Cisco DCM Series D9900 Digital Content Manager MPEG Processor

Today's digital systems demand powerful, flexible, and compact solutions that allow the service provider to support new network architectures. The Cisco® DCM Series D9900 Digital Content Manager (DCM) MPEG Processor is a compact 2RU platform capable of processing a high number of MPEG video streams. The DCM Series D9900 MPEG Processor is the next generation of intelligent headend processing equipment where the combination of compactness and flexibility leads to a cost-effective solution. Based on our experience, the DCM Series D9900 MPEG Processor brings operational and economic benefits in MPEG processing applications. The optional built-in DVB scrambler allows easy integration with several Conditional Access (CA) systems.

Figure 1. Cisco DCM Series D9900 MPEG Processor

Physical Configuration

The DCM Series D9900 MPEG Processor comes in a compact 2RU chassis with hot-swappable and redundant power supplies. The unit can be configured with up to four I/O cards, with each card having a maximum of ten ASI ports or four GbE ports. The DCM Series D9900 MPEG Processor can be fitted with up to four co-processor cards or up to three transcoder cards to support advanced video processing functions. The DCM DRD Satellite Reception and Decrytion card adds high density DVB-S and DVB-S2 reception capabilities and Common Interface decryption functionality. For receiving off-air ATSC terrestrial signals, the unit can be fitted with up to three high-density 8-VSB input cards. The DCM Series D9900 MPEG Processor conforms to the Network Equipment Building Standards (NEBS).

The ASI cards have been designed to support full ASI rates allowing freedom in system design. All ASI ports can be individually configured as input or output and all ASI ports support MPTS and SPTS streams.

The GbE I/O cards support four GbE ports via SFP connectors, with the card having a total throughput of 2 Gbps in and 2 Gbps out. The GbE ports support MPTS and SPTS streams. The co-processor cards' powerful MPEG content processing cores allow the DCM Series D9900 MPEG Processor to perform content recompression to lower bit rates, support open loop statistical multiplexing, digital program insertion, and scrambling. Because the cards are designed around

general purpose FPGAs, the DCM Series D9900 MPEG Processor is prepared to support multiple functions in the future through simple code downloads.

Each 8-VSB input card can simultaneously receive up to eight RF channels and can fully benefit from DCM's MPEG processing functionality.

The 2RU chassis can host up to 3 DRD Satellite Reception and Decryption that provides 12 RF inputs for the reception of DVB-S and DVB-S2 signals and 12 DVB-CI common interface slots for descrambling using CAM modules.

Programs from any input can be descrambled, which allows highly efficient and dense configurations.

Grooming and Remultiplexing

Grooming and remultiplexing of content is only the first step of the DCM Series D9900's MPEG processing capability.

The DCM Series D9900 MPEG Processor supports advanced PSI and descriptor handling capabilities. PSI, SI, and PSIP tables can be regenerated and played out, changing dynamically according to input changes and configurations. Integration with Continuum® DVP SI-Server allows customized PSI/SI situations to be addressed.

It supports extensive transport stream and program analysis, including program level bit rate measurements on both incoming and outgoing streams. This allows the operator to easily configure the content into logical outgoing program groups. Every version also includes monitoring of many TR 101 290 errors.

The high processing power of the DCM Series D9900 MPEG Processor is designed to meet evolving architectures for certain future applications.

Advanced Video Processing

The DCM Series D9900 MPEG Processor has been designed to provide MPEG processing power for today's needs as well as anticipated future requirements. The DCM Series D9900 MPEG Processor supports up to eight Gbps of input and output capability. Each of the four co-processing cores is capable of transrating, statistically multiplexing, or rate-limiting up to 350 SD streams or 85 HD streams using new IntelliRate Plus advanced transrating technology and algorithms. Each of the cores allow for digital program insertion (ad splicing) on SD streams as well as on HD streams.

Splicing on component level allows for seamless insertion of regional content or advertisements into existing transport streams. In addition to video processing, these cores also enable the DCM Series D9900 MPEG Processor to perform DVB Simulcrypt compliant scrambling. Functionality of the co-processing cores is enabled via software licenses, allowing the operator to scale the functionality to meet their needs while at the same time reducing the capital expense necessary to meet system requirements.

