39XX/51XX Switches and Platforms

Planning, Engineering, and Ordering Guide

SAOS 6.21.2

What's inside...

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Publication history

March 2022

Standard revision A.

First standard release of this document for SAOS 6.21.2.

Contents

About this document

This document provides planning, engineering, and ordering information for the products in the 39XX/51XX Switches and Platforms portfolio. This document is intended to provide background information that complements meetings with Ciena Sales Engineers.

Conventions used in this document

Hyperlinks are indicated by blue text in this document.

Intended audience

This document is intended for personnel tasked with planning the role of the 39XX/51XX Switches and Platforms.

Related documents

This document is part of a documentation suite that fully describes the 39XX/51XX Switches and Platforms. For more information about 39XX/51XX Switches and Platforms documentation, refer to the documentation roadmap in *39XX/51XX Switches and Platforms Product Fundamentals*.

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New in this release

For the SAOS 6.21.2 release, we made the following changes in *39XX/51XX Switches and Platforms Planning, Engineering, and Ordering Guide*.

- Support for dual AC and dual DC models to platform 3924 is added throughout the document.
- In Chapter 8, “Ordering”
  - In Table 8-6, added the description for part numbers: 170-3924-907, 170-3924-908.
  - In Table 8-6, added the Wall Mount bracket details for 3924 Dual Power Supply Unit and 5132, for part number 170-0347-900.
  - In Table 8-11, three new power supplies is supported for 5160 platform for part numbers: 170-0107-900, 170-0013-900, 170-0014-900.

Summary of 39XX/51XX switches

This chapter provides a summary of 39XX/51XX switches and platforms. Topics are:

Hardware

Table 2-1 provides a summary of 39XX/51XX switches.

Table 2-1
Summary of 39XX/51XX switches

Model	Platform Type	Primary use
3903	Service Delivery Switch	Business Demarcation
3903x	Service Delivery Switch	Business Demarcation
3904	Service Delivery Switch	Mobile Backhaul Synchronization
3905 AC	Service Delivery Switch	Outdoor
3905 DC	Service Delivery Switch	Outdoor
3905 MSO	Service Delivery Switch	Outdoor
3906 AC single	Service Virtualization Switch	Business Demarcation
3906 AC dual	Service Virtualization Switch	Business Demarcation
3924 AC single	Service Delivery Switch	Business Demarcation
3924 AC dual	Service Delivery Switch	Business Demarcation
3924 DC dual	Service Delivery Switch	Business Demarcation
3926	Service Delivery Switch	Business Demarcation
3928 AC, 3928 DC	Service Delivery Switch	Business Demarcation
3931 Standard	Service Delivery Switch	Outdoor, High capacity

Table 2-1
Summary of 39XX/51XX switches

Model	Platform Type	Primary use
3931 Sync	Service Delivery Switch	Outdoor, High capacity, Synchronization
3932	Service Delivery Switch	Mobile Backhaul
3942	Service Delivery Switch	High-density (HD) copper for Aggregation, Demarcation, Residential/Converged Applications, Mobile Backhaul
5142	Service Aggregation Switch	Service aggregation
5160	Service Aggregation Switch	Service aggregation

Software

The 39XX/51XX switches are configured with base software. Table 2-2 shows the active software versions for each platform.

Table 2-2
Active software

Platform	6.10	6.11	6.12	6.13	6.14	6.15	6.16	6.17	6.18	6.19	6.20	6.21
3902	X											
3903				X	X	X	X	X	X	X	X	X
3903x				X	X	X	X	X	X	X	X	X
3904				X	X	X	X	X	X	X	X	X
3905				X	X	X	X	X	X	X	X	X
3906						X	X	X	X	X	X	X
3911	X											
3916 AC Standard	X	X	X	X	X	X	X	X	X	X		
3916 AC Mini		X	X	X	X	X	X	X	X	X		
3916 Dual AC Standard	X	X	X	X	X	X	X	X	X	X		

Platform	6.10	6.11	6.12	6.13	6.14	6.15	6.16	6.17	6.18	6.19	6.20	6.21
3916 Dual AC Mini		X	X	X	X	X	X	X	X	X		
3916 DC Standard	X	X	X	X	X	X	X	X	X	X		
3920	X											
3924 AC single												X
3924 AC Dual												X
3924 DC Dual												X
3926								X	X	X	X	X
3928 AC, 3928 DC								X	X	X	X	X
3930	X	X	X	X	X	X	X	X	X	X		
3930-930	X	X	X	X	X	X	X	X	X	X		
3931	X	X	X	X	X	X	X	X	X	X		
3932		X	X	X	X	X	X	X	X	X		
3938				X	X	X	X					
3940	X	X	X									
3942			X	X	X	X	X	X	X	X	X	X
3960	X	X	X	X	X	X	X					
5140	X	X	X									
5142		X	X	X	X	X	X	X	X	X	X	X
5150	X	X	X	X	X	X	X	X	X	X		
5160		X	X	X	X	X	X	X	X	X	X	X

Additional features can be configured with the purchase of software license packages. Table 2-3 describes software license packages for 39XX/51XX switches.

Table 2-3
Software license packages

Software license	Description
Advanced 10G (3924 AC single, 3924 AC Dual, 3924 DC Dual, 3926, 3928 AC, 3928 DC, 3942, 5142 only)	10G Ethernet support on NNI ports (SFP+)
Advanced Ethernet	Enables the following features: • Broadcast containment • Virtual circuits • Virtual switches • Traffic profiling • Traffic services • Port state mirroring groups • MSTP • RSTP • Link aggregation • Virtual link loss indicator • VLAN create and delete • Service access control • Multicast services • Resource management • G.8032 ring protection • Timing: SyncE • Timing: BITS • Timing: GPS • Timing: TDM • Access Control List (ACL)

Table 2-3
Software license packages

Software license	Description
Advanced OAM	Enables the following features: • EOAM • Benchmark RFC2544 • CFM • IP static routing (Not supported on 3911) • NTP Hardware Timestamping • TWAMP • Y.1731
Advanced Security	Enables the following features: • 802.1x • SSHv2 • SFTP • SNMPv3 • TACACS+ • RADIUS • Secure copy
MPLS (Not supported on 3903, 3903x,3904, 3905, 3906, 3940)	Enables the following features: • MPLS-TP • MPLS pseudowires or virtual circuits • MPLS ingress, transit and egress tunnels, tunnel groups • MPLS ping, traceroute • BFD • LSP • VPLS • VPWS • AIS • On-demand CV&RT • pseudowire signals for static pseudowire • ISIS • LDP • OSPF • RSVP-TE • VPLS Integrated Routing and Bridging (supported on the 5160 only)

Table 2-3
Software license packages

Software license	Description
Advanced Synchronization (Not supported on 3902, 3903, 3903x, 3906, 3911, 3920, 3924-903, 3924-907, 3924-908, 3926, 3928 AC, 3928 DC,3938, 3940, 3960, 5140)	Advanced timing features (1588)

For more information about software licenses, refer to *39XX/51XX Switches and Platforms Software Management and Licensing*.

Hardware overview

This chapter describes 39XX/51XX switches.

3903 switch

The 3903 switch is a small Ethernet demarcation switch. It provides focused Ethernet services for small and medium-sized businesses with built-in SLA Performance Engine. The 3903 is a three-port platform.

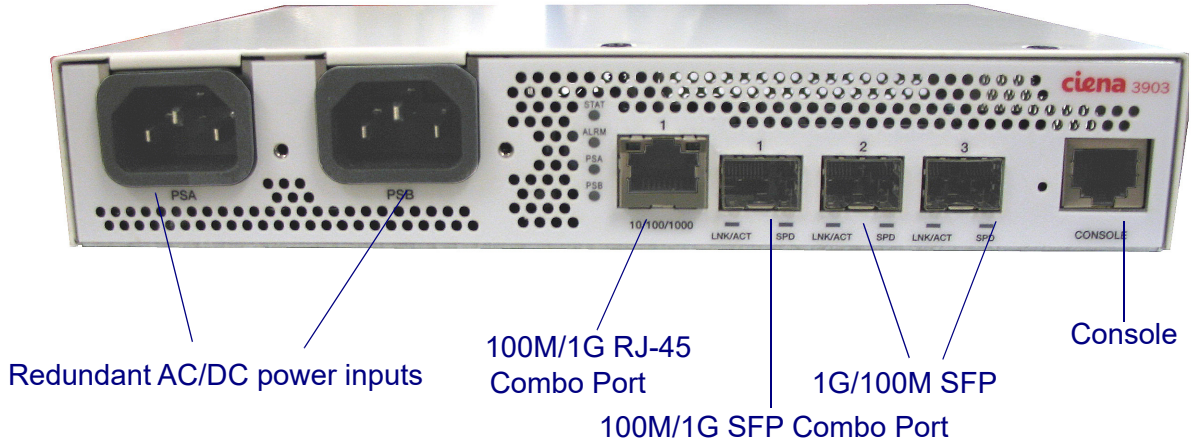
It has two variants:

- dual, built-in AC power supplies
- dual, built-in DC power supplies

The power provided by one power supply is sufficient; however, two power supplies provide redundancy.

The following figure shows the front of the 3903 switch.

Figure 3-1
Front of the 3903 switch

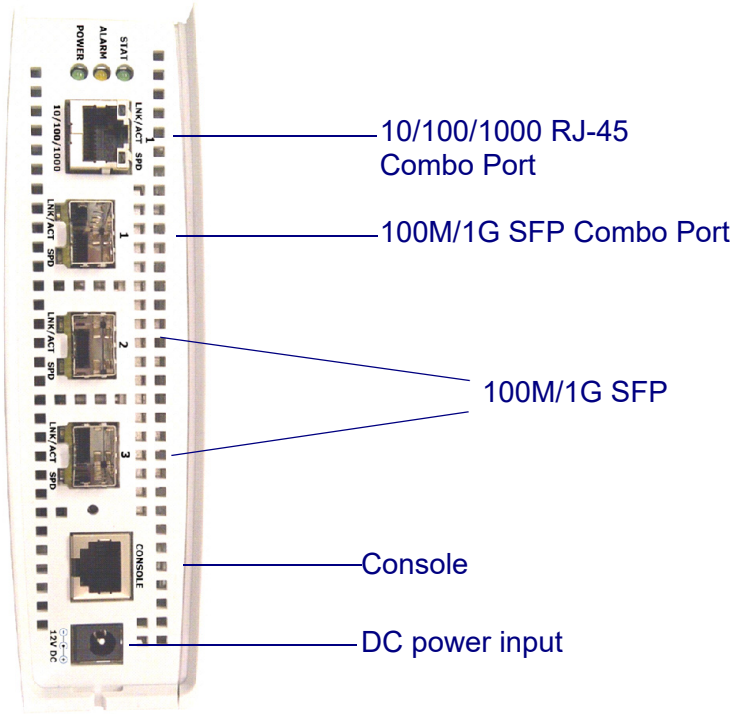


3903x switch

The 3903x switch is a small Ethernet demarcation switch. It provides focused Ethernet services for small and medium-sized businesses with built-in SLA Performance Engine. The 3903x is a three-port platform.

The following figure shows the front of the 3903x switch.

Figure 3-2
Front of the 3903x switch



3904 switch

While operators globally are converging networks, there is an increasing need for synchronization capabilities within those Carrier Ethernet networks. While Mobile Backhaul is the dominant example, it is becoming more pronounced with the emergence of small cell radios that will operate in more diverse locations that cannot rely upon GPS.

Synchronization is also being used to obtain one-way SLA monitoring or to increase accuracy and synchronization is being used in applications like SmartGrid to align network operation events. The 3904 switch supports Sync-as-a-Service offerings to widen the applicability and sophistication of EBS or MBH retail services.

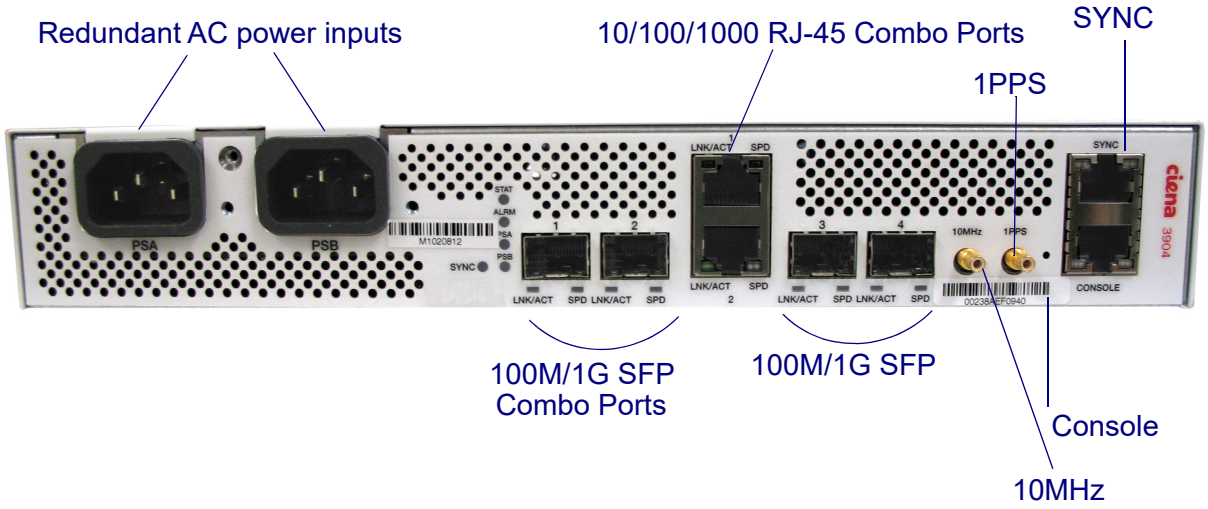
It has two variants:

- dual, built-in AC power supplies
- dual, built-in DC power supplies

The power provided by one power supply is sufficient; however, two power supplies provide redundancy.

The following figure shows the front of the 3904 switch.

Figure 3-3
Front of the 3904 switch

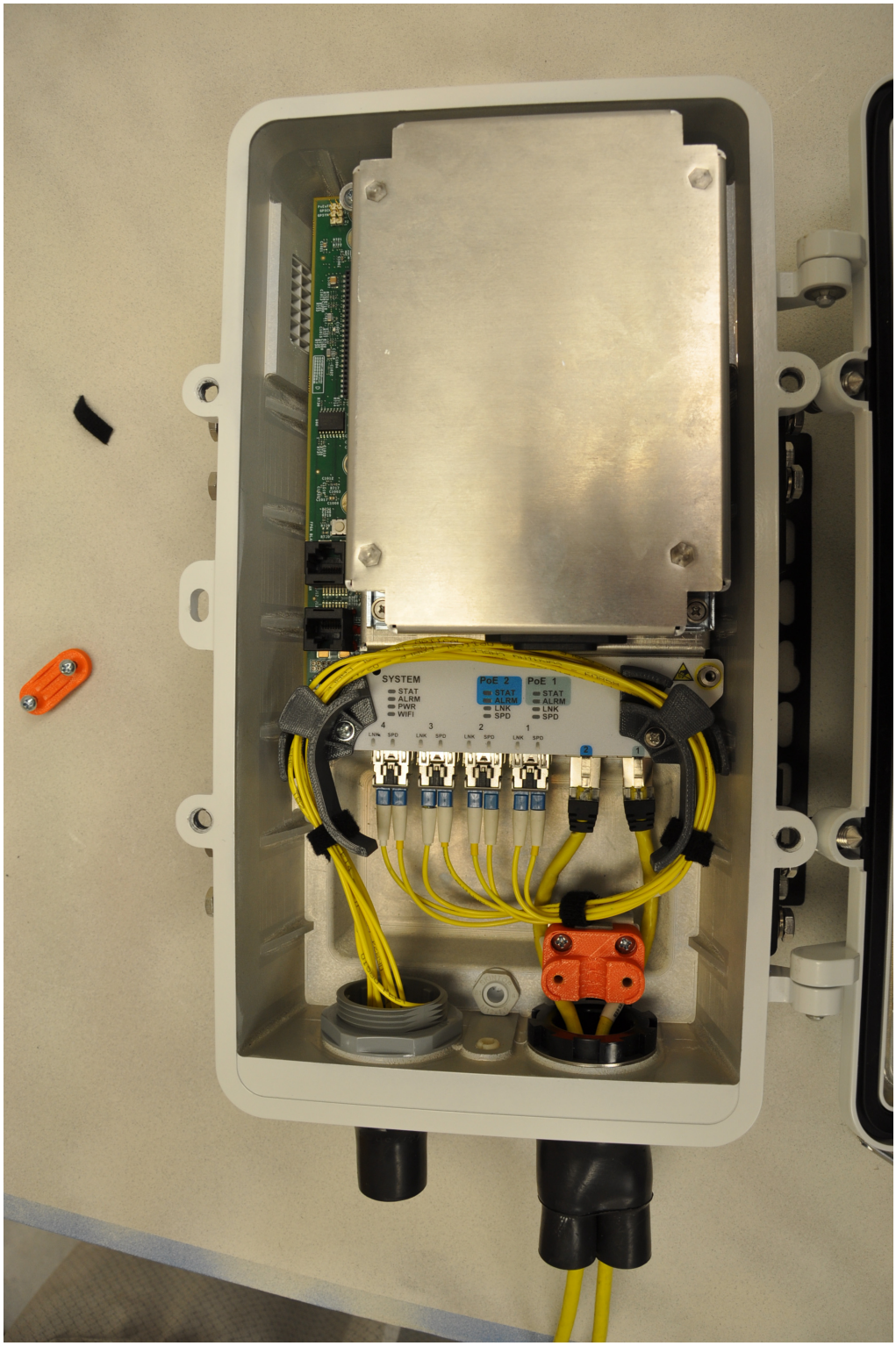


3905 switch

The 3905 switch features an environmentally hardened enclosure, which houses the electronics module and power supply. The enclosure can be mounted on a wall, pole or cable strand.

The following figure shows the front inside view of the 3905 switch.

Figure 3-4
Front, inside view of the 3905 switch



3906 switch

The 3906mvi switch is a small Ethernet demarcation switch. The 3906mvi has six external ports, consisting of four UNI ports and 2 NNI ports. It can support an optional pluggable module that can perform network functional virtualization (NFV) capabilities. The 3906mvi has a combined network element with L2 NTE and optional L3 VNF capability.

It has two variants:

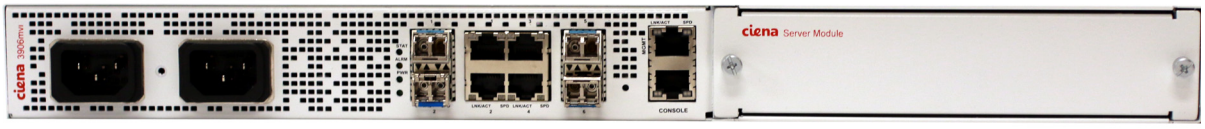
- single, built-in AC power supply
- dual, redundant, built-in AC power supplies

The power provided by one power supply is sufficient; however, two power supplies provide redundancy.

The 3906mvi has six fans.

The following figure shows the front of the 3906mvi switch.

Figure 3-5
Front of the 3906mvi switch



3924 switch

The 10 GbE 3924 Platform serves as service termination and demarcation device for business and mobile backhaul services. The power connection is made on the front of the chassis. The power unit is internal to the chassis and is not field-replaceable.

The chassis is available in three variants:

- single, built-in AC power supply
- dual, redundant, built-in AC power supply
- dual, redundant, built-in DC power supply

The switch is offered in three models:

- **3924 single AC**

— 10 GbE Ethernet Model: This model does not include support for Synchronous Ethernet (G.8261) and IEEE 1588v2, Ordinary Clock Slave (OC), Transparent Clock (TC), and Boundary Clock (BC).

— 10 GbE Ethernet, Sync Enabled Model: This model includes support for Synchronous Ethernet, IEEE 1588v2, and Stratum 3E holdover.

The following figures shows the front and rear view of the single AC switch.

Figure 6 Front view of the switch

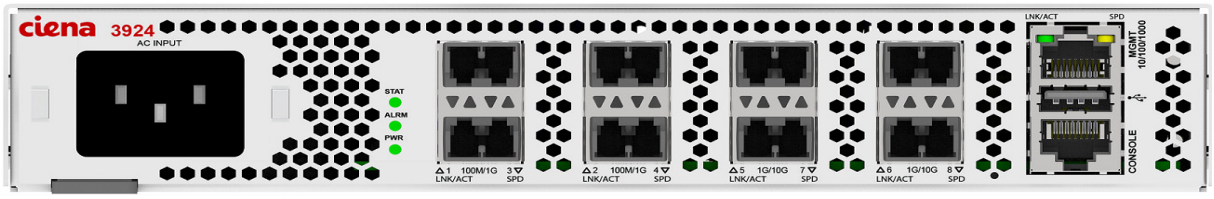
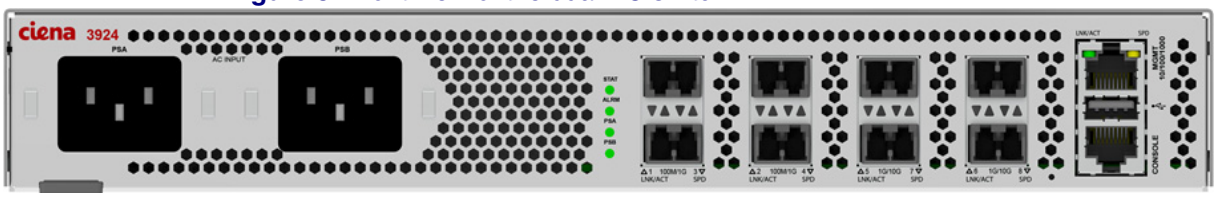


Figure 7 Rear view of the switch

- **3924 dual AC**

— 10 GbE Ethernet Model: This model does not include support for Synchronous Ethernet (G.8261) and IEEE 1588v2, Ordinary Clock Slave (OC), Transparent Clock (TC), and Boundary Clock (BC).

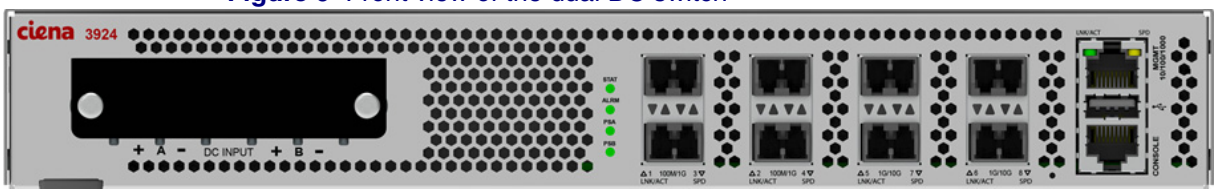
Figure 8 Front view of the dual AC switch



- **3924 dual DC**

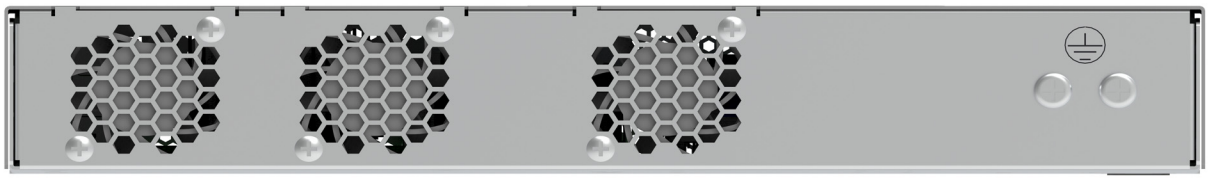
— 10 GbE Ethernet Model: This model does not include support for Synchronous Ethernet (G.8261) and IEEE 1588v2, Ordinary Clock Slave (OC), Transparent Clock (TC), and Boundary Clock (BC).

Figure 9 Front view of the dual DC switch



The following figure shows the rear view of the dual AC and dual DC switch.

