



14 FAQs about 14G Thermals

Tech Note by:

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SUMMARY

This Tech Note covers fourteen “hot topics” about PowerEdge 14G servers.

1. Why does my system fan speed change?

In general, fan speed changes due to change in system ambient temperature or hardware component temperatures. Fan speeds increase in order to maintain system reliability by ensuring components operate below their maximum temperature specifications. Most frequently, fan speeds increase due to the workload running on the CPU. Other hardware components with increased cooling requirements include GPU and FPGA cards, 3rd-party PCIe adapters, high-end networking adapters, and high density storage configurations.

2. Why are my fans running at very high speed or at full speed?

Fans may be running at high or full speed for a variety of reasons. The workload running on the server can result in high CPU utilization and thus an increase in cooling requirement. If the system is idle and fans are still at full speed, then either a hardware option (e.g. a high power card or a 3rd Party PCIe adapter) present in the server requires that full fan speed, or there is a failure of sensor communication, a fan failure, or operation of a server without chassis cover and/or air regulating shroud. Some systems require blanks for non-populated HDD slots, DIMM slots and/or CPU. Cooling for certain components may be compromised if these blanks are missing, resulting in higher fan speeds.

3. Why can't I lower my fan speeds?

Thermal algorithms define the minimum system fan speeds based on ambient temperature, system configuration and system utilization. Allowing the user to reduce fan speed could put system cooling at risk, potentially causing system thermal-related failures.

The only instance in which the user can reduce system fan speed is when a 3rd Party PCIe adapter card is part of the configuration for which a thermal algorithm provides cooling based on limited information from the card. This response may result in overcooling of the card. In this case, the user can turn off the fan response associated with this card, or define a custom airflow value for the card (iDRAC WebGUI or RACADM). Turning off 3rd Party Card fan response may reduce the fan speed if other components within the system are not requesting a higher fan speed than the response requested by the 3rd Party PCIe adapter card. It is generally not recommended to turn off this response unless the user is well aware of the cooling requirement of the adapter card.

4. I hear a fan spinning but my server is not powered ON. Is that expected?

Some server platforms are designed to allow one particular fan in the system to power ON when the system is in standby (AUX) state (AC plugged in, but power button not pressed). This fan may run under some system inlet ambient conditions to ensure cooling for onboard network devices that may be active in system AUX state.

5. How many fans are supported on this server?

Some platform configurations require only a limited subset of fans to be present in the server. For example, some 2-socket platforms may allow a lower fan count when configured with a single CPU. If a configuration does not require full fan population, a fan blank must be installed to prevent air recirculation within the system. Most configurations generally require full fan population. If the configuration has fewer fans than required, a fan failure log will be generated in iDRAC. Conversely, if there are more fans present than required, the additional fans may operate at their lowest speed, with no additional response to system utilization. It is generally not recommended to populate more or fewer fans than the required quantity for optimum cooling operation of the server.

Some platforms also support different fan types (Standard Performance vs. High Performance) and are generally represented as Type 1 or 2. A label on the individual fan carrier indicates if the fan is standard or high performance. Currently, there is no indication of the installed fan type in the iDRAC user interfaces. This feature may be added in a future iDRAC release. It is not recommended to swap standard fans with high performance fans, unless allowed by the platform configuration.

6. What is fan PWM (Pulse Width Modulation)?

Fan speeds are generally expressed in RPM (Revolution Per Minute) but the input signal that drives the fan to run at different speed is expressed as PWM (Pulse Width Modulation). PWM can be any number between 0% and 100%. It should be noted that a PWM of 0% generally does not mean that a fan is OFF. 0% is typically defined as the fan's lowest operational speed. Conversely, at 100% PWM, fans run at the maximum RPM. The relationship between fan PWM and RPM is generally linear.

7. What custom cooling options are available to users?

Various custom thermal settings are available and accessible via iDRAC interfaces like RACADM, iDRAC GUI, and BIOS HII browser. These thermal options include Custom Thermal Profiles (Maximum Performance, Maximum Performance per Watt, Sound Cap); custom fan speed options (minimum fan speed, fan speed offsets); and reduced Exhaust Temperature settings. In addition, custom airflow settings can be applied to 3rd Party PCIe adapter cards through RACADM and iDRAC GUI interfaces. The easiest way to access these options is to connect to the iDRAC WebGUI of the server and navigate to Cooling -> Configure Fans -> Fan Configuration.

8. What is the Sound Cap option in Custom Thermal Profiles?

Sound Cap is a new feature of PowerEdge 14G servers. Sound Cap was developed in response to customer requests and is for specialized environments in which minimizing acoustical output is a higher criteria than peak raw performance. Sound Cap limits, or "caps", CPU power consumption and thus fan speed, resulting in a lower acoustical ceiling. Its application is unique for acoustical deployments and may result in reduced system performance.



