ONS 15104 OC-48/STM-16 Bidirectional Regenerator

Provides Service Providers with the ability to extend the reach of their OC-48 network

The exponential growth in IP data traffic is placing significant demand on network capacity with backbone requirements quadrupling each year; OC-48 and OC-192 line rates in 1999 and 2000 respectively. At the same time accessibility to dark fiber is increasing with fiber installation continuing to run at record levels in excess of millions of kilometers per year. Service providers require a low-cost solution for lighting fiber over long distance. ONS 15104 enables direct long-haul connectivity at OC-48 line rates between Cisco 12000, 10700, 7600 and 7300 Series Routers, and other Cisco equipment with OC-48 interfaces. This eliminates the cost of deploying a network of SONET/SDH equipment.

ONS 15104 is a bidirectional OC-48/ STM-16 regenerator that supports single-mode optical fiber transmission when connected to an OC-48 line card (Packet-Over-SONET [POS] or Dynamic Packet Transport [DPT] based) in a Cisco 12000, 10700, 7600, 7300 Series and other routers. It provides OC-48 line extensions in increments of up to 50 miles (80 km) between these routers. This new regenerator is the first IP-addressable optical regenerator with Cisco IOS® support. Customers can use the same command-line interface (CLI)-based network management platform for the router as well as for the ONS 15104.

Summary of Features

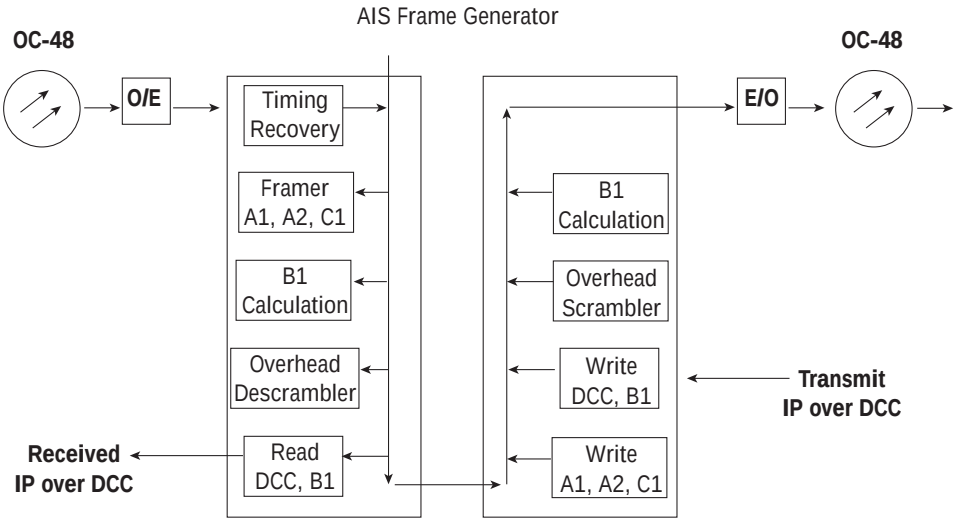
Regeneration

ONS 15104 provides a standards-compliant SONET/SDH interface, enabling it to be used in networks transitioning from a SONET/SDH to an IP infrastructure. The optical regenerator supports complete optical-to-electrical- to-optical regeneration with a payload transmission delay of less than 20 sec.

It regenerates the Synchronous Payload Envelope (SPE) and line layer overhead, and terminates and generates the section layer overhead. ONS 15104 provides monitoring and insertion of both the B1 and C1 bytes. The Data Communication Channel (DCC) is utilized for management, enabling IP addressing and Simple Network Management Protocol (SNMP) access.

Figure 1 ONS 15104

Figure 2 Block diagram for the ONS 15104



Alarm and Performance Monitoring

In compliance with GR-253, the ONS 15104 will generate an L-AIS within 125 supon detecting a Loss of Signal (LOS) and Loss of Frame (LOF). The ONS 15104 will also monitor for B1 parity errors and generate the appropriate alarms. ONS 15104 provides error counters for section-level performance parameters, Errored Seconds (ES), Severely Errored Seconds (SES), and more, which can be retrieved when notification is provided through a Threshold Crossing Alarm (TCA).

