

LiquiCool™ Rear Door Heat Exchanger

... in association with APW President Systems

The World's Most Efficient, Flexible and Cost-Effective Cooling Solution for Today's Sustainable Data Centers

Data centers are at a critical crossroads. Demand for compute, storage and communications capacity is experiencing dramatic growth. At the same time, business and economic pressures are forcing enterprises to consolidate facilities, streamline operations and aggressively drive down costs. So how can you address these conflicting demands and grow your data center capacity while reducing costs?

Power - As IT infrastructure scales, so does power consumption. With energy costs rising, this can cause operating expenses to grow exponentially. Cooling can account for up to 55% of a data center's total annualized operating cost - is it a threat or an opportunity?

LiquiCool reduces cooling energy consumption by 50% or more

Space - Whether you own, lease or out source your data center, odds are you have one of two real estate issues - too much space or not enough. Corporate mandates to drive down costs are accelerating data center consolidation and the adoption of virtualization and cloud computing. This leads to increased rack power densities which create distinct cooling challenges where legacy data center designs fail. Putting more cooling equipment into an already space-constrained facility may not be feasible. How can you reclaim your white space and deploy more equipment?

LiquiCool reduces data center space requirements by more than 55%

Total Cost of Ownership (TCO) - The average cost of operating datacom facilities has grown more than three times faster than capital investment in new IT equipment. Key drivers for uncontrolled TCO growth include cooling equipment capital expense, inefficient designs, high installation costs, rising energy bills and ongoing maintenance. So, how can you add value to your organization while meeting your cooling infrastructure challenges?

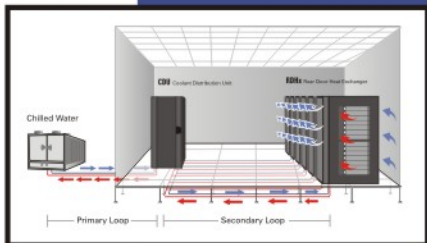
LiquiCool typically provides a complete return on investment in less than one year.



Rear Door Heat Exchanger (RDHx)

Rear Door Heat Exchanger (RDHx) Features:

- Provides up to 35kW of cooling
- Passive design - no fans, moving parts or electrical connections
- 100% sensible cooling - no condensate
- Installs in minutes
- No rearrangement of enclosures required
- Allows 8X the compute power versus air-cooled datacom facilities



Rear Door Heat Exchanger (RDHx) Specifications:

	RDWBS/RDW1S	RDWBW/RDW1W	RDWTS	RDWTW
Maximum Cooling Capacity	22kW	31kW	27kW	35kW
Nominal Cooling Capacity	16kW	21kW	20kW	26kW
Coolant Type	Chilled Water	Chilled Water	Chilled Water	Chilled Water
Connection Type	¾" Quick Connects	¾" Quick Connects	¾" Quick Connects	¾" Quick Connects
Connection Location	Bottom Feed	Bottom Feed	Top Feed	Top Feed
Coolant Volume	5.7L (1.5 Gallons)	6.8L (1.8 Gallons)	6.4L (1.7 Gallons)	7.7L (2.0 Gallons)
Input Power	None required	None required	None required	None required
Noise Level	None	None	None	None
Weight (empty)	30kg (66 lbs.)	32kg (70 lbs.)	32kg (71 lbs.)	34.2kg (75 lbs.)

Note: Cooling capacities listed are for 100% neutralization of heat load.

