



Preparing the Site

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Temperature Requirements

The Tetration (Secure Workload) cluster switches and servers require an operating temperature of 41 to 95°F (5 to 35°C) with a derating of the maximum temperature by 1°C for every 1000 feet (305 m) in elevation above sea level. If these devices are not operating, the temperature must be between -40 to 149°F (-40 to 65°C).

Humidity Requirements

High humidity can cause moisture to enter the switches and servers. Moisture can cause corrosion of internal components and degradation of properties such as electrical resistance, thermal conductivity, physical strength, and size. The switches and servers are rated to operate at 10 to 80 percent relative humidity, with a humidity gradation of 10 percent per hour. For nonoperating conditions, these devices can withstand from 5 to 93 percent relative humidity.

Buildings in which the climate is controlled by air-conditioning in the warmer months and by heat during the colder months usually maintain an acceptable level of humidity for the devices. However, if the devices are located in an unusually humid location, you should use a dehumidifier to maintain the humidity within an acceptable range.

Altitude Requirements

If you operate rack devices at a high altitude (low pressure), the efficiency of forced and convection cooling is reduced and can result in electrical problems that are related to arcing and corona effects. This condition can also cause sealed components with internal pressure, such as electrolytic capacitors, to fail or to perform at a reduced efficiency. These devices are rated to operate at altitudes from 0 to 10,000 feet (0 to 3,050 m), and can be stored at altitudes of 0 to 40,000 feet (12,200 m).

Dust and Particulate Requirements

Fans cool power supplies, switches, and servers by drawing in air and exhausting air out through various openings in the chassis. However, fans also ingest dust and other particles, causing contaminant buildup in the switch and increased internal chassis temperature. A clean operating environment can greatly reduce the negative effects of dust and other particles, which act as insulators and interfere with the mechanical components in the switches and servers.

In addition to regular cleaning, follow these precautions to avoid contamination of rack switches and servers:

- Do not permit smoking near the rack.
- Do not permit food or drink near the rack.

Minimize Electromagnetic and Radio Frequency Interference

Electromagnetic interference (EMI) and radio frequency interference (RFI) from the devices in the Tetration (Secure Workload) cluster rack can adversely affect other devices such as radio and television (TV) receivers operating near the rack. Radio frequencies that emanate from the devices in the rack can also interfere with cordless and low-power telephones. Conversely, RFI from high-power telephones can cause spurious characters to appear on the device monitors.

RFI is any EMI with a frequency above 10 kHz. This type of interference can travel from the switch to other devices through the power cable and power source or through the air as transmitted radio waves. The Federal Communications Commission (FCC) publishes specific regulations to limit the amount of EMI and RFI that can be emitted by computing equipment. Each switch meets these FCC regulations.

When wires are run for any significant distance in an electromagnetic field, interference can occur between the field and the signals on the wires with the following implications:

- Bad wiring can result in radio interference emanating from the plant wiring.
- Strong EMI, especially when it is caused by lightning or radio transmitters, can destroy the signal drivers and receivers in the chassis and even create an electrical hazard by conducting power surges through lines into equipment.



Note To predict and prevent strong EMI, consult experts in RFI.

The wiring is unlikely to emit radio interference if you use twisted-pair cable with a good distribution of grounding conductors. If you exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.

**Caution**

If the wires exceed the recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices. Consult experts in electrical surge suppression and shielding if you have had similar problems in the past.

Shock and Vibration Requirements

The devices in the Tetration (Secure Workload) cluster devices have been shock- and vibration-tested for operating ranges, handling, and earthquake standards.

Grounding Requirements

The devices in the Tetration (Secure Workload) cluster are sensitive to variations in voltage supplied by the power sources. Overvoltage, undervoltage, and transients (or spikes) can erase data from the memory or cause components to fail. To protect against these types of problems, make sure that there is an earth-ground connection for the devices. You must connect the rack to the facility earth ground.

You must provide the grounding wire to make this connection. Size the grounding wire to meet local and national installation requirements. Depending on the power supply and system, a 12-AWG to 6-AWG copper conductor is required for U.S. installations (for those installations, we recommend that you use commercially available 6-AWG wire). The length of the grounding wire depends on the proximity of the rack to facility earth ground connection.

Power Requirements

The Tetration (Secure Workload) clusters must be provisioned with power sources that provide the following amounts of power for operations:

- 39-RU large-form factor platform, single rack: 22,500 W
- 39-RU large-form factor platform, dual rack: 11,500 W for each rack
- 8-RU small-form factor platform: 5,500 W

For the required $n+n$ power redundancy, you need two AC power sources that each provide that amount of power.

Each chassis in the rack has two power supplies, one for operations and the other for redundancy. Each power supply is connected to a different power strip on the rack, and each power strip is connected to a different AC power source. If one power source fails, the other one provides the required power for each switch or server in the rack.

Airflow Requirements

The Tetration (Secure Workload) cluster requires that you position each rack with the power supplies and fans on the three switches in a cold aisle. When positioned this way, all the devices in the rack take in cooling air from a cold aisle and exhaust hot air to a hot aisle.

Clearance Requirements

The following table lists the amount of space required to install the 39-RU large-form factor (single- or dual-rack) or 8-RU small-form factor Tetration (Secure Workload) cluster. The installation aisle must be more than 24 inches (61 cm) wide for moving the rack into place. Additionally, you must have enough room for a person to access the front and rear to perform maintenance.

Installation Type	Aisle Minimum Width ¹	Rack Installation Minimum Space
C1-Tetration (Single-Rack) Installation	24 inches (61 cm)	24 inches (61 cm) wide by 43.38 inches (110.2 cm) deep
C1-Tetration (Dual-Rack)	24 inches (61 cm)	48 inches (122 cm) wide by 43.38 inches (110.2 cm) deep
C1-Tetration-M	24 inches (61 cm)	24 inches (61 cm) wide by 43.38 inches (110.2 cm) deep

¹ The Installation aisle and the aisle that the front door of the rack opens must be at least 24 inches (61 cm) wide. The other aisle, in which the double cabinet doors open, must be at least 12 inches (30.5 cm) wide for the doors to fully open but at least 24 inches (61 cm) is needed for a person to perform maintenance.

The rack is positioned with the switch fans (the side of the rack with the largest door) facing the cold aisle and the switch ports (the side of the rack with double doors) facing the hot aisle.