



Installation Operation Maintenance

Series R® Air-Cooled Rotary Liquid Chillers

Packaged Air-Cooled Chiller,
RTAA 70-125

Remote Evaporator
Air-Cooled Chiller,
RTAA 70-125



Models RTAA

RTAA-70
RTAA-80
RTAA-90

RTAA-100
RTAA-110
RTAA-125

September 2005

RTAA-SVX01A-EN



NOTICE: Warnings and Cautions appear at appropriate sections throughout this literature. Read these carefully.

⚠ WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION: Indicates a situation that may result in equipment or property-damage only accidents.

Important Environmental Concerns!

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants—including industry replacements for CFCs such as and HCFCs and HFCs.

Responsible Refrigerant Practices!

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ WARNING

Contains Refrigerant!

System contains oil and refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

Failure to follow proper procedures or the use of non-approved refrigerants, refrigerant substitutes, or refrigerant additives could result in death or serious injury or equipment damage.



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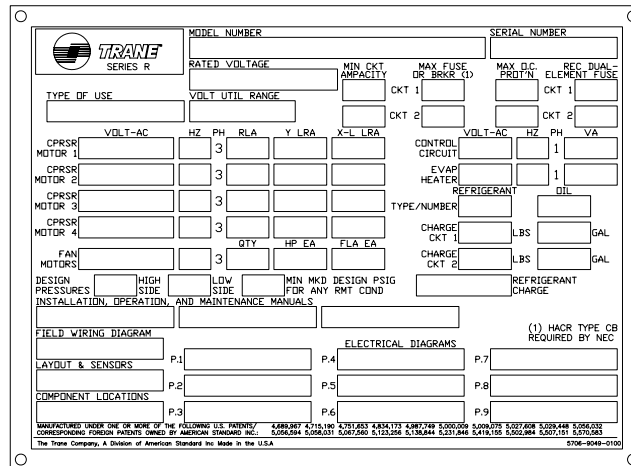
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General Information

Unit Identification - Nameplates

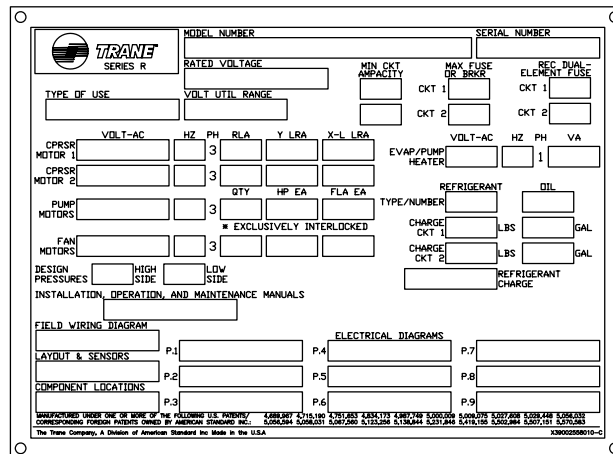
When the unit arrives, compare all nameplate data with ordering, submittal, and shipping information. A typical unit nameplate is shown in Figure 1.



The Standard Unit Nameplate form includes the following fields:

- MODEL NUMBER** and **SERIAL NUMBER**
- RATED VOLTAGE**, **MIN CKT AMPACITY**, **MAX FUSE OR BRKR (1)**, **MAX O.C. PROT'N**, **REC. DUAL ELEMENT FUSE**
- TYPE OF USE**, **VOLT UTIL RANGE**, **CKT 1**, **CKT 2**
- VOLT-AC**, **HZ**, **PH**, **RLA**, **Y LRA**, **X-L LRA**, **VOLT-AC**, **HZ**, **PH**, **VA**
- CPRSR MOTOR 1**, **CPRSR MOTOR 2**, **CPRSR MOTOR 3**, **CPRSR MOTOR 4**
- FAN MOTORS**, **QTY**, **HP**, **EA**, **FLA**, **EA**
- DESIGN PRESSURES**, **HIGH SIDE**, **LOW SIDE**, **MIN MKD DESIGN PSIG FOR ANY RMT COND**
- INSTALLATION, OPERATION, AND MAINTENANCE MANUALS**
- FIELD WIRING DIAGRAM**, **LAYOUT & SENSORS**, **COMPONENT LOCATIONS**
- ELECTRICAL DIAGRAMS**, **P.1**, **P.2**, **P.3**, **P.4**, **P.5**, **P.6**, **P.7**, **P.8**, **P.9**
- CHARGE**, **CKT 1**, **CKT 2**, **LBS**, **GAL**
- REFRIGERANT**, **CHARGE**, **CKT 1**, **CKT 2**, **LBS**, **GAL**
- REFRIGERANT CHARGE**
- (1) HACR TYPE CB REQUIRED BY NEC**

Figure 1 Standard Unit Nameplate



The Pump Package Unit Nameplate form includes the following fields:

- MODEL NUMBER** and **SERIAL NUMBER**
- RATED VOLTAGE**, **MIN CKT AMPACITY**, **MAX FUSE OR BRKR (1)**, **MAX O.C. PROT'N**, **REC. DUAL ELEMENT FUSE**
- TYPE OF USE**, **VOLT UTIL RANGE**, **CKT 1**, **CKT 2**
- VOLT-AC**, **HZ**, **PH**, **RLA**, **Y LRA**, **X-L LRA**, **VOLT-AC**, **HZ**, **PH**, **VA**
- CPRSR MOTOR 1**, **CPRSR MOTOR 2**
- PUMP MOTORS**, **QTY**, **HP**, **EA**, **FLA**, **EA**
- FAN MOTORS**, **QTY**, **HP**, **EA**, **FLA**, **EA**
- DESIGN PRESSURES**, **HIGH SIDE**, **LOW SIDE**, **MIN MKD DESIGN PSIG FOR ANY RMT COND**
- INSTALLATION, OPERATION, AND MAINTENANCE MANUALS**
- FIELD WIRING DIAGRAM**, **LAYOUT & SENSORS**, **COMPONENT LOCATIONS**
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- CHARGE**, **CKT 1**, **CKT 2**, **LBS**, **GAL**
- REFRIGERANT**, **CHARGE**, **CKT 1**, **CKT 2**, **LBS**, **GAL**
- REFRIGERANT CHARGE**
- (1) HACR TYPE CB REQUIRED BY NEC**

Figure 2 Pump Package Unit Nameplate

Nameplates

The RTAA outdoor unit nameplates are applied to the exterior of the Control Panel. A compressor nameplate is located on each compressor.

Outdoor Unit Nameplate

The outdoor unit nameplate provides the following information:

- Unit model and size description.
- Unit serial number.
- Identifies unit electrical requirements.
- Lists correct operating charges of R-22 and oil.



General Information

Lists unit test pressures.

Identifies installation, operation and maintenance and service data literature.

Lists drawing numbers for unit wiring diagrams.

Pump Package Information - Optional

Compressor Nameplate

The compressor nameplate provides following information:

Compressor model number.

Compressor serial number.

Compressor electrical characteristics.

Utilization range.

Recommended refrigerant.

Unit Inspection

When the unit is delivered, verify that it is the correct unit and that it is properly equipped. Compare the information which appears on the unit nameplate with the ordering and submittal information.

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 Trane Sales Office.

Do not proceed with installation of a damaged unit without sales office approval.

NOTE: If the Remote Evaporator Option is ordered, the remote evaporator will be shipped in a separate crate.

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 15 days after receipt.
- If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage. The owner must provide reasonable evidence that the damage did not occur after delivery.
- Notify the carrier's terminal of the damage immediately, by phone and by mail. Request an immediate, joint inspection of the damage with the carrier and the consignee.
- Notify the Trane sales representative and arrange for repair. Do not repair the unit, however, until damage is inspected by the transportation representative.

Loose Parts Inventory

Check all the accessories and loose parts which are shipped with the unit against shipping list. Included in these items will be water vessel drain plugs, isolators, rigging and electrical diagrams, and service literature, which are placed inside the control panel and/or starter panel for shipment.



General Information

Unit Description

The 70 through 125-ton Model RTAA units are helical-rotary type, air-cooled liquid chillers designed for installation outdoors. The unit has two compressors and the compressor circuits are completely assembled, hermetic packages. They are factory-piped, wired, leak-tested, de-hydrated, and tested for proper operation before shipment. The units are factory charged with refrigerant and oil.

The RTAA series features Trane's exclusive Adaptive Control™ logic with Clear Language Display. It monitors the control variables that govern the operation of the chiller unit. Adaptive Control logic can adjust these variables, when necessary, to optimize operational efficiencies, avoid chiller shutdown, and keep producing chilled water. An optional remote display is available to monitor unit operation from a remote location.

These dual-compressor units feature two independent circuits, one for each compressor. Compressor unloaders are solenoid actuated. Each refrigerant circuit is provided with filter drier, sight glass, electronic expansion valve, and charging valves.

The shell-and-tube type evaporator is manufactured in accordance with ASME standards. The evaporator is fully insulated and is equipped with water drain and vent connections. Packaged units have heat tape protection to -20 F.

NOTE: Packaged units are factory charged with refrigerant and oil. Remote evaporator units are shipped with a holding charge of nitrogen and a partial charge of oil.



General Information

Table 1 General RTAA Mechanical Specifications

		Size					
		70	80	90	100	110	125
Compressor							
Quantity		2	2	2	2	2	2
Nominal Size (Tons)(1)		35/35	40/40	50/40	50/50	60/50	60/60
Evaporator							
Water Storage	(Gallons)	39.8	37.8	34.4	32.1	53.4	45.8
	(Liters)	150.6	143.1	130.2	121.5	202.1	173.4
Min. Flow	(GPM)	84	96	108	120	132	150
	(L/Sec)	5.3	6.1	6.8	7.6	8.3	9.5
Max. Flow	(GPM)	252	288	324	360	396	450
	(L/Sec)	15.9	18.2	20.4	22.7	25.0	28.4
Refer to Pump Package Section for water storage of Pump and accocated piping.							
Condenser							
Qty of Coils		4	4	4	4	4	4
Coil Length (Ft)(1)		13/13	13/13	14/13	14/14	17/14	17/17
Coil Height (In)		42	42	42	42	42	42
Number of Rows		2	2	2	2	2	2
Condenser Fans							
Quantity (1)		4/4	4/4	5/4	5/5	5/5	5/5
Diameter (In)		30	30	30	30	30	30
Total Airflow (CFM)		68,380	68,380	73,365	78,355	82,950	87,550
Nominal RPM		855	855	855	855	855	855
Tip Speed (Ft./Min.)		6715	6715	6715	6715	6715	6715
Motor HP (Ea.)		1.1	1.1	1.1	1.1	1.1	1.1
Min. Starting/Oper. Ambient							
Std Unit (Deg. F)		15	15	15	15	15	15
Low Amb. (Deg. F)		-10	-10	-10	-10	-10	-10
General Unit							
Refrigerant		HCFC-22	HCFC-22	HCFC-22	HCFC-22	HCFC-22	HCFC-22
No. of Independent Refrigerant Circuits		2	2	2	2	2	2
% Min. Load (3)		10	10	10	10	10	10
Refrig Charge	(Lb) (1)	58/58	61/61	73/61	73/73	98/73	98/98
	(Kg)	26/26	27/27	33/27	33/33	44/33	44/44
Oil Charge	(Qts) (1.4)	10/10	10/10	12/10	12/12	12/12	12/12
	(L)	10.6/10.6	10.6/10.6	12.7/10.6	12.7/12.7	12.7/12.7	12.7/12.7

Notes:

1. Data containing information on two circuits shown as follows: ckt1/ckt2
2. Minimum start-up/operating ambient based on a 5 mph wind across the condenser.
3. Percent minimum load is for total machine, not each individual circuit.
4. Trane Part Change # Oil-31 (see service bulletin SCOM-SB-1)

General Information

Model Number Coding System

The model number for the unit is comprised of numbers and letters which represent features of the equipment. Shown on the chart in [Figure 3](#) are samples of typical unit model numbers, followed by the coding system.

Each position, or group of positions, in the number is used to represent a feature. For example, in [Figure 3](#), position 8 of the unit model number, Unit Voltage, contains the number "4". From the chart, it can be seen that a "4" in this position means that the unit voltage is 460/60/3.

Figure 3 Model Number Coding System:

Model Number	RTA	A	070	4	Y	AO	1	B	1	D	A	0
Digit Number	0					1						2
Digit Position	1 2 3	4	5 6 7	8	9	0 1	2	3	4	5	6	0

Digit 1-2

Unit Model

RT Rotary Chiller

Digit 3

Unit Type

A Air Cooled

Digit 4

Development Sequence

A First Sequence

Digit 5,6,7

Nominal Capacity

070 70 Nominal Tons
080 80 Nominal Tons
090 90 Nominal Tons
100 100 Nominal Tons
110 110 Nominal Tons
125 125 Nominal Tons

Digit 8

Unit Voltage

D 380/60/3
A 200/60/3
C 230/60/3
K 400/50/3
4 460/60/3
5 575/60/3

Digit 9

Compressor Starter Type

Y Y-Delta Closed Transition
X X-Line (Across the Line)

Digit 10, 11

Design Sequence

AO First Sequence (Factory Input)

Digit 12

Evaporator Leaving Temperature

1 Standard 40 to 65 F
2 Low 0 to 39 F
3 Ice-Making 20 to 65 F

Digit 13

Condenser Coil Fin Material

A Aluminum
2 CompleteCoat dipped coils
4 copper fins

Digit 14

Agency Listing

0 No Agency Listing
3 C-UL Listed

Digit 15

Control Interface

C Deluxe without Communication
D Deluxe with Communication
L LCI-C (LonTalk)

Digit 16

Chilled Water Reset

0 No Chilled Water Reset
1 Based on Return Water Temp
2 Based on Outside Air Temp

Digit 17

Miscellaneous Factory Installed

Options

A Architectural Louvered Panels
B Control Power Transformer
C Convenience Outlet
D Low Ambient Lockout Sensor
F Power Disconnect
G Low Ambient Operation
H Sound Attenuator
J Remote Evaporator
K Coil Protection
M Access Guard
N Neoprene Isolators
P Circuit Breaker
R Remote Display Panel
0 Size C 2 HP Pump Package
1 Size D 3 HP Pump Package
2 Size D 5 HP Pump Package
3 Size E 2 HP Pump Package
4 Size E 3 HP Pump Package
5 Size F 5 HP Pump Package
6 Size F 7 HP Pump Package
7 Size G 3 HP Pump Package
8 Size G 5 HP Pump Package



Installation – Mechanical

Installation Responsibilities

Generally, the contractor must do the following when installing an RTAA unit:

- Install unit on a flat foundation, level (within 1/4" [6 mm] across the length and width of the unit), and strong enough to support unit loading.
- Install unit per the instructions contained in the Installation-Mechanical and Installation-Electrical sections of this manual.
- Where specified, provide and install valves in water piping upstream and downstream of evaporator water connections to isolate the evaporator for maintenance, and to balance/trim system.
- Furnish and install flow switch to prove chilled water flow.
- Furnish and install pressure gauges in inlet and outlet piping of the evaporator.
- Furnish and install a drain valve to the bottom of the evaporator.
- Supply and install a vent cock to the top of the evaporator.
- Furnish and install strainers ahead of all pumps and automatic modulating valves.
- Provide and install field wiring.
- Install heat tape and insulate the chilled water lines and any other portions of the system, as required, to prevent sweating under normal operating conditions or freezing during low ambient temperature conditions.
- Start unit under supervision of a qualified service technician.

For remote evaporator units only

Furnish and install refrigerant piping, liquid line isolation valves, refrigerant, and oil, per instructions outlined in this manual.

Storage

Extended storage of the outdoor unit prior to installation requires the following precautionary measures:

Store the outdoor unit in a secure area.

At least every three months (quarterly), check the pressure in the refrigerant circuits to verify that the refrigerant charge is intact. If it is not, contact a qualified service organization and the appropriate Trane sales office.

Close the discharge and liquid line isolation valves.

Location Requirements

Noise Considerations

- Refer to *Trane Engineering Bulletins* for application information on RTAA chillers.
- Locate the outdoor unit away from sound-sensitive areas.
- If required, install rubber vibration isolators in all water piping and use flexible electrical conduit.
- Refer to "Unit Isolation."
- Consult an acoustical engineer for critical applications.



Installation — Mechanical

Foundation

Provide rigid, non-warping mounting pads or a concrete foundation of sufficient strength and mass to support the outdoor unit operating weight (i.e., including completed piping, and full operating charges of refrigerant, oil and water). Refer to [Figure 13](#) for unit operating weights. Once in place, the outdoor unit must be level within 1/4" (6.4 mm) over its length and width. The Trane Company is not responsible for equipment problems resulting from an improperly designed or constructed foundation.

Installation – Mechanical

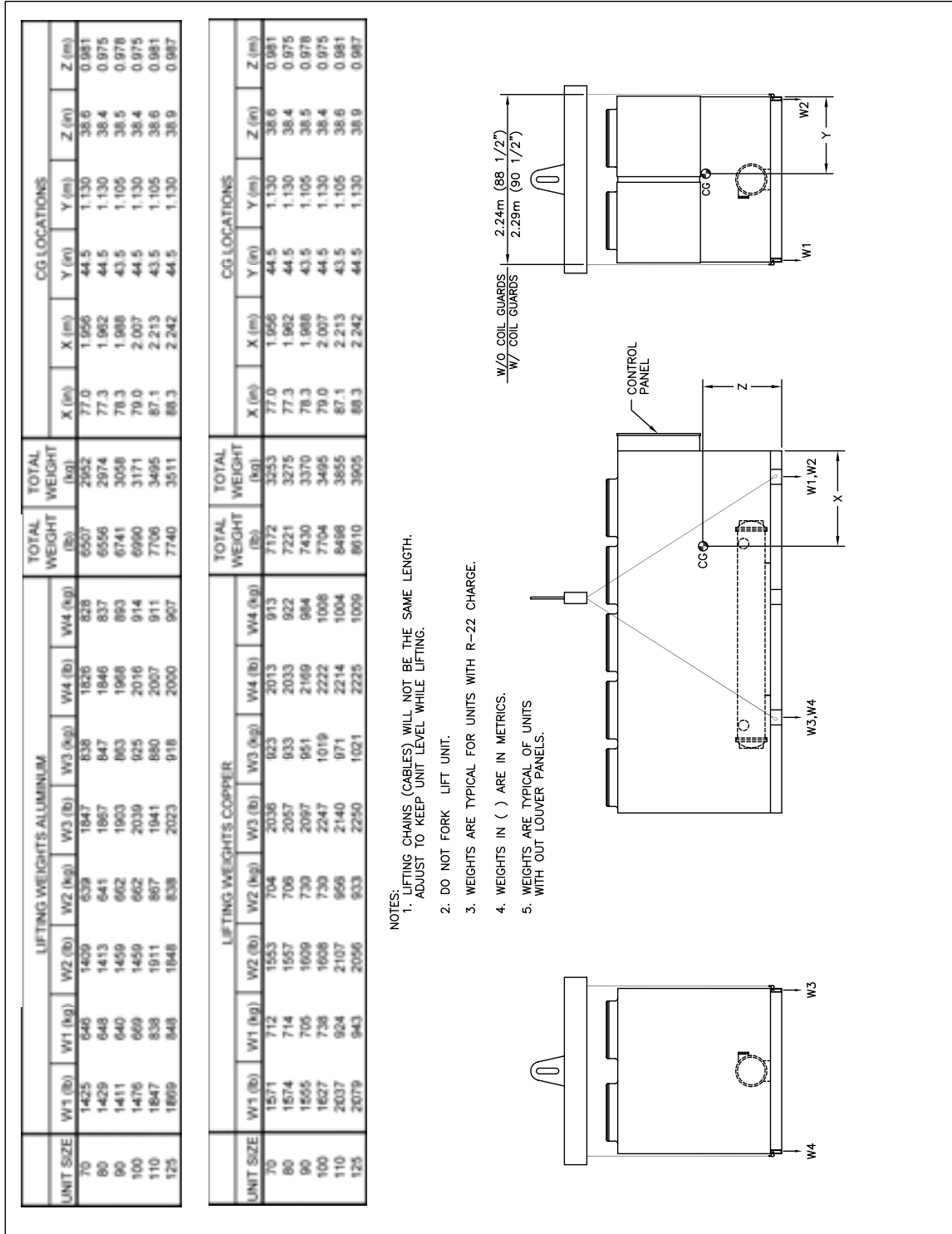


Figure 4 RTAA Rigging and Lifting Weights – Packaged Unit

Installation – Mechanical

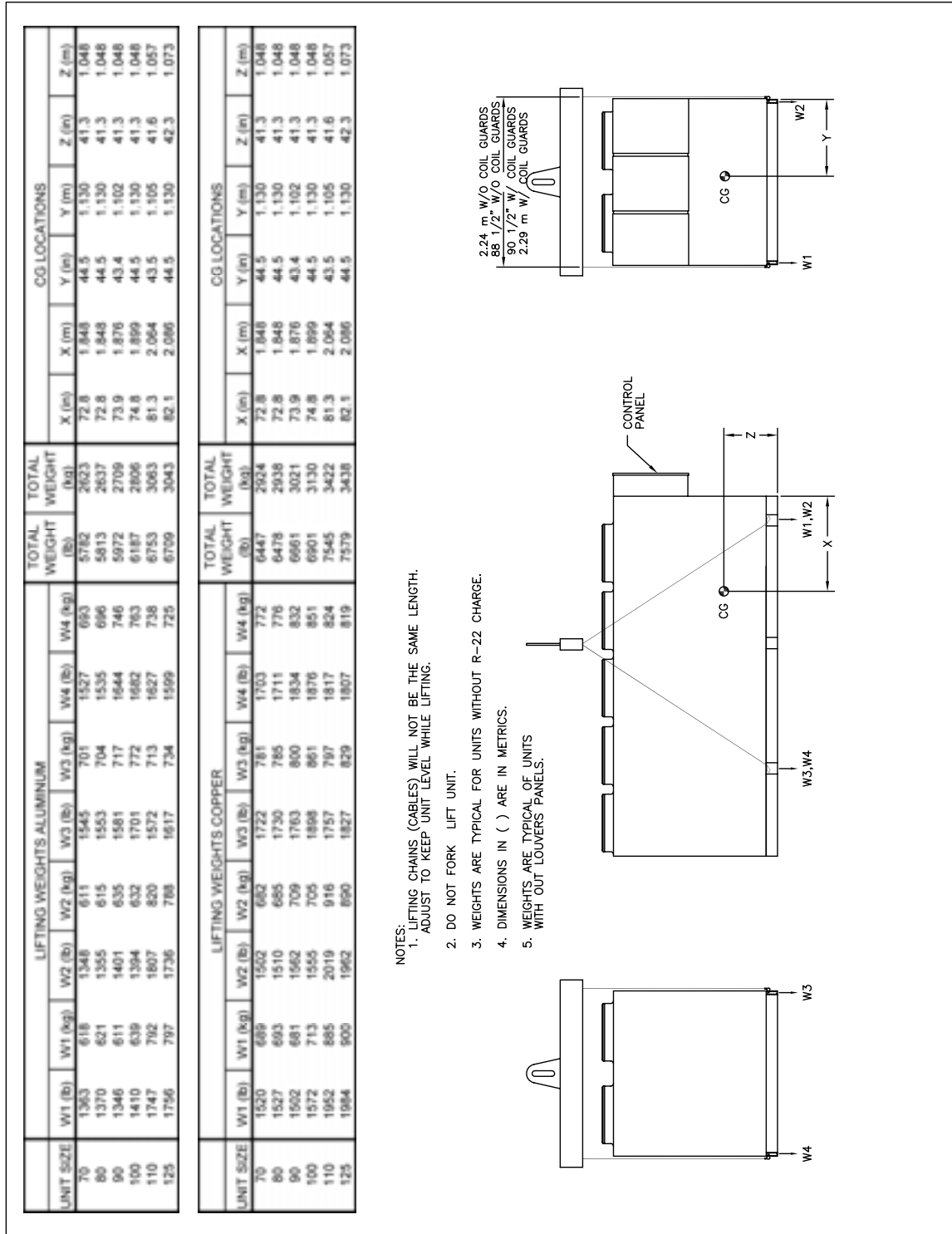


Figure 5 RTAA Rigging and Lifting Weights – Remote Evaporator



Installation – Mechanical

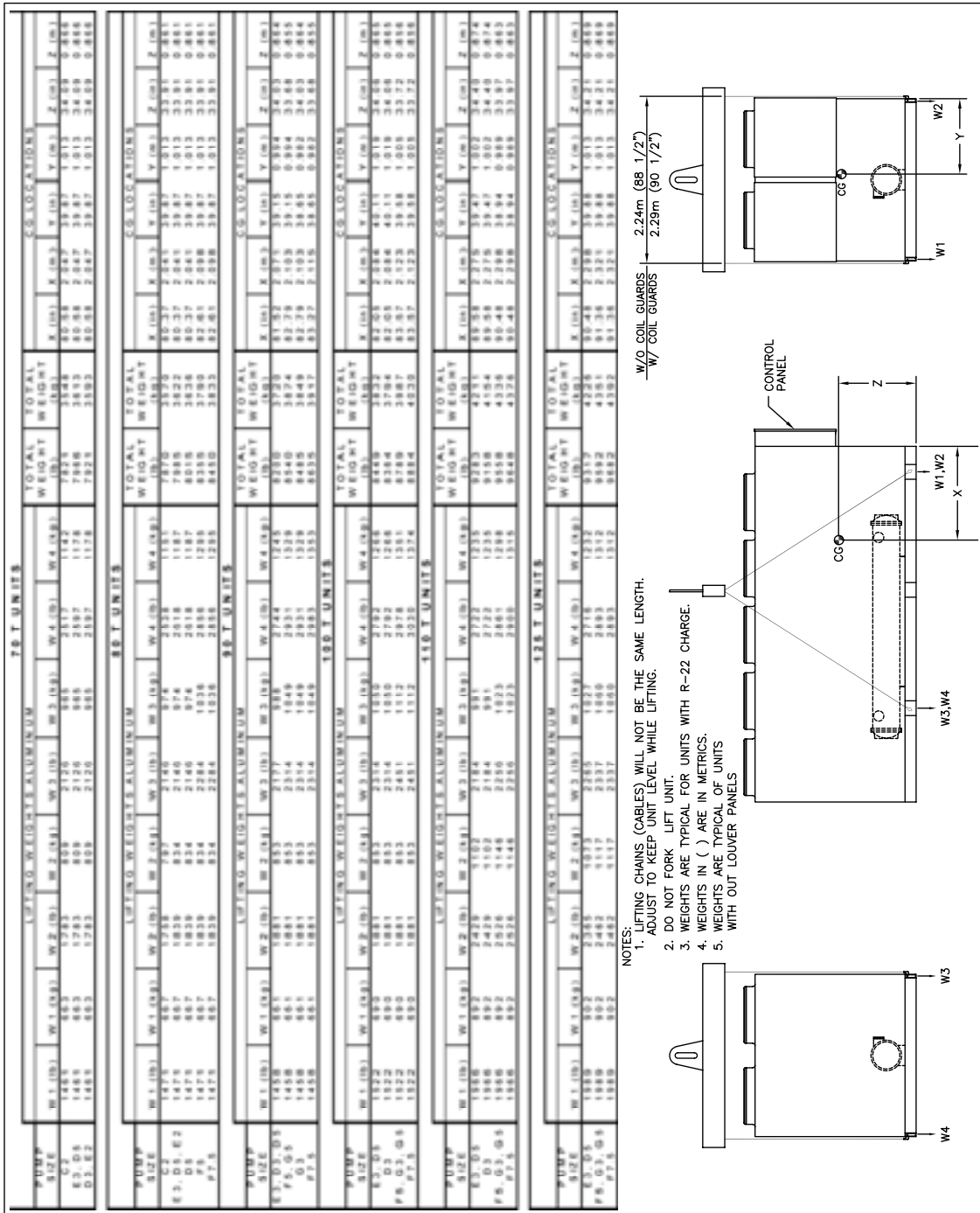


Figure 6 RTAA Rigging and Lifting Weights –Pump Package Aluminum Fins





Installation — Mechanical

Clearances

Provide enough space around the outdoor unit to allow the installation and maintenance personnel unrestricted access to all service points. Refer to submittal drawings for the unit dimensions, to provide sufficient clearance for the opening of control panel doors and unit service. Refer to [Figure 8](#), [Figure 9](#) and [Figure 12](#) for minimum clearances. In all cases, local codes which require additional clearances will take precedence over these recommendations.

NOTE: If the outdoor unit configuration requires a variance to the clearance dimensions, contact your Trane Sales Office Representative. Also refer to Trane Engineering Bulletins for application information on RTAA chillers.

Additional Location Requirements for Remote Evaporator Only

The Remote evaporator must be installed in a conditioned space, unless:

- The ambient temperature is always greater than 32 F.
- The system circulating liquid is a non-freezing glycol-type solution, selected for the prevailing ambient temperature. The evaporator is protected from freezing by properly installed and applied insulation and heat tape.

CAUTION

Freezing Equipment Damage!

To prevent damage due to freezing, do not install the unit outside without adequate freeze protection.

The remote evaporator should be mounted on a base of suitable strength to support the operating weight. Remote evaporator weights and mounting locations are shown in [Figure 10](#) and [Figure 11](#).

The remote evaporator must be level when installed. Be sure to allow adequate clearance for water and refrigerant piping connection, performance of service procedures, reading of gauges and thermometers, and operation of valves. Space must be allowed at one end of the evaporator to pull tubes, if required.

Rigging

The Model RTAA chiller should be moved by lifting. Refer to [Figure 4](#) for typical unit lifting and weights. Refer to the rigging diagram that ships with each unit for specific "per unit" weight data.

⚠ WARNING

Heavy Objects!

Do not use cables (chains or slings) except as shown. Each of the cables (chains or slings) used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift. Other lifting arrangements may cause equipment or property-only damage. Failure to properly lift unit may result in death or serious injury. See details below.

Installation — Mechanical

Lifting Procedure

CAUTION **Equipment Damage!**

**To prevent damage do not use a forklift to lift or push the unit.
Position lifting beam so that cables do not contact the unit.**

- Install chains and safety chains through the six lifting plates provided on the unit.
- Attach lifting chains or cables to the chains installed above. Each cable alone must be strong enough to lift the chiller.
- Attach cables to lifting beam. Total lifting weight, lifting weight distribution and required lifting beam dimensions are shown in [Figure 4](#) and [Figure 5](#) and on the rigging diagram shipped with each unit. Lifting beam cross-bars must be positioned so lifting cables do not contact the sides of the unit.

Installation – Mechanical

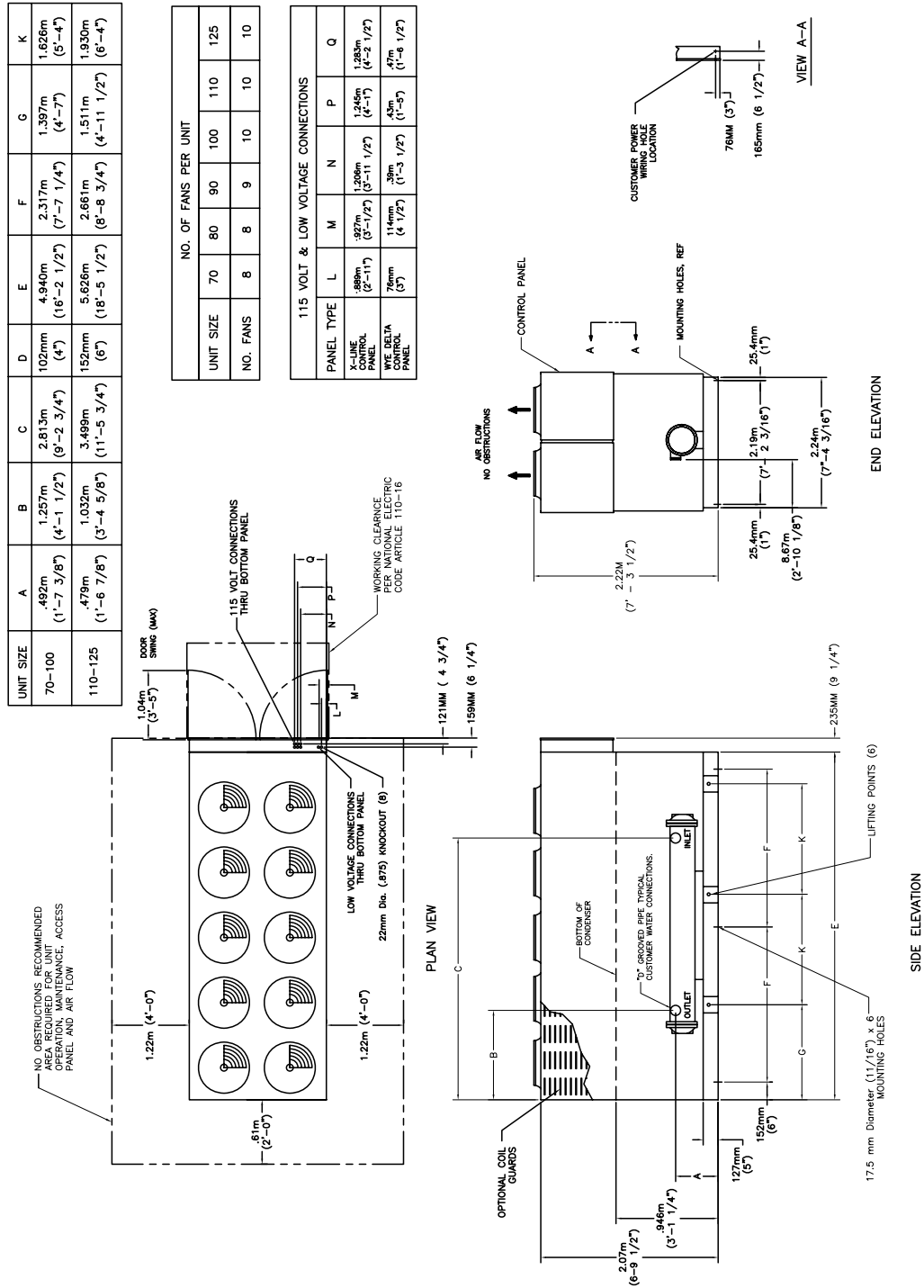


Figure 8 Dimensions and Clearances for RTAA Packaged Unit 70 – 125 Tons

Installation – Mechanical

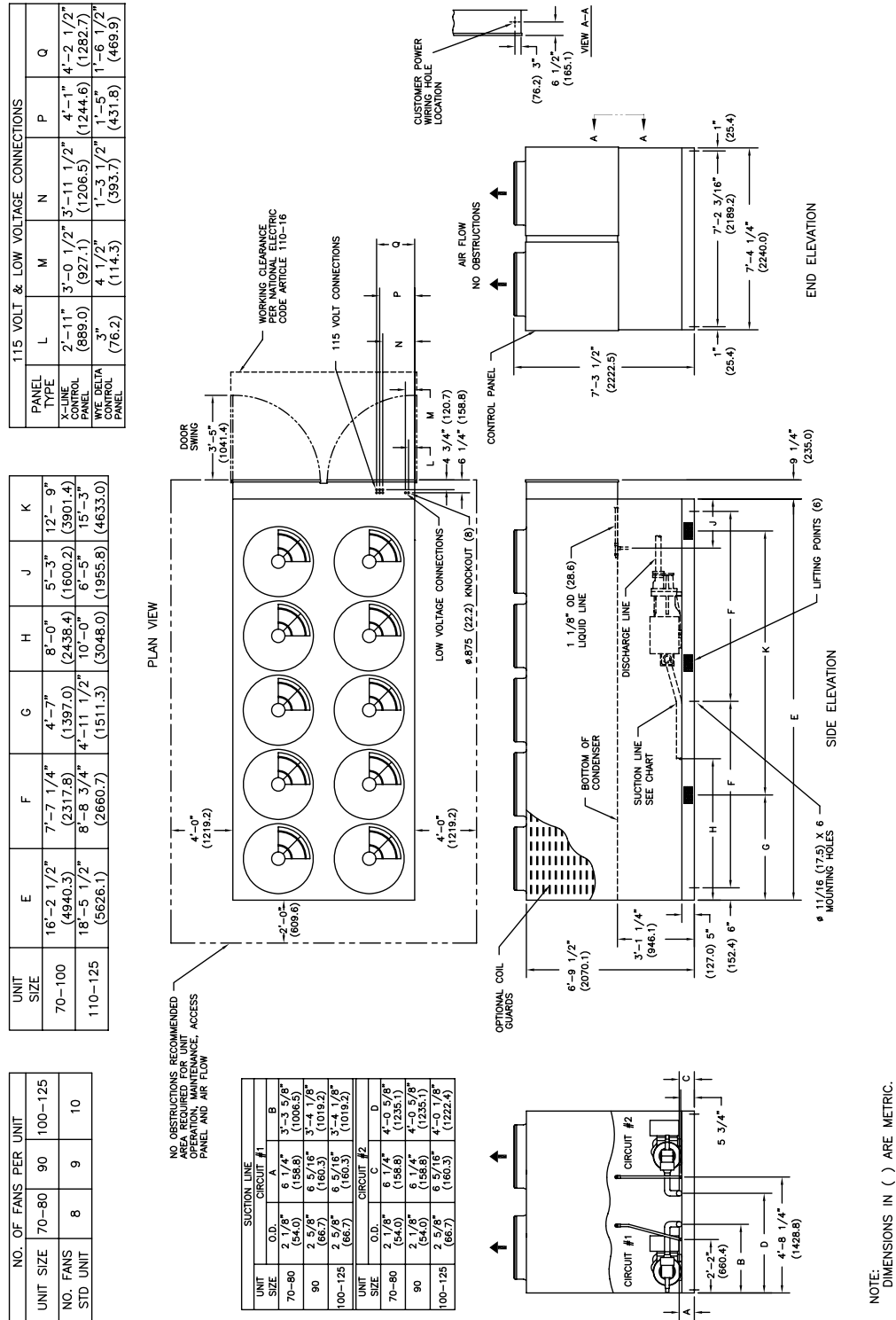


Figure 9 Dimensions and Clearances for RTAA with Remote Evaporator 70 – 125 Tons

Installation – Mechanical

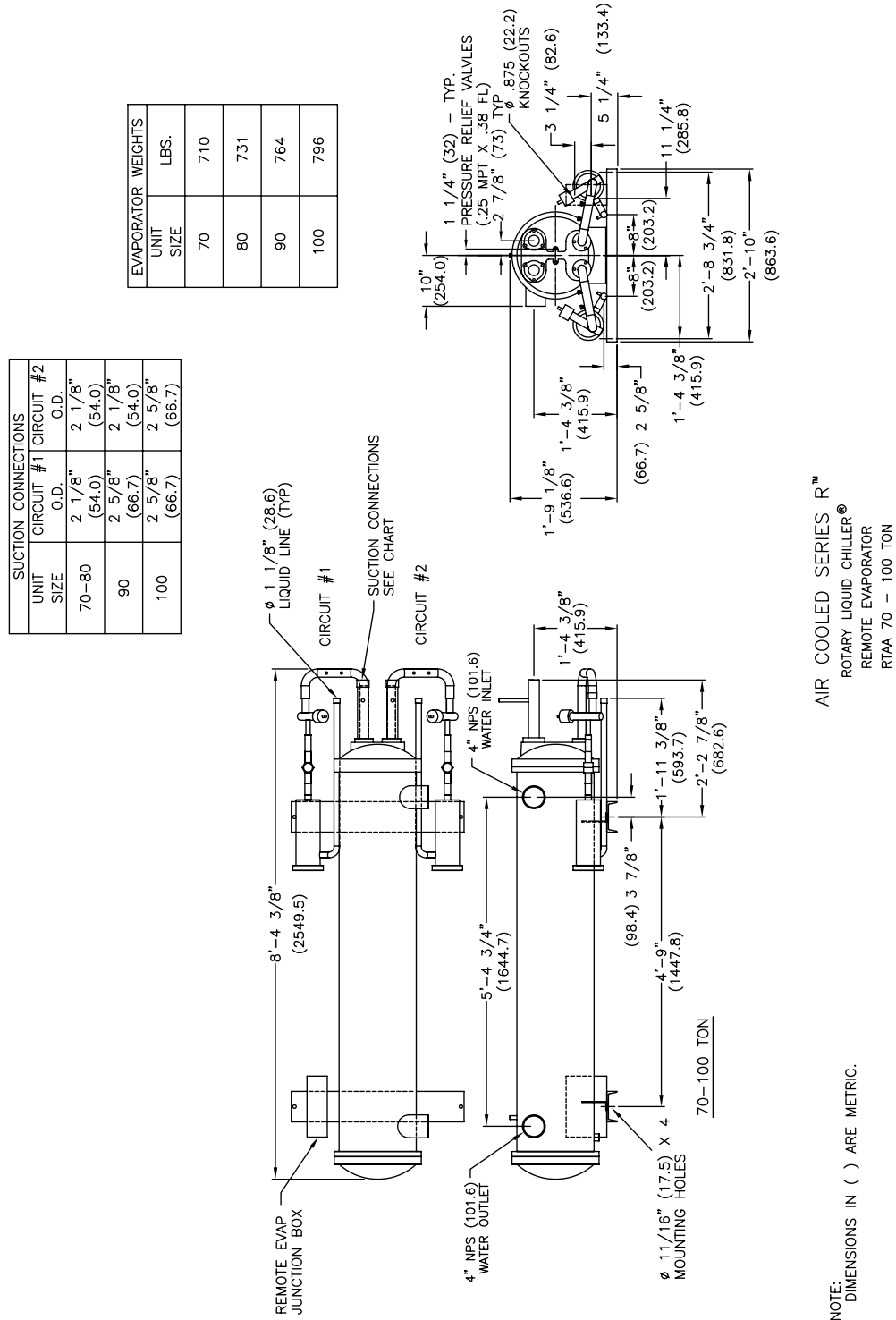


Figure 10 Remote Evaporator Dimensions, RTAA 70 – 125 Tons

Installation – Mechanical

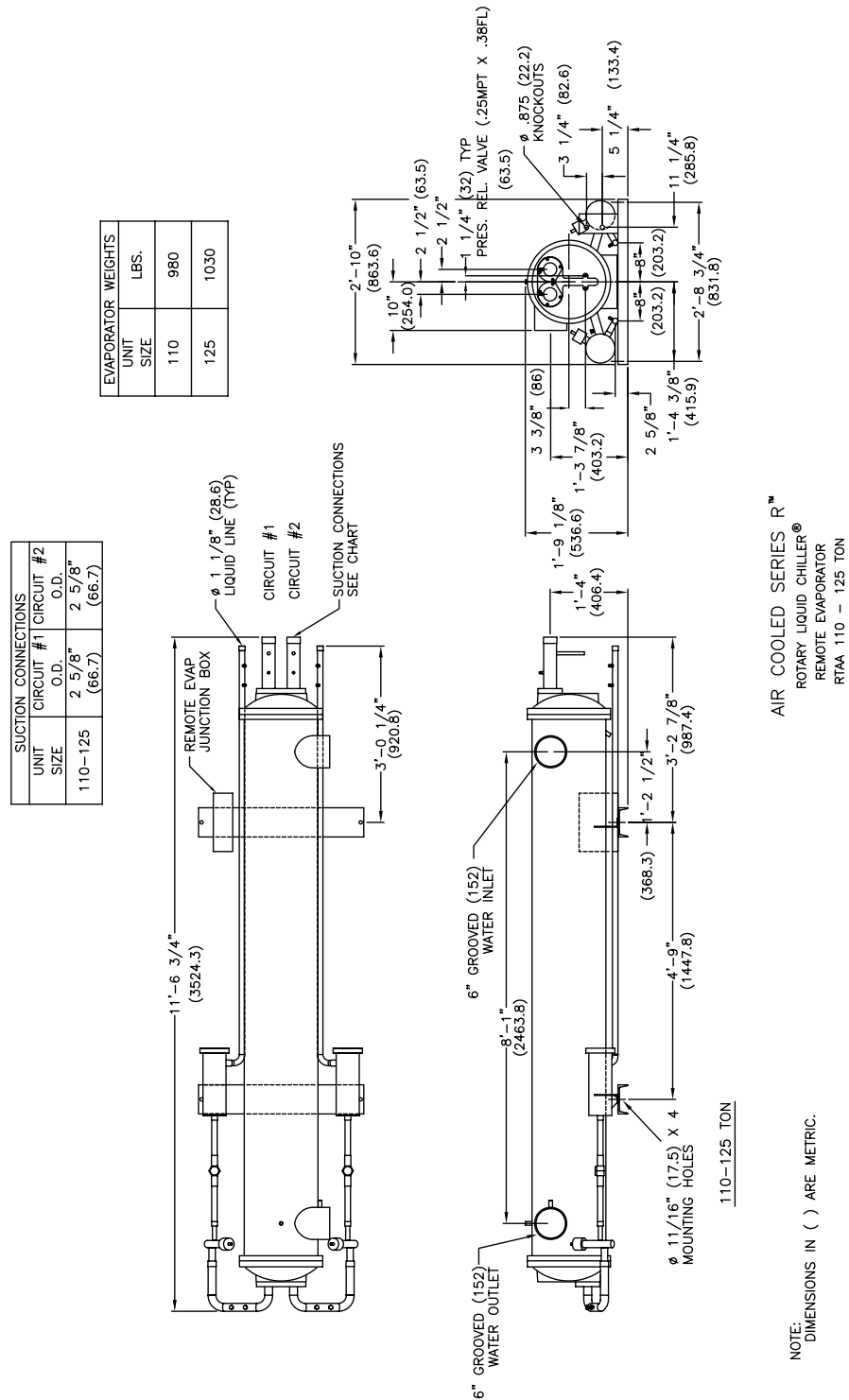


Figure 11 Remote Evaporator Dimensions, RTAA 110 – 125 Tons





Installation – Mechanical

Unit Isolation

There are two mounting methods that will minimize sound and vibration problems. They are the direct-mount method and the isolator-mount method.

Direct Mounting

The unit can be direct-mounted on an isolated concrete pad or on isolated concrete footings at each mounting location. Refer to [Figure 13](#) for unit operating weights. A mounting hole is provided in the base of the unit frame at each mounting location. Provide a means of securely anchoring the unit to the mounting surface. Level the unit carefully. Refer to "Unit Leveling".

Neoprene Isolators

Install the optional neoprene mounting isolators at each mounting location. Refer to [Figure 13](#) for isolator selection, placement and loading information. Isolators are identified by color and by the isolator part number.

Bolt the isolators to the mounting surface. Do not fully tighten the mounting bolts. Mount the unit on the isolators and install a 1/2" nut on each isolator positioning pin. Maximum isolator deflection should be approximately 1/4-inch. Level the unit carefully. Refer to "Unit Leveling". Now fully tighten isolator mounting bolts.

Unit Leveling

Before snugging down the mounting bolts, level the unit carefully. Check unit level end-to-end by placing a level on the top surface of the unit frame. Unit should be level to within 1/4-inch (6.35 mm) over its length. Place the level on the unit frame to check front-to-back level. Adjust to within 1/4" (35 mm) of level front-to-back. Use the adjustable spring isolators or shims to level the unit.

Water Piping

Thoroughly flush all water piping to the unit before making the final piping connections to the unit.

CAUTION

Use Piping Strainers!

To prevent evaporator damage, pipe strainers must be installed in the water supplies to protect components from water born debris. Trane is not responsible for equipment-only-damage caused by water born debris.

CAUTION

Proper Water Treatment!

The use of untreated or improperly treated water in a RTAA 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. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

Installation – Mechanical

MOUNTING LOCATIONS AND ISOLATOR PART NUMBER					
UNIT SIZE	LOC 1	LOC 2	LOC 3	LOC 4	LOC 5
70-100	RDP-3 GRAY	RDP-4 GRAY	RDP-4 BLK	RDP-4 BLK	RDP-4 RED
110-125	RDP-4 BLK	RDP-4 BLK	RDP-4 BLK	RDP-4 BLK	RDP-4 RED

MOUNTING WEIGHTS						
UNIT SIZE	LOC 1	LOC 2	LOC 3	LOC 4	LOC 5	LOC 6
	APPROX LBS					TOTAL WEIGHTS
70	1582	1608	1212	1232	842	856
80	1587	1613	1218	1237	848	862
90	1639	1596	1271	1237	903	879
100	1640	1668	1281	1303	922	937
110	1933	1885	1480	1443	1027	1001
125	1871	1902	1445	1469	1019	1036
APPROX KG						
70	718	729	550	559	382	388
80	720	732	553	561	385	391
90	743	724	577	561	410	399
100	744	757	581	591	418	425
110	877	855	671	655	466	454
125	849	863	655	666	462	470

SPECIFICATIONS		DIMENSIONS			
TYPE	MATERIAL	A	B	C	D
RDP-3	NEOPRENE	2.50 (63.5)	5.50 (139.7)	4.12 (104.6)	3.38 (85.9)
RDP-4	NEOPRENE	3.75 (95.3)	6.50 (165.1)	5.00 (127.0)	4.25 (108.0)

NOTE:
DIMENSIONS IN () ARE METRIC.

AIR COOLED SERIES R™
ROTARY LIQUID CHILLER®
ISOLATORS

RTAA 70 – 125 TON

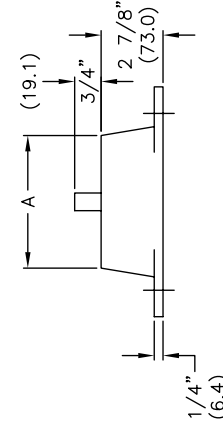
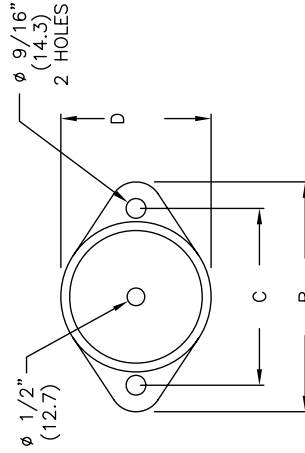


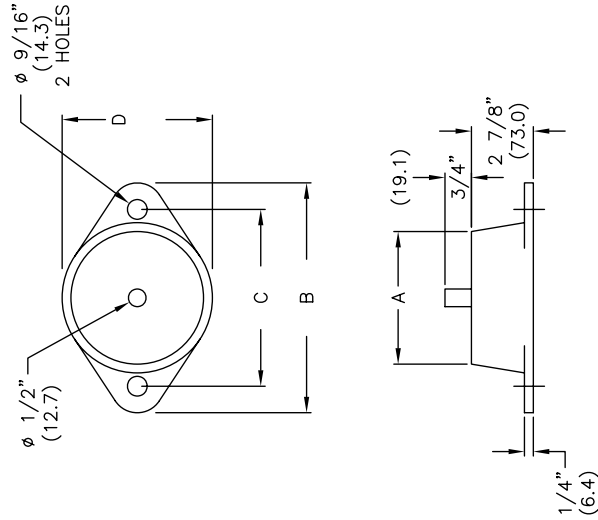
Figure 13 Isolator Placement for Typical RTAA Packaged Unit 70 – 125 Tons

Installation – Mechanical

CONTROL PANEL	
ON	OFF
ON	OFF
ON	OFF

MOUNTING LOCATIONS AND ISOLATOR PART NUMBER						
UNIT SIZE	LOC 1	LOC 2	LOC 3	LOC 4	LOC 5	LOC 6
70-80	RDP-3 RED	RDP-3 RED	RDP-4 BLACK	RDP-4 BLACK	RDP-4 RED	RDP-4 RED
90-125	RDP-3 GREEN	RDP-3 GREEN	RDP-4 BLACK	RDP-4 BLACK	RDP-4 RED	RDP-4 RED

UNIT SIZE		MOUNTING WEIGHTS						TOTAL WEIGHT
		LOC 1	LOC 2	LOC 3	LOC 4	LOC 5	LOC 6	
		APPROX. LBS						
70	1454	1482	1036	1056	618	629	6275	
80	1459	1487	1041	1061	623	635	6306	
90	1514	1467	1094	1061	675	654	6465	
100	1511	1541	1102	1124	694	708	6680	
110	1774	1722	1247	1212	720	699	7373	
125	1707	1740	1210	1233	713	727	7329	
		APPROX. KG						
70	660	672	470	479	280	285	2846	
80	662	675	472	481	283	288	2860	
90	687	666	496	481	306	297	2933	
100	685	699	500	510	315	321	3030	
110	805	781	566	549	327	317	3344	
125	774	789	549	559	328	330	3324	



SPECIFICATIONS					DIMENSIONS			
TYPE	COLOR	MAX LOAD EACH	DEFLECTION	MATERIAL	A	B	C	D
RDP-3	RED	525 LBS	.50	NEOPRENE	2.50	5.50	4.12	3.38
		238 KG	(12.7)		(63.5)	(139.7)	(104.6)	(85.9)
RDP-3	GREEN	750 LBS	.50	NEOPRENE	2.50	5.50	4.12	3.38
		340 KG	(12.7)		(63.5)	(139.7)	(104.6)	(85.9)
RDP-3	GRAY	1100 LBS	.50	NEOPRENE	2.50	5.50	4.12	3.38
		499 KG	(12.7)		(63.5)	(139.7)	(104.6)	(85.9)
RDP-4	RED	2250 LBS	.50	NEOPRENE	3.75	6.50	5.00	4.25
		1020 KG	(12.7)		(95.3)	(165.1)	(127.0)	(108.0)

NOTE:
DIMENSIONS IN () ARE METRIC.

