Packaged Air Cooled Modular Chiller

Water Cooled, Heat Pump, Heat Recovery, Free Cooling and Simultaneous Heating & Cooling Heat Pump

Model UCA: 20, 30, 50 and 70 tons

Installation, Operation & Maintenance Manual

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SHC on DEMAND® SIMULTANEOUS HEATING AND COOLING

CLIMACOOL®

A NIBE GROUP MEMBER

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Table of Contents

Introduction

General Description

ClimaCool's Air Cooled Packaged Modular Chiller, Model UCA, are available in 20, 30, 50 and 70 tons and can be configured to provide project turndown and capacity requirements from 20 to 420 tons. By simply adding modules, the UCA can satisfy future incremental growth needs. This model is a quiet, serviceable and extremely efficient system that will provide years of reliable operation.

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.

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

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

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

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

⚠ ATTENTION

If chilled water is to be maintained at a temperature below 40°F (4.4°C) or outdoor temperatures are expected to be below 32°F (0°C), an antifreeze of sufficient concentration must be used to prevent freeze-up at anticipated suction temperatures.

⚠ 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.

⚠ WARNING/ADVERTISSEMENT

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!

⚠ ATTENTION

Confirm all panels and electrical covers are properly installed/sealed, including the condenser fan motor cover.

⚠ WARNING/ADVERTISSEMENT

VERY HOT WATER!	L'EAU TRÉS CHAUDE!

⚠ ATTENTION

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

⚠ CAUTION/ATTENTION

Excessive Chlorine, undissolved solids and other improper water conditions **WILL DAMAGE** the internal heat exchanger and **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!**

⚠ 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.

⚠ CAUTION/ATTENTION

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

⚠ WARNING/ADVERTISSEMENT

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.

⚠ CAUTION/ATTENTION

3 PHASE SCROLL COMPRESSOR UNIT	UNITÉ 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 characteristsics 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; • Compressuers 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. Verify all components and loose parts immediately upon receipt. Note any damage on the Bill of Lading immediately and in the presence of the freight carrier's delivering agent. Report the damage to the freight carrier and file appropriate claim documents in accordance with ICC regulations. It is the responsibility of the recipient to contact ClimaCool Corp.

Thoroughly check for any visible damage of control panels, electrical and/or refrigeration components or broken copper lines. Be sure the nameplate voltage agrees with the site voltage. 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

Installation and storage of Packaged Air Cooled chillers, in locations with ambient temperatures below 36°F, will require a suitable antifreeze solution. See page 26 for more information.

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 7, 8 and 9 on page 10). Verify that all header grooved couplings, groove by groove 6" nipples and mounting hardware kits are on site prior to connecting the modules.

Rigging and Lifting

Each module should be lifted by using a 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 in the Rigging and Lifting Procedures on page 10.

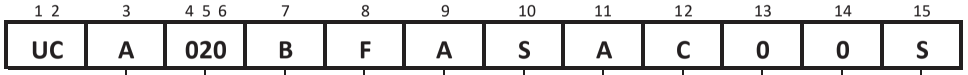
Warranty

To ensure proper equipment longevity, design performance and reliability, all ClimaCool chillers must be installed, operated and maintained in accordance with 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 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 Service Department at 405-815-3000 or at technicalsupport@climacoolcorp.com to schedule. There is a minimum of (three) 3 weeks notice required to schedule your factory startup.

⚠ ATTENTION

If chilled water is to be maintained at a temperature below 40°F (4.4°C) or outdoor temperatures are expected to be below 32°F (0°C), an antifreeze of sufficient concentration must be used to prevent freeze-up at anticipated suction temperatures.

Packaged Air Cooled Modular Chiller Model Key



REJECTION MEANS
A = Air Cooled Package (Outdoor)
F = Free Cooling Module
(Available in 30 & 70 Ton Only)

NOMINAL TONS
020 (N/A for Free Cooling Module)
030
050 (N/A for Free Cooling Module)
070

DESIGN SERIES
B
C (for all UCA070 only)

VOLTAGE
F = 460/3/60
H = 208-230/3/60
N = 575/03/60

CONTROLS & ELECTRICAL
A = Standard Controls
B = 65 KA SCCR
H = Heat Trace
I = Single Unit w/65 KA & HT
N = Fail to Run
S = Single Module Controls
T = Single Module Controls with LonWorks
U = Single Unit w/65 KA
W = 65 KA & Heat Trace
5 = Fail to Run & Heat Trace
6 = 65 KA & Fail to Run
7 = 65 KA & Fail to Run & Heat Trace

COMPRESSOR TYPE
D = Digital Scrolls (20 & 30 Ton Only)
E = Sound Blankets
L = Digital Scrolls & Sound Blankets
R = Lead VFD & Sound Blankets
S = Scroll
T = Lead VFD

REFRIGERANT
A = R-410A

APPLICATION
C = Cooling
T = Reverse Cycle (Heat Pump)
U = Simultaneous Heating & Cooling Heat Pump (4 headers)

WATER ISOLATION VALVES
E = Evap. Motorized Valves
M = Manual Valves for Evap

REFRIGERANT OPTIONS
0 = None - Standard Low Ambient to 20˚F in Cooling Mode and 15˚F in Heating Mode
B = Hot Gas Bypass - Both Circuits
M = Low Ambient to 0°F with Hot Gas Bypass - Both circuits
N = Low Ambient to 0°F

MODEL CONFIGURATION
B = Bird Screen
D = Coated Condenser
F = Condenser Coil Hail Guard
H = Headerless Module
I = Coated Condenser with Bird Screen
J = Coated Condenser with Hail Guard
K = Headerless Module with Condenser Hail Guard
L = Headerless Module with Condenser Coil Coating
N = Headerless Module with Condenser Coil Coating and Hail Guard
P = Headerless Module with Condenser Coil Coating, Hail Guard and Bird Screen
R = Coated Condenser with Hail Guard and Bird Screen
S = Standard
T = Headerless Module with Condenser Hail Guard and Bird Screen
U = Headerless Module with Coated Condenser and Bird Screen
Y = Condenser Coil Hail Guard with Bird Screen
Z = Headerless Module with Bird Screen

Physical Data

Model UCA	Cooling Only		Heat Pump		SHC[1]	
	20	30	20	30	20	30
Capacity (Tons)[2]	18.4	27.5	17.9	26.7	17.9	26.7
EER	10.3	10.3	9.97	9.97	9.97	9.97
Refrigerant Circuits (quantity)	2	2	2	2	2	2
Compressor Type	scroll	scroll	scroll	scroll	scroll	scroll
Compressor Quantity	2	2	2	2	2	2
Compressor Nominal Hp (per circuit)	10	15	10	15	10	15
Refrigerant Charge R-410A (lbs)	50	56	50	54	50	54
Module Operating Weight w/Water (lbs)[3]	2,250	2,410	2,250	2,410	3,115	3,275
Module Shipping Weight (lbs)[4]	2,035	2,195	2,035	2,195	2,735	2,895
Condenser Fans	**20**	**30**	**20**	**30**	**20**	**30**
Motor Type	T.E.	T.E.	T.E.	T.E.	T.E.	T.E.
HP	2.0	2.0	2.0	2.0	2.0	2.0
Quantity	1	2	1	2	1	2
Fan Type	Axial	Axial	Axial	Axial	Axial	Axial
Diameter	31.5”	31.5	31.5”	31.5	31.5”	31.5
Nominal Airflow (CFM per fan)	11,000	10,500	11,000	10,500	11,000	10,500
Nominal Airflow (Total CFM)	11,000	21,000	11,000	21,000	11,000	21,000
RPM	1,100	1,100	1,100	1,100	1,100	1,100
Maximum Design Working Pressure - refrigerant (PSI)	650	650	650	650	650	650
Condenser Coils	**20**	**30**	**20**	**30**	**20**	**30**
Fin Material	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
Tube Material	Copper	Copper	Copper	Copper	Copper	Copper
Dimensions (Quantity)	22” x 78” (4)	22” x 78” (4)	22” x 78” (4)	22” x 78” (4)	22” x 78” (4)	22” x 78” (4)
Rows Deep	4	4	4	4	4	4
Fins Per Inch	12	12	12	12	12	12
Evaporator	**20**	**30**	**20**	**30**	**20**	**30**
Heat Exchanger (Type)	Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate
Independent Refrigerant Circuits (quantity)	2	2	2	2	2	2
Water Storage Volume HX Only (gals.)	2.6	2.6	2.6	2.6	2.6	2.6
Water Storage Volume HX Plus 6” Main Headers (gals)	39.6	39.6	39.6	39.6	76.6	76.6
Maximum Design Working Pressure - Water Side (PSI)	300	300	300	300	300	300
Header Water Connections - Inlet/Outlet (inches)[5]	6”	6”	6”	6”	6”	6”

NOTES:

1. SHC - Simultaneous Heating and Cooling Heat Pump.
2. Unit tonnage and efficiency at AHRI rating conditions: 44°F leaving chilled water temperature, 95°F entering condenser air temperature, flow rate is 2.4 GPM per ton through the evaporator with a .0001 fouling factor.
3. Module operational weight includes water, compressor oil, and refrigerant charge. Multiply times the number of modules for a total system operational weight.
4. Unit shipping weight includes refrigerant charge, compressor oil and packaging; based on transportation.
5. Main header water/fluid connections are ASME, 6” scheduled 40 pipe with grooved couplings, 300 psig maximum working pressure.
6. Each refrigerant circuit is capable of providing reliable operation down to 20°F ambient with proper freeze protection.

Physical Data

Model UCA	Cooling Only		Heat Pump		SHC	
	50	70	50	70	50	70
Capacity (Tons)[2]	44.0	62.7	41.4	59.0	41.4	59.0
EER[2]	10.5	10.1	9.88	9.601	9.88	9.601
Refrigerant Circuits (quantity)	2.0	2.0	2.0	2.0	2.0	2.0
Compressor Type	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Compressor Quantity	2	2	2	2	2	2
Compressor Nominal Hp (per circuit)	25	35	25	35	25	35
Refrigerant Charge R-410A (lbs)	114	124	114	124	114	124
Module Operating Weight w/Water (lbs)[3]	4,101	4,275	4,101	4,275	4706	4880
Module Shipping Weight (lbs)[4]	3,855	4,005	3,855	4,005	4,255	4,405
Condenser Fans	**50**	**70**	**50**	**70**	**50**	**70**
Motor Type	T.E.	T.E.	T.E.	T.E.	T.E.	T.E.
HP	1.5	1.5	1.5	1.5	1.5	1.5
Quantity	4	4	4	4	4	4
Fan Type	Axial	Axial	Axial	Axial	Axial	Axial
Diameter	31.5	31.5	31.5	31.5	31.5	31.5
Nominal Airflow (CFM per fan)	10,500	10,500	10,500	10,500	10,500	10,500
Nominal Airflow (Total CFM)	42,000	42,000	42,000	42,000	42,000	42,000
Max RPM	1,100	1,100	1,100	1,100	1,100	1,100
Maximum Design Working Pressure - refrigerant (PSI)	650	650	650	650	650	650
Condenser Coils	**50**	**70**	**50**	**70**	**50**	**70**
Fin Material	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
Tube Material	Copper	Copper	Copper	Copper	Copper	Copper
Dimensions (Quantity)	22” x 78” (8)	22” x 78” (8)	22” x 78” (8)	22” x 78” (8)	22” x 78” (8)	22” x 78” (8)
Rows Deep	4	4	4	4	4	4
Fins Per Inch	12	12	12	12	12	12
Evaporator	**50**	**70**	**50**	**70**	**50**	**70**
Heat Exchanger (Type)	Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate
Independent Refrigerant Circuits (quantity)	2	2	2	2	2	2
Water Storage Volume HX Only (gals.)	4.9	7.7	4.9	7.7	4.9	7.7
Water Storage Volume HX Plus 6” Main Headers (gals)	43.5	48.4	43.5	48.4	43.5	48.4
Maximum Design Working Pressure - Water Side (PSI)	300	300	300	300	300	300
Header Water Connections - Inlet/Outlet (inches)[2]	6”	6”	6”	6”	6”	6”

NOTES:
1. SHC – Simultaneous Heating and Cooling Heat Pump.
2. Unit tonnage and efficiency at AHRI rating conditions: 44°F leaving chilled water temperature, 95°F entering condenser air temperature, flow rate is 2.4 GPM per ton through the evaporator with a 0.0001 fouling factor.
3. Module operational weight includes water, compressor oil, and refrigerant charge. Multiply times the number of modules for a total system operational weight.
4. Unit shipping weight includes refrigerant charge, compressor oil and packaging, based on transportation.
5. Main header water/fluid connections are ASME, 6” scheduled 40 pipe with grooved couplings, 300 psig maximum working pressure.

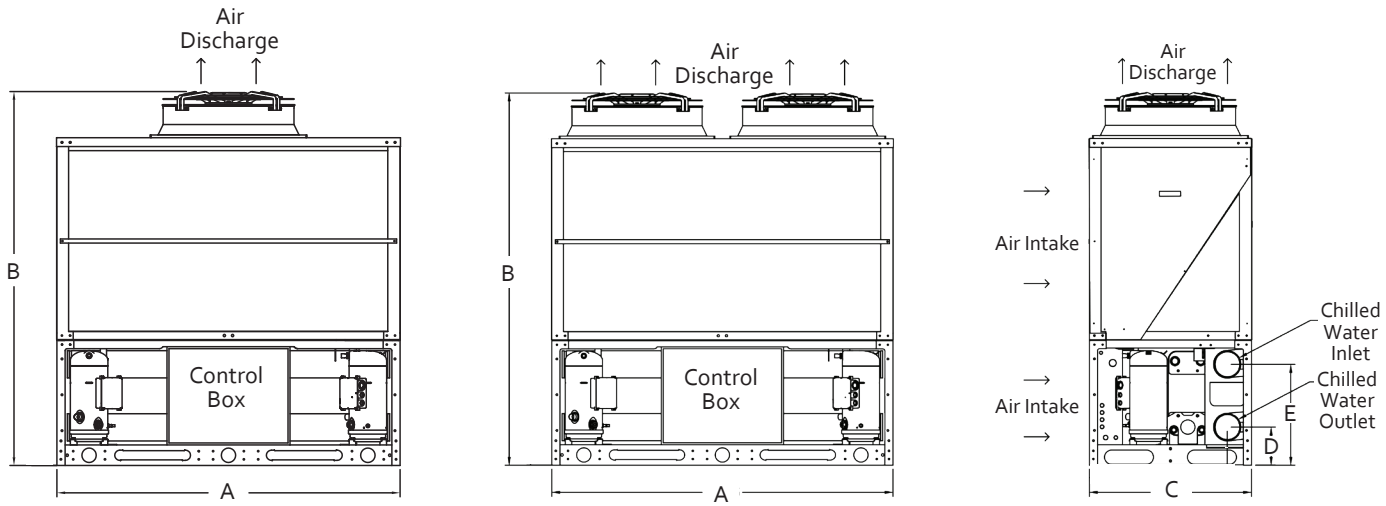
Physical Data

Free Cooling	Free Cooling	
Fans	**30**	**70**
Motor Type	T.E.	T.E.
HP	2.0	2.0
Quantity	2	4
Fan Type	Axial	Axial
Diameter	31.5	31.5
Airflow (CFM per circuit)	21,000	42,000
RPM	1,100	1,100
Free Cooling Coils	**30**	**70**
Fin Material	Aluminum	Aluminum
Tube Material	Copper	Copper
Dimensions (Quantity)	20” x 78” (4)	20” x 78” (8)
Rows Deep	6	6
Fins Per Inch	8	8
Miscellaneous Information	**30**	**70**
Maximum Design Working Pressure - Water Side (PSI)	300	300
Header Water Connections - Inlet/Outlet (inches)	6”	6”
Module Operating Weight[1]	2,000	4,000
Module Shipping Weight[2]	1,590	3,180

NOTES:
1. Module operational weight includes water. Multiply times the number of modules for a total system operational weight.
2. Unit shipping weight includes packaging; based on transportation.

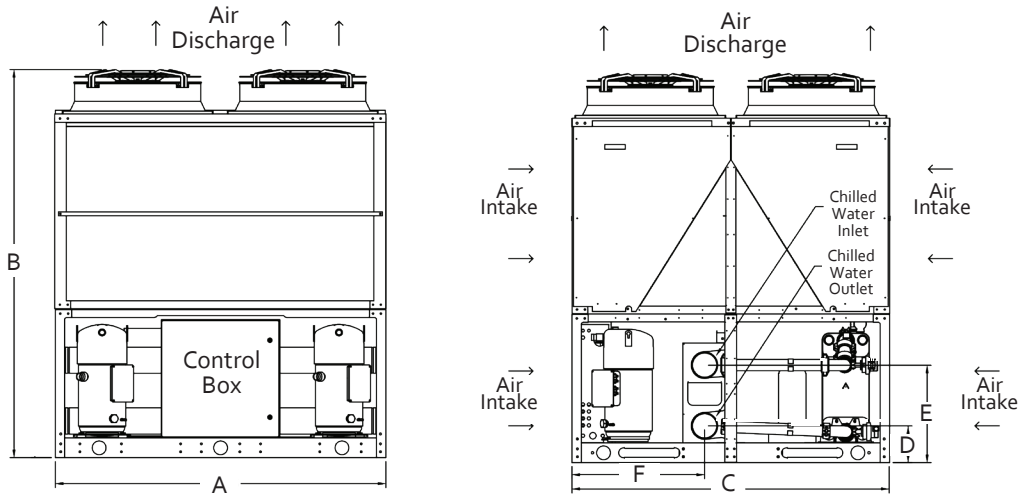
Dimensional Data and Drawings

Figure 1 - Cooling Only, UCA 020 & 030



Model UCA	Voltage	A Unit Width (in.)	B Unit Height (in.)	C Unit Depth (in.)	D Header Location (in.)	E Header Location (in.)	Header Connection (in.)
020	208, 230, 460, 575/3/60	83 ¾	92	39 ¾	9 ³⁄₁₀	24 ⁷⁄₁₀	6
030	208, 230, 460, 575/3/60	83 ¾	92	39 ¾	9 ³⁄₁₀	24 ⁷⁄₁₀	6

Figure 2 - Cooling Only, UCA 050 & 070

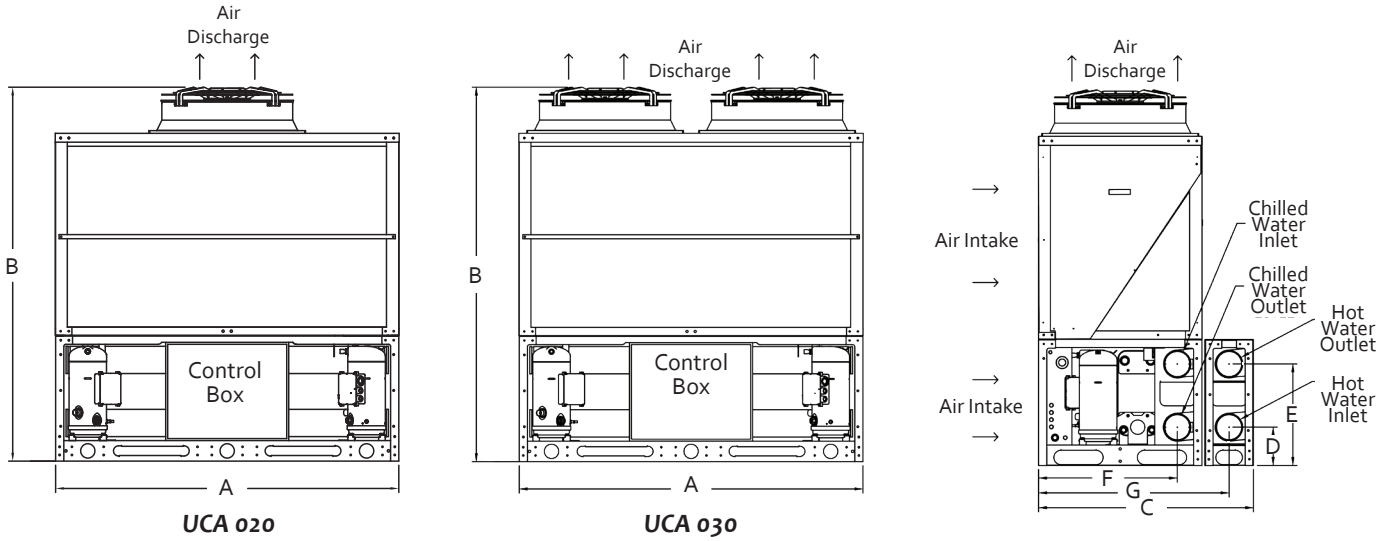


Model UCA[1]	Voltage	A Unit Width (in.)	B Unit Height (in.)	C Unit Depth (in.)	D Header Location (in.)	E Header Location (in.)	F Header Location (in.)	Header Connection (in.)
050	208, 230, 460, 575/3/60	83 ¾	99 ⅛	80 ½	9 ³⁄₁₀	24 ⁷⁄₁₀	33 ⅘	6
070	208, 230, 460, 575/3/60	83 ¾	99 ⅛	80 ½	9 ³⁄₁₀	24 ⁷⁄₁₀	33 ⅘	6

NOTE:
1. The model UCA 050 and 070 cannot be coupled back-to-back.

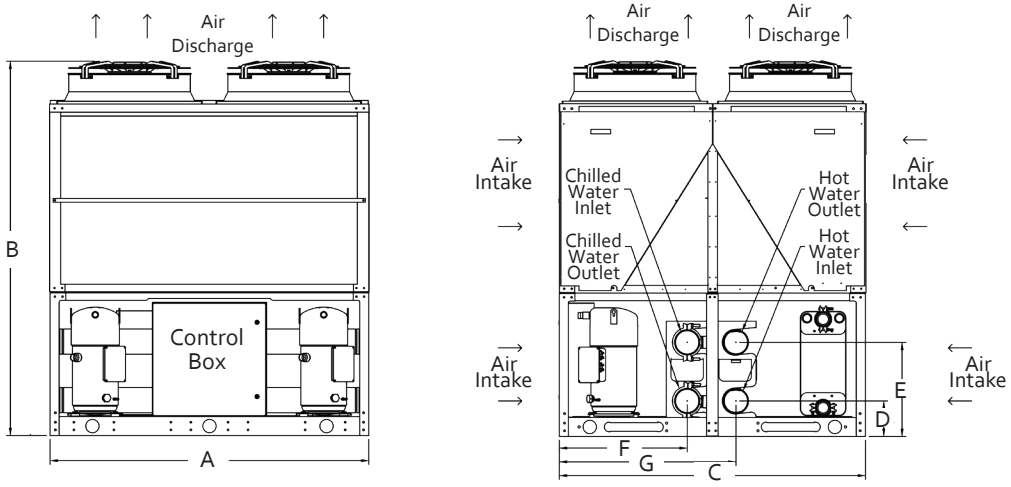
Dimensional Data and Drawings

Figure 3 - Simultaneous Heating & Cooling 020 & 030



Model UCA[1]	Voltage	A Unit Width (in.)	B Unit Height (in.)	C Unit Depth (in.)	D Header Location (in.)	E Header Location (in.)	F Header Location (in.)	G Header Location (in.)	Header Connection (in.)
020 SHC	208, 230, 460, 575/3/60	83 ¾	92	52 ½	9 3⁄10	24 7⁄10	33 ⅘	46 ⅗	6
030 SHC	208, 230, 460, 575/3/60	83 ¾	92	52 ½	9 3⁄10	24 7⁄10	33 ⅘	46 ⅗	6

Figure 4 - Simultaneous Heating & Cooling 050 & 070

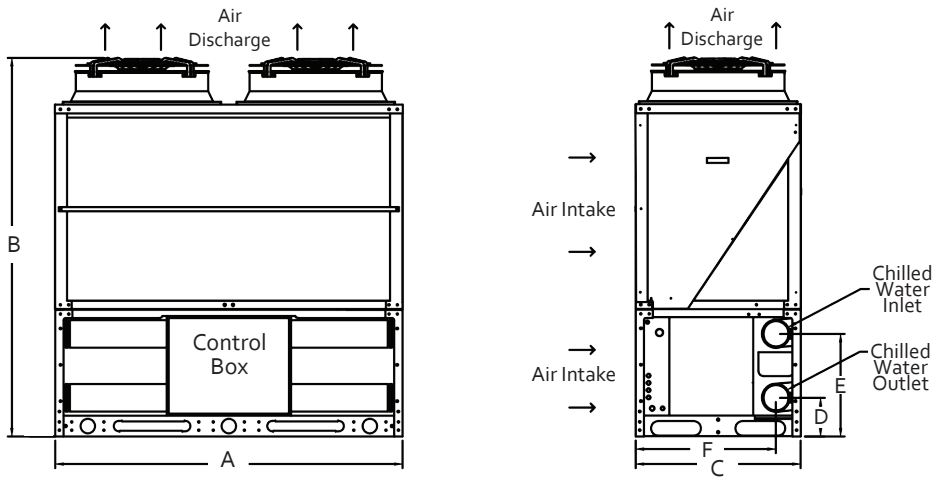


Model UCA[1]	Voltage	A Unit Width (in.)	B Unit Height (in.)	C Unit Depth (in.)	D Header Location (in.)	E Header Location (in.)	F Header Location (in.)	G Header Location (in.)	Header Connection (in.)
050 SHC	208, 230, 460, 575/3/60	83 ¾	99 ⅛	80 ½	9 3⁄10	24 7⁄10	33 ⅘	46 ⅗	6
070 SHC	208, 230, 460, 575/3/60	83 ¾	99 ⅛	80 ½	9 3⁄10	24 7⁄10	33 ⅘	46 ⅗	6

NOTES:
1. All SHC models cannot be coupled back-to-back.

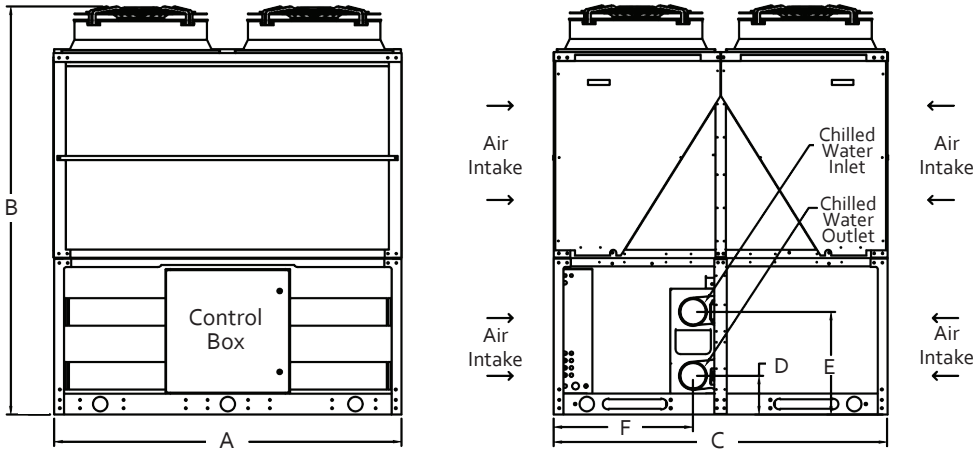
Dimensional Data and Drawings

Figure 5 - Free Cooling, UCF 030



Model UCF	Voltage	A Unit Width (in.)	B Unit Height (in.)	C Unit Depth (in.)	D Header Location (in.)	E Header Location (in.)	F Header Location (in.)	Header Connection (in.)
030	208, 230, 460, 575/3/60	83 ¾	92	39 ¾	9 3⁄10	24 7⁄10	33 ⅘	6

Figure 6 - Free Cooling, UCF 070



Model UCF[1]	Voltage	A Unit Width (in.)	B Unit Height (in.)	C Unit Depth (in.)	D Header Location (in.)	E Header Location (in.)	F Header Location (in.)	Header Connection (in.)
070	208, 230, 460, 575/3/60	83 ¾	99 ⅛	80 ½	9 3⁄10	24 7⁄10	33 ⅘	6

NOTE:
1. The model UCF 070 cannot be coupled back-to-back.

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 7

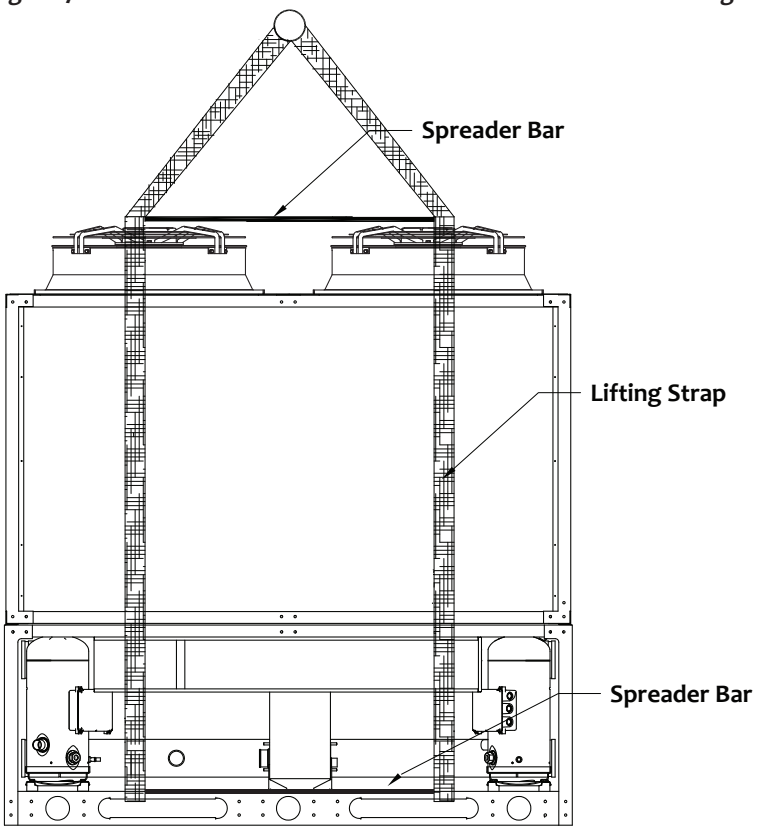
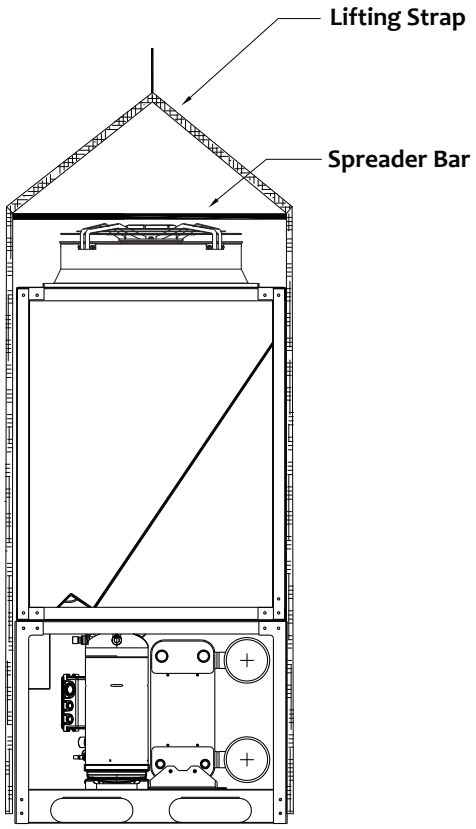


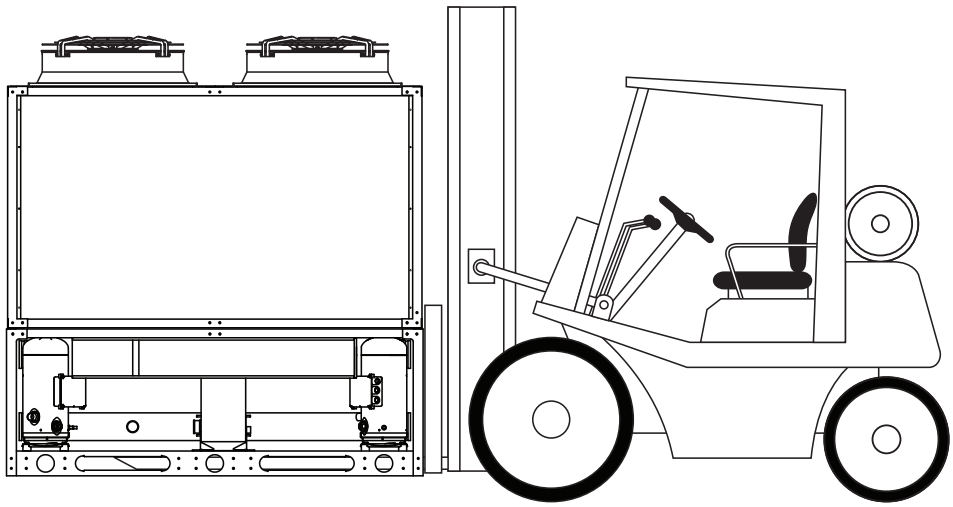
Figure 8



Lifting and Transporting Modules

Forklifts are required for lifting and transporting the module. Each module has base cutouts provided for ease of maneuverability.

