



TRANE®

RLC-DS-1
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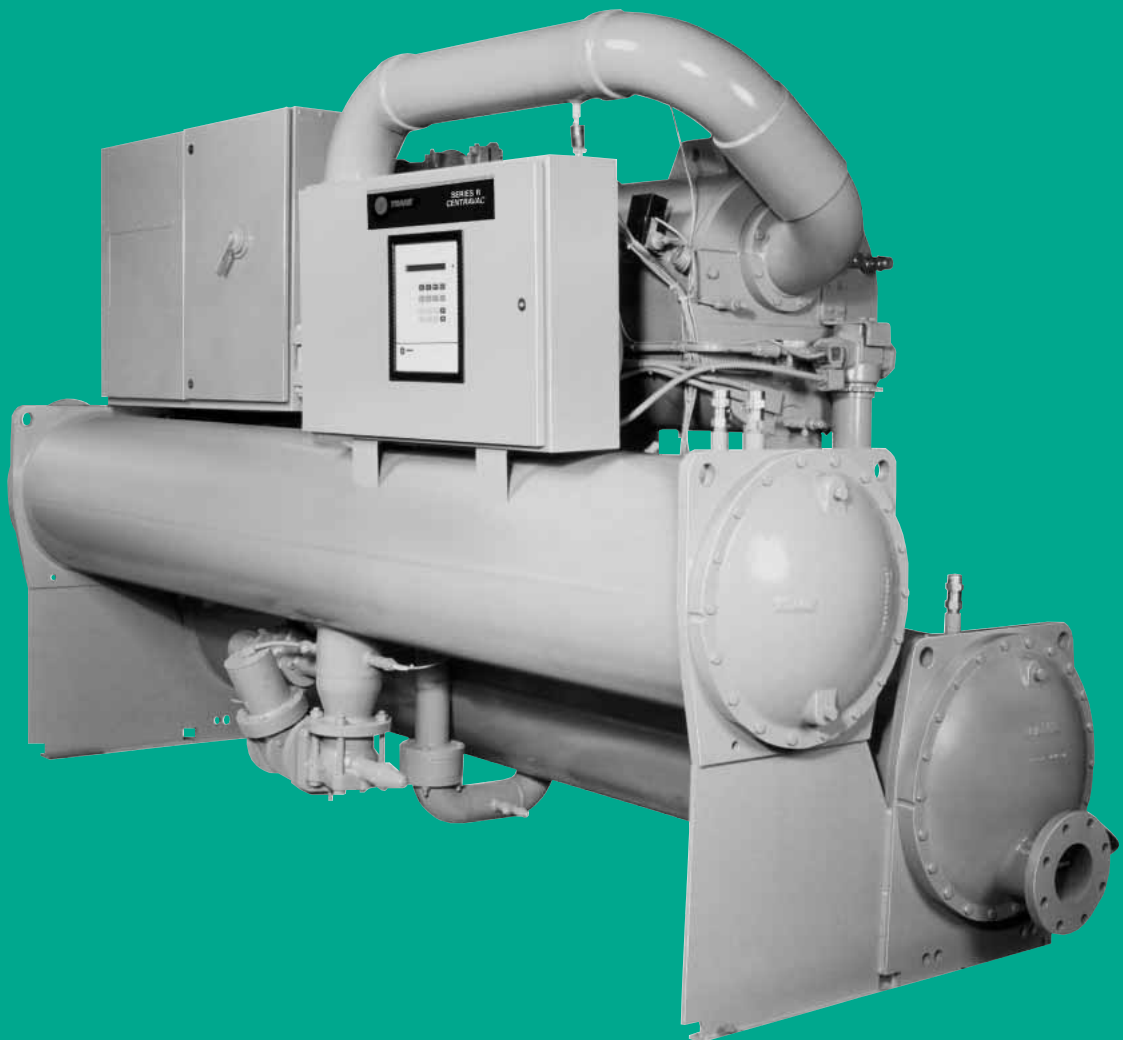
Revised

RLC-DS-1

**Series R® CenTraVac®
Rotary
Liquid Chillers**

**130 to 150 Tons
Water Cooled**

Built for the Industrial and Commercial Markets



Introduction

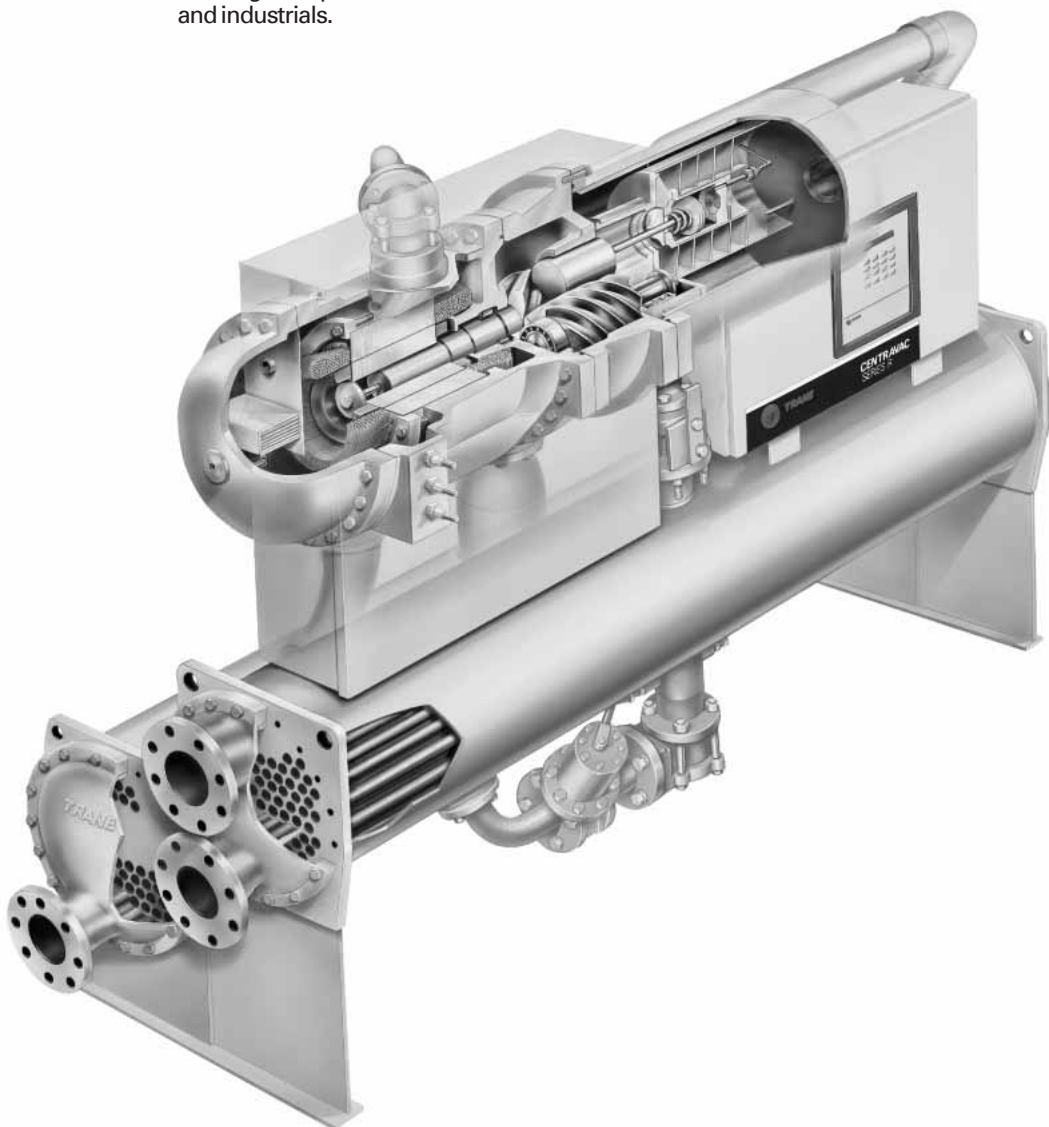
Trane Series R® Chiller – Model RTHB

The RTHB offers high reliability, ease of installation, and high energy efficiency due to its advanced design, low speed/ direct-drive compressor and proven Series R chiller performance.