Figure 14 Isolator Placement for RTAA with Remote Evaporator



Installation — Mechanical

Evaporator Water Piping

Figure 15 illustrates typical evaporator piping components. Components and layout will vary slightly, depending on the location of connections and the water source.

CAUTION

Evaporator Damage!

The chilled water connections to the evaporator are to be “victualic” type connections. Do not attempt to weld these connections, as the heat generated from welding can cause internal damage to the evaporator.

The chilled water connections are on the left side of the unit (when facing the control panel). If it is necessary for the chilled water piping to enter the unit from the right side, elbows can be used to route the piping 180° over the top of the evaporator.

A vent is provided on the top of the evaporator at the leaving water end. Be sure to provide additional vents at high points in the piping to bleed air from the chilled water system. Install necessary pressure gauges to monitor the entering and leaving chilled water pressures.

CAUTION

Chilled Water Components Damage!

To prevent damage to chilled water components, do not allow evaporator pressure (maximum working pressure) to exceed 215 psig.

Provide shutoff valves in lines to the gauges to isolate them from the system when they are not in use. Use rubber vibration eliminators to prevent vibration transmission through the water lines.

If desired, install thermometers in the lines to monitor entering and leaving water temperatures. Install a balancing valve in the leaving water line to control water flow balance. Install shutoff valves on both the entering and leaving water lines so that the evaporator can be isolated for service.

A pipe strainer must be installed in the entering water line to prevent water-borne debris from entering the evaporator.

Installation – Mechanical

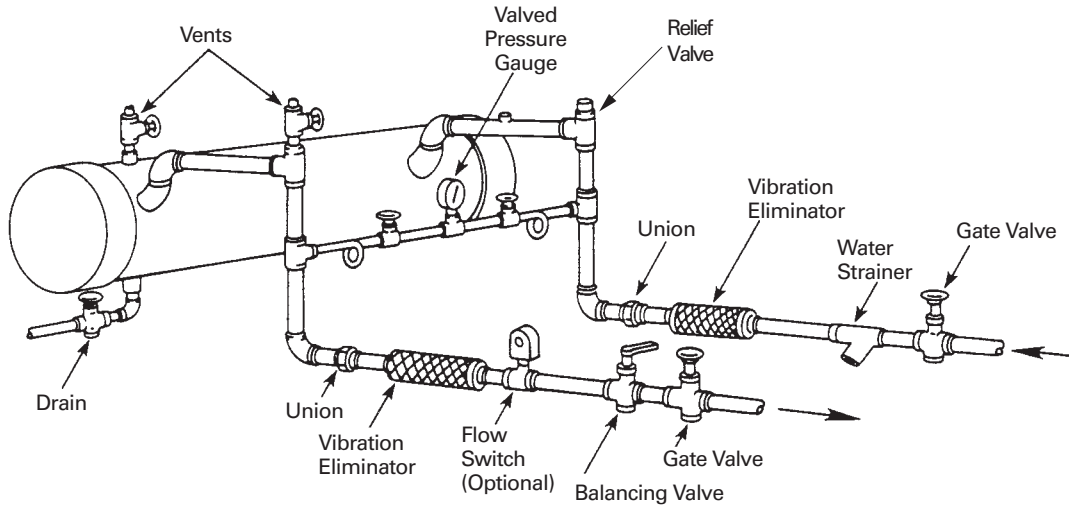


Figure 15 Suggested Piping for Typical RTAA Evaporator

Evaporator Piping Components

"Piping components" include all devices and controls used to provide proper water system operation and unit 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.
- Vibration eliminators.
- Shutoff (isolation) valves.
- Thermometers (if desired).
- Cleanout tees.
- Relief valve.
- Pipe strainer.

Leaving Chilled Water Piping Air vents (to bleed air from system).

- Air vents (to bleed air from system).
- Water pressure gauges with shutoff valves.
- Vibration eliminators. Shutoff (isolation) valves.
- Thermometers.
- Cleanout tees.
- Balancing valve.
- Flow Switch (If desired).



Installation — Mechanical

CAUTION

Evaporator Damage!

To prevent evaporator damage, do not exceed 215 psig (14.6 bar) evaporator water pressure.

Evaporator Drain

A 3/4" drain connection is located under the outlet end of the evaporator. This may be connected to a suitable drain to permit evaporator drainage during unit servicing. A shutoff valve must be installed on the drain line.

Chilled Water Flow Switch

Chilled water flow protection is provided by the UCM without the need for a chilled water flow switch. A flow switch for chilled water is strictly discretionary but if not installed, a signal must be sent to the chiller to indicate that water flow has been established, eg. chilled water pump motor starter auxiliary contacts, building automation system, etc.

If additional chilled water flow protection is desired, use a field-installed flow switch or differential pressure switch with the pump motor starter auxiliary contacts to sense system water flow. Install and wire the flow switch in series with the chilled water pump motor starter auxiliaries (refer to "Interlock Wiring").

Specific connection and schematic wiring diagrams are shipped with the unit. Some piping and control schemes, particularly those using a single water pump for both chilled and hot water, must be analyzed to determine how and or if a flow sensing device will provide desired operation.

Follow the manufacturer's recommendations for selection and installation procedures. General guidelines for flow switch installation are outlined below:

1. 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 flow.

2. To prevent switch fluttering, remove all air from the water system.

NOTE: The UCM provides a 6-second time delay after a "loss-of flow" diagnostic before shutting the unit down. Contact a qualified service representative if nuisance machine shutdowns persist.

3. Adjust the switch to open when water flow falls below nominal. Evaporator data is shown in [Figure 16](#) Refer to [Table 1](#) for minimum flow recommendations. Flow switch contacts are closed on proof of water flow.
4. Install a pipe strainer in the entering evaporator water line to protect components from water-borne debris.

Installation – Mechanical

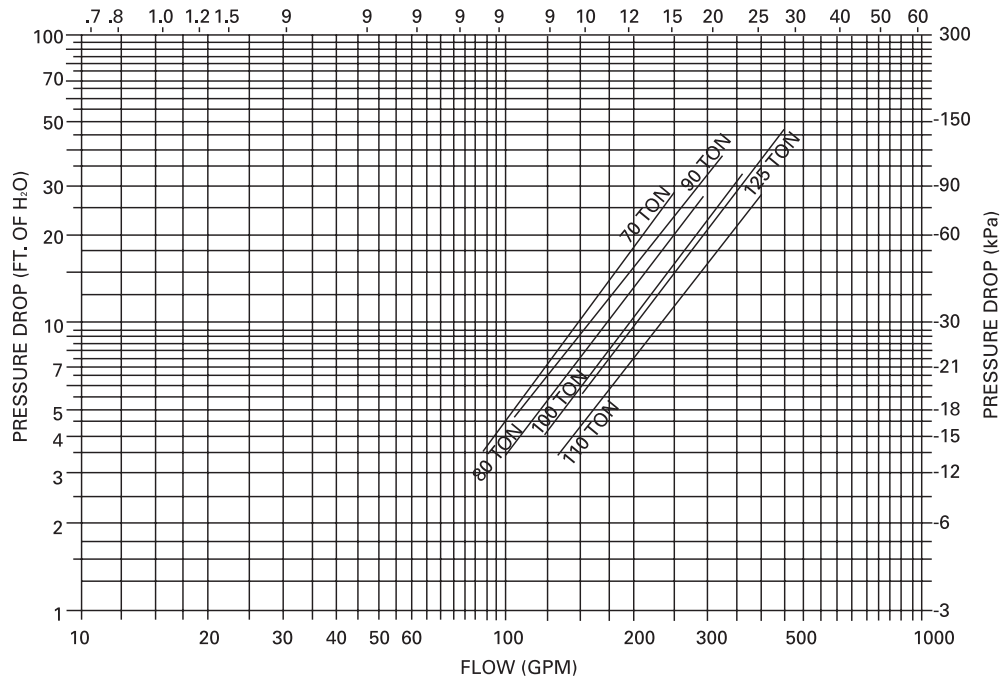


Figure 16 RTAA Evaporator Water Pressure Drop

Water Treatment

Using untreated or improperly treated water in these units may result in inefficient operation and possible tube damage. Consult a qualified water treatment specialist to determine whether treatment is needed.

Customer Note

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 Trane Company warranty specifically excludes liability for corrosion, erosion or deterioration of Trane equipment. Trane assumes no responsibilities for the results of the use of untreated or improperly treated water, or saline or brackish water.

Water Pressure Gauges

Install field-supplied pressure gauges (with manifolds, whenever practical) as shown in [Figure 15](#). 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.

To read manifolded 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.



Installation — Mechanical

Water Pressure Relief Valves

Install a water pressure relief valve in the evaporator inlet piping between the evaporator and the inlet shutoff valve, as shown in [Figure 15](#). Water vessels with close-coupled shutoff valves have a high potential for hydrostatic pressure buildup on a water temperature increase. Refer to applicable codes for relief valve installation guidelines.

Freeze Protection

If the unit will remain operational at subfreezing ambient temperatures, the chilled water system must be protected from freezing, following the steps listed below:

1. Heat tape is factory-installed on the packaged unit evaporator and will protect it from freezing in ambient temperatures down to -20 F.
2. Install heat tape on all water piping, pumps, and other components that may be damaged if exposed to freezing temperatures. Heat tape must be designed for low ambient temperature applications. Heat tape selection should be based on the lowest expected ambient temperature.
3. Add a non-freezing, low temperature, corrosion inhibiting, heat transfer fluid to the chilled water system. The solution must be strong enough to provide protection against ice formation at the lowest anticipated ambient temperature. Refer to [Table 1](#) for evaporator water storage capacities.

NOTE: Use of glycol type antifreeze reduces the cooling capacity of the unit and must be considered in the design of the system specifications.



Installation — Remote Evaporator

The RTAA outdoor unit with the remote evaporator option is shipped as two pieces: the outdoor unit (condenser) and the evaporator. Short suction line connections are provided with the outdoor condensing unit. The liquid line connections are at the end opposite the control panel.

The remote evaporator is shipped complete with factory-mounted refrigeration specialties (electronic expansion valves, sight-glasses and removable core filter-dryers). All evaporator refrigerant line connections are at one end of the evaporator. The installing contractor need only provide and install the inter-connecting refrigerant piping between the remote evaporator and the outdoor condensing unit and liquid line isolation valves. In some instances, the installing contractor may also need to lengthen the factory installed suction accumulator.

System Configuration and Interconnecting Refrigerant Piping

The system may be configured in any of the four arrangements shown in [Figure 17](#) through [Figure 20](#). The configurations and their associated elevations, along with the total distance between the remote evaporator and the compressor/condenser section, play a critical role in determining suction and liquid line sizes. This will also affect field refrigerant and oil charges. Consequently, there are physical limits which must not be violated if the system is to operate as designed. Please note the following requirements for field installation:

Installation – Remote Evaporator

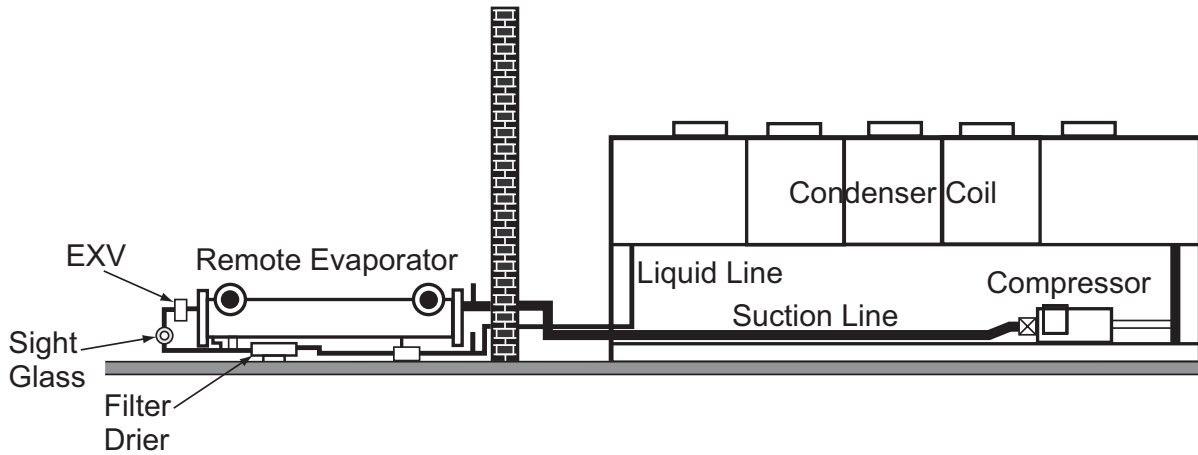


Figure 17 Remote Evaporator Installation
No Elevation Difference, Rise of Suction and Liquid Lines not to exceed 20 inches or Less

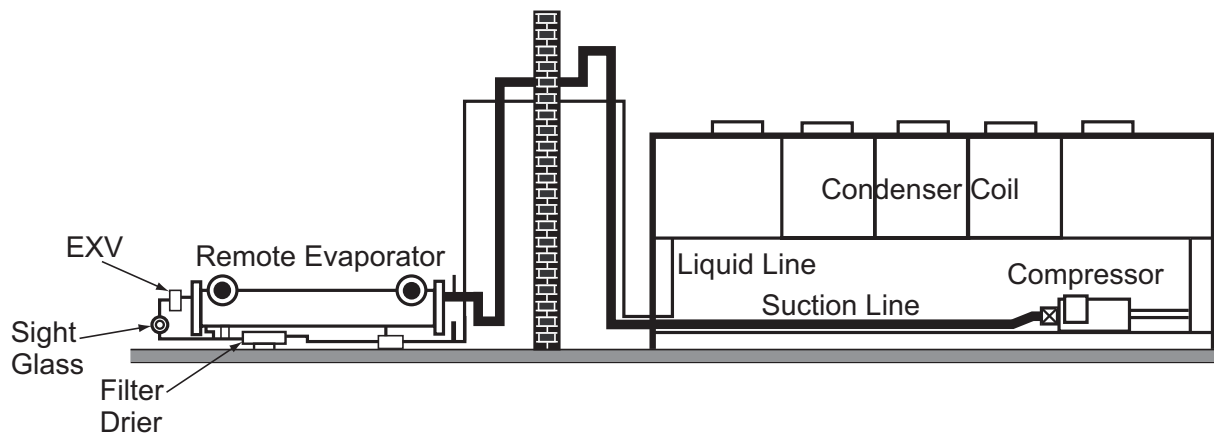


Figure 18 Remote Evaporator Installation
No Elevation Difference, Rise of Suction and Liquid Lines no to exceed 15 feet or Less
(Suction accumulator may be required)

Installation – Remote Evaporator

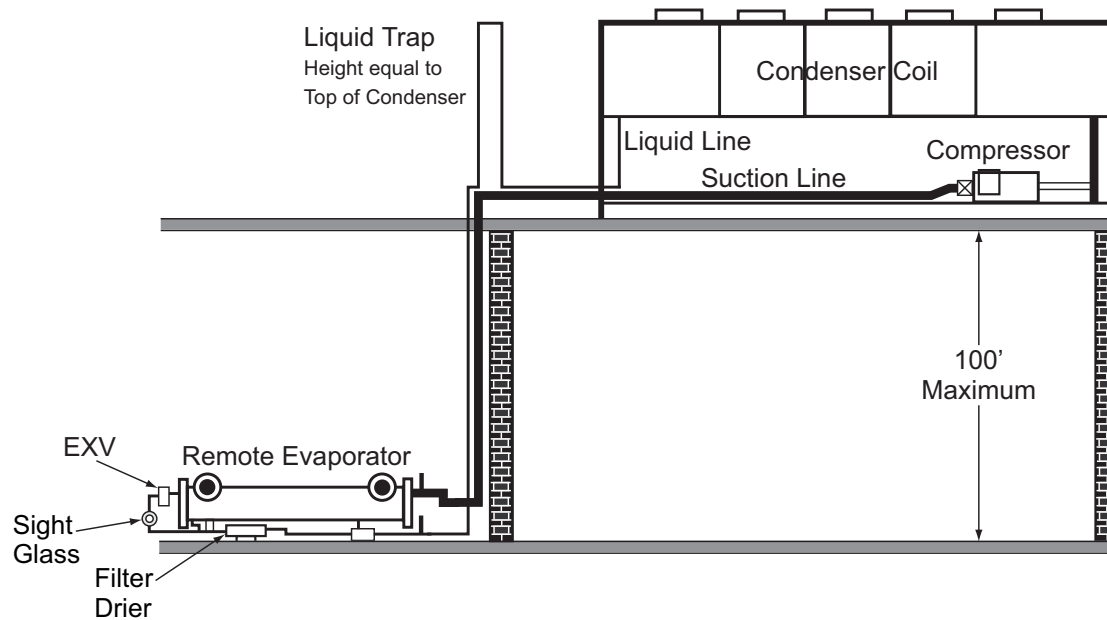


Figure 19 Remote Evaporator Installation
Condensing Unit Above Evaporator – 100 Feet or Less

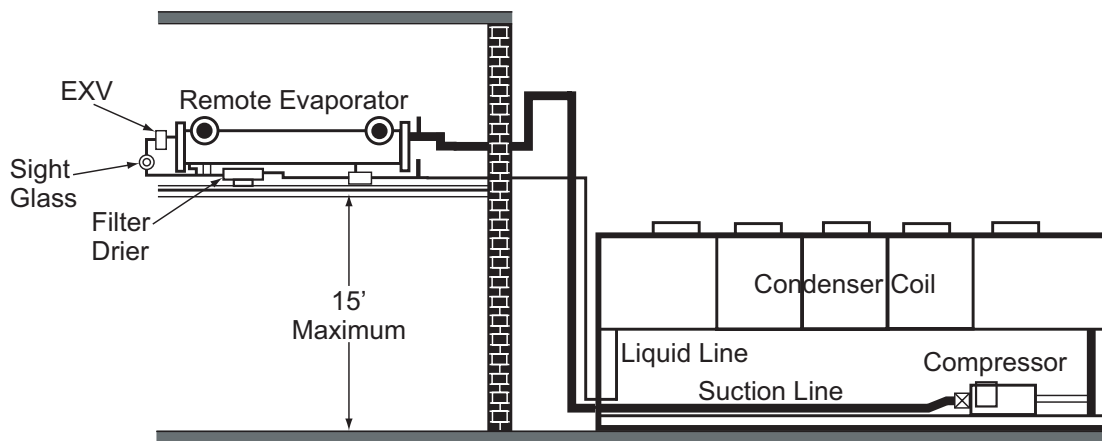


Figure 20 Remote Evaporator Installation
Condensing Unit Below Evaporator – 15 Feet or Less
(Suction accumulator may be required)

Installation — Remote Evaporator

1. The remote evaporator **MUST** be matched with its respective outdoor condensing unit.
2. The circuit number on the outdoor condensing unit must match the circuit number on the evaporator, i.e. circuit #1 on the outdoor condensing unit must be connected with circuit # 1 on the remote evaporator and likewise for circuit # 2.

See [Figure 21](#) for circuit number identification. RTAA Circuit Capacities are shown in [Table 2](#).

CAUTION

Equipment Damage!

If the circuits are crossed, serious equipment damage may occur.

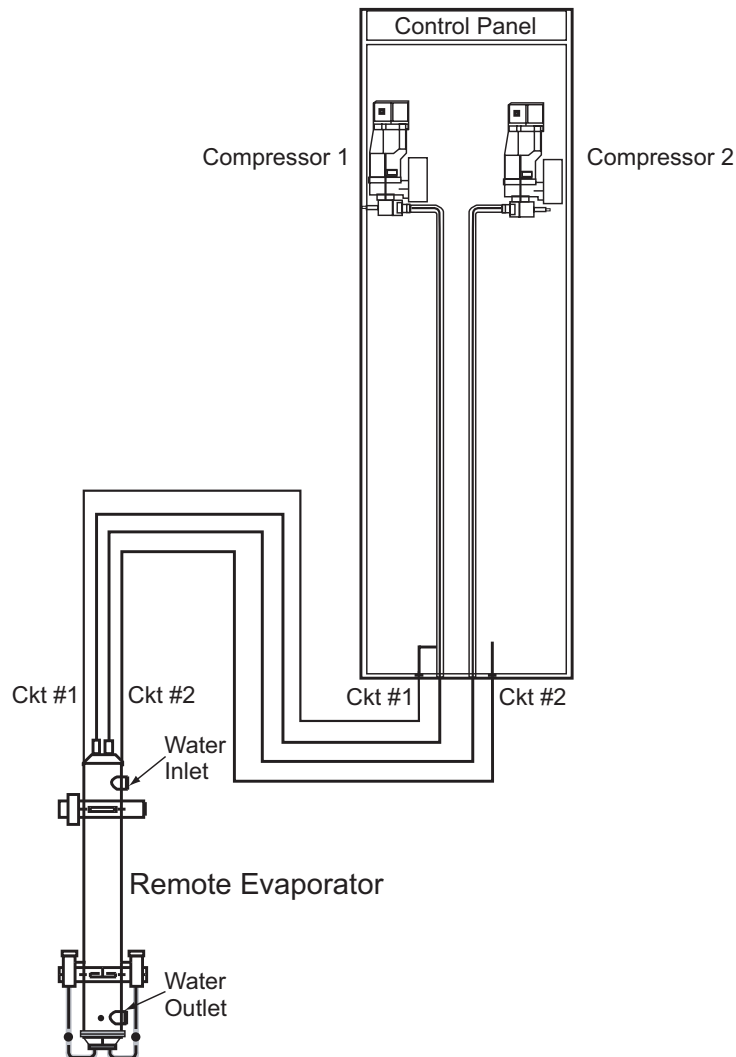


Figure 21 Refrigerant Circuit Identification

Installation – Remote Evaporator

Table 2 RTAA Circuit Capacities (nominal tons)

Model	Circuit 1	Circuit 2
70	35	35
80	40	40
90	50	40
100	50	50
110	60	50
125	60	60

Table 3 Equivalent Lengths of Non-Ferrous Valves and Fittings (feet)

Line Size Inches OD	Globe Valve	Short Angle Valve	Short Radius ELL	Long Radius ELL
1-1/8	87	29	2.7	1.9
1-3/8	102	33	3.2	2.2
1-5/8	115	34	3.8	2.6
2-1/8	141	39	5.2	3.4
2-5/8	159	44	6.5	4.2
3-1/8	185	53	8	5.1

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3. Piping between the evaporator and outdoor unit is not to exceed 200 actual feet and/or an equivalent length of 300 feet. (The latter includes the equivalent length of pressure drops of all associated field installed fittings, valves, accessories, and straight lengths of interconnecting piping including the suction accumulator.)
4. Horizontal portions of suction lines must be downward sloping toward the compressor at least 1/2 inch for each 10 feet of run. This promotes the movement of oil in the direction of gas flow.
5. Suction lines must be insulated.
6. The line sizes defined in [Table 4](#), [5](#), and [6](#) are to be used only for 40-50 F leaving water temperature and/or full-load ice-making applications.

NOTE: The factory must size piping for leaving water temperatures other than 40-50 F.



Installation – Remote Evaporator

Table 4 Liquid Line Sizes

35 Ton Circuit				
Total Equiv. Length (ft.)	Liquid Line Size (OD")			
	Horizontal or Downflow	Upflow 1-5 ft.	Upflow 6-10 ft.	Upflow 11-15 ft.
25	1.125	1.125	1.125	1.125
50	1.125	1.125	1.125	1.125
75	1.125	1.125	1.125	1.375
100	1.125	1.125	1.125	1.375
125	1.125	1.125	1.125	1.375
150	1.125	1.125	1.125	1.375
175	1.125	1.125	1.375	1.375
200	1.125	1.125	1.375	1.375
225	1.125	1.125	1.375	1.625
250	1.125	1.375	1.375	1.625
275	1.125	1.375	1.375	1.625
300	1.375	1.375	1.375	1.625

40 Ton Circuit				
Total Equiv. Length (ft.)	Liquid Line Size (OD")			
	Horizontal or Downflow	Upflow 1-5 ft.	Upflow 6-10 ft.	Upflow 11-15 ft.
25	1.125	1.125	1.125	1.125
50	1.125	1.125	1.125	1.375
75	1.125	1.125	1.125	1.375
100	1.125	1.125	1.125	1.375
125	1.125	1.125	1.375	1.375
150	1.125	1.125	1.375	1.375
175	1.125	1.375	1.375	1.625
200	1.125	1.375	1.375	1.625
225	1.375	1.375	1.375	1.625
250	1.375	1.375	1.375	1.625
275	1.375	1.375	1.375	1.625
300	1.375	1.375	1.375	1.625

50 Ton Circuit				
Total Equiv. Length (ft.)	Liquid Line Size (OD")			
	Horizontal or Downflow	Upflow 1-5 ft.	Upflow 6-10 ft.	Upflow 11-15 ft.
25	1.125	1.125	1.125	1.125
50	1.125	1.125	1.125	1.375
75	1.125	1.125	1.375	1.375
100	1.125	1.125	1.375	1.375
125	1.125	1.375	1.375	1.625
150	1.125	1.375	1.375	1.625
175	1.375	1.375	1.375	1.625
200	1.375	1.375	1.375	1.625
225	1.375	1.375	1.625	1.625
250	1.375	1.375	1.625	2.125
275	1.375	1.375	1.625	2.125
300	1.375	1.375	1.625	2.125

60 Ton Circuit				
Total Equiv. Length (ft.)	Liquid Line Size (OD")			
	Horizontal or Downflow	Upflow 1-5 ft.	Upflow 6-10 ft.	Upflow 11-15 ft.
25	1.125	1.125	1.125	1.375
50	1.125	1.125	1.375	1.375
75	1.125	1.125	1.375	1.625
100	1.125	1.375	1.375	1.625
125	1.375	1.375	1.375	1.625
150	1.375	1.375	1.375	1.625
175	1.375	1.375	1.625	1.625
200	1.375	1.375	1.625	2.125
225	1.375	1.375	1.625	2.125
250	1.375	1.625	1.625	2.125
275	1.375	1.625	1.625	2.125
300	1.375	1.625	1.625	2.125

Table 5 Suction Line Sizes ("O.D.")
for Upflow Lines

Circuit Size (nominal tons)	Outside Diameter (inches)
35	2-1/8
40	2-1/8
50	2-5/8
60	2-5/8

Installation — Remote Evaporator

Table 6 Suction Line Sizes ("O.D.") for Horizontal and/or Downflow Lines

Circuit Size:				
Total Equiv. Length (ft.)	35 Ton	40 Ton	50 Ton	60 Ton
25	2.125	2.125	2.625	2.625
50	2.125	2.125	2.625	2.625
75	2.125	2.125	2.625	2.625
100	2.125	2.625	2.625	2.625
125	2.125	2.625	2.625	2.625
150	2.625	2.625	2.625	2.625
175	2.625	2.625	2.625	3.125
200	2.625	2.625	2.625	3.125
225	2.625	2.625	2.625	3.125
250	2.625	2.625	2.625	3.125
275	2.625	2.625	3.125	3.125
300	2.625	2.625	3.125	3.125

7. [Figure 17](#) depicts an installation where the remote evaporator elevation is the same as that of the outdoor condensing unit. The suction and liquid line are horizontal or down flowing only.
8. [Figure 18](#) shows a variation to [Figure 17](#). The remote evaporator and outdoor condensing unit are at the same elevation but interconnecting piping may be installed up to 15 feet above the base elevation. In this case a suction line trap is required to assure oil return, and the suction accumulator line must be extended at least by the amount determined from [Table 7](#).
9. For installations where the remote evaporator is at a lower elevation than the outdoor condensing unit as shown in [Table 4](#), the elevation difference is not to exceed 100 feet. An inverted liquid line trap to prevent unwanted free cooling modes and a suction line trap to assure oil return from the evaporator must be included on both circuits as shown. The apex of the liquid line trap should be at a height above the condenser coils. The highest point of the suction line piping must not exceed 4 inches above the outdoor condensing unit suction line connection point.
10. When the elevation of the remote evaporator exceeds that of the outdoor condensing unit as shown in [Figure 20](#), the elevation difference may not exceed 15 feet. The suction accumulator line must be extended at least by the amount determined from [Table 7](#). This line must not exceed 4 inches above the outdoor unit suction line connection point. An inverted suction line trap whose apex is 3 to 15 feet above the elevation of the remote evaporator is required in both circuits.
11. Compressor and oil separator heaters must be on at least 24 hours prior to compressor start.



Installation — Remote Evaporator

Line Sizing

To determine the appropriate outside diameter for field installed liquid and suction lines, it is first necessary to establish the equivalent length of pipe for each line. It is also necessary to know the capacity (tons) of each circuit. Circuit capacities for each RTAA unit are listed in [Table 2](#).

Liquid Line Sizing Steps

Line sizing is an iterative process. While iterating to determine the proper equivalent line length use the "Horizontal or Downflow" column of [Table 4](#). After the final equivalent line length has been determined in step # 9, then break down the piping into its "Horizontal or Downflow" and "Upflow" components and select the proper outside diameter. Note that "Upflow" has a column for one to five, six to ten, and eleven to fifteen feet.

The steps to compute liquid line size are as follows:

1. Compute the actual length of field installed piping.
2. Multiply the length from step # 1 by 1.5 to estimate the equivalent length.
3. Using [Table 4](#) for the proper tonnage circuit, look in the "Horizontal or Downflow" column. Find the outside diameter that corresponds to the equivalent length computed in step # 2.
4. With the outside diameter found in step # 3, use [Table 3](#) to determine the equivalent lengths of each fitting in the field installed piping.
5. Sum the equivalent lengths of all the field installed elbows.
6. Add the length found in step # 5 to the actual length from step # 1. This is your new equivalent line length.
7. Using [Table 4](#) again, find the new outside diameter that corresponds to the new equivalent line length from step # 6.
8. Using [Table 2b](#) and the new outside diameter found in step # 7, find the equivalent line length of each elbow, and sum them.
9. Add the length found in step # 8 to the actual length from step # 1. This is your final equivalent line length.
10. With the final equivalent line length found in step # 9, use [Table 4](#) to select the proper outside diameter for horizontal or downflow lines, and any upflow lines.

Installation – Remote Evaporator

Table 7 Additional Suction Accumulator Line

Required Length in Feet of Field Installed Suction Line Accumulator								
Liquid Line Length in Actual Ft.	35 Ton Circuit		40 Ton Circuit		50 Ton Circuit		60 Ton Circuit	
	2 1/8" O.D. Suction Line	2 5/8" O.D. Suction Line	2 1/8" O.D. Suction Line	2 5/8" O.D. Suction Line	2 5/8" O.D. Suction Line	3 1/8" O.D. Suction Line	2 5/8" O.D. Suction Line	3 1/8" O.D. Suction Line
20	1	1	5	3	9	6	14	10
40	7	5	14	9	15	11	21	15
60	14	9	23	15	21	15	27	19
80	20	13	32	21	28	19	33	23
100	26	17	N/A	26	34	24	40	28
120	32	21	N/A	32	40	28	46	32
140	N/A	25	N/A	38	46	33	52	37
160	N/A	29	N/A	43	53	37	N/A	41
180	N/A	33	N/A	49	59	41	N/A	45
200	N/A	37	N/A	55	65	46	N/A	50

Example Liquid Line Sizing

For this example, refer to [Table 2](#), [3](#), [4](#), and [Figure 22](#), and assume a 50 ton circuit.

- From [Figure 22](#), the actual length of field installed piping is:

$$80+8+8+21 = 117 \text{ feet}$$
- Estimate equivalent line length:

$$117 \text{ feet} \times 5 = 175 \text{ feet}$$
- From [Table 4](#) for a 50 ton circuit, for 175 equivalent feet the OD is 1-3/8 inches.
- In [Figure 22](#) there are six long-radius elbows. From [Table 3](#), for 1-3/8 inch elbows, the equivalent feet is:

$$6 \text{ elbows} \times 2.2 \text{ feet} = 13.2 \text{ feet}$$
- Adding equivalent feet from step #4 to step #1 gives:

$$13.2 \text{ feet} + 117 \text{ feet} = 130.2 \text{ feet}$$
- From [Table 4](#), for a 50 ton circuit, for 125 equivalent feet (nearest to 130.2), the OD is 1-1/8 inches
- From [Table 3](#), for 1-1/8" OD long-radius elbows, the equivalent feet is:

$$6 \text{ elbows} \times 1.9 \text{ feet} = 11.4 \text{ feet}$$
- Adding equivalent feet from step #7 to step #1 gives:

$$11.4 \text{ feet} + 117 \text{ feet} = 128.4 \text{ feet}$$

Installation — Remote Evaporator

9. From [Table 4](#), for a 50 ton circuit, for 125 equivalent feet (also nearest to 128.2 feet), the OD is still:

Horizontal or Downflow = 1 1/8 inches

10. From [22](#), there is 8 feet of up-flow on the liquid line inverted trap. Therefore, select:

Upflow = 1-3/8 inches

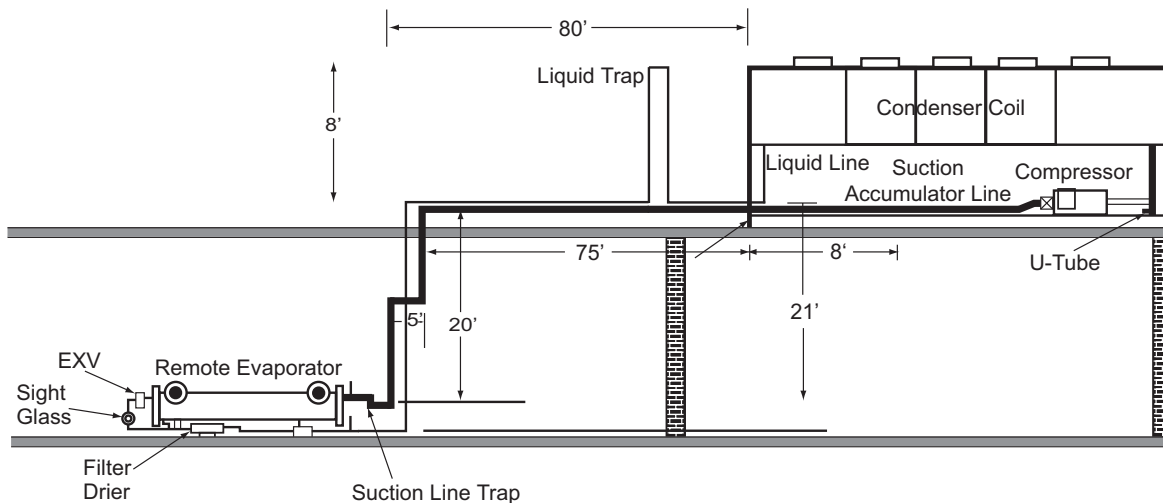


Figure 22 Liquid Line Sizing Example

Suction Line Sizing Steps

The steps to compute suction line size are as follows:

1. Break the suction line into its "Upflow" and "Horizontal or Downflow" components. The horizontal or downflow length should include that portion of field-installed suction line within the condensing unit's base. See [Figure 22](#).
2. From [Table 5](#), select the appropriate "Upflow" suction line outside diameter according to the circuit tonnage. This is the diameter of the upflow suction line and any fittings in the upflow line.
3. With the diameter found in step #2, use [Table 3](#) to find the equivalent length of each fitting in the upflow line. Sum the equivalent lengths of all the fittings in the upflow line.
4. Sum the final length found in step #3 with the actual length of the upflow line. This is the final equivalent length of the upflow portion of the suction line.
5. Multiply by 1.5, the actual length of the horizontal or downflow portion of the suction line.
6. Add the length from step #5 to the length from step # 4. This is the first estimate of the equivalent line length.
7. In [Table 6](#) find the column for the circuit tonnage you are sizing. In that

Installation — Remote Evaporator

column find the outside diameter that corresponds to the equivalent length computed in step #6.

8. Use [Table 3](#) and the diameter found in step #7 to determine the equivalent lengths of each fitting.
9. Sum the following: equivalent lengths of the fittings from step #8, the actual length of the horizontal or downflow suction line, and the equivalent length of the upflow line found in step # 4. This is the new estimate of the equivalent length of the entire suction line.
10. With the new length found in step #9, go back to [Table 6](#) and find the new diameter for the circuit you are sizing.
11. Repeat steps #8-10 with the new diameter found in step # 10.
12. The diameter found in step #11 is the horizontal or downflow suction line diameter.
13. The diameter found in step #2 is the diameter of the upflow suction line and any fittings in the upflow line.

NOTE: The diameters of the upflow, and horizontal or downflow portions of the suction line may differ depending on the application.

Example Suction Line Sizing

For this example, refer to [Table 3](#), [5](#), [6](#), and [23](#), and assume a 50 ton circuit on a 100 ton chiller.

1. From [23](#), the actual length of upflow, and horizontal or downflow is:
upflow $(20 + 5) = 25$ feet
horizontal or downflow $(75+8) = 83$ ft.
2. [Table 5](#) for a 50 ton circuit shows: Upflow suction line outside diameter = 2-5/8 inches
3. According to [Figure 23](#), there are 6 long radius ELLs. From Table 2b for a diameter of 2-5/8 inches:
 $6 \text{ elbows} \times 3.4 \text{ feet} = 20.4 \text{ feet}$
4. Final equivalent length of upflow suction line:
 $20.4 + 25 = 45.4 \text{ feet}$
5. There are no fittings in the horizontal portion. Therefore, the final equivalent line length is:
 $45.4 + 83 = 128.4 \text{ feet}$
6. From [Table 6](#), for a 50 ton circuit, and 125 equivalent feet (nearest to 128.4):
Horizontal or downflow suction line
diameter = 2-5/8 inches

NOTE: In this example, the horizontal line is pitched downward in the direction of flow.



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Suction Accumulator Sizing

Installations similar to those in [Figure 18](#) and [20](#) will require that the suction accumulator be extended at least by the amount shown in [7](#). The suction accumulator length in feet is dependent upon: circuit tonnage, suction line O.D., and actual liquid line length.

The following example uses [Figure 23](#) and assumes a 50 ton circuit with a 2-5/8 inch O.D. suction line. [Figure 23](#) illustrates an installation where the remote evaporator is 11 feet above the outdoor condensing unit. A liquid line at the same elevation as the evaporator runs horizontally 25 feet. Then it drops 11 feet to the same elevation as the suction line connecting points on the outdoor condensing unit, and runs horizontally 5 feet to the outdoor condensing unit. From [Figure 23](#), the actual length of liquid line is 41 feet (25 + 11 + 5). With the previously mentioned assumptions, [Table 7](#) indicates 15 feet of 2-5/8 inch O.D. suction accumulator needs to be added. [Figure 24](#) shows one method of piping the additional 15 feet.

NOTE: In this example, if the liquid and suction lines had dropped the 11 feet from the evaporator and then run the 25 feet horizontal at the outdoor condensing unit's elevation, the 15 feet of suction accumulator would not be required.

NOTE: When sizing suction line diameters, the length of the suction accumulator should be included in any computations.

The height of the suction accumulator, specified in [Table 7](#), may not exceed 4 inches above the suction line connecting point at the outdoor condensing unit. In addition, the suction accumulator must be pitched toward the compressor 1/2 inch per 10 feet of horizontal run.

Installation – Remote Evaporator

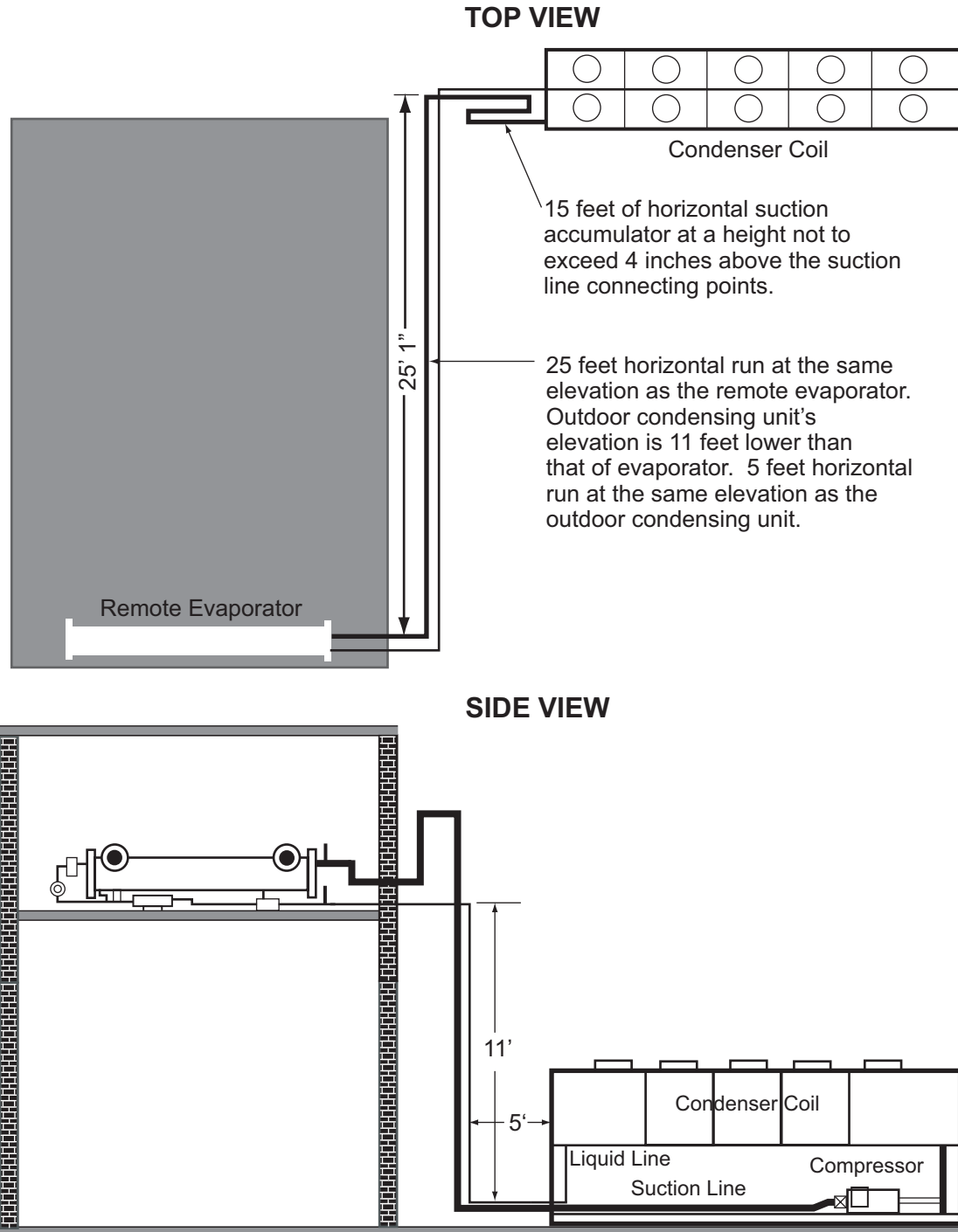


Figure 23 Suction Accumulator Sizing Example



Installation — Remote Evaporator

Piping Installation Procedures

The outdoor unit and the evaporator are shipped with a 25 psig holding pressure of dry nitrogen. Do not relieve this pressure until field installation of the refrigerant piping is to be accomplished. This will require the removal of the temporary pipe caps.

NOTE: Use Type L refrigerant-grade copper tubing only.

The refrigerant lines must be isolated to prevent line vibration from being transferred to the building. Do not secure the lines rigidly to the building at any point.

All horizontal suction lines should be pitched downward, in the direction of flow, at a slope of 1/2 in. per 10 feet of run. This allows for larger line size, which will improve unit efficiency.

Important: Relieve nitrogen pressure before removing end caps.

Do not use a saw to remove end caps, as this may allow copper chips to contaminate the system. Use a tubing cutter or heat to remove the end caps.

⚠ WARNING

Prevent Injury!

When sweating line connections, always provide a sufficient purge of dry nitrogen through the tubing to prevent the formation of oxides/scaling cause by high temperature from brazing. Use a pressure regulator in the line between the unit and the high pressure nitrogen cylinder to avoid over pressurization and possible explosion. If any refrigerant or refrigerant vapors are present a thorough purge with dry nitrogen will prevent the possible formation of toxic phosgene gas. Failure to follow these recommendations could result in death or serious injury.

Refrigerant Sensors

The suction line refrigerant sensors must be installed by the contractor installing the refrigerant piping. The sensors are prewired and each is "wire-tied" to its respective liquid line. Fittings and adapters for mounting of the sensors are located in the remote evaporator terminal box. See [Figure 24](#) for mounting instructions.

Installation – Remote Evaporator

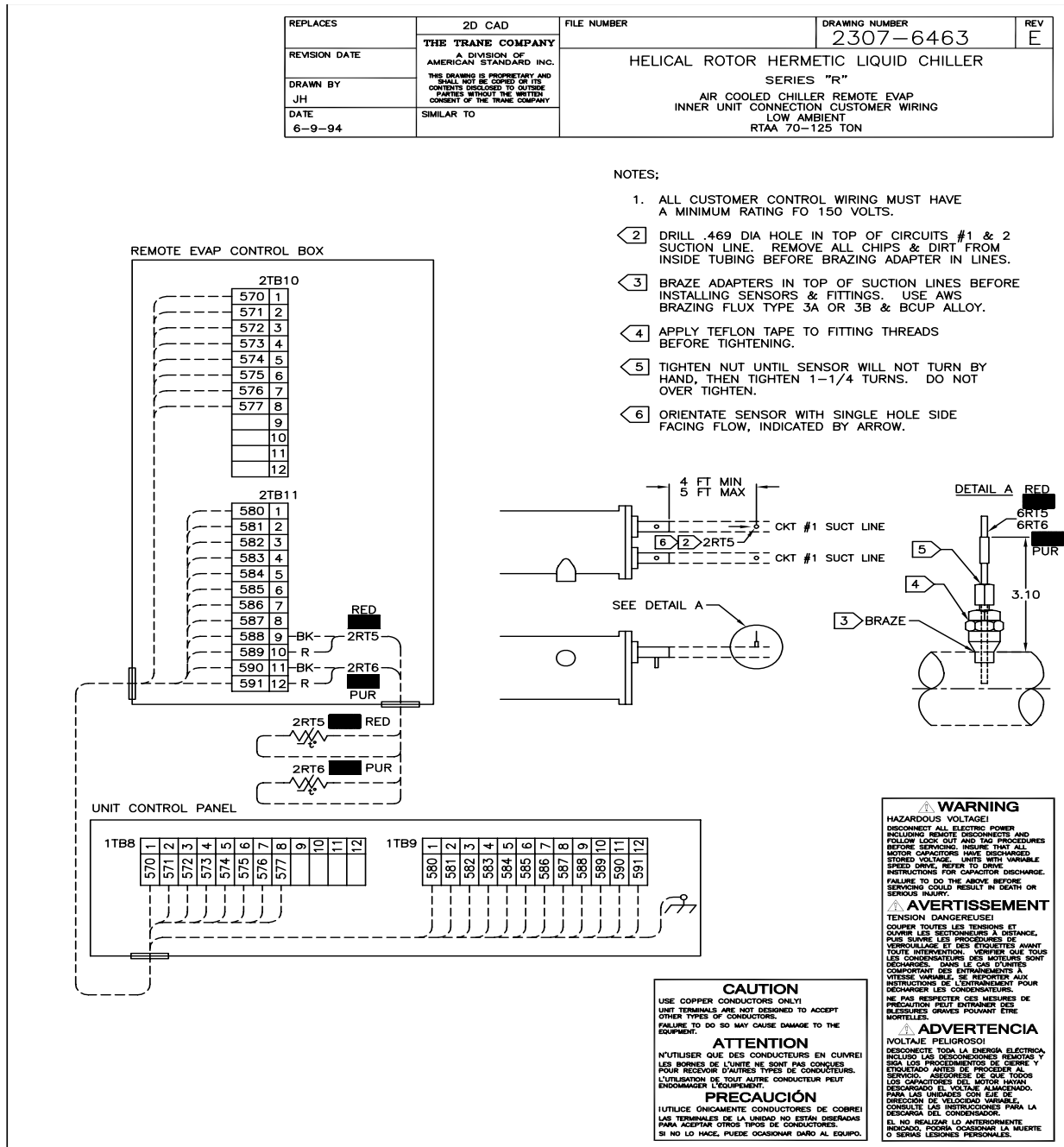


Figure 24 Refrigerant Sensor Mounting and Wiring



Installation — Remote Evaporator

Leak Test and Evacuation

After installation of the refrigerant piping, thoroughly test the system for leaks. Pressure test the system at pressures required by local codes.

Immediately before evacuation, install the liquid line filter cores. These will be shipped with the evaporator.

NOTE: Do not install these before the circuit is ready for evacuation, as the cores will absorb moisture from the atmosphere.

For field evacuation, use a rotary-type vacuum pump capable of pulling a vacuum of 100 microns or less. Follow the pump manufacturer's instructions for proper use of the pump. The line used to connect the pump to the system should be copper and be the largest diameter that can be practically used. A larger line size with minimum flow resistance can significantly reduce evacuation time.

Use the ports on the compressor suction service valves and the liquid line shutoff valves for access to the system for evacuation. Insure that the compressor suction service valve, the liquid line shutoff valve, the oil line shutoff valve and any field installed valves are open in the proper position before evacuating.

Insulate the entire suction line and the suction accumulator line. Where the line is exposed to the weather, wrap it with weatherproof tape and seal with weatherproof compound.

Table 8 System Refrigerant Charge

Circuit Size	Lbs. of R- 22
35	58
40	61
50	73
60	98

Refrigerant and Additional Oil Charge

Refrigerant Charge Determination

The approximate amount of refrigerant charge required by the system must be determined by referring to [Table 8](#) and must be verified by running the system and checking the liquid line sightglasses.

To determine the appropriate charge, first refer to [Table 8](#) to establish the required charge without the field-installed piping. Next, determine the charge required for the field-installed piping by referring to [Table 9](#).

NOTE: The amounts of refrigerant listed in [Table 9](#) are based on 100 feet of pipe. Actual requirements will be in direct proportion to the actual length of piping.

NOTE: [Table 9](#) assumes:

Liquid Temperature = 100 F

Suction Temperature = 35 F

Suction Superheat Temperature = 4 F

The approximate amount of refrigerant is therefore the sum of the values determined from [Table 8](#) and [Table 9](#).



Installation — Remote Evaporator

Oil Charge Determination

The unit is factory charged with the amount of oil required by the system, without the field-installed piping. The amount of additional oil required is dependent upon the amount of refrigerant that is added to the system for the field-installed piping.

Use the following formula to calculate the amount of oil to be added:

Pints of Oil (Trane Oil-31) =

$$\frac{\text{lbs of refrigerant added for field-installed piping}}{100}$$

From the example above, in which the weight of the additional refrigerant added for the field-installed piping was 34.0 lbs (30.6 + 3.4), the amount of oil to be added equals 0.34 pints (34.0/100) per circuit.

Example: Refrigerant Charge Computation

Determine the approximate amount of charge required for an RTAA 100 ton unit with a remote evaporator that is located 75 feet away (i.e the actual length of field-installed pipe is 75 feet for each suction line and liquid line). Assume that the suction lines have been previously determined to be in., O.D. and the liquid lines are in. 1-1/8 O.D.