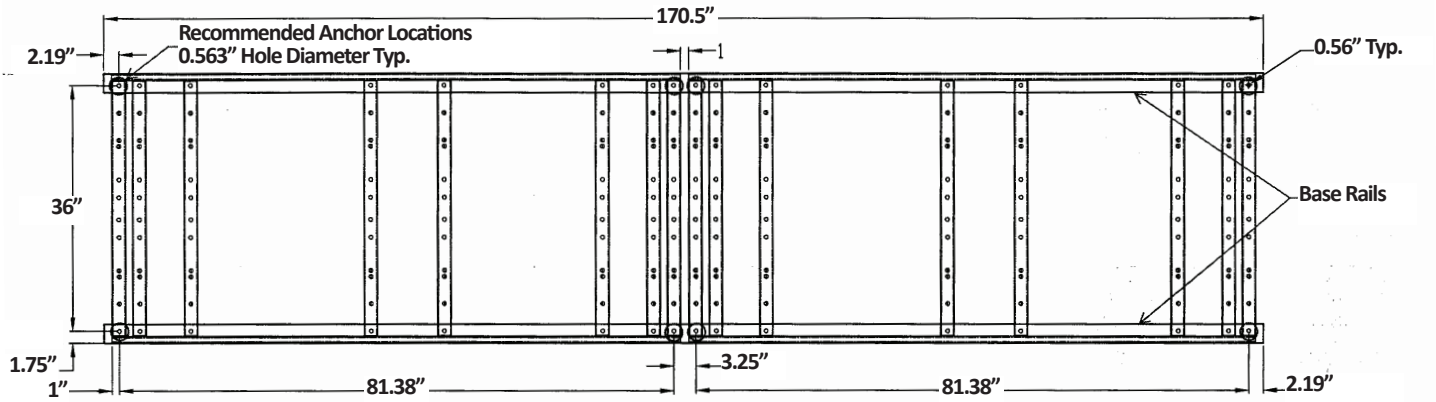
Figure 9



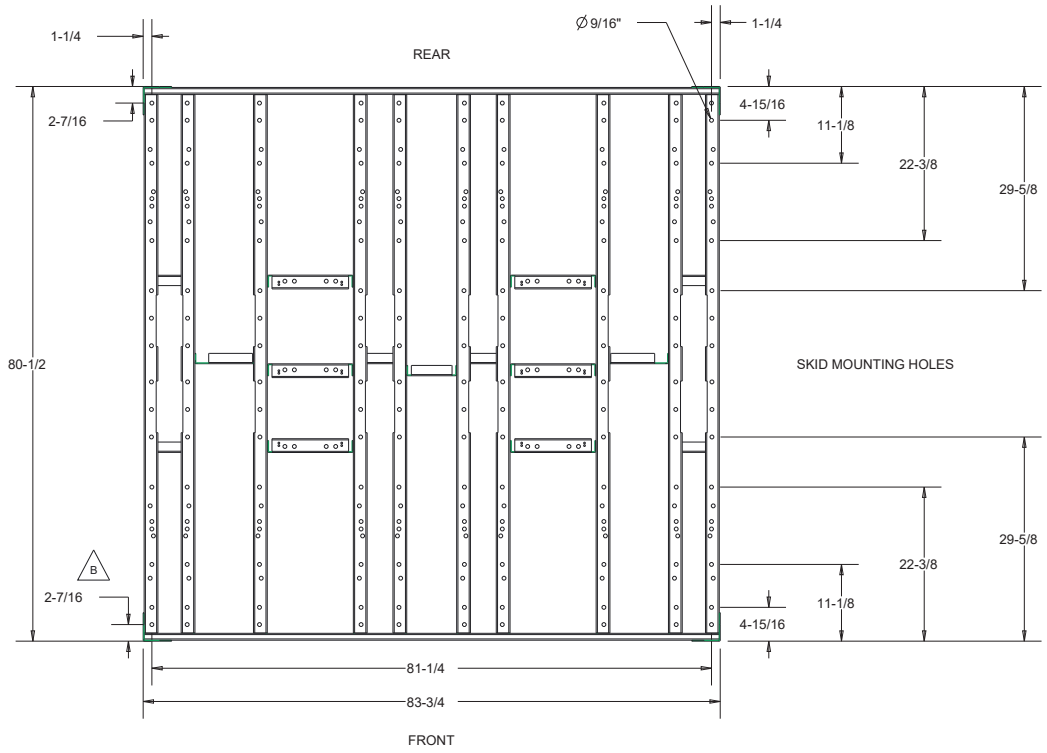
Mounting Rail and Vibration Isolation

ClimaCool recommends locking down the chiller to a concrete base or with the two (2) 4" base mounting rails using the six bolt holes provided in each base pan (see Figure 10). 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 11 and 12.

Figure 10 - UCA 020 - 030 Support Rails and Anchor Locations



UCA 050 - 070 Bolt Holes



Mounting Rail and Vibration Isolation

Figure 11 - Spring Vibration Isolators Option

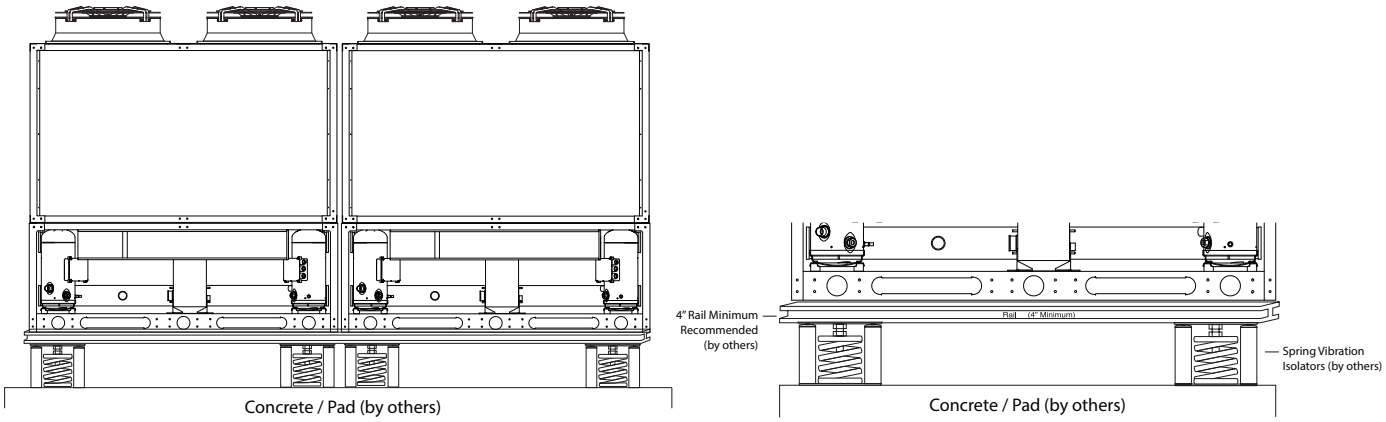
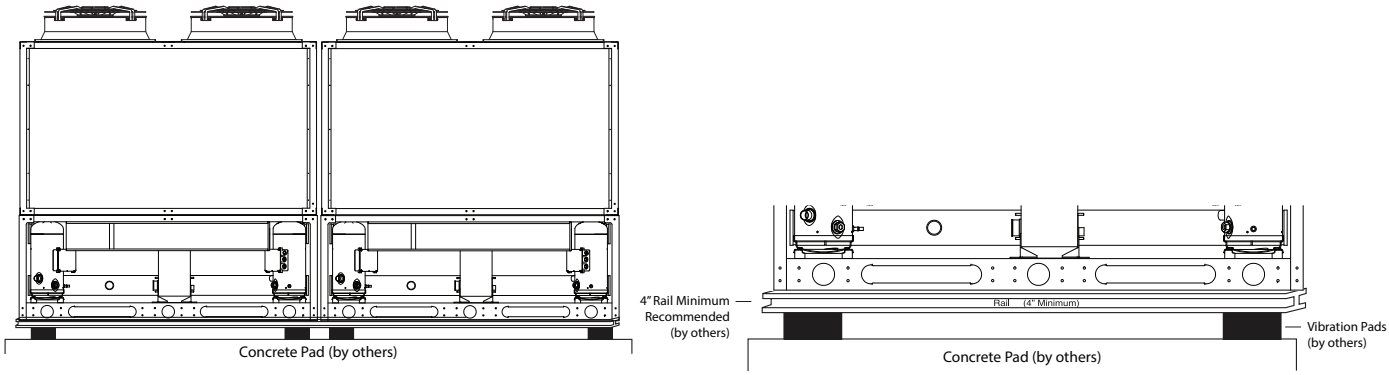


Figure 12 - Vibration Isolation Pads Option



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

Recommended Service Clearances

Figure 13 - End-to-End Configuration for UCA020 or 030 sizes only

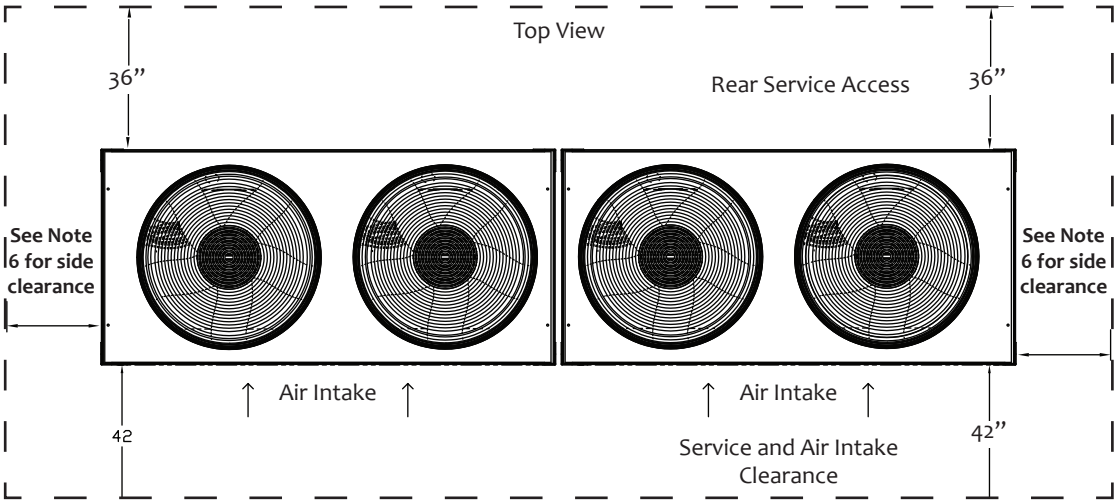
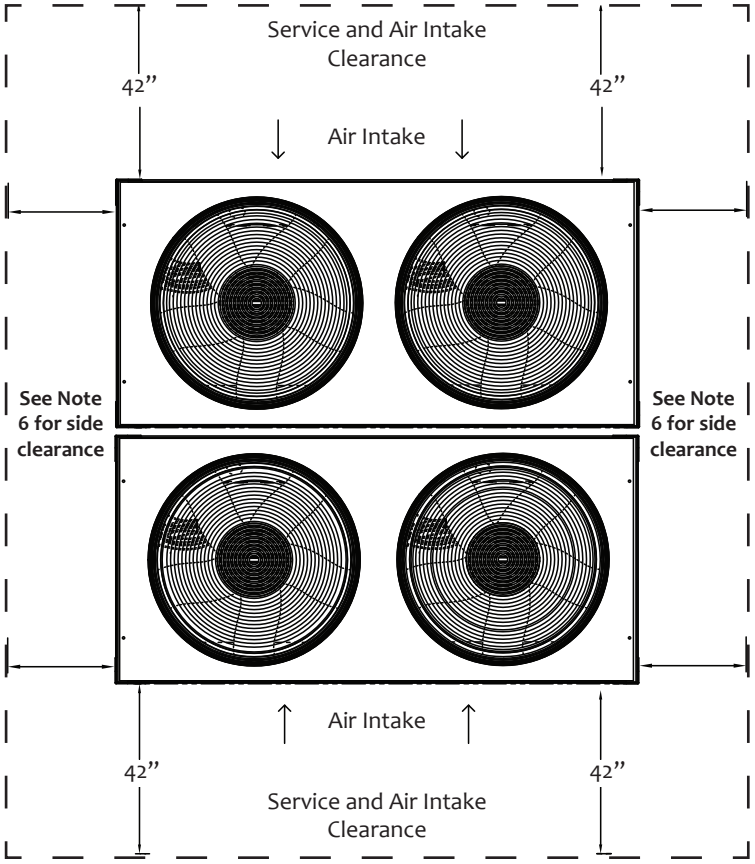


Figure 14 - Back-to-Back Configuration



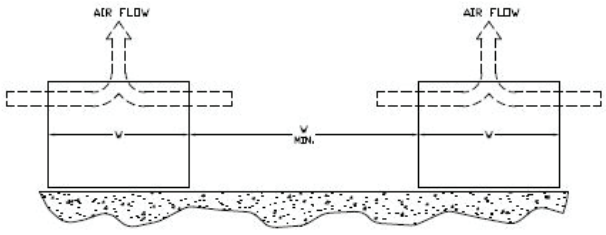
NOTES:

1. UCA/UCF 20 and 30 ton modules, end-to-end configuration require 42” clearance for electrical panels and 36” clearance for rear service access.
2. UCA/UCF 20 and 30 ton modules, back-to-back configuration require 42” clearance for all service and air intake sides.
3. UCA 50, 70 and UCF 70 ton modules can only be installed in the end-to-end configuration and require 42” clearance for both service and air intake sides.
4. Allow an unobstructed height clearance for airflow.
5. Local building or electrical codes may require additional clearance. Consult applicable codes.
6. Provide side clearance as required for field piping connections and components.

Unit Installation

Foundation for Unit Placement
The minimum foundation requirement for the ClimaCool chiller is a level surface capable of bearing the combined operating weight of the modules (See Physical Data - page 4-6).

Multiple Units/Banks
Multiple units/banks can be placed next to each other, side by side, as long as there is at least one width distance (or 84 in) between them, that being the width of the largest unit.



Service Access
Recommended Service Clearances and Bank Dimensions shown on page 13.

Draining
When performing standard maintenance procedures such as flushing a heat exchanger, it will be necessary to close off a section of a module. ClimaCool modular chillers offer optional water isolation valves for this purpose.

Assembling Modules
ClimaCool recommends locking down the chiller to a concrete base, or with the two (2) 4" base mounting rails using the bolt holes provided in the unit base. Although the compressors are installed on anti-vibration mountings, further isolation of the chiller from the structure is available by installing vibration eliminating springs or pads under the base rails on which the chiller will rest(See page 11 – Mounting Rail and Vibration Isolation). One end of the modules 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 two (2) for air cooled and heat pump applications and four (4) for simultaneous heat pump applications.
- Mounting hardware kit containing necessary bolts, spacers, nuts and washers.
- Header bank end cap kit containing two (2) each for air cooled and heat pump and four (4) each for simultaneous heat pump applications.
- Groove by groove 6" nipples, one (1) required per header.

Field installing the mounting hardware kit will assist with alignment of the modules in a bank and eliminate offset inconsistencies. The arrows in Figure 16, page 15 show the end to end and back to back holes for the 1" spacers between the units. The spacers will allow for a 1" separation between modules in both the end to end and back to back configurations.

Once the spacers are installed, the distance from the outside corner post upright to the adjacent outside corner post upright will be 1". Using the appropriate tools, tighten hardware assembly until seated.

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. Apply a thin layer of silicone or other non-petroleum lubricant to the sealing lips of the gasket and to the exterior of the gasket. Install gaskets on the pipe ends of one of the two modules to be mated. **Be sure the gasket is completely on the pipe so damage will not occur in the next step.**

One groove by groove 6" nipple per header is required to complete the connection between each module. Move the second module into position and line up the piping. Ensure you are maintaining alignment for any additional modules to be added. When pipe 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 the coupling halves over the gasket and make sure that the coupling keys, (the part that goes into the groove), are engaged into the grooves. Insert the bolts and install nuts to hand tight. Make sure that the oval neck of the bolt engages into the bolt hole of the housing. **Tighten nuts alternately and equally until the bolt pads meet and make metal to metal contact.** Tighten nuts by another 1/4 to 1/2 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.**

Assembling Modules Back to Back for UCA020 & 030 sizes only
To assemble module in a back to back configuration, see Figure 17.

- Remove zip tie from lower 2" flexible hose on the header-less unit.
- Loosen the lower 2" grooved coupling from the bottom header and remove the end cap.
- Lubricate the rubber gasket with approved grooved coupling lubricant.
- Insert the end of the flexible hose from the header-less unit into the 2" grooved coupling on the header where the end-cap was previously removed.
- Equally tighten the 2 bolts to 15 to 22 ft-lbs of torque.
- Repeat above procedure for the upper hose connection.

Figure 15 - Hardware Kit

Figure 16 - Spacer Holes

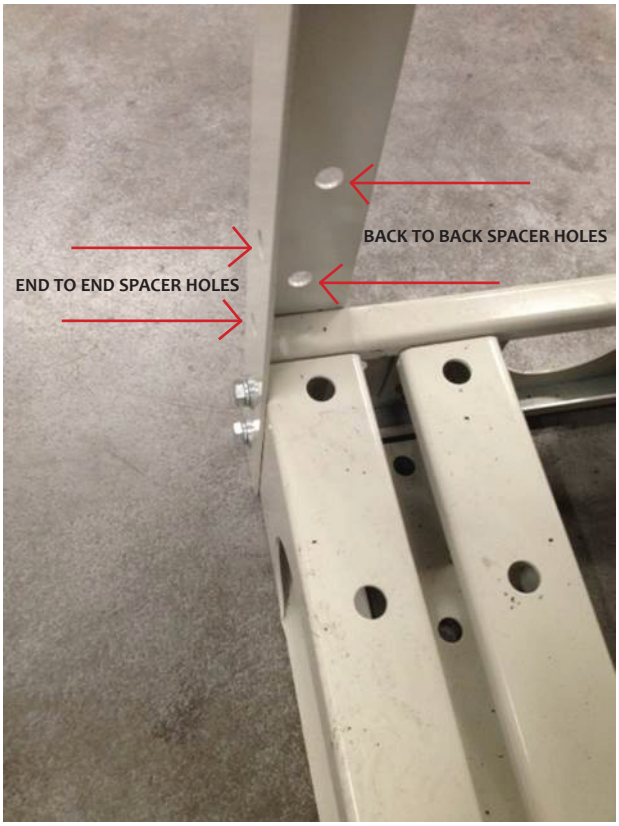
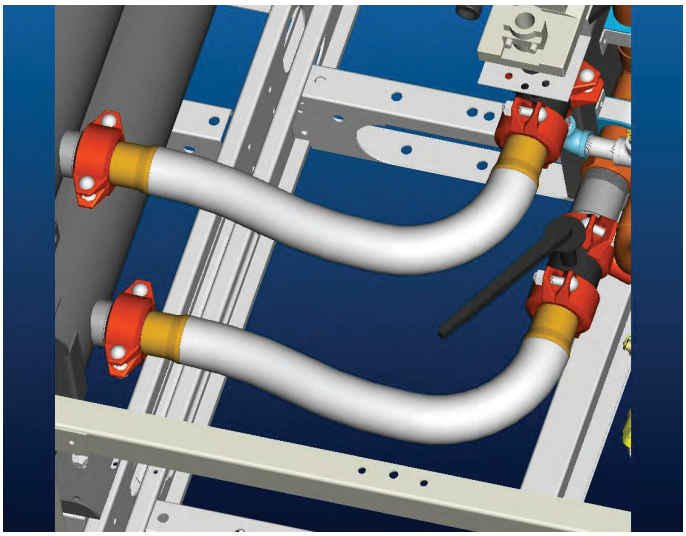


Figure 17 - Back to Back



Header Insulation

Chilled water piping is pre-insulated on each module at the factory with 3/4" closed cell insulation. **After bolting all modules together and leak testing, the entire coupling connection will need to be insulated by the installing contractor.**

Access Panels

To operate efficiently, side access panels shipped with the module, must be in place before installing adjacent module and always prior to operation of the bank. Lower side acess panels are available as an option.

The power for 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 upper right side of 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 shut off.** A typical power wiring is located on page 60 – 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* Bank Control Panel. Communication between the Bank Controller and chiller modules requires a simple two-conductor, 22 AWG shielded cable 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.**

See ARC156 Specifications on the next page. Refer to the Power Distribution schematic on page 60 and Wiring Diagrams on pages 87-88 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 damaging the compressors. ClimaCool recommends the use of a phase sequence indicating instrument following the manufactures directions. Another alternative would be 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* Bank 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* Bank 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 18.**

⚠ 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/ADVERTISSEMENT		
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.

⚠ CAUTION/ATTENTION	
3 PHASE SCROLL COMPRESSOR UNIT	**UNITÉ 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 characteristsics 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; • Compressuers 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.

Communications Wiring

Avoiding Noise*

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

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

ARC156 Wiring Specifications

Below are the specifications for ARC156 wiring. The wire jacket and UL temperature rating specifications list two acceptable alternatives. Halar® has a higher temperature rating and a tougher outer jacket than SmokeGard®, and it is appropriate for use in applications where you are concerned about abrasion. Halar is also less likely to crack in extremely low temperatures.

⚠ WARNING/ADVERTISSEMENT

For field installation of Port 1 communication wiring, installer must use:
- ARC-156 communication wire
- single-twisted pair
- shielded with drain
- low capacitance (12.5 pF/ft)
- 22AWG

This conductor must be daisy chained from the CoolLogic Controller to each chiller module.

Maximum separation of low voltage communication and high voltage power wiring is required.

The communication cable must be installed in its own conduit. Routing must enter and exit the low voltage section of the control box where the controller is located and should not be ran parallel to, or any closer than 6 inches from, any high voltage AC or DC wiring either inside or outside of the machinery compartment.

Pour l'installation sur place du câblage de communication du port 1, l'installateur doit utiliser:
- le câble de communication ARC-156
- Paire à simple torsion
- blindée avec drain
- faible capacité (12.5 pF/ft)
- 22AWG

Ce conducteur doit être connecté en guirlande du contrôleur CoolLogic à chaque module de refroidissement.

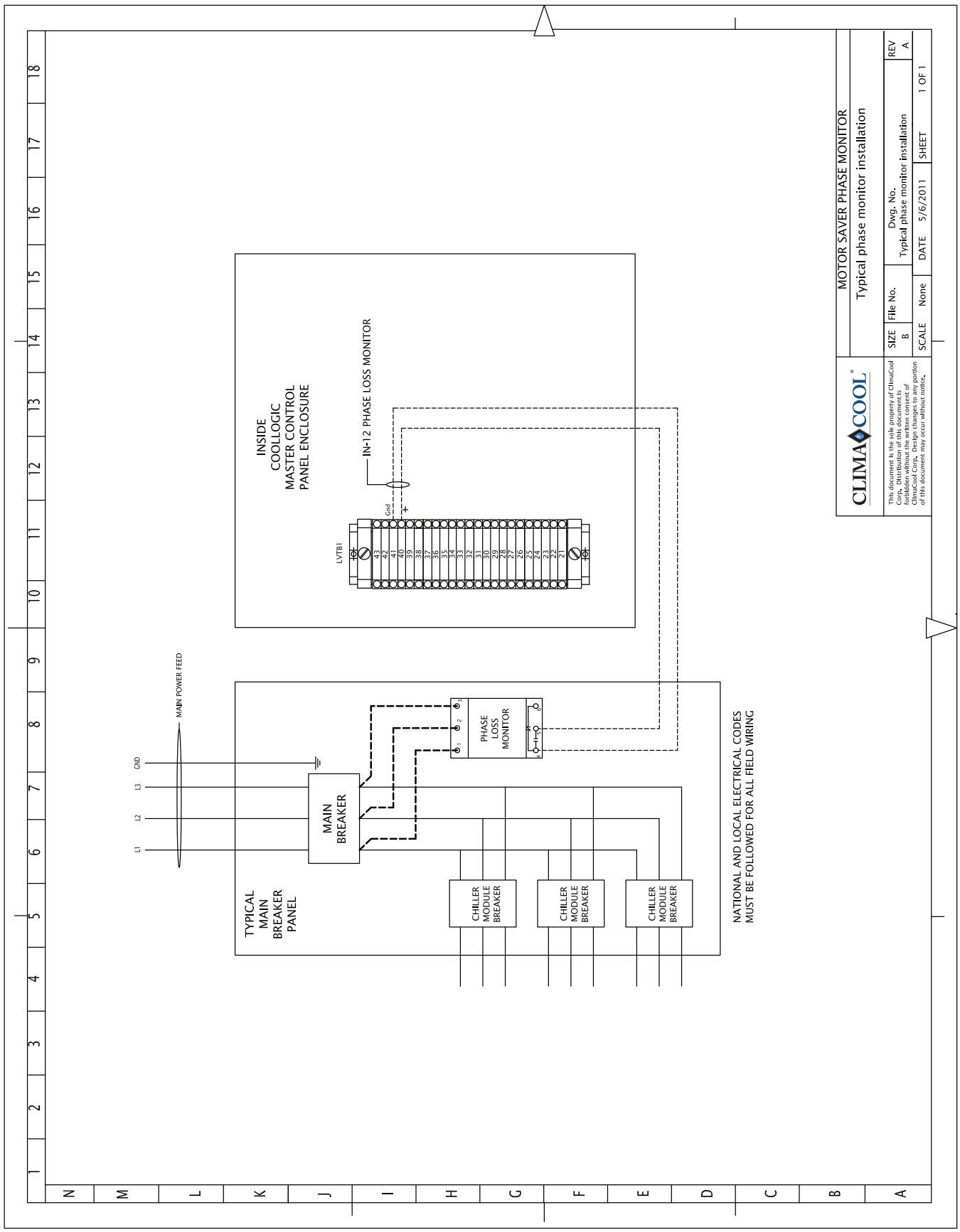
Le fil doit être installé dans son propre conduit. L'acheminement doit entrer et sortir de la section basse tension du boîtier de commande où se trouve le contrôleur et ne peut pas circuler à moins de 6 à 8 pouces de tout câblage de tension CA à l'intérieur ou à l'extérieur du compartiment des machines.

***NOTES:**
- If noise is a problem and you cannot move the wiring, use ferrite clamp-on chokes on the cabling to improve signal quality.
- Use the specified type of wire and cable for maximum signal integrity.

ARC156 Specifications

Description	Single twisted pair, low capacitance (12pF), CL2P, 22 AWG (7x30), TC foam FEP, plenum rated cable
Conductor	22 AWG (7x30) stranded copper (tin plated) 0.030 in. (0.762 mm) O.D. **NOTE:** 24 AWG can be used for segments <200 ft. (6.7 m).
Insulation	Foamed FEP 0.015 in. (0.381 mm) wall 0.060 in. (1.524 mm) O.D.
Color code	Black/white
Twist lay	2 in. (50.8 mm) lay on pair 6 twists/foot (20 twists/meter) nominal
Shielding	Aluminum/Mylar shield with 24 AWG (7x32) TC drain wire
Jacket	**SmokeGard®** (SmokeGard PVC) 0.021 in. (0.5334 mm) wall 0.175 in. (4.445 mm) O.D. **Halar®** (ECTFE) 0.010 in. (0.254 mm) wall 0.144 in. (3.6576 mm) O.D.
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 nominal
Weight	12 lbs./1000 feet (17.9 kg/km)
UL temperature rating	**SmokeGard®** 167°F (75°C) **Halar®** -40 to 302°F (-40 to 150°C)
Voltage	300 Vac, power limited
Listing	UL: NEC CL2P, or better

Wiring Diagram-Voltage/Phase Monitor



Water Piping

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 the chilled water system. (See Figures 21 and 22 on page 21 - Water Piping Configurations for configurations with multiple modules). All water piping must be installed in accordance with applicable codes and standards.

Temperature Sensor and Wells

ClimaCool provides two (2) temperature sensors and wells with each two pipe chiller system and four (4) with simultaneous heating & cooling four pipe chiller systems configured 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 chilled water inlet and chilled water outlet (See Water Piping Configurations – page 21). **NOTE: Sensors must be fully inserted into the well to obtain proper readings, and the well must be installed such that it is fully immersed into the flowing water of the field piping. Use a slender, blunt instrument to gently push the sensor to the bottom of the sensor well.**

Pressure Differential Flow Sensor

It is imperative that minimum and maximum water flow rates, as defined in the Operational Limitations on page 27, are not exceeded. To prevent operation of the chiller without sufficient water flow to the evaporator, it is required to install a pressure differential flow sensor in the chilled water circuit. Place downstream of the strainer on the outlet of a straight pipe, as close to the module as possible. **Do not put in an elbow on the outlet.** When connecting tubing to the differential pressure sensor, be sure to bleed any air from the tubing before tightening. (See Water Piping Configurations – page 21).

Pressure Taps

The installing contractor must provide access ports for connecting the pressure differential flow temperature sensors and pressure gauges for the chilled water system. A 1/4" pressure tap is required on the inlet and the outlet of the chilled water system for a total of four (4) taps with each two (2) pipe chiller system and six (6) with each simultaneous heating and cooling four pipe chiller system. If a port is shared by the pressure differential flow sensor and the pressure gauge it will require two (2) 1/2" taps. (See Water Piping Configurations – page 21).

Water Isolation Valves

It is recommended to provide bank water isolation valves for proper isolation and maintenance of the chiller, pump and strainer (See Water Piping Configurations – page 21).

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 chilled water systems include a strainer with a minimum of 60 mesh screen for proper filtration.** The strainer must be installed as shown in the Water Piping Configurations on page 21 and be in place at all times when the chiller is operating.

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 load cooling, cooling only and load cooling and load heating, simutaneous heating and cooling heat pump with variable pumping. The chiller bank bypass must be piped in such a way that the temperature and pressure differential flow sensors are still sensing active flow. (See Water Piping Configuration – page 21). 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, however, this limits the number of modules remaining for that duty. Also, with a module acting as a bypass increased wear of heat exchangers may be caused by abrasion from bypass flow.

Figure 18 - Reverse Return

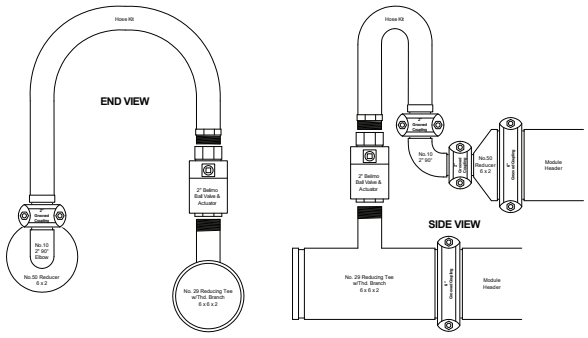


Figure 19 - Direct Return

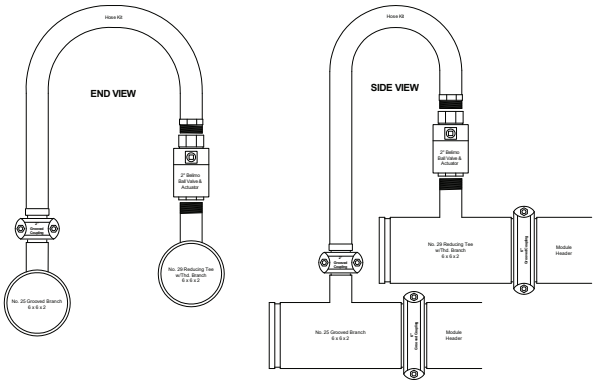


Figure 20 - Field Piping Direct Return - 1 to 5 Modules

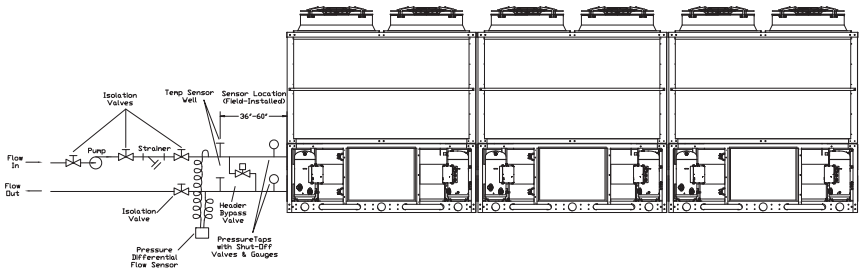
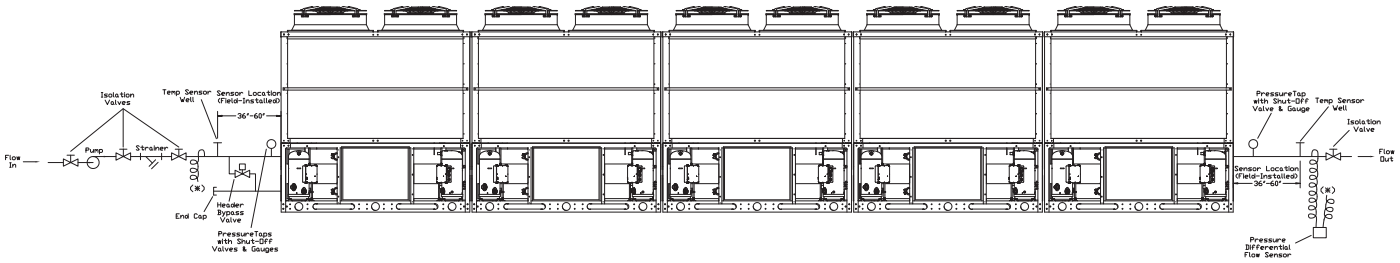


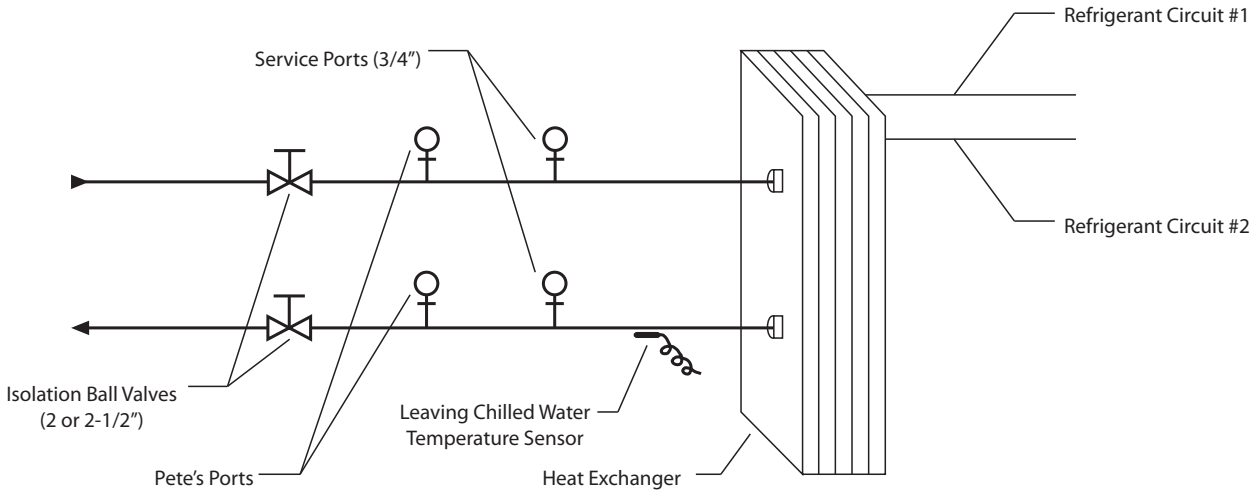
Figure 21 - Field Piping Reverse Return -(Preferred 1 to 5 modules) Required for 6 or more modules



NOTES:

1. Figures 20 and 21 are required piping for proper water regulation and distribution through ClimaCool modular chillers.
2. ClimaCool Standard Bank Package includes ship loose items to be installed in the field: strainer, temp sensors & wells, DP proof of flow sensors, bypass header kit, end caps & couplings for all water loops. The shown pump, isolation valves, & pressure taps with shut off valves & gauges are provided by others/ NOT included.
3. Module order and incoming/outgoing water flow, as shown in both Figure 20 and 21, can be set up as either a left-to-right or right-to-left configuration.
4. For chilled water (evaporator and hot water on simultaneous heating & cooling) inlet/outlet location dimensions, refer to pages 7-9 - Dimension Data and Drawings.
5. Chilled water hydronic circuit shown. Piping configurations are identical for the hot water hydronic circuit for SHC HP model.
6. The differential flow sensor provided as part of the ClimaCool Bank Package is a required proof of flow safety device on all water loops. Install the DP Sensor between the strainer and the entering side of the chiller as well as before the first water take off on the leaving side of the chiller. This sensor is NOT for pump control. The BAS should provide their own DP for VFD/ pump control.
7. A minimum first pass, 60 mesh strainer is required on each water loop. The 60 mesh strainer must be installed at time of start-up for valid warranty commencement. Installing dual strainers per water loop avoids bank shut down & is recommended for better redundancy.
8. Maximum water flow rates for the evaporator water header system in one bank of modules is 1,100 GPM.
9. Bypass header kits are provided & controlled for each water loop for all applications with motorized valves. System bypasses are provided & controlled by others.
10. Header bypass valve may be installed at either end of bank.
11. For over six (6) modules, please consult the factory.

