Water Cooled Ultimate Chiller Solution

Simultaneous Heating and Cooling
Heat Pump and Heat Recovery
Model SHC onDEMAND 30, 50, 70, 85

Installation, Operation & Maintenance

Patent Pending

R-410A

R-134a

SHC on DEMAND®
SIMULTANEOUS HEATING AND COOLING

CLIMA COOL®
THE ULTIMATE CHILLER SOLUTION®

Table of Contents

General Description

The SHC onDEMAND eliminates the need to have separate equipment for heating and cooling while saving installation costs thus reducing the physical footprint and overall operating costs. It satisfies required heating and cooling demands without using inter-module/external header isolation valves, controls, associated logic, piping or wiring while allowing any module to be indexed for heating or cooling regardless of its position in the bank.

Safety

Throughout this manual warning, danger, caution and attention notices appear. Read these items carefully before attempting any installation, service or troubleshooting of the equipment. All labels on unit access panels must be observed.

DANGER: *Immediate hazardous situation which, if not avoided,* **will** *result in death or serious injury.*

WARNING: *Potentially hazardous situation which, if not avoided,* **could** *result in death or serious injury.*

CAUTION: *Potentially hazardous situation or an unsafe practice which, if not avoided,* **could** *result in minor or moderate injury, product or property damage.*

ATTENTION: *Notification of installed, operation or maintenance information which is important, but* **not** *hazard-related.*

CAUTION/ATTENTION

Single wall heat exchanger, not suitable for potable water connection.	Single paroi echangeur, non approprié pour le raccordement d'eau potable.

ATTENTION

Do not defeat, cap, add piping to the outlet of the valve or attempt to change the relief setting.

⚠WARNING/AVERTISSEMENT

WATER AND REFRIGERANT SYSTEMS UNDER PRESSURE	EAU ET FRIGORIGÈNE EQUIPEMENTS SOUS PRESSION
• Isolate/Lockout source and relieve pressure BEFORE servicing equipment. • Failure to relieve pressure may result in property damage, serious bodily injury or death!	• Isoler la source / de verrouillage et de soulager la pression avant entretien de l'équipement. • Le défaut de soulager la pression peut entraîner des dommages matériels, des blessures corporelles graves ou la mort!

CAUTION/ATTENTION

Excessive Chlorine, undissolved solids and other improper water conditions WILL DAMAGE the internal heat exchanger & WILL VOID YOUR WARRANTY!	Chlore excessive, solides non dissous et les autres impropre conditions de l'eau, ENDOMMAGERA l'échangeur de chaleur interne et ANNULERA VOTRE GARANTIE!

⚠WARNING/AVERTISSEMENT

Very Hot Water!	L'eau Trés Chaude!

CAUTION/ATTENTION

Use only copper conductors for field installed wiring. Unit terminals are not designed to accept other types of conductors.	Utilisez uniquement des conducteurs en cuivre pour le câblage. Bornes de l'unité ne sont pas conçus pour accepter d'autres types de conducteurs.

⚠WARNING/AVERTISSEMENT

Disconnect power supply (ies) before servicing. Refer servicing to qualified service personnel. Electric shock hazard. May result in injury or death!		Debrancher avant d'entreprendre le dépannage de l'appareil. Consulter un réparateur qualifie pour le dépannage. Risque de choc électrique. Résiltat de mai dans dommages ou la mort!

⚠CAUTION/ATTENTION

Unit to be serviced by qualified personnel only. Refrigerant system under pressure. Relieve pressure before using torch. Recover refrigerant and store or dispose of properly.		Conifer la maintenance à un technicien qualifie. Le systéme frigorifique sous pression. Décomprimer avant d'exposer à la flamme. Récuperer le frigorigene et le stocker ou le détrulre correctement.

ATTENTION

To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state and federal proficiency requirements.

All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state and federal statues for the recovery and disposal of refrigerants.

If a compressor is removed from the unit, system refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, the refrigerant lines of the compressor must be sealed after it is removed.

⚠CAUTION/ATTENTION

3 PHASE SCROLL COMPRESSOR UNITS	UNITÉ DE COMPRESSEUR SCROLL 3-PHASE
If this unit uses a 3 Phase Scroll Compressor, the following instructions MUST BE followed: • Unit power supply MUST BE wired in the proper sequence to avoid damage to the 3 Phase Scroll Compressor; • Scroll Compressors with INCORRECT rotation show the following characteristics: - High sound level; - High suction pressure and low discharge pressure; - Low current draw. • If any of the three above characteristics exist, swap two of the three supply wires at the disconnect and recheck compressor for incorrect rotation.	Si cet appareil utilise compresseur scroll 3-Phase, les instructions suivantes doivent être suivies: • L'alimentation de l'appareil doit être monté dans l'ordre correct pour éviter endommager le compresseur scroll 3-Phase • Compresseurs scroll avec rotation incorrecte montrent les caractéristiques suivantes: - Haut niveau de son; - Pression d'aspiration élevée et une faible pression de décharge; - Faible ampérage • Si l'un des trois éléments mentionnés ci-dessus sont remplies , échanger deux des trois lignes électriques alimen tant la interrupteur de sécurité et vérifier la rotation du compresseur.

Pre-Installation

Inspection

Upon receipt of equipment, carefully check the shipment against the bill of lading and inspect each chiller for any damage incurred during shipment. Thoroughly check for any visible damage of control panels and electrical and/or refrigeration components or broken copper lines. The carrier must make proper notation of any damages or shortages on all copies of the bill of lading and complete a common carrier inspection report prior to your final acceptance of the shipment. **Note:** It is the responsibility of the purchaser to file all necessary claims with the carrier. In addition, please notify the ClimaCool Customer Service Department at 405-815-3000 or customerservice@climacoolcorp.com of all damage immediately.

Storage

Chillers should be stored in an upright position and kept in a clean, dry area.

Handling of Modules

Carefully remove the module's packaging. The chiller's steel base cutouts provide maneuverability by forklift or pallet jack into its final position (See Rigging and Lifting Procedures Figures 1 - 3 on page 6). Verify that all header grooved couplings and mounting hardware kits are on site prior to connecting the modules.

Rigging and Lifting

Each module should be lifted by using a pallet jack or fork lift. If it is necessary to utilize a crane for rigging or lifting, each module shall be lifted by using lifting straps and spreader bars using rigging points identified on page 6 - Rigging and Lifting Procedures.

Warranty

To ensure proper equipment longevity, design performance and reliability, all ClimaCool chillers must be installed, operated and maintained in accordance with the appropriate ClimaCool IO&M manuals. Water quality is of the utmost importance for the proper care and maintenance of your modular chiller system and regular treatment of the water will increase longevity of your system. **Failure to provide adequate filtration or treatment of evaporator and condenser water will void the ClimaCool module's warranty.** A factory authorized technician is required to perform the startup of your ClimaCool chiller. Please contact the ClimaCool Customer Service Department at 405-815-3000 or technicalsupport@climacoolcorp.com to schedule a date for your startup. **There is a minimum of three (3) weeks notice required to schedule your factory startup.**

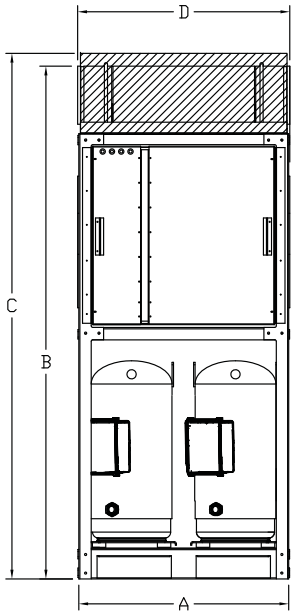
Physical Data

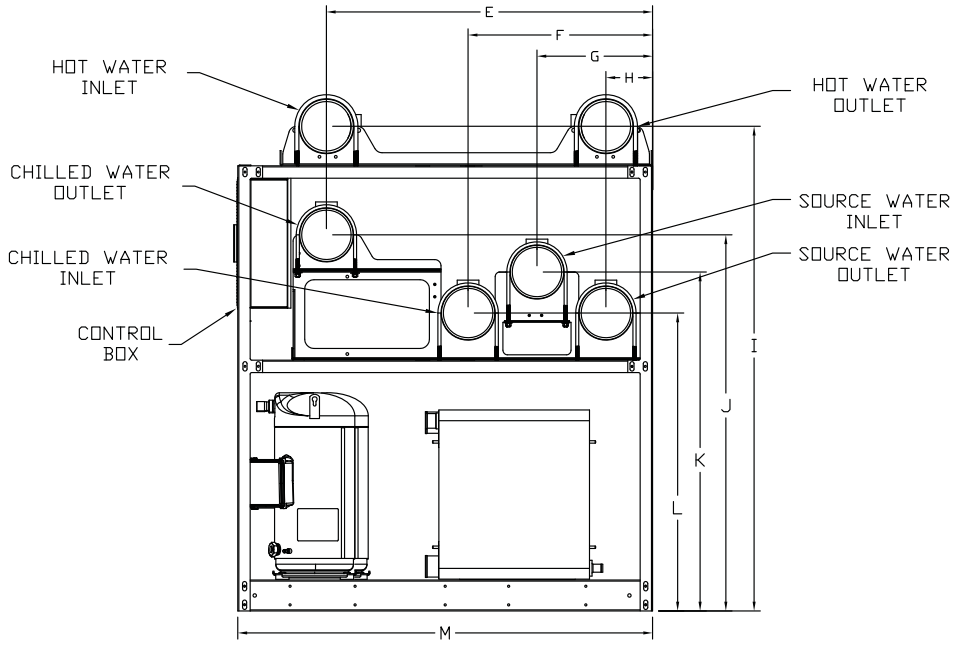
Model UCH Module and Compressor		SHC onDEMAND®			
		30	50	70	85
Capacity (tons)[1]		31.8	51.6	67.3	81.7
kW/Ton		0.734	0.742	0.741	0.748
Refrigerant Circuits (quantity)		2	2	2	2
Compressor Type		Scroll	Scroll	Scroll	Scroll
Compressor Quantity		2	2	2	2
Compressor Nominal Hp (per circuit)		15	25	35	40
Refrigerant Charge R-410A (lbs)		30	55	60	80
Module Operating Weight w/Water (lbs)[2] - SHC Heat Pump		1950	2560	2810	3480
Module Shipping Weight (lbs)[3] - SHC Heat Pump		1630	2250	2500	2980
Module Operating Weight w/Water (lbs)[2] - SHC Heat Recovery		2015	2770	2910	3550
Module Shipping Weight (lbs)[3] - SHC Heat Recovery		1695	2460	2600	3050
Model UCH Condenser		**30**	**50**	**70**	**85**
Heat Exchanger (type)		Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate
Independent Refrigerant Circuits (quantity)		2	2	2	2
Water Storage Volume HX Only (gals)		3.2	6.1	7.3	11.4
Water Storage Volume HX Plus Main Headers (gals)		13.1	16.7	17.9	26.2
System Volume[4]	Min	180	300	420	510
Maximum Design Working Pressure - Water Side (psi)		300	300	300	300
Header Water Connections - Inlet/Outlet (inches)[5]		6	6	6	8
Model UCH Evaporator		**30**	**50**	**70**	**85**
Heat Exchanger (type)		Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate
Independent Refrigerant Circuits (quantity)		2	2	2	2
Water Storage Volume HX Only (gals)		2.8	5.1	6.5	9.7
Water Storage Volume HX Plus 6" Main Headers (gals)		12.8	15.7	17.1	24.5
System Volume (gals)[4]	Min	180	300	420	510
Maximum Design Working Pressure - Water Side (psi)		300	300	300	300
Header Water Connections - Inlet/Outlet (inches)[5]		6	6	6	8

Notes:

1. Ratings in accordance with AHRI Standard 550/590.
2. Module operational weight includes water, compressor oil, and refrigerant charge. Multiply times the number of modules for a total system operational weight.
3. Unit shipping weight includes refrigerant charge, compressor oil and packaging.
4. Required to provide stable operation. Storage/buffer tanks may be utilized in return piping to meet the minimum volume requirements.
5. Main header water/fluid connections are 6" grooved coupling for the 30, 50 and 70 ton modules. The 85 ton module uses 8" grooved couplings.
6. Tonnage ratings conditions: 44°F leaving chilled water temperature, 85°F entering condenser water temperature, flow rates are 3 gpm per ton through the condenser with a fouling factor of .00025 hr-ft2-°F/Btu and 2.4 gpm per ton through the evaporator with a .0001 hr-ft2-°F/Btu fouling factor.
7. 85 ton module cannot be directly coupled with 30, 50 or 70 ton modules due to a difference in header and frame size.

Dimensional Data Drawings: SHC onDemand Heat Pump Configuration



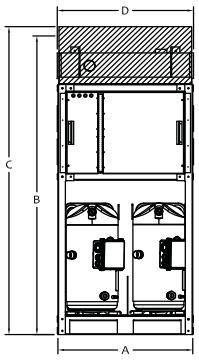


Unit Dimensions (in inches)

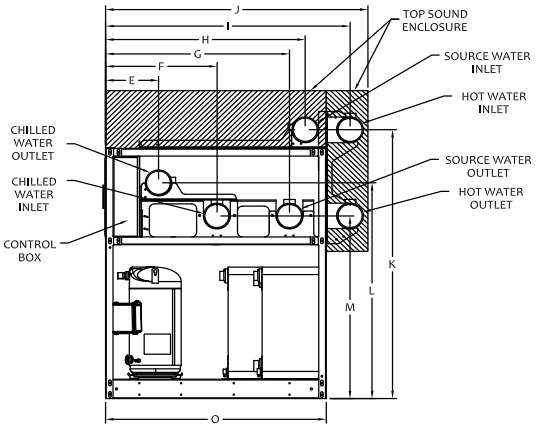
Model UCH	Voltage	A Unit Width	B Height Without Sound Enclosure	C Height With Sound Enclosure	D Header Width	E Header Location	F Header Location	G Header Location	H Header Location	I Header Location	J Header Location	K Header Location	L Header Location	M Unit Depth	Header Connection Size[1]
030	208/230/460/575/3/60	34	76 ⅞	78	34 ¼	41 ⅛	27 ½	18 ⅞	9 ¼	69 ⅞	58	58	47 ½	55 ½	6
050	208/230/460/575/3/60	34	76 ⅞	78	34 ¼	41 ⅛	27 ½	18 ⅞	9 ¼	69 ⅞	58	58	47 ½	55 ½	6
070	208/230/460/575/3/60	34	76 ⅞	78	34 ¼	41 ⅛	27 ½	18 ⅞	9 ¼	69 ⅞	58	58	47 ½	55 ½	6
085	208/230/460/575/3/60	34	83 ⅜	84 ⅞	34 ¼	52 ⅝	29 ¾	18 ⅝	7 ½	78 ¼	60 ¾	54 ¾	48 ⅛	67	8

Note:

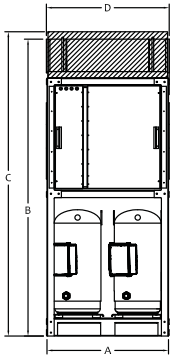
1. Model 085 cannot be directly coupled with 030, 050 or 070 due to differences in header and frame size



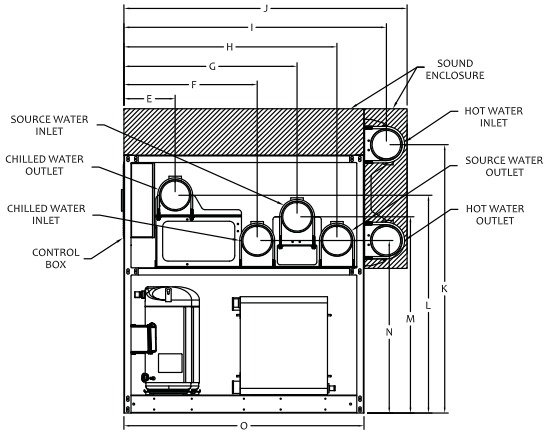
Front View
Model 030, 050, 070



Side View
Model 030, 050, 070



Front View
Model 085



Side View
Model 085

Unit Dimensions (in inches)

Model UCH	Voltage	A Unit Width	B Height Without Sound Enclosure	C Height Including Sound Enclosure	D Header Width	E Header Location	F Header Location	G Header Location	H Header Location	I Header Location	J Unit Depth Including Sound Enclosure	K Header Location	L Header Location	M Header Location	N Header Location	O Unit Depth	Header Connection Size[1]
030	208/230/460/ 575/3/60	34	78 ⅞	80	34 ¼	13 ⅜	28	46 ¼	50 ⅛	61 ½	66	69 ⅞	58	47 ½	N/A	55 ½	6
050	208/230/460/ 575/3/60	34	78 ⅞	80	34 ¼	13 ⅜	28	46 ¼	50 ⅛	61 ½	66	69 ⅞	58	47 ½	N/A	55 ½	6
070	208/230/460/ 575/3/60	34	78 ⅞	80	34 ¼	13 ⅜	28	46 ¼	50 ⅛	61 ½	66	69 ⅞	58	47 ½	N/A	55 ½	6
085	208/230/460/ 575/3/60	34	82 ¾	84 ⅛	34 ¼	14 ¼	37 ⅛	48 ¼	59 ⅜	73 ¼	79	74 ⅞	60 ¾	54 ¾	48 ⅛	67	8

Note:

1. Model 085 cannot be directly coupled with 030, 050 or 070 due to differences in header and frame size.

Rigging

Each module should be lifted by using lift straps threaded through the steel base cutouts and the use of a spreader bar.
Note: If no spreader bar is used, damage to the unit may occur.

Figure 1

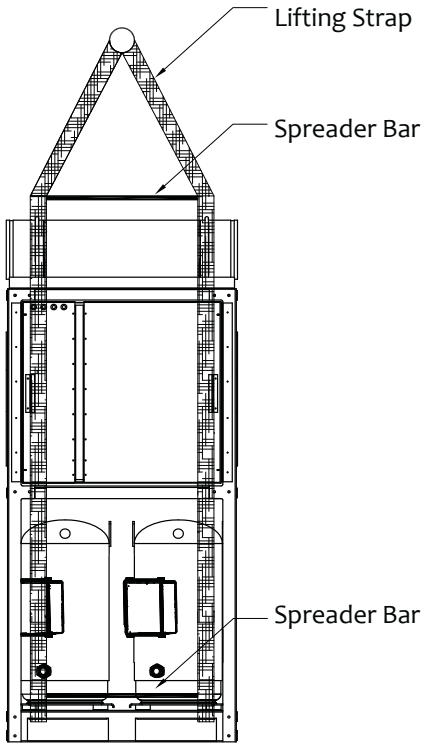
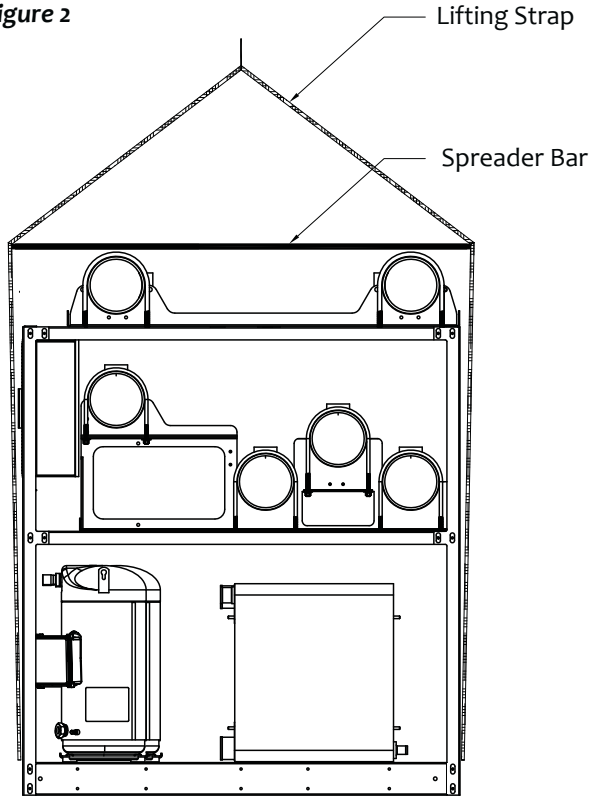


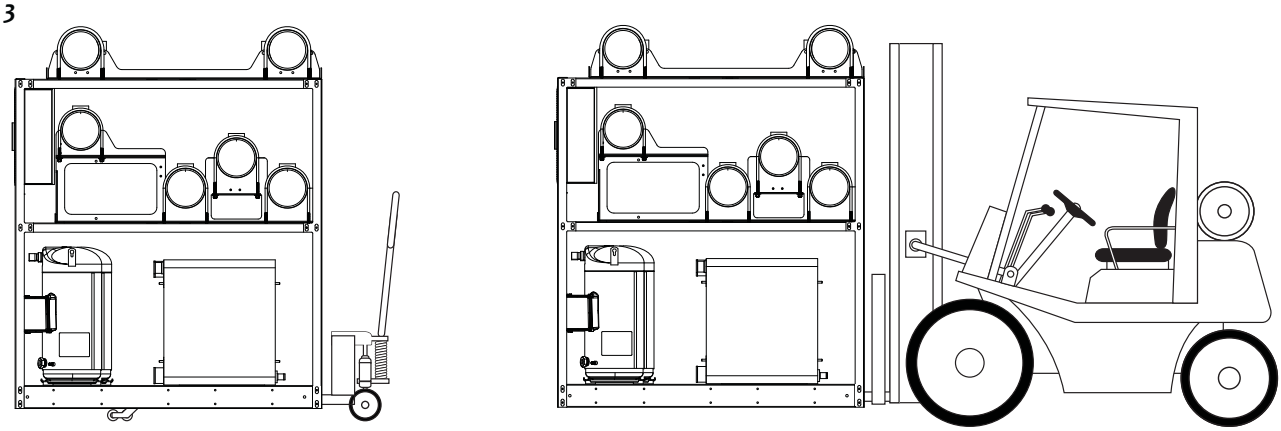
Figure 2



Lifting and Transporting Modules

Pallet jacks or forklifts are required for lifting and transporting the module. Each module has base cutouts provided for ease of maneuverability. 60" forks are recommended to prevent damage to chiller base.

Figure 3



Mounting Rail and Vibration Isolation

ClimaCool recommends locking down the chiller to a concrete base or to three (3) 4" base mounting rails using the six (6) bolt holes provided in each base pan. Due to the low vibration of the modules, ClimaCool does not require the application of spring isolators or pads. Should isolators or pads be desired, install in accordance with Figures 4 and 5.

Figure 4 - Spring Vibration Isolators Option

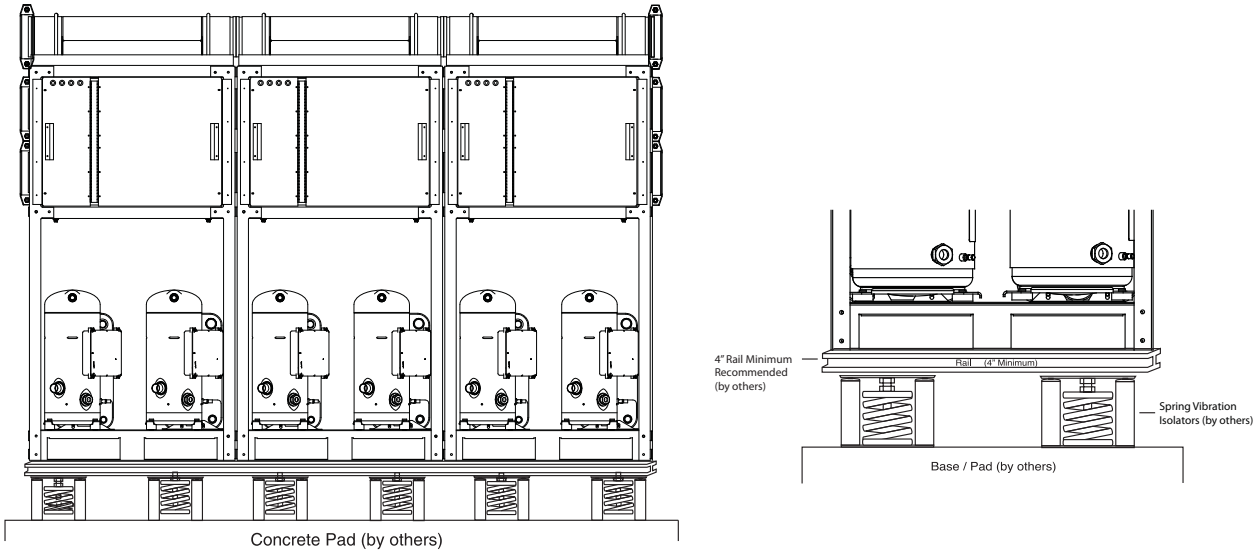
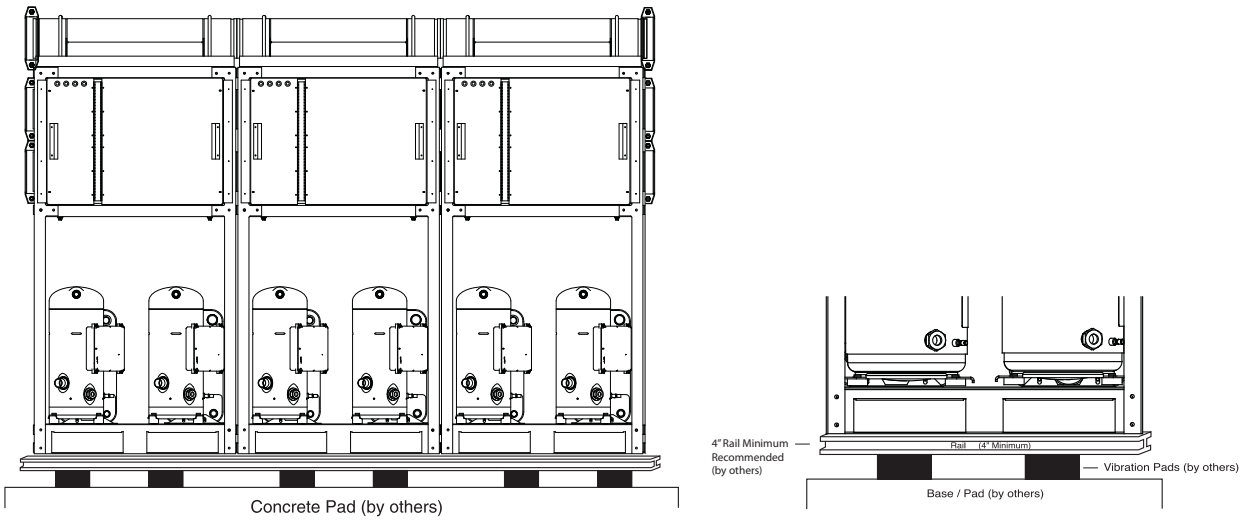


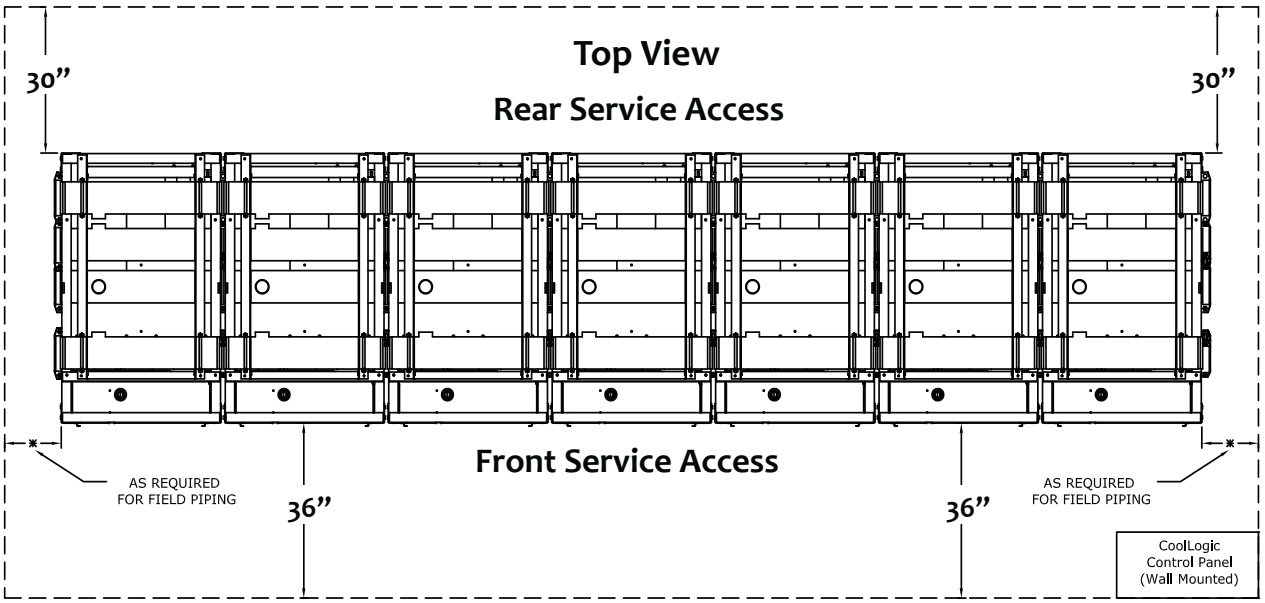
Figure 5 – Vibration Isolation Pads Option



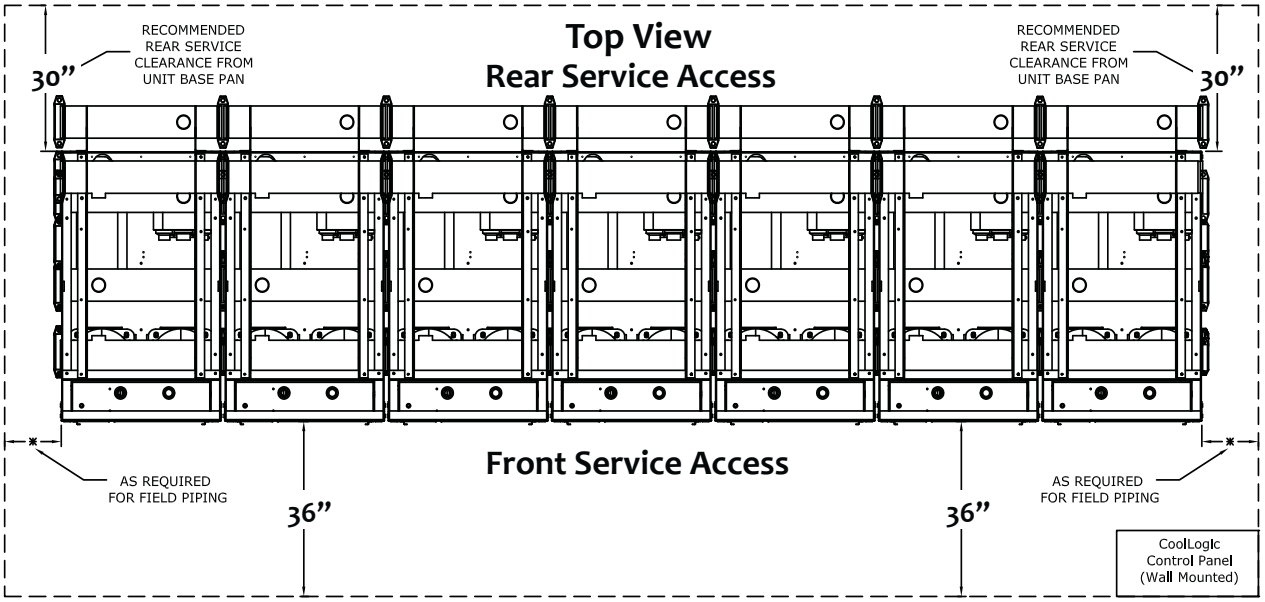
Note: Size and weight distribution is to be determined by a qualified structural engineer per individual job requirements.

