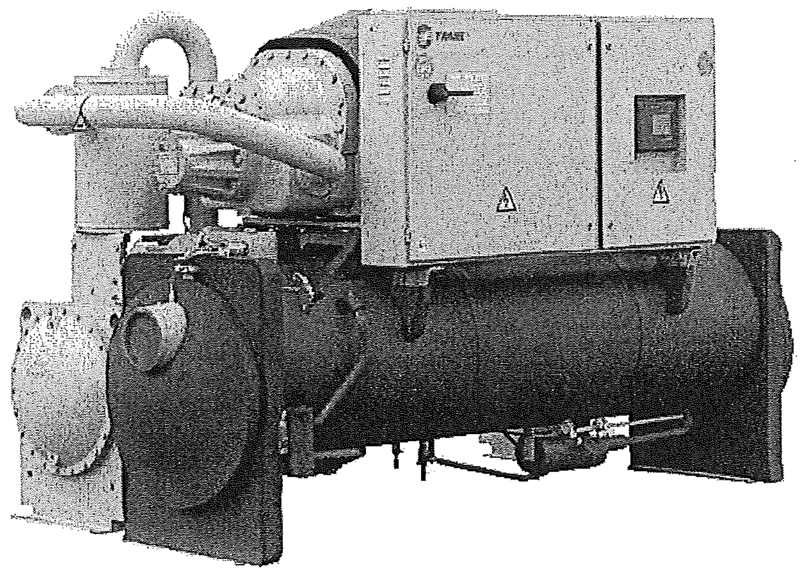
Installation
Operation
Maintenance

RTHD
Water-cooled
Helical-rotary chillers
550 -1600 kW



RLC-SVX05B-E4

Important Notice

Personal Protection

- Safety glasses with side shields before entering construction sites or manufacturing areas.
- Goggles and gloves when handling chemicals and when welding, cutting, brazing or grinding.
- Hard hat wherever there is potential danger from falling or flying objects.
- Gloves before touching any part of the machine that is operating or one that has recently been shut down. Assume that metal is hot.
- Hearing protection.
- Safety shoes.

Pressure Vessel

Do not attempt to remove fittings and covers or break lines while the machine is under pressure or while it is running. Do not weld or flamecut any vessel or line until all refrigerant has been removed. Do not use oxygen to purge lines, leak test, or pressurize a machine. Do not pressure test any vessel at its design pressure (found on the equipment nameplate). Testing of the pressures must be done in a special enclosure or by using hydraulic; refer to national regulation.

Refrigerant Emission Control

In respect of the environment, all service operation must use recovery systems to minimize losses of refrigerant to the atmosphere when servicing units with HFC refrigerants. Leak check and inspect all relief devices in accordance with national regulation.

Handling Refrigerant

Heavy concentration of refrigerant within a confined area can displace enough oxygen to cause suffocation. Do not weld or flamecut in an atmosphere containing refrigerant vapor until the area has been well ventilated. Avoid breathing refrigerant fumes.

Hazardous Voltage

Disconnect and lockout or tagout all electrical power, including remote disconnects before servicing. Trane assumes no liability for installation or service procedures performed by unqualified personnel.

Contents

General Information

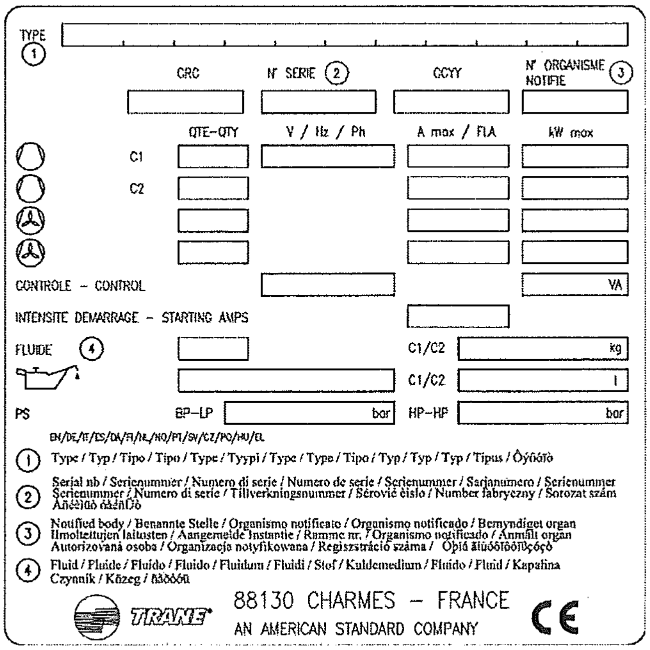
This manual describes installation, operation, and maintenance of RTHD units.

Unit Identification - Nameplates

When the unit arrives, compare all nameplate data with ordering, submittal, and shipping information.

A typical unit nameplate is shown in Figure 1.

Figure 1 - Typical Unit Nameplate



General Information

Unit Inspection

When the unit is delivered, verify that it is the correct unit and that it is properly equipped. Inspect all exterior components for visible damage. Report any apparent damage or material shortage to the carrier and make a "unit damage" notation on the carrier's delivery receipt. Specify the extent and type of damage found and notify the appropriate Sales Office. Do not proceed with installation of a damaged unit without sales office approval.

This chiller was performance tested before shipment. The water boxes drain plugs were withdrawn to avoid stagnation of the water and possible freeze-up inside the tube bundle. Rust-coloured stains may be present and are completely normal, but they must be wiped off at the time of reception.

Inspection Checklist

To protect against loss due to damage incurred in transit, complete the following checklist upon receipt of the unit:

- Inspect the individual pieces of the shipment before accepting the unit. Check for obvious damage to the unit or packing material.
- Inspect the unit for concealed damage as soon as possible after delivery and before it is stored. Concealed damage must be reported within 72 hours after receipt and confirmed by registered delivery to the carrier and the sales office.
- If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- Notify the sales representative and arrange for repair. Do not repair the unit, however, until damage is inspected by the carrier's representative.

Loose Parts Inventory

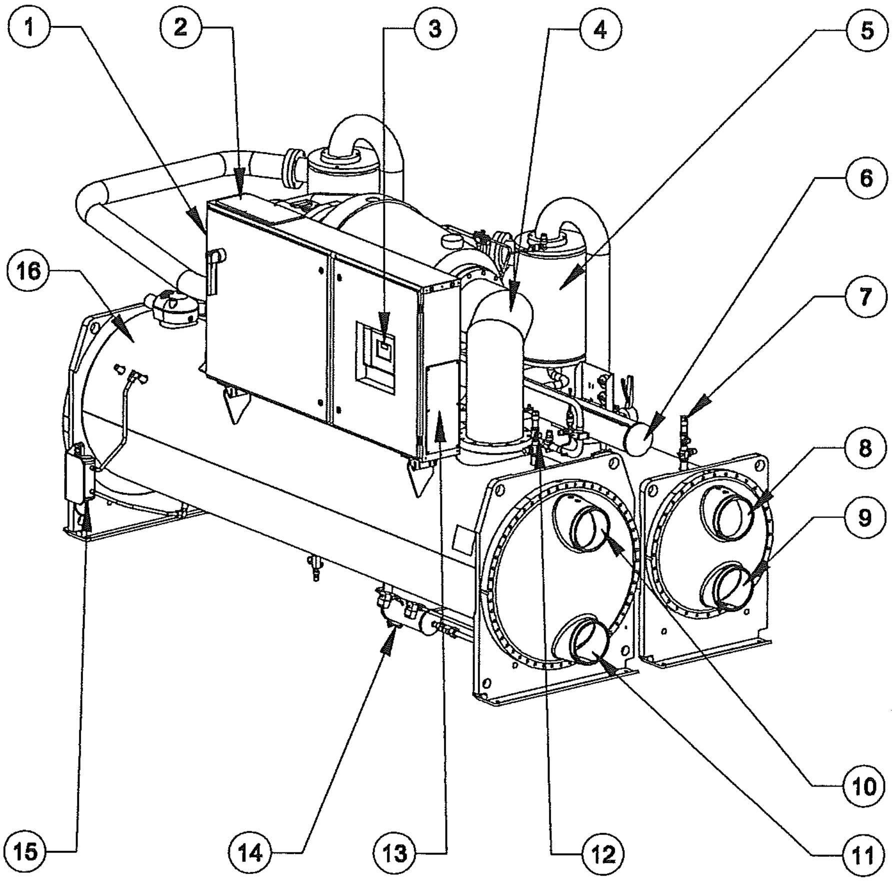
Check all items against the shipping list. Water flow switch (optional), water vessel drain plugs, isolation pads, rigging and electrical diagrams, and service literature are shipped in the starter control panel.

Unit Description

The RTHD units are single compressor, helical-rotary type, water-cooled liquid chillers designed for installation indoors. Each unit is a completely assembled, hermetic package that is factory-piped, wired, leak-tested, dehydrated, charged (refrigerant R134a or nitrogen), and tested for proper control operation before shipment. Figure 2 and Figure 3 show a typical RTHD unit and its components. Water inlet and outlet openings are covered before shipment. The oil tank is factory charged with the proper amount of refrigeration oil if the unit is factory charged with refrigerant R134a.

General Information

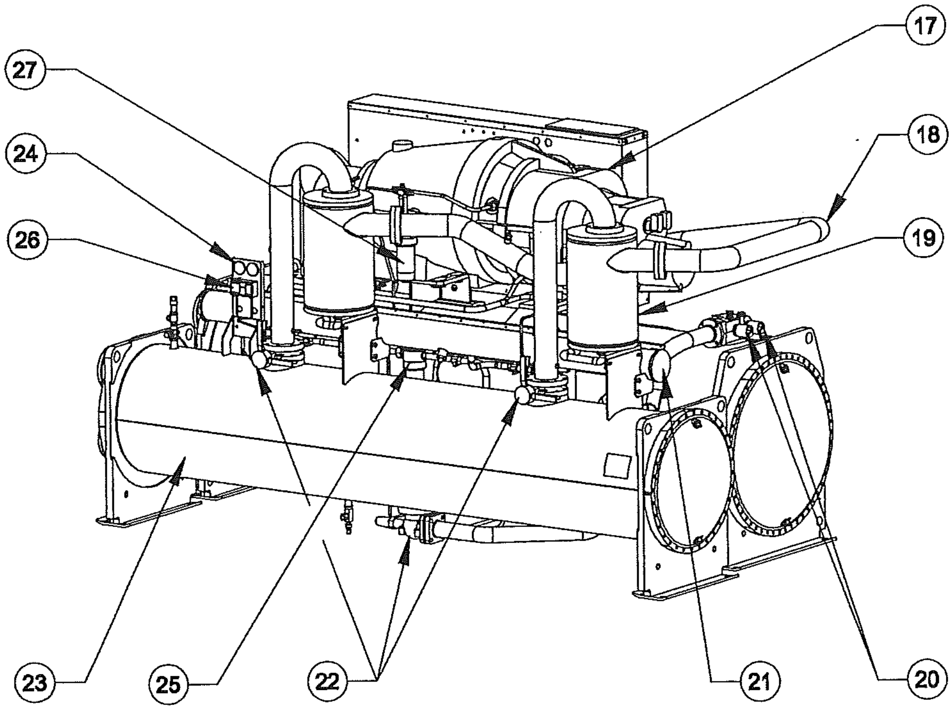
Figure 2 - Component Location for Typical RTHD Unit



1 = Starter/control panel
2 = Power cable gland plate for customer wiring
3 = DynaView interface
4 = Suction line
5 = Oil separator
6 = Oil sump
7 = HP relief valve (with refrigerant isolation valve option only)
8 = Condenser water outlet
9 = Condenser water inlet
10 = Evaporator water outlet
11 = Evaporator water inlet
12 = LP relief valve
13 = External control wiring cable gland plate for customer wiring
14 = Gas pump
15 = Liquid level sensor
16 = Evaporator

General Information

Figure 3 - Component Location for Typical RTHD Unit (Back View)



17 = Compressor
18 = Discharge line
19 = Unit nameplate (on side of starter/control panel)
20 = EXV
21 = Oil sump (the oil distribution system is located between the condenser and the evaporator
22 = Service valves (with refrigerant isolation valve option only)
23 = Condenser
24 = Pressure gauges
25 = Hot oil filter
26 = 2-stage high pressure cutout switch
27 = Cold oil filter

General Information

Installation Overview

Table 1 summarizes responsibilities that are typically associated with the RTHD chiller installation process.

- Locate and maintain the loose parts. Loose parts are located in the control panel.
- Install the unit on a foundation with flat support surfaces, level within 6 mm and of sufficient strength to support concentrated loading. Place the manufacturer-supplied isolation pad assemblies under the unit.
- Install the unit per the instructions outlined in the "Mechanical Installation" section.
- Complete all water piping and electrical connections.

Note: Field piping must be arranged and supported to avoid stress on the equipment. It is strongly recommended that the piping contractor provide at least 1m of clearance between the pre-installation piping and the planned location of the unit.This will allow for proper fit-up upon arrival of the unit at the installation site. All necessary piping adjustments can be made at that time

- Where specified, supply and install valves in the water piping upstream and downstream of the evaporator and condenser water boxes, to isolate the shells for maintenance and to balance/trim the system.
- Supply and install flow switches or equivalent devices in both the chilled water and condenser water piping. Interlock each switch with the proper pump starter and CH.530, to ensure that the unit can only operate when water flow is established.
- Supply and install taps for thermometers and pressure gauges in the water piping, adjacent to the inlet and outlet connections of both the evaporator and the condenser.
- Supply and install drain valves on each water box.
- Supply and install vent cocks on each water box.
- Where specified, supply and install strainers ahead of all pumps and automatic modulating valves.
- Supply and install refrigerant pressure relief piping from the pressure relief to the atmosphere.
- Start the unit under supervision of a qualified service technician.
- Where specified, supply and insulate the evaporator and any other portion of the unit, as required, to prevent sweating under normal operating conditions.
- For unit-mounted starters, cutouts are provided at the top of the panel for line-side wiring.
- Supply and install the wire terminal lugs to the starter.
- Supply and install field wiring to the line-side lugs of the starter.

General Information

Table 1 - Installation Responsibility

Requirement	Trane supplied Trane installed	Trane supplied Field installed	Field supplied Field installed
Rigging			- Safety chains - Lifting beam
Isolation		- Isolation pads	
Electrical	- Circuit breakers	- Flow switches(may be field supplied)	- Circuit breakers or fusible disconnect - Customer's starter panel - BAS wiring - Control voltage wiring - Water pump contactor
Water piping		- Flow switches(may be field supplied)	-Thermometers - Water flow pressure gauges - Isolation and balancing valves water piping - Vents and drain valves - Pressures relief valves for water side
Pressure relief	- Relief valves		- Vent line
Insulation	- Insulation(optional)		- Insulation

General Information

General Data

Compressor		B1	B1	B2	B2	C1	C1	C1	C2	C2	C2	D1	D1	D1	D2	D2	D2	D3	D3	D3	E3	E3	E3
Evaporator		B1	C1	B1	C1	D6	D5	D3	D6	D5	E1	D4	D3	G1	D1	F1	G2	D1	F1	G2	D2	F2	G3
Condenser		B1	D1	B1	D1	E5	E4	E3	E5	E4	F1	E4	E3	G1	E1	F2	G1	E1	F2	G2	E2	F3	G3
Evaporator																							
Water volume (total)	l	155	208	155	208	170	197	295	170	197	310	197	295	515	261	386	545	261	386	545	280	405	602
Minimum flow rate 2 Pass	l/s	16	20	16	20	18	22	31	18	22	28	22	31	/	26	36	/	26	36	/	28	38	/
Maximum flow rate 2 pass	l/s	70	89	70	89	81	97	134	81	97	125	97	134	/	114	156	/	114	156	/	125	168	/
Minimum flow rate 3 Pass	l/s	11	13	11	13	12	15	20	12	15	19	15	20	32	17	24	35	17	24	35	19	25	39
Maximum flow rate 3 pass	l/s	46	59	46	59	54	65	90	54	65	83	65	90	140	76	104	152	76	104	152	83	112	172
Minimum flow rate 4 Pass	l/s	8	10	8	10	9	11	15	9	11	14	11	15	24	13	18	26	13	18	26	14	19	29
Maximum flow rate 4 pass	l/s	35	44	35	44	41	49	67	41	49	62	49	67	105	57	78	114	57	78	114	62	84	129
Minimum flow rate 6 Pass	l/s	/	/	/	/	/	/	/	/	/	/	/	/	19	/	/	21	/	/	21	/	/	23
Maximum flow rate 6 pass	l/s	/	/	/	/	/	/	/	/	/	/	/	/	70	/	/	76	/	/	76	/	/	86
Condenser																							
Water volume (total)	l	106	117	106	117	110	121	178	110	121	226	121	178	299	166	216	299	166	216	344	178	231	367
Minimum flow rate 2 Pass	l/s	12	12	12	12	13	15	21	13	15	24	15	21	28	18	22	28	18	22	34	20	24	37
Maximum flow rate 2 pass	l/s	54	54	54	54	57	68	90	57	68	104	68	90	124	81	98	124	81	98	149	88	107	164
Oil Volume (total) (1)	l	17	17	17	17	23	23	23	23	23	38	23	23	42	23	38	42	23	38	42	23	38	42
Refrigerant Charge R134A	kg	186	222	186	222	222	222	222	222	222	238	222	222	318	215	284	318	215	284	318	215	284	318
Sound pressure level @ 1 meter	dB(A)	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5	79.5	78	78	78	78	78	78	78	78	78	82	82	82
Dimensions (2)																							
Height	mm	1850	1850	1850	1850	1940	1940	1940	1940	1940	1940	1940	1940	2035	1940	1940	2035	1940	1940	2035	1940	1940	2035
Length	mm	3175	3632	3175	3632	3277	3277	3277	3277	3277	3683	3404	3404	3886	3404	3785	3886	3404	3785	3886	3480	3785	3886
Width	mm	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1755	1600	1600	1755	1600	1600	1755	1600	1600	1755
Shipping Weight (3)	kg	4215	4462	4215	4462	5797	5884	6351	5797	5884	6639	5883	6351	8129	6551	7353	8516	6551	7353	8666	6676	7690	8913
Operating Weight (3) (4)	kg	4476	4787	4476	4787	6077	6202	6824	6077	6202	7175	6201	6824	8943	6978	7955	9360	6978	7955	9555	7134	8326	9882

(1) If oil cooler is installed, add 1 liter to the oil charge value given for B family units; add 4 liters for all other units.
(2) Overall dimensions are based on 3-pass evap/2 pass cond and LH/RH water connections, except for DGG/EGG: 4 passes evap / 2 passes cond. Refer to submittals for exact job configurations
(3) All weights ±3%, include standard 10 bar water boxes.
(4) Operating weights include refrigerant, oil, and water charges

Installation - Mechanical

Storage

If the chiller is to be stored more than one month prior to installation, observe the following precautions:

- Do not remove the protective coverings from the electrical panel.
- Store the chiller in a dry, vibration-free, secure area.
- At least every three months, attach a gauge and manually check the pressure in the refrigerant circuit. If the refrigerant pressure is below 5 bar at 21°C (3 bar at 10 °C), call a qualified service organization and the appropriate Trane sales office.

NOTE: Pressure will be approximately 1.0 bar if shipped with the optional nitrogen charge.

Noise Considerations

- Refer to Engineering Bulletin for sound consideration applications.
- Locate the unit away from sound-sensitive areas.
- Install the isolation pads under the unit. Refer to "Unit Isolation."
- Install rubber vibration isolators in all water piping.
- Use flexible electrical conduit for final connection to the CH.530.
- Seal all wall penetrations.

NOTE: Consult an acoustical engineer for critical applications.

Foundation

Provide rigid, non-warping mounting pads or a concrete foundation of sufficient strength and mass to support the chiller operating weight (including completed piping and full operating charges of refrigerant, oil and water).

Refer to Table 8 for unit operating weights.

