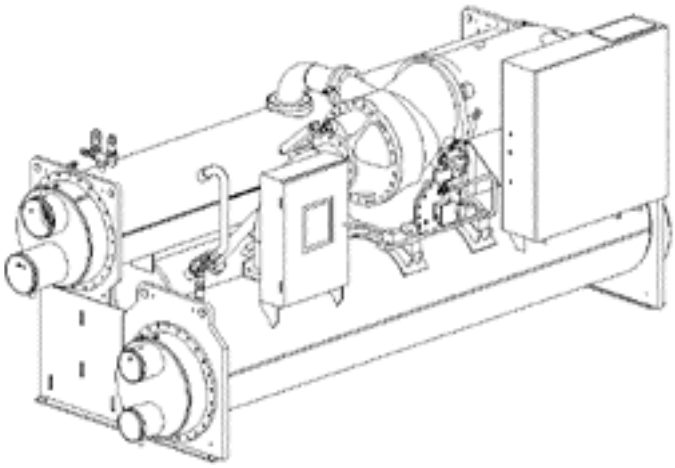
Installation
Operation
Maintenance

Gear-Driven Centrifugal Water-Cooled Liquid Chillers



Unit Model
CVGF 400-1000 Ton Units
(50 and 60 Hz)

X39640535-01 **CVGF-SVX001-GB**

General Information

Conversion Chart

SI	Multiply by	METRIC
psi	6.89	kPa
psi	.069	Bar
psi	.070	kg/cm^2
Degrees°F	(F-32)×5/9	Degrees°C
pound-ft	1.36	Nm
pound-ft	0.138	kg-m
pound-ft	0.0014	kN-m
gpm (US)	0.063	L/s
gpm (US)	6.309	m^3/sec
gpm (US)	63.09	cm^3/sec
in-H_2O	0.249	kPa
in-H_2O	0.0361	psi
in-H_2O	0.0736	in-Hg
inches	25.4	mm
inches	2.54	cm
feet	0.305	meters
$feet^2$	0.093	$meters^2$
Microns	0.001	mm Hg

Safety Control Settings Chart

Control	Settings I-P	Settings SI
Oil pressure control	Cutin 12 psi, Cutout 9 psi	Cutin 151 kPa, Cutout 124 kPa
High pressure control	Cutout 195 psi	Cutout 1344 kPa
High oil temperature	Cutout 180°F	Cutout 82.2°C
Low oil temperature	Cutout 5°F below set point	Cutout 2.8°C below set point
High motor temperature	Cutout 265°F ± 15°F	Cutout 130°C ± 8°C

Oil Chart

USA	Europe
Oil 0037	Oil 021E
Oil 0049	Oil 0020E

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General Information

Literature History

CVGF-SVX001-E4 (July 2000)

New manual describes installation, operation, and maintenance of CVGF units.

Unit Identification - Nameplates

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

Figure 1 – Typical Unit Nameplate

MODEL: CVGF500
MODEL NO:
CVGF0500RA0U33809405C1B5C1C23A1A201E3AA0
SERIAL NO: $ S.O. NO:

ELECTRICAL CHARACTERISTICS:
RATED VOLTAGE: 380 VOLTS 50HZ 3PH
NAMEPLATE NMKW: 338 kW
VOLTAGE UTILIZATION RANGE: 345- 422 VAC
MINIMUM CIRCUIT AMPACITY: 726 AMPS
MAXIMUM FUSE: 1200 AMPS
MAXIMUM CIRCUIT BREAKER 1200 AMPS
MAXIMUM OVERLOAD TRIP: 617 AMPS

	MAX VOLTS-AC	MAX HZ	PH	RLA	LRAY	LRAD
COMPRESSOR MOTOR	380	50	3	577	1048	3286
OIL PUMP MOTOR	380	50		31.43 FLA		
OIL TANK HEATER	115	50		11000 WATTS TOTAL		
CONTROL CIRCUIT	115	50		1500 VA MAX		

WHEN MOTOR CONTROLLER PROVIDED BY OTHERS
TRANE ENGINEERING SPEC. S6516-0360 APPLIES

GENERAL CHARACTERISTICS:
REFRIGERANT SYSTEM
TO BE FIELD CHARGED WITH 340 KG OF R-134A
ACTUALLY CHARGED WITH KG OF R-134A

MAXIMUM REFRIGERANT WORKING PRESSURE
HI SIDE 15.2 BAR LOW SIDE 15.2 BAR

FACTORY TEST PRESSURE
HI SIDE 16.7 BAR LOW SIDE 16.7 BAR
FIELD LEAK TEST PRESSURE 82.50 BAR MAX.
TESTED AT BAR
LEAK TEST AND CHARGING SPECIFICATION ARE SUPPLIED IN CONTROL PANEL (SERVICE LITERATURE MANUAL)

MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING
U.S. PATENTS: 4686834 4689967 4715190 5056032
5058031 5434738 5563489 5836382
SERVICE LITERATURE
INSTALLATION/OPERATION/MAINTENANCE MANUAL:
CVGF-SVX001-EN

"FOR INSTALLATION REQUIREMENTS, USE ELECTRICAL CHARACTERISTICS NOT PRODUCT DESCRIPTION"

PRODUCT DESCRIPTION:

MODL CVGF	DSEQ A0	NTON 500	VOLT 380
HRTZ 50	CPKW 338	CPIM 940	EVSZ 500
EVBS C	EVTB TE25	EFLD WATE	EVWB NM15
EVWP 2	EVCO FLGE	EVWA RERE	CDSZ 500
CDBS C	CDTB TE28	CFLD WATE	CDWB NM15
CDCO FLGE	CDWA RERE	ORSZ 23	AGLT UL
SPKG EXPS	INSL YES	OPTM YES	WVUO YES
TRMM TRMS	LCLD CLDC	LANG ENGL	SRTY USTR
SRRL 952	PNCO DISC	TEST PTR3	

General Information

Unit Nameplates

The CVGF "unit" nameplate (Figure 2 shows the nameplate location) is applied to the exterior surface of the control panel. The starter nameplate is located inside the starter panel.

The unit nameplate provides the following information:

- Unit model
- Unit serial number
- Unit device number - identifies unit electrical requirements
  - Lists correct operating charges of HFC-134a and lubrication oil
  - Lists unit test pressures and maximum working pressures

The starter nameplate provides the following information:

- Panel model number
- Rated load amps
- Voltage
- Electrical characteristics - starter type, wiring
- Options included

Unit Inspection

When the unit is delivered, verify that it is the correct unit and that it is properly equipped.

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.

Inspection Checklist

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

- 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 10 days after receipt.
- If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- Notify the Trane sales representative and arrange for repair. Do not repair the unit, however, until damage is inspected by the transportation representative.

Loose Parts Inventory

The loose parts items ship in the motor junction box for units without a unit-mounted starter, or in the starter panel for units equipped with a unit-mounted starter. This includes the isolation pads, extra oil filter, and any optional factory-shipped items.

Unit Description

The CVGF units are single-compressor, gear-type, water-cooled liquid chillers designed for installation indoors. Each unit is a completely assembled, hermetic package that is factory-piped, wired, leak-tested, dehydrated, oil-charged, and tested for proper control operation before shipment.
NOTE: high-voltage starters are not unit-mounted before shipment.

Figure 2 and Figure 3 show a typical CVGF unit and its components. Water inlet and outlet openings are covered before shipment. The oil tank is factory-charged with 15 gallons [56.8 L] of Trane Oil 37 and a holding charge of 5 psig [34 kPa] of dry nitrogen at 70°F [21°C]. (See Maintenance Procedures section for equivalent oil specification.)

General Information

Figure 2 – Component Location for Typical CVGF Unit

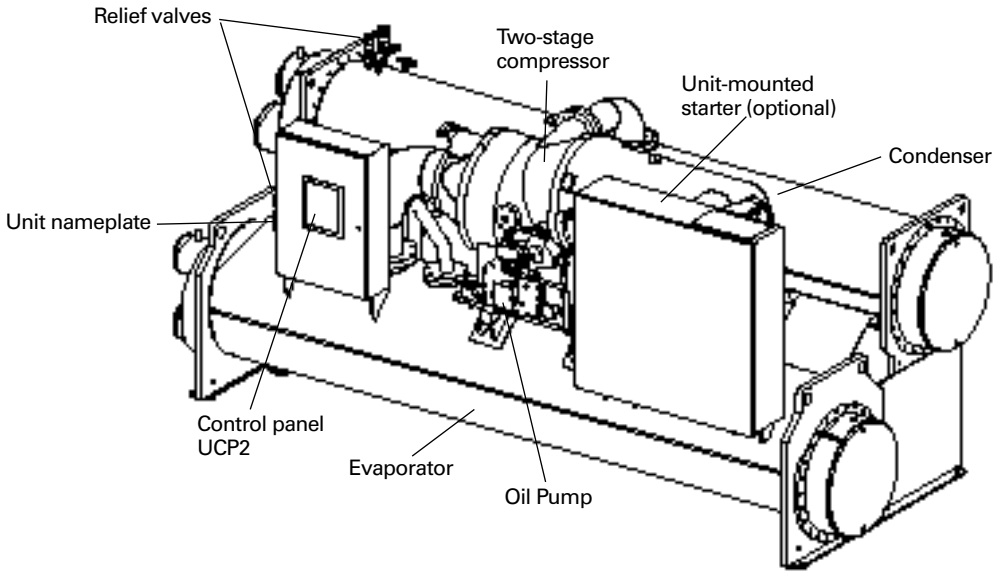
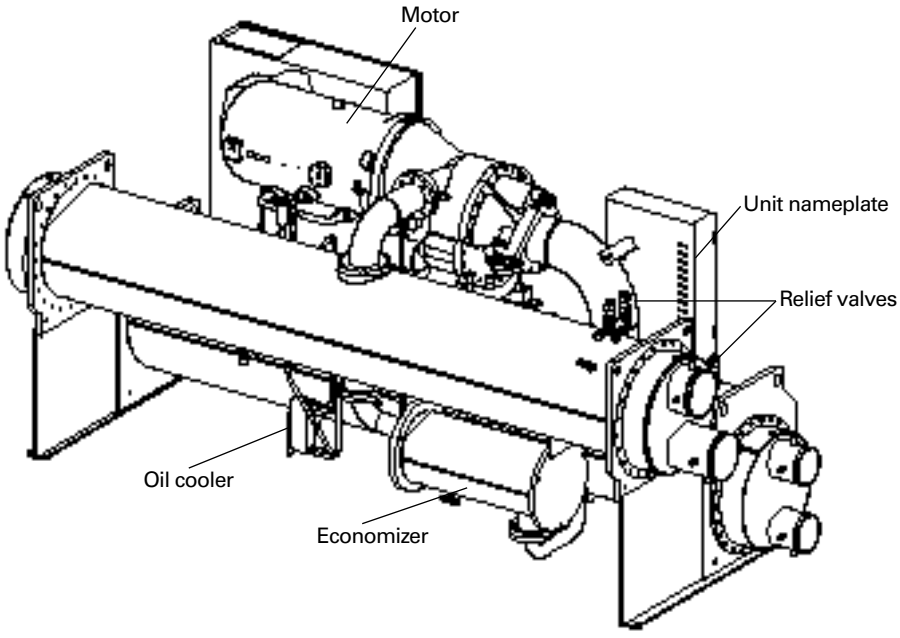


Figure 3 – Component Location for Typical CVGF Unit (Back View)



General Information

Model Number Coding System

The model numbers for the unit and the starter are composed of numbers and letters that represent features of the equipment. Shown in the three following tables are samples of typical unit and starter numbers, followed by the coding system for each.

Each position, or group of positions, in the model number is used to represent a feature. For example, in the first table, digit 9 of the unit model number, Unit Voltage, contains the letter "H". An H in this position means that the unit voltage is 460V-60Hz.

Unit Model Number

An example of a typical unit model number is:

CVGF0400HA0U31609005B1B5B1C230 0A201E2CC0

Model number digits are selected and assigned in accordance with the following definitions using the model number example shown above.

C = (1st digit)

V = (2nd digit)

G = (3rd digit) Gear Drive

F = (4th digit) Development sequence

0400 = (5th, 6th, 7th, and 8th digits) Nominal compressor tonnage
0400 = 400 tons
0500 = 500 tons
SSSS = Special

H = (9th digit) Unit Voltage
D = 380V-60Hz
F = 460V-60Hz
H = 575V-60Hz
R = 380V-50Hz
T = 400V-50Hz
U = 415V-50Hz
S = Special

A0 = (10th and 11th digits) Design Sequence

U = (12th digit) Control Interface
U = Micro Processor 2nd. Generation
S = Special

316 = (13th, 14th, and 15th digits) Compressor Motor Power (kW)
SSS = Special

0900 = (16th, 17th, 18th, and 19th digits) Compressor Impeller Cutback
SSSS = Special

5 = (20th digit) Evaporator Shell Size
5 = 500 ton evaporator
S = Special

B = (21st digit) Evaporator Tube Bundle
A = Small bundle
B = Medium bundle
C = Large bundle
S = Special

1 = (22nd digit) Evaporator Tubes
1 = .75" [19 mm] diameter; .025" [.63 mm] wall internally-enhanced copper tube
2 = 1.00" [25 mm] diameter; .025" [.63 mm] wall internally-enhanced copper tube
S = Special

B = (23rd digit) Evaporator Water box
B = 150 psi [1034 kPa] non-marine; 2-pass
C = 150 psi [1034 kPa] non-marine; 3-pass
S = Special

5 = (24th digit) Condenser Shell Size
5 = 500 ton condenser
S = Special

B = (25th digit) Condenser Tube Bundle
A = Small bundle
B = Medium bundle
C = Large bundle
S = Special

1 = (26th digit) Condenser Tubes
1 = .75" [19 mm] diameter; .028" [.71 mm] wall internally-enhanced copper tube
2 = 1.00" [25 mm] diameter; .028" [.71 mm] wall internally-enhanced copper tube
S = Special

C = (27th digit) Condenser Water box
C = 150 psi [1034 kPa] non-marine; 2-pass
S= Special

23 = (28th and 29th digits) Orifice Series
SS = Special

0 = (30th digit) Factory Installed Insulation
0 = None
A = Factory installed insulation

0 = (31st digit) Options Control Module
0 = None
1 = Options control module

A = (32nd. digit) Phase Voltage Sensors
0 = None
A = Phase voltage sensors

2 = (33rd digit) Tracer Interface Control Module
0 = None
1 = Tracer™ 100 control module Comm3
2 = Tracer™ Summit control module Comm4

0 = (34th digit) Ambient Chilled-Water Reset
0 = None
A = Ambient chilled-water reset

1 = (35th digit) Clear Language Display
0 = None
1 = Clear language display – complex character

E = (36th digit) Language
E = English
F = French
G = German
T = Italian
P = Spanish
S = Special

2 = (37th digit) Motor Frame Size
2 = 400 Frame
3 = 440E Frame
S = Special

C = (38th digit) Impeller Rim Diameter, 1st Stage
A = 9.5" Rim diameter
B = 10.0" Rim diameter
C = 10.6" Rim diameter
D = 11.1" Rim diameter
E = 11.6" Rim diameter
S = Special

C = (39th digit) Impeller Rim Diameter, 2nd Stage
A = 9.5" Rim diameter
B = 10.0" Rim diameter
C = 10.6" Rim diameter
D = 11.1" Rim diameter
E = 11.6" Rim diameter
S = Special

0 = (40th digit) Special Options

General Information

Service Model Numbers – Unit and Remote-Mounted Inside the Delta Solid-State Starters

An example of a typical starter model number is:

CVSG0277EAA0A11E01A0

Model number digits are selected and assigned in accordance with the following definitions, using the model number example shown above.

C = (1st digit)

V = 2nd digit)

S = (3rd digit)

G = (4th digit) Development Sequence
G = Rockwell Automation Solid-State Inside the Delta Starter for UCPII controls

0277 = (5th, 6th, 7th, and 8th digits) Starter Size. Use Rated Load Amps (NMRA) value

E = (9th digit) Unit Voltage
B = 208V-60Hz-3Ph
D = 380V-60Hz-3Ph
E = 440V-60Hz-3Ph
F = 460V-60Hz-3Ph
G = 480V-60Hz-3Ph
H = 575V-60Hz-3Ph
J = 600V-60Hz-3Ph
R = 380V-50Hz-3Ph
T = 400V-50Hz-3Ph
U = 415V-50Hz-3Ph
S = Special

A = (10th digit) Design Sequence

A = (11th digit) Starter Type
A = Unit-Mounted Solid-State Direct Drive
B = Remote Floor-Mounted Solid-State Direct Drive
C = Remote Wall-Mounted Solid-State Direct Drive
D = Unit-Mounted Solid-State Gear Drive
S = Special

0 = (12th digit) Connection Type
0 = Terminal Block, Main Lug Only
1 = Non-fused Disconnect
2 = Circuit Breaker
3 = Circuit Breaker, current Limiting
4 = Circuit Breaker, High Interrupt Capacity
5 = Circuit Breaker, Higher Interrupt Capacity
S = Special

A = (13th Digit) Power Structure
A = 180
B = 240
C = 360
D = 500

1 = (14th digit) Agency Listing
0 = UL and CUL Listed (Standard on all units)
1 = California Code
2 = CE

1 = (15th digit) Control Meters
0 = None
1 = Volt and Amp Meters
S = Special

E = (16th digit) Power Factor Correction Capacitor
0 = None
D = 25 KVAR
E = 30 KVAR
F = 35 KVAR
G = 40 KVAR
H = 45 KVAR
J = 50 KVAR
K = 60 KVAR
L = 70 KVAR
M = 75 KVAR
N = 80 KVAR
P = 90 KVAR
R = 100 KVAR
S = Special

0 = (17th digit) Surge Protector/ Lightning Arrestor
0 = None
A = Surge Protector/Lightning Arrestor
S = Special

1 = (18th digit) Potential Transformers
0 = None
1 = Transformers
S = Special

A = (19th digit) Ground Fault Protection
0 = None
A = Ground Fault Protection
S = Special

0 = (20th digit) Special Options
0 = None
S = Special Options (See Sales Order)

General Information

Service Model Numbers - Electro-mechanical Starters

An example of a typical starter model number is:

CVSH0035FAA01E1A0

Model number digits are selected and assigned in accordance with the following definitions, using the model number example shown above.

C = (1st digit)

V = 2nd digit)

S = (3rd digit)

H = (4th digit) Development Sequence
H = Cutler-Hammer electro-mechanical starter for gear-drive centrifugal chillers with UCP2 controls

0035 = (5th, 6th, 7th, and 8th digits) Starter Size. Use Rated Load Amps (RLA) Value

F = (9th digit) Unit Voltage
D = 380V-60Hz-3Ph
F = 460V-60Hz-3Ph
H = 575V-60Hz-3Ph
N = 4160V-60Hz-3Ph
P = 3300V-60Hz-3Ph
R = 380V-50Hz-3Ph
T = 400V-50Hz-3Ph
U = 415V-50Hz-3Ph
V = 3300V-50Hz-3Ph
Z = 6600V-50Hz-3Ph
S = Special

A = (10th digit) Design Sequence

A = (11th digit) Starter Type
A = Star-Delta, Unit Mounted
C = Star-Delta, Remote Mounted
E = X-Line Full Volt, Remote Mounted
F = Autotransformer, Remote Mounted
G = Primary Reactor, Remote Mounted
S = Special

0 = (12th digit) Connection Type
0 = Terminal Block
1 = Disconnect Switch, Non-Fused
2 = Circuit Breaker
3 = Circuit Breaker, Current Limiting
4 = Circuit Breaker, High Interrupt Capacity
5 = Circuit Breaker, Higher Interrupt Capacity
S = Special

1 = (13th digit) Agency Listing
1 = UL and CUL Listed (Standard on all units)
2 = CE

E = (14th digit) Power Factor Correction Capacitor
0 = None
D = 25 KVAR
E = 30 KVAR
F = 35 KVAR
G = 40 KVAR
H = 45 KVAR
J = 50 KVAR
K = 60 KVAR
L = 70 KVAR
M = 75 KVAR
N = 80 KVAR
P = 90 KVAR
R = 100 KVAR
T = 120 KVAR
U = 125 KVAR
V = 150 KVAR
S = Special

1 = (15th digit) Potential Transformers
0 = None
1 = Transformers
S = Special

A = (16th digit) Ground-Fault Protection
0 = None
A = Ground-Fault Protection
S = Special

0 = (17th digit) Special Options
0 = None
S = Special Options (See Sales Order)

General Information

Installation Overview

For convenience, Table 1 summarizes responsibilities that are typically associated with the CVGF chiller installation process.

Table 1 – Installation Responsibility Chart for CVGF Units

Requirement	Trane-supplied, Trane-installed	Trane-supplied, Field-installed	Field-supplied, Field-installed
Rigging			Safety chains Clevis connectors Lifting beam equipment, skates, rollers, and so forth
Isolation		Isolation pads Spring isolators	Spring isolators
Electrical	Circuit breakers or non-fused disconnects (optional) Unit-mounted starter (optional)	Remote-mounted starter (optional) Temperature sensor (optional outdoor air) Flow switches (may be field-supplied)	Circuit breakers or fusible disconnects (optional) Terminal lugs Ground connection(s) Jumper bars BAS wiring (optional) IPC wiring Control voltage wiring High-condenser-pressure interlock wiring Chilled-water-pump contactor and wiring Condenser-water-pump contactor and wiring Optional relays and wiring
Water piping		Flow switches (may be field-supplied)	Thermometers Water flow pressure gauges Isolation and balancing valves water piping Vents and drain valves Pressure relief valves (for water boxes as required)
Pressure Relief	Relief valves		Vent line and flexible connector
Insulation	Insulation (optional)		Insulation

Refer to the Installation Mechanical and Installation Electrical sections of this manual for detailed installation instructions.

- Locate and maintain the loose parts such as, isolators, bulb wells, temperature sensors, flow sensors or other factory-ordered, field-installed options, for installation as required. Loose parts are located in the starter panel if equipped with a unit-mounted starter. If not equipped with a unit-mounted starter, loose parts are shipped in the motor junction box.
- Install the unit on a foundation with flat support surfaces, level within 1/4" [6 mm] and of sufficient strength to support concentrated loading. Place the manufacturer-supplied isolation-pad assemblies under the unit.
- Install the unit per the instructions outlined in the Mechanical Installation section.
- Complete all water piping and electrical connections.

NOTE: Field piping must be arranged and supported to avoid stress on the equipment. It is strongly recommended that the piping contractor provide at least 3 feet [914 mm] of clearance between the pre-installation piping and the planned location of the unit. This will allow for proper fit-up upon arrival of the unit at the installation site. All necessary piping adjustments can be made at that time. Refer to the current engineering bulletin for further details on installation.

- Where specified, supply and install valves in the water piping, upstream and downstream of the evaporator and condenser water boxes, in order to isolate the shells for maintenance and to balance and trim the system.
- Supply and install flow switches or equivalent devices in both the chilled-water piping and the condenser-water piping. Interlock each switch with the proper pump starter and UCP2, to ensure that the unit can only operate when water flow is established (reference Section 3).
- Supply and install taps for thermometers and a pressure gauge manifold in the water piping, adjacent to the inlet and outlet connections of both the evaporator and the condenser.
- Supply and install drain valves on each water box.
- Supply and install vent cocks on each water box.
- Where specified, supply and install strainers ahead of all pumps and automatic modulating valves.
- Supply and install refrigerant pressure-relief piping from the pressure relief to the atmosphere.
- If necessary, supply enough HFC-134a refrigerant (1 pound = .45 kg) and dry nitrogen (75 psig = 517 kPa maximum) for leak testing.
- Evacuate the unit to less than 500 microns [5 mm Hg] or according to local code.
- Charge with refrigerant.
- Go over the pre-commissioning check sheet and ensure that all items have been completed.
- Start the unit under the supervision of a qualified service technician.

General Information

Table 2 – General Data

Nominal Tonnage	400					500				650			
Tube Outside Diameter (in.)	1.0		0.75			1.0		0.75		1.0		0.75	
Evaporator Water Pass	Two	Three	Two	Three		Two	Three	Two	Three	Two	Three	Two	Three
Refrigerant Type	R-134a												
Refrigerant Charge [kg]	650 pound [295]					750 pound [340]				975 pound [442.3]			
Oil Charge (gallon) [liter]	15 [56.8]	15 [56.8]	15 [56.8]	15 [56.8]		15 [56.8]	15 [56.8]	15 [56.8]	15 [56.8]	15 [56.8]	15 [56.8]	15 [56.8]	15 [56.8]
Overall Dimensions - in. [m]													
Length	190.81 [4.8]		190.81 [4.8]			190.81 [4.8]		190.81 [4.8]		192.0 [4877]		192.0 [4877]	
Width	78.29 [2]		78.29 [2]			78.29 [2]		78.29 [2]		81.75 [2076]		81.75 [2076	
Height	82.50 [2.1]		82.50 [2.1]			82.50 [2.1]		82.50 [2.1]		89.35 [2269]		89.35 [2269]	
Evaporator Inside Diameter	31.125 [.8]	31.125 [.8]	31.125 [.8]	31.125 [.8]		31.125 [.8]	31.125 [.8]	31.125 [.8]	31.125 [.8]	36.25 [921]	36.25 [921]	36.25 [921]	36.25 [921]
Evaporator Water Connection (NPS)	8	8	8	8		8	8	8	8	10	8	10	8
Condenser Inside Diameter	25.5 [.6]	25.5 [.6]	25.5 [.6]	25.5 [.6]		25.5 [.6]	25.5 [.6]	25.5 [.6]	25.5 [.6]	25.5 [647]	25.5 [647]	25.5 [647]	25.5 [647]
Condenser Nominal Connector Size (NPS)	10	10	10	10		10	10	10	10	12	12	12	12
Weight (lbm [kg]) except Water boxes													
Compressor and Motor	6220 [2821]	6220 [2821]	6220 [2821]	6220 [2821]	6220 [2821]	6220 [2821]	6220 [2821]	6220 [2821]	6220 [2821]	6800 [3084]	6800 [3084]	6800 [3084]	6800 [3084]
Evaporator	3948 [1791]	3948 [1791]	4228 [1918]	4228 [1918]		4193 [1902]	4193 [1902]	4568 [2072]	4568 [2072]	5461 [2477]	5834 [2643]	5461 [2477]	5834 [2643]
Condenser	2857 [1296]	-	3472 [1575]	-		3152 [1430]	-	3877 [1759]	-	3937 [1786]	4763 [2161]	3937 [1786]	4763 [2161]
Economizer	535 [243]	535 [243]	535 [243]	535 [243]		535 [243]	535 [243]	535 [243]	535 [243]	799 [362]	799 [362]	799 [362]	799 [362]
Starter Panel	500 [227]	500 [227]	500 [227]	500 [227]	500 [227]	500 [227]	500 [227]	500 [227]	500 [227]	542 [246]	542 [246]	542 [246]	542 [246]
Control Panel	157 [71]	157 [71]	157 [71]	157 [71]		157 [71]	157 [71]	157 [71]	157 [71]	157 [71]	157 [71]	157 [71]	157 [71]
Miscellaneous Item	2127 [965]					2127 [965]				2745 [1245]			
Shipping Weight [kg]	17867 [8104]					17867 [8104]				24140 [10950]			
Operating Weight [kg]	21460 [9734]					22564 [10235]				28344 [12857]			
Operational Data													
Minimum Evaporator Flow*	447 [28]	298 [20]	407 [25.6]	271 [17]		550 [34]	367 [23]	511 [32]	340 [21]	625 [39]	417 [26]	566 [36]	378 [24]
Maximum Evaporator Flow*	1638 [103]	1092 [69]	1493 [94]	995 [63]		2018 [127]	1346 [85]	1873 [118]	1248 [79]	2501 [159]	1529 [97]	1493 [94]	995 [63]
Minimum Condenser Flow*	499 [31]	-	487 [31]	-		606 [38]	-	586 [37]	-	682 [43]	-	668 [42]	-
Maximum Condenser Flow*	1831 [115]	-	1786 [113]	-		2221 [140]	-	2148 [135]	-	2501 [158]	-	2450 [155]	-

* Flow in gpm (L/s)

General Information

Table 3 – General Data (Continued)

Nominal Tonnage	**800**			
Tube Outside Diameter (in.)	**1.0**		**0.75**	
Evaporator Water Pass	**Two**	**Three**	**Two**	**Three**
Refrigerant Type	R-134a			
Refrigerant Charge [kg]	975 Pound [442.3]			
Oil Charge (gallon [L] (Trane Oil 37)	15 [56.8]	15 [56.8]	15 [56.8]	15 [56.8]
Overall Dimensions (in. [mm])				
Length	192.0 [4877]		192.0 [4877]	
Width	81.75 [2076]		81.75 [2076]	
Height	89.35 [2269]		89.35 [2269]	
Evaporator Inside Diameter	36.25 [921]	36.25 [921]	36.25 [921]	36.25 [921]
Evaporator Water Connection (NPS)	10	8	10	8
Condenser Inside Diameter	29.5 [749]	29.5 [749]	29.5 [749]	29.5 [749]
Condenser Nominal Connector Size (NPS)	12	12	12	12
Weight (lbm [kg]) except Water boxes				
Compressor/Motor	6800 [3084]	6800 [3084]	6800 [3084]	6800 [3084]
Evaporator	5835 [2647]	6275 [2846]	5835 [2647]	6275 [2846]
Condenser	4375 [1985]	5400 [2449]	4375 [1985]	5400 [2449]
Economizer	799 [362]	799 [362]	799 [362]	799 [362]
Starter Panel	542 [246]	542 [246]	542 [246]	542 [246]
Control Panel	157 [71]	157 [71]	157 [71]	157 [71]
Miscellaneous Item	2745 [1245]			
Shipping Weight [kg]	25218 [11439]			
Operating Weight [kg]	29924 [13573]			
	Operational Data			
Minimum Evaporator Flow*	784 [50]	523 [33]	698 [44]	465 [29]
Maximum Evaporator Flow*	3071 [194]	1916 [121]	1873 [118]	1248 [79]
Minimum Condenser Flow*	838 [53]	-	816 [52]	-
Maximum Condenser Flow*	3071 [194]	-	2993 [189]	-

* Flow in gpm (L/s)

General Information

Table 4 – General Data

Nominal Tonnage	400				500				650			
Tube Outside Diameter (in.)	1.0		0.75		1.0		0.75		1.0		0.75	
Evaporator Water Pass	Two	Three	Two	Three	Two	Three	Two	Three	Two	Three	Two	Three
Water Volume												
150 pound Water boxes												
Evaporator Water Storage (gallon [L])	101.7 [385]	101.49 [384]	95.7 [361]	95.4 [361]	117.2 [444]	116.9 [443]	111.2 [421]	110.9 [420]	163.2 [618]	158.2 [599]	154.1 [583]	149.1 [564]
Condenser Water Storage (gallon [L])	112 [424]	-	110.4 [418]	-	127.8 [484]	-	125.0 [473]	-	185.1 [701]	-	188.5 [714]	-
Evaporator 2-pass Weight (pound [kg])	Supply = 304 [138], Return = 337 [153]											
Evaporator 3-pass Weight (pound [kg])	Supply = 314 [142], Return = 332 [151]											
Condenser 2-pass Weight (pound [kg])	Supply = 304 [138], Return = 341 [155]											
300 pound Water boxes												
Evaporator Water Storage (gallon [L])	101.9 [386]	101.6 [385]	95.9 [363]	95.6 [362]	117.4 [444]	117.0 [443]	111.4 [422]	111.1 [421]	163.2 [618]	158.2 [599]	154.1 [583]	149.1 [564]
Condenser Water Storage (gallon [L])	112.3 [425]	-	110.6 [419]	-	128.0 [485]	-	125.3 [474]	-	185.1 [701]	-	189.4 [717]	-
Evaporator 2-pass Weight (pound [kg])	Supply = 427 [194], Return = 446 [202]											
Evaporator 3-pass Weight (pound [kg])	Supply = 448 [203], Return = 448 [203]											
Condenser 2-pass Weight (pound [kg])	Supply = 421 [191], Return = 436 [198]											

Table 5 – General Data

Nominal Tonnage	800			
Tube Outside Diameter (in.)	1.0		0.75	
Evaporator Water Pass	Two	Three	Two	Three
Water Volume				
150 pound Water boxes				
Evaporator Water Storage (gallon [L])	190.4 [721]	185.4 [702]	177.4 [672]	177.4 [672]
Condenser Water Storage (gallon [L])	213.5 [808]	-	218.0 [825]	-
Evaporator 2-pass Weight (pound [kg])	Supply = 303.57 [137.7], Return = 337.16 [152.9]			
Evaporator 3-pass Weight (pound [kg])	Supply = 313.56 [142.2], Return = 331.72 [150.5]			
Condenser 2-pass Weight (pound [kg])	Supply = 303.69 [137.8], Return = 340.67 [154.5]			
300 pound Water boxes				
Evaporator Water Storage (gallon [L])	190.4 [721]	185.4 [702]	177.4 [672]	172.4 [653]
Condenser Water Storage (gallon [L])	214.5 [812]	-	219.0 [829]	-
Evaporator 2-pass Weight (pound [kg])	Supply = 426.69 [193.5], Return = 446.20 [202.4]			
Evaporator 3-pass Weight (pound [kg])	Supply = 447.81 [203.1], Return = 447.98 [203.2]			
Condenser 2-pass Weight (pound [kg])	Supply = 421.43 [191.2], Return = 436.11 [197.8]			

Installation: Mechanical

Storage

If the chiller is to be stored for at least 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.
- At least every three months, attach a gauge to the service valve and manually check the pressure of dry nitrogen in the refrigerant circuit. If the pressure is below 5 psig [34 kPa] at 70°F [20°C], call a qualified service organization and the appropriate Trane sales office.

Location Requirements

Noise Considerations

- Locate the unit away from sound-sensitive areas.
- Install the isolation pads or isolation springs under the unit. Refer to "Unit Isolation."
- Install rubber vibration isolators in all water piping.
- Use flexible electrical conduit for final connection to the UCP2.

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 chiller operating weight (including completed piping and full operating charges of refrigerant, oil and water). Refer to Table 2 for unit operating weights.

After the chiller is in place, level the chiller within 1/4" [6 mm] over its length and width.

The Trane Company is not responsible for equipment problems resulting from an improperly designed or constructed foundation.

Vibration Eliminators

- Provide rubber boot-type isolators for all water piping at the unit.
- Provide flexible conduit for electrical connections to the unit.
- Isolate all pipe hangers and be sure they are not supported by main structural beams that could introduce vibration into occupied spaces.
- Make sure that the piping does not put additional stress on the unit.

NOTE: Do not use metal braided-type eliminators on the water piping. Metal braided eliminators are not effective at the frequencies at which the unit will operate.

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.

Allow adequate clearance for condenser and compressor servicing. A minimum of 3 feet [1 m] is recommended for compressor service and to provide sufficient clearance for the opening of control panel doors. Refer to Figure 4 for minimum clearances required for condenser tube service. In all cases, local codes will take precedence over these recommendations.

NOTES: Required vertical clearance above the unit is 36" [914 mm]. There should be no piping or conduit located over the compressor motor.

If the room configuration requires a variance to the clearance dimensions, contact your Trane sales office representative.

Installation: Mechanical

Figure 4 – Recommended Operating and Service Clearances – Model CVGF with Unit-Mounted Starters

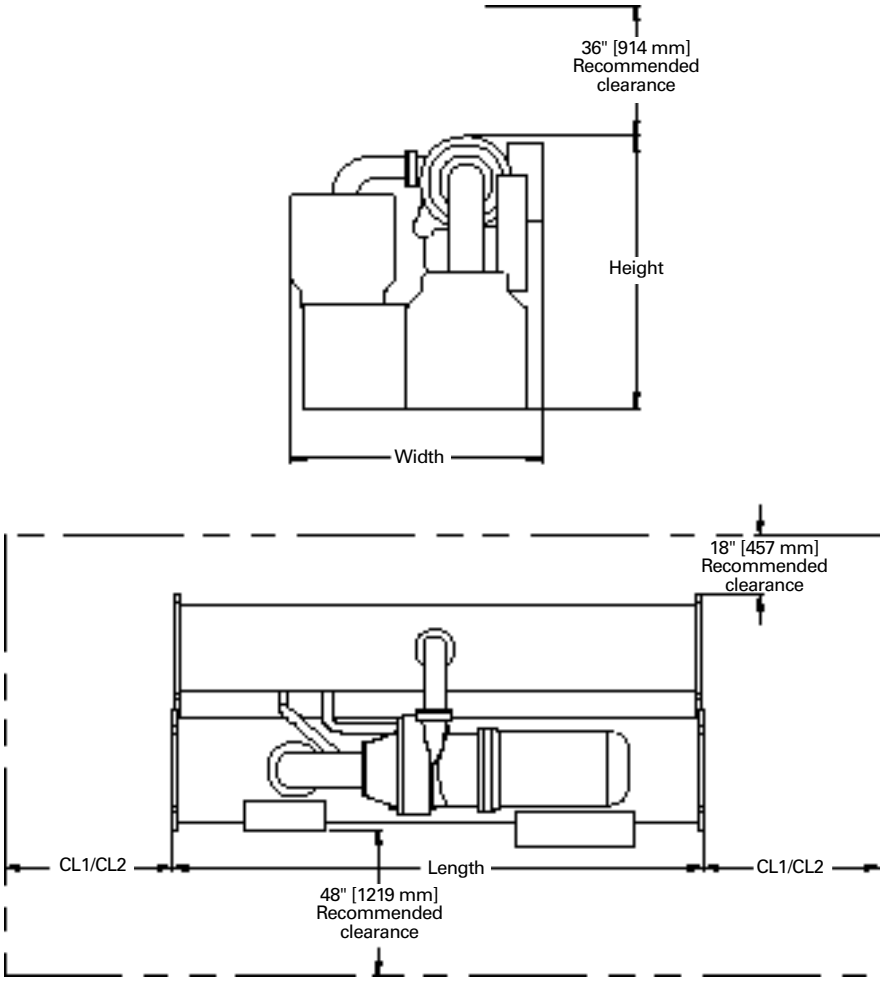


Table 6 – Dimensions for Figure 4

		Clearance (mm) Tube Pull		Unit Dimensions (mm) With Unit-Mounted Starters		
Compressor	Shell Size	CL1	CL2	Length	Height	Width
400-500	500	13' 10-3/4" [4236]	3' 7" [1093]	13' 4-3/4" [4083]	6' 10-1/2" [2094]	6' 6-1/8" [1984]
560-700	700	13' 10-3/4" [4236]	3' 7" [1093]	13' 4-3/4" [4083]	6' 10-1/2" [2094]	6' 10" [2083]
740-1000	1000	N/A	N/A	N/A	N/A	N/A

CL1 at either end of the machine and is required for tube pull clearance.
CL2 is always at the opposite end of the machine from CL1 and is for the water box plus clearance.
Add 14-5/8" [372 mm] on each end for the water box.

