



Overview of Cisco 4000 Series ISRs

Cisco 4000 Series Integrated Services Routers (ISRs) are modular routers with LAN and WAN connectivity. They support several interface modules, including Cisco Enhanced Service Modules (SM-X) and Cisco Network Interface Modules (NIMs).

Cisco 4000 Series ISRs target these applications:

- Enterprise applications—Intended for mid-size aggregation and gateway router that is located in a regional or large branch office:
 - WAN aggregation at Cisco Enterprise core
 - Internet gateway
 - Branch or regional office aggregation
 - Remote access aggregation
- Service provider applications—Intended for high-end Enterprise Branch environments:
 - High-end customer premises equipment (CPE) for business-quality Internet access
 - Service provider leased line aggregation
 - Provider edge (PE) and high-end customer edge (CE) for Layer 2 VPN or Layer 3 VPN services
 - Low-end Ethernet aggregation

Cisco 4000 Series ISRs are available in these models:

- Cisco 4461 ISR
- Cisco 4451-X ISR
- Cisco 4431 ISR
- Cisco 4351 ISR
- Cisco 4331 ISR
- Cisco 4321 ISR
- Cisco 4221 ISR

For more information on the features and specifications of Cisco 4000 Series Integrated Services Routers (ISRs), refer to the [Cisco 4000 Series Integrated Services Routers datasheet](#).



Note

Sections in this documentation apply to all models of Cisco 4000 Series ISRs unless a reference to a specific model is made explicitly.

This chapter contains the following sections:

- [Chassis Views, page 1-2](#)
- [Chassis Views, page 1-2](#)
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- [Hardware Features of Cisco 4000 Series ISRs, page 1-30](#)
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Chassis Views

This section contains views of the front and back panels of the Cisco 4000 Series ISRs, showing the locations of power and signal interfaces, module slots, status indicators, and chassis identification labels:

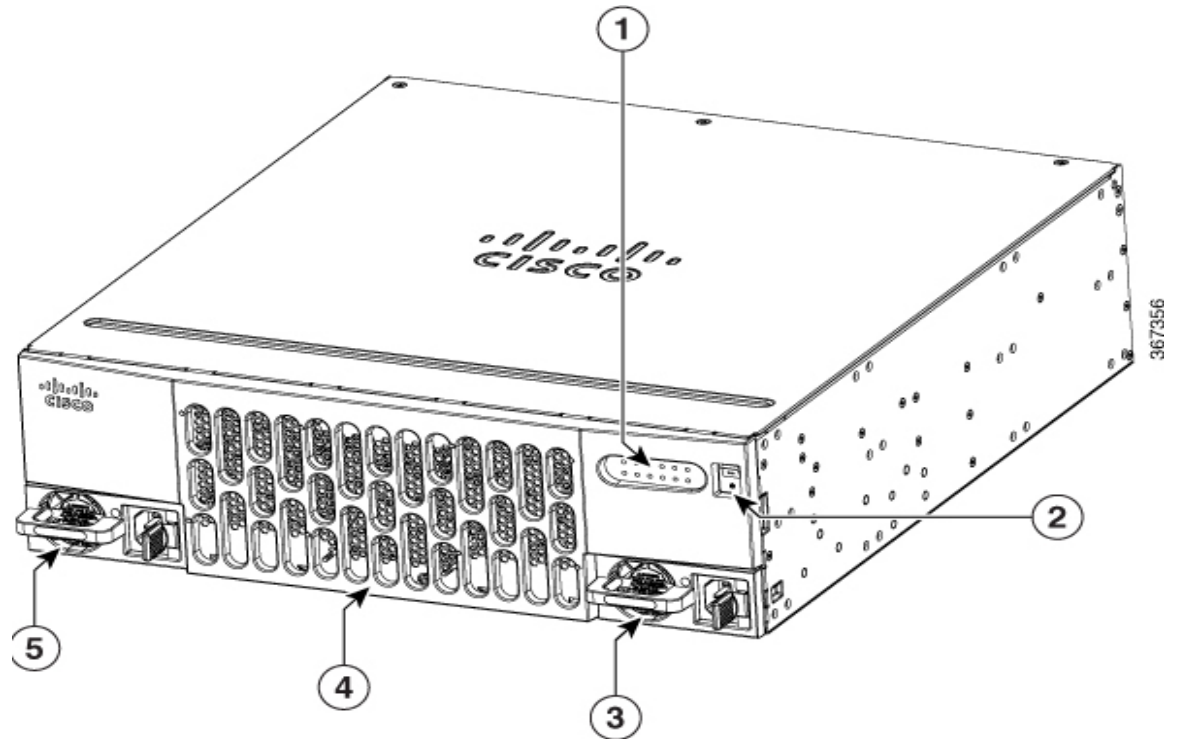
- [Cisco 4461 ISR Chassis](#)
- [Cisco 4451-X ISR Chassis](#)
- [Cisco 4431 ISR Chassis](#)
- [Cisco 4351 ISR Chassis](#)
- [Cisco 4331 ISR Chassis](#)
- [Cisco 4321 ISR Chassis](#)
- [Cisco 4221 ISR Chassis](#)

Cisco 4461 ISR Chassis

Cisco 4461 ISR routers support these slot types:

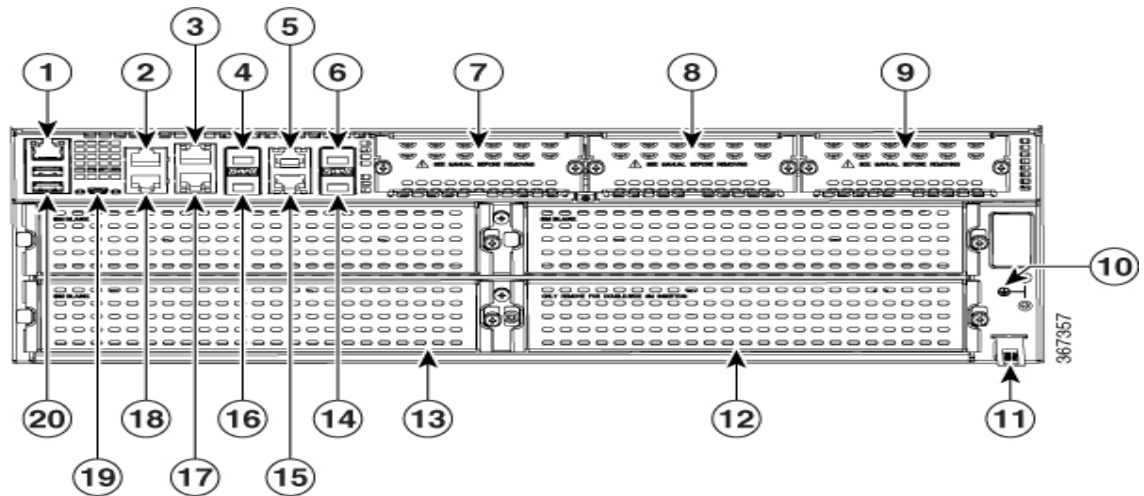
- Network Interface Modules (NIMs)
- Service modules (SM-X, like SM-X-1T3/E3)
- E-Series Server Modules

Figure 1-1 Bezel Side of Cisco 4461 ISR with Two PSUs



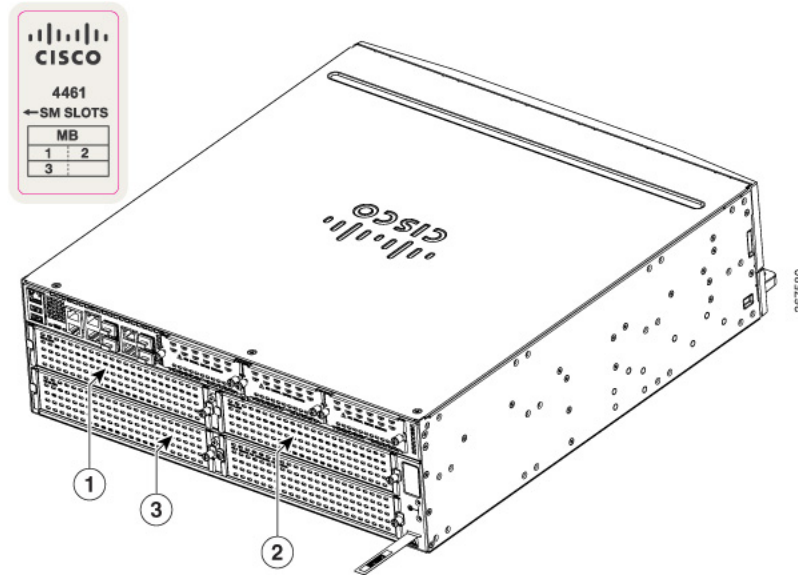
1	LED	2	Router power On/Off switch
3	Power supply unit (PSU1)	4	Router fan tray (hidden) behind removable bezel
5	Optional power supply unit (PSU0)		

Figure 1-2 Back Panel (I/O Side) Slots and Connectors on Cisco 4461 ISR



1	GE 0 management port	2	Auxiliary port
3	RJ-45 Gigabit Ethernet port (GE 0/0/0)	4	SFP/Gigabit Ethernet port (GE 0/0/0)
5	RJ-45 Gigabit Ethernet port (GE 0/0/2)	6	SFP+/10 Gigabit Ethernet port (TE 0/0/4)
7	NIM slot 1 (shown with slot divider removed).	8	NIM slot 2 (shown with slot divider removed).
9	NIM slot 3 (shown with slot divider removed).	10	Ground Connection
11	Slot for label	12	Enhanced Service Module (SM-X) with double wide
13	Enhanced Service Module (SM-X) 3	14	SFP+/10 Gigabit Ethernet port (TE0/0/5)
15	RJ-45 Gigabit Ethernet port (GE 0/0/3)	16	SFP/Gigabit Ethernet port (GE 0/0/1)
17	RJ-45 Gigabit Ethernet GE 0/0/1	18	Console Port
19	USB Console Port	20	USB Port

Figure 1-3 NIM and SM-X Slots



1	SM-X slot 1	2	SM-X slot 2
3	SM-X slot 3		

To remove an SM-X:

- Step 1** Read the “[Safety Warnings](#)” section and disconnect the power supply before you replace any module.
- Step 2** Access the SM-X slot. See [Figure 1-3](#) for the various NIM and SM-X slot locations.
- Step 3** Loosen the captive screws to open the slot cover.
- Step 4** Pull the SM-X out of the connector on the motherboard. Keep the SM-X parallel with the motherboard to prevent damage to the slot and standoff.



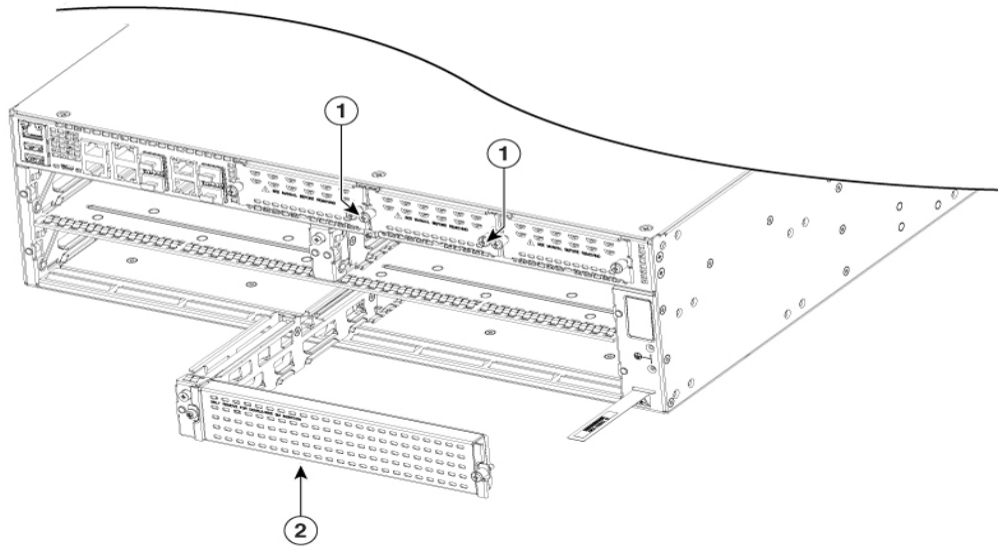
Note When you remove the SM-X slot 2, it removes the blank slot which is attached to the special divider. See [Figure 1-4](#).

- Step 5** Place the SM-X in an anti-static bag to protect it from ESD damage.



Note For more details on installation of SM-Xs, NIMs, and Cisco E-Series Server Modules, see the hardware installation guide for the particular module you have purchased.

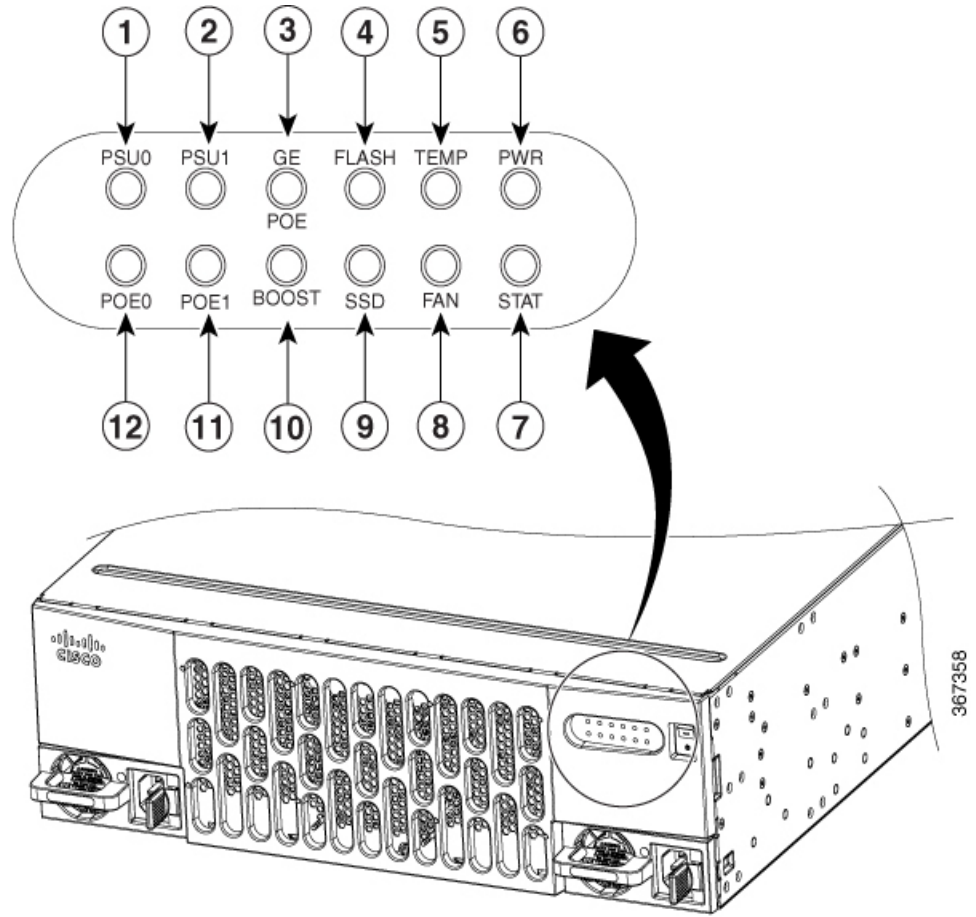
Figure 1-4 NIM and SM-X Slot with Divider



