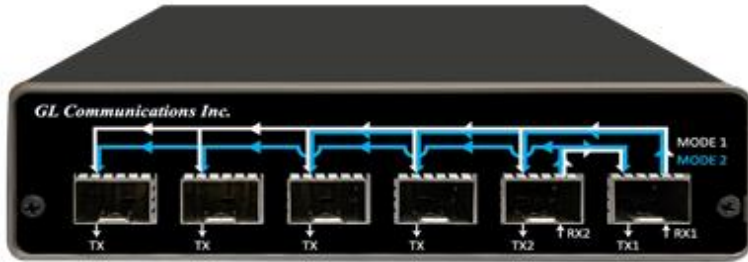

Optical Tap Repeaters (OTR) and Multiport T1 E1 Repeaters

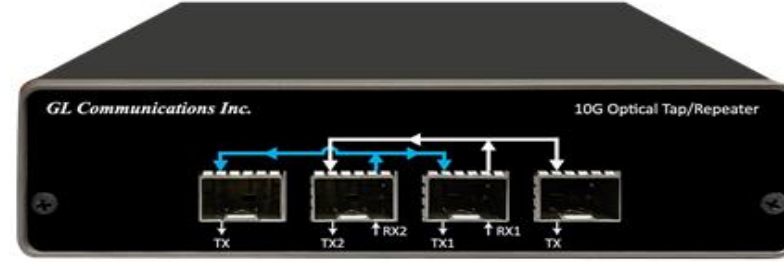


818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: info@gl.com
Website: <https://www.gl.com>

