Installation, Operation, and Maintenance

Air-Cooled Scroll Chillers

Model CGAM

20 – 130 Tons — Made in USA

⚠ 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.

October 2012

CG-SVX17F-EN

Warnings, Cautions and Notices

Warnings, Cautions and Notices. Note that warnings, cautions and notices appear at appropriate intervals throughout this manual. Warnings are provide to alert installing contractors to potential hazards that could result in death or personal injury. Cautions are designed to alert personnel to hazardous situations that could result in personal injury, while notices indicate a situation that could result in equipment or property-damage-only accidents.

Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

Read this manual thoroughly before operating or servicing this unit.

ATTENTION: Warnings, Cautions and Notices appear at appropriate sections throughout this literature. Read these carefully:

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

⚠CAUTION Indicates a potentially hazardous situation which, if not avoided, 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

Important Environmental Concerns!

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

Responsible Refrigerant Practices!

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

⚠WARNING

Proper Field Wiring and Grounding Required!

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 electrical codes. Failure to follow code could result in death or serious injury.

⚠WARNING

R-410A Refrigerant under Higher Pressure than R-22!

The units described in this manual use R-410A refrigerant which operates at higher pressures than R-22 refrigerant. Use ONLY R-410A rated service equipment or components with these units. For specific handling concerns with R-410A, please contact your local Trane representative.
Failure to use R-410A rated service equipment or components could result in equipment exploding under R-410A high pressures which could result in death, serious injury, or equipment damage.

⚠WARNING

Personal Protective Equipment (PPE) Required!

Installing/servicing this unit could result in exposure to electrical, mechanical and chemical hazards.

- **Before installing/servicing this unit, technicians MUST put on all Personal Protective Equipment (PPE) recommended for the work being undertaken. ALWAYS refer to appropriate MSDS sheets and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate MSDS sheets and OSHA guidelines for information on allowable personal exposure levels, proper respiratory protection and handling recommendations.**
- **If there is a risk of arc or flash, technicians MUST put on all Personal Protective Equipment (PPE) in accordance with NFPA 70E or other country-specific requirements for arc flash protection, PRIOR to servicing the unit.**

Failure to follow recommendations could result in death or serious injury.

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⚠WARNING

Hazardous Service Procedures!

The maintenance and troubleshooting procedures recommended in this manual could result in exposure to electrical, mechanical or other potential safety hazards. Always refer to the safety warnings provided throughout this manual concerning these procedures. 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. Failure to follow all of the recommended safety warnings provided, could result in death or serious injury.

Factory Warranty Information

Compliance with the following is required to preserve the factory warranty:

All Unit Installations

Startup MUST be performed by Trane, or an authorized agent of Trane, to VALIDATE this WARRANTY. Contractor must provide a two-week startup notification to Trane (or an agent of Trane specifically authorized to perform startup).

Additional Requirements for Units Requiring Disassembly

When a new fully assembled chiller is shipped and received from our Trane manufacturing location, and, for any reason, it requires disassembly or partial disassembly — which could include but is not limited to the evaporator, condenser, control panel, compressor/motor, factory-mounted starter or any other components originally attached to the fully assembled unit — compliance with the following is required to preserve the factory warranty:

- Trane, or an agent of Trane specifically authorized to perform startup and warranty of Trane® products, will perform or have direct onsite technical supervision of the disassembly and reassembly work.
- The installing contractor must notify Trane — or an agent of Trane specifically authorized to perform startup and warrant of Trane® products — two weeks in advance of the scheduled disassembly work to coordinate the disassembly and reassembly work.
- Startup must be performed by Trane or an agent of Trane specifically authorized to perform startup and warranty of Trane® products as noted above.

Trane, or an agent of Trane specifically authorized to perform startup and warranty of Trane® products, will provide qualified personnel and standard hand tools to perform the disassembly work at a location specified by the contractor. The contractor shall provide the rigging equipment such as chain falls, gantries, cranes, forklifts, etc. necessary for the disassembly and reassembly work and the required qualified personnel to operate the necessary rigging equipment.

Introduction

Overview

This manual covers the installation, operation and maintenance of the CGAM units.

Revision Summary

CG-SVX01F-EN

- Updated lug sizes for change in circuit breaker manufacturer.
- Added new factory warranty wording.
- Corrections to unit and water connections dimensions for units with options.

CG-SVX01E-EN

- High ambient option added
- Copper fin option added
- Seismically rated isolator option added
- No Freeze Protection option added
- Pump package option pressure drop information revised
- Maximum loop volume for pump package expansion tank added
- Diagnostics tables updated

Trademarks

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Table of Contents

Model Number Descriptions

Nameplates

The CGAM unit nameplates are applied to the exterior surface of the control panel door for 20-70 Ton sizes. The 80-120 Ton sizes have a nameplate on a support beam to the right side of the starter panel.

A compressor nameplate is located on each compressor.

See Figure 1.

Unit Nameplate

The unit nameplate provides the following information:

- Unit model and size descriptor.
- Unit serial number.
- Identifies unit electrical requirements.
- Lists correct operating charges of R-410A and refrigerant oil.
- Lists unit design pressures.
- Identifies installation, operation and maintenance and service data literature.
- Lists drawing numbers for unit wiring diagrams.

Compressor Nameplate

The compressor nameplate provides the following information:

- Compressor model number.
- Compressor serial number.
- Compressor electrical characteristics.
- Utilization Range.
- Recommended refrigerant.

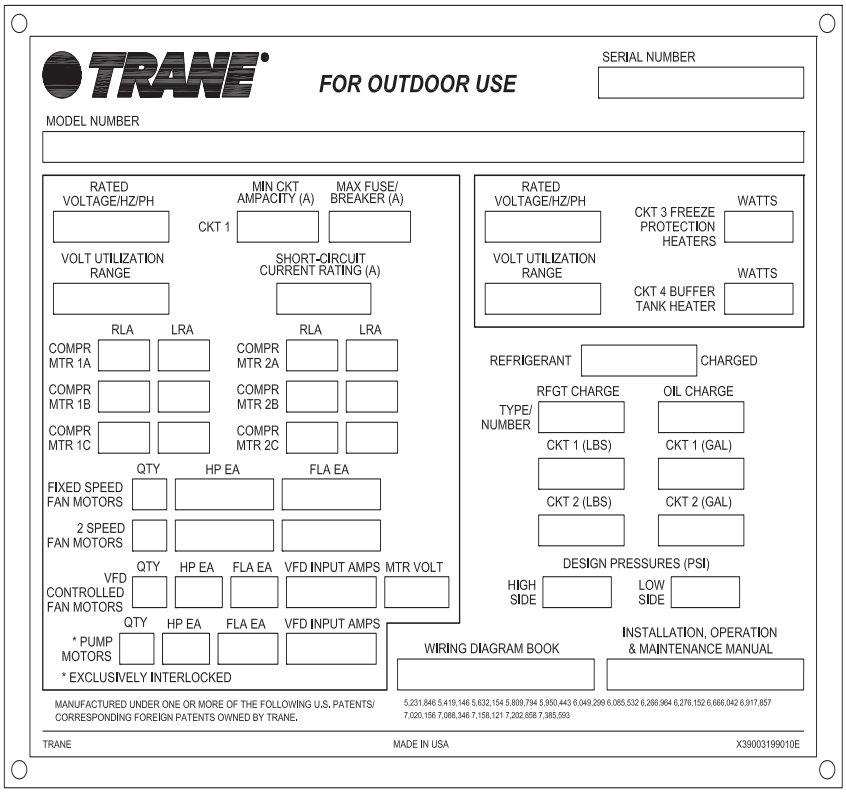
Model Number Coding System

The model numbers for the unit and the compressors are comprised of numbers and letter which represent features of the equipment.

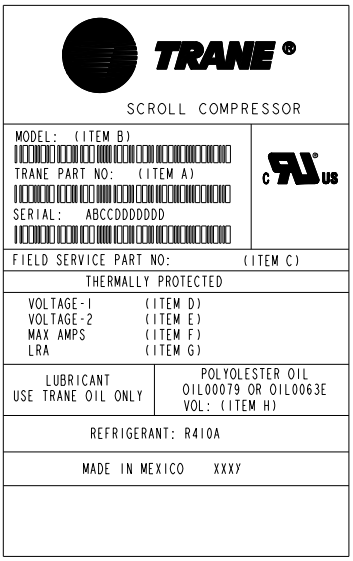
See "Unit Model Number Description," p. 8 and "Compressor Model Number Description," p. 9 for details.

Each position, or group of positions, in a number or letter is used to represent a feature. For example, from the chart, we can determine that the letter "F" in digit 8 of the unit model number indicates unit voltage is 460/60/3.

Figure 1. Unit and compressor nameplates



CGAM Unit Nameplate



CGAM Compressor Nameplate

Unit Model Number Description

Digits 1-4— Chiller Model

CGAM= Air-Cooled Scroll Packaged Chiller

Digits 5-7— Unit Nominal Ton

020 = 20 Tons
026 = 26 Tons
030 = 30 Tons
035 = 35 Tons
040 = 40 Tons
052 = 52 Tons
060 = 60 Tons
070 = 70 Tons
080 = 80 Tons
090 = 90 Tons
100 = 100 Tons
110 = 110 Tons
120 = 120 Tons
130 = 130 Tons

Digit 8— Unit Voltage

A = 208 Volt 60 Hz 3 Phase
B = 230 Volt 60 Hz 3 Phase
D = 380 Volt 60 Hz 3 Phase
E = 400 Volt 50 Hz 3 Phase
F = 460 Volt 60 Hz 3 Phase
G = 575 Volt 60 Hz 3 Phase

Digit 9— Manufacturing Plant

2 = Pueblo, USA

Digits 10-11— Design Sequence

A-Z = Factory/ABU Assigned

Digit 12— Unit Type

2 = High Efficiency

Digit 13— Agency Listing

X = No Agency Listing
A = UL Listed to U.S. and Canadian Safety Standard

Digit 14— Pressure Vessel Code

X = No Pressure Code

Digit 15— Unit Application

A = Std Ambient (45-115°F/7-46°C)
B = High Ambient (45-125°F/7-52°C)
C = Low Ambient (0-115°F/-18-46°C)
D = Super Wide Ambient (0-125°F/18-52°C)
G = Medium Ambient (14-125°F/-10-52°C)
H = Wide Ambient (14-125°F/-10-52°C)

Digit 16— Refrigerant Isolation Valves

2 = Refrigerant Isolation Valves (Discharge Valve)

Digit 17— Seismically Rated

A = Not Seismically Rated Unit
B = IBC Seismically Rated Unit
C = OSHPD Seismically Rated Unit

Digit 18— Freeze Protection (Factor-Installed Only)

X = Without Freeze Protection
1 = With Freeze Protection (External T-Stat Control)

Digit 19— Insulation

A = Factory Insulation - All Cold Parts
B = Insulation for High Humidity/ Low Evap Temp

Digit 20— Factory Charge

1 = Full Factory Refrigerant Charge (HFC-R10A)
2 = Nitrogen Charge

Digit 21— Evaporator Application

A = Standard Cooling (42 to 65°F/5.5 to 18°C)
B = Low Temperature Processing (lower than 42°F/5.5°C)
C = Ice-Making - Hardwired Interface (20 to 65°F/-7 to 18°C)

Digit 22— Water Connections

1 = Grooved Pipe Connection

Digit 23— Condenser Fin Material

A = Lanced Aluminum Fins
C = Non-Lanced Copper Fins
D = Lanced Aluminum Fins w/ CompleteCoat™

Digit 24— Condenser Heat Recovery

X = No Heat Recovery
1 = Partial Heat Recovery with Fan Control

Digit 25— Not Used

X

Digit 26— Starter Type

A = Across the Line Starter/ Direct on Line

Digit 27— Incoming Power Line Connection

1 = Single Point Power Connection

Digit 28— Power Line Connection Type

A = Terminal Block
C = Circuit Breaker
D = Circuit Breaker with High Fault Rated Control Panel

Digit 29— Enclosure Type

1 = Water Tight (per UL 1995 Standard)

Digit 30— Unit Operator Interface

A = Dyna-View/English
B = Dyna-View/Spanish-Spain
C = Dyna-View/Spanish-Mexico
D = Dyna-View/French
E = Dyna-View/German
F = Dyna-View/Dutch
G = Dyna-View/Italian
H = Dyna-View/Japanese
J = Dyna-View/Portuguese-Portugal
K = Dyna-View/Portuguese-Brazil
L = Dyna-View/Korean
M = Dyna-View/Thai
N = Dyna-View/Simplified Chinese
P = Dyna-View/Traditional Chinese
R = Dyna-View/Russian
T = Dyna-View/Polish
U = Dyna-View/Czech
V = Dyna-View/Hungarian
W = Dyna-View/Greek
Y = Dyna-View/Romanian
Z = Dyna-View/Swedish

Digit 31— Remote Interface (Digital Comm)

X = No Remote Digital Communication
2 = LonTalk/Tracer Summit Interface
3 = Time of Day Scheduling
4 = BACNet Interface

Digit 32— External Chilled/Hot Water and Current Demand Limit Setpoint

X = No External Chilled Water Setpoint
A = External Chilled Water and Demand Limit Setpoint 4-20mA
B = External Chilled Water and Demand Limit Setpoint 2-10Vdc

Digit 33— Percent Capacity

X = Without Percent Capacity
1 = With Percent Capacity

Digit 34— Programmable Relays

X = No Programmable Relays
A = Programmable Relays

Digit 35— Pump Type

X = No Pumps and No Contactors
8 = Dual High Head Pump

Digit 36— Pump Flow Control

X = No Pump Control
B = Pump Flow Controlled by Variable Speed Drive

Digit 37— Buffer Tank

X = No Buffer Tank
1 = With Buffer Tank

Digit 38— Short Circuit Rating

A = Default A Short Circuit Rating
B = High A Short Circuit Rating

Digit 39— Installation Accessories

X = No Installation Accessories
1 = Elastomeric Isolators
3 = Seismically Rated Isolators

Digit 40— Water Strainer

A = With Water Strainer Factory Installed

Digit 41— sound Attenuator Package

3 = Super Quiet
5 = Comprehensive Acoustic Package

Digit 42— Appearance Options

X = No Appearance Options
A = Architectural Louvered Panels
B = Half Louvers

Digit 43— Exterior Finish

1 = Standard Paint

Digit 44— Label, Literature Language

B = Spanish
D = English
E = French and English

Digit 45— Phase Reversal Protection

1 = Phase Reversal Protection

Digit 46— Shipping Package

X = No Skid (Standard)
A = Unit Containerization Package

Digit 47— Performance Test Options

X = No Performance Test
2 = 1 Point Test with Report
3 = Witness 1 Point Test with Report

Digit 48— Flow Switch Set Point

C = 15
F = 35
H = 45
L = 60

Digit 49— Not Used

X

Digit 50— Specials

X = None
S = Special

Note: *If a digit is not defined it may be held for future use.*

Compressor Model Number Description

Digits 1-4— Compressor Model

CSHD= Light Commercial
CSHN= Commercial

Digits 5-7— Capacity

125 = CSHD
161 = CSHD
184 = CSHN
250 = CSHN
315 = CSHN
374 = CSHN

Digit 8— Voltage

J = 200-230/60/3
K = 460/60/3 - 400/50/3
F = 230/50/3
D = 575/60/3
X = 380/60/3

Digit 9— Unloading

0 = No Unloading

Digit 10 — Design Sequence

Factory Assigned

Digit 11— Protection Module Voltage

0= Internal Line Break
A= 115 VAC
B= 230 VAC
H= 24 VAC
K= 115/230 VAC

Digit 12— Basic Compressor Variation

M= Suction & Discharge Tube, Oil Equalizer with Seal Nut, Grade 32 POE oill

General Information

Unit Description

The CGAM units are scroll type, air-cooled, liquid chillers, designed for installation outdoors. The 20-35 ton units have a single independent refrigerant circuit, with two compressors per circuit. The 40 ton and larger units have 2 independent refrigerant circuits, with two compressors per circuit. The CGAM units are packaged with an evaporator and condenser.

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

The CGAM series features Trane's exclusive Adaptive Control logic with CH530 controls. It monitors the control variables that govern the operation of the chiller unit. Adaptive Control logic can correct these variables, when necessary, to optimize operational efficiencies, avoid chiller shutdown, and keep producing chilled water.

Each refrigerant circuit is provided with filter, sight glass, electronic expansion valve, and charging valves on the CGAM.

The evaporator is a brazed plate heat exchanger which is equipped with a water drain and vent connections in the water piping. The condenser is an air-cooled slit fin coil.

The condensers are available in three configurations depending on the tonnage of the unit. Units may be referred to the size by the condenser configuration. The three configurations are slant, V and W.

Figure 2. CGAM slant 20-35T configuration

Figure 3. CGAM "V" 40-70Ton configuration

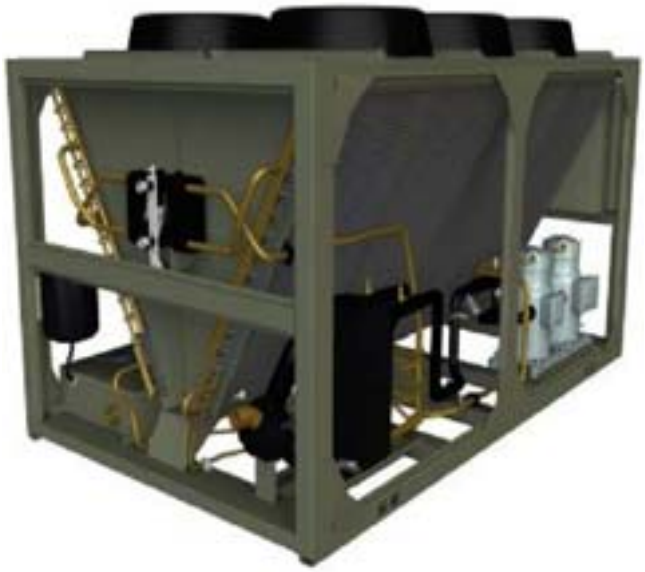


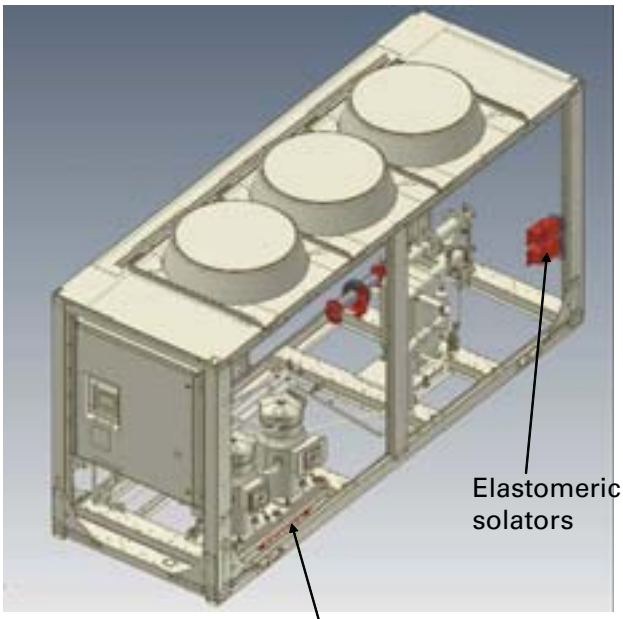
Figure 4. CGAM "W" 80-130T configuration

Accessory/Options Information

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

The unit isolators and fan prop rod ship on brackets attached to the frame of the unit. The location varies by unit tonnage. The following figures show the location of these ship with items for the different sizes.

Figure 5. Slant 20-35 ton - ship with location - isolators and prop rod



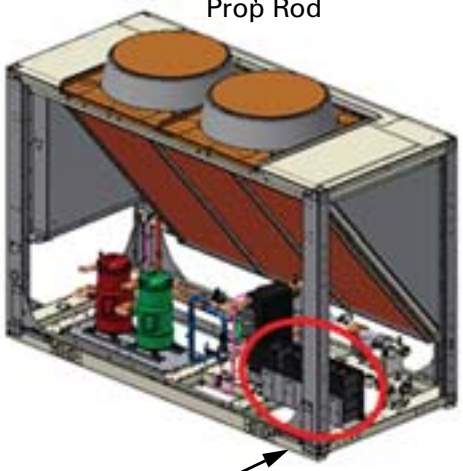
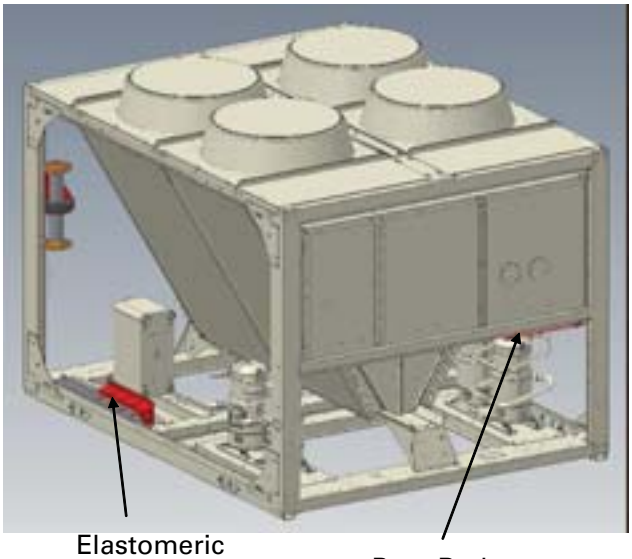


Figure 6. V 40-70 ton - ship with location - isolator and prop rod



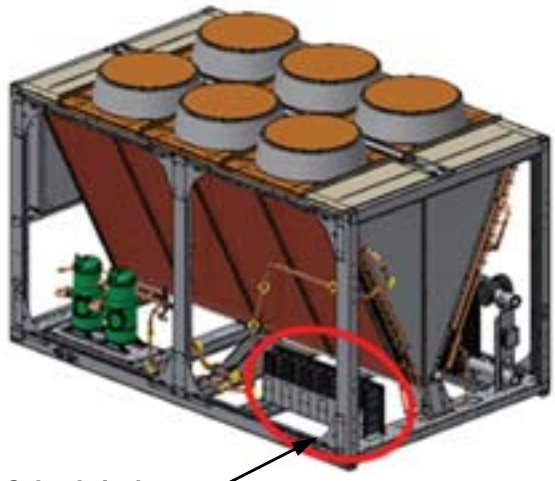
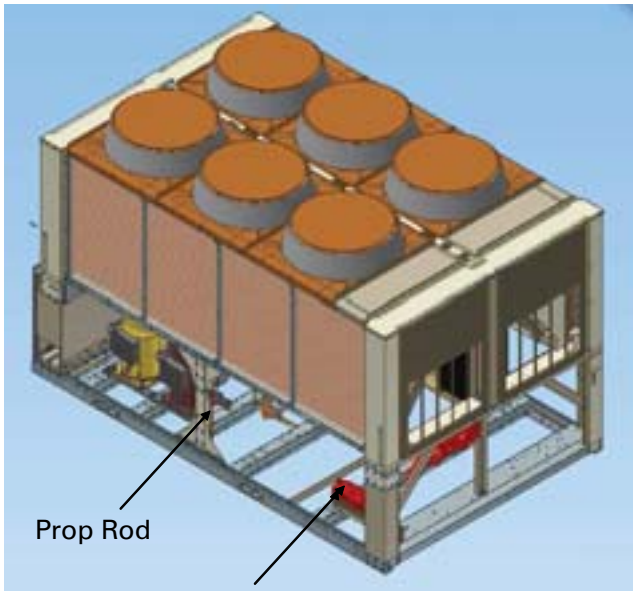
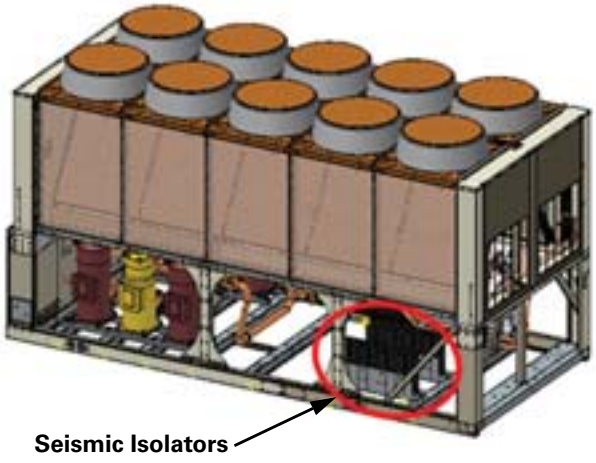


Figure 7. W 80-130 ton - ship with location - isolator and prop rod





General Data

Table 1. General Data - 60 Hz - IP

Size		20	26	30	35	40	52	60	70	80	90	100	110	120	130
Compressor															
Number	#	2	2	2	2	4	4	4	4	4	4	4	4	4	6
Tonnage/circuit[1]		10+10	13+13	15+15	15+20	10+10	13+13	15+15	15+20	20+20	20+25	25+25	25+30	30+30	20+20 +25
Evaporator															
Water storage	(gal)	1.4	2.2	2.2	3.2	2.4	4.1	5.0	7.5	7.0	9.0	10.3	11.5	11.5	12.3
Min. flow	(gpm)	30	38	42	50	57	74	84	100	115	129	145	157	170	184
Max. flow	(gpm)	69	89	100	117	136	176	201	238	275	307	346	375	407	440
Water connection	(in)	2	2.5	2.5	2.5	3	3	3	3	4	4	4	4	4	4
Condenser															
Quantity of coils	#	1	1	1	1	2	2	2	2	4	4	4	4	4	4
Coil length	(in)	91	91	127	127	91	91	127	127	121	121	144	144	144	180
Coil height	(in)	68	68	68	68	68	68	68	68	42	42	42	42	42	42
Number of rows	#	2	2	2	2	2	2	2	2	3	3	3	3	3	3
Fins per foot	(fpf)	192	192	192	192	192	192	192	192	192	192	192	192	192	192
Fan															
Quantity	#	2	2	3	3	4	4	6	6	6	6	8	8	8	10
Diameter	(in)	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8
Airflow per fan	(cfm)	9413	9420	9168	9173	9413	9420	9168	9173	9470	9472	9094	9096	9098	9094
Power per motor	(kW)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Motor RPM	(rpm)	840	840	840	840	840	840	840	840	840	840	840	840	840	840
Tip speed	(ft/min)	6333	6333	6333	6333	6333	6333	6333	6333	6333	6333	6333	6333	6333	6333
General Unit															
Refrig circuits	#	1	1	1	1	2	2	2	2	2	2	2	2	2	2
Capacity steps	%	50-100	50-100	50-100	43-100	25-50-75-100	25-50-75-100	25-50-75-100	21-43-71-100	25-50-75-100	22-44-72-100	25-50-75-100	23-45-73-100	25-50-75-100	15-31-46-62-81-100
Refrig charge/circuit[1]	(lbs)	32	34	48	48	32	32	50.5	48	74	78	90	91.5	86	112
Oil charge/circuit[1]	(gal)	1.7	1.7	3.5	3.5	1.7	1.7	3.5	3.5	3.5	3.5	3.5	3.7	3.8	5.8
Min ambient - wide	(°F)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Min ambient - high	(°F)	n/a										32	32	32	32
Pump Package															
Avail head pressure[2]	(ft H2O)	78.2	77.7	71.1	67.6	67.1	58.6	76.7	63.5	82.0	78.1	69.0	61.9	71.3	62.2
Power	(HP)	5.0	5.0	5.0	5.0	5.0	5.0	7.6	7.6	10.2	10.2	10.2	10.2	15.2	15.2
Expansion tank volume[4]	(gal)	5	5	5	5	5	5	5	5	6	6	6	6	6	6
Partial Heat Recovery															
Water storage/circuit[1]	(gal)	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.06	0.06
Max flow	(gpm)	39	39	39	39	78	78	78	78	127	127	127	127	127	127
Water connection	(in)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5
Buffer Tank															
Buffer tank volume	(gal)	140	140	140	140	140	140	140	140	152	152	195	195	195	195

Notes:
1. Data shown for circuit one only. The second circuits always matches.
2. When facing the control panel, circuit 1 is on the right side of unit.
3. 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.
4. See Table 30, p. 62 for maximum loop volumes with pump package expansion tank.

Table 2. General Data - 60 Hz - SI

Size		20	26	30	35	40	52	60	70	80	90	100	110	120	130
Compressor															
Number	#	2	2	2	2	4	4	4	4	4	4	4	4	4	6
Tonnage/circuit[1]		10+10	13+13	15+15	15+20	10+10	13+13	15+15	15+20	20+20	20+25	25+25	25+30	30+30	20+20 +25
Evaporator															
Water storage	(l)	5.3	8.3	8.3	12.1	9.1	15.5	18.9	28.4	26.5	34.1	39.0	43.5	43.5	46.6
Min. flow	(l/s)	1.8	2.3	2.6	3.1	3.6	4.6	5.3	6.3	7.2	8.1	9.1	9.9	10.7	11.6
Max. flow	(l/s)	4.4	5.6	6.3	7.4	8.6	11.1	12.7	15.1	17.4	19.4	21.9	23.7	25.7	27.8
Water connection	(mm)	50.8	63.5	63.5	63.5	76.2	76.2	76.2	76.2	101.6	101.6	101.6	101.6	101.6	101.6
Condenser															
Qty of coils	#	1	1	1	1	2	2	2	2	4	4	4	4	4	4
Coil length	(mm)	2311	2311	3226	3226	2311	2311	3226	3226	3073	3073	3658	3658	3658	4572
Coil height	(mm)	1727	1727	1727	1727	1727	1727	1727	1727	1067	1067	1067	1067	1067	1067
Number of rows	#	2	2	2	2	2	2	2	2	3	3	3	3	3	3
Fins per foot	(fpf)	192	192	192	192	192	192	192	192	192	192	192	192	192	192
Fan															
Quantity/circuit[1]	#	2	2	3	3	4	4	6	6	6	6	8	8	8	10
Diameter	(mm)	732	732	732	732	732	732	732	732	732	732	732	732	732	732
Airflow per fan	(m^3/h)	15993	16005	15577	15585	15993	16005	15577	15585	16090	16093	15451	15454	15458	15451
Power per motor	(kW)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Motor RPM	(rpm)	840	840	840	840	840	840	840	840	840	840	840	840	840	840
Tip speed	(m/s)	32	32	32	32	32	32	32	32	32	32	32	32	32	32
General Unit															
Refrig circuits	#	1	1	1	1	2	2	2	2	2	2	2	2	2	2
Capacity steps	%	50-100	50-100	50-100	43-100	25-50-75-100	25-50-75-100	25-50-75-100	21-43-71-100	25-50-75-100	22-44-72-100	25-50-75-100	23-45-73-100	25-50-75-100	15-31-46-62-81-100
Refrig charge/circuit[1]	(kg)	14.5	15.4	21.8	21.8	14.5	14.5	22.9	21.8	33.6	35.4	40.8	41.5	39.0	50.8
Oil charge /circuit[1]	(l)	6.6	6.6	13.4	13.4	6.6	6.6	13.4	13.4	13.4	13.4	13.4	13.9	14.4	22.0
Min ambient - wide	(°C)	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18
Min ambient - high	(°C)	n/a										0	0	0	0
Pump Package															
Avail head pressure[2]	(kPa)	233.7	232.3	212.6	202.1	200.6	175.0	229.2	189.7	245.1	233.3	206.3	185.0	213.1	185.8
Power	(HP)	5.0	5.0	5.0	5.0	5.0	5.0	7.6	7.6	10.2	10.2	10.2	10.2	15.2	15.2
Expansion tank volume[4]	(l)	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	22.7	22.7	22.7	22.7	22.7	22.7
Partial Heat Recovery															
Water storage/circuit[1]	(l)	0.07	0.09	0.09	0.11	0.07	0.09	0.09	0.11	0.12	0.16	0.16	0.16	0.21	0.21
Max flow	(l/s)	2.5	2.5	2.5	2.5	5.0	5.0	5.0	5.0	8.0	8.0	8.0	8.0	8.0	8.0
Water connection	(mm)	38.1	38.1	38.1	38.1	38.1	38.1	38.1	38.1	63.5	63.5	63.5	63.5	63.5	63.5
Buffer Tank															
Buffer tank volume	(l)	530	530	530	530	530	530	530	530	575	575	727	727	727	727

Notes:
1. Data shown for circuit one only. The second circuit always matches.
2. When facing the control panel, circuit 1 is on the right side of unit.
3. Pump available head pressure is based on: 6.7/12.2°C evaporator with water, .01761 m²°C/kW, 35°C ambient and 0 m elevation.
4. See Table 31, p. 63 for maximum loop volumes with pump package expansion tank.

General Data

Table 3. General Data - 50 Hz - IP

Size		20	26	30	35	40	52	60	70	80	90	100	110	120
Compressor														
Number	#	2	2	2	2	4	4	4	4	4	4	4	4	4
Tonnage/circuit[1]		10+10	13+13	15+15	15+20	10+10	13+13	15+15	15+20	20+20	20+25	25+25	25+30	30+30
Evaporator														
Water storage	(gal)	1.4	2.2	2.2	3.2	2.4	4.1	5.0	7.5	7.0	9.0	10.3	11.5	11.5
Min. flow	(gpm)	25	32	36	41	48	62	71	83	97	109	123	133	142
Max. flow	(gpm)	59	75	85	98	115	149	170	199	234	262	296	319	341
Water connection	(in)	2	2.5	2.5	2.5	3	3	3	3	4	4	4	4	4
Condenser														
Quantity of coils	#	1	1	1	1	2	2	2	2	4	4	4	4	4
Coil length	(in)	91	91	127	127	91	91	127	127	121	121	144	144	144
Coil height	(in)	68	68	68	68	68	68	68	68	42	42	42	42	42
Number of rows	#	2	2	2	2	2	2	2	2	3	3	3	3	3
Fins per foot	(fpf)	192	192	192	192	192	192	192	192	192	192	192	192	192
Fan														
Quantity	#	2	2	3	3	4	4	6	6	6	6	8	8	8
Diameter	(in)	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8
Airflow/fan	(cfm)	7796	7783	7587	7590	7795	7801	7587	7590	7827	7829	7503	7505	7506
Power/motor	(kW)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Motor RPM	(rpm)	700	700	700	700	700	700	700	700	700	700	700	700	700
Tip speed	(ft/min)	5278	5278	5278	5278	5278	5278	5278	5278	5278	5278	5278	5278	5278
General Unit														
Refrig circuits	#	1	1	1	1	2	2	2	2	2	2	2	2	2
Capacity steps	%	50-100	50-100	50-100	43-100	25-50-75-100	25-50-75-100	25-50-75-100	21-43-71-100	25-50-75-100	22-44-72-100	25-50-75-100	23-45-73-100	25-50-75-100
Refrig charge/circuit[1]	(lbs)	34	34	48	48	32	32	48	48	74	74	82	86	84
Oil charge/circuit[1]	(gal)	1.7	1.7	3.5	3.5	1.7	1.7	3.5	3.5	3.5	3.5	3.5	3.7	3.8
Min ambient - wide	(°F)	0	0	0	0	0	0	0	0	0	0	0	0	0
Min ambient - high	(°F)					n/a						32	32	32
Partial Heat Recovery														
Water storage/circuit[1]	(gal)	0.02	0.02	0.02	.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04
Max flow	(gpm)	39	39	39	39	78	78	78	78	127	127	127	127	127
Water connection	(in)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5

Notes:
1. Data shown for circuit one only. The second circuits always matches.
2. When facing the control panel, circuit 1 is on the right side of unit.

General Data

Table 4. General Data - 50 Hz - SI

Size		20	26	30	35	40	52	60	70	80	90	100	110	120
Compressor														
Number	#	2	2	2	2	4	4	4	4	4	4	4	4	4
Tonnage/circuit[1]		10+10	13+13	15+15	15+20	10+10	13+13	15+15	15+20	20+20	20+25	25+25	25+30	30+30
Evaporator														
Water storage	(l)	5.3	8.3	8.3	12.1	9.1	15.5	18.9	28.4	26.5	34.1	39.0	43.5	43.5
Min. flow	(l/s)	1.6	2.0	2.2	2.6	3.0	3.9	4.4	5.2	6.1	6.8	7.7	8.3	8.9
Max. flow	(l/s)	3.7	4.8	5.4	6.2	7.3	9.4	10.8	12.6	14.8	16.5	18.7	20.2	21.6
Water connection	(mm)	50.8	63.5	63.5	63.5	76.2	76.2	76.2	76.2	101.6	101.6	101.6	101.6	101.6
Condenser														
Quantity of coils	#	1	1	1	1	2	2	2	2	4	4	4	4	4
Coil length	(mm)	2311	2311	3226	3226	2311	2311	3226	3226	3073	3073	3658	3658	3658
Coil height	(mm)	1727	1727	1727	1727	1727	1727	1727	1727	1067	1067	1067	1067	1067
Number of rows	#	2	2	2	2	2	2	2	2	3	3	3	3	3
Fins per foot	(fpf)	192	192	192	192	192	192	192	192	192	192	192	192	192
Fan														
Quantity	#	2	2	3	3	4	4	6	6	6	6	8	8	8
Diameter	(mm)	732	732	732	732	732	732	732	732	732	732	732	732	732
Airflow/fan	(m^3/h)	13245	13223	12890	12895	13244	13254	12890	12895	13298	13302	12748	12751	12753
Power/motor	(kW)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Motor RPM	(rpm)	700	700	700	700	700	700	700	700	700	700	700	700	700
Tip speed	(m/s)	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
General Unit														
Refrig circuits	#	1	1	1	1	2	2	2	2	2	2	2	2	2
Capacity steps	%	50-100	50-100	50-100	43-100	25-50-75-100	25-50-75-100	25-50-75-100	21-43-71-100	25-50-75-100	22-44-72-100	25-50-75-100	23-45-73-100	25-50-75-100
Refrig charge/circuit[1]	(kg)	15.4	15.4	21.8	21.8	14.5	14.5	21.8	21.8	33.6	33.6	37.2	39.0	38.1
Oil charge/circuit [1]	(l)	6.6	6.6	13.4	13.4	6.6	6.6	13.4	13.4	13.4	13.4	13.4	13.9	14.4
Min ambient - wide	(°C)	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18
Min ambient - high	(°C)						n/a					0	0	0
Partial Heat Recovery														
Water storage/circuit[1]	(l)	0.07	0.07	0.09	0.09	0.07	0.07	0.09	0.09	0.12	0.12	0.12	0.16	0.16
Max flow	(l/s)	2.5	2.5	2.5	2.5	5.0	5.0	5.0	5.0	8.0	8.0	8.0	8.0	8.0
Water connection	(mm)	38.1	38.1	38.1	38.1	38.1	38.1	38.1	38.1	63.5	63.5	63.5	63.5	63.5

Notes:
1. Data shown for circuit one only. The second circuit always matches.
2. When facing the control panel, circuit 1 is on the right side of unit.

Pre-Installation

Inspection Checklist

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

Inspect all exterior components for visible damage. Report any apparent damage or material shortage to the carrier and make a “unit damage” notation on the carrier's delivery receipt. Specify the extent and type of damage found and notify the appropriate Trane Sales Office.

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

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

- Inspect the individual pieces of the shipment before accepting the unit. Check for obvious damage to the unit or packing material.
- Inspect the unit for concealed damage as soon as possible after delivery and before it is stored. Concealed damage must be reported within 15 days.
- If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- Notify the 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 should be blown out to remove any liquid and refrigerant isolation valves should be closed.

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

Note: *Pressure will be approximately 20 psig if shipped with the optional nitrogen charge.*

Installation Requirements

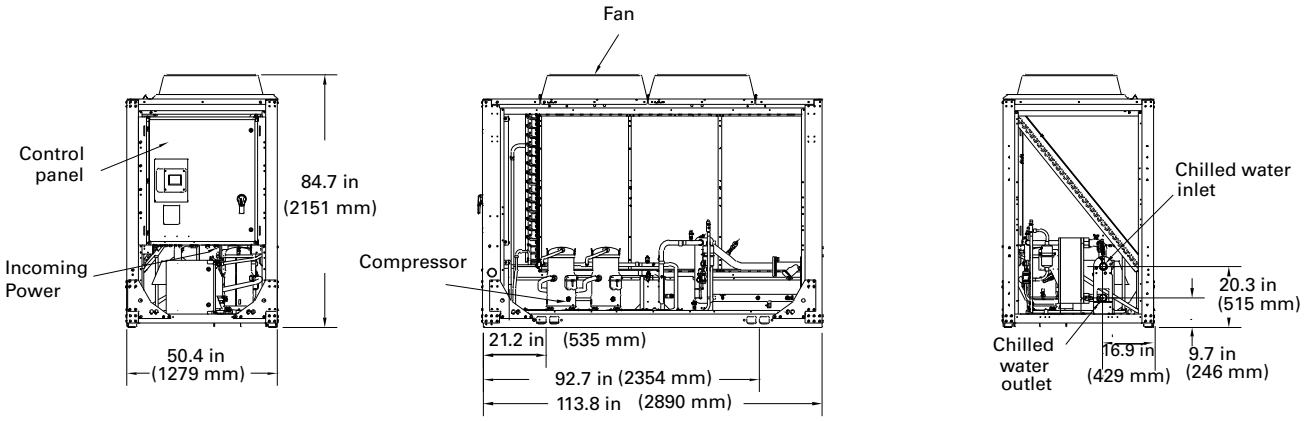
A list of the contractor responsibilities typically associated with the unit installation process is provided.

Type	Trane Supplied Trane Installed	Trane Supplied Field Installed	Field Supplied Field Installed
Foundation			• Meet foundation requirements
Rigging			• Safety chains • Clevis connectors • Lifting beam
Isolation		• Elastomeric isolators (optional)	• Elastomeric isolators (optional)
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 • Chilled water pump contactor and wiring including interlock • Option relays and wiring
Water piping	• Flow switch • Water strainer		• Taps for thermometers and gauges • Thermometers • Water flow pressure gauges • Isolation and balancing valves in water piping • Vents and drain • Pressure relief valves
Insulation	• Insulation • High humidity insulation (optional)		• Insulation
Water Piping Connection Components	• Grooved pipe		
Other Materials	• R-410A refrigerant (1 lb. maximum per machine as needed) • Dry nitrogen (20 psig maximum per machine as needed)		

Unit Dimensions/Weights

Dimensions

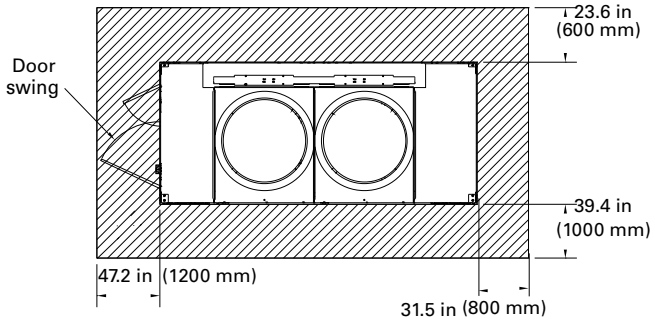
Figure 8. CGAM 20 and 26 ton — no options



Water connections are 1.7 in (44 mm) from the end.

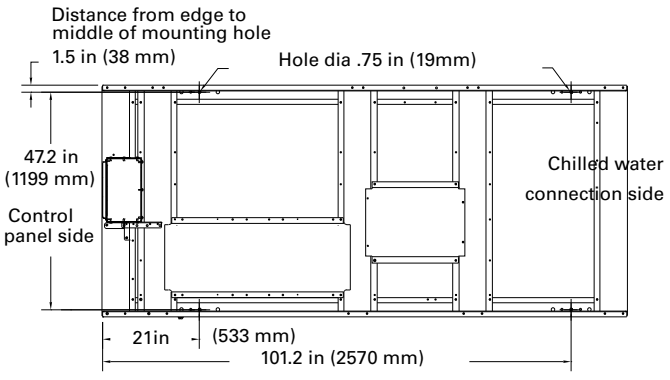
Figure 9. CGAM 20 and 26 ton — service clearances and mounting locations

Service and Airflow Clearance



More clearance may be needed for airflow depending on the installation.

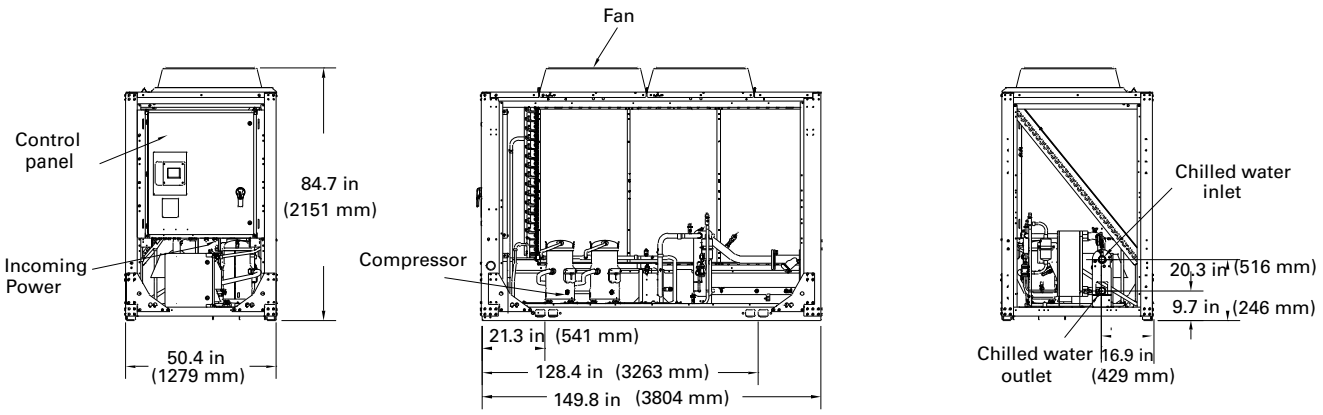
Mounting Locations



Total of four mounting locations.

Unit Dimensions/Weights

Figure 10. CGAM 30 and 35 ton — no options



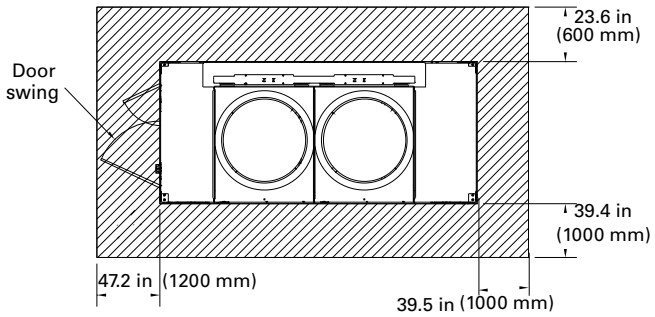
The number of fans shown does not represent the number of fans installed.

Water connections are 1.6 in (40 mm) from unit end.

Figure 11. CGAM 30 and 35 ton — service clearances and mounting locations

Service and Airflow Clearance

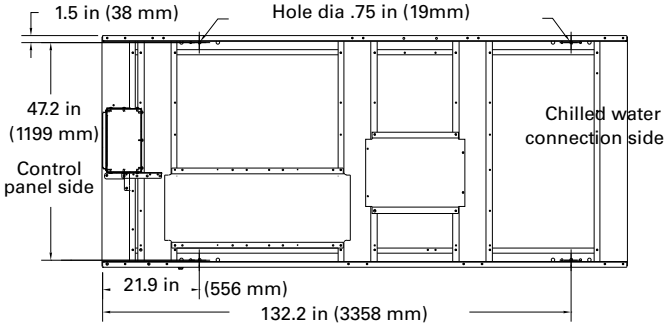
The number of fans shown does not represent the number of fans installed.



More clearance may be needed for airflow depending on the installation.

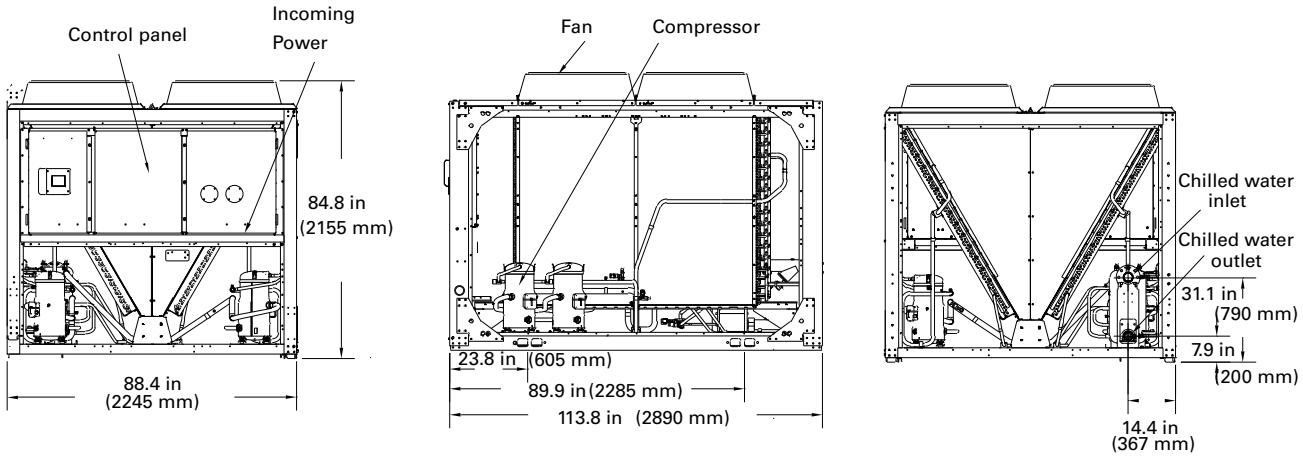
Mounting Locations

Distance from edge to middle of mounting hole



Total of four mounting locations.

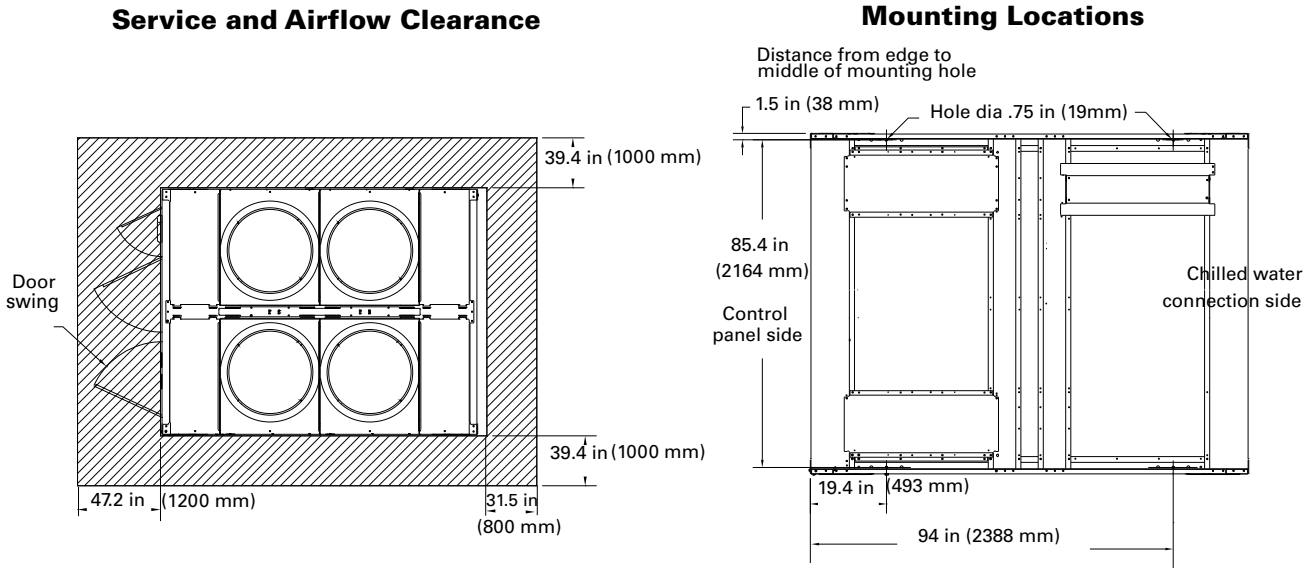
Figure 12. CGAM 40 and 52 ton — no options



Water connections are even with unit end.

Note: *When facing the control panel, circuit 1 is on the right side of unit.*

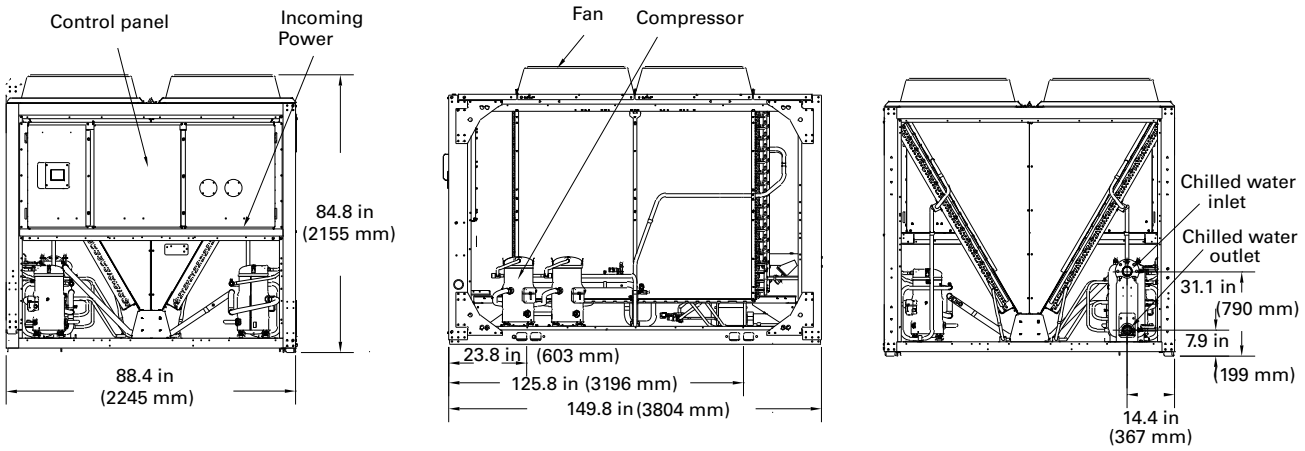
Figure 13. CGAM 40 and 52 ton — service clearances and mounting locations



More clearance may be needed for airflow depending on the installation.

Total of four mounting locations.

Figure 14. CGAM 60 and 70 ton — no options

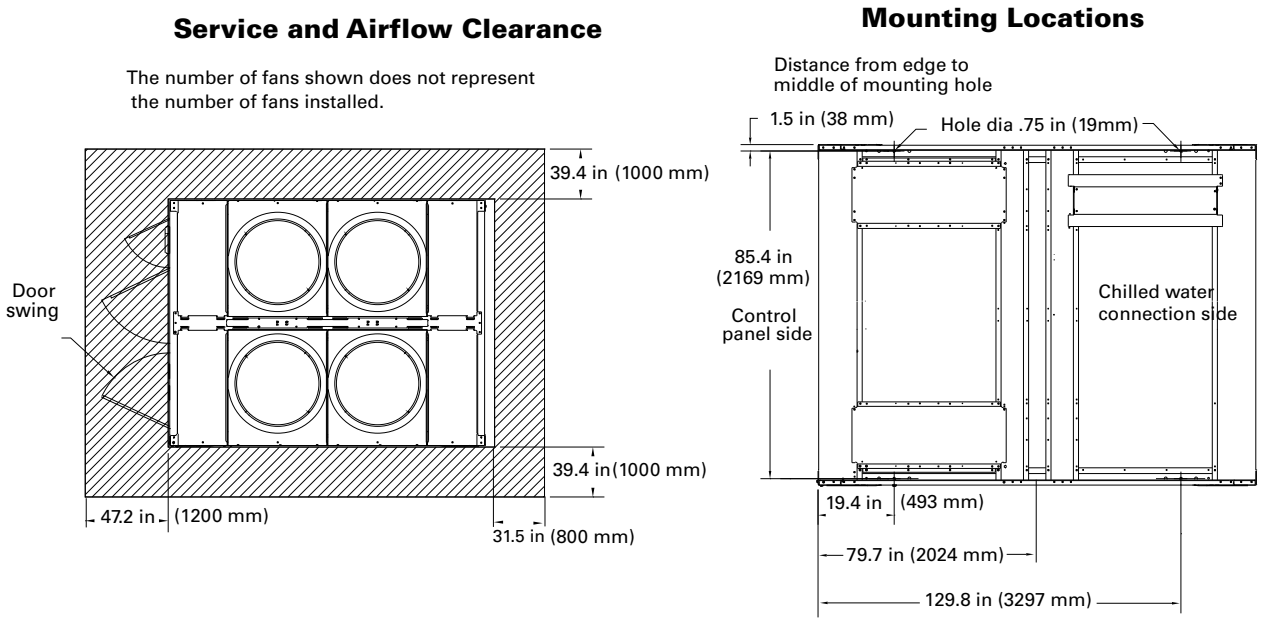


The number of fans shown does not represent the number of fans installed.

Water connections are even with unit end.

Note: *When facing the control panel, circuit 1 is on the right side of unit.*

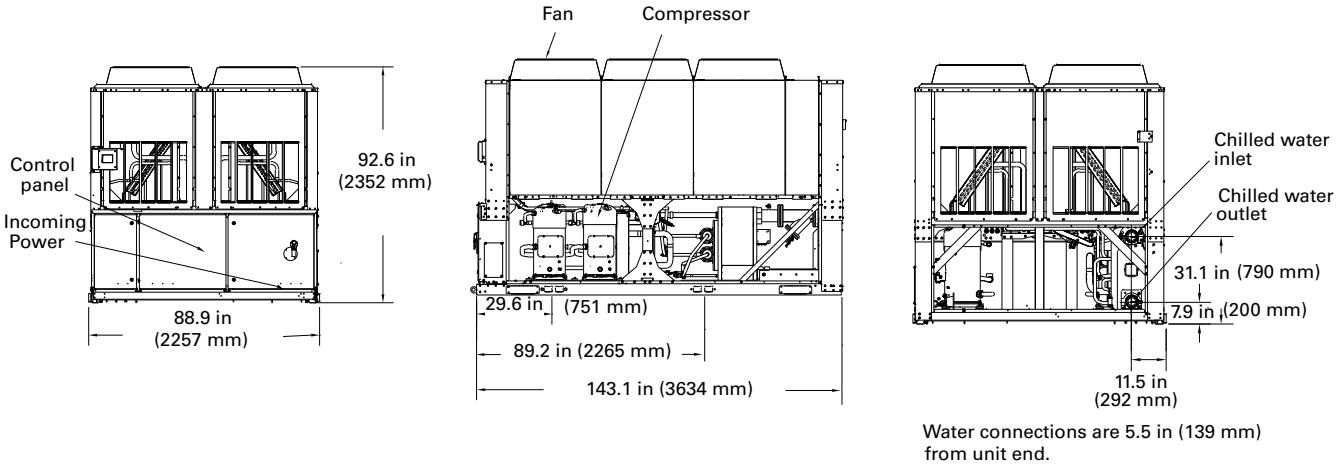
Figure 15. CGAM 60 and 70 ton - service clearances and mounting locations



More clearance may be needed for airflow depending on the installation.

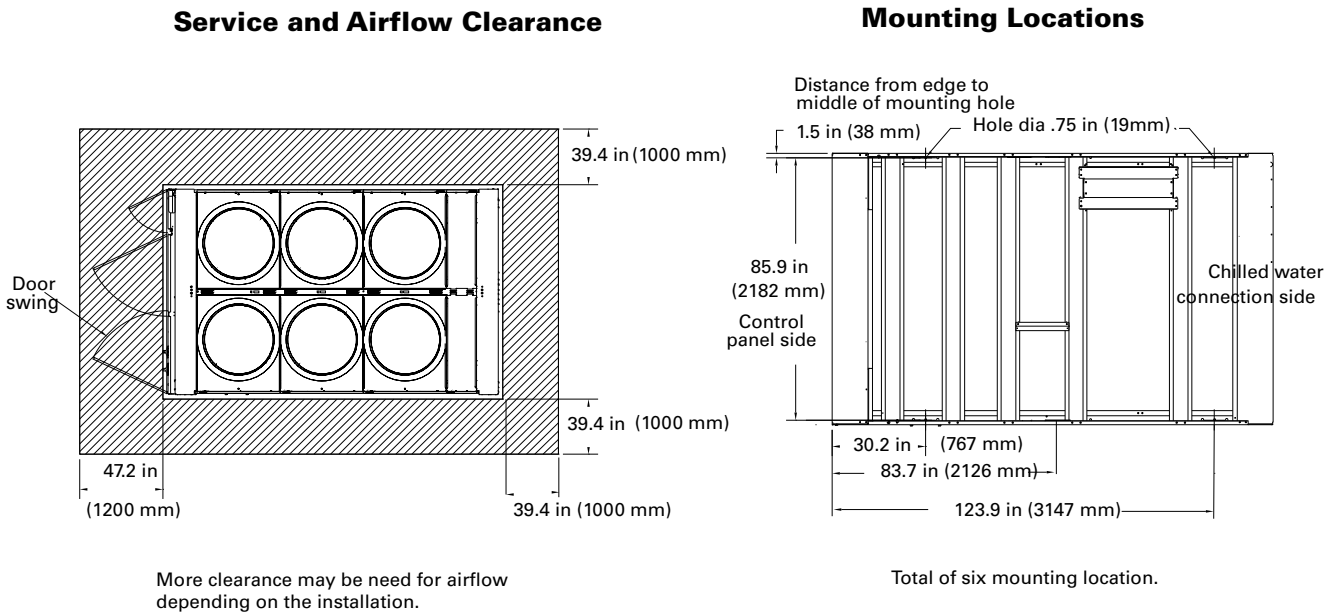
Total of six mounting locations.

Figure 16. CGAM 80 and 90 ton — no options



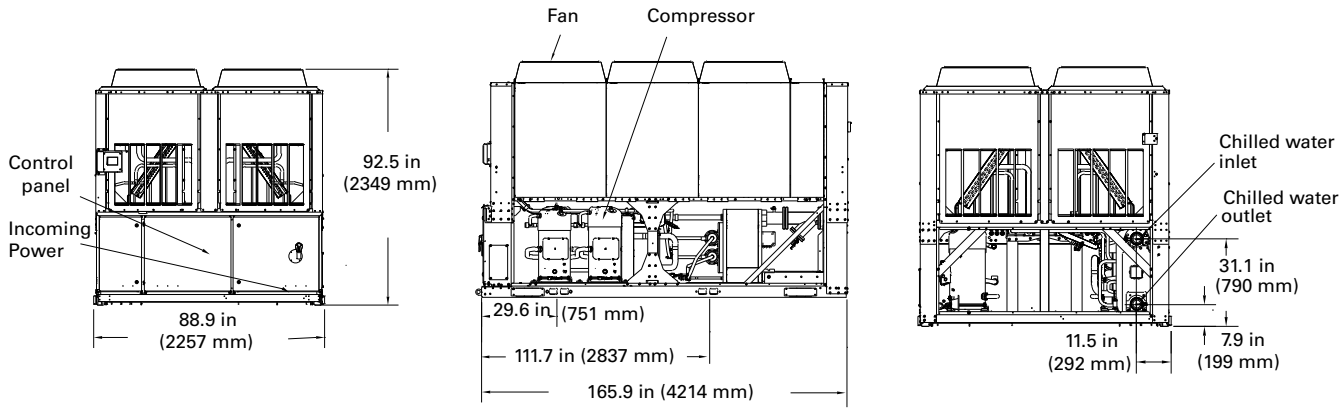
Note: *When facing the control panel, circuit 1 is on the right side of unit.*

Figure 17. CGAM 80 and 90 ton - service clearances and mounting locations



Unit Dimensions/Weights

Figure 18. CGAM 100, 110 and 120 ton — no options



The number of fans shown does not represent the number of fans installed.

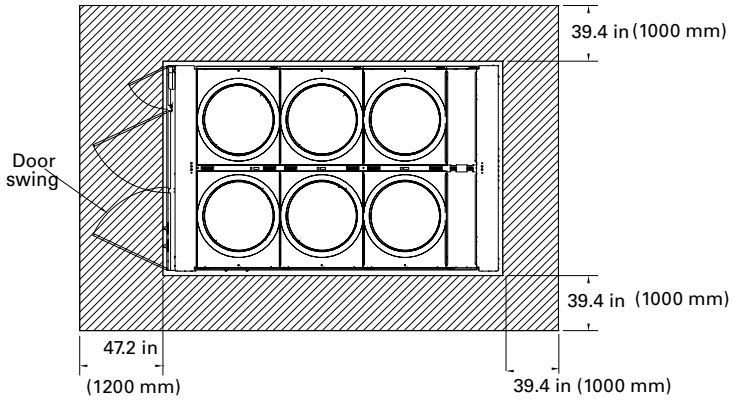
Water connections are 5.4 in (139 mm) from unit end.