Figure 10 Rear view of the dual AC and DC switch



3926 switch

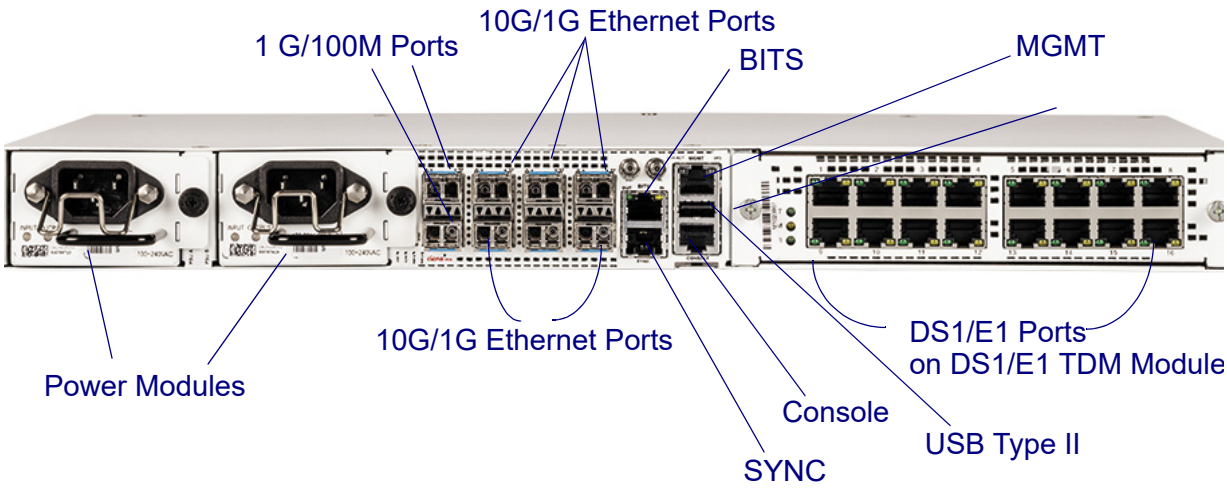
The 3926 is a 10G Edge NTE platform. As an option, the 3926 can be populated with a field replaceable unit (FRU), which inserts into a slot on the right side. The following FRU types are available: DS1/E1 TDM module for TDM over Pseudo-Wire Emulation; the Combo TDM OC48 FRU module for TDM/Ethernet circuit emulation, and the NFV Compute Server FRU. The 3926 is available with either AC or DC power supplies.

CAUTION
Risk of damage to equipment
Never insert or extract an AC power supply unit that has an AC power cord connected to it. Never insert or extract a DC power supply unit that has a DC power cable connected to it.

The power cord or cable must be disconnected from the power supply unit before the power supply unit is extracted from the 3926. The power cord or cable can be connected to the power supply unit only after the power supply unit has been inserted into the 3926.

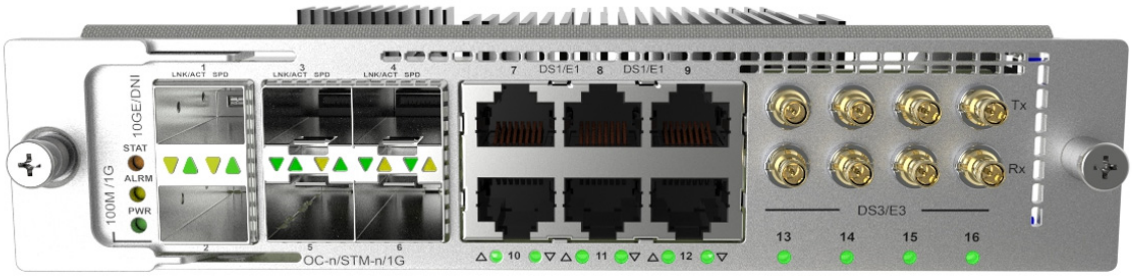
The following figure shows the front view of the 3926, populated with a DS1/E1 TDM module.

Figure 3-11
Front view of the 3926



The following figure shows the front view of the Combo TDM OC48 FRU module.

Figure 3-12
Front view of the Combo TDM OC48 FRU module



The following figure shows the front view of the NFV Compute Server FRU.

Figure 3-13
Front view of the NFV Compute Server FRU

Figure 3-14
3926 port numbering

PORT 1 SFP 1G/100M	PORT 3 SFP+/SFP 10G/1G	PORT 4 SFP+/SFP 10G/1G	PORT 5 SFP+/SFP 10G/1G
PORT 2 SFP 1G/100M	PORT 6 SFP+/SFP 10G/1G	PORT 7 SFP+/SFP 10G/1G	PORT 8 SFP+/SFP 10G/1G

The switch has 8 ports that accept pluggable transceivers. Each transceiver is hot-swappable and can be removed without impacting traffic running on adjacent interfaces.

The switch supports multiple transceiver types to accommodate different needs for wavelengths and reach.

Copper transceivers can be installed in ports 1-6. They can operate at the following rates:

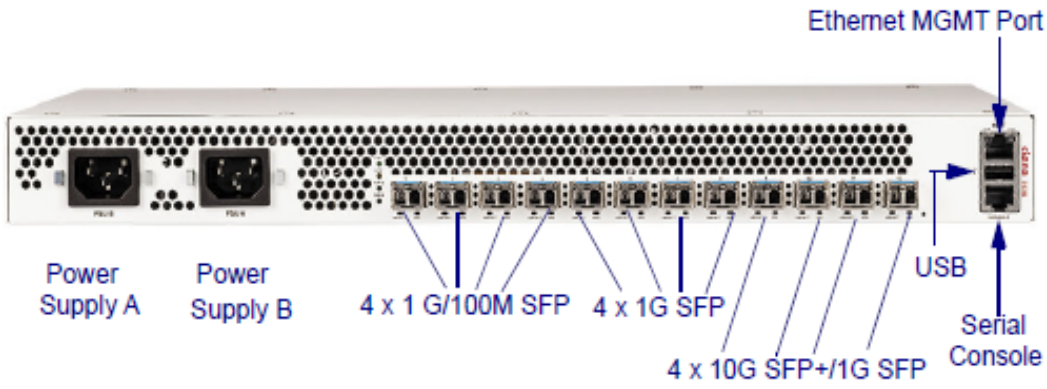
- ports 1-2 at 10/100/1000 Mbps
- ports 3-6 at 1Gbps

3928 switch

The 3928 10GE platform serves as service termination and demarcation device for business and mobile backhaul services.

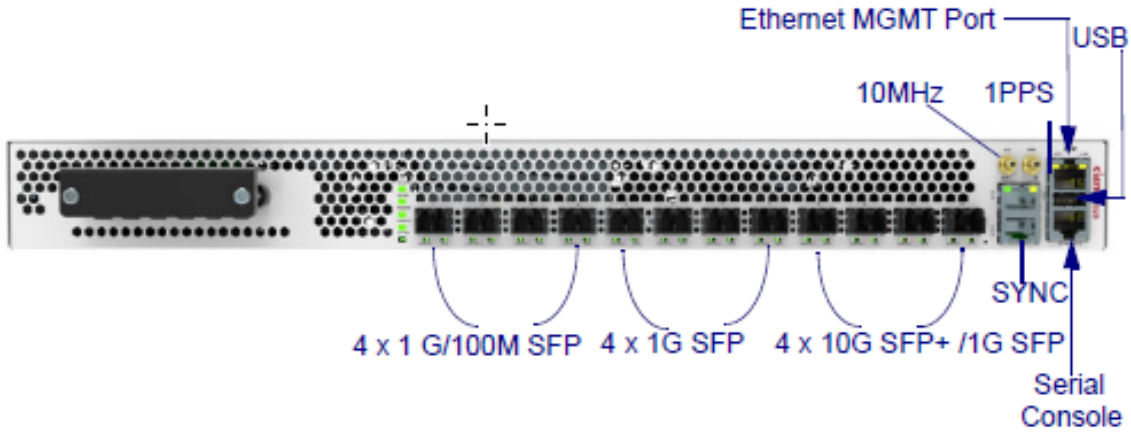
The following figure shows the front view of the 3928 AC switch.

Figure 3-15
Front view of the 3928 AC



The following figure shows the front view of the 3928 DC switch.

Figure 3-16
Front view of the 3928 DC



3942 switch

The 3942 switch is designed for in-building service delivery applications using copper UNI. The 3942 switch is a high-density (HD) copper Service Delivery Switch. It supports Gigabit Ethernet and 10 Gigabit Ethernet interfaces. The 3942 switch is focused on in-building service delivery applications using copper UNI.

The 3942 switch supports copper-based applications that include

- 1GE/10GE business services where the 3942 switch is deployed as a carrier aggregation or demarcation device offering 1GE or 10GE services and aggregation.
- Residential/converged applications where the 3942 switch is deployed as a service delivery device in the basement of a multi-dwelling unit, providing 1GE services with 10GE backhaul. HD copper is used where copper Ethernet interfaces are required.
- Mobile backhaul for 4G/LTE where the 3942 switch is deployed in a 4G/LTE mobile cell site location where copper-based Ethernet is required and where packet synchronization is not required.

An AC version and a DC version are available:

- Figure 3-17 shows the faceplate of the 3942 (AC version) and identifies the locations of the different ports.
- Figure 3-18 shows the faceplate of the 3942 (DC version) and identifies the locations of the different ports.

Figure 3-17
Front of the 3942 switch (AC version)

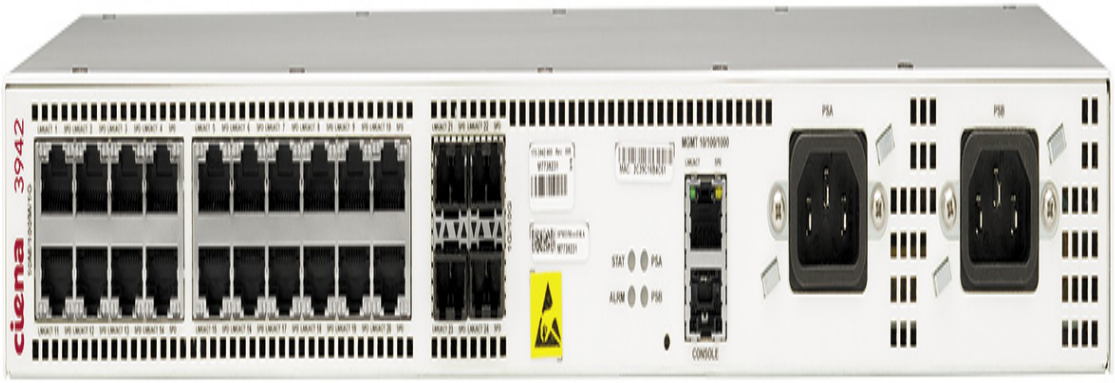
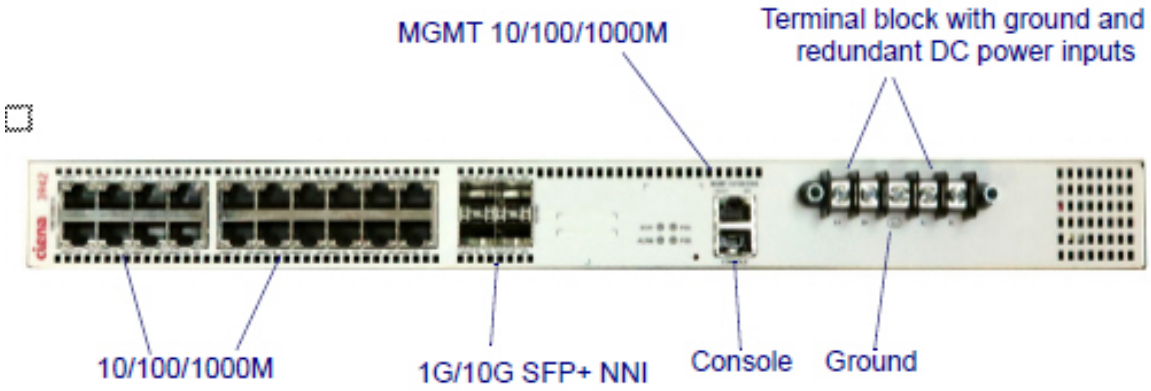


Figure 3-18
Front of the 3942 switch (DC version)



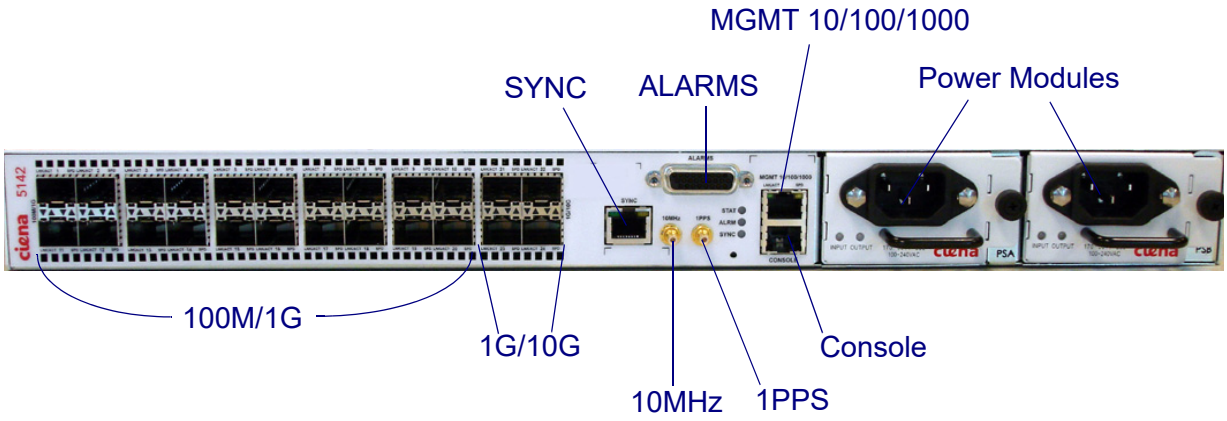
5142 switch

The 5142 switch provides premium 1/10 Gbps Carrier Ethernet Service Aggregation capability, at a low cost. The 5142 switch requires only 1 RU of space and is easy to install and deploy. In addition, the 5142 switch supports a range of SFP and SFP+ optics, providing port level flexibility to the available interfaces.

This powerful system is ideal for customers looking to evolve beyond 1 GbE aggregation, but who are looking for a lower density device for the site. Two variants are available, 170-5142-930 and 170-5142-931. The only difference is the OAM FPGA. The 170-5142-931 platform supports an OAM FPGA to provide hardware based Y.1731 session processing.

The following figure shows the front view of the 5142 switch.

Figure 3-19
Front view of the 5142 switch



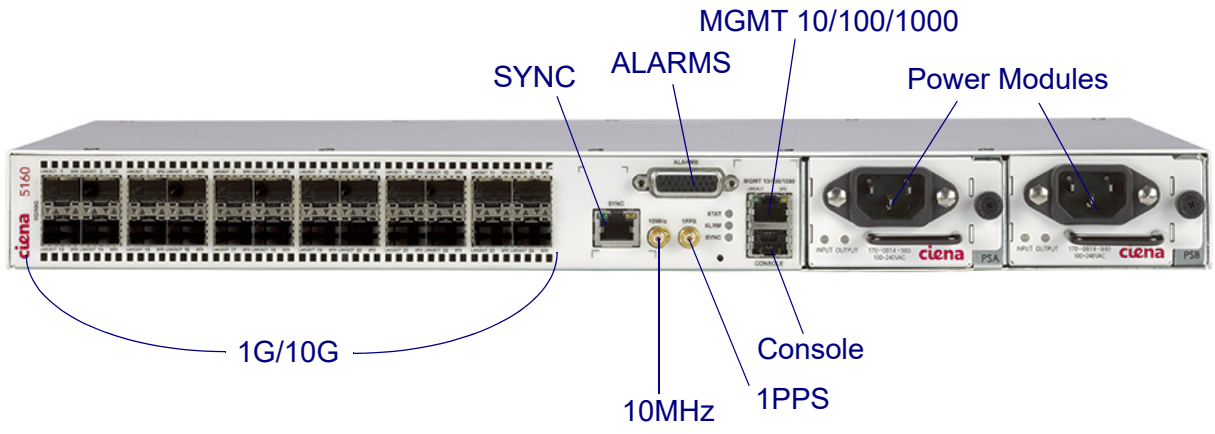
5160 switch

The 5160 switch provides premium 1/10 Gbps Carrier Ethernet Service Aggregation capability at a low cost. The 5160 switch requires only 1 RU of space and is easy to install and deploy. In addition, the 5160 switch supports a range of SFP and SFP+ optics, providing port level flexibility to the available interfaces.

This powerful system is ideal for customers looking to evolve beyond 1 GbE aggregation.

The following figure shows the front view of the 5160 switch.

Figure 3-20
Front view of the 5160 switch



Deployment options

This chapter describes deployment options for SAOS 39XX/51XX switches.

Topics are

Chassis

This section provides the information required to select a chassis.

Table 4-1 lists the chassis information.

Table 4-1
Chassis information

Model	Form factor	Ports	Temperature	Mounting options
3903	1 RU, ETSI	1 x 100M/1G SFP/RJ-45 UNI 2 x 100M/1G SFP NNI	-5C to +45C	19-inch frame 23-inch frame ETSI frame
3903x	1 RU, ETSI	1 x 100M/1G SFP/RJ-45 UNI 2 x 100M/1G SFP NNI	-5C to +45C	19-inch frame 23-inch frame ETSI frame
3904	1 RU, ETSI	2 x 100/1G SFP/RJ-45 UNI 2 x 100M/1G SFP NNI External Timing: BITS, 1 PPS, and 10 MHz Supports Sync-E, 1588 and Stratum 3E holdover clock	-5C to +65C	19-inch frame 23-inch frame ETSI frame
3905 AC	Outdoor	2 x 100M/1G SFP 2 x 100M/1G SFP/RJ45	-40C to +65C	Wall mount Pole mount Cable strand
3905 DC	Outdoor	2 x 100M/1G SFP 2 x 100M/1G SFP/RJ45	-40C to +65C	Wall mount Pole mount Cable strand
3905 Cable AC	Outdoor	2 x 100M/1G SFP 2 x 100M/1G SFP/RJ45	-40C to +65C	Wall mount Pole mount Cable strand
3906 AC single	1 RU, ETSI	2 x 10M/100M/1000M RJ-45 2 x 100M/1000M SFP	0C to +40C	19-inch frame 23-inch frame ETSI frame
3906 AC dual	1 RU, ETSI	2 x 10M/100M/1000M RJ-45 2 x 100M/1000M SFP	0C to +40C	19-inch frame 23-inch frame ETSI frame

Model	Form factor	Ports	Temperature	Mounting options
3924 AC single	1RU • Dimensions: 21.59 cm W x 25.031 cm D x 4.06 cm H (8.5 in W x 9.86 in D x 1.6 in H) • Weight without optics: 3.90 lb (1.77 kg) • Wall mountable, Desktop mountable or Rack mountable	4 x 100 MbE/1 GbE SFP/SFP+ ports 4 x 1/10 GbE SFP/SFP+ ports	0C to +50C	19-inch frame 21-inch frame 23-inch frame
3924 AC dual	1RU • Dimensions: 29.44 cm W x 25.044 cm D x 4.39 cm H (11.52 in W x 9.86 in D x 1.73 in H) • Weight without optics: 5.64 lb (2.56 kg) • Wall mountable, Desktop mountable or Rack mountable	4 x 100 MbE/1 GbE SFP/SFP+ ports 4 x 1/10 GbE SFP/SFP+ ports	0C to +50C	19-inch frame 21-inch frame 23-inch frame
3924 DC dual	1RU • Dimensions: 29.44 cm W x 25.044 cm D x 4.39 cm H (11.52 in W x 9.86 in D x 1.73 in H) • Weight without optics: 5.64 lb (2.56 kg) • Wall mountable, Desktop mountable or Rack mountable	4 x 100 MbE/1 GbE SFP/SFP+ ports 4 x 1/10 GbE SFP/SFP+ ports	-40C to +65C	19-inch frame 21-inch frame 23-inch frame
3926	1 RU	6 x Gigabit/10Gigabit SFP+ NNI/UNI 2 x Gigabit/100M SFP NNI/UNI 1 x 10/100/1000 RJ-45 management port	-40C to +65C	19-inch frame 23-inch frame Wall mount Desktop

Model	Form factor	Ports	Temperature	Mounting options
3928 AC	1 RU	4 x 1G/100M SFP 4 x 1G SFP 4 x 10G SFP+ or 1G SFP 1 x Serial RJ-45 console port 1 x Serial RJ-45 management port 2 x BITS/SYNC ports	0C to 50C	19-inch frame 23-inch frame Wall mount Desktop
3928 DC	1 RU	4 x 1G/100M SFP 4 x 1G SFP 4 x 10G SFP+ or 1G SFP 1 x Serial RJ-45 console port 1 x Serial RJ-45 management port 2 x BITS/SYNC ports 1 x 10 MHz 1 x PPS	-40C to +65C	19-inch frame 23-inch frame Wall mount Desktop
3942	1 RU	4 x Gigabit/10Gigabit SFP+ NNI/UNI 20 x 10/100/1000M RJ-45 UNI	0C to +65C	19-inch frame 23-inch frame Wall mount
5142	1 RU	4 x Gigabit/10Gigabit SFP+ NNI/UNI 20 x Gigabit SFP/SFP+ UNI External Timing: BITS, 1 PPS, and 10 MHz Supports Sync-E, 1588 and Stratum 3E holdover clock	-40C to +65C	19-inch frame 23-inch frame Wall mount
5160	1 RU	24 x Gigabit/10Gigabit SFP+ NNI/UNI External Timing: BITS, 1 PPS, and 10 MHz Supports Sync-E, 1588 and Stratum 3E holdover clock	-40C to +65C	19-inch frame 23-inch frame Wall mount

Power

Table 4-2 lists the power options.

Table 4-2
Power options

Model	Power	Details
3903	Dual built-in AC or DC	The 3903 switch is powered by a redundant, dual, fixed DC power supply module. The power is connected from the front of the chassis. These modules are not field-replaceable. Dual conversion integrated AC power supply: • Input voltage range 100 VAC to 240 VAC • Dual conversion integrated DC power supply; – Input voltage range 20 Vdc to 60Vdc – Input is floating with respect to ground – Terminal block with cover

Table 4-2
Power options

Model	Power	Details
3903x	External AC wall adapter	The 3903x uses a single external wall mount AC power supply. The AC power supply supports the following range of input voltages: 100VAC to 240VAC, 50 Hz to 60 Hz. The power supply is connected using a modular jack on the right side of the faceplate labeled 12Vdc. The 3903x switch has a power cord retainer to assist with strain relief for the power cord. AC power supplies are available with different wall plug interface plate specific to each country. The following list provides a summary of the currently supported power supplies: • AC power supply Australia • AC power supply Europe • AC power supply North America AC power supply United Kingdom
3904	Dual built-in AC or DC	The 3904 switch is powered by redundant, dual, fixed AC power supply module or a redundant, dual, fixed DC power supply module, Power is connected from the front of the chassis. These modules are not field-replaceable. • Dual conversion integrated AC power supply: – Input voltage range 100 VAC to 240 VAC • Dual conversion integrated DC power supply: – Input voltage range 20 Vdc to 60 Vdc – Input is floating with respect to ground – Terminal block with cover
3905 AC	Single, built-in AC	AC input socket accepts an IEC C15A plug. Power is connected through environmental glands. The 3905 AC power supply has a power cord retainer to assist with strain relief for the power cord. • Input voltage range 100 VAC to 240 VAC
3905 DC	Single, built-in DC	Single built-in DC power supply. Power is connected through environmental glands: • Input voltage range 20 Vdc to 60 Vdc • Input is floating with respect to ground • Terminal block

Table 4-2
Power options

Model	Power	Details
3905 MSO	Single, built-in MSO	The MSO power supply supports 60VAC or 90VAC Cable Television quasi-square wave AC power. The MSO power supply accepts an F-Type male coax at the front panel. Internally, the F-Type coax is adapted to a C15 plug by a specialized power cord. Externally, the RF and AC must be split. See *3905 Hardware Installation and Startup Manual* (009-3247-001) for details.
3906	Single or dual built in AC	The 3906 switch is powered by redundant, dual, built-in AC power supplies. Power is connected from the front of the chassis. These modules are not field replaceable. Chassis are factory configured with either a single AC power supply or with dual, AC power supplies in a redundant configuration. • Input voltage range 100 VAC to 240 VAC
3924	Single, built in AC	Single, built-in AC power supply, which is accessible from the front of the chassis. The power unit is internal to the chassis and is not field-replaceable. AC power unit rating range: • 100 VAC - 240 VAC, 50/60 Hz, 0.65 A
3924	Dual, redundant built-in AC	Dual redundant AC power supplies, which are accessible from the front of the chassis These power supplies are fixed units. AC power unit rating range: • 100 VAC - 240 VAC, 50/60 Hz, 0.65 A
3924	Dual, redundant built-in DC	Dual redundant DC power supplies, which are accessible from the front of the chassis. These power supplies are not field replaceable units. DC power unit rating range: • Input voltage range -24 VDC to -48 VDC, 1.9 A/0.94 A

Table 4-2
Power options

Model	Power	Details
3926	Dual Pluggable AC or Dual Pluggable DC	Dual pluggable AC power supplies, which are accessible from the front of the chassis. These power supplies are field-replaceable units: • Input voltage range 100 VAC to 240 VAC Dual pluggable DC power supplies. The power supplies are accessible from the front of the chassis. These power supplies are field-replaceable units: • Input voltage range 20 Vdc to 60 Vdc • Input is floating with respect to ground.
3928 AC	Dual, redundant built-in AC	Dual redundant AC power supplies, which are accessible from the front of the chassis These power supplies are fixed units: • Input voltage range 100 VAC to 240 VAC
3928 DC	Dual, redundant built-in DC	Dual redundant DC power supplies, which are accessible from the front of the chassis. These power supplies are not field replaceable units: • Input voltage range 20 Vdc to 60 Vdc
3942	Dual built-in AC or DC	• Dual pluggable AC power supplies. Power is connected from the front of the chassis: – Input voltage range 100 VAC to 240 VAC • Dual pluggable DC power supplies. Power is connected from the front of the chassis: These power supplies are field-replaceable units: – Input voltage range 20 Vdc to 60 Vdc – Input is floating with respect to ground
3960	Dual pluggable AC or dual pluggable DC	• Dual pluggable AC power supplies. The power supplies are accessible from the rear of the chassis. These power supplies are field-replaceable units: – Input voltage range 100 VAC to 240 VAC • Dual pluggable DC power supplies. The power supplies are accessible from the rear of the chassis. These power supplies are field-replaceable units: – Input voltage range 40.5 Vdc to 60 Vdc – Input is floating with respect to ground

Table 4-2
Power options

Model	Power	Details
5142	Dual pluggable AC or Dual pluggable DC	• Dual pluggable AC power supplies, which are accessible from within the enclosure. These power supplies are field-replaceable units: – Input voltage range 100 VAC to 240 VAC • Dual pluggable DC power supplies, which are accessible from within the enclosure. These power supplies are field-replaceable units: – Input voltage range 20 Vdc to 60 Vdc – Input is floating with respect to ground
5160	Dual pluggable AC or Dual pluggable DC	• Dual pluggable AC power supplies, which are accessible from within the enclosure. These power supplies are field-replaceable units: – Input voltage range 100 VAC to 240 VAC • Dual pluggable DC power supplies, which are accessible from within the enclosure. These power supplies are field-replaceable units: – Input voltage range 20 Vdc to 60 Vdc – Input is floating with respect to ground

Console cables

Switches in the Packet Networking portfolio have a console port that can be used to attach a terminal or a PC to the device for out-of-band management. This port is not intended to be installed as a permanent connection. It is labeled Console**.**

Note: The serial console port does not support connectivity to a modem.

