



# Environmental Threats to Data Centers and Computer Rooms



Your computer system is the lifeblood of your business. Cyber threats are what you hear most about today. Hacks, viruses and spyware get constant media attention. But environmental dangers can be just as serious.

Whether you have a small equipment closet or a large data center, the environment that surrounds your servers is critical. Servers crash. Fires damage equipment. Air conditioning systems fail. Intruders sabotage systems. Water pipes break. Employees cause accidents. The possibilities are endless. And they can impact your productivity, delivery, inventory, sales, staffing, and bottom line.

You and your staff can't be there 24/7 to keep an eye on things. Even if you could, some physical dangers are not easily noticed. Every data center is vulnerable to environmental damage that can occur from power outages, excessive moisture, smoke and overheating.

You can't control weather conditions and unexpected disasters like leaks, floods, fires and malfunctioning air conditioners. But you can be alerted immediately when an event occurs so that you can take fast, corrective action. Recognizing these events is the critical first step.



**TEMPERATURE**



**HUMIDITY**



**WATER DETECTION**



**POWER AND  
EQUIPMENT FAILURES**



**AIRFLOW**



**SECURITY**



## Temperature

Left unchecked, excessive heat can quickly bring a fully functional computer room to a screeching halt. Equipment creates heat, and rising temperature can indicate various problems: a failing CRAC/CRAH or chiller unit, a leaking coolant line, lost utility power, restricted air circulation. Or perhaps your recently added server pods now require additional cooling with the new load.

But just monitoring temperature won't give you enough early detection of what caused the problem. The server room gets hot within minutes and leaves you scrambling to find out what is going on. It could be anything from the server, power supply, cold air supply, a plenum blockage, a bad fan... anything. Soon you're flirting with the potential of shutting down servers before they overheat.

A rise in temperature indicates an issue, but an environmental monitoring system helps prevent issues in the first place. Let's start with the cooling system. Many CRAC/CRAH systems have built-in alarm fault panels that can be connected to your monitoring system to alert you the moment your cooling system detects an internal problem.



It is not as easy today to predict workloads and heat generation in data centers. Traditionally, computer rooms had predictable heat patterns that correlated with work schedules and workloads. However, today's larger data centers have more dynamic workloads. Applications can be easily moved from one server to another, causing changes in CPU usage and thus more heat from server to server and row to row. The best way to monitor temperature depends on the size of the room and the concentration of heat sources.

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## Recommended Temperature Sensor Placement

- ① Next to the thermostat controlling the room temperature
- ② Two sensors on the front door of each rack
- ③ One sensor midway on the back of each rack
- ④ One sensor for each plenum



## Water Detection

What's going on underneath your raised floor shouldn't be a mystery. Pipes can burst. Air conditioning units and cooling systems can leak from a failed condensate pump, broken supply lines or clogged drains. Sprinkler systems can malfunction. Obviously, water, computer equipment and electricity are a bad combination, and water on the floor can damage your equipment beyond repair.

Often a water problem can be festering for some time underneath a raised floor or above a drop ceiling without your knowledge. Early detection gives you enough lead-time to prevent a major shut down.

### Potential Water Sources:

- Air Conditioning Leakage /Condensation
- Water Cooled Server Rack
- Condensation
- Natural Water/Groundwater
- Local Plumbing - toilet, sink, sewer lines

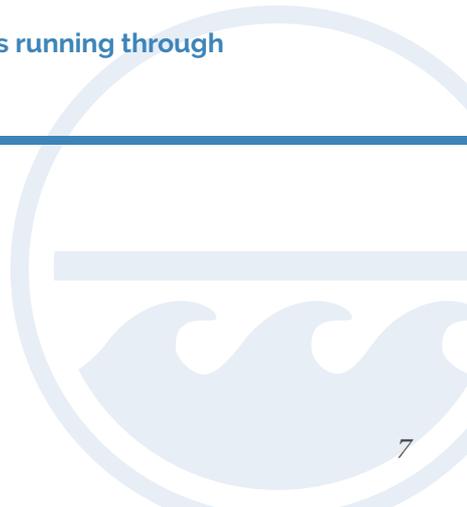
Proper placement of water sensors is key. Water tends to puddle at the lowest point of the floor and underneath pipe junctions and air conditioning units, and placing a sensor too

high won't trigger an alarm until after a serious flood has occurred. The entire perimeter under the raised floor should be fitted with leak detection rope, along with any pipes carrying fluids through your data center, especially under any valves or fittings within the pipe runs.