Note: *When facing the control panel, circuit 1 is on the right side of unit.*

Figure 19. CGAM 100, 110 and 120 ton — service clearances and mounting locations

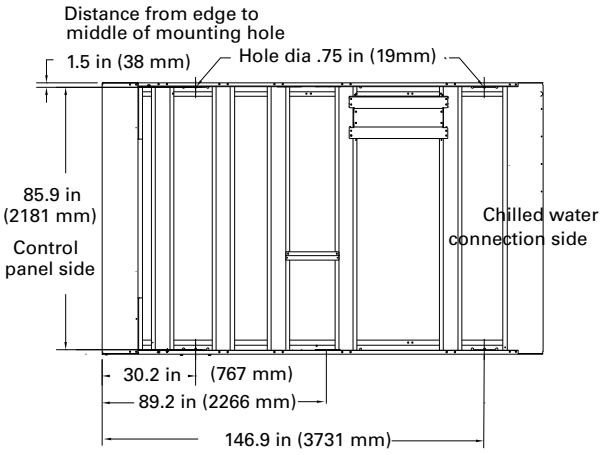
Service and Airflow Clearance

The number of fans shown does not represent the number of fans installed.



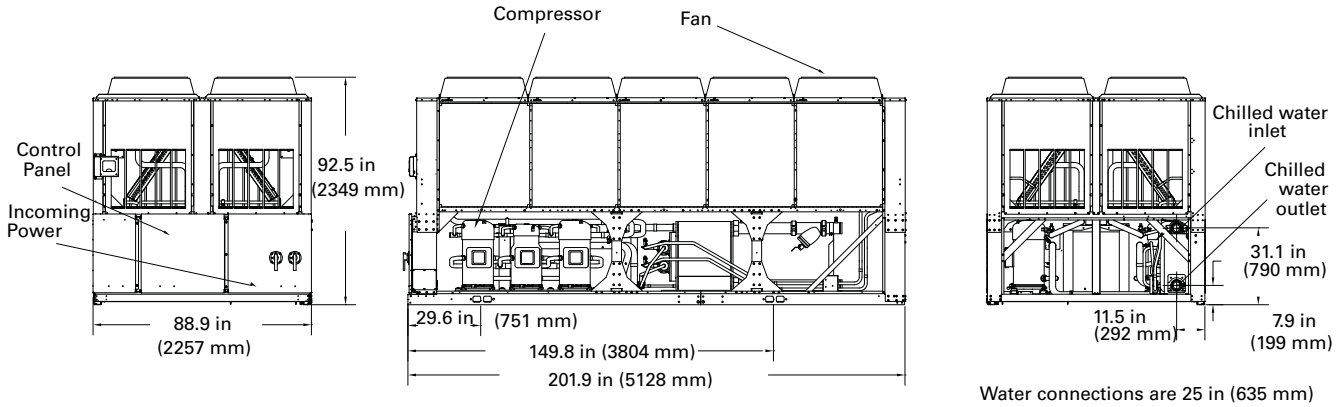
More clearance may be needed for airflow depending on the installation.

Mounting Locations



Total of six mounting locations.

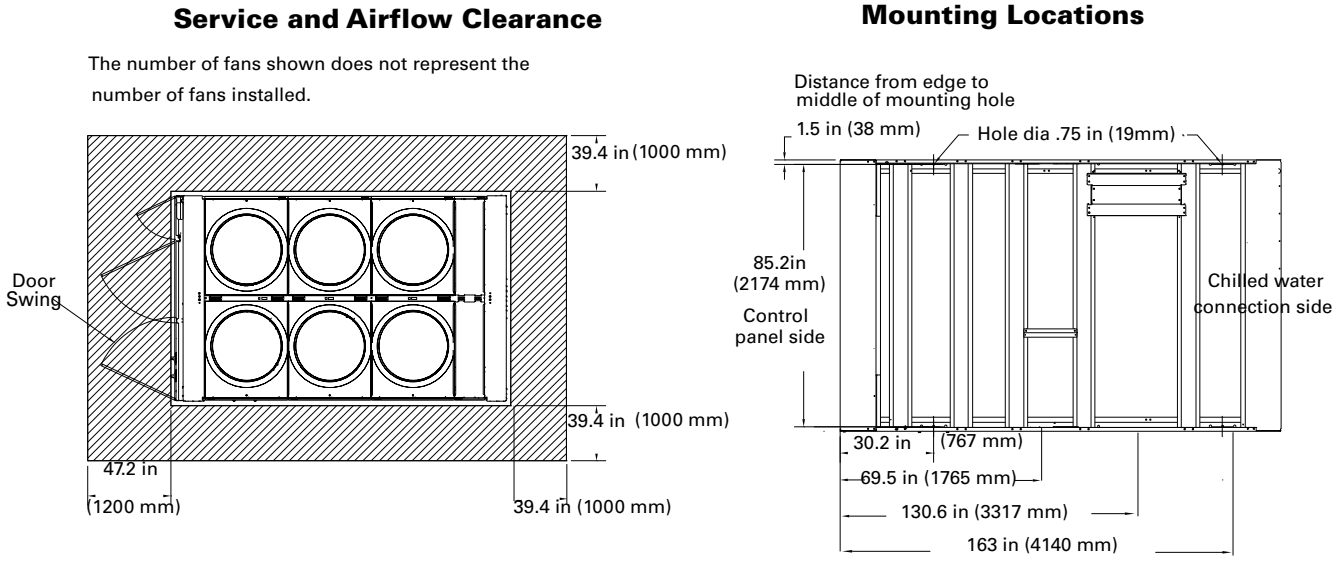
Figure 20. CGAM 130 ton — no options



Water connections are 25 in (635 mm) from unit end.

Note: *When facing the control panel, circuit 1 is on the right side of unit.*

Figure 21. CGAM 130 ton — service clearances and mounting locations



More clearance may be needed for airflow depending on the installation.

Total of eight mounting locations.

Unit Dimensions - CGAM with Options
Pump Package, Buffer Tank, Partial Heat Recovery

Figure 22. CGAM 20 and 26 ton — pump package, buffer tank, partial heat recovery

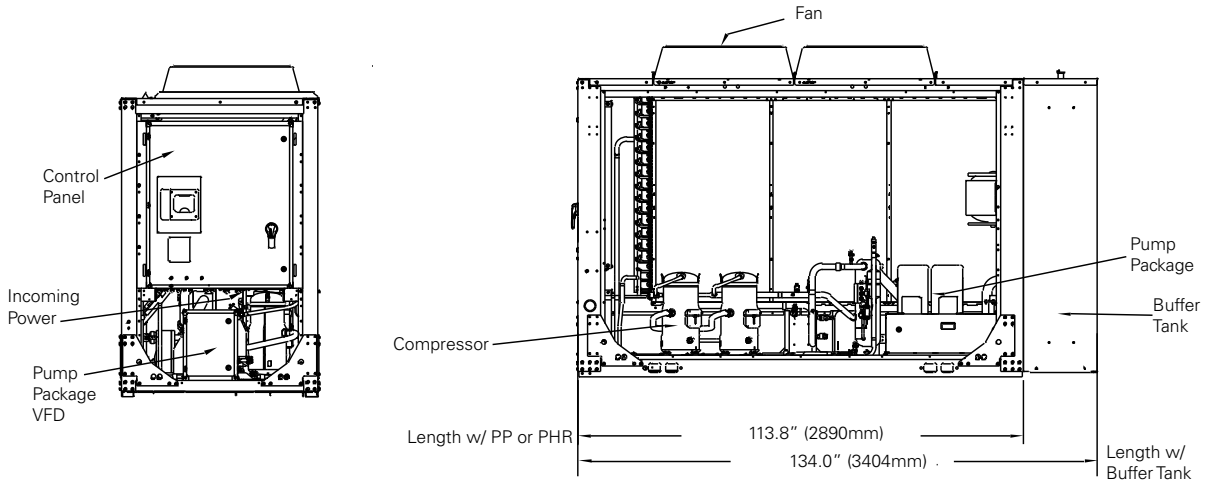


Figure 23. CGAM 30 and 35 ton — pump package, buffer tank, partial heat recovery

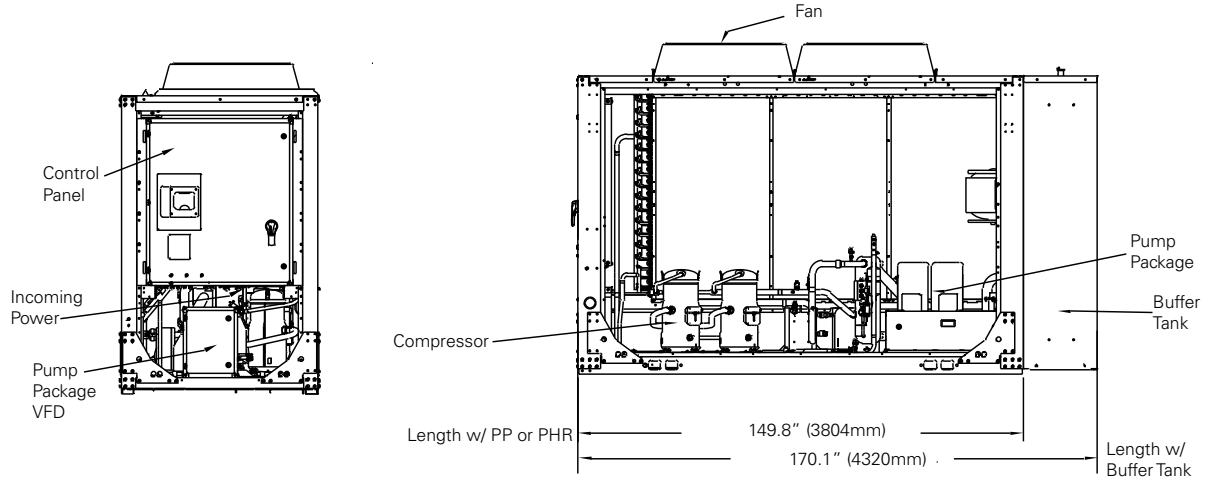


Figure 24. CGAM 40 and 52 ton — pump package, buffer tank, partial heat recovery

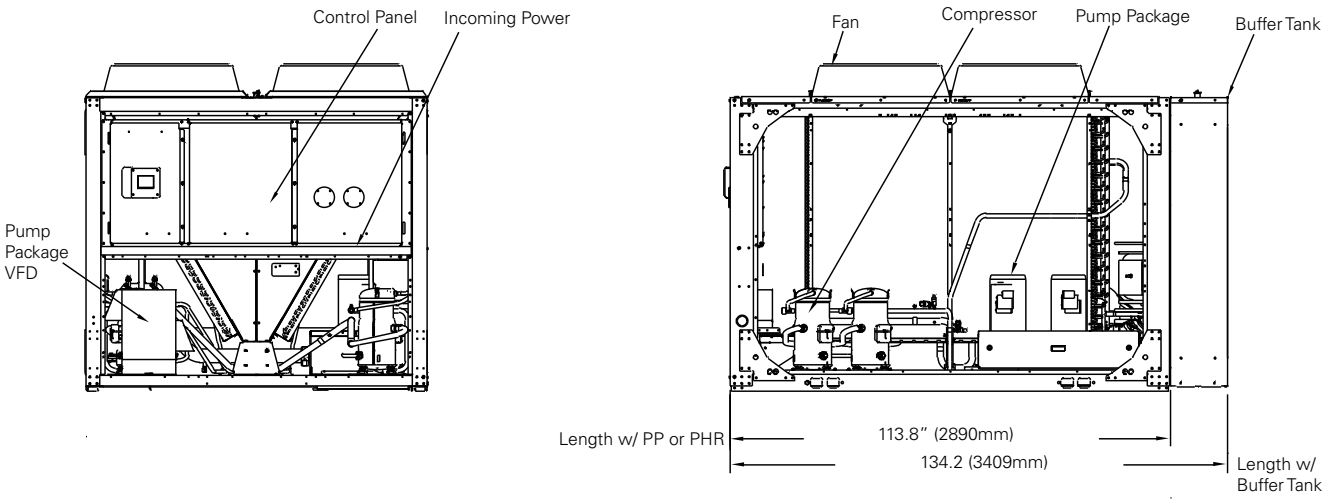


Figure 25. CGAM 60 and 70 ton — pump package, buffer tank, partial heat recovery

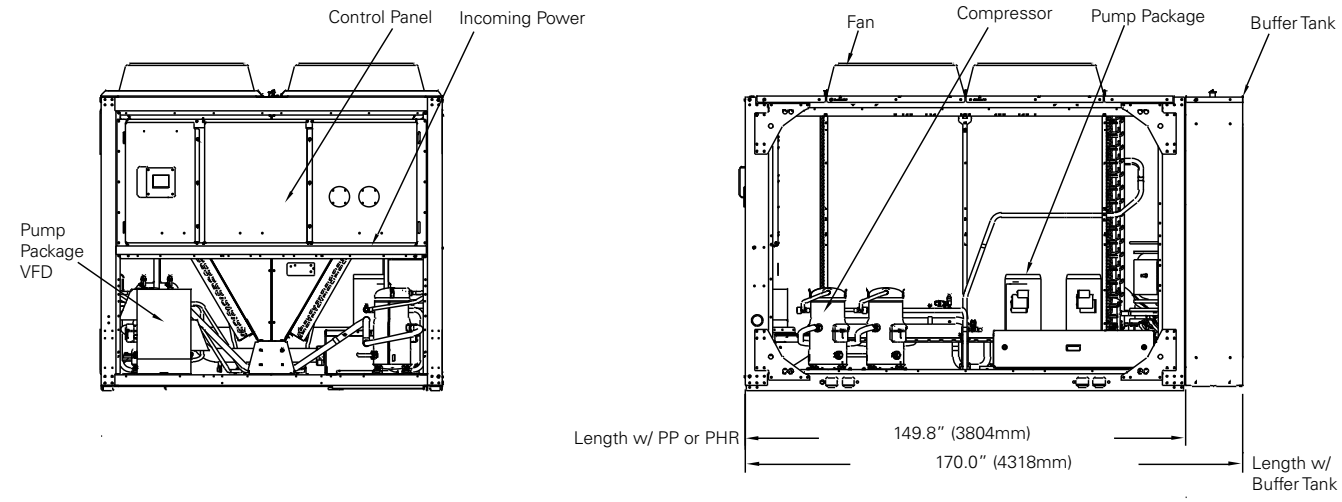
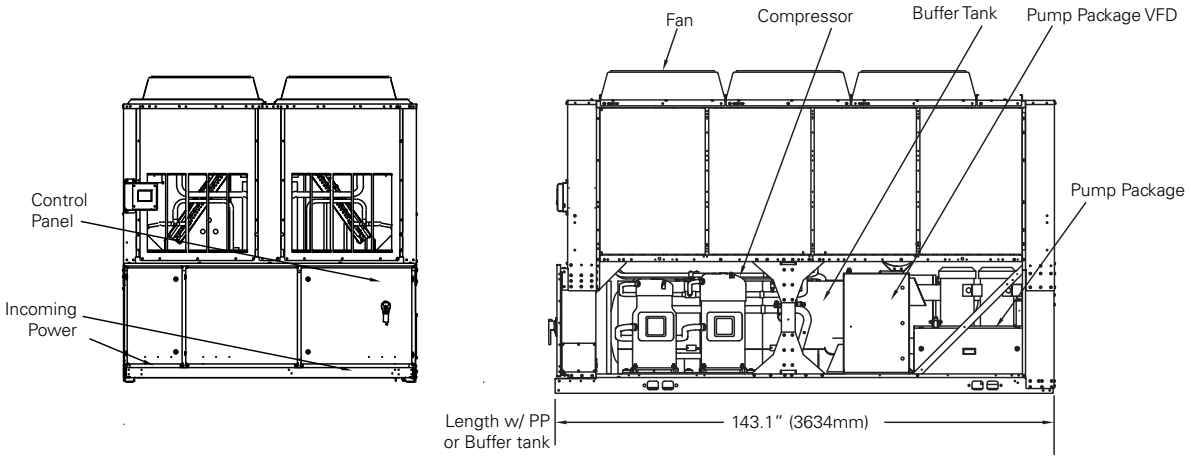
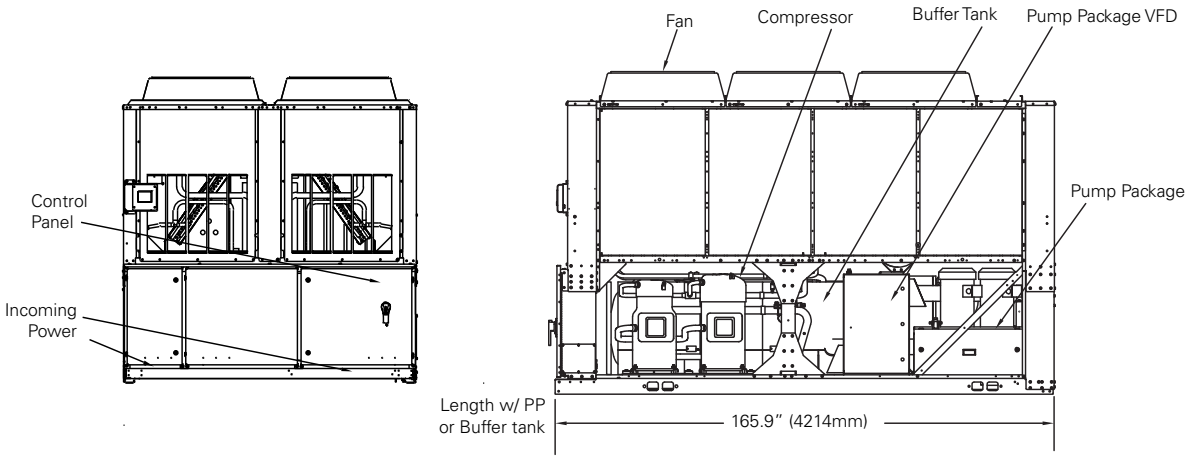


Figure 26. CGAM 80 and 90 ton — pump package, buffer tank, partial heat recovery



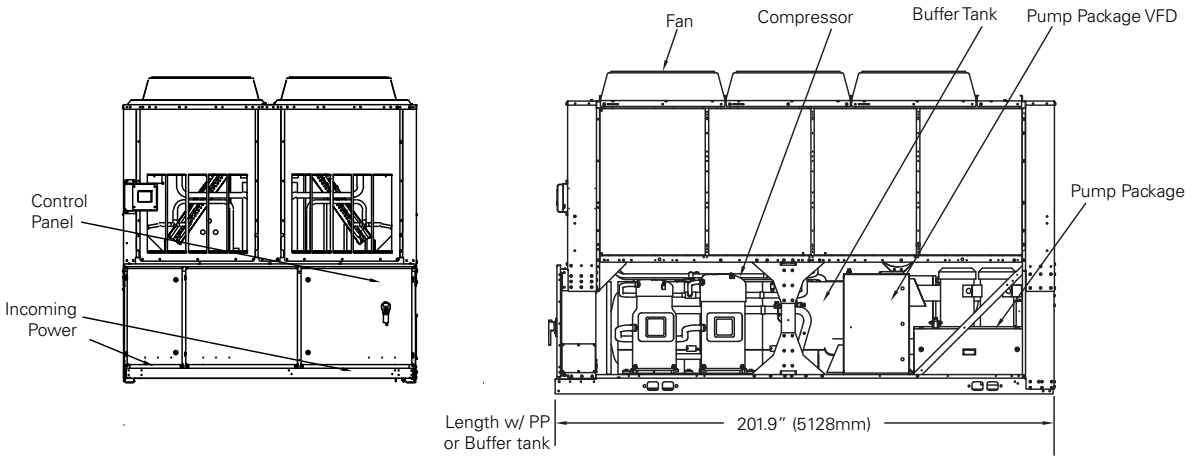
NOTE: For PHR units, add 2.21" (56mm) to overall length.

Figure 27. CGAM 100, 110 and 120 ton — pump package, buffer tank, partial heat recovery



NOTE: For PHR units, add 2.21" (56mm) to overall length.

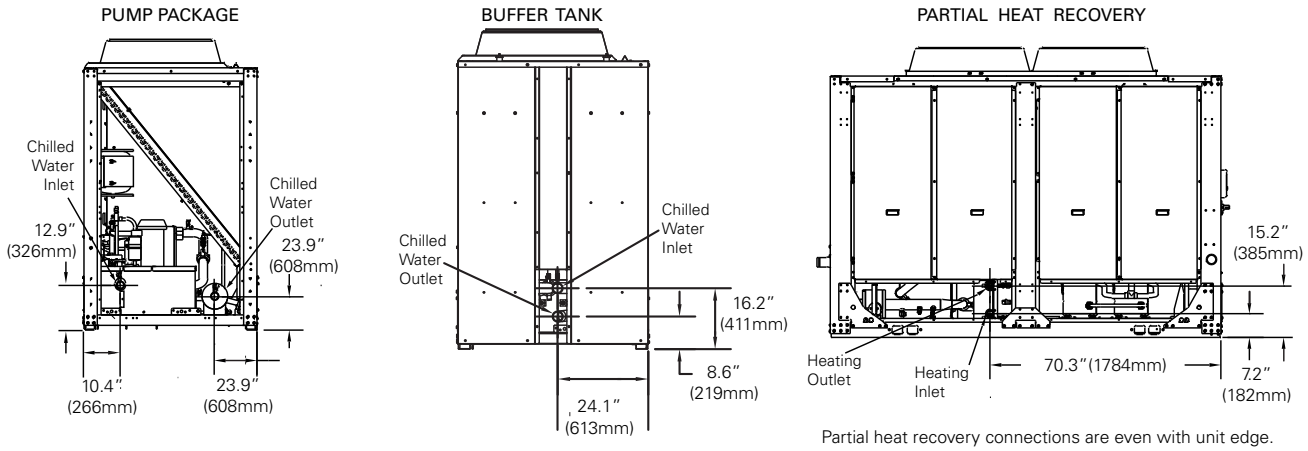
Figure 28. CGAM 130 ton — pump package, buffer tank, partial heat recovery



NOTE: For PHR units, add 2.21" (56mm) to overall length.

Water Connections - CGAM Units with Options Pump Package, Partial Heat Recover and Buffer Tank

Figure 29. CGAM 20 and 26 ton — pump package, buffer tank, partial heat recovery unit water connections

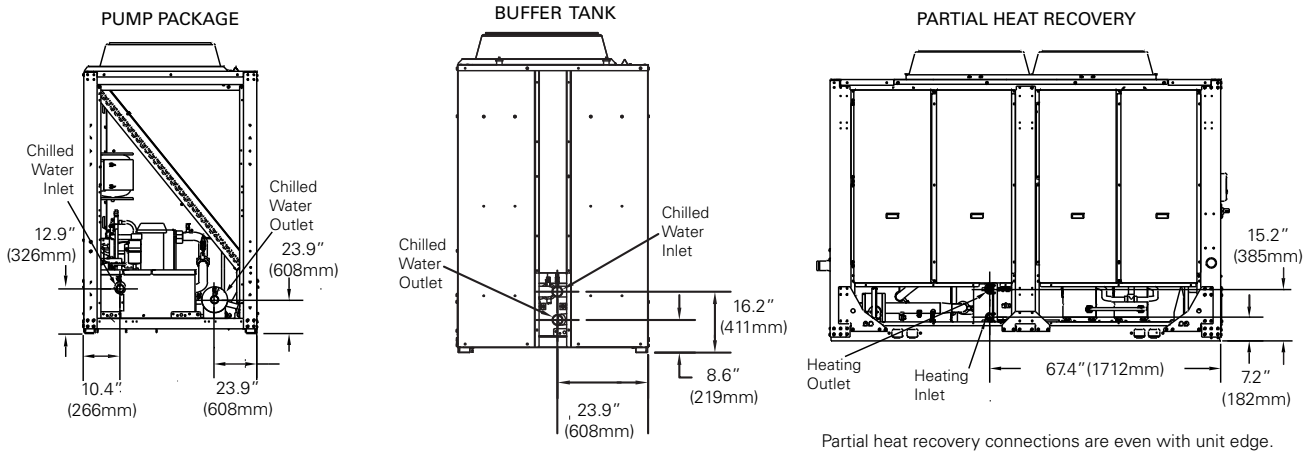


Water connections are recesssed 1.3" (33mm) from unit end.

Water connections are recesssed from unit end.
Inlet: 3.2" (81mm)
Outlet: 10.3" (262mm)

Partial heat recovery connections are even with unit edge. The chilled water inlet and outlet connections are the same as the standard unit unless pump package or buffer tank are ordered.

Figure 30. CGAM 30 and 35 ton — pump package, buffer tank, partial heat recovery unit water connections

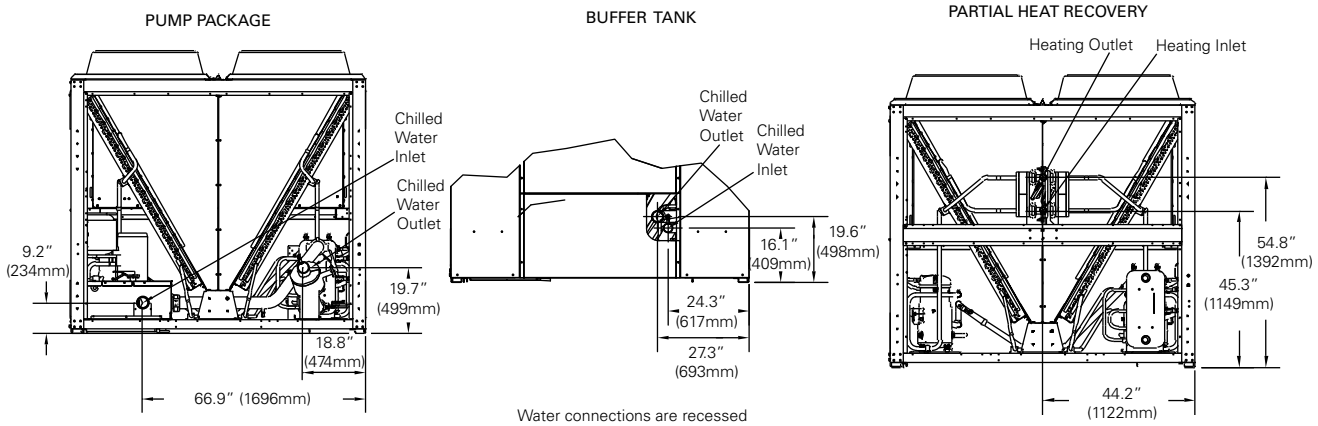


Water connections are recesssed 1.3″ (33mm) from unit end.

Water connections are recesssed from unit end.
Inlet: 3.2″ (81mm)
Outlet: 10.3″ (262mm)

Partial heat recovery connections are even with unit edge. The chilled water inlet and outlet connections are the same as the standard unit unless pump package or buffer tank are ordered.

Figure 31. CGAM 40 and 52 ton —pump package, buffer tank, partial heat recovery unit water connections



Water connections are recessed 1.3″ (33mm) from unit end.

Water connections are recessed from unit end:
Inlet:3.2″ (81mm)
Outlet: 8.5″ (216mm)

Partial heat recovery connections are even with unit end. The chilled water connections are the same as the standard unit unless pump packageor buffer tank are ordered.

Figure 32. CGAM 60 and 70 ton — pump package, buffer tank, partial heat recovery unit water connections

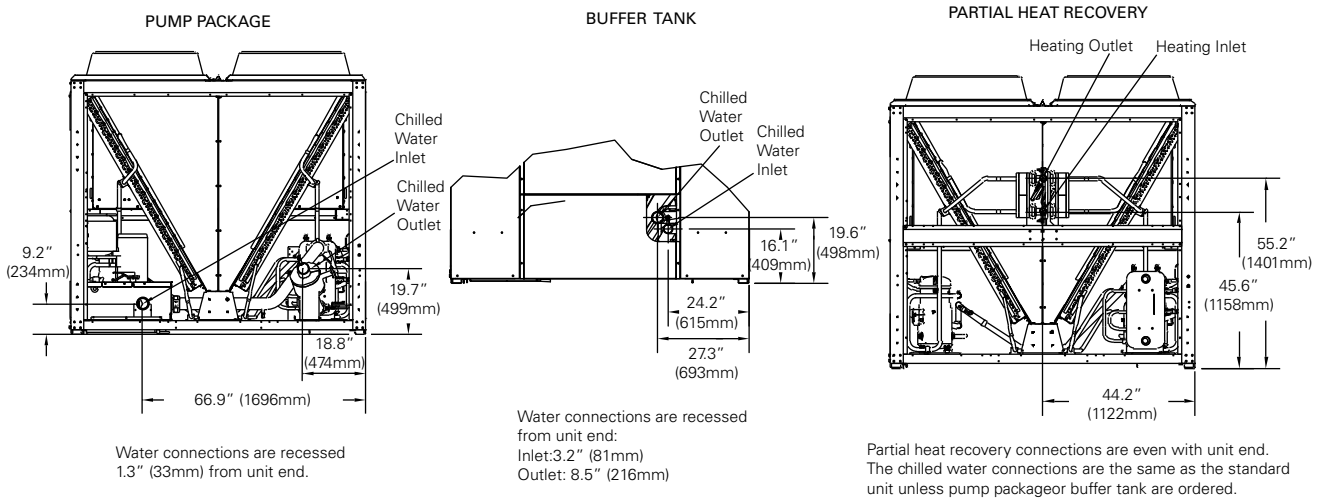
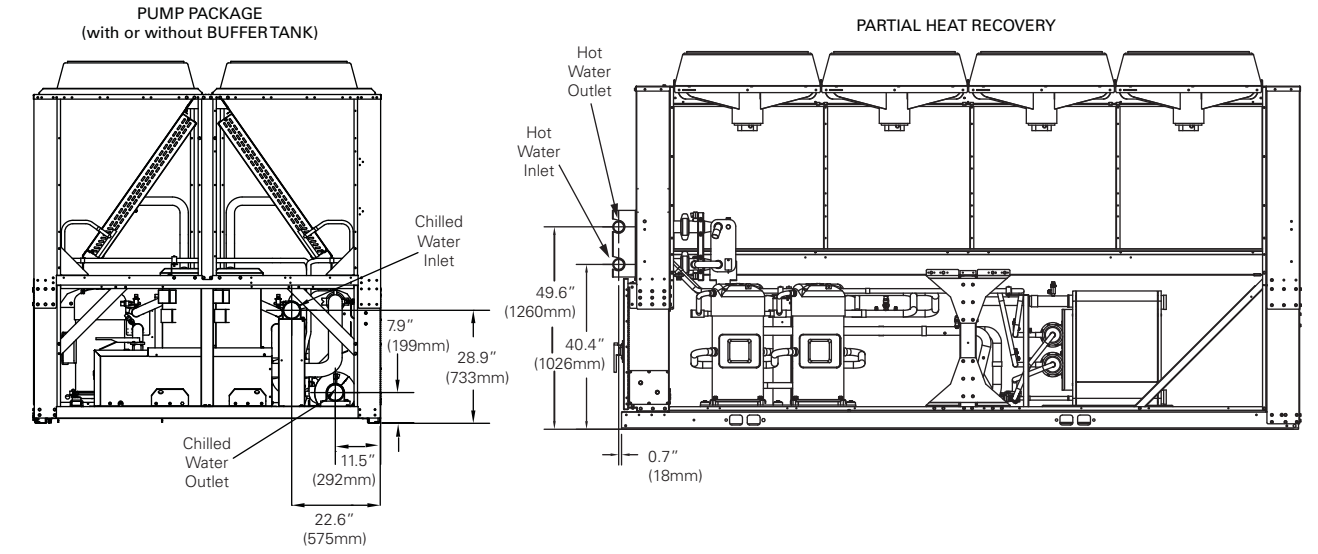


Figure 33. CGAM 80 -130 ton — pump package, buffer tank, partial heat recovery unit water connections[(a)]



(a) See Table 5 for water connections distance from end/side of unit.

Table 5. Water connections —80-130 tons with options - in (mm)

	Pump Package		Buffer Tank		Partial Heat Recovery	
	Distance from End of Unit		Distance from End of Unit		Distance from Side of Unit	
Unit Size	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
80, 90T	5.9 (151)	5.9 (151)	6.2 (158)	6.2 (158)	1.1 (28)	1.1 (28)
100, 110, 120T	5.9 (151)	5.9 (151)	6 (153)	6 (153)	1.1 (28)	1.1 (28)
130T	6.3 (159)	25 (635)	5.9 (150)	27.7 (703)	1.1 (28)	1.1 (28)

Weights

Table 6. Weights - 60 Hz

Tons	Base Unit Without Pump				Base Unit With Pump				Base Unit With Pump and Buffer Tank				Partial Heat Recovery - add				Copper - add	
	Shipping		Operating		Shipping		Operating		Shipping		Operating		Shipping		Operating			
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
20	2185	991	2207	1002	2726	1236	2814	1277	3253	1475	3964	1799	39	18	24	11	258	117
26	2249	1020	2278	1034	2790	1265	2891	1311	3317	1504	4035	1830	39	8	31	14	258	117
30	2846	1291	2879	1306	3388	1537	3496	1586	3915	1776	4636	2103	47	21	36	16	360	163
35	2878	1305	2919	1325	3420	1551	3545	1608	3947	1790	4676	2121	47	21	44	20	360	163
40	3666	1663	3696	1677	4285	1944	4382	1988	4876	2212	5524	2506	94	43	34	15	515	234
52	3761	1706	3805	1726	4379	1986	4505	2044	4970	2254	5633	2555	94	43	49	22	515	234
60	4978	2258	5032	2283	5814	2637	5984	2715	6405	2905	7102	3222	111	50	59	27	719	326
70	5045	2289	5119	2323	5881	2668	6092	2764	6472	2936	7190	3262	111	50	80	36	719	326
80	5607	2543	5691	2582	6486	2942	6788	3080	7077	3210	7969	3615	170	77	90	41	1270	576
90	5859	2658	5959	2704	6738	3056	7073	3209	7329	3324	8237	3737	170	77	109	49	1270	576
100	6646	3015	6757	3066	7549	3424	7907	3587	8265	3749	9419	4273	178	81	120	54	1511	686
110	6724	3050	6844	3105	7627	3460	8003	3631	8343	3785	9506	4313	178	81	129	59	1511	686
120	6762	3067	6882	3122	8018	3637	8393	3808	8734	3962	9896	4490	178	81	131	60	1511	686
130	7753	3517	7898	3583	9006	4085	9427	4277	9722	4410	10905	4947	178	81	156	71	1889	857

Notes:
1. Weights based on aluminum fins, refrigerant charge, isolators, circuit breakers and louvers.
2. Base unit weights are shown above on the left side for units without a pump package, units with a pump package and units with both pump package buffer tank options. The partial heat recovery and copper weights are in addition to the base unit weights.
3. All weights ±3%.

Table 7. Weights - 50 Hz

Tons	Base Unit				Partial Heat Recovery - add					
	Shipping		Operating		Shipping		Operating		Copper - add	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
20	2187	992	2209	1002	39	18	24	11	258	117
26	2249	1020	2278	1034	39	18	31	14	258	117
30	2845	1291	2879	1306	47	21	36	16	360	163
35	2877	1305	2919	1325	47	21	44	20	360	163
40	3665	1663	3696	1677	94	43	34	15	515	234
52	3760	1706	3805	1726	94	43	48	22	515	234
60	4977	2258	5032	2283	111	50	59	27	719	326
70	5044	2289	5119	2323	111	50	79	36	719	326
80	5606	2543	5691	2582	170	77	90	41	1270	576
90	5857	2657	5958	2703	170	77	107	49	1270	576
100	6628	3007	6741	3059	178	81	118	54	1511	686
110	6711	3045	6833	3100	178	81	129	59	1511	686
120	6756	3065	6878	3121	178	81	129	59	1511	686

Notes:
1. Weights based on aluminum fins, refrigerant charge, isolators, circuit breakers and louvers.
2. The partial heat recovery and copper weights are in addition to the base unit weights.
3. All weights ±3%.

Installation - Mechanical

Location Requirements

Sound Considerations

- Refer to *Trane Engineering Bulletin Chiller Sound Ratings and Installation Guide* CG-PRB010-EN for sound consideration applications.
- Locate the unit away from sound-sensitive areas.
- Install the optional elastomeric isolators under the unit. Refer to "Unit Isolation."
- Chilled water piping should not be supported by chiller frame.
- Install rubber vibration isolators in all water piping.
- Seal all wall penetrations.

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

Foundation

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

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. Refer to the chapter on "Unit Dimensions/Weights" for minimum clearances. In all cases, local codes which require additional clearances will take precedence over these recommendations.

Rigging

Refer to Unit Dimensions/Weights section for typical unit lifting weights. Refer to the rigging label attached to the unit for further details.

Lifting Procedure

⚠WARNING

Heavy Objects!

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. Other lifting arrangements could cause equipment or property damage. Failure to follow instructions above or properly lift unit could result in unit dropping and possibly crushing operator/ technician which could result in death or serious injury.

⚠WARNING

Improper Unit Lift!

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

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
  - If the unit CG is closer to the control panel, the straps on the control panel side of the spreader bar must be adjusted to be shorter than those on the opposite side of the spreader bar, allowing the spreader bar to move toward the control panel and over the unit CG. 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 34, p. 33 for illustration.

Figure 34. H-type spreader bar adjustment for level unit lift

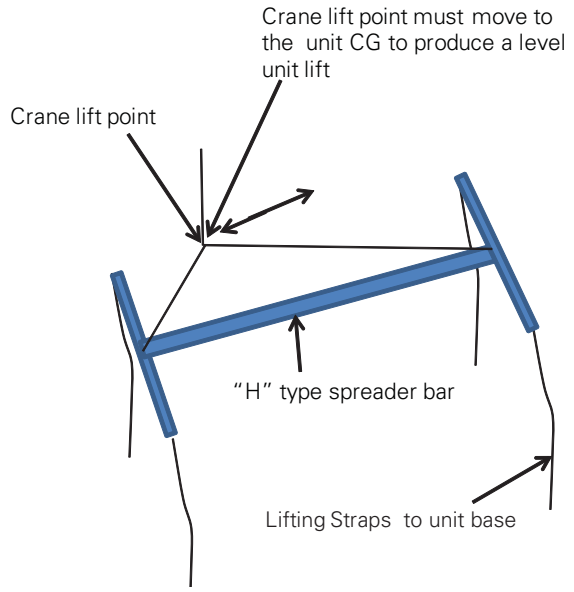


Figure 35. CGAM slant 20-35 ton rigging

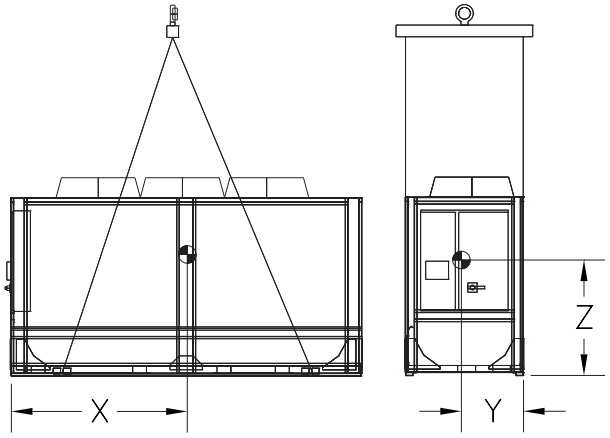


Figure 36. CGAM V 40-70 Ton Rigging

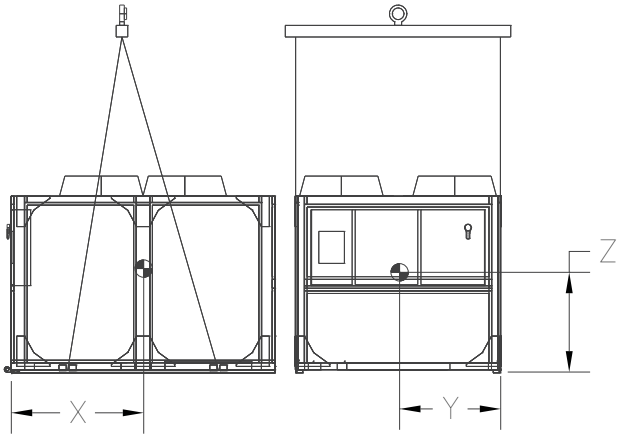


Figure 37. CGAM W 80-130 Ton Rigging

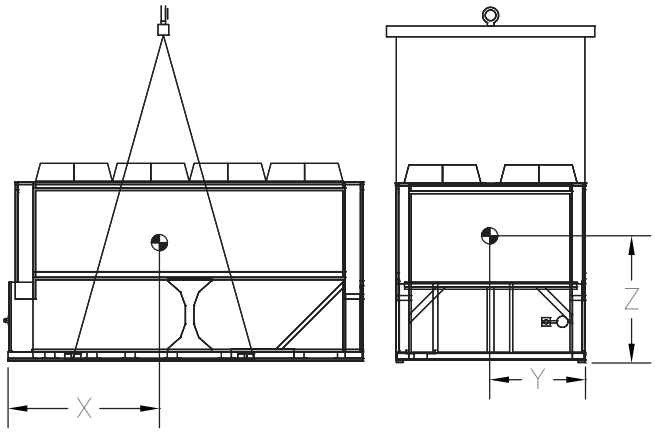


Table 8. CGAM center of gravity (in) - 60 Hz

Unit (tons)	Aluminum fins									Copper fins								
	Base Unit			With Pump Package			With Pump Pkg, Buffer Tank			Base Unit			With Pump Package			With Pump Pkg, Buffer Tank		
	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
Units without partial heat recovery																		
20	50	24	38	56	23	34	67	23	35	51	24	39	57	23	35	67	23	35
26	49	24	38	56	23	33	67	23	34	51	24	39	57	23	34	67	23	35
30	63	23	38	71	23	34	83	23	35	65	23	39	72	23	35	83	23	36
35	63	23	38	72	22	34	84	23	35	65	23	39	73	23	35	83	23	36
40	48	45	37	53	42	34	62	43	35	50	45	38	53	42	35	61	43	36
52	49	45	37	53	43	34	61	43	34	50	45	38	53	43	35	61	43	35
60	61	45	38	67	43	34	76	43	35	63	45	38	68	43	35	76	43	36
70	62	46	37	68	43	34	76	43	35	63	45	38	68	43	35	76	43	35
80	59	47	38	68	46	37	68	46	35	62	46	42	69	46	41	68	46	39
90	59	47	37	68	46	36	67	46	34	61	46	41	68	46	40	68	46	38
100	72	47	38	82	46	37	81	46	35	75	46	42	82	46	41	81	46	39
110	72	47	38	81	46	37	80	46	35	74	46	42	81	46	41	81	46	39
120	72	47	38	83	46	36	82	46	35	74	46	42	83	46	40	83	46	38
130	86	47	39	100	46	38	100	46	36	89	46	44	100	46	42	101	46	40
Units with partial heat recovery																		
20	50	24	38	57	23	33	67	23	34	52	24	39	57	23	35	67	24	35
26	50	24	37	56	23	33	67	23	34	51	24	38	57	23	34	67	23	35
30	63	23	37	71	23	34	83	23	34	65	23	38	72	23	35	83	23	35
35	63	23	37	71	23	34	83	23	34	65	23	38	73	23	35	83	23	35
40	50	45	37	54	42	34	62	43	35	51	45	38	54	43	35	62	43	36
52	50	45	37	54	43	34	62	43	35	51	45	38	54	43	35	62	43	35
60	63	45	38	69	43	35	77	43	35	64	45	38	69	43	36	77	43	36
70	63	46	38	69	43	34	77	43	35	65	45	38	70	43	35	77	43	36
80	58	47	38	67	46	37	67	46	35	61	46	42	68	46	41	67	46	39
90	58	47	37	67	46	36	66	46	35	60	46	41	67	46	40	67	46	39
100	71	47	38	80	46	37	79	46	35	73	46	42	81	46	41	80	46	39
110	71	47	38	80	46	37	79	46	35	73	46	42	80	46	41	80	46	39
120	70	47	38	82	46	36	81	46	35	73	46	42	82	46	40	82	46	39
130	84	46	39	98	46	38	99	46	36	88	46	44	99	46	42	100	46	40

Table 9. CGAM center of gravity (in) - 50 Hz

Unit (tons)	Aluminum fins									Copper fins								
	Base Unit			With Pump Package			With Pump Pkg, Buffer Tank			Base Unit			With Pump Package			With Pump Pkg, Buffer Tank		
	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
Units without partial heat recovery																		
20	49	24	38	54	23	35	66	23	36	51	24	39	55	23	36	66	24	36
26	49	24	38	54	23	34	66	23	35	51	24	39	55	23	36	65	23	36
30	63	23	38	69	23	35	82	23	36	65	23	39	70	23	36	82	23	37
35	63	23	38	69	23	35	82	23	35	65	23	39	71	23	36	82	23	36
40	48	45	37	52	43	35	61	43	35	50	45	38	52	43	36	60	43	36
52	49	45	37	52	43	34	61	43	35	50	45	38	53	43	35	60	43	36
60	61	45	38	67	43	34	76	43	35	63	45	38	68	43	35	75	43	36
70	62	46	37	67	43	34	76	43	35	63	45	38	68	43	35	76	43	36
80	59	47	38	68	46	37	67	46	35	62	46	42	69	46	41	68	46	39
90	59	47	37	67	46	36	67	46	35	61	46	41	68	46	40	67	46	38
100	72	47	38	81	46	37	80	46	35	74	46	42	81	46	41	80	46	39
110	72	47	38	81	46	37	80	46	35	74	46	42	81	46	41	80	46	39
120	72	47	38	82	46	36	81	46	35	74	46	42	82	46	40	81	46	39
Units with partial heat recovery																		
20	49	24	38	54	23	34	66	24	35	51	24	39	55	24	36	66	24	36
26	50	24	37	54	23	34	66	24	35	51	24	38	55	23	35	65	24	36
30	63	23	37	68	23	35	81	23	35	65	23	38	70	23	36	81	23	36
35	63	23	37	69	23	34	82	23	35	65	23	38	71	23	35	82	23	36
40	50	45	37	53	43	35	62	43	35	51	45	38	53	43	36	61	43	36
52	50	45	37	53	43	35	62	43	35	51	45	38	54	43	35	61	43	36
60	63	45	38	68	43	35	77	43	35	64	45	38	69	43	36	76	43	36
70	63	46	38	69	43	35	77	43	35	65	45	38	69	43	35	77	43	36
80	58	47	38	67	46	37	66	46	35	61	46	42	68	46	41	67	46	39
90	58	47	37	66	46	36	66	46	35	60	46	41	67	46	40	67	46	39
100	70	47	38	79	46	37	79	46	36	73	46	42	80	46	41	79	46	39
110	70	47	38	79	46	37	79	46	35	73	46	42	80	46	41	79	46	39
120	70	47	38	80	46	37	80	46	35	73	46	42	81	46	40	80	46	39

Unit Isolation and Leveling

Mounting

Construct an isolated concrete pad for the unit or provide concrete footings at each of the four unit mounting points. Mount the unit directly to the concrete pads or footings.

Level the unit using the base rail as a reference. The unit must be level within 1/4" over the entire length. Use shims as necessary to level the unit.

Elastomeric Isolator Installation (optional)

Install the optional neoprene isolators at each mounting location. Isolators are identified by part number and color.

1. Secure the isolators to the mounting surface, using the mounting slots in the isolator base plate, as shown in Figure 38. Do not fully tighten the isolator mounting bolts at this time.
2. Align the mounting holes in the base of the unit, with the threaded positioning pins on the top of isolators.
3. Lower the unit on to the isolators and secure the isolator to the unit with a nut. Level the unit carefully. Refer to "Leveling". Fully tighten the isolator mounting bolts.

Figure 38. CGAM Elastomeric isolator

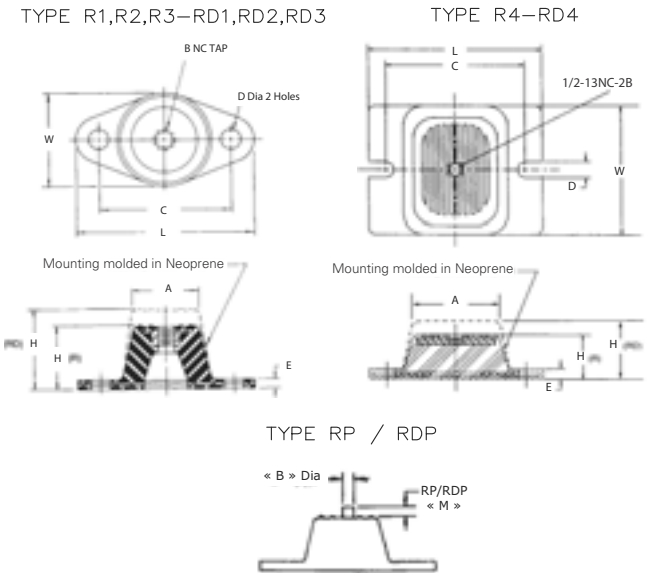


Table 10. CGAM elastomeric rated isolator

Ext	Max Load (lbs)	Color	Maximum Deflection (in)	Type
57	250	Black	0.50	RDP3-WR
58	525	Red		
59	750	Green		
60	1100	Gray		
61	1500	Brown	0.50	RDP4-WR
62	2250	Red		
63	3000	Green		
64	4000	Gray		

Ext	A	B	C	D	E	H	L	M	W
57 58 59 60	2.5	.5	4.12	.56	.25	2.88	5.5	1.13	3.38
61 62 63 64	3.0	.5	5.0	.56	.38	2.75	6.25	1.60 ±.25	4.63

Seismically Rated Isolator Installation

Seismically rated isolators are required for OSHPD seismically rated units, and optional for IBC seismically rated units.

Isolators are identified by part number and color. See Table 11, p. 36. For dimensions, see Figure 39 and Figure 40, p. 37. Install the optional seismically rated isolators at each mounting location .

Table 11. CGAM seismically rated isolator

Model	Rated Load (lbs)	Rated Deflection (in)	Spring Rate (lbs/in)	Color Code
MSSH-1E-530N	530	1.17	453	Black/Dk Blue
MSSH-1E-825N	825	1.07	769	Red/ Dk Blue
MSSH-1E-1000	1000	1.00	1000	Tan
M2SS-1E-800	800	1.32	606	Black
M2SS-1E-1060N	1060	1.17	906	Black/Dk Blue
M2SS-1E-1300	1300	1.05	1240	Red
M2SS-1E-1650N	1650	1.07	1538	Red/Dk Blue
M2SS-1E-2000	2000	1.00	2000	Tan
M2SS-1E-2400N	2400	1.04	2300	Tan/Dk Blue

Figure 39. MSSH seismically rated isolator

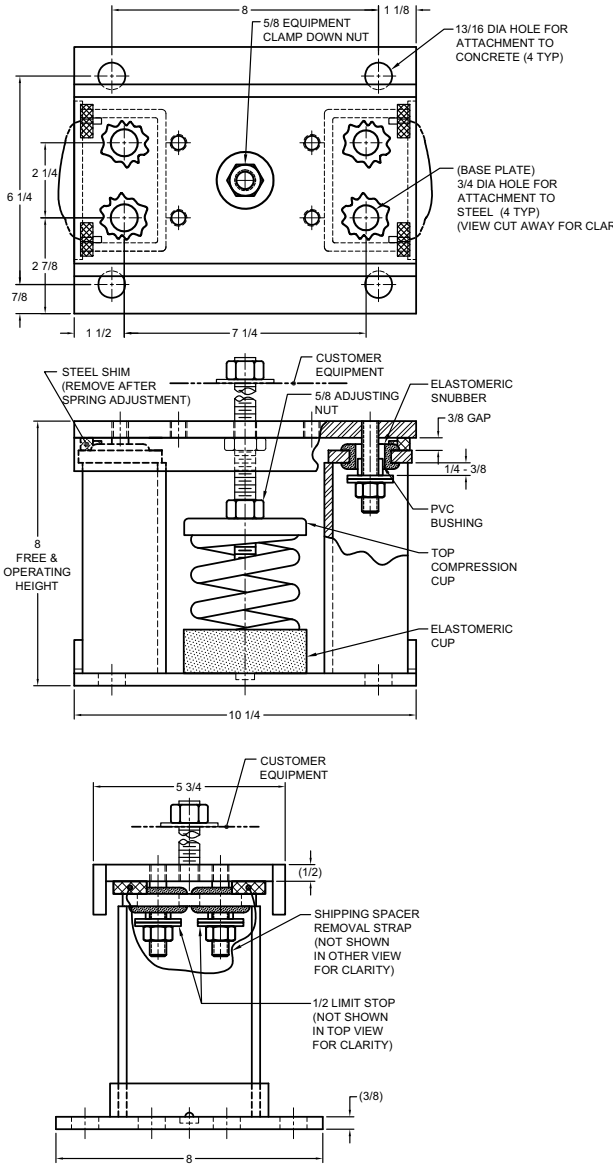
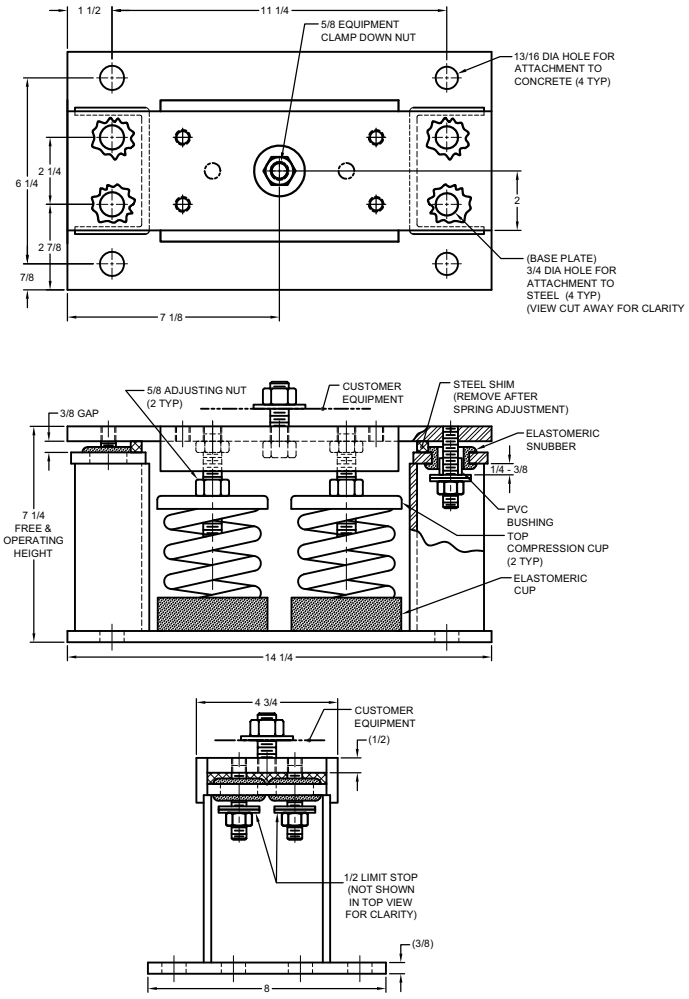


Figure 40. M2SS seismically rated isolator



Installation of Seismically Rated Isolators

See Figure 41 and Figure 42, p. 38 for reference.

Figure 41. MSSH Seismic isolator installation reference

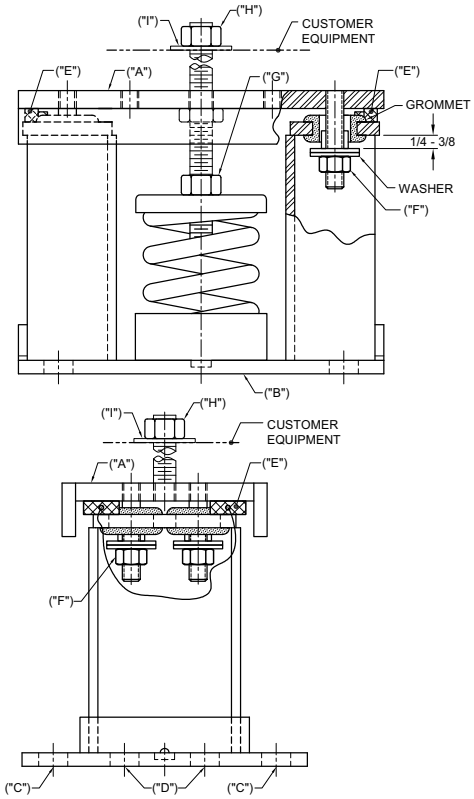
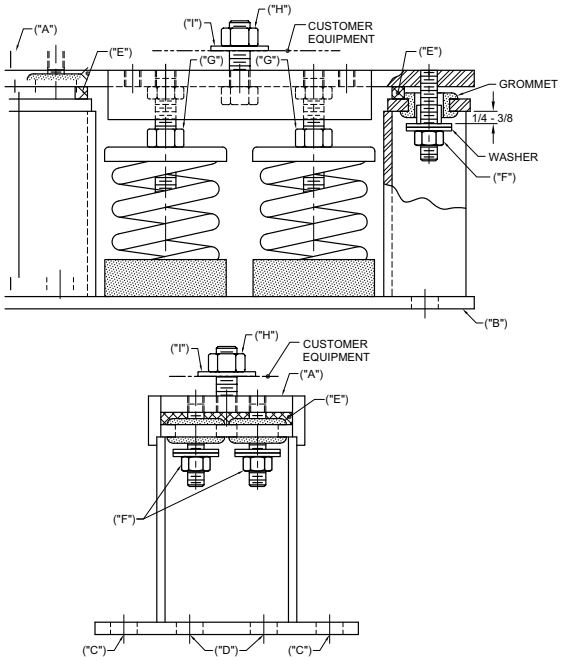


Figure 42. M2SS Seismic isolator installation reference

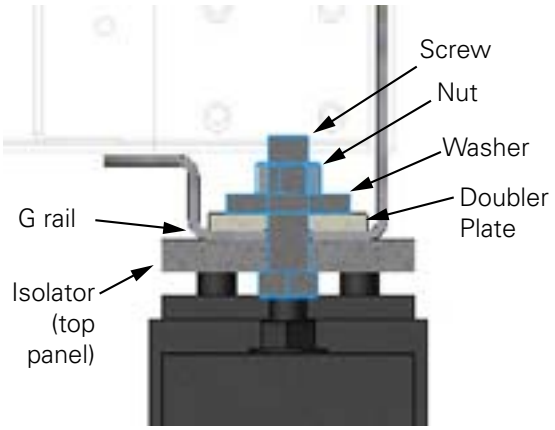


1. Set isolators on mounting surface, ensuring that all isolator centerlines match the submittal drawing. All isolator base plates (B) must be installed on a level surface. Shim or grout as required, leveling all isolat(or base plates at the same elevation.
2. Anchor all isolators to the surface using thru holes (C) for concrete or (D) for steel as require. Welding to steel is permitted providing the weld achieves the required strength.
3. Remove clamp down nut (H) and washer (I). Isolators are shipped with (2) removable spacer shims (E) between the top plate and the housing.

Important: *These shims MUST be in place when the equipment is positioned over the isolators.*

4. With all shims (E) in place, place the equipment onto the top plate (A) of the isolators.
5. Bolt equipment securely to the isolators using doubler plate (included in isolator kit), washer (I) and nut (H) as shown in Figure 43, p. 38.

Figure 43. Seismic isolator installation detail



Important: *The following adjustment process can only begin after the equipment or machine is at its full operating weight.*

6. Back off each of the (2) or (4) limit stop locknuts (F) per isolator 1/4-3/8".
7. Adjust each isolator in sequence by turning adjusting nut(s) (G) one full clockwise turn at a time. Repeat this procedure on all isolators, one at a time. check the limit stop locknuts (F) periodically to ensure that clearance between the washer and rubber grommet is maintained. Stop adjustment of an isolator only when the top plate (A) has risen just above the shim (E).
8. Remove all spacer shims (E).
9. Fine adjust isolators to level equipment.
10. Adjust all limit stop locknuts (F) per isolator to obtain 3/8" gap. the limit stop nuts must be kept at this 3/8" gap to ensure uniform bolt loading during uplift.