MPEG Processing Applications

Designed as an MPEG processing application platform, the DCM Series D9900 MPEG Processor accommodates bandwidth management of several encoder pools using IP-based closed-loop statistical multiplexing. The statistical multiplex controller includes support of the D9036 encoding platform.

The DCM Series D9900 MPEG Processor can also operate as a Digital Transport Formatter (DTF) in which multiple incoming transport streams are combined into a single transport stream, making it suitable for distributing DVB-T and DVB-H signals for broadcast networks that may operate in an SFN environment.Using an ASI SFN I/O card in the DCM Series D9900 MPEG Processor offers full SFN adapter functionality, including insertion of MIP information according to TS 101 191 in any outgoing ASI MPEG transport stream on that card.

The DCM Series D9900 MPEG Processor can also generate a so-called slate service out of a still image picture or clip that is loaded onto the device. The slate service might be used as a dummy service or as a backup program to switch to during a service loss.

Conditional Access

The built-in scrambler allows easy integration with several CA systems. Integrating multiple CA systems at the same time is possible through the Simulcrypt interface. The DCM Series D9900 MPEG Processor also supports BISS-1 scrambling to secure satellite or IP transmission links. It also provides BISS-1 descrambling functionality for remote locations that need to receive BISS-1 encrypted video streams over secured primary distribution links.

Transcoding

Following today's rapidly growing IPTV channel lineup requirements, the DCM Series D9900 MPEG Processor also performs high-density MPEG-2 to H.264 video transcoding, and is able to support optional audio transcoding from Dolby Digital (AC-3) and MPEG-1 Layer II to HE-AAC. It is capable of processing a high number of both SD and HD video streams, supporting 1080i and 720p formats at up to full HD resolution. It is designed to support numerous advanced features like closed caption handling, picture-in-picture (PIP), audio, and metadata pass-through. Functionality of the transcoding modules is enabled via software licenses, allowing operators to scale and grow to meet their needs.

Digital Overlays

To address applications like channel branding, message crawls and emergency alerts, the DCM Series D9900 MPEG Processor allows for insertion of digital overlays such as logos. The DCM Series D9900 MPEG Processor avoids complex decoding and re-encoding by overlaying and rendering logos that remain in the MPEG domain, resulting in a reduction in cost and complexity for the operator.

ATSC Off-air Reception

The state-of-the art 8-VSB input card allows four or eight RF channels to be received simultaneously depending on the chosen hardware version. Each RF input is licensed and can be configured independently to provide full flexibility. After reception, each received transport stream can use all other DCM processing functionality and allows operators to build a flexible solution.

Satellite Reception and DVB-CI Descrambling

For digital turnaround distribution applications, the Dense Receiver and Decrypter (DRD) card receives DVB-S and DVB-S2 satellite signals on all inputs simultaneously.

Each of the DVB-CI slots on a card can descramble satellite feeds and programs from any input, including ASI and GBE, allowing a more efficient use of the Conditional Access Modules (CAMs).

Redundancy and Reliability

The DCM Series D9900 MPEG Processor has been designed to help operators configure highly reliable networks. It supports hot-swappable and redundant power supplies and hot-swappable cooling fans. The DCM Series D9900 MPEG Processor can be configured in a hot 1:1 configuration to support maximum up-time with minimum switch-over interruption. To maximize service availability, the DCM Series D9900 MPEG Processor also offers port, transport stream, and service redundancy.

High-Quality Video Transmission over IP Networks

As IP is becoming more and more the transport network of choice, advanced functionality is required to maximize quality of service. The DCM Series D9900 MPEG Processor's extensive set of IP over GbE features, including extensive protocol support and Forward Error Correction (Pro-MPEG COP3 release 2 / SMPTE 2022 FEC) functionality, allows for seamless integration with these IP networks.

