Installation, Operation, and Maintenance

Trane Rental Services

200 Tons

Models: ACSA/ACXA

⚠SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

August 2024 **TEMP-SVX002A-EN**

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

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

Important 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 according to local rules. For the USA, 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

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

⚠WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labeling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

⚠WARNING

Follow EHS Policies!

Failure to follow instructions below could result in death or serious injury.

- **All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.**
- **Non-Trane personnel should always follow local regulations.**

⚠WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.
Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.

⚠WARNING

R-454B Flammable A2L Refrigerant!

Failure to use proper equipment or components as described below could result in equipment failure, and possibly fire, which could result in death, serious injury, or equipment damage.

The equipment described in this manual uses R-454B refrigerant which is flammable (A2L). Use ONLY R-454B rated service equipment and components. For specific handling concerns with R-454B, contact your local representative.

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Table of Contents

Model Number Description

Digit 1, 2 — Unit Model

RS = Rental Services

Digit 3, 4 — Unit Type

CA = Air-Cooled Chiller
XA = Air-Cooled Heat Pump

Digit 5, 6, 7, 8 — Unit Capacity

0200 = 200 Nominal Tons

Digit 9, 10 — Design Sequence

Note: *See the model series table below.*

Digit 11, 12 — Incremental Designator

AA

	Electrical Connection Type	Power Connection	Refrigerant Type	Pump Piping Bypass	VFD Included on Integral Pump
F0	Series 16 Cam-Type Connections	Single Point	R-410A	Yes	Yes
F1	Series 16 Cam-Type Connections	Single Point	R-454B	Yes	Yes

General Information

Unit Description

Ascend™ Model ACS and ACX units are scroll type, air-cooled, liquid chillers, designed for installation outdoors. The 200 ton units have two independent refrigerant circuits, with three compressors per circuit. The chillers are packaged with an evaporator and condenser.

Note: *Each unit is a completely assembled, hermetic - compressors packaged unit that is factory-piped, wired, leak-tested, dehydrated, charged and tested for proper control operations prior to shipment. The chilled water inlet and outlet openings are covered for shipment.*

The chiller features Tracer® Symbio 800 controls to monitor the control variables that govern the operation of the chiller unit. Adaptive Control logic can correct these variables, when necessary, to optimize operational efficiencies, avoid chiller shutdown, and keep producing chilled water.

Each refrigerant circuit is provided with filter, sight glass, electronic expansion valve, and charging valves. The evaporator is a brazed plate heat exchanger equipped with water drain and vent connections in the water piping. The condenser is an air-cooled slit or serpentine fin coil, arranged in a transverse V layout.

Accessories

For flexible hose data, see *Trane Rental Services Temporary Cooling - Flexible Water Hose - Installation, Operation, and Maintenance* (CHS-SVX01*-EN).

Electrical Cable

For electrical cable data, refer to **Electrical Cable** in *Trane Rental Services Electrical Cable - Engineering Bulletin* (CHS-PRB005*-EN).

Pig-Tail Connectors

Each cable box has pigtails for non cam-type connections. There is a cam-type on one end and a barrel lug on the other. The barrel lug end allows for connection into a power distribution panel or non cam-type equipment. The pig-tail can be connected to the standard cam-type cable (see Figure 1, p. 7).

Figure 1. Electrical connector overview

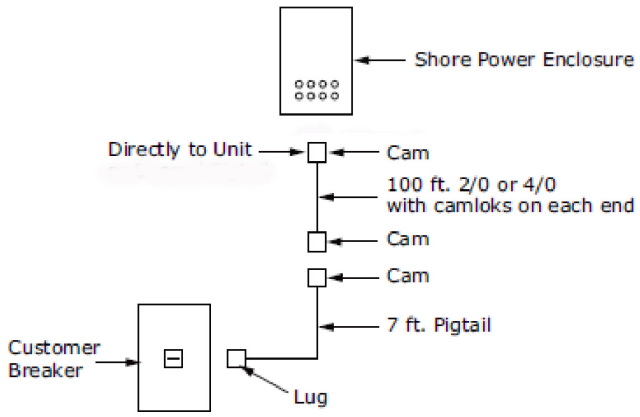
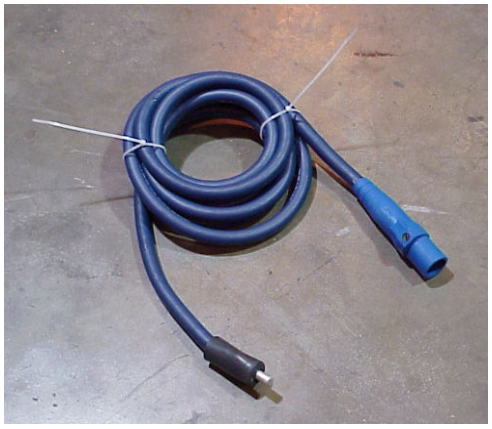


Figure 2. Pig-tail connectors



General Data

Table 1. General data - ACS (IP)

Unit Size (tons)	200	
Refrigerant	R-410A (F0); R-454B (F1)	
Compressor Model		
Quantity	#	6
Tonnage/ckt[a]		40+40+30
Evaporator		
Water storage - Standard Cooling	gal	17.4
Min. flow[b]	gpm	240
Max. flow[a]	gpm	720
Water storage - Other Applications	gal	14
Water connection	in.	4
Max. Water Temperature	°F	105
Min. Water Pressure	psig	0
Max. Water Pressure	psig	150
Condenser		
Quantity of coils	#	10
Coil length	in.	75
Coil height	in.	49
Tube width	in.	1
Fins per foot	fpf	276
Fan		
Quantity	#	10
Diameter	in.	37.5
EC - Airflow per fan	cfm	11336
AC - Airflow per fan	cfm	11642
EC Motor Power per motor	HP	2.4
AC Motor Power per motor	HP	1.8
EC Motor RPM	rpm	820
EC Tip speed	ft/min	7728
AC Motor RPM	rpm	84
AC Tip speed	ft/min	7916
General Unit		
Refrigerant circuits	#	2
Capacity steps	%	15-30-50-65-80-100
Min ambient	°F	-20
Refrig charge/ckt[a]	lb	63
F0-style Oil charge/ckt[a]	gal	6.6
F1-style Oil charge/ckt[a]	gal	6

(a) Data shown for one circuit only. The second circuit always matches.
(b) Minimum and maximum flow rates apply to constant-flow chilled water system running at AHRI conditions, without freeze inhibitors added to the water loop.

Table 2. General data - ACX (IP)

Unit Size (tons)	200	
Refrigerant	R-454B	
Compressor Model		
Quantity	#	6
Tonnage/ckt[a]		30+30+40
Evaporator		
Water storage - Standard Cooling	gal	17.4
Water storage - Ice Making	gal	14
Min. flow[b]	gpm	240
Max. flow[b]	gpm	720
Water storage - Other Applications	gal	14
Water connection	in.	4
Max. Water Temperature	°F	105
Min. Water Pressure	psig	0
Max. Water Pressure	psig	150
Condenser		
Quantity of coils	#	10
Coil length	in.	83.6
Coil height	in.	49.2
Coil width	in.	3.4
Fins per foot	fpf	180
Fan		
Quantity	#	10
Diameter	in.	37.5
Airflow per fan - cooling mode	cfm	12288
Airflow per fan - heating mode	cfm	10510
Power per motor - cooling mode	HP	1.7
Power per motor - heating mode	HP	1.5
Motor RPM - cooling mode	rpm	820
Motor RPM - heating mode	rpm	740
Tip speed - cooling mode	ft/min	7728
Tip speed - heating mode	ft/min	6785
General Unit		
Refrigerant circuits	#	2
Capacity steps	%	15-30-50-65-80-100
Cooling mode ambient - min/max	°F	-4/125
Heating mode ambient - min/max	°F	0/95
Refrig charge/ckt[a]	lb	63
Oil charge/ckt[a]	gal	7

(a) Data shown for one circuit only. The second circuit always matches.
(b) Minimum and maximum flow rates apply to constant-flow chilled water system running at AHRI conditions, without freeze inhibitors added to the water loop.

Pre-Installation

Inspection Checklist

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

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.
- Notify the carrier terminal of the damage immediately, by phone and 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, until damage is inspected by the carrier representative.

Unit Storage

If the chiller will be stored in ambients of 32°F or less, evaporator and pump should be blown out to remove any liquid.

Prior to installation, if storing the chiller for more than one month, see the following recommendations:

- Do not remove the protective coverings from the electrical panel.
- Store the chiller in a secure area.
- Units charged with refrigerant should not be stored where temperatures exceed 155°F.
- At least every three months, attach a gauge and manually check the pressure in the refrigerant circuit. If the refrigerant pressure is below 200 psig at 70° F (or 145 psig at 50° F), call a qualified service organization and the appropriate Trane sales office.

Installation Requirements

A list of the contractor responsibilities typically associated with the unit installation process is provided.

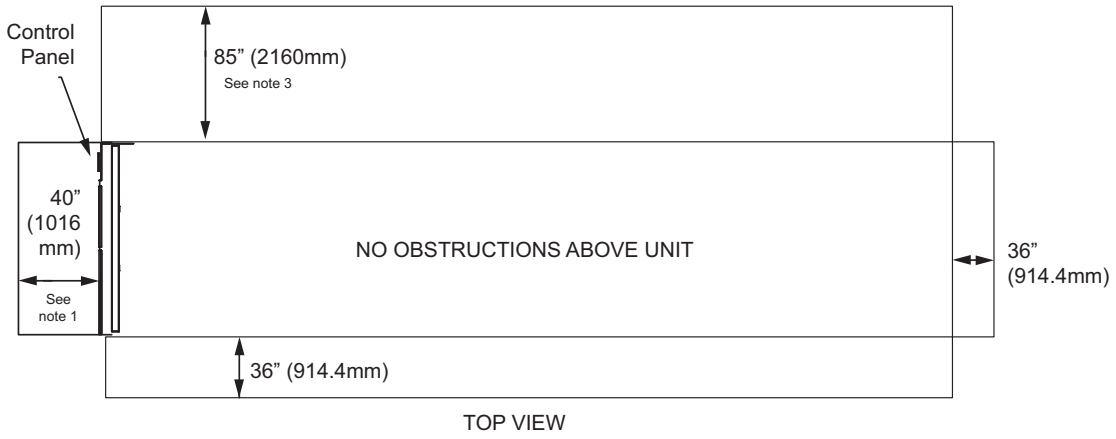
Table 3. Installation requirements

Type	Trane Supplied		Field Supplied Field Installed
	Trane Installed	Field Installed	
Foundation			Meet foundation requirements
Rigging			• Safety chains • Clevis connectors • Lifting beam
Electrical	• Circuit breakers (optional) • Unit mounted starter		• Circuit breakers (optional) • Electrical connections to unit mounted starter • Wiring sizes per submittal and NEC • Terminal lugs • Ground connection(s) • BAS wiring (optional) • Control voltage wiring • Option relays and wiring
Water Piping	• Flow switch • Water strainer • Taps for thermometers and gauges • Thermometers • Water flow pressure gauges • Isolation and balancing valves in water piping • Vents and drain • Pressure relief valves		Bypass piping and valves
Insulation	Insulation		Insulation
Water Piping Connection Components	Grooved pipe		

Dimensions and Weights

Service Clearances

Figure 3. Unit service clearance requirements



Notes:

- *A full 40 inch clearance is required in front of the control panel. Must be measured from front of panel, not end of unit base. Installer must also follow NEC and local/state codes for electrical clearance requirements.*
- *Area above unit is required for operation, maintenance, access panel and air flow. No obstructions above unit.*
- *Clearance of 85 inch on the side of the unit is required for coil replacement. Preferred side for coil replacement is shown (left side of the unit, as facing control panel), however either side is acceptable.*
- *For obstructions or multiple units, see Close-Spacing and Restricted Airflow Situations Engineering Bulletin (AC-PRB001*-EN).*

Unit Drawings

Figure 4. 200T ACSA (RSCA0200F0-F1)

