

## T1/E1 Multi-Protocol LIM for 16-port CES or ML-PPP

### Introduction

Due to the cost of running disparate or parallel networks, enterprises and carriers are looking for ways to transport multiple services over a lower cost packet-based network such as Ethernet or MPLS. The Xedge T1/E1 Multi-Protocol LIM allows circuit emulation over packet or cell networks. The front panel 68-pin high-density connector terminates in up to 16 individually configurable T1 or E1 ports. The LIM card provides all physical interfaces, cell delineation and convergence sub-layers.

The Xedge T1/E1-16MP LIM operates in three circuit emulation modes: SAToP, CESoPSN or AAL-1. In addition to Circuit Emulation Services, the 16-port LIM also supports the Multi-Link point-to-point protocol (ML-PPP) used for aggregation of T1s for bitrates above 1.5 Mbps or 2 Mbps per connection.

### Flexible, Scalable Operation

The LIMs install behind an Xedge PCX slot controller at the midplane connector of an Xedge switch. Low-, mid- and high-density Xedge switch chassis allow efficient sparing and deployment options. The 1RU Xedge 6002 switch supports 32 ports (2x16 T1 or E1 ports), while the high-density Xedge 6640/6645 switch supports up to 256 ports. A stand-alone version of the LIM is also available which does not require a slot controller.

### Timing Options

The Xedge T1/E1-16MP LIM can provide node timing/synchronization in compliance with IEEE 1588. The LIM is also an ideal solution for critical time-independent (TID) applications where individually configured port timing must be maintained across a packet network in accordance with ITU-T G.8261/RFC 4197. Each link can be optioned to one of four transmit timing modes:

- With System timing the LIM employs the Xedge switch timing bus structure, selecting which timing bus to use as the 8KHz reference to generate timing for the LIM.
- With an External clock reference, timing is derived from other links on the LIM.
- With the Local Oscillator on the LIM (an independent clock reference) timing is generated for the LIM. This timing arrangement supports failover.
- With the Adaptive clock reference on the LIM, when there are cell/packet arrival rate changes, this clock also changes. It will then clock the transmit timing for the link on the LIM to adapt to the new derived clock. Each of the 16 ports can use different derived timing.

### LIM Features

- Single-slot LIM supports sixteen T1/E1 ports for circuit emulation services or ML-PPP
- Channelized circuit emulation support (CESoPSN-RFC 5086) and AAL1
- Clear Channel Circuit Emulation (SAToP RFC 4553 or AAL-1)
- ANSI T1.102, T1.107, T1.403, T1.408, ITU-T G.703, G.704
- Configured E1 ports conform to ITU-T G.703, G.704
- Support for Multi-Link Point-to-Point Protocol (ML-PPP) RFC 1990
- Pseudowire Emulation (PWE) RFC 3985
- Interworking function with Ethernet support
- Transmit timing options for each T1/E1 port: System, Adaptive, External or Local Oscillator (internal). Local oscillator supports failover scenarios.
- Node Timing/Synchronization according to IEEE 1588.
- Designed for use with the PCX controller in any Xedge switch chassis
- One front panel 68-pin connector fans out to individual ports via cable/patch panel assy.
- Managed via RS232 console port, remote inband Telnet, SNMP, Ethernet, ProSphere NMS.
- Able to generate and monitor BER traffic
- Configured T1 ports comply with ANSI T1.102, T1.107, T1.403, T1.408, ITU-T G.703, G.704
- Configured E1 ports comply with ITU-T G.703, G.704
- Supports T1/E1 statistics, alarms, and line/local loopbacks, available at the user interfaces
- Front panel LEDs indicate In Service, Alarm and Loopback status.

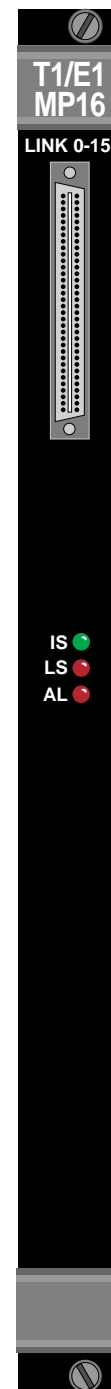


Figure 1: Front Panel Features of Xedge T1/E1 Multi-Protocol LIM

## Circuit Emulation

### SAToP Applications

The Xedge 16-port T1/E1 LIM card supports Structure Agnostic TDM over Packet (SAToP) according to RFC 4553. The RFC describes a method for encapsulating TDM bit streams into packet. The SAToP CES mode of operation is for clear channel only.

### CESoPSN Applications

The Xedge 16-port T1/E1 LIM supports Circuit Switch Circuit Emulation Service over a Packet Switched (CESoPSN) network in accordance with RFC 5086. This mode of operation provides for NxDS0 signals as pseudowires over packet switched networks.

### AAL-1 Applications

The Xedge 16 port T1/E1 LIM supports AAL-1 ATM circuit emulation in accordance with ATM Forum and ITU standards. In this application, the LIM operates in both structured and clear channel modes.

## Multi-Link Point-to-Point Protocol

The Xedge 16-port T1/E1 LIM supports the point-to-point protocol over T1s or E1s that are grouped together to form a bandwidth higher than 1.54 Mbps (T1) or 2 Mbps (E1). Grouping T1 or E1 circuits is a flexible means of creating higher bandwidth on a link costing less than a full DS3 or E3 circuit.