Security Functions

Today's IP attack profiles cover operating systems, networks, applications, and protocols. These attacks can cause hours or days of downtime, affecting availability of resources and creating serious breaches in data confidentiality and integrity. Depending on the level of the attack and the type of information compromised, the consequences vary in degree from mildly annoying to completely debilitating, and the cost of troubleshooting and recovery can become considerable. To cope with the increased complex and open nature of the IP network environment, the DCM Series D9900 MPEG Processor is designed with robust and comprehensive security features.

User Interface and Management

The DCM Series D9900 MPEG Processor is controlled via an easy and intuitive GUI. To keep things simple, there is no software to load on the user's computer. The GUI of the DCM Series D9900 MPEG Processor is a HTML-based user interface that can be opened using Microsoft Internet Explorer 7.0 and 8.0 or Firefox 3.5 and 3.6. The GUI supports simple program provisioning through drag-and-drop functionality. The interface provides detailed information to the user, showing the DCM Series D9900 MPEG Processor configuration, input and output bit rate measurements, transport stream alarms, and other information. For easy access to content details, sorting of program information can be performed on various program criteria, including input and output ports, bit rates, and program names. The general-purpose inputs on the chassis also allow for triggering of service backup or digital program insertion.

For integrated network monitoring and control, the DCM Series D9900 MPEG Processor is integrated with ROSA® Network Management and Control (NMC) system. All functionality available via the HTML interface is available with the ROSA control system.

Features

Interfaces

- Up to 40 ASI interfaces ports (10 ASI ports per ASI I/O card)
  - SPTS and MPTS supported
  - User-configurable as input or output on a per-port basis
  - Each ASI port supports up to 213 Mbps data rate
  - Supporting ASI input bandwidth limiting

    - Connector type: BNC
- Interface for external GPS receiver on ASI SFN I/O card (8 ASI ports per ASI SFN I/O card)
    - 1 PPS & 10 MHz inputs
    - SPTS and MPTS supported
    - User-configurable as input or output on a per-port basis
    - Each output port can be configured in normal or in SFN mode
    - Error resilience on GPS receiver signal loss
    - Each ASI port supports up to 213 Mbps data rate
    - Supporting ASI input bandwidth limiting
    - Connector type: BNC
- Up to 16 GbE ports (four ports per GbE I/O card)
    - SPTS and MPTS supported
    - Unicast and multicast support
    - Protocols supported: 802.3, Ethernet, VLAN, RTP, UDP, IP, ARP, ICMP, IGMPv2 / v3
    - Port configurations: 2+2 backup or two inputs + two outputs
    - Quality of Service: Diffserv/TOS 802.1p
    - Connector type: SFP interfaces
    - FEC according to Pro-MPEG COP3 release 2 (COP3R2)/SMPTE 2022
    - Low latency dejitter option
    - Connector type: SFP interfaces
- Up to 24 ATSC 8-VSB RF input ports
    - 4 and 8 RF input version card available
    - Each RF input is enabled via software licensing
    - ATSC A/74 tested
    - Supports reception of MPTS and SPTS
- Up to 12 DVB-S and DVB-S2 RF input ports
    - 2 and 4 RF satellite input versions available
    - Each RF input is enabled via software licensing
    - Supports reception of single and multi-stream signals
- Up to 12 Common Interface slots for CAMs
    - 2 and 4 CI slot versions available
    - Supports all major Conditional Access Modules (CAMs)
    - Supports descrambling of programs from any input

Remultiplexing

- PID filtering / remapping on each input
- PID tracking
- Auxiliary PID synchronization with video
- Remultiplexing of services and components
- Content routing from any input to any output port

Monitoring

- Error monitoring on each input
- Input and output bit rate measurements
- Graphical bit rate viewer showing transrater group bit rates

Advanced Video Processing

- Transrating of single SD and HD programs (recompression to lower bit rates)
  - VBR to VBR
  - VBR to CBR (clamped VBR)
  - CBR to CBR
- Open loop statistical remultiplexing of SD and HD programs
  - Group statistical multiplexing of programs and transrating to lower bit rate if required
  - Support of user-defined program prioritization
- Digital Program Insertion in both SD and HD domains
  - Ad insertion based on SCTE-35 and SCTE-30 standards
  - Program substitution based on SCTE-35 triggers or manual interaction
  - eTV (enhanced TV) support
- DVB Simulcrypt and/or BISS-1 (de)scrambling of SD and HD programs
- Advanced processing features enabled through software licenses on a per-program basis
- SCTE-21 to SCTE-20 closed captioning conversion

