Installation, Operation, and Maintenance

Trane Rental Services

25 to 120 Tons

Model: CGAM

⚠ 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.

September 2026

TEMP-SVX001B-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 Labelling 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

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.

⚠ WARNING

Cancer and Reproductive Harm!

This product can expose you to chemicals including lead and bisphenol A (BPA), which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

⚠ 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.

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Revision History

- Updated CGAM Design Sequence table in Model Number Description chapter.
- Updated the General Information chapter, including the Unit Description section and added the Accessories and General Data section.
- Updated the Dimensions and Weights chapter, including Service Clearances, Unit Drawings, and Unit Weights.
- Updated the Installation chapter, including Leveling, Unit Water Connection, Unit Performance (Reference Only), and added the Integral Pump Package and Start-Up and Shutdown sections.
- Added the Pre-Installation, Start-Up and Shutdown, and Maintenance and Diagnostics chapters.

Table of Contents

Model Number Description

Digit 1, 2 — Unit Model

CS = Rental Services

Digit 3, 4 — Unit Type

CA = Air-Cooled Chiller

Digit 5, 6, 7, 8 — Unit Capacity

0025 = 25 Nominal Tons
0040 = 40 Nominal Tons
0060 = 60 Nominal Tons
0080 = 80 Nominal Tons
0100 = 100 Nominal Tons
0120 = 120 Nominal Tons

Digit 9, 10 — Design Sequence

Note: *See the table below.*

Digit 11, 12 — Incremental Designator

AA

Table 1. CGAM design sequence

Design Sequence	Electrical Connection Type	Over-Head Frame	Unit Controller	Integral Pump Model	Refrigerant
0-1	Lugs or Series 16 Cam-Type Connections	Yes	Trane CH530®	Armstrong 4270 or 4280	R-410A
2	Series 16 Cam-Type Connections	Yes	Trane CH530	Armstrong 4270 or 4280	R-410A
3	Series 16 Cam-Type Connections	No	Trane CH530	Armstrong 4270 or 4280	R-410A
4	Lugs or Series 16 Cam-Type Connections	No	Trane Symbio™ 800	Taco CI-Series	R-454B

General Information

Unit Description

Trane rental CGAM model chillers are pre-assembled, packaged air-cooled chillers modified for easy installation in temporary applications and tested at Trane facilities to ensure reliable operation.

Refrigeration Circuit

The CGAM refrigeration circuit(s) are precharged and consist of either one refrigeration circuit with two hermetic scroll-type compressors (25-ton models) or two refrigeration circuits with two hermetic scroll-type compressors per circuit for a total of four compressors (40-ton and larger models).

The evaporator is a brazed plate design utilizing Electronic Expansion Valves (EEVs) to precisely meter refrigerant into the evaporator and ensure chilled water temperature stability.

The air-cooled condenser is coated to resist corrosion and is either fin-and-tube or Microchannel construction.

Waterside Connections and Pump Package

Trane Rental CGAM chillers are outfitted with a high-head, fixed-speed pump package with integrated, user-friendly controls and a pump piping bypass to allow for the use of external pumps.

All Trane Rental CGAM chillers have piping connections terminated in grooved Victaulic fittings and include onboard strainers and analog temperature/pressure gauges. For ease of installation drain and vent piping is extended to the perimeter of the machine.

See *Trane Rental Services Temporary Cooling - Flexible Water Hose Installation, Operation, and Maintenance* (CHS-SVX01*-EN) for information on temporary, flexible chilled water hose available through Trane Rental Services.

Electrical

Trane Rental CGAM chillers utilize cam-style electrical quick connections, with some models also allowing for hardwired connections. See *Trane Rental Services Electrical Cable, Product Catalog* (TEMP-PRC012*-EN) (USA) or *Trane Rental Services Electrical Cable — for use in Canada, Product Catalog* (TEMP-PRC013*-EN) (Canada) for additional information on Trane Rental temporary power cable.

All CGAM rental chillers include appropriately sized, unit-mounted circuit breakers with through-the-wall lockable disconnect handles for overcurrent protection.

In addition to the main electrical power supply, an optional 115V, 15 amp shore power plug-in is available for the purpose of energizing the unit controls and compressor heaters in the absence of main unit power supply. This shore power option becomes redundant once main power is applied.

Unit Controls

All units are equipped with a Trane microprocessor control with a touch-screen user interface and BACnet® integration capability.

For units with design sequence 0 to 3, a Trane CH530® controls system with Dynaview® operator interface is utilized, while units with design sequence 4 are equipped with Symbio™ 800 controls and a Tracer® TD-7 operator display.

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

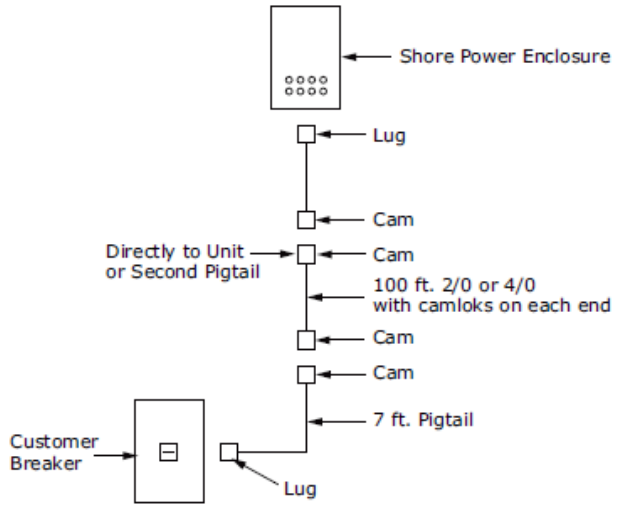
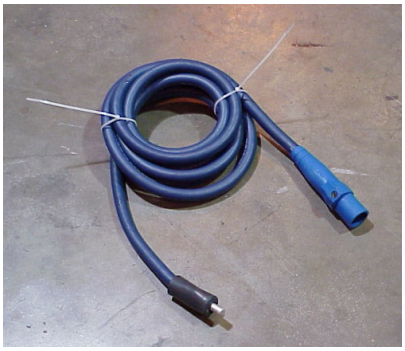


Figure 2. Pig-tail connectors



General Data

Table 2. General data, 60 Hz, high efficiency (I-P)

Size	Unit	25	40	60	80	100	110	120
Compressor								
Number	#	2	4	4	4	4	4	4
Tonnage/ckt[a]		13+13	10+10	15+15	20+20	25+25	30 + 25	30+30
Evaporator								
Water storage	(gal)	2.2	2.4	5.0	7.0	10.3	10.3	11.5
Min. flow [b] (LWT ≥42°F)	(gpm)	29.8	45.4	67.1	91.8	115.5	125.2	135.9
Min. flow[b] (LWT 40 to 41.9°F)	(gpm)	37.2	56.7	83.9	114.7	144.4	156.5	169.9
Max. flow[b]	(gpm)	89.0	136.0	201.0	275.0	346.0	375.0	407.0
Water Connection Size	(in)	2.5	2.5	4	4	4	6	4
Condenser								
Quantity of coils	#	1	2	2	4	4	4	4
Coil length	(in)	91	91	127	121	144	144	144
Coil height	(in)	68	68	68	42	42	42	42
Number of rows	#	2	2	2	3	3	3	3
Fins per foot	(fpf)	192	192	192	192	192	192	192
Microchannel Coils								
Quantity of coils	#	1	2	2	8	8	—	8
Coil length	(in)	91	91	127	68+46	68+68	—	68+68
Coil height[c]	(in)	42+10	42+10	42+10	34+7	34+7	—	34+7
Tube width	(in)	1	1	1	1	1	—	1
Fan								
Quantity	#	2	4	6	6	8	8	8
Diameter	(in)	28.8	28.8	28.8	28.8	28.8	28.8	28.8
Airflow per fan	(cfm)	9420	9413	9168	9470	9094	9178	9098
Power per motor	(HP)	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Motor RPM	(rpm)	840	840	840	840	840	840	840
Tip speed	(ft/min)	6333	6333	6333	6333	6333	6333	6333
General Unit								
Refrig circuits	#	1	2	2	2	2	2	2
Capacity steps	%	50-100	25-50-75-100	25-50-75-100	25-50-75-100	25-50-75-100	23-45-73-100	25-50-75-100
Min/Max ambient - tube/fin condenser	(°F)	0 / 125	0 / 125	0 / 125	0 / 125	0 / 125	0 / 125	0 / 125
Min/Max ambient - microchannel condenser	(°F)	-20 / 125	-20 / 125	-20 / 125	-20 / 125	-20 / 125	—	-20 / 125
Min/Max Fluid Setpoint	(°F)	0/65	0/65	0/65	0/65	0/65	0/65	0/65
Refrigerant/Oil Charge - Round Tube and Plate Fin Condenser								
R-410A Units: Refrig charge/ckt[a]	(lbs)	34	32	44	74	90	—	86
R-410A Units: Oil charge/ckt[a]	(gal)	1.7	1.7	1.9	3.5	3.5	—	3.8
R-454B Units: Refrig charge/ckt[a]	(lbs)	—	—	51	67	—	74	77

Table 2. General data, 60 Hz, high efficiency (I-P) (continued)

Size	Unit	25	40	60	80	100	110	120
R-454B Units: Oil charge/ckt[a]	(gal)	—	—	2.1	3.9	—	4.1	4.2
Refrigerant/Oil Charge - Microchannel Condenser								
R-410A Units: Refrig charge/ckt [a]	(lbs)	27.5	24	33	50	54	—	55
R-410A Units: Oil charge/ckt[a]	(gal)	1.4	1.4	1.6	2.9	2.9	—	3.1
Pump Package								
Size	(hp)	5.0	10.0	10.0	20.0	20.0	20	20.0
Min/Max Flow [d]	(gpm)	25/104	50/201	50/175	91/376	91/376	91/376	91/376
Available Head Pressure [d]	(ft H_2O)	122.2	137.7	137.7	148.0	162.9	148	148.0

[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.
[c] Microchannel coils are split horizontally between the condenser and subcooler coil.
[d] Pump available head pressure is based on 44/54°F evaporator with water, .0001 hr-ft2-°F/Btu, 95°F ambient and 0 ft elevation. Where multiple, similar pump models are present, the lowest value among available pump options is listed

Pre-Installation

Inspection Checklist

When the unit is delivered, verify that it is the correct unit and that it is 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's 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'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 carrier's representative.

Unit Storage

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

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

- Do not remove the protective coverings from the electrical panel.
- Store the chiller in a secure area.
- Units charged with refrigerant should not be stored where temperatures exceed 140°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

Table 3. Installation requirements (continued)

Type	Trane Supplied		Field Supplied Field Installed
	Trane Installed	Field Installed	
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	—	—
Insulation	Insulation	—	Insulation
Water Piping Connection Components	Grooved pipe	—	—

Dimensions and Weights

Service Clearances

Figure 3. CGAM service clearances

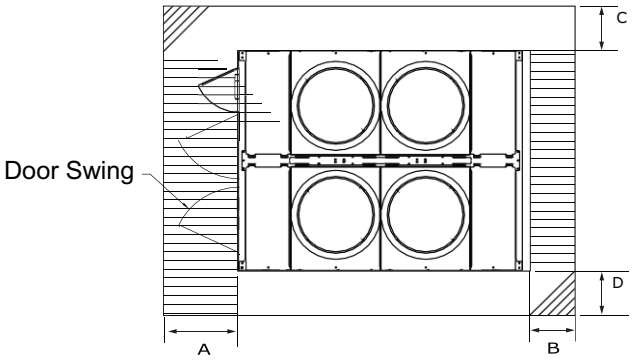


Table 4. CGAM service clearance dimensions

Unit Size	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	mm
25 ton	47.2	1200	31.5	800	23.6	600	39.4	1000
40 to 60 ton	47.2	1200	31.5	800	39.4	1000	39.4	1000
80 to 120 ton	47.2	1200	39.4	1000	39.4	1000	39.4	1000

Notes:

1. Number of fans and panel doors shown does not represent the number of fans installed.
2. More clearance may be needed for airflow, depending on installation.

Unit Drawings

Figure 4. 25T CGAM (CSCA0025F0)

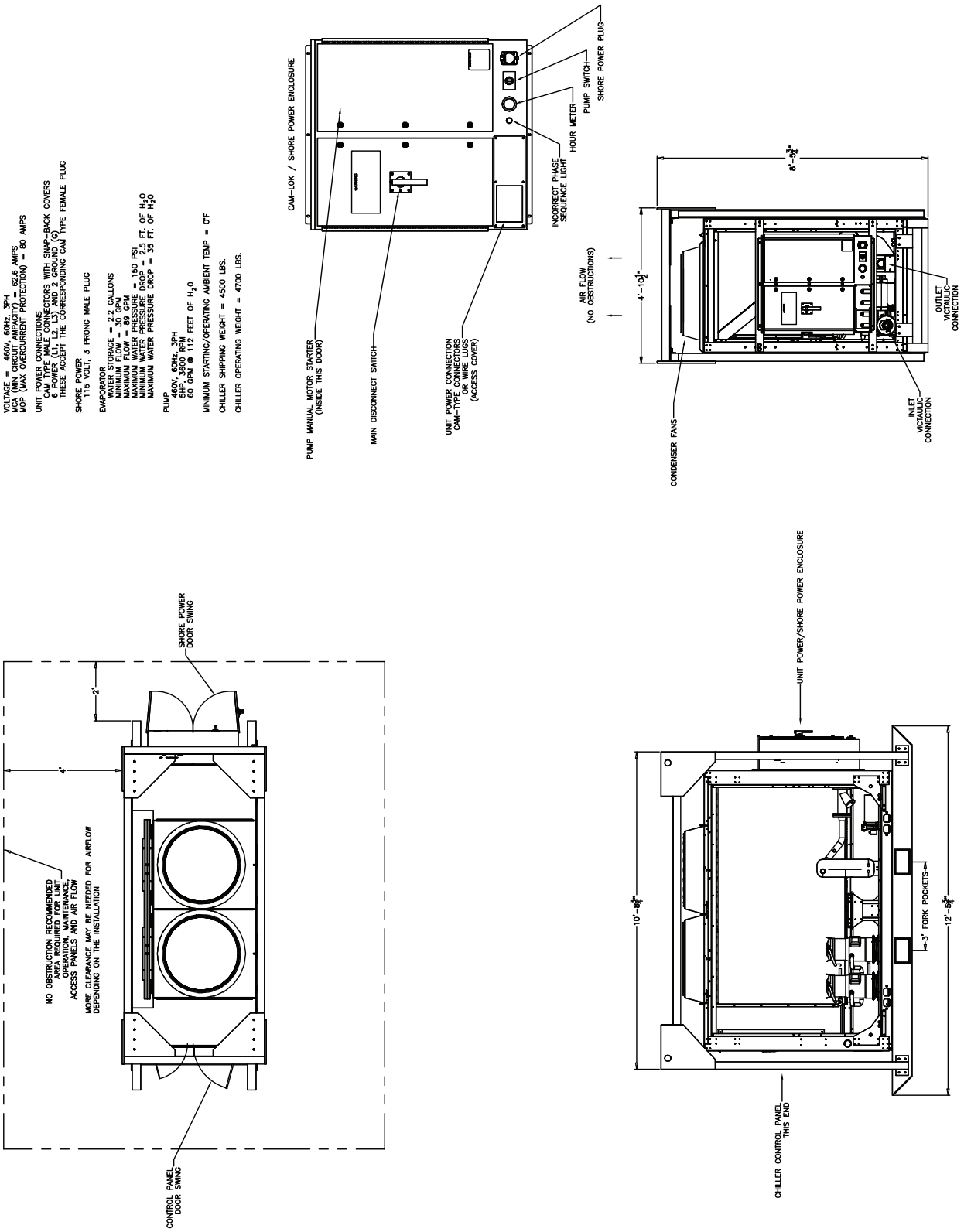


Figure 5. 25T CGAM (CSCA0025F2)

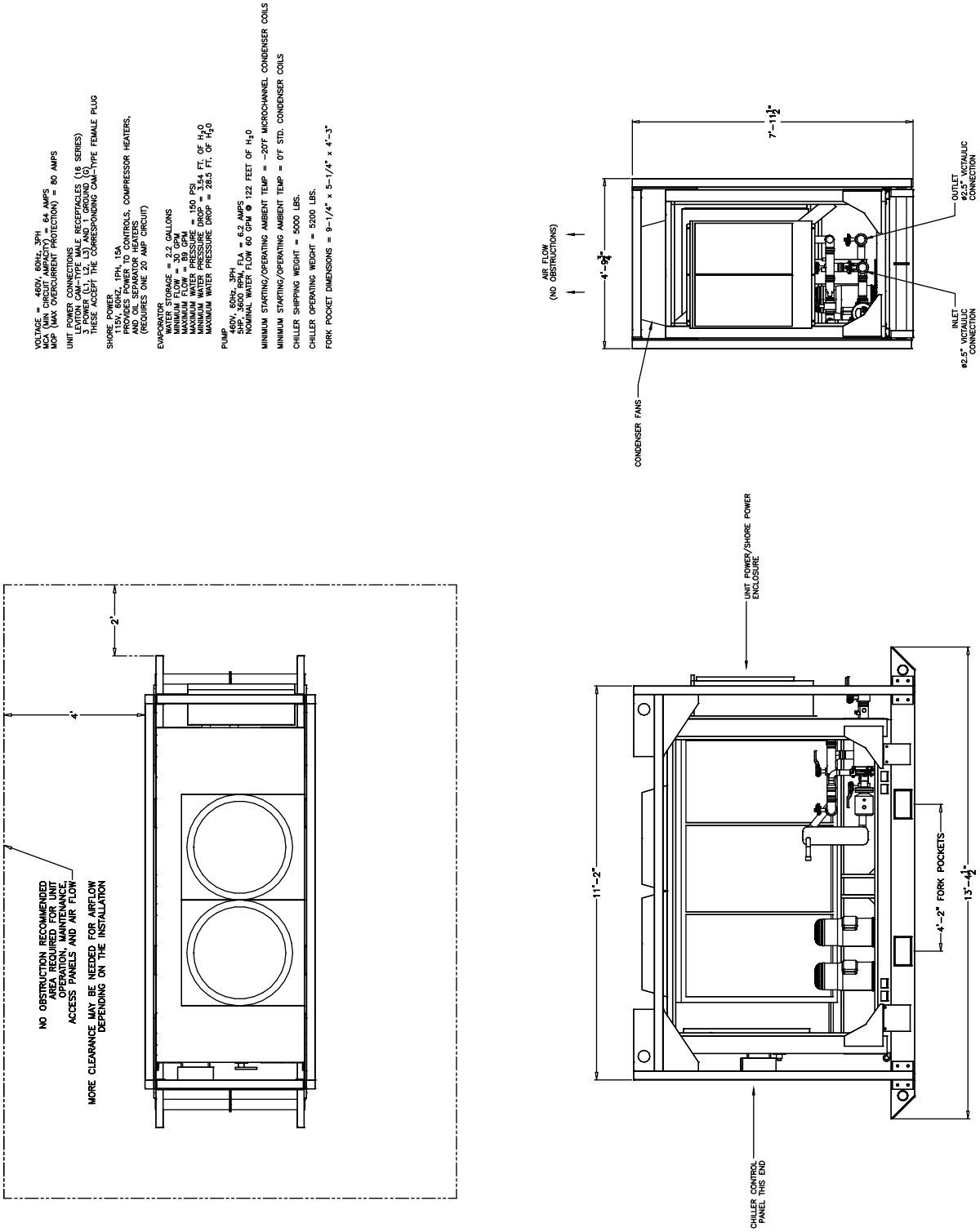


Figure 6. 40T CGAM (CSCA0040F0)

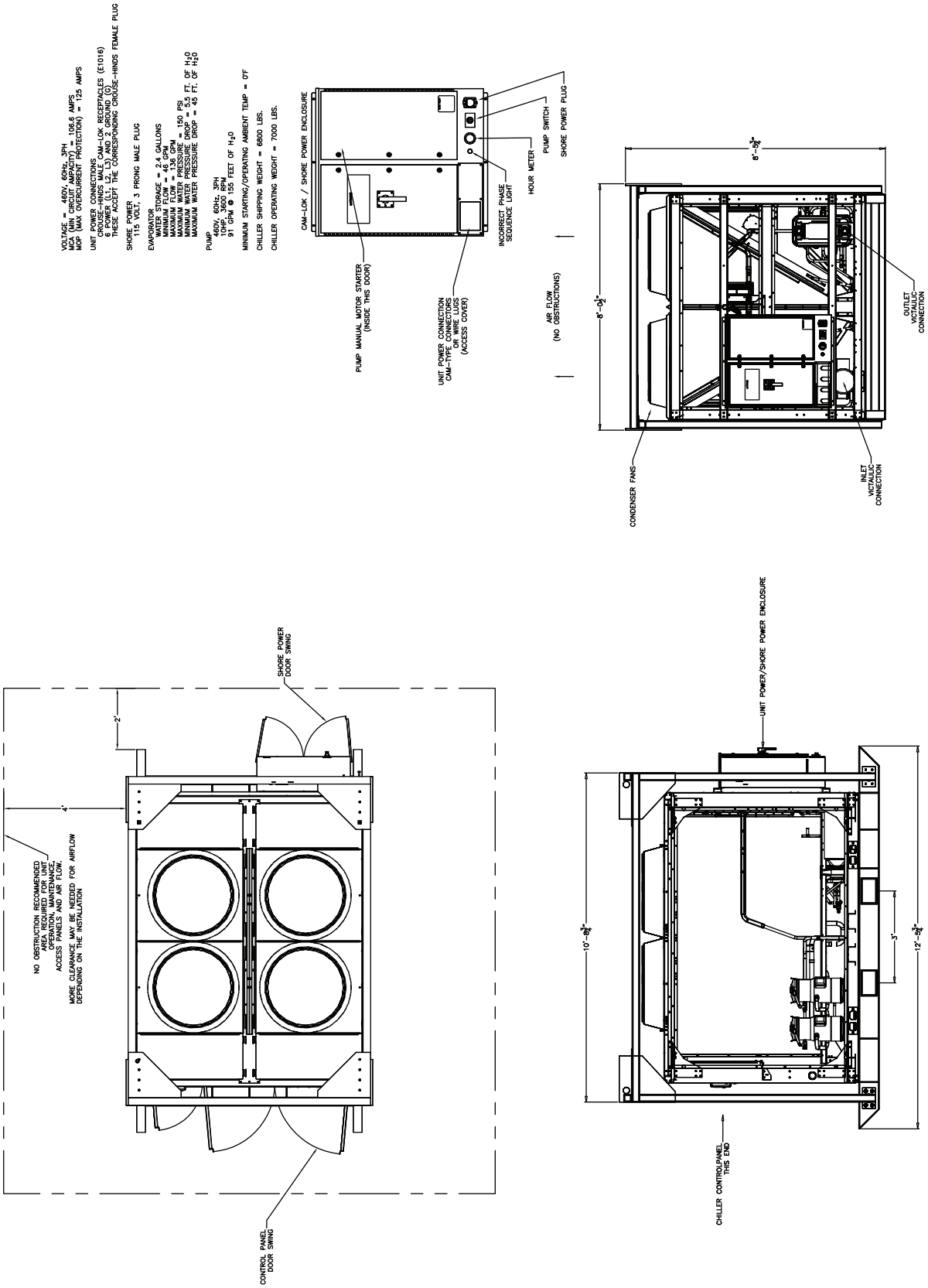


Figure 7. 40T CGAM (CSCA0040F2)

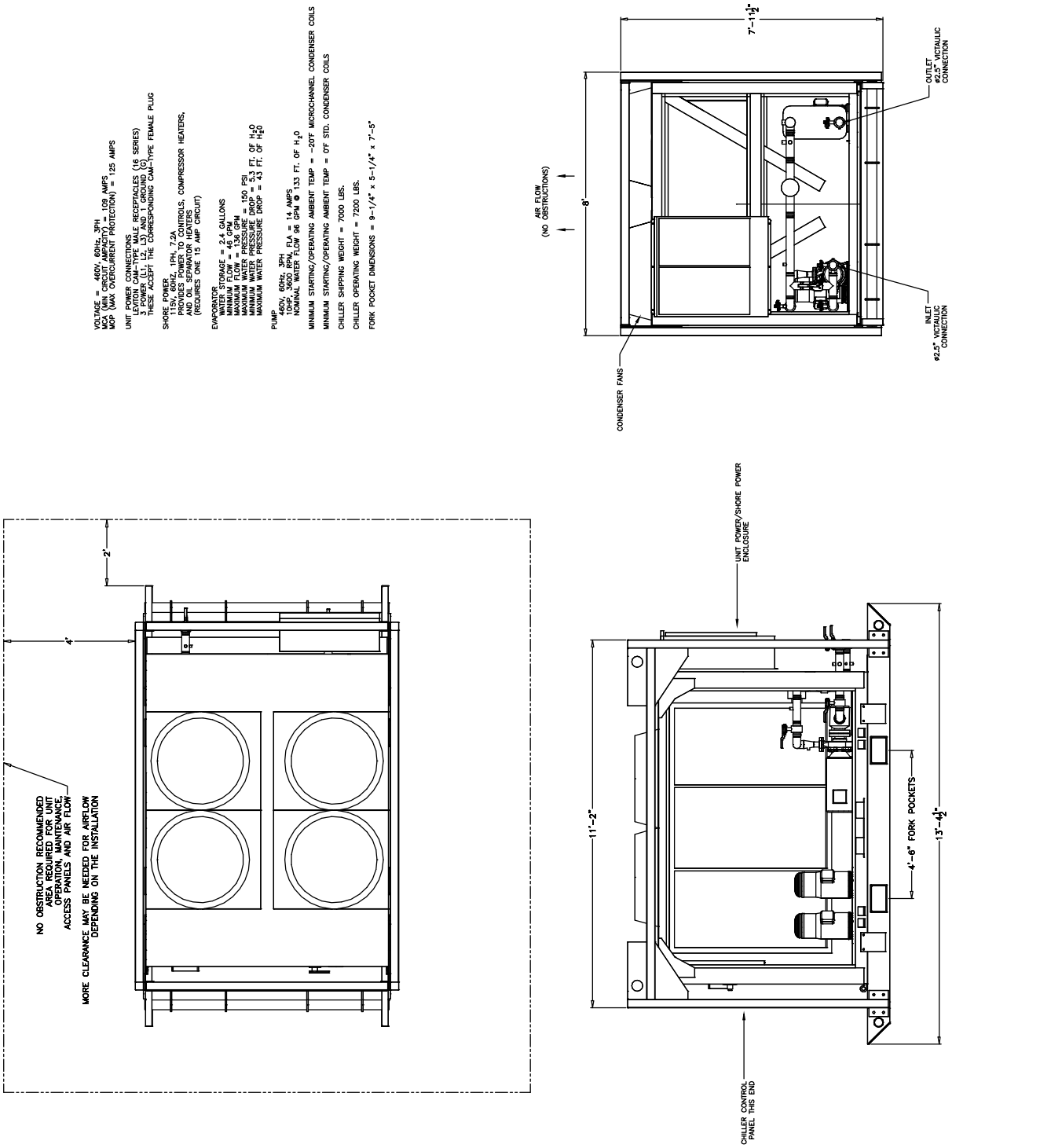


Figure 8. 60T CGAM (CSCA0060F0)

