Cisco ASR 900 Interface Modules

The Cisco® ASR 900 Interface Modules (Figure 1) are designed for the Cisco ASR 900 Aggregation Services Router Series. With a wide range of speed, temperature and capabilities, the interface modules make the Cisco ASR 900 Series a truly versatile platform for future-ready service provider networks. The Cisco ASR 900 Interface Modules provide cost-effective delivery of converged mobile and business services. This data sheet contains the specifications for several interface modules.

Figure 1. Cisco ASR 900 Interface Modules

Ethernet Interface Modules

The Cisco ASR 900 Ethernet interface modules are designed to give customers flexibility and value. All Ethernet interface modules share a common core that supports time-stamping on the module for Y.1731 operations, administration, and maintenance (OAM) delay measurement functions, to achieve precise results for one-way and two-way delay measurement. The modules also provide time-stamping functions for the IEEE 1588-2008 protocol. These time stamps help ensure that the Cisco ASR 900 Series Routers achieve outstanding results when deploying IEEE 1588-2008 protocols for frequency and phase synchronization. Not all customers will deploy IEEE 1588-2008 for synchronization, therefore the Ethernet interface modules also support input and output frequency synchronization using synchronous Ethernet (SyncE).

All Cisco ASR 900 Ethernet interface modules support online insertion and removal (OIR), which contributes to a higher uptime for the Cisco ASR 903 Router.

Cisco ASR 900 Series 1-Port 10GE XFP Interface Module

The Cisco ASR 900 Series 1-port 10GE XFP Interface Module delivers the highest performance per slot on the Cisco ASR 900 Series Routers. This interface module provides physical connectivity using a single pluggable 10-Gigabit XFP optic. The interface module supports both LAN and WAN physical layer (PHY), which allows flexible and versatile deployment models.

The module is supported in slots 0 to 3 of the router in combination with the Cisco ASR 903 Route Switch Processor 1 (RSP1).

Table 1 lists the pluggable optics that are supported in the Cisco ASR 900 Series 1-port 10 GE XFP Interface Module, on the Cisco IOS® XE Software releases for the Cisco ASR 903 Router.

Table 1. 10-Gigabit Ethernet Optics Supported in the ASR 903 Router

Optic Product Number	Supported as of Cisco IOS XE Release	Description
XFP10GER-192IR-L	3.8.0S	Cisco multirate XFP transceiver module for 10GBASE-ER/-EW Ethernet and OC-192/STM-64 intermediate-reach (IR-2), single-mode fiber (SMF), dual LC connector, low power (2.5W)
XFP10GLR-192SR-L	3.8.0S	Cisco multirate XFP transceiver module for 10GBASE-LR/-LW Ethernet and OC-192/STM-64 short-reach (SR-1), SMF, dual LC connector, low power (1.5W)
XFP-10GZR-OC192LR	3.8.0S	Cisco multirate XFP transceiver module for 10GBASE-ZR/-ZW Ethernet and OC-192/STM-64 long-reach, SMF, dual LC connector
XFP10GLR192SR-RGD	3.5.0S	Cisco multirate XFP transceiver module for 10GBASE-LR/-LW Ethernet and OC-192/STM-64 short-reach (SR-1), SMF, dual LC connector, industrial temperature range
XFP10GER192IR-RGD	3.5.0S	Cisco multirate XFP transceiver module for 10GBASE-ER/-EW Ethernet and OC-192/STM-64 intermediate-reach (IR-2), SMF, dual LC connector, industrial temperature range
XFP10GZR192LR-RGD	3.5.0S	Cisco multirate XFP transceiver module for 10GBASE-ZR/-ZW Ethernet and OC-192/STM-64 long-reach, SMF, dual LC connector, industrial temperature range
DWDM-XFP-C	3.5.0S	10GBASE-DWDM Tunable XFP (50-GHz ITU grid), dual LC connector
DWDM-XFP-xx.yy	3.8.0S	10GBASE-DWDM single wavelength XFP (100-GHz ITU grid), dual LC connector - 32 individual wavelength pluggable modules
ONS-XC-10G-EPxx.y=	3.8.0S	10GBASE-DWDM single wavelength Edge Performance XFP (100-GHz ITU grid), dual LC connector, 50 Km reach - 40 individual wavelength pluggable modules
ONS-XC-10G-xxxx=	3.10.0S	10GBASE-CWDM single wavelength XFP (ITU G694.2), dual LC connector, 40km reach - 8 individual wavelength pluggable modules
XFP-10G-MM-SR	3.5.0S	Cisco 10GBASE-SR Ethernet XFP transceiver module for multimode fiber (MMF), dual LC connector
XFP-10GLR-OC192SR	3.5.0S	Cisco multirate XFP transceiver module for 10GBASE-LR Ethernet and OC-192/STM-64 short-reach (SR-1) PoS applications, SMF, dual LC connector
XFP-10GZR-OC192LR	3.5.0S	Cisco multirate XFP transceiver module for 10GBASE-ZR Ethernet and OC-192/STM-64 long-reach PoS applications, SMF, dual LC connector

