NVIDIA Spectrum-4 SN5000 2U Switch Systems Hardware User Manual

Rev. 1.0

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Relevant for Models: SN5400 and SN5600.

About this Manual

This manual describes the installation and basic use of NVIDIA Ethernet switches based on the NVIDIA® Spectrum-4 ASIC.

Ordering Information

See Ordering Information.

Intended Audience

This manual is intended for IT managers and system administrators.

Related Documentation

Document	Description
Cumulus Linux User Guide	This document contains information regarding the configuration and management of the Cumulus® Linux® software. See https://docs.cumulusnetworks.com.
SONiC User Manual and *Release Notes*	To access SONiC documentation, log in to the NVIDIA Enterprise Support Portal → Downloads → Switches and Gateways → Switch Software → SONiC → Documentation Tab.
Open Network Install Environment (ONIE) Quick Start Guide	See https://github.com/opencomputeproject/onie/wiki/Quick-Start-Guide/.
Hands-on workshops	Cumulus on-site/remote training: https://academy.nvidia.com/en/cumulus-linux-boot-camp/
On-site/remote services	For any tailor-made service, contact nbu-services-sales@nvidia.com.

Revision History

A list of the changes made to this document are provided in Document Revision History.

Ordering Information

The following table lists ordering information for the available systems.

Please pay attention to the airflow direction when ordering your system. For more details, see Air Flow.

SN5400 Ordering Part Numbers

NVIDIA SKU	Product Description	Lifecycle Phase
920-9N42C-00RB-7C0	NVIDIA Spectrum-4 based 400GbE 2U Open Ethernet switch with Cumulus Linux Authentication, 64 QSFP56-DD ports and 1 2xSFP28 port, 2 power supplies (AC), x86 CPU, Secure-boot, standard depth, C2P airflow, Tool-less Rail Kit	Engineering samples

SN5600 Ordering Part Numbers

NVIDIA SKU	Product Description	Lifecycle Phase
920-9N42F-00RI-5N0	NVIDIA Spectrum-4 based 800GbE 2U Open Ethernet switch with ONIE, 64 OSFP ports and 1 SFP28 port, 2 power supplies (AC), x86 CPU, Secure-boot, standard depth, C2P airflow, Tool-less Rail Kit	Engineering samples
920-9N42F-00RI-7C0	NVIDIA Spectrum-4 based 800GbE 2U Open Ethernet switch with Cumulus Linux Authentication, 64 OSFP ports and 1 SFP28 port, 2 power supplies (AC), x86 CPU, Secure-boot, standard depth, C2P airflow, Tool-less Rail Kit	Engineering samples

Introduction

The NVIDIA Spectrum SN5000 series switches are the 5th generation of Spectrum switches, purpose-built to accelerate data center fabrics. The SN5000 series provides port speeds spanning from 40GbE to 800GbE, and delivers accelerated Ethernet to every data center. The SN5000 series is ideal for enabling cloud-scale infrastructure for data centers of any size. The SN5000 switch systems provide high performance and consistent low latency along with support for advanced software defined networking features, making them the ideal choice for AI, cloud, data analytics, and simulation applications.

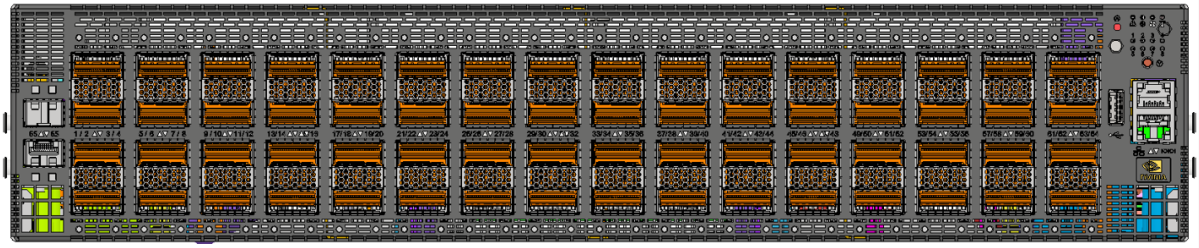
Powered by NVIDIA Spectrum-4 ASICs, the SN5000 series features dynamic, flexible shared buffers and predictable wire speed performance. The SN5000 is built to accelerate NVIDIA platforms, including NVIDIA EGXTM, NVIDIA DGX PODTM , and NVIDIA OVXTM SuperPODs, and AI solution stacks such as NVIDIA AI Enterprise and NVIDIA LaunchPad. As part of the Spectrum platform, the SN5000 systems are pre-tested and pre-validated with NVIDIA's full portfolio of Ethernet networking technology, including BlueField DPUs, ConnectX SmartNICs, and LinkX interconnects. This end-to-end switch to host solution is critical to powering accelerated workloads, and delivers the high performance and innovative feature set needed to supercharge cloud-native applications at scale.

SN5000 switch systems are based on the high-performance Spectrum-4 ASIC with a bidirectional switching capacity of up to 51.2 Tbps. SN5000 platforms are available in a range of configurations, each delivering high performance combined with feature-rich layer 2 and layer 3 forwarding, ideally suited for both top-of-rack leaf and fixed configuration spines. SN5000 series provides full wire speed, cut through-mode latency, on-chip fully-shared 128MB packet buffering, and flexible port use in addition to advanced capabilities. Combining a wide range of innovations in the area of programmability, telemetry, and tunneling with industry-leading performance, NVIDIA SN5000 series is capable of addressing the complex networking requirements of today's data centers.

- The SN5400 smart spine/super-spine offers 64 ports of 400GbE in a dense 2U form factor, fully splittable to up to 128 ports of 200GbE/40GbE, and up to 256 ports of 10/25/50/100GbE when used with splitter cables.
- The SN5600 smart spine/super-spine offers 64 ports of 800GbE in a dense 2U form factor, fully splittable to up to 128 ports of 400GbE, and up to 256 ports of 10/25/50/100/200GbE when used with splitter cables.

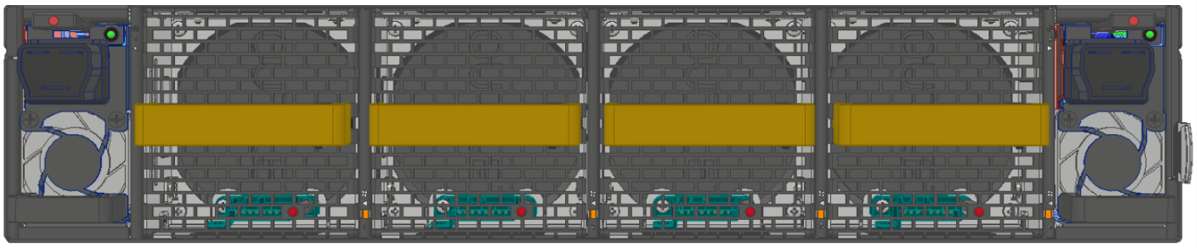
For a full list of all available ordering options, see Ordering Information.

SN5400 Front View



SN5600 Front View

SN5400 and SN5600 Rear View



Speed and Switching Capabilities

The table below describes maximum throughput and interface speed per system model.

System Model	Interfaces	Supported Rates	Max Throughput
SN5400	64 QSFP-DD 400GbE 2xSFP28 25GbE	64 x 400GbE 128 x 200GbE 256 x 10/25/50/100GbE ⚠ 1GbE is supported only in SFP28 ports #65 and #66.	25.6Tb/s
SN5600	64 OSFP 800GbE 1xSFP28 25GbE	64 x 800GbE 128 x 400GbE 256 x 10/25/50/100/200GbE ⚠ 1GbE is supported only in SFP28 port #65.	51.2Tbps

*The systems support different interfaces and speed rates using QSFP/QSDP-DD to SFP adapters or breakout cables. For further information, see Splitter (Breakout) Cables and Adapters.

Management Interfaces, PSUs and Fans

The table below lists the various management interfaces, PSUs and fans per system model.

System Model	USB-A	RJ45 MGT (Management)	RJ45 Console	PSU	Fan
SN5400	Front	Front	Front	Yes, 2	Yes, 4
SN5600	Front	Front	Front	Yes, 2	Yes, 4

Features

For a full feature list, please refer to the system's product brief. Go to https://www.nvidia.com/en-us/networking/. In the main menu, click on Products > Ethernet Switch Systems, and select the desired product family.

Certifications

For a list of certifications (such as EMC, Safety and others) per system for different regions of the world, please contact your NVIDIA representative.

Installation

System Installation and Initialization

Installation and initialization of the system require attention to the mechanical, power, and thermal precautions for rack-mounted equipment.

> ⚠ The rack mounting holes conform to the EIA-310 standard for 19-inch racks. Take precautions to guarantee proper ventilation in order to maintain good airflow at ambient temperature.

> ⚠ Unless otherwise specified, NVIDIA products are designed to work in an environmentally controlled data center with low levels of gaseous and dust (particulate) contamination.
>
> The operation environment should meet severity level G1 as per ISA 71.04 for gaseous contamination and ISO 14644-1 class 8 for cleanliness level.