The major advantages of the RTHB are:

- 99.5% reliable.
- High energy efficiency.
- Compact size.
- Optional bolt-together construction.
- Low maintenance.

The Series R helical rotary chiller is an industrial grade design built for the commercial market. It is ideal for office buildings, hospitals, schools, retailers and industrials.



Features and Benefits

The Series R® Helical Rotary Compressor

- Direct-drive, low speed for high efficiency and high reliability.
- Simple design with only three moving parts, resulting in high reliability and low maintenance.
- Field servicable compressor for easy maintenance.
- Precise rotor tip clearance for optimal efficiency.
- Liquid refrigerant cooled motor. The motor operates at lower temperatures for longer motor life.
- Five minute start-to-start/two minute stop-to-start anti-recycle timer allows for closer water loop temperature control.
- Years of research and testing. The Trane helical rotary compressor has amassed thousands of hours of testing, much of it at severe operating conditions beyond normal air conditioning applications.
- Proven track record. The Trane Company is the world's largest manufacturer of large helical rotary compressors. Over 60,000 commercial and industrial installations worldwide have proven that the Trane helical rotary compressor has a **reliability rate of greater than 99.5 percent** in the first year of operation — unequalled in the industry.

Applications

- Comfort cooling.
- Industrial process cooling.
- Ice/thermal storage.
- Heat recovery.
- Low temperature process cooling.

Electronic Expansion Valve

- Better part load efficiency.
- Extended operating range.
- Optimized refrigerant metering for more efficient control.

Advanced Heat Transfer Surfaces

- Condenser and evaporator tubes use the latest heat transfer technology for increased efficiency.

Compact Size

- Designed with the retrofit and replacement market in mind.
- Fits through standard double-width doors.
- Optional bolt-together construction for easy unit disassembly.
- Small footprint of Series R chiller saves valuable equipment room space.

Simple Installation

- Lightweight design simplifies rigging requirements. Reduces cost and speeds installation time.
- Simplified piping; the only water piping required is for the evaporator and condenser.

- No oil cooler or purge system connections.
- Simple power connection.
- Standard unit mounted starter eliminates additional jobsite labor requirements.
- Extensive factory testing.
- Full factory refrigerant and oil charge further reducing field labor, materials and installation cost.

Microprocessor Controls With UCP2

- Microprocessor-based unit control panel (UCP2) monitors and controls chiller operation and associated sensors, actuators, relays and switches. Control unit is entirely factory assembled and tested.
- Proportional integral derivative (PID) control strategy for stable, efficient chilled water temperature control.
- Exclusive Adaptive Control™ design to keep chiller on-line under adverse conditions.
- Standard electrical demand limiting.
- Chilled water reset for energy savings during part load operation.
- Complete range of chiller safety controls.
- Easy to use operator interface. Panel displays all operating and safety messages with complete diagnostics information.
- Clear language display is easy to read. The Standard clear language display panel supports eight languages including English, French, German, Spanish, Katakana, Italian, Portuguese and Dutch. An optional display panel is available to display Chinese, Japanese Kanji, Thai and Korean languages.
- Generic building automation system points available.
- Over 120 diagnostics and operating points including chiller current draw, condenser pressure and evaporator pressure are standard displays.

Integrated Comfort™ System Interface

- Microprocessor UCP2 easily interfaces with Trane Tracer® and Tracer Summit® building automation/energy management computer for Integrated Comfort™ systems benefits; all with a single twisted pair wire.

Availability

- The Series R® chiller is in stock and available now for quick ship needs.
- Packed stock inventory features standard configurations for immediate delivery.
- Trane offers the fastest ship cycles in the industry on built-to-order units.

Contents

Introduction	2
Features and Benefits	3
Model Number Description	5
Refrigeration Cycle	6
Selection Procedure	7
Application Considerations	9
Dimensional Data	10
Jobsite Connections	13
Controls	14
Typical Wiring Diagrams	16
Mechanical Specification	18

Those applications in this catalog specifically excluded from the ARI certification program are:

- Low temperature applications, including ice storage
- Glycol
- 50 Hz unit components



Water Chiller Systems
Business Unit

Features and Benefits

Complex Character Clear Language Display with Multi-Language Control Interface

Trane has multi-language support for all chillers controlled by the UCP2™ control panel. The standard clear language display (CLD) supports eight languages including English, French, German, Spanish, Katakana, Italian, Portuguese and Dutch. The Complex Character CLD was added to support languages such as Traditional and Simplified Chinese, Japanese Kanji, Thai and Korean whose characters could not be formed on the standard display .

- Super-twist LCD display with backlighting for readability.
- Access to all available chiller data (more than 200 items) including:
 - Setpoints
 - Field start-up items
 - Machine configuration items
 - Service test items

- Easily accessible reports, in logical groupings, including:
 - Chiller report
 - Refrigerant report
 - Compressor report
- Custom report capability for data arranged the way you want to see it.
- Alarm and diagnostic capability including:
 - More than 100 different diagnostic messages
 - Log of the last 20 diagnostics
 - An indicator to let you know when an alarm is present
 - Expanded help messages for each alarm to let you know what action to take
 - Operator security
 - Internationally recognized symbols

Trane Complex Character CLD is available for all chillers with UCP2 control panel.

The Complex Character CLD is available as a retrofit kit for the standard CLD on the UCP2 panel. With the same wiring and mounting, it is as simple as disconnecting two wires, unbolting the existing CLD, bolting on the Complex Character CLD and reconnecting the two wires.





Model Number Description

RTH B 150 FM A0 0 L W P 0 T U N N 3 L F 2 L F V Q U
1,2,3 4 5,6,7 8 9 10,11 12 13 14 15 16 17 19 20 21 22 23 24 25 26 27 28 30 31

Digits 01, 02, 03 — Series R® CTV
RTH = Series R CenTraVac®

Digit 04 — Dev Sequence
B = 2nd Major Development

Digits 05,06,07 — Nominal Tons
130 = 130 Nominal Tons
150 = 150 Nominal Tons

Digit 08 — UNIT VOLTAGE
A = 200/60/3
C = 230/60/3
D = 380/60/3
R = 380/50/3
N = 400/50/3
U = 415/50/3
F = 460/60/3
H = 575/60/3
S = SPECIAL

Digit 09
L = Lowest Nominal Kw Motor For Compressor Size
M = Medium Nominal Kw Motor For Compressor Size
H = Highest Nominal Kw Motor For Compressor Size

Digits 10, 11 — Design Sequence
A0 = "First Design, etc. Increment When Parts" Are Affected For Service Purposes.

Digit 12 — Unit Specials
0 = No Unit Specials
C = All Unit Specials Are Denoted By Digits Elsewhere In The Model Number
S = Unit Has An Uncatagorized Special Not Denoted By A Digit Elsewhere In The Model Number

Digit 13 — Shell Length
N = Standard (Short) Shells
L = High Eff. (Long) Shells

Digit 14 — Unit Structure
W = Welded
B = Separable

Digit 15 — Control Options
0 = Without Options Module
P = With Options Module

Digit 16 — Printer Interface
0 = Without Printer Interface
P = With Printer Interface

Digit 17 — ICS Interface
0 = Without Tracer Communications
T = Tracer Communications (COMM 3)
M = Tracer Summit Communications (COMM 4)

Digit 19 — Starter Type
U = Unit Mounted Starter
(See Starter Model No.)

Digit 20 — Evap Temp Range
N = Standard and Low Temp Range (Above 20 F)
V = Very Low Temp Range (20 F and Below)

Digit 22 — Evap Water Passes
2 = 2 Pass
3 = 3 Pass
4 = 4 Pass
S = Special Customer Option

Digit 23 — Evap Connections
L = 150 Psi Flanged Connections
H = 300 Psi Flanged Connections
S = Special Customer Option

Digit 24 — Evap Tubes
F = Standard 06A High-Perf Tubes
S = Special Customer Option

Digit 25 — Cond Water Passes
2 = 2 Pass
3 = 3 Pass
S = Special Customer Option

Digit 26 — Cond Connections
L = 150 Psi Flanged Connections
H = 300 Psi Flanged Connections
M = 300 Psi Marine Grooved Connections
S = Special Customer Option

Digit 27 — Cond Tubes
F = Standard I-E Finned Tubes
G = Smooth Bore Copper Tubes
H = Smooth Bore 90/10 CU-NI Tubes

Digit 28 — Isolation Valve
0 = No Condenser Isolation Valve
V = With Condenser Isolation Valve

Digit 30 — Thermal Insulation
0 = Without Thermal Insulation
Q = With Thermal Insulation
S = Special Customer Option

Digit 31 — Agency Listing
0 = No Agency Listing
U = C/UL Listed

Note: Position numbers not shown are currently unassigned. Not all combinations are available on all sizes.



