Troubleshoot Power Supplies on Catalyst 9000 Switches

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Introduction

This document describes common methods to troubleshoot power supplies on Catalyst 9000 Series Switches.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Catalyst 9000 Series Switches architecture

Components Used

The information in this document is based on these software and hardware versions:

- C9300
- C9500
- C9400
- C9600

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Physical Troubleshooting

1. Verify what color on the PS LED is displayed (green/amber/red/off).

LED status	Signification
Off	No AC power is present in any power supplies.
Green	This power supply operates properly in the main power mode.
Solid Amber	Indicates one of these: • No output power is available. • AC/DC input is under the range of operation. • Over voltage/over current/over temperature conditions. • Over-temperature protection (OTP) due to fan failure.
Blinking Amber	Indicates warning events such as a power supply module that continues to operate in high temperature or high power and a fan that runs slow and so on.

Red	Power supply failure.

Note: Consult specific hardware installation guide for each platform, meaning of LED color can vary from platform to platform.

2. If the LED color is other than green, try these tests:

Test	Steps
Reset the power supply	1. Remove the PS from its slot. 2. Wait a couple of minutes. 3. Re-insert the PS to its slot.
Reset the power cord	1. Remove the power cord from the affected PS. 2. Wait a couple of minutes. 3. Re-insert the power cord back to the PS.
Swap components	1. Try to use a well-known working power cord. 2. Try to use a well-known working power outlet. 3. Try a spare power supply in the same slot. 4. Try the same faulty PS in a well-known working slot. 5. Try the same faulty PS in a different switch.

Note: If applicable, ensure there are no cable ties or any other objects that can block the PS fan.

Common Verification Commands

Command	How to Use
Switch#show inventory	Verify power supply is detected in the inventory.
Switch#show post	Verify all the tests are in passed status.
Switch#show log	Look for any error message related with with the issue.

Catalyst 9300

Verification Commands

Use the **show environment power** privilege EXEC command to verify PS status and budget.

```
Switch#show env power
SW  PID                 Serial#     Status           Sys Pwr  PoE Pwr  Watts
--  ------------------  ----------  ---------------  -------  -------  -----
2A  PWR-C1-1100WAC      <snip>       OK              Good     Good     1100
2B  Not Present
```

Use the **show power inline** privilege EXEC command to verify the power budget is available for the PoE and it is properly allocated based on the power supplies installed.

```
Switch#show power inline
Module   Available     Used     Remaining
          (Watts)     (Watts)    (Watts)
------   ---------   --------   ---------
2           595.0        0.0       595.0
```

Use the **show stack-power detail** privilege EXEC command (applies only to devices configured as stack power) to verify the stack power mode, power allocation, stack power ports status and so on.

```
Switch#show stack-power detail
    Power Stack                    Stack   Stack    Total   Rsvd    Alloc   Sw_Avail Num  Num
    Name                           Mode    Topolgy  Pwr(W)  Pwr(W)  Pwr(W)   Pwr(W)  SW   PS
    ---------------------          ------  -------  ------  ------  ------  ------  ----- -----
    power-stack-1                  SP-PS   Ring     6600    30      1695    4875      3    6
    power-stack-1-1                SP-PS   Ring     4400    30      1193    3177      2    4

Power stack name: power-stack-1
    Stack mode: Power sharing
    Stack topology: Ring
    Switch 4:
        Power budget: 2043
        Power allocated: 434
        Low port priority value: 22
        High port priority value: 13
        Switch priority value: 4
        Port 1 status: Connected
        Port 2 status: Shut
        Neighbor on port 1: Switch 3 - <snip>
        Neighbor on port 2: 0000.0000.0000

    Switch 2:
        Power budget: 2375
        Power allocated: 919
```

```
        Low port priority value: 21
        High port priority value: 12
        Switch priority value: 3
        Port 1 status: Shut
        Port 2 status: Connected
        Neighbor on port 1: 0000.0000.0000
        Neighbor on port 2: Switch 3 - <snip>

    Switch 3:
        Power budget: 2043
        Power allocated: 342
        Low port priority value: 23
        High port priority value: 14
        Switch priority value: 5
        Port 1 status: Connected
        Port 2 status: Connected
        Neighbor on port 1: Switch 2 - <snip>
        Neighbor on port 2: Switch 4 - <snip>

Power stack name: power-stack-1-1
    Stack mode: Power sharing
    Stack topology: Ring
    Switch 5:
        Power budget: 1964
        Power allocated: 342
        Low port priority value: 24
        High port priority value: 15
        Switch priority value: 6
        Port 1 status: Not connected
        Port 2 status: Connected
        Neighbor on port 1: 0000.0000.0000
        Neighbor on port 2: Switch 1 - <snip>

    Switch 1:
        Power budget: 2375
        Power allocated: 851
        Low port priority value: 20
        High port priority value: 11
        Switch priority value: 2
        Port 1 status: Connected
        Port 2 status: Not connected
        Neighbor on port 1: Switch 5 - <snip>
        Neighbor on port 2: 0000.0000.0000
```

Special Considerations

- Consult the hardware installation guide for the PoE budget available on each model. Some models have a low PoE budget, such as the C9300-48UXM that has a PoE budget of 490 W with 1100 WAC power supply, this can be misinterpreted as a hardware failure.