Recommended Service Clearances

Service Clearances SHC - Heat Pump



Service Clearances SHC - Heat Recovery



Notes:

1. Allow 36” clearance for electrical panels and 30” clearance for rear service access to modules.
2. Allow a minimum of 18” height clearance for service for 30, 50 and 70 ton modules. Allow 24” for 85 ton modules.
3. Local building or electrical codes may require additional clearance. Consult applicable codes.

Ultimate Chiller Solution Model Key

Rejection Means
R = Remote Condenser (Air or Evap Cooled)
H = High Temperature
W = Water

Nominal Tons
030
050
070
085

Design Series
A

Voltage
F = 460/3/60
H = 208-230/3/60
N = 575/03/60
U = 380/3/50

Controls & Electrical
A = Standard Controls
S = Single Module Controls
T = Single Module Controls with LonWorks
X = Special Options

Compressor Type
S = Scroll
X = Special Options

Refrigerant
A = R-410A
B = R-134a (For use with hot water temperatures ≥ 140°, not available in 85 ton)
X = Special Options

Application
C = Cooling
H = Heat Recovery
R = Reverse Cycle (Heat Pump)
S = Simultaneous Heating & Cooling Heat Pump (6 headers)
W = Simultaneous Heating & Cooling - Heat Recovery (6 headers)
T = Simultaneous Heating & Cooling -Cooling Dual Source (6 headers)
V = Simultaneous Heating & Cooling - Heating Dual Source (6 headers)
X = Special Options

Water Isolation Valves
0 = (None)
B = Evap & Condsr Motorized Valves
E = Evap. Motorized Valves & Manual Condsr Valves
(less Manual Condsr Valves for Air Cooled)
M = Manual Valves for Evap & Condsr
(less Manual Condsr Valves for Air Cooled)
X = Special Options

Refrigerant Options
0 = (None)
B = Hot Gas Bypass - Both Circuits
(Not available with Heat Pump application)
P = Hot Gas Bypass with Pressure Relief Valves
R = Pressure Relief Valves (standard for all UCR's)
X = Special Options

Model Configuration
E = Seismic Certification (030, 050 & 070 ton, Water Cooled only)
S = Standard
X = Special Options

Unit Placement

ClimaCool modular chillers must be installed in a conditioned and dehumidified space. The minimum foundation requirement for the chiller is a level surface capable of bearing the combined operating weight of the modules (See Physical Data on page 3).

Service Access

The recommended service clearances are 36" for front access, 18" height clearance for 30, 50 and 70 ton modules, and 24" height clearance for 85 ton module, 30" for rear access and at least 12" for side clearance or as required for field piping (See Recommended Service Clearances on page 8). Local building or electrical codes may require additional clearance – consult applicable codes.

Draining

When performing standard maintenance procedures such as flushing a heat exchanger, it will be necessary to isolate either heat exchanger. ClimaCool modular chillers provide water isolation valves for this purpose. Access to a floor drain is helpful when performing standard maintenance procedures. **Warning: Water valves must be reopened after flushing is complete.**

Assembling Modules

ClimaCool recommends locking down the chiller to a concrete base or to three (3) 4" base mounting rails using the six (6) bolt holes provided in each base pan. Although the compressors are installed on anti-vibration mountings, further isolation of the chiller from the structure is recommended by installing vibration-eliminating springs or pads under the base rails on which the chiller will rest (See Mounting Rail and Vibration Isolation on page 7). One (1) module should be chosen as the reference module and carefully located.

Field installed mounting accessories are provided for adjoining each module:

- Header grooved coupling kits containing six (6) grooved couplings with gaskets
- Mounting hardware kit containing necessary bolts, spacers, nuts and washers
- Header bank end cap kit containing six (6) grooved couplings with gaskets and six (6) end caps

Field installing the mounting hardware kit will assist with alignment of the modules in a bank and eliminate offset inconsistencies. The ½" mounting holes are provided on sides of the unit base pan. First module should be set, then set adjacent unit on mounting surface roughly aligned 1 ½ inches away from the first unit. While holding spacer in place, work through first modules front base cutout to place a washer and insert bolt through front mounting hole and spacer. Repeat the process for the rear mounting hole. Line up mounting hole of adjacent module with bolt from previous module and working through adjacent modules front base cutout place a washer, split lock washer and nut. Using the appropriate tools, tighten hardware assembly until seated.

Grooved Couplings Installation

Inspect the pipe ends to ensure they are free from any indentations, projections, roll marks, or other harmful surface defects such as loose paint, scale, dirt, chips, grease and rust. Inspect the grooved coupling gasket for any defects. Grooved couplings are used to adjoin a bank of modules. This requires the temporary removal of all top, back and side sheet metal panels to obtain additional access to the headers. With the first unit positioned, the couplings can be installed using the following recommended instructions:

- Review Figure 6, SHC Heat Recovery and Figure 7, SHC Heat Pump below.
- Headers are numbered indicating the easiest order of coupling installation.
- SHC Heat Recovery chillers should have couplings installed on headers 1, 2 and 6 from the top and 3, 4 and 5 from the back of the unit.
- SHC Heat Pump chillers should have couplings installed from the top.

Figure 6 - SHC Heat Recovery

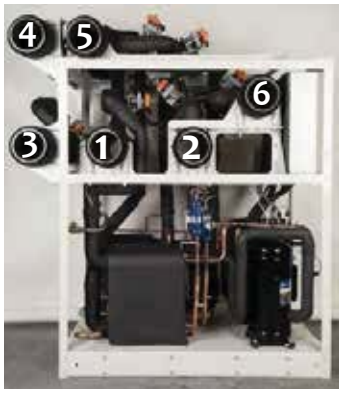


Figure 7 - SHC Heat Pump

- Remove the rubber gasket from the coupling.
- Apply a thin layer of silicone or other non-petroleum lubricant to both the inner and outer surface of the gasket to reduce friction.
- Slide the gaskets on the headers as shown in Figure 8.
- Be sure the gasket is completely on the pipe to eliminate any damage to the gasket.

Figure 8

- With gasket in place on each header of the positioned unit (see Figures 9 and 10), move the second module into position and line up the piping. Ensure alignment is maintained for any additional modules to be added.

Figure 9 - SHC Heat Recovery

Figure 10 - SHC Heat Pump

- Open the coupling by completely removing one bolt and nut (see Figure 11).
- Back the other nut off as far as possible while still keeping the coupling intact.
- Install with the nuts facing up for fastening.
- When the pipes ends are aligned, slide the gasket over the ends and center it between the grooves.
- No part of the gasket should protrude into the groove of either pipe end.
- Place coupling halves over the gasket and make sure that the coupling keys (the part that goes into the groove), are engaged into the grooves.

Figure 11

- Insert the previously removed bolt from the bottom to re-attach the two sides of the coupling (see Figure 12).
- **Tighten nuts alternately and equally until the bolt pads meet and make metal-to-metal contact.**
- Tighten nuts by another ¼ to ½ turn to make sure the nuts and bolts are snug and secure, the use of a torque wrench is usually not required.
- **Uneven tightening of bolts may cause the gasket to be pinched resulting in immediate or delayed leaks.**
- **Replace all sheet metal panels.**

Figure 12

Header Insulation

Chilled water piping is pre-insulated on each module at the factory with ¾" closed cell insulation. After bolting all modules together and leak testing, the entire coupling connection needs to be insulated by the installing contractor.

Sound Attenuation Panels and Gasket

Attenuation panels are enclosures made of 18 gauge galvanized steel with powder coat paint finish and fiberglass insulation. Field installed panel package includes two (2) upper panels and one (1) lower panel for each side of bank for both SHC heat pump and heat recovery models. Factory installed panels include:

- Heat Pump 30, 50, 70Ton – four (4) front and back panels and one (1) top cap made up of four (4) panels
- Heat Pump 85Ton - four (4) front and back panels and one (1) top cap made up of five (5) panels
- Heat Recovery 30, 50, 70Ton – four (4) front and back panels and two (2) top cap made up of seven (7) panels
- Heat Recovery 85Ton - four (4) front and back panels and two (2) top cap made up of eight (8) panels

Install panels by setting in place and locking down with the half turn latches or with self-tapping screw. **Note: Panel package includes a compressed 1" x 1"gasket sealant tape for installation between modules. Install the tape on the outer frame on the side of one module prior to installing the adjacent modules.**

The power for all modules is taken from a suitable circuit breaker/fused disconnect power supply within the main panel. The electrical service enters the individual modules through the top into the module's control panel enclosure. Proper grounding of the module is mandatory. **Before carrying out any electrical work, confirm that the main supply is isolated.** A typical power wiring is located on page 47 – Power Distribution Drawing. Knockout drawings are provided. **Do not drill into cabinet;** shavings can damage electronic components. The power for all individual modules shall be in compliance with all local and national codes.

CoolLogic Control System Wiring

A separate 115 volt power supply is required to power the *CoolLogic* Master Control Panel. Communication between the Master Control Panel and chiller modules requires a simple two-conductor 18 AWG shielded cable with drain rated at 60°C minimum, daisy chain connection. **Control wiring cannot be installed in the same conduit as line voltage wiring or with wires that switch highly inductive loads such as contactor and relay coils.** Refer to the Power Distribution drawing on page 47 of this manual for more information. All wiring shall be in compliance with all local and national codes.

Electrical Phase Sequencing

Proper clockwise rotation for scroll compressor motors is important to prevent damage to the compressors. ClimaCool recommends the use of a phase sequence indicating instrument following the manufactures directions. An alternative is to "bump test" the compressors one at a time with pressure gauges attached to the high and low gauge ports of the compressors to check for proper rotation. Energize the compressor for a few seconds to ensure the discharge pressure gauge increases significantly. If the discharge pressure does not increase, proper rotation is reversed. Compressor rotation can be reversed by opening the main electrical disconnect and switching any two of the main power supply leads feeding that compressor's contactor.

Proper Voltage Balance

Occasionally, in three phase circuits, a voltage imbalance occurs between phases. It is not recommended to operate equipment when an imbalance greater that 2% occurs. This causes motors to run at high temperatures and may affect their longevity. The following example describes how to calculate the average voltage of the three phases to see if the imbalance is greater than 2%.

Example: Line 1 = 226v Line 2 = 230v Line 3 = 228v

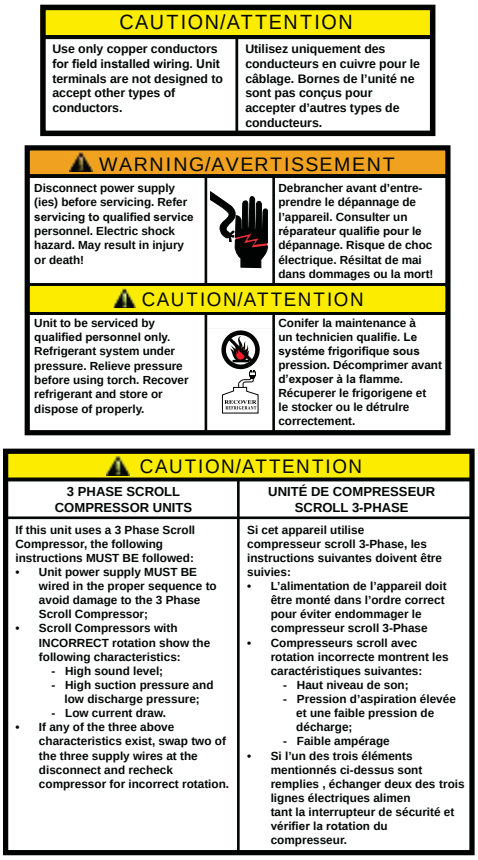
The average is: (226+230+228) / 3 = 228v

Next, [100(228-226)] / 228 = 0.9%

The voltage imbalance of the three phase circuit is 0.9%. This is well under the 2% range.

Voltage/Phase Monitor

Voltage/phase monitors are factory supplied for field installation with the *CoolLogic* Master Control Panel. The voltage/phase monitor helps guard the chiller bank against voltage fluctuations, phase failure or phase reversal conditions which could void your warranty. The voltage/phase monitor has three wires that connect to the main three phase power chiller bank input. Two low voltage control wires are connected to the *CoolLogic* Master Control Panel. Do not install control wiring in the same conduit as line voltage wiring or with wires that switch highly inductive loads such as contactor and relay coils. **Note: It is mandatory to install one (1) monitor per bank at main power distribution panel to monitor voltage and phasing of power to the modules. See Wiring Diagram on page 14.**



CAUTION/ATTENTION

Use only copper conductors for field installed wiring. Unit terminals are not designed to accept other types of conductors.	Utilisez uniquement des conducteurs en cuivre pour le câblage. Bornes de l'unité ne sont pas conçus pour accepter d'autres types de conducteurs.

⚠ WARNING/AVERTISSEMENT

Disconnect power supply (ies) before servicing. Refer servicing to qualified service personnel. Electric shock hazard. May result in injury or death!		Debrancher avant d'entre-prendre le dépannage de l'appareil. Consulter un réparateur qualifie pour le dépannage. Risque de choc électrique. Résiltat de mai dans dommages ou la mort!

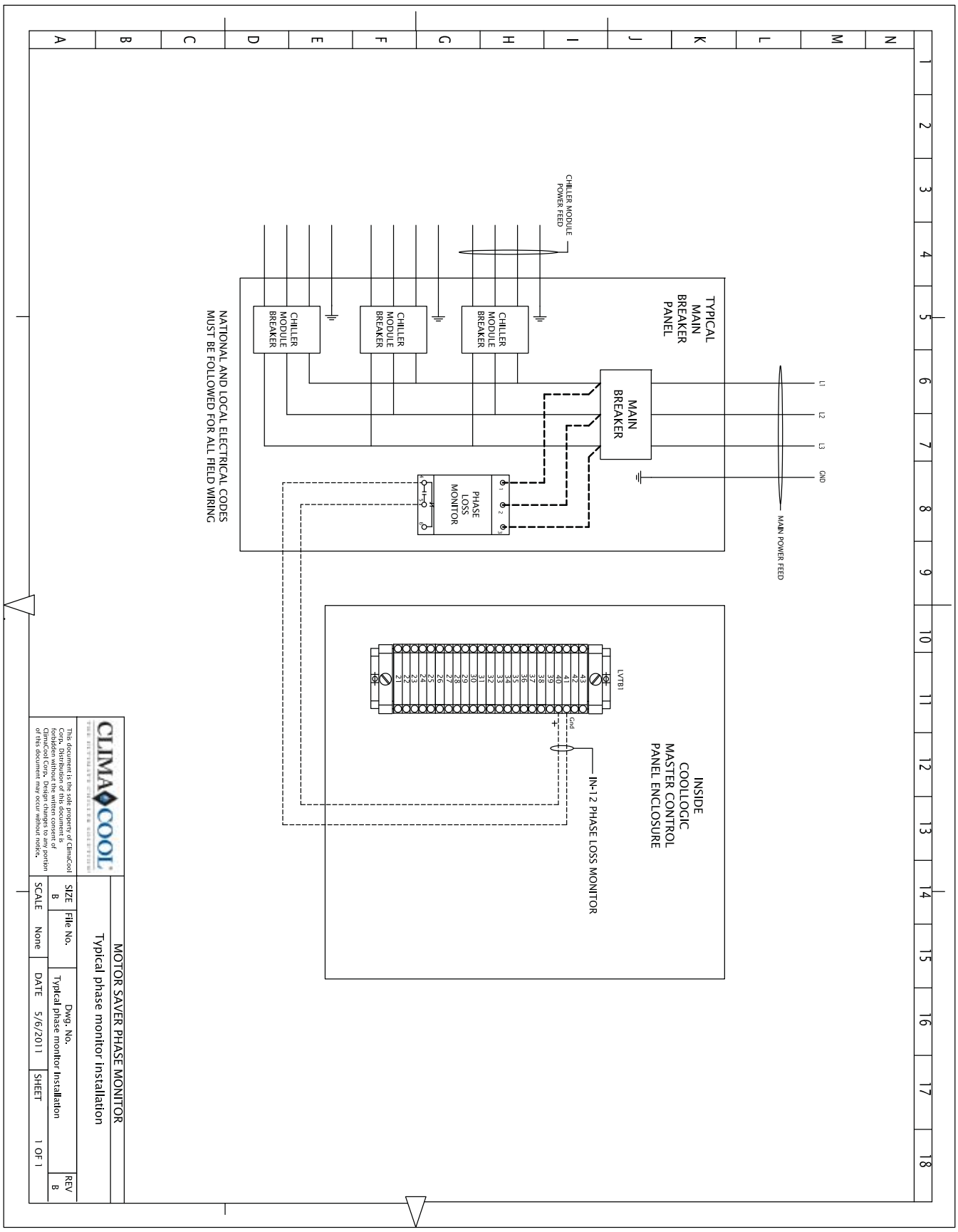
⚠ CAUTION/ATTENTION

Unit to be serviced by qualified personnel only. Refrigerant system under pressure. Relieve pressure before using torch. Recover refrigerant and store or dispose of properly.	RECOVER REFRIGERANT	Conifer la maintenance à un technicien qualifie. Le systéme frigorifique sous pression. Décomprimer avant d'exposer à la flamme. Récuperer le frigorigene et le stocker ou le détrulre correctement.

⚠ CAUTION/ATTENTION

3 PHASE SCROLL COMPRESSOR UNITS	UNITÉ DE COMPRESSEUR SCROLL 3-PHASE
If this unit uses a 3 Phase Scroll Compressor, the following instructions MUST BE followed: • Unit power supply MUST BE wired in the proper sequence to avoid damage to the 3 Phase Scroll Compressor; • Scroll Compressors with INCORRECT rotation show the following characteristics: - High sound level; - High suction pressure and low discharge pressure; - Low current draw. • If any of the three above characteristics exist, swap two of the three supply wires at the disconnect and recheck compressor for incorrect rotation.	Si cet appareil utilise compresseur scroll 3-Phase, les instructions suivantes doivent être suivies: • L'alimentation de l'appareil doit être monté dans l'ordre correct pour éviter endommager le compresseur scroll 3-Phase • Compresseurs scroll avec rotation incorrecte montrent les caractéristiques suivantes: - Haut niveau de son; - Pression d'aspiration élevée et une faible pression de décharge; - Faible ampérage • Si l'un des trois éléments mentionnés ci-dessus sont remplies , échanger deux des trois lignes électriques alimen tant la interrupteur de sécurité et vérifier la rotation du compresseur.

Voltage/Phase Monitor Wiring Diagram



As with any water system, it is important that the system be clean. The pipe work installer must remove weld scale, rust and contamination during pipe work fabrication. The system water piping must be flushed thoroughly with recommended alkaline flush or other chemicals that are compatible with 316 stainless steel, prior to making connections to the ClimaCool chiller. There are certain necessary components that should always be installed in both the chilled water and condenser water systems. (See Water Piping Configuration Figures 16 and 17 on page 17). Piping configurations on multiple modules may also be found on page 17. All water piping must be installed in accordance with applicable codes and standards.

Temperature Sensor and Wells

ClimaCool provides six (6) temperature sensors and wells with each chiller system programmed by the *CoolLogic* Control System. They must be field installed a minimum of 36" but no more than 60" away from the bank and before the strainer, on the source, hot and chilled water inlets and outlets (See Water Piping Configuration on page 17). **Note: Sensors must be fully inserted into the well to obtain proper readings and must be 2 ½ pipe diameter minimum before or after an elbow.**

Pressure Differential Flow Sensor

It is imperative that minimum and maximum water flow rates, as defined in the Operational Limitations tables on page 34, are not exceeded. To prevent the operation of the chiller without sufficient water flow it is required to install pressure differential flow sensors in the source, hot and chilled water circuits. Place one (1) on each side, downstream of the strainers on the inlet and outlet of a straight pipe as close to the module as possible. **Do not install in an elbow on the outlet.** (See Water Piping Configuration on page 17). **Note: Source, hot and chilled water sides both require sensors of equal pressure ranges.**

Pressure Taps

The installing contractor must provide access ports for connecting both the pressure differential flow sensors and pressure gauges for both the condenser and chilled water systems. A ¼" pressure tap is required on the inlet and the outlet of both water systems for a total of eight (8) taps. If a port is shared by the pressure differential flow sensor and the pressure gauge, it will require four (4) ½" taps. (See Water Piping Configuration on page 17).

Strainers – Minimum 60 Mesh Screen Required

ClimaCool chillers utilize brazed plate heat exchangers which are extremely sensitive to debris. **Therefore, it is mandatory that all condenser and chilled water systems include a strainer with a minimum of 60 mesh screen for proper filtration.** The strainers must be installed as shown in the Water Piping Configuration (see page 17) and be in place at all times while chillers are in operation.

ClimaCool's warranty does not cover and does not apply to products which have defects or damages due to freezing of the water supply, an inadequate or interrupted water supply, corrosives or abrasives in the water supply, or improper or inadequate filtration or treatment of the water supply.

Chiller/Heater System Water Header Bypass

A bypass is required for any chilled water/evaporator, hot water/condenser (heating load) and source water side (geothermal, cooling tower or closed circuit cooler) with variable pumping. The bypass must be piped in such a way that the temperature and differential pressure sensors are still sensing active flow. See Water Piping Configuration Figures 16 and 17 on page 17. The purpose of the chiller/heater system bypass is to prevent deadheading of the pumps when all of the internal unit valves go closed as well as allow temperature and differential pressure sensors to sense active flow. The bypass should be sized for an absolute minimum of one module's worth of design flow. Please refer to selection submittals for design flow rates.

Modules can be designated for fixed bypass for heating, cooling and source flow, however, this limits the number of modules remaining for that duty. For instance with an SHC OnDemand heat pump system with four (4) modules, if you designate one (1) module for heating bypass and one (1) module for cooling bypass, the system now only allows a maximum of three (3) modules for heating or three (3) modules for cooling. Also, with a module acting as a bypass increased wear of heat exchangers may be caused by abrasion from bypass flow.

ClimaCool offers two types of water header bypass kits, direct return (Figure 13) and reverse return (Figure 14) on page 16. The bypass kits must be installed on each water source loop and controls are integrated with the CoolLogic software Installation location can be found on page 17 – Water Piping Configuration.

Figure 13 - Direct Return

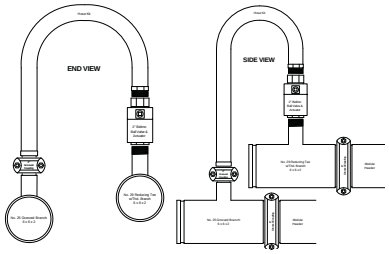
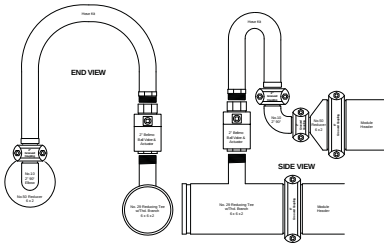


Figure 14 - Reverse Return



This bypass can also be created with field supplied piping. The design piping must accommodate one module's worth of design flow, and be positioned so that the temperature and differential flow sensors sense active flow in the bypass mode. See Figures 16 and 17 on page 17 - Water Piping Configuration. **The field supplied piped chiller/heater system bypass must be controlled by others.** There are system communication delays, polling and network conflicts that strictly prohibit the use of ClimaCool sensors and controls for control of field supplied bypasses or other field supplied items. The recommended method is to control via differential pressure or gpm flow meters across the chilled water/evaporator, hot water/condenser and source water systems.

Load Side System Bypass (Air Handlers, Fan Coils, etc.)

A load system bypass is required for preventing pump deadheading, allowing active flow system sensing and preventing starving flow from the chiller/heater system. Examples of an acceptable load side system bypass are:

- Utilize a quantity of 3-way control valves on the largest loads farthest from the chiller/heater system.
- Field piping with a control valve to provide a bypass across the larger system loads when their 2-way valves go closed.

Please refer to Figure 15 for a typical load bypass valve arrangement. The load side system bypass should be sized for an absolute minimum of one module's worth of design flow. (Please refer to selection submittals for design flow rates). A minimum of (6) six gallons per nominal system ton are also required to maintain proper system thermal inertia. This is to avoid short cycling of compressors in the chiller/heater system as well as prevent nuisance alarms.

Figure 15 - Typical Load Bypass Valve Arrangement

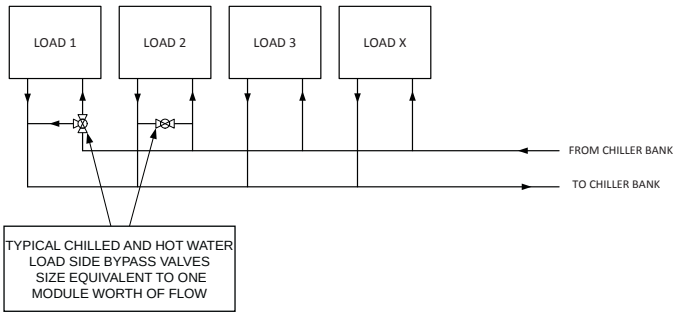


Figure 16 - Field Piping Direct Return

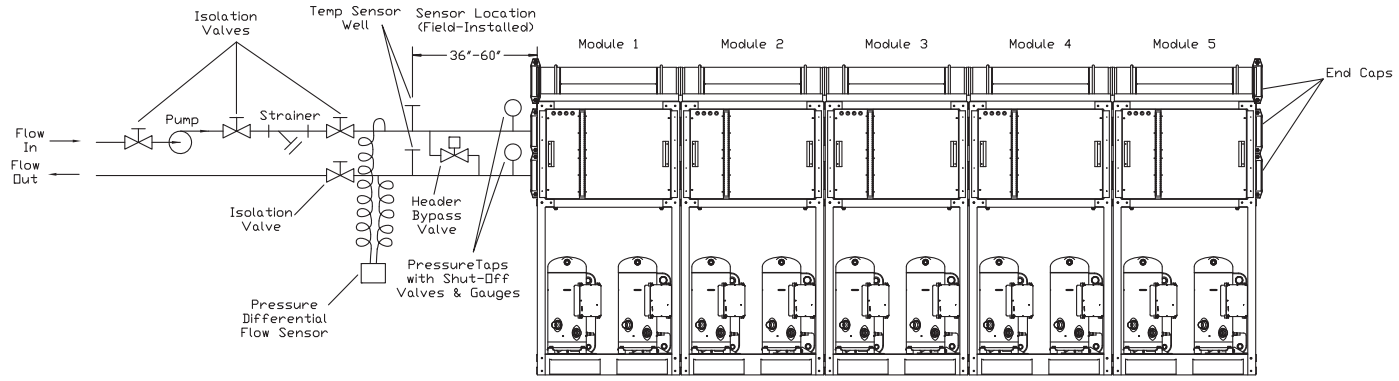
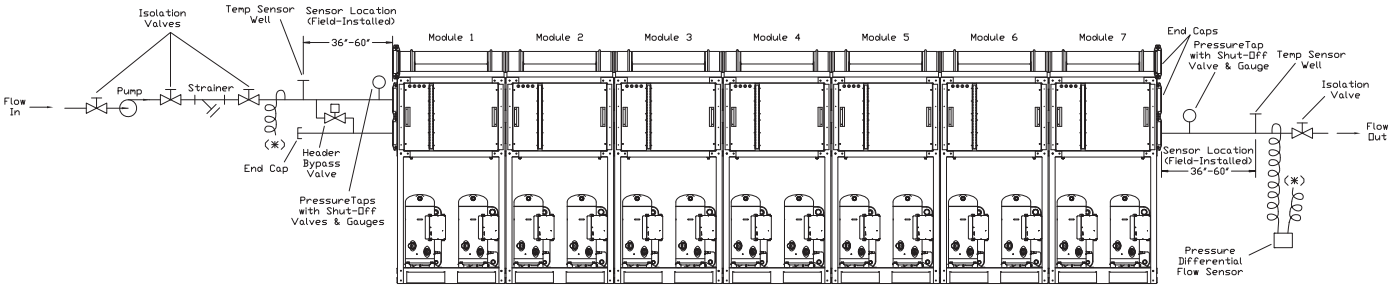


Figure 17 - Field Piping Reverse Return



Notes:

1. Figures 16 and 17 are required piping for proper water regulation and distribution through ClimaCool modular chillers.
2. Module order and incoming/outgoing water flow as shown in both Figure 16 and 17 can be set up as either a left-to-right or right-to-left configuration.
3. Condenser Hydronic Circuit shown. Piping configurations are similar for the chilled water hydronic circuit.
4. For source, hot and chilled water inlet/outlet location dimensions, refer to pages 4-5 Dimension Data Drawings.
5. A pressure differential flow sensor is a required safety device for ClimaCool modular chillers on the chilled and condenser water circuits.
6. A strainer with a minimum of 60 mesh stainless steel screen is a required safety to protect the brazed plate heat exchangers on both chilled and condenser water sides of the system.
7. Maximum water flow rates for both source, hot and chilled water header systems for 30, 50 and 70 ton modules in one bank is 1,000 gpm.
8. Maximum water flow rates for both source, hot and chilled water header systems for 85 ton modules in one bank is 2,400 gpm.
9. Bypass is **mandatory** for systems utilizing motorized valves.
10. Header bypass valve may be installed at either end of bank.
11. For over seven (7) modules, please consult the factory.