Once in place, level the chiller within 6 mm over its length and width.

The manufacturer is not responsible for equipment problems resulting from an improperly designed or constructed foundation.

Vibration Eliminators

- Provide rubber boot type isolators for all water piping at the unit.
- Provide flexible conduit for electrical connections to the unit.
- Isolate all pipe hangers and be sure they are not supported by main structure beams that could introduce vibration into occupied spaces.
- Make sure that the piping does not put additional stress on the unit.

NOTE: Do not use metal braided type eliminators on the water piping. Metal braided eliminators are not effective at the frequencies at which the unit will operate.

Clearances

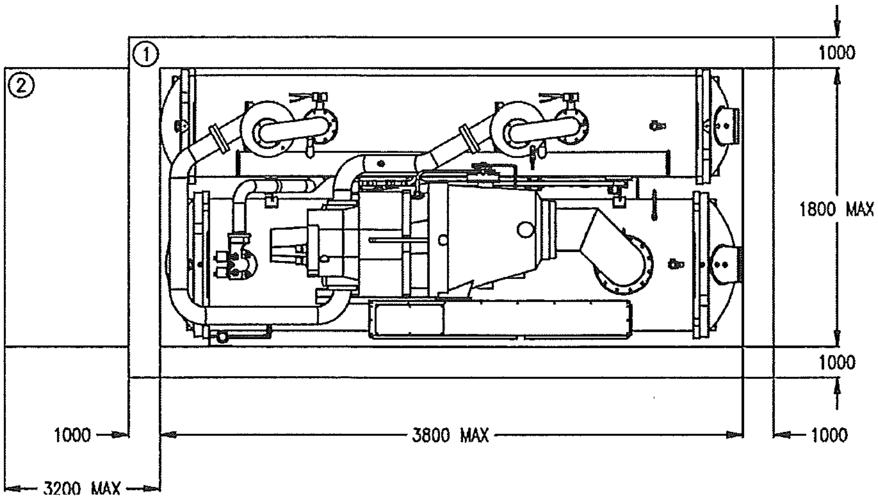
Provide enough space around the unit to allow the installation and maintenance personnel unrestricted access to all service points. A minimum of 1 m is recommended for compressor service and to provide sufficient clearance for the opening of control panel doors. Refer to Figure 4 for minimum clearances required for condenser or evaporator tube service. In all cases, local codes will take precedence over these recommendations. If the room configuration requires a variance to the clearance dimensions, contact your sales representative.

NOTE: Required vertical clearance above the unit is 1 m. There should be no piping or conduit located over the compressor motor.

NOTE: Maximum clearances are given. Depending on the unit configuration, some units may require less clearance than others in the same category.

Installation - Mechanical

Figure 4 - Recommended clearances



1 = Service clearance

2 =Tube removal clearance

Ventilation

The unit produces heat even though the compressor is cooled by the refrigerant. Make provisions to remove heat generated by unit operation from the equipment room. Ventilation must be adequate to maintain an ambient temperature lower than 50°C. Vent the evaporator, condenser and compressor pressure relief valves in accordance with all local and national codes. Refer to "Pressure Relief Valves". Make provisions in the equipment room to keep the chiller from being exposed to ambient temperatures below 10°C.

Water Drainage

Locate the unit near a large capacity drain for water vessel drain-down during shutdown or repair. Condensers and evaporators are provided with drain connections. Refer to "Water Piping." All local and national codes apply.

Access Restrictions

Door clearances for the RTHD units are given on pages 18-23. Refer to the unit submittals for specific dimensional information.

Lifting Procedure

WARNING

Heavy Equipment!
Always use lifting equipment with a capacity exceeding unit lifting weight by an adequate safety factor (+10%). Follow the procedures and diagrams in this manual and in the submittal. Failure to do so can result in death personal injury.

CAUTION

Equipment Damage!
Never use a forklift to move the unit. The skid is not designed to support the unit at any one point and using a forklift to move the equipment may cause unit damage. Always position the lifting beam so that cables do not contact the unit. Failure to do so may result in unit damage.

Installation - Mechanical

NOTE: If absolutely necessary, the chiller can be pushed or pulled across a smooth surface if it is bolted to wood shipping mounts.

WARNING

Shipping Mounts!

Do not use the threaded holes in the compressor to lift or assist in lifting the unit. They are not intended for that purpose. Do not remove the wood mounts (option) until the unit is in its final location. Removal of wood shipping mounts prior to unit final locating could result in death or serious injury or equipment damage.

1. When the unit is at its final location, remove the shipping bolts that secure the unit to the wood base mounts (option).
2. Rig the unit properly and lift from above or jack the unit (alternate moving method). Use the points shown on the rigging diagram that ships with the unit as shown in Figure 5. Remove the base mounts.
3. Install clevis connectors in lifting holes provided on the unit. Attach lifting chains or cables to clevis connectors as shown in Figure 5. Each cable alone must be strong enough to lift the chiller.
4. Attach cables to lifting beam. Total lifting weight, lifting weight distribution and required lifting beam dimensions are shown in the rigging diagram shipped with each unit and in Figure 5. The lifting beam crossbar must be positioned so the lifting cables do not contact unit piping or electrical panel enclosure.
5. Connect an anti-rotation strap or cable loosely between the lifting beam and the threaded coupling or eyelet provided at the top of the compressor. Use an eyebolt or clevis to secure the strap at the coupling or eyelet.

NOTE: The anti-rotation strap is not a lifting chain, but a safety device to ensure that the unit cannot tilt during lifting.

Alternate Moving Method

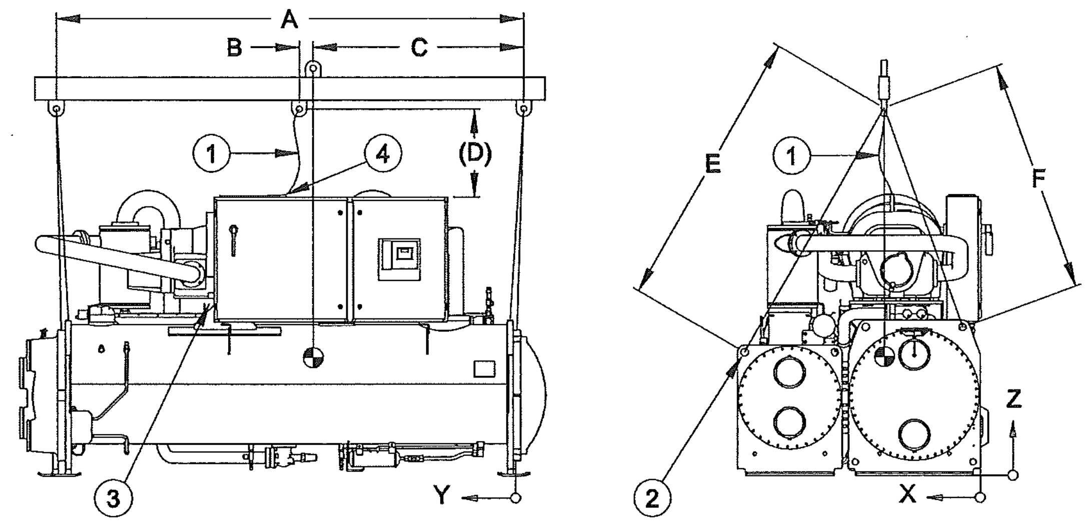
If it is not possible to rig from above as shown in the figures, the unit may also be moved by jacking each end high enough to move an equipment dolly under each tube sheet support. Once securely mounted on the dollies, the unit may be rolled into position.

WARNING

Connect an anti-rotation strap between the lifting beam and compressor before lifting unit. Failure to do so may result in death or serious injury should a lifting cable fail.

Installation - Mechanical

Figure 5



1 = Anti-rotation cable
2 = ø 55 mm lifting holes
3 = Unit model number location
4 = M16 internal thread

Table 2 - Weights and Rigging

Unit Configuration*	Lifting Weight (kg)	Dimension (mm)						CENTER OF GRAVITY (mm)		
		A	B	C	(D)	E(2x)	F(2x)	X	Y	Z
B1 B1	4215	2100	103	1153	600	1900	1650	581	1476	902
B1 C1 D1	4462	2100	99	925	600	1950	1700	568	1480	853
B2 B1 B1	4215	2100	103	1153	600	1900	1650	581	1476	902
B2 C1 D1	4462	2100	99	925	600	1950	1700	568	1480	853
C1 D6 E5	5797	2100	226	1198	600	1900	1650	662	1521	1022
C1 D5 E4	5884	2100	226	1198	600	1900	1650	662	1521	1022
C1 D3 E3	6351	2100	226	1198	600	1900	1650	662	1521	1022
C2 D6 E5	5797	2100	226	1198	600	1900	1650	662	1521	1022
C2 D5 E4	5884	2100	226	1198	600	1900	1650	662	1521	1022
C2 E1 F1	6639	1900	136	957	600	1950	1750	670	1612	1040
D1 D4 E4	5883	2100	226	1198	600	1900	1650	662	1521	1022
D1 D3 E3	6351	2100	226	1198	600	1900	1650	662	1521	1022
D2 D1 E1	6551	2100	226	1198	600	1900	1650	662	1521	1022
D3 D1 E1	6551	2100	226	1198	600	1900	1650	662	1521	1022
D2 F1 F2	7353	1900	41	956	600	1950	1750	703	1611	970
D3 F1 F2	7353	1900	41	956	600	1950	1750	703	1611	970
D1 G1 G1	8129	3500	38	1760	600	1950	1650	783	1615	954
D2 G2 G1	8516	3500	38	1760	600	1950	1650	783	1615	954
D3 G2 G2	8666	3500	38	1760	600	1950	1650	783	1615	954
E3 D2 E2	6676	2100	226	1198	600	1900	1650	662	1521	1022
E3 F2 F3	7690	1900	41	956	600	1950	1750	703	1611	970
E3 G3 G3	8913	3500	38	1760	600	1950	1650	783	1615	954

*Designator corresponds to digits 6, 7, 14, 15, 21, 22 of model number

Installation - Mechanical

Isolation Pads

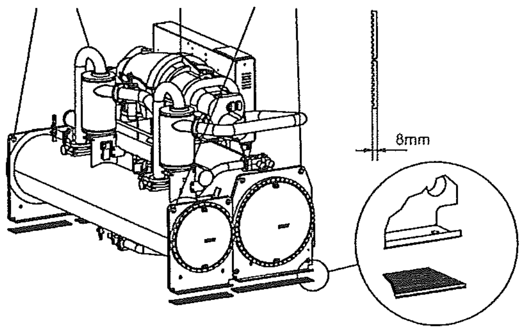
The elastomeric pads shipped (as standard) are adequate for most installations. For additional details on isolation practices, consult an acoustical engineer for sensitive installations.

7. During final positioning of the unit, place the isolation pads under the evaporator and condenser tube sheet supports as shown in Figure 6. Level the unit.

8. The unit is shipped with 5 spacers (only 3 on B family) on the compressor mount that protect the compressor isolation pads during shipping and in handling. Remove these spacers (Figure 7, 8) before the unit is operated.

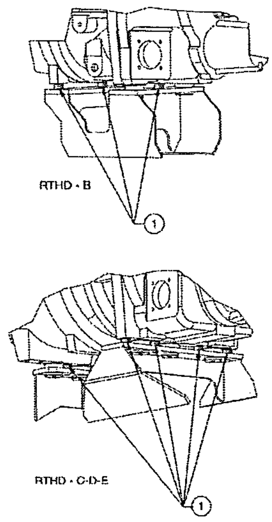
9. Remove the shipping brackets from the bottom sides of the oil separator(s) (Figure 8).

Figure 6



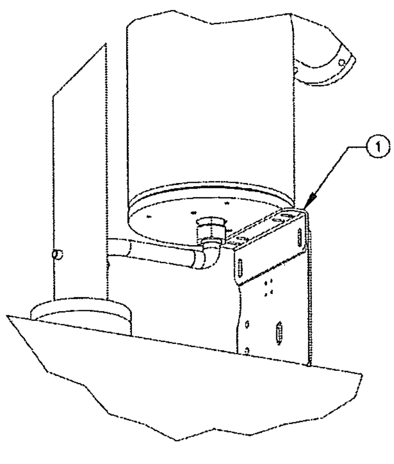
NOTE: Once shipping bracket(s) is removed, the oil separator is only supported by the discharge line.

Figure 7



1= Spacer to be removed

Figure 8



1 = Shipping bracket to be removed

Installation - Mechanical

Unit Leveling

NOTE: The electrical panel side of the unit is designated as the "front " of the unit.

1. Check unit level end-to-end by placing a level on the top surface of the evaporator shell.
2. If there is insufficient surface available on the top of the evaporator shell, attach a magnetic level to the bottom of the shell to level the unit. The unit should be level to within 6 mm over its length.
3. Place the level on the evaporator shell tube sheet support to check side-to-side (front-to-back) level. Adjust to within 6 mm of level front-to-back. NOTE: The evaporator MUST be level for optimum heat transfer and unit performance.
4. Use full-length shims to level the unit.

Installation - Mechanical

Water Piping

Piping Connections

To prevent equipment damage, bypass the unit if using an acidic flushing agent.

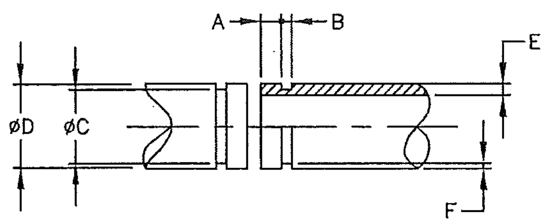
Make water piping connections to the evaporator and condenser. Isolate and support piping to prevent stress on the unit. Construct piping according to local and national codes. Insulate and flush piping before connecting to unit.
Use grooved pipe connectors for all water piping connections (refer to Figure 9). Evaporator and condenser water inlet and outlet sizes and locations are shown by the unit submittals .The designation in the tables corresponds to the compressor frame code followed by the evaporator shell code followed by the condenser shell code.

Reversing Water Boxes

All water boxes may be reversed end-for-end. Do not rotate water boxes. Remove the sensors from the wells before removing the water box. Complete the water box switch procedure and replace the sensors. If the water boxes are reversed, be sure to properly rewire the sensors to the CH.530 bus.

Note: Be certain to replace water boxes right-side-up to maintain proper baffle orientation. Use new o-rings

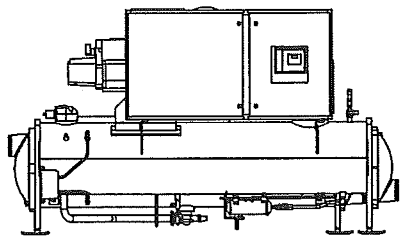
Figure 9 - Dimension of tube stub for grooved connection

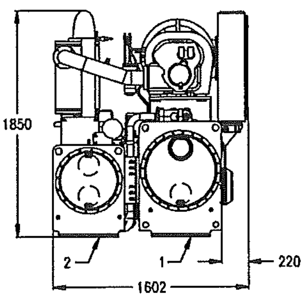


Ø D	A ± 0.8	B± 0.8	C + 0 -0.7	E MINI	F
6" (168.3)	15.87	9.52	164	5.56	2.15
8" (219.1)	19.05	11.11	214.4	6.04	2.34

Installation - Mechanical

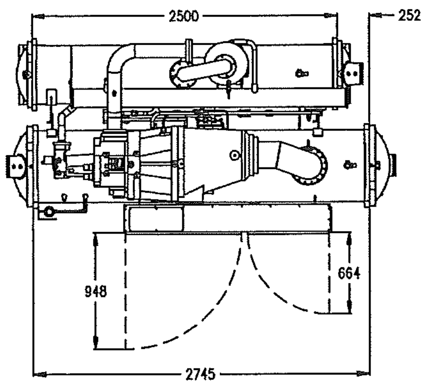
RTHD B1 B1 B1 / B2 B1 B1
Note: Connection configuration is available left or right hand.





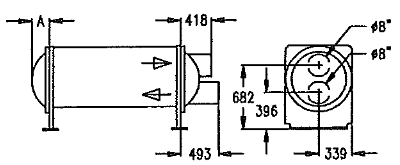
1 = Evaporator
2 = Condenser

Left hand

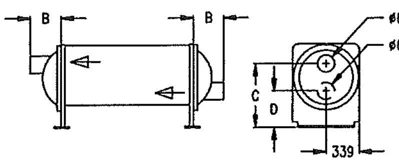


Right hand

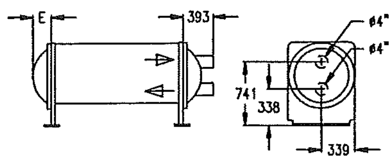
Evaporator 2 passes (option)
Right hand



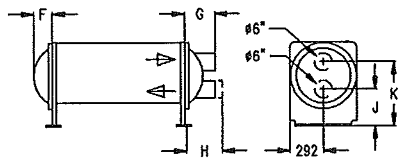
Evaporator 3 passes (standard)
Right hand



Evaporator 4 passes (option)
Right hand



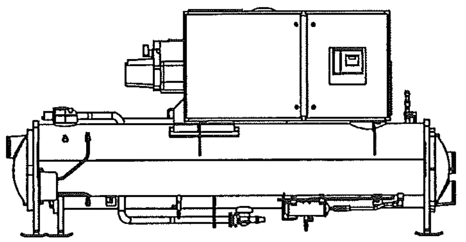
Condenser 2 passes (standard)
Right hand

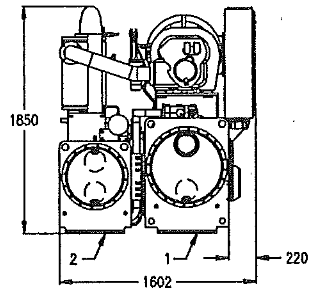


WATER BOXTYPE	A	B	C	D	E	F	G	H	J	K
10 bar	168	213	726	352	168	123	203	203	334	588
21 bar	183	418	711	367	183	148	283	358	348	575

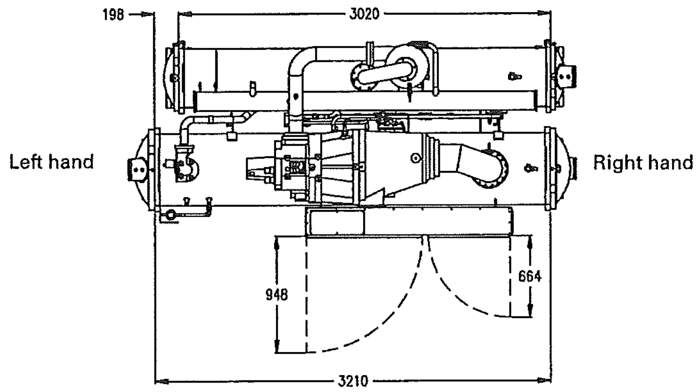
Installation - Mechanical

RTHD B1 C1 D1 / B2 C1 D1
Note: Connection configuration is available left or right hand.