For example, four E1s can be bonded to created 4 x 2M or 8 megabits on a link. The 16-port LIM can provide two groups of up to eight T1s or E1s in a bonded group. Sub groups of less than eight T1s or E1s are also supported.

**Figure 2** shows the Xedge 16-port LIM providing T1 or E1 ports for circuit emulation services over a packet network using Ethernet and ATM interfaces.

**Figure 3** shows the Xedge 16-port LIM grouping T1/E1 circuits in an ML-PPP application where Ethernet connectivity is not available.

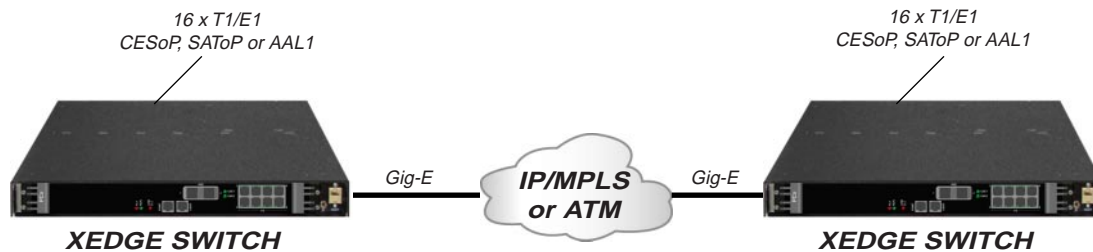


Figure 2: Circuit Emulation Service

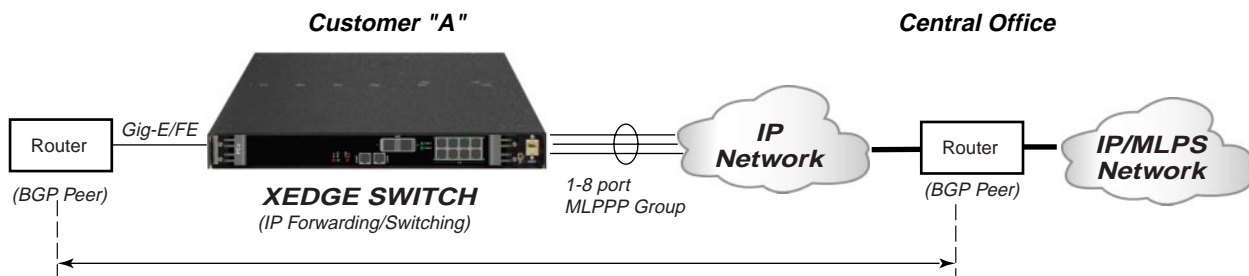


Figure 3: Multi-Link Point-to-Point Protocol Application

# Xedge T1/E1-MP16 LIM

Data Sheet

## Physical Specifications

### Xedge PCX Slot Controller only (Dual-slot Module)

(Horizontally installed)  
Dual-slot Height: 40.13 mm (1.58 in.)  
Width: 395.73 mm (15.58 in.)  
Depth: 240.53 mm (9.47 in.)  
Weight: TBD

### Xedge T1/E1 MultiProtocol Line Interface Module

Width: 19.81 mm (0.78 in.)  
Height: 261.62 mm (10.3 in.)  
Depth: 198.12 mm (7.80 in.)  
Weight: TBD

### Xedge PCX and LIM in Xedge 6002 Chassis

Width: 482.61 mm (19.0 in.)  
Height: 40.38 mm (1.59 in.)  
Depth: 482.6 mm (19.0 in.)  
Weight: TBD

## Environmental Specifications

### Non-Operating

Temperature: -40 to 70 degrees C (-40 to 158 degrees F)  
Relative Humidity: Up to 95%  
Altitude: up to 12,191 m (40,000 ft)

### Operating

Temperature: 0 to 50 degrees C (32 to 122 degrees F)  
Relative Humidity: Up to 95% non-condensing  
Altitude: -60 to 4,0000 m (-197 to 13,123 ft)

## Electrical Specifications

Dependent on Xedge Chassis used:

- Xedge 6645 Switch Chassis (16 I/O slots, DC Power)
- Xedge 6640 Switch Chassis (16 I/O slots, AC Power)
- Xedge 6280 Switch Chassis (7 I/O slots, AC or DC Power)
- Xedge 6160 Switch Chassis (4 I/O slots, AC or DC Power)
- Xedge 6002 Switch Chassis (2 I/O slots, AC or DC Power)

## Operational Specifications

Port Capacity: 16 ports  
Transmit Timing Modes: System, External, Adaptive, Local Oscillator  
Compatible Controllers: PCX  
Network Management: SNMP  
Line Encoding: B8ZS, AMI, HDB3  
Performance Monitoring:  
Errored Seconds, Severely Errored Seconds, Unavailable Seconds  
Transmit Timing: From received clock or internal oscillator

## Standard Interfaces

DS1 Services:  
T1/E1 ANSI T1.102, T1.107, T1.403, T1.408, ITU-T G.703, G.704  
Management:  
SNMP, standard and GDC MIB management, and GDC's ProSphere Network Management System

## Diagnostics & Alarms

Diagnostics: Transmit, Receive, and Payload Loopbacks  
Status LEDs:  
IS (In Service); LS (Loss of Signal); AL (Loopback or Loss of Frame)  
Alarms:  
IS (In Service); LS (Loss of Signal); AL (Loopback or Loss of Frame)