



Liebert® CRV™

**Air-Cooled, Water/Glycol-Cooled and Chilled Water,
50 & 60Hz**

Application Guide

Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures. Visit <https://www.VertivCo.com/en-us/support/> for additional assistance.

TABLE OF CONTENTS

1 What is the Liebert CRV?	5
1.1 Liebert CRV Intended Application	5
2 Liebert CRV Controls	7
2.1 Liebert CRV Sensor Location Guidelines	8
3 General Liebert CRV Guidelines	9
4 Site Application and Unit Placement	11

1 WHAT IS THE LIEBERT CRV?

The Liebert CRV is a Precision Cooling unit intended to be located within a row of heat-generating IT equipment racks. The Liebert CRV provides all the necessary functions of a precision air conditioner including cooling, humidification, dehumidification, air filtration and condensate management. Air enters the Liebert CRV unit from the hot aisle. The air, filtered, cooled and conditioned, is discharged into the cold aisle through an adjustable supply air baffle. The supply air baffle allows the air leaving the cooling unit to be directed to the racks the Liebert CRV is conditioning; maximizing its effectiveness, reducing the chance for hot spots and improving the overall system efficiency.

The Liebert CRV is optimized for maximum cooling capacity in a minimal footprint. The extremely energy efficient components of the system are managed by the Liebert iCOM control system. The environment is monitored in real time by the Liebert iCOM control through sensors positioned in a variety of locations. Sensors located in the return air, supply air and rack inlets allow the unit to optimize its operations for both performance and energy efficiency. All unit operations and sensor data can be reported remotely via a variety of communication protocols, providing end users with a built-in mini-monitoring system.

1.1 Liebert CRV Intended Application

The Liebert CRV can be utilized in a variety of applications. Since the Liebert CRV provides complete temperature and humidity control along with filtration, it can be deployed as the only cooling unit in small data centers and network closets. Larger data centers are able to benefit from its standard rack-sized footprint, deploying it as a supplemental spot cooler to address both hot spots and high-density racks. The small footprint and variable cooling and airflow allow the Liebert CRV to be initially oversized in anticipation of future IT expansion without any footprint or energy consumption penalties. The Liebert CRV can be applied on both raised and non-raised floors, allowing it work with existing under floor and overhead cooling systems. The Liebert CRV can operate in conjunction with an existing Liebert XD installation, or provide an excellent alternative for sites that are unable to support a Liebert XD system. The Liebert CRV is compatible with all types of aisle containment designs; however the Liebert CRV control algorithms have been optimized for cold-aisle containment.

Figure 1.1 Liebert CRV—front and rear views



2 LIEBERT CRV CONTROLS

The Liebert CRV is equipped with the latest in Liebert iCOM controls. Available in every Liebert CRV is a return temperature and humidity sensor, a supply temperature sensor and three remote rack sensors with the option to add an additional seven remote rack sensors. Each rack sensor takes two temperature readings and can be configured to report either the average or the higher of the two sensors.

The Liebert iCOM controller on the Liebert CRV leaves the factory with the fan speed and cooling capacity controlled by the supply air sensor. This control mode is extremely robust and will ensure delivery of precise cooling to the cold aisle. To unlock the full capability of the Liebert CRV, remote rack sensors can be installed, which will allow the fan speed and the cooling capacity to be “decoupled.” Decoupling means that the fan speed can now be controlled from the remote rack sensors and the cooling capacity controlled from the supply air sensor. In this advanced configuration, the Liebert CRV can now control the discharge temperature of the unit by modulating cooling capacity based on the supply sensor and use the remote rack sensors to ensure that the cool air is being delivered to the inlet of the racks. Using the supply and remote rack sensors in this decoupled mode is the preferred method for controlling the Liebert CRV in a hot-aisle/cold-aisle configuration. In addition to this configuration the Liebert CRV has additional flexibility for other applications that can be understood in Table 2.1 below.

Table 2.1 Coupled and decoupled control schemes

		Cooling Capacity		
		Supply Air Sensor	Remote Air Sensor	Return Air Sensor
Fan Speed	Supply Air Sensor	A (Coupled)	—	—
	Remote Air Sensor	D (Decoupled)	B (Coupled)	—
	Return Air Sensor	E (Decoupled)	F (Decoupled)	C (Coupled)

Table 2.1 above shows the flexibility of the Liebert CRV and how different sensor locations can be used to control the Liebert CRV fan speed and cooling capacity. The configurations labeled “A,” “B” and “C” are defined as coupled control schemes. These coupled control schemes allow both the cooling and fan speed to be controlled by the same sensor input, either from the supply air sensor, remote air sensor or return air sensor. Schemes labeled “D,” “E” and “F” are defined as decoupled control schemes. These decoupled control schemes use separate sensor inputs for controlling the fan speed and cooling. For instance, an alternate to the factory default control program is “D,” where the fans are controlled by the remote rack-mounted temperature sensors and the cooling is controlled by the discharge air temperature sensor in the Liebert CRV.