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NIM slot 1 and 2	2	SM-X slot divider
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Figure 1-5 Bezel Side LEDs of the Cisco 4461 ISR Model

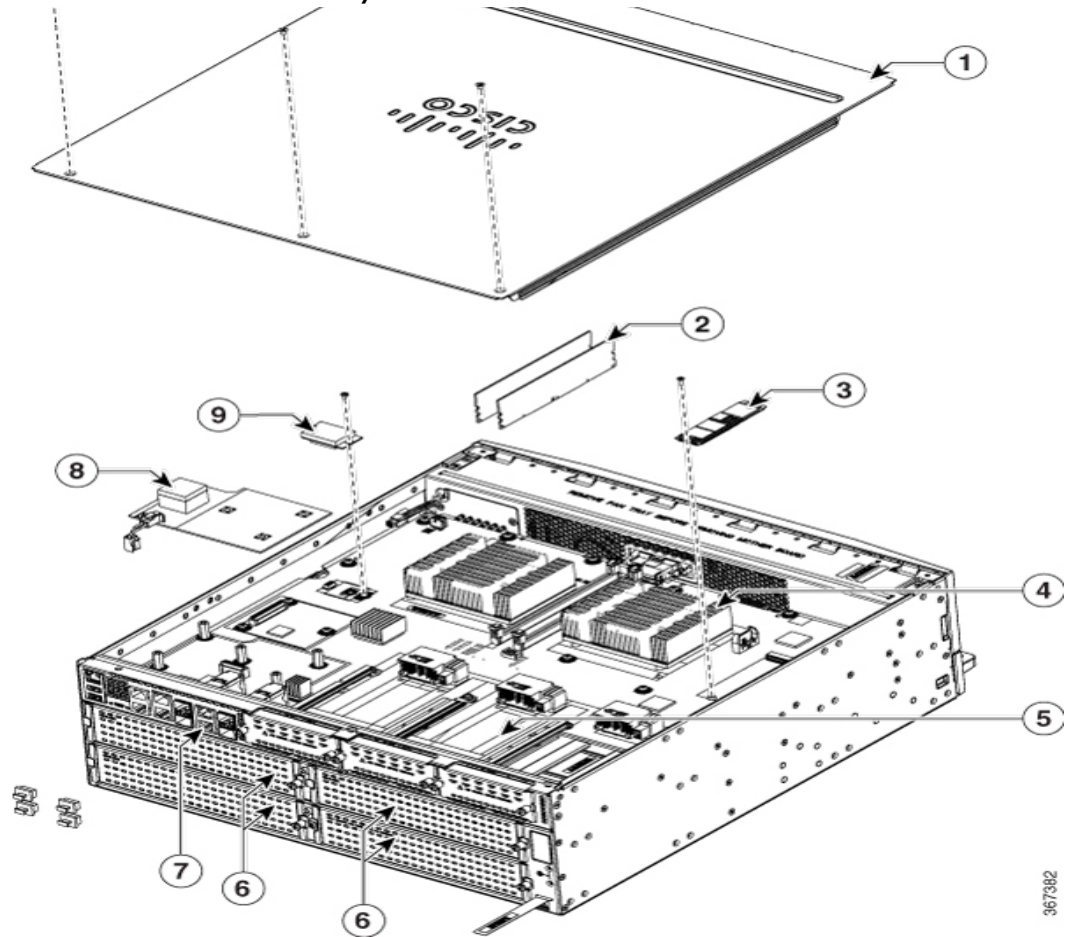


1	PSU0: Power supply unit 0	2	PSU1: Power supply unit 1
3	GE POE: Internal PoE daughter card status	4	FLASH: Compact flash status
5	TEMP: Temperature status	6	PWR: Power
7	STAT: System status	8	FAN: Fan status
9	M.2 SSD status	10	POE BOOST: Power over Ethernet boost mode
11	POE 1: Power over Ethernet 1 status	12	POE 0: Power over Ethernet 0 status

Platform Summary

Figure 1-6 shows the internal view of Cisco 4461 with parts and module locations.

Figure 1-6 Platform Summary of Cisco 4461 ISR



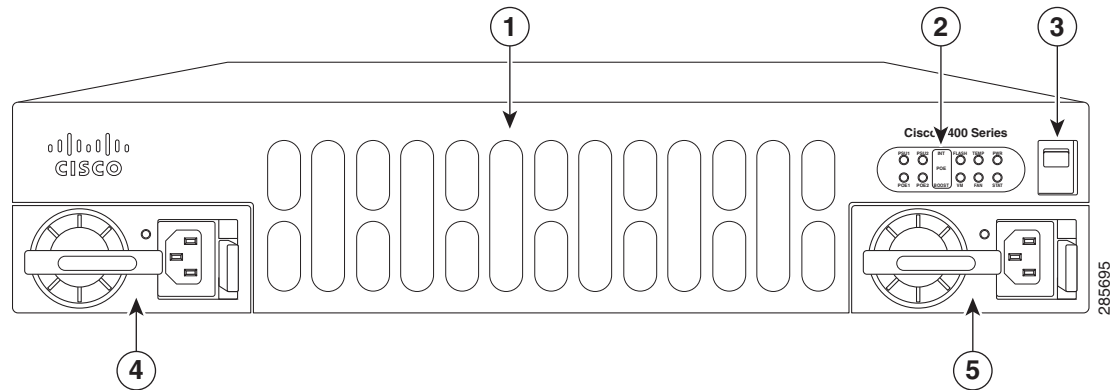
1	Cover	2	DIMMs
3	SSD M.2 storage device	4	CPU
5	NIM Slot	6	SM-X Slot 1, 2, and 3
7	RJ-45 Gigabit Ethernet port (GE 0/0/3)	8	POE daughter card
9	Flash Memory Card		

Cisco 4451-X ISR Chassis

Bezel view of the Cisco 4451-X ISR with two PSUs. Cisco 4451-X ISR routers support these slot types:

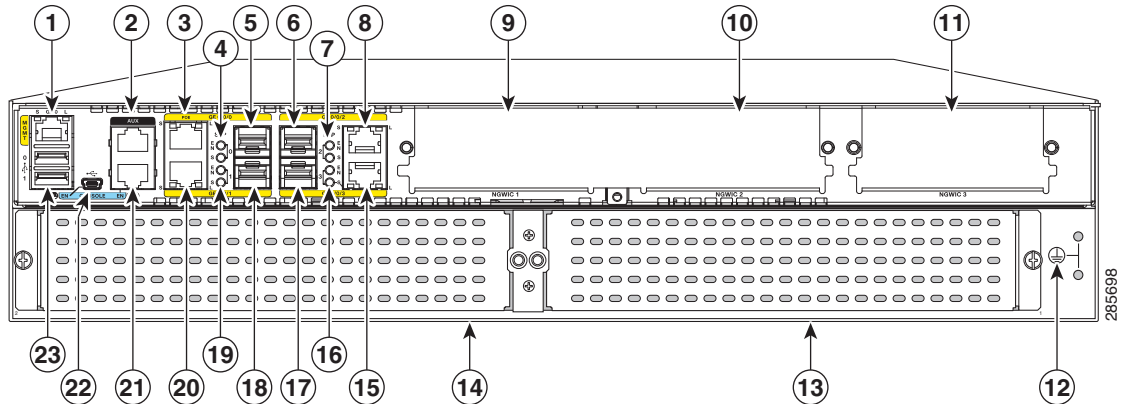
- Network Interface Modules (NIMs)
- Service modules (SM-X, like SM-X-1T3/E3)
- E-Series Server Modules.

Figure 1-7 Bezel View



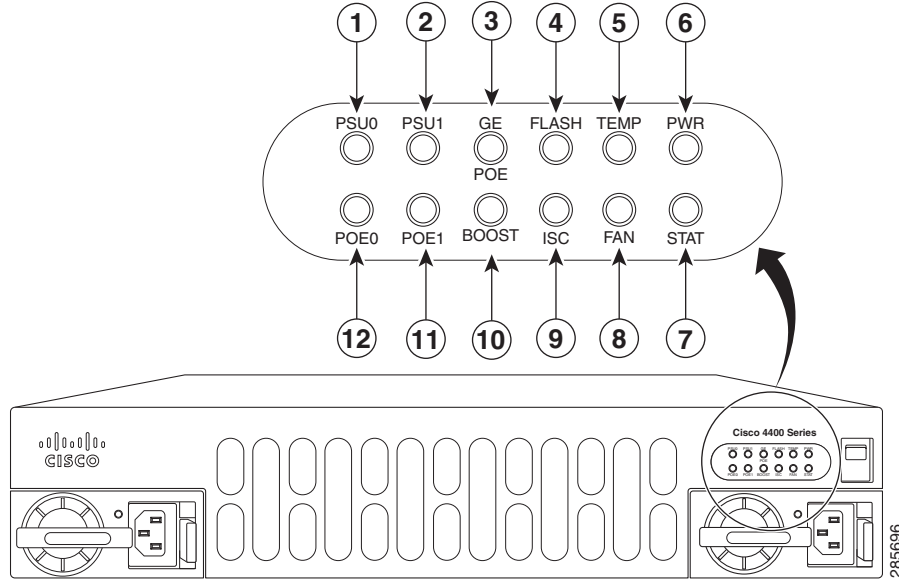
1	Router fan tray (hidden) behind removable bezel	2	LEDs
3	Router power On/Off switch	4	AC power supply unit (PSU0)
5	AC power supply unit (PSU1)		

Back panel slots and ports of the Cisco 4451-X ISR.

Figure 1-8 Back Panel (I/O Side) Slots and Connectors on Cisco 4451-X ISR

1	GE 0 management port	2	Auxiliary port
3	RJ-45 Gigabit Ethernet port (GE 0/0/0)	4	LEDs for the GE 0/0/0 interface (See Table 1-1 for detailed LED information)
5	SFP/Gigabit Ethernet port (GE 0/0/0)	6	SFP/Gigabit Ethernet port (GE 0/0/2)
7	LEDs for the GE 0/0/2 interface	8	RJ-45 Gigabit Ethernet port (GE 0/0/2)
9	NIM slot 1 (shown with slot divider removed).	10	NIM slot 2 (shown with slot divider removed).
11	NIM slot 3	12	Ground connection
13	Enhanced Service Module (SM-X) 2	14	Enhanced Service Module (SM-X) 1
15	RJ-45 Gigabit Ethernet port GE 0/0/3	16	LEDs for the GE 0/0/3 interface
17	SFP/Gigabit Ethernet GE 0/0/3	18	SFP Gigabit Ethernet GE 0/0/1
19	LEDs for the GE 0/0/1 interface	20	RJ-45 Gigabit Ethernet port GE 0/0/1
21	Serial console port	22	USB Type B mini port
23	USB 0 and USB 1		

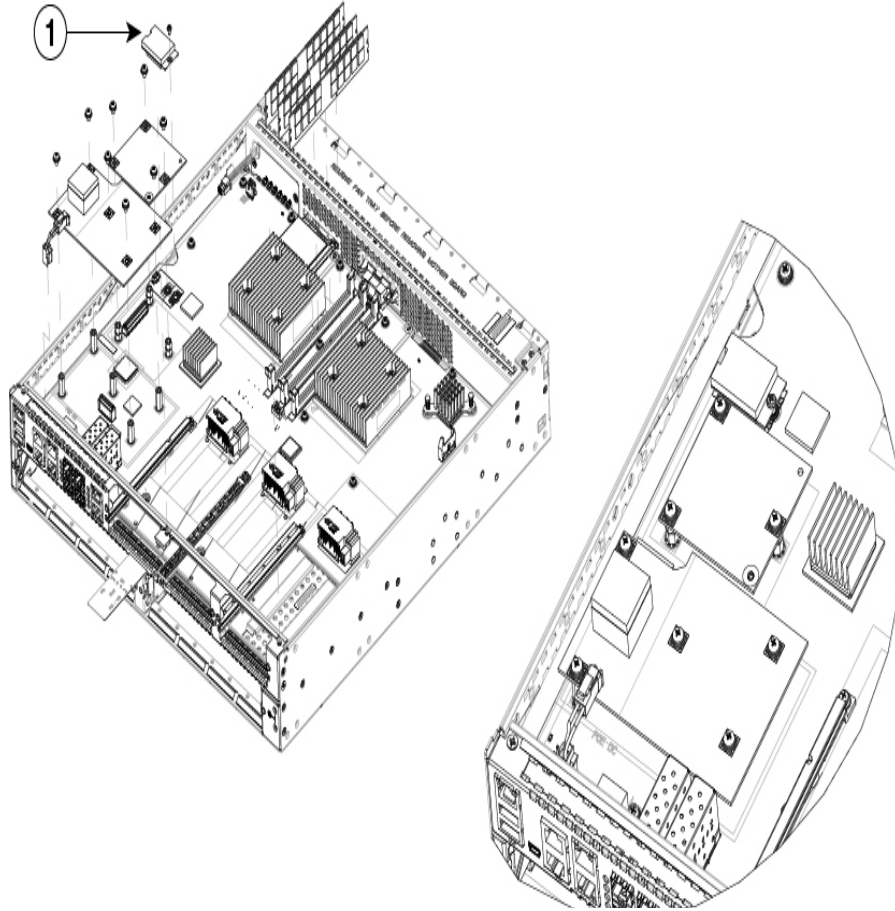
Figure 1-9 Bezel Side LEDs of the Cisco 4451-X ISR Model



1	PSU0: Power supply unit 1	2	PSU1: Power supply unit 2
3	GE POE: Internal PoE daughter card status	4	FLASH: Compact flash status
5	TEMP: Temperature status	6	PWR: Power
7	STAT: System status	8	FAN: Fan status
9	ISC: Integrated Services Card status	10	POE BOOST: Power over Ethernet boost mode
11	POE 1: Power over Ethernet 1 status	12	POE 0: Power over Ethernet 0 status

Figure 1-6 shows the internal view of Cisco 4451-X ISR with parts and module locations.