The installation procedure for the system involves the following phases:

Step	Procedure	See
1	Follow the safety warnings	Safety Warnings
2	Pay attention to the air flow consideration within the system and rack	Air Flow
3	Make sure that none of the package contents is missing or damaged	Package Contents
4	Mount the system into a rack enclosure	19" System Mounting Options
5	Power on the system	Initial Power On
6	Perform system bring-up	System Bring-Up
7	[Optional] FRU replacements	FRU Replacements

Safety Warnings

Prior to the installation, please review the Safety Warnings. Note that some warnings may not apply to all models.

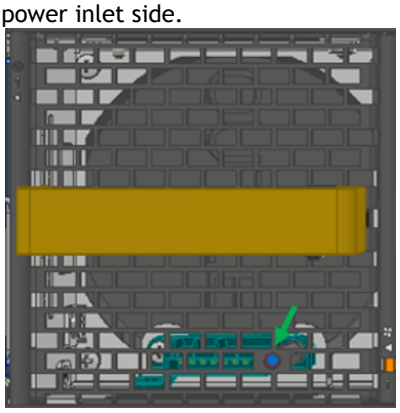
Air Flow

NVIDIA systems are offered with two air flow patterns:

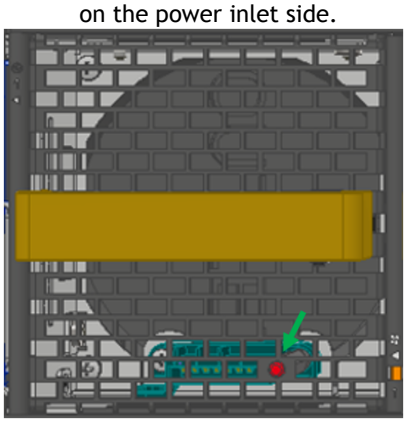
> ⚠ The SN5400 and SN5600 systems are currently offered with one airflow type only - Connector side inlet to power side outlet.

the images are provided for illustration purposes only. The design may slightly vary in different systems

- Power (rear) side inlet to connector side outlet - marked with blue dots that are placed on the power inlet side.



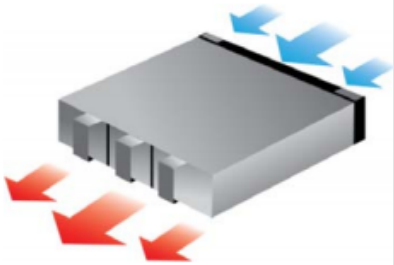
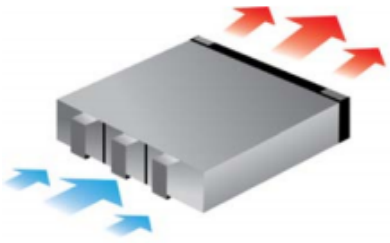
- Connector (front) side inlet to power side outlet - marked with red dots that are placed on the power inlet side.



All servers and systems in the same rack should be planned with the same airflow direction.

All FRU components need to have the same air flow direction. A mismatch in the air flow will affect the heat dissipation.

The table below provides an air flow color legend and respective OPN designation.

Direction	Description and OPN Designation
	Connector side inlet to power side outlet. Red dots are placed on the power inlet side.
	Power side inlet to connector side outlet. Blue dots are placed on the power inlet side.

Package Contents

Before installing your new system, unpack it and check against the parts list below that all the parts have been sent. Check the parts for visible damage that may have occurred during shipping.

The SN5400/SN5600 package content is as follows:

- 1 x System
- 1 x Rail kit
- 2 x Power cables for each power supply unit - Type C20 to C19
- 1 x Harness: HAR000028 - Harness RS232 2M cable - DB9 to RJ-45
- 2 x Cable retainers for each power supply unit

> ⚠ OSFP air caps should be installed and maintained in ports which are not connected to cables or modules.

⚠ If anything is damaged or missing, contact your sales representative at Networking-support@nvidia.com.

Mounting Options

By default, the systems are sold with fixed rail-kits. Telescopic Rail-kits are available for some systems, and should be purchased separately. For installation instructions, refer to the relevant links in the following table:

System Model	Rail-kit
SN5400/SN5600	SN5400/SN5600 Rail Kit

SN5400/SN5600 Rail Kit

Kit Part Number	Rack Size and Rack Depth Range
930-9SKIT-00L0-00A	NVIDIA 600-800 mm Tool-Less Rail-Kit for 64x400G and 64x800G Switch

⚠ The illustrations show the SN5400 system, yet the installation procedures apply to SN5600 systems as well.

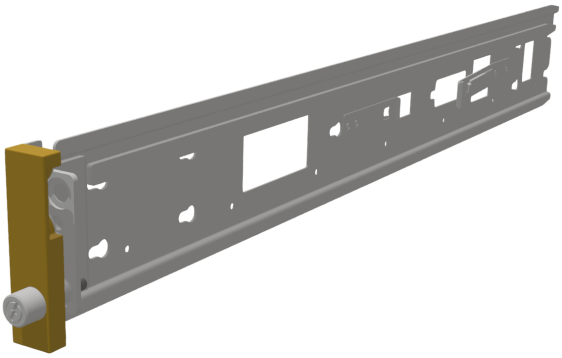
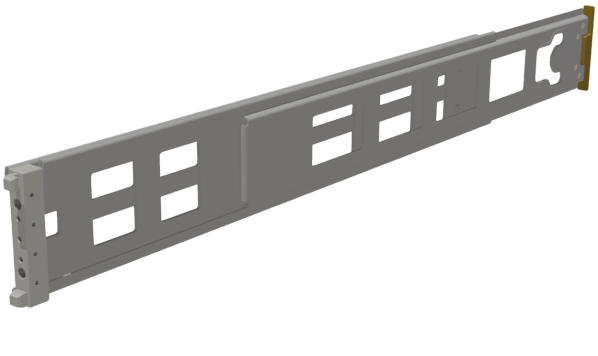
⚠ Prior to the installation procedure, inspect all rail-kit components and make sure none of them is missing or damaged. If anything is missing or damaged, contact your NVIDIA representative at Networking-support@nvidia.com.

The following parts are included in the tool-less rail kit (see figure below):

- 2x System Rails (A)
- 2x Rack Rails (B)

Rail Kit Parts

A	B

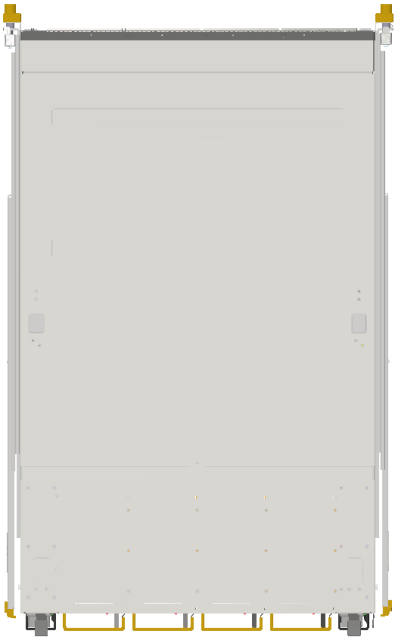
Prerequisites:

Before mounting the system to the rack, select the way you wish to place the system. Pay attention to the airflow within the rack cooling, connector and cabling options.

While planning how to place the system, review the two installation options shown in the table below, and consider the following points:

- Make sure the system air flow is compatible with your installation selection. It is important to keep the airflow within the rack in the same direction.
- Note that the part of the system to which you choose to attach the rails (the front panel direction, as demonstrated in Option 1 or the FRUs direction, as demonstrated in Option 2) will determine the system's adjustable side. The system's part to which the brackets are attached will be adjacent to the cabinet.
- The FRUs, as well as high-speed and MNG cables, must be extracted for replacement as part of the switch service. Consider this when planning the switch installation.

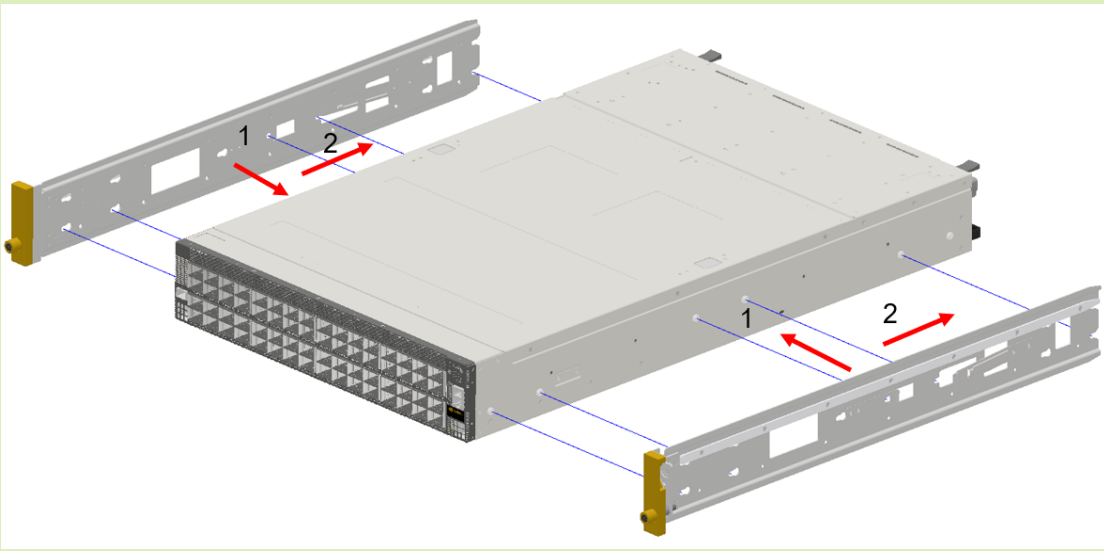
Switch Rails Installation - Top View

Front Side (Ports)	Rear Side (FRUs)
	

⚠ The following steps include illustrations that show front side (ports) installation, yet all instructions apply to all installation options.