The console port can be either DB-9 or RJ-45. Table 4-3 provides a summary of the connection type by platform.

Table 4-3
Console port connection summary by platform

Platform	Console port	Console pinout	Console cables	Ethernet management port
3903	RJ-45	EIA-561	RJ-45 Console Cable	—
3903x	RJ-45	EIA-561	RJ-45 Console Cable	—
3904	RJ-45	EIA-561	RJ-45 Console Cable	—

Table 4-3
Console port connection summary by platform (continued)

Platform	Console port	Console pinout	Console cables	Ethernet management port
3905	RJ-45	EIA-561	RJ-45 Console Cable	—
3906	RJ-45	EIA-561	RJ-45 Console Cable	10/100/1000 RJ-45
3924 AC single, 3924 AC dual, 3924 DC dual	RJ-45	EIA-561	RJ-45 Console Cable	10/100/1000 RJ-45
3926	RJ-45	EAI-561	RJ-45 Console Cable	—
3928 AC, 3928 DC	RJ-45	EAI-561	RJ-45 Console Cable	10G/1G RJ-45
5142	RJ-45	EIA-561	RJ-45 Console Cable	10/100/1000 RJ-45
5160	RJ-45	EIA-561	RJ-45 Console Cable	10-100/1000 RJ-45
Note: Multiple RJ-45 cables are available. See "RJ-45 console cable" on page 4-12 for more information.				

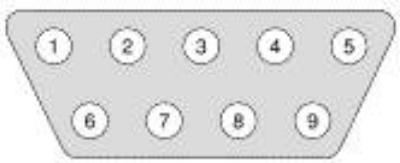
There are two console pinouts:

- EIA-232 — this is used by DB-9 console ports on Packet Networking products
- EIA-561 — this is used by RJ-45 console ports on Packet Networking products

Serial EIA-232 on DB-9

The EIA-232 port connector uses a standard DB-9 connector that follows standard DTE wiring pin assignment. Figure 4-1 shows the DB-9 device side (male connector) pin locations.

Figure 4-1
DB-9 connector pin-out



The corresponding EIA-232 console port pinout is provided in Table 4-4.

Table 4-4
Serial EIA-232 on DB-9 console port pin assignments

Pin #	Lead
1	—
2	Receive
3	Transmit
4	—
5	Ground
6	—
7	—
8	—
9	—
Note: Figure 4-1 shows the pin locations.	

DB-9 console cable

A null modem cable should be used to connect a PC (DTE) to the device console port. You can use a standard DB-9 to USB adapter cable.

Serial EIA-561 on RJ-45

The EIA-561 port connector uses a standard RJ-45 connector. Figure 4-2 shows the connector pin locations.

Figure 4-2
RJ-45 connector pin-out

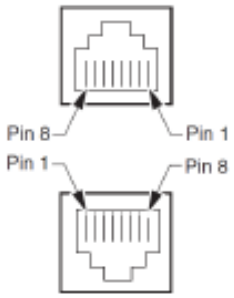


Table 4-5 shows the console port pinouts.

Table 4-5
Serial EIA-561 on RJ-45 Console port pin assignments

Pin #	Lead
1	—
2	—
3	—
4	Signal Ground
5	Received Data Line
6	Transmitted Data Line
7	—
8	—
Note: Figure 4-2 shows the pin locations.	

RJ-45 console cable

Note: The console cable can be used for a number of Ciena switches in the Packet Networking portfolio.

The console RJ-45 pinout is EIA compatible and can be converted to DB-9 (male or female) or Cisco pinout with separately purchased Ciena conversion cables. There are three adapter cables available:

- Console Serial Adapter (170-0062-900), RJ-45 EIA to Cisco RJ-45 pinout, 6 inches — must be connected to a customer-supplied null modem cable. This is a Cisco DTE pinout. A Cisco null modem cable is needed for DTE to DTE serial connections.

  Table 4-6 provides 170-0062-900 adapter pinout details. The RJ45 male connects to 39xx/51xx only. Use a Cisco null modem cable if connecting DTE to DTE. Do not use a cross-over adapter.

Table 4-6
170-0062-900 cable pinout details

Signal name	170-0062-900 CISCO DTE	
	RJ45 female pinout	Comments
TXD	3	Transmit Data from laptop. Input to 39xx/51xx on pin 5.
GND	4.5	Digital Ground from laptop to 39xx/51xx on pin 4
RXD	6	Receive Data from laptop. Output from 39xx/51xx.

- Console Serial Cable (170-0063-900), RJ-45 EIA to DB-9 Female for direct connection to laptop, 6 ft — no additional cables required. This cable was for telco technical craft interface when laptops had DB9 connectors as the default.

  Table 4-7 provides 170-0063-900 adapter pinout details. The RJ45 male connects to 39xx/51xx only. The DB9 female is wired for direct connection to the serial port on any laptop. (This is a cross-over cable.)

Table 4-7
170-0063-900 cable pinout details

Signal name	170-0063-900 DB9 female cable	
	DB9 female pinout	Comments
TXD	3	Transmit Data from Laptop. Input to 39xx/51xx.
RXD	2	Receive Data to Laptop. Output from 39xx/51xx.
GND	5	Digital Ground from laptop to 39xx/51xx on pin 4.

- Console Serial Adapter (170-0064-900), RJ-45 EIA pinout to DB-9 male connector, 6 inches — must be connected to a customer supplied null modem cable.

  Table 4-8 provides 170-0064-900 adapter pinout details. The RJ45 male connects to 39xx/51xx only.

Table 4-8
170-0064-900 cable pinout details

Signal name	170-0064-900 DB9 male cable	
	DB9 male pinout	Comments
TXD	3	Transmit Data from laptop. Input to 39xx/51xx on pin 5.
RXD	2	Receive data to laptop. Output from 39xx/51xx on pin 2.
GND	5	Digital Ground from laptop to 39xx/51xx on pin 4.

Console port connection settings

The console port connection settings are the same for all console ports, both serial EIA-232 and serial EIA-561, within the Packet Networking portfolio.

You can use terminal emulation software, for example, HyperTerminal, to connect to the system. The initial settings should be as follows:

- serial port VT-100 interface
- 9600 baud
- 8 bits
- no parity
- 1 stop bit
- no flow control

Default login

Once a connection has been established, the default login is as follows:

- Username: su
- Password: wwp

Procedures related to the initial configuration of a newly-installed system are located in the Hardware Installation and Start-up manual for each product. A complete list of the available documents is provided in the *39XX/51XX Product Fundamentals*.

Alarm interfaces

Some of the switches within the Packet Networking portfolio have alarm ports that can be used to accept external alarm inputs. The number of external alarm inputs and alarm port pin assignments varies from switch to switch. However, the overall function of the alarm circuit is the same for all switches in the portfolio. This chapter provides an overview of the alarm circuit guidelines and links to the alarm pin outs for all switches.

This section covers the following topics:

Alarm connection summary

Table 4-9 provides a summary of the alarm connections by platform.

Note: Switches in the Packet Networking portfolio that do not have alarm inputs do not appear in this table.

Table 4-9
Alarm connection summary by platform

Platform	Number of inputs	Connector	Alarm cable
5142	16	26-pin D-sub with custom pin-out. See “Alarm Custom Pin-out (26-pin D-sub connector)” on page 4-15.	15 foot alarm cable with high density 26-pin D-sub on one end and bare wires on the other end
5160	16	26-pin D-sub with custom pin-out. See “Alarm Custom Pin-out (26-pin D-sub connector)” on page 4-15.	15 foot alarm cable with high density 26-pin D-sub on one end and bare wires on the other end

Alarm circuit guidelines

The alarm circuitry for the switches in the Packet Networking portfolio that support external alarm inputs follows the same basic guidelines as outlined in this section.

Alarm sense circuit

The alarm sense circuit has the following characteristics:

- is negative with respect to local ground
- will be within +/- 60 V of local ground
- the sense loop can be closed if the alarm sense is connected to a remote ground as opposed to the supplied sense return signal
- current in the sense loop will be less than 2 mA when closed with a short
- The default state of each alarm circuit can be open or closed. The system will flag any state changes.

Alarm circuit voltage

The alarm circuit voltage behavior is as follows:

- The alarm will not be triggered with a leakage current of up to +/- 1 uA.
- The alarm will function normally if a resistance of 8.6K or less and a voltage of +/- 6.8 V or less is introduced into the loop.

Alarm Custom Pin-out (26-pin D-sub connector)

The 26-pin D-sub connector is used for the alarm connection on the following platforms:

- 5142
- 5160

A custom cable is available to connect to the alarm input on systems using the 26-pin D-sub connector. The 15 foot alarm cable has a high density 26-pin D-sub connector on one end, and bare wires on the other. These wires are then connected to a wire wrap panel.

Of the 26 pins on the connector, there are 16 return sense connections to detect switch close or opens and 8 returns. Up to two alarm sense lines can be connected to each return. The alarm sense lines can be paired with any return, however, it is recommended that the sensed switches that are paired come from equipment that is commonly grounded. The alarm pinout is provided in Table 4-10.

Table 4-10
Alarm port pin assignments for 26-pin D-sub connector (3930, 3932, 5142 and 5160)

Pin #	Lead	Color		Pin #	Lead	Color
1	Alarm sense 15	WH/BL		14	Alarm sense return 4	RD/OR
2	Alarm sense 13	BL/WH		15	Alarm sense return 3	OR/RD
3	Alarm sense 11	WH/OR		16	Alarm sense return 2	RD/GR
4	Alarm sense 9	OR/WH		17	Alarm sense return 1	GR/RD
5	Alarm sense 7	WH/GR		18	Frame ground	No connect
6	Alarm sense 5	GR/WH		19	Alarm sense 16	RD/BR
7	Alarm sense 3	WH/BR		20	Alarm sense 14	BR/RD
8	Alarm sense 1	BR/WH		21	Alarm sense 12	RD/SL
9	Frame ground	No connect		22	Alarm sense 10	SL/RD
10	Alarm sense return 8	WH/SL		23	Alarm sense 8	BK/BL
11	Alarm sense return 7	SL/WH		24	Alarm sense 6	BL/BK
12	Alarm sense return 6	RD/BL		25	Alarm sense 4	BK/OR
13	Alarm sense return 5	BL/RD		26	Alarm sense 2	OR/BK

Configuration provisioning

Configuration can be provisioned by means of:

- “Zero-Touch Provisioning” on page 4-17
- “OneControl Unified Management System” on page 4-18
- “Ethernet Services Manager and Integrated Services Management” on page 4-18
- “Directly on the switch” on page 4-19

Zero-Touch Provisioning

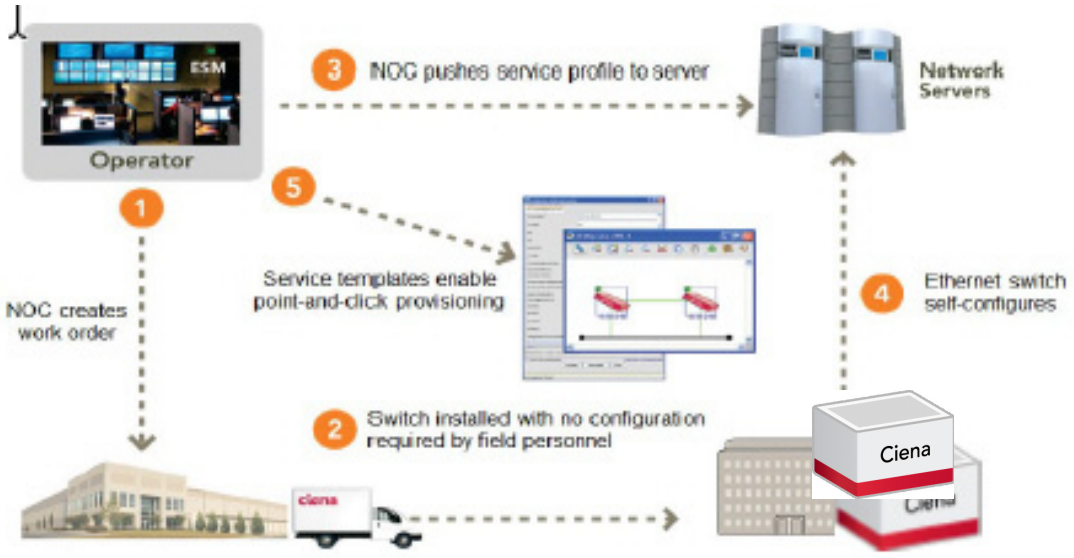
Zero-Touch Provisioning (ZTP) allows a switch to be provisioned from the Network Operations Center (NOC).The installer connects the switch to the network and applies power. The switch obtains its configuration information automatically from a DHCP server and a TFTP file server.

To configure an switch by means of ZTP, the following network conditions must be met:

- A link is established on any PSLM port. For more information about how to establish a link, refer to the *Installation, Startup and Upgrade* document for the chassis being configured.
- VLAN 127 is provisioned through the network for management.
- A DHCP server is accessible by means of VLAN 127 that is configured to assign a management IP address and support the following DHCP options:
  - Option 1: subnet mask
  - Option 3: router, that is, the gateway IP
  - Option 66: TFTP
  - Option 67: bootfile
- A TFTP server is accessible that contains a valid command file and any other supporting files needed to provision the switch.

Figure 4-3 shows ZTP configuration.

Figure 4-3
ZTP configuration



Ciena's Manage, Control and Plan

Ciena's MCP is the next-generation multi-layer Software Defined Networking (SDN) and Network Management System (NMS) platform with integrated network planning functionality that combines a web-scale platform, industry-leading SDN functionality and open interfaces.

OneControl Unified Management System

OneControl Unified Management System provides a single solution for network and service management capabilities across the whole portfolio of Ciena's Ethernet, Transport, and Switching services.

Ethernet Services Manager and Integrated Services Management

Ethernet Services Manager (ESM) is a carrier-grade, automated service activation, creation, and management platform for Ciena's Packet Networking service delivery and aggregation switches. Integrated Services Management (ISM) is an extension to ESM.

ISM enables end-to-end management of services and tunnels on network elements by computing paths, ensuring redundancy, policing Class of Service (CoS) and Quality of Service (QoS) and providing options for Control Protocol Tunnelling and enabling statistics. ISM maintains state so that services and tunnels can be deployed, modified, and terminated without loss of information.

Directly on the switch

A switch can be configured directly by means of a command line interface. For more information, refer to the following configuration documents:

- *Base Configuration*
- *Advanced Ethernet Configuration*
- *Advanced OAM Configuration*
- *MPLS Configuration*

System capabilities

This chapter describes system capabilities of the 39XX/51XX platforms. Topics are:

Networking capabilities

This section describes the network capabilities of the 39XX/51XX platforms. Topics are:

Physical ports

Table 5-1 lists the port capacity.

Table 5-1
Physical ports

Platform	Port capacity	Type
3903	3	1 UNI, 2 NNI
3903x	3	1 UNI, 2 NNI
3904	4	2 UNI, 2 NNI
3905	4	2 UNI, 2 NNI
3906	6	4 UNI, 2NNI
3924 AC single	8	4 UNI, 4 NNI
3924 AC dual	8	4 UNI, 4 NNI
3924 DC dual	8	4 UNI, 4 NNI
3926	8	4 UNI, 4 NNI
TDM FRU in 3926	16	
Combo TDM OC48 FRU in 3926	16 total 14 usable	
3928 AC, 3928 DC	12	8 UNI, 4 NNI
3942	24	20 UNI, 4 NNI
5142	24	20 UNI, 4 NNI
5160	24	24 UNI/NNI

Aggregate ports

Table 5-2 shows the number of link aggregation groups supported for each platform, and whether enhanced hashing is supported.

Table 5-2
Aggregate ports

Platform	Number of link aggregation groups	Number of physical ports per link aggregation group	Enhanced Hashing support
3903	3	3	Yes
3903x	3	3	Yes
3904	4	4	Yes
3905	4	4	Yes
3906	6	6	Yes
3924 AC single, 3924 AC dual, 3924 DC dual	8	8	Yes
3926	8	8	Yes
3928 AC, 3928 DC	8	8	Yes
3942	8	8	Yes
5142	8	8	Yes
5160	8	8	Yes

Virtual switches

The number of virtual switches and members supported for Q-in-Q depends upon the platform capabilities as shown in Table 5-3.

Table 5-3
Virtual switch capacity

Platform	Virtual switches	Virtual switch members per port	Virtual switch members per switch
3903	1024	3072	3072
3903x	1024	3072	3072
3904	1024	3072	3072
3905	1024	3072	3072
3906	1024	3072	3072
3924 AC single, 3924 AC dual, 3924 DC dual	1536	2048	2048
3926	1536	2048	2048
3928 AC, 3928 DC	1536	2048	2048
3942	4092	4095	8192
5142	4092	4095	16384
5160	4092	4095	16384

Note 1: The number of virtual switches and virtual switch members for each port and switch supported for Q-in-Q are reduced by the number of virtual switches and virtual switch members per port and switch configured for MPLS.

Note 2: Virtual circuits and virtual switches have a 1:1 relationship. A virtual circuit can only be associated with one virtual switch. A virtual switch can only be associated with one virtual circuit.

Static MAC addresses

The number of static MAC addresses supported for each platform are shown in Table 5-4.

Table 5-4
Static MAC addresses by platform.

Platform	Static MACs
3903	1024
3903x	1024
3904	1024
3905	1024
3906	1024
3924 AC single, 3924 AC dual, 3924 DC dual	1024
3926	1024
3928 AC. 3928 DC	1024
3942	1024
5142	1024
5160	2048

Dynamic MAC addresses

The number of dynamic MAC addresses supported for each platform are shown in Table 5-5.

Table 5-5
Dynamic MAC addresses by platform.

Platform	Static MACs
3903	16000
3903x	16000
3904	16000
3905	16000
3906	16000
3924 AC single, 3924 AC dual, 3924 DC dual	32000
3926	32000
3928 AC, 3928 DC	32000
3942	32000
5142	128000
5160	128000

Traffic profiling classifiers

Traffic profiling (also known as ingress metering) classifies traffic and meters the traffic flow to configured rates defined in kbps. Classification can be based on 802.1D, IP precedence, DSCP, and VLAN. The maximum number of classifiers (including ARP and non-conforming) that are configurable per mode and per port (without any adjustment to resource management) are listed in Table 5-6.

Note: The actual number of configurable classifiers will be less due to reserved profiles (ARP/non-conforming) per port. Each port automatically consumes two classifiers: one for ARP and one for non-conforming standard profiles.

Table 5-6
Traffic profiling classifiers

Classifier	Per mode	Per port (3903, 3903x, 3904, 3905, 3906, 3924 AC single, 3924 AC dual, 3924 DC dual, 3926, 3928 AC, 3928 DC	Per port (3942)	Per port (5142, 5160)
dot1dpri	8	8	8	8
ip-prec (ipp)	8	8	8	8
dscp	64	64	64	64
vlan or vs*	1	1024	2048	4096
vlan or vs/dot1dpri*	8	1024	2048	4096
vlan or vs/ip-prec*	8	1024	2048	4096
vlan or vs/dscp*	64	1024	2048	4096
untagged	1	1	1	1

G.8032 logical and virtual rings

Table 5-7 lists the number of ports, logical rings, and virtual rings by platform.

Table 5-7
Number of ports, logical rings, and virtual rings by platform

Platform	Number of ports	Logical rings	Virtual rings
3903	3	2	4
3903x	3	2	4
3904	4	3	6
3905	4	3	6
3906	3	2	4
3924 AC single, 3924 AC dual, 3924 DC dual	8	7	14
3926	8	10	20
3928	12	11	22
3942	24	23	46
5142	24	23	46
5160	24	23	46

IP-ACL scale

Table 5-8 shows show the maximum supported IP-ACL count on different platforms.

Table 5-8
Maximum supported IP-ACL count by platform

Platform	Maximum supported IP-ACL count
3942, 5142, 5160	64
3924, 3926, 3928	64
3903, 3903x, 3904, 3905, 3906	64

MPLS capabilities

Table 5-9 lists the following capabilities by platform:

- ingress tunnels
- egress tunnels
- transit tunnels
- dynamic co-routed tunnels

- bidirectional LSP protection groups
- tunnel protection switching for one tunnel

Table 5-9
MPLS capabilities

Platform	Ingress Tunnels	Egress Tunnels	Transit Tunnels	Dynamic Co-routed Bidirect-ional Tunnels [1]	Bidirectional LSP Protection Groups	Tunnel Protection Switching Time (LSP BFD)
3924 AC single, 3924 AC dual, 3924 DC dual	400[3]	400	400	200	200	Protection switching support in hardware and in software. Switching time depends on the number of tunnels and VCs: <50 ms for 20 PWs on 1 to 20 tunnel groups
3926[2]	400[3]	400	400	200	200	Protection switching support in hardware and in software. Switching time depends on the number of tunnels and VCs: <50 ms for 20 PWs on 1 to 20 tunnel groups
3928 AC[2], 3928 DC[2]	400[3]	400	400	200	200	Protection switching support in hardware and in software. Switching time depends on the number of tunnels and VCs: <50 ms for 20 PWs on 1 to 20 tunnel groups

Platform	Ingress Tunnels	Egress Tunnels	Transit Tunnels	Dynamic Co-routed Bidirect-ional Tunnels [1]	Bidirectional LSP Protection Groups	Tunnel Protection Switching Time (LSP BFD)
3942	2000	2000	4000	200	1000	Protection switching support in hardware: • < 50 ms for 128 tunnel groups, 256 VCs • < 6 ms for 1 tunnel group, 256 VCs
5142	2000	2000	4000	200	1000	Protection switching support in hardware: • < 50 ms for 128 tunnel groups, 256 VCs • < 6 ms for 1 tunnel group, 256 VCs
5160	2000	2000	4000	200	1000	Protection switching support in hardware: • < 50 ms for 128 tunnel groups, 256 VCs • < 6 ms for 1 tunnel group, 256 VCs

1.The lower capability limit for dynamic co-routed bidirectional tunnels is not enforced at the CLI, but the limit must be observed to ensure system performance.

2. On 3926 and 3928, the hardware resource limit, which is shared between MPLS virtual circuits (pseudowires) and label switched paths (ingress and transit tunnel), is 1400. Due to that limit, the maximum capacity is dependent upon the current system configuration, that is, the maximum capacity is dependent upon the current number of MPLS virtual circuits and label switched paths. Each MPLS pseudowire can consume a maximum of two HW resources. An ingress tunnel consumes one HW resource. A transit tunnel consumes one HW resource.