Mounting Point Locations and Weights

Figure 44. Mounting Point Locations

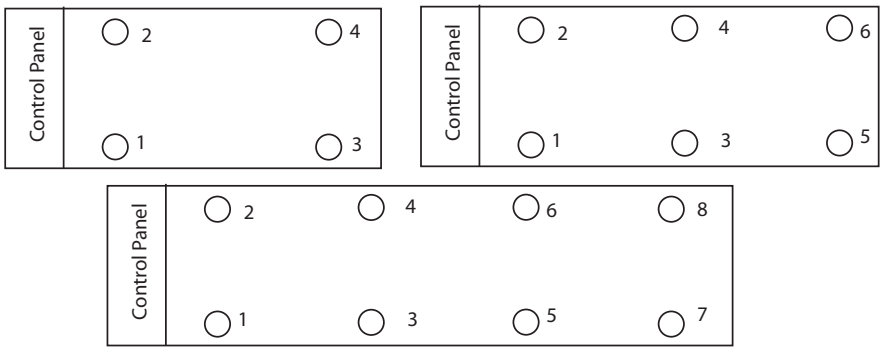


Table 12. Elastomeric isolator locations - base unit - with or without partial heat recovery

	Location							
Size (ton)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
20-26	RDP-3 Grey 60	RDP-3 Grey 60	RDP-3 Grey 60	RDP-3 Grey 60	-	-	-	-
30-35	RDP-4 Brown 61	RDP-4 Brown 61	RDP-3 Grey 60	RDP-3 Grey 60	-	-	-	-
40-52	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	-	-	-	-
60-70	RDP-4 Red 62	RDP-4 Red 62	RDP-3 Gray 60	RDP-4 Brown 61	RDP-3 Gray 60	RDP-3 Gray 60	-	-
80-120	RDP-4 Red 62	RDP-4 Green 63	RDP-4 Red 62	RDP-4 Red 62	RDP-3 Gray 60	RDP-3 Gray 60	-	-
130	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-3 Grey 60	RDP-3 Grey 60

Table 13. Elastomeric isolator locations - with pump package- with or without partial heat recovery

	Location							
Size (ton)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
20-26	RDP-4 Brown 61	RDP-3 Grey 60	RDP-3 Grey 60	RDP-3 Grey 60	-	-	-	-
30-35	RDP-4 Brown 61	RDP-4 Brown 61	RDP-4 Brown 61	RDP-4 Brown 61	-	-	-	-
40-52	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	-	-	-	-
60-90	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	-	-
100-120	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	-	-
130	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62

Table 14. Elastomeric isolator locations - with pump package and buffer tank option - with or without partial heat recovery

	Location							
Size (ton)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
20-35	RDP-3 Grey 60	RDP-3 Grey 60	RDP-4 Green 63	RDP-4 Green 63	-	-	-	-
40-52	RDP-4 Brown 61	RDP-4 Brown 61	RDP-4 Grey 64	RDP-4 Grey 64	-	-	-	-
60-70	RDP-4 Brown 61	RDP-4 Brown 61	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	-	-
80-90	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	RDP-4 Red 62	-	-
100-120	RDP-4 Grey 64	RDP-4 Grey 64	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	-	-
130	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63	RDP-4 Green 63

Table 15. Seismically rated isolator locations

	Locations							
Size (ton)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
20	MSSH-1E-825N Red/Dk Blue	MSSH-1E-825N Red/Dk Blue	MSSH-1E-530N Black/Dk Blue	MSSH-1E-530N Black/Dk Blue	-	-	-	-
26	MSSH-1E-1000 Tan	MSSH-1E-825N Red/Dk Blue	MSSH-1E-530N Black/Dk Blue	MSSH-1E-530N Black/Dk Blue	-	-	-	-
30	M2SS-1E-1300 Red	M2SS-1E-1060N Black/Dk Blue	M2SS-1E-800 Black	M2SS-1E-800 Black	-	-	-	-
35	M2SS-1E-1300 Red	M2SS-1E-1060N Black/Dk Blue	M2SS-1E-800 Black	M2SS-1E-800 Black	-	-	-	-
40	M2SS-1E-1300 Red	M2SS-1E-1300 Red	M2SS-1E-800 Black	M2SS-1E-1060N Black/Dk Blue	-	-	-	-
52	M2SS-1E-1300 Red	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-1060N Black/Dk Blue	M2SS-1E-1060N Black/Dk Blue	-	-	-	-
60	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-1060N Black/Dk Blue	M2SS-1E-1060N Black/Dk Blue	M2SS-1E-800 Black	M2SS-1E-800 Black	-	-
70	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-1060N Black/Dk Blue	M2SS-1E-1060N Black/Dk Blue	M2SS-1E-800 Black	M2SS-1E-800 Black	-	-
80	M2SS-1E-2000 Tan	M2SS-1E-2000 Tan	M2SS-1E-1060N Black/Dk Blue	M2SS-1E-1300 Red	M2SS-1E-800 Black	M2SS-1E-800 Black	-	-
90	M2SS-1E-2000 Tan	M2SS-1E-2000 Tan	M2SS-1E-1060N Black/Dk Blue	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-800 Black	M2SS-1E-800 Black	-	-
100	M2SS-1E-2000 Tan	M2SS-1E-2000 Tan	M2SS-1E-1300 Red	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-800 Black	M2SS-1E-800 Black	-	-
110	M2SS-1E-2000 Tan	M2SS-1E-2000 Tan	M2SS-1E-1300 Red	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-800 Black	M2SS-1E-800 Black	-	-
120	M2SS-1E-2000 Tan	M2SS-1E-2000 Tan	M2SS-1E-1300 Red	M2SS-1E-2000 Tan	M2SS-1E-800 Black	M2SS-1E-800 Black	-	-
130	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-1300 Red	M2SS-1E-1650N Red/Dk Blue	M2SS-1E-1060N Black/Dk Blue	M2SS-1E-1300 Red	M2SS-1E-800 Black	M2SS-1E-1060N Black/Dk Blue

Table 16. Point weights (lbs) - 60 Hz - base unit

Size (tons)	Isolator location															
	Aluminum Fins								Copper Fins							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Without partial heat recovery																
20	706	645	408	365	-	-	-	-	822	648	425	487	-	-	-	-
26	792	614	369	420	-	-	-	-	808	716	486	443	-	-	-	-
30	887	858	627	425	-	-	-	-	1027	882	673	574	-	-	-	-
35	894	862	645	436	-	-	-	-	1035	884	690	587	-	-	-	-
40	1152	1036	611	811	-	-	-	-	1198	1246	823	858	-	-	-	-
52	1081	1156	714	769	-	-	-	-	1210	1283	844	898	-	-	-	-
60	1130	1198	771	821	493	527	-	-	1252	1319	900	949	603	637	-	-
70	1118	1210	781	849	511	558	-	-	1239	1330	911	978	622	668	-	-
80	1435	1662	774	886	396	449	-	-	1796	1835	863	1203	581	594	-	-
90	1508	1763	802	927	406	466	-	-	1872	1931	888	1249	591	611	-	-
100	1640	1587	847	1120	608	866	-	-	1771	1993	1195	1342	886	995	-	-
110	1673	1634	851	1134	602	863	-	-	1803	2038	1200	1356	878	993	-	-
120	1691	1651	854	1138	600	861	-	-	1821	2055	1204	1360	876	990	-	-
130	1284	1273	910	1229	861	852	569	826	1270	1749	1301	1197	990	1246	1009	933
With partial heat recovery																
20	708	661	414	382	-	-	-	-	773	713	482	453	-	-	-	-
26	793	630	375	437	-	-	-	-	752	789	550	402	-	-	-	-
30	891	882	633	439	-	-	-	-	1032	905	677	590	-	-	-	-
35	955	829	593	507	-	-	-	-	1041	908	694	603	-	-	-	-
40	1062	1111	749	785	-	-	-	-	1191	1239	879	914	-	-	-	-
52	1073	1148	770	825	-	-	-	-	1202	1276	900	954	-	-	-	-
60	1111	1179	802	851	539	573	-	-	1232	1299	931	980	650	683	-	-
70	1098	1190	812	880	558	604	-	-	1311	1280	917	895	600	858	-	-
80	1529	1756	780	891	384	437	-	-	1889	1926	872	1213	568	580	-	-
90	1602	1858	808	933	394	454	-	-	1966	2023	896	1260	577	596	-	-
100	1732	1680	860	1138	596	848	-	-	1862	2083	1213	1361	870	978	-	-
110	1765	1726	864	1152	589	846	-	-	1935	1895	1210	1775	830	810	-	-
120	1784	1745	867	1156	588	843	-	-	1953	1913	1214	1780	827	807	-	-
130	1129	1587	1144	1072	855	803	589	812	1589	1476	1146	1605	938	1204	990	935

Table 17. Point weights (lbs) - 60 Hz - with pump package

Size (tons)	Isolator location															
	Aluminum Fins								Copper Fins							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Without partial heat recovery																
20	875	612	603	619	-	-	-	-	802	803	809	552	-	-	-	-
26	910	630	614	624	-	-	-	-	834	825	823	555	-	-	-	-
30	939	892	940	609	-	-	-	-	1173	822	892	853	-	-	-	-
35	946	897	958	620	-	-	-	-	1182	824	908	866	-	-	-	-
40	1214	1109	1009	932	-	-	-	-	1336	1244	1146	1054	-	-	-	-
52	1225	1146	1030	972	-	-	-	-	1349	1279	1165	1096	-	-	-	-
60	1275	1196	890	832	852	794	-	-	1287	1340	1227	938	863	901	-	-
70	1265	1209	897	855	870	829	-	-	1292	1239	1233	1181	869	830	-	-
80	1296	1663	922	1070	901	763	-	-	1637	1812	1190	1307	927	1012	-	-
90	1556	1616	816	1152	857	887	-	-	1712	1910	1217	1349	934	1031	-	-
100	1278	1684	1330	1175	1013	1226	-	-	1562	1736	1653	1828	1162	1278	-	-
110	1306	1733	1339	1189	1006	1221	-	-	1594	1778	1661	1846	1152	1275	-	-
120	1276	1623	1280	1630	1285	1091	-	-	1742	1721	1721	1700	1133	1679	-	-
130	835	1195	1150	1206	1168	1224	1177	1233	1341	1335	1253	1247	1116	1665	1565	1556
With partial heat recovery																
20	877	626	609	636	-	-	-	-	802	819	817	568	-	-	-	-
26	852	706	681	581	-	-	-	-	835	841	831	571	-	-	-	-
30	944	916	944	624	-	-	-	-	1181	843	894	871	-	-	-	-
35	1025	846	889	710	-	-	-	-	1190	846	910	884	-	-	-	-
40	1118	1190	1154	899	-	-	-	-	1329	1236	1202	1110	-	-	-	-
52	1128	1229	1177	938	-	-	-	-	1342	1272	1222	1152	-	-	-	-
60	1259	1180	912	854	903	845	-	-	1284	1211	1252	1180	899	846	-	-
70	1249	1192	919	878	922	880	-	-	1273	1221	1261	1209	917	879	-	-
80	1570	1609	804	1123	832	852	-	-	1728	1903	1203	1320	911	996	-	-
90	1649	1707	827	1166	842	871	-	-	1804	2001	1231	1362	918	1015	-	-
100	1584	1635	1178	1212	951	1331	-	-	1648	1823	1680	1855	1141	1257	-	-
110	1616	1681	1183	1226	943	1329	-	-	1680	1865	1688	1873	1131	1254	-	-
120	1586	1562	1136	1679	1212	1196	-	-	1828	1809	1748	1730	1114	1653	-	-
130	1067	1199	1089	1221	1124	1256	1143	1275	1381	1115	1359	1638	1324	1586	1305	1558

Table 18. Point weights (lbs) - 60 Hz - with pump package and buffer tank options

Size (tons)	Isolator location															
	Aluminum Fins								Copper Fins							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Without partial heat recovery																
20	617	413	1728	1650	-	-	-	-	610	538	1867	1650	-	-	-	-
26	650	434	1741	1653	-	-	-	-	640	562	1884	1650	-	-	-	-
30	860	552	1885	1782	-	-	-	-	858	718	2074	1789	-	-	-	-
35	868	556	1903	1794	-	-	-	-	865	722	2092	1801	-	-	-	-
40	838	790	2266	2136	-	-	-	-	967	918	2396	2264	-	-	-	-
52	856	820	2279	2182	-	-	-	-	985	948	2410	2311	-	-	-	-
60	882	838	1205	1146	1810	1721	-	-	1007	963	1325	1265	1926	1836	-	-
70	878	848	1208	1166	1826	1763	-	-	1004	972	1328	1285	1942	1878	-	-
80	1868	2086	1234	1379	899	1005	-	-	1892	2452	1703	1650	1040	1005	-	-
90	1873	2145	1281	1657	957	828	-	-	2169	2400	1565	1738	1012	1128	-	-
100	1681	2251	1789	1796	1263	1267	-	-	2292	2524	1638	1812	1559	1734	-	-
110	1710	2298	1797	1810	1255	1263	-	-	2324	2568	1645	1828	1549	1732	-	-
120	1862	2235	1856	1671	1234	1666	-	-	2314	2562	1710	1896	1685	1871	-	-
130	1210	1223	1148	1742	1580	1599	1504	1523	1110	1688	1706	1728	1768	1791	1801	1824
Without partial heat recovery																
20	624	423	1729	1672	-	-	-	-	616	549	1870	1671	-	-	-	-
26	585	516	1813	1604	-	-	-	-	646	574	1886	1671	-	-	-	-
30	872	569	1883	1805	-	-	-	-	867	738	2074	1810	-	-	-	-
35	880	572	1900	1817	-	-	-	-	874	742	2092	1821	-	-	-	-
40	831	783	2322	2191	-	-	-	-	959	911	2452	2320	-	-	-	-
52	849	813	2336	2238	-	-	-	-	977	941	2466	2367	-	-	-	-
60	870	827	1218	1159	1866	1777	-	-	841	928	1732	1273	1742	1920	-	-
70	866	836	1222	1179	1883	1819	-	-	837	937	1737	1294	1758	1962	-	-
80	1823	2358	1285	1248	980	953	-	-	2217	2293	1679	1736	827	1165	-	-
90	1959	2243	1296	1667	945	809	-	-	2293	2389	1710	1782	832	1183	-	-
100	1762	2347	1817	1815	1247	1245	-	-	2380	2613	1661	1836	1540	1715	-	-
110	1791	2394	1825	1829	1239	1241	-	-	2413	2657	1668	1851	1530	1713	-	-
120	1941	2333	1885	1694	1220	1639	-	-	2403	2651	1733	1919	1666	1852	-	-
130	1158	1611	1132	1573	1639	1514	1607	1482	1476	1637	1559	1720	1688	1849	1757	1918

Table 19. Point Weights (lbs) - 50 Hz - base unit

	Isolator location											
	Aluminum Fins						Copper Fins					
Size (tons)	1	2	3	4	5	6	1	2	3	4	5	6
Without partial heat recovery												
20	767	606	348	406	-	-	833	658	415	478	-	-
26	792	614	369	420	-	-	808	716	486	443	-	-
30	887	858	627	425	-	-	1027	882	673	574	-	-
35	894	862	645	436	-	-	1035	884	690	587	-	-
40	1152	1036	611	811	-	-	1198	1246	823	858	-	-
52	1081	1156	714	769	-	-	1210	1283	844	898	-	-
60	1130	1198	771	821	493	527	1252	1319	900	949	603	637
70	1118	1210	781	849	511	558	1239	1330	911	978	622	668
80	1435	1662	774	886	396	449	1796	1835	863	1203	581	594
90	1507	1763	802	927	406	465	1872	1931	887	1249	591	610
100	1654	1606	840	1113	593	847	1787	2008	1188	1336	869	977
110	1671	1632	849	1132	600	862	1801	2036	1198	1354	876	991
120	1690	1651	853	1137	600	860	1820	2055	1203	1360	875	990
With partial heat recovery												
20	769	621	354	422	-	-	784	724	472	444	-	-
26	793	629	375	437	-	-	752	789	550	402	-	-
30	891	882	633	439	-	-	1032	905	677	590	-	-
35	955	829	593	507	-	-	1041	908	694	603	-	-
40	1062	1111	749	785	-	-	1191	1239	879	914	-	-
52	1073	1148	770	824	-	-	1202	1276	900	953	-	-
60	1111	1179	802	851	539	573	1232	1299	931	980	650	683
70	1098	1190	812	880	558	604	1311	1281	917	895	600	858
80	1529	1756	780	891	384	437	1889	1926	872	1213	568	580
90	1601	1857	807	932	394	454	1965	2022	896	1259	577	596
100	1745	1697	853	1131	581	829	1877	2098	1206	1354	853	961
110	1763	1724	862	1150	588	844	1933	1893	1208	1772	828	809
120	1782	1743	866	1155	587	842	1951	1911	1213	1779	826	807

Table 20. Point Weights (lbs) - 50 Hz - with pump package

	Isolator location											
	Aluminum Fins						Copper Fins					
Size (tons)	1	2	3	4	5	6	1	2	3	4	5	6
Without partial heat recovery												
20	811	679	575	491	-	-	871	738	648	557	-	-
26	834	690	598	504	-	-	894	748	671	571	-	-
30	936	890	851	550	-	-	1162	828	811	786	-	-
35	943	895	887	572	-	-	1173	829	843	812	-	-
40	1193	1119	943	888	-	-	1232	1336	1162	928	-	-
52	1204	1156	963	928	-	-	1330	1287	1097	1054	-	-
60	1273	1202	879	826	833	781	1287	1346	1214	933	845	888
70	1264	1215	886	850	852	816	1291	1246	1220	1175	851	818
80	1298	1667	914	1059	885	748	1641	1816	1180	1296	912	998
90	1558	1619	807	1142	842	871	1716	1913	1207	1338	920	1016
100	1292	1707	1317	1162	983	1186	1582	1755	1638	1812	1129	1244
110	1306	1735	1328	1179	990	1201	1596	1780	1650	1834	1134	1257
120	1271	1847	1245	1205	1219	1179	1755	1743	1673	1662	1062	1582

Table 20. Point Weights (lbs) - 50 Hz - with pump package (continued)

	Isolator location											
	Aluminum Fins						Copper Fins					
Size (tons)	1	2	3	4	5	6	1	2	3	4	5	6
With partial heat recovery												
20	871	636	523	566	-	-	873	753	655	574	-	-
26	895	645	545	580	-	-	896	763	677	587	-	-
30	941	914	856	565	-	-	1170	849	813	804	-	-
35	948	919	892	588	-	-	1181	850	846	830	-	-
40	1186	1111	998	944	-	-	1309	1244	1133	1068	-	-
52	1197	1148	1019	984	-	-	1322	1279	1152	1109	-	-
60	1257	1186	901	849	884	832	1283	1218	1239	1174	882	834
70	1248	1199	908	872	903	867	1273	1228	1248	1202	900	866
80	1572	1613	796	1113	817	837	1731	1906	1193	1309	896	982
90	1650	1709	818	1155	827	856	1806	2003	1220	1352	904	1000
100	1600	1655	1163	1199	921	1293	1667	1841	1665	1838	1108	1224
110	1617	1683	1173	1216	927	1309	1683	1867	1677	1861	1114	1236
120	1600	1581	1098	1627	1128	1115	1682	1868	1724	1910	1177	1301

Table 21. Point Weights (lbs) - 50 Hz - with pump package and buffer tank options

	Isolator location											
	Aluminum Fins						Copper Fins					
Size (tons)	1	2	3	4	5	6	1	2	3	4	5	6
Without partial heat recovery												
20	616	419	1637	1585	-	-	609	544	1778	1584	-	-
26	637	430	1662	1596	-	-	628	558	1804	1593	-	-
30	853	554	1801	1719	-	-	850	721	1990	1726	-	-
35	862	557	1835	1743	-	-	859	724	2025	1750	-	-
40	735	882	2280	2010	-	-	954	920	2321	2229	-	-
52	843	822	2204	2146	-	-	972	950	2335	2275	-	-
60	881	842	1196	1143	1788	1709	1006	966	1316	1262	1905	1824
70	877	851	1200	1164	1804	1750	1003	975	1320	1283	1921	1865
80	1872	2089	1224	1369	884	991	2131	2206	1654	1710	829	1168
90	1876	2150	1271	1643	943	814	2206	2301	1684	1756	834	1185
100	1700	2273	1774	1778	1230	1233	2309	2542	1627	1801	1524	1698
110	1713	2300	1786	1798	1238	1246	2325	2569	1636	1818	1531	1713
120	1872	2259	1809	1631	1165	1569	2330	2575	1673	1857	1600	1784
With partial heat recovery												
20	623	429	1639	1607	-	-	614	555	1780	1604	-	-
26	573	511	1733	1548	-	-	633	569	1806	1614	-	-
30	865	571	1798	1742	-	-	859	740	1990	1746	-	-
35	874	574	1833	1766	-	-	868	744	2025	1770	-	-
40	818	784	2247	2155	-	-	946	912	2377	2284	-	-
52	836	814	2260	2202	-	-	964	942	2391	2331	-	-
60	869	830	1209	1156	1845	1765	994	954	1329	1275	1961	1880
70	866	839	1213	1177	1861	1806	991	964	1333	1296	1977	1921
80	1827	2361	1274	1237	966	938	2221	2298	1667	1724	815	1150
90	1961	2247	1285	1652	931	796	2295	2393	1697	1770	820	1167
100	1780	2368	1801	1797	1215	1212	2467	2452	1851	1840	1234	1840
110	1794	2396	1813	1817	1222	1224	2484	2479	1861	1858	1240	1856
120	1951	2356	1837	1653	1151	1543	2418	2664	1696	1880	1581	1765

Evaporator Piping

Evaporator water connections are grooved.

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

Components and layout will vary slightly, depending on the location of connections and the water source.

NOTICE:

Equipment Damage!

If using an acidic commercial flushing solution, construct a temporary bypass around the unit to prevent damage to internal components of the evaporator and the pump.

NOTICE:

Proper Water Treatment!

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

Drainage

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

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

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

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

Evaporator Piping Components

Piping components include all devices and controls used to provide proper water system operation and unit operating safety. See Figure 45, p. 46. These components are listed below.

Figure 45. Water piping components

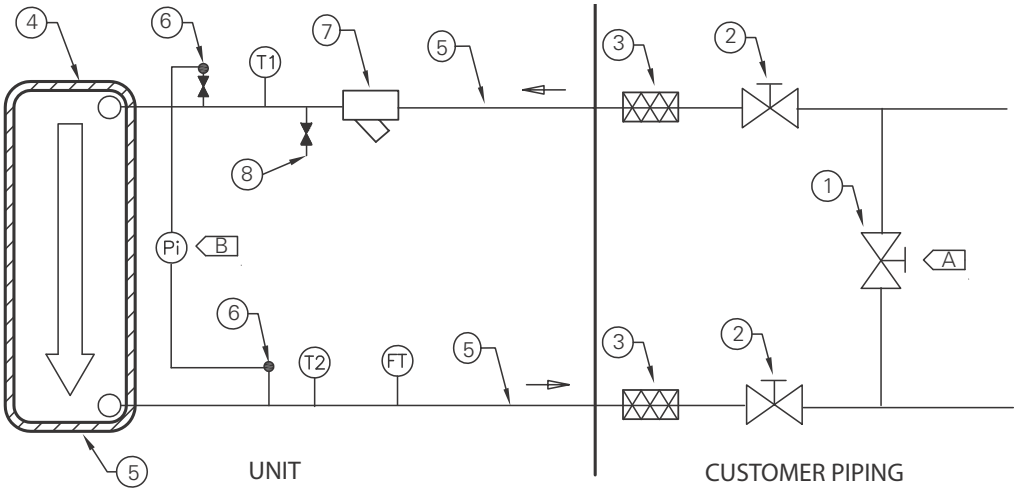


Table 22. Water piping components

Item	Description	Item	Description
1	Bypass Valve	Pi	Gauge
2	Isolation Valves	FT	Water Flow Switch
3	Vibration Eliminators	T1	Evap Water Inlet Temp Sensor
4	Evaporator Heat Exchanger	T2	Evap Water Outlet Temp Sensor
5	Water Heater	A	Isolate unit for initial water loop cleaning
6	Valve for Pressure Point	B	Brazed plate differential pressure gauge and piping not supplied. Must account for water head height difference when calculating brazed plate pressure differential.
7	Strainer		

Entering Chilled Water Piping

- Air vents (to bleed air from system)
- Water pressure gauges with shutoff valves
- Vibration eliminators
- Shutoff (isolation) valves
- Thermometers (if desired)
- Relief valve

Leaving Chilled Water Piping

- Air vents (to bleed air from system)
- Water pressure gauges with shutoff valves
- Vibration eliminators
- Shutoff (isolation) valves
- Thermometers (if desired)
- Balancing valve

NOTICE:

Water Damage!

Standard pressure is 72.5 Psig for all factory installed components on the suction side of water pump. Standard pressure of components on the discharge side of water pump is 145 Psig. You MUST drain the system FIRST before releasing the pressure. Failure to do so could result in water spray which could cause equipment and/or property damage.

Water Strainer

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

Flow Switch

NOTICE:

Equipment Damage!

Flow switch is on a 24V circuit. Do NOT apply 120V to the flow switch. Incorrect voltage application could cause damage to the flow switch.

The flow switch is factory-installed and programmed based on the operating conditions submitted with the order. The leaving evaporator temperature, fluid type and fluid concentration affect the selected flow switch. If the operating conditions on the job site change, the flow switch may need to be replaced.

The sensor head includes 3 LEDs, two yellow and one green. Wait 15 seconds after power is applied to the sensor before evaluating LEDs for flow status. When wired correctly and flow is established, only the green LED should be lit. Following are the LED indicators:

- Green ON, both yellow OFF — Flow
- Green and outside yellow ON — No Flow
- Center yellow ON continuously — Miswire

Factory installed jumper wire W11 must be removed if using auxiliary contacts and/or additional proof of flow. See schematics in CGAM-SVE01*-EN for more details.

Note: *Use caution when connecting the auxiliary contacts. Terminals 1X5-3 and 1X5-9 are to be used for field connections of auxiliary contacts. Inadvertant use of 1X5-4 and 1X5-9 will result in a FALSE FLOW indication.*

NOTICE:

Equipment Damage!

Incorrect wiring of auxiliary contacts could cause equipment damage.

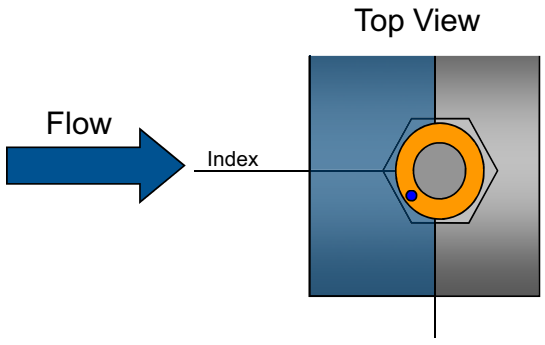
If using auxiliary flow sensing, both yellow LEDs come on initially when flow is stopped. The center yellow LED will turn off after approximately 7 seconds. The LED indicators are otherwise the same as indicated above.

Indexing Flow Switch

To properly index the flow switch, the following requirements must be met:

- The dot must be at a position no greater than 90° off Index.
- The torque must be between 22 ft-lb minimum and 74 ft-lb maximum.
- A minimum distance of 5x pipe diameter must be maintained between flow switch and any bends, valves, changes in cross sections, etc.

Figure 46. Proper flow switch indexing

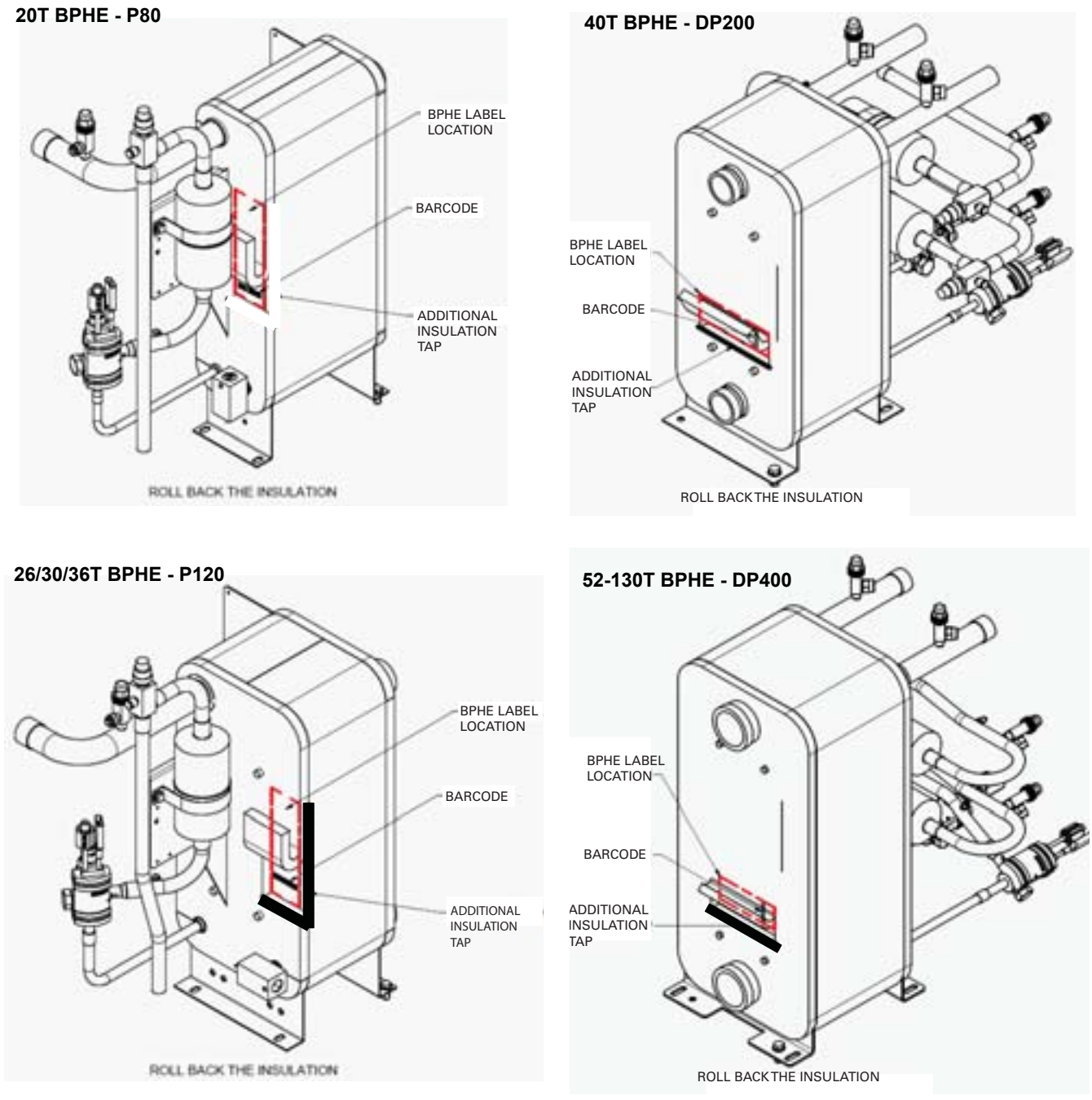


The flow switch must have the dot in the shaded area to the left of this line for proper indexing (±90° off Index)

Evaporator Label

The BPHE evaporator label, including barcode, is located under the insulation, in the locations shown in Figure 47, p. 48. Insulation backing over this area has not been removed, so that it can be rolled back to access BPHE label.

Figure 47. BPHE label locations



Pressure Drop Curves

For overlapping pressure drop curves, see General Data Tables in section "General Information," p. 10 for limit values .

Figure 48. Total unit pressure drop curves (60 Hz)

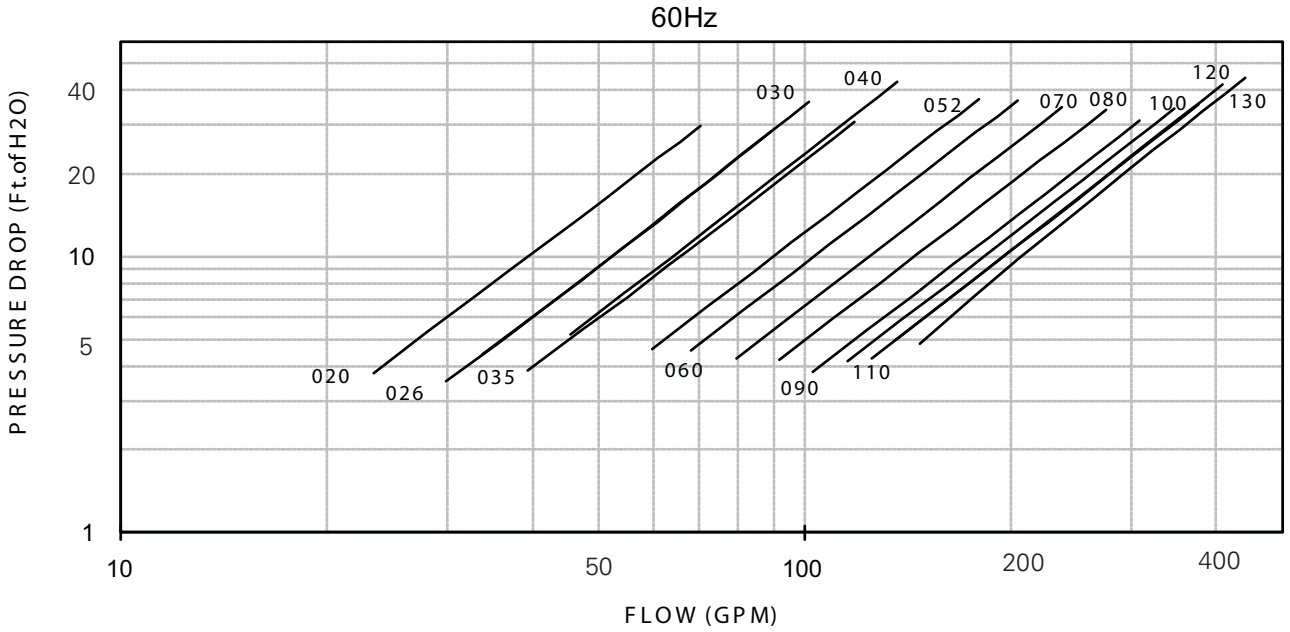
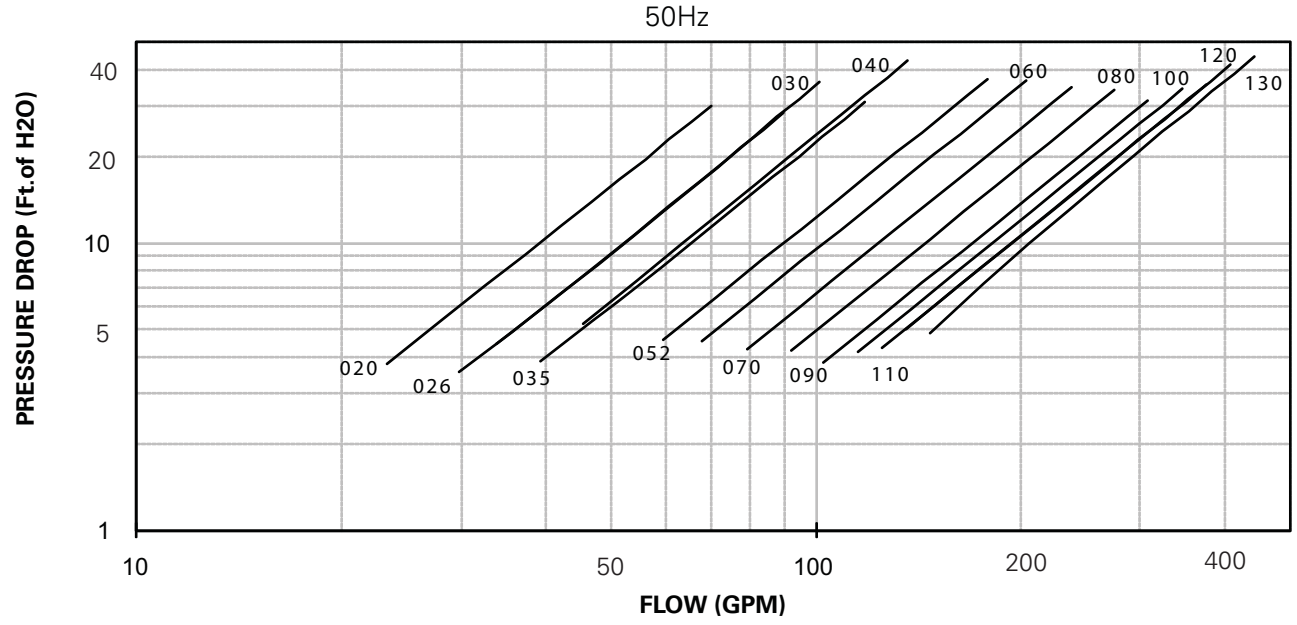


Figure 49. Total Unit Pressure Drop Curves (50 Hz)



Freeze Protection

Depending on the ambient temperature the unit may be exposed to, there are up to four different options for freeze protection. They are listed in order of highest ambient (least freeze protection) to lowest ambient (most freeze protection).

1. Water pump (for protection with ambient temperatures down to 0°F)
   a. CH530 controller can start the pump when the ambient temperatures drops to prevent freezing. For this option the pump must to be controlled by the CGAM unit and this function must be validated.
   b. Water circuit valves need to stay open at all times.

   Note: *If dual high head pump package option is selected, the chiller MUST control the pumps.*

OR

2. Heaters (for protection with ambient temperatures down to -20°F)

   Note: *This option is not applicable for units ordered with "No Freeze Protection" (model number digit 18 is "X"). Factory mounted heaters are NOT installed on these units, and one of the other forms of freeze protection must be used.*

   a. For units with freeze protection selected (model number digit 18 is "1"), 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).
   b. 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.

NOTICE:

Equipment Damage!

All heaters have separate power from the unit. All heaters must be energized or the CH530 must control the pumps when the unit is off (unless the water circuit is drained or sufficient glycol is used). In the event of power loss, neither heaters nor CH530 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 or use sufficient freeze inhibitor in the evaporator.

OR

3. Freeze inhibitor
   - Freeze protection can be accomplished by adding sufficient glycol to protect against freezing below the lowest ambient expected.
   - See "Low Evap Refrigerant Cutout/Percent Glycol Recommendations," p. 50.

OR

4. Drain water circuit (for protection with ambients below -20°F)
   a. Shut off the power supply to the unit and to all heaters.
   b. Purge the water circuit.
   c. Blow out the evaporator to ensure no liquid is left in the evaporator.

Note: *By default the CH530 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 CH530 to start the pump when the ambient temperature drops to freezing, disable this freeze protection control.*

Low Evap Refrigerant Cutout/Percent Glycol Recommendations

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

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

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

Table 23. Low Evap Refrigerant Temp Cutout and Low Water Temp Cutout

ETHYLENE GLYCOL							PROPYLENE GLYCOL						
% Glycol	Solution Freeze Point [F]	Low Refrig Temp Cutout [F]	Low Water Temp Cutout [F]	Min Chilled Water Set Point [F] Number of compressors			% Glycol	Solution Freeze Point [F]	Low Refrig Temp Cutout [F]	Low Water Temp Cutout [F]	Min Chilled Water Set Point [F] Number of compressors		
				2	4	6					2	4	6
0	32	22	35	42	42	42	0	32	22	35	42	42	42
1	31.6	21.6	34.6	41.6	39.1	38.2	1	31.6	21.6	34.6	41.6	39.1	38.2
2	31.0	21.0	34.0	41.0	38.5	37.6	2	31.0	21.0	34.0	41.0	38.5	37.6
3	30.3	20.3	33.3	40.3	37.8	37.0	3	30.4	20.4	33.4	40.3	37.8	37.0
4	29.7	19.7	32.7	39.7	37.2	36.3	4	29.9	19.9	32.9	39.7	37.2	36.3
5	29.0	19.0	32.0	39.0	36.5	35.7	5	29.3	19.3	32.3	39.0	36.5	35.7
6	28.3	18.3	31.3	38.3	35.8	35.0	6	28.7	18.7	31.7	38.3	35.8	35.0
7	27.6	17.6	30.6	37.6	35.1	34.3	7	28.1	18.1	31.1	37.6	35.1	34.3
8	26.9	16.9	29.9	36.9	34.4	33.6	8	27.6	17.6	30.6	36.9	34.4	33.6
9	26.2	16.2	29.2	36.2	33.7	32.9	9	27.0	17.0	30.0	36.2	33.7	32.9
10	25.5	15.5	28.5	35.5	33.0	32.1	10	26.4	16.4	29.4	35.5	33.0	32.1
11	24.7	14.7	27.7	34.7	32.2	31.4	11	25.7	15.7	28.7	34.7	32.2	31.4
12	23.9	13.9	26.9	33.9	31.4	30.6	12	25.1	15.1	28.1	33.9	31.4	30.6
13	23.1	13.1	26.1	33.1	30.6	29.8	13	24.4	14.4	27.4	33.1	30.6	29.8
14	22.3	12.3	25.3	32.3	29.8	29.0	14	23.8	13.8	26.8	32.3	29.8	29.0
15	21.5	11.5	24.5	31.5	29.0	28.1	15	23.1	13.1	26.1	31.5	29.0	28.1
16	20.6	10.6	23.6	30.6	28.1	27.2	16	22.4	12.4	25.4	30.6	28.1	27.2
17	19.7	9.7	22.7	29.7	27.2	26.3	17	21.6	11.6	24.6	29.7	27.2	26.3
18	18.7	8.7	21.7	28.7	26.2	25.4	18	20.9	10.9	23.9	28.7	26.2	25.4
19	17.8	7.8	20.8	27.8	25.3	24.5	19	20.1	10.1	23.1	27.8	25.3	24.5
20	16.8	6.8	19.8	26.8	24.3	23.5	20	19.3	9.3	22.3	26.8	24.3	23.5
21	15.8	5.8	18.8	25.8	23.3	22.5	21	18.4	8.4	21.4	25.8	23.3	22.5
22	14.7	4.7	17.7	24.7	22.2	21.4	22	17.6	7.6	20.6	24.7	22.2	21.4
23	13.7	3.7	16.7	23.7	21.2	20.3	23	16.7	6.7	19.7	23.7	21.2	20.3
24	12.5	2.5	15.5	22.5	20.0	19.2	24	15.7	5.7	18.7	22.5	20.0	19.2
25	11.4	1.4	14.4	21.4	18.9	18.1	25	14.8	4.8	17.8	21.4	18.9	18.1
26	10.2	0.2	13.2	20.2	17.7	16.9	26	13.8	3.8	16.8	20.2	17.7	16.9
27	9.0	-1.0	12.0	19.0	16.5	15.7	27	12.7	2.7	15.7	19.0	16.5	15.7
28	7.7	-2.3	10.7	17.7	15.2	14.4	28	11.6	1.6	14.6	17.7	15.2	14.4
29	6.4	-3.6	9.4	16.4	13.9	13.1	29	10.5	0.5	13.5	16.4	13.9	13.1
30	5.1	-4.9	8.1	15.1	12.6	11.8	30	9.3	-0.7	12.3	15.1	12.6	11.8
31	3.7	-6.3	6.7	13.7	11.2	10.4	31	8.1	-1.9	11.1	13.7	11.2	10.4
32	2.3	-7.7	5.3	12.3	10.4	10.4	32	6.8	-3.2	9.8	12.3	10.4	10.4
33	0.8	-9.2	3.8	10.8	10.4	10.4	33	5.5	-4.5	8.5	10.8	10.4	10.4
34	-0.7	-10.7	2.3	10.4	10.4	10.4	34	4.1	-5.9	7.1	10.4	10.4	10.4
35	-2.3	-12.3	0.7	10.4	10.4	10.4	35	2.7	-7.3	5.7	10.4	10.4	10.4
36	-3.9	-13.9	-0.9	10.4	10.4	10.4	36	1.3	-8.7	4.3	10.4	10.4	10.4
37	-5.6	-15.6	-2.6	10.4	10.4	10.4	37	-0.3	-10.3	2.7	10.4	10.4	10.4
38	-7.3	-17.3	-4.3	10.4	10.4	10.4	38	-1.8	-11.8	1.2	10.4	10.4	10.4
39	-9.0	-19.0	-5.0	10.4	10.4	10.4	39	-3.5	-13.5	-0.5	10.4	10.4	10.4
40	-10.8	-19.0	-5.0	10.4	10.4	10.4	40	-5.2	-15.2	-2.2	10.4	10.4	10.4

Table 23. Low Evap Refrigerant Temp Cutout and Low Water Temp Cutout (continued)

ETHYLENE GLYCOL							PROPYLENE GLYCOL						
% Glycol	Solution Freeze Point [F]	Low Refrig Temp Cutout [F]	Low Water Temp Cutout [F]	Min Chilled Water Set Point [F] Number of compressors			% Glycol	Solution Freeze Point [F]	Low Refrig Temp Cutout [F]	Low Water Temp Cutout [F]	Min Chilled Water Set Point [F] Number of compressors		
				2	4	6					2	4	6
41	-12.7	-19.0	-5.0	10.4	10.4	10.4	41	-6.9	-16.9	-3.9	10.4	10.4	10.4
42	-14.6	-19.0	-5.0	10.4	10.4	10.4	42	-8.8	-18.8	-5.0	10.4	10.4	10.4
43	-16.6	-19.0	-5.0	10.4	10.4	10.4	43	-10.7	-19.0	-5.0	10.4	10.4	10.4
44	-18.6	-19.0	-5.0	10.4	10.4	10.4	44	-12.6	-19.0	-5.0	10.4	10.4	10.4
45	-20.7	-19.0	-5.0	10.4	10.4	10.4	45	-14.6	-19.0	-5.0	10.4	10.4	10.4
46	-22.9	-19.0	-5.0	10.4	10.4	10.4	46	-16.7	-19.0	-5.0	10.4	10.4	10.4
47	-25.1	-19.0	-5.0	10.4	10.4	10.4	47	-18.9	-19.0	-5.0	10.4	10.4	10.4
48	-27.3	-19.0	-5.0	10.4	10.4	10.4	48	-21.1	-19.0	-5.0	10.4	10.4	10.4
49	-29.7	-19.0	-5.0	10.4	10.4	10.4	49	-23.4	-19.0	-5.0	10.4	10.4	10.4
50	-32.1	-19.0	-5.0	10.4	10.4	10.4	50	-25.8	-19.0	-5.0	10.4	10.4	10.4
51	-34.5	-19.0	-5.0	10.4	10.4	10.4	51	-28.3	-19.0	-5.0	10.4	10.4	10.4
52	-37.1	-19.0	-5.0	10.4	10.4	10.4	52	-30.8	-19.0	-5.0	10.4	10.4	10.4
53	-39.7	-19.0	-5.0	10.4	10.4	10.4	53	-33.4	-19.0	-5.0	10.4	10.4	10.4
54	-42.3	-19.0	-5.0	10.4	10.4	10.4	54	-36.1	-19.0	-5.0	10.4	10.4	10.4
55	-45.0	-19.0	-5.0	10.4	10.4	10.4	55	-38.9	-19.0	-5.0	10.4	10.4	10.4

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 50, p. 53 through Figure 55, p. 53 for approximate adjustment factors.

Figure 50. Ethylene - compressor power adjustment

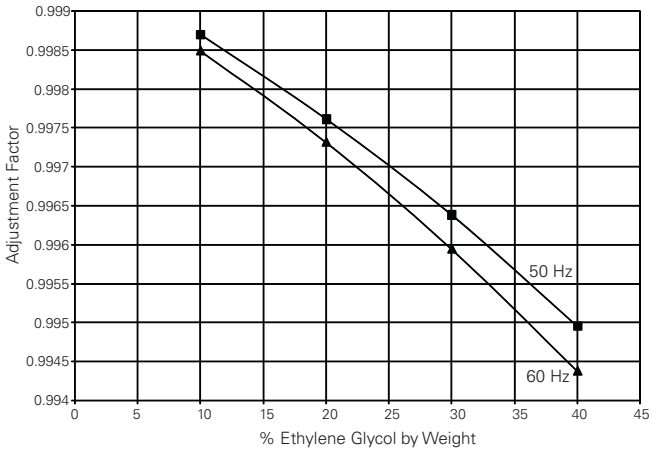


Figure 51. Propylene - compressor power adjustment

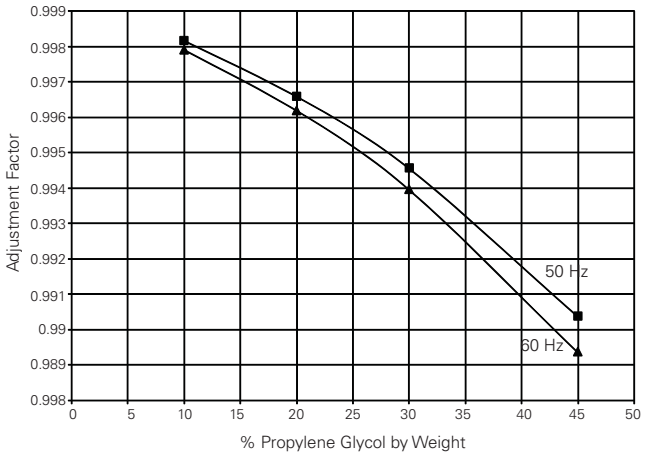


Figure 52. Ethylene - GPM adjustment

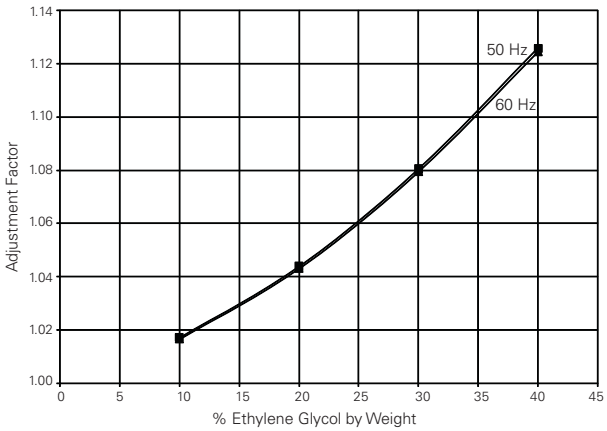


Figure 53. Propylene - GPM adjustment

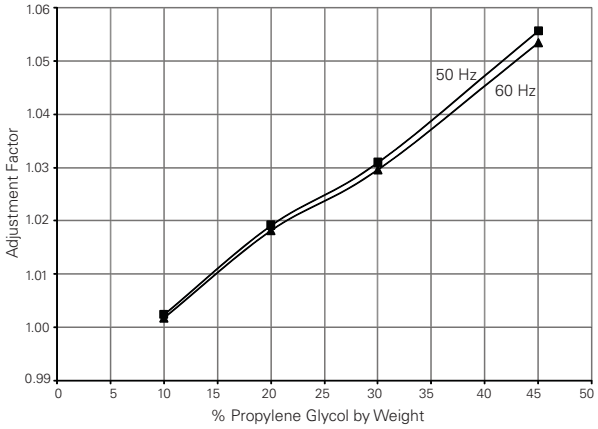


Figure 54. Ethylene - capacity adjustment

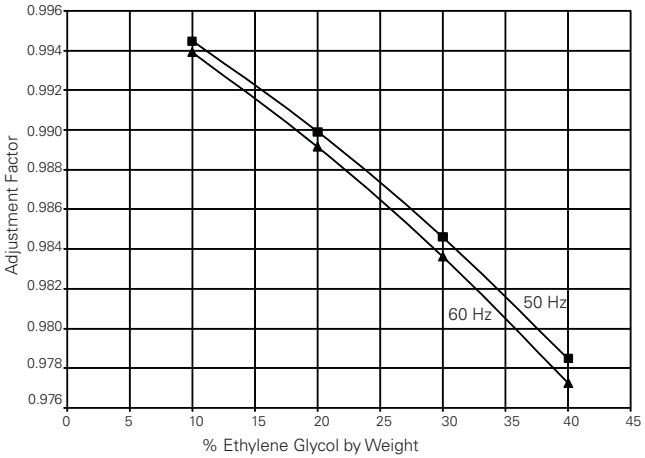
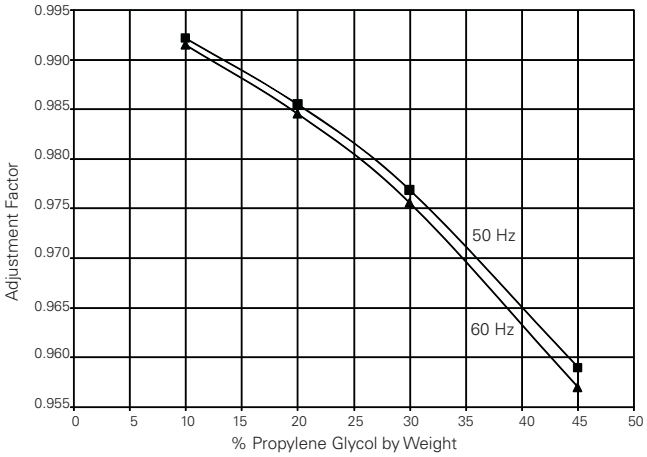


Figure 55. Propylene - capacity adjustment



Partial Heat Recovery

The partial heat recovery is comprised of an auxiliary heat exchanger installed in the discharge line between the compressor and the air -cooled condenser. The heat exchanger cools compressor discharge gas and rejects the energy to a separate water loop for hot water applications. The chiller can simultaneously produce chilled and hot water.

The heating capacity is driven by the cooling demand on the chiller, the condensing temperature and the flow rate through the heat exchanger.

The partial heat recovery includes:

- Brazed plate heat exchanger
  - Units 20-35 Tons have a single braze plate heat exchanger. Units 40-130 Tons have two braze plate heat exchangers in parallel arrangement.
- Piping between the heat exchanger(s)
- Insulation of the heat exchanger(s) and water pipe
- Two temperature sensors to read the inlet/outlet hot water temperature information on the unit control display
- Heater on partial heat recovery heat exchanger(s) and water pipe
- Manual air vent
- Drain pipe

Water circulating inside the heat recovery heat exchanger should never be used for drinking water, it must be used through an indirect loop to heat or preheat hot water.

Important: *The installation must comply with the rules and legislation applicable at the jobsite location regarding the use of drinkable water. The use of the water circulating in the heat recovery exchanger as drinkable water is not recommended. An intermediate heat exchanger should be used.*

The partial heat recovery pump must run at least three minutes after the partial heat recovery fan control is disabled. During the three minutes, water flow through the brazed plate heat exchanger will gradually be reduced and the unit can be switched to conventional cooling mode without partial heat recovery fan control.

NOTICE:

Equipment Damage!

If the partial heat recovery heat exchanger is drained the heater must be turned off to avoid damaging the partial heater recovery heat exchanger. The heater should only be on when the heat recovery heat exchanger has water in it.

Partial Heat Recovery Piping

A field installed safety or relief valve on the water side is required with the partial heat recovery to prevent risks resulting from a failure of the thermostat.

A 16 mesh strainer must be installed close to the partial heat recovery heat exchanger entering water line to protect the heat exchanger.

The partial heat recovery water temperature should be controlled via an external devise such as a 3-way valve or variable speed pump. In addition, a water tank and additional heater is suggested in the partial heat recovery loop.

Insulate water lines and other portions of the heat recovery water loop to prevent heat loss and potential injury due exposure to a hot surface.

For recommended partial heat recovery piping see Figure 56, p. 55.

NOTICE:

Proper Water Treatment!

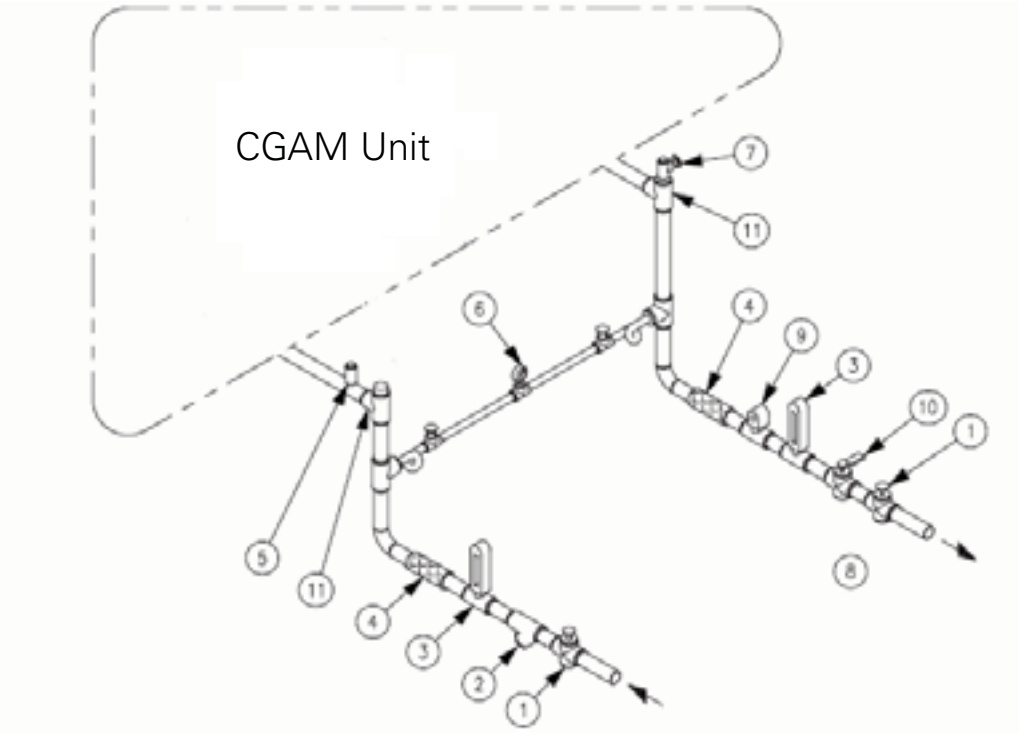
The use of untreated or improperly treated water could result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment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

NOTICE:

Equipment Damage!

Do not use untreated or improperly treated water in the heat recovery water loop since it will cause inefficient operation and potential damage to the unit such as: reduced heat transfer between water and refrigerant, increased water pressure drop and reduced water flow.

Figure 56. Partial Heat Recovery Piping Recommendations



Note: *In addition to those recommended for field piping, the CGAM unit includes factory installed manual air vent and water drain valve with partial heat recovery option. See Figure 81, p. 96 through Figure 83, p. 97 for partial heat recovery component locations.*

Partial Heat Recovery Freeze Protection

The heat recovery condenser is insulated and a factory-installed heater is installed and will protect the heat exchanger from freezing in ambient temperatures down to -20°F (-29°C).

When the ambient temperature drops to approximately 39°F (3.9°C) the thermostat energizes the heaters.

Note: *The inlet and outlet piping should be protected against freezing by one of the following methods:*

- Install heat tape on all field-installed water piping.

OR

- Add freeze inhibit fluid to the partial heat recovery water loop.

Partial Heat Recovery Pressure Drop Curves

Figure 57. Partial heat recovery pressure drop curve — 60 Hz

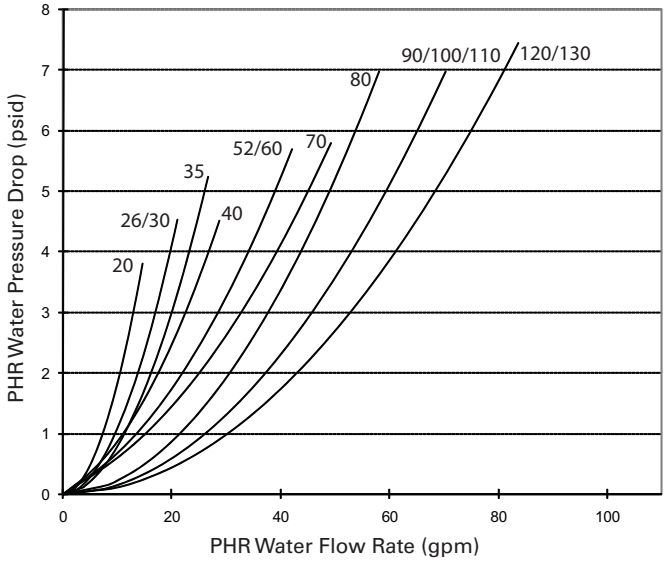


Figure 58. Partial heat recovery pressure drop curve — 50 Hz

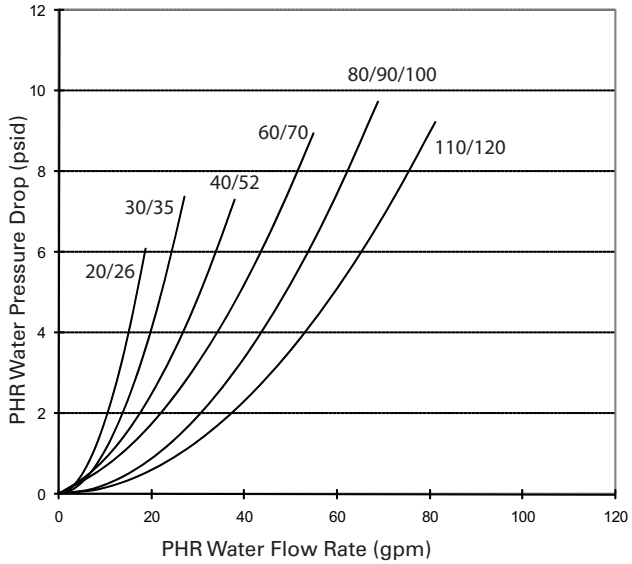


Table 24. Partial heat recovery flow rates — 60 Hz

Size		20	26	30	35	40	52	60	70	80	90	100	110	120	130
Nominal Flow Rate[a]	(gpm)	13	19	18	24	26	39	37	50	46	59	61	70	83	79
Maximum Flow Rate	(gpm)	39	39	39	39	79	79	79	79	127	127	127	127	127	127

(a) Water temperature inlet 122°F, outlet 131°F

Table 25. Partial heat recovery flow rates — 50 Hz

Size		20	26	30	35	40	52	60	70	80	90	100	110	120	130
Nominal Flow Rate[a]	(gpm)	11	15	16	20	21	30	32	40	39	47	48	58	65	11
Maximum Flow Rate	(gpm)	39	39	39	39	79	79	79	79	127	127	127	127	127	39

(a) Water temperature inlet 122°F, outlet 131°F

Note: *Partial heat recovery may function at flow rates near zero. However, heat transfer performance is severely reduced and water flow distribution is poor.*

Dual High Head Pump Package

Pump package includes: two high head pumps, VFD, expansion vessels, drainage valves, shut-off valves at entering and leaving connections. See Figure 60.

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.

Important: *When pump package is selected, the chiller MUST control the pumps.*

The CH530 displays evaporator pump starts and run-times. Freeze protection down to an ambient of -20°F (-29°C) is included as standard.The cold parts of the pump package will also be insulated. Designed with one redundant pump, the chiller controls both pumps through a lead/lag and failure/recovery functionality.

A variable speed drive is installed in an additional panel to control the pump.The inverter should be adjusted by the customer upon start up to balance the system flow and head requirements.The purpose is to save on wasted pump energy caused by a traditional balancing valve.

Note: *Speed command is also available for customer-provided variable flow input.*

Figure 59. Field water piping pump package unit

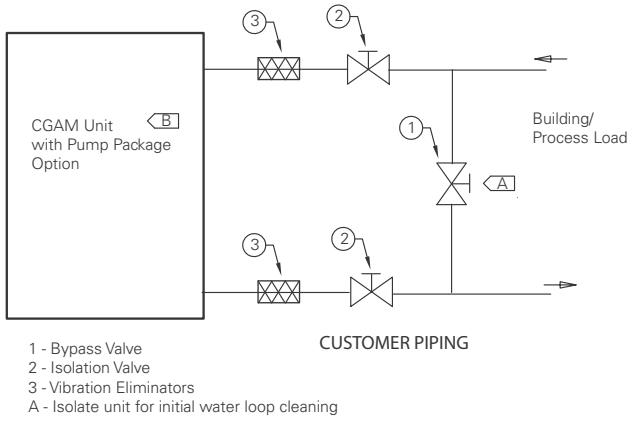


Table 26. Field water piping components - unit with pump package option

Item	Description
1	Bypass Valve
2	Isolator Valve
3	Vibration Eliminator
A	Isolate unit for initial water loop cleaning
B	See Figure 60 for CGAM pump package unit schematic.

Figure 60. Pump package unit schematic

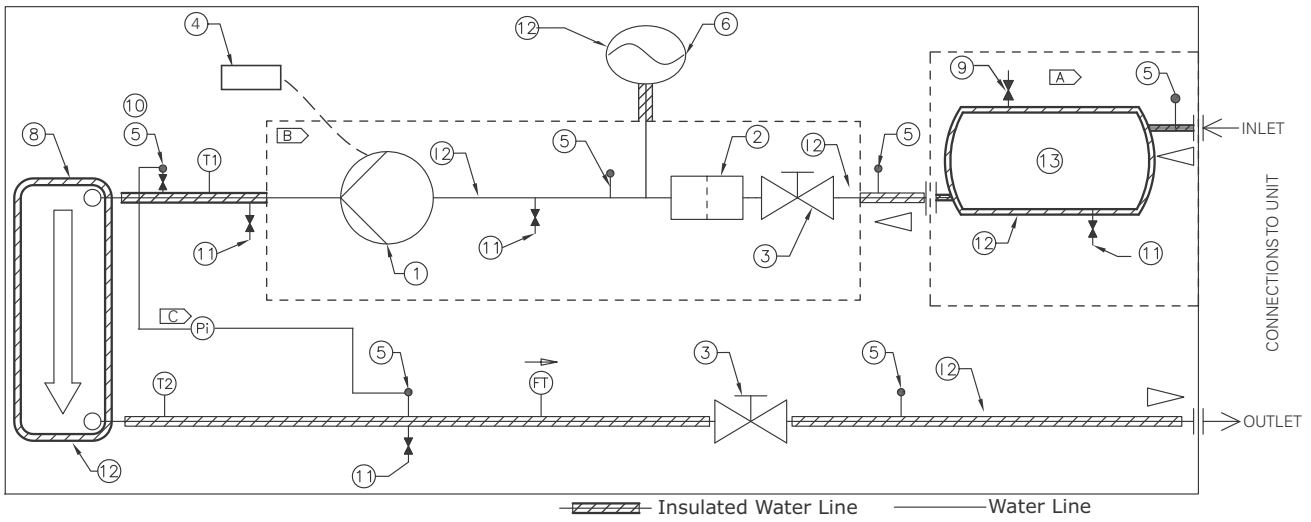


Table 27. Pump package components

Item	Description	Item	Description	Item	Description
1	Centrifugal Pump (Dual pumps std)	9	Automatic Air Vent	Pi	Gauge
2	Water Strainer	10	Manual Air Bleed	FT	Water Flow Switch
3	Butterfly Valve	11	Drain Valve	T1	Evap Water Inlet Temp Sensor
4	Inverter	12	Water Heater	T2	Evap Water Outlet Temp Sensor
5	Valve for Pressure Point	13	Buffer Tank (Optional)	A	Optional Buffer Tank
6	Expansion Tank			B	Insulated Pump Box
7	N/A			C	Brazed plate differential pressure gauge and piping not supplied. Must account for water head height difference when calculating brazed plate pressure differential.
8	Evaporator heat exchanger				

Pressure Drop Information - Units with Optional Pump Package

Water only

Factory Installed Pump Package - Pump Curves.

Figure 61 through Figure 64, p. 59 show manufacturer pump curves for factory-installed pump package.