1. From Table 2g for a 50 ton circuit requires:		= 73 lbs. R-22
2. From Table 2h for a 2-518 inch OD suction line:	75 feet x 4.5 feet	= 3.4 lbs. R-22
3. From Table 2h for a 1 118 inch OD liquid line:	75 feet x 40.8 feet	= 30.6 lbs. R-22
4. Total R-22 charge per circuit:	Sum results of steps 1, 2, and 3	= 107 lbs. R-22 per circuit
5. Total R-22 charge per machine:	2 circuits x 107 lbs.	= 214 lbs. R-22 per machine

Table 9 Field-Installed Piping Charge

Pipe O.D. (inches)	Lbs. R-22 per 100 ft.	
	Suction Line	Liquid Line
1-1/8	0.78	40.8
1-3/8	1.2	62.2
1-5/8	1.7	88
2-1/8	2.9	153.1
2-5/8	4.5	236.1
3-1/8	6.4	—

Relief Valve Venting

All relief valve venting is the responsibility of the installing contractor.

The remote evaporators on chillers sold with this option utilize relief valves installed in each circuit of the evaporator head. There is one relief valve per circuit, and they must be vented to the outside of the building.



Installation — Remote Evaporator

The relief valves are 3/8" SAE flare connections. They have a 300 psig relief setpoint, and relieve at 10.21 lba/min. The connection size and locations are shown in the chiller's submittals. Refer to local codes for relief valve vent line sizing information.



Installation — Electrical

General Recommendations

All wiring must comply with local and National Electric Codes. Minimum circuit capacities and other unit electrical data is on the unit nameplate. See the unit order specifications for actual electrical data. Electrical schematics are shipped with the unit.

Typical wiring diagrams are in the back of this manual.

⚠ WARNING

Hazardous Voltage w/Capacitors!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Note: For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN or PROD-SVB06A-FR

CAUTION

Use Copper Conductors Only!

Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors may result in equipment damage.

Important!

Do not allow conduit to interfere with other components, structural members or equipment. Control voltage (115V) wiring in conduit must be separate from conduit carrying low voltage (<30V) wiring.

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



Installation – Electrical

Table 10 Electrical Data

Unit Wiring					Motor Data						
Unit Size	Rotated Voltage	MCA (2)	MOP (1)	Rec Time Delay or RDE (3)	Qty.	Compressor (Ea) RLA (4)	LRA (7)	Qty.	Fans (Ea) KW	FLA	Control KW (6)
RTAA 70	200/60	300	400	350	2	115/115	800/800	8	1.0	5.1	0.75
	230/60	265	350	300	2	100/100	690/690	8	1.0	5.0	0.75
	460/60	133	175	150	2	50/50	330/330	8	1.0	2.5	0.75
	575/60	108	125	125	2	40/40	270/270	8	1.0	2.2	0.75
	346/50	153	200	175	2	58/58	390/390	8	1.0	2.7	0.75
	400/50	133	175	150	2	50/50	325/325	8	1.0	2.5	0.75
RTAA 80	200/60	361	500	400	2	142/142	800/800	8	1.0	5.1	0.75
	230/60	319	400	350	2	124/124	760/760	8	1.0	5.0	0.75
	460/60	160	200	175	2	62/62	380/380	8	1.0	2.5	0.75
	575/60	131	175	150	2	50/50	304/304	8	1.0	2.2	0.75
	346/50	184	250	225	2	72/72	430/430	8	1.0	2.7	0.75
	400/50	160	200	175	2	62/62	375/375	8	1.0	2.5	0.75
RTAA 90	200/60	428	600	600	2	192/142	990/880	9	1.0	5.1	0.75
	230/60	378	500	500	2	167/124	820/760	9	1.0	5.0	0.75
	460/60	190	250	225	2	84/62	410/380	9	1.0	2.5	0.75
	575/60	154	200	175	2	67/50	328/304	9	1.0	2.2	0.75
	346/50	243	300	250	2	96/72	485/430	9	1.0	2.7	0.75
	400/50	214	250	225	2	84/62	402/375	9	1.0	2.5	0.75
RTAA 100	200/60	483	600	600	2	192/192	990/990	10	1.0	5.1	0.75
	230/60	426	500	500	2	167/167	820/820	10	1.0	5.0	0.75
	460/60	214	250	250	2	84/84	410/410	10	1.0	2.5	0.75
	575/60	173	225	200	2	67/67	328/328	10	1.0	2.2	0.75
	346/50	243	300	300	2	96/96	485/485	10	1.0	2.7	0.75
	400/50	214	250	250	2	84/84	402/402	10	1.0	2.5	0.75
RTAA 110	200/60	536	700	600	2	233/192	1190/990	10	1.0	5.1	0.75
	230/60	471	600	600	2	203/167	1044/820	10	1.0	5.0	0.75
	460/60	235	300	300	2	101/84	522/410	10	1.0	2.5	0.75
	575/60	191	250	225	2	81/67	420/328	10	1.0	2.2	0.75
	346/50	270	350	300	2	117/96	585/485	10	1.0	2.7	0.75
	400/50	236	300	300	2	101/84	512/402	10	1.0	2.5	0.75
RTAA 125	200/60	576	800	700	2	233/233	1190/990	10	1.0	5.1	0.75
	230/60	507	700	600	2	203/203	1044/1044	10	1.0	5.0	0.75
	460/60	253	350	300	2	101/101	522/522	10	1.0	2.5	0.75
	575/60	205	250	225	2	81/81	420/420	10	1.0	2.2	0.75
	346/50	291	400	350	2	117/117	585/585	10	1.0	2.7	0.75
	400/50	253	350	300	2	101/101	512/512	10	1.0	2.5	0.75

(1) **MOP** - Maximum Overcurrent Protection - may be either type breaker (UL/CSA) or with circuit breakers (CSA only). MOP = 225 percent of the largest compressor RLA plus 100 percent of the second compressor plus the sum of the condenser fans FLAs per NEC 440-22.

(2) **MCA** - Minimum Circuit Ampacity - 125 percent of largest compressor RLA plus 100 percent of second compressor plus the sum of the condenser fans FLAs per NEC 440-33.

(3) **RECOMMENDED TIME DELAY OR DUAL ELEMENT (RDE) FUSE SIZE:** 150 percent of the largest compressor RLA plus 100 percent of the second compressor RLA and the sum the condenser fan FLAs.

(4) **RLA** - Rated Load Amps -rated in accordance with UL Standard 465.

(5) Local codes may take precedence.

(6) Control kw includes operational controls only. Does not include heat tapes.

(7) **LRA** - Locked Rotor Amps -based on full winding start units.

(8) **VOLTAGE UTILIZATION RANGE:**

Rated Voltage	Utilization Range
200/60	180-220
230/60	208-254
460/60	414-506
575/60	516-633
400/50	340-460

(9) **60 HZ UNITS** - A 115/60/1, 15 amp. customer provided power connection is required to power the evaporator heat tape 420 watts

(10) **50 HZ UNITS** - A separate 220/50/1 15 amp. customer provided power connection is needed to power evaporator heat tape 420 watts @ 220 volts.

Installation – Electrical

Table 11 Electrical Data - Pump Package Option

Unit Wiring							Motor Data						
Unit Size	Rotated Voltage	Pump HP	Pump FLA	MCA (2)	MOP (1)	Rec Time Delay or RDE (3)	Qty	Comp(Ea) RLA (4)	LRA (7)	Qty	Fans (Ea) KW	FLA	Control KW (6)
RTAA 70	460/60	2	3.1	136	175	150	2	50/50	330/330	8	1.0	2.5	0.75
	460/60	3	4.1	137	175	150	2	50/50	330/330	8	1.0	2.5	0.75
	460/60	5	6.6	139	175	175	2	50/50	330/330	8	1.0	2.5	0.75
RTAA 80	460/60	2	3.1	163	200	200	2	62/62	380/380	8	1.0	2.5	0.75
	460/60	3	4.1	164	225	200	2	62/62	380/380	8	1.0	2.5	0.75
	460/60	5	6.6	166	225	200	2	62/62	380/380	8	1.0	2.5	0.75
	460/60	7.5	10.3	170	225	200	2	62/62	380/380	8	1.0	2.5	0.75
RTAA 90	460/60	3	4.1	194	250	225	2	84/62	410/380	9	1.0	2.5	0.75
	460/60	5	6.6	196	250	225	2	84/62	410/380	9	1.0	2.5	0.75
	460/60	7.5	10.3	200	250	225	2	84/62	410/380	9	1.0	2.5	0.75
RTAA 100	460/60	3	4.1	218	300	250	2	84/84	410/410	10	1.0	2.5	0.75
	460/60	5	6.6	221	300	250	2	84/84	410/410	10	1.0	2.5	0.75
	460/60	7.5	10.3	224	300	350	2	84/84	410/410	10	1.0	2.5	0.75
RTAA 110	460/60	3	4.1	239	300	300	2	101/84	522/410	10	1.0	2.5	0.75
	460/60	5	6.6	242	300	300	2	101/84	522/410	10	1.0	2.5	0.75
	460/60	7.5	10.3	246	300	300	2	101/84	522/410	10	1.0	2.5	0.75
RTAA 125	460/60	3	4.1	256	350	300	2	101/101	522/522	10	1.0	2.5	0.75
	460/60	5	6.6	259	350	300	2	101/101	522/522	10	1.0	2.5	0.75
	460/60	7.5	10.3	263	350	300	2	101/101	522/522	10	1.0	2.5	0.75

(1) **MOP** - Maximum Overcurrent Protection - may be either type breaker (UL/CSA) or with circuit breakers (CSA only). MOP = 225 percent of the largest compressor RLA plus 100 percent of the second compressor plus the sum of the condenser fans FLAs per NEC 440-22.

(2) **MCA** - Minimum Circuit Ampacity - 125 percent of largest compressor RLA plus 100 percent of second compressor plus the sum of the condenser fans FLAs per NEC 440-33.

(3) **RECOMMENDED TIME DELAY OR DUAL ELEMENT (RDE) FUSE SIZE:** 150 percent of the largest compressor RLA plus 100 percent of the second compressor RLA and the sum the condenser fan FLAs.

(4) **RLA** - Rated Load Amps -rated in accordance with UL Standard 465.

(5) Local codes may take precedence.

(6) Control kw includes operational controls only. Does not include heat tapes.

(7) **LRA** - Locked Rotor Amps -based on full winding start units.

(8) **VOLTAGE UTILIZATION RANGE:**

Rated Voltage	Utilization Range
200/60	180-220
230/60	208-254
460/60	414-506
575/60	516-633
400/50	340-460

(9) **60 HZ UNITS** - A 115/60/1, 15 amp. customer provided power connection is required to power the evaporator heat tape 420 watts

(10) **50 HZ UNITS** - A separate 220/50/1 15 amp. customer provided power connection is needed to power evaporator heat tape 420 watts @ 220 volts.

Installer-Supplied Components

All wiring must comply with local codes and the National Electrical Code. The installing (or electrical) contractor must provide and install the system inter-connecting wiring, as well as the power supply wiring. It must be properly sized and equipped with the appropriate fused-disconnect switches. The type and installation location(s) of the fused-disconnects must comply with all applicable codes.

The installer must provide the following components if not ordered with the unit:

- Power supply wiring (in conduit) for all field-wired connections.
- All control (interconnecting) wiring (in conduit) for field supplied devices.
- Fused-disconnect switches.

Remote Evaporator Only:

- Control wiring between the outdoor unit and the evaporator terminal box.



Installation — Electrical

Power Supply Wiring

All power supply wiring must be sized and selected accordingly by the project engineer in accordance with the National Electrical Code.

All wiring must comply with local codes and the National Electrical Code. The installing (or electrical) contractor must provide and install the system inter-connecting wiring, as well as the power supply wiring. It must be properly sized and equipped with the appropriate branch circuit protection. The type and installation location(s) must comply with all applicable codes.

Cut holes for the appropriately-sized wiring conduits in the lower right side of the power connection panel. The wiring is passed through these conduits and connected to the terminal blocks or optional unit-mounted disconnect or circuit breaker.

To provide proper phasing of 3-phase input, make connections as shown in the Field Wiring diagrams and as stated on the yellow WARNING label in the starter panel. For additional information on proper phasing, refer to "Unit Voltage Phasing". Proper equipment ground must be provided to each ground connection in the panel.

Control Power Supply

The unit is equipped with the control power transformer. It is not necessary to provide control power voltage to the unit.

Heat Tape Power Supply (Packaged Units Only)

NOTE: Units with the Remote Evaporator option do not have heat tape.

The evaporator shell is insulated from ambient air and protected from freezing temperatures by a thermostatically-controlled heat tape. Whenever the chilled water temperature drops to approximately 37 F, the thermostat energizes the heat tape. The heat tape will protect the evaporator from ambient temperatures down to -20 F.

Provide an independent power source (115V, 15 amp), with a fuse disconnect. The heat tape is factory wired back to the unit control panel. Customer connections are made on terminal strip 1TB3, terminals 16 and 17.

Water Pump Power Supply

Provide power supply wiring with fused-disconnect for the chilled water pump(s) unless unit is equipped with optional pump package.

Interlock Wiring

CAUTION

Evaporator Damage!

The chiller water pump must operate for a minimum of one minute after the UCM receives a command through the external Auto/Stop input to shut down the chilled water system. Do not use the proof of chiller water flow interlock (1U1 TB3-1 and -2) by itself as the normal means of terminating chiller operation. Failure to continue pump operation for one minute after unit shut down may result in evaporator freeze up.

Normally, when the compressors are terminating a cycle (when chiller Stop key, loss of load, low ambient run inhibit, or external Auto/Stop), the controller will initiate the "Run: UNLOAD" mode. This operating mode commands the compressors to their complete unloaded position, which takes about 1/2

Installation — Electrical

minute. This will allow the compressor to be totally unloaded for the next start-up. If only the proof of chilled water flow interlock is used, the chiller will shut down on an immediate (non-friendly) shutdown and initiate an automatic reset diagnostic.

Figure 25 shows a typical interlock of an RTAA chiller. There are three points (six wires) on the chiller that are required to be connected.

1. External Auto/Stop (Terminals 1U1 TB3-3 and -4). This input would be supplied by the field. A contact closure would start the chiller water pump and chiller, via the UCM pump control contacts. Opening the contact would put the operating compressors into the "RUN:UNLOAD" mode and initiate a timing period (1 to 30 minutes, adjustable through the Clear Language Display). This will delay termination of chilled water pump operation via the UCM pump control contacts. Examples of the input at terminals 1U1 TB3-3 and -4 would be a time clock, ambient thermostat, building automation system, etc.
2. UCM Pump Control Contacts (Terminals 1U1 TB4-8 and -9). This output is a set of contacts that will close and start the chilled water pump when the external auto/stop contacts are closed. When the contacts are opened, 1 to 30 minutes later (adjustable through the Clear Language Display) the UCM pump contacts open.
3. Proof of Chilled Water Flow Interlock (Terminals 1U1 TB3-1 and -2). Contact closure between the terminals indicates proof of chilled water flow. Examples of this would be a pump starter auxiliary contact, flow switch, differential pressure switch, or a contact from a building automation system (see Chilled Water Flow Switch in the Water Piping section of this manual). Opening of this contact would shutdown the chiller and initiate an automatic reset diagnostic indicating loss of chilled water flow.

NOTE: Steps 2 and 3 are completed at the factory if unit is equipped with optional pump package.

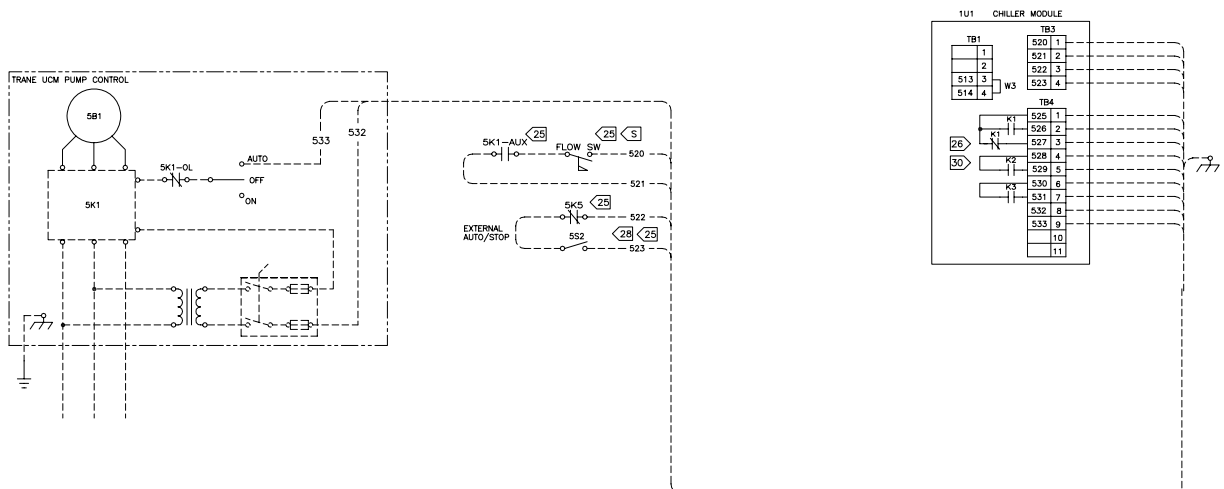


Figure 25 Typical RTAA Chiller Interlock

Installation — Electrical

Alarm/Running/Maximum Capacity Outputs

Terminals 1 to 7 on terminal strip TB4 of the 1U1 board provide a variety of contact outputs. These are dependent upon the setting of Programmable Relay Setup ("Service Setting Menu") and its relationship to diagnostics, compressors operating and the system operating at full capacity.

As shown in [Figure 26](#), there are three relays. Relay 1 has SPDT contacts. Relays 2 and 3 have SPST normally-open contacts. The relays can provide three different output configurations, as shown in [Table 12](#), and each configuration offers four choices as to how the alarm relay is to respond to a set of diagnostics.

[Table 13](#) shows the twelve settings available in Programmable Relay Setup ("Service Settings Menu") and the diagnostics which are issued for each set of conditions.

Table 12 Alarm/Running/Maximum Capacity Relay Output Configurations

Relay Output Configuration		
1:	RLY 1	= Alarm
	RLY 2	= Compressor Running
	RLY 3	= Maximum Capacity
2:	RLY 1	= Circuit 1 Alarm
	RLY 2	= Circuit 2 Alarm
	RLY 3	= Maximum Capacity
3:	RLY 1	= Alarm
	RLY 2	= Circuit 1 Running
	RLY 3	= Circuit 2 Running

Alarm/Running/Maximum Capacity Indicator Wiring

If the optional remote Alarm/Running/ Maximum Capacity contacts are used, provide electrical power, 115 VAC (contact load not to exceed 1150 VA inrush, 115 VA sealed), with fused-disconnect to a customer-furnished remote device. Also provide proper remote device ground connections.

To install the available remote running and alarm indication, the installer must provide leads 525 thru 531 from the panel to the proper terminals of terminal strip 1U1 TB4 on the UCM. Refer to the field diagrams which are shipped with the unit.

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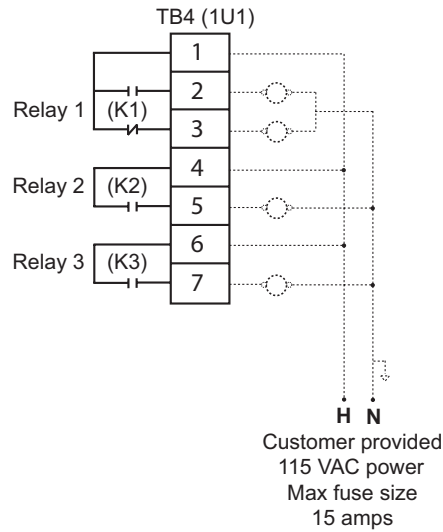


Figure 26 Alarm/Running/Maximum Capacity Contact Outputs

Table 13 Alarm/Running/Maximum Capacity Menu Settings

Programmable Relay Setup Setting (Service Setting Menu)	Relays Output Configuration (Table 12)	Diagnostics that the Alarm Relay(s) is Active		
		MMR/ CMR diag.	MAR/ CAR diag.	IFW
1	1	YES	NO	NO
2	1	YES	YES	NO
3	1	YES	YES	YES
4	1	YES	NO	YES
5	2	YES	NO	NO
6	2	YES	YES	NO
7	2	YES	YES	YES
8	2	YES	NO	YES
9	3	YES	NO	NO
10	3	YES	YES	NO
11	3	YES	YES	YES
12	3	YES	NO	YES

Notes:
MMR = Machine Manual Reset
CMR = Circuit Manual Reset
MAR = Machine Auto Reset
CAR = Circuit Auto Reset
IFW = Informational Warnings



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Low Voltage Wiring

The remote devices described below require low voltage wiring. All wiring to and from these remote input devices to the UCM must be made with shielded, twisted-pair conductors. Be sure to ground the shielding only at the Clear Language Display. See Wiring Section for the recommended conductor sizes.

Emergency Stop (Normal Trip)

The Clear Language Display provides auxiliary control for a customer specified/ installed latching tripout. When this customer-furnished remote contact (5K18) 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 Clear Language Display.

To connect, first remove the jumper located between terminals 3 and 4 of 1U1TB1. Connect low voltage leads 513 and 514 to those terminals. Refer to the field diagrams which are shipped with the unit.

Silver or gold-plated contacts are recommended. These customer-furnished contacts must be compatible with 12 VDC, 45 mA resistive load.

External Circuit Lockout — Circuit #1

The UCM provides for auxiliary control via a customer specified or installed contact closure, for individual operation of Circuit #1. If the contact is closed, the refrigerant circuit will not operate. The refrigerant circuit will run normally when the contact is opened. This feature is used to restrict total chiller operation, eg. during emergency generator operations.

External circuit lockout will only function if External Circuit Lockout (Service Setting Menu) is enabled.

These customer-supplied contact closures must be compatible with 12 VDC, 45 mA resistive load. Silver or gold plated contacts are recommended.

To install, cut, strip and wire-nut existing wire loop #W7 on the P43 connector of the 1U4 module to low voltage leads 45A and 45B. Connections are shown in the field diagrams which are shipped with the unit.

External Circuit Lockout — Circuit #2

The UCM provides for auxiliary control via a customer specified or installed contact closure, for individual operation of Circuit #2. If the contact is closed, the refrigerant circuit will not operate. The refrigerant circuit will run normally when the contact is opened. This feature is used to restrict total chiller operation, eg. during emergency generator operations.

External circuit lockout will only function if External Circuit Lockout (Service Setting Menu) is enabled.

These customer-supplied contact closures must be compatible with 12 VDC, 45 mA resistive load. Silver or gold plated contacts are recommended.

To install, cut, strip and wire-nut existing wire loop #4 on the P53 connector of the 1U5 module to low voltage leads 46A and 46B. Connections are shown in the field diagrams which are shipped with the unit.

Ice Making Option

Ice Machine Control (Operator Settings Menu) must be Enabled. The UCM provides auxiliary control for a customer specified/installed contact closure for ice making. When contact (5K20) is provided, the chiller will run normally when the contact is open. Upon contact closure, the UCM will initiate an ice-building mode, in which the unit runs fully loaded at all times. Ice-building shall be terminated either by opening the contact or based on the entering evaporator water temperature setting under Active Ice Termination Set-point (Chiller Report Menu). The UCM will not permit the ice-building mode to be

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reentered until the unit has been switched out of ice-building mode (open 5K20 contacts) and then switched back into ice building mode (close 5K20 contacts).

In ice-building, the current setpoint will be set at 120%. For example, if the Front Panel or External Current Limit setpoint is set to 80%, in ice-building the Active Current Limit is 120%.

If, while in ice-building mode, the unit gets down to the freezestat setting (water or refrigerant), the unit will shut down on a manually resettable diagnostic, just as in normal operation.

Connect leads 501 and 502 from 5K20 to the proper terminals 1U2TB1 -1 and -2. Refer to the field diagrams which are shipped with the unit.

Silver or gold-plated contacts are recommended. These customer furnished contacts must be compatible with 12 VDC, 45 mA resistive load.

External Chilled Water Setpoint (CWS)

This option allows the external setting of the Chilled Water Setpoint, independent of the Front Panel Chilled Water Setpoint, by one of three means:

1. A remote resistor/potentiometer input (fixed or adjustable).
2. An isolated voltage input 2-10 VDC.
3. An isolated current loop input 4-20 mA.

To enable external setpoint operation, "External Chilled Water Setpoint" (Operator Settings Menu) should be set to "E" using the Clear Language Display.

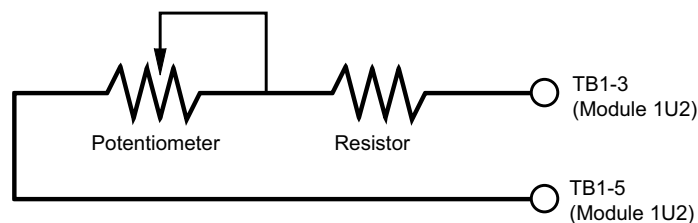


Figure 27 Resistor and Potentiometer Arrangement External Chilled Water Setpoint

1. Remote Resistor/Potentiometer Input (fixed or adjustable).

Connect the remote resistor and/or potentiometer to terminals 1TB1-3 and TB1-5 of Options Module 1U2, as shown in [Figure 27](#).

For units with 40 to 60 F LCWS range, a field-furnished 25 Kohm linear taper potentiometer ($\pm 10\%$) and a fixed 5.6 Kohm ($\pm 10\%$) 1/4 Watt resistor should be used.

For units with 20 F to 39 F LCWS range, a field-furnished 25 Kohm linear taper potentiometer ($\pm 10\%$) and a fixed 15 Kohm ($\pm 10\%$) 1/4 Watt resistor should be used.

If the potentiometer is to be remotely mounted, it and the resistor must be connected to the UCM prior to mounting. Then, with the Clear Language Display showing "Active Chilled Water Setpoint" (Chiller Report Menu), the Clear Language Display can be used to calibrate the positions of the potentiometer to correspond with the desired settings for the leaving water temperature. External resistor input values for various chilled water setpoints are shown in [Table 14](#).



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2. Isolated 2-10 VDC Voltage Source Input.

Set DIP Switch SW1-1 of Options Module 1U2 to “OFF.” Connect the voltage source to terminals TB1-4 (+) and TB1-5 (-) on Options Module 1U2. CWS is now based on the following equation:

$$\text{CW Setpoint } ^\circ\text{F} = (\text{VDC} \times 125) - 16.25$$

Sample values for CWS vs. VDC signals are shown in [Table 14](#).

Minimum setpoint = 0 F (2.0 VDC input)
Maximum setpoint = 65 F (9.4 VDC input)
Maximum continuous input voltage = 15 VDC
Input impedance (SW1-1 on) = 40.1 Kohms

3. Isolated 4-20 mA Current Source Input.

Set DIP Switch SW1-1 of Options Module 1U2 to “ON.” Connect the current source to terminals TB1-4 (+) and TB1-5 (-). CWS is now based on the following equation:

$$\text{Setpoint } ^\circ\text{F} = (\text{mA} \times 4.0625) - 16.25$$

Sample values for CWS vs., mA signals are shown in [Table 14](#).

Minimum setpoint = 0 F (40 mA)
Maximum setpoint = 65 F (18.8 mA)
Maximum continuous input voltage = 30 mA
Input impedance (SW1-1 off) = 499 ohms

NOTE: The negative terminal TB1 -5 is referenced to the UCM chassis ground. To assure correct operation, 2-10 VDC or 4-20 mA signals must be isolated or “floating” with respect to the UCM chassis ground.

Table 14 Input Values Vs. External Chilled Water Setpoint

Inputs			Resulting Chilled Water Setpoint (F)
Resistance (Ohms)	Current (ma)	Voltage (Vdc)	
944330	4.0	2.0	0.0
686092	5.2	2.6	5.0
52946	6.5	3.2	10.0
42434	7.7	3.9	15.0
34889	8.9	4.5	20.0
29212	10.2	5.1	25.0
24785	11.4	5.7	30.0
21236	12.6	6.3	35.0
18327	13.8	6.9	40.0
15900	15.1	7.6	45.0
13844	16.3	8.2	50.0
12080	17.5	8.8	55.0
10549	18.8	9.4	60.0
9050	20.0	10.0	65.0

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External Current Limit Setpoint (CLS)

This option allows the external setting of the Current Limit Setpoint, independent of the Front Panel Current Limit Setpoint, by one of three means:

1. A remote resistor/potentiometer input (fixed or adjustable).
2. An isolated voltage input 2-10 VDC.
3. An isolated current loop input 4-20 mA.

To enable external Current Limit Setpoint operation, "External Current Limit Setpoint" (Operator Settings Menu), should be set to "E" using the Clear Language Display.

1. Remote Resistor/Potentiometer Input.

To cover the entire range of Current Limit Setpoints (40 to 120%), a field furnished 50 Kohm log taper potentiometer ($\pm 10\%$) and a fixed 820 ohm ($\pm 10\%$) 1/4 Watt resistor should be wired in series and connected to terminals TB1-6 and TB1-8 of options module 1U2, as shown in [Figure 28](#).

If the potentiometer is to be remotely mounted, it and the resistor must be connected to the UCM prior to mounting. Then, with the Clear Language Display showing "Active Current Limit Setpoint" (Chiller Report Menu), the Clear Language Display can be used to calibrate the positions of the potentiometer to correspond with the desired settings for the current limits. External resistor input values for various current limit setpoints are shown in [Table 15](#).

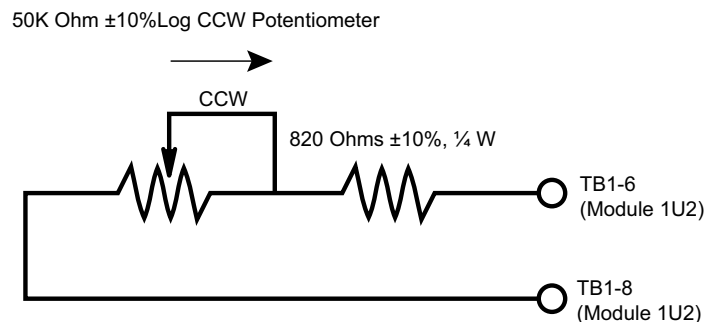


Figure 28 Resistor and Potentiometer Arrangement for External Current Limit Setpoint

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Table 15 Input Values Vs. External Current Limit Setpoint

Inputs			Resulting Chilled Water Setpoint (%RLA)
Resistance (Ohms)	Current (ma)	Voltage (Vdc)	
49000	4.0	2.0	40
29000	6.0	3.0	50
19000	8.0	4.0	60
13000	10.0	5.0	70
9000	12.0	6.0	80
6143	14.0	7.0	90
4010	16.0	8.0	100
2333	18.0	9.0	110
1000	20.0	10.0	120

2. 2-10 VDC Voltage Source Input.

Set DIP Switch SW1-2 of Options Module 1U2 to "OFF." Connect the voltage source to terminals TB1-7 (+) and TB1-8 (-) of Options Module 1U2. CLS is now based on the following equation:

$$\text{CL Setpoint\%} = (\text{VDC} \times 10) + 20$$

Sample values for CLS vs. VDC signals are shown in [Table 15](#).

Minimum setpoint = 40% (2.0 VDC input)
 Maximum setpoint = 120% (10.0 VDC input)
 Maximum continuous input voltage = 15 VDC
 Input impedance (SW1-1 on) = 40.1 Kohms

3. 4-20 mA Current Source Input.

Set DIP Switch SW1-2 of Options Module 1U2 to "ON." Connect the current source to terminals TB1-7 (+) and T131-8 (-) of Options Module 1U2. CLS is now based on the following equation:

$$\text{CL Setpoint\%} = (\text{mA} \times 5) + 20$$

Sample values for CLS vs. mA signals are shown in [Table 15](#).

Minimum setpoint = 40% (0 mA)
 Maximum setpoint = 120% (20.0 mA)
 Maximum continuous input voltage = 30 mA
 Input impedance (SW1-1 on) = 499 ohms

NOTE: The negative terminal TB1-8 is referenced to the UCM chassis ground. To assure correct operation, 2-10 VDC or 4-20 mA signals must be isolated or "floating" with respect to the UCM chassis ground.

Optional Bidirectional Communications Link (BCL)

This option allows the Clear Language Display in the control panel to exchange information (eg. operating setpoints and Auto/Standby commands) with a higher level control device, such as a Tracer, a multiple-machine



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controller or a remote display panel. A shielded, twisted-pair connection establishes the bidirectional communications link between the unit control panel and the Tracer, multiple-machine controller or remote display panel.

NOTE: The shielded, twisted-pair conductors must run in a separate conduit.

Field wiring for the communication link must meet the following requirements:

1. All wiring must be in accordance with the NEC and local codes.
2. Communication link wiring must be shielded, twisted-pair wiring (Belden 8760, or equivalent).
3. The maximum total wire length for each communication link is 5,000 feet.
4. The communication link cannot pass between buildings.
5. All UCM's on the communication link can be connected in a "daisy chain" configuration.

Communication Link Connection Procedure

1. Refer to the Tracer installation literature to determine proper communication link termination connections at the Tracer unit.
2. Refer to the Remote Clear Language Display installation procedure in this manual.
3. Connect the shield of the communication link wiring to the designated shield terminal at the Tracer unit.
4. Connect leads 561 and 562 from the proper terminals of 1U2TB2 on the UCM to the Tracer. There is no polarity requirement for this connection.
5. At the UCM, the shield should be cut and taped to prevent any contact between the shield and ground.

NOTE: On multiple-unit installations, splice the shielding of the two twisted-pairs that come into each UCM in the "daisy chain" system. Tape the spliced connections to prevent any contact between the shield and ground. At the last UCM in the chain, the shield should be cut and taped off.

6. For unit ICS address selection, see ICS Address (Service Settings Menu).

LonTalk Communication Interface (LCI-C)

The Tracer LCI-C interface acts as a translator between Trane's IPC (Inter-Processor Communication) and Echelon's LonTalk® communications protocol (ANSI/EIA/CEA 709.1). This allows the chiller to communicate with building automation systems which also communicate using the LonTalk® protocol. The LonTalk® communications protocol also allows for peer to peer communications between controllers so they can share information. Communicated setpoints have priority over locally wired inputs to the controller unless the controller is set to the "Local" control mode.

The LCI-C module provides connectivity to Trane's Rover® service tool for proper configuration of the LCI-C module.

NOTE: LonTalk® communication links are not polarity sensitive.

1. Connect BAS leads to J3-1,2 or J3-3,4.



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Remote Clear Language Display Installation Procedure

The Remote CLD is intended for indoor use and is not weatherproof. It is mounted in a molded-plastic display box with a molded rubber keypad. Although this is not the same as the membrane keypad of the unit's CLD, the key locations and labels are identical.

Field wiring for the communication link must meet the following requirements:

1. All wiring must be in accordance with NEC and all local codes.
2. Communication link wiring must be 14 AWG shielded, twisted pair wire (Belden 8760, or equivalent).
3. The communication link must not exceed 5,000 feet for each link.
4. The communication link must not pass between buildings.

Remote CLD Mounting

All mounting hardware (tools, screws, etc.) is to be field supplied. [Figure 29](#) shows the mounting holes in the back of the Remote OLD panel. Also shown are the electrical access knockouts at the bottom and top of the panel. Remove the knockouts that will be used for wire entry, prior to mounting the panel.

NOTE: On the back of the panel is a knockout for an electrical outlet box, if one is to be used.

Prior to mounting the panel, the actual microprocessing board needs to be carefully removed and set aside. To remove the board, open the protective door that covers the keypad. Remove the cover plate at the bottom of the keypad, by loosening the screw on the cover plate.

After removing the cover plate, remove the four screws that secure the keypad (one in each corner). The keypad can now be lifted out of the display box.

Attach the display box to the mounting surface with screws through the mounting hole and two mounting slots, shown in [Figure 30](#).

NOTE: If an electrical box is to be used, attach the display box with screws through the four mounting slots around the knockout.

The top of the display box is marked "TOP." Note the position of the box before mounting it to the surface. With the box in the desired position against the mounting surface, mark the location of the mounting holes.

Remove the box and drill the necessary holes in the surface. Put the display box back in position and secure it to the mounting with the required screws.

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The microprocessing board can now be replaced in the display box with its four attaching screws.

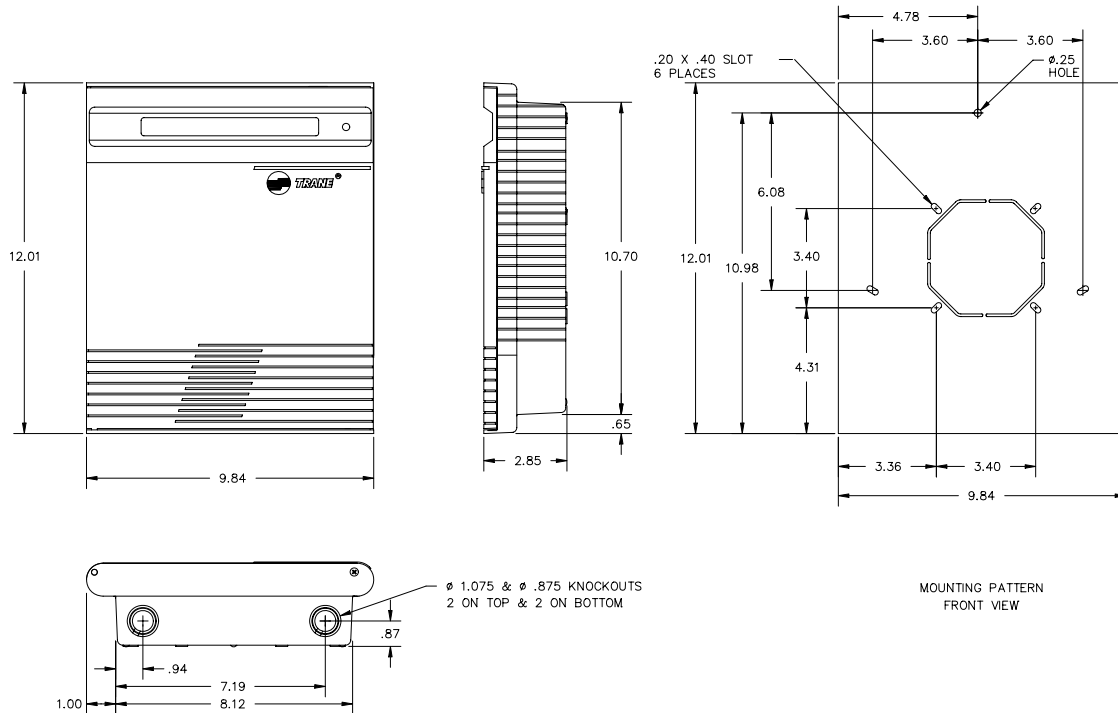


Figure 29 Remote CLD Panel Mounting Holes and Electrical Access Knockouts

Remote CLD Panel Wiring

The Remote CLD requires a 24 VAC power source and a shielded, twisted-pair wire between the panel and the Clear Language Display. See [Figure 30](#).

As shown in [Figure 31](#), the wire runs from terminals J3A-1(+) and J3A-2(-) in the unit's buffer module (1U7) to terminals J1(+) and J1(-) in the Remote CLD. Be sure that one lead is connected to the (+) terminal at each end and the other lead is connected to the (-) terminal at each end.

For units #2, #3 and #4 wire similarly as shown in [Figure 31](#).

Do not run the shielded, twisted-pair wire in a conduit that also contains circuits of greater than 30 volts. Attach the shield to a grounding lug in the unit's control panel. Cut and tape the shield at the Remote CLD panel, as shown in [Figure 30](#).

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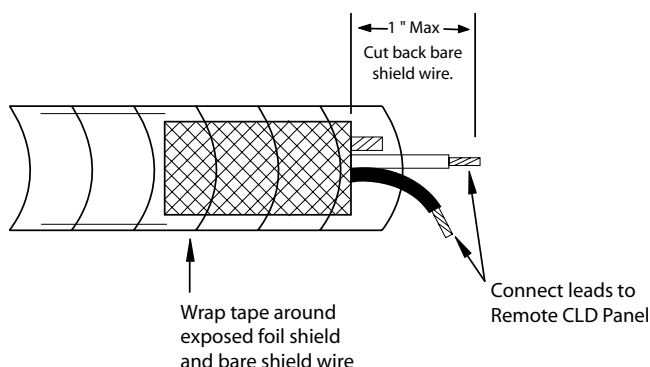


Figure 30 Shielded, Twisted Pair Communication Link at the Remote CLD Panel

Connect the 24 VAC power supply to terminals J2A and J2B in the Remote CLD panel. The polarity of the power source is not a concern, but the power source must be grounded to terminal J2Gnd.

NOTE: A field-supplied Class 2, 24 VAC, 40 VA transformer can be used as a power supply for the Remote CLD panel.

NOTE: Both a Remote CLD and a Tracer unit can be connected to the UCM.

ICS Address Setting

The setting of the ICS address for the Remote CLD is not necessary.

Multiple Unit Operation

In a multiple unit configuration, the Remote CLD Panel has the capability to communicate with up to four units. Each unit requires a separate communication link with the Remote CLD panel.

Terminal strip TB4 is used to wire in the second, third and fourth units to the Remote CLD. TB4 is labeled as shown below:

1	2	3	4	5	6	7	8	9
+	-	↘	+	-	↘	+	-	↘

Terminals 1-3 are for the second unit.

Terminals 4-6 are for the third unit.

Terminals 7-9 are for the fourth unit.

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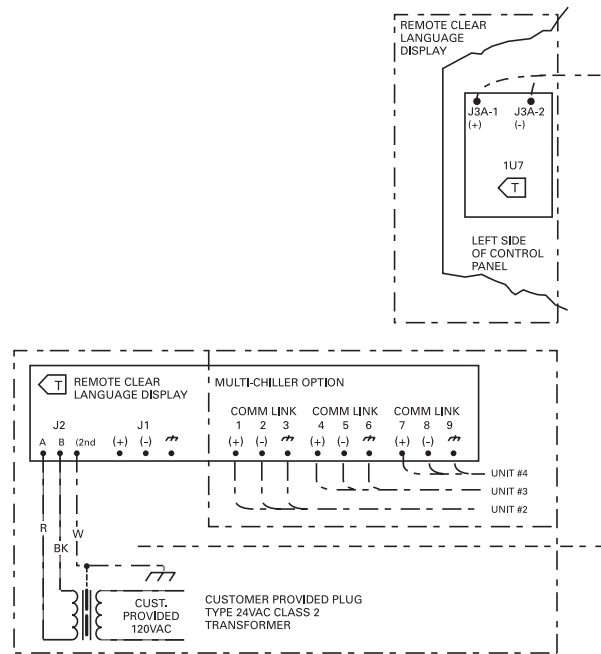


Figure 31 Remote Display Panel Interconnecting Wiring



Operating Principles

This section describes the mechanical operating principles of Series R air-cooled chillers equipped with microcomputer-based control systems.

The 70 - 125-ton Model RTAA units are dual-compressor, helical-rotary type air-cooled liquid chillers. The basic components of an RTAA unit are:

- Clear Language Display.
- Unit Control Modules (UCM).
- Unit-mounted panel.
- Helical-rotary compressor.
- Direct Expansion evaporator.
- Air-cooled condenser.
- Oil supply system (hydraulic and lubrication).
- Interconnecting piping.

Refrigeration (Cooling) Cycle

Cycle Description

[Figure 32](#) represents the refrigeration system and control components.

Vaporized refrigerant leaves the evaporator and is drawn into the compressor. Here it is compressed and leaves the compressor as a mixture of hot gas and oil (which was injected during the compression cycle).

The mixture enters the oil separator at the in/out cap. The separated oil flows to the bottom of the separator, while the refrigerant gas flows out the top and passes on to the tubes in the condensing coils. Here circulating air removes heat from the refrigerant and condenses it.

The condensed refrigerant passes through the electronic expansion valve and into the tubes of the evaporator. As the refrigerant vaporizes, it cools the system water that surrounds the tubes in the evaporator.

Operating Principles

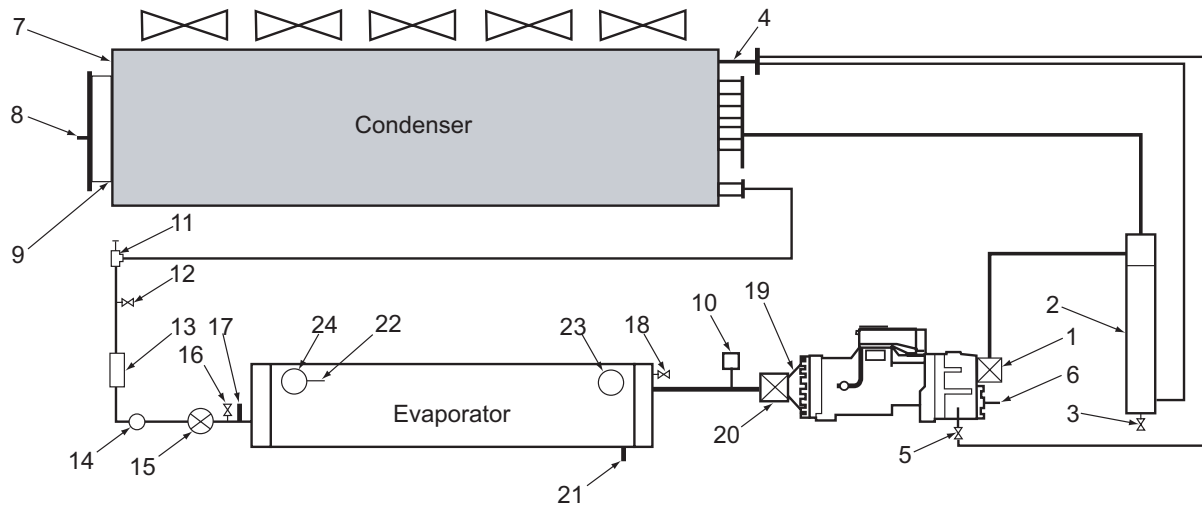


Figure 32 RTAA Refrigeration System and Control Components

- | | | |
|---|--|---|
| 1. Discharge Service Valve | 9. Subcooler | 17. Saturated Evaporator Rfgt. Temp. Sensor |
| 2. Oil Separator | 10. Low Pressure Switch | 18. Relief Valve |
| 3. 1/4" Angle Valve | 11. Liquid Line Service Valve (Backseat Port Upstream) | 19. Compressor Suction Rfgt. Temp. Sensor |
| 4. Oil Cooler | 12. Schrader Valve | 20. Suction Service Valve |
| 5. Quick Connect Shutoff Valve or Angle Valve | 13. Filter/Dryer | 21. Evaporator Entering Water Temp. Sensor |
| 6. Oil Temperature Sensor | 14. Sight Glass | 22. Evaporator Leaving Water Temp. Sensor |
| 7. Condenser | 15. Electronic Expansion Valve | 23. Entering Water Connection |
| 8. Saturated Condenser Rfgt. Temp. Sensor | 16. 1/4" Angle Valve | 24. Leaving Water Connection |

Compressor Description

The compressors used by the Model RTAA Series "R" Air-cooled chiller consists of two distinct components: the motor and the rotors.

Compressor Motor

A two-pole, hermetic, squirrel-cage induction motor (3600 rpm) directly drives the compressor rotors. The motor is cooled by suction refrigerant gas from the evaporator, entering the end of the motor housing through the suction line.

Operating Principles

Compressor Rotors

The compressor is a semi-hermetic, direct-drive helical rotary type compressor. Each compressor has two rotors - "male" and "female" - which provide compression. See [Figure 33](#) 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 helical rotary compressor is a positive displacement device. The refrigerant from the evaporator is drawn into the suction opening at the end of the motor barrel, through a suction strainer screen, across the motor, and into the intake of the compressor rotor section. The gas is then compressed and discharged directly into the discharge line.

There is no physical contact between the rotors and compressor housing. The rotors contact each other at the point where the driving action between the male and female rotors occurs. Oil is injected along the top 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 two unloader valve assemblies in the rotor section of the compressor. The female rotor valve is a two-position valve and the male valve is an infinitely variable position valve. See [Figure 33](#).

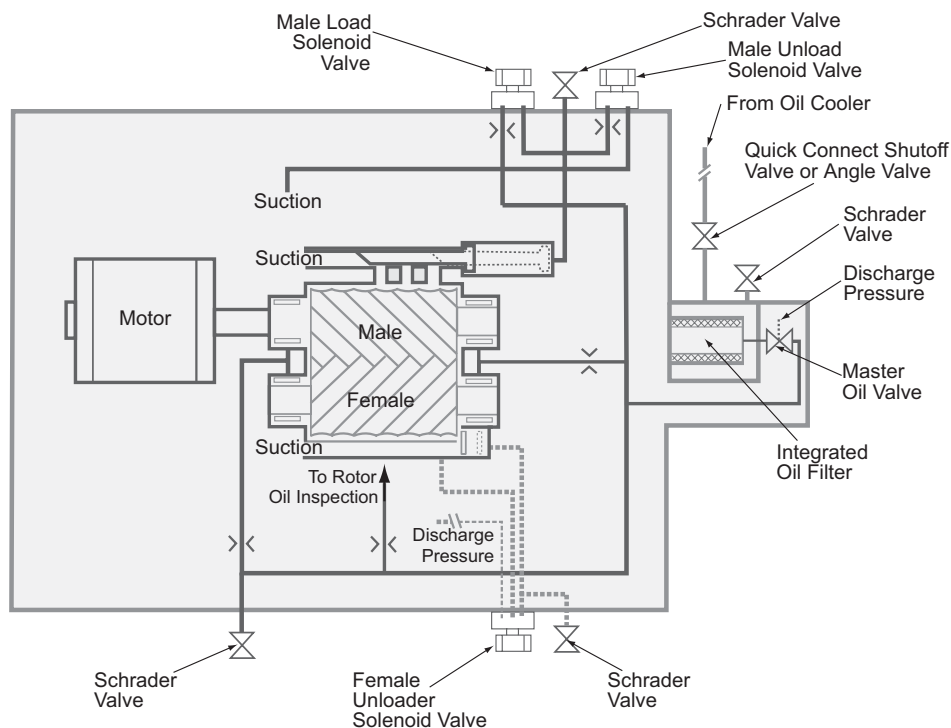


Figure 33 RTAA Refrigerant and Oil Diagram

Operating Principles

Compressor load capacity is determined by the positions of the unloader valves. They divert refrigerant gas from the rotors to the compressor suction, thus unloading the compressor. This varies the compressor capacity to match the load and reduces the KW draw of the compressor motor.

The two-position female unloader will fully open or fully close a port on the rotor housing, at the discharge end of the female rotor. This relieves the refrigerant gas to suction and unloads the compressor. The female unloader valve is the first stage of loading after the compressor starts and the last stage of unloading before the compressor shuts down.

The modulating male unloader valve opens or closes ports in the rotor housing along the side of the male rotor. It can move to a more loaded (closed) position after the female unloader valve is in the loaded position or can relieve refrigerant gas to suction to unload the compressor.

Compressor Loading Sequence

When there is a call for chilled water, the UCM will start the compressor which has the least number of starts. If the first compressor cannot satisfy the demand, the UCM will start the other compressor and then balance the load on both compressors by pulsing the load/unload solenoids.

The load on the compressors will be kept in balance, as load fluctuates, until the demand for chilled water is reduced to a level that can be handled by one compressor. At this time, the UCM will drop off the compressor that has the greatest number of operating hours and will adjust the load on the other compressor, as required.

Oil System Operation

Overview

Oil that collects in the bottom of the oil separator is at condensing pressure during compressor operation; therefore, oil is constantly moving to lower pressure areas. Refer to [Figure 33](#).

As the oil leaves the separator, it passes through the oil cooler at the top of the condensing coils. It then goes through the service valve and filter. At this point, some of the oil is used to control the slide valve movement in the compressor, via the male load/unload solenoids. The remaining oil passes through the master oil valve and performs the functions of compressor bearing lubrication and compressor oil injection.

If the compressor stops for any reason, the master oil valve closes, isolating the oil charge in the separator and oil cooler during "off" periods. The master oil valve is a pressure activated valve. Discharge pressure off the rotors, that is developed when the compressor is on, causes the valve to open.

To ensure proper lubrication and minimize refrigerant condensation in the compressor, a heater is mounted on the bottom of the compressor housing. A signal from the UCM energizes this heater during the compressor "Off" cycle to keep refrigerant from condensing in the compressor. The heater element is continuously energized when the compressor is not running.

Oil Separator

The oil separator consists of a vertical tube, joined at the top by the refrigerant discharge line from the compressor. The discharge line is essentially tangential to the tube. This causes the refrigerant to swirl in the tube and throws the oil to the outside, where it collects on the walls and flows to the bottom. The compressed refrigerant vapor, stripped of oil droplets, exits out the top of the oil separator and is discharged into the condensing coils.

The oil separators on chillers with the remote evaporator option incorporate heaters to prevent refrigerant migration when the machine is off.



