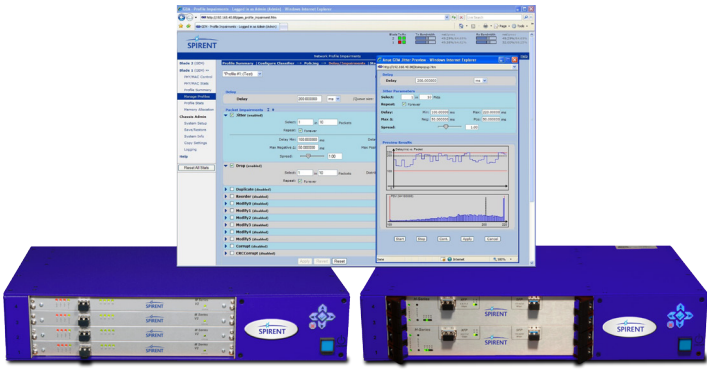
# SPIRENT SIGNAL DELAY NETWORK EMULATORS

## DG/OTU/CPRI

Spirent Communications' Signal Delay Network Emulator is a precision test instrument which allows users to accurately simulate network delays and impairments. Delays and impairments can be emulated 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.

### APPLICATIONS

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



### 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
- Multiprotocol support (SONET, SDH, OTN, Fibre Channel, Ethernet and CPRI)

### KEY FEATURES

- 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
- Multiprotocol 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

## TECHNICAL SPECIFICATIONS

### Delay

- Emulates 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:
  - 250ms delay (50,000km) 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)

### BER

- Capable of injecting bit errors at $10^{-17}$ to $10^{-3}$ bit error rates
  - 1 bit to 64k bit error burst—invert, PRBS, all ones or all zeroes
  - Error injection can be fixed/periodic or random; random distribution sequences include Poisson, Uniform or Gaussian

### Impairments

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

### User Interface

- Remote monitoring and control via RJ-45 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

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

### 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 (155.52Mbps), OC12/SDH STM-4 (622.08Mbps), SONET OC-48/SDH STM-16 (2488.32Mbps), SONET OC-192/SDH STM-64 (9953.28Mbps),
  - ITU-T G.709 OTU-2 at 10.709Gbps, OTU-1 at 2.6657Gbps
  - CPRI at 614.4Mbps, 1228.8Mbps or 2457.6Mbps
- 1310nm XFP MSA hot-pluggable XFP Transceiver MSA optical module (optional single mode 1550nm optics available) with LC connectors for 10G interfaces up to 11.3Gbps
  - Average Launch Power: -6 to -1dBm (1310nm)
  - Center Wavelength is 1290nm to 1330nm
  - Rx Center Wavelength 1270nm to 1660nm
  - Maximum Receiver Sensitivity is +0.5 dBm to -13.4dBm
- 1310nm SFP (Small Form Factor Pluggable) transceiver optical module (optional single mode 1550nm optics available) with LC connectors for interfaces up to 2.6657Gbps
  - Average Launch Power: -10 to -3dBm (1310nm)
  - Center Wavelength is 1266nm to 1360nm
  - Rx Center Wavelength 1266nm to 1580nm
  - Maximum Receiver Sensitivity is -3dBm to -20dBm

## ORDERING INFORMATION

**Chassis**

CKL-2U—Rack mountable chassis with support up to 4 M1 blades, 2 H10 blades or 2M1 + 1H10 blades

**Modules**

M1—'Maui' Network Emulator Hardware Module supports up to 2.6Gbps

H10—'Hawaii' Network Emulator Hardware Module supports up to 11.3Gbps

**Interfaces**

See Optics above

**Software/Emulator Load**

DG192—OC-192 / STM-64

DG48—OC-48 / STM-16

DG312—OC-3/12 / STM-1/4

OTU2—ITU-T G.709 OUT-2

OTU1—ITU-T G.709 OUT-1

CPRI-6—CPRI OS.6/OL.6

CPRI-12—CPRI OS.12/OL.12

CPRI-24—CPRI OS.24/OL.24

**SW1**

1-year Software Maintenance Agreement

## SPIRENT GLOBAL SERVICES

Spirent Global Services provides a variety of professional services, support services and education services—all focused on helping customers meet their complex testing and service assurance requirements. For more information, visit the Global Services Web site at www.spirent.com/gs or contact your Spirent sales representative.

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