Figure 18 - Condenser Hydronic Circuit

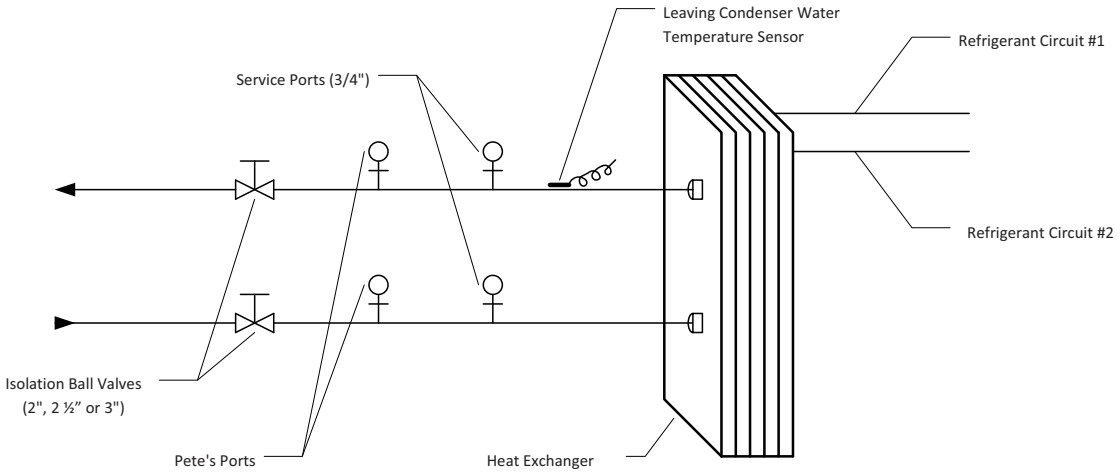
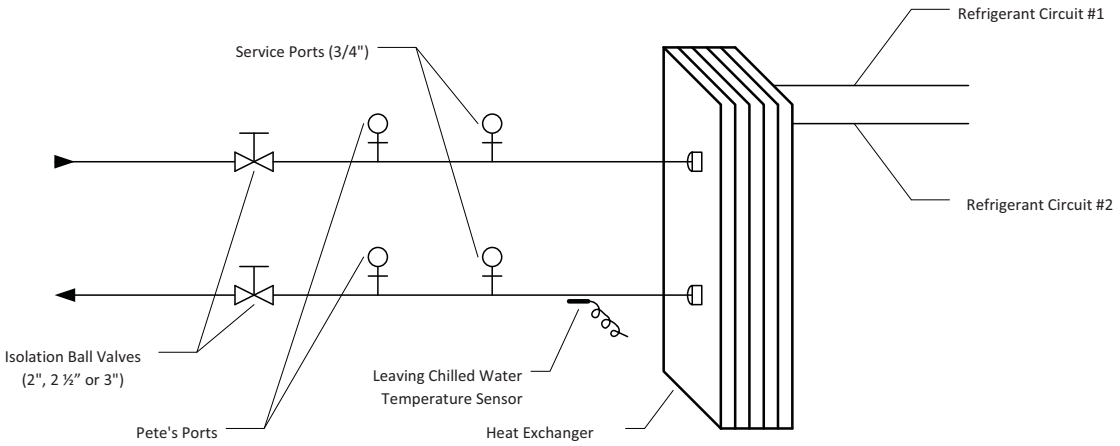


Figure 19 - Chilled Water Circuit



Note: Figure 18 and 19 depict hydronic piping in each ClimaCool chiller module.

Filling the Water System

It is imperative that the water systems are free from debris prior to initial operation. See Water Treatment for a comprehensive list of precautions on page 20.

Filling, Purging and Leak Testing the System

After the water systems have been properly installed, visually inspect all joints for tightness. If the chiller is to be installed in an existing system, the cleanliness of the existing system can be judged from the operating conditions of the present machines. The cooling tower in particular, should be inspected and cleaned, if required. It is a good practice to flush and, ideally, to acid wash the existing system **before** connecting a new chiller.

The following method is recommended to fill and leak check the water system:

1. Close all water isolation valves inside each module which isolate the individual heat exchangers.
2. Ensure that all drain valves are closed and that all water main isolation valves are opened.
3. The system should be filled with clean water sent through the strainers and the system checked for leaks.
4. Once the main water lines and the chiller headers are filled with clean water, purge and repeat the filling process at least three times.
5. All modules are equipped with ¾" fill and flush valves with lines teed into the inlet and outlet connections into and out of each heat exchanger. Ensure these ¾" valves are **CLOSED**.
6. Open the water isolation valves inside each modular chiller and repeat the filling process, this time also checking for leaks inside each module.
7. Following the final filling and leak checking procedure, air should be purged from the system.

Cleaning the System

The following method is recommended to properly clean the water systems:

1. Before cleaning the system, install a temporary bypass line between the main supply and return water headers of both chilled and condenser water systems when possible. Open the main header bypass lines to divert the initial water flow around the module heat exchangers until you are confident the circulating water is mostly pure.
2. Provided main header bypass lines are installed, close all water isolation valves inside all modular chillers.
3. It is mandatory to run the pumps with the strainers in place (see Starting the Pumps section for proper pump startup). All external hydronic branches should be open to all devices in the system.
4. Pressure drop across the strainer must be observed and as pressure change reaches 50% of the initial read, strainers must be isolated and cleaned.
5. Open all water isolation valves inside each module. Close off the main header bypass lines referred to in step 1 and open the flow to the main water headers. Repeat steps 3 and 4 until there is no more debris being collected by the strainers.

Starting the Pumps

Follow the manufacturer's recommendations when starting the pumps for the first time. The system should be checked for leaks and air purged with the pumps in operation. The pressure drop across the heat exchangers will give a good indication of flow through the system (See Condenser and Evaporator Water Pressure Drop Charts on page 22). This should be immediately checked against the expected pressure drop for the flow rate required. **If the pressure drop begins to fall and the flow rate is falling, this could indicate the need to clean the strainers.**

Water quality is of the utmost importance for the proper care and maintenance of the modular chiller system. Proper water treatment is a specialized industry and it is recommended to consult an expert in this field to analyze the water for compliance with the water quality parameters listed in Table 1. The materials exposed to the water are type 316 stainless steel, pure copper and carbon steel. Other materials may exist external to the ClimaCool chiller. It is the user's responsibility to ensure these materials are compatible with the treated water. Regular treatment of the water will increase longevity of your system. **Failure to provide adequate filtration or treatment of evaporator and condenser water will void the ClimaCool module's warranty.**

Heavy-Contaminated Water

In such instances whereby the particulates in the water are excessive, it is recommended to install an intermediate plate and frame heat exchanger to isolate the ClimaCool chiller from the building water system.

Cooling Tower

The cooling tower should be located away from sources of external contaminates such as trees, dust or grass cuttings. Insect infiltration can be reduced by eliminating lights near the tower. A periodic visual inspection of the tower system should be made and contaminates removed as required.

Table 1 - Water Quality Parameters

WATER CONTAINING	CONCENTRATION
Ammonia	Less than 2.0 mg/l
$CaCO_3$ Alkalinity	30 - 500 mg/l
$CaCO_3$ Hardness	30 - 500 mg/l
Chlorides	Less than 200 mg/l
Dissolved Solids	Less than 1000 mg/l
Iron	Less than 5.0 mg/l
Manganese	Less than 0.4 mg/l
Nitrate	Less than 100 mg/l
pH	7.0 - 9.0
Sulphate	Less Than 200 mg/l

CAUTION/ATTENTION	
Excessive Chlorine, undissolved solids and other improper water conditions WILL DAMAGE the internal heat exchanger & WILL VOID YOUR WARRANTY!	**Chlore excessive, solides non dissous et les autres impropre conditions de l'eau, ENDOMMAGERA l'échangeur de chaleur interne et ANNULERA VOTRE GARANTIE!**

Water Temperature Requirements

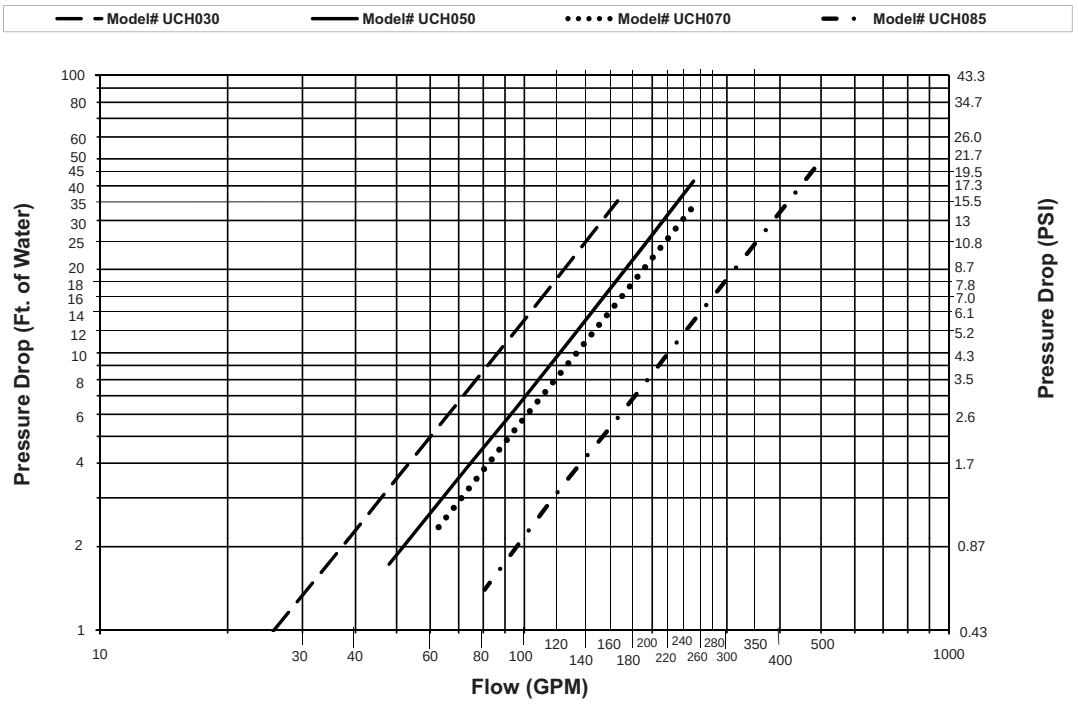
	Load Loops	Minimum LWT[5]	Maximum LWT[5]
Water Temperature Limits	Chilled Water	20°F[1]	62°F
	Hot Water	80°F	135°F
	Source Loop	**Minimum LWT[5]**	**Maximum LWT[5]**
Water Temperature Limits	Heating Mode	20°F[1]	62°F
	Cooling Mode	80°F	135°F

Notes:

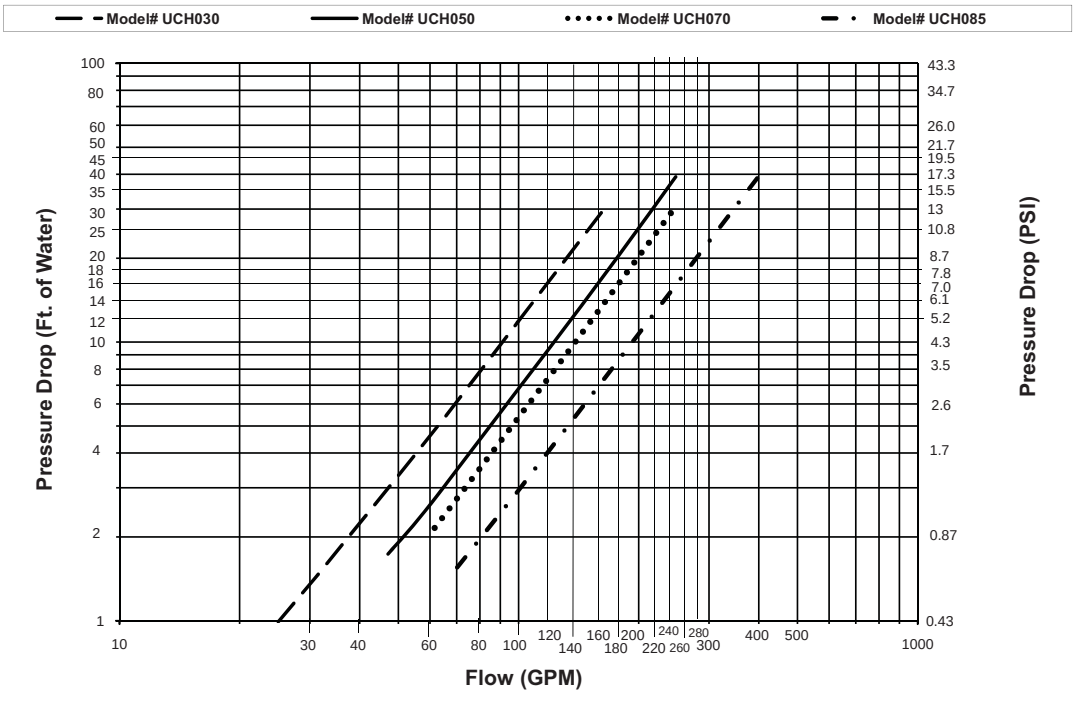
1. Operation below 40°F requires adequate glycol/antifreeze solution.
2. All modules can operate safety in this range without the need of special controls.
3. A glycol solution additive is required at lower operating suction temperatures in order to protect the evaporator from freeze-ups.
4. A maximum ΔT of 100°F is allowed between leaving load temperature and leaving source temperature for all products as well as leaving load heating temperature and leaving load cooling temperature for SHC onDEMAND heat recovery products. (Example: if using glycol and a chilled water temp of 25°F, maximum source water temp would be 125°F).
5. LWT: Leaving Water Temperature

Condenser and Evaporator Water Pressure Drop Charts

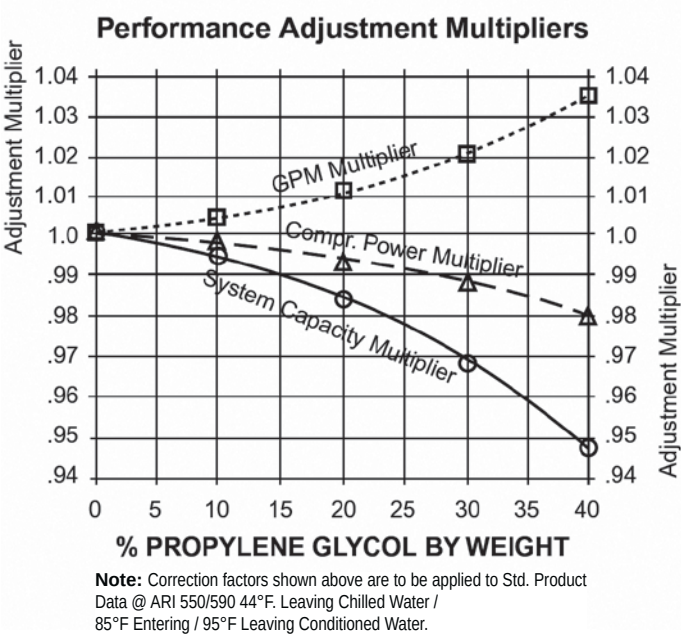
Condenser Water Pressure Drop
30, 50, 70 & 85-Ton, UCH Series



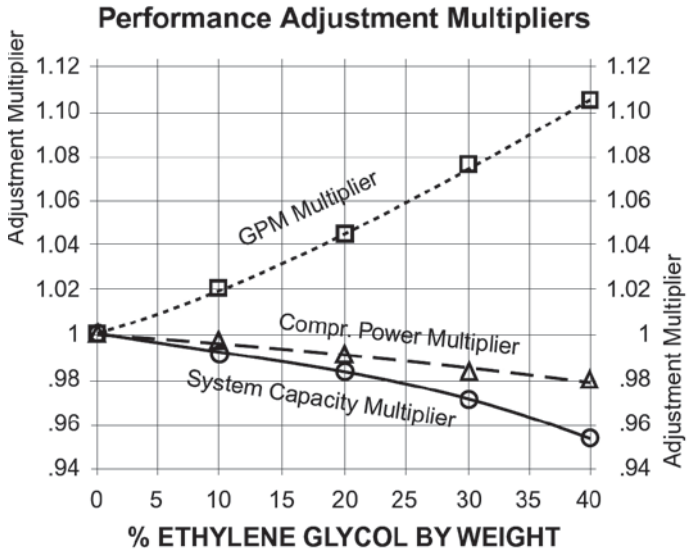
Evaporator Water Pressure Drop
30, 50, 70 & 85-Ton, UCH Series



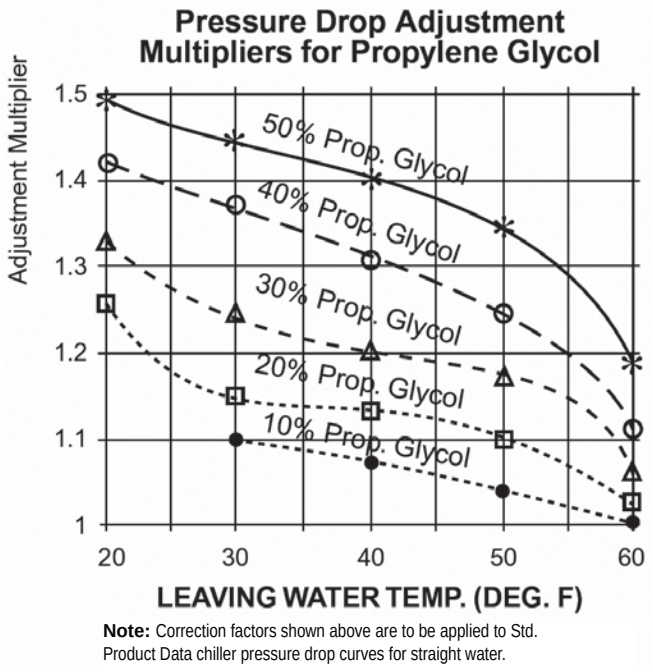
Glycol Performance Adjustment Factors Charts



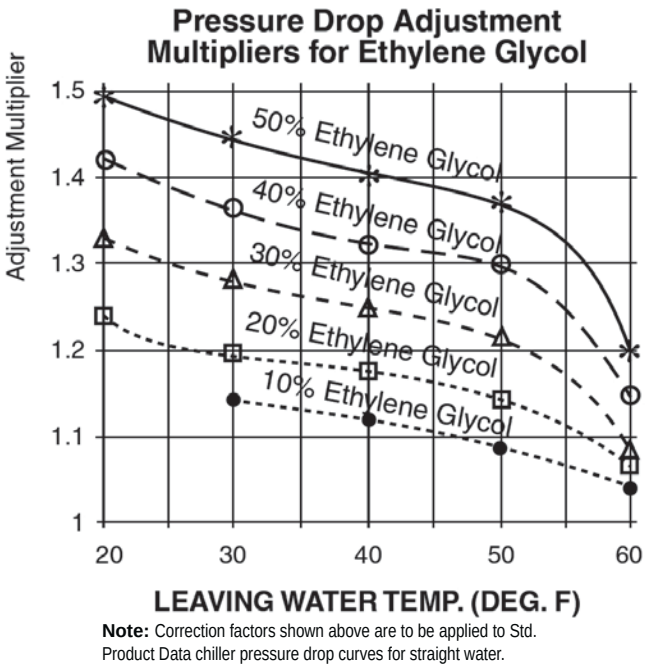
Note: Correction factors shown above are to be applied to Std. Product Data @ ARI 550/590 44°F. Leaving Chilled Water / 85°F Entering / 95°F Leaving Conditioned Water.



Note: Correction factors shown above are to be applied to Std. Product Data @ ARI 550/590 44°F. Leaving Chilled Water / 85°F Entering / 95°F Leaving Conditioned Water.



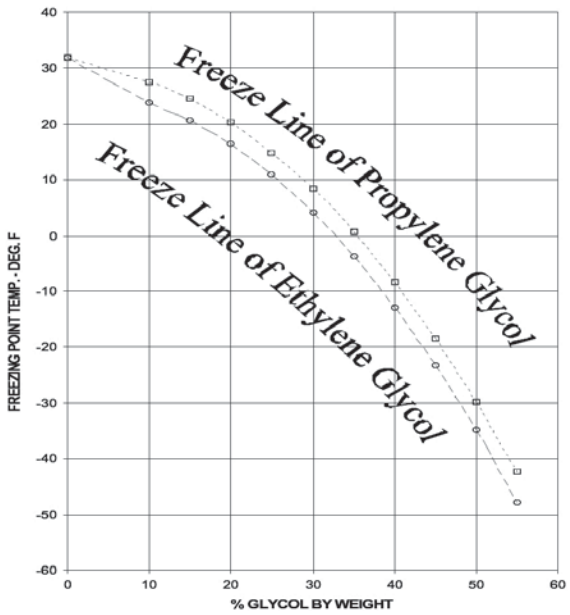
Note: Correction factors shown above are to be applied to Std. Product Data chiller pressure drop curves for straight water.

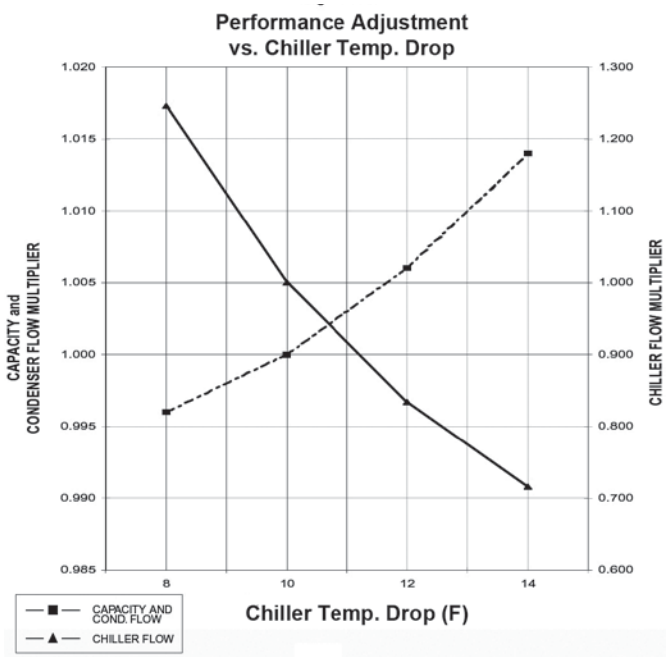


Note: Correction factors shown above are to be applied to Std. Product Data chiller pressure drop curves for straight water.

Glycol Performance Adjustment Factors Charts

Glycol Solution Freezing Point





All startups must be performed by ClimaCool factory trained personnel. Prior to chiller startup, there are certain essential checks which must be completed. Failure to carry out these checks could result in damage to the chiller voiding the modules warranty.

Electrical

It is imperative to turn off the main electrical power supply and follow proper lock-out/tag-out procedures prior to servicing any of the chiller's electrical components. **The following procedures can be performed only after the electrical power is confirmed to be off:**

1. The installation must be inspected and approved by the respective agent and be in compliance with all local and national electrical codes.
2. **Check and tighten all electrical terminal connections on each module as required.** Utilize any lock-out/tag-out procedures required for your project location when performing this operation. If no procedure exists, take all precautions necessary to prevent the power from being turned on. **A systematic tightening of all terminals inside the electrical control panel on each module should be carried out. This will include the compressor motor terminals, which would require removal of the compressor terminal cover.** Check connections at each safety and every termination in the panel.
3. Verify that a separate 115 volt power supply is used to power the *CoolLogic* Control System. Field connections are simplified requiring only a two conductor shielded cable daisy chain from the Master Control Panel to the modules. These control wires must be two-conductor shielded having #18 AWG minimum up to 50 feet, #16 AWG minimum up to 100 feet, rated at 60°C minimum. All field wiring must be identified (tagged). Refer to Power Distribution Drawing on page 47.
4. All field connections should be checked for tightness.
5. Check all fuses for proper sizing as indicated on the chiller data plate and/or the electrical diagram on the inside door of the electrical panel.
6. Verify proper operation of the **mandatory** field installed pressure differential flow sensor.
7. On 208/230V units, confirm transformer(s) are properly tapped for the measured incoming power supply.
8. Verify proper installation of the **mandatory factory provided, field installed voltage/phase monitor**.

Refrigeration

1. Refrigerant piping and components should be inspected for damage.
2. Place refrigerant gauges on the discharge and suction access ports of each refrigerant circuit to ensure a refrigerant charge is present. Leave the gauges on for compressor rotation check.
3. Confirm the settings on all pressure sensors.

Water System

1. Confirm that leak testing has been carried out.
2. Confirm that the system is clean.
3. Confirm that necessary water treatment systems are in place with both the evaporator and condenser water systems.
4. Confirm that both the chilled water and condenser water circulating pumps are operational and water is flowing through both exchangers.
5. Shut the entering water valve and blow out some water to check for particles or coloration from suspended particles. Record the pressure differential across the chiller and condenser heat exchangers, measured at the pete's ports at each module.
6. Confirm correct water flow rates through the condenser and evaporator. Acquire the design parameters for the chiller bank from the ClimaCool Selection Program data (available from the local representative). Compare the measured differential pressures from step 5 above with the predicted flow rates to ensure proper correlation to the flow results.
7. Verify proper installation and electrical termination location of the mandatory factory provided, field installed temperature sensors and wells **(sensor should be fully inserted in the well)** and verify calibration of sensors read through the *CoolLogic* Control System.
8. Confirm installation of **mandatory field installed condenser and chilled water strainers with a minimum of 60 mesh screens.**

CLIMACOOL
THE ULTIMATE CHILLER SOLUTION

Pre Startup Checklist* (SHC onDEMAND®) *E-mail*

technicalsupport@climacoolcorp.com ***Fax 405.815.3052***

Project Name:	**Date:**
Address/Phone:	

		YES	NO
1.	Are modules connected properly per Codes and ClimaCool Corp. Installation Manual? (Installation, Operation & Maintenance (IOM) Manual is available at www.climacoolcorp.com)	☐	☐
2.	Does the module(s) nameplate voltage agree with the site voltage being supplied?	☐	☐
3.	Is there a minimum of 60 mesh strainer on the inlet water of each of the three (3) loops? (Fill water to chiller being sure to pass through a minimum of 60 mesh strainer.)	☐	☐
4.	Is condenser water system filled and flushed? (See "Filling the Water System" in ClimaCool IOM.)	☐	☐
5.	Is chilled water system filled, flushed and all air purged from system? (Air **must be** purged from system prior to startup. See "Filling the Water System" in ClimaCool IOM.)	☐	☐
6.	Are all pumps tested and operational?	☐	☐
7.	Is required GPM (verified by pressure differential) supplied to the chilled water side? (See project specifications or selection and performance sheets available from ClimaCool Sales Rep.)	☐	☐
8.	Is required GPM/Pressure differential being supplied to the condenser? (See project specifications or selection and performance sheets available from ClimaCool Sales Rep.)	☐	☐
9.	Are the pressure differential flow sensors properly installed and wired to the CoolLogic controller?	☐	☐
10.	Have all chiller coupling connections been leak tested?	☐	☐
11.	Is water presently circulating through chiller?	☐	☐
12.	Verified that temperature sensors and voltage/phase monitor have been installed?	☐	☐
13.	Verified power supply agrees with chiller nameplate?	☐	☐
14.	Is power and communication wiring complete to each module?	☐	☐
15.	Verified that wiring and devices meet with approved electrical submittal drawings?	☐	☐
16.	Is required load available to run multiple compressors at startup?	☐	☐
17.	Is control functional to maintain condenser water temperature? (Includes maintaining "minimum" inlet temperature; see "Operational Limitations" in ClimaCool IOM.)	☐	☐

18. Is a water header bypass installed at the chiller? ☐ ClimaCool provided? ☐ Field provided? (*Check one*)

If you checked "No" to any question above, provide the line reference number and the date of scheduled completion below.
Please note **all conditions must be complete prior to the startup date.** _____

_____

_____

*This form must be completed and submitted to ClimaCool Corp. a minimum of **three (3) weeks** prior to final scheduling of any Startup. **NOTE**: **If any of the above items are not complete at time of startup, back charges will be assessed for additional costs.**

Contractor Name:	
Address:	
	(Authorized Signature)
Phone:	**Date:**

Doc: PreStartUp R-410A SHC onDEMAND®
SD #0017 Rev. 7.29.14

All startups must be performed by ClimaCool factory trained personnel.

1. Review all items are complete from the Pre Startup Check List.
2. Cross reference model number with submittal sheet to verify that the units are the correct model type and voltage requirements.
3. Verify the location and wiring connections of all main header temperature sensors (should be a minimum of 36" but no more than 60" from the bank). Confirm that all sensors are **FULLY INSERTED** into their sensor wells and wired back to the correct terminals in the Master Control Panel.
4. Verify the location and ports for all water differential pressure sensors used for flow detection ((+) port piped to the inlet headers and the (-) ports piped to the outlet headers).
   - Verify the correct wiring using the +5VDC power supply to the differential sensor inputs.
   - Verify the correct output wiring from the differential sensors back to the master controller universal input (UI) channels 8 and 11. Confirm inputs 8 and 11 jumpers are set to 'volts'. **Note:** The differential sensor ports should **NOT** be piped to a location which includes strainer pressure drops.
5. Verify that all header inlets (condenser, evaporator, source side) include strainer assemblies equipped with 60 mesh screens.
6. Inspect all refrigerant piping for oil leaks which may have occurred during shipment which might indicate a refrigerant leak. Check the high pressure cutout setting of the pressure controls. The setting should be 585 psig for all UCH models.
7. Verify the location and settings of the phase loss monitor. It should be in a location to sense the voltage condition in the main, high voltage panel which feeds high voltage to each module independently. (See Electrical Connections on page 13). Verify the low voltage output wiring from the phase loss monitor (terminals 4 and 5) back to the main CoolLogic controller, input channel 12.
8. Verify the settings of the motorized water isolation valves auxiliary switch dial settings, to ensure they close near:
   - 15% for source valve (condenser) and load side (evaporator or heat)
9. Confirm that the main water pumps are driven by VFD's, and that all VFD's are controlling the pump speeds to produce a nominal differential pressure drop across the chiller bank headers, measured precisely at the differential pressure sensor locations in step 4 above. Nominal differential pressure ranges are from 3 to 10 psid.
10. Confirm the jumper locations for all master controller and module controllers as shown on the wiring diagrams provided on the inside electrical door panels.
    - Set the rotary switches for the MAC Address of the master controller to be "01."
    - Set the rotary switches for the module controllers to be "02" for module #1, "03" for module #2, and so on.
11. Tighten every screw and lug connection inside the *CoolLogic* master control panel and inside each module control panel high voltage section. Check auxiliary contacts on contactors and ensure #1 auxiliary is wired on the #1 contactor. Open up the compressor junction box located on the front of each compressor and verify main electrical terminal lug tightness and the low voltage wires on protection module.
12. Verify the communication cable wiring to ensure it is 18 AWG, simple two conductor shielded cable and that the wiring is alone inside solid conduit between the master control panel and the first module control panel. Verify the cable's outer jacket is not stripped more than one inch. If so, the wires may have become untwisted, causing signal reflections. Confirm the wires are connected correctly to the terminal blocks at the master and each module as follows:
    Black wire to **Net-**
    White wire to **Net +**
    Shield wire to **Shield**
13. Power-up the master control panel and download the appropriate clipping file into the master controller, following instructions.
14. Power up each module control panel, turn OFF the two toggle switches located on the inside bottom of the low voltage side of the module electrical panel. Download the appropriate clipping file into the module controllers, following the instructions.
15. Check for proper line or high voltage values at each module input power block, and the 24 VAC low voltage values for correctness (+/- 10% of nominal values).
16. On 208/230V units, confirm transformer(s) are properly tapped for the measured incoming power supply.
17. Use refrigerant gauge set suitable for the high pressure R-410A, and hook up to the suction and discharge ports of each module's compressor stages separately. Bump start the compressors either by depressing the contactor manually, or by using the manual run commands from the Master Control Panel, (found in the FN 7, or the service menu). Bump the compressor only for 1-2 seconds to ensure the correct rotation of the scroll compressors (indicated by a rising highside pressure and a falling suction pressure).