Figure 61. Pump curve - 20-52T - water only

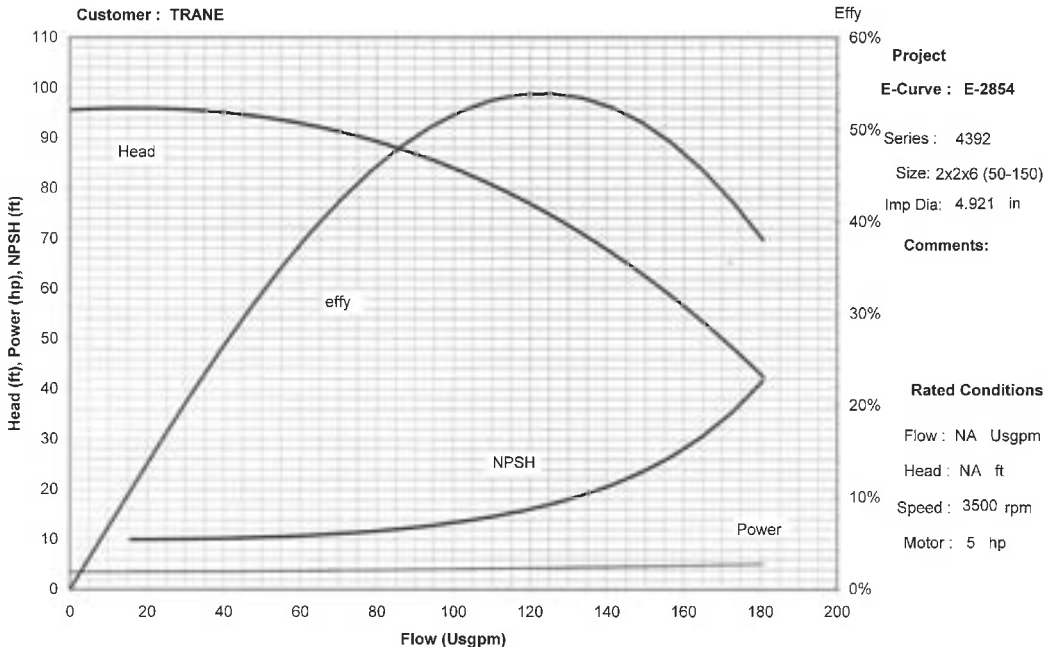


Figure 62. Pump curve - 60-70T - water only

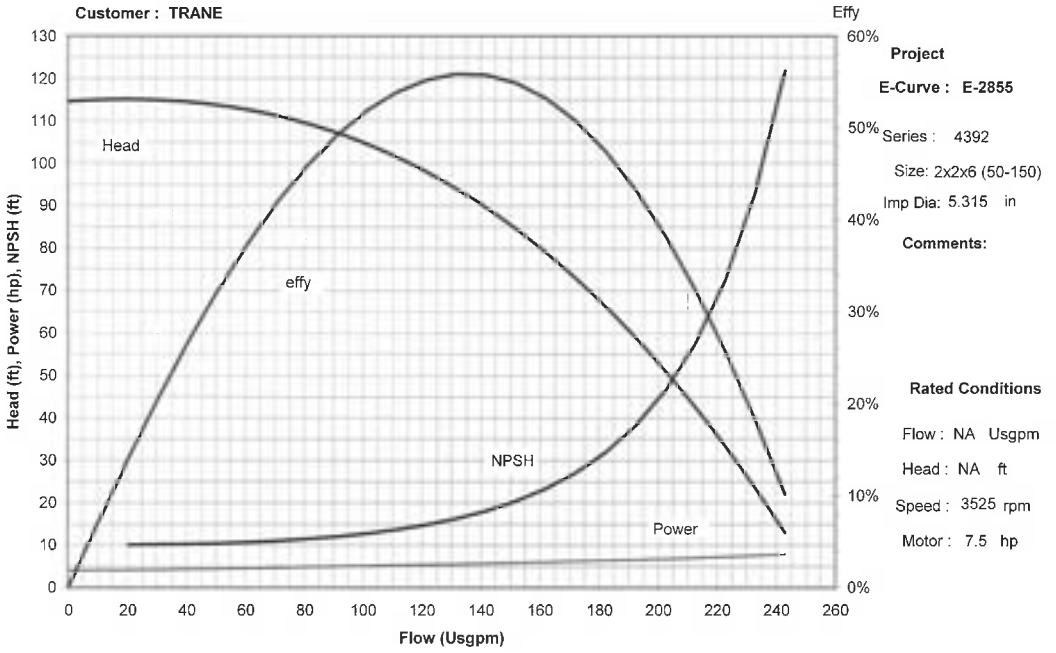


Figure 63. Pump curve - 80-110T - water only

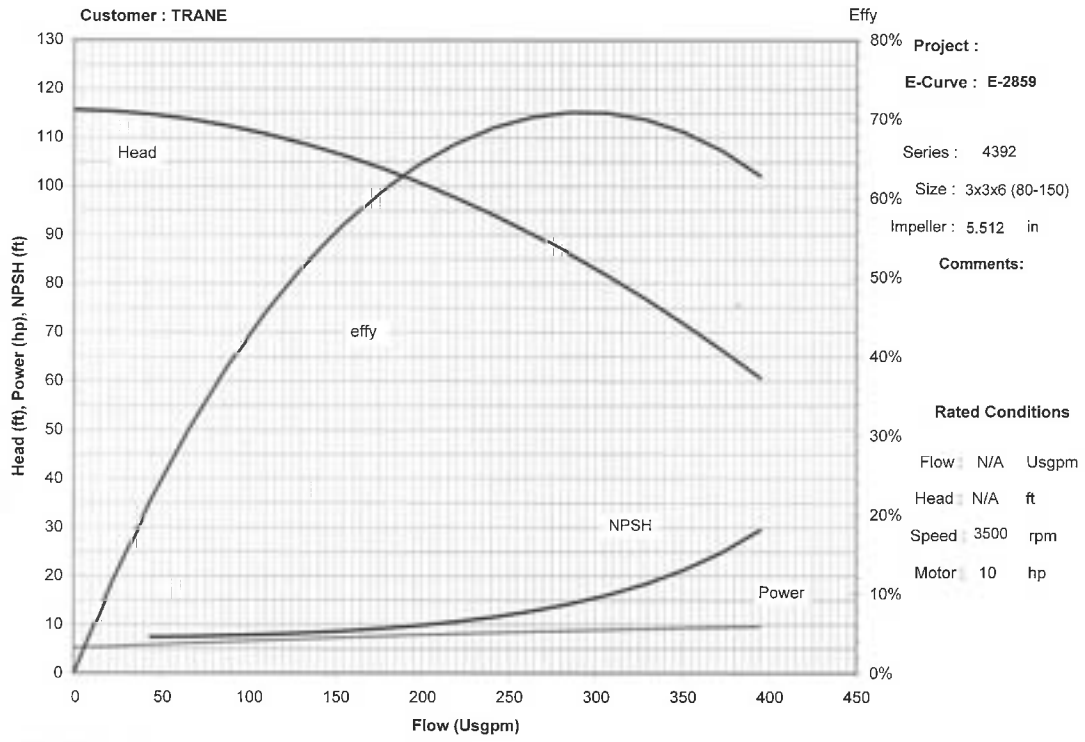
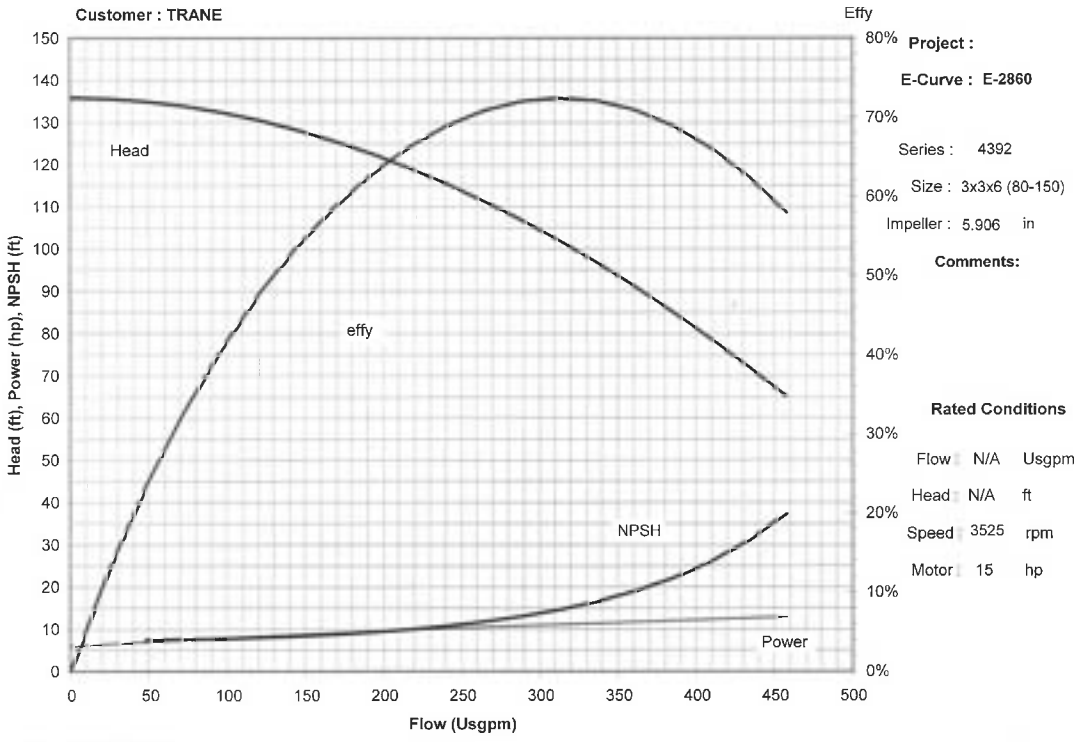
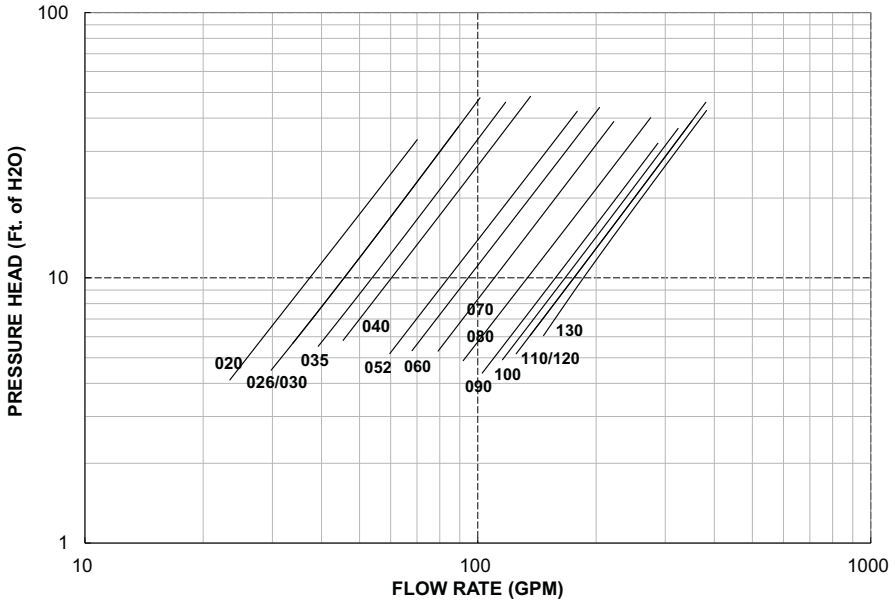


Figure 64. Pump curve - 120-130T - water only



Unit Component Pressure Drop. Figure 65 shows the pressure drop values for unit components.

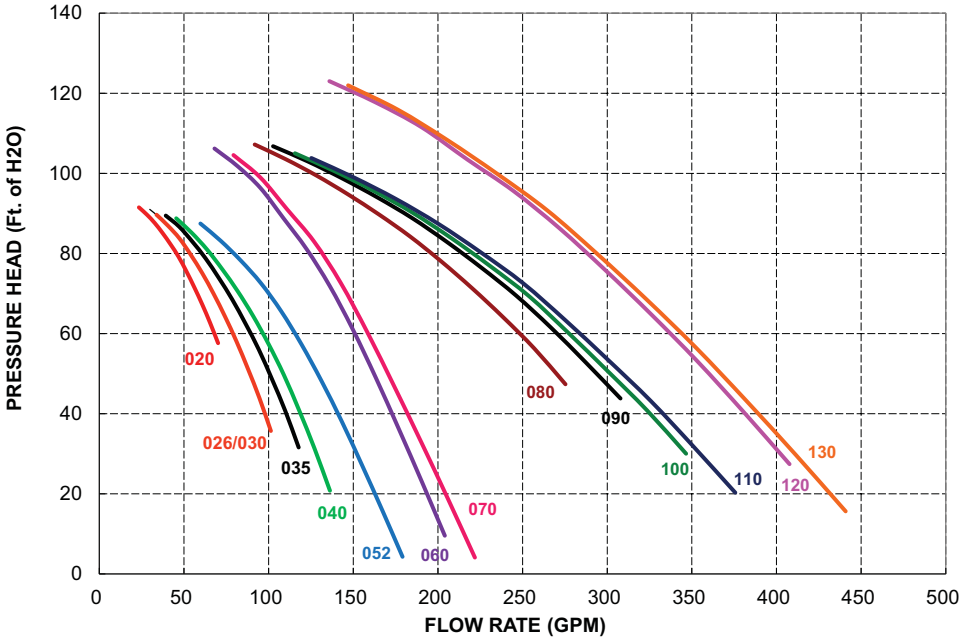
Figure 65. Unit component pressure drop - water only



System Head Pressure. See Figure 66 for the system head pressure available.

Note: *System Head Pressure = Pump Pressure - Component Pressure)*

Figure 66. CGAM pump package available head pressure - water only



Unit with Optional Pump Package Systems - Glycol

If using glycol in system, apply adjustment factors to pressure drops per the following formulas:

- Glycol Pump Head = Water Pump Head x Pump Adjustment Factor
- Glycol Component Pressure Drop = Components Pressure Drop x Component Adjustment Factor

Note:

- *For Water Pump Head, see Figure 61, p. 58 through Figure 64, p. 59*
- *For Component Pressure Drop, see Figure 65, p. 60*
- *For Pump and Component Adjustment Factors, see Table 28*

Table 28. Brine adjustment factors

Percentage Glycol	Ethylene Glycol Adjustment for		Propylene Glycol Adjustment for	
	Pump	Components	Pump	Components
5%	1.004	1.085	1.004	1.165
10%	1.009	1.120	1.009	1.200
15%	1.015	1.155	1.015	1.235
20%	1.021	1.190	1.021	1.270
25%	1.028	1.235	1.028	1.300
30%	1.034	1.280	1.034	1.330
35%	1.040	1.345	1.040	1.365
40%	1.046	1.410	1.046	1.400
45%	-	-	1.051	1.460

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 29

Table 29. Working fluid

Fluid Type	Fluid Percent (of weight)
Water	100%
Ethylene Glycol	0-40%
Propylene Glycol	0-45%

- Customer pressure drop must not exceed pump package head pressures found in section "General Information," p. 10.
- If buffer tank option is selected, customer water volume must not exceed the values in Table 30, p. 62 and Table 31, p. 63. User volume expansion capacity is defined as the additional expansion volume usable for the customer if the chiller is installed with pump package and buffer tank options.

Expansion Tank - Maximum Loop Volume

Expansion tanks supplied as part of the pump package option will allow loop expansion due to ambient fluctuations for maximum loop volumes shown in Table 30 and Table 31, p. 63.

Note: *Negative values indicate that a field-installed tank is required to cover the expansion due to ambient fluctuations of the fluid in the chiller.*

Important: *Chilled waterside pressure relief valve is designed to open at 226 ft. If relief valve is opening at lower pressures, verify system has sufficient expansion tank volume for the water and/or glycol solution used.*

Table 30. Maximum loop volume - gallons (external to the chiller)

	Maximum Ambient = 100°F										Maximum Ambient = 115°F									
		% Ethylene Glycol				% Propylene Glycol						% Ethylene Glycol				% Propylene Glycol				
Size	Water	10	20	30	40	10	20	30	40	45	Water	10	20	30	40	10	20	30	40	45
WITHOUT BUFFER TANK																				
020	479	433	296	199	148	292	198	139	108	98	317	293	216	155	120	222	155	112	87	80
026	479	433	296	199	148	292	198	139	108	98	317	293	216	155	120	222	155	112	87	80
030	479	433	296	199	148	292	198	139	108	98	317	293	216	155	120	222	155	112	87	80
035	479	433	296	199	148	292	198	139	108	98	317	293	216	155	120	222	155	112	87	80
040	474	428	291	194	143	286	193	134	102	93	312	287	211	150	114	216	149	106	82	75
052	474	428	291	194	143	286	193	134	102	93	312	287	211	150	114	216	149	106	82	75
060	474	428	291	194	143	286	193	134	102	93	312	287	211	150	114	216	149	106	82	75
070	474	428	291	194	143	286	193	134	102	93	312	287	211	150	114	216	149	106	82	75
080	626	565	383	253	185	377	252	174	131	119	411	378	276	194	147	283	194	136	104	95
090	626	565	383	253	185	377	252	174	131	119	411	378	276	194	147	283	194	136	104	95
100	626	565	383	253	185	377	252	174	131	119	411	378	276	194	147	283	194	136	104	95
110	626	565	383	253	185	377	252	174	131	119	411	378	276	194	147	283	194	136	104	95
120	626	565	383	253	185	377	252	174	131	119	411	378	276	194	147	283	194	136	104	95
130	626	565	383	253	185	377	252	174	131	119	411	378	276	194	147	283	194	136	104	95
WITH BUFFER TANK																				
020	335	289	152	55	4	148	54	-5	-36	-46	173	149	72	11	-24	78	11	-32	-57	-64
026	335	289	152	55	4	148	54	-5	-36	-46	173	149	72	11	-24	78	11	-32	-57	-64
030	335	289	152	55	4	148	54	-5	-36	-46	173	149	72	11	-24	78	11	-32	-57	-64
035	335	289	152	55	4	148	54	-5	-36	-46	173	149	72	11	-24	78	11	-32	-57	-64
040	338	292	155	58	7	150	57	-2	-34	-43	176	151	75	14	-22	80	13	-30	-54	-61
052	338	292	155	58	7	150	57	-2	-34	-43	176	151	75	14	-22	80	13	-30	-54	-61
060	338	292	155	58	7	150	57	-2	-34	-43	176	151	75	14	-22	80	13	-30	-54	-61
070	338	292	155	58	7	150	57	-2	-34	-43	176	151	75	14	-22	80	13	-30	-54	-61
080	470	409	226	97	29	220	96	17	-25	-38	254	221	119	38	-9	127	38	-20	-52	-62
090	470	409	226	97	29	220	96	17	-25	-38	254	221	119	38	-9	127	38	-20	-52	-62
100	425	364	181	52	-16	175	51	-28	-70	-83	210	177	74	-7	-54	82	-7	-65	-97	-107
110	425	364	181	52	-16	175	51	-28	-70	-83	210	177	74	-7	-54	82	-7	-65	-97	-107
120	425	364	181	52	-16	175	51	-28	-70	-83	210	177	74	-7	-54	82	-7	-65	-97	-107
130	425	364	181	52	-16	175	51	-28	-70	-83	210	177	74	-7	-54	82	-7	-65	-97	-107

Table 31. Maximum loop volume - liters (external to the chiller)

	Maximum Ambient = 100°F										Maximum Ambient = 115°F									
		% Ethylene Glycol				% Propylene Glycol						% Ethylene Glycol				% Propylene Glycol				
Size	Water	10	20	30	40	10	20	30	40	45	Water	10	20	30	40	10	20	30	40	45
WITHOUT BUFFER TANK																				
020	1813	1639	1121	754	561	1104	751	528	407	372	1201	1108	818	587	453	839	586	422	331	303
026	1813	1639	1121	754	561	1104	751	528	407	372	1201	1108	818	587	453	839	586	422	331	303
030	1813	1639	1121	754	561	1104	751	528	407	372	1201	1108	818	587	453	839	586	422	331	303
035	1813	1639	1121	754	561	1104	751	528	407	372	1201	1108	818	587	453	839	586	422	331	303
040	1793	1619	1101	734	541	1084	731	508	387	352	1181	1088	798	567	433	819	566	402	311	283
052	1793	1619	1101	734	541	1084	731	508	387	352	1181	1088	798	567	433	819	566	402	311	283
060	1793	1619	1101	734	541	1084	731	508	387	352	1181	1088	798	567	433	819	566	402	311	283
070	1793	1619	1101	734	541	1084	731	508	387	352	1181	1088	798	567	433	819	566	402	311	283
080	2370	2139	1448	958	701	1426	955	657	496	449	1555	1430	1044	736	558	1072	735	516	394	358
090	2370	2139	1448	958	701	1426	955	657	496	449	1555	1430	1044	736	558	1072	735	516	394	358
100	2370	2139	1448	958	701	1426	955	657	496	449	1555	1430	1044	736	558	1072	735	516	394	358
110	2370	2139	1448	958	701	1426	955	657	496	449	1555	1430	1044	736	558	1072	735	516	394	358
120	2370	2139	1448	958	701	1426	955	657	496	449	1555	1430	1044	736	558	1072	735	516	394	358
130	2370	2139	1448	958	701	1426	955	657	496	449	1555	1430	1044	736	558	1072	735	516	394	358
WITH BUFFER TANK																				
020	1268	1094	576	209	16	559	206	-17	-138	-173	656	563	273	42	-92	294	41	-123	-214	-242
026	1268	1094	576	209	16	559	206	-17	-138	-173	656	563	273	42	-92	294	41	-123	-214	-242
030	1268	1094	576	209	16	559	206	-17	-138	-173	656	563	273	42	-92	294	41	-123	-214	-242
035	1268	1094	576	209	16	559	206	-17	-138	-173	656	563	273	42	-92	294	41	-123	-214	-242
040	1278	1104	586	219	26	569	216	-7	-128	-163	666	573	283	52	-82	304	51	-113	-204	-232
052	1278	1104	586	219	26	569	216	-7	-128	-163	666	573	283	52	-82	304	51	-113	-204	-232
060	1278	1104	586	219	26	569	216	-7	-128	-163	666	573	283	52	-82	304	51	-113	-204	-232
070	1278	1104	586	219	26	569	216	-7	-128	-163	666	573	283	52	-82	304	51	-113	-204	-232
080	1778	1547	856	366	109	834	363	65	-96	-143	963	838	452	144	-34	480	143	-76	-198	-234
090	1778	1547	856	366	109	834	363	65	-96	-143	963	838	452	144	-34	480	143	-76	-198	-234
100	1608	1377	686	196	-61	664	193	-105	-266	-313	793	668	282	-26	-204	310	-27	-246	-368	-404
110	1608	1377	686	196	-61	664	193	-105	-266	-313	793	668	282	-26	-204	310	-27	-246	-368	-404
120	1608	1377	686	196	-61	664	193	-105	-266	-313	793	668	282	-26	-204	310	-27	-246	-368	-404
130	1608	1377	686	196	-61	664	193	-105	-266	-313	793	668	282	-26	-204	310	-27	-246	-368	-404

Installation - Electrical

General Recommendations

All wiring must comply with local codes and the National Electric Code. Typical field wiring diagrams are included at the end of the manual. Minimum circuit ampacities and other unit electrical data are on the unit nameplate. See the unit order specifications for actual electrical data. Specific electrical schematics and connection diagrams are shipped with the unit.

⚠ WARNING

Hazardous Voltage!

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

NOTICE:

Use Copper Conductors Only!

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

NOTICE:

Equipment Damage!

Do not allow conduit to interfere with other components, structural members or equipment. Control voltage (115V) wiring in conduit must be separate from conduit carrying low voltage (<30V) wiring. To prevent control malfunctions, do not run low voltage wiring (<30V) in conduit with conductors carrying more than 30 volts.

Electrical Data Tables

Table 32. Electrical data - 60 Hz

Unit Size	Rated Power	Number Circuits	Qty Comp	Qty Fans	Fan Motor Power (kw)	Cond Fan FLA	Compressor RLA[1]	Compressor LRA[2]	No pump MCA	No pump MOPD	Pump MCA	Pump MOP
	208/60/3	1	2	2	1	6.2	39-39	267-267	106	125	122	150
	230/60/3	1	2	2	1	6.7	39-39	267-267	106	125	122	150
20	380/60/3	1	2	2	1	3.7	22-22	160-160	60	80	n/a	
	460/60/3	1	2	2	1	3.2	19-19	142-142	51	60	64	80
	575/60/3	1	2	2	1	2.6	15-15	103-103	42	50	52	60
	208/60/3	1	2	2	1	6.2	51-51	315-315	131	175	148	175
	230/60/3	1	2	2	1	6.7	44-44	315-315	117	150	134	175
26	380/60/3	1	2	2	1	3.7	26-26	177-177	69	90	n/a	
	460/60/3	1	2	2	1	3.2	21-21	158-158	56	70	69	80
	575/60/3	1	2	2	1	2.6	19-19	126-126	50	60	59	70
	208/60/3	1	2	3	1	6.2	53-53	320-320	143	175	160	200
	230/60/3	1	2	3	1	6.7	54-54	320-320	146	175	153	200
30	380/60/3	1	2	3	1	3.7	31-31	210-210	83	110	n/a	
	460/60/3	1	2	3	1	3.2	26-26	160-160	70	90	83	100
	575/60/3	1	2	3	1	2.6	21-21	135-135	57	70	66	80
	208/60/3	1	2	3	1	6.2	53-74	320-485	169	225	186	250
	230/60/3	1	2	3	1	6.7	54-67	320-485	162	225	175	225
35	380/60/3	1	2	3	1	3.7	31-40	210-260	94	125	n/a	
	460/60/3	1	2	3	1	3.2	26-33	160-215	79	110	92	110
	575/60/3	1	2	3	1	2.6	21-26	135-175	64	90	73	90
	208/60/3	2	4	4	1	6.2	39-39/39-39	267-267/267-267	197	225	214	250
	230/60/3	2	4	4	1	6.7	39-39/39-39	267-267/267-267	198	225	214	250
40	380/60/3	2	4	4	1	3.7	22-22/22-22	160-160/160-160	112	125	n/a	
	460/60/3	2	4	4	1	3.2	19-19/19-19	142-142/142-142	95	110	108	125
	575/60/3	2	4	4	1	2.6	15-15/15-15	103-103/103-103	79	90	89	100
	208/60/3	2	4	4	1	6.2	51-51/51-51	315-315/315-315	246	250	263	300
	230/60/3	2	4	4	1	6.7	44-44/44-44	315-315/315-315	220	250	237	250
52	380/60/3	2	4	4	1	3.7	26-26/26-26	177-177/177-177	129	150	n/a	
	460/60/3	2	4	4	1	3.2	21-21/21-21	158-158/158-158	106	125	119	125
	575/60/3	2	4	4	1	2.6	19-19/19-19	126-126/126-126	93	110	103	110
	208/60/3	2	4	6	1	6.2	53-53/53-53	320-320/320-320	269	300		
	230/60/3	2	4	6	1	6.7	50-50/50-50	320-320/320-320	259	300	n/a	
60	380/60/3	2	4	6	1	3.7	31-31/31-31	210-210/210-210	157	175		
	460/60/3	2	4	6	1	3.2	26-26/26-26	160-160/160-160	132	150	148	150
	575/60/3	2	4	6	1	2.6	21-21/21-21	135-135/135-135	107	125	118	125
	208/60/3	2	4	6	1	6.2	53-74/74-54	320-485/485-320	316	350		
	230/60/3	2	4	6	1	6.7	50-67/67-50	350-485/485-350	297	350	n/a	
70	380/60/3	2	4	6	1	3.7	31-40/40-31	210-260/260-210	177	200		
	460/60/3	2	4	6	1	3.2	26-33/33-26	160-215/215-160	148	175	164	175
	575/60/3	2	4	6	1	2.6	21-26/26-21	135-175/175-135	120	125	131	150

Table 32. Electrical data - 60 Hz (continued)

Unit Size	Rated Power	Number Circuits	Qty Comp	Qty Fans	Fan Motor Power (kw)	Cond Fan FLA	Compressor RLA[1]	Compressor LRA[2]	No pump MCA	No pump MOPD	Pump MCA	Pump MOP
	208/60/3	2	4	6	1	6.2	74-74/74-74	485-485/485-485	358	400	388	450
	230/60/3	2	4	6	1	6.7	67-67/67-67	485-485/485-485	331	350	362	400
80	380/60/3	2	4	6	1	3.7	40-40/40-40	260-260/260-260	194	225	n/a	
	460/60/3	2	4	6	1	3.2	33-33/33-33	215-215/215-215	162	175	186	200
	575/60/3	2	4	6	1	2.6	26-26/26-26	175-175/175-175	131	150	150	175
	208/60/3	2	4	6	1	6.2	74-91/91-74	485-560/560-485	397	450	428	500
	230/60/3	2	4	6	1	6.7	67-85/85-67	485-560/560-485	370	450	401	450
90	380/60/3	2	4	6	1	3.7	40-55/55-40	260-310/310-260	227	275	n/a	
	460/60/3	2	4	6	1	3.2	33-42/42-33	215-260/260-215	182	200	206	225
	575/60/3	2	4	6	1	2.6	26-34/34-26	175-210/210-175	149	175	168	200
	208/60/3	2	4	8	1	6.2	91-91/91-91	560-560/560-560	444	500	475	500
	230/60/3	2	4	8	1	6.7	85-85/85-85	560-560/560-560	418	500	449	500
100	380/60/3	2	4	8	1	3.7	55-55/55-55	310-310/310-310	263	300	n/a	
	460/60/3	2	4	8	1	3.2	42-42/42-42	260-260/260-260	206	225	230	250
	575/60/3	2	4	8	1	2.6	34-34/34-34	210-210/210-210	169	200	188	200
	208/60/3	2	4	8	1	6.2	91-110/110-91	560-680/680-560	485	500	516	600
	230/60/3	2	4	8	1	6.7	85-109/109-85	560-680/680-560	473	500	504	600
110	380/60/3	2	4	8	1	3.7	55-60/60-55	310-360/360-310	275	300	n/a	
	460/60/3	2	4	8	1	3.2	42-51/51-42	260-320/320-260	226	250	250	250
	575/60/3	2	4	8	1	2.6	34-39/39-34	210-235/235-210	179	200	198	225
	208/60/3	2	4	8	1	6.2	110-110/110-110	680-680/680-680	521	600	n/a	
	230/60/3	2	4	8	1	6.7	109-109/109-109	680-680/680-680	522	600	568	600
120	380/60/3	2	4	8	1	3.7	60-60/60-60	360-360/360-360	285	300	n/a	
	460/60/3	2	4	8	1	3.2	51-51/51-51	320-320/320-320	244	250	268	300
	575/60/3	2	4	8	1	2.6	39-39/39-39	235-235/235-235	188	225	207	225
	208/60/3	2	6	10	1	6.2	74-74-91/91-74-74	485-485-560/ 560-485-485	569	600	n/a	
	230/60/3	2	6	10	1	6.7	67-67-85/85-67-67	485-485-560/ 560-485-485	531	600	578	600
130	380/60/3	2	6	10	1	3.7	40-40-55/55-40-40	260-260-310/ 310-260-260	321	350	n/a	
	460/60/3	2	6	10	1	3.2	33-33-42/42-33-33	215-215-260/ 260-215-215	261	300	285	300
	575/60/3	2	6	10	1	2.6	26-26-34/34-26-26	175-175-210/ 210-175-175	212	225	231	250

1. RLA - Rated Load Amps - Rated in accordance with UL Standard 1995.
2. LRA - Locked Rotor Amps - Based on full winding starts.
3. MCA - Minimum Circuit Ampacity - 125 percent of largest compressor RLA plus 100 percent of all other loads.
4. MOPD or Max fuse size - 225 percent of the largest compressor RLA plus all other loads.
5. Local codes may take precedence.
6. Voltage Utilization Range: +/- 10% of rated voltage
   Rated voltage (use range): 208/60/3 (187.2-228.8), 230/60/3(208-254), 380/60/3 (342-418), 460/60/3 (414-506), 575/60/3 (516-633)
7. One separate 120/60/1, 15 amp customer provided power connection is required to power the heaters.
8. n/a - not available

Table 33. Lug size range - 60 Hz

Unit Size	Rated Power	No Pump Terminal Blocks	No Pump Std Fault Ckt Breaker[1]	No Pump High Fault Ckt Breaker[1]	Pump Terminal Blocks	Pump Std Fault Ckt Breaker[1]	Pump High Fault Ckt Breaker[1]
20	208/60/3	#6 - 350 MCM	#8 - 3/0	#8 - 3/0	#6 - 350 MCM	#4 - 4/0	#4 - 4/0
	230/60/3	#6 - 350 MCM	#8 - 3/0	#8 - 3/0	#6 - 350 MCM	#4 - 4/0	#4 - 4/0
	380/60/3	#6 - 350 MCM	#14 - 1/0	#8 - 3/0	n/a	n/a	n/a
	460/60/3	#6 - 350 MCM	#14 - 1/0	#8 - 3/0	#6 - 350 MCM	#14 - 1/0	#8 - 3/0
	575/60/3	#6 - 350 MCM	#14 - 1/0	n/a	#6 - 350 MCM	#14 - 1/0	n/a
26	208/60/3	#6 - 350 MCM	#4 - 4/0	#4 - 4/0	#6 - 350 MCM	#4 - 4/0	#4 - 4/0
	230/60/3	#6 - 350 MCM	#4 - 4/0	#4 - 4/0	#6 - 350 MCM	#4 - 4/0	#4 - 4/0
	380/60/3	#6 - 350 MCM	#14 - 1/0	#8 - 3/0	n/a	n/a	n/a
	460/60/3	#6 - 350 MCM	#14 - 1/0	#8 - 3/0	#6 - 350 MCM	#14 - 1/0	#8 - 3/0
	575/60/3	#6 - 350 MCM	#14 - 1/0	n/a	#6 - 350 MCM	#14 - 1/0	n/a
30	208/60/3	#6 - 350 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#6 - 350 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	230/60/3	#6 - 350 MCM	#4 - 4/0	#4 - 4/0	#6 - 350 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	380/60/3	#6 - 350 MCM	#8 - 3/0	#8 - 3/0	n/a	n/a	n/a
	460/60/3	#6 - 350 MCM	#14 - 1/0	#8 - 3/0	#6 - 350 MCM	#14 - 1/0	#14 - 1/0
	575/60/3	#6 - 350 MCM	#14 - 1/0	n/a	#6 - 350 MCM	#14 - 1/0	n/a
35	208/60/3	#6 - 350 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#6 - 350 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	230/60/3	#6 - 350 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#6 - 350 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	380/60/3	#6 - 350 MCM	#8 - 3/0	#8 - 3/0	n/a	n/a	n/a
	460/60/3	#6 - 350 MCM	#8 - 3/0	#8 - 3/0	#6 - 350 MCM	#8 - 3/0	#8 - 3/0
	575/60/3	#6 - 350 MCM	#14 - 1/0	n/a	#6 - 350 MCM	#14 - 1/0	n/a
40	208/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	230/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	380/60/3	#4 - 500 MCM	#4 - 4/0	#4 - 4/0	n/a	n/a	n/a
	460/60/3	#4 - 500 MCM	#8 - 3/0	#8 - 3/0	#4 - 500 MCM	#4 - 4/0	#4 - 4/0
	575/60/3	#4 - 500 MCM	#8 - 3/0	n/a	#4 - 500 MCM	#8 - 3/0	n/a
52	208/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]
	230/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	380/60/3	#4 - 500 MCM	#4 - 4/0	#4 - 4/0		n/a	
	460/60/3	#4 - 500 MCM	#4 - 4/0	#4 - 4/0	#4 - 500 MCM	#4 - 4/0	#4 - 4/0
	575/60/3	#4 - 500 MCM	#8 - 3/0	n/a	#4 - 500 MCM	#8 - 3/0	n/a
60	208/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]			
	230/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]		n/a	
	380/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM			
	460/60/3	#4 - 500 MCM	#4 - 4/0	#4 - 4/0	#4 - 500 MCM	#4 - 4/0	#4 - 4/0
	575/60/3	#4 - 500 MCM	#4 - 4/0	n/a	#4 - 500 MCM	#4 - 4/0	n/a

1. Optional circuit breaker and high fault circuit breaker.
2. Will accept two conduits per phase in this size.
3. Copper wire only, based on nameplate Minimum Circuit Ampacity (MCA).
4. Data shown for circuit one. The second circuit is always the same.
5. n/a - not available

Table 33. Lug size range - 60 Hz (continued)

		No Pump			Pump		
Unit Size	**Rated Power**	**Terminal Blocks**	**Std Fault Ckt Breaker[1]**	**High Fault Ckt Breaker[1]**	**Terminal Blocks**	**Std Fault Ckt Breaker[1]**	**High Fault Ckt Breaker[1]**
70	208/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]			
	230/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]		n/a	
	380/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM			
	460/60/3	#4 - 500 MCM	#4- 4/0	#4 - 4/0	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	575/60/3	#4 - 500 MCM	#4- 4/0	n/a	#4 - 500 MCM	#4- 4/0	n/a
80	208/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 350 MCM[2]	2/0 - 500 MCM[2]	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]
	230/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 350 MCM[2]	2/0 - 500 MCM[2]	#4 - 500 MCM[2]	#1 - 600 MCM or #1 - 350 MCM[2]	2/0 - 500 MCM[2]
	380/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM		n/a	
	460/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	575/60/3	#4 - 500 MCM	#4- 4/0	n/a	#4 - 500 MCM	3/0 - 350 MCM	n/a
90	208/60/3	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]
	230/60/3	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]
	380/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM		n/a	
	460/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#6 - 350 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	575/60/3	#4 - 500 MCM	#4- 4/0	n/a	#6 - 350 MCM	3/0 - 350 MCM	n/a
100	208/60/3	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]	#6 - 350 MCM	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]
	230/60/3	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]	#6 - 350 MCM	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]
	380/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]		n/a	
	460/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#6 - 350 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	575/60/3	#4 - 500 MCM	3/0 - 350 MCM	n/a	#6 - 350 MCM	3/0 - 350 MCM	n/a
110	208/60/3	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]	#6 - 350 MCM	2/0-500 MCM[2]	2/0-500 MCM[2]
	230/60/3	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]	#6 - 350 MCM	2/0-500 MCM[2]	2/0-500 MCM[2]
	380/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]		n/a	
	460/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#6 - 350 MCM	3/0 - 350 MCM	3/0 - 350 MCM
	575/60/3	#4 - 500 MCM	3/0 - 350 MCM	n/a	#6 - 350 MCM	3/0 - 350 MCM	n/a
120	208/60/3	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]		n/a	
	230/60/3	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]	#6 - 350 MCM	2/0-500 MCM[2]	2/0-500 MCM[2]
	380/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]		n/a	
	460/60/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM	#6 - 350 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]
	575/60/3	#4 - 500 MCM	3/0 - 350 MCM	n/a	#6 - 350 MCM	3/0 - 350 MCM	n/a
130	208/60/3	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]		n/a	
	230/60/3	#4 - 500 MCM[2]	2/0 - 500 MCM[2]	2/0 - 500 MCM[2]	#4 - 500 MCM[2]	2/0-500 MCM[2]	2/0-500 MCM[2]
	380/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]		n/a	
	460/60/3	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]	#4 - 500 MCM	#1 - 600 MCM or #1 - 250 MCM[2]	2/0 - 500 MCM[2]
	575/60/3	#4 - 500 MCM	3/0 - 350 MCM	n/a	#4 - 500 MCM	3/0 - 350 MCM	n/a

1. Optional circuit breaker and high fault circuit breaker.
2. Will accept two conduits per phase in this size.
3. Copper wire only, based on nameplate Minimum Circuit Ampacity (MCA).
4. Data shown for circuit one. The second circuit is always the same.
5. n/a - not available

Table 34. Electrical data - 50Hz

Unit Size	Rated Power	Number Circuits	Qty Comp	Qty Fans	Fan Motor Power (kW)	Cond Fan FLA	Compressor RLA[1] [2]	Compressor LRA[1] [3]	MCA	MOPD
20	400/50/3	1	2	2	1	2.4	17-17	142-142	46	60
26	400/50/3	1	2	2	1	2.4	21-21	158-158	55	70
30	400/50/3	1	2	3	1	2.4	27-27	160-160	71	90
35	400/50/3	1	2	3	1	2.4	27-33	160-215	79	110
40	400/50/3	2	4	4	1	2.4	17-17/17-17	142-142/142-142	85	100
52	400/50/3	2	4	4	1	2.4	21-21/21-21	158-158/158-158	102	110
60	400/50/3	2	4	6	1	2.4	27-27/27-27	160-160/160-160	133	150
70	400/50/3	2	4	6	1	2.4	27-33/33-27	160-215/215-160	147	175
80	400/50/3	2	4	6	1	2.4	33-33/33-33	215-215/215-215	160	175
90	400/50/3	2	4	6	1	2.4	33-43/43-33	215-260/260-215	181	200
100	400/50/3	2	4	8	1	2.4	43-43/43-43	260-260/260-260	204	225
110	400/50/3	2	4	8	1	2.4	43-47/47-43	260-320/260-320	214	250
120	400/50/3	2	4	8	1	2.4	47-47/47-47	320-320/320-320	223	250

1. RLA - Rated Load Amps - Rated in accordance with UL Standard 1995.
2. LRA - Locked Rotor Amps - Based on full winding starts.
3. MCA - Minimum Circuit Ampacity - 125 percent of largest compressor RLA plus 100 percent of all other loads.
4. MOPD or Max fuse size - 225 percent of the largest compressor RLA plus all other loads.
5. Local codes may take precedence.
6. Voltage Utilization Range: +/- 10% of rated voltage
   Rated voltage (use range): 400/50/3 (360-440)
7. One separate 120/50/1, 15 amp customer provided power connection is required to power the heaters.
8. n/a - not available
9. Pump package not available with 50 Hz units.

Table 35. Lug size range - 50 Hz

Unit Size	Rated Power	Terminal Blocks	Std Fault Ckt Breaker[1]	High Fault Ckt Breaker[1]
20	400/50/3	#6 - 350 MCM	#14 - 1/0	#8 - 3/0
26	400/50/3	#6 - 350 MCM	#14 - 1/0	#8 - 3/0
30	400/50/3	#6 - 350 MCM	#14 - 1/0	#8 - 3/0
35	400/50/3	#6 - 350 MCM	#8 - 3/0	#8 - 3/0
40	400/50/3	#4 - 500 MCM	#8 - 3/0	#6 - 350 MCM
52	400/50/3	#4 - 500 MCM	#8 - 3/0	#6 - 350 MCM
60	400/50/3	#4 - 500 MCM	#4 - 4/0	#6 - 350 MCM
70	400/50/3	#4 - 500 MCM	#4 - 4/0	#6 - 350 MCM
80	400/50/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM
90	400/50/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM
100	400/50/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM
110	400/50/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM
120	400/50/3	#4 - 500 MCM	3/0 - 350 MCM	3/0 - 350 MCM

1. Optional circuit breaker and high fault circuit breaker.
2. Will accept two conduits per phase in this size.
3. Copper wire only, based on nameplate Minimum Circuit Ampacity (MCA).
4. Data shown for circuit one. The second circuit is always the same.
5. n/a - not available

Installer-Supplied Components

Customer wiring interface connections are shown in the electrical schematics and connection diagrams that are shipped with the unit. The installer must provide the following components if not ordered with the unit:

- Power supply wiring (in conduit) for all field-wired connections.
- All control (interconnecting) wiring (in conduit) for field supplied devices.
- Circuit breakers.

Power Supply Wiring

⚠WARNING

Proper Field Wiring and Grounding Required!

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 electrical codes. Failure to follow code could result in death or serious injury.

All power supply wiring must be sized and selected accordingly by the project engineer in accordance with NEC Table 310-16.

⚠WARNING

Hazardous Voltage!

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

All wiring must comply with local codes and the National Electrical Code. The installing (or electrical) contractor must provide and install the system interconnecting wiring, as well as the power supply wiring. It must be properly sized and equipped with the appropriate fused disconnect switches.

The type and installation location(s) of the fused disconnects must comply with all applicable codes.

NOTICE:

Use Copper Conductors Only!

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

Knock-outs for wiring are located on the bottom right side of the control panel. The wiring is passed through these conduits and connected to the terminal blocks or HACR type breakers. Refer to Table 36.

To provide proper phasing of 3-phase input, make connections as shown in field wiring diagrams and as stated on the WARNING label in the starter panel. For additional information on proper phasing, refer to "Unit Voltage Phasing," p. 122. Proper equipment ground must be provided to each ground connection in the panel (one for each customer-supplied conductor per phase).

The high voltage field-provided connections are made through knockouts on the right side of the panel. The low voltage connections are made through the left side of the panel (Figure 36). Additional grounds may be required for each 115 volt power supply to the unit. Green lugs are provided for 115V customer wiring.

Control Power Supply

The unit is equipped with a control power transformer; it is not necessary to provide additional control power voltage to the unit. No other loads should be connected to the control power transformer.

All units are factory-connected for appropriate labeled voltages.

NOTICE:

Equipment Damage!

Control panel main processor does not check for loss of power to the heat tape nor does it verify thermostat operation. A qualified technician must verify power to the heat tape and confirm operation of the heat tape thermostat to avoid catastrophic damage to the evaporator or partial heat recovery heat exchanger.

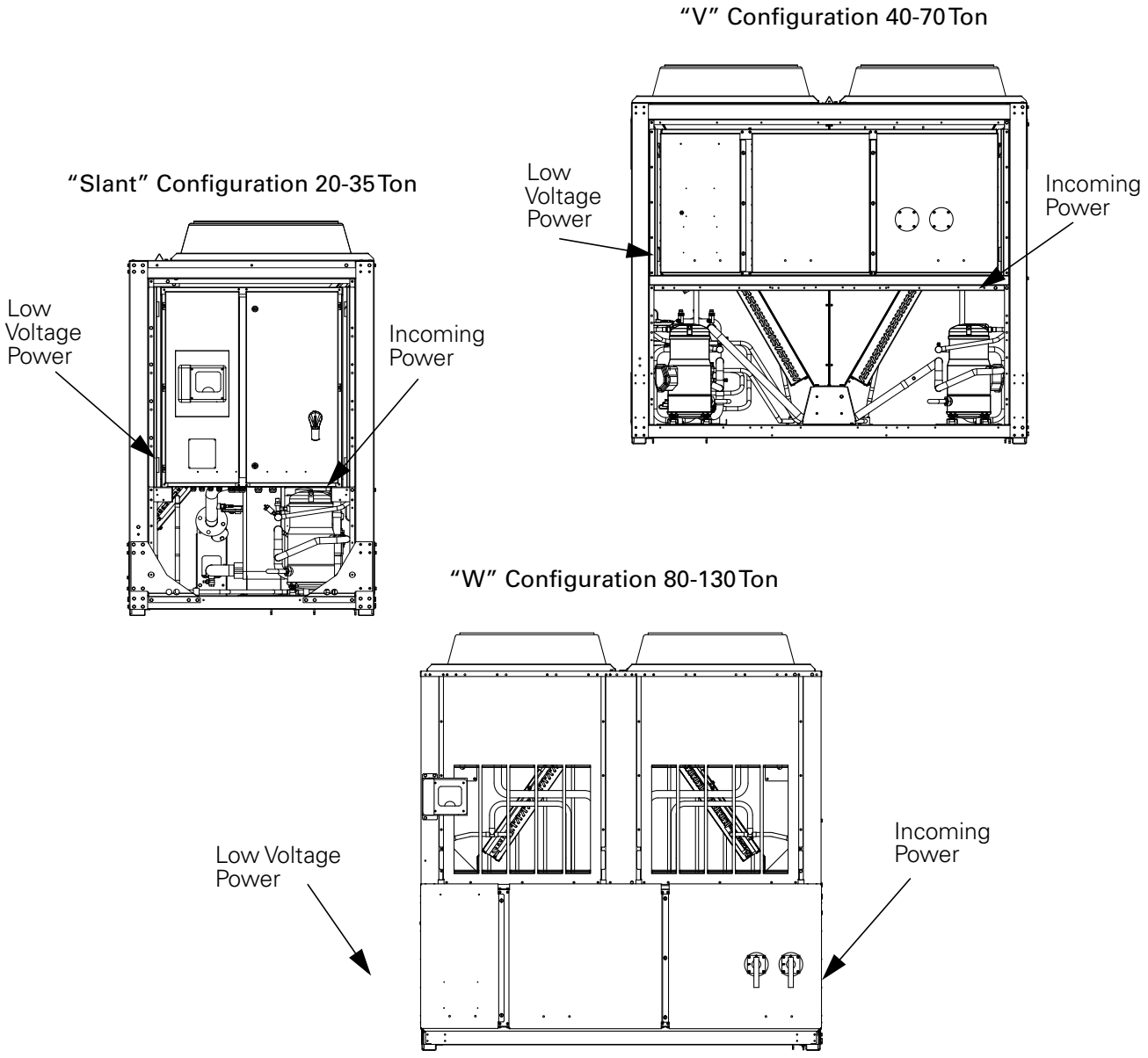
Heater Power Supply

For units with freeze protection selected (model number digit 18 is "1"), the evaporator shell is insulated from ambient air and protected from freezing temperatures by a thermostatically-controlled immersion heaters. When the ambient temperature drops to approximately 37°F (2.8°C) the thermostat energizes the heaters. The heaters will provide protection from ambient temperatures down to -20°F (-29°C).

It is required to provide an independent power source (115V 60-Hz-20 amp, 50Hz-15 amp), with a fused-disconnect to the heaters. The heaters are factory-wired back to the unit control panel.

Note: *If evaporator is drained, the heater must be turned off in order to avoid damaging the evaporator. The heater should only be on when the evaporator has water in it.*

Table 36. Power Entrance



Partial Heat Recovery Power Supply

The partial heat recover heat exchanger is insulated from ambient air and protected from freezing temperatures by an immersion heater. When the ambient air temperature drops to approximately 37°F (2.8°C) the thermostat energizes the heaters. The heaters will provide protection from ambient temperatures down to -20°F (-29°C).

It is required to provide an independent power source (115V 60-Hz-20 amp, 50Hz-15 amp), with a fused-disconnect to the heater. The heaters are factory-wired back to the unit control panel.

Note: *If partial heat recovery heat exchanger is drained, the heater must be turned off in order to avoid damaging the partial heat recovery heat exchanger. The heater should only be on when the heat recovery heat exchanger has water in it.*

Water Pump Power Supply

Provide power supply wiring with disconnect for the chilled water pump(s).

Interconnecting Wiring

Chilled Water Flow (Pump) Interlock

All CGAM model chillers have a factory-installed flow switch. In addition, it is recommended to use an additional field-supplied control voltage contact input through an auxiliary contact to prove flow. Connect the auxiliary contact to 1X5-3 and 1X5-9. Refer to the field wiring for details. The auxiliary contact can be a BAS signal, starter contactor auxiliary or any signal which indicates the pump is running.

Chilled Water Pump Control

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 build up 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. Normally, the EWP relay follows the AUTO mode of the chiller. Whenever the chiller has no diagnostics and is in the AUTO mode, regardless of where the auto command is coming from, the 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.

t

NOTICE:

Equipment Damage!

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

Table 37. Pump Relay Operation

Chiller Mode	Relay Operation
Auto	Instant close
Ice Building	Instant close
Tracer Override	Close
Stop	Timed to Open
Ice Complete	Instant 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 CH530 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!

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

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

A Low Chilled Water Temperature diagnostic (non-latching) unless also accompanied by an Evap 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 CH530 control. If another method of freeze protection is used (i.e. glycol, heaters, purge, etc) then the pump may be controlled by another system.*

Chilled Water Pump Control - Field Supplied Dual Pumps

CH530 can provide pump control for two customer-supplied pumps, as long as the pump contactor coils 1A9 and connect the pump fault feedback signals 1A12 are properly connected.

In this situation, the unit will leave the factory with Evaporator Pump Control (EVPC) = No Pump Control (Pump Request Relay) (NPMP) and Evaporator Pump Fault Input (EVFI) = Installed (INST). When the contactors and pumps are set up in the field, the CH530 Service Tool (TechView) must be used to reconfigure to Evaporator Pump Control = Dual Pump Fixed Speed and Evaporator Pump Fault Input = Not Installed or Installed depending on how the fault feedback wire is connected. It is strongly recommended to install the Fault Input if possible as the controls will “hot-swap” the pumps upon detection of a fault, and may avoid the inevitable Flow Loss diagnostic (and unit shutdown) that will result if there is no fault feedback.

When configured for Dual Pump Fixed Speed, the CH530 will swap pumps on detection of a fault (if installed), or when a flow loss or overdue event occurs. It will also switch pumps each time the overall pump request is removed and re-engaged, unless a fault is detected on one of the pumps. If faults are detected on both pumps, the unit will be shut down.

In addition to the factory installed flow switch, a field-supplied auxiliary contact is required, so that the chiller will only detect flow if a pump is running and the flow switch says flow is present.

Chilled Water Pump Control - Optional Pump Package

When factory installed pump package option is selected, the chiller MUST control the pumps. See "Chilled Water Pump Control," p. 72.

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 38. The relay will be energized when the event/state occurs.

Table 38. Alarm and Status Relay Output Configuration Table

	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

CH530 ServiceTool (TechView) is used to install the Alarm and Status Relay Option package and 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 39. Default Relay Assignments

Relay	
Relay 1 Terminals J2 -12,11,10:	Compressor Running
Relay 2 Terminals J2 - 9,8,7:	Latching Alarm

Table 39. Default Relay Assignments

Relay	
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!

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 electrical codes. Failure to follow code could result in death or serious injury.

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

CH530 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. Refer to the field diagrams that are shipped with the unit.

NOTICE:

Equipment Damage!

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

Ice Building Option

CH530 provides auxiliary control for a customer specified/installed contact closure for ice building if so configured and enabled. This output is known as the Ice Building Status Relay. The normally open contact will be closed when ice building is in progress and open when ice building has been normally terminated either through Ice Termination setpoint being reached or removal of the Ice Building command. When contact 6K6 is provided, the chiller will run normally when the contact is open.

CH530 will accept either an isolated contact closure (External Ice Building command) or a Remote Communicated input (Tracer) to initiate and command the Ice Building mode.

CH530 also provides a "Front Panel Ice Termination Setpoint", settable through TechView, and adjustable from 20 to 31°F (-6.7 to -0.5°C) in at least 1°F (1°C) increments.

When in the Ice Building mode, and the evaporator entering water temperature drops below the ice termination setpoint, the chiller terminates the Ice Building mode and changes to the Ice Building Complete Mode.

NOTICE:

Evaporator Damage!

Freeze inhibitor must be adequate for the leaving water temperature. Failure to do so may result in damage to system components.

TechView may also be used to enable or disable Ice Machine Control. This setting does not prevent the Tracer from commanding Ice Building mode.

Upon contact closure, the CH530 will initiate an ice building mode, in which the unit runs fully loaded at all times. Ice building shall be terminated either by opening the contact or based on the entering evaporator water temperature. CH530 will not permit the ice building mode to be reentered until the unit has been switched out of ice building mode (open 5K20 contacts) and then switched back into ice building mode (close 5K20 contacts.)

In ice building, all limits (freeze avoidance, evaporator, condenser, current) will be ignored. All safeties will be enforced.

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

Connect leads from 6K6 to the proper terminals of 1A16. Refer to the field diagrams which are shipped with the unit.

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

External Chilled Water Setpoint (ECWS) Option

The CH530 provides inputs that accept either 4-20 mA or 2-10 VDC signals to set the external chilled water setpoint (ECWS). **This is not a reset function.** The input defines the set point. This input is primarily used with generic BAS (building automation systems). The chilled water setpoint set via the DynaView or through digital communication with Tracer.

The chilled water setpoint may be changed from a remote location by sending either a 2-10 VDC or 4-20 mA signal to the 1A14, J2-1 and 2. The 2-10 VDC and 4-20 mA each correspond to a 10 to 65°F (-12 to 18°C) external chilled water setpoint.

The following equations apply:

Voltage Signal

$$VDC = (8*ECWS_{°F} + 2*ECWS_{max} - 10*ECWS_{min})/(ECWS_{max} - ECWS_{min})$$

Current Signal

$$mA = (16*ECWS_{°F} + 4*ECWS_{max} - 20*ECWS_{min})/ (ECWS_{max} - ECWS_{min})$$

Note: *To convert ECWS values to °F, use the following formula: °F = 1.8*(°C) + 32*

If the ECWS input develops an open or short, the LLID will report either a very high or very low value back to the main processor. This will generate an informational diagnostic and the unit will default to using the Front Panel (DynaView) Chilled Water Setpoint.

TechView Service Tool is used to set the input signal type from the factory default of 2-10 VDC to that of 4-20 mA. TechView is also used to install or remove the External Chilled Water Setpoint option as well as a means to enable and disable ECWS.

External Demand Limit Setpoint (EDLS) Option

CH530 provide a means to limit the capacity of the chiller by limiting the number of compressors or stages that are allowed to run. The maximum number of compressor or stages allowed to run can vary from one to the number of stages on the unit. The staging algorithm is free to decide which compressor or stage shall be turned off or prevented from running to meet this requirement.

CH530 shall accept either a 2-10 VDC or 4-20 mA analog input suitable for customer connection to set the unit external demand limit setpoint (EDLS).

2-10 VDC and 4-20 mA shall each correspond to an EDLS range with a minimum of 0% and a maximum of 100%. The following equations exist.

Global Scroll	Voltage Signal	Current Signal
As generated from external source	Vdc = 8*(EDLS) + 2	mA = 16*(EDLS) + 4
As processed by CH530	EDLS = (Vdc - 2)/8	EDLS = (mA - 4)/16

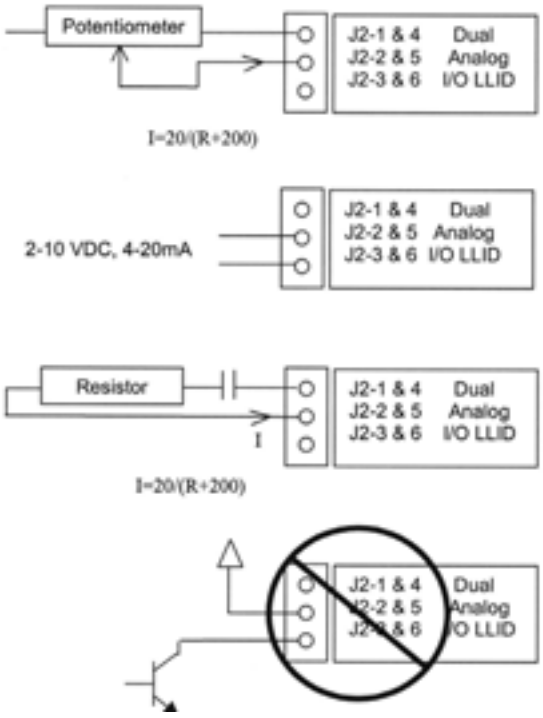
The minimum EDLS will be clamped at the front panel based on 100% / Total number of Compressors. For input signals beyond the 2-10VDC or 4-20mA range, the end of range value shall be used. For example, if the customer inputs 21 mA, the EDLS shall limit it self to the corresponding 20 mA EDLS.

ECWS and EDLS Analog Input Signal Wiring Details

Both the ESWS and EDLS can be connected and setup as either a 2-10 VDC (factory default), 4-20 mA, or resistance input (also a form of 4-20 mA) as indicated below. Depending on the type to be used, the TechView Service Tool must be used to configure the LLID and the MP for the proper input type that is being used. This is accomplished by a setting change on the Custom Tab of the Configuration View within TechView.

The J2-3 and J2-6 terminal is chassis grounded and terminal J2-1 and J2-4 can be used to source 12 VDC. The ECLS uses terminals J2-2 and J2-3. EDLS uses terminals J2-5 and J2-6. Both inputs are only compatible with high-side current sources.

Figure 67. Wiring Examples for ECLS and EDLS



Chilled Water Reset (CWR)

CH530 resets the chilled water temperature set point based on either return water temperature, or outdoor air temperature.

The following shall be selectable:

- One of three Reset Types: None, Return Water Temperature Reset, Outdoor Air Temperature Reset, or Constant Return Water Temperature Reset.
- Reset Ratio Set Points.
- For outdoor air temperature reset there shall be both positive and negative reset ratio's.
- Start Reset Set Points.
- Maximum Reset Set Points.

The equations for each type of reset are as follows:

Return

CWS' = CWS + RATIO (START RESET - (TWE - TWL))

and CWS' > or = CWS

and CWS' - CWS < or = Maximum Reset

Outdoor

CWS' = CWS + RATIO * (START RESET - TOD)

and CWS' > or = CWS

and CWS' - CWS < or = Maximum Reset

where

CWS' is the new chilled water set point or the "reset CWS"

CWS is the active chilled water set point before any reset has occurred, e.g. normally Front Panel, Tracer, or ECWS

RESET RATIO is a user adjustable gain

START RESET is a user adjustable reference

TOD is the outdoor temperature

TWE is entering evap. water temperature

TWL is leaving evap. water temperature

MAXIMUM RESET is a user adjustable limit providing the maximum amount of reset. For all types of reset, CWS' - CWS < or = Maximum Reset.

Reset Type	Reset Ratio Range	Start Reset Range	Maximum Reset Range	Increment IP	Increment SI	Factory Default Value
Return	10-120%	4-30°F (2.2-16.7°C)	0-20°F (0.0-11.1°C)	1%	1%	50%
Outdoor	80--80%	50 - 130°F (10-54.4°C)	0 - 20°F (0.0-11.1°C)	1%	1%	10%

In addition to Return and Outdoor Reset, the MP provides a menu item for the operator to select a Constant Return Reset. Constant Return Reset will reset the leaving water temperature set point so as to provide a constant entering water temperature. The Constant Return Reset equation is the same as the Return Reset equation except on selection of Constant Return Reset, the MP will automatically set Ratio, Start Reset, and Maximum Reset to the following.

RATIO = 100%

START RESET = Design Delta Temp.

MAXIMUM RESET = Design Delta Temp.

The equation for Constant Return is then as follows:

CWS' = CWS + 100% (Design Delta Temp. - (TWE - TWL))

and CWS' > or = CWS

and CWS' - CWS < or = Maximum Reset

When any type of CWR is enabled, the MP will step the Active CWS toward the desired CWS' (based on the above equations and setup parameters) at a rate of 1 degree F every 5 minutes until the Active CWS equals the desired CWS'. This applies when the chiller is running.

When the chiller is not running the CWS is reset immediately (within one minute) for Return Reset and at a rate of 1 degree F every 5 minutes for Outdoor Reset. The chiller will start at the Differential to Start value above a fully reset CWS or CWS' for both Return and Outdoor Reset.

Percent Capacity Output Option

CH530 provides an optional percent capacity output for those customers without a communicating BAS interface. The active unit capacity (AUC) is provided through a 2-10 VDC analog output at 1A25 terminals J2-4 and J2-6 (GND). The active unit capacity value (in %) can be derived from the 2-10 VDC output voltage (OV) using the following calculation:

AUC = 100*(OV - 2.0V)/(10.0V - 2.0V)

Note: *The percent capacity output is based on the number and size of compressors energized, and is not adjusted for operating conditions. This value cannot be used as an accurate measure of total unit current, power or cooling capacity.*

Communications Interface options

Tracer Communications Interface

This option allows the Tracer CH530 controller to exchange information (e.g. operating setpoints and Auto/Standby commands) with a higher-level control device, such as a Tracer Summit or a multiple-machine controller. A shielded, twisted pair connection establishes the bi-directional communications link between the Tracer CH530 and the building automation system.

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

⚠ WARNING

Proper Field Wiring and Grounding Required!

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 electrical codes. Failure to follow code could result in death or serious injury.

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 40. Wire Size

Wire Size	Maximum Length of Communication Wire
14 AWG (2.5 mm^2)	5,000 FT (1525 m)
16 AWG (1.5 mm^2)	2,000 FT (610 m)
18 AWG (1.0 mm^2)	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.

LonTalk Communications Interface for Chillers (LCI-C)

CH530 provides an optional LonTalk Communication Interface (LCI-C) between the chiller and a Building Automation System (BAS). An LCI-C LLID shall be used to provide “gateway” functionality between a LonTalk compatible device and the Chiller. The inputs/outputs include both mandatory and optional network variables as established by the LonTalk Functional Chiller Profile 8040.

