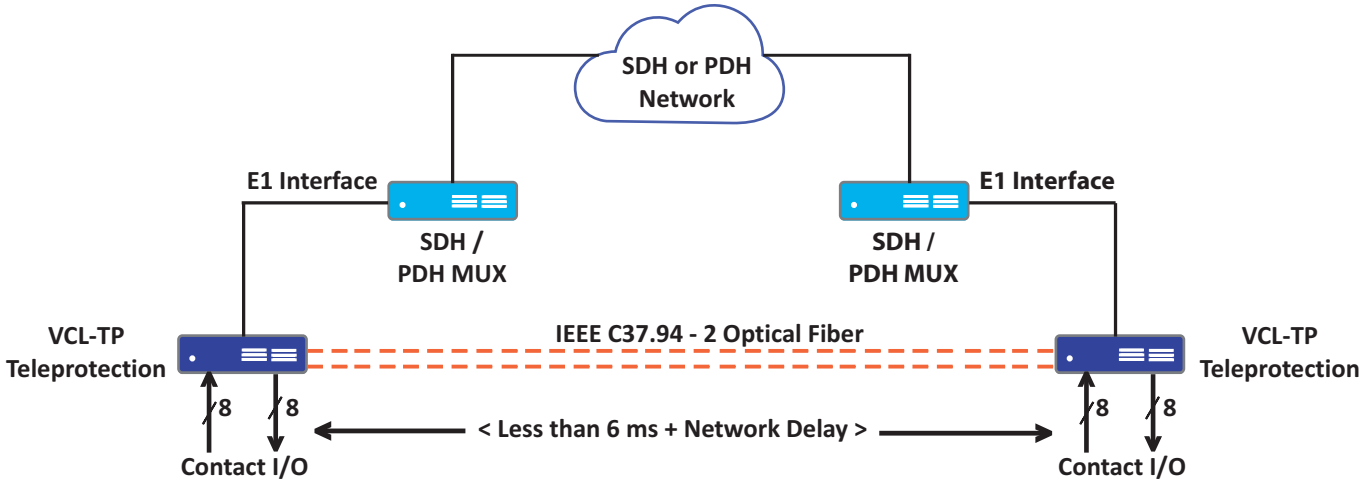


1+1 Redundant E1 interface with link failure detection and automatic failover

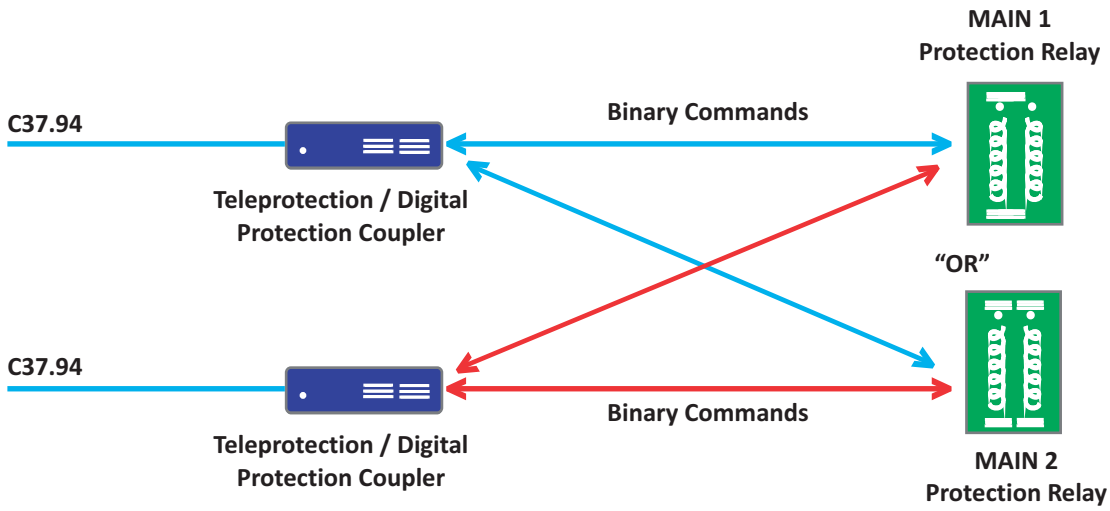
Teleprotection over IEEE C37.94 Optical Interface



Teleprotection over E1 (2.048Mbps) + C37.94 Interface (Redundant Transmission Links)