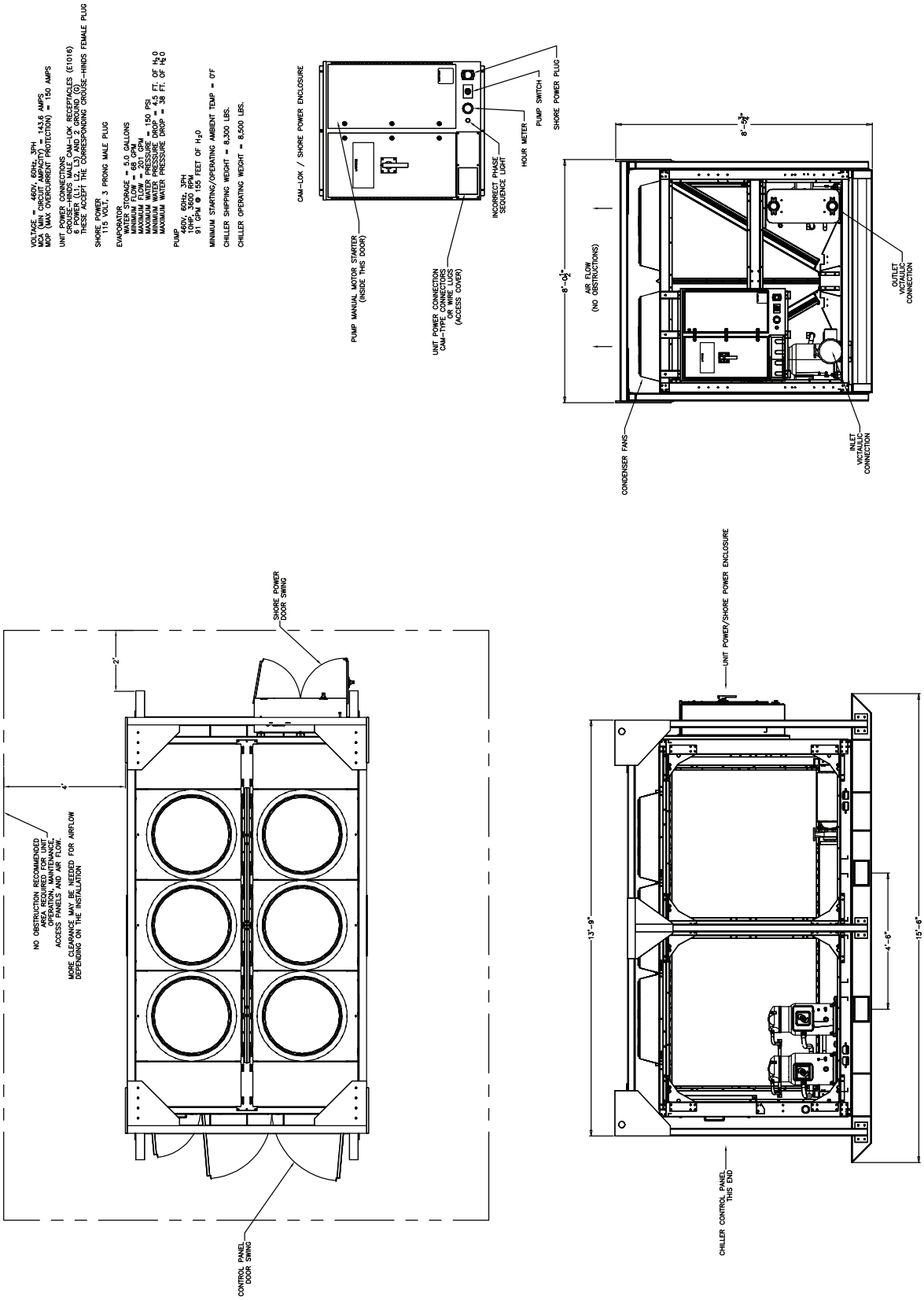


Figure 9. 60T CGAM (CSCA0060F2)

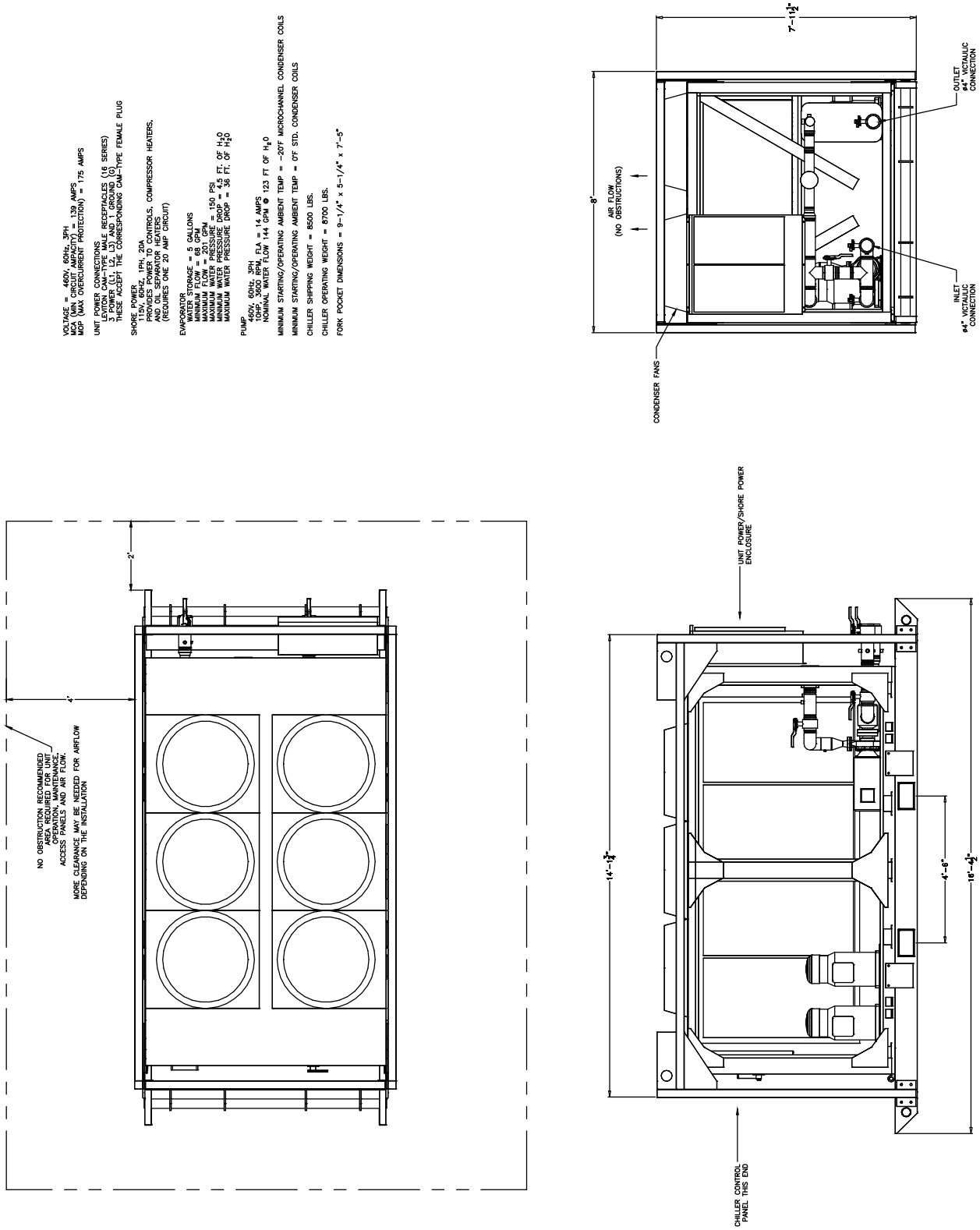


Figure 10. 60T CGAM (CSCA0060F3)

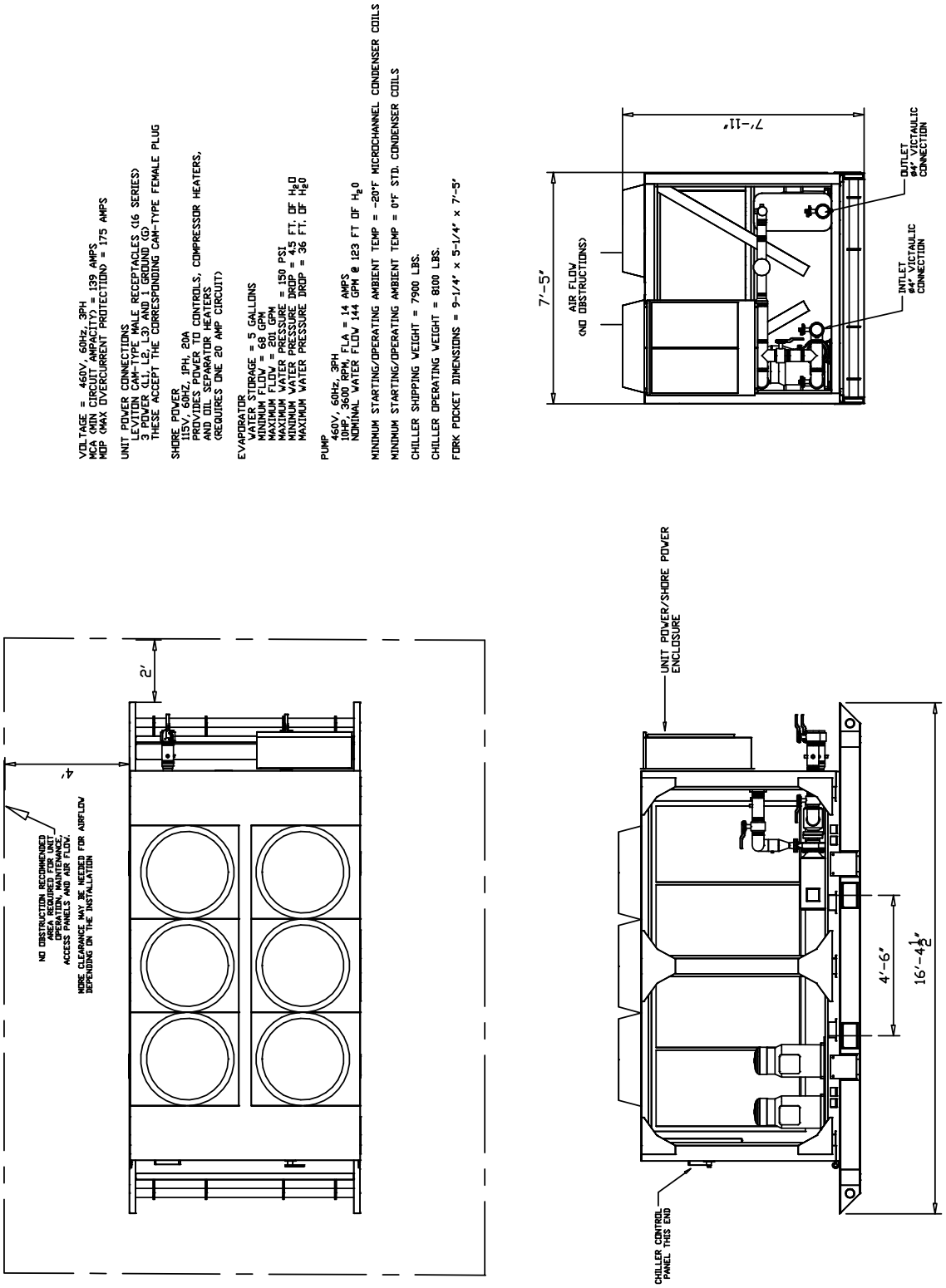


Figure 11. 60T CGAM (CSCA0060F4)

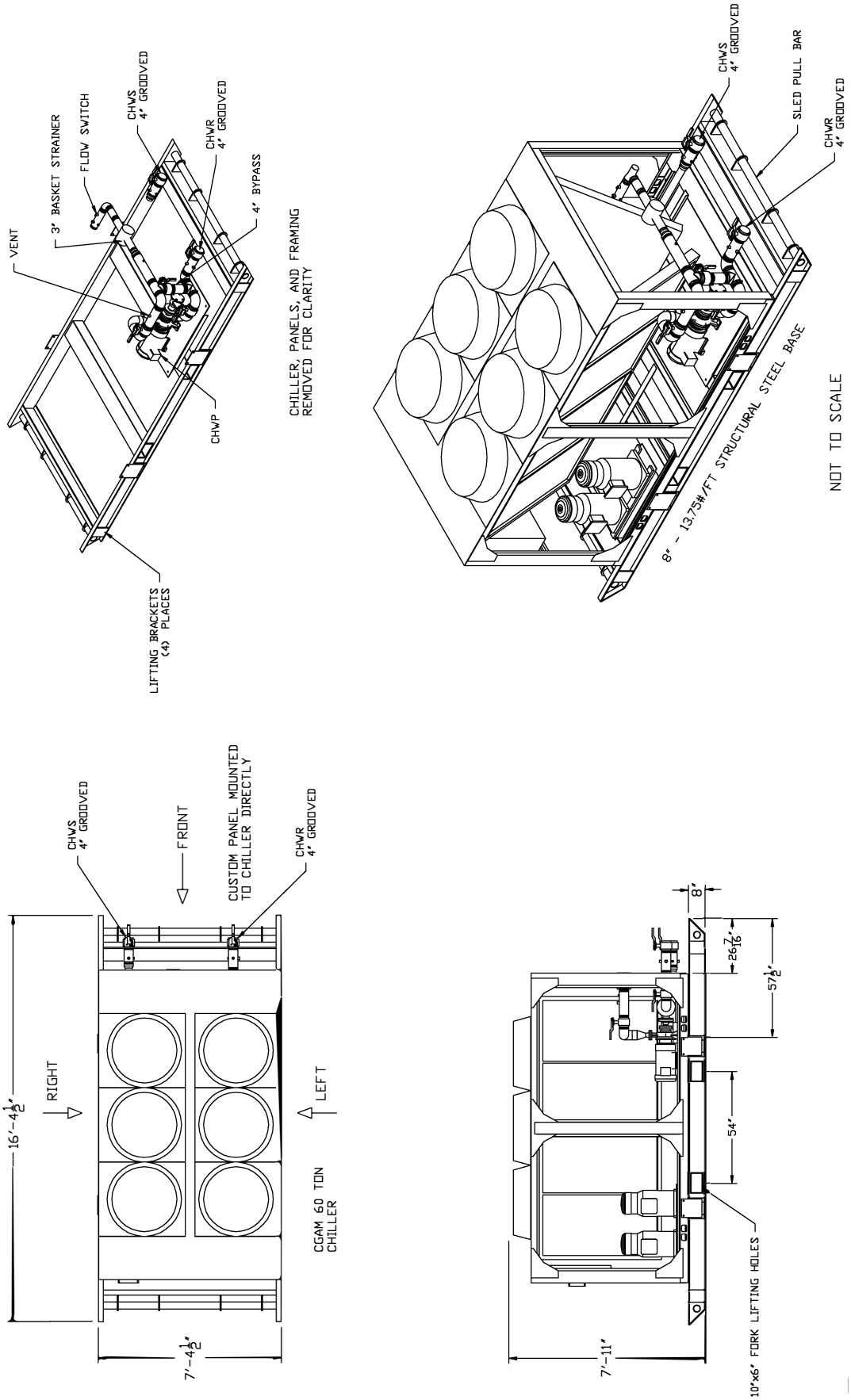


Figure 12. 80T CGAM (CSCA0080F1)

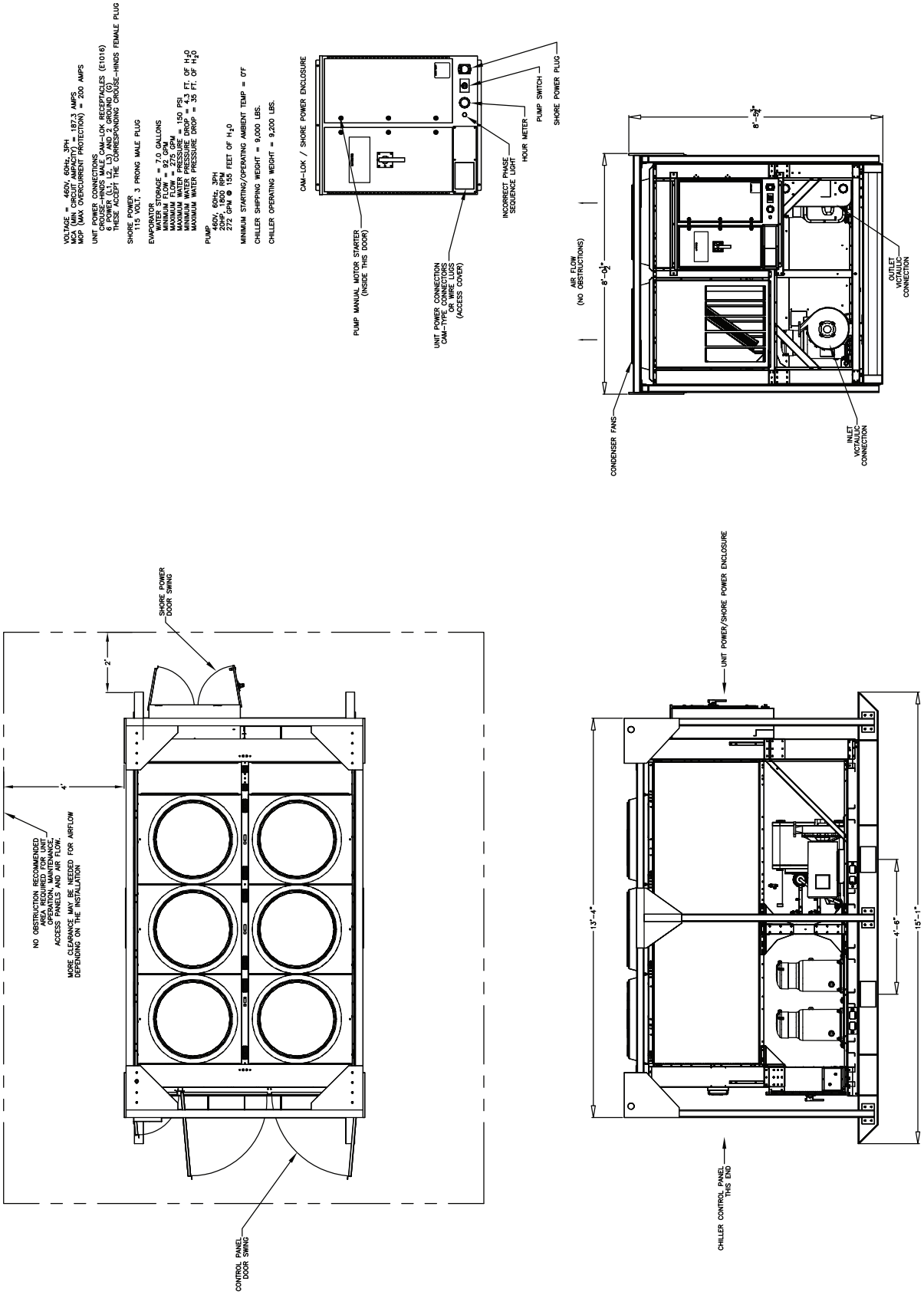


Figure 13. 80T CGAM (CSCA0080F2)

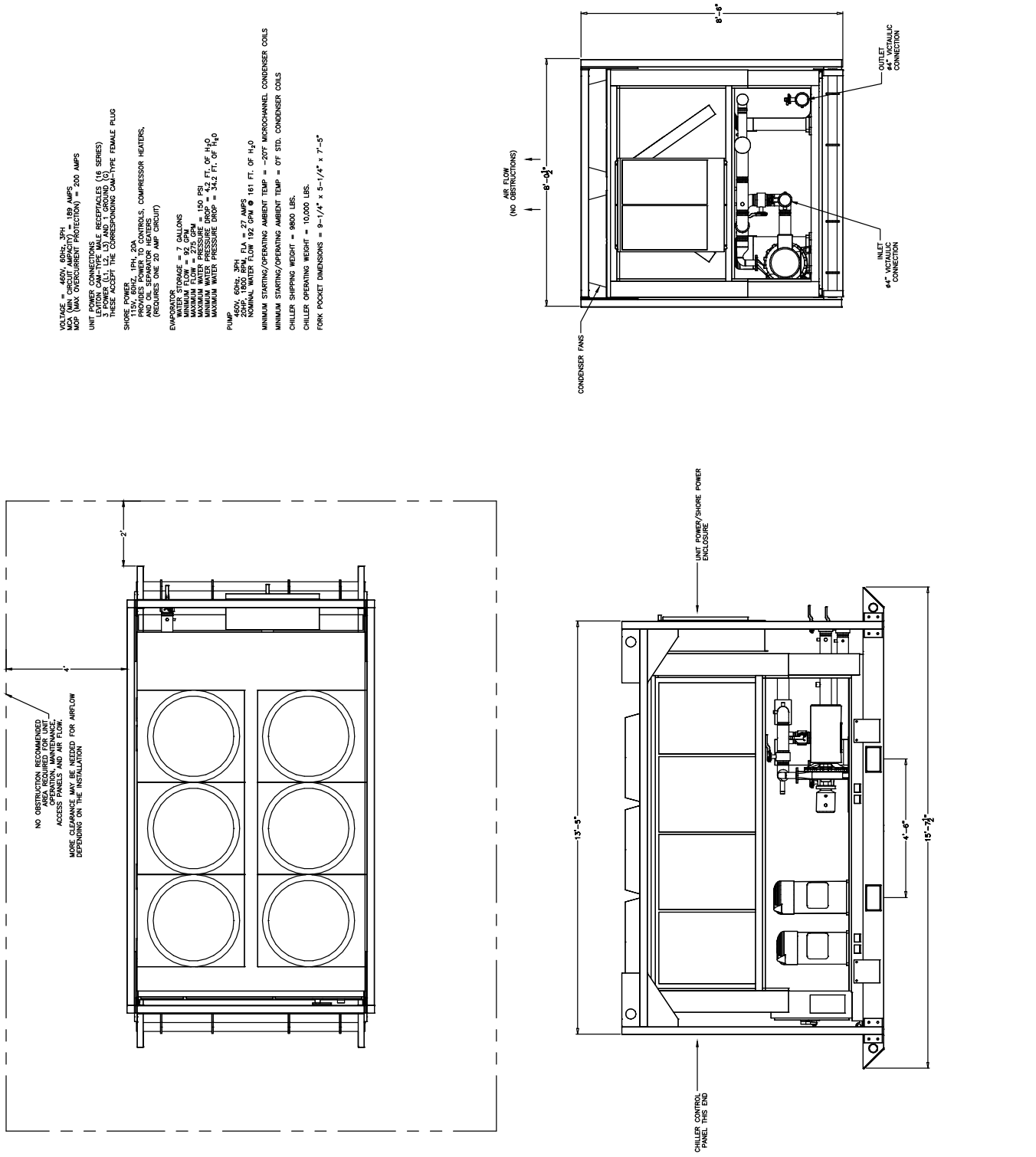


Figure 14. 80T CGAM (CSCA0080F4)