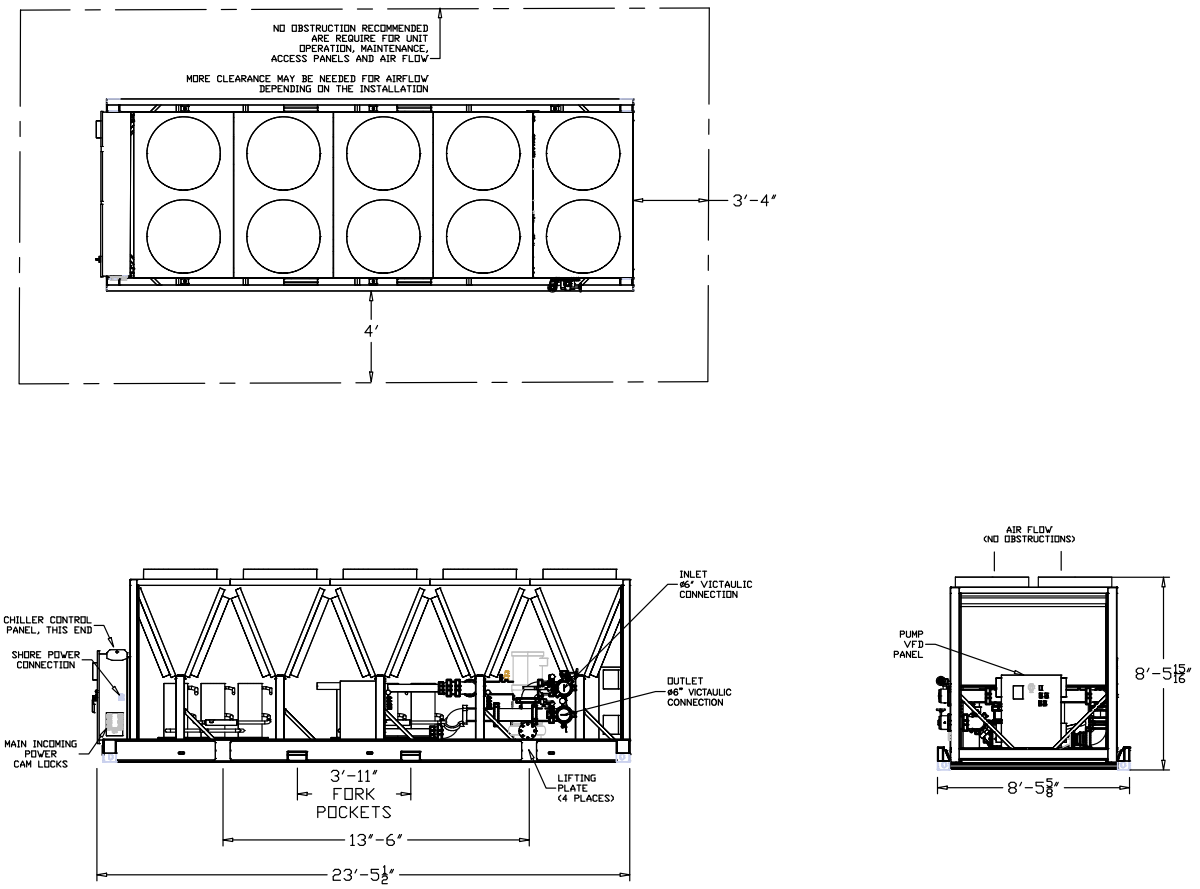
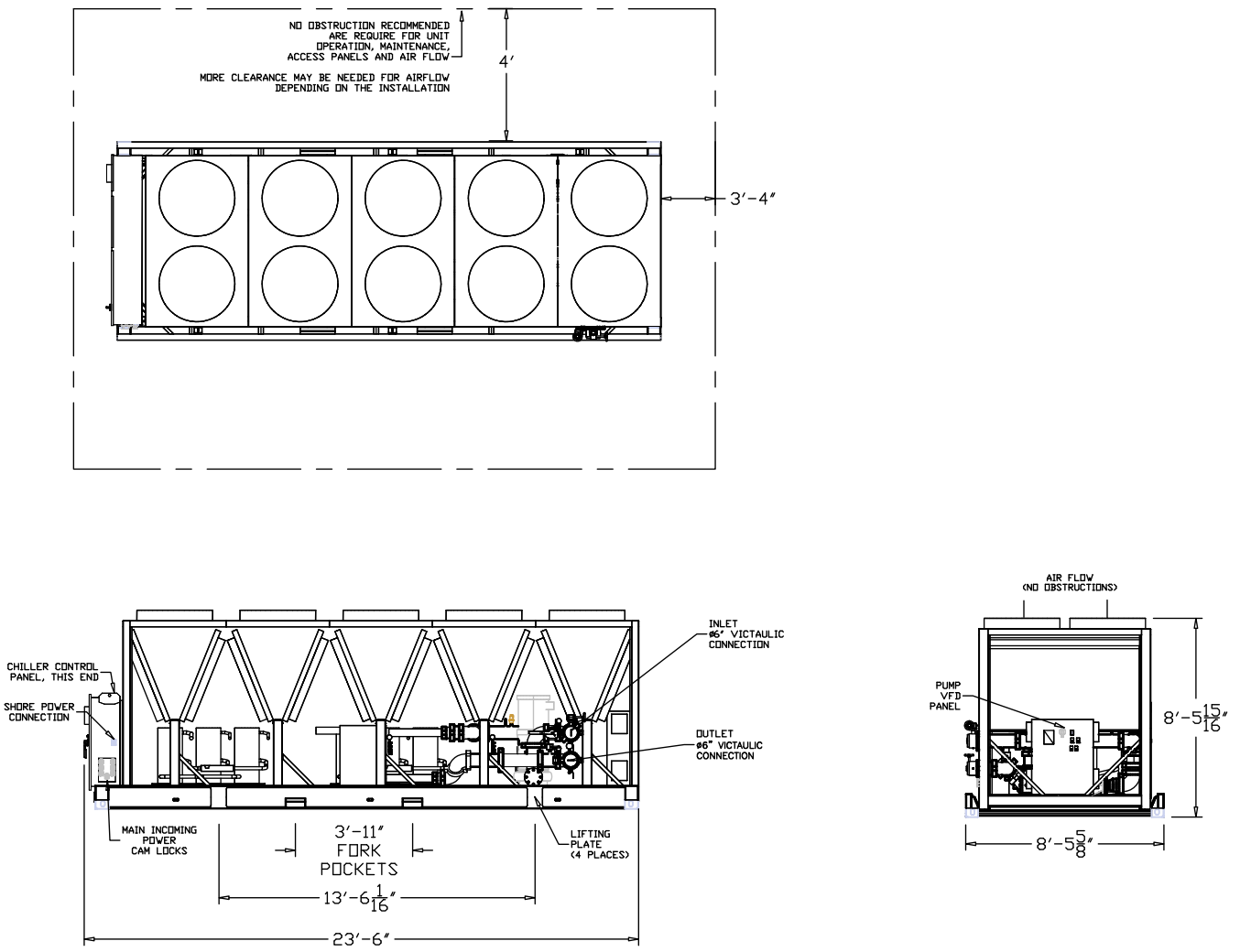


Figure 5. 200T ACXA (RSXA0200F1)



Unit Weights

Table 4. Unit weights

Unit	Weight (lb)	
	Shipping	Operational
RSCA0200F0-F1	15,020	15,520
RSXA0200F1	18,769	19,328

A2L Work Procedures

⚠WARNING

Risk of Fire — Flammable Refrigerant!

Failure to follow instructions below could result in death or serious injury, and equipment damage.

- **To be repaired only by trained service personnel.**
- **•Do not puncture refrigerant tubing.**
- **•Dispose of properly in accordance with federal or local regulations.**

⚠WARNING

Refrigerant under High Pressure!

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage.

System contains 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.

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

The units described in this manual use R-454B refrigerant. Use ONLY R-454B rated service equipment or components with these units. For specific handling concerns with R-454B, contact your local Trane representative.

Installation, repair, removal, or disposal should be performed by trained service personnel.

At all times, Trane's maintenance and service guidelines shall be followed. If in doubt, contact Trane technical support for assistance.

Servicing

Prior to initiating work on equipment, check the area with an appropriate refrigerant detector. Ensure the service personnel are properly trained regarding work in potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed, or intrinsically safe. Be aware that the refrigerant does not contain an odor.

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available on hand. A dry powder or CO2 fire extinguisher should be located adjacent to the charging area.

At all times, Trane's maintenance and service guidelines shall be followed. If in doubt, contact Trane technical support for assistance.

All maintenance staff and others working in the local area shall be instructed on the nature of the work being carried out. Work in confined spaces shall be avoided.

Ignition Source Mitigation

Do not use any sources of ignition when working on the refrigeration system.

Keep all ignition sources, including cigarette smoking, away from the site of installation, repair, removal or disposal, during which refrigerant can potentially be released to the surrounding space.

Survey the area around the equipment before initiating work to ensure no flammable hazards or ignition risks are present.

"No Smoking" signs shall be displayed.

Do not use devices that can be a source of ignition to accelerate defrosting of components. Use only defrost and cleaning procedures recommended by Trane. Do not pierce or burn.

Ventilation

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere. If present, check that the ventilation system, including outlets, are operating adequately and are not obstructed.

Refrigerating Equipment

Refrigerant piping or components should not be installed in locations where substances which may corrode them are present.

Check that equipment hazard markings are visible and legible. Replace them if they are not.

For equipment using secondary fluids, like water or glycol, check that refrigerant is not present in the secondary fluid loop before conducting any hot work.

Electrical Devices

Do not apply power to the circuit if a fault exists which compromises safety. If the fault cannot be corrected immediately, but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be

reported to the owner of the equipment, so all parties are advised.

Initial safety checks shall include:

- Cabling is not subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. Account for the effects of aging or continual vibration from sources such as compressors or fans.
- Capacitors are discharged. This shall be done in a safe manner to avoid possibility of sparking.
- No live electrical components and wiring are exposed while charging, recovering, or purging the system.
- Verify continuity of earth bonding.
- Replace electrical components with Trane replacement parts, or those meeting the same ratings and qualified for flame arrest protection, UL LZGH2 category.

Leak Detection

Never use an open flame to detect leaks. A halide torch should not be used. Use only approved leak detection methods per this instruction manual.

The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL gas (25% maximum) is confirmed.

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

Examples of leak detection fluids are:

- Bubble method
- Fluorescent method agents

If a leak is suspected, all naked flames shall be removed/ extinguished.

If a refrigerant leak is found which requires brazing, all refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

Refrigerant Removal and Evacuation

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration.

The following procedure shall be adhered to:

1. Safely remove refrigerant following local and national regulations.
2. Evacuate.
3. Purge the circuit with inert gas.
4. Evacuate (optional for A2L).
5. Continuously flush or purge with inert gas when using flame to open circuit.
6. Open the circuit.

Prior to refrigerant removal, open all appropriate valves, including solenoid and electronic expansion valves (EXVs). Use control settings, where available. When not available, manually open all electronically controlled valves using acceptable service procedures.

The recovery equipment shall be in good working order with instructions available. Equipment shall be suitable for the recovery of the flammable refrigerant. For specific handling concerns, contact the manufacturer. Ensure all hose connections are checked for tightness to avoid refrigerant leaks.

The refrigerant shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. Do not mix refrigerants in recovery unit and especially not in cylinders.

Refrigerant recovery unit should be purged with an inert gas after each use or before using with a different refrigerant Class – for example, A2L to A1.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

The system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

The system shall be vented down to atmospheric pressure to enable work to take place.

The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Refrigerant Charging

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.

- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Prior to refrigerant charging, open all appropriate valves, including solenoid and electronic expansion valves (EXVs). Use control settings, where available. When not available, manually open all electronically controlled valves using acceptable service procedures.

Decommissioning

Before carrying out the decommissioning procedure, it is essential that the trained service personnel is completely familiar with the equipment and all its details. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate system electrically.
3. Before attempting the procedure, ensure that:
   a. Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
   b. All personal protective equipment is available and being used correctly.
   c. The recovery process is supervised at all times by a competent person.
   d. Recovery equipment and cylinders conform to the appropriate standards.
4. Pump down refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure that cylinder is situated on the scales before recovery takes place.
7. Start the recovery machine and operate in accordance with instructions.
8. Do not overfill cylinders (no more than 80% volume liquid charge).
9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
11. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked. When equipment has been decommissioned, attach a signed label which includes the date of decommissioning.
12. When equipment has been decommissioned, attach a signed label which includes the date of decommissioning.

Installation

Location Requirements

Sound Considerations

- Locate the unit away from sound-sensitive areas.
- Chilled water piping should not be supported by chiller frame.
- Install rubber vibration isolators in all water piping.
- Seal all wall penetrations.

Note: *Sound data does not include on-board pump. Consult an acoustical engineer for critical applications.*

Table 5. ACSA standard noise sound power levels (Lw, in dB, ref 1 pW)

Unit size	Octave Band Center Frequency (Hz)								Overall A-Wtd
	63	125	250	500	1000	2000	4000	8000	
Full Load									
200	96	101	96	97	96	89	82	77	99
Nominal 83 % Load (1 Compressor Off)									
200	96	101	96	97	95	89	82	76	99
Nominal 67 % Load (2 Compressors Off)									
200	95	101	96	96	94	88	82	75	98
Nominal 50 % Load (Half of The Compressors Off)									
200	93	98	94	93	94	89	83	75	97
Nominal 33% Load (4 Compressors Off)									
200	90	90	90	90	92	86	81	75	94
Nominal 17% Load (5 Compressors Off)									
200	87	87	86	86	88	83	78	73	91

Table 6. ACSA standard sound pressure levels (Lp, in dB, ref 1 µPa) - 10m from center of broad sides of chiller

Unit size	Octave Band Center Frequency (Hz)								Overall A-Wtd
	63	125	250	500	1000	2000	4000	8000	
Full Load									
200	69	74	69	70	69	62	55	50	72
Nominal 83 % Load (1 Compressor Off)									
200	69	74	69	70	68	62	55	49	72
Nominal 67 % Load (2 Compressors Off)									
200	68	74	69	69	67	61	55	48	71
Nominal 50 % Load (Half of The Compressors Off)									
200	66	71	67	66	67	62	56	48	70
Nominal 33% Load (4 Compressors Off)									
200	63	63	63	63	65	59	54	48	67
Nominal 17% Load (5 Compressors Off)									
200	60	60	59	59	61	56	51	46	64

Table 7. ACSA standard sound pressure levels (Lp, in dB, ref 1 µPa) - 10m from end of chiller

Unit size	Octave Band Center Frequency (Hz)								Overall A-Wtd
	63	125	250	500	1000	2000	4000	8000	
Full Load									
200	65	70	65	66	65	58	51	46	68
Nominal 83 % Load (1 Compressor Off)									
200	65	70	65	66	64	58	51	45	68
Nominal 67 % Load (2 Compressors Off)									
200	64	70	65	65	63	57	51	44	67
Nominal 50 % Load (Half of The Compressors Off)									
200	62	67	63	62	63	58	52	44	66
Nominal 33% Load (4 Compressors Off)									
200	59	59	59	59	61	55	50	44	63
Nominal 17% Load (5 Compressors Off)									
200	56	56	55	55	57	52	47	42	60

Note: ACSA full and part load sound data by octave band. The ACXA has no separate sound information available at this time - ACXA and ACSA have the same main components that contribute to sound.