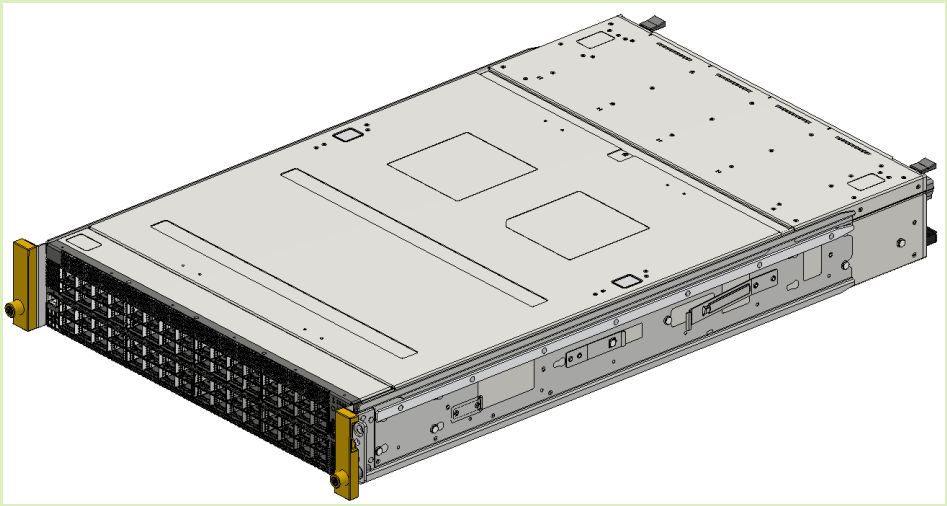
1. Attach the left and right system rails (A) to the switch.

Attaching the System Rails (A) to the Switch

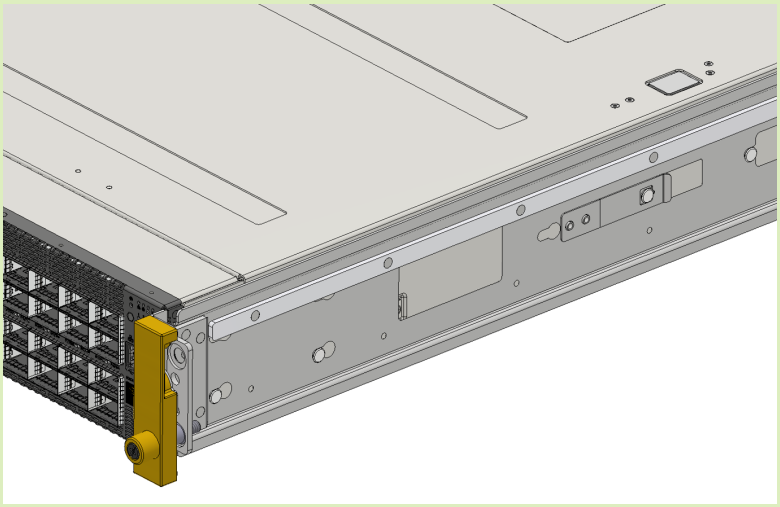


2. Secure the assembly by gently pushing the system chassis' pins through the slider key holes, until locking occurs

Securing the System in the Switch Rails (A)

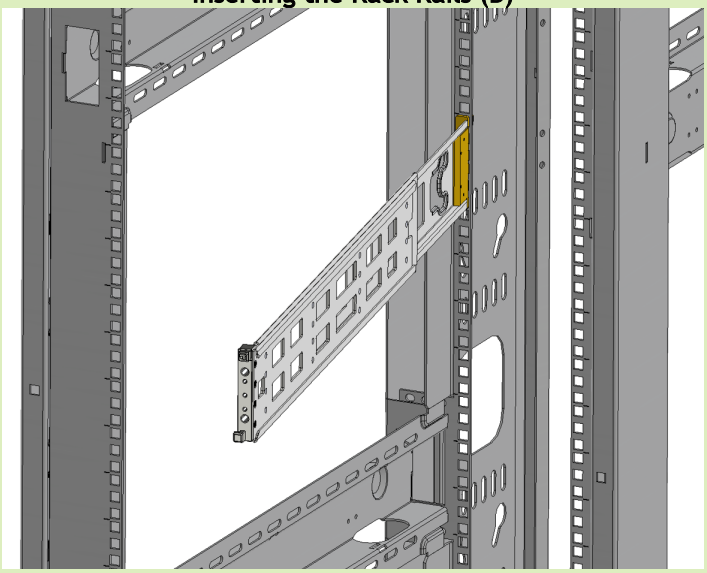


Chassis' Pins in the Rails' Slots Locking them in a Fixed Position



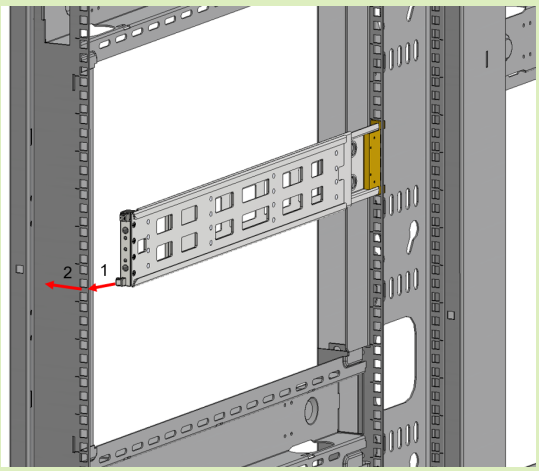
3. Mount both of the rack rails (B) into the rack by angularly inserting the brakes located at the rails edges into the designated slots in the rack unit, as shown in the following figure:

Inserting the Rack Rails (B)

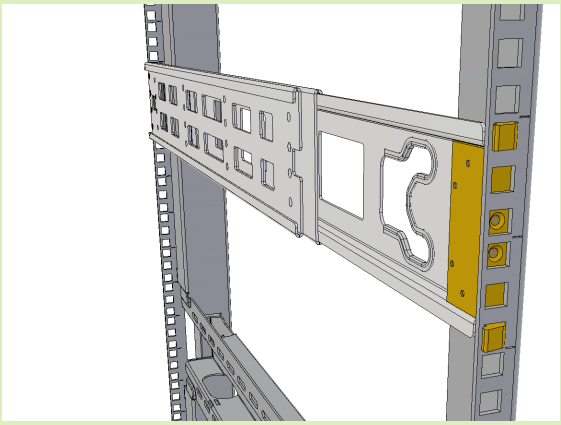


4. Align both rack rails (B) to sit horizontally in parallel to the rack assembly. By straightening the rails' angular position, their breaks will be caught and locked in the rack's slots.

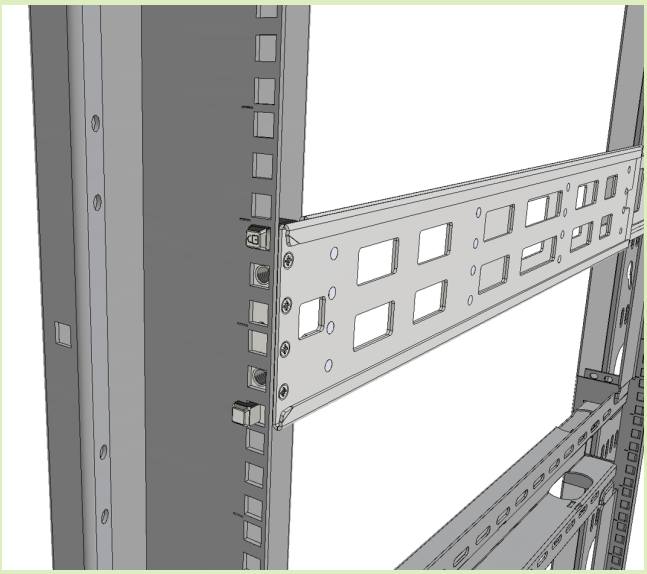
Aligning the Rack Rails (B) Angular Position



The Breaks are Caught and Locked in the Rack's Slots



Rack Rails Fully Inserted and Locked in the Rack Assembly



5. Pull the rack rails' telescopic extensions all the way to the rack's opposite side, and insert the latches at the rails' free edges to the rack's slots. A click should be heard as the spring latches are fully inserted and locking occurs.