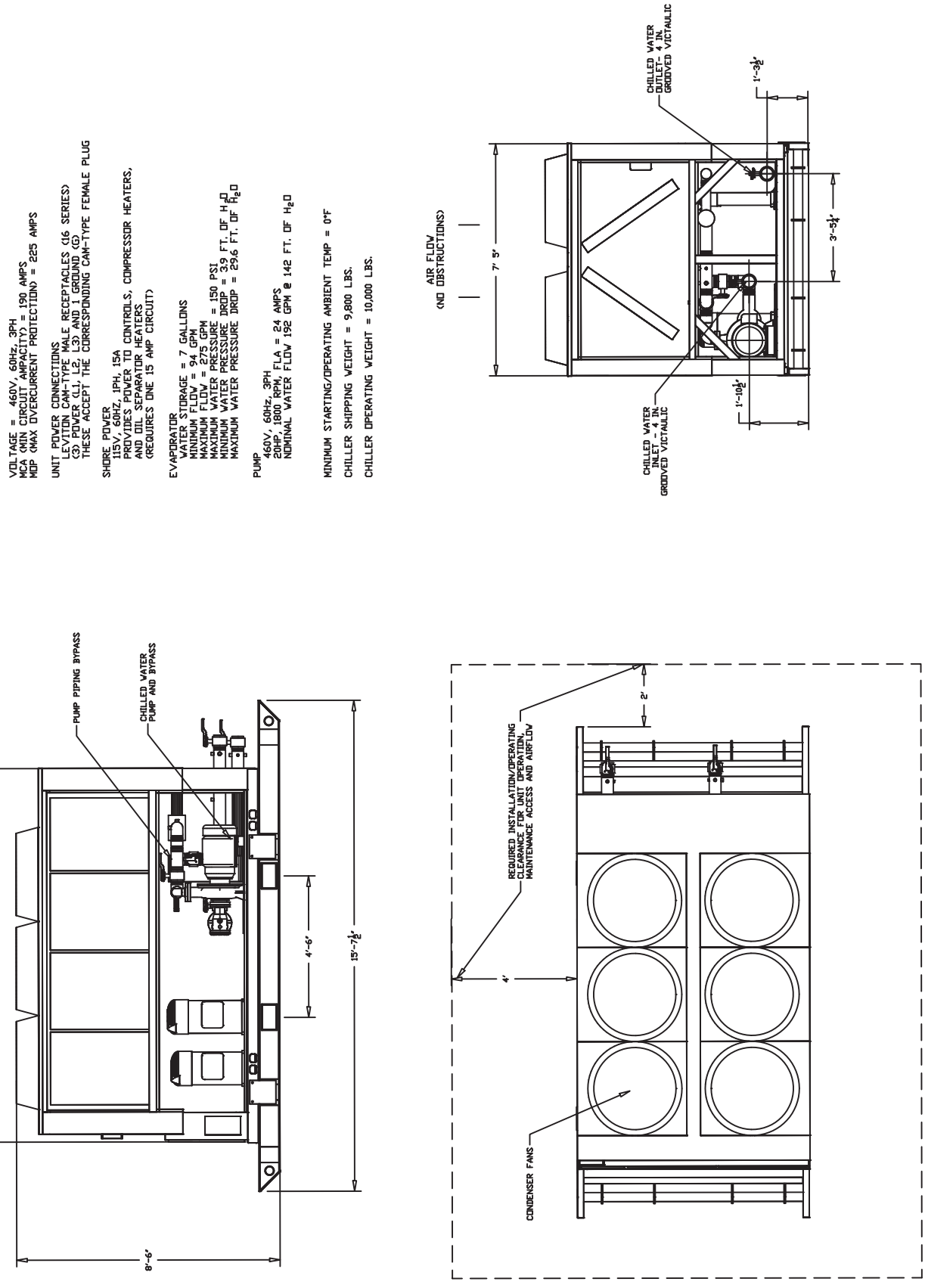


Figure 15. 80T CGAM (RSCA0080J4)

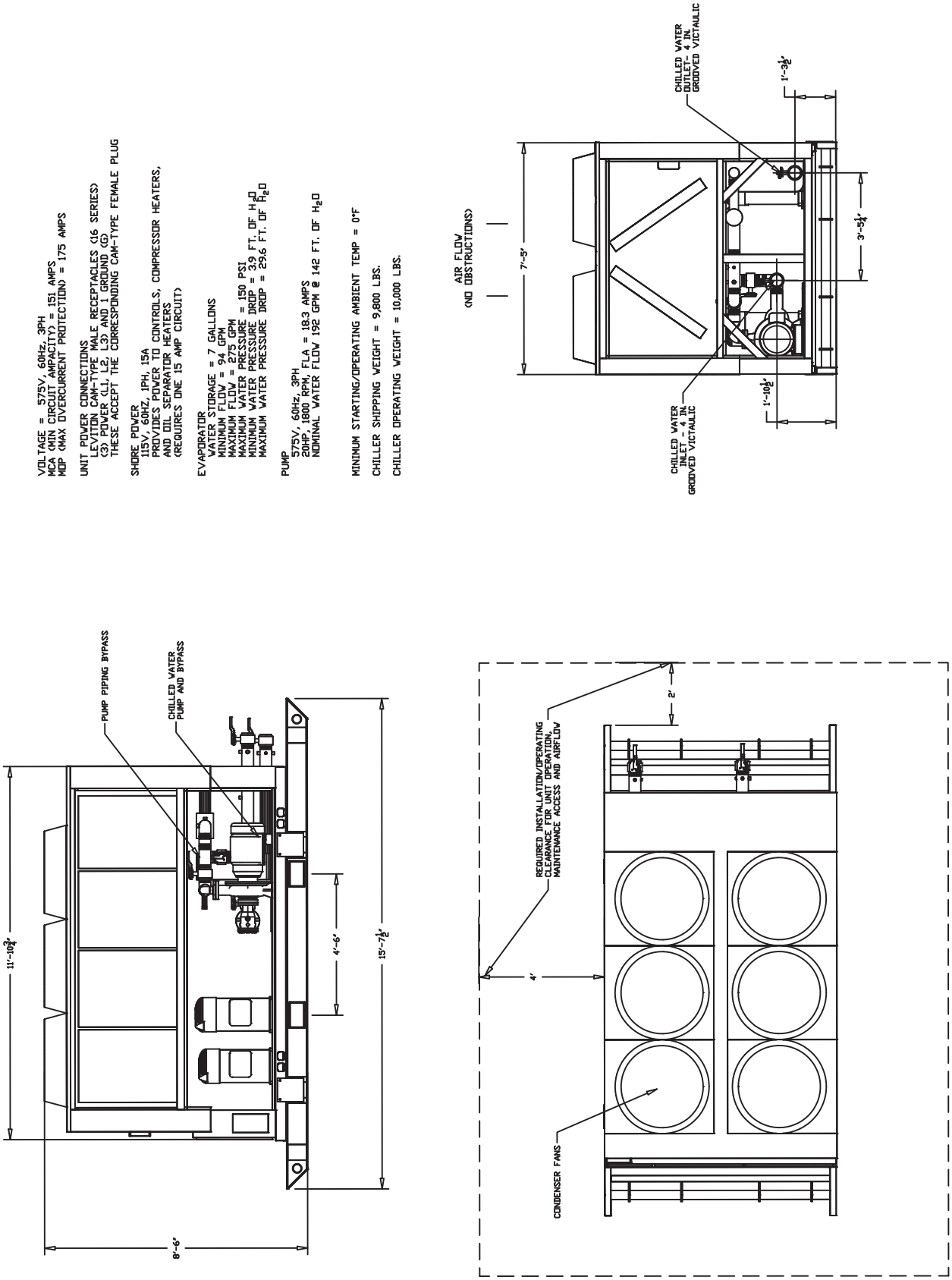
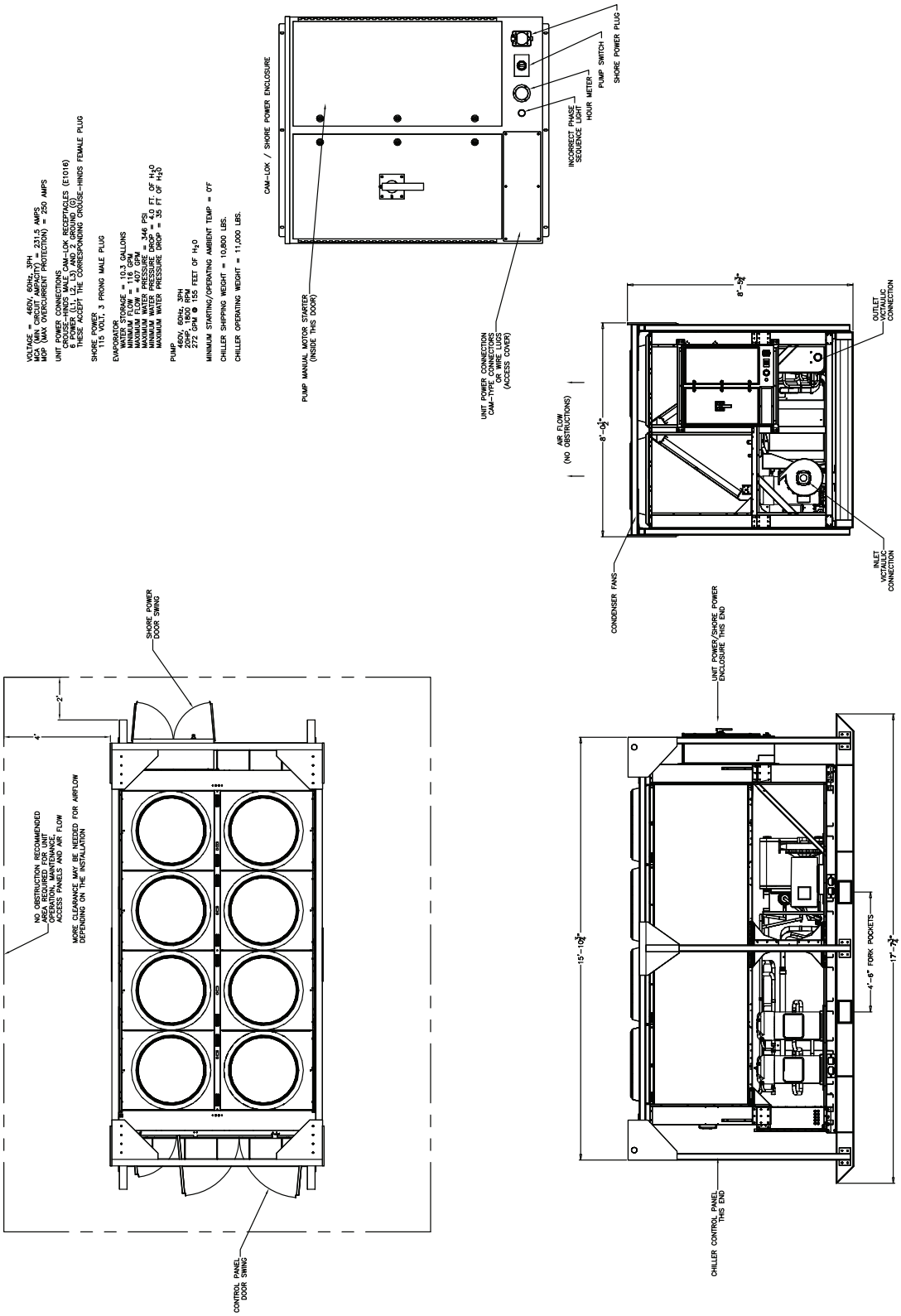


Figure 16. 100T CGAM (CSCA0100F1)



Dimensions and Weights

Figure 17. 100T CGAM (CSCA0100F2)

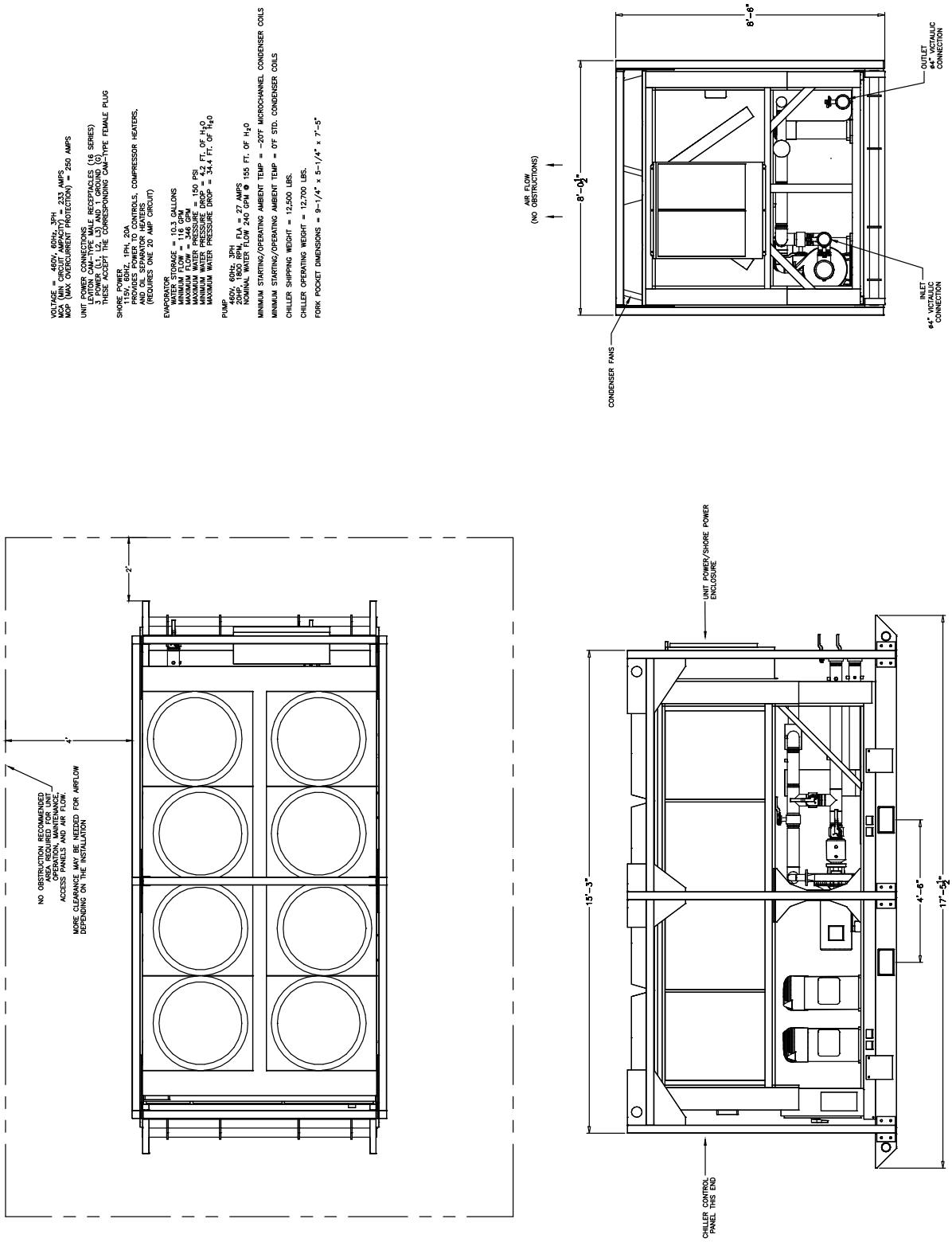


Figure 18. 100T CGAM (CSCA0100F3)

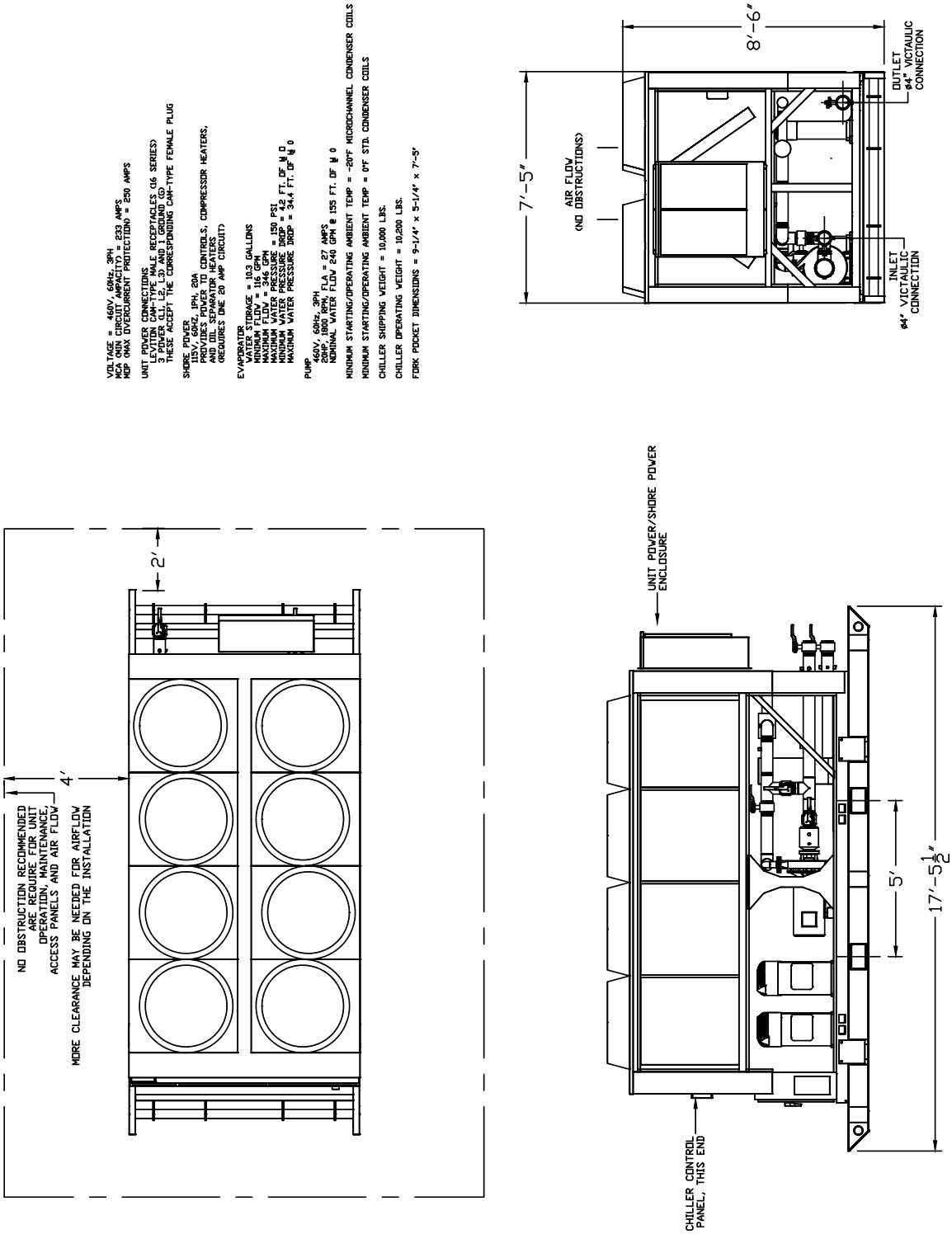


Figure 19. 110T CGAM (CSCA0110J4)

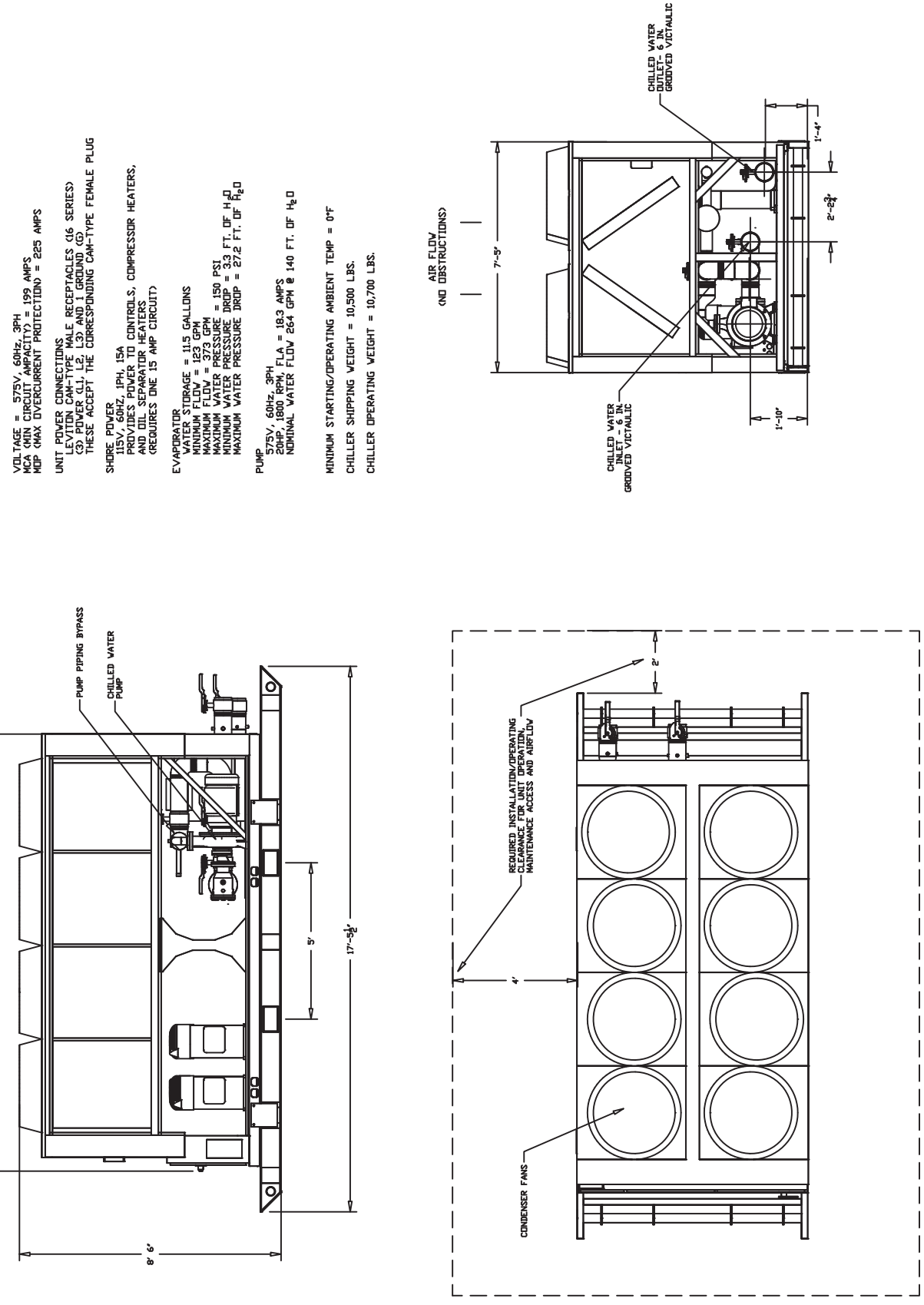


Figure 20. 120T CGAM (CSCA0120F1)

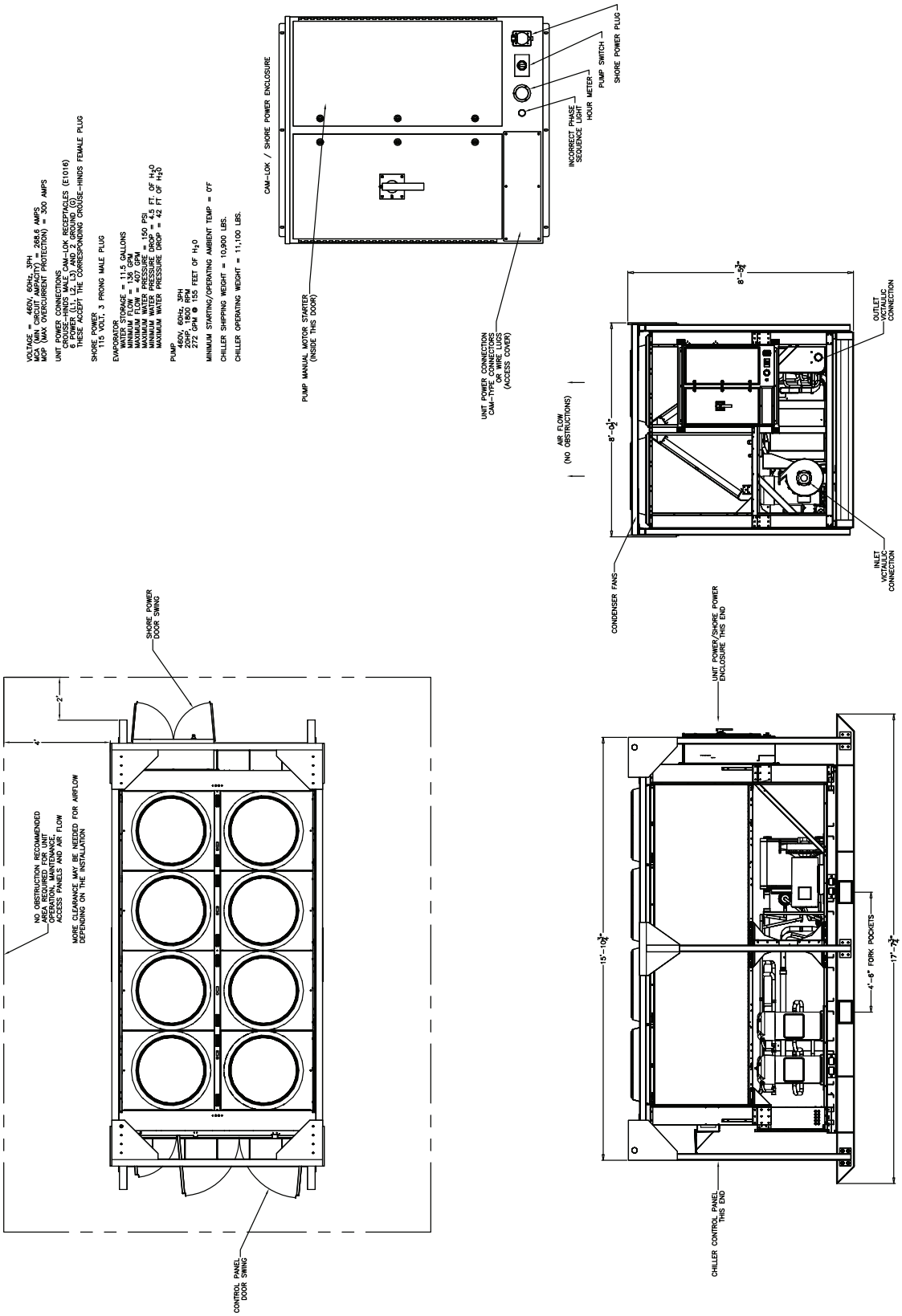


Figure 21. 120T CGAM (CSCA0120F2)

