

# Resource Arbitration Processor (RAP-OC48 LR)

## D E S C R I P T I O N

The Calix C7 RAP-OC48 LR is a common control plug-in card that contains the switch matrix, real-time processor and memory, and timing source for the Calix C7 system. The RAP-OC48 LR maintains the database of the Calix C7 system in non-volatile memory for storage of cross-connect information and system software. In addition to its common control function, the card contains one GR-253 compliant, 1550 nm long-reach optical interface to be used as protocol flexible inter-terminal transport, subscriber service interface, or network interface. This combination of functionality on a single card radically lowers start-up costs and frees more slots for revenue-generating services. The RAP-OC48 LR supports STS-1-mapped traffic in STS-1, STS-3c, STS-12c, or STS-48c increments. Each STS-n can carry any payload type (TDM, ATM, Ethernet, IP/MPLS).

The RAP-OC48 LR is equipped with network processors that deliver traffic management and wire speed forwarding capability on its optical interface. When used as inter-terminal transport between Calix C7 nodes, the RAP-OC48 LR provides packet concentration functionality - packet traffic from multiple nodes is statistically multiplexed into a single pool of bandwidth shared across the transport network. This results in significant bandwidth savings when compared to multiple point-to-point connections required with SONET multiplexors.

The RAP-OC48 LR card plugs into either of the two common control slots of the Calix C7 shelf (CS-A and CS-B). Physical access to the OC-48 interface on the RAP-OC48 LR plug-in card is through standard LC connectors mounted on the faceplate of the plug-in card.

## K E Y   A T T R I B U T E S

**SWITCHING CAPACITY:** The RAP-OC48 LR manages up to 50 Gbps of user traffic in the Calix C7 shelf, and supports the following switching and cross-connect capabilities:

- Packet switch: Asymmetric fabric (optimized for access and transport applications)
  - 2.4 Gbps ingress (actual packet traffic)
  - 50 Gbps egress (multicast)
- STS cross connect: 1,056 STS-1 cross-connects for STS-based signals. The switch matrix on the RAP-OC48 LR cross connects TDM traffic in a byte-interleaved manner identical to a traditional SONET ADM.

- DS0 cross connect: 11,700 DS0 cross-connects for POTS and other DS0-based services

This versatile bandwidth and switching capacity enables service providers to support their needs today while building capacity and packet processing capability for their subscribers' service needs of the future.

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**PACKET-BASED PATH PROTECTION:** In addition to traditional SONET protection schemes (UPSR, LAPS), the Calix C7 implements a packet-based path protection scheme that provides a shared pool of bandwidth (STS-1, STS-3c, STS-12c) across multiple nodes for statistical multiplexing of packet traffic (ATM, IP, etc). For example, one STS-3c can be provisioned in a ring to add and drop ATM traffic at multiple nodes. This protection scheme provides the benefits of SONET survivability with the bandwidth efficiency gained from traffic shaping and aggregation. This capability is in addition to the traditional path and line SONET protection capabilities.

**FLEXIBLE PROTOCOL SUPPORT:** The RAP-OC48 LR is equipped with network processors that deliver traffic management and wire speed packet forwarding capability on each payload up to STS-12c. This allows the user to configure the card to support multiple protocols simultaneously over the same fiber link. In particular, the optical interface on the RAP-OC48 LR supports the following configurations:

- Channelized: Supports STS- mapped traffic in STS-1, STS-3c, STS-12c or STS-48c increments. Each STS-1 or STS-(N)c can contain different payload types (TDM, ATM, Ethernet, IP/MPLS). The RAP-OC48 LR can terminate and process each payload up to STS-12c.

- ATM UNI/NNI: Supports CBR, UBR, rt-VBR, nrt-VBR and GFR service categories with up to 14,000 user PVCs.

**DISTRIBUTED PACKET SWITCH FABRIC:** The centralized packet switching fabric on the RAP-OC48 LR combines with the packet-based optical and DS3 plug-in cards to form a distributed switch fabric. The individual plug-in cards perform packet concentration and traffic shaping. This function separates actual packet traffic from the physical interface and aggregates it across all ports on the card before forwarding the payload to the centralized switch fabric on the RAP-OC48 LR. This combination results in very efficient use of centralized switching resources, and in tremendous scalability potential via distributed packet processing.

**GR-253-CORE COMPLIANT:** Standard SONET compliance enables a network of Calix C7 systems to seamlessly and transparently co-exist with currently deployed SONET networks from other vendors. It also enables service providers to continue utilizing their existing SONET test equipment and procedures.

## SPECIFICATIONS

# Resource Arbitration Processor (RAP-OC48 LR)

### ORDERING INFORMATION

Calix Part No.: 100-00429

### COMMON CONTROL FUNCTIONS

#### SWITCHING CAPACITY

STS—1,056 STS-1 cross connects  
ATM Traffic—32k PVCs, Asymmetric  
2.4 Gbps ingress, 50 Gbps egress  
(multicast)  
TDM Traffic—11,700 DS0 cross-  
connects

#### CLOCK/SYNCHRONIZATION

Stratum 3, holdover  
Clock inputs: composite, external

#### EQUIPMENT PROTECTION

(Optional) 1:1  
Common control protection switching  
is handled independently from  
optical protection switching.

