

# TN1Ue SDH Multiplexer



## Powerful and Flexible Multiplexing Solutions

The Lentronics™ TN1Ue SDH Multiplexer delivers powerful optical networking solutions for critical communications applications. With a wide range of tributary interface units, the TN1Ue provides both transport and access capabilities for voice, data, IP/Ethernet Wide Area Network (WAN), video and utility teleprotection traffic in a single package. Harsh environment ready, including a special metal cage enclosure to satisfy ETSI EMC requirements, the modular TN1Ue delivers flexible, secure, and reliable communications.

### Key Benefits

- Eliminate complex multi-device equipment solutions with a single integrated package
- High speed fibre optic communications (STM-1, STM-4, STM-16)
- 99.999% system availability with redundant common equipment for path switched ring networks
- Fast path protection switching (<3 ms)
- Reduce connectivity, expansion, and configuration costs with modular solution
- Advanced network visibility from the SDH level down to individual 64 kb/s signals
- Comprehensive network management capabilities using VistaNET™
- Secure and dependable transport of critical services

### Application Specific Optical Solutions



#### Energy

- Connecting substations, generation plants, control centres, administration offices
- Highly secure traffic segmentation
- Teleprotection, SCADA, video surveillance, voice, IP/Ethernet WAN



#### Oil & Gas

- Connecting production platforms, FPSO vessels, and on-shore facilities
- Voice, data, CCTV, IP/Ethernet for SCADA and security sub-systems



#### Pipelines

- Connecting block valves, metering, pumping/compressor stations and control centres
- Operational communications for voice, data, CCTV, IP/Ethernet WAN, security, safety and SCADA sub-systems



#### Transportation

- Connecting train platforms, traction power substations, wayside cabinets, maintenance facilities and control centres
- Emergency voice, passenger information and ticketing systems, train control, traction power and security sub-systems

## Utility Hardened

- Meets IEC® 61850-3 and IEEE® 1613 specifications for communications networking devices in electric power substations
- Reliable operation in extreme temperatures from -20°C to +60°C (-4°F to +140°F)
- Meets Earthquake Risk Zone 4 shock and vibration specification

## Scalable Design

- Add/Drop Multiplexer supporting industry standard network topologies
- Optional site specific tributary interfaces for video, voice, IP/Ethernet and utility teleprotection applications
- High-bandwidth optical interfaces from STM-1 to STM-16

## Robust & Reliable

- 99.999% system availability with ITU-T standards
- Fast path protection switching (<3 ms)
- Built-in test capabilities
- Designed with redundant common equipment for ring architectures
- VistaNET network management software provides complete system monitoring and diagnostics

## Secure & Dependable

- Segregated and dedicated SDH payload assignments for each application optimize QoS and security
- Port and VLAN partitioning isolate and protect critical communications applications



## SDH Network Access

Facing increasingly complex demands for communications and security, organisations are looking for cost-effective, reliable solutions for managing mission critical operations. The robust design of GE's Lentronics TN1Ue SDH Multiplexer makes it the ideal optical networking solution for electric power utility, transportation, pipeline and many industrial requirements.

### System Technology

This powerful SDH multiplexer has a modular design for ease of maintenance, configuration flexibility, and expandability.

The TN1Ue delivers the benefits of the ITU-T SDH telecommunications standards to applications previously serviced by a mix of proprietary and legacy standards based equipment.

The multiplexer provides redundancy for critical modules, with guaranteed performance over an extended ambient temperature range of -20°C to +60°C (-4°F to



+140°F). It meets ANSI®/IEEE Surge Withstand Capability (SWC), Radio Frequency Interference (RFI) as well as Zone 4 Earthquake specifications, providing secure performance in harsh environments.

The TN1Ue is powered by optionally redundant 48 VDC power supplies. Its built-in test capabilities can save the cost of purchasing SDH test equipment.

The TN1Ue can be customised to the user's requirements by equipping each site with specific modules as needed. New modules are added to the product line, as market needs dictate.

### SDH Network Flexibility

Simply replacing optical transceiver modules allows users to expand an existing TN1Ue system to a higher capacity, while maintaining their capital investment.

