GE
Digital Energy

# Lentronics™ E1MXe Multiplexer

## Multiplexing Solutions for Critical Communications

The Lentronics E1MXe Multiplexer is a powerful, flexible and reliable solution for converged service networks. The E1MXe extends critical channel access into harsh utility environments over microwave radio, leased line and dedicated fiber optic or copper cable networks.

### Key Benefits

- Secure and dependable transport of critical utility information over public or private communication infrastructures
- Harsh environment ready, meeting IEC/ETSI®/ANSI® specifications for EMC, RFI and SWC
- Supports standalone E1 networks, E1 spurs and E1 access applications for higher order systems
- Upgradable to a TN1Ue SDH Multiplexer to satisfy increasing bandwidth requirements
- Network managed providing complete system monitoring and diagnostics for each individual DS0 channel

### Application Specific Solutions

**Energy**
- Communication between substations, generation plants, control centers and administration offices
- Supporting teleprotection, video surveillance, SCADA, substation automation, voice and data

**Oil & Gas**
- Communication between well clusters, production platforms, tank storage and control centers
- Voice, data, CCTV, IP/Ethernet telecom services for SCADA, safety/fire and security sub-systems

**Water & Wastewater**
- Communication between remote wells, dams, metering, treatment facilities, pumping / compressor stations and control centers
- Voice, data, CCTV, IP/Ethernet, security and safety sub-systems

**Transportation**
- Communication for train platforms, traction power substations, wayside cabinets, maintenance facilities and control centers
- Data, voice, transducers and contacts, IP/Ethernet

## 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

- Integrated Compact Digital Access X-Connect (CDAX)
- Supports a wide range of TN1Ue SDH compatible DS0 interface units including voice, data, teleprotection and Ethernet applications

## Robust & Reliable

- Built-in test capabilities
- No external power converter required and no internal fans
- Hot swappable units eliminate the need to power down the multiplexer, minimizing traffic disruptions
- Optional 1:1 protected CDAX units improve reliability and circuit availability

## Network Managed

- End-to-end circuit monitoring
- Integrated NMS solution with TN1Ue SDH Multiplexer networks

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## Application Flexibility

The Lentronics E1MXe Multiplexer, a part of the field proven TN1Ue digital transport and access system, supports a wide range of DS0 applications.

The E1MXe can be deployed in several network configurations such as:

- Terminal multiplexer
- Add/Drop multiplexer
- Cross connect configuration

The E1MX's Compact Digital Access and X-connect (CDAX) unit provides integrated multiplexer control including network management, E1 line interfaces and DS0 cross connect. The 120 × 120 cross connect permits the grooming and consolidation of DS0 channels between multiple E1s, or from multiple E1s to an E1 drop port on the CDAX unit paddleboard.

The E1MXe's can be used in leased line, microwave radio, or SDH networks, as well as dedicated copper and fiber optic cable applications. Standalone E1 networks connecting multiple facilities, or multiple sites within a single large facility, provide an efficient and cost effective telecommunication solution.

The E1MXe is a a powerful solution to extend the reach of TN1Ue SDH Multiplexer networks.

The E1MXe Multiplexer provides best of class solutions for electric power grid protection and control, pipeline control, as well as water, rail and highway mission critical applications.

## Interface Units

Supporting a wide range of DS0 interface units, the E1MXe has voice, data, teleprotection and Ethernet options. For high circuit count applications, the E1MXe offers expansion shelves to grow with the network's requirements.

## Reliability

Designed for critical infrastructure applications, the E1MXe supports full duplex E1.102 (ITU-T G.703) 2.048 Mb/s channelized circuits ensuring low latency for DS0 applications.

With hot swappable units, the E1MXe eliminates the need to power down the multiplexer for unit additions, minimizing traffic disruptions. In addition, the E1MXe offers an optional redundant multiplexer control and E1 line unit (CDAX unit). This protects against CDAX unit failure and ensures rapid, automatic cutover to a hot standby CDAX unit, maximizing system uptime and reliability.