Installation Recommendations

- 22 AWG Level 4 unshielded communication wire recommended for most LCI-C installations
- LCI-C link limits: 4500 feet, 60 devices
- Termination resistors are required
- 105 ohms at each end for Level 4 wire
- 82 ohms at each end for Trane "purple" wire
- LCI-C topology should be daisy chain
- Zone sensor communication stubs limited to 8 per link, 50 feet each (maximum)
- One repeater can be used for an additional 4500 feet, 60 devices, 8 communication stubs

Table 41. LonTalk Points List

Inputs/Outputs	Length and Contents	SNVT / UNVT
Chiller Enable/Disable Request	2 bytes	SNVT_switch
Chilled Water Setpoint	2 bytes	SNVT_temp_p
Capacity Limit Setpoint (used by Demand Limit Setpoint)	2 bytes	SNVT_lev_percent
Operating Mode Request	1 byte	SNVT_hvac_mode
Chiller Running State	2 bytes	SNVT_switch
Active Chilled Water or Hot Water Setpoint	2 bytes	SNVT_temp_p
Actual Running Capacity	2 bytes	SNVT_lev_percent
Active Capacity Limit Setpoint (from Active Demand Limit Setpoint)	2 bytes	SNVT_lev_percent
Evaporator Leaving Water Temp	2 bytes	SNVT_temp_p
Evaporator Entering Water Temp	2 bytes	SNVT_temp_p
Alarm Description	31 bytes	SNVT_str_asc
Chiller Status 00 = Chiller off 01 = Chiller in start mode 02 = Chiller in run mode 03 = Chiller in pre-shutdown mode 04 = Chiller in service mode 03 = Cooling only 0A = Cooling with compressor not running 0B = Ice-making mode bit 0 (MSB) = in alarm mode bit 1 = run enabled bit 2 = local bit 3 = limited bit 4 = evaporator water flow	3 bytes	SNVT_chlr_status

BACnet Communications Interface for Chillers (BCI-C)

The optional BACnet Communication Interface for Chillers (BCI-C) is comprised of a Tracer UC400 controller with interface software. It is a non-programmable communications module that allows the RTWD or RTUD unit to communicate on a BACnet communications network.

BACnet Data Points and Configuration Property Definitions

The BCI-C device allows certain models of Trane chillers with CH530 controls to communicate with BACnet systems and devices using BACnet MS/TP. This section includes information about:

- BACnet protocol implementation conformance statement (PICS)
- Object types: descriptions and configuration (refer to Table 42, p. 79)
- BACnet protocol: data link layers, device address binding, networking options, and character sets
- Object data points and configurations

BACnet Protocol Implementation Conformance Statement (PICS)

Standardized Device Profile (Annex L)

Profile Description	Supported Profile
BACnet Advanced Application Controller (B-AAC)	
BACnet Application Specific Controller (B-ASC)	ü
BACnet Building Controller (B-BC)	
BACnet Operator Workstation (B-OWS)	
BACnet Smart Actuator (B-SA)	
BACnet Smart Sensor (B-SS)	

Interoperability Building Blocks (Annex K)

Data Sharing Description	Supported BIBB
Data Sharing-COV-B (DS-COV-B)	
Data Sharing-ReadProperty-A (DS-RP-A)	ü
Data Sharing-ReadProperty-B (DS-RP-B)	ü
Data Sharing-ReadPropertyMultiple-B (DS-RPM-B)	ü
Data Sharing-WriteProperty-A (DS-WP-A)	ü
Data Sharing-WriteProperty-B (DS-WP-B)	ü
Data Sharing-WritePropertyMultiple-B (DS-WPM-B)	ü
Alarm and Event Management Description	**Supported BIBB**
Alarm and Event-ACKI-B (AE-ACK-B)	ü
Alarm and Event-Alarm Summary-B (AE-ASUM-B)	ü
Alarm and Event-Enrollment Summary-B (AE-ESUM-B)	ü
Alarm and Event-Information-B (AE-INFO-B)	ü
Alarm and Event-Notification Internal-B (AE-N-I-B)	ü
Trending Description	**Supported BIBB**
Trending-Automated Trend Retrieval-B (T-ATR-B)	ü
Trending-viewing and Modifying Trends Internal-B (T-VMT-I-B)	ü
Device Management Description	**Supported BIBB**
Device Management-Backup and Restore-B (DM-BR-B)	ü
Device Management-Device Communication Control-B (DM-DCC-B)	ü
Device Management-Dynamic Device Binding-A (DM-DDB-A)	ü
Device Management-Dynamic Device Binding-B (DM-DDB-B)	ü
Device Management-Dynamic Object Binding-B (DM-DOB-B)	ü
Device Management-List Manipulation-B (DM-LM-B)	ü
Device Management-Object Creation and Deletion-B (DM-OCD-B)	ü
Device Management-Private Transfer-A (DM-PT-A)	ü
Device Management-Private Transfer-B (DM-PT-B)	ü
Device Management-Reinitialize Device-B (DM-RD-B)	ü
Device Management-TimeSynchronization-B (DM-TS-B)	ü

Segmentation Capability

Segmentation Description	Supported Segment
Segmented Requests/ Window Size: 1	ü
Segmented Responses/ Window Size: 1	ü

Object Types

Table 42. Descriptions and configurations

Object Type	Required Properties Read	Properties Written[a]	Optional Properties Read	Ability to Create	Ability to Delete
Analog Input	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Units	• Object_Name • Description • Out_Of_Service • Present_Value • Reliability • Min_Pres_Value • Max_Pres_Value • COV_Increment • Time_Delay • Notification_Class • High_Limit • Low_Limit • Deadband • Limit_Enable • Event_Enable • Notify_Type	• Description • Reliability • Min_Pres_Value • Max_Pres_Value • COV_Increment • Time_Delay • Notification _Class • High_Limit • Low_Limit • Deadband • Limit_Enable • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps	Yes	Yes, only user created objects
Analog Output	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Units • Priority_Array • Relinquish_Default	• Object_Name • Description • Out_Of_Service • Present_Value • Reliability • Min_Pres_Value • Max_Pres_Value • Relinquish_Default • COV_Increment • Time_Delay • Notification_Class • High_Limit • Low_Limit • Deadband • Limit_Enable • Event_Enable • Notify_Type	• Description • Reliability • Min_Pres-Value • Max_Pres_Value • COV_Increment • Time_Delay • Notification _Class • High_Limit • Low_Limit • Deadband • Limit_Enable • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps	Yes	Yes, only user created objects
Analog Value	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Units	• Object_Name • Description • Out_Of_Service • Present_Value • Reliability • Relinquish_Default • COV_Increment • Time_Delay • Notification_Class • High_Limit • Low_Limit • Deadband • Limit_Enable • Event_Enable • Notify_Type	• Description • Reliability • Priority_Array • Relinquish_Default • COV_Increment • Time_Delay • Notification_Class • High_Limit • Low_Limit • Deadband • Limit_Enable • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps	Yes	Yes, only user created objects

Table 42. Descriptions and configurations (continued)

Object Type	Required Properties Read	Properties Written[a]	Optional Properties Read	Ability to Create	Ability to Delete
Binary Input	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Polarity	• Object_Name • Description • Out_Of_Service • Inactive_Text • Active_Text • Present_Value • Reliability • Change_Of_State_Count • Elapsed_Active_Time • Time_Delay • Notification_Class • Alarm_Value • Event_Enable • Acked_Transitions • Notify_Type	• Description • Inactive_Text • Active_Text • Change_Of_State_Time • Change_Of_State_Count • Time_Of_State_Count_Reset • Elapsed_Active_Time • Time_Of_Active_Time_Reset • Time_Delay • Notification_Class • Alarm_Value • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps • Reliability	Yes	Yes, only user created objects
Binary Output	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Polarity • Priority_Array • Relinquish_Default	• Object_Name • Description • Out_Of_Service • Inactive_Text • Active_Text • Present_Value • Reliability • Change_Of_State_Count • Elapsed_Active_Time • Minimum_On_Time • Minimum_Off_Time • Relinquish_Default • Time_Delay • Notification_Class • Event_Enable • Acked_Transitions • Notify_Type	• Description • Inactive_Text • Active_Text • Change_Of_State_Time • Change_Of_State_Count • Time_Of_State_Count_Reset • Elapsed_Active_Time • Time_Of_Active_Time_Reset • Minimum_On_Time • Minimum_Off_Time • Time_Delay • Notification_Class • Feedback_Value • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps • Reliability	Yes	Yes, only user created objects
Binary Value	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Polarity	• Object_Name • Description • Out_Of_Service • Inactive_Text • Active_Text • Present_Value • Reliability • Change_Of_State_Count • Elapsed_Active_Time • Minimum_On_Time • Minimum_Off_Time • Relinquish_Default • Time_Delay • Notification_Class • Alarm_Value • Event_Enable • Acked_Transitions • Notify_Type	• Description • Inactive_Text • Active_Text • Change_Of_State_Time • Change_Of_State_Count • Time_Of_State_Count_Reset • Elapsed_Active_Time • Time_Of_Active_Time_Reset • Priority_Array • Relinquish_Default • Minimum_On_Time • Minimum_Off_Time • Time_Delay • Notification_Class • Alarm_Value • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps • Reliability	Yes	Yes, only user created objects

Table 42. Descriptions and configurations (continued)

Object Type	Required Properties Read	Properties Written[a]	Optional Properties Read	Ability to Create	Ability to Delete
Device	• Object_Identifier • Object_Name • Object_Type • System_Status • Vendor_Name • Vendor_Identifier • Model_Name • Firmware_Revision • Application_Software_Version • Protocol_Version • Protocol_Revision • Protocol_Services_Supported • Protocol_Object_Types_Supported • Object_List • Max_APDU_Length_Accepted • Segmentation_Supported • APDU_Timeout • Number_Of_APDU_Retries • Device_Address_Binding • Database_Revision	• Object_Name • Location • Description • APDU_Segment_Timeout • APDU_Timeout • Number_Of_APDU_Retries • Backup_Failure_Timeout	• Location • Description • Max_Segments_Accepted • APDU_Segment_Timeout • Max_Master • Max_Info_Frames • Local_Time • Local_Date • Configuration_Files • Last_Restore_Time • Backup_Failure_Timeout • Active_COV_Subscriptions	None	None
Event Enrollment Object	• Object_Identifier • Object_Name • Object_Type • Event_Type • Notify_Type • Event_Parameters • Object_Property_Reference • Event_State • Event_Enable • Acked_Transitions • Notification_Class • Event_Time_Stamps	• Object_Name • Notify_Type • Event_Parameters • Object_Property_Reference • Event_Enable • Notification_Class	• None	Yes	Yes, only user created objects
Multistate Input	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Number_Of_States	• Object_Name • Description • State_Text • Out_Of_Service • Present_Value • Reliability • Time_Delay • Notification_Class • Alarm_Values • Fault_Values • Event_Enable • Notify_Type	• State_Text • Reliability • Time_Delay • Notification_Class • Alarm_Values • Fault_Values • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps	Yes	Yes, only user created objects
Multistate Output	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Number_Of_States • Priority_Array • Relinquish Default	• Object_Name • Description • State_Text • Out_Of_Service • Present_Value • Reliability • Time_Delay • Notification_Class • Event_Enable • Notify_Type	• State_Text • Reliability • Relinquish_Default • Time_Delay • Notification_Class • Feedback_Values • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps	Yes	Yes, only user created objects

Table 42. Descriptions and configurations (continued)

Object Type	Required Properties Read	Properties Written[a]	Optional Properties Read	Ability to Create	Ability to Delete
Multistate Value	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Number_Of_States	• Object_Name • Description • State_Text • Out_Of_Service • Present_Value • Reliability • Priority_Array • Relinquish_Default • Time_Delay • Notification_Class • Alarm_Values • Fault_Values • Event_Enable • Notify_Type	• State_Text • Reliability • Relinquish_Default • Time_Delay • Notification_Class • Alarm_Values • Fault_Values • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps	Yes	Yes, only user created objects
Notification Class	• Object_Identifier • Object_Name • Object_Type • Notification_Class • Priority • Ack_Required • Recipient_List	• Object_Name • Priority • Ack_Required • Recipient_List	None	Yes	Yes, only user created objects
Trend	• Object_Identifier • Object_Name • Object_Type • Log_Enable • Stop_When_Full • Buffer_Size • Log_Buffer • Record_Count • Total_Record_Count • Event_State	• Object_Name • Log_Enable • Start_Time • Stop_Time • Log_DeviceObjectProperty • Log_Interval • Stop_When_Full • Buffer_Size • Log_Buffer • Record_Count • Notification_Threshold • Notification_Class • Event_Enable • Notify_Type	• Start_Time • Stop_Time • Log_DeviceObjectProperty • Log_Interval • Stop_When_Full • Buffer_Size • Notification_Threshold • Records_Since_Notification • Last_Notify_Record • Notification_Class • Event_Enable • Acked_Transitions • Event_Time_Stamps	Yes	Yes, only user created objects

(a) Properties written for Present_Value and Reliability only if Out_of_Service is TRUE.

BACnet Protocol

Data Link Layer Options

Data Link Layer Description	Option
ANSI/ATA 878.1, 2.5 Mb ARCNET (Clause 8)	
ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), Baud Rate(s)	
BACnet IP, (Annex J)	
BACnet IP, (Annex J), Foreign Device	
ISO 8802-3, Ethernet (Clause 7)(10Base2, 10Base5, 10BaseT, Fiber)	
LonTalk, (Clause 11), Medium	
MS/TP Master (Clause 9), Baud Rate(s): 9600, 19200, 38400, 76800, and 115200 @1.5% Nominal Baud Rate	ü
MS/TP Slave (Clause 9), Baud Rate(s)	
Other	
Point-to-Point, EIA 232 (Clause 10), Baud Rate(s): 9600, 19200, 38400	
Point-to-Point, Modem (Clause 10), Baud Rate(s): 9600, 19200, 38400	

Device Address Binding

Device Address Binding	Supported?
Static Device Binding Supported	ü

Networking Options

Networking Descriptions	Supported Option
Annex H, BACnet Tunneling	
BACnet/IP Broadcast Management Device (BBMD)	
Does the BBMD Support Registrations by Foreign Devices?	
Router	

Character Sets

Indicates support for multiple characters sets, but does not imply that all character sets are supported simultaneously. Maximum supported string length is 64 bytes (any character set).

Character Set Descriptions	Supported
ANSI X3.4	ü
IBM/Microsoft DBCS	
ISO 10646 (UCS-4)	
ISO 10646 (UCS2)	ü
ISO 8859-1	ü
JIS C 6226	

Object Data Points and Diagnostic Data Points with Corresponding Chiller Models

For quick reference, the following tables are listed two different ways. Table 43 through Table 48 are listed by input/output type and sorted by object identifier. These tables provide the user with the units type for each object type. Table 49 is sorted by object name and provides a complete list of object names, types, values/ranges, and descriptions. Not all points are available to the user. The available data points are defined during self-configuration and are dependent on the type of equipment

.

Table 43. Analog Output

Object Identifier	Object Name	Description	Units	Valid Range	Relinq Default
Analog Output 1	Chilled Water Setpoint	Desired leaving water temperature if chiller is in cooling mode.	°F (64)	0°F to 75°F	44°F
Analog Output 2	Current Limit Setpoint	Sets the maximum capacity that the chiller can use.	Percent (98)	0% to 120%	100%
Analog Output 4	Hot Water Setpoint	Desired leaving water temperature if chiller is in heating mode.	°F (64)	80°F to 140°F	120°F

Table 44. Analog Input

Object Identifier	Object Name	Description	Units
Analog Input, 1	Active Cool/Heat Setpoint Temperature	Active chiller water or hot water setpoint.	Degrees-Fahrenheit (64)
Analog Input, 2	Active Current Limit Setpoint	Active capacity current limit setpoint.	Percent (98)
Analog Input, 5	Actual Running Capacity	Level of capacity that the chiller is currently running at.	Percent (98)
Analog Input, 7	Suction Pressure- Ckt 1	Circuit 1 suction pressure.	PSI
Analog Input, 10	Suction Pressure- Ckt 2	Circuit 2 suction pressure.	PSI
Analog Input, 12	Evaporator Saturated Refrigerant Temperature-Ckt 1	Circuit 2 evaporator refrigerant temperature.	Degrees-Fahrenheit (64)
Analog Input, 14	Evaporator Saturated Refrigerant Temperature-Ckt 2	Circuit 2 evaporator refrigerant temperature.	Degrees-Fahrenheit (64)
Analog Input, 16	Condenser Refrigerant Pressure- Ckt 1	Circuit 1 condenser refrigerant pressure.	PSI
Analog Input, 18	Condenser Refrigerant Pressure- Ckt 2	Circuit 2 condenser refrigerant pressure.	PSI
Analog Input, 20	Condenser Saturated Refrigerant Temperature-Ckt 1	Circuit 1 condenser refrigerant temperature.	Degrees-Fahrenheit (64)
Analog Input, 22	Condenser Saturated Refrigerant Temperature-Ckt 2	Circuit 2 condenser refrigerant temperature.	Degrees-Fahrenheit (64)
Analog Input, 24	Unit Power Consumption	The power being consumed by the chiller.	Kilowatts
Analog Input, 25	Local Atmospheric Pressure	Local atmospheric pressure.	PSI
Analog Input, 26	Starts-Compressor 1A	Number of starts for compressor 1A.	None
Analog Input, 27	Starts-Compressor 1B	Number of starts for compressor 1B.	None

Table 44. Analog Input (continued)

Object Identifier	Object Name	Description	Units
Analog Input, 28	Starts-Compressor 2A	Number of starts for compressor 2A.	None
Analog Input, 29	Starts-Compressor 2B	Number of starts for compressor 2B.	None
Analog Input, 34	Run Time-Compressor 1A	Total run time of compressor 1A.	Hours
Analog Input, 35	Run Time-Compressor 1B	Total run time of compressor 1B.	Hours
Analog Input, 36	Run Time-Compressor 2A	Total run time of compressor 2A.	Hours
Analog Input, 37	Run Time-Compressor 2B	Total run time of compressor 2B.	Hours
Analog Input, 42	Airflow Percentage-Circuit 1	Approximate airflow percentage of circuit 1.	Percent (98)
Analog Input, 43	Airflow Percentage-Circuit 2	Approximate airflow percentage of circuit 2.	Percent (98)
Analog Input, 44	Evaporator Entering Water Temp	Temperature of the water entering the evaporator.	Degrees-Fahrenheit (64)
Analog Input, 45	Evaporator Leaving Water Temp	Temperature of the water leaving the evaporator.	Degrees-Fahrenheit (64)
Analog Input, 46	Condenser Entering Water Temp	Temperature of the water entering the condenser.	Degrees-Fahrenheit (64)
Analog Input, 47	Condenser Leaving Water Temp	Temperature of the water leaving the condenser.	Degrees-Fahrenheit (64)
Analog Input, 48	High Side Oil Pressure-Compressor 1A	Pressure of the oil at the high side of compressor 1A.	PSI
Analog Input, 49	High Side Oil Pressure-Compressor 1B	Pressure of the oil at the high side of compressor 1B.	PSI
Analog Input, 50	High Side Oil Pressure-Compressor 2A	Pressure of the oil at the high side of compressor 2A.	PSI

Table 44. Analog Input (continued)

Object Identifier	Object Name	Description	Units
Analog Input, 51	High Side Oil Pressure-Compressor 2B	Pressure of the oil at the high side of compressor 2B.	PSI
Analog Input, 56	Refrigerant Disch Temp- Ckt 1	Temperature of the refrigerant being discharged from Ckt 1.	Degrees-Fahrenheit (64)
Analog Input, 57	Outdoor Air Temperature	Outdoor air temperature.	Degrees-Fahrenheit (64)
Analog Input, 58	Condenser Control Output	Percentage of condenser water flow being requested by the chiller.	Percent (98)
Analog Input, 59	Phase AB Voltage-Compressor 1A	Phase AB voltage, compressor 1A.	Volts
Analog Input, 60	Phase BC Voltage-Compressor 1A	Phase BC voltage, compressor 1A.	Volts
Analog Input, 61	Phase CA Voltage-Compressor 1A	Phase CA voltage, compressor 1A.	Volts
Analo5 Input, 62	Phase AB Voltage-Compressor 1B	Phase AB voltage, compressor 1B.	Volts
Analog Input, 63	Phase BC Voltage-Compressor 1B	Phase BC voltage, compressor 1B.	Volts
Analog Input, 64	Phase CA Voltage-Compressor 1B	Phase CA voltage, compressor 1B.	Volts
Analog Input, 65	Phase AB Voltage-Compressor 2A	Phase AB voltage, compressor 2A.	Volts
Analog Input, 66	Phase BC Voltage-Compressor 2A	Phase BC voltage, compressor 2A.	Volts
Analog Input, 67	Phase CA Voltage-Compressor 2A	Phase CA voltage, compressor 2A.	Volts
Analog Input, 68	Phase AB Voltage-Compressor 2B	Phase AB voltage, compressor 2B.	Volts
Analog Input, 69	Phase BC Voltage-Compressor 2B	Phase BC voltage, compressor 2B.	Volts

Table 44. Analog Input (continued)

Object Identifier	Object Name	Description	Units
Analog Input, 70	Phase CA Voltage-Compressor 2B	Phase CA voltage, compressor 2B	Volts
Analog Input, 71	Line 1 Current (in Amps)-Compressor 1A	Line 1 Current (in Amps)-Compressor 1A	Amps
Analog Input, 72	Line 2 Current (in Amps)-Compressor 1A	Line 2 Current (in Amps)-Compressor 1A	Amps
Analog Input, 73	Line 3 Current (in Amps)-Compressor 1A	Line 3 Current (in Amps)-Compressor 1A	Amps
Analog Input, 74	Line 1 Current (in Amps)-Compressor 1B	Line 1 Current (in Amps)-Compressor 1B	Amps
Analog Input, 75	Line 2 Current (in Amps)-Compressor 1B	Line 2 Current (in Amps)-Compressor 1B	Amps
Analog Input, 76	Line 3 Current (in Amps)-Compressor 1B	Line 3 Current (in Amps)-Compressor 1B	Amps
Analog Input, 77	Line 1 Current (in Amps)-Compressor 2A	Line 1 Current (in Amps)-Compressor 2A	Amps
Analog Input, 78	Line 2 Current (in Amps)-Compressor 2A	Line 2 Current (in Amps)-Compressor 2A	Amps
Analog Input, 79	Line 3 Current (in Amps)-Compressor 2A	Line 3 Current (in Amps)-Compressor 2A	Amps
Analog Input, 80	Line 1 Current (in Amps)-Compressor 2B	Line 1 Current (in Amps)-Compressor 2B	Amps
Analog Input, 81	Line 2 Current (in Amps)-Compressor 2B	Line 2 Current (in Amps)-Compressor 2B	Amps
Analog Input, 82	Line 3 Current (in Amps)-Compressor 2B	Line 3 Current (in Amps)-Compressor 2B	Amps
Analog Input, 83	Line 1 Current (%RLA)-Compressor 1A	Line 1 Current (%RLA)-Compressor 1A	Percent (98)
Analog Input, 84	Line 2 Current (%RLA)-Compressor 1A	Line 2 Current (%RLA)-Compressor 1A	Percent (98
Analog Input, 85	Line 3 Current (%RLA)-Compressor 1A	Line 3 Current (%RLA)-Compressor 1A	Percent (98)
Analog Input, 86	Line 1 Current (%RLA)-Compressor 1B	Line 1 Current (%RLA)-Compressor 1B	Percent (98)
Analog Input, 87	Line 2 Current (%RLA)-Compressor 1B	Line 2 Current (%RLA)-Compressor 1B	Percent (98)
Analog Input, 88	Line 3 Current (%RLA)-Compressor 1B	Line 3 Current (%RLA)-Compressor 1B	Percent (98)
Analog Input, 89	Line 1 Current (%RLA)-Compressor 2A	Line 1 Current (%RLA)-Compressor 2A	Percent (98)

Table 44. Analog Input (continued)

Object Identifier	Object Name	Description	Units
Analog Input, 90	Line 2 Current (%RLA)-Compressor 2A	Line 2 Current (%RLA)-Compressor 2A	Percent (98)
Analog Input, 91	Line 3 Current (%RLA)-Compressor 2A	Line 3 Current (%RLA)-Compressor 2A	Percent (98)
Analog Input, 92	Line 1 Current (%RLA)-Compressor 2B	Line 1 Current (%RLA)-Compressor 2B	Percent (98
Analog Input, 93	Line 2 Current (%RLA)-Compressor 2B	Line 2 Current (%RLA)-Compressor 2B	Percent (98)
Analog Input, 94	Line 3 Current (%RLA)-Compressor 2B	Line 3 Current (%RLA)-Compressor 2B	Percent (98)
Analog Input, 95	Number of Circuits	Number of Circuits	None
Analog Input, 96	Number of Compressors, Ckt 1	Number of Compressors, Ckt 1	None
Analog Input, 97	Number of Compressors, Ckt 2	Number of Compressors, Ckt 2	None

Table 45. Multistate Output

Object Identifier	Object Name	Description	Relinq Default	Object States
Multi-State Output, 1	Chiller Mode Command	Mode of operation of the chiller.	1 = Cool	1 = HVAC _Heat 2 = HVAC_Cool 3 = HVAC_Ice 4 = Not Used

Table 46. Multistate Input

BCI-C Object Identifier	Object Name	Description	Object States
Multi-State Input, 1	Running Mode	Indicates the primary running mode of the chiller.	1 = Chiller Off 2 = Chiller in Start Mode 3 = Chiller in Run Mode 4 = Chiller in Pre-shutdown Mode 5 = Chiller in Service Mode
Multi-State Input, 2	Operating Mode	Indicates the primary operating mode of the chiller.	1 = HVAC_Heat 2 = HVAC_Cool 3 = HVAC_Ice 4 = Not Used
Multi-State Input, 3	MP Comm. Status	Communication status.	1 = R-22 2 = Communication 3 = Communication Lost 4 = Failed to Established 5 = Waiting to Establish
Multi-State Input, 4	Refrigerant Type	Refrigerant type.	1 = R-11 2 = R-12 3 = R-22 4 = R-123 5 = R-134A 6 = R407C 7 = R-410A

Table 46. Multistate Input (continued)

BCI-C Object Identifier	Object Name	Description	Object States
Multi-State Input, 5	Model	Indicates the model type of the chiller.	1 = RTA 2 = CVH 3 = CVG 4 = CVR 5 = CDH 6 = RTH 7 = CGW 8 = CGA 9 = CCA 10 = RTW 11 = RTX 12 = RTU 13 = CCU 14 = CXA 15 = CGC 16 = RAU
Multi-State Input, 6	Cooling Type	Cooling type of the condenser.	1 = Water Cooled 2 = Air Cooled
Multi-State Input, 7	Manuf. Location	Location where chiller was manufactured.	1 = Field Applied 2 = La Crosse 3 = Pueblo 4 = Charmes 5 = Rushville 6 = Macon 7 = Waco 8 = Lexington 9 = Forsyth 10 = Clarksville 11 = Ft. Smith 12 = Penang 13 = Colchester 14 = Curitiba 15 = Taicang 16 = Taiwan 17 = Epinal 18 = Golbey

Table 47. Binary Output

Object Identifier	Object Name	Description	Relinq Default	Object States
Binary Output, 1	Chiller Auto Stop Command	Allows the chiller to run if conditions for running are met.	True	Inactive = Stop Active = Auto
Binary Output, 2	Remote Diagnostic Reset Command	Resets remotely diagnostics that can be reset.	False	Inactive = No Reset Request Active = Reset Request
Binary Output, 4	Noise Reduction Request	Requests chiller to enter mode to reduce noise.	False	Inactive = Normal Active = Reduced Noise

Table 48. Binary Input

Object Identifier	Object Name	Description	Object States
Binary Input, 1	Run Enabled	Indicates if the chiller is available to run or is currently running.	Inactive = Stop Active = Auto
Binary Input, 2	Local Setpoint Control	Indicates if the chiller is being controlled by local setpoints instead of BAS setpoints.	Inactive =Remote Control Active = Local Control
Binary Input, 3	Capacity Limited	Indicates if conditions may exist that prevent the chiller from reaching setpoint.	Inactive = Not Limited Active = Limited
Binary Input, 4	Chiller Running State	Indicates if the chiller is running or stopped.	Inactive = Off Active = On
Binary Input, 5	Condenser Water Flow Status	Condenser water flow status.	Inactive = No Flow Active = Flow
Binary Input, 6	Maximum Capacity	Indicates if all available chiller capacity is being used.	Inactive = Off Active = On
Binary Input, 7	Head Relief Request	Indicates if the chiller is asking an outside system to provide more heat rejection from the condenser water loop.	Inactive = Off Active = On
Binary Input, 9	Compressor 1A Running	Indicates if compressor 1A is running.	Inactive = Off Active = Running
Binary Input, 10	Compressor 1B Running	Indicates if compressor 1B is running.	Inactive = Off Active = Running
Binary Input, 11	Compressor 2A Running	Indicates if compressor 2A is running.	Inactive = Off Active = Running
Binary Input, 12	Compressor 2B Running	Indicates if compressor 2B is running.	Inactive = Off Active = Running
Binary Input, 17	Evaporator Water Pump Request	Indicates a request from the chiller to turn on the evaporator water pump.	Inactive = Off Active = On
Binary Input, 19	Condenser Water Pump Request	Indicates a request from the chiller to turn on the condenser water pump.	Inactive = Off Active = On
Binary Input, 20	Noise Reduction Active	Indicates if the chiller is in a state where noise is being reduced.	Inactive = Off Active = On
Binary Input, 22	Evaporator Water Flow Status	Indicates if water is flowing through the evaporator.	Inactive = No Flow Active = Flow
Binary Input, 23	Alarm Present	Indicates if an alarm is active.	Inactive = No Alarm Active = Alarm
Binary Input, 24	Shutdown Alarm Present	Indicates if a shutdown alarm is active.	Inactive = No Alarm Active = None
Binary Input, 25	Last Diagnostic	Indicates last diagnostic for the chiller.	Inactive = Off Active = On

Table 49. All Object Types Sorted by Object Name (*Refer to previous tables for detailed descriptions of objects*)

Object Identifier[a]	Object Name	Description
Analog Output 1	Chilled Water Setpoint	Desired leaving water temperature if chiller is in cooling mode.
Analog Output 2	Current Limit Setpoint	Sets the maximum capacity that the chiller can use.
Analog Output 4	Hot Water Setpoint	Desired leaving water temperature if chiller is in heating mode.
Analog Input, 1	Active Cool/Heat Setpoint Temperature	Active chiller water or hot water setpoint.
Analog Input, 2	Active Current Limit Setpoint	Active capacity current limit setpoint.
Analog Input, 5	Actual Running Capacity	Level of capacity that the chiller is currently running at.
Analog Input, 7	Suction Pressure- Ckt 1	Circuit 1 suction pressure.
Analog Input, 10	Suction Pressure- Ckt 2	Circuit 2 suction pressure.
Analog Input, 12	Evaporator Saturated Refrigerant Temperature- Ckt 1	Circuit 2 evaporator refrigerant temperature.
Analog Input, 14	Evaporator Saturated Refrigerant Temperature- Ckt 2	Circuit 2 evaporator refrigerant temperature.
Analog Input, 16	Condenser Refrigerant Pressure- Ckt 1	Circuit 1 condenser refrigerant pressure.
Analog Input, 18	Condenser Refrigerant Pressure- Ckt 2	Circuit 2 condenser refrigerant pressure.
Analog Input, 20	Condenser Saturated Refrigerant Temperature- Ckt 1	Circuit 1 condenser refrigerant temperature.
Analog Input, 22	Condenser Saturated Refrigerant Temperature- Ckt 2	Circuit 2 condenser refrigerant temperature.
Analog Input, 24	Unit Power Consumption	The power being consumed by the chiller.
Analog Input, 25	Local Atmospheric Pressure	Local atmospheric pressure.
Analog Input, 26	Starts- Compressor 1A	Number of starts for compressor 1A.
Analog Input, 27	Starts- Compressor 1B	Number of starts for compressor 1B.
Analog Input, 28	Starts- Compressor 2A	Number of starts for compressor 2A.
Analog Input, 29	Starts- Compressor 2B	Number of starts for compressor 2B.
Analog Input, 34	Run Time- Compressor 1A	Total run time of compressor 1A.
Analog Input, 35	Run Time- Compressor 1B	Total run time of compressor 1B.
Analog Input, 36	Run Time- Compressor 2A	Total run time of compressor 2A.
Analog Input, 37	Run Time- Compressor 2B	Total run time of compressor 2B.
Analog Input, 42	Airflow Percentage- Circuit 1	Approximate airflow percentage of circuit 1.
Analog Input, 43	Airflow Percentage- Circuit 2	Approximate airflow percentage of circuit 2.
Analog Input, 44	Evaporator Entering Water Temp	Temperature of the water entering the evaporator.
Analog Input, 45	Evaporator Leaving Water Temp	Temperature of the water leaving the evaporator.
Analog Input, 46	Condenser Entering Water Temp	Temperature of the water entering the condenser.
Analog Input, 47	Condenser Leaving Water Temp	Temperature of the water leaving the condenser.
Analog Input, 48	High Side Oil Pressure- Compressor 1A	Pressure of the oil at the high side of compressor 1A.
Analog Input, 49	High Side Oil Pressure- Compressor 1B	Pressure of the oil at the high side of compressor 1B.
Analog Input, 50	High Side Oil Pressure- Compressor 2A	Pressure of the oil at the high side of compressor 2A.
Analog Input, 51	High Side Oil Pressure- Compressor 2B	Pressure of the oil at the high side of compressor 2B.
Analog Input, 56	Refrigerant Disch Temp- Ckt 1	Temperature of the refrigerant being discharged from Ckt 1.
Analog Input, 57	Outdoor Air Temperature	Outdoor air temperature.
Analog Input, 58	Condenser Control Output	Percentage of condenser water flow being requested by the chiller.
Analog Input, 59	Phase AB Voltage- Compressor 1A	Phase AB voltage, compressor 1A.
Analog Input, 60	Phase BC Voltage- Compressor 1A	Phase BC voltage, compressor 1A.
Analog Input, 61	Phase CA Voltage- Compressor 1A	Phase CA voltage, compressor 1A.
Analo5 Input, 62	Phase AB Voltage- Compressor 1B	Phase AB voltage, compressor 1B.
Analog Input, 63	Phase BC Voltage- Compressor 1B	Phase BC voltage, compressor 1B.

Table 49. All Object Types Sorted by Object Name (*Refer to previous tables for detailed descriptions of objects*) (continued)

Object Identifier[a]	Object Name	Description
Analog Input, 64	Phase CA Voltage- Compressor 1B	Phase CA voltage, compressor 1B.
Analog Input, 65	Phase AB Voltage- Compressor 2A	Phase AB voltage, compressor 2A.
Analog Input, 66	Phase BC Voltage- Compressor 2A	Phase BC voltage, compressor 2A.
Analog Input, 67	Phase CA Voltage- Compressor 2A	Phase CA voltage, compressor 2A.
Analog Input, 68	Phase AB Voltage- Compressor 2B	Phase AB voltage, compressor 2B.
Analog Input, 69	Phase BC Voltage- Compressor 2B	Phase BC voltage, compressor 2B.
Analog Input, 70	Phase CA Voltage- Compressor 2B	Phase CA voltage, compressor 2B
Analog Input, 71	Line 1 Current (in Amps)- Compressor 1A	Line 1 Current (in Amps)- Compressor 1A
Analog Input, 72	Line 2 Current (in Amps)- Compressor 1A	Line 2 Current (in Amps)- Compressor 1A
Analog Input, 73	Line 3 Current (in Amps)- Compressor 1A	Line 3 Current (in Amps)- Compressor 1A
Analog Input, 74	Line 1 Current (in Amps)- Compressor 1B	Line 1 Current (in Amps)- Compressor 1B
Analog Input, 75	Line 2 Current (in Amps)- Compressor 1B	Line 2 Current (in Amps)- Compressor 1B
Analog Input, 76	Line 3 Current (in Amps)- Compressor 1B	Line 3 Current (in Amps)- Compressor 1B
Analog Input, 77	Line 1 Current (in Amps)- Compressor 2A	Line 1 Current (in Amps)- Compressor 2A
Analog Input, 78	Line 2 Current (in Amps)- Compressor 2A	Line 2 Current (in Amps)- Compressor 2A
Analog Input, 79	Line 3 Current (in Amps)- Compressor 2A	Line 3 Current (in Amps)- Compressor 2A
Analog Input, 80	Line 1 Current (in Amps)- Compressor 2B	Line 1 Current (in Amps)- Compressor 2B
Analog Input, 81	Line 2 Current (in Amps)- Compressor 2B	Line 2 Current (in Amps)- Compressor 2B
Analog Input, 82	Line 3 Current (in Amps)- Compressor 2B	Line 3 Current (in Amps)- Compressor 2B
Analog Input, 83	Line 1 Current (%RLA)- Compressor 1A	Line 1 Current (%RLA)- Compressor 1A
Analog Input, 84	Line 2 Current (%RLA)- Compressor 1A	Line 2 Current (%RLA)- Compressor 1A
Analog Input, 85	Line 3 Current (%RLA)- Compressor 1A	Line 3 Current (%RLA)- Compressor 1A
Analog Input, 86	Line 1 Current (%RLA)- Compressor 1B	Line 1 Current (%RLA)- Compressor 1B
Analog Input, 87	Line 2 Current (%RLA)- Compressor 1B	Line 2 Current (%RLA)- Compressor 1B
Analog Input, 88	Line 3 Current (%RLA)- Compressor 1B	Line 3 Current (%RLA)- Compressor 1B
Analog Input, 89	Line 1 Current (%RLA)- Compressor 2A	Line 1 Current (%RLA)- Compressor 2A
Analog Input, 90	Line 2 Current (%RLA)- Compressor 2A	Line 2 Current (%RLA)- Compressor 2A
Analog Input, 91	Line 3 Current (%RLA)- Compressor 2A	Line 3 Current (%RLA)- Compressor 2A
Analog Input, 92	Line 1 Current (%RLA)- Compressor 2B	Line 1 Current (%RLA)- Compressor 2B
Analog Input, 93	Line 2 Current (%RLA)- Compressor 2B	Line 2 Current (%RLA)- Compressor 2B
Analog Input, 94	Line 3 Current (%RLA)- Compressor 2B	Line 3 Current (%RLA)- Compressor 2B
Analog Input, 95	Number of Circuits	Number of Circuits
Analog Input, 96	Number of Compressors, Ckt 1	Number of Compressors, Ckt 1
Analog Input, 97	Number of Compressors, Ckt 2	Number of Compressors, Ckt 2
Multi-State Input, 1	Running Mode	Indicates the primary running mode of the chiller.
Multi-State Input, 2	Operating Mode	Indicates the primary operating mode of the chiller.
Multi-State Input, 3	MP Communication Status	Communication status.
Multi-State Input, 4	Refrigerant Type	Refrigerant type.
Multi-State Input, 5	Model Information	Indicates the model type of the chiller.
Multi-State Input, 6	Cooling Type	Cooling type of the condenser.
Multi-State Input, 7	Manufacturing Location	Location where chiller was manufactured.
Binary Output, 1	Chiller Auto Stop Command	Allows the chiller to run if conditions for running are met.
Binary Output, 2	Remote Diagnostic Reset Command	Resets remotely diagnostics that can be reset.
Binary Output, 4	Noise Reduction Request	Requests chiller to enter mode to reduce noise.
Binary Output, 1	Chiller Auto Stop Command	Allows the chiller to run if conditions for running are met.

Table 49. All Object Types Sorted by Object Name (*Refer to previous tables for detailed descriptions of objects*) (continued)

Object Identifier[a]	Object Name	Description
Binary Input, 1	Run Enabled	Indicates if the chiller is available to run or is currently running.
Binary Input, 2	Local Setpoint Control	Indicates if the chiller is being controlled by local setpoints instead of BAS setpoints.
Binary Input, 3	Capacity Limited	Indicates if conditions may exist that prevent the chiller from reaching setpoint.
Binary Input, 4	Chiller Running State	Indicates if the chiller is running or stopped.
Binary Input, 5	Condenser Water Flow Status	Condenser water flow status.
Binary Input, 6	Maximum Capacity	Indicates if all available chiller capacity is being used.
Binary Input, 7	Head Relief Request	Indicates if the chiller is asking an outside system to provide more heat
Binary Input, 9	Compressor 1A Running	Indicates if compressor 1A is running.
Binary Input, 10	Compressor 1B Running	Indicates if compressor 1B is running.
Binary Input, 11	Compressor 2A Running	Indicates if compressor 2A is running.
Binary Input, 12	Compressor 2B Running	Indicates if compressor 2B is running.
Binary Input, 17	Evaporator Water Pump Request	Indicates a request from the chiller to turn on the evaporator water pump.
Binary Input, 19	Condenser Water Pump Request	Indicates a request from the chiller to turn on the condenser water pump.
Binary Input, 20	Noise Reduction Active	Indicates if the chiller is in a state where noise is being reduced.
Binary Input, 22	Evaporator Water Flow Status	Indicates if water is flowing through the evaporator.
Binary Input, 23	Alarm Present	Indicates if an alarm is active.
Binary Input, 24	Shutdown Alarm Present	Indicates if a shutdown alarm is present.
Binary Input, 25	Last Diagnostic	Indicates the last diagnostic for the chiller.

(a) AI=Analog Input, AO=Analog Output, AV=Analog Value, BI=Binary Input, BO=Binary Output, MI=Multistate Input, MO=Multistate Output

BCI-C Alarming

The BCI-C unit has three binary input points that are used for communicating alarms and one binary output point that is used to reset alarms remotely. Those inputs and output points are:

- **BI 23; Alarm Present**–This object indicates if any alarms are active regardless of severity. A notification will be sent to any recipients of the *Information Notification Class* object when the point transitions from *No Alarm* to *Alarm*.
- **BI 24; Shutdown Alarm Present**–This object indicates if any alarms that result in the shutdown of the chiller are active. A notification will be sent to any recipients of the *Critical Notification Class* object when the point transitions from *No Alarm* to *Alarm*.
- **BI 25; Last Diagnostic**–The active text of this object will reflect the description of the last diagnostic to occur on the chiller.
- **BO 2; Remote Diagnostic Reset Command**–This object is used to remotely reset diagnostics on the chiller. Immediately after commanding this point value to *1*, the BCI-C will send the reset command to the chiller and set this point value back to *0* and clear the priority array.

Note: *Not all diagnostics are able to be reset remotely. Some will require local reset at the chiller front panel.*

CGAM Operating Principles

This section contains an overview of the operation of CGAM air-cooled liquid chiller equipped with microcomputer-based control systems. It describes the overall operating principles of the CGAM water chiller.

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

General

The Model CGAM units are scroll compressor air-cooled liquid chillers. These units are equipped with unit-mounted starter/control panels and operates with R-410A refrigerant.

The basic components of an CGAM unit are:

- Unit-mounted panel containing starter and Tracer CH530 controller and Input/Output LLIDS
- Scroll compressors
- Brazed plate evaporator
- Air-cooled condenser with subcooler
- Electronic expansion valve
- Optional partial heat recovery
- Related interconnecting piping.

Components of a typical CGAM unit are identified in the following diagrams.

Figure 68. Slant 20-35 ton component location

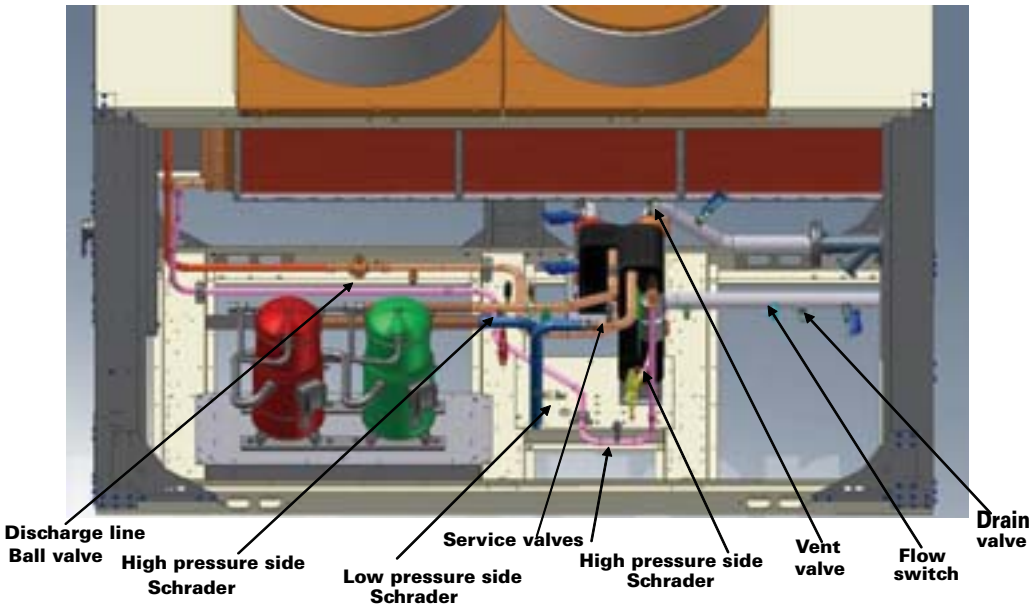


Figure 69. V 40-70 ton component location - circuit 1

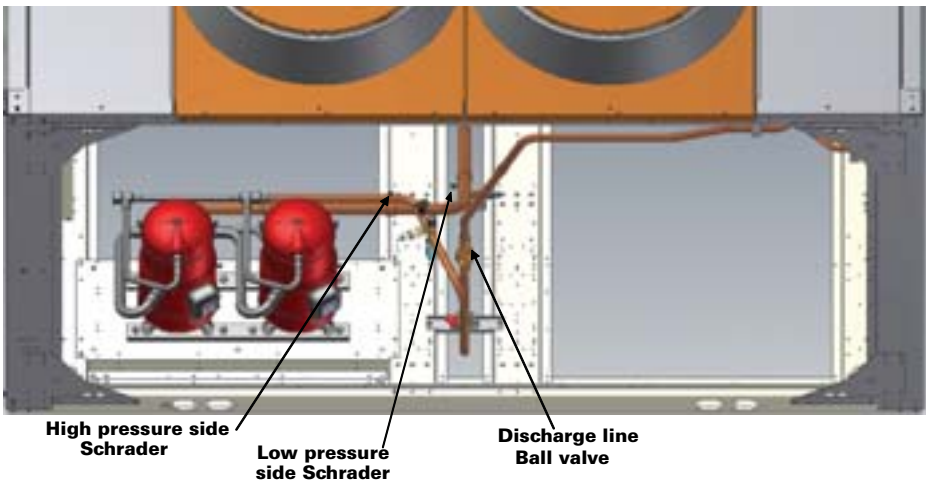


Figure 70. V 40-70 ton component location- circuit 2

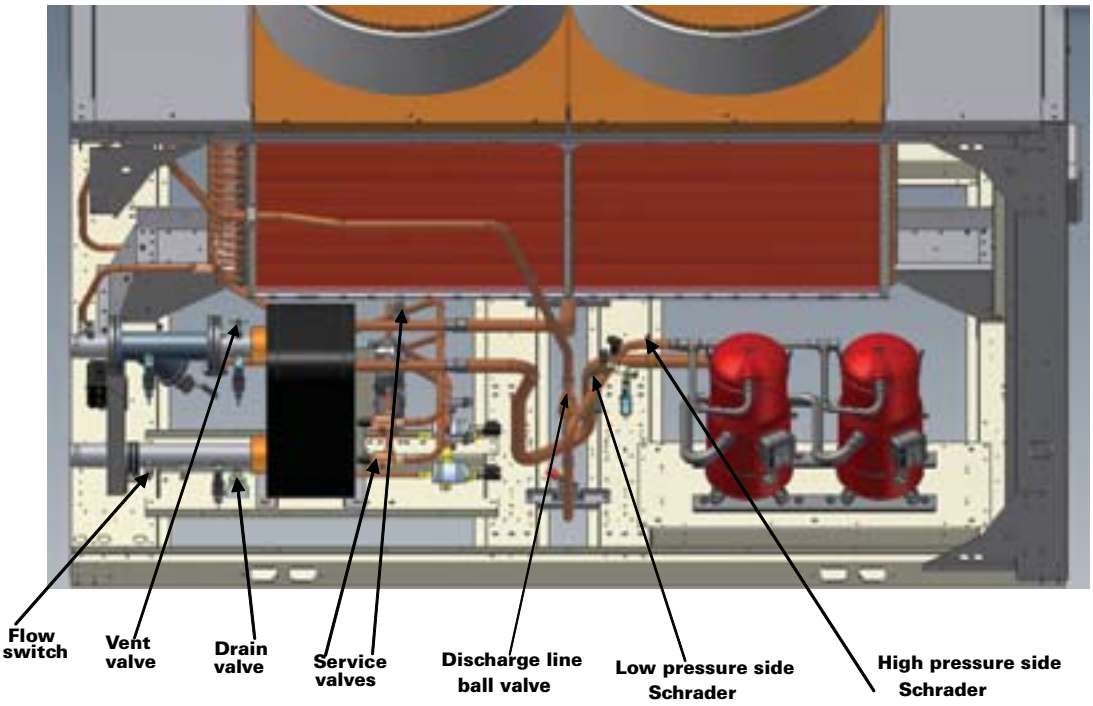


Figure 71. W 80-130 ton component location - compressor view

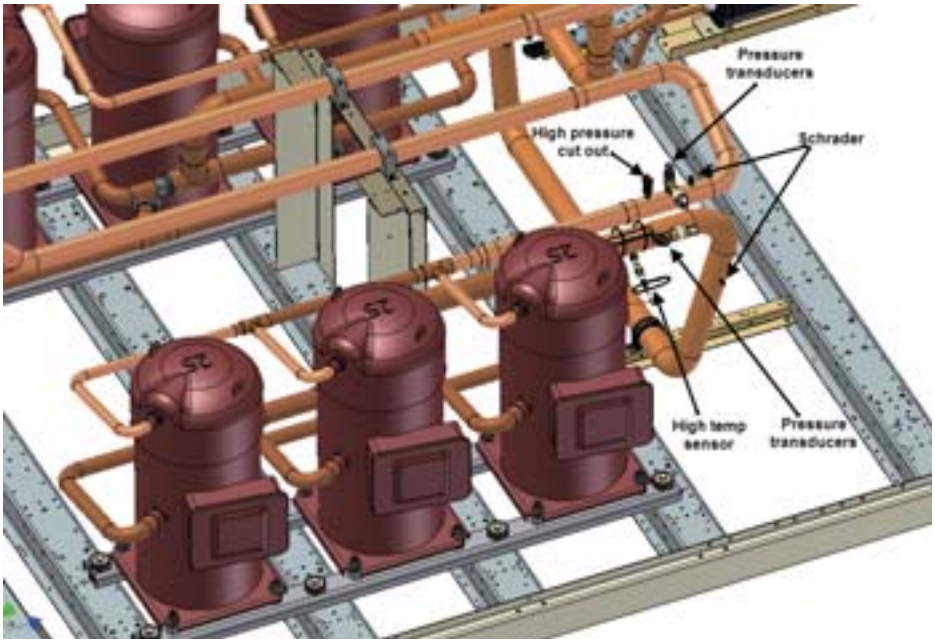
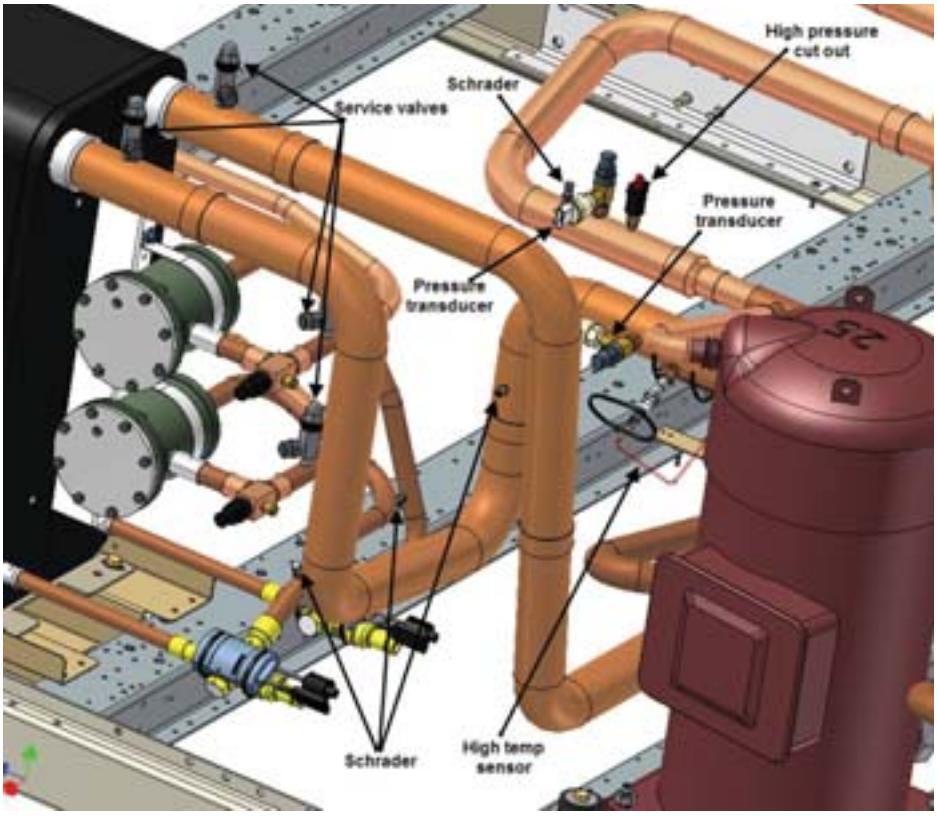


Figure 72. W 80-130 ton component location - evaporator side



Pump Package Components - Optional

Figure 73. Pump package components, slant 20-35T, view 1

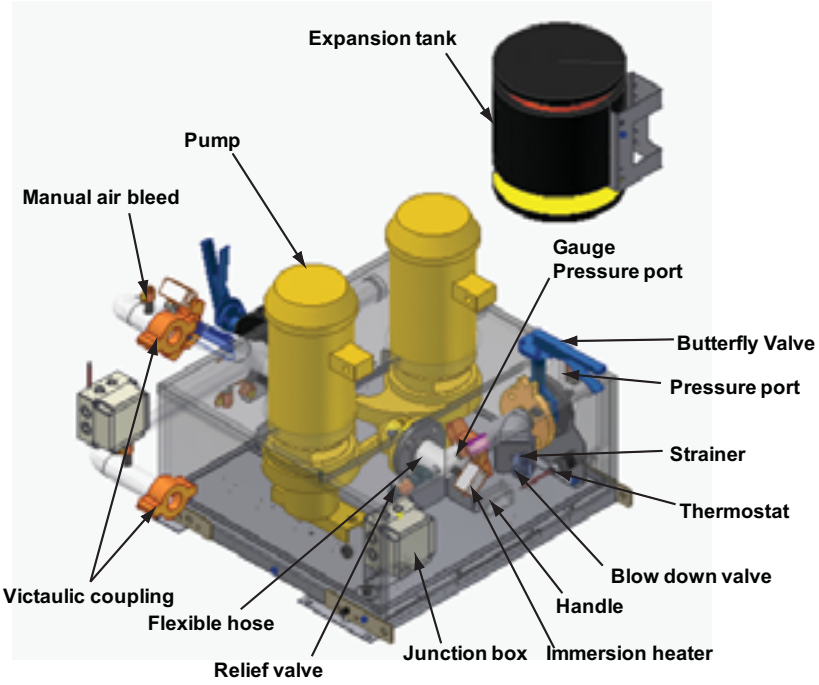


Figure 74. Pump package components, slant 20-35T, view 2

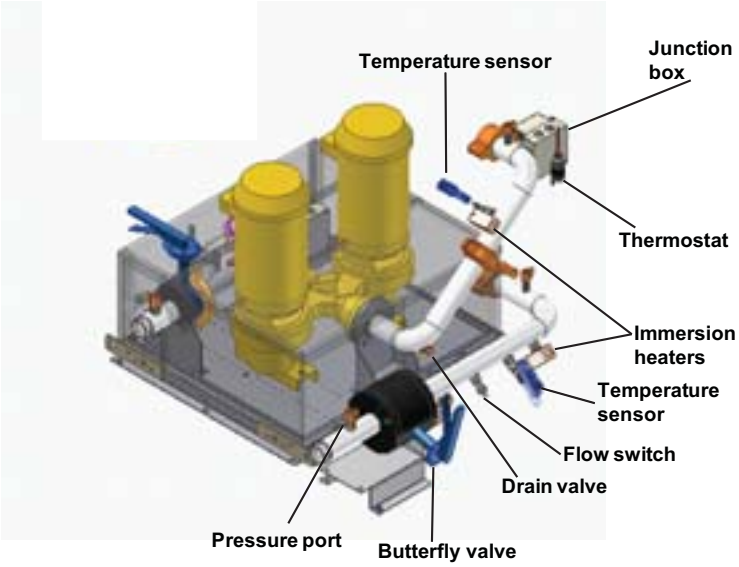


Figure 75. Pump package components, V40-70T, view 1

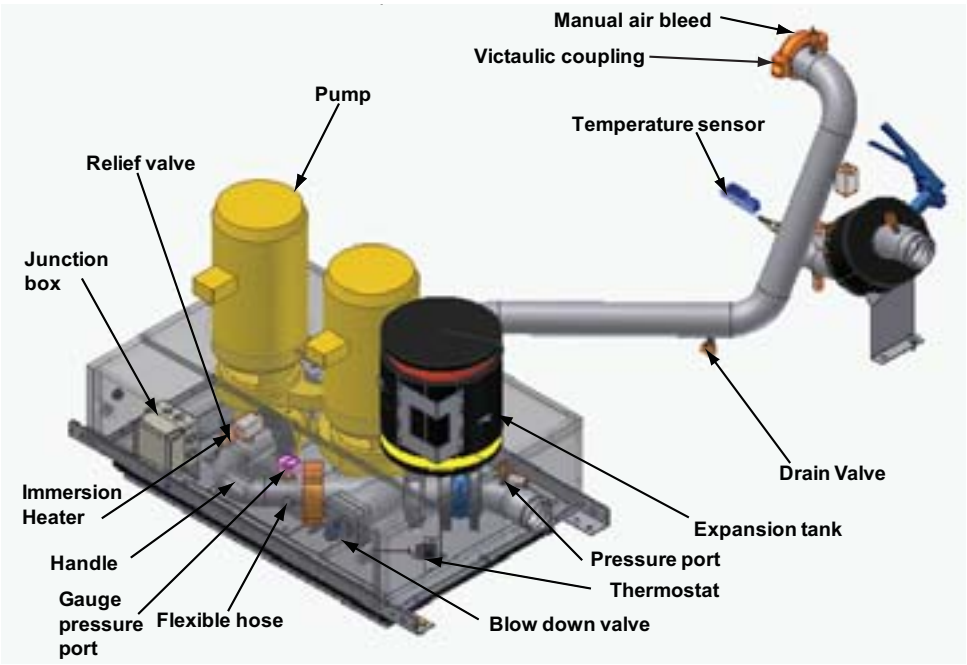


Figure 76. Pump package components, V40-70T, view 2

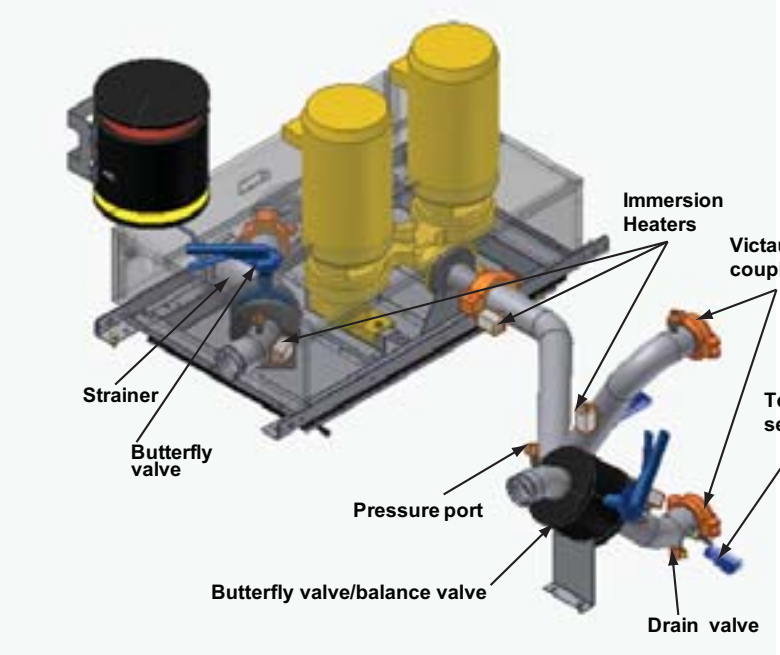


Figure 77. Pump package components — V 40-70 ton — view 3

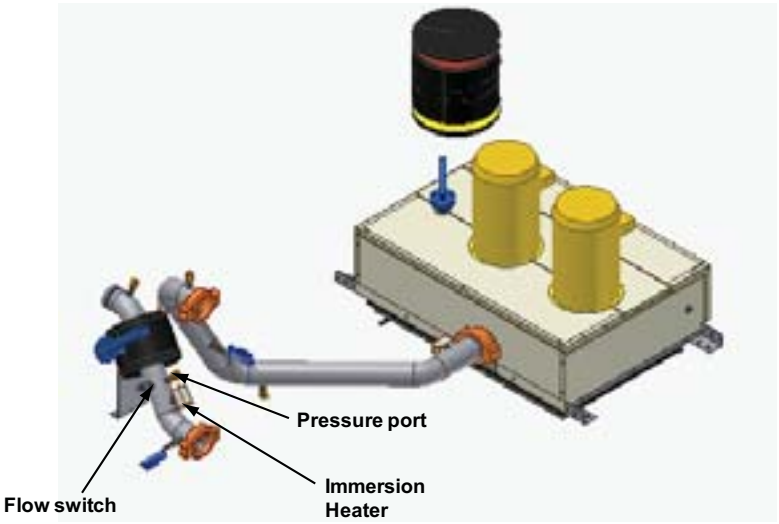


Figure 78. Pump package components — W 80-130 ton — view 1

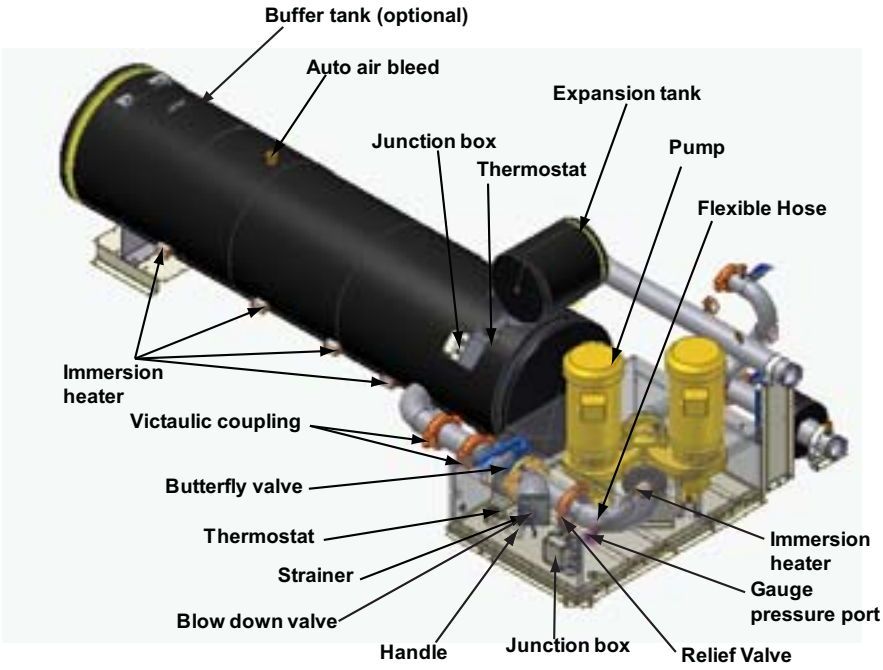
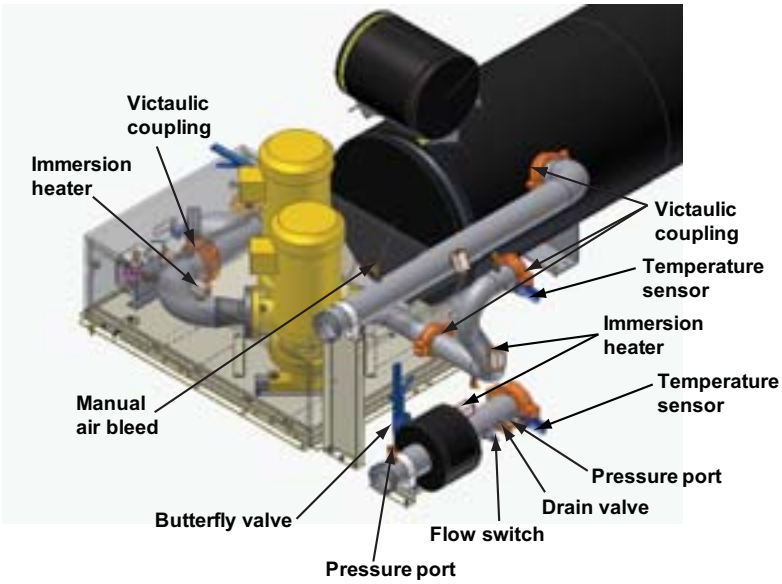
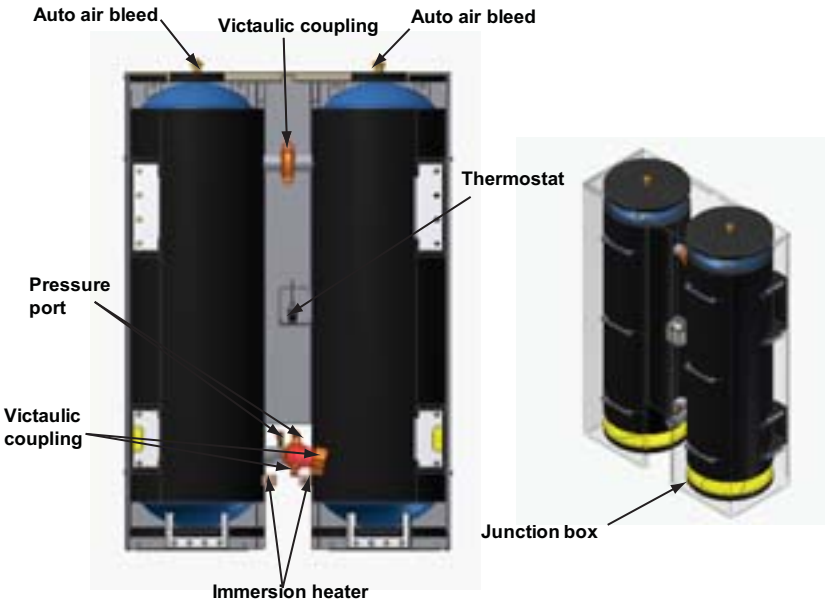


