



Liebert®

CRV™ Row-Based Cooling

Intelligent Precision Cooling For
Data Center Equipment

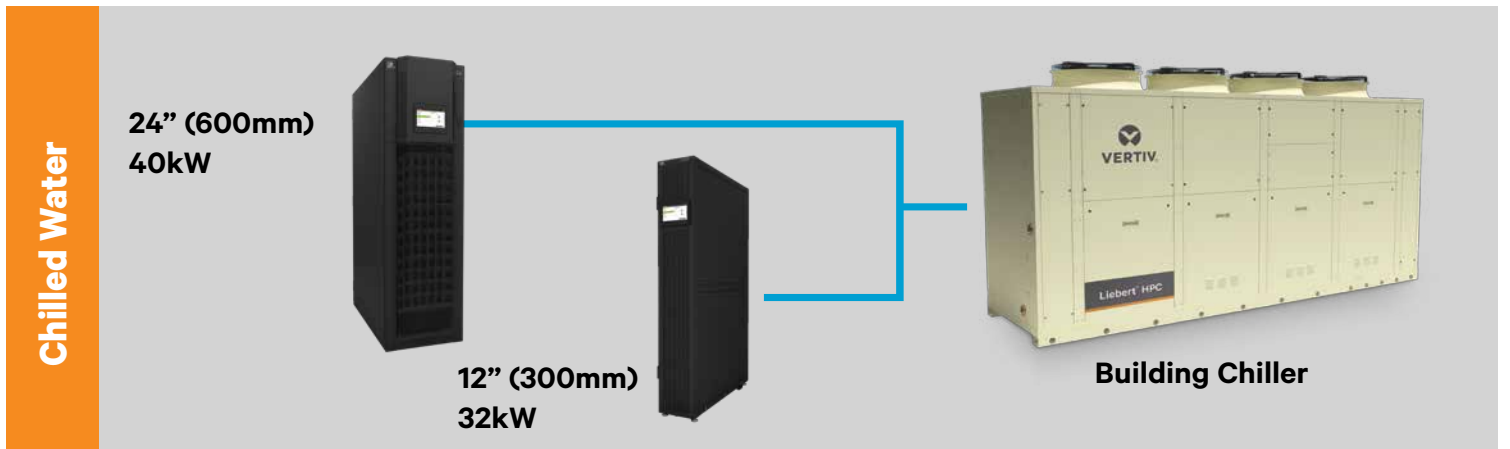


System Overview

The Liebert CRV is a multi-option, precision data center cooling solution providing temperature and humidity control. It integrates within a row of data center racks, providing cooling close to the server heat source, for efficient and effective data center heat management.

The horizontal airflow is suitable for raised and non-raised floors along with new and existing sites. The Liebert CRV uses either environmentally-friendly R410A refrigerant or chilled water in a 24" (600mm) wide or 12" (300mm) wide foot print. The Liebert CRV features the Liebert iCOM™ controls and 20 racks sensors resulting in a highly reliable and optimized data center.

TYPE		NOMINAL CAPACITY AIRFLOW	FOOTPRINT
DX	Air or Water/ Glycol	19 kW 2250 CFM	12" x 43"
DX	Air or Water/ Glycol	20 kW 2450 CFM	24" x 43"
DX	Air or Water/ Glycol	35 kW 3260 CFM	24" x 43"
Chilled Water		32 kW 2500 CFM	12" x 43"
Chilled Water		40 kW 3325 CFM	24" x 43"



Why Row-Based Cooling?

Row-based cooling can provide several benefits to traditional perimeter solutions:

- Increased efficiency by moving closer to the source
- Easy to install and less costly
- Lower capital costs
- Flexible application
- Also great for small rooms

Moving the cooling closer to the heat source increases the efficiency

- Increasing the capacity of the cooling unit by pulling in hotter air in comparison to a perimeter unit.
- Decreasing the energy consumed by the unit. The row-based units can utilize smaller fans to circulate the air than a perimeter unit as it is trying to cool a local area rather than an entire room.