## Local or Remote Configuration

Allowing simple installation, ongoing management and maintenance of the multiplexer, without expensive workstations, the E1MXe Multiplexer offers local or remote configuration, performance monitoring and diagnostics. With settings and configuration parameters maintained in non-volatile flash memory, configuration is maintained after loss of power.

## Network Management System

VistaNET™ provides remote configuration, monitoring and testing of all common equipment and telecommunication service interface units at any node in the system, minimizing disruption and maintenance costs. More than one user is able to simultaneously configure and monitor the system. Time stamped logging of alarms and intelligent processing of alarm lists, assists in identifying hard-to-find problems, facilitates alarm acknowledgement and provides immediate update on current system status.

Recording of network configuration changes provides an audit trail for future reference. A single integrated system view for interconnected and discrete network segments simplifies management. Security is enhanced through a multi-level password and privilege system with automatic expiration interval, controlled by a system administrator. Optical status information and BER statistics provide preliminary indications of system level problems, such as fiber cable and equipment component degradation.

## Applications

### Electric Power Utilities

Originally designed for the unique needs of electric power utilities, the E1MXe system supports a wide range of speciality traffic including teleprotection (direct transfer trip 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 industry standards.

The E1MXe goes beyond industry standards for E1 communications by incorporating design characteristics that allow it to meet IEC/IEEE RFI, SWC and EMC standards for operation in harsh utility environments.

### Industrial Facilities

The rugged design, compact size and low power consumption of the E1MXe Multiplexer makes it the ideal solution for oil and gas, water, as well as mining related applications.

The E1MXe Multiplexer creates greater value 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 E1 link.

### Transportation Corridors

For highway, roadway, bridge, tunnel, rail transit, freight railway, and airport applications, the E1MXe Multiplexer system cost-effectively integrates services previously provided by proprietary and legacy standards based equipment. For applications such as video surveillance, toll collection, traffic monitoring and control, VMS, emergency voice, SCADA, signaling and loop detection the E1MXe is the multiplexer of choice.

# Network Applications

The Lentronics E1MXe Multiplexer can be deployed in a variety of applications, from E1 circuit extensions through leased lines, E1 microwave radio links and spurs, as well as in standalone E1 networks connecting multiple facilities or multiple sites within a single large facility.