Unit Location and Mounting

- Inspect the location for installation and verify service access clearances.
- Provide adequate blocking to level unit or trailer.

Foundation

Provide rigid, non-warping mounting pads or a concrete foundation of sufficient strength and mass to support the applicable operating weight (including completed piping, and full operating charges of refrigerant, oil and water). Refer to the chapter on "Dimensions and Weights," p. 11 for unit operating weights. Once in place, the unit must be level within 1/4-inch (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.

Clearances

Provide enough space around the 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. See "Service Clearances," p. 11 for minimum clearances. In all cases, local codes which require additional clearances will take precedence over these recommendations.

For close spacing information, see *Close-Spacing and Restricted Airflow Situations Ascend™ Chiller Models ACR and ACS Sintesis™ Chiller Model RTAF - Engineering Bulletin* (AC-PRB001*-EN).

Rigging

See Table 4, p. 13 for typical unit lifting weights. Refer to the rigging label attached to the unit for further details.

⚠WARNING

Heavy Objects!

Failure to follow instructions below could result in unit dropping which could result in death or serious injury, and equipment or property-only damage.
Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles 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.

⚠WARNING

Improper Unit Lift!

Failure to properly lift unit in a LEVEL position could result in unit dropping and possibly crushing operator/ technician which could result in death or serious injury, and equipment or property-only damage.
Test lift unit approximately 24 inches (61 cm) to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level.

NOTICE

Equipment Damage!

To prevent damage to unit, do not fork lift or allow lifting cables to contact unit during lift.

Lifting using either a single spreader bar or an H-type spreader is acceptable. Attach chains or cables to lifting beam. Lifting beam crossbars **MUST** be positioned so lifting cables do not contact the sides of the unit.

Important: *The center of gravity (CG) is never at the midpoint of the base rail lifting strap holes. A level unit lift is required for a safe lift and to prevent unit damage.*

Lifting a unit with equal length straps will NOT produce a level unit during the lift because the CG will not be at the midpoint between the base lifting holes. The following adjustments must be made to produce a level lift:

- Single spreader bar lifting method.
  - Several adjustments of the strap length may be required to produce a level unit during lift.
- H-type spreader bar lifting method.
  - If the straps from the H bar to the unit base are the same length, the crane lifting point on the center web of the H bar must be adjusted to produce a level unit lift. See Figure 6, p. 19.

Figure 6. H-type spreader bar adjustment for level unit lift

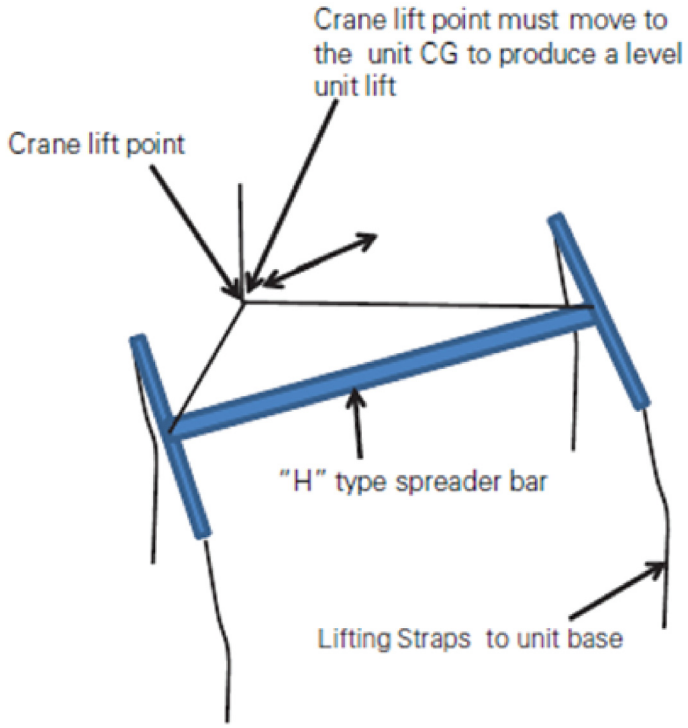
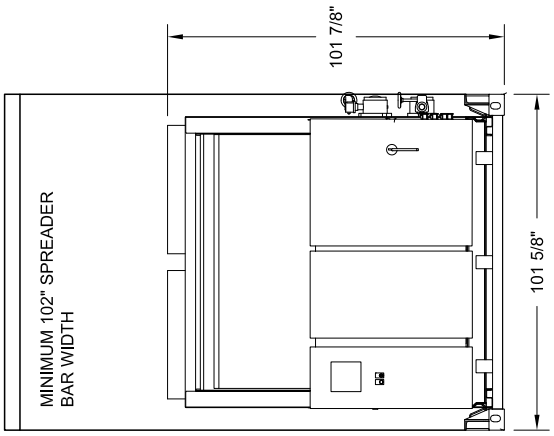
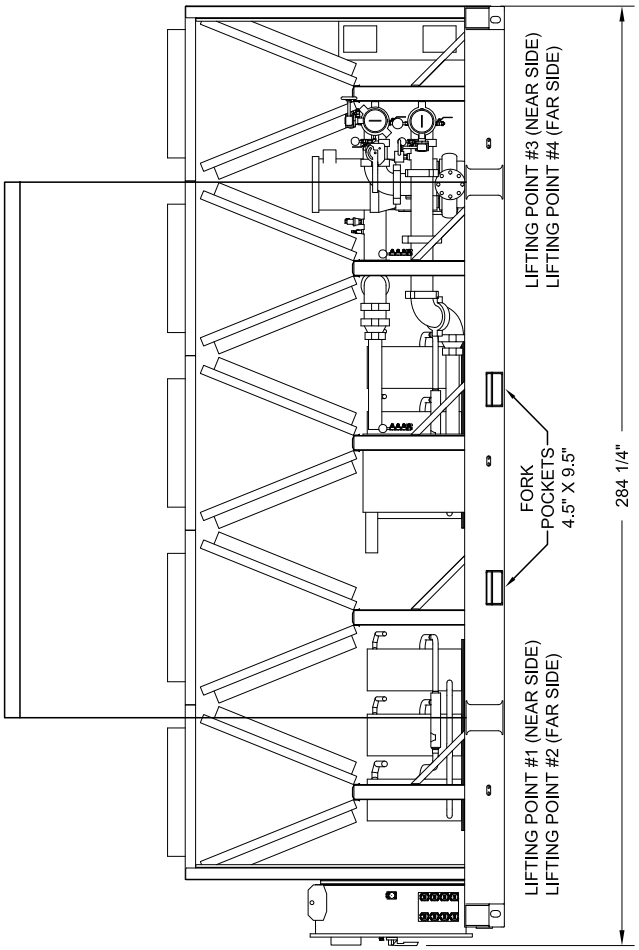


Figure 7. 200T ACSA/ACXA rigging diagram





LIFTING WEIGHTS BY LOCATION				
1	2	3	4	TOTAL SHIPPING WEIGHT
3135 lb	4675 lb	3975 lb	3230 lb	15020 lb

Handling

⚠WARNING

Heavy Objects!

Failure to follow instructions below could result in unit dropping which could result in death or serious injury, and equipment or property-only damage.
Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles 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.

Units can be left on the trailer or removed from the trailer for rental. Remove units by the forklift pockets that are easily accessible for wide forklift trucks. See Table 4, p. 13 to determine if a forklift truck has the capacity to lift the unit. Units can also be lifted by using the lifting plates and spreader bars.

Leveling

Level the unit using the base rail as a reference. The unit must be level within 1/4-inch over the entire length (end-to-end as well as side-to-side). Use shims as necessary to level the unit.

Evaporator Piping

NOTICE

Equipment Damage!

Failure to follow these instructions could result in equipment damage.
All heaters have separate power from the unit. All heaters must be energized or the unit controller must control the pumps when the unit is off (unless the water circuit is drained or sufficient glycol is used). In the event of prolonged power loss, neither heaters nor unit control of the pumps will protect the evaporator from catastrophic damage. In order to provide freeze protection in the event of a power loss you MUST drain the evaporator, use sufficient freeze inhibitor in the evaporator or provide back-up power for pump.

- Evaporator water connections are grooved.
- Thoroughly flush all water piping to the unit before making the final piping connections to the unit.
- Components and layout will vary slightly, depending on the design sequence of the unit.

Drainage

Locate the unit near a large capacity drain for water vessel drain-down during shutdown or repair. Drain connections are provided in the chilled water outlet line of evaporator. All local and national codes apply. In order to prevent the lines from freezing, it is recommended the drain and vent lines are disconnected and plugged, or heat traced, if the ambient temperature is expected to drop below freezing and the system contains no glycol.

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

How to drain the water circuit (for protection with ambients below -20°F):

1. Shut-off the power supply to the unit and to all heaters.
2. Purge the water circuit.
3. Blow out the evaporator to confirm no liquid is left in the evaporator.

Air Vents

A vent port is located at the highest points in the water piping and extend to the sides of the chiller. Additional vents must be installed at high points in the piping system to facilitate air purging during the filling process.

Evaporator Piping Components

NOTICE

Evaporator Damage!

Do not exceed 150 psig evaporator pressure as it could result in damage to the evaporator.

NOTICE

Proper Water Treatment Required!

The use of untreated or improperly treated water could result in scaling, erosion, corrosion, algae or slime. Use the services of a qualified water treatment specialist 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.

Piping components include all devices and controls used to provide proper water system operation and unit operating safety.

Water Pressure Gauges

Water pressure gauges are installed to measure differential pressure across the strainer, suction guide, pump inlet/outlet, and evaporator.

Water Shut-off Valves

Shut-off valves are provided in the **supply** and **return** pipe near the chiller so the gauge(s), thermostats, sensors, strainer, etc., can be isolated during service.

Pipe Unions and Connectors

Pipe unions and Victaulic® connectors are used to simplify disassembly for system service.

Thermometers

Temperature gauges are used in the lines to monitor the evaporator entering and leaving water temperatures.

Flow Sensor

A flow sensor is installed on this unit near the outlet piping. The purpose of the flow sensor is to determine if there is adequate flow to prevent the evaporator from freezing. This flow sensor is wired into the controls of this unit. The unit has a pump interlock control that requires flow to operate. If there is no flow through the evaporator of the unit, the chiller will not start or will shut down if the evaporator loses flow. For more information about chilled water flow, refer to the **Chilled Water Flow (Pump) Interlock** section in *Ascend™ Air-Cooled Chiller Models ACS and ACX With Symbio™ Controls 140 to 230 Nominal Tons Installation, Operation, and Maintenance* (AC-SVX004*-EN).

Balancing Valves

A balancing valve is installed in the leaving water line. It will be used to establish a balanced flow.

Note: *Both the entering and leaving water lines have shut-off valves installed to isolate the evaporator for service.*

Water Strainer

The water strainer is factory-installed with taps for the pressure gauges on the inlet and outlet. Install pressure gauges in order to measure differential pressure across the filter. This will help to determine when it is necessary to clean the water strainer.

Chiller Drain

The chiller drain is piped with a ball shut-off valve to facilitate evaporator draining during service or shutdown procedures.

Pressure Drop Curves

Evaporator, water strainer, and suction guide head loss are illustrated below. These pressure drop curves indicate water applications.

