

## Cisco 10720 Router

**The Cisco® 10720 Router from Cisco Systems® is the industry's first router combining IP, Resilient Packet Ring, and Ethernet technologies optimized for high-speed metropolitan (metro) services.**

The high-performance Cisco 10720 Router is a principle building block in the next-generation Metro IP network (Figure 1). It helps service providers offer innovative and differentiated IP and VPN services to their customers at optical speeds. Equipped with Ethernet technology for customer access and the innovative Resilient Packet Ring (RPR) technology for metro optical connectivity, the Cisco 10720 allows service providers to offer IP and VPN services closer to the user, helping them better control admission to network resources.

Powered by Cisco IOS® Software and Parallel Express Forwarding (PXF) technology, the Cisco 10720 is a cost-effective, reliable platform that not only supports the full suite of IP routing protocols in both IPv4 and IPv6 but also enables value-added services. The Cisco 10720 can be used to efficiently introduce advanced features such as Layer 2 and Layer 3 VPNs (L2VPNs and L3VPNs) without compromising on performance.

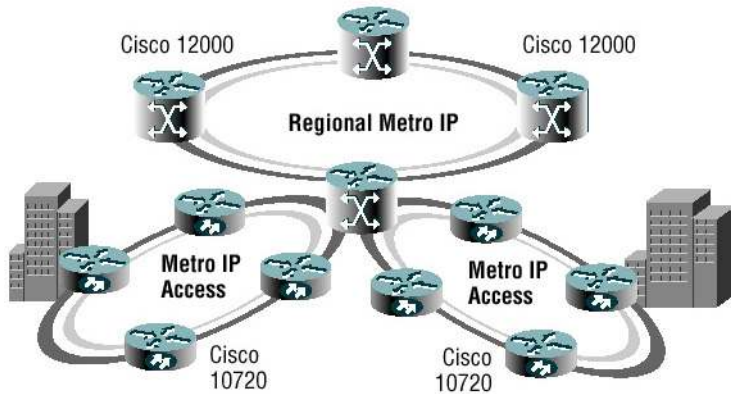
With the rapid growth in bandwidth-intensive applications on the Internet, the demand for Internet connectivity has grown exponentially in the past few years. Service providers are seeking ways to offer Internet access at ever-faster speeds and to differentiate themselves from competitors by offering value-added services to their customers. Traditional optical networking products, such as SONET add/drop multiplexers (ADMs), are optimized only for voice services delivery. To deliver high-speed Internet access, service providers are required to deploy an overlay IP network, which is complex, bandwidth inefficient, and difficult to manage. The Cisco 10720 Router can be deployed directly over fiber, enabling service providers to offer IP + Optical access without the need for a SONET or SDH optical transport infrastructure, but maintaining carrier-class SONET/SDH characteristics for management and restoration.

**Figure 1.** Cisco 10720 Router



The Cisco IP + Optical architecture, incorporating Cisco 12000 Series routers in the core and at the provider edge and the Cisco 10720 for metro access (Figure 2), provides a unique solution to service providers. This solution is applicable to both new service providers that are looking to build networks that deliver data, voice, and video services over IP and traditional service providers that want to optimize and extend their IP network infrastructures.

Figure 2. Metro IP Architecture



Alternatively, when the Cisco 10720 Router is configured with the Console/Auxiliary module and the Ethernet module (that is, without any RPR interfaces), it makes a very good choice for a high-performance Ethernet router with a rich set of Layer 3 and quality-of-service (QoS) features for a managed customer-premises-equipment (CPE) application.

## KEY BENEFITS

### Building Block for Metro Optical Internet

The architecture and onboard RPR optical uplink support of the Cisco 10720 allows service providers to offer high-speed IP services at the network edge. The platform uses Ethernet technology for simple, cost-effective customer access and RPR for metro network connectivity, allowing service providers to bypass traditional DS-1 and DS-3 access options. The dual-counter rotating-ring technology of RPR is cost-effective because it uses both rings and it can be deployed over dark fiber while maintaining the less-than-50-ms restoration common in SONET/SDH systems. For multiservice applications, RPR can also be deployed over traditional SONET/SDH ADMs and wavelength-division multiplexing (WDM) systems. The Cisco 10720 is one of the industry's first routers to support IEEE 802.17 standards-compliant RPR.