SONET SDH Ethernet Optical Tap Repeaters (OTR) and Multiport T1 E1 Repeaters



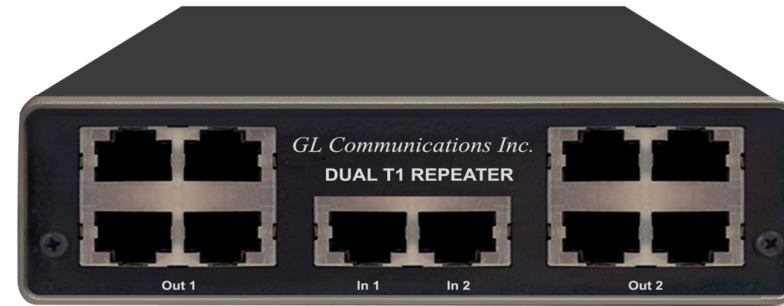
Optical 100 Mbps to 2.5 Gbps



Optical Up to 10 Gbps



Single T1 E1 Multiport Repeater

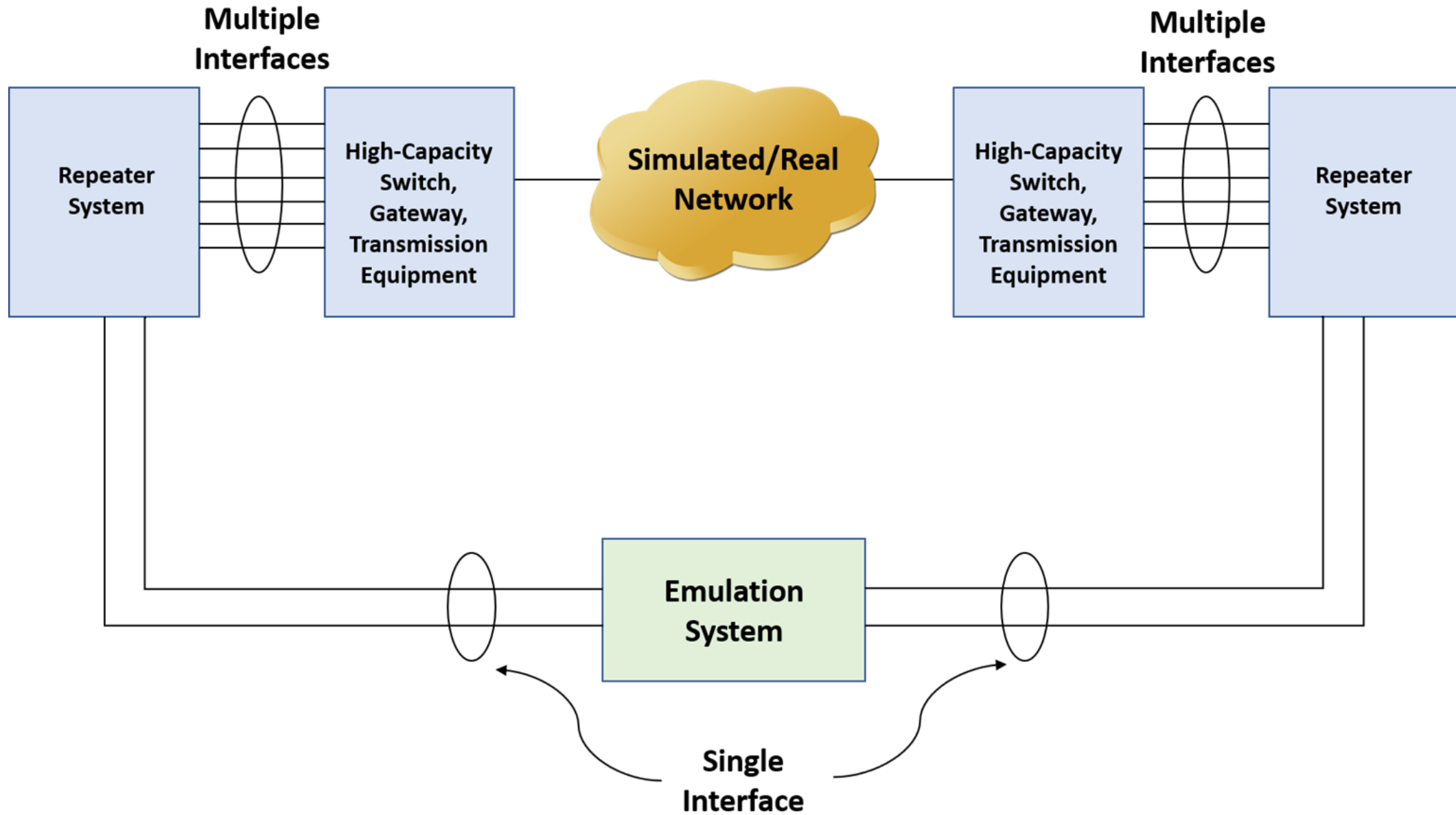


Dual T1 E1 Multiport Repeater

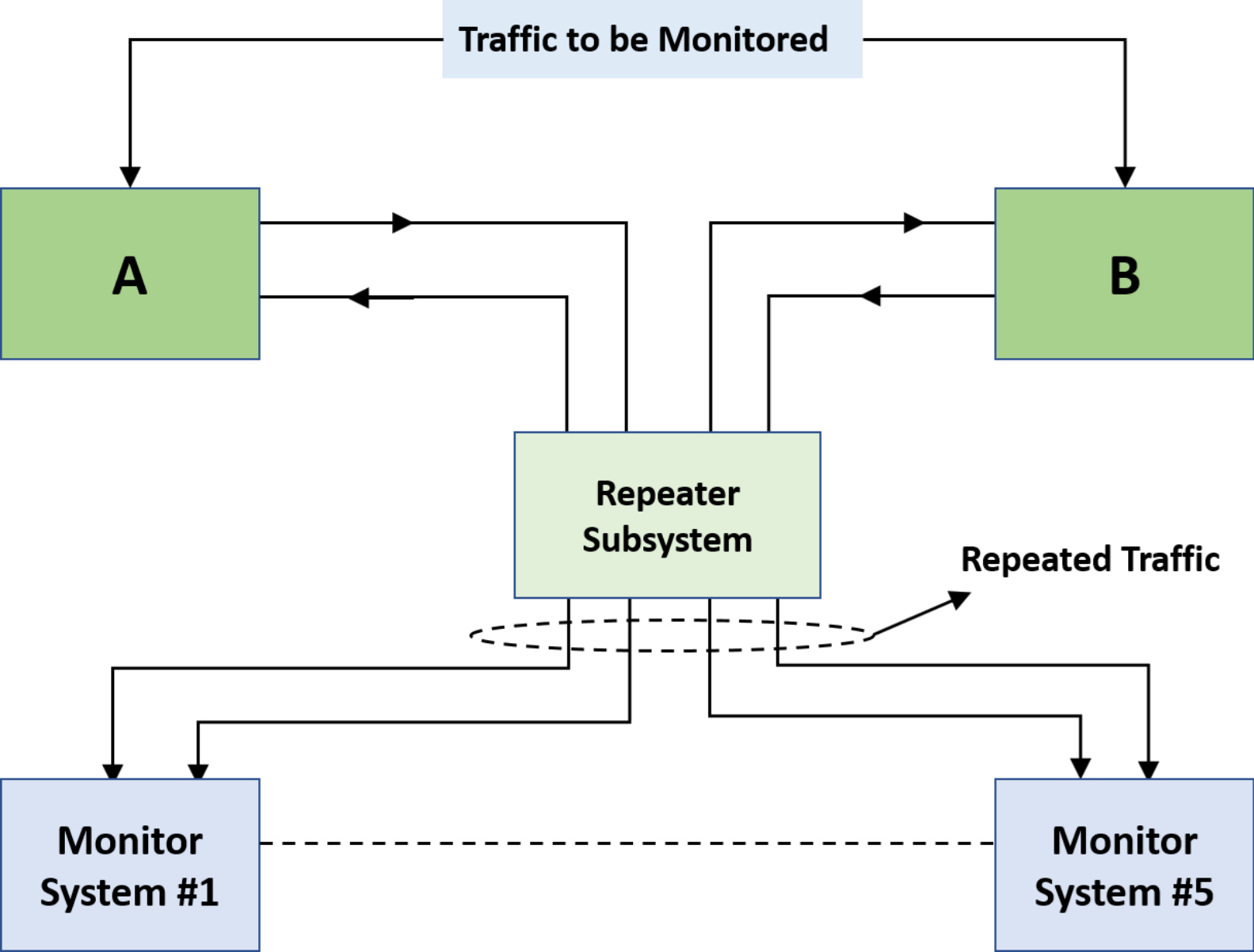
Applications of Optical Tap Repeaters (OTRs) & T1 E1 Multiport Repeaters

- Loading - High density traffic to test capacity, performance, fault tolerance
- Monitoring – Non-intrusive monitoring for diagnostics, analysis, load balancing

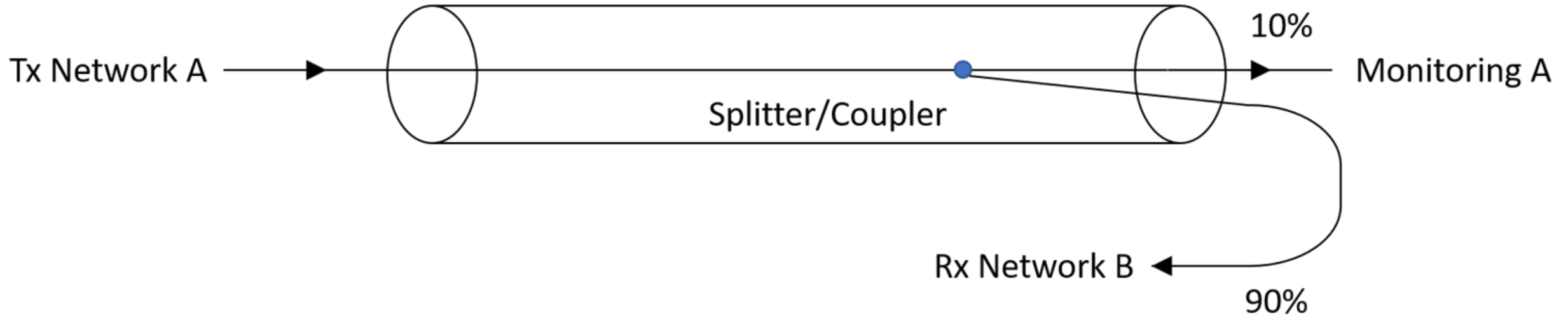
Loading



Monitoring



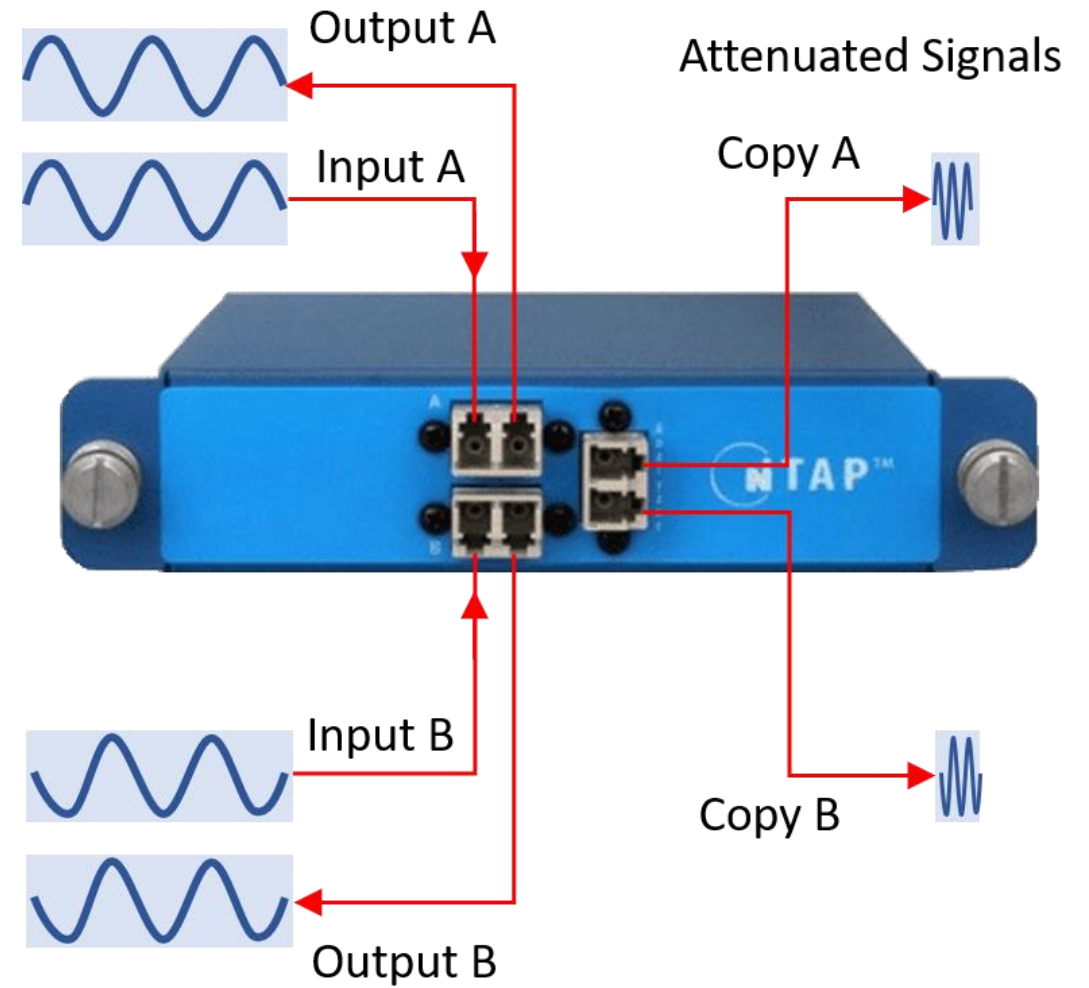
Passive Resistive / Optical Tap Principle