Table 5-10 lists the following capabilities by platform:

- PWs for each VPLS
- VPLS
- VPWS
- Virtual circuits (pseudowires)
- VPWS VS
- AC (EVPL)

Table 5-10
MPLS capabilities

Platform	PWs per VPLS	VPLS	VPWS	Virtual Circuits (Pseudowires)	VPWS VS	AC (EVPL)
3924 AC single, 3924 AC dual, 3924 DC dual	500	250	500	500[1]	500	500
3926	500	250	500	500[1]	500	500[2]
3928 AC, 3928 DC	500	250	500	500[1]	500	500
3942	4000	2000	4000	4000[3]	4000	4000
5142	8000	2000	4000	8000[3]	4000	4000
5160	8000	2000	4000	8000[3]	4000	4000

1. On 3926 and 3928, the hardware resource limit, which is shared between MPLS virtual circuits (pseudowires) and label switched paths (ingress and transit tunnel), is 1400. Due to that limit, the maximum capacity is dependent upon the current system configuration, that is, the maximum capacity is dependent upon the current number of MPLS virtual circuits and label switched paths. Each MPLS pseudowire can consume a maximum of two HW resources. An ingress tunnel consumes one HW resource. A transit tunnel consumes one HW resource.
2. If a 3926 is equipped with a Combo TDM OC48 FRU module, the maximum number of attachment circuits is 2,302.
3. The value is 1000 for dynamic co-routed tunnels.

Table 5-11 lists the following capabilities by platform:

- Dual home PW protection (2 PWs)
- Dual home PW protection (10 PWs)
- IGP (ISIS routes)
- IGP (OSPF routes)

Table 5-11
MPLS capabilities

Platform	Dual home PW Protection (2 PWs)	Dual home PW protection (10 PWs)	IGP (ISIS Routes)	IGP (OSPF Routes)
3924 AC single, 3924 AC dual, 3924 DC dual			2000	2000
3926			2000	2000
3928 AC, 3928 DC			2000	2000
3942			4000	4000
5142			4000	4000
5160	<=1 sec	<=5 sec	4000	4000

Note: The 39XX/51XX system software does not block users from configuring more tunnels than the maximum recommended per port. If tunnels are configured beyond the recommended numbers, the system might become unstable.

Table 5-12 shows the MPLS PW scale limitations.

Table 5-12
MPLS PW scale limitations

	Standalone No VC Switching		MTU VC Switching	
Dynamic VC/Port (VPLS)	4000	Status TLV off	1000	Status TLV on
Static VC/Port (VPLS)	4000	Status TLV off	2000	Status TLV on
Dynamic VC/Port (VPWS)	4000	Status TLV off	N/A	Status TLV off
Static VC/Port (VPWS)	4000	Status TLV off	N/A	Status TLV off.
Dynamic Tunnels/Port	1000		500	
Static Tunnels/Port	1000		500	

	Standalone No VC Switching		**MTU VC Switching**	
VC/Tunnel Ratio	Full Scale, less than 20	2	Full Scale, less than 20	
PW Reversion Time	N/A		Full Scale, less than 120 sec	
Refresh Interval	N/A		Full Scale, less than 60 sec	

Table 5-13 shows the platform capabilities for related protocols.

Table 5-13
Related protocol capabilities

Platform	**IP Interfaces**	**OSFP areas**	**IS-IS areas**	**RSVP-TE Paths**
3924 AC single, 3924 AC dual, 3924 DC dual	64	3	3	500 with 16 hops per path
3926	64	3	3	500 with 16 hops per path
3928 AC, 3928 DC	64	3	3	500 with 16 hops per path
3942	256	3	3	500 with 16 hops per path
5142	256	3	3	500 with 16 hops per path
5160	128	3	3	500 with 16 hops per path

Table 5-14 describes the capabilities of CVID bundling, ingress and egress L2 transforms and RCoS:

Table 5-14
CVID bundling, L2 transforms and RCoS limitations

Feature	**5142, 5160**	**3924 AC, 3924 dual AC, 3924 dual DC, 3926, 3928 AC, 3928 DC, 3942**
CVID Bundling	Supported	Supported
Egress-l2-transform		
Pop only for traffic withTPID=8100	Supported	Supported
Push-8100/88a8/9100.<vlanid> for traffic with TPID-8100, 88a8, 9100	Supported	Supported
Stamp-8100.<vlanid> only for traffic with TPID=8100	Supported	Supported
Ingress-l2-transform		
Pop for traffic with TPID=8100, 88a8, 9100	Supported	Supported
Push-8100.<vlanid> for traffic with TPID-8100, 88a8, 9100	Supported	Supported
Stamp-8100.<vlanid>	Supported	Supported
Ingress-RCoS (encap-cos-policy per (port, vlan))		
Fixed (untrusted) vs-encap-cos-policy=vs-inherit or fixed	Supported	Supported
Mapped (trusted vs-encap-cos-policy=port-inherit port rcos-policy=dot1d-tag1-cos, l3-dscp,fixed	Supported	Supported
Egress-RCoS (port based)	Supported	Supported

LSP switching performance information

Table 5-15 provides LSP switching performance information with respect to

fault recovery on the 5160 platform.

Table 5-15
LSP switching performance information (in milliseconds) on the 5160

Number of services	LSP	Number of PWs	Average time for left to right	Average time for right to left	Maximum time for left to right	Maximum time for right to left
Port fault at LER						
2000	100	20	20.34	38.38	33.05	52.3
2000	50	40	21.22	30.87	33.05	38.6
2000	20	100	11.7	28.6	13.7	33.6
BFD-propagated fault						
2000	100	20	36.06	35.83	49.58	49.58
2000	50	40	28.8	29.15	35.81	35.81
2000	20	100	26.48	26.7	30.3	33
Unidirectional fiber fault						
2000	100	20	28.17	36.3	41.3	49.5
2000	20	100	14.5	26	22	30

Table 5-16 provides LSP switching performance information with respect to fault recovery on the 3928 platform.

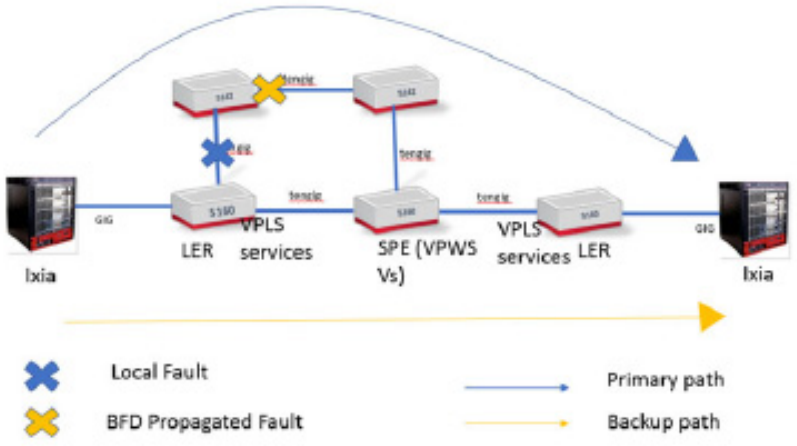
Table 5-16
LSP switching performance information (in milliseconds) on the 3928

Number of services	LSP	Number of PWs	Average time for left to right	Average time for right to left	Maximum time for left to right	Maximum time for right to left
Port fault at LER						
250 (max)	50	5	23.527	35.757	33.5	44.385
BFD-propagated fault						
250 (max)	50	5	33.546	21.801	41.934	26.774

Note: The number of services differ based on Table 5-10, “MPLS capabilities” on page 5-11.

This topology was used for the LSP switching performance results:

Figure 5-1
Topology used for LSP switching performance information



These parameters were used for the LSP switching performance results:

- Tunnel type: Static co-routed tunnel
- Pseudowire type: Static pseudowire
- Traffic: Unicast traffic
- BFD interval: 10 ms
- VS mode: VPLS
- Scenario: MS-PW

OAM capabilities

Table 5-17 lists the OAM capabilities of the 39XX/51XX switches.

Table 5-17
OAM capabilities

Capability	Capacity
CFM and Y.1731 sessions	
CFM (Hardware-based CCMs) total sessions	
3.3ms sessions	512 for 3903, 3903x, 3904, 3905, 3924 AC single, 3924 AC dual, 3924 DC dual, 3926, 3928 AC, 3928 DC, 3942, 5142, 5160

Capability	Capacity
10ms sessions	512 for 3903, 3903x, 3904, 3905, 3924 AC single, 3924 AC dual, 3924 DC dual, 3926, 3928 AC, 3928 DC, 3942, 5142, 5160
100ms sessions	512 for 3903, 3903x, 3904, 3905, 3924 AC single, 3924 AC dual, 3924 DC dual, 3926, 3928 AC, 3928 DC, 3942, 5142, 5160
1s sessions	1000 for 3903, 3903x, 3904, 3905 2000 for 3924 AC, 3924 AC dual, 3924 DC dual, 3926 and 3928 AC, 3928 DC 4000 for 3942, 5142, 5160
Y.1731	
100ms interval sessions	250 for 3903, 3903x, 3904, 3905, 3924 AC single, 3924 AC dual, 3924 DC dual, 3926, 3928 AC, 3928 DC, 3942, 5142, 5160
10ms interval sessions	25 for 3903, 3903x, 3904, 3905, 3924 AC single, 3924 AC dual, 3924 DC dual, 3926, 3928 AC, 3928 DC, 3942, 5142, 5160
BFD sessions	
IP BFD sessions	
10ms sessions	32 for 3942, 5142
100ms sessions	100 for 3942, 5142, 5160
300ms sessions	100 for 3931 200 for 3942, 5142, 5160
1s sessions	greater than or equal to 200 for 3942, 5142, 5160
LSP BFD sessions	
3.3ms sessions	200 in HW for 3924, 3926, 3928 380 in HW for 3942, 5142, 5160
10ms sessions	24 in SW for 3924, 3926, 3928 32 in SW for 3942, 5142, 5160 200 in HW for 3924, 3926, 3928 750 in HW for 3942, 5142, 5160
100ms sessions	100 in SW for 3924, 3926, 3928, 3942, 5142, 5160 200 in HW for 3924, 3926, 3928 1000 in HW for 3942, 5142, 5160

Capability	Capacity
300ms sessions	200 in SW for 3924, 3926, 3928, 3942, 5142, 5160 200 in HW for 3924, 3926, 3928 1000 in HW for 3942, 5142, 5160
1s sessions	300 in SW for 3924, 3926, 3928 200 in HW for 3924, 3926, 3928 1000 in SW for 3942, 5142, 5160 1000 in HW for 3942, 5142, 5160
10s sessions	300 in SW for 3924, 3926, 3928 200 in HW for 3924, 3926, 3928 1000 in SW for 3942, 5142, 5160 1000 in HW for 3942, 5142, 5160
AIS/LDI sessions	
On-demand CV&RT sessions	

Management capabilities

Table 5-18 lists the management capabilities of the 6.x devices.

Table 5-18
Management capabilities

Capability	Capacity
Protocols	
SSH_SFTP sessions	16
SNMP trap servers	17
Syslog Collectors	16
Surveillance	
PM instances total	
PM bins total	96 per instance
RMON	
userHistoryControlBuckets	6400
userHistoryObjects	256
Infrastructure	
RADIUS servers	8
TACACS servers	8
NTP servers	10
DNS servers	3
Local user accounts	100

Service Activation Test capabilities with Y.1564

Table 5-19 and Table 5-20 show the Y.1564 solution UNI generator simultaneous test session scale and capabilities.

Table 5-19
UNI generator simultaneous test scale and capabilities

Platform	Generator simultaneous test sessions (LM/chassis)	Reflector address swap			
		MAC SA/DA	IPv4 SA/DA	IPv6 SA/DA	UDP/TCP Src/Dest port
3903	32	Y	Y	Y	Y
3904	32	Y	Y	Y	Y
3905	32	Y	Y	Y	Y
3924 AC single, 3924 AC dual, 3924 DC dual	32	Y	Y	Y	Y
3926	32	Y	Y	Y	Y
3928 AC, 3928 DC	32	Y	Y	Y	Y
3942	32	Y	Y	Y	Y
5142	32	Y	Y	Y	Y
5160	128	Y	Y	Y	Y

Table 5-20
UNI generator simultaneous test scale and capabilities

Platform	Addressability		
	MAC	IPv4	IPv6
3903	Y	Y	Y
3904	Y	Y	Y
3905	Y	Y	Y
3924 AC single, 3924 AC dual, 3924 DC dual	Y	Y	Y

Table 5-20
UNI generator simultaneous test scale and capabilities

Platform	Addressability		
	MAC	IPv4	IPv6
3926	Y	Y	Y
3928 AC, 3928 DC	Y	Y	Y
3942	Y	Y	Y
5142	Y	Y	Y
5160	Y	Y	Y

Table 5-21 shows the Y.1564 solution UNI generator platform support.

Table 5-21
UNI generator platform support

Platform	Up to 1 Gbps	Up to 10 Gbps	Up to 100 Gbps
3903	SAOS 6.13	Not supported	Not supported
3904	SAOS 6.13	Not supported	Not supported
3905	SAOS 6.13	Not supported	Not supported
3924 AC single	SAOS 6.21	SAOS 6.21	Not supported
3924 AC dual	SAOS 6.21.1	SAOS 6.21.1	Not supported
3924 DC dual	SAOS 6.21.1	SAOS 6.21.1	Not supported
3926	SAOS 6.17	Not supported	Not supported
3928 AC, 3828 DC	SAOS 6.17	Not supported	Not supported
3942	SAOS 6.13	Not supported	Not supported
5142	SAOS 6.11	Not supported	Not supported
5160	SAOS 6.11	SAOS 6.11	Not supported

Operations and maintenance

This chapter provides an overview of operations and maintenance for the 39XX/51XX Switches and Platforms.

Operations

Table 6-1 shows the operating and storage conditions, including operating temperature range, maximum humidity, and storage temperature range.

Table 6-1
Operating and storage conditions

Platform	Operating temperature range	Maximum humidity	Storage temperature range
3903	-5C to +45C (23F to 113F)	90%	-40C to +70C (-40F to 158F)
3903x	0C to +40C (32F to 104F)	90%	-40C to +70C (-40F to 158F)
3904	-5C to +65C (23F to 149F)	90%	40C to +70C (-40F to 158F)
3905	-40C to +65C (-40F to 149F)	100%	-40C to +85C (-40F to 185F)
3906	0C to +40C (32F to 104F)	90%	-40C to +70C (-40F to 158F)
3924 AC single	0C to 50C (32F to 122F)	5% to 95%	-40C to +70C (-40F to 158F)
3924 AC dual	0C to 50C (32F to 122F)	5% to 95%	-40C to +70C (-40F to 158F)
3924 DC dual	-40C to +65C (-40F to 149F)	5% to 95%	-40C to +70C (-40F to 158F)
3926	-40C to 65 C (-40F to 149F)	95%	-40C to 70C (-40F to 158F)
3928 AC	0C to 50C (32F to 122F)	95%	-40C to 70C (-40F to 158F)
3928 DC	-40C to 65C (-40F to 149F)	95%	-40C to 70C (-40F to 158F)
3942	-5C to +65C (23F to 149F)	90%	-40C to 70C (-40F to 158F)
5142	-40C to 65C (-40F to 149F)	95%	-40C to 70C (-40F to 158F)
5160	-40C to 65C (-40F to 149F)	95%	-40C to 70C (-40F to 158F)

Maintenance

Table 6-2 summarizes the maintenance tasks for each platform.

Table 6-2
Maintenance tasks

Platform	Maintenance tasks
3903	No maintenance tasks for this platform
3903x	No maintenance tasks for this platform
3904	No maintenance tasks for this platform
3905	No maintenance tasks for this platform
3906	No maintenance tasks for this platform
3924 AC single, 3924 AC dual, 3924 DC dual	No maintenance tasks for this platform
3926	The 3926 maintenance tasks include: • Replacing an AC power supply • Replacing an DC power supply Refer to the 3926 Platform Hardware Installation and Startup Manual in the Maintenance chapter for details.
3928 AC, 3928 DC	No maintenance tasks for this platform
3942	No maintenance tasks for this platform
5142	The 5142 maintenance tasks include: • Replacing an AC power supply • Replacing an DC power supply Refer to the 5142 Service Delivery Switch Hardware Installation and Start-up Manual in the Maintenance chapter for details.
5160	The 5160 maintenance tasks include: • Replacing an AC power supply • Replacing an DC power supply Refer to the 5160 Service Delivery Switch Hardware Installation and Start-up Manual in the Maintenance chapter for details.

System physical specifications

This chapter summarizes the technical specifications for the 39XX/51XX Switches and Platforms.

3903 switch specifications

Table 7-1 summarizes the technical specifications for the 3903 switch.

Table 7-1
3903 switch specifications

Feature	Specification	
Fault Tolerance	Redundant power supplies	
Power Rating	AC Input Power	Two integrated AC power supplies 90 volts to 264 volts AC
	DC Input Power	Two integrated DC power supplies -24V, -24V, -36V, -48DC Nominal Terminal blocks with covers
Power Consumption	Typical Power Consumption	27W
	Maximum Power Consumption	45W maximum
Connector Types	3 1G/100M SFP	SFP optics
	1 1G/100M SFP, 10/100/100M Combo Port	RJ-45
	Console Port	RJ-45 (EIA-561)
	IEC C14 AC power connector	
	DC Terminal Block	terminal spade
Physical	Chassis Dimensions	3.81 cm H x 21.59 cm W x 20.37 cm D (1.5 in H x 8.5 in W x 8.02 in D)
	Rack Unit Height	1 RU

Feature	Specification	
Environmental	Ambient Operating Temperature	Includes indoor locations and partially controlled environments. -5C to +45C (23F to 113F)
	Operating Humidity	5% to 90%, non-condensing
	Storage	-40C to +70C (-40F to 158F)

3903x switch specifications

Table 7-2 summarizes the technical specifications for the 3903x switch.

Table 7-2
3903x switch specifications

Feature	Specification	
Power Rating	AC Input Power	90 VAC to 264 VAC (wall-mounted)
Power Consumption	Typical Power Consumption	12.90W
	Maximum Power Consumption	15W maximum
Connector Types	3 1G/100M SFP	SFP optics
	1 10/100/1000	RJ-45
	Console Port	RJ-45 (EIA-561)
Physical	Chassis Dimensions	6.0 in W x 6.8 in D x 7.7 in H (15.24 cm W x 17.27 cm D x 19.55 cm H)
	Weight	1.5 lb (0.74 kg) (Power Adapter: 0.4 lbs (0.2 kg)
Environmental	Ambient Operating Temperature	Includes indoor locations and partially controlled environments. 0C to +40C (32F to 104F)
	Operating Humidity	5% to 90%, non-condensing
	Storage	-40C to +70C (-40F to 158F)

3904 switch specifications

Table 7-3 summarizes the technical specifications for the 3904 switch.

Table 7-3
3904 switch specifications

Feature	Specification	
Fault Tolerance	Redundant power supplies	
Power Rating	AC Input Power	Two integrated AC power supplies 90 volts to 264 volts AC
	DC Input Power	Two integrated DC power supplies +24V, -24V, -36V, -48VDC Nominal Terminal blocks with covers
Power Consumption	Typical Power Consumption	47W
	Maximum Power Consumption	55W
Connector Types	2 x 1G/100M SFP UNI/NNI ports	SFP optics
	2 x 1G/100M SFP NNI ports	SFP optics
	2 x 10/10/100M UNI combo ports	RJ-45
	1 x SYNC port (BITS/TOD)	RJ-45 (custom cable)
	1 x 10 MHz	50 Ohm SMB interface
	1 x PPS	50 Ohm SMB interface
	Console Port	RJ-45 (EIA-561)
	IEC C14 AC power connector	
	DC Terminal Block	terminal spade
Physical	Chassis Dimensions	4.34 cm H x 27.56 cm W x 20.4 cm D (1.71 in H x 10.85 in W x 8.03 in D)
	Rack Unit Height	1 RU
Environmental	Ambient Operating Temperature	Includes indoor locations and partially controlled environments. -5C to +65C (23F to 149F)
	Operating Humidity	5% to 90%, non-condensing
	Storage	-40C to +70C (-40F to 158F)

3905 switch specifications

Table 7-4 summarizes the technical specifications for the 3905 switch.

Table 7-4
3905 switch specifications

Feature	Specification	
Fault Tolerance	Redundant power supplies	
Power Rating	AC Input Power	90 volts to 264 volts AC
	DC Input Power	• -48VDC steady state-state value range = -42.5V to -56.7V • +24VDC steady state-state value range = +19.V to +28.3V • -24VDC steady state-state value range = -19.2 V to -28.3V
	Cable AC Input Power	60 to 90V AC quasi-square wave input 47 to 63 Hz input
Power Consumption	Typical Power Consumption	21.66W
	Maximum Power Consumption	24W
Connector Types	NNI Ports (1 Gbps and 100 Mbps)	SFP optics
	Local Management Port	RJ-45
	Console Port	RJ-45 (EIA-561)
	IEC C13 power connector	
	UNI combo ports (1 Gbps, 10/100/1000M)	RJ-45
Physical	Chassis Dimensions	The dimensions are as follows: • 17.78 cm H (with bracket) x 26.67 cm x 38.1 cm (7 in H (with bracket) x 10.5 in x 15 in)
	Door Clearance	27.94 cm (11 in)
	Weight	10 lb (4.5 kg)

Feature	Specification	
Environmental	Ambient Operating Temperature	Includes indoor locations and partially controlled environments. -40C to +65C (-40F to 149F)
	Operating Humidity	5 - 100%, non-condensing
	Storage	-40C to +85C (-40F to 185F)
	Enclosure Type	4X
	Pollution Degree	3

3906 switch specifications

Table 7-5 summarizes the technical specifications for the 3906 switch.

Table 7-5
3906 switch specifications

Feature	Specification	
Fault Tolerance	Redundant power supplies	
Power Rating	AC Input Power	Two integrated AC power supplies: 1 AC power supply, 1 redundant, dual AC power supply 90 volts to 264 volts AC
Power Consumption	Typical Power Consumption	Base chassis (no x86 NFV server module), 30W Chassis with x86 NFV server module, 82W
	Maximum Power Consumption	Base chassis (no x86 NFV server module), 49W Chassis with x86 NFV server module, 125W
Connector Types	2 x 10M/100M/1000M	RJ-45
	2 x 100M/1000M SFP	SFP optics
	2 x 10/100M/1000M combo	RJ-45 and SFP
	Local Management Port	RJ-45
	Console Port	RJ-45 (EIA-561)
	IEC C14 AC power connector	
Physical	Chassis Dimensions	4.32 cm H x 44.45 cm W x 27.94 cm D (1.7 in H x 17,5 in W x 11 in D)
	Rack Unit Height	1 RU

Feature	Specification	
Environmental	Ambient Operating Temperature	Includes indoor locations and partially controlled environments. 0C to +40C (32F to 104F)
	Operating Humidity	5% to 90%, non-condensing
	Storage	-40C to +70C (-40F to 158F)

3924 switch specifications

Table 7-6 summarizes the technical specifications for the 3924 switch.

Table 7-6
3924 switch specifications

Feature	Specification	
Fault Tolerance	Power supply	• One fixed AC power supply • Dual, redundant AC power supply • Dual, redundant DC power supply
	Fans	Tolerance for one fan failure
Power Rating	AC input power	AC power unit rating range: • 100 VAC - 240 VAC, 50/60 Hz, 0.65 A Recommended fuse/breaker size: 3 A
	DC input power	DC power unit rating range: • -20 VDC to -48 VDC, 1.9A/0.94 A Nominal: • -48 VDC Recommended fuse/breaker size: 5 A

Feature	Specification	
Power Consumption	3924 single AC	Typical power consumption: • 10 GbE Ethernet Model: 23 W • 10 GbE Ethernet, Sync Enabled Model: 28 W Maximum power consumption • 10 GbE Ethernet Model: 30 W • 10 GbE Ethernet, Sync Enabled Model: 35 W
	3924 dual AC	• Typical power consumption: 23 W • Maximum power consumption: 30 W
	3924 dual DC	• Typical power consumption: 23 W • Maximum power consumption: 35 W
Connector Types	4 x 100 MbE/1 GbE SFP/SFP+ ports	SFP/SFP+ optics
	4 x 1/10 GbE SFP/SFP+ ports	SFP/SFP+ optics
	1 Console Port	RJ45 (EIA-561)
	1 Management Port	RJ45
	1 Universal Serial Bus Port	USB 2.0
	AC power connector	IEC C14
	DC power connector	Terminal block with cover
Physical	Chassis Dimensions	3924 single AC: • 21.59 cm W x 25.031 cm D x 4.06 cm H (8.5 in W x 9.85 in D x 1.6 in H)
		3924 dual AC and 3924 dual DC: • 29.44 cm W x 25.044 cm D x 4.39 cm H (11.52 in W x 9.86 in D x 1.73 in H)
	Rack Unit Height	1 RU
	Weight without optics	3924 single AC: 3.90 lb (1.77 kg)
		3924 dual AC and 3924 dual DC: 5.64 lb (2.56 kg)

Feature	Specification	
Environmental	Ambient Operating Temperature ***Note:*** The temperature range applies to indoor locations and partially-controlled environments.	3924 single AC and 3924 dual AC: • 0° C to +50° C (32° F to 122° F)
		3924 dual DC: • -40° C to +65° C (-40° F to 149° F)
	Operating Humidity	5% to 95%, non-condensing
	Storage	-40° C to +70° C (-40° F to +158° F)

3926 switch specifications

Table 7-7 summarizes the technical specifications for the 3926 switch.