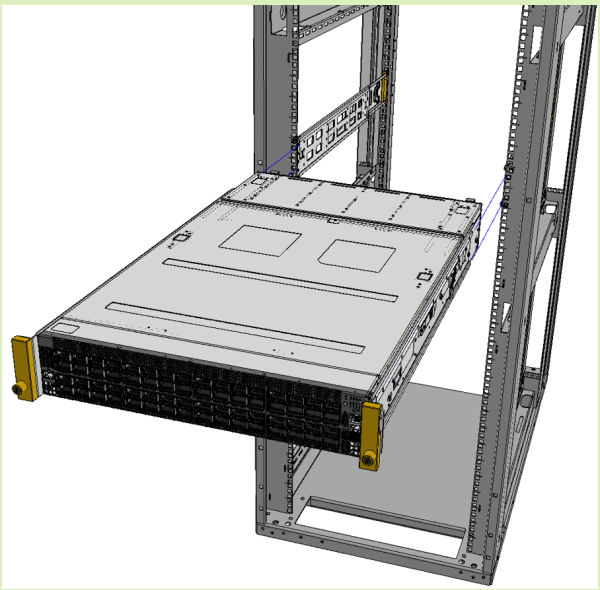
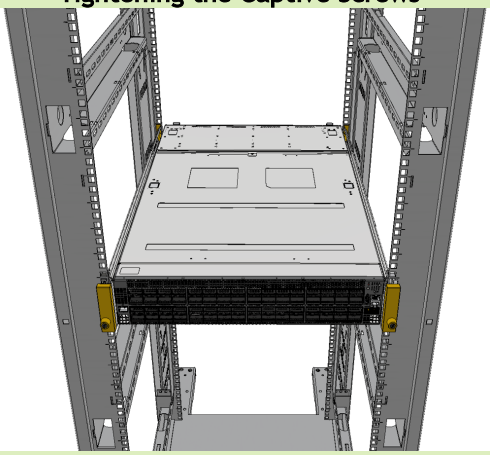
Inserting the Spring Latches to the Rack's Slots

To mount the system into the rack:

> Two people are required to safely mount the system in the rack.

While your installation partner is supporting the system’s weight, perform the following steps:

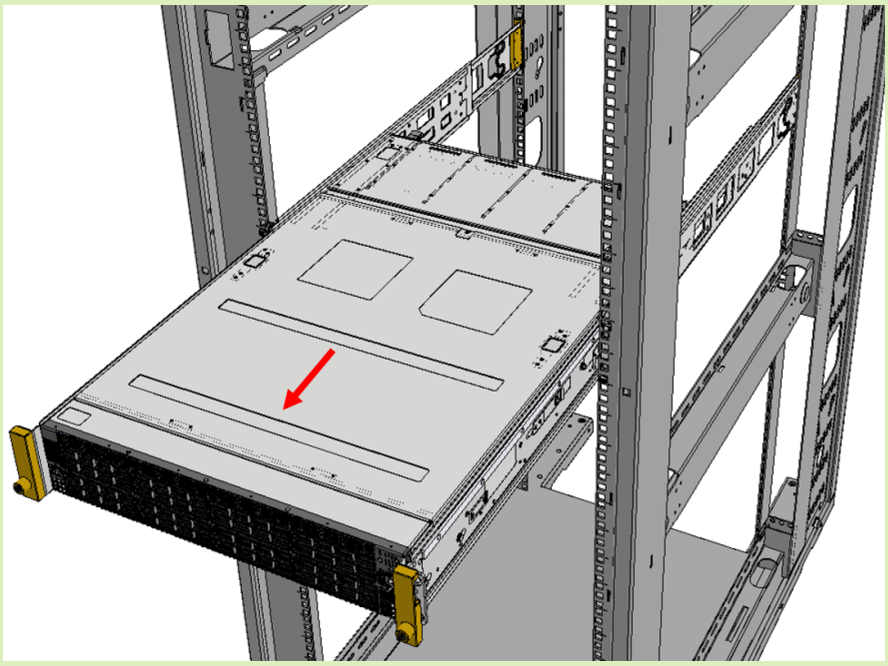
6. Slide the rails installed on the system into the channels in the rack rails. Push them forward until the locking mechanism is activated on both sides, and a click is heard.
7. Tighten the captive screws on both sides to further secure the system to the rack's posts.
Sliding the System's Rails (A) into the Rack Rails (B)

Sliding the System Rails (A) into the Rack Rails (B)	Tightening the Captive Screws
	

To remove the system from the rack:

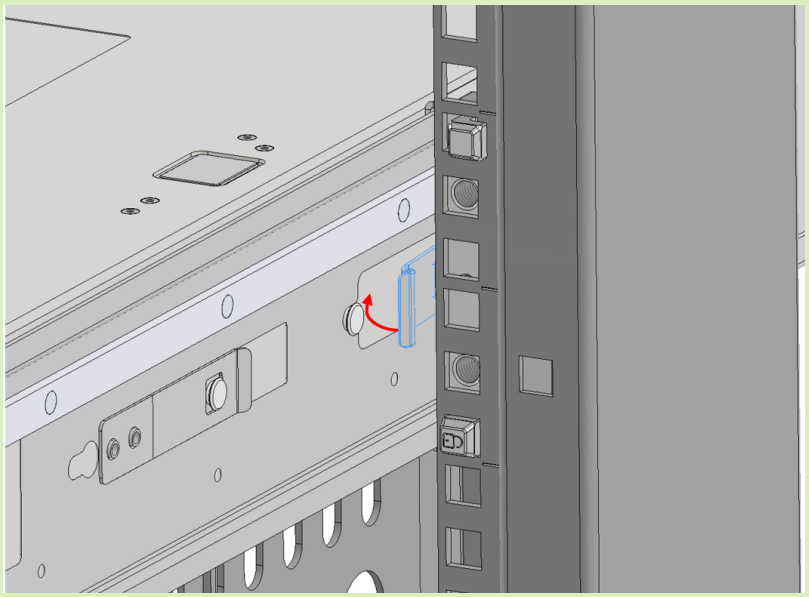
1. Turn off the system and disconnect it from peripherals and from the electrical outlet.
While your installation partner is supporting the system’s weight:
2. Loosen the captive screws attaching the system's rails to the rack's posts.
3. Use two hands to pull the system out until the rails are stopped.

Pulling the System Out



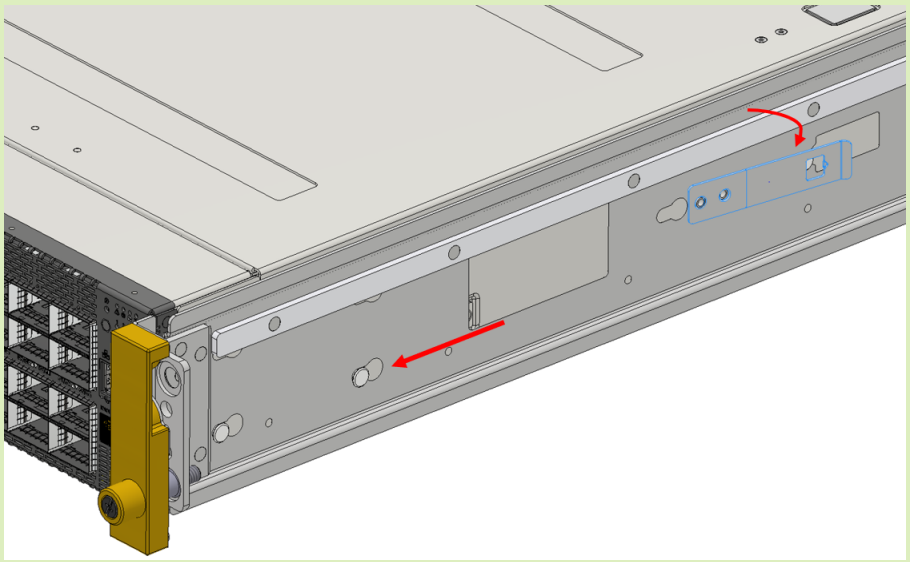
4. Press the spring latches on both sides of the rack, and continue to pull the system out until the rack rails are clear of the system's rails.