Figure 1-10 E-USB on the Cisco 4451-X ISR

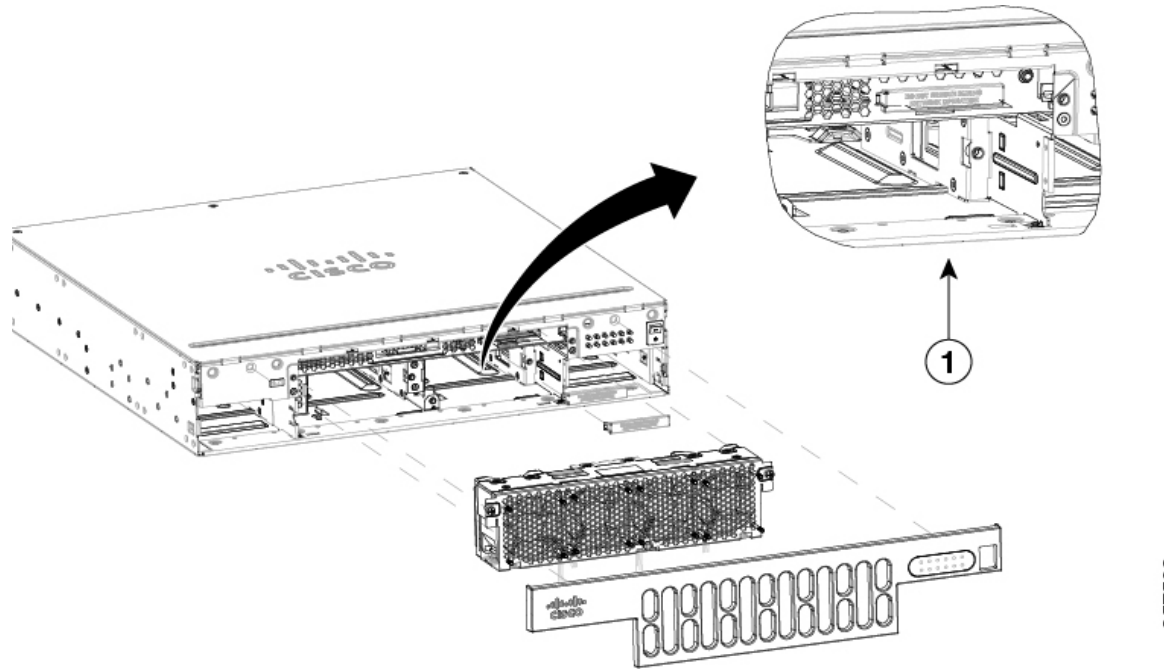


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1	E-USB	
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Figure 1-6 shows the internal view of Cisco 4451-X ISR with parts and module locations.

Figure 1-11 Compact Flash on the Cisco 4451-X ISR

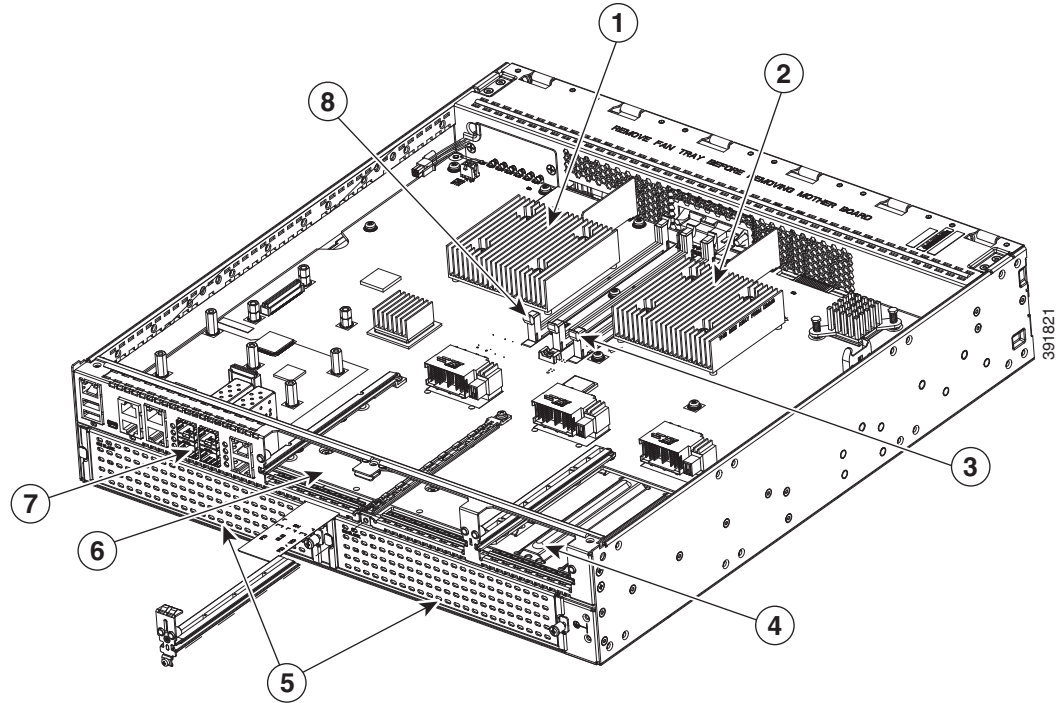


1	Compact Flash	
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Platform Summary

Figure 1-6 shows the internal view of Cisco 4451-X ISR with parts and module locations.

Figure 1-12 Platform Summary of Cisco 4451-X ISR

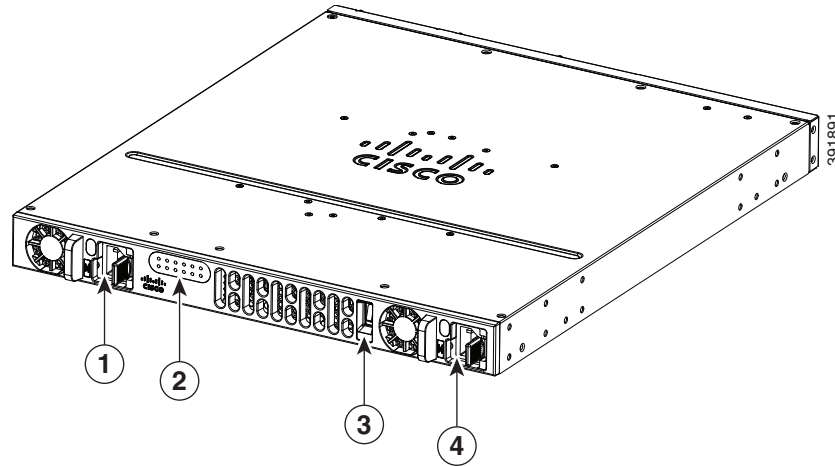


1	Forwarding plane processor	2	Control plane processor
3	Control plane processor DIMMs	4	NIM 3 (single-wide) slot
5	Enhanced Service Module (SM-X) slots	6	NIM slot 1 and 2 (shown with slot divider removed)
7	SFP GE ports	8	Forwarding plane processor DIMM

Cisco 4431 ISR Chassis

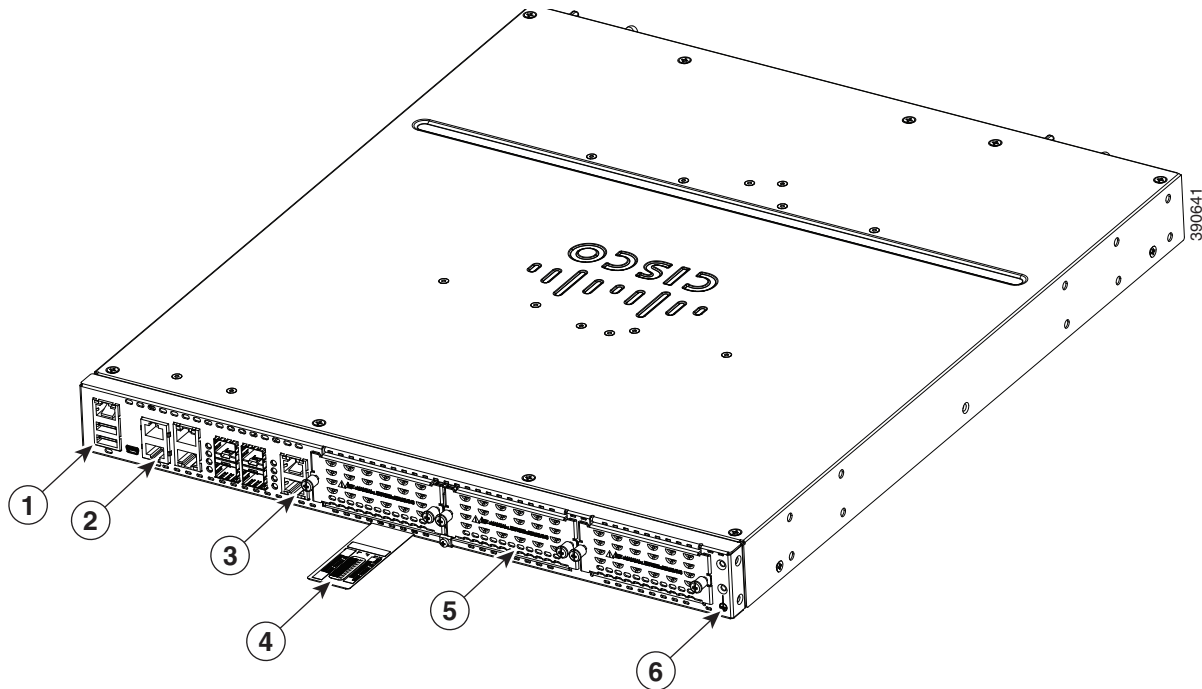
Cisco 4431 ISR supports the Network Interface Modules (NIMs) and Integrated Services Card (ISC slots for PVDM4s).

Figure 1-13 Bezel View of Cisco 4431 ISR with Two Power Supply Units



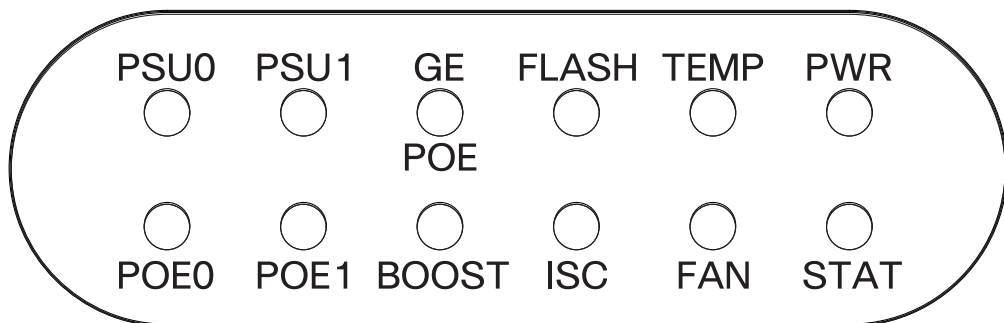
1	Power supply unit (PSU1)	2	LEDs
3	On/Off switch	4	Optional power supply unit (PSU0)

Figure 1-14 View of Cisco 4431 ISR Chassis



1	USB ports	2	GE ports
3	Screws to open the NIM slot	4	Router label tray
5	NIM slot (with cover)	6	Ground connection

Figure 1-15 LEDs on the Cisco 4431 ISR

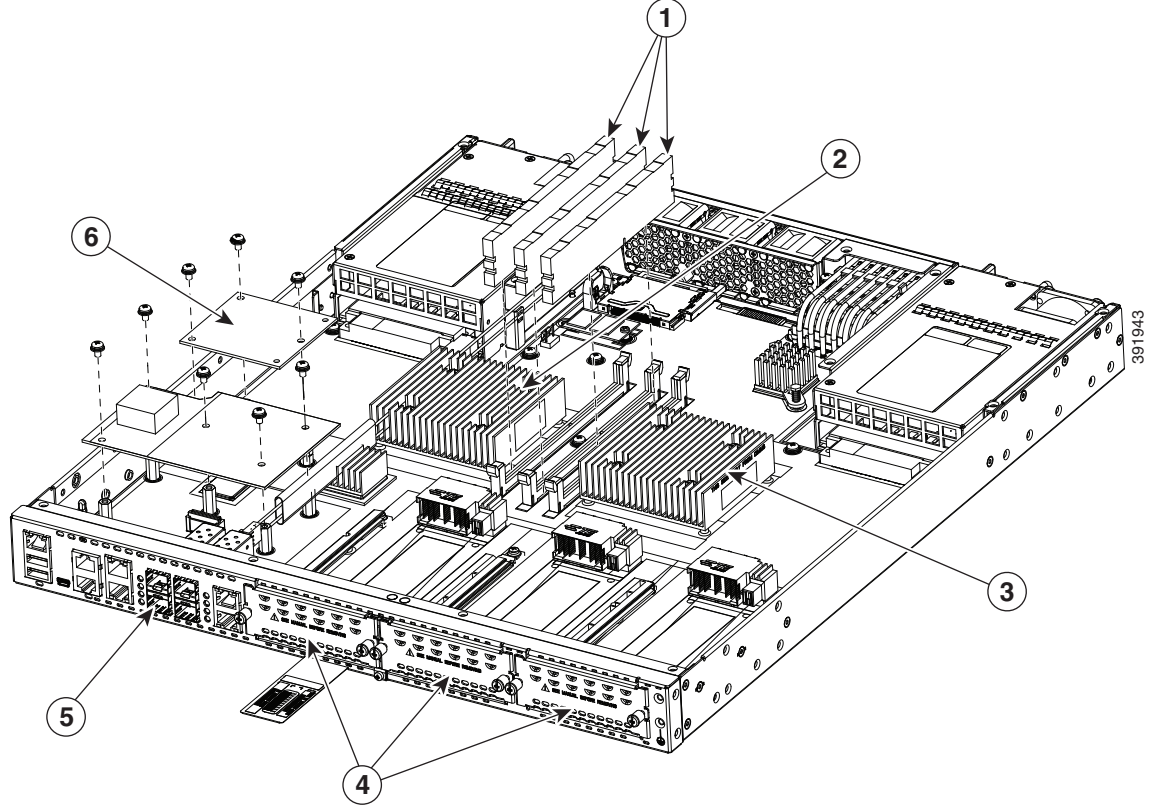


For detailed information on LEDs, see the [“LED Indicators”](#) section on page 1-32.

Platform Summary

Figure 1-16 shows the internal view of Cisco 4431 ISR with parts and module locations.