Installation: Mechanical

Figure 5 – Recommended Operating and Service Clearances – Model CVGF without Unit-Mounted Starters

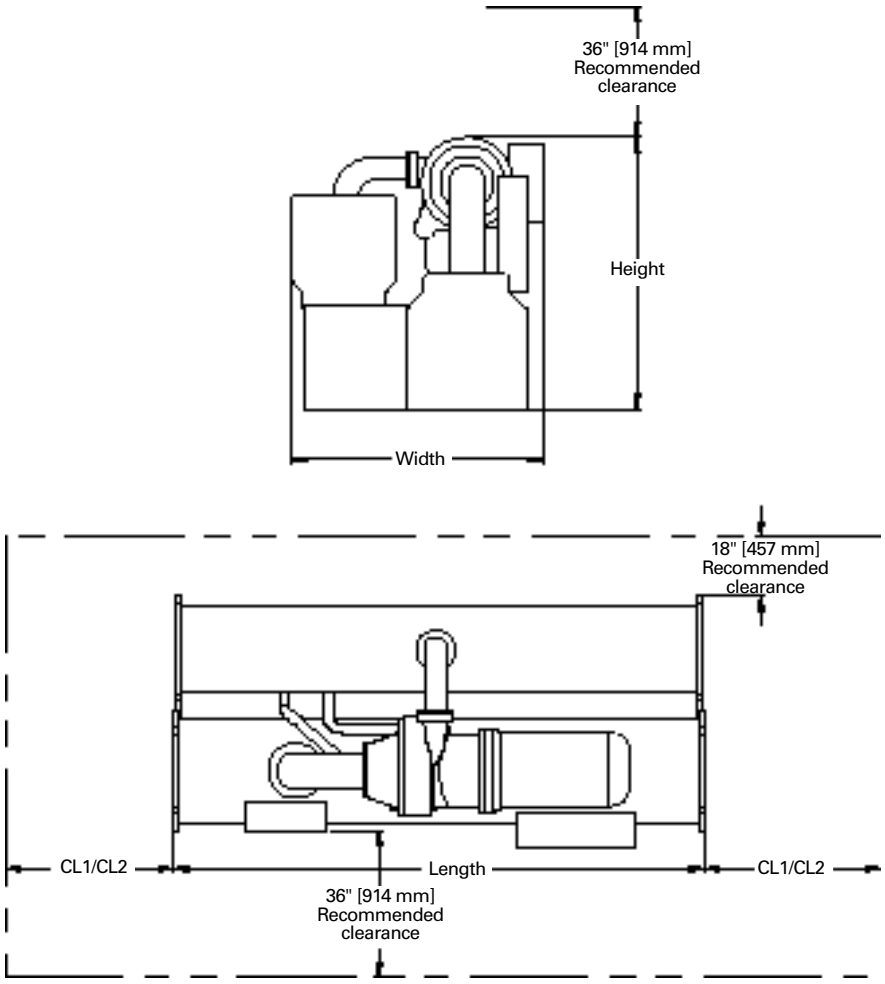


Table 7 – Dimensions for Figure 5

		Clearance (mm) Tube Pull		Unit Dimensions (mm) With Unit-Mounted Starters		
Compressor	Shell Size	CL1	CL2	Length	Height	Width
400-500	500	13' 10-3/4" [4236]	3' 7" [1093]	13' 4-3/4" [4083]	6' 10-1/2" [2094]	6' 3-15/16" [1929]
560-700	700	13' 10-3/4" [4236]	3' 7" [1093]	13' 4-3/4" [4083]	6' 10-1/2" [2094]	6' 7-27/32" [2028]
740-1000	1000	N/A	N/A	N/A	N/A	N/A

CL1 at either end of the machine and is required for tube pull clearance.
CL2 is always at the opposite end of the machine from CL1 and is for the water box plus clearance.
Add 14-5/8" [372 mm] on each end for the water box.

Installation: Mechanical

Table 8 – Model CVGF Water Connection Pipe Size (mm)

	Shell Size		
	500	700	1000
Water Passes	Nominal Pipe Size (inches) NPS		
Evaporator			
2-pass (DN200)	8" (DN250)	10" (DN300)	12"
3-pass (DN200)	8" (DN200)	8" (DN250)	10"
Condenser			
2-pass (DN250)	10" (DN300)	12" (DN350)	14"

Ventilation

The unit produces heat even though the compressor is cooled by the refrigerant. Make provisions to remove heat generated by unit operation from the equipment room. Ventilation must be adequate to maintain an ambient temperature lower than 122°F [50°C].

Vent the unit pressure relief valves in accordance with all local and national codes. Refer to "Pressure Relief Valves."

Make provisions in the equipment room to keep the chiller from being exposed to freezing temperatures [32°F/0°C].

Water Drainage

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

Moving and Rigging

The Model CVGF chiller should be moved by lifting at designated lift points only. Refer to the rigging diagram that ships with each unit for specific "per unit" weight data.

⚠ WARNING

Always use lifting equipment with a capacity exceeding the unit lifting weight by an adequate safety factor. (+10%). Follow the procedures and diagrams in this manual and in the submittal. Failure to do so can result in personal injury or death.

Chiller Isolation

To minimize sound and vibration transmission through the building structure, and to assure proper weight distribution over the mounting surface, install isolation pads or spring isolators under the chiller feet.

Note: Isolation pads are provided with each chiller unless spring isolators are specified on the sales order.

Specific isolator loading data is provided in the unit submittal package. Also refer to Table 9. If necessary, contact your local Trane sales office for further information.

Isolation Pads

When the unit is ready for final placement, position isolation pads end-for-end under the full length of the chiller leg. The pads measure 6" × 18" [152 × 457 mm]. No gaps should be present between pads.

Remember that the chiller must be level within 1/4" [6.35 mm] over its length and width after it is lowered onto the isolation pads. In addition, all piping connected to the chiller must be properly isolated and supported so that it does not place any stress on the unit.

Spring Isolators

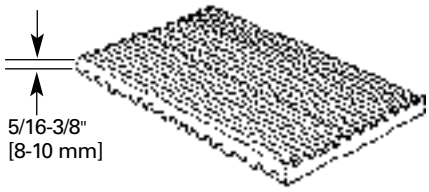
Spring isolators should be considered whenever chiller installation is planned for an upper-story location. Base isolator selection and placement information is presented in Figure 8 and Figure 10. (Note that three types of spring isolators, each with its own maximum loading characteristics, are used with the CVGF chillers.)

Spring isolators are typically shipped assembled and ready for installation. To install and adjust the isolators properly, follow the instructions given.

Note: Do not adjust the isolators until the chiller is piped and charged with refrigerant and water.

1. Position the spring isolators under the chiller as shown in Figure 8 and Figure 9. Make sure that each isolator is centered in relation to the tube sheet.
2. Set isolators on the sub-base; shim or grout them as necessary to provide a flat, level surface at the same elevation for all mountings. Be sure to support the full underside of the isolator base plate; do not straddle gaps or small shims.

Figure 6 – Isolation Pad



3. If required, bolt the isolators to the floor through the slots provided, or cement the pads.

   Note: Fastening the isolators to the floor is not necessary unless specified.
4. If the chiller must be fastened to the isolators, insert cap screws through the chiller base and into the holes tapped in the upper housing of each isolator. Do not however, allow the screws to protrude below the underside of the isolator upper housing. An alternative method of fastening the chiller to the isolators is to cement the neoprene pads.
5. Set the chiller on the isolators; refer to the "Rigging" section for lifting instructions.

   The weight of the chiller will force the upper housing of each isolator down, perhaps causing it to rest on the isolator's lower housing. Figure 10 illustrates spring isolator construction.
6. Check the clearance on each isolator. If this dimension is less than 1/4" [6 mm] on any isolator, use a wrench to turn the adjusting bolt one complete revolution upward.

   Repeat this operation until a 1/4" [6 mm] clearance is obtained at all isolators.

Installation: Mechanical

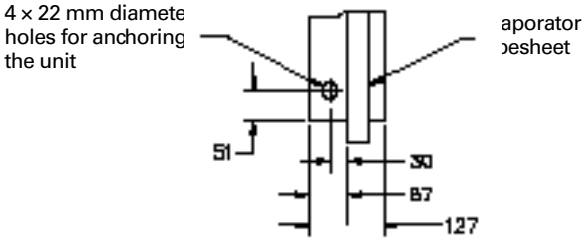
Figure 7 – CVGF Rigging Submittal

1. Dimensions are in millimeters (mm).

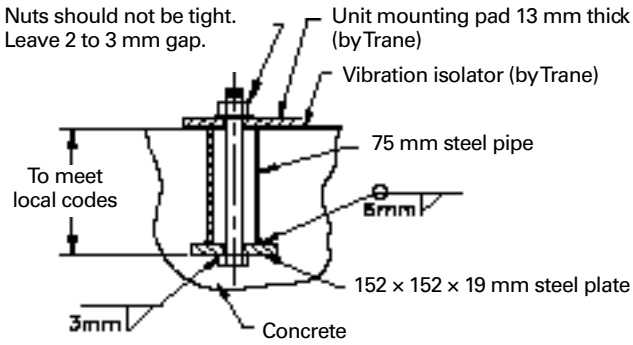
⚠ WARNING

DO NOT USE CHAINS OR CABLES OTHER THAN AS SHOWN.
Failure to heed this warning by using alternative lifting arrangements may result in death or serious injury and equipment damage.

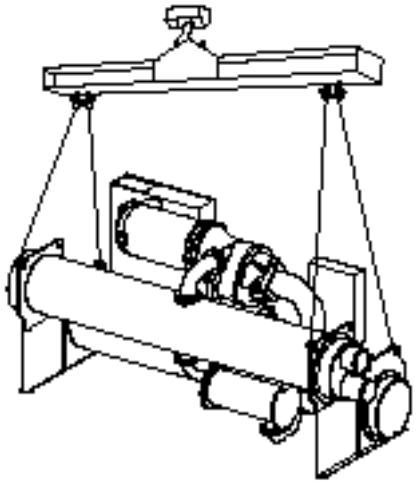
2. Do not use chains (cables) or slings except as shown. Other lifting arrangements may cause equipment damage or serious personal injury.
3. Each chain (cable) used to lift the unit must be capable of supporting the entire weight of the chiller.
4. Use a 3600 mm lifting beam and adjust the chains (cables) for an even, level lift.
5. 900 mm recommended clearance above highest point of compressor.
6. Weights shown below include standard non-marine 10.5 bar water boxes and a unit-mounted starter. More detailed weight information is available upon request. Shipping weight: 8,105 kg.

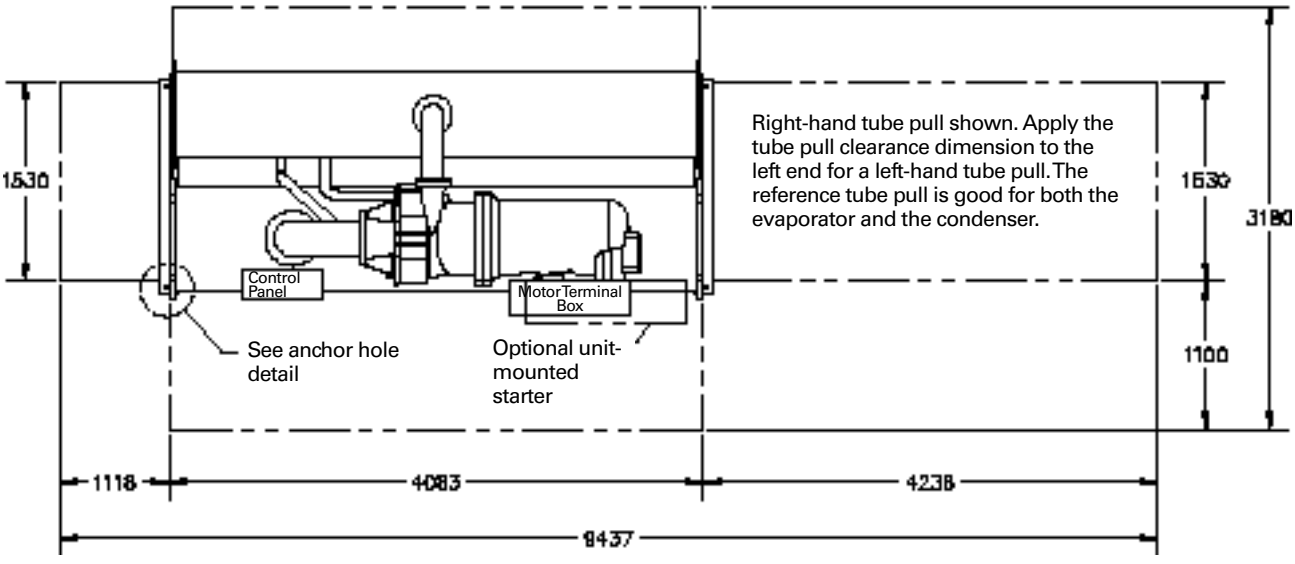


Anchor Hole Detail
Dimensions are typical for each corner



Anchor Bolt Detail
Recommended procedure to allow for thermal expansion. (Unless otherwise specified, parts are furnished by the customer.)





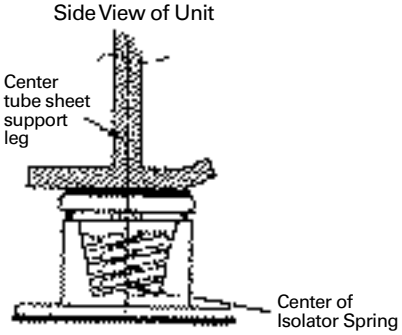
Note: When the load is applied to the isolators (Step 5), the top plate of each isolator moves down to compress the springs until either 1. the springs support the load, or 2. the top plate rests on the bottom housing of the isolator.

If the springs are supporting the load, screwing down on the adjusting bolt (Step 7) will immediately begin to raise the chiller.

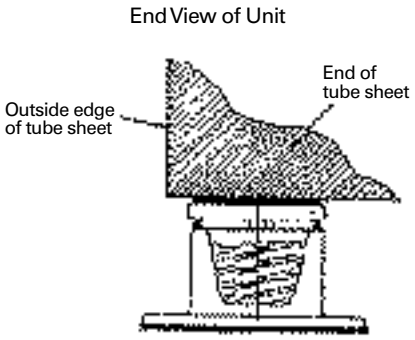
Installation: Mechanical

7. Turn the adjusting bolt on each of the remaining isolators to obtain the required minimum clearance of 1/4" [6 mm].
8. After the minimum required clearance is obtained on each of the isolators, level the chiller by turning the adjusting bolt on each of the isolators on the low side of the unit. Be sure to work from one isolator to the next. Remember that the chiller must be level to within 1/4" [6 mm] over its length and width and that clearance of each isolator must be 1/4" [6 mm]

Figure 8 – Chiller Foot/Isolator Orientation



Note: The spring isolator must be centered in relation to the tube sheet. Do **not** align the isolator with the flat part of the chiller foot, because the tube sheet is often off-center.

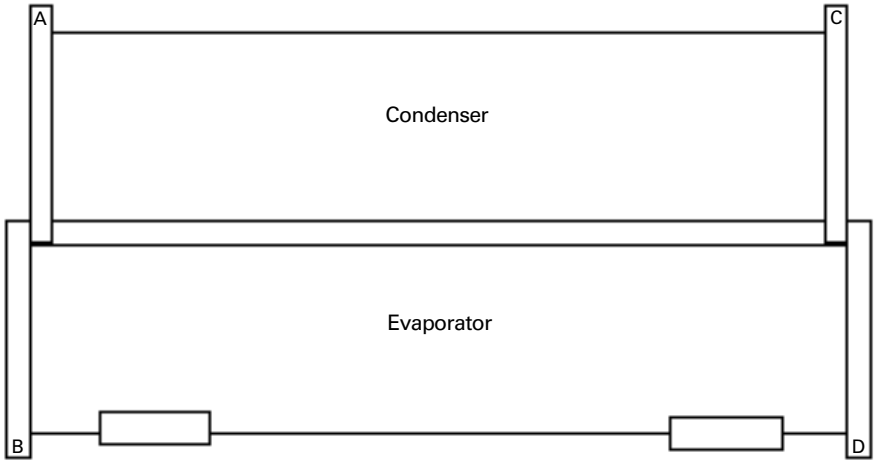


Note: Place isolator near outside edge of tube sheet as shown.

Table 9 – Isolation Loads - 500 and 700 Ton Families (Reference Figure 9)

	500 Ton Family	700 Ton Family
Location Point	Maximum Load - pound (kg)	Maximum Load - pound (kg)
A	5905 [2679]	8388 [3805]
B	7005 [3177]	9431 [4278]
C	6090 [2762]	8991 [4078]
D	7225 [3277]	10340 [4690]

Figure 9 – Load Points - 500 and 700 Ton Families - CVGF (Reference Table 9)



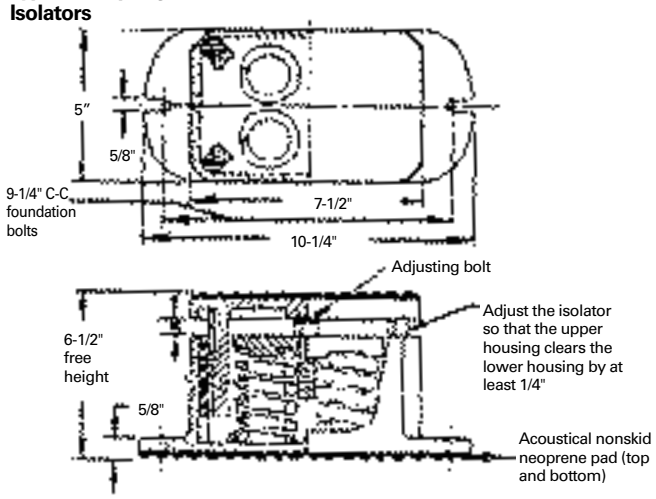
Top View

Note: Place isolators near outside edge of tube sheet as shown.

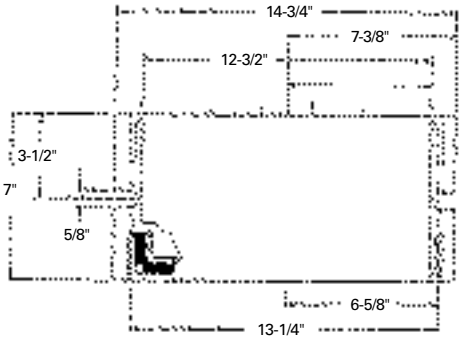
Installation: Mechanical

Figure 10 – Typical Spring Isolator Types and Construction

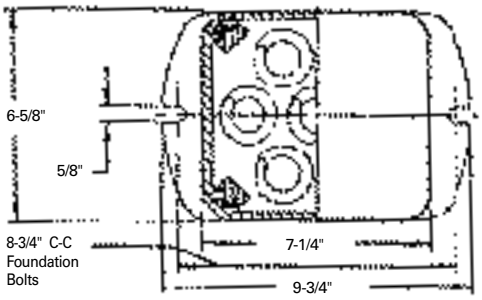
Type CT-4 Spring Isolators

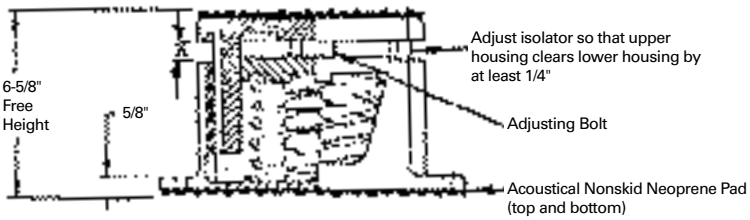


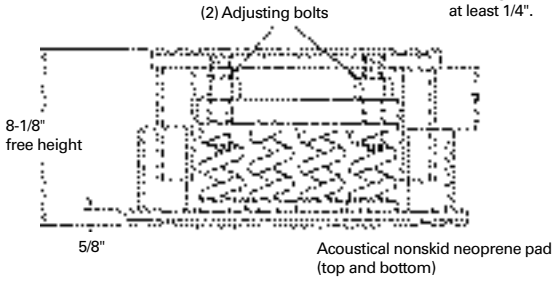
Type CT-12 Spring Isolators



Type CT-7 Spring Isolators







English to Metric Conversion

1/4"	5/8	3-1/5	6-1/4	6-5/8	7-1/4	7-3/8	7-1/2	7-3/8	8-1/8	8-3/4	9-1/4	9-3/4	10-1/4	12-1/2	13-1/4	14-3/4
6 mm	15.9	89	159	168	184	187	191	187	206	222	235	248	260	317	337	375

Installation: Mechanical

Table 10 – Type CT-4 Spring Isolator (4 springs)

Isolator Type and Size	Maximum Load (pound/kg)	Deflection (inch/mm)	Spring Color Coding
CT-4-25	1800 [816]	1.22 [31.0]	Red
CT-4-26	2400 [1089]	1.17 [29.7]	Purple
CT-4-27	3000 [1361]	1.06 [27.0]	Orange
CT-4-28	3600 [1633]	1.02 [25.9]	Green
CT-4-31	4400 [1996]	0.83 [21.1]	Gray
CT-4-32	5200 [2359]	0.74 [18.8]	White

Table 11 – Type CT-7 Spring Isolator (7 springs)

Isolator Type and Size	Maximum Load (pound/kg)	Deflection (inch/mm)	Spring Color Coding
CT-7-25	3150 [1429]	1.22 [31.1]	Red
CT-7-26	4200 [1905]	1.17 [29.7]	Purple
CT-7-27	5250 [2381]	1.06 [27.0]	Orange
CT-7-28	6300 [2858]	1.02 [25.9]	Green
CT-7-31	7700 [3493]	0.83 [21.1]	Gray
CT-7-32	9100 [4128]	0.74 [18.8]	White

Table 12 – Type CT-12 Spring Isolator (12 springs)

Isolator Type and Size	Maximum Load (pound/kg)	Deflection (inch/mm)	Spring Color Coding
CT-12-25	5400 [2449]	1.22 [31.0]	Red
CT-12-26	7200 [3266]	1.17 [29.7]	Purple
CT-12-27*	9000 [4082]	1.06 [27.0]	Orange
CT-12-28**	10800 [4899]	1.02 [25.9]	Green
CT-12-31	13200 [5988]	0.83 [21.1]	Gray
CT-12-32	5200 [2359]	0.74 [18.8]	White

Note:

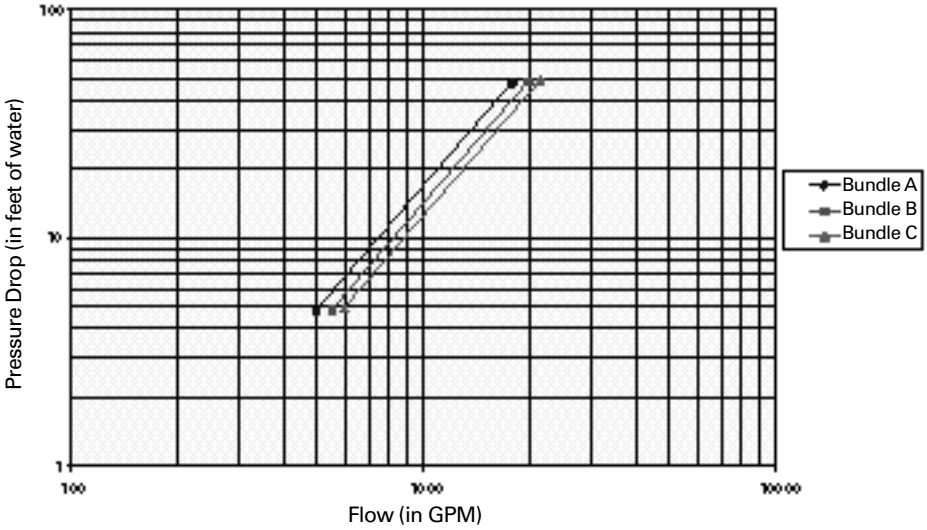
* Used for 700-ton family at locations A and C (reference Figure 9)

** Used for 700-ton family at locations B and D (reference Figure 9)

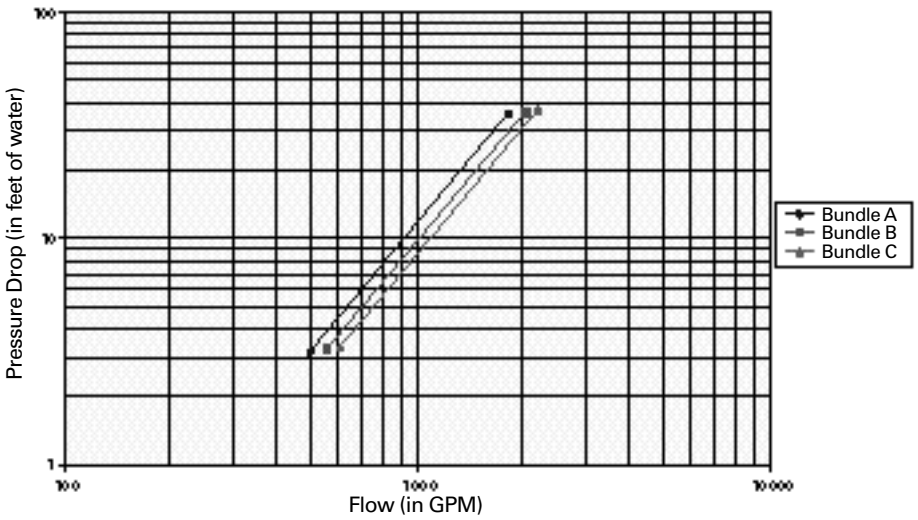
Installation: Mechanical

Water Pressure Drop Data

Pressure Drop for CVGF 500 Condensers with 3/4" Outside Diameter tubes and 2-pass water boxes



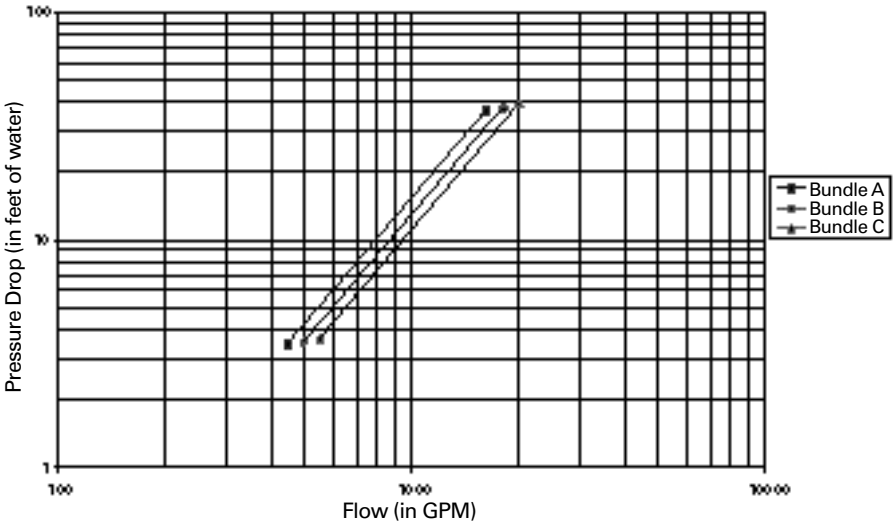
Pressure Drop for CVGF 500 Condensers with 1" Outside Diameter tubes and 2-pass water boxes



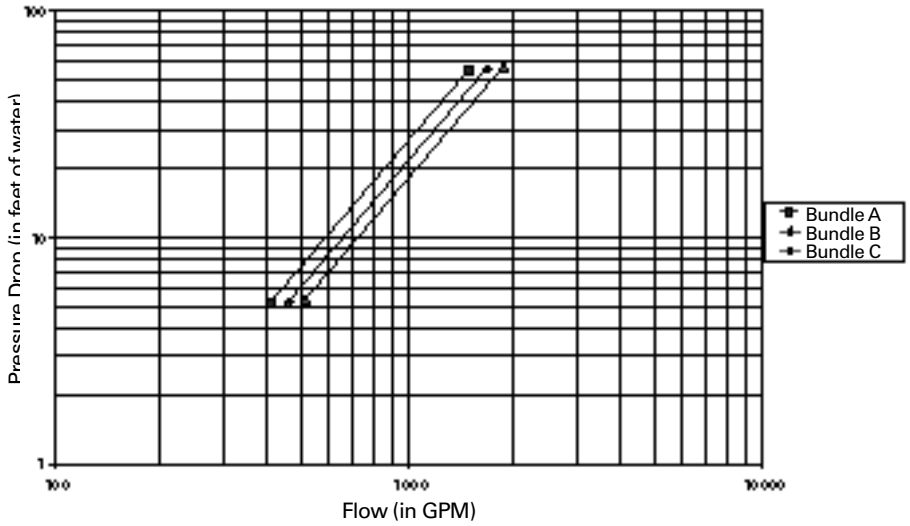
Installation: Mechanical

Water Pressure Drop Data

Pressure Drop for CVGF 500 Evaporators with 1" Outside Diameter tubes and 2-pass water boxes



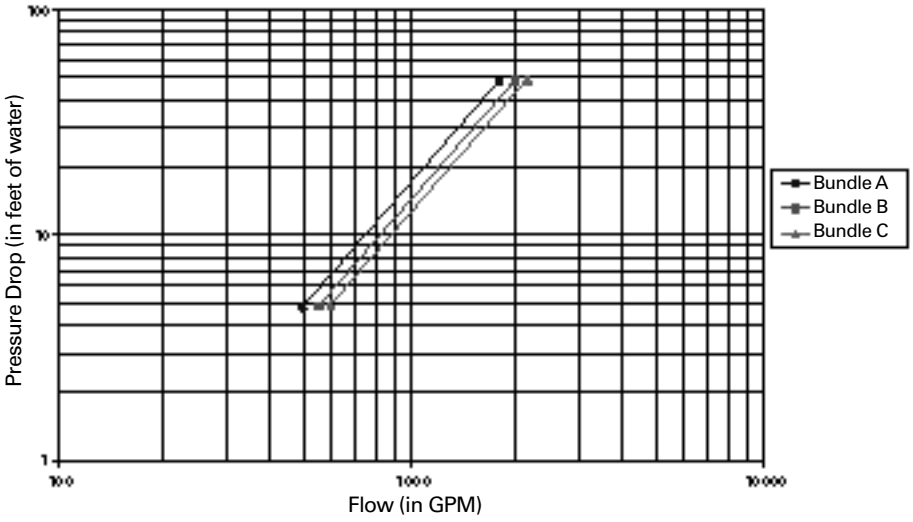
Pressure Drop for CVGF 500 Evaporators with 3/4" Outside Diameter tubes and 2-pass water boxes



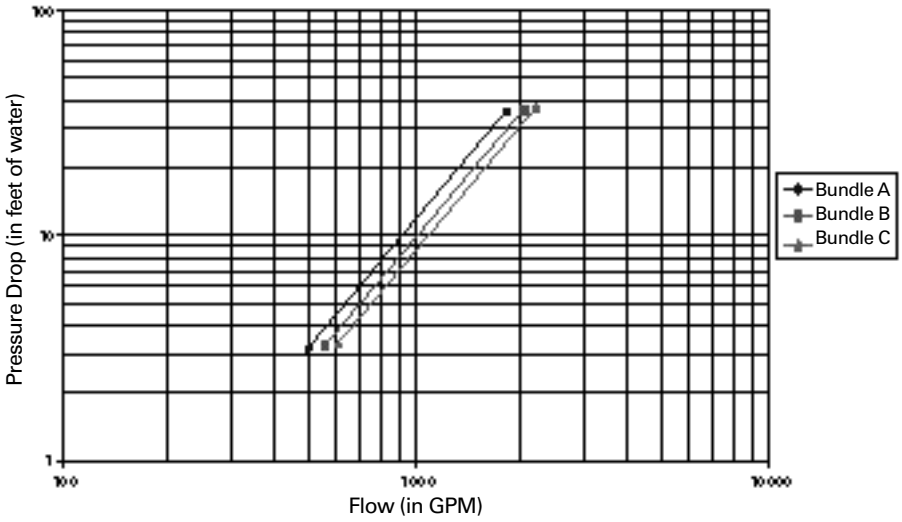
Installation: Mechanical

Water Pressure Drop Data

Pressure Drop for CVGF 500 Condensers with 3/4" Outside Diameter tubes and 2-pass water boxes



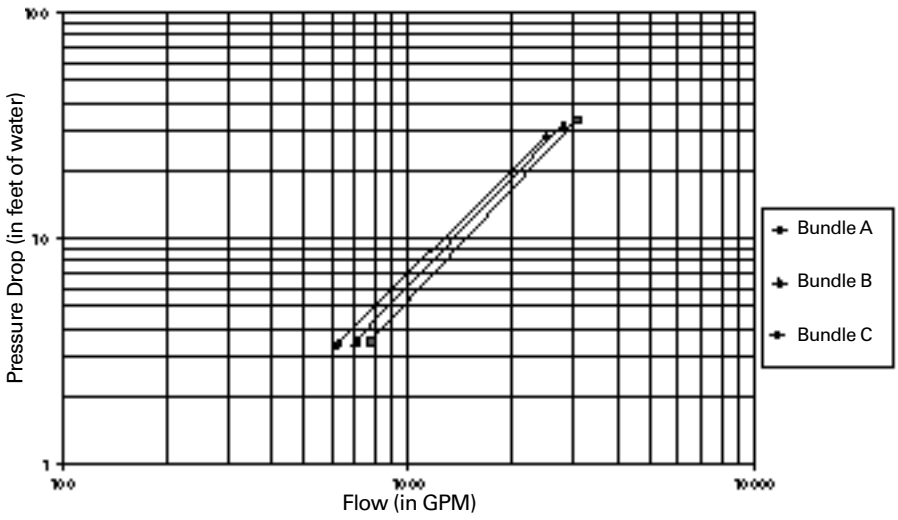
Pressure Drop for CVGF 500 Condensers with 1" Outside Diameter tubes and 2-pass water boxes



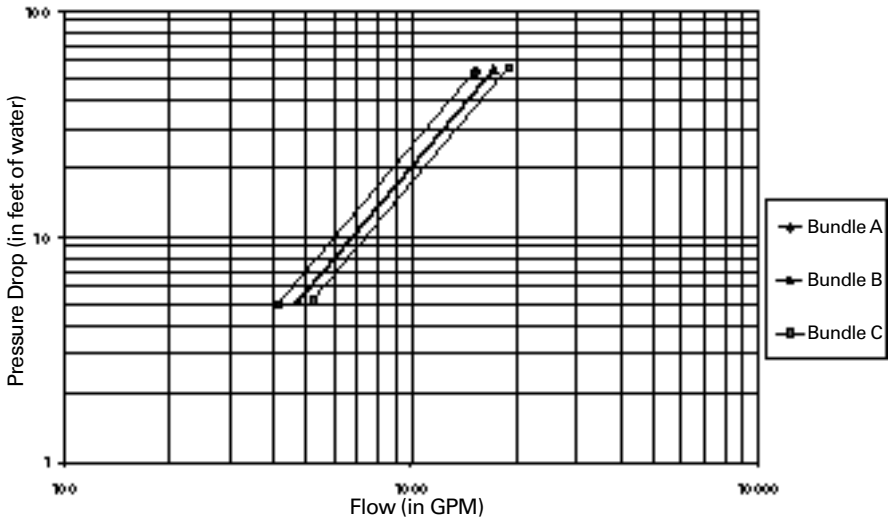
Installation: Mechanical

Water Pressure Drop Data

Pressure Drop for CVGF 700 Evaporators with 1" Outside Diameter tubes and 2-pass water boxes



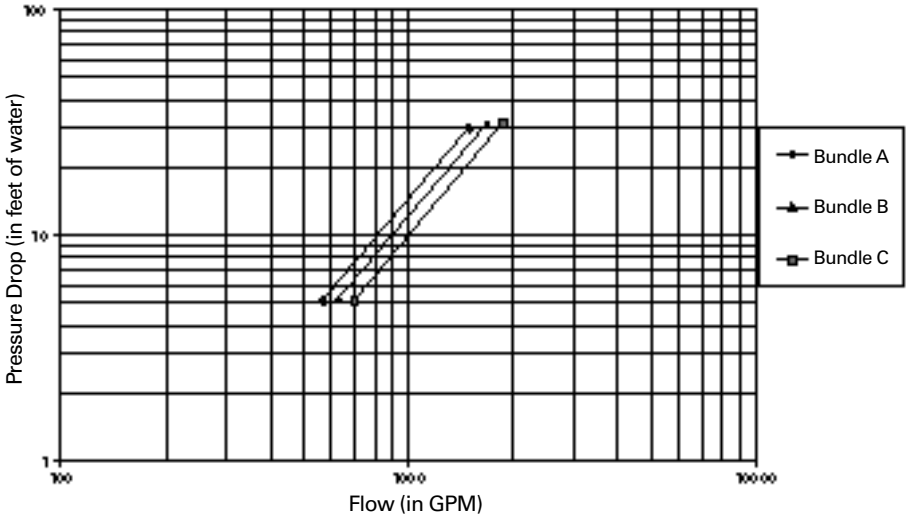
Pressure Drop for CVGF 700 Evaporators with 1" Outside Diameter tubes and 3-pass water boxes



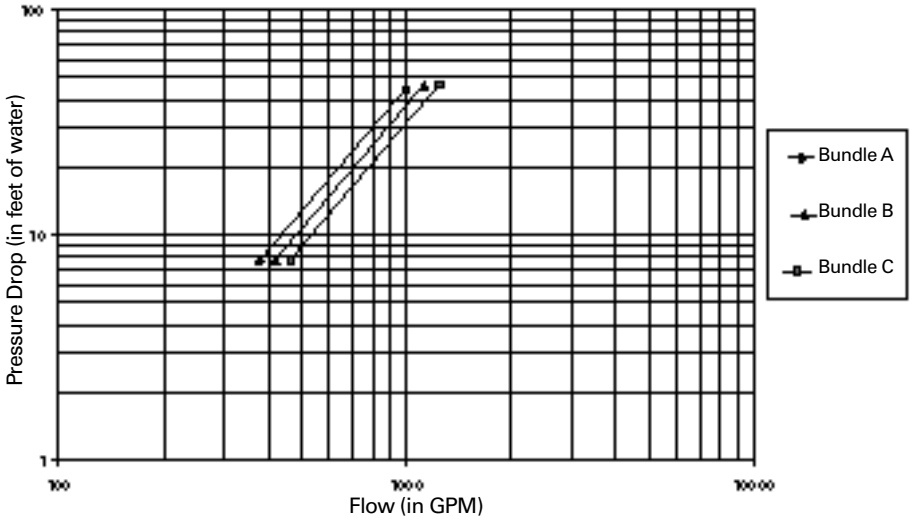
Installation: Mechanical

Water Pressure Drop Data

Pressure Drop for CVGF 700 Evaporators with 3/4" Outside Diameter tubes and 2-pass water boxes



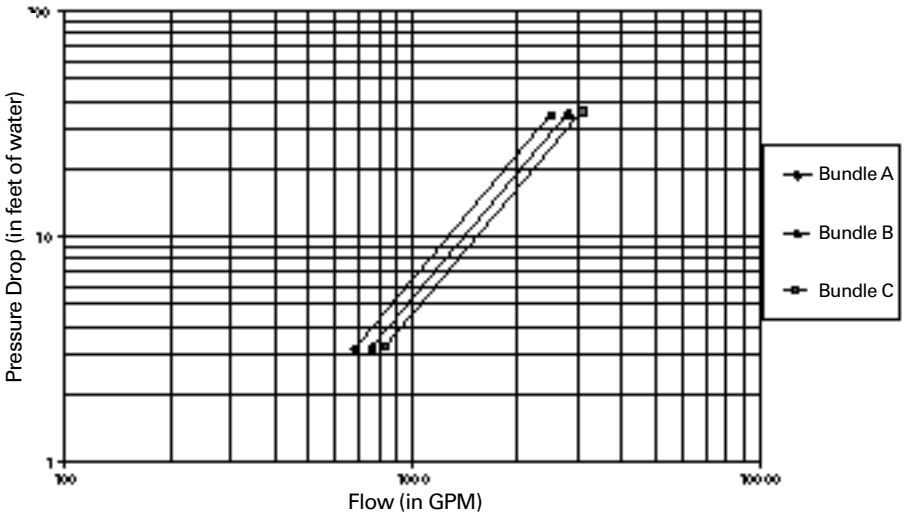
Pressure Drop for CVGF 700 Evaporators with 3/4" Outside Diameter tubes and 3-pass water boxes



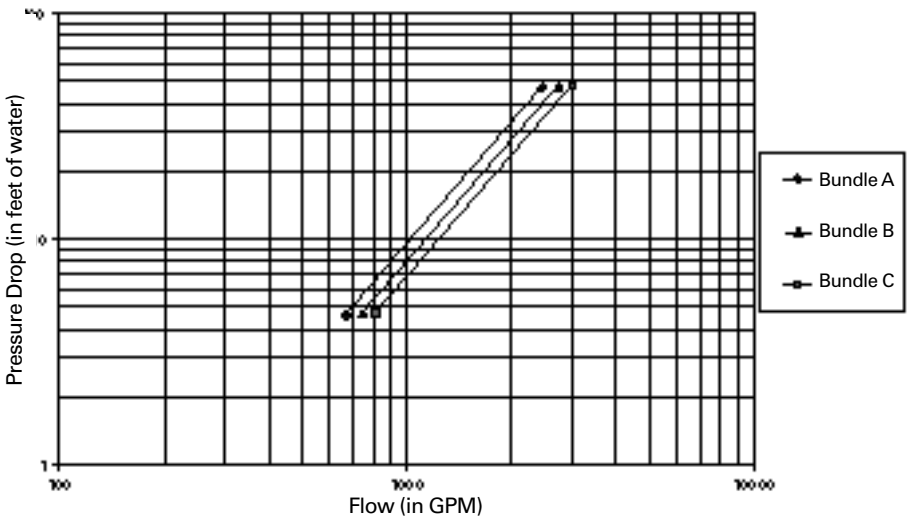
Installation: Mechanical

Water Pressure Drop Data

Pressure Drop for CVGF 700 Condensers with 1" Outside Diameter tubes and 2-pass water boxes



Pressure Drop for CVGF 700 Condensers with 3/4" Outside Diameter tubes and 2-pass water boxes



Installation: Mechanical

Connecting Groove Pipes

⚠ CAUTION

To prevent damage to water piping, do not overtighten the connections.