Table 7-7
3926 switch specifications

Feature	Specification	
Fault Tolerance	Redundant power supplies	
Power Rating	AC Input Power	Two pluggable AC power supplies 100 volts to 240 volts AC Nominal
	DC Input Power	Two pluggable DC power supplies -24, + 24, -36, -48VDC Nominal
Power Consumption	Typical Power Consumption	Base chassis (no module), 48 W
	Maximum Power Consumption	Base chassis (no module), 71W
Connector Types	2 x 1G/100M SFP	SFP optics
	6 x 10G/1G SFP+	SFP+ optics
	Console Port	RJ-45 (EIA-561)
	Management Port	RJ-45
	1 PPS, Frequency	mini coaxial
	BITS	RJ-45
	SYNC	RJ-45
	DC power terminal	14 AWG (2 mm^2) - 18 AWG (0.8 mm^2) wire
	AC power connector	IEC C14

Feature	Specification	
Physical	Chassis Dimensions	4.4 cm H x 44.57 cm W x 25.17cm D (1.75 in H x 17.55 in W x 9,91 in D)
	Rack Unit Height	1 RU
	Weight with 2 PSUs (no module)	8.0 lbs (3.63 kg)
	Weight with 2 PSUs and module	9.0 lbs (4.08 kg)
Environmental	Ambient Operating Temperature	Includes indoor locations and partially controlled environments -40C to +65C (-40F to 149F)
	Operating Humidity	5 to 90%, non-condensing
	Storage	-40C to +70C (-40F to 158F)

3928 switch specifications

Table 7-8 summarizes the technical specifications for the 3928 switch.

Table 7-8
3928 switch specifications

Feature	Specification	
Fault Tolerance	Redundant power supplies	
Power Rating	AC Input Power	Two integrated AC power supplies 100 volts to 240 volts AC
	DC Input Power	Two integrated DC power supplies +24V, -24V, -36V, -48VDC Nominal Terminal blocks with covers
Power Consumption	Typical Power Consumption	AC: 40W DC: 45W
	Maximum Power Consumption	AC: 45W DC: 50W

Feature	Specification	
Connector Types	4 x 1G/100M SFP ports	SFP optics
	4 x 1G SFP ports	SFP optics
	4 x 10G/1G SFP+ ports	SFP+ optics
	1 x SYNC port (BITS/TOD)	RJ-45 (custom cable) - DC only
	1x BITS port (BITS/TOD)	RJ-45 (custom cable) - DC only
	1 x 10 MHz	50 Ohm SMB interface - DC only
	1 x PPS	50 Ohm SMB interface - DC only
	Console Port	RJ-45 (EIA-561)
	IEC C14 AC power connector	AC only
	DC Terminal Block	terminal spade - DC only
Physical	Chassis Dimensions	4.45 cm H x 44.53 cm W x 23.28 cm D (1.75 in H x 17.53 in W x 9.17 in D)
	Rack Unit Height	1 RU
	Weight with TDM module	3.63 kg (8.0 lbs)
Environmental	Ambient Operating Temperature	Includes indoor locations and partially controlled environments. **DC version:** -40C to +65C (-40F to 149F) **AC version:** 0C to +50C (32F to 122F)
	Operating Humidity	5 to 95%, non-condensing
	Storage	-40C to +70C (-40F to 158F)

3942 switch specifications

Table 7-9 summarizes the technical specifications for the 3942 switch.

Table 7-9
3942 switch specifications

Feature	Specification	
Fault Tolerance	Redundant power supplies	
Power Rating	AC Input Power	1A

Feature	Specification	
Power Consumption	Typical Power Consumption	65W
	Maximum Power Consumption	100W
Connector Types	NNI / UNI Ports (1/10 Gigabit)	SFP and SFP+ optics
	Local Management Port (10/100/1000 Mbps)	RJ-45
	Console Port	RJ-45 (EIA-561)
	IEC C14 power connector	
	UNI ports 1-29 (10/100/1000)	RJ-45
Physical	Chassis Dimensions	4.4 cm H x 44.4 cm W x 25.4 cm D (1.75 in H x 17.5 in W x 10 in D)
	Rack Unit Height	1 RU
Environmental	Ambient Operating Temperature	Includes indoor locations and partially controlled environments. -5C to +65C (23F to 149F)
	Operating Humidity	5 to 90%, non-condensing
	Storage	-40C to +70C (-40F to 158F)

5142 switch specifications

Table 7-10 summarizes the technical specifications for the 5142 switch.

Table 7-10
5142 switch specifications

Feature	Specification	
Fault Tolerance	Redundant power supplies	
Power Rating	AC Input Power	100 to 240 VAC, 50/60 Hz, 2.2 Amps max
	DC Input Power	-/+24 VDC. -/+36 VDC, or -/+ 48 VDC Minimum 20 VDC, Maximum 60 VDC, 10 Amps max
Power Consumption	Typical Power Consumption	85 W
	Maximum Power Consumption	150 W

Feature	Specification	
Connector Types	NNI / UNI Ports (1/10 Gigabit)	SFP and SFP+ optics
	Local Management Port (10/100/1000 Mbps)	RJ-45
	Console Port	RJ-45 (EIA-561)
	Sync Port (BITS/TOD)	RJ-45 (Custom cable)
	1 PPS Port	50 Ohm SMB interface
	10 MHz Port	50 Ohm SMB interface
	Alarm	26-pin D-sub
Physical	Chassis Dimensions	4.4 cm H x 44.4 cm W x 25.4 cm D (1.75 in H x 17.5 in W x 10 in D)
	Rack Unit Height	1 RU
Environmental	Ambient Operating Temperature	Outdoor Street Cabinets (GR-3108 class 2), huts and other unconditioned locations -40C to +65C (-40F to 149F)
	Operating Humidity	5 to 95%, non-condensing
Alarm Circuit	Alarm Sense	• Is negative with respect to local ground • Will be within +/- 60 V of local ground • The sense loop can be closed if the alarm sense is connected to a remote ground as opposed to the supplied sense return signal • Current in the sense loop will be less than 2 mA when closed with a short • The default state of each alarm circuit can be open or closed. The system will flag any state changes.
	Alarm Circuit Voltage	• The alarm will not be triggered with a leakage current of up to +/- 1 uA • The alarm will function normally if a resistance of 8.6K or less and a voltage of +/- 6.8 V or less is introduced into the loop.

5160 switch specifications

Table 7-11 summarizes the technical specifications for the 5160 switch.

Table 7-11
5160 switch specifications

Feature	Specification	
Fault Tolerance	Redundant power supplies	
Power Rating	AC Input Power	100 to 240 VAC, 50/60 Hz, 2.8 Amps maximum
	DC Input Power	-/+24 VDC. -/+36 VDC, or -/+ 48 VDC Minimum 20 VDC, Maximum 60 VDC, 12 Amps maximum
Power Consumption	Typical Power Consumption	113 W
	Maximum Power Consumption	175 W
Connector Types	NNI / UNI Ports (1/10 Gigabit)	SFP and SFP+ optics
	Local Management Port (10/100/1000 Mbps)	RJ-45
	Console Port	RJ-45 (EIA-561)
	Sync Port (BITS/Time of Day)	RJ-45 (Custom cable)
	1 PPS Port	50 Ohm SMB interface
	10 MHz Port	50 Ohm SMB interface
	Alarm	26-pin D-sub
Physical	Chassis Dimensions	4.4 cm H x 44.4 cm W x 25.4 cm D (1.75 in H x 17.5 in W x 10 in D)
	Rack Unit Height	1 RU
Environmental	Ambient Operating Temperature	Outdoor Street Cabinets (GR-3108 class 2), huts and other unconditioned locations -40C to +65C (-40F to 149F)
	Operating Humidity	5 to 95%, non-condensing

Feature	Specification	
Environmental	Ambient Operating Temperature	Outdoor Street Cabinets (GR-3108 class 2), huts and other unconditioned locations -40C to +65C (-40F to 149F)
	Operating Humidity	5 to 95%, non-condensing
Alarm Circuit	Alarm Sense	• Is negative with respect to local ground • Will be within +/- 60 V of local ground • The sense loop can be closed if the alarm sense is connected to a remote ground as opposed to the supplied sense return signal • Current in the sense loop will be less than 2 mA when closed with a short • The default state of each alarm circuit can be open or closed. The system will flag any state changes.
	Alarm Circuit Voltage	• The alarm will not be triggered with a leakage current of up to +/- 1 uA • The alarm will function normally if a resistance of 8.6K or less and a voltage of +/- 6.8 V or less is introduced into the loop.

Ordering

This chapter describes ordering considerations for the 39XX/51XX switches. Topics are:

For information about ordering transceivers, refer to *Packet Networking Transceivers Reference*.

3903 switch ordering

This table lists parts that are required for 3903 switches.

Table 8-1
Parts for 3903 switches

Part number	Description
170-3903-900	3903,(2)100M/1G SFP,(1)100M/1G SFP/RJ45,DUAL AC POWER,REQ. POWER CABLE
170-3903-901	3903,(2)100M/1G SFP,(1)100M/1G SFP/RJ45,DUAL DC POWER
Software	
Required OS Base System Perpetual Software Licenses	

Table 8-1
Parts for 3903 switches

Part number	Description
S70-0020-900	SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR 3903 SYSTEM
S70-0020-901	SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR 3903 SYSTEM
Optional OS Applications	
170-0204-900	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH SAOS 6.X
ESM Related	
S70-0021-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3903
Cables	
CABL-PW01AU	AC POWER CORD, IEC C13, AUSTRALIA, TYPE I
CABL-PW01CH	AC POWER CORD, IEC C13, SWITZERLAND, TYPE J
CABL-PW01EU	AC POWER CORD, IEC C13, EUROPE, TYPE F
CABL-PW01IN	AC POWER CORD, IEC C13, INDIA, TYPE D
CABL-PW01JA	AC POWER CORD, IEC C13, JAPAN, TYPE B
CABL-PW01NA	AC POWER CORD, IEC C13, NORTH AMERICA,TYPE B
CABL-PW01UK	AC POWER CORD, IEC C13, UNITED KINGDOM, TYPE G
CABL-PW01UN	AC POWER CORD, C13, UNIVERSAL
170-0044-900	AC POWER CORD, IEC C13, 10FT, NORTH AMERICA
170-0062-900	EIA-RJ45M STANDARD TO CISCO RJ45F SERIAL PORT ADAPTER,6 IN
170-0063-900	DB9F TO EIA-RJ45M STANDARD, 6 FT SERIAL CONSOLE CABLE
170-0064-900	DB9M TO EIA-RJ45M SERIAL PORT ADAPTER,6 IN

Table 8-1
Parts for 3903 switches

Part number	Description
Mounting and Brackets	
170-0109-900	19 INCHES RACK MOUNT EARS,FOR USE W/ 3903 ***Note:*** This mounting bracket kit is included when ordering the 170-3903-90x basic switch assembly, but can be separately ordered as a spare. This kit is also used for wall-mounting the 170-3903-90x basic switch assembly.
170-0105-900	23 INCHES RACK MOUNT EARS,FOR USE W/ 3903 ***Note:*** While the 19-inch mounting bracket kit is included in the 170-3903-90x basic switch assembly, this kit can be ordered separately if 23-inch rack mounting is required.

Cables provided by the network operator

In addition to the cables listed in Parts for 3903 switches, the following cables are to be provided by the network operator:

- Ethernet cables
- fiber cables

3903x switch ordering

This table lists parts that are required for 3903x switches.

Table 8-2
Parts for 3903x switches

Part number	Description
170-3903-910	3903x, (2)100M/1G SFP,(1)100M/1G SFP/RJ45,(1) SLOT EXTERNAL PWR SUP, INCLUDES EXT NA AC PSU
K70-3903-910	PTO KIT,3903X,(2)100M/1G SFP,(1)100M/1G SFP/RJ45,(1) SLOT EXT PWR SUP,INCLUDES 1 EXT GLOBAL PSU
Software	
Required OS Base System Perpetual Software Licenses	
S70-0020-900	SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR 3903 SYSTEM
S70-0020-901	SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR 3903 SYSTEM
Optional OS Applications	
170-0204-900	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH SAOS 6.X

Table 8-2
Parts for 3903x switches

Part number	Description
ESM Related	
S70-0021-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3903
Cables	
170-0062-900	EIA-RJ45M STANDARD TO CISCO RJ45F SERIAL PORT ADAPTER,6 IN
170-0063-900	DB9F TO EIA-RJ45M STANDARD, 6 FT SERIAL CONSOLE CABLE
170-0064-900	DB9M TO EIA-RJ45M SERIAL PORT ADAPTER, 6 IN
Miscellaneous	
170-0077-900	SPARE AC EXTERNAL POWER SUPPLY FOR USE IWTH 3903X, NORTH AMERICA
170-0078-900	SPARE AC EXTERNAL POWER SUPPLY FOR USE WITH 3903X, GLOBAL
170-0106-900	SPARE 3903X MOUNTING BRACKET FOR USE WITH 170-3903-910 ***Note:*** This mounting bracket kit is included when ordering the 170-3903-910 basic switch assembly, but can be separately ordered as a spare.

Cables provided by the network operator

In addition to the cables listed in Parts for 3903x switches, the following cables are to be provided by the network operator:

- Ethernet cables
- fiber cables

3904 switch ordering

This table lists parts that are required for 3904 switches.

Table 8-3
Parts for 3904 switches

Part number	Description
170-3904-900	3904,(2)100M/1G SFP,(2)100M/1G SFP/RJ45,SYNCH,DUAL AC POWER,REQ. POWER CABLE
170-3904-901	3904,(2)100M/1G SFP,(2)100M/1G SFP/RJ45,SYNCH,DUAL DC POWER
Software	

Table 8-3
Parts for 3904 switches

Part number	Description
Required OS Base System Perpetual Software Licenses	
S70-0023-900	SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR 3904
S70-0023-901	SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR 3904
Optional OS Applications	
S70-0023-903	SAOS ADVANCED SYNCHRONIZATION PERPETUAL SOFTWARE LICENSE FOR 3904 SYSTEM
170-0204-900	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH SAOS 6.X
ESM Related	
S70-0024-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3904
Cables	
170-0062-900	EIA-RJ45M STANDARD TO CISCO RJ45F SERIAL PORT ADAPTER,6 IN
170-0063-900	DB9F TO EIA-RJ45M STANDARD, 6 FT SERIAL CONSOLE CABLE
170-0064-900	DB9M TO EIA-RJ45M SERIAL PORT ADAPTER, 6 IN
Mounting and Brackets	
170-0097-900	19 INCHES RACK MOUNT EARS,FOR USE W/ 3916 MINI AND 3904 CHASSIS (170-3916-904 & 170-3916-906)
170-0098-900	23 INCHES RACK MOUNT EARS,FOR USE W/ 3916 MINI AND 3904 CHASSIS (170-3916-904 & 170-3916-906)

Cables provided by the network operator

In addition to the cables listed in Parts for 3904 switches, the following cables are to be provided by the network operator:

- Ethernet cables
- fiber cables

3905 switch ordering

This table lists parts that are required for 3905 switches.

Table 8-4
Parts for 3905 switches

Part number	Description
170-3905-900	3905,(2)100M/1G SFP,(2)100M/1G SFP/RJ45,AC POWER,REQ. POWER CABLE
170-3905-902	3905,(2)100M/1G SFP,(2)100M/1G SFP/RJ45,DC POWER
170-3905-903	3905,(20100M/1G SFP,(2)1--M/1G SFP/RJ45,CABLE AC POWER
Software	
Required OS Base System Perpetual Software Licenses	
S70-0027-900	SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR 3905
S70-0027-901	SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR 3905
Optional OS Applications	
S70-0027-903	SAOS ADVANCED SYNCHRONIZATION PERPETUAL SOFTWARE LICENSE FOR 3905
170-0204-900	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH SAOS 6.X
ESM Related	
S70-0028-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3905
Cables	
170-0019-902	AC POWER CORD, IEC C15, 10FT,OUTDOOR,NORTH AMERICA
170-0019-903	AC POWER CORD, IEC C15, 25FT PIGTAIL
Mounting and Brackets	
170-0088-900	3905,POLE MOUNT KIT
170-0089-900	3905,WALL MOUNT KIT
170-0090-900	3905,STRAND MOUNT KIT
170-0091-900	3905,POLEMOUNT BANDCLAMPS KIT
170-0074-900	CABLE ENTRY SEAL, OUTSIDE PLANT FIBER, 1/2”, FOR 3905/3931
170-0075-900	CABLE ENTRY SEAL, OUTSIDE PLANT FIBER, 3/4”, FOR 3905/3931

Cables provided by the network operator

In addition to the cables listed in Parts for 3905 switches, the following cables are to be provided by the network operator:

- Ethernet cables
- fiber cables

3906 switch ordering

This table lists parts that are required for 3906 switches.

Table 8-5
Parts for 3906 switches

Part number	Description
170-3906-900	3906,(2)1G SFP,(2)100M/1G SFP/RJ45,(2)10M/100M/1G RJ45,NFV SERVER SLOT,(1) AC PS,REQ. POWER CABLE
170-3906-901	3906,(2)1G SFP,(2)100M/1G SFP/RJ45,(2)10M/100M/1G RJ45,NFV SERVER SLOT,(2) AC PS,REQ. POWER CABLE
170-0122-901	MEDIUM NFV COMPUTE SERVER FRU, BROADWELL D-1527, 16GB RAM, 120GB SSD
170-0128-901	LARGE NFV COMPUTE SERVER FRU, BROADWELL D-1548, 32GB RAM, 480GB SSD
170-0128-903	LARGE NFV COMPUTE SERVER FRU, BROADWELL D-1548, 64GB RAM, 1.9TB SSD
Software	
Required OS Base System Perpetual Software Licenses	
S70-0033-900	SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR 3906 SYSTEM
S70-0033-901	SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR 3906 SYSTEM
Optional OS Applications	
170-0204-901	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH SAOS 6.X
ESM Related	
S70-0034-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3906
Cables	
CABL-PW01AU	AC POWER CORD, IEC C13, AUSTRALIA, TYPE I
CABL-PW01CH	AC POWER CORD, IEC C13, SWITZERLAND, TYPE J

Table 8-5
Parts for 3906 switches

Part number	Description
CABL-PW01EU	AC POWER CORD, IEC C13, EUROPE, TYPE F
CABL-PW01IN	AC POWER CORD, IEC C13, INDIA, TYPE D
CABL-PW01JA	AC POWER CORD, IEC C13, JAPAN, TYPE B
CABL-PW01NA	AC POWER CORD, IEC C13, NORTH AMERICA,TYPE B
CABL-PW01UK	AC POWER CORD, IEC C13, UNITED KINGDOM, TYPE G
CABL-PW01UN	AC POWER CORD, C13, UNIVERSAL
170-0044-900	AC POWER CORD, IEC C13, 10FT, NORTH AMERICA
170-0062-900	EIA-RJ45M STANDARD TO CISCO RJ45F SERIAL PORT ADAPTER,6 IN
170-0063-900	DB9F TO EIA-RJ45M STANDARD, 6 FT SERIAL CONSOLE CABLE
170-0064-900	DB9M TO EIA-RJ45M SERIAL PORT ADAPTER, 6 IN
Mounting and Brackets	
170-0109-900	19 INCHES RACK MOUNT EARS,FOR USE W/ 3906 ***Note:*** This mounting bracket kit is included when ordering the 170-3906-90x basic switch assembly, but can be separately ordered as a spare.
170-0105-900	23 INCHES RACK MOUNT EARS,FOR USE W/ 3906 ***Note:*** While the 19-inch mounting bracket kit is included in the 170-3906-90x basic switch assembly, this kit can be ordered separately if 23-inch rack mounting is required.

Cables provided by the network operator

In addition to the cables listed in Parts for 3906 switches, the following cables are to be provided by the network operator:

- Ethernet cables
- fiber cables

3924 switch ordering

This table lists parts that are required for 3924 switches.

Table 8-6
Parts for 3924 switches

Part number	Description
For 3924 single AC model:	
170-3924-901	3924,(4)100M/1G SFP,(4)10/1G SFP+,SAOS 6.X,SINGLE AC POWER,REQ. POWER CABLE
170-3924-903	3924,(4)100M/1G SFP,(4)10/1G SFP+,SAOS 6.X, SYNC, SINGLE AC POWER,REQ. POWER CABLE
For 3924 dual AC and 3924 dual DC models:	
170-3924-907	3924,(4)100M/1G SFP,(4)10/1G SFP+,SAOS 6.X, DUAL AC POWER,REQ. POWER CABLE
170-3924-908	3924,(4)100M/1G SFP,(4)10/1G SFP+,SAOS 6.X, EXT. TEMP, DUAL DC POWER
Software	
Required OS Base System Perpetual Software Licenses	
S70-0054-900	SAOS ADVANCED ETHERNET & OAM PERPETUAL SOFTWARE LICENSE FOR 3924
Optional OS Base System Perpetual Software Licenses	
S70-0054-902	SAOS ADVANCED MPLS APPLICATION PERPETUAL SOFTWARE LICENSE FOR 3924
S70-0054-903	SAOS ADVANCED SYNCHRONIZATION PERPETUAL SOFTWARE LICENSE FOR 3924-903
S70-0054-904	SAOS 10G PERPETUAL SOFTWARE LICENSE FOR 3924 (for all 4 ports)
S70-0054-905	SAOS SECURITY PERPETUAL SOFTWARE LICENSE FOR FOR 3924
S70-0055-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3924
REQUIRED OS BASE SYSTEM PERPETUAL SOFTWARE VIRTUAL LICENSE	
S71-3924-900	SAOS VIRTUAL ETHERNET & OAM PERPETUAL SOFTWARE LICENSE FOR 3924
OPTIONAL OS BASE SYSTEM PERPETUAL SOFTWARE VIRTUAL LICENSE	
S71-3924-904	SAOS VIRTUAL MPLS APPLICATION PERPETUAL SOFTWARE LICENSE FOR 3924

Table 8-6
Parts for 3924 switches

Part number	Description
S71-3924-905	SAOS VIRTUAL SYNCHRONIZATION PERPETUAL SOFTWARE LICENSE FOR 3924
S71-3924-910	SAOS VIRTUAL SECURITY PERPETUAL SOFTWARE LICENSE FOR FOR 3924
S71-3924-906	SAOS VIRTUAL 10G PERPETUAL SOFTWARE LICENSE FOR 3924 (for all 4 ports)
S71-3924-903	ESM VIRTUAL CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3924
Cables	
170-0111-900	AC POWER CORD IEC C13, AUTO LOCK, AUSTRALIA
170-0112-900	AC POWER CORD IEC C13, AUTO LOCK, SWITZERLAND
170-0113-900	AC POWER CORD IEC C13, AUTO LOCK, EUROPE
170-0114-900	AC POWER CORD IEC C13, AUTO LOCK, NORTH AMERICA
170-0115-900	AC POWER CORD IEC C13, AUTO LOCK, UNITED KINGDOM
170-0116-900	AC POWER CORD IEC C13, AUTO LOCK, UNIVERSAL
Mounting Kits	
170-0344-900	19 IN. RACK MOUNT EARS KIT FOR USE WITH ONE 3924 CHASSIS
170-0341-900	19 IN. RACK SHELF KIT FOR USE WITH TWO 3924 CHASSIS, SIDE BY SIDE
170-0345-900	ETSI RACK MOUNT EARS KIT FOR USE WITH ONE 3924 CHASSIS
170-0342-900	ETSI RACK SHELF KIT FOR USE WITH TWO 3924 CHASSIS, SIDE BY SIDE
170-0346-900	23 IN. RACK MOUNT EARS KIT FOR USE WITH ONE 3924 CHASSIS
170-0343-900	23 IN. RACK SHELF KIT FOR USE WITH TWO 3924 CHASSIS, SIDE BY SIDE
170-0347-900	• WALL MOUNT KIT FOR MOUNTING 3924 CHASSIS ON WALL OR OTHER VERTICAL SURFACE • WALL MOUNT BRACKETS FOR USE WITH 5132, 3924 Single AC, and 3924 Dual PSU

Cables provided by the network operator

In addition to the cables listed in Parts for 3924 switches, the following cables are to be provided by the network operator:

- Ethernet cables
- fiber cables

3926 switch ordering

This table lists parts that are required for 3926 switches.

