

Thermal Management for Racks and Healthcare Network Closets



The network closet has become critical to a wide variety of functions within healthcare delivery. As new IT, telecommunications, and networking gear is added to closets to support increased digitalization and telehealth, heat loads are rising to dangerous levels. Without proper attention to airflow management and heat removal, unsafe operating conditions can develop. These conditions can degrade the performance of IT and telecommunications equipment and shorten their service life.

The Challenges

Thermal management approaches common in the data center, such as perimeter cooling and economization systems, can't be applied in distributed closets. Yet, the risk to IT equipment is the same. Small, enclosed spaces can heat up quickly, putting critical equipment at risk of premature failure. Some hospitals rely on building air conditioning or small comfort cooling systems for these distributed environments, but these approaches may become inadequate as heat loads in the closet exceed 1.5 kW — a common scenario in today's digitalized healthcare environment. Key challenges that must be addressed in configuring cooling systems for network closets include:

- **Capacity:** Building and comfort cooling systems aren't designed for the concentrated and constant heat generated by IT equipment. As in the data center, today's closets typically require dedicated cooling designed to handle the specific requirements of the IT systems in the space.
- **Precision:** Building air conditioning systems lack the ability to precisely manage environmental conditions within a specific space, leading either to inefficient overcooling, or more commonly, inadequate cooling in spaces housing IT equipment. The amount of cooling provided can also vary based on the preferences of the patient care staff, the time of day, and outside temperatures. Dedicated precision cooling systems allow temperatures in the space to be maintained within a narrow range.
- **Humidity:** High temperatures aren't the only environmental risk to IT equipment. Excessive humidity can cause condensation that is fatal to IT systems while too little humidity increases the risk of electrostatic discharge. Cooling systems for these environments should be designed to maximize sensible cooling and minimize constant, uncontrolled humidification.
- **Reliability:** Small comfort cooling units aren't designed to provide the continuous, year-round cooling required by IT systems and typically have a short life span in this application. They also lack the communication capabilities that enable remote monitoring, meaning a failure can take days or weeks to identify. Closet cooling systems should be capable of supporting continuous operation for 10 years.
- **Space Limitations:** Many closets are too small for a standard IT equipment rack or are just large enough for the rack to fit. Cooling for this environment must employ compact and space-saving designs without sacrificing performance.
- **Scalability:** As more equipment gets added to closets, cooling can become a limiting factor. Properly sized precision cooling systems provide the necessary scalability while operating efficiently at reduced loads.
- **Visibility:** How will you know if conditions in a remote closet exceed thresholds for safe operation? The cooling system should enable remote monitoring of conditions within the space and immediately alert personnel of conditions that exceed pre-defined thresholds.

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Vertiv™ Solutions

Vertiv is a global leader in critical infrastructure that offers purposefully designed and innovative small space cooling solutions. Vertiv™ products have an outstanding reputation for reliability and are among the most efficient in their class. By offering multiple systems for small space cooling, Vertiv enables healthcare delivery networks to optimize their investment in critical infrastructure and tailors the solution to IT capacity and physical space requirements

Airflow Management

Communication devices have different airflow requirements than servers. The front-to-back airflow design of IT equipment racks, particularly in a tight space, can restrict airflow through these devices.

The Vertiv™ Geist™ SwitchAir™ is a simple and effective rackmount device that creates a path for cool air to flow from the front of the rack to a switch or router's air intake. Available in active (integrated fan) or passive models, the Geist SwitchAir is easy to install and works within the same rack space as the device it is supporting. It can be deployed as a stand-alone solution to improve airflow or as a complement to a dedicated cooling system.

Rackmount Cooling

The Vertiv™ VRC is a self-contained, rackmount cooling system that provides up to 3.5 kW of cooling using just 10U of rack space. The system is designed for easy installation and precise, reliable, and efficient cooling. Additional capabilities include:

- **Flexibility:** The Vertiv VRC easily accommodates the many different site challenges presented by small IT spaces. Its flexible duct work can be routed to reject heat to the ceiling or an adjacent space.
- **Efficiency:** The system uses variable speed components to ensure high efficiency and scalable capacity that continually matches temperature and airflow to changing loads.

- **Simplicity:** The Vertiv™ VRC includes an integrated heat rejection system, pre-charged with refrigerant, and plug connection for quick plug-and-play installation. Unit mounts within a standard 19-inch rack and is designed for easy handling.
- **Multiple Heat Rejection options:** For rooms without available heat rejection, the Vertiv VRC is also available in a split version, using just 6U of rack space, and enables outdoor heat rejection.
- **Remote Monitoring:** The Vertiv VRC employs Modbus-RTU protocol for connection to building management systems and can be configured with a plug-in SNMP card for monitoring over the network.