Figure 1-16 Platform Summary of the Cisco 4431 ISR



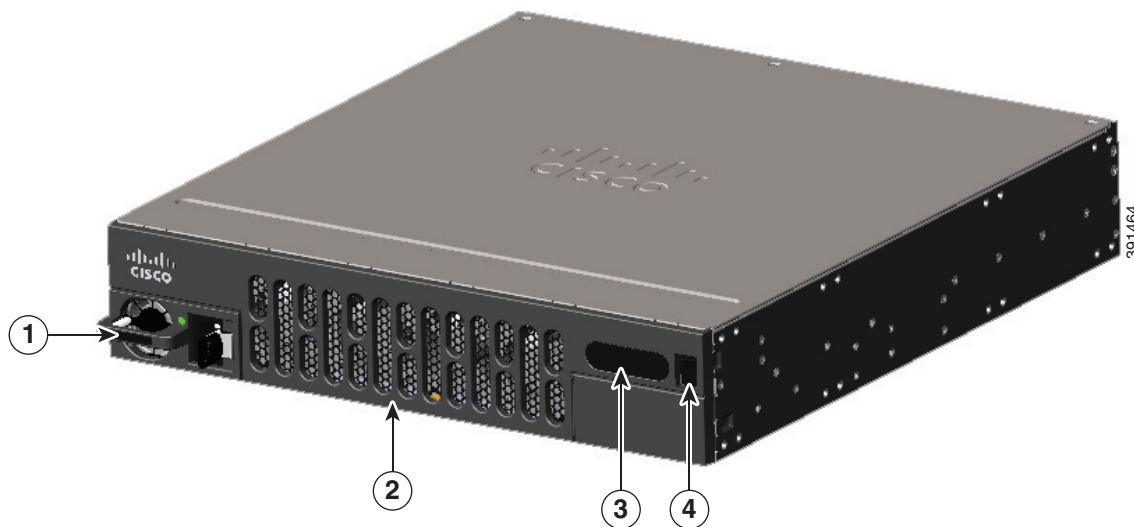
1	DIMMs	2	Forwarding plane processor
3	Control plane processor	4	NIMs
5	SFP GE ports	6	PVDM card

Cisco 4351 ISR Chassis

This section contains the following views of Cisco 4351ISR chassis:

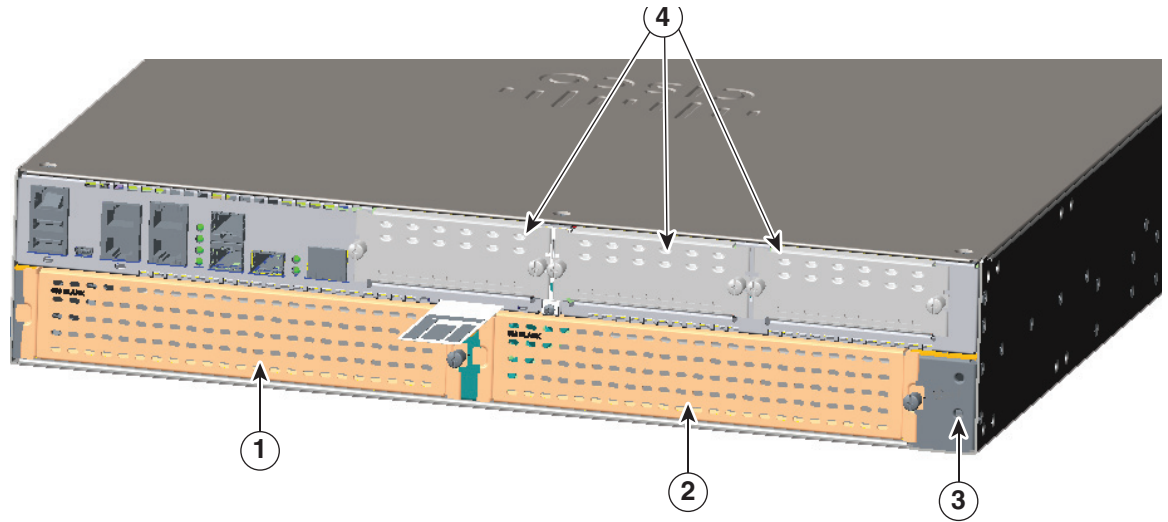
- Power Supply and Bezel Side View of Cisco 4351 ISR (Figure 1-17)
- Back Panel Ports, Slots, and Serial Number on Cisco 4351 ISR (Figure 1-18)
- Ports on Cisco 4351 ISR (Figure 1-19)
- LEDs on Cisco 4351 ISR (Figure 1-20)

Figure 1-17 Power Supply and Bezel Side View of Cisco 4351 ISR



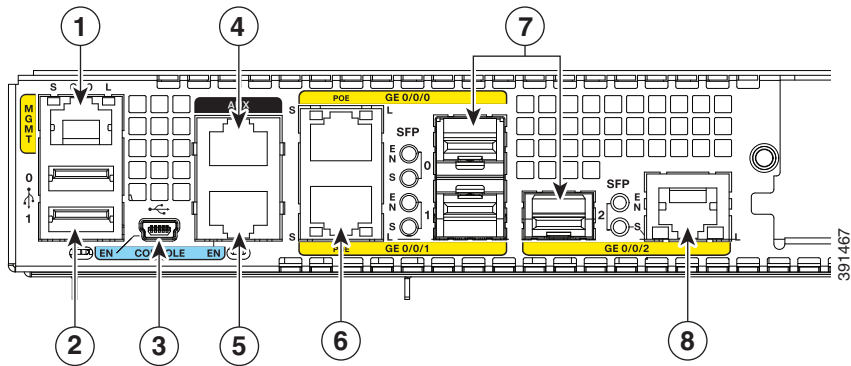
1	Power supply unit	2	Router fan tray (hidden behind the removable bezel)
3	LEDs	4	Router power On/Off switch

Figure 1-18 Back Panel Ports, Slots, and Serial Number on Cisco 4351 ISR



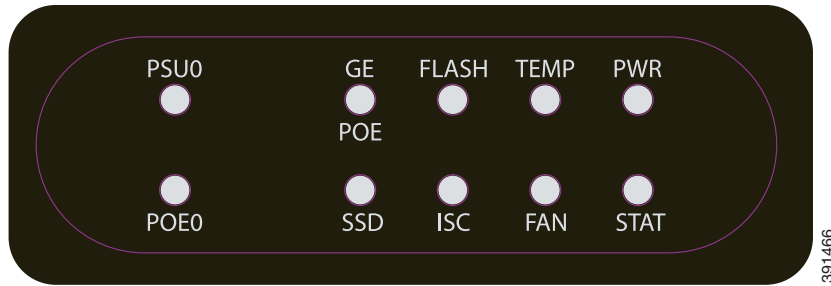
1	Enhanced Service Module (SM-X) slot	2	Enhanced Service Module (SM-X) slot
3	Ground connection	4	NIM slots

Figure 1-19 Ports on Cisco 4351 ISR



1	GE management port	2	USB Type A port
3	USB Type B mini port	4	Auxiliary port
5	Console port	6	RJ-45 port (GE 0/0/0, GE 0/0/1)
7	SFP port (GE 0/0/0, GE 0/0/1, GE 0/0/2)	8	RJ-45 port (GE 0/0/2)

Figure 1-20 LEDs on Cisco 4351 ISR

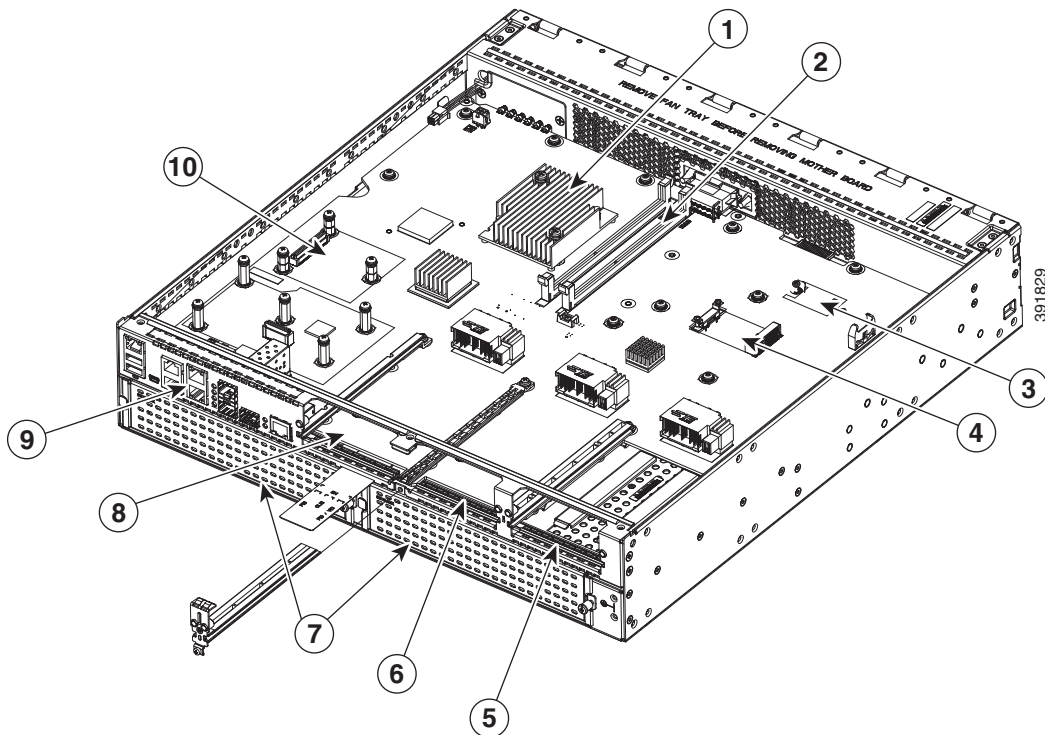


For detailed information on LEDs, see the “LED Indicators” section on page 1-32.

Platform Summary

Figure 1-21 shows the internal view of Cisco 4351 ISR chassis with parts and module locations.

Figure 1-21 Platform Summary of Cisco 4351 ISR Chassis



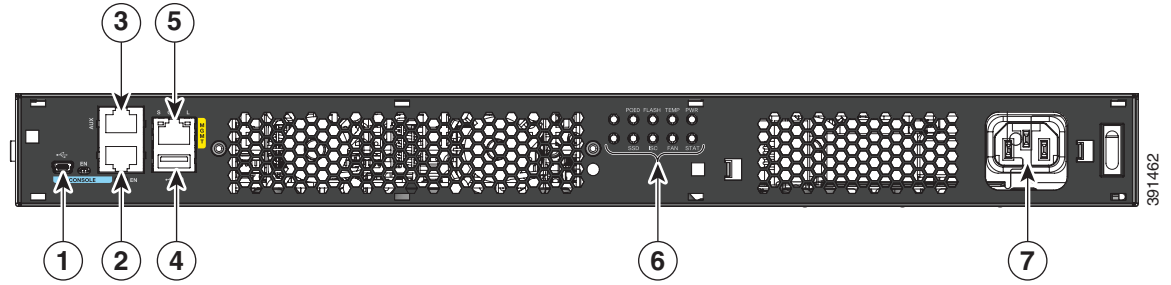
1	CPU	2	DIMMs
3	Flash memory card connector	4	SSD mSATA connector
5	NIM slot 3	6	NIM slot 2
7	SM-X slots	8	NIM slot 1
9	RJ-45 GE ports	10	ISC slot

Cisco 4331 ISR Chassis

This section contains the following views of Cisco 4331 ISR router:

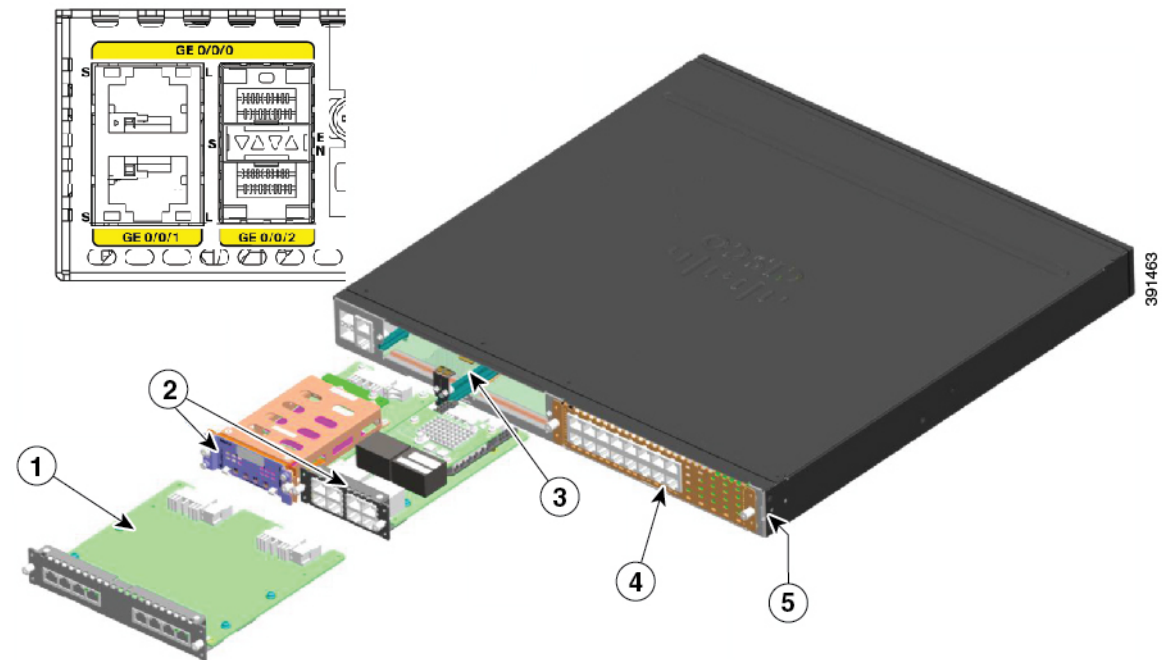
- [Bezel Side Ports and LEDs on Cisco 4331 ISR \(Figure 1-22\)](#)
- [Back Panel Ports and Slots on Cisco 4331 ISR \(Figure 1-23\)](#)
- [Ground Connection on Cisco 4331 ISR \(Figure 1-24\)](#)

Figure 1-22 Bezel Side Ports and LEDs on Cisco 4331 ISR



1	USB Type B mini port	2	Serial console port
3	AUX port	4	USB Type A port
5	Management port	6	LEDs
7	AC Power		

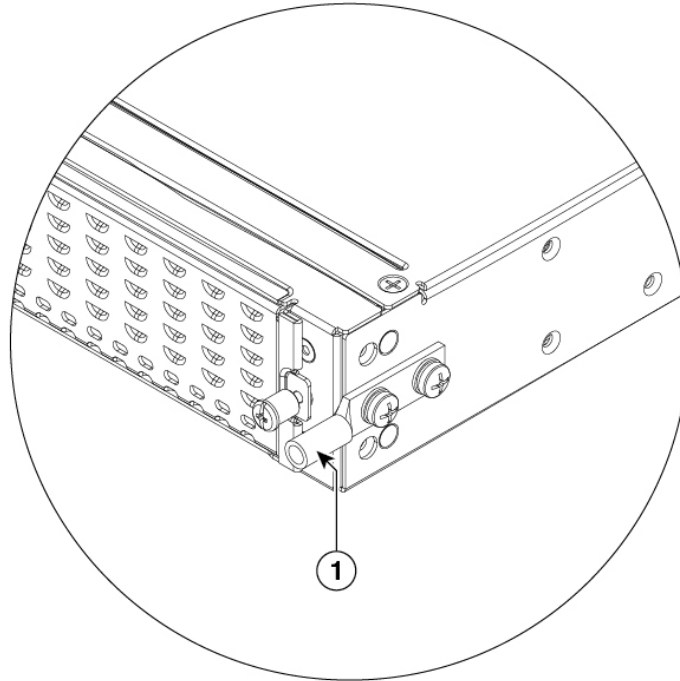
Figure 1-23 Back Panel Ports and Slots on Cisco 4331 ISR



1	Double-wide NIM	2	NIMs
3	Removable module slot divider	4	SM-X slot
5	Ground connection		

For detailed information on LEDs, see the [“LED Indicators”](#) section on page 1-32.