90/10, 80/20, 70/30, 60/40, 50/50 tap ratios are possible

Conventional Passive Optical Taps

- Gigabit signals are optical
- To duplicate them requires some form of optical coupling with little distortion as shown in the previous slide
- 90/10 = tap loss 20 dB, thru loss 1 dB
- 70/30 = tap loss 10 dB, thru loss 3 dB
- **NOT Identical signals as Inputs**

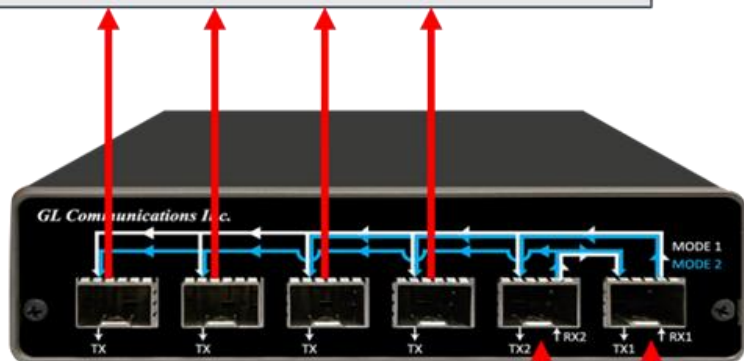


Passive Optical Tap

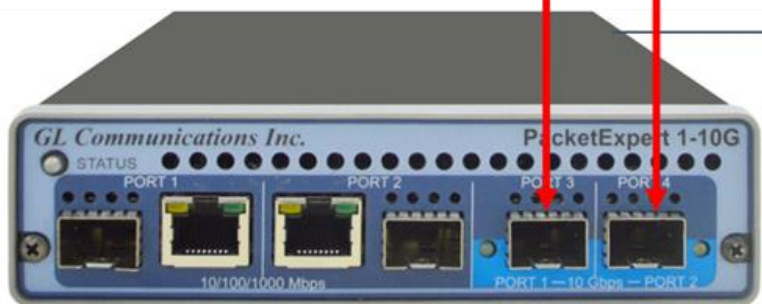
Multi-Rate Optical Tap/Repeater (OTR) 100 Mbps to 2.5 Gbps – Portable Unit