Table 8-7
Parts for 3926 switches

Part number	Description
170-3926-900	3926, (2)100M/1G SFP, (6)10/1G SFP+, (1)OPTION SLOT, EXT. TEMP, (2)SLOTS AC/DC PWR SUP
170-3926-902	3926, (2)100M/1G SFP, (6)10/1G SFP+, (1)OPTION SLOT, EXT. TEMP, (2)SLOTS AC/DC PWR SUP
170-3926-904	3926, (2)100M/1G SFP, (6)10/1G SFP+, (1)OPTION SLOT, SAOS 6.X, EXT. TEMP, (2)SLOTS AC/DC PWR SUP
170-0131-900	3926, (16) DS1/E1 TDM MODULE
170-0176-900	3926, (6) DS1/E1, (4) DS3/E3 AND (4) OC3/12 STM1/4 OR (1) OC48/ STM16 TDM MODULE ***Note:*** This FRU can be installed in 170-3926-902, but not in 170-3926-900.
170-0122-901	MEDIUM NFV COMPUTE SERVER FRU, BROADWELL D-1527, 16GB RAM, 120GB SSD
170-0128-901	LARGE NFV COMPUTE SERVER FRU, BROADWELL D-1548, 32GB RAM, 480GB SSD
170-0128-903	LARGE NFV COMPUTE SERVER FRU, BROADWELL D-1548, 64GB RAM, 1.9TB SSD
170-0013-900	3930/3932/5142/3926, DC PLUGGABLE POWER SUPPLY, WIDE RANGE 24/48V
170-0014-900	3930/3932/5142/3926, AC PLUGGABLE POWER SUPPLY, WIDE RANGE 120/240V
Software	
Required OS Base System Perpetual Software Licenses	
S70-0042-900	SAOS ADVANCED ETHERNET & OAM PERPETUAL SOFTWARE LICENSE FOR 3926
Optional OS Applications	

Table 8-7
Parts for 3926 switches

Part number	Description
S70-0042-902	SAOS ADVANCED MPLS APPLICATION PERPETUAL SOFTWARE LICENSE FOR 3926
S70-0042-903	SAOS ADVANCED SYNCHRONIZATION PERPETUAL SOFTWARE LICENSE FOR 3926
S70-0042-905	SAOS ADVANCED 10G PERPETUAL SOFTWARE LICENSE FOR 3926
S70-0042-906	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH3926
ESM Related	
S70-0043-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3926
Cables	
CABL-PW01AU	AC POWER CORD, IEC C13, AUSTRALIA, TYPE I
CABL-PW01CH	AC POWER CORD, IEC C13, SWITZERLAND, TYPE J
CABL-PW01EU	AC POWER CORD,IEC C13, EUROPE, TYPE F
CABL-PW-1NA	AC POWER CORD, IEC C13, NORTH AMERICA, TYPE B
CABL-PW01UK	AC POWER CORD, IEC C13, UNITED KINGDOM, TYPE G
CABL-PW01JA	AC POWER CORD, IEC C13, JAPAN, TYPE B
CABL-PW01IN	AC POWER CORD, IEC C13, INDIA,TYPE D
CABL-PWO1UN	AC POWER CORD, C13, UNIVERSAL
170-0044-900	AC POWER CORD, IEC C13, 10FT, NORTH AMERICA
Mounting and Brackets	
170-0602-903	19 INCHES RACK MOUNT EARS,FOR USE W/ 1 RU CHASSIS ***Note:*** This mounting bracket kit is included when ordering the 170-3926-90x basic switch assembly, but can be separately ordered as a spare.
170-0603-903	23 INCHES RACK MOUNT EARS,FOR USE W/1RU CHASSIS ***Note:*** While the 19-inch mounting bracket kit is included in the 170-3926-90x basic switch assembly, this kit can be ordered separately if 23-inch rack mounting is required.
170-0023-900	WALL MOUNT BRACKETS,FOR USE WITH 1RU/2RU CHASSIS
Miscellaneous	

Table 8-7
Parts for 3926 switches

Part number	Description
170-0139-900	DS3 CABLE 6FT, DIN-BNC, FOR USE WITH XCVR-CEP003 OR DS3 CABLE 30FT, DIN-BNC, FOR USE WITH XCVR-CEP003 OR 170-0176-900, SINGLE CABLE , SINGLE CABLE
170-0196-900	DS3 CABLE 30FT, DIN-BNC, FOR USE WITH XCVR-CEP003 OR 170-0176-900, SINGLE CABLE
170-0062-900	EIA-RJ45M STANDARD TO CISCO RJ45F SERIAL PORT ADAPTER,6 IN
170-0063-900	DB9F TO EIA-RJ45M STANDARD, 6 FT SERIAL CONSOLE CABLE
170-0064-900	DB9M TO EIA-RJ45M SERIAL PORT ADAPTER, 6 IN
NTTP04CDE6	Transceiver, OC3/OC12 rate, for use in ports 3, 4, 5, and 6 in the Combo TDM OC48 FRU Module. Usable in SAOS 6.19 and onwards.
NTTP03CFE6	Transceiver, OC48 rate, for use in port 3 in the Combo TDM OC48 FRU Module. Usable in SAOS 6.19 and onwards.

Cables provided by the network operator

In addition to the cables listed in Parts for 3926 switches, the following cables are to be provided by the network operator:

- Ethernet cables
- fiber cables

3928 switch ordering

This table lists parts that are required for 3928 switches.

Table 8-8
Parts for 3928 switches

Part number	Description
170-3928-900	3928,(8)100M/1G SFP,(4)10/1G SFP+,SYNCH,DUAL AC POWER,REQ. POWER CABLE
170-3928-901	3928,(8)100M/1G SFP,(4)10/1G SFP+,SYNCH,EXT. TEMP,DUAL DC POWER
170-3928-904	3928,(4)100M/1G SFP,(4)1G SFP,(4)10/1G SFP+,SAOS 6.X,SYNCH,EXT. TEMP,DUAL DC POWER
170-3928-907	3928,(4)100M/1G SFP,(4)1G SFP,(4)10/1G SFP+,SAOS 6.X,DUAL AC POWER,REQ. POWER CABLE
170-3928-908	3928,(4)100M/1G SFP,(4)1G SFP,(4)10/1G SFP+,SAOS 6.X,DUAL AC POWER,REQ. POWER CABLE

Table 8-8
Parts for 3928 switches

Part number	Description
170-3928-909	3928,(4)100M/1G SFP,(4)1G SFP,(4)10/1G SFP+,SAOS 6.X,SYNCH,EXT. TEMP,DUAL DC POWER
Software	
Required OS Base System Perpetual Software Licenses	
S70-0040-900	SAOS ADVANCED ETHERNET & OAM PERPETUAL SOFTWARE LICENSE FOR 3928
Optional OS Applications	
S70-0040-902	SAOS ADVANCED MPLS APPLICATION PERPETUAL SOFTWARE LICENSE FOR 3928
S70-0040-903	SAOS ADVANCED SYNCHRONIZATION PERPETUAL SOFTWARE LICENSE FOR 3928
S70-0040-905	SAOS ADVANCED 10G PERPETUAL SOFTWARE LICENSE FOR 3928
S70-0040-906	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR 3928
ESM Related	
S70-0041-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3928
Cables	
CABL-PW01AU	AC POWER CORD, IEC C13, AUSTRALIA, TYPE I
CABL-PW01CH	AC POWER CORD, IEC C13, SWITZERLAND, TYPE J
CABL-PW01EU	AC POWER CORD, IEC C13, EUROPE, TYPE F
CABL-PW01IN	AC POWER CORD, IEC C13, INDIA, TYPE D
CABL-PW01JA	AC POWER CORD, IEC C13, JAPAN, TYPE B
CABL-PW01NA	AC POWER CORD, IEC C13, NORTH AMERICA,TYPE B
CABL-PW01UK	AC POWER CORD, IEC C13, UNITED KINGDOM, TYPE G
CABL-PW01UN	AC POWER CORD, C13, UNIVERSAL
170-0044-900	AC POWER CORD, IEC C13, 10FT, NORTH AMERICA
Mounting and Brackets	

Table 8-8
Parts for 3928 switches

Part number	Description
170-0602-903	19 INCHES RACK MOUNT EARS,FOR USE W/ 1RU CHASSIS ***Note:*** This mounting bracket kit is included when ordering the 170-3928-90x basic switch assembly, but can be separately ordered as a spare.
170-0603-903	23 INCHES RACK MOUNT EARS,FOR USE W/ 1RU CHASSIS ***Note:*** While the 19-inch mounting bracket kit is included in the 170-3928-90x basic switch assembly, this kit can be ordered separately if 23-inch rack mounting is required.
170-0023-900	WALL MOUNT BRACKETS,FOR USE WITH 1RU/2RU CHASSIS
Miscellaneous	
170-0062-900	EIA-RJ45M STANDARD TO CISCO RJ45F SERIAL PORT ADAPTER,6 IN
170-0063-900	DB9F TO EIA-RJ45M STANDARD, 6FT SERIAL CONSOLE CABLE
170-0064-900	DB9M TO EIA-RJ45M SERIAL PORT ADAPTER, 6 IN

Cables provided by the network operator

In addition to the cables listed in Parts for 3928 switches, the following cables are to be provided by the network operator:

- Ethernet cables
- fiber cables

3942 switch ordering

This table lists parts that are required for 3942 switches.

Table 8-9
Parts for 3942 switches

Part number	Description
170-3942-900	3942,(4)1G/10G SFP+,(20)10/100/1000M RJ45, DUAL AC POWER,REQ. POWER CABLE
170-3942-901	3942,(4)1G/10G SFP+,(20)10/100/1000M RJ45, DUAL DC POWER
Software	
Required OS Base System Perpetual Software Licenses	
S70-0025-900	SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR 3942
Optional OS Applications	

Table 8-9
Parts for 3942 switches

Part number	Description
S70-0025-901	SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR 3942
S70-0025-902	SAOS ADVANCED MPLS APPLICATION PERPETUAL SOFTWARE LICENSE FOR 3942
S70-0025-903	SAOS ADVANCED 10G PERPETUAL SOFTWARE LICENSE FOR 3942
170-0204-900	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH SAOS 6.X
ESM Related	
S70-0026-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 3942
Cables	
CABL-PW01AU	AC POWER CORD, IEC C13, AUSTRALIA, TYPE I
CABL-PW01CH	AC POWER CORAD, IEC C13, SWITZERLAND, TYPE J
CABL-PW01EU	AC Power Cord, IEC C13 EUROPE, TYPE F
CABL-PW01IN	AC POWER CORD, IEC C13, INDIA, TYPE D
CABL-PW01JA	AC POWER CORD, IEC C13, JAPAN, TYPE B
CABL-PW01NA	AC Power Cord, IEC C13 NORTH AMERICA, TYPE B
CABL-PW01UK	AC POWER CORD IEC C13 UNITED KINGDOM, TYPE G
CABL-PW01UN	AC POWER CORD, C13 UNIVERSAL
170-0044-900	AC POWER CORD, IEC C13, 10FT, NORTH AMERICA

Cables provided by the network operator

In addition to the cables listed in Parts for 3942 switches, the following cables are to be provided by the network operator:

- Ethernet cables
- fiber cables

5142 switch ordering

This table lists parts that are required for 5142 switches.

Table 8-10
Parts for 5142 switches

Part number	Description
170-5142-930	5142,(20)100M/1000M SFP,(4) 1G/10G SFP+, SYNC, EXT. TEMP, (2)SLOTS AC OR DC PLUG POWER SUPPLY
170-5142-931	5142,(20)100/1000M SFP,(4) 1G/10G SFP+, SYNC, EXT. TEMP, (2)SLOTS AC OR DC PLUG POWER SUPPLY
170-0014-900	3930/3932/5142,AC PLUGGABLE POWER SUPPLY,WIDE RANGE 120/240V
170-0013-900	3930/3932/5142,DC PLUGGABLE POWER SUPPLY,WIDE RANGE 24/48V
Software	
Required OS Base System Perpetual Software Licenses	
S70-0012-900	SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR 5142
Optional OS Applications	
S70-0012-901	SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR 5142
S70-0012-903	SAOS ADVANCED MPLS APPLICATION PERPETUAL SOFTWARE LICENSE FOR 5142
170-0204-900	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH SAOS 6.X
S70-0012-904	SAOS ADVANCED SYNCHRONIZATION PERPETUAL SOFTWARE LICENSE FOR 5142
S70-0012-905	SAOS ADVANCED 10G PERPETUAL SOFTWARE LICENSE FOR 5142
ESM Related	
S70-0013-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 5142
Cables	
CABL-PW01AU	AC POWER CORD, IEC C13, AUSTRALIA, TYPE I
CABL-PW01CH	AC POWER CORD, IEC C13, SWITZERLAND, TYPE J
CABL-PW01EU	AC POWER CORD, IEC C13, EUROPE, TYPE F
CABL-PW01IN	AC POWER CORD, IEC C13, INDIA, TYPE D

Table 8-10
Parts for 5142 switches

Part number	Description
CABL-PW01JA	AC POWER CORD, IEC C13, JAPAN, TYPE B
CABL-PW01NA	AC POWER CORD, IEC C13, NORTH AMERICA,TYPE B
CABL-PW01UK	AC POWER CORD, IEC C13, UNITED KINGDOM, TYPE G
CABL-PW01UN	AC POWER CORD, C13, UNIVERSAL
170-0019-902	AC POWER CORD, IEC C15, 10FT,OUTDOOR,NORTH AMERICA
170-0044-900	AC POWER CORD, IEC C13, 10FT, NORTH AMERICA
170-0052-900	ALARM CABLE, 15 FT, FOR USE WITH 3930/3932/5142/5160
170-0083-900	BITS CABLE RJ-45,100 OHM,6 FEET
170-0084-900	BITS CABLE RJ-45,120 OHM,6 FEET
170-0085-900	GPS/1PPS/TOD CABLE,COAX,6 FEET
Mounting and Brackets	
170-0602-903	19 INCHES RACK MOUNT EARS,FOR USE W/ 1RU CHASSIS ***Note:*** This mounting bracket kit is included when ordering the 170-5142-93x basic switch assembly, but can be separately ordered as a spare.
170-0603-903	23 INCHES RACK MOUNT EARS,FOR USE W/ 1RU CHASSIS ***Note:*** While the 19-inch mounting bracket kit is included in the 170-5142-93x basic switch assembly, this kit can be ordered separately if 23-inch rack mounting is required.
170-0023-900	WALL MOUNT BRACKETS,FOR USE WITH 1RU/2RU CHASSIS
Miscellaneous	
170-0062-900	EIA-RJ45M STANDARD TO CISCO RJ45F SERIAL PORT ADAPTER,6 IN
170-0063-900	DB9F TO EIA-RJ45M STANDARD, 6 FT SERIAL CONSOLE CABLE
170-0064-900	DB9M TO EIA-RJ45M SERIAL PORT ADAPTER, 6 IN

Cables provided by the network operator

In addition to the cables listed in Parts for 5142 switches, the following cables are to be provided by the network operator:

- Ethernet cables
- fiber cables

5160 switch ordering

This table lists parts that are required for 5160 switches.

Table 8-11
Parts for 5160 switches

Part number	Description
170-5160-900	5160,(24)1/10G SFP+,EXT. TEMP,(2)SLOTS AC OR DC PLUG POWER SUPPLY
170-0070-900	5160,AC PLUGGABLE POWER SUPPLY, WIDE RANGE 120/240V
170-0069-900	5160,DC PLUGGABLE POWER SUPPLY, WIDE RANGE 24/48V
170-0107-900	3930/3932/3926/5142/5160, DC PLUGGABLE POWER SUPPLY, 100-280 VDC
170-0013-900	3930/3932/3926/5142/5160, DC PLUGGABLE POWER SUPPLY, WIDE RANGE 24/48V
170-0014-900	3930/3932/3926/5142/5160, AC PLUGGABLE POWER SUPPLY, WIDE RANGE 120/240V
Software	
Required OS Base System Perpetual Software Licenses	
S70-0017-900	SAOS ADVANCED ETHERNET PERPETUAL SOFTWARE LICENSE FOR 5160 SYSTEM
Optional OS Applications	
S70-0017-901	SAOS ADVANCED OAM PERPETUAL SOFTWARE LICENSE FOR 5160 SYSTEM
S70-0017-903	SAOS ADVANCED MPLS APPLICATION PERPETUAL SOFTWARE LICENSE FOR 5160 SYSTEM
S70-0017-904	SAOS ADVANCED SYNCHRONIZATION PERPETUAL SOFTWARE LICENSE FOR 5160 SYSTEM
170-0204-900	SAOS ADVANCED SECURITY PERPETUAL SOFTWARE LICENSE FOR USE WITH SAOS 6.X
ESM Related	
S70-0018-900	ESM CARRIER ED RIGHT TO MANAGE PERPETUAL SOFTWARE LICENSE FOR 5160 SYSTEM
Cables	
CABL-PW01AU	AC POWER CORD, IEC C13, AUSTRALIA, TYPE I
CABL-PW01CH	AC POWER CORD, IEC C13, SWITZERLAND, TYPE J

Table 8-11
Parts for 5160 switches

Part number	Description
CABL-PW01EU	AC POWER CORD, IEC C13, EUROPE, TYPE F
CABL-PW01IN	AC POWER CORD, IEC C13, INDIA, TYPE D
CABL-PW01JA	AC POWER CORD, IEC C13, JAPAN, TYPE B
CABL-PW01NA	AC POWER CORD, IEC C13, NORTH AMERICA,TYPE B
CABL-PW01UK	AC POWER CORD, IEC C13, UNITED KINGDOM, TYPE G
CABL-PW01UN	AC POWER CORD, C13, UNIVERSAL
170-0019-902	AC POWER CORD, IEC C15, 10FT,OUTDOOR,NORTH AMERICA
170-0044-900	AC POWER CORD, IEC C13, 10FT, NORTH AMERICA
170-0083-900	BITS CABLE RJ-45,100 OHM,6 FEET
170-0084-900	BITS CABLE RJ-45,120 OHM,6 FEET
170-0085-900	GPS/1PPS/TOD CABLE,COAX,6 FEET
Mounting and Brackets	
170-0602-903	19 INCHES RACK MOUNT EARS,FOR USE W/ 1RU CHASSIS ***Note:*** This mounting bracket kit is included when ordering the 170-5160-900 basic switch assembly, but can be separately ordered as a spare.
170-0603-903	23 INCHES RACK MOUNT EARS,FOR USE W/ 1RU CHASSIS ***Note:*** While the 19-inch mounting bracket kit is included in the 170-5160-900 basic switch assembly, this kit can be ordered separately if 23-inch rack mounting is required.
170-0023-900	WALL MOUNT BRACKETS,FOR USE WITH 1RU/2RU CHASSIS
Miscellaneous	
170-0052-900	ALARM CABLE, 15 FT, FOR USE WITH 3930/3932/5142/5160
170-0062-900	EIA-RJ45M STANDARD TO CISCO RJ45F SERIAL PORT ADAPTER,6 IN
170-0063-900	DB9F TO EIA-RJ45M STANDARD, 6 FT SERIAL CONSOLE CABLE
170-0064-900	DB9M TO EIA-RJ45M SERIAL PORT ADAPTER, 6 IN

Cables provided by the network operator

In addition to the cables listed in Parts for 5160 switches, the following cables are to be provided by the network operator:

- Ethernet cables

- fiber cables

Grounding

This chapter describes grounding for 39XX/51XX switches.

3903 switch

The 3903 is connected to ground at the power supplies and also offers a supplemental grounding connector on the side of the chassis.

Power supply grounding

The safety ground connection is provided by the AC power cord or as a commons on the DC terminal.

WARNING
The AC power supply relies on the AC power cord for the Safety Ground. The outlet providing power to the 3903 switch must meet the local and national safety codes.

Supplemental ground

Two holes, located on the left side of the chassis are provided for connecting a supplemental grounding lug to the chassis.

Grounding screws are provided. The customer provides the grounding lug and grounding wire, according to the following specifications:

- #6 AWG (minimum) wire
- 2 hole lug @ 5/8” centers and with hole size for #10-32 or 1/4” screw (use UL listed two hole lug Thomas and Betts part number 256-31426-9 or an equivalent)

The ground source should be connected in accordance with local and national regulations and safety guidelines and the grounding procedures used by your company. The DC resistance between the chassis and the supplemental ground source should be verified to be less than 25 milliohms.

Figure 9-1
Left side of the 3903 chassis, grounding screw location

3903x switch

The 3903x is connected to ground at the power supplies and also offers a supplemental grounding connector on the side of the chassis.

Power supply grounding

The safety ground connection is provided by the AC power cord or as a commons on the DC terminal.

WARNING
The AC power supply relies on the AC power cord for the Safety Ground. The outlet providing power to the 3903x switch must meet the local and national safety codes.

Supplemental ground

Two holes, located on the left side of the chassis are provided for connecting a supplemental grounding lug to the chassis.

Grounding screws are provided. The customer provides the grounding lug and grounding wire, according to the following specifications:

- #6 AWG (minimum) wire
- 2 hole lug @ 5/8” centers and with hole size for #10-32 or 1/4” screw (use UL listed two hole lug Thomas and Betts part number 256-31426-9 or an equivalent)

The ground source should be connected in accordance with local and national regulations and safety guidelines and the grounding procedures used by your company. The DC resistance between the chassis and the supplemental ground source should be verified to be less than 25 milliohms.

Figure 9-2
Left side of the 3903x chassis, grounding screw location

3904 switch

The 3904 switch is connected to ground at the power supplies and also offers a supplemental grounding connector on the side of the chassis.

Power supply grounding

The safety ground connection is provided by the AC power cord or as a commons on the DC terminal.

WARNING
The AC power supply relies on the AC power cord for the Safety Ground. The outlet providing power to the 3904 switch must meet local and national safety codes.

Supplemental ground

Two holes, located on the left side of the chassis are provided for connecting a supplemental grounding lug to the chassis. Figure 9-3 shows the grounding screw location on the left side of the 3904 switch.

Figure 9-3
Grounding screw location on the left side of the 3904 switch

Grounding screws are provided. The customer provides the grounding lug and grounding wire, according to the following specifications:

- #6 AWG (minimum) wire
- 2 hole lug @ 5/8” centers and with hole size for #10-32 or 1/4” screw (use UL listed two hole lug Thomas and Betts part number 256-31426-9 or an equivalent)

The ground source should be connected in accordance with local and national regulations and safety guidelines and the grounding procedures used by your company. The DC resistance between the chassis and the supplemental ground source should be verified to be less than 25 milliohms.

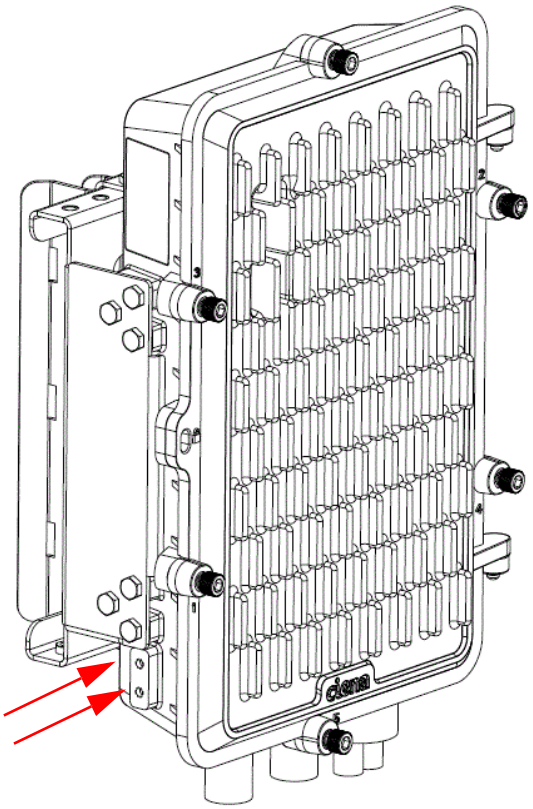
3905 switch

The 3905 switch offers a supplemental grounding connector on the chassis.