Figure 1-24 Ground Connection on Cisco 4331 ISR



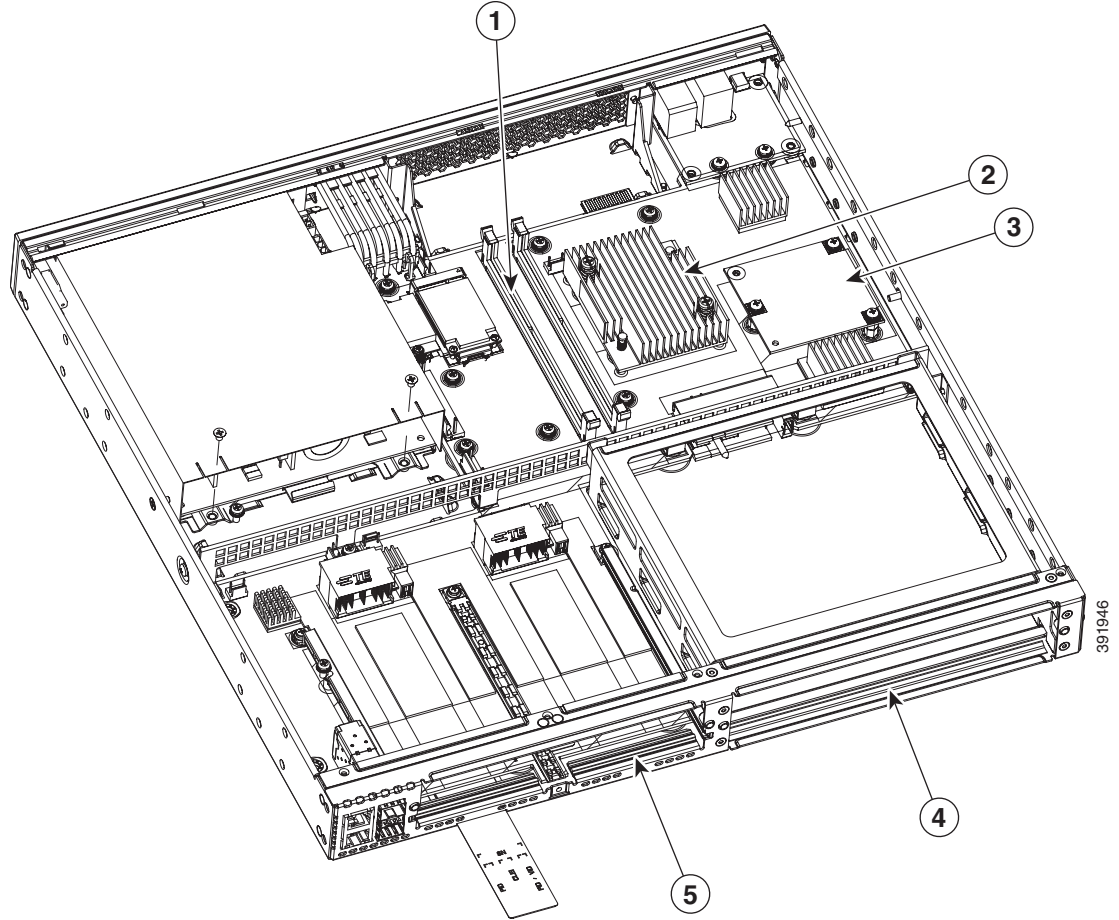
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1	Ground Connection		
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Platform Summary

[Figure 1-25](#) shows the internal view of the Cisco 4431 ISR with parts and module locations.

Figure 1-25 Platform Summary of Cisco 4331 ISR Chassis



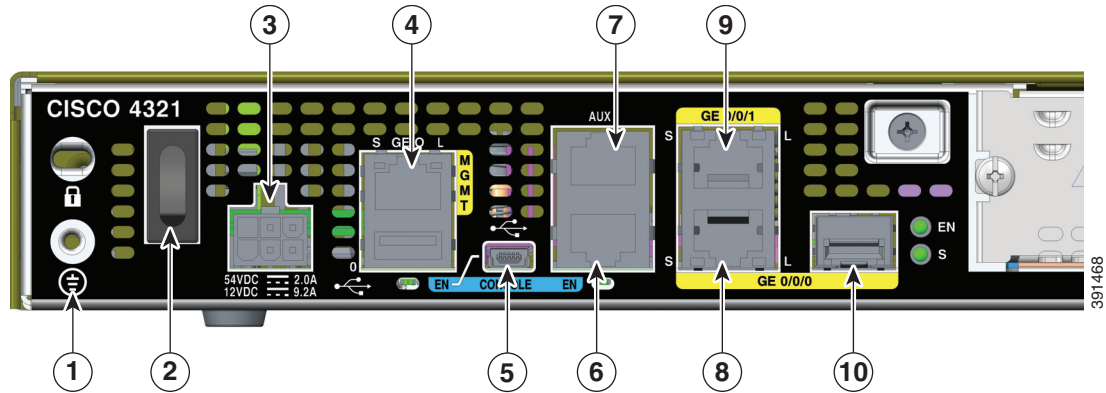
1	DIMMs	2	CPU
3	ISC slot	4	SM-X slot
5	NIM slot		

Cisco 4321 ISR Chassis

This section contains the following views of Cisco 4321 ISR router:

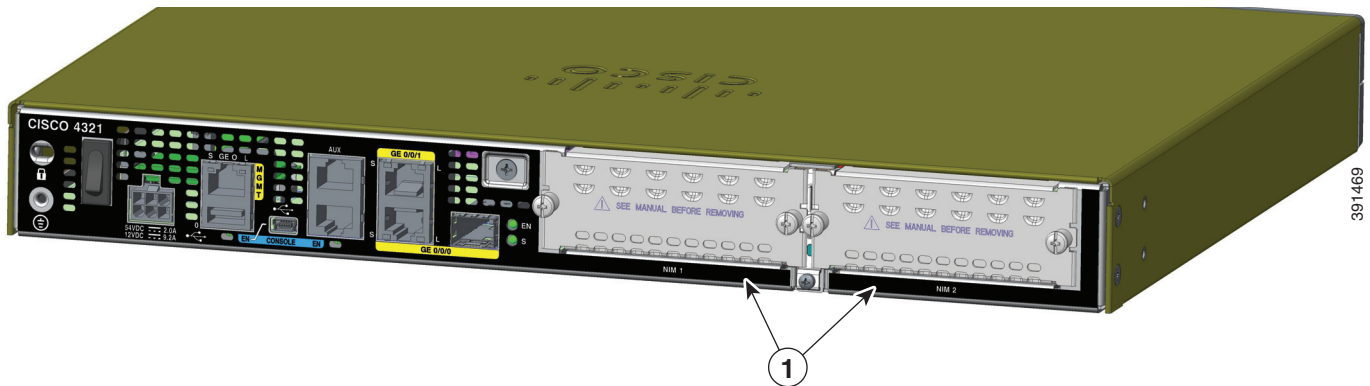
- [Back Panel Ports on Cisco 4321 ISR \(Figure 1-26\)](#)
- [Back Panel \(I/O Side\) View of Cisco 4321 ISR \(Figure 1-27\)](#)
- [LEDs on Cisco 4321 ISR \(Figure 1-28\)](#)

Figure 1-26 Back Panel Ports on Cisco 4321 ISR



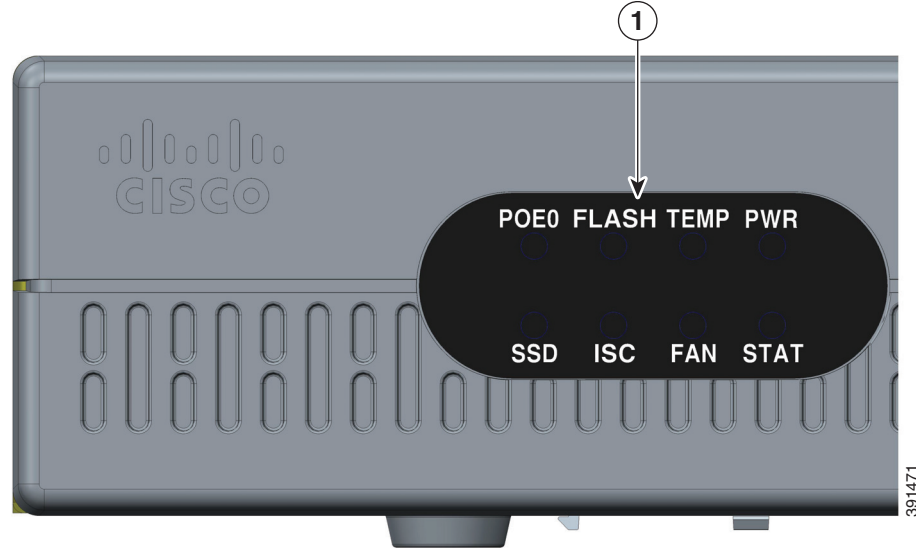
1	Grounding	2	Power switch
3	Power input connector	4	GE “MGMT” port (with USB port below)
5	USB Type B mini port	6	Console port
7	Auxiliary port	8	GE 0/0/0 (copper cable) port
9	GE 0/0/1 RJ-45 (copper cable) port	10	GE 0/0/0 SFP (fiber-optic) port

Figure 1-27 Back Panel (I/O Side) View of Cisco 4321 ISR



1	NIM slots
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Figure 1-28 LEDs on Cisco 4321 ISR



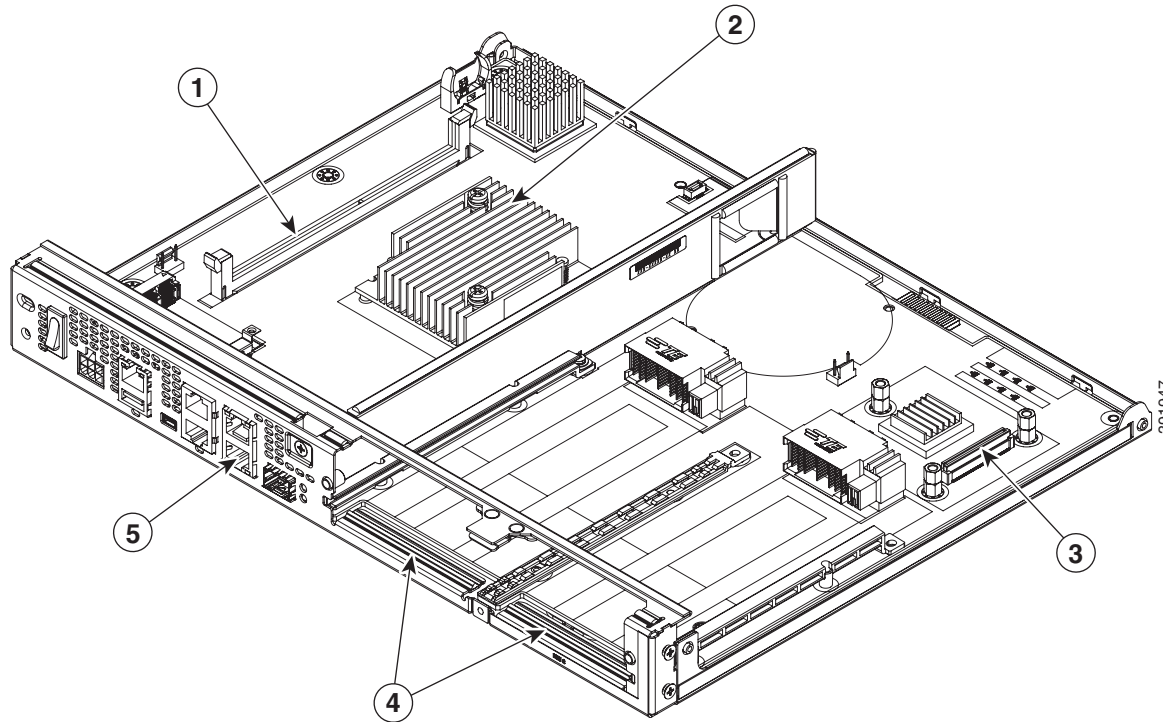
1	LEDs
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For detailed information on LEDs, see the [“LED Indicators”](#) section on page 1-32.

Platform Summary

Figure 1-29 shows the internal view of Cisco 4321 ISR with parts and module locations.

Figure 1-29 Platform Summary of Cisco 4321 ISR Chassis



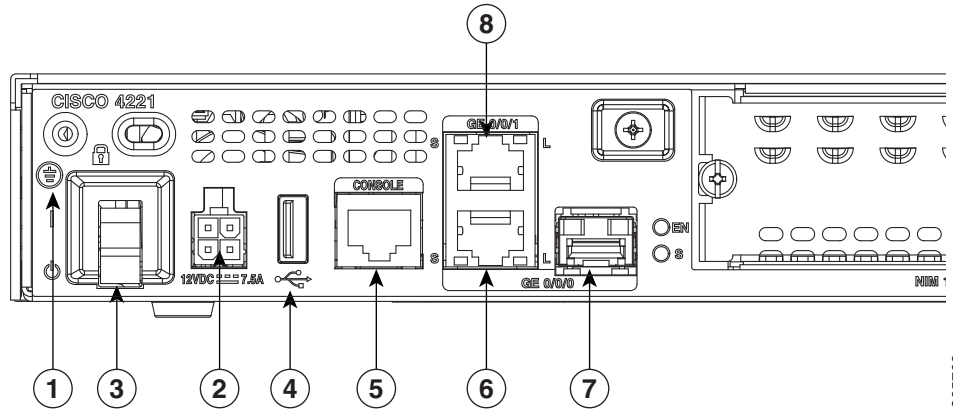
1	DIMM	2	CPU
3	ISC slot	4	NIM slots
5	GE ports		

Cisco 4221 ISR Chassis

This section contains the following views of Cisco 4221 ISR router:

- [Back Panel Ports on Cisco 4221 ISR \(Figure 1-30\)](#)
- [Back Panel \(I/O Side\) View of Cisco 4221 ISR \(Figure 1-31\)](#)
- [LEDs on Cisco 4221 ISR \(Figure 1-32\)](#)

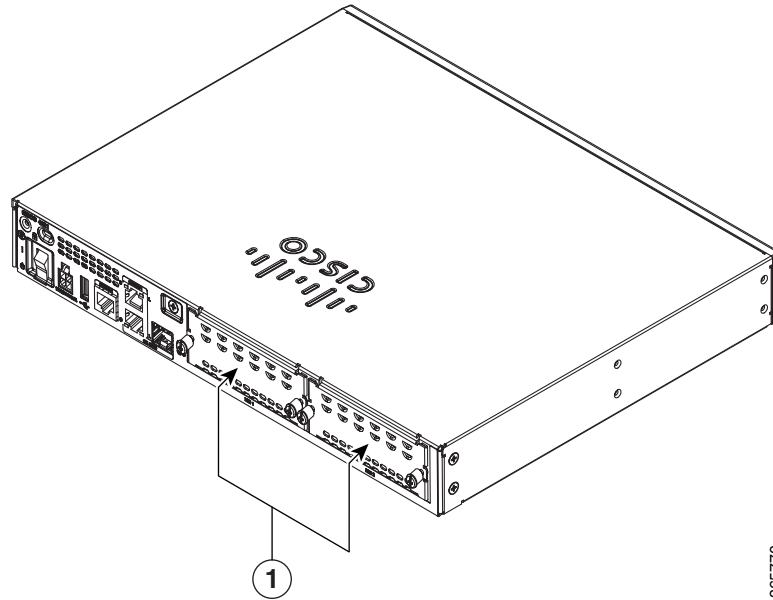
Figure 1-30 Back Panel Ports on Cisco 4221 ISR



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1	Grounding	2	Power input connector
3	Power switch	4	USB
5	Console port	6	GE 0/0/0 RJ-45 (copper cable) port
7	GE 0/0/0 SFP (fiber-optic) port	8	GE 0/0/1 (copper cable) port

