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-100
RTAA-80  RTAA-110
RTAA-90  RTAA-125

September 2005
RTAA-SVX01A-EN
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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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.

**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

<table>
<thead>
<tr>
<th></th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>70</td>
</tr>
<tr>
<td><strong>Compressor</strong></td>
<td></td>
</tr>
<tr>
<td>Quantity</td>
<td>2</td>
</tr>
<tr>
<td>Nominal Size (Tons) (1)</td>
<td>35/35</td>
</tr>
<tr>
<td><strong>Evaporator</strong></td>
<td></td>
</tr>
<tr>
<td>Water Storage (Gallons)</td>
<td>39.8</td>
</tr>
<tr>
<td>(Liters)</td>
<td>150.6</td>
</tr>
<tr>
<td>Min. Flow (GPM)</td>
<td>84</td>
</tr>
<tr>
<td>(L/Sec)</td>
<td>5.3</td>
</tr>
<tr>
<td>Max. Flow (GPM)</td>
<td>252</td>
</tr>
<tr>
<td>(L/Sec)</td>
<td>15.9</td>
</tr>
<tr>
<td>Refer to Pump Package Section for water storage of Pump and associated piping.</td>
<td></td>
</tr>
<tr>
<td><strong>Condenser</strong></td>
<td></td>
</tr>
<tr>
<td>Qty of Coils</td>
<td>4</td>
</tr>
<tr>
<td>Coil Length (Ft) (1)</td>
<td>13/13</td>
</tr>
<tr>
<td>Coil Height (In)</td>
<td>42</td>
</tr>
<tr>
<td>Number of Rows</td>
<td>2</td>
</tr>
<tr>
<td><strong>Condenser Fans</strong></td>
<td></td>
</tr>
<tr>
<td>Quantity (1)</td>
<td>4/4</td>
</tr>
<tr>
<td>Diameter (In)</td>
<td>30</td>
</tr>
<tr>
<td>Total Airflow (CFM)</td>
<td>68,380</td>
</tr>
<tr>
<td>Nominal RPM</td>
<td>855</td>
</tr>
<tr>
<td>Tip Speed (Ft./Min.)</td>
<td>6715</td>
</tr>
<tr>
<td>Motor HP (Ea.)</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Min. Starting/Oper. Ambient</strong></td>
<td></td>
</tr>
<tr>
<td>Std Unit (Deg. F)</td>
<td>15</td>
</tr>
<tr>
<td>Low Amb. (Deg. F)</td>
<td>-10</td>
</tr>
<tr>
<td><strong>General Unit</strong></td>
<td></td>
</tr>
<tr>
<td>Refrigerant</td>
<td>HCFC-22</td>
</tr>
<tr>
<td>No. of Independent Refrigerant Circuits</td>
<td>2</td>
</tr>
<tr>
<td>% Min. Load (3)</td>
<td>10</td>
</tr>
<tr>
<td>Refrig Charge (Lb) (1)</td>
<td>58/58</td>
</tr>
<tr>
<td>(Kg)</td>
<td>26/26</td>
</tr>
<tr>
<td>Oil Charge (Qt) (1.4)</td>
<td>10/10</td>
</tr>
<tr>
<td>(L)</td>
<td>10.6/10.6</td>
</tr>
</tbody>
</table>

**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:

<table>
<thead>
<tr>
<th>Digit Number</th>
<th>RTA</th>
<th>A</th>
<th>0 7 0</th>
<th>4</th>
<th>Y</th>
<th>A 0</th>
<th>1</th>
<th>B</th>
<th>1</th>
<th>D</th>
<th>A</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digit Position</td>
<td>1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 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 Cool Fin Material
- A: Aluminum
- 2: Complete Coat 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-L (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

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>LIFTING WEIGHTS ALUMINUM</th>
<th>LIFTING WEIGHTS COPPER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V1 (lb)</td>
<td>W1 (lb)</td>
</tr>
<tr>
<td>80</td>
<td>1370</td>
<td>621</td>
</tr>
<tr>
<td>90</td>
<td>1346</td>
<td>611</td>
</tr>
<tr>
<td>100</td>
<td>1325</td>
<td>602</td>
</tr>
<tr>
<td>110</td>
<td>1307</td>
<td>593</td>
</tr>
<tr>
<td>125</td>
<td>1283</td>
<td>587</td>
</tr>
</tbody>
</table>

**NOTES:**
1. LIFTING CHAINS (CABLES) WILL NOT BE THE SAME LENGTH.
2. DO NOT FORK LIFT UNIT WITHOUT R-22 CHARGE.
3. WEIGHTS ARE TYPICAL FOR UNITS WITHOUT R-22 CHARGE.
4. DIMENSIONS IN ( ) ARE IN METRIC.

---

**Figure 5 Diagram**

- CG
- FLG (Optional)
- LMK
- X
- Z
- ZRM, X

---

RTAA-SVX01A-EN 13
Figure 6  RTAA Rigging and Lifting Weights – Pump Package Aluminum Fins
Figure 7  RTAA Rigging and Lifting Weights –Pump Package Copper 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
Figure 9  Dimensions and Clearances for RTAA with Remote Evaporator 70 – 125 Tons
Figure 10
Remote Evaporator Dimensions, RTAA 70 - 125 Tons

**SUCTION CONNECTIONS**

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>CIRCUIT #1</th>
<th>CIRCUIT #2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D.O.</td>
<td>D.O.</td>
</tr>
<tr>
<td>70-80</td>
<td>2 7/8&quot; (54.0)</td>
<td>2 1/8&quot; (54.0)</td>
</tr>
<tr>
<td>90</td>
<td>2 5/8&quot; (66.7)</td>
<td>2 1/8&quot; (54.0)</td>
</tr>
<tr>
<td>100</td>
<td>2 5/8&quot; (66.7)</td>
<td>2 5/8&quot; (66.7)</td>
</tr>
</tbody>
</table>

**EVAPORATOR WEIGHTS**

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>LBS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>710</td>
</tr>
<tr>
<td>80</td>
<td>731</td>
</tr>
<tr>
<td>90</td>
<td>764</td>
</tr>
<tr>
<td>100</td>
<td>796</td>
</tr>
</tbody>
</table>

**NOTE:**
Dimensions in ( ) are metric.

**AIR COOLED SERIES R**

ROTARY LIQUID CHILLER
REMOTE EVAPORATOR
RTAA 70 - 100 TON
Figure 12
Dimensions and Clearances for RTAA with Pump Package 70 – 125 Tons

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>K</th>
<th>L</th>
<th>S</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>70–100</td>
<td>1</td>
<td>1</td>
<td>3/4&quot;</td>
<td>2</td>
<td>4</td>
<td>3/4&quot;</td>
<td>4</td>
<td>1/2&quot;</td>
<td>2</td>
<td>3/4&quot;</td>
<td>1</td>
</tr>
<tr>
<td>110–125</td>
<td>1</td>
<td>6</td>
<td>7/8&quot;</td>
<td>2</td>
<td>4</td>
<td>5/8&quot;</td>
<td>4</td>
<td>1/2&quot;</td>
<td>2</td>
<td>3/4&quot;</td>
<td>1</td>
</tr>
<tr>
<td>NO. FANS PER UNIT</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
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<td>10</td>
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</table>

115 VOLT & LOW VOLTAGE CONNECTIONS

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<thead>
<tr>
<th>PANEL TYPE</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>P</th>
<th>Q</th>
</tr>
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<tbody>
<tr>
<td>X-LINE CONTROL PANEL</td>
<td>2&quot;</td>
<td>1&quot;</td>
<td>1/2&quot;</td>
<td>1&quot;</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>WYE-Delta CONTROL PANEL</td>
<td>3&quot;</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
</tr>
</tbody>
</table>

Installation – Mechanical
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.
Figure 13  Isolator Placement for Typical RTAA Packaged Unit 70 – 125 Tons
### Installation — Mechanical

#### Figure 14: Isolator Placement for RTAA with Remote Evaporator

**Mounting Locations and Isolator Part Number**

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>LOC 1</th>
<th>LOC 2</th>
<th>LOC 3</th>
<th>LOC 4</th>
<th>LOC 5</th>
<th>LOC 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 - 80</td>
<td>RDP-3 RED</td>
<td>RDP-3 RED</td>
<td>RDP-4 BLACK</td>
<td>RDP-4 BLACK</td>
<td>RDP-4 RED</td>
<td>RDP-4 RED</td>
</tr>
<tr>
<td>90 - 125</td>
<td>RDP-3 GREEN</td>
<td>RDP-3 GREEN</td>
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<td>RDP-4 BLACK</td>
<td>RDP-4 RED</td>
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**Mounting Weights**

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<th>UNIT SIZE</th>
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<th>LOC 3</th>
<th>LOC 4</th>
<th>LOC 5</th>
<th>LOC 6</th>
<th>TOTAL WEIGHT</th>
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<tr>
<td>70</td>
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<td>1482</td>
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<td>629</td>
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<td>713</td>
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**Approx Lbs**

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<th>LOC 3</th>
<th>LOC 4</th>
<th>LOC 5</th>
<th>LOC 6</th>
<th>TOTAL WEIGHT</th>
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</thead>
<tbody>
<tr>
<td>70</td>
<td>560</td>
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<td>3324</td>
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**Approx Kg**

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<td>TYPE</td>
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<td>RDP-3 RED</td>
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</tr>
<tr>
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<td>1100 LBS</td>
</tr>
<tr>
<td>RDP-4 RED</td>
<td>2250 LBS</td>
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</table>

**NOTE:**

Dimensions in ( ) are metric.
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.
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 shut downs 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**

![RTAA Evaporator Water Pressure Drop Graph](image)

**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.
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

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.