Figure 22 - Chilled Water Circuit

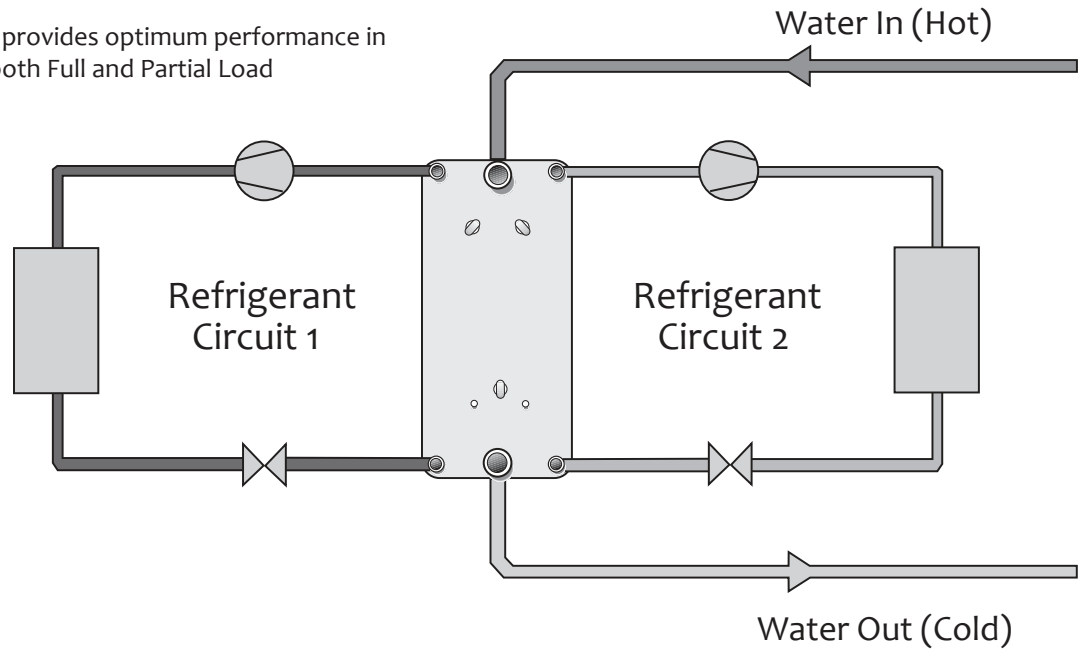


NOTE: Figure 22 depicts hydronic piping in each ClimaCool chiller module and is shown with water isolation valves.

Part-Load Performance Advantage

Figure 23

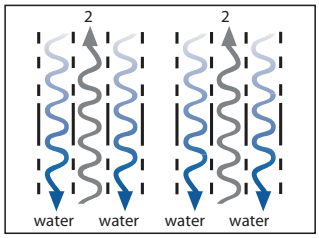
Coil design provides optimum performance in both Full and Partial Load



ClimaCool modular chillers employ reliable and highly efficient brazed plate heat exchangers. These compact exchangers are true dual-circuit heat exchangers in which each water channel is flanked by two refrigerant circuits. This design gives maximum performance, even at part-load.

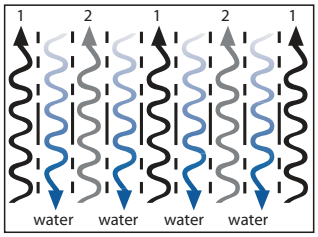
Refrigerant Circuit 2 Only

If circuit 1 is cut, the unique design allows each water channel to remain in contact with refrigerant circuit 2, providing optimum heat transfer.



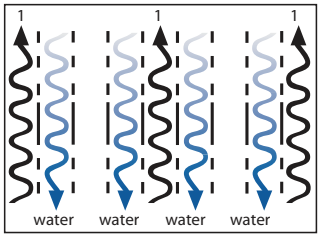
Refrigerant Circuits 1 and 2

Of course, full performance is attained when the dual-circuit heat exchangers are run to full-load (i.e. with both refrigerant circuits).



Refrigerant Circuit 1 Only

The same results are achieved if circuit 1 is ran and circuit 2 cut out; optimum heat transfer, even at part-load.



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 25.

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. It is 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 for modules **WITH** Water Isolation Valves:

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 that tee 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.

The following system is recommended to fill and leak check the water system for modules **WITHOUT** Water Isolation Valves:

1. Ensure that all drain valves are closed.
2. All modules are equipped with ¾" fill and flush valves with lines that tee into the inlet and outlet connections into and out of each heat exchanger. Ensure these ¾" valves are **CLOSED**.
3. The system should be filled with clean water sent through the strainer 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. 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 equipped with manual or automatic water isolation valves. If the modules are **NOT** equipped with water isolation valves, we recommend installing 3-way main header bypass valves so the initial water flow bypasses all module heat exchangers.
3. It is mandatory to run the pumps with the strainers in place (see Starting the Pumps section below 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 equipped with manual or automatic water isolation valves (see step 6 for modules **NOT** equipped with water valves). If bypass lines are not installed (described in step 1) it is recommended to drain out the initial fill of water to help flush out debris. 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.
6. If bypass lines are not installed (described in step 1) and the modules are **NOT** equipped with water isolation valves, it is recommended to drain out the initial fill of water to help flush out debris. Remove and clean the strainers before refilling and purging the system again. 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 project selection print-out or contact local representative). 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 Treatment

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 used in the ClimaCool chiller 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.**

Heavily 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.

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 and **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

Table 2 - Water Temperature Requirements

Water Temperature Limits	Load Loops	Minimum LWT[4]	Maximum LWT[4]
	Chilled Water	20°F[1]	62°F
	Hot Water	90°F	135°F (at 40°F ambient or above)

NOTES:

1. Operating in ambient temperatures below 36°F requires a suitable antifreeze solution.
2. All modules can operate in this range without the need of special controls.
3. A glycol solution additive is required at a lower operating suction temperatures in order to protect the evaporator from freeze-ups.
4. LWT: Leaving Water Temperature.
5. **When the chiller is exposed to lower ambient temperatures of 36°F (2.2 °C) or below, freeze-up protection is required using inhibited ethylene or propylene glycol. 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.**
6. The max LHWT will be limited in heating mode as the outdoor ambient falls.

⚠ ATTENTION

If chilled water is to be maintained at a temperature below 40°F (4.4°C) or outdoor temperatures are expected to be below 32°F (0°C), an antifreeze of sufficient concentration must be used to prevent freeze-up at anticipated suction temperatures.

Operating Limits

Table 4 - Voltage 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

Table 5 - Compressor Operating Limitations

Compressor Operating Limitations	UCA
Maximum Compression Ratio	5.7:1
Minimum Operating Pressure Differential (psi)	85
Maximum Operating Pressure Differential (psi)	475
Minimum Discharge Pressure (psig)	235
Maximum Discharge Pressure (psig)	590
Minimum Suction Pressure (No Glycol) (psig)	95
Minimum Suction Pressure (with Glycol) (psig)	70
Maximum Suction Pressure (psig)	155
Maximum Discharge Temperature (°F)	265
Minimum Subcooling (°F)	5
Maximum Subcooling (°F)	15
Minimum Superheat at Compressor (°F)	6
Maximum Superheat at Compressor (°F)	18
Maximum Oil Temperature (Max) (°F)	200
Maximum Saturation Discharge Temperature (°F)	145

Table 6 - Straight Cool Chiller Water Flow and Air Temperature Data

Straight Cool Chiller Water Flow and Air Temperature Data	Cooling Mode			
	UCA020	UCA030	UCA050	UCA070
Minimum Load Water Flow (gpm)	30	35	55	70
Maximum Load Water Flow (gpm)	140	155	245	310
Minimum Leaving Evaporator Water Temperature (No Glycol) (°F)	40	40	40	40
Minimum Leaving Evaporator Water Temperature (with Glycol) (°F)	20	20	20	20
Maximum Leaving Evaporator Water Temperature (°F)	62	62	62	62
Minimum Evaporator Water Differential Temperature (°F)	5	7	7	7
Maximum Evaporator Water Differential Temperature (°F)	15	15	15	18
Minimum Entering Condenser Air Temperature (°F)	20	20	20	20
Minimum Entering Condenser Air Temperature with 0°F Low Ambient Option	0	0	0	0
Maximum Entering Condenser Air Temperature (°F)	115	115	115	115

Table 7 - Heat Pump Chiller Water Flow & Air Temperature

Heat Pump Chiller Water Flow and Air Temperature Data	Cooling Mode			
	UCA020	UCA030	UCA050	UCA070
Minimum Load Water Flow (gpm)	30	35	55	70
Maximum Load Water Flow (gpm)	140	155	245	310
Minimum Leaving Evaporator Water Temperature (No Glycol) (°F)	40	40	40	40
Minimum Leaving Evaporator Water Temperature (with Glycol) (°F)	20	20	20	20
Maximum Leaving Evaporator Water Temperature (°F)	62	62	62	62
Minimum Evaporator Water Differential Temperature (°F)	5	7	7	7
Maximum Evaporator Water Differential Temperature (°F)	15	15	15	18
Minimum Entering Condenser Air Temperature (°F)	20	20	20	20
Maximum Entering Condenser Air Temperature (°F)	115	115	115	115
	Heating Mode			
	UCA020	UCA030	UCA050	UCA070
Minimum Load Water Flow (gpm)	30	35	52	70
Maximum Load Water Flow (gpm)	140	155	245	310
Minimum Leaving Hot Water Temperature (°F)	90	90	90	90
Maximum Leaving Hot Water Temperature (°F)	135	135	135	135
Minimum Hot Water Differential Temperature (°F)	4.2	5.7	5.5	7
Maximum Hot Water Differential Temperature (°F)	16	20	20	22.4
Minimum Entering Source Air Temperature (°F)	17	17	17	17
Maximum Entering Source Air Temperature (°F)	100	100	100	100

NOTE:

1. Operating in ambient temperatures below 36°F requires a suitable antifreeze solution.
2. If project operating parameters are needed outside of the above values, please contact your local sales representative.

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 as required all electrical terminal connections on each module.** 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* Bank Control Panel. Field connections are simplified requiring only a two conductor shielded cable daisy chain from the Bank Controller to the modules. These control wires should be two-conductor shielded having ARC156 wiring #22 AWG; #24 AWG can be used for segments to 200 feet, rated at 60°C minimum. **See ARC 156 Wiring Specs on page 17.** All field wiring must be identified (tagged).
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.
9. **Confirm all panels and electrical covers are properly installed/sealed, including the condenser fan motor cover.**

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.
4. Confirm the settings on all pressure switches.

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 the evaporator water systems.
4. Confirm the chilled water circulating pumps are operational and water is flowing through the exchanger.
5. Shut the entering water valve and blow out some water from the lower flush port to check for particles or coloration from suspended particles. Record the pressure differential across the chiller heat exchanger measured at the pete's ports at each module.
6. Confirm correct water flow rates through the evaporator. Acquire the design parameters for the chiller bank from the ClimaCool Selection Program data (available from your 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 of the mandatory factory provided field installed pressure differential flow sensor, temperature sensors and wells (**sensors should be fully inserted in the well and the well must be installed such that it is fully immersed into the flowing water of the field piping**) and verify calibration of sensors read through *CoolLogic* Control System.

Confirm installation of the **mandatory field installed chilled water strainer with minimum of 60 mesh screen.**

⚠ WARNING/ADVERTISSEMENT

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.

⚠ CAUTION/ATTENTION

3 PHASE SCROLL COMPRESSOR UNIT	UNITÉ 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 characteristsics 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; • Compressuers 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.

CLIMACOOL®
A NIBE GROUP MEMBER

Pre Start-Up Checklist* (Packaged Air-Cooled) UCA

E-mail technicalsupport@climacoolcorp.com • Phone: 405.815.3000

Project Name: **Date:**

Address/Phone:

		YES	NO
1.	Are modules connected properly per Codes and Installation Manual? (Installation, Operation & Maintenance (IOM) Manual is available at www.climacoolcorp.com).	☐	☐
2.	Is there a 60 mesh strainer on the inlet water of each loop? (4 pipe SHC has two (2) loops) (Fill water to chiller being sure to pass through a minimum of 60 mesh strainer).	☐	☐
3.	Is chilled water system filled, flushed and all air purged from system? (All air **must be** purged from system prior to startup. See "Filling the Water System" in IOM).	☐	☐
4.	Are all pumps tested and operational?	☐	☐
5.	Are required GPM's (verified by pressure differential) supplied to the chilled water side? (See project specifications or selection and performance sheets available from ClimaCool Sales Rep).	☐	☐
6.	Are the pressure differential flow sensors properly installed and wired to the CoolLogic controller?	☐	☐
7.	Have all chiller coupling connections been leak tested?	☐	☐
8.	Is water presently circulating through chiller?	☐	☐
9.	Verified that temperature sensors and voltage/phase monitor have been installed?	☐	☐
10.	Verified power supply agrees with chiller nameplate?	☐	☐
11.	Are power and communication wiring complete to each module?	☐	☐
12.	Verified that wiring and devices meet with approved electrical submittal drawings?	☐	☐
13.	Is required load available to run multiple compressors at start-up?	☐	☐
14.	Is a water header bypass installed at the chiller? ☐ ClimaCool provided? ☐ Field Provided? *(Check One)*		
15.	Are all panels and electrical covers properly installed/sealed, including condenser fan motor covers?	☐	☐

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 start-up date**.

* This form must be completed and submitted to ClimaCool Corp. **three (3) weeks** prior to final scheduling of any Start-up.
Note: If any of the above items are not complete at time of start-up, backcharges will be assessed for additional costs.

Contractor Name:

Address:

(Authorized Signature)

Phone: **Date:**

All startups must be performed by ClimaCool factory trained personnel.

1. Review all items are complete from the Pre Startup Checklist.
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 chiller bank). Confirm that all sensors are **FULLY INSERTED** into their sensor wells and wired back to the correct terminals in the bank control panel.
4. **Confirm all panels and electrical covers are properly installed/sealed, including the condenser fan motor cover.**
5. 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 bank 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.**
6. Verify that evaporator header inlets (hot water side if simultaneous application) include strainer assemblies equipped with 60 mesh screens.
7. 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 UCA models.
8. 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 16). Verify the low voltage output wiring from the phase loss monitor (terminals 4 and 5) back to the main *CoolLogic* controller, input channel 12.
9. Verify motorized water isolation valves auxiliary switch dial settings, to ensure they close near:
   - 30% for evaporator/chilled water valves for cooling only units and hot water/condener valves for Simultaneous Heating and Cooling units
10. 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.
11. Confirm the jumper locations for all bank 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 bank 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.
12. Tighten every screw and lug connection inside the *CoolLogic* Bank 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.
13. Verify the communication cable wiring to ensure it is ARC156 22 AWG, simple two conductor shielded cable and that the wiring is alone inside solid conduit between the bank 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 bank and each module as follows:
    Black wire to **Net–**
    White wire to **Net+**
    Shield wire to **Shield**
14. Power-up the bank control panel and download the appropriate clipping file into the bank controller, following instructions.
15. 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.
16. 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).
17. On 208/230V units, confirm transformer(s) are properly tapped for the measured incoming power supply.

18. 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 Bank 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).
19. Verify proper communications from each module back to the bank 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.
20. Set up the bank 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 (bank factory settings).
    - It is imperative to access EVERY MENU and EVERY PARAMETER to ensure all settings are appropriate.
21. 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.

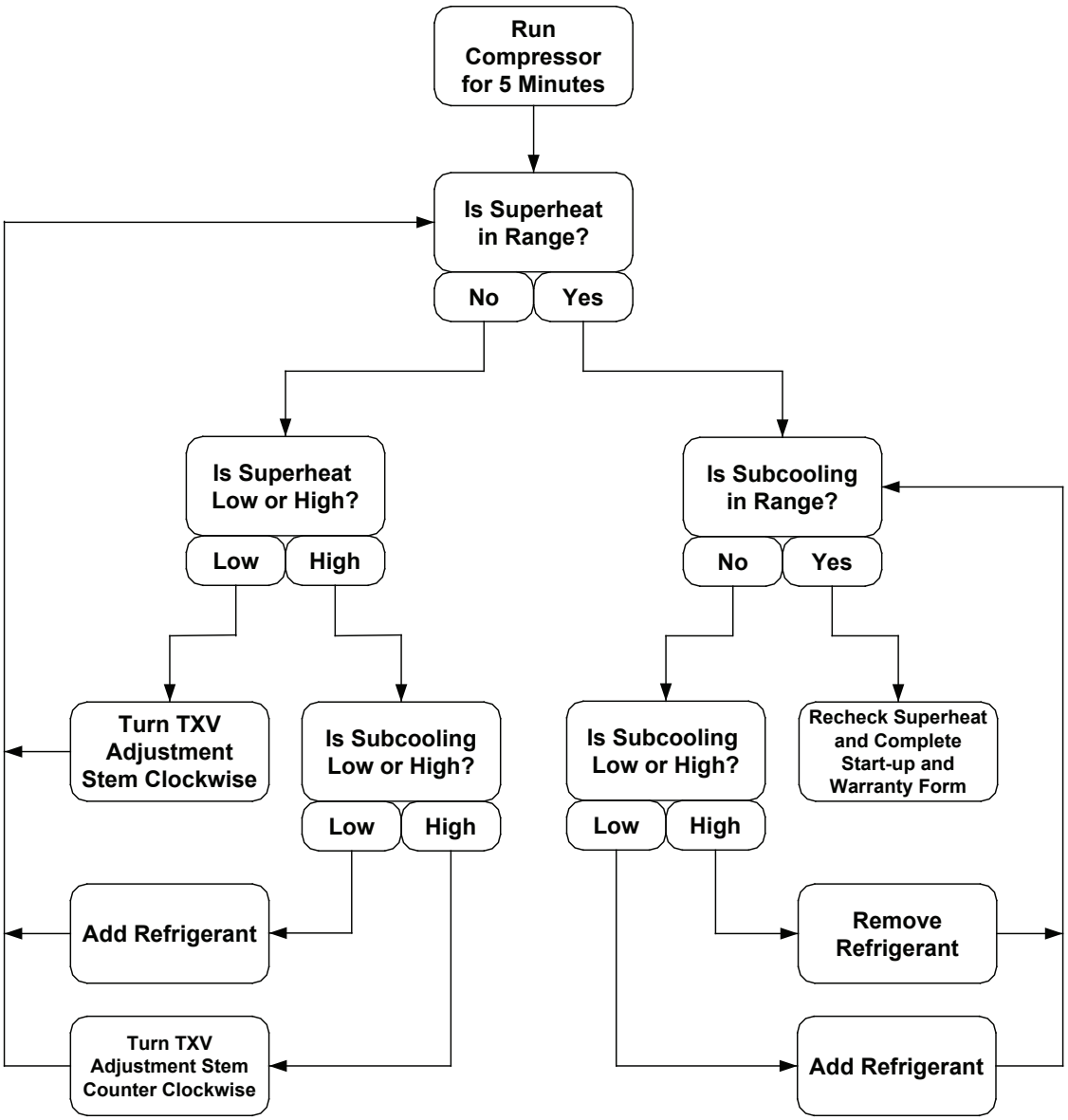
After checking compressor rotation, choose a circuit to be tested first. Connect test equipment to monitor the suction line and liquid line temperatures simultaneously. Place a manifold gauge set on the suction line and liquid line then start the compressor. As long as the suction pressure is high enough 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° 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 degrees and the discharge line temperature is not more that 220°F degrees. 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 degrees, 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.

Superheat & Subcooling 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 33 for Startup and Warranty Registration Form and page 92 for Warranty).

Water Testing

Extract three (3) water samples from each water side, evaporator/chilled for a cooling only application or evaporator/chilled and hot water/condenser for Simultaneous Heating and Cooling aplication using the bottles provided (three bags; each bag containing three 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 (Pkg Air-Cooled UCA)

Sign, date and E-mail to: technicalsupport@climacoolcorp.com
For any questions, call 405.815.3000/ Option 2, then Option 3

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 Pressure Entering / Leaving

Evaporator: _____/_____ _____Δ P

Water Samples Taken: (Mark "X")

Evaporator: ☐ Yes ☐ N/A

"Flow devices" shut off chiller below 40% of flow for Cool loop & 25% for Heat loop: (if used) ☐ 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

Voltage / Ground

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

Phase / Phase

Voltage:	L1/L2	L2/L3	L1/L3
Fan Amps:	L1 _____	L2 _____	L3 _____
Fan Amps:	L1 _____	L2 _____	L3 _____
Fan Amps:	L1 _____	L2 _____	L3 _____
Fan Amps:	L1 _____	L2 _____	L3 _____

Compressor Circuit #1

Amperage: L1 _____ L2 _____ L3 _____		
Sight Glass Oil Level:		_____
Suction Pressure (psig):		_____
Suction Temperature (F):		_____
Compressor Superheat (F):		_____
Discharge Pressure (psig):		_____
Discharge Temperature (F):	220° max	_____
Discharge Gas Superheat (F):	50° min	_____
Condenser Liquid Line Temperature (F):		_____
Condenser Liquid Subcooling Temp. (F):		_____
Evaporator Entering Water Temperature (F):		_____
Evaporator Leaving Water Temperature (F):		_____
Condenser Entering Air Temperature (F):		_____
Condenser Leaving Air Temperature (F):		_____
Evaporator Pressure Differential (psig):		_____

Compressor Circuit #2

Amperage: L1 _____ L2 _____ L3 _____		
Sight Glass Oil Level:		_____
Suction Pressure (psig):		_____
Suction Temperature (F):		_____
Compressor Superheat (F):		_____
Discharge Pressure (psig):		_____
Discharge Temperature (F):	220° max	_____
Discharge Gas Superheat (F):	50° min	_____
Condenser Liquid Line Temperature (F):		_____
Condenser Liquid Subcooling Temp. (F):		_____
Evaporator Entering Water Temperature (F):		_____
Evaporator Leaving Water Temperature (F):		_____
Condenser Entering Air Temperature (F):		_____
Condenser Leaving Air Temperature (F):		_____
Evaporator Pressure Differential (psig):		_____

Software Version: _____

▶ Verify Safety Setting Limits:

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

▶ Verify Safety Setting Limits:

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

Are all panels and electrical covers properly installed/sealed, including condenser fan motor covers? ☐

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

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							
Chilled No.							
Technician							
	Sun.	Mon.	Tue.	Wed.	Thur.	Fri.	Sat.
Chilled Water Entering Temperature							
Chilled Water Leaving Temperature							
Chilled Water Pressure Drop							
Faults: Note by Module Number							

Daily

- A daily operational log should be kept.
- Perform visual inspection.
- Record entering and leaving chilled 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 controller operating parameters and setpoints.

- Check temperature drop/rise on heat exchanger. *
- Check compressor oil level.
- Check compressor oil color.
- Check water flow rates and pressure drops across evaporator heat exchanger.
- Clean condenser coil with vacuum and soft brush (to protect coil fins) and to prevent dirt accumulation.
- Check all electrical connections for tightness.
- Properly document all data taken.

* 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 the evaporator depending on application. Consult the bank performance sheet for your specific project 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.

Visually inspect inner and outer condenser coil slab and remove surface loaded fibers as needed. Use a vacuum cleaner. If a vacuum cleaner is not available, a soft non metallic brush may be used. In either case, brush in the direct of the fin as they can be easily bent over and damaged.

A periodic clean water rinse is very beneficial for coils applied in coastal or industrial environments. It is very important the water rinse is made with a low velocity stream to avoid damage to the coil fins. **Use only environmentally sound coil cleaners. Avoid the use of: Coil brighteners, high pressure washers and poor water quality for cleaning.**

Winter Shutdown – at the end of the cooling season

1. Drain the fluid from the cooler, hydronic package (if installed) and internal piping.
2. Fill the cooler and hydronic package with at least 2 gallons (7.6 L) of inhibited propylene glycol or other suitable inhibited antifreeze solution to prevent any residual water in the cooler and hydronic package/piping from freezing.
3. At the beginning of the next cooling season, refill the cooler and add the recommended inhibitor.

Annual maintenance tasks continued on the next page.

⚠ WARNING/ADVERTISSEMENT

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!

⚠ WARNING/ADVERTISSEMENT

VERY HOT WATER!	L'EAU TRÉS CHAUDE!

Annual

- Back flush all heat exchangers. If fouling is suspected, use only ClimaCool recommended de-scalers (see page 38 - Chemical Clean In Place Washing).
- 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 setpoints, sensors and general control configuration.
- Properly document all data taken.

⚠ WARNING/ADVERTISSEMENT

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!

⚠ WARNING/ADVERTISSEMENT

VERY HOT WATER!	L'EAU TRÉS CHAUDE!

Condenser Fans

Highly efficient, variable speed electrically commutated (EC) condenser fans with integral head pressure control are provided as standard. Fans include electronically switched external rotor motors with permanent magnets and a speed that is controlled by an integrated controller. Fan speed is controlled by a 0-10 VDC signal.

The integrated variable speed drives are equipped with a solid state motor overload protection and a solid state short circuit protection. The solid state motor overload protection protects the motor under overload conditions by reducing current flow to the internal motor output terminals. The overload protection circuitry is optimally configured to the specific motor and the specific final application of the integrated variable speed drive.

Figure 24 - Condenser Fan

Repairs and Maintenance

- Allow maintenance work to be carried out by trained specialists only.
- Please observe the safety regulations and the worker´s protection rules by all maintenance and service work (DIN EN 50 110, IEC 364).
- The fan must be disconnected from the power supply and secured against switching back on prior to maintenance.
- Keep the airways of the fan free.
- Depending on the application and the transfer medium the impeller has a natural wear. Deposits on the impeller can lead to imbalance, fracture, damage or disintegration. Proper maintenance must be provided.
- In case of imbalance, rebalance the impeller.
- Check the impeller, in particular the weld-seams, for possible cracks. Any repairs by welding is prohibited.
- The fan or motor is maintenance free due to the use of ball bearings with "life-long lubrication". At the end of the grease service life (ca. 30-40,000 h during standard usage) it is necessary to change the bearing.
- Regular inspection, and cleaning is necessary to prevent imbalance due to ingress of dirt.

Cleaning

The use of paint solvents, abbrasive and/or aggresive cleaners are prohibited.

Cleaning with a Water Jet:

- Make sure that water does not get inside the motor and electronics.
- Do not hold the jet spray directly on the motor openings and seals.
- Warranty does not cover corrosion formation, paint adhesion for unpainted or painted fans if cleaning with a jet spray.
- After the cleaning process, the fan must be operated for 30 minutes at 80 – 100% of maximum speed for drying purposes.

Attention: Confirm all panels and electrical covers are properly installed/sealed, including the condenser fan motor cover.

Draining

When performing standard maintenance procedures such as flushing a heat exchanger, it will be necessary to close off a section of a module. This can easily be done if factory mounted water isolation valves are provided. 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 as opposed to system water (see Figure 25 on page 38 – City Water Cleaning Arrangement). The back washing procedure is accomplished by isolating each individual heat exchanger and introducing the city water using a connection hose to the 3/4" service port to flow in an opposite direction from the normal heat exchanger flow direction. On the opposite 3/4" service port, connect a drain hose continuing back flow until all debris is removed. **Warning: Water valves must be re-opened after flushing is complete.**

Chemical Clean In Place Washing Without Water Isolation Valves

Chemical Clean in place washing will typically provide the best debris removal, even from severely clogged heat exchangers. In order to clean the heat exchangers for modules **WITHOUT** water isolation valves, it will be necessary to mechanically and electrically isolate each module separately from the bank of modules. The rest of the chiller modules will need to be disabled during this cleaning procedure as the flow through the main bank header will be interrupted. The cleaning tank, pump and pump strainer should be arranged in the manner shown in Figure 26 on page 38 - 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 3/4" 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. Upon successful cleaning of a module, proceed to isolate a second module separately from the bank and repeat the cleaning process.

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 26 on page 38 - 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 3/4" 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 is recommended. 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. **Hydrochloric or sulfuric acids must not 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 25 – 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.

Cleaning Arrangement

Figure 25 - City Water Cleaning Arrangement

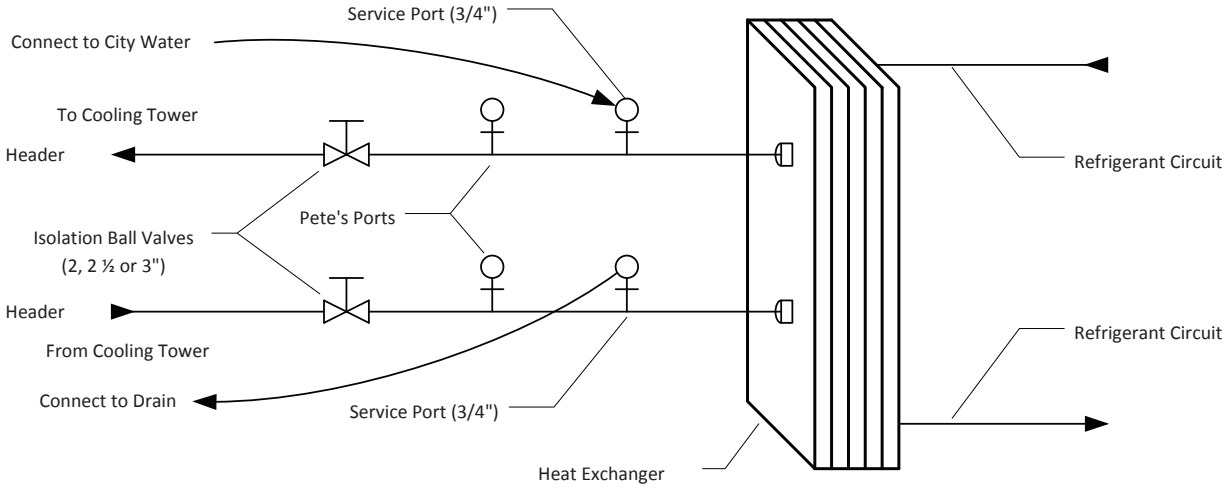
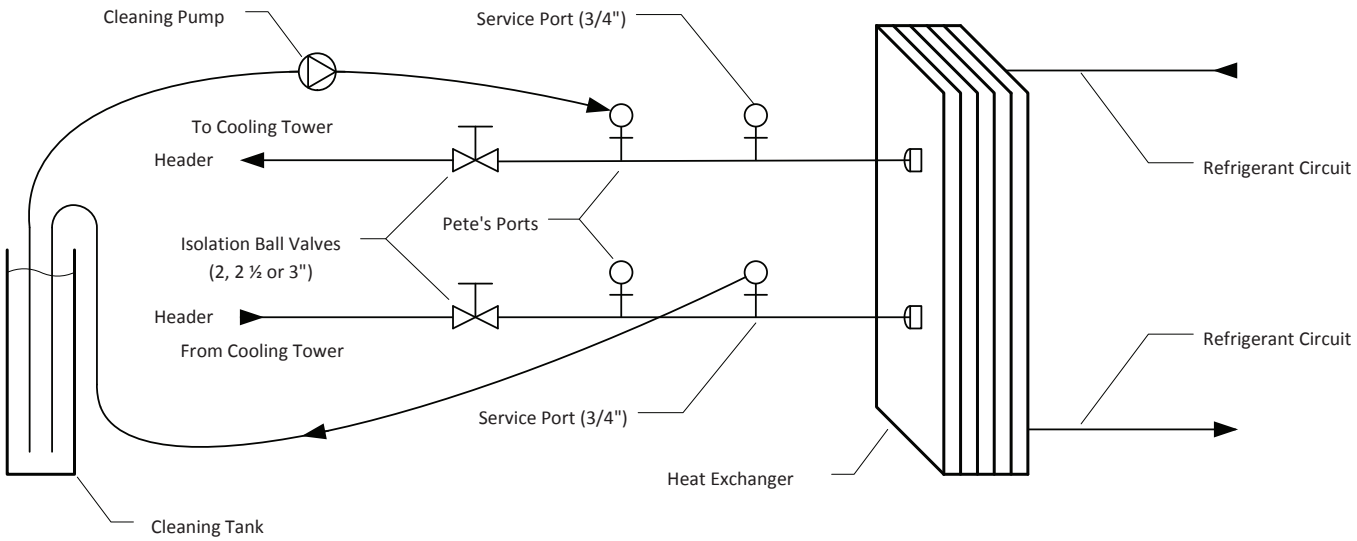


Figure 26 - In Place Cleaning Arrangement



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.

Compressor Information

Highly efficient and extremely reliable scroll compressors are used on Model UCA. 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 loud 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 90 seconds and minimum off 200 seconds.

Compressor Crankcase Heater

A crankcase heater is factory installed to prevent refrigerant migration, condensation and mixing with the compressor oil during the off cycle.

Compressor Lubrication

The compressor operates on a sealed system and oil can only be lost if 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 1/8" of the 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.

After any compressor replacement, the oil level in the compressor should be observed for at least one hour of continuous operation and if the oil level rises to the top of the sight glass, oil may need to be removed to prevent damage from a potential of hydraulic compression.

⚠ CAUTION/ATTENTION

3 PHASE SCROLL COMPRESSOR UNIT	UNITÉ 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 characteristsics 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; • Compressuers 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.

⚠ 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.

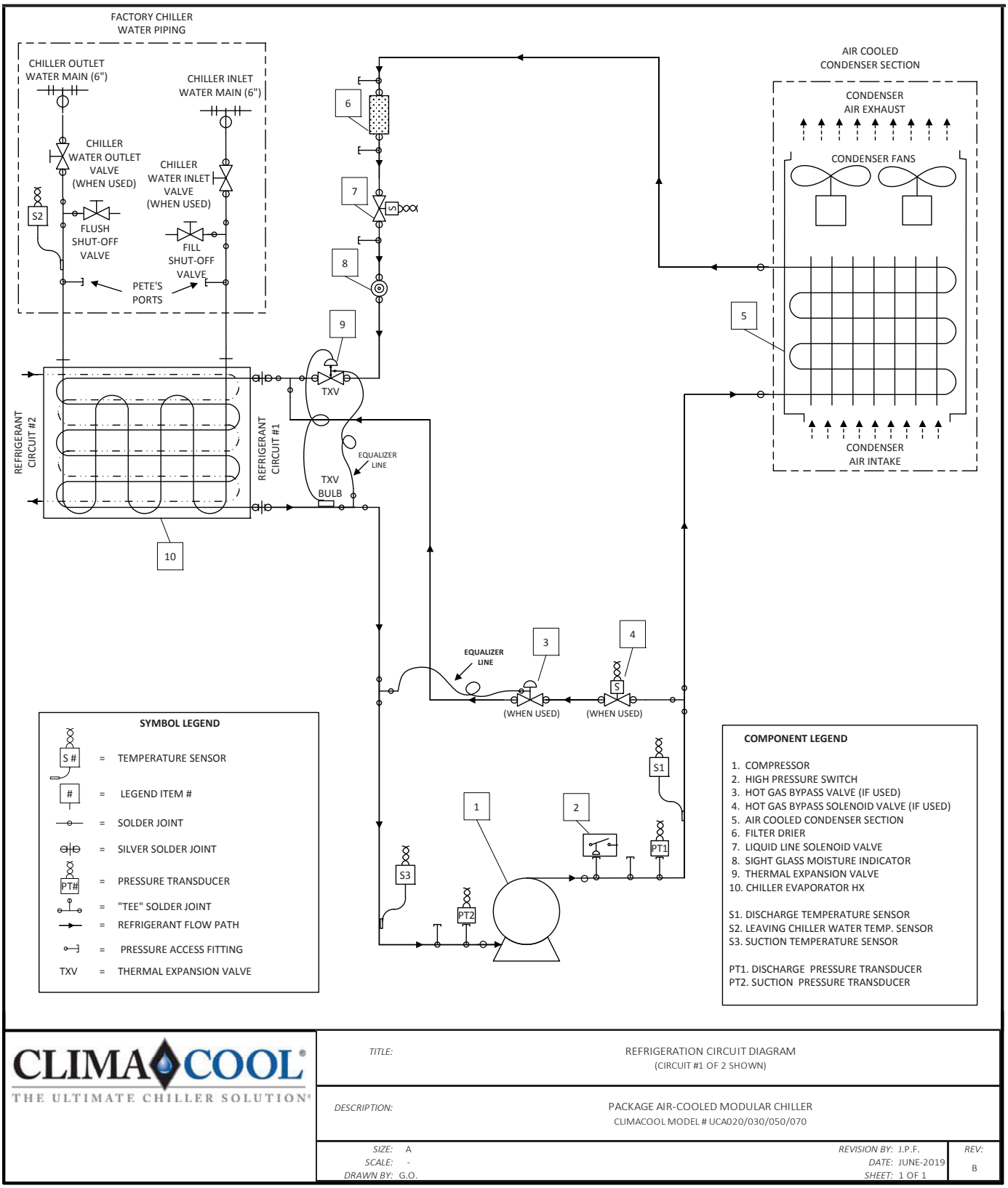
All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state and federal statues for the recovery and disposal of refrigerants.