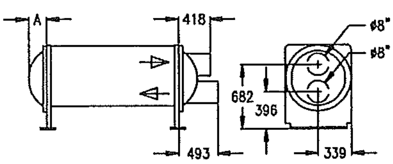




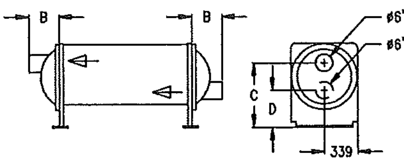
1 = Evaporator
2 = Condenser



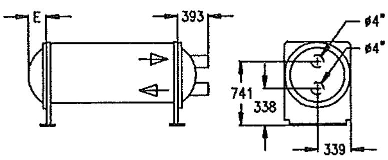
Evaporator 2 passes (option)
Right hand



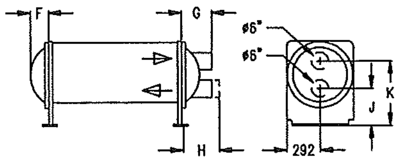
Evaporator 3 passes (standard)
Right hand



Evaporator 4 passes (option)
Right hand



Condenser 2 passes (sandard)
Right hand

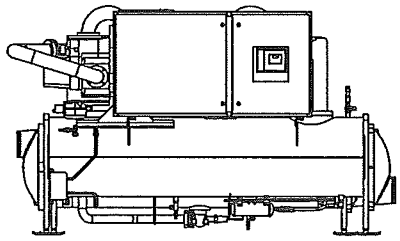


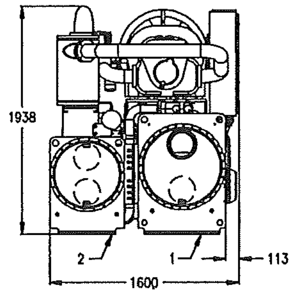
WATER BOXTYPE	A	B	C	D	E	F	G	H	J	K
10 bar	168	213	726	352	168	123	203	203	334	588
21 bar	183	418	711	367	183	148	283	358	348	575

Installation - Mechanical

RTHD
C1 D6 E5 / C1 D5 E4
C1 D3 E3 / C2 D6 E5
C2 D5 E4 / D1 D4 E4
D1 D3 E3 / D2 D1 E1
D3 D1 E1 / E3 D2 E2

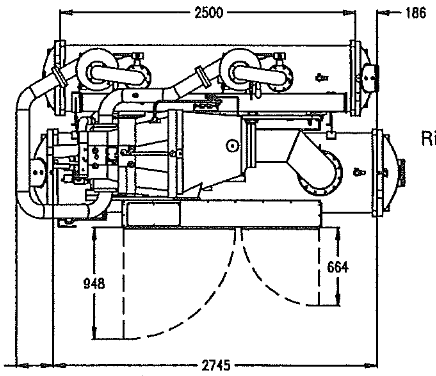
Note: Connection configuration is available left or right hand.





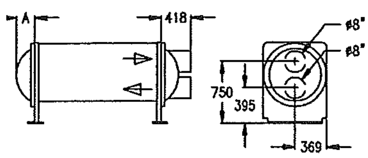
1 = Evaporator
2 = Condenser

Left hand

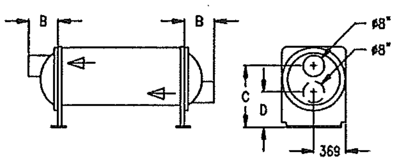


Right hand

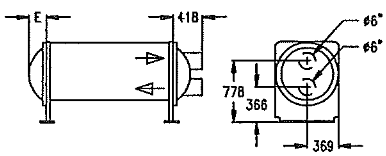
Evaporator 2 passes (option)
Right hand



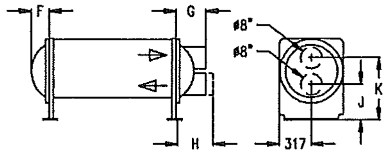
Evaporator 3 passes (standard)
Right hand



Evaporator 4 passes (option)
Right hand



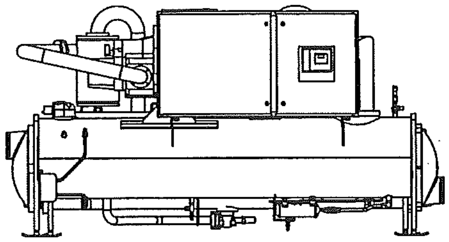
Condenser 2 passes (standard)
Right hand

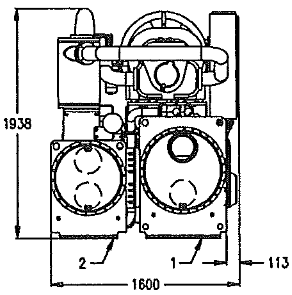


WATER BOXTYPE	A	B	C	D	E	F	G	H	J	K
10 bar	173	230	766	378	173	150	199	199	359	657
21 bar	183	418	750	395	183	178	323	398	373	643

Installation - Mechanical

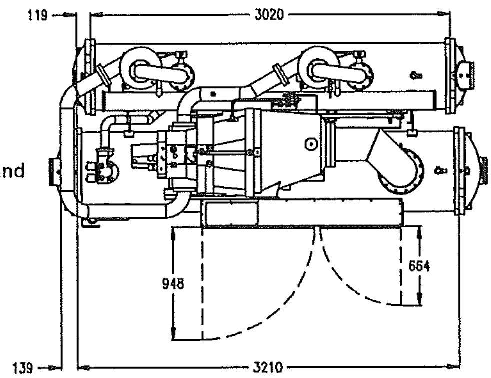
RTHD C2 E1 F1
Note: Connection configuration is available left or right hand.





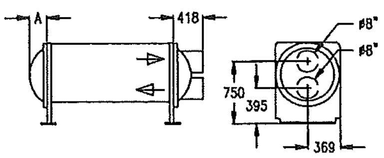
1 = Evaporator
2 = Condenser

Left hand

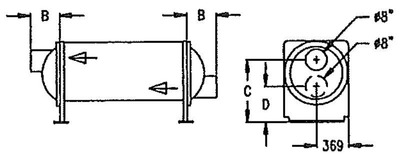


Right hand

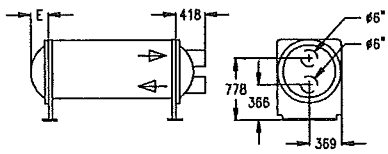
Evaporator 2 passes (option)
Right hand



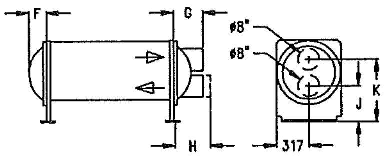
Evaporator 3 passes (standard)
Right hand



Evaporator 4 passes (option)
Right hand



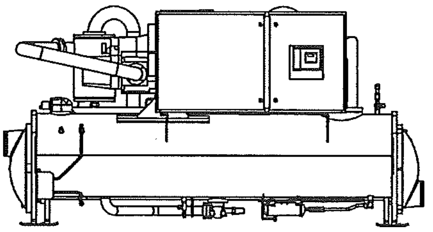
Condenser 2 passes (standard)
Right hand

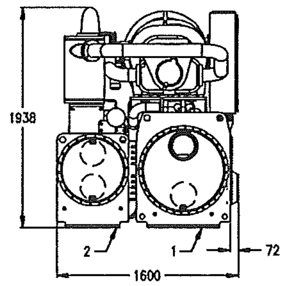


WATER BOXTYPE	A	B	C	D	E	F	G	H	J	K
10 bar	173	230	766	378	173	150	199	199	359	657
21 bar	183	418	750	395	183	178	323	398	373	643

Installation - Mechanical

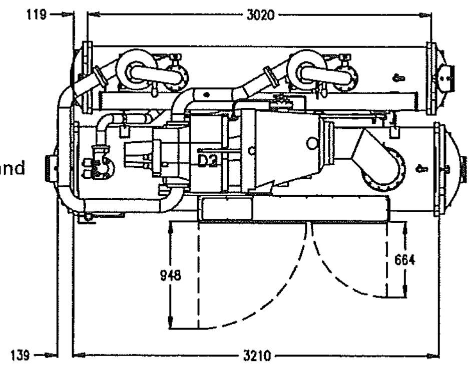
RTHD
D2 F1 F2
D3 F1 F2
E3 F2 F3
Note: Connection configuration is available left or right hand.





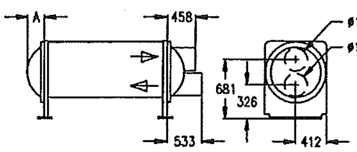
1 = Evaporator
2 = Condenser

Left hand

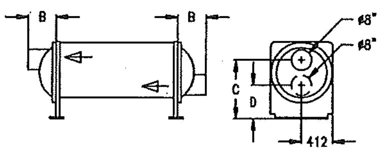


Right hand

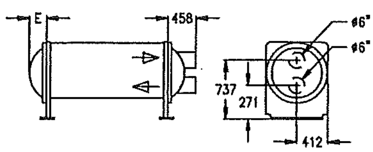
Evaporator 2 passes (option)
Right hand



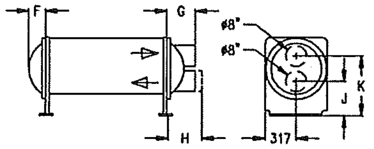
Evaporator 3 passes (standard)
Right hand



Evaporator 4 passes (option)
Right hand



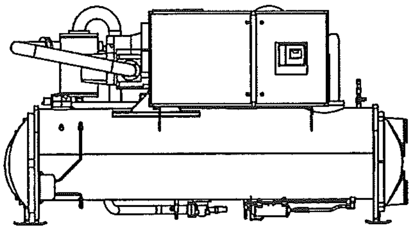
Condenser 2 passes (standard)
Right hand

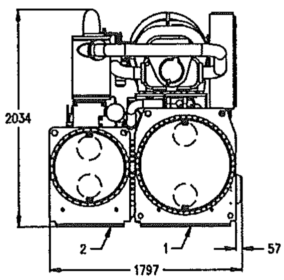


WATER BOXTYPE	A	B	C	D	E	F	G	H	J	K
10 bar	218	238	720	288	218	150	199	199	359	657
21 bar	228	458	708	299	228	178	323	398	373	643

Installation - Mechanical

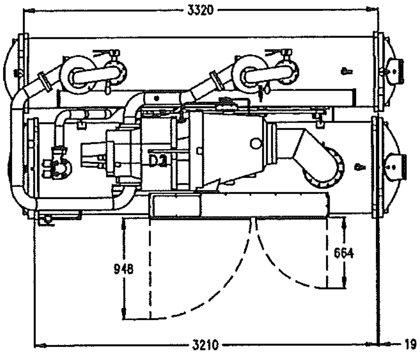
RTHD
D1 G1 G1 / D2 G2 G1
D3 G2 G2 / E3 G3 G3
Note: Connection configuration is available left or right hand.





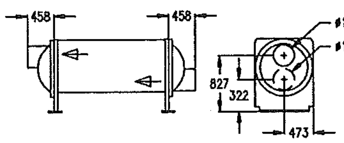
1 = Evaporator
2 = Condenser

Left hand

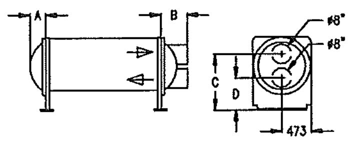


Right hand

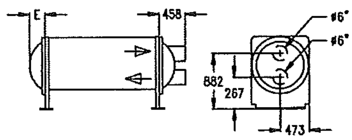
Evaporator 3 passes (option)
Right hand



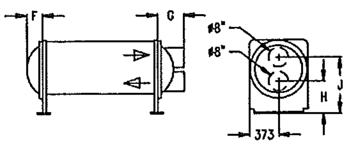
Evaporator 4 passes (standard)
Right hand



Evaporator 6 passes (option)
Right hand



Condenser 2 passes (standard)
Right hand



WATER BOX TYPE	A	B	C	D	E	F	G	H	J
10 bar	238	276	860	289	228	184	232	378	734
21 bar	248	458	854	295	248	188	323	375	336

Installation - Mechanical

Table 3 - Evaporator and Condenser Data

Compressor		B1	B1	B2	B2	C1	C1	C1	C2	C2	C2	D1	D1	D1	D2	D2	D2	D3	D3	D3	E3	E3	E3
Evaporator		B1	C1	B1	C1	D6	D5	D3	D6	D5	E1	D4	D3	G1	D1	F1	G2	D1	F1	G2	D2	F2	G3
Condenser		B1	D1	B1	D1	E5	E4	E3	E5	E4	F1	E4	E3	G1	E1	F2	G1	E1	F2	G2	E2	F3	G3
Evaporator																							
Shell diameter	(mm)	584	584	584	584	673	673	673	673	673	673	673	673	851	673	737	851	673	737	851	673	737	851
Nominal Conn. Size																							
2 passes	(mm)	200	200	200	200	200	200	200	200	200	200	200	200	250	200	200	250	200	200	250	200	200	250
3 passes	(mm)	150	150	150	150	200	200	200	200	200	200	200	200	250	200	250	250	200	250	250	200	250	250
4 passes	(mm)	100	100	100	100	150	150	150	150	150	150	150	150	200	150	150	200	150	150	200	150	150	200
6 passes	(mm)	/	/	/	/	/	/	/	/	/	/	/	/	150	/	/	150	/	/	150	/	/	150
Condenser																							
Shell diameter	(mm)	476	476	476	476	558	558	558	558	558	558	558	558	654	558	558	654	558	558	654	558	558	654
Nominal Conn. Size																							
2 passes	(mm)	150	150	150	150	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200

Table 4 - Evaporator water pressure drop (kPa) (1)

	Waterflow (l/s)																												
Evaporator 2 passes	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**	**125**	**130**	**135**	**140**	**145**	**150**	**155**	**160**
B1	9	14	20	26	33	40	49	58	68	79	90																		
C1		11	15	20	26	32	38	45	53	61	70	80	90	100															
D1			7	11	15	18	22	27	31	36	41	46	52	58	64	71	78	86	94	102									
D2			7	10	13	16	20	24	28	32	36	41	46	51	57	63	69	75	81	88	95	103							
D3			5	8	10	13	16	19	23	26	30	34	38	42	47	51	57	62	67	73	79	85	92	99					
D4			13	17	21	27	32	38	45	52	60	68	76	86	95	105	116												
D5			13	17	21	27	32	38	45	52	60	68	76	86	95	105	116												
D6	7	11	15	20	26	32	39	46	54	63	72	82	92																
E1			7	10	13	16	20	24	28	32	36	41	45	50	56	61	67	73	79	86	93	100							
F1				7	9	12	15	18	21	24	27	31	35	39	43	47	52	57	62	67	72	78	84	90	96	102	109	115	
F2				7	9	11	14	17	20	23	27	31	35	39	43	48	53	58	64	70	76	82	88	95	102	110	117	125	133

	Waterflow (l/s)																													
Evaporator 3 passes	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**	**125**	**130**	**135**	**140**	**145**	**150**	**155**	**160**
B1	15	27	40	55	72	91	113																							
C1	11	20	30	42	55	69	85	103	123	144																				
D1		11	17	24	31	40	49	59	70	81	94	108	122																	
D2		9	15	21	27	35	43	51	61	71	82	94	106	119																
D3			12	17	23	29	36	43	51	60	69	78	89	100	111	124														
D4		15	23	32	42	54	66	80	95	111	129																			
D5		15	23	32	42	54	66	80	95	111	129																			
D6	11	20	31	42	55	70	87	105	125																					
E1		10	16	22	30	38	46	56	66	77	89	101	115	129																
F1			11	15	20	26	32	39	46	54	62	70	79	89	99	110	121	133												
F2				12	17	23	29	35	41	48	55	63	71	79	88	98	107	118	128	139										
G1					12	16	20	24	29	34	39	44	50	56	63	70	77	84	92	100	109	118	127	136	146					
G2					10	14	17	21	25	30	34	39	45	50	56	62	68	75	82	89	97	105	113	122	131	140	149			
G3					8	11	14	17	20	23	27	31	34	39	43	47	52	56	61	66	71	77	82	88	93	99	105	111	117	123

Installation - Mechanical

Evaporator 4 passes	Waterflow (l/s) 10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
B1	17	35	58	85	118																
C1	11	26	43	65	89	117	148														
D1		13	24	37	51	66	84	103	125	148											
D2		11	21	31	44	57	73	89	108	127	149										
D3		9	18	27	37	49	62	76	92	109	127	146									
D4		19	33	49	68	89	113	139													
D5		19	33	49	68	89	113	139													
D6	12	26	44	65	90	118	151														
E1		13	23	35	49	64	81	100	121	143											
F1			15	24	33	44	56	68	82	98	114	131	150								
F2				21	29	39	49	60	73	86	100	115	132	149							
G1					19	26	33	40	49	58	67	77	88	99	111	123	136				
G2					15	22	29	36	44	53	61	71	81	91	102	114	126	139			
G3					12	17	23	29	35	42	49	57	65	73	82	91	101	112	123	134	147

Evaporator 6 passes	Waterflow (l/s) 20	25	30	35	40	45	50	55	60
G1	28	43	60	79	99	122	147		
G2	24	37	52	68	86	105	127	150	
G3	18	29	41	55	69	85	103	121	142

Table 5 - Condenser water pressure drop (kPa) (1)

Condenser 2 passes	Waterflow (l/s) 15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145	150	155	160
B1	9	16	24	34	45	57	71	86	102																					
D1	11	19	29	40	52	66	82	99	119																					
E1		8	12	16	22	28	34	41	49	57	66	76	86	97																
E2		7	10	14	19	24	30	36	43	50	58	66	75	85	95															
E3		6	10	13	18	22	28	34	40	47	54	62	70	79	88	98														
E4		11	17	23	30	39	48	58	69	81	94																			
E5	8	15	22	30	40	51	63	77	92																					
F1			9	12	16	21	26	31	37	43	50	57	65	73	82	91	101	111	122											
F2			10	14	18	23	29	35	42	49	57	65	74	83	93	104	115	126												
F3			9	12	16	20	25	31	37	43	50	57	65	73	81	91	100	110	121											
G1				10	13	17	21	26	31	36	42	48	54	61	69	76	84	93	102	111	121	131								
G2					9	13	16	20	23	27	32	36	41	47	52	58	65	71	78	86	94	102	111	120	129	139	150			
G3					8	11	13	16	20	23	26	30	34	38	43	48	53	58	63	69	75	81	88	95	102	109	116	124	132	139

(1) Based on 12°C evaporator entering water temperature, 30°C condenser entering water temperature

Installation - Mechanical

Vents and Drains

Install pipe plugs in evaporator and condenser water box drain and vent connections before filling the water systems. To drain water, remove vent and drain plugs, install a NPT connector in the drain connection and connect a hose to it.

Evaporator Piping Components

Note: Make sure all piping components are between the shutoff valves, so that isolation can be accomplished on both the condenser and the evaporator. "Piping components" include all devices and controls used to provide proper water system operation and unit operating safety. These components and their general locations are given below.

Entering Chilled Water Piping

- Air vents (to bleed air from system)
- Water pressure gauges with shutoff valves
- Pipe unions
- Vibration eliminators (rubber boots)
- Shutoff (isolation) valves
- Thermometers
- Clean out tees
- Pipe strainer

Leaving Chilled Water Piping

- Air vents (to bleed air from system)
- Water pressure gauges with shutoff valves
- Pipe unions
- Vibration eliminators (rubber boots)
- Shutoff (isolation) valves
- Thermometers
- Clean out tees
- Balancing valve
- Pressure relief valve

To prevent evaporator damage, do not exceed 10 bar evaporator water pressure for standard water boxes. Maximum pressure for high pressure water boxes is 21 bar. Refer to order write-up.

To prevent tube damage, install a strainer in the evaporator water inlet piping.

Condenser Piping Components

"Piping components" include all devices and controls used to provide proper water system operation and unit operating safety. These components and their general locations are given below.

Entering Condenser Water Piping

- Air vents (to bleed air from system)
- Water pressure gauges with shutoff valves
- Pipe unions
- Vibration eliminators (rubber boots)
- Shutoff (isolation) valves
- One per each pass
- Thermometers
- Clean out tees
- Pipe strainer
- Flow switch

Leaving Condenser Water Piping

- Air vents (to bleed air from system)
- Water pressure gauges with shutoff valves
- Pipe unions
- Vibration eliminators (rubber boots)
- Shutoff (isolation) valve
- One per each pass
- Thermometers
- Clean out tees
- Balancing valve
- Pressure relief valve

To prevent condenser damage, do not exceed 10 bar water pressure for standard water boxes.
Maximum pressure for high pressure water boxes is 21 bar. Refer to the order write-up.
To prevent tube damage, install a strainer in condenser water inlet piping.