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### **Recommended Water Detection Sensor Placement**

- 1 Under the perimeter of the raised floor**
- 2 Under each CRAC unit**
- 3 Under any pipes running through the data center**





## Airflow

Air conditioning alone isn't enough to protect your CRAC/CRAH system. Airflow is an important factor. The output of your air handler needs to be unrestricted. What if you missed a filter change, a blower motor is beginning to fail, or the fans have become unbalanced?

Your monitoring system can give you the assurance that your system will run at peak efficiency and that you will be notified immediately of any drop in airflow.

**Airflow management** / air-flow management /

Making sure cool air is going to the server intakes and the hot air emanating from servers is properly exhausted.

Larger rooms often require additional sensor information to determine potential problems with cooling efficiency. It's important to measure the rate of airflow to gauge the overall health of the environment.



Airflow management is critical because it controls static electricity and dust build-up on computer fans that can cause equipment crashes.

The sooner you learn of a ventilation failure, the faster you can act to prevent reduced server performance, equipment damage and complete shutdowns. Using airflow sensors with your monitoring system can be very enlightening.

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## Recommended Airflow Sensor Placement

- ① In each cold air supply
- ② In each hot air return





## Humidity

Humidity is an environmental condition that is often overlooked, but it can be almost as important to a data center as temperature. ASHRAE recommends a humidity level of 41.9 °F dew point to 60% RH, with an allowable range between 20%-80%.

Humidity can be very temperamental. Humidity too high can cause condensation, and long-term condensation issues will lead to corrosion and breakdown of components within the data center environment. Yet, humidity

**Low Humidity** / low humidity /

Excessively low humidity causes constant static electricity discharges that can wear and damage your expensive equipment and systems.



**High Humidity** / high humidity /

High humidity is just as bad. It causes condensation on internal electronics leading to corrosion and premature failure.

too low can create electrostatic discharge across crucial components such as CPUs, RAM drives, hard drives and motherboards.

The only way to properly maintain correct humidity levels is to monitor them. Many external factors can change the internal humidity levels in your data center, especially if you are using an air-side economizer system. When bringing cold air in from the outside to cool your data center, the air will need to go through a humidification or dehumidification process.

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## Recommended Humidity Sensor Placement

- ① **For every 5 racks**
- ② **Near each return**
- ③ **Near your humidity control system**

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A quality system will monitor your data center humidity levels from 0%-100%. Humidity sensors placed properly through out your server room will provide you with the information you need to monitor the varying humidity levels. Any threat to this equipment can be detected early with the use of a humidity sensor.



## Power and Equipment Failures

It's important to monitor the power distribution units (PDUs) that serve up your electronics power. Each server rack typically has an outlet strip powered by the PDU, and each strip's load is monitored by the PDU itself. The PDU has a built-in alarm panel that will trigger an output relay when a power issue is detected in any of these strips or the main PDU.

Your monitoring system can easily be integrated into this alarm panel for instant alarm notifications. For redundant monitoring, an external power sensor can be plugged into each strip to monitor for voltage drops. This backup will give you the assurance that each strip has power. And if the PDU ever fails to trip its relay or send an alert, you can instantly get the information you need from the monitoring system.

“Routinely testing UPS backup systems prevents a catastrophe during a power failure.”

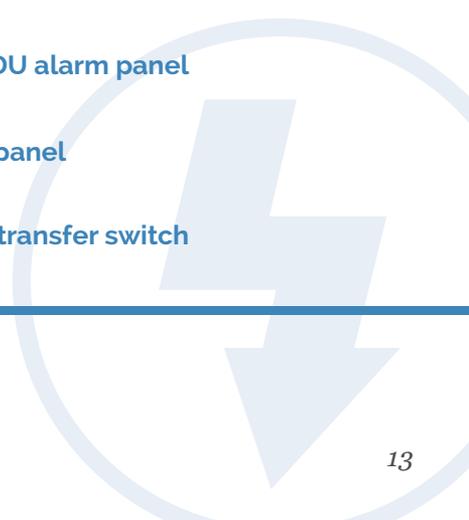


Inevitably, power failures will occur. When they do, the uninterruptible power supplies (UPS) in your data center maintain the servers until the automatic transfer switch (ATS) calls for generator power. That's why it's important for you to maintain and routinely test UPS backup systems for optimum performance. Failing to do so could lead to a catastrophe during a power failure.