---

### Table 2: RTAA Circuit Capacities (nominal tons)

<table>
<thead>
<tr>
<th>Model</th>
<th>Circuit 1</th>
<th>Circuit 2</th>
</tr>
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<tr>
<td>70</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>80</td>
<td>40</td>
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</tr>
<tr>
<td>90</td>
<td>50</td>
<td>40</td>
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<tr>
<td>100</td>
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<tr>
<td>110</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>125</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Line Size Inches OD</th>
<th>Globe Valve</th>
<th>Short Angle Valve</th>
<th>Short Radius ELL</th>
<th>Long Radius ELL</th>
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</thead>
<tbody>
<tr>
<td>1-1/8</td>
<td>87</td>
<td>29</td>
<td>2.7</td>
<td>1.9</td>
</tr>
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<td>1-3/8</td>
<td>102</td>
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<td>2.2</td>
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<td>1-5/8</td>
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<td>3-1/8</td>
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<td>8</td>
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</table>

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## Table 4  Liquid Line Sizes

<table>
<thead>
<tr>
<th>Total Equiv. Length (ft.)</th>
<th>35 Ton Circuit</th>
<th>40 Ton Circuit</th>
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</thead>
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<tr>
<td></td>
<td>Horizontal or Downflow</td>
<td>Upflow 1-5 ft.</td>
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<tr>
<td>300</td>
<td>1.375</td>
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</table>

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

<table>
<thead>
<tr>
<th>Circuit Size (nominal tons)</th>
<th>Outside Diameter (inches)</th>
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<tr>
<td>35</td>
<td>2-1/8</td>
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<td>50</td>
<td>2-5/8</td>
</tr>
<tr>
<td>60</td>
<td>2-5/8</td>
</tr>
</tbody>
</table>
Installation — Remote Evaporator

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

<table>
<thead>
<tr>
<th>Total Equiv. Length (ft.)</th>
<th>35 Ton</th>
<th>40 Ton</th>
<th>50 Ton</th>
<th>60 Ton</th>
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</thead>
<tbody>
<tr>
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<td>2.625</td>
<td>2.625</td>
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<tr>
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<td>2.625</td>
<td>2.625</td>
<td>3.125</td>
<td>3.125</td>
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</tbody>
</table>

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 it’s “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.
Example Liquid Line Sizing
For this example, refer to Table 2, 3, 4, and Figure 22, and assume a 50 ton circuit.

1. From Figure 22, the actual length of field installed piping is:
   \[80+8+8+21 = 117 \text{ feet}\]

2. Estimate equivalent line length:
   \[117 \text{ feet} \times 5 = 175 \text{ feet}\]

3. From Table 4 for a 50 ton circuit, for 175 equivalent feet the OD is 1-3/8 inches.

4. In Figure 22 there are six long-radius elbows. From Table 3, for 1-3/8 inch elbows, the equivalent feet is:
   \[6 \text{ elbows} \times 2.2 \text{ feet} = 13.2 \text{ feet}\]

5. Adding equivalent feet from step #4 to step #1 gives:
   \[13.2 \text{ feet} + 117 \text{ feet} = 130.2 \text{ feet}\]

6. From Table 4, for a 50 ton circuit, for 125 equivalent feet (nearest to 130.2), the OD is 1-1/8 inches

7. From Table 3, for 1-1/8" OD long-radius elbows, the equivalent feet is:
   \[6 \text{ elbows} \times 1.9 \text{ feet} = 11.4 \text{ feet}\]

8. Adding equivalent feet from step #7 to step #1 gives:
   \[11.4 \text{ feet} + 117 \text{ feet} = 128.4 \text{ feet}\]
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

---

**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...
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 elbows x 3.4 feet = 20.4 feet

4. Final equivalent length of upflow suction line:
   20.4 + 25 = 45.4 feet

5. There are no fittings in the horizontal portion. Therefore, the final equivalent line length is:
   45.4 + 83 = 128.4 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.
Installation — Remote Evaporator

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.
Figure 23  Suction Accumulator Sizing Example
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.
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 weather-proof compound.

**Table 8  System Refrigerant Charge**

<table>
<thead>
<tr>
<th>Circuit Size</th>
<th>Lbs. of R-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>58</td>
</tr>
<tr>
<td>40</td>
<td>61</td>
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<tr>
<td>50</td>
<td>73</td>
</tr>
<tr>
<td>60</td>
<td>98</td>
</tr>
</tbody>
</table>

**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:

\[
\begin{align*}
\text{Liquid Temperature} & = 100 F \\
\text{Suction Temperature} & = 35 F \\
\text{Suction Superheat Temperature} & = 4 F
\end{align*}
\]

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 2-5/18 inch OD suction line: 75 feet x 4.5 feet = 3.4 lbs. R-22
3. From Table 2h for a 1 11/8 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

<table>
<thead>
<tr>
<th>Pipe O.D. (inches)</th>
<th>Suction Line</th>
<th>Liquid Line</th>
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</thead>
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<td>1-1/8</td>
<td>0.78</td>
<td>40.8</td>
</tr>
<tr>
<td>1-3/8</td>
<td>1.2</td>
<td>62.2</td>
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<tr>
<td>1-5/8</td>
<td>1.7</td>
<td>88</td>
</tr>
<tr>
<td>2-1/8</td>
<td>2.9</td>
<td>153.1</td>
</tr>
<tr>
<td>2-5/8</td>
<td>4.5</td>
<td>236.1</td>
</tr>
<tr>
<td>3-1/8</td>
<td>6.4</td>
<td>—</td>
</tr>
</tbody>
</table>

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.
### Table 10  Electrical Data

<table>
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<tr>
<th>Unit Size</th>
<th>Voltage</th>
<th>MCA (2)</th>
<th>MOP (1)</th>
<th>Rec Time Delay or RDE (3)</th>
<th>Qty</th>
<th>Compressor (Ea) RLA (4)</th>
<th>LRA (7)</th>
<th>Qty</th>
<th>Fans (Ea)</th>
<th>FLA</th>
<th>Control KW (6)</th>
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</thead>
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<td>300</td>
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<td>576</td>
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<td>700</td>
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<td>232/233</td>
<td>1190/990</td>
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<td>585/585</td>
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<td>1.0</td>
<td>2.5</td>
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<td></td>
</tr>
</tbody>
</table>

(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:**

<table>
<thead>
<tr>
<th>Rated Voltage</th>
<th>Utilization Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>200/60</td>
<td>115-200</td>
</tr>
<tr>
<td>230/60</td>
<td>180-220</td>
</tr>
<tr>
<td>460/60</td>
<td>414-506</td>
</tr>
<tr>
<td>575/60</td>
<td>516-633</td>
</tr>
<tr>
<td>400/50</td>
<td>340-480</td>
</tr>
</tbody>
</table>

(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

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 interconnecting 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.

Table 11  Electrical Data - Pump Package Option

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Rotated Voltage</th>
<th>Pump HP</th>
<th>Pump FLA</th>
<th>MCA (2)</th>
<th>MOP (1)</th>
<th>Rec Time Delay or RDE (3)</th>
<th>Qty</th>
<th>Comp(Ea) RLA (4)</th>
<th>LRA (7)</th>
<th>Qty</th>
<th>Fans (Ea) KW</th>
<th>FLA</th>
<th>Control KW (6)</th>
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<tr>
<td>RTAA 70</td>
<td>460/60</td>
<td>2</td>
<td>3.1</td>
<td>136</td>
<td>175</td>
<td>150</td>
<td>2</td>
<td>50/50</td>
<td>330/330</td>
<td>8</td>
<td>1.0</td>
<td>2.5</td>
<td>0.75</td>
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<td></td>
<td>460/60</td>
<td>3</td>
<td>4.1</td>
<td>137</td>
<td>175</td>
<td>150</td>
<td>2</td>
<td>50/50</td>
<td>330/330</td>
<td>8</td>
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<tr>
<td></td>
<td>460/60</td>
<td>5</td>
<td>6.6</td>
<td>139</td>
<td>175</td>
<td>175</td>
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<td>50/50</td>
<td>330/330</td>
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<td>4.1</td>
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<td>460/60</td>
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<td>84/62</td>
<td>410/380</td>
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<td></td>
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<td>410/380</td>
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<td>250</td>
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<td>84/84</td>
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<td>6.6</td>
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<td>250</td>
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<td>410/410</td>
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<td>2.5</td>
<td>0.75</td>
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<tr>
<td></td>
<td>460/60</td>
<td>7.5</td>
<td>10.3</td>
<td>224</td>
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<td>350</td>
<td>2</td>
<td>84/84</td>
<td>410/410</td>
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<td>1.0</td>
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<td>522/410</td>
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<td>2.5</td>
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<td>2.5</td>
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<td>522/522</td>
<td>10</td>
<td>1.0</td>
<td>2.5</td>
<td>0.75</td>
</tr>
</tbody>
</table>

(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.