Installation - Mechanical

Condenser Water Temperatures

With the model RTHD chiller, a condenser water control method is necessary only if the unit starts with entering water temperatures below 13°C, or between 7°C and 13°C, when a temperature increase of 0.6°C per minute to 13°C is not possible.
When the application requires startup temperatures below the prescribed minimums, a variety of options are available. To control a 2-way or 3-way valve, Trane offers a Condenser Regulating Valve Control option for the CH530 controls.
Trane Series R chillers start and operate successfully and reliably over a range of load conditions with controlled entering condenser water temperature. Reducing the condenser water temperature is an effective method of lowering chiller power input required, but the ideal temperature for optimizing total system power consumption will depend on the overall system dynamics. From a system perspective, some improvements in chiller efficiency may be offset by the increased cooling device fan and pumping costs required to achieve the lower cooling device temperatures.
Contact your local Trane systems solution provider for more information on optimizing system performance.
The minimum acceptable refrigerant pressure differential between condenser and evaporator is 1.7 Bar. The chiller control system will attempt to obtain and maintain this differential at startup, but for continuous operation a design should maintain a 14°C differential from evaporator leaving water temperature to condenser leaving water temperature.

Condenser Water Regulation

The Condenser Head Pressure Control Option provides for a 0-10VDC (maximum range -a smaller range is adjustable) output interface to the customer's condenser water flow device. This option enables the CH530 controls to send a signal for opening and closing a 2-way or 3-way valve as necessary to maintain chiller differential pressure.
Methods other than those shown can be employed to achieve the same results. Contact your local Trane office for details.
Contact the manufacturer of the cooling device for compatibilty with variable water flow.

Throttling valve (Figure 10)

This method maintains condensing pressure and temperature by throttling water flow leaving the condenser in response to condenser pressure or system differential pressures.

Advantages:

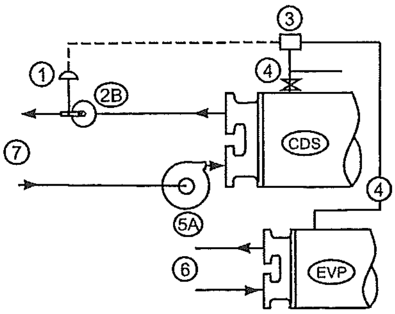
- Good control with proper valve sizing at relatively low cost.
- Pumping cost can be reduced.

Disadvantages:

- Increased rate of fouling due to lower condenser water velocity.
- Requires pumps that can accommodate variable flow.

Installation - Mechanical

Figure 10



Cooling device bypass (Figure 11)

Cooling device bypass is also a valid control method if the chiller temperature requirements can be maintained.

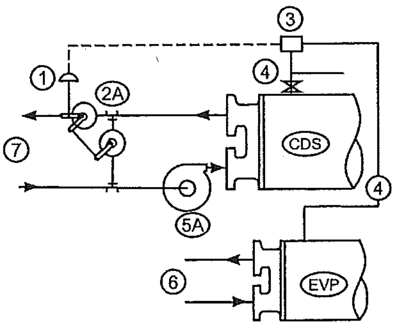
Advantage:

- Excellent control by maintaining constant water flow through the condenser.

Disadvantage:

- Higher cost because of the dedicated pump required for each chiller if condenser pressure is the control signal.

Figure 11



Condenser water pump with variable frequency drive (Figure 12)

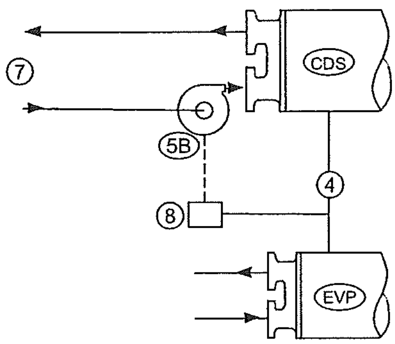
Advantages:

- Pumping cost can be reduced. Good cooling device temperature control.
- Relatively low first cost.

Disadvantage:

- Increased rate of fouling due to lower water velocity in the condenser.

Figure 12



1 = Electric or pneumatic valve actuator
2A = 3-way valve or 2 butterfly valves
2B = 2 butterfly valves
3 = RTHD controller
4 = Refrigerant pressure line
5A = Condenser water pump
5B = Condenser water pump with VFD
6 =To/from cooling load
7 =To/from cooling device
8 = Electric controller

Installation - Mechanical

Condenser Water Regulating Valve Adjustment

A separate TechView Settings Menu tab entitled "Condenser Head Pressure Control -Setup" that is only visible if the configuration is selected, contain the following settings and manual overrides for user adjustments and commissioning all under one tab:

- "Off State "Output Command (0-10 Vdc, 0.1 volt increments, Default 2.0 Vdc)
- Output Voltage @Desired Minimum Flow (Adj:0 to 10.0 in 0.1 volt increments, Default 2.0 Vdc)
- Desired Minimum Flow (Adj:0-100% of full flow in 1%intervals, Default 20%)
- Output Voltage @Desired Maximum Flow (Adj:0 to 10.0 in 0.1 volt increments (or finer),Default 10 Vdc)
- Actuator Stroke Time (Min to Max Range Time)(Adj:1 to 1000 seconds, in 1 second increments, Default 30s)
- Damping Coefficient (adj:0.1 to 1.8, in 0.1 increments, Default .5)
- Head Pressure Control Override (enumeration of: disabled (auto),"off" state, minimum, maximum (100%),) default : disabled (auto). When this setting is in "disabled (auto)"
- Condenser Water Pump Prerun Time

WARNING: In low temperature chilled water applications, in the case of a power loss, there is a risk of a condenser freeze-up. For low temperature chilled water applications, it is recommended to take freeze protection measures.

Water Treatment

WARNING: Do not use untreated or improperly treated water. Use of untreated or improperly treated water may result in equipment damage.

The following disclamatory label is provided on each RTHD unit:

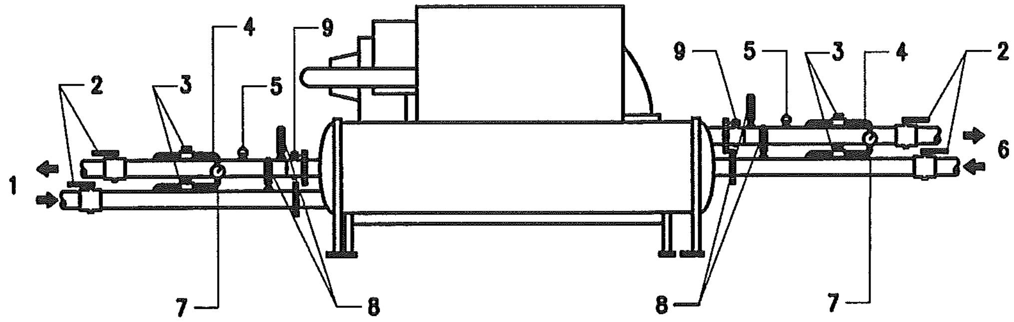
The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is advisable.
The warranty specifically excludes liability for corrosion, erosion or deterioration of the manufacturer's equipment. The manufacturer assumes no responsibilities for the results of the use of untreated or improperly treated water, or saline or brackish water.

Water Pressure Gauges and Thermometers

Install field-supplied thermometers and pressure gauges (with manifolds, whenever practical) as shown in Figure 13. Locate pressure gauges or taps in a straight run of pipe; avoid placement near elbows, etc. Be sure to install the gauges at the same elevation on each shell if the shells have opposite-end water connections. To read manifolded water pressure gauges, open one valve and close the other (depending upon the reading desired). This eliminates errors resulting from differently calibrated gauges installed at unmatched elevations. Refer to *Trane Engineering Bulletin* - Series R. *Chiller Sound Ratings and Installation Guide* for sound-sensitive applications.

Installation - Mechanical

Figure 13



1 = Evaporator water flow
2 = Isolation valves
3 = Shut off valves
4 = Manifold
5 = Flow switch
6 = Condenser water flow
7 = Pressure differential gauge
8 =Thermometers
9 = Relief valve

TRANE

Installation - Mechanical

Water Pressure Relief Valves

Install a pressure relief valve in both evaporator and condenser water systems. Failure to do so could result in shell damage.

Install a water pressure relief valve in one of the condenser and one of the evaporator water box drain connections or on the shell side of any shutoff valve. Water vessels with close-coupled shutoff valves have a high potential for hydrostatic pressure buildup on a water temperature increase. Refer to applicable regulation for relief valve installation guidelines.

Flow Sensing Devices

Use field-provided flow switches or differential pressure switches with pump interlocks to sense system water flow. Flow switch locations are schematically shown in Figure 13.

To provide chiller protection, install and wire flow switches in series with the water pump interlocks, for both chilled water and condenser water circuits (refer to the "Installation Electrical" section). Specific connections and schematic wiring diagrams are shipped with the unit.

Flow switches must stop or prevent compressor operation if either system water flow drops off drastically. Follow the manufacturer's recommendations for selection and installation procedures. General guidelines for flow switch installation are outlined below.

- Mount the switch upright, with a minimum of 5 pipe diameters of straight, horizontal run on each side.
- Do not install close to elbows, orifices or valves.

Note: The arrow on the switch must point in the direction of the water flow. To prevent switch fluttering, remove all air from the water system.

Note: The CH.530 provides a 6-second time delay on the flow switch input before shutting down the unit on a loss-of-flow diagnostic. Contact a qualified service organization if nuisance machine shutdowns persist. Adjust the switch to open when water flow falls below nominal. Refer to the General Data table for minimum flow recommendations for specific water pass arrangements. Flow switch contacts are closed on proof of water flow.

Refrigerant Pressure Relief Valve Venting

To prevent injury due to inhalation of R134 gas, do not discharge refrigerant anywhere. If multiple chillers are installed, each unit must have separate venting for its relief valves. Consult local regulations for any special relief line requirements.

All relief valve venting is the responsibility of the installing contractor. All RTHD units use evaporator and condenser pressure relief valves that must be vented to the outside of the building. Relief valve connection sizes and locations are shown in the unit submittals. Refer to national regulations for relief valve vent line sizing information.

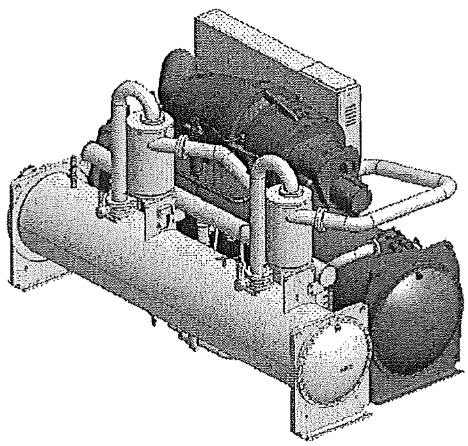
Installation - Mechanical

Do not exceed vent piping code specifications. Failure to heed specifications could result in capacity reduction, unit damage and/or relief valve damage.
Note: Once opened, relief valves tend to leak.

Thermal Insulation

All RTHD units are available with optional factory-installed thermal insulation. If the unit is not factory-insulated, install insulation over the areas designated in Figure 14.
Note: Filter, refrigerant charging valves, water temperature sensors, drain and vent connections when insulated must remain accessible for service. Use only water-base latex paint on factory-applied insulation. Failure to do so may result in insulation shrinkage.
Note: Units in environments with higher humidity or very low leaving water temperature may require thicker insulation.

Figure 14



Location	Type	Square meters
Evaporator	19 mm	10
Compressor	19 mm	8
All components and piping on low side of system (gas pump, return oil line, filter from pump)	19 mm	4

Installation - Electrical

General Recommendations

For proper electrical component operation, do not locate the unit in areas exposed to dust, dirt, corrosive fumes, or excessive humidity. If any of these conditions exist, corrective action must be taken.

Disconnect all electrical power, including remote disconnects before servicing. Failure to disconnect power before servicing can cause severe personal injury or death.

All wiring must comply with national electric regulations. Minimum circuit ampacities and other unit electrical data is on the unit nameplate. See the unit order specifications for actual electrical data. Specific electrical schematics and connection diagrams are shipped with the unit.

Use copper conductors only! Unit terminals are not designed to accept other types of conductors. Failure to do so may cause damage to the equipment.

Do not allow conduit to interfere with other components, structural members or equipment. All conduit must be long enough to allow compressor and starter removal.

Note: To prevent control malfunctions, do not run low voltage wiring (<30V) in conduit with conductors carrying more than 30 volts.

Power Supply Wiring

Model RTHD chillers are designed according to European standard EN 60204; therefore, all power supply wiring must be sized and selected accordingly by the project engineer.

Water Pump Power Supply

Provide power supply wiring with fused disconnect for both the chilled water and condenser water pumps.

Electrical Panel Power Supply

Power supply wiring instructions for the starter/control panel are:
Run the line voltage wiring in conduit to the access opening(s) on the starter/control panel. See the product catalog for wire sizing and selection information and refer to Table 6 and Figure 15 that show typical electrical connection sizes and locations. Always refer to submittal information for your actual unit specifications.

Note: Asterisked connections require the user to provide an external source of power. The 115V control power transformer is not sized for additional load.

Compressor Motor Phase Sequencing

Always verify that proper rotation of the RTHD compressor is established before the machine is started. Proper motor rotation requires confirmation of the electrical phase sequence of the power supply. The motor is internally connected for clockwise rotation with the incoming power supply phased A, B, C (L1, L2, L3).

To confirm the correct phase sequence (ABC), use a phase meter.

Basically, voltages generated in each phase of a polyphase alternator or circuit are called phase voltages. In a 3-phase circuit, 3 sine wave voltages are generated, differing in phase by 120 electrical degrees. The order in which the 3 voltages of a 3-phase system succeed one another is called phase sequence or phase rotation. This is determined by the direction of rotation of the alternator. When rotation is clockwise, phase sequence is usually called "ABC." This direction may be reversed outside the alternator by interchanging any two of the line wires. It is this possible interchange of wiring that makes a phase sequence indicator necessary if the operator is to quickly determine the phase rotation of the motor.

Installation - Electrical

Table 6 - Compressor Motor Electrical Data - 50 Hz -

Compressor Code	Nominal Voltage	380	400	415
	Voltage Utilization Range	361-399	380-420	394-436
B1 - B2	Max motor (kW)	139	145	148
	Max. RLA (A)	233	233	233
	Inrush current in star connection (A)	391	412	428
	Power factor	0.910	0.900	0.880
C1 - C2	Max motor (kW)	201	209	213
	Max. RLA (A)	349	349	349
	Inrush current in star connection (A)	456	480	498
	Power factor	0.875	0.865	0.850
D1 - D2 - D3	Max motor (kW)	271	280	284
	Max. RLA (A)	455	455	455
	Inrush current in star connection (A)	711	748	776
	Power factor	0.905	0.890	0.870
E3	Max motor (kW)	288	301	306
	Max. RLA (A)	488	488	488
	Inrush current in star connection (A)	711	748	776
	Power factor	0.900	0.890	0.870

Table 7 - Electrical Connections

Compressor Code		B1 - B2	C1 - C2	D1 - D2 - D3 - E3
Option non-fused disconnect switch				
Disconnect switch size	(A)	315	400	630
Disconnect switch minimum cable cross section	(mm^2)	150	185	2x150
Disconnect switch maximum cable cross section	(mm^2)	240	240	2x300
Option fused disconnect switch				
Disconnect switch size	(A)	315	500	630
Fuse size	(A)	250T2	400T2	500T3
Disconnect switch/fuses minimum cable cross section	(mm^2)	150	240	2x150
Disconnect switch/fuses maximum cable cross section	(mm^2)	240	240	2x300
Option Circuit breaker				
Circuit breaker size	(A)	400	630	630
Circuit breaker minimum cable cross section	(mm^2)	2x70	2x70	2x70
Circuit breaker maximum cable cross section	(mm^2)	2x240	2x240	2x240
Option Terminal block				
Terminal block maximum cable cross section	(mm^2)	2x300	2x300	2x300

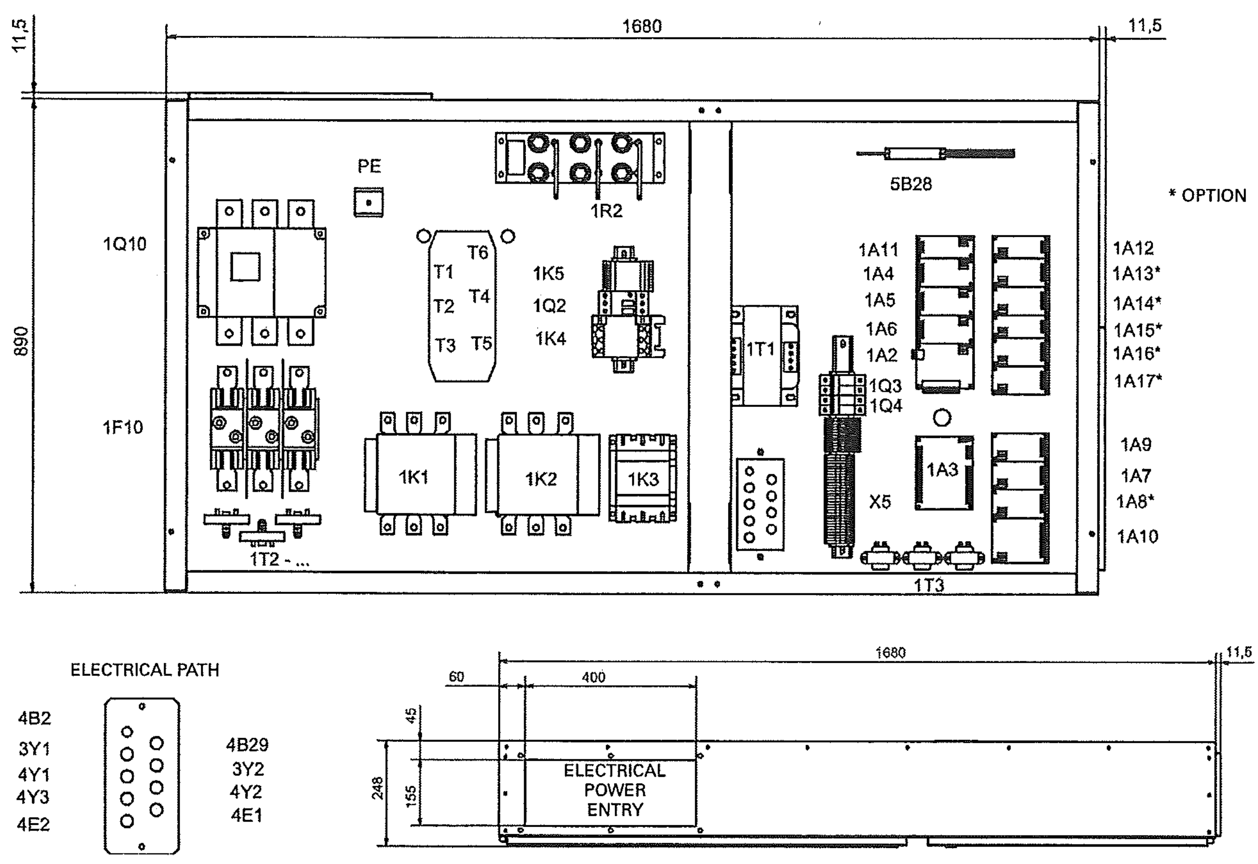
Note: Minimum cable cross section is an electrical component supplier data. It's up to the electrical contractor to correctly size the power cable according to the maximum current value.

Installation - Electrical

Module and Control Panel Connectors

All connectors can be unplugged or the wires can be removed. If an entire plug is removed, make sure the plug and the associated jack are marked for proper location identification during reinstallation.