Figure 79. Pump package components — W 80-130 ton — view 2



Buffer Tank Components - Optional

Figure 80. Buffer tank components — slant 20-35 ton & V 40-70 ton



Partial Heat Recovery Components

Figure 81. Partial heat recovery components, slant 20-35T

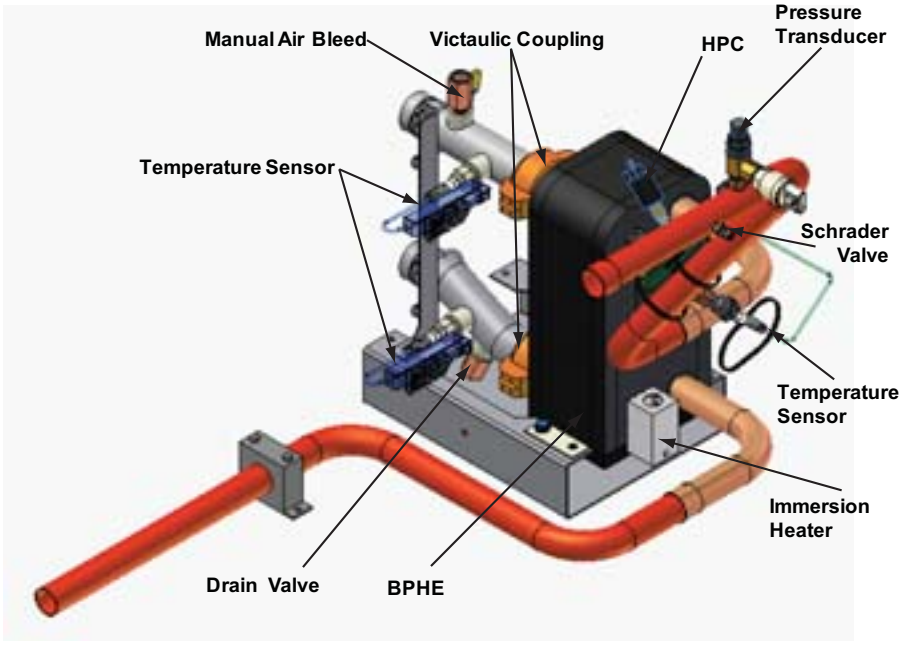


Figure 82. Partial heat recovery components, V40-70T

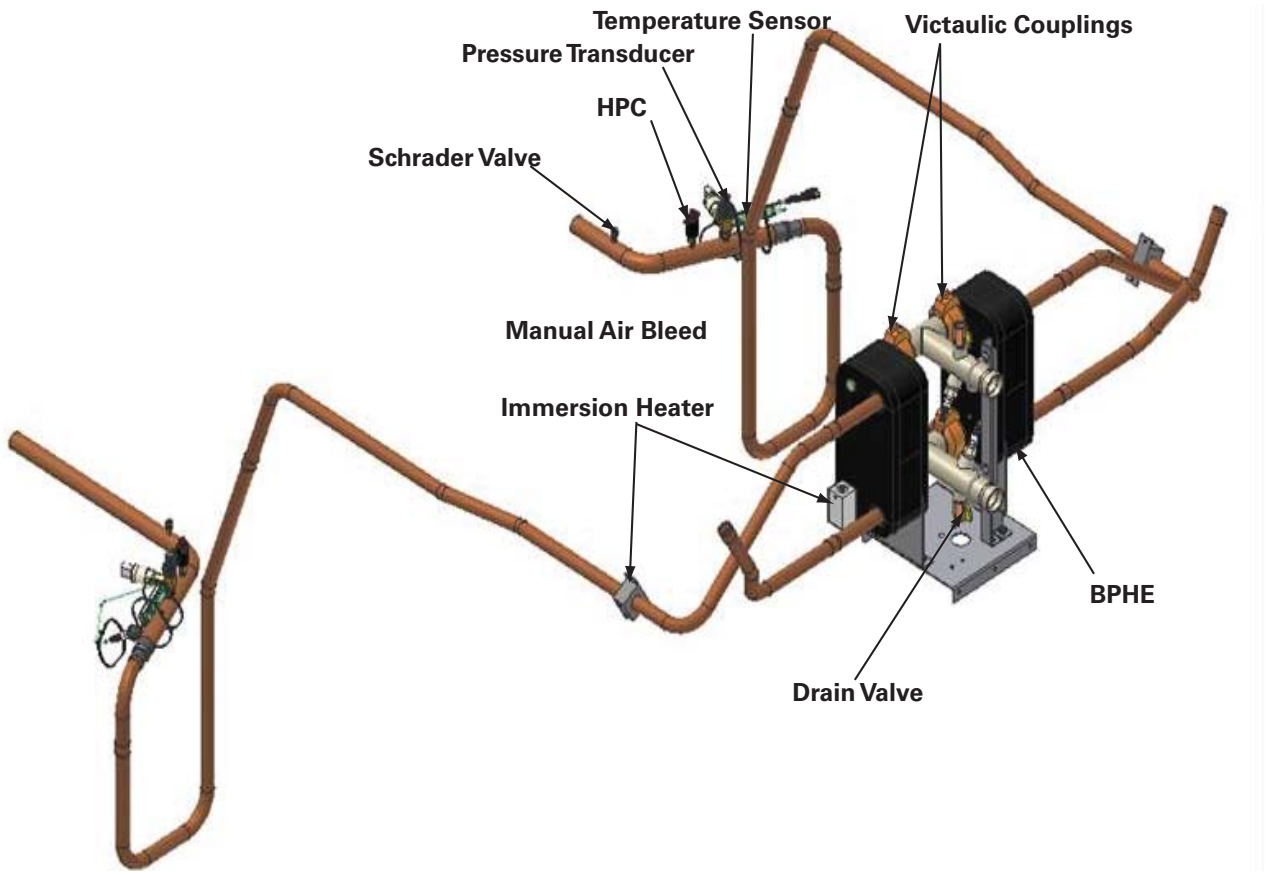
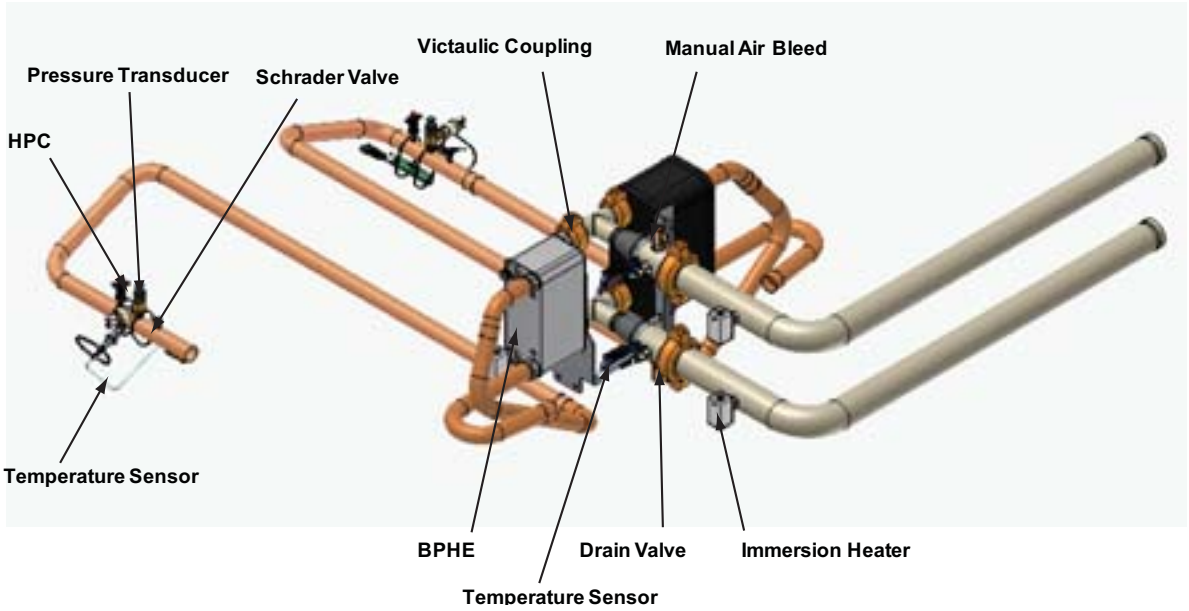
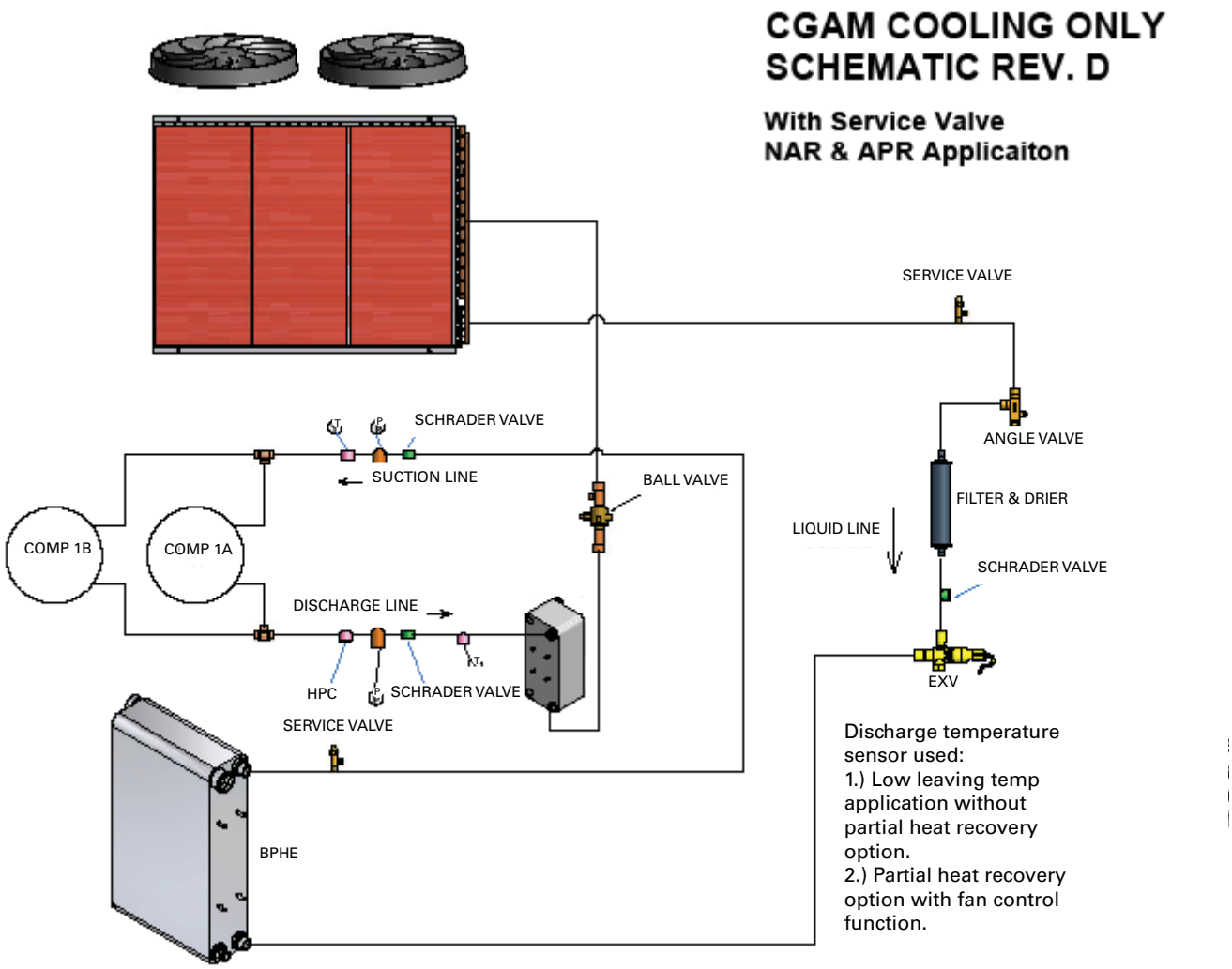


Figure 83. Partial heat recovery components — W 80-130 ton



Refrigerant Cycle

Figure 84. CGAM refrigerant circuit



The refrigeration cycle of the Model CGAM chiller is conceptually similar to other Trane air-cooled chiller products. The CGAM chiller uses a brazed plate evaporator and an air-cooled condenser. The compressors use suction gas cooled motors and an oil management system to provide almost oil-free refrigerant to the condenser and evaporator for maximum heat transfer while lubricating and sealing compressor bearings. The lubrication system helps to assure long compressor life and contributes to quiet operation.

Refrigerant condensers in the air-cooled heat exchanger which is available in three configurations—slant, V and W—based on the CGAM nominal tonnage cooling capacity. Liquid refrigerant is metered into the brazed plate evaporator using an electronic expansion valve to maximize chiller efficiency at full and part load operation.

The CGAM chiller is equipped with a unit-mounted starter and control panel. Microprocessor-based unit control modules (Trane Tracer™ CH530) provide accurate chilled water control and provide monitoring, protection and adaptive limit functions. The adaptive nature of the controls intelligently prevent the chiller from operating outside of its limits, or compensates for unusual operating conditions while keeping the chiller running rather than simply shutting off the chiller. If problems do occur, the CH530 controls provide diagnostic messages to help the operator in troubleshooting.

Refrigerant Cycle Description

The CGAM refrigeration cycle is described using the pressure-enthalpy chart shown in Figure 84 Key State Points 1 through 5 are indicated on the chart. A schematic showing refrigerant components throughout the system is shown in Figure 85.

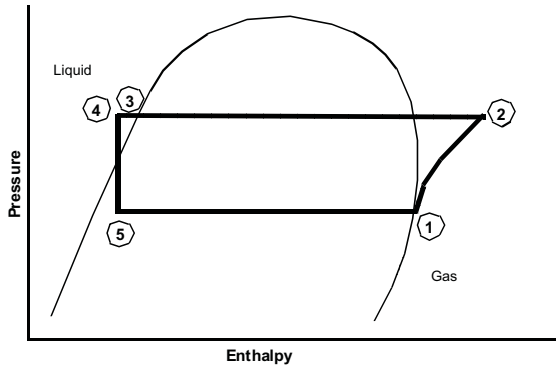
Refrigerant evaporation occurs in the brazed plate evaporator. Metered refrigerant vaporizes as it cools the chilled water or liquid flowing through the evaporator

passages. The refrigerant vapor leaves the evaporator as superheated gas. State Point 1.

Refrigerant vapor generated in the evaporator flows to the compressor suction manifold where it enters and flows across the compressor motor windings to provide cooling. The vapor is then compressed in the compressor scroll chambers and discharged. Oil from the compressor sump lubricates the bearings and seals the small clearances between the compressor scrolls. Refrigerant vapor is discharged to the air-cooled condenser at State Point 2.

After the refrigerant vapor condenses into liquid (State Points 3 and 4) it is returned to the evaporator (State Point 5) where the refrigerant again flashes into vapor and the refrigeration cycle repeats.

Figure 85. Pressure/Enthalpy Curve



Oil System Operation (CGAM)

Overview

The oil is efficiently separated inside the scroll compressor and will remain in the scroll compressor during all run cycles. Between 1-2% of the oil circulates around with the refrigerant.

Figure 86. CGAM scroll compressor sizes

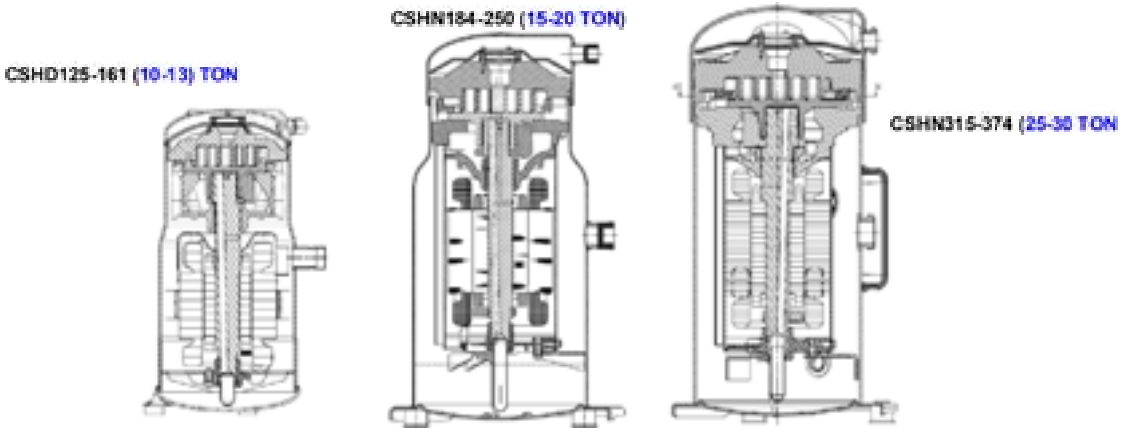


Figure 87. Compressor Internal Components, 15-30T

Figure 88. Compressor Internal Components, 15-30T

Controls Interface

CH530 Communications Overview

The Trane CH530 control system that runs the chiller consists of several elements:

- The main processor collects data, status, and diagnostic information and communicates commands to the starter module and the LLID (for Low Level Intelligent Device) bus. The main processor has an integral display (DynaView).
- Low level intelligent device (LLID) bus. The main processor communicates to each input and output device (e.g. temperature and pressure sensors, low voltage binary inputs, analog input/output) all connected to a four-wire bus, rather than the conventional control architecture of signal wires for each device.
- The communication interface to a building automation system (BAS).
- A service tool to provide all service/maintenance capabilities.

Main processor and service tool (TechView) software is downloadable from www.trane.com. The process is discussed later in this section under TechView Interface.

DynaView provides bus management. It has the task of restarting the link, or filling in for what it sees as "missing" devices when normal communications has been degraded. Use of TechView may be required.

The CH530 uses the IPC3 protocol based on RS485 signal technology and communicating at 19.2 Kbaud to allow 3 rounds of data per second on a 64-device network. A typical four-compressor CGAM will have around 30 devices.

Most diagnostics are handled by the DynaView. If a temperature or pressure is reported out of range by a LLID, the DynaView processes this information and calls out the diagnostic. The individual LLIDs are not responsible for any diagnostic functions.

Note: *It is imperative that the CH530 Service Tool (TechView) be used to facilitate the replacement of any LLID or reconfigure any chiller component. TechView is discussed later in this section.*

Controls Interface

Each chiller is equipped with a DynaView interface. The DynaView has the capability to display information to the operator including the ability to adjust settings. Multiple screens are available and text is presented in multiple languages as factory-ordered or can be easily downloaded from www.trane.com.

TechView can be connected to the DynaView module and provides further data, adjustment capabilities, diagnostics information using downloadable software.

DynaView Interface

The DynaView enclosure design is weatherproof and made of durable plastic for use as a device on the outside of the unit.

The display on DynaView is a 1/4 VGA display with a resistive touch screen and an LED backlight. The display area is approximately 4 inches wide by 3 inches high (102mm x 60mm).

Key Functions

In this touch screen application, key functions are determined completely by software and change depending upon the subject matter currently being displayed. The basic touch screen functions are outlined below.

Radio Buttons

Radio buttons show one menu choice among two or more alternatives, all visible. The radio button model mimics the buttons used on old-fashioned radios to select stations. When one is pressed, the one that was previously pressed "pops out" and the new station is selected. In the DynaView model the possible selections are each associated with a button. The selected button is darkened, presented in reverse video to indicate it is the selected choice. The full range of possible choices as well as the current choice is always in view.

Spin Value Buttons

Spin values are used to allow a variable setpoint to be changed, such as leaving water setpoint. The value increases or decreases by touching the increment (+) or decrement (-) arrows.

Action Buttons

Action buttons appear temporarily and provide the user with a choice such as **Enter** or **Cancel.**

Hot Links

Hot links are used to navigate from one view to another view.

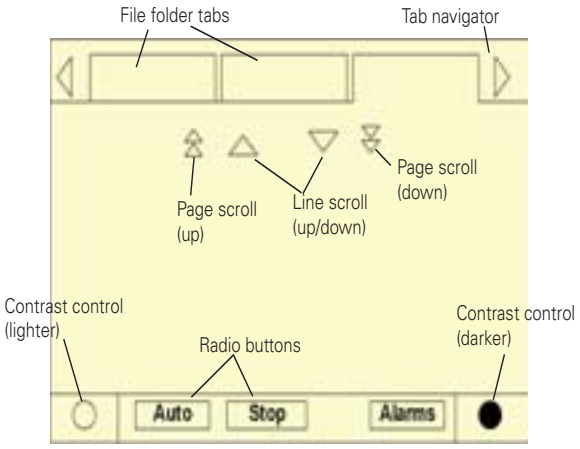
File Folder Tabs

File folder tabs are used to select a screen of data. Just like tabs in a file folder, these serve to title the folder/screen selected, as well as provide navigation to other screens. In DynaView, the tabs are in one row across the top of the display. The folder tabs are separated from the rest of the display by a horizontal line. Vertical lines separate the tabs from each other. The folder that is selected has no horizontal line under its tab, thereby making it look like a part of the current folder (as would an open folder in a file cabinet). The user selects a screen of information by touching the appropriate tab.

Display Screens

Basic Screen Format

The basic screen format appears as:



The file folder tabs across the top of the screen are used to select the various display screens.

Scroll arrows are added if more file tabs (choices) are available. When the tabs are at the left most position, the left navigator will not show and only navigation to the right will be possible. Likewise when the right most screen is selected, only left navigation will be possible.

The main body of the screen is used for description text, data, setpoints, or keys (touch sensitive areas). The Chiller Mode is displayed here.

The double up arrows cause a page-by-page scroll either up or down. The single arrow causes a line by line scroll to occur. At the end of the page, the appropriate scroll bar will disappear.

A double arrow pointing to the right indicates more information is available about the specific item on that same line. Pressing it will bring you to a subscreen that will present the information or allow changes to settings.

The bottom of the screen (Fixed Display) is present in all screens and contains the following functions. The **left circular area** is used to reduce the contrast/viewing angle of the display. **The right circular area** is used to increase the contrast/viewing angle of the display. The contrast may require re-adjustment at ambient temperatures significantly different from those present at last adjustment.

The other functions are critical to machine operation. The AUTO and STOP keys are used to enable or disable the chiller. The key selected is in black (reverse video). The chiller will stop when the STOP key is touched and after completing the Shutting Down mode.

Touching the AUTO key will enable the chiller for active cooling if no diagnostic is present. (A separate action must be taken to clear active diagnostics.)

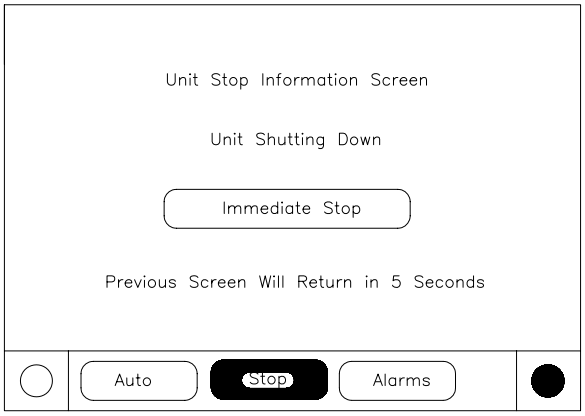
The AUTO and STOP keys, take precedence over the Enter and Cancel keys. (While a setting is being changed, AUTO and STOP keys are recognized even if Enter or Cancel has not been pressed.)

The ALARMS button appears only when an alarm is present, and blinks (by alternating between normal and reverse video) to draw attention to a diagnostic condition. Pressing the ALARMS button takes you to the corresponding tab for additional information.

Auto, Stop/Immediate Stop

The Auto and Stop keys will be presented as radio buttons within the persistent key display area. The selected key will be black.

The chiller will stop when the Stop key is touched, entering the Run Unload mode. An informational screen will be displayed for 5 seconds indicating that a second depression of an “Immediate Stop” key during this time period will result in an immediate stop. Pressing the “Immediate Stop” key while the immediate stop screen is displayed, will cause the unit to stop immediately, skipping operational pumpdown.



NOTICE:

Equipment Damage!

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

Touching the Auto key will arm the chiller for active cooling if no diagnostic is present. As in UCP2, a separate action must be taken to clear active diagnostics.

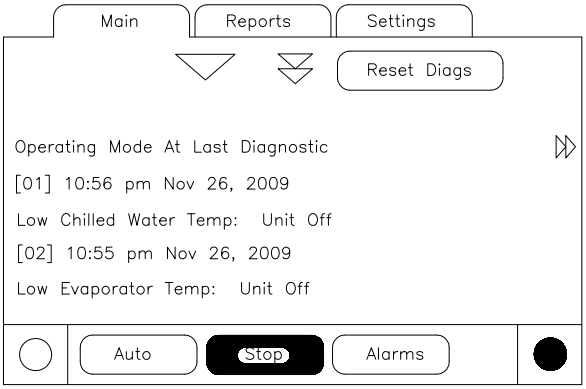
The AUTO and STOP, take precedence over the ENTER and CANCEL keys. (While a setting is being changed, AUTO and STOP keys are recognized even if ENTER or CANCEL has not been pressed.

Diagnostic Annunciation

When an active diagnostic is present, an Alarms key will be added to the persistent display area. This key will serve two purposes. The first purpose will be to alert the

operator that a diagnostic exists.The second purpose is to provide navigation to a diagnostic display screen.

Diagnostic Screen

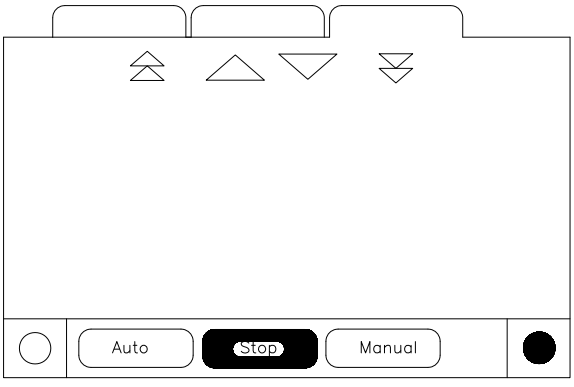


A complete listing of diagnostics and codes is included in the Diagnostic Section.

Manual Override Exists

An indicator to present the presence of a manual override will share space with the Alarms enunciator key. While a manual override exists, the space used for the Alarms key will be occupied by a "Manual" icon, that will display solid inverse color similar to the appearance of the Alarms enunciator. An Alarm will take precedence of the Manual, until the reset of active alarms, at which point the Manual indicator would re-appear if such an override exists.

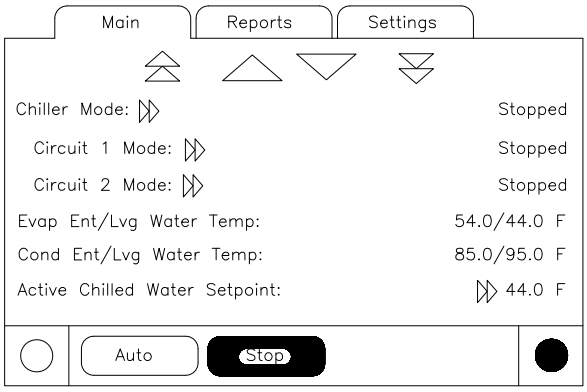
If the Manual indicator is pressed, the Manual Control Settings screen will be displayed.



Main Screen

The Main screen is a "dashboard" of the chiller. High level status information is presented so that a user can quickly understand the mode of operation of the chiller.

The Chiller Operating Mode will present a top level indication of the chiller mode (i.e. Auto, Running, Inhibit, Run Inhibit, etc.).The "additional info" icon will present a subscreen that lists in further detail the subsystem modes.



The Main screen shall be the default screen. After an idle time of 30 minutes the CH530 shall display the Main screen with the first data fields.

The remaining items (listed in the following table) will be viewed by selecting the up/down arrow icons.

Table 50. Main Screen Data Fields Table

Description	Units	Resolution
Chiller Mode (>> submodes)	enumeration	
Circuit Mode (>> submodes)	enumeration	
Circuit 1 Mode (>> submodes)	enumeration	
Circuit 2 Mode (>> submodes)	enumeration	
Evap Ent/Lvg Water Temp	F / C	0.1
Active Chilled Water Setpoint (>>source)	F / C	0.1
Active Hot Water Setpoint (>>source)	F / C	0.1
Active Demand Limit Setpoint (>>source)	%	1
Outdoor Air Temperature	F / C	0.1
Software Type	enumeration	Scroll
Software Version		X.XX

Chiller Operating Mode

The machine-operating mode indicates the operational status of the chiller. A subscreen with additional mode summary information will be provided by selection of an additional information icon (>>).The operating mode line will remain stationary while the remaining status items scroll with the up/down arrow keys.

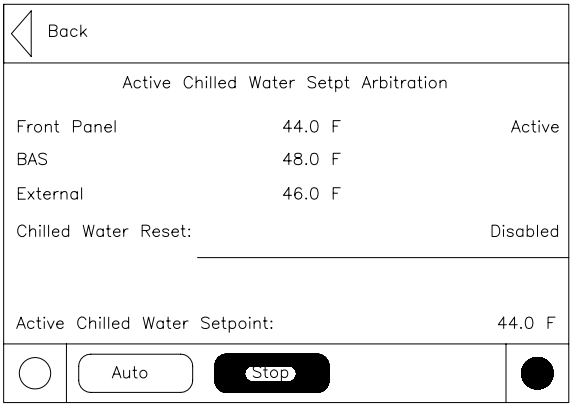
Active Chilled Water Setpoint

The active chilled water setpoint is the setpoint that is currently in use. It results from the logical hierarchy of setpoint arbitration by the main processor. It will be displayed to 0.1 degrees Fahrenheit or Celsius.

Touching the double arrow to the left of the Active Chilled Water Setpoint will take the user to the active chilled water setpoint arbitration sub-screen.

Active Chilled Water Subscreen

The active chilled water setpoint is that setpoint to which the unit is currently controlling. It is the result of arbitration between the front panel, BAS, schedule, external, and auxiliary setpoints (schedule and auxiliary not shown in the following diagram), which in turn may be subjected to a form of chilled water reset.



The chilled water reset status area in the right most column will display one of the following messages

- Return
- Constant Return
- Outdoor
- Disabled

The left column text “Front Panel”, “BAS” or “Schedule”, “External”, “Auxiliary”, “Chilled Water Reset”, and “Active Chilled Water Setpoint” will always be present regardless of installation or enabling those optional items. In the second column “-----” will be shown if that option is Not Installed, otherwise the current setpoint from that source will be shown.

Setpoints that are adjustable from the DynaView (Front Panel Chilled Water Setpoint, Auxiliary Chilled Water Setpoint) will provide navigation to their respective setpoint change screen via a double-arrow to the right of the setpoint source text. The setpoint change screen will look identical to the one provided in the Chiller Setpoints screen. The “Back” button on the setpoint change screen provides navigation back to the setpoint arbitration screen.

The “Back” button on the setpoint arbitration screen provides navigation back to the chiller screen.

Other Active Setpoints

The Active Demand Limit Setpoint will behave the same was as the Active Chilled Water Setpoint, except that its units are in percent and there is an Ice Building source in place of the Auxiliary source. Front Panel Demand Limit Setpoint will provide navigation to its setpoint change screen.

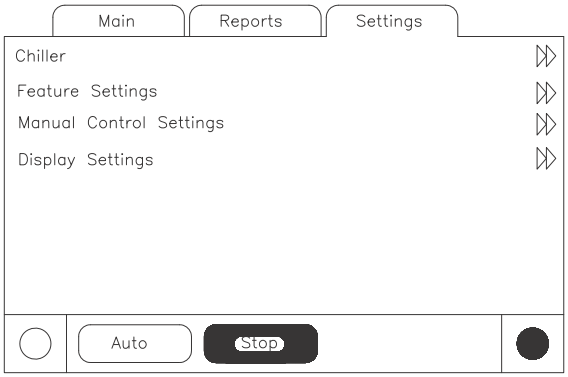
Password-Protected Settings

The user can change some settings from the DynaView display on the chiller. Other settings are password-protected. In order to change these setting the password is 314.

Settings Screen

The Settings screen provides a user the ability to adjust settings necessary to support daily tasks. The layout provides a list of sub-menus, organized by typical subsystem. This organization allows each subscreen to be shorter in length which should improve the user's navigation.

A sample Settings screen is a list of the subsystems as shown below.



Settings Sub-Screens - Table of Text, Data, Ranges, etc.

Below is the table of text, resolution, field size, enumerated selections, and data for Settings subscreens. See the functional specification “CGAM Settings and Setpoints” for further information such as ranges and operation.

Table 51. Unit

Description	Resolution or (Enumerations)	Units
Front Panel Cool	Cool	Enum
Front Panel Chilled Water Setpt:	+ or - XXX.X	Temperature
Auxiliary Chilled Water Setpt:	+ or - XXX.X	Temperature
Front Panel Demand Limit Setpt:	XXX	Percent
Front Panel Ice Build Cmd:	On/Auto	Enum
Front Panel Ice Term Setpt:	+ or - XXX.X	Temperature
Front Panel Noise Stb Cmd:	On/Auto	Enum
Setpoint Source:	(BAS/Ext/FP, Ext/ Front Panel, Front Panel), BAS/Ext/FP	Enum

Table 52. Feature Settings

Description	Resolution or (Enumerations), Default	Units
Power-Up Start Delay:	10 seconds	Seconds (MM:SS)
Cool Low Ambient Lockout:	(Enable, Disable), Enable	Enum
Cool Low Ambient Lockout Stpt:	+ or - XXX.X	Temperature
Water Pump Off Delay:	1 minute	Minutes (HH:MM)
Ice Building:	(Enable, Disable), Disable	Enum
PHR Fan Control:	(Enable, Disable), Disable	Enum
Local Time of Day Schedule	Subscreen (see below)	
External/BAS	Subscreen (see below)	
Chilled Water Reset	Subscreen (see below)	

Table 53. External/BAS Feature Settings (subscreen of Feature Settings)

Description	Resolution or (Enumerations), Default	Units
Ext Chilled Setpt:	(Enable, Disable), Disable	Enum
Ext Demand Limit Setpoint:	(Enable, Disable), Disable	Enum
Max Capacity Debounce Time:	30 seconds	Seconds (MM:SS)
Limit Annunc Debounce Time:	30 seconds	Seconds (MM:SS)
LCI-C Diag Encoding:	(Text, Code) Text	Enum
LCI-C Diag Language:	(English, Selection 2, Selection 3) English (0)	Enum

Table 54. Chilled Water Reset Feature Settings (subscreen of Feature Settings)

Description	Resolution or (Enumerations), Default	Units
Chilled Water Reset:	(Const Return, Outdoor, Return, Disable), Disable	Enum
Return Reset Ratio:	XXX	Percent
Return Start Reset:	XXX.X	Temperature
Return Maximum Reset:	XXX.X	Temperature
Outdoor Reset Ratio:	XXX	Percent
Outdoor Start Reset:	XXX.X	Temperature
Outdoor Maximum Reset:	XXX.X	Temperature

Table 55. Control Settings

Description	Resolution or (Enumerations), Default	Units
Cooling Design Delta Temp:	XXX.X	Delta Temperature
Heating Design Delta Temp:	XXX.X	Delta Temperature
Differential to Start:	XXX.X	Delta Temperature
Differential to Stop:	XXX.X	Delta Temperature
Staging Deadband Adjustment:	XXX.X	Delta Temperature
Capacity Control Softload Time:	120 seconds	Seconds (MM:SS)
Circuit Staging Option:	(Bal Starts/Hrs, Circuit 1 Lead, Circuit 2 Lead), Bal Starts/Hrs	Enum
Compressor Staging Option:	(Fixed, Bal Starts/Hrs)	Enum
Leaving Water Temp Cutout:	XX.X	Temperature
Low Refrigerant Temp Cutout:	XX.X	Temperature
Evap Flow Overdue Wait Time:	30 seconds	Seconds (MM:SS)
Disch Press Limit Setpt:	85%	Percent
Disch Press Limit Unload Setpt:	97%	Percent

Table 56. System Manual Control Settings

Description	Resolution or (Enumerations), Default	Units	Monitor Value
Evap Water Pump	(Auto, On), Auto	Enum	1) Evap Flow status 2) Override Time Remaining
Clear Restart Inhibit Timer	(Clear Timer)		1) Restart Inhibit Time (composite value)
Capacity Control	(Auto, Manual) Auto	Enum	
Binding	Special	Special	None

Table 57. Circuit Manual Control Settings

Description	Resolution or (Enumerations), Default	Units	Monitor Value
Front Panel Ckt Lockout	(Not Locked Out, Locked Out), Not Locked Out	Enum	
Cprsr A Lockout	(Not Locked Out, Locked Out), Not Locked Out	Enum	
Cprsr B Lockout	(Not Locked Out, Locked Out), Not Locked Out	Enum	

Table 57. Circuit Manual Control Settings (continued)

Description	Resolution or (Enumerations), Default	Units	Monitor Value
Cprsr C Lockout	(Not Locked Out, Locked Out), Not Locked Out	Enum	
Manual EXV Control:	(Auto, Manual), Auto	Enum	
Manual EXV Position Cmd:	XXX	Percent	EXV Status Suction Pressure
Cooling EXV Manual Ctrl:	(Auto, Manual), Auto	Enum	
Cooling EXV Manual Position Cmd:	XXX	Percent	EXV Status Suction Pressure
Cprsr A Pumpdown	Status: (Avail, Not Avail, Pumpdown) Override Subscreen command buttons: (Abort, Pumpdown) - *button is either grayed out or not shown if not available*	Enum	Suction Pressure
Cprsr B Pumpdown	Status: (Avail, Not Avail, Pumpdown) Override Subscreen command buttons: (Abort, Pumpdown) - *button is either grayed out or not shown if not available*	Enum	Suction Pressure
Cprsr C Pumpdown	Status: (Avail, Not Avail, Pumpdown) Override Subscreen command buttons: (Abort, Pumpdown) - *button is either grayed out or not shown if not available*	Enum	Suction Pressure

Local Time of Day Schedule Screen

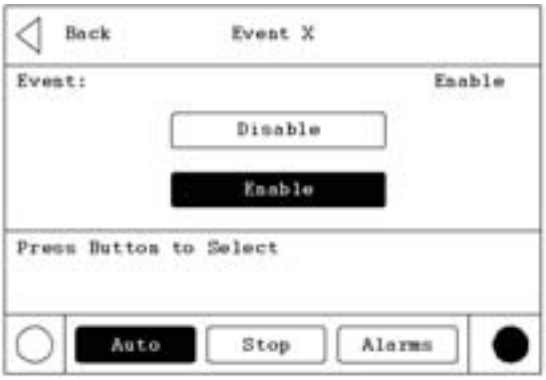
To access the optional Local Time of Day Schedule Screen it must be configured in TechView. This option will then be shown under the Feature Settings screen.

This screen shows the overall feature enable/disable setting, plus a listing of all 10 events, including their event time and active days of the week.

Local Settings Event Screen

This screen displays the details for a particular event, including the active days, event time, and the Local Schedule arbitrated setpoints. Selecting a given item will allow the user to modify it.

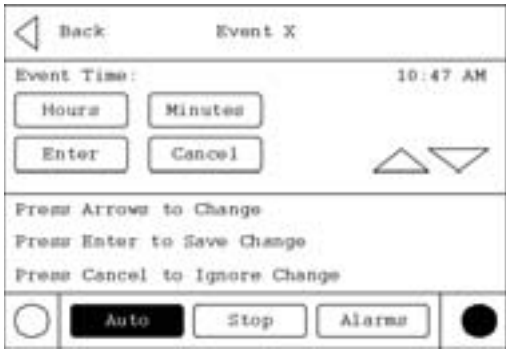
Event Enable/Disable Screen



Event Active Days Screen

This screen is unusual because it does not use radio buttons, which only allow one active selection at a time. These buttons are more like "selection buttons" or check boxes. The user can select any combination of days, or none at all.

Event Time Screen



Event Arbitrated Settings Screens

For analog setpoints, the screen is slightly different than the standard screen, because there are two additional buttons - "Used" and "Not Used". Selecting "Used" will make the setting valid and allow the user to change the value. Selecting "Not Used" will make the setting invalid, and will not allow the user to change the value.

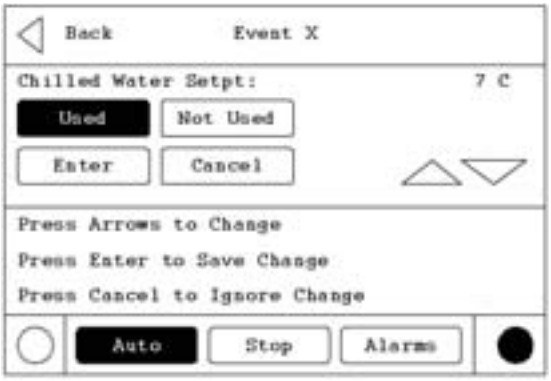


Table 58. Display Settings

Description	Resolution or (Enumerations), Default	Units
Date Format	("mmm dd, yyyy", "dd-mmm-yyyy"), "mmm dd, yyyy	Enum
Date[4]		
Time Format	(12-hour, 24-hour), 12-hour	Enum
Time of Day[4]		
Keypad/Display Lockout[3]	(Enable, Disable), Disable	Enum
Display Units	(SI, English), English	Enum
Pressure Units	(Absolute, Gauge), Gauge	Enum
Local Atmospheric Pressure:	XXX.X	Pressure (always absolute)
Language[1]	(English, Selection 2, Selection 3), English (0)	Enum

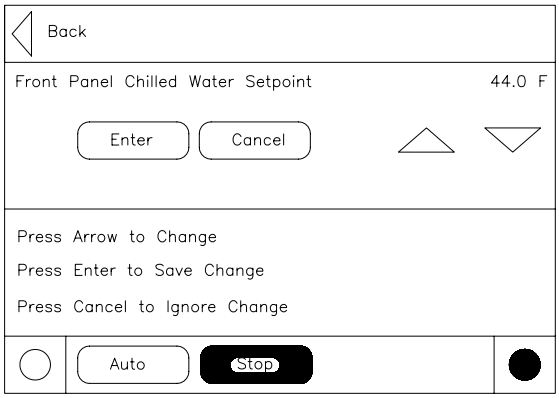
(1) Language choices are dependent on what the Service Tool has setup in the Main Processor. Get Radio Button names from Main Processor setups. Language selections will include English and qty 2 alternate as loaded by TechView.
(2) Temperatures will be adjustable to 0.1 deg F or C. The Main Processor will provide the minimum and maximum allowable value.
(3) Enables a DynaView Lockout screen. All other screens time-out in 30 minutes to this screen. The DynaView Lockout Screen will have 0-9 keypad to permit the user to re-enter the other DynaView screens with a fixed password. See below for further details.
(4) The Date and Time setup screen formats deviate slightly from the standard screens defined above. See the alternate screen layouts below.
(5) Language shall always be the last setting listed on the Control Settings menu (which will also always be the last item listed on the Settings menu list). This will allow a user to easily find language selection if looking at an unrecognizable language.
(6) The pump on mode terminates after 60 minutes.

Upon selecting a Settings list all setpoints available to change and the current value appear. Operator selects a setpoint by touching either the verbal description or setpoint value, causing the screen to switch to either Analog Settings Subscreen or Enumerated Settings Subscreen.

Analog Setting Subscreens

Analog Settings Subscreen displays the current value of the chosen setpoint in the upper ½ of the display. It is displayed in a changeable format consistent with its type. Binary setpoints are considered to be simple two state enumerations and will use radio buttons. Analog setpoints

are displayed as spin buttons. The lower half of the screen is reserved for help screens.

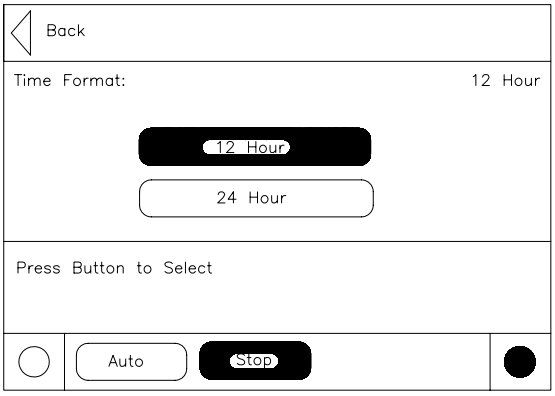


All setpoint subscreens will execute the equivalent of a Cancel key if any display activities cause the subscreen to be left before a new setpoint is entered. E.g. If Alarms key is pressed before a new setpoint is entered, new setpoint will be cancelled. The same applies to any time-outs.

Pressing the Auto or Stop keys will not cause a cancel since the setpoint subscreen is not left on this action.

Enumerated Settings Subscreen

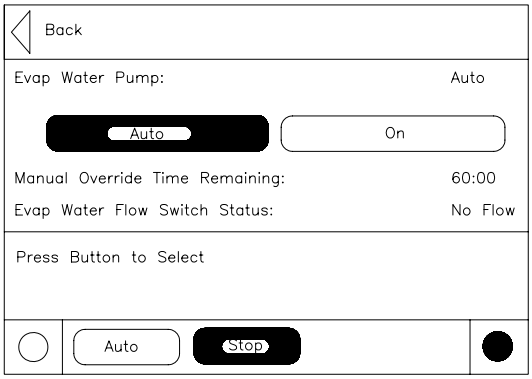
The enumerated setpoint subscreen has no cancel or enter key. Once a radio key is depressed the item is immediately set to the new enumeration value.



Mode Override Subscreens

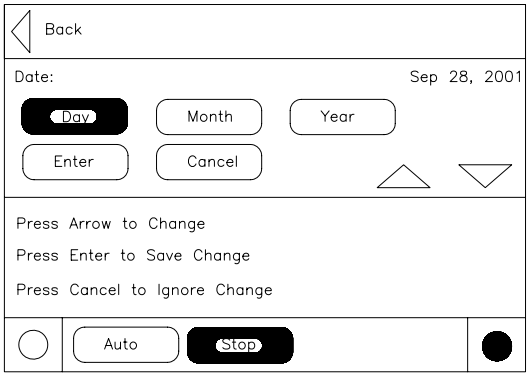
The Mode Override subscreen has no cancel or enter key. Once a radio key is depressed that new value is immediately assumed.

Mode Override for Enumerated Settings is shown below:

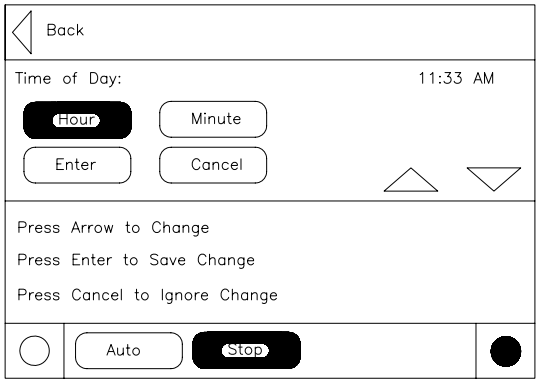


Date/Time Subscreen

The setpoint screen for setting up the CH530 date is shown below: The user must select Day, Month, or Year and then use the up/down arrows to adjust.



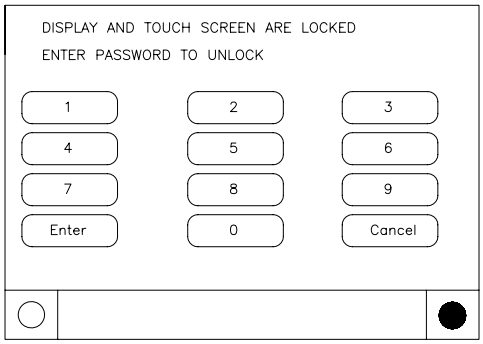
The setpoint screen for setting up the CH530 time with a 12 hour format is shown below. User must select Hour, or Minute, then use up/down arrows to adjust. Adjusting hours will also adjust am/pm.



Lockout Screen

The DynaView Display and Touch Screen Lock screen is shown. This screen is used if the Display and Touch Screen Lock feature is Enabled. Thirty minutes after the last key stroke this screen will be displayed and the Display and Touch Screen will be locked out until "159 Enter" is entered.

Until the proper password is entered there will be no access to the DynaView screens including all reports, all setpoints, and Auto/Stop/Alarms/Interlocks. The password "159" is not programmable from either DynaView or TechView.

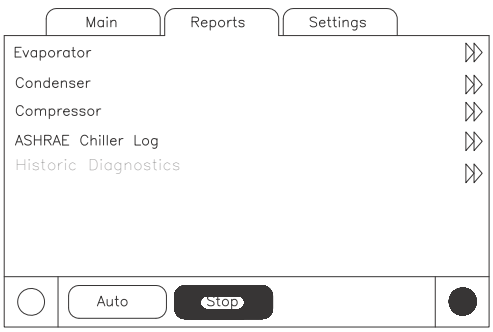


If the Display and Touch Screen Lock feature is Disabled, a similar screen including "Enter 159 to Unlock" will show if the MP temperature is approximately less than 32°F (0°C) and it has been 30 minutes after the last key stroke. Note: the main processor is equipped with an on-board temp sensor which enables the ice protection feature (OAT is not required).

Freezing rain can form on the touch panel and actuate the touch screen as the rain freezes on its surface. A specific pattern of key presses will avoid this issue.

Reports

The Reports tab will allow a user to select from a list of possible reports headings (i.e. Custom, ASHRAE Guideline 3, Refrigerant, etc.) Each report will generate a list of status items as defined in the tables that follows:



Historic Diagnostics are also included in this menu.

Table 59. Report name: System Evaporator

Description	Resolution	Units
Evap Entering Water Temp:	+ or - XXX.X	Temperature
Evap Leaving Water Temp:	+ or - XXX.X	Temperature
Evap Pump Inverter 1 Run Cmd:	On, Off	Enumeration
Evap Pump 1 Command:	On, Off	Enumeration
Evap Pump 2 Command:	On, Off	Enumeration
Evap Water Flow Switch Status:	Flow, No Flow	Enumeration

Table 60. Report name: Circuit Evaporator

Description	Resolution	Units
Suction Pressure	XXX.X	Pressure
Suction Saturated Rfgt Temp:	+ or - XXX.X	Temperature
Suction Temperature:	+ or - XXX.X	Temperature
Evap Approach Temp:	+ or - XXX.X	Temperature
EXV Position Status:	XXX.X	Percent
Heating EXV Position Status:	XXX.X	Percent

Table 61. Report name: System Condenser

Description	Resolution	Units
Outdoor Air Temperature:	+ or - XXX.X	Temperature
Heat Rcvy Entering Water Temp:	+ or - XXX.X	Temperature
Heat Rcvy Leaving Water Temp:	+ or - XXX.X	Temperature

Table 62. Report name: Circuit Condenser

Description	Resolution	Units
Discharge Pressure:	XXX.X	Pressure
Discharge Saturated Rfgt Temp:	+ or - XXX.X	Temperature
Discharge Temperature:	+ or - XXX.X	Temperature
Cond Approach Temp:	+ or - XXX.X	Temperature
Current Air Flow:	XXX.X	Percent

Table 63. Report name: System Compressor

Description	Resolution	Units
Chiller Running Time:	XXXX:XX	hr:min

Table 64. Report name: Circuit Compressor

Description	Resolution	Units
Compressor A Starts:	XXXX	Integer
Compressor A Running Time:	XXXX:XX	hr:min
Compressor B Starts:	XXXX	Integer
Compressor B Running Time:	XXXX:XX	hr:min
Compressor C Starts:	XXXX	Integer
Compressor C Running Time:	XXXX:XX	hr:min

Table 65. Report name: System ASHRAE Chiller Log

Description	Resolution	Units
Current Time/Date:	XX:XX mmm dd, yyyy	Date / Time
Chiller Mode:		Enum
Active Chilled Water Setpoint:	XXX.X	Temperature
Active Hot Water Setpoint:	XXX.X	Temperature
Evap Entering Water Temp:	XXX.X	Temperature
Evap Leaving Water Temp:	XXX.X	Temperature
Evap Water Flow Switch Status:		Enum
Outdoor Air Temperature:	XXX.X	Temperature
Active Demand Limit Setpoint:	XXX	Percent

Table 66. Report name: Circuit ASHRAE Chiller Log

Description	Resolution	Units
Circuit Mode:		Enum
Suction Pressure:	XXX.X	Pressure
Suction Saturated Rfgt Temp:	XXX.X	Temperature
Evap Approach Temp:	XXX.X	Temperature
Discharge Pressure:	XXX.X	Pressure
Discharge Saturated Rfgt Temp:	XXX.X	Temperature
Cond Approach Temp:	XXX.X	Temperature
Compressor A Starts:	XXXX	Integer
Compressor A Running Time:	XX:XX	Hours: Minute
Compressor B Starts:	XXXX	Integer
Compressor B Running Time:	XX:XX	Hours: Minute
Compressor C Starts:	XXXX	Integer
Compressor C Running Time:	XX:XX	Hours: Minute

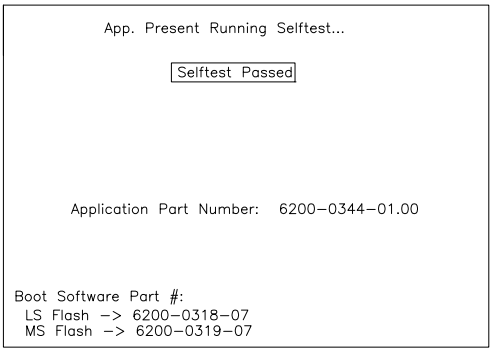
Power Up and Self Tests

Power-Up DynaView

DynaView will progress through three Power-Up screens:

First Screen, Application Status, Boot Software P/N, Self Test and Application Time Stamp.

This screen will display for 3-10 seconds. This screen will give the status of the Application software, the Boot Software P/N, display Self Test results and display the Application Part Number (CGAM 6200-0450-01). The contrast will also be adjustable from this screen. The message "Selftest Passed" may be replaced with "Err2: RAM Error" or "Err3: CRC Failure".



Display Formats

Temperature settings can be expressed in F or C, depending on Display Units settings.

Pressure settings can be expressed in psia, psig, kPaa (kPa absolute), or kPag (kPa gauge) depending on Display Units settings.

Dashes ("-----") appearing in a temperature or pressure report, indicates that the value is invalid or not applicable.

Languages

The languages for DynaView will reside in the main processor. The main processor will hold three languages, English, and two alternate languages. The service tool (TechView) will load the main processor with user selected languages from a list of available translations.

TechView

TechView is the PC (laptop) based tool used for servicing Tracer CH530. Technicians that make any chiller control modification or service any diagnostic with Tracer CH530 must use a laptop running the software application "TechView." TechView is a Trane application developed to minimize chiller downtime and aid the technicians understanding of chiller operation and service requirements.

Important: *Performing any Tracer CH530 service functions should be done only by a properly trained service technician. Please contact your local Trane service agency for assistance with any service requirements.*

TechView software is available via Trane.com. (http://www.trane.com/COMMERCIAL/DesignAnalysis/TechView.aspx?i=1435)

This download site provides a user the TechView installation software and CH530 main processor software that must be loaded onto your PC in order to service a CH530 main processor. The TechView service tool is used to load software into the Tracer CH530 main processor.

Minimum PC requirements to install and operate TechView

- Microsoft Windows XP Professional, Windows Vista Business or Windows 7 Enterprise operating system
- Internet Explorer 6.0 or higher
- USB 2.0 or higher
- Pentium II, III or higher processor
- 128Mb RAM minimum for TechView, 1G recommended for total Windows system
- 1024 x 768 resolution of display
- CD-ROM (optional for copying TechView install to CD)
- 56K modem (optional for internet connection)
- 9-pin RS-232 serial connection (optional for connection to DynaView)

Note: *TechView was designed for the preceding listed laptop configuration. Any variation will have unknown results. Therefore, support for TechView is limited to only those operating systems that meet the specific configuration listed here. Only computers with a Pentium II class processor or better are supported; Intel Celeron, AMD, or Cyrix processors have not been tested.*

TechView is also used to perform any CH530 service or maintenance function. Servicing a CH530 main processor includes:

- Updating main processor software
- Monitoring chiller operation
- Viewing and resetting chiller diagnostics
- Low Level Intelligent Device (LLID) replacement and binding
- Main processor replacement and configuration modifications
- Setpoint modifications
- Service overrides

TechView Software Download, Installation

This information can also be found at http://www.trane.com/COMMERCIAL/DesignAnalysis/TechView.aspx?i=1435.

1. Create a folder called "CH530" on your (C:\CH530) on your hard drive. This \CH530 folder is the standard recommended location for the installation file. Storing the installation file in this location helps you remember where it is stored and makes it easier for technical support personnel to assist you.
2. Click the link for the latest version on the TechView Software Download page. Enter your name, e-mail address and other required information. Click **Submit**.
3. A download link will be sent to the e-mail address provided. Before you click the link please note:
   - Sent link may only be used one time.
   - Internet options must be set correctly to allow download. To verify correct setting:
     - Open Internet Explorer Browser
     - Click **Tools**
     - Select **Internet Options**
     - Select **Security** tab
     - Click on **Internet** zone
     - Click **Custom Level** button
     - Scroll to **Downloads** section
     - Verify/Enable "Automatic prompting for file downloads"
     - Click **OK**
     - Click YES on warning window
     - Click Apply, then OK

     Note: *If this setting is incorrect, you may or may not receive an error message during download attempt.*
4. Click the download link in the e-mail message.
   - If the download window does not open immediately, please look for a yellow highlighted message bar/line near the top of your browser. It may contain a message such as "To help protect your security, Internet Explorer blocked this site from downloading files to your computer. Click here for options..." Click on message line to see options.
   - When dialog box appears, click **Save** and navigate to the CH530 folder created in Step 1. Click OK.
   - If you do not complete the download successfully, you will have to request another download link (Step 2).
5. Navigate to the CH530 folder created in Step 1. Double-click the installation (.exe) file. The License Agreement dialog box appears.
6. Click **I Agree** after reviewing License Agreement. The **Choose Components** dialog box appears. All components are selected by default. (These are the

actual MP versions for all units.) Deselect any components you do not want.

Note: *Deselecting components reduces the size of the installed application.*

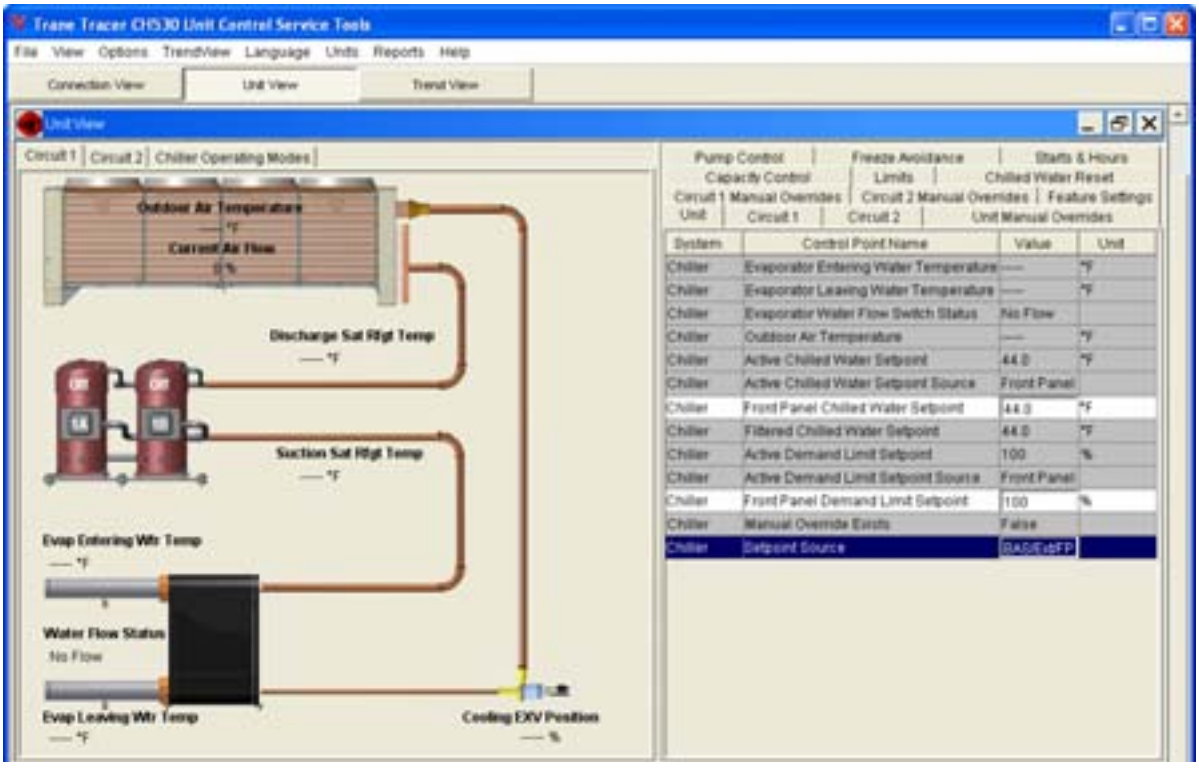
7. Click **Install**. A progress meter dialog box appears. An information file appears when installation is complete.

Note: *Techview requires a current version of JAVA. If you do not have the current release, TechView installation will be interrupted, and you will be provided with information for required JAVA software download. Once you have completed the JAVA installation, return to Step 5 to restart installation.*

Unit View

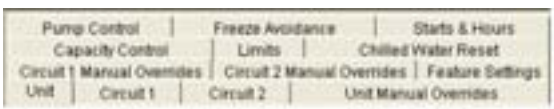
Unit view is a summary for the system organized by chiller subsystem. This provides an overall view of chiller operating parameters and gives you an "at-a-glance" assessment of chiller operation.

Figure 89. Unit View



Unit View also displays, in real time, all non-setpoint data organized by tabs. As data changes on the chiller it is automatically updated in the Unit View.

