# MiTOP-E3/T3

## SFP-Format TDM Pseudowire Gateway


- Miniature TDM pseudowire access gateway employing SAToP (RFC 4553) payload encapsulation
- Support for synchronous Ethernet (Sync-E) solutions
- ASIC-based architecture for minimizing processing delay
- Advanced clock distribution mechanism, and configurable jitter buffer
- Comprehensive OAM and performance monitoring

MiTOP-E3/T3 is a TDM pseudowire (PW) access gateway extending E3/T3 services over packet-switched networks.

Housed in a Small Form-Factor Pluggable (SFP) enclosure, it is designed for quick and simple insertion into any 100/1000BaseFx Ethernet port with an MSA-compatible socket.

MiTOP-E3/T3 is a simple and cost-effective alternative to external, standalone gateways or conversion cards for each user device, saving on space, power consumption, cabling, and simplifying management.

### PSEUDOWIRE PERFORMANCE

High-performance ASIC-based buffering and forwarding techniques are used to minimize end-to-end processing delay.

The gateway provides a legacy over PSN solution for transmitting E3/T3 streams over packet switched networks. The device converts the data stream from its user E3/T3 ports into packets for transmission over the network. The addressing scheme of these packets is UDP/IP, MPLS or MEF. These packets are transmitted via a 100/1000BaseFx port of the host device to the PSN. A remote pseudowire gateway converts the packets back to E3/T3 traffic.

Configurable packet size balances between PSN throughput and delay.

A large configurable jitter buffer per each PW connection compensates for the delay variation introduced by the PSN.

The gateway employs SAToP payload encapsulation. On the network side, the unit uses MPLS, MEF and UDP/IP encapsulation techniques.

### SFP ENCLOSURE

Housed in a Small Form Factor Pluggable (SFP) package, MiTOP-E3/T3 complies with the Multi-Source Agreement.

Running on power derived from the host device, it requires no additional power supply.

MiTOP-E3/T3 is hot-swappable and features a special release mechanism for easy extraction from the SFP socket.

### PSEUDOWIRE QoS/CoS

For Ethernet networks – the outgoing pseudowire packets are assigned a dedicated VLAN ID according to 802.1Q and marked for priority using 802.1p bits.

E3/T3 circuit emulation over packet switched networks

TDMoIP Driven®

RAD data communications
The Access Company

# MiTOP-E3/T3

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For IP networks – the outgoing pseudowire packets are marked for priority using ToS (including the DSCP and Diffserv bits).

For MPLS networks – the outgoing pseudowire packets are assigned to a specific MPLS tunnel and marked for priority using EXP bits.

### TIMING

Synchronization between TDM devices is maintained by deploying advanced clock distribution mechanisms. The clocking options are:

- Internal – the master clock source for the TDM circuit is the internal oscillator
- Loopback – the transmit clock for the TDM is derived from the E3/T3 port receive clock
- Adaptive – the clock for the TDM is recovered from the PSN.

  Clock recovery conforms to G.823 using G.8261-defined scenarios.
- Sync-E (Gigabit Ethernet only) – Synchronous Ethernet timing is received via PSN and used to create a locked TDM clock. This ensures both sides of the network work with the same clock source.

Jitter and wander of the recovered clock are maintained at levels that conform to G.823/G.824 traffic. For adaptive clock recovery, the recovered clock performance depends on the packet network characteristics.

### TDM INTERFACE

The TDM port connects to any standard E3 or T3 device.

E3 and T3 interfaces feature:

- HDB3 (E3) and B3ZS, AMI (T3) line codes
- M23, C-bit framing (T3).

MiTOP-E3/T3 is transparent to all signaling protocols.

### FAULT PROPAGATION

Loss of E3 or T3 signal is propagated by sending an electrical LOS signal to the 100/1000BaseFx port, and is visually indicated by the LOS LED (red) turning on. This in turn can automatically turn off the LAN link. Turning on/off the packet link is user-configurable (enabled or disabled).