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(8) VOLTAGE UTILIZATION RANGE:

<table>
<thead>
<tr>
<th>Rated Voltage</th>
<th>Utilization Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>200/60</td>
<td>180-220</td>
</tr>
<tr>
<td>230/60</td>
<td>206-254</td>
</tr>
<tr>
<td>460/60</td>
<td>414-506</td>
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<tr>
<td>575/60</td>
<td>516-633</td>
</tr>
<tr>
<td>400/50</td>
<td>340-420</td>
</tr>
</tbody>
</table>

(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

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 interconnecting 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 oper-
   ation via the UCM pump control contacts. Examples of the input at termi-
   nals 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).** Con-
   tact 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 sys-
   tem (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

<table>
<thead>
<tr>
<th>Relay Output Configuration</th>
<th>1:</th>
<th>2:</th>
<th>3:</th>
</tr>
</thead>
<tbody>
<tr>
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<td>RLY 1</td>
<td>RLY 1</td>
<td>RLY 1</td>
</tr>
<tr>
<td></td>
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<td>= Circuit 1 Running</td>
<td>= Alarm</td>
</tr>
<tr>
<td>= Compressor Running</td>
<td>= Circuit 2 Alarm</td>
<td>= Circuit 2 Running</td>
<td></td>
</tr>
<tr>
<td>= Maximum Capacity</td>
<td>= Maximum Capacity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
### Table 13  Alarm/Running/Maximum Capacity Menu Settings

<table>
<thead>
<tr>
<th>Programmable Relay Setup Setting (Service Setting Menu)</th>
<th>Relays Output Configuration (Table 12)</th>
<th>Diagnostics that the Alarm Relay(s) is Active</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>MMR/CMR diag.</td>
<td>MAR/CAR diag.</td>
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<td>NO</td>
</tr>
<tr>
<td>2</td>
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</tr>
<tr>
<td>3</td>
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<td>4</td>
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<tr>
<td>12</td>
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</table>

**Notes:**

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

---

**Figure 26**  Alarm/Running/Maximum Capacity Contact Outputs

**Table 13**  Alarm/Running/Maximum Capacity Menu Settings

<table>
<thead>
<tr>
<th>Programmable Relay Setup Setting (Service Setting Menu)</th>
<th>Relays Output Configuration (Table 12)</th>
<th>Diagnostics that the Alarm Relay(s) is Active</th>
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<td>MMR/CMR diag.</td>
<td>MAR/CAR diag.</td>
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<tr>
<td>1</td>
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<td>5</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>6</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>7</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>8</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>9</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>10</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>11</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>12</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

**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
Installation — Electrical

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.

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

1. 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 (±10%) and a fixed 5.6 Kohm (±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 (±10%) and a fixed 15 Kohm (±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 IU2. CWS is now based on the following equation:

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

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:

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

Sample values for CWS vs., mA signals are shown in Table 14.

- Minimum setpoint = 0°F (40mA)
- Maximum setpoint = 65°F (18.8 mA)
- Maximum continuous input current = 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

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Resistance (Ohms)</th>
<th>Current (ma)</th>
<th>Voltage (Vdc)</th>
<th>Resulting Chilled Water Setpoint (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>944330</td>
<td>4.0</td>
<td>2.0</td>
<td>2.0</td>
<td>0.0</td>
</tr>
<tr>
<td>686092</td>
<td>5.2</td>
<td>2.6</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>52946</td>
<td>6.5</td>
<td>3.2</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>42434</td>
<td>7.7</td>
<td>3.9</td>
<td>15.0</td>
<td></td>
</tr>
<tr>
<td>34889</td>
<td>8.9</td>
<td>4.5</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td>29212</td>
<td>10.2</td>
<td>5.1</td>
<td>25.0</td>
<td></td>
</tr>
<tr>
<td>24785</td>
<td>11.4</td>
<td>5.7</td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>21236</td>
<td>12.6</td>
<td>6.3</td>
<td>35.0</td>
<td></td>
</tr>
<tr>
<td>18327</td>
<td>13.8</td>
<td>6.9</td>
<td>40.0</td>
<td></td>
</tr>
<tr>
<td>15900</td>
<td>15.1</td>
<td>7.6</td>
<td>45.0</td>
<td></td>
</tr>
<tr>
<td>13844</td>
<td>16.3</td>
<td>8.2</td>
<td>50.0</td>
<td></td>
</tr>
<tr>
<td>12080</td>
<td>17.5</td>
<td>8.8</td>
<td>55.0</td>
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<tr>
<td>10549</td>
<td>18.8</td>
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<td>60.0</td>
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<tr>
<td>9050</td>
<td>20.0</td>
<td>10.0</td>
<td>65.0</td>
<td></td>
</tr>
</tbody>
</table>
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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 (±10%) and a fixed 820 ohm (±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](image-url)
# Installation — Electrical

## Table 15  Input Values Vs. External Current Limit Setpoint

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Current (ma)</th>
<th>Voltage (Vdc)</th>
<th>Resulting Chilled Water Setpoint (%RLA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>49000</td>
<td>4.0</td>
<td>2.0</td>
<td>40</td>
</tr>
<tr>
<td>29000</td>
<td>6.0</td>
<td>3.0</td>
<td>50</td>
</tr>
<tr>
<td>19000</td>
<td>8.0</td>
<td>4.0</td>
<td>60</td>
</tr>
<tr>
<td>13000</td>
<td>10.0</td>
<td>5.0</td>
<td>70</td>
</tr>
<tr>
<td>9000</td>
<td>12.0</td>
<td>6.0</td>
<td>80</td>
</tr>
<tr>
<td>6143</td>
<td>14.0</td>
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<td>90</td>
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<tr>
<td>4010</td>
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<td>8.0</td>
<td>100</td>
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<td>2333</td>
<td>18.0</td>
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<td>110</td>
</tr>
<tr>
<td>1000</td>
<td>20.0</td>
<td>10.0</td>
<td>120</td>
</tr>
</tbody>
</table>

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)
- 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)
- 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 (e.g., 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.

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.
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

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.

Figure 32  RTAA Refrigeration System and Control Components

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

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 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 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:
   Enter
4. To enter into the Machine Configuration Menu, press:
   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

[OPERATING MODE]
Reset
Stopped by Local Display
Stopped by Remote Display
Stopped by Tracer
Stopped by Ext Source
Auto
Waiting, Restart Inhibit
Starting
Running
Running, Current Limit
Running, Condenser Limit
Running, Evaporator Limit
Stopping
Making Ice
Ice Making Complete
Low Ambient Temp Lockout
EXV Test
Manufacturing Test
Service Pumpdown

[SETPT SOURCE]
Local
Tracer

Chiller Report

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

Next

MODE:
REQUESTED SETPOINT SOURCE:

Next

COMPRESSORS ON
CIRCUITS LOCKED OUT

Next

[Operating Mode]
MAKING ICE,
ICE MAKING ALL
COMPLETE OTHERS

Next

ACTIVE ICE TERMINATION SETPOINT XXX F
EVAP ENTERING WATER TEMP XXX.X F

Next

ACTIVE CHILLED WATER SETPOINT XXX F
EVAP LEAVING WATER TEMP XXX.X F

Next

EVAP ENTERING WATER TEMP XXX.X F
EVAP LEAVING WATER TEMP XXX.X F

Next

Fan Control
(Service Setting Menu)
DISABLE ENABLE

Next

CONDENSER ENTERING WATER TEMP XXX.X F
CONDENSER LEAVING WATER TEMP XXX.X F

Next

WATER HTR ENTERING WATER TEMP XXX.X F
WATER HTR LEAVING WATER TEMP XXX.X F

Next

To ACTIVE CURRENT LIMIT SETPOINT on next page.
* Dashes will be displayed if the sensor is open or shorted and neither Outdoor Air Reset or Low Ambient Lockout is enabled.

* Dashes will be displayed if the Zone Temp. Sensor is open or shorted and Zone Reset is not enabled.