NOTE: Make sure that all piping is flushed and cleaned prior to starting the unit.

To prevent equipment damage, bypass

⚠ CAUTION

the unit if using an acidic flushing agent.

Vents and Drains

Install pipe plugs or ball valves, with NPT-to-hose bib connections, in evaporator and condenser water box drain and vent connections before filling the water systems.

To drain water, remove the vent and drain plugs or open the ball valves, install an NPT connector in the drain connection, and connect a hose to it.

Evaporator Piping Components

NOTE: Ensure that all piping components are between the shutoff valves, so that both the condenser and the evaporator can be isolated.

"Piping components" include all devices and controls used to provide proper water-system operation and unit operating safety. These components and their general locations are described below.

Entering Chilled-Water Piping
- Air vents (to bleed air from system)
- Water pressure gauges manifolded with shut-off valves
- Pipe unions
- Vibration eliminators (rubber boots)
- Shut-off (isolation) valves
- Thermometers
- Cleanout tees
- Pipe strainer
- Flow switch

Leaving Chilled-Water Piping
- Air vents (to bleed air from system)
- Water pressure gauges manifolded with shut-off valves
- Pipe unions
- Vibration eliminators (rubber boots)
- Shut-off (isolation) valves
- Thermometers
- Cleanout tees
- Balancing valve
- Pressure relief valve

⚠ CAUTION

To prevent evaporator damage, do not exceed 150 psig [1035 kPa] evaporator water pressure for standard water boxes. The maximum pressure for high-pressure water boxes is 300 psig [2100 kPa]. Refer to digit 14 of the Model Number.

To prevent tube damage by erosion, install a strainer in the evaporator water inlet piping.

Condenser Piping Components

"Piping components" include all devices and controls used to provide proper water-system operation and unit operating safety. These components and their general locations are given below.

Entering condenser-water piping
- Air vents (to bleed air from system)
- Water pressure gauges manifolded with shut-off valves
- Pipe unions
- Vibration eliminators (rubber boots)
- Shut-off (isolation) valves. One per pass
- Thermometers
- Cleanout tees
- Pipe strainer
- Flow switch

Leaving condenser-water piping
- Air vents (to bleed air from system)
- Water pressure gauges with manifolded shut-off valves
- Pipe unions
- Vibration eliminators (rubber boots)
- Shut-off (isolation) valves. One per pass
- Thermometers
- Cleanout tees
- Balancing valve
- Pressure relief valve.

⚠ CAUTION

To prevent condenser damage, do not exceed 150 psig [1035 kPa] water pressure for standard water boxes. The maximum pressure for high-pressure water boxes is 300 psig [2100 kPa]. Refer to digit 18 of the Model Number.

To prevent tube damage, install a strainer in the condenser water inlet piping.

To prevent tube corrosion, ensure that the initial water fill has a balanced pH.

Water Treatment

⚠ CAUTION

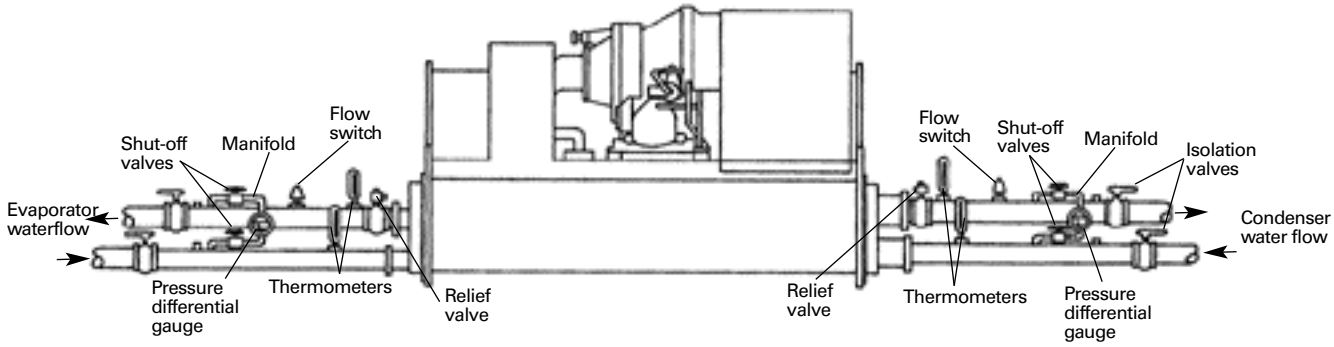
Water Treatment! Do not use untreated or improperly treated water. Use of untreated or improperly treated water may result in equipment damage.

Using untreated or improperly treated water in these units may result in inefficient operation and possible tube damage. Consult a qualified water-treatment specialist to determine whether treatment is needed. The following disclamatory label is provided on each CVGF unit:

The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae, or slime. The services of a qualified water-treatment specialist should be engaged to determine what treatment, if any, is advisable. The Trane Company warranty specifically excludes liability for corrosion, erosion, or deterioration of Trane equipment. Trane assumes no responsibility for the results of the use of untreated, improperly treated, saline, or brackish water.

Installation: Mechanical

Figure 11 – Typical Thermometer, Valving, and Manifold Pressure Gauge Set-Up



Water Pressure Gauges and Thermometers

Install field-supplied thermometers and pressure gauges (with manifolds whenever practical) as shown in Figure 11. Locate pressure gauges or taps in a straight run of pipe; avoid placement near elbows, and so forth. Be sure to install the gauges at the same elevation on each shell if the shells have opposite-end water connections.

To read manifolded water pressure gauges, open one valve and close the other (depending upon the reading desired). This eliminates errors resulting from differently-calibrated gauges installed at unmatched elevations.

Water Pressure-Relief Valves

⚠ CAUTION

Install a pressure-relief valve in both the evaporator and condenser water systems. Failure to do so could result in shell damage.

Install a water pressure-relief valve in one of the condenser, and one of the evaporator, water box drain connections, or on the shell side of any shut-off valve. Water vessels with close-coupled shut-off valves have a high potential for hydrostatic pressure buildup during a water temperature increase. Refer to applicable codes for relief-valve installation guidelines.

Flow-Sensing Devices

Use field-provided flow switches or differential pressure switches with pump interlocks to sense system water flow. Flow switch locations are schematically shown in Figure 11.

To provide chiller protection, install and wire flow switches in series with the water pump interlocks, for both chilled-water and condenser-water circuits (refer to the Installation Electrical section). Specific connections and schematic wiring diagrams are shipped with the unit.

Flow switches must stop or prevent compressor operation if either system water flow drops below the required minimum that is shown on the pressure drop curves. Follow the manufacturer's recommendations for selection and installation procedures. General guidelines for flow switch installation are outlined below.

- Mount the switch upright, with a minimum of 5 pipe diameters of straight, horizontal run on each side.
- Do not install close to elbows, orifices, or valves.

NOTE: The arrow on the switch must point in the direction of the water flow.

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

NOTE: The UCP2 provides a six-second time delay on the flow switch input before shutting down the unit on a loss-of-flow diagnostic. Contact a qualified service organization if nuisance machine shutdowns persist.

- Adjust the switch to open when water flow falls below nominal. Refer to the General Data table (Table 2) in Section 1 for minimum flow recommendations for specific water-pass arrangements. Flow switch contacts are closed when there is proof of water flow.

Installation: Mechanical

Refrigerant Pressure-Relief Valve Venting

⚠ WARNING

To prevent injury or death due to inhalation of HFC-134 gas, do not discharge refrigerant indoors.

If multiple chillers are installed, each unit must have separate venting for its relief valves. Consult local regulations for any special relief-line requirements.

NOTE: Vent pipe size must conform to the ANSI/ASHRAE Standard 15 for vent pipe sizing. All country, federal, state, and local codes take precedence over any suggestions stated in this manual.

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

All CVGF units use evaporator and condenser pressure-relief valves that must be vented to the outside of the building.

Relief-valve connection sizes and locations are shown in the unit submittals. Refer to local codes for relief-valve vent line sizing information.

⚠ CAUTION

Do not exceed vent piping code specifications. Failure to heed specifications could result in capacity reduction, unit damage, and/or relief valve damage.

After the relief valve has opened, it will reclose when pressure is reduced to a safe level. *Relief valves should be replaced if they have opened.*

NOTE: Relief valves tend to leak if they have opened and must be replaced.

Thermal Insulation

All CVGF units are available with optional factory-installed thermal insulation. If the unit is not factory insulated, install insulation over the areas shaded in Figure 12. Refer to Table 13 for types and quantities of insulation required. All CVGF units come from the factory with oil sump insulation.

NOTES: Refrigerant charging valves, water temperature sensors, and drain and vent connections, when insulated, must remain accessible for service.

Use only water-base latex paint on factory-applied insulation. Failure to do so may result in insulation shrinkage.

More (thicker) insulation may be required in areas with high humidity.

Installation: Mechanical

Figure 12 – Typical CVGF Insulation Requirements

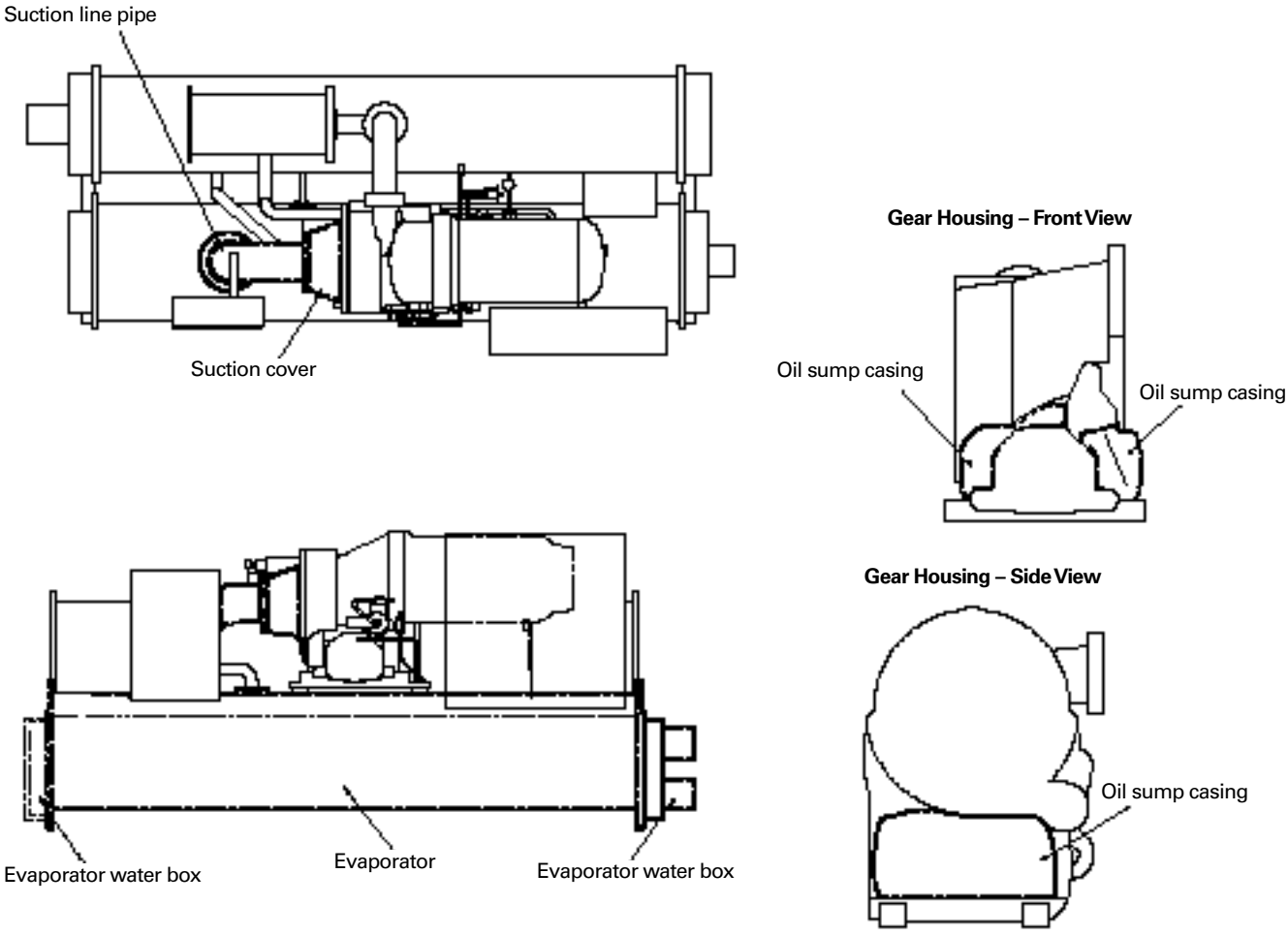


Table 13 – Recommended Insulation Types

Location	Type	Square Feet (Square m)
1	3/4" wall [19 mm]	160 [15]
2	3/4" wall [19 mm]	20 [2]
3	3/4" wall [19 mm]	10 [1]

1 = evaporator, water boxes and tube sheets
2 = compressor suction elbow and suction cover
3 = all components and piping on low side of system

NOTE: Units in environments with higher humidity may require thicker insulation.

Installation: Electrical

General Recommendations

For proper electrical component operation, do not locate the unit in areas exposed to dust, dirt, corrosive fumes, or excessive humidity. If any of these conditions exist, corrective action must be taken.

⚠ WARNING

Hazardous Voltage! Disconnect all electrical power, including remote disconnects, before servicing. Failure to disconnect power before servicing can cause severe personal injury or death.

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

⚠ CAUTION

Use copper conductors only! Unit terminals are not designed to accept other types of conductors. Failure to do so may cause damage to the equipment.

Do not allow conduit to interfere with other components, structural members, or equipment. All conduit must be long enough to allow compressor and starter removal.

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

Power Supply Wiring

Model CVGF chillers are designed according to NEC Article 310-15 or EN 60-204-1 for Europe; therefore, all power supply wiring must be sized and selected accordingly by the project engineer.

For a complete discussion on the use of conductors, see Trane Engineering Bulletin EB-MSCR-40.

Refer to Trane Engineering Bulletin CTV-EB-93 for power wire sizing.

Water Pump Power Supply
Provide power supply wiring with fused disconnect for both the chilled water and condenser water pumps.

Electrical Panel Power Supply
Power supply wiring instructions for the starter/control panel are:

1. Run line voltage wiring in conduit to access opening(s) on starter/control panel or pull-box. See Trane CTV-EB-93 for wire sizing and selection information. Always refer to submittal information for your actual unit specifications.

Temperature Sensor Circuits

1. All temperature sensors are factory installed except the optional outdoor air-temperature sensor. Mount this sensor in the fresh-air intake, or on the north wall of the building out of direct sunlight.
2. If the leads on the sensor do not reach all the way back to the UCP2:
   (a) Route the sensor leads to a junction box mounted in a convenient location.
   (b) Splice the leads to 14-18 AWG, 600 V wire of sufficient length inside the junction box.
   (c) Route the added length of wire to the UCP2 in conduit (unless it is shielded).
   (d) All temperature lead wires are to be twisted pair unless installed in conduit.
3. Attach the outdoor air-temperature sensor wires at 1U1-J5-5 and -6.

Note: If shielded cable is used to extend the sensor leads, be sure to tape off the shield wire at the junction box and ground it at the UCP2. If the added length is run in conduit, do not run it in the same conduit with other circuits carrying 30 or more volts.

⚠ CAUTION

DO NOT ROUTE LOW-VOLTAGE SENSOR LEADS WITH OTHER CONDUCTORS CARRYING 30 OR MORE VOLTS. Doing so can result in sensor malfunction due to electrical noise.

4. All of the water temperature sensors used in the UCP2 control system are accurate to within ±1.0°F [0.5°C], and are "matched" pairs.

   The term "matched sensor pair" indicates that both sensors in a given pair have the same accuracy. For example, a sensor that registers a temperature that is 0.5°F [0.3°C] higher than the "actual" value guide is paired with another sensor that also registers 0.5 high.

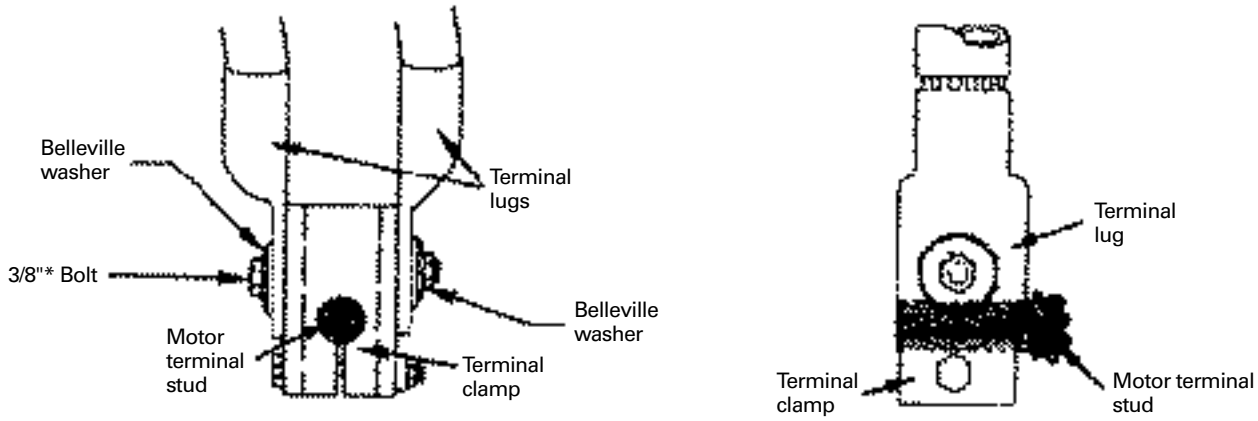
   If entering-and leaving-water temperature sensors are not "matched," the accuracy of the temperature readings displayed on the face of the UCP2 is reduced.

Installation: Electrical

Optional Relay Circuits

Optional Control/Output Circuits:
Install various optional wiring as required by the owner's specifications.

Figure 13 – Terminal Stud, Clamp, and Lug Assembly



* Note: Must be 3/8" - Grade 8 bolt

UCP2 Electrical Specifications

Following is a list of constraints for the UCP2 in the control panel:

1. Note that the control panel is designed to receive input from the secondary of a power transformer in the starter panel.
2. Nominal Voltage: 115 Vac, with operating range of 98 to 132 Vac, inclusive.
3. Maximum VA: 3.0 kVA (20 amp fuse).
4. Power input wiring must be at least 6" [152 mm] from low-voltage, less than 30 V wiring.
5. All signal inputs are low-voltage, less than 30 V.
6. UCP2 Storage Range: -40 to 158°F [-40° to 70°C], in other words, not applicable for chiller.

Installation: Electrical

Control Circuit Wiring

Interlock circuits

Chilled water flow. Wire the evaporator-water pump contactor (5K1) to a separate 115-volt, single-phase power supply with 14 AWG, 600-volt copper wire or equivalent, then connect this circuit to 1U1-J12-1 and 2. This will allow the UCP2 to control the evaporator water pump. Alternately, wire the 5k1 contactor to operate the evaporator water pump remotely and independently of the UCP2.

Wire the auxiliary contacts of the evaporator-water pump contactor (5K1) in series with the flow switch (5S1) installed in the evaporator supply pipe. Use 14 AWG, 600-volt copper wire or equivalent.

Connect this circuit to UCP2 terminals 1TB1-10 and 12.

When installed properly, the chilled-water interlock circuit will only allow compressor operation if the evaporator pump is running and is providing at least the minimum water flow required.

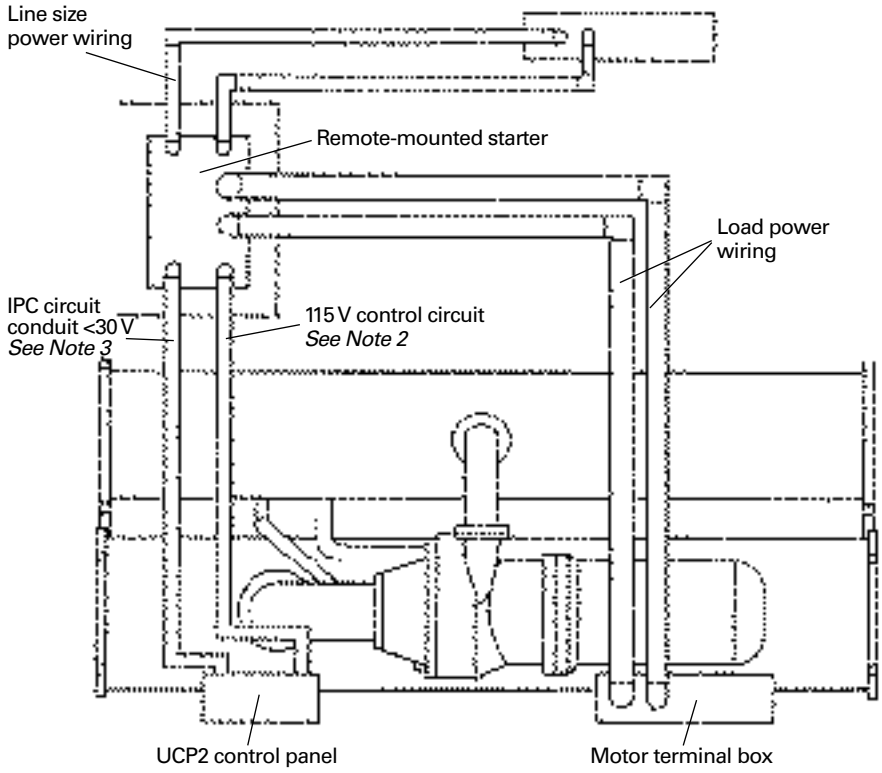
Condenser water flow. Wire the condenser-water pump contactor (5K2) to a separate 115-volt, single-phase power supply with 14 AWG, 600-volt copper wire or equivalent; then connect this circuit to UCP2 terminals 1U1-J14-1 and 2.

Next, use 14 AWG, 600-volt copper wire to connect the auxiliary contacts of the condenser-water pump contactor (5K2) in series with the flow switch (5S2) installed in the condenser supply pipe.

Connect this circuit to UCP2 terminals 1TB-11 and -13.

When installed properly, the condenser-water interlock circuit will only allow the compressor to operate if the condenser pump is running and providing at least the minimum water flow required.

Figure 14 – Typical Equipment Room Layout with Remote-Mounted Wye-Delta Starter



NOTE: There should be no piping or conduit located over the compressor motor

⚠ CAUTION

Do not route control circuit conduit into the top of the UCP2 enclosure. Failure to follow the above caution could result in damage to the UCP2 components.

Notes for Figure 14:

1. Refer to the unit field connection diagram for approximate UCP2 knockout locations.
2. 115-volt conduit must enter the left back portion of the UCP2.
3. IPC circuit conduit must enter the left-hand back portion of the UCP2.
4. See starter submittal drawing for location of incoming wiring to the starter.

Installation: Electrical

Interconnecting Wiring

Typical equipment-room conduit layouts without and with unit-mounted starters are shown in Figure 14 and Figure 15, respectively.

Remember that the interconnecting wiring between the starter panel, compressor, and UCP2 control panel is factory-installed with a unit-mounted starter, but must be field-installed when a remote-mounted starter is used.

⚠ CAUTION

To Prevent Damage to UCP2 Components, do NOT route control circuit conduit to the top of the UCP2 enclosure.

Optional PFCCs

Power-factor correction capacitors (PFCCs) are designed to provide power-factor correction for the compressor motor. They are available as an option.

Note: Remember that the PFCC nameplate voltage rating must be greater than, or equal to, the compressor voltage rating stamped on the unit nameplate. See Table 14 to determine what PFCC design voltage is appropriate for each compressor voltage application.

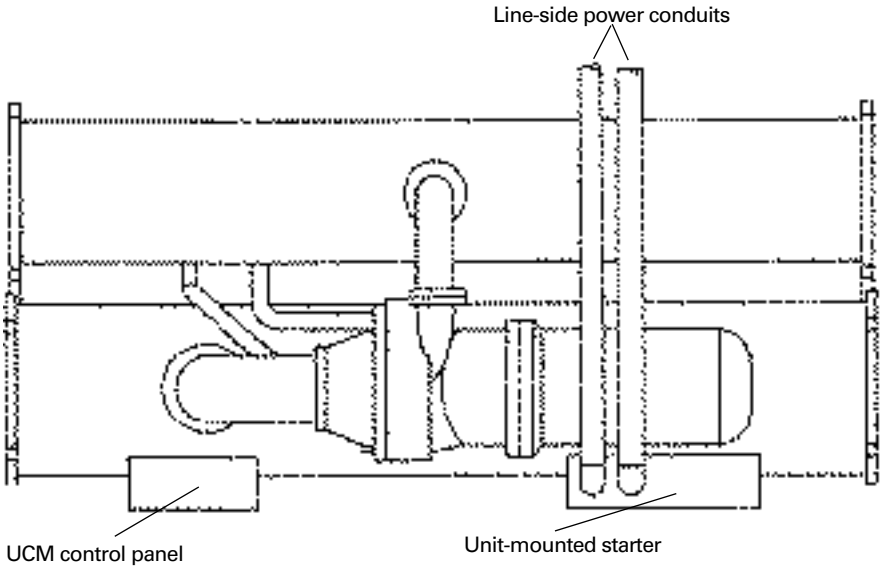
⚠ CAUTION

PFCCs MUST BE WIRED INTO THE STARTER CORRECTLY! Misapplication of these capacitors could result in a loss of motor overload protection and subsequently cause motor damage.

Table 14 – PFCC Sizing for Compressor Voltage Application

PFCC Design Voltage	Compressor Motor Rating (See Unit Nameplate)
480V/60Hz	380V/60Hz
	460V/60Hz
	480V/60Hz
600V/60Hz	575V/60Hz
4160V/60Hz	3300V/60Hz
	4160V/60Hz
480V/50Hz	380V/50Hz
	400V/50Hz
	415V/50Hz
4160V/50Hz	3300V/50Hz
	6600V/50Hz

Figure 15 – Typical Equipment Room Layout with Unit-Mounted Wye-Delta Starter

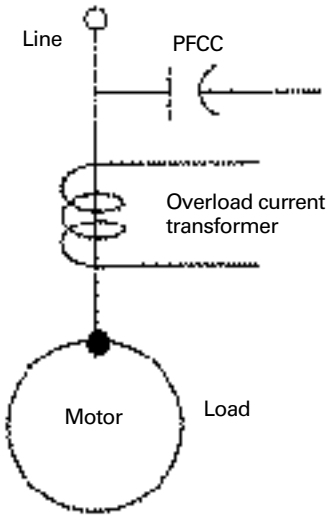


Note: There should be no piping or conduit located over the compressor motor.

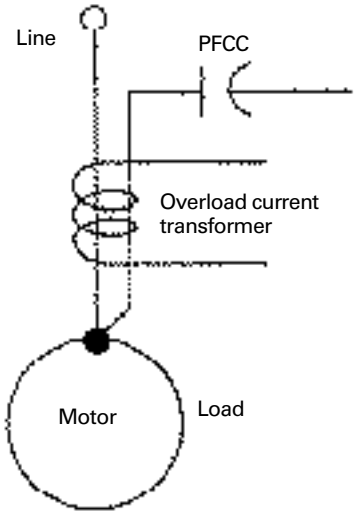
Note: See Starter submittal drawing for location of incoming wiring to the Starter.

Figure 16 – PFCC Leads Routed through Overload Current Transformer (Solid-State and Other Starters)

Solid-State



All Other Starters Electro-mechanical



Installation: Electrical

Starter to Motor (Remote-Mounted Starters only)

Ground-Wire Terminal Lugs. Ground-wire lugs are provided in the motor terminal box and in the starter panel.

Terminal Clamps. Terminal clamps are supplied with the motor terminals to accommodate either bus bars or standard motor-terminal wire lugs. Terminal clamps provide additional surface area to minimize the possibility of improper electrical connections.

Wire Terminal Lugs. Wire terminal lugs must be field-supplied.

1. Use field-provided, crimp-type wire terminal lugs properly sized for the application.

Note: Wire size ranges for the starter line and load-side lugs are listed on the starter submittal drawings supplied by the starter manufacturer and/or Trane. Carefully review the submitted wire lug sizes for compatibility with the conductor sizes specified by the electrical engineer or contractor.

2. A terminal clamp with a 3/8" bolt is provided on each motor terminal stud; use the factory-supplied Belleville washers on the wire lug connections.
3. Tighten each bolt to 24 pound-feet [33 Nm].
4. Install, but do not connect, the power leads between the starter and compressor motor. (These connections will be completed under the supervision of a qualified Trane service engineer, after the prestart inspection).

⚠ CAUTION

Ensure that the power supply wiring and output to motor wiring can be connected to the proper terminals.

Bus Bars. Install the bus bars between the motor terminals when a low-voltage "across the line", "primary reactor/resistor" or "auto transformer" is used.

Be sure to install jumpers from motor terminal T1 to T6, T2 to T4, and T3 to T5.

Note: Bus bars are not needed in high-voltage applications because only three terminals are used in the motor and starter.

Starter to UCP2 (Remote-Mounted Starters only)

Electrical connections required between the remote-mounted starter and the chiller control panel are shown in the wiring diagrams in the Appendix. An example of a point-to-point starter-to-UCP2 connection schematic is provided in the appendix to this manual.

Note: Install 10-gauge conduit between the right-hand back portion of the UCP2 (when facing the front of the UCP2) and the starter for the 115-volt circuits, and also between the left-hand back portion of the UCP2 and the starter for the Interprocessor Communication (IPC) control circuit.

When sizing and installing the electrical conductors for these circuits, follow the guidelines listed.

⚠ CAUTION

Remove debris from inside the starter panel. Debris may cause an electrical short that can seriously damage the starter components.

1. If the starter enclosure must be cut to provide electrical access, exercise care to prevent debris from falling inside the enclosure.
2. Use only shielded, twisted pair for the IPC control circuit between the starter and the UCP2 on remote mounted starters. Recommended wire is Belden Type 8760, 18 AWG or equivalent, for runs up to 1000 feet [305 m].

Note: the polarity of the IPC wire pair is critical for proper operation.

3. Separate low-voltage (less than 30 V) wiring from the 115 V wiring by running each in its own conduit.
4. As you route the IPC control circuit out of the starter enclosure, make sure that it is at least 6" [152 mm] from all wires that carry a higher voltage, for example, 115 V.
5. For UCP2 IPC shielded, twisted-pair wiring, the shield should be grounded on one end only, at the UCP2. The other end should be unterminated and taped back on the cable sheath, to prevent any contact between shield and ground.

⚠ CAUTION

Maintain at least 6" [152 mm] between low-voltage (<30 V) and 115 V circuits.

Failure to do so could result in electrical noise that may distort the signals carried by the low-voltage wiring, including the IPC.

Overload Setting for Oil Pump Motor
Verify that the overload is set between 100-113% of the nameplate amps of the motor.

Installation: Electrical

Power Supply Wiring

To ensure that power supply wiring to the starter panel is properly installed and connected, review and follow the guidelines outlined below.

3-Phase Power Source

1. Verify that the starter nameplate ratings are compatible with the power supply characteristics and with the electrical data on the unit nameplate.
2. If the starter enclosure must be cut to provide electrical access, exercise care to prevent debris from falling inside the enclosure. If the starter cabinet has a removable panel, be sure to remove the panel from the unit before drilling holes.
3. Use copper conductors to connect the 3-phase power supply to the remote or unit-mounted starter panel.

⚠ CAUTION

To avoid corrosion or overheating, use only copper conductors for terminal connections.

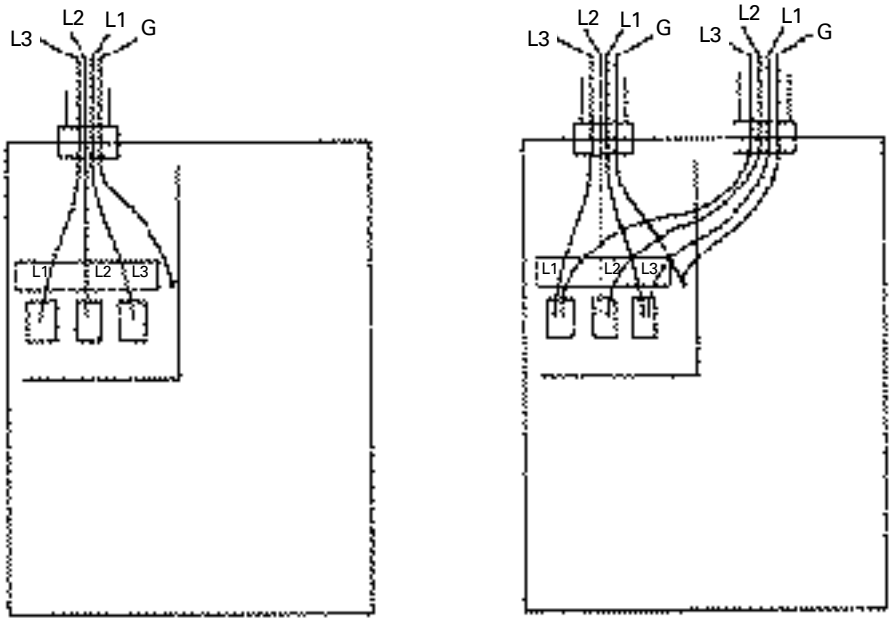
4. Size the power supply wiring in accordance with the NEC, using the RLA value stamped on the chiller nameplate and the control power load on L1 and L2.
5. Make sure that the incoming power wiring is properly phased; each power supply conduit run to the starter must carry the correct leads to ensure equal phase representation. See Figure 17.
6. As you install the power supply conduit, make sure that this position does not interfere with the serviceability of any of the unit components, or with structural members and equipment.

Also, ensure that the conduit is long enough to simplify any servicing that may be necessary in the future (for example, starter removal).

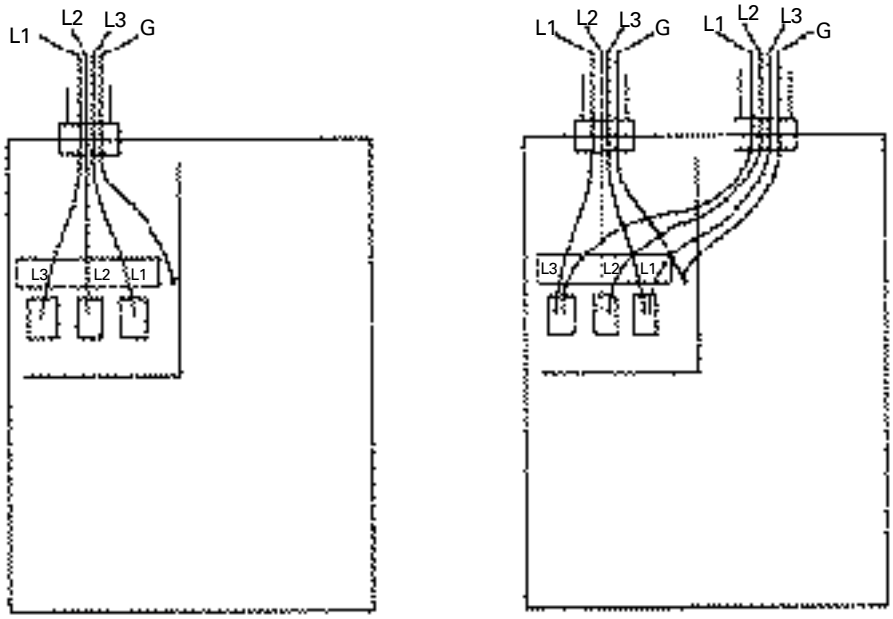
Note: Use flexible conduit to enhance serviceability and minimize vibration transmission.

Figure 17 – Proper Phasing for Starter Power-Supply Wiring

Unit-Mounted Starters



Remote-Mounted Starters



Installation: Electrical

Circuit Breakers and Fusible Disconnects
In compliance with the NEC or local guidelines, size the circuit breaker or fused disconnect to the chiller-nameplate maximum fuse size or maximum circuit-breaker size marking.

Other Supply Power Components

Fused Disconnect Switches
Size fused disconnect switches in accordance with NEC Article 440-22(a).

Compressor-Motor Power Wiring
Provide line voltage wiring from the starter panel to the proper terminals in the compressor-motor junction box. See Trane CTV-EB-93 for power-wire sizing information.

Terminal Lugs
Proper starter-panel, line-side lug sizes are specified on the starter submittals. These lug sizes must be compatible with conductor sizes specified by the electrical engineer or contractor. Appropriate lug sizes are provided.

Rated Load Ampacity (RLA)
The compressor motor RLA for a particular chiller is determined by the field selection program and indicated on the compressor nameplate.

Minimum Circuit Ampacity (MCA)
The MCA is equal to 1.25 × the compressor RLA (on nameplate).

Maximum Fuse or Circuit Breaker Size
The maximum fuse/circuit breaker size is equal to 2.25 × the compressor RLA ,in accordance with UL 1995, paragraph 36.15, or equivalent standards.

The recommended dual element (RDE) fuse size is equal to 1.75 × RLA, in accordance with NEC Table 430-152 or equivalent standards.

Compressor Motor Phase Sequencing

Always verify proper rotation of the CVGF compressor, using the following bump-start procedure, before the unit is started after any power wiring changes.

⚠ CAUTION

The following procedure is a requirement prior to the first start of the chiller. Failure to complete this procedure may result in damage to the compressor and void warranty.

1. Complete all UCP2 control settings.
2. Ensure that water flows in the condenser and evaporator are correct per the pre-commissioning procedures.
3. Ensure that the unit has been charged with the correct amount of refrigerant and oil, and that the oil is at the correct operating temperature.
4. Complete a phase-rotation test if the voltage is less than 600 volts.

The following checks will require two people to complete. During the bump start of the compressor, one person will be required to look at the rotor from the rear of the motor, through the sight glass, for correct direction. Looking at the sight glass, the direction must be counterclockwise. Do not check the rotation of the motor after the start sequence has been completed, as the indication may be incorrect.

With the voltage applied to the mains on the starter, place the chiller in Auto mode.

After the pre-lube is complete, let the starter energize the motor, permitting a start.

After three seconds, activate the Emergency Stop by pressing the Stop button twice in quick succession. During this three second period, the rotor should be seen to rotate counterclockwise.

If the direction is incorrect, the mains cabling must be isolated from the power source, and two legs swapped, to get the correct direction of rotation. Instead of just swapping, check the wiring per the schematic: L1 must go to T1, and so forth; recheck power supply phasing.

Installation: Electrical

Solid-State Starters

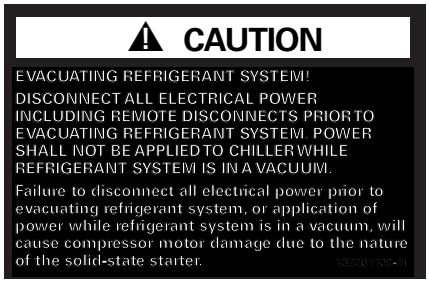
Precautions When Using Solid-State Starters

When using solid-state starters, there are two precautions that servicing personnel need to be aware of.

STARTER AND MOTOR TERMINALS REMAIN "HOT" AT HIGH VOLTAGE EVEN WHEN MOTOR AND STARTER ARE "OFF."

Be Certain To Disconnect All Power To The Unit Before Performing Any Work In The Starter Panel.

Figure 18 – Caution label on starter panels equipped with solid-state starters



Contacting any of the motor terminals, even with the motor off, can cause a severe, potentially fatal, shock.