	ROW-BASED	PERIMETER	WHY
Capacity	43.1 kW	36.6 kW	Higher return air
Energy	1.3 kW	2.9 kW	Smaller fans

Easy to Install

- Using caster-mount design for easy installation.
- Locating all components to be accessible from the front or rear of the unit, eliminating the need for side access.

Lower Capital Costs

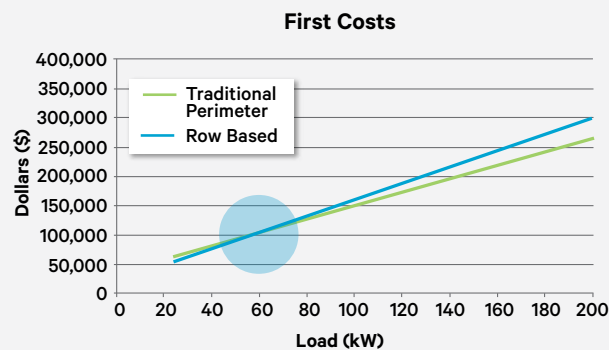
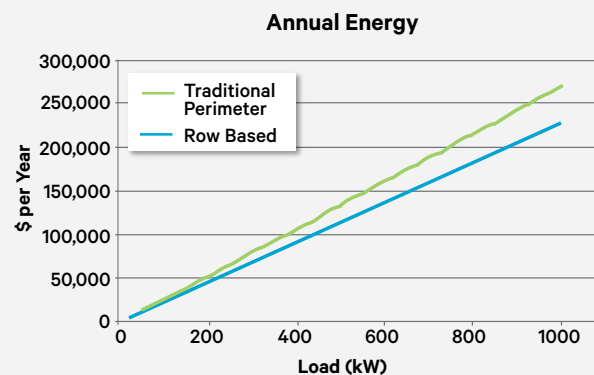
- Smaller building block sizes
- Utilizing smaller infrastructure (power and chiller)
- Consuming less floor space

Flexible Application

- Compatible with Containment
- Works with raised and non-raise floor
- Spot cool in larger data centers

When does it make sense to apply row-based cooling over traditional perimeter cooling?

- If your site has hot spots, row based solutions are great options.
- If the loads are uncertain, row based solutions can handle high and low densities applications.
- If the method of deployment is accomplished by incremental projects, row based solutions.
- If your primary project goal is energy costs, row based units only cool a local area rather than a room which saves energy
- If the load is <100kW and first cost is the project primary goal, row based designs are the solution to consider. Above 100kW, the first cost of the design are lower with a traditional perimeter unit.



When and How to Apply Row-Based Cooling

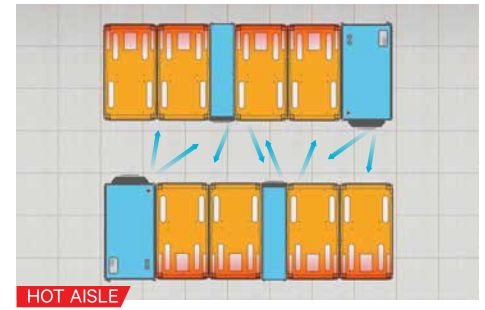
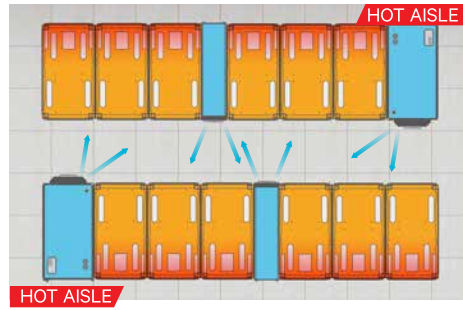
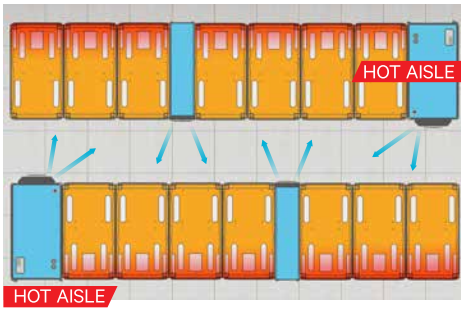
Liebert® CRV™ installs at the ends or within the row of racks on non-raised or raised floor applications.