Refrigeration Cycle

The Series R® CenTraVac® chiller, like other Trane CenTraVac chillers, is designed for reliability and efficiency. Features such as direct drive, reliable motor cooling, electronic expansion valve/fixed orifice refrigerant flow control and an economizer cycle have all been incorporated into the design of the Series R CenTraVac chiller.

During operation, liquid refrigerant is distributed along the length of the flooded evaporator uniformly coating each tube. As it cools the system water flowing through the evaporator tubes, the refrigerant absorbs heat causing it to vaporize.

The gaseous refrigerant is then drawn through the suction cavity in the evaporator and into the compressor where the compression process begins.

Partially compressed evaporator refrigerant vapor in the compressor is joined by vapor produced during the motor cooling process and the economizer cycle at an intermediate point in the compression cycle. The combined refrigerant vapor streams are then fully compressed and the hot refrigerant vapor is discharged to the condenser.

Baffles within the condenser shell distribute the compressed refrigerant gas evenly across the condenser tube bundle. Cooling tower water circulates through the condenser tubes and absorbs heat from this refrigerant, causing it to condense.

Once the liquid refrigerant leaves the bottom of the condenser, it passes through an electronic expansion valve. Because of the pressure drop created by the electronic expansion valve, some of the liquid vaporizes. The resulting mixture of liquid and gaseous refrigerant then enters the motor housing, where it uniformly surrounds and cools the motor. Motor heat absorbed by the refrigerant causes more of the liquid refrigerant to “flash” to a gas.

All of the refrigerant vapor available at this point is “economized” — that is, routed directly to the rotor section of the compressor housing. The liquid refrigerant leaves the motor housing, passes through a fixed orifice system and returns to the evaporator continuing the cycle.

Compressor Description

The compressor used in Series R CenTraVac chillers has three distinct sections: the motor, the rotor and the oil separator.

Motor Section

The hermetic 3600 rpm motor is an induction type motor and is cooled by liquid refrigerant.

Rotor Section

Each Series R CenTraVac uses a helirotor type compressor. Each compressor has only three moving parts: two rotors and a slide valve. The male rotor is directly attached to and driven by the motor. The female rotor is, in turn, driven by the male rotor. Separately housed bearing sets are provided at each end of both rotors. The slide valve is located, and moves, along the top of these rotors.

The helirotor compressor is a positive displacement compressor. Refrigerant from the evaporator is drawn into the suction opening at the bottom of the compressor rotor section. After being compressed by the meshing action of the rotor teeth, the high pressure refrigerant gas is discharged from the end of the rotors directly into the oil separator.

Oil sprayed along the top of the compressor rotor section bathes both rotors along with the compressor housing interior. While the oil injected here does provide lubrication for the driving action of the rotors, its primary purpose is to seal the clearance spaces that exist between the rotors and compressor housing. Effective seals between these internal parts enhance compressor efficiency by limiting leakage between the high and low pressure cavities.

Capacity control is accomplished by a slide valve in the rotor section of the compressor. Positioned along the top of the rotors and parallel to the rotors; the slide valve is driven by a piston/cylinder.

Compressor loading is determined by the position of the slide valve over the rotors. When the slide valve is fully extended over the rotors the compressor is fully loaded. Unloading occurs as the slide valve is drawn towards the discharge side of the compressor since compression no longer occurs over the entire length of the compressor rotor section. Slide valve unloading lowers refrigeration capacity by shortening the effective length of the rotors.

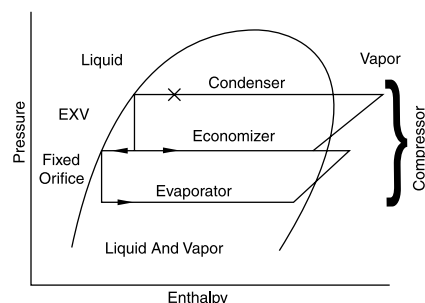
Oil Separator Section

The oil separator section of the compressor is located at the discharge end of the compressor.

Once oil is injected into the interior of the compressor's rotor section, it mixes with compressed refrigerant vapor and is then discharged into the oil separator by the rotors. The oil separator consists of a perforated cylinder that surrounds a helical passageway. As the refrigerant and oil mixture travels through this passageway, centrifugal force forces the oil to collect on the walls of the cylinder and passes through perforations to the cylinder's exterior. Oil that accumulates on this surface then runs off the cylinder and collects in an oil sump located at the bottom of the housing.

Meanwhile, the compressed refrigerant vapor, stripped of oil droplets, continues its passage through the oil separator and enters the discharge line leading to the condenser.

Figure RC-1 – Refrigerant Cycle Diagram





Selection Procedure

The Series R® chiller performance is rated in accordance with ARI Standard 550/590-98 Certification Program. Chiller selections and performance information can be obtained through the use of the Series R chiller selection program available through local Trane sales offices.

Performance

The Series R computer selection program provides performance data for each chiller selection at the full load design point and part load operating points as required.

It should be noted that changing the number of water passes or the water flow rates may significantly alter the performance of a particular chiller. To obtain the maximum benefit from the wide range of selections available, designers are encouraged to develop performance specifications and use the computer selection program outputs to optimize their selections. This will allow the selection of the particular compressor-evaporator-condenser combination which most closely meets the job requirements. All selections should be made using the computer selection program.

Fouling Factors

ARI Standard 550 includes a definition of clean tube fouling. Recommended field fouling allowances have not changed on a relative basis; the standard fouling adjustment is a 0.00010 increment from 0.0000 "clean" for the evaporator and 0.00025 increment from 0.0000 "clean" for the condenser.

Chiller specifications should be developed using the most current standard fouling factors.

Unit Performance with Fluid Media Other Than Water

Series R chillers can be selected with a wide variety of media other than water. Typically used media include ethylene glycol or propylene glycol either in the evaporator, condenser or both. Chillers using media other than water are excluded from the ARI Standard 550/590-98 Certification Program, but are rated in accordance with ARI Standard 550/590-98. Trane factory performance tests are only performed with water as the cooling and heat rejection medium. For media other than water, contact the local Trane sales office for chiller selections and information regarding factory performance testing.

Dimensional Drawings

The dimensional drawings illustrate overall measurements of the unit. The service clearances indicate clearances required to easily service the recommended Series R chiller.

All catalog dimensional drawings are subject to change. Current submittal drawings should be referred to for detailed dimensional information. Contact the local Trane sales office for submittal information.

Electrical Data Tables

Compressor motor electrical data is shown in the data section for each compressor size. Rated load amperes (RLA), locked rotor wye amperes (LRAY) and locked rotor delta amperes (LRAD) for standard voltages of all 50 and 60 Hertz, 3 phase motors are shown. The RLA is based on the performance of the motor developing full rated horsepower. The kW rating of the motor will equal or exceed the kW requirement determined by the Series R computer selection program at design conditions. If motor kW draw at design conditions is less than the kW rating of the motor, the RLA at design conditions is determined by multiplying the motor RLA (at the desired voltage) by the ratio of design kW to the motor kW rating. This is done by the Series R chiller computer selection program. RLA is available in the selection program as part of the design predictions. Predicted values include power factor variation from point to point.

A voltage utilization range is tabulated for each voltage listed. Series R chillers are designed to operate satisfactorily over a utilization range of ± 10 percent of the standard design voltages of 200 V, 230 V, 380 V, 460 V, and 575 V for 60 Hertz, 3 phase and 380 V, 400 V, 415 V for 50 Hertz, 3 phase.