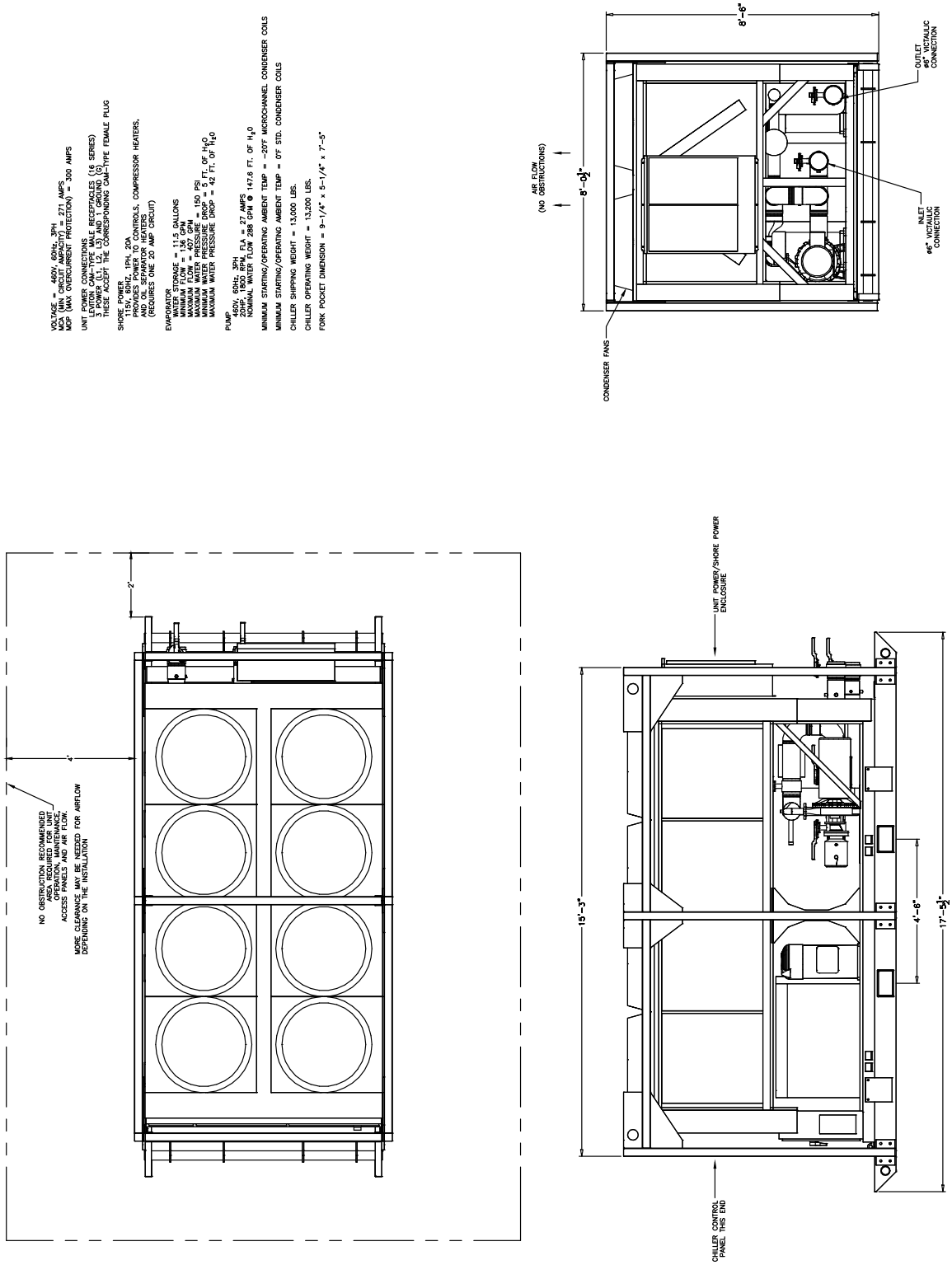


Figure 22. 120T CGAM (CSCA0120F3)

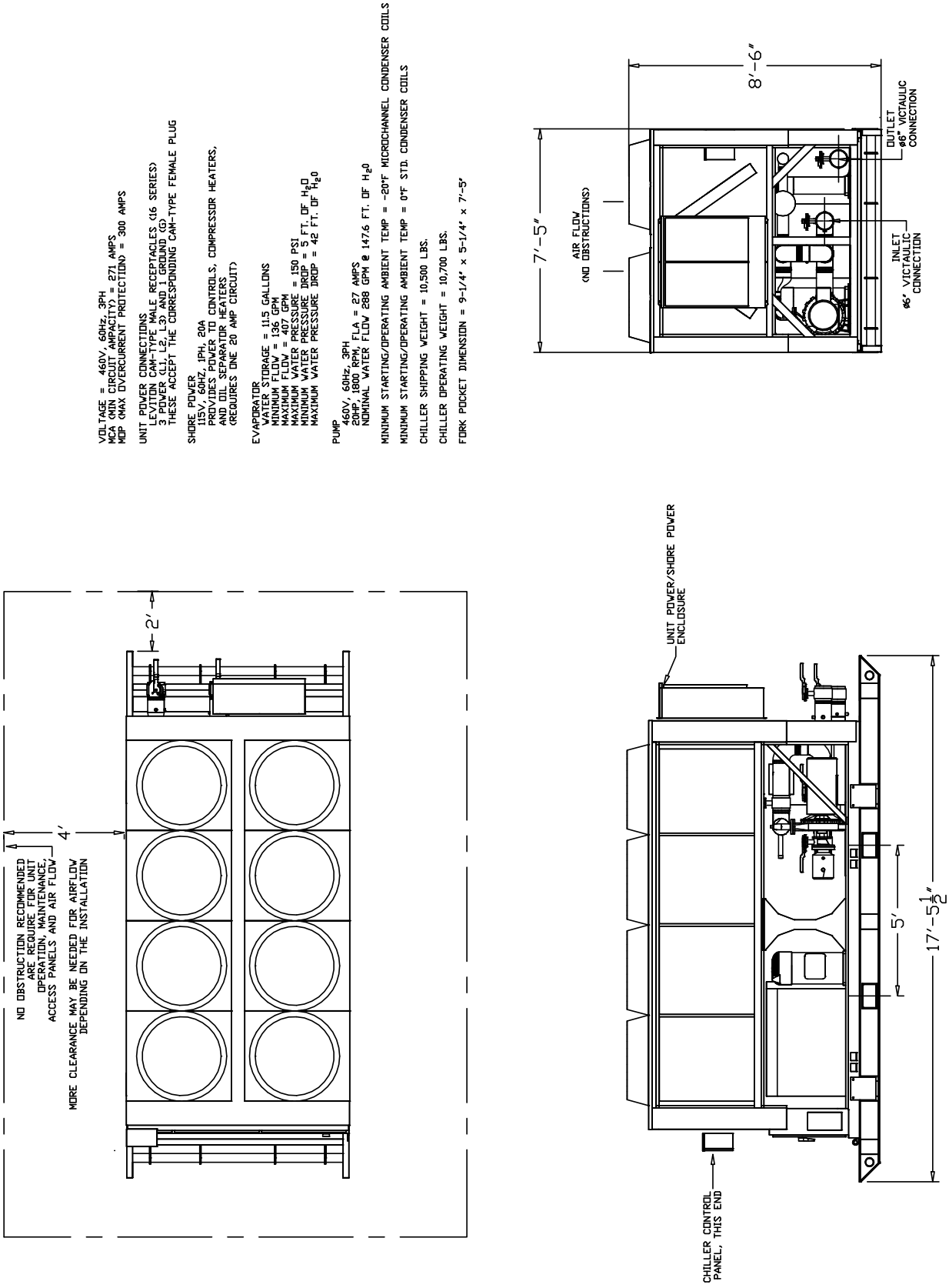
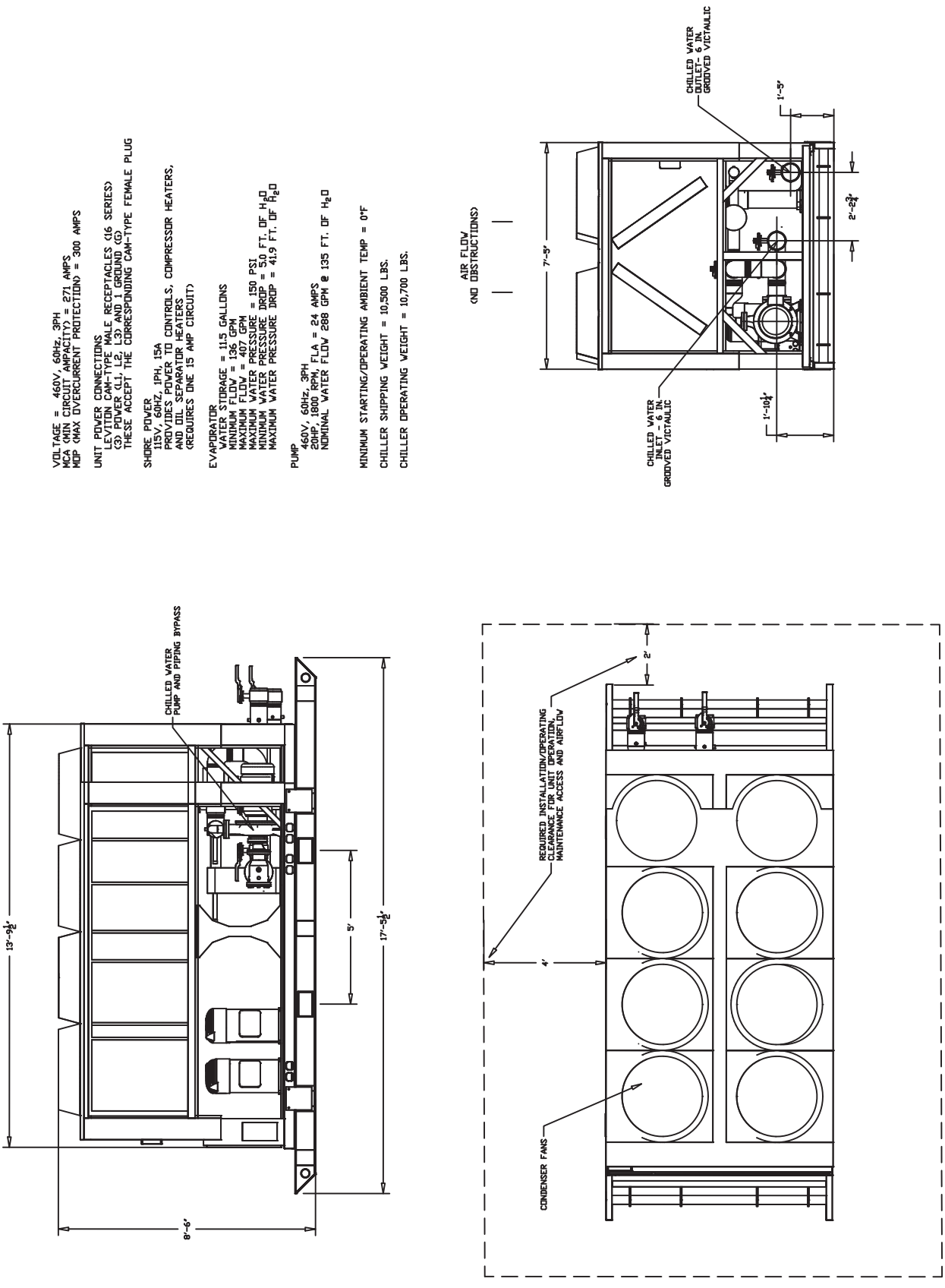


Figure 23. 120T CGAM (CSCA0120F4)



Unit Weights

See table below for unit weights.

Table 5. Unit weights

Unit	Weight (lb)	
	Shipping	Operational
CSCA0025F0	5,200	5,400
CSCA0025F2	5,000	5,200
CSCA0040F0	7,600	7,800
CSCA0040F2	7,000	7,200
CSCA0060F0	9,000	9,200
CSCA0060F2	8,500	8,700
CSCA0060F3	7,900	8,100
CSCA0060F4	7,900	8,100
CSCA0080F1	10,100	10,300
CSCA0080F2	9,800	10,000
CSCA0080F,J4	9,800	10,000
CSCA0100F1	11,200	11,400
CSCA0100F2	12,500	12,700
CSCA0100F3	10,000	10,200
CSCA0110J4	10,500	10,700
CSCA0120F1	11,200	11,400
CSCA0120F2	13,000	13,200
CSCA0120F3	10,500	10,700
CSCA0120F4	10,500	10,700

Installation

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 CO_2 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.) Verify 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

Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (special cylinders for the recovery of refrigerant, for example). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

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.

In addition, a set of calibrated weighing scales shall be available and in good working order.

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.
12. When equipment has been decommissioned, attach a signed and dated label stating it has been decommissioned and emptied of refrigerant.
13. Ensure that there are labels on the equipment stating it contains flammable refrigerant.

Location Requirements

Sound Considerations

- See *Sound Ratings and Installation Guide 20 to 120 CGAM, 50 to 60 Hz AquaStream™ Air-Cooled Chillers Engineering Bulletin* (CG-PRB010*-EN) for sound consideration applications.
- 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, if Trane Rental Services flexible chilled water hose is not used.
- Seal all wall penetrations.

Note: *Consult an acoustical engineer for critical applications.*

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 (i.e., including completed piping, and full operating charges of refrigerant, oil and water). Refer to the chapter on “Dimensions and Weights,” p. 12 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. 12 for minimum clearances. In all cases, local codes which require additional clearances will take precedence over these recommendations.

Rigging

See Table 5, p. 33 for typical unit lifting weights. Refer to the rigging label attached to the unit for further details.

⚠ WARNING

Heavy Object!

