

MiTOP-E3/T3

SFP-Format TDM Pseudowire Gateway



- Miniature TDM pseudowire access gateway employing SAToP (RFC 4553) payload encapsulation
- ASIC-based architecture for minimizing processing delay
- Advanced clock distribution mechanism, including synchronous Ethernet (Sync-E)
- 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 100/1000BASE-FX 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.

TDM PSEUDOWIRE

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.

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 100/1000BASE-FX 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 supports the following encapsulation methods:

- Payload - SAToP
- Network - MPLS, MEF, and UDP/I.

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.

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. Both single and double tagging is supported.

OAM and Performance Monitoring

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

TIMING AND SYNCHRONIZATION

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 TDM circuit clock is recovered from the reception rate of packets from the PSN. Clock recovery conforms to G.823/G.824 using G.8261 ACR-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



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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.

MONITORING AND DIAGNOSTICS

Alarms

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.

Fault Propagation

E3 or T3 loss signal is propagated by sending an electrical LOS signal to the 100/1000BASE-FX 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).

Loopbacks Tests

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

MANAGEMENT AND SECURITY

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.2 unit, using YMODEM protocol
- Central server, using TFTP

ARCHITECTURE

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.

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

OPERATION AND MAINTENANCE

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

MiTOP-E3/T3

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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

100/1000BASE-FX

Compliance

IEEE 802.3

Edge Connector

SFP-based, MSA-compliant

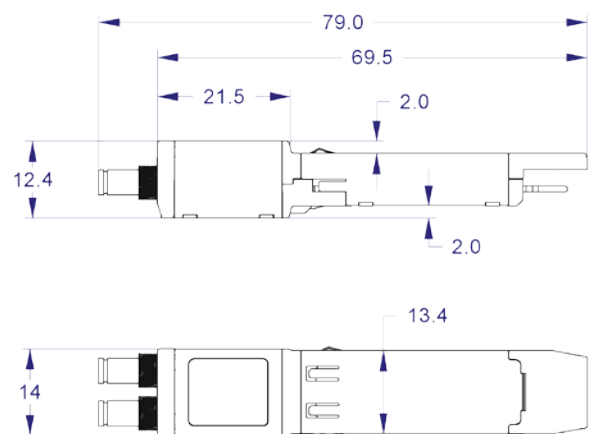


Figure 2. Physical Dimensions

MiTOP-E3/T3

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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)

TIMING

Internal, loopback, adaptive or Sync-E

GENERAL

Indicators

LINK (green) – Ethernet link status and activity

LOS (red) – E3/T3 signal status

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

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

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Ordering

RECOMMENDED CONFIGURATIONS

MiTOP-E3/T3/FE

SFP-format TDM pseudowire gateway, Fast Ethernet SFP port interface

MiTOP-E3/T3/FE/H

SFP-format TDM pseudowire gateway with temperature-hardened enclosure, Fast Ethernet SFP port interface

MiTOP-E3/T3/GE

SFP-format TDM pseudowire gateway, 1000BASE-T Ethernet user port

SPECIAL CONFIGURATIONS

Please contact your local RAD partner for additional configuration options

SUPPLIED ACCESSORIES

CBL-MINIBNC-BNC

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

OPTIONAL ACCESSORIES

SFP-CA.2

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

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