- Ideal for hot/cold aisle configurations.
- Rows should have no missing racks and minimal cold aisle obstructions.
- Ensure obstruction exists (rack, wall, etc.) directly across from cooling unit.
- Optimal performance when used with an Vertiv Network Power SmartAisle™ cold-aisle containment system.

Liebert CRV is available in Direct Expansion or Chilled Water Models

- Direct Expansion Models are air cooled, water cooled or glycol cooled.
- Chilled Water Models require connection to a chilled water source.

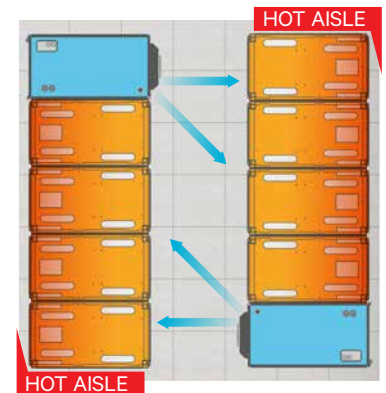
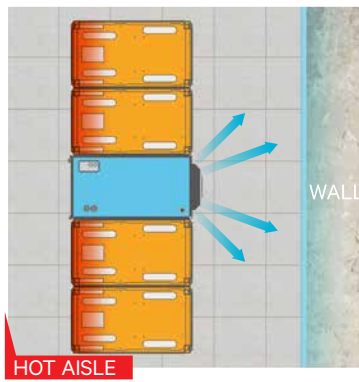
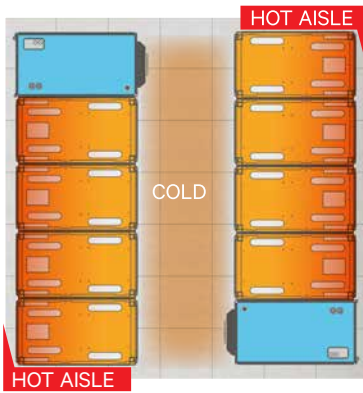
Typical Configurations



By placing Liebert CRV 600mm units at either end of the rows and inserting 300mm wide units throughout, the Liebert iCOM™ controls ensure that the aisle is evenly pressurized, simulating cold aisle containment.

All Liebert CRV units communicate with each other via unit-to-unit networking to ensure even air distribution and optimized system efficiency.

As rack densities increase, inserting additional cooling units within the row will meet cooling demand.



For data centers where heat density needs to be increased without installing a raised floor or a higher roof, the Liebert CRV and Vertiv Network Power SmartAisle™ cold aisle containment is the ideal solution.

The Liebert CRV adapts to obstructions, such as walls, pillars, and open racks doors.

Liebert CRV systems operating in hot aisle/cold aisle configuration.

Why the Liebert® CRV™?

- Has the best capacity
- Has the highest efficiency
- Has the most intelligent airflow design
- Provides availability approaching 100%
- Utilizes the industry's most advanced control and performance optimization
- Is backed by the industry's best service and support