2.1 Liebert CRV Sensor Location Guidelines

Three rack sensors come with the Liebert CRV unit to help prevent any problem spots in the row. Rack sensors help combat cooling problems related to recirculation of air, uneven rack loading and air distribution. The rack sensors are intended for use in the cold aisle only. To ensure effective cooling provided by a Liebert CRV, follow these suggestions for locating the rack sensor probes:

- Place on the top of the perforated rack door.
- In front of the highest-mounted servers in the rack.
- In front of the highest-density area of the rack.
- In the airflow path entering the rack.
- Do not place the probe directly on the metal surface of the perforated door.

Additional information about sensor location can be found in the Liebert CRV Installation, Operation and Maintenance manual, SL-11975, which is available at www.VertivCo.com.

3 GENERAL LIEBERT CRV GUIDELINES

The Liebert CRV is capable of supporting many varied room configurations. Following a few basic guidelines, the Liebert CRV can provide efficient and precision cooling to the space and adjacent rack mounted equipment. The following points are highly effective recommendations for precision performance and efficient operation of the Liebert CRV in many room layouts:

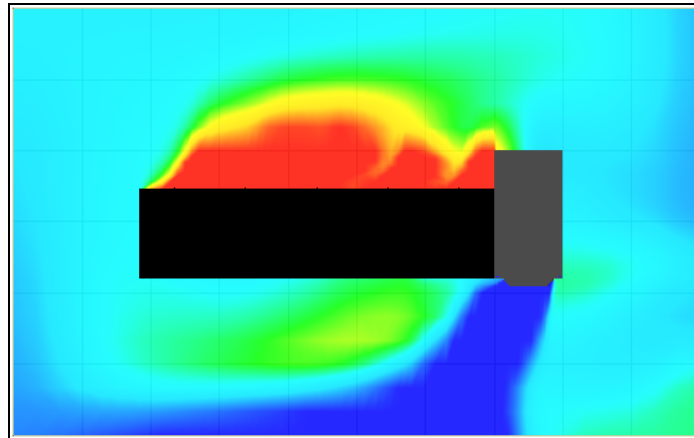
- Distribute equipment as evenly as possible across the height of the rack.
- Use blanking panels to prevent recirculation of air through gaps in rack equipment.
- Locate racks closely together, preventing gaps between equipment racks.
- Where applicable, use dividers to prevent hot air wrap around to the cold aisle.
- Locate the Liebert CRV appropriately to effectively deliver cooling to the rack row.

The application of a Liebert CRV is meant to provide cooling to between two and six racks of equipment in a single row. A row of equipment longer than six racks might not receive the appropriate quantity of conditioned air from a single Liebert CRV unit. The total number of racks that can be cooled will depend fully upon the rack loads and airflow requirements of the equipment to be cooled, as well as the type and size of the Liebert CRV selected. In conjunction with Liebert CRV placement, maintaining a cold aisle between three and four feet wide is highly suggested. This is beneficial because it provides a smaller volume for conditioned air to inhabit, preventing hot aisle air intrusion. The density of the conditioned air will help to prevent hot aisle air from recirculating through the rack equipment. Wider cold aisles can be utilized with cold aisle containment designs, including the Liebert Cold Aisle Containment product line.

This page intentionally left blank.

4 SITE APPLICATION AND UNIT PLACEMENT

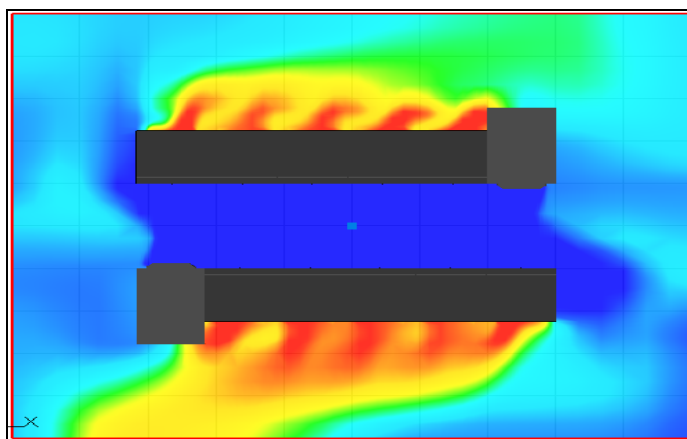
Scenario 1: Single Equipment Row



The Liebert CRV is intended to cool a single row of racks by providing a curtain of cold discharge air across the face of the equipment. Ideally the Liebert CRV should be located at the end of the rack row with a three to four foot cold aisle. Adjustment to the baffle system will allow cooling to be directed down the row effectively delivering coverage to the rack row.