Figure 90. Unit view tabs



The Control Panel tab displays important operating information for the unit and allows you to change several key operating parameters. The panel is divided into four or more sub-panels (depending on the number of circuits in the unit).

The Operating Mode tab displays the unit, circuit and compressor top level operating modes.

The Hours and Starts tab displays the number a hours (total) a compressor has run and the number of times the compressor has started. This window plays a key role in evaluating maintenance requirements.

Upon successful Local Connect TechView will display UNIT VIEW. The Unit View displays the system, control point name, value and unit of measure. It reflects active setpoints and allows you to make changes.

CGAM Unit View is shown below:

Circuit/Compressor Lockout

In order to lock out a circuit the user must go to the Unit View/Circuit 1 Manual Overrides Tab and then select the Front Panel Lockout for circuit 1 and/or circuit 2. It is also possible to lockout individual compressors from the same Circuit 1 Manual Overrides Tab in this view.

Table 67. Unit view tabs - detail

Tab	Item Type	Units	Min Value	Max Value	Default Value
Unit Tab					
Evaporator Entering Water Temperature	Status	Temp (°C)			
Evaporator Leaving Water Temperature	Status	Temp (°C)			
Evaporator Water Flow Switch Status	Status	Flow/No Flow			
Outdoor Air Temperature	Status	Temp (°C)			
Active Chilled Water Setpoint	Status	Temp (°C)			
Active Chilled Water Setpoint Source	Status	BAS/External/Front Panel/Auxiliary/Schedule			
Front Panel Chilled Water Setpoint	Setting	Temp °C (°F)	Capacity Control Chilled Water Setpoint	20°C (68°F)	6.7°C (44°F)
BAS Chilled Water Setpoint	Status	Temp (°C)			
Local Schedule Chilled Water Setpoint	Status	Temp (°C)			
External Chilled Water Setpoint	Status	Temp (°C)			
Auxiliary Chilled Water Setpoint	Status	Temp (°C)			
Filtered Chilled Water Setpoint	Status	Temp (°C)			
Active Demand Limit Setpoint	Status	%			
Active Demand Limit Setpoint Source	Status	BAS/External/Front Panel/Auxiliary/Schedule			
Front Panel Demand Limit Setpoint	Setting	%	Smallest Capacity Step	100	100
BAS Demand Limit Setpoint	Status	%			
Local Schedule Demand Limit Setpoint	Status	%			
External Demand Limit Setpoint	Status	%			
Active Ice Building Command	Status	Off /On			
Front Panel Ice Building Command	Setting	Auto	No Request	Ice Building Request	No Request
Active Ice Termination Setpoint	Status	Temp (°C)			
Front Panel Ice Termination Setpoint	Setting	Temp °C (°F)	-6.67°C (20°F)	0°C (32°F)	-2.78°C (27°F)
Manual Override Exists	Status	False/True			
Setpoint Source	Setting	BAS/Ext/FP			
Circuit 1 Tab					
Suction Pressure	Status	Pressure (kPa)			
Discharge Pressure	Status	Pressure (kPa)			
Suction Saturated Refrigerant Temperature	Status	Temp (°C)			
Suction Temperature	Status	Temp (°C)			
Discharge Saturated Refrigerant Temperature	Status	Temp (°C)			
Discharge Temperature	Status	Temp (°C)			
Condenser Approach Temperature	Status	Temp (°C)			
Evaporator Approach Temperature	Status	Temp (°C)			
EXV Position Status (%)	Status	%			
Circuit 2 Tab					
Suction Pressure	Status	Pressure (kPa)			
Discharge Pressure	Status	Pressure (kPa)			
Suction Saturated Refrigerant Temperature	Status	Temp (°C)			
Suction Temperature	Status	Temp (°C)			
Suction Superheat	Status	Delta Temp (°C)			

Table 67. Unit view tabs - detail (continued)

Tab	Item Type	Units	Min Value	Max Value	Default Value
Discharge Saturated Refrigerant Temperature	Status	Temp (°C)			
Discharge Temperature	Status	Temp (°C)			
Condenser Approach Temp	Status	Temp (°C)			
Evaporator Approach Temp	Status	Temp (°C)			
EXV Position Status (%)	Status	%			
Unit Manual Overrides Tab					
Manual Capacity Control	Setting	Auto/Manual			
Manual Capacity Control Command	Setting	Unload/Hold/Load			
Clear Restart Inhibit	Setting				
Maximum Restart Inhibit Time Remaining	Status	Time (Seconds to MM:SS)			
Manual Evaporator Pump Control	Setting	Auto/On			
Manual Evaporator Pump Override Time	Status	Time (Seconds to MM:SS)			
Circuit 1 Manual Overrides Tab					
Front Panel Lockout	Setting	Not Locked/Locked			
Compressor A Lockout	Setting	Not Locked/Locked			
Compressor B Lockout	Setting	Not Locked/Locked			
Compressor C Lockout	Setting	Not Locked/Locked			
Manual EXV Control	Setting	Auto/Manual			
Manual EXV Control Percent	Setting	%			
Compressor 1A Pumpdown Command	Setting	Abort			
Compressor 1A Pumpdown Status	Status	Available/Not Available/ In Progress/Inhibited			
Compressor 1B Pumpdown Command	Setting	Abort/Start			
Compressor 1B Pumpdown Status	Status	Available/Not Available/ In Progress/Inhibited			
Compressor 1C Pumpdown Command	Setting	Abort/Start			
Compressor 1C Pumpdown Status	Status	Available/Not Available/ In Progress/Inhibited			
Suction Pressure	Status	Pressure (kPa)			
Circuit 2 Manual Overrides Tab					
Front Panel Lockout	Setting	Not Locked/Locked	Auto	Stop	Auto
Compressor A Lockout	Setting	Not Locked/Locked	Auto	Stop	Auto
Compressor B Lockout	Setting	Not Locked/Locked	Auto	Stop	Auto
Compressor C Lockout	Setting	Not Locked/Locked	Auto	Stop	Auto
Manual EXV Control	Setting	Auto/Manual			
Manual EXV Control Percent	Setting	%			
Compressor 2A Pumpdown Command	Setting	Abort/Start			
Compressor 2A Pumpdown Status	Status	Available/Not Available/ In Progress/Inhibited			
Compressor 2B Pumpdown Command	Setting	Abort/Start			
Compressor 2B Pumpdown Status	Status	Available/Not Available/ In Progress/Inhibited			
Compressor 2C Pumpdown Command	Setting	Abort/Start			
Compressor 2C Pumpdown Status	Status	Available/Not Available/ In Progress/Inhibited			
Suction Pressure	Status	Pressure (kPa)			
Feature Settings Tab					

Table 67. Unit view tabs - detail (continued)

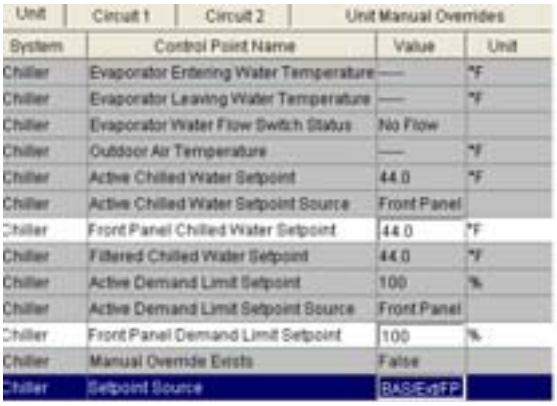
Tab	Item Type	Units	Min Value	Max Value	Default Value
Local Atmospheric Pressure	Setting	Pressure (kPa)	68.9 kPa	110.3 kPa	101.4 kPa
Power-Up Start Delay	Setting	Time (Seconds)	0	600	0
Operational Pumpdown Temperature Setpoint	Setting	Temp °C (°F)	-26°C (-14.8°F)	-10°C (14°F)	-17.78°C (0°F)
External Chilled Water Setpoint	Setting	Disable/Enable			Disabled
External Demand Limit Setpoint	Setting	Disable/Enable			Disabled
Limit Annunciation Debounce Time	Setting	Time (Seconds)	0s	3600s	1200s
Maximum Capacity Annunciation Debounce Time	Setting	Time (Seconds)	0s	3600s	1200s
Ice Building Feature	Setting	Disable/Enable			Disabled
EXV Recalibration Time	Setting	Time (Seconds)	?	?	
Capacity Control Tab					
Cooling Design Delta Temperature	Setting	Delta Temp °C (°F)	1°C (1.8°F)	12°C (21.6°F)	5.56°C (10°F)
Differential To Start	Setting	Delta Temp °C (°F)	1°C (1.8°F)	6°C (10.8°F)	2.78°C (5°F)
Differential To Stop	Setting	Delta Temp °C (°F)	1°C (1.8°F)	7°C (12.6°F)	2.78°C(5°F)
Staging Deadband Adjustment	Setting	Delta Temp °C (°F)	-1°C (-1.8°F)	5°C (9°F)	0°C (0°F)
Circuit Staging Option	Setting	Balance Strts-Hrs/Circuit 1 Lead/ Circuit 2 Lead			Balance Starts Hours
Compressor Staging Option	Setting	Fixed Sequence/ Balanced Strts-Hrs			Fixed Sequence
Compressor Start Delay Time	Setting	Time (Seconds)	0 s	600 s	60 s
Capacity Control Softload Time	Setting	Time (Seconds)	0 s	3600 s	900 s
Limits Tab					
Cooling Low Ambient Lockout	Setting	Disable/Enable			Enabled
Cooling Low Ambient Lockout Setpoint	Setting	Temp °C (°F)	-20°C (-4°F)	20°C (68°F)	-10°C (14°F)
Discharge Pressure Limit Setpoint	Setting	%	80%	120%	85%
Discharge Pressure Limit Unload Setpoint	Setting	%	90%	120%	97%
Restart Inhibit Free Starts	Setting	Starts			2
Restart Inhibit Start To Start Time	Setting	Time (Minutes)			6 min
Chilled Water Reset Tab					
Chilled Water Reset Type	Setting	Disable/Return/Outdoor Air/Constant			
Return Reset Ratio	Setting	%	10%	120%	50%
Return Start Reset	Setting	Delta Temp °C (°F)	2.22°C (36°F)	16.67°C (62°F)	5.55°C (42°F)
Return Maximum Reset	Setting	Delta Temp °C (°F)	0°C (32°F)	11.11°C (52°F)	2.78°C (37°F)
Outdoor Reset Ratio	Setting	%	-80%	80%	10%
Outdoor Start Reset	Setting	Temp °C (°F)	10°C (50°F)	54.44°C (130°F)	32.22°C (90°F)
Outdoor Maximum Reset	Setting	Delta Temp °C (°F)	0°C (32°F)	11.11°C (52°F)	2.78°C (37°F)
Cooling Design Delta Temperature	Setting	Delta Temp °C (°F)	1°C (33.8°F)	12°C (53.6°F)	5.56°C (42°F)
Pump Control Tab					
Evaporator Water Flow Switch Status	Status	No Flow/Flow			
Evap Pump Inverter 1 Run Command	Status	Off/On			
Evaporator Pump 1 Command	Status	Off/On			
Evaporator Pump 2 Command	Status	Off/On			
Evap Pump Off Delay	Setting	Time (Minutes)	0 min	30 min	1 min
Evap Flow Overdue Wait Time	Setting	Time (Seconds)	300 s	3600 s	1200 s
High Evaporator Water Temp Setpoint	Setting	Temp °C (°F)			55°C
Freeze Avoidance Tab					
Leaving Water Temp Cutout	Setting	Temp °C (°F)	-18.33°C (-1°F)	2.22°C (36°F)	2.22°C (36°F)

Table 67. Unit view tabs - detail (continued)

Tab	Item Type	Units	Min Value	Max Value	Default Value
Low Refrigerant Temperature Cutout	Setting	Temp °C (°F)	-28.33°C (-19°F)	2.22°C (36°F)	-5.56°C (22°F)
Evaporator Pump Freeze Avoidance	Setting	Disable/Enable			Enabled
Evap Pump Freeze Avoidance Adaptive Learning	Setting	Fixed/Adaptive			Enabled
Evap Pump Freeze Avoidance Time Constant	Setting	Time (minutes)	2 min	360 min	10 min
Evap Pump Freeze Avoidance Temp Margin	Setting	Delta Temp °C (°F)	0°C (32°F)	5°C (41°F)	2°C (35.6°F)
Starts and Hours Tab					
Chiller Running Time	Status	Time (Sec to HH:MM)			
Compressor 1A Starts	Status	Starts			
Compressor 1A Running Time	Status	Time (Sec to HH:MM)			
Compressor 1B Starts	Status	Starts			
Compressor 1B Running Time	Status	Time (Sec to HH:MM)			
Compressor 1C Starts	Status	Starts			
Compressor 1C Running Time	Status	Time (Sec to HH:MM)			
Compressor 2A Starts	Status	Starts			
Compressor 2A Running Time	Status	Time (Sec to HH:MM)			
Compressor 2B Starts	Status	Starts			
Compressor 2B Running Time	Status	Time (Sec to HH:MM)			
Compressor 2C Starts	Status	Starts			
Compressor 2C Running Time	Status	Time (Sec to HH:MM)			
Evaporator Water Pump 1 Starts	Status	Starts			
Evaporator Water Pump 1 Running Time	Status	Time (Sec to HH:MM)			
Evaporator Water Pump 1 Starts	Status	Starts			
Evaporator Water Pump 1 Running Time	Status	Time (Sec to HH:MM)			
Heat Recovery Tab					
Partial heat recovery (PHR) Fan Control	Setting	Disable/Enable			
PHR Leaving Water Temperature Setpoint	Setting	Temp (°C)			
PHR Leaving Water Temperature Adjustment	Setting	Delta Temp (°C)			
Generic Monitoring Tab					
Generic Temp Sensor	Status	Temp (°C)			
Generic Pressure Sensor	Status	Pressure (kPa)			
Generic Analog Monitor	Status	Current (mA)			
Generic Low Volt Monitor	Setting	Open/Closed			
Generic High Volt Monitor	Setting	Off/On			

The items that can be modified show up in white. The items that cannot be modified show up in gray.

Figure 91. Fields in white



To change the setpoint enter a new value for the setpoint into the text field.

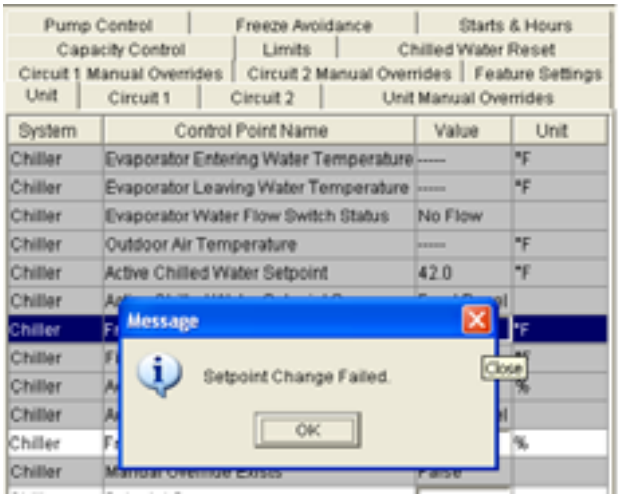
Figure 92. Change setpoint

If the entered value is outside the given range, the background turns red.

Figure 93. Change out of range

If the value entered is not valid, an error message will display and the change will not occur.

Figure 94. Setpoint change failed



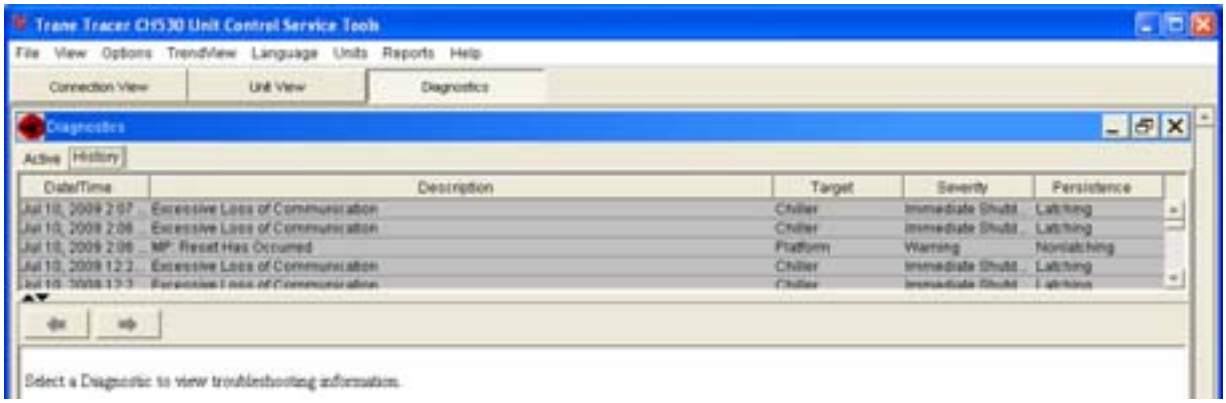
Diagnostics View

This window lists the active and inactive (history) diagnostics. There can be up to 60 diagnostics, both active and historic. For example, if there were 5 active diagnostics, the possible number of historic diagnostics would be 55. You can also reset active diagnostics here, (i.e., transfer active diagnostics to history and allow the chiller to regenerate any active diagnostics).

Resetting the active diagnostics may cause the chiller to resume operation.

The Active and History diagnostics have separate tabs. A button to reset the active diagnostics displays when either tab is selected.

Figure 95. Diagnostic view



Configuration View

This view is under the CH530 tab and displays the active configuration and allows you to make changes to the unit configuration. Configuration View allows you to define the chiller's components, ratings, and configuration settings. These are all values that determine the required installed devices, and how the chiller application is run in the main processor. For example, a user may set an option to be installed with Configuration View, which will require devices to be bound using Binding View. And when the main processor runs the chiller application, the

appropriate steps are taken to monitor required inputs and control necessary outputs.

Any changes made in the Configuration View, on any of the tabs, will modify the chiller configuration when you click on the Load Configuration button (located at the base of the window). The Load Configuration button uploads the new configuration settings into the main processor.

Selecting the Undo All button will undo any configuration setting changes made during the present TechView connection and since the last time the Load Configuration button was selected.

Figure 96. Configuration view - CH530 tab

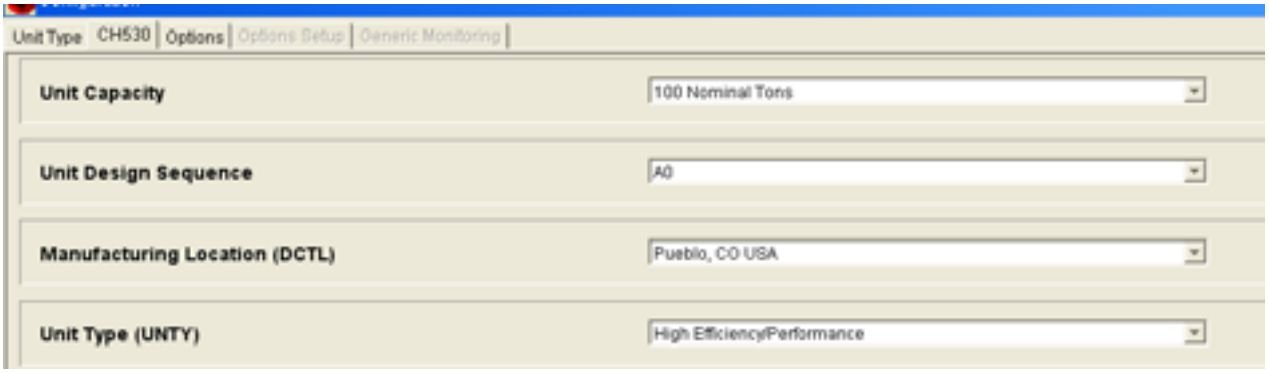


Table 68. Configuration view items - CH530 tab

Item	Description
Basic Product Line	CGAM - Air-Cooled Scroll Packaged Chiller
Unit Capacity	020 Nominal Tons 023 Nominal Tons (TAI, EPL only) 026 Nominal Tons 030 Nominal Tons 035 Nominal Tons 039 Nominal Tons (EPL only) 040 Nominal Tons 045 Nominal Tons (EPL only) 046 Nominal Tons (TAI, EPL only) 052 Nominal Tons 060 Nominal Tons 070 Nominal Tons 080 Nominal Tons 090 Nominal Tons 100 Nominal Tons 110 Nominal Tons 120 Nominal Tons
Unit Design Sequence	Factory Assigned
Manufacturing Location	Epinal, France Pueblo, USA Taicang, China Curitiba, Brazil
Unit Type	Standard Efficiency/Performance (EPL only) High Efficiency/Performance
Sound Package	High Duty (EPL and TAI only) Standard Noise Low Noise
Supply Power Frequency	60 Hz 50 Hz

Table 68. Configuration view items - CH530 tab

Item	Description
Unit Application	Standard Ambient (EPL and TAI only) Low Ambient (EPL and TAI only) High Ambient (EPL and TAI only) Wide Ambient
Heat Recovery	No Heat Recovery Partial Heat Recovery w/ Fan Control Partial Heat Recovery w/o Fan Control (EPL and TAI only)
Evaporator Pump Control	No Pump Flow Control Single Pump Fixed Speed (TAI, EPL only) Single Pump Variable Speed (TAI, EPL only) Dual Pump Fixed Speed (TAI, EPL only) Dual Pump Variable Speed

A couple of additional tabs in Configuration View allow you to change other unit configuration options using the Options tab and the Options Setup tab. The features that are installed on the Options Tab will control what is displayed on the Options Setup tab.

Figure 97. Configuration view - options tab

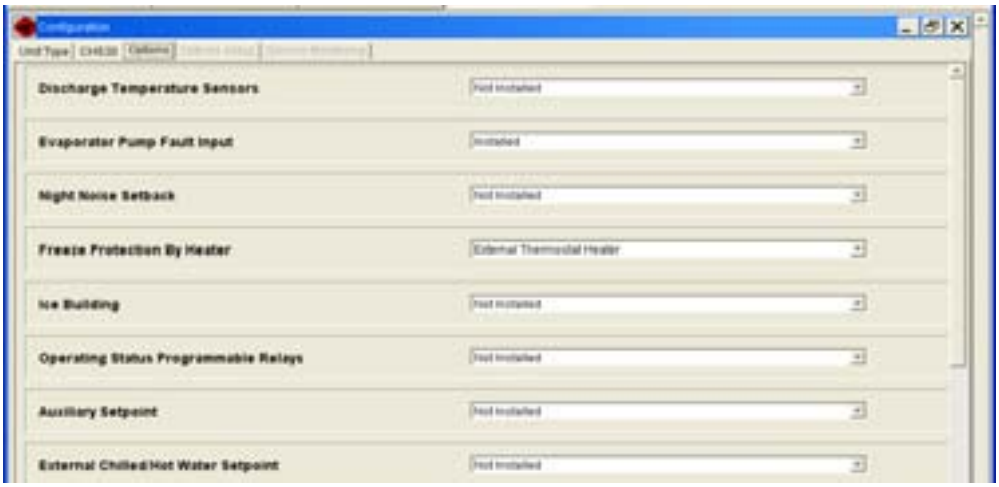
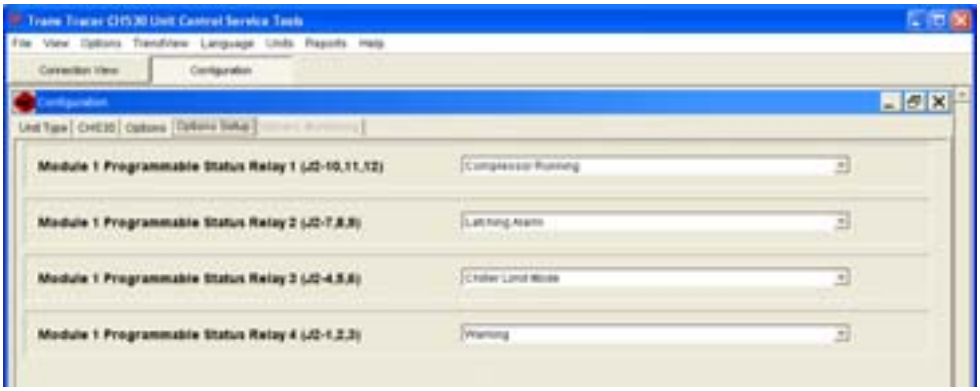


Figure 98. Configuration view - options setup tab

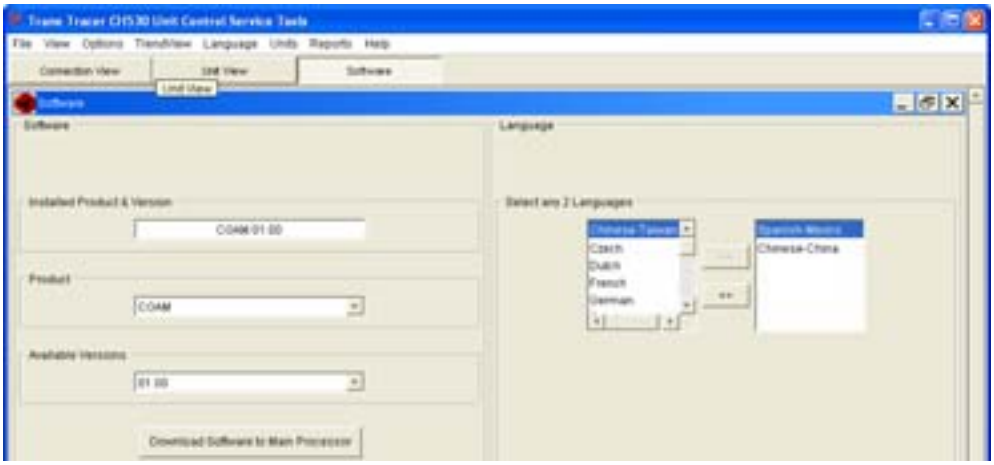


Software View

Software view allows you to verify the version of chiller software currently running on the EasyView or DynaView and download a new version of chiller software to the EasyView or DynaView.

You can also add up to two available languages to load into the DynaView. Loading an alternate language file allows the DynaView to display its text in the selected alternate language, English will always be available.

Figure 99. Software view



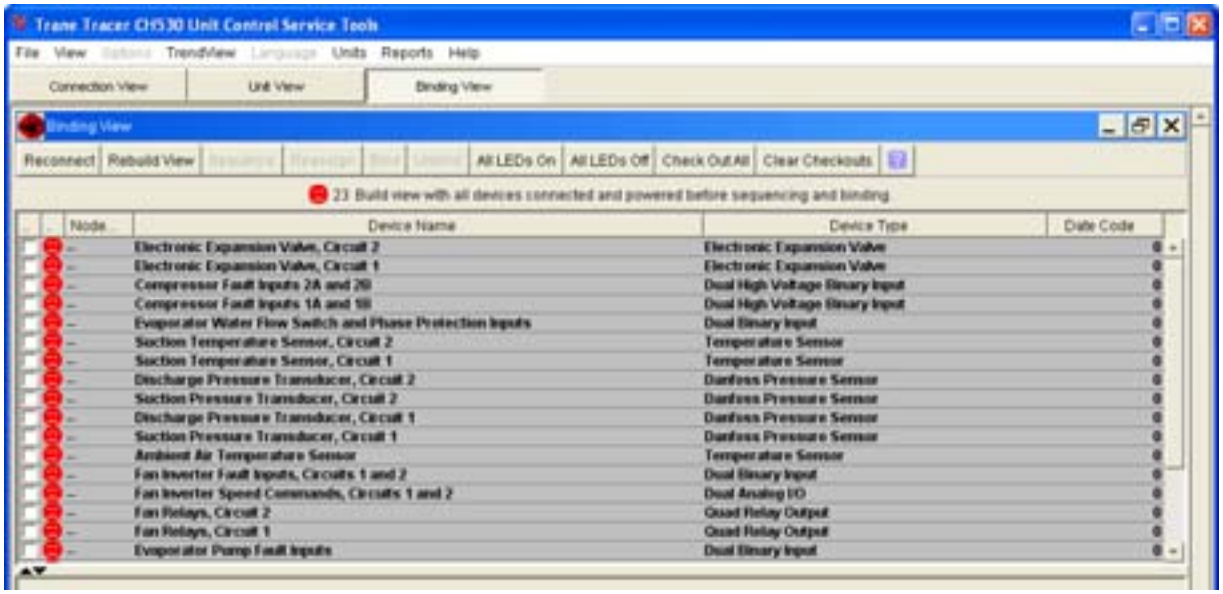
Binding View

Binding View allows you to assess the status of the network and all the devices connected as a whole, or the status of individual devices by using status icons and function buttons.

Binding View is essentially a table depicting what devices and options are actually discovered on the network bus (and their communication status) versus what is required to support the configuration defined by the feature codes and categories. Binding View allows you to add, remove, modify, verify, and reassign devices and options in order to match the configuration requirements.

Whenever a device is installed, it must be correctly configured to communicate and to function as intended. This process is called binding. Some features of Binding View are intended to serve a second purpose; that is diagnosing problems with communication among the devices.

Figure 100. Binding view



Replacing or Adding Devices

If a device is communicating but incorrectly configured, it might not be necessary to replace it. If the problem with the device is related to communication, attempt to rebind it, and if the device becomes correctly configured, it will then communicate properly.

If a device that needs to be replaced is still communicating, it should be unbound. Otherwise, it will be necessary to rebuild the CH530 network image for Binding View to discover that it has been removed. An unbound device stops communicating and allows a new device to be bound in its place.

It is good practice to turn the power off while detaching and attaching devices to the CH530 network. Be sure to keep power on the service tool computer. After power is restored to the CH530 network, the reconnect function in Binding View restores communication with the network. If the service tool computer is turned off, you must restart TechView and Binding View.

If a device is not communicating, the binding function displays a window to request manual selection of the device to be bound. Previously-selected devices are deselected when the function starts. When manual selection is confirmed, exactly one device must be selected; if it is the correct type, it is bound. If the desired device cannot be selected or if multiple devices are accidentally selected, you can close the manual selection window by clicking on No and repeat the bind function.

Pre-Start Checkout

Note: *For any installation violations of this manual, use Non-Compliance form PROD-ADF001-EN.*

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

⚠WARNING

Hazardous Voltage!

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

- Verify that all refrigerant valves are "OPEN"

NOTICE:

Compressor Damage!

Do not operate the unit with the compressor, oil discharge, liquid line service valves and the manual shutoff on the refrigerant supply to the auxiliary coolers "CLOSED". Failure to "OPEN" all valves may cause serious compressor damage.

- Check the power supply voltage to the unit at the main power fused-disconnect switch. Voltage must be within the voltage utilization range stamped on the unit nameplate. Voltage imbalance must not exceed 2 percent. See "Unit Voltage Imbalance," p. 122.
- Check the unit power phasing to be sure that it has been installed in an "ABC" sequence. See "Unit Voltage Phasing," p. 122.

⚠WARNING

Live Electrical Components!

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

- Verify that the compressor oil sump heaters are installed tightly around the compressor. Energize and verify heaters are operational using a temperature probe. See Table 69, p. 121.

Table 69. Compressor oil sump heater summary[a]

Heater Grp	Heater Description	Heater Designation(s)
Compressor Oil Sump	Compr 1A, Ckt 1	3M1E1
	Compr 1B, Ckt 1	3M2E1
	Compr 1C, Ckt 1	3M3E1
	Compr 2A, Ckt 2	4M1E1
	Compr 2B, Ckt 2	4M2E1
	Compr 2C, Ckt 2	4M3E1

(a) Not all heaters are present on all unit configurations. See schematics and component locations in section"Unit Wiring," p. 151.

- Verify that the VSD blanket and optional pump VSD heaters are operational. See Table 70, p. 121. Install jumper across thermostat and verify each heater is functioning. See section "Unit Wiring," p. 151 for component locations.

Table 70. Operational heater summary

Heater Group	Thermo-stat Designation	Jumper Terminals	Heater Description	Heater Designation
VSD Blanket	1S2	1X4-1 to 1X4-25	Blanket, 1A36	1E1, 1E2
			Blanket, 1A37	1E3
Pump VSD Enclosure (optional)	5S4	5X4-1 to Wire 632	Pump VSD Enclosure	5E9

- Fill the evaporator chilled water circuit. Vent the system while it is being filled. Open the vents on the top of the evaporator during filling and close when filling is completed.

NOTICE:

Proper Water Treatment!

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

- Close the fused-disconnect switch(es) that supplies power to the chilled water pump starter.

⚠WARNING

Hazardous Voltage!

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

- Start the chilled water pump to begin circulation of the water. Inspect all piping for leakage and make any necessary repairs.
- With water circulating through the system, adjust water flow and check water pressure drop through the evaporator.
- Prove all Interlock and Interconnecting Wiring Interlock and External.
- Check and set, as required, all CH530 Menu Items.
- Stop the chilled water pump.

Unit Voltage Power Supply

⚠WARNING

Live Electrical Components!

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

Voltage to the unit must meet the criteria given. Measure each leg of the supply voltage at the unit's main power fused-disconnect. If the measured voltage on any leg is not within specified range, notify the supplier of the power and correct the situation before operating the unit.

NOTICE:

Equipment Damage!

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

Unit Voltage Imbalance

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

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

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

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

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

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

The percentage of imbalance is then:

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

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

Unit Voltage Phasing

It is important that proper rotation of the compressors be established before the unit is started. Proper motor rotation requires confirmation of the electrical phase sequence of the power supply. The motor is internally connected for clockwise rotation with the incoming power supply phased A, B, C.

Basically, voltages generated in each phase of a polyphase alternator or circuit are called phase voltages. In a three-phase circuit, three sine wave voltages are generated, differing in phase by 120 electrical degrees. The order in which the three voltages of a three-phase system succeed one another is called phase sequence or phase rotation. This is determined by the direction of rotation of the alternator. When rotation is clockwise, phase sequence is usually called "ABC", when counterclockwise, "CBA".

This direction may be reversed outside the alternator by interchanging any two of the line wires. It is this possible interchange of wiring that makes a phase sequence indicator necessary if the operator is to quickly determine the phase rotation of the motor.

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

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

Phase Sequence Lead	Terminal
Black (Phase A)	L1
Red (Phase B)	L2
Yellow (Phase C)	L3

11. Turn power on by closing the unit supply power fused-disconnect switch.
12. Read phase sequence on indicator. The "ABC" LED on the face of phase indicator will glow if phase is "ABC".
13. If the "CBA" indicator glows instead, open the unit main power disconnect and switch two line leads on the line power terminal block(s) (or the unit mounted disconnect). Reclose the main power disconnect and recheck the phasing.

NOTICE:

Equipment Damage!

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

14. Reopen unit disconnect and disconnect phase indicator.

⚠WARNING

Hazardous Voltage!

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

Water System

Flow Rates

NOTICE:

Equipment Damage!

Establish a balanced chilled water flow through the evaporator. The flow rates should fall between the minimum and maximum values. Flow rates outside the recommended range could cause evaporator failure.

Establish a balanced chilled water flow through the evaporator. The flow rates should fall between the minimum and maximum values. Chilled water flow rates below the minimum values will result in laminar flow, which reduces heat transfer and causes either loss of EXV control or repeated nuisance, low temperature cutouts. Flow rates that are too high can cause tube erosion.

Pressure Drop

Measure water pressure drop through the evaporator at the field-installed pressure taps on the system water piping. Use the same gauge for each measurement. Measure flow at the field-installed supply and return. This will include valves, strainers, and fittings in the pressure drop readings.

Pressure drop readings should be approximately those shown in the Pressure Drop Charts in the Installation-Mechanical section.

Start Up Checklist

CGAM Mandatory Start Up Checklist	
******This checklist is not intended to be a substitution for the contractors installation instruction.*** ***This checklist is intended to be a guide for the Trane technician just prior to unit 'start-up'. Many of the recommended checks and actions could expose the technician to electrical and mechanical hazards.*** ***Refer to the appropriate sections in the unit manual for appropriate procedures, component specifications and safety instructions.***	
Job Name	***Serial #***
Job Location	***Model #***
Sales Order #	***Ship Date***
Unit DL # (special units)	***Date***
Starting Sales Office	***Technician***
Except where noted; it is implied that the technician is to use this checklist for inspection / verification of prior task completed by the general contractor at installation. *Use the line item content to also record the associated values onto the Trane unitary packaged equipment log.*	*Complete*
1.) Unit clearances adequate for service and to avoid air recirculation etc.	☐
2.) Unit exterior inspected	☐
3.) Compressor oil sump heaters connected tightly and working properly for **24 hours** prior to arrival of Trane technician performing start up	☐
4.) Correct voltage supplied to unit and electric heaters (imbalance not to exceed 2%)	☐
5.) Unit power phasing (A-B-C sequence) proper for compressor rotation and pump rotation.	☐
6.) Copper power wiring meets sizing requirement in job submittal	☐
7.) Unit properly grounded	☐
8.) All automation and remote controls installed/wired	☐
9.) All wiring connections tight	☐
10.) Prove chilled water side Interlock and Interconnecting Wiring Interlock and externals (chilled water pump)	☐
11.) Field installed control wiring landed on correct terminals (external start/stop, emergency stop, chilled water reset…)	☐
12.) Verify all refrigerant and oil valves are open/back seated	☐
13.) Pump Package (if installed)	
a.) Pump shaft able to rotate freely	☐
b.) Full of working fluid	☐
c.) Shutoff valve in open position.Flush line valves in open position.	☐
d.) Automatic air bleed functioning properly	☐
e.) Relief valve functioning properly	☐

14.) Compressor oil levels (1/2 -3/4 high in glass) proper	☐
15.) Verify chilled water strainer is clean and free of debris and evaporator chilled water circuits are filled	☐
16.) Close the fused-disconnect switch(es) that supplies power to the chilled water pump starter	☐
17.) Start the chilled water pump to begin circulation of the water. Inspect piping for leaks and repair as necessary	☐
18.) With water circulating through the system, adjust water flow and check water pressure drop through evaporator	☐
19.) Adjust the chilled water flow switch for proper operation	☐
20.) Return chilled water pump to auto	☐
21.) Verify all CH530 Menu Items on DynaView and KestrelView	☐
22.) Fan amperages within nameplate specs	☐
23.) All panels/doors secured prior to start-up	☐
24.) All coil fins inspected and straightened	☐
25.) Rotate fans before starting unit to inspect for potential audible and visual signs of rubbing	☐
Start unit	☐
26.) Press AUTO key. The unit will start if the chiller control calls for cooling and the safety interlocks are closed	☐
27.) Check the EXV sight glasses after sufficient time has elapsed allowing entering and leaving water to stabilize	☐
28.) Check the evaporator and the condenser refrigerant pressure under Refrigerant Report on CH530 TechView	☐
29.) Confirm Superheat and subcooling values are normal	☐
30.) Compressor operation normal and within amperage rating	☐
31.) Operating log completed	☐
32.) Press stop key	☐
33.) Inspect fans again after being under load to ensure no signs or rubbing exist	☐
34.) Verify the chilled water pump runs for at least 1 minute after the chiller is commanded to stop (for normal chilled water systems)	☐
Comments:	
****For content inquires contact Trane Tech Services*	

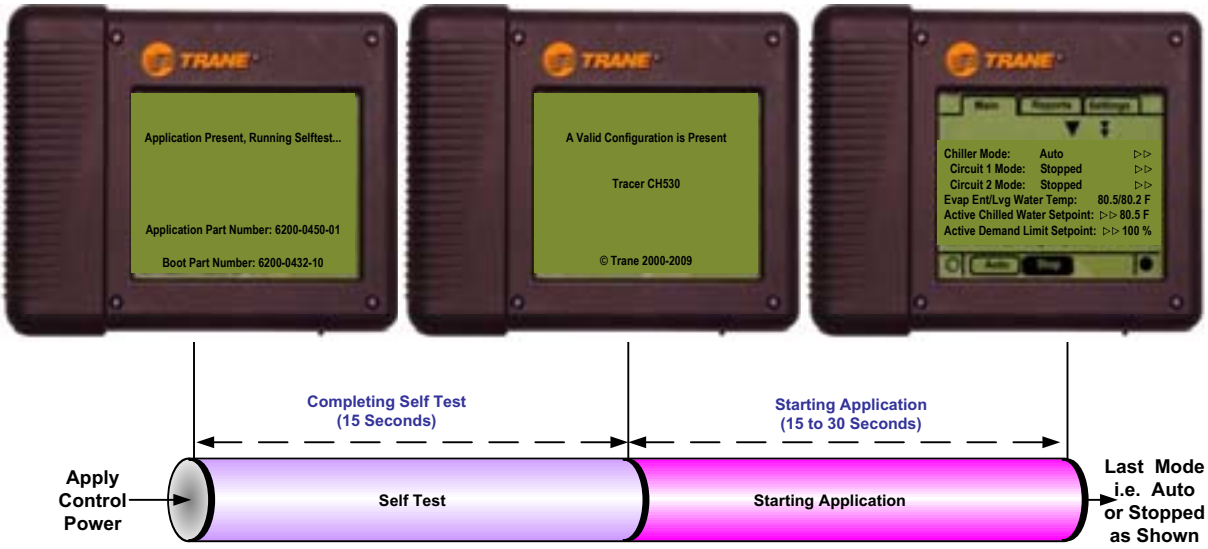
Unit Start-Up Procedures

Sequence of Operation

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 101. Power up



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

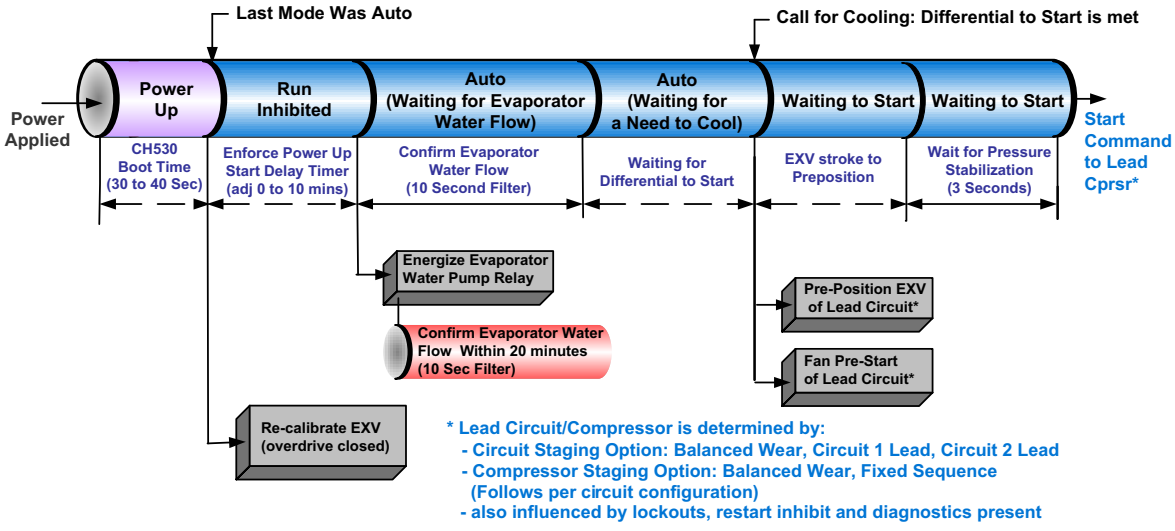
Power Up to Starting

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

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

The above conditions would allow for a minimum power up to starting compressor time of 95 seconds.

Figure 102. 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:

6. No motor restart inhibit
7. Evaporator Water flowing
8. Power up Start Delay Timer has expired
9. Adjustable Stop to Start Timer has expired
10. Need to cool

The above conditions would allow the compressor to start in 60 seconds.

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

NOTICE:

Compressor Damage!

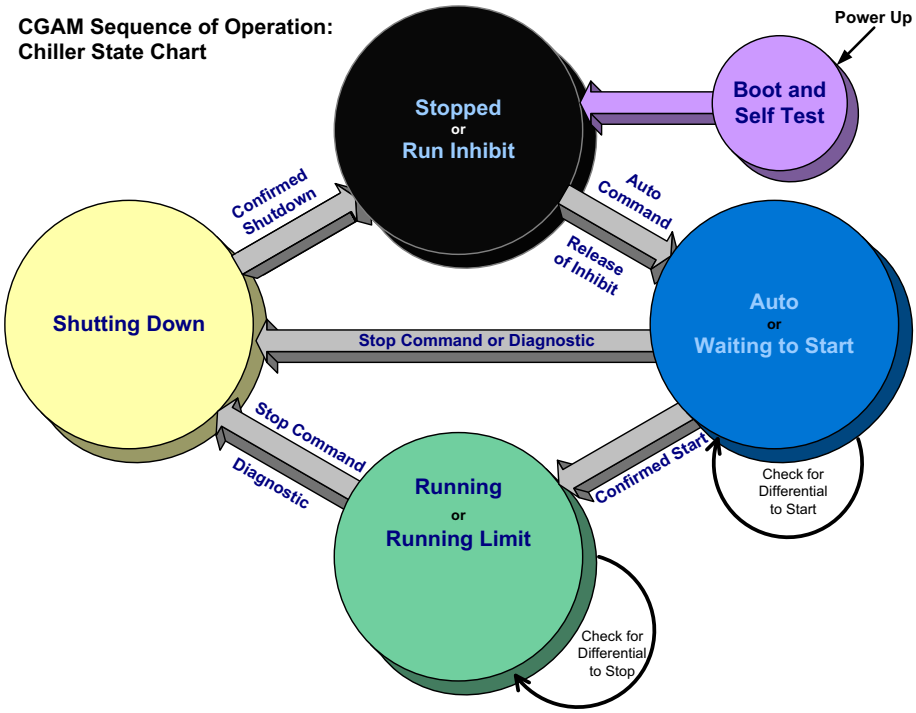
Use only refrigerant specified on the unit nameplate (R-410A) and OIL00080 (1 gallon). Failure to do so may cause compressor damage and improper unit operation.

NOTICE:

Equipment Damage!

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

Figure 103. Chiller state chart



Start-Up

NOTICE:

Equipment Damage!

Ensure that the oil sump heaters are connected properly and are operating properly for a minimum of 24 hours before starting. Failure to do so may result in equipment damage.

If pre-start checkout has been completed, unit is ready to start.

1. Press the STOP key on the CH530.
2. As necessary, adjust the setpoint values in the CH530 menus using TechView.
3. Close the fused-disconnect switch for the chilled water pump. Energize the pump(s) to start water circulation.
4. Check the service valves on the discharge line, suction line, oil line and liquid line for each circuit. These valves must be open (backseated) before starting the compressors.

NOTICE:

Compressor Damage!

Catastrophic damage to the compressor will occur if the oil line shut off valve or the isolation valves are left closed on unit start-up.

5. Press the AUTO key. If the chiller control calls for cooling and all safety interlocks are closed, the unit will start. The compressor(s) will load and unload in response to the leaving chilled water temperature.
6. Verify that the chilled water pump runs for at least one minute after the chiller is commanded to stop (for normal chilled water systems).

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

7. Check the evaporator refrigerant pressure and the condenser refrigerant pressure under Refrigerant Report on the CH530 TechView.

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

8. 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.

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

9. Measure the system subcooling.
10. A shortage of refrigerant is indicated if operating pressures are low and subcooling is also low. If the operating pressures, sight glass, superheat and subcooling readings indicate a refrigerant shortage, gas-charge refrigerant into each circuit, as required. With the unit running, add refrigerant liquid charge slowly thought the suction line service valve until operating conditions become normal.

Print out a Chiller Service Report from TechView to file a start-up claim and to keep for reference with the chiller.

Seasonal Unit Start-Up Procedure

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

NOTICE:

Equipment Damage!

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

Compressor Damage!

NOTICE:

Compressor Damage!

Catastrophic damage to the compressor will occur if the oil line shut off valve or the isolation valves are left closed on unit start-up.

Limit Conditions

CH530 will automatically limit certain operating parameters during startup and run modes to maintain optimum chiller performance and prevent nuisance diagnostic trips. These limit conditions are noted in Table 71.

Table 71. Limit Conditions

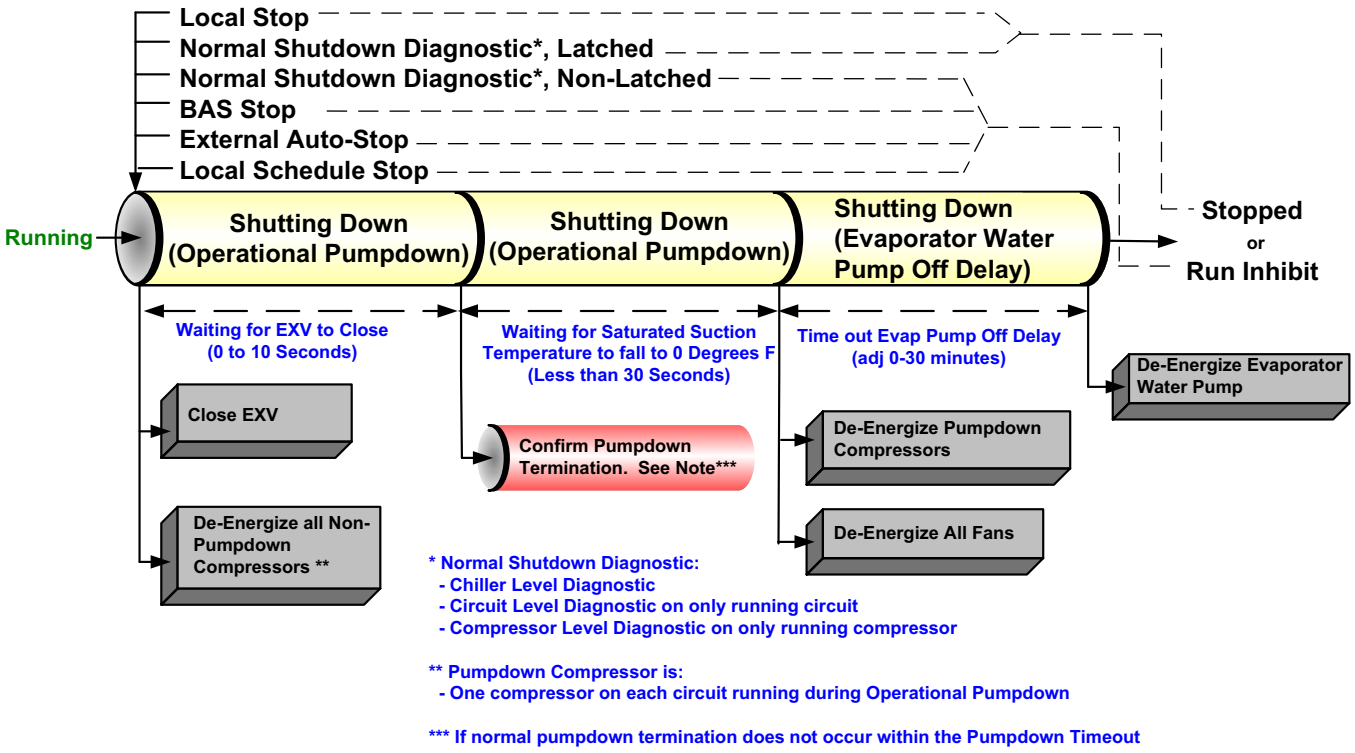
Condition	Description
Running - Limited	The chiller, circuit, and compressor are currently running, but the operation of the chiller/compressor is being actively limited by the controls. Further information is provided by the sub-mode.
Capacity Limited by High Cond Press	The circuit is experiencing condenser pressures at or near the condenser limit setting. The compressor will be unloaded to prevent exceeding the limits.
Capacity Limited by Low Evap Rfgt Temp	The circuit is experiencing saturated evaporator temperatures at or near the Low Refrigerant Temperature Cutout setting. The compressors will be unloaded to prevent tripping.
Discharge Temperature Limit	The circuit is experiencing high discharge temperatures. The circuit will be unloaded (or, if at minimum capacity, shall be prevented from loading further) to reduce discharge temperature.

Unit Shutdown

Normal Shutdown to Stopped

Figure 104 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 104. Normal shutdown to stopped or run inhibitl



Seasonal Unit 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 the chilled water and pumps are cycled off. If desired, open the disconnect switches to the pumps.
3. Verify that the compressor oil sump heaters are installed tightly around the compressor. Energize and verify heaters are operational using a temperature probe. See Table 72, p. 129.

Table 72. Compressor oil sump heater summary[a]

Heater Group	Heater Description	Heater Designation(s)
Compressor Oil Sump	Compr 1A, Ckt 1	3M1E1
	Compr 1B, Ckt 1	3M2E1
	Compr 1C, Ckt 1	3M3E1
	Compr 2A, Ckt 2	4M1E1
	Compr 2B, Ckt 2	4M2E1
	Compr 2C, Ckt 2	4M3E1

(a) Not all heaters are present on all unit configurations. See schematics and component locations in section"Unit Wiring," p. 151.

4. Verify that the freeze protection heaters are operational. See Table 73, p. 130. Install jumper across thermostat and verify current flow. See section "Unit Wiring," p. 151 for component locations.

NOTICE:

Equipment Damage!

If the chiller evaporator or evaporator water piping is drained of water, the evaporator immersion heater must be de-energized. Failure to de-energize the heater will cause it to burn out.

Table 73. Freeze protection heater summary[a]

Heater Group	Thermostat Designation	Jumper Terminals	Heater Description	Heater Designation
Evaporator and Water Pipe Heaters	5S1	5X1-2 to 5X1-3	Evaporator	5E1
			Evap Entering Water Piping	5E4, 5E18
			Evap Leaving Water Piping	5E5, 5E19
			Water Pump Piping	5E6, 5E14
			Partial Heat Recovery (optional)	5E10, 5E11, 5E16, 5E17
			Expansion Tank (included in pump package option)	5E7
Pump Package (optional)	5S2	5X2-1 to 5X2-2	Water Pump Piping	5E13, 5E15
Buffer Tank (optional)	5S3	Across thermostat	Buffer Tank	5E2, 5E8, 5E12, 5E13

(a) Not all heaters are present on all unit configurations. See schematics and component locations in CGAM-SVE01*-EN.

Note: *See "Freeze Protection," p. 50 for more information on freeze protection requirements.*

5. Once the unit is secured, perform the maintenance identified in the following sections.

Maintenance

Periodic Maintenance

General

Perform all maintenance procedures and inspection at the recommended intervals. This will prolong the life of the chiller and minimize the possibility of malfunctions.

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

If the unit is not operating properly during maintenance inspections, consult the "Diagnostic and Troubleshooting" section of this manual.

Weekly Maintenance

Verify that compressor oil sump heaters are connected tightly around the compressor.

After the chiller has been operating for approximately 30 minutes and the system has stabilized, check the operating pressures and temperatures and complete the following checks:

Check the evaporator and condenser refrigerant pressures in the Refrigerant Report menu of the CH530 display. Pressures are referenced at sea level (14.6960 psia).

Check the electronic expansion valve sight glasses. (Note: The electronic expansion valve is commanded closed at unit shutdown and if the unit is off, there will be no refrigerant flow through the sight glasses. Only when a circuit is running will refrigerant flow be present.) The refrigerant flow through the sight glasses should be clear. Bubbles in the refrigerant indicate either low refrigerant charge or excessive pressure drop in the liquid line. A restriction in the line can sometimes be identified by a noticeable temperature differential between the two sides of the restriction. Frost may often form on the liquid line at this point. Correct refrigerant charges are shown in the General Data Tables.

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

⚠WARNING

R-410A Refrigerant under High Pressure!

Use ONLY R-410A rated service equipment or components with these units. For specific handling concerns with R-410A, please contact your local Trane representative.
Failure to use R-410A rated service equipment or components could result in equipment exploding under R-410A high pressures which could result in death, serious injury, or equipment damage.

NOTICE:

Compressor Damage!

Only add liquid in the suction line when the compressor is running. Use extreme caution to meter liquid refrigerant into the suction line slowly. If liquid is added too rapidly, compressor oil dilution and oil pumpout could occur. Failure to follow the above could result in compressor failure or reduced compressor life.

Check the system superheat, subcooling, evaporator temperature drop (Delta-T), evaporator water flow, evaporator approach temperature, compressor discharge superheat, condenser approach and compressor RLA.

Normal operating conditions at AHRI Conditions (55-44°, 95° ambient, .0001ffe) are:

- Evaporator Pressure: 120 psig
- Evaporator Approach: 5-10°F
- Evaporator Superheat: 12°F
- Electronic Expansion Valve: 40-50 percent open
- Evaporator Temperature Drop (Delta-T): 10°F
- Compressor Discharge Temperature: 63°F or more
- Compressor Suction Temperature: 20°F or more
- Condensing Pressure: 420-440 psig
- Condensing Approach Temperature: 25°F
- System Subcooling: 15-20°F
- Compressor RLA: 100 percent

If operating pressures and sight glass conditions seem to indicate a refrigerant shortage, measure the system superheat and subcooling. Refer to "System Superheat" and "System Subcooling."

If operating conditions indicate a refrigerant overcharge, remove refrigerant at the liquid line service valve. Allow refrigerant to escape slowly to minimize oil loss. Use a refrigerant recovery cylinder and do not discharge refrigerant into the atmosphere.

⚠CAUTION

Refrigerant at Freezing Temperature!

Avoid contact with skin. If working with refrigerant is necessary, you MUST wear all Personal Protective Equipment (PPE) including eye protection, safety gloves, long sleeves, and pants. In case of contact, treat the injury similar to frostbite. Slowly warm the affected area with lukewarm water and seek immediate medical attention. Direct contact with liquid refrigerant could result in minor to moderate injury.

Inspect the entire system for unusual conditions and inspect the condenser coils for dirt and debris. If the coils are dirty, refer to "Coil Cleaning" in this manual.

Monthly Maintenance

Complete all weekly maintenance procedures.

Measure and record the evaporator superheat. Refer to "Evaporator Superheat."

Measure and record the system subcooling. Refer to "System Subcooling."

Manually rotate the condenser fans to ensure that there is proper clearance on the fan shroud openings.

⚠WARNING

Rotating Components!

The following procedure involves working with rotating components. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in rotating components cutting and slashing technician which could result in death or serious injury.

Annual Maintenance

Complete all weekly and monthly maintenance checks.

Check the oil level and refrigerant charge. Routine changing of oil is not required.

Have a qualified laboratory perform a compressor oil analysis to determine system moisture content and acid level. This analysis is a valuable diagnostic tool.

Contact a qualified service provider to leak test the chiller, check operating and safety controls, and to inspect electrical components for proper operation. Leak testing my be accomplished using soap solution or with electronic or ultrasonic leak detectors.

Inspect all piping components for leaks and damage. Clean all water strainers.

NOTICE:

Equipment Damage!

If the CGAM chiller evaporator or evaporator water piping is drained of water, the evaporator immersion heater must be de-energized. Failure to de-energize the heater will cause it to burn out.

Clean and repaint any components that show corrosion.

Clean the condenser coils. Refer to "Coil Cleaning" in this manual.

⚠WARNING

Rotating Components!

The following procedure involves working with rotating components. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in rotating components cutting and slashing technician which could result in death or serious injury.

Clean the condenser fans. Check the fan assemblies for proper clearance in the fan shroud openings and for motor shaft misalignment or abnormal end-play, vibration and noise.

Compressor Service Information

Compressor Electrical Connections

It is very important that CSHD compressors used in Trane Model CGAM chillers are wired correctly for proper rotation. These compressors will not tolerate reverse rotation. Verify correct rotation/phasing using a rotation meter. Proper phasing is clockwise, A-B-C. If wired incorrectly a CSHD compressor will make excessive noise, will not pump and will draw about half the normal current. It will also become very hot if allowed to run for an extended period.

NOTICE:

Compressor Failure!

Do not "bump" the compressor to check rotation as incorrect rotation could cause compressor motor failure in as little as 4 to 5 seconds!

It is also very important that CSHN compressors used in Trane Model CGAM chillers are wired correctly for proper rotation. Correct rotation of CSHN compressors is also clockwise, with A-B-C phasing. Improper rotation of the CSHN compressors is indicated by a compressor module trip, noisy operation, no pressure difference on manifold gauges and low amp draw.

Motor Protection

Internal motor protection is provided on model CSHN compressors (15, 20, 25 and 30T sizes). LED indicators are as follows:

- Green — No Fault
- Red — Fault

See Table 74, p. 133 for fault diagnostic indications on the protection module. Manual reset is required at the module.

Table 74. Compressor fault indicators on protection module (CSHN compressors only)

Fault	LED on	LED off	LED on	LED off
PTC Overheat	40 ms	460 ms	40 ms	460 ms
PTC Reset Delay Active	80 ms	920 ms	80 ms	920 ms
Phase Loss	500 ms	500 ms	500 ms	500 ms
Wrong Phase Sequence	120 ms	120 ms	120 ms	120 ms

Note: *Internal motor protection is not available on CHSD compressors (10 and 13T sizes).*

Oil Level

Oil should also be visible in the sight glass when the compressor is running. When operating, each compressor in a tandem or trio set may have a different oil level.

To check compressor oil level, refer to the label near the compressor sight glass. The compressor(s) must be off. Wait three minutes. With tandem or triple compressors the oil level will equalize after shutdown. Compressor oil level should be clearly visible within the sight glass when the compressors are off.

Oil Fill, Removal and Capacity

The Model CSHN compressors have an oil charging valve with a dip tube that goes to the bottom of the compressor. This can be used to add or remove oil from the compressor.

Model CSHD compressors have a Schrader valve in the middle of the compressor which is used to add oil. To remove oil from these compressors, the system refrigerant charge must be removed and then the oil can be removed using a suction style hand pump and tube in the oil equalizer tube fitting. Oil can also be added to these compressors through the oil equalizer tube fitting. Care must be taken to prevent moisture from entering the system when adding oil.

Compressor Oil Capacity

Important: *Use only Trane OIL00080 (1 gallon). Do not use any other POE oil.*

Table 75. Oil capacity

Compressor Model	Oil Capacity (pints)
CSHD 125, 161	7
CSHN 184	14.2
CSHN 250	15.2
CSHN 315	16.2
CSHN 374	17.2

NOTICE:

Equipment Damage!

Never reuse oil. Reusing oil could cause equipment damage.

Oil Testing

Use Trane Oil Testing Kit KIT06815 only for testing lubricating oil in the Model CGAM chiller. Note that the POE oil used in this product is very hygroscopic and easily absorbs and retains moisture. The acceptable moisture content is less than 100 ppm and acceptable acid level is less than 0.5 TAN. Note that refrigerant and moisture is very difficult to remove from this oil using vacuum. Also note that once the seal on a container of POE oil is opened, the oil must be used.

In the event of a compressor failure, always test the oil with an acid test kit to determine whether the compressor failure was mechanical or electrical. This is important because it dictates correct cleanup procedure.

Compressor Operational Pump Down

The operational pump down is used to manage the refrigerant charge and prevent liquid slugging into the compressors, oil dilution and oil starvation. The pump down will be completed by the last operating compressor in the refrigerant circuit and occurs during normal shutdown conditions. The electronic expansion valve will close.

The operational pump down sequence will end when:

- Saturated evaporator temperature drops below the operational pump down set point
- Compressor pressure differential exceeds 348 psid (Condensing Pressure - (Evaporator Pressure x 2.9)
- When the operational pump down time expires (60 x (100/circuit capacity %))
- An immediate shutdown diagnostic occurs
- A pressure transducer fails

Compressor Service Pump Down Procedure

The Service Pump down procedure is used to store the Model CGAM refrigerant in the condenser. The condenser is sized to hold the entire refrigerant charge.

Procedure:

- Select compressor to use for pump down.
- All chiller safeties remain in effect.
- Evaporator water flow must be proven
- Condenser fans operate normally
- Manually close refrigerant liquid line service valve

Note: *The service pumpdown algorithm expects the liquid line service valve to be closed during service pumpdown. The EXV will open, allowing the refrigerant between the liquid line service valve and EXV to be pumped out.*

Service pump down is complete when:

- Service pump down time expires (60 x (100/circuit capacity %))
- Saturated evaporator pressure falls below Low Pressure Cutout x1.15 for one second

After pump down terminates, the MP automatically puts circuit into lockout. Pump down can also be terminated by "Abort Pump down" in service tool, an immediate shutdown diagnostic occurs or a pressure transducer fails.

Oil Equalizer Line

CSHN Compressors

The oil equalizer line is equipped with a Rotolock fitting for easy removal. Torque values for tightening these fitting is 100 ft.-lbs, plus or minus 10 ft. lbs.