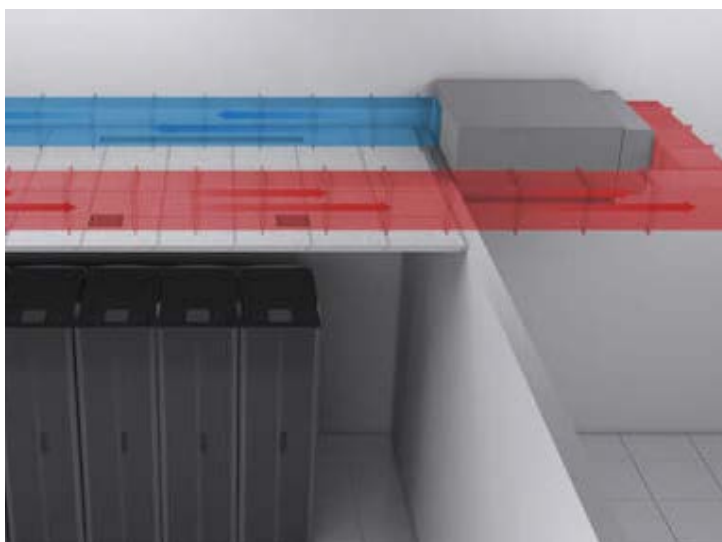


Vertiv™ VRC installed in rack rejecting heat to ceiling plenum

Wall-Mount Cooling

The Liebert® DataMate is a small footprint cooling system for 24x7 temperature and humidity control in network closets, computer rooms, and other small spaces. Its low profile permits floor-mount or wall-mount installation and requires little or no floor space. Additional features include:

- **High Sensible Cooling Capacity:** Unlike comfort air conditioners, the Liebert DataMate is designed to the requirements of IT systems with 80% of capacity dedicated to the removal of dry “sensible” heat and 20% for control of humidity.
- **Reliable Components:** The system is proven in IT applications and is designed with high reliability components, including a high-efficiency copper tube, aluminum-fin evaporator coil, and a double-inlet direct-drive fan.
- **Quiet Operation:** The Liebert DataMate is designed to work in environments where people and IT share the same space. Compressor vibration is isolated from the chassis and the cabinet is insulated to minimize noise.



Liebert® Mini-Mate 3 installed in ceiling

Ceiling-Mount Cooling

For higher capacity closets, the Liebert® Mini-Mate 3 system provides a zero-footprint solution that supports up to 17.5 kW of equipment. Mounted in the ceiling as a split-system solution, the Liebert Mini-Mate 3 provides the efficiency and scalability needed in small IT spaces. Additional capabilities include:

- **Efficiency:** Through use of direct-drive variable speed fans and variable capacity compressors that continually match temperature and airflow to changing loads, efficiency is maximized.
- **Flexibility:** The Liebert Mini-Mate 3 can be installed in side-, back-, and down-airflow configurations, making it highly adaptable to locations with space limitations.
- **Reliability:** The Liebert Mini-Mate 3 is designed for 24x7 continuous operation for 10 years or more. It does not use belts and has fewer moving parts than alternative systems, significantly reducing the need for maintenance, repair and replacement.
- **Advanced Controls:** The Liebert Mini-Mate 3 uses Liebert® iCOM™ controls to manage the precision cooling unit and control the environment. It delivers precise control of temperature, humidity, and fan speed while minimizing compressor wear and maximizing efficiency. It can also provide remote and return sensor reporting, standby/lead-lag rotation, and protection against coil freezing.
- **Remote Monitoring:** Remote monitoring, management, and alarm troubleshooting are available through integration with the Liebert® IntelliSlot Unity dual protocol (IS-Unity-DP) card. IS-Unity-DP provides web access, environmental sensor data, alarm notifications, and integration with Vertiv™ LIFE™ Services, Vertiv™ Trellis™, and Liebert® Nform. It also provides support for third-party protocols required to interface with building or data center management system applications.

In-Row Cooling

For larger spaces, such as small server rooms in satellite facilities, the Liebert® CRV in-row cooling solution delivers up to 40 kW of cooling in a standard rack size. The Liebert CRV sits alongside or between equipment IT racks and uses adjustable baffles to direct cool air to the rack inlet. Because the Liebert CRV sits adjacent to the equipment it supports, air travel is minimized, enabling high efficiency cooling. Additional features include:

- **High Capacity:** The Liebert CRV offers twice the capacity per square foot as competitive in-row solutions in the same footprint.
- **Efficiency:** With variable speed fans and airflow directed to the rack inlet, the Liebert CRV delivers industry-leading efficiency.
- **Reliability:** The high-reliability design of the Liebert CRV results in availability approaching 100%.
- **Advanced Controls:** The Liebert CRV can independently manage airflow and temperature, greatly improving efficiency and supporting higher rack densities.
- **Remote Monitoring:** Remote monitoring, management, and alarm troubleshooting are available through integration with the Liebert® iCOM™ CMS Monitoring and Control System, which is accessible via a mobile app, secure desktops, and building management systems.



Liebert® CRV in small room application

Vertiv™ Small Space Cooling Solutions

	Geist™ SwitchAir™	Vertiv™ VRC	Liebert® DataMate	Liebert® Mini-Mate 3	Liebert® CRV
Capacity		3.5 kW	5-10.5 kW	10.5 kW/14 kW/17.5 kW	19-40 kW
Cooling Technology	Passive airflow management	Refrigerant	Air, glycol and chilled water systems available	Air-cooled	Air, glycol, and chilled water systems available
Form Factor	Rackmount (0U)	Rackmount 10U - with indoor heat rejection, 6U - with outdoor heat rejection	Wall or floor mount	Ceiling mount	In-row, standard IT rack, and 300mm wide half-rack frame,
Connectivity		Available with IntelliSlot communication card		Liebert® IntelliSlot communication card and Liebert® iCOM™	Liebert® IntelliSlot communication card and Liebert® iCOM™
Additional Capabilities		Plug-and-play installation or split system	Installs as self-contained or split system	Support for side, back and down airflow	Independent airflow and temperature control

Vertiv Partners Are Ready to Help

Need help configuring your closet? Vertiv has a network of partners available to help you. [Find a Vertiv partner near you.](#)

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