### Ethernet Customer Connectivity

The two versions of the Ethernet modules available for the Cisco 10720 provide flexible deployment options. The Fast Ethernet module provides a high density of 100BASE-T ports and the combined Gigabit Ethernet and Fast Ethernet module provides the flexibility of Gigabit Ethernet and Fast Ethernet in one module. The Gigabit Ethernet ports support various reaches of pluggable optics as well as coarse wavelength-division multiplexing (CWDM) and copper pluggable optics.

### High-Performance IP Routing

The Cisco 10720 is a fully functional router powered by Cisco IOS Software and the PXF technology. It supports all unicast and multicast IP routing protocols and advanced buffering and scheduling mechanisms, and it offers the capability to store up to 250,000 routes. It also supports a forwarding rate of approximately 2 mpps with all services enabled.

### Metro Networking Solutions

The Cisco 10720 is designed to ideally support metro services with its RPR architecture for optimal fiber connectivity as well as features such as IP class of service (CoS), L2VPN, and L3VPN services.

## Comprehensive IP Class-of-Service Features

The Cisco 10720 Router software is based on industry-leading Cisco IOS Software. IP forwarding as well as the following advanced IP QoS features are performance-optimized to ensure the highest possible throughput in every port. These features allow service providers to offer differentiated service (such as gold, silver, and bronze) to their customers with the various QoS features that allow bandwidth control and prioritization of traffic:

- Modular QoS CLI(MQC)—A framework that allows configuration of QoS features:
  - Versatile traffic management system (VTMS), the latest scheduling technique for servicing output queues based on traffic classes and controlling the order and frequency that output queues are serviced based on their configuration
  - Flexible classification mechanism to support up to 8 CoSs
  - Weighted Random Early Detection (WRED) for TCP congestion avoidance on both the Ethernet and the OC-48 uplink ports
- Turbo access control lists (ACLs)—Access-list processing without affecting performance

## Adaptive Network Processing for Future IP Service Enhancements

The central processing engine of the Cisco 10720 consists of two sets of PXF network processors—an array of individual, programmable subprocessors. This architecture allows for parallel processing of 32 packets; in addition, it allows for new features to be developed in microcode and implemented efficiently with a simple software download. Unlike the traditional designs based on application-specific integrated circuits (ASICs), which require a hardware change for introducing new features, the PXF-based architecture allows for value-added service features such as L2VPNs and L3VPNs to be developed in short timeframes and implemented in new releases of Cisco IOS Software without sacrificing performance.

## Unique Combination of Form factor, Features, and Performance

The Cisco 10720 supports a wide range of IP, QoS, and VPN features, all at the performance of 2 mpps, and is packaged in a 2-rack-unit (2RU) chassis, making the router versatile and usable in numerous different service provider and enterprise applications.

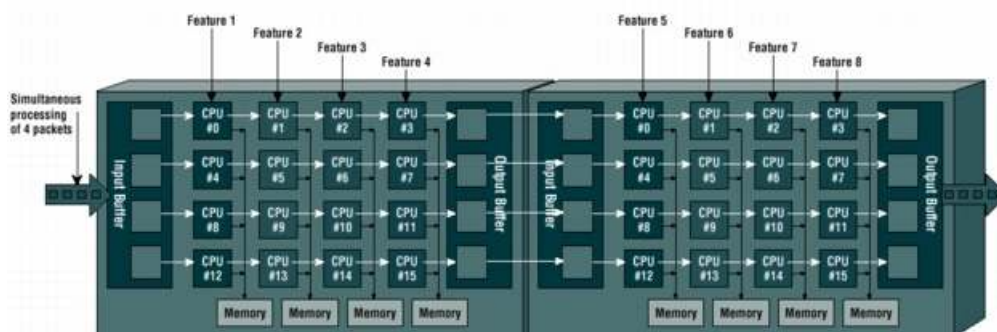
## FEATURES AT A GLANCE

### Hardware Features

#### Central Processing Engine

The central processing engine consists of two sets of processors that manage the control- and data-plane traffic. The PXF network processors manage the data plane and support IP forwarding as well as advanced QoS features. The multiple processors in the PXF process packets simultaneously at the rate of approximately 2 mpps (Figure 3).

Figure 3. PXF Processing



## Redundant Power Supply

The Cisco 10720 Router is equipped with a dual power supply by default. Both AC and DC power supplies are supported as options.