### MANAGEMENT

The units can be managed using different ports and applications:

- Out-of-band via the I2C channel (of the SFP edge connector)
- Inband via the Ethernet port, using a Web browser.

To facilitate integration of a new device into an IP network, if no IP address has been manually configured, MiTOP-E3/T3 automatically requests one from the DHCP server upon booting.

Management traffic can run over a dedicated VLAN.

Application software can be downloaded to MiTOP-E3/T3 via:

- SFP-CA unit, using YMODEM protocol
- Central server, using TFTP.

### OAM AND PERFORMANCE MONITORING

RAD's TDM PW OAM mechanism verifies connectivity and prevents pseudowire configuration mismatch.

### DIAGNOSTICS

External and internal loopbacks can be used to check TDM link connectivity.

Alarms detected during operation are stored in a buffer holding up to 100 events.

TDM alarms of a connected device are forwarded to the peer side using the control word of the PW packet. Alarm Indication Signals (AIS) are sent to the connected TDM device if no PW packets are received or an L-bit Active packet is received.

### TEMPERATURE-HARDENED SFP

A temperature-hardened version of the gateway with Fast Ethernet interface is intended for industrial installations.

### CONFIGURATION ADAPTER

An optional configuration adapter is available for connecting MiTOP-E3/T3 to a PC via a USB 2.0 port.

The configuration adapter is used for preliminary configuration or software download.