Operating Principles

Compressor Bearing Oil Supply

Oil is injected into the bearing housings located at each end of both the male and female rotors. Each bearing housing is vented to compressor suction, so that oil leaving the bearings returns through the compressor rotors to the oil separator.

Compressor Rotor Oil Supply

Oil flows through this circuit directly from the master oil valve, through the oil filter to the top of the compressor rotor housing. There it is injected along the top of the rotors to seal clearance spaces between the rotors and the compressor housing and to lubricate the rotors.

Female Unloader Valve

The position of the female unloader valve determines compressor capacity. Its position is dependent on whether the backside of the female unloader valve is exposed to the compressor discharge or suction pressure. See [Figure 33](#).

The female unloader valve solenoid receives a constant signal from the UCM, based on system cooling requirements. To load the compressor, the female unloader valve solenoid is energized and discharge pressure is passed through the normally-closed port and into the cylinder. This pushes the female unloader valve closed.

To unload the compressor, the female unloader valve solenoid is de-energized and the discharge pressure is relieved to the suction of the compressor. The female unloader valve retracts into the cylinder and the compressor is unloaded.

Just prior to a normal compressor shut-down, the male unload valve solenoid is energized and the slide valve moves to the fully-unloaded position, so the unit always starts fully unloaded.

Oil Filter

Each compressor is equipped with a replaceable-element oil filter. The filter removes any impurities that could foul the solenoid valve orifices and compressor internal oil supply galleries. This also prevents excessive wear of compressor rotor and bearing surfaces. Refer to the maintenance portion of this manual for recommended filter element replacement intervals.

Condenser Fan Staging

The fans on the RTAA 70 -125 Ton units are staged by logic in the UCM. The UCM takes several different pressures and temperatures into account, to determine when fans should be added or subtracted. Input from the outside air temperature sensor, the saturated condensing refrigerant temperature sensor, and the saturated evaporator refrigerant temperature sensor are monitored to determine fan staging.

The number of fans activated at startup is dependant upon the outdoor air temperature. [Figure 34](#) shows fan activation at different temperatures.

During normal operation, the micro uses PID control to maintain a 70 ± 5 psid between the condensing pressure and the evaporator pressure. Through the use of algorithm logic, a fan will be added if the pressure differential is greater than 75 psid and the fan inverter is at maximum speed.

A "Low Differential Pressure" diagnostic will take the circuit off-line if the pressure differential falls below 40 psid for more than two minutes.

A "High Differential Pressure" diagnostic will take the circuit off-line if the pressure differential increases to 350 psid or greater. This diagnostic can also be produced if the pressure differential increases to the range between 320

Operating Principles

psid and 349 psid. The UCM will allow the unit to remain on-line if there is no increase in pressure for a one hour period. Otherwise, the unit will trip off-line and display the "High Differential Pressure" diagnostic.

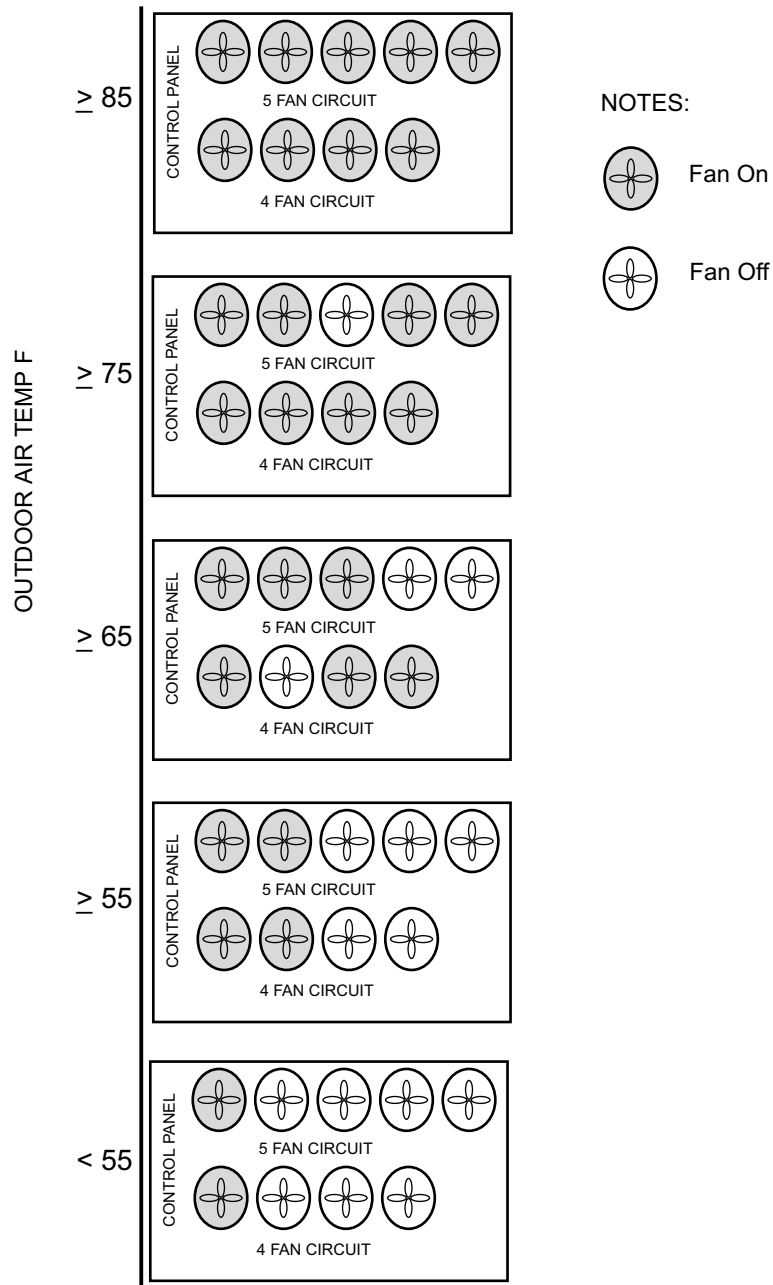


Figure 34 Fan State at Circuit Startup



Controls Interface

The exclusive Trane Adaptive Control logic with the Clear Language Display is comprised of a system of individual modules located in the control panel. The system consists of six different microprocessor-based components. The processors are:

- Clear Language Display - 1U6.
- Chiller Module - 1U1.
- Communication and Setpoint Reset Option Module - 1U2.
- Expansion Valve Module - 1U3.
- Compressor Module (one per compressor) - 1U4, 1U5.
- Remote Display Buffer Option Module - 1U7.
- LCI-C Option Module - 1U8.

The Clear Language Display has various functions that allow the operator to read unit information and adjust setpoints. The following is a list of the available functions:

- Operating and Diagnostic descriptions.
- Settings of local setpoints and adjustments.
- Actual controlling setpoints.
- Specific temperatures.
- Specific Pressures.
- Enable/Disable status of features and options.
- Selection status of SI units or English units.
- Under/Over voltage protection.
- Display of % line voltage.
- Alarm/Running/Maximum Capacity contacts.
- Display Starts and Hours.

Clear Language Display Keypad Overview

Local operator interface with the system is accomplished using the 16 keys on the front of the Clear Language Display panel. The readout screen is a two line, 40 character liquid crystal with a backlight. The backlight allows the operator to read the display in low-light conditions. The depression of any key will activate the backlight. The backlight will stay activated for 10 minutes after the last key is pressed. At 10 F or below the backlight will stay activated continuously.

The keys are grouped on the keyboard by the following functions (refer to Figure 35):

- Select Report Group.
- Select Settings Group.
- Selection Keys.
- Stop & Auto Keys.

Controls Interface



Figure 35 Operator Interface Adaptive Control

Select Report Group

This group of four keys allows the operator to select and view the following reports:

- Custom Report.
- Chiller Report.
- Refrigerant Report.
- Compressor Report.

The Custom Report is the only report of the four that is defined by the operator. Any display under the other three reports can be added to the Custom Report by pressing the plus Δ key while the desired read-out is on the display. A maximum of 20 entries can be contained under the Custom Report. Items can be deleted from the Custom Report by pressing the minus ∇ key when the desired read-out is on the display. The operator must be in the Custom Report menu to delete the desired item.

The Chiller Report, Refrigerant Report and Compressor Report are informational reports that give current status. Each report and its contents are discussed in detail on the following pages.

When any of the four report keys are pressed, the first readout on the display will be the header. The header identifies the title of the report and summarizes the items in the report.



Controls Interface

The Next key and Previous key allow the operator to scroll up and down through the display items listed under the report menus. When the last item of a report is displayed and the Next key is pressed, the display will wrap around to the header of the report. When the first item of a report is displayed and the Previous key is pressed, the display will wrap around to the last item.

Select Settings Group

The first three keys on the second row – Operator Settings, Service Settings and Service Tests – allow the operator to adjust various setpoints and perform various tests. Certain items in these groups are password protected. Refer to the Password section for additional information.

When a setpoint key is pressed, a header will be displayed. The setpoint headers identify the available items and setpoint functions.

The Next and Previous keys function in the same manner as that described in Selected Report Group, above.

Setpoint values are incremented by pressing the plus Δ key and decremented by pressing the Minus ∇ key. Once a setpoint is changed, the Enter key must be pressed to save the new setpoint. If the Cancel key is pressed, the setpoint value on the display will be ignored and the original setpoint will remain.

Passwords

Passwords are needed to enter into the Service Setup Menu and the Machine Configuration Menu. Both of these menus are accessed through the Service Settings key. If access into these menus is necessary, follow the list of steps below:

1. Press Service Settings.
2. Press Next until the readout in the display is:
Password Required For Further Access
"Please enter Password"
3. To enter into the Service Setup Menu, press:
 $\Delta \Delta \nabla \nabla \Delta \Delta$ Enter
4. To enter into the Machine Configuration Menu, press:
 $\Delta \nabla \Delta \nabla \Delta \nabla$ Enter

Select Report Group and Select Settings Group Flowcharts

The first block of the flowchart is the header which is shown on the display after the menu key is pressed. For example:

Press Chiller Report and the readout on the display will be:

CHILLER RPRT:STATUS, WTR TEMPS & SETPTS
"PRESS (NEXT) (PREVIOUS) TO CONTINUE"

Press Next to move down through the Chiller Report. As shown in the figures, the flowchart explains the conditions that the UCM looks at to determine which readout is to be displayed next. For example:



Controls Interface

Press Chiller Report to display the header Press Next to display
MODE: OPERATING MODE]
REQUESTED SETPOINT SOURCE: [SETPT SOURCE]

Press Next to display

COMPRESSOR ON
CIRCUITS LOCKED OUT

Press Next to display

ACTIVE ICE TERMINATION SETPOINT

Or

ACTIVE CHILLED WATER SETPOINT

The UCM will determine which screen will be displayed after looking at the current Operating Mode. If the Operating Mode is "Ice Making" or "Ice Making Complete," ACTIVE ICE TERMINATION SETPOINT will be displayed. Otherwise, ACTIVE CHILLED WATER SETPOINT will be shown.

The flowcharts also list the setpoint ranges, default options and a brief description of the item, when necessary. This information is shown in the lefthand column of the page, adjacent to the appropriate display.

Auto/Stop Keys

The chiller will go through a "STOPPING" mode when the Stop key is pressed if a compressor is running. This key has a red background color surrounding it, to distinguish it from the others.

If the chiller is in the Stop mode, pressing the Auto key will cause the UCM to go into the Auto/Local or Auto/Remote mode, depending on the Setpoint Source setting. The Auto key has a green background color.

When either the Auto or Stop key is pressed, Chiller Operating Mode (Chiller Report Menu) will be shown on the display.

Power Up

When power is first applied to the control panel, the Clear Language Display goes through a self-test. For approximately five seconds, the readout on the display will be:

SELF TEST IN PROGRESS

During the self-test, the backlight will not be energized. When the tests are successfully complete, the readout on the display will be

6200 xxxx-xx [TYPE] configuration

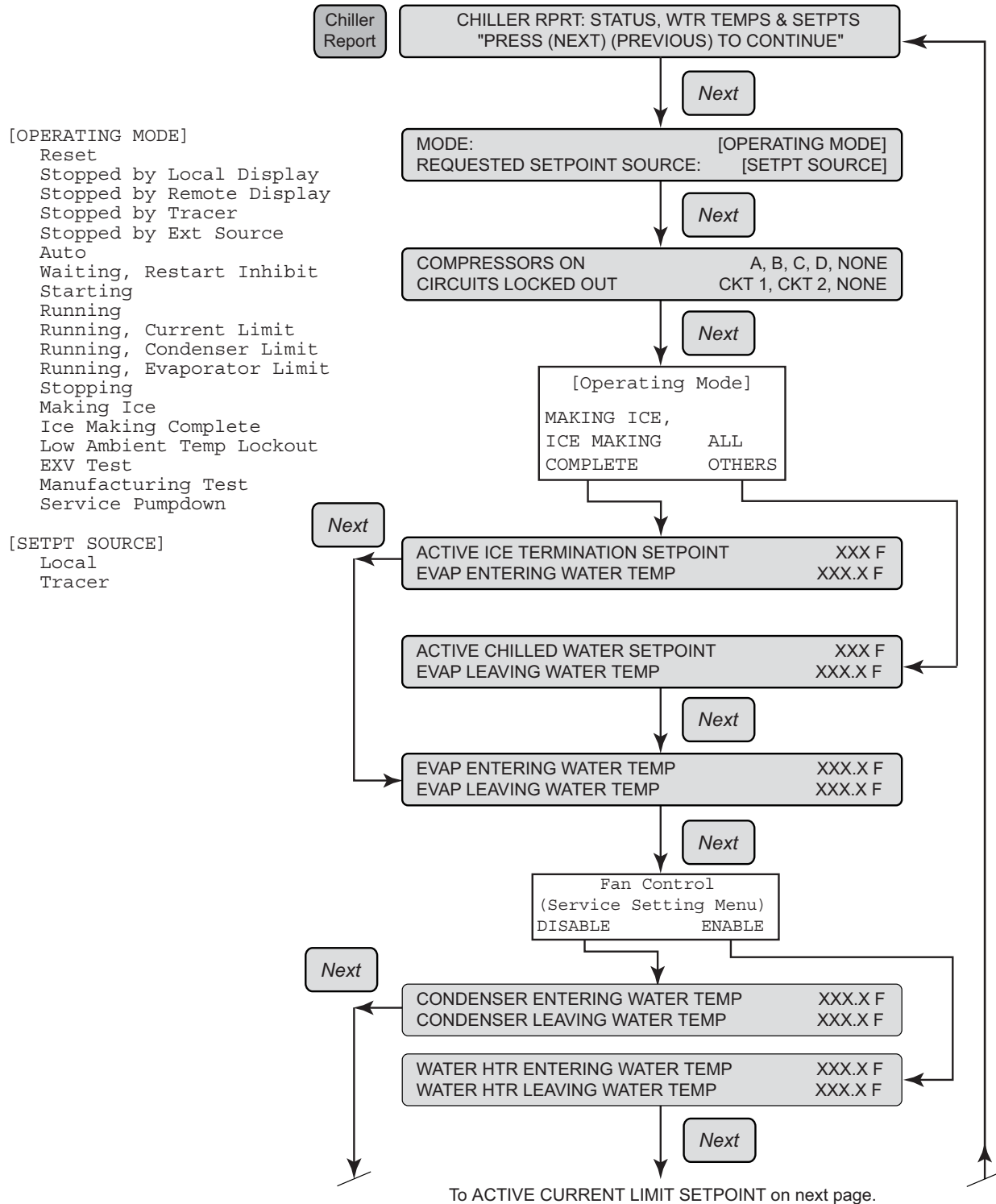
Updating Unit Data, Please Wait

When updating is successfully completed, the system will default to the first display after the Chiller Report header:

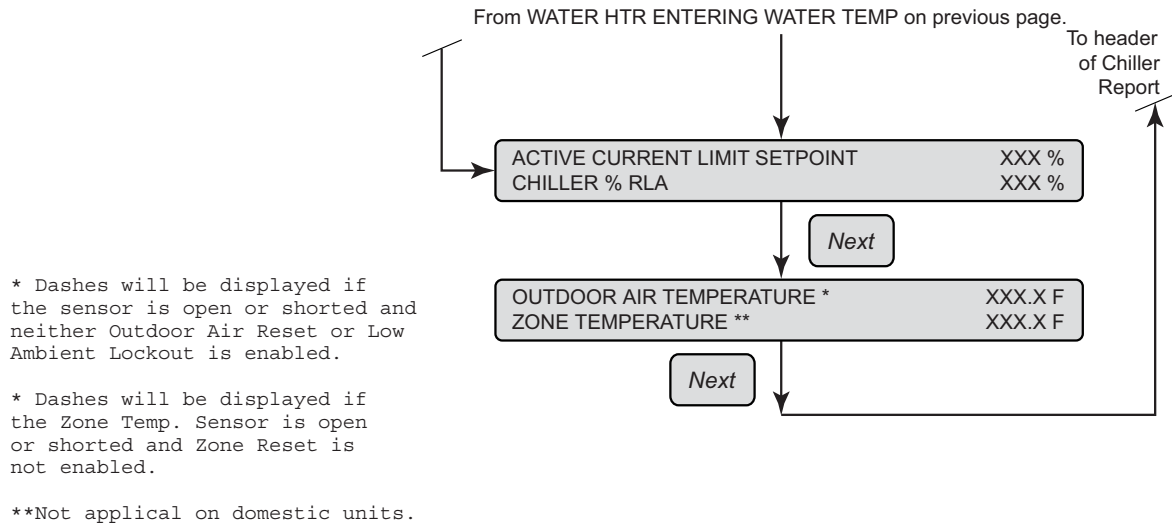
MODE: OPERATING MODE]
REQUESTED SETPOINT SOURCE: [SETPT SOURCE]

and the backlight will be activated.

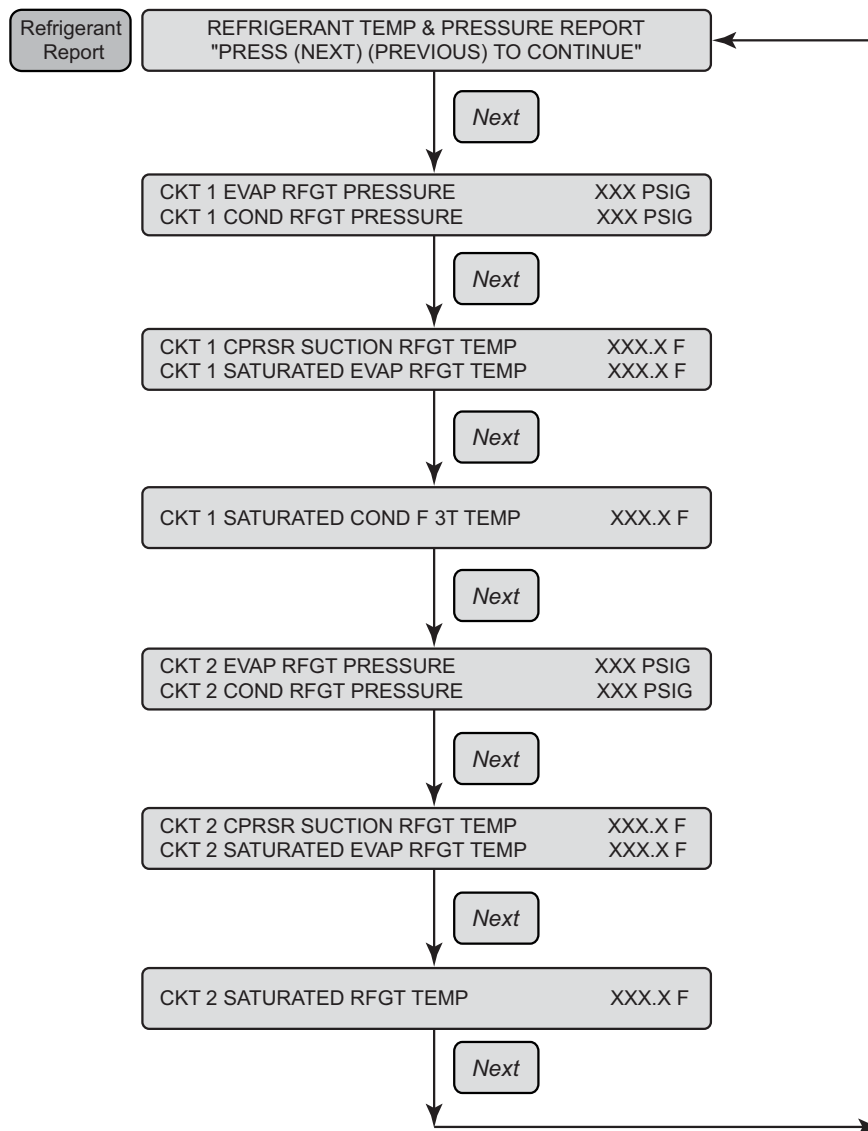
Controls Interface



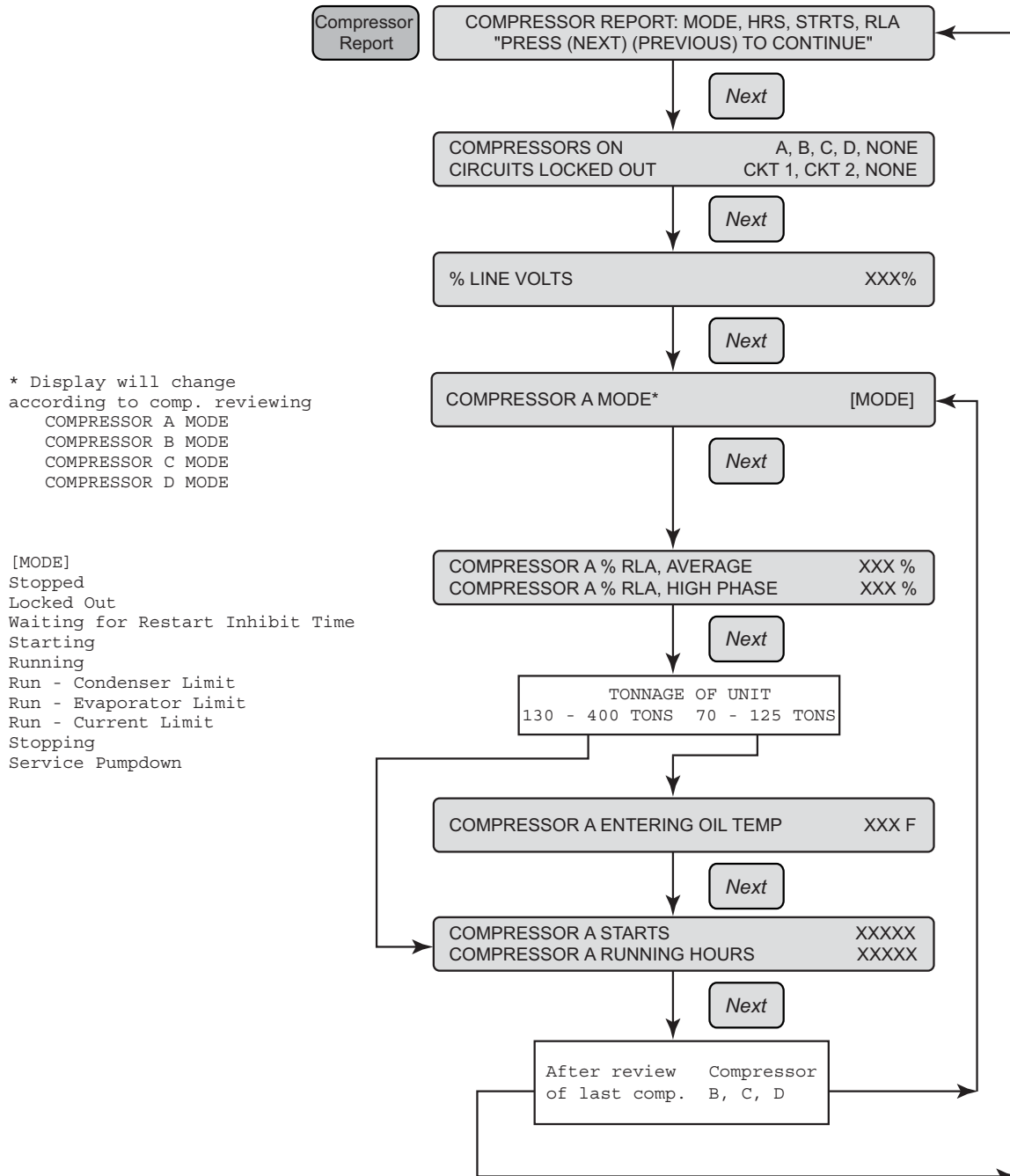
Controls Interface



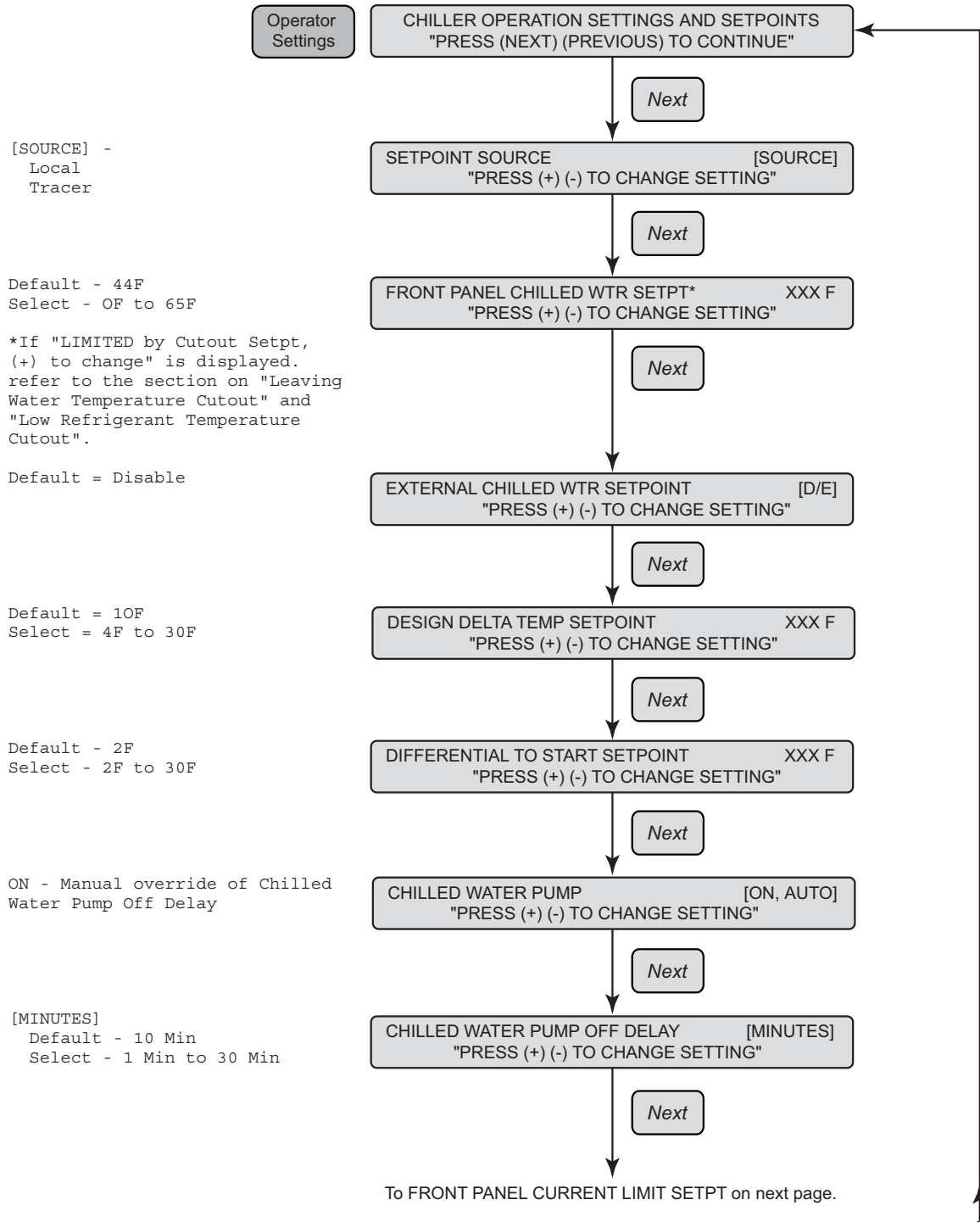
Controls Interface



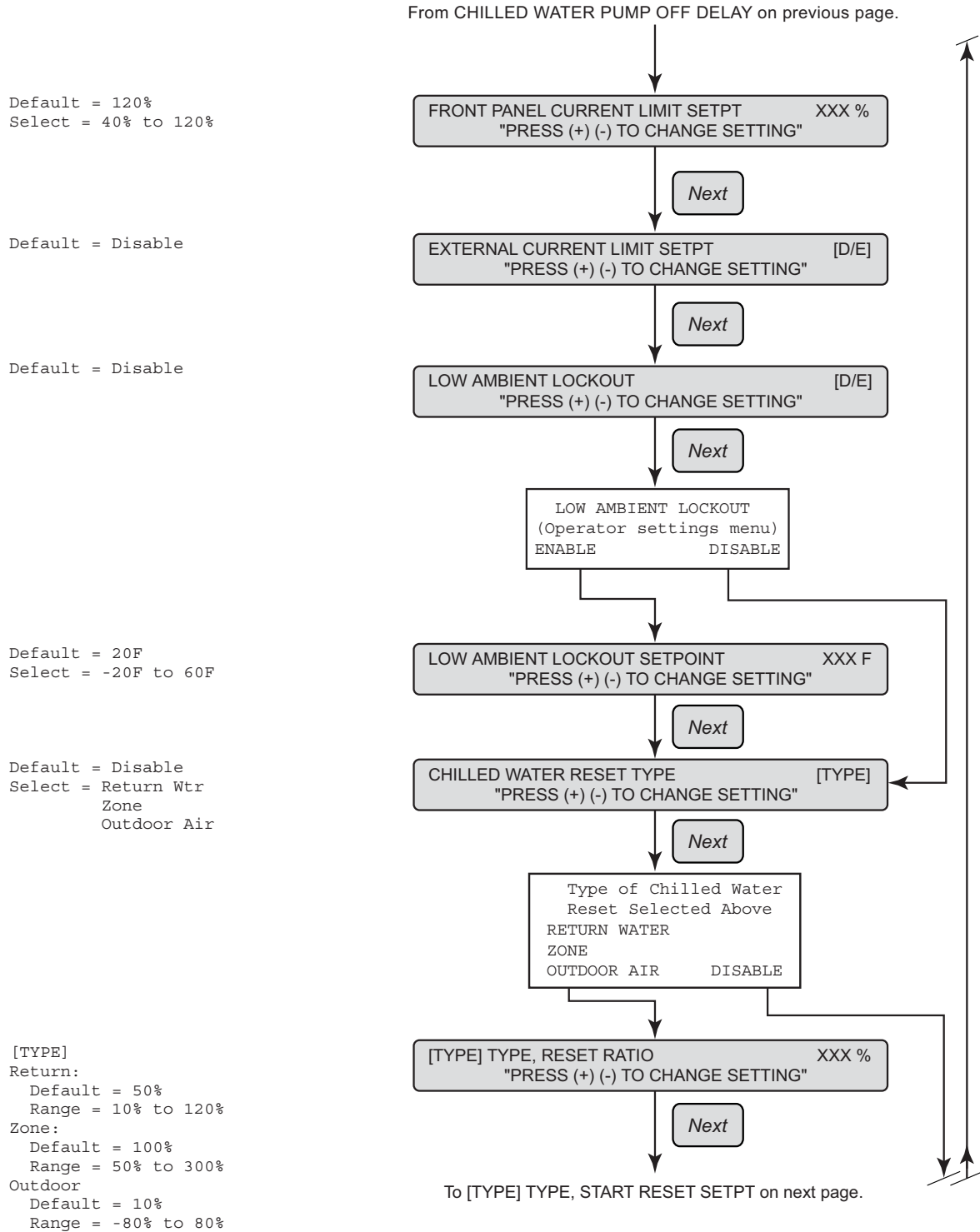
Controls Interface



Controls Interface



Controls Interface



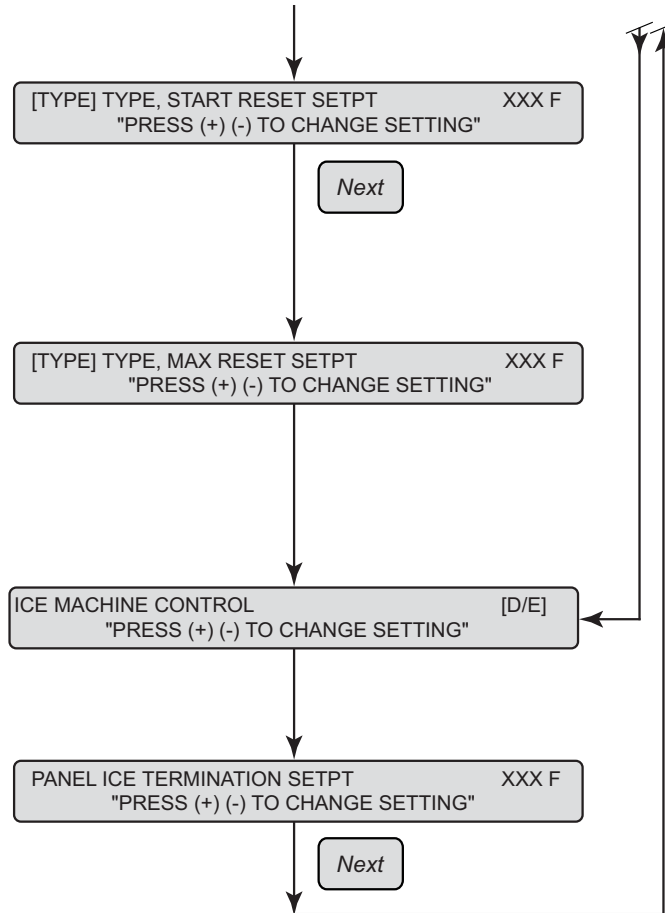
Controls Interface

[TYPE]
Return:
Default = 10F
Range = 4F to 30F
Zone:
Default = 78F
Range = 55F to 85F
Outdoor:
Default = 90F
Range = 50F to 130F

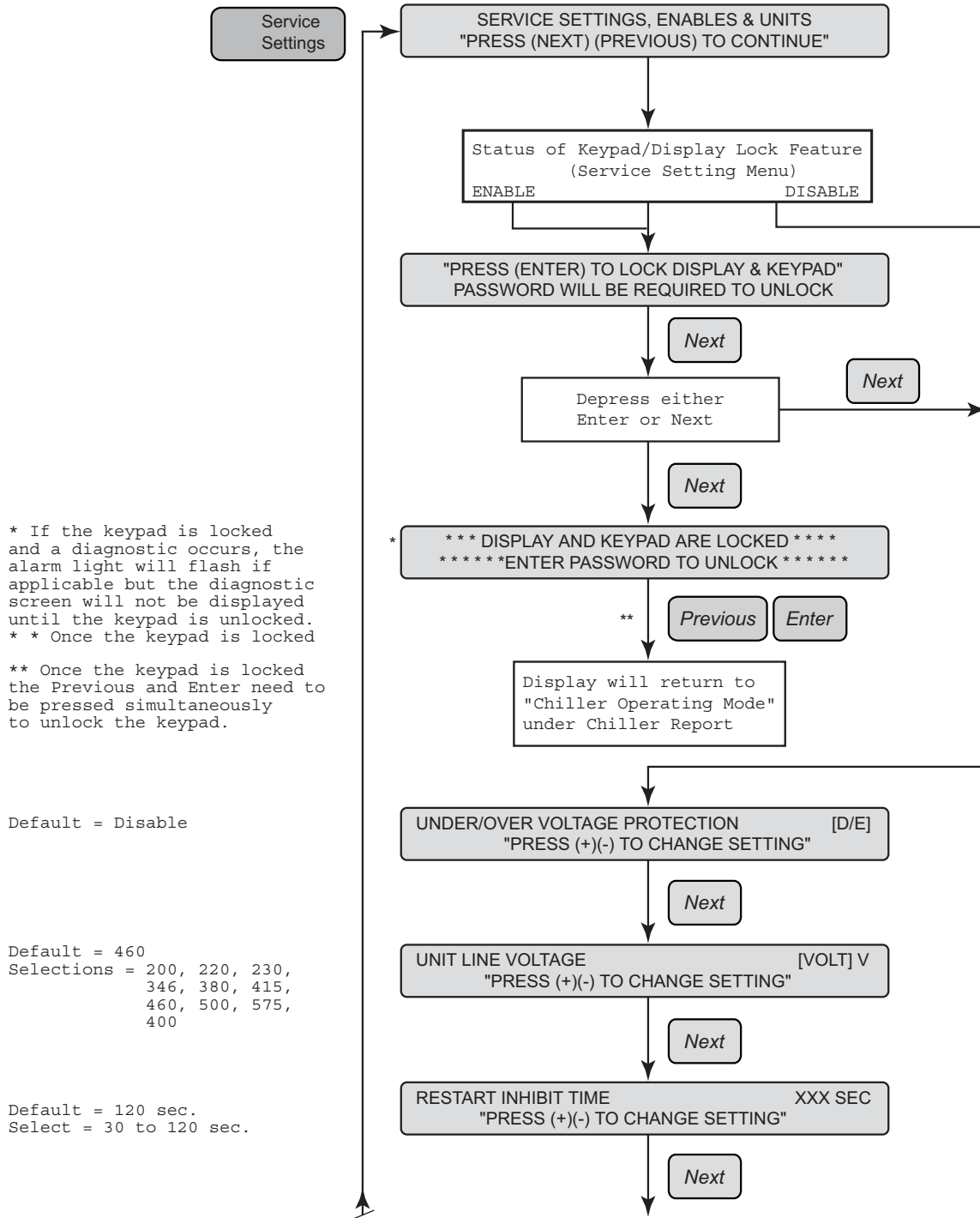
[TYPE]
Return:
Default = 5F
Range = 0F to 20F
Zone:
Default = 5F
Range = 0F to 20F
Outdoor:
Default = 5F
Range = 0F to 20F
Default = Disable

Default = 27F
Select = 20F to 31F

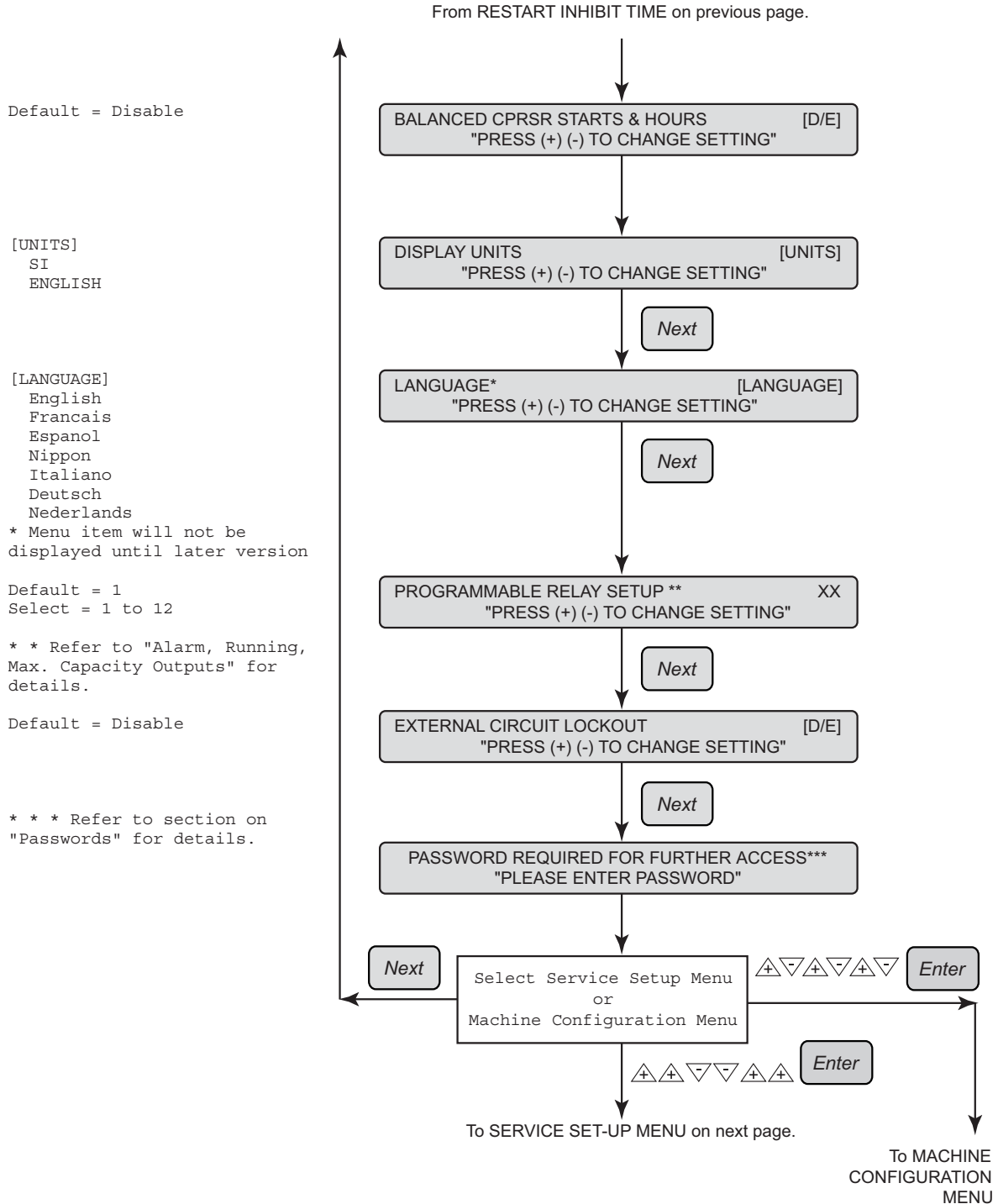
From [TYPE] TYPE, RESET RATIO on previous page.



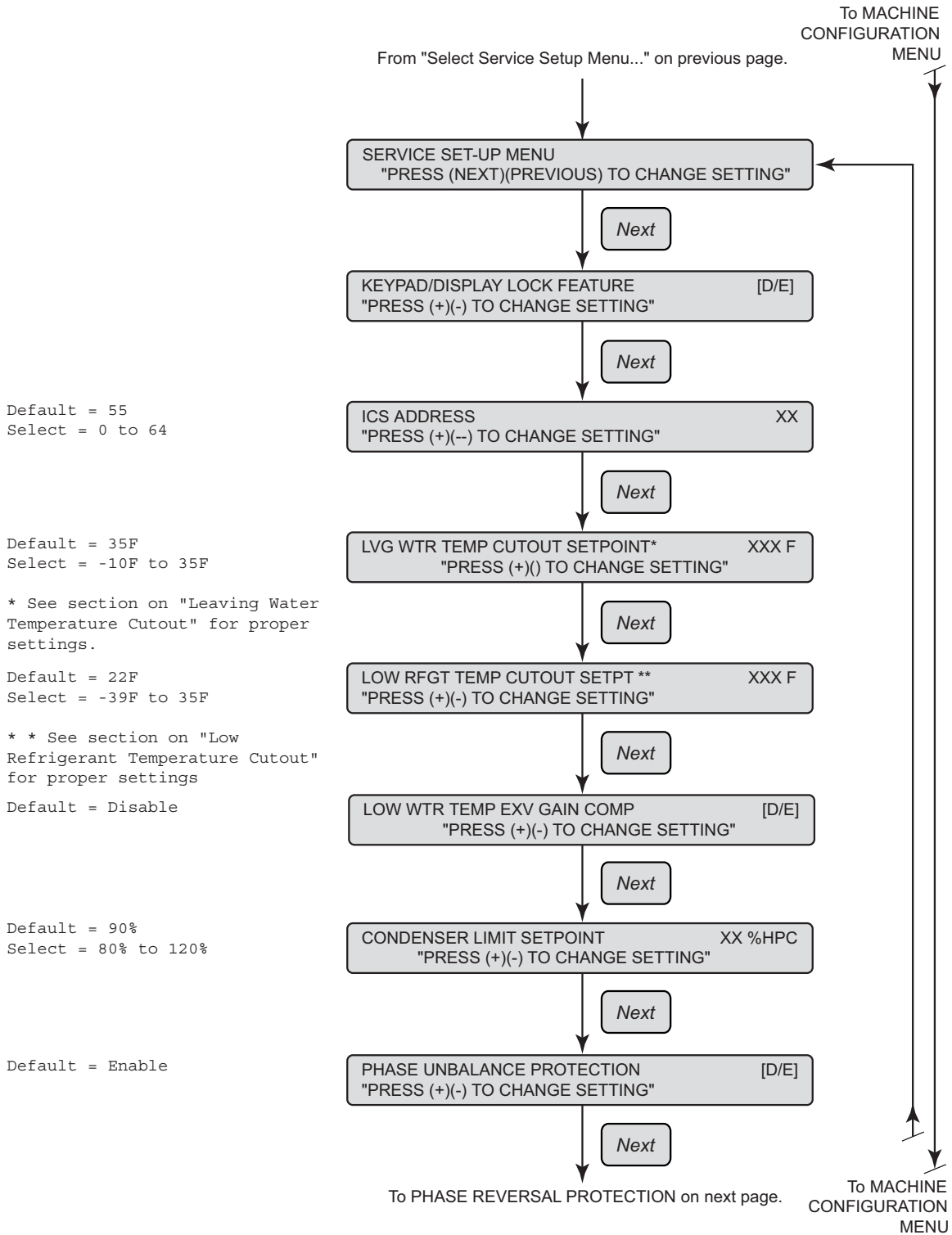
Controls Interface



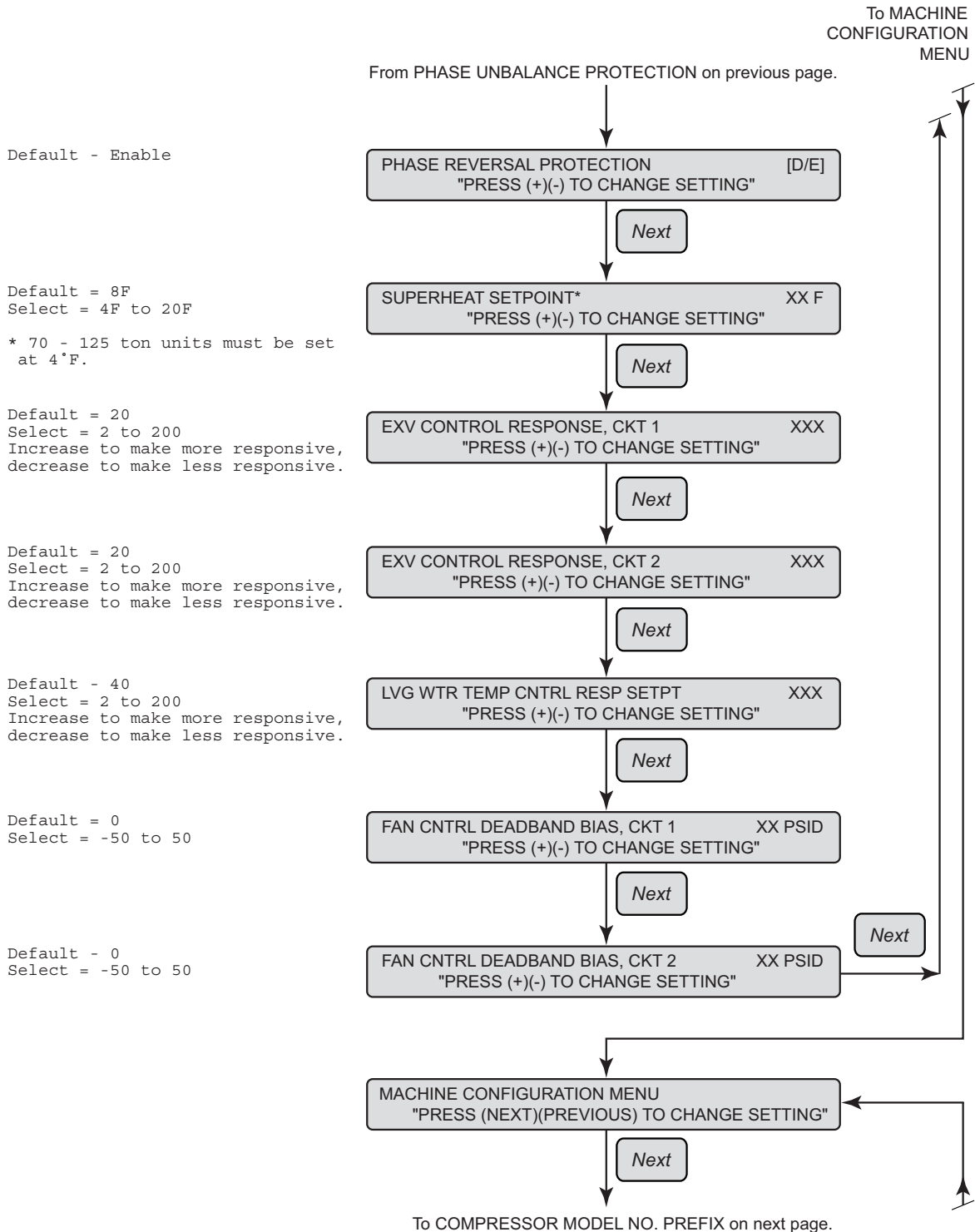
Controls Interface



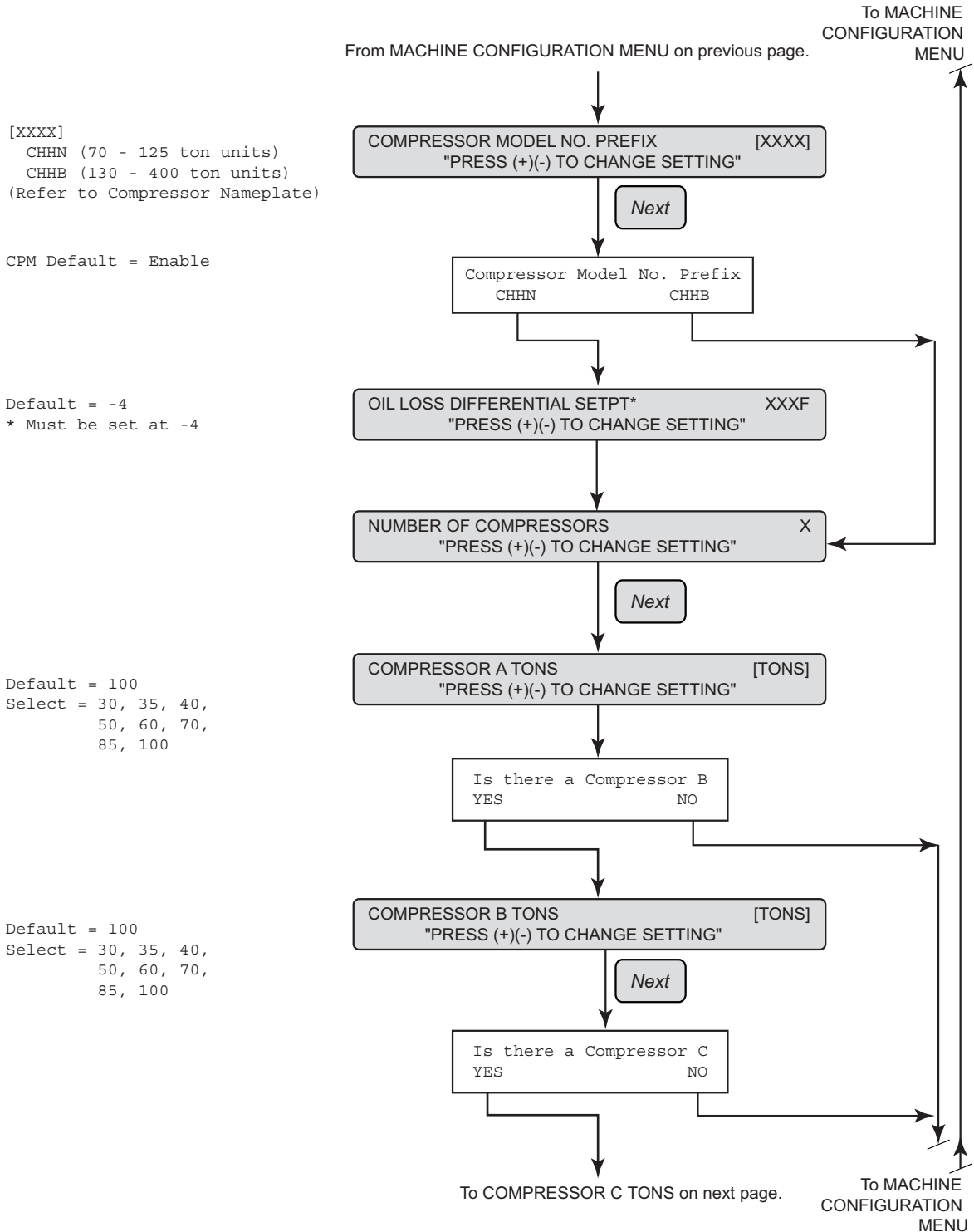
Controls Interface



Controls Interface



Controls Interface



Controls Interface

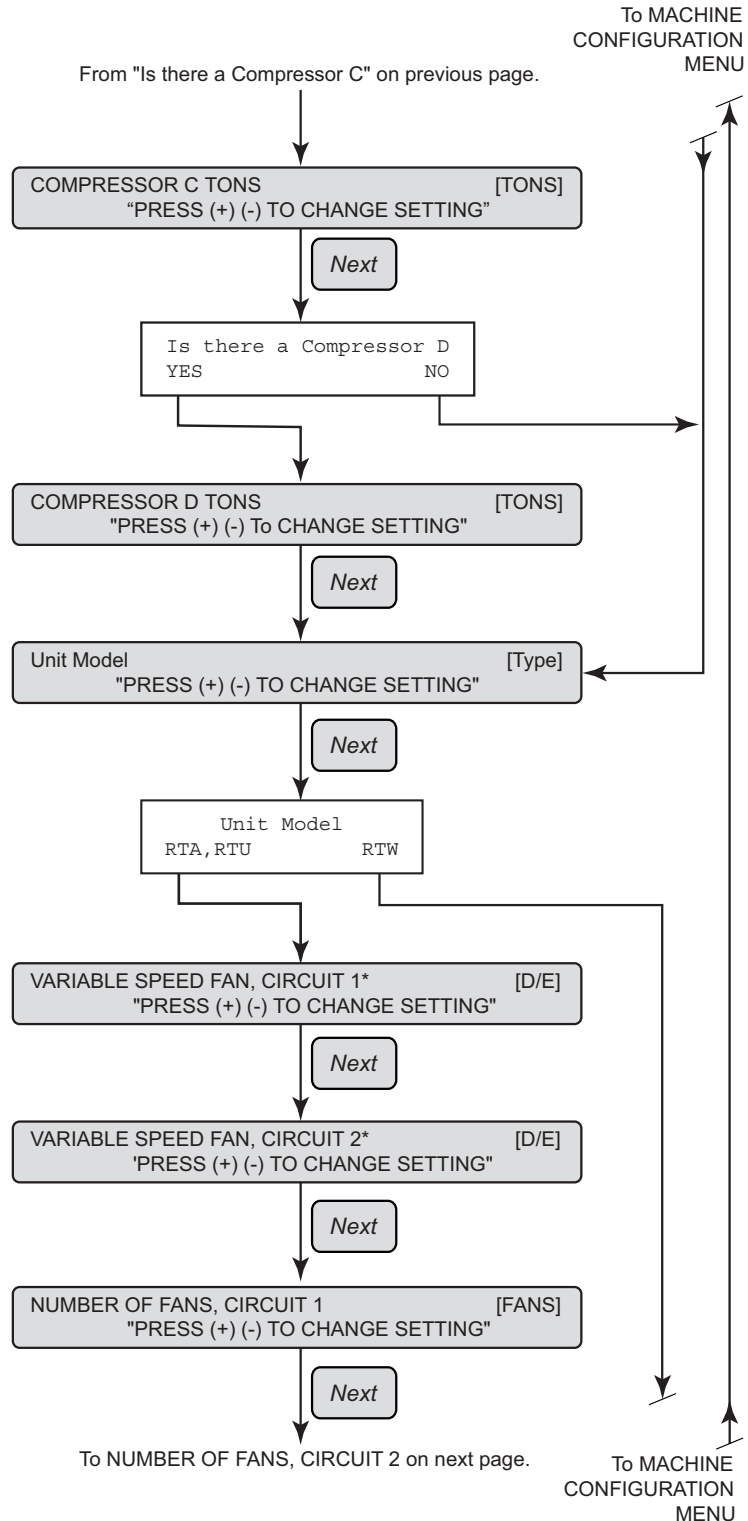
Default = 100
Select = 30, 35, 40,
50, 60, 70,
85, 100