## Interface Modules

The Cisco 10720 has two dedicated slots for interface modules (modules are not interchangeable or hot-swappable):

- The upper slot is dedicated for a Console/Auxiliary, RPR, or Packet over SONET/SDH (PoS) uplink module equipped with two OC-48c/STM-16c ports. All uplink modules also have one console port and one auxiliary port for management purposes, both with RJ-45 connectors.
- RPR uplink module—This module provides an aggregate bandwidth of approximately 5 Gbps. It is equipped with 2 OC-48/STM-16 ports that support pluggable optics in short reach (SR), intermediate reach 1 (IR1), and long reach 2 (LR2) (Figure 4).
- PoS uplink module—This module is equipped with two OC-48/STM-16 ports with fixed optics in SR only. It can be optionally configured to operate in Spatial Reuse Protocol (SRP) mode.
- Console/Auxiliary module—This module has only the console and auxiliary ports and no OC-48c/STM-16c ports (Figure 5).

**Figure 4.** IEEE 802.17 RPR/SRP



**Figure 5.** Console/Auxiliary Module



- The lower slot is dedicated for either a 24-port Fast Ethernet module or a combined 4-port Gigabit Ethernet and 8-port Fast Ethernet module.
  - 24-port Fast Ethernet module—This module is available in TX (100m reach) (Figure 6).
  - 4-port Gigabit Ethernet + 8-port Fast Ethernet module—The Gigabit Ethernet ports are equipped with Small Form-Factor Pluggable (SFP) optics that are available in SX (2-km reach) or LH (10-km reach) optics (Figure 7).

**Figure 6.** 24-Port 10/100-BASET



**Figure 7.** 4-Port Gigabit Ethernet + 8-Port 10/100BASE-TX



## Software Features

- RPR features— Intelligent Protection Switching (IPS) with less than 50-ms restoration time and SRP/RPR MIB support
- IPv4 and IPv6 forwarding

- IP routing protocols—Including Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), and Border Gateway Protocol (BGP)
- Multicast support—Including Protocol Independent Multicast (PIM) sparse mode (PIM-SM), PIM dense mode (PIM-DM), and Multiprotocol BGP
- L2VPN—Layer 2 Tunneling Protocol Version 3 (L2TPv3) or Ethernet over MPLS (EoMPLS) for Ethernet-based L2VPN services
- L3VPN—Multiprotocol Label Switching (MPLS) provider and provider edge functions
- QoS features—8 queues support with egress rate-limiting and shaping capability, Weighted Random Early Detection (WRED), VTMS traffic shaping, and access lists
- Ethernet features—10/100 speed autonegotiation, HDX-FDX negotiation and time domain reflectometry (TDR) for 10/100BASE-TX, Hot Standby Router Protocol (HSRP), and multiple HSRP
- Security—Including authentication, authorization, and accounting (AAA); RADIUS authentication; TACACS+; encrypted passwords; and so on

### Management and Administration

- Cisco IOS command-line interface (CLI)
- TACACS+ and RADIUS
- Configuration and administration features, including Telnet and Cisco Discovery Protocol
- Serial (auxiliary) and console ports for local and remote administration
- Remote software download with Trivial File Transfer Protocol (TFTP) and Remote Copy Protocol (RCP)
- IP over data communication channel (DCC) for remote management of the OC-48/STM-16 Cisco ONS 15104 Optical Regenerator, where applicable
- Flash memory of 64 MB built in for software and configuration load
- Optical receive power monitoring support on OC-48/STM-16 and Gigabit Ethernet interface
- Supported MIBs, including Simple Network Management Protocol (SNMP), SRP, SONET, and OSPF
- Autoinstall feature support for remote deployments

### SPECIFICATIONS

#### Physical

- Weight: 34 lb (15.3 kg)
- Dimensions (H x W x D): 3.5 x 17.5 x 18.25 in. (8.9 x 44.45 x 46.35 cm)
- Mounting options: 19, 23, and 24 in. EIA; ETSI; front-, mid-, or rear-rack mounting; wall mounting; and table mounting

#### Upper Slot Modules

- Two-port single-mode OC-48c/STM-16c Dynamic Packet Transport (DPT) or PoS (Note: All DPT modules are end-of-sale status since December 2005. For the PoS modules in IR, LR1, and LR2, the end-of-sale date is April 2006.)
  - SR: 1.2 miles (2 km)
  - IR: 9.3 miles (15 km)
  - LR1: 25 miles (40 km)