Mixed TN1Ue access networks of STM-1/STM-4, combined with TN1Ue backbone rings of STM-4 or STM-16 cost-effectively distribute telecommunications services, allocating bandwidth only where it is needed.

The product also has the flexibility to operate with GE's MDS™ or third party microwave radios and higher capacity STM-n multiplexers.

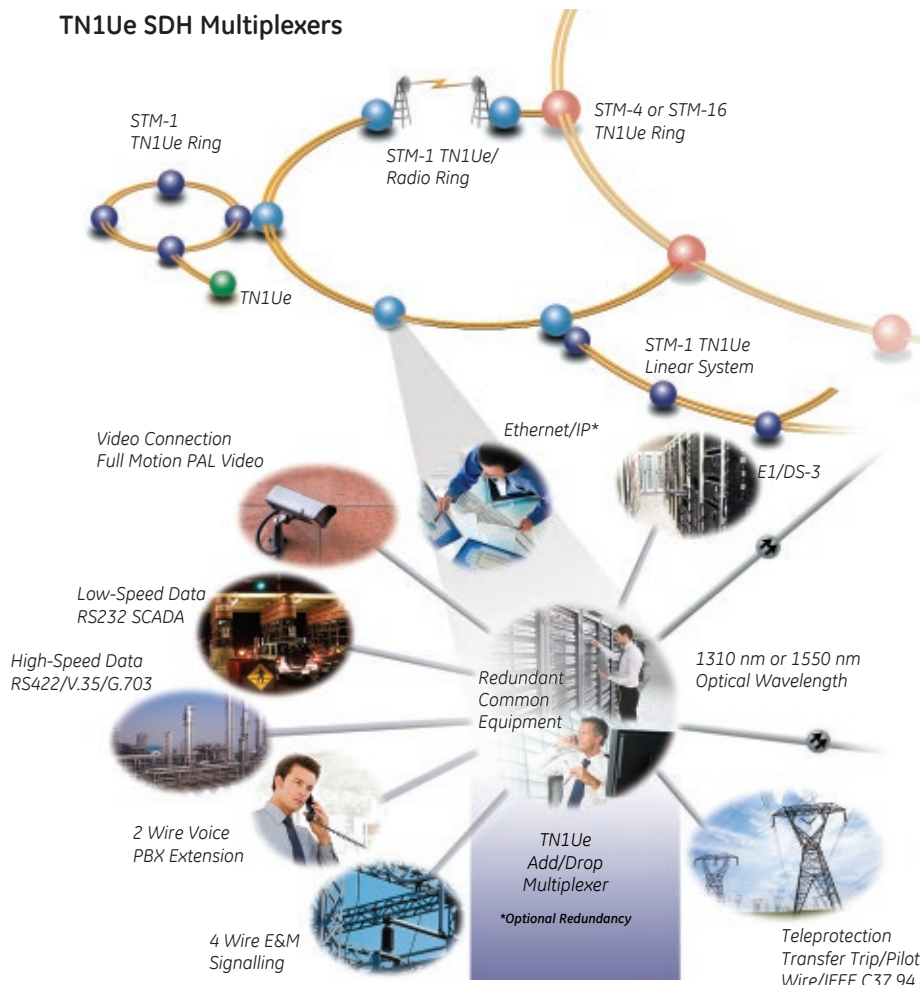
### Operations, Administration, Maintenance and Provisioning (OAM&P)

The TN1Ue takes advantage of the inherent network management capabilities provided by the SDH telecommunications standards.

VistaNET NMS software provides network visibility down to the individual circuit level at all nodes. This facilitates remote provisioning, monitoring, and alarm logging of the network from any node. VistaNET software operates on a Windows® based personal computer. An optional SNMP Network Management System (NMS) interface is available. VistaNET is also used for system diagnostics and troubleshooting.

Visibility of all TN1Ue equipment, including the 64 kb/s tributary units, improves maintenance response time and saves the operator money.

## TN1Ue SDH Multiplexers



## Applications

### Electric Power Utilities

Originally designed for the unique needs of utilities, the TN1Ue system supports a wide range of specialty traffic, including teleprotection (direct transfer trip, pilot wire, and IEEE C37.94 optical interface to protection relays), surveillance video, substation automation, Ethernet WAN/IP and telephony.