Figure 15 - Electrical panel layout



Installation - Electrical

Interconnecting Wiring (Field Wiring Required)

Important: Do not turn chiller on or off using the chilled water pump interlocks.
When making field connections, refer to the appropriate field layout, wiring, schematics and controls diagrams that ship with the unit.
Whenever a contact closure (binary output) is referenced, the electrical rating is:

At 120 VAC	7.2 amp resistive 2.88 amp pilot duty 250 W, 7.2 FLA, 43.2 LRA
At 240 VAC	5.0 amp resistive 2.0 amp pilot duty 250 W, 3.6 FLA, 21.3 LRA

Whenever a dry contact input (binary input) is referenced, the electrical rating is 24VDC, 12 mA.
Whenever a control voltage contact input (binary input) is referenced, the electrical rating is 120 VAC, 5mA.

Note: Asterisked connections require the user to provide an external source of power. The 115V control power transformer is not sized for additional load.

Chilled Water Pump Control

CH.530 has a evaporator water pump output relay that closes when the chiller is given a signal to go into the Auto mode of operation from any source. The contact is opened to turn off the pump in the event of most machine level diagnostics to prevent the build up of pump heat. To protect against the build-up of pump heat for those diagnostics that do not stop and/or start the pump and to protect against the condition of a bad flow switch, the pump shall always be stopped when the evaporator pressure is seen to be close to the Low Side Evaporator Pressure relief valve setting.

Chilled Water Flow Interlock

CH.530 has an input that will accept a contact closure from a proof-of-flow device such as a flow witch. The flow switch is to be wired in series with the chilled water pump starter's auxiliary contacts. When this input does not prove flow within 20 minutes relative to transition from Stop to Auto modes of the chiller, or if the flow is lost while the chiller is in the Auto mode of operation, the chiller will be inhibited from running by a non-latching diagnostic. The flow switch input shall be filtered to allow for momentary openings and closings of the switch due to turbulent water flow. This is accomplished with a 6 seconds filtering time. The sensing voltage for the condenser water flow switch is 115/240 VAC

IMPORTANT! DO NOT cycle the chiller through starting and stopping the chilled water pump. This could cause the compressor to shut down fully loaded. Use the external stop/start input to cycle the chiller.

Installation - Electrical

Condenser Water Pump Control

CH.530 provides a contact closure output to start and stop the condenser water pump. If condenser pumps are arranged in a bank with a common header, the output can be used to control an isolation valve and/or signal another device that an additional pump is required.
Condenser Water Pump Prestart time has been added to help with cold condenser water problems. In very cold outdoor ambient, the cooling device's sump cold water would reach the chiller some time after the low system differential pressure protection had run through its ignore time, and result in an immediate shutdown and latching diagnostic. By simply starting the pump earlier, and allowing mixing of the warmer indoor loop with the cooling device's sump, this problem can be avoided.

Condenser Water Flow Interlock

The CH.530 shall accept an isolated contact closure input from a customer installed proof-of-flow device such as a flow switch and customer provided pump starter auxiliary contact for interlocking with condenser water flow.
The input shall be filtered to allow momentary openings and closings of the switch due to turbulent water flow, etc.This shall be accomplished with a 6 seconds filtering time.The sensing voltage for the condenser water flow switch is 115/240 VAC.
On a call for cooling after the restart inhibit timer has timed out, the CH.530 shall energize the condenser water pump relay and then check the condenser water flow switch and pump starter interlock input for flow confirmation.

Startup of the compressor will not be allowed until flow has proven. If flow is not initially established within 1200 seconds (20 minutes) of the condenser pump relay energizing, an automatically resetting diagnostic "Condenser Water Flow Overdue" shall be generated which terminates the prestart mode and denergizes the condenser water pump relay.This diagnostic is automatically reset if flow is established at any later time.

Note: This diagnostic would never automatically reset if CH.530 was in control of the condenser pump through its condenser pump relay since it is commanded off at the time of the diagnostic. It could however reset and allow normal chiller operation if the pump was controlled from some external source.

Programmable Relays (Alarm and Status)-Optional

CH.530 provides a flexible alarm or chiller status indication to a remote location through a hard wired interface to a dry contact closure. 4 relays are available for this function, and they are provided (generally with a Quad Relay Output LLID) as part of the Alarm Relay Output Option.The events/states that can be assigned to the programmable relays are listed in the following table.

Installation - Electrical

Table 8 - Chiller events/status descriptions

Event/State	Description
Alarm - Latching	This output is true whenever there is any active diagnostic that requires a manual reset to clear, that effects the Chiller, the Circuit, or any of the Compressors on a circuit.This classification does not include informational diagnostics.
Alarm - Auto Reset	This output is true whenever there is any active diagnostic that could automatically clear, that effects the Chiller, the Circuit, or any of the Compressors on a circuit.This classification does not include informational diagnostics. If all of the auto resetting diagnostics were to clear, this output would return to a false condition.
Alarm	This output is true whenever there is any diagnostic effecting any component, whether latching or automatically clearing.This classification does not include informational diagnostics.
Warning	This output is true whenever there is any informational diagnostic effecting any component, whether latching or automatically clearing.
Chiller Limit Mode	This output is true whenever the chiller has been running in one of the Unloading types of limit modes (Condenser, Evaporator, Current Limit or Phase Imbalance Limit) continuously for the last 20 minutes. A given limit or overlapping of different limits must be in effect continuously for 20 minutes prior to the output becoming true. It will become false, if no Unload limits are present for 1 minute.The filter prevents short duration or transient repetitive limits from indicating.The chiller is considered to be in a limit mode for the purposes of front panel display and annunciation, only if it is fully inhibiting loading by virtue of being in either the "hold" or "forced unload" regions of the limit control, excluding the"limited loading region". (In previous designs, the "limit load" region of the limit control was included in the criteria for the limit mode call out on the front panel and annunciation outputs)
Compressor Running	The output is true whenever any compressors are started or running on the chiller and false when no compressors are either starting or running on the chiller.This status may or may not reflect the true status of the compressor in Service Pumpdown if such a mode exists for a particular chiller.
Chiller Head Pressure Relief Request Relay	This relay output is energized anytime the chiller is running in one of the following modes; Ice Making Mode or Condenser Pressure Limit Control Mode continuously for the duration specified by the Chiller Head Relief Relay Filter Time.The Chiller Head Relief Relay FilterTime is a service setpoint.The relay output is de-energized anytime the chiller exits all above modes continuously for the duration specified by the same Chiller Head Relief Relay FilterTime.

Installation - Electrical

The CH.530 ServiceTool (TechView) is used to install and assign any of the above listed events or status to each of the 4 relays provided with this option. The default assignments for the 4 available relays are listed below.

LLID Name	LLID Software Relay Designation	Output Name	Default
Operating Status Programmable Relays	Relay 0	Status Relay 4, J2-1,2,3	Head Pressure Relief Request
	Relay 1	Status Relay 3, J2-4,5,6	Chiller Limit Mode Relay
	Relay 2	Status Relay 2, J2-7,8,9	Chiller Alarm Relay (latching or non-latching)
	Relay 3	Status Relay 1, J2-10,11,12	Compressor Running Relay

Emergency Stop

The CH.530 provides auxiliary control for a customer specified/installed latching trip out. When this customer-furnished remote contact is provided, the chiller will run normally when the contact is closed. When the contact opens, the unit will trip off on a manually resettable diagnostic. This condition requires manual reset at the chiller switch on the front of the control panel.

External Auto/Stop

If the unit requires the external Auto/Stop function, the installer must provide leads from the remote contacts to the proper terminals of the LLID on the control panel. The chiller will run normally when the contacts are closed. When the contact opens, the compressor(s), if operating, will go to the RUN : UNLOAD operating mode and cycle off. Unit operation will be inhibited. Re-closure of the contacts will permit the unit to automatically return to normal operation.

NOTE: A "panic " stop (similar to "emergency " stop) can be manually commanded by pressing the STOP button twice in a row, the chiller will immediately shut down, but without creating a latching diagnostic.

Soft Loading

Soft loading will prevent the chiller from going to full capacity during the pull-down period. The CH.530 control system has two soft loading algorithms running all of the time. They are capacity control soft loading and current limit soft loading. These algorithms introduce the use of a Filtered Chilled Water Setpoint and a Filtered Current Limit Setpoint. After the compressor has been started, the starting point of the filtered chilled water setpoint is initialized to the value of the Evap Leaving WaterTemperature. The filtered current limit setpoint is initialized to the value of the Current Limit Softload Starting Percent. These filtered setpoints allow for a stable pull-down that is user adjustable in duration. They also eliminate sudden transients due to setpoint changes during normal chiller operation.

3 settings are used to describe the behavior of soft loading. The setup for soft loading can be done using TechView.

- Capacity Control SoftloadTime: This setting controls the time constant of the Filtered Chilled Water Setpoint. It is settable between 0 and 120 min.

Installation - Electrical

- Current Limit Control SoftloadTime: This Setting controls the time constant of the Filtered Current Limit Setpoint. It is settable between 0 and 120 minutes.
- Current Limit Softload Starting %: This setting controls the starting point of the Filtered Current Limit Setpoint. It is adjustable from 20 (40 for RTHD) to 100% RLA.

External Base Loading - Optional

Primarily for process control requirements, base loading provides for immediate start and loading of a chiller up to an externally or remotely adjustable current limit setpoint without regard to differential to start or stop, or to leaving water temperature control. This allows the flexibility to prestart or preload a chiller in anticipation of a large load application. It also allows you to keep a chiller on line between processes when leaving water temperature control would normally cycle the unit.
When the base loading option is installed throughTechView it will be controllable through DynaView/ TechView, External Hardware Interface orTracer (ifTracer is installed).Order for precedence for all setpoints, DynaView/TechView then External thenTracer from lowest to highest priority. If one of the higher priority setpoints drops out due to a bad sensor or communication loss then base loading shall go to the next lowest priority of command and setpoint. The command settings and control setpoints associated with base loading are explained below.

Base Loading Control setpoint

This setpoint has three possible sources, an External Analog Input, DynaView/TechView orTracer.

- DynaView/TechView Base Loading Control Setpoint

The range is 40 -100 % Compressor Load (Max %RLA).The default is 50%.

- Tracer Base Loading Control Setpoint

The range is 40 -100 %Compressor Load (Max %RLA).The default is 50%.

- External Base Loading Setpoint

This is an Analog Input that sets the base loading setpoint.This signal can be controlled by either a 2-10Vdc or 4-20ma Signal based on configuration information.The equations show the relationship between input and percent compressor load:

If the input is configured as a 4 -20 mA: %Load =3.75 *(mA Input)+25

If the input is configured as a 2 -10 Vdc: %Load =7.5 *(Vdc Input)+25

Summit Interface - Optional

CH.530 provides an optional interface between the chiller and a Trane Summit BAS.A Communications interface LLID shall be used to provide "gateway" functionality between the chiller and Summit.

LonTalk Communication Interface - Optional

CH.530 provides an optional LonTalk Communication Interface (LCI-C) between the chiller and a BAS. An LCI-C LLID shall be used to provide "gateway" functionality between the LonTalk protocol and the chiller.

Ice Making Contact - Optional

CH.530 accepts a contact closure input to initiate Ice Building. When in the ice building mode, the compressor will be fully loaded (not given a low setpoint) and will continue to operate until the ice contacts open or the return water temperature reaches the Ice Termination Setpoint. If terminated on return setpoint, CH.530 will not allow the chiller to restart until the ice making contact is opened.

Installation - Electrical

Ice Machine Control - Optional
CH.530 provides an output contact closure that can be used as a signal to the system that ice building is in operation. This relay will be closed when ice building is in progress and open when ice building has been terminated by either CH.530 or the remote interlock. It is used to signal the system changes required to convert to and from ice making.

External Chilled Water Setpoint - Optional
CH.530 will accept either a 2-10 VDC or a 4-20 mA input signal, to adjust the chilled water setpoint from a remote location.

External Current Limit Setpoint - Optional
CH.530 will accept either a 2-10VDC or a 4-20mA input signal to adjust the current limit setpoint from a remote location.

Percent Condenser Pressure Output - Optional
CH.530 provides a 2-10 VDC analog output to indicate percent High Pressure Cutout (HPC) condenser pressure.

Percent HPC =(Condenser Pressure/High Pressure Cutout Setpoint)*100

Compressor Percent RLA Output - Optional
CH.530 provides a 0-10 Vdc analog output to indicate %RLA of compressor starter average phase current. 2 to 10 Vdc corresponds to 0 to 120% RLA.

Operating Principles Mechanical

This section contains an overview of the operation and maintenance of RTHD chillers equipped with microcomputer-based control systems. It describes the overall operating principles of the RTHD design. Following the section is information regarding specific operating instructions, detailed descriptions of the unit controls and options and maintenance procedures that must be performed regularly to keep the unit in top condition. Diagnostic information is provided to allow the operator to identify system malfunctions.

Note: To ensure proper diagnosis and repair, contact a qualified service organization if a problem should occur.

General

The Model RTHD units are single-compressor, helical-rotary type water-cooled liquid chillers. These units are equipped with unit-mounted starter/control panels. The basic components of an RTHD unit are:

- Unit-mounted panel containing starter and Tracer CH.530 controller and Input/output LLIDS
- Helical-rotary compressor
- Evaporator
- Electronic expansion valve
- Water-cooled condenser with integral subcooler
- Oil supply system
- Oil cooler (application dependent)
- Related interconnecting piping

Refrigeration (Cooling) Cycle

The refrigeration cycle of the RTHD chiller is conceptually similar to that of other Trane chiller products. It makes use of a shell-and-tube evaporator design with refrigerant evaporating on the shell side and water flowing inside tubes having enhanced surfaces.

The compressor is a twin-rotor helical-rotary type. It uses a suction gas-cooled motor that operates at lower motor temperatures under continuous full- and part-load operating conditions. An oil management system provides oil-free refrigerant to the shells to maximize heat transfer performance, while providing lubrication and rotor sealing to the compressor. The lubrication system ensures long compressor life and contributes to quiet operation.

Condensing is accomplished in a shell-and-tube heat exchanger where refrigerant is condensed on the shell side and water flows internally in the tubes.

Refrigerant is metered through the flow system using an electronic expansion valve that maximizes chiller efficiency at part load.

A unit-mounted starter and control panel is provided on every chiller. Microprocessor-based unit control modules (Tracer CH.530) provide for accurate chilled water control as well as monitoring, protection and adaptive limit functions. The "adaptive" nature of the controls intelligently prevents the chiller from operating outside of its limits, or compensates for unusual operating conditions, while keeping the chiller running rather than simply tripping due to a safety concern. When problems do occur, diagnostic messages assist the operator in troubleshooting.

Operating Principles Mechanical

Cycle Description

The refrigeration cycle for the RTHD chiller can be described using the pressure-enthalpy diagram shown in Figure 16. Key State Points are indicated on the figure and are referenced in the discussion following. A schematic of the system showing the refrigerant flow loop as well as the lubricant flow loop is shown in Figure 17.

Evaporation of refrigerant occurs in the evaporator that maximizes the heat transfer performance of the heat exchanger while minimizing the amount of refrigerant charge required. A metered amount of refrigerant liquid enters a distribution system in the evaporator shell and is then distributed to the tubes in the evaporator tube bundle. The refrigerant vaporizes as it cools the water flowing through the evaporator tubes. Refrigerant vapor leaves the evaporator as saturated vapor (State Point 1).

The refrigerant vapor generated in the evaporator flows to the suction end of the compressor where it enters the motor compartment of the suction-gas-cooled motor. The refrigerant flows across the motor, providing the necessary cooling, then enters the compression chamber. Refrigerant is compressed in the compressor to discharge pressure conditions. Simultaneously, lubricant is injected into the compressor for two purposes: (1) to lubricate the rolling element bearings, and (2) to seal the very small clearances between the compressor's twin rotors.

Immediately following the compression process the lubricant and refrigerant are effectively divided using an oil separator. The oil-free refrigerant vapor enters the condenser at State Point 2. The lubrication and oil management issues are discussed in more detail in the compressor description and oil management sections that follow.

Baffles within the condenser shell distribute the compressed refrigerant vapor evenly across the condenser tube bundle. Cooling device water, circulating through the condenser tubes, absorbs heat from this refrigerant and condenses it.

As the refrigerant leaves the bottom of the condenser (State Point 3), it enters an integral subcooler where it is subcooled before traveling to the electronic expansion valve (State Point 4). The pressure drop created by the expansion process vaporizes a portion of the liquid refrigerant. The resulting mixture of liquid and gaseous refrigerant then enters the Evaporator Distribution system (State Point 5). The flash gas from the expansion process is internally routed to the compressor suction, and while the liquid refrigerant is distributed over the tube bundle in the evaporator.

The RTHD chiller maximizes the evaporator heat transfer performance while minimizing refrigerant charge requirements. This is accomplished by metering the liquid refrigerant flow to the evaporator's distribution system using the electronic expansion valve. A relatively low liquid level is maintained in the evaporator shell, which contains a bit of surplus refrigerant liquid and accumulated lubricant. A liquid level measurement device monitors this level and provides feedback information to the CH.530 unit controller, which commands the electronic expansion valve to reposition when necessary. If the level rises, the expansion valve is closed slightly, and if the level is dropping, the valve is opened slightly such that a steady level is maintained.

Operating Principles Mechanical

Figure 16 - Pressure /Enthalpy Curve

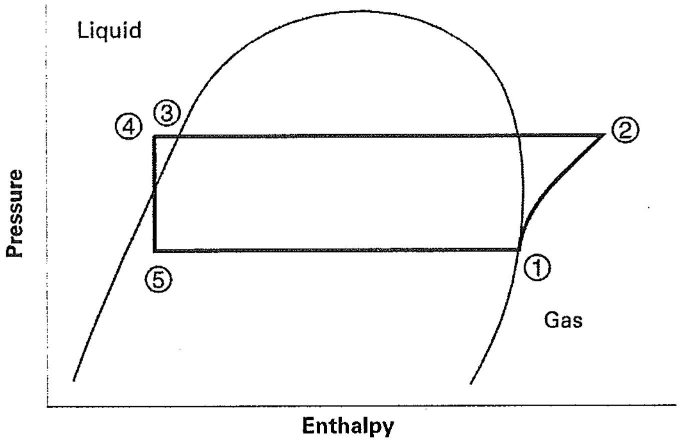
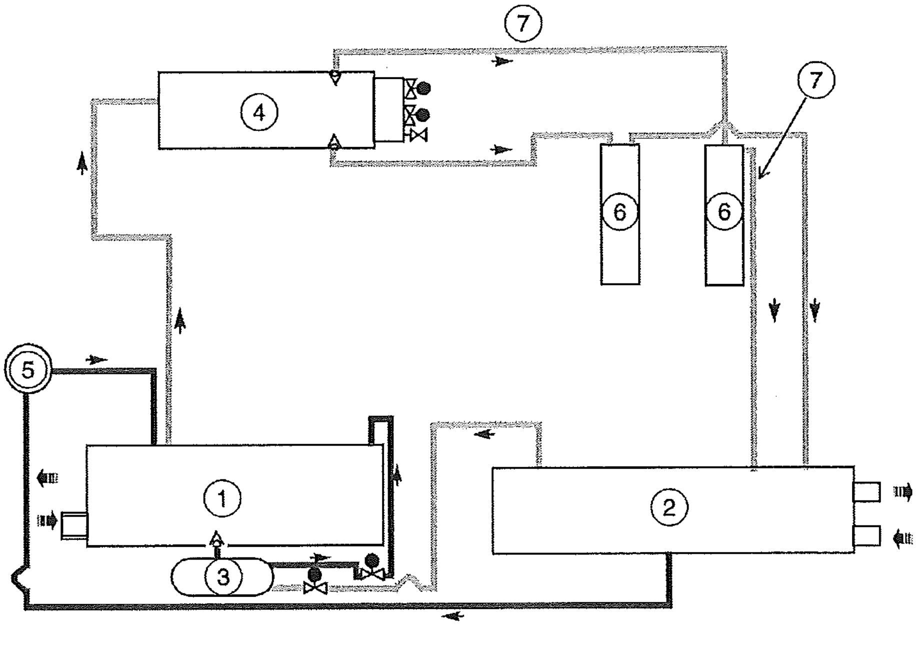