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 24, p. 37

Figure 24. H-type spreader bar adjustment for level unit lift

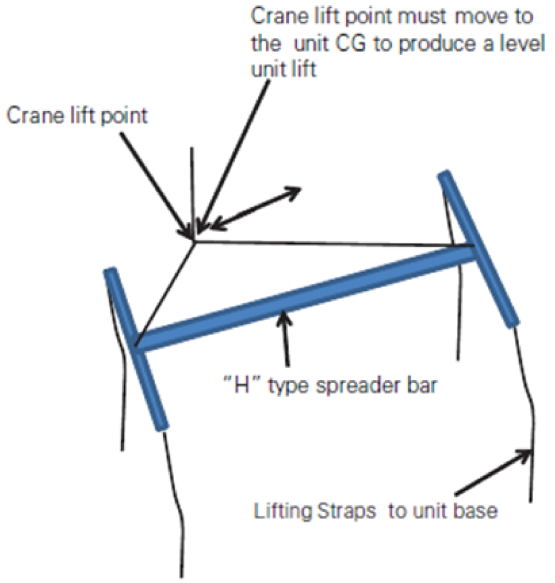


Figure 25. 25T CGAM rigging diagram

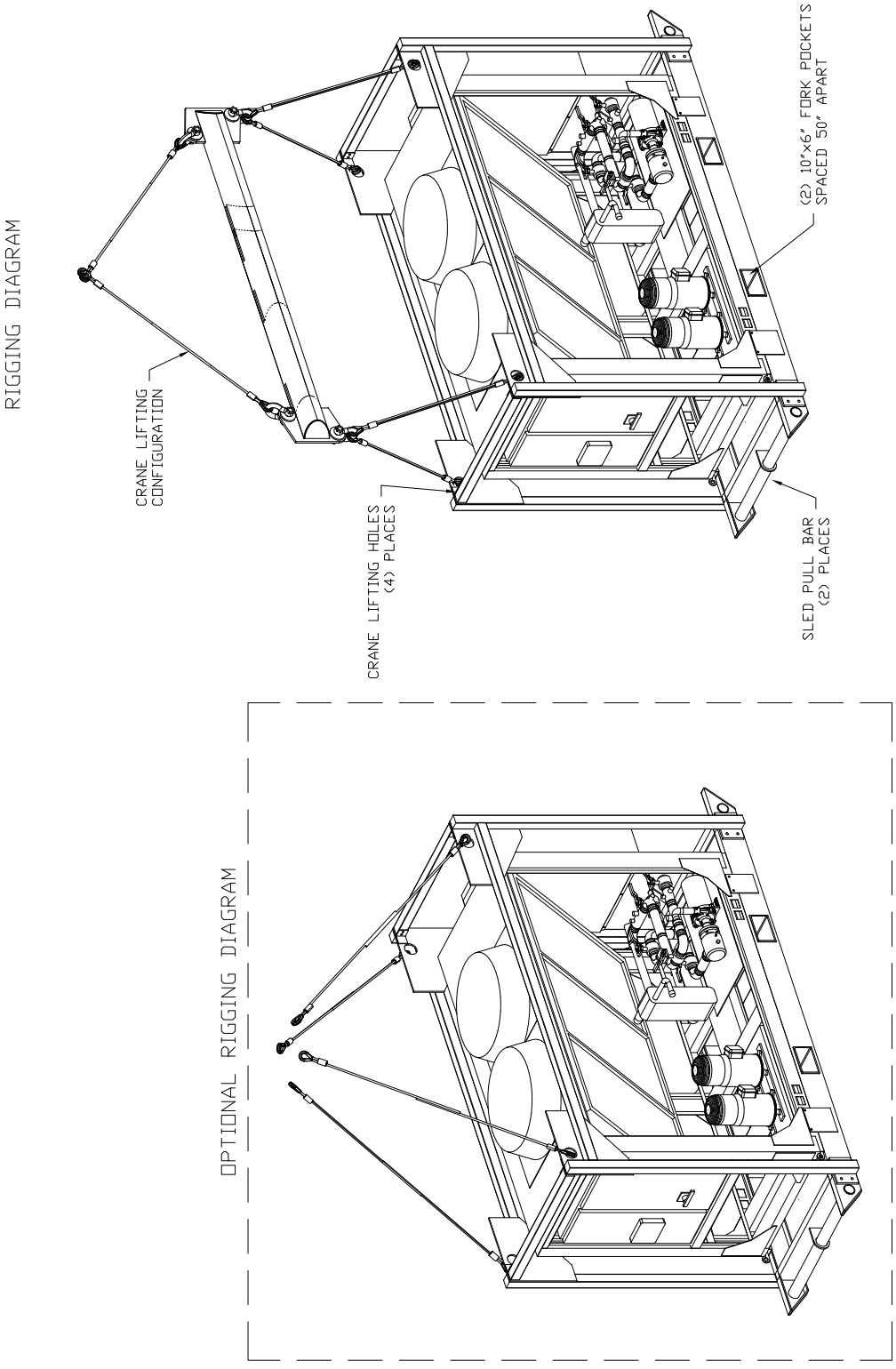


Figure 26. 40T CGAM rigging diagram

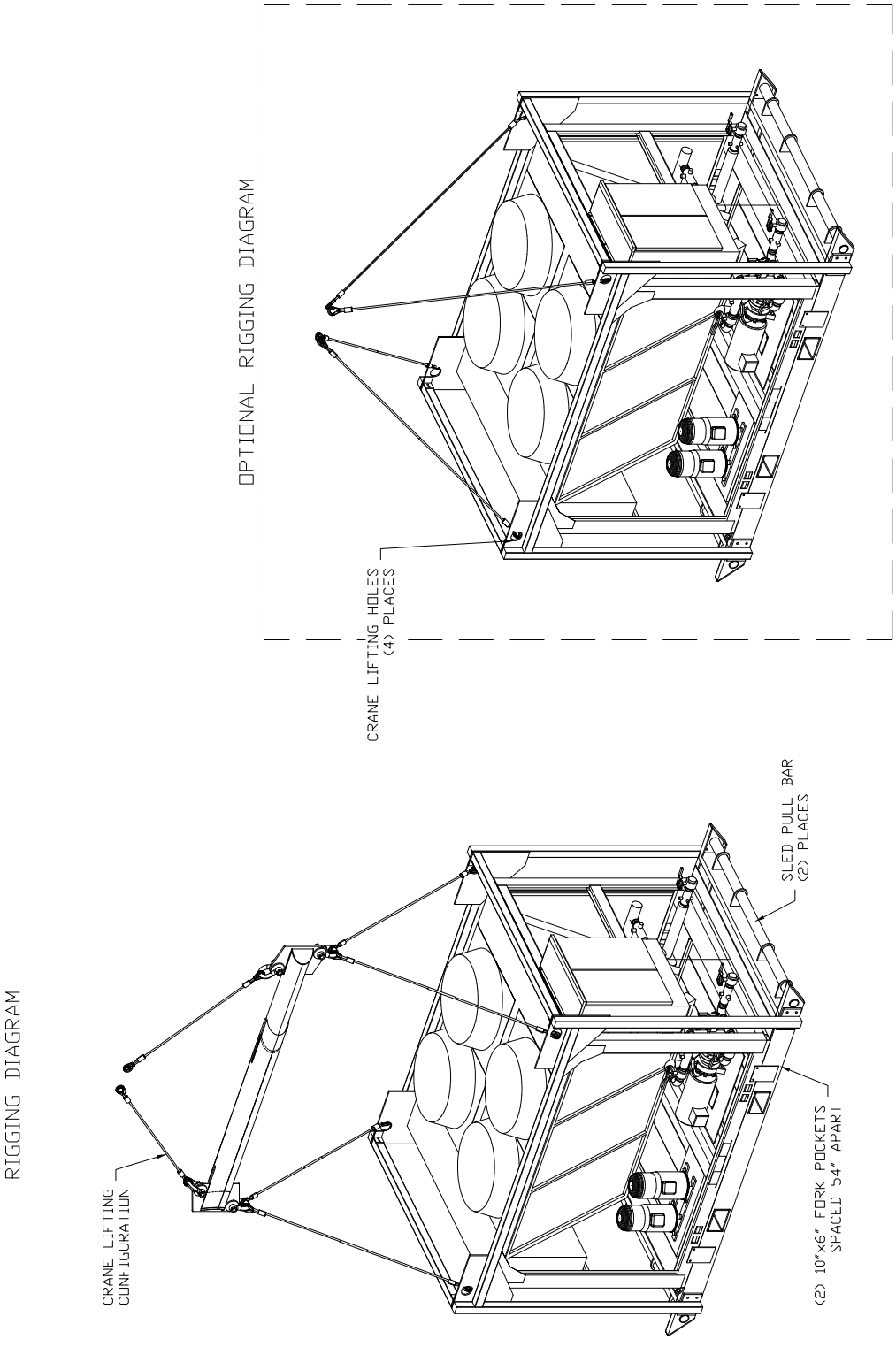


Figure 27. 60T CGAM rigging diagram

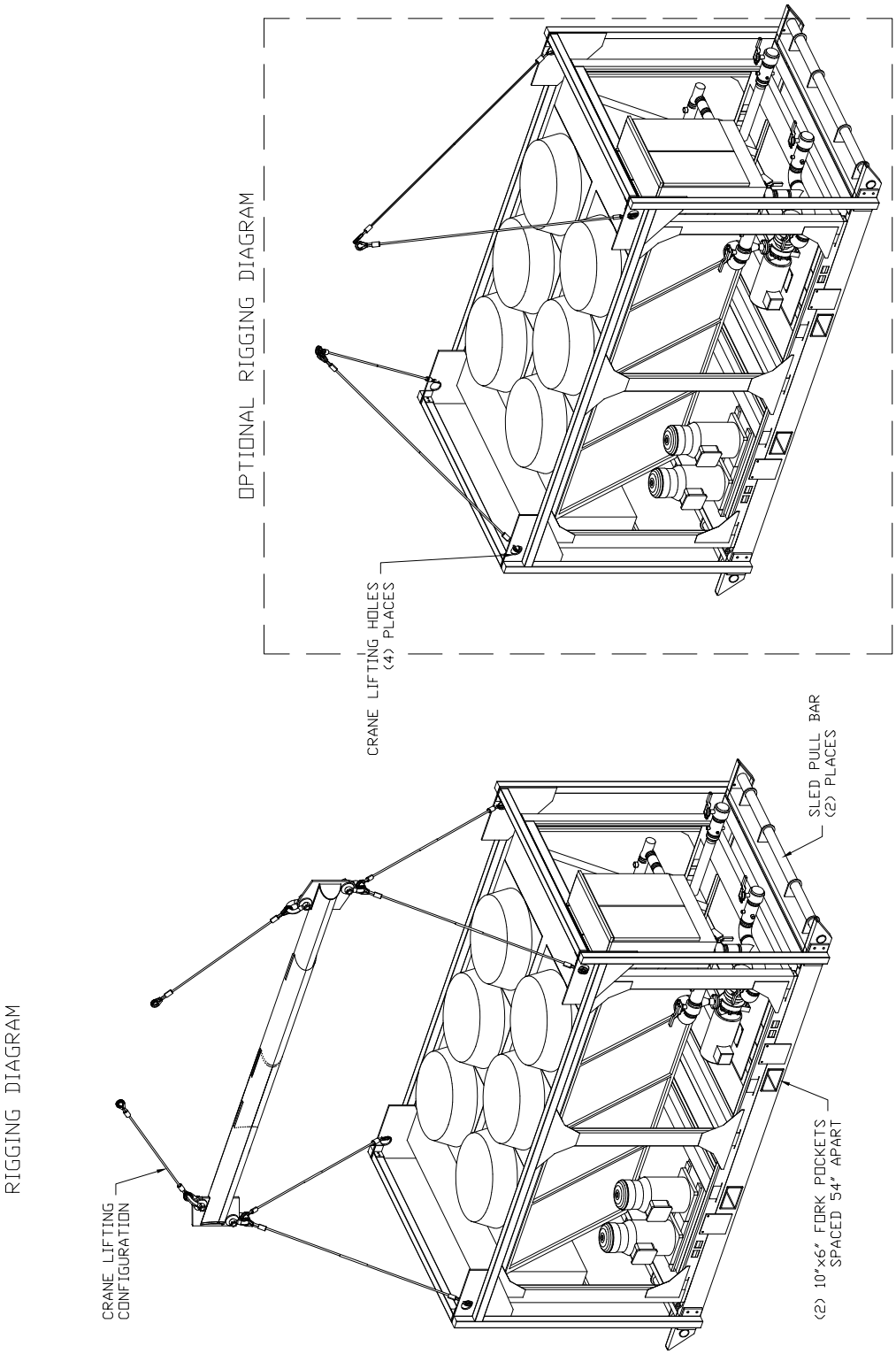


Figure 28. 80T CGAM rigging diagram

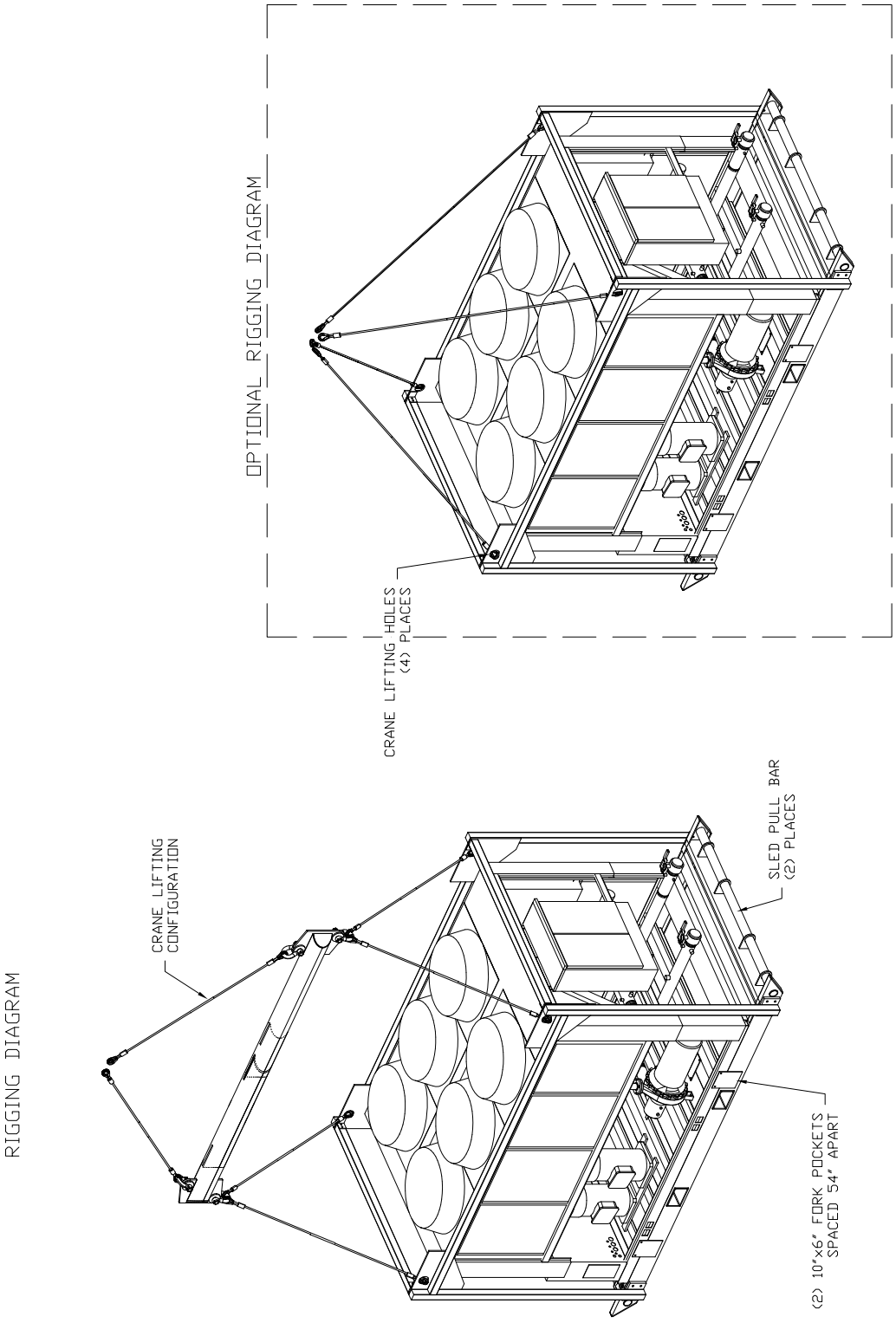


Figure 29. 100T CGAM rigging diagram

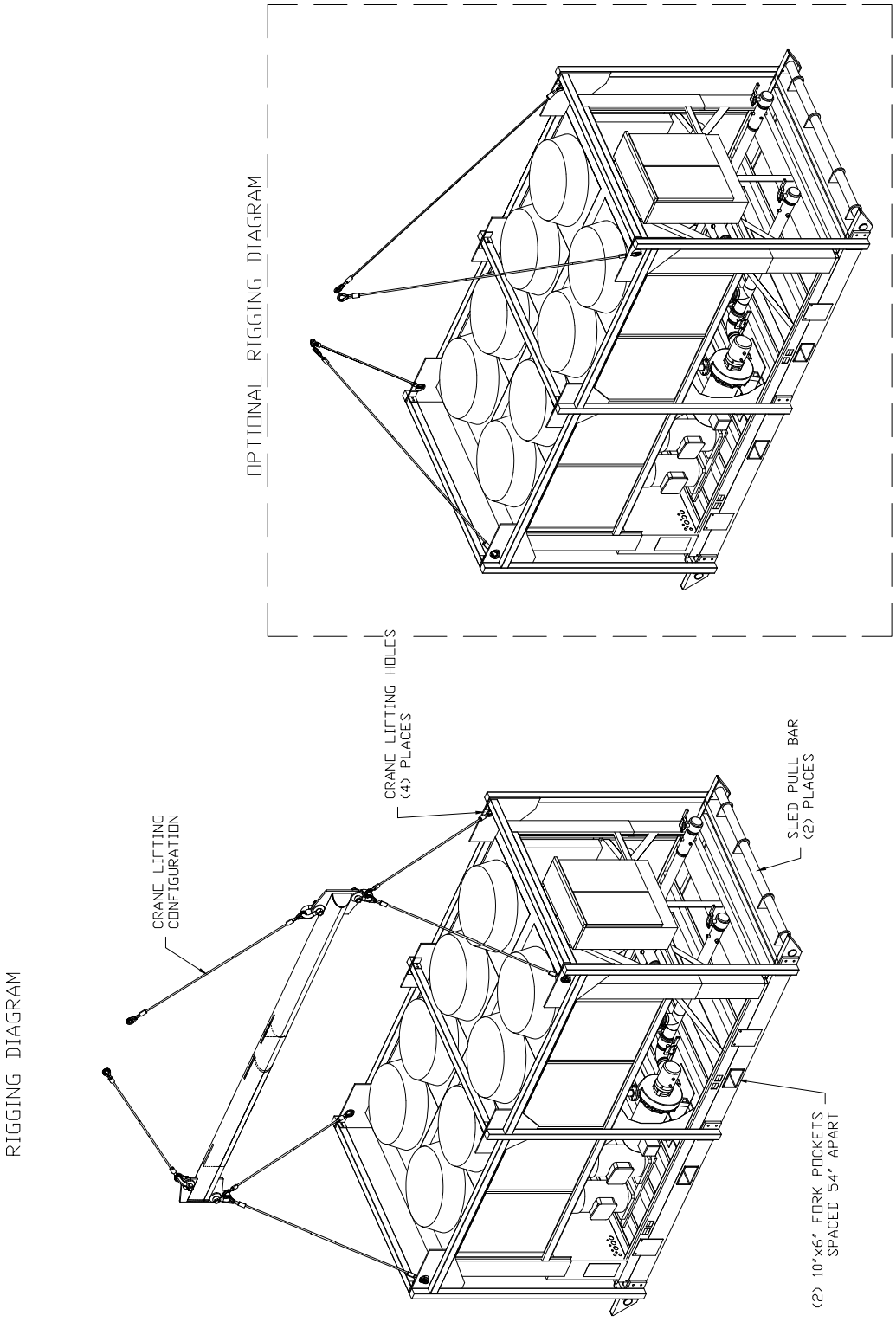
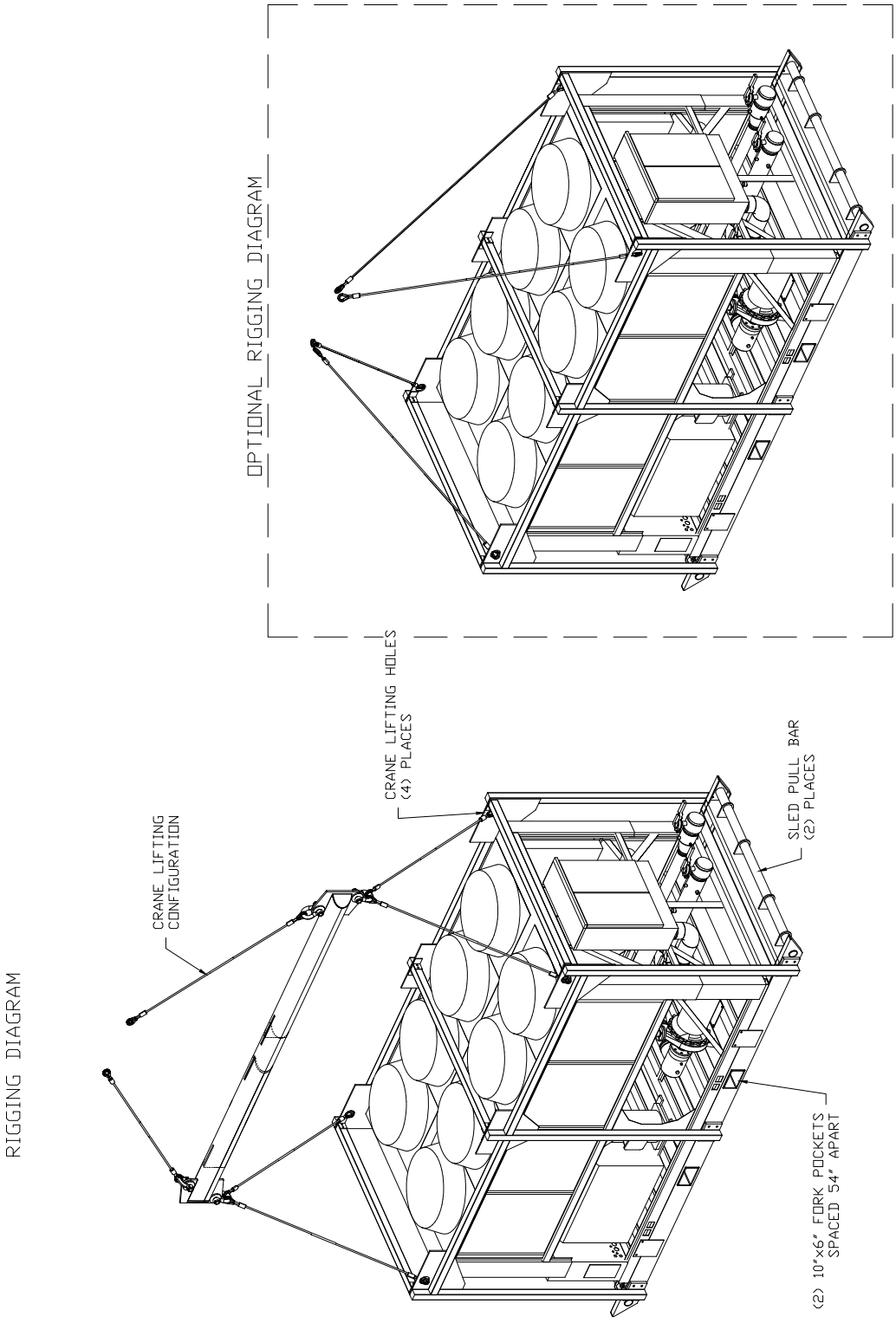


Figure 30. 120T CGAM rigging diagram



Handling

⚠ WARNING

Heavy Object!

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 5, p. 33 to determine if a forklift truck has the capacity to lift the unit. Some units can also be lifted by an overhead-lifting frame and spreader bars. See "Unit Drawings," p. 13 to determine which models include overhead lifting frames.

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.

Chilled Water Piping and Integral Pump Package

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 and/or heaters.

- Chiller inlet and outlet connections utilize grooved Victaulic connections.
- 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.

⚠ 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. Open all pump, evaporator, piping drains, and vents to purge water from the unit.
3. Blow out the evaporator to confirm no liquid is left in the evaporator.

Air Vents

A vent port is located on top of the chiller near the return end. 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

A water pressure gauge is provided to obtain evaporator pressure drop values that can be used to estimate flow rate. The gauge will be either a dedicated differential pressure gauge or a standard analog pressure gauge with isolation valves provided to allow separate measurement of the heat exchanger entering and leaving pressure values.

To calculate pressure drop, subtract the leaving pressure value from the entering pressure value.

See Figure 31, p. 46 and Figure 32, p. 46 for evaporator pressure drop curves to estimate flow rate based on evaporator pressure drop values.

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

Analog temperature gauges are installed near the chiller inlet and outlet connection points to monitor the evaporator entering and leaving water temperatures.

Flow Sensor

A flow sensor is installed on this CGAM 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.

The flow switch will either be a paddle-type mechanical flow switch on units with CH530 controls (rental design sequence 0 to 3) or an adjustable thermal dispersion flow meter for units with Symbio800 controls (design sequence 4).

This flow switch is integrated into the controls such that, absent a flow-proving signal, the chiller will be prevented from starting or will be shut down if already running at the time that the flow signal is lost.

For more information about chilled water flow, see **Chilled Water Flow (Pump) Interlock** section in *Air-Cooled Scroll Chillers Model CGAM 20 to 130 Tons – Made in USA, Installation Operation and Maintenance* (CG-SVX17*-EN).

Liquid Sensing Switch

A liquid sensing switch and relay have been installed on each unit. The purpose of this liquid sensing switch is to prevent the immersion heater operation in the absence of liquid.

Balancing Valves

Chillers with Rental Design Sequence 2 through 4 include butterfly style isolation valves on the chiller inlet and outlet, which can be used to isolate the chiller for service or decomissioning along with balancing and adjusting flow during operation. In addition these chillers have isolation valves on the inlet and outlet of the integrated pump package, along with a bypass valve which can be opened when utilizing an external pump to provide flow.

Chillers with design sequence 0 and 1 include pump inlet/outlet and pump bypass valves, but do not have inlet and outlet isolation valves. When balancing flow on these chillers the pump isolation valves can be used.

Water Strainer

The CGAM rental configuration includes a pump suction guide strainer with 0.125-inch perforations and an addition fine-mesh strainer at the heat exchanger inlet. Debris collected in these strainers from elsewhere in the chilled water system may accumulate to the degree that it affects pump performance and flow rate. A visual inspection of the strainers or field-installed pressure gauges can be used to determine whether the strainer needs to be cleaned.

Chillers with design sequence 4 include pressure gauges pre-piped to allow users to check pressures at the inlet and outlet of the strainers to determine pressure drop. Contact Trane Rental Services for additional information on interpreting these values.

Under no circumstances should fluid be circulated through the chiller without these strainers in place as doing so may cause the brazed plate heat exchanger passages to become clogged.

Chiller Drain

The chiller drains are piped with ball valves to facilitate draining the system during service or shutdown procedures.

Differential Pressure Gauge Assembly

A means of determining the evaporator pressure drop is provided on all Trane Rental Services CGAM chillers to allow for estimation of flow rates when no other flow measurement tools are available. In addition, chillers with design sequence 4 include provisions for measuring pressure rise across the pump and pressure drop across the pump suction guide and the evaporator fine-mesh strainer to provide additional feedback on flow rates and strainer condition.

See Figure 31, p. 46 and Figure 32, p. 46 to estimate flow based on evaporator pressure drop.

Figure 31. Total unit pressure drop curves, F0–F3

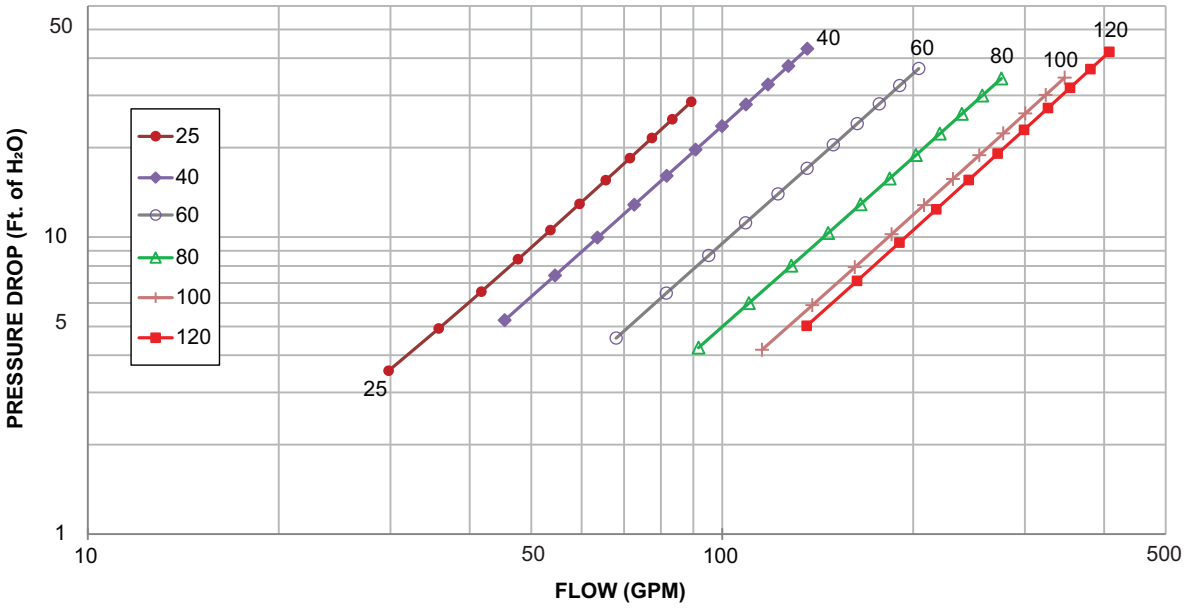
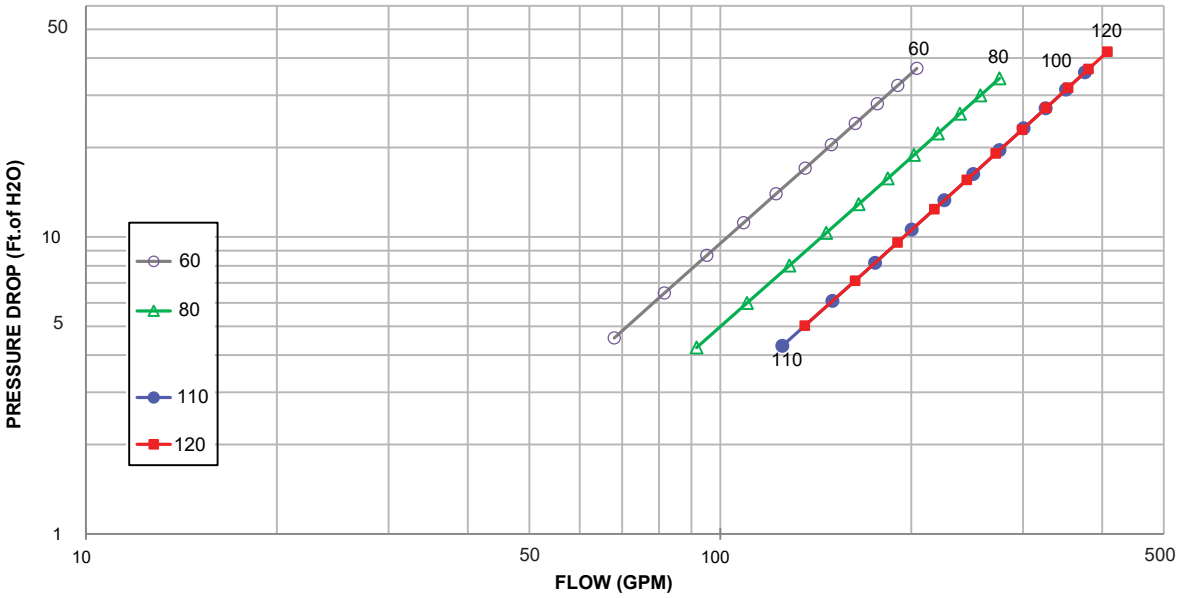


Figure 32. Total unit pressure drop curves, F4



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 6. Unit water connection sizes

CGAM Unit Model	Piping Connection Size
CSCA0025F0-F2	2.5 in. Victaulic
CSCA0040F0-F2	2.5 in. Victaulic
CSCA0060F0-F4	4 in. Victaulic
CSCA0080F1-F4	4 in. Victaulic
CSCA0080J4	4 in. Victaulic
CSCA0100F1-F3	4 in. Victaulic
CSCA0110J4	6 in. Victaulic
CACS0120F1-F4	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 instructions below 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 Installation

Trane Rental Services offers flexible chilled water hose in kitted assemblies that are compatible with the standard grooved Victaulic connection sizes on CGAM chillers, as shown in Table 6, p. 47. The hose kits include hose rated to 150 psig in 10, 15, and 25 ft. lengths, along with grooved Victaulic elbows, couplings, and Victaulic flange adapters.

This flexible, temporary chilled water hose is designed to lay flat for easy packing and shipment when not in use. During use, sufficient pressure is required to prevent hose collapse, particularly at the chilled water inlet or at other locations where an onboard or external pump may reduce water pressure below 1 psig. For this reason, the chilled water system should be pressurized to a standing pressure of 20 psig or greater where possible. Hard pipe or suction-rated flexible hose is required between the pump outlet inlet and any points in the system that are at atmospheric pressure, such as an open buffer tank or cooling tower basin.

See *Trane Rental Services Temporary Cooling - Flexible Water Hose, Installation Operation and Maintenance* (CHS-SVX01*-EN) for flexible hose kit contents, installation instructions, pressure drop values, and other product specifications.

Hard Pipe Guidelines

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

When installing hard pipe:

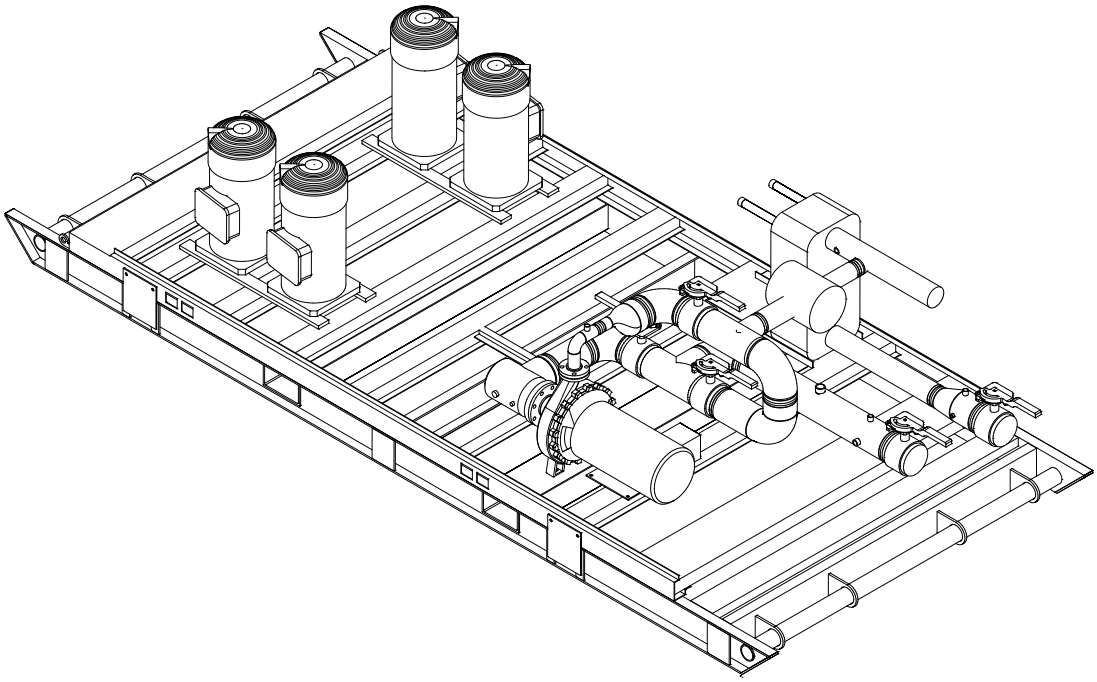
- Construct and install the piping according to local and national codes.
- Isolate and support the piping as required to prevent stress on the unit and vibration to building piping.

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.

Figure 33. Water inlet/outlet connections



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

Ambient Freeze Avoidance

A glycol type anti-freeze may be required for freeze protection. For more information, see Freeze Protection section in *Air-Cooled Scroll Chillers Model CGAM 20 to 130 Tons - Made in USA Installation Operation and Maintenance* (CG-SVX17*-EN).

Note: *CGAM 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 7, p. 48 must be used to protect the CGAM chiller from ambient freeze damage.

Table 7. CGAM ambient freeze avoidance methods

Method	Protects to ambient temperature	Notes
Water pump control	Down to 0°F	• Unit controller can start the pump when the ambient temperature drops to prevent freezing. For this option the pump must be controlled by the CGAM unit and this function must be validated. • Water circuit valves need to stay open at all times.
Heaters	Down to -20°F	• Heaters are factory-installed on the evaporator and water piping and will protect them from freezing in ambient temperatures down to -20°F (-29°C). • 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***.

Table 7. CGAM ambient freeze avoidance methods (continued)

Method	Protects to ambient temperature	Notes
Freeze Inhibitor	Varies. See Table 8, p. 49 and Table 10, p. 52	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 and confirm no liquid is left in the evaporator. • ***By default, the chiller's freeze protection control is enabled and will request the start of the chilled water pump with ambient temperatures less than the evaporator low leaving water temperature setpoint. The pump remains ON until the minimum evaporator water temperature is greater than low leaving water temperature setpoint plus 7°C. The minimum on time for the pump is 5 minutes. If you do NOT want the chiller to start the pump when the ambient temperature drops to freezing, disable this freeze protection control.***

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 and/or heaters.