High system availability is provided through redundant common equipment and compliance with ITU-T SDH standards for path switched ring protection architecture.

But the TN1Ue goes beyond SDH standards, offering the industry's fastest path protection switching (<3 ms), and incorporating special design characteristics that allow it to meet IEC RFI and SWC standards for operation in harsh utility environments.

### Transportation Corridors

For highway, roads, bridges, tunnels, rail transit, freight railway, and airport applications the TN1Ue system cost-effectively integrates services previously provided by proprietary and legacy standards based equipment. Now these services can be combined to receive the full benefits of a SDH network.

For applications, such as video surveillance, fare collection, passenger information

systems, train control, emergency voice and signalling, the TN1Ue is the optical communications product of choice.

TN1Ue networks support both 48 Mb/s and 12 Mb/s video WANs. Each analog video source (ex. camera, VCR) is digitized with a user configurable compression algorithm for bit-rate bandwidth management and then integrated into a shared video WAN.

For incident detection in surveillance applications, intelligent bandwidth allocation allows more bandwidth to be instantly assigned to specific cameras, permitting a higher resolution and more frames per second. When required, audio and data channels may be transported with the video.

The TN1Ue video interface addresses the issues of quality versus bandwidth by efficiently transporting video signals.

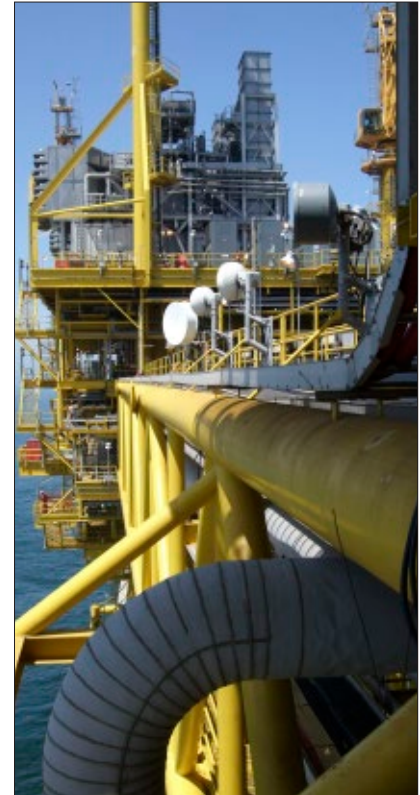
An optional remote video interface accessory is also available, which economically extends video capability up to 30 km from a TN1Ue node via fibre optic cable.

### Pipelines and Industrial Facilities

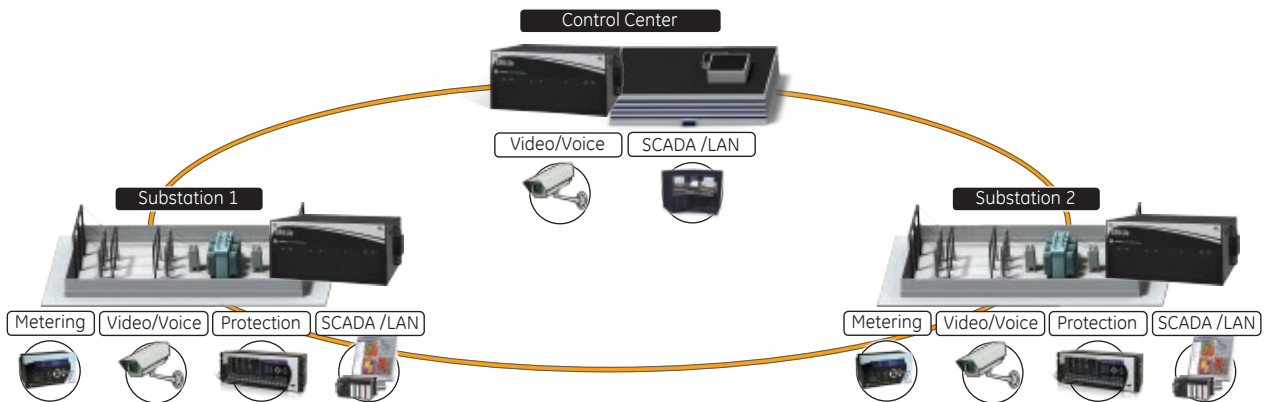
The rugged design, compact size and low power consumption of the TN1Ue also make it the ideal optical communications solution for oil, gas, refined products, water and slurry pipelines. Field proven industrial applications include electrical distribution protection and control in mines, as well as SCADA for onshore

or offshore oil and gas production fields.