Pressing the Spring Latches on Both Sides



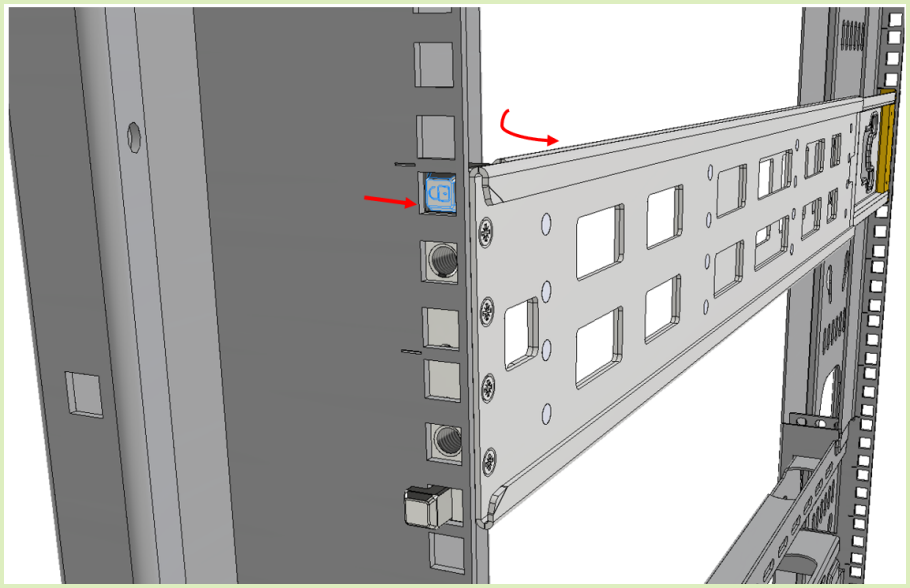
5. Remove the rails from the system. Release the metal latches and pull out the rails, so the system's pins will be removed out of the oval slots.

Removing the Rails from the System



6. Remove the rails from the rack by pressing the lock button, and pull the rails outside of the rack assembly.

Pressing the Lock Button to Remove the Rails from the Rack



Cable Installation

All cables can be inserted or removed with the unit powered on.

To insert a cable, press the connector into the port receptacle until the connector is firmly seated. The LED indicator, corresponding to each data port, will light orange when the physical connection is established. When a logical connection is made, the LED color will change to green.

To remove a cable, disengage the locks and slowly pull the connector away from the port receptacle. The LED indicator for that port will turn off when the cable is unseated.

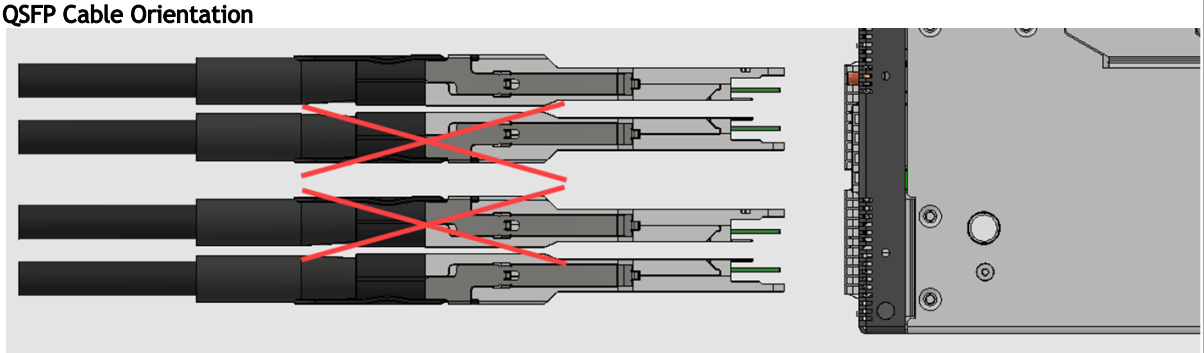
For a list of Supported Cables and Transceivers, please refer to the SN5000 Systems Datasheet.

For full cabling guidelines, ask your NVIDIA representative for a copy of *NVIDIA Cable Management Guidelines and FAQs Application Note*.

For more information about port LEDs, refer to Port LEDs.

> Do not push the cable connector into the receptacle using excessive force, as this may cause damage to the cable or to the cage.

QSFP Cable Orientation



Splitter (Breakout) Cables and Adapters

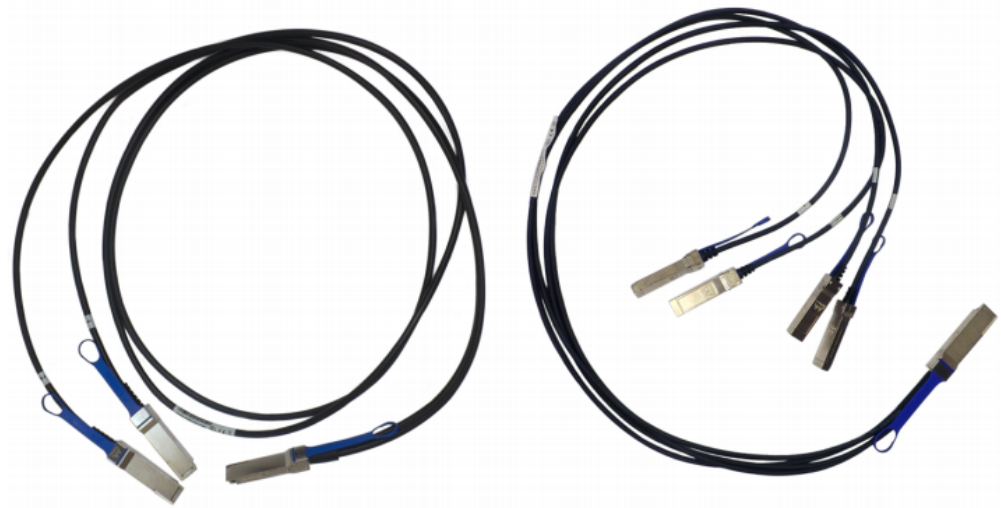
When using an NVIDIA splitter cable, the following splitting options are available:

- **SN5400 (see "Splitting Options"):**
  - When running at a 50GbE per lane, each 400GbE port can be split to 2 ports of 200GbE or 4 ports of 100GbE without any limitation, or 8 ports of 50GbE while disabling (unmapping) the 50GbE port above or below it.
  - When running at a 25GbE per lane, each 200GbE port can be split to 2 ports of 100GbE or 4 ports of 50GbE without any limitation.
- SN5600 (see "Splitting Options"):
  - When running at 100GbE per lane, each 800GbE port can be split to 4 ports of 200GbE without any limitation, or 4 odd ports of 100GbE while disabling (unmapping) even ports.
  - When running at a 50GbE per lane, each 400GbE port can be split to 2 ports of 200GbE or 4 ports of 100GbE without any limitation.
  - When running at 25GbE, each 200GbE port can be split to 2 ports of 100GbE or 4 ports of 50GbE without any limitation.

Using Splitter (Breakout) Cables with Cumulus Linux

If you are using splitter cables, edit the `/etc/cumulus/ports.conf` to enable support for these cables, and restart the switchd service using the `sudo systemctl restart switchd` command. For more details, see Switch Port Attributes in the Cumulus Linux User Guide.

Examples of Splitter (Breakout or Fanout) Cables



Splitting Options

Initial Power On

Each system's input voltage is specified in the Specifications chapter.

The power cords should be standard 3-wire AC power cords including a safety ground and rated for 16A or higher.

> The system platform will automatically power on when AC power is applied. The system has no power switch. Check all power supplies and fan tray modules for proper insertion before plugging in a power cable.

1. Plug in the first power cable.
2. Plug in the second power cable.
3. Wait for the System Status LED to turn green.

   > Complete system boot may take up to five minutes. If the System Status LED shows amber after five minutes, unplug the system and call your NVIDIA representative for assistance.

4. Check the System Status LEDs and confirm that all of the LEDs show status lights consistent with normal operation as shown in the figure below. For more information, refer to "LEDs".

*The figure is for illustration purposes only. The LEDs location and shape may slightly vary in different systems.

> After inserting a power cable and confirming the green System Status LED light is on, make sure that the Fan Status LED is green.
> If the Fan Status LED is not green, unplug the power connection and check that the fan module is inserted properly and that the mating connector of the fan unit is free of any dirt and/or obstacles. If no obstacles were found and the problem persists, call your NVIDIA representative for assistance.

Two Power Inlets - Electric Caution Notifications:

> - Risk of electric shock and energy hazard. The two power supply units are independent. Disconnect all power supplies to ensure a powered down state inside of the switch platform.

- ACHTUNG Gafahr des elektrischen Schocks. Entferrnen des Netzsteckers elnes Netzteils spannungsfrei. Um alle Einhieten spannungsfrei zu machen sind die Netzstecker aller Netzteile zu entfernen.
- ATTENTION Risque de choc et de danger e'lectriques. Le de'branchment d'une seule alimentation stabilise'e ne de'branch uniquement qu'un module "Alimentation Stabilise'e". Pour isoler completement le module en cause, Il faut de'brancher toutes les alimentations stabilise'es.

System Bring-Up

To view the bring-up instructions for a switch system with Cumulus Linux operating system, go to Configuring Network Attributes Using Cumulus Linux.

To view the bring-up instructions for a switch system with SONiC operating system, log into the NVIDIA Enterprise Support Portal, and go to Downloads → Switches and Gateways → Switch Software → SONiC → Documentation Tab.

Configuring Network Attributes Using Cumulus Linux

For Cumulus Linux initial configuration instructions, see Configuring Cumulus Linux in the Cumulus Linux Quick Start Guide.