Figure 8. Evaporator pressure drop curve

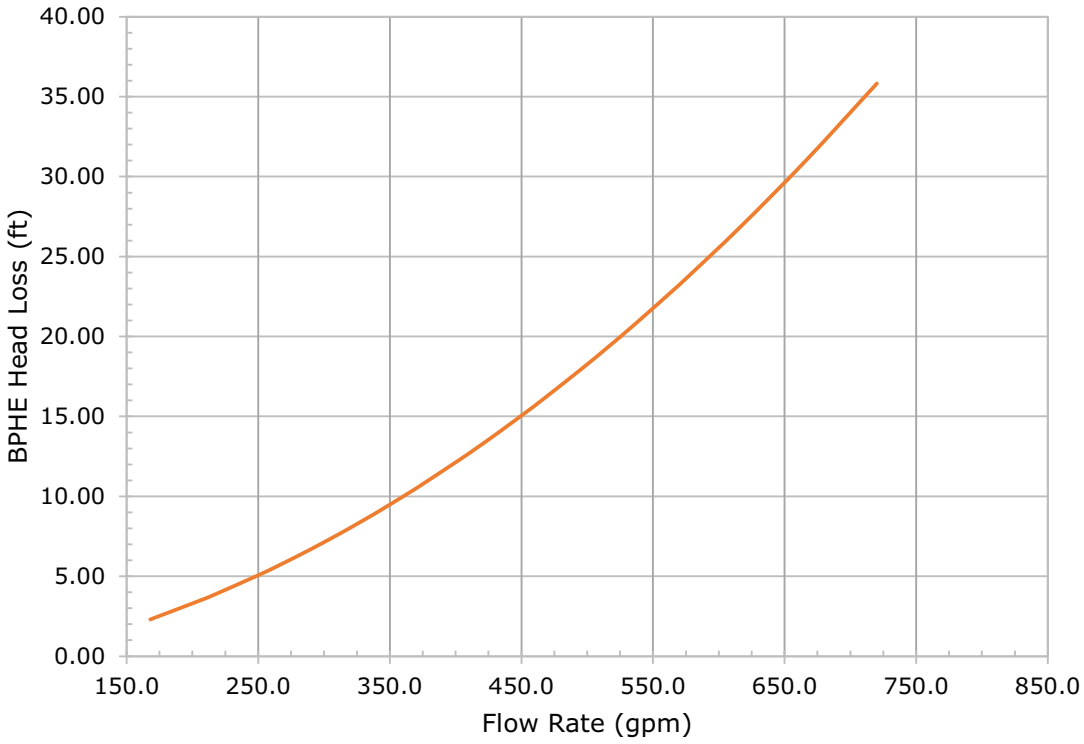


Figure 9. Differential pressure - suction guide

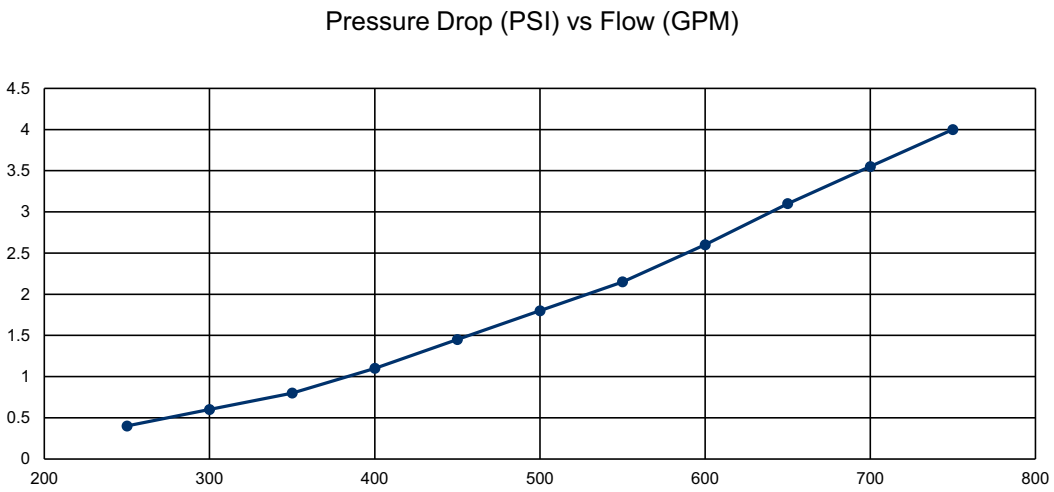
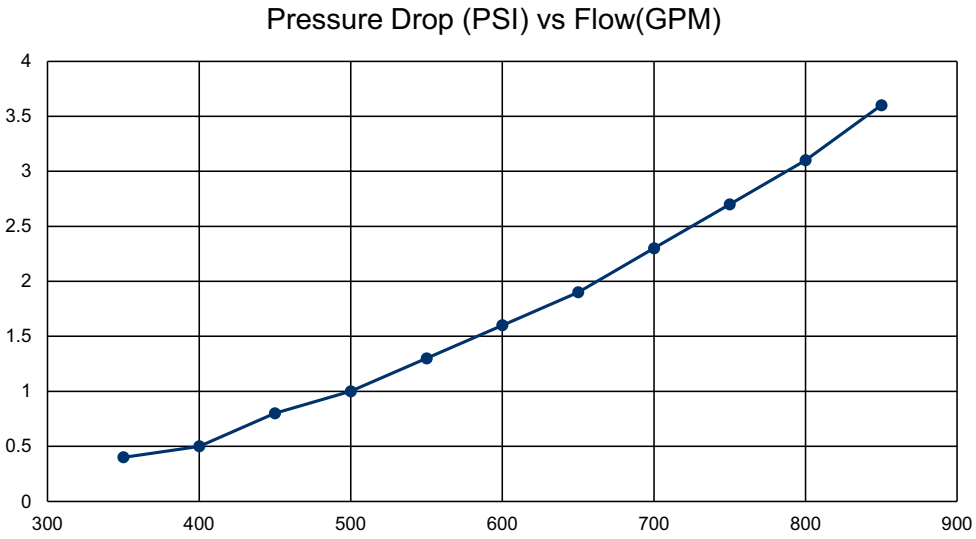


Figure 10. Differential pressure - T-strainer



Water Piping Connections

1. All water piping to the system should be flushed thoroughly before making the final connections.

NOTICE

Pump Damage!

Failure to follow instruction could result in pump damage.
If using any commercial flushing/cleaning solution, construct a temporary bypass around the unit to prevent damage to internal components of the evaporator/condenser. Trane assumes no responsibility for equipment damage caused by flushing/cleaning solutions or water-borne debris.

2. Connect the water pipe to the chilled water piping connections.
3. Confirm the drain shut-off valve is closed.
4. While filling the chiller system with solution, vent the air from the system at the highest points.

NOTICE

Proper Water Treatment Required!

The use of untreated or improperly treated water could result in scaling, erosion, corrosion, algae or slime. Use the services of a qualified water treatment specialist 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.

Table 8. Unit water connection sizes

ACSA/ACXA Unit Model	Piping Connection Size
RSCA0200F0-F1	6 in. Victaulic
RSXA0200F1	6 in. Victaulic

NOTICE

Evaporator Damage!

Do not exceed 150 psig evaporator pressure as it could result in damage to the evaporator.

NOTICE

Pump Damage!

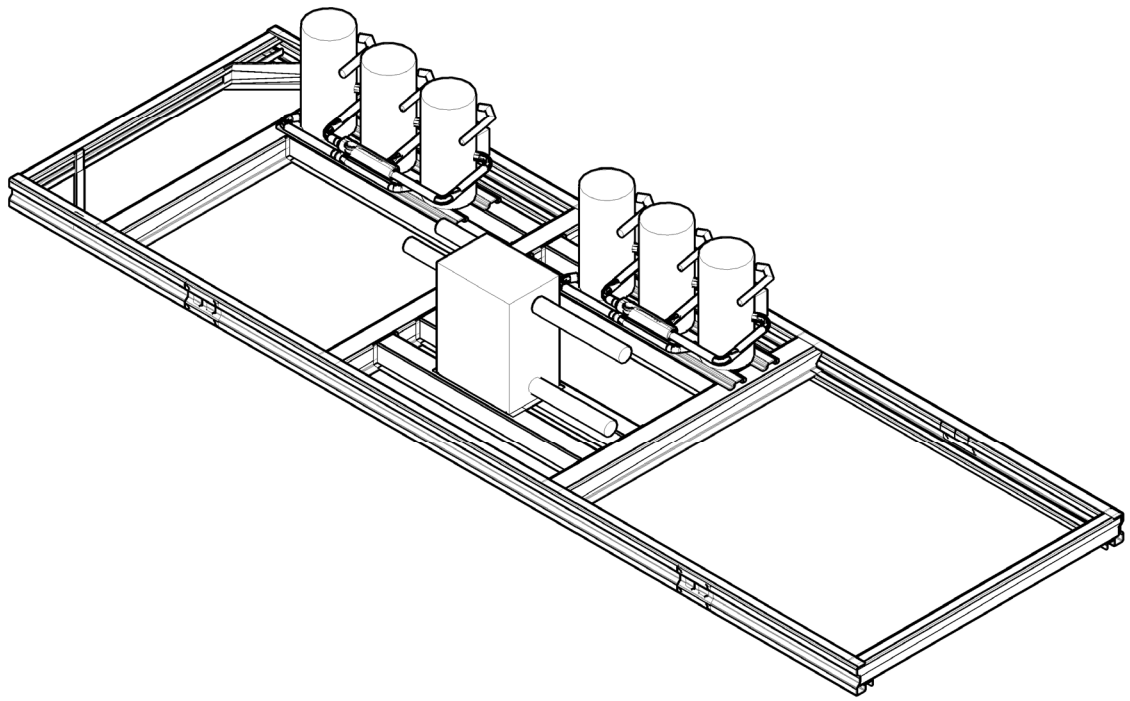
Failure to follow these instructions could result in pump or unit damage.
Do not reverse system water piping connections to the unit or pump.

To prevent unit or pump damage, do NOT reverse system water piping connections to the unit or pump; water entering the evaporator is pre-piped to the discharge of the pump.

Flexible Hose and Hard Pipe Installation

To minimize premature or catastrophic failure of flexible hose provided as part of a Trane Rental Services rental or hard pipe, refer to CHS-SVX01*-EN for installation data.

Figure 11. Water inlet/outlet connections



Note: *When installing water pipes, route them away from the compressor access panels to allow for compressor servicing or replacement.*

Hard Pipe Guidelines

Certain installations may require the use of hard pipe (steel or PVC). Hard pipe is typically recommended for semi-permanent installations (three months or more), installations with space limitations, and/or between connection and pump inlet.

When installing hard pipe:

- Construct and install the piping according to local and national codes.
- Isolate and support the piping as required to prevent stress on the unit and vibration to building piping.

If there are any questions regarding how to install water piping, contact Trane Rental Services Technical Service Support.

Exceptions

Trane Rental Services Support must authorize any exceptions to the guidelines established in this bulletin in writing.

Material disposition

In the event the hose fails or leaks:

1. Call Trane Rental Services Support.
2. Tag the hose **BAD**.
3. Place it back in the shipping box.

Ambient Freeze Avoidance

A glycol type anti-freeze may be required for freeze protection. For more information, refer to the Freeze Protection section in *Ascend™ Air-Cooled Chiller Models ACS and ACX With Symbio™ Controls 140 to 230 Nominal Tons - Installation, Operation, and Maintenance* (AC-SVX004*-EN).

Note: *ACSA/ACXA chillers use brazed plate heat exchanges, which are NOT at risk for refrigerant migration freeze. Chiller must only be protected from freeze due to low ambient conditions.*

One or more of the ambient freeze avoidance methods in Table 9, p. 25 must be used to protect the ACSA/ACXA chiller from ambient freeze damage.

Table 9. ACSA/ACXA ambient freeze avoidance methods

Method	Protects to ambient temperature	Notes
Water pump control	Down to 0°F	• Symbio™ 800 controller can start the pump when the ambient temperatures drops to prevent freezing. For this option the pump must to be controlled by the chiller and this function must be validated. • Heaters are factory-installed on the evaporator and water piping and will protect them from freezing.
Heaters	Down to -20°F	• Heaters are factory-installed on the evaporator and will protect it from freezing in ambient temperatures down to -20°F (-29°C). If protection below freezing is using heaters is required, field-installed heat tracing must be supplied. • 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. • ***See NOTICE below for important information.***
Freeze Inhibitor	Varies. See "Low Evaporator Refrigerant Cutout/ Percent Glycol Recommendations," p. 25	Freeze protection can be accomplished by adding sufficient glycol to protect against freezing below the lowest ambient expected.
Drain Water Circuit	Below -20°F	• Shut off the power supply to the unit and to all heaters. • Purge the water circuit. • Blow out the evaporator to confirm no liquid is left in the evaporator.

NOTICE

Equipment Damage!

Failure to follow these instructions could result in equipment damage.
All heaters must be energized or the Symbio 800 must control the pumps when the unit is off (unless the water circuit is drained or sufficient glycol is used). In the event of prolonged power loss, neither heaters nor Symbio 800 control of the pumps will protect the evaporator from catastrophic damage. In order to provide freeze protection in the event of a power loss you MUST drain the evaporator, use sufficient freeze inhibitor in the evaporator or provide back-up power for pump.

Low Evaporator Refrigerant Cutout/ Percent Glycol Recommendations

The tables below shows the low evaporator temperature cutout for different glycol levels.

Additional glycol beyond the recommendations will adversely effect unit performance. The unit efficiency will be reduced and the saturated evaporator temperature will be reduced. For some operating conditions this effect can be significant.

If additional glycol is used, then use the actual percent glycol to establish the low refrigerant cutout setpoint.