18. Verify proper communications from each module back to the master controller using the "STATUS" menu, then indexing down to the desired compressor data screen.
    - If the compressor data parameters all read "0," then communications are not yet established, and communications cable troubleshooting is required.
    - When all compressor data parameters read actual values which agree with the refrigerant gauge set and refrigerant line temperatures, then it is safe to assume that communications are established.
19. Set up the master controller parameters according to the specific job submittal sheets.
    - All parameters can be found in the FN 2 menu (setup), FN 6 menu (module factory settings), FN 7 menu (service), FN 8 menu (master factory settings).
    - It is imperative to access EVERY MENU and EVERY PARAMETER to ensure all settings are appropriate.
20. Set up the Building Automation System (BAS) interface parameters (as required) using the FN 0 menu (network number selection, IP addressing), FN 4 menu (device instances).

Adjusting Unit Charge and Thermal Expansion Valves Using Subcooling and Superheat Method

Due to varying installation conditions/applications and to optimize performance, proper refrigerant charge and thermal expansion valve (TXV) adjustment must be confirmed.

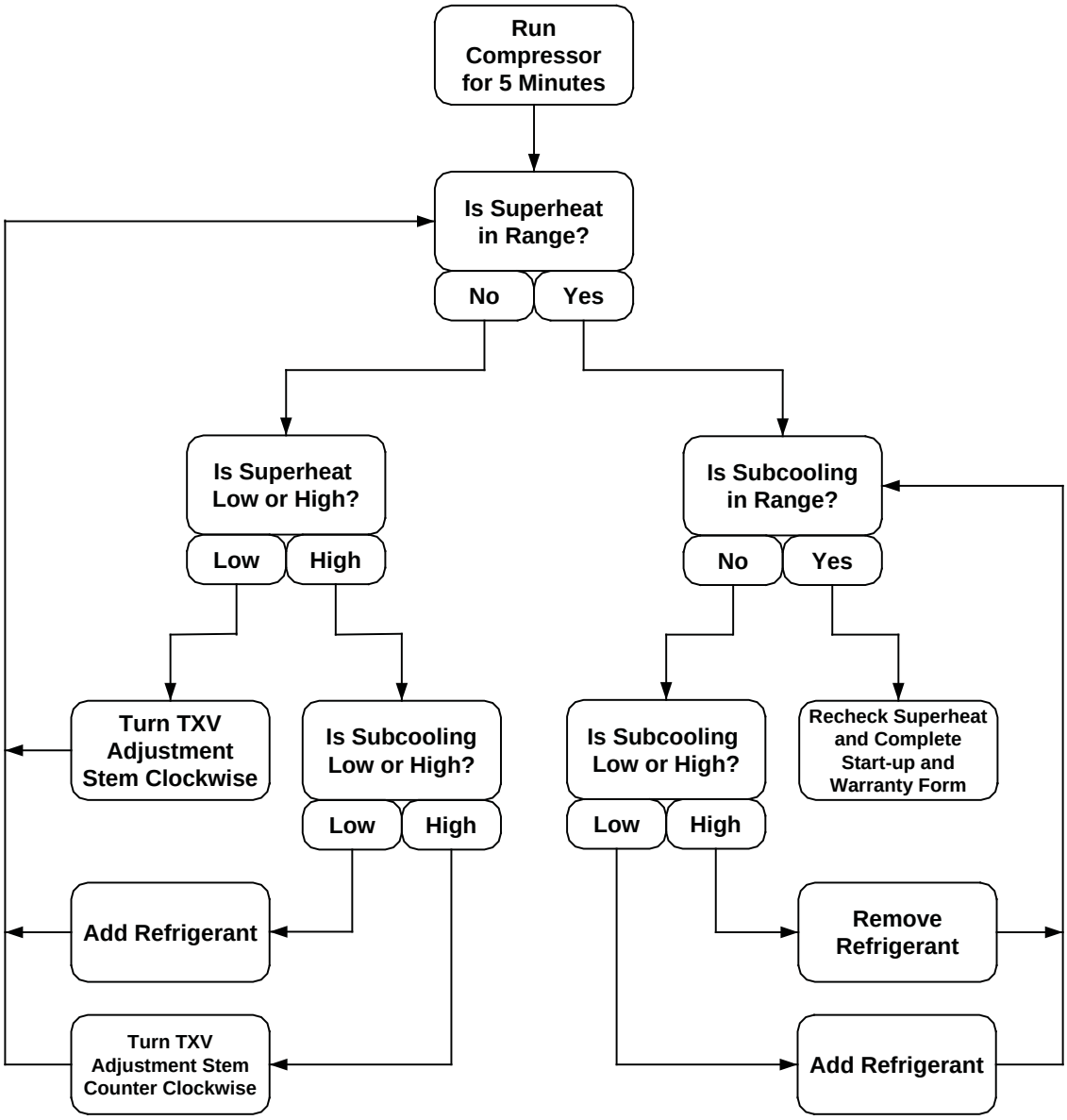
After checking compressor rotation, choose a circuit to be tested first. Connect test equipment to monitor the suction line and liquid line temperatures simultaneously. Place a manifold gauge set on the suction line and liquid line then start the compressor. As long as the suction pressure is high enough to prevent the low pressure switch from tripping, run the compressor for five minutes.

Verify proper subcooling. This is accomplished by subtracting the liquid line temperature from the saturated condensing temperature. The saturated condensing temperature is found by converting the liquid line pressure reading on the manifold gauge to the related temperature. The normal subcooling temperature range at the condenser is 5-15°F, BUT for total accuracy please follow the charge recommendations found in the selection program. If subcooling is too low, then refrigerant must be added to the system. Add charge and wait five minutes before checking results. If subcooling is too high, then refrigerant must be removed from the system.

Verify proper superheat by subtracting the saturated evaporative temperature from the suction line temperature. The saturated evaporative temperature is found by converting the suction pressure reading on the manifold gauge to the related temperature. The proper superheat temperature range is 6-18°F at normal operating conditions (typically 44^{oF} leaving chilled water temperature). If superheat is low, this may indicate that the expansion valve is overfeeding. To adjust the expansion valves, turn the adjustment stem clockwise. This will cause the superheat to rise. Wait five minutes before checking the results of this adjustment. Repeat until the desired superheat is achieved.

Once adjusted, also check the discharge gas superheat (DGSH) to confirm reading is not less than 50°F and the discharge line temperature is not more that 220°F. To check discharge gas superheat, first obtain the saturated condensing temperature by converting the discharge pressure to saturated refrigerant temperature using a pressure temperature chart. Next, measure the discharge line temperature 6 to 10 inches from the compressor. Subtract the saturated condensing temperature from the discharge line temperature to find the discharge gas superheat. If the DGSH is below 50°F, liquid refrigerant is still present in the suction gas vapor returning to the compressor. The TXV will require additional clockwise adjustment to raise the discharge gas superheat into the acceptable range.

Subcooling & Superheat Flow Chart



Caution: Do not charge to achieve subcooling temperature when the expansion valve is overfeeding. If the expansion valve is overfeeding, readings may still indicate low subcooling and low superheat, but circuit may not be undercharged.

Startup Documentation

All startup paperwork and documentation must be submitted to ClimaCool. Future warranty claims cannot be processed without a completed Startup and Warranty Registration form on file (See page 30).
Note: Electronic version of the Startup forms available on www.climacoolcorp.com in the Library section.

Water Testing

Extract three (3) water samples from each water loop, Hot Water/Condenser, Chilled Water/Evaporator, and Source Water using the bottles provided (three (3) bags; each bag containing three (3) bottles) from the Water Sample test kit. Confirm that the sample bottles are filled to the top leaving no air in the bottles. All the sample bottles must have labels completed per instructions included with the bottles. Ship the bottles immediately to the appropriate water testing laboratory per the instructions.

Startup and Warranty Registration Form (SHC onDEMAND®)

Sign, date and E-mail to: technicalsupport@climacoolcorp.com or
Fax: 405.815.3052 Attn: Technical Support

Ambient Temp: _____ Page 1 of 1

Project Name: _____
Address: _____
City/State/Zip: _____
Startup Date: _____

Contractor Name: _____
Address: _____
City/State/Zip: _____
Phone No.: _____

Module

Model No.: _____
Serial No.: _____
Chiller No.: _____ Bank No.: _____

Compressor

Model No.: _____
Serial No. 1: _____
Serial No. 2: _____

Bank Water Pressures Entering / Leaving

Evaporator: ____ / ____ ____ Δ P
Condenser: ____ / ____ ____ Δ P
Source: ____ / ____ ____ Δ P

Water Samples Taken (Mark "X")

Evaporator: ☐ Yes ☐ N/A
Condenser: ☐ Yes ☐ N/A
Source: ☐ Yes ☐ N/A

"Flow devices" shut off chiller below 40% of flow for Cool & Source loop and 25% for Heat loop: ☐ Yes

For initial MANDATORY water samples, bottles are provided.
Follow instructions on label and mail the same day sample is taken.

► All wiring terminations in module panel, safeties and compressors tightened: ☐ Yes ☐ No

► Rotation of scroll compressor is correct: ☐ Yes ☐ No

Voltage / Ground

L1 _____ L2 _____ L3 _____
Low Voltage (24V): _____

Phase / Phase

L1/L2 _____ L2/L3 _____ L1/L3 _____

Compressor Circuit #1

Amperage: L1 _____ L2 _____ L3 _____

		HEAT	COOL
Sight Glass Oil Level:			
Suction Pressure:			
Suction Temperature:			
Compressor Superheat:			
Discharge Pressure:			
Discharge Line Temperature (F):	220° max		
Discharge Gas Superheat (F):	50° min		
Liquid Line Temperature:			
Liquid Subcooling:			
Evaporator Entering Water Temperature:			
Evaporator Leaving Water Temperature:			
Condenser Entering Water Temperature:			
Condenser Leaving Water Temperature:			
Evaporator Pressure Differential:			
Condenser Pressure Differential:			

Compressor Circuit #2

Amperage: L1 _____ L2 _____ L3 _____

		HEAT	COOL
Sight Glass Oil Level:			
Suction Pressure:			
Suction Temperature:			
Compressor Superheat:			
Discharge Pressure:			
Discharge Line Temperature (F):	220° max		
Discharge Gas Superheat (F):	50° min		
Liquid Line Temperature:			
Liquid Subcooling:			
Evaporator Entering Water Temperature:			
Evaporator Leaving Water Temperature:			
Condenser Entering Water Temperature:			
Condenser Leaving Water Temperature:			

Software Version: _____

► Verify Safety Setting Limits:

Low Temp:	High Pressure:	Low Pressure:
☐ ____	☐ ____	☐ ____

► Verify Safety Setting Limits:

Low Temp:	High Pressure:	Low Pressure:
☐ ____	☐ ____	☐ ____

Rep Signature: _____ Print Name: _____
E-Signature: ☐ Check Box (Authorized Signature)

Doc: SHC onDEMAND® StartupWarranty
SD #0018 Rev. 5.16.14

Pressure and Temperature Log

A log of temperatures and pressures should be taken regularly. Periodically conduct a visual inspection of the chiller to identify problems before they reach the point of failure. As with any mechanical system, it is necessary to conduct a series of checks to the ClimaCool chiller to confirm correct operation.

Maintaining a Daily Log

Date	Chiller No.			Technician			
	SUN	MON	TUE	WED	THU	FRI	SAT
Chilled Water Entering Temperature							
Chilled Water Leaving Temperature							
Condenser Water Entering Temperature							
Condenser Water Leaving Temperature							
Source Water Entering Temperature							
Source Water Leaving Temperature							
Chilled Water Pressure Drop							
Condenser Water Pressure Drop							
Source Water Pressure Drop							
Faults: Note By Module Number							

Daily

- A daily operational log should be kept.
- Perform visual inspection.
- Record entering and leaving chiller water and condenser water temperatures and pressures.
- Note any problems that may exist and immediately plan for further investigation. If repair is necessary, schedule for earliest possible date.
- Properly document all data taken.

Weekly

- Review daily log from previous week.
- Perform visual inspection.
- Properly document all data taken.
- Note any problems that may exist. Immediately plan for further investigation. If repair is necessary, schedule for earliest possible date.

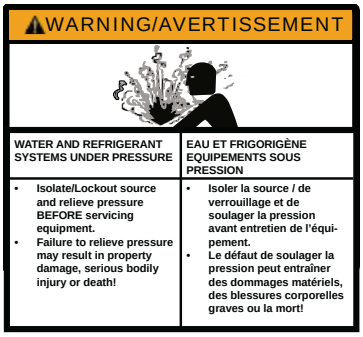
Quarterly

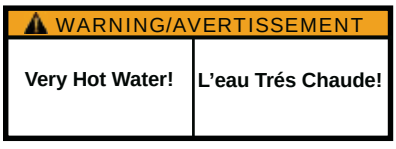
- Check the master and module control panel operating parameters and set points.
- Check temperature drop/rise on each individual heat exchanger.*
- Check compressor oil level.
- Check compressor oil color.
- Check water flow rates and pressure drops across evaporator and condenser heat exchangers.
- Properly document all data taken.
- Check all electrical connections for tightness.

* The temperature drop/rise on a fully loaded (both compressors) heat exchanger is generally 10°F. If only one compressor is running the temperature drop/rise will be approximately 5°F. Some projects are designed to have a higher or lower temperature drop on either the evaporator or the condenser depending on application. Consult your specific project bank performance sheet for these values. If the temperature drop/rise is greater than the design, your heat exchanger may need to be back flushed or the strainer may need to be cleaned.

Annual

- Back flush all heat exchangers. If fouling is suspected use only ClimaCool recommended de-scalers (see Chemical Clean In Place Washing on page 32).
- Remove and clean all waterside strainers.
- Manually operate all waterside isolation valves, if provided, on each module.
- Check all electrical connections for tightness.
- Perform leak check on all refrigerant circuits.
- Check all header piping couplings for tightness.
- Check oil level and color on each compressor.
- Check and test all refrigerant safeties for proper operation.
- Check all peripheral systems for proper operation.
- Check and test *CoolLogic* Control System.
- Verify set points, sensors and general control configuration.
- Properly document all data taken.





Draining

When performing standard maintenance procedures such as flushing a heat exchanger, it will be necessary to isolate either heat exchanger. This can easily be done with the provided factory mounted water isolation valves. Access to a floor drain is helpful when performing standard maintenance procedures.

Back Washing

It may become evident from the recorded weekly log data that the performance of the chiller is gradually degrading. This could be due to a buildup of debris or sludge obstructing the free passage of flow through the heat exchangers. This debris can be removed by a back washing process, which involves the introduction of a forced, violent, backwards flow through the heat exchanger, using a carefully formulated flushing solution. To be effective, this back flow should be slightly higher than the normal flow, and in the opposite direction. The difficulties and practicality of this method depends on the back wash pumping system itself. Another method is to back flush each heat exchanger using city water instead of system water (see City Water Cleaning Arrangement in Figure 20 on page 33). The back washing procedure is accomplished by isolating each individual heat exchanger and introducing the city water using a connection hose to the ¾" service port to flow in an opposite direction from the normal heat exchanger flow direction. On the opposite ¾" service port, connect a drain hose to run to a suitable floor drain. Continue back flow until all debris is removed. **Warning: Water valves must be re-opened after flushing is complete.**

Chemical Clean In Place Washing With Water Isolation Valves

Chemical Clean in place washing will typically provide the best debris removal, even from severely clogged heat exchangers. It is only necessary to mechanically and electrically isolate one chiller module at a time. The rest of the chiller modules can continue to operate to satisfy the cooling load required. The cleaning tank, pump and pump strainer should be arranged in the manner shown in Figure 21 on page 33 - In Place Cleaning Arrangement. The flow of the cleaning is arranged in the opposite flow to the normal operational direction. Connection points are provided using the ¾" service ports at each heat exchanger. The cleaning solution used can be either a detergent or hot water to remove particles and simple cleaning. If correct water treatment has been implemented, this should provide adequate cleaning for most situations. The solution can be pumped through the heat exchangers and allowed to soak for a time and then pumped again.

If it is required to remove carbonates, then an acidic wash should be used. A 2% solution of phosphoric or sulfamic acids in pure water are generally acceptable. These acid solutions should only be allowed to circulate within the heat exchanger for 10 to 15 minutes, followed by a thorough pure water flush for 10 to 15 minutes. **No Hydrochloric or sulfuric acids can be used**. In any case, consult the chemical supplier to establish the correct formulation and handling process. The materials, which will be exposed to the wash, are stated on page 20 – Water Treatment.

Once the washing is complete, the solution should be flushed out completely by pumping clean, fresh water through the chiller. To achieve a reasonable level of dilution, it may be required to change the water several times. After cleaning, the water quality and water treatment should be confirmed.

Figure 20 - City Water Cleaning Arrangement

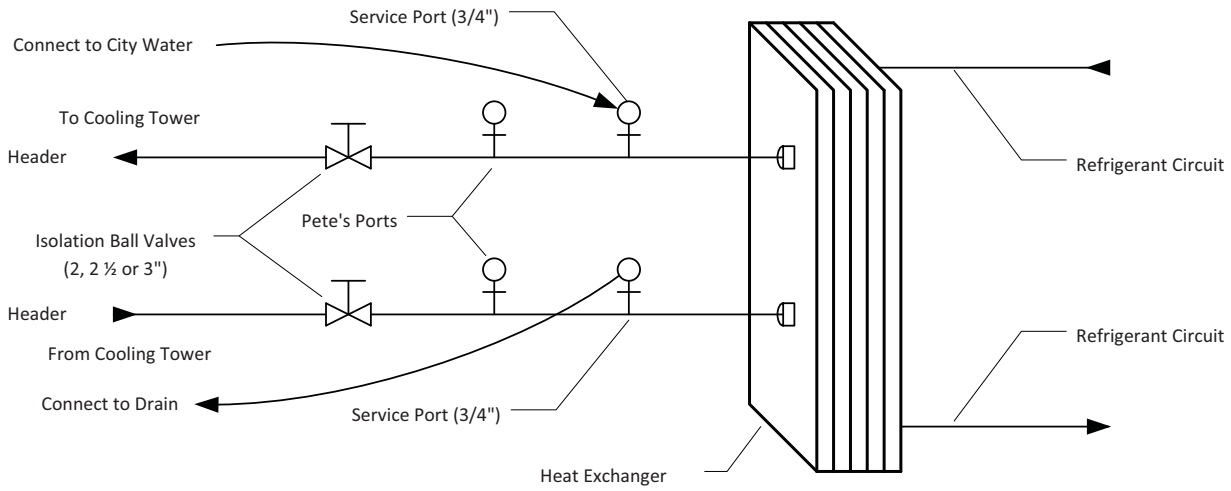
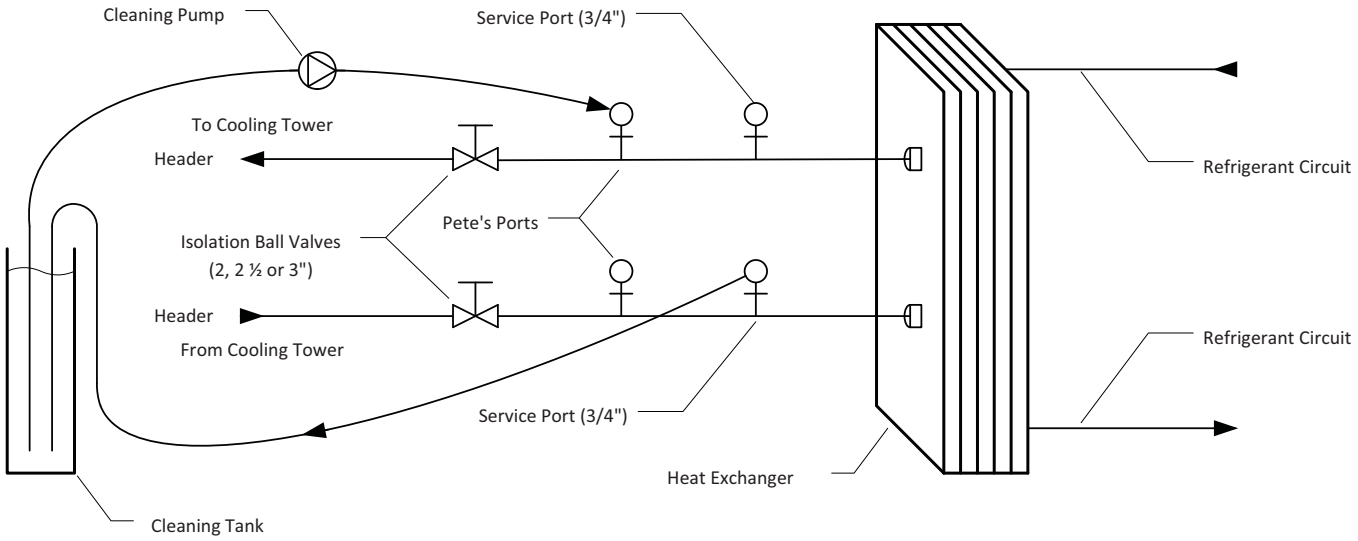


Figure 21 - In Place Cleaning Arrangement



Notes:

1. When backwashing, be sure to flush in opposite direction of flow.
2. Be sure to open all manual valves before unit is put back into operation.

Operational Limitations

Voltage Limitations		
The following voltage limitations are absolute and operation beyond these limitations may cause serious damage to the compressor.		
Nominal Voltage	**Minimum Voltage**	**Maximum Voltage**
208/230/3/60	187	253
460/3/60	414	506
575/3/60	518	632

Water Flow Data	SHC onDEMAND® - Model UCH				
	025	030	050	070	085
Minimum Evaporator Water Flow (gpm)[1]	30	40	65	85	100
Maximum Evaporator Water Flow (gpm)[1]	140	165	250	250	350
Minimum Condenser Water Flow (gpm)[1]	25	30	50	70	85
Maximum Condenser Water Flow (gpm)[1]	140	165	250	250	485
Minimum Leaving Evaporator Water Temperature (No Glycol)(°F)	40	40	40	40	40
Minimum Leaving Evaporator Water Temperature (with Glycol)(°F)	20	20	20	20	20
Maximum Leaving Evaporator Water Temperature (°F)	62	62	62	62	62
Minimum Evaporator Water Differential Temperature (°F)	5	5	5.4	5.9	4.5
Maximum Evaporator Water Differential Temperature (°F)	20	20	20	20	25
Minimum Entering Condenser Water Temperature (°F)	60	60	60	60	60
Minimum Condenser Water Differential Temperature (°F)	6.5	6.5	6.9	7.2	5.5
Maximum Condenser Water Differential Temperature (°F)	30	30	30	30	30
Water Flow Data	**025**	**030**	**050**	**070**	**085**
Maximum Leaving Condenser Water Temperature (°F)	135	135	135	135	135
Equipment Room Data	**025**	**030**	**050**	**070**	**085**
Minimum Equipment Room Ambient Temperature (°F)	55	55	55	55	55
Maximum Equipment Room Ambient Temperature (°F)	105	105	105	105	105

Compressor Operating Limitations	SHC onDEMAND® - Model UCH				
	025	030	050	070	085
Maximum Compression Ratio	5.7:1	5.7:1	5.7:1	5.7:1	5.7:1
Minimum Operating Pressure Differential (psi)	85	85	85	85	85
Maximum Operating Pressure Differential (psi)	475	475	475	475	475
Minimum Discharge Pressure (psig)	215	215	215	215	215
Maximum Discharge Pressure (psig)	590	590	590	590	590
Minimum Suction Pressure (No Glycol)(psig)	90	90	90	90	90
Minimum Suction Pressure (With Glycol)(psig)	70	70	70	70	70
Maximum Suction Pressure (psig)	155	155	155	155	155
Maximum Discharge Temperature (°F)	265	265	265	265	265
Minimum Subcooling (°F)	5	5	5	5	5
Maximum Subcooling (°F)	15	15	15	15	15
Minimum Superheat at Compressor (°F)	6	6	6	6	6
Maximum Superheat at Compressor (°F)	12	12	12	12	12
Maximum Oil Temperature (Max) (°F)	200	200	200	200	200
Maximum Saturation Discharge Temperature (°F)	145	145	145	145	145

Note:

1. Minimum and maximum allowable flow rates may vary based on application.

ClimaCool SHC onDemand use scroll compressors. They are highly efficient and extremely reliable. The information contained in this manual will be useful for their care.

Compressor Rotation

All scroll-type machines are unidirectional and will only compress in one direction. Operating in the reverse rotation can be destructive and will be indicated by a load operating noise together with a lack of compression.

Compressor Anti-Short Cycle Timer

Built into the logic of the *CoolLogic* Control System is an anti-short cycle timer which will prevent the compressors from restarting immediately following a compressor shutdown. Minimum on is 75 seconds and minimum off is 200 seconds.

Compressor Lubrication

The compressor operates on a sealed system and oil can only be lost if a leak occurs. There are few cases when oil will need to be added to a machine in normal operation.

Oil Type

The oil in scroll compressors will be either Polyolester type oil (POE) or polyvinyl-ether type oil (PVE). Both refrigerant oils require special handling and should be protected from contamination. They are extremely hygroscopic and will absorb moisture rapidly from the air. It is strongly recommended to store and dispense both oils from sealed metal cans. **Note: Refer to compressor name plate for proper oil type. Different oils cannot be mixed.**

Oil Levels

The oil level in the compressor should be checked with the compressor running. The compressor oil level may vary during operation and particularly on the startup. The normal operating compressor oil level should be between ⅓ and ½ of the sight glass. During operation a certain amount of oil is carried out into the refrigerant system. The system has been designed to bring the oil back to the compressor. If the level in the sight glass falls, it may be due to the operating conditions and enough time should be given to allow the oil to return before more oil is added. This could take up to six hours of operation. The compressor should not be allowed to operate with less than ⅛" oil sight glass for longer than four to six hours.

Adding Oil

The compressor must never be ran in a vacuum. A suitable hydraulic pump should be used to add oil and reserved for this process. **It is imperative that oil type be verified prior to adding to a compressor.** Oil should only be added to a compressor while it is operating to observe valid oil sight glass levels. Oil is pressure-injected either into a gauge connection on the suction line or injected into the oil process port at the bottom of the compressor housing. Only enough oil should be added to raise the level above the ⅓ sight glass point.

ATTENTION

To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state and federal proficiency requirements.

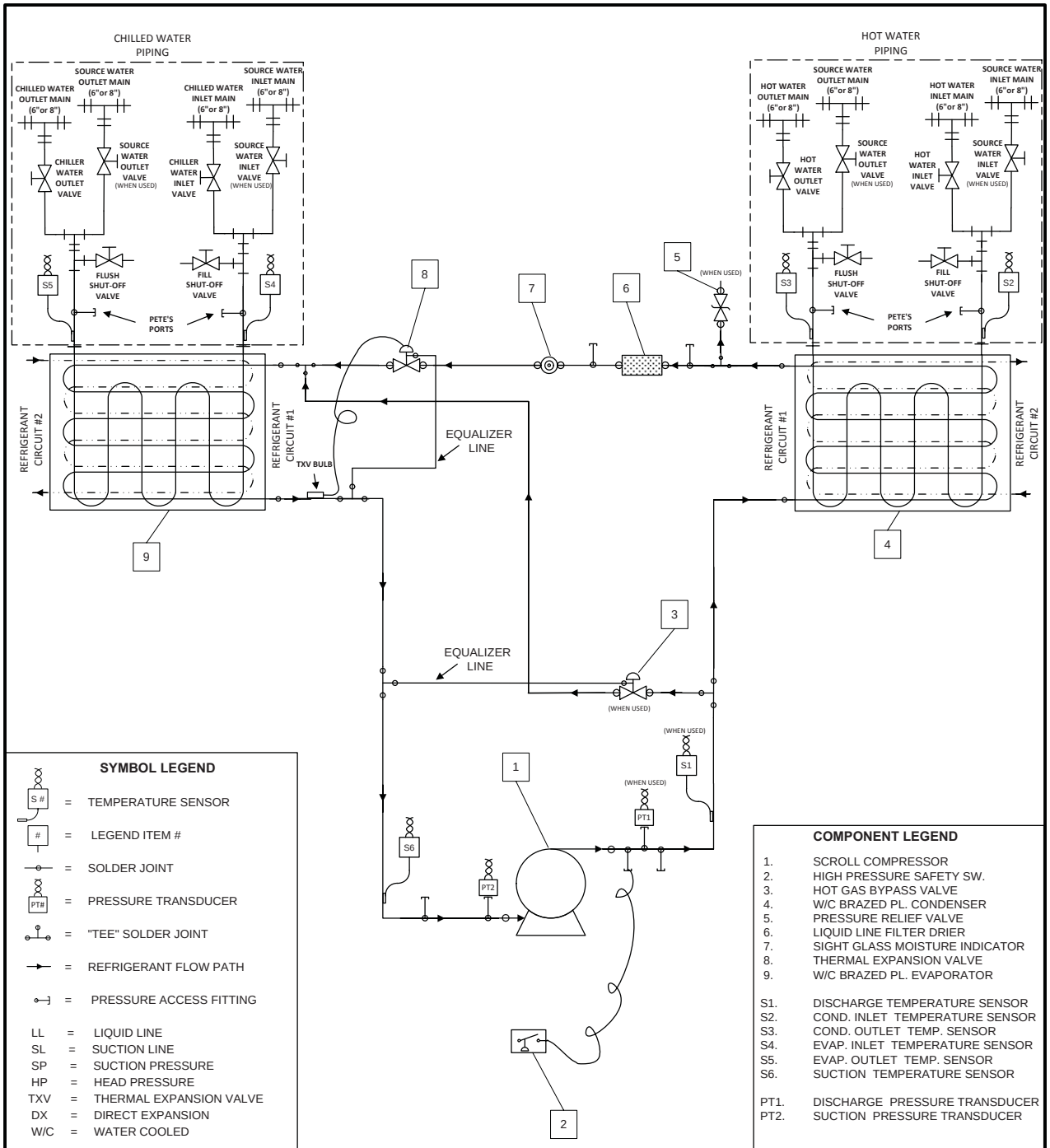
All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state and federal statues for the recovery and disposal of refrigerants.