Remote Connection with Cumulus Linux

Cumulus Linux uses the OpenSSH package to provide SSH functionality. To securely access a Cumulus Linux switch remotely, please follow the instructions on the "SSH for Remote Access" page in the Cumulus Linux User Guide.

Configuring Network Attributes Using SONiC

For initial configuration instructions using SONiC, see Configuring the Switch for the First Time in the SONiC User Manual available on the NVIDIA Enterprise Support Portal.

FRU Replacements

⚠ For a list of the FRU replacements, see "Accessory and Replacement Parts".

Power Supplies

NVIDIA systems that are equipped with two replaceable power supply units work in a redundant configuration. Either unit may be extracted without bringing down the system.

Make sure that the power supply unit that you are NOT replacing is showing green for the power supply unit LED without powering down the system.

Power supply units have directional air flows similar to the fan module. The fan module airflow must coincide with the airflow of all of the power supply units (there are different power supply Part Numbers to indicate the different airflow types).

If the power supply unit airflow direction is different from the fan module airflow direction, the system's internal temperature will be affected. For power supply unit air flow direction, refer to Air Flow.

To extract a power supply unit:

1. Remove the power cord from the power supply unit.
2. Grasping the handle with your hand, push the latch release with your thumb while pulling the handle outward. As the power supply unit unseats, the power supply unit status LEDs will turn off.
3. Remove the power supply unit.

To insert a power supply unit:

1. Make sure the mating connector of the new unit is free of any dirt and/or obstacles.

   Do not attempt to insert a power supply unit with a power cord connected to it.

2. Make sure that the board connector is located on the right (looking from the system's rear side forward), and insert the unit by sliding it into the opening, until a slight resistance is felt.
3. Continue pressing the power supply unit until it seats completely. The latch will snap into place, confirming the proper installation.
4. Insert the power cord into the supply connector.
5. Insert the other end of the power cord into the AC outlet/PDU of the correct voltage.

   The green power supply unit indicator should light. If it does not, repeat the whole procedure to extract the power supply unit and re-insert it.

Fans

The system has 3+1 fan module redundancy. Full operation is possible with 3 fans only.

Make sure that the fans configuration matches the model number. Operation with incorrect fan configuration can cause over-temperature/temperature shutdown in certain scenarios. For power supply unit air flow direction, refer to Air Flow.

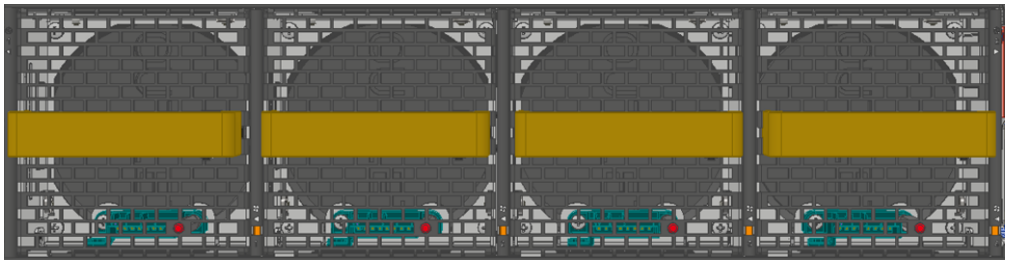
In case the system is operated at 35°C ambient temperature at full capacity with all ports occupied, and one of the system fans becomes faulty, it is recommended to replace the fan as soon as possible to avoid the risk of having no fan redundancy.

To remove a fan unit:

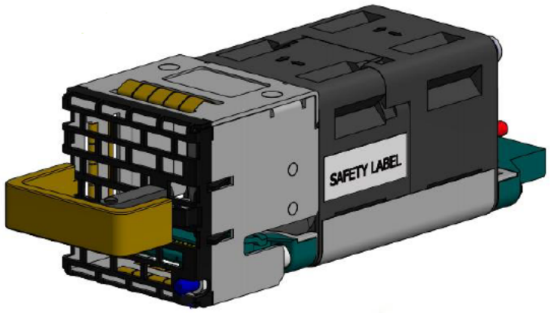
When replacing a faulty fan unit in an operational switch system, do not leave the slot unpopulated for more than 60 seconds.

1. Grasping the handle and pull the unit outward. As the fan unit unseats, the fan unit status LEDs will turn off.
2. Remove the fan unit.

SN5400/SN5600C Fan Module Latches



SN5400/SN5600C Fan Module Pulled Out



To insert a fan unit:

1. Make sure the mating connector of the new unit is free of any dirt and/or obstacles.
2. Insert the fan unit by sliding it into the opening until slight resistance is felt. Continue pressing the fan unit until it seats completely.

Upon first installation, the green Fan Status LED should light. If not, extract the fan unit and reinsert it. After two unsuccessful attempts to install the fan unit, power off the system before attempting any system debug.

Interfaces

The systems support the following interfaces:

- 10/100/1000Mb Ethernet management interface (RJ45)
- USB port (Type A)
- RS232 Console port (RJ45)
- Reset button
- Status and Port LEDs
- Lane select LEDs and power button

In order to reviLane select LEDs and LS PBew the full configuration options matrix, refer to Management Interfaces, PSUs and Fans.

Speed

Ethernet speed must be set manually. The system's ports can be manually configured to run at a wide range of speeds (for more details, see Specifications). To change the port speed configuration, refer to the Switch Port Attributes chapter in the Cumulus Linux User Guide.

RS232 (Console)

The Console port is labeled IOIOI.

The "Console" port is an RS232 serial port on the front side of the chassis that is used for initial configuration and debugging. Upon first installation of the system, the user must connect a PC to this interface and configure network parameters for remote connections. To view the full procedure, refer to Interface Configuration and Management chapter in the Cumulus Linux User Guide.

Management

RJ45 Ethernet "MGT" port is labeled  .

The RJ45 Ethernet "MGT" port provides access for remote management. The management port is configured with auto-negotiation capabilities by default (10MbE to 1000GbE). The management ports' network attributes (such as IP address) need to be pre-configured via the RS232 serial console port or by DHCP before use. To view the full procedure, refer to Interface Configuration and Management chapter in the Cumulus Linux User Guide.

Make sure you use only FCC compliant Ethernet cables.

USB

The USB interface is USB 3.0 compliant and can be used by the operating system to connect to an external disk for software upgrade or file management. The connector complies with the USB 3.0 type A standard.

To view the full matrix of the USB configuration options, refer to Management Interfaces, PSUs and Fans.

> ⚠ USB 1.0 is not supported.

> ⚠ Do not use excessive force when inserting or extracting the USB disk to and from the connector.

Reset Button

The reset button is located on the front side of the system. This reset button requires a tool to be pressed.

> ⚠ Do not use a sharp pointed object such as a needle or a push pin for pressing the reset button. Use a flat object to push the reset button.

For Cumulus Linux password reset instructions, please refer to the Single User Mode - Password Recovery section in the *Cumulus Linux User Guide*.

Status and Port LEDs

See LED Notifications.

Data Interfaces and High Power Transceivers Support

Data Interfaces

The data interfaces can be used with QSFP-DD/OSFP modules or transceivers. The full list of interfaces per system is provided in Speed and Switching Capabilities.

As detailed in the following table, for additional data interfaces, each QSFP-DD/OSFP port can be connected with a QSFP-DD/OSFP cable or module to SFP (Dynamix QSA™) adapters, hybrid or split cables*.

Model Family	Ports	Maximum Speed
SN5400	64	400GbE (50Gbps/lane)
	128	200GbE
		40GbE
	256	100GbE
		50GbE
		25GbE
		10GbE
SN5600	64	800GbE (100Gbps/lane)
	128	400GbE
	256	200GbE
		100GbE
		50GbE
		25GbE
		10GbE

The systems offer several high-power ports for optical transceivers that require such support. The following table specifies each system's ports max power capabilities:

High Power Transceivers Support

Model Family	Ports	Maximum High Power Support
SN5400	All 64 ports	12W
	Ports #1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61	21W
SN5600 with Dual 3KW PSU	Port #1-64	18W

LED Notifications

The system’s LEDs are an important tool for hardware event notification and troubleshooting.

LED Symbols

Symbol	Name	Description	Normal Conditions
	System Status LED	Shows the health of the system.	Green/Flashing green when booting
	Fan Status LED	Shows the health of the fans.	Green

Symbol	Name	Description	Normal Conditions
	Power Supply Units LEDs	Shows the health of the power supply units.	Green
	Unit Identifier LED	Lights up on command through the CLI.	Off or blue when activated by the user

System Status LED

The LED in the red oval shows the system's status.

Front (Ports Side):

*The figure is provided for Illustration purposes only. The design may slightly vary in different systems.

It may take up to five minutes to boot the system. If the System Status LED shows amber after five minutes, unplug the system and call your NVIDIA representative for assistance.

System Status LED Assignments

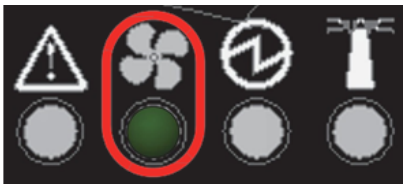
LED Behavior	Description	Action Required
Solid Green	The system is up and running normally.	N/A
Flashing Green	The system is booting up.	Wait up to five minutes for the end of the booting process.
Solid Amber	An error has occurred. For example, corrupted firmware, system is overheated etc..	In case the System Status LED shows amber five minutes after starting the system, refer to Troubleshooting for further instructions.