Evaporator and Condenser Pressure Drop

Pressure drop data is determined by the Series R chiller computer selection program available through local Trane sales offices.

Part Load Performance

The Series R chiller possesses excellent part load performance characteristics. Actual air conditioning system loads are usually significantly less than full load design conditions. Therefore, the chillers may operate at full load relatively little percentage of the time. The Series R chiller can provide significant operating savings at these part load conditions due to its energy efficient operation.

Part load chiller operation is normally associated with reduced condenser water temperatures. At part load operation, the heat rejected to the cooling tower is less than at full load operation. Also, part load operation is typically associated with reduced outside wet bulb temperatures, resulting in improved cooling tower performance. The net result of less heat rejection and lower wet bulb temperature is cooler condenser water entering the chiller and improved unit performance. To determine specific unit part load performance, use the Series R chiller computer selection program.

Selection Procedure

Part Load Performance

The Series R CenTraVac chiller possesses excellent part load performance characteristics. Air conditioning system loads are usually significantly less than full load design conditions. Therefore, the chillers operate at full load relatively little of the time. The Series R CenTraVac chiller can provide significant operating savings over centrifugal chillers.

Part load chiller operation is normally associated with reduced condenser water temperatures. At part load operation, the heat rejected to the

cooling tower is less than at full load operation. Also, part load operation is typically associated with reduced outside wet bulb temperatures, resulting in improved cooling tower performance. The net result of less heat rejection and lower wet bulb temperature is cooler condenser water entering the chiller and improved unit performance. A representative load line is shown in Figure SP-1, which takes into account condenser water relief per ARI Standard 550/590-98. To determine specific unit part load performance, use of the Series R CenTraVac chiller selection program is recommended.

Integrated Part Load Performance

The Integrated Part Load Value (IPLV) is a method of measuring total chiller performance over a defined range of part load conditions. This method was established by ARI and is included in ARI Standard 550/590-98. IPLV serves as a good method of comparing on equal basis, the part load efficiency of various chillers. The formula for calculating IPLV is defined as:

SI Metric Units

$$\begin{aligned} \text{IPLV} &= 0.01A + 0.42B + \\ \text{or} &= 0.45C + 0.12D \\ \text{APLV} & \end{aligned}$$

Where: A = COP at 100%
B = COP at 75%
C = COP at 50%
D = COP at 25%

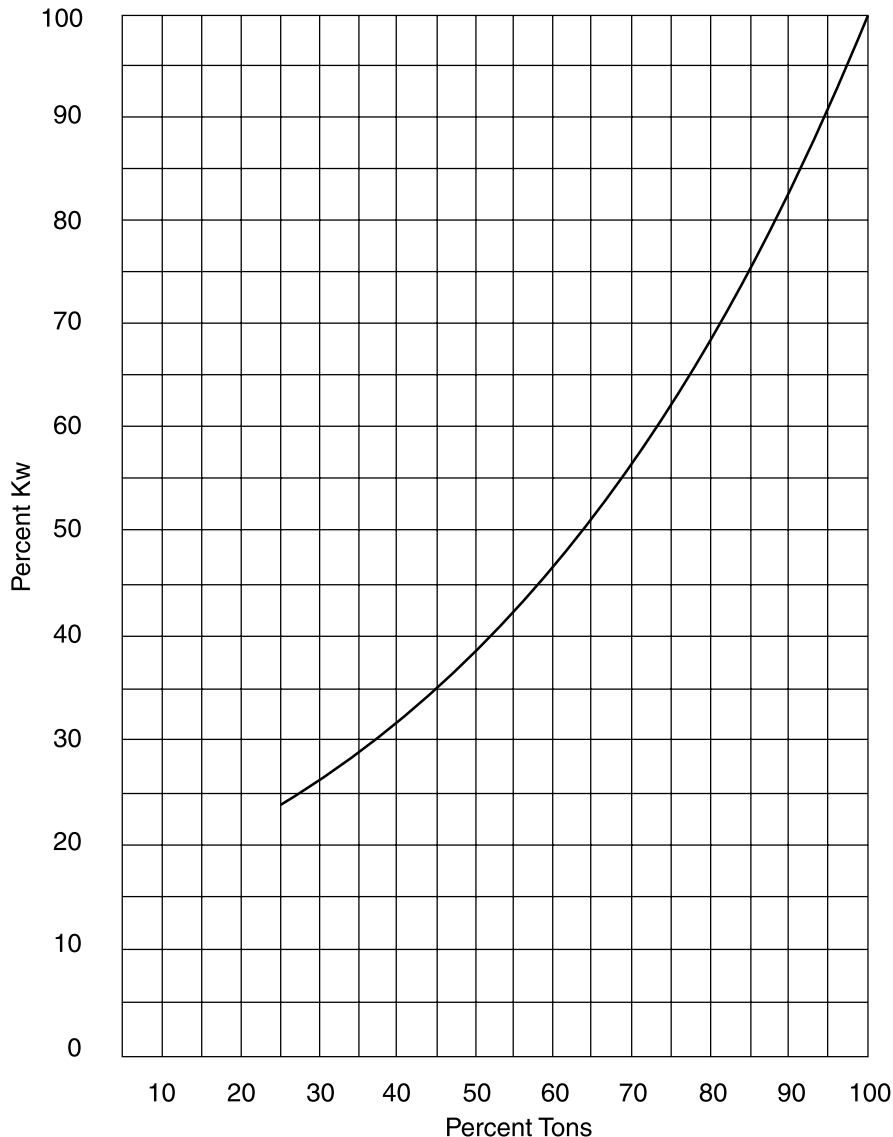
U.S. Standard Units

$$\begin{aligned} \text{IPLV} &= \frac{1}{\frac{0.01}{A} + \frac{0.42}{B} + \frac{0.45}{C} + \frac{0.12}{D}} \\ \text{or} &= \frac{0.01}{A} + \frac{0.42}{B} + \frac{0.45}{C} + \frac{0.12}{D} \\ \text{APLV} & \end{aligned}$$

Where: A = kW/ton at 100%
B = kW/ton at 75%
C = kW/ton at 50%
D = kW/ton at 25%

To approximate total energy requirements over a period of time, use of a computerized load and performance program that considers air conditioning load, machine performance, cooling tower performance and outside wet bulb temperature is suggested. The Trane TRACE® analysis program is particularly well suited for this type of calculation, as well as for economic evaluation of equipment and system alternatives.

Figure SP-1 – Typical Part Load Performance





Application Considerations

Condenser Water Limitations

Trane Series R® CenTraVac® chillers start and operate satisfactorily over a range of load conditions with uncontrolled entering condenser water temperature. Reducing the condenser water temperature is an effective method of lowering power input required. However, beyond certain limits, the effect of further lowering the condenser water temperature is a relative increase in power consumption. This is because as the slide valve closes and the compressor unloads, compressor efficiency is determined by several factors. The leaving chilled water temperature and the percent of load have the most direct impact on the optimum condenser water temperature. In general, continuous machine operation with entering condenser water temperature below 55 F is not recommended. When the entering condenser water temperature is expected to drop below 55 F, it is recommended that some form of condenser water temperature control be used to ensure optimum machine performance.

Short Evaporator Water Loops

The proper location of the chilled water temperature control sensor is in the supply (outlet) water. This location allows the building to act as a buffer and assures a slowly changing return water temperature. If there is not a sufficient volume of water in the system to provide an adequate buffer, temperature control can be lost, resulting in erratic system operation and excessive compressor cycling. A short water loop has the same effect as attempting to control from the building return water.

As a guideline, ensure the volume of water in the evaporator loop equals or exceeds two times the evaporator flow rate. For a rapidly changing load profile, the amount of volume should be increased.

To prevent the effect of a short water loop, the following item should be given consideration:

A storage tank or larger header pipe to increase the volume of water in the system and, therefore, reduce the rate of change of the return water temperature.

Water Treatment

The use of untreated or improperly treated water in chillers may result in scaling, erosion, corrosion and algae or slime buildup. It is recommended that the services of a qualified water treatment specialist be engaged to determine what treatment, if any, is advisable. The Trane Company assumes no responsibility for the results of untreated or improperly treated water.