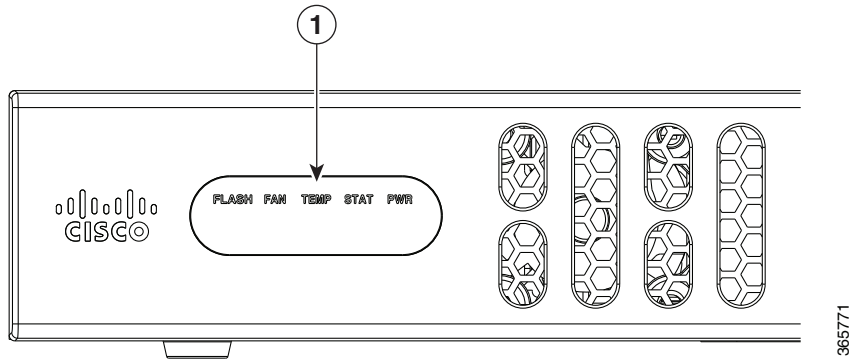
Figure 1-31 Back Panel (I/O Side) View of Cisco 4221 ISR



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1	NIM slots
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Figure 1-32 LEDs on Cisco 4221 ISR



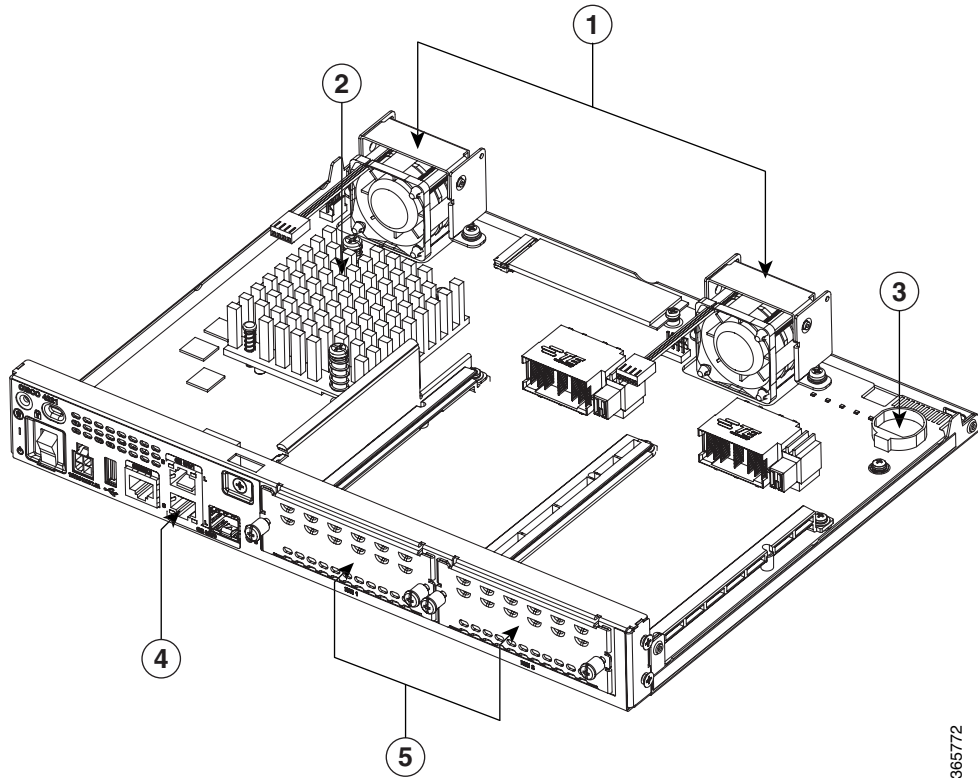
1	LEDs
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For detailed information on LEDs, see the “LED Indicators” section on page 1-32.

Platform Summary

Figure 1-33 shows the internal view of Cisco 4221 ISR with parts and module locations.

Figure 1-33 Platform Summary of Cisco 4221 ISR Chassis



1	Fan	2	CPU
3	Battery	4	GE 0/0/0/0 RJ-45 (copper cable) port
5	NIM slots		

Locate Product Identification Details

Software License

The serial number (SN), product ID (PID), version ID (VID), and Common Language Equipment Identifier (CLEI) are printed on a label on the back of the router or on a label tray located on the router chassis or motherboard.

To obtain a software license, you need a product authorization key (PAK) and the unique device identifier (UDI) of the device where the license is to be installed.

The UDI has two main components:

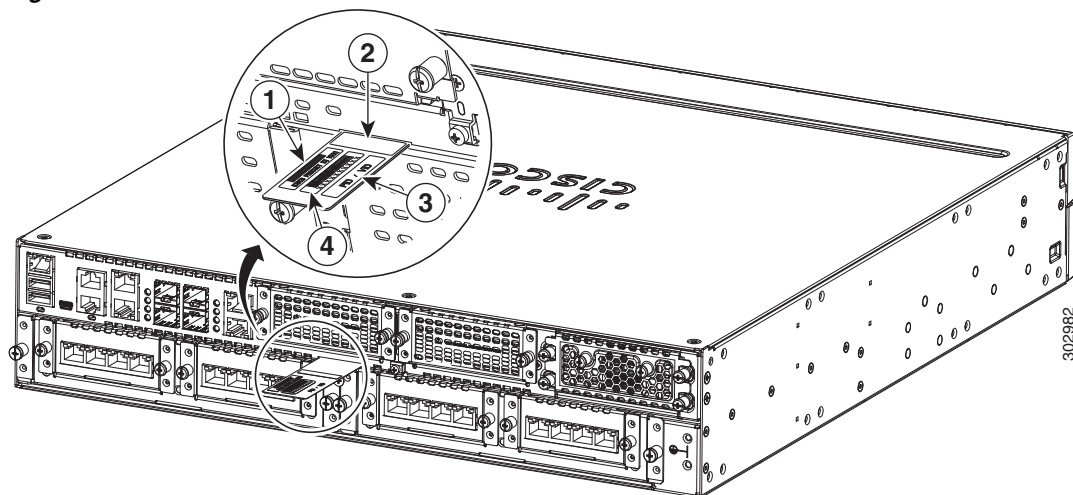
- Product ID (PID)
- Serial number (SN)

The UDI can be viewed using the **show license udi** command in privileged Exec mode in Cisco Internet Operating System (IOS) software.

For additional information on the UDI or how to obtain a PAK, see the [Cisco Software Activation on Integrated Services Routers and Cisco Integrated Service Routers Generation 2](#) document at cisco.com.

Labels on Cisco 4000 Series ISRs

Figure 1-34 shows the location of the labels on Cisco 4451-X ISR. Labels are located at the same location on all routers in the Cisco 4000 series. Though your router may be different from the one shown in Figure 1-34.

Figure 1-34 Label Location on Cisco 4451-X ISR

1	Product ID	2	Serial Number
3	PID/VID	4	CLEI

Additional Help for Locating Cisco 4000 Series ISRs Labels

Use the Cisco Product Identification (CPI) tool to find labels on the router. The tool provides detailed illustrations and descriptions of where labels are located on Cisco products. It includes the following features:

- A search option that allows browsing for models by using a tree-structured product hierarchy
- A search field on the final results page that makes it easier to look up multiple products
- End-of-sale products clearly identified in results lists

The tool streamlines the process of locating serial number labels and identifying products. Serial number information expedites the entitlement process and is required for access to support services.

Hardware Features of Cisco 4000 Series ISRs

This section describes the hardware features of Cisco 4000 Series ISRs.

- [Built-In Interface Ports, page 1-30](#)
- [LED Indicators, page 1-32](#)
- [Fans, Ventilation, and Airflow, page 1-41](#)

Built-In Interface Ports

Cisco 4000 Series ISRs have multiple 10/100/1000 front panel ports, SFPs, and 10/100/1000 management ports.

Dual Mode GE or SFP Ports

There are dual mode ports available on the router which can function as GE or SFP ports.

GE Ports

The GE RJ-45 copper interface ports support 10BASE-T, 100BASE-TX, and 1000BASE-T.

SFP Ports

The small-form-factor pluggable (SFP) ports support, 1000BASE-LX/LH, 1000BASE-SX, 1000BASE-ZX, and Coarse Wavelength-Division Multiplexing (CWDM-8) modules, as well as 100Mbps SFP modules.

The SFP port shares the same physical port as an RJ-45 GE port with the same number. At a time, it can be used for only one function. As described in the IEEE 802.3ah specification, the SFP port supports auto-media-detection, auto-failover, and remote fault indication (RFI).

Use the **media-type** command to enable the auto-media-detection and auto-failover features.

You can configure the SFP port by using the **media-type** configuration command to select either the RJ-45 or the SFP connector. When the media-type is not configured, by default, the auto-select feature is enabled. The auto-select feature automatically detects the media that is connected and links it up. If both media are connected, the media that comes up first is linked, and it is treated as the primary media. This primary media is explicitly indicated as an SFP or RJ-45 link. When the router receives an indication that the primary media is down, the secondary failover media is enabled. After the switchover, when the primary media is later restored, the media does not switch back to the primary media. By default, the RJ-45 port is configured as the primary media-type and if it fails, the media failovers to the SFP port. Conversely, when the SFP port is configured as the primary media-type and if it fails, the media switches to the RJ-45 port.

USB Serial Console Port

The Mini-USB type B serial port can be used as an alternative to the RJ-45 console port. For Windows operating systems earlier than Windows 7, you must install a Windows USB device driver before using the USB console port.



Note

Cisco 4461 supports Mini-USB type B serial port and Micro-USB type B serial port.

Front Panel PoE+ Ports

On Cisco 4451-X ISR and Cisco 4351 ISR, two front panel Ethernet ports are PoE+ (802.3at) compliant ports. These are ports GE 0/0/0 and GE 0/0/1. Cisco 4431 ISR, Cisco 4321 ISR and Cisco 4221 do not support front panel PoE+.

System PoE power supplies do not provide power to the front panel ports.

Internal PoE Daughter Card

The internal PoE daughter card provides a total of 30.8 watts of power across the two ports.

LED Indicators

Table 1-1 summarizes the LED indicators that are located in the router bezel or chassis, but not on the interface cards and modules.


Note

For module LEDs, please refer to the respective module installation guides for each module.

Table 1-1 LED Descriptions (Applies to Cisco 4461 ISR, Cisco 4451-X ISR, Cisco 4431 ISR, and Cisco 4351 ISR)

LED	Represents	Color	Description	Location	Available On
STAT	System Status	Solid green	System operates normally.	Bezel side	All models
		Blinking amber	BIOS/Rommon is booting.		
		Amber	BIOS/Rommon has completed booting, and system is at Rommon prompt or booting platform software.		
		Off	System is not out of reset or BIOS image is not loadable.		
TEMP	Temperature Status	Solid green	All temperature sensors in the system are within acceptable range.	Bezel side	All models
		Amber	One or more temperature sensors in the system are outside the acceptable range.		
		Off	Temperature is not being monitored.		
FAN	Fan Status	Green	All fans are operating.	Bezel side	All models
		Amber	One fan has stopped working.		
		Blinking Amber	Two or more fans have stopped working, or the fan tray has been removed.		
		Off	Fans are not being monitored.		
L (left)	Ethernet ports 0 and 1 Link	Green	Ethernet cable is present and link is established with other side or PoE power is enabled for this port.	I/O side	All models
		Off	No link.		
S (left)	Speed of Ethernet ports 0 and 1	Green	Blink frequency indicates port speed: <ul style="list-style-type: none"> 1 blink+ pause - FE or GE port operating at 10 Mb/s 2 blinks + pause - FE or GE port operating at 100 Mb/s 3 blinks + pause - GE port operating at 1000 Mb/s 	I/O side	All models
		Off			

Table 1-1 LED Descriptions (Applies to Cisco 4461 ISR, Cisco 4451-X ISR, Cisco 4431 ISR, and Cisco 4351 ISR)

LED	Represents	Color	Description	Location	Available On
L (right)	Ethernet ports 2 and 3 ¹ and Management Ethernet Link	Green	Ethernet cable is present and link is established with other side.	I/O side	All models
		Off	No link.		
S (right)	Ethernet ports 2, and 3 ¹ and Management Ethernet Speed	Green	Blink frequency indicates port speed: <ul style="list-style-type: none"> • 1 blink+ pause - FE or GE port operating at 10 Mb/s • 2 blinks + pause - FE or GE port operating at 100 Mb/s • 3 blinks + pause - GE port operating at 1000 Mb/s 	I/O side	All models
		Off	No link		
SFP EN	Port 0, 1, 2, and 3 Enable	Green	Present and enabled.	I/O side	All models ¹
		Amber	Present with failure.		
		Off	Not present.		
SFP S	Status of Ports 0, 1, 2, and 3	Blinking Green	Blinking frequency indicates port speed. See the definition for the S LED.	I/O side	All models ¹
		Amber	Initialized with error.		
		Off	Not present.		
L/A	SFP+port 0/1 Link Active	Green	Link established.	I/O side	Cisco 4461 ISR
		Blinking Green	Packets being transmitted.		
		Off	Not present.		
SER CON (right)	Serial Console Active	Green	Active console port is RJ-45. Note When this LED is on, the USB CON LED will be off.	I/O side	All models
USB CON (left)	USB Console Active	Green	Active console port is USB. Note When this LED is on, the SER CON LED will be off.	I/O side	All models
SSD	mSATA/M.2 Slot Status	Green	SSD mSATA/M.2 present and enabled.	Bezel side	Cisco 4351ISR and Cisco 4461 ISR
		Amber	Initialized with error.		
		Off	Not present.		
ISC	ISC Slot Status	Green	PVDM4 is present and is enabled.	Bezel side	All models ²
		Amber	Initialized with error.		
		Off	Not present.		

Table 1-1 LED Descriptions (Applies to Cisco 4461 ISR, Cisco 4451-X ISR, Cisco 4431 ISR, and Cisco 4351 ISR)

LED	Represents	Color	Description	Location	Available On
FLASH	System Flash Status	Blinking Green	Compact flash/eUSB flash is present and is currently being accessed. Note Do not remove the flash device while the system is powered on.	Bezel side	All models
PSU	Power Supply Unit (P0 and P1) Status	Green	PSU is on and provides power.	Bezel side	All models ³
		Amber	PSU is on but with errors or in a failure condition.		
		Off	Power supply is turned off.		
POE PSU (not supported in Cisco IOS XE 3.8)	Power Over Ethernet Power Supply Unit 0 and 1 Status	Green	PSU is on and provides power.	Bezel side	All models ^{1 3}
		Amber	PSU is on but with errors or in a failure condition.		
		Off	PSU is off.		
POE Boost (not supported in Cisco IOS XE 3.8)	Power Over Ethernet Boost Mode	Green	Two PoE power supplies are installed and operating in boost mode.	Bezel side	Cisco 4451-X ISR, Cisco ISR4431
		Off	This can mean one of the following: <ul style="list-style-type: none"> No PoE PSU is installed. One PoE PSU is installed. Two PoE PSUs are installed and operate in redundant mode. 		
GE POE	Internal PoE Daughter Card Status	Green	PSU is installed and provides power	Bezel side	All models
		Amber	PSU is installed but in a failure condition.		
		Off	PSU is off.		
PWR	System Power	Green	System power is on and system functions correctly.	Bezel side	All models
		Green blinking	System power is in the process of shutting down.		
		Amber	System power is up, but low level initialization has failed.		
		Amber blinking:	System power is up, but the system has failed to come out of reset.		
		Off	System power is off.		
AC OK	AC power status	Green	AC power is on.	On each power supply unit	All models
		Off	AC power is off.		