IMPORTANT! WHEN EVACUATING THE CHILLER'S REFRIGERANT SYSTEM, ALWAYS HAVE THE MAIN POWER DISCONNECT OR CIRCUIT BREAKER OPENED.

Even when the compressor is not running, voltage is present at the compressor motor terminals, providing the potential for current to flow.

As the chiller is evacuated below atmospheric pressure, the dielectric strength (resistance to arcing) of the gaseous atmosphere is significantly reduced. Because the SCRs are connected "inside the delta," three of the motor terminals are connected at the line voltage. An "arc over" can occur between motor terminals under conditions that occur in the evacuation process. If this occurs, the circuit breaker (or other external protective devices) will trip, in response to high fault currents, and motor damage may also occur. This can be avoided by being certain that the chiller is **fully disconnected from all power sources before beginning pumpdown or evacuation procedures**, and also guaranteeing that the disconnect **cannot be accidentally closed** while the chiller is in a vacuum.

Module Connections for Interconnecting Wiring

CAUTION

Plugs and jacks must be clearly marked before disconnecting, because specific plugs will fit into other jacks. Possible damage to equipment may occur if the plugs are reversed with the jacks.

All connectors can be unplugged or the wires can be removed from the screw assembly. If an entire plug is removed, make sure that the plug and the associated jack are marked for proper location identification during reinstallation.

Interconnecting Wiring (Field Wiring Required)

Important: *Do not turn chiller on or off using the chilled-water pump interlocks.*

When connecting wires in the field, refer to the appropriate field layout, wiring, schematics, and controls diagrams that ship with the unit. The diagrams included at the end of this manual are typical only, and may not match the unit.

Whenever a contact closure (binary output) is referenced, the electrical rating is:

Table 15 – Electrical Rating for Interconnecting Wiring

At 115 Vac	7.2 amp resistive
	2.88 amp pilot duty
	1/3 hp, 7.2 FLA, 43.2 LRA
At 240 Vac	5.0 amp resistive
	2.0 amp pilot duty
	1/3 hp, 3.6 FLA, 21.6 LRA

Whenever a dry-contact input (binary input) is referenced, the electrical rating is 24 VDC, 12 mA.

Whenever a control-voltage contact input (binary input) is referenced, the electrical rating is 115 Vac, 5 mA.

NOTE: Asterisked connections require the user to provide an external source of power. The 115 V control power transformer is not sized for any additional load.

Chilled-Water Pump Control*

The chiller module (1U1) provides a contact closure output (J12-1, J12-2) to control the chilled-water pump starter. This contact closure pulls in when the external auto-stop input is closed and mode is Auto, and opens when the timeout period, specified in the Service Settings group, expires, after the external auto-stop input opens or the Auto mode is exited.

Installation: Electrical

Chilled-Water Flow Interlock
The chiller module (1U1) requires a control-voltage contact input (1TB1-10), through a flow proving switch (5S1) and an auxiliary contact (5K1 AUX) from the chilled-water pump starter that provides proof of flow.

IMPORTANT! DO NOT cycle the chiller by starting and stopping the chilled water pump. This will cause the compressor to shut down fully loaded. Use the external stop/start input to cycle the chiller.

Condenser-Water Pump Control*
The chiller module (1U1) provides a contact-closure output (J14-1, J14-2) to control the condenser-water pump starter. This contact closure pulls in any time the UCP2 generates a need for cooling, based on the leaving chilled-water temperature versus set point, and opens when the compressor is stopped.

Condenser-Water Flow Interlock
The chiller module (1U1) requires a control-voltage contact input (1TB1-11), through a flow-proving switch (5S2) and an auxiliary contact (5K2 AUX) from the condenser-water pump starter that provides proof of flow.

NOTE: The following three connections have programmable functions. Each relay can be configured individually as an alarm contact, compressor contact, or a limit warning contact. Their default functions are described as follows.

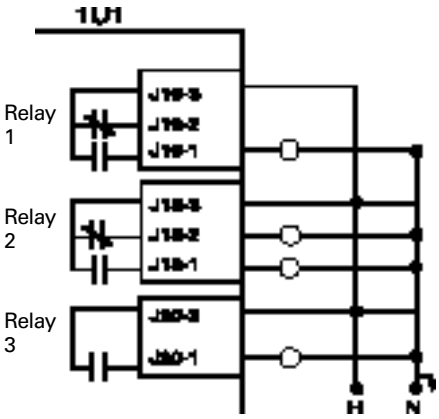
See Section 5, Service Settings, for details on other functions that can be assigned to these contacts.

Relay 1 - Programmable*
The chiller module (1U1) provides normally-open (J16-3, J16-1) and normally-closed (J16-3, J16-2) contact closure outputs that may be used to remotely indicate the compressor is running, in any mode except Run Unload.

Relay 2 - Programmable*
The chiller module (1U1) provides normally-open (J18-3, J18-1) and normally-closed (J18-3, J18-2) contact closure outputs that may be used to remotely indicate that a latching diagnostic exists.

Relay 3 - Programmable*
The chiller module (1U1) provides a normally-open (J20-2, J20-1) contact closure output that may be used to remotely indicate a load limit condition (condenser, evaporator, or current) existing for more than 20 minutes.

Figure 19 – CVGF Electrical Installation Programmable Relays



Customer-provided 115 Vac power;
Maximum fuse size: 15 amp

Outdoor Air Temperature Sensor
The chiller module (1U1) provides for connection (J5-5, J5-6) of an outdoor air temperature sensor (5RT1) that may be used for outdoor air chilled-water reset. The UCP2 contains the logic that is required, based on menu items selected, to perform these functions.

External Auto Stop
The chiller module (1U1) provides a dry contact input (J5-1, J5-2) that must be used to enable or disable the chiller from a remote location, unless a Tracer is performing this function. If this feature is not used, a jumper must be placed across this input. If the chilled-water pump is controlled by the UCP2 (chiller module J12-2, J12-1), the external auto-stop and the CLD Auto button will start and stop the pump as described above.

Emergency Stop
The chiller module (1U1) provides a dry contact input (J5-3, J5-4) that may be used to immediately shut the chiller down. If this feature is not used, a jumper must be placed across this input.

NOTE: A "panic" stop (similar to "emergency" stop) can be manually commanded using the Clear Language Display. If the STOP button is pressed twice in a row, the chiller will immediately shut down, but without creating a latching diagnostic.

The CLD Stop, Tracer, commanded stop, or External Auto-Stop are acceptable routine stops. In these cases, a pre-stop, run-unload period is allowed for the compressor to fully unload prior to shutdown.

Operation and diagnostics are discussed in detail in sections 5 and 10.

Installation: Electrical

External Base Loading
The chiller module (1U1) provides for external hard-wired control of the chiller in a mode known as "base loading."

Primarily for process control requirements, base loading provides for immediate start and loading of a chiller, up to an externally or remotely adjustable current-limit set point without regard to differential to start or stop, or to leaving-water temperature control. This allows the flexibility to prestart or preload a chiller in anticipation of a large load application. It also allows you to keep a chiller on line between processes when leaving water temperature control would normally cycle the unit.

This feature is controllable either through a Tracer communication interface or a 4-20 mA or 2-10 VDC hard-wired analog input (J7-11, J7-12) with a binary input (J7-1, J7-2) for enable/disable. When the binary input is closed, the base load function will be enabled and the chiller will attempt to start (subject to all normal safeties and interlocks). The chiller will then load up to a current-limit defined by the analog input. A 2 VDC or 4 mA input corresponds to a base load of 40% RLA, and a 10 VDC or 20 mA input corresponds to 100% RLA. Dip switch 1SW2-1 must be set ON for 4-20 mA operation.

Tracer-Controlled Contact
The options module (1A5) provides a Tracer-controlled relay normally-open contact closure output (J18-1, J18-3) and a normally-closed contact output (J18-2, J18-3). This feature can be used for any customer-specified requirement, by programming Tracer to control this relay.

External Chilled-Water Set point
The options module (1A5) will accept either a 2-10 VDC or a 4-20 mA input (J9-4, J9-5) signal, to adjust the chilled-water set point from a remote location. DIP switch 1SW3-1 must be set to ON for 4-20 mA or OFF for 2-10 VDC. The 2-10 VDC or 4-20 mA input corresponds to a 0 to 65°F [-18 to 18°C] chilled-water set point range, in other words, 2 VDC or 4 mA corresponds to 0°F [-18°C] and 10 VDC or 20 mA corresponds to 65°F [18°C].

Both external chilled-water set point and current-limit set point must use the same input type. External chilled-water set point input may be installed and the type selected in the UCP2 machine configuration group.

External Current Limit Set Point
The options module (1A5) will accept either a 2-10 VDC or a 4-20 mA input (J7-11, J7-12) signal to adjust the current-limit set point from a remote location. DIP switch 1SW2-1 must be set to ON for 4-20 mA or OFF for 2-10 VDC. The 2-10 VDC or 4-20 mA input corresponds to a 40-120 percent current-limit set point range, in other words, 2 VDC or 4 mA corresponds to 40 percent and 10 VDC or 20 mA corresponds to 120 percent (UCP2 will limit to 100%).

Both external chilled-water set point and current-limit set point must use the same input type. External current-limit set point input may be installed and the type selected in the UCP2 machine configuration group.

Tracer Temperature-Sensor Option
The options module (1A5) accepts input (J7-7, J7-8) from a temperature sensor (5RT1) that may be used by Tracer for chilled-water reset, ambient lockout, or other user-specified functions performed by the Tracer logic.

Refrigerant Condenser-Pressure Output
This analog output may be used to indicate either percent condenser pressure or refrigerant differential pressure.

The circuit module (1A5) provides a 2-10 VDC output (J7-1, J7-2) signal that is proportional to the percent condenser pressure. At 2 VDC output, the condenser pressure is 0 psia [0 kPa] (0%) and at 10 VDC output, the condenser pressure is equal to the high-pressure cutout (psia) (100%) specified in the UCP2 machine configuration group. This output may be used for any user-specified function such as cooling-tower water temperature control or input to a generic building automation system. Note that in many applications such as tower control, events must take place before reaching either end of the scale, and an appropriate band must be selected for proper, steady control. Refer to the instructions supplied with the controlled device for setup.

Refrigerant Differential Pressure Indication
The transfer function is 2 to 10 VDC, corresponding to the menu entered "Minimum Delta Pressure Calibration" setting to the menu entered "Max Delta Pressure Calibration" setting. The Minimum Delta Pressure Calibration setting has a range of 0-400 psid [7-2758 kPa] in increments of 1 psid [1 kPa]. The Max Delta Pressure Calibration setting has a range of 1-400 psid [7-2758 kPa] in increments of 1 psid [1kPa].

The condenser-refrigerant pressure is based on the condenser-refrigerant pressure sensor if the condenser pressure option is selected as "installed" at the CLD. The condenser-refrigerant pressure is based on the saturated condenser-refrigerant temperature sensor if the condenser pressure option is selected as "Not Installed" at the CLD. The evaporator-refrigerant pressure is based on the saturated evaporator-refrigerant temperature sensor.

Compressor Percent RLA Output
The options module (1A5) provides a 2-10 VDC output (J7-3, J7-4) signal that is proportional to the percent compressor RLA. 2 VDC equals 40% RLA and 10 VDC equals 120% RLA.

Operating Principles: Mechanical Specifications

This section contains an overview of the operation and maintenance of CVGF chillers equipped with microcomputer-based control systems. It describes the overall operating principles of the CVGF design.

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

Refrigeration Cycle

The refrigeration cycle of the CVGF chiller is conceptually similar to that of other Trane centrifugal chiller products. It makes use of a shell-and-tube evaporator design, with refrigerant evaporating on the shell side and water flowing inside tubes that have enhanced heat-transfer surfaces.

The compressor is a two-stage centrifugal compressor. The motor is a liquid-refrigerant-cooled motor that operates at economizer temperature under continuous full-and part-load operating conditions. An oil management system provides oil-free refrigerant to the shells to maximize heat-transfer performance, while providing lubrication to gears and bearings. The lubrication system ensures long compressor life and contributes to quiet operation.

Calibrated orifice devices maintain pressure differential, and meter refrigerant flow from the condenser to the evaporator.

A unit-mounted (UCP2) control panel on every chiller provides accurate chilled-water control as well as monitoring, protection, and adaptive limit functions. The adaptive nature of the controls intelligently prevents the chiller from operating outside of its limits and compensates for unusual operating conditions, while keeping the chiller running rather than automatically tripping due to a safety. When problems do occur, diagnostic messages provide ease of troubleshooting.

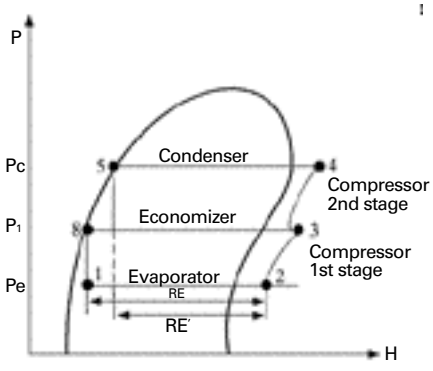
Cycle Description
The refrigeration cycle of the CVGF chiller can be described using the pressure–enthalpy diagram shown in Figure 20. Key state points are indicated and will be referred to in the following discussion. A schematic of the system, illustrating refrigerant flow, is given in Figure 21.

Evaporator: A liquid–vapor refrigerant mixture enters the evaporator at state point 1. Liquid refrigerant is vaporized to state point 2 as it absorbs heat from the system cooling load. The vaporized refrigerant flows into the compressor first-stage.

Compressor first-stage: Refrigerant vapor is drawn from the evaporator into the first-stage compressor. The first-stage impeller accelerates the vapor increasing its temperature and pressure to state point 3.

Compressor second-stage: Refrigerant vapor leaving the first-stage compressor is mixed with cooler refrigerant vapor from the economizer. This mixing lowers the enthalpy of the vapor entering the second-stage. The second-stage impeller accelerates the vapor, further increasing its temperature and pressure to state point 4.

Figure 20 – P-h Chart



Condenser: Refrigerant vapor enters the condenser where the system cooling load and heat of compression are rejected to the condenser water circuit. This heat rejection cools and condenses the refrigerant vapor to a liquid at state point 5.

Economizer and refrigerant orifice system: Liquid refrigerant leaving the condenser at state point 5 flows through the first orifice and enters the economizer, flashing a small amount of refrigerant at an intermediate pressure labeled P1. Flashing some liquid refrigerant cools the remaining liquid to state point 8.

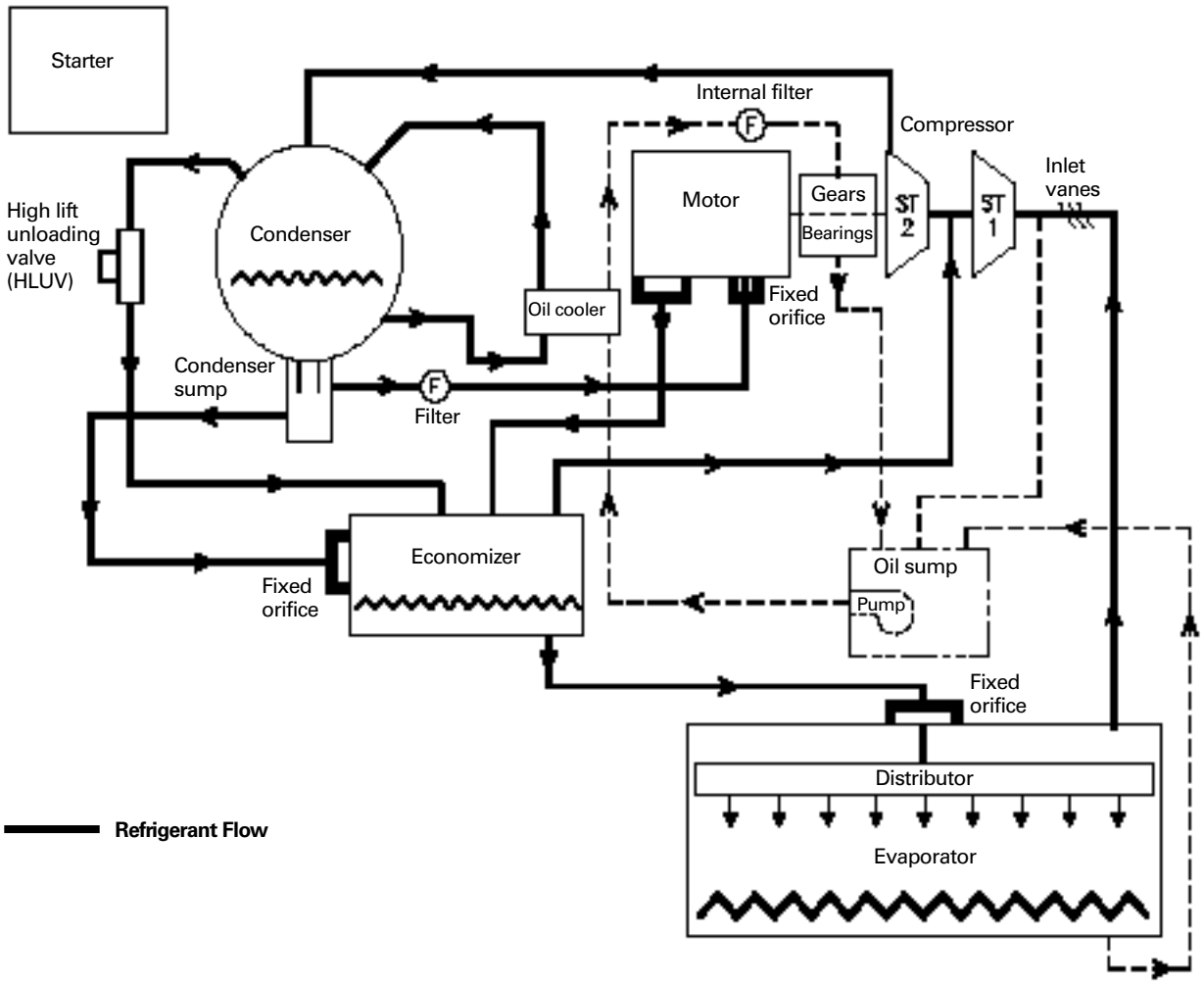
Another benefit of flashing refrigerant is to increase the total evaporator refrigeration effect from RE' to RE. The economizer provides around 4 percent energy savings compared to chillers with no economizer.

To complete the operating cycle, liquid refrigerant leaving the economizer at state point 8 flows through a second orifice. Here, refrigerant pressure and temperature are reduced to evaporator conditions at state point 1.

An innovative design feature of the CVGF chiller is maximizing the evaporator heat-transfer performance while minimizing refrigerant-charge requirements. This is accomplished by the Trane-patented falling film evaporator design. The amount of refrigerant charge required in CVGF is less than that in comparably-sized chillers of flooded evaporator design.

Operating Principles: Mechanical Specifications

Figure 21 – Refrigerant Flow Diagram



Operating Principles: Mechanical Specifications

Compressor Description

The CVGF compressor consists of three distinct sections: the two-stage centrifugal compressor, the motor, and the gear box with integral oil sump. See Figure 22.

Compressor
The centrifugal compressor is two-stage, with high-strength aluminum alloy fully-shrouded impellers. The impellers are tested at 25 percent over design operating speed. The rotating assembly is dynamically balanced for vibration of less than 5.1 mm/second (0.2 ips peak velocities) at nominal operating speeds. The control system affords 100-20 percent capacity modulation using electrically actuated guide vanes upstream of each impeller.

Drive Train
The drive train consists of helical bull-and-pinion gears. Gear tooth surfaces are case hardened and precision ground. The one-piece impeller shaft is supported by hydrodynamic thrust and radial bearings.

Motor
The motor is a hermetic, liquid-refrigerant-cooled, two-pole, low-slip squirrel cage induction motor. A radial hydrodynamic bearing and duplex angular-contact ball bearings support the rotor assembly. Winding-embedded sensors provide positive thermal protection.

High-Lift Unloading Valve (HLUV)

A high-lift unloading valve is standard equipment on the 400 and 500 ton CVGF units. This is a solenoid valve located between the condenser and the economizer, which, when energized, allows refrigerant gas to flow from the condenser to the economizer. The valve is either open or closed with no modulation capability. This valve allows smooth operation while unloading down to a minimum load without requiring condenser relief.

Operation of HLUV
The following equation is used to establish when the HLUV is energized for the CVGF.

Trigger IGV% =
(A × Lift) + (B × CPIM) + C

Constants A, B, and C are based on unit size (NTON) and are shown in Table 16. Lift is calculated by the UCP2 and is the difference between saturated condensing and evaporating temperatures. CPIM is the compressor impeller size and is input through the CLD of the UCP2 in the machine configuration group menu.

Table 16 – Coefficients for HLUV Control and IGV Limit

NTON	A	B	C
400	0.98	-0.065	57.9
500	0.98	-0.065	55.9
650	0.98	-0.065	61.5
800	0.98	-0.065	61.5
1000	*	*	*

*Not Available

When the chiller is unloading (detected by the chilled-water temperature being at least 0.5°F [0.28°C] below the chilled-water set point) with insufficient head relief and the IGV position declines to this trigger value, the HLUV will be energized (opened). Note that the requirement of chilled-water temperature being 0.5°F [0.28°C] below set point will prevent the HLUV from opening on chiller start-up. This will cause condenser gas to flow into the economizer and increase the second-stage compressor gas flow, stabilizing the flow within the compressor.

Further unloading (reducing the IGV position) is performed until the IGV reaches 60% of the trigger IGV% (called Limit IGV%), at which time further unloading is prevented (unless the chiller is operating in a higher level mode such as high condenser limit). This limiting of the IGV reduction is done because of the size of the valve. Therefore, Limit IGV% = 60% of Trigger IGV%. With increasing load, the HLUV will be de-energized (closed) when IGV position reaches Trigger IGV% + 5%.

In this example:

Assume a 500-ton chiller with a CPIM of 960. The unit is operating at 500 tons, without condenser (head) relief, at a saturated evaporator temperature of 40°F [4.4°C] and a saturated condenser temperature of 90°F [32°C]. The lift is therefore 50°F [10°C] (90 - 40). Thus,

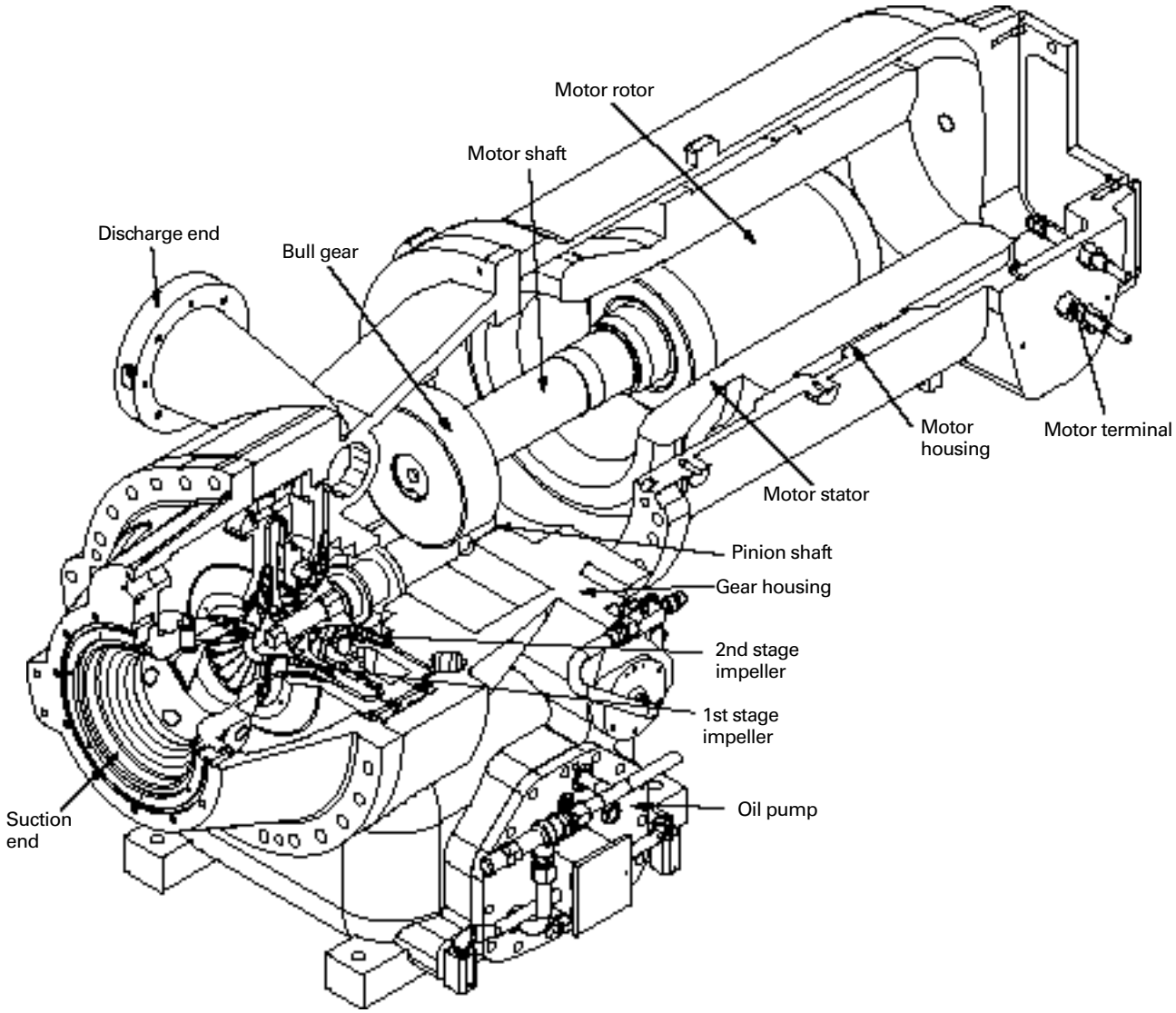
the trigger IGV% = (0.98 × 50) - (0.098 × 960) + 87.94

or 42.86%

As the chiller unloads, the inlet guide vanes (IGV) will start closing. When the inlet guide vanes reach 42.86%, the HLUV will be energized (opened). Unloading can continue decreasing to Limit IGV% of 25.72% (Limit IGV% = .60 * Trigger IGV%), at which time shutdown will occur if the load continues to drop. If unloading does not proceed that far and the load pickup begins, the HLUV will remain open until the IGV percentage reaches 47.86% (42.86 + 5), at which time the HLUV will close and remain closed until the IGV percentage again falls to 42.86%.

Operating Principles: Mechanical Specifications

Figure 22 – Compressor Cross-Section View



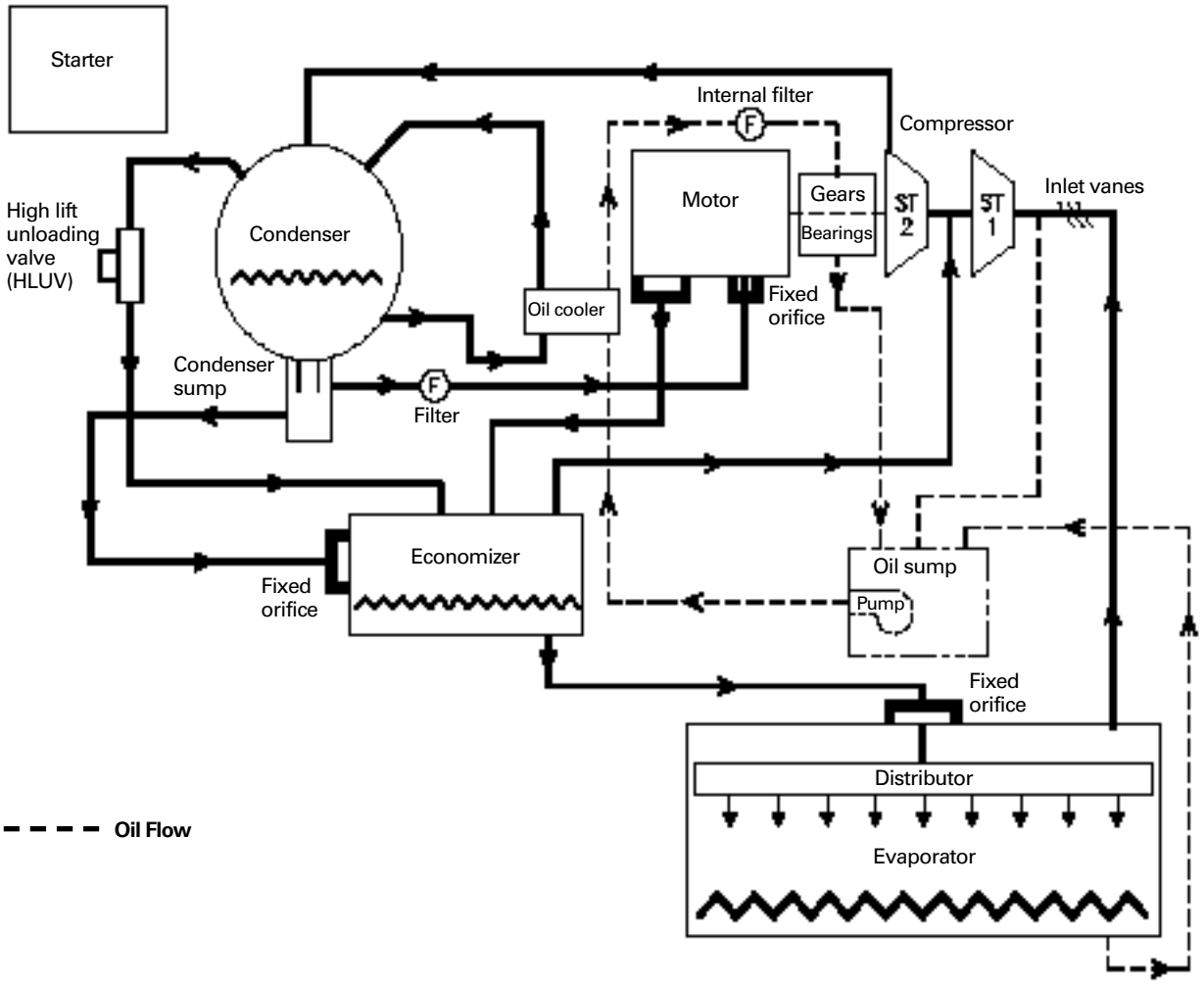
Operating Principles: Mechanical Specifications

Oil Management System

The compressor and motor bearings are pressure-lubricated by an oil pump and electric motor located in the integral compressor oil sump. See Figure 23. Oil under pressure is also sprayed over the compressor gears.

During operation, oil is supplied to the bearings and gears through a thermosiphon-operated, brazed-plate heat exchanger to cool the oil. The oil is filtered with an internal replaceable 4-micron oil filter. The oil filter can be replaced without discharging the unit. A pressure-regulating valve controls the oil pressure and a pressure-differential switch provides protection to ensure lubrication to the bearings and gears. A temperature sensor in the oil sump provides high and low oil temperature protection.

Figure 23 – Oil Flow Diagram



Operating Interface: Controls

This section contains an overview of the operator interface for the CVGF chillers equipped with microcomputer-based control systems. It presents the array of options available using the Clear Language Display and the associated keypad.

The section is organized first as a discussion of the control system and the individual modules, showing their relationship and functions.

The remainder of the section presents information on accessing available chiller information, using the screens to either monitor or change settings and set points. This section covers information available to you by pressing each report key followed by the settings, tests, and diagnostics keys.

The display information is for reference only and is not in the form of sequential operating or controls instructions, although certain specific instructions as to programming and changing settings is given. In many cases, background information on specific key or controls functions is provided.

In all cases other than report data displays, caution should be observed before changing any parameters, until the impact of the change on chiller performance is understood.

IMPORTANT: When setting up the menus, first select the unit type CVGF in the machine configuration menu. After this is done, other menu items may be changed. Failure to follow this sequence may result in inappropriate menus being selected.

UCP2 Microprocessor Control System

The Unit Control Panel version 2 (UCP2) microprocessor control system is a collection of modules and software that perform system control, protection, and optimization functions for the CVGF chiller. All module control elements reside in the control panel, usually "stacked" on top of one another and mounted on the panel's backplane. Additionally, the Clear Language Display operator interface is mounted on the panel door.

The following paragraphs describe the modules and the specific chiller operating characteristics that are displayed and reported.

Chiller Module

The chiller module (1U1) is the central processing unit of the chiller, communicating commands to other modules and collecting data, status, and diagnostic information from other modules over the IPC (inter-processor communications) link. The chiller module performs the leaving chilled-water temperature and limit control algorithms, setting capacity against any operating limit constraining the chiller.

The chiller module contains non-volatile memory, checking for valid set points and retaining them during any power loss.

Inputs and outputs include chilled-water system level input/output (I/O), such as evaporator and condenser water temperatures, evaporator and condenser water pump control, and general status and alarm relays. Other machine inputs and outputs include flow protection and other devices like External Auto Stop Emergency Stop, Outdoor Air Temperature Sensor, Heat Pump and External Loading.

Circuit Module

The circuit module (1U2) serves as an input/output expander and has inputs and outputs associated with motor, refrigerant, and lubrication functions. These include motor winding temperatures, oil temperature, oil tank heater operation, oil pump control, HPC indication, generic refrigerant monitor, Refrigerant Condenser Pressure, and oil flow.

Stepper Module

The stepper module (1U3) drives the stepper-motor inlet guide-vane actuator on chillers. The stepper module receives, from the chiller module, the direction and distance to drive the inlet guide vanes and then generates the appropriate signals to operate the stepper motor. The stepper module has inputs and outputs used to support the functions on the stepper module. These include saturated evaporator-refrigerant temperature, inlet guide-vane binary position (B.P.I.), and saturated condenser-refrigerant temperature.

Starter Module

The starter module (2U1) provides control of the starter when starting, running and stopping the motor. The starter module provides interface to, and control of, Y-Delta and Solid-State starters. The starter module also provides protection to both the motor and the compressor such as running current overload, current phase reversal, phase loss, current phase unbalance, momentary power loss, over/under voltage, restart inhibit, and surge.

Operating Interface: Controls

Options Module

The options module (1U5) satisfies control or interface requirements for a number of options. Some of these options are standalone such as generic BAS interface (on Chiller module J5, 5, 6). Other options support either additions or modifications to the chiller itself. Some features supported by the options module are external chilled-water set point, external current-limit set point, Tracer Temperature sensor, Tracer-controlled relay, head relief max. capacity, and % RLA output.

COMM3 or COMM4 (Tracer Interface)

Two communication modules are available for various communication functions. One available option provides a 9600 baud non-isolated link to Tracer Summit (Comm4) and another can provide a 1200 baud isolated, communications link to existing Tracer 100 systems (Comm3).

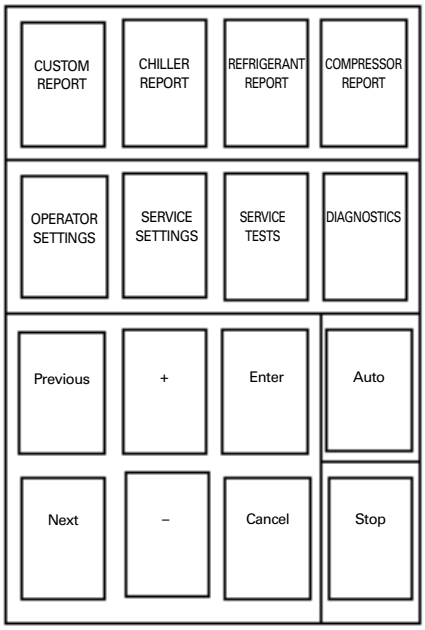
Clear Language Display (CLD)

The local Clear Language Display (1U4) is mounted on the control panel door, and displays chiller data and provides access to operation and service controls, set points, and chiller setup information or configuration. All set points and other settings are stored in non-volatile memory in the chiller module. The interface is programmed with a variety of languages. The display on the Clear Language Display is a two-line, 40-character, liquid-crystal display. The display has a backlight so that it can be read in low light conditions.

In addition to the alpha-numeric liquid-crystal display, a red "alarm" LED is installed that flashes on and off whenever a latching diagnostic (requiring manual reset) is present. The red LED is also used to indicate that a function or control has been set to manual, from within the service test menu, for a maintenance task such as manual oil pump control. If a control has been set to manual, the LED is on continuously. If a diagnostic is active while another function is in a manual mode, the LED will flash on and off. Diagnostic displays and resetting procedures are discussed in Section 10.

A membrane keypad is used on the unit-mounted operator interface. The keypad is sealed, making it weather-resistant and dirt-resistant. The keypad has 16 keys arranged in a 4-by-4 matrix as shown in Figure 24.

Figure 24 – Clear Language Display Key Assignments



Complex Character Clear Language Display (CCCLD)

The CCCLD is available as an option. This display functions identically to the CLD, but has a higher resolution that can support complex character sets such as those used with Chinese, Korean, and Kanji.

Keypad functions are identical but the keys are "soft labeled," with the text describing them incorporated into the display in the appropriate language.

Key Functions

Report Groups

The top row of keys on the CLD provides for "view only" access to all the available chiller information, in the form of three major Report Groups and one user-defined Custom Report.

The Chiller, Refrigerant, and Compressor Reports each contain a number of related items (temperatures, pressures, currents, and so forth) arranged in a pre-determined order. (Values displayed are updated approximately every two seconds.) These items can be accessed by selecting and pressing the desired Report key that brings up the group's "header" screen, describing the type of information available in that group. (NOTE: The header screen may be bypassed by disabling the "Menu Headings" feature under the Service Settings Group, in which case the first data item in the group will be shown.)

The <Next> and <Previous> keys can then be used to scroll from one report item to the next. As the last item is reached, continued scrolling will cause the display to wrap around to the beginning of the report group.

More information about what items are included in each of the reports is provided later in this section.

The Custom Report allows you to select items from any of the other three Report Groups, in any order, so that frequently-read information can be more quickly accessed. Refer to the paragraph on Custom Report Group Programming for information on how to set up the Custom Report.

Operating Interface: Controls

Settings Groups
The second row of keys provides access to all adjustable set points, settings, and commands, as divided into four major Settings Groups. Items in the Operator Settings, Service Settings, Service Tests, and Diagnostics Group can be accessed by selecting and pressing the desired Settings Group Key that will bring up the Header screen describing the type of settings available in that menu.

The <Next> and <Previous> keys allow you to move through the menu's items, not just to view the settings, but to change them. Some items are password-protected; others or all, however, can be locked out within any of these settings groups without requiring the password. Items included in each of the Settings Groups, as well as password protection features, are discussed later in this section.

Changing Settings or Set Points
After the particular setting is displayed on the screen, pressing the <+> or <-> key will cause the setting that is displayed to increment or decrement (increase or decrease), respectively. If the <+> or <-> key is held down for more than 1/2 second, it will increase or decrease the setting continuously, at approximately ten counts per second, until the key is released. If the key is held down for two seconds, the setting will change at ten times its normal incremental value.

To prevent inadvertent changes, a changed setting is not stored until the <Enter> key is pressed. The <Cancel> key may be pressed if a changed setting should not be saved. Once the <+> or <-> key has been pressed to change a particular setting, the display will show that setting, but not store or save it, until the <Enter> or <Cancel> key is pressed. The display will blank out for a moment, after the <Enter> key is pressed, to indicate to the user that the key stroke has been recognized.

Note that the <Stop> and <Auto> keys act immediately and do not require the use of the <Enter> key.

STOP, AUTO
The chiller will stop when the <Stop> key is pressed, entering the Run Unload mode. The <Stop> key has a red background. If <Stop> is pressed a second time within five seconds, an immediate "panic stop" will be executed, bypassing the normal compressor unload period. During the five second period, a message is displayed indicating the optional command.

If the <Stop> key is pressed again during this five-second period, a message will be displayed for two seconds indicating that the panic stop is being executed.

To execute a panic stop, first press the <Stop> key.

The message displayed during the five seconds after the <Stop> key is pressed is:

IF (STOP) IS PRESSED DURING THIS DISPLAY
**** A PANIC STOP WILL BE EXECUTED ****

If the <Stop> key is pressed again during this five second period, the following message will be displayed for two seconds before reverting to the first screen of the chiller report, where the current unit operating mode message is given. (These messages are discussed in the chiller report section.)

**** EXECUTING PANIC STOP ****

If the <Stop> key is not pressed during this five-second period, the chiller will enter the Run Unload mode and the display will go to the first display of the chiller report.