Default = 100
Select = 30, 35, 40,
50, 60, 70,
85, 100

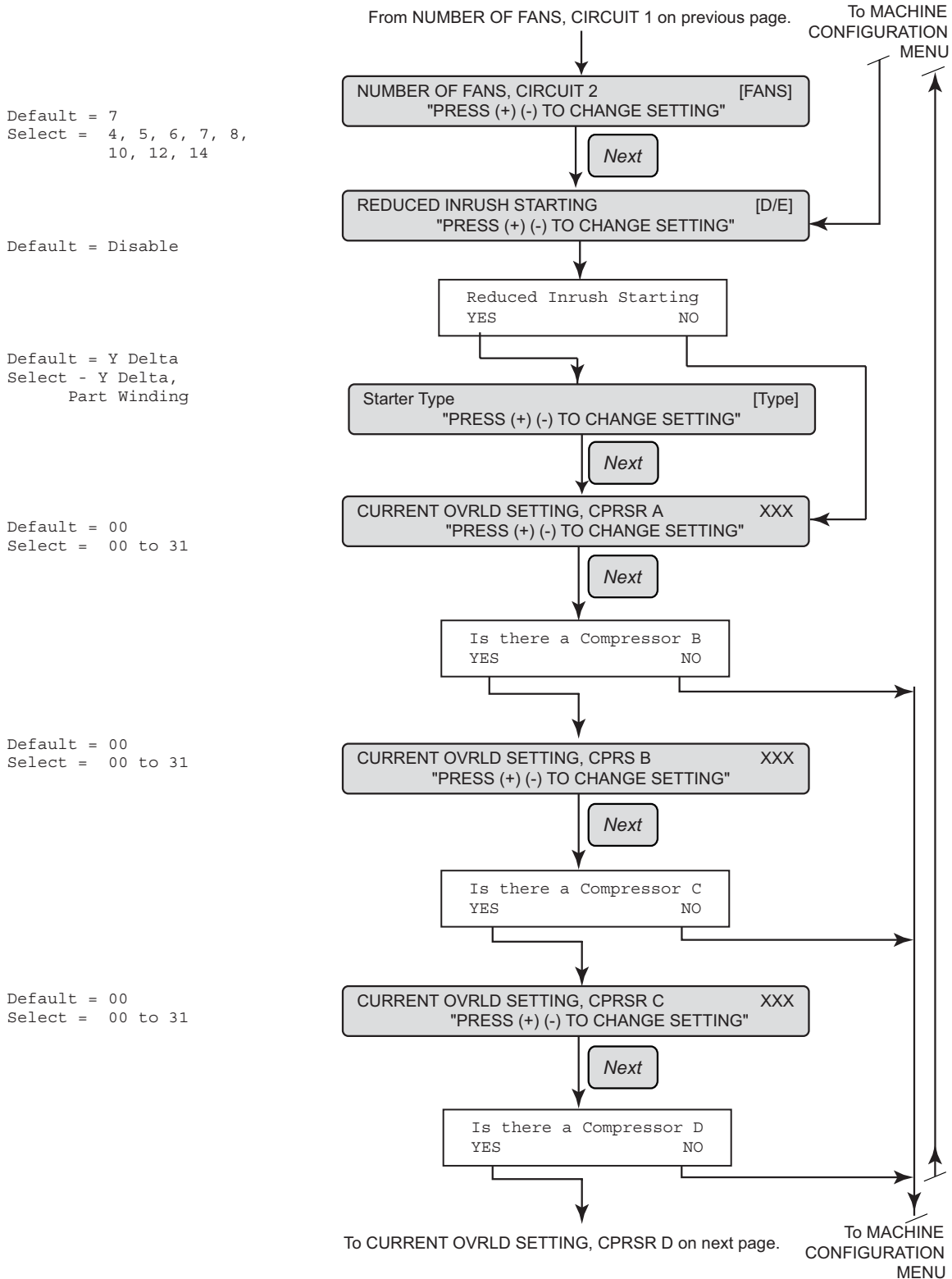
Default = RTA
Select = RTA, RTW, RTU

Default = Disable
* If Variable Speed Fan is set
to Enable for either Circuit 1
or Circuit 2, then 'Low Ambient
Unit, Half Air Flow Fan' and
'Low Ambient Unit, Two Speed
Motor' are forced to Disable.
Default = Disable

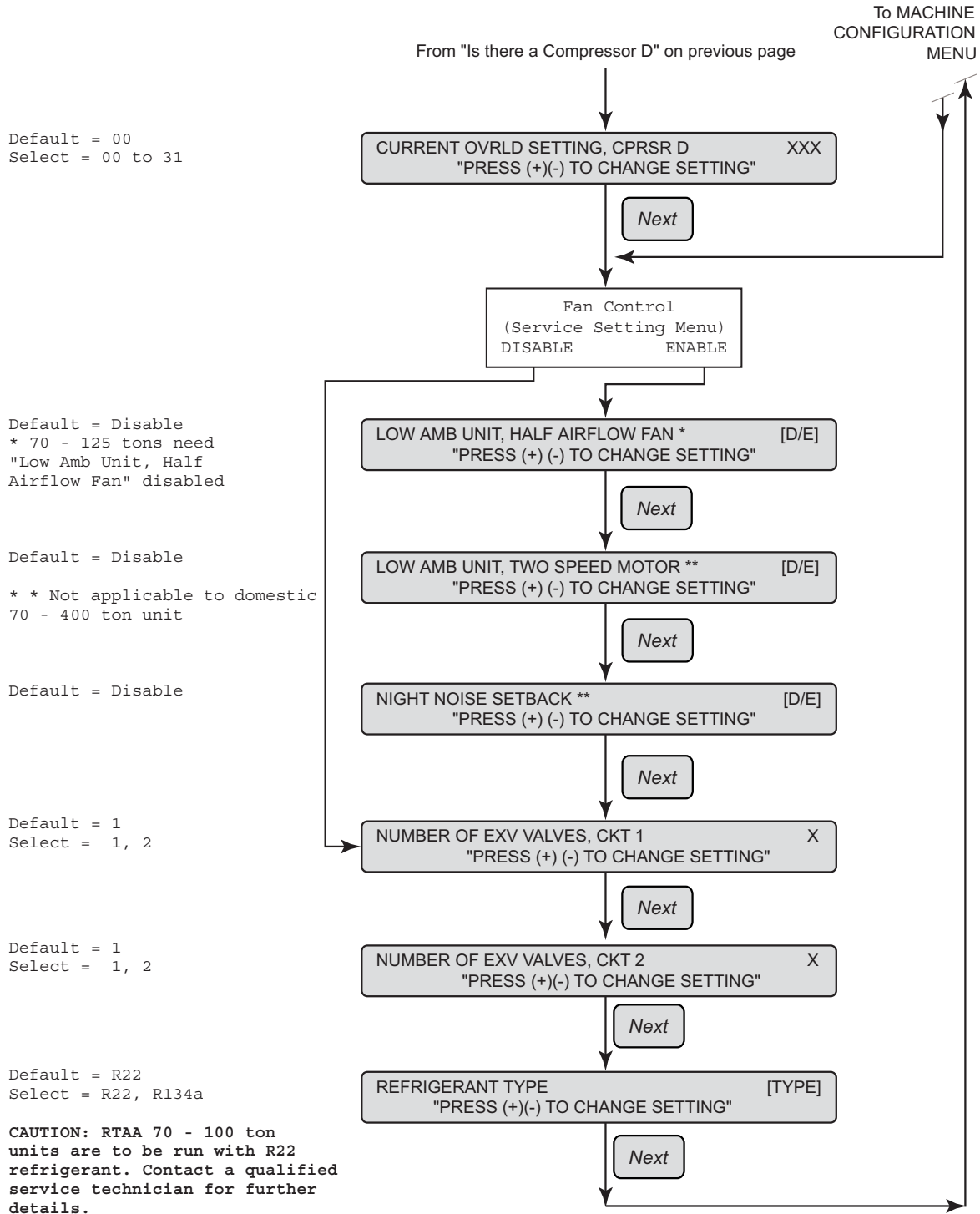
Default = 7
Select = 4, 5, 6, 7, 8,
10, 12, 14



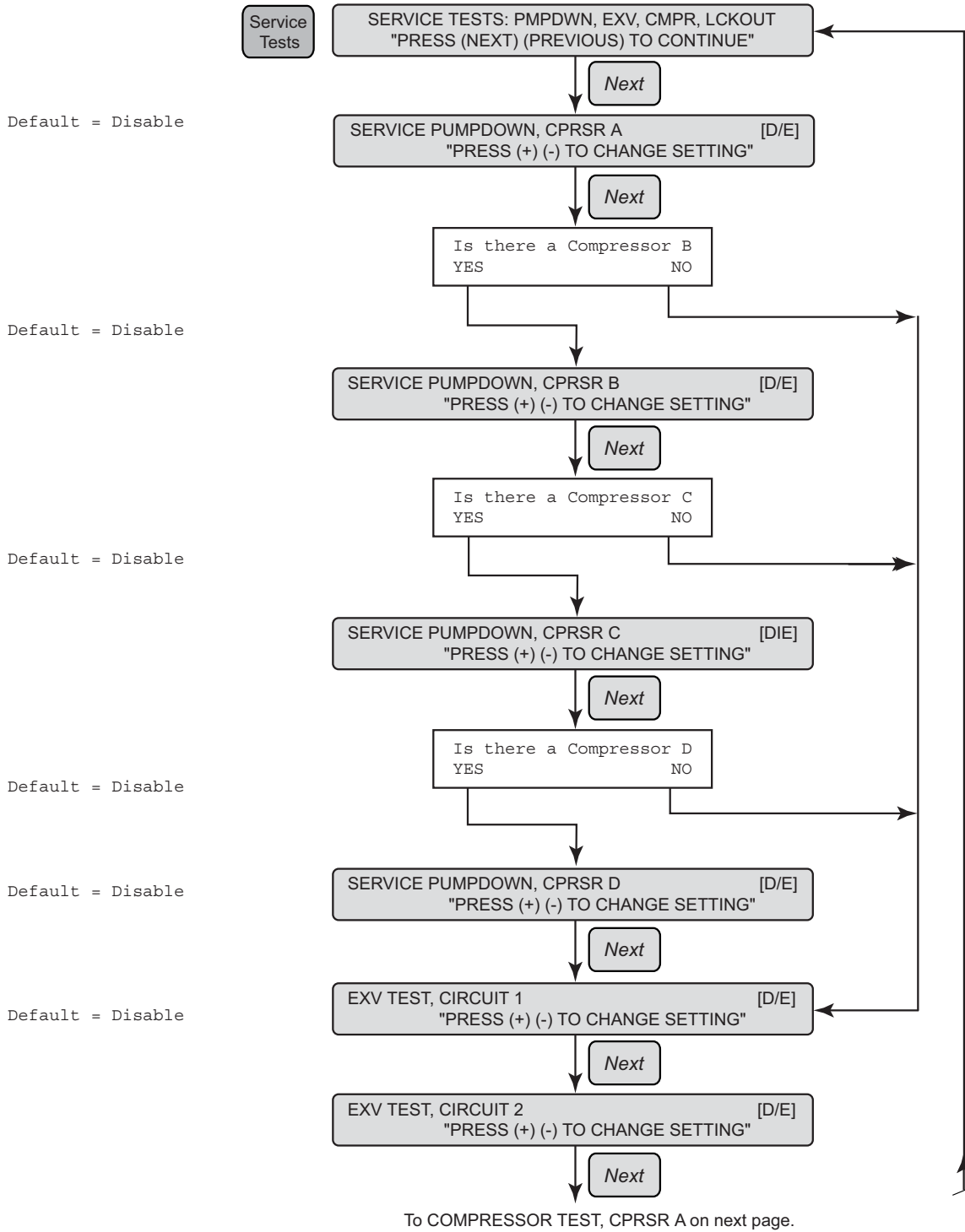
Controls Interface



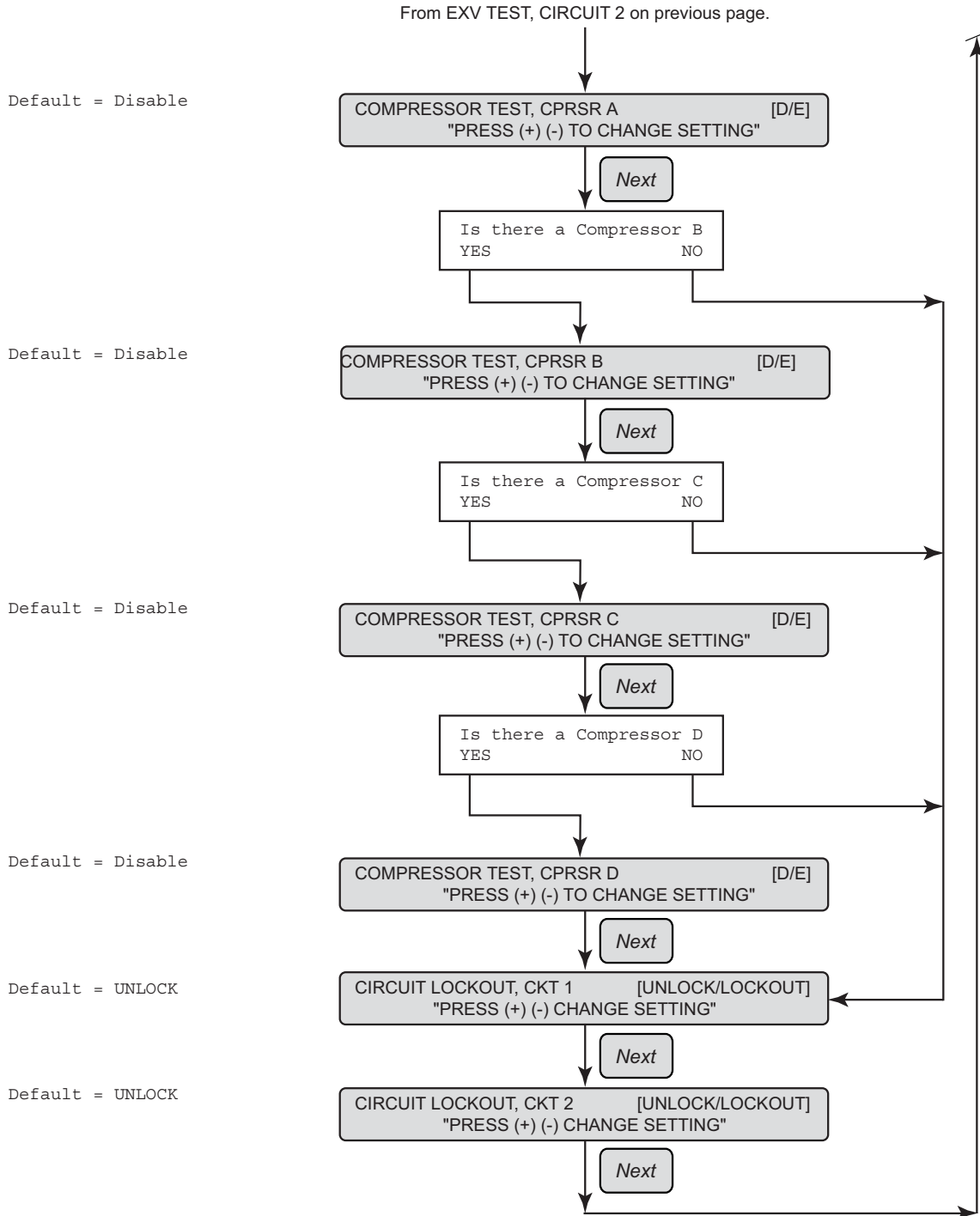
Controls Interface



Controls Interface



Controls Interface



Controls Interface

Diagnostics

If there are no diagnostic messages, the selected menu item will be displayed continuously. If the Diagnostics key is pressed and there are no active diagnostics, the readout on the display will be

NO ACTIVE DIAGNOSTICS PRESENT

When a system malfunction occurs, one of the following appropriate diagnostic messages will be displayed:

A MACHINE SHUTDOWN HAS OCCURRED!

A MACHINE SHUTDOWN OCCURRED
BUT HAS CLEARED "PRESS (NEXT)"

A CIRCUIT SHUTDOWN HAS OCCURRED!

A CIRCUIT SHUTDOWN OCCURRED
BUT HAS CLEARED "PRESS (NEXT)"

INFORMATIONAL WARNING

AN INFORMATIONAL WARNING OCCURRED.
BUT HAS CLEARED "PRESS (NEXT)"

When a Circuit Shutdown – Manual Reset (CMR) or a Machine Shutdown – Manual Reset (MMR) occurs, the red LED to the right of the display will flash. Otherwise this alarm LED is deenergized.

If more than one diagnostic is present, only the highest priority active diagnostic will be explained in detail. For example, if three diagnostics occur in the following order before the operator returns – IFW, MMR, CMR – the display will read

*** A MACHINE SHUTDOWN HAS OCCURRED! ***

because the MMR has the highest priority. However, as the operator moves through the diagnostic menu to the "Last Diagnostic," the [Diagnostic Description] will show the CMR diagnostic as well as the IFW. If the "Next" key is pressed, the display will show all other active and historic diagnostics.

The active diagnostic priorities, listed from highest to lowest are:

- Machine Shutdown –
Manual Reset (MMR)
- Machine Shutdown –
Automatic Reset (MAR)
- Circuit Shutdown –
Manual Rest (CMR)
- Circuit Shutdown –
Automatic Reset (CAR)
- Informational Warning (IFW)

Use the Next key to enter the main diagnostic menu, where diagnostics can be cleared.

Important: Record diagnostic before pressing enter to clear.



Controls Interface

Operational Features

Entering Evaporator Water Temperature

When one or both compressors are running, the UCM continually monitors and compares the entering and leaving evaporator water temperatures. If the temperature of the entering water drops more than 2 F below the leaving water temperature for more than 100 degree F seconds, the UCM uses this to indicate a loss of water flow through the evaporator. This will shut down that circuit's compressor and will display an MMR diagnostic.

Current Limit Setpoint

The current limit setpoint for the system (front panel or remote) are entered through the Clear Language Display menus. The current limit setpoint for each compressor is shown in Table 16.

Based upon current levels received at the UCM, the compressor slide valve is modulated to prevent the actual chiller current from exceeding the CLS.

When a compressor is turned off, the CLS for the remaining running compressor shall be reset upward immediately. When a compressor is added, the CLS for the running compressor shall be ramped downward at a rate not less than 10% RLA per minute to the new setpoint.

Low Ambient Lockout

The lockout provides a method for preventing unit start-up when the outdoor air temperature is below the setpoint. If the outdoor temperature goes below the setpoint during operation, the UCM will go through a normal shutdown of the unit. If the outdoor temperature subsequently increases to 5 F above the setpoint, the UCM will automatically re-enable the unit. The low ambient lockout feature has a range from -20 F to 60 F

Electronic Expansion Valve (EXV) Test

This test can be performed only when the Stop key has been pressed. It will confirm proper operation of the electronic expansion valve and the EXV module.

Once the test has been initiated at the Clear Language Display, the UCM will:

1. Overdrive the EXV closed (25 seconds).
2. Overdrive the EXV open (25 seconds).
3. Overdrive the EXV closed (25 seconds).
4. Reset the display to disable and end the test.

The EXV produces an audible clicking sound when it is driven against its end stops. Step 1 drives the EXV to its closed position, during which time service personnel can move from the Clear Language Display to the EXV.

NOTE: A tool may be needed to aid in hearing the clicking of the EXV, such as a screwdriver held between the EXV and the ear.

When Step 1 completes, the clicking stops and the UCM begins to open the EXV. When the EXV is fully opened, the valve will begin to click against its end stop. The service personnel must be prepared to time the period between the end of clicking in Step 1 and the beginning of clicking in Step 2.

The time between the end of clicking in Step 2 and the beginning of clicking in Step 3 must also be recorded. The time for the EXV to go from fully closed to fully open (which is the first time recorded) should be approximately 15 seconds. The time to go back to fully closed (which is the second time recorded) is approximately 15 seconds.

Controls Interface

Current Overload Protection

The UCM continually monitors compressor current to provide unit protection in the event of an overcurrent or locked rotor condition. Protection is based on the phase with the highest current and, if limits are exceeded, the UCM will shutdown the compressor and will display an MMR diagnostic.

Leaving Chilled Water Temperature Control

If the Auto key is pressed and a remote chilled water setpoint has been communicated, the UCM will control to the Remote Chiller Water Setpoint. Otherwise, it will control to the front panel setpoint. Control is accomplished by both staging compressors and modulating the slide valves on each compressor.

Upon start-up, if the leaving chilled water temperature is dropping 5 F per minute or faster, the chiller will not load further.

Chilled Water Reset (CWR)

As an option, the UCM will reset the chilled water temperature setpoint, based on either the return water temperature, zone air temperature, or outdoor air temperature. The 1U2 Module is necessary to preform CWR.

The following are selectable:

1. One of three RESET TYPEs, from top to bottom in order of reset:
no CWR
RETURN WATER TEMPERATURE RESET
OUTDOOR AIR TEMPERATURE RESET

The Clear Language Display will not permit more than one type of reset to be selected in the Operator Settings Menu.

2. RESET RATIO Setpoints. For OUTDOOR AIR TEMPERATURE RESET, there are both positive and negative reset ratios.
3. START RESET Setpoints
4. MAXIMUM RESET Setpoints. The maximum resets are with respect to the chilled water setpoint.

No matter which type of reset is selected all parameters are factory set to a predetermined set of values. Field adjustment of 2,3,or 4 above, is usually not required.

Table 16 Compressor(s) Current Limit Setpoints vs. Chiller Current Limit Setpoint (CLS)

System CLS	(70 - 125)	
	Number of compressors in operation	
	One	Two
120%	120	120
100%	120	100
80%	120	80
60%	120	60
40%	80	40

Controls Interface

The equations for each type of reset are:

RETURN WATER TEMPERATURE RESET

$$\begin{aligned} \text{CWS}' &= \text{CWS} + \text{RESET RATIO} \\ &[\text{START RESET} - (\text{TWE} - \text{TWL})] \\ \text{and CWS}' &> \text{or} = \text{CWS} \\ \text{and CWS}' - \text{CWS} &< \text{or} = \text{MAXIMUM RESET} \end{aligned}$$

OUTDOOR AIR TEMPERATURE RESET

$$\begin{aligned} \text{CWS}' &= \text{CWS} + \text{RESET RATIO} \\ &[\text{START RESET} - \text{TOD}] \\ \text{and CWS}' &> \text{or} = \text{CWS} \\ \text{and CWS}' - \text{CWS} &< \text{or} = \text{MAXIMUM RESET} \end{aligned}$$

CWS' is the new chilled water setpoint.

CWS is the active chilled water setpoint before any reset has occurred.

RESET RATIO is a user adjustable gain.

START RESET is a user adjustable reference.

TOD is the outdoor temperature.

TWE is the entering evaporator water temperature.

TWL is the leaving evaporator water temperature.

MAXIMUM RESET is a user adjustable limit, providing the maximum amount of reset.

NOTE: When any type of CWR is enabled, the UCM will step the CWS toward the desired CWS' (based on the above equations and setup parameters) at a rate of 1 F every 5 minutes. This applies when the chiller is both running and off. Normally the chiller will start at the Differential-to-Start value above a fully reset CWS or CWS'.

The values for RESET RATIO for each type of reset are:

Reset Type	Reset Ratio Range	Increment English Units	Increment SI Units	Factory Default Value
Return	10 to 120%	1%	1%	50%
Outdoor	80 to -80%	1%	1%	10%

The values for START RESET for each type of reset are:

Reset Type	Start Reset Range	Increment English Units	Increment SI Units	Factory Default Value
Return	4 TO 30 F (2.2 to 16.7 C)	1 F	0.1 C	10 F (5.6 C)
Outdoor	50 to 130 F (10 to 54.4 C)	1 F	0.1 C	90 F (32.2 C)

The values for MAXIMUM RESET for each type of reset are:

Reset Type	Maximum Reset Range	Increment English Units	Increment SI Units	Factory Default Value
Return	10 to 20 F (-17.8 to -6.7 C)	1 F	0.1 C	5 F (2.8 C)
Outdoor	0 to 20 F (-17.8 to -6.7 C)	1 F	0.1 C	5 F (2.8 C)

Controls Interface

Leaving Water Temperature Cutout

This temperature cutout provides protection against freezing caused by low leaving water temperature. The setpoint is both factory set and adjustable from the Service Settings Menu. Temperatures below the setpoint will cause the UCM to accelerate reduction of chiller capacity, even to the point of compressor shutdown. A non-latching diagnostic will be generated if the LWT is below the cutout for more than 30 degree F seconds. See Table 10 for proper settings.

There must be a minimum of 5 F between the cutout temperature and both the front panel and active chilled water setpoints. The Clear Language Display will not permit setting of either the front panel or active chilled water temperatures less than 5 F above this cutout temperature. The second line will state "Limited by Cutout Setpoint, (+) to change".

If the leaving water temperature cutout is set upward, the Clear Language Display will maintain the 5 F minimum and will automatically raise the settings on the front panel and active chilled water setpoints, if necessary.

If the front panel or Active Chilled Water Setpoints were adjusted, the display will show the following when the "Enter" key is pressed:

"FRONT PANEL CHILLED WATER SETPOINT
HAS BEEN INCREMENTED DUE TO CUTOUT
SETPOINT CHANGE"

If the leaving water temperature drops below the cutout setpoint while the compressors are de-energized, it will produce an IFW diagnostic. If the leaving water temperature drops below the cutout setpoint while the compressors are energized for 30 F seconds, the unit will shut down on an MAR diagnostic.

Low Refrigerant Temperature Cutout

Both circuits are protected from a saturated evaporator refrigerant temperature that goes below this setting. The cutout setpoint must be a minimum of 15 F lower than the front panel or active chilled water setpoints. See Table 17 for proper settings.

There must be a minimum of 15 F between the cutout temperature and both the front panel and active chilled water setpoints. The Clear Language Display will not permit setting of either the front panel or active chilled water temperatures less than 15 F above this cutout temperature and the display will flash the last valid temperature.

If the leaving water temperature cutout is set upward, the Clear Language Display will maintain the 15 F minimum and will automatically raise the settings on the front panel and active chilled water setpoints, if necessary.

If the front panel or Active Chilled Water Setpoints were adjusted, the display will show the following when the "Enter" key is pressed:

"FRONT PANEL CHILLED WATER SETPOINT
HAS BEEN INCREMENTED DUE TO CUTOUT
SETPOINT CHANGE"

If the saturated evaporator refrigerant temperature for a circuit drops below this setpoint for longer than 30 degree F seconds, the circuit will be shutdown and a CMR diagnostic will be displayed.

NOTE: Ice Termination will allow cutouts to be set anywhere, although when running, software follows 5 F and 15 F rules.

Controls Interface

Table 17 Leaving Fluid Temperature Setpoints

The leaving chilled water temperature is not the same as the ice termination setpoint. The ice termination setpoint is based on entering chilled water temperature. Therefore, the ice termination setpoint, minus temperature drop across the evaporator while in the ice making mode, equals the leaving chilled water temperature.

Leaving Chilled Water Temp - F	Leaving Water Temp Cutout - F	Low Refrig Temp Cutout - F	Recommended*** % Ethylene Glycol	Solution Freeze Point - F
40	35	22	0	32
39	34	20	3	
38	33	18	6	
37	32	17	8	
36	31	15	10	25
35	30	14	12	
34	29	12	14	
33	28	11	15	21
32	27	9	17	
31	26	7	19	
30	25	6	20	16
29	24	4	21	
28	23	2	23	
27	22	0	25	10
26	21	-1	26	
25	20	-3	28	
24	19	-5	29	
23	18	-6	30	4
22	17	-8	31	
21	16	-10	33	
20	15	-11	34	
19	14	-13	35	-3
18	13	-15	36	
17	12	-17	37	
16	11	-18	38	
15	10	-19	39	
14	9	-21	40	-11
13	8	-23	41	
12	7	-24	42	
11	6	-26	43	
10	5	-27	43	
9	4	-29	44	
8	3	-31	45	-21
7	2	-32	46	
6	1	-34	47	
5	0	-35	47	
4	-1	-37	48	
3	-2	-38	49	
2	-3	-39	50	-32
1	-4	-39	50	
0	-5	-39	50	

***Recommended% Ethylene Glycol will give freeze protection consistent with other chiller safety controls (solution freeze point is nominally 10°F above refrig temp cutout).

Low Ambient Temperature Start

The Low Refrigerant Temperature Cutout (LRTC) and Low Pressure Cutout (LPC) on a circuit is ignored, briefly, each time the circuit is started. The "ignore time" is a function of the Saturated Condenser Refrigerant Temperature at the time the compressor starts, as shown in Figure 36.

Controls Interface

Low Refrigerant Temperature Cutout and Low Pressure Cutout Retry

If the LRTC or LPC trips despite the low ambient temperature start logic, the circuit will be permitted to shutdown and retry one time.

If the LRTC or LPC trips within the first 20 minutes after initial start but after the low ambient ignore time (grace period), the compressor stops immediately and the Restart Inhibit timer is set to one minute. After time expires, the compressor will reset if there is a call for cooling.

If the LRTC or LPC trips again during the grace period, a CMR diagnostic will occur. If there is an LRTC or LPC trip anytime after the grace period, a CMR diagnostic will occur.

Balanced Compressor Starts and Hours

This feature is enabled/disabled in Balanced Starts and Hours (Service Settings Menu). When enabled, the UCM will start the compressor with the fewest starts and stop the compressor with the greatest hours, as determined by the "Compressor Starts" accumulator and the "Compressor Hours" accumulator. This will tend to balance out hours and starts equally over both compressors.

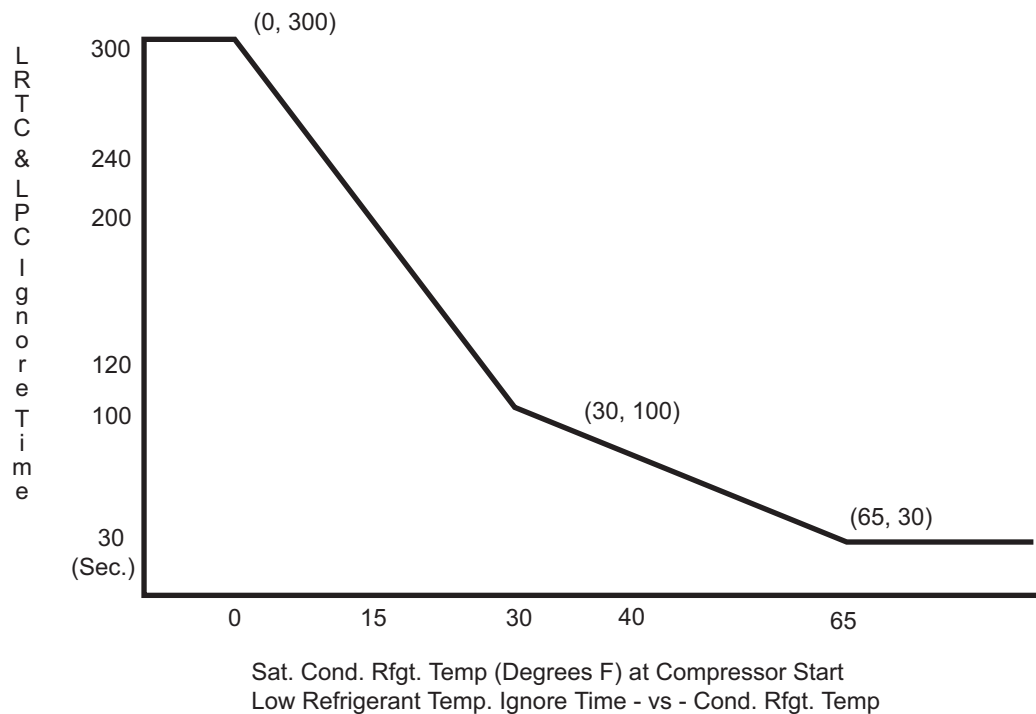


Figure 36 Low Refrigerant Temperature and Low Pressure Cutout Ignore Time

Phase Imbalance Protection

The Clear Language Display monitors the current in each phase and calculates the percentage of imbalance as follows:

$$\% \text{ Imbalance} = \frac{(I_x - I_{ave}) \times 100}{I_{ave}}$$

Controls Interface

$$I_{ave} = \frac{(I_1 + I_2 + I_3)}{3}$$

I_x = phase with greatest difference from I_{ave} (without regard to sign)

If Phase Unbalanced Protection (Service Settings Menu) is enabled, and the average three phase current is greater than 80% RLA, and the percent of imbalance is calculated to exceed 15%, the UCM will shutdown the compressor and display a CMR diagnostic.

In addition to the 15% criteria, the Clear Language Display has a non-defeatable 30% criteria which has its own diagnostic. If the 15% criteria is enabled, it will always display the 15% diagnostic first. The 30% criteria is always active when a compressor is running, regardless of % RLA.

Reverse Rotation Protection

The Clear Language Display monitors incoming current during start-up and will shutdown the compressor within one second, if phase reversal is detected.

CAUTION

Reversed Phase Rotation!

Phase relationships during installation of unit power must be carefully controlled to assure compressor protection against reversed phase rotation.

Oil Failure Protection

The 70 to 125 Ton units do not use the differential pressure switch to monitor for an oil line restriction. The logic of the UCM uses a comparison of the entering oil temperature at the compressor to the saturated condenser temperature to determine if there is an oil line restriction.

The differential between the entering oil temperature and the saturated condenser temperature is referred to as the "Oil Loss Differential Setpoint" in the Service Settings Menu. This setpoint must remain at the default of -4 F for the unit to function properly.

If the entering oil temperature drops 4 F below the saturated condenser temperature for more than 30 minutes, the circuit will shutdown on a CMR diagnostic. The diagnostic will be presented as:

"OIL SYSTEM FAULT - CKT X"

DIP Switch Settings

Compressor Overload DIP Switches

The settings for these switches are shown in Table 18.

IPC Address

The IPC address set the address for Inter-Processor Communications of the Clear Language Display modules. The following is the IPC DIP switch settings for the RTAA 70 – 125 modules.

IPC DIP SWITCH	MODULE			
	1U3	1U4	1U5	1U7
1	OFF	OFF	OFF	OFF
2	OFF	OFF	ON	OFF
3	—	—	—	ON

Controls Interface

Table 18 Compressor Overload DIP Switch Settings

Compressor Tons	Volts/Hz	RLA	Primary Turns Through Current Transformer	Current Transformer Extension*	Overload Setting Dip Sw/Decimal12345**
35	200/60	115	1	-02	01011/11
	230/60	100	1	-01	11111/31
	346/50	58	1	-10	01100/12
	380/60	61	1	-10	10000/16
	400/50	50	1	-10	00000/0
	460/60	50	1	-10	00000/0
	575/60	40	1	-09	01111/15
40	200/60	142	1	-02	11011/27
	230/60	124	1	-02	10001/17
	346/50	72	1	-01	00111/7
	380/60	75	1	-01	01010/10
	400/50	62	1	-10	10001/17
	460/60	62	1	-10	10001/17
	575/60	50	1	-10	00001/1
50	200/60	192	1	-03	11100/28
	230/60	167	1	-03	10010/18
	346/50	96	1	-01	11100/28
	380/60	101	1	-02	00001/1
	400/50	84	1	-01	10011/19
	460/60	84	1	-01	10011/19
	575/60	67	1	-10	10111/23
60	200/60	233	1	-04	10011/19
	230/60	203	1	-04	01000/8
	346/50	117	1	-02	01101/13
	380/60	123	1	-02	10001/17
	400/50	101	1	-02	00001/16
	460/60	101	1	-02	00001/1
	575/60	81	1	-01	10000/16

*The Current Transformer base part number is X1358025. The numbers in this column are suffixes to the base number.

**On the DIP switch, 1=ON, 0=OFF The decimal value should be set in the compressor overload setting menu of the UCM. If the DIP switch value does not match the decimal value entered into the UCM, the related compressor(s) will continue to run, but a diagnostic will be initiated, both settings will be ignored, and the UCM will use the lowest possible trip setting value.

2-10 VDC/4-20 mA Input for External Chilled Water Setpoint (CWS) and Current Limit Setpoint (CLS)

When either external CWS or external CLS is used on the optional Module 1U2, DIP switch SW1 positions 1 and/or 2 must be set to accommodate the type of signal source the customer has chosen, either 2-10 VDC or 4-20 mA. Position SW-1-1 sets 2-10 VDC/4-20 mA for external CWS. SW1-2 sets 2-10 VDC/4-20 mA for external CLS. The "OFF" setting configures the external input for 2-10 VDC; the "ON" setting configures the external input for 4-20 mA.



Controls Interface

Mechanical Control Settings

The settings for the High Pressure switch, Oil Pressure switch, and Winding Thermostat are shown below:

	CLOSE	OPEN
Compressor Discharge High Pressure Switch – PSIG	300 $\pm$ 20	405 $\pm$ 7
Compressor Motor Winding Thermostat – F	181	221
Low Pressure Cutout	22 $\pm$ 4	7 $\pm$ 4

Remote CLD Operation

With only few exceptions, operation of the Remote CLD is identical to the unit's CLD. To ease the operation of the Remote CLD, additional displays have been added. For example, if multiple unit operation is used, the following display will be inserted as the second display of the setpoint group:

Modify Setpoints for Units X
"Press (+) (-) to change settings"

The Stop and Auto keys function in the same manner, but the following hierarchy between the unit's Stop/Auto keys and the Remote CLD Stop/Auto keys is as follows:

1. Local Stop will always override Local Auto, Remote Stop and Remote Auto.
2. Local Auto will always override Local Stop, Remote Stop and Remote Auto.
3. Remote Stop will override Local Auto and Remote Auto but not Local Stop.
4. Remote Auto will override Local Auto and Remote Stop but not Local Stop.

If an operator tries to start the unit from the Remote CLD after the Stop command has been given at the unit CLD, the screen on the Remote CLD will read:

"LOCAL STOP command at unit cannot be
overridden by this remote device"

Communication Failure

If a communication failure occurs between the Remote CLD and the unit's CLD, the setpoints will remain the same but a diagnostic will occur at the Remote CLD panel. The Remote display screen will read:

"No communication to Unit X"
Press (enter) to select new unit

Pre-Start Checkout

When installation is complete, but prior to putting the unit into service, the following pre-start procedures must be reviewed and verified correct:

⚠ WARNING

Hazardous Voltage w/Capacitors!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Note: For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN or PROD-SVB06A-FR

- Inspect all wiring connections to be sure they are clean and tight.
- Verify that all refrigerant valves, as shown in [Figure 32](#), are "OPEN".

CAUTION

Compressor Damage!

Do not operate the unit with the compressor, oil, suction and liquid line service valves "CLOSED". Failure to have these "OPEN" may cause serious compressor damage.

- Check the power supply voltage to the unit at the main power fused-disconnect switch. Voltage must be within the voltage utilization range, given in [Table 10](#) and also stamped on the unit nameplate. Voltage imbalance must not exceed 2 percent. Refer to "Unit Voltage Imbalance".
- Check the unit power phasing to be sure that it has been installed in an "ABC" sequence. Refer to "Unit Voltage Phasing".

CAUTION

Equipment Damage!

It is imperative that L1-L2-L3 in the starter be connected in the A-B-C phase sequence to prevent equipment damage due to reverse rotation.

- Check the condenser fans to be sure that they rotate freely in the fan openings and that each is securely attached to its fan motor shaft.
- Energize the compressor sump heaters by closing the unit main disconnects. If unit-mounted disconnects are used, they must also be closed. If



Pre-Start Checkout

the unit does not have the optional control power transformer, 115 VAC power must be field supplied to terminals 1TB3-1 AND 1TB3-2. Press the Stop key on the Clear Language Display.

CAUTION Compressor Damage!

The compressor sump heaters must be energized for a minimum of 24 hours prior to unit operation, to prevent compressor damage caused by liquid refrigerant in the compressor at start-up.

- Energize the evaporator heat tape.
- Fill the evaporator chilled water circuit. Refer to Table 1 for evaporator liquid capacities. Vent the system while it is being filled. Open the vent on the top of the evaporator during filling and close when filling is completed.

CAUTION Proper Water Treatment!

The use of untreated or improperly treated water in a RTAA 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. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

CAUTION Equipment Damage!

Do not fill the water system unless the evaporator heat tapes have been energized.

- Close the fused-disconnect switch(es) that supplies power to the chilled water pump starter.
- Start the chilled water pump to begin circulation of the chilled water. Inspect all piping for leakage and make any necessary repairs.
- With chilled water circulating through the system, adjust water flow and check water pressure drop through the evaporator. Refer to [Figure 16](#).
- Adjust the chilled water flow switch (if installed) for proper operation.
- Prove Chilled Water Flow Interlock and External Auto/Stop as described in Interlock Wiring.
- Check and set, as required, all Clear Language Display Menu Items.
- Stop the chilled water pump.

Pre-Start Checkout

Unit Voltage Power Supply

⚠ WARNING

Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Voltage to the unit must meet the criteria given in [Table 10](#). Measure each leg of the supply voltage at the unit main power fused-disconnect. If the measured voltage on any leg is not within specified range, notify the supplier of the power and correct the situation before operating the unit.

CAUTION

Equipment Damage!

Inadequate voltage to the unit may cause control components to malfunction and shorten the life of relay contact, compressor motors and contactors.

Unit Voltage Imbalance

Excessive voltage imbalance between the phases of a three-phase system can cause motors to overheat and eventually fail. The maximum allowable imbalance is 2 percent. Voltage imbalance is determined using the following calculations:

$$\% \text{ Imbalance} = \frac{(V_x - V_{ave}) \times 100}{V_{ave}}$$

$$V_{ave} = \frac{(V_1 + V_2 + V_3)}{3}$$

V_x = phase with greatest difference from V_{ave} (without regard to sign)

For example, if the three measured voltages are 221, 230, and 227 volts, the average would be:

$$\frac{221 + 230 + 227}{3} = 226$$

The percentage of imbalance is then:

$$\frac{100(221 - 226)}{226} = 2.2\%$$

This exceeds the maximum allowable (2%) by 0.2%.



Pre-Start Checkout

Unit Voltage Phasing

It is important that proper rotation of the compressors be established before the unit 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.

Basically, voltages generated in each phase of a polyphase alternator or circuit are called phase voltages. In a three phase circuit, three sine wave voltages are generated, differing in phase by 120 electrical degrees. The order in which the three voltages of a three-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", when counterclockwise, "CBA".

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.

Proper compressor motor electrical phasing can be quickly determined and corrected before starting the unit. Use a quality instrument, such as the Associated Research Model 45 Phase Sequence Indicator, and follow this procedure.

1. Press the Stop key on the Clear Language Display.
2. Open the electrical disconnect or circuit protection switch that provides line power to the line power terminal block(s) in the starter panel (or to the unit-mounted disconnect).
3. Connect the phase sequence indicator leads to the line power terminal block, as follows:

<u>Phase Sea. Lead</u>	<u>Terminal</u>
Black (Phase A)	L1
Red (Phase B)	L2
Yellow (Phase C)	L3
4. Turn power on by closing the unit supply power fused disconnect switch.
5. Read the phase sequence on the indicator. The "ABC" LED on the face of the phase indicator will glow if phase is "ABC".

⚠ WARNING

Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

6. If the "CBA" indicator glows instead, open the unit main power disconnect and switch two line leads on the line power terminal block(s) (or the unit mounted disconnect). Reclose the main power disconnect and recheck the phasing.

Pre-Start Checkout

CAUTION

Compressor Damage!

Do not interchange any load leads that are from the unit contactors or the motor terminals.

7. Reopen the unit disconnect and disconnect the phase indicator.

Water System Flow Rates

Establish a balanced chilled water flow through the evaporator. The flow rates should fall between the minimum and maximum values given in [Table 1](#). Chilled water flow rates below the minimum values will result in laminar flow, which reduces heat transfer and causes either loss of EXV control or repeated nuisance diagnostics. Flow rates that are too high can cause tube erosion and damage to the tube supports and baffles in the evaporator.

CAUTION

Evaporator Freezing Damage!

Once the evaporator is filled with water, the evaporator heat tape must be energized to protect the evaporator from freezing and bursting if the outdoor air temperature drops below freezing.

Water System Pressure Drop

Measure chilled water pressure drop through the evaporator at the field-installed pressure taps on the system water piping. See [Figure 15](#). Use the same gauge for each measurement. Do not include valves, strainers fittings in the pressure drop readings.

Pressure drop readings should be approximately those shown in the Pressure Drop Charts, [Figure 16](#).

Clear Language Display Set-up

Refer to "Clear Language Display Keypad Overview" for instruction on adjustment of the settings.



Start-Up Procedures

If the pre-start checkout, as discussed above, has been completed, the unit is ready to start. The Clear Language Display is shown in [Figure 35](#) and Clear Language Display Sequence of Operation is shown in [Figure 1](#). Complete each step, in sequence, as follows:

- Press the Stop key on the Clear Language Display.
- As necessary, adjust the setpoint values in the Clear Language Display menus, as describe in "Clear Language Display Key Pad Overview".
- Close the fused-disconnect switch for the chilled water pump. Energize the pump to start chilled water circulation.
- Check the service valves on the discharge line, suction line, oil line and liquid line for each circuit. These valves must be open (backseated) before starting the compressors.

CAUTION

Compressor Damage!

To prevent compressor damage, do not operate the unit until all refrigerant and oil line service valves are opened.

- Energize the compressor sump heaters, if not already energized. Also close the unit-mounted disconnect, if used.

CAUTION

Compressor Damage!

The compressor sump heaters must be energized for a minimum of 24 hours prior to unit operation, to prevent compressor damage caused by liquid refrigerant in the compressor at start-up.

- Verify that the evaporator heat tape is energized.
- Verify that the chilled water pump runs for one minute after the chiller is commanded to stop (for normal chilled water systems). See Interlock Wiring.
- Press the Auto key. If the chiller control calls for cooling and all safety interlocks are closed, the unit will start. The compressor(s) will load and unload in response to the temperature of the leaving chilled water temperature.

If optional low-ambient lockout is used, outside air temperature must be above the minimum starting ambients, as shown in [Table 1](#), for continued unit operation. Also refer to the wiring diagrams.

Once the system has been operating for approximately 30 minutes and has become stabilized, complete the start-up procedures, as follows:

- Check the evaporator refrigerant pressure and the condenser refrigerant pressure under Refrigerant Report on the Clear Language Display. The pressures are referenced to sea level (14.6960 psia).
- Check the liquid line sight glasses. The refrigerant flow past the sight glasses should be clear. Bubbles in the refrigerant indicate either low

Start-Up Procedures

refrigerant charge or excessive pressure drop in the liquid line. A restriction in the line can sometimes be identified by a noticeable temperature differential between the two sides of the restriction. Frost may form on the line at this point. Proper refrigerant charges are shown in [Table 1](#).

CAUTION **Equipment Check!**

A clear sight glass alone does not mean that the system is properly charged. Also check system superheat, subcooling, and unit operating pressures.