NOTE: It is not ideal to place the Liebert CRV in the middle of a single rack row. Middle placement may create hot spots at the top of the rack equipment, due to inconsistent air coverage.

Scenario 2: Double Equipment Row

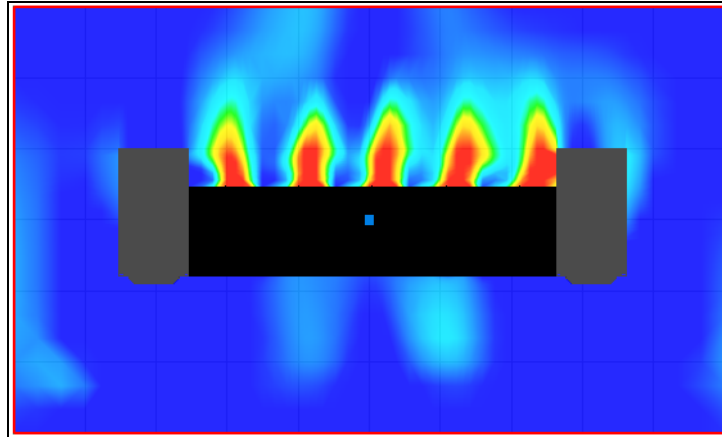


When using a Liebert CRV with double rack rows, location of the Liebert CRV unit is similar to the single-row placement. Locate the Liebert CRVs at opposite ends of the two rows and adjust the air baffles in the direction of desired cooling. Placing the Liebert CRV at opposite ends of each row will allow the Liebert CRVs to provide coverage for both rack rows by pressurizing the cold aisle. Increased pressurization in the cold aisle helps to eliminate any hot spots from developing in the row. Double-row usage simulates a containment approach. The opposing rack row acts as a wall or partition, helping to contain the provided cooling in the cold aisle instead of allowing it to spread throughout the space that the equipment is located.

NOTE: It is not suggested to locate two Liebert CRV units directly across from one another or by locating two units adjacent to one another in a row. Both situations have potential to reduce the effective cooling of both Liebert CRV units in the row. If more than one Liebert CRV unit needs to be placed within a row, separation of at least one rack is recommended.

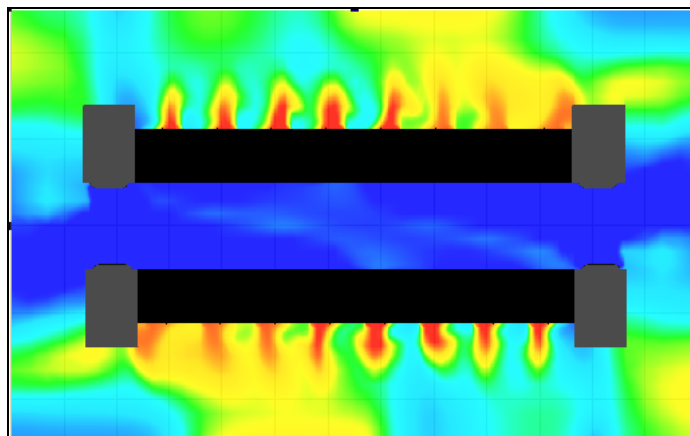
Scenario 3: Redundancy

Single-Row Redundancy



Single-row redundancy can be achieved by locating two Liebert CRV units at opposite ends of a row, as shown. Directing the air baffles toward one another and down the face of the rack row will allow the Liebert CRV units to operate at partial load while providing the required cooling. If a unit failure should occur, the remaining unit will ramp up airflow, respond to the higher return air temperature and provide the required cooling based on input from sensor data. This scenario can also work in a lead/lag operation or duty cycle scenario, by running a single Liebert CRV to match the load with the secondary unit in standby. Two or more Liebert CRVs can be networked together for teamwork, lead/lag or cascade operation.