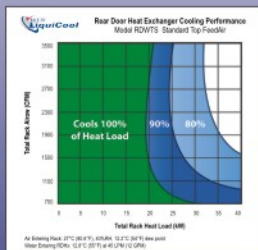
Enclosure Compatibility:

RDHx Part No.	Enclosure Model	H x W x EIA Standard	Enclosure Part No.	Depth Adder*
RDW1S	IBM 19" NetBAY42 Enterprise Rack	42U x 648mm x 19"	93084PX/EX	4.7"
RDW1W	IBM 775mm Wide Enclosures	42U x 775mm x 24"	n/a	1.7"
RDWBS-01	DAMAC Extreme Series	43U x 610mm x 19"	CE78Exxxxxxx	3.6"
RDWBS-02	HP10000 G2 and Rittal TS8	42U x 600mm x 19"	10642 and DK7831.xxx	6.6"
RDWBS-03	Dell PowerEdge, IBM 42U S2 Std.	42U x 600mm x 19"	4210 and 93074RX/XX	6.6"
RDWBS-04	APC SX NetShelter	42U x 600mm x 19"	AR3100, AR3300	5.9"
RDWBS-05	APC VX NetShelter	42U x 600mm x 19"	AR2100BLK/AR2101BLK	5.7"
RDWBS-06	Wright Line Paramount	44U x 610mm x 19"	n/a	5.5"
RDWBS-07	Great Lakes Enhanced	44U x 762mm x 19"	GL840ES-3042	5.6"
RDWBW-08	AMCO 3G Console	44U x 737mm x 19"	FR3G44U29-45	5.6"
RDWBS-09	AMCO 3G Console	44U x 610mm x 19"	FR3G44U24-42	5.6"
RDWBS-10	NER Ultimate Core	42U x 610mm x 19"	n/a	5.5"
RDWBS-11	Wright Line Vantage S2	42U x 610mm x 19"	n/a	5.5"
RDWBW-12	AMCO 3G Console	47U x 737mm x 19"	FR3G47U29-45	5.6"
RDWBS-13	Chatsworth Products TeraFrame	42U x 600mm x 19"	FC1L-112A-C12	5.6"
RDWBS-14	AFCO Systems High Density	45U x 610mm x 19"	1HDF-E1R1-1B2BB-B	6.6"
RDWBW-15	APC SX NetShelter	42U x 750mm x 19"	AR3150	5.9"

Note: All part numbers above are bottom feed. For top feed, replace the "B" with a "T". *Depth of RDHx with Transition Frame (where applicable).

Contact Coolcentric for information on enclosure compatibility not listed above

minus the depth of standard enclosure rear door



Top Feed RDHx with full height coil



Quick connected couplings allow for easy attachment.



LiquiCool™ Coolant Distribution Units

The World's Most Efficient, Flexible and Cost-Effective Cooling Solution for Today's Sustainable Data Centers

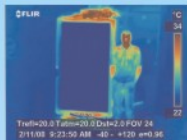
The Coolant Distribution Unit (CDU) provides close controlled cooling water for the Coolcentric Rear Door Heat Exchangers. The CDU creates an isolated secondary loop, separate from the chilled water supply (building chilled water, dedicated chiller etc.), enabling strict containment and control of the liquid cooling system. The CDU maintains the secondary loop supply temperature above the dew point of the data center, preventing condensation and ensuring 100% sensible cooling. Heat removed by connected Rear Door Heat Exchangers is then rejected to the chilled water supply by means of a stainless steel plate heat exchanger within the CDU. The CDU controller provides intelligent monitoring and interfaces with building management systems and web management tools for the highest reliability.

The floor-mount CDU is a versatile unit designed with redundant variable speed pumps, actuators and control valves to maximize system availability. This CDU provides up to 150kW capacity and supports up to 12 Rear Door Heat Exchangers. It is available with a variety of secondary loop distribution options offering maximum flexibility. Easy to deploy and maintain, the CDU can be placed next to IT enclosures or outside of the white space entirely.

Coolcentric's rack-mount CDU is a 6U high unit that mounts within a 19" EIA IT enclosure. Rated at 20kW, this smaller CDU is a cost effective method to support 1-2 Rear Door Heat Exchangers.