### Hybrid E1MXe and TN1Ue SDH Multiplexer Networks
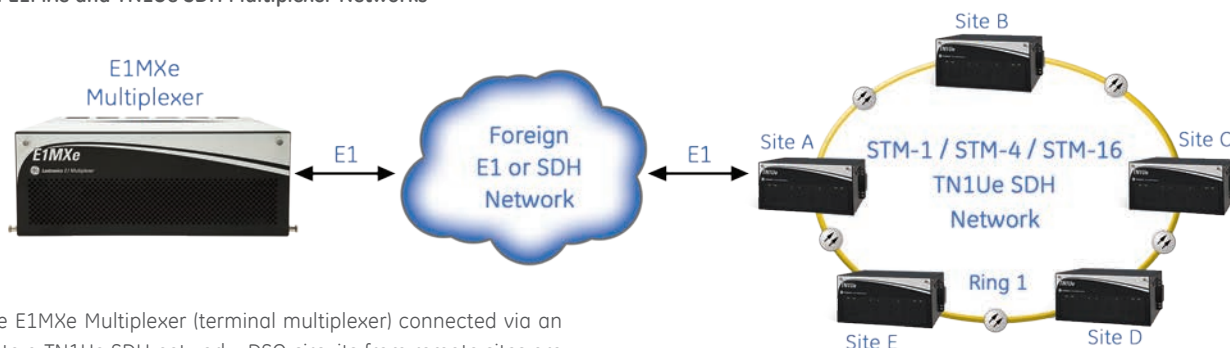


Remote E1MXe Multiplexer (terminal multiplexer) connected via an E1 link to a TN1Ue SDH network. DS0 circuits from remote sites are groomed into an E1 link for connection on the SDH network.
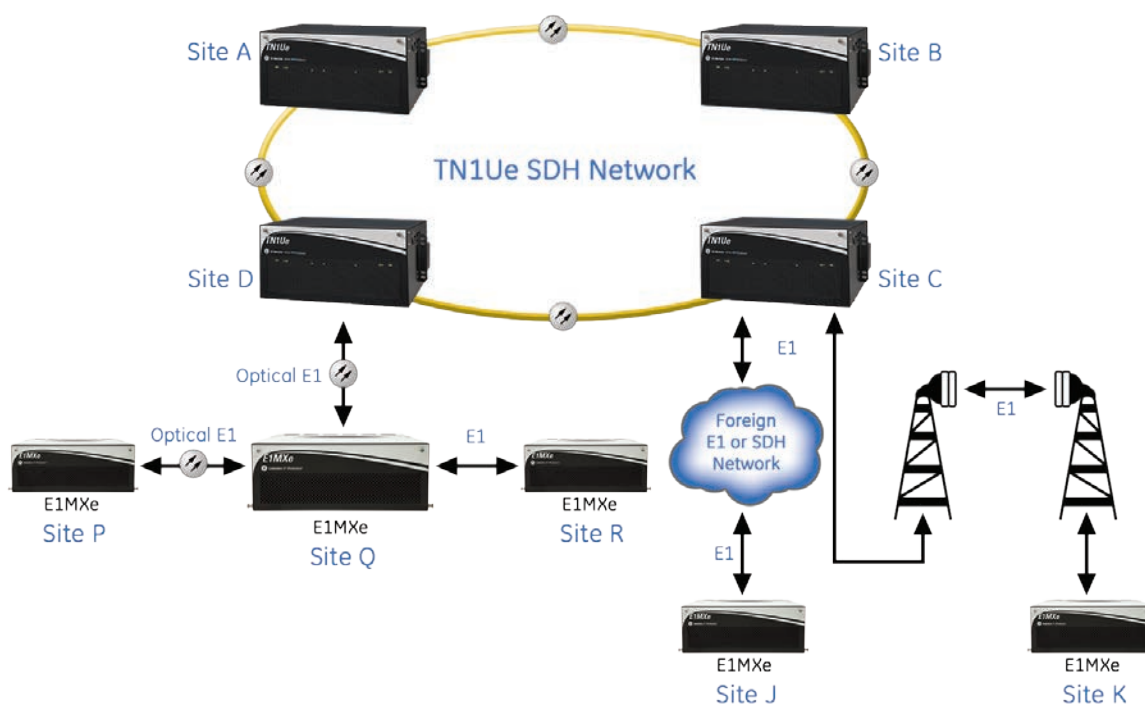


Remote E1MXe Multiplexers (Add/Drop) are connected to a TN1Ue SDH network over an E1 link. DS0 channels from Sites P and R are consolidated at Site Q and groomed for E1 connection to Site D.

Remote E1MXe Multiplexers are installed at Site J and Site K. DS0 channels from Site J and Site K are groomed and consolidated at Site C along with other DS0 channels and transported in a SDH shared TU-1 to another site, such as Site A. Site C is additionally equipped with CDAX units, and will interoperate over the SDH network with existing CMUX units (i.e. at Site A or B).

# Lentronics E1MXe Multiplexer



Power supply unit    DSO application units    CDAX units    Power supply unit
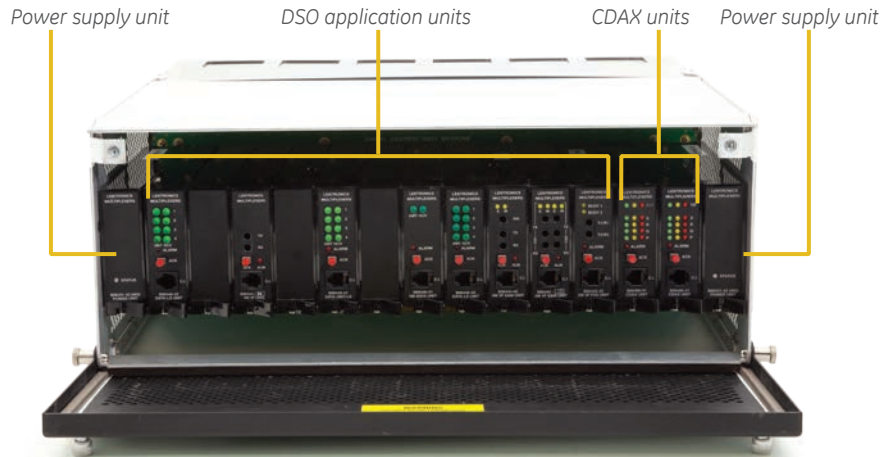
- 19" rack mount
- 4 rack units (RU) high
- 15 shelf slot positions
- Optional redundant power supply and CDAX units
- Software configurable, no hardware dip switch settings