If the chiller is in the Stop mode, pressing the <Auto> key causes the chiller to go into the Auto/Local or Auto/Remote mode. The <Auto> key is recognized by its green background color.

When the <Auto> or <Stop> keys are pressed, the display will go to the first display of the chiller report.

Communications and Settings Storage

The individual modules identified earlier in this section communicate via the InterProcessor Communication (IPC) link. The IPC allows the modules to work together to direct overall chiller operation, each module handling specific functions.

In the IPC communication protocol, the 1U1 is the initiator and arbitrator of all module communication. The 1U1 requests "packets" of information from each module in a preset sequence. The other modules respond only, and cannot initiate communication. Specific IPC diagnostic techniques are discussed in section 10.

The settings used by the unit are stored in the Chiller module, not in the Clear Language Display. The chiller module is also responsible for verifying that the settings memory is not corrupted. It substitutes safe default settings if the stored settings become corrupted, and generates appropriate warnings or diagnostics.

If there is no IPC communication between the chiller module and the Clear Language Display at power up, the following is displayed:

No Communications - Data Not Valid

When IPC communications have been established, the "Data Not Valid" display is used if all chiller module communications are lost for more than five seconds.

The Clear Language Display automatically displays the chiller operating mode (the first screen in the chiller report) after a normal power-up or after communications are re-established.

Internal communications with the Clear Language Display are not necessary for the chiller to run. However, the chiller will require Clear Language Display communication to occur at least once in 15 seconds or an informational diagnostic screen will result.

Operating Interface: Controls

If the operator changes a setting that is communicated to the chiller module but not accepted (after 30 seconds of no key activity), the following message is displayed at the end of the chiller report:

Setting Was Not Acknowledged By Chiller
Press (Next) (Previous) To Continue

If many settings are changed in a short time, or if setting changes are communicated to the chiller module but not acknowledged, the transmit buffer may become full and not be able to accept additional changes. If that happens, the following message is displayed for two seconds:

HI Xmit Buffer is Full

The Clear Language Display will generally clear its transmit buffer without the message indicating the cause of the communications problem. Persistent problems should be referred to Trane Service.

Custom Report Group: Programming Instructions

Reports are added to the custom report group by pressing the <+> key when the desired report is being displayed from its normal report location.

Reports are removed from the custom report group by pressing the <-> key when the desired custom report is being displayed.

The custom report group can contain a maximum of 20 displays. If you attempt to add more than 20 displays, the following message:

Custom Report Is Full, Report Not Added

is displayed for two seconds, indicating that the custom report is full.

If you attempt to add a report to the custom report when it is already stored in the custom menu, the message:

Report Already In Custom Menu

will be displayed for two seconds.

NOTE: Only displays from the chiller refrigerant or compressor reports can be added to the custom report.

The custom report sequence is as follows:

User Defined Custom Report
Press (Next) (Previous) to Continue

If items are selected for the custom report, the report heading and the selected items are displayed sequentially when <Next> or <Previous> is pressed.

If no entries are selected for the custom report, however, the second entry is:

No Items Are Selected For Custom Report
See Operator's Manual To Select Entries

The report then wraps around to the report heading when <Next> is pressed.

Operating Interface: Controls

Chiller Report

The Chiller Report displays chiller status, water temperature settings, and set points. The sequence of displays is as follows:

Chiller Status, Water Temps & Setpts
*"Press (Next) (Previous) to Continue**

Continuing, the following report option is given:

Press (Enter) for ASHRAE Guideline 3 Rpt
Press (Next) (Previous) To Continue

If <Enter> is pressed, the ASHRAE Guideline 3 Report menu comes up. Pressing <Next> brings up the standard report as described in the following paragraphs, beginning with the chiller operating mode. The report selection is a matter of preference. Although slightly different parameters are displayed as shown in the following comparison, the numbers corresponding to the order displayed:

Parameter Displayed	Sequence	
	Standard Report	ASHRAE Report
Operating Mode	1	2
Chilled-Water Set Point/Source	2	3
Evaporator Leaving-Water Temperature		
Reset Chilled-Water Set Point/Source	4	
Evaporator Entering Water Temperature	5	4
Condenser Entering Water Temperature	6	12
Condenser Leaving-Water Temperature		
Current Limit Set Point/Source	7	5
Active Current Limit Set Point/Setting Source	8	
Outdoor Air Temperature	9	
Time/Refrigerant Type		1
Saturated Evaporator Refrigerant Temperature		7
Compressor Discharge Temperature		
Compressor Starts/Running Time		8
Evaporator Refrigerant Pressure		9
Evaporator Approach Temperature		10
Chilled-Water Flow Switch Status		11
Saturated Condenser Temperature		13
Condenser Refrigerant Pressure		
Condenser Approach Temperature		14
Condenser Water Flow Switch Status		15

The chiller operating modes display comes up first in the standard report:

[Operating mode line 1]
[Operating mode line 2]

Line 1 (and 2 if needed) indicates a current condition of the unit as shown in Table 17. In some cases, an associated timer or system parameter will be displayed that indicates the transition to an expected mode is in progress, particularly during the unit start-up sequence.

Operating Interface: Controls

Table 17 – Operating Modes

Unit Operation	Operating Mode Display* (First Line/Second Line)
Stop	Resetting
	Local Stop: Cannot Be Overridden By Any External or Remote Device
	Remote Display Stop: Chiller May Be Set To Auto By Any External Or Remote Device
	Remote Run Inhibit From External Source
	Remote Run Inhibit From Tracer
	Heat Sink Temperature Start Inhibit
	Diagnostic Shutdown Stop
Auto	Diagnostic Shutdown Auto
	Auto Waiting For Evaporator Water Flow
	Auto Waiting For A Need To Cool
	Waiting For Tracer Communications To Establish Operating Status
	Starting Is Inhibited By Staggered Start Time Remaining: MIN:SEC
	Starting Is Inhibited By Restart Inhibit Timer: Time Remaining: MIN:SEC
Prestart	Establishing Condenser Water Flow Establishing Oil Pressure
	Establishing Condenser Water Flow Prelubrication Time: MIN:SEC
	Condenser Water Is Flowing Prelubrication Time: MIN:SEC
	Condenser Water Is Flowing Establishing Oil Pressure
	Condenser Water Is Flowing Performing IGV BPI Search and Calibration
	Condenser Water Is Flowing Prestart Unload Time Remaining: MIN:SEC
Start	Starting Compressor
Run	Unit Is Running Base Loaded Current Based Soft Loading
	Unit Is Running In Minimum Capacity
	Unit Is Running In Minimum Capacity Time Remaining: MIN:SEC
Run-Unload	Unit Is Preparing To Shutdown

Unit Operation	Operating Mode Display* (First Line/Second Line)
Run	Unit Is Running Capacity Limited By Phase Unbalance
	Unit Is Running Capacity Limited By High Condenser Press
	Unit Is Running Capacity Limited By Low Evaporator Temperature
	Unit is Running Capacity Limited By Vane Open Travel Stop
	Unit Is Running Minimum Capacity Due To Vane Closed Travel Stop
	Unit Is Running in Surge Condition
	Unit Is Running; Capacity Limited By Pulldown Rate Based Soft Loading
	Unit Is Running; Capacity Limited By Current Based Soft Loading
Auto	Auto Waiting For Condenser Water Flow
Run	Establishing Evaporator Water Flow Establishing Oil Pressure
	Establishing Evaporator Water Flow Prelubrication Time: MIN:SEC
	Evaporator Water Is Flowing Prelubrication Time: MIN:SEC
	Evaporator Water Is Flowing Performing IGV BPI Search and Calibration
	Establishing Evaporator Water Flow Performing IGV BPI Search and Calibration
	Unit is Running; Base Loaded
	Unit is Running; Base Loaded Capacity Limited By High Current
	Unit is Running; Base Loaded Capacity Limited By Phase Unbalance
	Unit Is Running; Base Loaded Capacity Limited By High Condenser Pressure
	Unit Is Running; Base Loaded Capacity Limited By Low Evaporator Temperature
	Unit is Running; Base Loaded At Vane Open Travel Stop
Post-Lube	Post Lubrication Time Remaining: MIN:SEC
Stop	Panic Stop
	Starter Dry Run

* Displays are not in any sequence. Some displays will never appear, depending on options and situation

Operating Interface: Controls

Chilled-Water Set Point Evaporator Leaving Water Temperature (Standard Report)

Chilled-Water Set point:	*xxx.x F/C*
Evap Leaving Water Temp:	*xxx.x F/C*

This is the actual set point currently in use by the chiller.

Reset Chilled-Water Set Point and Type/Starting Chilled-Water Set Point and Source (Standard Report)

The following will only be displayed if chilled-water reset is enabled:

[reset type] CWS:	*xxx.x F/C*
[source] CWS:	*xxx.x F/C*

with [reset type] being outdoor air reset, return reset, or constant return reset, and [source] being Front Panel, External, or Tracer.

The first line displays the actual set point to which the chiller is controlling, as reset upward depending on the reset type, reset ratio, and maximum reset parameters, set elsewhere on the operator settings menu.

The second line displays the fundamental temperature (and its source) on which the reset is based. This represents the lowest set point possible when no reset is applied.

Evaporator Entering-and Leaving-Water Temperatures (Standard Report)

Evap Entering Water Temp:	*xxx.x F/C*
Evap Leaving Water Temp:	*xxx.x F/C*

Condenser Entering-and Leaving-Water Temperatures (Standard Report)

Dashes "-------" will be displayed for the condenser entering-or leaving-water temperature if the corresponding input is open or shorted.

Cond Entering Water Temp:	*xxx.x F/C*
Cond Leaving Water Temp:	*xxx.x F/C*

Current Limit Set Point and Source (Standard Report)

Current Limit Set point [source]:	*xxx%*
Press (Next) (Previous) To Continue	

If the source is displayed, it is Tracer or External.

Outdoor Temperature (Standard Report)

If the outdoor air temperature input is open or shorted, and neither outdoor air reset nor low-ambient lockout is enabled, "-------" (dashes) are displayed. Otherwise, the temperature received from the chiller module is displayed.

Outdoor Air Temperature:	*xxx.x F/C*
Press (Next) (Previous) To Continue	

If Tracer is installed, the Tracer outdoor air temperature is displayed. If no Tracer is installed, the chiller module outdoor air temperature sensor is used.

ASHRAE Guideline 3 Report Menu

ASHRAE Guideline 3 Report
Press (Next) (Previous) To Continue

Time of Day and Refrigerant Type (ASHRAE Report)

Current Time/Date HH: MM mm Mon, XX XXXX
Refrigerant Type: R134a

Chiller Operating Mode (ASHRAE Report)

[Operating mode line 1]
[Operating mode line 2]

Operating mode line 1 (and line 2 if needed) is a continuous message and display of the chiller's current state or activity. It may also show an associated timer or system parameter, in some cases. The message is one from Table 17, "Operating Modes," and identical to the operating mode given in the standard report.

Chilled-Water Set Point and Source/Evaporator Leaving Water Temperature (ASHRAE Report)

Chilled Wtr Setpt [source]:	*xxx.x F/C*
Evap Leaving Water Temp:	*xxx.x F/C*

This is the actual set point currently in use by the chiller where [source] shows from where it is derived. If no source is displayed, Front Panel set point source is implied.

Current Limit Set point and Source (ASHRAE Report)

Current Limit Setpt [source] xxx%
Press (Next) (Previous) To Continue

Setting source will be Front Panel (field not displayed), Tracer or External.

Operating Interface: Controls

Saturated Evaporator Temperature/Compressor Discharge Temperature (ASHRAE Report)

Saturated Evap Rfgt Temp:	*xxx.x F/C*
Compressor Discharge Temp:	*xxx.x F/C*

Compressor Starts and Running Time (ASHRAE Report)

The starts and hours counters are displayed:

Compressor Starts:	*xxxxx*
Compressor Running Time:	*HRS:MIN:SEC*

The compressor starts counter is increased with each start, or attempted start, of the compressor.

Evaporator Entering-and Leaving-Water Temperatures (ASHRAE Report)

Evap Entering Water Temp:	*xxx.x F/C*
Evap Leaving Water Temp:	*xxx.x F/C*

Saturated Evaporator Temperature/ Evaporator Refrigerant Pressure (ASHRAE Report)

Saturated Evap Rfgt Temp:	*xxx.x F/C*
Evap Rfgt Pressure:	*xxx.x psig/kPa*

Evaporator Approach Temperature (ASHRAE Report)

Evaporator Approach Temp:	*xxx.x F/C*
Press (Next) (Previous) to Continue	

Note: If a negative approach temperature is displayed, check the sensors for proper operation.

Chilled-Water Flow Switch Status (ASHRAE Report)

The screen displays the status of the chilled-water flow switch at the input to the UCM.

Chilled-Water Flow Switch Status:
Flow Switch is [y]

where [Y] is "Open/No Flow" or "Closed/Flow"

Condenser Entering-and Leaving-Water Temperatures (ASHRAE Report)

Cond Entering Water Temp:	*xxx.x F/C*
Cond Leaving Water Temp:	*xxx.x F/C*

Dashes will be displayed for either temperature if the input is open or shorted.

Saturated Condenser Temperature/Condenser Refrigerant Pressure (ASHRAE Report)

Saturated Cond Temp:	*xxx.x F/C*
Cond Rfgt Pressure:	*xxxx.x psig/kPa*

Condenser Approach Temperatures (ASHRAE Report)

Condenser Approach Temp:	*xxx.x F/C*
Press (Next) (Previous) to Continue	

Condenser-Water Flow Switch Status (ASHRAE Report)

The screen displays the status of the condenser-water flow switch at the input to the UCM, if and only if the differential water-pressure sensor option is not installed.

Condenser Water Flow Switch Status:
Flow Switch is [y]

where [Y] is "Open/No Flow" or "Closed/Flow"

Operating Interface: Controls

Refrigerant Report

Report Heading

Refrigerant Temp & Pressure Report
Press (Next) (Previous) to Continue

Evaporator and Condenser Refrigerant Pressure

Evap Rfgt Pressure:	*xxx.x psig/kPa*
Cond Rfgt Pressure:	*xxx.x psig/kPa*

NOTE: The evaporator and condenser pressures are not measured directly but derived from associated temperatures, assuming saturated conditions for R134a refrigerant

Saturated Evaporator Temperature/ Evaporator Refrigerant Pressure

Sat Evap Rfgt Temp:	*xxx.x F/C*
Evaporator Refrigerant Pressure:	*xxx.x psig/kPa*

Saturated Condenser Temperature/ Condenser Refrigerant Pressure

Sat Cond Temp:	*xxx.x F/C*
Cond Rfgt:	*xxx.x psig/kPa*

Saturated Evaporator Temperature and Discharge Temperature

Saturated Evap Rfgt Temp:	*xxx.x F/C*
Compressor Discharge Temp:	*xxx.x F/C*

Evaporator and Condenser Approach Temperatures

Evaporator Approach Temp.:	*xxx.x F/C*
Condenser Approach Temp.:	*xxx.x F/C*

Note: Malfunctioning or miswired sensors should be suspected if negative approach temperatures are encountered.

Compressor Report

Report Heading

Compressor Hours, Starts & Amps
Press (Next) (Previous) to Continue

Differential Oil Pressure, Oil Temperature - FastPak Only

Differential Oil Pressure:	*xxx.x [units]*
Oil Tank Temp:	*xxx.x F/C*

Differential Oil Pressure: xxx.x [units] is only displayed if the "Oil Pressure Protection" set point is set to "Transducer" or "Xducer and Switch." If 'Switch' is selected as the set point, then ' Differential Oil Pressure Switch: [Status]' is displayed where Status is open or closed.

Inlet Guide Vane Position
This screen does not appear if "Inlet Guide Vane Output" is set to "Pulsed."

Inlet Guide Vane Position	*xxx.x % open*
Inlet Guide Vane Position	*xx.x degrees*

Compressor Line Currents - % RLA

Compressor Line Currents - % RLA		
A xxxx.x%	*B xxxx.x%*	*C xxxx.x%*

Compressor Line Currents Amps

Compressor Line Currents - Amps		
A xxxx amps	*B xxxx amps*	*C xxxx amps*

Compressor Line Voltages

Compressor Line Voltages		
AB xxxx v	*BC xxxx v*	*CA xxxx v*

This data is displayed only if the line voltage sensing option is installed. if not installed, no screen is displayed.

Compressor Starts and Running Time
The starts and hours counters are displayed as follows:

Compressor Starts:	*xxxxx*
Compressor Running Time:	*HRS:MIN:SEC*

Operator Settings

Operator Settings Group Heading

Chilled-Water & Current Limit Setpts
Press (Next) (Previous) to Continue

Menu Settings Password
If the menu settings password is enabled in the service setup group, the following will be displayed after each setting group heading

Settings In This Menu Are [Status]
[password message]

Likewise, if the menu settings password is disabled in the service setup group, the above screen will not appear.

The possible values for status are "Locked" or "Unlocked." If the password status is locked, the password message will be "Enter Password to Unlock." Press <-> <+> <-> <+><-><+> followed by the <Enter> key to unlock.

NOTE: The last six keystrokes represent the current password and up to 20 keystrokes can be entered.

If the password status is unlocked, the password message will be "Press (Enter) to Lock." Pressing <Enter> locks the settings in all the menus. If the password is entered to unlock the settings, this unlocks the settings in ALL menus.

Whenever a password is in use, the "Press (+) (-) to change setting" message will be suppressed on set point screens. Any attempt to change the setting will result in the message "Setting is Locked." The password, once entered, will remain valid until canceled.

Set Contrast - (CCCLD Display Only)
The following screen is used with the complex character Clear Language Display only.

Set Contrast: Press (X) to Save
Press (+) (-) To Change Setting

Operating Interface: Controls

Time-Of-Day Setting

Current Time/Date HH:MM xm Mon, XX, XXXX
(Enter) to Change: (Next) to Continue

The top level "Current Time/Date" is displayed when this screen is first selected. Pressing the <Next> or <Previous> key cause the screen to display the next or previous screen.

If the <Enter> key is selected, five separate screens can be displayed to make changes to the time and date. The "Current Time/Date" will be displayed on line one of each screen. Each screen will allow the changing of one element in the time/date at a time. The second line of each screen indicates the element that can be changed and its current value.

If the first time-element changing screen (hours) is displayed and the <Previous> key is pressed, the top level "Current Time/Date" screen will be displayed and the <Enter> key must be pressed to re-enter the time-changing screens.

If the last (fifth) time/date-changing screen is displayed and the <Next> key is pressed, the next screen will be displayed. If the <Previous> key is pressed at this point, the top level "Current Time/Date" screen will be displayed and the <Enter> key will have to be pressed to re-enter the time/date-changing screens.

To change an element of the current time or date, press <Enter> from the top level "Current Time/Date" screen. Press <Next> or <Previous> to get to the desired screen. Then press the <+> or <-> keys to change the element to its proper value and then press the <Enter> key to store the new time/date. The message "Updating Chiller Clock, Please Wait" is displayed for two seconds after the key is pressed.

The five time/date-changing screens under the top level ("current time/date") are as follows:

Current Time/Date HH:MM xm Mon, XX, XXXX
To Change Hour, Press (+) (-) & (Enter)

Current Time/Date HH:MM xm Mon, XX, XXXX
To Change Minute, Press (+) (-) and (Enter)

Current Time/Date HH:MM xm Mon, XX, XXXX
To Change Month, Press (+) (-) and (Enter)

Current Time/Date HH:MM xm Mon, XX, XXXX
To Change Day, Press (+) (-) and (Enter) XX

Current Time/Date HH:MM xm Mon, XX, XXXX
To Change Year, Press (+) (-) and (Enter) XXXX

Front Panel Chilled-Water Set Point

Front Panel Chilled Wtr Setpt: *xxx.x F/C*
Press (+) (-) to Change Setting

The range of values is from 0 to 65°F [-17 to 18.3°C], in increments of 1 or 0.1°F or °C depending on the service setup screen. The ROM default is 44.0°F [6.7°C].

The second line of the setting display shown above will change if an attempt is made to increase or decrease the set point out of the set point range. The second line would then become:

Top of Range, Press (-) to Change

or, if low,

Bottom of Range, Press (+) to Change

Also, if a wrong key is pressed, the display will prompt:

Press (+) (-) (Enter) (Cancel) to Continue

The exception is pressing the <Stop> key, which is always active. Other messages may be displayed in special cases with explanations.

When the front panel chilled-water set point is within 1.7°F [.94°C] of the leaving-water temperature cutout set point, or within 6°F [3.3°C] of the low refrigerant temperature cutout set point, the second line of this display will read:

Limited by Cutout Setpt, (+) to Change

Front Panel Current Limit Set Point

Front Panel Current Limit Setpt: xxx%
Press (+) (-) to Change Setting

The range of values is from 40 to 100% in increments of 1%. The ROM default is 100%.

Chilled-Water Reset Type

Chilled Wtr Reset Type: [type]
Press (+) (-) to Change Setting

The possible values for [type] are: disable (ROM default), return, constant return, and outdoor air.

If either disable or constant return is selected, the remaining chilled-water reset displays are skipped. If either return or outdoor air is selected, the first word of the remaining chilled-water reset displays will be the type of reset.

Reset Ratio

[type] Reset Ratio: *xxx%*
Press (+) (-) to Change Setting

The ratio range is from 10 to 120% for return reset with a ROM default of 50%, and 80 to -80% for outdoor reset with a ROM default of 10%.

Start Reset Set Point

[type] Start Reset: *xxx.x F/C*
Press (+) (-) to Change Setting

The start reset range is from 4 to 30°F [2.2 to 16.7°C] for return reset with the ROM default of 10°F [5.6°C]. For outdoor reset, the range is from 50 to 130°F [10 to 54.4°C] with the ROM default of 90°F [32.2°C].

Operating Interface: Controls

Front Panel Current Limit Set Point

[type] Max Reset Set point: xxx.x F/C
Press (+) (-) to Change Setting

The maximum reset range is from 0 to 20°F [0.0 to 11.1°C] for return reset with the ROM default of 5°F [2.8°C]. For outdoor reset, the range is from 0 to 20°F [0.0 to 11.1°C] with the ROM default of 5°F [2.8°C].

Chilled-Water Set Point Source
This screen will only be displayed if the external chilled-water set point is installed at the machine configuration menu. If the Tracer option is installed, the word "Default" will appear in front of the set point source.

[Default] Chilled-Water Set point Source:
[source]

Possible values of [source] are Front Panel (ROM default) and External source.

Current Limit Set Point Source
This screen will only be displayed if the external chilled-water set point is installed in the machine configuration menu. If the Tracer option is installed, the word "Default" will appear in front of the set point source.

[Default] Current Limit Set point Source:
[source]

where [source] is Front Panel (ROM default) or External.

Set Point Source Override

Set Point Source Override
[source]

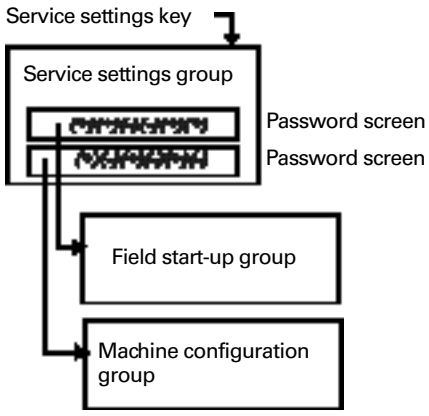
Possible values of [source] are none (ROM default), "Use Front Panel set points," and "Override Tracer. Use default set points" for which the Tracer option must be installed. this is a global override that will prevent Tracer, External, or Chilled-Water Reset from asserting control on the chilled-water set point.

Service Settings (Non-Password-Protected Service Settings Group)

All service settings are accessed by pressing the <Service Settings> key on the CLD.

The service settings menu has three distinct groupings of items as shown in Figure 25. The first group is the non-password-protected group that consists of all of the settings, feature enables, set points, and so forth, that are unlikely to be changed often by a user or operator. Changes in them do not seriously affect the standard protection or reliability of the chiller.

Figure 25 – Service Settings Key Menu Structure



The other two groupings are protected, each with a separate password. These two groups are for changing parameters and settings for field commissioning, and for fundamental protection and control of the chiller subsystems (Service Setup) or for programming of the UCP2 (machine configuration) if, for example, a Chiller module is replaced.

When properly set, the items in these protected menus should NEVER be changed again without specific knowledge of the effects of the changes. These are accessible only for field commissioning and to allow for field programming.

When the Service Settings key is pressed, the group heading display appears.

Service Settings: Basic Setups
Press (Next) (Previous) to Continue

Menu Settings Password
Only if the menu settings password is enabled, in the service setup group, will the following be displayed after each setting group heading:

Settings In This Menu Are (status)
Enter Password to Unlock

Likewise, if the menu settings password is disabled in the service setup group, the above screen will not appear.

Status can be "locked" or "unlocked." If the password status is locked, the password message will be "Enter Password to Unlock." Press <-> <+> <-> <+> <-> <+> followed by the <Enter> key to do so. An incorrect password will result in the message "Incorrect Password" message to be displayed for 1 second.

After the password status is unlocked, the password message will be "Press Enter to Lock." Pressing <Enter> will lock all of the set point menus. Likewise, if the password status is locked and the correct password is entered, all of the set point menus will be unlocked.

Whenever a password is in use, the "Press (+) (-) to change setting" message will not appear on set point screens. Any attempt to change a set point will result in the message "Setting is Locked" being displayed for 1 second. The password, once entered, will remain valid until canceled.

Operating Interface: Controls

Keypad/Display Lockout
This feature allows you to lock the keypad and display. After access to the service settings is given, the following display appears

Press (Enter) to Lock Display & Keypad
Password will be required to Unlock

If the <Enter> key is pressed to lock the keypad, the following message is displayed and all further input from the keypad is ignored, including the <Stop> key, until the password is entered.

The password consists of pressing the <Previous> and <Enter> keys at the same time.

******DISPLAY AND KEYPAD ARE LOCKED******
******ENTER PASSWORD TO UNLOCK******

If the keypad is locked and the password is entered, the display will go to the Chiller Operating Mode display of the Chiller Report.

Language Setting

Language: *xxxxxxx*
Press (+) (-) to Change Setting

Possible Language Selections are: English (factory default), Francais, Deutsch, Espanol, Nippon (also known as Katakana, use Japanese characters), Italiano, Nederlands, CODED, and Portugues.

Possible language selections for the CCCLD are English (ROM default), Traditional Chinese, Simplified Chinese, Korean, Thai, and Japanese.

Display Units

Display Units: (type)
Press (+) (-) to Change Setting

Possible values of [Type] are: English (Factory Default) and SI.

Decimal Places Displayed

Decimal Places Displayed: *(status)*
Press (+) (-) to Change Setting

The choices for [status] are XXX.X (factory default) and XXX.

Display Menu Headings

Display Menu Headings: *(d/e)*
Press (+) (-) to Change Setting

The factory default value is enabled. If disabled, the menu headings in each menu or group will not appear.

Clear Custom Menu

Press (Enter) To Clear the Custom Menu

Pressing <Enter> will cause a brief message to appear indicating that the menu has been cleared.

Differential to Start
Differential to start is the number of degrees above set point that the return-water temperature must drift before the chiller will start.

Differential to Start Chiller: *xxx.x F/C*
Press (+) (-) to Change Setting

The range of values is from1 to 10°F (0.5 to 5.5°C] in increments of 1 or 0.1°F or °C depending on the service setup screen xxx or xxx.x. The factory default is 5°F (2.8°C].

Differential to Stop
Differential to stop is the number of degrees below set point that the supply-water temperature must drift before the chiller will shut down. This is used to prevent nuisance shutdowns on momentary drops in temperature.

Differential to Stop Chiller: *xxx.x F/C*
Press (+) (-) to Change Setting

The range of values is from 1 to 10°F (0.5 to 5.5°C] in increments of 1 or 0.1°F or °C depending on the service setup screen. The factory default is 5°F (2.8°C].

Evaporator/Condenser Pump Off Delay Time
This time delay is used to keep the chilled-water pump on during the run-unload cycle, after the UCP2 has been given the command to stop. This stop command could come from the Clear Language Display, Tracer, or External Auto/Stop.

Evap Pump Off Delay: *xx Minimum*
Press (+) (-) to Change Setting

The range of values is from 0 to 30 minutes in increments of 1 minute. Factory default is 1 minute.

Clear Restart Inhibit Timer
The restart inhibit timer function is used to protect the compressor motor from heat caused by repeated starts within a short time. It allows for motor heating and cool down. This override should only be used with caution. If the motor overheats because of too many successive starts, motor damage could result.

Press (Enter) to Clear the Restart Inhibit Timer

When <Enter> is pressed, the timer is cleared and the compressor start sequence is allowed to begin immediately. A two-second message appears as follows and then returns to the above screen.

Restart Inhibit Timer Has Been Cleared

Field Start-up Group Password Request

Pswd Reqd to Access Field Start-up Group
Please Enter Password

The service setup password is <+> <+> <-> <-> <+> <+> <Enter>. Successfully entering the password sends you to the service setup group heading screen below.

Press (Enter) To Access Field Start-up Group

Machine Configuration Group Password Request

Password Reqd to Access Machine ConfigGroup
Please Enter Password

The service setup password is <+> <-> <+> <-> <+> <-> <Enter>. Successfully entering the password sends you to the machine configuration group heading screen below.

Press (Enter) To Access
Machine Configuration Group

Operating Interface: Controls

Service Settings (Password-Protected Field Start-up Group)

The field start-up group password is <+> <-> <-> <+> <+> <Enter>. The field start-up group contains items that are primarily associated with field commissioning of the chiller, as well as the fundamental control and protection of the chiller subsystems.

If the field start-up password is entered, the display goes to the menu defined below. If a key is not pressed within ten minutes in this password-protected menu, the display returns to the chiller operating mode display of the chiller report, and the password must be entered again to return to this menu.

Field Start-up Group Heading

Field Start-up Group Settings
"Press (Next) (Previous) to Continue"

This header is displayed when the headers are not displayed in the service settings menu.

Keypad/Display Lock Feature Enable
This feature permits the entire keypad and display to be locked out. A message appears on the screen to describe this condition. No access is permitted to either the report screens or the setting screens when this feature is both enabled here and locked at the service settings menu.

NOTE: In this locked condition, both the <Stop> and <Auto> keys ***do not function.***

As with other keypad lock features, <Previous> and <Enter> must be pushed together to unlock.

Keypad/Display Lock Feature:	*[d/e]*
Press (+)(-) to Change Setting	

Disabled is the ROM default.

When the keypad lock feature is disabled, the keypad lock display does not appear in the non-password-protected area of the Service settings menu and the Keypad/Display cannot be locked. When the keypad/display lock feature is enabled, the keypad lock display will appear in the service settings menu so the keypad can be locked.

Menu Settings Password Enable
The menu settings password permits the settings in each of the menus to be password protected. All report menus and setting menus can still be viewed at any time if this feature is either enabled or disabled; the <Stop> and <Auto> keys also remain active. If this feature is enabled, then all menu settings are password protected.

Menu Settings Password Feature:	*[d/e]*
Press (+)(-) to Change Setting	

Disabled is the ROM Default.

When the feature is disabled, the menu setting password display does not appear at the top of each of the settings menus and the menu settings cannot be password protected. When the menu setting password feature is enabled, the menu settings password display appears just below each of the settings menu headers so the settings can be changed if the proper password is entered.

ICS Address

ICS Address:	*xx*
Press (+)(-) to Change Setting	

The range of values is from 1 to 127 in increments of 1. The ROM default is 65.

Power-Up Start Delay Time
For system installations, this delay time is used to prevent multiple chillers from cycling on at the same time after power is supplied or restored to the UCP2. A programmed delay can stagger the start sequence, minimizing the amount of inrush current required.

Power Up Start Delay Time:	*xxx sec*
Press (+)(-) to Change Setting	

The range of values is from 0 to 600 seconds in increments of 1. The ROM default is 0 seconds.

Design Delta Temperature
This value should be set to the delta temperature specified for the chiller during the initial selection, based on all operating conditions expected. If operating conditions change significantly, check with Trane technical service to see if modifications may be required.

Design Delta Temperature:	*xxx.x F/C*
Press (+)(-) to Change Setting	

The range of values is from 4 to 30°F [2.2 to 16.7°C] in increments of 1 or 0.1°F or °C, depending on the service setup screen. The ROM default is 10°F [5.5°C].

Leaving-Water Temperature Cutout Set Point

Lvg Wtr Temp Cutout Set point:	*xxx.x F/C*
Press (+)(-) to Change Setting	

The range of values is from -10 to 36°F [-23.3 to 2.2°C] in increments of 1 or 0.1°F or °C, depending on the service setup screen. The ROM default is 36.0°F [2.2°C].

When this set point is within 1.7°F [0.9°C] of the front panel chilled-water set point, the front panel chilled-water set point is increased along with this set point to maintain the differential. A message will be displayed for two seconds to indicate that the FPCW set point has been increased.

When this set point is adjusted below 35.3°F [1.8°C], the following is displayed on the second line: "Warning: Adequate Antifreeze Required."

Operating Interface: Controls

Low Refrigerant Temperature Cutout Set Point

Low Rfgt Temp Cutout Setpt: xxx.x F/C
Press (+)(-) to Change Setting

The range of values is -5 to 36°F [-27.2 to 2.2°C] in increments of 1 or 0.1°F or °C, depending on the service setup screen. The ROM default is 32.0°F [0.0°C].

When this set point is within 6°F [3.3°C] of the front panel chilled-water set point, the front panel chilled-water set point is increased along with this set point to maintain the differential. A message will be displayed for two seconds to indicate that the front panel chilled-water set point has been increased.

When this set point is adjusted below 28.5°F [-1.9°C], the following is displayed on the second line: "Warning: Adequate Antifreeze Required."

Condenser Limit Set Point

Condenser Limit Set point: xx% HPC
Press (+)(-) to Change Setting

The range of values is from 80 to 120% in increments of 1%. The ROM default is 93%. NOTE: This setting is relative to the high-pressure cutout switch setting as defined in the machine configuration menu, and defines where the condenser limit control will take effect to avoid a high-pressure cutout.

Maximum Restart-Inhibit Timer Setting

Maximum RI Timer: xxx minutes
Press (+)(-) to Change Setting

The range of values is from 30 to 60 minutes in increments of one minute. The ROM default is 60 minutes.

Surge Protection Enable

Surge Protection: [d/e]
Press (+)(-) to Change Setting

where possible values of d/e are disable and enable (ROM default).

Under/Over Voltage Protection Enable

This feature is disabled if the line voltage sensing option is not installed.

Under/Over Voltage Protection: [d/e]
Press (+)(-) to Change Setting

where disabled is the ROM default.

Phase Reversal Protection Enable

Phase Reversal Protection: [d/e]
Press (+)(-) to Change Setting

Enabled is the ROM default.

Phase Unbalance Limit Enable

UCP2 provides a non-defeatable phase unbalance protection that stops compressor operation with more than 30% phase unbalance for 90 seconds. If this unbalance limit is enabled, the motor will be "limited" from running at full load as a function of percent unbalance. This feature prevents excessive overheating that otherwise would result. If the limit is disabled, then no current-limit is imposed due to phase unbalance.

Phase Unbalance Limit: [d/e]
Press (+)(-) to Change Setting

where enabled is the ROM default.

Momentary Power-Loss Protection Enable

Momentary Power Loss Protection: [d/e]
Press (+)(-) to Change Setting

Enabled is the ROM default.

Enhanced Oil-Temperature Protection Enable

Enhanced Oil Temp Protection: [option]
Press (+)(-) to Change Setting

Enabled is the ROM default.

Oil Temperature Set Point

Oil Temp Cutout Set point: xxx.x F/C
Press (+)(-) to Change Setting

The range of values is from 100 to 160°F [37.8 to 71.1°C] in increments of 1 or 0.1°F or °C, depending on the service setup screen. The ROM default is 136.0°F [57.8°C].

Low Oil Temperature Cutout

Low Oil Temp Cutout: xxx.x F/C
Press (+)(-) to Change Setting

The range of values is from 80 to 140°F [26.7 to 60°C] in increments of 1 or 0.1°F or °C, depending on the service setup screen. The ROM default is 95.0°F [35.0°C].

Soft Load Control Enable

Soft Load Control: [d/e]
Press (+)(-) to Change Setting

Disabled is the ROM default

Soft Load Starting-Current Limit

Soft Load Starting Current Limit: xxx%
Press (+)(-) to Change Setting

The range of values is from 40 to 100% in increments of 1%. The ROM default is 100%.

Soft Load Current-Limit Rate-Of-Change

Soft Load Starting Current Limit: xxx%
Press (+)(-) to Change Setting

The range of values is from 0.5 to 5%/Minimum in increments of 1 or 0.1%/Minimum depending on the service setup screen. The ROM default is 5%/Minimum.

Soft Load Current Limit Rate: x.x%/Minimum
Press (+)(-) to Change Setting

Operating Interface: Controls

Soft Load Leaving-Water Temperature Rate-of-Change

Soft Load Lvg Water Rate: x.x F/C/Minimum
Press (+)(-) to Change Setting

The range of values is from 0.5 to 5°F/Minimum [0.3 to 2.8°C/Minimum] in increments of 1 or 0.1°F/Minimum, depending on the service setup screen. The ROM default is 5°F/Minimum [2.8°C/Minimum].

LWT Control Proportional Gain (Kp) Set Point

LWT Control Proportional Gain: xxx.x%/F
Factory Default is 6.0%/F and 10.8%/C

The range of values is from 0 to 100%/F [0 to 180%/C] in increments of 0.1. The ROM default is 10%/F [18%/C].

LWT Control Integral Gain (Ki) Set Point

LWT Control Integral Reset Time: xx sec
Press (+)(-) to Change Setting

The range of values is from 0 to 1%/F in increments of .001. The ROM default is .110%/F [.198%/C].

LWT Control Derivative Gain (Kd)

LWT Control Rate Time: xx sec
Press (+)(-) to Change Setting

The range of values is from 0 to10%/F [0 to 18%/C] in increments of 0.1. The ROM Default is 0.0%/F [0.0%/C].

IGV Maximum Travel Set Point

IGV Maximum Travel: xx,xxx Steps
Press (+)(-) to Change Setting

The range of values is from 0 to 60,000 steps in increments of 100 steps. ROM default is 50,000 steps.

Guide Vane Closed Travel Stop

Guide Vane Closed Travel Stop: xx.x%
Press (+)(-) to Change Setting

The range of values is from 0 to 100% in increments of 1%. ROM default is 0%.

Minimum Capacity Timer Enable

Min Capacity Timer: [Status]
Press (+)(-) to Change Setting

The choices for status are enable (ROM default) and disable; unlimited time.

Note: on non-adaptive frequency chillers, this timer times out when the chiller is at minimum IGV position and the leaving water temperature is below the CWS. On adaptive frequency chillers, this timer times out when the chiller is at minimum IGV position, or minimum AF speed, and the leaving water temperature <chilled-water set point.

Time Permitted at Minimum Capacity

Time Permitted at Min Cap: xxx Min
Press (+)(-) to Change Setting

Range of values is from 1 to 480 minutes in increments of 1 minute. ROM default is 30 minutes.

Local Atmospheric Pressure

Local Atmospheric Pressure: xx.x psia/kPa
Press (+)(-) to Change Setting

The range of settings is from 10 to 16 psia [68.8 to 110.3 kPa] in increments of 1 or 0.1 psia, or kPa, depending on the service setup screen. The ROM default is 14.7 psia [101.3 kPa].

Refrigerant Pressure Analog Output Option

Rfgt Pressure Output Option: [Status]
Press (+)(-) to Change Setting

Possible values for status are: %Condenser (ROM default) and delta.

Minimum Delta Pressure Calibration

Min Delta Pressure Calibration (2 VDC): xxxx PSID/kPa Press (+)(-) to Change Setting

The range of values is from 0 to 400 psid [0-2758 kPa] in increments of 1 psid/kPa. ROM default is 0 psid [0 kPa].

Note 6.8948 kPa = 1 psi

Maximum Delta Pressure Calibration

Max Delta Pressure Calibration (10 VDC): xxxx PSID/kPa Press (+)(-) to Change Setting

The range of values is from1 to 400 psid [7-2758 kPa] in increments of 1 psid/kPa. ROM default is 30 psid [207 kPa].

