

How to Avoid IT System Failures Due to Equipment Overheating

*Using Ceiling-Mount Spot Air Conditioners as a
Cost-Effective Way of Cooling Server Rooms*

*A Guide for Facility and IT Managers,
Consulting/Specifying Engineers
and Mechanical Contractors*

***Today's server
rooms have
specialized air-
conditioning
needs***

As businesses and other organizations constantly increase their reliance on IT equipment such as servers and telecom switches for their vital, everyday business functions, they face a new and serious challenge: Finding a cost-effective way of keeping the equipment cool.

Usually IT equipment is housed in a dedicated server room, also referred to as a server closet, office data center, computer room, telecom room, network closet, etc.

Even for small businesses, a server room can easily contain two or more racks of equipment, which is both heat-sensitive and also a source of considerable heat itself. This equipment must be kept cool in order to prevent it from malfunctioning or incurring expensive damage. Even more serious consequences can result when a heat-related IT equipment failure causes a business interruption.

A building's central air-conditioning system can sometimes provide the necessary cooling, but it is usually expensive, as well as a wasteful use of energy. This is especially so since most IT equipment must operate continuously, including periods

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when the building is unoccupied and does not otherwise require cooling, such as nights, weekends and holidays.

Moreover, the temperature in the server room usually needs to be kept lower than the rest of the office space, and its higher heat-load requires more cooling power. Unless air conditioning can be delivered separately to the server room, other parts of the office can become uncomfortably cold for employees working there.

In addition, during cool-weather months, if the central air conditioning system switches to heating mode, the server room and its equipment will be heated along with the rest of the building. When that happens, a heat-caused IT equipment disaster is almost inevitable.

Because of all these reasons, server rooms usually require their own dedicated air-conditioning system. Yet the traditional choices—precision cooling and mini-split systems—involve costly installation, and have other drawbacks as well.

Fortunately, a new class of self-contained, ceiling-mount spot air conditioners offers a more efficient and cost-effective alternative. This paper examines the benefits of using such self-contained, ceiling-mount spot air conditioners to keep server rooms cool.

Growth in the Use of Server Rooms

Computers and associated electronics equipment have become essential to a wide range of business activities, including general operations, accounting, Internet transactions, internal and external e-mail, IP telephones, hotel pay-per-view and satellite television systems, etc.

The dynamic growth in the amount of electronics equipment used by businesses to perform these functions means that dedicated server rooms are increasingly required to house this equipment, separate from general office space.

System downtime due to equipment overheating can cause severe damage to a business.

The Dangers of IT Equipment Overheating

Electronics equipment can suffer both short-term and long-term effects from overheating.

In some situations, inadequately cooled equipment may continue to function and show no immediate signs of overheating, but its life cycle may be considerably shortened, adding to investment costs.

In other situations, severe overheating and accompanying system failure can occur very quickly, especially if there are several or more racks of equipment, which can generate a large amount of heat.

If the temperature rises to a dangerous level, servers, which contain a company's critical data, will usually shut themselves down to prevent possible damage or data loss. Network routers, which handle a company's internal and external data transmissions, such as e-mail and telephone communications, however, are even more vulnerable. Overheating can permanently damage these, requiring costly replacement.

Potentially even more costly than equipment replacement is system downtime. If a downtime occurs, all business activities and transactions supported by the electronics equipment come to a halt, sometimes with devastating results.

Keeping Electronics Equipment Cool: A Historical Perspective

Server technology presents new cooling challenges.

Originally, mainframe computers, which produced very high amounts of heat, were housed in their own rooms the size of basketball courts. Huge air-conditioning systems kept the ambient temperature at a constant 55 °F. Later, with the introduction of server technology, sophisticated precision cooling systems were specifically designed to accommodate the many dozens or even hundreds of racks of equipment contained in large, dedicated data centers.

Today, the proliferation of server rooms within general-use office space presents new challenges for air conditioning.

Until recently, providing server rooms with dedicated air conditioning has most commonly been accomplished with either

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mini-split or precision cooling systems. Both of these alternatives have significant disadvantages, however.

Mini-Splits

Mini-splits have a fairly low purchase price and take up no floor space, but they are designed for comfort cooling and generally do not have the high sensible cooling capacity necessary for computer equipment.