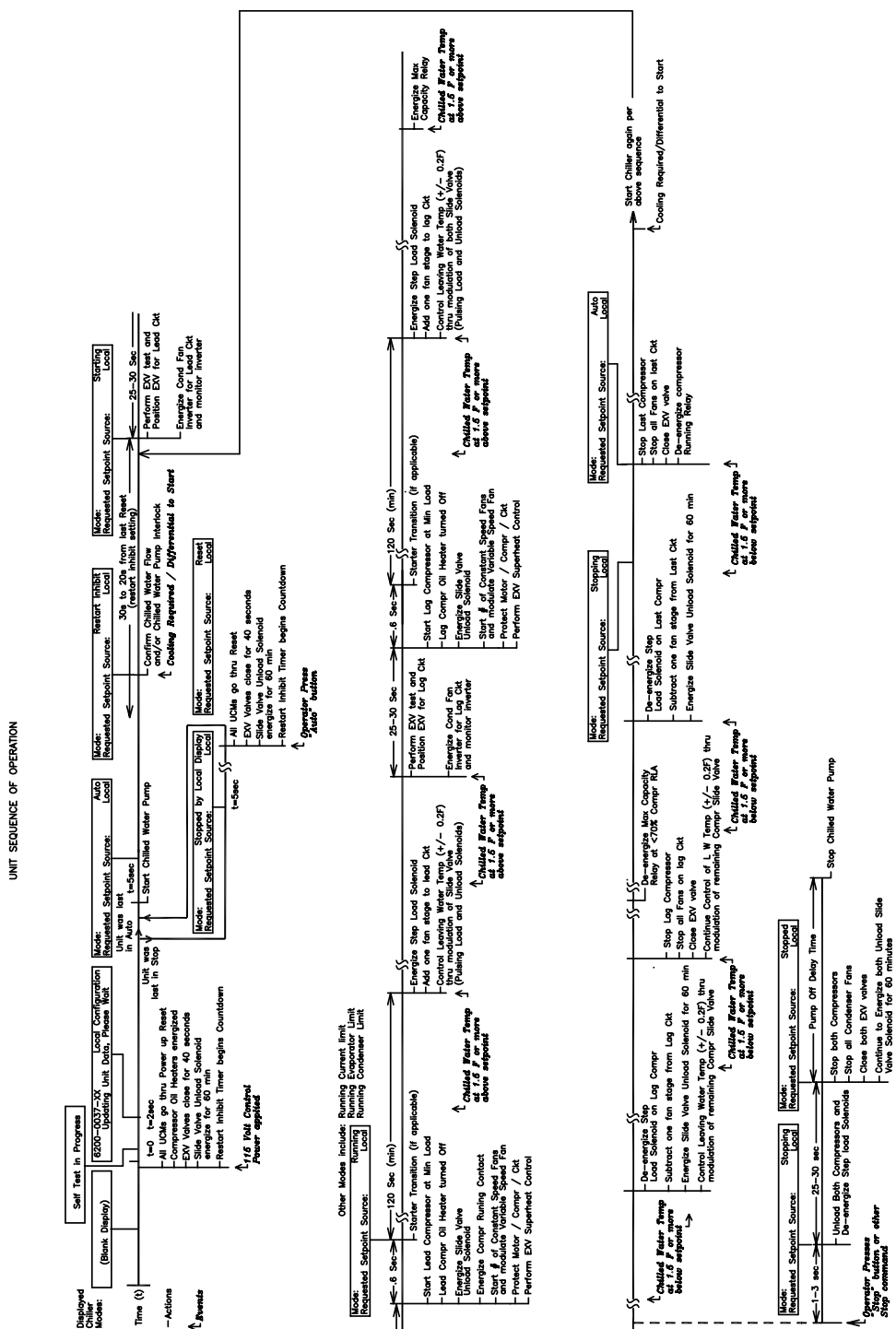


Figure 37 Unit Sequence of Operation

Start-Up Procedures

- A shortage of refrigerant is indicated if operating pressures are low and subcooling is also low. If the operating pressures, sight glass, superheat and subcooling readings indicate a refrigerant shortage, gas-charge refrigerant into each circuit, as required. With the unit running, add refrigerant vapor by connecting the charging line to the suction service valve and charging through the backseat port until operating conditions become normal.

CAUTION

Overcharging the Circuit!

If both suction and discharge pressures are low but subcooling is normal, a problem other than refrigerant shortage exists. Do not add refrigerant, as this may result in overcharging the circuit.

CAUTION

Compressor Damage!

Use only refrigerants specified on the unit nameplate, to prevent compressor damage and insure full system capacity.

⚠ WARNING

Contains Refrigerant!

System contains oil and refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

Failure to follow proper procedures or the use of non-approved refrigerants, refrigerant substitutes, or refrigerant additives could result in death or serious injury or equipment damage.

- If operating conditions indicate a refrigerant overcharge, remove refrigerant at the liquid line service valve. Allow refrigerant to escape slowly, to minimize oil loss. Do not discharge refrigerant into the atmosphere.

System Superheat

Normal suction superheat for each circuit is approximately 4 F at full operating load. Superheat temperature can be expected to be moving around the 4 F setpoint when the chiller is pulling down, the compressor slide valve is being modulated, or the fans are staging on either the same or opposite circuits. Superheat can be expected to settle out at approximately 4 F when the above items stabilize.

System Subcooling

Normal subcooling for each circuit ranges from 11 F to 20 F, depending on the unit. If superheat is normal but subcooling is not, contact a qualified service technician.



Unit Shutdown Procedures

Temporary Shutdown and Restart

To shut the unit down for a short time, use the following procedure:

1. Press the Stop key on the Clear Language Display. The compressors will continue to operate and, after unloading for 20 seconds, will stop when the compressor contactors de-energize. The condenser fans will be de-energized at this time.
2. The unit disconnect switch and unit-mounted disconnect (if installed) should remain closed to keep the compressor sump heaters energized.
3. Maintain power to keep the evaporator heat tape energized.
4. Stop the chilled water circulation by turning off the chilled water pump.

To restart the unit after a temporary shutdown, restart the chilled water pump and press the AUTO key. The unit will start normally, provided the following conditions exist:

1. The UCM must receive a call for cooling and the differential to-start must be above the setpoint.
2. All system operating interlocks and safety circuits must be satisfied.

Extended Shutdown Procedure

The following procedure is to be followed if the system is to be taken out of service for an extended period of time, eg., seasonal shutdown:

1. Test the unit for refrigerant leakage and repair as necessary.
2. Open the electrical disconnect switches for the chilled water pump. Lock the switch in the "OPEN" position.

CAUTION

Pump Damage!

Lock the chilled water pump disconnect open to prevent pump damage.

3. Close all chilled water supply valves. Drain the chilled water from the evaporator. If the unit will be exposed to freezing ambient conditions, flush the evaporator with an antifreeze solution or energize the evaporator heat tape.

CAUTION

Evaporator Freezing Damage!

To prevent damage to the evaporator by freezing, flush the evaporator with an antifreeze solution or energize the evaporator heat tape.

4. Open the unit main electrical disconnect and unit-mounted disconnect (if installed) and lock on the "OPEN" position.

Unit Shutdown Procedures

CAUTION

Accidental Start-up Damage!

Lock the disconnects on the “OPEN” position to prevent accidental start-up and damage to the system when it has been setup for extended shutdown.

5. At least every three months (quarterly), check the pressure in the unit to verify that the refrigerant charge is intact.

System Restart After Extended Shutdown

Follow the procedures below to restart the unit after extended shutdown:

1. Verify that the liquid line service valves, oil line, compressor discharge service valves and suction service valves (if installed) are open (backseated).

CAUTION

Compressor Damage!

To prevent damage to the compressor, be sure that all refrigerant valves are open before starting the unit.

2. Close the main disconnect and unit-mounted disconnect (if installed) to energize the compressor sump heaters. If the optional control transformer is not installed, it will be necessary to close the disconnect for 115 VAC power to 1TB3-1 and 1TB3-2.

CAUTION

Compressor Damage!

The compressor sump heaters must be energized for a minimum of 24 hours prior to unit operation, to prevent compressor damage caused by liquid refrigerant in the compressor at start-up.

3. Maintain power to the evaporator heat tape connections.
4. Check the oil separator oil level. See “Oil Separator Level Check”.
5. Fill the evaporator chilled water circuit. Refer to [Table 1](#) for evaporator liquid capacities. Vent the system while it is being filled. Open the vent on the top of the evaporator during filling and close when filling is completed.



Unit Shutdown Procedures

CAUTION

Proper Water Treatment!

The use of untreated or improperly treated water in a RTAA 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. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

6. Close the fused-disconnect switch that provides power to the chilled water pump.
7. Start the chilled water pump and, while chilled water is circulating, inspect all piping for leakage. Make any necessary repairs before starting the unit.
8. While the chilled water is circulating, adjust the chilled water flow and check the chilled water pressure drop through the evaporator. Refer to "Water System Flow Rates" and "Water System Pressure Drop".
9. Adjust the flow switch on the evaporator piping (if installed) for proper operation.
10. Stop the chilled water pump. The unit is now ready for start-up as described in "Start-Up Procedures".

Periodic Maintenance

Perform all maintenance procedures and inspections at the recommended intervals. This will prolong the life of the equipment and minimize the possibility of costly failures.

Use an "Operator's Log" to record an operating history for the unit. The log serves as a valuable diagnostic tool for service personnel. By observing trends in operating conditions, an operator can anticipate and prevent problem situations before they occur.

If the unit does not operate properly during maintenance inspections, refer to "Diagnostics and Troubleshooting".

Weekly Maintenance

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

- Check the evaporator refrigerant pressure and the condenser refrigerant pressure in the Refrigerant Report Menu on the Clear Language Display. The pressures are referenced to sea level (14.6960 psia).
- Check the liquid line sight glasses. The refrigerant flow past the sight glasses should be clear. Bubbles in the refrigerant indicate either low refrigerant charge, non condensable or excessive pressure drop in the liquid line. A restriction in the line can sometimes be identified by a noticeable temperature differential between the two sides of the restriction. Frost may often form on the line at this point. Proper refrigerant charges are shown on Table 1.

CAUTION Equipment Check!

A clear sight glass alone does not mean that the system properly charged. Also check system superheat, subcooling, and unit operating pressures.

- If operating pressures and sight glass conditions seem to indicate refrigerant shortage, measure the system superheat and system subcooling. Refer to "System Superheat" and "System Subcooling".
- If operating conditions indicate a refrigerant overcharge, remove refrigerant at the liquid line service valve. Use appropriate refrigerant recovery practices that allow refrigerant to escape slowly, to minimize oil loss. Do not discharge refrigerant into the atmosphere.
- Inspect the entire system for unusual conditions and inspect the condenser coils for dirt and debris. If the coils are dirty, refer to RTAA-SB-20 and RTAC-SVG01A-EN.

Monthly Maintenance

- Perform all weekly maintenance procedures.
- Measure and record the system superheat. Refer to "System Superheat".
- Measure and record the system subcooling. Refer to "System Subcooling".



Periodic Maintenance

- Manually rotate condenser fans to insure proper clearance on the fan openings.

Annual Maintenance

- Perform all weekly and monthly maintenance procedures.
- Check the oil level and refrigerant charge. Refer to "Maintenance Procedures". Routine changing of oil is not required. See Oil Separator Level Check in the Maintenance section of this manual.
- Have a qualified laboratory perform a compressor oil analysis to determine system moisture content and acid level. This analysis is a valuable diagnostic tool.
- Contact a qualified service organization to leak test the chiller, to check operating and safety controls, and to inspect electrical components for deficiencies.
- Inspect all piping components for leakage and damage. Clean out any inline strainers.
- Clean and repaint any areas that show signs of corrosion.
- Clean the condenser coils. refer to RTAA-SB-20 and RTAC-SVG01A-EN.
- Clean the condenser fans. Check the fan assemblies for proper clearance in the fan openings and for motor shaft misalignment, abnormal end-play, vibration and noise.



Periodic Maintenance

RTAA Operator's Log						
Job Name:			Job Location:			
Unit Serial Number:			Elevation Above Sea Level:			
Model No:			Nameplate Voltage:			
Compressor A Serial Number:			Fan Motor RLA			
Compressor A Model Number:			Heat Tape Voltage			
Compressor B Serial Number:						
Compressor B Model Number:						
Evap Water Pressure Drop						
Design PSID:			Actual PSID:			
Design GPM:			Actual GPM:			
Circuit			1	2	1	2
Compressor			A	B	A	B
			15 min	15 min	30 min	30 min
Unit	Phase	A-B				
Voltage		A-C				
		B-C				
Compressor	Phase	A				
Amps		B				
		C				
Unit Operating Mode						
Last Diagnostic						
Evaporator Entering Water Temp. <i>F or C</i>						
Evaporator Leaving Water Temp. <i>F or C</i>						
Outdoor Air Temperature <i>F or C</i>						
Active Chill Water Setpoint <i>F or C</i>						
Active Current Limit Setpoint						
Saturated Evaporator Rfgt.Temp. <i>F or C</i>						
Saturated Condenser Rfgt. Temp. <i>F or C</i>						
Condenser Refrigerant Pressure <i>psig/kPa</i>						
Evaporator Refrigerant Pressure <i>psig/kPa</i>						
Compressor RLA <i>% RLA</i>						
Compressor Starts						
Compressor Hours						
External Hardwired Lockout			Not Locked out/ Locked out		Not Locked out/ Locked out	
Front Panel Lockout			Not Locked out/ Locked out		Not Locked out/ Locked out	



Periodic Maintenance

RTAA Log			
Operator Settings:			
Set Point Source		Low Wtr Temp EXV Gain Comp [D/E]	
Front Panel Chilled Wtr Setpt		Condenser Limit Setpt	
External Chilled Wtr Setpt [D/E]		Phase Unbalance Protection [D/E]	
Design Delta Temp Setpt		Phase Reversal Protection [D/E]	
Differential To Start Setpt		Superheat Setpt	
Chilled Water Pump [On/Auto]		EXV Control Response Ckt 1	
Chilled Water Pump Off Delay		EXV Control Response Ckt 2	
Front Panel Current Limit Setpt		LVG Wtr Temp Cntrl Resp Setpt	
External Current Limit Setpt [D/E]		Fan Cntrl Deadband Bias, Ckt 1	
Low Ambient Lockout [D/E]		Fan Cntrl Deadband Bias, Ckt 2	
Low Ambient Lockout Setpt		Title Machine Config. Menu (++++-)	
Chilled Water Reset Type		Compressor Model No. Prefix	
Type, Reset Ratio		Number of Compressors	
Type, Start Reset Setpt		Oil Loss Differential Setpt	
Type, Max Reset Setpt		Compressor A Tons	
Ice Machine Control [D/E]		Compressor B Tons	
Panel Ice Termination Setpt		Unit Model	
Title Service Settings		Fan Control [D/E]	
Under/Over Voltage Protection [D/E]		Variable Speed Fan, Circuit 1 [D/E]	
Unit Line Voltage		Variable Speed Fan, Circuit 2 [D/E]	
Restart Inhibit Time		Number of Fans, Circuit 1	
Balanced CPRSR Starts & Hours [D/E]		Number of Fans, Circuit 2	
Display Units		Reduced Inrush Starting [D/E]	
Programmable Relay Setup		Current Ovrld Setting, CPRSR A	
External Circuit Lockout [D/E]		Current Ovrld Setting, CPRSR B	
Service Set-up Menu (++- -++)		Low Amb Unit, Half Airflow Fan [D/E]	
Keypad/Display Lock Feature [D/E]		Low Amb Unit, Two Speed Motor [D/E]	
ICS Address		Night Noise Setback [D/E]	
LVG Wtr Temp Cutout Setpt		Number of EXV Valves, Ckt 1	
Low Rfgr Temp Cutout Setpt		Number of EXV Valves, Ckt 2	

Maintenance

This section describes specific maintenance procedures which must be performed as a part of the normal maintenance program for this unit. Be certain that electrical power to the unit is disconnected before performing these procedures.

Coil Cleaning

⚠ WARNING

Hazardous Chemicals!

Coil cleaning agents can be either acidic or highly alkaline. Handle chemical carefully. Proper handling should include goggles or face shield, chemical resistant gloves, boots, apron or suit as required. For personal safety refer to the cleaning agent manufacturer's Materials Safety Data Sheet and follow all recommended safe handling practices. Failure to follow all safety instructions could result in death or serious injury.

Clean the condenser coils at least once each year, or more frequently if the unit is located in a "dirty" environment. This will maintain proper unit operating efficiencies. Follow the detergent manufacturer's instructions as closely as possible to avoid damage to the coils.

To clean the coils, use a soft brush and a sprayer, either a garden, pump-up type or a high-pressure type. A high-quality detergent, such as "Trane Coil Cleaner, CHM-0002" is recommended for standard and Copper coils.

Refer to RTAC-SVG01B-EN for maintenance and cleaning procedures coated coil

NOTE: If the detergent mixture is strongly alkaline (pH value greater than 8.5), an inhibitor must be added.

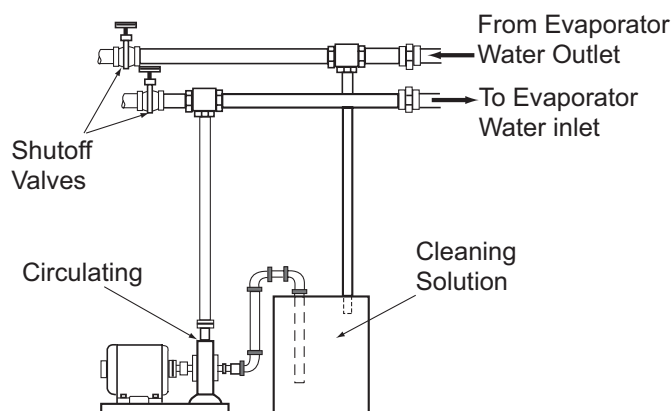


Figure 38 Chemical Cleaning Configuration

Maintenance

Chemically Cleaning The Evaporator

The chilled water system is a closed-loop and therefore should not accumulate scale or sludge. If the chiller becomes fouled, first attempt to dislodge the material by backflushing the system. If unsuccessful after several attempts, chemically clean the evaporator.

CAUTION

Equipment Damage!

Do not use an acid type cleaning agent that will damage steel, galvanized steel, polypropylene, or internal copper components.

With this information, water treatment firms will be able to recommend a suitable chemical for use in this system.

A typical configuration for chemical cleaning is shown in [Figure 38](#). The supplier of the cleaning chemicals must provide or approve:

- All of the materials used in this configuration

- The amount of chemicals used

- Insure that the apex of the line above the sightglass is as high as possible, to eliminate liquid traps which can give erroneous readings.

Water Treatment

The use of untreated or improperly treated water in the unit may result in the formation of scale, algae, or slime. It may also cause erosion or corrosion. It is recommended that a qualified water treatment specialist provide recommendations for proper water treatment.

CAUTION

Proper Water Treatment!

The use of untreated or improperly treated water in a RTAA 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. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

Oil Separator Level Check

Follow the steps listed below and refer to the notes listed in [Figure 39](#).

1. Turn off the unit.
2. Attach the hoses and sight glass to the oil separator charging Schrader valve and the compressor discharge service valve, as shown in [Figure 39](#). Remove non-condensibles.
3. After the unit has been off for 10 minutes, move the sight glass up and down until the level can be seen.

Maintenance

- After the level has been determined, remove the sight glass and hoses.

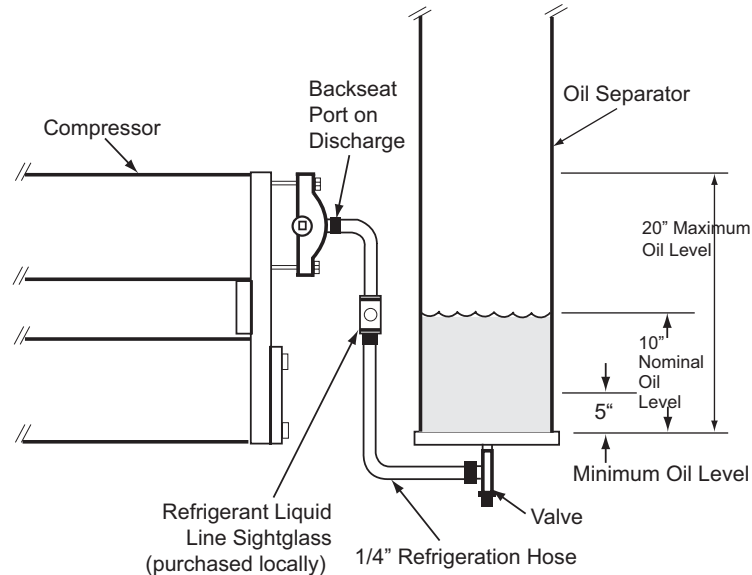


Figure 39 System Oil Level Specifications

Oil Filter Change

NOTE: Routine changing of the oil or the oil filter is not recommended. The oil filter is oversized for this application and should not require replacement.

The oil and filter should be replaced only if analysis reveals that the oil is contaminated. Oil type and system capacities are shown in [Table 1](#).

Pressure drops across the oil filter are shown in [Figure 41](#). Oil filter pressure drop is the difference between the pressure at the oil filter cover plate Schrader valve and the pressure at the compressor oil supply Schrader valve, on top of the compressor.

To change the oil filter in the unit, refer to [Figure 40](#) and follow the steps listed below.

- Shut off the compressor and disconnect all electrical service to the compressor.
- Connect manifold gauge sets to the backseat ports of the suction and discharge service valves and the Schrader valve on the oil filter cover plate.
- Frontseat the suction and discharge service valves. Separate the Aeroquip valve coupling, or close valve at the oil supply to the compressor or, on later chillers, frontseat the oil supply line angle valve.
- Recover refrigerant from the three connections in Step 2.

NOTE: The Schrader valve may have a high quantity of oil.

⚠ WARNING

Components Under High Pressure!

Failure to relieve pressure before removing filter retaining bolt could result in death or serious injury



Maintenance

5. Remove the seven bolts on the oil filter cover. A pan may be necessary to catch any oil that is released after the cover is loosened.

NOTE: Observe the placement of copper gasket under one bolt head.

6. Remove the cover and oil filter element. Install the new filter element.
7. Coat the new cover gasket with refrigerant oil.
8. Install the cover plate and cover plate gasket.
9. Install a new copper gasket under the same bolt head that had one at time of removal. Replace all other bolts and tighten to 150 ft. lbs.
10. Energize the three solenoid valves on the compressor by jumpering the proper terminals at the UCM.
11. Evacuate to 400 microns from the three ports in Step 2 and perform a rise test.
12. De-energize the three solenoid valves.
13. Reconnect the Aeroquip coupling that was separated or open valve in Step 3 or, on later chillers, backseat the oil supply line angle valve.

CAUTION

Equipment Damage!

The Aeroquip valve must be completely tightened to open the valve. If the valve is not completely tightened, the valve may remain closed, causing catastrophic damage to the compressor.

NOTE: Insure that this step is performed before Step 15, as this will insure that the oil filter housing is full of oil before the compressor is started.

14. Backseat the suction and discharge service valves.
15. Remove the manifold gauge sets.

Maintenance

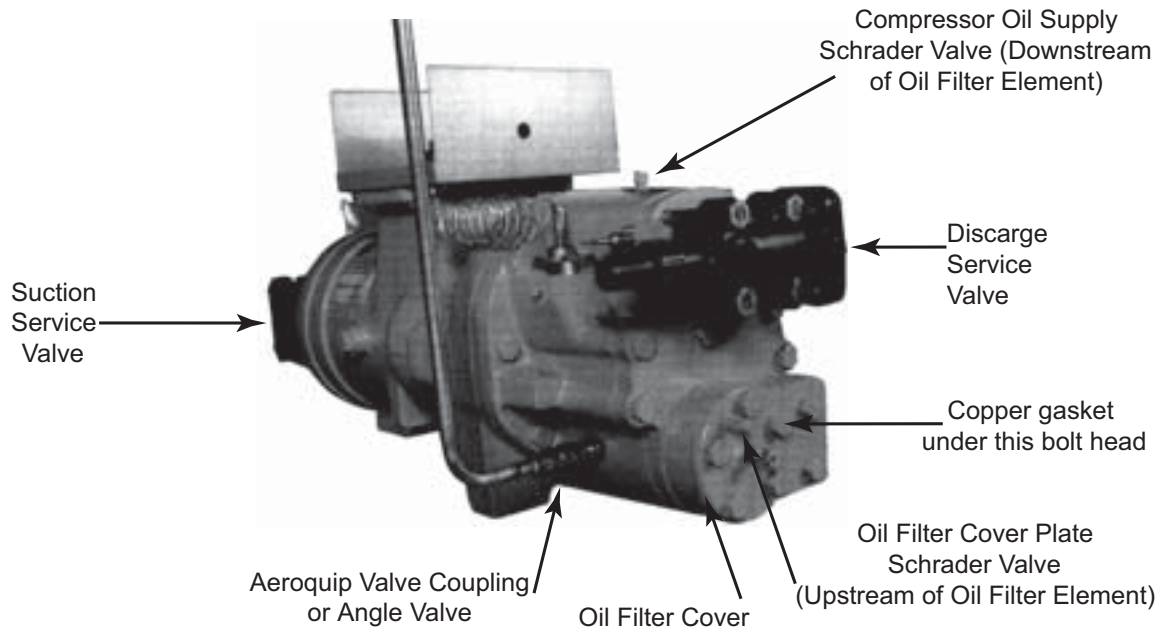


Figure 40 Oil Filter Change

Maintenance

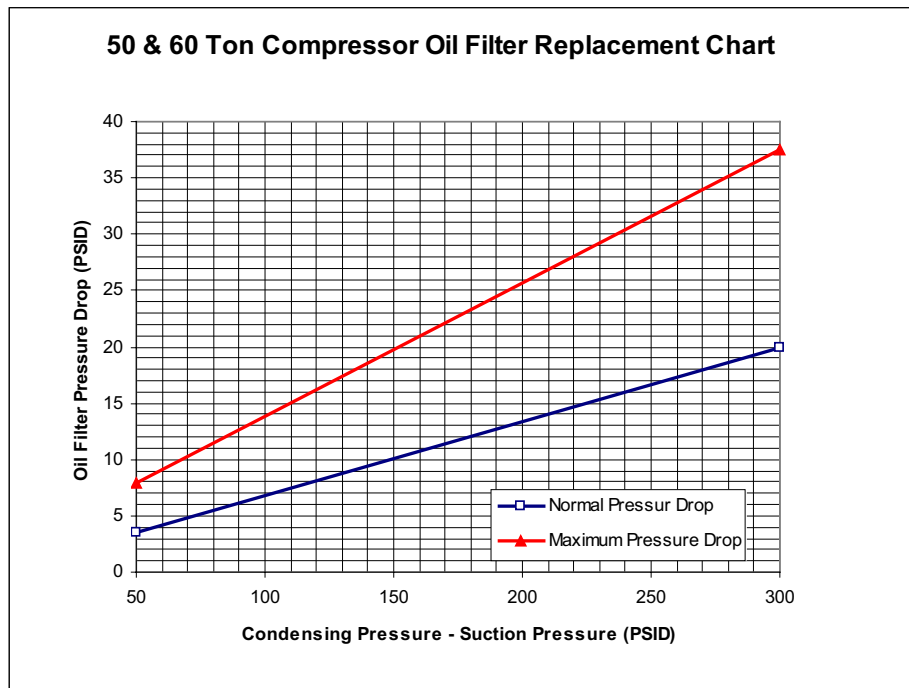
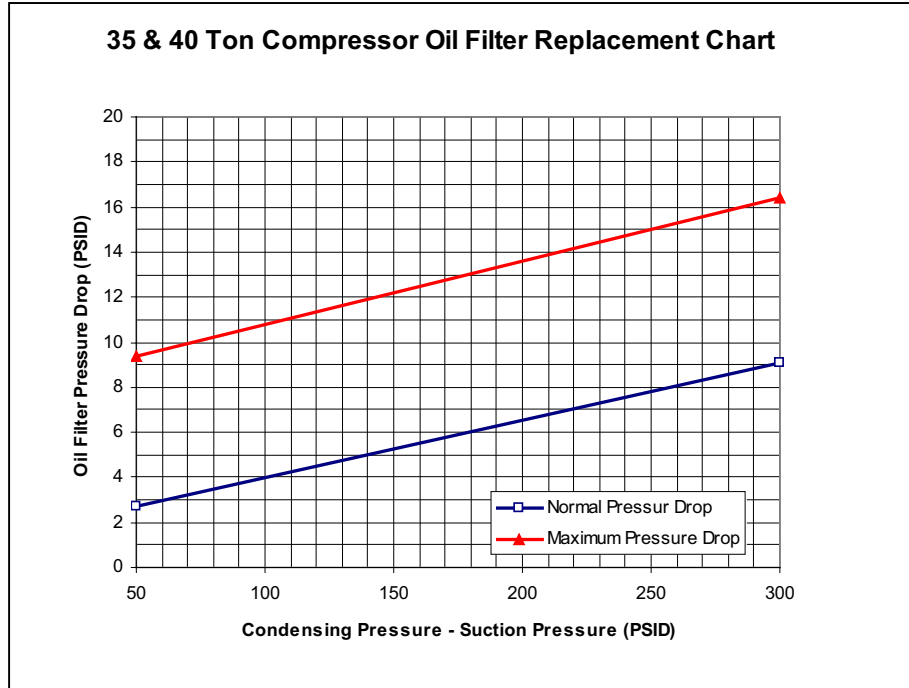


Figure 41 Oil Pressure Drop

Refrigerant Charging and Recovery

If the refrigerant charge needs to be adjusted, be certain to monitor the subcooling and superheat measurements. The subcooling needs to be between 10 F and 20 F when the unit is running fully loaded. The ambient temperature is between 75 F and 100 F and the leaving water temperature is between 40 F and 55 F. Refer to Figures 1, 2 and 21.

CAUTION Equipment Damage!

The evaporator water flow must be established and maintained while adjusting the charge. Refrigerant pressures below 65 psig can cause freezing and rupturing of the evaporator tubes.

Low Side Repairs

If the refrigerant charge needs to be isolated in the high side of the unit, perform the following procedures:

1. Press the STOP key and send the unit through a stopping mode.
2. Place a manifold gauge set on the backseat port of the liquid line service valve before actually closing the valve.
3. Close the liquid line service valve.
4. While the unit is in the STOP mode, enable Service Pumpdown for the specific compressor. Service Pumpdown is found under the Service Tests menu.

NOTE: Service Pumpdown can only be enabled for one compressor at a time. Only one pumpdown per compressor can be performed, until the unit has been reset. If these requirements are not met and Service Pumpdown is enabled, the screen will display "PROHIBITED" for one second and then return to disable.

With Service Pumpdown enabled, the Restart Inhibit will be ignored, the EXV will be prepositioned and the selected compressor will start and run for one minute.

5. Once the compressor stops, close the discharge service valve on the compressor.
6. The remaining refrigerant needs to be recovered from the suction service valve and the liquid line Schrader valve. Attach the inlet of a recovery system to the backseat port on the suction service valve and the Schrader valve between the liquid line service valve and the filter drier. Attach the outlet of the recovery system to the manifold gauge set that is already attached to the access port on the liquid line service valve. The condenser will be used as the storage vessel.
7. Complete all necessary repairs.
8. Evacuate out of the backseat port on the suction service valve and from the Schrader valve between the liquid line service valve and the filter drier.
9. Break the vacuum by adding refrigerant to the service port on the suction valve.



Refrigerant Charging and Recovery

10. Open all valves, start the unit and verify the refrigerant charge by measuring the subcooling.

High Side Repair

If the refrigerant needs to be isolated in the low side of the unit, perform the following procedures:

1. Press the STOP key and send the unit through a stopping mode.
2. Close the discharge service valve.
3. Before closing the liquid line service valve, attach a manifold gauge set to the liquid line valve backseat port.
4. Close the liquid line service valve.
5. Attach the inlet of a liquid transfer pump to the manifold gauge set and the outlet to the 1/4" angle valve, located between the EXV and the evaporator. This will transfer the liquid refrigerant.
6. Remove the liquid transfer pump. Attach the inlet of a recovery system to the manifold gauge set and the outlet to the 1/4" angle valve, located between the EXV and the evaporator. Remove all of the vapor from the high side of the system.
7. Complete all necessary repairs.
8. Evacuate the high side through the access port on the liquid line service valve that has the manifold gauge set attached to it.
9. Open all of the valves and run the unit. Verify the refrigerant charge by measuring the subcooling and monitor the sightglass.

Adding Refrigerant

If the entire charge has been removed, perform the following procedures to recharge the unit:

1. Open all service valves.
2. Establish water flow through the evaporator. Connect a hose from the refrigerant bottle to the backseat port on the liquid line shutoff valve. Midseat the valve.

CAUTION

Freezing and Rupturing Tubes Damage!

The evaporator water flow needs to be established and maintained while adjusting the charge to avoid freezing and rupturing the tubes. Refrigerant pressure below 65 psig can also cause freezing and rupturing of the evaporator tubes.

3. It may not be possible to put the entire amount of the refrigerant charge required using Step 2. If so, start the unit and add liquid refrigerant through the 1/4" liquid line angle valve between the EXV and the evaporator.
4. Once the unit has been charged with refrigerant, start the unit. Measure the subcooling and monitor the sightglass to verify that the refrigerant charge is correct.

Diagnostics

In the table below, a latching diagnostic is a condition which shall cause the machine or a portion of the machine as noted to shut down and shall require a manual reset to restore operation. A diagnostic that is non-latching shall reset automatically when the condition causing the diagnostic goes away. A non-latching diagnostic shall shut down the machine or a part of the machine if so indicated. If a diagnostic is informative only, no machine or circuit action is taken except to load a diagnostic code into the last diagnostic register.

Diagnostic Types (And Action)

MMR = Machine Shutdown, Manual Reset

MAR = Machine Shutdown, Auto Reset

CMR = Circuit Shutdown, Manual Reset

CAR = Circuit Shutdown, Auto Reset

IFW = Information Warning

Table 19 Diagnostic Codes

Diagnostic Description	Type	Cause
Chilled Water Flow (Ent Wtr Temp)	MMR	a. The entering evaporator water temp. fell below the leaving evaporator water temp. by more than 2F for 100 degree F - seconds. b. Causes to trip this diagnostic include either a loss of chilled water flow or a calibration shift in the evap. water temp. sensors.
Chilled Water Flow Interlock	MAR	The chilled water flow switch input was open for more than 6 seconds.
Compressor Overload Setting Cprsr A	IFW	The CPM NovRam Based overload setting did not agree with the MCSP Dip Switch overload setting for 30 contiguous seconds. The affected MCSP shall use the minimum (00000 binary, 00 decimal) overload setting as a default until the UCM is reset when this diagnostic occurs.
Compressor Overload Setting - Cprsr B	I FW	Same as Cprsr A, above.
Compressor Overload Setting - Cprsr C	IFW	Same as Cprsr A, above.
Compressor Overload Setting - Cprsr D	IFW	Same as Cprsr A, above.
Cond Fan Var Speed Drive Fault Ckt 1	IFW	The controlling MCSP for the given circuit has unsuccessfully attempted (5 times within 1 minute) to clear a fault signal from the Condenser Fan Inverter Drive. The 5th attempt removes power from the inverter to create a power up reset. If the fault does not clear, the UCM will revert to constant speed operation without the use of the inverters fan. The inverter must be manually bypassed for full fixed speed fan operation.
Cond Fan Var Speed Drive Fault Ckt 2	IFW	Same as Ckt 1, above.
Cond Entering Wtr Temp Sensor	IFW	Shorted Cond. temp sensor. No diagnostic on open.
Cond Leaving Wtr Temp Sensor	IFW	Shorted Cond. temp sensor. No diagnostic on open.
Cond Rfgt Temp Sensor - CKT 1	CMR	Open or short.
Cond Rfgt Temp Sensor - CKT 2	CMR	Open or short.

Diagnostics

Table 19 Diagnostic Codes

Diagnostic Description	Type	Cause
Contactors CPRSR A	MMR	a. Welded cprsr contactor. b. Detected a welded compressor contactor when the compressor was commanded off but the current does not go to zero. Detection time shall be 5 second minimum and 10 seconds maximum. On detection, generate the diagnostic, energize the appropriate alarm relay, continue to command the affected compressor off, energize the affected compressors oil line solenoid, stop all other compressors, unload the running compressor with the welded contactor, open the EXV to its maximum open position, and continue to do fan control. Do not exit this condition until the controller is manually reset.
Contactors CPRSR B	MMR	Same as CPRSR A.
Contactors CPRSR C	MMR	Same as CPRSR A.
Contactors CPRSR D	MMR	Same as CPRSR A.
CPRSR Suct Temp Sensor - Ckt 1	CMR	Open or short.
CPRSR Suct Temp Sensor - Ckt 2	CMR	Open or short.
CWS/Leaving Water Temp Cutout Setpoint Overlap	None	No diagnostic, display to flash and 1 limit value to last legal value.
<i>NOTE: The above is not a diagnostic because you don't want the display vectoring you to a different display state when you are trying to set either the chilled water setpoint or the leaving water temp. cutout setpoint as it will in the case of a diagnostic.</i>		
Discharge Temp - Cprsr A	CMR	a. The discharge temp. exceeded the trip value; 135 + or -3 C. b. The discharge temp. PTC or wiring is open. c. Time to trip from either trip value exceeded or input open shall be 0.5 to 2.0 seconds.
Discharge Temp - Cprsr B	CMR	Same as Diagnostic for Cprsr A, above.
Discharge Temp - Cprsr C	CMR	Same as Diagnostic for Cprsr A, above.
Discharge Temp - Cprsr D	CMR	Same as Diagnostic for Cprsr A, above.
Emergency Stop	MMR	EMERGENCY STOP input is open. An external interlock has tripped. Time to trip from input opening to unit stop shall be 0.1 to 1.0 seconds.
Entering Oil Temp Sensor - Cprsr A	CMR	Open or short.
Entering Oil Temp Sensor - Cprsr B	CMR	Open or short.
Entering Oil Temp Sensor - Cprsr C	CMR	Open or short.
Entering Oil Temp Sensor - Cprsr D	CMR	Open or short.
Evap Entering Wtr Temp Sensor	MMR	Open or short.
Evap Leaving Wtr Temp Sensor	MMR	Open or short.
Evap Rfgr Temp Sensor - CKT 1	CMR	Open or short (for 30 sec).
Evap Rfgr Temp Sensor - CKT 2	CMR	Open or short (for 30 sec).

Diagnostics

Table 19 Diagnostic Codes

Diagnostic Description	Type	Cause
External Chilled Water Setpoint	IFW	a. Not "Enabled": no diagnostics. b. "Enabled": Out-Of-Range Low, set diagnostic. Out-Of-Range Hi, no diagnostic.
External Current Limit Setpoint	IFW	a. Not "Enabled": no diagnostics. b. "Enabled": Out-Of-Range Low, set diagnostic. Out-Of-Range Hi, no diagnostic.
EXV Elec. Drive CKT - Rfgt Ckt 1	CMR	Run the EXV electrical drive circuit test both on demand from the human interface and just before either a circuit or one of a pair of circuits starts.
EXV Elec. Drive CKT - Rfgt Ckt 2	CMR	Same as Diagnostic for Ckt 1, above.
High Diff. Press. - Ckt 1	CMR	The difference between the Condenser pressure and the evaporator pressure exceeded 350 PSID for 0.8-5.0 seconds. 320 PSID must hold, 320 + to trip in One Hour.
High Diff. Press - Ckt 2	CMR	Same as Diagnostic for Ckt 1, above.
High Oil Temp - Cprsr A	CMR	Entering Oil Temp to given compressor exceeded 170F. Time to trip is given by equation: trip time = (190-Oil Temp) x 180 sec/F.
High Oil Temp - Cprsr B	CMR	Same as Cprsr A, above.
High Oil Temp - Cprsr C	CMR	Same as Cprsr A, above.
High Oil Temp - Cprsr D	CMR	Same as Cprsr A, above.
High Pressure Cutout - Cprsr A	CMR	A high pressure cutout was detected on Cprsr A; trip at 405 + or -7 PSIG.
High Pressure Cutout - Cprsr B	CMR	A high pressure cutout was detected on Cprsr B; trip at 405 + or -7 PSIG.
High Pressure Cutout - Cprsr C	CMR	A high pressure cutout was detected on Cprsr C; trip at 405 + or -7 PSIG.
High Pressure Cutout - Cprsr D	CMR	A high pressure cutout was detected on Cprsr D; trip at 405 + or -7 PSIG.
Loss of Local Display Panel COM	IFW	The 1U1 has detected a loss of IPC communication with the Local Display panel for at least 15 seconds.
Low Chilled Water Temp (Unit off)	IFW	The chilled water temp. fell below the cutout setpoint while the compressors were not running.
Low Chilled Water Temp (Unit on)	MAR	The chilled water temp. fell below the cutout setpoint while the compressors were running for 30 degree F Seconds.
Low Differential Press - Ckt 1	CMR	The fan control algorithm detected a low differential Temperature/Pressure condition that existed for more than 180 contiguous seconds. Trip point is 40 PSID.
Low Differential Press - Ckt 2	CMR	Same as Diagnostic for Ckt 1, above.
Low Evap Rfgt Temp - Ckt 1	CMR	a. The Saturated Evap Rfgt Temp - Circuit 1 dropped below the Low Rfgt Temp Cutout Setpoint while the circuit was running for 30 deg F seconds. b. See the low ambient ignore time on startup.
Low Evap Rfgt Temp - Ckt 2	CMR	Same as Diagnostic for Ckt 1, above.

Diagnostics

Table 19 Diagnostic Codes

Diagnostic Description	Type	Cause
Low Oil Flow - Cprsr A	CMR	The differential oil pressure switch remained opened for more than 20 contiguous seconds on Cprsr A. Note: Although GP cmprs do not have pressure switch or Oil Line solenoid, this diagnostic is still active. The input must be jumpered for normal operation on GP cmprs.
Low Oil Flow - Cprsr B	CMR	Same as Diagnostic for Cprsr A, above, but Cprsr B.
Low Oil Flow - Cprsr C	CMR	Same as Diagnostic for Cprsr A, above, but Cprsr C.
Low Oil Flow - Cprsr D	CMR	Same as Diagnostic for Cprsr A, above, but Cprsr D.
Low Pressure Cutout - Ckt 1	CMR	The low pressure switch opened or remained open past the ignore time during compressor operation (after one retry) or the low pressure switch was open prior to compressor start with Sat Cond Temp above -18F.
Low Pressure Cutout - Ckt 2	CMR	Same as Ckt 1.
Low Superheat - Ckt 1	CMR	A low superheat condition existed for an extended period of time. If a superheat less than or equal to 2 degrees F (1.11 degrees C) is detected for more than 2400 degree F seconds, the circuit shall be shutdown. The integrated area (2400 Degree F seconds) shall be only below 2 degrees F superheat.
Low Superheat - Ckt 2	CMR	Same as Diagnostic for Ckt 1, above.
Memory Error Type I	IFW	On UCM either power up or following a Type II Memory Error a NOVRAM memory error was detected. The UCM is operating on all Engineering ROM defaults for all setup parameters. Check all setup parameters and continue to run chiller. Replace the Chiller Module as soon as a replacement is available. <i>NOTE: It is expected that this diagnostic will be detected on the very first power up of the Chiller Module at the Manufacturer since the NOVRAM will not contain valid data on first power up.</i>
Memory Error Type II	IFW	A Shadow RAM memory error was detected. The UCM is operating on all last valid values (pulled from NOVRAM) for all setup parameters. No setup parameter changes were pending to be loaded into NOVRAM, a complete recovery of all setup parameters was made and there is no need to check unit setup parameters. Compressor starts and hour were lost for not more than the last 24 hours. This is expected to be an isolated event and repair or replacement is not required. If this diagnostic does occur repeatedly, then replace the Chiller module.
Memory Error Type III	IFW	A Shadow RAM memory error was detected. The UCM is operating on all last valid values (pulled from NOVRAM) for all setup parameters. Setup parameter changes less than 24 hours old pending to be loaded into NOVRAM were lost. Check all setup parameters made in the last 24 hours. Compressor starts and hours were lost for not more than the last 24 hours. This is expected to be an isolated event and repair or replacement is not required. If this diagnostic does occur repeatedly, then replace the Chiller module.

Diagnos

Table 19 Diagnostic Codes

Diagnostic Description	Type	Cause
Oil System Fault - Ckt 1	CMR	Entering Oil Temp on either compressor of the given circuit reads a temperature x degrees below the given ckts' saturated condenser temperature for more than 30 minutes where x is the Oil Loss Differential Setpoint (2 degree F hysteresis to clear timer).
Oil System Fault - Ckt 2	CMR	Same as for Ckt 1, above.
Outdoor Air Temp Sensor (Both Outdoor Air Reset and Low Ambient Lockout not selected)	None	Open or short. a. Display dashes e.g. "14—"
Outdoor Air Temp Sensor (Either Outdoor Air Reset or Low Ambient Lockout selected.)	I FW	Open or short. a. Use end of range value (whatever value the open or short. b. Clear diag. when the resistance returns to normal range.
Over Voltage	MAR	Line voltage above + 10% of nominal. (Must hold = + 10% of nominal. Must trip = + 15% of nominal. Reset differential = min. of 2% and max. of 4%. Time to trip = minimum of 10 sec. and maximum of 20 seconds.) Design: Nom. trip: 15 seconds at greater than 113.5%, ± 2.8% at 200V, or ± 1.8% at 575V, Auto reset at 110.5% or less.
Overload Trip - CPRSR A	CMR	Cprsr current exceeded overload time vs. trip characteristic.
Overload Trip - CPRSR B	CMR	Same as Diagnostic for Cprsr A.
Overload Trip - CPRSR C	CMR	Same as Diagnostic for Cprsr A.
Overload Trip - CPRSR D	CMR	Same as Diagnostic for Cprsr A.
Phase Loss - Cprsr A	CMR	No current was sensed on one or more of the current x former inputs. (Must hold = 20% RLA. Must trip = 5% RLA.) Time to trip shall be 1 second minimum, 3 seconds maximum.
Phase Loss - Cprsr B	CMR	Same as Diagnostic for Cprsr A, above.
Phase Loss - Cprsr C	CMR	Same as Diagnostic for Cprsr A, above.
Phase Loss - Cprsr D	CMR	Same as Diagnostic for Cprsr A, above.
Phase Reversal - Cprsr A	CMR	A phase reversal was detected on the incoming current. On a compressor startup the phase reversal logic must detect and trip in a maximum of 1.0 second from compressor start.
Phase Reversal - Cprsr B	CMR	Same as Diagnostic for Cprsr A, above.
Phase Reversal - Cprsr C	CMR	Same as Diagnostic for Cprsr A, above.
Phase Reversal - Cprsr D	CMR	Same as Diagnostic for Cprsr A, above.
Phase Rev Prot Lost Cprsr A	CMR	The phase reversal protection on compressor A has become inoperative. The phase rotation protection system failed to detect 2 in a row of one of the four phase circuit states: Phase reversal, Phase rotation OK, Phase A lost., Phase B lost.
Phase Rev Prot Lost - Cprsr B	CMR	Same as Cprsr A, above, but Cprsr B.
Phase Rev Prot Lost - Cprsr C	CMR	Same as Cprsr A, above, but Cprsr C.
Phase Rev Prot Lost - Cprsr D	CMR	Same as Cprsr A, above, but Cprsr D.
Phase Unbalance - Cprsr A	CMR	A 15% phase unbalance condition has been detected.
Phase Unbalance - Cprsr B	CMR	Same as Diagnostic for Cprsr A.
Phase Unbalance - Cprsr C	CMR	Same as Diagnostic for Cprsr A.

Diagnostics

Table 19 Diagnostic Codes

Diagnostic Description	Type	Cause
Phase Unbalance - Cprsr D	CMR	Same as Diagnostic for Cprsr A.
Power Loss - Cprsr A	CAR	a. The Cprsr was running and all three phases of current were lost. b. There was an open Transition input after transition had been previously proven to have been complete. c. There was an incomplete Transition on the first check after transition and all three phases of current were not present.
Power Loss - Cprsr B	CAR	Same as Diagnostic for Cprsr A, above.
Power Loss - Cprsr C	CAR	Same as Diagnostic for Cprsr A, above.
Power Loss - Cprsr D	CAR	Same as Diagnostic for Cprsr A, above.
Severe Phase Unbalance - Cprsr A	CMR	A 30% Phase Unbalance diagnostic has been detected. The 15% Phase Unbalance criteria has been defeated. Items to check are the Current Transformer Part Numbers (they should all match). The current Transformer resistances, line voltage phase balance, all power wiring connections, the contactor pole faces, and the motor. If all these are OK, replace the MCSP module of the affected circuit.
Severe Phase Unbalance - Cprsr B	CMR	Same as Diagnostic for Cprsr A, above.
Severe Phase Unbalance - Cprsr C	CMR	Same as Diagnostic for Cprsr A, above.
Severe Phase Unbalance - Cprsr D	CMR	Same as Diagnostic for Cprsr A, above.
Slaved EXV E1ec Drive CKT - Rfgr Ckt 1	CMR	Run the EXV electrical drive circuit test both on demand from the human interface and just before either a circuit or one of a pair of circuits starts.
Slaved EXV Elec Drive CKT -	CMR	Same as Diagnostic for Ckt 1, above.
Starter Transition - Cprsr A	CMR	a. The UCM did not receive a transition complete signal in the designated time from the UCM command to transition. The must hold time from the UCM transition command is 1 second. The Must trip time from the transition command is 6 seconds. b. The Transition Complete input was found to be shorted before the compressor was started. c. Active only if Reduced Inrush Starting is Enabled.
Starter Transition - Cprsr B	CMR	Same as Diagnostic for Cprsr A, above.
Starter Transition - Cprsr C	CMR	Same as Diagnostic for Cprsr A, above.
Starter Transition - Cprsr D	CMR	Same as Diagnostic for Cprsr A, above.
Subcooled Liquid Temp Sensor - Ckt 1	IFW	Open or short.
Subcooled Liquid Temp Sensor - Ckt 2	IFW	Open or short.

Diagnostics

Table 19 Diagnostic Codes

Diagnostic Description	Type	Cause
Tracer Communications Loss	IFW	a. While the chiller switch was in AUTO/REMOTE the communications between the CSR and the connected remote device, e.g., a Tracer or Remote Display, had either never been established for more than 15 minutes after power up or had been lost for more than 15 minutes after it had been established; use the Front Panel Setpoints and the Default Chiller Auto/Stop. b. In AUTO/LOCAL communications had been established and was then lost for more than 15 minutes. Regardless of the remote communications status the UCM uses Front Panel setpoints.
<i>NOTE: The active modes for this diagnostic follow the positions of the chiller switch which account for other chiller modes.</i>		
Under Voltage	MAR	Line voltage below - 10% of nominal or the Under/Over transformer is not connected. (Must hold = -10% of nominal. Must trip = -15% of nominal. Reset differential = min. of 2% and max. of 4%. Time to trip = min. of 10 sec. and max. of 20 sec.) Design: Nom. trip: 15 seconds at less than 87.5%. $\pm$ 2.8% at 200V. or $\pm$ 1.8% at 575V, Auto reset at 90.5% or greater.
U1 Indicating U2 Communications	IFW	The 1U1 has det. a loss of IPC comm from the 1U2 module.
U1 Indicating U3 Communications	MMR	The 1U1 has det. a loss of IPC comm from the 1U3 module.
U1 Indicating U4 Communications	CMR	The 1U1 has det. a loss of IPC comm from the 1U4 module.
U1 Indicating U5 Communications	CMR	The 1U1 has det. a loss of IPC comm from the 1U5 module.
U1 Indicating U6 Communications	CMR	The 1U1 has det. a loss of IPC comm from the 1U6 module.
U1 Indicating U7 Communications	CMR	The 1U1 has det. a loss of IPC comm from the 1U7 module.
U3 Indicating U1 Communications	MMR	The 1U3 has det. a loss of IPC comm from the 1U1 module.
U3 Indicating U4 Communications	CMR	The 1U3 has det. a loss of IPC comm from the 1U4 module.
U3 Indicating U5 Communications	CMR	The 1U3 has det. a loss of IPC comm from the 1U5 module.
U3 Indicating U6 Communications	CMR	The 1U3 has det. a loss of IPC comm from the 1U6 module.
U3 Indicating U7 Communications	CMR	The 1U3 has det. a loss of IPC comm from the 1U7 module.
U4 Indicating U1 Communications	CMR	The 1U4 has det. a loss of IPC comm from the 1U1 module.
U4 Indicating U3 Communications	CMR	The 1U4 has det. a loss of IPC comm from the 1U3 module.
U4 Indicating U5 Communications	CMR	The 1U4 has det. a loss of IPC comm from the 1U5 module.
U5 Indicating U1 Communications	CMR	The 1U5 has det. a loss of IPC corn from the 1U1 module.
U5 Indicating U3 Communications	CMR	The 1U5 has det. a loss of IPC corn from the 1U3 module.
U5 Indicating U4 Communications	CMR	The 1U5 has det. a loss of IPC comm from the 1U4 module.
U6 Indicating U1 Communications	CMR	The 1U6 has det. a loss of IPC comm from the 1U1 module.
U6 Indicating U3 Communications	CMR	The 1U6 has det. a loss of IPC comm from the 1U3 module.
U6 Indicating U7 Communications	CMR	The 1U6 has det. a loss of IPC comm from the 1U7 module.
Winding Temp - Cprsr A	CMR	a. The motor winding temperature thermostat opened; nominally 221 F. b. The motor temp. thermostat or wiring is open. c. Time to trip from input open to compressor shutdown shall be 0.5 to 2.0 seconds.