If a compressor is removed from the unit, system refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, the refrigerant lines of the compressor must be sealed after it is removed.

⚠ CAUTION/ATTENTION

3 PHASE SCROLL COMPRESSOR UNITS	UNITÉ DE COMPRESSEUR SCROLL 3-PHASE
If this unit uses a 3 Phase Scroll Compressor, the following instructions MUST BE followed: • Unit power supply MUST BE wired in the proper sequence to avoid damage to the 3 Phase Scroll Compressor; • Scroll Compressors with INCORRECT rotation show the following characteristics: - High sound level; - High suction pressure and low discharge pressure; - Low current draw. • If any of the three above characteristics exist, swap two of the three supply wires at the disconnect and recheck compressor for incorrect rotation.	Si cet appareil utilise compresseur scroll 3-Phase, les instructions suivantes doivent être suivies: • L'alimentation de l'appareil doit être monté dans l'ordre correct pour éviter endommager le compresseur scroll 3-Phase • Compresseurs scroll avec rotation incorrecte montrent les caractéristiques suivantes: - Haut niveau de son; - Pression d'aspiration élevée et une faible pression de décharge; - Faible ampérage • Si l'un des trois éléments mentionnés ci-dessus sont remplies , échanger deux des trois lignes électriques alimen tant la interrupteur de sécurité et vérifier la rotation du compresseur.

Refrigeration Circuit Diagram - SHC Heat Recovery



SYMBOL LEGEND

S #	=	TEMPERATURE SENSOR
#	=	LEGEND ITEM #
	=	SOLDER JOINT
PT#	=	PRESSURE TRANSDUCER
	=	"TEE" SOLDER JOINT
	=	REFRIGERANT FLOW PATH
	=	PRESSURE ACCESS FITTING

LL	=	LIQUID LINE
SL	=	SUCTION LINE
SP	=	SUCTION PRESSURE
HP	=	HEAD PRESSURE
TXV	=	THERMAL EXPANSION VALVE
DX	=	DIRECT EXPANSION
W/C	=	WATER COOLED

COMPONENT LEGEND

1.	SCROLL COMPRESSOR
2.	HIGH PRESSURE SAFETY SW.
3.	HOT GAS BYPASS VALVE
4.	W/C BRAZED PL. CONDENSER
5.	PRESSURE RELIEF VALVE
6.	LIQUID LINE FILTER DRIER
7.	SIGHT GLASS MOISTURE INDICATOR
8.	THERMAL EXPANSION VALVE
9.	W/C BRAZED PL. EVAPORATOR
S1.	DISCHARGE TEMPERATURE SENSOR
S2.	COND. INLET TEMPERATURE SENSOR
S3.	COND. OUTLET TEMP. SENSOR
S4.	EVAP. INLET TEMPERATURE SENSOR
S5.	EVAP. OUTLET TEMP. SENSOR
S6.	SUCTION TEMPERATURE SENSOR
PT1.	DISCHARGE PRESSURE TRANSDUCER
PT2.	SUCTION PRESSURE TRANSDUCER

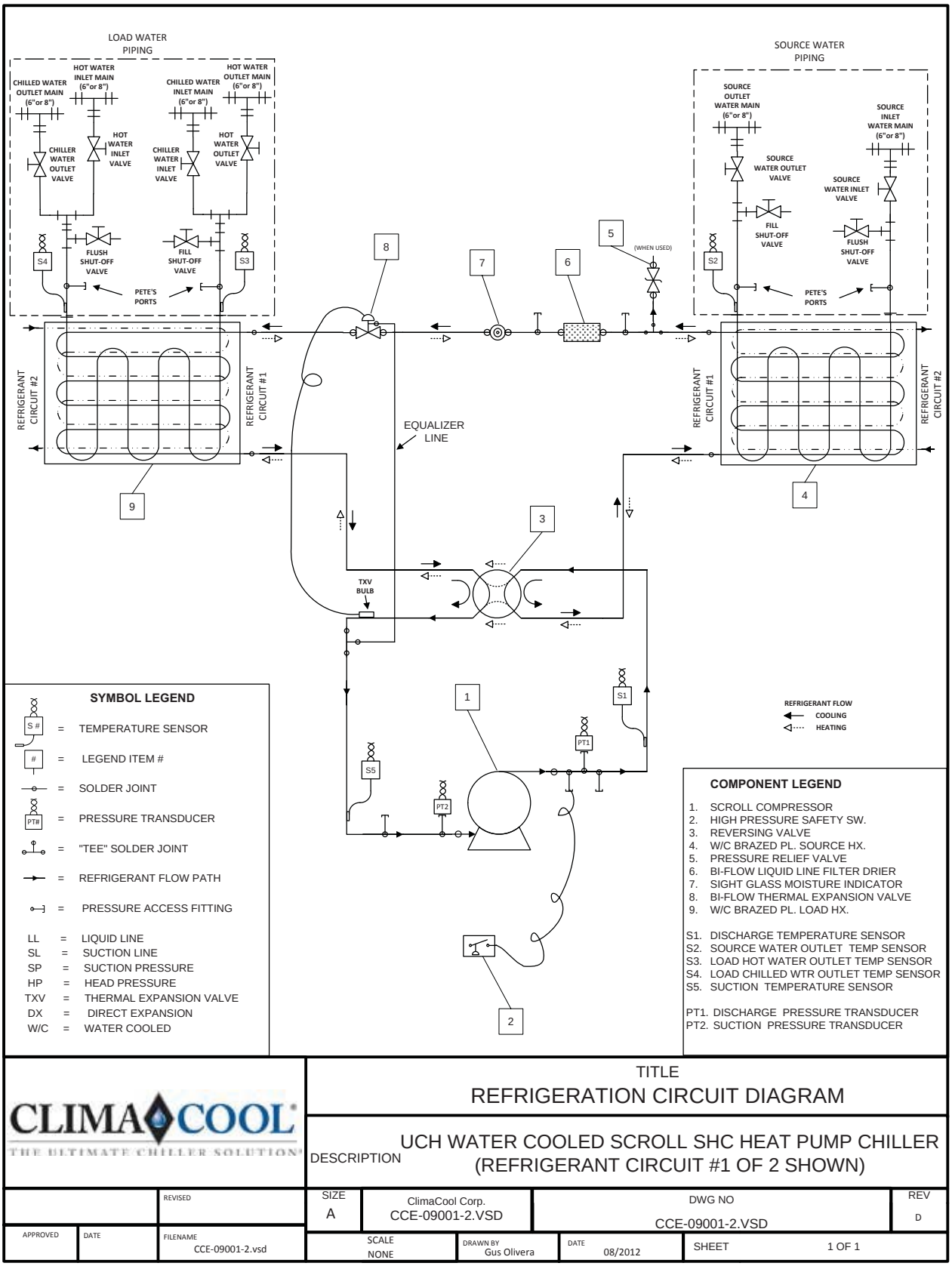
CLIMACOOL® THE ULTIMATE CHILLER SOLUTION®

TITLE: REFRIGERATION CIRCUIT DIAGRAM

DESCRIPTION: UCH WATER COOLED SCROLL SHC HEAT RECOVERY CHILLER (REFRIGERANT CIRCUIT #1 OF 2 SHOWN)

REVISED	SIZE A	ClimaCool Corp. CCE-12001-1.VSD	DWG NO CCE-12001-1.VSD	REV A
APPROVED / DATE	SCALE NONE	DRAWN BY Gus Olivera	DATE 09/2012	SHEET 1 OF 1
FILENAME CCE-12001-1.vsd				

Refrigeration Circuit Diagram - SHC Heat Pump



Refrigeration System Re-Processing

Conforming to local and national codes is the responsibility of the service technician or installing contractor. The service technician should be familiar with the following codes:

- ASHRAE Standard Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15
- American National Standard Code for Pressure Piping, ANSI B31.5

Factory Tested

ClimaCool modular chillers have been pressure-tested, evacuated, fully charged and run tested at design water flow rates prior to shipment. In the unlikely event that a refrigerant leak is detected at startup, the following guidelines should be consulted before reprocessing the refrigeration systems.

Refrigerant System Reprocessing

Debris and moisture can enter copper tubing in a matter of minutes. All tubing, coil connections, or any refrigerant containing portions should be temporarily capped or sealed to keep contaminants to a minimum. Filter driers should be opened just prior to brazing into the system to prevent moisture infiltration whenever possible, and flood the system with low pressure dry nitrogen while brazing to prevent oxidation inside the copper piping.

After all of the repairs have been made to the refrigeration system, a pressure test using refrigerant and nitrogen should be performed. Pressurize the system with dry nitrogen to 20 psi and check for any obvious leaks. If no leaks are present introduce a "trace" amount of refrigerant to the system (raise system pressure to 30-40 psi). With a dry nitrogen tank equipped with a regulator set to 150 psi, continue to pressurize the system to 150 psi. Using a leak detector, carefully check the system for any remaining leaks. If the system is free of leaks, you may release the pressure.

Evacuating the System

The compressors should never be run while the system is in a vacuum. This could cause immediate failure to the compressors. After the system has been leak tested and sealed, any moisture that entered the system should be dehydrated and removed. While the pressure is reduced under a vacuum, the boiling point of moisture trapped inside the lines is reduced also. A pressure of .0095 psia, or 500 microns absolute pressure or better must be reached and sustained for several hours in order for the system to be considered free from moisture. It is necessary to use a micron meter equipped with an absolute pressure gauge (or transducer) to take this reading. ClimaCool recommends the triple evacuation process to ensure proper removal of moisture and contaminants from the refrigeration system. After the initial vacuum is reached and held on the system, allow dry nitrogen back into the system until the pressure reaches zero psig or slightly higher. Then, repeat the entire evacuation process described above. The evacuation process is considered complete **ONLY** after a successful "blank-off" test is performed.

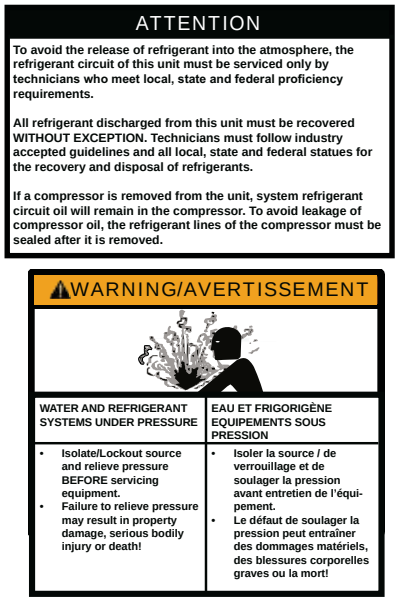
A "blank-off" test is defined as:

- Pulling a vacuum level less than 500 microns on the system and holding it for several hours.
- Record the vacuum level in the system in microns, then close off the vacuum pump from the system for 15 minutes, and continue to monitor the micron level inside the refrigeration system.
- If the vacuum level inside the system does NOT rise more than 400 microns above the recorded vacuum level at the start of the 15 minute period, then the evacuation process is complete.

If the vacuum level rises more than 400 microns in 15 minutes, then continue to evacuate the system for 1-2 hours, then repeat a "blank-off" test.

Recharging the System

After all repairs have been completed, the system has been leak tested, and proper vacuum pressures have been reached and maintained, refrigerant may be recharged into the system. With a known weight of refrigerant in the cylinder, use the gauge manifold set to connect the cylinder's liquid charging port to the charging access port near the refrigerant liquid line valve. Open the compressor suction and discharge line valves, if available. Gradually meter the appropriate weight of liquid refrigerant into the condenser side of the system first, until no additional refrigerant can be dispensed. Accurate refrigerant charge per circuit may be found in the Physical Data information on page 3. Then continue the charging process by filling the evaporator side of the system with refrigerant. Close the refrigerant cylinder charging port, close all gauge manifold ports and start the compressor. Be careful when continuing to charge the balance of the refrigerant, constantly maintaining a positive compressor suction pressure (>25 psig) at all times.



Pressure Differential Flow Sensor

Field installed to prevent operation of chiller without sufficient water flow to evaporator and condenser.

Manual Strainers

Field installed strainers are external to the chiller bank to increase efficiency and ensure long life of the modules. A minimum 60 mesh stainless steel screen is required to protect both the condenser and evaporator circuit.

Automatic CS Series Strainer Package

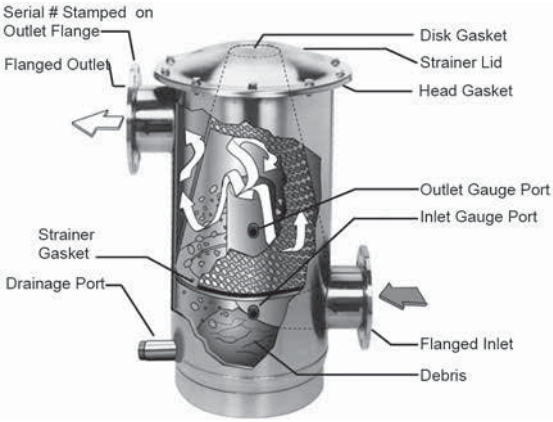
Field installed high quality stainless steel filtration systems with minimum 60 mesh stainless steel screens. Available options include pressure differential alarm and automatic time flush.

Water Header Bypass

A bypass is required for any chilled water/evaporator, hot water/condenser (heating load) and source water side (geothermal, cooling tower or closed circuit cooler) with variable pumping.

- Direct Return - Motorized evaporator/condenser water isolation valves.
- Reverse Return - Motorized evaporator/condenser water isolation valves.

Figure 22 - Stainless Steel Strainer



Safety Considerations

Prior to installation, this manual must be read carefully and all instruction understood. Personal injury or product damage can occur if the following safety precautions are overlooked or ignored. ClimaCool strongly recommends that you follow these safety precautions and avoid the potential hazards listed below when operating and maintaining the strainer:

1. After unpacking your strainer, carefully inspect your strainer housing, lid assembly and screen for damaged or missing parts. Contact ClimaCool's customer service department for any replacement parts.
2. The strainer should not be modified or used in a manner not consistent with the manufacture's recommendations. If there are any questions regarding its application or installations, contact ClimaCool's customer service department.
3. Absolutely under no conditions should the strainer lid or pressure gauges be removed while the strainer is pressurized.
4. Standard bolted lid models should never exceed 150 psi; V-Band clamp models should never exceed 125 psi.
5. Install back-flow prevention devices (or check valves) both upstream and downstream of the strainer to prevent back flow or vacuum effects which can cause damage to the strainer housing or screen.
6. Install properly sized pressure relief valves both upstream and downstream of the strainer. This will help prevent damage to the strainer and screen in the event that water flow is stopped abruptly, or if water hammering occurs. The pressure relief valves should be set to relieve pressure at 1.2 times the strainer's maximum operating pressure (not to exceed the maximum rated pressure). Consult your local dealer or pressure relief valve manufacturer to obtain properly sized valves for your application.

Note: Minimum 60 mesh screen is required. At no time should the internal pressure exceed the maximum rated pressure of the strainer.

Strainer Installation Recommendations

Follow the recommended guidelines below for strainer installation:

1. The Carbon Steel (CS) strainer should be placed on a firm, supporting surface. Failure to do so can cause stress on the weld joints. It is recommended a concrete pad be poured under the base of the strainer. The weight of the CS strainer should not be supported by the main water lines connecting it.
2. The inlet and outlet connections should be securely fastened. The arrows depict flow direction (see Figure 22).
3. The back-mount pressure gauges should be installed in the gauge ports located on the front of the strainer body. These gauges will allow you to monitor the pressure differential across the strainer screen providing an indication when the strainer element is clogged and requires cleaning.
4. The CS strainer lid must be securely fastened according to the following torque specifications to ensure product safety and an adequate seal.

Torque Specifications

Clamped Lid Models: CS strainer models 3CS and 4CS have "over-center latch clamp" lid designs. The over-center clamp does not require adjustment when installing or removing the lid. The lock washer is set at the factory for proper clamp compression and normally requires no field adjustment. Minor tightening may be necessary over time. The lids are installed as follows:

1. Place the clamp around the strainer lid.
2. Latch the T-bolt with the receiver and push the latch handle towards the strainer body until the safety catch engages.

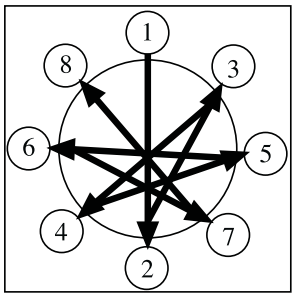
Bolted Lid Models: CS strainer models 6CS, 8CS and 10CS have "bolted" lid designs. Grade 5 zinc-plated bolts, nuts and washers are used to attach the lids to these strainers. See Table 2 for proper lid bolt size and torque rating for each strainer (page 41). (Exercise care when tightening the lid bolts so as not to damage the strainer lid or housing).

It is important to follow the torque specifications as over-tightening may result in premature failure of the bolts. It is equally important to follow a star wheel torque pattern when tightening the lid bolts (see Figure 23). The strainer lid may not be seated down completely after the first torque sequence. A second torque sequence should be adequate to seat the lid securely to the body.

Table 2

Strainer	Bolt Size (inches)	Recommended Torque (ft. lbs)
3CS	5/16 - 18	60 - 80
4CS	3/8 - 16	15 - 25
6CS	1/2 - 13	45 - 55
8CS	1/2 - 13	45 - 55
10CS	5/8 - 11	80 - 100

Figure 23 - Recommended Torquing Sequence



Strainer Operation

Periodically, it will be necessary to flush out the debris that is collected and settles to the bottom of the strainer reservoir. CS-3 strainers must have a valve installed on the drainage port. The larger CS strainers (4CS, 6CS, 8CS and 10CS) are equipped with a flush port (or drainage port) extending inside the strainer. When it becomes time to clean the strainer, the flush port valve should be opened while the strainer is in operation (while pressurized and with water flowing). A thorough flushing of the strainer reservoir will depend upon the length of time the flush valve remains opened. This flush time will typically range from 15 to 60 seconds depending on the flow, inlet water pressure and the amount of debris collected by the strainer. As a general rule, the larger strainers will require higher inlet water pressures in order to achieve a complete flushing. For example, the 4CS model can be flushed with inlet water pressures as low as 15-20 psi, while the 6CS can be flushed with 30-35 psi. The 8CS and 10CS models should be flushed with inlet water pressures greater than 40 psi. **Note: When shutting down the chiller for extended periods of time, the strainer should be isolated and completely drained.**

Strainer Element Cleaning

If the strainer assembly is equipped with optional pressure gauges, the operator will be able to monitor the pressure differential between the inlet and outlet sides of the strainer. When this pressure differential reaches 5-10 psi the strainer element may require cleaning.

Caution: Prior to dismantling the strainer for cleaning it is imperative that the strainer assembly is isolated and completely de-pressurized.

Follow the following steps when cleaning the CS strainer element:

Step 1. **(Bolted Lid Models):** Remove the top of the strainer by removing the Grade 5 Zinc plated bolts from the lid.

Step 1. **(Clamped Lid Models):** Remove the top of the strainer by taking off the band-clamp assembly.*

Step 2. Lift the strainer element (conical screen) out of the strainer body.

Step 3. Carefully scrub down the strainer element with a rigid nylon brush until all matter is loosened. **Do not use a steel brush.**

Step 4. Wash the strainer element off with clean water. It is preferable to use a hose with a significant amount of water pressure. **Do not use a pressure washer.**

Step 5. Wash all matter from the strainer gaskets and clean the inner-ring where the bottom of the strainer element rests.

Step 6. Make sure the U-shaped gasket is fitted securely to the bottom of the strainer element. Reposition the strainer element into the body of the strainer.

Step 7. Make sure the strainer head gasket is secure on the top of the strainer body. On V-band models, O-rings should be seated completely in the body flange. Reposition the strainer lid back on the strainer body. **Tighten the lid securely either with the bolts or with the band-clamp.**

* For clamped models, opening and closing is achieved without adjusting the lock nut. It is tightened at the factory to the correct compression. (Minor tightening may be necessary if the gasket loses memory over time.) To open the clamp, depress the safety latch and pull the over-center lever outward. To close the clamp, make sure the T-bolt is seated in its receiver and push the over-center lever back toward the strainer housing. **Be sure that the safety latch is engaged before putting the unit to use.**

What is Water Hammer?

Water hammer is a phenomenon that can occur in fluid systems with long pipes. Water hammer is a rapid change of pressure caused by a rapid change in velocity. If the flow has been abruptly shut off downstream, the pressure in the entire system is raised very quickly.

What Causes Water Hammer?

Any action that can cause a rapid change in the velocity of the flow can set off a water hammer, such as closing a downstream valve, pump stoppage, etc. Typically, for short lengths of pipe (below 500 feet) downstream valves that are closed within 1/10 of a second can generate a water hammer.

What Can Water Hammer Do?

Pressure spikes from water hammer can raise fluid pressures to dangerously high values. These pressure spikes can cause serious damage to valves, pipes, strainers, joints, etc. The CS strainer is rated to an absolute maximum pressure of 150 psi for bolted lid models, and 125 psi for clamp lid modes. A water hammer pressure spike that raises the pressure higher than the maximum rated pressure may result in strainer damage, voiding the manufacturer's warranty.

What Can I Do to Prevent Water Hammer?

There are certain precautions that can be taken to prevent or decrease the effect of water hammer. The addition of a surge tank or accumulator fitted with a suitable pressure relief valve and strategically located within the water system may provide adequate protection against the effects from water hammer. Careful attention should be given to the design and control strategy for valves and pumps so their actions do not invite a water hammer.

Strainer Options

Automatic Timer Flush (ATF) Package Option

The ATF-EA-1.5 flush valve package provides an automatic method for flushing away the debris collected in the strainer's reservoir. The power supply and timer controls for the valve package are housed inside the ATF control box. The ATF controls can be pre-programmed to set the flushing duration and the time interval between flushes.

System Components

1. Timer based valve controller: (see Figure 24) sets the flush duration (length of the flush) and the flush interval (time between flushes).
2. Electric Ball Valve: designed for dirty water use (see Figure 25 and 26).

Figure 24

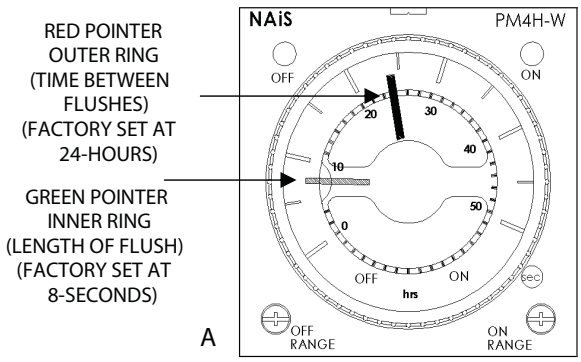


Figure 25

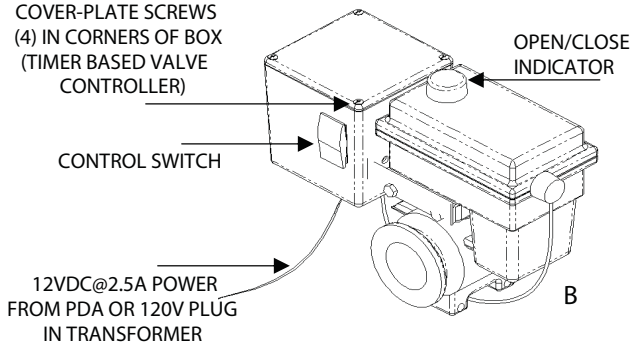
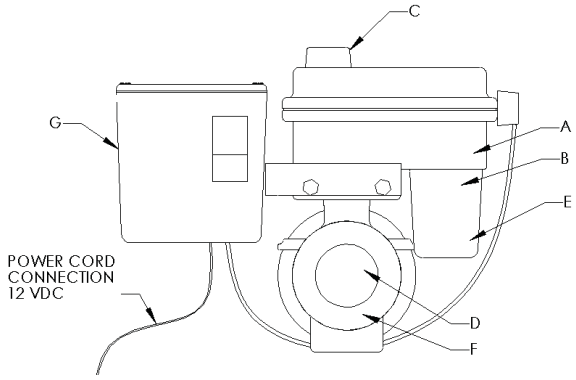


Figure 26



Valve Specifications (See Figure 26)

A. Water-resistant polypropylene motor case
B. High torque motors with perma-lube gears
C. Open and close indicator
D. Stainless steel ball valve and hardware
E. Auto reset circuit breaker
F. 90 degree bi-directional rotation
G. Controller case

Operation Instructions

Flush valve line must be piped to atmospheric pressure such as an open floor drain. The flush line should not undergo any changes in elevation and should be sloped downward in the direction of drainage. **Do not pipe the flush or drain line into a pressurized line. Note: The Automatic Timer Flush Package needs to be programmed when it is received by the end-user. The programming is simple and takes only a few moments. However, because every application has different parameters that affect the required frequency between flushes and the duration of the flush, the end-user must choose the controller's settings (refer to your specific strainer manual).**

To Program the ATF Controller

1. Plug the transformer into a 120-VAC outlet.
2. Insert the 12-VDC plug coming from the transformer into the jack on the underside of the ATF box.
3. Test for power by pressing the manual flush side of the control switch (lower switch light should come on the valve will start to open).
4. Adjust the "ON TIME" (Valve Open) by turning the inner timer ring with the GREEN POINTER clockwise to increase duration. The ON TIME RANGE is factory set at eight seconds. (See Figure 24 on page 42).
5. Adjust the "OFF TIME" (Valve Close) by turning the outer ring with the RED POINTER clockwise to increase duration. The OFF TIME RANGE is factory set at twenty-four hours. (See Figure 24 on page 42).
6. Set the control switch to auto flush. The red off light on the timer will come on and the upper light on the switch will come on and stay on. During the flush cycle the on light on the timer and the lower switch light will come on.

Control Switch

Control switch flushing is initiated by pressing and holding down the manual control switch located on the front of the controller (See Figure 25 on page 42). The manual flush control switch can also be used to conveniently drain the water out of the strainer before removing the conical screen element from the strainer housing. A yellow indicator arrow on top of the ATF valve will rotate in sync with the ball valve to show the valve position (open or closed). When the manual flush control switch is released, the valve will automatically close.

SAFETY FIRST! - Keep fingers away from valve opening to avoid getting caught in the moving parts. The electric motor supplies a sufficient amount of power to cause personal injury. Take precaution when handling.

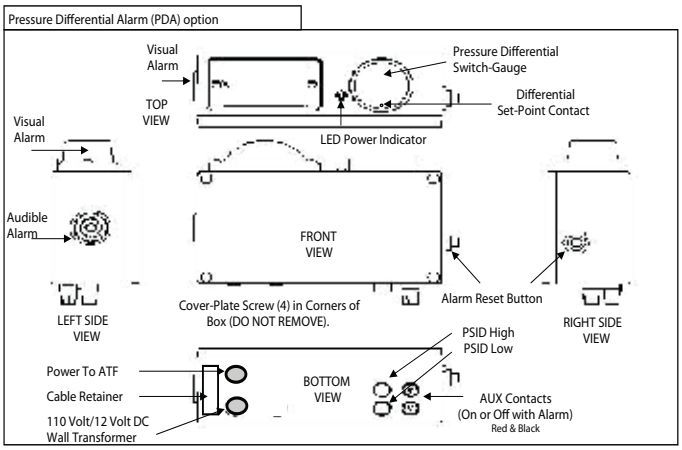
Water Resistance

The valve and controller are water-resistant, but not water-proof. Do not install below ground level where the component can be submerged in water. Only remove the cover plate from the Valve Controller when setting or changing the flush settings. Keep the cover tightly sealed on the unit during normal operation.

Pressure Differential Alarm Package Option

The pressure differential alarm option continually monitors and displays the strainer's inlet and outlet differential pressure. When the strainer element (conical strainer basket) becomes significantly clogged, the pressure differential switch-gauge will trigger an audible siren and a visual flashing alarm light. These alarms are intended to alert maintenance personnel that the strainer element must be removed and cleaned (See Strainer Element Cleaning on page 41).

Figure 27



Operation Instructions

Remove the power supply and insert the connector end into the socket on the bottom of the PDA housing (See Figure 27 above) and plug the transformer into the power source. Standard systems are supplied with a 120V power supply to the primary of the transformer, with an output secondary of 12 VDC. The pressure differential switch-gauge is factory set to 7-8 psi. The CS strainer operates at a pressure differential slightly less that 1 psi during maximum flow when the strainer screen is clean. By the time the differential pressure reaches 7-8 psi, the strainer element will be significantly clogged and require immediate removal and cleaning. To adjust the pressure differential switch-gauge setting, insert a 1/16" allen wrench and rotate the differential set point contact to the desired location (See Figure 27). **Note: We do not recommend setting the differential switch-gauge higher than 10 PSI. Disabling the alarm or increasing the**

alarm set point could result in damage to the strainer element and allow debris to pass into the system.

When the differential set point is reached both the audible and visual alarms will be triggered and will remain engaged until both the Alarm condition is corrected and the Alarm-Reset button is pressed. (If the Alarm-Reset button is pressed but the differential pressure is beyond the set point, the alarms will re-engage immediately). After the strainer is cleaned and put back in service, the differential pressure should return to 1 psi.