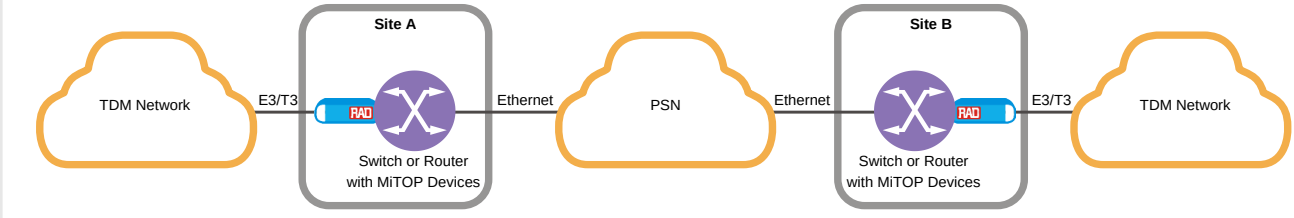


Figure 1 Delivering E3/T3 Services over PSN

# Specifications

## E3 INTERFACE

**Number of Ports**
1

**Compliance**
ITU-T Rec. G.703, G.751, G. 775, G.823, G.832

**Data Rate**
34,368 Mbps

**Line Code**
HDB3

**Framing**
Framed (G.832, G.751), unframed

**Line Impedance**
75Ω, unbalanced

**Transmit Clock**
Receive, internal, adaptive

**Jitter and Wander Performance**
Per ITU-T G.823

**Cable Length**
Up to 275m (900 ft)

**Connector**
DIN 1.0/2.3

## T3 INTERFACE

**Number of Ports**
1

**Compliance**
GR-499-CORE, T1.107, T1.404, G.703, G.704, G.775, G.824

**Framing**
C-bit, M23, unframed

**Data Rate**
44.736 Mbps

**Line Code**
B3ZS, AMI

**Line Impedance**
75Ω, unbalanced

**Transmit Clock**
Receive, internal, adaptive

**Jitter and Wander Performance**
Per ITU-T G.823, G.824

**Cable Length**
Up to 275m (900 ft)

**Connector**
DIN 1.0/2.3

## ETHERNET INTERFACE

**Type**
100/1000BaseFx

**Compliance**
IEEE 802.3

**Edge Connector**
SFP-based, MSA-compliant

## PSEUDOWIRE CONNECTIONS

**Standard Compliance**
SAToP: IETF RFC 4553

MEF: MEF 8

**Number of PW Connections**
1

**Jitter Buffer Depth**
Up to 60 ms (E3) or 45 ms (T3)

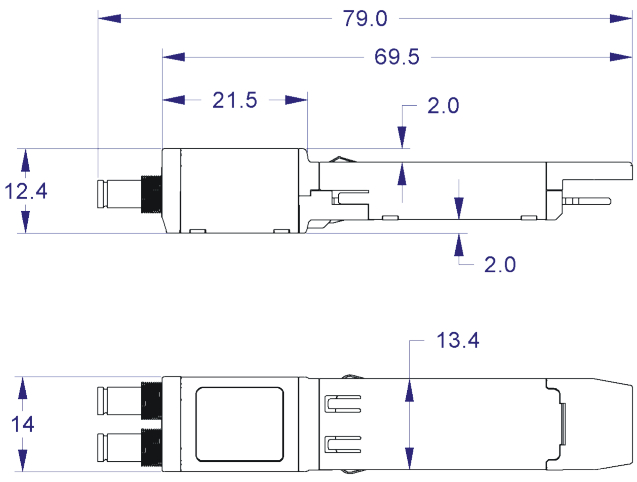


Figure 2 Physical Dimensions

Data Sheet

# MiTOP-E3/T3

## SFP-Format TDM Pseudowire Gateway

### GENERAL

**Indicators**

LINK (green) – Ethernet link status and activity

LOS (red) – E3/T3 signal status

**Timing**

Internal, loopback, adaptive or Sync-E

**Physical**

Height: 12.4 mm (0.48 in)
Width: 14.0 mm (0.55 in)
Depth: 79 mm (3.1 in)
Weight: 30.0g (1.0 oz)

**Power Supply**

3.3V, up to 400 mA (Fast Ethernet)

3.3V, up to 470 mA (Gigabit Ethernet)

**Power Consumption**

1.3W (Fast Ethernet)

1.55W (Gigabit Ethernet)

**Environment**

Temperature:

MiTOP-E3/T3/FE:
Ambient: -40 to 55°C (-40 to 131°F)
Case: -40 to 70°C (-40 to 158°F)

MiTOP-E3/T3/GE:
Ambient: -40 to 60°C (-40 to 140°F)
Case: -40 to 75°C (-40 to 167°F)

MiTOP-E3/T3/FE/H:
Ambient: -40 to 65°C (-40 to 149°F)
Case: -40 to 80°C (-40 to 176°F)

Humidity: Up to 90%, non-condensing

Table 1. MiTOP Family Product Comparison

| Features | MiTOP-E1/T1 (Ver. 3.0)  | MiTOP-E3/T3 (Ver. 3.0)  |
|---|---|---|
| TDM interface | E1/T1 | E3/T3 |
| Ethernet port | 100/1000BaseFx | 100/1000BaseFx |
| Number of PWs | 1 | 1 |
| Payload encapsulation | CESoPSN, SAToP | SAToP |
| Jitter buffer size (msec) | Up to 256 (E1, framed T1)<br>Up to 340 (unframed T1) | Up to 60 (E3)<br>Up to 45 (T3) |

## Ordering

**MITOP-E3T3/+/?**

*Legend*

**+** PSN interface:

- **FE** Fast Ethernet
- **GE** Gigabit Ethernet

**?** Enclosure (Default=regular enclosure):

- **H** Temperature-hardened enclosure (MiTOP-E3/T3/FE units only)

### SUPPLIED ACCESSORIES

**CBL-MINIBNC-BNC**

Two 1m (3.28 ft) DIN 1.0/2.3 to BNC cable adapters

### OPTIONAL ACCESSORIES

**SFP-CA**

Configuration adapter for connecting MiTOP-E3/T3 to a PC



**International Headquarters**
24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
Tel. 972-3-6458181
Fax 972-3-6498250, 6474436
E-mail market@rad.com

**North America Headquarters**
900 Corporate Drive
Mahwah, NJ 07430, USA
Tel. 201-5291100
Toll free 1-800-4447234
Fax 201-5295777
E-mail market@radusa.com

**www.rad.com**



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