Cisco ASR 900 Series 8-Port SFP Gigabit Ethernet Interface Module

The Cisco ASR 900 Series 8-port SFP Gigabit Ethernet Interface Module delivers 8 ports of Gigabit Ethernet and Fast Ethernet connectivity on the Cisco ASR 900 Series Routers. The interface speed can be selected per interface, depending on the optic used. This interface module provides physical connectivity using eight Small Form-Factor Pluggable (SFP) optics.

The module is supported in slots 0 to 5 of the router. When inserted in slot 5 in combination with the Cisco ASR 903 RSP1, port 0/5/0 will not be useable.

Table 2 lists the pluggable optics that are supported in the Cisco 900 Series 8-port SFP Gigabit Ethernet Interface Module, on the Cisco IOS XE Software releases for the Cisco ASR 903 Router.

Table 2. Ethernet Optics Supported in the ASR 903 Router

Optic Product Number	Supported as of Cisco IOS XE Release	Description
GLC-FE-100FX-RGD	3.5.0S	100BASE-FX SFP module for Industrial Ethernet 100-MB ports, 1310 nm wavelength, 2 km over MMF
GLC-FE-100LX-RGD	3.5.0S	100BASE-LX SFP module for Industrial Ethernet 100-MB ports, 1310 nm wavelength, 10 km over SMF
GLC-FE-100LX	3.8.0S	100BASE-LX SFP for Fast Ethernet SFP Ports, 1310 nm wavelength, 10 km over SMF

Optic Product Number	Supported as of Cisco IOS XE Release	Description
GLC-FE-100FX	3.8.0S	100BASE-FX SFP for Fast Ethernet SFP Ports, 1310 nm wavelength, 2 km over MMF
GLC-FE-100ZX	3.10.0S	100BASE-ZX SFP for Fast Ethernet SFP Ports, 1550 nm wavelength, 80 km over SMF
GLC-FE-100EX	3.10.0S	100BASE-EX SFP for Fast Ethernet SFP Ports, 1310 nm wavelength, 40km over SMF
GLC-FE-100BX-U	3.8.0S	100BASE-BX10-U SFP for Fast Ethernet SFP Ports. Single-strand SMF up to 10 Km, transmits on a 1310-nm channel and receives on a 1550-nm signal
GLC-FE-100BX-D	3.8.0S	100BASE-BX10-D SFP for Fast Ethernet SFP Ports. Single-strand SMF up to 10 Km, transmits on a 1550-nm channel and receives on a 1310-nm signal
GLC-EX-SMD	3.5.0S	1000BASE-EX SFP transceiver module for SMF, 1310-nm wavelength, extended operating temperature range and Digital Optical Monitoring (DOM) support, dual LC/PC connector
GLC-BX-D	3.5.0S	1000BASE-BX10 SFP module for single-strand SMF, 1490-nm TX/1310-nm RX wavelength, single LC/PC connector
GLC-BX-U	3.5.0S	1000BASE-BX10 SFP module for single-strand SMF, 1310-nm TX/1490-nm RX wavelength, single LC/PC connector
GLC-ZX-SM-RGD	3.5.0S	1000BASE-ZX SFP transceiver module for SMF, 1550-nm wavelength, industrial Ethernet, dual LC/PC connector
GLC-SX-MM-RGD	3.5.0S	1000BASE-SX SFP transceiver module for MMF, 850-nm wavelength, industrial Ethernet, dual LC/PC connector
GLC-LX-SM-RGD	3.5.0S	1000BASE-LX/LH SFP transceiver module for MMF and SMF, 1300-nm wavelength, industrial Ethernet, dual LC/PC connector
SFP-GE-T	3.5.0S	1000BASE-T SFP transceiver module for Category 5 copper wire, extended operating temperature range, RJ-45 connector
SFP-GE-L	3.10.0S	1000BASE-LX/LH SFP transceiver module for MMF and SMF, 1310-nm wavelength
SFP-GE-S	3.10.0S	1000BASE-SX SFP transceiver module for MMF, 850-nm wavelength
SFP-GE-Z	3.10.0S	1000BASE-ZX SFP transceiver module for SMF, 1550-nm wavelength
DWDM-SFP-xxxx (36 wavelengths)	3.6.0S	Cisco 1000BASE-DWDM Gigabit Ethernet SFP, with 36 different wavelengths ranging from1561.42 nm to 1530.33nm or ITU channel 20 to 59
CWDM-SFP-xxxx (8 wavelenghts)	3.6.0S	Cisco CWDM Gigabit Ethernet SFP, with 8 different wavelengths ranging from 1470 nm to 1610 nm
GLC-ZX-SMD	3.6.0S	1000BASE-ZX SFP transceiver module for SMF, 1550-nm wavelength, dual LC/PC connector
GLC-SX-MMD	3.6.0S	1000BASE-SX SFP transceiver module for MMF, 850-nm wavelength, extended operating temperature range and DOM support, dual LC/PC connector
GLC-LH-SMD	3.6.0S	1000BASE-LX/LH SFP transceiver module for MMF and SMF, 1300-nm wavelength, extended operating temperature range and DOM support, dual LC/PC connector