Auxiliary Contacts

The PDA option is equipped with a remote alarm feature. The remote alarm contacts are located at the two (2) Black and Red Banana Clip Posts (See Figure 27 on page 43). The alarm can be set up in one of two ways: 1) a remote alarm signal of 12 VDC can be sent to a central monitoring station or 2) a set of auxiliary contacts will indicate a "closed" condition when the alarm activates. (Locate the Auxiliary Contact Schematic inside the PDA box by removing the four screws on the cover plate).

Water Resistance

The Pressure Differential Alarm Controller is water-resistant, but not water proof. Do not install below ground level where the box can be submerged in water. **Do not remove** the cover plate from the PDA controller. Keep the cover tightly sealed on the module during normal operation.

Table 3

Troubleshooting for ATF Package		
Problem		**Solution**
Valve is leaking past ball	• Seals damaged or worn out	• Install repair kit
	• Valve is not stopping at proper closed position	• Adjust limit switches
Valve stem leaks	• Worn stem seals	• On metal valves: tighten stem packing nut 1/2 turn. CAUTION! Over tightening stem nut could cause drag on motor and trip internal circuit breaker. May require repair kit or new valve.
Valve body leaks	• Loose body bolts or excessive operation pressure	• Check bolts and observe recommended pressure ratings
	• Defective seals	• Install repair kits or new valve
Valve hard to turn	• Swollen seals or product buildup in valve chamber	• Check valve for compatibility with product, may require valve cleaning or new valve
	• Valve bolts too tight	• Loosen bolts slightly
	• Stem nut too tight	• Loosen stem nut slightly

"Y" Strainer

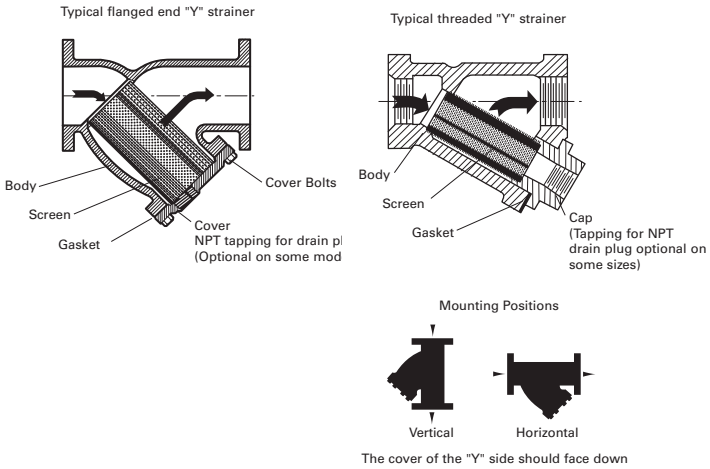
Before installing the "Y" strainer (refer to Figure 28), be sure its pressure rating is correct for the system. If the end connections are threaded or designed for soldering or brazing, be sure the piping is straight and not at an angle or offset. If the strainer has flanged ends, be sure the flanges of the connecting piping are square with the pipe so that no undue stress is put on the strainer or piping when tightening the flange bolts. Tighten in sequence, crossing to opposites.

For maximum efficiency, a differential pressure gauge installed across the inlet and outlet will indicate pressure loss due to clogging and may be used as a guide to determine when cleaning is required. Normally, when differential pressure reaches 5 - 10 psi, the screen must be cleaned. If the strainer is equipped with a blow-down valve, open and flush out until any sediment is removed. If the strainer is not fitted for blow-down cleaning, (strainer must be off line), remove the cover or cap and clean the screen. Reinstall the screen in the strainer in the same position as before and tighten the cover or cap. Replace the gasket if necessary. Keeping a spare, clean screen will minimize shut down time.

Warning

Individuals performing removal and disassembly should be provided with suitable protection from possibly hazardous liquids. **Note:** Large size "Y" strainers are supplied with Breech-Lok screens. To remove the screen, rotate the screen 45° and the Breech-Lok will disengage. Minimum 60 mesh screen is required.

Figure 28 - "Y" Strainers and Mounting Positions



CALIFORNIA PROPOSITION 65 WARNING

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. (California law requires this warning to be given to customers in the State of California.)

For more information: www.watts.com/prop65

Basket Strainer

Before installing the simplex basket strainer (refer to Figure 29), be sure its pressure rating is correct for the system. If the end connections are threaded, be sure the piping is straight and not at an angle or offset. If the strainer has flanged ends, be sure the flanges of the connecting piping are square with the pipe so that undue stress is not put on the strainer or piping when tightening flange bolts. Tighten bolts in sequence crossing to opposites.

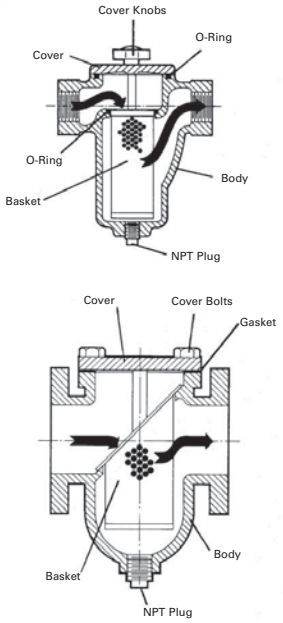
Maintenance

For maximum efficiency, a differential pressure gauge installed across the inlet and outlet will indicate pressure loss due to clogging and may be used, as a guide, to determine when cleaning is required. If the strainer is not set up for backwash cleaning, remove the cover access to the basket. After cleaning, replace the basket in the same position as before and tighten the cover. Replace the gasket or O-ring if necessary. Keeping a spare, clean basket will minimize shut down time.

Warning

Individuals performing removal and disassembly should be provided with suitable protection from possibly hazardous liquids. Knob and clamp type quick opening covers should not be used for high temperature service. Consult factory for recommendations. **Note:** Minimum 60 mesh screen is required.

Figure 29 - Basket Strainers



Basket Strainers should be installed in the position shown in the illustrations above.

Model Type	Model #	Voltage	Power Wiring - per Module					Internal Wiring - per Compressor				
			Rated Load Amps[1]	Min.Cir. Amps (MCA)[2]	MaxFuse Size (MOP)[3, 4]	Rec. Fuse Size[4, 5]	Discon. Switch Size[6]	Rated Load Amps[1]	Min.Cir. Amps (MCA)[2]	Locked Rotor (LRA)[7]	MaxFuse Size (MOP)[3, 4]	Rec. Fuse Size[4, 5]
UCH030	UCH030AHASAXB0S	208-230/3/60	113	127	175	150	175	56.4	70.5	425	125	90
	UCH030AFASAXB0S	460/3/60	51	57	80	70	80	25.5	31.9	173	50	40
	UCH030ANASAXB0S	575/3/60	41	46	60	60	70	20.4	25.5	128	45	35
UCH050	UCH050AHASAXB0S	208-230/3/60	189	213	300	250	300	94.7	118.4	605	200	150
	UCH050AFASAXB0S	460/3/60	86	96	125	110	150	42.8	53.5	272	90	70
	UCH050ANASAXB0S	575/3/60	69	77	110	90	110	34.3	42.8	238	70	60
UCH070	UCH070AHASAXB0S	208-230/3/60	249	280	400	325	400	124.3	155.4	599	250	200
	UCH070AFASAXB0S	460/3/60	112	126	175	150	175	56.2	70.3	310	125	90
	UCH070ANASAXB0S	575/3/60	90	101	125	125	150	45.0	56.2	239	100	70
UCH085	UCH085AHASAXB0S	208-230/3/60	317	357	500	400	500	158.5	198.1	732	350	250
	UCH085AFASAXB0S	460/3/60	144	162	225	200	225	71.7	89.6	368	150	90
	UCH085ANASAXB0S	575/3/60	115	129	175	150	175	57.3	71.7	292	125	80

Notes:

1. RLA - Rated Load Amps are calculated as per UL1995.
2. MCA - Minimum Circuit Ampacity is: 125% of the RLA of the largest compressor motor plus 100% of the RLA of all other concurrent motors and/or electrical loads.
3. MOP - Maximum Overcurrent Protected device amp size is rounded down from: 225% of the RLA of the largest compressor motor plus 100% of the RLA of all other concurrent electrical loads.
4. MOP Device or Recommended Fusing Device for Module Power Wiring supplied by others. These are recommended values for electrical power protection of modules selected.
5. Recommended Dual Element Fuse Sizing: Rounded up from 150% of the RLA of the largest compressor motor plus 100% of the RLA of all other concurrent electrical loads.
6. Disconnect Switch for Module Power Wiring supplied by others. These are recommended values for electrical power protection of modules selected.
7. LRA - Locked Rotor Amps are instantaneous starting amperage per compressor.
8. Module internal wiring is per NEC.
9. Voltage Tolerance Range:

   208-230V / 60 Hz: Min. 187V Max. 253V
   460V / 60 Hz: Min. 414V Max. 506V
   575V / 60 Hz: Min. 518V Max. 632V

Power Distribution Drawing

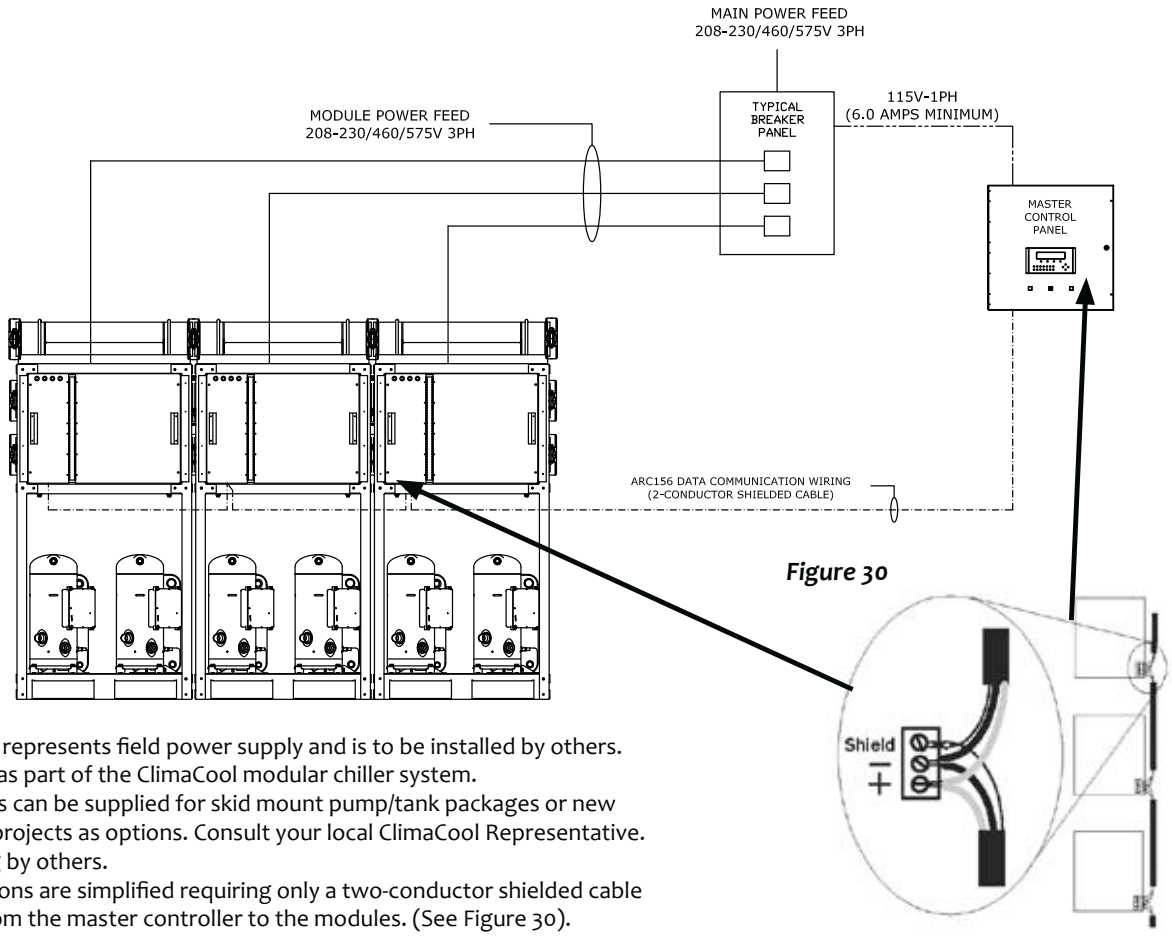


Figure 30

Notes:

1. Breaker panel represents field power supply and is to be installed by others. Not provided as part of the ClimaCool modular chiller system.
2. Breaker panels can be supplied for skid mount pump/tank packages or new construction projects as options. Consult your local ClimaCool Representative.
3. Control wiring by others.
4. Field connections are simplified requiring only a two-conductor shielded cable daisy chain from the master controller to the modules. (See Figure 30).

Specifications for ARC156 Wiring

- Description - Single twisted pair, low capacitance, CL2P, TC foam FEP, plenum rated cable
- Conductor - 18 AWG (7x30) stranded copper (tin plated) 0.0.0 in. (0.762mm) O.D.
- Insulation – Foamed FEP, 0.015 in. (0.381mm) wall, 0.060 in. (1.524mm) O.D.
- Twist Lay – 2 in. (50.8mm) lay on pair, 6 twists/foot (20 twists/meter) nominal
- Shielding – Aluminum/Mylar shield with 24 AWG (7x32) TC drain
- DC Resistance – 15.2 Ohms/1000 feet (50 Ohms/km) nominal
- Capacitance – 12.5 pF/ft (41 pF/meter) nominal conductor to conductor
- Characteristic Impedance – 100 Ohms

Cable Shields

Do not ground the shield to earth ground or to the control module's power ground. The PROT485 and the individual control modules allow the shield to float a limited amount so that there are no ground loops. If the voltage on the shield becomes too great relative to the earth ground, then the excess voltage is bled off with protective devices on the PROT485 or on the control modules.

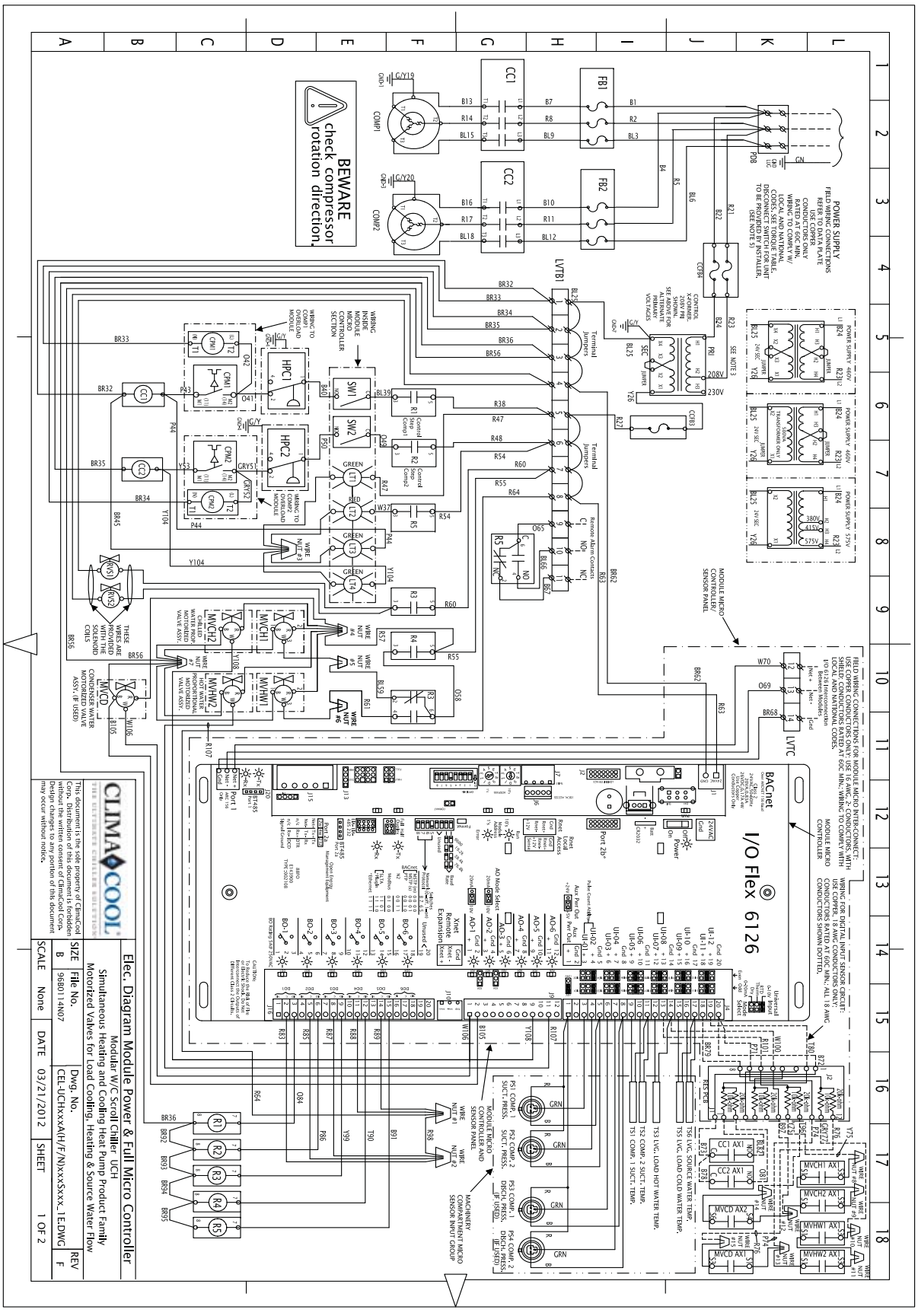
Noise Avoidance

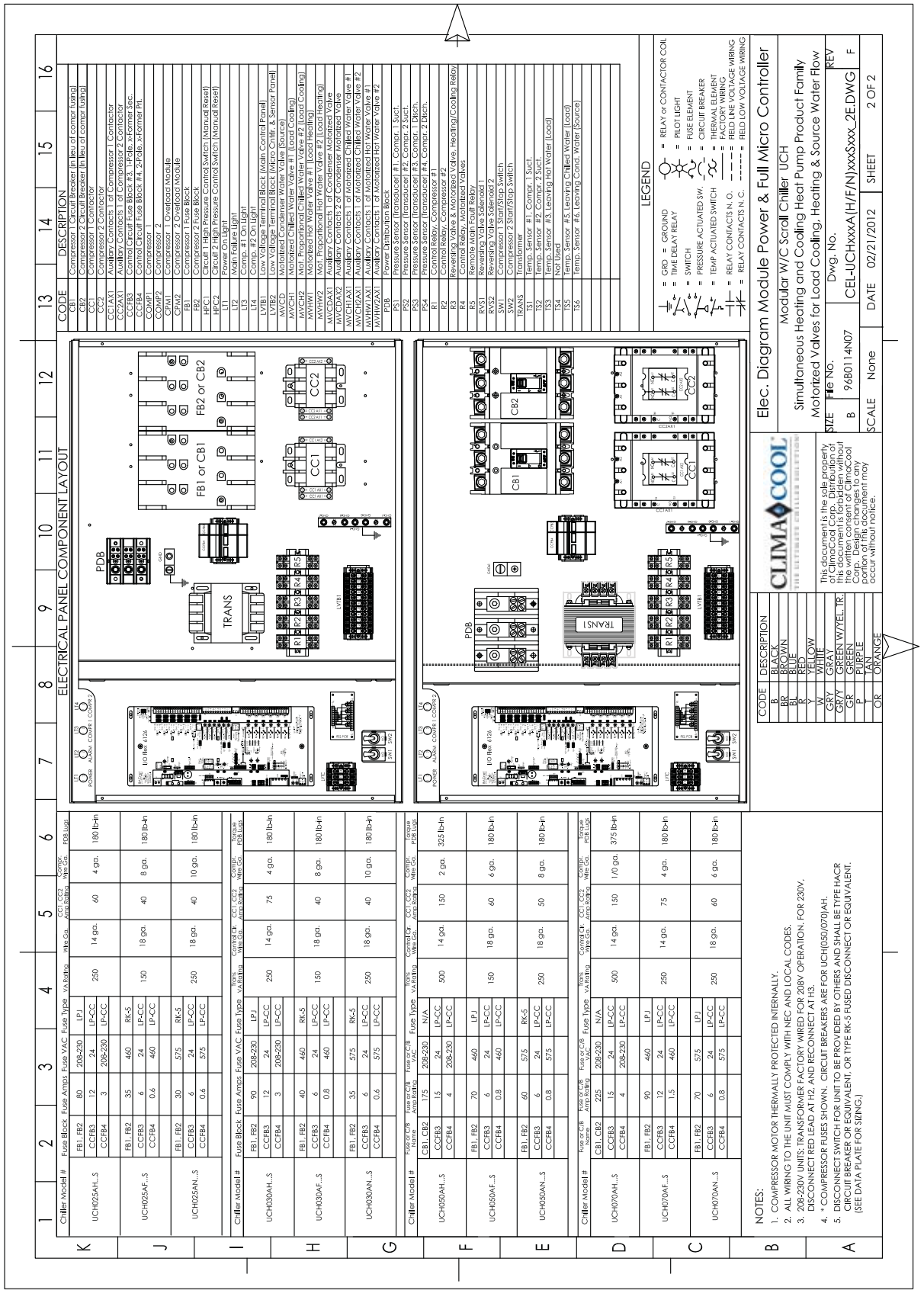
Avoid running communication wires or sensor input wires next to AC power wires or the control module's relay output wires. These can be a source of noise that can affect signal quality. Common sources of noise are:

Spark ignitors	Induction heaters
Radio transmitters	Large contactors (ex.motor starters)
Variable speed drives	Video display devices
Electric motors (> 1hp)	Lamp dimmers
Generators	Fluorescent lights
Relays	Parallel runs with power lines
Transformers	Other electronic modules

If noise is a problem and you cannot move the wiring, use ferrite clamp-on chokes on the cabling to improve signal quality.

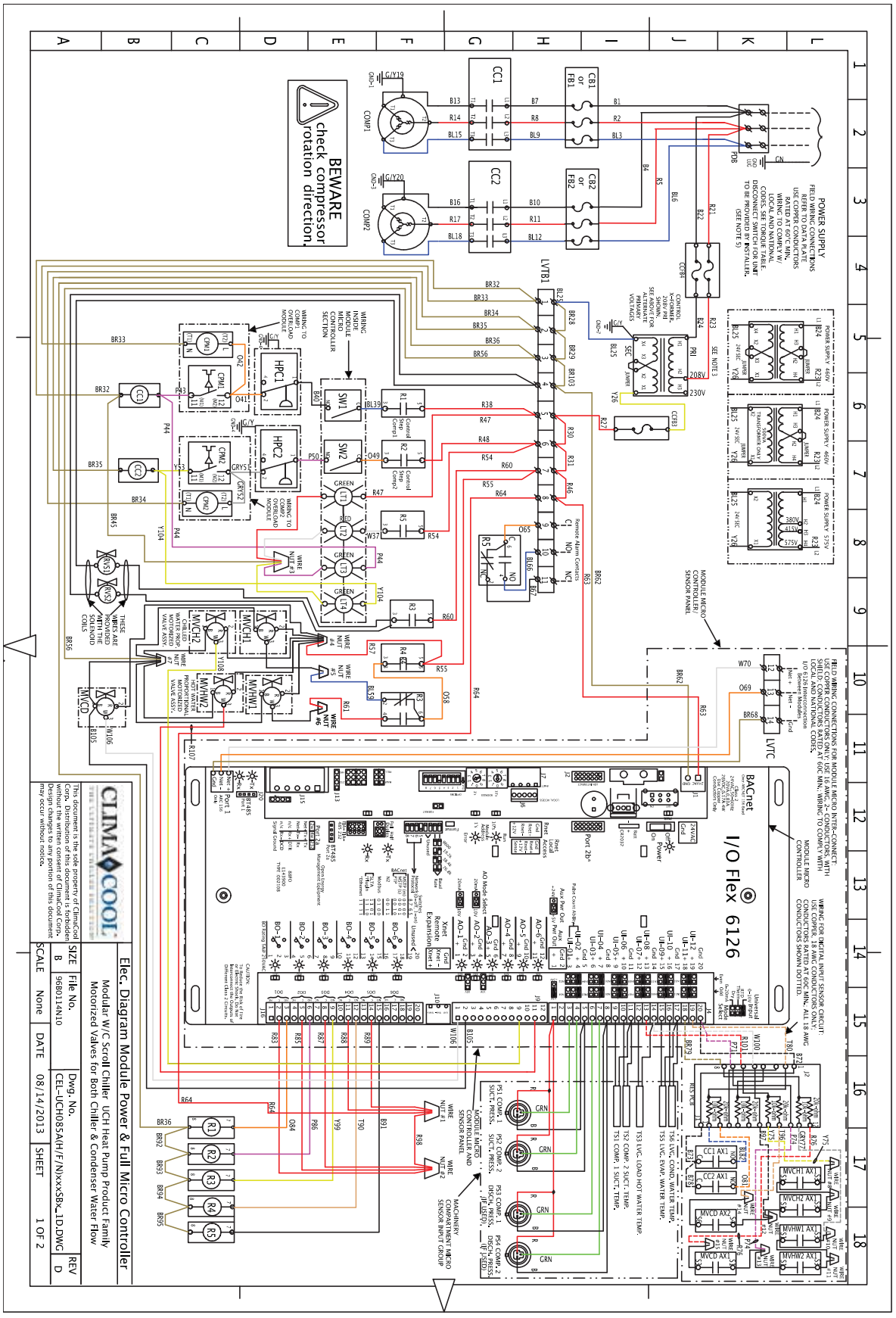
Wiring Diagrams - SHConDEMAND, Heat Pump 30, 50 and 70 Ton

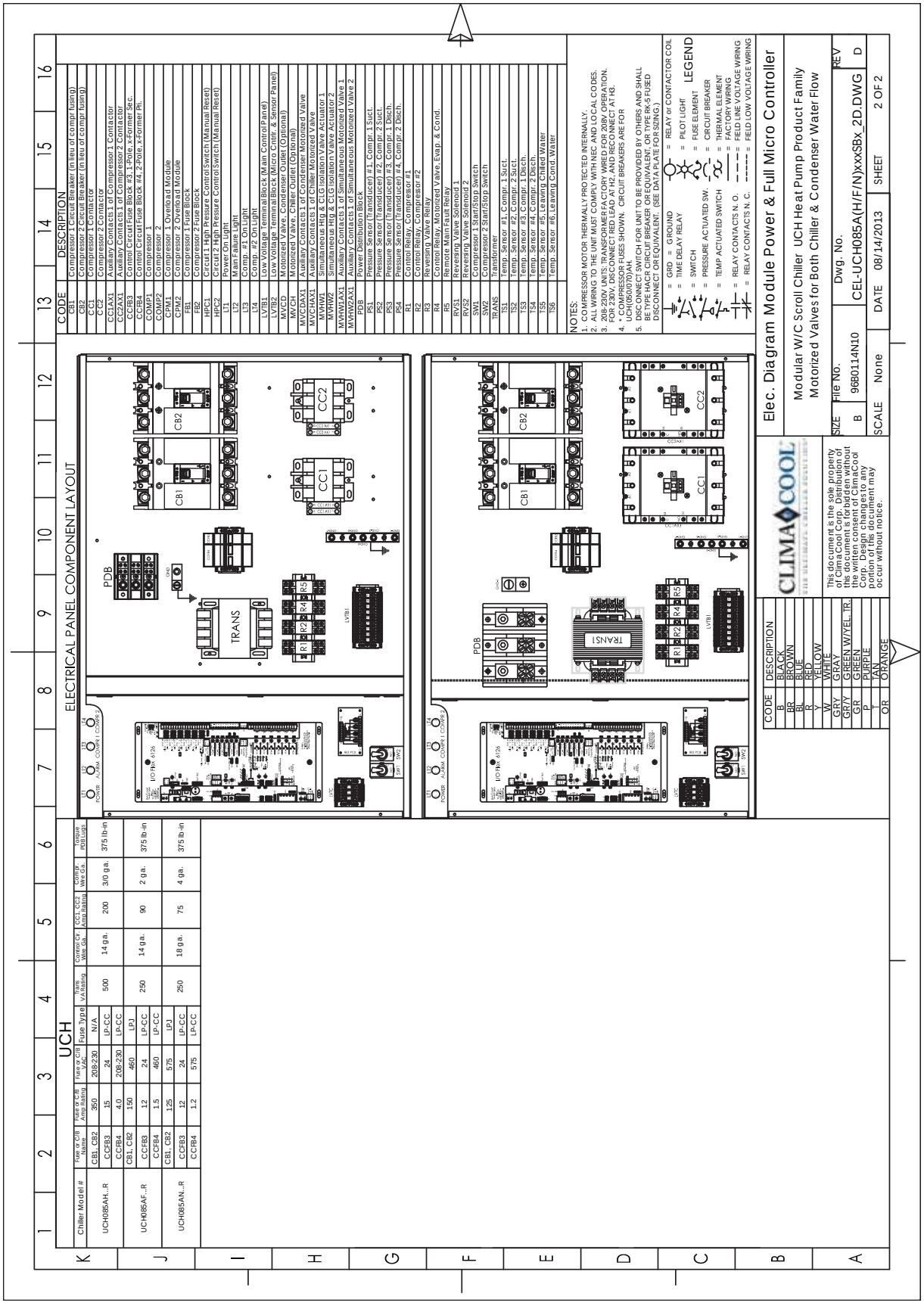




Chiller Model #	Fuse Block	Fuse Amps	Fuse or C/B Amp Rating	Fuse VAC	Fuse Type	Xfmr VA Rating	Control Ckt Wire Gage	CC1, CC2 Amp Rating	Compr. Wire Gage	Torque PCB Lugs
UCH025AH...S	FB1, FB2	80	90	208-230	LPJ	250	14 ga.	60	4 ga.	180 lb-in
	CCFB3	12	12	24	LP-CC					
	CCFB4	3	3	208-230	LP-CC					
UCH025AF...S	FB1, FB2	35	40	460	RK-5	150	18 ga.	40	8 ga.	180 lb-in
	CCFB3	6	6	24	LP-CC					
	CCFB4	0.6	0.8	460	LP-CC					
UCH025AN...S	FB1, FB2	30	35	575	RK-5	250	18 ga.	40	10 ga.	180 lb-in
	CCFB3	6	6	24	LP-CC					
	CCFB4	0.6	0.8	575	LP-CC					
UCH030AH...S	FB1, FB2	90	90	208-230	LPJ	250	14 ga.	75	4 ga.	180 lb-in
	CCFB3	12	12	24	LP-CC					
	CCFB4	3	3	208-230	LP-CC					
UCH030AF...S	FB1, FB2	40	40	460	RK-5	150	18 ga.	40	8 ga.	180 lb-in
	CCFB3	6	6	24	LP-CC					
	CCFB4	0.8	0.8	460	LP-CC					
UCH030AN...S	FB1, FB2	35	40	575	RK-5	250	18 ga.	40	10 ga.	180 lb-in
	CCFB3	6	6	24	LP-CC					
	CCFB4	0.6	0.8	575	LP-CC					
UCH050AH...S	CB1, CB2	175	175	208-230	N/A	500	14 ga.	150	2 ga.	325 lb-in
	CCFB3	15	15	24	LP-CC					
	CCFB4	4	4	208-230	LP-CC					
UCH050AF...S	FB1, FB2	70	70	460	LPJ	150	18 ga.	60	6 ga.	180 lb-in
	CCFB3	6	6	24	LP-CC					
	CCFB4	0.8	0.8	460	LP-CC					
UCH050AN...S	FB1, FB2	60	60	575	RK-5	250	18 ga.	50	8 ga.	180 lb-in
	CCFB3	6	6	24	LP-CC					
	CCFB4	0.8	0.8	575	LP-CC					
UCH070AH...S	CB1, CB2	225	225	208-230	N/A	500	14 ga.	150	1/0 ga.	375 lb-in
	CCFB3	15	15	24	LP-CC					
	CCFB4	4	4	208-230	LP-CC					
UCH070AF...S	FB1, FB2	90	90	460	LPJ	250	14 ga.	75	4 ga.	180 lb-in
	CCFB3	12	12	24	LP-CC					
	CCFB4	1.5	1.5	460	LP-CC					
UCH070AN...S	FB1, FB2	70	70	575	LPJ	250	18 ga.	60	6 ga.	180 lb-in
	CCFB3	6	6	24	LP-CC					
	CCFB4	0.8	0.8	575	LP-CC					