Synchronization

ONS 15104 supports through timing meeting Bellcore's category II jitter transfer requirements. In addition a standby local oscillator is provided to allow communication during network failures.

Management

ONS 15104 is easily manageable through SNMP. It utilizes the DCC channel to provide IP addressing. Cisco IOS software is also supported. Using either a console port or a 10BaseT Ethernet port, the Cisco IOS software CLI can be accessed for configuration capabilities. In addition, SNMP Management Information Bases (MIBs), RFC 1595, and RFC 1213 are also supported.

Applications

ONS 15104 supports two unidirectional OC-48 interfaces at 1550nm with a power budget of 26 dB. The regenerator signal can be carried up to 50 miles (80 km) when transmitting over high-quality, single-mode fiber with minimal high-quality splices. It is TR-917 standards-compliant and meets the requirement for 30 cascadable units. ONS 15104, coupled with the Cisco 12000, 10700, 7600, 7300 Series and other routers can be deployed to enhance the following OC-48 network applications:

- Migration support from SONET/SDH to IP based infrastructure—ONS 15104 provides cost savings over traditional SONET/SDH infrastructure by enabling the removal of expensive SONET/SDH-based networks to provide long-haul connectivity. Flattening the network reduces cost and improves reliability. Since ONS 15104 supports IP over DCC each regenerator can be managed remotely using SNMP and Cisco IOS software, thereby providing end-to-end seamless network management.

Figure 3 Migrating from SONET/SDH to IP Based Infrastructure

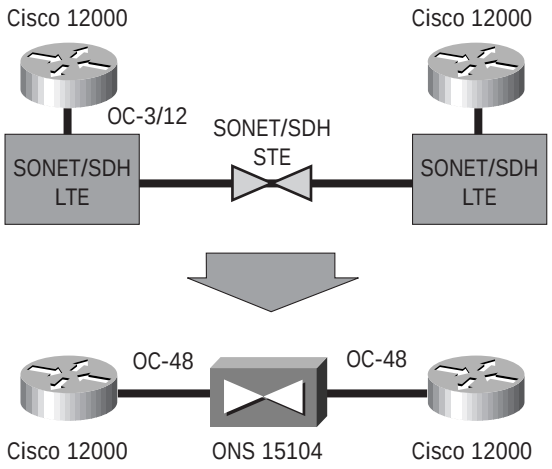
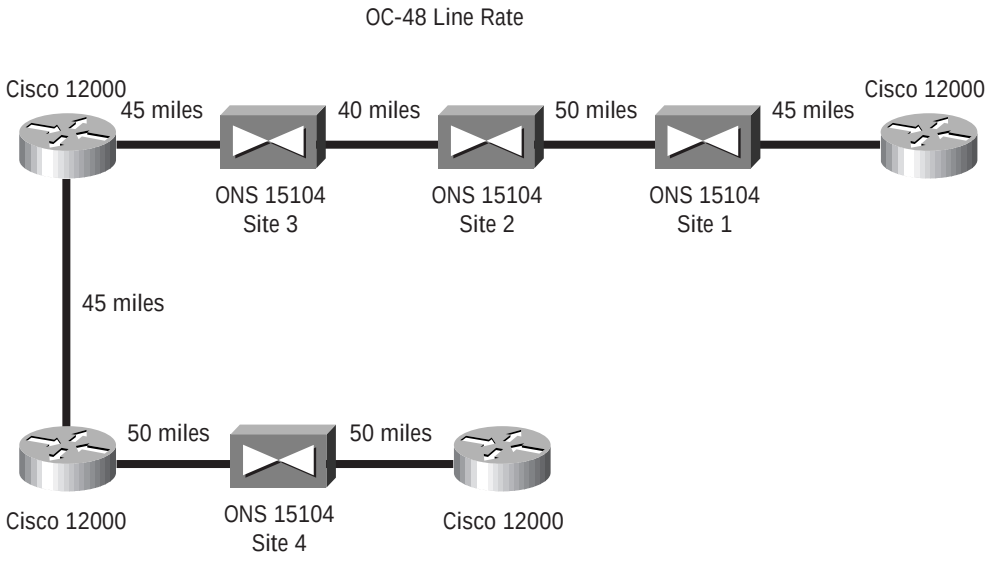
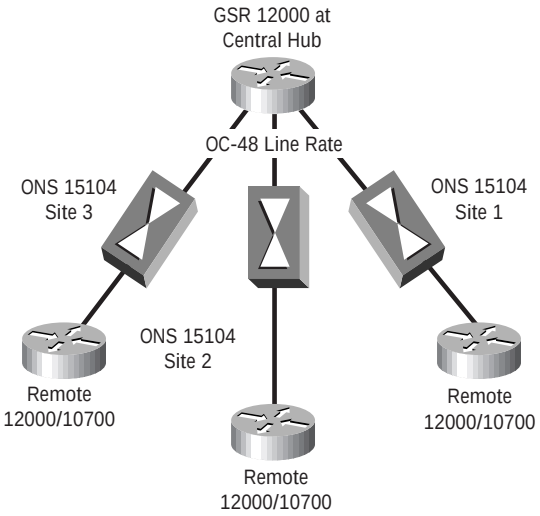