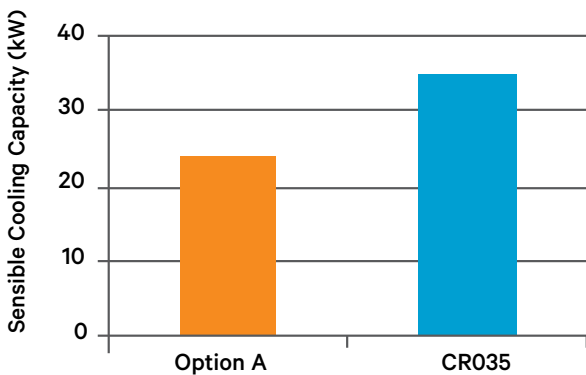


Liebert® CRV™ Row-Based Cooling

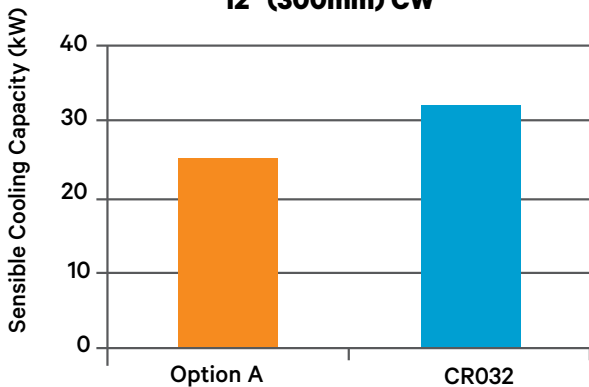
Best Capacity

Compared to other options on the market, the Liebert CRV can provide up to 2X the capacity for the same footprint..

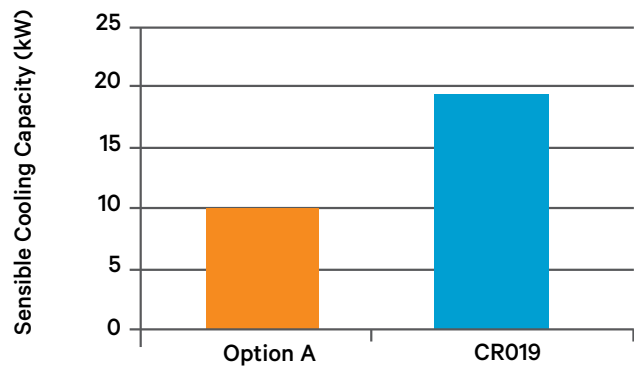
24" (600mm) DX



12" (300mm) CW



12" (300mm) DX



DX: Highest Efficiency in Direct Expansion

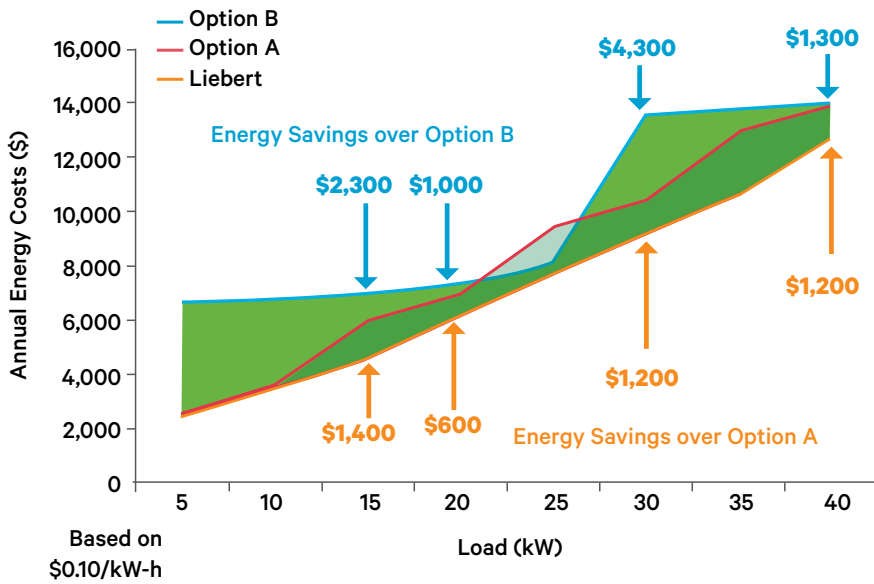
Liebert® CRV™ is designed with energy efficiency in mind starting with the components