Cisco ASR 900 Series 8-Port Cu Gigabit Ethernet Interface Module

The Cisco ASR 900 Series 8-port Cu Gigabit Ethernet Interface Module delivers 8 ports of Gigabit Ethernet, Fast Ethernet, and Ethernet connectivity on the Cisco ASR 900 Series Routers. The interface speed can be software selected per interface. This interface module provides physical connectivity using eight RJ-45 connectors.

The module is supported in slots 0 to 5 of the router. When inserted in slot 5 in combination with the Cisco ASR 903 RSP1, port 0/5/0 will not be useable.

Multiservice Interface Modules

The Cisco ASR 900 multiservice interface modules are designed to help customers connect to legacy networks and transition to packet networks. The multiservice interface modules support connections to Point-to-Point Protocol (PPP), Multilink PPP, ATM, Inverse Multiplexing over ATM (IMA) and High-Level Data Link Control (HDLC) links. In addition to these protocols, the interface modules can also be used to transport time-division multiplexing (TDM) and ATM interfaces over an IP/MPLS packet network using Pseudowire Emulation (PWE) services, such as Circuit Emulation Services over Packet Switched Network (CESoPSN) and Structure-Agnostic Transport over Packet (SAToP) transport. Software support for the interface module hardware capabilities will be delivered over time in the several Cisco IOS XE software releases scheduled for the Cisco ASR 903 Router. Software support is described in the Cisco IOS XE Software for Cisco ASR 903 Router data sheet, which will contain updates for new capabilities when they are supported.

All Cisco ASR 900 multiservice interface modules support OIR, which contributes to a higher uptime for the Cisco ASR 900 Series Routers.

Cisco ASR 900 Series 14-Port Serial Interface Module

The Cisco ASR 900 Series 14 port Sync/Async Interface Module delivers 14 ports of Asynchronous RS-232 to facilitate connectivity to devices that require RS-232 connectivity. Coupled with the Raw Socket feature and functionality, this interface module is a key enabler to provide transport of traditional async serial based protocols, such as SCADA across IP and MPLS networks. These scenarios help ease the migration from traditional serial based devices to next generation IP enabled devices by adding to the flexible set of connectivity options on the Cisco ASR 903 Series.

The module is supported in slots 0 to 5 on the Cisco ASR 903 Router. The protocols supported on the module are software configurable per Interface, which allows for flexible deployment and efficient use of the hardware.

The interface module utilizes 6 standard Cisco 12-in-1 connectors along with 2 high density 68 pin connectors to provide the 14 ports of Asynchronous RS-232. Supported cables for both the 12-in-1 connectors as well as the 68 pin connectors are listed in Table 3 below.