The tables below show the low evaporator temperature cutout for different glycol levels. In all cases, validate glycol concentration by refractometer or other means before adjusting freeze protection settings.

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.

Table 8. R-410A low evaporator refrigerant temperature cutout and low water temperature cutout — ethylene glycol

% Glycol	Solution Freeze Point (°F)	Low Refrig Temp Cutout (°F)	Low Water Temp Cutout (°F)	FLOW >= 1.2 GPM/TON		FLOW >= 1.5 GPM/TON	
				Min Chilled Water Setpoint (°F)		Min Chilled Water Setpoint (°F)	
				Number of compressors		Number of compressors	
				2	4	2	4
0	32.0	22.0	36.0	42.0	42.0	41.0	40.0
1	31.6	21.6	35.6	42.0	40.1	40.6	39.1
2	31.0	21.0	35.0	42.0	39.5	40.0	38.5
3	30.3	20.3	34.3	41.3	38.8	39.3	37.8
4	29.7	19.7	33.7	40.7	38.2	38.7	37.2
5	29.0	19.0	33.0	40.0	37.5	38.0	36.5
6	28.3	18.3	32.3	39.3	36.8	37.3	35.8
7	27.6	17.6	31.6	38.6	36.1	36.6	35.1
8	26.9	16.9	30.9	37.9	35.4	35.9	34.4
9	26.2	16.2	30.2	37.2	34.7	35.2	33.7
10	25.5	15.5	29.5	36.5	34.0	34.5	33.0
11	24.7	14.7	28.7	35.7	33.2	33.7	32.2
12	23.9	13.9	27.9	34.9	32.4	32.9	31.4
13	23.1	13.1	27.1	34.1	31.6	32.1	30.6
14	22.3	12.3	26.3	33.3	30.8	31.3	29.8
15	21.5	11.5	25.5	32.5	30.0	30.5	29.0

Table 8. R-410A low evaporator refrigerant temperature cutout and low water temperature cutout — ethylene glycol (continued)

% Glycol	Solution Freeze Point (°F)	Low Refrig Temp Cutout (°F)	Low Water Temp Cutout (°F)	FLOW >= 1.2 GPM/TON		FLOW >= 1.5 GPM/TON	
				Min Chilled Water Setpoint (°F)		Min Chilled Water Setpoint (°F)	
				Number of compressors		Number of compressors	
				2	4	2	4
16	20.6	10.6	24.6	31.6	29.1	29.6	28.1
17	19.7	9.7	23.7	30.7	28.2	28.7	27.2
18	18.7	8.7	22.7	29.7	27.2	27.7	26.2
19	17.8	7.8	21.8	28.8	26.3	26.8	25.3
20	16.8	6.8	20.8	27.8	25.3	25.8	24.3
21	15.8	5.8	19.8	26.8	24.3	24.8	23.3
22	14.7	4.7	18.7	25.7	23.2	23.7	22.2
23	13.7	3.7	17.7	24.7	22.2	22.7	21.2
24	12.5	2.5	16.5	23.5	21.0	21.5	20.0
25	11.4	1.4	15.4	22.4	19.9	20.4	18.9
26	10.2	0.2	14.2	21.2	18.7	19.2	17.7
27	9.0	-1.0	13.0	20.0	17.5	18.0	16.5
28	7.7	-2.3	11.7	18.7	16.2	16.7	15.2
29	6.4	-3.6	10.4	17.4	14.9	15.4	13.9
30	5.1	-4.9	9.1	16.1	13.6	14.1	12.6
31	3.7	-6.3	7.7	14.7	12.2	12.7	11.2
32	2.3	-7.7	6.3	13.3	10.8	11.3	9.8
33	0.8	-9.2	4.8	11.8	9.3	9.8	8.3
34	-0.7	-10.7	3.3	10.3	7.8	8.3	6.8
35	-2.3	-12.3	1.7	8.7	6.2	6.7	5.2
36	-3.9	-13.9	0.1	7.1	4.6	5.1	3.6
37	-5.6	-15.6	-1.6	5.4	2.9	3.4	1.9
38	-7.3	-17.3	-3.3	3.7	1.2	1.7	0.2
39	-9.0	-19.0	-5.0	2.0	0.0	0.0	0.0
40	-10.8	-20.8	-6.8	0.2	0.0	0.0	0.0
41	-12.7	-21.0	-7.0	0.0	0.0	0.0	0.0
42	-14.6	-21.0	-7.0	0.0	0.0	0.0	0.0
43	-16.6	-21.0	-7.0	0.0	0.0	0.0	0.0
44	-18.6	-21.0	-7.0	0.0	0.0	0.0	0.0
45	-20.7	-21.0	-7.0	0.0	0.0	0.0	0.0
46	-22.9	-21.0	-7.0	0.0	0.0	0.0	0.0
47	-25.1	-21.0	-7.0	0.0	0.0	0.0	0.0
48	-27.3	-21.0	-7.0	0.0	0.0	0.0	0.0
49	-29.7	-21.0	-7.0	0.0	0.0	0.0	0.0
50	-32.1	-21.0	-7.0	0.0	0.0	0.0	0.0
51	-34.5	-21.0	-7.0	0.0	0.0	0.0	0.0
52	-37.1	-21.0	-7.0	0.0	0.0	0.0	0.0
53	-39.7	-21.0	-7.0	0.0	0.0	0.0	0.0
54	-42.3	-21.0	-7.0	0.0	0.0	0.0	0.0
55	-45.0	-21.0	-7.0	0.0	0.0	0.0	0.0

Table 9. R-410A low evaporator refrigerant temperature cutout and low water temperature cutout — propylene glycol

% Glycol	Solution Freeze Point (°F)	Low Refrig Temp Cutout (°F)	Low Water Temp Cutout (°F)	FLOW >= 1.2 GPM/TON		FLOW >= 1.5 GPM/TON	
				Min Chilled Water Setpoint (°F)		Min Chilled Water Setpoint (°F)	
				Number of compressors		Number of compressors	
				2	4	2	4
0	32.0	22.0	36.0	42.0	42.0	41.0	40.0
1	31.6	21.6	35.6	42.0	40.1	40.6	39.1
2	31.0	21.0	35.0	42.0	39.5	40.0	38.5
3	30.4	20.4	34.4	41.4	38.9	39.4	37.9
4	29.9	19.9	33.9	40.9	38.4	38.9	37.4
5	29.3	19.3	33.3	40.3	37.8	38.3	36.8
6	28.7	18.7	32.7	39.7	37.2	37.7	36.2
7	28.1	18.1	32.1	39.1	36.6	37.1	35.6
8	27.6	17.6	31.6	38.6	36.1	36.6	35.1
9	27.0	17.0	31.0	38.0	35.5	36.0	34.5
10	26.4	16.4	30.4	37.4	34.9	35.4	33.9
11	25.7	15.7	29.7	36.7	34.2	34.7	33.2
12	25.1	15.1	29.1	36.1	33.6	34.1	32.6
13	24.4	14.4	28.4	35.4	32.9	33.4	31.9
14	23.8	13.8	27.8	34.8	32.3	32.8	31.3
15	23.1	13.1	27.1	34.1	31.6	32.1	30.6
16	22.4	12.4	26.4	33.4	30.9	31.4	29.9
17	21.6	11.6	25.6	32.6	30.1	30.6	29.1
18	20.9	10.9	24.9	31.9	29.4	29.9	28.4
19	20.1	10.1	24.1	31.1	28.6	29.1	27.6
20	19.3	9.3	23.3	30.3	27.8	28.3	26.8
21	18.4	8.4	22.4	29.4	26.9	27.4	25.9
22	17.6	7.6	21.6	28.6	26.1	26.6	25.1
23	16.7	6.7	20.7	27.7	25.2	25.7	24.2
24	15.7	5.7	19.7	26.7	24.2	24.7	23.2
25	14.8	4.8	18.8	25.8	23.3	23.8	22.3
26	13.8	3.8	17.8	24.8	22.3	22.8	21.3
27	12.7	2.7	16.7	23.7	21.2	21.7	20.2
28	11.6	1.6	15.6	22.6	20.1	20.6	19.1
29	10.5	0.5	14.5	21.5	19.0	19.5	18.0
30	9.3	-0.7	13.3	20.3	17.8	18.3	16.8
31	8.1	-1.9	12.1	19.1	16.6	17.1	15.6
32	6.8	-3.2	10.8	17.8	15.3	15.8	14.3
33	5.5	-4.5	9.5	16.5	14.0	14.5	13.0
34	4.1	-5.9	8.1	15.1	12.6	13.1	11.6
35	2.7	-7.3	6.7	13.7	11.2	11.7	10.2
36	1.3	-8.7	5.3	12.3	9.8	10.3	8.8
37	-0.3	-10.3	3.7	10.7	8.2	8.7	7.2
38	-1.8	-11.8	2.2	9.2	6.7	7.2	5.7
39	-3.5	-13.5	0.5	7.5	5.0	5.5	4.0
40	-5.2	-15.2	-1.2	5.8	3.3	3.8	2.3
41	-6.9	-16.9	-2.9	4.1	1.6	2.1	0.6
42	-8.8	-18.8	-4.8	2.2	0.0	0.2	0.0

Table 9. R-410A low evaporator refrigerant temperature cutout and low water temperature cutout — propylene glycol (continued)

% Glycol	Solution Freeze Point (°F)	Low Refrig Temp Cutout (°F)	Low Water Temp Cutout (°F)	FLOW >= 1.2 GPM/TON		FLOW >= 1.5 GPM/TON	
				Min Chilled Water Setpoint (°F)		Min Chilled Water Setpoint (°F)	
				Number of compressors		Number of compressors	
				2	4	2	4
43	-10.7	-20.7	-6.7	0.3	0.0	0.0	0.0
44	-12.6	-21.0	-7.0	0.0	0.0	0.0	0.0
45	-14.6	-21.0	-7.0	0.0	0.0	0.0	0.0
46	-16.7	-21.0	-7.0	0.0	0.0	0.0	0.0
47	-18.9	-21.0	-7.0	0.0	0.0	0.0	0.0
48	-21.1	-21.0	-7.0	0.0	0.0	0.0	0.0
49	-23.4	-21.0	-7.0	0.0	0.0	0.0	0.0
50	-25.8	-21.0	-7.0	0.0	0.0	0.0	0.0
51	-28.3	-21.0	-7.0	0.0	0.0	0.0	0.0
52	-30.8	-21.0	-7.0	0.0	0.0	0.0	0.0
53	-33.4	-21.0	-7.0	0.0	0.0	0.0	0.0
54	-36.1	-21.0	-7.0	0.0	0.0	0.0	0.0
55	-38.9	-21.0	-7.0	0.0	0.0	0.0	0.0

Table 10. R-454B low evap refrigerant temp cutout and low water temp cutout — ethylene glycol

% Glycol	Solution Freeze Point (°F)	Low Refrig Temp Cutout (°F)	Low Water Temp Cutout (°F)	FLOW >= 1.2 GPM/TON			FLOW >= 1.5 GPM/TON		
				Min Chilled Water Setpoint (°F)			Min Chilled Water Setpoint(°F)		
				Number of compressors			Number of compressors		
				2	4	6	2	4	6
0	32.0	22.0	36.0	42.0	42.0	42.0	41.0	40.0	40.0
1	31.6	21.6	35.6	42.0	40.1	39.2	40.6	39.1	38.6
2	31.0	21.0	35.0	42.0	39.5	38.6	40.0	38.5	38.0
3	30.3	20.3	34.3	41.3	38.8	38.0	39.3	37.8	37.3
4	29.7	19.7	33.7	40.7	38.2	37.3	38.7	37.2	36.7
5	29.0	19.0	33.0	40.0	37.5	36.7	38.0	36.5	36.0
6	28.3	18.3	32.3	39.3	36.8	36.0	37.3	35.8	35.3
7	27.6	17.6	31.6	38.6	36.1	35.3	36.6	35.1	34.6
8	26.9	16.9	30.9	37.9	35.4	34.6	35.9	34.4	33.9
9	26.2	16.2	30.2	37.2	34.7	33.9	35.2	33.7	33.2
10	25.5	15.5	29.5	36.5	34.0	33.1	34.5	33.0	32.5
11	24.7	14.7	28.7	35.7	33.2	32.4	33.7	32.2	31.7
12	23.9	13.9	27.9	34.9	32.4	31.6	32.9	31.4	30.9
13	23.1	13.1	27.1	34.1	31.6	30.8	32.1	30.6	30.1
14	22.3	12.3	26.3	33.3	30.8	30.0	31.3	29.8	29.3
15	21.5	11.5	25.5	32.5	30.0	29.1	30.5	29.0	28.5
16	20.6	10.6	24.6	31.6	29.1	28.2	29.6	28.1	27.6
17	19.7	9.7	23.7	30.7	28.2	27.3	28.7	27.2	26.7
18	18.7	8.7	22.7	29.7	27.2	26.4	27.7	26.2	25.7
19	17.8	7.8	21.8	28.8	26.3	25.5	26.8	25.3	24.8
20	16.8	6.8	20.8	27.8	25.3	24.5	25.8	24.3	23.8
21	15.8	5.8	19.8	26.8	24.3	23.5	24.8	23.3	22.8
22	14.7	4.7	18.7	25.7	23.2	22.4	23.7	22.2	21.7
23	13.7	3.7	17.7	24.7	22.2	21.3	22.7	21.2	20.7

Table 10. R-454B low evap refrigerant temp cutout and low water temp cutout — ethylene glycol (continued)

% Glycol	Solution Freeze Point (°F)	Low Refrig Temp Cutout (°F)	Low Water Temp Cutout (°F)	FLOW >= 1.2 GPM/TON			FLOW >= 1.5 GPM/TON		
				Min Chilled Water Setpoint (°F)			Min Chilled Water Setpoint(°F)		
				Number of compressors			Number of compressors		
				2	4	6	2	4	6
24	12.5	2.5	16.5	23.5	21.0	20.2	21.5	20.0	19.5
25	11.4	1.4	15.4	22.4	19.9	19.1	20.4	18.9	18.4
26	10.2	0.2	14.2	21.2	18.7	17.9	19.2	17.7	17.2
27	9.0	-1.0	13.0	20.0	17.5	16.7	18.0	16.5	16.0
28	7.7	-2.3	11.7	18.7	16.2	15.4	16.7	15.2	14.7
29	6.4	-3.6	10.4	17.4	14.9	14.1	15.4	13.9	13.4
30	5.1	-4.9	9.1	16.1	13.6	12.8	14.1	12.6	12.1
31	3.7	-6.3	7.7	14.7	12.2	11.4	12.7	11.2	10.7
32	2.3	-7.7	6.3	13.3	10.8	9.9	11.3	9.8	9.3
33	0.8	-9.2	4.8	11.8	9.3	8.5	9.8	8.3	7.8
34	-0.7	-10.7	3.3	10.3	7.8	7.0	8.3	6.8	6.3
35	-2.3	-12.3	1.7	8.7	6.2	5.4	6.7	5.2	4.7
36	-3.9	-13.9	0.1	7.1	4.6	3.8	5.1	3.6	3.1
37	-5.6	-15.6	-1.6	5.4	2.9	2.1	3.4	1.9	1.4
38	-7.3	-17.3	-3.3	3.7	1.2	0.4	1.7	0.2	0.0
39	-9.0	-19.0	-5.0	2.0	0.0	0.0	0.0	0.0	0.0
40	-10.8	-20.8	-6.8	0.2	0.0	0.0	0.0	0.0	0.0
41	-12.7	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
42	-14.6	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
43	-16.6	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
44	-18.6	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
45	-20.7	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
46	-22.9	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
47	-25.1	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
48	-27.3	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
49	-29.7	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
50	-32.1	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
51	-34.5	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
52	-37.1	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
53	-39.7	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
54	-42.3	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
55	-45.0	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 11. R-454B low evap refrigerant temp cutout and low water temp cutout — propylene glycol

% Glycol	Solution Freeze Point (°F)	Low Refrig Temp Cutout (°F)	Low Water Temp Cutout (°F)	FLOW >= 1.2 GPM/TON			FLOW >= 1.5 GPM/TON		
				Min Chilled Water Setpoint (°F)			Min Chilled Water Setpoint(°F)		
				Number of compressors			Number of compressors		
				2	4	6	2	4	6
0	32	22	36	42	42	42	41	40	40
1	31.6	21.6	35.6	42	40.1	39.2	40.6	39.1	38.6
2	31.0	21.0	35.0	42	39.5	38.7	40.0	38.5	38.0
3	30.4	20.4	34.4	41.4	38.9	38.1	39.4	37.9	37.4
4	29.9	19.9	33.9	40.9	38.4	37.5	38.9	37.4	36.9
5	29.3	19.3	33.3	40.3	37.8	37.0	38.3	36.8	36.3

Table 11. R-454B low evap refrigerant temp cutout and low water temp cutout — propylene glycol (continued)

% Glycol	Solution Freeze Point (°F)	Low Refrig Temp Cutout (°F)	Low Water Temp Cutout (°F)	FLOW >= 1.2 GPM/TON			FLOW >= 1.5 GPM/TON		
				Min Chilled Water Setpoint (°F)			Min Chilled Water Setpoint(°F)		
				Number of compressors			Number of compressors		
				2	4	6	2	4	6
6	28.7	18.7	32.7	39.7	37.2	36.4	37.7	36.2	35.7
7	28.1	18.1	32.1	39.1	36.6	35.8	37.1	35.6	35.1
8	27.6	17.6	31.6	38.6	36.1	35.2	36.6	35.1	34.6
9	27.0	17.0	31.0	38.0	35.5	34.6	36.0	34.5	34.0
10	26.4	16.4	30.4	37.4	34.9	34.0	35.4	33.9	33.4
11	25.7	15.7	29.7	36.7	34.2	33.4	34.7	33.2	32.7
12	25.1	15.1	29.1	36.1	33.6	32.8	34.1	32.6	32.1
13	24.4	14.4	28.4	35.4	32.9	32.1	33.4	31.9	31.4
14	23.8	13.8	27.8	34.8	32.3	31.4	32.8	31.3	30.8
15	23.1	13.1	27.1	34.1	31.6	30.7	32.1	30.6	30.1
16	22.4	12.4	26.4	33.4	30.9	30.0	31.4	29.9	29.4
17	21.6	11.6	25.6	32.6	30.1	29.3	30.6	29.1	28.6
18	20.9	10.9	24.9	31.9	29.4	28.5	29.9	28.4	27.9
19	20.1	10.1	24.1	31.1	28.6	27.8	29.1	27.6	27.1
20	19.3	9.3	23.3	30.3	27.8	26.9	28.3	26.8	26.3
21	18.4	8.4	22.4	29.4	26.9	26.1	27.4	25.9	25.4
22	17.6	7.6	21.6	28.6	26.1	25.2	26.6	25.1	24.6
23	16.7	6.7	20.7	27.7	25.2	24.3	25.7	24.2	23.7
24	15.7	5.7	19.7	26.7	24.2	23.4	24.7	23.2	22.7
25	14.8	4.8	18.8	25.8	23.3	22.4	23.8	22.3	21.8
26	13.8	3.8	17.8	24.8	22.3	21.4	22.8	21.3	20.8
27	12.7	2.7	16.7	23.7	21.2	20.4	21.7	20.2	19.7
28	11.6	1.6	15.6	22.6	20.1	19.3	20.6	19.1	18.6
29	10.5	0.5	14.5	21.5	19.0	18.2	19.5	18.0	17.5
30	9.3	-0.7	13.3	20.3	17.8	17.0	18.3	16.8	16.3
31	8.1	-1.9	12.1	19.1	16.6	15.8	17.1	15.6	15.1
32	6.8	-3.2	10.8	17.8	15.3	14.5	15.8	14.3	13.8
33	5.5	-4.5	9.5	16.5	14.0	13.2	14.5	13.0	12.5
34	4.1	-5.9	8.1	15.1	12.6	11.8	13.1	11.6	11.1
35	2.7	-7.3	6.7	13.7	11.2	10.4	11.7	10.2	9.7
36	1.3	-8.7	5.3	12.3	9.8	8.9	10.3	8.8	8.3
37	-0.3	-10.3	3.7	10.7	8.2	7.4	8.7	7.2	6.7
38	-1.8	-11.8	2.2	9.2	6.7	5.8	7.2	5.7	5.2
39	-3.5	-13.5	0.5	7.5	5.0	4.2	5.5	4.0	3.5
40	-5.2	-15.2	-1.2	5.8	3.3	2.5	3.8	2.3	1.8
41	-6.9	-16.9	-2.9	4.1	1.6	0.7	2.1	0.6	0.1
42	-8.8	-18.8	-4.8	2.2	0.0	0.0	0.2	0.0	0.0
43	-10.7	-20.7	-6.7	0.3	0.0	0.0	0.0	0.0	0.0
44	-12.6	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
45	-14.6	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
46	-16.7	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
47	-18.9	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
48	-21.1	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
49	-23.4	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 11. R-454B low evap refrigerant temp cutout and low water temp cutout — propylene glycol (continued)

% Glycol	Solution Freeze Point (°F)	Low Refrig Temp Cutout (°F)	Low Water Temp Cutout (°F)	FLOW >= 1.2 GPM/TON			FLOW >= 1.5 GPM/TON		
				Min Chilled Water Setpoint (°F)			Min Chilled Water Setpoint(°F)		
				Number of compressors			Number of compressors		
				2	4	6	2	4	6
50	-25.8	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
51	-28.3	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
52	-30.8	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
53	-33.4	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
54	-36.1	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0
55	-38.9	-21.0	-7.0	0.0	0.0	0.0	0.0	0.0	0.0

R-410A Performance Adjustment Factors

Concentration and type of glycol used will affect unit performance. If operating conditions, including concentration of freeze inhibitor, have changed since the unit was ordered, contact sales representative to rerun selection. See Figure 34, p. 55 through Figure 39, p. 56 for approximate adjustment factors.