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.

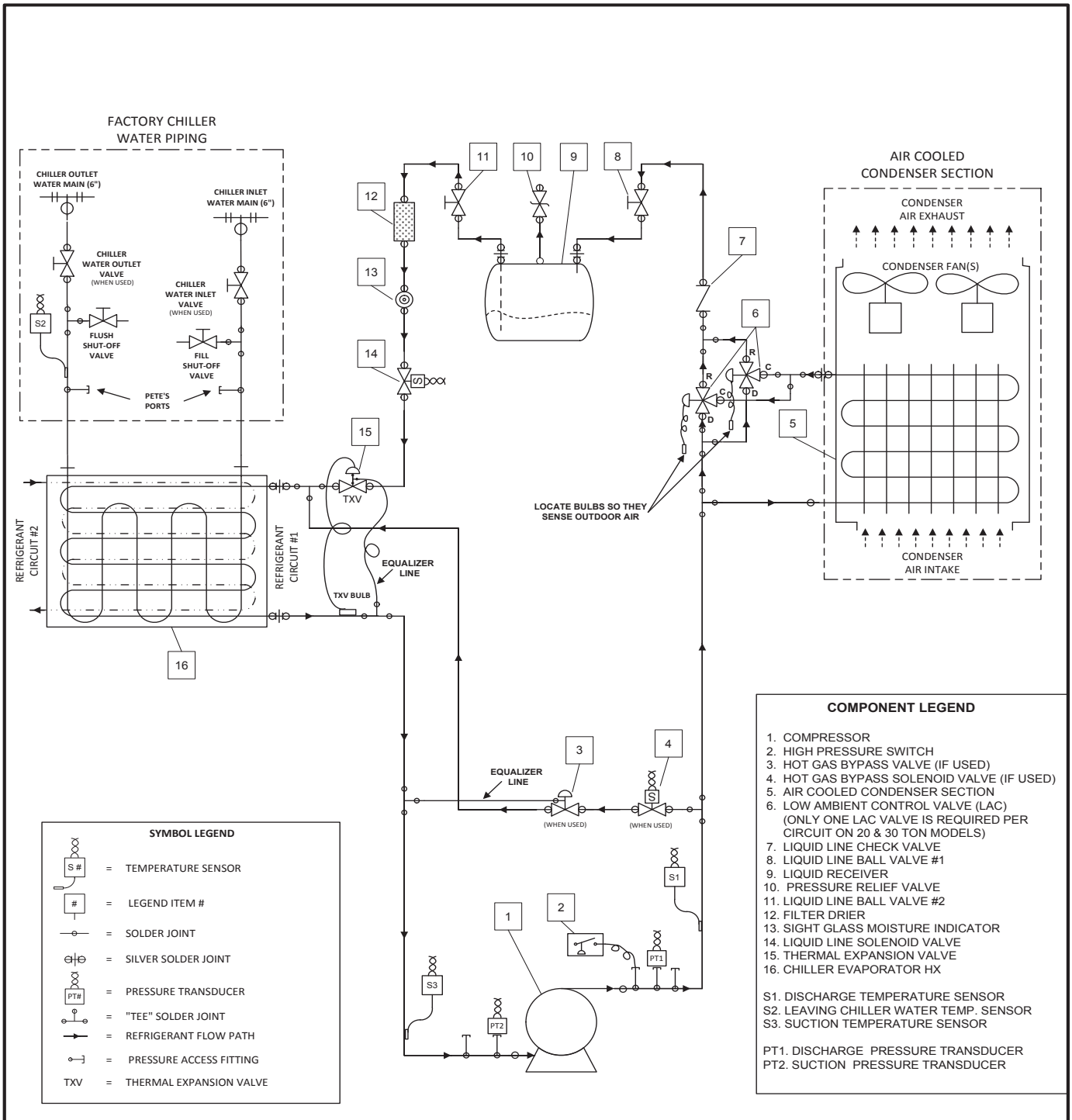
⚠ WARNING

With Advanced Scroll Compressor Temperature Protection, the compressor may stop pumping with motor running. Turn off and wait until cool. May need more than one hour to reset.

Refrigeration Circuit Diagram, Cooling Only



Refrigeration Circuit Diagram, Cooling Only, 0°F Low Ambient



SYMBOL LEGEND

S #	=	TEMPERATURE SENSOR
#	=	LEGEND ITEM #
	=	SOLDER JOINT
	=	SILVER SOLDER JOINT
PT#	=	PRESSURE TRANSDUCER
	=	"TEE" SOLDER JOINT
	=	REFRIGERANT FLOW PATH
	=	PRESSURE ACCESS FITTING
TXV	=	THERMAL EXPANSION VALVE

COMPONENT LEGEND

1. COMPRESSOR
2. HIGH PRESSURE SWITCH
3. HOT GAS BYPASS VALVE (IF USED)
4. HOT GAS BYPASS SOLENOID VALVE (IF USED)
5. AIR COOLED CONDENSER SECTION
6. LOW AMBIENT CONTROL VALVE (LAC) (ONLY ONE LAC VALVE IS REQUIRED PER CIRCUIT ON 20 & 30 TON MODELS)
7. LIQUID LINE CHECK VALVE
8. LIQUID LINE BALL VALVE #1
9. LIQUID RECEIVER
10. PRESSURE RELIEF VALVE
11. LIQUID LINE BALL VALVE #2
12. FILTER DRIER
13. SIGHT GLASS MOISTURE INDICATOR
14. LIQUID LINE SOLENOID VALVE
15. THERMAL EXPANSION VALVE
16. CHILLER EVAPORATOR HX

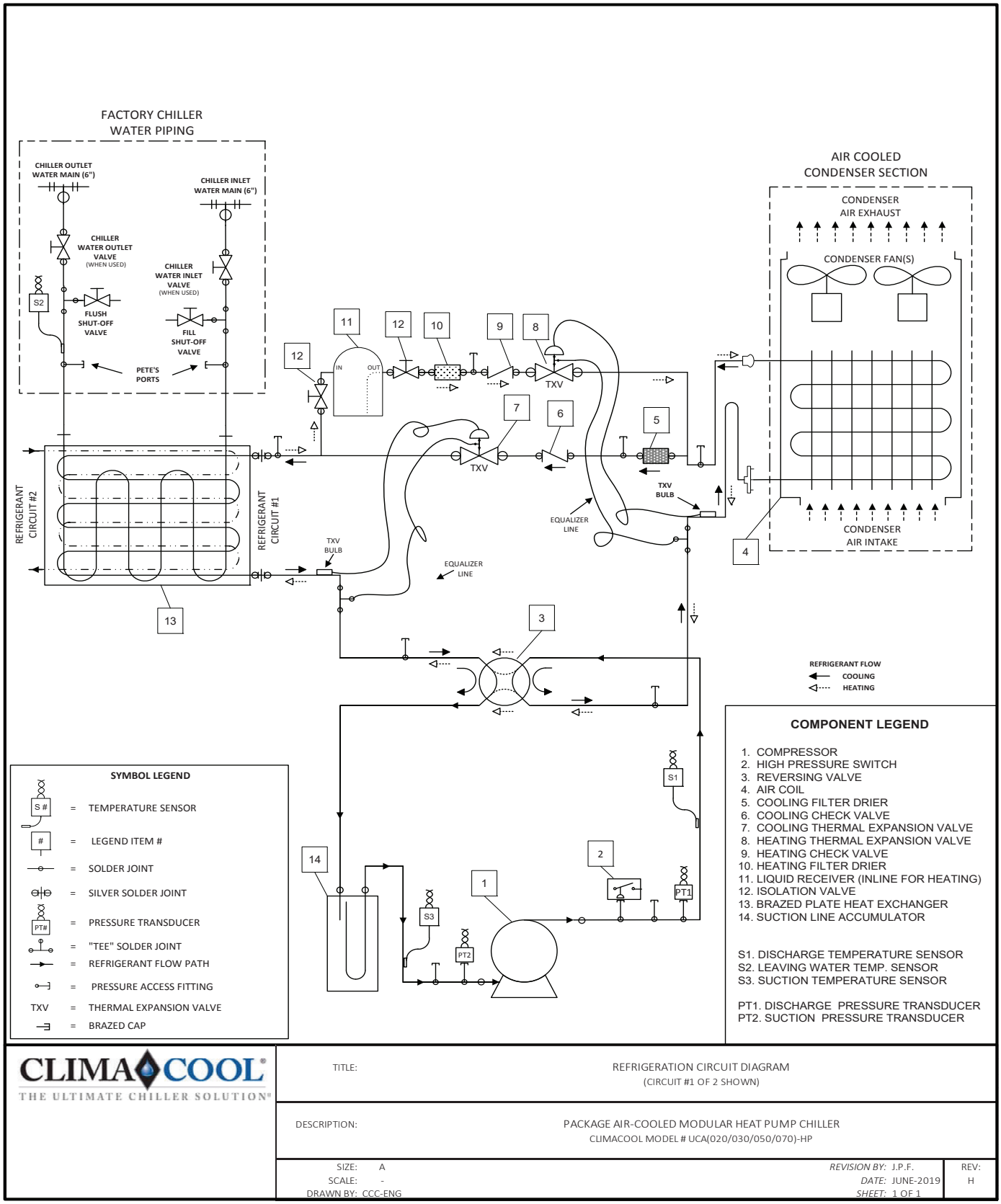
S1. DISCHARGE TEMPERATURE SENSOR
S2. LEAVING CHILLER WATER TEMP. SENSOR
S3. SUCTION TEMPERATURE SENSOR

PT1. DISCHARGE PRESSURE TRANSDUCER
PT2. SUCTION PRESSURE TRANSDUCER

CLIMACOOL®

TITLE	REFRIGERATION CIRCUIT DIAGRAM (CIRCUIT #1 OF 2 SHOWN)				
DESCRIPTION	PACKAGE AIR-COOLED MODULAR CHILLER 0°F LOW AMBIENT CONTROL CLIMACOOL Model # UCA020,030,050,070				
REVISED					
REVISED		SIZE A	ClimaCool Corp. RefriDiag-UCA (-20°F Ambient)	DWG NO RefriDiag-UCA (-20°F Ambient)	REV A
APPROVED	DATE 03/14/2014	FILENAME RefriDiag-UCA (-20°F Ambient)	SCALE NONE	DRAWN BY Engineering	DATE 03/14/2014	SHEET 1 OF 1

Refrigeration Circuit Diagram, Heat Pump



SYMBOL LEGEND

S #	=	TEMPERATURE SENSOR
#	=	LEGEND ITEM #
	=	SOLDER JOINT
	=	SILVER SOLDER JOINT
PT#	=	PRESSURE TRANSDUCER
	=	"TEE" SOLDER JOINT
	=	REFRIGERANT FLOW PATH
	=	PRESSURE ACCESS FITTING
TXV	=	THERMAL EXPANSION VALVE
	=	BRAZED CAP

COMPONENT LEGEND

1. COMPRESSOR
2. HIGH PRESSURE SWITCH
3. REVERSING VALVE
4. AIR COIL
5. COOLING FILTER DRIER
6. COOLING CHECK VALVE
7. COOLING THERMAL EXPANSION VALVE
8. HEATING THERMAL EXPANSION VALVE
9. HEATING CHECK VALVE
10. HEATING FILTER DRIER
11. LIQUID RECEIVER (INLINE FOR HEATING)
12. ISOLATION VALVE
13. BRAZED PLATE HEAT EXCHANGER
14. SUCTION LINE ACCUMULATOR

S1. DISCHARGE TEMPERATURE SENSOR
S2. LEAVING WATER TEMP. SENSOR
S3. SUCTION TEMPERATURE SENSOR

PT1. DISCHARGE PRESSURE TRANSDUCER
PT2. SUCTION PRESSURE TRANSDUCER

CLIMACOOL®
THE ULTIMATE CHILLER SOLUTION®

TITLE: REFRIGERATION CIRCUIT DIAGRAM
(CIRCUIT #1 OF 2 SHOWN)

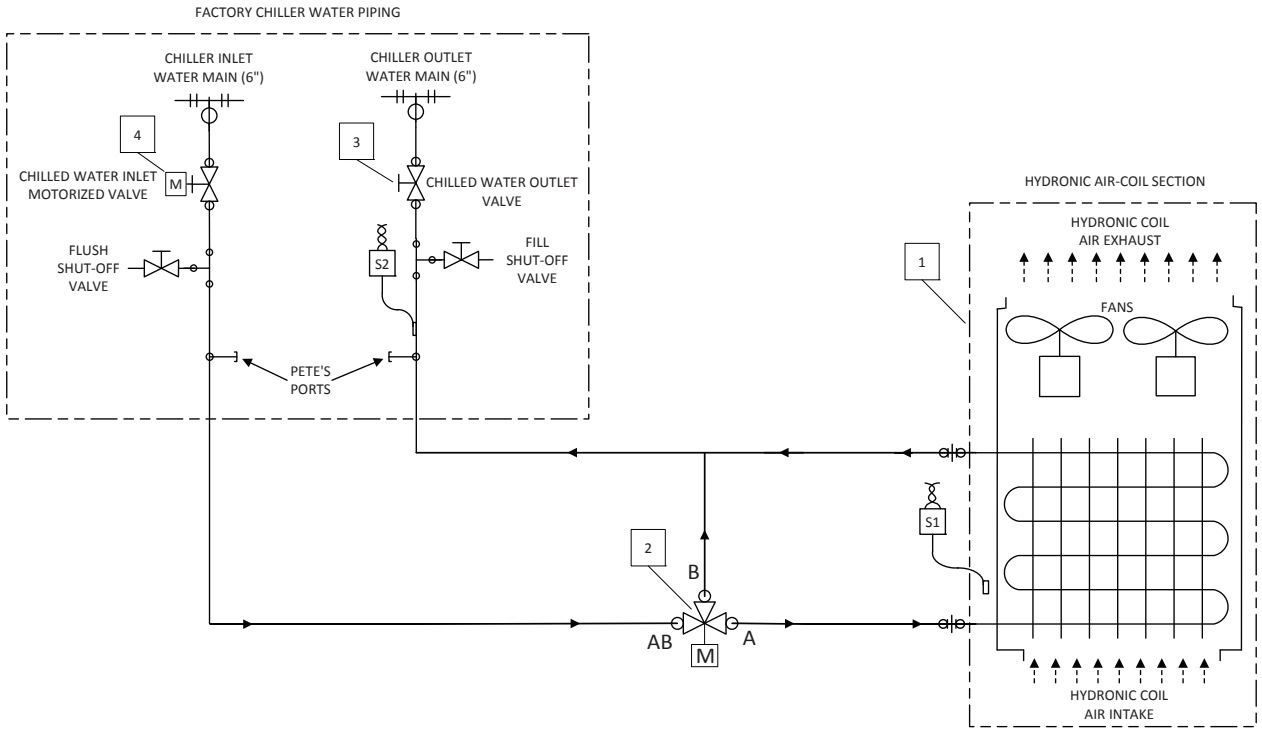
DESCRIPTION: PACKAGE AIR-COOLED MODULAR HEAT PUMP CHILLER
CLIMACOOL MODEL # UCA(020/030/050/070)-HP

SIZE: A
SCALE: -
DRAWN BY: CCC-ENG

REVISION BY: J.P.F.
DATE: JUNE-2019
SHEET: 1 OF 1

REV: H

Refrigeration Circuit Diagram, Free Cooling Module



MOTORIZED (PROPORTIONAL) 3-POSITION WATER VALVE DETAIL:

AB-A: FULL FLOW TO HYDRONICS COIL, *2vdc control voltage to actuator*
AB-B: BYPASS FLOW AROUND HYDRONICS COIL, 10*vdc control voltage to actuator*

SYMBOL LEGEND

- S # = TEMPERATURE SENSOR
- # = LEGEND ITEM #
- = SOLDER JOINT
- = SILVER SOLDER JOINT
- = "TEE" SOLDER JOINT
- = WATER FLOW PATH
- = PRESSURE ACCESS FITTING

COMPONENT LEGEND

1. HYDRONIC COIL AND FAN SECTION
2. MOTORIZED (PROPORTIONAL) 3-POSITION WATER VALVE
   UCF070: QTY-2 PER UNIT
3. MANUAL WATER ISOLATION VALVE
   UCF070: QTY-2 PER UNIT
4. MOTORIZED (ON/OFF) 2-POSITION WATER VALVE
   UCF070: QTY-2 PER UNIT

S1. OUTSIDE AIR TEMPERATURE SENSOR
S2. LEAVING CHILLED WATER TEMPERATURE SENSOR
   UCF070: QTY-2 PER UNIT

CLIMACOOL® THE ULTIMATE CHILLER SOLUTION®

TITLE:	HYDRONICS CIRCUIT DIAGRAM (UCF030 CIRCUIT SHOWN)
DESCRIPTION:	PACKAGE FREE COOLING MODULE CLIMACOOL MODEL # UCF(030/070)
SIZE: A SCALE: - DRAWN BY: CCC-ENG	*REVISION BY:* J.P.F. *DATE:* JUNE-2019 *SHEET:* 1 OF 1
REV: A	

Head Pressure Control Valve Operation (LAC)

High and Low Ambient Stability

The design of air conditioning systems, utilizing air cooled condensing units, involves two main problems that must be solved if the system is to operate reliably and economically during **high ambient** and **low ambient** operation. If the condensing unit is properly sized, it will operate satisfactorily during extremely high ambient temperatures. However, some units will be required to operate at ambient temperatures below their design dry bulb temperature during most of the year; the solution to low ambient operation is more complex.

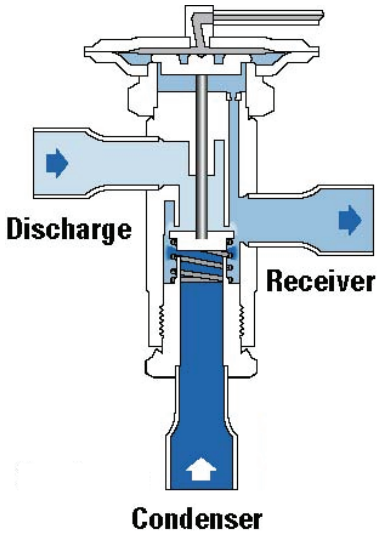
Without good head pressure control during low ambient operation, the system can experience both running cycle and off-cycle problems. Since the pressure differential across the thermostatic expansion valve port affects the rate of refrigerant flow, low head pressure generally causes insufficient refrigerant to be fed to the evaporator. Failure to have sufficient head pressure will result in low suction pressure and/or iced evaporator coils. The primary off-cycle problem is refrigerant migration to the condenser. Insufficient flow through the TXV will cause a low suction pressure.

The typical method of maintaining normal head pressure in a refrigeration system during periods of low ambient temperature is to restrict liquid flow from the condenser to the receiver, and at the same time divert hot gas to the inlet of the receiver. This backs liquid refrigerant up into the condenser reducing its capacity which in turn increases the condensing pressure. At the same time the hot gas raises liquid pressure in the receiver, allowing the system to operate normally.

LAC-10 Valve Operation

The valve designation LAC stands for **Low Ambient Control**. The LAC is a three-way modulating valve that responds to receiver pressure. As shown in Figure 28, the receiver pressure acts under the diaphragm. As the receiver pressure drops below the valve setting, the seat moves away from the discharge port allowing discharge gas to bypass the condenser. This discharge gas warms the liquid in the receiver and raises the pressure to the valve setting. At the same time discharge gas is bypassing the condenser, liquid flow from the condenser is restricted, which allows liquid to back up in the condenser. Flooding the condenser reduces the area available for condensing thus raising the condensing pressure. During summer conditions, the seat closes the discharge port due to high pressure in the receiver. Therefore, there is full liquid flow from the condenser to the receiver.

Figure 27 - LAC-10 Valve



Refrigerant Migration

During an off cycle there is a potential for refrigerant to migrate from the warm receiver to the cold condenser. An auxiliary check valve should be used in the liquid line between the LAC valves and the receiver to prevent this from occurring. See Refrigeration Circuit Diagrams on page 40-43 for the list of components.

Refrigeration System Re-Processing and Charging

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 15-1978
- American National Standard Code for Pressure Piping, ANSI B31.5-1974

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. Remove the refrigerant pressure transducers and cap the Schrader ports during nitrogen pressure testing and evacuation processes. Filter driers should be opened just prior to brazing into the system to prevent moisture infiltration whenever possible, and flood the system with 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 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 also reduced. 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 double evacuation process to ensure the 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, and 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. 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 pages 4-6. 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.

General
Factory-assembled and wired remote air cooled chiller. Chiller consists of two compressors, one evaporator, safety and operational controls. The modular remote air cooled chiller shall incorporate one or more modules with two independent refrigerant circuits. Modules shall be capable of independent operation powered by a field installed fused disconnect switch (or equivalent module circuit breaker) supplied by others, so that any one module can be shut down for repair without interrupting the remaining remote air cooled chiller modules in operation.

Basic Construction
The frame design shall consist of heavy gauge galvanized steel with 3 mil powder coat paint finish baked at 350° for resilience in transport and installation and service access panels made of 18 gauge sheet metal with powder coat paint finish and quick release half turn latches. The module must have a low center of gravity, detachable schedule 40 carbon steel pipe water headers, designed to connect to adjacent modules through the use of 300PSI rated grooved couplings, base with cutouts for forklifts or pallet jacks.

Refrigeration Circuit
Each independent circuit shall consist of a scroll compressor, crankcase heater, and thermostatic expansion valve for refrigerant metering, sight glass, filter drier, solenoid valve, high and low pressure controls and safety controls. The modular chiller bank must be able to produce chilled water even in the event of a failure of one or more refrigerant circuits.

Evaporator
Each evaporator shall be dual-circuited, brazed plate heat exchangers constructed of stainless steel; UL Listed and Labeled. The evaporator heat exchanger shall be mounted to eliminate the effect of migration of refrigerant to the cold evaporation with consequent liquid slugging on start-up. The evaporator shall be mounted on two layers of noise attenuating rubber isolation pads which also acts as a thermal barrier. The evaporator shall be wrapped with ¾ inch closed cell insulated blanket and closed cell insulation shall be provided on suction side refrigerant tubing including refrigerant to chiller heat exchanger to prevent condensation.

Air Cooled Condensers
Coils shall include aluminum fins mechanically bonded to enhanced copper tubes with integral subcooling circuits. Condenser fan(s) shall be ultra-quiet, direct drive axial type with EC variable speed motors and integral head pressure control.

Compressors
Each module shall contain two scroll compressors independently circuited for redundancy. Each compressor shall be mounted with rubber isolated compressor mounts to the module base and each shall include compressor overload protection, high discharge pressure and low suction pressure cutouts.

Starter/Control Panel
Module Controllers shall be provided for individual control as well as system integration. The control shall consist of a simple two-conductor shielded daisy chain connection to allow communication between modules with minimal field wiring. The packaged air cooled chiller control panel shall be a NEMA Type 4 enclosure including: power distribution block, compressor fusing, contactors, finger safe control fusing, transformer, isolation relays, status and alarm relay, 16-bit microprocessor bank controller with built in native Building Automation System (BAS) communication protocols, (BACnet), status indicating lights showing: 1) compressor operation (on/off), 2) unit alarm status, 3) power on, two toggle switches to disable each individual compressor during start-up or troubleshooting.

CoolLogic Control System

The *CoolLogic* Control System shall be fully compatible with the Building Automation System via native BACnet communication. Scheduling of the various compressors shall be performed by the bank microprocessor based controller. A compressor run time equalization sequence is provided to ensure even distributionof compressor run time. A load limit control shall be available to limit the number of compressors that can be energized at one time. The *CoolLogic* Control System shall monitor and report the following for each refrigeration circuit in each module:

- Discharge pressure and temperature faults
- Suction pressure and temperature faults
- Compressor winding high temperature fault
- Low evaporator leaving chilled water temperature fault

The Bank Controller shall monitor and report the following system parameters for the chiller system:

- Chilled water entering and leaving temperature
- Evaporator water flow availability

Any module failure condition shall cause a "fault" indication at the bank Control Panel and shutdown of that compressor circuit with the transfer of the load requirements to the next available module. In the case of a system "fault" the entire chiller will be shut down. When any fault occurs, the bank Control Panel shall record conditions at the time of the fault, and store the data for recall. This information shall be capable of recall through the keypad of the bank Control Panel and displayed on the 4 line by 40 character, back-lit LCD. A history of faults shall be maintained including date and time for each fault (up to the last 100 occurrences). The Bank Control Panel monitors voltage/phase failure and internal leaving chilled water reset control will ensure that the parallel evaporators are operated above the freeze point for part load operation.

Factory Testing

Each packaged air cooled chiller module shall be pressure-tested, evacuated and charged with nitrogen.

Options and Accessories

Free Cooling Modules
Directly couples to chiller bank. Includes: glycol type free cooling coils (intended to be used with glycol in the loop and not straight water.), high efficiency, variable speed EC condenser fans with integral head pressure control with acoustical airfoil blade design providing low operating sound levels, two position motorized water isolation valve, 3-way bypass valves and fully integrated controls.

Hail Guards
Factory or field installed 18 gauge galvanized steel louver panels with powered coat paint finish for outdoor element protection.

Harsh Environment
Factory installed coil coating for outdoor element protection.

Heat Pump
Factory installed reverse cycle heat pump for heating and cooling operation.

Heat Trace
Optional factory-installed heat trace. Heat trace option requires 1-120/1 field connections per unit to emergency power.

Hot Gas Bypass or Digital Scrolls or Lead VFDs
Factory installed on circuits allowing unit operation below the minimum step of unloading.

Low Ambient to 0°F
Factory installed variable speed fan control for all condenser fans provides optimum head pressure control. Liquid receivers, refrigerant relief valves and flood-back head pressure control valves are provided for all refrigerant circuits.

Manual Strainers
Field installed to increase efficiency and ensure long life of the equipment with Y-style and Basket strainers of cast iron 200 psi or carbon 275 psi with 60 mesh stainless steel screens. All strainers are field installed external to the chiller bank for ease of service.

Motorized or Manual Water Isolation Valves and Flush Ports
Factory installed water isolation valves and flush ports shall provide isolation to the module for maintenance and cleaning of evaporator heat exchangers while adjacent modules continue normal operation. Both motorized and manual valves include standard ¾" fill and flush valves. **NOTE: All Heat Pump configurations require motorized valves.**

Available choices include:

- One each motorized valve for evaporator with one each manual valves for the evaporator.
- Two each manual valves for the evaporator.

Simultaneous Heating and Cooling
Factory installed patent pending, four (4) header design SHC heat pump satisfies required heating and cooling demands with the use of integral header isolation valves and controls. Allows any module to be indexed for heating or cooling regardless of its position in the bank. Provides hot water, as high as 130°F at above 35°F ambient.

Water Header Bypass
Field installed to prevent deadheading the pump, a water header bypass may be field installed and is mandatory when using motorized valves.

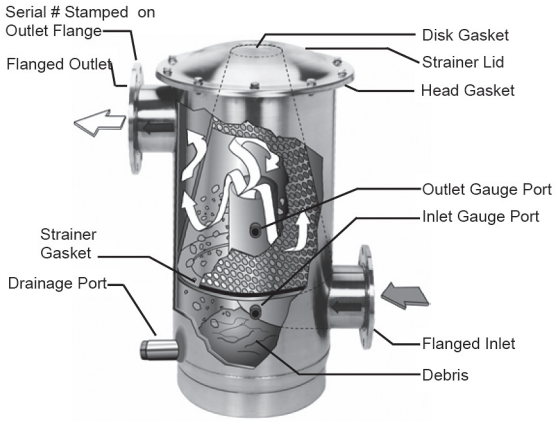
Options available:

- Direct return with motorized evaporator/isolation valves.
- Reverse return with motorized evaporator/isolation valves.

Weatherproof Enclosure
Field installed Nema 4 enclosure for *CoolLogic* Bank Panel.

Stainless Steel Strainer Option

Figure 28 - 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. We strongly recommend 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 strainer should be placed on a firm, supporting surface. Failure to do so can cause stress on the weld joints. It is recommended that 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 28).
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 8 for proper lid bolt size and torque rating for each strainer (page 50). (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 29). 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.

Stainless Steel Strainer Option

Table 8 - Bolt Size and Recommended Torque

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

Strainer Operation

Periodically, it will be necessary to flush out the debris that is collected and settled at 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 your strainer assembly is equipped with optional pressure gauges, you 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.

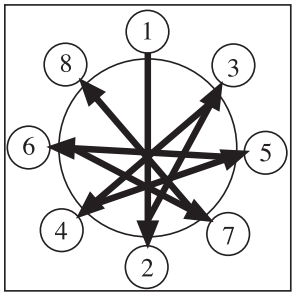
Follow the steps below when cleaning the CS strainer element:

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.

Figure 29 - Recommended Torquing Sequence



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 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 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 clamped lid models. 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 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.

Stainless Steel 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 30) 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 Figures 31 and 32).

Figure 30 - Timer Based Valve Controller

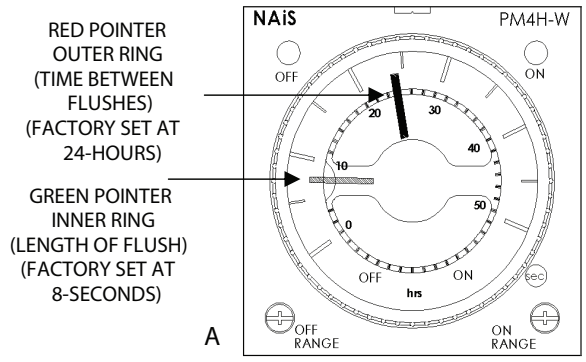


Figure 31 - Electric Ball Valve

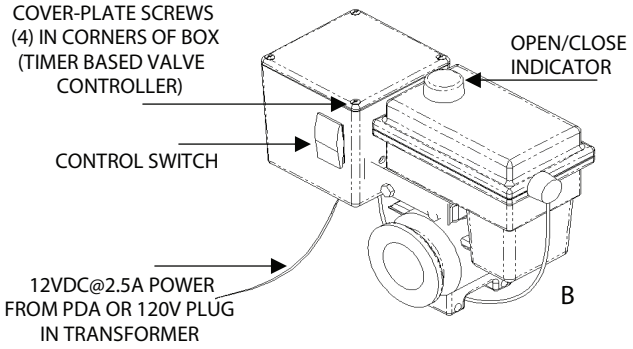
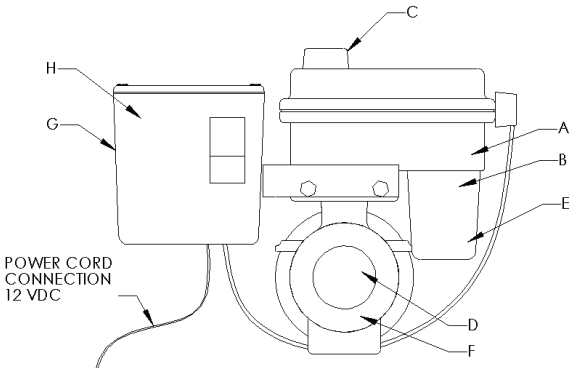


Figure 32 - Valve Specifications



Valve Specifications (See Figure 32)
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° F 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).

Programming 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 then 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 30 on page 51).
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 (24) hours. (See Figure 30 on page 51).
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 31 on page 51). 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.

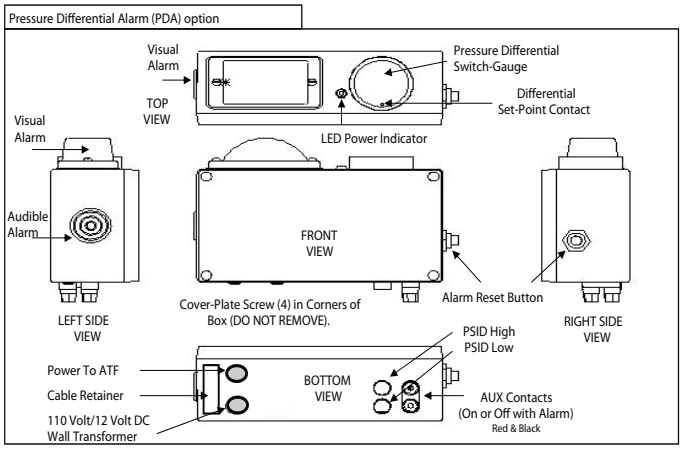
Water Resistance

The valve and controller are water-resistant, 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 (PDA) 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 50).

Figure 33 - Pressure Differential Alarm



Operation Instructions

Remove the power supply and insert the connector end into the socket on the bottom of the PDA housing (See Figure 33 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 than 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 33). **NOTE: It is not recommended to set 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 black and red banana clip posts (See Figure 33 on page 52). 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.
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, 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 9 - 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

WYE Strainers

The correct size of the WYE Strainer is determined by its job fuction, not by the size of the pipeline.

Pre Installation Checklist:

1. Ensure working conditions (pressure/temperature) are within the specified capacity of the product being installed. Please refer to the certified drawings to assist in determining these values.
2. Inspect all sealing surfaces to ensure gasket surfaces are free of defects (no nicks or cuts). The pipeline should also be checked for proper alignment. WYE strainers should never be utilized to realign an existing piping system.
3. Ensure that the pipeline's mating flanges are the same type as the WYE strainer being installed. Raised face flange ends cannot be mated to flat face flange ends.
4. Ensure strainer end-to-end length and installation gap are within ¼ in gap for gasket, and have sufficient clearance for easy opening of cover and screen removal.
5. If the WYE strainer is to be located on the discharge side of a pump, then a safety release valve must be installed between the WYE strainer and the pump.