- Variable EC Fans
- Digital Scroll Compressor to match load and saves energy with 80-step capacity modulation
- Field-adjustable air baffles to get the air where it really needs to be

**What does this efficient design mean for you?
Saving significant energy!**

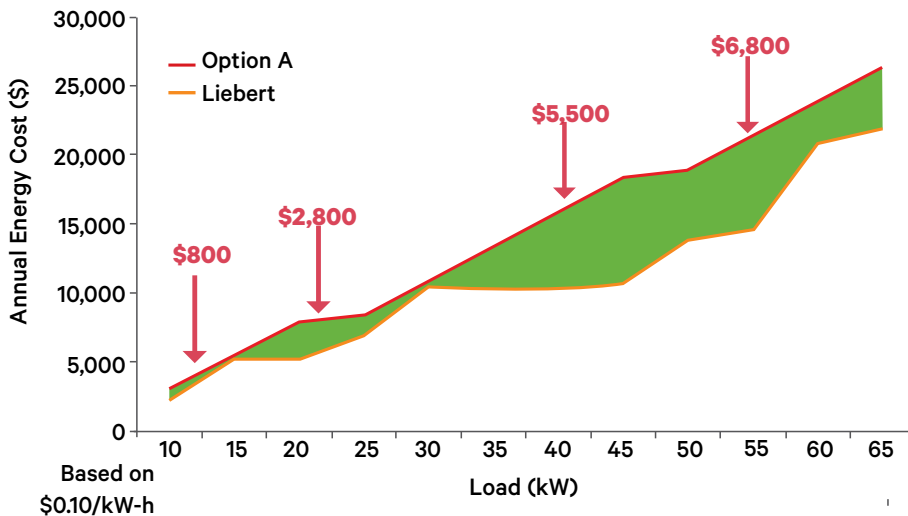


12" DX Row Based Unit Energy Cost Comparison



Variable EC Fans

24" DX Row Based Unit Energy Cost Comparison



Digital Scroll compressor



Field adjustable baffles

CW: Highest Efficiency in Chilled Water

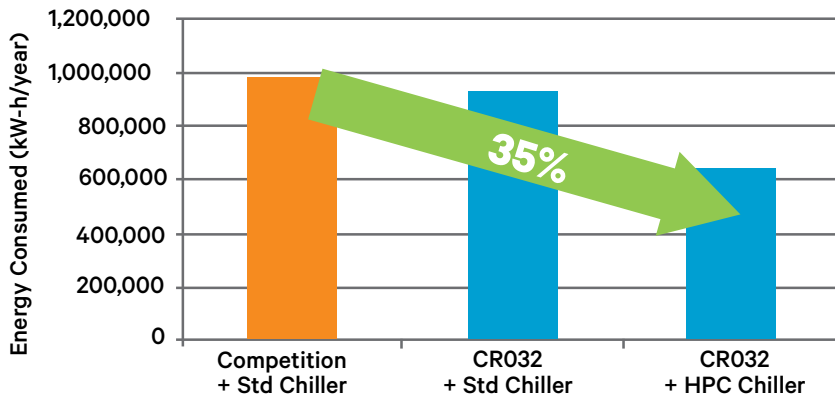
Liebert® CRV™ is designed with energy efficiency in mind starting with the components

- Variable Speed Fans to match load
- Field-adjustable air baffles - getting the air where it really needs to be
- Only row based solution to incorporate energy savings at the chiller - Liebert HPC™ Super Saver mode