Figure 34. Ethylene – compressor power adjustment

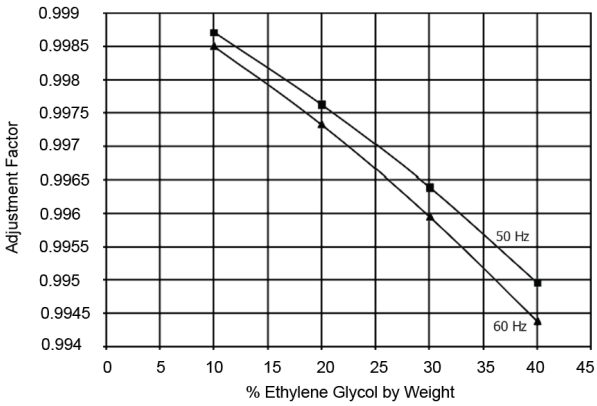


Figure 35. Propylene – compressor power adjustment

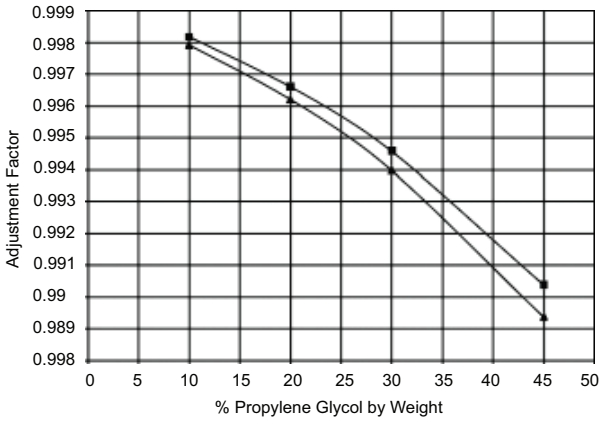


Figure 36. Ethylene – GPM adjustment

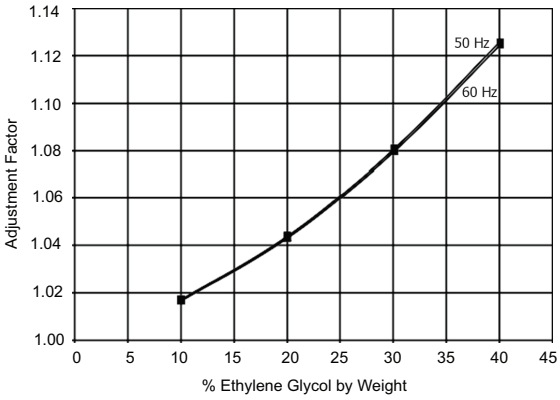


Figure 37. Propylene – GPM adjustment

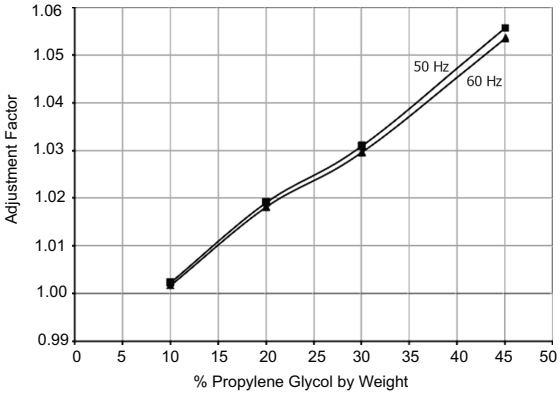


Figure 38. Ethylene – capacity adjustment

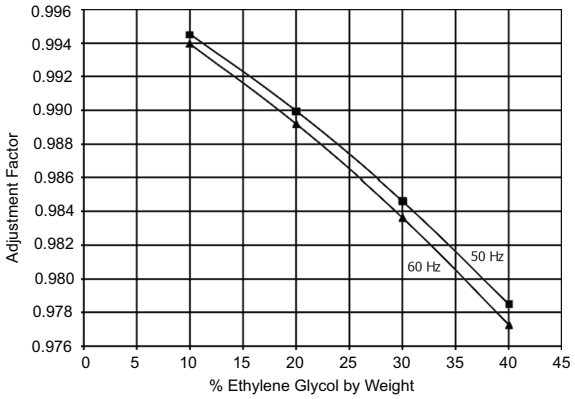
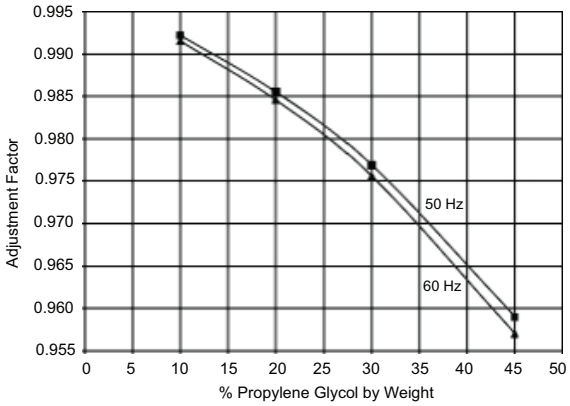


Figure 39. Propylene - capacity adjustment



Pump Curves

Figure 40. 25T CGAM pressure curve

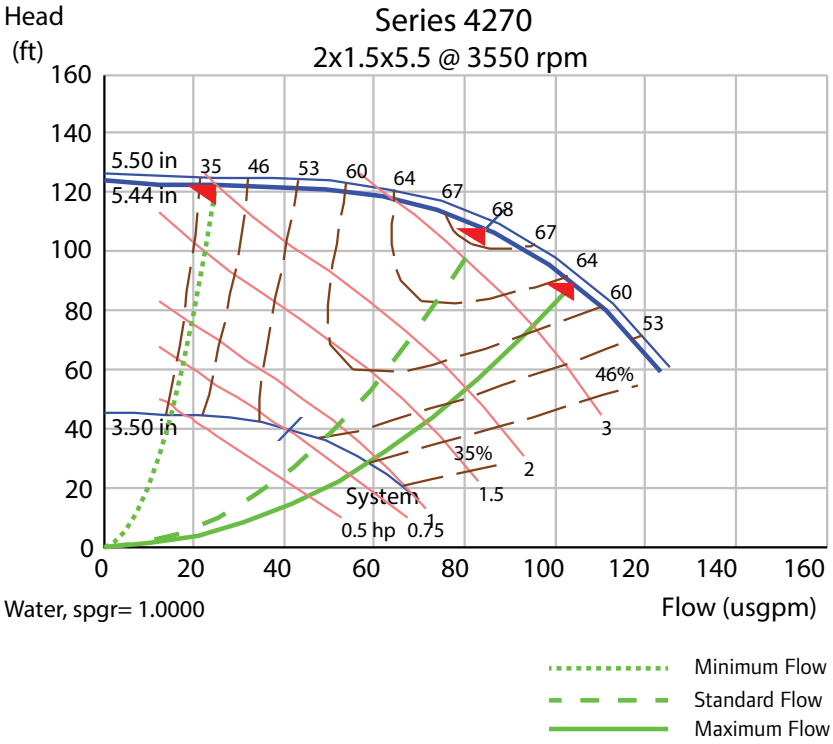


Figure 41. 40 to 60T CGAM pressure curve

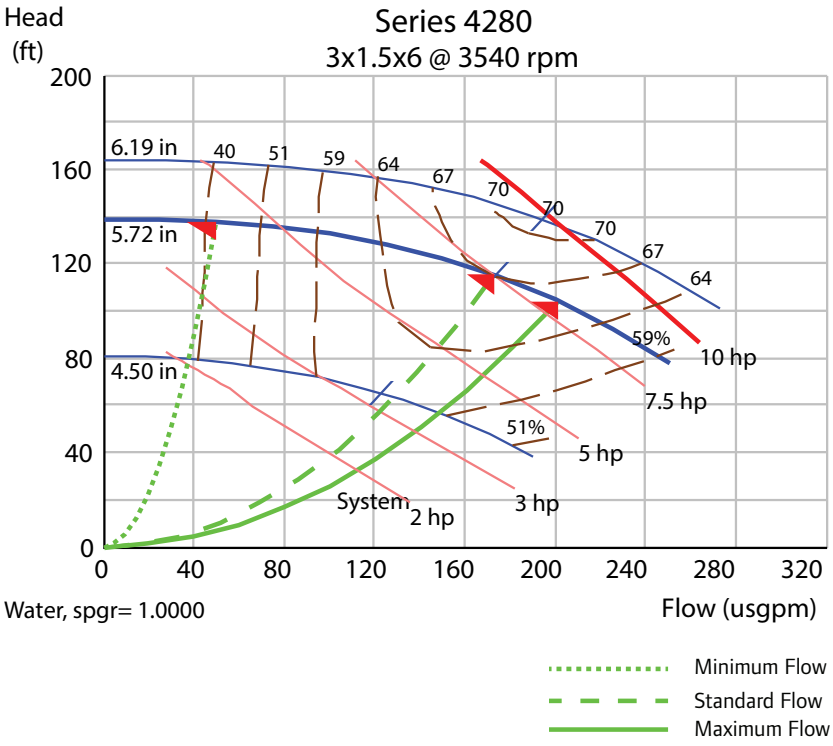


Figure 42. 60T F4 series CGAM pressure curves

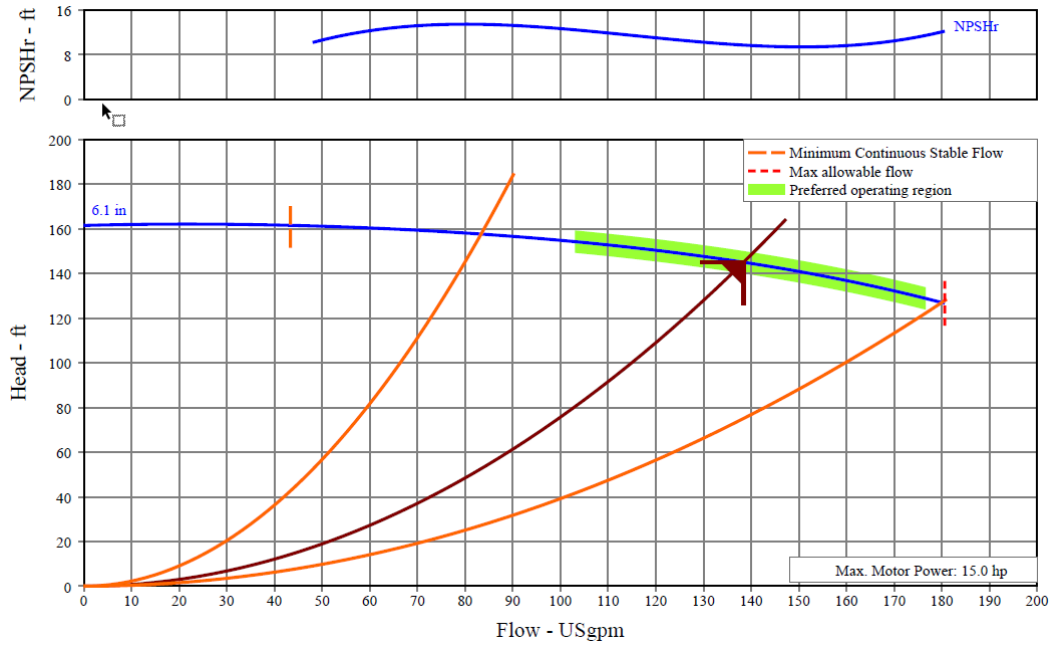


Figure 43. 80 to 120T (F1 to F3) CGAM pressure curve

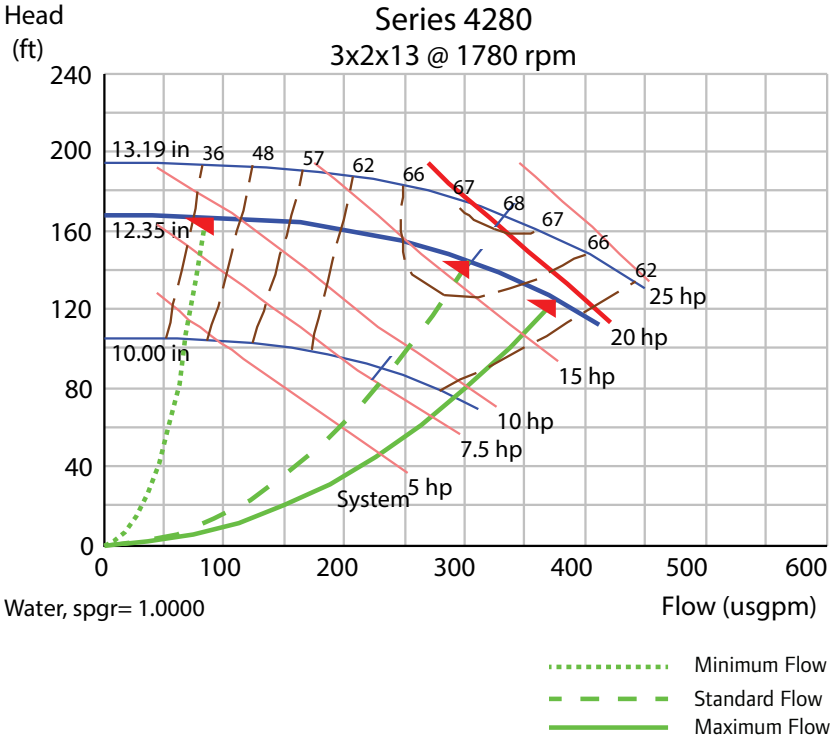
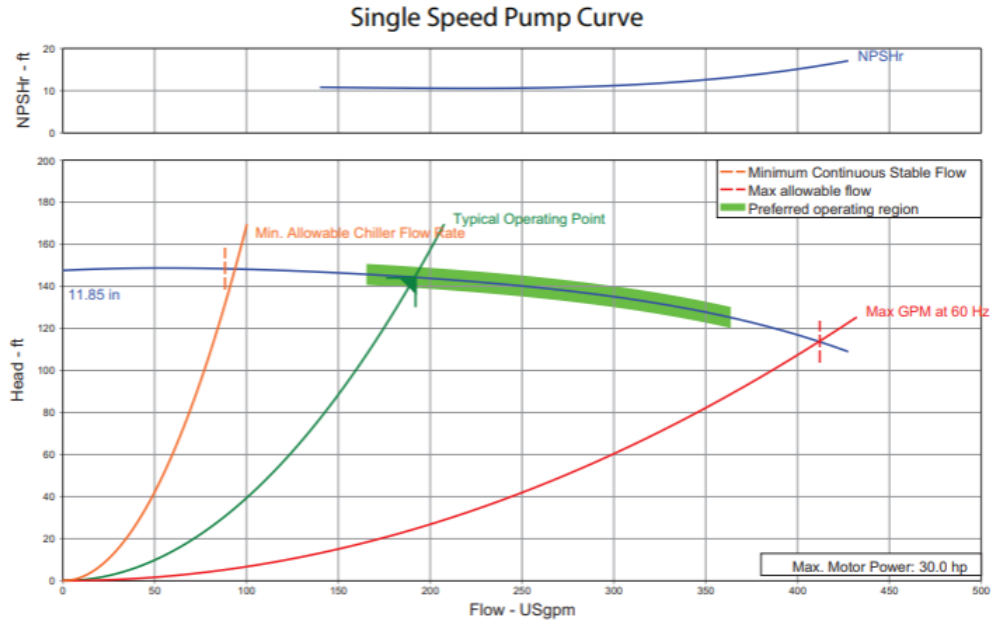


Figure 44. CSCA0080–120 F,J4 series



Integral Pump Package

valves, shut-off valves at entering and leaving connections. See Figure 45, p. 59 through Figure 48, p. 61 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 45. Field water piping pump package unit

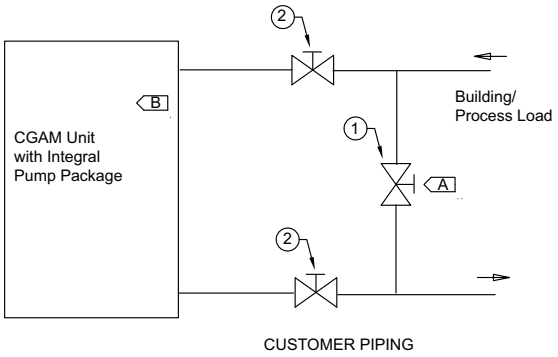
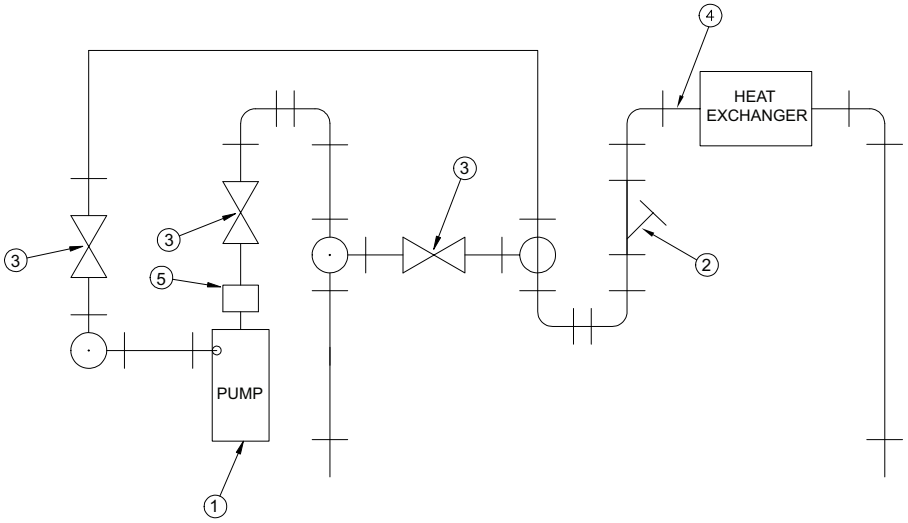


Table 12. Field water piping components

Item	Description
1	Bypass Valve
2	Isolator Valve
A	Isolate unit for initial water loop cleaning
B	See Figure 45, p. 59 through Figure 48, p. 61 for CGAM integral pump schematics

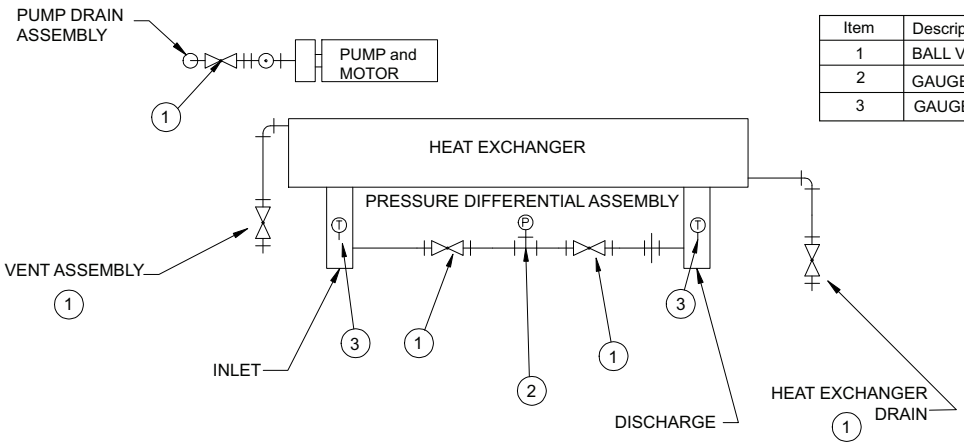
Figure 46. Pump package unit schematic – CSCA0025F0 - CSCA0060F0

CSCA0080F1, CSCA0100F1 and CSCA01200F1 PIPING DIAGRAM



Item	Description
1	PUMP MOTOR
2	STRAINER
3	BUTTERFLY VALVE
4	FLOW SWITCH
5	SUCTION GUIDE

CSCA0080F1, CSCA0100F1 and CSCA01200F1 INSTRUMENTATION DIAGRAM



Item	Description
1	BALL VALVE
2	GAUGE; PRESSURE 0 - 160 PSI
3	GAUGE; TEMPERATURE

Figure 47. Pump package unit schematic – CSCA0025F2 - CSCA0060F3

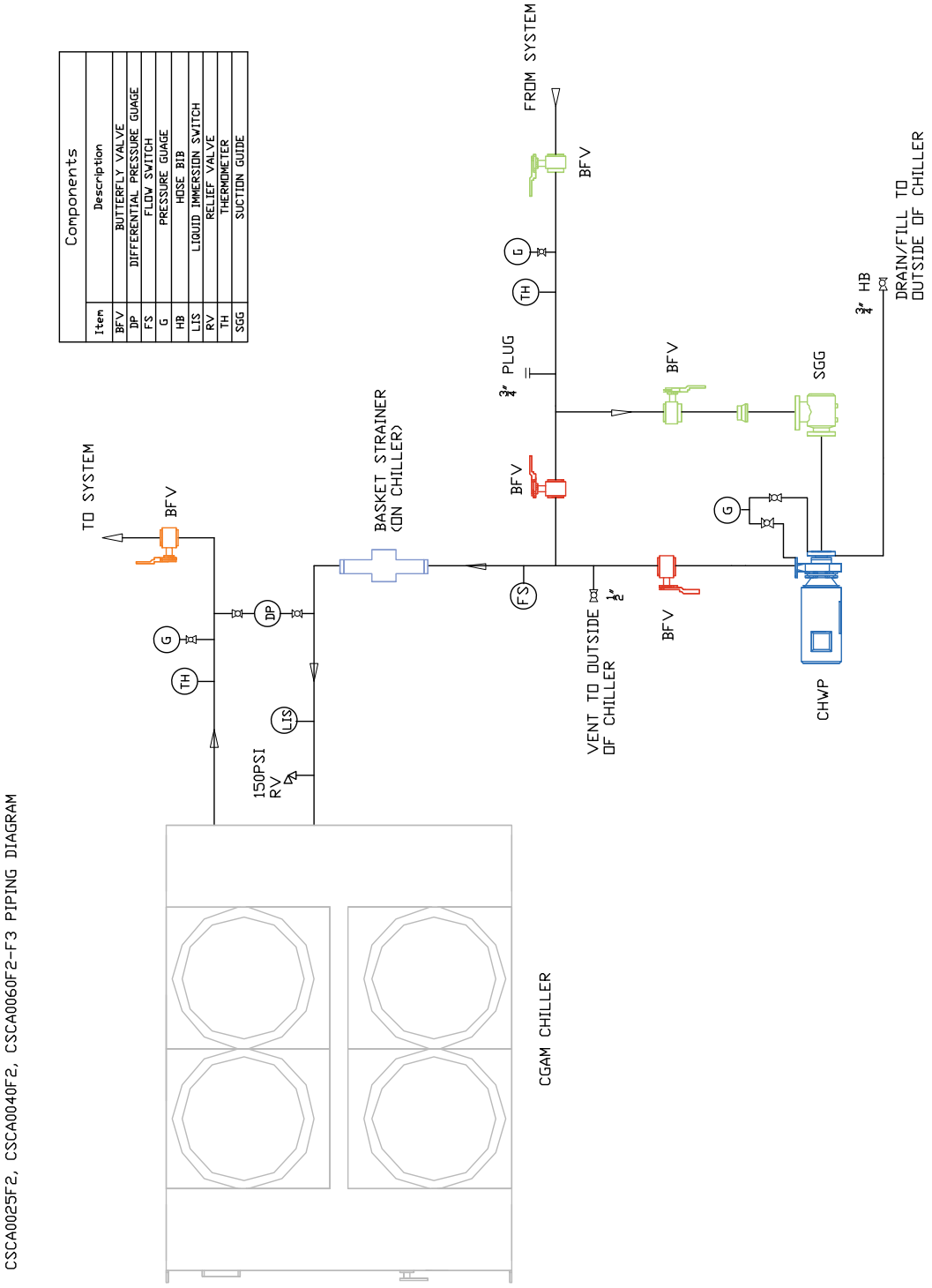
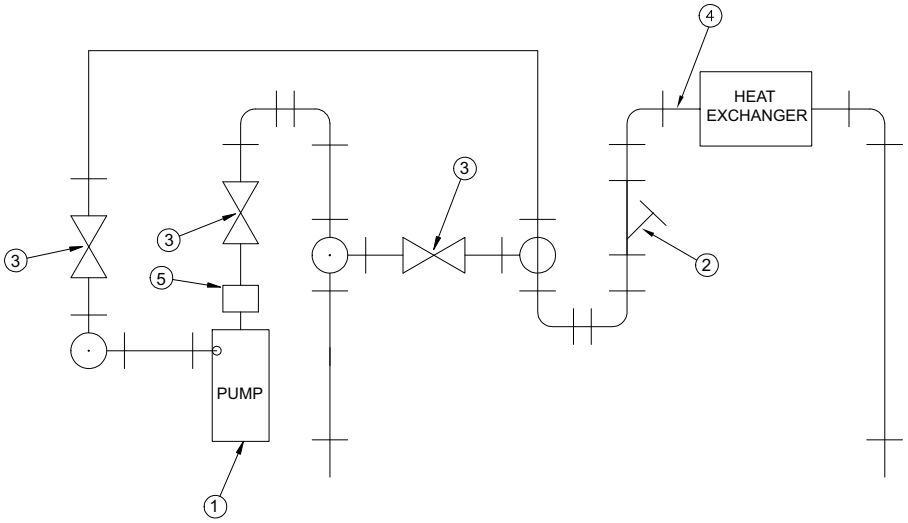


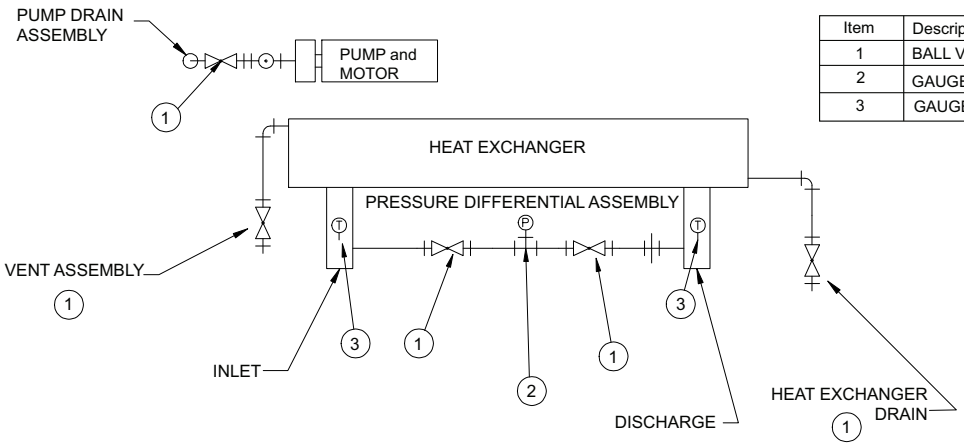
Figure 48. Pump package unit schematic – CSCA0080F1 - CSCA0120F1

CSCA0080F1, CSCA0100F1 and CSCA01200F1 PIPING DIAGRAM



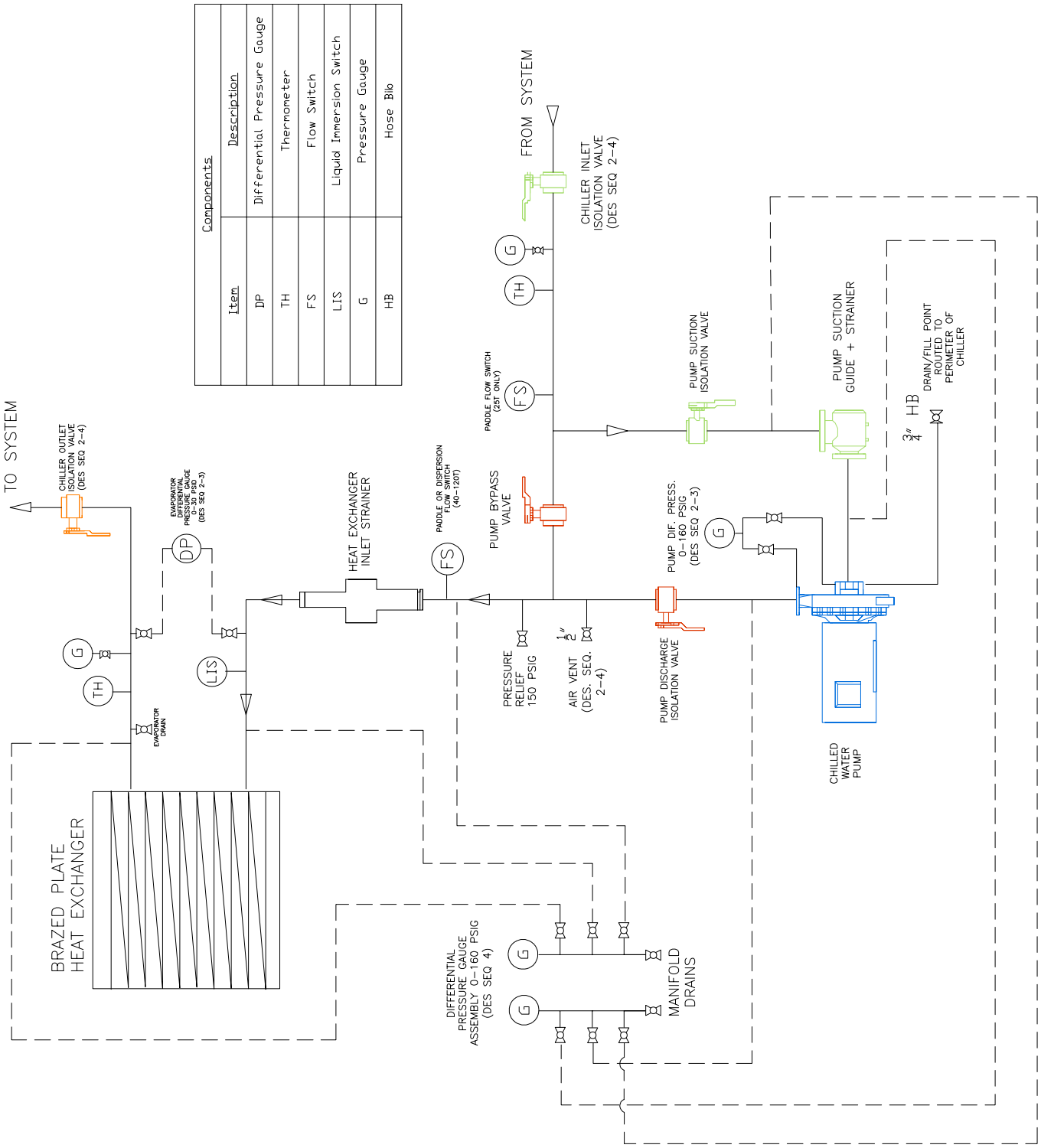
Item	Description
1	PUMP MOTOR
2	STRAINER
3	BUTTERFLY VALVE
4	FLOW SWITCH
5	SUCTION GUIDE

CSCA0080F1, CSCA0100F1 and CSCA01200F1 INSTRUMENTATION DIAGRAM



Item	Description
1	BALL VALVE
2	GAUGE; PRESSURE 0 - 160 PSI
3	GAUGE; TEMPERATURE

Figure 49. Pump package unit schematic - CSCA0080F2 - CSCA0120F4



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. 63
- Net positive suction head greater than 25 ft. H_2O

Table 13. Working fluid

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

Electrical Connections

The main breaker and disconnect for the CGAM unit is located either at the main control panel (design sequence 4) or on the auxiliary shore power enclosure located opposite the main control panel (design sequence 0 to 3). Power is supplied to the unit by one of the following methods:

- Cam-type electrical connections.
- Hardwired connection to main breaker or power distribution blocks, bypassing the panel-mounted Cam-type connections. Contact Trane Rental Services for additional information regarding this wiring method.