They also have a condensing unit that must be installed outside, adding to installation and maintenance costs. In addition, the condensing unit usually cannot be installed more than about 50 feet away from the inside evaporator unit, or at more than a 25-foot vertical distance, restricting their application range.

Precision Cooling Systems

At the other end of the spectrum are precision cooling systems, whose sophisticated features and high cooling capacities are generally geared toward large data centers.

Ceiling-mount precision cooling systems take up no floor space, are highly configurable and provide high amounts of sensible cooling. Like mini-splits, most precision cooling systems have a split design, although some models do not require the condensing unit to be located outside.

Precision systems have other drawbacks, however, including their large size, which prevents them from easily fitting into the cramped space above many server rooms; high purchase price; and high installation and maintenance costs.

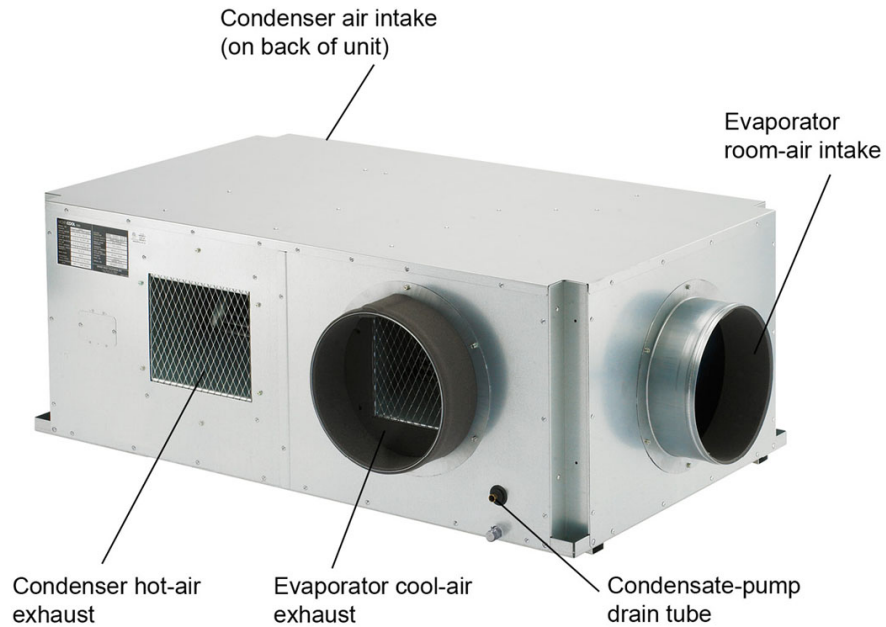
The New Solution: Self-Contained, Ceiling-Mount Spot Air Conditioners

The introduction of a relatively new class of self-contained commercial air conditioners, called spot air conditioners or spot coolers, provides a more efficient and more cost-effective alternative to both mini-splits and precision cooling systems

How Self-Contained Spot Air Conditioners Work

Self-contained spot air conditioners combine both a condenser and evaporator coil in a single unit.

Conventional air conditioners, including precision cooling and mini-split systems, consist of two separate units, one containing a condenser and the other an evaporator coil. Self-contained spot air conditioners, on the other hand, combine both a condenser and an evaporator coil in a single unit.



As with conventional systems, cold refrigerant flows through copper tubing from the condenser to the evaporator coil. A fan blows over the coil, pushing cold air out. A second fan pushes hot exhaust air out through a flexible duct, which is usually directed into the crawl space above a drop ceiling.

In addition to air-cooled spot air conditioners, water-cooled models can be used in applications where there is no available space for the hot exhaust air.

With either air- or water-cooled units, excess moisture removed from the air collects in a small condensation tank and is automatically pumped out to a drain or, in the case of portable units, can also be disposed of manually.

Portable Vs. Ceiling-Mount

Spot air conditioners are available in both portable as well as ceiling-mount models. Even though portable models are primarily designed for applications where they can be quickly and easily moved, they are often used in permanent installations as well.