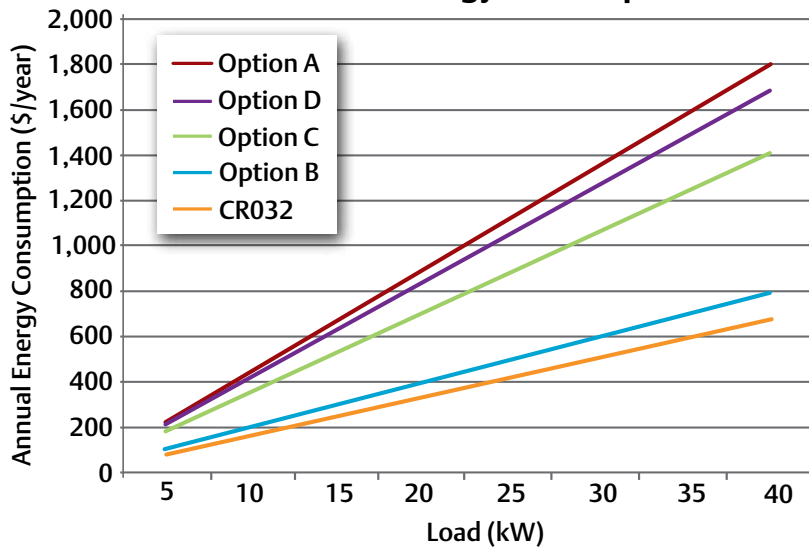
How do this efficient design help you? Significant Energy Savings!

Adding the Liebert HPC Chiller can increase the system efficiency with an integrated economizer and the Super Saver Mode.

Annual Energy



Annual Energy Consumption



TOTAL SYSTEM ENERGY OPTIMIZATION!

- Instant, automatic economizer changeover
- Eliminates low ambient nuisance trips
- Full run test with water prior to shipping
- Full unit enclosure for maximum protection
- Restart to 100% capacity in 80 seconds



Intelligent Airflow Design

Efficiency Starts with Understanding the Equipment Being Cooled

IT Equipment is not designed around entering and leaving temperature differences. As IT equipment technologies have progressed the minimum required air flows have declined for energy efficiency gains. As airflow requirements have decreased, the temperature difference between the enter air of the IT equipment and the leaving air of the IT equipment has gone up.

Properly matching the cooling equipment airflow to the IT equipment needs is critical to not waste air or energy. Liebert CRV is designed to provide the proper airflow for not only today's equipment but tomorrow's.

Having the correct airflow is a starting point, getting the air to where it needs to be is the next step. All Liebert® CRV™ models have adjustable baffles. The baffles

- Eliminate hot spots more effectively
- Eliminate containment infrastructure requirements for efficient operation
- Eliminate the requirement to place in the middle of a row

What does an intelligent airflow design give you?

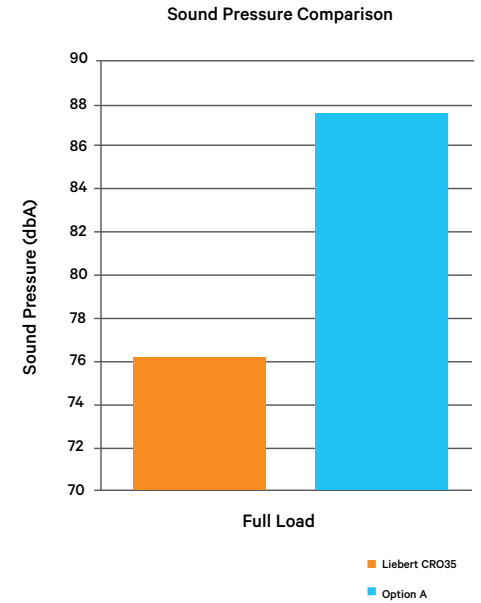
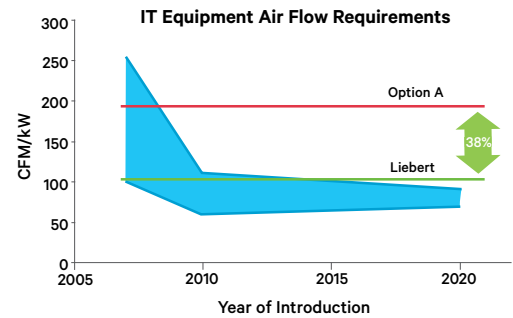
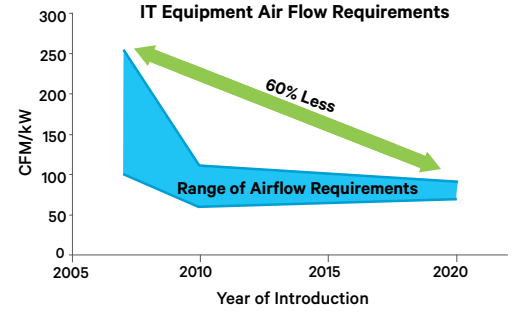
- Saves energy by not wasting air
- Liberates the design to use containment or not
- Allows the cooling unit to be placed where it is needed on the end or in the middle of a row
- Provides a quieter unit