Note: *Table below is not a substitute for full unit simulation for proper prediction of unit performance for specific operating conditions. For information on specific conditions, contact Trane product support.*

Table 10. Low evaporator refrigerant temperature cutout (LERTC) and low water temperature cutout (LWTC) — ethlyene glycol

Glycol Percentage (%)	Solution Freeze Point (°F)	Minimum Recommended LERTC (°F)	Minimum Recommended LWTC (°F)	Minimum Chilled Water Setpoint (°F)
0	32.0	26.0	36.0	41.7
1	31.6	25.6	35.6	41.3
2	31.0	25.0	35.0	40.7
3	30.3	24.3	34.3	40.0
4	29.7	23.7	33.7	39.4
5	29.0	23.0	33.0	38.7
6	28.3	22.3	32.3	38.0
7	27.6	21.6	31.6	37.3
8	26.9	20.9	30.9	36.6

Table 10. Low evaporator refrigerant temperature cutout (LERTC) and low water temperature cutout (LWTC) — ethlyene glycol (continued)

Glycol Percentage (%)	Solution Freeze Point (°F)	Minimum Recommended LERTC (°F)	Minimum Recommended LWTC (°F)	Minimum Chilled Water Setpoint (°F)
9	26.2	20.2	30.2	35.9
10	25.5	19.5	29.5	35.2
11	24.7	18.7	28.7	34.4
12	23.9	17.9	27.9	33.6
13	23.1	17.1	27.1	32.8
14	22.3	16.3	26.3	32.0
15	21.5	15.5	25.5	31.2
16	20.6	14.6	24.6	30.3
17	19.7	13.7	23.7	29.4
18	18.7	12.7	22.7	28.4
19	17.8	11.8	21.8	27.5
20	16.8	10.8	20.8	26.5
21	15.8	9.8	19.8	25.5
22	14.7	8.7	18.7	24.4
23	13.7	7.7	17.7	23.4
24	12.5	6.5	16.5	22.2
25	11.4	5.4	15.4	21.1
26	10.2	4.2	14.2	19.9
27	9.0	3.0	13.0	18.7
28	7.7	1.7	11.7	17.4
29	6.4	0.4	10.4	16.1
30	5.1	-0.9	9.1	14.8
31	3.7	-2.3	7.7	13.4
32	2.3	-3.7	6.3	12.0
33	0.8	-5.2	4.8	10.5
34	-0.7	-6.7	3.3	9.0
35	-2.3	-8.3	1.7	7.4
36	-3.9	-9.9	0.1	5.8
37	-5.6	-11.6	-1.6	4.1
38	-7.3	-13.3	-3.3	2.4
39	-9.0	-15.0	-5.0	0.7
40	-10.8	-16.8	-6.8	0.0
41	-12.7	-18.7	-7.0	0.0
42	-14.6	-20.6	-7.0	0.0
43	-16.6	-21.0	-7.0	0.0
44	-18.6	-21.0	-7.0	0.0
45	-20.7	-21.0	-7.0	0.0
46	-22.9	-21.0	-7.0	0.0
47	-25.1	-21.0	-7.0	0.0
48	-27.3	-21.0	-7.0	0.0
49	-29.7	-21.0	-7.0	0.0
50	-32.1	-21.0	-7.0	0.0

Table 10. Low evaporator refrigerant temperature cutout (LERTC) and low water temperature cutout (LWTC) — ethlyene glycol (continued)

Glycol Percentage (%)	Solution Freeze Point (°F)	Minimum Recommended LERTC (°F)	Minimum Recommended LWTC (°F)	Minimum Chilled Water Setpoint (°F)
51	-34.5	-21.0	-7.0	0.0
52	-37.1	-21.0	-7.0	0.0
53	-39.7	-21.0	-7.0	0.0
54	-42.3	-21.0	-7.0	0.0
55	-45.0	-21.0	-7.0	0.0

Table 11. Low evaporator refrigerant temperature cutout (LERTC) and low water temperature cutout (LWTC) — propylene glycol

Glycol Percentage (%)	Solution Freeze Point (°F)	Minimum Recommended LERTC (°F)	Minimum Recommended LWTC (°F)	Minimum Chilled Water Setpoint (°F)
0	32.0	26.0	36.0	41.7
1	31.6	25.6	35.6	41.3
2	31.0	25.0	35.0	40.7
3	30.4	24.4	34.4	40.1
4	29.9	23.9	33.9	39.6
5	29.3	23.3	33.3	39.0
6	28.7	22.7	32.7	38.4
7	28.1	22.1	32.1	37.8
8	27.6	21.6	31.6	37.3
9	27.0	21.0	31.0	36.7
10	26.4	20.4	30.4	36.1
11	25.7	19.7	29.7	35.4
12	25.1	19.1	29.1	34.8
13	24.4	18.4	28.4	34.1
14	23.8	17.8	27.8	33.5
15	23.1	17.1	27.1	32.8
16	22.4	16.4	26.4	32.1
17	21.6	15.6	25.6	31.3
18	20.9	14.9	24.9	30.6
19	20.1	14.1	24.1	29.8
20	19.3	13.3	23.3	29.0
21	18.4	12.4	22.4	28.1
22	17.6	11.6	21.6	27.3
23	16.7	10.7	20.7	26.4
24	15.7	9.7	19.7	25.4
25	14.8	8.8	18.8	24.5
26	13.8	7.8	17.8	23.5
27	12.7	6.7	16.7	22.4
28	11.6	5.6	15.6	21.3
29	10.5	4.5	14.5	20.2
30	9.3	3.3	13.3	19.0
31	8.1	2.1	12.1	17.8

Table 11. Low evaporator refrigerant temperature cutout (LERTC) and low water temperature cutout (LWTC) — propylene glycol (continued)

Glycol Percentage (%)	Solution Freeze Point (°F)	Minimum Recommended LERTC (°F)	Minimum Recommended LWTC (°F)	Minimum Chilled Water Setpoint (°F)
32	6.8	0.8	10.8	16.5
33	5.5	-0.5	9.5	15.2
34	4.1	-1.9	8.1	13.8
35	2.7	-3.3	6.7	12.4
36	1.3	-4.7	5.3	11.0
37	-0.3	-6.3	3.7	9.4
38	-1.8	-7.8	2.2	7.9
39	-3.5	-9.5	0.5	6.2
40	-5.2	-11.2	-1.2	4.5
41	-6.9	-12.9	-2.9	2.8
42	-8.8	-14.8	-4.8	0.9
43	-10.7	-16.7	-6.7	0.0
44	-12.6	-18.6	-7.0	0.0
45	-14.6	-20.6	-7.0	0.0
46	-16.7	-21.0	-7.0	0.0
47	-18.9	-21.0	-7.0	0.0
48	-21.1	-21.0	-7.0	0.0
49	-23.4	-21.0	-7.0	0.0
50	-25.8	-21.0	-7.0	0.0
51	-28.3	-21.0	-7.0	0.0
52	-30.8	-21.0	-7.0	0.0
53	-33.4	-21.0	-7.0	0.0
54	-36.1	-21.0	-7.0	0.0
55	-38.9	-21.0	-7.0	0.0

Integral Pump Package

Integral pump package includes: integral pump, drainage valves, shut-off valves at entering and leaving connections. See Figure 13, p. 29 for specific model schematics.

The pump package is single point power integrated into the chiller unit power with a separate factory wired control panel. The control of the pump is integrated into the chiller controller.

Figure 12. Field water piping pump package unit

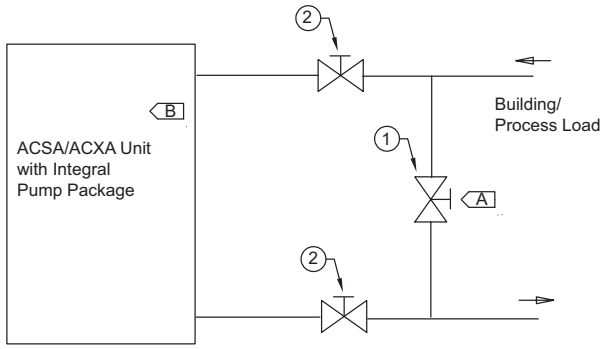
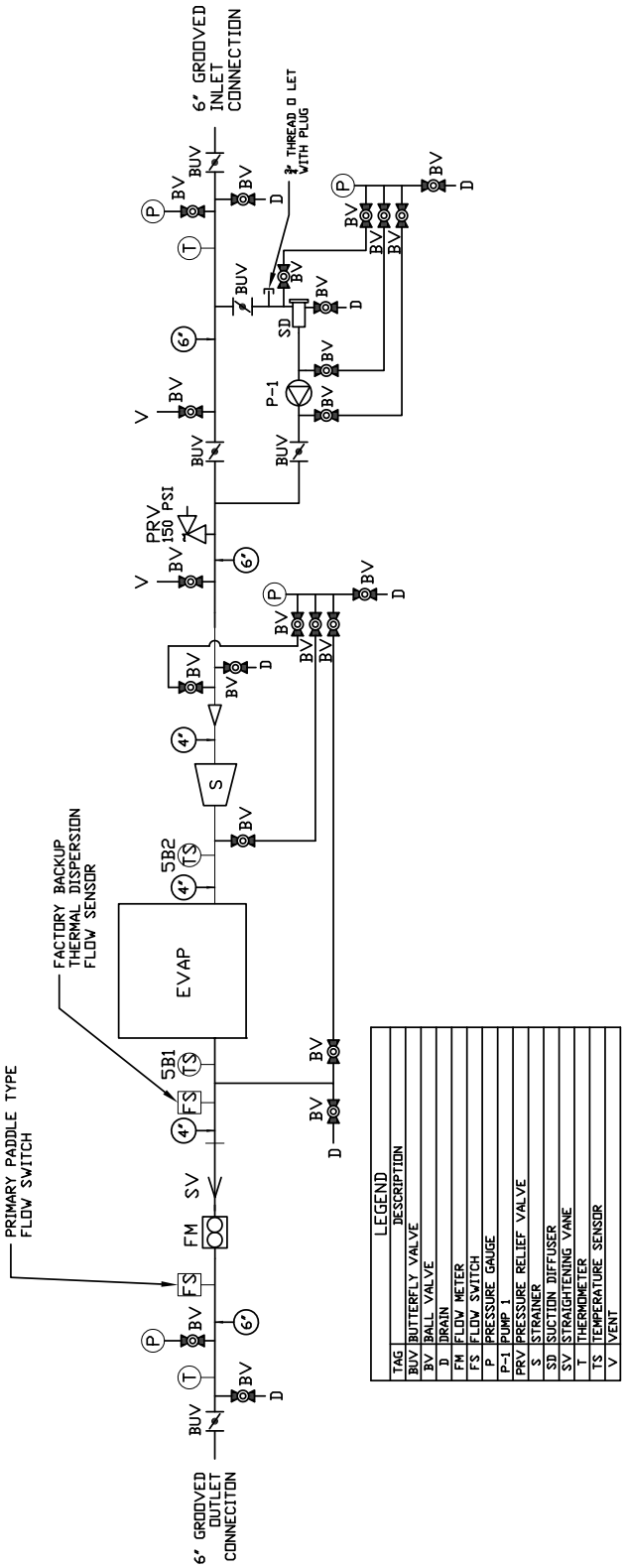


Table 12. Field water piping components

Item	Description
1	Bypass Valve
2	Isolator Valve
A	Isolate unit for initial water loop cleaning
B	See Figure 13, p. 29 for integral pump schematics