Table 3. Asynchronous RS-232 Cables Supported in the Cisco ASR 903 Router

Cable Product ID	Supported as of Cisco IOS XE Release	Description
CAB-HD4-232MT	3.10.0S	4-port EIA-232 DTE Cable, 68-pin port, 10 ft. length, male DB-25 connector
CAB-HD4-232FC	3.10.0S	4-port EIA-232 DCE Cable, 68-pin port, 10 ft. length, female DB-25 connector
CAB-QUAD-ASYNC-F	3.10.0S	4-port EIA-232 DTE Cable, 68-pin port, 10 ft. length, female RJ-45 connector
CAB-QUAD-ASYNC-M	3.10.0S	4-port EIA-232 DTE Cable, 68-pin port, 10 ft. length, male RJ-45 connector
CAB-9AS-M	3.10.0S	4-port EIA-232 DTE Cable, 68-pin port, 10 ft. length, male DB-9 connector
CAB-SS-232MT	3.10.0S	4-port EIA-232 DTE Cable, 12-in-1 port, 10 ft. length, male DB-25 connector
CAB-SS-232FC	3.10.0S	4-port EIA-232 DCE Cable, 12-in-1 port, 10 ft. length, female DB-25 connector

Cisco ASR 900 Series 16-Port T1/E1 Interface Module

The Cisco ASR 900 Series 16-port T1/E1 Interface Module delivers 16 ports of T1 or E1 connectivity on the Cisco ASR 900 Series Routers. The interface module can be software configured as either T1 mode or E1 mode per interface module in a Cisco ASR 900 Series. This interface module provides physical connectivity using a single high-density connector and requires a breakout cable and third-party patch panel for individual port connections.

The module is software configurable for 16 T1 or 16 E1 ports; mixing of T1 and E1 ports on the same interface module is not supported. The module is supported in slots 0 to 5 on the Cisco ASR 903 Router and can be clocked from a line or from an internal clock source. The protocols supported on the module are software configurable per Interface, which allows for flexible deployment and efficient use of the hardware.

Cisco ASR 900 Series 4-Port OC-3/STM-1 or 1-Port OC-12/STM-4 Interface Module

The Cisco ASR 900 Series 4-Port OC-3/STM-1 or 1-Port OC-12/STM-4 Interface Module delivers four active ports of OC-3 or Synchronous Transport Module level 1 (STM-1) connectivity, or one active port of OC-12 or STM-4 connectivity, on the Cisco ASR 900 Series Routers. The interface module supports:

- Channelized OC-3 to clear channel T1, clear channel DS3 and channelized T1/E1
- Channelized OC-12 to clear channel T1/E1
- Clear channel OC-3
- Channelized STM-1 to clear channel T1/E1 and channelized T1/E1
- Channelized STM-4 to clear channel T1/E1

The module is supported in slots 0 to 5 on the Cisco ASR 903 Router and can be clocked from a line or from an internal clock source.

By using per-port software licenses, this module delivers a true multiservice and multirate capability in a small form factor in combination with a pay-as-you-grow pricing model. The interface module can be software configured as either SONETmode or SDH mode per module in the ASR 900 Series configuration.

The interface module hardware has been designed for high availability; this includes Access Circuit Redundancy (ACR), 1+1 APS across two modules, and SDH Linear Multiplexer Section Protection (MSP) protocols. Support of these capabilities is software dependent and described in the Cisco IOS XE Software for Cisco ASR 900 Series data sheet.

This interface module provides physical connectivity using pluggable SFP optics.

Table 4 lists the pluggable optics that are supported in the Cisco ASR 900 Series 4-Port OC-3/STM-1 or 1-Port OC-12STM-4 Interface Module, on the Cisco IOS XE Software releases for the Cisco ASR 903 Router.