24" Field adjustable baffles



12" Field adjustable baffles



Availability Approaching 100%

The Liebert CRV provides a solution that keeps you running when conditions change. Whether it be water-carry over or hot spots, the Liebert CRV has been designed to protect your site.

Water - Carry Over

Water carry over occurs when water in the air passing over a cooling coil condenses and is carried into supply air to your servers. The Liebert CRV design incorporate:

- **Hydrophilic fin coating** (blue color on fins)
- **Coil tilted toward airstream** (natural water drainage against airflow)
- **Intermediate drain pan** (reduces time water is exposed to airflow)
- **Low face velocity** (slower moving air)



Hydrophilic Coated Coil

Hot Spots

Hot spots may occur briefly or for a longer period of time due to an increase in server loads. Placing the cooling unit closer to the heat source and directing the air helps but the Liebert CRV takes it one step further—rack sensors. The Liebert CRV can monitor up to 20 rack sensor readings to provide the proper amount of cold air.

Emergency Air Flow

Liebert CRV's run at a maximum 75% fans speed under normal conditions. In the event of a heat soaked environment or a fan failure and more airflow is needed, the Liebert CRV will automatically ramp up it's fan speed. A fan failure will result in no loss of capacity. A heat soaked room will cool more quickly.



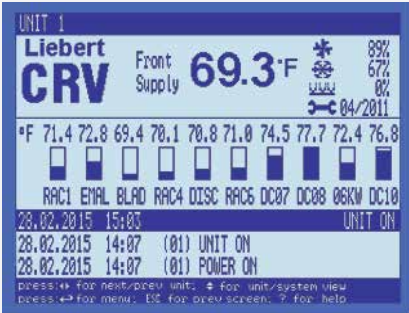
Rack Sensors

MODEL	100% RATING	MAX FAN SPEED	EXTRA AIRFLOW
CRV 19kW	2250 CFM	2579 CFM	13%
CRV 20kW	2454 CFM	2887 CFM	18%
CRV 35kW	3260 CFM	4006 CFM	23%
CRV 40kW	3325 CFM	3854 CFM	16%
CRV 32kW	2500 CFM	3074 CFM	17%

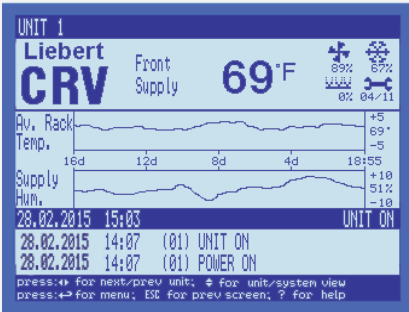


GRAPHIC DISPLAY

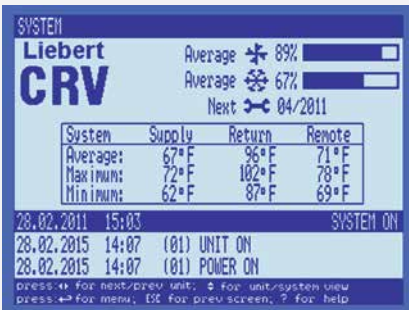
The Large Graphic Display features a 320x240 dot matrix screen operates with intuitive images rather than pages of text. This display can be used to control a single cooling unit or any cooling unit on a network.