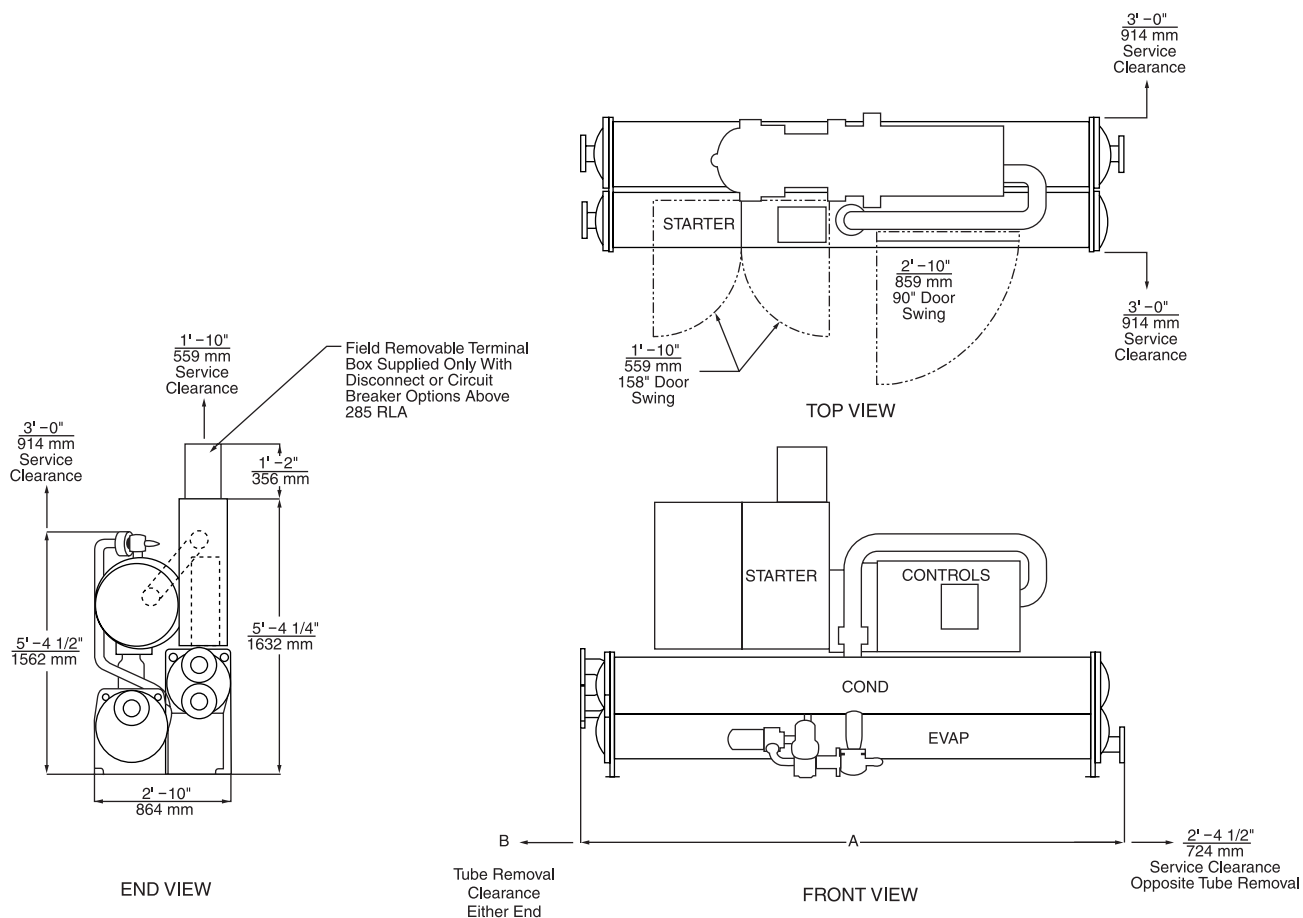
Water Pumps

Avoid specifying or using 3600 rpm condenser water and chilled water pumps. Such pumps may operate with objectionable noises and vibrations. In addition, a low frequency beat may occur due to the slight difference in operating rpm between water pumps and Series R chiller motors. Where noise and vibration-free operation are important, The Trane Company encourages the use of 1750 rpm pumps. Note: Do not use the chilled water pump to stop the chiller.

Installation/Acoustics

Refer to Trane Engineering Bulletin RLC-EB-3 for both chiller sound ratings, installation tips and considerations on chiller location, pipe isolation, etc. Using the information provided in this engineering bulletin, contact a certified sound consultant to aid in proper mechanical room design and treatment.

Unit	A		B	
	English	Metric	English	Metric
130/150 Ton Std.	8' 10 7/8"	2715 mm	7' 8"	2337 mm
130/150 Ton Long	11' 4 7/8"	3477 mm	10' 2"	3099 mm



General Data

RTHB 130 – RTHB 150

Table GD-1 — Electrical Data

		Nominal Voltage	60 Hz					Nominal Motor Rating (kW)	50 Hz		
			200	230	380	460	575		380	400	415
Model	Nominal Motor Rating (kW)	Voltage Utilization Range	180/220	207/253	342/418	414/506	518/632		342/418	360/440	374/457
RTHB 130	107	RLA	348	302	183	151	121	241	174	175	169
		MCA	435	378	229	189	151		218	219	211
		LRA	1502	1316	781	658	544		591	625	652
RTHB 150	121	RLA	390	339	205	170	136	270	197	197	190
		MCA	488	424	256	213	170		246	246	238
		LRA	1846	1555	972	803	630		712	755	789

Notes:

1. RLA = Rated Load Amps at Nominal Motor kW.

MCA= Minimum Circuit Ampacity is 125% of the compressor RLA per NEC 440-32 and 440-33.

LRA = Locked Rotor Amps.

2. In all cases, the motor to be furnished must have a kW rating equal to or greater than the full load kW determined from the cataloged data or the Series R® CenTraVac® Computer selection Program.

Table GD-2 — General Data

		RTHB 130				RTHB 150			
		Standard Shell		Long Shell		Standard Shell		Long Shell	
Refrigerant Type		HCFC-22		HCFC-22		HCFC-22		HCFC-22	
Refrigerant Charge	(lb.)	300		400		285		380	
	(Kg)	136		182		130		173	
Operating Weight	(lb.)	5,716		6,364		5,716		6,364	
	(Kg)	2,598		2,893		2,598		2,893	
Shipping Weight	(lb.)	5,375		5,932		5,375		5,932	
	(Kg)	2,443		2,696		2,443		2,696	

Table GD-3 — Evaporator Data

		RTHB 130								RTHB 150							
		Standard Shell				Long Shell				Standard Shell				Long Shell			
		1 Pass	2 Pass	3 Pass	4 Pass	1 Pass	2 Pass	3 Pass	4 Pass	1 Pass	2 Pass	3 Pass	4 Pass	1 Pass	2 Pass	3 Pass	4 Pass
Storage Capacity	(gal)	19	19	19	19	25	25	25	25	21	21	21	21	28	28	28	28
	(L)	72	72	72	72	95	95	95	95	79	79	79	79	106	106	106	106
Minimum Flow Rate	(GPM)	376	188	125	94	376	188	125	94	430	215	143	107	430	215	143	107
	(L/s)	24	12	8	6	24	12	8	6	27	14	9	7	27	14	9	7
Maximum Flow Rate	(GPM)	1374	687	458	344	1374	687	458	344	1576	788	525	394	1576	788	525	394
	(L/s)	87	43	29	22	87	43	29	22	99	50	33	25	99	50	33	25
Connection Size	(IN)	6	4	4	4	6	4	4	4	6	4	4	4	6	4	4	4

Table GD-4 — Condenser Data

		RTHB 130				RTHB 150			
		Standard Shell		Long Shell		Standard Shell		Long Shell	
		2 Pass		2 Pass		2 Pass		2 Pass	
Storage Capacity(gal)		18		25		22		29	
	(L)	68		95		83		110	
Minimum Flow Rate(GPM)		149		149		173		173	
	(L/s)	9		9		11		11	
Maximum Flow Rate(GPM)		545		545		636		636	
	(L/s)	34		34		40		40	
Connection Size	(IN)	4		4		4		4	