**Not applicable on domestic units.
Controls Interface

Refrigerant Report

REFRIGERANT TEMP & PRESSURE REPORT
"PRESS (NEXT) (PREVIOUS) TO CONTINUE"

Next

CKT 1 EVAP RFGT PRESSURE XXX PSIG
CKT 1 COND RFGT PRESSURE XXX PSIG

Next

CKT 1 CPRSR SUCTION RFGT TEMP XXX X F
CKT 1 SATURATED EVAP RFGT TEMP XXX X F

Next

CKT 1 SATURATED COND F 3T TEMP XXX X F

Next

CKT 2 EVAP RFGT PRESSURE XXX PSIG
CKT 2 COND RFGT PRESSURE XXX PSIG

Next

CKT 2 CPRSR SUCTION RFGT TEMP XXX X F
CKT 2 SATURATED EVAP RFGT TEMP XXX X F

Next

CKT 2 SATURATED RFGT TEMP XXX X F

Next
Controls Interface

* Display will change according to comp. reviewing
  - COMPRESSOR A MODE
  - COMPRESSOR B MODE
  - COMPRESSOR C MODE
  - COMPRESSOR D MODE

[MODE]
- Stopped
- Locked Out
- Waiting for Restart Inhibit Time
- Starting
- Running
- Run - Condenser Limit
- Run - Evaporator Limit
- Run - Current Limit
- Stopping
- Service Pumpdown

After review Compressor of last comp. B, C, D
Controls Interface

[Source] -
Local
Tracer

Default - 44F
Select - 0F to 65F

*If "LIMITED by Cutout Setpt, (+) to change" is displayed, refer to the section on "Leaving Water Temperature Cutout" and "Low Refrigerant Temperature Cutout".

Default = Disable

Default = 10F
Select = 4F to 30F

Default = 2F
Select = 2F to 10F

ON - Manual override of Chilled Water Pump Off Delay

[Minutes]
Default = 10 Min
Select = 1 Min to 30 Min

To FRONT PANEL CURRENT LIMIT SETPT on next page.
Controls Interface

From CHILLED WATER PUMP OFF DELAY on previous page.

**Default = 120%**
Select = 40% to 120%

**Default = Disable**

**Default = Disable**

**Default = 20F**
Select = -20F to 60F

**Default = Disable**
Select = Return Wtr Zone
Outdoor Air

**[TYPE]**
Return:
Default = 50%
Range = 10% to 120%
Zone:
Default = 100%
Range = 50% to 300%
Outdoor:
Default = 10%
Range = -80% to 80%

To [TYPE] TYPE, START RESET SETPT on next page.
[TYPE] TYPE
Return:
  Default = 10°F
  Range = 4°F to 30°F
Zone:
  Default = 78°F
  Range = 55°F to 85°F
Outdoor:
  Default = 90°F
  Range = 50°F to 130°F

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

Default = 27°F
Select = 20°F to 31°F

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

[TYPE] TYPE, START RESET SETPT
  XXX F
  "PRESS (+) (-) TO CHANGE SETTING"

[TYPE] TYPE, MAX RESET SETPT
  XXX F
  "PRESS (+) (-) TO CHANGE SETTING"

ICE MACHINE CONTROL
  "PRESS (+) (-) TO CHANGE SETTING"

[D/E]

PANEL ICE TERMINATION SETPT
  XXX F
  "PRESS (+) (-) TO CHANGE SETTING"
Controls Interface

Service Settings

SERVICE SETTINGS, ENABLES & UNITS
"PRESS (NEXT) (PREVIOUS) TO CONTINUE"

Status of Keypad/Display Lock Feature
(Service Setting Menu)
ENABLE
DISABLE

"PRESS (ENTER) TO LOCK DISPLAY & KEYPAD"
PASSWORD WILL BE REQUIRED TO UNLOCK

Next

Depress either
Enter or Next

Next

* If the keypad is locked
and a diagnostic occurs, the
alarm light will flash if
applicable but the diagnostic
screen will not be displayed
until the keypad is unlocked.
* * Once the keypad is locked
** Once the keypad is locked
the Previous and Enter need to
be pressed simultaneously
to unlock the keypad.

Default = Disable

Default = 460
Selections = 200, 220, 230,
346, 380, 415,
460, 500, 575,
400

Default = 120 sec.
Select = 30 to 120 sec.

UNDER/OVER VOLTAGE PROTECTION [D/E]
"PRESS (+)(-) TO CHANGE SETTING"

Next

UNIT LINE VOLTAGE [VOLT] V
"PRESS (+)(-) TO CHANGE SETTING"

Next

RESTART INHIBIT TIME [XXX SEC]
"PRESS (+)(-) TO CHANGE SETTING"

Next

To BALANCED CPRSR STARTS & HOURS on next page.
Controls Interface

From RESTART INHIBIT TIME on previous page.

**BALANCED CPRS STARTS & HOURS**
"PRESS (+) (-) TO CHANGE SETTING"

**DISPLAY UNITS**
"PRESS (+) (-) TO CHANGE SETTING"

**LANGUAGE"**
"PRESS (+) (-) TO CHANGE SETTING"

**PROGRAMMABLE RELAY SETUP**
"PRESS (+) (-) TO CHANGE SETTING"

**EXTERNAL CIRCUIT LOCKOUT**
"PRESS (+) (-) TO CHANGE SETTING"

**PASSWORD REQUIRED FOR FURTHER ACCESS**
"PLEASE ENTER PASSWORD"

* * Refer to section on "Passwords* for details.

**Default = Disable**

**[UNITS]**
SI
ENGLISH

**[LANGUAGE]**
English
Francais
Espanol
Nippon
Italiano
Deutsch
Nederlands
* Menu item will not be displayed until later version

**Default = 1**
**Select = 1 to 12**

* * * Refer to "Alarm, Running, Max. Capacity Outputs" for details.

**Default = Disable**

Select Service Setup Menu or Machine Configuration Menu

To SERVICE SET-UP MENU on next page.

To MACHINE CONFIGURATION MENU
Controls Interface

From "Select Service Setup Menu..." on previous page.

SERVICE SET-UP MENU
"PRESS (NEXT)(PREVIOUS) TO CHANGE SETTING"

Next

KEYPAD/DISPLAY LOCK FEATURE
"PRESS (+)(-) TO CHANGE SETTING" [D/E]

Next

ICS ADDRESS
"PRESS (+)(-) TO CHANGE SETTING" XX

Next

LVG WTR TEMP CUTOUT SETPOINT*
"PRESS (+)(-) TO CHANGE SETTING" XXX F

Next

LOW RFGT TEMP CUTOUT SETPT **
"PRESS (+)(-) TO CHANGE SETTING" XXX F

Next

LOW WTR TEMP EXV GAIN COMP
"PRESS (+)(-) TO CHANGE SETTING" [D/E]

Next

CONDENSER LIMIT SETPOINT
"PRESS (+)(-) TO CHANGE SETTING" XX %HPC

Next

PHASE UNBALANCE PROTECTION
"PRESS (+)(-) TO CHANGE SETTING" [D/E]

Next

To PHASE REVERSAL PROTECTION on next page.

To MACHINE CONFIGURATION MENU

Default = 55
Select = 0 to 64

Default = 35F
Select = -10F to 35F

* See section on "Leaving Water Temperature Cutout" for proper settings.

Default = 22F
Select = -39F to 35F

* * See section on "Low Refrigerant Temperature Cutout" for proper settings.

Default = Disable

Default = 90%
Select = 80% to 120%

Default = Enable
Controls Interface

From PHASE UNBALANCE PROTECTION on previous page.

Default - Enable

Default = 8F
Select = 4F to 20F
* 70 - 125 ton units must be set at 4°F.

Default = 20
Select = 2 to 200
Increase to make more responsive, decrease to make less responsive.

Default = 20
Select = 2 to 200
Increase to make more responsive, decrease to make less responsive.

Default - 40
Select = 2 to 200
Increase to make more responsive, decrease to make less responsive.

Default = 0
Select = -50 to 50

Default = 0
Select = -50 to 50

To MACHINE CONFIGURATION MENU

To COMPRESSOR MODEL NO. PREFIX on next page.
Controls Interface

[XXXX]
CHRN (70 - 125 ton units)
CHHB (130 - 400 ton units)
(Refer to Compressor Nameplate)

CPM Default = Enable

Default = -4
* Must be set at -4

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

From MACHINE CONFIGURATION MENU on previous page.

COMPRESSOR MODEL NO. PREFIX
"PRESS (+)(-) TO CHANGE SETTING"

COMPRESSOR Model No. Prefix
CHRN
CHHB

OIL LOSS DIFFERENTIAL SETPT*
XXXF
"PRESS (+)(-) TO CHANGE SETTING"

NUMBER OF COMPRESSORS
"PRESS (+)(-) TO CHANGE SETTING"

COMPRESSOR A TONS
"PRESS (+)(-) TO CHANGE SETTING"

Is there a Compressor B
YRS NO

COMPRESSOR B TONS
"PRESS (+)(-) TO CHANGE SETTING"

Is there a Compressor C
YRS NO

To COMPRESSOR C TONS on next page.

To MACHINE CONFIGURATION MENU
Controls Interface

From "Is there a Compressor C" on previous page.

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

To MACHINE CONFIGURATION MENU
Controls Interface

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

Default = Disable

Default = Y Delta
Select = Y Delta, Part Winding

Default = 00
Select = 00 to 31

Default = 00
Select = 00 to 31

Default = 00
Select = 00 to 31

From NUMBER OF FANS, CIRCUIT 1 on previous page.