Figure 13. Pump package unit schematic - RSCA0200F0-RSCA0200F1, and RSXA0200F1



Pump Curves

Figure 14. 200T ACSA/ACXA single-speed pressure curve

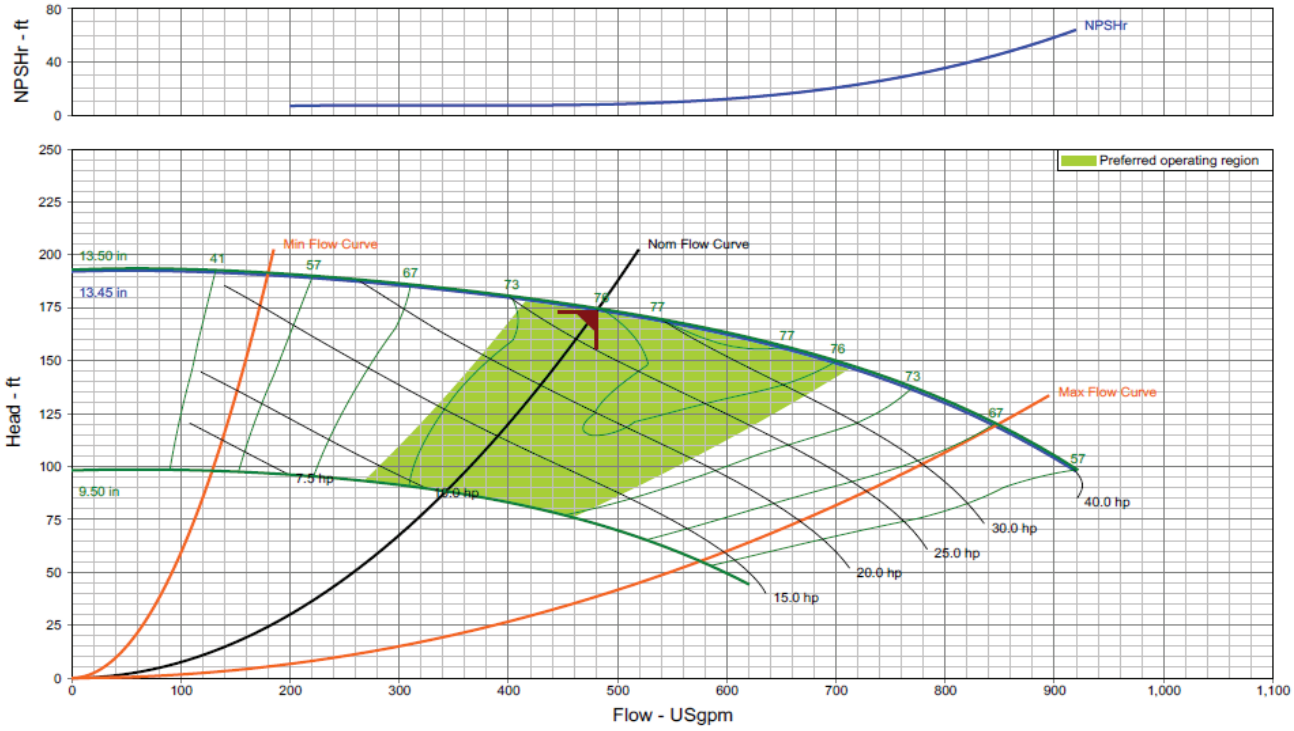
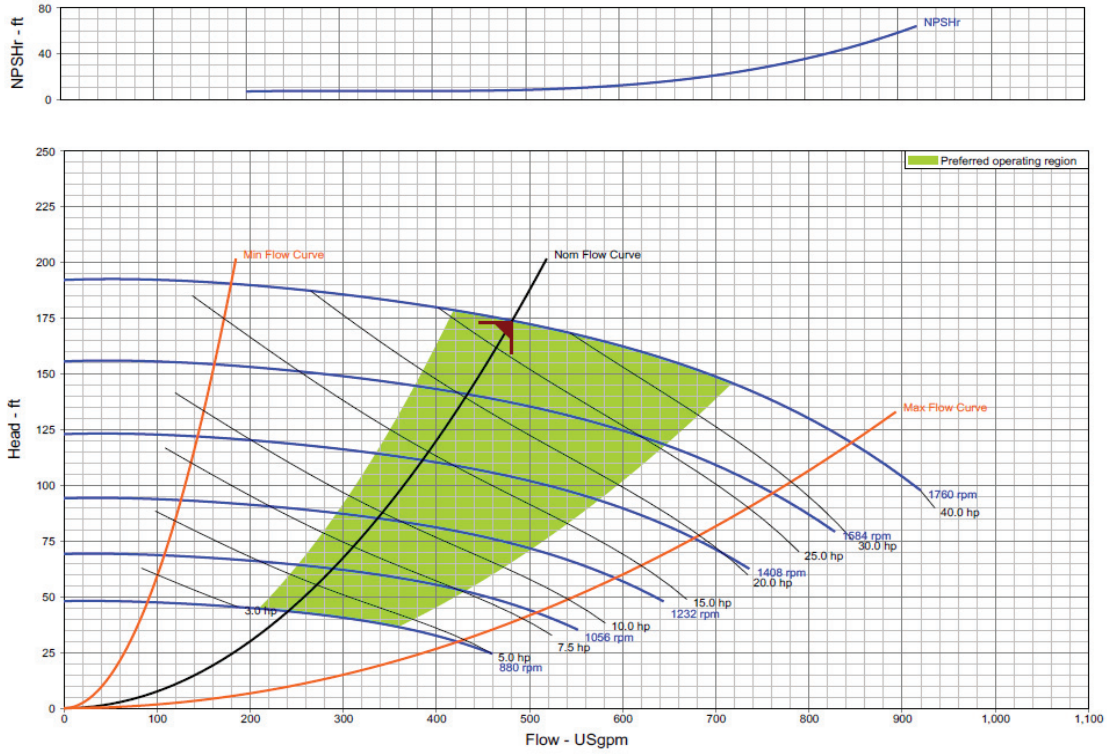


Figure 15. 200T ACSA/ACXA multi-speed pressure curve



Pump Package Requirements

The following requirements must be met for proper operation of pump package:

- Maximum working pressure 150 psig
- Fluid type shown in Table 13, p. 31

Table 13. Working fluid

Fluid Type	Fluid Percent (of weight)
Water	100%
Ethylene Glycol	0–50%
Propylene Glycol	0–50%

Electrical Connections

The breaker for the ACSA/ACXA unit is located in the main electric panel. Main power is supplied to the unit by cam-type electrical connections, or hard-wiring with copper conductors if required.

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

All wiring must comply with National Electric Code (NEC) and state and local requirements. Outside the United States, the national and/or local electrical requirements of other countries shall apply. The installer must provide properly sized system interconnecting and power supply wiring with appropriate fused disconnect switches. Type and locations of disconnects must comply with all applicable codes.

NOTICE

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as the equipment was not designed or qualified to accept other types of conductors.

Figure 4, p. 12 through Figure 5, p. 13 show the locations of the unit electrical access openings.

Shore Power Supply (115 Vac)

Each Trane Rental Services ACSA/ACXA unit comes with a shore power connection. The shore power connection supplies power to the Symbio 800 controls and interface. The shore power circuit is powered by a 115 Volt, 15 A max, 60 Hz circuit where power is supplied to a NEMA 5-15 plug on the electrical panel enclosure, from the building, with an extension cord.

The shore power circuit powers the following components:

- Compressor crankcase heaters
- Compressor heater transformer
- Symbio™ 800 interface
- Symbio 800 controls

Important: *If the door on the right side of the electrical panel is opened, the shore power plug circuit will disengage and the listed devices (above) will not be powered. The door must remain closed for these devices to operate. If the electric panel doors are opened for service, they should be closed as soon as service is completed.*

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

Refer to unit schematics to check the number of disconnects required to de-energize the unit.

When electrically troubleshooting the compressor make sure electrical power is NOT applied.

- Inspect all wiring connections; electrical connections should be clean and tight.
- Stop the chilled water pump.
- Open all circuit breakers.

Unit Voltage and Amperage Checks

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.
When it is 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.

Electrical power to the unit must meet stringent requirements for the unit to operate properly. Total voltage supply and voltage imbalance between phases should be within the following tolerances.

Voltage Supply

Measure each leg of supply voltage at all line voltage on circuit breaker. Readings must fall within the voltage utilization range shown on the unit nameplate. If voltage on any leg does not fall within tolerance, notify the power company to correct this situation before operating the unit. Inadequate voltage to the unit will cause control components to malfunction and shorten the life of electrical components and compressor motors.

Voltage Imbalance

Excessive voltage imbalance between phases in a three-phase system will cause motors to overheat and eventually fail. Maximum allowable imbalance is 2 percent.

If the voltage imbalance is over 2 percent, notify the proper agencies to correct the voltage problem before operating this equipment.

Field-Installed Power Wiring

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

An overall layout for the field installed wiring entrance into the unit is illustrated in Figure 4, p. 12 through Figure 5, p. 13. Follow the guidelines outlined below to confirm the unit supply power wiring is properly sized and installed.

Note: *All field installed wiring must conform to NEC guidelines as well as State and Local codes.*

Verify that the power supply available is compatible with the unit nameplate ratings. The available supply power must be within 10 percent of the rated voltage stamped on the nameplate. Use only copper conductors to connect the 3-phase power supply to the unit.

Short-circuit current rating when using Series-16 cam connectors mounted to side of machine is 35,000A. Up to 65,000A short-circuit current rating can be achieved by hard-wiring directly into unit circuit breaker using copper conductors. Contact Trane Rental Services for further information.

NOTICE

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as the equipment was not designed or qualified to accept other types of conductors.

Circuit Breaker External Handle

Units are provided with an externally mounted circuit breaker handle. This allows the operator to disconnect power from the unit without having to open the control panel door. The handle locations and its three positions are described below:

- **ON** – The circuit breaker is closed, allowing the main power supply to be applied at the unit.
- **OFF** – The circuit breaker is open, interrupting the main power supply to the unit controls.
- **OPEN COVER/RESET** – Turn the handle to this position to release the handle from the circuit breaker, allowing the control panel door to be opened.

Once the door has been opened, it can be closed with the handle in any one of the three positions outlined above, provided it matches the circuit breaker position.

Refer to the wiring diagram that shipped with the unit for specific electrical schematic and connection information.

Before Supplying Power

⚠WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.
Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.

NOTICE

Compressor Damage!

Failure to follow instructions below could result in compressor failure due to lack of refrigerant and/or oil flow. Fully open all compressor service valves (suction, discharge, liquid line, and oil line) prior to start-up.

NOTICE

Heater Damage!

Failure to ensure that there is water in the evaporator before turning on heaters could result in equipment-only-damage. Heaters will overheat and burn out without water in the evaporator.

NOTICE

Proper Water Treatment Required!

The use of untreated or improperly treated water could result in scaling, erosion, corrosion, algae or slime. Use the services of a qualified water treatment specialist 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.

- Inspect the interior of the unit for tools and debris.
- Fill the chilled water system.
- Vent the chilled water system at the highest points in the system. Vent the air out of the chiller using the chiller vent lines. Close the vent when the chiller is full of water.
- Once the system has been filled, inspect the entire chilled water piping system for leaks. Make any necessary repairs before proceeding.

Electrical Wiring

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

- Check for tight connections for the unit power supply wiring with the circuit breaker to the terminal block.
- Check interlock wiring, chilled water pump control, chilled water flow interlock and external auto stop (required). For further details, see *Ascend™ Air-Cooled Chiller Models ACS and ACX With Symbio™ Controls 140 to 230 Nominal Tons Installation, Operation, and Maintenance* (AC-SVX004*-EN) or refer to unit wiring schematics.

NOTICE

Equipment Damage!

Failure to follow all instructions could result in equipment damage. Follow instructions for the chilled water pump interlock and external auto/stop.

- Control power wiring isolated in control panel/starter enclosure.
- Required - chilled water pump controlled by Symbio™ 800.
- Inspect all wiring connections. Connections should be clean and tight.
- Energize oil sump heaters 24 hours prior to start up.

  Note: *Connecting shore power to the unit without main power energizes the crankcase and oil separator heaters. TD7 is powered at the same time.*
- Confirm all service and isolation valves are open.

Chilled Water Pump Performance and Operation

Each unit comes with a 460 volt, 3-phase, 60 Hertz, centrifugal water pump permanently installed on the unit. The pump contactor is located in the shore power panel and has a control switch with an indication light that will be lit when the pump is running.

The pump switch can be used to select between three operating modes: Off, Hand, and Auto.

- **Auto** – The pump is controlled through the chiller controls.
- **Hand** – The pump will run until the operating mode is changed.
- **Off** – The pump will remain off until the operating mode is changed.

Table 14. Unit performance, reference only

Unit Size	Motor Size (hp)	Evaporator Flow (gpm)			Pump Flow (gpm)			Discharge Head Pressure (ft)		
		Min.	Nominal	Max.	Min.	Nominal	Max.	at Min. Flow	Nominal	at Max. Flow
200T	40	240	420	720	181	480	845	190	173	99

Chilled Water Pump Control

Water Pump Power Supply

Power is provided to the pump through a separate factory-wired VFD panel, which is integrated into the chiller unit power.

Chilled Water Flow (Pump) Interlock

All model chillers have a factory-installed flow switch.

Chilled Water Pump Control

An evaporator water pump output relays normally-open contact closes to start the evaporator water pump when the chiller is given a signal to go into the Auto mode of operation from any source. The contact is opened to turn off the pump in the event of most machine level diagnostics to prevent the build up of pump heat.

The relay output is required to operate the Evaporator Water Pump (EWP) contactor. The relays contacts are compatible with 115/240 Vac control circuits. See Programmable Relays section for rating details. Normally, the EWP relay follows the AUTO mode of the chiller. Whenever the chiller has no diagnostics and is in the AUTO mode, regardless of where the auto command is coming from, the relay is energized and the normally-open contact is closed. When the chiller exits the AUTO mode, the relay's normally-open contact is timed to open in an adjustable (using Tracer® TU service tool) 0 to 30 minutes. The non-AUTO modes, in which the pump is stopped, include Reset, Stop, External Stop, Remote Display Stop, Stopped by Tracer, Start Inhibited by Low Ambient Temp, and Ice Building complete.

NOTICE

Equipment Damage!

If the microprocessor calls for a pump to start and water does not flow, the evaporator may be damaged catastrophically. It is the responsibility of the installing contractor and/or the customer to ensure that a pump will always be running when called upon by the chiller controls.

Table 15. Pump relay operation

Chiller Mode	Relay Operation
Auto	Instant Close
Tracer® Override	Close
Stop	Timed Open
Diagnostics	Instant Open

When going from Stop to Auto, the EWP relay is energized immediately. If evaporator water flow is not established in 20 minutes (for normal transition) or 4 minutes, 15 seconds (for pump commanded ON due to an override safety), the Symbio 800 de-energizes the EWP relay and generates a non-latching diagnostic. If flow returns (e.g. someone else is controlling the pump), the diagnostic is cleared, the EWP is re-energized, and normal control resumed.

If evaporator water flow is lost once it had been established, the EWP relay remains energized and a nonlatching diagnostic is generated. If flow returns, the diagnostic is cleared and the chiller returns to normal operation.

NOTICE

Equipment Damage!

Do NOT enable/disable the chiller by removing water flow or equipment damage can occur.

In general, when there is either a non-latching or latching diagnostic, the EWP relay is turned off as though there was a zero time delay. The relay continues to be energized with:

A Low Chilled Water Temperature diagnostic (non-latching) unless also accompanied by an Evaporator Leaving Water Temperature Sensor Diagnostic.

or

A Loss of Evaporator Water Flow diagnostic (non-latching) and the unit is in the AUTO mode, after initially having proven evaporator water flow.

Note: *If pump control is used for freeze protection, then the pump MUST be controlled by the Symbio™ 800 control. If another method of freeze protection is used (glycol, heaters, purge, etc) then the pump may be controlled by another system.*

When going from Stop to Hand, the common run contacts close and the pump runs continuously. Examples of when Hand should be used include when multiple chillers are tied into the same loop, if the chiller is not running when there are low ambient temperatures, or if trying to bleed air out of the system while filling with water.