Table 4. OC-3/STM-1 Optics Supported in the Cisco ASR 903 Router

Optic Product ID	Supported as of Cisco IOS XE Release	Description
ONS-SI-155-SR-MM	3.6.0S	OC-3/STM-1, Short Reach (SR), 1310 nm, multimode (MM), SFP, industrial temperature range
ONS-SI-155-I1	3.6.0S	OC-3/STM-1 intermediate reach (IR), 1310 nm, SFP, industrial temperature range
ONS-SI-155-L1	3.6.0S	OC-3/STM-1 long reach (LR), 1310 nm, SFP, industrial temperature range
ONS-SI-155-L2	3.6.0S	OC-3/STM-1 long reach (LR), 1550 nm, SFP, industrial temperature range
ONS-SC-155-EL	3.7.0S	STM-1 Electrical SFP, Commercial temperature range
ONS-SI-622-SR-MM	3.9.0S	OC-12/STM-4, Short Reach (SR), 1310 nm, multimode (MM), SFP, industrial temperature range
ONS-SI-622-I1	3.9.0S	OC-12/STM-4 intermediate reach (IR), 1310 nm, SFP, industrial temperature range
ONS-SI-622-L1	3.9.0S	OC-12/STM-4 long reach (LR), 1310 nm, SFP, industrial temperature range
ONS-SI-622-L2	3.9.0S	OC-12/STM-4 long reach (LR), 1550 nm, SFP, industrial temperature range

Ordering Information

Table 5 lists the part numbers for the Cisco ASR 900 Interface Modules.

Table 5. Cisco ASR 900 Interface Modules

Part Number	Description
A900-IMA8T	ASR 900 8-Port 10/100/1000 Ethernet Interface Module
A900-IMA8T=	ASR 900 8-Port 10/100/1000 Ethernet Interface Module, Spare
A900-IMA8S	ASR 900 8-Port SFP Gigabit Ethernet Interface Module
A900-IMA8S=	ASR 900 8-Port SFP Gigabit Ethernet Interface Module, Spare
A900-IMA1X	ASR 900 1-Port 10GE XFP Interface Module
A900-IMA1X=	ASR 900 1-Port 10GE XFP Interface Module, Spare
A900-IMASER14A/S	ASR 900 14 port Sync/Async Interface Module
A900-IMASER14A/S=	ASR 900 14 port Sync/Async Interface Module, Spare
A900-IMA16D	ASR 900 16-Port T1/E1 Interface Module
A900-IMA16D=	ASR 900 16-Port T1/E1 Interface Module, Spare
A900-IMA4OS	ASR 900 4-Port OC-3/STM1 or 1-Port OC-12/STM4 Interface Module
A900-IMA4OS=	ASR 900 4-Port OC-3/STM1 or 1-Port OC-12/STM4 Interface Module, Spare

Software and Licensing

Cisco IOS Licenses

The Cisco ASR 900 Series is supported in Cisco IOS XE Software, which is designed to provide modular packaging, feature velocity, and powerful resiliency.

With the Cisco ASR 903 Router supported as of Cisco IOS XE Software Release 3.5.0S, the concept of Cisco software activation is also introduced to the Cisco ASR 900 Series. Feature and software licenses details are described in more detail in the Cisco IOS XE Software for Cisco ASR 903 Router data sheet.

Feature Licenses

In addition to Cisco IOS licenses, two licenses are used for specific ATM and TDM services and OC-3 and STM-1 ports. These two additional feature licenses for the Cisco ASR 903 Router are:

- **ATM license:** Allows service providers to enable ATM functionality on TDM interfaces when required. One license is required for each Cisco ASR 903 Router that needs ATM functionality. This includes support for ATM pseudowires over MPLS (ATMoMPLS), ATM local switching, ATM interworking, and local ATM termination. This license requires the system to have at least one T1/E1, OC-3/STM-1, or OC-12/STM-4 card installed.
- **OC-3 port license:** Allows service providers to enable one OC-3/STM-1 port, supporting a pay-as-you-grow strategy and simplified spare part management. One license is required for each OC-3/STM-1 port that needs to be enabled on the Cisco ASR 903 Router (requires the purchase of a combined OC-3, STM-1, OC-12, and STM-4 combination interface module).
- **OC-12 port license:** Allows service providers to enable one OC-12/STM-4 port, supporting a pay-as-you-grow strategy and simplified spare part management. One license is required for each OC-12/STM-4 port that needs to be enabled on the Cisco ASR 903 Router (requires the purchase of a combined OC-3, STM-1, OC-12, and STM-4 combination interface module).

Table 6 lists the Cisco ASR 903 Router feature licenses and product activation keys (PAKs).