Drain the oil to a level below the oil equalizer tube fitting before removing the oil equalizer line. This must be done on both compressors. Use the oil drain valve on the compressor. If the oil is drained below the level of the oil level sight glass, it will be below the oil equalizer line level. Pressurize the low side of the compressor using nitrogen to help drain the oil. No more than 10 psig of pressure will be needed.

CSHD Compressors

CSHD compressors do not have an oil drain valve. Therefore, before removing the oil equalizer line, the system refrigerant charge must be recovered before draining the oil. Use a catch pan to catch the oil when the compressor oil equalizer line is loosened to ensure that oil does not spill out of the compressor when the equalizer line is removed. The torque value for the Rotolock fitting on CSHD compressors is 64 ft.-lbs., plus or minus 2 ft.-lbs.

Tandem Compressor Suction Restrictors

Since most tandem compressor sets use unequal size compressors, these combinations require the use of a restrictor in the suction line of one or more compressors in order to provide correct oil level balance between compressors when they are operating. See Figure 105, p. 134 for compressor installation locations for various unit configurations and Table 76, p. 135 for correct restrictor applications.

Figure 105. Compressor location

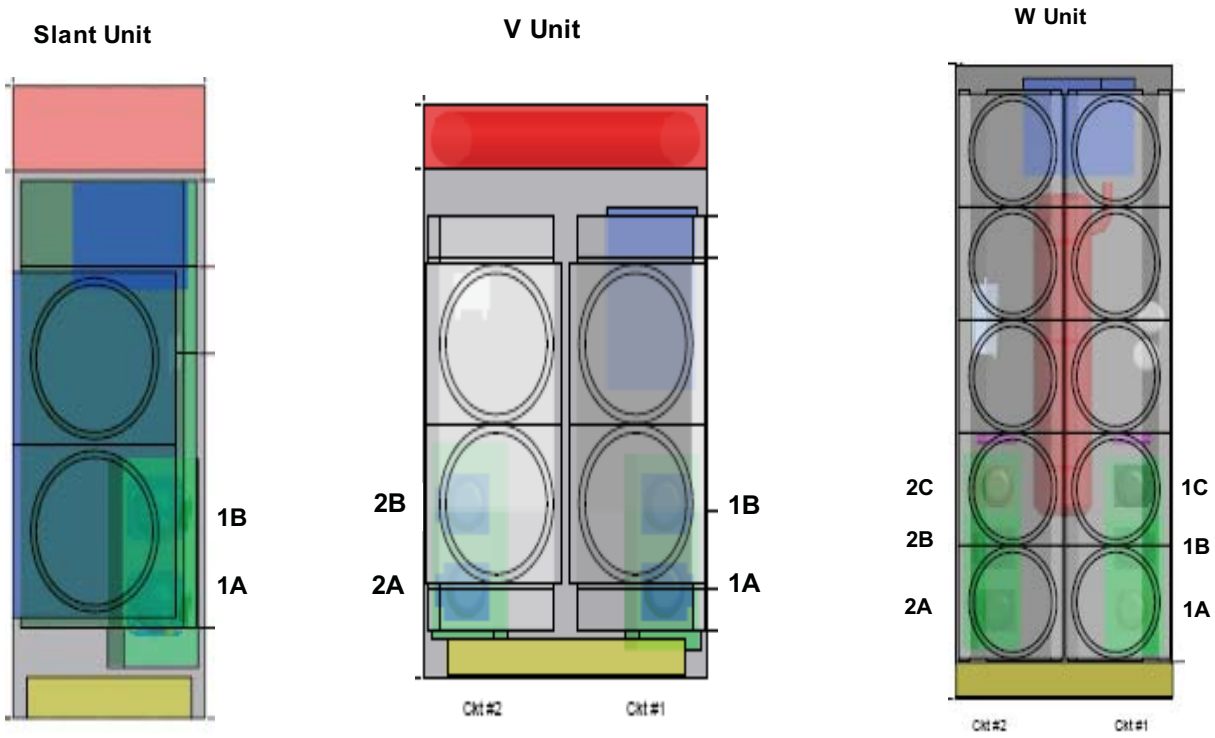


Table 76. Compressor manifold order

Unit Size (tons)	Compressor Size 1A	1B	2A	2B	Restrictor Size mm	Location
020	10	10	N/A		N/A	
023	10	13			25/23	1A
026	13	13			N/A	
030	15	15			N/A	
035	15	20			31	1A
039	20	20			N/A	
045	20	25			31	1A
050	25	25			N/A	
040	10	10	10	10	N/A	
046	10	13	13	10	25/23	1A & 2B
052	13	13	13	13	N/A	
060	15	15	15	15	N/A	
070	15	20	20	15	31	1A & 2B
080	20	20	20	20	N/A	
090	20	25	25	20	31	1A & 2B
100	25	25	25	25	N/A	
110	25	30	30	25	31	1A & 2B
120	30	30	30	30	N/A	

Compressor Replacement

If the CGAM chiller suffers a failed compressor, use these steps for replacement:

Each compressor has lifting eyes. Both lifting eyes must be used to lift the failed compressor. See Table 77 for compressor weights.

Important: *DO NOT LIFT A COMPRESSOR USING A SINGLE LIFTING EYE.*

Use proper lifting techniques, a spreader bar and rigging as for lifting both compressors simultaneously.

Table 77. Compressor weights

Compressor Model	Weight (lbs)
CSHD 125	142
CSHD 161	155
CSHN 184	234
CSHN 250	238
CSHN 315	337
CSHN 374	362

After a mechanical failure of a compressor, it is necessary to change the oil in the remaining compressor and also replace the liquid line filter drier. After an electrical failure of a compressor, it will also be necessary to change the oil in the remaining compressor, replace the liquid line filter drier and add a suction filter drier with clean-up cores.

Note: *Do not alter the refrigerant piping in any way as this can affect compressor lubrication.*

Note: *Do not add a filter drier within 10 inches of the elbow for CSHD compressors, or within 16 inches of the elbow for CSHN compressors.*

Refrigerant System Open Time

Model CGAM chillers use POE oil and therefore refrigerant system open time must be kept to a minimum. The following procedure is recommended:

Leave a new compressor sealed until it is ready to be installed in the unit. Maximum system open time is dependent upon ambient conditions, but do not exceed one hour open time.

Plug the open refrigerant line to minimize moisture absorption.

Always change the liquid line filter drier.

Evacuate the system to 500 microns or below.

Do not leave POE oil containers open to the atmosphere. Always keep them sealed.

Mechanical Compressor Failure

Replace the failed compressor(s) and change the oil in the remaining compressor(s) along with the refrigerant system liquid line filter drier.

Electrical Compressor Failure

Replace the failed compressor and change the oil in the other compressor(s). Also add a suction filter with cleanup cores and change the liquid line filter drier. Change filters and oil until the oil no longer test acidic. See “Oil Testing.”

Compressor Motor Megging

Motor megging determines the electrical integrity of the compressor motor winding insulation. Use a 500 volt megger. A less than 1 meg-ohm reading is acceptable and 1000 ohms per nameplate volts is required to safely start the compressor.

Compressor Current Imbalance

Normal current imbalance could be 4 to 15 percent with balanced voltage due to motor design. Each phase should register 0.3 to 1.0 ohms and each phase should be within 7 percent of the other two phases. Phase to ground resistance must be infinity.

Note: *Maximum allowable voltage imbalance is 2 percent.*

Refrigerant Piping

The compressor suction and discharge lines are copper. In most instances, piping may be reused. If piping is not reusable, order the correct service parts. Cut all tubing with a tubing cutter to prevent copper filings from entering the system. Cut the tubing in a straight length of pipe after

the compressor connection has been unsweated. The line can then be reinstalled using a slip coupling and brazing.

NOTICE:

Equipment Damage!

The compressor suction line configuration must not be changed in any way. Changing compressor suction line configuration will compromise proper oil return to the compressor(s).

Compressor Electrical Terminal Box

Be sure to protect the terminal box when unbrazing or brazing compressor refrigerant piping connections

Compressor Oil Sump Heaters

Compressor oil sump heaters must be energized at least 24 hours before starting the CGAM chiller. This is required to boil refrigerant out of the oil before startup. Ambient temperature is not a factor and the oil sump heaters must always be energized prior to startup.

Condenser Maintenance

Condenser Coil Cleaning

⚠ WARNING

Hazardous Chemicals!

Coil cleaning agents can be either acidic or highly alkaline and can burn severely if contact with skin occurs. Handle chemical carefully and avoid contact with skin. ALWAYS wear Personal Protective Equipment (PPE) including goggles or face shield, chemical resistant gloves, boots, apron or suit as required. For personal safety refer to the cleaning agent manufacturer's Materials Safety Data Sheet and follow all recommended safe handling practices. Failure to follow all safety instructions could result in death or serious injury.

Clean the condenser coils at least once a year or more frequently if the unit is in a "dirty" environment. A clean condenser coil will help to maintain chiller operating efficiency. Follow the detergent manufacturer's instructions to avoid damaging the condenser coils.

To clean the condenser coils use a soft brush and a sprayer such as a garden pump type or a high-pressure type. A high quality detergent such as Trane Coil Cleaner (Part No. CHM-00255) is recommended.

Refer to RTAC-SVG01B-EN for maintenance and cleaning procedures.

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

Evaporator Maintenance

NOTICE:

Equipment Damage!

The factory-installed immersion heater must be de-energized if the BPHE evaporator is drained of water for any reason. Failure to de-energize the immersion heater will cause it to burn out.

The Trane Model CGAM liquid chiller uses a brazed plate heat exchanger (BPHE) evaporator with factory-installed electronic flow switch (IFM efector) that is positioned in the evaporator water pipe. The evaporator inlet also includes a factory-installed immersion heater for freeze protection and a water strainer that must be kept in place to keep debris out of the evaporator.

Note: *Strainer maintenance is critical to proper operation and reliability. Any particles larger than 1mm entering the BPHE evaporator may cause the evaporator to fail, requiring replacement.*

Acceptable BPHE evaporator water flow rate is 1.5 to 3.6 GPM per nominal unit ton capacity. To maintain 54-44 F in/out chilled water temperatures, the nominal water flow rate is 2.4 GPM per ton.

Minimum water flow rate must be maintained to avoid laminar flow, potential evaporator freezing, scaling and poor temperature control. The microprocessor and capacity control algorithms are designed to take a 10 percent change in water flow rate per minute while maintaining a ±2°F (1.1°C) leaving water temperature control accuracy. The chiller tolerates up to 30 percent per minute water flow variation as long as the flow is equal to or greater than minimum flow requirements.

Maximum water flow is 18 feet per second. Flow rates greater than this will cause excessive erosion.

The BPHE evaporator is difficult to clean should it become plugged with debris. Indications of a plugged BPHE evaporator include "wet" suction due to lack of heat exchange, loss of superheat control, depressed discharge superheat (<63°F), compressor oil dilution and/or starvation and premature compressor failure.

Evaporator Replacement

If the CGAM evaporator requires replacement, it is very important that the new evaporator be replaced correctly and with the correct refrigerant and water piping connections. The refrigerant inlet/liquid connection is at the bottom of the evaporator and the refrigerant outlet/suction connection is at the top of the evaporator and both are on the same side. Pay particular attention to evaporators with dual circuits. Avoid cross-circuiting when installing the new evaporator.

Water Strainer Maintenance

Factory-installed water strainer is a Y-type design. The stainer is equipped with a blow-down valve. The strainer is a 16 mesh (approximately 1 mm) material.

Figure 106. Water strainer - Y type

For maximum efficiency, a differential pressure gauge installed across the inlet and outlet will indicate pressure loss due to clogging and may be used as a guide to determine when cleaning is required. The taps for the pressure gauges are included as standard from the factory.

Normally when differential pressure reaches 5-10psi, the screen must be cleaned. The strainer is equipped with a blow-down valve on the cover plate. To clean open and flush out until any sediment is removed.

Pump Package Maintenance

Rust Prevention

Pumps not immediately placed into service, or removed from service and stored, must be properly prepared to prevent excessive rusting.

- Pump port protection plates must not be removed until the pump is ready to connect to the piping.
- Rotate the shaft periodically (at least monthly) to keep rotating element free and bearings fully functional.
- For long term storage (3 months or longer), prevent internal rust buildup and possibility of freezing by performing the following steps:
    - Remove the plugs at the top and bottom of the casing.
    - Drain or blow out all water.
    - As an optional step, it is acceptable to rustproof or pack the casing with moisture absorbing material and cover the flanges.

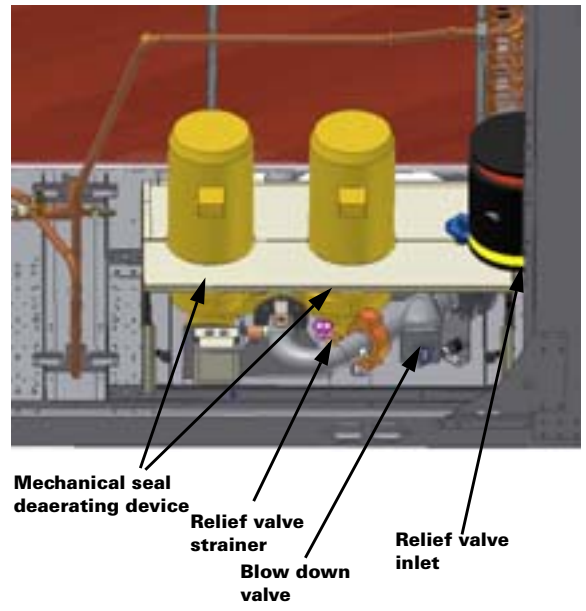
When returning pumps to service

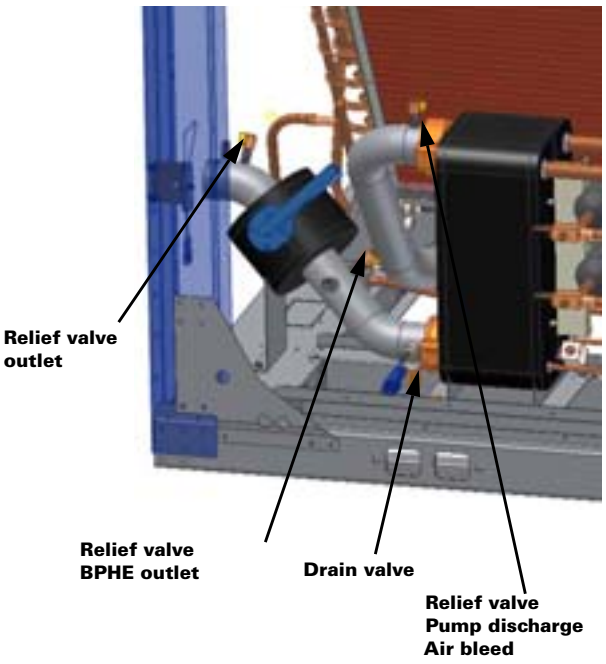
- Remove drying agent from the pump, if used.
- Reinstall plugs at the top and bottom of the casing.

Accessing Pump Package Components for Servicing

To access pump package components for servicing, unlock the access panel door, and remove. Remove remaining top panel(s). See Table 107 for location of bleed, drain and flush valves.

Figure 107. Pump package valve location





Pump Motor Seal Service

Each pump motor includes a mechanical seal to prevent leakage from the pump housing.The pump motor must be removed to service the mechanical seal. See "Pump Package Motor Lifting," p. 138. See Table 78, p. 138 for pump motor weights. Follow replacement instructions included in the seal kit.

Table 78. Pump weights

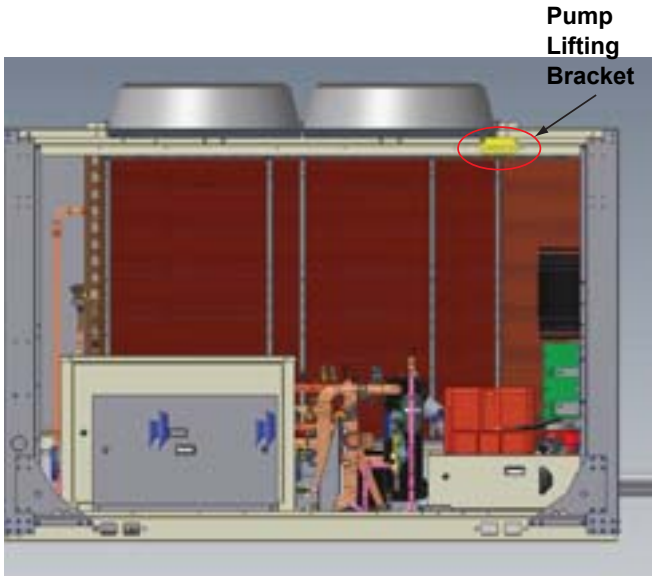
	Motor Weight - Single Pump		Motor Weight - Pump Pair		Pump Weight Less Motors		Total Pump & Motor Weight	
Unit Size	**lbs**	**kg**	**lbs**	**kg**	**lbs**	**kg**	**lbs**	**kg**
20-52	86	39	172	78	138	63	310	141
60-70	133	60	266	121	138	63	404	183
80-110	154	70	308	140	196	89	504	229
120-130	242	110	484	220	196	89	680	308

Pump Package Motor Lifting

20-70 Ton — Slant, V Frame Units

- Attach block and tackle to lifting bracket which is attached to condenser from directly above pump package, shown in Figure 108, p. 138.
- Attach lifting cables around pump motor, or to pump motor hooks, where available.
-

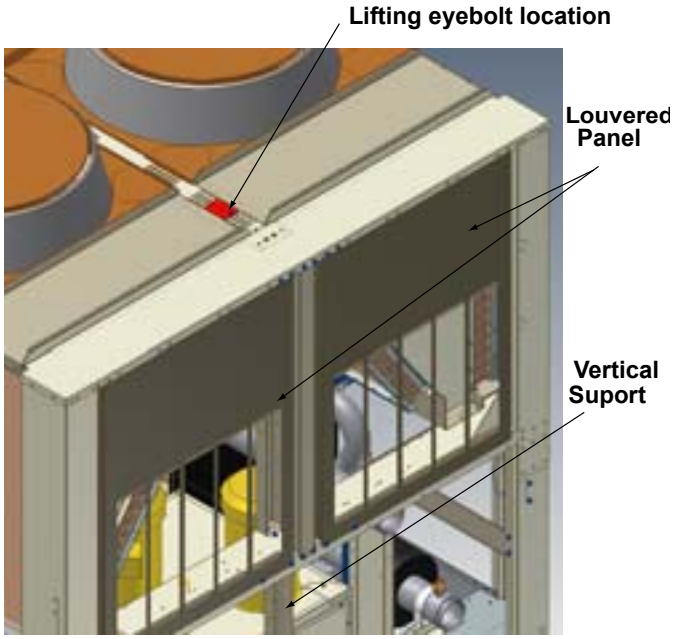
Figure 108. Pump lifting bracket, 20-70T (slant, V frame)



80-130 Ton — W Frame Units

- Remove louvered panels and center condenser box frame vertical support as shown in Figure 109, p. 138.
- Attach block and tackle to 3/8" x 16 lifting eyebolt which is located in the top of the condenser box as shown in Figure 109, p. 138.
- Motor and pump must be separated and removed through opening created by removal of loubered panels and vertical support.
- Attach lifting cables to motor hooks to remove.

Figure 109. Pump lifting bracket, 80-130T (W frame)



Diagnostics

Explanatory Comments

Diagnostic Text:

Black text is intended for use on TechView. It has no intrinsic length limit. It should contain few or no abbreviations.

Blue (italicized) *text is intended for use on DynaView. It has a 40 character length limit for English and other European languages, based on 8 pixel character width (DynaView's display is 320 pixels wide). The text should be abbreviated as necessary to meet the length limit. Trane standard abbreviations or ASME standard abbreviations (ASME Y14.38-1999 or later) should be used wherever possible.*

Orange (underlined) text is intended for use on LCI-C. LCI-C has a 28 character length limit for English and other European languages, based on one character per byte (LCI-C diagnostic text has a 28 byte limit). It should be abbreviated as necessary to meet the length limit. Trane standard abbreviations or ASME standard abbreviations (ASME Y14.38-1999 or later) should be used wherever possible. "Comm:" is the standard abbreviation for "Comm Loss:" in order to leave enough space for the rest of the diagnostic text.

Legacy Hex Code: Three digit hexadecimal code used on all past products to uniquely identify diagnostics.

Diagnostic Name and Source: Name of Diagnostic and its source. Note that this is the exact text used in the User Interface and/or Service Tool displays.

The following codes were added to cover the unmapped diagnostics:

- 6B6: Unknown Chiller Diagnostic
- 6B7: Unknown Compressor Diagnostic

Affects Target: Defines the "target" or what is affected by the diagnostic. Usually either the entire **Chiller**, or a particular **component** is affected by the diagnostic (the same one as the source), but in special cases functions are modified or disabled by the diagnostic. **None** implies that there is no direct affect to the chiller, sub components or functional operation.

Severity: Defines the severity of the above effect. **Immediate** means immediate shutdown of the effected portion, **Normal** means normal or friendly shutdown of the effected portion, **Special Mode** means a special mode of operation (limp along) is invoked, but without shutdown, and **Warning** means an Informational Note or Warning is generated.

Persistence: Defines whether or not the diagnostic and its effects are to be manually reset (Latched), or can be either manually or automatically reset (Nonlatched).

Active Modes [Inactive Modes]: States the modes or periods of operation that the diagnostic is active in and, as necessary, those modes or periods that it is specifically not active in as an exception to the active modes. The inactive modes are enclosed in brackets, [ ]. Note that the modes used in this column are internal and not generally annunciated to any of the formal mode displays

Criteria: Quantitatively defines the criteria used in generating the diagnostic and, if nonlatching, the criteria for auto reset. If more explanation is necessary a hot link to the Functional Specification is used.

Reset Level: Defines the lowest level of manual diagnostic reset command which can clear the diagnostic. The manual diagnostic reset levels in order of priority are: **Local** and **Remote**. A diagnostic that has a reset level of Local, can only be reset by a local diagnostic reset command, but not by the lower priority remote Reset command whereas a diagnostic listed as Remote reset can be reset by either.

Help Text: Provides for a brief description of what kind of problems might cause this diagnostic to occur. Both control system component related problems as well as chiller application related problems are addressed (as can possibly be anticipated). These help messages will be updated with accumulated field experience with the chillers.

Main Processor Diagnostic

Table 79. Main processor diagnostics

Diagnostic Name	Affects	Severity	Persis-tence	Active Modes [Inactive Modes]	Criteria	Reset Level
BAS Communication Lost *BAS Communication Lost* BAS Communication Lost	Chiller	Special	NonLatch	All	Refer to the LCI-C interface for details on the LonTalk interface. The BCI-C interface contains details on the BACnet interface. Refer to setpoint arbitration to determine how setpoints and operating modes may be affected by the comm loss.	Remote
BAS Failed to Establish Communication *BAS Failed to Establish Communication* BAS Failed to Establish Comm	Chiller	Special	NonLatch	At power-up	Refer to the LCI-C interface for details on the LonTalk interface. The BCI-C interface contains details on the BACnet interface. Refer to setpoint arbitration to determine how setpoints and operating modes may be affected.	Remote
Check Clock *Check Clock* Check Clock	Platform	Warning	Latch	All	The real time clock had detected loss of its oscillator at some time in the past. Check / replace battery? This diagnostic can be effectively cleared only by writing a new value to the chiller's time clock using the TechView or DynaView's "set chiller time" functions.	Remote
Chilled Water Flow (Entering Water Temp) *Chilled Water Flow (Entering Water Temp)* Chilled Wtr Flow (Ent Temp)	Chiller	Immediate	Latching	Any Ckt(s) Energized [No Ckt(s) Energized]	The entering evaporator water temp fell below the leaving evaporator water temperature by more than 3°F for 100°F-sec while at least one compressor was running.	Remote
Circuit Pumpdown Terminated *Circuit Pumpdown Terminated* Circuit Pumpdown Terminated	Circuit	Warning	Latching	Operational/ Service Pumpdown [All Except Operational and Service Pumpdown]	Operational Pumpdown or Service Pumpdown procedure did not terminate normally by reaching the termination pressure within the allotted time.	Remote
Compressor Fault *Compressor Fault* Compressor Fault	Cprsr	Immediate	NonLatch	All	The compressor fault switch input is open.	Local
Compressor Fault Lockout *Compressor Fault Lockout* Compressor Fault Lockout	Cprsr	Immediate	Latch	All	The compressor fault switch input remained open for more than 35 minutes. Five compressor fault diagnostics have occurred within the last 210 minutes.	Local
Emergency Stop *Emergency Stop* Emergency Stop	Chiller	Immediate	Latch	All	Emergency Stop input is open.	Local
Evaporator Pump 1 Starts/Hours Modified *Evaporator Pump 1 Starts/Hours Modified* Evap Pmp Starts/Hrs Modified	Chiller	Warning	NonLatch	All	A counter for evaporator pump 1 starts or hours has been modified by TechView. This diagnostic is immediately and automatically cleared and thus can only be seen in the historic diagnostic list.	NA
Evaporator Pump 2 Starts/Hours Modified *Evaporator Pump 2 Starts/Hours Modified* Evap Pmp Starts/Hrs Modified	Chiller	Warning	NonLatch	All	A counter for evaporator pump 2 starts or hours has been modified by TechView. This diagnostic is immediately and automatically cleared and thus can only be seen in the historic diagnostic list.	NA
Evaporator Water Flow Lost *Evaporator Water Flow Lost* Evap Water Flow Lost	Chiller	Immediate and Special Action	NonLatch	All	After the pump request was activated, water flow was established and then lost. Special action is to keep the evap pump request active in a diagnostic override mode.	Remote
Evaporator Water Flow Lost – Pump 1 *Evaporator Water Flow Lost – Pump 1* Evap Water Flow Lost	Chiller	Warning and Special Action	NonLatch	All	For dual evaporator pump configurations only. Evaporator Water Flow Lost diagnostic occurred while Pump 1 was the selected pump.	Remote

Table 79. Main processor diagnostics (continued)

Evaporator Water Flow Lost – Pump 2 *Evaporator Water Flow Lost – Pump 2* Evap Water Flow Lost	Chiller	Warning and Special Action	NonLatch	All	For dual evaporator pump configurations only. Evaporator Water Flow Lost diagnostic occurred while Pump 2 was the selected pump.	Remote
Evaporator Water Flow Lost Lockout *Evaporator Water Flow Lost Lockout* Evap Water Flow Lost Lockout	Chiller	Immediate	Latch	All	Four (4) water flow loss events occurred in a moving 4 day time window. Corrective action is needed to identify and eliminate the cause.	Local
Evaporator Water Flow Overdue *Evaporator Water Flow Overdue* Evap Water Flow Overdue	Chiller	Immediate and Special Action	NonLatch	All	After the pump request was activated, the evaporator water flow overdue wait time elapsed before water flow was established. Special action is to keep the evap pump request active in a diagnostic override mode.	Remote
Evaporator Water Flow Overdue – Pump 1 *Evaporator Water Flow Overdue – Pump 1* Evap Water Flow Overdue	Chiller	Warning and Special Action	NonLatch	All	For dual evaporator pump configurations only. Evaporator Water Flow Overdue diagnostic occurred while Pump 1 was the selected pump.	Remote
Evaporator Water Flow Overdue – Pump 2 *Evaporator Water Flow Overdue – Pump 2* Evap Water Flow Overdue	Chiller	Warning and Special Action	NonLatch	All	For dual evaporator pump configurations only. Evaporator Water Flow Overdue diagnostic occurred while Pump 2 was the selected pump.	Remote
Evaporator Water Flow Too Low *Evaporator Water Flow Too Low* Evap Water Flow Too Low	Chiller	Immediate	Latch	Cooling Mode [Not Cooling Mode]	Refrigerant side to water side heat balance indicates that water flow has dropped below allowable manufacturer limits.	Local
External Chilled/Hot Water Setpoint *External Chilled/Hot Water Setpoint* Ext Chilled/Hot Water Setpt	Chiller	Warning	NonLatch	All	a. Function Not "Enabled": no diagnostics. B. "Enabled ": Out-Of-Range Low or Hi or bad LLID, set diagnostic, default CWS/HWS to next level of priority (e.g. Front Panel SetPoint). This Warning diagnostic will automatically reset if the input returns to the normal range.	Remote
External Demand Limit Setpoint *External Demand Limit Setpoint* External Demand Limit Setpt	Chiller	Warning	NonLatch	All	a. Function Not "Enabled": no diagnostics. B. "Enabled ": Out-Of-Range Low or Hi or bad LLID, set diagnostic, default DLS to next level of priority (e.g. Front Panel SetPoint). This Warning diagnostic will automatically reset if the input returns to the normal range.	Remote
Fan Fault *Fan Fault* Fan Fault	Circuit	Warning	Latch	All	The fan deck is indicating a fault.	Local
Fan Inverter Fault *Fan Inverter Fault* Fan Inverter Fault	Circuit	Warning	NonLatch	Ckt Energized [Ckt Not Energized]All	The fan inverter fault input is ignored for the first 5 seconds of start up to allow variable speed drives to power up.	Local
Fault Detected: Evaporator Water Pump 1 *Fault Detected: Evaporator Water Pump 1* Fault: Evap Water Pump	Chiller	Normal Immediate or Warning and Special Action	NonLatch	All	For systems with no evaporator pump, a single evaporator pump, or a single inverter driving dual evaporator pumps, an immediate shutdown shall be performed.For multiple pump systems, detection of a pump fault will generally cause pump control to switch to the redundant pump. For single inverter, dual pump configuration, switching to the redundant pump can only happen after the fault is cleared. For systems with no evaporator pump or a single evaporator pump, a normal shutdown shall be performed. For multiple pump systems, detection of a pump fault will generally cause pump control to switch to the redundant pump.	Remote

Table 79. Main processor diagnostics (continued)

Fault Detected: Evaporator Water Pump 2 *Fault Detected: Evaporator Water Pump 2* Fault: Evap Water Pump	Chiller	Normal Immediate or Warning and Special Action	NonLatch	All	For systems with no evaporator pump, a single evaporator pump, or a single inverter driving dual evaporator pumps, an immediate shutdown shall be performed. For multiple pump systems, detection of a pump fault will generally cause pump control to switch to the redundant pump. For single inverter, dual pump configuration, switching to the redundant pump can only happen after the fault is cleared. For systems with no evaporator pump or a single evaporator pump, a normal shutdown shall be performed. For multiple pump systems, detection of a pump fault will generally cause pump control to switch to the redundant pump.	Remote
High Compressor Pressure Differential *High Compressor Pressure Differential* High Cprsr Press Diff	Circuit	Immediate	Latch	Ckt Energized [Ckt Not Energized or Operational Pumpdown]	Compressor involute pressure differential exceeded allowable limits.	Local
High Discharge Refrigerant Pressure *High Discharge Refrigerant Pressure* High Discharge Rfgt Press	Circuit	Immediate	Latch	All	Discharge pressure exceeded the high pressure cutout setpoint + 100 kPa. Likely cause: failed or incorrectly set high pressure cutout switch. Prevents release of refrigerant through relief valve.	Local
High Discharge Temperature *High Discharge Temperature* High Discharge Temperature	Circuit	Immediate	NonLatch	Ckt Energized [Ckt Not Energized]	The discharge temperature exceeded the limits for the compressor.	Local
High Discharge Temperature Lockout *High Discharge Temperature Lockout* High Discharge Temp Lockout	Circuit	Immediate	Latch	All	5 high discharge temperature diagnostics occurred over 210 minutes.	
High Evaporator Water Temperature *High Evaporator Water Temperature* High Evap Water Temperature	Chiller	Info and Special Action	NonLatch	Only effective if either 1) Evaporator Water Flow Overdue, 2) Evaporator Water Flow Lost, 3) Low Evap Water Temp: Unit Off, diagnostic is active.	The leaving water temperature exceeded the high evap water temp setting (TV service menu settable– default 55.0°C (131°F)) for 15 continuous seconds. The evaporator water pump relay will be de-energized to stop the pump, but only if it is running due to one of the diagnostics listed on the left. The diagnostic will auto reset and the pump will return to normal control when the temperature falls 2.778°C (5°F) below the trip setting. The primary purpose is to stop the evaporator water pump and its associated pump heat from causing excessive water-side temperatures and water-side pressures when the unit is not running but the evap pump is on due to either Evaporator Water Flow Overdue, Evaporator Water Flow Lost , or Low Evap Water Temp – Unit Off diagnostics. This diagnostic will not auto clear solely due to the clearing of the enabling diagnostic. *at unit installation, especially reversible units, high evap water temp setting will need to be written. The value should be approximately 65.556°C (150°F) for heat pumps	Remote
High Pressure Cutout *High Pressure Cutout* High Pressure Cutout	Circuit	Immediate	Latch	All	The high pressure cutout switch recognized a high pressure.	Local

Table 79. Main processor diagnostics (continued)

High Suction Refrigerant Pressure *High Suction Refrigerant Pressure* High Suction Rfgt Press	Chiller	Immediate	NonLatch	All	Any circuit's suction pressure has risen above 95% of the high pressure cutout setting. The evaporator water pump relay will be de-energized to stop the pump regardless of why the pump is running. The diagnostic will auto reset and the pump will return to normal control when all circuits' suction pressures fall below 85% of the high pressure cutout setting. The primary purpose is to stop the evaporator water pump and its associated pump heat from causing refrigerant side pressures close to the relief valve setting when the chiller is not running, such as could occur with Evaporator Water Flow Overdue, Evaporator Water Flow Lost, or Low Evap Water Temp – Unit Off diagnostics. This condition is unlikely unless a discharge isolation valve is installed and closed.	Remote
Inverted Water Temp (Heating) *Inverted Water Temp (Heating)* Inverted Wtr Temp (Heating)	Chiller	Immediate	Latching	Unit energized and all ckts' reversing valves in heating direction [Unit de-energized or any ckt's reversing valve in cooling direction]	The leaving evaporator water temp fell below the entering evaporator water temperature by more than 3°F for 100°F-sec. There is a 60 second ignore time after the condition to enable the diagnostic is met. During the ignore time, the temperature error is not integrated.	Remote
LCI-C Software Mismatch: Use BAS Tool *LCI-C Software Mismatch: Use BAS Tool* LCI-C Software: Use BAS Tool	Chiller	Warning	NonLatch	All	LCI-C Neuron software and LCI-C IPC3 software do not match. Load new LCI-C Neuron software using LonTalk service tool.	Remote
Loss of Charge *Loss of Charge* Loss of Charge	Circuit	Immediate	Latch	Ckt Energized [Ckt Not Energized]	This feature is active on cooling-only units, not on heat pumps (even during cooling mode). The circuit must have EXV superheat control. See algorithm specification for details.	Local
Low Differential Refrigerant Pressure *Low Differential Refrigerant Pressure* Low Differential Rfgt Press	Circuit	Normal	Latch	Ckt Energized [Ckt Not Energized]	The system differential pressure for the respective circuit was below 90 psid for more than 4000 psid-sec, with a 2.5 minute ignore time from the start of the circuit.	Local
Low Discharge Saturated Temperature *Low Discharge Saturated Temperature* Low Discharge Sat Temp	Circuit	Normal	Latch	Ckt Energized [Ckt Not Energized]	The discharge saturated temperature for the respective circuit was below 20 °C for more than 3750 °C-sec, with a 10 minute ignore time from the start of the circuit. Integration starts after the ignore time is completed.	Local
Low Evap Leaving Water Temp: Unit Off *Low Evap Leaving Water Temp: Unit Off* Low Evap Leav Wtr Temp: Off	Chiller or Circuit	Warning and Special Action	NonLatch	Unit in Stop Mode, or in Auto Mode and No Ckt(s) Energized [Any Ckt Energized]	The leaving chilled water temperature fell below the leaving water temp cutout setting for 30 degree F seconds while the Chiller is in the Stop mode, or in Auto mode with no compressors running. Energize Evap Water pump Relay until diagnostic auto resets, then return to normal evap pump control. Automatic reset occurs when the temp rises 2°F above the cutout setting for 30 minutes. When this diagnostic is active AND Leaving Water Temperature sensor diagnostic (loss of comm or out of range) the Evap Water pump relay shall be de-energized. If evaporator protection temperature sensors are installed, the effect is on the appropriate circuit. Else, the effect is on the chiller.	Remote

Table 79. Main processor diagnostics (continued)

Low Evap Leaving Water Temp: Unit On *Low Evap Leaving Water Temp: Unit On* Low Evap Leav Wtr Temp: On	Chiller or Circuit	Immediate and Special Action	NonLatch	Any Ckt[s] Energized [No Ckt(s) Energizd]	The chilled water temp. fell below the cutout setpoint for 30 degree F Seconds while a compressor was running. Automatic reset occurs when the temperature rises 2 °F above the cutout setting for 2 minutes. This diagnostic shall not de-energize the Evaporator Water Pump Output. If this diagnostic is active the Low Evap Leaving Water Temp: Unit Off diagnostic shall be suppressed. If evaporator protection temperature sensors are installed, the effect is on the appropriate circuit. Else, the effect is on the chiller.	Remote
Low Pressure Cutout *Low Pressure Cutout* Low Pressure Cutout	Circuit	Immediate	Latch	All	The suction refrigerant pressure fell below the low pressure cutout trip point.	Local
Low Refrigerant Temperature *Low Refrigerant Temperature* Low Refrigerant Temperature	Circuit	Immediate	Latch	Circuit Energized [Service Pumpdown, Operational Pumpdown]	The suction saturated refrigerant temperature dropped below the Low Refrigerant Temperature Cutout Setpoint for 16.67°C-seconds (30°F-seconds).	Local
Low Suction Superheat *Low Suction Superheat* Low Suction Superheat	Circuit	Immediate	Latch	Ckt Energized [Ckt Not Energized]	Measured suction superheat stays below 2.22 °C for one continuous minute, with a 1 minute ignore time fro m the start of the circuit. Suction Superheat = suction temp – sat. suction temp.	Local
MP: Could not Store Starts and Hours *MP: Could not Store Starts and Hours* MP: Starts and Hours Failure	Platform	Warning	Latch	All	MP has determined there was an error with the previous power down store. Starts and Hours may have been lost for the last 24 hours.	Remote
MP: Non-Volatile Block Test Error *MP: Non-Volatile Block Test Error* MP: NV Block Test Error	Platform	Warning	Latch	All	MP has determined there was an error with a block in the Non-Volatile memory. Check settings.	
MP: Non-Volatile Memory Reformatted *MP: Non-Volatile Memory Reformatted* MP: NV Memory Reformatted	Platform	Warning	Latch	All	MP has determined there was an error in a sector of the Non-Volatile memory and it was reformatted. Check settings.	Remote
MP: Reset Has Occurred *MP: Reset Has Occurred* MP: Reset Has Occurred	Chiller	Warning	NonLatch	All	The main processor has successfully come out of a reset and built its application. A reset may have been due to a power up, installing new software or configuration. This diagnostic is immediately and automatically cleared and thus can only be seen in the historic diagnostic list.	NA
No Partial Heat Recovery *No Partial Heat Recovery* No Partial Heat Recovery	Circuit	Warning	NonLatch	Ckt Energized [Ckt Not Energized]	PHR entering water temperature is greater than the discharge temperature by 1.11°C for 30 continuous minutes.	
No Total Heat Recovery *No Total Heat Recovery* No Total Heat Recovery	Heat Recovery	Normal Warning	NonLatch	Unit energized and THR control enabled [Unit de-energized or THR disabled]	This diagnostic is only effective if all the following requirements are met: 1) Unit is running. 2) THR Control is enabled. 3) THR entering water temperature is less than 4°C, or discharge temperature integral is greater than Discharge Temperature Integral Limit in all the energized circuits. It shall be de-activated when any one of the following requirement is met: 1) THR entering water temperature is greater than 5°C., and the discharge saturated temperature is greater than minimum discharge saturated temperature in at least one energized circuit, see Total Heat Recovery Control Algorithm specification for details. 2) THR entering water temperature is invalid (comm loss or sensor diagnostic). 3) Total Heat Recovery Control disabled. 4) No compressor energized.	Remote

Table 79. Main processor diagnostics (continued)

Phase Protection Fault *Phase Protection Fault* Phase Protection Fault	Chiller	Immediate	NonLatch	All	Phase protection module recognized a phase loss or phase reversal of the line power. Reset automatically after module recognizes good power for 30 continuous seconds.	Local
Power Factor Correction Fault *Power Factor Correction Fault* Pwr Factor Correction Fault	Chiller	Warning	Latch	All	Power Factor Correction module has signaled a fault condition.	Remote
Software Error 1001: Call Trane Service *Software Error 1001: Call Trane Service* Software Error 1001	All functions	Immediate	Latch	All	A software monitor has detected a condition in which there was a continuous 1 minute period of compressor operation, with no Evaporator water flow. The presence of this software error message suggests an internal software problem has been detected. The events that led up to this failure, if known, should be recorded and transmitted to Trane Controls Engineering.	Local
Software Error 1002: Call Trane Service *Software Error 1002: Call Trane Service* Software Error 1002	All functions	Immediate	Latch	All	A software monitor has detected a condition in which there was a continuous 1 minute period of compressor operation, with a misaligned state machine. Reported if state chart misalignment occurred inferred form the Capacity Control, Circuit, or Compressor State Machines being in *Stopped state* or *Inactive state* while a compressor was operating and this condition existed for at least 1 minute. The presence of this software error message suggests an internal software problem has been detected. The events that led up to this failure, if known, should be recorded and transmitted to Trane Controls Engineering.	Local
Software Error 1003: Call Trane Service *Software Error 1003: Call Trane Service* Software Error 1003	All functions	Immediate	Latch	All	A software monitor has detected a condition in which there was a continuous 1 minute period of compressor operation, with a misaligned state machine. Reported if state chart misalignment occurred inferred from the Capacity Control, Circuit, or Compressor State Machines remaining in the *Stopping state* for more than 4 minutes with operating compressors. The presence of this software error message suggests an internal software problem has been detected. The events that led up to this failure, if known, should be recorded and transmitted to Trane Controls Engineering.	Local
Starts/Hours Modified *Starts/Hours Modified* Starts/Hours Modified	Cprsr	Warning	NonLatch	All	A counter for compressor starts or hours has been modified by TechView. This diagnostic is immediately and automatically cleared and thus can only be seen in the historic diagnostic list.	NA
Suction Temperature Too High *Suction Temperature Too High* Suction Temp Too High	Circuit	Immediate	Latch	Ckt Energized [Ckt Not Energized]	The suction temperature measurement is larger than the entering temperature by more than a threshold value for 5 continuous minutes. The threshold value is 3°C (5.4°F) for cooling-only units, and 5°C (9°F) for heat pumps. The entering temperature is the evaporator entering water temperature when the reversing valve is in the cooling direction, and the ambient air temperature when the reversing valve is in the heating direction. There is an ignore time of 2 minutes following circuit startup. The trip criteria is not evaluated (and time above the threshold is not counted) until the ignore time passes.	Local

Table 79. Main processor diagnostics (continued)

Very Low Suction Pressure – Circuit 1 *Very Low Suction Pressure – Circuit 1* Very Low Suct Press – Ckt 1	Chiller	Immediate	Latch	All [circuit in manual lockout]	The circuit's suction pressure dropped below (Low Pressure Cutout Setpoint (kPa absolute) * 0.5) regardless of whether or not compressors are running on that circuit. This diagnostic was created to prevent compressor failures due to cross-binding by forcing an entire chiller shutdown. If a given circuit is locked out, the suction pressure transducer associated with it will be excluded from causing this diagnostic.	Local
Very Low Suction Pressure – Circuit 2 *Very Low Suction Pressure – Circuit 2* Very Low Suct Press – Ckt 2	Chiller	Immediate	Latch	All [circuit in manual lockout]	The circuit's suction pressure dropped below (Low Pressure Cutout Setpoint (kPa absolute) * 0.5) regardless of whether or not compressors are running on that circuit. This diagnostic was created to prevent compressor failures due to crossbinding by forcing an entire chiller shutdown. If a given circuit is locked out, the suction pressure transducer associated with it will be excluded from causing this diagnostic.	Local

Sensor Failure Diagnostics

Notes:

1. The following sensor failure diagnostics will not occur unless that input or output is required to be present by the particular configuration and installed options for the unit.
2. Sensor diagnostics are named by the Functional Name of the input or output that is no longer sending a valid value to the Main Processor, indicating a sensor failure. Some LLIDs may have more than one functional output associated with it. Refer to the unit's wiring diagrams to relate the occurrence of such sensor failure diagnostics back to the physical LLID boards that they have been assigned to (bound).

Table 80. Sensor failure diagnostics

Diagnostic Name	Affects	Severity	Persis-tence	Active Modes [Inactive Modes]	Criteria	Reset Level
Discharge Pressure Transducer *Discharge Pressure Transducer* Discharge Pressure Xdcr	Circuit	Immediate	Latch	All	Bad Sensor or LLID	Remote
Discharge Temperature Sensor *Discharge Temperature Sensor* Discharge Temperature Sensor	Circuit	Immediate	Latch	All	Bad Sensor or LLID	Remote
Evaporator Entering Water Temp Sensor *Evaporator Entering Water Temp Sensor* Evap Ent Water Temp Sensor	Chiller	Normal	Latch	All	Bad Sensor or LLID.	Remote
Evaporator Leaving Water Temp Sensor *Evaporator Leaving Water Temp Sensor* Evap Leav Water Temp Sensor	Chiller	Normal	Latch	All	Bad Sensor or LLID	Remote
Heat Recovery Entering Water Temp Sensor *Heat Recovery Entering Water Temp Sensor* HR Entering Wtr Temp Sensor	Heat Recovery	Warning or Normal	Latch	All	Bad Sensor or LLID. Warning for Partial Heat Recovery. Normal shutdown for Total Heat Recovery.	Remote
Heat Recovery Leaving Water Temp Sensor *Heat Recovery Leaving Water Temp Sensor* HR Leaving Wtr Temp Sensor	Heat Recovery	Warning	Latch	All	Bad Sensor or LLID	Remote
Outdoor Air Temp Sensor *Outdoor Air Temp Sensor* Outdoor Air Temp Sensor	Chiller	Normal	Latch	All	Bad Sensor or LLID.	Remote
Suction Pressure Transducer *Suction Pressure Transducer* Suction Pressure Xdcr	Circuit	Immediate	Latch	All	Bad Sensor or LLID	Remote
Suction Temperature Sensor *Suction Temperature Sensor* Suction Temperature Sensor	Circuit	Immediate	Latch	All	Bad Sensor or LLID	Remote

Communication Diagnostics

Note: *The following communication loss diagnostics will not occur unless that input or output is required to be present by the particular configuration and installed options for the chiller. 2. Communication diagnostics (with the exception of "Excessive Loss of Comm" are named by the Functional Name of the input or output that is no longer being heard from by the Main Processor. Many LLIDs, such as the Quad Relay LLID, have more than one functional output associated with it. A comm loss with such a multiple function board, will generate multiple diagnostics. Refer to the Chiller's wiring diagrams to relate the occurrence of multiple communication diagnostics back to the physical llid boards that they have been assigned to (bound).*

Table 81. Communication diagnostics

Diagnostic Name	Affects	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Comm Loss: Anti-Freeze Heater Relay *Comm Loss: Anti-Freeze Heater Relay* Comm: Anti-Freeze Heater Rly	Chiller	Warning and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Auxiliary Setpoint Command *Comm Loss: Auxiliary Setpoint Command* Comm: Auxiliary Setpt Cmd	Chiller	Warning and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period. Chiller shall discontinue use of the Auxiliary Setpoint and revert to the Chilled Water Setpoint based on setpoint arbitration	Remote
Comm Loss: Compressor Fault Input *Comm Loss: Compressor Fault Input* Comm: Compressor Fault Input	Cprsr	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Compressor Run Command *Comm Loss: Compressor Run Command* Comm: Cprsr Run Command	Cprsr	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Cooling EXV *Comm Loss: Cooling EXV* Comm: Cooling EXV	Circuit	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Discharge Pressure Transducer *Comm Loss: Discharge Pressure Transducer* Comm: Discharge Press Xdcr	Circuit	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Discharge Temperature Sensor *Comm Loss: Discharge Temperature Sensor* Comm: Discharge Temp Sensor	Circuit	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Electronic Expansion Valve *Comm Loss: Electronic Expansion Valve* Comm: EXV	Circuit	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Emergency Stop *Comm Loss: Emergency Stop* Comm: Emergency Stop	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Evap Entering Water Temp *Comm Loss: Evap Entering Water Temp* Comm: Evap Ent Water Temp	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Evap Leaving Water Temp *Comm Loss: Evap Leaving Water Temp* Comm: Evap Leav Water Temp	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Evap Pump Inverter 1 Fault Input *Comm Loss: Evap Pump Inv 1 Fault Input* Comm: Evap Pmp Inv 1 Flt Inp	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Evap Pump Inverter 1 Frequency Feedback *Comm Loss: Evap Pump Inv 1 Freq Feedback* Comm: Evap Pmp Inv 1 Freq	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Evap Pump Inverter 1 Run Command *Comm Loss: Evap Pump Inverter 1 Run Cmd* Comm: Evap Pmp Inv 1 Run Cmd	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote

Table 81. Communication diagnostics (continued)

Comm Loss: Evaporator Pump 1 Fault Input *Comm Loss: Evaporator Pump 1 Fault Input* Comm: Evap Pump Fault Input	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Evaporator Pump 2 Fault Input *Comm Loss: Evaporator Pump 2 Fault Input* Comm: Evap Pump Fault Input	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Evaporator Water Flow Switch *Comm Loss: Evaporator Water Flow Switch* Comm: Evap Water Flow Sw	Chiller	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Evaporator Water Pump 1 Relay *Comm Loss: Evaporator Water Pump 1 Relay* Comm: Evap Water Pump Relay	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Evaporator Water Pump 2 Relay *Comm Loss: Evaporator Water Pump 2 Relay* Comm: Evap Water Pump Relay	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Ext Chilled/Hot Wtr Setpoint *Comm Loss: Ext Chilled/Hot Wtr Setpoint* Comm: Ext Chil/Hot Wtr Setpt	Chiller	Warning and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period. Chiller shall discontinue use of the External Chilled/Hot Water Setpoint source and revert to the next higher priority for setpoint arbitration	Remote
Comm Loss: Ext Demand Limit Setpoint *Comm Loss: Ext Demand Limit Setpoint* Comm: Ext Demand Limit Setpt	Chiller	Warning and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period. Chiller shall discontinue use of the External Demand Limit Setpoint source and revert to the next higher priority for setpoint arbitration	Remote
Comm Loss: External Auto/Stop *Comm Loss: External Auto/Stop* Comm: External Auto/Stop	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: External Heat Recovery Input *Comm Loss: External Heat Recovery Input* Comm: Ext Heat Recovery Inp	Heat Recovery	Warning and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period. External input is excluded from arbitration logic per standard arbitration rules.	Remote
Comm Loss: External Ice Building Control Input *Comm Loss: Ext Ice Building Ctrl Input* Comm: Ext Ice Building Ctrl	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period. Chiller shall revert to normal (non-ice building) mode regardless of last state.	Remote
Comm Loss: External Night Noise Setback Input *Comm Loss: Ext Night Noise Setback Input* Comm: Ext Night Noise Inp	Chiller	Warning and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period. External input is excluded from arbitration logic per standard arbitration rules.	Remote
Comm Loss: Fan Control Relays *Comm Loss: Fan Control Relays* Comm: Fan Control Relays	Circuit	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Fan Fault *Comm Loss: Fan Fault* Comm: Fan Fault	Circuit	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Fan Inverter Fault *Comm Loss: Fan Inverter Fault* Comm: Fan Inverter Fault	Circuit	Warning and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period. Revert to fixed-speed fan algorithm using remaining fans.	Remote
Comm Loss: Fan Inverter Speed Command *Comm Loss: Fan Inverter Speed Command* Comm: Fan Inverter Speed Cmd	Circuit	Warning and Special Action	Non Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period. Revert to fixed-speed fan algorithm using remaining fans.	Remote
Comm Loss: Heat Recovery Entering Water Temperature Sensor *Comm Loss: HR Entering Water Temperature* Comm: HR Entering Water Temp	Heat Recovery	Warning or Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period. Warning for Partial Heat Recovery. Normal shutdown for Total Heat Recovery.	Remote
Comm Loss: Heat Recovery Leaving Water Temperature Sensor *Comm Loss: HR Leaving Water Temperature* Comm: HR Leaving Water Temp	Heat Recovery	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Heat Recovery Three Way Valve *Comm Loss: Heat Recovery Three Way Valve* Comm: HR Three Way Valve	Heat Recovery	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Heat/Cool Switch *Comm Loss: Heat/Cool Switch* Comm: Heat/Cool Switch	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote

Table 81. Communication diagnostics (continued)

Comm Loss: Heating EXV *Comm Loss: Heating EXV* Comm: Heating EXV	Circuit	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: High Pressure Cutout Switch *Comm Loss: High Pressure Cutout Switch* Comm: High Press Cutout Sw	Circuit	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Local BAS Interface *Comm Loss: Local BAS Interface* Comm: Local BAS Interface	Chiller	Warning and Special Action	Non Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period. Use the last values sent from BAS.	Remote
Comm Loss: Night Noise Setback Relay *Comm Loss: Night Noise Setback Relay* Comm: Night Noise Setbk Rly	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Op Status Programmable Relays *Comm Loss: Op Status Programmable Relays* Comm: Op Status Relays	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Outdoor Air Temperature *Comm Loss: Outdoor Air Temperature* Comm: Outdoor Air Temp	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Percent Capacity Output *Comm Loss: Percent Capacity Output* Comm: Percent Capacity Out	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Phase Protection Fault Input *Comm Loss: Phase Protection Fault Input* Comm: Phase Protect Flt Inp	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Power Factor Correction Fault Input *Comm Loss: Power Factor Correction Fault* Comm: Pwr Fac Correction Flt	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Receiver Fill Valve Relay *Comm Loss: Receiver Fill Valve Relay* Comm: Receiver Fill Vlv Rly	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Reversing Valve *Comm Loss: Reversing Valve* Comm: Reversing Valve	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 sec period.	Remote
Comm Loss: Subcooler Shutoff Valve Relay *Comm Loss: Subcooler Shutoff Valve Relay* Comm: Subcooler Shut Vlv Rly	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 sec period.	Remote
Comm Loss: Suction Pressure Transducer *Comm Loss: Suction Pressure Transducer* Comm: Suction Pressure Xdcr	Circuit	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Suction Temperature *Comm Loss: Suction Temperature* Comm: Suction Temperature	Circuit	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 35-40 second period.	Remote
Comm Loss: Supplemental Heat Relay 1 *Comm Loss: Supplemental Heat Relay 1* Comm: Supplmntl Heat Rly 1	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID for relay 1 has occurred for a 35-40 second period.	Remote
Comm Loss: Supplemental Heat Relay 2 *Comm Loss: Supplemental Heat Relay 2* Comm: Supplmntl Heat Rly 2	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID for relay 2 has occurred for a 35-40 second period.	Remote
Comm Loss: Supplemental Heat Relay 3 *Comm Loss: Supplemental Heat Relay 3* Comm: Supplmntl Heat Rly 3	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID for relay 3 has occurred for a 35-40 second period.	Remote
Comm Loss: Supplemental Heat Relay 4 *Comm Loss: Supplemental Heat Relay 4* Comm: Supplmntl Heat Rly 4	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID for relay 4 has occurred for a 35-40 second period.	Remote
Excessive Loss of Comm *Excessive Loss of Comm* Excessive Loss of Comm	Chiller	Immediate	Latch	All	Loss of comm with 10 or more of the LLIDs configured for the system has been detected. This diagnostic will suppress the callout of all subsequent comm loss diagnostics. Check power supply(s) and power disconnects – troubleshoot LLID bus using TechView.	Remote

Main Processor- Boot Messages and Diagnostics

DynaView Display	Description/Troubleshooting
A Valid Configuration is Present	A valid configuration is present in the MP's nonvolatile memory. The configuration is a set of variables and settings that define the physical makeup of this particular chiller. These include: number/airflow,/and type of fans, number/ and size of compressors, special features, characteristics, and control options. // Temporary display of this screen is part of the normal power up sequence.
App Present. Running Selftest.... Selftest Passed	An application has been detected in the Main Processor's nonvolatile memory and the boot code is proceeding to run a check on its entirety. 8 seconds later, the boot code had completed and passed the (CRC) test. // Temporary display of this screen is part of the normal power up sequence.
App Present. Running Selftest Err3: CRC Failure	An application has been detected in Main Processor's nonvolatile memory and the boot code is proceeding to run a check on its entirety. A few seconds later, the boot code had completed but failed the (CRC) test. //Connect a TechView Service Tool to the MP's serial port, provide chiller model number (configuration information) and download the configuration if prompted by TechView. Then proceed to download the most recent RTAC application or specific version as recommended by Technical Service. Note that this error display may also occur during the programming process, if the MP never had a valid application any time prior to the download. If problem persists, replace MP.
Boot Software Part Numbers: LS Flash --> 6200-0318-XX MS Flash --> 6200-0319-XX	The "boot code" is the portion of the code that is resident in all MPs regardless of what application code (if any) is loaded. Its main function is to run power up tests and provide a means for downloading application code via the MP's serial connection. The Part numbers for the code are displayed in the lower left hand corner of the DynaView during the early portion of the power up sequence and during special programming and converter modes. See below. For the EasyView, the extension of the boot code part number is displayed for approximately 3 immediately following power up. // This is normal, but you should provide this information when contacting Technical Service about power up problems.
Converter Mode	A command was received from the Service Tool (Tech View) to stop the running application and run in the "converter mode". In this mode the MP acts as a simple gateway and allows the TechView service computer to talk to all the LLIDS on the IPC3 bus.
Err2: RAM Addr Test #1 Failure	There were RAM errors detected in RAM Address Test #1. //Recycle power, if error persists, replace MP.
Err2: RAM Addr Test #2 Failure	There were RAM errors detected in RAM Address Test #2. //Recycle power, if the error persists, replace MP.
Err2: RAM Pattern 1 Failure	There were RAM errors detected in RAM Test Pattern #1. // Recycle power, if the error persists, replace MP.
Err2: RAM Pattern 2 Failure	There were RAM errors detected in RAM Test Pattern #2. //Recycle power, if the error persists, replace MP.
Err4: UnHandled Interrupt Restart Timer: [3 sec countdown timer]	An unhandled interrupt has occurred while running the application code. This event will normally cause a safe shutdown of the entire chiller. Once the countdown timer reaches 0, the processor will reset, clear diagnostics, and attempt to restart the application and allow a normal restart of chiller as appropriate. // This condition might occur due to a severe electro-magnetic transient such as can be caused by a near lightening strike. Such events should be rare or isolated and if no damage results to the CH.530 control system, the Chiller will experience a shutdown and restart. If this occurs more persistently it may be due to an MP hardware problem. Try replacing the MP. If replacement of the MP proves ineffective, the problem may be a result of extremely high radiated or conducted EMI. Contact Technical Service. If this screen occurs immediately after a software download, attempt to reload both the configuration and the application. Failing this, contact Technical Service.
Err5: Operating System Error Restart Timer: [3 sec countdown timer]	An Operating System error has occurred while running the application code. This event will normally cause a safe shutdown of the entire chiller. Once the countdown timer reaches 0, the processor will reset, clear diagnostics, and attempt to restart the application and allow a normal restart of chiller as appropriate. // See Err 4 above
Err6: Watch Dog Timer Error Restart Timer: [3 sec countdown timer]	A Watch Dog Timer Error has occurred while running the application code. This event will normally cause a safe shutdown of the entire chiller. Once the countdown timer reaches 0, the processor will reset, clear diagnostics, and attempt to restart the application allowing a normal restart of chiller as appropriate.
Err7: Unknown Error Restart Timer: [3 sec countdown timer]	An unknown Error has occurred while running the application code. This event will normally cause a safe shutdown of the entire chiller. Once the countdown timer reaches 0, the processor will reset, clear diagnostics, and attempt to restart the application allowing a normal restart of chiller as appropriate
Err8: Held in Boot by User Key Press [3 sec countdown timer]	A touch was detected during boot indicating the user wanted to stay in boot mode. This mode can be used to recover from a fatal software error in the application code. Cycle power on the MP to clear this error if it was unintentional.
MP Application Memory CRC Error	App software inside the MP failed its own checksum test. Possible causes: application software in the MP is not complete – software download to the MP was not completed successfully - or MP hardware problem. Note: User should attempt to reprogram the MP if this diagnostic occurs.
MP: Invalid Configuration	MP has an invalid configuration based on the current software installed
No Application Present Please Load Application...	No Main Processor Application is present – There are no RAM Test Errors. // Connect a TechView Service Tool to the MP's serial port, provide chiller model number (configuration information) and download the configuration if prompted by TechView. Then proceed to download the most recent application or specific version as recommended by Technical Service.
Programming Mode	A command was received by the MP from the Tech View Service Tool and the MP is in the process of first erasing and then writing the program code to its internal Flash (nonvolatile) Memory. Note that if the MP never had a prior application already in memory, the error code "Err3"will be displayed instead of this, during the programming download process.

Unit Wiring

The table below provides a list of field wiring diagrams, electrical schematics and connection diagrams for 20-130 ton CGAM units. The complete unit wiring package is documented in CGAM-SVE01*-EN. A laminated wiring diagram kit is also shipped with each CGAM unit.

Drawing Number		Description	
2309-2075 Slant Frame Units	Sheet 1	Schematic Slant Frame Units	Table of Contents
	Sheet 2		Legend
	Sheet 3		Notes
	Sheet 4		Compressor Power Circuit 1
	Sheet 5		Blank
	Sheet 6		Fan Power Circuit 1
	Sheet 7		Fan Power Circuit 1
	Sheet 8		Blank
	Sheet 9		Blank
	Sheet 10		Pump Power/Control
	Sheet 11		Compressor Control
	Sheet 12		Fan Control, 2 & 3 Fan/Ckt Units
	Sheet 13		Blank
	Sheet 14		Common Control
	Sheet 15		CH530 Control
	Sheet 16		Freeze Protection
2309-2075 V Frame Units	Sheet 1	Schematic V Frame Units	Table of Contents
	Sheet 2		Legend
	Sheet 3		Notes
	Sheet 4		Compressor Power Circuit 1
	Sheet 5		Compressor Power Circuit 2
	Sheet 6		Fan Power Circuit 1
	Sheet 7		Fan Power Circuit 1
	Sheet 8		Fan Power Circuit 2
	Sheet 9		Fan Power Circuit 2
	Sheet 10		Pump Power/Control
	Sheet 11		Compressor Control
	Sheet 12		Fan Control, 2 & 3 Fan/Ckt Units
	Sheet 13		Blank
	Sheet 14		Common Control
	Sheet 15		CH530 Control
	Sheet 16		Freeze Protection
2309-2075 W Frame Units	Sheet 1	Schematic W Frame Units	Table of Contents
	Sheet 2		Legend
	Sheet 3		Notes
	Sheet 4		Compressor Power Circuit 1
	Sheet 5		Compressor Power Circuit 2
	Sheet 6		Fan Power Circuit 1
	Sheet 7		Fan Power Circuit 1
	Sheet 8		Fan Power Circuit 2
	Sheet 9		Fan Power Circuit 2
	Sheet 10		Pump Power/Control
	Sheet 11		Compressor Control
	Sheet 12		Fan Control, 2 & 3 Fan/Ckt Units
	Sheet 13		Fan Control, 4 & 5Fan/Ckt Units
	Sheet 14		Common Control
	Sheet 15		CH530 Control
	Sheet 16		Freeze Protection
2309-2076	Sheet 1	Field Wiring	Diagram
	Sheet 2		Notes
5720-6468	Sheet 1	Diagram Slant Frame	Component Location - Control Panel
	Sheet 2		
5720-6497		Assembly - Slant Frame	Device Location Sensor and CH530
5720-6469	Sheet 1	Diagram V frame	Component Location - Control Panel
	Sheet 2		
5720-6498		Assembly - V Frame	Assembly - Device Location Sensor and CH530 - V frame
5720-6470	Sheet 1	Diagram W Frame	Component Location - Control Panel
	Sheet 2		
5720-6499		Assembly - W Frame	Assembly - Device Location Sensor and CH530

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CG-SVX17F-EN 04 Oct 2012
Supersedes CG-SVX17E-EN (10 Jun 2012)

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