# Specifications

## E1 INTERFACES

| | |
|---|---|
| Line Rate | 2.048 Mb/s ± 50 ppm |
| Line Code Options | HDB3 and AMI |
| Framing Format | CRC multi-frame |
| | Signaling multi-frame (CAS) |
| | Per ITU-T G.704 |
| PRBS Generator | $2^{11}-1$, $2^{15}-1$, $2^{20}-1$ |
| Pulse Shape | ITU-T G.703 compliant |
| Nominal Line Impedance | 120 Ω balanced ± 5% resistive |
| Line Buildout (LBO) | ITU G.703 compliant |
| | 0-200 meters (655 feet) |
| Connectors | DB9 for CBUS |
| | DB9 or RJ48C modular adaptor for electrical E1 (balanced) |
| | SFP cages for optical E1 |
| | DB9 or RJ48C for both major and minor shelf alarm contact outputs and shelf power supply(s) alarm contact input |

## TELEPROTECTION INTERFACES

| | |
|---|---|
| Transfer Trip | Separate transmit and receive units |
| Nx64 kb/s Data Optical | N=1 to 12 64kb/s channels |
| | IEEE C.37.94 standard for fiber optical connection to protection relays |
| G.703 Data | 64 kb/s channel supporting co-directional timing and Form-C relay alarm output |

## DATA INTERFACES

| | |
|---|---|
| Low Speed Data | RS232 interface |
| | Sub-rate multiplexing |
| | Point-to-point and multi-point |
| | Synchronous and asynchronous |
| High Speed Data· | 64 kb/s rates |
| | RS422, V.35, G.703 and OCUDP interfaces |
| Nx64 kb/s Data Electrical | N = 1 to 12 64 kb/s channels |

## TELEMETRY INTERFACES

| | |
|---|---|
| Contact Input/ Output | Transport of contact closure |

## VOICE INTERFACES

| | |
|---|---|
| 4W VF | Optional E&M signaling |
| | Point-to-point and multi-point |
| 2W VF | Optional E&M signaling |
| 2W Foreign Exchange | Loop, ground or PLAR signaling |

## POWER

48 VDC
Optional redundant power supply units

## NETWORK MANAGEMENT

VistaNET, operating on MS-Windows based PCs, allows network access via E1 or SDH Multiplexer nodes for system monitoring and diagnostics
Alarm logging and time stamping
Simple troubleshooting and network maintenance
RS-232 serial and IP LAN access, as well as SNMP software license choices

## SYSTEM ALARMS

| | |
|---|---|
| Major | Form C alarm relays |
| Minor | Form C alarm relays |

These contacts can optionally reflect one or more of the following

| | |
|---|---|
| | Test conditions |
| | Power unit alarm inputs |
| | Auxiliary contact inputs |

## ENVIRONMENTAL

| | |
|---|---|
| Operating Temperature | -20°C to +60°C (-4°F to +140°F) |
| Storage Temperature | -40°C to +70°C (-40°F to +158°F) |
| Humidity | 5-95% non-condensing |
| Earthquake | Earthquake Risk Zone-4 shock and vibration |

## ENVIRONMENTAL – ELECTRIC POWER SUBSTATION

| | |
|---|---|
| EMI/RFI | Meets ANSI/IEEE C37.90.2 RFI |
| SWC/ISOLATION | Meets ANSI/IEEE C37.90.1 SWC |
| EMC | Meets ETSI EN 300386-2 and CENELEC EN 50082-2 |

## PHYSICAL DATA

| | |
|---|---|
| Height | 178 mm (7 inches) |
| Width | 483 mm (19 inches) |
| Depth | 409 mm (16.1 inches) |
| Weight | Dependent upon configuration |

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