The TN1Ue SDH Multiplexer creates greater value for its user by carrying a multitude of services, such as low speed polling data, SCADA, power measurement data, video surveillance, Ethernet WAN/IP and PBX phone drop extensions over a single network.



## TN1Ue SDH Multiplexer Electric Utility Application



# Specifications

## SIGNALLING RATES AND OPTICAL INTERFACES

### STM-1 SIGNAL

|   |                       |
|---|-----------------------|
| Speed                                       | 155.52 Mb/s           |
| Line Code                                   | NRZ                   |
| Optical Connector                           | LC                    |
| System Gain (singlemode fibre)              |                       |
| @ 1310 nm                                   | 20 dB                 |
| Intermediate Reach up to 30 km (19 miles)   |                       |
| @ 1310 nm                                   | 29 dB                 |
| Long Reach up to 50 km (31 miles)           |                       |
| @ 1550 nm                                   | 34 dB                 |
| Extra Long Reach up to 120 km (75 miles)    |                       |
| @ 1550 nm                                   | 38 dB                 |
| Extra Long Reach-2 up to 200 km (125 miles) |                       |
| System Gain (multimode fibre)               |                       |
| @ 1310 nm                                   | 12 dB                 |
| Intra-office                                | up to 2 km (1¼ miles) |

### STM-4 SIGNAL

|   |                     |
|---|---------------------|
| Speed                                       | 622.08 Mb/s         |
| Line Code                                   | NRZ                 |
| Optical Connector                           | LC                  |
| System Gain (singlemode fibre)              |                     |
| @ 1310 nm                                   | 14 dB               |
| Intermediate Reach up to 20 km (12.4 miles) |                     |
| @ 1310 nm                                   | 25 dB               |
| Long Reach up to 40 km (25 miles)           |                     |
| @ 1550 nm                                   | 34 dB               |
| Extra Long Reach up to 120 km (100 miles)   |                     |
| @ 1550 nm                                   | 38 dB               |
| Extra Long Reach-2 up to 160 km (100 miles) |                     |
| System Gain (multimode fibre)               |                     |
| @ 1310 nm                                   | 7 dB                |
| Intra-office                                | up to 1 km (½ mile) |

### STM-16 SIGNAL

|  |            |
|--|------------|
| Speed                                      | 2.488 Gb/s |
| Line Code                                  | NRZ        |
| Optical Connector                          | LC         |
| System Gain (singlemode fibre)             |            |
| @ 1310 nm                                  | 13 dB      |
| Intermediate reach up to 15 km, (9 miles)  |            |
| @ 1310 nm                                  | 26 dB      |
| Long reach up to 40 km, (25 miles)         |            |
| @ 1550 nm                                  | 26 dB      |
| Extra long reach up to 80 km, (50 miles)   |            |
| @ 1550 nm                                  | 31 dB      |
| Extra long reach up to 120 kms, (75 miles) |            |

Digital Energy  
 North America/Worldwide  
 100 - 8525 Baxter Place  
 Burnaby, BC  
 Canada V5A 4V7  
 Tel: 604-421-8733  
 Fax: 604-421-8707

lentronics@ge.com

[GEDigitalEnergy.com](http://GEDigitalEnergy.com)

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## CONFIGURATIONS SUPPORTED

Self healing D-P Rings  
 Two fibre linear systems  
 Multiple rings plus spurs  
 Multiple STM-1/STM-4/STM-16 rings interconnected through synchronous TIE links