Table 6. Cisco ASR 903 Router Feature Licenses

Part Number	Supported as of Cisco IOS XE Release	Description
Port and Feature Licenses		
FLSASR903-ATM	3.5.0S	ASR 903 ATM License
FLSASR900-1OC3	3.6.0S	ASR 900 1 Port OC-3/STM-1 License
FLSASR900-1OC12	3.9.0S	ASR 900 1 Port OC-12/STM-4 License
Port and Feature Licenses Product Activation Keys		
FLSASR903-ATM=	3.5.0S	ASR 903 ATM License Paper PAK
L-FLSASR903-ATM=	3.5.0S	ASR 903 ATM License E-Delivery PAK
FLSASR900-1OC3=	3.6.0S	ASR 900 1 Port OC-3/STM-1 License Paper PAK
L-FLSASR900-1OC3=	3.6.0S	ASR 900 1 Port OC-3/STM-1 License E-Delivery PAK
FLSASR900-1OC12=	3.9.0S	ASR 900 1 Port OC-12/STM-4 License Paper PAK
L-FLSASR900-1OC12=	3.9.0S	ASR 900 1 Port OC-12/STM-4 License E-Delivery PAK

Product Specifications

Table 7 lists the general specifications and Table 8 lists the safety and compliance specifications of the Cisco ASR 900 Interface Modules.

Table 7. Cisco ASR 900 Interface Module Specifications

Features	Description
Product compatibility	• All ASR 900 Interface Modules are compatible with the Cisco ASR 903 RSP1A and RSP1B Route Switch Processors in an ASR 903 Router chassis • All ASR 900 Gigabit Ethernet and TDM interface modules can be inserted in slots 0-5 of an ASR 903 Router chassis • When inserted in slot 5 of an ASR 903 chassis with RSP1A or RSP1B, the 8-port SFP Gigabit Ethernet Interface Module cannot use port 0/5/0 • The 1-Port 10GE XFP Interface Module can be inserted in slot 0-3 of an ASR 903 Chassis with RSP1A or RSP1B • A maximum of 2 14-port Asynchronous Serial Interface modules are supported per ASR 903 chassis
Port density	• 8-port Gigabit Ethernet, SFP, and RJ-45 version • 1-port 10-Gigabit Ethernet, XFP • 14-port Asynchronous Serial RS-232 • 16-port T1/E1 TDM • 4-port OC-3/STM-1 TDM or 1-Port OC-12/STM-4
Power draw	• 8-port Gigabit Ethernet SFP: 17.5W max. • 8-port Gigabit Ethernet RJ-45: 17.5W max. • 1-port 10-Gigabit Ethernet XFP: 13W max. • 14-port Asynchronous Serial RS-232: 31W max. • 16-port T1/E1 TDM: 14.5W max. • 4-port OC-3/STM-1 TDM: 26W max.
Environmental specifications[1]	–40ºC to 65ºC operating temperature (DC operation) –5ºC to 55ºC operating temperature (AC operation)[2] 0ºC to 40ºC operating temperature (AC operation) –60m to 1800m operating altitude (for full operating temperature range) Up to 4000m operating altitude (at up to +40ºC temperature)
Relative humidity	5% to 95%, noncondensing
Storage environment	Temperature: –40 to +70ºC Altitude: 15,000ft (4570m)

Features	Description
Reliability and availability	OIR field-replaceable SFP optics modules Support for both 1+1 SONET Automatic Protection Switching (APS) and SDH Linear Multiplexer Section Protection (MSP) protocols Single Interface Module software reset Rolling Software upgrade, interface module by interface module
SONET/SDH multiplexing granularity	Up to 336 T1 or 252 E1 per OC-12/STM-4 Interface Module Up to 84 T1 or 63 E1 ports per OC-3/STM-1 port and up to 336 T1 or 252 E1 per OC-3/STM-1 Interface Module Up to 1024 nxDS-0 channels (where n is 1 to 31) per STM-1 Interface Module Channelized OC-3 to T1 Channelized STM-1 to E1, full-rate T1, channelized T1/E1 and fractional T1/E1 for Circuit Emulation Pseudo Wires • Support for SONET Virtual Tributary 1.5 (VT1.5) mapping: OC-3 <-> STS-3 <-> STS-1 <-> VTG <-> VT1.5 <-> T1 • Support for ITU-T G.707 (SDH CEPT/ETSI) Virtual Container 12 (VC-12) mapping: STM-1 <-> AUG <-> AU-4 <-> VC-4 <-> TUG-3 <-> TUG-2 <-> TU-12 <-> VC-12 <-> E1 • Support for ITU-T G.707 (SDH-ANSI) Virtual Container 11 (VC-11) mapping: STM-1 <-> AUG <-> AU-3 <-> VC-3 <-> TUG-2 <-> TU-11 <-> VC-11 <-> T1

1. Optics used may limit the temperature range.
2. Not more than the following in a one-year period: 96 consecutive hours, or 360 hours total, or 15 occurrences.
3. The above are for normal (nonfailure) operation. When operating with a fan failure, the above may be exceeded.