To Loading or Monitoring Equipment

High-Capacity Switch, Gateway,
Transmission



Optical Tap Repeater

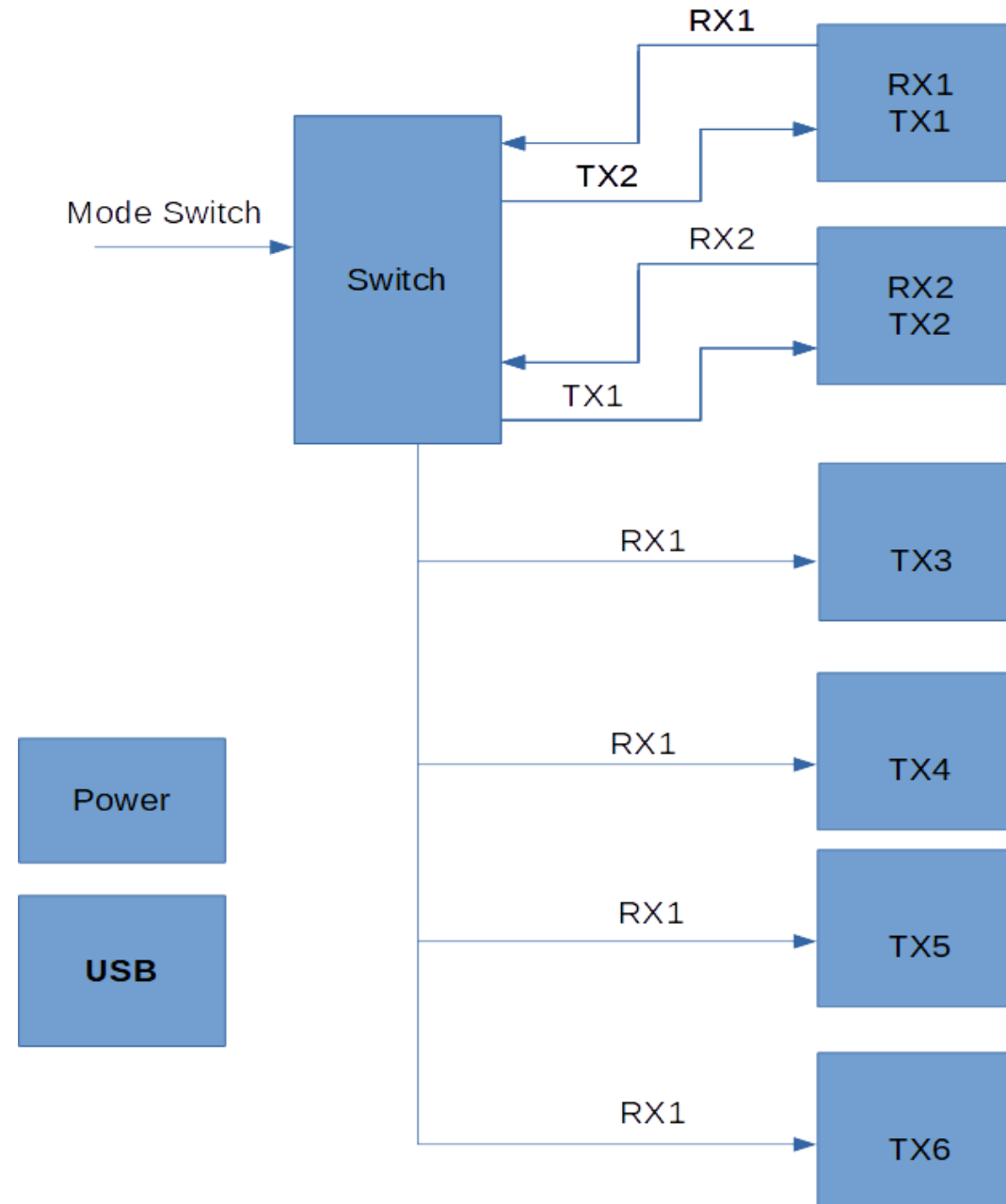


PacketExpert & SonetSDH
Expert Emulation System