### TRANSPORT INTERFACE

#### OC DATA RATE

2.488 Gbps, GR-253 LR2

#### TRANSMITTER WAVELENGTH

1500–1580 nm, nominal 1550 nm

#### RECEIVER INPUT WAVELENGTH

1310 nm or 1550 nm

#### TRANSMIT POWER

Maximum +3 dBm  
Minimum –2 dBm

#### RECEIVER INPUT

Maximum –9 dBm  
Minimum –28 dBm

### FIBER TYPE

Single Mode (SMF-28)

### DISPERSION PENALTY

2 dB

### LINK LOSS BUDGET

24 dB

### CONNECTOR TYPE

LC mounted on card faceplate

### PROTECTION

#### PATH:

Unidirectional path switched ring (UPSR,  
STS traffic)  
UPSR with packet aggregation (STS and/  
or packet traffic)  
Linear path protection switching (STS  
and/or packet traffic)

#### LINE:

1 + 1 automatic protection switching (1 + 1  
APS), uni- or bi-directional  
1:1 automatic protection switching (1:1  
APS), uni- or bi-directional

### ATM

UNI 3.0/3.1 PVC support  
CBR, UBR, rt-VBR, nrt-VBR, and  
GFR service categories per ATM  
Forum Traffic Management 4.0/4.1  
specifications.  
Full UNI and NNI VPI/VCI fields with  
translation.  
14,000 user PVCs for optical interface  
Per-VC dual leaky bucket policing  
supported on all PVCs.  
Per-VC traffic shaping supported on all  
PVCs.  
F4/F5 OAM cells for management

### STATUS INDICATORS

**FAIL:** Red – Card has failed

**ACTIVE:** Green – One or more of the  
optical ports are provisioned

**STBY:** Yellow – Card is in standby mode  
for protection

**NE:** Red – Near-end failure on at least  
one interface

**FE:** Yellow – Far-end failure on at least  
one interface

**FAC:** Green – Indicates the optical  
facility is active

### POWER DISSIPATION

55 Watts per card

### PHYSICAL DIMENSIONS

9.3 inches (height) x 0.7 inches (width)  
x 9.0 inches (depth)

### OPERATING ENVIRONMENT

Temperature: –40 C to +65 C (–40 F  
to +149 F)

Humidity: 5 to 90% non-condensing

Altitude: to 13,125 feet

### STORAGE TEMPERATURE

–40 C to +70 C (–40 F to +158 F)

### NEBS LEVEL 3 COMPLIANCE

Telcordia GR-63-CORE, Network  
Equipment-Building System  
(NEBS) Requirements, Issue 1,  
October 1995

Telcordia GR-1089-CORE,  
Electromagnetic Compatibility and  
Electrical Safety, Issue 2, December  
1997 with revision 1, February 1999

Telcordia GR-3028-CORE,  
Thermal Management In  
Telecommunications Central Offices,  
2001

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## S P E C I F I C A T I O N S

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### **SAFETY**

NTRL-UL 1950

### **EMI/RFI**

FCC Part 15 Class A

### **STANDARDS SUPPORT**

Telcordia, GR-253-CORE,  
Synchronous Optical Network  
(SONET) Transport Systems:  
Common Generic Criteria, Issue 3,  
September 2000.  
Telcordia, GR-499-CORE, Transport  
Systems Generic Requirements  
(TSGR): Common Requirements,  
Issue 2, December 1998  
Telcordia, GR-496, SONET Add-  
Drop Multiplex Equipment  
(SONET ADM) Generic Criteria,  
Issue 1, December 1998  
Telcordia, GR-1244-CORE, Clocks  
for the Synchronized Network:  
Common Generic Criteria, Issue 2,  
December 2000

Telcordia, GR-1400-CORE, SONET  
Dual-Fed Unidirectional Path  
Switched Ring (UPSR) Equipment  
Generic Criteria, Issue 2,  
January 1999  
ANSI T1.405-1995, SONET-Payload  
Mappings  
ANSI T1.105, Synchronous Optical  
Network (SONET) - Automatic  
Protection  
ANSI T1.107 - 1995, Digital  
Hierarchy-Formats Specifications.  
ANSI T1X1.5 Generic Framing  
Procedure  
ITU-T, I.610, B-ISDN Operation  
and Maintenance Principles and  
Functions, 1999.  
ATM Forum UNI 3.0/3.1  
ATM Forum Traffic Management  
4.0/4.1



1035 N. McDOWELL BLVD., PETALUMA, CA 94954  
TEL: 877.766.3500 WWW.CALIX.COM

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