Thermal Images taken on a 23 KW Cabinet



Coolant Distribution Unit Advantages

- Maintains water above room dew point to ensure 100% sensible cooling
- Creates an isolated secondary cooling loop minimizing liquid volume
- Controls water pressure and flow
- Allows quick and easy addition of Rear Door Heat Exchangers
- Intelligent monitoring and management
- Enables proper water treatment for long life, high performance and reliability

LiquiCool™ Coolant Distribution Units

Coolant Distribution Unit Specifications:

	CD020Wxx	CD120Wxx-x	CD150Wxx-x
Maximum Cooling Capacity	20kW	120kW	150kW
Coolant Type	Chilled Water	Chilled Water	Chilled Water
Physical Configuration	Rack-mount	Floor-mount	Floor-mount
Design Pump Capacity	40 L/min (10.6 GPM)	240 L/min (63 GPM)	240 L/min (63 GPM)
Available External Head	29 psi @ 10.6 GPM	36 psi @ 63 GPM	36 psi @ 63 GPM
Primary Pressure Drop	7.2 psi @ 10.6 GPM	7.2 psi @ 63 GPM	9.9 psi @ 63 GPM
Primary Connection	3/4" BSP flat face	42mm/1.5" sweat	42mm/1.5" sweat
Secondary Connection	3/4" Quick Connects	3/4" Quick Connects or 1.5" Flex Tails	3/4" Quick Connects or 1.5" Flex Tails
Secondary Coolant Volume	3.5L (0.9 Gallons)	32L (8.5 Gallons)	33.5L (8.9 Gallons)
Approach Temperature at 100% Load	7.3°C (13.1°F)	6.7°C (12.1°F)	4.6°C (8.3°F)
Number of RDHx supported	1-2 RDHx	up to 12 RDHx	up to 12 RDHx
Power Supply	208V, 1Ø, 60Hz or 230V, 1Ø, 50Hz	208-230V, 3Ø, 50/60Hz or 380-480V, 3Ø, 50/60Hz	208-230V, 3Ø, 50/60Hz or 380-480V, 3Ø, 50/60Hz
Maximum Power Consumption	690W at 230V	2.6kW at 480V	2.6kW at 480V
Noise level at 3 meters	<55dBA	<55dBA	<55dBA
Dimensions (HxWxD)	(6U) 27x48x73cm (6U) 10.5"x19"x29"	(36U) 183x80x109cm (36U) 72"x31.5"x43"	(36U) 183x80x109cm (36U) 72"x31.5"x43"
Dry Weight: Rack-mount	46kg (101lbs)	n/a	n/a
Dry Weight: Floor-mount with Flex Tails	n/a	375kg (828lbs)	384kg (847lbs)
Dry Weight: Floor-mount with Internal Manifold	n/a	398kg (878lbs)	407kg (897lbs)

CDU Part Numbers

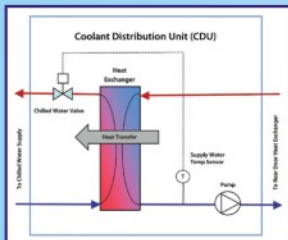
Coolcentric CDU P/ N Enclosure Model Electrical

CD020W1A 20kW Rack-mount 208V, 1Ø, 60Hz
 CD020W2A 20kW Rack-mount 230V, 1Ø, 50Hz
 CD120W3A-x 120kW Floor-mount 208-230V, 3Ø, 50/60Hz
 CD150W3A-x 150kW Floor-mount 208-230V, 3Ø, 50/60Hz
 CD120W4A-x 120kW Floor-mount 380-480V, 3Ø, 50/60Hz
 CD150W4A-x 150kW Floor-mount 380-480V, 3Ø, 50/60Hz

X:

F = Flex Tails; M = Internal Manifold with Quick Connects, no Flow Regulators;

R = Internal Manifold with Quick Connects and Flow Regulators

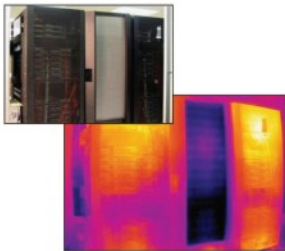


LiquiCool™ Global Services

The World's Most Reliable Liquid Cooling Solution for High Density Server, Storage and Communications Equipment

Coolcentric's Global Services organization provides specialized support for customers who are deploying liquid cooling solutions. Our diverse team of professional engineers and technicians has extensive experience in mission critical datacom environments.