NUMBER OF FANS, CIRCUIT 2
"PRESS (+) (-) TO CHANGE SETTING"

REDUCED INRUSH STARTING
"PRESS (+) (-) TO CHANGE SETTING"

Reduced Inrush Starting
YES NO

Starter Type
"PRESS (+) (-) TO CHANGE SETTING"

CURRENT OVRLD SETTING, CPRSR A
"PRESS (+) (-) TO CHANGE SETTING"

Is there a Compressor B
YES NO

CURRENT OVRLD SETTING, CPRSR B
"PRESS (+) (-) TO CHANGE SETTING"

Is there a Compressor C
YES NO

CURRENT OVRLD SETTING, CPRSR C
"PRESS (+) (-) TO CHANGE SETTING"

Is there a Compressor D
YES NO

To CURRENT OVRLD SETTING, CPRSR D on next page.

To MACHINE CONFIGURATION MENU
Controls Interface

From "Is there a Compressor D" on previous page

To MACHINE
CONFIGURATION
MENU

Default = 00
Select = 00 to 31

CURRENT OVRLD SETTING, CPRSR D
"PRESS (+) (-) TO CHANGE SETTING"

Next

Fan Control
(Service Setting Menu)
DISABLE ENABLE

Default = Disable
* 70 - 125 tons need
"Low Amb Unit, Half
Airflow Fan" disabled

Default = Disable

LOW AMB UNIT, HALF AIRFLOW FAN *
[D/E]
"PRESS (+) (-) TO CHANGE SETTING"

Next

LOW AMB UNIT, TWO SPEED MOTOR **
[D/E]
"PRESS (+) (-) TO CHANGE SETTING"

Next

NIGHT NOISE SETBACK **
[D/E]
"PRESS (+) (-) TO CHANGE SETTING"

Next

NUMBER OF EXV VALVES, CKT 1
"PRESS (+) (-) TO CHANGE SETTING"

Next

NUMBER OF EXV VALVES, CKT 2
"PRESS (+) (-) TO CHANGE SETTING"

Next

REFRIGERANT TYPE
"PRESS (+) (-) TO CHANGE SETTING"

Next

CAUTION: RTAA 70 - 100 ton
units are to be run with R22
refrigerant. Contact a qualified
service technician for further
details.
Controls Interface

SERVICE TESTS: PMPDWN, EXV, CMPR, LCKOUT
"PRESS (NEXT) (PREVIOUS) TO CONTINUE"

Default = Disable

SERVICE PUMPDOWN, CPRSR A
"PRESS (+) (-) TO CHANGE SETTING"

Is there a Compressor B
YES
NO

Default = Disable

SERVICE PUMPDOWN, CPRSR B
"PRESS (+) (-) TO CHANGE SETTING"

Is there a Compressor C
YES
NO

Default = Disable

SERVICE PUMPDOWN, CPRSR C
"PRESS (+) (-) TO CHANGE SETTING"

Is there a Compressor D
YES
NO

Default = Disable

SERVICE PUMPDOWN, CPRSR D
"PRESS (+) (-) TO CHANGE SETTING"

EXV TEST, CIRCUIT 1
"PRESS (+) (-) TO CHANGE SETTING"

EXV TEST, CIRCUIT 2
"PRESS (+) (-) TO CHANGE SETTING"

To COMPRESSOR TEST, CPRSR A on next page.
Controls Interface

From EXV TEST, CIRCUIT 2 on previous page.

**Default = Disable**

COMPRESSOR TEST, CPRSR A

“PRESS (+) (-) TO CHANGE SETTING”

Next

Is there a Compressor B

YES

NO

**Default = Disable**

COMPRESSOR TEST, CPRSR B

“PRESS (+) (-) TO CHANGE SETTING”

Next

Is there a Compressor C

YES

NO

**Default = Disable**

COMPRESSOR TEST, CPRSR C

“PRESS (+) (-) TO CHANGE SETTING”

Next

Is there a Compressor D

YES

NO

**Default = Disable**

COMPRESSOR TEST, CPRSR D

“PRESS (+) (-) TO CHANGE SETTING”

Next

**Default = UNLOCK**

CIRCUIT LOCKOUT, CKT 1

“PRESS (+) (-) CHANGE SETTING”

Next

**Default = UNLOCK**

CIRCUIT LOCKOUT, CKT 2

“PRESS (+) (-) CHANGE SETTING”

Next
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 perform 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>
<thead>
<tr>
<th>System CLS</th>
<th>(70 - 125)</th>
<th>Number of compressors in operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>One</td>
</tr>
<tr>
<td>120%</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>100%</td>
<td>120</td>
<td>100</td>
</tr>
<tr>
<td>80%</td>
<td>120</td>
<td>80</td>
</tr>
<tr>
<td>60%</td>
<td>120</td>
<td>60</td>
</tr>
<tr>
<td>40%</td>
<td>80</td>
<td>40</td>
</tr>
</tbody>
</table>
Controls Interface

The equations for each type of reset are:

RETURN WATER TEMPERATURE RESET

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

OUTDOOR AIR TEMPERATURE RESET

\[ CWS' = CWS + \text{RESET RATIO} \]
\[ \text{[START RESET - TOD]} \]
and \( CWS' > \text{or} = CWS \)
and \( CWS' - CWS < \text{or} = \text{MAXIMUM RESET} \)

\( CWS' \) is the new chilled water setpoint.
\( CWS \) is the active chilled water setpoint before any reset has occurred.
\( \text{RESET RATIO} \) is a user adjustable gain.
\( \text{START RESET} \) is a user adjustable reference.
\( \text{TOD} \) is the outdoor temperature.
\( \text{TWE} \) is the entering evaporator water temperature.
\( \text{TWL} \) is the leaving evaporator water temperature.
\( \text{MAXIMUM RESET} \) 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 \( \text{RESET RATIO} \) for each type of reset are:

<table>
<thead>
<tr>
<th>Reset Type</th>
<th>Reset Ratio Range</th>
<th>Increment English Units</th>
<th>Increment SI Units</th>
<th>Factory Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return</td>
<td>10 to 120%</td>
<td>1%</td>
<td>1%</td>
<td>50%</td>
</tr>
<tr>
<td>Outdoor</td>
<td>80 to -80%</td>
<td>1%</td>
<td>1%</td>
<td>10%</td>
</tr>
</tbody>
</table>

The values for \( \text{START RESET} \) for each type of reset are:

<table>
<thead>
<tr>
<th>Reset Type</th>
<th>Start Reset Range</th>
<th>Increment English Units</th>
<th>Increment SI Units</th>
<th>Factory Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return</td>
<td>4 to 30 F (2.2 to 16.7 C)</td>
<td>1 F</td>
<td>0.1 C</td>
<td>10 F (5.6 C)</td>
</tr>
<tr>
<td>Outdoor</td>
<td>50 to 130 F (10 to 54.4 C)</td>
<td>1 F</td>
<td>0.1 C</td>
<td>90 F (32.2 C)</td>
</tr>
</tbody>
</table>

The values for \( \text{MAXIMUM RESET} \) for each type of reset are:

<table>
<thead>
<tr>
<th>Reset Type</th>
<th>Maximum Reset Range</th>
<th>Increment English Units</th>
<th>Increment SI Units</th>
<th>Factory Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return</td>
<td>10 to 20 F (-178 to -6.7 C)</td>
<td>1 F</td>
<td>0.1 C</td>
<td>5 F (2.8 C)</td>
</tr>
<tr>
<td>Outdoor</td>
<td>0 to 20 F (-178 to -6.7 C)</td>
<td>1 F</td>
<td>0.1 C</td>
<td>5 F (2.8 C)</td>
</tr>
</tbody>
</table>
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.

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

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

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

\[
\text{% Imbalance} = \left( \frac{l_x - l_{ave}}{l_{ave}} \right) \times 100
\]
Controls Interface

\[ I_{\text{ave}} = \frac{(I_1 + I_2 + I_3)}{3} \]

\[ I_x \] = phase with greatest difference from l\text{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.