Evaporator Leaving Water Offset

Evap Leaving Water Temp Offset: [setting]
Press (+)(-) to Change Setting

The range of values is -2.0 to 2.0°F in 0.1°F increments [± 1.1°C in 0.1°C increments]). The ROM default is 0.0°F [0.0°C].

Saturated Evaporator Refrigerant Temperature Offset

Saturated Evap Rfgt Temp Offset: [setting]
Press (+)(-) to Change Setting

The range of values is from -2.0 to 2.0°F in 0.1°F increments [± 1.1°C in 0.1°C increments]. The ROM default is 0.0°F [0.0°C].

Operating Interface: Controls

Service Settings (Password-Protected Machine Configuration Group)

The machine configuration password is <+> <-> <+> <-> <+> <-> <Enter>. If the machine configuration password is entered, the display goes to the following menu series. If a key is not pressed within the time set on the Password Duration Screen, the display returns to the chiller operating mode display of the chiller report, and the password must be entered again to return to this menu.

Machine Configuration Group Heading

Machine Configuration Group Settings
Press (Next)(Previous) To Continue

This header appears when the headers do not appear in the service settings menu.

Unit Frequency

Unit Frequency: *[Frequency]*
Press (+)(-) to Change Setting

Possible values of frequency are 60 Hz (ROM default) and 50 Hz.

Unit Type

Unit Type: *[Type]*
Press (+)(-) to Change Setting

Unit type will default to one of three chiller types. The ROM default is CVHE. When the ROM default is CVHE, possible values of unit type are "CVHE and CVHG," "CVHF," "CVHB," "CVGE and CVGG," "CVGF and CVAE," FastPak Water-Cooled, and FastPak Air-Cooled.

Nominal Unit Tons

Nominal Unit Tons: *[tons]*
Press (+)(-) to Change Setting

Possible values of [tons] are from 100 through 1800 in 10 ton increments. ROM default is 500 tons.

Refrigerant Type

Refrigerant Type: *[Type]*
Press (+)(-) to Change Setting

Possible values of [type] are R11, R123 (ROM default), R134a, R22, and R113.

Starter Type

Starter Type: *[type]*
Press (+)(-) to Change Setting

Possible values for type are Y-Delta, X-Line, SMCPP, primary reactor, auto transformer, Solid-State, and C515.

Start-up Contactor Test - Y-D Starters Only

This screen will be displayed only when the starter type is Y-Delta; otherwise this screen is bypassed.

Starter Contactor Test:
Perform the test by first closing 1M(2k1) and checking to make sure no currents are detected by the CTs. Then the Shorting Contactor (S)(2K3) is individually energized and a check is made to ensure that there are no currents detected by the CTs. If current is detected when only S is energized at Start, then 1M is shorted. If currents are detected when only 1M is closed first at start, then one of the other contactors is shorted. *Note: This test applies only to factory-installed Y-Delta Closed Transition Starters.*

Level 2 Contactor Integrity Test: *[d/e]*
Press (+)(-) to Change Setting

where disabled is the ROM default.

Rated Load Amps
This value should be set at the design rated load amps as determined during the initial selection process. If conditions change, contact Trane Technical Support for new settings based on the new operating conditions.

Rated Load Amps: *xxxx Amps*
Press (+)(-) to Change Setting

The range of values is from 0 to 2500 in 1 amp increments. The ROM default is 300 amps.

Operating Interface: Controls

Motor Heating Constant

Motor Heating Constant: xxx Min
Press (+)(-) to Change Setting

The range of values XXX is from 0 to 100 minutes in one minute increments. The ROM default is 25 minutes. This value is used in the calculation of the restart inhibit timer. Set the Motor Heating Constant according to the following table.

NTON		Motor Heating Constant
60 Hz	50 Hz	
230-320	190-270	30 Minutes
360-500	300-420	35 Minutes
560-800	470-660	40 Minutes
890-1280	740-1040	45 Minutes

Procedure for Selecting Current Overload Settings for UCP2

1. Determine the Rated Load Amps (RLA) from the Unit Nameplate.
2. Refer to Table 18 or Table 19 as follows:

   Select Table 18 if:

   - the unit has a unit-mounted starter with an RLA less than or equal to 1620 Amps

     or

   - if the unit has a 24" [609 mm] wide control panel, no unit-mounted starter, and an RLA less the 1261 amps and less than or equal to 600 V

     or

   - if the starter has a single CT/phase, wired directly to the starter module.

   Select Table 19 if:

   - the unit has an RLA over 1620 Amps

     or

   - if the unit has a 38" [965 mm] double-wide "Starter By Others" control panel

     or

   - if the starter has two CTs/phase, wired to the starter module (greater than 600 volts).

3. Using Table 18 or Table 19 (determined from Step 2), determine the CT Meter Scale Rating based on the RLA from Step 1.
4. Calculate the CT factor using one of the following two equations:

   If Table 18 was used: CT Factor = (Motor RLA/CT Meter Scale Rating) × 100

   If Table 19 was used, CT Factor = (Motor RLA/CT Meter Scale Rating) × 139

5. Refer to Table 20. Determine Current Overload Settings Number 1 and calculated in Step 4.
6. Verify Current Overload Setting Number 1.
7. Verify Current Overload Setting Number 2.

Operating Interface: Controls

Table 18 – Current Transformer Selection Table for Single CT/Phase Systems CT Factor = (Motor RLA/CT Meter Scale Rating) × 100

Motor RLA	CT Part Number	Extension	CT Meter Scale Rating
34-50A	x13580253	09	50A
51-67A		10	75A
68-100A		01	100A
101-134A		02	150A
135-184A		03	200A
185-267A		04	275A
268-334A		05	400A
335-467A		06	500A
468-667A		07	700A
668-935A		08	1000A
936-1260		11	1400A
1261-1800		12	1800A

Table 19 – Current Transformer Selection Table for Two CT/Phase Systems CT Factor = (Motor RLA/CT Meter Scale Rating) × 139

Line CT Part Number	Extension	Line CT Ratio	CT Terminal Connection	Number of Primary Turns	RLA Ranges	Meter Scale
X13580272	-01	50:5	X1 to X2	3	8.0 – 11.9	16.7
	-01	50:5	X1 to X2	2	12.0 – 17.9	25.0
	-02	75:5	X1 to X2	2	18.0 – 23.9	37.5
	-01	50:5	X1 to X2	1	24.0 – 35.9	50
	-02	75:5	X1 to X2	1	36.0 – 47.9	75
X13580271	-01	100:5	X1 to X2	1	48.0 – 72.0	100
X13580048		150:5	X1 to X2	1	72.0 – 86.3	150
		180:5	X1 to X3	1	86.4 – 95.9	180
		200:5	X1 to X4	1	96.0 – 119.9	200
	-02	250:5	X1 to X2	1	120.0 – 143.9	250
		300:5	X1 to X3	1	144.0 – 167.9	300
		350:5	X1 to X4	1	168.0 – 191.9	350
	-03	400:5	X1 to X2	1	192.0 – 239.9	400
		500:5	X1 to X3	1	240.0 – 287.9	500
		600:5	X1 to X4	1	288.0 – 335.9	600
	-04	700:5	X1 to X2	1	336.0 – 383.9	700
		800:5	X1 to X3	1	384.0 – 479.9	800
		1000:5	X1 to X4	1	480.0 – 575.9	1000
	-05	1200:5	X1 to X2	1	576.0 – 719.9	1200
		1500:5	X1 to X3	1	720.0 – 863.9	1500
X13580047	-01	1800:5	X1 to X2	1	864.0 – 1007.9	1800
		2100:5	X1 to X3	1	1008.0 – 1199.9	2100
		2500:5	X1 to X4	1	1200.0 – 1800	2500
	-02	1000:5	X1 to X2	1	480.0 – 575.9	1000
		1200:5	X1 to X3	1	576.0 – 719.9	1200
		1500:5	X2 to X4	1	720.0 – 863.9	1500

Table 20 – Current Overload Settings

CT Factor	Current Overload Setting #1	Current Overload Setting #2	CT Factor	Current Overload Setting #1	Current Overload Setting #2	CT Factor	Current Overload Setting #1	Current Overload Setting #2
66	00	255	77	11	244	88	22	233
67	01	254	78	12	243	89	23	232
68	02	253	79	14	241	90	24	231
69	03	252	80	15	240	91	25	230
70	04	251	81	16	239	92	25	230
71	06	249	82	17	238	93	26	229
72	06	248	83	18	237	94	27	228
73	07	248	84	19	236	95	28	227
74	08	247	85	20	235	96	28	227
75	09	246	86	21	234	97	29	226
76	10	245	87	22	233	98	30	225
						99	30	225

Operating Interface: Controls

Current Overload Setting #1

Current Overload Setting #1:	*xxx*
Press (+)(-) to Change Setting	

The range of values is from decimal 00 through 31. The ROM default is 00. Both the maximum acceleration timers and the overload settings are not adjustable from Tracer or any other remote or external device.

The UCP2 will continuously monitor compressor current to provide running-overcurrent and locked-rotor protection. Overcurrent protection is based on the phase with the highest current. It will trigger a manually resettable diagnostic, shutting the unit down, when the current exceeds a specified time-trip curve.

The compressor overload is based on the unit RLA. RLA is set in the UCP2 menu items, along with the current overload settings specific to a certain current transformer (CT) and machine nameplate RLA. Use the following procedure to set current overload #1 and #2.

Current Overload Setting #2

Current Overload Setting #2:	*xx*
Press (+)(-) to Change Setting	

The range of values is from decimal 224 through 255. The ROM default is 255. For security purposes, the second setting is the 8-bit ones complement of the first setting above. Both the maximum acceleration timers and the overload settings are not adjustable from Tracer or any other remote/external device.

Maximum Acceleration Timer #1
This value indicates the time at which the UCP2 expects full acceleration of the motor to occur, either during the part-winding phase of the Y-Delta start sequence or during current-limit control of the solid-state starter.

Maximum Acceleration Timer #1:	*xx sec*
Press (+)(-) to Change Setting	

The range of values is from 6 to 64 seconds. The ROM default is 27 seconds. Both the maximum acceleration timers and the overload settings are not adjustable from Tracer or any other remote/external device. Adjusting this value to a longer time than suggested for a particular compressor is not recommended, as it can compromise the motor protection. Failure of the motor to fully accelerate within this time will cause either an aborted start, or an immediate starter transition or bypass depending on the setting of the Acceleration Time Out Action (entry below). In either case, an appropriate diagnostic is generated.

Maximum Acceleration Timer #2

Maximum Acceleration Timer #2:	*xx sec*
Press (+)(-) to Change Setting	

The range of values is from 191 to 249 sec. The ROM default is 228. Timer # 1 and Timer # 2 settings must equal 255. Both the maximum acceleration timers and the overload settings are not adjustable from Tracer or any other remote/ external device.

Acceleration Time Out Action

Acceleration Time Out Action:	*[action]*
Press (+)(-) to Change Setting	

This setting defines the action that the starter will take if the motor is not accelerated within the maximum acceleration timer # 1 above.

Possible values for action include shutdown (ROM default), and transition [non-solid-state starter types only]. If shutdown is selected, the start will be aborted upon failure to accelerate.

Heatsink Start Inhibit Temperature Set Point

This screen is displayed for starter type SMCDP.

Heatsink Start Inhibit Temp:	*xxx.x f/c*
Press (+)(-) to Change Setting	

The range of values is from 100.0 to 200.0°F [37.8 to 93.3°C] in increments of .1°F/°C. Default is 100°F [37.8°C].

High-Lift Unloading Valve

High Lift Unloading Valve:	*[Status]*
Press (+)(-) to Change Setting	

Possible values for status are: Installed and Not Installed (ROM Default).

CPIM Set Point

CPIM:	*[Value]*
Press (+)(-) to Change Setting	

The range of values is from 880 to 1300 in increments of 1. The Default is 980.

External Chilled-Water Set Point Option

CPIM:	*[Value]*
Press (+)(-) to Change Setting	

Possible values for status are: Installed and Not Installed (ROM Default).

External Current Limit Set Point Option

External Chilled Wtr Set point:	*[Status]*
Press (+)(-) to Change Setting	

Possible values for status are Installed and Not Installed (ROM Default).

Motor Winding RTD Type

Motor Winding RTD Type:	*[type]*
Press (+)(-) to Change Setting	

Possible values for type are 75 Ohm at 75°F [24°C] (ROM Default) and 100 Ohm at 32°F [0°C].

Operating Interface: Controls

External Chilled-Water Set Point Option

External Chilled Wtr Setpt: [Status]
Press (+)(-) to Change Setting

Possible values for status are: Installed and Not Installed (ROM Default).

External Current Limit Set Point Option

External Current Limit Setpt: [Status]
Press (+)(-) to Change Setting

Possible values for status are: Installed and Not Installed (ROM Default).

High Pressure Cutout Setting

High Pressure Cutout Setting: xxxx Psig
Press (+)(-) to Change Setting

The range of values is from 5-500 psig [35-3447 kPa] in increments of 5 psig/kPa. The ROM default is 180 psig [1241 kPa].

NOTE: 6.8948 kPa = 1 psi.

Line Voltage Sensing Option

Line Voltage Sensing Option: [status]
Press (+)(-) to Change Setting

Possible values for status are: Installed and Not Installed (ROM Default).

Unit Line Voltage
This screen only appears if the line voltage sensing option is installed.

Unit Line Voltage: [volt] V
Press (+)(-) to Change Setting

Possible values of [volt] are from 180 through 6600 in 5 volt increments. The ROM default is 460 volts.

External Set Point Analog Input Type Selection, 4-20 mA and 2-10 Vdc

External Set point Inputs: [type]
Press (+)(-) to Change Setting

Possible values for type are from 4-20 mA (ROM default) and 2-10 Vdc.

Tracer Option

Tracer Option: [status]
Press (+)(-) to Change Setting

Possible values for status are: Installed and Not Installed (ROM Default).

NOTE: the Tracer option will automatically be installed if communication with a Tracer occurs. This screen is only necessary to de-install Tracer communication in the event of an inadvertent automatic installation (such as might occur if a chiller module is swapped in the field).

Tracer Communication Interface Module Option

TCI Module Option: [status]
Press (+)(-) to Change Setting

Possible values for status are: Installed and Not Installed (ROM Default).

Notes: the Tracer communication interface module option will automatically be installed if communication with a TCI module occurs. This screen is only necessary to de-install the TCI module in the event of inadvertent installation (such as might occur if a chiller module is swapped in the field).

It also can be used in factory test procedures.

IGV Output Type

Inlet Guide Vane Output: [Y]
Press (+)(-) to Change Setting

Possible Values for Y are Stepper Motor (ROM Default) and Pulsed.

Oil Pressure Protection: [status]
Press (+)(-) to Change Setting

Possible Values for [status] are Transducer (ROM Default), Diff Switch Xducer and Switch.

Service Tests

The service tools group contains items that are primarily associated with either test or manual override of the chiller or chiller subsystems. If the service tools password is entered, the display goes to the menu below.

If a key is not pressed for the duration of the password timer, the display returns to the chiller operating mode display of the chiller report, and the password must be entered again to return to this menu.

If any item in the service tools group is in manual override, the red alarm LED will be on (non-flashing). The following table contains the service tools set points that affect the alarm light.

To turn the alarm light off (from an on and non-flashing state), all the conditions must be satisfied.

Function/Set Point:	*Condition to Turn Alarm Off:*
"Chilled-Water Pump"	*Auto*
"Condenser Water Pump"	*Auto*
"Oil Pump	*Auto*
"Vane Control"	*Auto*

Service Tools Group Password Request

Pswd Reqd to Access Service Tools Group
Please Enter Password

The service tools password is <+> <+> <-> <-> <+> <+> <Enter>. Successfully entering the password sends you to the service tools group heading screen.

Service Tests Menu Heading

Service Tests & Overrides
Press (Next)(Previous) To Continue

Chilled-Water Pump

Chilled-Water Pump: [Mode]
Press (+)(-) to Change Setting

Possible values for mode are Auto (ROM default) and On.

Operating Interface: Controls

Chilled-Water Flow Switch Status

This screen displays the status of the chilled-water flow switch at the input to the UCM.

Chilled-Water Flow Switch Status:
[y]

Possible Values for [y] are Flow Switch is Open/No Flow or Flow Switch is Closed/Flow.

Condenser Water Pump

Condenser Water Pump: *[mode]*
Press (+)(-) to Change Setting

Possible values for mode are Auto (ROM default) and On.

Condenser-Water Flow-Switch Status
The following screen is not a set point. This screen displays the status of the condenser-water flow-switch at the input to the UCM.

Condenser Water Flow Switch Status:
[y]

Possible values for [y] are Flow Switch is Open/No Flow or Flow Switch is Closed/Flow.

Starter Dry Run
Use the following screen when [xx] = "Disabled."

Starter Dry Run: *[xx]*
Press +/- to Change

Possible values of [xx] are Disabled (ROM default); Shorting Relay On; Run Relay On; Start Relay On; Transition Relay On; or Start and Run Relays On.

Use the following screen when [xx] is not equal to "Disabled."

Starter Dry Run: *[xx]*
(+)(-) (Enter): Trans Compl Inp: [y]

Possible values of [xx] are Disabled (ROM default); Shorting Relay On; Run Relay On; Start Relay On; Transition Relay On; or Start and Run Relays On.

Possible values of [y] are:

Closed (meaning the transition–complete input is detecting a contact closure), or

Open (meaning the transition–complete input is detecting a contact open).

If the unit is not in the local stop mode the following is displayed.

Starter Dry Run: *Disabled*
Unit Must Be In Local Stop To Execute

Oil Pump
This screen is always displayed.

Oil Pump: [Status]
Diff Oil Press Sw Status: [y]

Possible Values for Status are Auto (ROM Default) and On.

Differential Oil Pressure Sw Status is not a set point but a status display. Possible values for [y] are Open and Closed. Open denotes that the differential oil pressure is below 9 psid [62 kPa]. Closed denotes that the differential oil pressure is at or above 9 psid [62 kPa].

Vane Control Status/Vane Position Commands

Vane Control Is: *[Status]*
Press (+)(-) to Change Setting

The possible values of [status] are "Auto" or "Manual." The factory default is "Auto."

If the vane control status is "Auto" the following is displayed:

Inlet Guide Vane Position: *xxx.x % Open*
Press (+)(-) to Change Setting

If the vane control status is "Manual" the following is displayed. When the Vane Control Status is updated from "Auto" to "Manual," the manual target is initialized to the current vane position.

Vane Pos xxx.x% *Target xxx.x% Open*
LWT = xx.x *[limit mode]*

The possible values of limit mode are: "Current Limit," "Condenser Limit," "Evaporator Limit," and "(+) (-) and <Enter>."

Vane Position

Inlet Guide Vane Position: *xxxxx steps*
Inlet Guide Vane Position: *xx.x degrees*

Oil Flow Delta Pressure Switch Status
The following display is not a set point. It gives the Oil Flow Delta Pressure Switch status at the input to the UCM.

Oil Flow Delta Pressure Status:
[s]

Possible values of [y] are Flow Switch is Open/No Flow and Flow Switch is Closed/Flow.

Module Software Revision Levels

Press (Enter) To Display Software
Revision Levels Or (Next) To Continue

If <Enter> is selected, the following screen can be displayed 4 times with 4 different pairs of modules.

[Module x:] *[Software PN]*
{Module y:] *[Software PN]*

The modules and prefix software PN will be one of the following:

Chiller	*6200-0079-xx*
Circuit	*6200-0039-xx*
Starter	*6200-0055-xx*
Options	*6200-0040-xx*
Stepper	*6200-0081-xx*
TCI	*6200-0093-xx*
LCLD (local CLD)	*6200-0091-xx*
CCCLD (Complex Character CLD)	*6200-0092-xx*

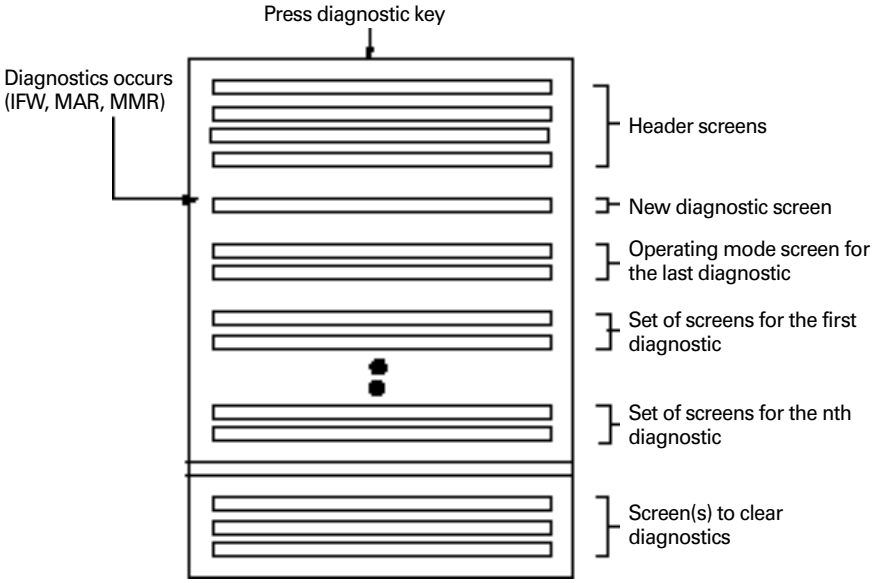
where xx is the software revision level as communicated over the IPC bus. The entire formal software part number for the particular module will be displayed for each of the modules or devices shown above (with the exception of the refrigerant monitor, which will only display the revision level). If a software part number for a given module has not been read by the CLD at any time since its last reset (RAM initialization), it will display the words: "not available" in place of the software PN.

Notes: These screens will display a line item for every possible module in an RTHC system. If a module fails during operation, the software revision for that module will still appear on the CLD until after a CLD power down reset.

Operating Interface: Controls

Diagnostics Menu

The Diagnostics Group is where all diagnostics, both historical and active, are presented. The group also contains the facility to clear active and historic diagnostics, and to purge diagnostics as individual groups. To clearly annunciate the occurrence of a diagnostic, the display will automatically go to this menu and display specific messages as explained below. The following illustration gives an overview of how the diagnostic key and the screens below it work.



Diagnostics Group Heading

Active & Historic Diagnostics
Press (Next)(Previous) To Continue

Menu Settings Password

If the Menu Settings Password is enabled in the Service Setup Group, after each setting group heading the following will be displayed:

Settings In This Menu Are [status]
[password message]

Likewise, if the Menu Settings Password is Disabled in the Service Setup Group, the above screen will not appear.

The possible values for status are "Locked" or "Unlocked." If the password status is locked, the password message will be "Enter Password to Unlock." The user will then depress "-+-+-+" followed by the <Enter> key. The password keystrokes will be echoed to the screen as a visual aid. The last six keystrokes represent the current password, and up to twenty keystrokes can be entered. An incorrect password, or the twenty-first keystroke, will result in the password message "Invalid Password."

If the password status is unlocked, the password message will be "Press (Enter) to Lock." Any attempt to change the setting will result in the message "Setting is Locked." The password, once entered, will remain valid until cancelled.

Diagnostics and Annunciation

If there are no diagnostics present, only the following screen will be displayed under the Diagnostics Group heading screen.

No Diagnostics Present
Press (Next) (Previous) To Continue

If there are any diagnostics present, the following 3 screens are displayed sequentially when the <Next> key is pressed. The first screen is:

Diagnostic Report Follows
Press (Next) For More

The second screen is:

Press (Enter) To Display Operating Mode
At Time Of Last Diagnostic or(Next) For More

The third screen is the chiller operating mode display that was present at the time that the most recent diagnostic occurred.

If there are one or more diagnostics present, the following displays will be inserted into the display sequence. Diagnostics will be listed in order of occurrence, from newest to oldest. Diagnostics will be displayed on 2 screens. The two screens will vary slightly depending on whether the diagnostic is active or historic.

The first active diagnostic screen will be:

[sequence #] [diagnostic]
(Next) [diagnostic type]

The sequence number will run from 1 through n (n <= 20) and number the diagnostics sequentially, where the most recent diagnostic is sequence # [01].

The possible replacements for "diagnostic type" are:

Warning Only - Reset Not Required (Applies to all IFW diagnostics.)

Unit Shutdown - Reset Required (Applies to all MMR diagnostics)

Unit Shutdown - Automatic Reset (Applies to all MAR diagnostics)

The second active diagnostic display screen will contain the diagnostic sequence #, a time and date stamp, and a help message suggesting possible service procedures. The second active diagnostic display screen will be:

[sn] occurred at HH:MM xm Mon xx, 200x
[help message]

Operating Interface: Controls

The time will be displayed as xx:xx am/pm.

The date will be displayed as month - date- year.

The month will use a standard 3-letter abbreviation. The year will not be abbreviated.

Depressing the <next> key will advance the display to the next diagnostic in the sequence.

The first historic diagnostic screen will be:

[sequence number] [Diagnostic]
Historic Only, Press (Next) For More

The definitions of diagnostic and sequence number are the same as for the active diagnostic messages. If <Next> is pressed, the second historic diagnostic screen is displayed. The second historic diagnostic screen will be:

[sn] occurred at HH:MM xm Mon xx, 200x
Historic Only, Reset At End Of Diag Menu

Up to 20 diagnostics will be displayed.

Clearing Diagnostics
At the end of the diagnostic menu, there will be 4 screens that allow the user to clear and reset the different diagnostic groups.

If any active diagnostics are present, the following screen will be displayed:

Press (Enter) To Clr Active Diagnostics
And Shutdown / Reset System

If the <Enter> key is pressed, the following message is displayed for two seconds:

Active Diagnostics Have Been Cleared
System Is Resetting

The display will be reset to the operating mode screen of the chiller report after this message clears.

If any historic diagnostics are present, the following screen will be displayed:

Press (Enter) To
Clear Historic Diagnostics

If the <Enter> key is pressed, the following message is displayed for four seconds:

Historic Diagnostics Have Been Cleared
Diagnostic Report Is Being Reset

The display will be reset to the top of the Diagnostic Menu after this message clears.

New Diagnostic Display
When a new diagnostic is sensed by the system, the display will reset to the diagnostic menu. A "one-time" screen will be displayed to inform the user that a new diagnostic has been detected. This screen will vary, depending on the type of diagnostic detected. The two major categories of diagnostics are, those which are informational only, and those which have resulted in machine shutdown.

If the diagnostic is an MMR/MAR, the screen will be:

**** A MACHINE SHUTDOWN HAS OCCURRED ****
Press (Next) For More

Otherwise, the screen will be:

A New Warning Has Been Detected
Press (Next) For More

This screen will be inserted into the diagnostic menu directly after the "Diagnostic Report Follows" screen. Pressing <Next> will therefore take the user to the "Press (Next) to display operating mode at time of last diagnostic" screen. If <Next>or <Previous> is pressed, this screen will no longer be in the display sequence.

Diagnostics

In the table following, a "Latching" diagnostic is a condition that will cause the machine, or a portion of the machine as noted, to shut down, and will require a manual reset to restore operation. A diagnostic that is non-latching is reset automatically when the condition causing the diagnostic goes away. A non-latching diagnostic will shut down the machine, or a part of the machine, if so indicated. If a diagnostic is information only, no machine action is taken.

Unless otherwise stated, all active diagnostics will be lost on loss of power.

Diagnostic Types And Action

MMR = Machine Shutdown - Manual Reset

MAR = Machine Shutdown - Auto Reset

IFW = Information Warning - May affect machine operation; lowest level of diagnostic

Remotely Resettable Diagnostics:
Except for the following, all diagnostics can be reset remotely from the Remote Clear Language Display, the Tracer, or the External Diagnostic Reset input at the Options Module. The following diagnostics shall only be resettable ONLY at the Local Clear Language Display, for example, with the operator standing at the unit.

Operating Interface: Controls

DIAGNOSTIC DESCRIPTION	Diagnostic Type	Can Be Remotely Reset
Starter Contactor Interrupt Failure	MMR	No
Low Evaporator Refrigerant Pressure	MMR	No
Phase Loss	MMR	No
Phase Reversal	MMR	No
Current Overload	MMR	No
Compressor did not Accelerate: Shutdown	MMR	No
Starter did not Transition	MMR	No
High Pressure Cutout Tripped	MMR	No
Low Evaporator Refrigerant Temperature	MMR	No
Emergency Stop Input	MMR	No
Starter Dry Run Test	MMR	No
Solid-State Starter Fault Relay Open	MMR	No
Adaptive Frequency Drive Fault Relay Open	MMR	No
High Motor Temperature Position #1	MMR	No
High Motor Temperature Position #2	MMR	No
Starter Fault Type I	MMR	No
Starter Fault Type II	MMR	No
Starter Fault Type III	MMR	No
Compressor did not Accelerate Fully	MMR	No
High Compressor Discharge Temperature	MMR	No
Phase Sequence Monitor: Phase Reversal	MMR	No
Transition Complete Input Shorted	MMR	No
At-Speed Input Shorted	MMR	No
Transition Complete Input Opened	MMR	No
At-Speed Input Opened	MMR	No

Operating Interface: Controls

Table 21 – Diagnostic Table

DIAGNOSTIC DESCRIPTION	Diagnostic Type	Diagnostic Active Modes	CAUSE	Help Message
Auxiliary Heat Recovery Entering Water Temperature Sensor	IFW	All	Open or shorted and Heat Recovery is installed (at the CLD)	Check sensor, wiring, and connections
Auxiliary Heat Recovery Leaving-Water Temperature Sensor	IFW	All	Open or shorted and Heat Recovery is installed (at the CLD)	Check sensor, wiring, and connections
Check Clock	IFW	All	On loss of power the clock does not keep time, if there is an extended power loss (greater than 15 seconds) this diagnosis is also generated to alert the operator to check the clock.	Check main power supply, reset clock
Chilled-Water Flow Lost	MAR	All modes except STOP (00) and EXTERNAL STOP (100)	a. The chilled-water flow switch input was open for more than 6-10 continuous seconds. b. 6-10 seconds of continuous flow shall clear this diagnostic.	Check pump, valves, flow switch
Chiller Module reference Voltage Calibration	IFW	All	An improper reference voltage was detected at the Chiller Module. A 2.5 Vdc reference is used to calibrate the non-ratiometric analog I/O, such as 2-10 Vdc and 4-20 mA inputs, as well as PWM analog outputs. The microprocessor checks to see that the A/D value falls within an acceptable range.	Check chiller module voltages
Chiller: Loss of Comm with TCI	IFW	All	The Tracer was set up as "installed" at the CLD and the chiller module lost communications with the TCI (Comm3 or Comm4) module for 15 continuous seconds.	Check IPC wiring and connections
Chiller: Loss of Comm with Circuit	MMR	All	The chiller module lost communications with the circuit module for 15 continuous seconds.	Check IPC wiring and connections
Chiller: Loss of Comm with Local CLD. Note: As implemented this is a latching IFW diagnostic. That is, once generated it cannot be regenerated until a manual reset is done.	IFW-AR	All	The chiller module lost communications with the CLD module for 15 continuous seconds.	Check IPC wiring and connections
Chiller: Loss of Comm with Options	IFW	All	The chiller lost communications with the Options module for 15 continuous seconds. This 1FW diagnostic is generated if Free Cooling is not installed, otherwise this is an MMR diagnostic under code 2F6.	Check IPC wiring and connections
Chiller: Loss of Comm with Options	MMR	All	The chiller module lost communications with the Options module for 15 continuous seconds. This MMR diagnostic is generated if Free Cooling is installed, otherwise this is an IFW diagnostic under code 2AE.	Check IPC wiring and connections
Chiller: Loss of Comm with Starter	MMR	All	The chiller module lost communications with the Starter module for 15 continuous seconds.	Check IPC wiring and connections
Chiller: Loss of Comm with Stepper #1	MMR	All	The chiller module lost communications with the Stepper #1 module for 15 continuous seconds.	Check IPC wiring and connections
Circuit Module reference Voltage Calibration	IFW	All	An improper reference was detected at the Circuit Module. A 2.5 Vdc reference is used to calibrate the non-ratiometric analog I/O such as 2-10 Vdc and 4-20 mA inputs, as well as PWM analog outputs. The microprocessor checks to see that the A/D value falls within an acceptable range.	
Circuit Module 24 Vdc Reference Missing	IFW	All	24Vdc reference missing and the refrigerant monitor is installed.	Check Refrigerant Monitor Wiring/24 Vdc Supply
Circuit: Loss of Comm with Chiller	MMR	All	The circuit module lost communications with the Chiller module for 15 continuous seconds. On loss of communications, the circuit module shall run the oil pump for the post-lube time and then turn the oil pump off. On loss of communications, the circuit module shall continue to control the oil heater.	Check IPC wiring and connections
Circuit: Loss of Comm with Starter	MMR	All	The circuit module lost communications with the Starter module for 15 continuous seconds.	Check IPC wiring and connections
Condenser Entering Water Temperature Sensor	IFW	All	Open or short	Check sensor, wiring, and connections
Condenser Leaving-Water Temperature Sensor	IFW	All	Open or short a. IFW on Chilled-Water Control b. MMR on Heat Pump (Hot Water) Control	Check sensor, wiring, and connections
Condenser Refrigerant Temperature Sensor	MMR	All	Open or Short	Check sensor, wiring, and connections
Compressor did not Accelerate Fully	MMR	Starting	a. Using a Solid-State Starter the UCP2 did not receive an Up-to-Speed or At-Speed Signal within the Maximum Acceleration Timer Setting. b. The Up-to-Speed/At-Speed input was found to be shorted before the compressor was started. c. Applies only to Solid-State Starters.	Check end of limit at speed input

Operating Interface: Controls

DIAGNOSTIC DESCRIPTION	Diagnostic Type	Diagnostic Active Modes	CAUSE	Help Message
Compressor did not Accelerate Shutdown	MMR	Start Mode	a. The compressor did not come up to speed in the allotted time defined by the Maximum Acceleration Timer. b. The Human Interface setups defined "Shutdown" as the action when the Maximum Acceleration Timer was exceeded.	Check main power supply and wiring
Compressor did not Accelerate: Transition (The Motor is put across the line).	IFW	Start Mode	a. The compressor did not come up to speed in the allotted time defined by the Maximum Acceleration Timer. b. The Human Interface setups defined "Transition" as the action when the Maximum Acceleration Timer was exceeded.	
Current Overload	MMR	All Running Modes	Motor current exceeded overload time vs. trip characteristic.	Check main power supply and wiring
Current Overload Setpoints Error	IFW	All	a. The redundant overload settings did not agree for 30 continuous seconds. (Continue to use the previous value for the 30 second timeout.) When this diagnostic occurs, the affected Starter Module shall use the minimum (00000 binary, 00 decimal) overload setting as a default until either the UCP2 is reset, or, if the redundant settings agree again, the starter module can go back to using the actual setting.	Review overload setup
CWS/Leaving-Water Temperature Cutout Set point Overlap	None	All	No diagnostic, limit value to the last legal value and tell the operator about it on the second line of the display. Note: The above is not a diagnostic, because you don't want the display vectoring you to a different display state when you are trying to set either the chilled-water set point or the leaving-water temperature cutout set point, as it will in the case of a diagnostic.	Not available
Differential Oil Pressure Overdue	MMR	Pre-Lube	A differential oil pressure was not established within 3 minutes of starting the oil pump in the Pre-Lube Mode. Design: Some hysteresis was introduced into this diagnostic.	
Discharge Temperature Sensor	MMR	All	Open or Short, only if HGBP and the Discharge Temperature Sensor is called out as "Installed" at the Human Interface.	Check sensor wiring and connections
Emergency Stop Input	MMR	All	a. EMERGENCY STOP input is open. An external interlock has tripped. Time-to-trip, from input opening to unit stop, shall be 0.1 to 1.0 seconds.	Check emergency stop input device
Evaporator Entering Water Temperature Sensor	IFW	All	Open or Short a. Normal operation, no effects on control. b. Chilled-Water Reset. Will run at either normal CWS or will run at maximum reset permitted.	Check sensor, wiring and connections
Evaporator Leaving-Water Temperature Sensor	MMR	All	Open or Short	Check sensor, wiring, and connections
Evaporator Refrigerant Temperature Sensor	MMR	All	Open or Short	Check sensor, wiring, and connections
Extended Energy Valve Position Set point	MMR	All	a. Not "Enabled:" no diagnostics. b. "Enabled:" Out-Of-Range Low or Hi, set diagnostic.	Check signal at input.
Extended Compressor Surge	MMR	All Running Modes	An extended surge condition was detected and the Surge Protection Feature was enabled at the Clear Language Display.	Check condenser water temperature
Extended Power Loss Note: This diagnostic and the functions tied to it are handled by the Check Clock diagnostic.	IFW	All	The unit lost power for an extended period of time. On CTV units, if power is lost for an extended period of time, the oil pump is not run on Power Up. If a power loss is determined to be a Momentary Power Loss, the Oil Pump is run on the Power Up to post-lube the bearings. The deciding factor determining if a power loss is Extended or Momentary is TBD.	Check main power supply and wiring
External Chilled-Water Set point	IFW-AR	All	a. Not "Enabled:" no diagnostics. b. "Enabled:" Out-Of-Range Low or Hi, set diagnostic, default CWS to next level of priority (for example, Front Panel Set point). This IFW diagnostic will automatically reset if the input returns to the normal range.	Check signal at input
External Current Limit Set point	IFW-AR	All	a. Not "Enabled:" no diagnostics. b. "Enabled:" Out-Of-Range Low or Hi, set diagnostic, default CLS to next level of priority (for example, Front Panel Set point). This IFW diagnostic will automatically reset if the input returns to the normal range.	Check signal at input

Operating Interface: Controls

DIAGNOSTIC DESCRIPTION	Diagnostic Type	Diagnostic Active Modes	CAUSE	Help Message
External Hot Water Set point	IFW-AR	All	a. Not "Enabled:" no diagnostics. b. "Enabled:" Out-Of-Range Low or Hi, set diagnostic, default HWS to next level of priority (for example, Front Panel Set point). This IFW diagnostic will automatically reset if the input returns to the normal range.	Check signal a input
External Vane Position Set point	MMR	All	a. Not "Enabled:" no diagnostics. b. "Enabled:" Out-Of-Range Low or Hi, set diagnostic.	Check signal at input
High Compressor Discharge Temperature	MAR	All	a. The discharge temperature exceeded the trip value, 212°F [100°C]	
High Motor Temperature Position # 1	MMR	Any Start and Run Mode	The Motor Winding temperature at sensor #1 exceeded 265°F ± 15°F [130°C ± 8°C] for 0.5 to 2 seconds. (Note: BR, Weight, and DT may be "instantaneous trip" but consistent with the analog input filtering function.)	
High Motor Temperature Position # 2	MMR	Any Start and Run Mode	The Motor Winding temperature at sensor #2 exceeded 265°F ± 15°F [130°C ± 8°C] for 0.5 to 2 seconds. (Note: BR, Weight, and DT may be "instantaneous trip" but consistent with the analog input filtering function.)	
High Motor Temperature Position # 3	MMR	Any Start and Run Mode	The Motor Winding Temperature at sensor #3 exceeded 265°F ± 15°F [130°C ± 8°C] for 0.5 to 2 seconds. (Note: BR, Weight, and DT may be "instantaneous trip" but consistent with the analog input filtering function.)	
High Oil Temperature	MMR	All Starting and Running Modes	UCP2 shall provide a fixed High Oil Temperature Cutout of 180°F [82.2°C]. If the oil temperature violates the cutout by 120°F-seconds [66.6°C-seconds] an MMR diagnostic shall be generated.	Check oil system
High Pressure Cutout Tripped	MMR	All	A high-pressure cutout was detected. See the trip points for the various products under the HPC switch description of this specification.	Check condenser water temperature
High Restart Inhibit Timer Warning	IFW	All	The Restart Inhibit timer has reached a maximum threshold for the host chiller. For CTV chillers this is 45 minutes. This indicates excessive chiller cycling. Steps should be taken to correct this.	Check for excessive chiller cycling
IGV BPI Found Low During Search	IFW	All	The Inlet Guide Vane Actuator Binary Position Indicator was found too low in the stroke of the IGV during the BPI search.	Check stepper module, wiring, and motor
IGV BPI Not Found During Search	IFW	All	The Inlet Guide Vane Actuator Binary Position Indicator was not found over the entire stroke of the IGV during the BPI search.	
IGV BPI Shorted	IFW	Pre-Start	At what is believed to be a closed position. The IGV BPI was found to be shorted.	Check sensor, wiring, and connections
IGV Electrical Drive Circuit Open (Available CTV Phase?? release)	MMR	On Demand and Pre-Start	Run the IGV Actuator electrical drive circuit test, both on demand from the Human Interface and just before the chiller starts.	
Incorrect Chiller Software Installed	MMR	All	The Incorrect EPROM was loaded into this module. The diagnostic is detected when a factory test computer sets the unit type to something other than what the EPROM software was intended for.	(No message is required.)
Incorrect Stepper Software Installed	MMR	All	The incorrect EPROM was loaded into this module. This diagnostic is detected when a factory test computer sets the unit type to something other than what the EPROM software was intended for.	(No message is required.)
Low Chilled-Water Temperature: Unit Off (Unit in Auto but not Starting or Running)	IFW-AR	Unit in Auto and No Circuits Energized (Any Circuit(s) Energized	a. The chilled-water temperature fell below the cutout set point while the compressor (or Solution Pump) was not running for 30°F-seconds [16.6°C-seconds]. Automatic Reset of the IFW diagnostic shall occur 2°F [1.1°C] above the cutout set point.	Check flow, sensor, and wiring
Low Chilled-Water Temperature: Unit On (Unit Starting or Running)	MAR	Any Circuits Energized (No Circuits Energized)	a. The chilled-water temperature fell below the cutout set point while the compressor (or Solution Pump) was not running for 30°F-seconds [16.6°C-seconds] . Automatic Reset of the IFW diagnostic shall occur 2°F [1.1°C] above the cutout set point.	Check flow, sensor, and wiring
Low Evaporator Refrigerant Temperature	MMR	Starter Contactor Energized	a. The Saturated Evaporator Refrigerant Temperature dropped below the Low Refrigerant Temperature Cutout Set point when the circuit was running for 30°F-seconds [16.6°C-seconds].	Check operation, call service
Low Oil Temperature	MAR	All Non-running Modes	The oil temperature dropped below its adjustable Low Oil Temperature Cutout ("Instantaneous trip" but consistent with the analog input filtering function). Automatic Reset of the MAR diagnostic shall occur 5°F [2.8°C] above the cutout set point.	