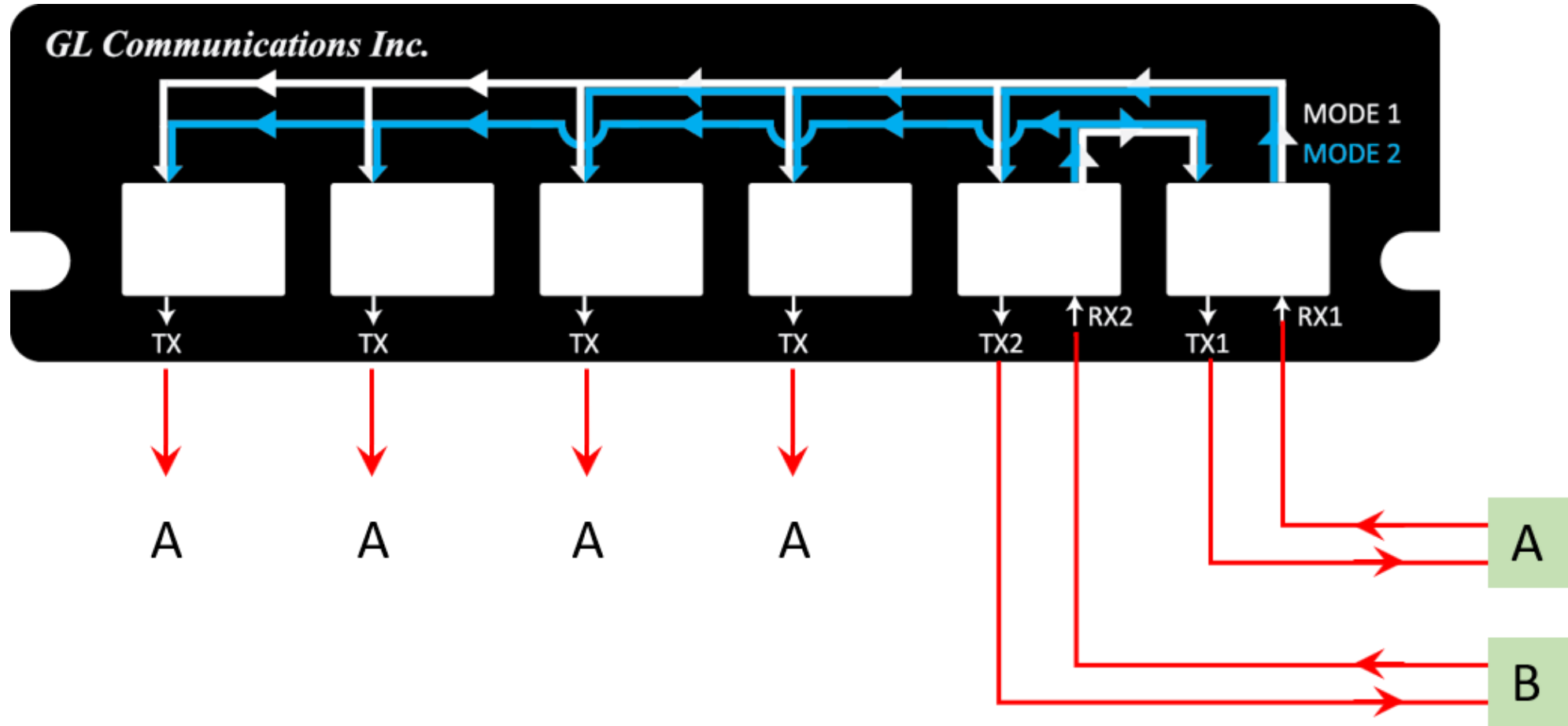
USB



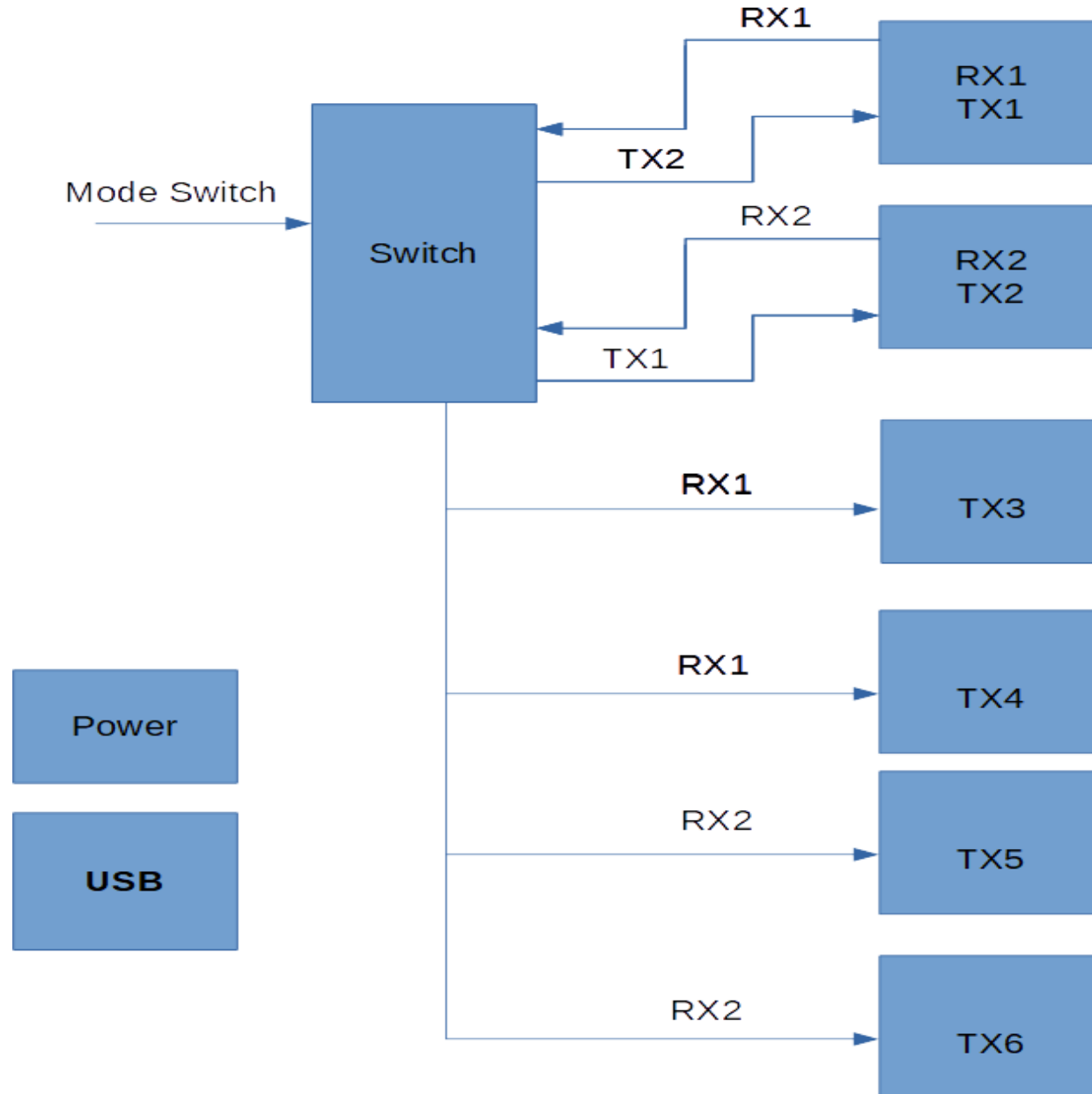
Mode 1 – 1X5 – Switch Mode Down



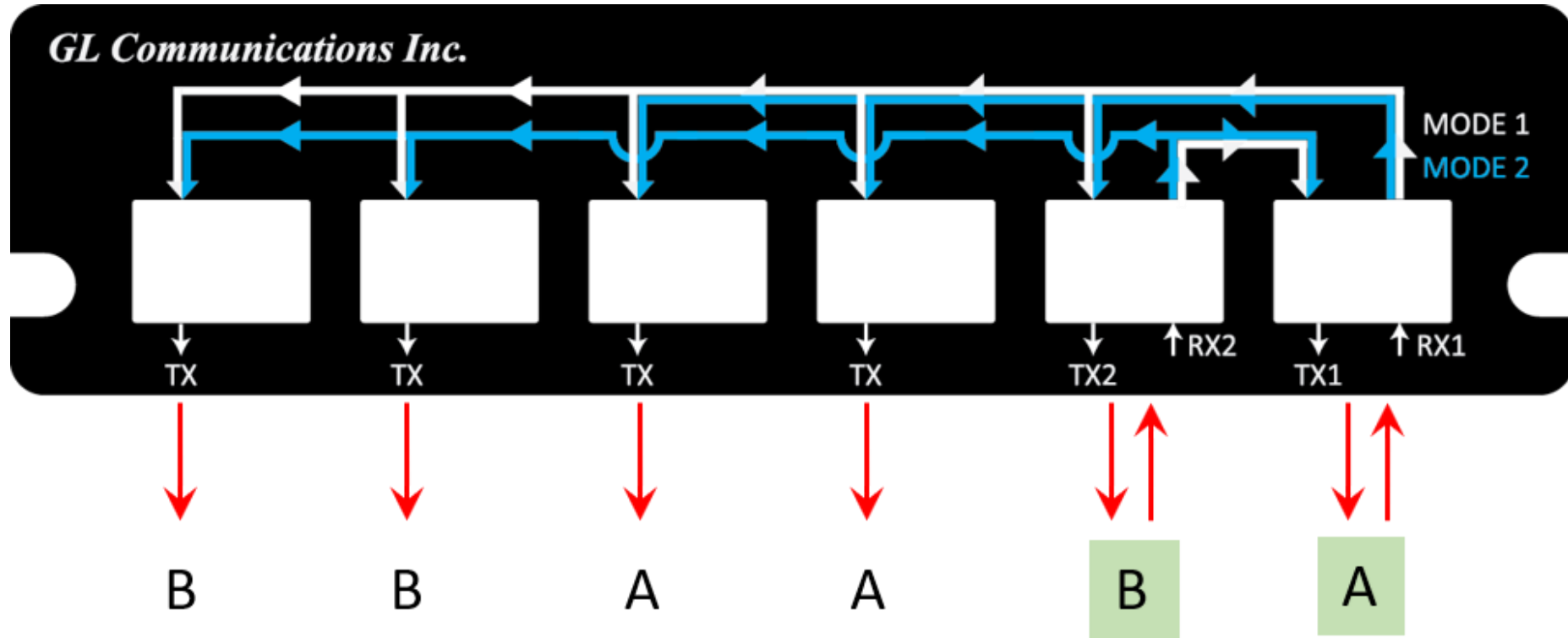
Single Interface Repetition (Mode 1)



