



Key Benefits

- Enables validation, performance and interoperability testing of systems under real world conditions, with reproducible results
- Provides realistic problem replication for troubleshooting
- Improves Proof of Concept testing and customer demonstrations
- Allows for dynamically changing delays and impairments
- Field programmable architecture protects investment
- Multi protocol support (SONET, SDH, OTN, Fibre Channel, Ethernet and CPRI)

Applications

- SONET/SDH/G.709 framer, alarm threshold, protection switch testing
- Satellite Communications
- Disaster Recovery and Storage Extension Solutions
- Validating CPRI Devices
- Interoperability Testing
- Customer Proof of Concept
- SLA Emulation
- Corporate LAN/WAN Emulation

Ordering Information

CKL-2U

Rack mountable chassis – uni- or bi-directional emulation support

M1, H10

Network Emulator Hardware Blade
M1 supports to 2.6Gbps, H10 to 11.3Gbps

DG192, DG48, DG312

OC-192/STM-64, OC-48/STM-16 and OC-3/12 / STM-1/4 Signal Delay Network Emulators

OTU2, OTU1

ITU-T G.709 OTU-2 and OTU-1 Signal Delay Network Emulators

CPRI-6, CPRI-12, CPRI-24

CPRI OS.6/OL.6, OS.12/OL.12 and OS.24/OL.24 Signal Delay Network Emulators

DX2 and DX4

Doubler / Quadrupler provide 2x or 4x delay

DOP100 or DOP200

Dynamic Delay – provide transmit clock frequency control

SW1

1 year Software Maintenance Agreement

Note: up to 7 emulator loads including Gigabit Ethernet and Fibre Channel may be combined onto one platform

Signal Delay Network Emulators

Signal Delay & Impairments up to 11.3Gbps for SONET/SDH, OTN, CPRI and others



Overview

The Signal Delay Network Emulator is a precision test instrument which allows users to accurately simulate the delays and impairments that occur over live production SONET, SDH, OTN, CPRI and other Networks for validating and evaluating new hardware or software products and technologies under real world conditions in a controlled lab environment.

Highlights

- Hardware based architecture provides maximum precision and accuracy
- Precisely emulates signal delays that occur over SONET/SDH/G.709 OTN, CPRI and other networks
- Stresses systems with controlled bit errors and “bit slips”
- Cost effective alternative to test beds built with fiber spools and optical amplifiers
- Dynamically changing impairments tests failure recovery mechanisms
- Multi protocol support (Ethernet, SONET, SDH, OTN, Fibre Channel and CPRI)
- Easy GUI and scripting support for automating tests
- Transparent to all higher layer protocols above SONET, SDH, G.709 OTN, CPRI

Primary Applications

- Validate Signal Fail and Degrade alarm threshold algorithms
- Facilitate automatic protection switch testing under the presence of persistent bit errors, LOS or LOF
- Test average time to achieve GFP framing and staying in sync under high BER
- Validate of Disaster Recovery and Storage Extension Solutions
- Real world Interop and Customer Proof of Concept testing
- Characterize and Validate of CPRI solutions



Features

Delay

- Emulate signal delays that occur in SONET, SDH, ITU-T G.709 OTN, CPRI and other networks
- Fully transparent operation: delayed output is logically identical to original signals
 - No modification of overhead or payload bytes
 - No pointer movements are introduced
- With the standard configuration, delay is adjustable up to maximum delay of:
 - 250 ms delay (50,000 km) for all except 1 sec delay at OC-12/STM-4 and 4 sec delay at OC-3/STM-1
- Minimum programmable incremental delay equals 1 bit
 - 100ps at OC-192/STM-64
 - 93.3ps at OTU-1, 375.1ps at OTU-2
 - 401.8ps at OC-48/STM-16, 1.607ns at OC-12/STM-4, 6.43ns at OC-3/STM-1
 - 406.9ps at CPRI OS.24, 813.8ps at OS.12 and 1.627ns at OS.6
- Minimum absolute delay
 - 200ns at OC-192/STM-64 and OTU-2
 - 400ns at OC-48/STM-16 and OTU-1
 - 1.5us at OC-12/STM-4
 - 6us at OC-3/STM-1
 - 400ns at CPRI OS.24, 1.5us at OS.6
- Delay “Doubler” and “Quadrupler” are available to extend the maximum delay capability (even greater delay amounts are available upon request)

Specifications

Optics

- Signal Delay Emulators provide support for any interface up to 11.3Gbps including but not limited to the following:
 - SONET OC-3 / SDH STM-1 (155.52 Mbps), OC12 / SDH STM-4 (622.08 Mbps), SONET OC-48 / SDH STM-16 (2488.32 Mbps), SONET OC-192 / SDH STM-64 (9953.28Mbps)
 - ITU-T G.709 OTU-2 at 10.709 Gbps, OTU-1 at 2.6657 Gbps
 - CPRI at 614.4Mbps, 1228.8Mbps or 2457.6Mbps
- 1310nm XFP MSA hot-pluggable XFP Transceiver MSA optical module (optional single mode 1550 nm optics available) with LC connectors for 10G interfaces up to 11.3Gbps
 - Average Launch Power: -6 to -1 dBm (1310nm)
 - Center Wavelength is 1290 nm to 1330 nm
 - Rx Center Wavelength 1270 nm to 1660 nm
 - Maximum Receiver Sensitivity is +0.5 dBm to -13.4 dBm
- 1310nm SFP (Small Form Factor Pluggable) transceiver optical module (optional single mode 1550 nm optics available) with LC connectors for interfaces up to 2.6657 Gbps
 - Average Launch Power: -10 to -3 dBm (1310nm)
 - Center Wavelength is 1266 nm to 1360 nm



- Rx Center Wavelength 1266 nm to 1580 nm
- Maximum Receiver Sensitivity is -3 dBm to -20 dBm

BER

- Inject bit-errors at 10⁻¹⁷ to 10⁻³ bit error rates
 - 1-bit to 64k-bit error burst – invert, PRBS, all ones or all zeros
 - Error injection can be fixed/periodic or random; random distribution sequences include Poisson, Uniform or Gaussian

Impairments

- Emulate loss of signal, loss of frame and or squelch mode under user program control

User Interface

- Remote monitoring & control via RJ45 Fast Ethernet
- HTML based GUI
 - For intuitive/interactive remote control
- Front panel LCD display and controls for standalone operation
- Powerful TCL based scripting interface to enable automated lab testing
- User configurations can be saved and restored

Options

- 1550 nm or other ITU-T wavelength XFP and SFP optical transceiver(s)
- Dynamic Delay providing transmit clock frequency control (Doppler Emulation)

Chassis

- Rack Mountable
- Regulatory Compliance
 - CE Mark, FCC Part 15 Class A, Canadian ICES-003
 - EMC: EN55022:2002, EN55024:2002, FCC/ANSI C63.4:2000, EN61000-3-2:2000, EN61000-3-3:2001
- Input Voltage 100-240 VAC auto-switching, Power Supply Frequency 50-60Hz
- Power supply UL, CSA, TUV, CE, FCC Class B Certified
- Operating temp: 0 to 30 °C
- Size in inches: 2U bi-directional chassis = 17.3W x 12L x 3.5H
- Weight: 2U chassis = 6.0 kg (13lb, 3oz)