Bar graphs show the inlet temperature of every rack with a 2T temperature sensor.



Line graphs show the historical temperature and humidity conditions for the past 8 minutes to 16 days.



A single view shows the average, minimum, and maximum temperature of every 2T rack sensor in a single- or multi-unit system.

Industry's Most Advanced Control and Performance Optimization

The Liebert® CRV utilizes the most advanced and flexible control for the performance optimization, Liebert iCOM™. The Liebert iCOM control system provides advanced control and monitoring capabilities to Liebert CRV units, allowing up to 32 cooling units to work together as a single system to optimize room performance and improve energy efficiency. Liebert iCOM controls offer a variety of advantages, including icon-based navigation, adjustable control algorithms, and data center monitoring capabilities.

Control

Advanced control algorithms allow the air flow and cooling to be modulated independently, eliminating excessive operations. Not only saving component life, independent operation of the fans from the compressor or control valve saves energy. The Liebert iCOM algorithms balance the quality and quantity of the air provided to the serves.

Temperature sensors attached to server racks allow the optimal amount of air and cooling to be provided without any increased risk for hot spots.

Multiple Liebert CRV units communicate with each other to optimize system performance while reducing noise and airflow, to provide a work-friendly environment.

Six control modes of operation allow the Liebert CRV to be customized for any application in the field.

Monitoring

Six selectable status screens allow you to customize how system information is presented.

Up to 20 rack temperatures may be summarized using bar graphs or a drawing of the data center on the local display, or all data may be reported remotely, providing users with a built-in mini-monitoring system.

All unit information may be reported remotely through a variety of protocols, including HTTP, SNMP, RS-485 Modbus, BACnet IP and Liebert SiteScan® Web 4.0 Protocol.

Predictive Wellness/Maintenance

Enhances reliability with predictive analysis of components and performance – advance notice allows proactive management of system maintenance for the unit as a whole, compressor, and fans - not just filters.

Event logs store the last 400 messages to enrich unit history and enhance support.

Service and Spare Parts History

On-board service history allows prompt access to records for service personnel.

On-board spare parts list provides convenient identification of the appropriate unit spare parts and part numbers for faster service and support.

Backed by the Industry's Best Service and Support

Installation and service is not an afterthought in the Liebert™ CRV® design.

For fast and easy installation, the Liebert CRV has

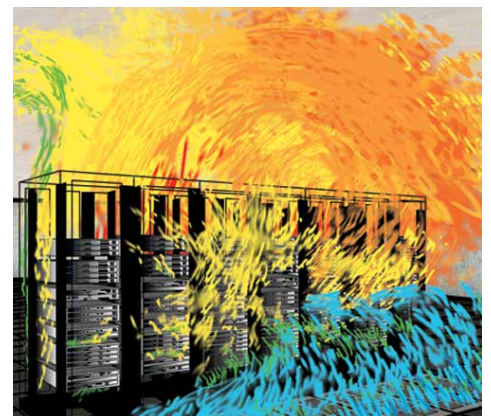
- Casters for quick and simple installation in existing or small rooms
- Top and bottom connections pre-pipes
- Factory installed communication cards
- Factory installed dual-float condensate pump
- Both top and bottom piping and electrical connections are standard

To reduce service time, the Liebert CRV

- Requires no side access
- Compressor removal requires
 - No torch
 - No refrigerant evacuation
 - Can be done without removing the unit from the row
 - Components are located towards the edge of the unit

Like all Vertiv™ products, the Liebert CRV is backed by the best service and support with

- Nationwide service through local factory trained technicians
- 24-hour customer and technical support
- Remote Monitoring delivered by data center experts
- Energy Optimization Services
 - CFD modeling services
 - Energy Efficiency Assessments
 - Reduce energy costs 15-40%





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