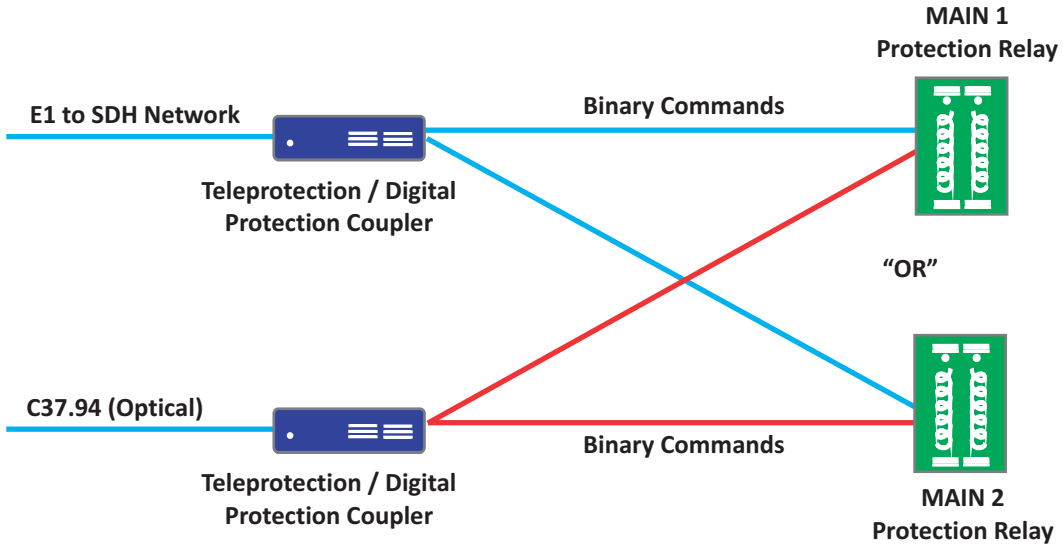
Teleprotection over C37.94 Redundant Distance Protection Scheme using “OR” Binary Commands



Note:

1. This diagram illustrates the scheme in which the MAIN 1 and MAIN 2 relays are connected to C37.94 Teleprotection equipment (Teleprotection over redundant 1+1 C37.94 interfaces) to implement the concept of "Reliable Communications" and provide 1+1 provide 1+1 Redundancy for establishing a resilient protection network.
2. The "OR" function is used to provide alternate tripping paths for both MAIN 1 and MAIN 2 protection relays, to provide fail-safe distance protection.

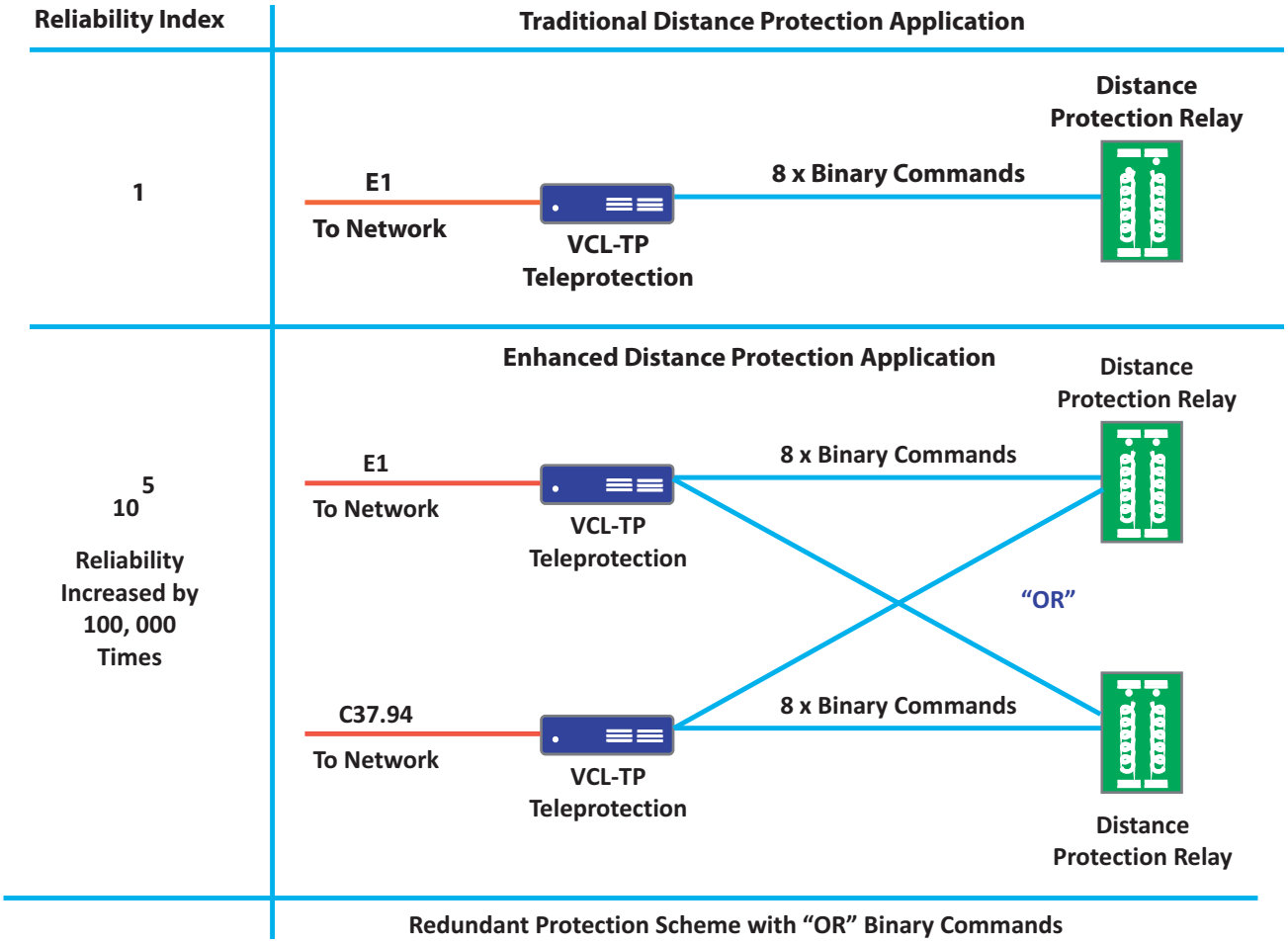
Teleprotection over C37.94 and E1 - Redundant Distance Protection Scheme using “OR” Binary Commands