Transcoding

- Up to 48 SD or 12 HD channels in 2RU chassis
- Up to 96 stereo pairs transcoding of Dolby Digital (AC-3) or MPEG-1 Layer II to HE-AAC
- Support of audio and metadata pass-through
- Closed caption handling
- Integrated PIP support
- Transcoding features enabled through software licenses on a per-program basis

Digital Overlays

- Static and animated logo insertion with logo resolution up to 320 x 180
- Up to 12 MPEG-2 SD or HD programs in 2RU chassis
- Text crawl messages

Extended PSI-SI Capabilities

- Dynamic PSI/SI regeneration
- PSI/SI playout carousel
- Import of PSI/SI tables according DVB Simulcrypt
- PSI descriptor editing capabilities
- Built-in PSI/SI viewer
- Pass-through and regeneration of PSIP tables

Redundancy

- 1:1 Redundant configuration supported
- 1:1 GbE port backup supported
- ASI, GbE port, and GbE port pair mirroring
- Input service and transport stream redundancy

System

- 10 Gbps internal processing throughput with 8 Gbps of I/O capability
- User hot-swappable power supplies and fans
- Redundant load-sharing power supplies, supports both AC and DC power supplies
- Configuration settings stored on Compact Flash card (transferable to cold standby unit)

Management

- SNMP traps
- ROSA management
- Easy control using web browser
- Ethernet interface for communication with management system and web browser
- IPsec
- General-purpose inputs

Product Specifications

Table 1. Product Specifications

Specification	Value
ASI Interface Card	
Number of ports per card	10 ports, each port configurable as input or output
Connector	BNC-type
Impedance	75 ohms
Interface type	Asynchronous Serial Interface (ASI) (according to EN 50083-9)
Packet format	Auto detection: 188 / 204 byte packets
Bit rate	0.1 – 213 Mbps
Syntax	SPTS or MPTS (according to ISO/IEC 13818)
ASI SFN Interface Card	
Number of ASI ports per card	8 ports, each port configurable as input or output
ASI port connector	BNC-type
ASI port impedance	75 ohms
ASI port interface type	Asynchronous Serial Interface (ASI) (according to EN 50083-9)
ASI port packet format	Auto detection: 188 / 204 byte packets
ASI port bit rate	0.1 – 213 Mbps
ASI port syntax	SPTS or MPTS (according to ISO/IEC 13818)
GPS interfaces	1 PPS & 10 MHz reference inputs
GPS interface connector	BNC-type
GPS interface impedance	50 ohms or > 1 kilohm (selectable via GUI)
10 MHz reference input frequency	10 MHz