⚠ 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. 13 through Figure 22, p. 31 show the locations of the unit electrical access openings.

Shore Power Supply (115 Vac)

All Trane Rental CGAM chillers are equipped with a shore power feature which allows users to energize chiller controls and oil heaters in the absence of main power, using a 115V extension cord. The shore power connection point is a flanged receptacle connection with a standard straight-blade 115V plug, to be energized by a 115Vac, single phase, 60Hz power circuit with maximum fuse/breaker size of 20 amps, using an extension cord rated for no less than 15 amps.

On chillers with design sequence 0 through 3, the shore power plug is located on a separate enclosure above the chilled water connections. On units with design sequence of 4, the shore power connection is located on the side of the main control panel.

The shore power enclosure powers the following components:

- Compressor heaters
- Evaporator piping heater
- Evaporator heater
- Compressor heater transformer
- VFD heater blanket
- Dynaview™ or AdaptiView™ Display interface
- CH530 or Symbio™ controls

Important: *If the door on the right side of the shore power 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 devises to operate. If the shore power 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.

See 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

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 as described on the nameplate. Use only copper conductors to connect the 3-phase power supply to the unit.

Voltage Imbalance

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

If the voltage imbalance is over two 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. 13 through Figure 22, p. 31. 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.*

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.

See 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 follow instructions below could result in equipment damage.

Verify there is water in the evaporator before powering on. Heaters will overhead and burn out without water.

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 piping and heat exchanger using the supplied vent valves on the perimeter of the chiller. Close the vent when the chiller is completely 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 *Air-Cooled Scroll Chillers Model CGAM 20 to 130 Tons — Made in USA Installation Operation and Maintenance* (CG-SVX17*-EN) or see 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.
- In locations and during periods where freezing weather is possible and freeze inhibitor is not present in the loop, the chilled water pump (integral or external) must be controlled by the unit controller as described in the "Ambient Freeze Avoidance," p. 48.
- 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. DynaView™ is powered at the same time.*

- Confirm all service and isolation valves are open.

Chilled Water Flow (Pump) Interlock

All CGAM model chillers have a factory-installed flow switch.

Chilled Water Pump Performance and Operation

Each unit comes with a 3-phase, 60 Hz, fixed speed centrifugal water pump permanently installed on the unit.

The pump motor starter and overload are integrated into the chiller power circuit and controls. A control switch is provided to control pump operation as described below.

- On units with CH530 controls, the switch is located on the shore power enclosure near the water connections.
- On units with Symbio™ 800 controls, the switch is located on the main power panel. The switch includes a built-in indicator light that illuminates when the pump is running.

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

- **Auto** – The pump is controlled through the chiller controls.
- **On** – 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

CGAM 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
25T	5	30	62	89	25	84.5	104.0	122.2	107.9	89.3
40T	10	46	96	136	50	173.4	201.6	137.7	115.0	104.1
60T	10	68	144	201	50	173.4	201.6	137.7	115.0	104.1
80T (F1–F3)	20	92	192	275	91	304.4	376.0	162.9	144.2	124.5
80T (F4)	20	92	192	275	88	310	412	148	133	114
100T	20	116	240	346	91	304.4	376.0	162.9	144.2	124.5
120T (F1–F3)	20	136	288	407	91	304.4	376.0	162.9	144.2	124.5
120T (F4)	20	136	288	407	88	310	412	148	133	114

Chilled Water Pump Control

With the pump switch in Auto, an evaporator water pump output relay closes when the chiller is given a signal to go into the Auto mode of operation from any source. The contact is opened to turn off the pump in the event of most machine level diagnostics to prevent the buildup of pump heat.

The relay output from 1A9 is required to operate the Evaporator Water Pump (EWP) contactor. Contacts should be compatible with 115/240 Vac control circuit. The EWP relay follows the AUTO mode of the chiller. When the chiller has no diagnostics and is in AUTO mode, regardless of where the auto command is coming from, the normally open relay is energized. When the chiller exits the AUTO mode, the relay is timed to open in an adjustable (using TechView™) 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

Evaporator 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 to open
Diagnostics	Instant open

When going from Stop to Auto, the EWP relay is energized immediately. If evaporator water flow is not established in 4 minutes and 15 seconds, the unit controller 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 relay is re-energized, and normal control resumed.

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

NOTICE

Equipment Damage!

Failure to follow instructions below could cause equipment damage.

Do NOT enable/disable the chiller by removing water flow.

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 CGAM unit controller. If another method of freeze protection is used (i.e. glycol, heaters, purge, etc) then the pump may be controlled by another system.*

Alarm and Status Relay Outputs (Programmable Relays)

A programmable relay concept provides for enunciation of certain events or states of the chiller, selected from a list of likely needs, while only using four physical output relays, as shown in the field wiring diagram. The four relays are provided (generally with a Quad Relay Output LLID) as part of the Alarm Relay Output Option. The relay's contacts are isolated Form C (SPDT), suitable for use with 120 Vac circuits drawing up to 2.8 amps inductive, 7.2 amps resistive, or 1/3 HP and for 240 Vac circuits drawing up to 0.5 amp resistive.

The list of events/states that can be assigned to the programmable relays can be found in Table 16, p. 67. The relay will be energized when the event/state occurs.

Note: *Programmable relay 2 is typically used to energize the elapsed time meter in the rental configuration, with the remaining three relay contacts available for other uses. Contact Trane Rental Services if the use of all four programmable relay contacts is required.*

Table 16. Alarm and status relay output configuration

	Description
Alarm - Latching	This output is true whenever there is any active diagnostic that requires a manual reset to clear, that affects either the Chiller, the Circuit, or any of the Compressors on a circuit. This classification does not include informational diagnostics.
Alarm - Auto Reset	This output is true whenever there is any active diagnostic that could automatically clear, that affects either the Chiller, the Circuit, or any of the Compressors on a circuit. This classification does not include informational diagnostics.
Alarm	This output is true whenever there is any diagnostic affecting any component, whether latching or automatically clearing. This classification does not include informational diagnostics
Alarm Ckt 1	This output is true whenever there is any diagnostic effecting Refrigerant Circuit 1, whether latching or automatically clearing, including diagnostics affecting the entire chiller. This classification does not include informational diagnostics.
Alarm Ckt 2	This output is true whenever there is any diagnostic affecting Refrigerant Circuit 2 whether latching or automatically clearing, including diagnostics effecting the entire chiller. This classification does not include informational diagnostics.
Chiller Limit Mode (with a 20 minute filter)	This output is true whenever the chiller has been running in one of the Unloading types of limit modes (Condenser, Evaporator, Current Limit or Phase Imbalance Limit) continuously for the last 20 minutes.
Circuit 1 Running	This output is true whenever any compressor is running (or commanded to be running) on Refrigerant Circuit 1, and false when no compressors are commanded to be running on that circuit.
Circuit 2 Running	This output is true whenever any compressor is running (or commanded to be running) on Refrigerant Circuit 2, and false when no compressors are commanded to be running on that circuit.
Chiller Running	This output is true whenever any compressor is running (or commanded to be running) on the chiller and false when no compressors are commanded to be running on the chiller.
Maximum Capacity	This output is true whenever the chiller has all compressors on. The output is false once one compressor is shut-off.

Relay Assignments Using TechView™

Trane technician service software is used to assign any of the above list of events or status to each of the four relays provided with the option. The relays to be programmed are referred to by the relay's terminal numbers on the LLID board 1A18.

The default assignments for the four available relays of the CGAM Alarm and Status Package Option are:

Table 17. Default relay assignments

Relay	
Relay 1 Terminals J2 -12,11,10:	Compressor Running
Relay 2 Terminals J2 - 9,8,7:	Latching Alarm
Relay 3 Terminals J2-6,5,4:	Chiller Limit Mode
Relay 4 Terminals J2-3,2,1:	Warning

If any of the Alarm/Status relays are used, provide electrical power, 115 Vac with fused-disconnect to the

panel and wire through the appropriate relays (terminals on 1A13. Provide wiring (switched hot, neutral, and ground connections) to the remote annunciation devices. Do not use power from the chiller's control panel transformer to power these remote devices. Refer to the field diagrams which are shipped with the unit.

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

The unit control system provides auxiliary control for a customer specified/ installed latching trip out. When this customer-furnished remote contact 6K5 is provided, the chiller will run normally when the contact is closed. When the contact opens, the unit will trip on a manually resettable diagnostic. This condition requires manual reset at the chiller switch on the front of the control panel.

Connect low voltage leads to terminal strip locations on 1A13, J2-3 and 4. Refer to the field diagrams that are shipped with the unit.

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 contact 6K4 to the proper terminals on 1A13, J2-1 and 2.

The chiller will run normally when the contact is closed. When the contact opens, the compressor(s), if operating, will go to the RUN:UNLOAD operating mode and cycle off. Unit operation will be inhibited. Closure of the contact 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. See the field diagrams that are shipped with the unit.

NOTICE

Equipment Damage!

Failure to follow instructions below could cause equipment damage.

Do NOT enable/disable the chiller by removing water flow.

⚠ 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.

Field Wiring Considerations

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

- All wiring must be in accordance with the NEC and local codes.
- Communication link wiring must be shielded, twisted pair wiring (Belden 8760 or equivalent). See the table below for wire size selection.

Table 18. Wire size

Wire Size	Maximum Length of Communication Wire
14 AWG (2.5 mm2)	5,000 FT (1525 m)
16 AWG (1.5 mm2)	2,000 FT (610 m)
18 AWG (1.0 mm2)	1,000 FT (305 m)

- The communication link cannot pass between buildings.
- All units on the communication link can be connected in a **daisy chain** configuration.

BACnet® Interface (BCI-C)

Optional BACnet Communication Interface for all Trane Rental CGAM chillers include either native Symbio™ 800 BACnet support (Design sequence 4) or BACnet BCI interfaces for CH530 chillers (design sequences 0 to 3).

Note: *For more information, see BACnet® Communication Interface for Chiller (BCI-C) For RTWD, RTUD, RTHD, RTAC, CGAM/CXAM, and CGWN/CCUN Integration Guide (BAS-SVP05*-EN).*

Additional Communication Protocols

In addition to BACnet support, the Symbio 800 controller includes support for MODBUS and (with additional hardware) Lontalk protocols. Contact your local Trane office for additional information on integrating with building automation systems using these protocols.

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!

Failure to follow instructions below could result in equipment damage.

Improper adjustment of the flow switch could cause equipment damage due to freezing.

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 DynaView.
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 Refrigerant Report on the unit display.

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. 74

Sequence of Operation

This section will provide basic information on chiller operation for common events. With microelectronic controls, ladder diagrams cannot show today's complex logic, as the control functions are much more involved than older pneumatic or solid state controls.

Adaptive control algorithms can also complicate the exact sequence of operations. This section illustrates common control sequences.

Software Operation Overview

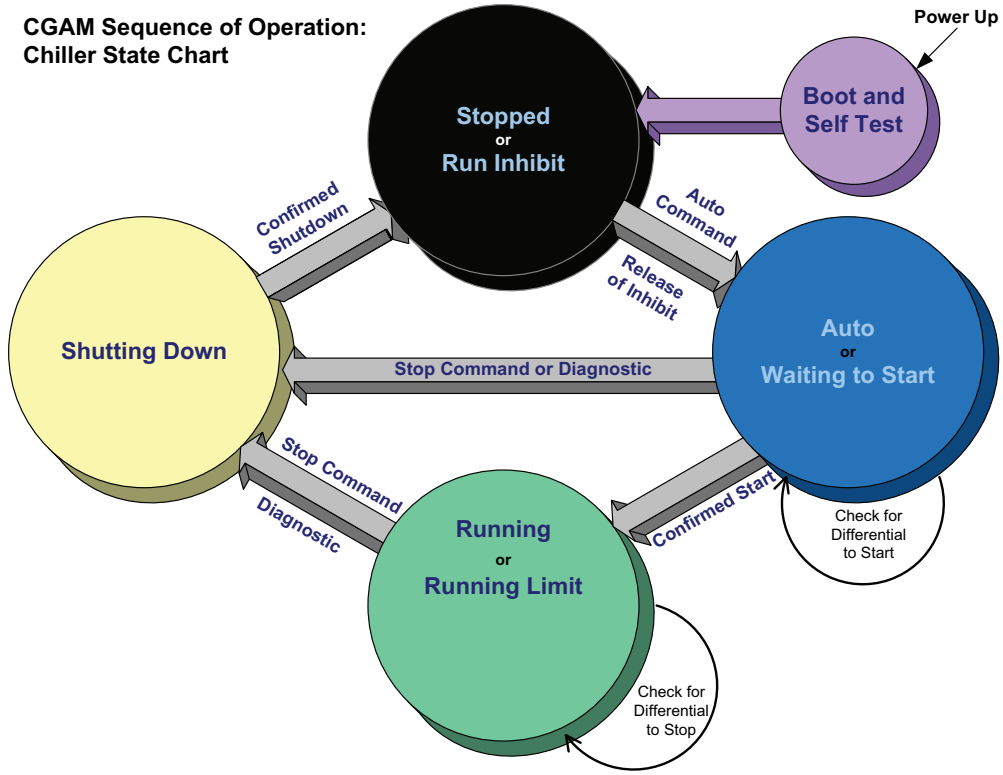
The software operation overview shown in Figure 50, p. 71 is a diagram of the five possible software states. This diagram can be thought of as a state chart, with the arrows and arrow text depicting the transitions between states.

- The text in the circles is the visible top level operating mode displayed on DynaView Main tab.
- The shading of each software state circle corresponds to the shading on the time lines that show the state the chiller is in.

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

- Power Up
- Stopped
- Starting
- Running
- Stopping

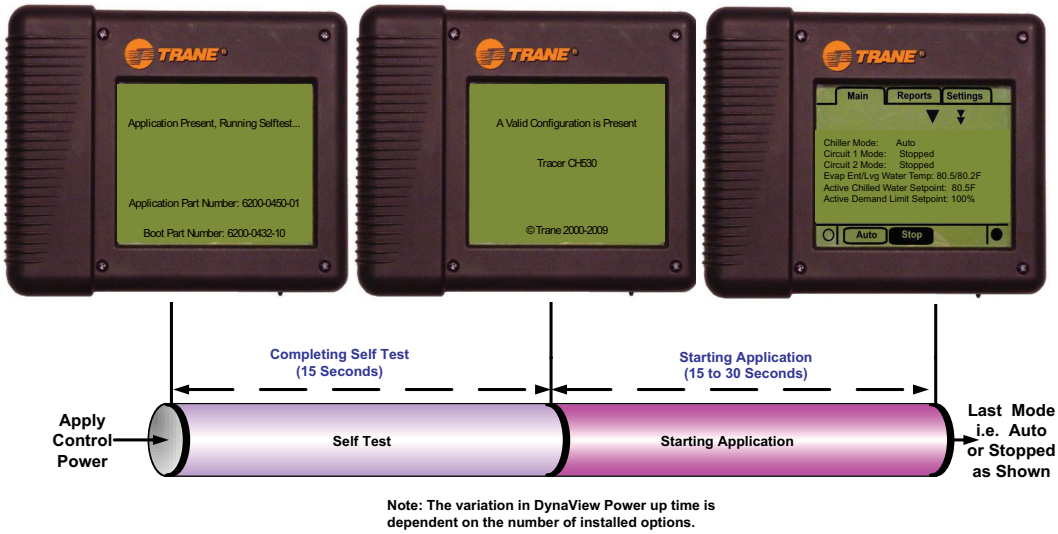
Figure 50. Chiller state chart



Power Up

The Power up chart shows the respective DynaView screens during a power up of the main processor. This process takes from 30 to 45 seconds depending on the number of installed Options. On all power ups, the software model will always transition through the Stopped Software state independent of the last mode. If the last mode before power down was Auto, the transition from Stopped to Starting occurs, but it is not apparent to the user.

Figure 51. Power up



Note: The variation in DynaView Power up time is dependent on the number of installed options.

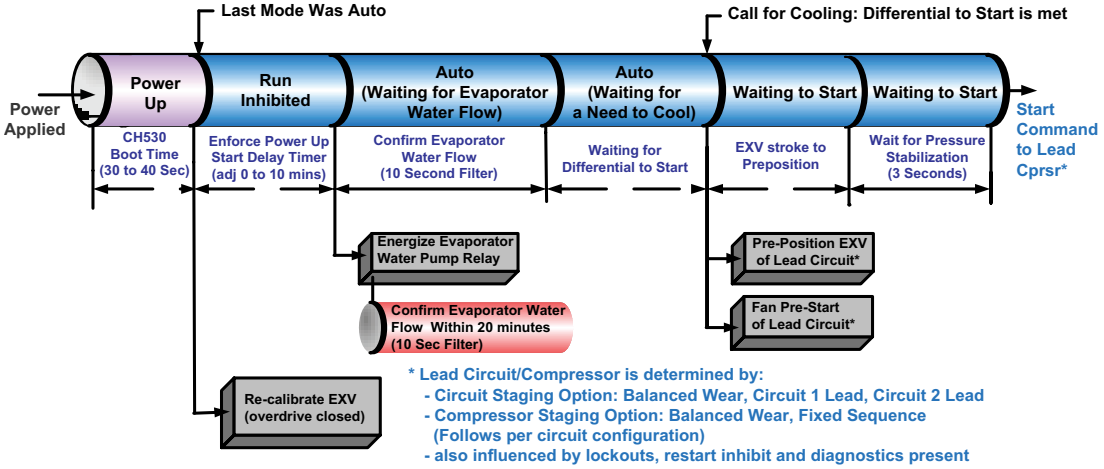
Power Up to Starting

Power up to starting diagram shows 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
- Evaporator Water flow occurs quickly with pump on command
- Power up Start Delay setpoint set to 0 minutes
- Need to cool (differential to start) already exists

The above conditions would allow for a minimum power up to starting the first compressor time of about 85 seconds, depending on options installed.

Figure 52. Power up to starting



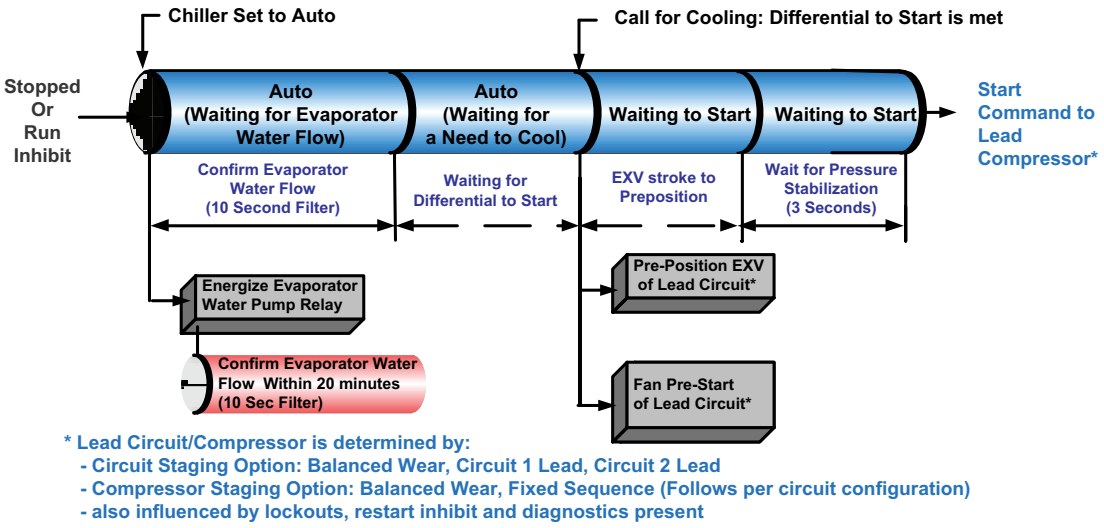
Stopped to Starting

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

- No motor restart inhibit
- Evaporator Water flow occurs quickly with pump on command
- Need to cool (differential to start) already exists

The above conditions would allow the compressor to start in about 35 seconds.

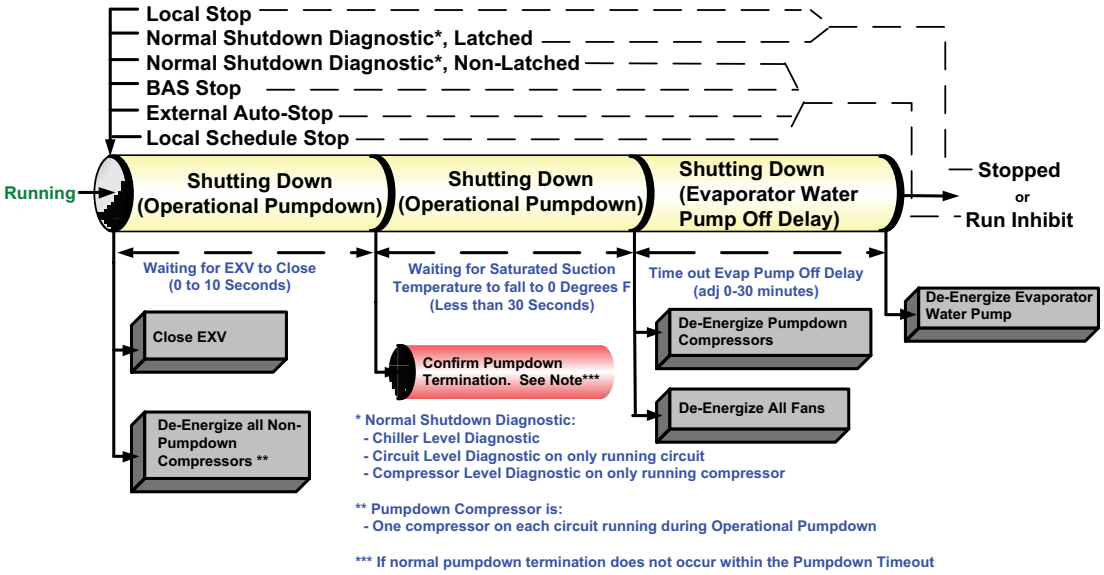
Figure 53. Stopped to starting



Normal Shutdown to Stopped

Figure 54, p. 73 shows transition from Running through a Normal (friendly) Shutdown. Dashed lines on top attempt to show final mode if you enter stop via various inputs.

Figure 54. Normal shutdown to stopped or run inhibit



Controls Interface

For controls interface information, see *Air-Cooled Scroll Chillers Model CGAM 20 to 130 Tons - Made in USA Installation Operation and Maintenance* (CG-SVX17*-EN).

Maintenance and Diagnostics

For maintenance procedures, see **Weekly Maintenance** and **Monthly Maintenance** sections in *Air-Cooled Scroll Chillers Model CGAM 20 to 130 Tons - Made in USA Installation Operation and Maintenance* (CG-SVX17*-EN).

Refrigerant Charge Information

For R-410A refrigerant charge information, see *Air-Cooled Scroll Chillers Model CGAM 20 to 130 Tons - Made in USA Installation Operation and Maintenance* (CG-SVX17*-EN).

For R-454B refrigerant charge information, see *Air-Cooled Scroll Chillers Model CGAM with Symbio™ Controls 20 to 130 Nominal Tons (60 Hz), Installation Operation and Maintenance* (CG-SVX063*-EN).

Decommissioning Procedure

1. Press **STOP** key on the CH530 DynaView or Symbio 800 control. 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 on F0–F3 units, see *Air-Cooled Scroll Chillers Model CGAM 20 to 130 Tons - Made in USA Installation Operation and Maintenance* (CG-SVX17*-EN).

For diagnostic information on F4 and J4 units, see *Air-Cooled Scroll Chillers Model CGAM with Symbio™ Controls 20 to 130 Nominal Tons (60 Hz), Installation Operation and Maintenance* (CG-SVX063*-EN).

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