Fan Status LED

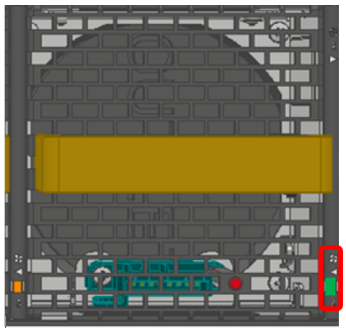
Fan Status LED - Front and Rear Sides

Both of the LEDs in the red ovals show the fans' status.
*The figures are provided for Illustration purposes only. The design may slightly vary in different systems.

Front Panel LED:



Rear Panel LED:



Fan Status Front LED Assignments

LED Behavior	Description	Action Required
Solid Green	All fans are up and running.	N/A
Solid Amber	Error, one or more fans are not operating properly.	The faulty FRUs should be replaced.

Fan Status Rear LED Assignments (One LED per Fan)

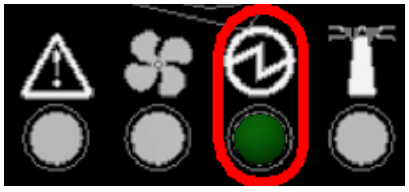
LED Behavior	Description	Action Required
Solid Green	A specific fan unit is operating.	N/A
Solid Amber	A specific fan unit is missing or not operating properly.	The fan unit should be replaced.

Risk of Electric Shock! Do not insert tools or body parts into the fan module cavity.

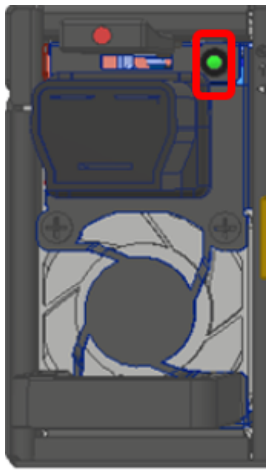
Power Supply Status LEDs

The LEDs in the red ovals show the power supply status.
*The figures are provided for Illustration purposes only. The design may slightly vary in different systems.

Front Panel LED:



Rear Panel LED:

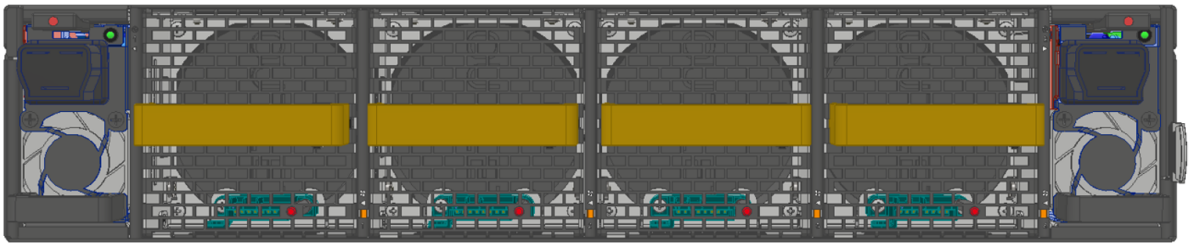


In the SN5400 and SN5600 switches there are two power supply inlets in each system (for redundancy). The system can operate with only one power supply connected. Each power supply unit has two single color LEDs on the right side of the unit, that indicate the status of the unit.

When looking from the FRUs side, the first power supply (PS) unit is located on the left side of the system, and the second unit is located on the right side.

Rear Side Panel

PS (1)	Fan Modules	PS (2)



*The figure is provided for Illustration purposes only. The design may slightly vary in different systems.

Power Supply Unit Status Front LED Assignments

LED Behavior	Description	Action Required
Solid Green	All power supply units are connected and running normally.	N/A
Solid Amber	One or both of the power supplies are not operational or not powered up/ the power cord is disconnected.	Make sure the power cord is plugged in and active. If the problem resumes, refer to Troubleshooting for further instructions.

Power Supply Unit Status Rear LED Assignments

LED Behavior	Description	Action Required
Solid Green	The PSU is running normally.	N/A

LED Behavior	Description	Action Required
Flashing Green 1Hz	AC Present, Standby - On, Main Output - Off	Refer to Troubleshooting. For further assistance, call your NVIDIA representative.
Flashing Amber 1Hz	PSU warning - events where the PSU continues to operate	
Solid Amber	PSU failure (voltage, current, temperature or fan related issue)	
Off	No AC power to all power supplies.	Plug in the AC cor

Unit Identification LED

The UID LED is a debug feature, that the user can use to find a particular system within a cluster by turning on the UID blue LED.

To activate the UID LED on a switch system, run:

```
switch (config) # led MGMT uid on
```

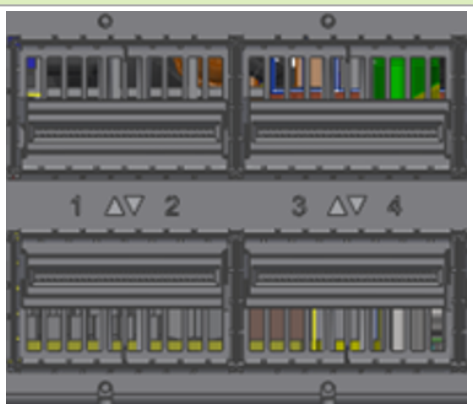
To verify the LED status, run:

```
switch (config) # show leds
Module LED Status
------------------------------------------------------------------------------
MGMT UID Blues
```

To deactivate the UID LED on a switch system, run:

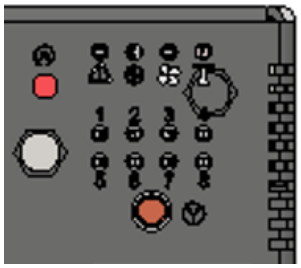
```
switch (config) # led MGMT uid off
```

Port LEDs

SN5400 Port LEDs	SN5600 Port LEDs
	

*The figures are provided for Illustration purposes only. The design may slightly vary in different systems.

Each QSFP-DD/OSFP module can be used as two 4X ports or four 2X ports, and certain modules can be split to eight 1X ports as well. Each QSFP-DD/OSFP module has one dedicated bi-color LED. In order to provide link information for more than one port by using one LED, LED splitting control button is available. You may use the lane select button to select between 8 indication states. By pressing the button, the next indication state will be selected in a cyclic manner. The current state can be identified by the LED splitting state indication LEDs. The states and their indications are detailed in the below table.

	Lane Select LEDs
LED Splitting Control →	

LED Splitting Options

State	State Indication LEDs [/1 /2 /3 /4]	OSFP/QSFP-DD Module LED Indication	Comments
0		Any link is up	See details in Port LEDs Indications (State 0)
1		8x/4xA/2xA/1xA	• See details in Port LEDs Indications (States 1-8). • Only one of the link types can be up at a given time.
2		8x/4xB/2xB/1xB	
3		8x/2xC/1xC	
4		8x/2xD/1xD	
5		8x/1xE	

State	State Indication LEDs [/1 /2 /3 /4]	OSFP/QSFP-DD Module LED Indication	Comments
6		8x/1xF	
7		8x/1xG	
8		8x/1xH	

The port LED behavior indicates the port state, as follows:

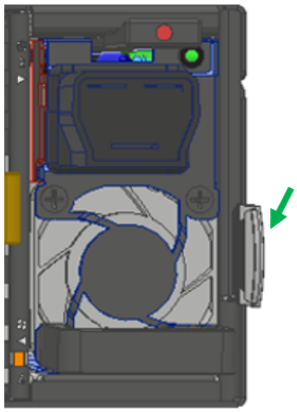
Port LEDs Indications

State	LED Behavior	Description	Action Required
0	Off	No 8x/4x/2x/1x link was established on this OSFP/QSFP-DD module	N/A
	Solid Green	At list one link was established: 8x/4x/2xA/2xB/1xA/1xB/1xC/1xD/1xE/1xF/1xG/1xH	
	Flashing Green	Traffic is running in linked ports	
	Flashing Amber	N/A	
1-8	Off	Link is down	
	Solid Green	Link is up with no traffic	
	Flashing Green	Link is up with traffic	
	Flashing Amber	A problem with the link	Refer to Troubleshooting.

Inventory Information

The system's inventory parameters (such as serial number, part number and GUID address) can be extracted from the inventory pull-out tab on the right side of the rear panel.

Pull-out Tab

SN5400 and SN5600		 *The above label example is provided for illustration purposes only.

Software Management

The SN5000 series switches are available out of the factory in two different flavors:

- Pre-installed with NVIDIA Cumulus Linux, that is providing a rich routing functionality for large-scale applications. For Cumulus Linux software management instructions, refer to the *Cumulus Linux User Guide*.
- Bare metal including ONIE image, installable with any ONIE-mounted OS.