Specification	Value
10 MHz reference input level	200 mVpp – 3 Vpp
10 MHz reference input coupling	AC
10 MHz reference input clock edge	Rising or falling edge (selectable via GUI)
1 PPS reference input frequency	1 PPS, phase locked to the 10 MHz reference input
1 PPS reference input range	0 V min., 5 V max.
1 PPS reference input sensitivity	200 mVpp min.
1 PPS reference input power	150 mW RMS into 50E max.
1 PPS reference input coupling	DC
1 PPS reference input trigger	Rising or falling edge (selectable via GUI)
1 PPS reference input trigger level	Automatic or manual (selectable via GUI)
GPS reference input failure resilience time	Typical 30s. minimum (see Note 1)
Digital Transport Formatter (ASI Interface Card Mode)	
Number of ASI input ports per card	7 ASI ports
Number of ASI output ports per card	3 ASI ports (ports are identical)
Scrambling Activation	Per combined incoming transport stream
Conditional Access	BISS Mode 1
GbE Interface Card	
Number of ports per card	4 GbE ports, 2+2 (for redundancy)
Connector type	Optical/electrical Small Form Factor Pluggable (SFP) (see Note 2)
Interface type	Gigabit Ethernet (GbE) according to IEEE 802.3ab (Electrical) or IEEE 802.3z (optical) Support for IEEE 802.Q VLAN tagging
Protocols	MPEG over IP/UDP and IP/UDP/RTP
Maximum throughput	2 Gbps input and 2 Gbps output per card
Syntax	SPTS or MPTS (according to ISO/IEC 13818)
Forward Error Correction	Pro-MPEG COP3R2/SMPTE-2022
IP Statmux (GbE Card Mode)	
Statistical Multiplexing control of D9036	Up to 24 encoders in a maximum of 4 pools. Encoders can be any mix of SD and HD, MPEG-2 and H.264.
Statistical Multiplexing control of: • Mix of D9032, D9050 • Mix of D9032, D9050, D9034, D9054	Up to 60 MPEG-2 encoders in up to 20 statmux pools
Co-Processing Card	
Video formats	MP@ML (SD) en MP@HL (HD)
Audio formats	MPEG-1 Layer II and Dolby Digital (AC-3)
Transrating (MPEG 2)	Up to 420 PAL/350 NTSC SD Streams or 85 HD Streams per card
DVB Simulcrypt Scrambling	Up to 500 streams per card
Maximum throughput	2 Gbps
Transcoder Card	
Video input coding format	MPEG-2 MP@ML (SD) and MPEG-2 MP@HL (HD)
Video output coding format	H.264 MP@L3, H.264 HP@L3 and H.264 HP@L4
Video resolutions	SD: 525i/29.97 and 625i/50 HD: 720p/59.94, 1080i/29.97, 720p/50 and 1080i/25
Video modes	CBR and VBR

Specification	Value
Video transcoding	Up to 16 SD streams per card or up to 4 HD streams per card
Audio input coding format	MPEG-1 Layer II and AC-3
Audio output coding format	Pass-through: MPEG-1 Layer II, AC-3 and others Transcoding: HE-AAC
Audio transcoding	Up to 32 stereo pairs per card
PIP encoding format	H.264 main profile
PIP picture size	96 x 96 or 128 x 96 or 176 x 144 or 192 x 192
Chassis Compact Flash size	16 GB required
8-VSB Input Card	
Number of ports per card	4 or 8 ports, each port independently configurable
Connector	F-type, female
Impedance	75 ohms
Interface type	ATSC 8-VSB according to ATSC A/53 - Part 2 (A/74 tested)
Frequency range	50 – 860 MHz
Channel range	2 – 69
Input level range	-80 – -20 dBm (Note 3)
Syntax	SPTS or MPTS (according to ISO/IEC 13818)
Satellite Input and CI Decryption Card	
Number of RF ports per card	2 or 4 ports, each port independently configurable
Input return loss	> 10dB
Connector	F-type, female (75 Ω)
Interface type	DVB-S (according to ETSI EN 300 421) DVB-S2 (according to ETSI EN 302 307)
Frequency range	950 to 2150 MHz
Input level range	-65 to -25 dBm
Constellation	QPSK, 8PSK, 16APSK
Symbol Rate	1 to 45 MSym/s
FEC code rate	DVB-S QPSK: 1/2, 2/3, 3/4, 5/6, 7/8 DVB-S2 QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 DVB-S2 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 DVB-S2 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
FEC Frame	Normal and Short
Roll Off factor	0.20, 0.25 and 0.35
Modulation Mode	CCM and VCM
Transport stream mode	Single and Multi-stream
Number of Common Interface slots per card	2 or 4 independent PCMCIA slots
Interface type	DVB-CI (according to EN 50221)
Transport Stream Processing	
PID filtering / remapping capability	
Built-in PSI Viewer	
Dynamic PSI regeneration with advanced descriptor handling support	
Detailed bit rate measurement of incoming services	
Error monitoring	
Conditional Access	