Operating Interface: Controls

DIAGNOSTIC DESCRIPTION	Diagnostic Type	Diagnostic Active Modes	CAUSE	Help Message
Maximum Acceleration Setpoints Error	IFW	All	a. The redundant Maximum Acceleration settings did not agree for 30 continuous seconds. (Continue to use the previous value for the 30 second timeout.) When this diagnostic occurs, the affected Starter Module shall use 6 seconds as a default until either the UCM is reset, or, if the redundant settings agree again, the starter module can go back to using the actual setting.	Review maximum acceleration setup
Memory Error Type I: NOVRAM	MMR	On UCM Power Up or following a Type II Memory error diagnostic	a. On UCM, either power up or following a Type II Memory Error, a NOVRAM memory error was detected. The UCM is operating all Engineering ROM defaults for all setup parameters. Check all setup parameters and continue to run the chiller. Replace the Chiller Module as soon as a replacement is available. Note: It is expected that this diagnostic will be detected on the very first power up of the Chiller Module at the manufacturer, because the NOVRAM will not contain valid data on the first power up.	Call service to check all settings
Memory Error Type II: Shadow RAM	IFW	All	a. A Shadow RAM memory error was detected. The UCM is operating on all last-valid values (pulled from NOVRAM) for all setup parameters. No setup parameter changes were pending to be loaded into NOVRAM, a complete recovery of all setup parameters was made, and there is no need to check unit setup parameters. Compressor starts and hours were lost for not more than the last 24 hours. This is expected to be an isolated event, and repair or replacement is not required. If this diagnostic does occur repeatedly, then replace the Chiller Module.	No settings were lost
Memory Error Type III	IFW	All	a. A Shadow RAM memory error was detected. The UCM is operating on all last-valid values (pulled from NOVRAM) for all setup parameters. Setup parameter changes less than 24 hours old, pending to be loaded into NOVRAM, were lost. Check all setup parameters made in the last 24 hours. Compressor starts and hours were lost for not more than the last 24 hours. This is expected to be an isolated event, and repair or replacement is not required. If this diagnostic does occur repeatedly, then replace the Chiller Module.	Settings changed in the last 24 hours lost
Momentary Power Loss	MAR	All Running Modes (Start Mode, for example, Before transition)		Determine cause of power interruption
Motor Temperature Sensor #1	MMR	All	Open or Short	Check sensor, wiring, and connections
Motor Temperature Sensor #2	MMR	All	Open or Short	Check sensor, wiring, and connections
Motor Temperature Sensor #3	MMR	All	Open or Short	Check sensor, wiring, and connections
MPL Detect Circuit Inoperative	MMR MMR	All	A failure was detected in the Momentary Power Loss detect circuit. If there are no zero-cross interrupts in Vab for approximately 3 half-line cycles, the timer interrupt will trip and generate a diagnostic that indicates that our ability to detect MPL is gone. If Vab was truly gone, the module would be powered down, therefore, if we can detect that Vab is gone, there must be a hardware failure on the board.	
Oil Temperature Sensor	IFW	All	Open or Short	Check sensor, wiring, and connections
Option Module Reference Voltage Calibration	IFW	All	An improper reference voltage was detected at the Options Module. A 245 Vdc reference is used to calibrate the non-ratiometric analog I/O, such as 2-10 Vdc and 4-20 mA inputs, as well as PWM Analog outputs. The microprocessor checks to see that the A/D value falls within an acceptable range.	
Options Module 24 Vdc Reference Missing	MMR	All	24 Vdc reference missing, and the differential water pressure transducers are installed.	Check press transducer wiring and 24 Vdc supply
Options Module 24 Vdc Reference Missing	IFW	All	24 Vdc reference missing, the differential water pressure transducers are installed, and VSD is installed.	Check press transducer wiring and 24 Vdc supply
Options: Loss of Comm with Chiller	IFW	All	The options module lost communications with the chiller module for 15 continuous seconds.	Check IPC wiring and connections
Options: Loss of Comm with Starter		All	The options module lost communications with the Starter module for 15 continuous seconds.	Check IPC wiring and connections

Operating Interface: Controls

DIAGNOSTIC DESCRIPTION	Diagnostic Type	Diagnostic Active Modes	CAUSE	Help Message
Outdoor Air Temperature Sensor (Both Outdoor Air Reset and Low Ambient Lockout not selected)	None	All	Open or Short a. Display end-of-range value.	Not Available
Outdoor Air Temperature Sensor (Either Outdoor Air Reset or Low Ambient Lockout selected)	IFW	All	Open or Short a. Use end-of-range value (whatever value the open or short gives). b. Clear diagnostic when the resistance returns to normal range.	Check sensor, wiring, and connections
Over Voltage	MAR	Pre-Start and Any Circuit(s) Energized	a. Line voltage above +10% of nominal. (Must hold = +10% of nominal. Must trip = +15% of nominal. Reset differential = minimum of 2% and maximum of 4%. Time to trip = minimum of 1 minute 10 seconds and maximum of 5 minutes 20 seconds). Design: Nominal trip 60 seconds at greater than 112.5%, Auto Reset at 109.5% or less.	Check main power supply and wiring
Phase Loss	MMR	Contactor Energized (All Non-Ring Modes)	a. No current was sensed on one or more of the current transformer inputs. (Must hold = 20% RLA. Must trip = 5% RLA). Time to trip shall be 1 second minimum, 3 seconds maximum. Actual design trip point is 10%.	Check main power supply and wiring
Phase Reversal	MMR	Contactor Energized to transition command (All Other Times)	a. A phase reversal was detected on the incoming current. On a compressor start-up, the phase reversal logic must detect and trip in a maximum of 0.7 seconds from compressor start for CTV.	Check main power supply and wiring
Phase Reversal Protection Lost	MMR	Starter Contactor energized to transition command	a. The phase-reversal protection on the compressor has become inoperative. The phase-rotation protection system failed to detect 2 in a row, of one of the four phase circuit states: phase reversal, phase rotation OK, phase A lost, phase B lost.	Check starter module
Severe Phase Unbalance	MMR	All Running Modes	a. A 30% Phase Unbalance diagnostic has been detected. Items to check are the Current Transformer Part #s (they should all match), the Current Transformer resistances, line voltage phase balance, all power wiring connections, the contactor pole faces, and the motor. If all these are OK, replace the Starter module.	Check main power supply and wiring
Starter Contactor Interrupt Failure	MMR	Starter Contact not Energized (Starter Contact Energized)	a. Welded starter contactor. b. Detected a welded compressor contactor when the compressor was commanded off, but the current did not go to zero. Detection time shall be 5 seconds minimum and 10 seconds maximum for all electromechanical and solid-state starters. Detection time for Variable Speed Drives shall be 12 seconds minimum and 17 seconds maximum. On detection, generate the diagnostic, energize the appropriate alarm relay, and continue to command the affected compressor off.	Complete starter checkout required
Starter did not Transition	MMR	On the first check after transition	a. The UCM did not receive a transition complete signal in the designated time from the UCM command to transition. The must-hold time from the UCM transition command is 1 second. The must-trip time from the transition command is 6 seconds. Actual design is 2.5 seconds. b. The Transition Complete input was found to be shorted before the compressor was started. c. Item a. above is active only for Y-Delta, Auto-Transformer and Primary Reactor Starters. d. Item b. above is active for all electromechanical starters.	Complete starter checkout required
Starter Dry Run Test	MMR	Starter Dry Run Mode	While in the Starter Dry Run Mode, either 50% Line Voltage was sensed at the Potential Transformer or 10% RLA Current was sensed at the Current Transformers.	Current or voltage detected
Starter Fault Type I	MMR	Starting	a. This is a specific starter test where 1M is closed first and a check is made to ensure that there are no currents detected by the CTs. If currents are detected when only 1M is closed first at start, then one of the other contactors is shorted. b. This test applies only to Y-Delta Closed Transition Starters.	

Operating Interface: Controls

DIAGNOSTIC DESCRIPTION	Diagnostic Type	Diagnostic Active Modes	CAUSE	Help Message
Starter Fault Type I	MMR	Starting	a. This is a specific starter test where the Shorting Contactor(s) is individually energized and a check is made to ensure that there are no currents detected by the CTs. If current is detected when only S energized at Start, then 1M is shorted. b. This test in a. above applies to all forms of starters. (Note: It is understood that many starters do not connect to the Shorting Contactor.)	
Starter Fault Type III	MMR	Starting	a. As part of the normal start sequence to apply power to the compressor, the Shorting Contactor(s) and then the Main Contactor (1M) were energized. 1.6 seconds later there were no currents detected by the CTs, for the last 1.2 seconds, on all three phases. b. This test in a. above applies to all forms of starters except Variable Speed Drives. (Note: It is understood that many starters do not connect to the Shorting Contactor.)	
Starter Mod Refrigerant Voltage Calibration	IFW	All	An improper reference voltage was detected at the Starter Module. A 2.5 Vdc reference is used to calibrate the non-ratiometric analog I/O such as 1-10 Vdc and 2-20 mA inputs as well as PWM Analog outputs. The microprocessor checks to see that the A/D value falls within an acceptable range.	
Starter: Loss of Comm with Chiller	MMR	All	The starter module lost communication with the Chiller module for 15 continuous seconds.	Check IPC wiring and connections
Starter: Loss of Comm with Circuit	MMR	All	The starter module lost communication with the Chiller Module for 15 continuous seconds.	Check IPC wiring and connections
Stepper #1: Loss of Comm with Chiller	MMR	All	The Stepper #1 module lost communications with the Chiller Module for 15 continuous seconds.	Check IPC wiring and connections
Stepper #1: Loss of Comm with Starter	MMR	All	The Stepper #1 module lost communications with the Chiller module for 15 continuous seconds.	Check IPC wiring and connections
TCI: Loss of Comm with Chiller	IFW	All	The TCI module lost communications with the Chiller module for 15 continuous seconds.	Check IPC wiring and connections
TCI: Loss of Comm with Circuit	IFW	All	The TCI module lost communications with the Circuit module for 15 continuous seconds.	Check IPC wiring and connections
TCI: Loss of Comm with Options	IFW	All	The TCI module lost communications with the Options module for 15 continuous seconds.	Check IPC wiring and connections
TCI: Loss of Comm with Purge	IFW	All	The TCI module lost communications with the Purge module for 15 continuous seconds.	Check IPC wiring and connections
TCI: Loss of Comm with Starter	IFW	All	The TCI module lost communications with the Starter module for 15 continuous seconds.	Check IPC wiring and connections
TCI: Loss of Comm with Stepper #1	IFW	All	The TCI module lost communications with the Stepper #1 module for 15 continuous seconds.	Check IPC wiring and connections
Tracer Communications Lost	IFW	All	The Tracer was set up as "installed" at the CLD, and the TCI lost communications with the Tracer for 15 continuous minutes after it had been established. Continue to run the chiller with the last valid Tracer Setpoints/Mode.	Check Tracer to UCP wiring and connections
Tracer failed to Establish Comm	IFW	At power-up	The Tracer was set up as "installed" at the CLD and the Tracer did not communicate with the TCI within 2 minutes after power-up.	Check Tracer wiring, connections, and power
Tracer Outdoor Air Temperature Sensor Fail	IFW	All		Check sensor, wiring, and connections
Tracer Temperature Sensor	IFW	All	Input Shorted	Check sensor, wiring, and connections
Under Voltage	MAR	Pre-Start and Any Circuit(s) Energized	a. Line voltage below – 10% of nominal or the Under/Overvoltage transformer is not connected. (Must hold = 10% of nominal. Must trip = -15% of nominal. Reset differential = minimum of 2% and maximum of 4%. Time to trip = minimum of 1 minute and maximum of 5 minutes.) Design: Nominal trip 60 seconds at less than 87.5%, ± 2.8% at 200V or ± 1.8% at 575V. Auto Reset at 90.5% or greater.	Check main power supply and wiring

Operating Interface: Controls

Restart Inhibit

A Restart Inhibit (**RI**) Timer is used to prevent high frequent chiller on-off cycling and subsequent motor overheating.

The Restart Inhibit (RI) timer is set based on a Background Timer (**BT**) that is incremented by (XX) minutes at every start, is timed out from the new total only while the chiller is running, and is based on the equation:

RI = BT – 50

The value of XX is based on nominal compressor size to include the motor heating constant as listed in the table.

The value of the motor heating constant (XX) must be set in the Machine Configuration Group of the Service Settings menu, based on the unit NTON and motor frequency.

On any UCM reset (either hardware, for example, power-up or software), the RI Timer is reset to 30 seconds if the motor winding temperature is less than or equal to 165°F [73.8°C] or 15 minutes if the motor winding temperature is greater than 165°F [73.8°C].

The maximum value of the RI Timer is 60 minutes, and is adjustable from 30 to 60 minutes in the Field Start-up Group of the Service Settings menu.

See Figure 26 for an example of how the RI Timer functions.

Any other pre-start system timers, for example, prelube = 30 seconds, overlap the RI Timer to anticipate its time out, and permit start of the compressor at or shortly after the RI. If the RI Timer value ever reaches 45 minutes, an IFW diagnostic is generated.

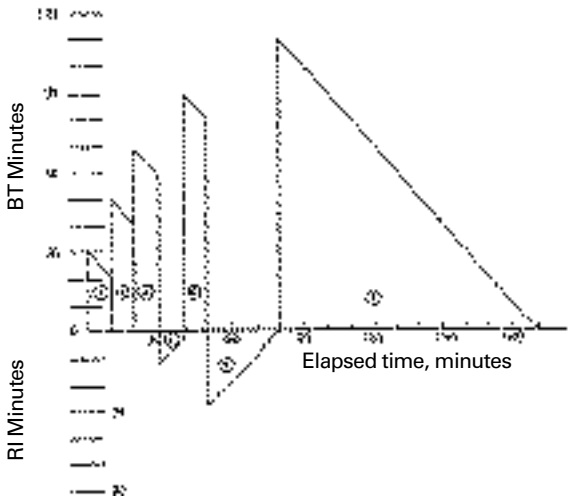
The RI Timer can be cleared to 30 seconds in the Service Settings menu.

If the RI Timer is the overriding criteria holding the chiller off, this mode will be displayed along with the remaining time, counting down, prior to the chiller starting.

Parameter	CVGF
Background Timer Increment on Start (Motor Heating Constant)	Adjustable, 25 minute Factory Default
General RI Timer Setting	RI = BT – 50
Minimum RI Timer Setting	30 seconds
Maximum RI Timer Setting	60 minutes
Adjustment Range of Maximum RI Timer Setting	30-60 minutes
Winding Temperature Decision Point/RI Timer Above this Temperature after Reset	165°F [73.8°C]/15 minutes
IFW Diagnostic Threshold	RI Timer = 45 Minutes

Any other pre-start system timers, for example, prelube = 30 seconds, overlap the RI Timer to anticipate its time out, and permit start of the compressor at or shortly after the RI. If the RI Timer value ever reaches 45 minutes, an IFW diagnostic is generated. If the calculated RI is negative, then RI = 0.

Figure 26 – Example of Restart Inhibit



Example for Motor Heating

Constant XX = 30

1. Unit started and ran 10 minutes, BT incremented 30 minutes and decreased by 10 minutes:
   BT = 30 – 10 = 20 minutes
   RI = 20 – 50 = -30 minutes
   RI = 0
2. Unit restarted, BT incremented another 30 minutes. Unit ran 10 minutes, so BT decreases by 10 minutes:
   BT = 20 + 30 – 10 = 40 minutes
   RI = 40 – 50 = -10 minutes
   RI = 0
3. Unit restarted, BT incremented another 30 minutes. Unit ran 10 minutes, so BT decreases by 10 minutes:
   BT = 40 + 30 – 10 = 60 minutes
   RI = 60 – 50 = 10 minutes
4. Unit Restart Inhibit is 10 minutes from (3).
5. Unit Restarted after 10 minutes Restart Inhibit in (4). BT Incremented another 30 minutes. Unit ran 10 minutes, so BT decreases by 10 minutes:
   BT = 60 + 30 – 10 = 80 minutes
   RI = 80 – 50 = 30 minutes
6. Unit Restart Inhibit is 30 minutes from (5).
7. Unit Restarted after 30 minutes Restart Inhibit in (6). BT incremented another 30 minutes. Unit ran for 110 minutes, and BT goes to zero:
   BT = 80 + 30 – 110 = 0 minute.
   RI = 0 – 50 = -50 minutes
   RI = 0

Operating Interface: Controls

Leaving-Water Temperature Cutout
Leaving-water temperature cutout is a safety control that protects the chiller from damage caused by water freezing in the evaporator.

For freeze protection from low leaving-water temperature, the UCP2 provides a low leaving water temperature cutout based on leaving-water temperature. The "Leaving-Water Temperature Cutout Set Point" is independently adjustable from the chilled-water set point, and is factory set. Shutdown of the compressor due to violation of the Leaving-Water Temperature Cutout results in an automatically resettable diagnostic (MAR).

The UCP2 indicates when the "Leaving-Water Temperature Cutout Set Point" conflicts with the chilled-water temperature set point by a message on the display. The "Leaving-Water Temperature Cutout Set Point" and chilled-water set point, both active and front panel, are separated by a minimum of 1.7°F [0.9°C]. When either difference is violated, the UCP2 does not permit the above differences to be violated, and the display screen displays a message to that effect and remains at the last valid set point.

When the chilled-water set point, both active and front panel, is adjusted downward, it does not violate the above minimum differences and the "Leaving-Water Temperature Cutout Set Point" remains at its current setting. When the "Leaving-Water Temperature Cutout Set Point" is adjusted upward, the above minimum difference is not violated and the "Leaving-Water Temperature Cutout Set Point" is adjusted upward, the chilled-water set point, both active and front panel, is raised to maintain the minimum difference.

After violation of the "Leaving-Water Temperature Cutout Set Point" for 30°F-seconds [16°C-seconds] the chiller will shut down and indicate a diagnostic.

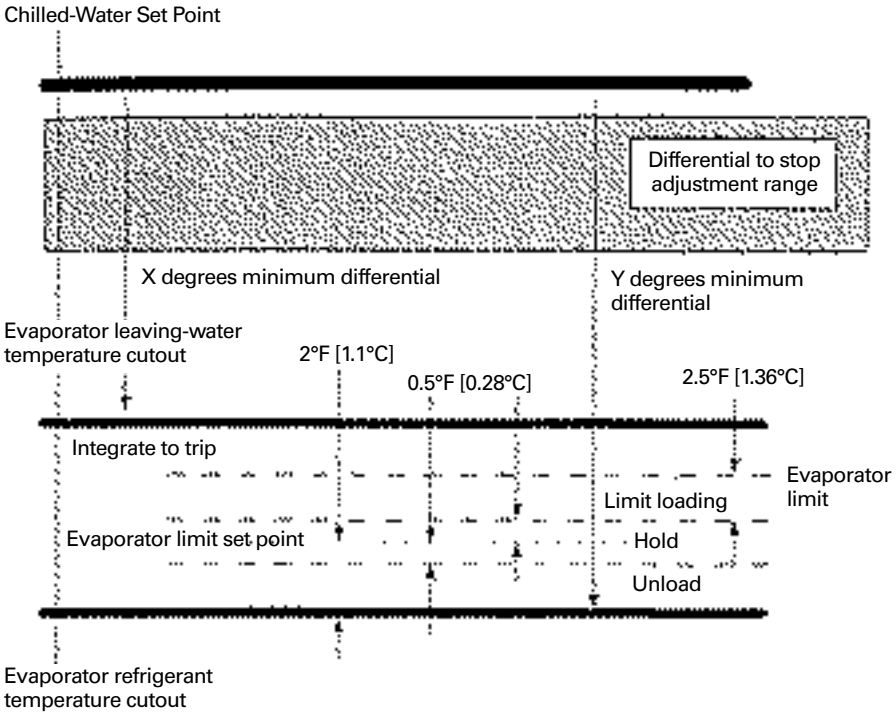
Low Refrigerant Temperature Cutout
This is a safety function that prevents water in the evaporator from freezing due to low evaporator-refrigerant temperatures. When the trip point is violated, the chiller will shut down and display a latching diagnostic (MMR) indicating the violation.

The UCP2 indicates when the "Low Refrigerant Temperature Cutout Set Point" conflicts with the chilled-water temperature set point by a message on the display. The "Low Refrigerant Temperature Cutout Set Point" and chilled-water set point, both active and front panel, are separated by a minimum of 6°F [3.3°C] (Figure 27). When either difference is violated, the UCP2 does not permit the above differences to be violated, and the display screen displays a message to that effect and remains at the last valid set point.

When the chilled-water set points, both active and front panel, are adjusted downward, it does not violate the above minimum differences, and the "Low Refrigerant Temperature Cutout Set Point" remains at its current setting. When the "Low Refrigerant Temperature Cutout Set Point" is adjusted upward, the above minimum difference is not violated, and as the "Low Refrigerant Temperature Cutout Set Point" is adjusted upward, the chilled-water set points, both active and front panel, are raised to maintain the minimum difference.

After violation of the "Low Refrigerant Temperature Cutout Set Point" for 30°F-seconds [16°C-seconds], the chiller will shut down and indicate a diagnostic.

Figure 27 – Cutout Strategy



Operating Interface: Controls

Enhanced Condenser Limit Control (option)
When the chiller is running in Condenser Limit Mode or in Surge Mode, the head-relief request relay on the Options Module will be energized and can be used to control, or signal for a reduction in, the entering condenser-water temperature.

Designed to prevent high refrigerant-pressure trip-outs during critical periods of chiller operation, this UCP2 option consists of:

- The Options Module (A15) with the head-relief request relay.
- Interconnecting Wiring

The unit will use the condenser-refrigerant temperature-sensor (input converted to saturated refrigerant pressure) to perform the Standard Condenser Limit function, by limiting inlet guide-vane stroke and chiller capacity.

Keep in mind that the UCP2 Condenser Limit Control supplements the protection provided by the condenser pressure high-pressure cutout switch B51.

Unit Start-Up and Shutdown

Daily Unit Start-Up

1. Verify that the chilled-water pump and condenser water pump starters are in "ON" or "AUTO."
2. Verify that the cooling-tower is in "ON" or "AUTO."

Note: Refer to Figure 28 for UCP Start-Run-Shutdown sequence and UCP timing functions.

3. Check the oil level in the oil tank; the level must be between the two sight glasses. Also, be sure to check the oil tank temperature; normal oil tank temperature before start-up is 134 to 139°F [56.7 to 59.4°C]. Minimum oil temperature for start-up is the larger of evaporator saturation temperature 30°F [16.7°C] or 105°F [40.5°C].

Note: The oil heater is energized whenever power is supplied to the unit, the chiller is not running and the oil temperature is less than 134°F [56.7°C].

4. Check the chilled-water set point and readjust it, if necessary, in the Operator Settings menu.
5. If necessary, readjust the current-limit set point in the Operators Setting menu.
6. Press "AUTO."

UCP2 checks the compressor motor winding temperature, and a minimum 30-second delay is initiated if the winding temperature is less than 165°F [74°C]. If it is greater than 165°F [74°C], however, a 15-minute delay period begins. The chilled-water pump relay is energized and evaporator water flow is proven.

Next, UCP2 checks the leaving-evaporator water temperature and compares it to the chilled-water set point. If the difference between these values is less than the start differential set point, cooling is not needed.

If UCP2 determines that the difference between the evaporator leaving-water temperature and the chilled-water set point exceeds the start differential set point, the unit enters the initial Start Mode, and the oil pump and the condenser water pump are started.

If condenser water flow is not proven (that is, flow switch 6S56 does not close) within 3 minutes, the unit is locked out on an MMR Diagnostic.

Oil pressure must be verified within 3 minutes or an MMR diagnostic is generated.

When less than 5 seconds remain on the restart inhibit, the pre-start starter test is conducted on Y-Delta starters. If faults are detected, the unit's compressor will not start, and an MMR Diagnostic will be generated.

After the pre-start Starter test, UCP2 sends a start signal to the compressor motor. Within 2 seconds, 3 phases of current in the correct phase sequence must be detected. If there is no current, 1 or 2 phases missing, or a reverse electrical sequence, diagnostics will occur. Acceleration and proof of transition must occur within 2.5 seconds of transition initiation, or else unit start-up is aborted. If this occurs, the unit goes into the post-lube mode, and an MMR diagnostic is generated.

If the compressor motor starts and accelerates successfully, "Unit is Running" appears on the display.

Note: Whenever UCP2 detects an MMR diagnostic condition during start-up, unit operation is locked out and manual reset is required before the start-up sequence can begin again.

When the cooling requirement is satisfied, UCP2 originates a "Shutdown" signal. The inlet guide vanes are driven closed for 50 seconds, and the unit enters a 2 minute post-lube period. The compressor motor and condenser water-pump starter are de-energized immediately, but the oil pump continues to run during this 2 minute interval; the evaporator pump will continue to run.

After the post-lube cycle is complete, the unit remains in the auto mode, waiting for a demand for cooling.

Seasonal Unit Start-Up

Note: Refer to Figure 28 for UCP Start-Run-Shutdown sequence and UCP timing functions.

1. Close all drain valves, and re-install the drain plugs in the evaporator and condenser headers.
2. Service the auxiliary equipment according to the start-up and maintenance instructions provided by the respective equipment manufacturers.
3. Vent and fill the cooling-tower, if used, as well as the condenser and piping. At this point, all air must be removed from the system (including each pass). Then close the vent valves in the condenser water boxes.
4. Open all of the valves in the evaporator chilled-water circuit.
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), close the vent valves in the evaporator water boxes.
6. Lubricate the external vane control linkage.
7. Check the adjustment and operation of each safety and operating control.
8. Close all disconnect switches.

⚠ WARNING

To prevent injury or death due to electrical shock or contact with moving parts, use care when measurements, adjustments, or other service related operations are performed with power on.

9. Perform instructions listed in "Daily Unit Start-Up" section.

Unit Start-Up and Shutdown

Unit Shutdown Procedures

Daily Unit Shutdown

Note: Refer to Figure 28 for UCP Start-Run-Shutdown sequence and UCP timing functions.

1. Press STOP.
2. After compressor shutdown, turn pump contactors to off or open pump disconnects.

Seasonal Unit Shutdown

Note: Refer to Figure 28 for UCP Start-Run-Shutdown sequence and UCP timing functions.

1. Press STOP
2. After compressor shutdown, turn off the chilled-water pump at the pump's pushbutton station. (Or, stop chilled-water flow by the means devised for this particular application).
3. Open all disconnect switches except the control power disconnect switch.

⚠ CAUTION

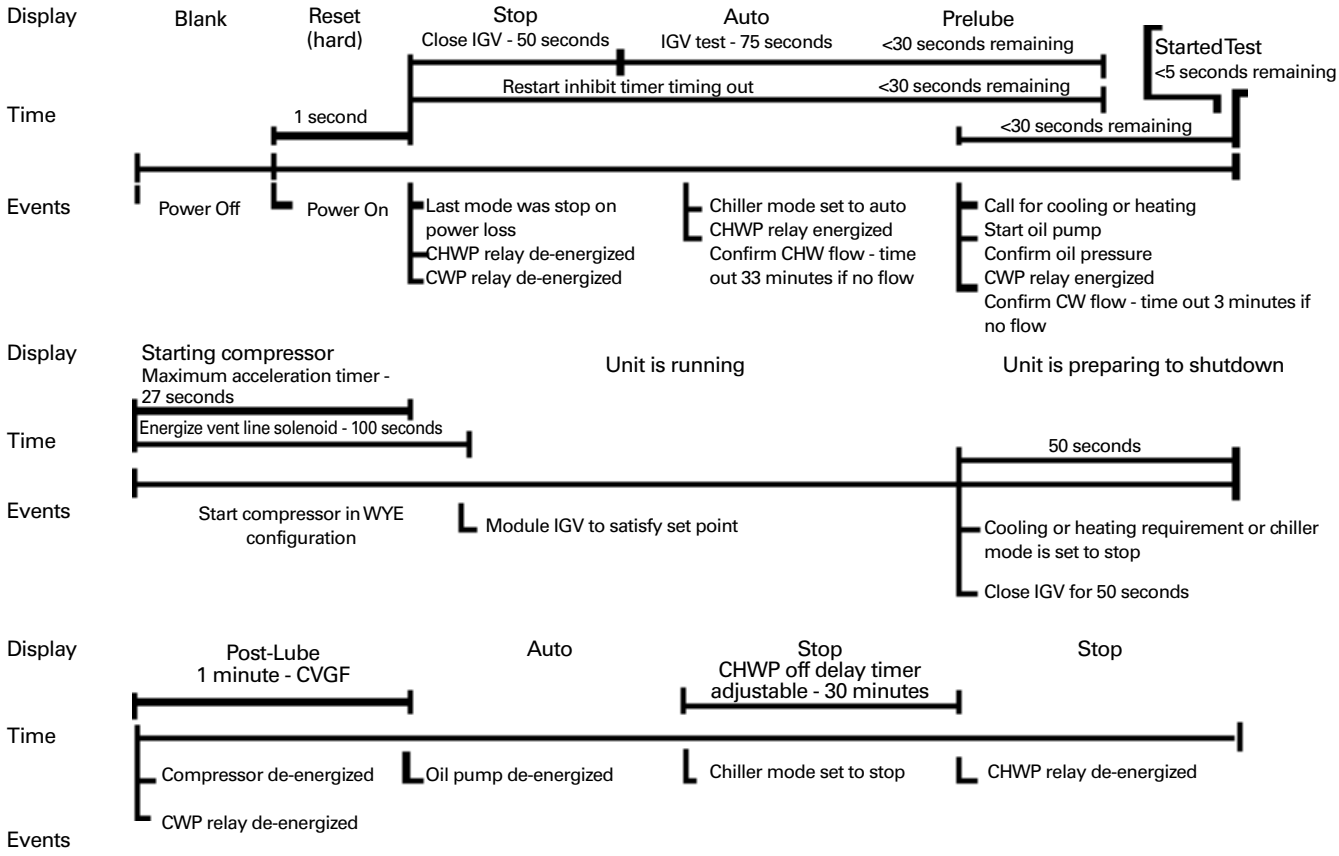
Control Power disconnect must remain closed during the entire shutdown period to allow oil sump heater operation. This prevents refrigerant from condensing in the oil sump.

4. Drain the condenser piping and cooling-tower, if used.
5. Remove the drain and vent plugs from the condenser headers to drain the condenser.
6. After the unit is secured for winter, the maintenance procedures described under "Annual Maintenance" in the Periodic Maintenance section of this manual should be performed by qualified Trane service technicians.

⚠ CAUTION

Do not allow the chiller temperature to exceed 125°F [50°C] while the unit is off, because this will cause the opening of the safety valve and discharge the refrigerant from the machine. Continuous running of evaporator water pumps while the machine is off may cause this condition to occur.

Figure 28 – CVGF – UCP Sequence/Timing with WYE-Delta Starter



Maintenance Procedures

Weekly

Check the following after the machine has been in operation for at least 30 minutes:

1. Chilled-water and condenser-water entering and leaving temperatures.
2. Current drawn by the compressor (amps).
3. Oil level in the oil sump. The oil level must be visible in the sight glass.
4. Condenser pressure, evaporator pressure at UCP2.
5. Unusual noise, vibration, and so forth.

It is strongly recommended that unit readings and observations are recorded on a weekly log sheet.

The acceptance of a warranty claim may depend on this.

Annually

The yearly maintenance should be performed by an authorized Trane service technician. It should include weekly and any monthly checks.

1. Check setting and operation of all controls and safety devices.
2. Leak-test the entire machine for refrigerant leaks.
3. Check starter contactors for wear, and replace if required.
4. Check motor winding insulation.
5. Check motor amps drain.
6. Perform an oil analysis.
7. Perform vibration analysis.
8. Check and adjust the water flow
9. Check and adjust interlocks.
10. Clean the condenser.

Condenser cleaning
Water available for cooling condensers frequently contains minerals that collect on the condenser tube walls as carbonate scale. The scale accumulation rate will be increased by high condensing temperatures and water with a high mineral content.

Cooling towers, when used, may collect dust and form material that will deposit in the condenser tubes, forming sludge.

Scale and sludge formation is indicated by high condensing temperatures and large differences between condensing-and-leaving water temperatures.

To maintain maximum efficiency, the condenser must remain free of scale and sludge. Even a very thin coating on the tube surface may greatly decrease condenser heat-transfer capacity. Two methods for cleaning condenser tubes are mechanical and chemical.

The mechanical method removes sludge and loose material from the condenser tubes. Working a round nylon or bristle brush, attached to a rod, in and out of the tubes loosens the sludge. After cleaning, flush the tubes with clean water.

The chemical method removes scale deposits. The standard condenser water circuit consists of copper, steel and cast iron. Any reliable water treatment company will be able to recommend a cleaning solution for the job.

Note: Trane assumes no responsibility if deterioration of the unit is due to inadequate water treatment.

Evaporator cleaning
The evaporator is part of a closed water circuit and should not accumulate an appreciable amount of scale or sludge. However, if cleaning should be required, use the same methods outlined for cleaning the condenser.

Note: Trane assumes no responsibility if deterioration of the unit is due to inadequate water treatment.

Controls checkout and adjustments
Controls are checked and calibrated during run-in of the unit prior to shipment. Any adjustments should be made exclusively by authorized Trane Service Personnel.

It is strongly recommended to have proper functioning and set points of all controls checked once per year.

Control settings
For control calibration and check-out, contact a Trane-qualified service organization.

Trouble Analysis
If the red light on the control panel is flashing, an MMR diagnostic has occurred. See Diagnostic Section for trouble shooting information. The diagnostic must be analyzed, corrections made by qualified personnel, and the MMR diagnostic reset, before the chiller can be returned to operation.

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

Unless otherwise stated, all active diagnostics will be lost on loss of power.

Maintenance Procedures

Leak Testing Procedure
To leak-test the CVGF, weigh a one-pound charge of trace gas and bring the pressure up to a maximum of 75 psig [517 kPa] using dry nitrogen. This pressure has been found to be adequate to find leaks in a CVGF when using a sensitive electronic leak detector. Set the scale to "medium," which corresponds to a 1/2-ounce [.015 L] per year leak rate, and probe all joints thoroughly. Be sure to relieve the pressure in the unit before evacuation or leak repair. Local codes take precedence when conducting evacuation.

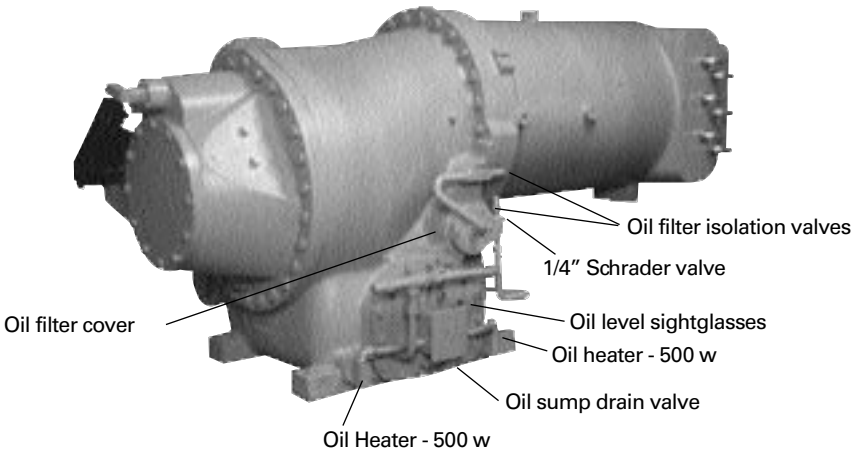
Taking an Oil Sample
To take an oil sample, an approved oil sample cylinder for R134a should be used. Make sure the upstream oil-filter isolation angle valve is completely backseated to close the ¼" Schrader-valve port. Attach a low-loss hose or line, with a Schrader-valve depressor, to the oil sampling ¼" Schrader valve located on the upstream oil filter isolation valve.

Attach the other end of the hose or the line to the oil-sampling cylinder. Evacuate the cylinder and hose (or line) to remove any non-condensables or moisture. Open the valve on the sample cylinder. Turn the upstream oil-isolation angle-valve stem approximately one turn clockwise (toward the frontseat) to allow oil under pressure to enter the sample cylinder.

Weigh the cylinder as the oil is being transferred and shut off the cylinder valve when the desired weight of oil has been transferred. Backseat the angle valve to shut off oil flow, and remove the hose from the Schrader valve. Be sure to replace the Schrader and angle-valve caps and secure them when sampling is complete. Recover the oil/refrigerant from the oil sample hose or line with an approved R134a recovery unit.

When oil analysis indicates the need to change the oil (high acidity, moisture, and so forth), use the following procedure for removing the oil.

Figure 29 – CVGF Compressor Oil System Component Locations



Removing Compressor Oil
Make sure that the unit is not running and the power has been disconnected to the oil heaters. To remove the compressor oil, attach an oil recovery/recharge and distillation unit oil-pickup hose or line to the oil-sump drain valve, located on the bottom of the oil sump (see Figure 29), and attach the refrigerant-vapor return hose or line of the recovery unit to the condenser service valve. Open the oil-sump drain valve and condenser service valve, and activate the oil recovery process according to the operation specifications of the recovery unit. After all the oil has been recovered and residual R134a refrigerant vapor has been returned to the condenser, shut the oil drain valve and condenser service valve off, and secure the caps to both valves.

Maintenance Procedures

Oil Charging - CVGF

⚠ CAUTION

Due to the hygroscopic properties of POE oil, all oil must be stored in metal containers. The oil will absorb water if stored in a plastic container.

CVGF units are shipped factory-charged with 15 gallons [56.8 L] of oil and a 5 psig [34 kPa] @ 70°F [20°C] dry-nitrogen holding charge.

Note: The correct oil charge for all CVGF units is 15 gallons [56.8 L] of Trane OIL00037 (Trane OIL00037 is R134a miscible oil in 1-gallon [3.785 L] containers). A 5 gallon [18.9 L] container of Trane approved R134a oil is available (Trane OIL00049). This is a polyolester oil that is extremely hygroscopic, meaning it readily attracts moisture. The oil cannot be stored in plastic containers ,due to the hygroscopic properties and because moisture can penetrate the plastic. As with mineral oil, if water is in the system it will react with the oil to form acids. Use the following table to determine the acceptability of the oil.