## NETWORK MANAGEMENT CAPABILITIES

- Windows based PC NMS allowing network access from any node for full system monitoring and diagnostics
- Network visibility of every node, remote-provisioning (monitoring and configuration) of the network
- Alarm logging and time stamping
- Simple troubleshooting and network maintenance
- Optional redundant NMS platforms
- Optional interface for SNMP Manager, allowing common NMS integration using IP

## SYSTEM ALARMS

|       |  |
|-------|--|
| Major | Form C alarm relays and LED indicators |
| Minor | Form C alarm relays and LED indicators |

## ORDERWIRE

64 kb/s voice channel carried in SDH overhead

## CHANNEL INTERFACE UNITS

LED status indicators  
 Teleprotection units have Form C alarm-relays

## NODE THROUGH-DELAY

STM-1, STM-4: 20 µs  
 STM-16: 25 µs

## D-PR PATH PROTECTION SWITCHING TIME

<3 ms

## POWER REQUIREMENTS

48 VDC optional redundancy

## LOW POWER CONSUMPTION:

10 W for add/drop node common equipment (For individual channel unit power consumption, refer to the technical data sheet for that unit)

## RFI/EMC/ISOLATION/SWC

IEEE 1613  
 IEC 61850-3

## 1/0 CROSS-CONNECT

Optional CDAX Unit provides integrated 168x120 digital cross-connect for grooming 64 kb/s channels and optimizing tributary payloads.

## AVAILABILITY

99.9999% for redundant 1+1 protected common equipment (For individual interface unit MTBF figures, refer to the unit interface technical data sheet)

## ENVIRONMENTAL

|                       |                                |
|-----------------------|--------------------------------|
| Operating Temperature | -20° to +60°C (+14° to +140°F) |
| Storage Temperature   | -40° to +70°C (-40° to +158°F) |
| Humidity              | 5-95% non-condensing           |

## PHYSICAL DATA

### COMMON EQUIPMENT SHELF

|        |                       |
|--------|-----------------------|
| Height | 222 mm (8.75 inches)  |
| Width  | 483 mm (19 inches)    |
| Depth  | 413 mm (16.26 inches) |
| Weight | 5.9 kg (13 lbs)       |

### CHANNEL (EXPANSION) SHELF

|        |                      |
|--------|----------------------|
| Height | 178 mm (7 inches)    |
| Width  | 483 mm (19 inches)   |
| Depth  | 409 mm (16.1 inches) |
| Weight | 5.7 kg (12.9 lbs)    |

## VOICE UNITS

### 4W VF

Standard 600/900 Ω 4W interface with optional E&M signalling operating at standard TX/RX levels

### 2W VF

Standard 600/900 Ω 2W interface with optional E&M signalling operating at standard TX/RX levels

### 2W FOREIGN EXCHANGE

Loop start, ground start or PLAR signalling

## DATA UNITS

### LOW SPEED DATA

Asynchronous V.24/V.28 (RS232) interface, sub-rate multiplexing of four 9.6 kb/s or two 19.2 kb/s or one 38.4 kb/s signal

### HIGH SPEED DATA

V.11/RS422, V.35, G.703 interfaces, 56 kb/s or 64 kb/s (Synchronous/Asynchronous)

### NX64 KB/S DATA ELECTRICAL INTERFACE

N = 1 to 12 64 kb/s channels  
 V.35 interface

### E1

G.703 2.048 Mb/s E1 interface (75Ω and 120Ω)

## ETHERNET

10/100/1000 Mb/s Ethernet Learning Bridges per IEEE 802.3 standard

## VIDEO

User adjustable video signal bandwidth and frame refresh rates. Supports transport of:

- PAL or NTSC video signal
- Full duplex audio
- V.10/V.11/V.24/V.28 data
- Contact I/O
- PTZ camera control and remote alarms

## TELEPROTECTION UNITS

### TRANSFER TRIP

Separate transmit and receive units, optional test panel

### CURRENT DIFFERENTIAL

HCB, CPD, SPD, RADHL pilot wire relay interfaces

### CONTACT INPUT/OUTPUT

Transport of contact closure

### N X 64 KB/S DATA OPTICAL INTERFACE

N = 1 to 12 64 kb/s channels  
 IEEE C37.94 fibre optic connection to protection relays