Figure 34: WYE Strainer Straining Illustration

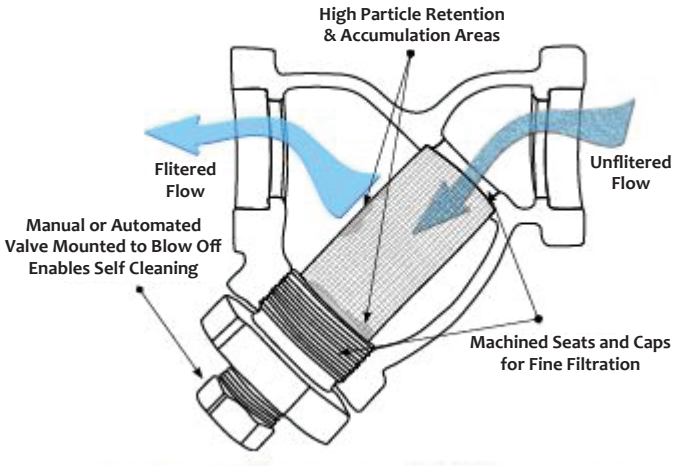
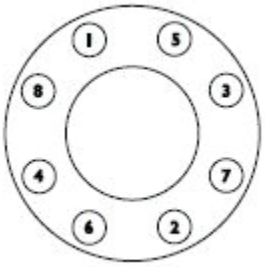


Figure 35: WYE Strainer - Flanged Ends

Installation Procedure:

1. Also, for maximum efficiency, install a differential pressure gauge at inlet and outlet connections or at the strainer gauge tap (if provided).
2. WYE strainers must be positioned in the pipeline ahead of the equipment requiring protection.
3. To provide for easier maintenance, the WYE strainer should be located where the drain plug can be removed. Additionally, ensure the drain is located at the lowest position when installed. **If installed in the vertical position, the WYE side of the strainer must be pointing downward.**
4. Ensure there is ample space at the WYE side of the strainer for screen removal.
5. Before placing the WYE strainer into place, support the existing pipeline with pipe supports near the inlet and outlet connections.
6. Place the WYE strainer into the pipeline ensuring that the flow arrow on the body of the WYE strainer is pointing in the direction of the pipeline flow. For large or heavy strainers, appropriate material handling equipment must be used.
7. Install a standard ANSI (⅛" thick) flange gasket between the WYE strainer and pipeline flanges, on both sides. Install lubricated flange bolts and hand tighten. Flange bolts should then be tightened, using a star or crisscross pattern to evenly load the bolts, in accordance with established piping standards. This is illustrated in figure 36.

Figure 36: Bolting Sequence Pattern



NOTE: Excessive bolt torque may damage flanges. Please refer to established flange bolt torques for guidelines.

Operation

Once proper installation has been successfully completed, start the system gradually, at start up as well as after shut down. This eliminates sudden shock to the strainer and other equipment in the line. This is extremely important for steam service.

Start-Up Procedure

1. To remove all fluid from the strainer belly, a drip-leg can be installed or the piping can be placed at a ¼" slope. **NOTE: With piping systems that contain fluids other than water or when the working temperature is above 120°F, fluid must be drained to safe area, away from the operator.** Operators should always be fitted with appropriate equipment (goggles, gloves, vests etc.) when venting or servicing is performed.
2. Start the piping system by opening the outlet valve nearest the WYE strainer's outlet first. Then gradually open the inlet valve nearest the WYE strainers' inlet, approximately 25% of normal operational flow. It is important to start the system gradually to avoid displacing or damaging the WYE strainer.
3. Continue to open the inlet valve until the desired service flow has been reached.

Maintenance

WYE strainers require little monitoring once they are properly installed. The pressure differential across the strainer should be checked periodically to determine if the screen needs to be cleaned or replaced. If the pressure differential goes unchecked and the screen becomes completely clogged, the screen will break and require replacing. **NOTE: Strainer screens are not designed to withstand the same pressure ratings as the housings.** If the screen becomes completely clogged, it will be exposed to the same pressure as the housing. In most cases, this will cause the screen to fail and potentially damage downstream equipment.

Regular maintenance involves:

- Timely cleaning or replacement of screen
- Periodically checking for leaks

During normal use, the screen will become clogged with foreign matter, causing the differential pressure to increase. Once the differential pressure has increased to an unacceptable value, typically by 5 psi to 10 psi, it is time to clean or replace the screen. It is not advisable to let the differential pressure increase by 20 psi. This may cause the screen to fail and possibly damage downstream equipment.

A convenient and safe way to determine when the screen needs to be replaced is to install pressure gauges on the inlet and outlet sides of the strainer. The maximum acceptable pressure drop across the strainer will indicate when the screen needs to be replaced. Screen size and construction determine the maximum pressure drop that a strainer screen can withstand.

Screen Removal/Cleaning/Replacement

1. Isolate the strainer by closing the inlet and outlet valve connections on either side of the WYE strainer. Make sure valves are bubble tight.
2. Open vent to relieve pressure inside and drain fluid from the strainer.
3. Once pressure is relieved, remove the WYE side cap or cover.
4. Remove screen and clean. Do not permit screen to dry as it will be difficult to remove debris after it has hardened. Avoid banging or hitting the screen to remove stubborn debris.
5. Inspect screen and cover gasket for damage. If either is damaged, replace. Always ensure there is a spare gasket and screen on hand prior to maintenance.
6. Remove any debris or sludge from within the strainer.
7. Replace cleaned or new screen into its original position, ensuring it is squarely positioned on the screen.
8. Replace cover gasket and cap or cover. Tighten cap or cover to specified torque rating.

Follow the Start-up procedure outlined within the Operation Instructions.

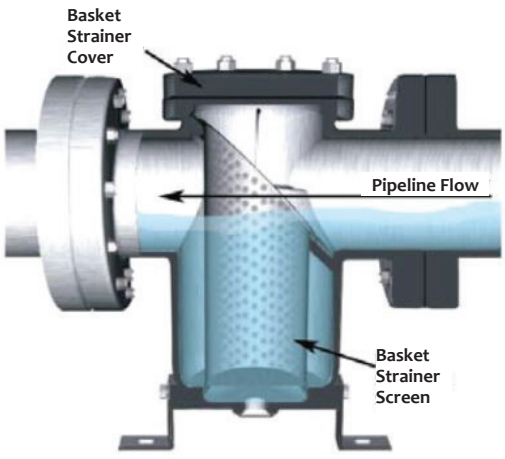
Basket Strainers

The correct size of Basket Strainer is determined by its job function, not by the size of the pipeline.

Pre Installation Checklist:

1. Inspect the basket strainer's flange ends and the pipeline's mating flanges to ensure gasket surfaces are free of defects. The pipeline should also be checked for proper alignment. Strainers should never be utilized to realign an existing piping system.
2. Ensure that the pipeline's mating flanges are the same type as the basket strainer being installed. Raised face flange ends cannot be mated to flat face flange ends.
3. Ensure that the pipeline setup allows a horizontal installation of the basket strainer.
4. If pipeline strain is a concern when installing larger basket strainers (6" and above), a concrete or steel pad should be used to provide additional support. Larger basket strainers can also be fitted with legs to assist in reducing strain on the pipeline.
5. If the basket strainer is to be located on the discharge side of a pump, then a safety release valve must be installed between the basket strainer and the pump.

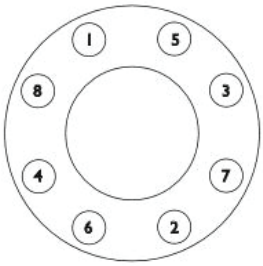
Figure 37 - Installed Basket Strainer with Bolted Cover



Installation Procedure:

1. To provide for easier maintenance, the basket strainer should be located where the drain plug can be removed and where there is ample space above the basket strainer for screen removal.
2. Before placing the basket strainer into place, support the existing pipeline with pipe supports near the inlet and outlet connections of the basket strainer.
3. Place the basket strainer into the pipeline ensuring that the flow arrow on the body of the basket strainer is pointing in the direction of the pipeline flow. For large or heavy strainers, lift the basket strainer into place using slings positioned underneath the inlet and outlet connections.
4. Install a standard ANSI (⅛" thick) flange gasket between the basket strainer and pipeline flanges, on both sides. Install lubricated flange bolts and hand tighten. Flange bolts should then be tightened, using a star or crisscross pattern to evenly load the bolts, in accordance with established piping standards. This is illustrated in figure 38.

Figure 38: Bolting Sequence Pattern



NOTE: Excessive bolt torque may damage flanges. Please refer to established flange bolt torques for guidelines.

Operation

Once proper installation has been successfully completed, start the system gradually, at start up as well as after shut down. This eliminates sudden shock to the strainer and other equipment in the line. This is extremely important for steam service.

Start-Up Procedure

1. Remove air from the pipeline by opening the vent near the basket strainer. **NOTE: With piping systems that contain fluids other than water or when the working temperature is above 120˚F, fluid must be drained to safe area, away from the operator.** Operators should always be fitted with appropriate equipment (goggles, gloves, vests etc.) when venting or servicing is performed.
2. Start the piping system by opening the outlet valve nearest the basket strainer's outlet first. Then gradually open the inlet valve nearest the basket strainer's inlet, approximately 25% of normal operational flow. It is important to start the system gradually to avoid displacing or damaging the basket strainer.
3. Continue to open the inlet valve until the desired service flow has been reached.

Maintenance

Basket strainers require little monitoring once they are properly installed. The pressure differential across the strainer should be checked periodically to determine if the screen needs to be cleaned or replaced. If the pressure differential goes unchecked and the screen becomes completely clogged, the screen will break and require replacing. **NOTE: Strainer screens are not designed to withstand the same pressure ratings as the housings.** If the basket becomes completely clogged, it will be exposed to the same pressure as the housing. In most cases, this will cause the basket to fail and potentially damage downstream equipment.

Regular maintenance involves:

- Periodically checking for leaks
- Timely cleaning or replacement of screen

During normal use, the basket will become clogged with foreign matter, causing the differential pressure to increase. Once the differential pressure has increased to an unacceptable value, typically by 5 psi to 10 psi, it is time to clean or replace the screen. It is not advisable to let the differential pressure increase by 20 psi. This may cause the screen to fail and possibly damage downstream equipment.

A convenient and safe way to determine when the screen needs to be replaced is to install pressure gauges on the inlet and outlet sides of the strainer. The maximum acceptable pressure drop across the strainer will indicate when the screen needs to be replaced. Screen size and construction determine the maximum pressure drop that a strainer screen can withstand. Please consult factory for exact pressure ratings.

Strainer Element Cleaning

Before removing the cover of the basket strainer, the pressure inside the vessel must be reduced to atmospheric via suction or venting. Failure to do so may result in serious bodily injury.

1. Isolate the basket strainer by closing the inlet and outlet valve connections on either side of the basket strainer.
2. Open vent or drain plug to relieve pressure inside the basket strainer. Drain fluid up to screen seat level.
3. Once pressure is relieved, remove the cover.
4. Remove baskets and clean. Avoid banging or hitting the screen to remove stubborn debris.
5. Inspect basket and cover gasket for damage. If either is damaged, replace. Always ensure there is a spare gasket and basket on hand prior to maintenance.
6. Remove any debris or sludge from within the basket strainer.
7. Replace clean basket into its original position, ensuring it is squarely positioned on the screen seat.
8. Replace cover gasket and replace and tighten cover.

Follow the Start-up precedure outlines within the Operation Instructions.

Electrical Data – UCA, Cooling Only and Heat Pump

ClimaCool Base Model	Typical Model #	Voltage	Power Wiring - per Module					Internal Wiring - Cond. Fans[10]			Internal Wiring - per Compressor				
			Rated Load Amps[1]	Min.Cir. Amps (MCA)[2]	MaxFuse Size (MOP)[3,8]	Rec. Fuse[4,8] Size	Discon. Switch Size[9]	Rated Load Amps[1]	Min.Cir. Amps (MCA)[2]	MaxFuse Size (MOP)[3]	Rated Load Amps[1]	Min.Cir. Amps (MCA)[2]	Locked Rotor (LRA)[5]	MaxFuse Size (MOP)[3]	Rec. Fuse[4] Size
UCA020BH	UCA020BHASAC00S	208V-230V/ 3PH/ 60HZ	86.2	96.3	125.0	110.0	150.0	4.5	5.6	10.0	40.3	50.3	239.0	90.0	60.0
UCA020BF	UCA020BFASAC00S	460V/ 3PH/ 60HZ	39.2	43.8	60.0	50.0	60.0	2.3	2.9	7.5	18.3	22.9	125.0	40.0	30.0
UCA020BN	UCA020BNASAC00S	575V/ 3PH/ 60HZ	31.0	34.5	45.0	40.0	50.0	2.1	2.6	6.0	14.3	17.9	80.0	30.0	25.0
UCA030BH	UCA030BHASAC00S	208V-230V/ 3PH/ 60HZ	133.4	149.0	200.0	175.0	200.0	7.0	8.8	15.0	62.6	78.2	340.0	125.0	90.0
UCA030BF	UCA030BFASAC00S	460V/ 3PH/ 60HZ	60.7	67.8	90.0	80.0	100.0	3.6	4.5	10.0	28.4	35.5	173.0	60.0	45.0
UCA030BN	UCA030BNASAC00S	575V/ 3PH/ 60HZ	50.3	56.1	70.0	70.0	80.0	3.4	4.3	7.5	23.3	29.1	132.0	50.0	40.0
UCA050BH	UCA050BHASAC00S	208V-230V/ 3PH/ 60HZ	203.2	227.3	300.0	300.0	350.0	8.0	10.0	10.0	96.4	120.5	436.0	200.0	150.0
UCA050BF	UCA050BFASAC00S	460V/ 3PH/ 60HZ	91.7	102.6	150.0	125.0	150.0	4.0	5.0	5.0	43.6	54.5	212.0	90.0	70.0
UCA050BN	UCA050BNASAC00S	575V/ 3PH/ 60HZ	73.5	82.2	110.0	100.0	125.0	3.2	4.1	4.0	34.9	43.6	168.0	70.0	60.0
UCA070BH	UCA070BHASAC00S	208V-230V/ 3PH/ 60HZ	296.6	331.1	450.0	400.0	450.0	18.0	22.5	15.0	138.1	172.6	635.0	300.0	225.0
UCA070BF	UCA070BFASAC00S	460V/ 3PH/ 60HZ	133.3	148.9	200.0	175.0	200.0	8.0	10.0	10.0	62.4	78.0	280.0	125.0	100.0
UCA070BN	UCA070BNASAC00S	575V/ 3PH/ 60HZ	108.0	120.5	150.0	150.0	175.0	7.6	9.5	7.5	50.0	62.5	225.0	100.0	80.0

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 Protection or Max.Fuse 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. 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.
5. LRA - Locked Rotor Amps are instantaneous starting amperage per compressor.
6. Module internal wiring is per NEC.
7. 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
8. MOP Device or Recommended Fusing Device for Module Power Wiring supplied by others. These are recommended values for electrical power protection of modules selected.
9. Disconnect Switch for Module Power Wiring supplied by others. These are recommended values for electrical power protection of modules selected.
10. Condenser fans are fused in pairs for 070 models as shown in their respective electrical diagrams.

Electrical Data – Model UCF, Free Cooling

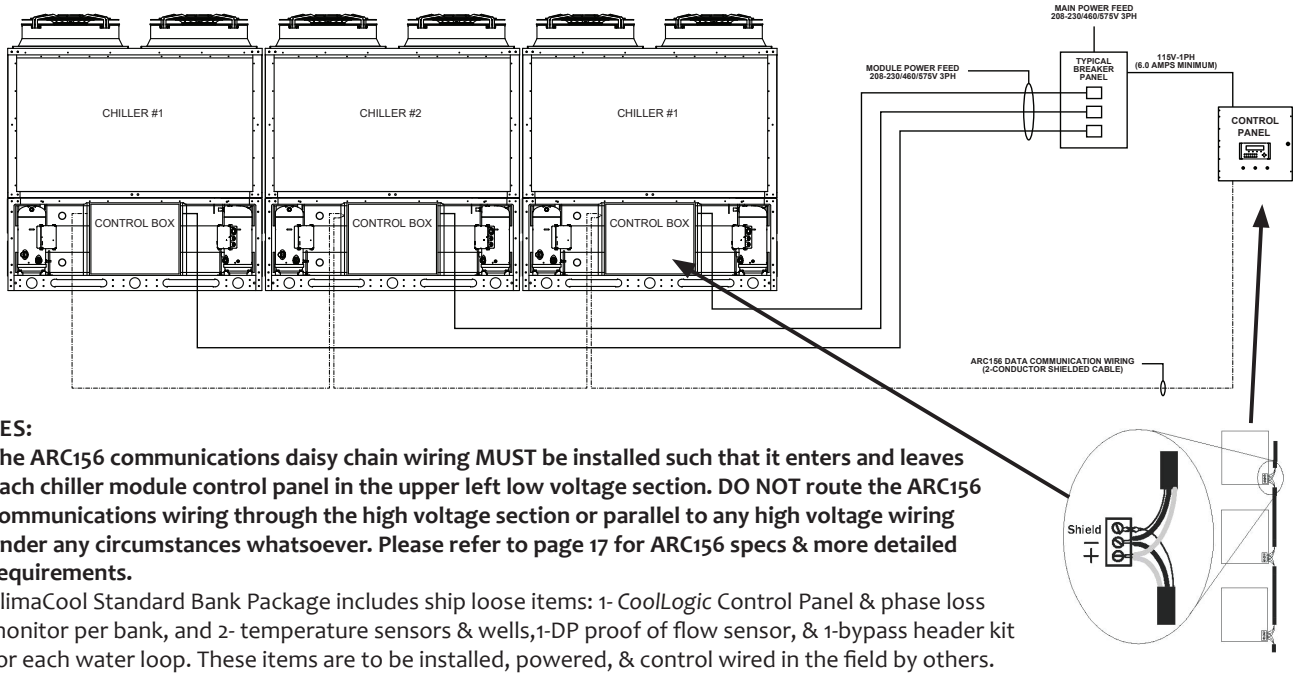
ClimaCool Base Model	Typical Model #	Voltage	Power Wiring - per Module					Internal Wiring - Cond. Fans[10]		
			Rated Load Amps[1]	Min.Cir. Amps (MCA)[2]	MaxFuse Size (MOP)[3,8]	Rec. Fuse[4,8] Size	Discon. Switch Size[9]	Rated Load Amps[1]	Min.Cir. Amps (MCA)[2]	MaxFuse Size (MOP)[3]
UCF030BH	UCF030BHA00000S	208V-230V/ 3PH/ 60HZ	9.9	11.1	20.0	15.0	15.0	9.2	10.4	15.0
UCF030BF	UCF030BFA00000S	460V/ 3PH/ 60HZ	5.1	5.7	15.0	7.5	15.0	4.8	5.4	7.5
UCF030BN	UCF030BNA00000S	575V/ 3PH/ 60HZ	4.7	5.2	15.0	7.0	15.0	4.4	5.0	7.0
UCF070BH	UCF070BHA00000S	208V-230V/ 3PH/ 60HZ	19.1	11.1	20.0	15.0	15.0	18.4	10.4	15.0
UCF070BF	UCF070BFA00000S	460V/ 3PH/ 60HZ	9.9	5.7	15.0	7.5	15.0	9.6	5.4	7.5
UCF070BN	UCF070BNA00000S	575V/ 3PH/ 60HZ	9.1	5.2	15.0	7.0	15.0	8.8	5.0	7.0

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 Protection or Max.Fuse 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. 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.
5. LRA - Locked Rotor Amps are instantaneous starting amperage per compressor.
6. Module internal wiring is per NEC.
7. 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
8. MOP Device or Recommended Fusing Device for Module Power Wiring supplied by others. These are recommended values for electrical power protection of modules selected.
9. Disconnect Switch for Module Power Wiring supplied by others. These are recommended values for electrical power protection of modules selected.
10. Condenser fans are fused in pairs for 070 models as shown in their respective electrical diagrams.

Power Distribution Drawing

Figure 39 - Power Distribution Drawing



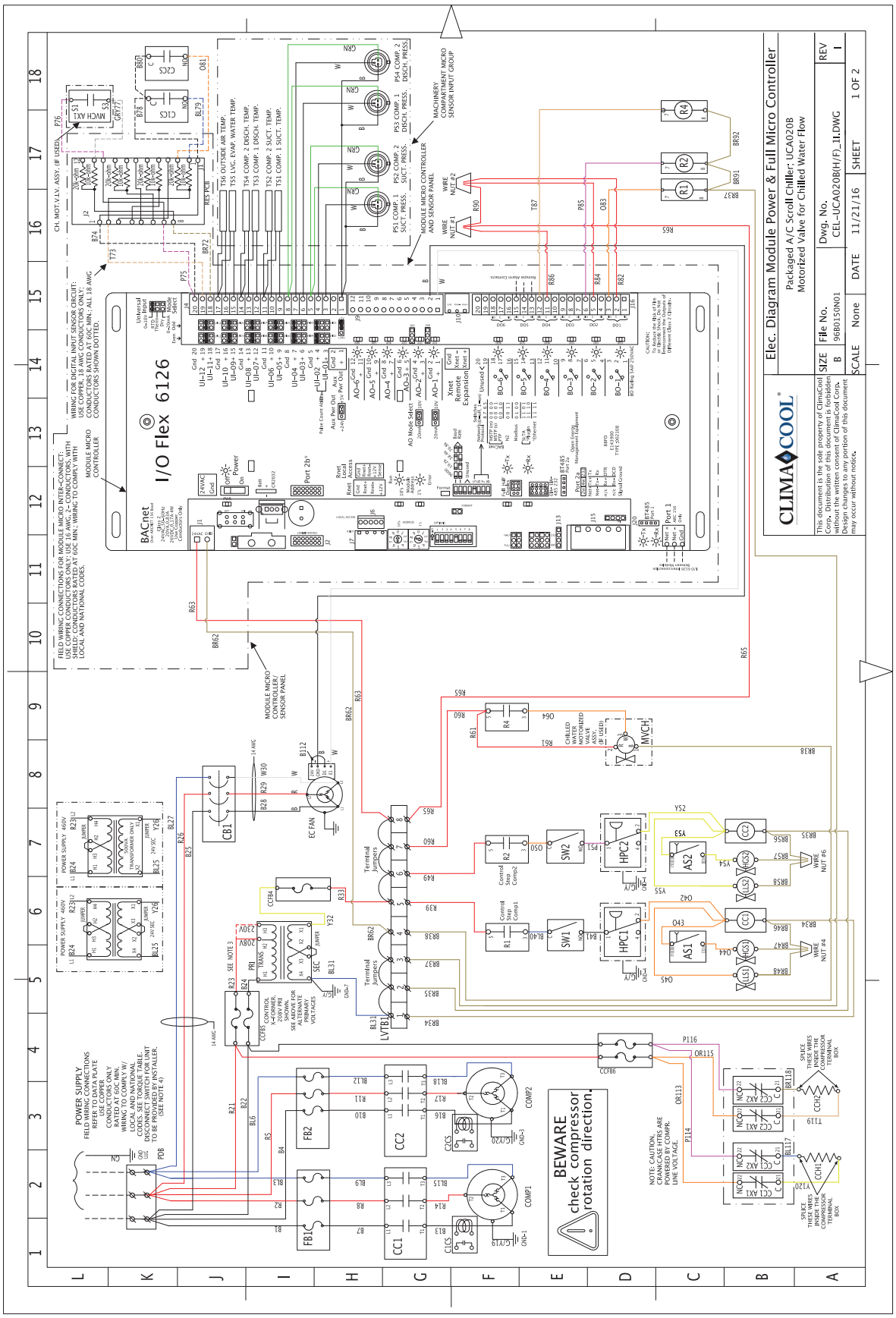
NOTES:

1. **The ARC156 communications daisy chain wiring MUST be installed such that it enters and leaves each chiller module control panel in the upper left low voltage section. DO NOT route the ARC156 communications wiring through the high voltage section or parallel to any high voltage wiring under any circumstances whatsoever. Please refer to page 17 for ARC156 specs & more detailed requirements.**
2. ClimaCool Standard Bank Package includes ship loose items: 1- *CoolLogic* Control Panel & phase loss monitor per bank, and 2- temperature sensors & wells,1-DP proof of flow sensor, & 1-bypass header kit for each water loop. These items are to be installed, powered, & control wired in the field by others.
3. The shown Breaker Panel may be purchased through ClimaCool Corp, but is typically provided by the project electrical contractor.
4. Breaker panels can be supplied for skid mount packages or new construction projects as options. Consult your local ClimaCool representative.
5. Control wiring is by others.
6. Field connections are simplified requiring only a two-conductor shielded cable daisy chain from the bank controller to the modules.
7. Disconnects NOT included.

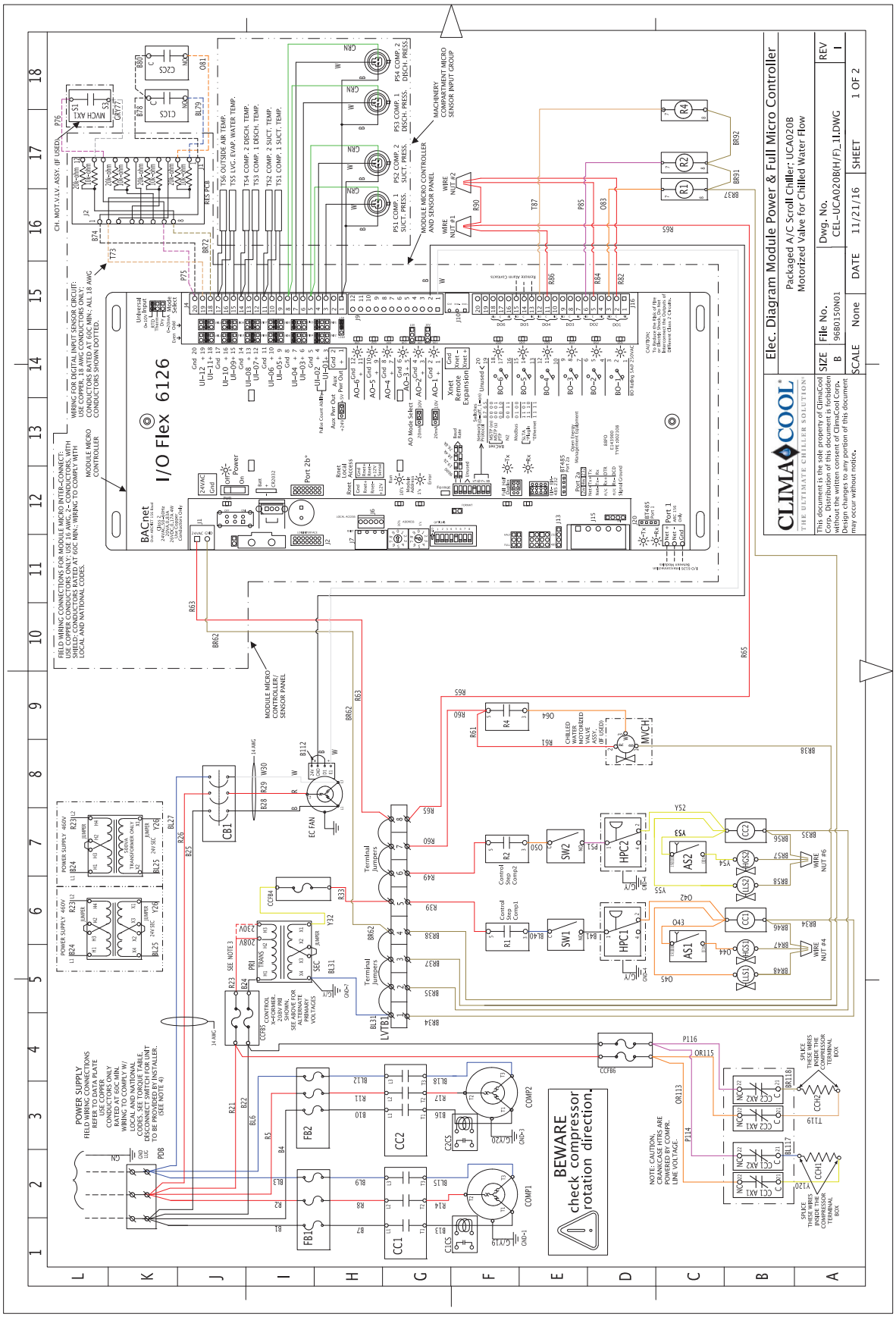
Cable Shields

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.

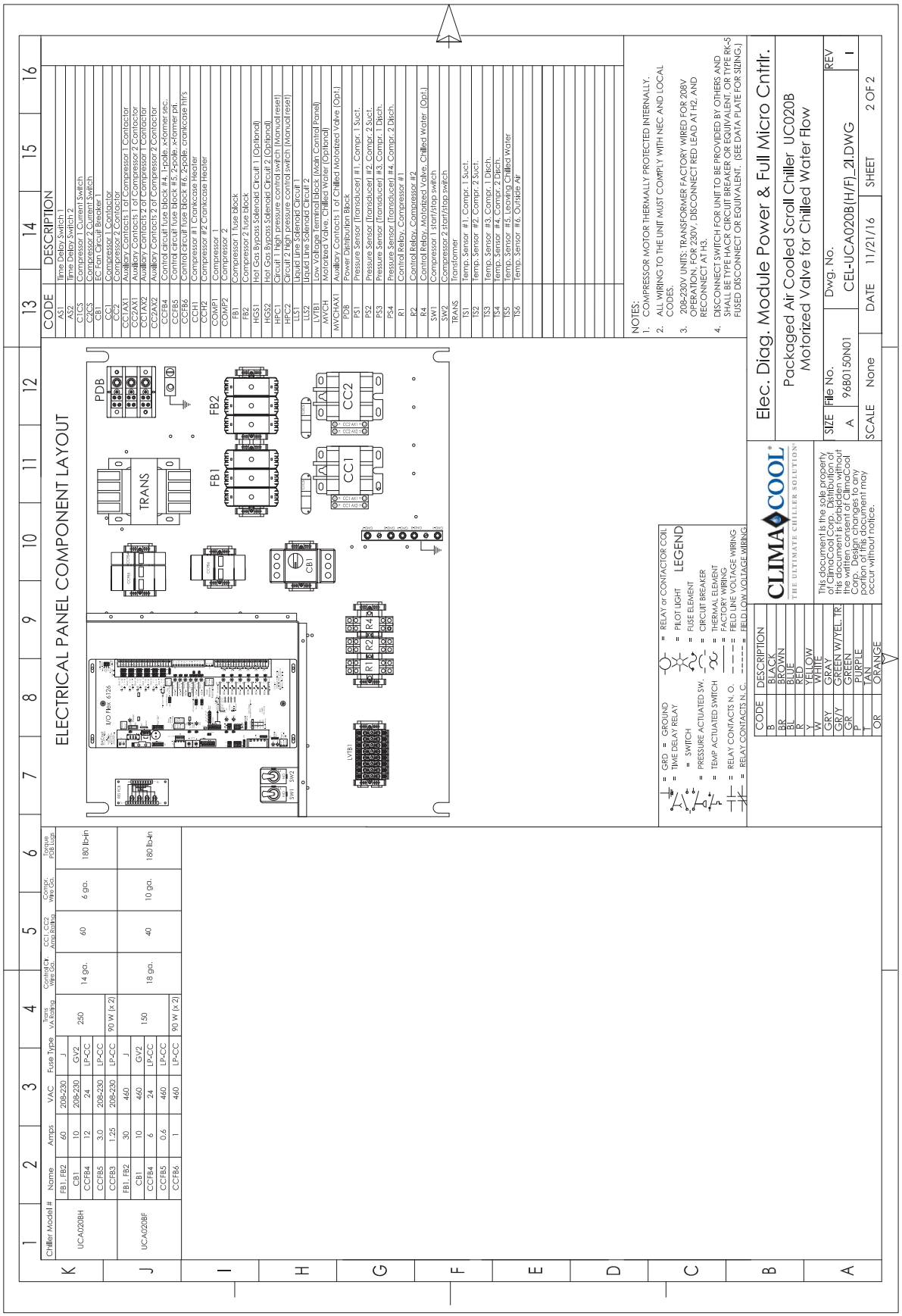
Wiring Diagram – UCA020, Cooling Only, 208v, 230v, 460v



Wiring Diagram – UCA020, Cooling Only, 208v, 230v, 460V



Wiring Diagram – UCA020, Heat Pump, 208v, 230v, 460v

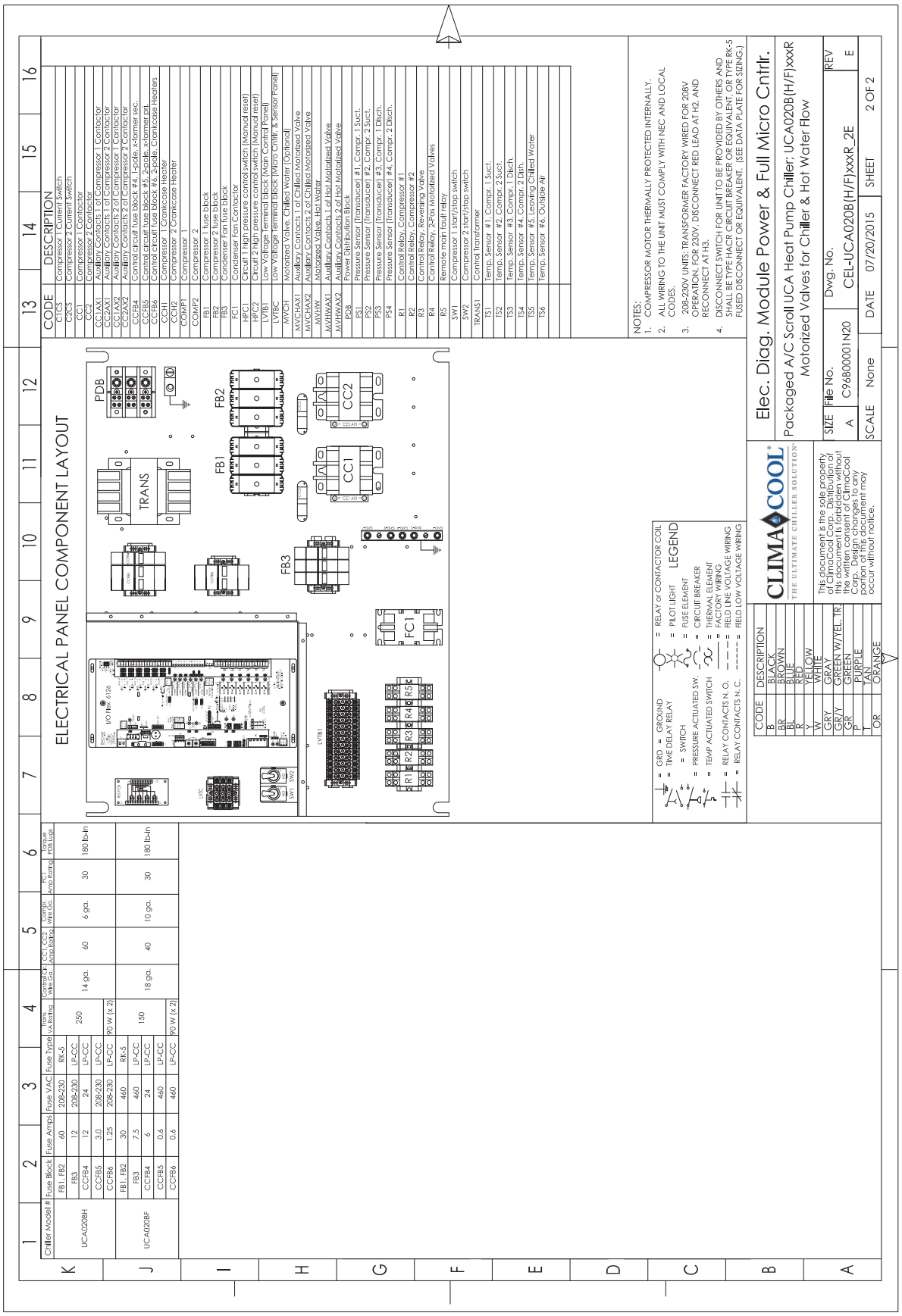


CODE	DESCRIPTION
AS1	Time Delay Switch 1
AS2	Time Delay Switch 2
C1CS	Compressor 1 Current Switch
C2CS	Compressor 2 Current Switch
CB1	EC Fan Circuit Breaker 1
CC1	Compressor 1 Contactor
CC2	Compressor 2 Contactor
CC1AX1	Auxiliary Contacts 1 of Compressor 1 Contactor
CC2AX1	Auxiliary Contacts 1 of Compressor 2 Contactor
CC1AX2	Auxiliary Contacts 2 of Compressor 1 Contactor
CC2AX2	Auxiliary Contacts 2 of Compressor 2 Contactor
CCFB4	Control circuit fuse block #4, 1-pole, x-former sec.
CCFB5	Control circuit fuse block #5, 2-pole, x-former pri.
CCFB6	Control circuit fuse block #6, 2-pole, crankcase htr's
CCH1	Compressor #1 Crankcase Heater
CCH2	Compressor #2 Crankcase Heater
COMP1	Compressor 1
COMP2	Compressor 2
FB1	Compressor 1 fuse Block
FB2	Compressor 2 fuse Block
HGS1	Hot Gas Bypass Solenoid Circuit 1 (Optional)
HGS2	Hot Gas Bypass Solenoid Circuit 2 (Optional)
HPC1	Circuit 1 high pressure control switch (Manual reset)
HPC2	Circuit 2 high pressure control switch (Manual reset)
LLS1	Liquid Line Solenoid Circuit 1
LLS2	Liquid Line Solenoid Circuit 2
MVTB1	Low Voltage Terminal Block (Main Control Panel)
MVCH	Motorized Valve, Chilled Water (Optional)
MVCHAX1	Auxiliary Contacts 1 of Chilled Motorized Valve (Opt.)
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
R4	Control Relay, Motorized Valve, Chilled Water (Opt.)
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, Compr. 1 Disch.
TS4	Temp. Sensor #4, Compr. 2 Disch.
TS5	Temp. Sensor #5, Leaving Chilled Water
TS6	Temp. Sensor #6, Outside Air