Note:

1. This diagram illustrates the scheme in which the MAIN 1 and MAIN 2 relays are connected to provide Teleprotection over C37.94 and E1 Channels to implement the concept of "Reliable Communications" and 1+1 Redundancy for establishing a resilient protection network.
2. The “OR” function is used to provide alternate tripping paths for both MAIN 1 and MAIN 2 protection relays, to provide fail-safe distance protection.

Distance Protection Reliability Index over E1 plus C37.94 using "OR" Commands.



Ordering Information

BASE UNIT without Network Interface and PSUs:

Part #	Description
VCL-TP-1531	VCL-TeleProtection Terminal Equipment 19-Inch, Rack mountable Supports: – Upto 8, 2-way independent-simultaneous command channels which may be configured to operate selectively or simultaneously over Optical / PDH / SDH network(s) – OAM [SNMP, Telnet (RJ45) and Serial Port (USB and DB-9 COM Port)] – Graphical User Interface (GUI) and Network Management Software (NMS), System Core Cables, Installation Accessories, Documentation, System User Disk etc (Set) **[# Add IRIG-B / NTP / 1588 PTP Time synchronization (optional)]** **[# Add Network Interface]** **[# Add Power Supply]** **[# Select / Specify Command Voltage]** **[# Add Trip Counter Display (optional)]**

Add IRIG-B / NTP Time Synchronization (Optional)

Part #	Description
IRIG-B / NTP	IRIG-B / NTP Time Synchronization Option (50 Ohms BNC Input for IRIG-B and RJ45 for NTP)

Add Network Interface (Any one option)

Part #	Description
1546	2.048Mbps 120 Ohms E1 interface (RJ45)
2730-2736	1+1 redundant, automatic protection E1 interface - 2 x 2.048Mbps E1 (120 Ohms) digital data interface [RJ45 (F)]
2730-2736-MP	1+1 redundant, automatic protection E1 interface - 2 x 2.048Mbps E1 (120 Ohms) digital data interface [RJ45 (F)] (Point-to-Multipoint)
2715-2733	1 x 2.048Mbps E1 (120 Ohms) Digital Interface (RJ45) 1 x C37.94 (Modulated) Optical Interface [without SFP]
2715-2734	1 x 2.048Mbps E1 (120 Ohms) digital interface (RJ45) 1 x C37.94 Complaint Optical Interface [820nm MM, TX/RX, ST Connector]
1569	C37.94 (Modulated) SFP based optical fiber interface. (without SFP - the SFP must be ordered separately) **^ Select SFP Option from below** **[1 SFP per / each Card]**
E1-120-75-CONV	E1 120 Ohms (RJ45) to E1 75 Ohms (BNC) Converter