POE Oil Properties	Acceptable Levels
Moisture content	less than 300 ppm
Acid Level	less than 0.5 TAN (mg KOH/g)

Note: An oil recovery/recharge and distillation unit suitable for polyolester oil, such as the Trane 01088/TOL01116 (103-127 V, 50/60 Hz, 1 ph) or Trane TOL01089/TOL01117 (220-240 V, 50/60 Hz, 1 ph) or similar product, must be used for all polyolester oil removal and charging operations for the CVGF.

The Trane Company recommends subscribing to an oil analysis program to determine the condition of the oil, rather than changing the oil on a periodic basis. This program will help reduce the chiller's lifetime oil consumption and minimize refrigerant emissions. The oil analysis should be performed by a qualified laboratory experienced in refrigerant and oil chemistry and the servicing of Trane centrifugal chillers.

Oil Charging Procedure

Use appropriate oil as specified:

USA	Europe
Oil 0037	Oil 021E
Oil 0049	Oil 0020E

Unit Charged With Refrigerant

1. Decant the oil from the shipping container into the cylinder of an oil recovery/recharge and distillation unit per the unit operation instructions (15 gallons [56.8 L] required).
2. Activate the distillation process according to the operation specifications, to remove any residual moisture from the new polyolester oil. A vacuum of at least 500 microns must be attained and an oil temperature of at least 122°F [50°C] maintained to remove existing moisture. A standing vacuum-rise test should be performed after the distillation process is complete, to ensure the oil has completely outgassed any moisture or non-condensables. A vacuum rise of less than 100 microns [0.1 mm Hg] in a 2-hour period indicates the oil is ready for transfer.
3. Attach the oil transfer hose of the recovery-unit oil pump to the oil-sump charging and drain valve and evacuate (see oil recovery unit operating manual).
4. Open the oil-charging valve on the bottom of the oil tank of the CVGF and operate the oil recovery and recharge unit oil pump to charge the oil into the tank.
5. When the oil is at the center of the upper sight glass, stop the transfer of oil.
6. Energize the oil heaters.
7. At the UCP2 control panel, go to the Service Tests menu and scroll down to the "oil pump" screen. Turn the oil pump on in manual mode and let it run for several minutes. This will charge the oil lines and oil cooler with oil.
8. After shutting the oil pump off, check the oil level in the sump sight glasses. The level should be between the center of the upper glass and the center of the lower sight glass. Float balls are installed in each sight glass to allow easy level determination.
9. If the oil level is below the center of the lower sight glass, charge oil into the sump as outlined in step 4.
10. Close the oil sump drain valve and remove the oil charging line.
11. Reinstall the oil drain valve cap and tighten securely.

Maintenance Procedures

Unit in a Vacuum.

1. Connect one end of an oil charging line to an oil supply (15 gallons [56.8 L] total required), and the other end to the oil-sump drain valve located at the bottom of the oil sump (see Figure 29). If possible, evacuate the oil-charging line to remove any non-condensables and moisture. This will require a shutoff valve on the oil-supply side of the line and an access valve located on the line itself.
2. Open the oil-sump drain valve and allow the vacuum to draw the oil into the sump until the upper sight glass ball is located in the center of the upper sight glass.
3. Close the oil-sump drain valve and remove the oil charging line. Reinstall the oil-drain valve cap and tighten it securely.
4. Make sure the oil heaters are energized and the oil is up to temperature (greater than 122°F [50°C]).
5. Continue pulling a vacuum on the unit to remove any residual moisture or non-condensables that may have been introduced during the oil charging. A vacuum of at least 500 microns [0.5 mm Hg] should be attained before blanking off the vacuum pump. A vacuum rise test should be performed, to ensure all non-condensables and moisture have been removed from the system, before charging the unit with refrigerant 134a. The vacuum level should not rise by more than 100 microns [0.1 mm Hg] in a 2-hour period.
6. After charging the unit with refrigerant, operate the oil pump in the manual mode, as outlined in step 7 in the preceding procedure, and follow that procedure if additional oil is required to bring the level between the center of the two sight glasses.

Replacing the Oil Filter

The oil filter should not be changed unless absolutely required due to plugging, which will shut the chiller off on low oil pressure, or if the oil is required to be changed. To replace the oil filter, use the following procedure:

1. Be sure the chiller is in the Stop mode.
2. Locate the two oil-filter isolation valves (see Figure 29).
3. Connect an approved refrigerant recovery unit for R134a to the ¼" Schrader valve on the oil-filter inlet-isolation valve to allow removal of oil and refrigerant from the oil filter cavity.
4. Close both isolation valves.
5. Recover the refrigerant and oil out of the oil filter cavity.
6. Remove the oil filter cover by removing the bolts and loosening the Rotolok connector on the outlet oil-filter isolation valve.

Note: When removed, do not allow any contaminants to get on the oil filter cover. Re-installing a contaminated oil filter cover could decrease the life of the compressor.

7. Remove the oil filter and o-ring.
8. Install a new oil filter, o-ring, and Rotolok nylon seal.
9. Replace the oil filter cover and torque the bolts and Rotolok connector. The cover is torqued to 19 pound-ft [2.62 N-m] and the Rotolok to 90 pound-ft [12.44 N-m].
10. Evacuate the oil filter cavity by attaching a deep-vacuum pump to the ¼" Schrader valve and pulling at least a 500 micron [0.5 mm Hg] vacuum. Do a standing vacuum rise test to determine if any leaks are present. If leak free, remove the vacuum pump from the valve.
11. Replace the Schrader valve cap and tighten.
12. Open both isolation valves.
13. At the UCP2 control panel, go to the Service Tests menu and select the “oil pump” feature in the menu. Start and run the oil pump in manual mode to charge the oil filter with oil. Allow the pump to run for several minutes and shut the oil pump off by going back to the Auto mode at the UCP2 control panel.
14. Check the oil level in the sump. If it is below the center of the lower sight glass, add oil by following the oil charging procedure outlined previously.

Maintenance Procedures

Oil Sump Heaters
The CVGF uses two 500-watt heaters to maintain the oil sump temperature at 136°F [57.7°C]. These heaters are located in the lower oil-sump casting, one on each side of the oil sump cover, and can be serviced without removing the refrigerant or oil, because the heaters are not located in the oil sump itself but in the casting (see Figure 29).

The UCP2 will not allow the chiller to start unless the oil sump temperature is at least 30°F [16.7°C] above saturated evaporator temperature, or at least 105°F [37.8°C], whichever is higher. The oil sump comes factory-insulated and must remain insulated to allow the oil temperature to maintain 136°F [57.7°C] while the unit is off.

The oil heaters are only energized during the unit "off" cycle to maintain oil temperature for start-up. During the run cycle, the oil-sump heaters are de-energized and the oil temperature may vary depending on load and operating conditions. The unit will trip on a latching diagnostic of high oil temperature if the oil exceeds 180°F [82°C].

Oil Pressure Protection
A differential oil pressure switch provides protection for the CVGF, in case the oil pressure falls below safe operating levels for any reason. This switch opens at 9 psid [62kPa] and closes at 12 psid [82 kPa]. The oil-pressure regulator is factory-set to maintain oil pressure between 18 and 22 psid [124 and 151 kPa]. The unit will not start if the oil pressure is below 12 psid [82 kPa].

Adjusting the Oil-Pressure Regulating Valve
The oil-pressure regulating valve is factory set and should not require adjustment. In the event that the oil pressure switch will not close to allow unit start-up, the following diagnostic procedure should be followed:

1. With the unit off and the oil pump in the Off mode, disconnect the oil-pressure differential-switch capillary tubes at the Schrader valves and attach a pressure gauge at each location. (An optional method is to use a differential pressure gauge instead of two separate gauges.)

   At the UCP2 control panel, go to the Service Tests menu and scroll down to the oil pump screen. Turn the oil pump to the On mode and allow to operate for approximately 30 seconds. Check the oil-pressure gauge readings, and calculate the differential oil pressure by subtracting the oil sump pressure reading from the discharge oil pressure reading.
2. If the differential pressure is between 18 and 22 psid [124 and 151 kPa], the oil pressure regulating valve should not be adjusted. If the oil pressure switch is not closed at pressures above 12 psid [82 kPa], the switch is defective and should be replaced. If the switch is closed and the unit will not start due to a low oil pressure diagnostic, the UCP2 circuit module is defective and should be replaced. If the discharge oil pressure is less than the suction oil pressure (a negative differential pressure), the oil pump motor is running backwards.
3. To reverse the oil pump motor rotation, two leads must be swapped on the oil pump motor contactor. Be sure to remove all power from the unit before doing any electrical wiring changes. (Note: Be sure to perform the Bump Start test as given later in this section to determine proper compressor rotation before operating the chiller.) If the differential oil pressure measured is below 12 psid [82 kPa], the oil filter may be plugging or the regulator may need adjustment.
4. To check the pressure drop across the oil filter, attach a pressure gauge to the ¼" [6 mm] Schrader valve located on the upstream oil-filter isolation valve. This valve is normally in the backseated position, which shuts off pressure to the Schrader valve. Turn the angle valve stem approximately one turn clockwise (toward the frontseat position) to allow a reading to be taken. Subtract the discharge oil pressure reading from this reading to obtain the oil-filter pressure drop. If the pressure drop is excessive (more than 8 psid [54 kPa]), shut the oil pump off and replace the oil filter per the procedure outlined previously.
5. When the oil filter change is completed, check the differential oil pressure. If it is below 18 psid [124 kPa], adjust the oil pressure regulator to obtain a reading of between 18 and 22 psid [124 and 151 kPa].

   If the pressure drop across the filter is not excessive, but the oil differential pressure is below 18 psid, adjust the oil pressure regulating valve to obtain 18 to 22 psid [124 to 151 kPa] oil pressure. To increase pressure, remove the oil-pressure regulator cap and screw the regulator stem in a clockwise direction. Be sure to replace the cap and tighten it when adjustment is complete.
6. Remove the pressure gauges and reinstall the differential oil pressure switch capillary tubes when all diagnostic work is complete. Be sure to replace and secure any valve caps that were removed.

CVGF Oil Pump
The oil pump for the CVGF is a positive displacement, direct-drive pump powered by a one-horsepower, three-phase motor. The motor must be phased correctly to provide positive differential oil pressure. This pump and motor is located within the oil sump and can not be serviced without recovering the refrigerant and removing the oil from the machine.

Maintenance Procedures

Refrigerant Charge

If a low refrigerant charge is suspected, first determine the cause of lost refrigerant. After the problem is repaired, follow the procedures below for evacuating and charging the unit.

Evacuation and Dehydration

1. Disconnect ALL power before and during evacuation.
2. Connect the vacuum pump to the 5/8" flare connection on the bottom of the evaporator and/or side of the condenser.
3. To remove all of the moisture from the system and to insure a leak-free unit, pull the system down below 500 microns [0.5 mm Hg].
4. After the unit is evacuated, perform a standing rise test for at least an hour. This vacuum should not rise more than 100 microns [0.1 mm Hg] per hour to a maximum of 500 microns [0.5 mm Hg] over 12 hours. If the vacuum rises above this, either there is a leak or the unit has moisture present.

NOTE: If oil is in the system, this test is more difficult. The oil is aromatic and will give off vapors that will raise the pressure of the system. Check for oil temperature >122°F [50°C].

Refrigerant Charging

When the system is deemed leak and moisture free, use the 5/8" flare connections at the bottom of the evaporator and side of condenser to add refrigerant charge. See Unit Nameplate for correct refrigerant charge amounts.

⚠ CAUTION

Water can freeze during charging. Circulate water during charging to prevent freezing and resultant equipment damage.

Pre-Commissioning Bump Start Procedure

⚠ CAUTION

Note: The following procedure is a requirement prior to the first start of the chiller. Failure to complete this procedure may result in damage to the compressor and void the warranty.

Procedure

1. Complete all UCP2 control settings.
2. Ensure that water flows in the condenser and evaporator are correct according to the pre-commissioning procedures.
3. Ensure that the unit has been charged with the correct amount of refrigerant and oil, and that the oil is the proper operating temperature.
4. Complete a phase-rotation test if the voltage is less than 600 volts.

The following checks require TWO personnel to complete. During the bump start of the compressor, one person will look at the rotor from the rear of the motor, through the sight glass, to determine correct direction. Looking at the sight glass, the direction will be counterclockwise. Do not check the rotation of the motor after the start sequence has completed as the indication may be incorrect.

5. With the voltage applied to the mains on the starter, place the chiller in Auto mode.
6. After the pre-lube is complete, let the starter energize the motor, permitting a start.
7. After three seconds, activate the emergency stop by pressing the Stop button at the UCP2 panel twice in quick succession. During this three-second period, the rotor should be seen to rotate in a counter-clockwise direction.
8. If the direction is incorrect, the mains cabling must be isolated from the power source and two legs swapped to obtain the correct direction of rotation.

Maintenance Forms

CVGF START-UP TEST LOG

Job Name	Site Location
Model Number	Serial Number Start Date
Sales Order Number	Job Elevation (ft) [m]
Starter Data	**Pre Start-Up**
Manufacturer	Pressure on Arrival microns (mm)
Type (Star-Delta) (Solid-State)	Vacuum Reading microns (mm)
Vendor ID Number Model Number	Standing Vacuum mm rise in hours
Volts Amps Hertz	
Compressor Data	**Unit Charges**
Model Number	Unit Refrigerant Charge …….. kg Of R134a
Serial Number	…….. pounds Of R134a

NAMEPLATE DATA	
FLA	kW
Volts	Hz
DESIGN DATA	
RLA	kW
Volts	Hz

Design Conditions

Evaporator		**Condenser**	
Design Flow	gpm [L/s]	Design Flow	gpm [L/s]
Actual Flow	gpm [L/s]	Actual Flow	gpm [L/s]
Design Pressure Drop	psi [kPa]	Design Pressure Drop	psi [kPa]
Actual Pressure Drop	psi [kPa]	Actual Pressure Drop	psi [kPa]
Entering Water	°F [°C]	Entering Water	°F [°C]
Leaving Water	°F [°C]	Leaving Water	°F [°C]

Maintenance Forms

CVGF CHILLER OPERATING LOG

Report menu		15 minutes	30 minutes	45 minutes	60 minutes
Chiller Report					
Measurement Type:	Imperial/Metric				
Operating Mode					
Active Chilled-Water Set Point	°F [°C]				
Chilled-Water Entering Temperature	°F [°C]				
Chilled-Water Leaving Temperature	°F [°C]				
Actual Chilled-Water Pressure Drop	psi [kPa]				
Actual Chilled-Water Flow	gpm [L/s]				
Condenser-Water Entering Temperature	°F [°C]				
Condenser-Water Leaving Temperature	°F [°C]				
Actual Condenser-Water Flow:	gpm [L/s]				
Actual Condenser-Water Pressure Drop	psi [kPa]				
Active Current Limit Set Point:	%				
Refrigerant And Compressor Report					
Saturated Evaporator Refrigerant Temperature	°F [°C]				
* Evaporator Refrigerant Pressure	psi [kPa]				
Saturated Condenser Refrigerant Temperature	°F [°C]				
*Condenser Refrigerant Pressure	psi [kPa]				
Evaporator Approach Temperature	°F [°C]				
Condenser Approach Temperature	°F [°C]				
Inlet Guide Vane Position					
Oil Report					
* Oil Tank Pressure :					
* Discharge Oil Pressure :					
Oil Temperature Set Point					
Oil Temperature					
Oil Temperature After Oil Cooler					
Motor Report					
Compressor Line	Amperage - L1				
	Amperage - L2				
	Amperage - L2				
Compressor Line Voltages: Volts AB					
	Volts BC				
	Volts CA				
Compressor Winding Temperature	W1				
	W2				
	W3				
Compressor Starts					
Compressor Run Hours					

* Denotes: Install service gauges to obtain readings.

Maintenance Forms

UCP-2 MENU SETTINGS

Chiller Report

Number	Description	Range	Recommend	Actual
1.	Chilled-Water Set Point Source	External, Tracer, Reset, Not displayed		
2.	Chilled-Water Reset Source			
3.	Current Limit Source	Tracer, External,		

Operator Settings

Number	Description	Range	Recommend	Actual
1.	Front Panel Chilled-Water Set Point	0 to 65°F [-17 to 18.3°C] default 44°F [6.7°C]	44°F [6.7°C]	
2.	Front Panel Current Limit Set Point	40 to 100%, default = 100%	100%	
3.	Chilled-Water Reset Type	Disable(default), return, constant return, outside air	Disable	
4.	Reset Ratio	Return = 10 to 120% default 50% Outside air 80 to -80% default 10%	10%	
5.	Start Reset Set Point	Return 4 to 30°F [2.2 to 16.7°C] default 10°F [5.6°C] Outside air 50 to 130°F [10 to 54.4°C] default 90°F [32.2°C]	90°F [32.2°C]	
6.	Maximum Reset Set Point	Return 0 to 20°F [0 to 11.1°C] default 5°F [2.8°C] Outside air 0 to 20°F [0 to 11.1°C] default 5°F [2.8°C]	5°F [2.8°C]	
7.	Chilled-Water Set Point Source	Front panel (default), external	Front Panel	
8.	Current Limit Set Point Source	Front panel (default), external	Front Panel	
9.	Set Point Source Override	None (default), use front panel, override Tracer	None	

Service Settings

Number	Description	Range	Recommend	Actual
1.	Display units	English (default) or SI		
2.	Decimal point places	XXX.X (Default) or XXX	XXX.X	
3.	Display Menu Headings	Enable (default), disabled	Enable	
4.	Differential To Start	1 to 10°F [0.5 to 5.5°C] in increments of 0.1°F [1°C] default 5°F [2.8°C]	5°F [2.8°C]	
5.	Differential To Stop	1 to 10°F [0.5 to 5.5°C] in increments of 0.1°F [1°C] default 5°F [2.8°C]	5°F [2.8°C]	
6.	Evaporator/Condenser Pump Off Delay Time	0 to 30 minutes in increments of 1 minute. Default 1 minute	3 minutes	

Maintenance Forms

UCP-2 MENU SETTINGS

Field Start-Up Group Service Settings

Number	Description	Range	Recommend	Actual
1.	Keypad Display Lock Feature	Disable (default), enable	Disable	
2.	Menu Setting Password Feature	Disable (default), enable	Disable	
3.	ICS Address	1 to 127 in increments of 1, default 65	65	
4.	Power Up Start Delay Time	0 (default) to 600 seconds	0	
5.	Design Delta Temperature	4 to 30°F [2.2 to 16.7°C] in increments of 0.1°F [1°C]. Default 10°F [5.5°C]	See order	
6.	Leaving Water Temperature Cutout	-10 to 36°F [-213.3 to 2.2°C] in increments of 0.1°F [1°C]. Default 36.0°F [2.2°C]	36.0°F [2.2°C])	
7.	Low Refrigerant Temperature Cutout Set Point	-5 to 36°F [-37.2 to 2.2°C] in increments 0.1°F [1°C] Default 32°F [0.0°C]	32°F [0.0°C]	
8.	Condenser Limit Set Point	80 to 120 % (default) 93%	93%	
9.	Maximum Restart Inhibit Timer	30 to 60 in increments of 1 minute. (default) 60 minutes	30 minutes	
10.	Surge Protection	Disable, enable (default)	Enable	
11.	Under/Over Voltage Protection	Disable, enable (default when voltage sensing option is installed)	Disable	
12.	Phase Reversal Protection	Disable, enable (default)	Enable	
13.	Phase Unbalance Protection	Disable, enable (default)	Enable	
14.	Momentary Power Loss Protection	Disable, enable (default)	Enable	
15.	Oil Temperature Set Point	100 to 160°F [37.8 to 71.1°C] in increments of 0.1°F [1°C] (default 136.0°F [57.8°C])	136.0°F [57.8°C]	
16.	Low Oil Temperature Cutout	80 to 140°F [26.7 to 60°C] in increments of 0.1°F [1°C]. Default 95°F [35°C]	95°F [35°C]	
17.	Soft Load Control	Disable (default), enable	Disable	
18.	Soft Load Starting Current Limit	40 to 100 % (default 100%)	100%	
19.	Soft Load Current Limit Rate Of Change	0.5 to 5%/ minute in increments of 0.1%/minute. (default 5%/minute)	5%/ minute	
20.	Soft Load Leaving Water Temperature Rate Of Change	0.5 to 5°F [0.3 to 2.8°C]/minute in increments of 0.1°F/minute [1°C/minute] Default 5°F/minute [2.8°C/minute]	5°F/minute [2.8°C/minute]	

Maintenance Forms

UCP-2 MENU SETTINGS

Field Start-Up Group Service Settings

Number	Description	Range	Recommend	Actual
21.	Leaving Water Temperature Control Proportional Gain (Kp) Set point	0 to 100%/°F [0 to 180%/°C] in increments of 0.1%, Default 10%/°F [18%/°C]	0%/°F [18%/°C]	
22.	Leaving Water Temperature Control Integral Gain (Ki) Set point	0 to 1%/°F [0.198%/°C] in increments of 0.001%. (Default) 0.110%/°F [198%/°C]	0.110%/°F [198%/°C]	
23.	Leaving Water Temperature Control Derivative Gain (Kd) Set point	0 to 10%/°F [0 to 18%/°C] in increments of 0.1%. (Default)	0.0%/°F (0.0%/°C)	
24.	IGV Maximum Travel Set point	Record setting: 0 to 60000 steps Actual Setting ……..	Do not adjust Factory Setting	
25.	IGV Closed Travel Stop	0 to 100 % in increments of 1 %. Default 0.0%	0.0%	
26.	Minimum Capacity Timer	Enable (default) disable (unlimited time)	Enable	
27.	Time Permitted At Minimum Capacity	1 to 480 minutes in increments of I minute. Default 30 minutes	30 minutes	
28.	Local Atmospheric Pressure	10 to 16 psia [68.9 to 110 kPa] in increments of 0.1 psia [1 kPa] Default 14.7 psia [100 kPa]	14.7 psia [100 kPa]	
29.	Evaporator Leaving Water Offset	-2 to 2°F [-1.1 to 1.1°C] in Increments of 0.1°F [1°C. Default 0.0°F (0.0°C)	0.0°F [0.0°C]	
30.	Saturated Evaporator Refrigerant Temperature Offset	-2 to 2°F [-1.1 to 1.1°C] in Increments of 0.1°F [1°C]. Default 0.0°F (0.0°C)	0.0°F [0.0°C]	
31.	Refrigerant Pressure Output Option	% Condenser (Default) or Delta		
32.	Minimum Delta Pressure Calibration	0 to 400 psid [0 to 2758 kPa] in increments of 1 psid/kPa. Default 0	0 psid/kPa	
33.	Maximum Delta Pressure Calibration	0 to 400 psid [0 to 2758 kPa] in increments of 1 psid/kPa. Default 0	0 psid/kPa	
34.	Evaporator Leaving Water Temperature Offset	-2.0 to 2.0°F [-1.1 to 1.1°C] in increments of 0.1°F [0.1°C] Default 0.0°F [0.0°C]	0.0°F/°C	
35.	Saturated Evaporator Refrigerant Temperature Offset	-2.0 to 2.0°F [-1.1 to 1.1°C] in increments of 0.1°F [0.1°C] Default 0.0°F [0.0°C]	0.0°F/°C	

Maintenance Forms

MACHINE CONFIGURATION GROUP

Number	Description	Range	Recommend	Actual
1.	Unit Frequency	50hz, 60hz default	See Order	
2.	Unit Type	CVHE (default), CVHG, CVHF, CVHB, CVGE, CVGG, CVGF, CVAE, FastPak water-Cooled, FastPak Air-Cooled	CVGF	
3.	Nominal Unit Tons	100 to 1800 tons in 10 ton increments, Default 500 tons	See Order	
4.	Refrigerant Type	R11, R123 (Default), r134a, R22, R113	R134a	
5.	Starter Type	Y-D, X-L, Solid-state, SMCPP, Primary reactor, Auto Transformer, C515	See Order	
6.	Level 2 Contactor Integrity Test	Disable (default), enable (Y-D starters only)	See Design Data	
7.	Rated Load Amps	0 to 2500 amps in increments of 1 amp. Default 300 amps	See Design Data	
8.	Motor Heating Constant	0 to 100 minutes in 1 minute increments. Default 5 minutes	5 minutes	
9.	Current Overload Setting #1	00 to 31 in increments of 1. Default 00	See Table 15	
10.	Current Overload Setting #2	244 to 255 in increments of 1. Default 255. #1 and 2 must total 255	# 1 and 2 = 255	
11.	Maximum Acceleration Timer #1	6 to 64 seconds. Default 27 seconds	Refer to starter Type	
12.	Maximum Acceleration Timer #2	191 to 249 Seconds. Default 228. #1 and # 2 must total 255.	# 1 and 2 = 255	
13.	Acceleration Time Out Action	Shutdown (Default), Transition (Non- solid-state)	Shutdown	
14.	Heat Sink Inhibit Temperature Set Point	100 to 200°F [37.8 to 93.3°C] in increments of 0.1°F (0.1°C). Default 100°F [37.3°C]	100°F [37.3°C]	
15.	High Lift Unloader Valve	Installed or Not installed (Default)	Installed	
16.	CPIM	880 to 1300 in increments of 1 Default 1	980	
17.	External Chilled-Water Set point Option	Installed, not installed (Default)	Not Installed	
18.	External Current Limit Set point Option	Installed, not installed (Default)	Not Installed	
19.	Motor Winding RTD Type	75 Ohm at 75°F [23.8°C] 100 Ohm at 32°F [0°C]	75 Ohm at 75°F [23.8°C]	
20.	High Pressure Cutout Setting	5 to 500 psig [35 to 3447 kPa] on increments of 5 psig [5 kPa]. Default 180 psig [1241 kPa]	195 psig [1344.5 kPa]	
21.	Line Voltage sensing Option	Installed, not installed (Default)	See Order	
22.	Unit Line Voltage	180 to 6600 in 5 volt increments, Default 460 volts	See Order	
23.	External Set Point Analog Input Type	4-20 mA (Default) 2-10 Vdc	4-20 mA	
24.	Tracer option	Installed, Not Installed (Default)	Not Installed	
25.	TCI Module Option	Installed, Not Installed (Default)	Not Installed	
26.	IGV Output Type	Stepper Motor (Default), Pulsed	Stepper Motor	
27.	Oil pressure Protection	Transducer (Default), Differential switch	Differential Switch	

Maintenance Forms

INSTALLATION CHECKLIST FOR CVGF GEAR-DRIVE CENTRIFUGAL WATER CHILLER

Job Name _____ Location _____

Model Number _____ Serial Number _____

Sales Order Number _____ Start-Up Date _____

PRE-START UP OPERATIONS	✓
1. Check the nitrogen holding charge on the chiller. The normal holding charge of a CVGF chiller is 5 psig [34 kPa] at 75°F [23.8°C]. If it is not a leak test must be carried out. Pressure _____kPa Pressure _____psig	
2. Disconnect the power leads from the motor Megohm-test each phase to ground, and phase to phase. **DO NOT MEGOHM-TEST MOTOR WHILE UNDER A VACUUM** **DO NOT MEGOHM-TEST MOTOR WHEN CONNECTED TO A SOLID-STATE STARTER** T1 To Earth _____ T4 To Earth _____ T1 To T2 _____ T1 To T4 _____ T2 To Earth _____ T5 To Earth _____ T1 To T3 _____ T2 To T5 _____ T3 To Earth _____ T6 To Earth _____ T2 To T3 _____ T3 To T6 _____	
3. Relieve the nitrogen holding-charge from the unit.	
4. Evacuate the chiller. See evacuation dehydration procedures under Maintenance Procedures.	
PRE-START OPERATION - EVAPORATOR	✓
5. Check that isolation and flow balancing valves are installed and that the thermometers and pressure gauges are installed, in and out of the evaporator, on the machine side of any valve or elbow.	
6. If the evaporator pump is controlled by the UCP2, check that the field wiring is correct and complete.	
7. Check that the evaporator pump(s) have been run for 24 hours and that the system and strainers have been properly cleaned and/or flushed. The evaporator-water strainer should, ideally, be in close proximity to the entering-water connection of the evaporator.	
8. Check that provisions have been installed to properly maintain water treatment additives, and that the initial water treatment has been added to the system.	
9. Check that a flow switch or a differential-pressure switch is installed and wired in series with the auxiliary of the pump motor starter. Verify the operation of the circuit. Differential-Pressure Switch Cut-in ..... psig [kPa] Cut-out .....psig [kPa]	
10. Check that the evaporator water flow is balanced Design P.D. .....psig [kPa] Actual P.D. .....psig [kPa] Design Flow ..... gpm [L/s] Actual Flow .....gpm [L/s]	

Maintenance Forms

PRE-START UP OPERATIONS – CONDENSER	✓
11. Check that isolation and flow-balancing valves are installed, and that the manometers and temperature gauges are installed, in and out of the condenser, on the machine side of any valve or elbow.	
12. If the condenser pump is controlled by the UCP-2, check that the field wiring is correct and complete.	
13. Check that the condenser pump(s) run and that the system and strainers have been properly cleaned and/or flushed. The condenser-water strainer should, ideally, be installed in close proximity to the entering-water connection of the condenser.	
14. Check that provisions have been installed to properly maintain water treatment additives, and that initial water treatment has been added to the system.	
15. Check that a flow switch or a differential pressure switch is installed and wired in series with the auxiliary of the pump motor starter. Verify the operation of the circuit. Differential-Pressure Switch Cut-in .....psig [kPa] Cut-out.....psig [kPa]	
16. Check that the condenser water flow is balanced Design P.D. .....psi [kPa] Actual P.D. .....psig [kPa] Design Flow ..... gpm [L/s] Actual Flow .....gpm [L/s]	
PRE-START UP OPERATIONS – Electrical and Controls (Starter Panel)	✓
17. Check that all terminals are tightened and wiring is free from abrasion, kinks, and sharp corners.	
18. Check that all contactors and relays have freedom of movement.	
19. Check that all contactors are free of foreign material, and that the panel is free of dust, debris, and so forth.	
20. Check the ratio of the current transformers and record the part numbers below. Part Number ("X" Code and two-digit extension). Primary CT's Secondary CT's X ..... --- ..... X ..... --- ..... X ..... --- ..... X ..... --- ..... X ..... --- ..... X ..... ---	
21. Is the starter panel connected to the UCP-2 on a remote starter? YES NO If yes, check that the connection has been made using a shielded, twisted pair. Recommended wire is Belden 8760, 18 AWG. TERMINATION POLARITY IS CRITICAL!	
22. Check that the low voltage IPC link (< 30 volts) is in a separate conduit from higher voltages, and that its mounting in the starter panel is a minimum of 6" [15.2 cm] from any of the higher voltage cables	
23. Check the termination of the mains cabling between the starter panel and the Motor. (Check for correct connection as per the wiring diagram.	
24. Check the wiring to the starters for size, voltage, and correct phase sequence (A-L1, B-L2, C-L3).	

Maintenance Forms

PRE-STARTUP OPERATIONS – Electrical and Controls (Control Panel)	✓
25. Check that all wiring is tight and free from abrasion, kinks, and sharp corners.	
26. Check all low voltage wiring (<30 volts) is isolated from higher voltages.	
27. Check that the panel is free of dirt and debris.	
28. Power up the control panel 1) Ensure that the main disconnect switch is off and locked out. 2) Remove the main power control fuse from the starter panel. 3) Connect an auxiliary 115 Vac power supply to Terminals 2TB-1 and 2TB1-2 in the starter panel. **Important: Make sure the polarity is correct. The active supply must be connected to Terminal 2TB1-1 and the neutral to 2TB1-2.** 4) Plug in the cord to 115 Vac power source to energize the control panel.	
29. Check, set, and record the settings found in the Operators Menu, Service Menu, Field Start-up Menu and Machine Configuration Menu in the UCP-2. Refer to Design Data, Unit Configuration Data and CVGF-SVX001-E4 UCP-2 settings	
30. Disconnect the three-phase power supply to the oil pump.	
31. Connect a temporary 3-phase fuse-protected power supply to the oil pump.	
32. Check and record oil heater amperage. Left Heater ……. amps, Right Heater ….....amps	
33. Check the settings of the oil-pressure switch and oil pressure-regulator. 1) Use the Service Test Menu of the UCP-2 to manually start the compressor. 2) Install service gauges to the discharge side of the oil filter and the oil tank, and observe the oil pressure. **Oil pressure is to be between 18 and 22 psig [124 kPa and 152 kPa]** 3) If the oil pressure cannot be attained, shut down the oil pump and isolate the power supply. Reverse (or rotate) any two phases. Do not change the leads to the oil pump motor, as a phase rotation test is required after the main power supply is connected to the chiller. 4) Power up the oil pump and check the required oil pressure. A. Check and record the settings of the oil pressure switch. **Oil pressure switch requirements:** cut-in 12 psig [82.7 kPa] cut-out 9 psig [62 kPa] Pre-set non-adjustable Actual Settings: cut-in …… psig [kPa] cut-out …… psig [kPa]	
34. Check and record oil pump amperage. L1……. amps L2 …….. amps L3 ……. amps	
35. Check and set the oil pressure regulator to maintain the design oil pressure supply. Rotate the oil pressure regulator clockwise to increase pressure and counterclockwise to decrease pressure. When complete, return the oil pump to the auto setting.	
36. Check the vane operator and vanes: 1) Use the Service Test Menu of the UCP-2 to manually override the vane control. 2) Enter targets from 0% to 100% and observe vane operation. At minimum and maximum travel, the operator should not exert any force on the vane assembly. Adjust as required. 3) Check that vane movement is smooth to open and close. 4) Check that vane movement is reported back to the UCP2. 5) Return Vane control to "auto."	
37. Dry-run the starter: Make sure the starter disconnect is safely locked open. Use the Service Tests menu of the UCP2 to initiate the Starter Dry Run. Observe the correct operation of the starter contactors. Observe the correct operation of the transition complete signal (if required). Disable Starter Dry Run when complete.	
38. If evacuation is complete, disconnect 3-phase and 115 V temporary power supply from the oil pump and control panel respectively. Reconnect control and oil pump power supply.	

Maintenance Forms

PREPARATION FOR START-UP	✓
39. Evacuation Check: 1) When the vacuum has been pulled down to, or less than, 500 microns [.5 mm of Hg , isolate the vacuum pump. 2) Perform a standing test for 12 hours. 3) If the rise in the vacuum is less than 250 micron [.25 mm Hg] per 12 hours, the unit may be charged. Recorded Vacuum ……..micron [mm Hg] After 12 hours ……..micron [mm Hg]	
40. Isolate the control power supply to the compressor starter.	
41. Close the main power supply to the chiller starter and control panel.	
42. Measure the voltage and compare it to the design specification of the unit. Design Voltage …….. Actual voltage …….. Control panel voltage ……..	
43. Ensure that the oil temperature is at set point.	
44. Check and confirm that the chilled-water pump is running, and charge the unit with the nameplate quantity of refrigerant R134a. Nameplate refrigerant charge ……. pounds [kg] Actual Charge …….. pounds [kg]	
45. Oil pressure test: 1) Connect a 3-phase rotation meter to the oil pump contactor, and check for correct rotation. 2) Connect a set of gauges to the discharge oil line and the oil tank, and confirm the correct oil pressure is maintained. If unable to maintain oil pressure, change any two phases on the outgoing side of the oil pump contactor. 3) Recheck for correct oil pressure.	
46. Motor Bump-Start Procedure. **NOTE: The following procedures are a requirement prior to the first start of the chiller. Failure to comply may result in damage to the compressor and void the Warranty.**	
1) Complete all UCP2 control settings.	
2) Ensure water flows through the condenser and evaporator are correct per the pre-commissioning procedures.	
3) Ensure that the unit has been charged with the correct quantity of oil and refrigerant.	
4) Complete a phase rotation test if the unit voltage is less than 600 Vac.	
5) NOTE: The following checks will require two personnel to complete. During the bump-start procedure of the compressor, one person will be required to look at the rotor from the rear of the motor, through the sight glass, for correct rotation. Looking at the sight glass, the direction will be **counterclockwise** (see arrow). Do not check the rotation of the rotor after the start sequence is complete, because the direction is incorrect.	
6) With the voltage applied to the starter, place the chiller in the AUTO mode.	
7) After the pre-lube is complete, let the starter start the motor rotation.	
8) After a period of **3 SECONDS**, activate the emergency stop by pressing the STOP button on the UCP-2 twice in quick succession.	
9) During this 3-SECOND period, the rotor should be seen to rotate in a COUNTERCLOCKWISE direction.	
10) If the direction is incorrect, the main power cable must be isolated from the power source and any two phases exchanged to obtain correct rotation. Note. Check the rotation direction of the oil pump if the main cables have been changed.	

Maintenance Forms

CHILLER START-UP	✓
47. **Make all Preliminary Checks:** Oil temperature, chilled-water flow, condenser-water flow, chilled-water load, and so forth.	
48. **Start the unit and observe conditions:** As the unit starts and runs, observe closely all operation conditions of the unit.	
49. Readjust the oil pressure if necessary to maintain 18 and 22 psig [124 kPa and 152 kPa].	
50. After the unit has brought the system down to design leaving-chilled-water temperature and is under control, begin taking the start-up log. Log the unit a minimum of 4 times at 15-minute intervals	
OPERATOR / OWNER INSTRUCTIONS	
51. Instruct the operators in the correct start-up, operating, and shutting down procedures of the chiller.	
52. Instruct the operators on the correct procedure for logging the chiller.	
53. Instruct the operator on the correct maintenance procedures.	

Comments and/or Recommendations:

Customer	Name:	Date:
Contractor	Signature:	
Technician's	Office	
Name:		

Maintenance Procedures

Evacuation Procedure.

The Trane Oil 0037 or Trane Oil 0049 used in the CVGF chiller is very hygroscopic and will absorb a large amount of moisture when exposed to the atmosphere. To reduce the amount of moisture absorbed, the following recommendations should be followed:

Commissioning of new units

1. The oil must be evacuated to less than 500 micron [.5 mm Hg].
2. During evacuation of the oil it must be heated to at least 122.0°F [50°C].
3. During evacuation, and after the oil has been heated, it is recommended to agitate the oil (run the oil pump).
4. A standing vacuum-rise test must be done to a limit of 100 micron [1 mm Hg] per hour to a maximum of 500 micron [.5 mm Hg] over 12 hours.

Servicing units

1. Using an Oil Recovery/recharge and distillation unit suitable for Ester oil (Oil 0037-Oil 0049) Part Number TOL01088, TOL01089, TOL01116, TOL01117, POD1000, or similar product, decant the oil from its shipping container, or from the chiller, into the recovery cylinder.
2. Activate the recycle process according to the operation specifications of the recovery unit.
5. When the vacuum is less than 500 micron, perform a standing test done to a limit of 100 micron [.1 mm Hg] per hour to a maximum of 500 micron [.5 mm Hg] over 12 hours.
3. Connect a transfer line from the recovery-unit oil pump to the charging valve of the oil tank, and evacuate. (See Oil Recovery Unit Operating Manual).
4. Connect another line from the condensers to the top of the recovery cylinder and evacuate. (See Oil Recovery Unit Operating Manual).
5. Open the charging valve on the bottom of the oil tank and the condenser, and transfer the oil into the oil tank.
6. When the oil is at the center level of the top sight glass, stop the transfer of oil.
7. Connect the power source to the oil heaters and maintain the required oil temperature.
8. At the UCP-2 control panel, go to the "Service Test" Menu and scroll down to the" Oil Pump" screen. Turn the oil pump on in the manual mode and let it run for several minutes. This will charge the oil circuit with oil.
9. After shutting the oil pump off, check the oil level in the sight glasses. The level should be at the center of the top sight glass.
10. If the oil is below the center level of the bottom sight glass, charge oil as outlined in step 6.
11. Close the oil sump drain valve and vent line on the condenser and remove the recovery tank.
12. Reinstall the oil drain valve cap and tighten it securely.

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File Number	CVGF-SVX001-GB-0700
Supersedes	New
Stocking Location	La Crosse

The Trane Company
An American Standard Company
www.trane.com

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