<table>
<thead>
<tr>
<th>MODULE</th>
<th>1U3</th>
<th>1U4</th>
<th>1U5</th>
<th>1U7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>—</td>
<td>—</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>
Controls Interface

Table 18  Compressor Overload DIP Switch Settings

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

*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:

<table>
<thead>
<tr>
<th></th>
<th>CLOSE</th>
<th>OPEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor Discharge High Pressure Switch – PSIG</td>
<td>300 ±20</td>
<td>405 ±7</td>
</tr>
<tr>
<td>Compressor Motor Winding Thermostat – F</td>
<td>181</td>
<td>221</td>
</tr>
<tr>
<td>Low Pressure Cutout</td>
<td>22 ±4</td>
<td>7 ±4</td>
</tr>
</tbody>
</table>

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:

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

\[
V_{\text{ave}} = \frac{(V_1 + V_2 + V_3)}{3}
\]

\(V_x = \) phase with greatest difference from \(V_{\text{ave}}\) (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:

<table>
<thead>
<tr>
<th>Phase Sea. Lead</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black (Phase A)</td>
<td>L1</td>
</tr>
<tr>
<td>Red (Phase B)</td>
<td>L2</td>
</tr>
<tr>
<td>Yellow (Phase C)</td>
<td>L3</td>
</tr>
</tbody>
</table>
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.
Start-Up Procedures

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

<table>
<thead>
<tr>
<th>Job Name:</th>
<th>Job Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Serial Number:</td>
<td>Elevation Above Sea Level:</td>
</tr>
<tr>
<td>Model No:</td>
<td>Nameplate Voltage:</td>
</tr>
<tr>
<td>Compressor A Serial Number:</td>
<td>Fan Motor RLA</td>
</tr>
<tr>
<td>Compressor A Model Number:</td>
<td>Heat Tape Voltage</td>
</tr>
<tr>
<td>Compressor B Serial Number:</td>
<td></td>
</tr>
<tr>
<td>Compressor B Model Number:</td>
<td></td>
</tr>
<tr>
<td>Evap Water Pressure Drop</td>
<td></td>
</tr>
<tr>
<td>Design PSID:</td>
<td>Actual PSID:</td>
</tr>
<tr>
<td>Design GPM:</td>
<td>Actual GPM:</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Circuit</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Voltage</td>
<td>A-B</td>
<td>A-C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Circuit</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor</td>
<td>A</td>
<td>B</td>
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</tbody>
</table>

### Unit Operating Mode

<table>
<thead>
<tr>
<th>Last Diagnostic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaporator Entering Water Temp.</td>
<td>F or C</td>
</tr>
<tr>
<td>Evaporator Leaving Water Temp.</td>
<td>F or C</td>
</tr>
<tr>
<td>Outdoor Air Temperature</td>
<td>F or C</td>
</tr>
<tr>
<td>Active Chill Water Setpoint</td>
<td>F or C</td>
</tr>
<tr>
<td>Active Current Limit Setpoint</td>
<td></td>
</tr>
<tr>
<td>Saturated Evaporator Rfgt. Temp.</td>
<td>F or C</td>
</tr>
<tr>
<td>Saturated Condenser Rfgt. Temp.</td>
<td>F or C</td>
</tr>
<tr>
<td>Condenser Refrigerant Pressure</td>
<td>psig/Pa</td>
</tr>
<tr>
<td>Evaporator Refrigerant Pressure</td>
<td>psig/Pa</td>
</tr>
<tr>
<td>Compressor RLA</td>
<td>% RLA</td>
</tr>
</tbody>
</table>

### Compressor

<table>
<thead>
<tr>
<th>Compressor Starts</th>
<th>Compressor Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Hardwired Lockout</td>
<td>Not Locked out/ Locked out</td>
</tr>
<tr>
<td>Front Panel Lockout</td>
<td>Not Locked out/ Locked out</td>
</tr>
</tbody>
</table>
## Periodic Maintenance

### Operator Settings:

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

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

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.

1. Shut off the compressor and disconnect all electrical service to the compressor.
2. 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.
3. 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.
4. 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.
Figure 40  Oil Filter Change
Maintenance

35 & 40 Ton Compressor Oil Filter Replacement Chart

50 & 60 Ton Compressor Oil Filter Replacement Chart

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**

<table>
<thead>
<tr>
<th>Diagnostic Description</th>
<th>Type</th>
<th>Cause</th>
</tr>
</thead>
</table>
| 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         | IFW  | 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

<table>
<thead>
<tr>
<th>Diagnostic Description</th>
<th>Type</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contactor CPRSR A</td>
<td>MMR</td>
<td>a. Welded cprsr contactor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>Contactor CPRSR B</td>
<td>MMR</td>
<td>Same as CPRSR A.</td>
</tr>
<tr>
<td>Contactor CPRSR C</td>
<td>MMR</td>
<td>Same as CPRSR A.</td>
</tr>
<tr>
<td>Contactor CPRSR D</td>
<td>MMR</td>
<td>Same as CPRSR A.</td>
</tr>
<tr>
<td>CPRSR Suct Temp Sensor - Ckt 1</td>
<td>CMR</td>
<td>Open or short.</td>
</tr>
<tr>
<td>CPRSR Suct Temp Sensor - Ckt 2</td>
<td>CMR</td>
<td>Open or short.</td>
</tr>
<tr>
<td>CWS/Leaving Water Temp Cutout Setpoint Overlap</td>
<td>None</td>
<td>No diagnostic, display to flash and limit value to last legal value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE:</strong> 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.</td>
</tr>
<tr>
<td>Discharge Temp - Cprsr A</td>
<td>CMR</td>
<td>a. The discharge temp. exceeded the trip value; 135 + or -3 C.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. The discharge temp. PTC or wiring is open.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Time to trip from either trip value exceeded or input open shall be 0.5 to 2.0 seconds.</td>
</tr>
<tr>
<td>Discharge Temp - Cprsr B</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above.</td>
</tr>
<tr>
<td>Discharge Temp - Cprsr C</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above.</td>
</tr>
<tr>
<td>Discharge Temp - Cprsr D</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above.</td>
</tr>
<tr>
<td>Emergency Stop</td>
<td>MMR</td>
<td>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.</td>
</tr>
<tr>
<td>Entering Oil Temp Sensor - Cprsr A</td>
<td>CMR</td>
<td>Open or short.</td>
</tr>
<tr>
<td>Entering Oil Temp Sensor - Cprsr B</td>
<td>CMR</td>
<td>Open or short.</td>
</tr>
<tr>
<td>Entering Oil Temp Sensor - Cprsr C</td>
<td>CMR</td>
<td>Open or short.</td>
</tr>
<tr>
<td>Entering Oil Temp Sensor - Cprsr D</td>
<td>CMR</td>
<td>Open or short.</td>
</tr>
<tr>
<td>Evap Entering Wtr Temp Sensor</td>
<td>MMR</td>
<td>Open or short.</td>
</tr>
<tr>
<td>Evap Leaving Wtr Temp Sensor</td>
<td>MMR</td>
<td>Open or short.</td>
</tr>
<tr>
<td>Evap Rfgt Temp Sensor - CKT 1</td>
<td>CMR</td>
<td>Open or short (for 30 sec).</td>
</tr>
<tr>
<td>Evap Rfgt Temp Sensor - CKT 2</td>
<td>CMR</td>
<td>Open or short (for 30 sec).</td>
</tr>
</tbody>
</table>
## Diagnostics

### Table 19 Diagnostic Codes

<table>
<thead>
<tr>
<th>Diagnostic Description</th>
<th>Type</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External Chilled Water Setpoint</strong></td>
<td>IFW</td>
<td>a.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not &quot;Enabled&quot;: no diagnostics.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Out-Of-Range Hi, no diagnostic.</td>
</tr>
<tr>
<td><strong>External Current Limit Setpoint</strong></td>
<td>IFW</td>
<td>a.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not &quot;Enabled&quot;: no diagnostics.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Out-Of-Range Hi, no diagnostic.</td>
</tr>
<tr>
<td><strong>EXV Elec. Drive CKT - Rfgt Ckt 1</strong></td>
<td>CMR</td>
<td>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.</td>
</tr>
<tr>
<td><strong>EXV Elec. Drive CKT - Rfgt Ckt 2</strong></td>
<td>CMR</td>
<td>Same as Diagnostic for Ckt 1, above.</td>
</tr>
<tr>
<td><strong>High Diff. Press. - Ckt 1</strong></td>
<td>CMR</td>
<td>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.</td>
</tr>
<tr>
<td><strong>High Diff. Press. - Ckt 2</strong></td>
<td>CMR</td>
<td>Same as Diagnostic for Ckt 1, above.</td>
</tr>
<tr>
<td><strong>High Oil Temp - Cprsr A</strong></td>
<td>CMR</td>
<td>Entering Oil Temp to given compressor exceeded 170F. Time to trip is given by equation: trip time = (190 -oil Temp) x 180 sec/F.</td>
</tr>
<tr>
<td><strong>High Oil Temp - Cprsr B</strong></td>
<td>CMR</td>
<td>Same as Cprsr A, above.</td>
</tr>
<tr>
<td><strong>High Oil Temp - Cprsr C</strong></td>
<td>CMR</td>
<td>Same as Cprsr A, above.</td>
</tr>
<tr>
<td><strong>High Oil Temp - Cprsr D</strong></td>
<td>CMR</td>
<td>Same as Cprsr A, above.</td>
</tr>
<tr>
<td><strong>High Pressure Cutout - Cprsr A</strong></td>
<td>CMR</td>
<td>A high pressure cutout was detected on Cprsr A; trip at 405 + or -7 PSIG.</td>
</tr>
<tr>
<td><strong>High Pressure Cutout - Cprsr B</strong></td>
<td>CMR</td>
<td>A high pressure cutout was detected on Cprsr B; trip at 405 + or -7 PSIG.</td>
</tr>
<tr>
<td><strong>High Pressure Cutout - Cprsr C</strong></td>
<td>CMR</td>
<td>A high pressure cutout was detected on Cprsr C; trip at 405 + or -7 PSIG.</td>
</tr>
<tr>
<td><strong>High Pressure Cutout - Cprsr D</strong></td>
<td>CMR</td>
<td>A high pressure cutout was detected on Cprsr 0; trip at 405 + or -7 PSIG.</td>
</tr>
<tr>
<td><strong>Loss of Local Display Panel COM</strong></td>
<td>IFW</td>
<td>The 1U1 has detected a loss of IPC communication with the Local Display panel for at least 15 seconds.</td>
</tr>
<tr>
<td><strong>Low Chilled Water Temp (Unit off)</strong></td>
<td>IFW</td>
<td>The chilled water temp. fell below the cutout setpoint while the compressors were not running.</td>
</tr>
<tr>
<td><strong>Low Chilled Water Temp (Unit on)</strong></td>
<td>MAR</td>
<td>The chilled water temp. fell below the cutout setpoint while the compressors were running for 30 degree F Seconds.</td>
</tr>
<tr>
<td><strong>Low Differential Press - Ckt 1</strong></td>
<td>CMR</td>
<td>The fan control algorithm detected a low differential Temperature/Pressure condition that existed for more than 180 contiguous seconds. Trip point is 40 PSID.</td>
</tr>
<tr>
<td><strong>Low Differential Press - Ckt 2</strong></td>
<td>CMR</td>
<td>Same as Diagnostic for Ckt 1, above.</td>
</tr>
<tr>
<td><strong>Low Evap Rfgt Temp - Ckt 1</strong></td>
<td>CMR</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. See the low ambient ignore time on startup.</td>
</tr>
<tr>
<td><strong>Low Evap Rfgt Temp - Ckt 2</strong></td>
<td>CMR</td>
<td>Same as Diagnostic for Ckt 1, above.</td>
</tr>
</tbody>
</table>
## Diagnostics