Ordering Information

Specify Command Voltage (Any One Option)

Part #	Description
CV024048	Command Voltages: 16-24V DC / 38-48V DC
CV048110	Command Voltages: 38-48V DC / 110V-125V DC
CV110220	Command Voltages: 110-125V DC / 220-250V DC

Add Power Supply Option (Any One Option)

Part #	Description
AC220	1 x 110~240V AC Power Supply Input
AC220R	2 x 110~240V AC Power Supply Input [Redundant]
DC048	1 x 48V DC Power Supply Input
DC110	1 x 110V~125V DC Power Supply Input
DC220	1 x 110V~250V DC Power Supply Input
DC048R	2 x 48V DC Power Supply Input [Redundant]
DC110R	2 x 110V~125V DC Power Supply Input [Redundant]
DC220R	2 x 110V~250V DC Power Supply Input [Redundant]

^ Select SFP Option from below (Maximum 1 SFP per UNIT for 1569 & 2 SFPs per UNIT for 1569R ONLY)

Part #	Description
VCL-EMOD 0262-TP	SFP Transceiver, Duplex LC, 850nm, 2Km, MM (Multi-Mode)
VCL-EMOD 0294-TP	SFP Transceiver, Duplex LC, 1310nm, 2Km, MM (Multi-Mode)
VCL-EMOD 0193-TP	SFP Transceiver, Duplex LC, 1310nm, 15Km, SM (Single-Mode)
VCL-EMOD 0194TP	SFP Transceiver, Duplex LC, 1310nm, 40Km, SM (Single-Mode)
VCL-EMOD 0348-TP	SFP Transceiver, Duplex LC, 1550nm, 40Km, SM (Single-Mode)
VCL-EMOD 0217-TP	SFP Transceiver, Duplex LC, 1550nm, 80Km, SM (Single-Mode)
VCL-EMOD 0402-TP	SFP Transceiver, Duplex LC, 1550nm, 160Km, SM (Single-Mode)
VCL-EMOD 0171-TP	SFP Transceiver, Duplex LC, 1550nm, 180Km, SM (Single-Mode)
VCL-EMOD 0244-TP	SFP Transceiver, Duplex LC, 1550nm, 200Km, SM (Single-Mode)
VCL-EMOD 0451-TP	SFP Transceiver, Duplex LC, CWDM, 1270nm, 80Km, SM (Single-Mode)

Add Trip Counter Display (External Trip Counter Display) – optional, if required

Part #	Description
VCL-DISP-1599-1597-08-DC048	Trip Counter Display / Alarm Extension Unit – 16 x Trip (8 Input and 8 Output) Counter Display – 8 x User Assignable External Relay Alarm outputs 19-Inch, 2U High Rack mountable – 1 x (-) 48V DC Power Supply Input
VCL-DISP-1599-1597-08-DC048R	Trip Counter Display / Alarm Extension Unit – 16 x Trip (8 Input and 8 Output) Counter Display – 8 x User Assignable External Relay Alarm outputs 19-Inch, 2U High Rack mountable – 2 x (-) 48V DC Power Supply Inputs

Note 1: The Trip Counter Display and Alarm Extension Unit is an optional extra unit which interconnects with the main Teleprotection unit through an interconnecting cable (supplied with the Trip Counter Display and Alarm Extension Unit).

Note 2: The Trip Counter Display and Alarm Extension Unit may, or may not be ordered with the Teleprotection Equipment, depending upon the user requirements.

Add VCL-TP external feed-through terminal block panel optional, if required

Part #	Description
VCL-HTER 1030-60IO	VCL-TP external feed-through Knife disconnect Terminal Block (TB) 60-I/O (2 x input and 2 x output) 19" 2U High Rack Mount Version
VCL-HRNS 1294-08-01.00M	8-Point, Feed-through Cable (8PINF/RA/Screw Flange to open), 1 meter] [4 cables required to order]
VCL-HRNS 1294-04-01.00M	4-Point, Feed-through Cable (8PINF/RA/Screw Flange to open, 1 meter) [2 cables required to order]
VCL-HRNS 1294-03-01.00M	3-Point, Feed-through Cable (5PINF/RA to open, 1 meter) [1 cable required to order]

Technical specifications are subject to changes without notice.
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