Figure 4 Deployment of ONS 15104 for Regional Inter-POP/Interoffice Connectivity



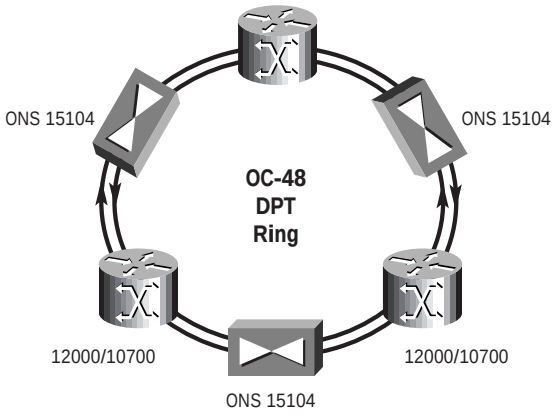
- Regional Inter-POP/Interoffice connectivity—ONS 15104 supports the use of dark fiber to establish point-to-point connectivity between Cisco 12000, 10700, 7600, 7300 or other routers that are separated over long distances. Multiple regenerators can be cascaded together to enable long-haul OC-48 connections between GSRs.
- Remote metro POP interconnection—ONS 15104 can be utilized to extend the reach of remote routers (Customer Premise Equipment [CPE] and Internet service provider [ISP] sites) interconnecting to a central hub or POP.

Figure 5 Deployment of ONS 15104 for Remote Metro POP Connections



- OC-48 DPT rings with long distance span connectivity—Implementing the new DPT technology on routers enables long distance reliable packet ring networks. ONS 15104 allows the DPT rings to span across long distances, making them capable of supporting cross-country backbone networks.

Figure 6 Deployment of ONS 15104 for OC-48 DPT Rings



Features and Benefits

Table 1 Summary of the Features and Benefits for the ONS 15104

Features	Benefits
Significant Cost Reduction	Eliminates the need for SONET/SDH layer of equipment for applications requiring direct connections of Cisco routers over dark fiber. The optical interface is OC-48/STM-16 LR-2 standards-compliant and compatible with the OC-48/STM-16 long-reach line card.
Simplified Network Management	ONS 15104 is IP addressable with Cisco IOS software support. This enables the use of the same CLI-based network management platform for the routers and the ONS 15104. Further, the support of IP over DCCs enables remote network management from the Cisco 12000 GSRs at either end of the long-haul span.
Improved Network Availability	Elimination of an entire layer of equipment means less chance of failure.
Increased Flexibility for Deploying Long-Haul IP Networks	Allows cost-effective implementation for long-haul connections between Cisco routers with typical distances of 50 miles (80km) between the cascadable ONS 15104, up to a maximum of 30 units in a cascaded chain of Regenerators.
Rapid Network Restoration Capability	Support for the full suite of regenerator alarms and performance monitoring functions enables quick fault isolation and diagnostics. Functions supported include monitoring and insertion of both B1 and C1 bytes, generation of L-AIS, generation of alarms and alerts, and error counters for section-level performance.
Increased Rack Space	Very compact box has a one-rack unit form factor with the equivalent function to regenerators sold by other telecommunication vendors. This means additional room for other networking equipment within the same floor space.