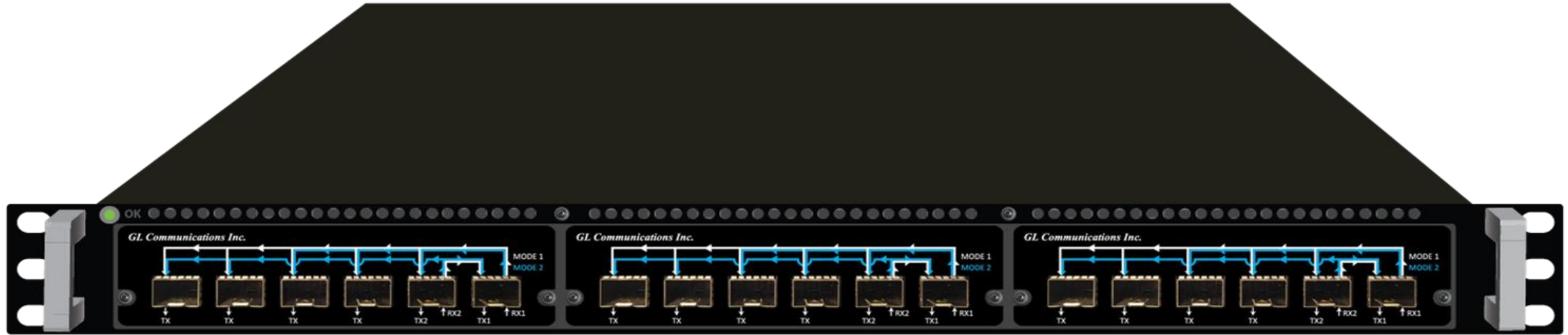
Mode 2 – 2X3 – Switch Mode Up



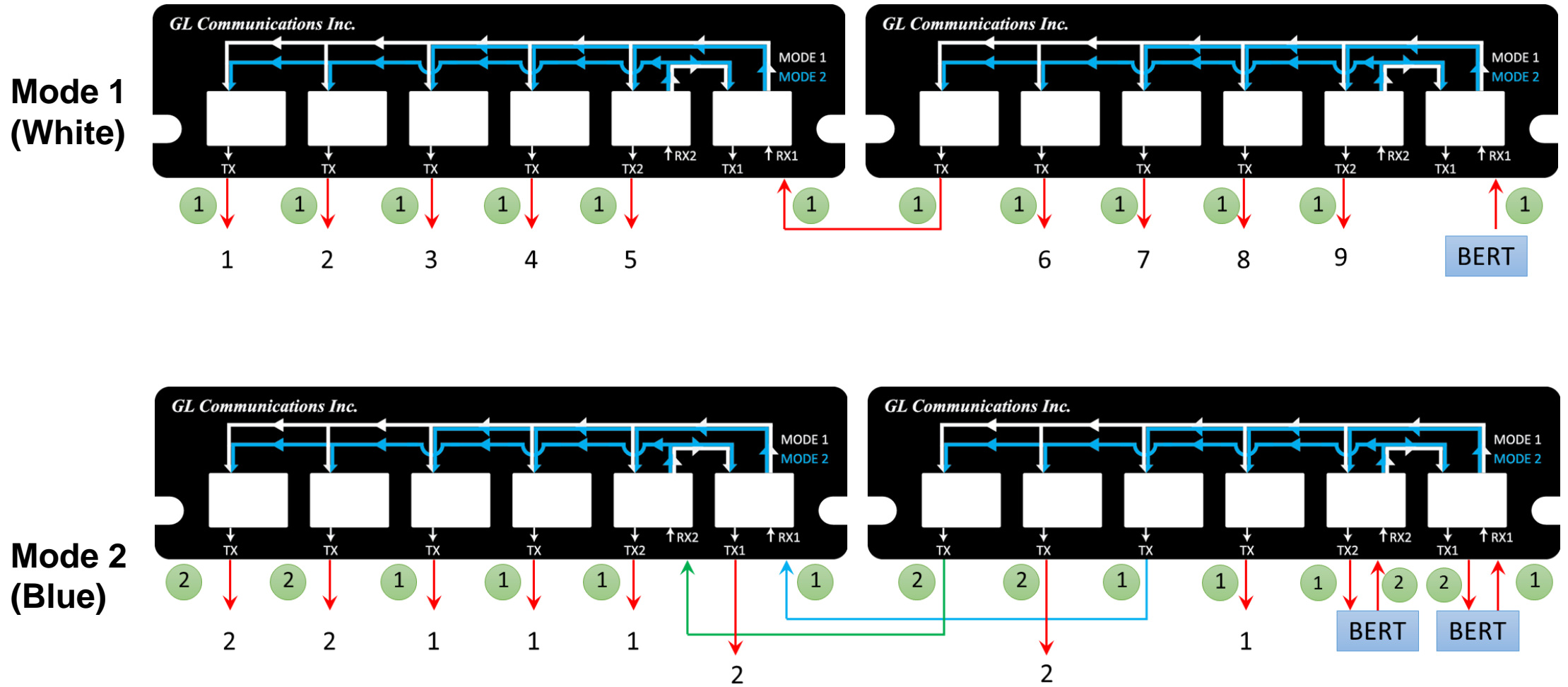
Double Interface Repetition (Mode 2)



Multi-Rate OTR 100 Mbps to 2.5 Gbps – mTop™ 1U Rack Unit



Cascade of Multi-Rate Optical Tap/Repeater – 100 Mbps to 2.5 Gbps



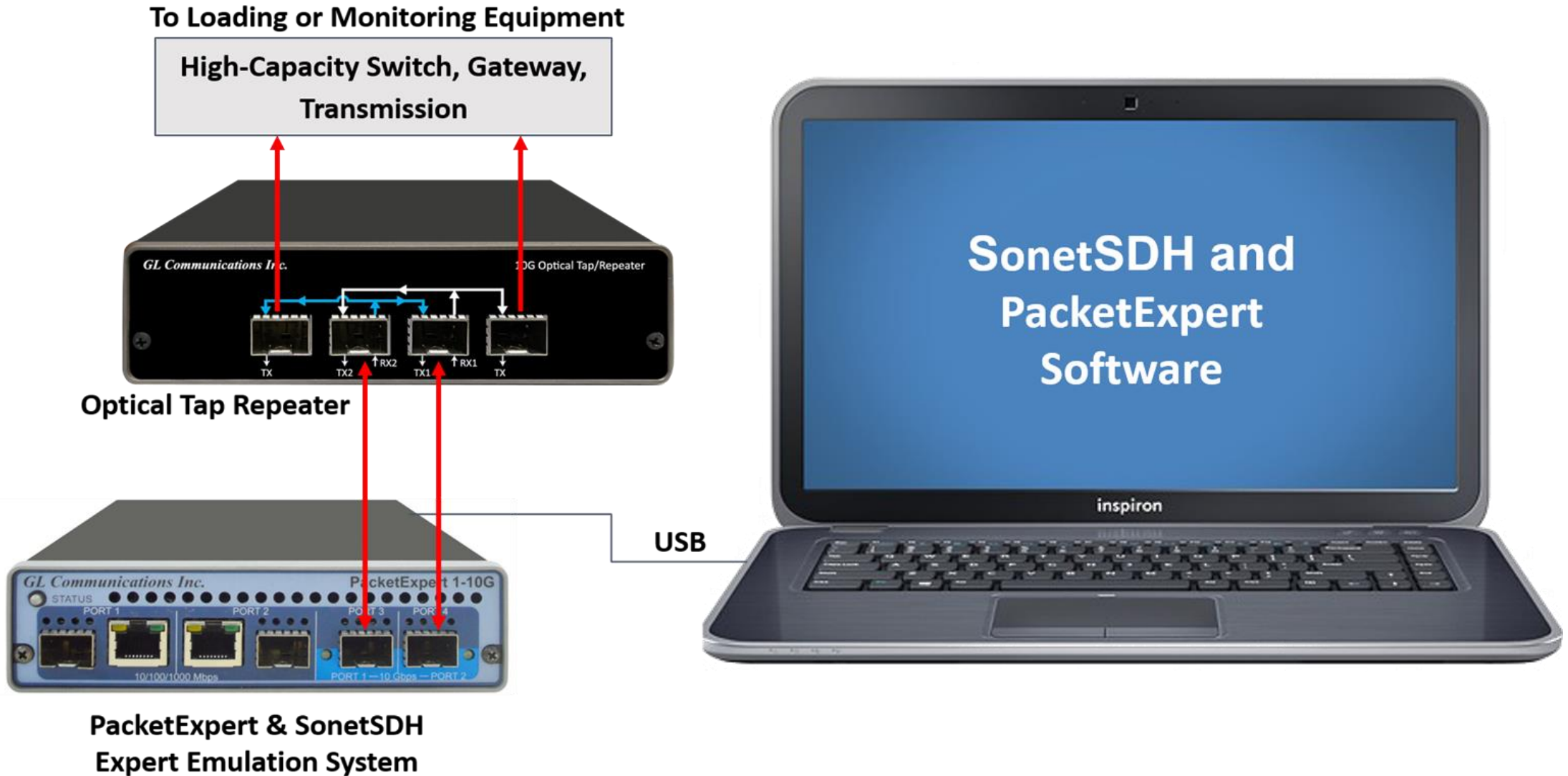
Multi-Rate OTR for 100 Mbps to 2.5 Gbps

SONET / SDH or Ethernet	Bit Rate
OC-3/STM-1	155.52 Mbps
OC-12/STM-4	622.08 Mbps
OC-48/STM-16	2488.32 Mbps
100 Mbps	100 Mbps
1 GigE	1000 Mbps, 1 Gbps
2.5 GigE	2500 Mbps, 2.5 Gbps

Features of OTR – 100 Mbps to 2.5 Gbps

- Accepts up to 6 standard SFPs from OC-3 to OC-48, or 100 Mbps to 2.5 Gbps
- SFPs can be Electrical (Copper) or Optical Fiber (Single Mode or Multimode)
- Mode Switch = 1 Pass thru Input to 5 Identical Outputs, or
- Mode Switch = 2 Pass thru Inputs to 2 Identical Outputs/each
- Cascade two or more OTRs for greater repetition
- Convert Single Mode to Multimode or Multimode to Single Mode
- Convert Optical to Electrical or Electrical to Optical
- Error and jitter free repetition