- LR2: 50 miles (80 km)
- Weight: 3.0 lb (1.35 kg)
- Dimensions (H x W x D): 0.96 x 13.16 x 8.55 in. (2.44 x 33.43 x 21.71 cm)
- Two-port RPR/DPT module supporting OC-48/STM-16 pluggable optics
  - Weight: 3.0 lb (1.35 kg)
  - Dimensions (H x W x D): 0.96 x 13.16 x 8.55 in. (2.44 x 33.43 x 21.71 cm)
  - LEDs: Overtemp, cardfail, system status, power, active, carrier, receive packet, passthrough, and protect
- Console or auxiliary module
  - Console and auxiliary ports
  - Weight: 2.4 lb (1.09 kg)
  - Dimensions (H x W x D): 0.96 x 13.16 x 8.55 in. (2.44 x 33.43 x 21.71 cm)
  - LEDs: Overtemp, cardfail, system status, and power

#### **Lower Slot Module**

- 24-port 10/100BASE-TX access module:
  - Weight: 2.8 lb (1.26 kg)
  - Dimensions (H x W x D): 1.49 x 13.16 x 8.55 in. (3.78 x 33.42 x 21.71 cm)
  - LEDs: Cardfail, power, error (R), link/active (G), and 100 Mbps
  - Connectors: RJ-45
- 24-port 100BASE-FX access module (FX-SM or FX-MM): (Note: They are end-of-sale status since November 2004)
  - Weight: 3.2 lb (1.44 kg)
  - Dimensions (H x W x D): 1.49 x 13.16 x 8.55 in. (3.78 x 33.42 x 21.71 cm)
  - LEDs: error (R), link (G), active, cardfail, and power
- 4-port 1000BASE-FX + 8-port 10/100BASE-TX access module:
  - Weight: 2.8 lb (1.26 kg)
  - Dimensions (H x W x D): 1.49 x 13.16 x 8.55 in. (3.78 x 33.42 x 21.71 cm)
  - LEDs: Cardfail, power, error (R), link/active (G), and 100 Mbps

#### **Environmental**

- Temperature:
  - Operating: 32 to 104°F (0 to 40°C)
  - Nonoperating: -4 to 149°F (-20 to 65°C)
- Relative humidity:
  - Operating: 10 to 85% noncondensing
  - Nonoperating: 5 to 95% noncondensing

- Altitude:
  - Operating: 0 to 10,000 ft (0 to 3000m)
  - Nonoperating: 0 to 15,000 ft (0 to 4570m)
- Heat dissipation:
  - Maximum DC: 500W
  - Maximum AC: 500W
- Shock:
  - Operating (half sine): 21 in./sec (0.53 m/sec)
  - Nonoperating (trapezoidal pulse): 20 G<sup>1</sup>, 52 in./sec (1.32 m/sec)
- Acoustic noise: Maximum 60 dBa
- Vibration:
  - Operating: 0.35 Grms<sup>2</sup> from 3 to 500 Hz
  - Nonoperating: 1.0 Grms from 3 to 500 Hz

### Safety Compliance

- ACA TS 001
- AS/NZS 3260
- EN/IEC 60825 Laser Safety
- CSA C22.2 No. 950 ~ UL 1950
- IEC60950 second edition with A1-A4
- EN60950 second edition with A1-A4

### Immunity Compliance

- EN 300 386/EN 300 386-2
- EN55024
- EN50082-1

### Electromagnetic Emissions Certification

- AS/NZS 3548 – Class A
- FCC Part 15 (47CFR15 Subpart B) – Class A
- EN 300 386/EN 300 386-2 – Class A/B<sup>3</sup>
- EN55022 class A/B3
- EN61000-3-2
- EN61000-3-3
- ICES-003 – Class A

<sup>1</sup> G is a value of acceleration, where 1 G equals 32.17 ft/sec (9.81 m/sec)

<sup>2</sup> Grms is the root mean square value of acceleration

<sup>3</sup> Class B with shielded Ethernet cable (CAT5); Class A with unshielded Ethernet cable (CAT5)

- VCCI – Class A
- CISPR 22 - Class A/B3
- BSMI (Taiwan) – Class A<sup>4</sup>

### **Immunity Tests**

- EN/IEC-61000-4-2: ESD
- EN/IEC-61000-4-3: Radiated immunity
  - EN/IEC-61000-4-4: EFT
  - EN/IEC 61000-4-5: Surge
  - EN/IEC-61000-4-6: Conducted immunity
  - EN/IEC-61000-4-11: Voltage dips and sags

### **Network Equipment Building Standards**

Telcordia (Bellcore) Network Equipment Building Standards (NEBS):

- GR-1089-CORE
- GR-63-CORE

### **Power**

Dual DC power supply:

- Total DC input power: 200 to 300W (measured maximum)
- Heat dissipation: 500W
- Input voltage: –48/–60 VDC nominal
- Maximum input current: 9.0A
- Typical input current: 3.0 to 4.0A

Dual AC power supply:

- Total AC input power: 200 to 300W (measured maximum)
- Heat dissipation: 500W
- Input voltage: 100 to 240 VAC
- Input line frequency: 50/60 Hz
- Input current: 2.5 to 5.0A

### **Software**

Cisco IOS Software Release 12.0S

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<sup>4</sup> Requires the use of shielded (CAT5) Ethernet cable on the Fast Ethernet TX ports for 10720-FE-TX and 10720-GE-FE-TX; not applicable for 10720-GE-FE-TX-B



Tables 1 through 3 give optics information, Table 4 gives part numbers that are no longer orderable, and Table 5 gives ordering information for the Cisco 10720.

**Table 1.** OC-48c/STM-16c Single-Mode DPT Uplink Module Optics (Note: End of sale since December 2004)

|  | SR        | IR        | LR1       | LR2       |
|--|-----------|-----------|-----------|-----------|
| Connector type   | LC duplex | LC duplex | LC duplex | LC duplex |
| Operating wavelength   | 1310 nm   | 1310 nm   | 1310 nm   | 1550 nm   |
| Transmit power   |           |           |           |           |
| Minimum  | -10 dBm   | -5 dBm    | -2 dBm    | -2 dBm    |
| Maximum  | -3 dBm    | 0 dBm     | 3 dBm     | 3 dBm     |
| Receive sensitivity  |           |           |           |           |
| Minimum  | -18 dBm   | -18 dBm   | -27 dBm   | -28 dBm   |
| Maximum  | -3 dBm    | 0 dBm     | -9 dBm    | -9 dBm    |
| Rated distance (dispersion-unshifted single-mode fiber per GR-20-CORE) | 2 km      | 15 km     | 40 km     | 80 km     |

**Table 2.** OC-48c/STM-16c SFP Optics

|  | SR               | IR                | LR2              |
|--|------------------|-------------------|------------------|
| Product part number  | SFP-OC48-SR      | SFP-OC48-IR1      | SFP-OC48-LR2     |
| Connector type   | LX duplex        | LX duplex         | LX duplex        |
| Operating wavelength   | 1310 nm          | 1310 nm           | 1550 nm          |
| Transmit power   |                  |                   |                  |
| Minimum  | -10 dBm          | -5 dBm            | -2 dBm           |
| Maximum  | -3 dBm           | 0 dBm             | 3 dBm            |
| Receive sensitivity  |                  |                   |                  |
| Minimum  | -18 dBm          | -18 dBm           | -28 dBm          |
| Maximum  | -3 dBm           | 0 dBm             | -9 dBm           |
| Power budget   | 8 dB             | 13 dB             | 26 dB            |
| Rated distance (dispersion-unshifted single-mode fiber per GR-20-CORE) | 1.2 miles (2 km) | 9.3 miles (15 km) | 50 miles (80 km) |

**Table 3.** 100-Mbps FX Ethernet Module Optics (Note: End of sale since November 2004)

| Part Number  | FE-FX-MM  | FE-FX-SM  |
|--|-----------|-----------|
| Connector type   | MT-RJ     | MT-RJ     |
| Operating wavelength   | 1310 nm   | 1310 nm   |
| Transmit power   |           |           |
| Minimum  | -23.5 dBm | -20.0 dBm |
| Maximum  | -14.0 dBm | -14.0 dBm |
| Receive sensitivity  |           |           |
| Minimum  | -31.0 dBm | -31.0 dBm |
| Maximum  | -14.0 dBm | -8 dBm    |
| Rated distance (dispersion-unshifted single-mode fiber per GR-20-CORE) | 2 km      | 15 km     |

**Table 4.** Part Numbers No Longer Orderable Because of End of Sale

| Part Number    | Description                              | End-of-Sale Date |
|----------------|--|------------------|
| 10720-GE-FE-TX | 4 Port Ge 8 Port 10/100 Ethernet RJ45 TX | June 2004        |
| 10720-FE-FX-MM | 24-port 100Mbps Ethernet FX MM MTRJ 2KM  | November 2004    |