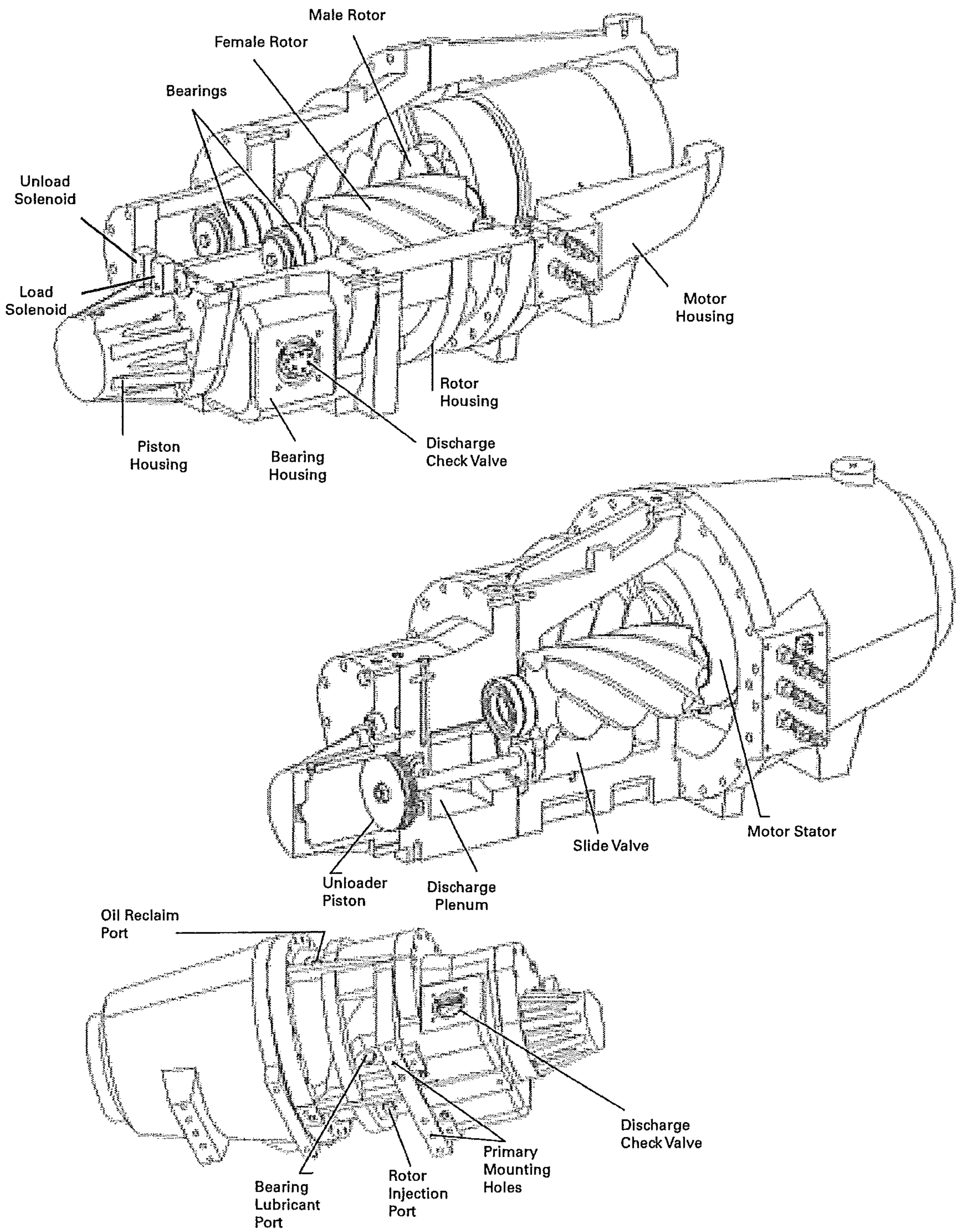
Figure 17 - Refrigerant Flow Diagram



1 = Evaporator
2 = Condenser
3 = Gas pump
4 = Compressor
5 = EXV
6 = Separator
7 = Dual discharge lines only on C, D, and E frame compressors

Operating Principles Mechanical

Figure 18 - Compressor Description



Operating Principles Mechanical

The compressor (Figure 18) used by the RTHD chiller consists of 3 distinct sections: the motor, the rotors and the bearing housing.

Compressor Motor

A two-pole, hermetic, squirrel-cage induction motor directly drives the compressor rotors. The motor is cooled by suction vapor drawn from the evaporator and entering the end of the motor housing.

Compressor Rotors

Each Series R chiller uses a semi-hermetic, direct-drive Helical-Rotary type compressor. Excluding the bearings, each compressor has only 3 moving parts: 2 rotors - "male" and "female" - provide compression, and a slide valve that controls capacity. The male rotor is attached to, and driven by, the motor, and 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 below (and moves along) the rotors.
The helical-rotary compressor is a positive displacement device. Refrigerant from the evaporator is drawn into the suction opening at the end of the motor section. The gas is drawn across the motor, cooling it, and then into the rotor section. It is then compressed and discharged directly into the discharge plenum.
There is no physical contact between the rotors and compressor housing.
Oil is injected into the bottom of the compressor rotor section, coating both rotors and the compressor housing interior. Although this oil does provide rotor lubrication, its primary purpose is to seal the clearance spaces between the rotors and compressor housing. A positive seal between these internal parts enhances compressor efficiency by limiting leakage between the high pressure and low pressure cavities.
Capacity control is accomplished by means of a slide valve assembly located in the rotor/bearing housing sections of the compressor.
Positioned along the bottom of the rotors, the slide valve is driven by a piston/cylinder along an axis that parallels those of the rotors.

Compressor load condition is dictated by the coverage of the rotors by the slide valve. When the slide valve fully covers the rotors, the compressor is fully loaded. Unloading occurs as the slide valve moves away from the suction end of the rotors. Slide valve unloading lowers refrigeration capacity by reducing the compression surface of the rotors.

Slide Valve Movement

Movement of the slide valve piston determines slide valve position which, in turn, regulates compressor capacity. Compressed vapor flowing into and out of the cylinder governs piston movement, and is controlled by the load and unload solenoid valves. The solenoid valves (both normally closed) receive "load" and "unload" signals from the CH.530, based on system cooling requirements. To load the compressor, the CH.530 opens the load solenoid valve. The pressurized vapor flow then enters the cylinder and, with the help of the lower suction pressure acting on the face of the unloader valve, moves the piston toward the rotors. The compressor is unloaded when the unload solenoid valve is open. Vapor "trapped" within the cylinder is drawn out into the lower-pressure suction area of the compressor. As the pressurized vapor leaves the cylinder, the slide valve slowly moves away from the rotors. When both solenoid valves are closed, the present level of compressor loading is maintained. On compressor shutdown, the unload solenoid valve is energized. Springs assist in moving the slide valve to the fully-unloaded position, so the unit always starts fully unloaded.

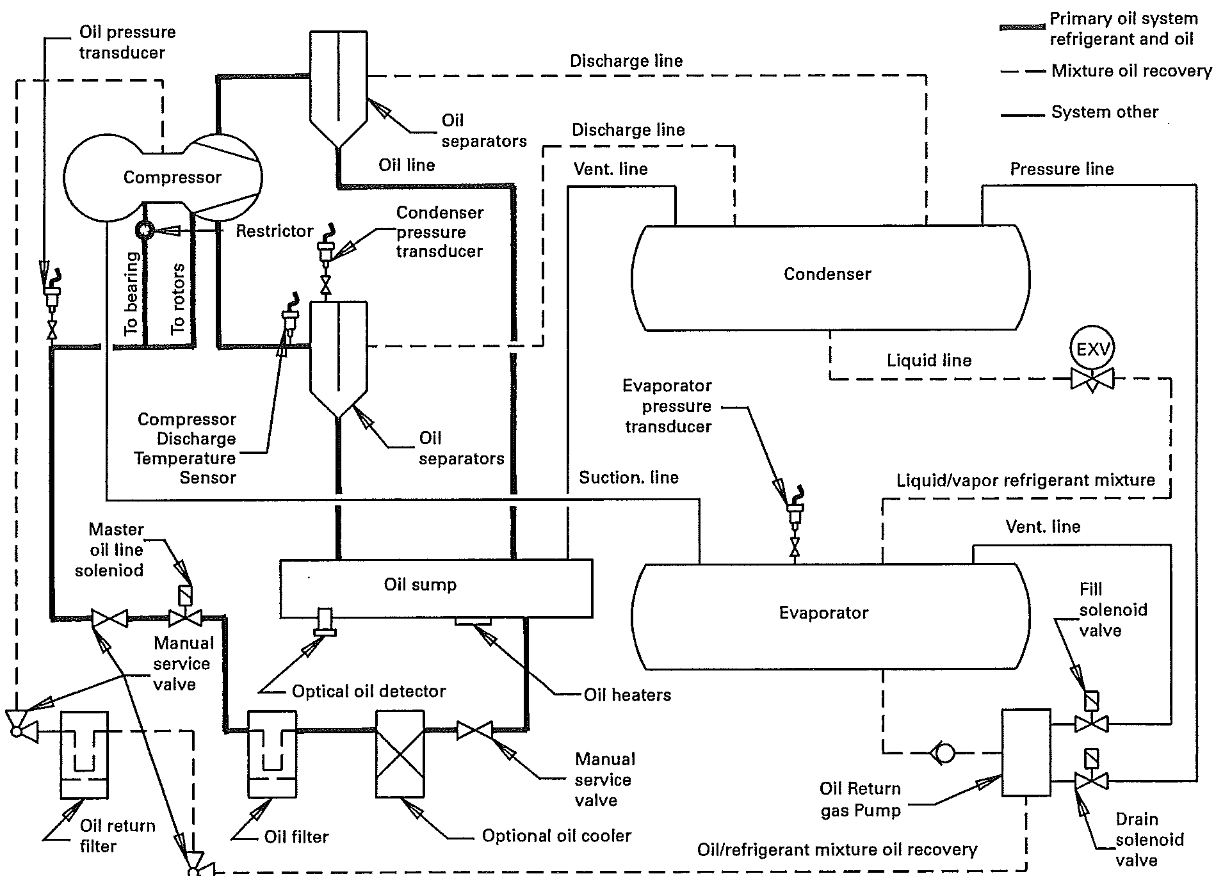
Operating Principles Mechanical

Oil Management System

Oil Separator

The oil separator consists of a vertical cylinder surrounding an exit passageway. Once oil is injected into the compressor rotors, it mixes with compressed refrigerant vapor and is discharged directly into the oil separator. As the refrigerant-and-oil mixture is discharged into the oil separator, the oil is forced outward by centrifugal force, collects on the walls of the cylinder and drains to the bottom of the oil separator cylinder. The accumulated oil then drains out of the cylinder and collects in the oil sump located near the top and in-between the evaporator and condenser shells. Oil that collects in the oil tank sump is at condensing pressure during compressor operation; therefore, oil is constantly moving to lower pressure areas.

Figure 19 - Oil Flow Diagram



Operating Principles Mechanical

Oil Flow Protection

Oil flowing through the lubrication circuit flows from the oil sump to the compressor (Figure 19). As the oil leaves the sump, it passes through a service valve, an oil cooler (if used), oil filter, master solenoid valve, and another service valve. Oil flow then splits into two distinct paths, each performing a separate function: (1)bearing lubrication and cooling, and (2)compressor oil injection. Oil flow and quality is proven through a combination of a number of sensors, most notably a pressure transducer and the optical oil level sensor.

If for any reason oil flow is obstructed because of a plugged oil filter, closed service valve, faulty master solenoid, or other source, the oil pressure transducer will read an excessively high pressure drop in the oil system (relative to the total system pressure) and shut down the chiller.

Likewise, the optical oil level sensor can detect the lack of oil in the primary oil system (which could result from improper oil charging after servicing, or oil logging in other parts of the system).The sensor will prevent the compressor from starting or running unless an adequate volume of oil is present. The combination of these two devices, as well as diagnostics associated with extended low system differential pressure and low superheat conditions, can protect the compressor from damage due to severe conditions, component failures, or improper operation.

If the compressor stops for any reason, the master solenoid valve closes; this isolates the oil charge in the sump during "off" periods. With the oil efficiently contained in the sump, oil is immediately available to the compressor at start-up. Such flows would otherwise purge oil from the lines and the oil sump, which is an undesirable effect.

To ensure the required system differential pressure is adequate to move oil to the compressor, the CH.530 attempts to both control a minimum system differential pressure as well as monitor it. Based on readings from pressure transducers in both the evaporator and condenser, the EXV is modulated to maintain evaporator pressure at a minimum of 1.7 bar below the condenser pressure. Once the minimum is met, the EXV will return to normal liquid level control (see the paragraph on "Cycle Description"). If the differential is significantly lower than required, the unit will trip and initiate appropriate diagnostics and would enforce a compressor "cool down" period.To ensure proper lubrication and minimize refrigerant condensation in the oil sump, heaters are mounted on the bottom of the oil sump. An auxiliary contact of the compressor starter, energizes these heaters during the compressor off cycle to maintain a proper elevation of the oil temperature.The heater element is continuously energized while the compressor is off and does not cycle on temperature.

Oil Filter

All Series R chillers are equipped with replaceable-element oil filters. Each removes any impurities that could foul the compressor internal oil supply galleries.This also prevents excessive wear of compressor rotor and bearing surfaces and promotes long bearing life. Refer to maintenance section for recommended filter element replacement intervals.

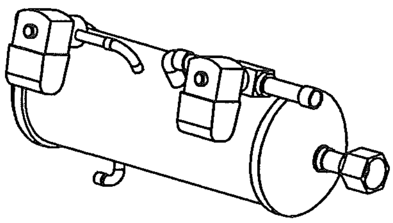
Compressor Bearing Oil Supply

Oil is injected into the rotor housing where it is routed to the bearing groups located in the motor and bearing housing sections. Each bearing housing is vented to compressor suction so oil leaving the bearings returns through the compressor rotors to the oil separator.

Operating Principles Mechanical

Compressor Rotor Oil Supply
Oil flowing through this circuit enters the bottom of the compressor rotor housing. From there it is injected along the rotors to seal clearance spaces around the rotors and lubricate the contact line between the male and female rotors.

Figure 20 - Gas Pump



Lubricant Recovery
Despite the high efficiency of the oil separators, a small percentage of oil will get past them, move through the condenser, and eventually end up in the evaporator. This oil must be recovered and returned to the oil sump. The function of active oil return is accomplished by a pressure-actuated pump referred to as the "gas pump." The gas pump, mounted just beneath the evaporator, is a cylinder with 4 ports controlled by 2 solenoids. The pump serves to return accumulating oil in the evaporator to the compressor at regular time intervals. As the refrigerant-oil mixture enters the gas pump from the bottom of the evaporator, a fill solenoid opens to allow refrigerant vapor to be vented into the top of the evaporator, and is then closed. A second solenoid then opens to allow refrigerant at condenser pressure to enter the gas pump. Simultaneously, a check valve prevents reverse flow back into the evaporator. A liquid refrigerant and oil mixture is displaced from the gas pump cylinder and is directed through a filter to the compressor.

The oil then combines with oil injected into the compressor and returns to the oil sump via the oil separators.

Oil Cooler

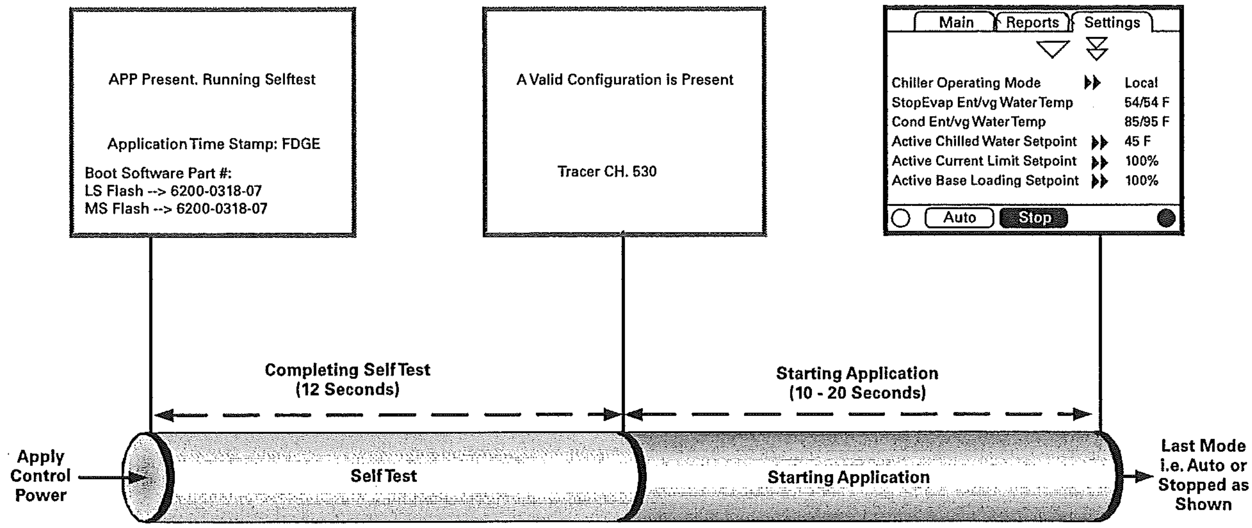
The oil cooler is a brazed plate heat exchanger located near the oil filter. It is designed to transfer approximately 3.5 kW of heat from the oil to the suction side of the system. Subcooled liquid is the cooling source. The oil cooler is required on units running at high condensing or low suction temperatures. The high discharge temperatures in these applications increase oil temperatures above the recommended limits for adequate lubrication and reduce the viscosity of the oil.

Unit Start-up

Power Up

Figure 21 shows the screens during a power up of the main processor. This process takes 30-50 seconds depending on the number of installed options. On all power ups, the software model will always transition through the 'Stopped' Software state independent of the last mode. If the last mode before power down was 'Auto', the transition from 'Stopped' to 'Starting' occurs, but it is not apparent to the user.