Water Pressure Drop Data

**RTHB 130 –
RTHB 150**

Chart WPD-1 — Standard Length Evaporators

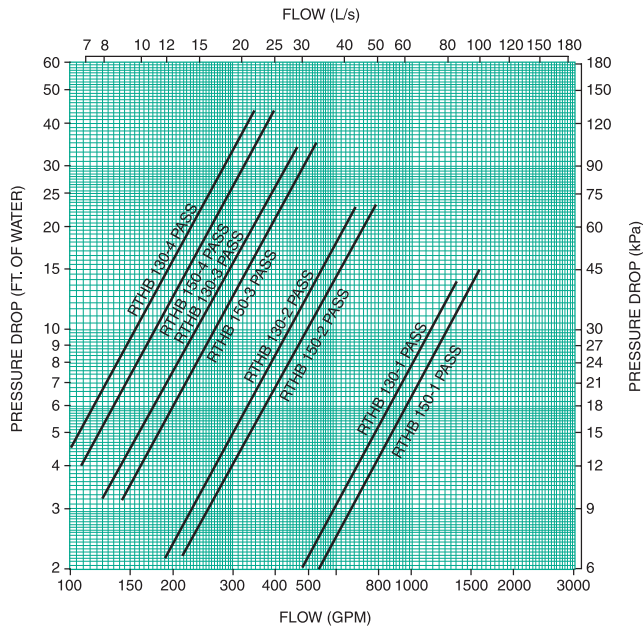


Chart WPD-2 — Long Length Evaporators

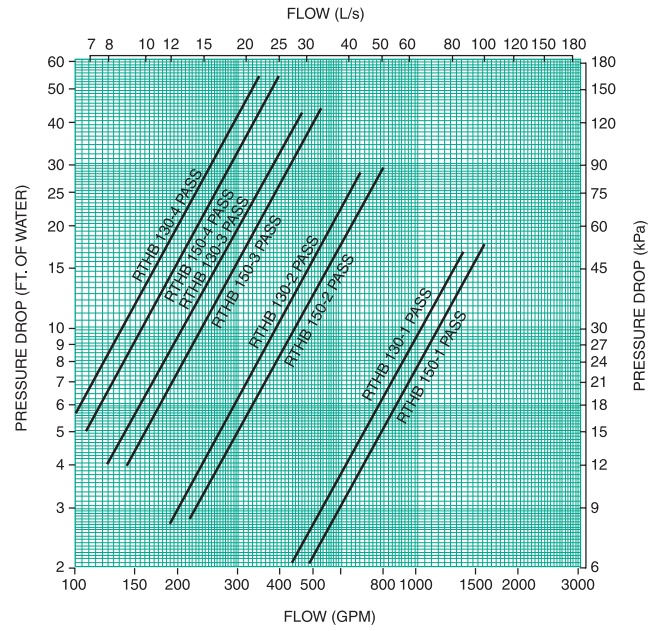


Chart WPD-3 — Standard Length Condensers

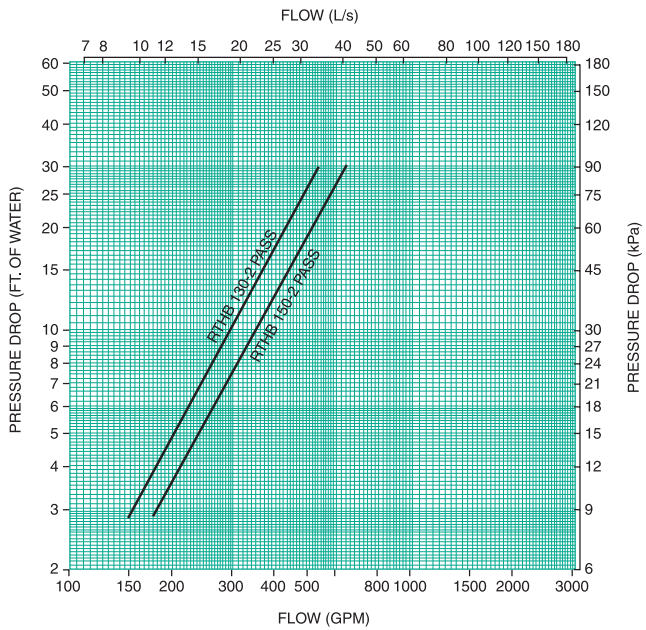
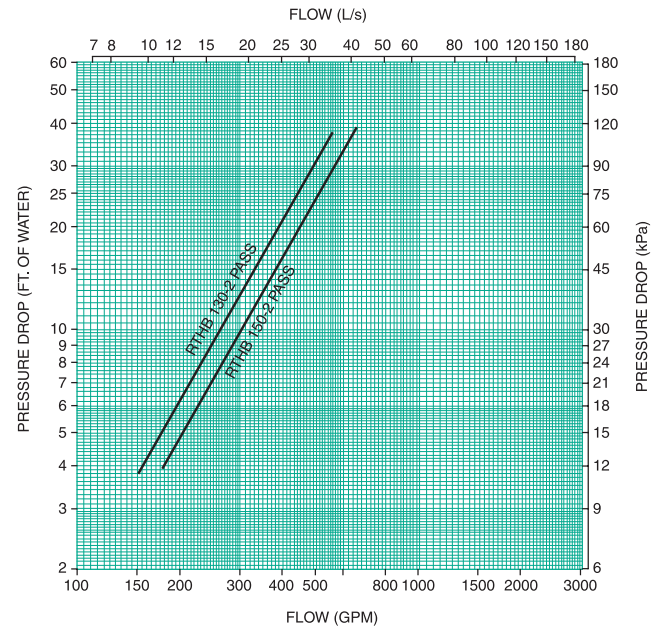


Chart WPD-4 — Long Length Condensers





A microcomputer-based controller controls the Series R® CenTraVac® chiller. The microcomputer controller offers better control than with past types of controls and has new, important benefits.

Adaptive Control™ Microprocessor

The microcomputer-based controller allows Trane to optimize controls around the chiller application and the specific components used with the Series R CenTraVac chiller. For instance, the compressor protection system is specifically designed for the Series R CenTraVac chiller. A new leaving chilled temperature control algorithm maintains accurate temperature control, minimizes drift from setpoint and provides better building comfort. The microcomputer control incorporates improved chiller start-up and load limiting into standard operation. Interface with outside systems such as building automation controls is flexible and easy.

Microcomputer Controls

Unit Control Panel (UCP2)

Most conventional “relay logic” circuits have been replaced by software in the Series R CenTraVac microprocessor. The microprocessor performs unit control functions, limit functions, sequence of operation, compressor motor control, compressor motor protection, and the starter functions. Additionally, the microprocessor accepts external inputs from sensors and adjustment devices.

Adjustments and menus located on the two line by 40 character microprocessor display include three pre-programmed reports (compressor, refrigerant, and chiller) and one custom report that can be tailored to suit the individual owners’ requirements. The compressor report displays all the key data necessary to monitor compressor operation. It will display data such as compressor running hours, number of starts, bearing temperatures, currents, voltages, power factor, kW draw, etc. The refrigerant report displays temperatures, pressures, superheats, expansion valve positioning, etc. The chiller report displays status, operating mode, all chiller temperatures and setpoints, current limit setpoints, etc. The custom report can be user-tailored to include any data from any of the three pre-programmed reports that the user feels is important to group together for any specific chiller operation.

Password protection is provided so that only those with authorized access may adjust chiller operating parameters. The operator and service personnel have password access to all the settings and setpoints required for chiller adjustment and maintenance. Service tests may be done on the chiller and allow override capabilities to simulate a test. With easy front panel programmability of Daily, Service Start-up and Machine Configuration settings and setpoints, the operator, service technician, and system designer can customize the use of the microcontroller to unique conditions of the chiller plant – whether the purpose of chilled water is for comfort cooling or for process cooling.

The modular structure of UCP2 makes it possible for the designer to select the system controls and associated interfaces to Tracer® (or other building automation systems) that are required for the chiller plant design. With this modular concept, capability can be added or upgraded at any time – with only temporary interruption of chilled water production. UCP2 is designed to have backward and forward compatibility with all generations of Trane equipment.