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

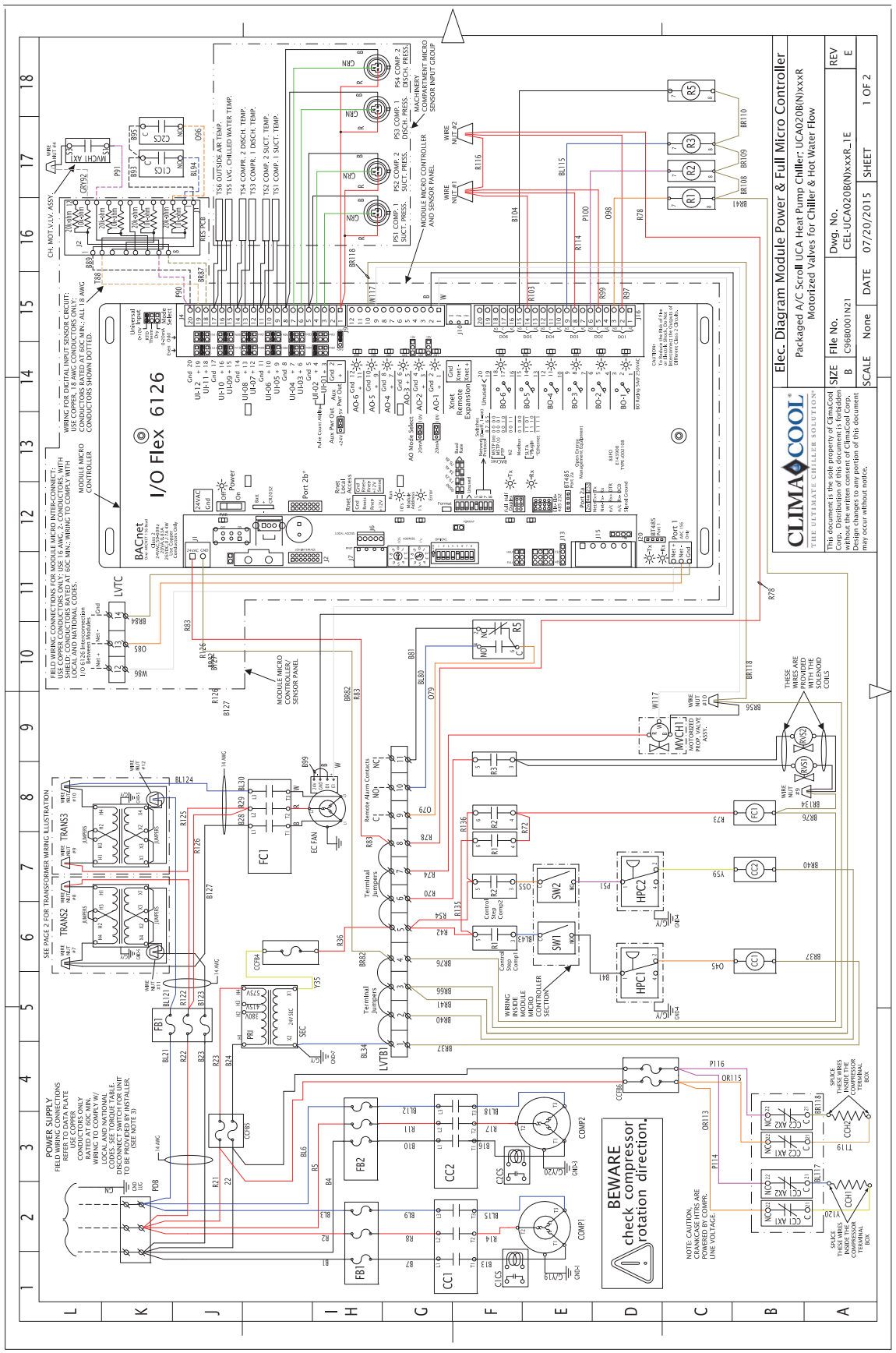
Chiller Model #	Name	Amps	VAC	Fuse Type	Trans VA Rating	Control Circ. Wire Size	CC1, CC2 Amp Rating	Compr. Wire Size	Torque (TB) Lugs
UCA020BH	FB1, FB2	60	208-230	J	250	14 ga.	60	6 ga.	180 lb-in
	CB1	10	208-230	GV2					
	CCFB4	1.2	24	LP-CC					
	CCFB5	3.0	208-230	LP-CC	90 W (x 2)				
	CCFB3	1.25	208-230	LP-CC					
UCA020BF	FB1, FB2	30	460	J	150	18 ga.	40	10 ga.	180 lb-in
	CB1	10	460	GV2					
	CCFB4	6	24	LP-CC					
	CCFB5	0.6	460	LP-CC	90 W (x 2)				
	CCFB6	1	460	LP-CC					

Wiring Diagram – UCA020, HeatPump, 208v, 230v, 460v

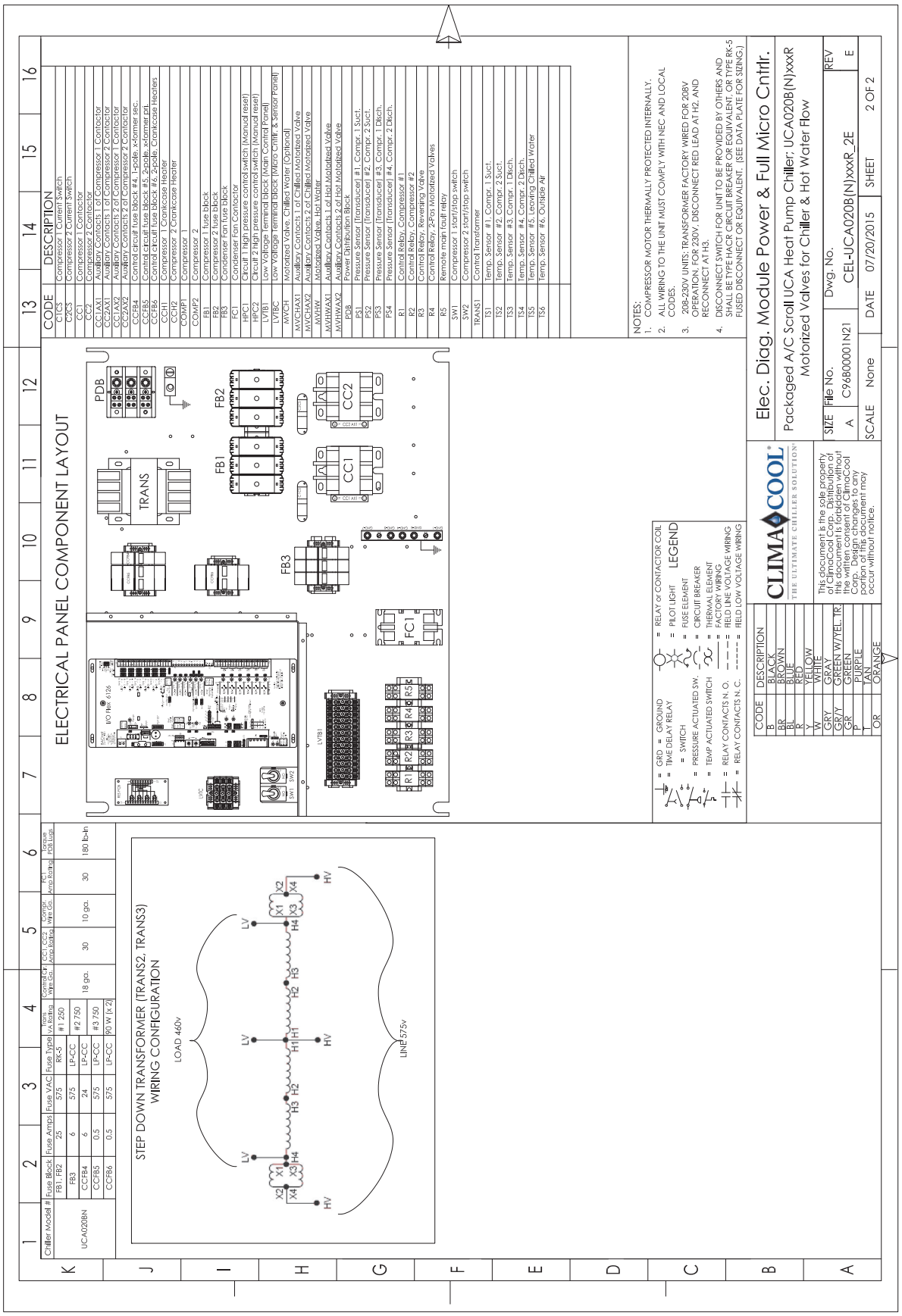


Chiller Model #	Fuse Block	Fuse Amps	Fuse VAC	Fuse Type	Volts VA Rating	Control Ckt Wire Ga.	CC1, CC2 Amp Rating	Compr. Wire Ga.	FC1 Amp Rating	Torque PDB Lugs
UCA020BH	FB1, FB2	60	208-230	RK-5	250	14 ga.	60	6 ga.	30	180 lb-in
	FB3	12	208-230	LP-CC						
	CCFB4	12	24	LP-CC						
	CCFB5	3.0	208-230	LP-CC	PO W (x 2)					
	CCFB6	1.25	208-230	LP-CC						
UCA020BF	FB1, FB2	30	460	RK-5	150	18 ga.	40	10 ga.	30	180 lb-in
	FB3	7.5	460	LP-CC						
	CCFB4	6	24	LP-CC						
	CCFB5	0.6	460	LP-CC						
	CCFB6	0.6	460	LP-CC	PO W (x 2)					

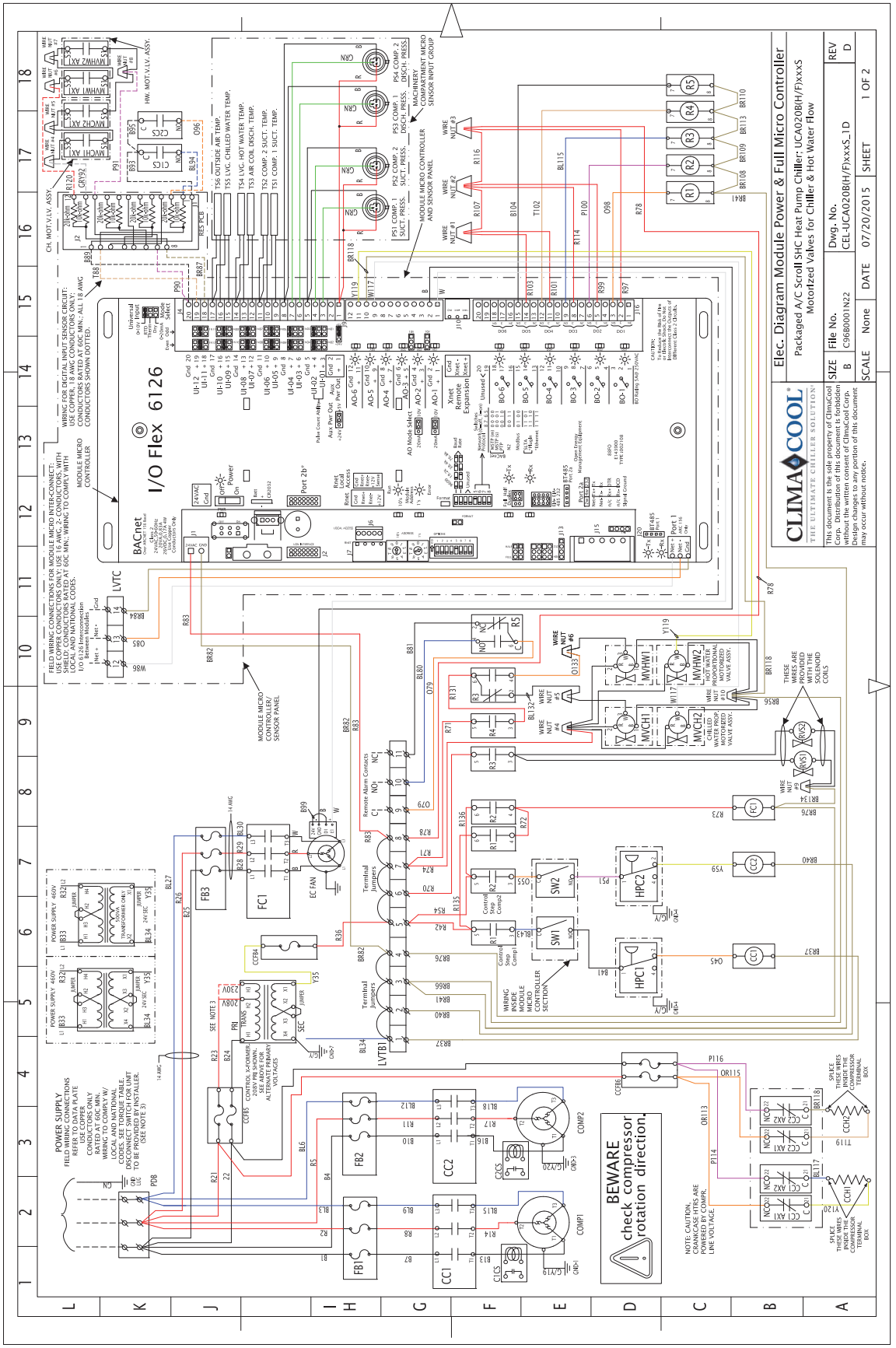
Wiring Diagram – UCA020, Heat Pump, 575v



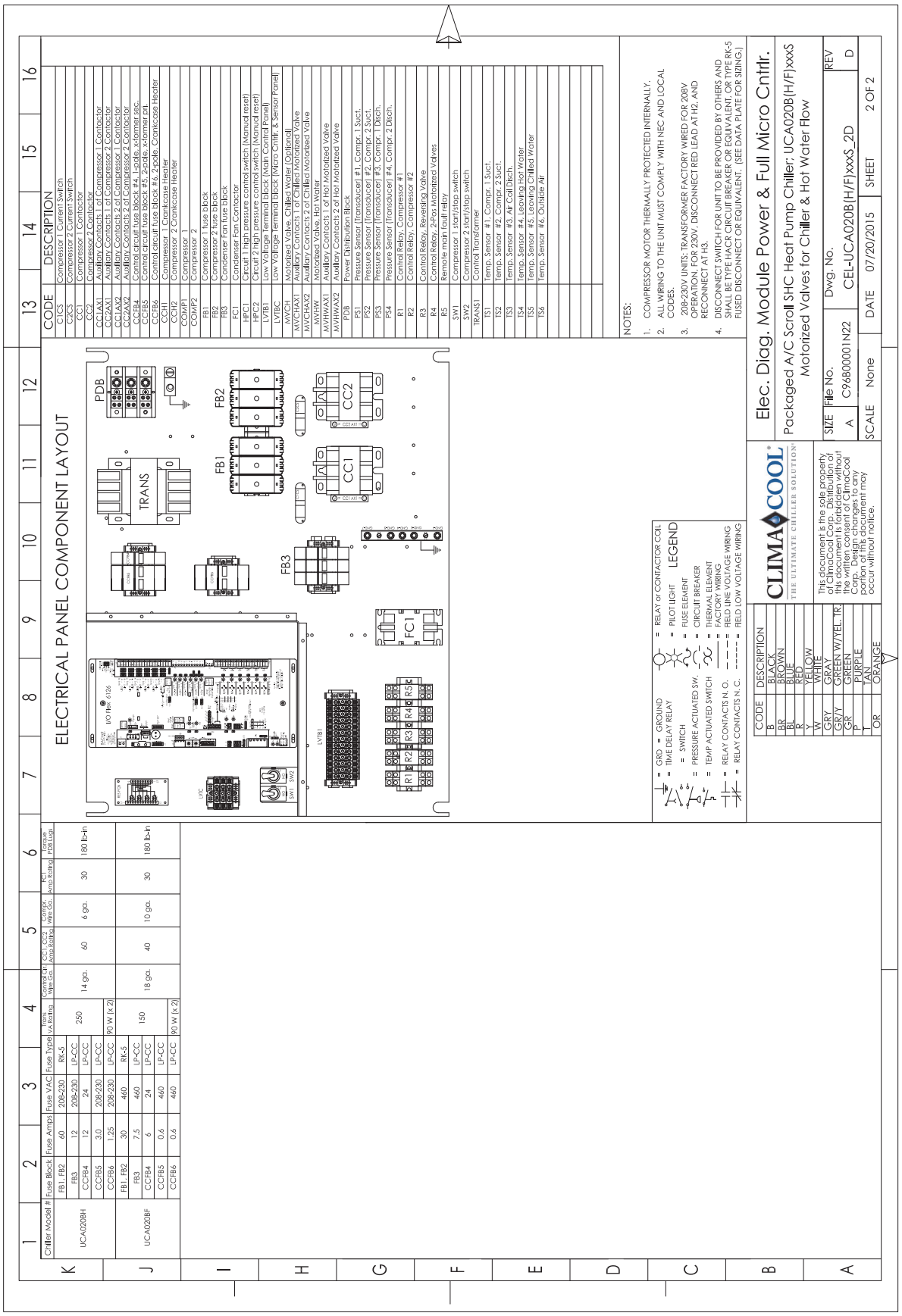
Wiring Diagram – UCA020, Heat Pump, 575v



Wiring Diagram – UCA020, SHC Heat Pump, 208v, 230v, 460v



Wiring Diagram – UCA020, SHC Heat Pump, 208v, 230v, 460v

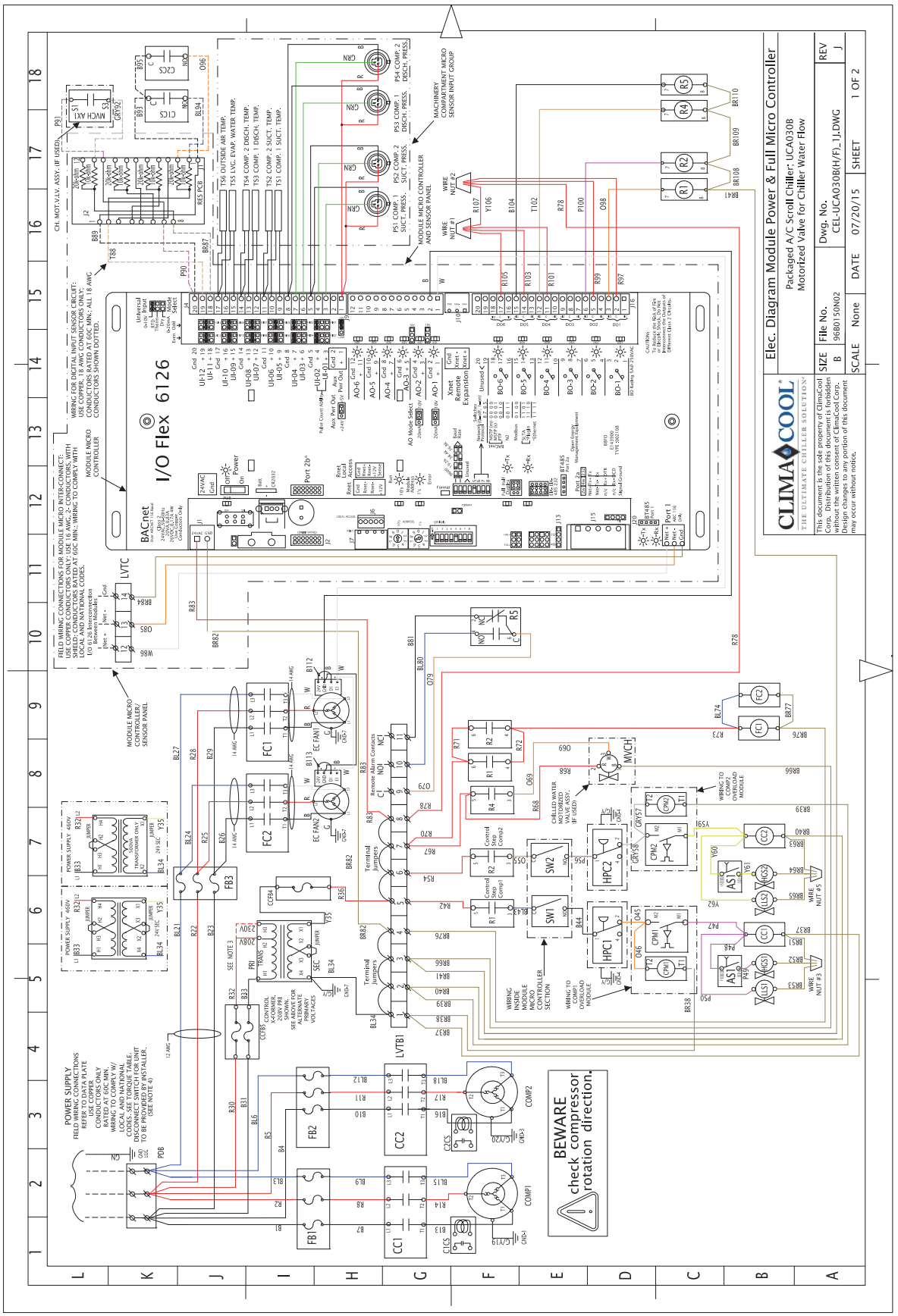


Chiller Model #	Fuse Block	Fuse Amps	Fuse VAC	Fuse Type	Volts-VA Rating	Control Ckt Wire Ga.	CC1, CC2 Amp Rating	Compr. Wire Ga.	FC1 Amp Rating	Torque: PDB Lugs
UCA020BH	FB1, FB2	60	208-230	RK-5						
	FB3	12	208-230	LP-CC	250	14 ga.	60	6 ga.	30	180 lb-in
	CCFB4	12	24	LP-CC						
	CCFB5	3.0	208-230	LP-CC	90 W (x 2)					
	CCFB6	1.25	208-230	LP-CC						
UCA020BF	FB1, FB2	30	460	RK-5						
	FB3	7.5	460	LP-CC	150	18 ga.	40	10 ga.	30	180 lb-in
	CCFB4	6	24	LP-CC						
	CCFB5	0.6	460	LP-CC	90 W (x 2)					
	CCFB6	0.6	460	LP-CC						

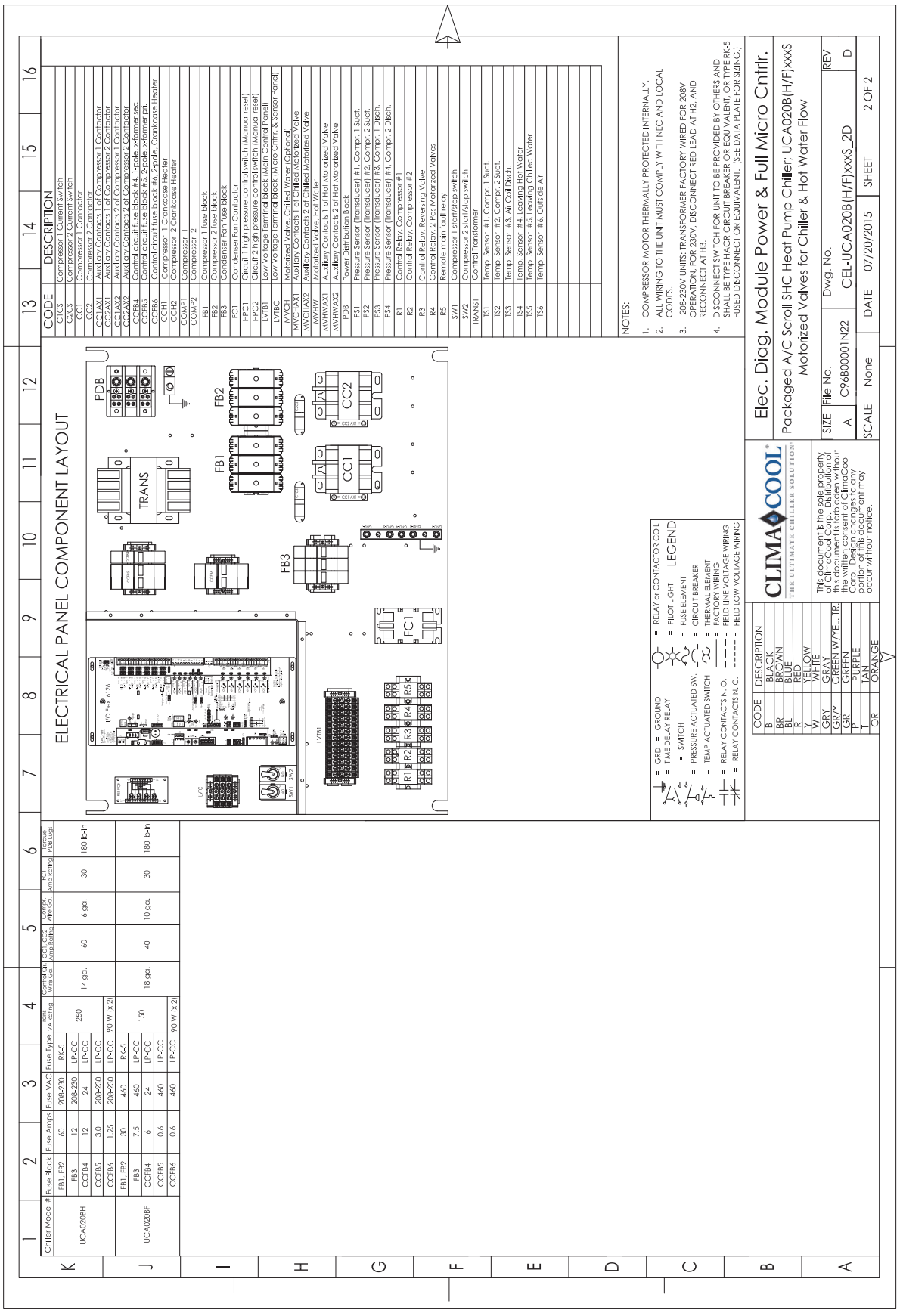
CODE	DESCRIPTION
C1CS	Compressor 1 Current Switch
C2CS	Compressor 2 Current Switch
CC1	Compressor 1 Contactor
CC2	Compressor 2 Contactor
CC1AX1	Auxiliary Contacts 1 of Compressor 1 Contactor
CC2AX1	Auxiliary Contacts 1 of Compressor 2 Contactor
CC1AX2	Auxiliary Contacts 2 of Compressor 1 Contactor
CC2AX2	Auxiliary Contacts 2 of Compressor 2 Contactor
CCFB4	Control circuit fuse block #4, 1-pole, x-former sec.
CCFB5	Control circuit fuse block #5, 2-pole, x-former pri.
CCFB6	Control circuit fuse block #6, 2-pole, Crankcase Heater
CCH1	Compressor 1 Crankcase Heater
CCH2	Compressor 2 Crankcase Heater
COMP1	Compressor 1
COMP2	Compressor 2
FB1	Compressor 1 fuse block
FB2	Compressor 2 fuse Block
FB3	Condenser Fan fuse Block
FC1	Condenser Fan Contactor
HPC1	Circuit 1 high pressure control switch (Manual reset)
HPC2	Circuit 2 high pressure control switch (Manual reset)
LVTB1	Low Voltage terminal block (Main Control Panel)
LVTBC	Low Voltage terminal Block (Micro Cmtr. & Sensor Panel)
MVCH	Motorized Valve, Chilled Water (Optional)
MVCHAX1	Auxiliary Contacts 1 of Chilled Motorized Valve
MVCHAX2	Auxiliary Contacts 2 of Chilled Motorized Valve
MVHW	Motorized Valve, Hot Water
MVHWAX1	Auxiliary Contacts 1 of Hot Motorized Valve
MVHWAX2	Auxiliary Contacts 2 of Hot Motorized Valve
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
R3	Control Relay, Reversing Valve
R4	Control Relay, 2-Pos Motorized Valves
R5	Remote main fault relay
SW1	Compressor 1 start/stop switch
SW2	Compressor 2 start/stop switch
TRANS1	Control Transformer
TS1	Temp. Sensor #1, Compr. 1 Suct.
TS2	Temp. Sensor #2, Compr. 2 Suct.
TS3	Temp. Sensor #3, Air Coil Disch.
TS4	Temp. Sensor #4, Leaving Hot Water
TS5	Temp. Sensor #5, Leaving Chilled Water
TS6	Temp. Sensor #6, Outside Air

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

Wiring Diagram – UCA030, Cooling Only, 208v, 230v, 460v

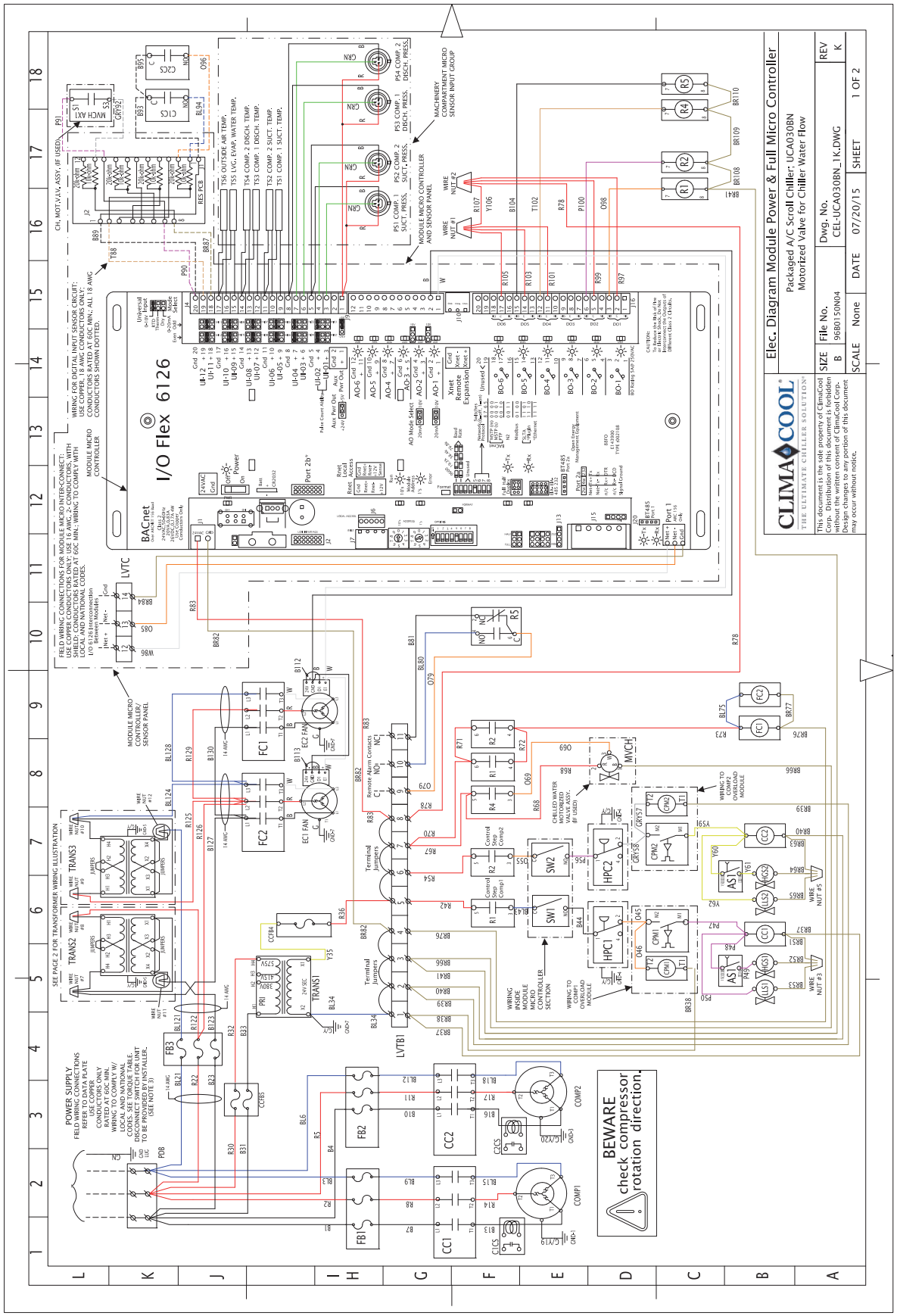


Wiring Diagram – UCA030, Cooling Only, 208V, 230v, 460v

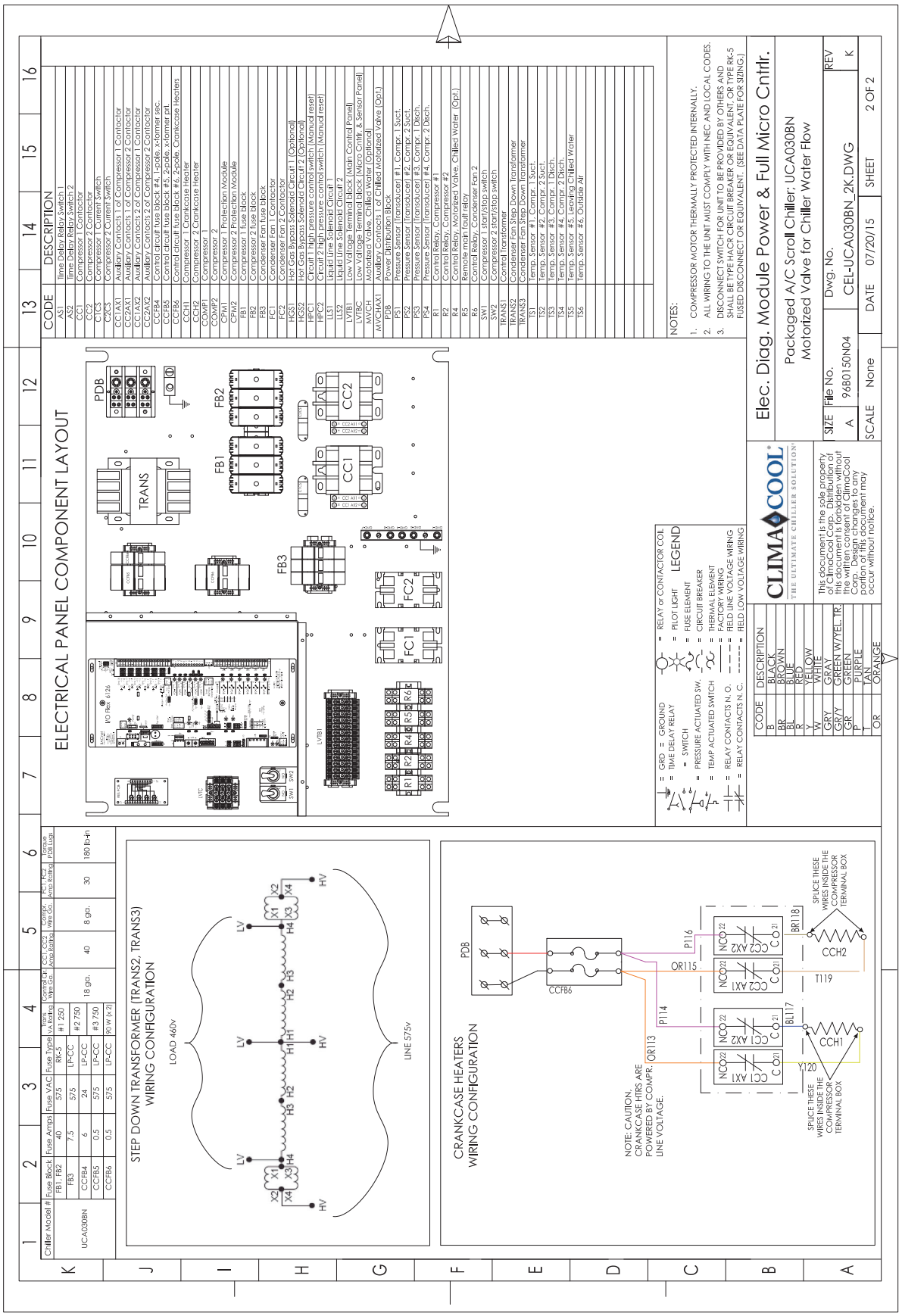


Chiller Model #	Fuse Block	Fuse Amps	Fuse VAC	Fuse Type	Volts VA Rating	Control Ckt Wire Ga.	CC1, CC2 Amp Rating	Compr. Wire Ga.	FC1 Amp Rating	Torque PDB Lugs
UCA020BH	FB1, FB2	60	208-230	RK-5	250	14 ga.	60	6 ga.	30	180 lb-in
	FB3	12	208-230	LP-CC						
	CCFB4	12	24	LP-CC						
	CCFB5	3.0	208-230	LP-CC	90 W (x 2)					
	CCFB6	1.25	208-230	LP-CC						
UCA020BF	FB1, FB2	30	460	RK-5	150	18 ga.	40	10 ga.	30	180 lb-in
	FB3	7.5	460	LP-CC						
	CCFB4	6	24	LP-CC						
	CCFB5	0.6	460	LP-CC	90 W (x 2)					
	CCFB6	0.6	460	LP-CC						