Specification	Value
Scrambling Algorithm	DVB Common Scrambling Algorithm BISS Mode 1
Level and mode of scrambling	Service/Program level scrambling support, Component level scrambling support, both MPTS and SPTS scrambling supported
Number of CA system connectors	1
Connector type	RJ-45
Interface Type	Ethernet 10/100/1000 BT
Simulcrypt	Simulcrypt version 3
Digital Overlays	
Video input coding format	MPEG-2 MP@ML (SD) and MPEG-2 MP@HL (HD)
Video output coding format	MPEG-2 MP@ML (SD) and MPEG-2 MP@HL (HD)
Video resolutions	SD: 720 x 576i, 704 × 576p, 720 x 480i, 720 × 486, 704 x 480p HD: 1280x720p Frame Rates: 24, 29.97, 30, 59.94, 60
End-to-end delay	1.4 s
Logo format	PNG or TGA
Number of logos per program	Up to 4
Maximum logo resolution	320 x 180 pixels
Total supported screen logo size	Up to 25% vertically and horizontally of screen size

Notes:

1. GPS Input reference loss resilience feature available on hardware version 2 only.
2. SFP Module not included.
3. Input level range for channel 2: -20 to -79 dBm at ambient temperature.

Figure 2. Cisco DCM Series D9900 MPEG Processor Rear Panel with AC and DC power supplies, 2 GbE cards, 1 ASI card, and 1 ASI SFN card

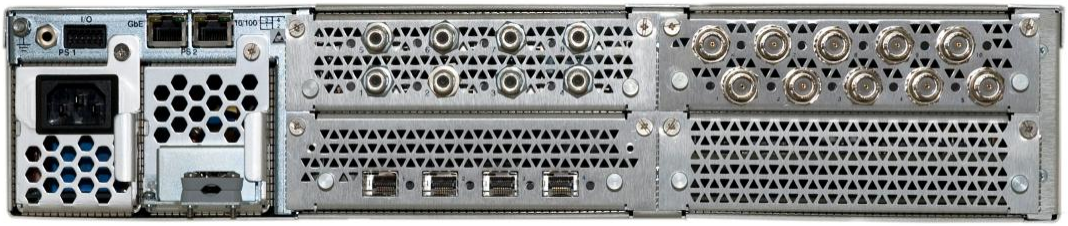

Table 2. Rear Panel Features

Specification	Value
Management and Monitoring	
Number of ports on chassis	2
Connector type	RJ-45
Interface type	10/100 & 10/100/1000 BT
Protocols	HTTP, SNMP, IIOP
User interface	Embedded HTML user interface
General Purpose Inputs	4 (spring clamp terminal block connector)
Environmental Specifications	
Operating temperature	0°C – +50°C / +32°F – +122°F

Specification	Value
Storage temperature	-40°C – +70°C / -40°F – +158°F
Humidity	5% – 95% (non condensing)
Altitude	-200 – 10000 feet (-61 – 3048 m)
Power Requirements	
Power consumption (fully loaded)	< 350 W
Input voltage • AC input voltage ◦ Nominal ◦ Normal service voltage range ◦ Frequency • DC input voltage ◦ Nominal ◦ Normal service voltage range	 100 – 240 VAC 90 – 254 VAC 47 – 63 Hz -48 VDC -38 – -58 VDC
Chassis Mechanical Specifications	
Height	2RU 3.48 in. / 88 mm
Width	19 in. / 483 mm
Depth	21.8 in. / 554 mm
Weight (fully loaded)	28.3 lbs / 12.8 kg
Cooling	Front to back, forced air; units are stackable

Ordering Information

Table 3. Ordering Information Cisco DCM Series D9900 Components

Description	Part Number
Chassis	
D9901 DCM MKI Chassis, 2RU, No PSU, Main	DCM-MK1-2RU
Hardware Modules (Boards delivered as separate kits)	
DCM ASI I/O board	DCM-ASI-MK1
DCM ASI SFN I/O board	DCM-ASI-SFN-MK1
DCM GbE I/O board	DCM-GBE-MK1
DCM Co-Processor board	DCM-COP-MK1
DCM FEC board	DCM-FEC-MK1
DCM Transcoder board	DCM-TC-MK1
DCM MPEG-2 Digital Overlay board	DCM-OVERLAY-MK1
DCM 8-VSB input card with 4 RF inputs	DCM-8VSB-4RF
DCM 8-VSB input card with 8 RF inputs	DCM-8VSB-8RF
DCM DRD Satellite Reception and Decryption board with 2 RF and 2 CI inputs	DCM-DRD-2SAT2CI
DCM DRD Satellite Reception and Decryption board with 4 RF and 4 CI inputs	DCM-DRD-4SAT4CI
DCM blank plate for I/O slot	DCM-BLANK-IO
DCM blank plate for power supply	DCM-BLANK-PSU
DCM 2RU MKI Cisco Front Dust Filter	DCM-MK1-DUST-2U
DCM 16GB Compact Flash upgrade kit (select version in Cisco's Dynamic Configuration Tool)	MEM-DCM-CF16
Power Supplies	