Each facility presents unique and unpredictable circumstances. Our installation, logistics and project management staff use standardized tools, written procedures and detailed reporting to assure that your site will benefit from our extensive quality assurance controls.



Design Services

Coolcentric Global Services can help you design and implement your mission critical cooling infrastructure using best practices. Our engineers can assist in choosing the proper cooling equipment and the optimal floor plan layout. We can perform thermal airflow modeling of existing facilities using Computational Fluid Dynamics (CFD) software and thermal cameras to help you determine how to leverage existing assets while providing guidance on new buildout.

Integration Services

Coolcentric can provide project management for the implementation of a new datacom liquid cooling solution. Services include delivery logistics, mechanical/electrical sub-contracting and pipe and wire design. Coolcentric will work with your project team to help deliver a cooling solution that meets your exact needs and is installed on time.

Installation & Commissioning

Coolcentric offers end-to-end installation and commissioning services for the Coolcentric LiquiCool™ system and ancillary cooling equipment. Services include initial start-up, commissioning and comprehensive installation. Training of on-site staff in the operation and proper maintenance of the LiquiCool system is available.

Preventive Maintenance

Preventive maintenance services are offered to ensure the proper operation, peak operating efficiency and continued reliability of the LiquiCool system. At Coolcentric, we understand the mission critical nature of your data center operations, and we will work within your schedule to provide services when you need them.

Warranty Support

Coolcentric Global Services technicians are factory trained to provide break-fix service for all LiquiCool products. Our technicians are qualified in mechanical and electrical troubleshooting to quickly identify and rectify warranty issues.





Hose Kits

Coolcentric's flexible chilled water Hose Kits connect Coolcentric's Rear Door Heat Exchangers to Coolant Distribution Units (CDU) or External Manifolds.

- Abrasion-resistant rubber material with factory crimped connections
- Stainless steel quick connects available at one end or both ends for quick and easy deployment.
- Hydrostatically leak-tested to 250psi providing a 3X factor of safety over normal operating conditions.
- Available in straight lengths or with right angle elbows for tight clearances.
- Standard lengths from 3 feet (0.9m) to 50 feet (15m) with custom lengths available upon request.



External Manifolds

Coolcentric's external manifolds allow users to run hard piping when redundancy is required, when CDUs are located remote from the Rear Door Heat Exchangers or where preferred.

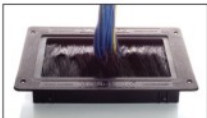
- Provides another level of flexibility for secondary loop distribution options.
- Available in standard manifold configurations or in custom designed configurations to meet unique facility requirements.
- Deploy under raised floors or overhead.
- Quick connects or NPT fittings.



Airflow Control

Coolcentric offers a suite of products that help control the flow of air within IT enclosures and Data Centers to help maximize the LiquiCool system efficiency.

- HotLok® Blanking Panels direct hot exhaust air from the rack-mount equipment through the Rear Door Heat Exchanger and prevents recirculation.
- Panels snap into place on the front vertical mounting rails without tools.
- KoldLok® Raised Floor Grommets block open holes in the raised floor tiles to prevent cool supply air from escaping into areas where it is not needed.
- Seals the supply and return hose penetrations in the raised floor.



Water Treatments

The quality of water used in the Rear Door Heat Exchanger is essential to proper operation.

- Coolcentric's water treatment solutions control inhibitors and biocides to maintain clean heat transfer surfaces and protect the system from downtime.
- Protects against scaling, fouling and corrosion, ensuring optimum performance and longevity of the cooling equipment.
- Available in 5 gallon (19 Liters) or 55 gallon (209 Liter) containers.

Best-in-class Solutions for Networking, Telecom, Industrial and General Electronics