1. Cisco 4351ISR does not have SPF 3.
2. Cisco 4461 ISR does not have ISC.
3. Cisco 4351 ISR does not support POE PSU 1.

Table 1-2 LED Descriptions (Applies to the Cisco 4331 ISR and the Cisco 4321 ISR Routers)

LED	Represents	Color	Description	Location	Available On
STAT	System Status	Solid green	System operates normally.	Bezel side	All models
		Blinking amber	BIOS/Rommon is booting.		
		Amber	BIOS/Rommon has completed booting, and system is at Rommon prompt or booting platform software.		
		Off	System is not out of reset or BIOS image is not loadable.		
TEMP	Temperature Status	Solid green	All temperature sensors in the system are within acceptable range.	Bezel side	All models
		Amber	One or more temperature sensors in the system are outside the acceptable range.		
		Off	Temperature is not being monitored.		
FAN	Fan Status	Green	All fans are operating.	Bezel side	All models
		Amber	One fan has stopped working.		
		Blinking Amber	Two or more fans have stopped working, or the fan tray is removed.		
		Off	Fans are not being monitored.		
L	Ethernet ports 0 and 1 ¹	Green	Ethernet cable is present and link is established with other side.	I/O side	All models
		Off	No link.		
S	Speed of Ethernet ports 0 and 1	Green	Blink frequency indicates port speed: <ul style="list-style-type: none"> • 1 blink - 10-Mbps link speed • 2 blinks - 100-Mbps link speed • 3 blinks - 1000-Mbps link speed 	I/O side	All models
		Blinking			
		Off			
SFP EN	Port 0, and 1 (for Cisco 4331 ISR), and Port 0 for Cisco 4321 ISR) Enable	Green	SFP module is detected and recognized.	I/O side	All models
		Amber	Initialized with error.		
		Off	Not present.		
SFP S	Status of port 0, and 1 (for Cisco 4331 ISR), and Port 0 for Cisco 4321 ISR)	Green	SFP module is detected and recognized.	I/O side	All models
		Amber	Initialized with error.		
		Off	Not present.		
		Off	Not present.		
SER CON (right)	Serial Console Active	Green	Active console port is RJ-45. Note When this LED is on, the USB CON LED will be off.	I/O side ²	All models

LED	Represents	Color	Description	Location	Available On
USB CON (left)	USB Console Active	Green	Active console port is USB. Note When this LED is on, the SER CON LED will be off.	I/O side ²	All models
SSD	mSATA Slot Status	Green	SSD mSATA is present and enabled.	Bezel side	All models.
		Amber	Initialized with error.		
		Off	Not present.		
POE0	POE PSU	Green	PoE is on and provides power.	Bezel side	All models.
		Amber	PoE is in a failed condition.		
		Off	PoE supply is not present.		
ISC	ISC Slot Status	Green	PVDM4 is present and enabled.	Bezel side	All models
		Amber	Initialized with error.		
		Off	Not present.		
FLASH	System Flash Status	Blinking Green	Compact flash/eUSB flash is present and currently being accessed. Note Do not remove the flash device while the system is powered on.	Bezel side	All models
PWR	System Power	Green	System power is on and system functions correctly.	Bezel side	All models
		Green blinking	System power is in the process of shutting down.		
		Amber	System power is up, but low level initialization has failed.		
		Amber blinking:	System power is up, but the system has failed to come out of reset.		
		Off	System power is off.		

1. Management Ethernet Link on bezel side on Cisco 4331 ISR.

2. These LEDs are on the bezel side for Cisco 4331 ISR

Table 1-3 LED Descriptions (Applies to the Cisco 4221 ISR Router)

LED	Represents	Color	Description	Location	Available On
STAT	System Status	Solid green	System operates normally.	Bezel side	All models
		Blinking amber	BIOS/Rommon is booting.		
		Amber	BIOS/Rommon has completed booting, and system is at Rommon prompt or booting platform software.		
		Off	System is not out of reset or BIOS image is not loadable.		

LED	Represents	Color	Description	Location	Available On
TEMP	Temperature Status	Solid green	All temperature sensors in the system are within acceptable range.	Bezel side	All models
		Amber	One or more temperature sensors in the system are outside the acceptable range.		
		Off	Temperature is not being monitored.		
FAN	Fan Status	Green	All fans are operating.	Bezel side	All models
		Amber	One fan has stopped working.		
		Blinking Amber	Two or more fans have stopped working, or the fan tray is removed.		
		Off	Fans are not being monitored.		
L	Ethernet ports 0 and 1 ¹	Green	Ethernet cable is present and link is established with other side.	I/O side	All models
		Off	No link.		
S	Speed of Ethernet ports 0 and 1	Green	Blink frequency indicates port speed: <ul style="list-style-type: none"> • 1 blink - 10-Mbps link speed • 2 blinks - 100-Mbps link speed • 3 blinks - 1000-Mbps link speed 	I/O side	All models
		Blinking			
		Off			
SER CON (right)	Serial Console Active	Green	Active console port is RJ-45. Note When this LED is on, the USB CON LED is off.	I/O side ²	All models
USB CON (left)	USB Console Active	Green	Active console port is USB. Note When this LED is on, the SER CON LED is off.	I/O side ²	All models
		Off	PoE supply is not present.		
ISC	ISC Slot Status	Green	PVDM4 is present and enabled.	Bezel side	All models
		Amber	Initialized with error.		
		Off	Not present.		
FLASH	System Flash Status	Blinking Green	Compact flash/eUSB flash is present and currently being accessed. Note Do not remove the flash device while the system is powered on.	Bezel side	All models

LED	Represents	Color	Description	Location	Available On
PWR	System Power	Green	System power is on and system functions correctly.	Bezel side	All models
		Green blinking	System power is in the process of shutting down.		
		Amber	System power is up, but low level initialization has failed.		
		Amber blinking:	System power is up, but the system has failed to come out of reset.		
		Off	System power is off.		

1. Management Ethernet Link on bezel side on Cisco 4221 ISR.
2. These LEDs are on the bezel side for Cisco 4221 ISR

Removable and Interchangeable Modules and Cards

Service Modules (SM-Xs), Network Interface Modules (NIMs), and E-Series Server Modules, fit into external slots and can be removed or replaced without opening the chassis.

External Slots

- [Network Interface Modules and Service Modules, page 1-38](#)
- [Cisco UCS E-Series Server Modules, page 1-39](#)
- [Memory, page 1-40](#)

Internal Slots

- [Memory, page 1-40](#)
- [Memory, page 1-40](#)
- [System Flash, page 1-39](#)

See the [Overview of Cisco Network Modules and Service Modules for Cisco Access Routers](#) document for general information and single- and double-wide slot numbering.

See the “[Install and Remove NIMs and SM-Xs on Cisco 4000 Series ISRs](#)” section on page 5-30 for instructions that describe how to install SM-Xs and NIMs in the router.

See the [Overview of Cisco Interface Cards for Cisco Access Routers](#) for general interface card information.

See the [Installing Cisco Interface Cards in Cisco Access Routers](#) document, for instructions that describe how to install legacy interface cards in the router.



Note

See the [router product](#) page at cisco.com for a list of supported network modules and interface cards.

Network Interface Modules and Service Modules

To install NIMs and SM-Xs on the router chassis, see the “[Install and Remove NIMs and SM-Xs on Cisco 4000 Series ISRs](#)” section on page 5-30.

Cisco UCS E-Series Server Modules

Cisco UCS E-Series Servers (E-Series Servers) are the next generation of Cisco UCS Express servers. E-Series Servers are a family of size-, weight-, and power-efficient blade servers that are housed within the Generation 2 Cisco Integrated Services Routers (ISR G2) and Cisco 4000 Series Integrated Services Router. For more information on the E-Series Server Modules, see the [Cisco UCS E-Series Servers Configuration Guides](#).

System Flash

Depending on the model that you have purchased, the routers use a CompactFlash or an eUSB flash for the internal bootflash memory. The CompactFlash and eUSB flash stores the operating system software image.

The CompactFlash is applicable to only Cisco 4451-X ISR. Each model supports 1 internal CompactFlash 8-GB, 16-GB, or 32-GB memory card. The CompactFlash is located behind the fan tray on the router chassis.

Cisco 4431 ISRs have a eMMC flash device. The device supports 8GB, 16GB, or 32 GB.

Cisco 4300 Series ISRs have an onboard flash device or an eMMC flash device. It supports 8GB or 16GB.

**Note**

For Cisco 4451-X ISR, you must use Cisco-qualified CompactFlash cards. The use of any other cards during normal network operation can affect system performance or reliability.

**Note**

Do not run the router without a CompactFlash card installed. Cisco IOS XE software does not boot without a flash card in the router.

**Note**

Depending on the model that you have purchased, the routers use a CompactFlash, or an eUSB flash for the internal bootflash memory. Cisco 4431 ISRs have a eMMC flash device. The device supports 8GB, 16GB, or 32 GB. The latest model of Cisco 4451x ISRs support both eUSB and CompactFlash. If a CompactFlash is installed, it will disable the eUSB. However, you can use the old CompactFlash that is available with the routers.

Solid State Drives

The NIM slots in the router support a field-replaceable solid state drive module with a dual-SSD SATA slot. The NIM can be installed in any bay slot 0. The SSDs are hot-swappable as part of normal operation. See the “Locate Internal and External Slots for Modules on Cisco 4331 ISR” section on page 6-9 section for more information.

Cisco 4300 ISR platforms support an optional internal SSD mSATA. This device is not hot-swappable and requires opening the chassis to service or upgrade.

Cisco 4461 ISR platform supports an optional internal M2.SSD with the capacity of 800 G. See the “Locate Internal and External Slots for Modules on Cisco 44611 ISR” section on page 6-9 section for more information.

Packet Voice Digital Signal Processor Modules

The Packet Voice Digital Signal Processor Modules (PVDM4s) add additional voice capabilities to the routers. The PVDM4 is installed inside the chassis of the router. See the “Install PVDM4 on the Motherboard of Cisco 4400 Series ISRs” section on page 6-33 for installation instructions.

Memory

The routers contain the following types of memory:

- DIMMs—Stores the running configuration and routing tables and is used for packet buffering by the network interfaces. Cisco IOS XE software executes from memory. Supported module types are Dual In-Line Memory Modules (DIMMs).



Note The DIMMs are interchangeable although the same sizes are not supported in all locations. The Cisco 4300 ISRs use a different type of DIMM compared to the 4400 ISRs. For proper operation, the DIMMs for the Cisco 4400 ISR should not be installed in an Cisco 4300 ISR, and vice versa. The single forwarding plane DIMM must have a 2-GB DIMM that is exactly like one of the two DIMMs used for the control plane with 4 GB of default memory. The control plane uses two DIMMs and they must be exactly the same type and density. This applies to only Cisco 4400 Series ISRs. Cisco 4300 Series ISRs do not have a distinct forwarding plane DIMM.

- Boot/NVRAM—Stores the bootstrap program (ROM monitor) and the configuration register. The boot/NVRAM is not serviceable.
- Flash memory—Internal bootflash memory. For details, see the “System Flash” section on page 1-39.
- CompactFlash memory card (Cisco 4451-X ISR routers)—Available in 8 GB, 16 GB, or 32 GB.
- eUSB flash card (Cisco 4300 ISR router)—Available in 8 GB or 16 GB.

Power Supply

The routers support a variety of power supply configurations. The power supplies module are field-replaceable and externally accessible. Cisco 4331 ISR power supply module is inside the chassis.

Table 1-4 summarizes the power options.

Table 1-4 Field Replaceable Unit Power Options

Router Model	AC Input PSU	DC Input PSU	Dual, Hot Swap Power Supply	PoE Power Supply Converter
Cisco 4461 ISR	Y	Y	Y	Y
Cisco 4451-X ISR	Y	Y	Y	Y
Cisco 4431 ISR	Y	Y	Y	—
Cisco 4351 ISR	Y	—	—	Y
Cisco 4331 ISR	Y	Y	—	—

Table 1-4 Field Replaceable Unit Power Options (continued)

Router Model	AC Input PSU	DC Input PSU	Dual, Hot Swap Power Supply	PoE Power Supply Converter
Cisco 4321 ISR	Y	—	—	—
Cisco 4221 ISR	Y	Y	—	—

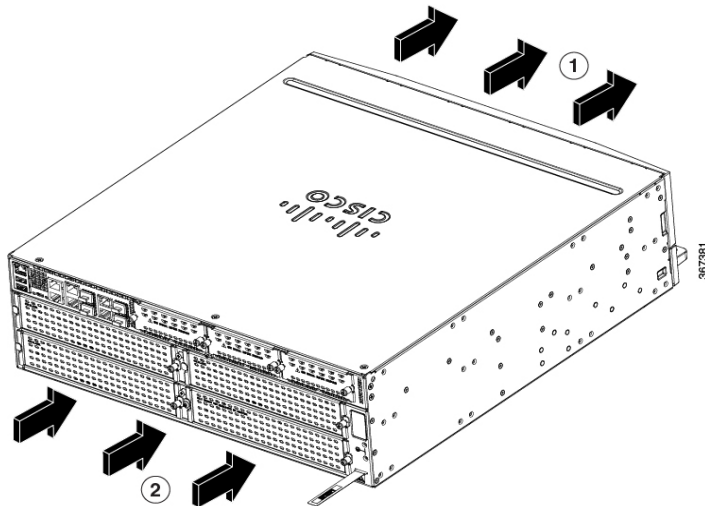
Fans, Ventilation, and Airflow

Chassis Ventilation

Router and chassis temperature is regulated with internal fans. An onboard temperature sensor controls the fan speed. The fans are always on when the router is powered on. Under most conditions, the fans operate at the slowest speed to conserve power and reduce noise. When necessary, the fans operate at higher speeds under conditions of higher ambient temperature. To replace Cisco 4451-X ISR, Cisco 4431 ISR, and Cisco ISR4351 fan trays, see the [“Replace a Fan Tray”](#) section on page 5-60.

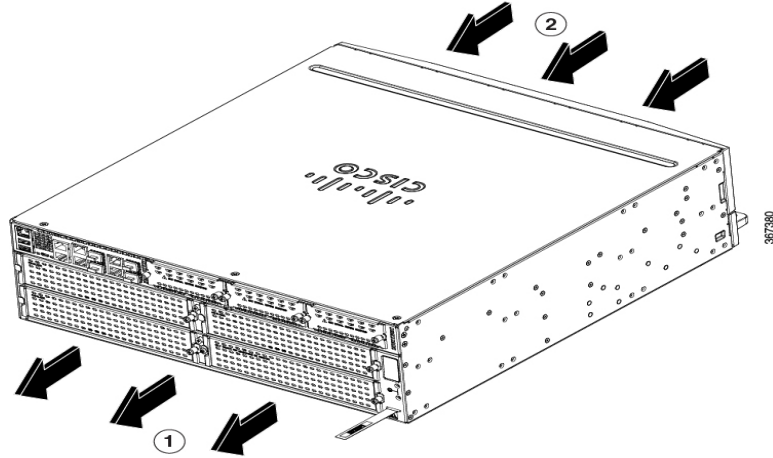
[Figure 1-35](#) and [Figure 1-36](#) show Cisco 4461 airflow, [Figure 1-37](#) shows Cisco 4451-X ISR airflow, [Figure 1-38](#) shows Cisco 4431 ISR airflow, [Figure 1-39](#) shows Cisco 4321 ISR airflow, and [Figure 1-40](#) shows Cisco 4221 ISR airflow.