Diagnostics

Table 19 Diagnostic Codes

Diagnostic Description	Type	Cause
Winding Temp - Cprsr B	CMR	Same as Diagnostic for Cprsr A, above.
Winding Temp - Cprsr C	CMR	Same as Diagnostic for Cprsr A, above.
Winding Temp - Cprsr D	CMR	Same as Diagnostic for Cprsr A, above.
Zone Temp Sensor (Zone Reset Selected)	IFW	Open or Short. a. Use end of range value (whatever value the open or short gives). b. Clear diag. when the resistance returns to normal range. c. If Shorted, go into the ice making mode if "Ice Machine Control" is enabled.
Zone Temp Sensor (Zone Reset not Selected)	None	a. If Open, do normal chiller control. b. If Shorted, go into the ice making mode if "Ice Machine Control " is enabled.

Pump Package

The Canariis Pumping System is completely assembled and consists of two centrifugal pumps, butterfly isolation valves, check valves, y-stainer, multi-purpose valve, controls and piping designed to maintain a suitable water pressure over a widely varying flow range. Maintenance, once the system is properly installed is minimal.

Temporary Storage

If the unit will not be placed into immediate service, store in a clean dry area. Rotate each pump shaft by hand monthly to coat the bearings with lubricant and retard oxidation and corrosion.

Piping

Avoid any points in the piping that might create air pockets and throttle the flows. DO NOT FORCE PIPING WHEN MAKING CONNECTIONS! Use piping hangers or other supports. Suction piping should be independently supported and properly aligned so that NO STRAIN IS TRANSMITTED TO THE UNIT.

Table 20 Water Storage

Pump Package	Water Storage Gallons (Liters)	Pump Package	Water Storage Gallons (Liters)
C2-2.5-4	13.64(51.63)	E5-3-6	19.59 (74.16)
D3-2.5 - 4	13.54 (51.25)	F5-4-4	23.54 (89.11)
D3-2.5-6	16.98 (64.28)	F5-4-6	26.09 (98.76)
D5-3-4	16.18 (61.25)	F7.5-4-4	23.54 (89.11)
E2-3-4	16.25 (61.51)	F7.5-4-6	26.09 (98.76)
E3-3-4	16.25 (61.51)	G3-4-4	23.62 (89.41)
E5-3-4	16.25 (61.51)	G3-4-6	26.56 (100.54)
D5-3-6	19.41 (73.47)	G5-4-4	23.62 (89.41)
E3-3-6	19.59 (74.16)	G5-4-6	26.56 (100.54)

This is for pump package only. For evaporator water storage refer to General information section.

C2-2.5¹-4²

¹ Digit 17 plus in the model number.

² Size of evap water connection.

Tightening Connections

All piping and wiring is factory tested. Handling during transit, off-loading and installation can loosen the connections and the tightening of some connections may be required.

Pre-Start Review and Inspection

Before starting the system it is important to review the following information. Each system is custom fabricated incorporating a variety of components.

The system construction, options, control sequencing panel features and operation of your system is defined in the following pages.

A close visual inspection of the system components is recommended.



Pump Package

Control Panel Features and Options

1. NEMA 3R Control Panel Enclosure
2. Individual Fused Disconnect Switches
3. Each A/C motor starter is a full voltage, non-reversing magnetic starter and is provided with adjustable 3-leg overload protection with manual overload reset push button. Motor starters are mechanically and electrically interlocked to ensure single pump operation.
4. Each pump is provided with a panel mounted light (green) which illuminates when the pump is running and H/O/A switch for manual and automatic operation. The hand or manual mode will not override system protection devices such as differential pressure failure.
5. Control Circuit will be 115 volt A/C. The transformer will be provided with two fuses on the primary and one fuse on the secondary.
6. Control Power (on-off) Switch and Light (amber) provides a means of isolating the control circuit without disconnecting the incoming power at the main disconnect. The light provides visual indication of power to the control circuit.
7. System Differential Pressure Circuit with light (red) - often called "pump fault protection". This feature automatically starts the lag pump after a time delay if the differential pressure sensed in the suction and discharge manifold drops below a preset point (determined by job conditions). Alarm indicator light remains on until manually reset.
8. Auto Alternator - (2) equal pumps. This feature will automatically alternate the sequence of the pumps on each shutdown cycle to equalize their running time.
9. Elapsed Time Meters are non-resettable and provide a record of the hours of operation for each pump.
10. Auxiliary Relay Contact provides hard-wired "System Status" contact to the control panel terminal strip for remote indication.
11. Lead Pump Remote Start/Stop provides hard-wired input to the control panel terminal strip for remote start/stop.

Connection Power

The unit will operate under the following conditions:

The voltage can be +/- 10% of the motor nameplate data

The frequency can be +/- 5% of the motor nameplate data

The combined voltage/frequency variation cannot exceed +/- 10%.

Install electrical wiring in accordance with NEC Standards and any local regulations. The line voltage and wire ampacity must match the voltage and the full load AMP's of the system.

Pump Package

⚠ 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.

1. Place panel disconnects(s), H/O/A switches, and control power On/Off switch (if provided) to the "Off" position.
2. Open the panel and visually check components for any shipping damage and verify that all power leads are secure (see "Tightening Torque Reference Guide" label on inner panel door).
3. Switch main power supply disconnect to "ON". This will provide power to the terminal block of the Booster System Control Panel. Verify the power supply agrees with the Booster System Panel.

IF NOT PROCEEDING WITH START UP AT THIS TIME, DISCONNECT POWER SUPPLY TO PANEL.

Pump Checkout Procedure

1. Verify electric power and water are available.
2. All valves, including main suction valve and discharge valves must be in closed position.
3. If unit is in storage for more than 3 months, rotate each pump by hand. Units should turn freely.
4. Open the main suction valve on inlet to system manifold and check suction pressure against specifications.
5. Slowly open suction valve to one pump at a time. Check pump units and fittings for leaks.
6. Vent each pump volute by loosening a pipe plug at the highest point to assure no air is trapped which would cause seal failure and/or pump "vapor lock".
7. Slowly open pump discharge valve - one pump at a time. Check fittings for leaks. DO NOT OPEN MAIN DISCHARGE VALVE (Multi-Purpose Valve) ON OUTLET OF SYSTEM MANIFOLD AT THIS TIME.

Control Panel Checkout

YOU WILL BE UNABLE TO PROCEED WITH THIS SECTION UNTIL REQUIREMENTS OF CONNECTING POWER SOURCE

1. Confirm the suction pressure is adequate.
2. Energize power supply to panel if necessary.

Pump Package

Caution Pump Damage!

Do not run the pumps without water in the system. Damage to the pump seal will result if the pump is run dry for more for more than a few seconds.

3. Confirm all H/O/A Switches are in the "Off" position. Turn control power (On / Off) switch to "On".
4. Turn disconnects only, to "ON" position (panel door must be closed).
5. Jog each pump by turning the respective H/O/A switch momentarily to the "HAND" position.

System Start-up

1. Verify that the system piping in the building can be pressurized. Open a valve at the highest point to release the air in the system.
2. Close each individual pump discharge valve. Partially open Multi-purpose Valve.
3. Turn Pump 1 H/O/A switch to the "Hand" position.
4. Slowly open Pump 1 discharge valve.
5. Fill the entire building system and observe the high point valve until all the air is released and then close the valve.
6. Turn Pump 1 H/O/A switch to the "OFF" position.
7. Repeat steps C - F for Pump 2.
8. Check to determine if system pressure remains stable. Failure to maintain stable pressure may indicate an improperly operating check valve, system leakage or entrapped air.
9. Turn all H/O/A switches to the "AUTO" position. The system is now operating in the fully automatic mode. All control devices can be exercised and adjusted to field conditions if necessary.
10. The system is now ready for unattended automatic operation. The isolation valves must be left fully open. The small suction and discharge pressure gauge ball valves must be adjusted to dampen out gauge fluctuations (and prolong gauge life), but must not be turned fully off or the differential pressure switch will not monitor pressure changes.

Pump Package

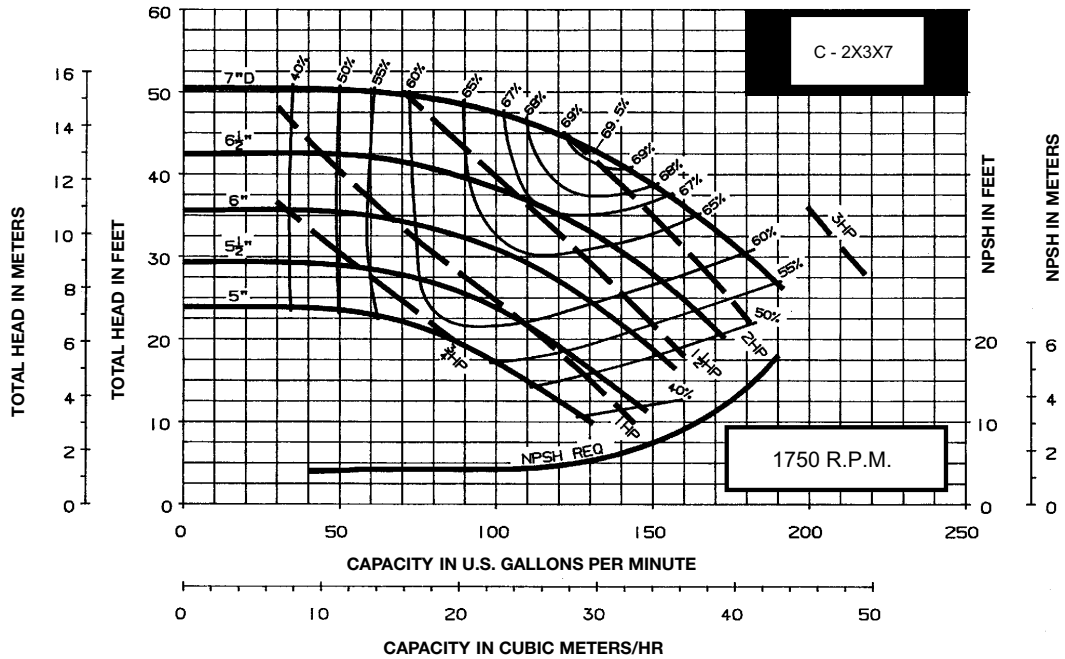


Figure 42 C - Pump Curves Before Impeller Trim

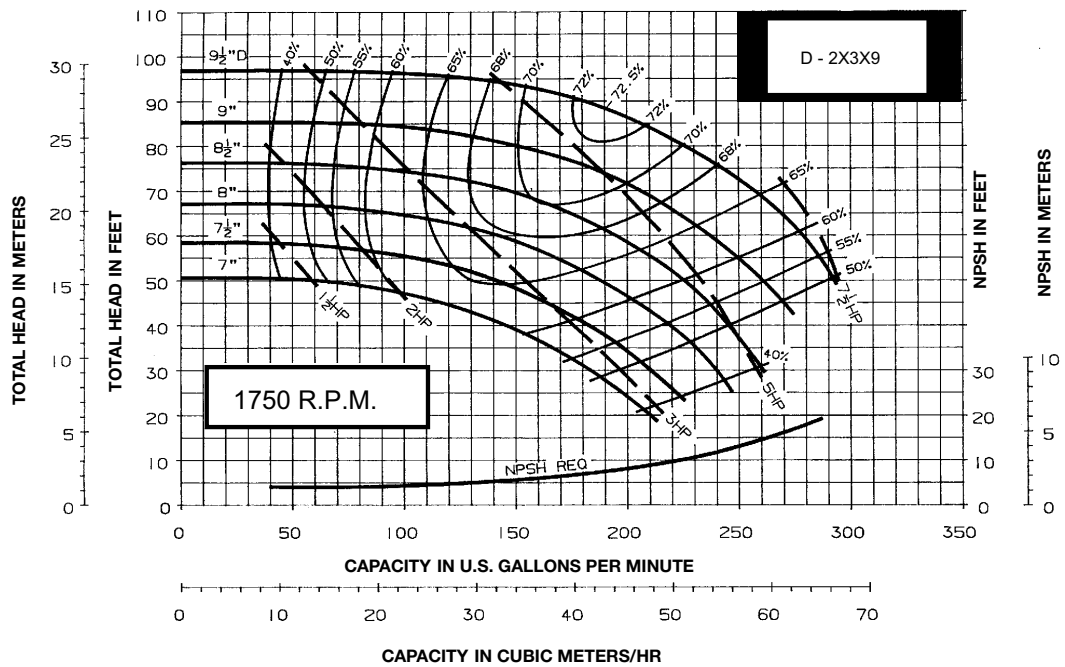


Figure 43 D - Pump Curves Before Impeller Trim

Pump Package

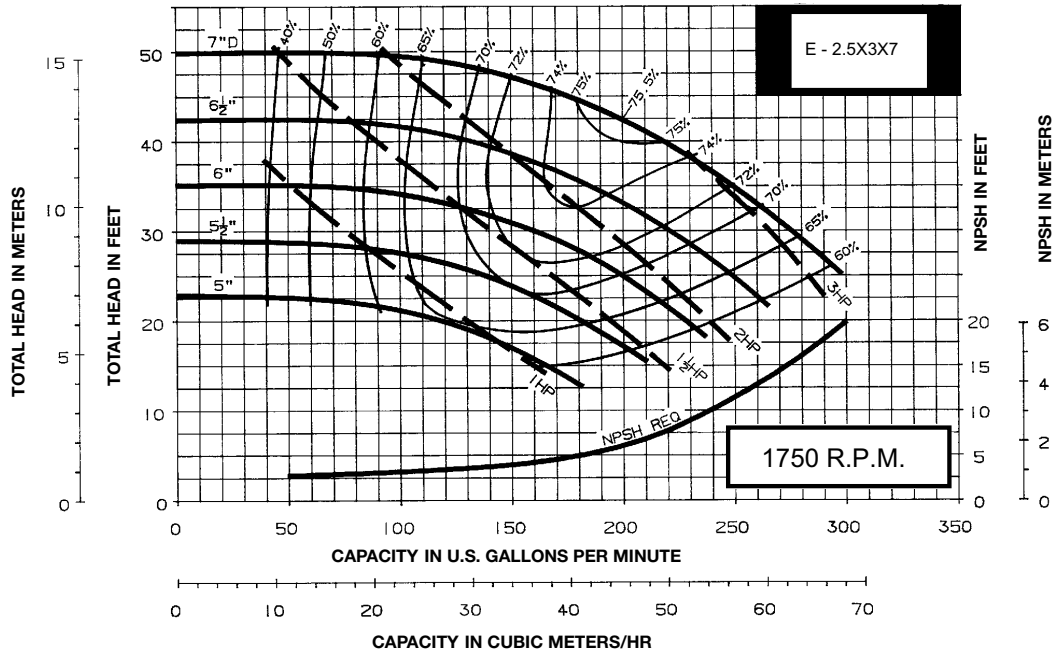


Figure 44 E - Pump Curves Before Impeller Trim

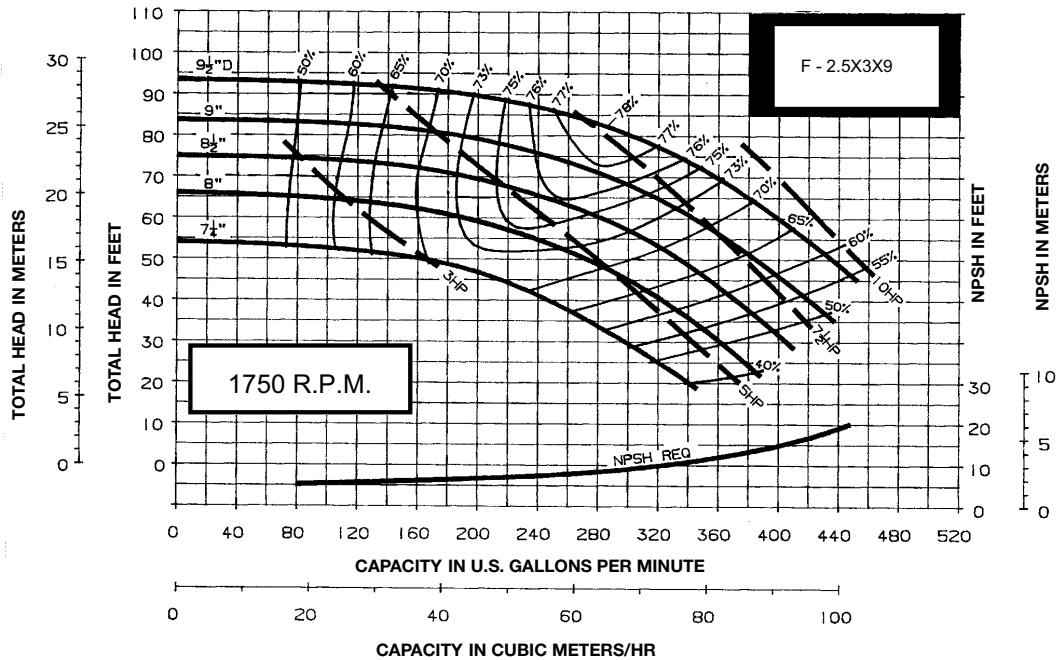


Figure 45 F - Pump Curves Before Impeller Trim

Pump Package

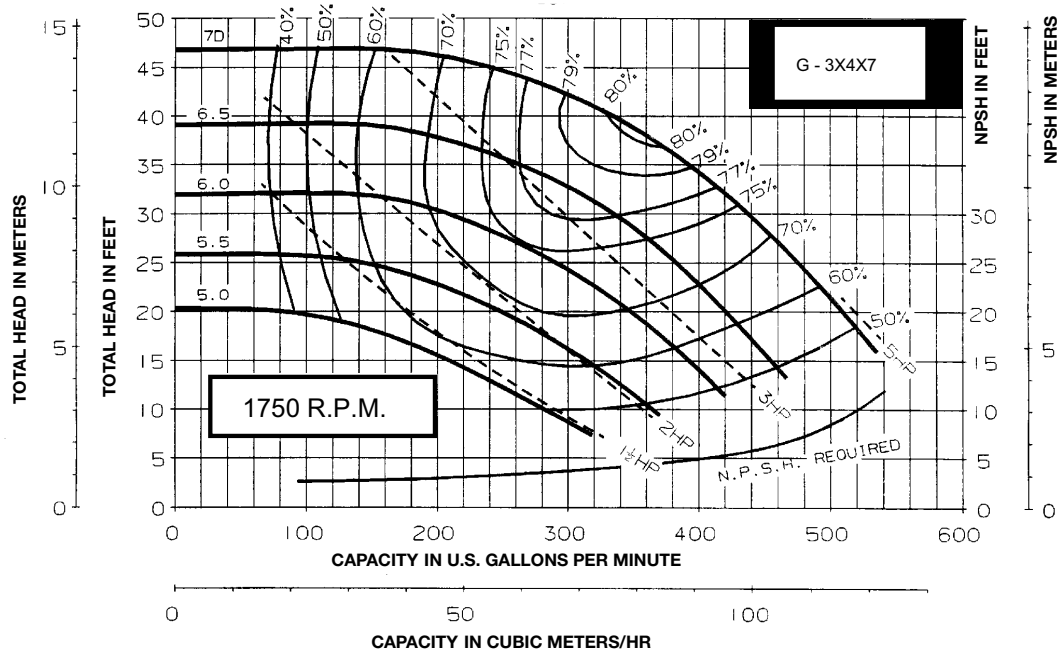


Figure 46 G - Pump Curves Before Impeller Trim

Planned Shutdown

1. Temporary - for short periods under normal ambient conditions, the unit may be shut down by merely turning all H/O/A switches and disconnect(s) to the "OFF" position. Before reactivating the system, each motor shaft should be turned by hand to see that they rotate freely, and the pump seal chambers should be re-bled of any air that may have collected in the system.
2. Long Periods - For extended periods of inactivity, or if freezing conditions will exist, the unit should be isolated and drained of liquid. Remove vent and drain plugs from pumps and blow out all liquid passages and pockets with compressed air.
3. All electrical disconnects should be turned off. The complete start up procedure should be followed when placing the unit back in service.

Maintenance

Periodic maintenance requirements are minimal. If water contains dirt or minerals, the y-strainers should occasionally be cleaned.

The mechanical seals used on pumps do not require periodic maintenance. The electric motors are equipped with bearing grease fittings. In the absence of specific instruction on the motor, these fittings should be greased every six months, with relief plug removed.

Pump Package

Troubleshooting

Table 21 Pump Package Troubleshooting

Problem	Possible Cause
Pumps will not run in hand or auto	Power to panel is disconnected
	Panel disconnect is in off position
	Overload relay tripped
	Control circuit fuses blown
	Loose connection on power circuit
	Motor fuses blown
Motor runs hot	High flow resulting in high amp draw
	Incorrect supply voltage
Noisy Pump/Motor	Motor bearings worn
	Pump impeller clogged
	Inadequate suction pressure
	Piping stress
	Suction valve closed
	Entrapped air
Pump leaks	Mechanical seal damaged
	Casing gasket damaged
	Loose bolts
Inadequate capacity or pressure	Wrong pump rotation
	Suction pressure too low
	Pump or pipe clogged
	Air binding
	Isolation valve closed
	Check valve not holding
Pump operates then stops	Check panel safety features such as
	Differential pressure switch failure
	Differential pressure switch misadjusted
	Remote start/stop signal cycling
Excess system pressure	Triple duty valve not set correctly

Pump Package

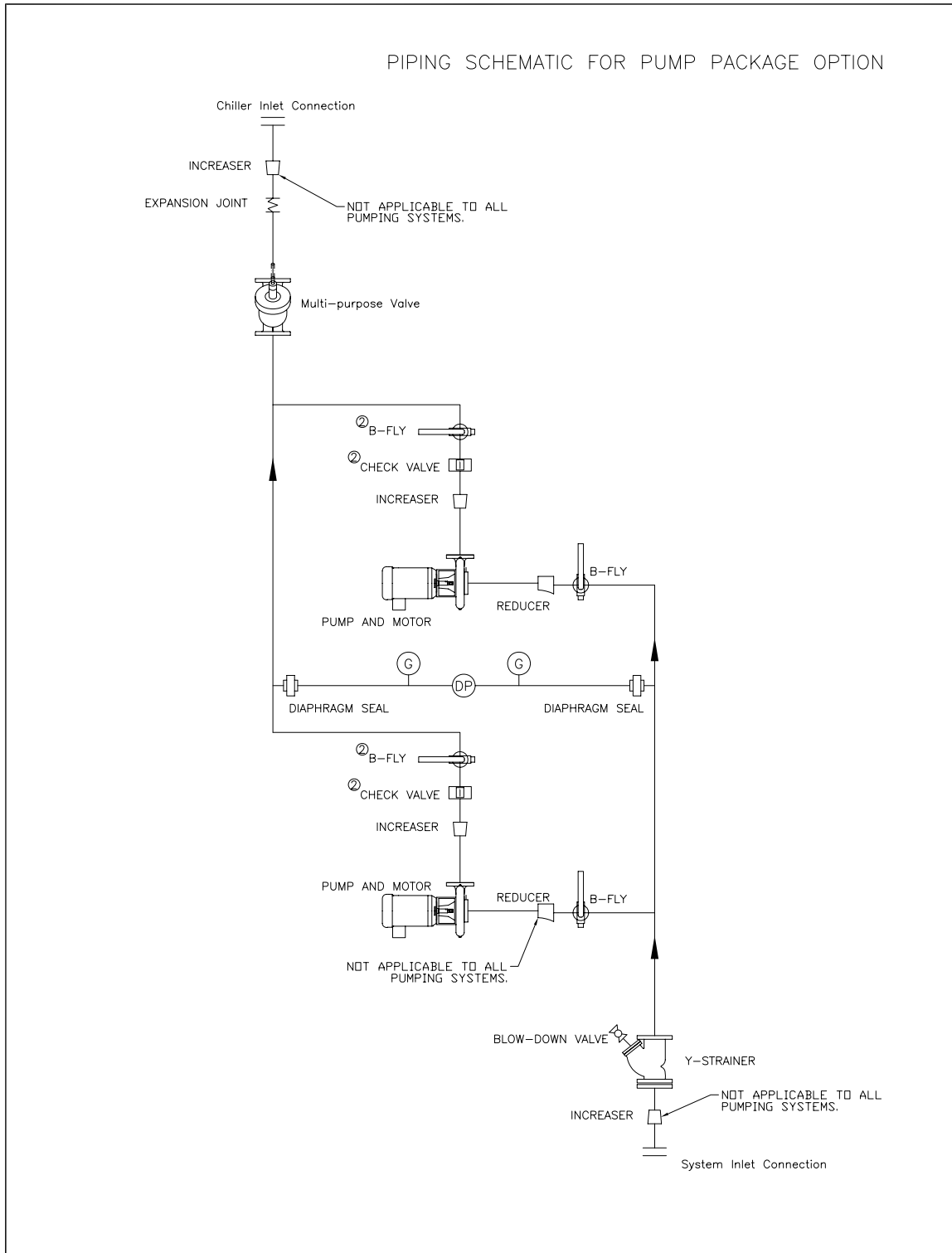


Figure 47 Pump Package Piping Schematic



Pump Package

Unit Wiring

Typical field connection diagrams, electrical schematics and connection diagrams for 70 -125 Ton RTAA units of "AO" design sequence are shown on the following pages.

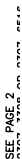
NOTE: The typical wiring diagrams in this manual are representative of "AO" design sequence units and are provided only for general reference. These diagrams may not reflect the actual wiring of your unit. For specific electrical connection and schematic information, always refer to the wiring diagrams which were shipped with your unit.

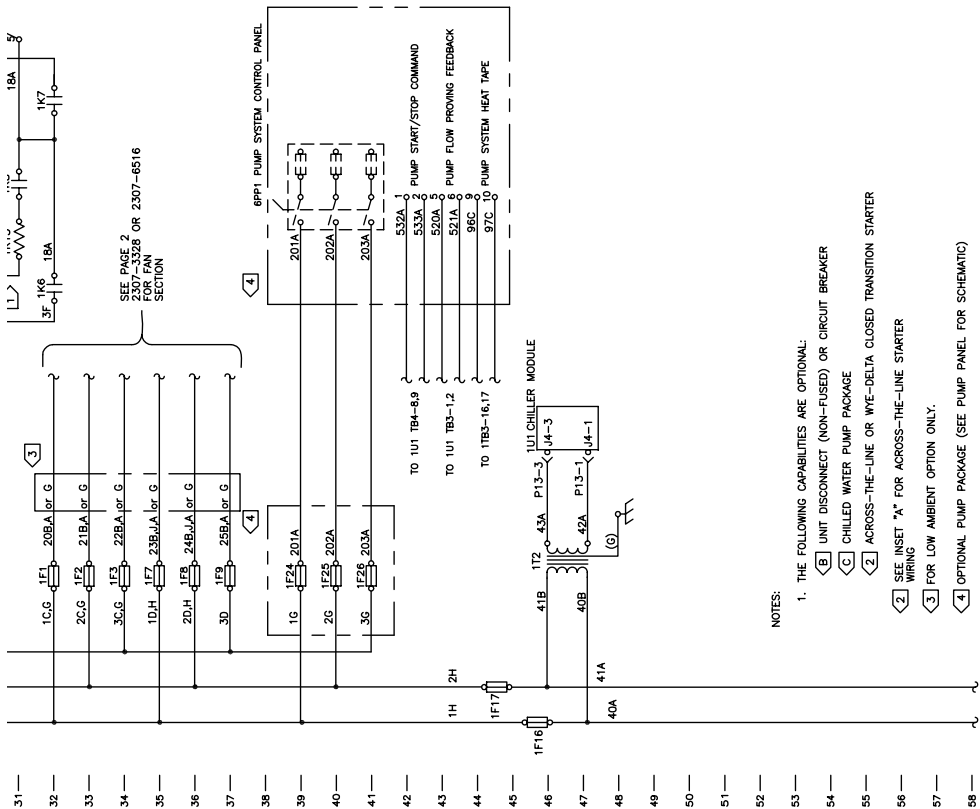
Unit Electrical Data

To determine the specific electrical characteristics of a particular chiller, always refer to the nameplates mounted on the unit..

Table 22 Legend

Drawing Number	Description	Page
2307-3327	Schematic Page 1	146
2307-3328	Schematic Page 2 - Low Ambient	148
2307-6516	Schematic Page 2 - Std Ambient	150
2307-3329	Schematic Page 3 - Package Units	152
2307-6472	Schematic Page 3 - Remote Evap Units	154
2307-3330	Schematic Page 4 - Package Units	156
2307-6046	Schematic Page 4 - Remote Evap Units	158
2307-3331	Schematic Page 4 - Package Units Low Ambient	160
2307-6519	Schematic Page 4 - Package Units Std Ambient	162
2307-6047	Schematic Page 5 - Remote Evap Units	164
2307-3325	Field Wiring Page 1 - Package Units	166
2307-6048	Field Wiring Page 1 - Remote Evap Units	168
2307-6543	Field Wiring Page 2 - Package Units	170
2307-3326	Component Location	172
2307-6049	Component Location - Remote Evap (Outside)	174
2307-6463	Component Location - Remote Evap (Inside)	176





REPLACES	2D CAD	FILE NUMBER	DRAWING NUMBER	REV
REVISION DATE	THIS TRANE COMPANY		2307-3327	J
DRAWN BY	A DIVISION OF AMERICAN STANDARD INC.		HELICAL ROTOR HERMETIC LIQUID CHILLER	
DATE	THE DESIGN IS THE PROPERTY OF THIS TRANE COMPANY. IT IS TO BE USED ONLY FOR THE DESIGN OF THE SAME EQUIPMENT OR FOR THE REPAIR OF THE SAME EQUIPMENT.		SERIES "R" AIR COOLED CHILLER SCHEMATIC WIRING RTAA 70-125 TON SHEET 1 OF 5	
1-20-93	SIMILAR TO			

WARNING

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT TAG PROCEDURES BEFORE WORKING ON THE UNIT. MOTOR CAPACITORS HAVE DISCHARGED STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE: REFER TO DRIVE DISCHARGE INSTRUCTIONS ON DRIVE CONTROLS. FAILURE TO DO THE ABOVE BEFORE SERVICING COULD RESULT IN DEATH OR SERIOUS INJURY.

AVERTISSEMENT

TENSION DANGEREUSE!

COUPER TOUTES LES TENSIONS ET OUVRIR LES SECTIONNEURS A DISTANCE. DESERVICES LES CONDENSEURS ET VERROUILLEZ ET DES ETIQUETTES AVANT TOUTE INTERVENTION. VERIFIER QUE TOUTS LES CONDENSEURS DES MOTEURS SONT DECHARGES AVANT TOUTE INTERVENTION. POUR LES UNITES A VITESSE VARIABLE, SE REPORTER AUX INSTRUCTIONS DE L'ENTRAINEMENT POUR DECHARGER LES CONDENSEURS. NE PAS RESPECTER CES MESURES DE SECURITE PEUT CAUSER LA MORT OU DES BLESSURES GRAVES POUVANT ETRE MORTELLES.

ADVERTENCIA

VOLTAJE PELIGROSO!

DESCONECTE TODA LA ENERGIA ELECTRICA, INCLUIDO LAS DESCONEXIONES REMOTAS Y SIGA LOS PROCEDIMIENTOS DE BLOQUEO Y ETIQUETADO ANTES DE PROCEDER AL SERVICIO. ASEGURESE DE QUE TODOS LOS CAPACITORES DEL MOTOR HAYAN SIDO DESCARGADOS ANTES DE EMPEZAR EL TRABAJO. PARA LAS UNIDADES CON EJE DE DIRECCION DE VELOCIDAD VARIABLE, CONSULTE LAS INSTRUCCIONES PARA LA DESCARGA DEL CONDENSADOR. NO RESPETAR ESTAS MEDIDAS DE SEGURIDAD PUEDE CAUSAR LA MUERTE O SERIAS LESIONES PERSONALES.

CAUTION

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.

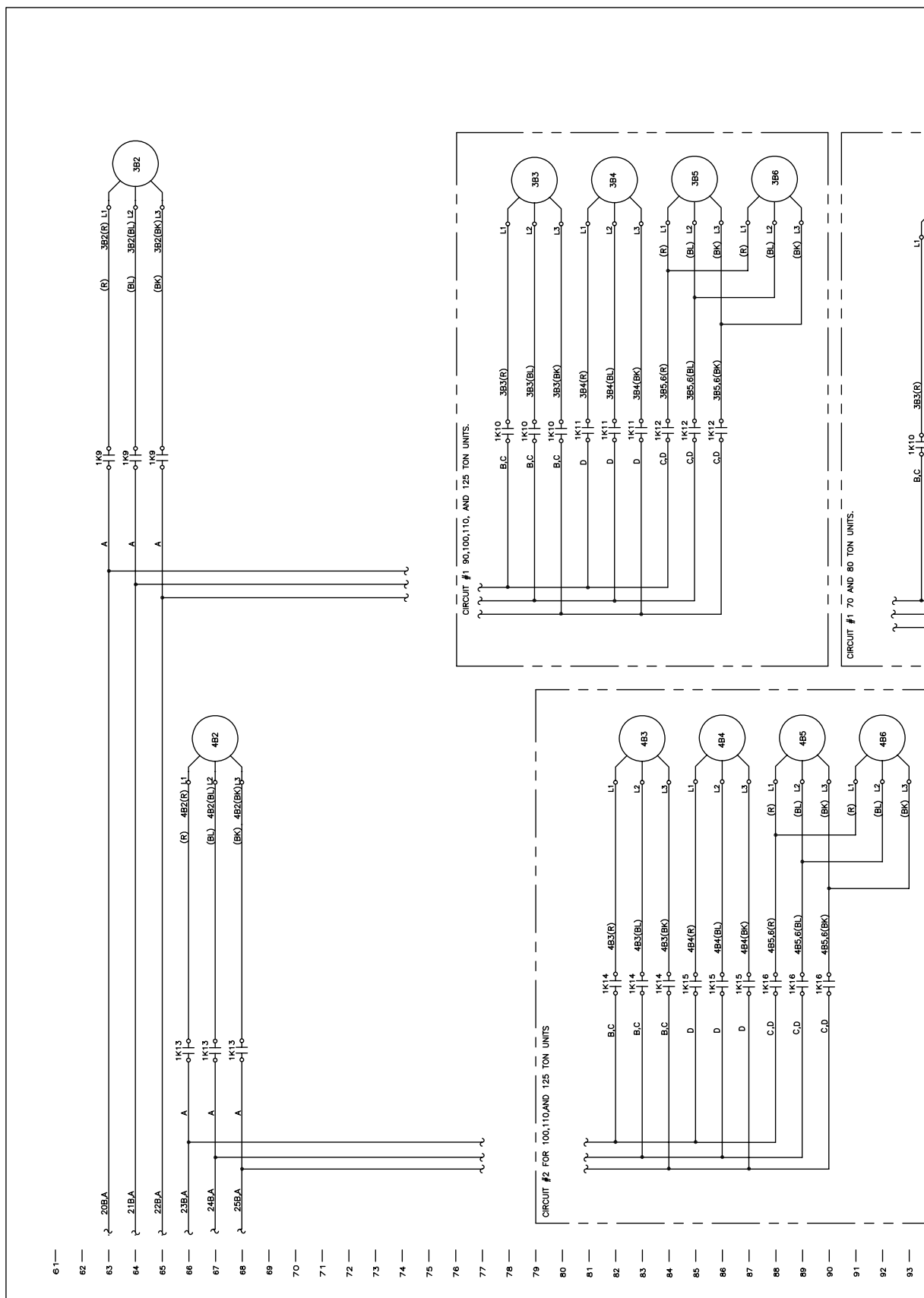
ATTENTION

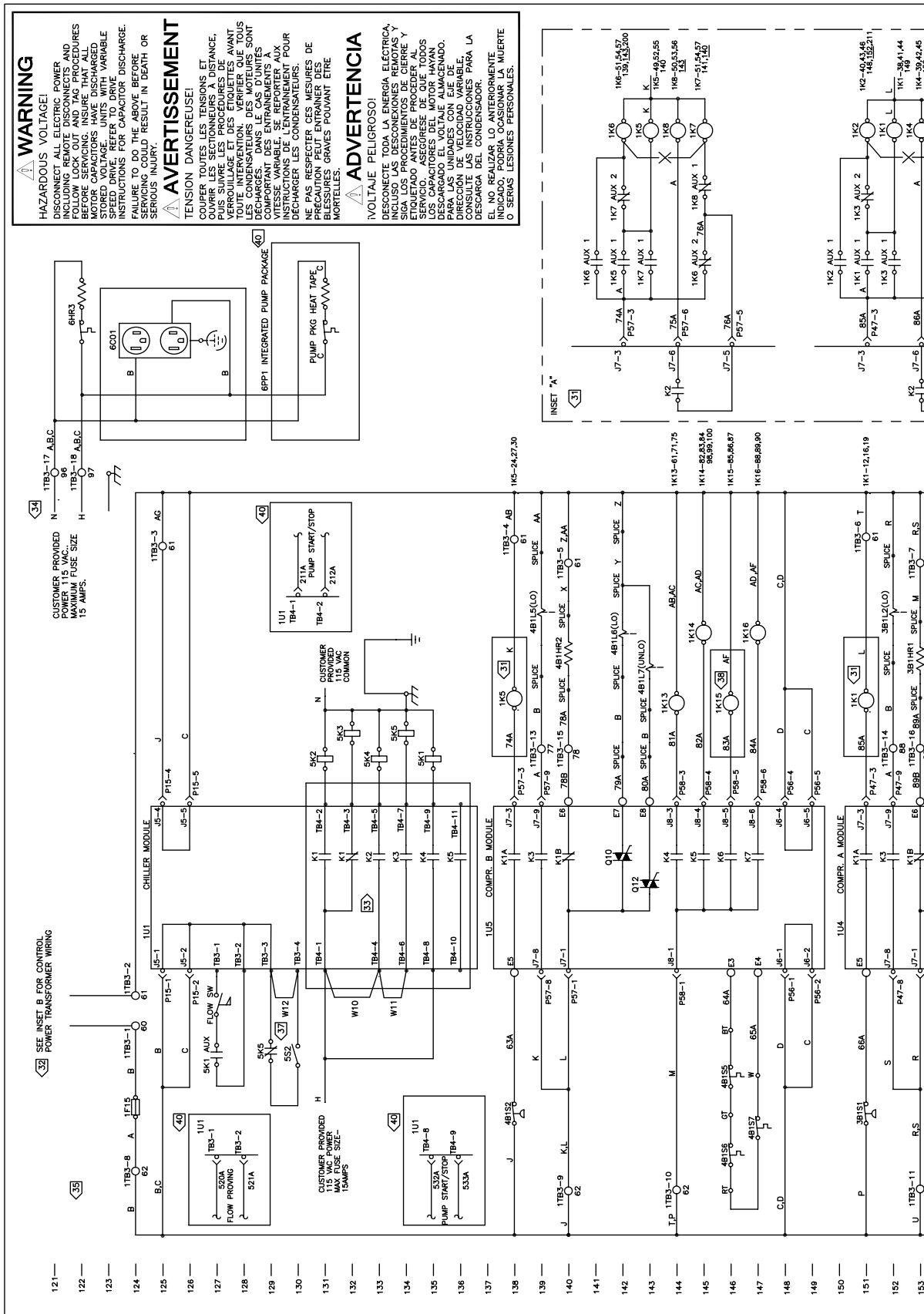
N'UTILISER QUE DES CONDUCTEURS EN CUIVRE!
LES BORNES DE L'UNITE NE SONT PAS CONÇUES POUR RECEVOIR D'AUTRES TYPES DE CONDUCTEURS. L'USAGE DE TOUT AUTRE CONDUCTEUR PEUT ENDOMMAGER L'EQUIPEMENT.

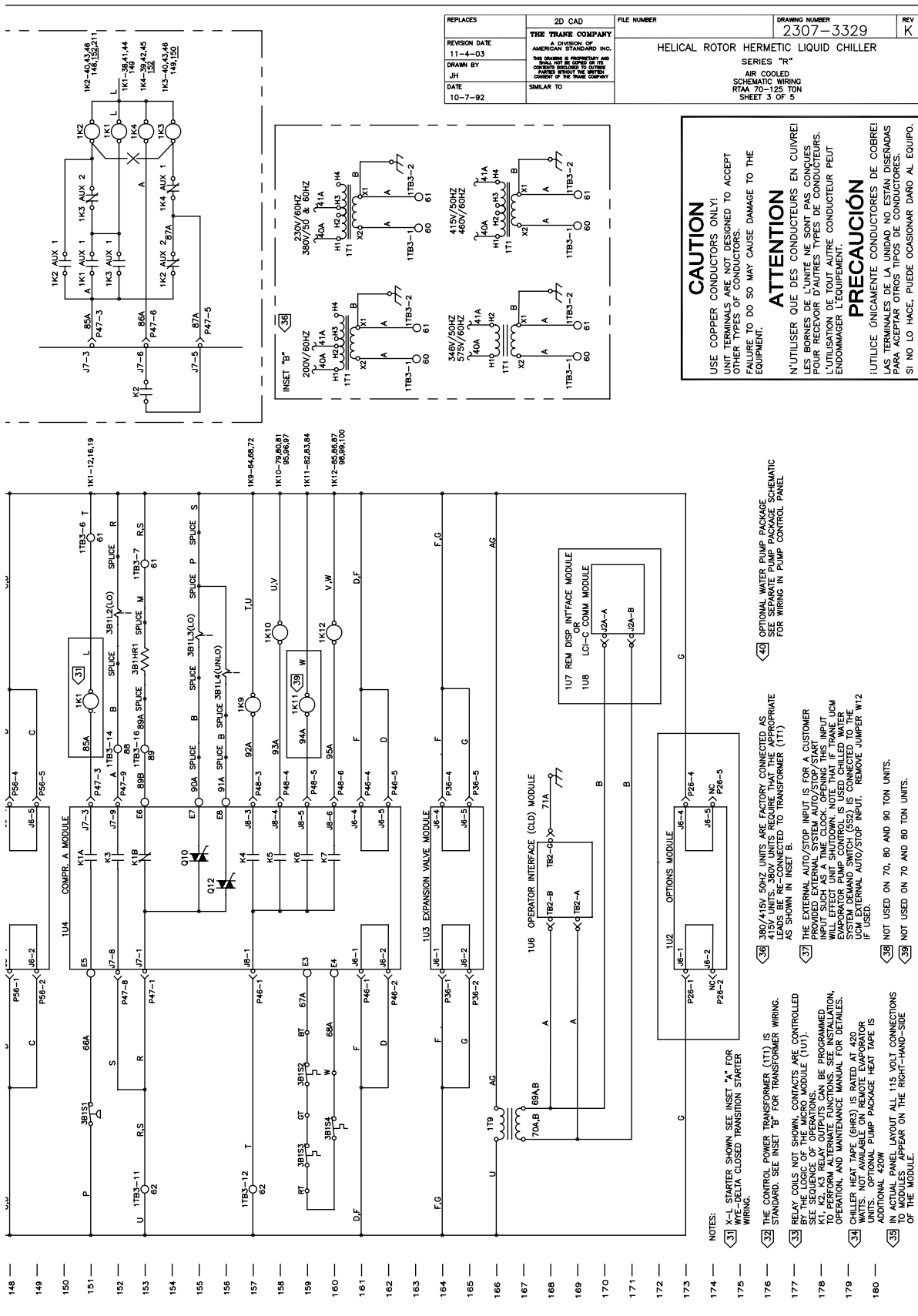
PRECAUCIÓN

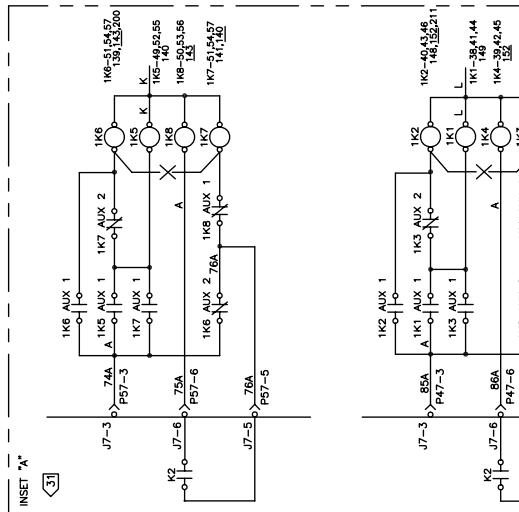
¡UTILICE ÚNICAMENTE CONDUCTORES DE COBRE!
LAS TERMINALES DE LA UNIDAD NO ESTÁN DISEÑADAS PARA ACEPTAR OTROS TIPOS DE CONDUCTORES. SI NO LO HACE, PUEDE OCASIONAR DAÑO AL EQUIPO.