Table 8. Safety and Compliance

Type	Standards
Safety	• UL 60950-1, 2nd edition • CAN/CSA C22.2 No. 60950-1-07 2nd edition • IEC 60950-1, 2nd edition • EN 60950-1, 2nd edition • AS/NZS 60950.1:2003
Electromagnetic	• FCC CFR47 Part 15 Class A
Emissions compliance	• EN55022, class A • CISPR22, class A • ICES-003, class A • EN 300 386, class A • VCCI, class A • KN22, class A • EN61000-3-2 to EN61000-3-3
Immunity compliance	• EN 300 386 • EN 61000-6-1 • EN 50082-1 • CISPR24 • EN 55024 • KN 24 • EN 50121-4 • EN/KN 61000-4-2 to EN/KN 61000-4-6 • EN/KN 61000-4-8 • EN/KN 61000-4-11
Network Equipment Building Systems (NEBS)[1]	• GR-63-CORE Issue 3 • GR-1089-CORE Issue 5 • SR-3580 NEBS Level 3
Power Substation System Standards	• IEC 61850-3 (2002) • IEEE 1613 (2009)
ETSI	• ETS/EN 300 119 Part 4 • ETS/EN 300 019 - Storage: Class 1.2, Transportation: Class 2.3, In-Use/Operational: Class 3.2 • ETS/EN 300 753

Type	Standards	
Telecom	T1: • ITU-T G.703 • ITU-T G.824 • TIA-968-B • IC CS-03 • HKTA 2028 • ID0002 • DSPR Technical Conditions • ANSI T1.403 E1: • ITU-T G.703/G.704 • ITU-T G.823 • AS/ACIF S016 • ETSI TBR12/13 • RRA 2009-38 (RRL 2005-96) • IDA TS DLCN	SONET/SDH subrate: • GR-253-CORE • ANSI T1.105 • ITU G.957 • ITU G.783 • ITU G.707 Ethernet: • DSPR Technical Conditions • RRA 2009-38 (RRL 2005-96) • IEEE 802.3-2005 • IEEE 802.3z • IEEE 802.3ab • IEEE 802.3ae
Network synchronization	• GR-1244-CORE • GR-253-CORE • ANSI T1.101 • ITU-T G.813 • ITU-T G.703 clause 5 • ITU-T G.703 clause 9 • ITU-T G.823 • ITU-T G.824 • ITU-T G.8261/Y.1361 • ITU-T G.781 • ITU-T G.8262 • ITU-T G.8264 • IEEE1588-2008	

[1]. Notable exceptions: All cabling is provided through the front panel.

Warranty Information

Find warranty information on Cisco.com at the Product Warranties page.

Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco Services help you protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, refer to Cisco Technical Support Services or Cisco Advanced Services.

Cisco is committed to minimizing your total cost of ownership. Cisco offers a portfolio of technical support services to help ensure that Cisco products operate efficiently, remain highly available, and benefit from the most up-to-date system software. The services and support programs described in Table 9 are available as part of the Cisco Carrier Ethernet Switching Service and Support solution and are available directly from Cisco and through resellers.

Table 9. Service and Support

Advanced Services	Features	Benefits
Cisco Total Implementation Solutions (TIS), available directly from Cisco Cisco Packaged TIS, available through resellers	• Project management • Site survey, configuration, and deployment • Installation, text, and cutover • Training • Major moves, adds, and changes • Design review and product staging	• Supplement existing staff • Help ensure functions meet needs • Mitigate risk
Cisco SP Base Support and Service Provider-Based Onsite Support, available directly from Cisco Cisco Packaged Service Provider- Based Support, available through resellers	• 24-hour access to software updates • Web access to technical repositories • Telephone support through the Cisco Technical Assistance Center (TAC) • Advance replacement of hardware parts	• Facilitate proactive or expedited problem resolution • Lower total cost of ownership by taking advantage of Cisco expertise and knowledge • Minimize network downtime

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