Specifications

Physical

- Occupies one rack unit
- Weight: 10.3 lb. (4.66 kg)
- Height: 1.72 in. (4.4 cm)
- Depth: 11.8 in. (30.0 cm)
- Width: 17.3 in. (43.94 cm)

Reliability

- Network Element (NE) availability of 99.999 percent
- MTBF of nine years (Bellcore GR332 calculations)
- Meets all reliability and quality criteria of Bellcore documents TA-418 and TR-499 and section 7.5 of GR-253

Environmental

- Operating temperature: 32 to 104 F (0 to 40 C)
- Storage temperature: -40 to 185 F (-40 to 85 C)
- Relative humidity: 5 to 95%, noncondensing
- Noise Level: 51 dbA3 at 3 ft (0.914m)

Regulatory Compliance

- Telecordia (Bellcore) GR-253, GR-917 and GR-418 (where applicable)
- ITU-T G.957 and G.958 (where applicable)

Safety

- UL 1950, Third Edition
- CSA C22.2, No. 950-95, Third Edition
- EN 60950
- EN 41003
- AUSTEL TS001
- AS/NZS 3260
- EN 60825 Laser Safety (Class 1)
- Network Equipment Building Systems (NEBS) Level 3

Electromagnetic Emissions Certification

- FCC Class A
- AS 3548 Class A
- EN 55022 Class A
- VCCI Class 1

Immunity

- IEC-1000-4-2 ESD
- IEC-1000-4-3 radiated immunity
- IEC-1000-4-4 EFT
- IEC-1000-4-5 surge
- IEC-1000-4-6 low-frequency common immunity
- IEC-1000-4-11 voltage dips and sags
- IEC-1000-3-2 power line harmonics

LEDs

- OC-48 link activity indicator
- Ethernet and console port activity indicator
- Power on
- System ready/fail indicator

Connector

- SC connector for OC-48/STM-16 links
- RJ45 connector for RS-232 console port and 10BaseTX Ethernet port

Network Management

- CiscoView
- SNMP
- MIB-II
- SONET/SDH MIB

Power Supply Specifications

ONS15104-AC

- Total AC Input Power
  - 125 watts RMS
- Input Voltage
  - 90 to 264 VAC
- Input Line Frequency
  - 50-60Hz
- Input Current
  - 1.0-0.5A
- Source AC service requirement
  - 15A North America: 10A or 16A International
- Power dissipation
  - 100w (max.), 342 BTU/hr

ONS15104-DC

- Total DC Input Power
  - 125W
- Input Voltage
  - –40.5V to –75V
- Input Current Rating
  - 2.1A
- Source DC service requirement
  - Commensurately rated DC source

Power Budget and Signal Specifications

The maximum distance for single-mode installations is determined by the optical attenuation and the chromatic dispersion in the fiber path. High-quality, single-mode fiber with minimal high-quality splices can carry an ONS 15104 signal up to 50 miles (80 km).

Table 2 Power Budget and Signal Specifications for ONS 15104

Transceiver	Power Budget	Transmit Power	Receiver Sensitivity	Typical Maximum Distance
Single-Mode, Long-Reach with 1510 Nanometer (nm)	26 db	-2 to +3 dBm at 1500 to 1580 nm	-28 to -9 dBm	50 miles (80 km)

Table 3 Ordering and Availability

Product Number	Description	Availability	Cisco IOS Release
ONS15104-AC	OC-48/STM-16 bidirectional optical regenerator, SC connectors—AC Power	August 1999	12.0(5)T or higher
ONS15104-DC	OC-48/STM-16 bidirectional optical regenerator, SC connectors—DC Power	January 2001	12.0(5)T or higher

For additional information, please visit the Web site at www.cisco.com/univercd/cc/td/doc/product/core/cis_ons/index.htm.

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