

## Reducing the Cost of Keeping Office Data Centers Cool

*Portable Spot Air Conditioners as Permanent  
Cooling Solutions*

*A Guide for Facility Managers, IT Managers  
and Mechanical Contractors*

As businesses increasingly rely on computers and telecom equipment to help run more and more aspects of their operations, they often find that the many pieces of IT equipment they have accumulated need to be housed in an office data center.

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***Today's office  
data centers  
have specialized  
air-conditioning  
needs.***

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Even for small to medium-size businesses, such data centers can easily contain four or more racks of equipment, which is both heat-sensitive as well as 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 for an office data center, but it is usually expensive and a wasteful use of energy. This is especially so since most data centers operate continuously, including times when the building is unoccupied and does not otherwise require cooling, such as after business hours, on weekends and holidays.

Moreover, the temperature in the data center 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

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can be delivered separately to the data center, this can be uncomfortable for employees working in other parts of the office.

In addition, during cool-weather months, if the central air conditioning system switches to heating mode, the data center and its equipment will be heated along with the rest of the building.

For all these reasons, data centers usually require their own dedicated air-conditioning system. Yet the traditional choices—precision-cooling or mini-split systems—involve costly installation and have other drawbacks.

Many office data centers are in leased space. Here, the lease agreement may prohibit a split precision-cooling or mini-split system. These usually require cutting openings in the roof or an outer wall, as well as interior walls, through which copper connecting pipes can be run. The pipes require sweating and brazing to connect them, and the units need to be charged with refrigerant, adding considerably to the installation cost.

Self-contained precision-cooling systems are available that do not require external piping, but they are more expensive and require significant other installation work that a lease agreement may also prohibit.

Another problem with split systems is that they require a suitable place outside the building where the condensing unit can be installed. Especially with mini-splits, the distance and height differential between the indoor evaporator and the outdoor condensing unit cannot be too great. Even in the absence of lease restrictions, this effectively rules out split systems in many situations, particularly in high-rise buildings.

It can also rule out many split systems in low-rise buildings if the data center is located on one side of the building, but the condensing unit needs to be installed on the other, or where the refrigerant piping needs to go up over a wall. In these cases, the split system may not be powerful enough to pump the refrigerant the necessary distance or height.

Fortunately, a class of industrial air conditioners, called portable spot air conditioners or spot coolers, can provide a simpler, more convenient and less costly solution. Even though these self-contained units are portable, some manufacturers specifically design their spot coolers for heavy-duty, 24/7 usage, with a mean time between failures (MTBF) that may actually be longer than that of a non-portable, fixed system.

This paper will examine the benefits of using portable spot air conditioners as a less-expensive alternative to precision-cooling systems and mini-splits.

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***Providing air conditioning for office data centers in leased office spaces presents new challenges.***

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## **Continued Growth in the Use of IT Equipment**

Computer and telecom equipment continue to become more and more essential for an ever-widening range of business functions, including general operations, accounting, Internet transactions, e-mail and telephone communications.

The dynamic growth in the number of pieces of electronics equipment used by businesses to perform these functions means that dedicated office data centers are increasingly required to house such equipment, separate from general office space.

## **The Dangers of IT Equipment Overheating**

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

If an air-conditioning system does not keep the temperature low enough, the equipment in the data center may continue to function and show no signs of overheating, but its life cycle may be considerably shortened, adding to investment costs.

In situations where the cooling capacity of the air-conditioning system is inadequate, severe overheating can quickly occur, especially if there are several or more racks of equipment, which can generate a large amount of heat.

As the temperature rises to the danger 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, are even more heat-sensitive. Overheating can permanently damage them, requiring costly replacement.

Potentially even more costly than equipment replacement, however, 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**

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, relatively large and sophisticated precision-cooling systems were specifically

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

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designed to accommodate the many dozens or even hundreds of racks of equipment contained in large, dedicated data centers.

Today, the proliferation of smaller, office data centers within companies' general-use, leased office space, presents new challenges for air conditioning.

### **The Solution: Portable Spot Coolers as Permanent Air-Conditioning Systems**

A relatively new class of commercial portable air conditioners, called portable spot air conditioners or portable spot coolers, provides a convenient and cost-effective way of cooling office data centers.

Portable spot air conditioners can be used in leased spaces, where installation of a precision-cooling system or mini-split may not be allowed. Because they are portable and are therefore designed to hold up under hard use, these units are often even more rugged than permanent systems. In fact, many portable units have been in operation for 20 years or more, with only minimal maintenance.

There are two basic types of portable spot air conditioners: air-cooled and water-cooled. Although water-cooled air conditioners are more efficient than air-cooled ones, they use high-pressure water lines that can leak. Consequently, along with portable evaporative coolers, which can also leak, they are usually considered too risky to use with IT equipment. For the purposes of this paper, therefore, the terms "portable air conditioner" or "portable spot cooler" refer only to air-cooled systems.

### **How Spot Air Conditioners Work**

Split air-conditioning systems consist of two separate units. One is the outdoor unit containing a compressor, condenser coil and hot-air exhaust fan. The other is the indoor unit, containing an evaporator coil and cool-air delivery fan.