All data that is necessary for the safe operation and easy serviceability of the chiller is provided as standard on all CenTraVac chillers. Options are available that provide additional controls/data that are required for: an industrial process design, applications outside of typical chilled water system design, the need for redundant machine protection, or the desire for more information.

Controls

Safety Controls

A centralized microcomputer offers a higher level of machine protection. Since the safety controls are smarter, they limit compressor operation to avoid compressor or evaporator failures, thereby minimizing nuisance shutdown. The unit control module (UCM) directly senses the control variables that govern the operation of the chiller; motor current draw, evaporator temperature, condenser temperature, etc. When any of the variables approaches a limit condition where the unit may be damaged or shut down on a safety, the UCM takes corrective action to avoid shutdown and keep the chiller operating. It does this through combined actions of compressor slide valve modulation and electronic expansion valve modulation. The UCM optimizes total chiller power consumption during normal operating conditions. During abnormal operating conditions, the UCM will continue to optimize chiller performance by taking the corrective action necessary to avoid shutdown. This keeps cooling capacity available until the problem can be solved.

Whenever possible, the chiller is allowed to perform its function; make chilled water. In addition, microcomputer controls allow for more types of protection such as under and over voltage. Overall the safety controls help keep the building running and out of trouble.

Monitoring and Diagnostics

Since the microcomputer provides all control functions, it can easily indicate such parameters as leaving chilled water temperature and percent RLA. If a failure does occur, one of over 90 individual diagnostics will indicate the problem, giving more specific information about the failure. All of the monitoring and diagnostic information is displayed directly on the microcomputer display.

Interface With The Trane Integrated Comfort™ System (ICS)

When the Series R CenTraVac chiller is used in conjunction with a Trane Tracer® system, the unit can be monitored and controlled from a remote location. The Series R CenTraVac chiller can be controlled to fit into the overall building automation strategy by using time-of-day scheduling, timed override, duty cycling, demand limiting, and chiller sequencing. A building owner can completely monitor the Series R CenTraVac chiller from the Tracer system, as all of the monitoring information indicated on the microcomputer can be read off the Tracer system display. In addition, all the powerful diagnostic information can be read back at the Tracer system. Best of all, this powerful capability comes over a single twisted pair of wires!

Microcomputer Controls

Interface With Other Control Systems

Series R® CenTraVac® chillers can interface with many different external control systems, from simple stand-alone units to ice making systems. For basic stand-alone applications, the interface with outside control is no different than for other Trane chillers. However the RTHB units have many features that can be used to interface with building control systems.

Standard Features

1

External Auto/Stop

A jobsite provided contact closure will turn the unit on and off.

2

Chilled Water and Condenser Water Pump Start

The RTHB has the capability to start both the chilled water and the condenser water pumps.

3

Chilled Water and Condenser Water Pump Interlock

A jobsite provided contact closure from a chilled water pump contactor, condenser water pump contactor or a flow switch will allow unit operation if a load exists. This feature will allow the unit to run in conjunction with the pump system.

4

External Interlock

A jobsite supplied contact opening wired to this input will turn the unit off and require a manual reset of the unit microcomputer. This closure is typically triggered by a jobsite supplied system such as a fire alarm.

5

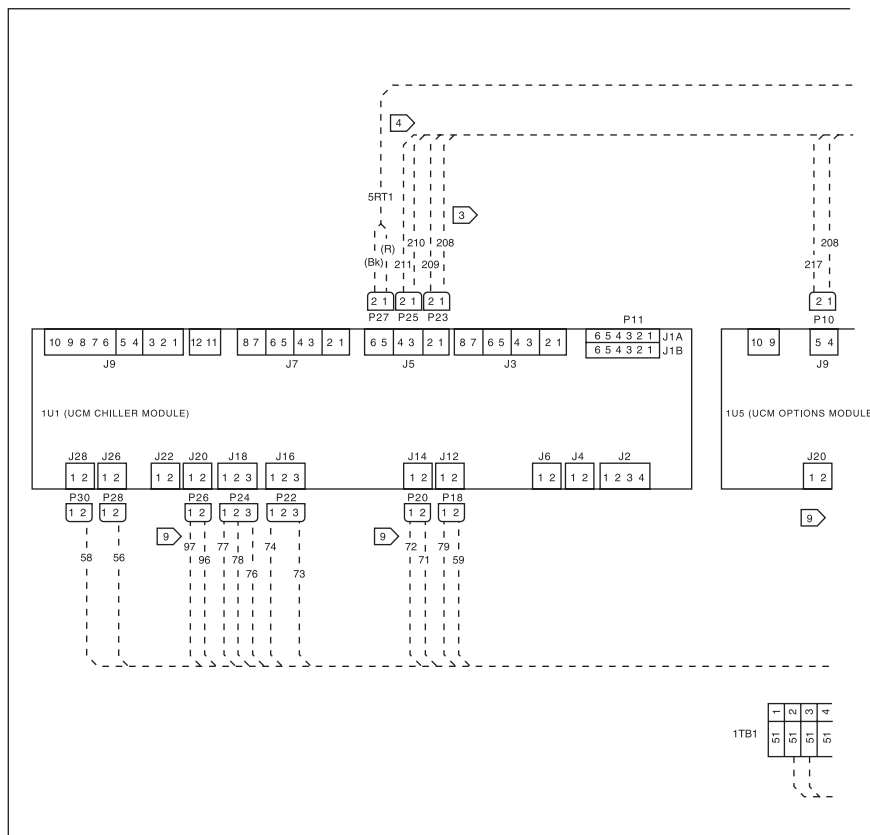
Chilled Water Reset

Chilled water reset based on return water temperature.



Typical Wiring Diagrams

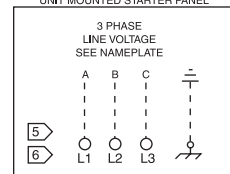
Model RTHB Chillers with Unit Mounted Starters



NOTES:

1. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. PHANTOM LINES INDICATE ALTERNATE CIRCUITRY OR AVAILABLE SALES OPTION. CHECK SALES ORDER TO DETERMINE IF WIRING IS REQUIRED FOR SPECIFIC OPTIONS.
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC), STATE AND LOCAL REQUIREMENTS, OTHER COUNTRIES APPLICABLE NATIONAL AND/OR LOCAL REQUIREMENTS SHALL APPLY.
3. P23 TERMINALS 1 & 2 (1U1J5-1 AND -2) MUST BE JUMPED IF NOT USED.
4. P23 TERMINALS 1 & 2 (1U1J5-3 AND -4) MUST BE JUMPED IF NOT USED.
5. RETIGHTEN TERMINALS A MINIMUM OF 24 HOURS AFTER INITIAL INSTALLATION, DO NOT OVER TIGHTEN.
6. COPPER WIRE, SIZED PER NEC, BASED ON UNIT NAMEPLATE MCA (MINIMUM CIRCUIT AMPACITY), PHASING OF 3 PHASE INPUT; L1 TO A, L2 TO B, L3 TO C WHERE ABC REPRESENTS STANDARD PHASE ROTATION.
7. 30V OR LESS #14 - 18 AWG 600V WIRE. DO NOT RUN IN CONDUIT WITH HIGHER VOLTAGE WIRE.
8. 115V AC, #14 AWG 600V WIRE.
9. FIELD WIRED ELECTRICAL LOADS ARE NOT TO EXCEED 120VAC/240VA FOR CONNECTIONS AT TERMINALS 1U1J12-1,2; 1U1J14-1,2; 1U1J16-1,3; 1U1J18-1,2,3; 1U1J20-1,2; 1U5J12-1,2; 1U5J18-1,3; AND 1U5J8-1,2.
10. NEGATIVE SIGNAL INPUTS ARE GROUNDED TO UCP2 ENCLOSURE, FOR CORRECT OPERATION, EXTERNAL EQUIPMENT SIGNALS SHALL BE ISOLATED OR FLOATING WITH RESPECT TO UCP2 ELECTRICAL SERVICE GROUND AND ISOLATED FROM EACH OTHER, SPECIAL CONSIDERATION MUST BE GIVEN TO 4-20 MA SIGNALS, IF THE CURRENT SOURCE REGULATES CURRENT FLOW ON THE NEGATIVE LEAD, USE A SEPERATE POWER SUPPLY FOR EACH CHANNEL IN SOME APPLICATIONS IT MAY BE NECESSARY TO INSTALL A LOOP ISOLATOR IN EACH CHANNEL TO PREVENT LOOP INTERFERENCE.
11. USE TWISTED SHIELDED PAIR 18 AWG WIRE, CONSULT SALES OFFICE FOR SELECTION.
12. 9 PIN SUB,D RS 232 CONNECTION, REFER TO IOM FOR ADDED REQUIREMENTS.
13. CONTACTS TO BE SUITABLE FOR USE WITH 24 Vdc, 12mo CIRCUIT.