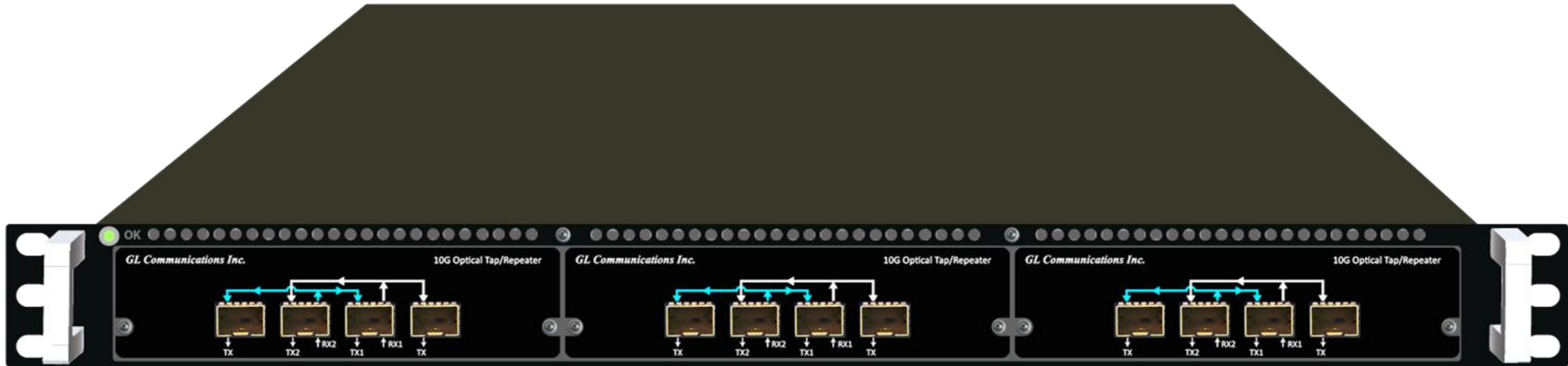
Multi-Rate Optical Tap/Repeater (OTR) up to 10 Gbps – Portable Unit



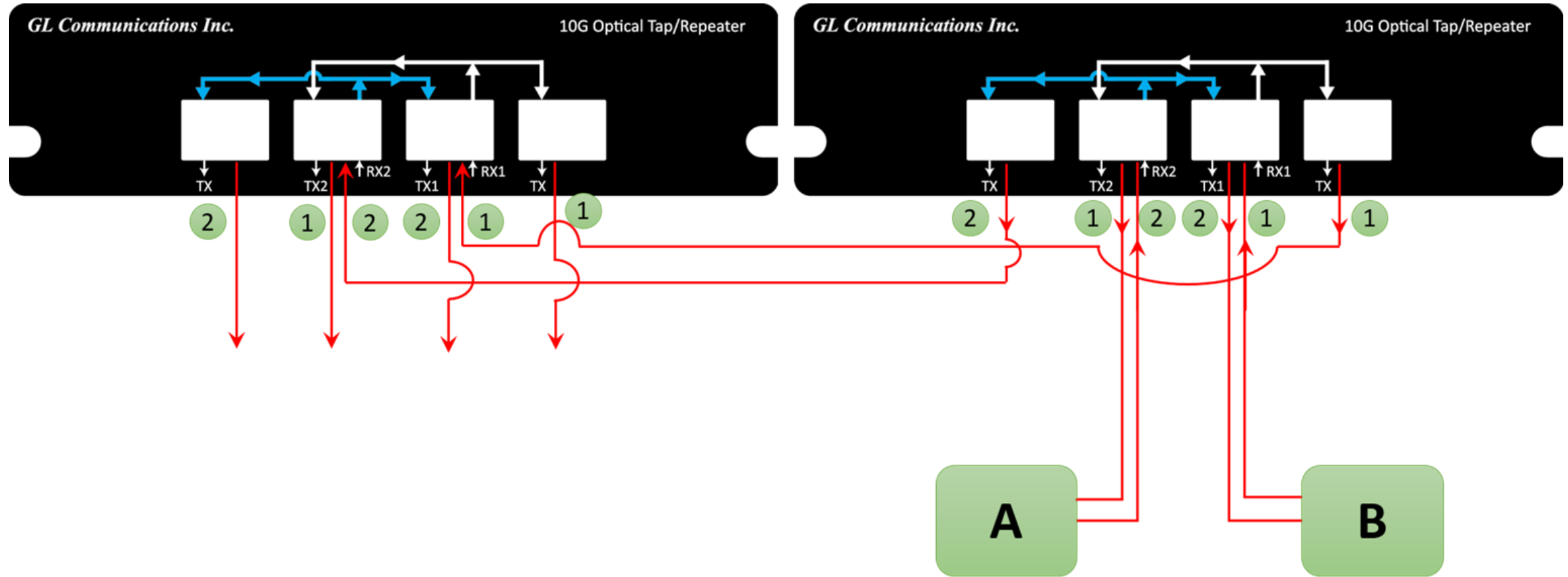
Multi-Rate OTR for up to 10 Gbps

SONET/SDH or Ethernet	Bit Rate
OC-3/STM-1	155.52 Mbps
OC-12/STM-4	622.08 Mbps
OC-48/STM-16	2488.32 Mbps
OC-192/STM-64	9.953 Gbps
100 Mbps	100 Mbps
1 GigE	1000 Mbps
2.5 GigE	2500 Mbps
10 GigE	10,000 Mbps

Multi-Rate OTR up to 10 Gbps – mTop™ 1U Rack Unit



Cascade Configuration



Features of OTR – up to 10 Gbps

- Accepts up to 4 standards SFPs or SFP+s from OC-3 to OC-192, or from 1 GigE up to 10 GigE
- SFP and SFP+ can be Single or Multimode or a mixture of each
- **Do Not Use** 10G Electrical SFPs, current draw is too great
- Cascade two or more OTR 10Gs for greater duplication
- Convert Single Mode to Multimode
- Error free repetition

T1 E1 Single or Dual Multiport Repeater

Single or Dual T1 E1 Multiport Repeater

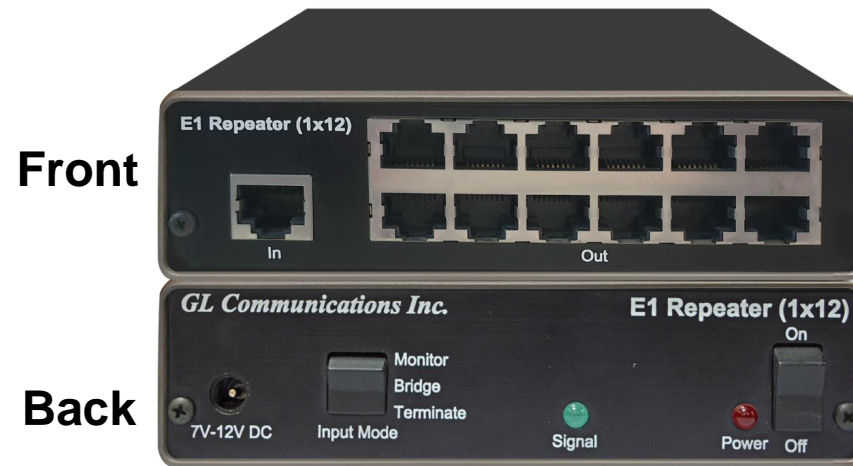
- A single bantam version provides ten identical outputs from a single T1 or E1 input
- A single RJ45 version provides twelve identical outputs from a single T1 or E1 input
- A dual version provides four outputs for each of the two inputs