### Table 19 Diagnostic Codes

<table>
<thead>
<tr>
<th>Diagnostic Description</th>
<th>Type</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Oil Flow - Cprsr A</td>
<td>CMR</td>
<td>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.</td>
</tr>
<tr>
<td>Low Oil Flow - Cprsr B</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above, but Cprsr B.</td>
</tr>
<tr>
<td>Low Oil Flow - Cprsr C</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above, but Cprsr C.</td>
</tr>
<tr>
<td>Low Oil Flow - Cprsr D</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above, but Cprsr D.</td>
</tr>
<tr>
<td>Low Pressure Cutout - Ckt 1</td>
<td>CMR</td>
<td>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.</td>
</tr>
<tr>
<td>Low Pressure Cutout - Ckt 2</td>
<td>CMR</td>
<td>Same as Ckt 1.</td>
</tr>
<tr>
<td>Low Superheat - Ckt 1</td>
<td>CMR</td>
<td>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.</td>
</tr>
<tr>
<td>Low Superheat - Ckt 2</td>
<td>CMR</td>
<td>Same as Diagnostic for Ckt 1, above.</td>
</tr>
<tr>
<td>Memory Error Type I</td>
<td>IFW</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE:</strong> 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.</td>
</tr>
<tr>
<td>Memory Error Type II</td>
<td>IFW</td>
<td>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.</td>
</tr>
<tr>
<td>Memory Error Type III</td>
<td>IFW</td>
<td>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.</td>
</tr>
</tbody>
</table>
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</thead>
<tbody>
<tr>
<td>Oil System Fault - Ckt 1</td>
<td>CMR</td>
<td>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 hysterisis to clear timer).</td>
</tr>
<tr>
<td>Oil System Fault - Ckt 2</td>
<td>CMR</td>
<td>Same as for Ckt 1, above.</td>
</tr>
<tr>
<td>Outdoor Air Temp Sensor (Both Outdoor Air Reset and Low Ambient Lockout not selected)</td>
<td>None</td>
<td>Open or short.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Display dashes e.g. “14---”.</td>
</tr>
<tr>
<td>Outdoor Air Temp Sensor (Either Outdoor Air Reset or Low Ambient Lockout selected.)</td>
<td>IFW</td>
<td>Open or short.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Use end of range value (whatever value the open or short.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Clear diag. when the resistance returns to normal range.</td>
</tr>
<tr>
<td>Over Voltage</td>
<td>MAR</td>
<td>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.</td>
</tr>
<tr>
<td>Overload Trip - CPRSR A</td>
<td>CMR</td>
<td>Cprsr current exceeded overload time vs. trip characteristic.</td>
</tr>
<tr>
<td>Overload Trip - CPRSR B</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A.</td>
</tr>
<tr>
<td>Overload Trip - CPRSR C</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A.</td>
</tr>
<tr>
<td>Overload Trip - CPRSR D</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A.</td>
</tr>
<tr>
<td>Phase Loss - Cprsr A</td>
<td>CMR</td>
<td>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.</td>
</tr>
<tr>
<td>Phase Loss - Cprsr B</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above.</td>
</tr>
<tr>
<td>Phase Loss - Cprsr C</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above.</td>
</tr>
<tr>
<td>Phase Loss - Cprsr D</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above.</td>
</tr>
<tr>
<td>Phase Reversal - Cprsr A</td>
<td>CMR</td>
<td>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.</td>
</tr>
<tr>
<td>Phase Reversal - Cprsr B</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above.</td>
</tr>
<tr>
<td>Phase Reversal - Cprsr C</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above.</td>
</tr>
<tr>
<td>Phase Reversal - Cprsr D</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A, above.</td>
</tr>
<tr>
<td>Phase Rev Prot Lost Cprsr A</td>
<td>CMR</td>
<td>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.</td>
</tr>
<tr>
<td>Phase Rev Prot Lost - Cprsr B</td>
<td>CMR</td>
<td>Same as Cprsr A, above, but Cprsr B.</td>
</tr>
<tr>
<td>Phase Rev Prot Lost - Cprsr C</td>
<td>CMR</td>
<td>Same as Cprsr A, above, but Cprsr C.</td>
</tr>
<tr>
<td>Phase Rev Prot Lost - Cprsr D</td>
<td>CMR</td>
<td>Same as Cprsr A, above, but Cprsr D.</td>
</tr>
<tr>
<td>Phase Unbalance - Cprsr A</td>
<td>CMR</td>
<td>A 15% phase unbalance condition has been detected.</td>
</tr>
<tr>
<td>Phase Unbalance - Cprsr B</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A.</td>
</tr>
<tr>
<td>Phase Unbalance - Cprsr C</td>
<td>CMR</td>
<td>Same as Diagnostic for Cprsr A.</td>
</tr>
</tbody>
</table>
Diagnoses

Table 19  Diagnostic Codes

<table>
<thead>
<tr>
<th>Diagnostic Description</th>
<th>Type</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase Unbalance - CPRSR D</td>
<td>CMR</td>
<td>Same as Diagnostic for CPRSR A.</td>
</tr>
</tbody>
</table>
| 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 - 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. |
| 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.  
                                |      | 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

<table>
<thead>
<tr>
<th>Diagnostic Description</th>
<th>Type</th>
<th>Cause</th>
</tr>
</thead>
</table>
| 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. |
| 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%. ± 2.8% at 200V, or ± 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 comm from the 1U1 module.              |
| U5 Indicating U3 Communications        | CMR  | The 1U5 has det. a loss of IPC comm 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

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

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

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

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.
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 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.
Impellers are trimmed in 1/8" increments to supply required capacity. Responsibility for final impeller sizing remains with ITT Bell & Gossett.
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

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

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2307-3327</td>
<td>Schematic Page 1</td>
<td>146</td>
</tr>
<tr>
<td>2307-3328</td>
<td>Schematic Page 2 - Low Ambient</td>
<td>148</td>
</tr>
<tr>
<td>2307-6516</td>
<td>Schematic Page 2 - Std Ambient</td>
<td>150</td>
</tr>
<tr>
<td>2307-3329</td>
<td>Schematic Page 3 - Package Units</td>
<td>152</td>
</tr>
<tr>
<td>2307-6472</td>
<td>Schematic Page 3 - Remote Evap Units</td>
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<td>2307-3330</td>
<td>Schematic Page 4 - Package Units</td>
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<td>2307-6046</td>
<td>Schematic Page 4 - Remote Evap Units</td>
<td>158</td>
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<td>2307-3331</td>
<td>Schematic Page 4 - Package Units Low Ambient</td>
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<td>2307-3325</td>
<td>Field Wiring Page 1 - Package Units</td>
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<td>2307-6048</td>
<td>Field Wiring Page 1 - Remote Evap Units</td>
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<td>Field Wiring Page 2 - Package Units</td>
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<td>2307-3326</td>
<td>Component Location</td>
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<td>2307-6049</td>
<td>Component Location - Remote Evap (Outside)</td>
<td>174</td>
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<td>2307-6463</td>
<td>Component Location - Remote Evap (Inside)</td>
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</tr>
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</table>
**WARNING**
HAZARDOUS VOLTAGE!
DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING.
FAILURE TO DO SO MAY CAUSE SEVERE INJURY OR DEATH.

**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**
INTUITEZ QUE DES CONDUCTEURS EN CUIVRE
LES BORNE DE L'UNITÉ NE SONT PAS CONÇUES
POUR RECEVOIR D'AUTRES TYPES DE CONDUCTEURS.
L'UTILISATION DE TOUT AUTRE CONDUCTEUR PEUT
ENDOMMAGER L'ÉQUIPEMENT.