Figure 21- RTHD sequence of operation: Power-up



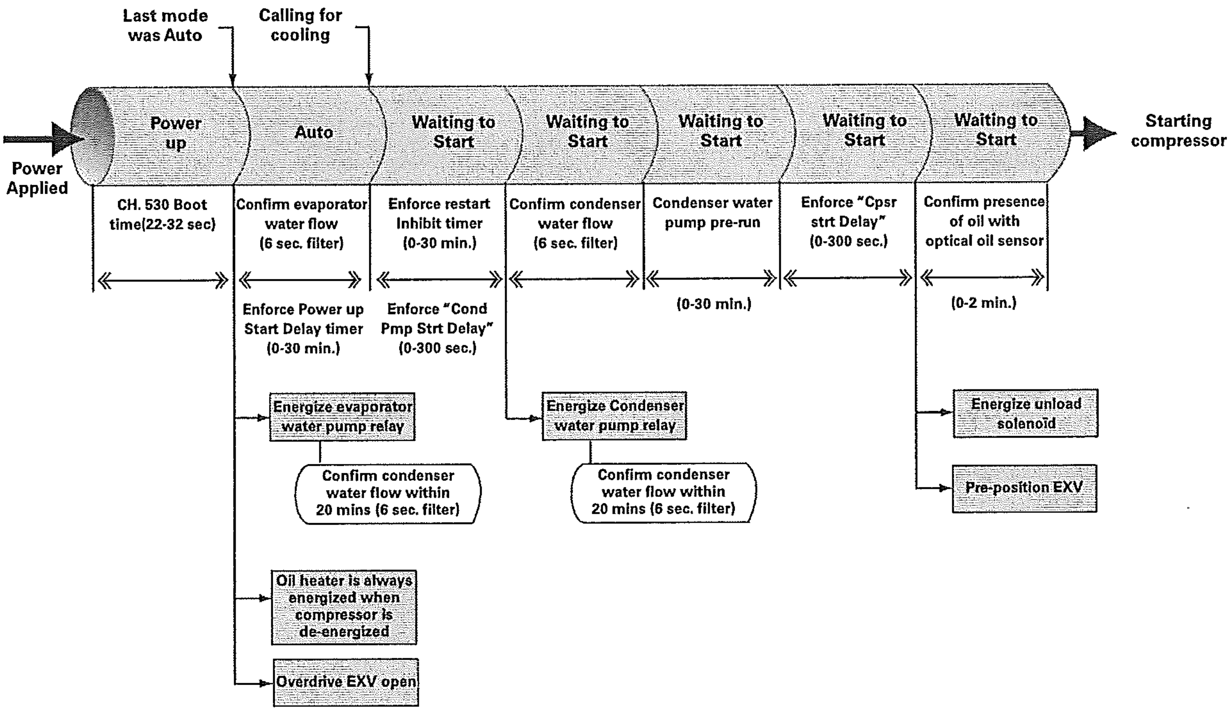
Unit Start-up

Power Up to Starting

Figure 22 shows the timing from a power up event to energizing the compressor. The shortest allowable time, 95 seconds, would be under the following conditions:

1. No motor restart inhibit
2. Evaporator and Condenser Water flowing
3. Power up Start Delay setpoint set to 0 minutes
4. Adjustable Stop to Start Timer set to 5 seconds
5. Need to cool

Figure 22 - Power Up to Starting



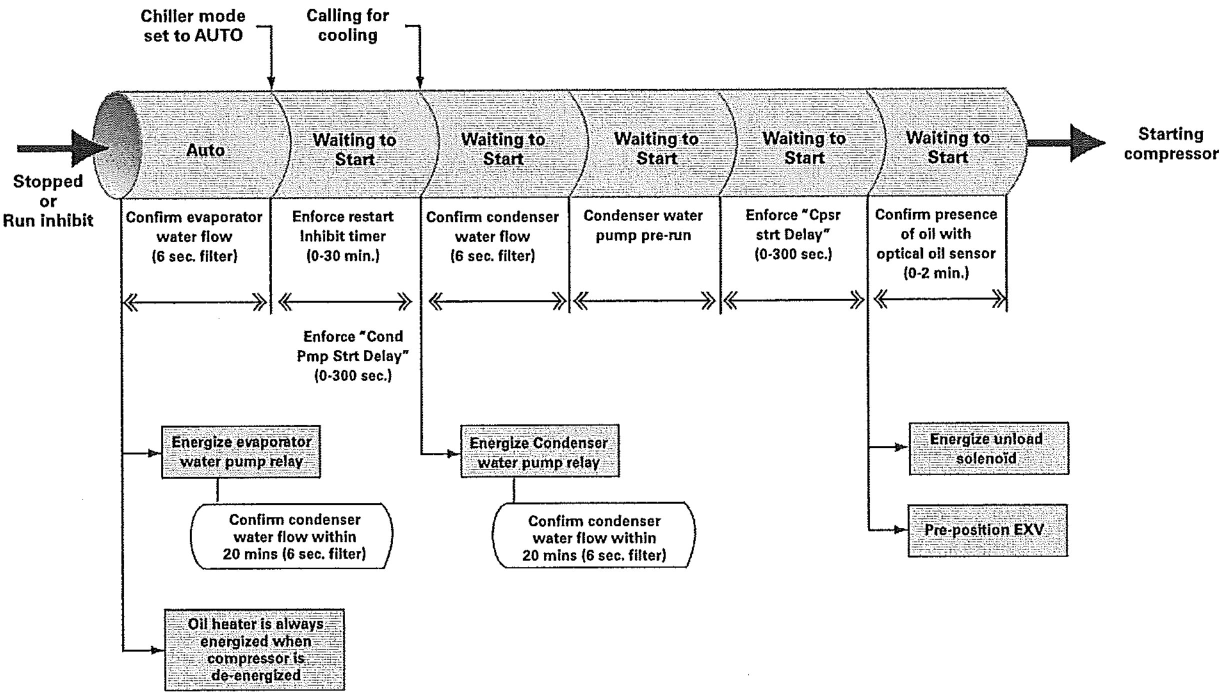
Unit Start-up

Stopped to Starting

The stopped to starting diagram shows the timing from a stopped mode to energizing the compressor. The shortest allowable time, 60 seconds, would be under the following conditions:

1. No motor restart inhibit
2. Evaporator and Condenser Water flowing
3. Power up Start DelayTimer has expired
4. Adjustable Stop to StartTimer has expired
5. Need to cool

Figure 23 - Stopped to Starting



Unit Start-up

Limit Conditions

CH.530 will automatically limit certain operating parameters during startup and run modes to maintain optimum chiller performance and prevent nuisance diagnostic trips. These limit conditions are noted in Table 9.

Table 9 - Limit Conditions

Running - Limited	The chiller, circuit, and compressor are currently running, but the operation of the chiller/compressor is being actively limited by the controls. Further information is provided by the sub-mode.
Capacity Limited by High Cond Press	The circuit is experiencing condenser pressures at or near the condenser limit setting. The compressor will be unloaded to prevent exceeding the limits.
Capacity Limited by Low Evap Rfgt Temp	The circuit is experiencing saturated evaporator temperatures at or near the Low Refrigerant Temperature Cutout setting. The compressors will be unloaded to prevent tripping.
Capacity Limited by Low Liquid Level	The circuit is experiencing low refrigerant liquid levels and the EXV is at or near full open. The compressor will be unloaded to prevent tripping.
Capacity Limited by High Current	The compressor is running and its capacity is being limited by high currents. The current limit setting is 120% RLA (to avoid overcurrent trips).
Capacity Limited by Phase Unbalance	The compressor is running and its capacity is being limited by excessive phase current unbalance.

Note: RTHC are not built to operate continuously unloaded due to motor cooling concerns. Doing so could lead to latching trips on motor and compressor protection devices and could not be claimed to TRANE.

Seasonal Unit Start-Up Procedure

1. Close all valves and re-install the drain plugs in the evaporator and condenser heads.
2. Service the auxiliary equipment according to the start-up/maintenance instructions provided by the respective equipment manufacturers.
3. Vent and fill the cooling device, if used, as well as the condenser and piping. At this point, all air must be removed from the system (including each pass). Close the vents in the evaporator chilled water circuits.
4. Open all the valves in the evaporator chilled water circuits.
5. If the evaporator was previously drained, vent and fill the evaporator and chilled water circuit. When all air is removed from the system (including each pass), install the vent plugs in the evaporator water boxes.

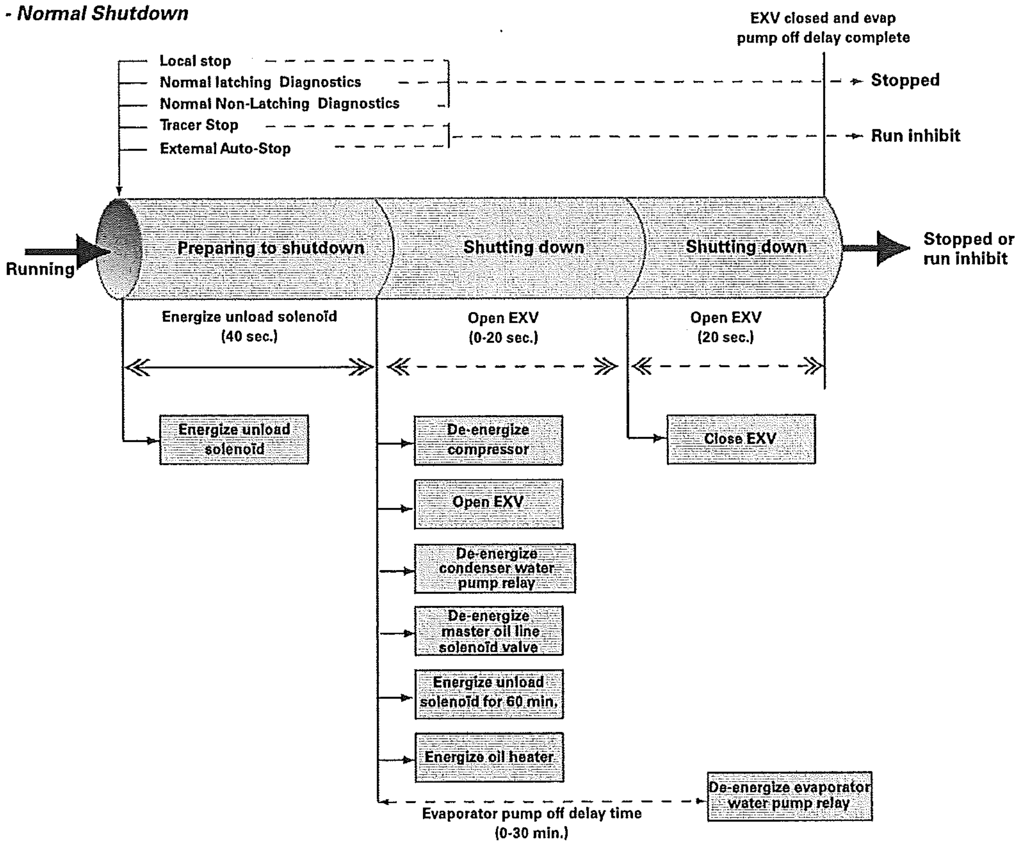
CAUTION: Equipment Damage! Ensure that the oil sump heaters have been operating for a minimum of 24 hours before starting. Failure to do so may result in equipment damage.

6. Check the adjustment and operation of each safety and operating control.
7. Close all disconnect switches.
8. Refer to the sequence for daily unit startup for the remainder of the seasonal startup.

Normal Shutdown to Stopped

The Normal Shutdown diagram shows the Transition from Running through a Normal (friendly) Shutdown. The Dashed lines (------) on the top attempt to show the final mode if you enter the stop via various inputs.

Figure 24 - Normal Shutdown



Seasonal Unit Shutdown

1. Perform the normal stop sequence using the <Stop> key.

NOTE: Do not open the starter disconnect switch. This must remain closed to provide control power from the control power transformer to the oil sump heater.

2. Verify that the chilled water and condenser water pumps are cycled off. If desired, open the disconnect switches to the pumps.
3. Drain the condenser piping and cooling device, if desired to protect again freezing. It is recommended to use antifreeze solution (i.e. glycol) to protect against freezing.
4. If the drain solution is used, remove the drain and vent plugs from the condenser headers to drain the condenser.
5. Verify that the crank case heater is working.
6. Once the unit is secured, perform the maintenance identified in the following sections.

Periodic Maintenance

Overview

This section describes preventative maintenance procedures and intervals for the Series R unit. Use a periodic maintenance program to ensure optimal performance and efficiency of the units. An important aspect of the chiller maintenance program is the regular completion of the "Operating Log ". When filled out properly the completed logs can be reviewed to identify any developing trends in the chiller's operating conditions.

Weekly Maintenance and Checks

After the unit has operated for approximately 30 minutes and the system has stabilized, check the operating conditions and complete the procedures below:

- Log the chiller.
- Check evaporator and condenser pressures with gauges and compare to the reading on the Clear Language Display. Pressure readings should fall within the following ranges specified in the Operating Conditions.

NOTE: Optimum condenser pressure is dependent on condenser water temperature, and should equal the saturation pressure of the refrigerant at a temperature 1 to 3°C above that of leaving condenser water at full load.

Monthly Maintenance and Checks

- Review operating log.
- Clean all water strainers in both the chilled and condensing water piping systems.
- Measure the oil filter pressure drop. Replace oil filter if required. Refer to "Service Procedures ".
- Measure and log the subcooling and superheat.
- If operating conditions indicate a refrigerant shortage, leak check the unit using soap bubbles.
- Repair all leaks.
- Trim refrigerant charge until the unit operates in the conditions listed in the note below.

Note: condenser water: 30/35°C and evaporator water: 12/7°C.

Table 10 - Operating Conditions at Full Load

Description	Condition
Evaporator pressure	1.8 - 2.7 bar
Condensing pressure	8 - 8.5 bar
Discharge superheat	10°C
Subcooling	3 - 5°C
EXV percent open	40 - 50% open in Auto mode

All conditions stated above are based on the unit running fully loaded, running at conditions indicated above. If full load conditions can not be met, refer to note below to trim the refrigerant charge

Note: entering condenser water: 30°C and entering evaporator water: 12°C.

Periodic Maintenance

Table 11 - Operating Conditions at Minimum Load

Description	Condition
Evaporator approach	*< 4°C (non-glycol applications)
Condensing approach	*< 4°C
Subcooling	1-2°C
EXV percent open	10-20% open

* 0.5°C for new unit.

Annual Maintenance

WARNING: Hazardous Voltage! Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout / tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

- Shut down the chiller once each year to check the following:
- Perform all weekly and monthly maintenance procedures.
- Check the refrigerant charge and oil level. Refer to "Maintenance Procedures ". Routine oil changing is not necessary on a hermetic system.
- Have a qualified laboratory perform an oil analysis to determine system moisture content and acid level.

IMPORTANT NOTE: Due to the hygroscopic properties of the POE oil, all oil must be stored in metal containers. The oil will absorb water if stored in a plastic container.

- Check the pressure drop across the oil filter. Refer to "Maintenance Procedures ".
- Contact a qualified service organization to leak check the chiller, to inspect safety controls, and inspect electrical components for deficiencies.
- Inspect all piping components for leakage and/or damage. Clean out any inline strainers.
- Clean and repaint any areas that show signs of corrosion.
- Test vent piping of all relief valves for presence of refrigerant to detect improperly sealed relief valves. Replace any leaking relief valve.
- Inspect the condenser tubes for fouling; clean if necessary. Refer to "Maintenance Procedures ".
- Check to make sure that the crank case heater is working.

Scheduling Other Maintenance

- Use a nondestructive tube test to inspect the condenser and evaporator tubes at 3-year intervals.

NOTE: It may be desirable to perform tube tests on these components at more frequent intervals, depending upon chiller application. This is especially true of critical process equipment.

- Depending on chiller duty, contact a qualified service organization to determine when to conduct a complete examination of the unit to determine the condition of the compressor and internal components.
- Follow national regulation when special prescriptions.

Periodic Maintenance

Contractor Confirmation Check Sheet

This check sheet must be completed by the installing contractor and submitted prior to requesting Trane Service start-up support. The check sheet identifies a list of items that need to be completed prior to actual machine start-up.

Contractor Confirmation Check Sheet	
Addressed to the Trane Service office of:	
Job Name:	**Job location:**
Model No.:	**Sales order No.:**
Unit	**Cooling water**
❑ Unit installed	❑ Connected to the unit
❑ Isolator pads in place	❑ Connected to the cooling device
Chilled Water	❑ Connected to the pumps
❑ Connected to the unit	❑ System flushed and then filled
❑ Connected to the air handling units	❑ Pumps run and air bled
❑ Connected to the pumps	❑ Strainers cleaned
❑ System flushed and then filled	❑ Flow switch installed and checked/set
❑ Pumps run and air bled	❑ Throttling cock installed in leaving water
❑ Strainers cleaned	❑ Thermometers installed in leaving/entering water
❑ Flow switch installed and checked/set	❑ Gauges installed in leaving/entering water
❑ Throttling cock installed in leaving water	❑ Cooling water control operational
❑ Thermometers installed in leaving/entering water	❑ Water treatment equipment
❑ Gauges installed in leaving/entering water	**Wiring**
	❑ Power supply connected and available
	❑ External interlock connected
	Load
	❑ System can be operated under load condition

We will therefore require your service technician on job by*__________________.

Checklist completed by______________________________________.

Date____.

* Return this completed checklist to your Trane Service office as soon as possible to enable the start-up visit to be scheduled. Be aware that advance notification is required to allow scheduling of the start-up as close to the requested date as possible. Additional time required to complete the start-up and adjustment due to incompleteness of the installation will be invoiced at prevailing rates.

Maintenance Procedures

Cleaning the Condenser

CAUTION: Proper Water Treatment! The use of untreated or improperly treated water in a RTHD may result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. The manufacturer assumes no responsibility for equipment failures which result from untreated or improperly treated water, saline or brackish water.

Condenser tube fouling is suspect when the "approach " temperature (i.e., the difference between the refrigerant condensing temperature and the leaving condenser water temperature) is higher than predicted. Standard water applications will operate with less than a 5°C approach. If the approach exceeds 5°C and there is no-condensable in the system cleaning the condenser tubes is recommended.

NOTE: Glycol in the water system typically doubles the standard approach.

If the annual condenser tube inspection indicates that the tubes are fouled, 2 cleaning methods can be used to rid the tubes of contaminants. The methods are:

Mechanical Cleaning Procedure

Mechanical tube cleaning this method is used to remove sludge and loose material from smooth-bore condenser tubes.

1. Remove the retaining bolts from the water boxes at each end of the condenser. Use a hoist to lift the water boxes.
2. Work a round nylon or brass bristled brush (attached to a rod) in and out of each of the condenser water tubes to loosen the sludge.
3. Thoroughly flush the condenser water tubes with clean water. (To clean internally enhanced tubes, use a bi-directional brush or consult a qualified service organization for recommendations.)

Chemical Cleaning Procedure

Scale deposits are best removed by chemical means. Consult a qualified water treatment specialist (i.e., one that knows the local water supply chemical/mineral content) for a recommended cleaning solution suitable for the job. (A standard condenser water circuit is composed solely of copper, cast iron and steel.) Improper chemical cleaning can damage tube walls.
All of the materials used in the external circulation system, the quantity of the solution, the duration of the cleaning period, and any required safety precautions should be approved by the company furnishing the materials or performing the cleaning.

NOTE: Chemical tube cleaning should always be followed by mechanical tube cleaning.

Cleaning the Evaporator

Since the evaporator is typically part of a closed circuit, it does not accumulate appreciable amounts of scale or sludge. However, if cleaning is deemed necessary, use the same cleaning methods described for the condenser tubes.

Compressor Oil

CAUTION: Equipment Damage! To prevent oil sump heater burnout, open the unit main power disconnect switch before removing oil from the compressor.

Trane Polyolester Oil is the approved oil for the RTHD units. Polyolester oil is extremely hygroscopic meaning it readily attracts moisture. The oil can not be stored in plastic containers due to the hygroscopic properties. As with mineral oil, if water is in the system it will react with the oil to form acids. Use Table 12 to determine the acceptability of the oil. Trane approved oils: OIL 048E and OIL 023E. The proper charge amounts are given on page 10.
Note: Use an oil transfer pump to change the oil regardless of chiller pressure.

Maintenance Procedures

Table 12 - POE Oil Properties

Description	Acceptable Levels
Moisture content	less than 300 ppm
Acid Level (mg KOH/g)	less than 0.5TAN

Mineral oil used in the RTHA and RTHB units had different acceptable levels (<50 ppm of moisture and < 0.05 mg KOH/g)

Oil Sump Level Check

The oil level in the oil sump can be measured to give an indication of the system oil charge. Follow the procedures below to measure the level.

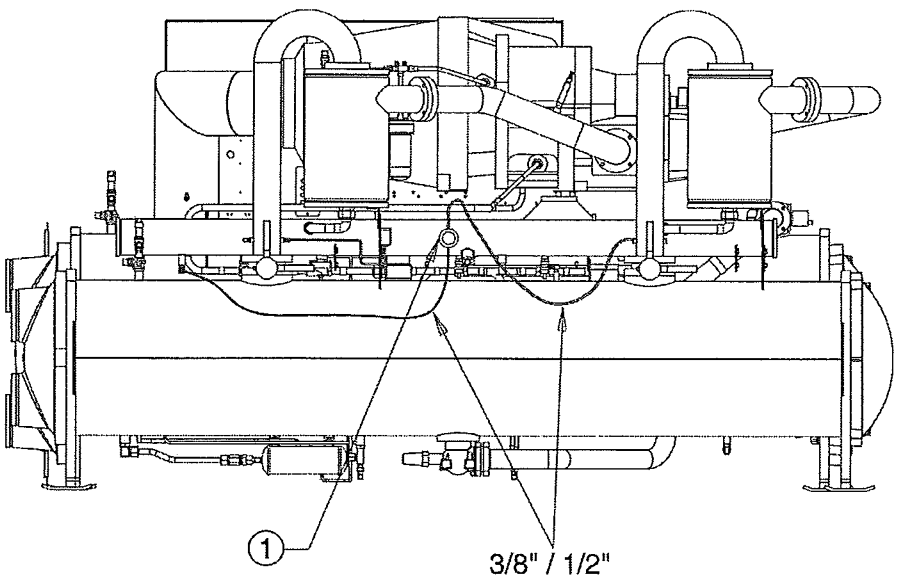
1. Run the unit fully loaded for approximately 20 minutes.