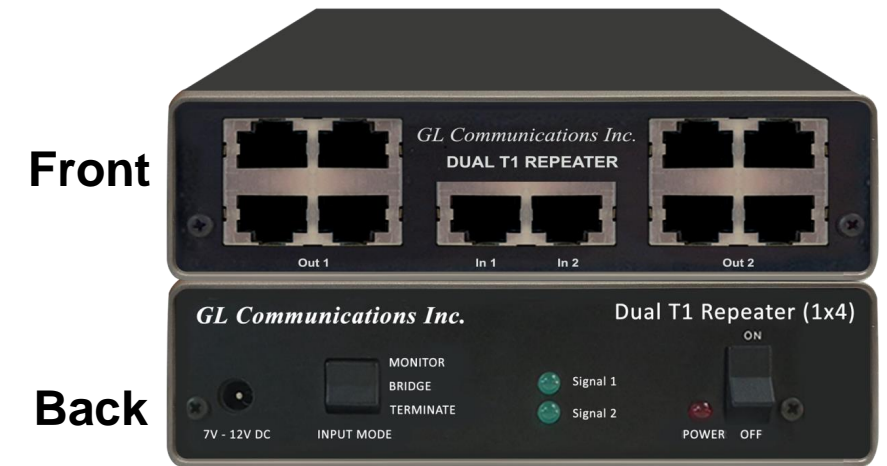
**Single Multiport Repeater
(Bantam Version)**



**Dual Multiport Repeater
(Bantam Version)**



**Single Multiport Repeater
(RJ45 Version)**



**Dual Multiport Repeater
(RJ45 Version)**

Features

- Generates multiple identical T1 or E1 outputs for each T1 or E1 input, thus increasing the range of transmission of T1 or E1 signals
- Output signals are regenerated versions of the input signal(s)
- Preserve the strength of the signal and extend the distance over which the signal can be transmitted
- Useful in lab environments for load testing and signal duplication purposes
- Test and load multiple T1 or E1 interfaces simultaneously
- Broadcast applications and traffic generation and simulation
- mTOP™ high-density rack test platforms, 1U rack enclosures with T1 E1 Multiport Repeaters can be stacked to provide high density form factor

Single T1 E1 Multiport Repeater Features

Input Features

- Terminate and Monitor Input:
 - DSX level E1 signal is terminated at 120Ω
 - DSX level T1 signal is terminated at 100Ω
- Bridged Input:
 - DSX level T1 E1 signal is terminated at $> 1000\Omega$

Output Features

- A single Multiport Repeater contains ten or twelve identical output ports
- The input T1 E1 signal is regenerated and provided at the ten or twelve output ports



**Single Multiport Repeater
(RJ-45 Version)**

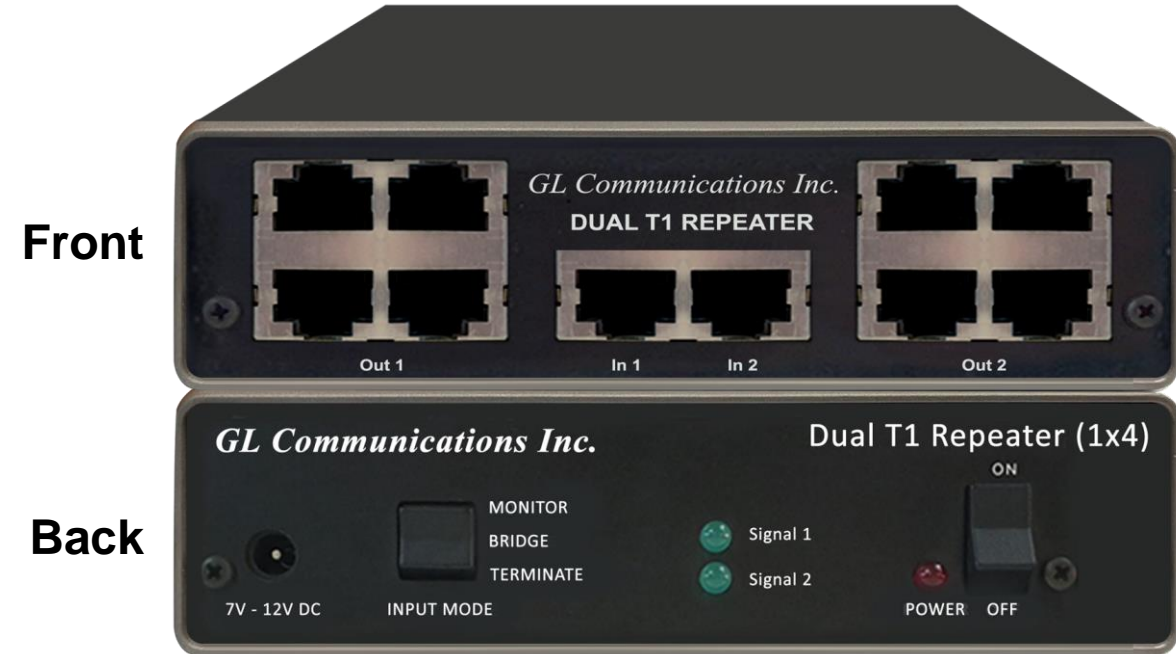
Dual T1 E1 Multiport Repeater Features

Input Features

- Provides two independent sections of logic that repeat and multiply input T1 or E1 signals; each input is repeated 4 times at the output
- For each section, the input termination is 100Ω for T1, 120Ω E1 balanced (bantam or RJ45) controlled through a front panel switch

Output Features

- Each section has four outputs: two outputs are 100Ω T1, 120Ω E1 balanced (bantam or RJ45)
- The output of one section can be fed to the input of the second section, thereby providing seven identical outputs consisting of seven (7) bantam or RJ45 outputs



**Dual Multiport Repeater
(RJ45 Version)**

Dual T1 E1 mTOP™ Multiport Repeater Features

- High Density T1 E1 Multiport Repeaters form factor solution are used are used to generate multiple identical T1 or E1 outputs for each T1 or E1 input, thus increasing the range of transmission of T1 or E1 signals
- The chassis comprises of A single/ dual Multiport Repeater with stacked USB units greatly reduces the licensing



**1U mTOP™ rack w/ Dual T1 (1:4)
Multiport Repeater**



**1U mTOP™ rack w/ Dual E1 (1:4)
Multiport Repeater**



1U mTOP™ rack w/ Single E1 Multiport (1:12) Repeater

Thank you