**PRECAUCIÓN**
UTILICE 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.

**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**
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LES BORNE DE L'UNITÉ NE SONT PAS CONÇUES
POUR RECEVOIR D'AUTRES TYPES DE CONDUCTEURS.
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ENDOMMAGER L'ÉQUIPEMENT.

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**ATTENTION**
INTUITEZ QUE DES CONDUCTEURS EN CUIVRE
LES BORNE DE L'UNITÉ NE SONT PAS CONÇUES
POUR RECEVOIR D'AUTRES TYPES DE CONDUCTEURS.
L'UTILISATION DE TOUT AUTRE CONDUCTEUR PEUT
ENDOMMAGER L'ÉQUIPEMENT.

**PRECAUCIÓN**
UTILICE 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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<td>FAN FUSES CIRCUIT BREAKER</td>
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<td>176-7</td>
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<td>INVERTER/AC-TRANS POWER FUSES CIRCUIT BREAKER</td>
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<td>AUTO-TRANSFORMER CONTACTORS</td>
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<td>COMPRESSOR MODUL</td>
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</tbody>
</table>

**NOTES:**
- **2** 238 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **3** 237 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **4** 236 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **5** 235 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **6** 234 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **7** 233 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **8** 232 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **9** 231 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **10** 230 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **11** 229 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **12** 228 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **13** 227 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **14** 226 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **15** 225 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **16** 224 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **17** 223 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **18** 222 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **19** 221 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **20** 220 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **21** 219 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **22** 218 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **23** 217 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **24** 216 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **25** 215 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **26** 214 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **27** 213 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **28** 212 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **29** 211 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
- **30** 210 FAN MOTOR SUPPLY TEMPERATURE SENSOR CIRCUIT BREAKER.
## SEE DRAWING 2307–6543 FOR CUSTOMER WIRE SELECTION TABLE

### NOTES
1. Dash-Units indicate temperature field wiring by a number is indicated throughout the unit. Table 1 lists the exceptions for each circuit, wire size and terminal. Table 2 lists the exceptions for each circuit, wire size and terminal.
2. All terminal block connections are made by hand. Unless a specific connection is described, the terminal block connections are made with a crimp tool and wire size is subject to change without notice.
3. All bushings are included with the unit. All bushings are field installed. Do not substitute bushings.
4. Check and start-up procedures have been completed.
5. Wiring is not intended for field wiring. Check-out and start-up procedures have been completed.

### Wiring and Circuit Requirements
20. All field wiring must be in accordance with national and local codes. Install field wiring to ensure that all terminals are properly sized and grounded. Do not use field wiring for any purpose other than the temperature setting. Do not connect field wiring to any power source other than the unit. Do not connect field wiring to any power source other than the unit. Do not connect field wiring to any power source other than the unit. Do not connect field wiring to any power source other than the unit.

### CAUTION
Use copper conductors only. Unit terminals are not designed to accept non-circular conductors. Failure to do so may cause damage to the equipment.

### ATTENTION
Use only terminals where the length of the uninsulated portion of the conductor is not greater than the length of the terminal. Do not exceed the maximum current rating of the terminal.

### PRECAUCIÓN
Utilice sólo conductores de cobre. Los terminales no están diseñados para aceptar tipos de conductores diferentes. La falla en hacerlo puede causar daños al equipo.

### WARNING
Use only terminals where the length of the uninsulated portion of the conductor is not greater than the length of the terminal. Do not exceed the maximum current rating of the terminal.

### AVERTISSEMENT
N'utilisez que des conducteurs de cuivre. Les borniers ne sont pas conçus pour accepter d'autres types de conducteurs. L'utilisation de tout autre conducteur peut endommager l'équipement.

### ADVERTENCIA
Utilice solo conductores de cobre. Los bornes no están diseñados para aceptar otros tipos de conductores. La utilización de cualquier otro conductor puede dañar el equipo.

### Diagram
![Diagram of the equipment with labels and connections](image)

### Table

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Voltage</th>
<th>Size</th>
<th>Notes</th>
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<td>1-10</td>
<td>110V</td>
<td>12AWG</td>
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<td>220V</td>
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<tr>
<td>21-30</td>
<td>380V</td>
<td>12AWG</td>
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### IMPORTANT
When there is a command to shutdown the chilled water system, the chilled water pump is required to operate for a minimum of one minute after the External AUTO/TEST gives the shutdown command.
<table>
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<tr>
<th>Unit Size</th>
<th>Rated Voltage</th>
<th>Wire Selection Size to Main Terminal Block</th>
<th>Wire Selection Size to Disconnect</th>
<th>Wire Selection Size to Circuit Breaker</th>
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<td>Terminal Size</td>
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<td>Connector Wire Range (per phase)</td>
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<td>760 Amp</td>
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<tr>
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<td>230/60</td>
<td>310 Amp</td>
<td>#8 to 350 MCM</td>
<td>400 Amps</td>
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<tr>
<td></td>
<td>380/60</td>
<td>310 Amp</td>
<td>#8 to 350 MCM</td>
<td>250 Amps</td>
</tr>
<tr>
<td></td>
<td>460/60</td>
<td>175 Amp</td>
<td>#14 to 2/0</td>
<td>250 Amps</td>
</tr>
<tr>
<td></td>
<td>575/60</td>
<td>175 Amp</td>
<td>#14 to 2/0</td>
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<td></td>
<td>575/60</td>
<td>310 Amp</td>
<td>#8 to 350 MCM</td>
<td>350 Amps</td>
</tr>
<tr>
<td></td>
<td>400/50</td>
<td>310 Amp</td>
<td>#8 to 350 MCM</td>
<td>350 Amps</td>
</tr>
<tr>
<td>RTAA 125</td>
<td>200/60</td>
<td>760 Amp</td>
<td>#4 to 500 MCM</td>
<td>400 Amps</td>
</tr>
<tr>
<td></td>
<td>230/60</td>
<td>760 Amp</td>
<td>#4 to 500 MCM</td>
<td>400 Amps</td>
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<td>380/60</td>
<td>310 Amp</td>
<td>#8 to 350 MCM</td>
<td>400 Amps</td>
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<td></td>
<td>460/60</td>
<td>310 Amp</td>
<td>#8 to 350 MCM</td>
<td>350 Amps</td>
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<td>400/50</td>
<td>310 Amp</td>
<td>#8 to 350 MCM</td>
<td>350 Amps</td>
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*760 Amp for X-line #4 to 500 MCM
Fuse Replacement Selection

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

<table>
<thead>
<tr>
<th>Wire size</th>
<th>Maximum Length for Sensor Leads</th>
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<tbody>
<tr>
<td>14 AWG</td>
<td>5000 FT</td>
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<tr>
<td>16 AWG</td>
<td>2000 FT</td>
</tr>
<tr>
<td>18 AWG</td>
<td>1000 FT</td>
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</tbody>
</table>

(1) Do Not Run in Conduct With Higher Voltage Circuits.
LOW AMBIENT OPTION

STANDARD UNIT
HELI Rotor HER MECTIC LIQUID CHILLER
SERIES "R"
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.
   a) DRILL 469 Dia HOE IN TOP OF CIRCUITS #1 & 2 SUCTION LINE. REMOVE ALL CHIPS & DIRT FROM INSIDE TUBING BEFORE BRAZING ADAPTER IN LINES.
   b) BRAZE ADAPTERS IN TOP OF SUCTION LINES BEFORE INSTALLING SENSORS & FITTINGS. USE AWS BRAZING FLUX TYPE 3A OR 3B & BCUP ALLOY.
   c) APPLY Teflon Tape to Fitting Threads Before Tightening.
   d) TIGHTEN NUT UNTIL SENSOR WILL NOT TURN BY HAND, THEN TIGHTEN 1-1/4 TURNS. DO NOT OVER TIGHTEN.
   e) ORIENTATE SENSOR WITH SINGLE HOLE SIDE FACING FLOW, INDICATED BY ARROW.

DETAIL A 3,10

RED

RK - 2RTR

PUR

CAUTION
1. USE COPPER CONNECTION CABLES
2. USE CORRECT GROUND CONNECTION CABLES
3. USE ONLY CORRECT SIZE WIRING TO THE UNIT

ATTENTION
1. AVERTISSEMENT
2. AVERTISSEMENT
3. AVERTISSEMENT

CAUTION
1. USE COPPER CONNECTION CABLES
2. USE CORRECT GROUND CONNECTION CABLES
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ATTENTION
1. AVERTISSEMENT
2. AVERTISSEMENT
3. AVERTISSEMENT
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.

<table>
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<tr>
<th>Literature Order Number</th>
<th>RTAA-SVX01A-EN</th>
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<tr>
<td>File Number</td>
<td>SV-RF-RTAA-SVX01A-EN-0905</td>
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<tr>
<td>Supersedes</td>
<td>RTAA-IOM-4A</td>
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<td>Stocking Location</td>
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For more information contact your local district office or e-mail us at comfort@trane.com.