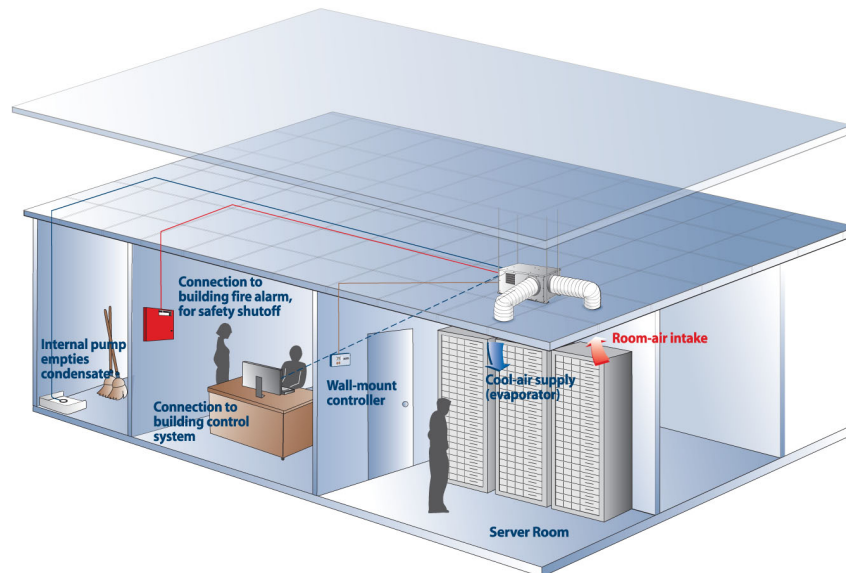
A major advantage of portable spot air conditioners is their small size. This makes them ideal for use in applications where space is at a premium, such as small to medium-size server rooms. Many server rooms, however, do not have even the small amount of floor space that a portable spot air conditioner requires. In such cases, a ceiling-mount model is usually the only practical choice.

Benefits of Ceiling-Mount Spot Air Conditioners

The benefits of ceiling-mount spot air conditioners include:

- Low cost
- Quick, easy installation
- No outside condensing unit to maintain
- Flexible placement of air supply and return

Ceiling-mount spot air conditioners are designed for quick and easy installation.



In addition to their low cost, ceiling-mount spot air conditioners are considerably smaller than precision cooling systems, so they

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are easier to install in the limited crawl space found above most server rooms.

Also, ceiling-mount spot air conditioners consist of only a single, precharged unit. This eliminates the cost of installing and maintaining an external condensing unit, which most often involves penetrating an outside wall or the roof, as well as the cost of sweating or brazing copper connecting tubes and charging the refrigerant.

In addition, whereas precision cooling systems are generally offered only in 230-V configurations, some ceiling-mount spot air conditioners are available in 115-V models, potentially reducing installation costs still further.

Another advantage of ceiling-mount spot air conditioners is their high degree of placement flexibility.

In some crawl spaces, obstructions such as light fixtures can limit where an air conditioner can be placed. To overcome this, ceiling-mount spot air conditioners use flexible air ducts for both supply and return. This allows the air conditioner itself to be conveniently placed anywhere in the crawl space, independent of where the supply and return need to be located.

Also, the location of the supply and return can be easily changed whenever necessary, to eliminate any new hot spots that may result from changes in equipment configuration.

What to Look for in a Ceiling-Mount Spot Air Conditioner

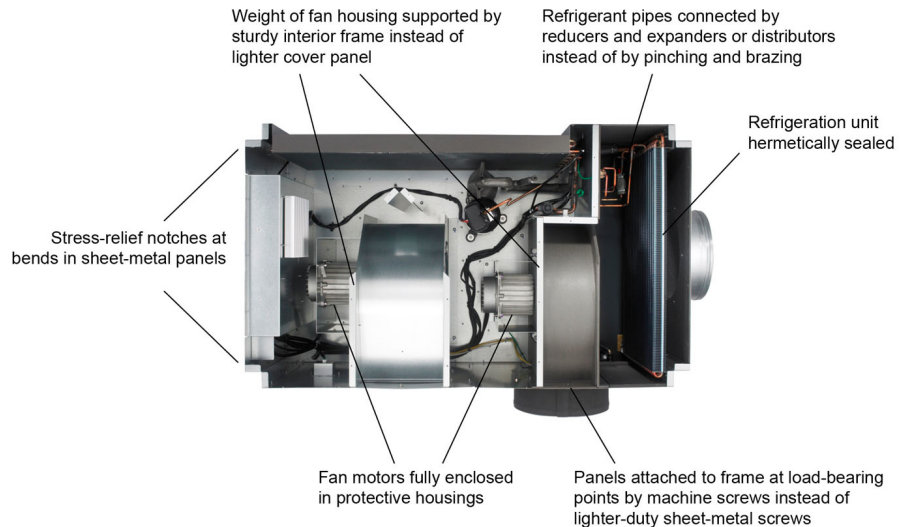
When choosing a ceiling-mount spot air conditioner, features can vary greatly between manufacturers. Here are some important things to look for:

High sensible cooling capacity: Heat-generating IT equipment requires a higher sensible cooling capacity than most applications, so before choosing an air conditioner it is essential to determine the minimum sensible cooling capacity needed. Also, be sure to take into account possible future increases in the amount of equipment to be cooled.

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For reliable, 24/7 cooling of IT equipment, an air-conditioning system must be built to the highest quality standards.

Quality of manufacturing: Especially when critical electronics or telecom equipment is involved, air conditioning must be reliable. Look for a system that is built to the highest quality standards.



Specifically, check to see if the fan motors are fully enclosed in protective housings to prevent dust from building up. Dust that accumulates on the motors can absorb moisture, leading to corrosion or electrical shorts.

Next, look at the sheet-metal panels to see if they have stress-relief notches at the bends. Also, are the panels attached to the frame at load-bearing points by machine screws, or by lighter-duty sheet-metal screws? Is the weight of the fan housing supported by a sturdy interior frame, or only by a lighter cover panel?

Another important area to pay attention to is the refrigeration unit itself. Is it hermetically sealed, or does it have service valves, which are prone to leaks? Are the refrigerant pipes connected by reducers and expanders or distributors, instead of by pinching and brazing?

Pinching and brazing restricts the flow of the refrigerant, reducing cooling efficiency and long-term performance. In addition, the connections created using this method are weaker and more subject to vibration-caused stress cracks and subsequent leakage.

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Such quality-oriented details are telling indicators of high-quality equipment that is designed and manufactured with long-term reliability in mind.

Built-in features: The best self-contained air conditioners will usually come with built-in features that can have a major impact on the cost and ease of installation, as well as on the ease of use in daily operation. Some of the most important features include:

- Vibration isolators
- Mounting brackets that allow installation with off-the-shelf hardware
- Condensate pump
- Air supply and return flanges
- Wall-mounted, programmable controller
- Easy integration with an energy management system (EMS)
- Connection to building fire alarm, for automatic safety shutoff
- Connection to building control system, for remote control and monitoring of operation
- High seasonal energy efficiency ratio (SEER)

Look for an established manufacturer who will stand behind their product.

Established manufacturer: Look for a company that has established itself for many years in the industry and stands out as a leading manufacturer of air-conditioning equipment. This is a good sign that the company will be around to support their equipment well into the future.

Also look for a company with a broad distribution base and a large number of dealers who will support and service their equipment throughout North America and globally, no matter where you are located.

Comprehensive warranty: Most industry warranties limit the labor coverage in their warranties to a shorter period than the coverage for parts, which can be costly to the user. The highest-quality manufacturers cover their equipment for both parts and labor for the entire length of the warranty, up to two years for the complete unit and up to three years for the compressor.

MovinCool Spot Air Conditioners

MovinCool, the world's largest manufacturer of commercial spot air conditioners, offers a complete line of models used in a variety of IT applications, including server rooms, telecom closets, data centers, etc.

Within the air-conditioning industry, MovinCool enjoys a reputation for highest quality and reliability.

Dealers who specialize in spot air conditioners stand to lose significant profit if they have to replace a unit once it is installed. Such dealers consistently say they prefer MovinCool models, knowing they can always count on them to deliver the high levels of performance and reliability their customers demand.

MovinCool is a brand of DENSO, one of the world's largest manufacturers of automotive parts. As a principal supplier of advanced automotive technology, systems and components, including air conditioners, to all the of the world's major car manufacturers, DENSO's commitment to quality is paramount.

In the 1980s, DENSO pioneered the concept of workspace spot cooling to meet its own factory needs in Japan. Since then, MovinCool has developed a wide range of self-contained spot-cooling systems for many different applications. For more information, visit MovinCool's Web site at <http://www.movincool.com>.