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### Recommended Dry Contact Sensor Placement

- ① Air handler, CRAC/CRAH alarm panel
- ② UPS and PDU alarm panel
- ③ Fire alarm panel
- ④ Automatic transfer switch





A self-test is integrated in to each UPS. This self-test provides diagnostics on battery capacity, AC/DC load, and the charging system. It can also provide a power failure simulation. If any of these internal tests fail, an alarm panel will display the fault and activate a relay output. Equipping a monitoring system to the general alarm output on the UPS will produce an immediate alarm notification so that you can take corrective action. You only get one shot during a power failure, and the system needs to perform flawlessly.

Another key component to your backup power is the automatic transfer switch or ATS. The ATS transfers the load to your backup generator and can also advise the generator to start. Typically, there is a delay, and during this time the UPS units in place should maintain the power to your data center. Most transfer switches include auxiliary dry contacts specifically for alarming purposes. A monitoring system would seamlessly integrate into this alarm output.



Redundancy is ideal. Alongside your building's fire and suppression system, your remote monitoring system can monitor and detect the presence of smoke or fire within the data center, IDF or PBX rooms and send a notification to the proper personnel. In addition, many fire alarm panels have auxiliary contact outputs that can be attached to your monitoring system for backup alarm notifications.





## Physical Security

Protecting your data is always a critical concern. Most data center managers put into place many measures to preserve system security, but many are not protected against security breaches that can occur if an unauthorized person gains entry to the room after hours.

Everything about your company is housed on your servers. A breach of security could cause you to lose vital data, including proprietary information. Whether it is through an unauthorized or forced entry or an accidental offense by someone on your staff, if not monitored 24/7, your servers are at risk.

Data center monitoring systems can perform physical security functions. For example, you can add sensors to the entrance doors and the doors to the individual server cabinets. To avoid receiving constant alerts on busy days, you can configure the monitoring system to alert you only after hours and on weekends.

# 80%

**of data theft occurs  
at the physical level**

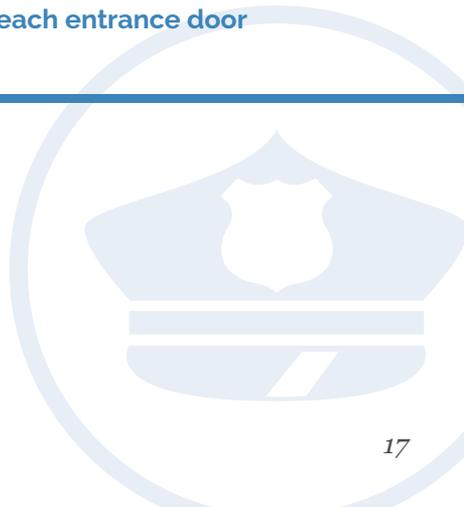


You can also install passive infrared (PIR) sensor motion detectors inside and outside equipment rooms. They can interface with third-party IP cameras and your remote monitoring system. That way you can always get a first-hand look at the data center environment.

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## Recommended Security Sensor Placement

- ① Door sensor on each rack door
- ② Door sensor on each entrance door
- ③ PIR sensors for each entrance door





## Taking Control of Environmental Threats

Remote monitoring systems provide a vital additional layer of protection for your data center. They monitor critical conditions like temperature, water leaks, airflow, room humidity, contact status from other devices – even physical security – to provide peace of mind.

Whether you are on site or off site, you are always aware of the critical conditions that threaten the life of your equipment and could cost your business significant money, time and productivity.

Remote monitoring systems:

- Detect environmental threats
- Instantly inform you when conditions are less than perfect
- Provide an easy way to check on the status of conditions at any time

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### Have Questions? Need Advice?

**Talk with a Sensaphone data center expert today.  
877-373-2700**

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## About the Author

Since 1985, Sensaphone® has designed and built its full line of innovative remote environmental monitoring systems and early detection products in Aston, Pennsylvania that quickly and effectively provide alerts to problems at your facilities. Over 400,000 systems are in use today around the world with the highest customer satisfaction rates in the industry.

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