- It has been seen in some scenarios where a second power supply is inserted, but the PoE budget remains as a budget from one single PS. When a switch does not detect the PoE budget for a second PS and power supplies are detected on a "Good" status, you can try to perform a full power cycle as workaround.

Remove the power cords from both PS to turn the switch off, then:

1. Remove PS1.
2. Remove PS2.
3. Wait a couple of minutes.
4. Re-insert PS1.
5. Re-insert PS2.
6. Connect power cord to PS1.
7. Connect power cord to PS2.



Note: In case of a stack, all members affected must be power cycled.

Catalyst 9500

Verification Commands

Use the show power detail privilege EXEC command to verify the power supply status. You can use this command to check the power supply capacity and model.

```
Switch#show power detail
Switch:1

Power                                                  Fan States
Supply  Model No              Type  Capacity  Status     0     1
------  --------------------  ----  --------  ---------  ----------
PS0     C9K-PWR-650WAC-R      AC    650 W     ok         good  N/A
PS1     Not Present           N/A   N/A       N/A        N/A   N/A

Fan                Fan States
Tray    Status     0     1     2     3
------  ---------  ----------------------
FM0     ok         good  good  good  good
FM1     ok         good  good  good  good

Switch:2

<snip>
```

Use the **show platform hardware chassis power-supply detail switch [switch number]** all privilege EXEC command to verify the input and output values are under proper ranges (this command also works for the C9600 platform).

```
Switch#show platform hardware chassis power-supply detail switch 1 all
PS1:
  Input Voltage   :     200.0000 V
```

```
  Output Voltage  :      12.0480 V
  Input Current   :       0.6800 A
  Output Current  :       9.7500 A
  Input Power     :     131.0000 W
  Output Power    :     118.0000 W
  Temperature 1   :      23.0000 C
  Temperature 2   :      29.0000 C
  Temperature 3   :      28.0000 C
  Fan Speed 1     :   10176.0000 RPM
 PS2:
<snip>
```



Note: Consult the data sheet for power supply specifications.

Catalyst 9400 and 9600

Power Supplies Configuration Modes

Combined Mode

This is the default power supply mode. All available power supplies are active, share power, and can operate up to 100% capacity. Available power in the combined mode is the sum of individual power supplies.

If there are other power supply modes configured, you can use the **power redundancy-mode combined** command to return to default mode:

```
Switch(config)#power redundancy-mode switch 1 combined
```

Redundant Mode N+1

For this mode, "n" number of power supply modules are active ("n" can be 1 to 7 power supply modules), and +1 is the power supply module reserved for redundancy.

The default standby power supply slot is PS8. Specify a standby slot with the **power redundancy-mode redundant n+1 [standby-PS-slot]** command.

In the next example, the power supply inserted in slot 5 is configured as standby:

```
Switch(config)#power redundancy-mode switch 1 redundant N+1 5
```

Redundant Mode N+N

For this mode, "n" number of power supplies are active, and "n" number of power supply modules are configured as standby. The default standby slots for this mode are PS5 through PS8. Specify the standby slots with the **power redundancy-mode redundant n+n [standby-PS-slots]** command.

In the next example, the power supplies inserted in slots 2, 3, and 4 are configured as standby:

```
Switch(config)#power redundancy-mode switch 1 redundant N+N 2 3 4
```

Verification Commands

Use the **show environment status** privilege EXEC command to verify the power supply status, **PS Current Configuration Mode and PS Current Operating State**.

```
Switch#show environment status
Switch:1

Power                                                    Fan States
Supply  Model No              Type  Capacity  Status        1     2
------  --------------------  ----  --------  ------------  -----------
PS1     C9400-PWR-3200AC      ac    3200 W    active        good  good
PS2     C9400-PWR-3200AC      ac    3200 W    active        good  good

PS Current Configuration Mode : Combined
PS Current Operating State    : Combined

Power supplies currently active    : 2
Power supplies currently available : 2
<snip>
Switch 1:
Fantray : good
Power consumed by Fantray : 540 Watts
Fantray airflow direction : side-to-side
Fantray beacon LED: off
Fantray status LED: green
SYSTEM : GREEN
```