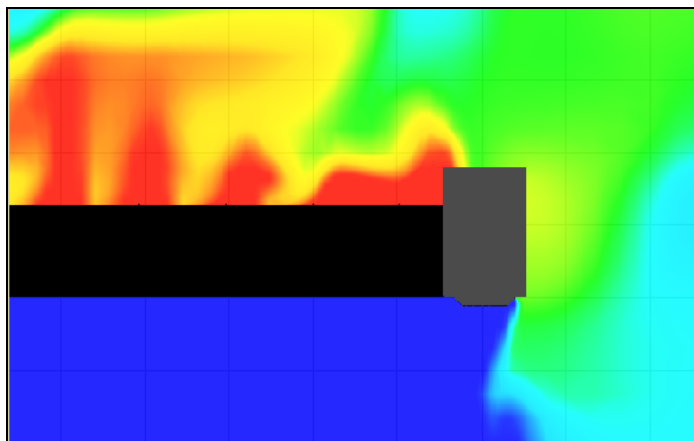
Dual-Row Redundancy



Dual-row redundancy can be achieved in a similar manner to a single row redundancy plan. In this scenario, two single rows are facing one another, sharing a cold aisle. Liebert CRV units may be networked together to provide shared informed coverage of the row equipment demands. Redundancy can be accomplished by locating Liebert CRVs at the ends of the rows and directing their airflow inward towards the equipment row, as shown. Operating all four Liebert CRV units at partial load or two units at full load with two in standby is recommended for unit redundancy. Furthermore, it is suggested that when utilizing this configuration, Liebert CRVs at opposite ends of the rows should be in operation, to deliver the most effective coverage to the equipment. Aligning two Liebert CRVs across the row from one another is an acceptable design, assuming that each Liebert CRV will be operating at partial capacity or operating together at full capacity only in an emergency situation.

NOTE: Equipment loads that require a greater amount of cooling can utilize additional Liebert CRVs located in-between the row of equipment. The discharge of the in-between Liebert CRVs should be directed both to the left and right, adding supplemental cooling to the effect of the Liebert CRVs located at the end of the row.

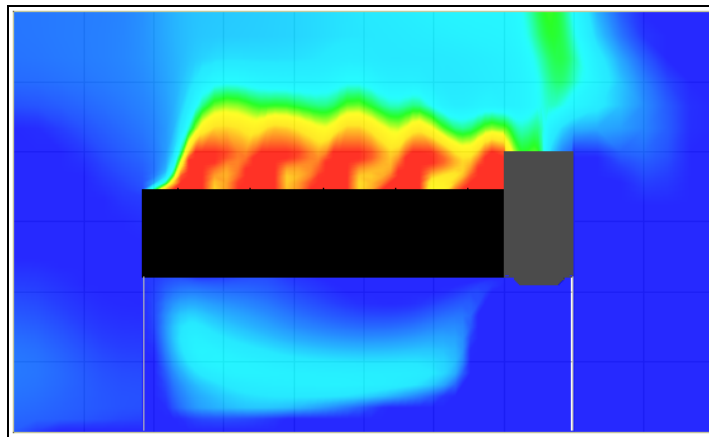
Scenario 4: Partial Containment



The Liebert CRV is most effective when the cold aisle can be contained by a natural or manufactured obstruction opposite to the face of the unit. As can be seen in this layout, a single Liebert CRV is positioned at the end of a rack row that is parallel to a room wall. The wall opposing the row equipment acts as a containment barrier supporting pressurization of the cold aisle. Additionally, the end of the equipment row being located on a room wall acts as an end panel preventing wraparound of cool mixing with the hot aisle air. In conjunction with this effect, the Liebert CRV discharge is positioned to provide a curtain of cooling that encapsulates the cold aisle, acting as an end cap to the cold aisle.

NOTE: To achieve a level of redundancy in this scenario, it is suggested to locate an additional Liebert CRV in one of two locations. Locate an additional operating Liebert CRV at the end of the equipment row adjacent to the wall (to the far left in the illustration above). The two units will operate at a reduced capacity each, while still providing the required cooling. Should a failure of a unit occur, the remaining Liebert CRV unit will be able to provide cooling and airflow requirements from an acceptable position. Alternatively, locate a standby, non-operating Liebert CRV adjacent to the operating Liebert CRV. This allows for the same basic positioning of the unit while maintaining the intent of this scenario.

Scenario 5: Cold-Aisle Containment



The Liebert CRV is ideal for use with a cold-aisle containment approach, with the Liebert Cold Aisle Containment solution or similar products. Utilizing the Liebert CRV in conjunction with cold-aisle containment products does not limit the location of the Liebert CRV with respect to the rack row. The Liebert CRV can be located anywhere within the equipment row, with the unit's discharge air baffle directed as the equipment airflow needs demand. The cold aisle containment completely encapsulates the available cooling in the aisle maximizing cooling efficiency while preventing hot air intrusion through, around or over the row of equipment.



VertivCo.com | Vertiv Headquarters, 1050 Dearborn Drive, Columbus, OH, 43085, USA

© 2017 Vertiv Co. All rights reserved. Vertiv and the Vertiv logo are trademarks or registered trademarks of Vertiv Co. All other names and logos referred to are trade names, trademarks or registered trademarks of their respective owners. While every precaution has been taken to ensure accuracy and completeness herein, Vertiv Co. assumes no responsibility, and disclaims all liability, for damages resulting from use of this information or for any errors or omissions. Specifications are subject to change without notice.

SL-11979_REV2_11-17/590-1785-501A