Description	Part Number
AC power supply (AC power cord needs to be ordered separately)	PWR-AC-DCM-MK1-2U
DC power supply	PWR-DC-DCM-MK1-2U
AC Power Cords	
Argentina	CAB-PWR-DMN-ARG
Australia	CAB-PWR-DMN-AUS
China	CAB-PWR-DMN-CHN
Europe	CAB-PWR-DMN-EU
Italy	CAB-PWR-DMN-IT
Japan	CAB-PWR-DMN-JPN
UK	CAB-PWR-DMN-UK
Software	
Software license CD-ROM (Add licenses in Cisco's Dynamic Configuration Tool)	DCM-LIC-UPGR

Table 4. Ordering Information SFP Plug-ins (see Note)

Description	Part Number
SFP Plug-ins – WDM types	
GbE SFP module 850 nm (LC, up to 500 m)	SFP-WDM-850-0500
GbE SFP module 1310 nm (LC, up to 5 km)	SFP-WDM-1310-5
GbE SFP module 1310 nm (LC, up to 40 km)	SFP-WDM-1310-40
SFP Plug-ins – CWDM types	
GbE SFP module 1470 nm (LC, up to 40 km)	SFP-CWDM-1470-40
GbE SFP module 1490 nm (LC, up to 40 km)	SFP-CWDM-1490-40
GbE SFP module 1510 nm (LC, up to 40 km)	SFP-CWDM-1510-40
GbE SFP module 1530 nm (LC, up to 40 km)	SFP-CWDM-1530-40
GbE SFP module 1550 nm (LC, up to 40 km)	SFP-CWDM-1550-40
GbE SFP module 1570 nm (LC, up to 40 km)	SFP-CWDM-1570-40
GbE SFP module 1590 nm (LC, up to 40 km)	SFP-CWDM-1590-40
GbE SFP module 1610 nm (LC, up to 40 km)	SFP-CWDM-1610-40
GbE SFP module 1470 nm (LC, up to 70 km)	SFP-CWDM-1470-70
GbE SFP module 1490 nm (LC, up to 70 km)	SFP-CWDM-1490-70
GbE SFP module 1510 nm (LC, up to 70 km)	SFP-CWDM-1510-70
GbE SFP module 1530 nm (LC, up to 70 km)	SFP-CWDM-1530-70
GbE SFP module 1550 nm (LC, up to 70 km)	SFP-CWDM-1550-70
GbE SFP module 1570 nm (LC, up to 70 km)	SFP-CWDM-1570-70
GbE SFP module 1590 nm (LC, up to 70 km)	SFP-CWDM-1590-70
GbE SFP module 1610 nm (LC, up to 70 km)	SFP-CWDM-1610-70
SFP Plug-ins – 1000 BT copper	
GbE SFP module 1000 BT copper	SFP-CU-RJ45

Note: All Class 1 SFP plug-ins are according to IEC 60825-1 (1997) Amendment 2 (2001).

Service and Support

Using the Cisco Lifecycle Services approach, Cisco and its partners provide a broad portfolio of end-to-end services and support that can help increase your network's business value and return on investment. This approach defines the minimum set of activities needed by technology and by network complexity to help you successfully deploy and operate Cisco technologies and optimize their performance throughout the lifecycle of your network.

For More Information

To learn more about this product, contact your local account representative.

To subscribe to receive end-of-life/end-of-sale information, go to http://www.cisco.com/cisco/support/notifications.html.

Manage your network with ROSA service and element management. Get faster mean-time-to-repair, increased uptime, and management that evolves as you provision your networks.

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