Supplemental ground

Two holes, located on the left side of outside of the enclosure are provided for connecting a grounding lug to the chassis. Figure 9-4 shows the location of the grounding screws.

Figure 9-4
Rear of the 3905 chassis: grounding screw location



Grounding screws are provided. The customer provides the grounding lug and grounding wire, according to the following specifications:

- #6 AWG (minimum) wire
- 2 hole lug @ 5/8” centers and with hole size for #10-32 or 1/4” screw (use UL listed two hole lug Thomas and Betts part number 256-31426-9 or an equivalent)

The ground source should be connected in accordance with local and national regulations and safety guidelines and the grounding procedures used by your company. The DC resistance between the chassis and the supplemental ground source should be verified to be less than 25 milliohms.

3906 switch

The 3906mvi is connected to ground at the power supplies and also offers a supplemental grounding connector on the side of the chassis.

Power supply grounding

The safety ground connection is provided by the AC power cord.

WARNING
The AC power supply relies on the AC power cord for the Safety Ground. The outlet providing power to the 3906mvi switch must meet the local and national safety codes.

Supplemental ground

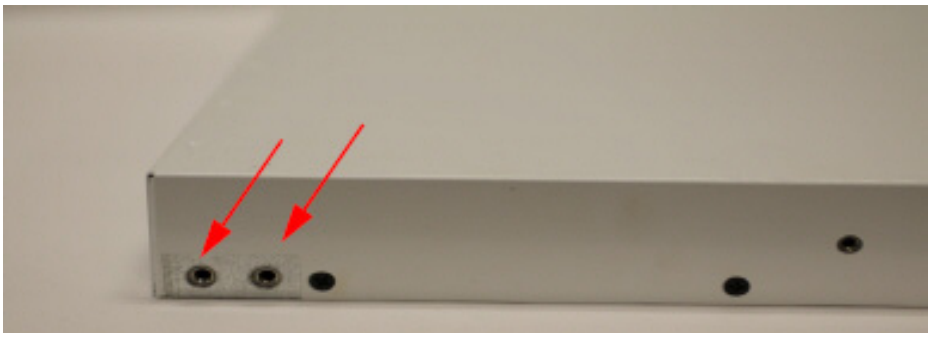
Two holes, located on the left side of the chassis are provided for connecting a supplemental grounding lug to the chassis.

Grounding screws are provided. The customer provides the grounding lug and grounding wire, according to the following specifications:

- #6 AWG (minimum) wire
- 2 hole lug @ 5/8” centers and with hole size for #10-32 or 1/4” screw (use UL listed two hole lug Thomas and Betts part number 256-31426-9 or an equivalent)

The ground source should be connected in accordance with local and national regulations and safety guidelines and the grounding procedures used by your company. The DC resistance between the chassis and the supplemental ground source should be verified to be less than 25 milliohms. Figure 9-5 shows the grounding screw location.

Figure 9-5
Left side of the 3906mvi chassis, grounding screw location



3924 switch

The 3924 switch is connected to ground at the AC power supply (3924 AC single and 3924 AC dual models.) They offer supplemental grounding connectors on the chassis.

Power supply grounding

The safety ground connection is provided by the AC power cord.

WARNING
The outlet providing power to the 3924 switch must meet the local and national safety codes.

Supplemental ground

The 3924 AC single model has three ground attachment points on the chassis: one on the left side, one on the right side, and one at the rear. Any ground attachment can be used to ground the chassis. Do not use all, or a combination of ground attachment points.

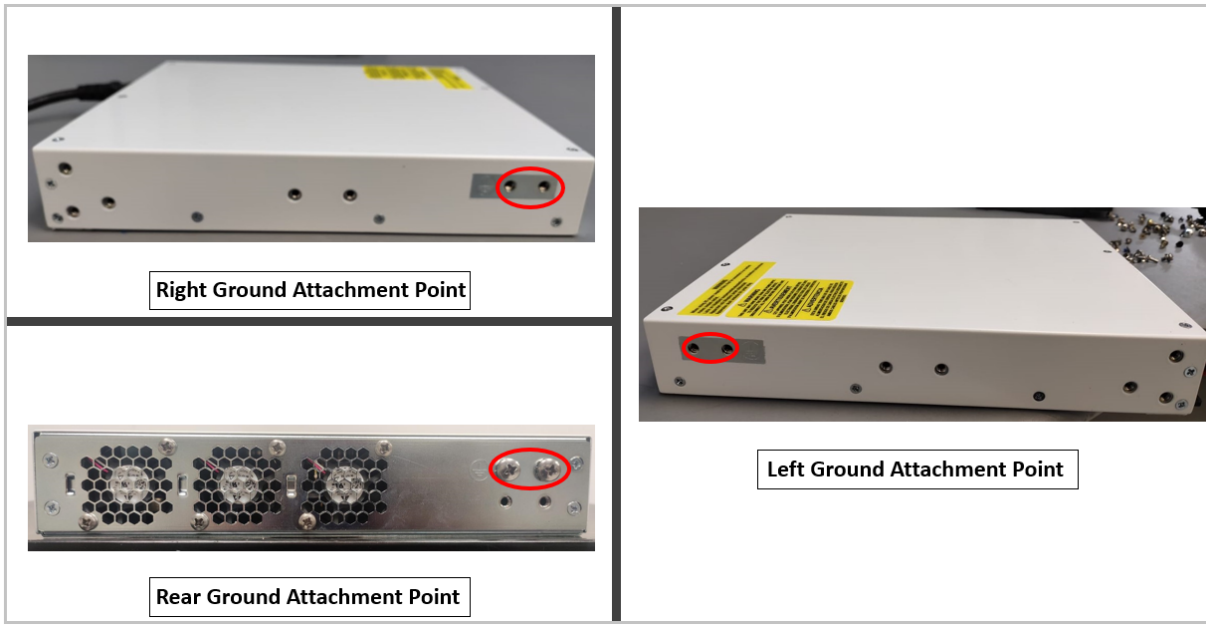
The 3924 AC dual and 3924 DC dual models have two ground attachment points on the chassis: one on the left side, and another at the rear. Any ground attachment can be used to ground the chassis.

Installing the chassis ground connection requires the following tools and equipment:

- two hole compression-type ground terminal lug. Select a lug angle that suits the installation.
- torque wrench/driver capable of torquing No. 10 Keps nuts to 35 inch-pounds (3.95 Nm)
- #6 AWG (16 mm ^{2}) 7-strand copper insulated conductor grounding wire
- stripping and crimping tools that accommodate AWG gauge
- corrosion-preventing compound such as NO-OX
- clear 0.5 in. (12.7 mm) heat-shrink tubing
- heat gun suitable for heat-shrink tubing
- analog meter (Simpson 260 or equivalent) or a Digital Multimeter (DMM) with test leads

The ground source should be connected in accordance with local and national regulations and safety guidelines and the grounding procedures used by your company. Figure 9-6 shows the ground attachment points.

Figure 9-6
Location of the ground attachment points



Note: If (left or right) side ground attachment point is used, use screws from the rear point to attach.

3926 switch

Two holes, located on the left side of the rear chassis are provided for connecting a supplemental grounding lug to the chassis.

Power supply grounding

The safety ground connection is provided by the AC power cord.

WARNING
The AC power supply relies on the AC power cord for the Safety Ground. The outlet providing power to the 3926 switch must meet the local and national safety codes.

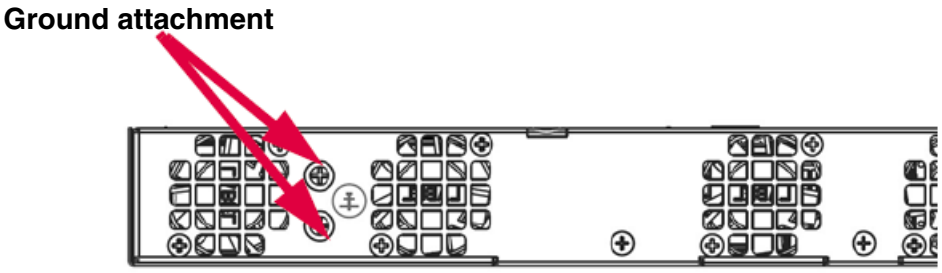
Supplemental ground

Grounding screws are provided. The customer provides the grounding lug and grounding wire, according to the following specifications:

- #14 AWG (minimum) wire based on an overcurrent protection of 20 amps
- customer-supplied right angle 2 hole lug @ 5/8” centers and with hole size for #10 or 1/4” screw

The ground source should be connected in accordance with local and national regulations and safety guidelines and the grounding procedures used by your company. The DC resistance between the chassis and the supplemental ground source should be verified to be less than 25 milliohms. Figure 9-7 shows the grounding screw location.

Figure 9-7
Left side of the 3926 chassis, grounding screw location



3928 switch

Two holes, located on the left side of the rear chassis are provided for connecting a supplemental grounding lug to the chassis.

Power supply grounding

The external ground attachments are only used with the DC version of the 3928. The AC version provides grounding through the power cable. For AC systems, the safety ground is the supply cord and the chassis ground is only a supplemental ground.

WARNING
The AC version relies on the AC power cord for Safety ground. The outlet providing power to the 3928 switch must meet local and national safety codes.

WARNING
The DC version relies on the connector at the front of the power supply to provide safety ground. This grounding connection must be properly attached when the 3928 switch is installed.

Supplemental ground

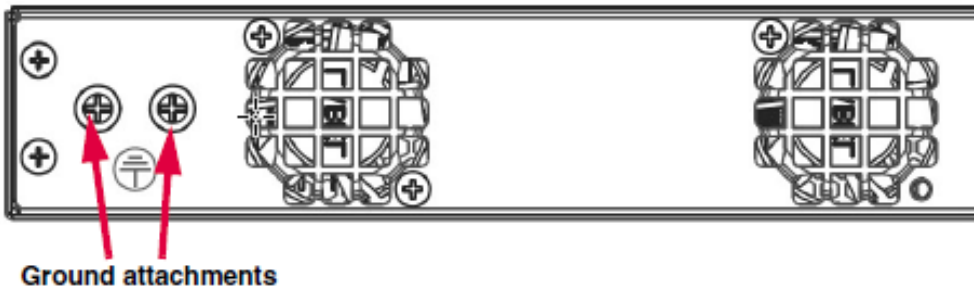
Two holes, located on the left side of the chassis are provided for connecting a supplemental grounding lug to the chassis.

Grounding screws are provided. The customer provides the grounding lug and grounding wire, according to the following specifications:

- #14 AWG (minimum) wire based on an overcurrent protection of 20 amps
- 2 hole lug @ 5/8” centers and with hole size for #10 or 1/4” screw

The ground source should be connected in accordance with local and national regulations and safety guidelines and the grounding procedures used by your company. The DC resistance between the chassis and the supplemental ground source should be verified to be less than 25 milliohms. Figure 9-8 shows the grounding screw location.

Figure 9-8
Left side of the 3928 chassis, grounding screw location



3942 switch

The 3942 switch is connected to ground at the power supplies and also offers a supplemental grounding connector on the chassis.

Power supply grounding

Safety ground is connected at the power supplies:

- AC safety ground is connected through the ground connection of the AC power cord.
- DC safety ground is connected to the DC terminal block.

WARNING
The AC power supply relies on the AC power cord for the safety ground. The outlet providing power to the 3942 switch must meet local and national safety codes.

Supplemental ground

Two holes, located on the left side of the back of the chassis, are provided for connecting a grounding lug to the chassis.

5142 switch

The 5142 switch is connected to ground at the power supplies and the chassis.

> ***Note:*** The Battery Return lead is considered DC-I (isolated from rack ground) as described in GR-1089-Core, Issue 6.

Power supply grounding

The safety ground connection is provided by the AC power cord or by the grounding terminal on the DC power supply.

WARNING
The AC version relies on the AC power cord for safety ground. The outlet providing power to the 5142 switch must meet the local and national safety codes.

WARNING
The DC version relies on the connector at the front of the power supply to provide safety ground. This grounding connection must be properly attached when the 5142 switch is installed.

Supplemental ground

A supplemental ground location is provided on the back of the chassis. This ground location supports a 2-hole lug.

The grounding screws are provided and are located at the rear of the chassis in the center. Figure 9-9 shows the location of the grounding screws.

Figure 9-9
Rear grounding screw location

The grounding lug and grounding wire are customer-supplied according to the following specifications:

- #6 AWG (minimum) wire
- 2 hole lug @ 5/8” centers and with hole size for #10 or 1/4” screw

The ground source should be connected in accordance with local and national regulations and safety guidelines, and the grounding procedures used by your company.

The DC resistance between the chassis and the supplemental ground source should be verified to be less than 100 milliohms.

5160 switch

The 5160 switch is connected to ground at the power supplies and the chassis.

> ***Note:*** The Battery Return lead is considered DC-I (isolated from rack ground) as described in GR-1089-Core, Issue 6.

Power supply grounding

The safety ground connection is provided by the AC power cord or by the grounding terminal on the DC power supply.

> **WARNING**
> The AC version relies on the AC power cord for Safety ground. The outlet providing power to the 5160 switch must meet local and national safety codes.

WARNING
The DC version relies on the connector at the front of the power supply to provide safety ground. This grounding connection must be properly attached when the 5160 switch is installed.

Supplemental ground

A supplemental ground location is provided on the back of the chassis. This ground location will support a 2-hole lug.

The grounding screws are provided and are located on the rear of the chassis in the center. Figure 9-10 shows the location of the grounding screws.

Figure 9-10
Grounding screw location on 5160 switch

The grounding lug and grounding wire are customer supplied. The following description indicates the required specifications:

- #6 AWG (minimum) wire
- 2 hole lug @ 5/8” centers and with hole size for #10 or 1/4” screw

The ground source should be connected in accordance with local and national regulations and safety guidelines and the grounding procedures used by your company.

The DC resistance between the chassis and the supplemental ground source should be verified to be less than 100 milliohms.

Interfaces

This chapter describes interfaces for 39XX/51XX switches.

3903 switch

User and management interfaces for the 3903 switch are located on the front of the chassis. Table 10-1 provides an overview of the interfaces available on the 3903 switch.

Table 10-1
3903 interface summary

Port Type	Number of Ports	Description
100M/1G RJ-45 combo port	1	100M/1G RJ-45 combo port. This port uses an RJ-45 connector and is fully compliant with the IEEE 802.3u 1000Base-Tx Ethernet standard. This port works in tandem with the RJ-45 combo port 1. Only one of these ports is active at a time. If an optic is present in the SFP combo port 1, the RJ-45 Combo port will not be active. Copper SFPs are not supported in these ports.
100M/1G SFP combo port	1	SFP combo port capable of operating at 100M or 1 Gbps. This port is the SFP port labeled 1. This port works in tandem withe the RJ-45 Combo port 1. Only one of these ports is active at a time.Copper SFPs are not supported in these ports. If an optic is present in this port, the RJ-45 port will not be functional, even if no cables are connected to the SFP port.
1G/100M SFP	2	SFP ports capable of operating at 1 Gb using a standard 1 GbE SFP transceiver or a multi-rate SFP transceiver capable of 1G and 100M. The SFP ports can operate at 100M with a multi-rate SFP transceiver capable of 1G and 100M. Copper or optical SFPs can be installed. These ports support 1G, 100M, dual rate 1G/100M, and copper triple rate transceivers.
Console	1	Serial EIA-561 (RJ-45) port

Status LEDs for all SFP ports are located directly below the port. For both RJ-45 ports (Combo port 1 and Console port), the LEDs are integrated into each port.

3903x switch

User and management interfaces for the 3903x switch are located on the front of the chassis. Table 10-2 provides an overview of the interfaces available on the 3903x switch.

Table 10-2
3903 interface summary

Port Type	Number of Ports	Description
100M/1G RJ-45 combo port	1	100M/1G RJ-45 combo port. This port uses an RJ-45 connector and is fully compliant with the IEEE 802.3u 1000Base-Tx Ethernet standard. This port works in tandem with the RJ-45 combo port 1. Only one of these ports is active at a time. If an optic is present in the SFP combo port 1, the RJ-45 Combo port will not be active.
100M/1G SFP combo port	1	SFP combo port capable of operating at 100M or 1 Gbps. This port is the SFP port labeled 1. This port works in tandem withe the RJ-45 Combo port 1. Only one of these ports is active at a time. Copper SFPs are not supported in these ports. If an optic is present in this port, the RJ-45 port will not be functional, even if no cables are connected to the SFP port.
1G/100M SFP	2	SFP ports capable of operating at 1 Gb using a standard 1 GbE SFP transceiver or a multi-rate SFP transceiver capable of 1G and 100M. The SFP ports can operate at 100M with a multi-rate SFP transceiver capable of 1G and 100M. Copper or optical SFPs can be installed. These ports support 1G, 100M, dual rate 1G/100M, and copper triple rate transceivers.
Console	1	Serial EIA-561 (RJ-45) port

Status LEDs for all SFP ports are located directly below the port. For both RJ-45 ports (Combo port 1 and Console port), the LEDs are integrated into each port.

3904 switch

The chassis is designed so that all interface and power cabling connections, with the exception of the external ground, are located on the front of the chassis. Table 10-3 provides an overview of the interfaces available.

Table 10-3
3904 switch interface summary

Port type	Number of ports	Description
100M/1G SFP Combo Ports	2	100M or 1 Gbps SFP ports labeled 1 and 2. These ports work in tandem with the RJ-45 Combo ports 1 and 2. Only one of the ports in each combo is active at a time. Each port supports multiple SFP types to accommodate different wavelengths and reach.Copper SFPs are not supported in these ports. When an SFP is inserted in one of these ports, the corresponding RJ-45 port (1 or 2) will not be active, even if no cables are connected to the port.
10/100/1000 RJ-45 Combo Ports	2	RJ-45 combo ports of 10/100/1000baseT copper Ethernet. These ports are located between the two sets of SFPs and are labeled 1 and 2. These ports work in tandem with the SFP Combo ports 1 and 2. Only one of the ports in each pair can be active at a time. If an optic is present in the SFP Combo port, the RJ-45 Combo port will not be active. These ports use RJ-45 connectors and are fully compliant with the IEEE 802.3u 1000Base-Tx Ethernet standard. The auto-negotiation is mandatory for 1000 Mbps interface while it is not mandatory for 10/100 Mbps interfaces as it can operate with fixed speed.
100M/1G SFP Ports	2	100M or 1 Gbps SFP ports labeled 3 and 4. Each port supports multiple SFP types to accommodate different wavelengths and reach. Copper SFPs installed in these ports support 10/100/1000 Mbps speeds. There is also 100/1000 support for fiber modules in that same port.
10 MHz	1	Mini coax GPS (10MHz) SMB Port frequency port in or out. This functionality is selectable using the SAOS CLI.
1PPS	1	Mini coax 1PPS/ToD SMB interface in or out. This functionality is selectable using the SAOS CLI.
Sync	1	RJ-45 BITS in or out, ToD in or out, or 1PPS in or out. This functionality is selectable using the SAOS CLI.
Console	1	Serial EIA-561 (RJ-45) port for maintenance purposes.

Status LEDs for all SFP ports are located directly below the port. For the four RJ-45 ports, that is, combo ports 1 and 2, Console, and SYNC, the LEDs are integrated into each port.

3905 switch

The enclosure is designed so that all ports and power connections are accessible only when the outer door is open. Table 10-4 provides an overview of the interfaces available on the 3905.

Table 10-4
3905 interface summary

Port Type	Number of Ports	Description
1G/100M SFP Combo Ports	2	100M or 1 Gbps SFP ports labeled 1 and 2. These ports work in tandem with the RJ-45 Combo ports 1 and 2. Only one of the ports in each combo is active at a time. Each port supports multiple SFP types to accommodate different wavelengths and reach.Copper SFPs installed in these ports support 10/100/1000 Mbps. When an SFP is inserted in one of these ports, the corresponding RJ-45 port (1 or 2) will not be active, even if no cables are connected to the port.
10/100/100 RJ-45 Combo Ports	2	RJ-45 combo ports of 10/100/1000baseT copper Ethernet. These ports are located between the two sets of SFPs and are labeled 1 and 2. These ports work in tandem with the SFP Combo ports 1 and 2. Only one of the ports in each pair can be active at a time. If an optic is present in the SFP Combo port, the RJ-45 Combo port will not be active. These ports use RJ-45 connectors and are fully compliant with the IEEE 802.3u 1000Base-Tx Ethernet standard. The auto-negotiation is mandatory for 1000 Mbps interface while it is not mandatory for 10/100 Mbps interfaces as it can operate with fixed speed.
1G/100M SFP Ports	2	100M or 1 Gbps SFP ports labeled 3 and 4. Each port supports multiple SFP types to accommodate different wavelengths and reach. Copper SFPs installed in these ports support 10/100/1000 Mbps. There is also 100/1000 support for fiber modules in that same port.
Console	1	Serial EIA-561 (RJ-45) port for maintenance purposes. This port is located on the left side of the electronics board but is not labeled.

Status LEDs for all SFP ports are located directly above the port on the fiber management tray. They are labeled 1 - 4. For the two RJ-45 combo ports, the LEDs are located on the right side of the fiber management tray and are labeled Copper 1 and Copper 2. The console port does not have any LEDs associated with it.

3906 switch

User and management interfaces for the 3906mvi switch are located on the front of the chassis. Table 10-5 provides an overview of the interfaces available on the 3906mvi switch.

Table 10-5
3906mvi interface summary

Port Type	Number of Ports	Description
1G RJ-45 SFP UNI	2	1G RJ-45 SFP UNI ports. This port uses an RJ-45 SFP connector and is fully compliant with the IEEE 802.3u 1000Base-Tx Ethernet standard. Only one of these ports is active at a time. If an optic is present in the SFP combo port 1, the RJ-45 Combo port will not be active. Copper SFPs are not supported in these ports.
1G RJ45 UNI	2	1G RJ45 UNI port. This port works in tandem with the 1G RJ-45 SFP UNI port. Only one of these ports is active at a time. Copper SFPs are not supported in these ports. If an optic is present in this port, the RJ-45 port will not be functional, even if no cables are connected to the SFP port.
1G SFP UNI	2	SFP ports capable of operating at 1 Gb using a standard 1 GbE SFP transceiver or a multi-rate SFP transceiver capable of 1G and 100M. The SFP ports can operate at 100M with a multi-rate SFP transceiver capable of 1G and 100M. Copper or optical SFPs can be installed. These ports support 1G, 100M, dual rate 1G/100M, and copper triple rate transceivers.
Console	1	Serial EIA-561 (RJ-45) port
Management	1	10/100/1000M copper faceplate port

Status LEDs for all SFP ports are located directly below the port. For both RJ-45 ports, the LEDs are integrated into each port.

3924 switch

All interfaces on the 3924 switch is accessible from the faceplate of the unit. With the exception of the Console port, all the interfaces have integrated LEDs which provide status information for the port.

Table 10-9 provides an overview of the interfaces available on the 3924 switch.

Table 10-6
3924 interface summary

Port Type	Number of Ports	Description
Gigabit/100M NNI/UNI	4	The faceplate of the 3924 has 4 Gbps/100 Mbps Ethernet using standard SFP modules. Each port supports multiple SFP types to accommodate different wavelengths and distance. These ports support SGMII.
10Gbps/ 1Gbps NNI/ UNI	4	4 ports 10 Gbps/1Gbps Ethernet using standard SFP+ modules. Each port supports multiple SFP+ types to accommodate different wavelengths and distance.
Console	1	Serial EIA-561 (RJ-45) port. The serial console port.
Management port	1	The 3924 includes one 10/100/1000 Mbps port for out-of band management. This port is located on the right side of the faceplate and is labeled MGMT 10/100/1000. This port uses an RJ-45 connector.

3926 switch

All interfaces on the 3926 switch are accessible from the faceplate of the unit. With the exception of the Console port, all the interfaces have integrated LEDs which provide status information for the port.

Table 10-7 provides an overview of the interfaces available on the 3926 switch.

Table 10-7
3926 interface summary

Port Type	Number of Ports	Description
Gigabit/100M NNIN/UNI	2	The faceplate of the 3926 has 2 SFP ports of 1G/100M Ethernet using standards SFP modules. These ports support multiple SFP types to accommodate different wavelengths and distance.
Gigabit/ 10Gibabit NNIN/UNI	6	6 SFP+ ports of 10G/1G Ethernet using standard SFP+ modules. These ports support multiple SFP+ types to accommodate different wavelengths and distances.
10 MHz	1	1 Mini coax GPS (10MHz) SMB port frequency port in or out (SW selectable).
1PPS	1	1 Mini coax 1PPS/ToD SMG interface in or out (SW selectable)
BITS	1	1 RJ-45 BITS in or out. ToD in or out or 1PPS in or out (SW selectable)

Table 10-7
3926 interface summary (continued)

Port Type	Number of Ports	Description
SYNC	2	1 RJ-45 BITS in or out, ToD in or out, or 1PPS in or out (SW selectable)
Management port	1	The 3926 includes one 10/100/1000 Mbps port for out-of band management. This port is located on the right side of the faceplate and is labeled MGMT 10/100/1000. This port uses an RJ-45 connector.
Console	1	Serial EIA-561 (RJ-45) port. The serial console port.