Spot air conditioners, on the other hand, are self-contained systems, combining a compressor, condenser coil and evaporator coil in a single unit. Within the unit, cold refrigerant flows through copper tubing from the compressor coil into the evaporator coil. A fan blows over the evaporator coil, pushing cool air out. A second fan pushes hot exhaust air out through flexible ducting, which is usually directed into the crawl space above a drop ceiling.

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*Portable spot air conditioners are often built to be more durable than permanent units.*

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Excess moisture removed from the air collects in a small condensation tank, which can be emptied manually or, with most models, automatically via a pump.

### **Benefits of Portable Spot Air Conditioners**

The most important benefit of portable spot air conditioners is that they allow quick and easy installation that does not involve construction. This gives them a lower cost than other systems, and also means they do not violate most lease agreements.

Installation, which does not normally require prior approval of the building owner, usually consists of no more than rolling a unit in, removing a drop-ceiling panel and positioning the exhaust duct in the space, which the panel previously occupied.

Another important benefit of portable spot air conditioners is their flexibility. Whenever necessary, they can be quickly and easily moved to a different place in the data center and their airflow redirected. This is particularly helpful if any new hot spots develop, such as when equipment is added or racks are reconfigured. Also, if the business moves to a new location, unlike permanently installed air conditioners, the portable units can be taken along, eliminating the need to invest in new equipment.

In addition, manufacturers offer portable spot air-conditioner models with the same type of convenience and safety features found on permanent units. These include the ability to communicate with the data center or building's monitoring and control systems, and to receive automatic safety shutoff commands from the building's fire-alarm control panel.

### **What to Look for in a Portable Spot Air Conditioner**

When choosing a portable spot air conditioner, here are some important things to look for:

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

Specifically, check to see if the fan-motor case has ventilation holes in it. Higher-quality fan motors are made with temperature-resistant materials that eliminate the need for ventilation holes. Holes or other ventilation cutouts in the case

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*Installation of portable spot air conditioners does not require construction, greatly reducing costs.*

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allow moisture-absorbing dust to accumulate on the motor, leading to corrosion or electrical shorts.

Also, examine the casters for their durability. Are they securely attached to the frame by a mounting plate and heavy-duty bolts with welded nuts, or only by the caster stem? The stem is a weak point that can bend and cause the caster to malfunction if it goes over a rough or uneven surface.

Next, look at the sheet-metal panels to see if they have stress-relief notches at the bends, to prevent possible cracks. Also, are the panels attached to the frame at load-bearing points by durable weld nuts and machine screws, or only by light sheet-metal screws, which can come loose or break? Is the weight of the fan housing supported by a sturdy, steel-frame interior panel, or only by a light cover panel, which can weaken and collapse?

Another important area to pay attention to is the refrigeration unit. Is it hermetically sealed, or does it have leak-prone service valves, which make it periodically necessary to perform costly recharging?

Finally, check the drain pan to see if it is fully insulated, not just powder-coated. This ensures that moisture will not come into contact with the metal surface of the pan, protecting it from corrosion and possible leaks.

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

**Industry-standard measurements:** Cooling capacity, measured in Btu/hr or tons (12,000 Btu/hr = 1 ton), is the most basic measure of an air conditioner's ability to cool a given space.

When choosing a portable air conditioner, be sure that the manufacturer's claimed cooling capacity has been arrived at following an industry-accepted standard from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), and not just an arbitrary one. Otherwise, the unit may provide inadequate cooling.

For portable spot air conditioners, the relevant ASHRAE Standard 128-1989 specifies ambient conditions of 95 °F at 60% RH. Unless this standard is used, the cooling capacity of the equipment in question may be much lower than what is claimed.

Manufacturers of quality equipment, however, will adhere to this standard and clearly state that they have used these conditions when measuring cooling capacity.

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*Hermetically sealed refrigeration units eliminate the need to recharge the refrigerant, reducing costs.*

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*To allow proper evaluation of cooling capacity, an industry-standard method of measuring must be used.*

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**Total cost:** When comparing different air-conditioning systems, as with any equipment acquisition, be sure to take into consideration the overall cost, including purchase price, installation costs, maintenance costs and estimated service life.

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

The best manufacturers also offer a true manufacturer's warranty, not supplemental coverage from a third party.

**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.

### **About MovinCool**

MovinCool, the world's largest manufacturer of commercial spot air conditioners, offers a complete line of portable units used in a variety of IT applications, including data centers, computer rooms and network closets. Models are available with cooling capacities as high as 60,000 Btu/h (5 tons) and in all voltage ranges.

Within the air-conditioning industry, MovinCool enjoys a reputation for the highest quality and reliability. Dealers who specialize in portable spot air conditioners stand to lose considerably if they have to replace a unit once it is installed. Such dealers consistently say they prefer MovinCool spot air conditioners because of their superior reliability.

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 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. Since then, MovinCool has developed a wide range of self-contained

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spot-cooling systems. For more information, visit MovinCool's Web site at <http://www.movincool.com>.