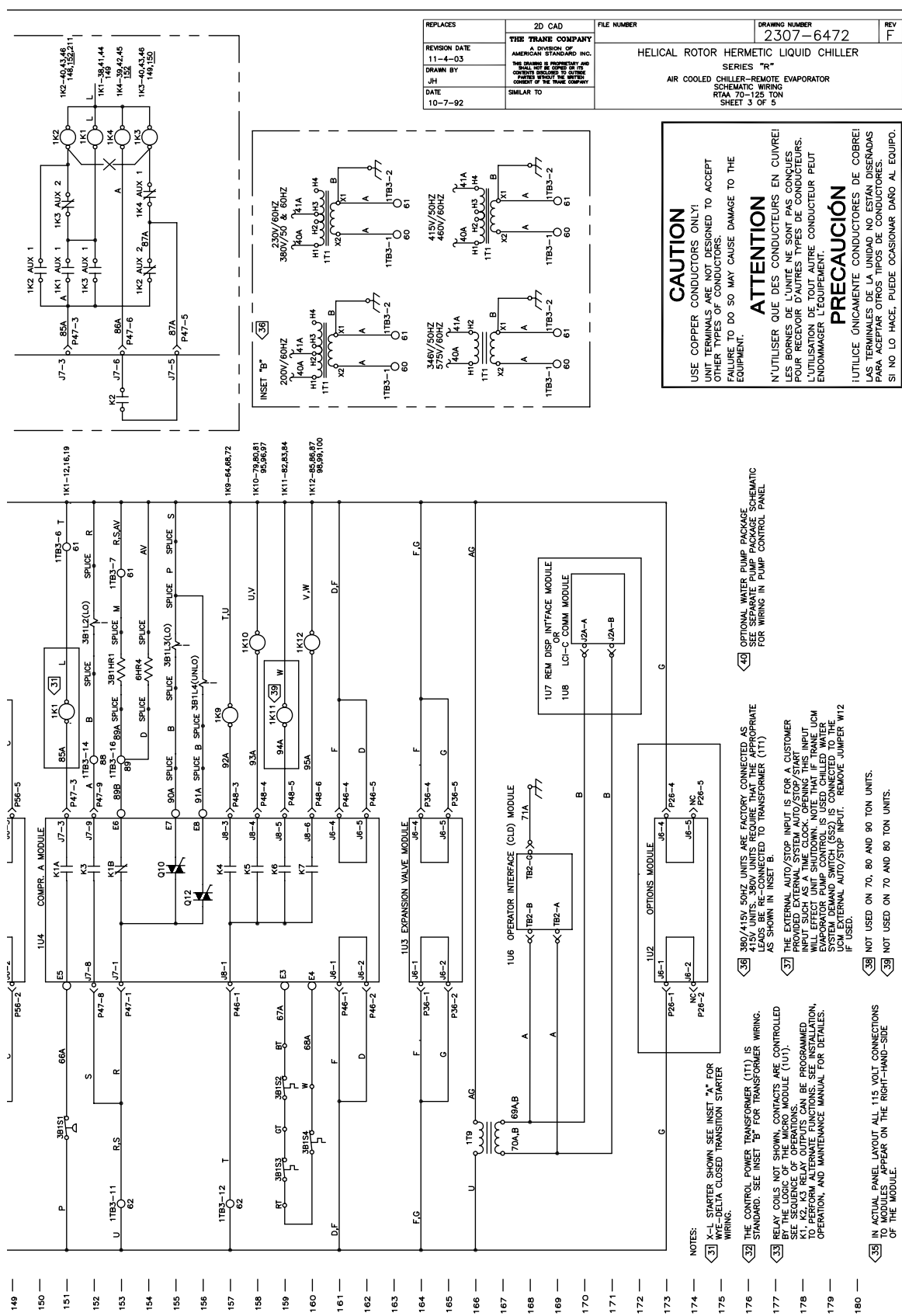


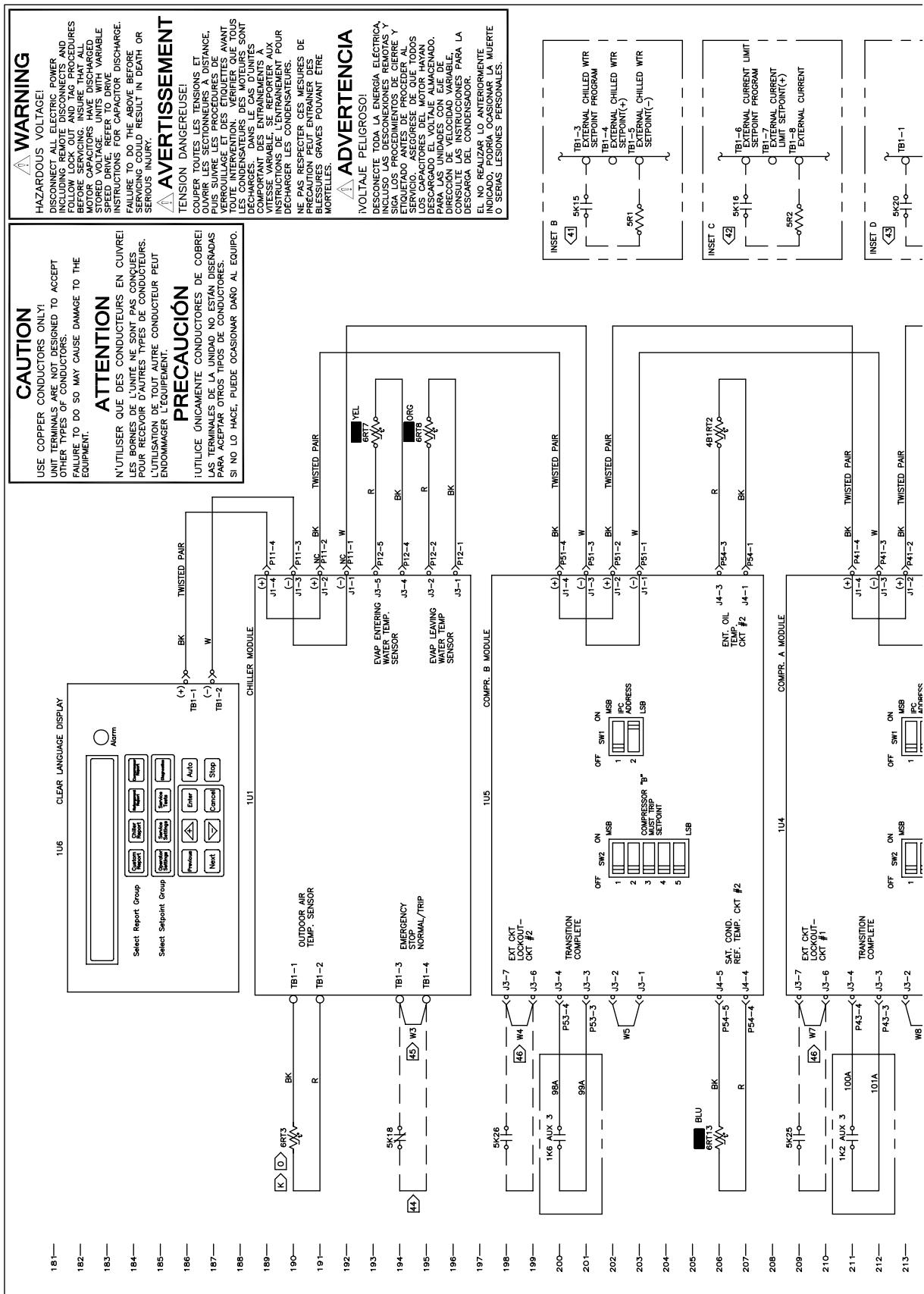


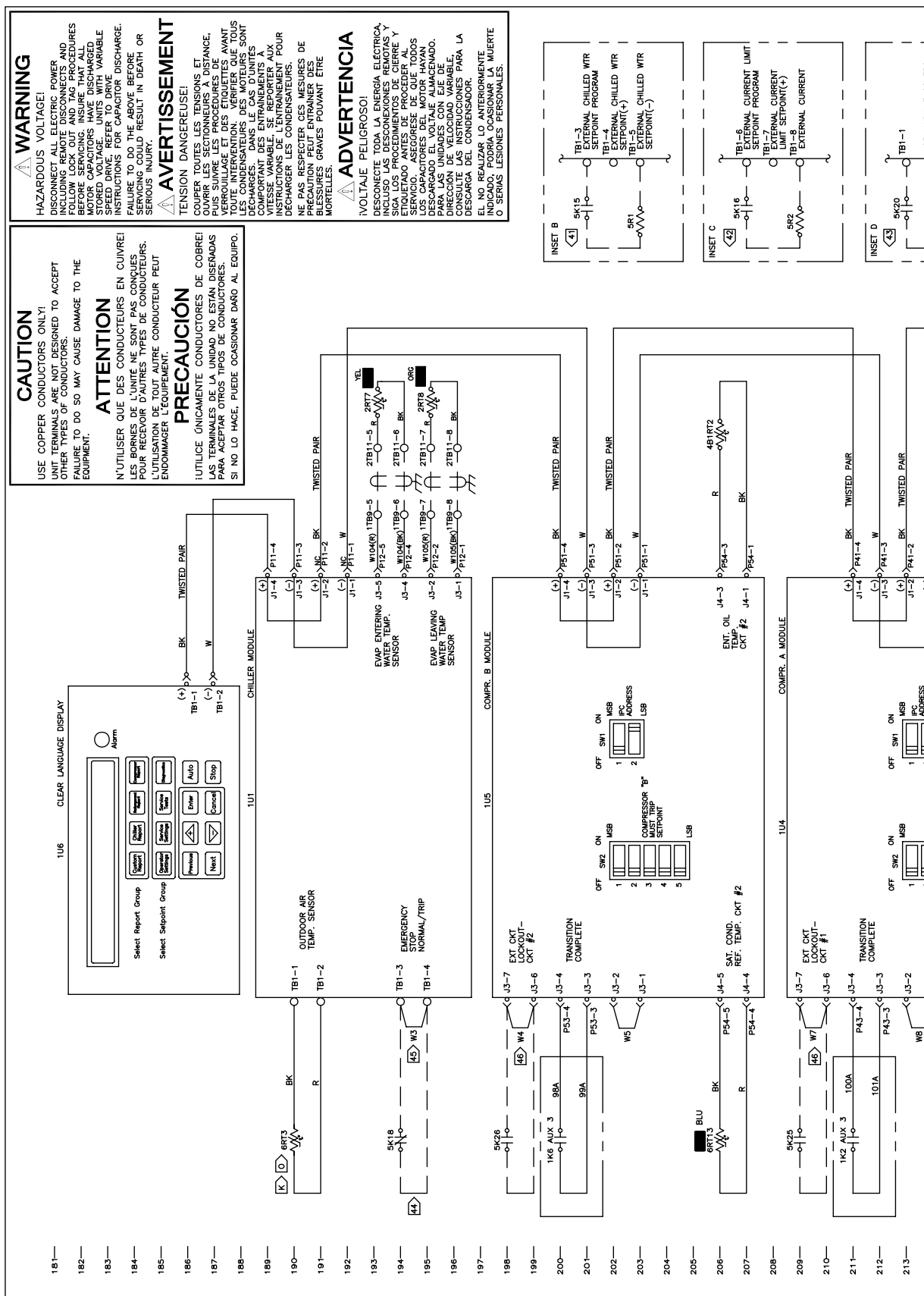


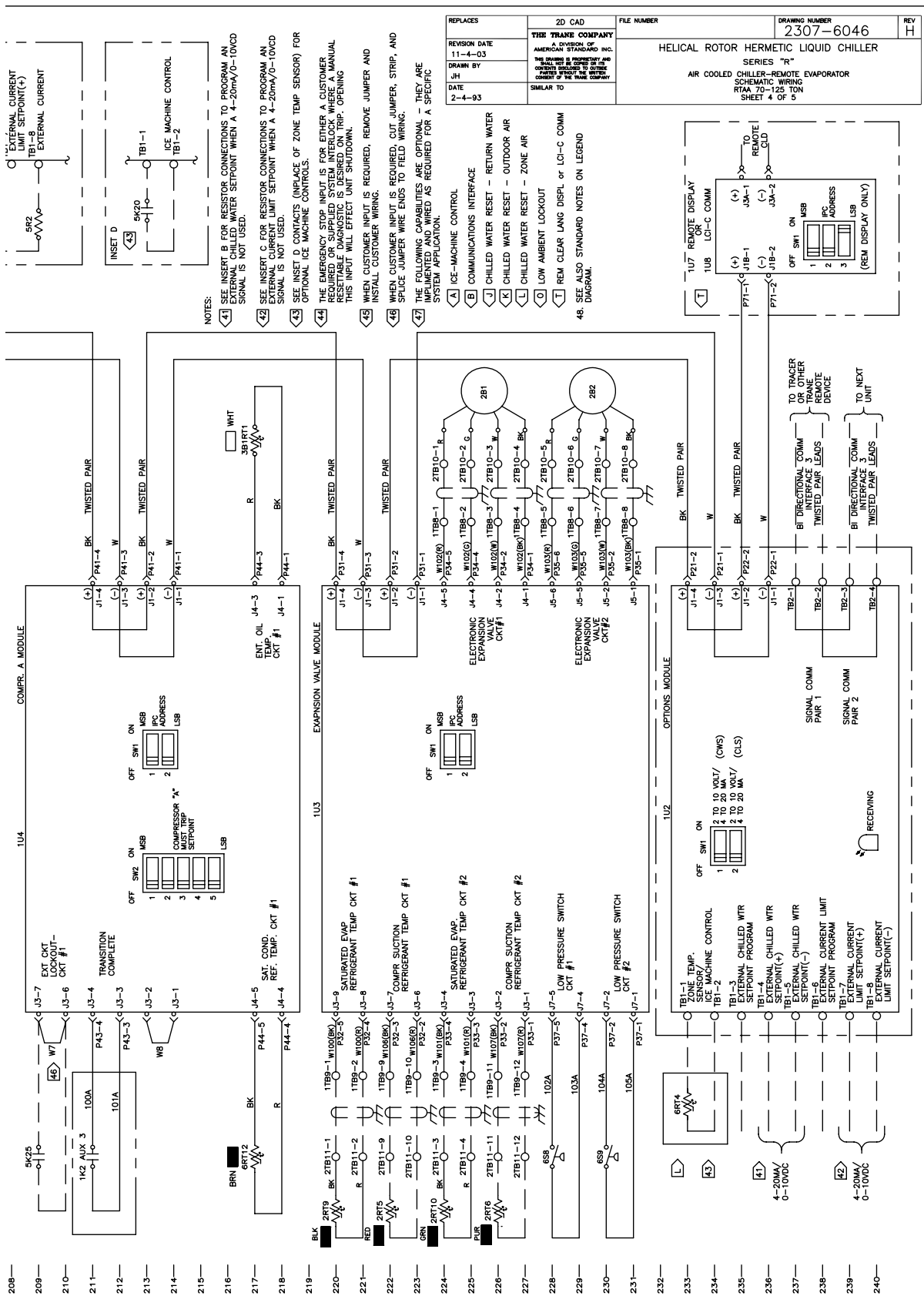












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Other Modes include:	Running	Current limit
Running	Exhaustor	Running
Local	Condenser	Limit
Source:		

120 Sec (min)

Transition (if applicable)

Exhaustor at Min. Load

Exhaustor turned Off

Chilled Water Temp at 1.5 F or more above setpoint

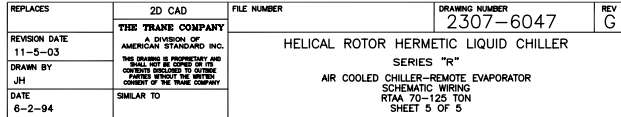
Running Contact

Speed Fns

Compr / Ckt

Exhaust Control

UNIT SEQUENCE OF OPERATION



NOTES:

1. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. PHANTOM LINES INDICATE ALTERNATE CIRCUITRY OR AVAILABLE SENSE OPTIC CABLE SIZES OPTION TO DETERMINE IF WIRING IS REQUIRED FOR SPECIFIC OPTIONS.
 2. ALL THREE PHASE MOTORS SUPPLIED WITH THE UNIT ARE PROTECTED UNDER PRIMARY SINGLE FAULTLINE CONDITIONS.
 3. CAUTION - DO NOT ENERGIZE UNIT UNTIL CHECK OUT AND START-UP PROCEDURES HAVE BEEN COMPLETED.
 4. USE INSERT "AT" FOR RESISTOR CONNECTIONS TO PROGRAM AN EXTERNAL CHILLED WATER SETPOINT WHEN 4 - 20 mA OR A 2 - 10 VDC SIGNAL IS NOT USED. SEE THE OPERATORS MANUAL FOR RESISTOR VALUES.
 5. USE INSERT "BT" FOR RESISTOR CONNECTIONS TO PROGRAM AN EXTERNAL CURRENT LIMIT SETPOINT WHEN 4 - 20 mA OR A 2 - 10 VDC SIGNAL IS NOT USED. SEE THE OPERATORS MANUAL FOR RESISTOR VALUES.
 6. USE INSERT "CT" FOR CONTACTS (IN PLACE OF THE ZONE TEMP. SENSOR) FOR OPTIONAL ICE MACHINE CONTROL - OPTION "A".
7. THE FOLLOWING CAPABILITIES ARE OPTIONAL - THEY ARE IMPLEMENTED AND WIRED AS REQUIRED FOR A SPECIFIC SYSTEM APPLICATION.
- | | |
|---|---|
| A | ICE-MACHINE CONTROL |
| B | COMMUNICATIONS INTERFACE |
| D | WYE-DELTA CLOSED TRANSITION STARTER. |
| H | UNIT DISCONNECT, NON-FUSED OR CIRCUIT BREAKER |
| J | CHILLED WATER RESET - RETURN WATER |
| K | CHILLED WATER RESET - OUTDOOR AIR |
| O | LOW AMBIENT FLOWOUT |
| S | CHILLED WATER FLOW SWITCH (NOT REQUIRED FOR CHILLER PROTECTION) |
| T | REMOTE CLEAR LANGUAGE DISPLAY |
| U | LO-COM INTERFACE (CANNOT BE USED WITH OPT B,K,L,T) |
| V | TRANE INTEGRATED PUMP PACKAGE |

CONTROL WIRE SELECTION FOR 30V AND LESS CIRCUITS.	
WIRE SIZE	MAXIMUM LENGTH FOR SENSOR LEADS.
14 AWG	5000 FEET
16 AWG	2000 FEET
18 AWG	1000 FEET

WIRING AND CONTACT REQUIREMENTS

20. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC), STATE AND LOCAL REQUIREMENTS, OUTSIDE THE UNITED STATES, OTHER COUNTRIES APPLICABLE NATIONAL AND/OR LOCAL REQUIREMENTS SHALL ~~APPLY~~ **APPLY**. THE HEAT TAPES MUST BE POWERED FROM A SEPARATE CUSTOMER
21. WIRING NOT REQUIRED WITH OPTIONAL TRANS INTEGRATED PUMP PACKAGE (EVAP PUMP POWER, CONTROL, AND FLOW SWITCH WILL BE FACTORY WIRED)
22. PROVIDED 115 VAC, 420 WATT SOURCE FOR 200/230/460/575 60HZ UNITS, 220 VAC 420 WATT SOURCE FOR 380/415 50HZ UNITS. IF OPTIONAL TRANS INTEGRATED PUMP PACKAGE IS INSTALLED, POWER IS 500W TOTAL
23. CUSTOMER SUPPLIED CONTACTS MUST BE COMPATIBLE WITH DRY CIRCUIT 120VDC, 45mA RESISTIVE LOAD, SILVER OR GOLD PLATED CONTACTS ARE RECOMMENDED.
24. 30 VOLT OR LESS CIRCUIT, DO NOT RUN IN CONDUCT WITH HIGHER VOLTAGE CIRCUITS, USE #14-18 AWG, SEE SELECTION TABLE.
25. MINIMUM PILOT DUTY CONTACT RATING AT 115 VAC, 6.9VA INRUSH, 1.3VA SEALED.
26. FIELD WIRE ELECTRICAL LOADING IS NOT TO EXCEED THE FOLLOWING RATINGS:

TERMINALS	DEVICE	VOLTAGE	SEALED VA	INRUSH VA
1U1-TB4-1,2	1U1K1,NO	115	180	1150*
1U1-TB4-3	1U1K1,NC	115	180	1150*
1U1-TB4-5,4	1U1K2,NO	115	180	1150*
1U1-TB4-6,7	1U1K3,NC	115	180	1150*
1U1-TB4-8,9	1U1K2,NO	115	250	1150*
1U1-TB4-10,11	1U1K3,NC	115	180	1150*

- * STANDARD PILOT DUTY RATING (35% POWER FACTOR).
- 27 IF EXTERNAL CIRCUIT LOCKOUT IS USED ON CKT 1 CUT JUMPER W# ON CIRCUIT #1 AND JUMPER 46B ON CIRCUIT #2. THE INDIVIDUAL CUTS OF THE JUMPER FOR CIRCUIT #2 CUT JUMPER W# AND SPICE 46A AND 46B TO THE INDIVIDUAL CUTS OF THE JUMPER.
- 28 CHILLED WATER PUMP CONTROL FROM TRANSIT UCM MODE: CHILLED WATER PUMP OPERATES TO MAINTAIN A MINIMUM OF 1 MINUTE AFTER A COMMAND TO TERMINATE CHILLER OPERATION (UCM WILL PROVIDE TIME DELAY CONTACTS). CHILLED WATER SYSTEM DEMAND SWITCH (SS2) IS CONNECTED TO THE CHILLER AUTO STOP.
- 29 AS SHIPPED 380/415 VOLT UNIT TRANSFORMER T11-(OPTIONAL) IS WIRED FOR 415 VOLT OPERATION. IF UNIT IS TO BE OPERATED ON A 380 VOLT POWER SUPPLY, THE TAP AS SHOWN ON THE TRANSFORMER MUST BE CHANGED TO THE 380V TAP. SETTING MENU OF CLEAR LANGUAGE DISPLAY FROM 415 TO 380.
- 30 K1, K2, K3 RELAY OUTPUTS CAN BE PROGRAMMED TO PERFORM ALTERNATE FUNCTIONS. SEE INSTALLATION, OPERATION, & MAINTENANCE MANUAL FOR DETAILS, FUNCTION #1 IS SHOWN.

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.

N'UTILISER QUE DES CONDUCTEURS EN CUIVRE!

LES BORNES DE L'UNITÉ NE SONT PAS CONÇUES
POUR RECEVOIR D'AUTRES TYPES DE CONDUCTEURS.
L'UTILISATION DE TOUT AUTRE CONDUCTEUR PEUT
ENDOMMAGER L'ÉQUIPEMENT.

¡UTILICE ÚNICAMENTE CONDUCTORES DE COBRE!

LAS TERMINALES DE LA UNIDAD NO ESTÁN DISEÑADAS PARA ACEPTAR OTROS TIPOS DE CONDUCTORES. SI NO LO HACE, PUEDE OCASIONAR DAÑO AL EQUIPO.

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING. INSURE THAT ALL MOTOR CAPACITORS HAVE DISCHARGED STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE, REFER TO DRIVE INSTRUCTIONS FOR CAPACITOR DISCHARGE.

FAILURE TO DO THE ABOVE BEFORE SERVICING COULD RESULT IN DEATH OR SERIOUS INJURY.

TENSION DANGEREUSE!

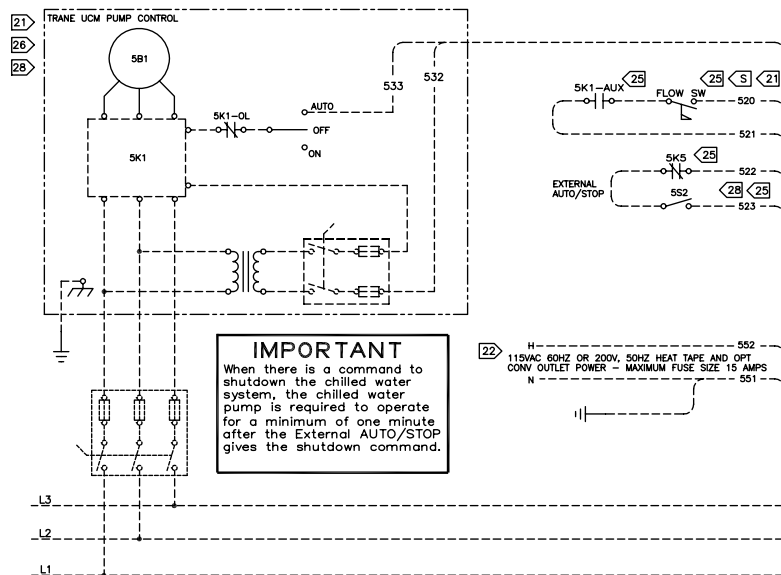
COUPER TOUTES LES TENSIONS ET
OUVRIR LES SECTIONNEURS A DISTANCE,
PUIS SUIVRE LES PROCÉDURES DE
VERROUILLAGE ET DES ÉTIQUETTES AVANT
TOUTE INTERVENTION. VÉRIFIER QUE TOUTS
LES CONDENSATEURS DES MOTEURS SONT
DÉCHARGÉS. DANS LE CAS D'UNITÉS
COMPORTANT DES ENTRAÎNEMENTS
VITESSE VARIABLE, SE REPORTER AUX
INSTRUCTIONS DE L'ENTRAÎNEMENT POUR
DÉCHARGER LES CONDENSATEURS.

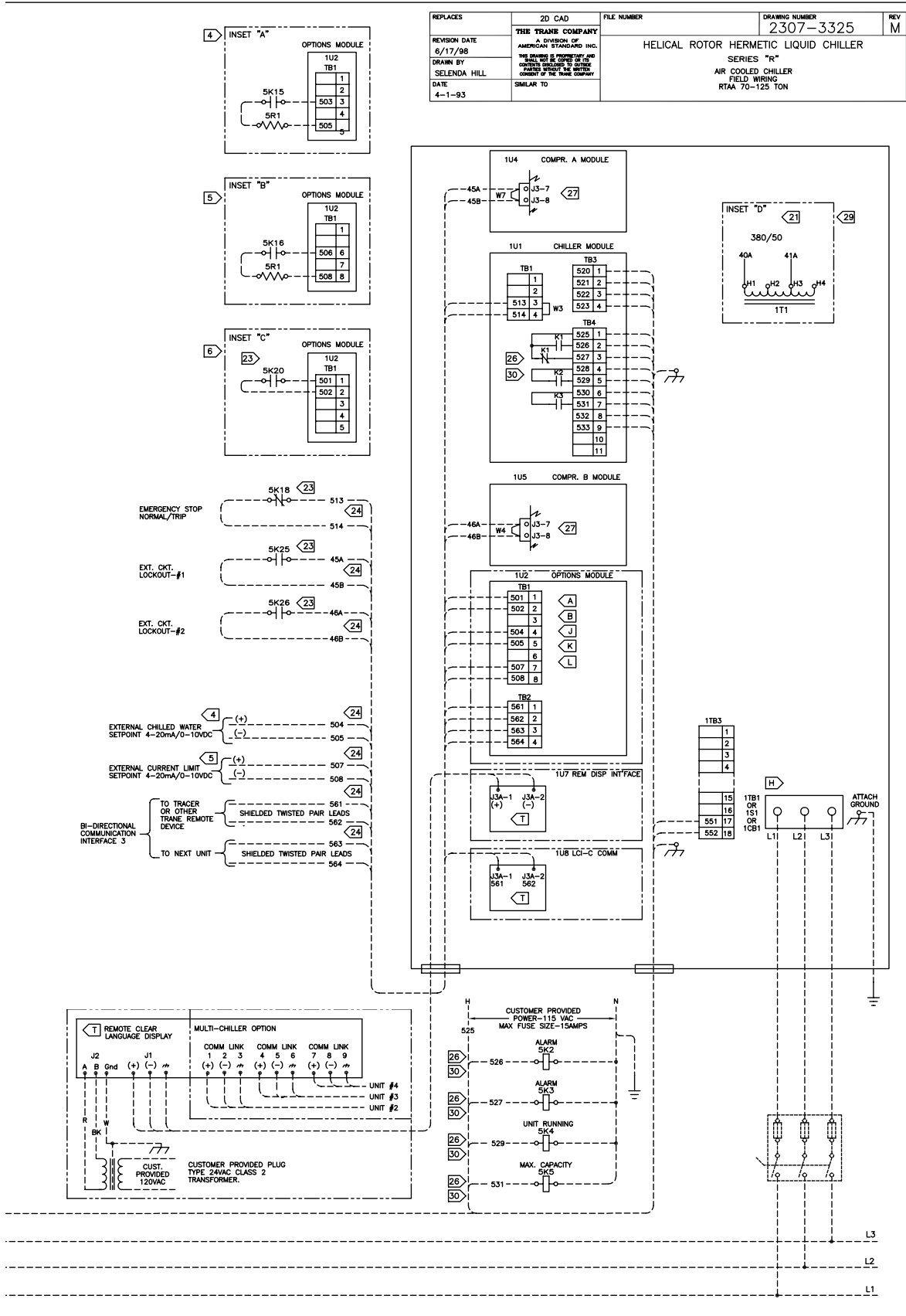
NE PAS RESPECTER CES MESURES DE
PRÉCAUTION PEUT ENTRAÎNER DES
BLESSURES GRAVES POUVANT ÊTRE
MORTELLES.

¡VOLTAJE PELIGROSO!

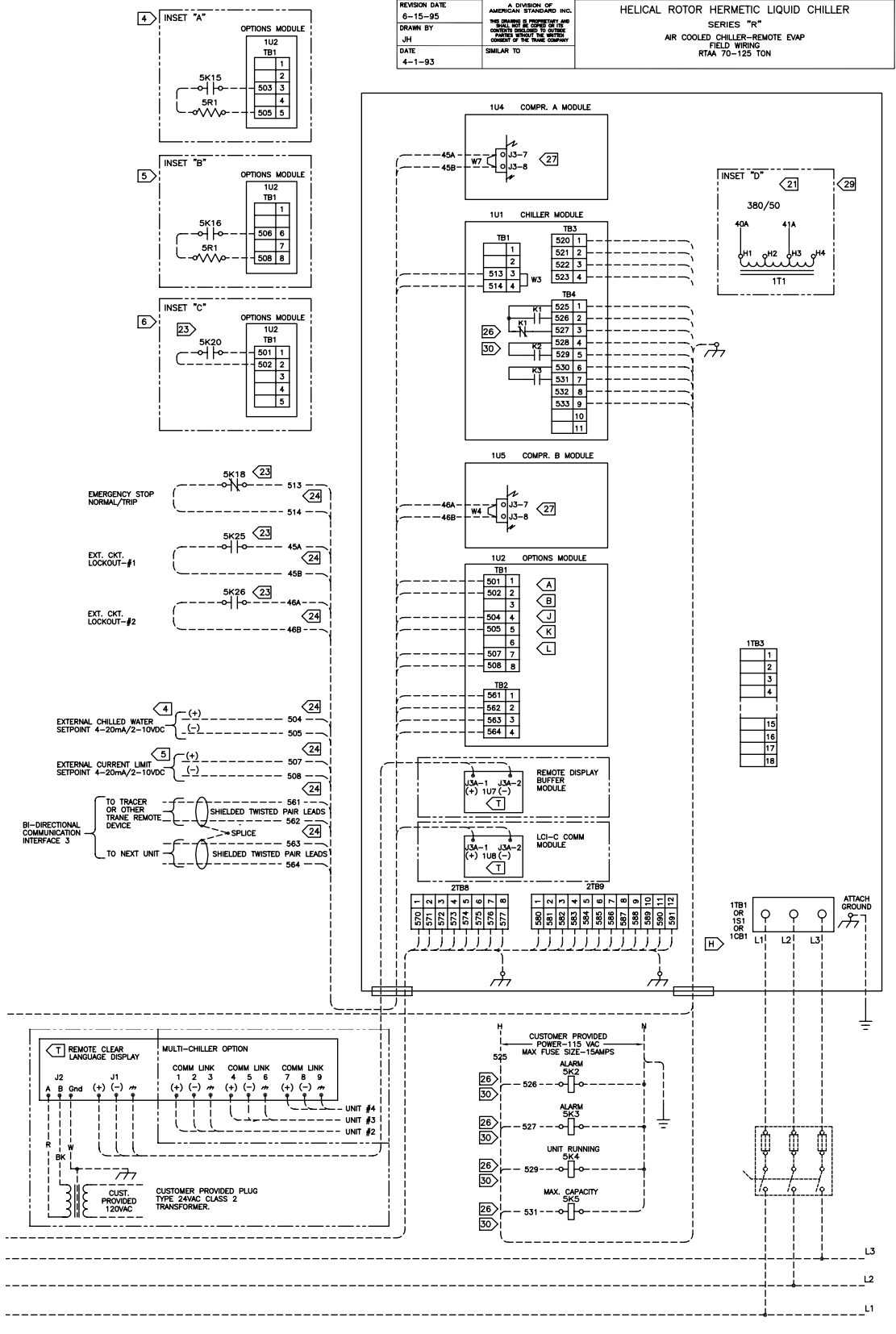
DESCONECTE TODA LA ENERGÍA ELÉCTRICA. INCLUSE LAS DESCONECCIONES REMOTAS Y SIGA LOS PROCEDIMIENTOS DE CIERRE Y ETIQUETADO ANTES DE PROCEDER AL SERVICIO. ASEGURESE DE QUE TODOS LOS CAPACITORES DEL MOTOR HAYAN DESCARGADO EL VOLTAJE ALMACENADO. PARA LAS UNIDADES CON EJE DE DIRECCIÓN DE VELOCIDAD VARIABLE, CONSULTE LAS INSTRUCCIONES PARA LA DESCARGA DEL CONDENSADOR.

EL NO REALIZAR LO ANTERIORMENTE INDICADO, PODRÍA OCASIONAR LA MUERTE O SERIAS LESIONES PERSONALES.





REPLACES	2D CAD	FILE NUMBER	DRAWING NUMBER	REV
	THE TRANE COMPANY		2307-6048	J
REVISION DATE	6-15-95		HELICAL ROTOR HERMETIC LIQUID CHILLER	
DRAWN BY	JH		SERIES "R"	
DATE	4-1-93		AIR COOLED CHILLER-REMOTE EVAP	
			FIELD WIRING	
			RTAA 70-125 TON	



2307-6543
Rev. B

Customer Wire Selection

Power Wire Selection									
Unit Size	Wire Selection Size to Main Terminal Block			Wire Selection Size to Disconnect			Wire Selection Size to Circuit Breaker		
	Rated Voltage	Terminal Size	Connector Wire Range (per phase)	Disconnect Size	Connector Wire Range (per phase)	Circuit Breaker Size	Circuit Breaker Size	Connector Wire Range (per phase)	Factory Installed Option
RTAA 70	200/60	760 Amp	#4 to 500 MCM	400 Amps	Two 3/0 to 500 MCM	400 Amps	400 Amps	Two 3/0 to 500 MCM	
	230/60	310 Amp	#8 to 350 MCM	400 Amps	Two 3/0 to 500 MCM	350 Amps	350 Amps	Two 3/0 to 500 MCM	
	380/60	310 Amp	#8 to 350 MCM	250 Amps	#6 to 350 MCM	250 Amps	250 Amps	#6 to 350 MCM	
	460/60	175 Amp	#14 to 2/0	250 Amps	#6 to 350 MCM	150 Amps	150 Amps	#6 to 350 MCM	
	575/60	175 Amp	#14 to 2/0	250 Amps	#6 to 350 MCM	125 Amps	125 Amps	#6 to 350 MCM	
	400/50	175 Amp	#14 to 2/0	250 Amps	#6 to 350 MCM	150 Amps	150 Amps	#6 to 350 MCM	
RTAA 80	200/60	760 Amp	#4 to 500 MCM	400 Amps	Two 3/0 to 500 MCM	400 Amps	400 Amps	Two 3/0 to 500 MCM	
	230/60	310 Amp	#8 to 350 MCM	250 Amps	#6 to 350 MCM	300 Amps	300 Amps	#4 to 350 MCM	
	380/60	310 Amp	#8 to 350 MCM	250 Amps	#6 to 350 MCM	175 Amps	175 Amps	#6 to 350 MCM	
	460/60	175 Amp	#14 to 2/0	250 Amps	#6 to 350 MCM	150 Amps	150 Amps	#6 to 350 MCM	
	575/60	175 Amp	#14 to 2/0	250 Amps	#6 to 350 MCM	175 Amps	175 Amps	#6 to 350 MCM	
	400/50	175 Amp	#14 to 2/0	250 Amps	#6 to 350 MCM	600 Amps	600 Amps	Two 3/0 to 500 MCM	
RTAA 90	200/60	760 Amp	#4 to 500 MCM	400 Amps	Two 3/0 to 500 MCM	400 Amps	400 Amps	Two 3/0 to 500 MCM	
	230/60	310 Amp*	#8 to 350 MCM	400 Amps	Two 3/0 to 500 MCM	350 Amps	350 Amps	Two 3/0 to 500 MCM	
	380/60	310 Amp	#8 to 350 MCM	250 Amps	#6 to 350 MCM	225 Amps	225 Amps	#6 to 350 MCM	
	460/60	175 Amp	#14 to 2/0	250 Amps	#6 to 350 MCM	175 Amps	175 Amps	#6 to 350 MCM	
	575/60	310 Amp	#8 to 350 MCM	250 Amps	#6 to 350 MCM	225 Amps	225 Amps	#6 to 350 MCM	
	400/50	310 Amp	#8 to 350 MCM	600 Amps	Two 3/0 to 500 MCM	600 Amps	600 Amps	Two 3/0 to 500 MCM	
RTAA 100	200/60	760 Amp	#4 to 500 MCM	400 Amps	Two 3/0 to 500 MCM	400 Amps	400 Amps	Two 3/0 to 500 MCM	
	230/60	310 Amp*	#8 to 350 MCM	400 Amps	Two 3/0 to 500 MCM	350 Amps	350 Amps	Two 3/0 to 500 MCM	
	380/60	310 Amp	#8 to 350 MCM	250 Amps	#6 to 350 MCM	200 Amps	200 Amps	#6 to 350 MCM	
	460/60	310 Amp	#8 to 350 MCM	250 Amps	#6 to 350 MCM	300 Amps	300 Amps	Two 3/0 to 500 MCM	
	575/60	310 Amp	#8 to 350 MCM	600 Amps	Two 3/0 to 500 MCM	600 Amps	600 Amps	Two 3/0 to 500 MCM	
	400/50	310 Amp	#8 to 350 MCM	600 Amps	Two 3/0 to 500 MCM	600 Amps	600 Amps	Two 3/0 to 500 MCM	
RTAA 110	200/60	760 Amp	#4 to 500 MCM	400 Amps	Two 3/0 to 500 MCM	400 Amps	400 Amps	Two 3/0 to 500 MCM	
	230/60	310 Amp	#8 to 350 MCM	400 Amps	Two 3/0 to 500 MCM	350 Amps	350 Amps	Two 3/0 to 500 MCM	
	380/60	310 Amp*	#8 to 350 MCM	400 Amps	Two 3/0 to 500 MCM	225 Amps	225 Amps	#6 to 350 MCM	
	460/60	310 Amp	#8 to 350 MCM	400 Amps	Two 3/0 to 500 MCM	350 Amps	350 Amps	Two 3/0 to 500 MCM	
	575/60	310 Amp	#8 to 350 MCM	600 Amps	Two 3/0 to 500 MCM	600 Amps	600 Amps	Two 3/0 to 500 MCM	
	400/50	310 Amp*	#8 to 350 MCM	600 Amps	Two 3/0 to 500 MCM	600 Amps	600 Amps	Two 3/0 to 500 MCM	
RTAA 125	200/60	760 Amp	#4 to 500 MCM	400 Amps	Two 3/0 to 500 MCM	400 Amps	400 Amps	Two 3/0 to 500 MCM	
	230/60	310 Amp	#8 to 350 MCM	400 Amps	Two 3/0 to 500 MCM	350 Amps	350 Amps	Two 3/0 to 500 MCM	
	380/60	310 Amp*	#8 to 350 MCM	400 Amps	Two 3/0 to 500 MCM	225 Amps	225 Amps	#6 to 350 MCM	
	460/60	310 Amp	#8 to 350 MCM	400 Amps	Two 3/0 to 500 MCM	350 Amps	350 Amps	Two 3/0 to 500 MCM	
	575/60	310 Amp	#8 to 350 MCM	600 Amps	Two 3/0 to 500 MCM	600 Amps	600 Amps	Two 3/0 to 500 MCM	
	400/50	310 Amp*	#8 to 350 MCM	600 Amps	Two 3/0 to 500 MCM	600 Amps	600 Amps	Two 3/0 to 500 MCM	
*760 Amp for X-line									

Fuse Replacement Selection

Fuse Description	Unit Size	Unit Voltage	Fuse Type	Fuse Size
Condenser Fans (1F3 - 1F3, 1F7 - 1F9)	All	All	Class RK5 (600V)	30 Amp
Inverter/Auto-transformer (1F18-1F23) Low Ambient Option only	All	200/230	No Fuse Class CC (600V)	6 Amp
Integrated Pump Package (1F24-1F26) Pump Package Option only	All	All	Class CC (600V)	20 Amp
Control Circuit (1F15)	All	All	Class CC (600V)	10 Amp
Control Power Transformer (1F16 - 1F17)	All	200/230 380/400 460/575	Class CC (600V)	5 Amp 4Amp 4 Amp
CPM & MCSP (1U1F1, 1U4F1, 1U5F1)	All	All	Buss GMC - 1/4 Littlefuse 239.250	0.25 Amp 5x20 mm
EXV (1U3F1)	All	All	Buss GMC - 3/10 Littlefuse 239.300	0.30 Amp 5x20 mm
GRS (1U2F2)	All	All	Buss GMC - 1/10 Littlefuse 239.200	0.10 Amp 5x20 mm

Control Wire for 30 Volt or Less Circuit (1)

Wire size	Maximum Length for Sensor Leads
14 AWG	5000 FT
16 AWG	2000 FT
18 AWG	1000 FT

(1) Do Not Run in Conduit With Higher Voltage Circuits.

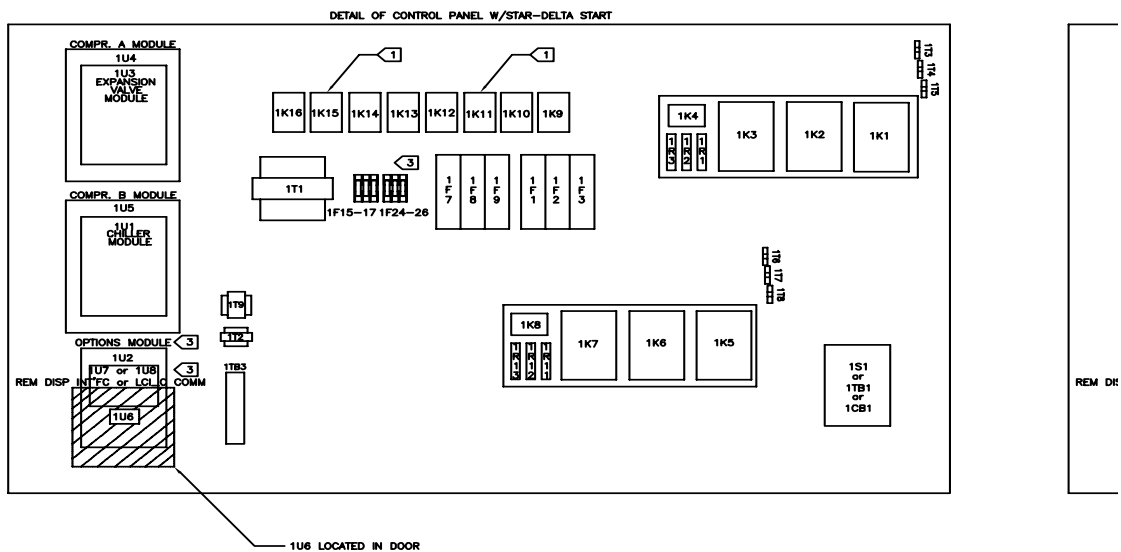
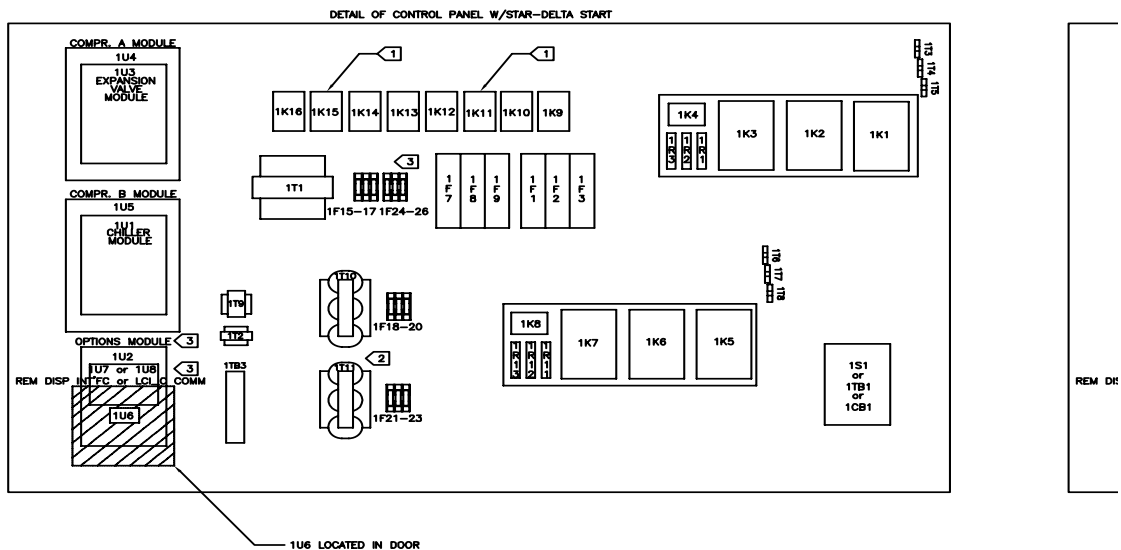
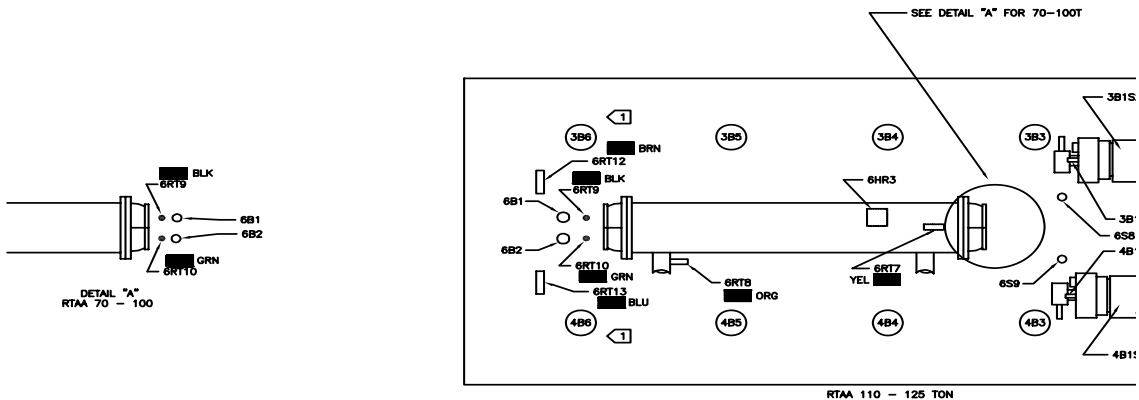
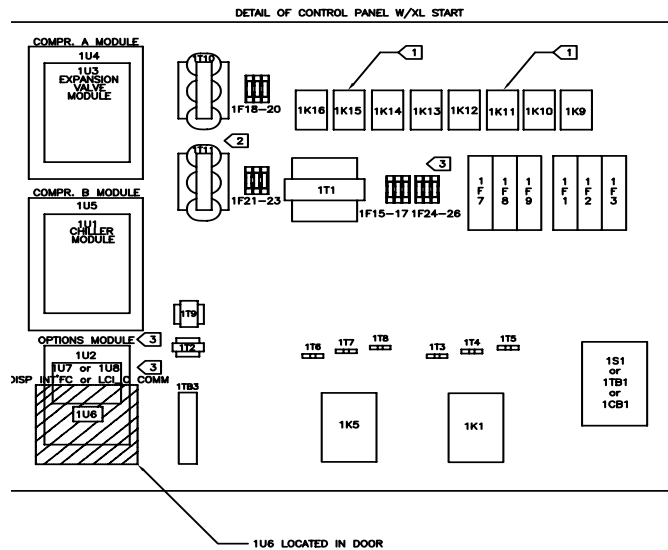
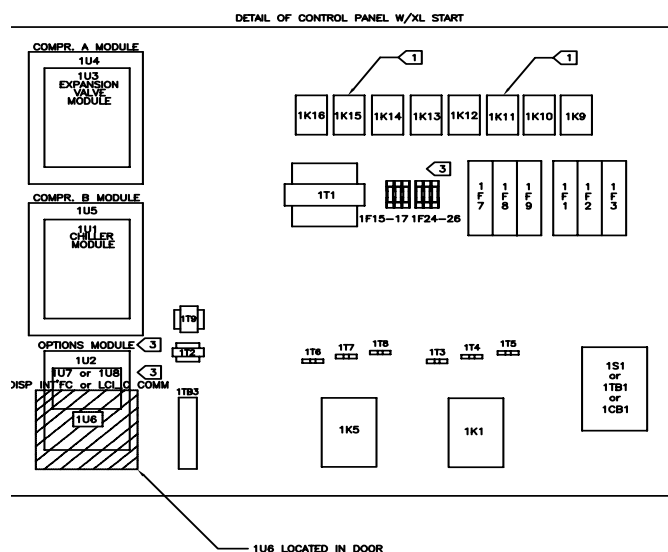


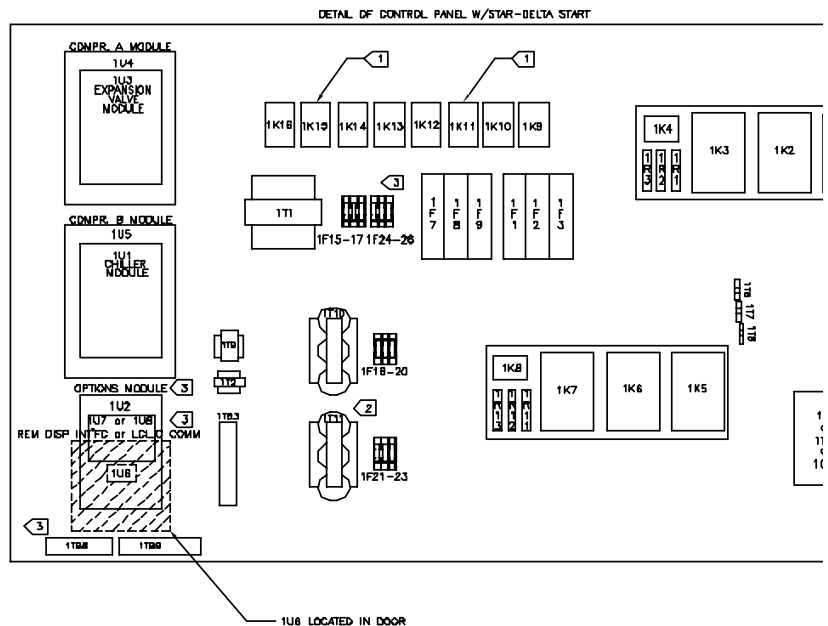
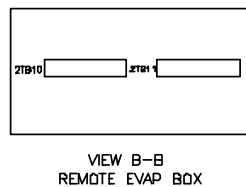
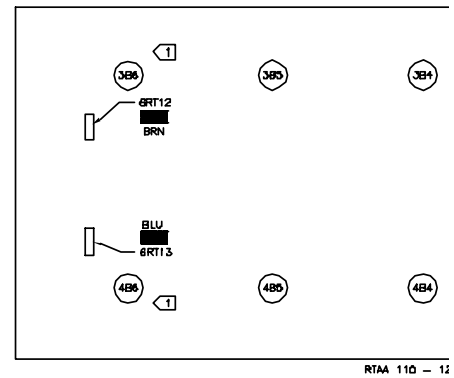
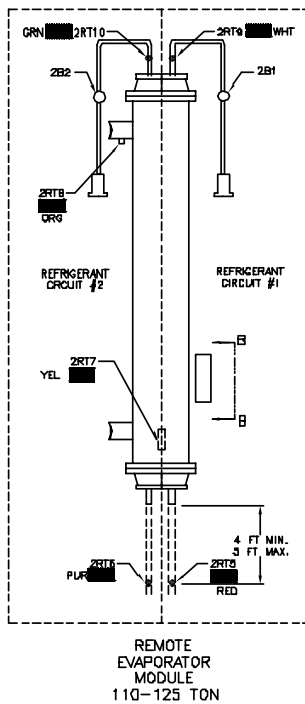
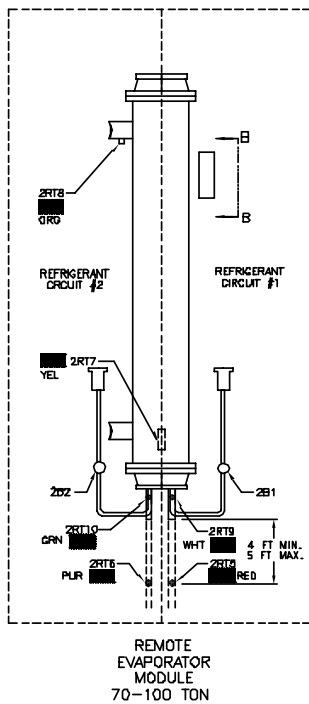
Diagram of the control panel showing various components and their connections. The diagram includes labels for components like S2,3,4, 3B1L3, 3B1L4, 3B1RT1, 3B1S1, 3B1L2, 4B1S2, 4B1L6, 4B1L7, 4B1RT2, 4B1L5, 1S5,6,7, 6RT3, 6U9, 6U10, and 4. A dashed line indicates a connection to the CONTROL PANEL.



LOW AMBIENT OPTION



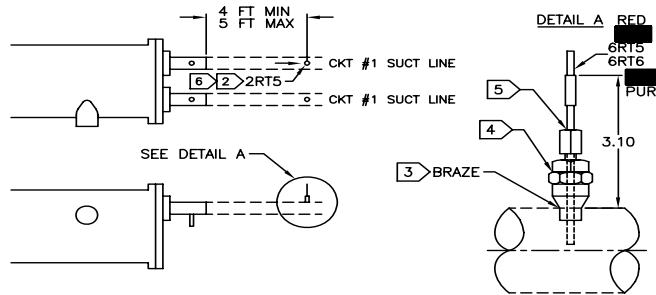
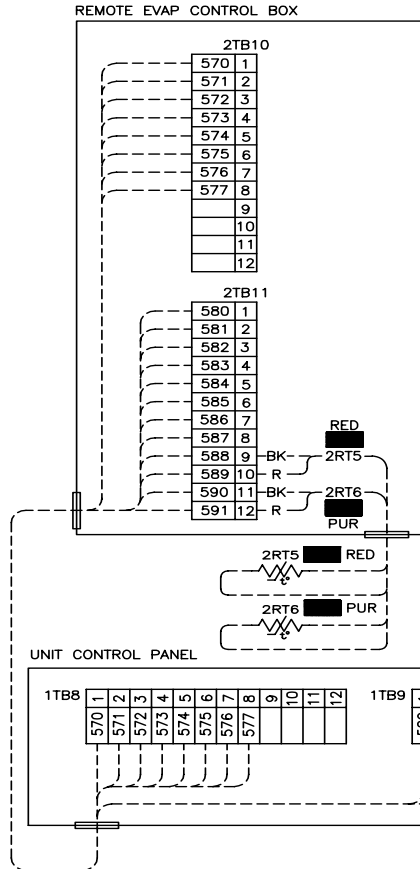
STANDARD UNIT



REPLACES	2D CAD	FILE NUMBER	DRAWING NUMBER	REV
REVISION DATE	THE TRANE COMPANY		2307-6463	E
DRAWN BY	A DIVISION OF AMERICAN STANDARD INC.	HELICAL ROTOR HERMETIC LIQUID CHILLER		
DATE	JH	SERIES "R"		
6-9-94	SIMILAR TO	AIR COOLED CHILLER REMOTE EVAP INNER UNIT CONNECTION CUSTOMER WIRING LOW AMBIENT RTAA 70-125 TON		

NOTES:

1. ALL CUSTOMER CONTROL WIRING MUST HAVE A MINIMUM RATING FO 150 VOLTS.
2. DRILL .469 DIA HOLE IN TOP OF CIRCUITS #1 & 2 SUCTION LINE. REMOVE ALL CHIPS & DIRT FROM INSIDE TUBING BEFORE BRAZING ADAPTER IN LINES.
3. BRAZE ADAPTERS IN TOP OF SUCTION LINES BEFORE INSTALLING SENSORS & FITTINGS. USE AWS BRAZING FLUX TYPE 3A OR 3B & BCUP ALLOY.
4. APPLY TEFLON TAPE TO FITTING THREADS BEFORE TIGHTENING.
5. TIGHTEN NUT UNTIL SENSOR WILL NOT TURN BY HAND, THEN TIGHTEN 1-1/4 TURNS. DO NOT OVER TIGHTEN.
6. ORIENTATE SENSOR WITH SINGLE HOLE SIDE FACING FLOW, INDICATED BY ARROW.



CAUTION
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.

ATTENTION
N'UTILISER QUE DES CONDUCTEURS EN CUIVRE!
LES BORNES DE L'UNITÉ NE SONT PAS CONÇUES POUR RECEVOIR D'AUTRES TIPIES DE CONDUCTEURS.
L'UTILISATION DE TOUT AUTRE CONDUCTEUR PEUT ENDOMMAGER L'EQUIPEMENT.

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SI NO LO HACE, PUEDE OCASIONAR DAÑO AL EQUIPO.

WARNING
HAZARDOUS VOLTAGE!
DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING. INSURE THAT ALL MOTOR CAPACITORS HAVE DISCHARGED. STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE, REFER TO DRIVE INSTRUCTIONS FOR CAPACITOR DISCHARGE. FAILURE TO DO THE ABOVE BEFORE SERVICING COULD RESULT IN DEATH OR SERIOUS INJURY.

AVERTISSEMENT
TENSION DANGEREUSE!
COUPER TOUTES LES TENSIONS ET OUVRIRE LES SECTIONNEURS A DISTANCE. PLUS SUIVRE LES PROCEDURES DE VERROUILLAGE ET DES ETIQUETTES AVANT TOUTE INTERVENTION. VERIFIER QUE TOUTS LES CONDENSATEURS DES MOTEURS SONT DECHARGES. UNITS A VITESSE VARIABLE, SE REPORTER AUX INSTRUCTIONS DE L'ENTRETIENMENT POUR DECHARGER LES CONDENSATEURS.

ADVERTENCIA
¡VOLTAJE PELIGROSO!
DESCONECTE TODA LA ENERGIA ELECTRICA, INCLUIDO LAS DESCONEXIONES REMOTAS Y SIGA LOS PROCEDIMIENTOS DE CIERRE Y ETIQUETADO ANTES DE PROCEDER AL SERVICIO. ASEGURESE QUE TODOS LOS CAPACITORES DEL MOTOR HAYAN DESCARGADO EL VOLTAJE ALMACENADO. PARA LAS UNIDADES CON ESE DE DRECCION DE VELOCIDAD VARIABLE, CONSULTE LAS INSTRUCCIONES PARA LA DESCARGA DEL CONDENSADOR. EL NO REALIZAR LO ANTERIORMENTE INDICADO, PODRIA OCASIONAR LA MUERTE O SERIAS LESIONES PERSONALES.



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office or e-mail us at comfort@trane.com

Literature Order Number	RTAA-SVX01A-EN
File Number	SV-RF-RTAA-SVX01A-EN-0905
Supersedes	RTAA-IOM-4A
Stocking Location	Inland

Trane has a policy of continuous product data and product improvement and reserves the right to change design and specifications without notice. Only qualified technicians should perform the installation and servicing of equipment referred to in this bulletin.