Figure 1-35 Cisco 4461 ISR Airflow



1	Exhaust	2	Intake
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Figure 1-36 Cisco 4461 ISR Airflow (NEBS View)



1 Exhaust

2 Intake

Figure 1-37 Cisco 4451-X ISR Airflow

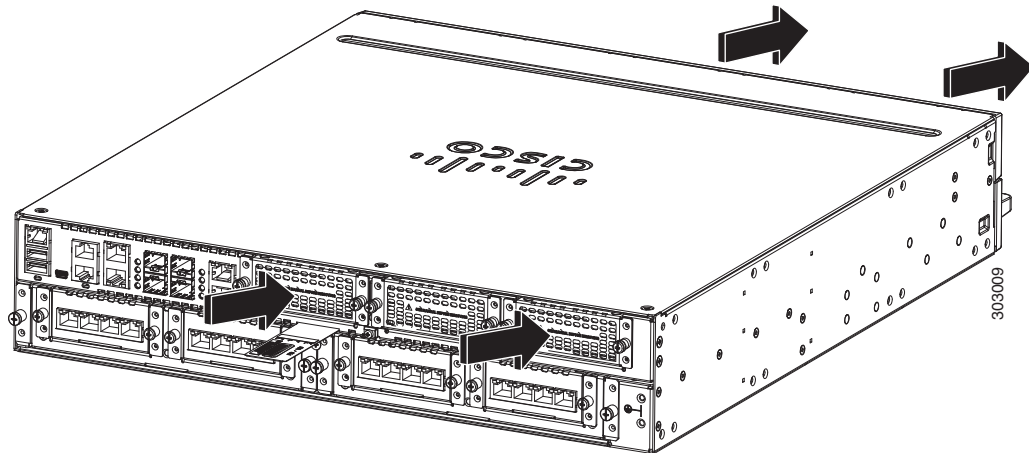


Figure 1-38 Cisco 4431 ISR Airflow

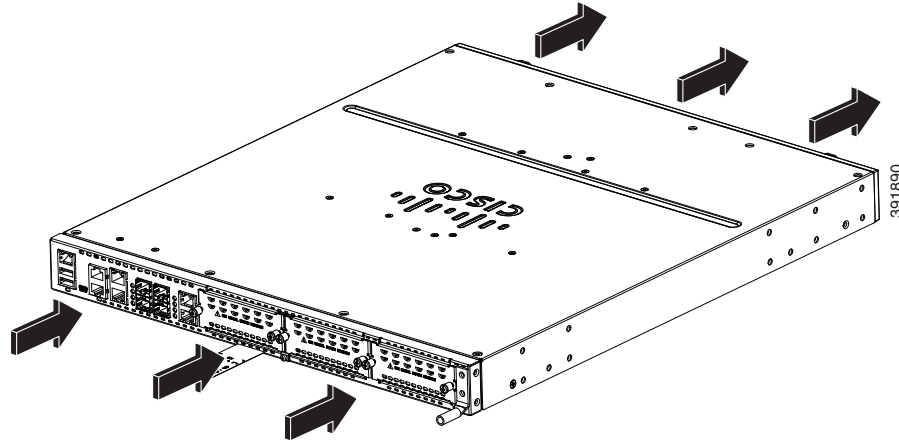
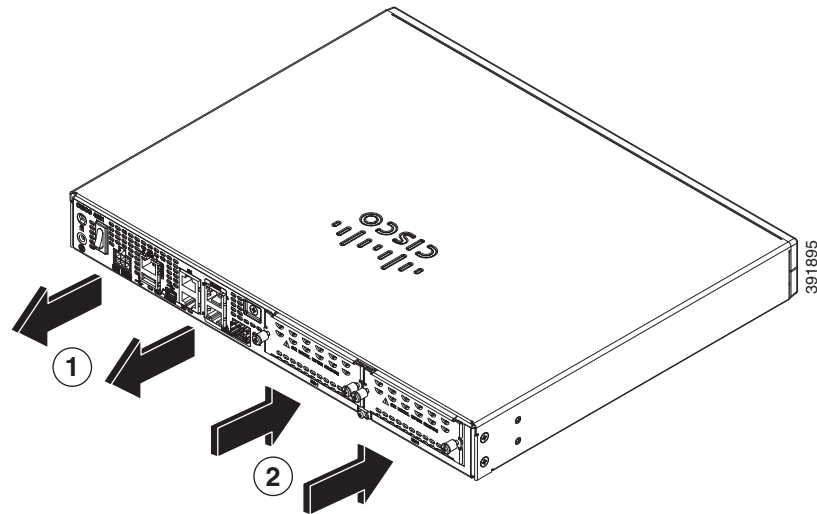
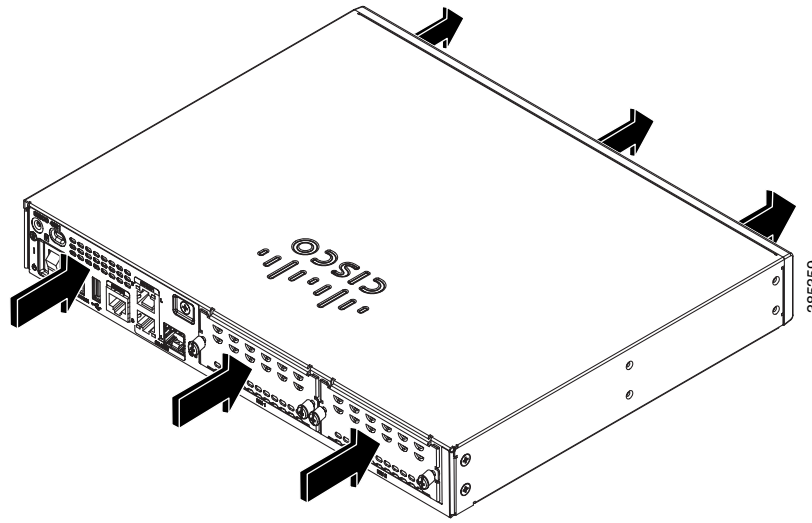


Figure 1-39 Cisco 4321 ISR Airflow



1	Exhaust	2	Intake
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Figure 1-40 Cisco 4221 ISR Airflow



Slots, Subslots (Bay), Ports, and Interfaces in Cisco 4000 Series ISRs

The routers supports two types of interface modules: Enhanced Service Modules (SM-X) and Network Modules (NIMs).

In most cases, the router designates its interfaces using a 3-tuple notation that lists the slot, bay, and port. The 3-tuple value is zero based. An example of a 3-tuple is 0/1/2. This refers to slot 0, the second bay in slot 0 (the first bay is 0 so the second bay is 1), and the third port in bay 1. See [Table 1-5](#) for more examples.

Table 1-5 Slot, Subslot (Bay) and Port Numbering

3-Tuple Example	Slot	Bay	Port
0/1/2	0	2nd	3rd
0/0/1	0	1st	2nd
1/1/1	1	2nd	2nd

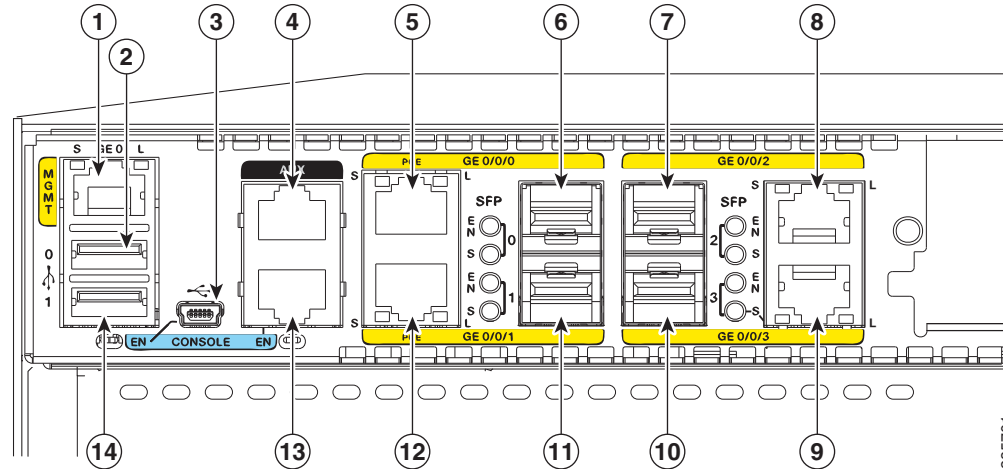
- Slots and bays are numbered from the left to the right, and from the top to the bottom.
- The auxiliary (AUX) serial port and console (CON) serial port do not have slot, bay, or port numbers.
- The GE management port is named GE 0 and has a port number. It does not have a slot or bay number.
- The two USB ports are named USB0 and USB1. They do not have slot or bay numbers. Cisco 4331 ISR and Cisco 4321 ISR have only one USB port.



Note USB0 and USB1 can be used to insert flash drives.

Figure 1-41 shows the ports and slots on Cisco 4451-X ISRs.

Figure 1-41 Ports and Slots on the Cisco 4451-X ISRs



1	Gigabit Ethernet management port	2	USB port 0
3	USB Type B mini port	4	Auxiliary port
5	RJ-45 Gigabit Ethernet port (GE 0/0/0)	6	Small-form-factor pluggable (SFP) 0/Gigabit Ethernet port (GE 0/0/0)
7	SFP 2/Gigabit Ethernet port (GE 0/0/2)	8	RJ-45 Gigabit Ethernet port (GE 0/0/2)
9	RJ-45 Gigabit Ethernet port GE 0/0/3	10	SFP 3/Gigabit Ethernet GE 0/0/3
11	SFP 1/Gigabit Ethernet GE 0/0/1	12	RJ-45 Gigabit Ethernet port GE 0/0/1
13	Console port	14	USB port 1

Slot Numbering

Slots are numbered 0, 1, and 2.

About Slot 0

The following are the main features of Slot 0:

- Slot 0 is the motherboard and not removable. It is reserved for integrated ports and NIMs.
- NIMs are designated by the number of the first slot that they occupy. A double-wide NIM occupies two slots, but its designation is only the left-most slot number.
- The front panel GE ports (or native interface ports) always reside in slot 0 and bay 0. The ports are called Gigabitethernet 0/0/0, Gigabitethernet 0/0/1, Gigabitethernet 0/0/2, and Gigabitethernet 0/0/3 (up to as many ports supported on the particular router).
- PVDM4s do not have an external slot number. Therefore, the nomenclature for PVDM4s always has 0 in the first tuple. For example, the 3-tuple for an PVDM4 can be 0/4/x.

Subslot/Bay Numbering

- Integrated devices, also known as integrated ports or FPGEs, and integrated NIMs reside in a fixed section of bay 0.
- Main board NIMs bays start at bay 1, because the integrated devices and integrated NIMs take up bay 0.
- The bay numbers for PVDM4s start with the next bay number after the last NIM bay number.

Gigabit Ethernet Management

Cisco 4000 Series ISRs provides a Gigabit Ethernet Management port, called GE0. This port is the only 1-tuple port on the system. See the [Gigabit Ethernet Management Port](#) section in the *Software Configuration Guide for the Cisco ISR 4400 Series and Cisco ISR 4300 Series Routers* for additional information about the Gigabit Ethernet Management port.

Specifications

For information on specifications of the Cisco 4000 Series ISRs, see, <https://www.cisco.com/c/en/us/products/collateral/routers/4000-series-integrated-services-routers-isr/datasheet-c78-732542.html>.

This table describes the regulatory compliance information of the Cisco 4000 Series ISRs,

Table 1-6 Regulatory Compliance Table

Safety compliance	<p>IEC 60950-1, Safety of information technology equipment [world-wide]</p> <p>EN 60950-1:2006, Safety of information technology equipment [EU]</p> <p>UL 60950-1, Second Edition, Standard of safety for information technology equipment [US]</p> <p>CAN/CSA C22.2 No. 60950-1-07, Safety of information technology equipment including electrical business equipment [Canada]</p> <p>AS/NZS 60950.1: 2011 [Australia]</p> <p>GB 4943[PRC]</p> <p>IEC 60950-1: 2005 plus Am1: 2009, [World-wide]</p> <p>EC 62368-1, Second Edition, Audio/video, information and communication technology equipment-Part 1: Safety requirements [World-Wide]</p> <p>EN 62368-1, Second Edition, Audio/video, information and communication technology equipment-Part 1: Safety requirements [EU]</p> <p>CAN/CSA C22.2 No. 62368-1, Audio/video, information and communication technology equipment-Part 1: Safety requirements [Canada]</p> <p>UL 62368-1, Audio/video, information and communication technology equipment-Part 1: Safety requirements [US]</p> <p>For detailed compliance information, see the Regulatory Compliance and Safety Information for the Cisco 4000 Series Routers document.</p>
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Table 1-6 Regulatory Compliance Table

Immunity compliance	<p>CISPR24 ITE-Immunity characteristics, Limits and methods of measurement</p> <p>EN 55024 ITE-Immunity characteristics, Limits and methods of measurement</p> <p>EN 50082-1 Electromagnetic compatibility - Generic immunity standard - Part 1</p> <p>EN 300-386 V1.6.1 Electromagnetic compatibility for TNE</p> <p>EN 61000</p> <p>For detailed compliance information, see the Regulatory Compliance and Safety Information for the Cisco ISR 4400 and Cisco ISR 4300 Series Routers document.</p>
EMC compliance	<p>EN 55022, class A</p> <p>CISPR22, class A</p> <p>CFR47, Part 15, Subpart B, class A</p> <p>AS/NZS CISPR22, Class A</p> <p>VCCI, Class A</p> <p>CNS13438 (Taiwan)</p> <p>KN22:2009 (Korea)</p> <p>ICES-003</p> <p>Harmonic Current Emission</p> <p>EN 61000</p> <p>Voltage Fluctuation Flicker</p> <p>EN61000</p> <p>For detailed compliance information, see the Regulatory Compliance and Safety Information for the Cisco ISR 4400 and Cisco ISR 4300 Series Routers document.</p>

Periodic Inspection and Cleaning

To minimize the negative impact of environmental dust or debris, we recommend periodic inspection and cleaning of the external surface of the router. The frequency of inspection and cleaning is dependent upon the severity of the environmental conditions, but we recommend a minimum frequency of every six months. Cleaning involves vacuuming of router air intake and exhaust vents. See the [“Fans, Ventilation, and Airflow”](#) section on page 1-41.



Caution

Sites with ambient temperatures consistently above 25°C or 77°F and with potentially high levels of dust or debris may require periodic preventative maintenance cleaning.