Wiring Diagrams - SHConDEMAND, Heat Pump 85 Ton




ELECTRICAL PANEL COMPONENT LAYOUT
UCH
Chiller Model #
Fuse or CB Amp Rating
Fuse or CB VAC
Fuse Type
Main Wiring
Control Ckt Wire Ga.
CC1, CC2 Compr Wire Ga.
Comp Power Wire Ga.
Torque (lb-in)
UCH085AH..R
UCH085AF..R
UCH085AN..R
CB1, CB2
CCFB3
CCFB4
N/A
LP-CC
LPJ
500
250
14 ga.
90
200
75
3/0 ga.
2 ga.
4 ga.
375 lb-in
CODE
DESCRIPTION
Compressor 1 Circuit Breaker (in lieu of compr fusing)
Compressor 2 Circuit Breaker (in lieu of compr fusing)
Compressor 1 Contactor
Compressor 2 Contactor
Auxiliary Contacts 1 of Compressor 1 Contactor
Auxiliary Contacts 1 of Compressor 2 Contactor
Control Circuit Fuse Block #3, 1-Pole, X-Former Sec.
Control Circuit Fuse Block #4, 2-Pole, X-Former Pri.
Compressor 1
Compressor 2
Compressor 1 Overload Module
Compressor 2 Overload Module
Compressor 1 Fuse Block
Compressor 2 Fuse Block
Circuit 1 High Pressure Control Switch (Manual Reset)
Circuit 2 High Pressure Control Switch (Manual Reset)
Power On Light
Main Failure Light
Comp. #1 On Light
Comp. #2 On Light
Low Voltage Terminal Block (Main Control Panel)
Low Voltage Terminal Block (Micro Cntr. & Sensor Panel)
Motorized Valve, Condenser Outlet (Optional)
Motorized Valve, Chiller Outlet (Optional)
Auxiliary Contacts 1 of Condenser Motorized Valve
Auxiliary Contacts 1 of Chiller Motorized Valve
Simultaneous Htg & C.L.G Isolation Valve Actuator 1
Simultaneous Htg & C.L.G Isolation Valve Actuator 2
Auxiliary Contacts 1 of Simultaneous Motorized Valve 1
Auxiliary Contacts 1 of Simultaneous Motorized Valve 2
Pressure Sensor (Transducer) #1, Compr. 1 Suct.
Pressure Sensor (Transducer) #2, Compr. 2 Suct.
Pressure Sensor (Transducer) #3, Compr. 1 Disch.
Pressure Sensor (Transducer) #4, Compr. 2 Disch.
Control Relay, Compressor #1
Control Relay, Compressor #2
Reversing Valve Relay
Control Relay, Motorized Valve, Evap. & Cond.
Remote Main Fault Relay
Reversing Valve Solenoid 1
Reversing Valve Solenoid 2
Compressor 1 Start/Stop Switch
Compressor 2 Start/Stop Switch
Transformer
Temp. Sensor #1, Compr. 1 Suct.
Temp. Sensor #2, Compr. 2 Suct.
Temp. Sensor #3, Compr. 1 Disch.
Temp. Sensor #4, Compr. 2 Disch.
Temp. Sensor #5, Leaving Chilled Water
Temp. Sensor #6, Leaving Cond. Water
NOTES:
1. COMPRESSOR MOTOR THERMALLY PROTECTED INTERNALLY.
2. ALL WIRING TO THE UNIT MUST COMPLY WITH NEC AND LOCAL CODES.
3. FOR 208/230V, DISCONNECT RED LEAD AT H3 AND BLACK LEAD AT H4 FOR 208V OPERATION. FOR 230V, DISCONNECT RED LEAD AT H2 AND RECONNECT AT H3.
4. * COMPRESSOR FUSES SHOWN. CIRCUIT BREAKERS ARE FOR UCH(050/070)AH.
5. DISCONNECT SWITCH FOR UNIT TO BE PROVIDED BY OTHERS AND SHALL BE TYPE HACR CIRCUIT BREAKER OR EQUIVALENT, OR TYPE RK-5 FUSED DISCONNECT (OR EQUIVALENT. (SEE DATA PLATE FOR SIZING.)
LEGEND
GRD = GROUND
TIME DELAY RELAY
SWITCH
PRESSURE ACTUATED SW.
TEMP ACTUATED SWITCH
RELAY CONTACTS N. O.
RELAY CONTACTS N. C.
RELAY or CONTACTOR COIL
PILOT LIGHT
FUSE ELEMENT
CIRCUIT BREAKER
THERMAL ELEMENT
FACTORY WIRING
FIELD LINE VOLTAGE WIRING
FIELD LOW VOLTAGE WIRING
CODE
DESCRIPTION
B
BLACK
BR
BROWN
BL
BLUE
R
RED
Y
YELLOW
W
WHITE
GR/Y
GREEN W/YEL. TR.
GR
GREEN
P
PURPLE
T
TAN
OR
ORANGE
CLIMACOOL
This document is the sole property of ClimaCool Corp. Distribution of this document to third parties without the written consent of ClimaCool Corp. Design changes to any portion of this document may occur without notice.
Elec. Diagram Module Power & Full Micro Controller
Modular W/C Scroll Chiller UCH Heat Pump Product Family
Motorized Valves for Both Chiller & Condenser Water Flow
SIZE
File No.
Dwg. No.
REV
B
96B0114N10
CEL-UCH085A(H/F/N)xxSBx_2D.DWG
D
SCALE None
DATE 08/14/2013
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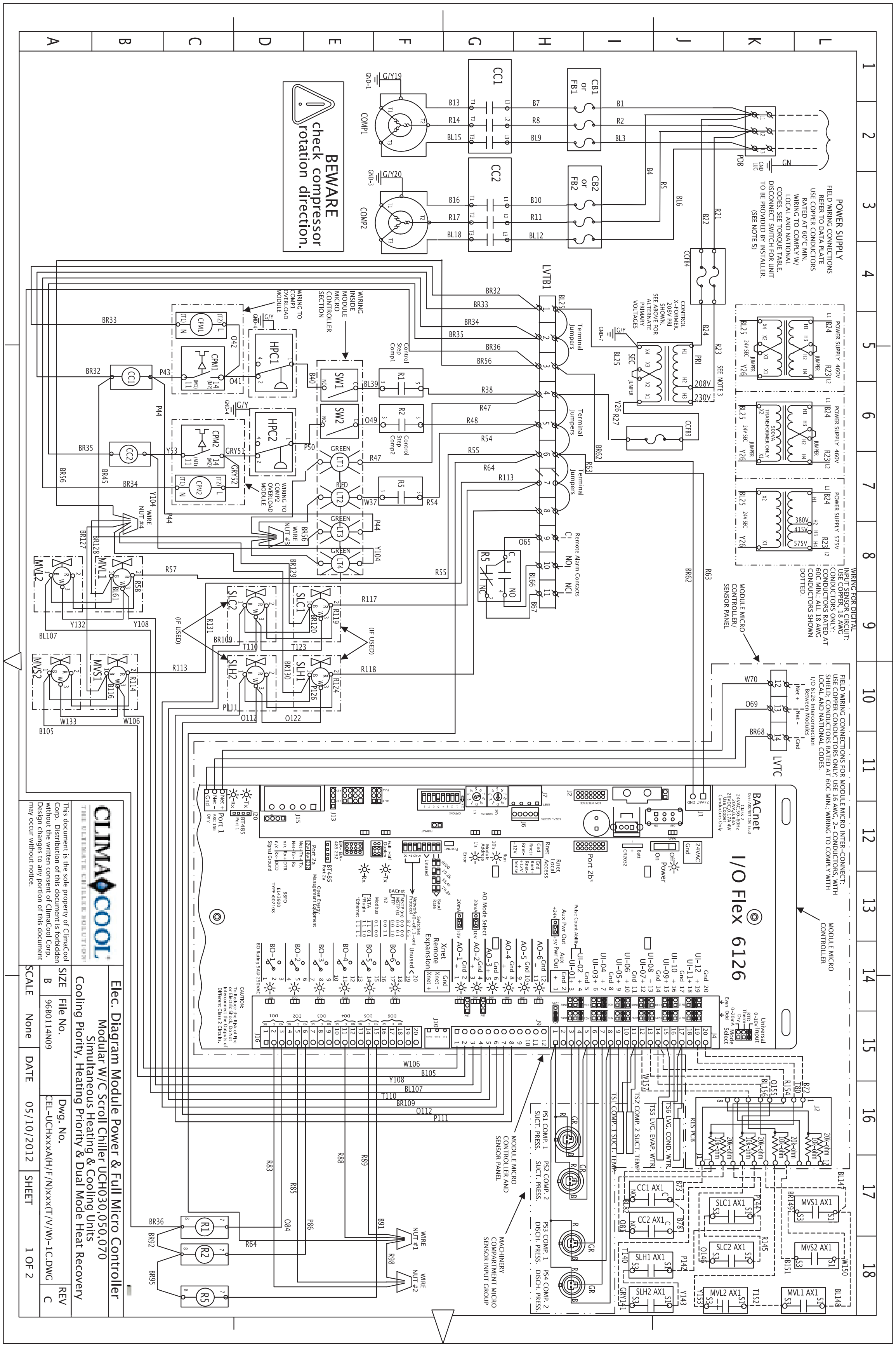
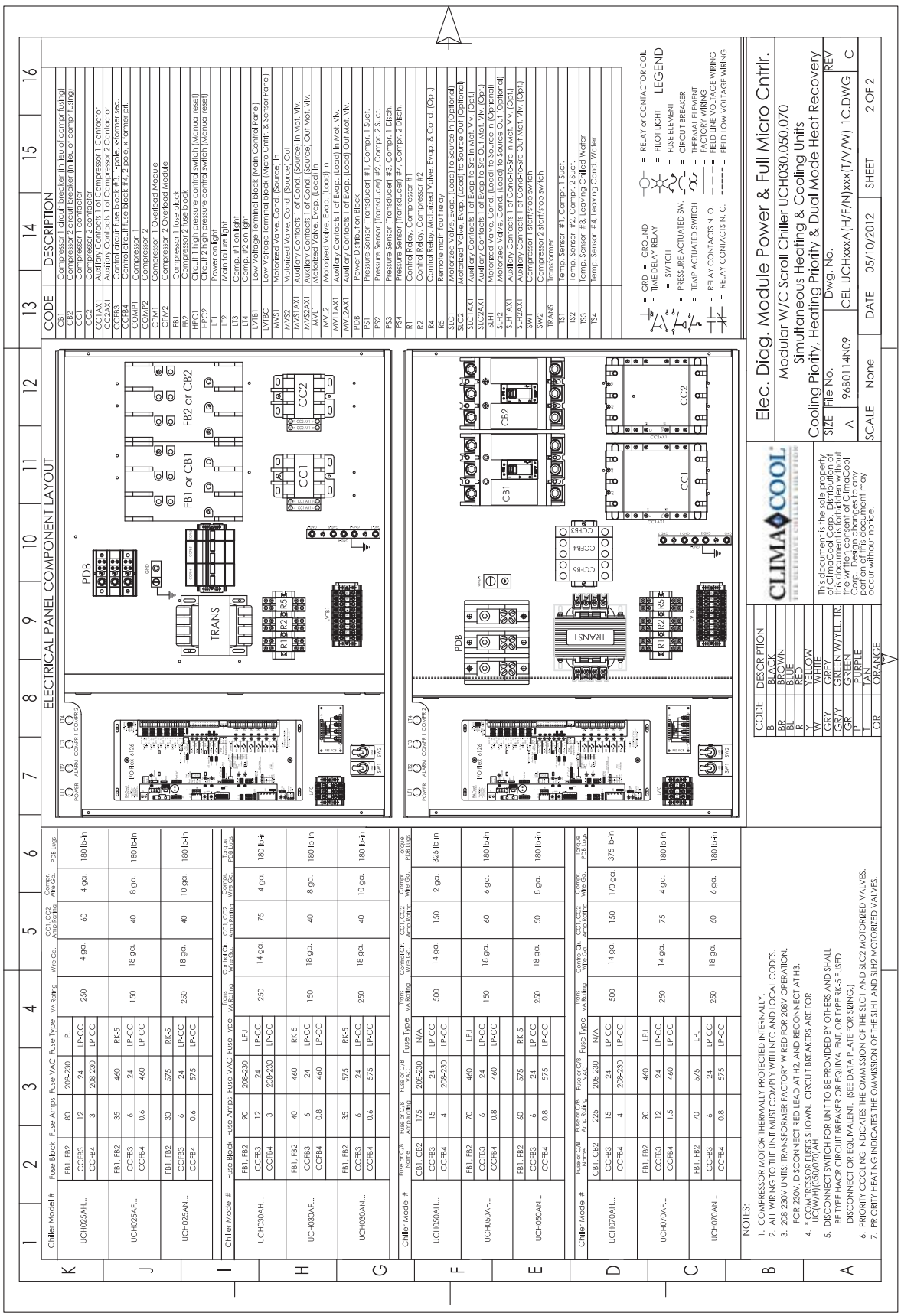

BEWARE
check compressor
rotation direction.
POWER SUPPLY
I/O Flex 6126
BACnet
Elec. Diagram Module Power & Full Micro Controller
Modular W/C Scroll Chiller UCH030,050,070
Simultaneous Heating & Cooling Units
Cooling Priority, Heating Priority & Dual Mode Heat Recovery
SIZE B
File No. 968014N09
Dwg. No. CEL-UCHxxxA(H/F/N)xxx(T/V/W)-1C.DWG
REV C
SCALE None
DATE 05/10/2012
SHEET 1 OF 2



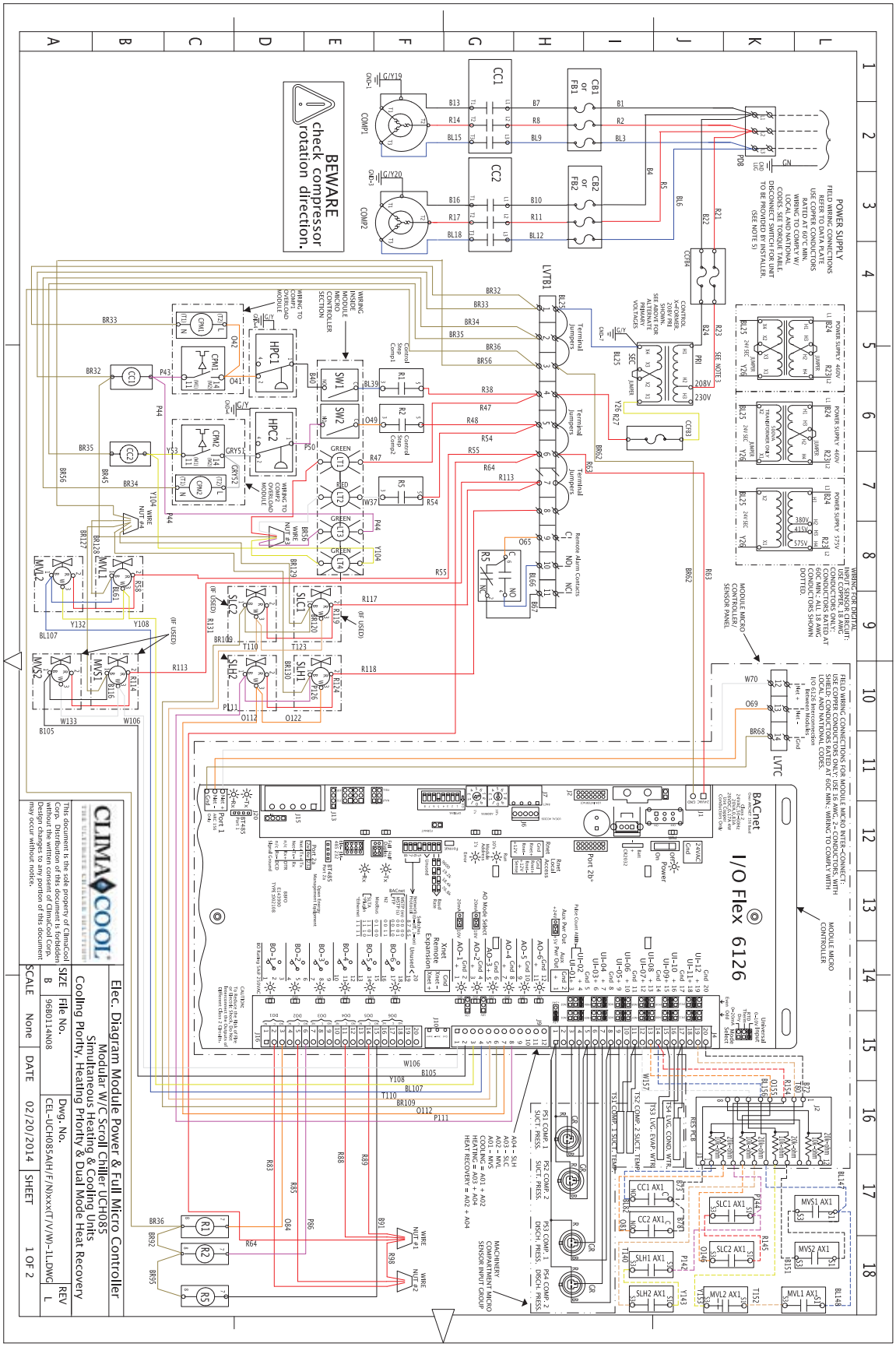
Chiller Model #	Fuse Block	Fuse Amps	Fuse VAC	Fuse Type	Trans. VA Rating	Control Circuit Wire Ga.	CC1, CC2 Amp Rating	Compr. Wire Ga.	PDB Lugs
UCH025AH...	FB1, FB2	80	208-230	LPJ	250	14 ga.	60	4 ga.	180 lb-in
	CCFB3	12	24	LP-CC					
	CCFB4	3	208-230	LP-CC					
UCH025AF...	FB1, FB2	35	460	RK-5	150	18 ga.	40	8 ga.	180 lb-in
	CCFB3	6	24	LP-CC					
	CCFB4	0.6	460	LP-CC					
UCH025AN...	FB1, FB2	30	575	RK-5	250	18 ga.	40	10 ga.	180 lb-in
	CCFB3	6	24	LP-CC					
	CCFB4	0.6	575	LP-CC					

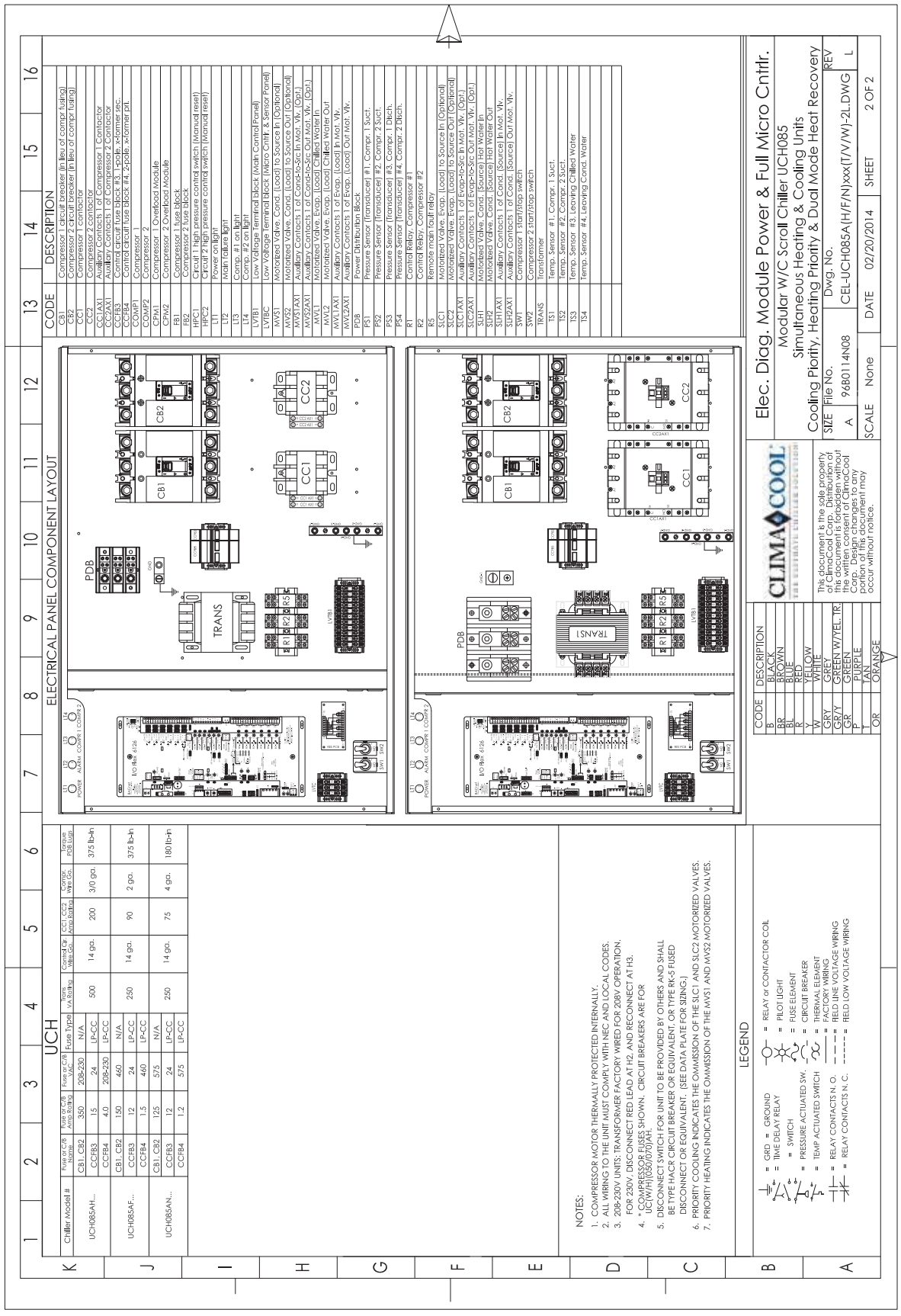
Chiller Model #	Fuse Block	Fuse Amps	Fuse VAC	Fuse Type	Trans. VA Rating	Control Circuit Wire Ga.	CC1, CC2 Amp Rating	Compr. Wire Ga.	Torque PDB Lugs
UCH030AH...	FB1, FB2	90	208-230	LPJ	250	14 ga.	75	4 ga.	180 lb-in
	CCFB3	12	24	LP-CC					
	CCFB4	3	208-230	LP-CC					
UCH030AF...	FB1, FB2	40	460	RK-5	150	18 ga.	40	8 ga.	180 lb-in
	CCFB3	6	24	LP-CC					
	CCFB4	0.8	460	LP-CC					
UCH030AN...	FB1, FB2	35	575	RK-5	250	18 ga.	40	10 ga.	180 lb-in
	CCFB3	6	24	LP-CC					
	CCFB4	0.6	575	LP-CC					

Chiller Model #	Fuse or C/B Name	Fuse or C/B Amp Rating	Fuse or C/B VAC	Fuse Type	Trans. VA Rating	Control Circuit Wire Ga.	CC1, CC2 Amp Rating	Compr. Wire Ga.	Torque PDB Lugs
UCH050AH...	CB1, CB2	175	208-230	N/A	500	14 ga.	150	2 ga.	325 lb-in
	CCFB3	15	24	LP-CC					
	CCFB4	4	208-230	LP-CC					
UCH050AF...	FB1, FB2	70	460	LPJ	150	18 ga.	60	6 ga.	180 lb-in
	CCFB3	6	24	LP-CC					
	CCFB4	0.8	460	LP-CC					
UCH050AN...	FB1, FB2	60	575	RK-5	250	18 ga.	50	8 ga.	180 lb-in
	CCFB3	6	24	LP-CC					
	CCFB4	0.8	575	LP-CC					

Chiller Model #	Fuse or C/B Name	Fuse or C/B Amp Rating	Fuse or C/B VAC	Fuse Type	Trans. VA Rating	Control Circuit Wire Ga.	CC1, CC2 Amp Rating	Compr. Wire Ga.	Torque PDB Lugs
UCH070AH...	CB1, CB2	225	208-230	N/A	500	14 ga.	150	1/0 ga.	375 lb-in
	CCFB3	15	24	LP-CC					
	CCFB4	4	208-230	LP-CC					
UCH070AF...	FB1, FB2	90	460	LPJ	250	14 ga.	75	4 ga.	180 lb-in
	CCFB3	12	24	LP-CC					
	CCFB4	1.5	460	LP-CC					
UCH070AN...	FB1, FB2	70	575	LPJ	250	18 ga.	60	6 ga.	180 lb-in
	CCFB3	6	24	LP-CC					
	CCFB4	0.8	575	LP-CC					

Wiring Diagrams - SHConDEMAND, Heat Recovery 85 Ton





Chiller Model #	Fuse or C/B Amp Rating	Fuse or C/B Volts AC	Fuse Type	Trans VA Rating	Comp1 Gr. Wire Size	CC1, CC2 combination	Comp. wire Gr.	Terminal Lugs
UCH085AH...	CB1, CB2 350	208-230	N/A	500	14 ga.	200	3/0 ga.	375 lb-in
	CCFB3 15	24	LP-CC					
	CCFB4 4.0	208-230	LP-CC					
UCH085AF...	CB1, CB2 150	460	N/A	250	14 ga.	90	2 ga.	375 lb-in
	CCFB3 12	24	LP-CC					
	CCFB4 1.5	460	LP-CC					
UCH085AN...	CB1, CB2 125	575	N/A	250	14 ga.	75	4 ga.	180 lb-in
	CCFB3 12	24	LP-CC					
	CCFB4 1.2	575	LP-CC					

NOTES:
1. COMPRESSOR MOTOR THERMALLY PROTECTED INTERNALLY.
2. ALL WIRING TO THE UNIT MUST COMPLY WITH NEC AND LOCAL CODES.
3. 208-230V UNITS: TRANSFORMER FACTORY WIRED FOR 208V OPERATION. FOR 230V, DISCONNECT RED LEAD AT H2, AND RECONNECT AT H3.
4. * COMPRESSOR FUSES SHOWN. CIRCUIT BREAKERS ARE FOR UC[W/H][030/070]AH.
5. DISCONNECT SWITCH FOR UNIT TO BE PROVIDED BY OTHERS AND SHALL BE TYPE HACR CIRCUIT BREAKER OR EQUIVALENT, OR TYPE RK-5 FUSED DISCONNECT OR EQUIVALENT. (SEE DATA PLATE FOR SIZING.)
6. PRIORITY COOLING INDICATES THE OMMISSION OF THE SLC1 AND SLC2 MOTORIZED VALVES.
7. PRIORITY HEATING INDICATES THE OMMISSION OF THE MVS1 AND MVS2 MOTORIZED VALVES.