Combo TDM OC48 FRU for the 3926

The Combo TDM OC48 FRU Module installs in the FRU slot on the right side of the 3926. If the TDM mode is ANSI (the default) the Combo TDM OC48 FRU Module supports either one OC48 connection or up to four OC-12/OC-3 connections, as well as six DSI connections and four DS3 connections. If the TDM mode is set to ETSI, the Combo TDM OC48 FRU Module supports either one STM16 connection or up to four STM4/STM1 connections, as well as six E1 connections and four E3 connections.

The following table provides an overview of the interfaces available on the Combo TDM OC48 FRU.

Table 10-8
Combo TDM OC48 interface summary

Port Type	Number of Ports	Description
	2	Ports 1 and 2 are not used in this release
OC48/ STM16	1	SONET/SDH SFP port. If the TDM mode of the FRU is ANSI (the default), port 3 supports an OC48 connection. If the TDM mode of the FRU is set to ETSI, port 3 supports an STM16 connection. If port 3 is used for an OC48 or SMT16 connection, then ports 4, 5, and 6 cannot be used.
OC3/OC12/ STM1/STM4	4	SONET/SDH SFP ports. If the TDM mode of the FRU is ANSI (the default), and if port 3 is not used for an OC48 connection, then each of ports 3 to 6 can support an OC3 or OC12 connection. The OC3 and OC12 connections can be in any combination. If the TDM mode of the FRU is set to ETSI, and if port 3 is not used for an STM16 connection, then each of ports 3 to 6 supports an STM1 or STM4 connection. The STM1and STM4 connections can be in any combination.
DS1	6	DS1 RJ45 ports. If the TDM mode is ANSI (the default) the ports labeled 7 to 12 support DS1 connections. The ports are auto-created, and are named tdm01 to tdm06.

Table 10-8
Combo TDM OC48 interface summary

Port Type	Number of Ports	Description
DS3	4	DS3 DIN 1.0/2.3 ports. If the TDM mode is ANSI (the default) the ports labeled 13 to 16 support DS3 connections. The ports are auto-created, and are named tdm07 to tdm10.
STM16	1	SDH SFP port. If the TDM mode is set to ETSI, port 3 supports an STM16 connection. If port 3 is used for an STM16 connection, then ports 4, 5, and 6 cannot be used.
STM1/STM4	4	SDH SFP ports. If the TDM mode is set to ETSI, and if port 3 is not used for an STM16 connection, then each of ports 3 to 6 can support an STM1 or STM4 connection, in any combination.
E1	6	E1 RJ45 ports. If the TDM mode is set to ETSI, the ports labeled 7 to 12 support E1 connections. The ports are auto-created, and are named tdm01 to tdm06.
E3	4	E3 DIN 1.0/2.3 ports. If the TDM mode is set to ETSI, the ports labeled 13 to 16 support E3connections. The ports are auto-created, and are named tdm07 to tdm10.

3928 switch

All interfaces on the 3928 AC and 3928 DC switches are accessible from the faceplate of the unit. With the exception of the Console port, all the interfaces have integrated LEDs which provide status information for the port.

Table 10-9 provides an overview of the interfaces available on the 3928 AC and 3928 DC switches.

Table 10-9
3928 interface summary

Port Type	Number of Ports	Description
Gigabit/100M NNI/UNI	4	The faceplate of the 3928 has 4 Gbps/100 Mbps Ethernet using standard SFP modules. Each port supports multiple SFP types to accommodate different wavelengths and distance. These ports support SGMII.
Gigabit NNI/ UNI	4	The faceplate of the 3928 has 4 Gbps Ethernet using SFP modules. Each port supports multiple SFP types to accommodate different wavelengths and distance.
10Gbps/ 1Gbps NNI/ UNI	4	4 ports 10 Gbps/1Gbps Ethernet using standard SFP+ modules. Each port supports multiple SFP+ types to accommodate different wavelengths and distance.

Table 10-9
3928 interface summary (continued)

Port Type	Number of Ports	Description
10 MHz	1	(DC only) 1 Mini coax GPS (10MHz) SMB port frequency port in or out (SW selectable).
1PPS	1	(DC only) 1 Mini coax 1PPS/ToD SMG interface in or out (SW selectable)
BITS	1	(DC only) 1 RJ-45 BITS in or out., ToD in or out, or 1PPS in or out (SW selectable)
SYNC	1	(DC only) 1 RJ-45 BITS in or out, ToD in or out, or 1PPS in or out (SW selectable)
Console	1	Serial EIA-561 (RJ-45) port. The serial console port.
Management port	1	The 3928 includes one 10/100/1000 Mbps port for out-of band management. This port is located on the right side of the faceplate and is labeled MGMT 10/100/1000. This port uses an RJ-45 connector.

3942 switch

All interfaces on the 3942 switch are accessible from the faceplate of the unit. With the exception of the Console port, all the interfaces have integrated LEDs which provide status information for the port.

Ports on the 3942 switch are:

- “1/10 Gigabit Ethernet ports” on page 10-9
- “1 Gigabit Ethernet ports” on page 10-10
- “Local management port (10/100/1000)” on page 10-10
- “Console port” on page 10-10

1/10 Gigabit Ethernet ports

The faceplate of the 3942 switch has four high-capacity ports. These are ports 21 to 24, and these ports are NNI capable. All ports support both SFP and SFP+ modules.

These ports are capable of operating at 1 Gbps or 10 Gbps (SFP+ and NNI) speeds. Copper SFPs installed in these ports support 10/100/1000 Mbps. The port characteristics are set by the capabilities of the SFPs that are installed. The SFP ports conform to the IEEE 802.3ae 10-Gigabit Ethernet standard and are hot-swappable.

1 Gigabit Ethernet ports

The faceplate of the 3942 switch has 20 ports capable of operating at 10M, 100M or 1 Gbps. These are ports 1 to 20 which are UNI capable. These ports also include integrated status LEDs.

Local management port (10/100/1000)

The 3942 switch includes one 10/100/1000 Mbps port for out-of-band management. This port is located on the right of the faceplate and is labeled MGMT 10/100/1000. This port uses an RJ-45 connector and is fully compliant with the IEEE 802.3u 1000Base-Tx Ethernet standard.

The management port can be used to attach a PC directly to the device, or it can be connected to the network for management. The management port uses auto-MDI/MDIX. A straight through (MDI) or a crossover cable (MDIX) can be connected to this port. Connection speed and duplex are negotiated with auto-negotiation.

Console port

The 3942 switch includes one serial port with RJ-45 connector for maintenance purposes. This port is located on the right side of the faceplate and is labeled Console. The two LEDs on the connector are unused.

5142 switch

All interfaces on the 5142 switches are accessible from the faceplate of the unit. With the exception of the Console port and Alarm port, all the interfaces have integrated LEDs which provide status information for the port.

This section provides an overview of the ports available on the 5142 switch:

1/10 Gigabit Ethernet ports

The faceplate of the 5142 switch has four high-capacity ports. These are Ports 21 to 24, and these ports are NNI capable. All ports support both SFP and SFP+ modules.

These ports are capable of operating at 1 Gbps or 10 Gbps (SFP+) speeds. If SGMII copper transceivers are installed the port can operate at 10/100/1000M speeds. The port characteristics are set by the capabilities of the SFPs that are installed. The SFP ports conform to the IEEE 802.3ae 10-Gigabit Ethernet standard and are hot-swappable.

1 Gigabit Ethernet Ports

The faceplate of the 5142 switch has 20 ports capable of operating at 100M or 1 Gbps. If SGMII copper transceivers are installed the port can operate at 10/100/1000M speeds. These are Ports 1 to 20, and these ports are UNI capable. All ports support SFP module.

The port characteristics are set by the capabilities of the SFPs that are installed. The SFP ports conform to the IEEE 802.3ae 10-Gigabit Ethernet standard and are hot-swappable.

Local management port (10/100/1000)

The 5142 switch includes one 10/100/1000 Mbps port for out-of-band management. This port is located on the right of the faceplate and is labeled MGMT 10/100/1000. This port uses an RJ-45 connector and is fully compliant with the IEEE 802.3u 1000Base-Tx Ethernet standard.

The management port can be used to attach a PC directly to the device, or it can be connected to the network for management. The management port uses auto-MDI/MDIX. A straight through (MDI) or a crossover cable (MDIX) can be connected to this port. Connection speed and duplex are negotiated with auto-negotiation.

Sync Port

The port is located on the right side of the faceplate and is labeled SYNC.

For more information about this port as it relates to external timing refer to “Sync port” on page 11-2.

1 PPS

The port is located on the right side of the faceplate and is labeled 1PPS.

For more information about this port as it relates to external timing refer to “1 PPS” on page 11-4.

10 MHz

The port is located on the right side of the faceplate and is labeled 10MHz.

For more information about this port as it relates to external timing refer to “10 MHz” on page 11-5.

Console Port (EIA-561)

The 5142 switch includes one serial port with RJ-45 connector for maintenance purposes. This port is located on the right side of the faceplate and is labeled Console. The two LEDs present on the connector are unused.

External alarm inputs

The 5142 switch supports 16 external alarm inputs. The alarm connector is located in the center/right section of the 5142 switch and is labeled ALARMS.

5142 switch

All interfaces on the 5142 switches are accessible from the faceplate of the unit. With the exception of the Console port and Alarm port, all the interfaces have integrated LEDs which provide status information for the port.

This section provides an overview of the ports available on the 5142 switch:

1/10 Gigabit Ethernet ports

The faceplate of the 5142 switch has four high-capacity ports. These are Ports 21 to 24, and these ports are NNI capable. All ports support both SFP and SFP+ modules.

These ports are capable of operating at 1 Gbps or 10 Gbps (SFP+) speeds. If SGMII copper transceivers are installed the port can operate at 10/100/1000M speeds. The port characteristics are set by the capabilities of the SFPs that are installed. The SFP ports conform to the IEEE 802.3ae 10-Gigabit Ethernet standard and are hot-swappable.

1 Gigabit Ethernet Ports

The faceplate of the 5142 switch has 20 ports capable of operating at 100M or 1 Gbps. If SGMII copper transceivers are installed the port can operate at 10/100/1000M speeds. These are Ports 1 to 20, and these ports are UNI capable. All ports support SFP module.

The port characteristics are set by the capabilities of the SFPs that are installed. The SFP ports conform to the IEEE 802.3ae 10-Gigabit Ethernet standard and are hot-swappable.

Local management port (10/100/1000)

The 5142 switch includes one 10/100/1000 Mbps port for out-of-band management. This port is located on the right of the faceplate and is labeled MGMT 10/100/1000. This port uses an RJ-45 connector and is fully compliant with the IEEE 802.3u 1000Base-Tx Ethernet standard.

The management port can be used to attach a PC directly to the device, or it can be connected to the network for management. The management port uses auto-MDI/MDIX. A straight through (MDI) or a crossover cable (MDIX) can be connected to this port. Connection speed and duplex are negotiated with auto-negotiation.

Sync Port

The port is located on the right side of the faceplate and is labeled SYNC.

For more information about this port as it relates to external timing refer to “Sync port” on page 11-2.

1 PPS

The port is located on the right side of the faceplate and is labeled 1PPS.

For more information about this port as it relates to external timing refer to “1 PPS” on page 11-4.

10 MHz

The port is located on the right side of the faceplate and is labeled 10MHz.

For more information about this port as it relates to external timing refer to “10 MHz” on page 11-5.

Console Port (EIA-561)

The 5142 switch includes one serial port with RJ-45 connector for maintenance purposes. This port is located on the right side of the faceplate and is labeled Console. The two LEDs present on the connector are unused.

External alarm inputs

The 5142 switch supports 16 external alarm inputs. The alarm connector is located in the center/right section of the 5142 switch and is labeled ALARMS.

5160 switch

All interfaces on the 5160 switch are accessible from the faceplate of the unit. With the exception of the Console port and Alarm port, all the interfaces have integrated LEDs which provide status information for the port.

This section provides an overview ports on the 5160 switch:

- “1/10 Gigabit Ethernet ports” on page 10-14

1/10 Gigabit Ethernet ports

The faceplate of the 5160 switch has 24 high-capacity ports. All ports are UNI/NNI capable. All ports support both SFP and SFP+ modules.

These ports are capable of operating at 1 Gbps or 10 Gbps (SFP+) speeds. The port characteristics are set by the capabilities of the SFPs that are installed. The SFP ports conform to the IEEE 802.3ae 10-Gigabit Ethernet standard and are hot-swappable. Copper SFPs are supported on all the ports. However, while all other ports support triple speed operation that is 10/100/1000 Mbps, ports 19 and 20 support fixed 1G rate only.

Local management port (10/100/1000)

The 5160 switch includes one 10/100 Mbps port for out-of-band management. This port is located on the right of the faceplate and is labeled MGMT 10/100/1000. This port uses an RJ-45 connector and is fully compliant with the IEEE 802.3u 1000Base-Tx Ethernet standard.

The management port can be used to attach a PC directly to the device, or it can be connected to the network for management. The management port uses auto-MDI/MDIX. A straight through (MDI) or a crossover cable (MDIX) can be connected to this port. Connection speed and duplex are negotiated with auto-negotiation.

Sync port

The port is located on the right side of the faceplate and is labeled SYNC. This port is used as either a BITS-IN or BITS-OUT interface.

For more information about this port as it relates to external timing, refer to “Sync port” on page 11-2.

1 PPS

The port is located on the right side of the faceplate and is labeled 1PPS.

For more information about this port as it relates to external timing, refer to “1 PPS” on page 11-4 for more information about this port.

10 MHz

The port is located on the right side of the faceplate and is labeled 10MHz.

For more information about this port as it relates to external timing, refer to “10 MHz” on page 11-5 for more information about this port.

Console port (EIA-561)

The 5160 switch includes one serial port with RJ-45 connector for maintenance purposes. This port is located on the right side of the faceplate and is labeled Console. The two LEDs present on the connector are unused.

The console port pinout and cabling information for the products in the Packet Networking portfolio are described in “Console cables” on page 4-9.

External alarm inputs

The 5160 switch supports 16 external alarm inputs. The alarm connector is located in the center/right section of the 5160 switch labeled ALARMS.

External timing

Some of the switches in the Packet Networking portfolio have external timing interfaces. Table 11-1 provides a summary.

Table 11-1
External timing summary

Port name	Connector	Capability of port	Type of timing recovered or distributed from interface	Notes
SYNC	RJ-45	BITS-IN	Frequency	The port can be used as either a BITS-IN or BITS-OUT interface. It cannot support both BITS-IN and BITS-OUT simultaneously.
		BITS-OUT	Frequency	
		1 PPS	Phase	—
		Time of Day	Time-of-day	The systems are hardware ready to support Time of Day. In release 6.12, time-of-day extracted from PTP is only displayed. Full time-of-day functionality will be supported in a future release.
1 PPS	SMB	1 PPS	Phase and Time-of-day	—
		Time of Day	Time-of-day	The systems are hardware ready to support Time of Day. In release 6.13, time-of-day extracted from PTP is only displayed. Full time-of-day functionality will be supported in a future release
10 MHz	SMB	10 MHz	Frequency	Supports the following rates: 1.544 MHz, 2.048 MHz, or 10 MHz.
Note: External timing interfaces can be configured to either receive a signal or provide an output signal. They cannot support both transmit and receive simultaneously.				

This chapter provides an overview of each of these timing ports. The faceplate location for each of these ports varies from switch to switch. Refer to the following graphics for assistance locating these ports:

- 3904 — Figure 3-3 on page 3-3
- 5142 — Figure 3-19 on page 3-13
- 5160 — Figure 3-20 on page 3-13

For the procedures for configuring system timing, refer to *39XX/51XX Advanced Ethernet Configuration*.

Sync port

This port is labeled SYNC on the faceplate. The port uses an RJ-45 connector and is intended for intra-building use only. This port has integrated status LEDs. Refer to the product hardware installation guide for more information.

The sync port can be used for the following:

- BITS — the port can be used as either a BITS-IN or BITS-OUT interface. It cannot support both BITS-IN and BITS-OUT simultaneously
- 1 PPS
- Time of Day

Table 11-2 provides a summary of the parameters that are supported on the sync port. These parameters are available on both BITS-IN and BITS-OUT configurations.

Table 11-2
Sync port parameters

Signal Format	Impedance	Notes
1.544 Mbps (DS1)	100 Ohm	DS1 SF/ESF AMI or B8ZS line coding.
2.048 Mbps (E1)	120 Ohm	E1, Basic Frame, CRC4, AMI or HDB3 line coding.
2 MHz	120 Ohm	—

Both 1 PPS and ToD input signals can be directed to, or 1 PPS and ToD output signals can be directed from, the relevant pins on the SYNC port. The ToD signal on the SYNC port uses RS-422.

Ciena offers two optional cables for this interface that are 6 foot long shielded cables with the following specifications:

- 100 Ohm cable with RJ-45 connectors is cable (170-0083-900)
- 120 Ohm cable with RJ-45 connectors is cable (170-0084-900)

One end has a shielded RJ-45 connector and the other end is un-terminated. When using this cable, the shield of the un-terminated end must be connected.

The sync cable wiring connection summary is provided in Table 11-3.

Table 11-3
Sync cable wiring connection summary

Pair	Color	Signal	Pin #
1	White	Rx tip	1
	Blue	Rx ring	2
2	White	ToD/1PPS	3
	Green	ToD/1PPS	6
3	White	Tx tip	4
	Orange	Tx ring	5
4	White	—	7
	Brown	—	8
Note: The wiring information in this table applies to both the available Ciena cables.			

A customer-supplied cable can also be used provided the following:

- The cable is shielded.
- The cable is CAT 5 or better.
- The shield is terminated at both ends.

The sync port pinout is provided in Table 11-4.

Table 11-4
Sync port pin assignments

Pin #	Signal	Direction
1	Rx tip	Input
2	Rx ring	Input
3	ToD/1PPS	Bidirectional
4	Tx tip	Output
5	Tx ring	Output
6	ToD/1PPS	Bidirectional

Table 11-4
Sync port pin assignments (continued)

Pin #	Signal	Direction
7	Shield	—
8	Shield	—
Note: Connector is tab up, pin 1 is to the right when looking into the jack.		

1 PPS

The port is labeled 1 PPS on the faceplate. This port uses an 50 Ohm SMB interface.

The 1 Pulse Per Second (1 PPS) port is used to provide external synchronization with a 1 PPS signal. This port can be configured to receive a 1pps input or to provide a 1pps output.

Table 11-5 provides a summary of the supported settings.

Table 11-5
1 PPS port settings

Attribute	1PPS (Input)	1PPS (Output)
Waveform	Pulse Shape	Pulse Shape
Amplitude	2.4 V TTL	2.4 V TTL
Impedance	50 Ohm	50 Ohm
Pulse Width	26 microsecond	26 microseconds
Rise Time	20 nanosecond	20 nanoseconds

Ciena offers a cable (170-0085-900) for connection to this port. The cable is 6 feet long, with coax on one end and an SMB connector on the other.

10 MHz

The port is labeled 10MHz on the faceplate. This port uses an 50 Ohm SMB interface. A cable is available for connection to this interface.

The 10 MHz port is used to provide external synchronization with a GPS signal. The following rates are supported: 1.544 MHz, 2.048 MHz, or 10 MHz. This port can be configured to receive input from a GPS receiver or to provide an output at these frequencies.

Table 11-6 provides a summary of the supported settings.

Table 11-6
10 MHz port settings

Attribute	10MHz (Input)	10MHz (Output)
Waveform	Sine Wave	Square Wave
Amplitude	1.7 V p-p	2.4 V TTL
Impedance	50 Ohm	50 Ohm
Pulse Width	50% duty cycle	50% duty cycle
Rise Time	AC coupled	20 nanoseconds

Ciena offers a cable (170-0085-900) for connection to this port. The cable is 6 feet long, with coax on one end and an SMB connector on the other.

Default configuration

If a system does not have an operational configuration, the default configuration is used. Default port settings vary depending on the platform and port number. Table 12-1 shows the general settings applicable to all ports and platforms.

Table 12-1
Default settings - applicable to all ports and platforms

Attribute	Default setting
Flow Control Advertisement	Off
Flow Control	Off
Duplex	Full
Ingress VLAN Filter	Enabled
Max Frame Size	1526
PVID	1
Egress Untagged VLAN	1

Table 12-2 shows the default general settings that vary by platform.

Table 12-2
Factory default general port settings by platform

Platform	Ports	Type	Connector mode	Speed	VLAN	Acceptable frame types	Auto negotiation	Dying Gasp	Inter-packet gap
3903	1	UNI	Default	1 Gbps	1	All	On	Yes	No
	2-3	NNI	SFP	Auto	1,127	Tagged Only	On	Yes	Yes
3903x	1	UNI	Default	1 Gbps	1	All	On	No	No
	2-3	NNI	SFP	Auto	1,127	Tagged Only	On	No	Yes
3904	1-2	UNI	Default	1 Gbps	1	All	On	Yes	No
	3-4	NNI	SFP	Auto	1,127	Tagged Only	On	Yes	Yes
3905	1-2	UNI	Default	1 Gbps	1	All	On	Yes	No
	3-4	NNI	SFP	Auto	1,127	Tagged Only	On	Yes	Yes
3906	1-4	UNI	Default	1 Gbps	1, 127	All	On	Yes	No
	5-6	NNI	SFP	SFP	1, 127	Tagged Only	On	Yes	Yes
	i1-i4	UNI	RJ-45 (Internal)	1 Gbps	1, 127	All	On	No	No
3924 AC single 3924 AC dual 3924 DC dual	1-4	UNI	SFP	1 Gbps	1	All	On	Yes	No
	5-8	NNI	SFP	1 Gbps	1, 127	All	On	Yes	Yes
3926	1-2	UNI	SFP	1 Gbps	1	All	On	No	No
	3-4	UNI	SFP (Note 1)	10 Gbps	1	All	On	No	No
	5-8	NNI	SFP (Note 1)	Auto	1, 127	Tagged Only	On	Yes	Yes
	i1-i3	UNI	RJ-45 (Internal)	Auto	1	All	On	No	No

Table 12-2
Factory default general port settings by platform (continued)

Platform	Ports	Type	Connector mode	Speed	VLAN	Acceptable frame types	Auto negotiation	Dying Gasp	Inter-packet gap
3928 AC 3928 DC	1-8	UNI	SFP	1 Gbps	1	All	On	No	No
	9-12	NNI	SFP (Note 1)	Auto	1, 127	Tagged Only	On	Yes	Yes
3942	1-20	UNI	RJ-45	1 Gbps	1	All	On	Yes	No
	21-24	NNI	SFP (Note 1)	Auto	1, 127	Tagged Only	On	Yes	Yes
5142	1-20	UNI	SFP	Auto	1, 127	Tagged Only	On	Yes	Yes
	21-24	NNI	SFP (Note 2)	Auto	1, 127	Tagged Only	On	Yes	No
5160	1-24	NNI	SFP (Note 3)	Auto	1, 127	Tagged Only	On	Yes	Yes
Note 1: On the 3926, 3928 and 5160, when 1 10 Gbps SFP + is installed in NNI ports 9 and 10, auto-negotiation is turned off to override the default setting (on). The SFP mode accepts both SFP and SFP+ without changing the defaults. This also applies to 3926 ports 3-8, 3928 AC and 3928 DC ports 9-12, 3942 and 5142 ports 21-24, and all ports on 5160. ***Note 2:*** On the 5142,when a 10 Gbps SFP+ is installed in NNI ports 21 to 24, auto-negotiation is turned off to override the default setting (on). The SFP mode accepts both SFP and SFP+ without changing the defaults. ***Note 3:*** On the 5160 when a 10 Gbps SFP+ is installed in any of the ports, auto-negotiation is turned off to override the default setting (on). The SFP mode accepts both SFP and SFP+ without changing the defaults. ***Note 4:*** Dying gasp support is not restricted to the ports configured by default, and it can be enabled on any ports.									

Note: The internal ports on the 3906 and 3926 platforms are related to their virtualization capabilities.

39XX/51XX Switches and Platforms

Planning, Engineering, and Ordering Guide

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