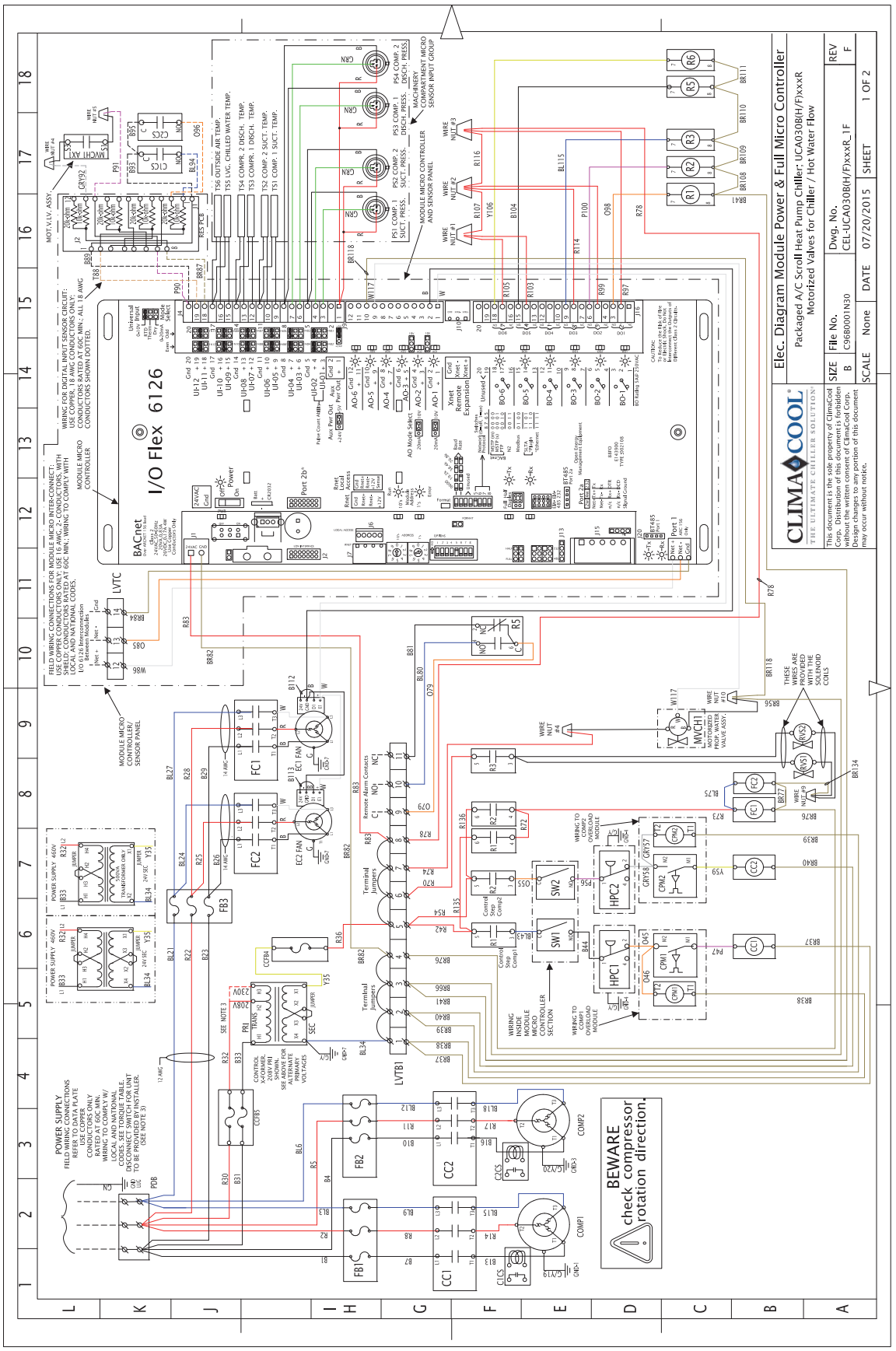
Wiring Diagram – UCA030, Cooling Only, 575v



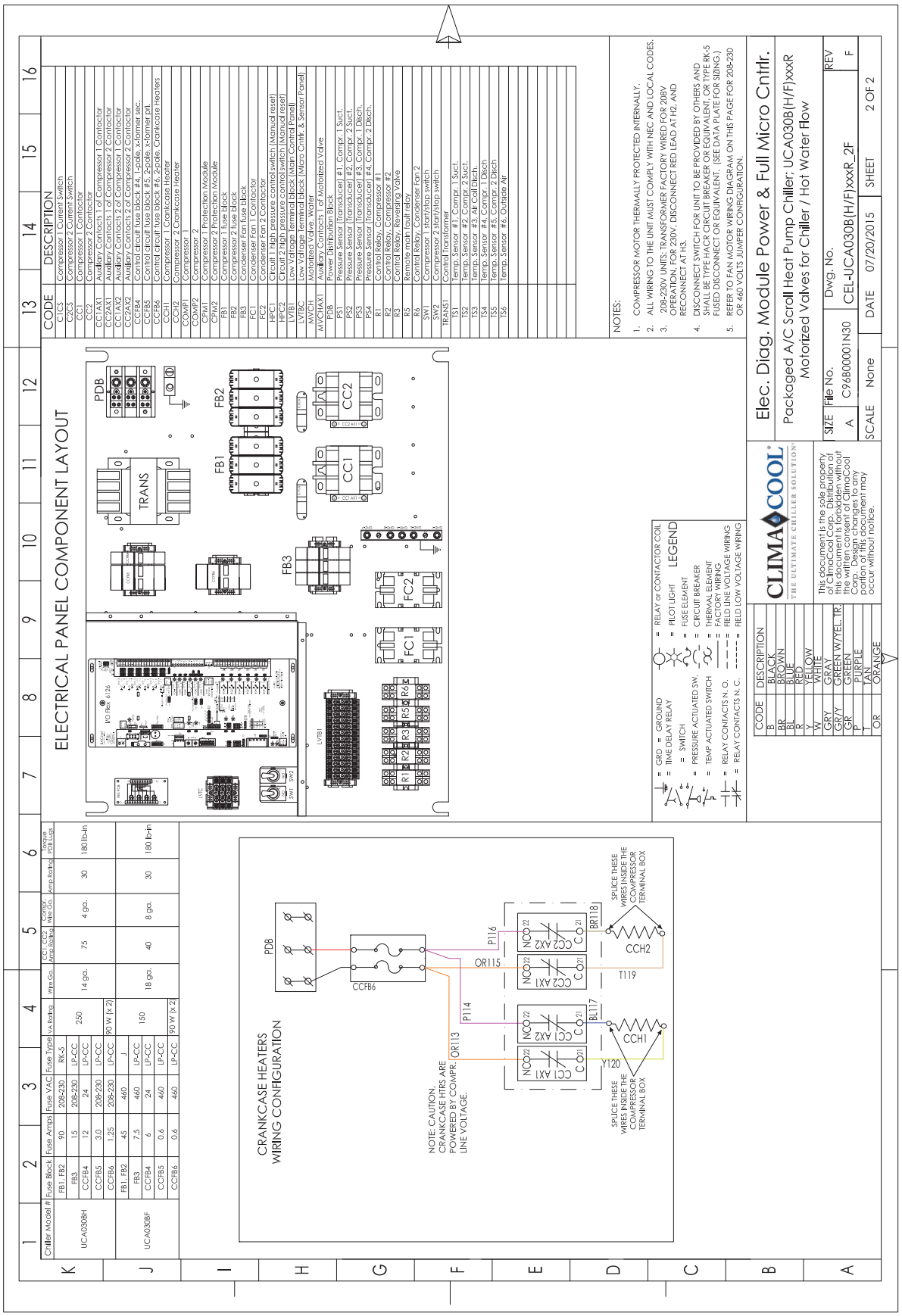
Wiring Diagram – UCA030, Cooling Only, 575v



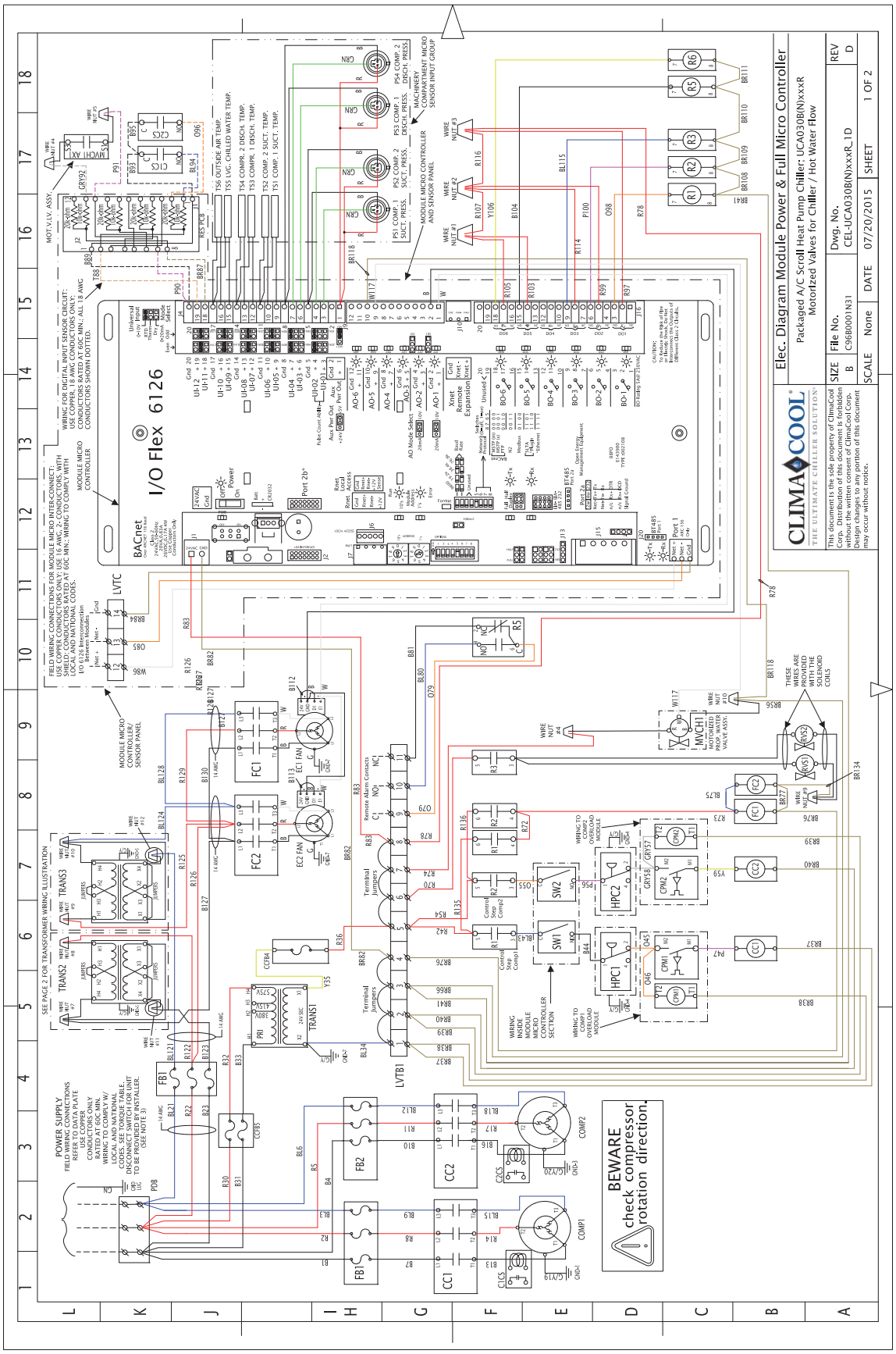
Wiring Diagram – UCA030, Heat Pump, 208V, 230v, 460v



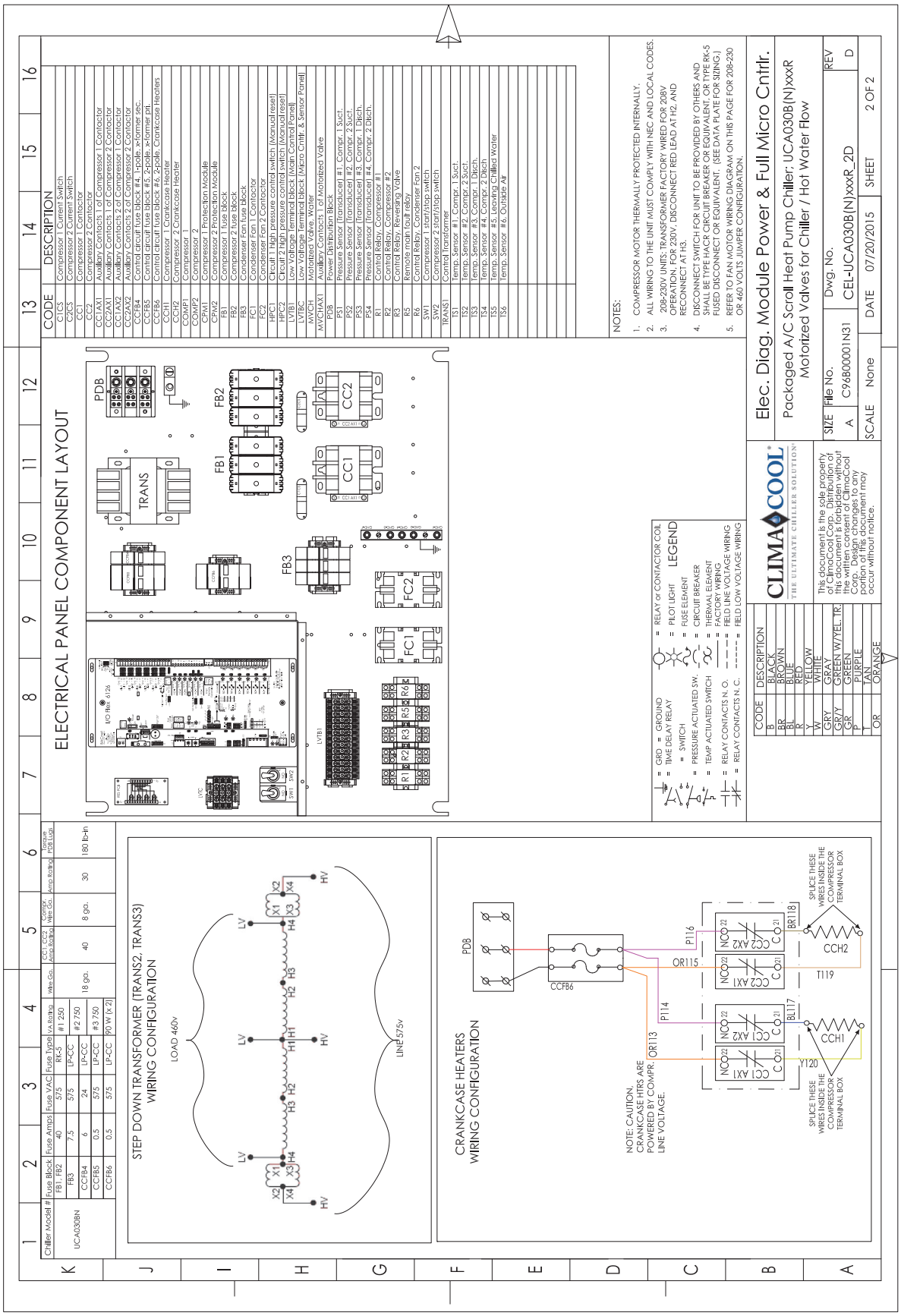
Wiring Diagram – UCA030, Heat Pump, 208v, 230v, 460v



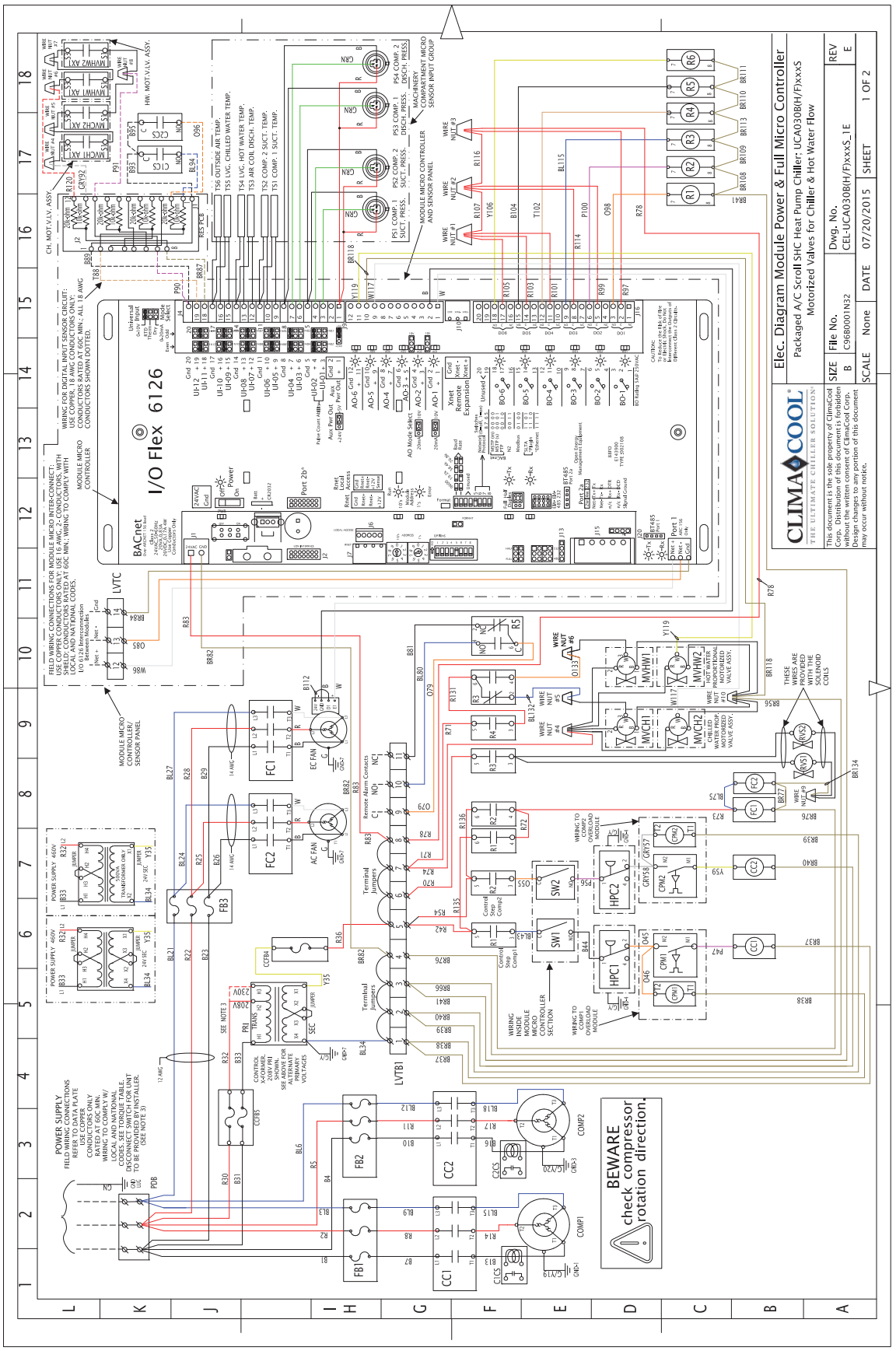
Wiring Diagram – UCA030, Heat Pump, 575v



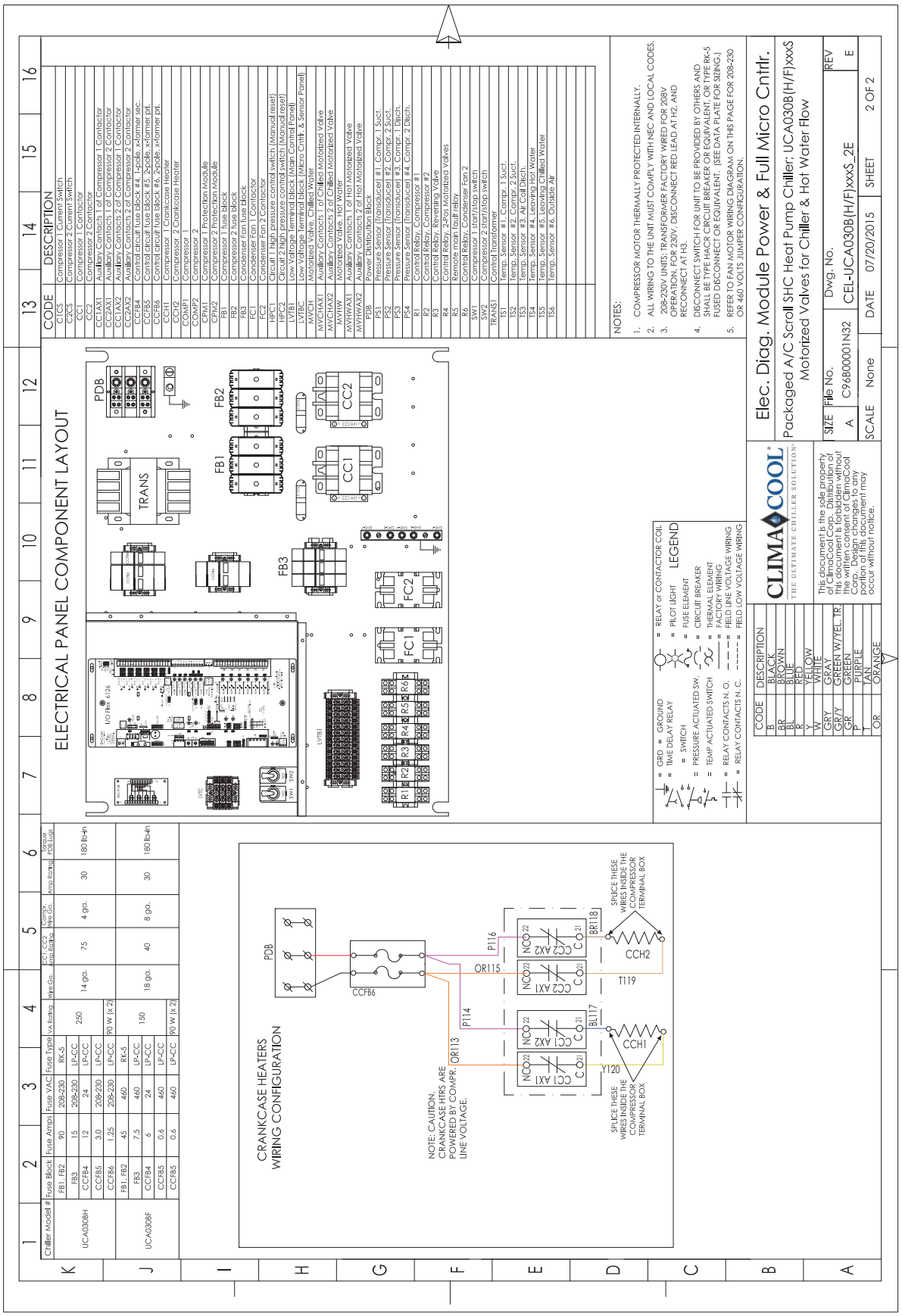
Wiring Diagram – UCA030, Heat Pump, 575v



Wiring Diagram – UCA030, SHC Heat Pump, 208v, 230v, 460v



Wiring Diagram – UCA030, SHC Heat Pump, 208v, 230v, 460v

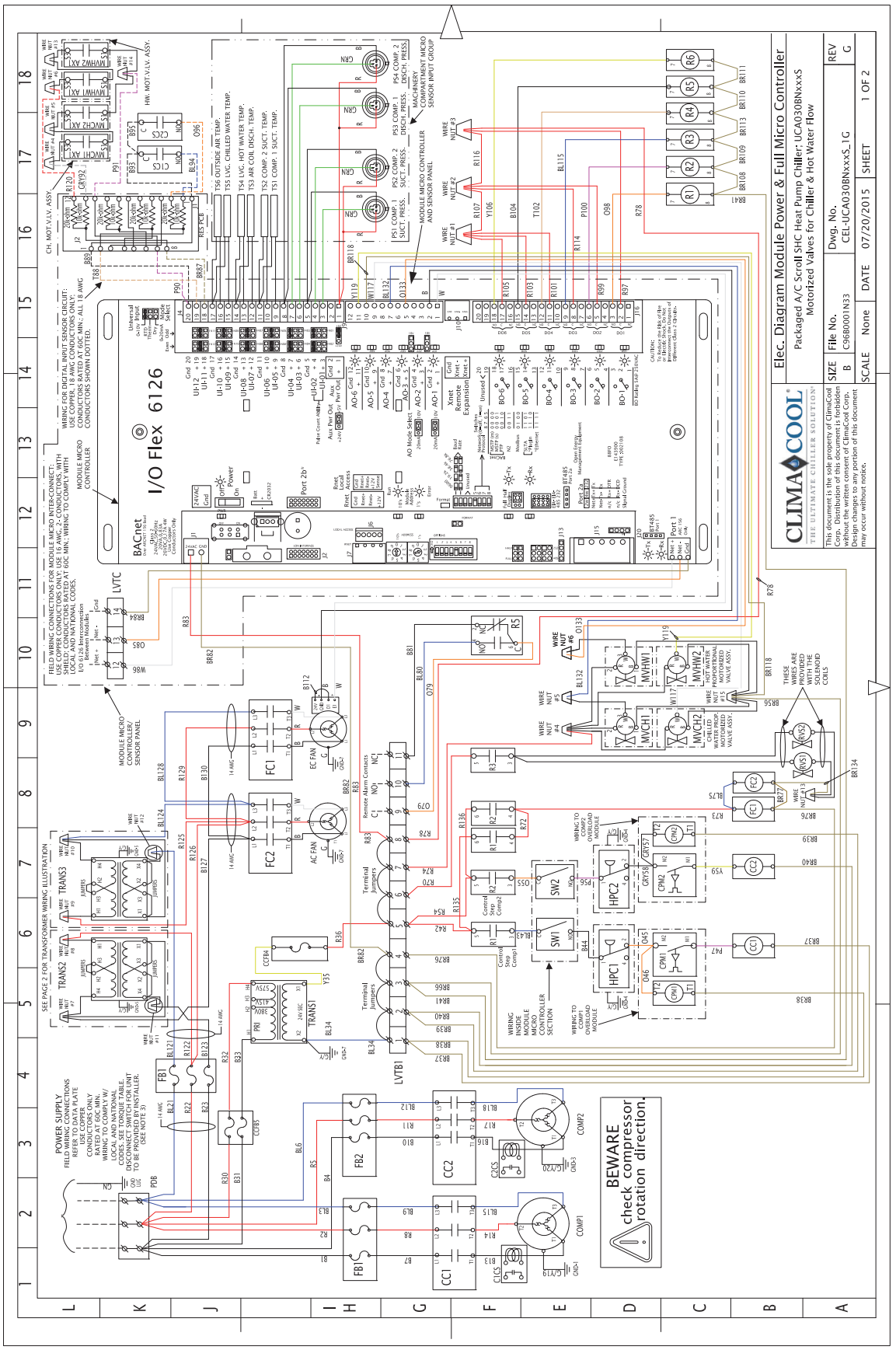


Chiller Model #	Fuse Block	Fuse Amps	Fuse VAC	Fuse Type	VA Rating	Wire Ga.	ECI, CC2 Amp Rating	Compr. Wire Ga.	Amp Rating	Torque PDB Lugs
UCA030BH	FB1, FB2	90	208-230	RK-5	250	14 ga.	75	4 ga.	30	180 lb-in
	FB3	15	208-230	LP-CC						
	CCFB4	12	24	LP-CC						
	CCFB5	3.0	208-230	LP-CC						
	CCFB6	1.25	208-230	LP-CC	90 W (X 2)					
UCA030BF	FB1, FB2	45	460	RK-5	150	18 ga.	40	8 ga.	30	180 lb-in
	FB3	7.5	460	LP-CC						
	CCFB4	6	24	LP-CC						
	CCFB5	0.6	460	LP-CC						
	CCFB6	0.6	460	LP-CC	90 W (X 2)					