Low Voltage Wiring

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

The remote devices described below require low voltage wiring. All wiring to and from these remote input devices to the Control Panel must be made with shielded, twisted pair conductors. Be sure to ground the shielding only at the panel.

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

Emergency Stop

Symbio™ 800 provides auxiliary control for a customer specified/installed latching trip out. When this customer furnished remote contact 5S1 is provided, the chiller will run normally when the contact is closed. When the contact opens, the unit will trip on a latching diagnostic. This latched condition requires either a manual reset at the front of the control panel or a power cycle of the Symbio 800 to clear.

Silver or gold-plated contacts are recommended. These customer-furnished contacts must be compatible with 24 Vdc, 12 mA resistive load.

External Auto/Stop

If the unit requires the external Auto/Stop function, the installer must provide leads from the remote contacts 5K1.

The chiller will run normally when the contacts are closed. When either contact opens, the compressor(s), if operating, will go to the RUN:UNLOAD operating mode and cycle off. Unit operation will be inhibited. Closure of the contacts will permit the unit to return to normal operation.

Field-supplied contacts for all low voltage connections must be compatible with dry circuit 24 Vdc for a 12 mA resistive load. Refer to the field diagrams that are shipped with the unit.

NOTICE

Equipment Damage!

Do NOT enable/disable the chiller by removing water flow or equipment damage can occur.

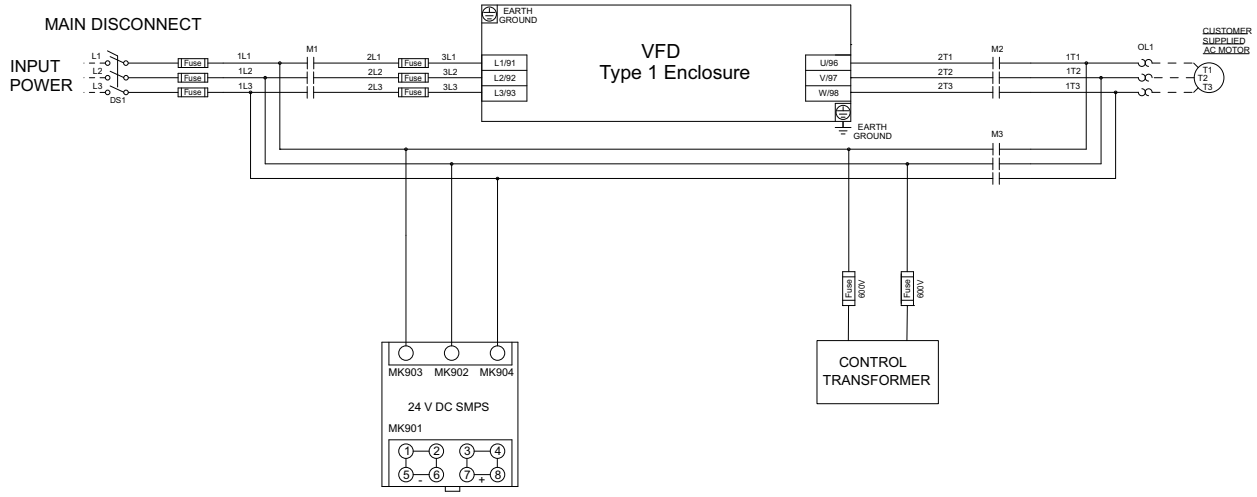
Variable Frequency Drive Operation

Each unit comes with a TR200 pump VFD permanently installed on the unit. The VFD is located on the opposite side of the unit from the main electrical panel. The VFD is controlled by a combination of two switches: the pump H/O/A switch under the TD7 display and the EMB2 mode selector switch.

The pump H/O/A switch does not start the pump directly, but provides a common run permissive signal to the EMB2 control board. The EMB2 mode selector switch is used for 3-contactor bypass on EMB2 units. The selector switch allows the operator to select from four modes of operation:

- **Drive:** When drive mode is selected, the M1 and M2 contactors are closed allowing power to flow in and out of the drive to the motor.
- **Off:** This mode opens all contactors removing any power to the motor.
- **Bypass:** When bypass mode is selected, the M3 contactor closes and allows the motor to run directly from the input line power.
- **Test:** Test mode closes the M1 and M3 contactors and allows the motor to be powered by the input line power. This also allows the drive to power up for programming without being connected to the motor.

Figure 16. Basic bypass circuit



Communications Interface Options

BACnet Interface (BCI-C)

The BACnet® control network for Symbio™ 800 expands communications from the unit UCM network to the Tracer Ensemble or Tracer SC+ building automation system or third party building automation system. Utilizing BACnet, the BAS allows external setpoint and configuration adjustment and monitoring of status and diagnostics.

The Symbio 800 utilizes the BACnet defined MS/TP protocol as defined in ASHRAE standard 135-2004. This controller works in standalone mode, with Tracer Ensemble, Tracer SC+ or when connected to a third party building automation system that supports BACnet.

Note: *For more information, see BACnet and Modbus Integration to Ascend™ Air-Cooled Chiller Models ACS and ACX with Symbio Controls (BAS-SVP051*-EN).*

Start-Up and Shutdown

NOTICE

Equipment Damage!

Failure to follow instructions could result in equipment damage.
Improper phasing can result in equipment damage due to reverse rotation.

1. Confirm phase sequencing A-B-C.

   Note: *Unit is equipped with auxiliary phase monitors. If the Phase Indicator pilot light is on, the phasing is incorrect. Phase Indicator (red) pilot lights are located in the door of the shore power enclosure.*

2. Emergency stop diagnostic must be manually reset.
3. Fill the chilled water system.
4. Turn pump switch to **On** if integral chilled water pump is used.
5. Vent air from system, and check for leaks and repair.

NOTICE

Freeze Damage to Unit!

Improper adjustment of the flow switch could cause equipment damage due to freezing. To prevent equipment damage, refer to AC-SVX004*-EN.

NOTICE

Equipment Damage!

Snow, ice, or debris build up on fans could cause excessive imbalance and equipment damage.
Clear fans of build up prior to machine start-up.

Contact Trane Rental Services for any questions.

6. With water running, adjust water flow, check pressure drop and adjust flow switch.
7. Add appropriate amount of glycol to system, if required. Run pump to thoroughly mix solution.
8. Return pump to automatic position.
9. Set local atmospheric pressure in AdaptiView™ TD7.
10. Front panel lockout feature should be disabled.

Checking Operating Conditions

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

1. Check the evaporator refrigerant pressure and the condenser refrigerant pressure under Subcomponent Report on the AdaptiView™ TD7 or Tracer® TU.

Note: *The pressures are referenced to sea level (14.6960 psia). This value is adjustable in TechView.*

2. Check the EXV sight glasses after sufficient time has elapsed to stabilize the chiller. The refrigerant flow past the sight glasses should be clear. Bubbles in the refrigerant indicate either low refrigerant charge or excessive pressure drop in the liquid line or a stuck open expansion valve. A restriction in the line can sometimes be identified by a noticeable temperature differential between the two sides of the restriction. Frost will often form on the line at this point. Proper refrigerant charges are shown in General Data tables.

Important: *A clear sight glass alone does not mean that the system is properly charged. Also check system sub-cooling, liquid level control and unit operating pressures.*

If chiller is limited by any limiting conditions, contact local Trane Rental Services for more information.

Start-Up Procedure

1. Verify/close all drain valves.
2. Service the auxiliary equipment according to the start-up/maintenance instructions provided by the respective equipment manufacturers.
3. Remove all air from the system (including each pass). Close the vents in the evaporator chilled water circuits.
4. Open all valves in evaporator chilled water circuits.

NOTICE

Equipment Damage!

Failure to follow instructions could result in equipment damage.
Ensure that the compressor and oil sump heaters have been operating properly for a minimum of 24 hours before starting.

Shutdown

1. Perform normal unit stop sequence using **Stop** key.

Note: *Starter disconnect switch must remain closed to provide power to compressor oil sump heaters.*

2. Verify that compressor oil sump heaters are installed tightly around compressor. Energize and verify heaters are operational using a temperature probe.
3. Once the unit is secured, perform maintenance identified in “Maintenance and Diagnostics,” p. 42.

Sequence of Operation

This section provides basic information on chiller operation for common events. Adaptive control algorithms are used on these chillers. This section illustrates common control sequences.

Software Operation Overview

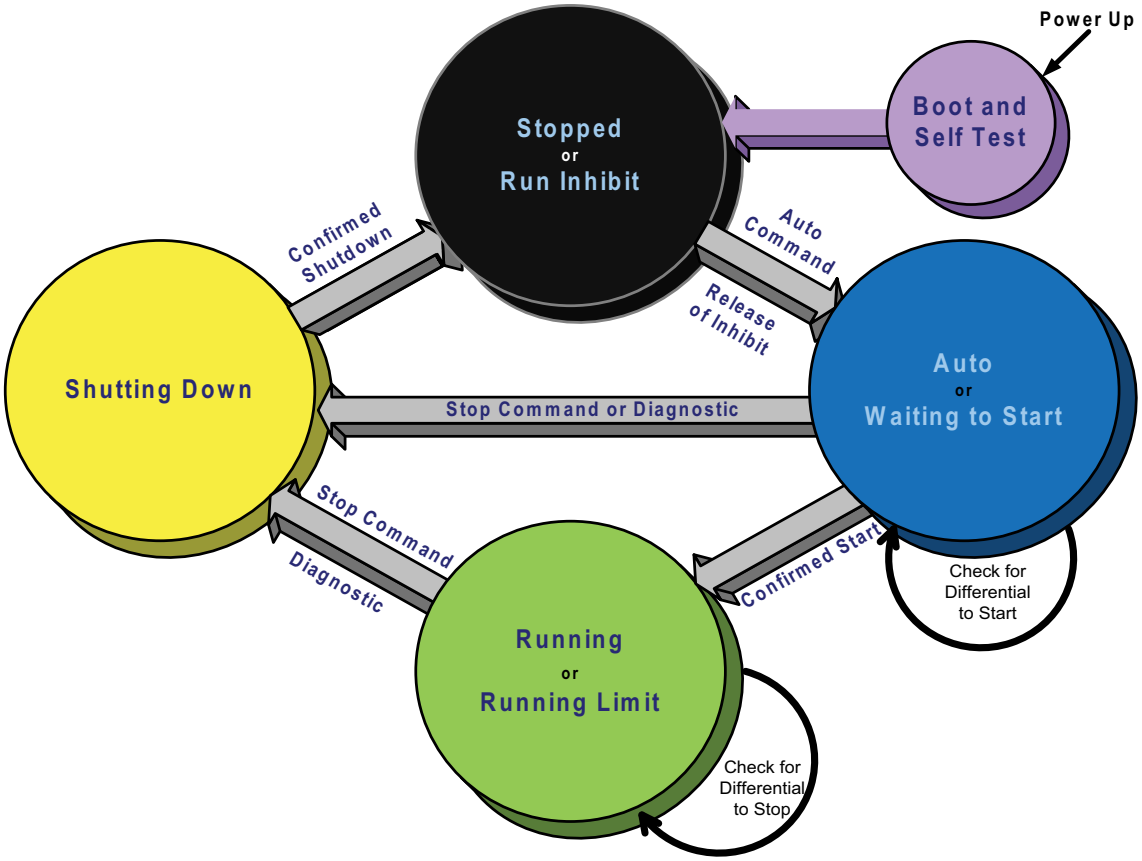
The Software Operation Overview shown in Figure 17, p. 38 is a diagram of the five possible software states. This diagram can be thought of as a state chart, with the arrows and arrow text depicting the transitions between states.

- The text in the circles is the internal software designations for each state.
- The shading of each software state circle corresponds to the shading on the time lines that show the chiller's state.