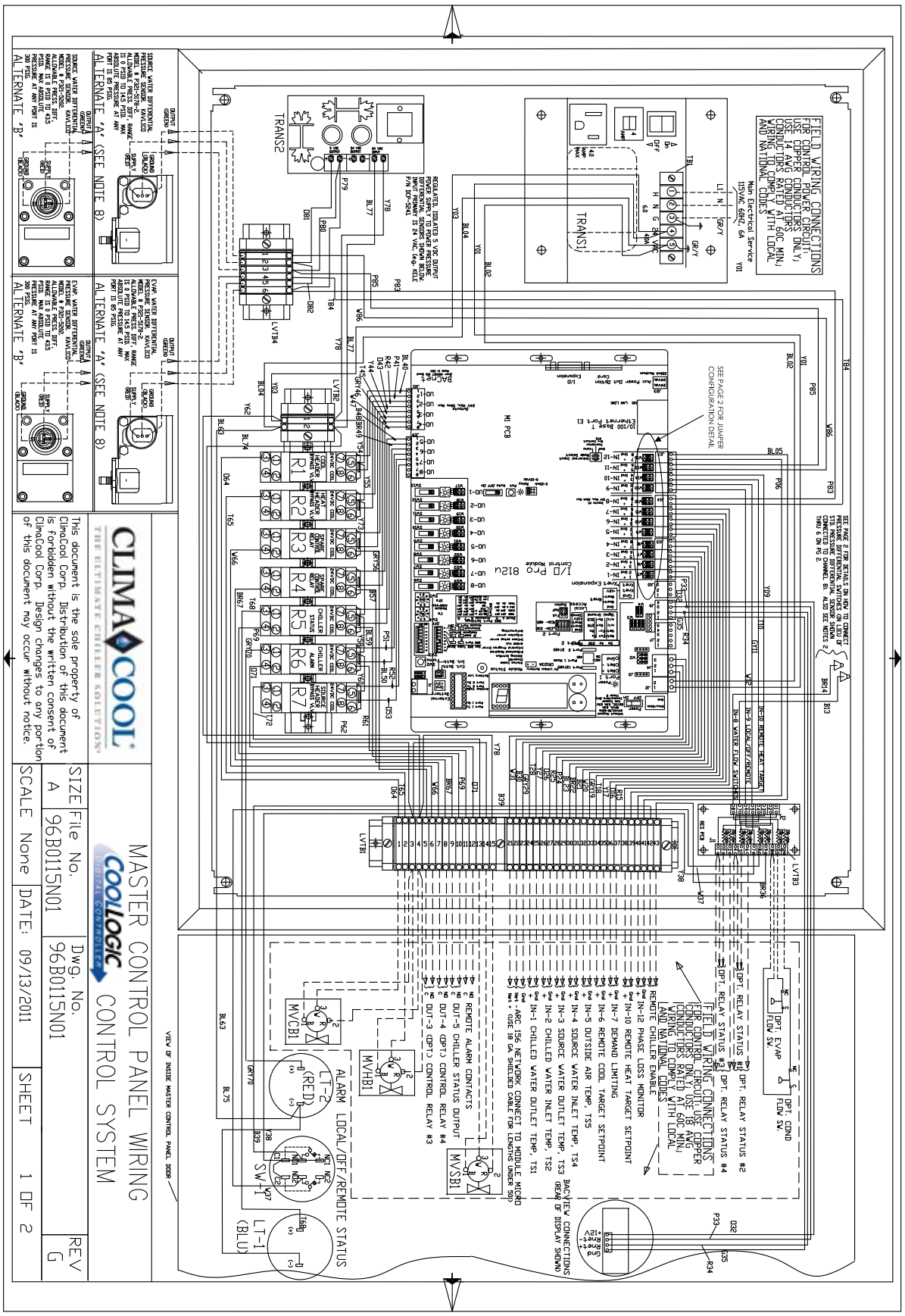
LEGEND

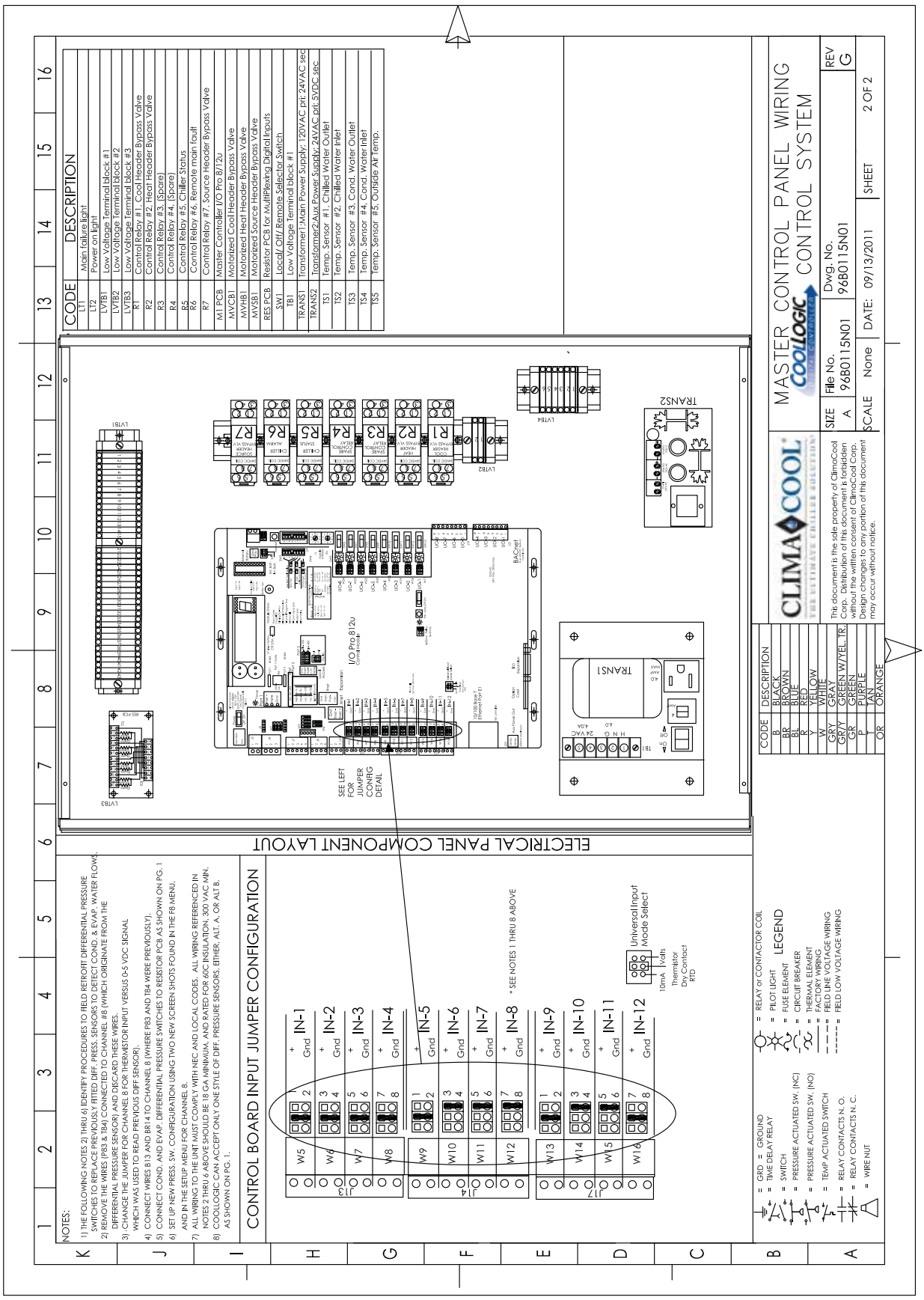
GRD = GROUND	= RELAY or CONTACTOR COIL		
TIME DELAY RELAY	= PILOT LIGHT		
= SWITCH	= FUSE ELEMENT		
= PRESSURE ACTUATED SW.	= CIRCUIT BREAKER		
= TEMP ACTUATED SWITCH	= THERMAL ELEMENT		
	= FACTORY WIRING		
= RELAY CONTACTS N. O.	= FIELD LINE VOLTAGE WIRING		
= RELAY CONTACTS N. C.	= FIELD LOW VOLTAGE WIRING		

CODE	DESCRIPTION
B	BLACK
BR	BROWN
BL	BLUE
R	RED
Y	YELLOW
W	WHITE
GRY	GREY
GR/Y	GREEN W/YEL. TR.
GR	GREEN
P	PURPLE
T	TAN
OR	ORANGE

CODE	DESCRIPTION
CB1	Compressor 1 circuit breaker (in lieu of compr fusing)
CB2	Compressor 2 circuit breaker (in lieu of compr fusing)
CC1	Compressor 1 contactor
CC2	Compressor 2 contactor
CC1AX1	Auxiliary Contacts 1 of Compressor 1 Contactor
CC2AX1	Auxiliary Contacts 1 of Compressor 2 Contactor
CCFB3	Control circuit fuse block #3, 1-pole, x-former sec.
CCFB4	Control circuit fuse block #4, 2-pole, x-former pri.
COMP1	Compressor 1
COMP2	Compressor 2
CPM1	Compressor 1 Overload Module
CPM2	Compressor 2 Overload Module
FB1	Compressor 1 fuse block
FB2	Compressor 2 fuse block
HPC1	Circuit 1 high pressure control switch (Manual reset)
HPC2	Circuit 2 high pressure control switch (Manual reset)
LI1	Power on light
LI2	Main failure light
LI3	Comp. #1 on light
LI4	Comp. #2 on light
LVTB1	Low Voltage Terminal Block (Main Control Panel)
LVTB2	Low Voltage Terminal Block (Micro Cntrlr. & Sensor Panel)
MVS1	Motorized Valve, Cond. (Load) to Source In [Optional]
MVS2	Motorized Valve, Cond. (Load) to Source Out [Optional]
MVS1AX1	Auxiliary Contacts 1 of Cond-to-Src In Mot. Vlv. [Opt.]
MVS2AX1	Auxiliary Contacts 1 of Cond-to-Src Out Mot. Vlv. [Opt.]
MV1	Motorized Valve, Evap. (Load) Chilled Water In
MV2	Motorized Valve, Evap. (Load) Chilled Water Out
MV1.1AX1	Auxiliary Contacts 1 of Evap. (Load) In Mot. Vlv.
MV2AX1	Auxiliary Contacts 1 of Evap. (Load) Out Mot. Vlv.
PDB	Power Distribution Block
PS1	Pressure Sensor [Transducer] #1, Compr. 1 Suct.
PS2	Pressure Sensor [Transducer] #2, Compr. 2 Suct.
PS3	Pressure Sensor [Transducer] #3, Compr. 1 Disch.
PS4	Pressure Sensor [Transducer] #4, Compr. 2 Disch.
R1	Control Relay, Compressor #1
R2	Control Relay, Compressor #2
R5	Remote main fault relay
SLC1	Motorized Valve, Evap. (Load) to Source In [Optional]
SLC2	Motorized Valve, Evap. (Load) to Source Out [Optional]
SLC1AX1	Auxiliary Contacts 1 of Evap-to-Src In Mot. Vlv. [Opt.]
SLC2AX1	Auxiliary Contacts 1 of Evap-to-Src Out Mot. Vlv. [Opt.]
SLH1	Motorized Valve, Cond. (Source) Hot Water In
SLH2	Motorized Valve, Cond. (Source) Hot Water Out
SLH1AX1	Auxiliary Contacts 1 of Cond. (Source) In Mot. Vlv.
SLH2AX1	Auxiliary Contacts 1 of Cond. (Source) Out Mot. Vlv.
SW1	Compressor 1 start/stop switch
SW2	Compressor 2 start/stop switch
TRANS	Transformer
TS1	Temp. Sensor #1, Compr. 1 Suct.
TS2	Temp. Sensor #2, Compr. 2 Suct.
TS3	Temp. Sensor #3, Leaving Chilled Water
TS4	Temp. Sensor #4, Leaving Cond. Water

Wiring Diagrams - Master Control Panel




MASTER CONTROL PANEL WIRING
CONTROL SYSTEM
CLIMACOOL
COOLOGIC
SIZE A
File No. 96B0115N01
Dwg. No. 96B0115N01
REV G
SCALE None
DATE: 09/13/2011
SHEET 2 OF 2
ELECTRICAL PANEL COMPONENT LAYOUT
CONTROL BOARD INPUT JUMPER CONFIGURATION
NOTES:
1) THE FOLLOWING NOTES 2) THRU 6) IDENTIFY PROCEDURES TO FIELD RETROFIT DIFFERENTIAL PRESSURE SWITCHES TO REPLACE PREVIOUSLY FITTED DIFF. PRESS. SENSORS TO DETECT COND. & EVAP. WATER FLOWS.
2) REMOVE THE WIRES, PER B, TB4, CONNECTED TO CHANNEL 8 (WHICH ORIGINATE FROM THE DIFFERENTIAL PRESSURE SENSOR) AND DISCARD THESE WIRES.
3) CHANGE THE JUMPER FOR CHANNEL 8 FOR THERMISTOR INPUT VERSUS 0-5 VDC SIGNAL WHICH WAS USED TO READ PREVIOUS DIFF SENSOR).
4) CONNECT WIRES B13 AND B14 TO CHANNEL 8 (WHERE P83 AND T84 WERE PREVIOUSLY).
5) CONNECT COND. AND EVAP. DIFFERENTIAL PRESSURE SWITCHES TO RESISTOR PCB AS SHOWN ON PG. 1
6) SET UP NEW PRESS. SW. CONFIGURATION USING TWO NEW SCREEN SHOTS FOUND IN THE F8 MENU, AND IN THE SETUP MENU FOR CHANNEL 8.
7) ALL WIRING TO THE UNIT MUST COMPLY WITH NEC AND LOCAL CODES. ALL WIRING REFERENCED IN NOTES 2 THRU 6 ABOVE SHOULD BE 18 GA MINIMUM, AND RATED FOR 60C INSULATION, 300 VAC MIN.
8) COOLOGIC CAN ACCEPT ONLY ONE STYLE OF DIFF. PRESSURE SENSORS, EITHER, ALT. A, OR ALT B, AS SHOWN ON PG. 1.
* SEE NOTES 1 THRU 8 ABOVE
Universal Input Mode Select
10mA Volts
Thermistor
Dry Contact
RTD
SEE LEFT FOR JUMPER CONFIG DETAIL
I/O Pro 812u
TRANS1
TRANS2
CODE DESCRIPTION
LT1 Main failure light
LT2 Power on light
LVTB1 Low Voltage Terminal block #1
LVTB2 Low Voltage Terminal block #2
LVTB3 Low Voltage Terminal block #3
R1 Control Relay #1, Cool Header Bypass Valve
R2 Control Relay #2, Heat Header Bypass Valve
R3 Control Relay #3, (Spare)
R4 Control Relay #4, (Spare)
R5 Control Relay #5, Chiller Status
R6 Control Relay #6, Remote main fault
R7 Control Relay #7, Source Header Bypass Valve
M1 PCB Master Controller I/O Pro 8/12u
MVCB1 Motorized Cool Header Bypass Valve
MVHB1 Motorized Heat Header Bypass Valve
MVSB1 Motorized Source Header Bypass Valve
RES PCB Resistor PCB for MultiPlexing Digital Inputs
SW1 Local/ Off/ Remote Selector Switch
TB1 Low Voltage Terminal block #1
TRANS1 Transformer1:Main Power Supply: 120VAC pri: 24VAC sec
TRANS2 Transformer2:Aux Power Supply: 24VAC pri: 5VDC sec
TS1 Temp. Sensor #1, Chilled Water Outlet
TS2 Temp. Sensor #2, Chilled Water Inlet
TS3 Temp. Sensor #3, Cond. Water Outlet
TS4 Temp. Sensor #4, Cond. Water Inlet
TS5 Temp. Sensor #5, Outside Air Temp.
CODE DESCRIPTION
B BLACK
BR BROWN
BL BLUE
R RED
Y YELLOW
W WHITE
GRY GRAY
GRY/Y GREEN W/YEL. TR.
GR GREEN
P PURPLE
OR ORANGE
GRD = GROUND
TIME DELAY RELAY
SWITCH
PRESSURE ACTUATED SW. (NC)
PRESSURE ACTUATED SW. (NO)
TEMP ACTUATED SWITCH
RELAY CONTACTS N. O.
RELAY CONTACTS N. C.
WIRE NUT
RELAY or CONTACTOR COIL
PILOT LIGHT
FUSE ELEMENT
CIRCUIT BREAKER
THERMAL ELEMENT
FACTORY WIRING
FIELD LINE VOLTAGE WIRING
FIELD LOW VOLTAGE WIRING
LEGEND
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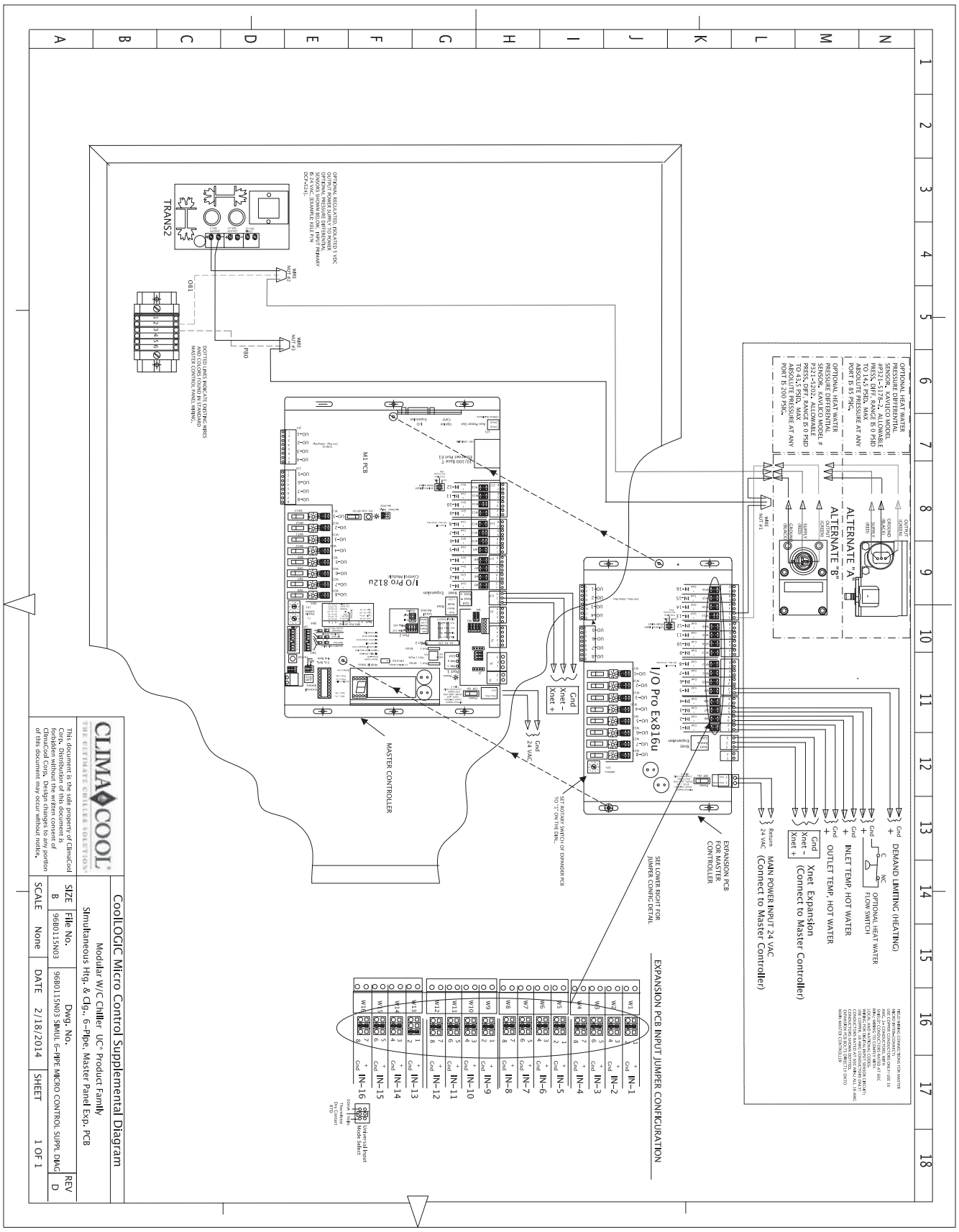
Wiring Diagrams - Expansion Board, SHC Heat Pump

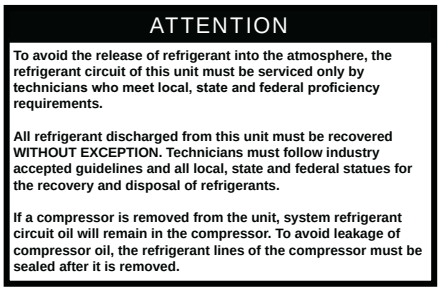


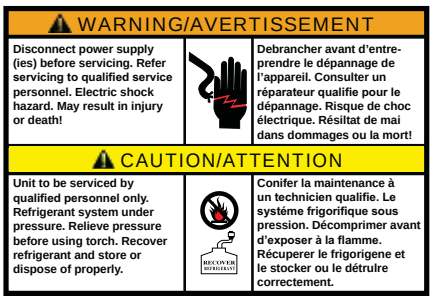
WARNING!
The troubleshooting guidelines recommended in this section could result in exposure to electrical safety hazards. Please refer to the safety warnings provided in this manual. Failure to follow all of the recommended safety warnings provided could result in death or serious injury. When possible, disconnect all electrical power including remote disconnects before servicing. Follow proper lockout-tagout procedures. Only a qualified licensed electrician or persons trained to handle live electrical components should be allowed to work with energized electrical components.

Chiller Will Not Start	
Possible Cause	**Remedy**
Power off	Check main disconnect switch
Main line open	Check main fuses
Incorrect wiring	Check the wiring diagram
Loose terminals/connections	Tighten the terminal connections
Control circuit open	Check interlocks with auxiliary equipment, pressure and temperature controls
Improper phasing of main power	Change any two of three phases of main power
Compressor Hums But Does Not Start	
Possible Cause	**Remedy**
Low voltage	Check at main power entry and unit power entry (consult power company if low)
Phase loss	Check power wiring and fuses
Compressor Runs But Does Not Cool	
Possible Cause	**Remedy**
Improper phasing of main power	Switch any two of three phases of main power
Compressor Cuts Out On Low Pressure Safety Control	
Possible Cause	**Remedy**
Main chilled water valve closed or restricted	Open valve to full open position
Module chilled water isolation valves, if provided, closed or restricted	Open valves to full open position
Refrigerant storage	Check for leaks – add refrigerant
No load on water chiller	Check water pump operation
Restriction in liquid line	Plugged liquid line drier – replace liquid line drier
Expansion valve clogged or inoperative	Repair/replace the expansion valve
Low discharge pressure	Raise and control discharge pressure within design limits
Low water flow through the cooler	Check water flow through the cooler
Chilled water temperature too cold	Raise water temperature setpoint
Fouled evaporator brazed plate heat exchanger	Clean-in-place heat exchanger as described in IOM (page 32)
Improper chilled water circulation	Use an ample sized cleanable strainer in the chilled water circuit; make certain the strainer is clean to insure full flow of chilled water (strainer screen must be 60 mesh minimum)
Faulty suction pressure transducer	Verify transducer calibration using a calibrated manifold gauge and replace if defective
Wrong suction pressure cutout setpoint	Verify suction pressure cutout setpoint to be set equal to the corresponding leaving chilled solution freeze temperature equivalent pressure on a PT chart. (i.e. If the solution freeze point is 32°F, the equivalent pressure setpoint will be 101 psig.)

Compressor Cycle On High Pressure Control	
Possible Cause	**Remedy**
Main condenser water valve closed or restricted	Open valve to full open position
Module condenser water isolation valves, if provided, closed or restricted	Open valves to full open position
Water regulating valve incorrectly set or defective	Reset or replace
Compressor discharge valve partially closed	Open valve to full open position
Non-condensable gases in hydronic system	Recover non-condensable gases from bleed valve on condenser or at bleed valve of the building condenser water system
Overcharge of refrigeration	Recover refrigerant from system while in operation until the first sign of bubbles are shown in the sight glass. Add back refrigerant just until bubbles clear.
Condenser water temperature high	Check water supply temperature against requirements; if cooling tower is used check spray nozzles on cooling tower.
Improper condenser water circulation	Use an ample sized cleanable strainer in the condenser water circuit; make certain the strainer is clean to insure full flow of condenser water (strainer must be 60 mesh minimum). It may sometimes be necessary to treat water to prevent formation of deposits.
Insufficient water flow through the condenser	Check water flow through condenser against design requirements.
Fouled condenser brazed plate heat exchanger	Clean-in-place heat exchanger as described in IOM (page 32).
Defective high pressure switch	Replace high pressure switch.
Causes and Prevention of Freeze-Ups	
Possible Cause	**Remedy**
Improper charging	Charge per ClimaCool data plate information, located on the chiller, following the Superheat and Subcooling procedure described in IOM (page 28).
Improper chilled water circulation	Use an ample sized cleanable strainer in the chilled water circuit; make certain the strainer is clean to insure full flow and velocity of chilled water (strainer screen must be 60 mesh minimum). It may sometimes be necessary to treat water to prevent formation of deposits.
Not draining for winter shutdown	When the system is shut down for the winter, remove the drain plugs from the flush ports and drain the cooler. Blow out remaining water with air.
Faulty leaving chilled solution temperature	Verify sensor calibration using a calibrated thermometer and replace if defective.
Wrong freeze-up protection temperature setpoint	Verify leaving chilled solution freeze protection temperature setpoint to be set at 6°F above solution freeze point

Note: See page 44 for Troubleshooting for ATF Package





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ULTIMATE CLIMATE SOLUTIONS

CLIMACOOL CORPORATION
LIMITED EXPRESS WARRANTY/LIMITATION OF REMEDIES AND LIABILITY
WITH EXTENDED COMPRESSOR WARRANTY

WARRANTY DISCLAIMER
It is expressly understood that unless a statement is specifically identified as a warranty, statements made by ClimaCool Corp., an Oklahoma corporation ("CC"), or its representatives, relating to CC's products, whether oral, written or contained in any quote, sales literature, catalog or any agreement, are not express warranties and do not form a part of the basis of the bargain, but are merely CC's opinion or commendation of CC's products. **EXCEPT AS SPECIFICALLY SET FORTH HEREIN, THERE IS NO EXPRESS WARRANTY AS TO ANY OF CC'S PRODUCTS. CC MAKES NO WARRANTY AGAINST LATENT DEFECTS. CC MAKES NO WARRANTY OF MERCHANTABILITY OF THE GOODS OR OF THE FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE.**

GRANT OF LIMITED EXPRESS WARRANTY
CC warrants CC's products purchased and retained in the United States of America and Canada to be free from defects in material and workmanship under normal use and maintenance only as follows:

FOR MODULAR CHILLERS: (a) All modular chillers built or sold by CC for twelve (12) months from the date of unit start-up or eighteen (18) months from date of shipment (from CC's warehouse), whichever comes first; and (b) Any repair and replacement parts, which are not supplied under warranty, for ninety (90) days from date of shipment (from CC's warehouse) and (c) If such extended warranty is purchased, the compressors in all modular chillers built or sold by CC shall extend for sixty (60) months from the date of shipment (from CC's warehouse).

FOR ROOF TOP UNITS: (a) All roof top units built or sold by CC for twelve (12) months from the date of unit start-up or eighteen (18) months from date of shipment (from CC's warehouse), whichever comes first; (b) All compressors supplied by CC with CC's roof top units for sixty (60) months from date of shipment (from CC's warehouse); (c) All gas fired stainless steel heat exchangers supplied by CC with CC's roof top units for ten (10) years from date of shipment (from CC's warehouse); and (d) Any repair and replacement parts, which are not supplied under warranty, for ninety (90) days from date of shipment (from CC's warehouse).

All parts must be returned to CC's warehouse in Oklahoma City, Oklahoma, freight prepaid, no later than sixty (60) days after the date of the failure of the part. If CC determines the part to be defective and within CC's Limited Express Warranty, CC shall, when such part has been either replaced or repaired, return such to a CC recognized dealer, contractor or service organization, F.O.B. CC's warehouse, Oklahoma City, Oklahoma, freight prepaid. The warranty on any part repaired or replaced under warranty expires at the end of the original warranty period.

This warranty does not cover and does not apply to: (1) Fuses, refrigerant, fluids, oil; (2) Products relocated after initial installation; (3) Any portion or component of the system that is not supplied by CC, regardless of the cause of the failure of such portion or component; (4) Products on which the units identification tags or labels have been removed or defaced; (5) Products on which payment to CC is or has been in default; (6) Products which have defects or damage which result from improper installation, wiring, electrical imbalance characteristics or maintenance (including, without limitation, defects or damages caused by voltage surges, inadequate voltage conditions, phase imbalance, any form of electrical disturbances, inadequate or improper electrical circuit installation or protection, failure to perform common maintenance, etc.); or are caused by accident, misuse or abuse, fire, flood, alteration or misapplication of the product; (7) Products which have defects or damage which result from a contaminated or corrosive air or liquid supply, operation at abnormal temperatures, or unauthorized opening of refrigerant circuit; (8) Products subjected to corrosion or abrasion or chemicals; (9) Mold, fungus or bacteria damage; (10) Products manufactured or supplied by others; (11) Products which have been subjected to misuse, negligence or accidents; (12) Products which have been operated in a manner contrary to CC's printed instructions; (13) Products which have defects, damage or insufficient performance as a result of insufficient or incorrect system design or the improper application of CC's products; (14) Products which have defects or damages due to freezing of the water supply, an inadequate or interrupted water supply, corrosives or abrasives in the water supply, or improper or inadequate filtration or treatment of the water or air supply: (15) Products which are defects caused by overfiring, use of incorrect fuel, or improper burn or control adjustments; or (16) Products which have incomplete or inadequate combustion.
CC is not responsible for: (1) The costs of any fluids, refrigerant or other system components, or the associated labor to repair or replace the same, which is incurred as a result of a defective part covered by CC's Limited Express Warranty; (2) The costs of labor, refrigerant, materials or service incurred in removal of the defective part, or in obtaining and replacing the new or repaired part; or, (3) Transportation costs of the defective part from the installation site to CC or the return of any part not covered by CC's Limited Express Warranty.

Limitation: This Limited Express Warranty is given in lieu of all other warranties. If, notwithstanding the disclaimers contained herein, it is determined that other warranties exist, any such warranty, including without limitation, any express warranties or any implied warranties of fitness for any particular purpose and merchantability, shall be limited to the duration of the Limited Express Warranty.

LIMITATION OF REMEDIES
In the event of a breach of this Limited Express Warranty, CC will only be obligated at CC's option to repair the failed part or module or to furnish a new or rebuilt part or module in exchange for the part or module which has failed. If, after written notice to CC's Head Office in Oklahoma City, Oklahoma of each defect, malfunction or other failure and a reasonable number of attempts by CC to correct the defect, malfunction or other failure and the remedy fails of its essential purpose, CC shall refund the purchase price paid to CC in exchange for the return of the sold good(s). Said refund shall be the maximum liability of CC. **THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY AGAINST CC FOR BREACH OF CONTRACT, FOR THE BREACH OF ANY WARRANTY OR FOR CC'S OWN NEGLIGENCE OR IN STRICT LIABILITY.**

LIMITATION OF LIABILITY
CC shall have no liability for any damages if CC's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to any, war, civil unrest, government restrictions or restraints, strikes, or work stoppages, fire, flood, accident, allocation, shortages of transportation, fuel, material or labor, acts of God or any other reason beyond the sole control of CC. **CC EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGE IN CONTRACT, FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, OR IN TORT, WHETHER FOR CC'S OWN NEGLIGENCE OR AS STRICT LIABILITY.**

OBTAINING WARRANTY PERFORMANCE
Normally, the contractor or service organization who installed the products will provide warranty performance for the owner. Should the installer be unavailable, contact any CC recognized contractor or service organization. If assistance is required in obtaining warranty performance, write:

ClimaCool Corp. • P.O. Box 2055 • Oklahoma City, Oklahoma 73101 • (405) 815-3000 • e-mail: Claims@climacoolcorp.com

NOTE: Some states or Canadian provinces do not allow limitations on how long an implied warranty lasts, or the limitation or exclusion of consequential or incidental damages, so the foregoing exclusion and limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and from Canadian province to Canadian province.

Please refer to the CC Installation, Operation and Maintenance Manual for operating and maintenance instructions.

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