|                  |   |               |
|------------------|---|---------------|
| 10720-FE-FX-SM   | 24 Port 100Mbps Ethernet FX SM MTRJ 15KM                                  | November 2004 |
| 10720-SR-LC      | OC-48 SRP Short Reach 2KM Uplink Module                                   | December 2005 |
| 10720-IR-LC      | OC-48 SRP Intermediate Reach 15KM Uplink Module                           | December 2005 |
| 10720-LR1-LC     | OC-48 SRP Long Reach 40KM Uplink Module                                   | December 2005 |
| 10720-LR2-LC     | OC-48 SRP Long Reach 80KM Uplink Module                                   | December 2005 |
| 10720-GE-SFP-SX  | GE SFP – Short Reach 550M LC  | December 2005 |
| 10720-GE-SFP-LH  | GE SFP – Intermediate Reach 10KM LC                                       | December 2005 |
| 10720-IR-LC-POS  | OC-48c/STM-16c POS Intermediate Reach (15 km) Uplink Module-LC connectors | April 2006    |
| 10720-LR1-LC-POS | OC-48c/STM-16c POS Long Reach (40 km) Uplink Module-LC connectors         | April 2006    |
| 10720-LR2-LC-POS | OC-48c/STM-16c POS Long Reach (80 km) Uplink Module-LC connectors         | April 2006    |

**Table 5.** Ordering Information

| Part Number       | Description   |
|-------------------|---|
| CISCO10720-AC-A   | Cisco 10720 Internet Router with dual AC power supply-Rev A       |
| CISCO10720-DC-A   | Cisco 10720 Internet Router with dual DC power supply-Rev A       |
| 10720-FE-TX       | 24-Port 10/100 Ethernet Access Module-RJ-45 connectors            |
| 10720-GE-FE-TX -B | 4-Port GE 8-Port 10/100 Ethernet RJ45-Revision B                  |
| SFP-GE-S          | GE SFP-Short Reach 550m-Extended temperature                      |
| SFP-GE-L          | GE SFP-Intermediate Reach 10 km-Extended temperature              |
| GLC-ZX-SM         | GE SFP-Long Reach 70 km LC connectors                             |
| CWDM-SFP-1470     | Longwave 1470 nm laser, single mode-Gray                          |
| CWDM-SFP-1490     | Longwave 1490 nm laser, single mode-Violet                        |
| CWDM-SFP-1510     | Longwave 1510 nm laser, single mode-Blue                          |
| CWDM-SFP-1530     | Longwave 1530 nm laser, single mode-Green                         |
| CWDM-SFP-1550     | Longwave 1550 nm laser, single mode-Yellow                        |
| CWDM-SFP-1570     | Longwave 1570 nm laser, single mode-Orange                        |
| CWDM-SFP-1590     | Longwave 1590 nm laser, single mode-Red                           |
| CWDM-SFP-1610     | Longwave 1610 nm laser, single mode-Brown                         |
| SFP-GE-T          | GE SFP-1000BASE-T   |
| 10720-SR-LC-POS   | OC-48c/STM-16c POS Short Reach (2 km) Uplink Module-LC connectors |
| 10720-CON-AUX     | Console/Auxiliary Module  |
| 10720-RPR-SFP     | OC-48c/STM-16c RPR/SRP Uplink Module                              |
| SFP-OC48-SR       | OC-48/STM-16 Pluggable Short Reach (2 km) Optics                  |
| SFP-OC48-IR1      | OC-48/STM-16 Pluggable Intermediate Reach1 (15 km) Optics         |
| SFP-OC48-LR2      | OC-48/STM-16 Pluggable Long Reach2 (80 km) Optics                 |
| 10720-MEM-512=    | 512MB memory module for 10720 <sup>5</sup>                        |

For additional information, go to: <http://www.cisco.com/en/US/products/hw/routers/ps147/ps148/index.html>.

<sup>5</sup> Please note all systems shipping since December 2004 are equipped with default RP memory of 512MB. This part is for those systems deployed prior to that date for purpose of upgrading from 256MB



**Corporate Headquarters**  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
www.cisco.com  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 526-4100

**European Headquarters**  
Cisco Systems International BV  
Haarlerbergpark  
Haarlerbergweg 13-19  
1101 CH Amsterdam  
The Netherlands  
www-europe.cisco.com  
Tel: 31 0 20 357 1000  
Fax: 31 0 20 357 1100

**Americas Headquarters**  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
www.cisco.com  
Tel: 408 526-7660  
Fax: 408 527-0883

**Asia Pacific Headquarters**  
Cisco Systems, Inc.  
168 Robinson Road  
#28-01 Capital Tower  
Singapore 068912  
www.cisco.com  
Tel: +65 6317 7777  
Fax: +65 6317 7799

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