With the **show power detail** privilege EXEC command, you can verify the amount of power consumed or reserved for each line card, supervisor, and even for the fan tray. Additionally, you can verify the power budget mode, it can be either Single Sup or Dual Sup.

```
Switch#show power detail
Switch:1

Power                                                        Fan States
Supply  Model No              Type  Capacity  Status        1     2
------  --------------------  ----  --------  ------------  -----------
PS1     C9400-PWR-3200AC      ac    3200 W    active        good  good
PS2     C9400-PWR-3200AC      ac    3200 W    active        good  good

PS Current Configuration Mode : Combined
PS Current Operating State    : Combined

Power supplies currently active    : 2
Power supplies currently available : 2


Switch:2

<snip>


Switch:1
Power Summary          Maximum
 (in Watts)    Used    Available
-------------  ------  ---------
System Power   1670    1670
Inline Power   0       4730
-------------  ------  ---------
Total          1670    6400

Switch:2
<snip>

Switch:1

Automatic Linecard Shutdown : Enabled
Power Budget Mode           : Dual Sup

                           autoLC    Power                                 Out of  In
Mod  Model No              Priority  State     Budget  Instantaneous  Peak  Reset   Reset
---  --------------------  --------  --------  ------  -------------  ----  ------  -----
1    C9400-LC-24XS         0         accepted  200     94             96    200     10
2    C9400-LC-48U          1         accepted  65      32             33    65      5
3    C9400-SUP-1XL         0         accepted  400     239            252   400     130
4    C9400-SUP-1XL         0         ---       400     239            252   0       130
5    C9400-LC-48H          2         accepted  65      31             32    65      5
--   Fan Tray              0         accepted  540     --             --    540     --
---  --------------------  --------  --------  ------  -------------  ----  ------  -----
Total   1670
```



Note: When the power budget mode is Dual Sup, it automatically reserves power for a second supervisor even when there is no second supervisor installed.

Special Considerations

ROMMON Variable SINGLE_SUP_CHASSIS

By default, the system reserves power for both supervisors to ensure high availability. Some C9600 can be configured with the ROMMON variable SINGLE_SUP_CHASSIS=”0” or SINGLE_SUP_CHASSIS=”1”. When this variable is set to 0, it indicates the power budget mode is for Dual Sup, when it is set to 1, it indicates the power budget mode is Single Sup.

You can verify if the variable is configured with the **show romvar** privilege EXEC command.

```
Switch#show romvar | in SUP
 MODEL_NUM="C9600-SUP-1"
 SINGLE_SUP_CHASSIS="0"
```

When the ROMMON variable SINGLE_SUP_CHASSIS is set to 1, it is not reflected in **show power detail** command, but, it can still show the power budget mode as Dual Sup. However, the reserved power for a second supervisor reflects 0.

```
Power Budget Mode           : Dual Sup

                          Power                                    Out of  In
Mod  Model No             State     Budget  Instantaneous  Peak    Reset   Reset
---  -------------------  --------  ------  -------------  ----  ------  -----
1    C9600-LC-48YL        accepted  230     0              0     230     10
2    C9600-LC-24C         accepted  200     0              0     200     10
3    C9600-SUP-1          accepted  775     0              0     775     202
4    C9600-SUP-1          ---       0       --             --    0       0
FM1  C9606-FAN            accepted  450     --             --    450     --
```

Although the ROMMON variable indicates single sup mode, when a second supervisor is inserted, that supervisor consumes the proper power budget if there is enough power available. If you need the switch to reserve power for a second supervisor even when there is no second supervisor installed, you can set the ROMMON variable to SINGLE_SUP_CHASSIS to 0, for this you must use ROMMON mode.



Note: If you want to install a second supervisor, always remember to have the proper number of power supplies installed.

Power Budget Mode Dual Sup

If there is only one supervisor and not enough power supplies installed, the default power budget mode can trigger a scenario where the line cards are prevented to receive power and can show a power deny status.

```
Mod  Model No              State     Budget  Instantaneous  Peak  Reset   Reset
---  --------------------  --------  ------  -------------  ----  ------  -----
1    C9600-LC-48YL         denied    10      0              0     230     10
2    C9600-LC-24C          denied    10      0              0     200     10
3    C9600-SUP-1           accepted  775     0              0     775     202
4    C9600-SUP-1           ---       775     --             --    775     0
FM1  C9606-FAN             accepted  450     --             --    450     --
---  --------------------  --------  ------  -------------  ----  ------  -----
Total allocated power:  2020
Total required power:   2430
```

To solve this, you can configure the power budget mode for Single Sup. This power budget mode allows the switch to use the reserved power for the second supervisor to enable the line cards.

```
Switch(config)#power budget mode single-sup
```

If you need to install a second supervisor, remember to configure the switch back to Dual Sup and to install the proper number of power supplies needed to meet the power requirements.

```
Switch(config)#no power budget mode single-sup
```

Warning: If you do not configure the switch back to power budget mode in Dual Sup, and you do not install the proper number of PS, this can trigger a low power condition where the system can shut down.

Tip: The Cisco Power Calculator is an educational resource that can help you as a starting point to plan you power requirements.

Software Defects

- Cisco Bug ID: CSCwc87761
- Cisco Bug ID: CSCvk48435
- Cisco Bug ID: CSCvx30283
- Cisco Bug ID: CSCvz62847

Note: Only registered Cisco users can access internal bug information and tools.

Related Information

- Cisco Power Calculator
- Cisco Catalyst 9600 Series Switches Hardware Installation Guide
- Cisco Catalyst 9300 Series Switches Hardware Installation Guide, Product Overview
- Cisco Catalyst 9500 Series Switches Data Sheet
- Cisco Technical Support & Downloads