Note: Operating the unit at minimum load tends to lower oil sump levels to as low as 50mm , well below the normal 120mm-150mm levels. This is because the evaporator tends to hold more oil at minimum load conditions. Before adding any oil, obtain an oil level reading near a full load operating condition.

2. Cycle the compressor off line.

CAUTION: Oil Loss!
Never operate the compressor with the sight glass service valves opened. Severe oil loss will occur. Close the valves after checking the oil level. The sump is above the condenser and it is possible to drain the oil.

Figure 25 - Determining Oil Level in Sump



Maintenance Procedures

3. Attach a 3/8 " or 1//2 " hose with a sightglass (1) in the middle to the oil sump drain valve and the 1/4 " schraeder valve on the top of the discharge line. Using high pressure rated clear hose with appropriate fittings can help speed up the process.
4. After the unit is off line for 10 minutes, move the sightglass (1) along the side of the oil sump.
5. The level should be between 50 mm and 125 mm from the bottom of the oil sump. If the level appears to be above 200 mm, the oil sump is completely full. Most likely more oil resides in the rest of the system and some oil needs to be removed until the level falls between 50 mm and 125 mm in the oil sump.
6. If the level is below 50 mm, there is not enough oil in the sump. This can occur from not enough oil in the system or more likely, oil migration to the evaporator. Oil migration can occur from a low refrigerant charge, gas pump malfunction, etc.

NOTE: If the oil is logged in the evaporator confirm the operation of the gas pump. If the gas pump is not functioning properly all oil will be logged in the evaporator.

7. After the level is determined, close the service valves and remove the hose/sight glass assembly.

Removing Compressor Oil

The oil in the compressor oil sump is under a constant positive pressure at ambient temperature. To remove oil, open the service valve located on the bottom of the oil sump and drain the oil into a suitable container using the procedure outlined below:

CAUTION: POE Oil!
Due to the hygroscopic properties of the POE oil, all oil must be stored in metal containers. The oil will absorb water if stored in a plastic container.

Oil should not be removed until the refrigerant is isolated or removed.

8. Connect a line to the oil sump drain valve.
9. Open the valve and allow the desired amount of oil to flow into the container and close the charging valve.
10. Measure the exact amount of oil removed from the unit.

Oil Charging Procedure

It is critical to fill the oil lines feeding the compressor when charging a system with oil. The diagnostic "Loss of oil at the compressor stopped " will be generated if the oil lines are not full on start-up.

To properly charge the system with oil, follow the steps below:

1. Locate the 1/4 " schrader valve between the ball valve and oil filter (or the ball valve and oil cooler, if so equipped).
2. Loosely connect oil pump to schrader valve called out in step 1.
3. Operate oil charging pump until oil appears at the charging valve connection; then tighten the connection.

Note: To keep air from entering the oil, the charging valve connection must be air-tight.

4. Close the ball valve just upstream of the schrader valve connected to the oil pump. This will allow the oil to travel through the oil lines to the compressor first rather than directly to the oil sump.
5. Energize the master oil solenoid.
6. This will allow the oil to travel from the schrader to the compressor. It takes approximately 7.5 l of oil to fill the lines.
7. After charging the first 7.5 l, de-energize the master solenoid.
8. Open the ball valve just upstream of the schrader connected to the oil pump. This will allow the remainder of the charge to flow to the oil sump.

Maintenance Procedures

9. Monitor the "Oil Loss Level Sensor Status in TechView under the Status view. This display shows whether the optical sensor is seeing oil (wet) or if it is not (dry).

NOTE: The remainder of the oil charge can be charged into the 1/4 " service valve located at the bottom of the sump if a larger connection is preferred.

Replacing the Main Oil Filter (Hot Filter)

The filter element should be changed if the oil flow is sufficiently obstructed. Two things can happen: first, the chiller may shut down on a "Low Oil Flow " diagnostic, or secondly, the compressor may shut down on a "Loss of Oil at Compressor (Running) diagnostic. If either of these diagnostics occurs, it is possible the oil filter needs replacement. The oil filter is not usually the cause of a Loss of oil at Compressor diagnostic.

Specifically, the filter must be changed if the pressure drop between the 2 service valves in the lubrication circuit exceeds the maximum level as given in Figure 26. This chart shows the relationship between the pressure drop measured in the lubrication circuit as compared with operating pressure differential of the chiller (as measured by pressures in the condenser and evaporator).

Normal pressure drops between the service valves of the lubrication circuit are shown by the lower curve. The upper curve represents the maximum allowable pressure drop and indicates when the oil filter must be changed. Pressure drops that lie between the lower and upper curves are considered acceptable.

For a chiller equipped with an oil cooler, add 35 kPa to the values shown in Figure 26. For example, if the system pressure differential was 550 kPa, then the clean filter pressure drop would be approximately 100 kPa (up from 70 kPa For a chiller with an oil cooler and operating with a dirty oil filter, the maximum allowable pressure drop would be 190 kPa (up from 160 kPa).

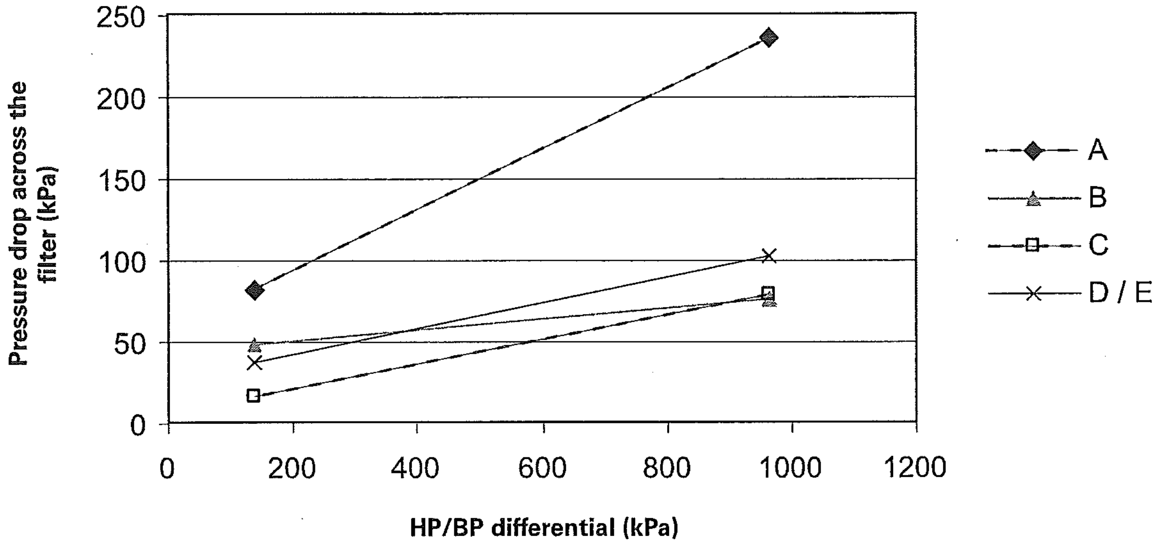
Under normal operating conditions the element should be replaced after the first year of operation and then as needed thereafter.

Refer to Table 2 and unit nameplate for oil charge information.

1. Isolate the oil filter by closing the 2 ball valves located before and after the filter.
2. Relieve the pressure from the hydraulic line through the 1/4" schrader valve located between the ball valve and the oil filter (or the ball valve and oil cooler, if so equipped).
3. Use a strap wrench to break loose the nut that secures the oil filter element to the filter manifold.
4. Turn the nut clockwise until the filter element detaches from the manifold.
5. Remove the filter element and measure the exact amount of oil contained in the filter bowl and element.
6. Place the cartridge in the nut after filling the bowl with the proper amount of refrigerant oil (see Step 5). Turn the new nut assembly counterclockwise and tighten securely.
7. Connect manifold gauge set at oil charging valve and evacuate the filter to 500 microns.
8. Charge the oil line back with the amount of oil removed. Open the isolation valves to the oil supply system.

Maintenance Procedures

Figure 26 - Oil Filter Replacement Chart



A = Maximum pressure drop
B = B compressors
C = C compressors
D/E = D and E compressors

Maintenance Procedures

Replacing the Gas Pump Oil Filter

The filter element in the gas pump circuit may need to be changed if the gas pump is unable to return the oil to the compressor.
An evaporator logged with oil will have a high liquid level when referring to the liquid level sensor, low suction pressures, and higher than normal approach on the evaporator.
Once the oil is logged in the evaporator, it may be necessary to manually move the oil from the evaporator to the oil sump to avoid losses in the main oil lines.

Refrigerant Charge

If a low refrigerant charge is suspected, first determine the cause of lost refrigerant. Once the problem is repaired follow the procedures below for evacuating and charging the unit.

Refrigerant recovery

1. **Insure that the water flow is maintained on condenser and evaporator during all the recovery operation.**
2. **Connections on evaporator and condenser are available to remove the refrigerant. Weigh the refrigerant removed.**

CAUTION !
Never recover refrigerant without maintaining nominal water flow on heat exchangers during all the recovery operation. Evaporator or condenser could freeze and bringing severe damages to the unit.

3. **Use a "refrigerant transfer machine" and adequate service cylinders to stock the recovered refrigerant.**
4. **According to its quality, use recovered refrigerant to charge the unit or give it to refrigerant producer for recycling or elimination.**

Evacuation and Dehydration

1. Disconnect ALL power before/during evacuation.
2. Connect the vacuum pump to the 5/8 " flare connection on the bottom of the evaporator and/or condenser.
3. To remove all of the moisture from the system and to insure a leak free unit, pull the system down below 500 microns.
4. After the unit is evacuated, perform a standing rise test for at least an hour. The pressure should not rise more than 150 microns. If the pressures rises more than 150 microns, either a leak is present or moisture still in the system.

NOTE: If oil is in the system, this test is more difficult. The oil is aromatic and will give off vapors that will raise the pressure of the system.

Refrigerant Charging

Once the system is deemed leak and moisture free, use the 5/8 "flare connections at the bottom of the evaporator and condenser to add refrigerant charge. Refer to Table 2 and unit nameplate for refrigerant charge information.

Freeze Protection

For unit operation in a low temperature environment, adequate protection measures must be taken against freezing. Adjusted settings and recommended ethylene glycol solution strengths are contained in Table 13.

Maintenance Procedures

Table 13 - Low Refrigerant Temperature, Ethylene Glycol, and Freeze Protection Settings

		BBB, CDE, DDE, EDE*			BCD, CEF, DFF, EFF*			DGG, EGG*		
Chilled Water Setpt (°C)	Leaving Wtr Temp Cutout (°C)	Low Rfgt Temp Cutout (°C)	Rec % Ethylene Glycol	Solution Freeze Point (°C)	Low Rfgt Temp Cutout (°C)	Rec % Ethylene Glycol	Solution Freeze Point (°C)	Low Rfgt Temp Cutout (°C)	Rec % Ethylene Glycol	Solution Freeze Point (°C)
4.4	1.1	-1.9	0	0.0	-1.9	0	0.0	-1.9	0	0.0
3.9	0.6	-2.7	2	-0.8	-2.4	1	-0.4	-2.3	0	0.0
3.3	0.0	-3.5	4	-1.6	-3.1	3	-1.1	-2.7	2	-0.5
2.8	-0.6	-4.3	6	-2.4	-3.7	5	-1.7	-3.1	3	-1.0
2.2	-1.1	-5.2	8	-3.3	-4.3	6	-2.4	-3.5	4	-1.5
1.7	-1.7	-6.1	11	-4.2	-5.0	8	-3.1	-3.9	6	-2.1
1.1	-2.2	-6.6	12	-4.7	-5.5	10	-3.6	-4.4	7	-2.6
0.6	-2.8	-7.1	13	-5.2	-6.1	11	-4.2	-5.0	8	-3.1
0.0	-3.3	-7.7	15	-5.8	-6.6	12	-4.7	-5.6	10	-3.7
-0.6	-3.9	-8.3	16	-6.4	-7.3	14	-5.4	-6.3	12	-4.4
-1.1	-4.4	-8.9	17	-7.1	-8.0	15	-6.1	-7.1	13	-5.2
-1.7	-5.0	-9.6	18	-7.7	-8.6	16	-6.7	-7.6	14	-5.7
-2.2	-5.6	-10.2	20	-8.3	-9.2	17	-7.3	-8.1	15	-6.2
-2.8	-6.1	-10.9	21	-9.0	-9.8	18	-7.9	-8.7	16	-6.8
-3.3	-6.7	-11.6	22	-9.7	-10.4	20	-8.5	-9.2	17	-7.3
-3.9	-7.2	-12.3	23	-10.4	-11.1	21	-9.2	-9.8	19	-7.9
-4.4	-7.8	-13.0	24	-11.1	-11.7	22	-9.8	-10.4	20	-8.6
-5.0	-8.3	-13.7	25	-11.8	-12.4	23	-10.5	-11.1	21	-9.2
-5.6	-8.9	-14.5	26	-12.6	-13.1	24	-11.2	-11.7	22	-9.8
-6.1	-9.4	-15.3	27	-13.4	-13.8	25	-11.9	-12.4	23	-10.5
-6.7	-10.0	-16.1	28	-14.2	-14.6	26	-12.7	-13.1	24	-11.2
-7.2	-10.6	-16.9	30	-15.0	-15.3	27	-13.4	-13.7	25	-11.8
-7.8	-11.1	-17.7	31	-15.8	-16.1	29	-14.2	-14.4	26	-12.6
-8.3	-11.7	-18.6	32	-16.7	-16.9	30	-15.0	-15.2	28	-13.3
-8.9	-12.2	-19.4	33	-17.5	-17.7	31	-15.8	-15.9	29	-14.1
-9.4	-12.8	-20.3	33	-18.4	-18.5	32	-16.6	-16.7	30	-14.8
-10.0	-13.3	N/A	34	-19.3	-19.3	33	-17.4	-17.4	31	-15.6
-10.6	-13.9	N/A	35	-20.2	-20.2	34	-18.3	-18.2	32	-16.3
-11.1	-14.4	N/A	36	-21.2	N/A	34	-19.2	-19.1	33	-17.2
-11.7	-15.0	N/A	37	-22.1	N/A	35	-20.1	-19.9	34	-18.0
-12.2	-15.6	N/A	38	-23.1	N/A	36	-20.9	-20.7	34	-18.8

* Refer to unit Model No. digits 6, 14, 21
N/A = chiller is not to be applied at leaving evaporator water temperatures, which result in the LRTC setting below those shown in the table.

Notes

Table 14 - Low Refrigerant Temperature, Propylene Glycol, and Freeze Protection Settings

		BBB, CDE, DDE, EDE*			BCD, CEF, DFF, EFF*			DGG, EGG*		
Chilled Water Setpt (°C)	Leaving Wtr Temp Cutout (°C)	Low Rfgt Temp Cutout (°C)	Rec % Propylene Glycol	Solution Freeze Point (°C)	Low Rfgt Temp Cutout (°C)	Rec % Propylene Glycol	Solution Freeze Point (°C)	Low Rfgt Temp Cutout (°C)	Rec % Propylene Glycol	Solution Freeze Point (°C)
4.4	1.1	-1.9	0	0	-1.9	0	0	-1.9	0	0
3.9	0.6	-2.7	3	-0.8	-2.3	2	-0.4	-1.9	0	0
3.3	0	-3.7	6	-1.8	-3.1	4	-1.2	-2.4	2	-0.5
2.8	-0.6	-4.7	9	-2.8	-3.7	6	-1.8	-2.8	3	-0.9
2.2	-1.1	-6	12	-4.1	-4.6	9	-2.7	-3.3	5	-1.4
1.7	-1.7	-7.2	15	-5.3	-5.4	10	-3.5	-3.9	7	-2
1.1	-2.2	-7.7	17	-5.8	-5.9	12	-4	-4.4	8	-2.5
0.6	-2.8	-8.1	18	-6.2	-6.5	14	-4.6	-4.8	10	-2.9
0	-3.3	-8.8	20	-6.9	-7	16	-5.1	-5.5	11	-3.6
-0.6	-3.9	-9.4	21	-7.5	-7.8	17	-5.9	-6.3	13	-4.4
-1.1	-4.4	-10.3	23	-8.4	-8.7	19	-6.8	-7.4	16	-5.5
-1.7	-5	-10.9	24	-9	-9.3	21	-7.4	-7.8	17	-5.9
-2.2	-5.6	-11.5	25	-9.6	-9.9	22	-8	-8.2	19	-6.3
-2.8	-6.1	-12.4	27	-10.5	-10.6	23	-8.7	-8.9	20	-7
-3.3	-6.7	-13.2	28	-11.3	-11.2	25	-9.3	-9.3	21	-7.4
-3.9	-7.2	-14.1	30	-12.2	-12.1	26	-10.2	-10	22	-8.1
-4.4	-7.8	-14.9	31	-13	-12.7	27	-10.8	-10.8	24	-8.9
-5	-8.3	-15.8	32	-13.9	-13.6	29	-11.7	-11.5	25	-9.6
-5.6	-8.9	-16.8	33	-14.9	-14.4	30	-12.5	-12.1	26	-10.2
-6.1	-9.4	-17.9	34	-16	-15.3	31	-13.4	-13	28	-11.1
-6.7	-10	-18.9	36	-17	-16.3	32	-14.4	-13.8	29	-11.9
-7.2	-10.6	-19.9	37	-18	-17.1	34	-15.2	-14.4	30	-12.5
-7.8	-11.1	N/A	38	-19.1	-18.2	35	-16.3	-15.5	32	-13.6
-8.3	-11.7	N/A	40	-20.3	-19.2	36	-17.3	-16.3	33	-14.4
-8.9	-12.2	N/A	41	-21.4	-20.3	38	-18.4	-17.4	34	-15.5
-9.4	-12.8	N/A	42	-22.6	N/A	39	-19.4	-18.2	35	-16.3
-10	-13.3	N/A	43	-23.9	N/A	40	-20.5	-19.3	36	-17.4
-10.6	-13.9	N/A	44	-25.1	N/A	41	-21.7	-20.1	37	-18.2
-11.1	-14.4	N/A	46	-26.6	N/A	43	-23	-21.4	39	-19.5
-11.7	-15	N/A	47	-27.8	N/A	44	-24.2	N/A	40	-20.5
-12.2	-15.6	N/A	48	-29.2	N/A	45	-25.2	N/A	41	-21.5

* Refer to unit Model No. digits 6, 14, 21

N/A = chiller is not to be applied at leaving evaporator water temperatures, which result in the LRTC setting below those shown in the table.

Note 1:these values are given for reference only and will vary with the unit configuration and with the operating conditions.

Note 2: When setting up an ice-making system, the ice termination set point is the entering water. Subtract 3.4°C from the setpoint to use the above table : Chilled Water Setpoint (ice-making only) = Ice Termination setpoint - 3.4°C.

Notes

Quality Management
System Approval

Literature Order Number	RLC-SVX05B-E4
Date	0704
Supersedes	RLC-SVX05A-E4_0903
Stocking Location	Europe

www.trane.com

For more information, contact your local district office or e-mail us at comfort@trane.com

American Standard Europe BVBA
Registered Office: 1789 Chaussée de Wavre, 1160 Brussels - Belgium