UNIT MOUNTED STARTER PANEL



WARNING

HAZARDOUS VOLTAGE!
DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.
FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

AVERTISSEMENT

VOLTAGE HASARDEUX!
DECONNECTEZ TOUTES LES SOURCES ELECTRIQUES INCLUANT LES DISJONCTEURS SITUES A DISTANCE. AVANT D'EFFECTUER L'ENTRETIEN.
FAUTE DE DECONNECTER LA SOURCE ELECTRIQUE AVANT D'EFFECTUER L'ENTRETIEN PEUT ENTRAINER DES BLESSURES CORPORELLES SEVERES OU LA MORT.

IMPORTANT

USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.





Mechanical Specifications

General

Exposed metal surfaces are painted with an air-dry beige primer-finisher prior to shipment. Each unit ships with a full operating charge of refrigerant and oil. (Separable shell units may be shipped with or without refrigerant. See note under options section.) Molded neoprene isolation pads are supplied for placement under all support points. Start-up and operator instruction by factory trained service personnel is included.

Compressor-Motor

Semihermetic, direct-drive, 3600 rpm, rotary compressor with: capacity control slide valve, integral single-stage economizer, oil sump heater and differential pressure refrigerant oil flow system. Four pressure lubricated rolling element bearing groups support the rotating assembly.

Motor is a liquid refrigerant cooled, hermetically sealed, two-pole, squirrel cage induction motor.

Evaporator-Condenser

Shells are carbon steel plate. Evaporator and condenser are designed, tested and stamped in accordance with ASME Code for refrigerant side working pressure of 300 psig.

All tube sheets are carbon steel. Evaporator and condenser tubes are individually replaceable. Standard tubes are externally finned, internally enhanced seamless copper with lands at all tube sheets. Evaporator tubes are 1" diameter. Condenser tubes are 3/4" diameter. Tubes are mechanically expanded into tube sheets. Condenser tubes are mechanically fastened to tube supports. Condenser baffle prevents direct impingement of compressor discharge gas upon the tubes.

All water pass arrangements are available in either flat-faced flange (150 or 300 psig waterside) or condenser marine configuration with grooved connections (300 psig waterside). All connections may be either right or left handed. Waterside is hydrostatically tested at 1½ times design working pressure, but not less than 225 psig.

Refrigerant Circuit

A multiple orifice control system consisting of an electronically controlled expansion valve and a fixed orifice, maintains proper refrigerant flow.

Control Panel

Factory mounted microprocessor-based control panel. Automatic shutdown protection with manual reset is provided for low evaporator refrigerant temperature and pressure, high condenser refrigerant pressure, loss of condenser water flow, high motor temperature, low oil flow, motor current overload, phase reversal, phase loss, and severe phase imbalance. Automatic shutdown protection with automatic reset when condition is corrected is provided for loss of chilled water flow, high compressor discharge temperature, under/over voltage, and momentary power loss.

Sentinel™ Charge Monitoring System provides early detection and warning of refrigerant loss.

Microprocessor based chilled water reset based on return water is standard.

The unit control module (UCM) utilizing the Adaptive Control™ microprocessor automatically takes action to prevent unit shutdown due to abnormal operating conditions associated with low evaporator refrigerant temperature, high condensing temperature, and motor current overload. If the abnormal operating condition continues and the protective limit is reached, the machine will be shut down.

Clear Language Display Panel (UCM)

Factory mounted to the door of the control panel, the operator interface has a 16 button keypad for operator input and a two line by 40 character display screen. A chiller report, refrigerant report, compressor report, an operator configurable custom report, operator settings, service settings, service tests, and diagnostics may be accessed by pressing the appropriate button. All diagnostics and messages are displayed in "clear language."

Starter

NEMA 1 enclosure with top power wiring access and three-phase solid-state overload protection. Starters are available in Wye-Delta, solid-state and across-the-line configurations. Factory installed and wired 1KVA control power transformer provides all unit control power (120 volt secondary). Optional starter features include: Circuit breakers and mechanical non-fused disconnects.

OPTIONS:

Insulation: All low temperature surfaces are covered with ¾ inch Armaflex II or equal (k = 0.28), including the evaporator, water boxes and economizer lines.

Refrigerant Isolation Valve: Provide means of isolating refrigerant charge in the condenser during servicing.

Communications: Tracer® communications are available for Tracer) or Tracer Summit (Generic building automation system communications requires options module.)

Options Module: Accepts generic Building Automation System inputs for current limit setpoint and chilled water setpoint via 2-10 VDC or 4-20 mA. Outputs a 2-10 VDC or 4-20 mA signal to Generic BAS to monitor compressor % RLA. Outputs a binary signal to Generic BAS for use with condenser limit control. Allows remote enable/disable of ice making operation. (Ice making requires options module.)

Separable Shells: Allow chiller disassembly into individual components for tight installation requirements. (Isolation valves must be ordered separately if refrigerant is required to ship with unit.)

Printer Interface Module: Allows a printer to be directly connected to the UCP2 via an RS-232 port.

Under/over Voltage Protection: Volts display on micro.

Condenser Marine Water Boxes: Allow easy access for tube cleaning.

Condenser Tubes: Smooth bore copper, smooth bore 90/10, cupro-nickel.

Icemaking Controls: Icemaking thermal storage can be utilized at night for reduced peak electrical demand. (Requires Options Module.)

Chilled water reset based on outdoor air temperature.

Mechanical Specifications

OPTIONS:

Insulation

All low temperature surfaces are covered with $\frac{3}{4}$ -inch Armaflex II or equal ($K = 0.28$), including the evaporator, water boxes, and economizer lines.

Smooth Bore Condenser Tubes

Smooth bore copper tubes are available for high fouling water applications. Smooth bore condenser tubes are $\frac{3}{4}$ " diameter and are .035 WOF.

Cupro-Nickel Tubes (Condenser Only)

Cupro-nickel tubes (condenser only) are available for special applications on standard ship cycles. 90/10 cupro-nickel tubes are $\frac{3}{4}$ " diameter and .035 WOF.

Condenser Marine Water Boxes

Allows for easy cleaning and maintenance of both the evaporator and condenser tubes by providing an easy access without removal of water piping.

Standard Ice Making

Controls and safeties to allow operation with brine temperatures greater than or equal to 20 F. Includes dual setpoints for ice making capability and daytime comfort cooling. A typical application would include ice storage system with daytime chiller operation above 40 F. (Requires Options Module.)

Separable Shells

This option gives the installer the flexibility of taking apart the unit, reducing the overall weight and size, and making installation much easier. Units ship assembled, with or without refrigerant. Units ordered without refrigerant isolation valve option will be shipped less refrigerant.

Options Module

Accepts generic Building Automation System inputs for current limit setpoint and chilled water setpoint via 2-10 VDC or 4-20 mA. Outputs a 2-10 VDC or 4-20 mA signal to Generic BAS to monitor compressor % RLA. Outputs a binary signal to Generic BAS for use with condenser limit control. Allows remote enable/disable of ice making operation. (Ice making requires options module.)

Communications

Tracer® communications are available for Tracer or Tracer Summit. (Generic Building Automation System communications requires Options Module.)

The Trane Company
3600 Pammel Creek Road
La Crosse, WI 54601-7599
www.trane.com
An American Standard Company

Since The Trane Company has a policy of continuous product improvement, it reserves the right to change design and specification without notice.

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