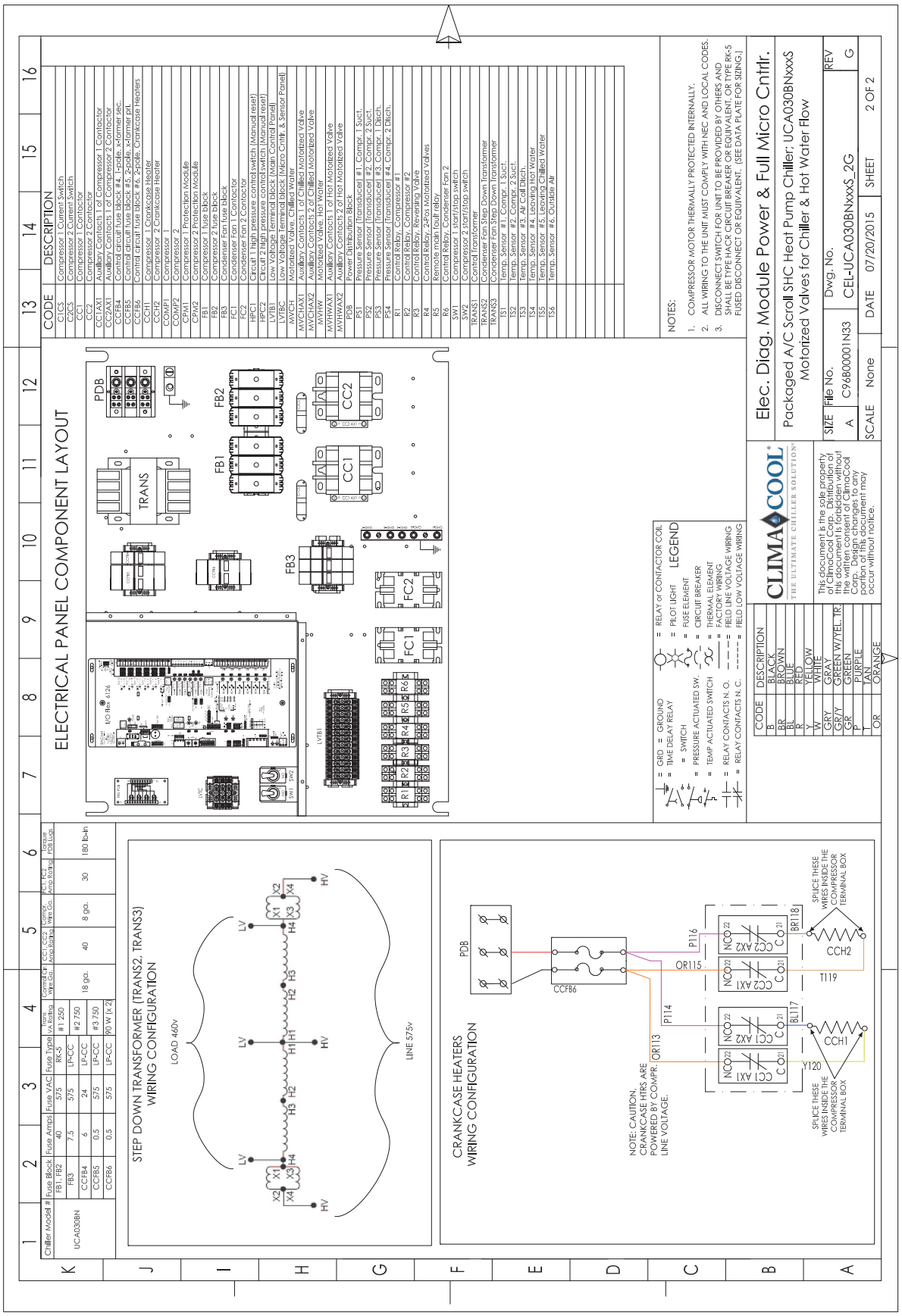
CODE	DESCRIPTION
CTCS	Compressor 1 Current Switch
C2CS	Compressor 2 Current Switch
CC1	Compressor 1 Contactor
CC2	Compressor 2 Contactor
CC1AX1	Auxiliary Contacts 1 of Compressor 1 Contactor
CC2AX1	Auxiliary Contacts 1 of Compressor 2 Contactor
CC1AX2	Auxiliary Contacts 2 of Compressor 1 Contactor
CC2AX2	Auxiliary Contacts 2 of Compressor 2 Contactor
CCFB4	Control circuit fuse block #4, 1-pole, >former sec.
CCFB5	Control circuit fuse block #5, 2-pole, >former pri.
CCFB6	Control circuit fuse block #6, 2-pole, >former pri.
CCH1	Compressor 1 Crankcase Heater
CCH2	Compressor 2 Crankcase Heater
COMP1	Compressor 1
COMP2	Compressor 2
CPM1	Compressor 1 Protection Module
CPM2	Compressor 2 Protection Module
FB1	Compressor 1 fuse Block
FB2	Compressor 2 fuse Block
FB3	Condenser Fan fuse Block
FC1	Condenser Fan 1 Contactor
FC2	Condenser Fan 2 Contactor
HPC1	Circuit 1 high pressure control switch (Manual reset)
HPC2	Circuit 2 high pressure control switch (Manual reset)
LVTB1	Low Voltage Terminal Block (Micro Cntrl. & Sensor Panel)
MVCHW	Motorized Valve, Chilled Water
MVCHAX1	Auxiliary Contacts 1 of Chilled Motorized Valve
MVCHAX2	Auxiliary Contacts 2 of Chilled Motorized Valve
MVHW	Motorized Valve, Hot Water
MVHWAX1	Auxiliary Contacts 1 of Hot Motorized Valve
MVHWAX2	Auxiliary Contacts 2 of Hot Motorized Valve
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
R3	Control Relay, Reversing Valve
R4	Control Relay, 2-Pos Motorized Valves
R5	Remote main fault relay
R6	Control Relay, Condenser Fan 2
SW1	Compressor 1 start/stop switch
SW2	Compressor 2 start/stop switch
TRANS1	Control Transformer
TS1	Temp. Sensor #1, Compr. 1 Suct.
TS2	Temp. Sensor #2, Compr. 2 Suct.
TS3	Temp. Sensor #3, Air Cond. Discharge
TS4	Temp. Sensor #4, Leaving Hot Water
TS5	Temp. Sensor #5, Leaving Chilled Water
TS6	Temp. Sensor #6, Outside Air

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

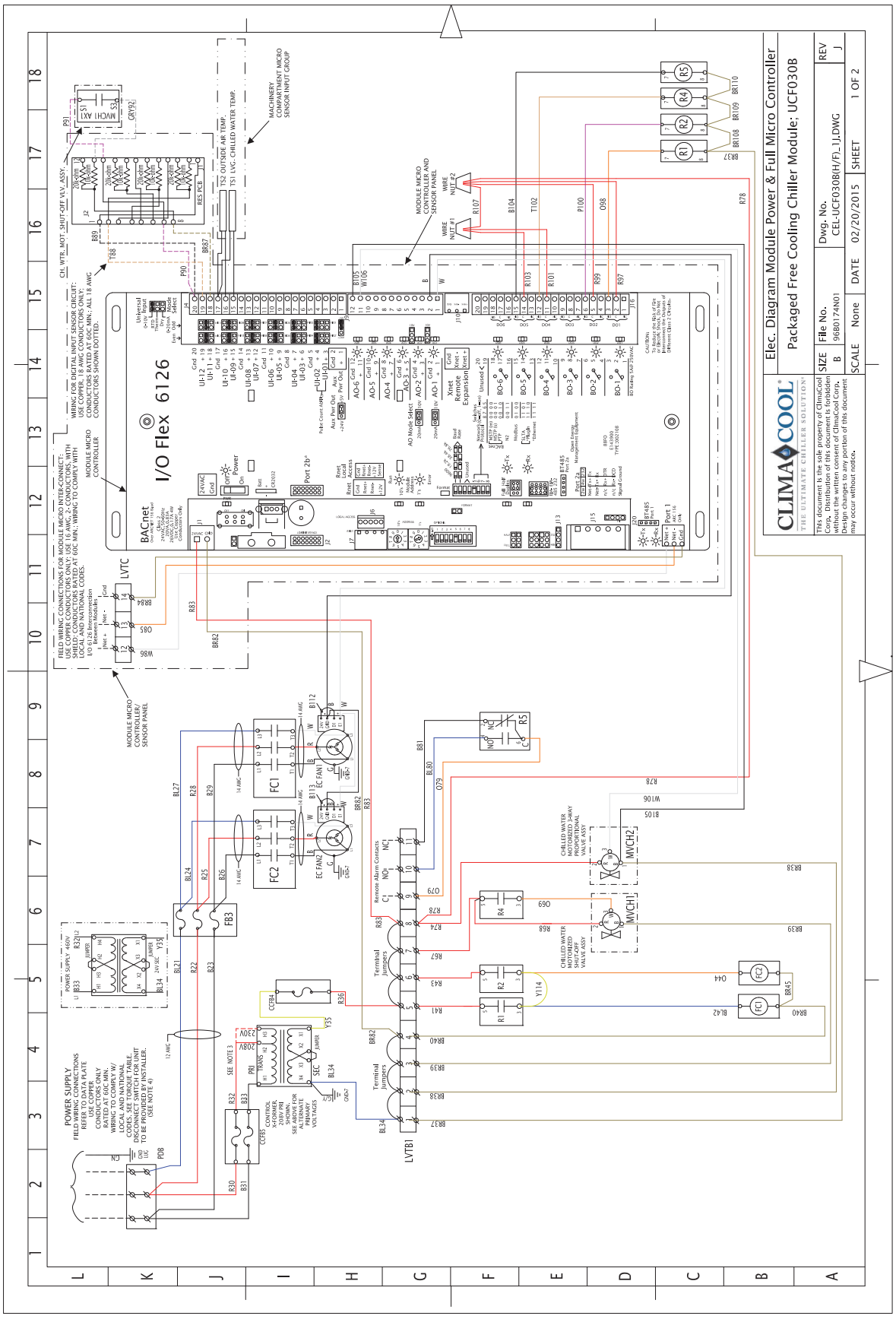
Wiring Diagram – UCA030, SHC Heat Pump, 575v



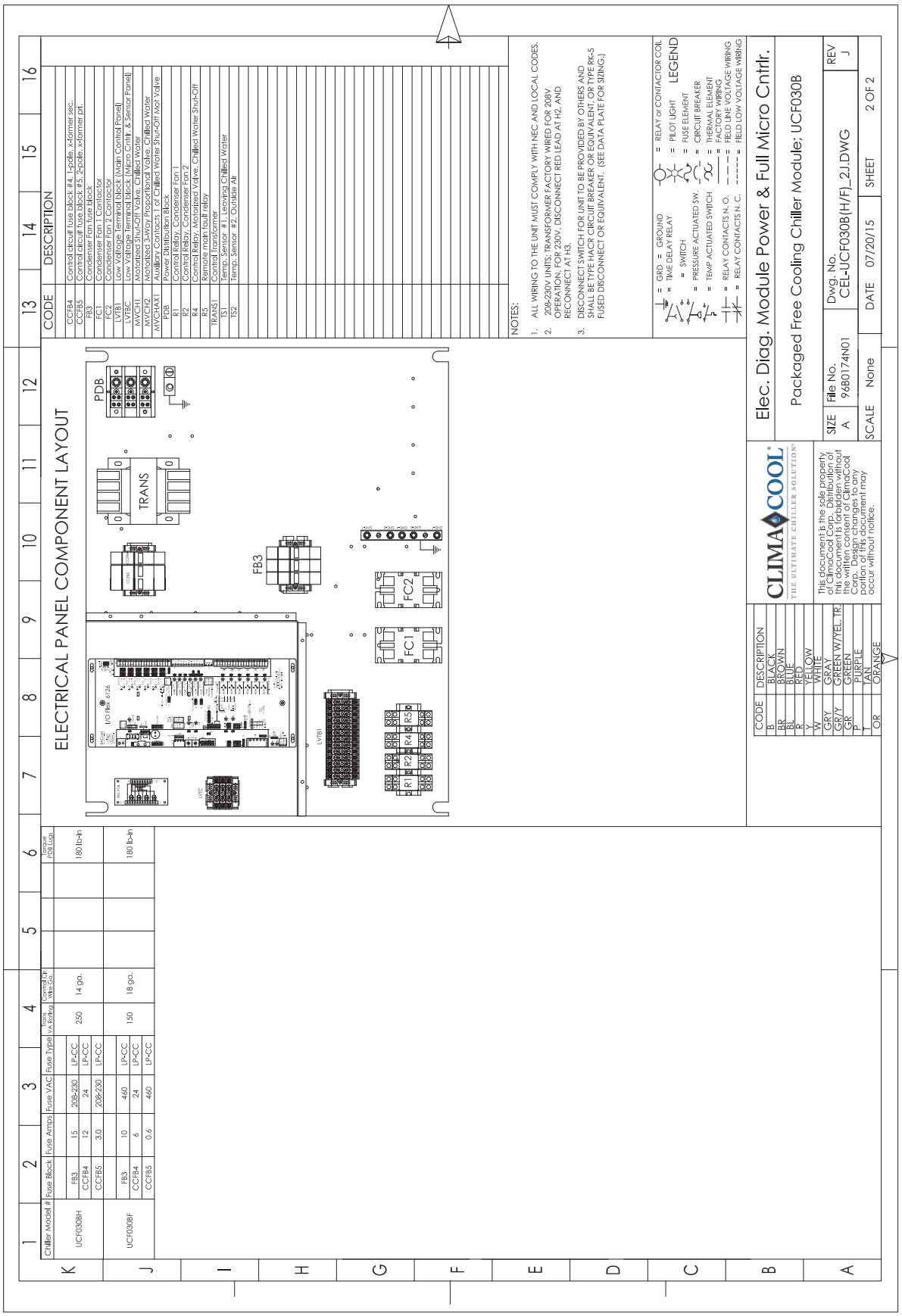
Wiring Diagram – UCA030, SHC Heat Pump, 575v



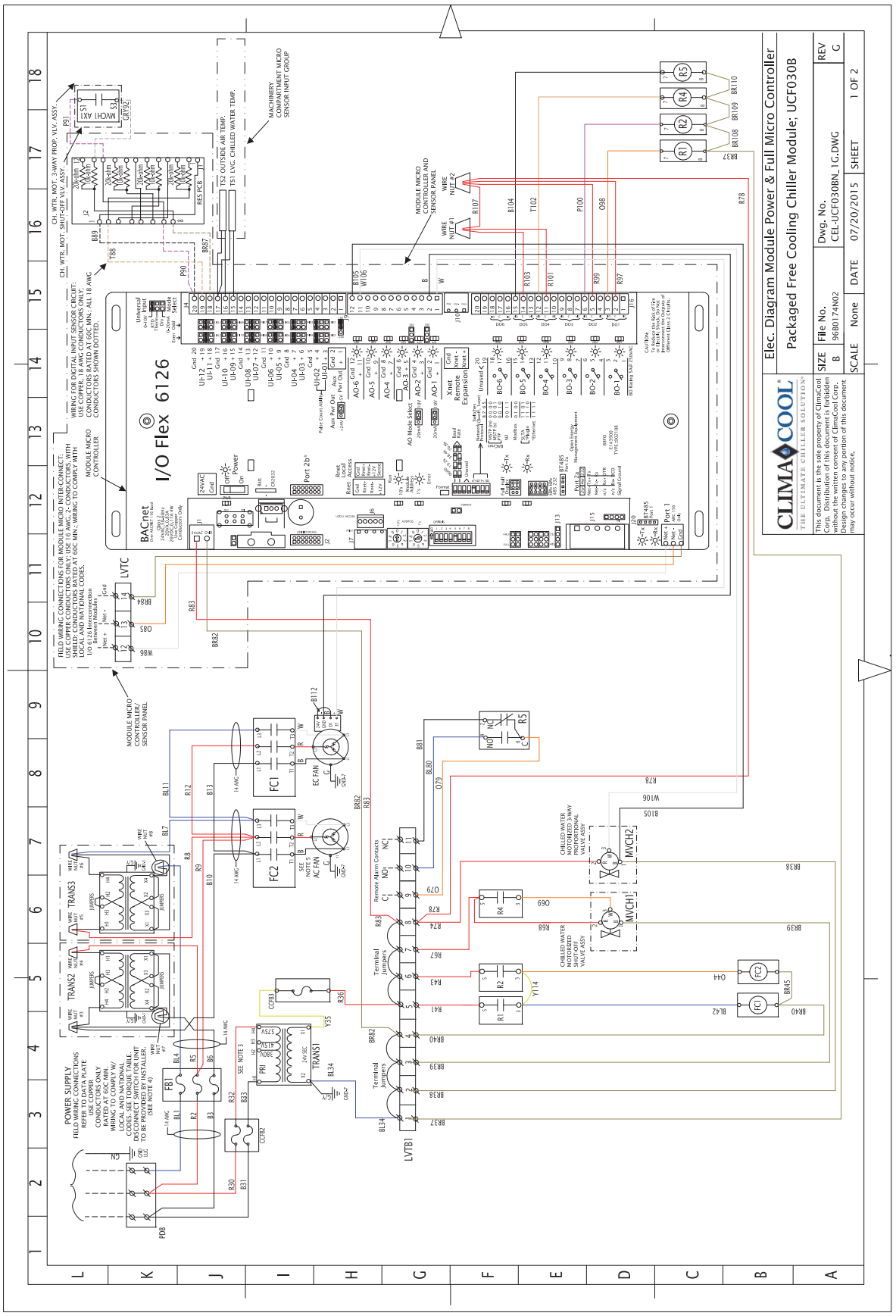
Wiring Diagram – UCF030, Free Cooling, 208v, 230v, 460v



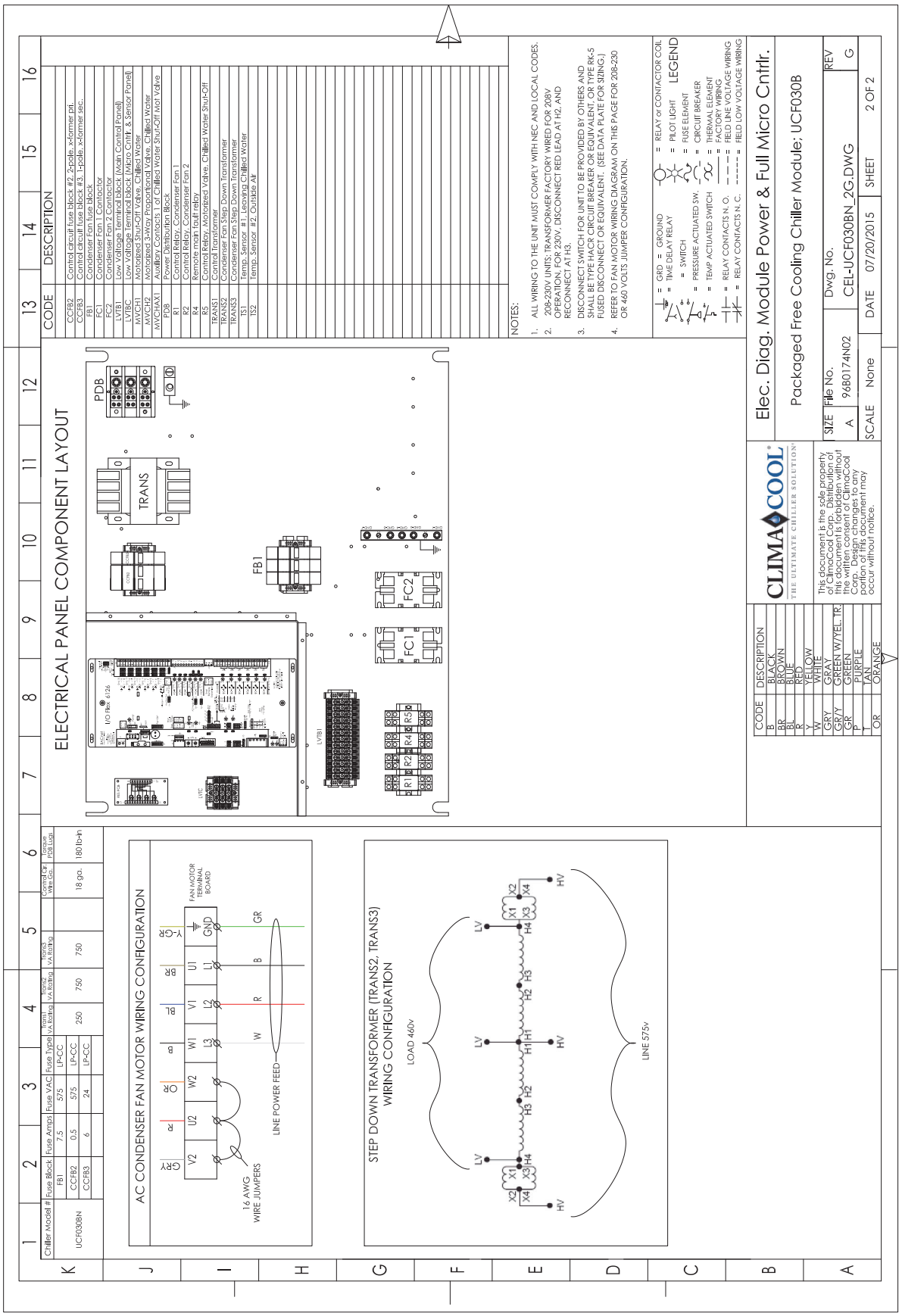
Wiring Diagram – UCF030, Free Cooling, 208v, 230v, 460v



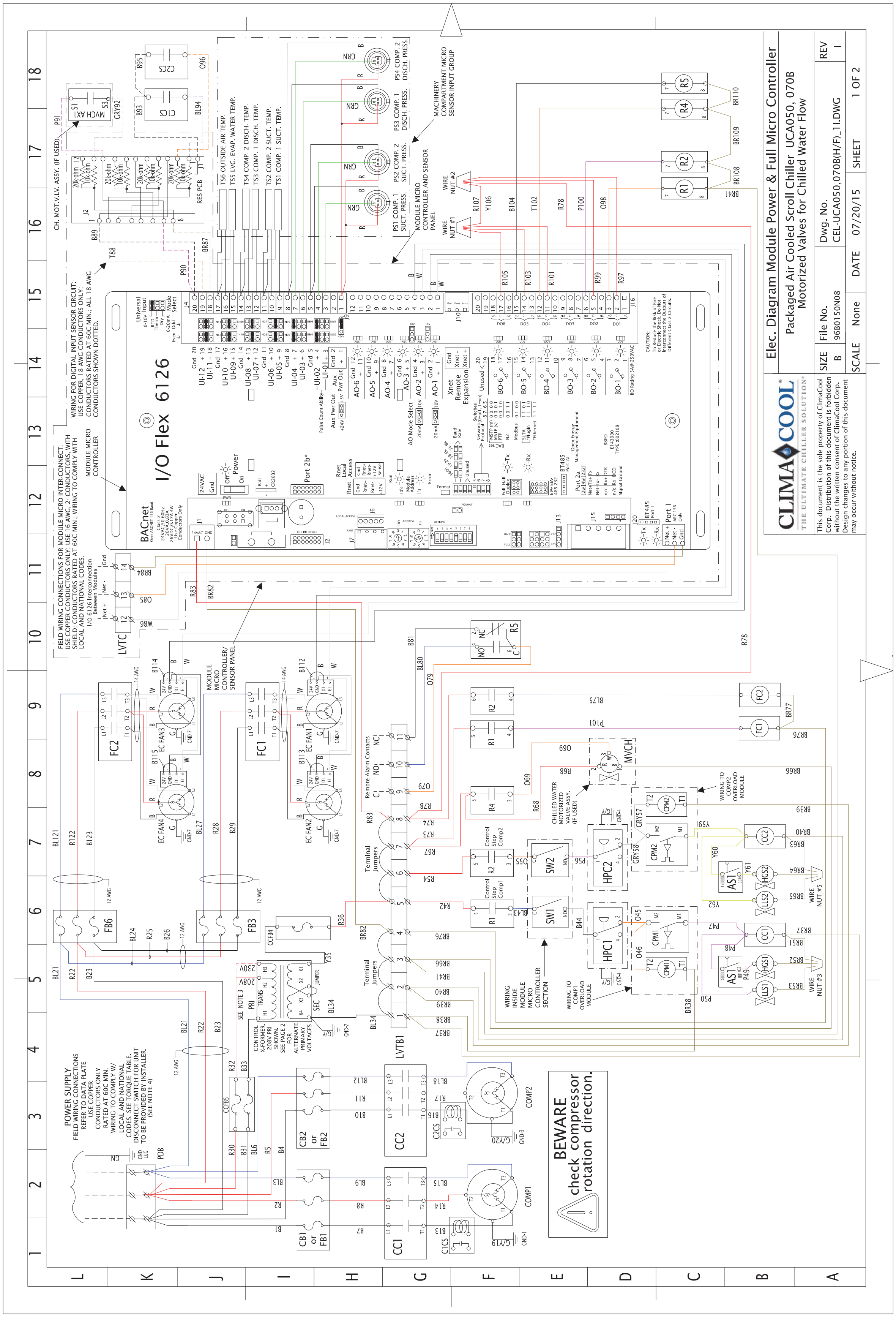
Wiring Diagram – UCF030, Free Cooling, 575v



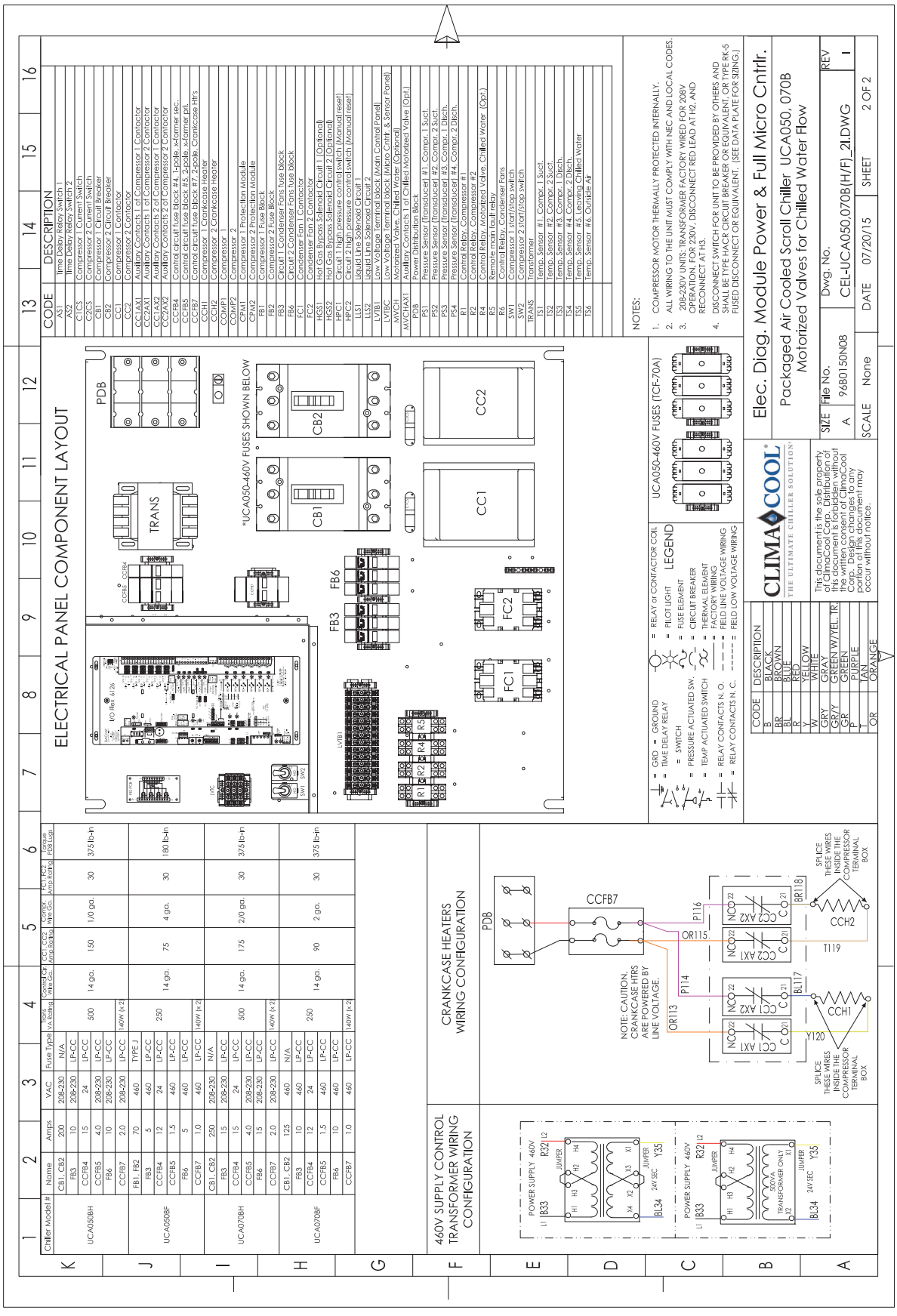
Wiring Diagram – UCF030, Free Cooling, 575v



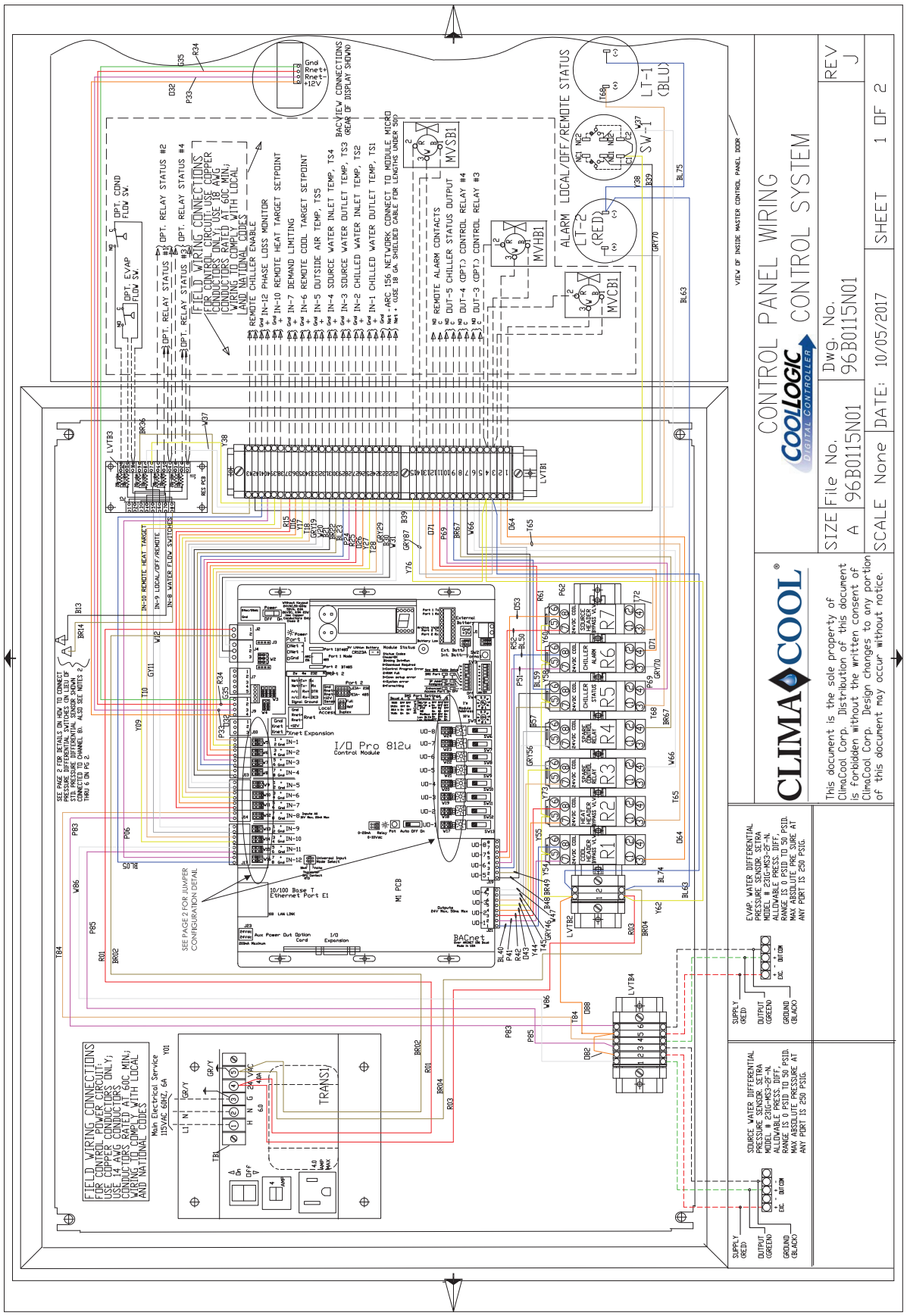
Wiring Diagrams – UCA070, Cooling Only, 208v, 230v, 460v



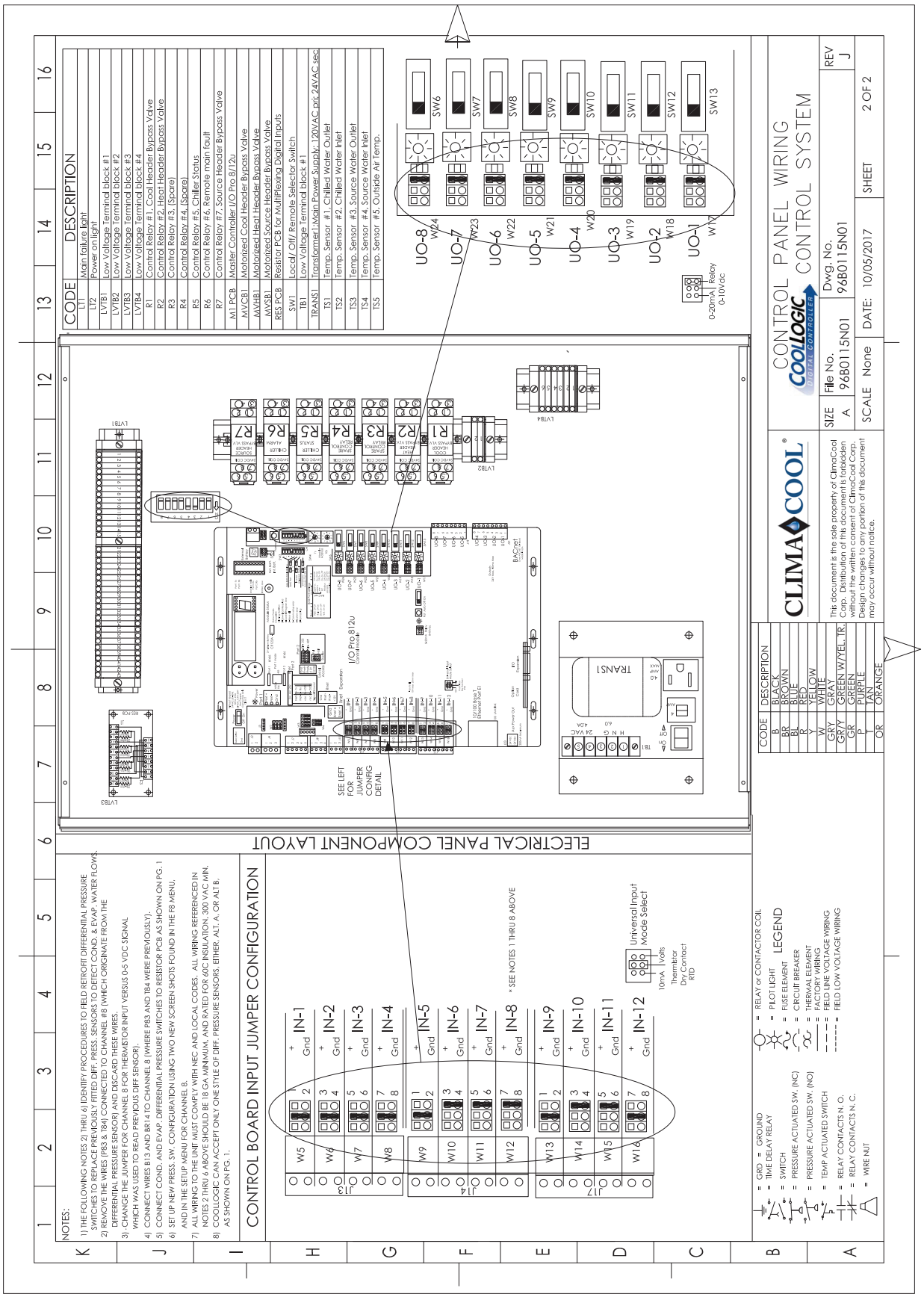
Wiring Diagrams – UCA070, Cooling Only, 208v, 230v, 460v



Wiring Diagrams – Bank Control Panel



Wiring Diagrams – Bank Control Panel



Troubleshooting Guide

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.

⚠ WARNING/ADVERTISSEMENT		
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.

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.
Improper chilled water circulation	Use an ample sized cleanable strainer in the chilled water circuit; make certain the strainer is clean to ensure 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.).

Table continued on next page.

Table continued from previous page.

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 ensure 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.
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.
Improper chilled water circulation	Use an ample sized cleanable strainer in the chilled water circuit; make certain the strainer is clean to ensure full flow and velocity of chilled water (strainer screen must be 60 mesh minimum). It may sometimes be necessary to treat the 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 8°F above solution freeze point

CLIMACOOL®

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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).

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. • 15 South Virginia Ave. • Oklahoma City, Oklahoma 73106 • (405) 815-3000 • e-mail: customersupport@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.

Revised: 04-27-22

Notes

Notes

Revision History

Date	Item	Action
05/05/23	All Pages	editorial updates, page alignments
04/20/23	All Pages	editorial updates, deletion of old charts and references, added emphasis on ARCnet 156 comm wiring, aligning pages and figures, correcting operating parameter discrepancies

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COOLLOGIC DIGITAL CONTROLLER

ClimaCool works continually to improve its products. As a result, the design and specifications of each product at the time for order may be changed without notice and may not be as described herein. Please contact ClimaCool's Customer Service Department at (405) 815-3000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimaCool's opinion or commendation of its products.