Software Upgrade

Cumulus Linux Software Upgrade

For Cumulus Linux software upgrade instructions, see Upgrading Cumulus Linux in the Cumulus Linux User Guide.

SONiC Software Upgrade

For SONiC software upgrade instructions, log into the NVIDIA Enterprise Support Portal, and go to Downloads → Switches and Gateways → Switch Software → SONiC → Documentation Tab.

Switch Firmware Update

The systems do not require firmware updating. Firmware updating is done through the management software.

Troubleshooting

Problem Indicator	Symptoms	Cause and Solution
LEDs	System Status LED is blinking for more than 5 minutes	Cause: The operating system did not boot properly, and only firmware is running. Solution: Connect to the system via the console port, and check the software status. For further instructions, see Monitoring and Troubleshooting in the *Cumulus Linux User Guide*.
	System Status LED is Amber	Cause: • Critical system fault (CPU error, bad firmware) • Over temperature Solution: • Check environmental conditions (room temperature)
	Fan Status LED is Amber	Cause: Possible fan issue Solution: • Check that the fan is fully inserted and nothing blocks the airflow • Replace the fan FRU if needed
	PSU Status LED is Amber	Cause: Possible PSU issue Solution: • Check/replace the power cable • Replace the PSU if needed
System boot failure while using Cumulus Linux	Software upgrade failed on x86 based systems	See Monitoring and Troubleshooting in *Cumulus Linux User Guide*.

Specifications

This document is preliminary and subject to change.

SN5400 Specifications

Feature		Value
Mechanical	Size:	3.39” x 17.2” x 28.3” 86.2mm (H) x 438mm (W) x 720mm (D)
	Mounting:	19” rack mount
	Weight:	23.5kg
	Speed:	Ports #1-64: 10/25/40/50/100/200/400GbE Port #65-66: 1/10/25GbE
	Connector cage:	Ports #1-64: QSFP56-DD Port #65-66: SFP28
Environmental	Temperature:	Operational: 0° to 40°C Non-Operational: -40° to 70°C
	Humidity:	Operational: 10% - 85% non-condensing Non-Operational: 10% - 90% non-condensing
	Altitude:	3050m
Regulatory	Safety/ EMC:	CB, cTUVus, CE, CU, S_Mark, FCC, VCCI, ICES, RCM, BSMI, KCC, CCC
	RoHS:	RoHS compliant
Power	Input Voltage:	1x/2x, High Line, Rated Vac 220V-240V Vac Minimum 208 Vac Maximum 264 AC current rating 16A 50/60Hz
	Global Power Consumption:	Typical power with passive cables (ATIS): TBD
Main Devices	CPU:	Intel x86 Xeon, Hexa-core Coffee Lake E-2276ME w/ secured-boot
	PCIe:	Gen3 x4
	Switch:	NVIDIA Spectrum®-4
	Memory:	32GB RAM DDR4, 160GB SSD
Throughput		25.6Tbps

SN5600 Specifications

Feature		Value
Mechanical	Size:	3.39” x 17.2” x 28.3” 86.2mm (H) x 438mm (W) x 720mm (D)
	Mounting:	19” rack mount
	Weight:	23.5kg
	Speed:	Ports #1-64: 10/25/40/50/100/200/400/800G Port #65: 1G/10G/25G

Feature		Value
	Connector cage:	Ports #1-64: OSFP Port #65: SFP28
Environmental	Temperature:	Operational: 0° to 35°C Non-Operational: -40° to 70°C
	Humidity:	Operational: 10% - 85% non-condensing Non-Operational: 10% - 90% non-condensing
	Altitude:	3050m
Regulatory	Safety/ EMC:	CB, cTUVus, CE, CU, S_Mark, FCC, VCCI, ICES, RCM, BSMI, KCC, CCC
	RoHS:	RoHS compliant
Power	Input Voltage:	1x/2x, High Line, Rated Vac 220V-240V Vac Minimum 208 Vac Maximum 264 AC current rating 16A 50/60Hz
	Global Power Consumption:	Typical power with passive cables (ATIS): 940W
Main Devices	CPU:	Intel x86 Xeon, Hexa-core Coffee Lake E-2276ME w/ secured-boot
	PCIe:	Gen3 x4
	Switch:	NVIDIA Spectrum®-4
	Memory:	32GB RAM DDR4, 160GB SSD
Throughput		51.2Tb/s

Appendixes

This document is preliminary and subject to change.

The document contains the following appendixes:

Accessory and Replacement Parts

This document is preliminary and subject to change.

Ordering Part Numbers for Replacement Parts

Part Type	Part Number	Description	Supported Systems
Rack Installation Kit	930-9SKIT-00L0-00A	NVIDIA Tool-Less Rail-Kit for 64x400G and 64x800G Switch	SN5400, SN5600
Fan Modules	930-9SFAN-00RM-00A	NVIDIA FAN Unit, C2P Airflow, for 64x400G and 64x800G switch	SN5400, SN5600
Power Supplies	930-9SPSU-00RA-00B	NVIDIA Power-Supply Unit, 3KW AC, C2P Airflow, for 64x800G switch, Power cord included	SN5400, SN5600
Cables and Harnesses	HAR000631	RS232 Cable - DB9 to RJ45 2M harness 2M for SX67X0 and SB78X0	SN5400, SN5600
	ACC000734	Power Cord Black 250V, 16A 2000MM C19 to C20	SN5400, SN5600

Thermal Threshold Definitions

Three thermal threshold definitions are measured by the Spectrum®-4 ASICs, and impact the overall switch system operation state as follows:

- Warning – 105°C: On managed systems only: When the ASIC device crosses the 100°C threshold, a Warning Threshold message will be issued by the management software, indicating to system administration that the ASIC has crossed the Warning threshold. Note that this temperature threshold does not require nor lead to any action by hardware (such as switch shutdown).
- Critical – 120°C: When the ASIC device crosses this temperature, the switch firmware will automatically shut down the device.
- Emergency – 130°C: In case the firmware fails to shut down the ASIC device upon crossing its Critical threshold, the device will auto-shutdown upon crossing the Emergency (130°C) threshold.

For thermal threshold definitions in Cumulus Linux, see Configuring SNMP Traps in the Cumulus Networks Help Center.

Interface Specifications

Small Form Factors Specifications

NVIDIA switch systems come in a flexible range of form factors - SFP/QSFP, SFP28/QSFP28, SFP56/QSFP56, SFP-DD/QSFP-DD and OSFP.

All form factors specification documents are available on the Storage Networking Industry Association (SNIA) Website.

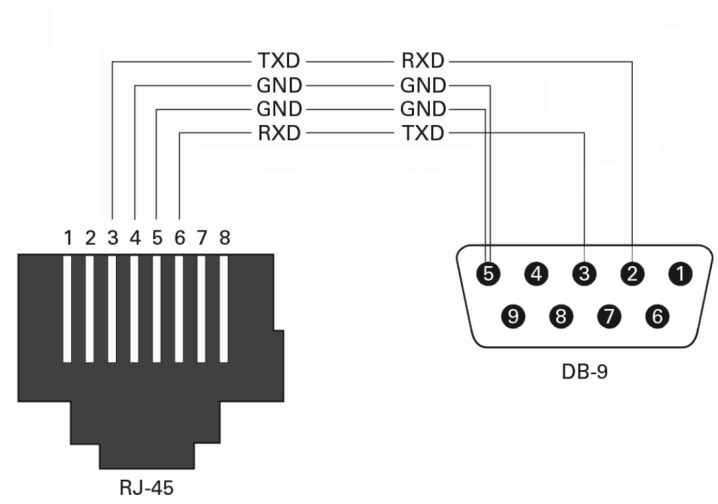
USB Standard Specifications

For the specification documents of all available USB types, please refer to the document library in the USB Organization Website.

RJ45 to DB9 Harness Pinout

In order to connect a host PC to the Console RJ45 port of the system, a RS232 harness cable (DB9 to RJ45) is supplied.

RJ45 to DB9 Harness Pinout



Disassembly and Disposal

Disassembly Procedure

To disassemble the system from the rack:

1. Unplug and remove all connectors.
2. Unplug all power cords.
3. Remove the ground wire.
4. Unscrew the center bolts from the side of the system with the bracket.

   > Support the weight of the system when you remove the screws so that the system does not fall.

5. Slide the system from the rack.
6. Remove the rail slides from the rack.
7. Remove the caged nuts.

Disposal

According to the WEEE Directive 2002/96/EC, all waste electrical and electronic equipment (EEE) should be collected separately and not disposed of with regular household waste. Dispose of this product and all of its parts in a responsible and environmentally friendly way.

Lithium Battery

The product's Real-time Clock includes a Lithium coin battery (CR2032) that contains perchlorate. When replacing the battery, use only a replacement battery that is recommended by the equipment manufacturer.

> The battery can explode if not properly used, replaced, or disposed of.
>
> Dispose of the battery according to your local regulations. Do not attempt to recharge the battery, disassemble, puncture, or otherwise damage it.

Document Revision History

Date	Revision	Description
April 2023	1.0	First release

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