There are five generic states that the software can be in:

- Power Up
- Stopped
- Starting
- Running
- Stopping

Figure 17. Chiller state chart



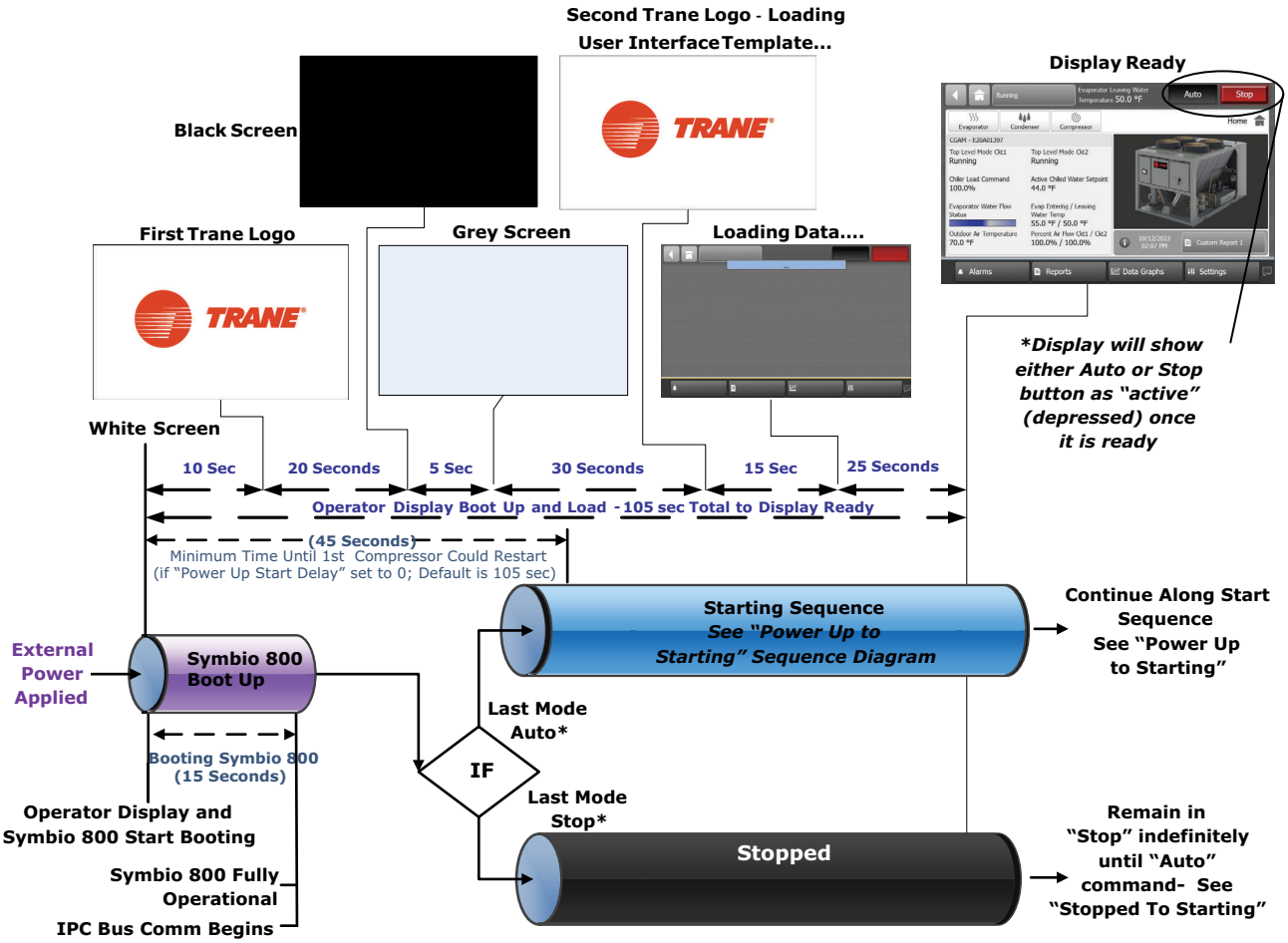
In the following diagrams:

- The time line indicates the upper level operating mode, as it would be viewed in the Tracer® AdaptiView™.
- The shading color of the cylinder indicates the software state.
- Text in parentheses indicates sub-mode text as viewed in the Tracer AdaptiView.
- Text above the time line cylinder is used to illustrate inputs to the Symbio 800. This may include user input to the Tracer AdaptiView touch screen, control inputs from sensors, or control inputs from a generic BAS.
- Boxes indicate control actions such as turning on relays, or pulsing compressor load or unload solenoids.
- Smaller cylinders under the main cylinder indicate diagnostic checks.
- Text outside a box or cylinder indicates time-based functions.
- Solid double arrows indicate fixed timers.
- Dashed double arrows indicate variable timers.

Power Up Diagram

The following diagram shows the respective TD7 AdaptiView screens during a power up of the Symbio 800 and display. This process takes 15 seconds for the Symbio 800 and 105 seconds for the display. On all power ups, the software model always will transition through the 'Stopped' Software state independent of the last mode. If the last mode before power down was 'Auto', the transition from 'Stopped' to 'Starting' occurs, but it is not apparent to the user.

Figure 18. Sequence of operation: power up diagram



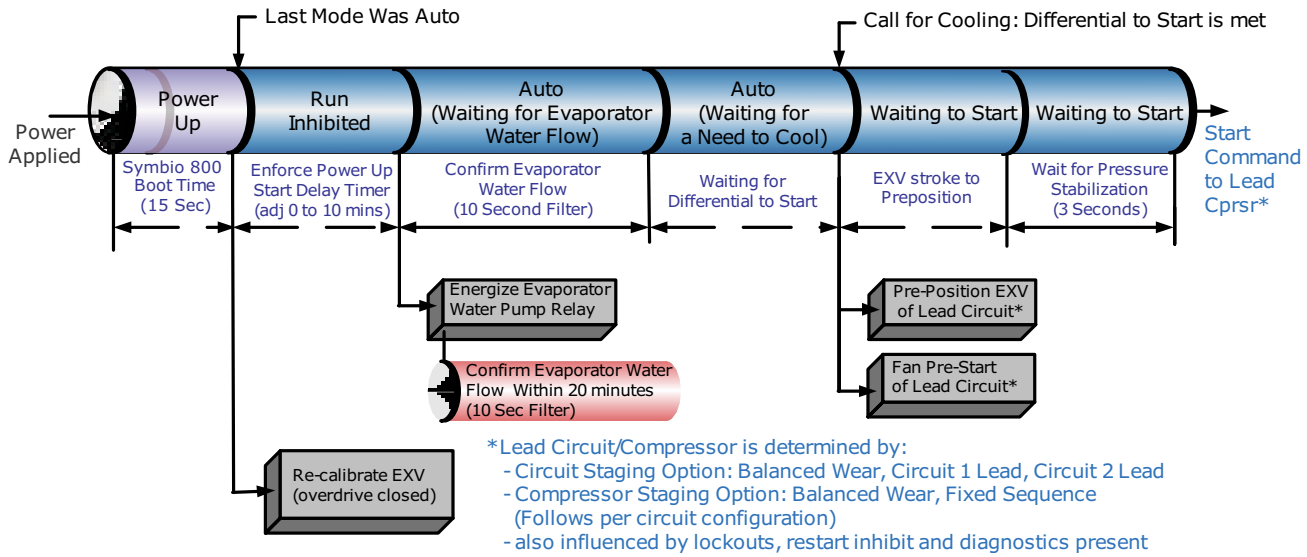
Power Up to Starting

The following diagram shows the timing from a power up event to energizing the first compressor. The shortest allowable time would be under the following conditions:

- No motor restart inhibit time left from subsequent starts
- Evaporator Water flow occurs quickly with pump on command
- Power up Start Delay set to 0 minutes
- Need to cool (differential to start) already exists
- Oil level is detected immediately

The above conditions would allow for a minimum power up to starting the first compressor time of about 45 seconds (variations may exist due to options installed). Note that it is not advisable to start a chiller “cold”, the oil heaters should be in operation for a sufficient length of time prior to first start.

Figure 19. Power up to starting

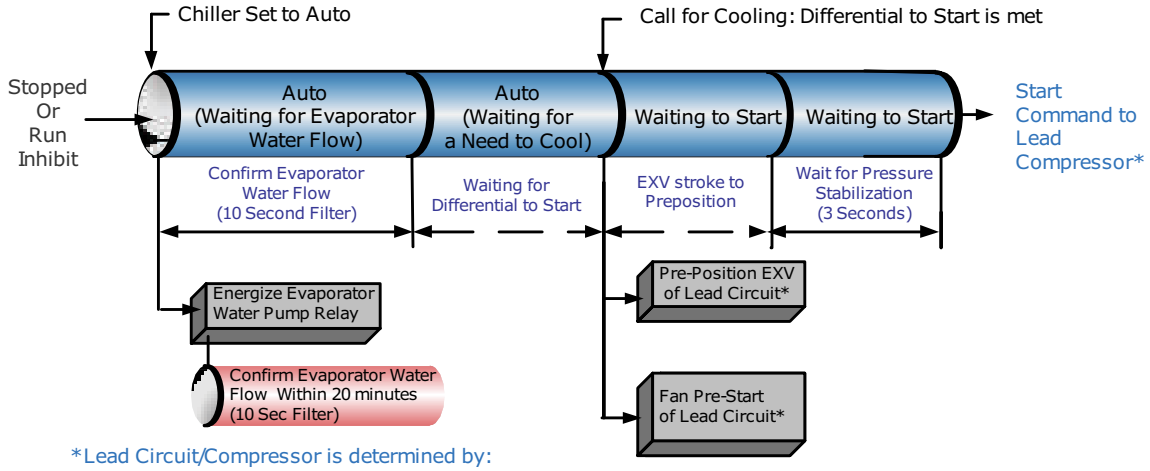


Stopped to Starting

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

- No motor restart inhibit time left from subsequent starts
- Evaporator Water flow occurs quickly with pump on command
- Need to cool (differential to start) already exists
- The above conditions would allow a compressor to start in about 20 seconds.

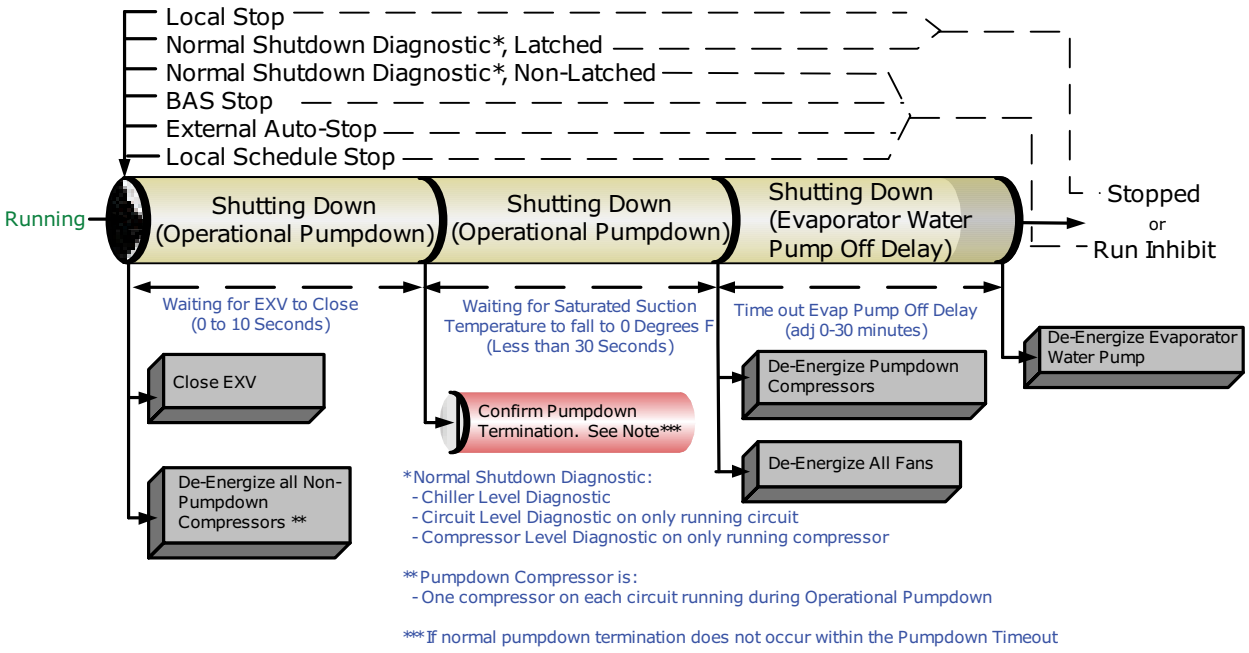
Figure 20. Stopped to starting



Normal Shutdown to Stopped

The following diagram shows the Transition from Running through a Normal (friendly) Shutdown. The dashed lines on the top attempt to show the final mode if stop is selected via various inputs.

Figure 21. Sequence of operation: normal shutdown to shopped or run inhibit



Controls Interface

For controls interface information, see *Ascend™ Air-Cooled Chiller Models ACS and ACX With Symbio™ Controls 140 to 230 Nominal Tons Installation, Operation, and Maintenance* (AC-SVX004*-EN).

Maintenance and Diagnostics

For maintenance procedures, refer to the **Weekly Maintenance** and **Monthly Maintenance** sections in *Ascend™ Air-Cooled Chiller Models ACS and ACX With Symbio™ Controls 140 to 230 Nominal Tons Installation, Operation, and Maintenance* (AC-SVX004*-EN).

Refrigerant Charge Information

For refrigerant charge information, see *Ascend™ Air-Cooled Chiller Models ACS and ACX With Symbio™ Controls 140 to 230 Nominal Tons Installation, Operation, and Maintenance* (AC-SVX004*-EN).

Decommissioning Procedure

1. Press **STOP** key on the AdaptiView™ TD7. Allow enough time for compressors to go through the unload sequence and shut down.
2. Turn the chilled water pump to **OFF**.

Note: *Local codes and regulations apply for disposal of glycol or anti-freeze solutions.*

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

3. Put unit disconnect in the **OFF** or **OPEN** position and locate and disconnect utility power source. Verify system is not energized before proceeding with next steps.
4. Drain solution from system. If the system has glycol or other anti-freeze solution, flush hoses and evaporator with water. Leave vent and drain valve(s) open.
5. Secure any loose panels. Replace any sheet metal screws or bolts to prevent panel from blowing off during transportation.
6. Return hose, fittings or cables (if furnished by Trane Rental Services) to appropriate containers for return shipment.
7. Notify Trane Rental Services if unit needs repairs or has damage.

Diagnostics

For diagnostic information, see *Ascend™ Air-Cooled Chiller Models ACS and ACX With Symbio™ Controls 140 to 230 Nominal Tons Installation, Operation, and Maintenance* (AC-SVX004*-EN).

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