9. Why are PCIe adapter cards installed based on a slot priority requirement in the server?

There are a variety of reasons that slot restrictions exist for certain cards. Some common ones are:

- Certain slots are limited by PCIe lane width (like x4, x8, x16)
- Mechanically, a card may fit only in certain locations. This can be based on e.g. whether the card is single wide vs. double wide, or standard-length or full-length card
- There may be cabling that is connected to the card that requires the card to be in a certain location for optimum cable routing
- There may be cooling limitations in certain slots, e.g. airflow limitations may cause a Cooling or Thermal priority

10. Where can I find more information about PCIe adapter card cooling on the server?

The best place to look for this information is within the iDRAC WebGUI. From the iDRAC home screen, select Cooling → Fan Overview → Configure Fans. Then scroll down to see the “PCIe Airflow Settings”. This section displays all the PCIe adapter slots present in the system and the maximum airflow in LFM (Linear Feet per Minute) available at each slot (when all fans are at full speed). This section also indicates if a particular PCIe adapter card is considered a 3rd Party Card, and if so, what LFM is being provided. The user has the option to customize the airflow based on the card specifications. This feature is new with PowerEdge 14G servers and is an industry first.

11. Why is the top cover of my system hot and is that an indication of potential cooling problem? **OR** Why are CPU temperatures high? **OR** Why is the air coming out of the server so hot?

The system top cover may get hot in local regions above the CPU heatsinks or near the back of the system. This occurs most commonly in dense systems and in 1U servers. The localized heating of the top cover is due to the close proximity of the cover to the CPU heatsink or to the heated exhaust air at the rear of the system. The surface- and exhaust temperatures should not exceed safety limits of 70°C. Components such as CPUs, GPUs, and general board components are generally designed to run at significant higher temperatures without impact component or system reliability.

Users wanting to review or adjust system temperatures or exhaust air temperature can use Custom Thermal Settings through various iDRAC interfaces (RACADM, WebGUI) to increase fan speed (and thus system cooling) by applying any one of the Fan Speed Offset, Minimum Fan Speed, and/or Custom Exhaust Temperature options.

12. Does my platform support GPUs?

Many high power compute GPU devices that are passively cooled require platform-specific configuration restrictions, and those are allowed only on a limited number of platforms. Lower power (e.g. less than 75W) PCIe adapters are generally supported on all platforms. See platform-specific limitations to ensure compliance.

13. Why are different CPU heatsinks required in some configurations?

Some platforms require different CPU heatsinks based on the installed CPU TDP or other specific hardware options. For example, shorter heatsinks and a different air shroud are required in the R740 and R740xd to allow for proper GPU cooling. Refer to the individual platform details for specific information.

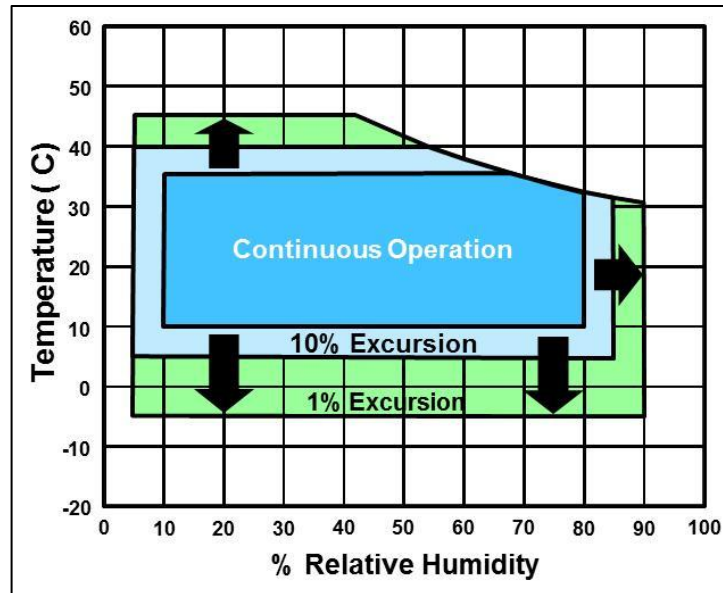
14. What are the ranges of environmental conditions supported for the server platforms, and what are the general configuration restrictions for extended environment (Fresh Air)?

The table below summarizes the standard and extended (Fresh Air) environment limits:

	Continuous Operation	≤10% of operational hours	≤1% of operational hours
Temperature Ranges For Altitude ≤950 meters or 3116.8 feet	10°C to 35°C (50°F to 95°F) with no direct sunlight on the equipment	5°C to 10°C, and 35°C to 40°C (41°F to 50°F, and 95°F to 104°F) with no direct sunlight on the equipment	-5°C* to 5°C, and 40°C to 45°C (23°F to 41°F, 104°F to 113°F) with no direct sunlight on the equipment
Humidity Percent Ranges	10% to 80%RH with 29°C (84.2°F) maximum dew point	5% to 85%RH with 29°C (84.2°F) maximum dew point	5% to 90%RH with 29°C (84.2°F) maximum dew point

*No cold start-ups below 5°C (41°F) due to hard disk drive (HDD) constraints

The figure below provides a graphical representation of C35E45 (i.e. 35°C continuous operation with 45°C excursion) capability, Fresh Air Cooling. Note that the climatogram below is similar to the ETSI Class 3.1e climatogram (see ETS 300 019-1-3), however Dell server systems are generally not ETSI compliant because the ETSI telecom specification has a wide range of other requirements beyond temperature and humidity.



Users can view the status of the system Fresh Air compliance in the iDRAC WebGUI under Cooling -> Temperature section.