Ultra Green Chiller

Water Cooled - Model UGW

Installation, Operation & Maintenance

CLIMA COOL®

THE ULTIMATE CHILLER SOLUTION®

AHRI CERTIFIED
www.ahridirectory.org
Water-Cooled Chillers
AHRI Standard 550/590

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Introduction

General Description

The ClimaCool Ultra Green Chiller Solution, model UGW, incorporates 80 ton nominal chiller modules, with availability of up to 640 tons per bank, utilizing the most advanced technology compact quiet screw compressor, optimized for water cooled applications and non-ozone depleting R-134a refrigerant.

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

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

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

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

⚠ WARNING/AVERTISSEMENT	
To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.	Pour éviter les blessures ou la mort par électrocution, ouvrir la interrupteur de sécurité et fixez-le en position ouverte lors de l'installation.

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.

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/AVERTISSEMENT		
Disconnect power supply (ies) before servicing. Refer servicing to qualified service personnel. Electric shock hazard. May result in injury or death!		Debrancher avant d'entreprendre le dépannage de l'appareil. Consulter un réparateur qualifie pour le dépannage. Risque de choc électrique. Résiltat de mai dans dommages ou la mort!
⚠ CAUTION/ATTENTION		
Unit to be serviced by qualified personnel only. Refrigerant system under pressure. Relieve pressure before using torch. Recover refrigerant and store or dispose of properly.		Conifer la maintenance à un technicien qualifie. Le systéme frigorifique sous pression. Décomprimer avant d'exposer à la flamme. Récuperer le frigorigene et le stocker ou le détrulre correctement.

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

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

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

Pre-Installation

Inspection

Upon receipt of equipment, carefully check the shipment against the bill of lading and inspect each chiller for any damage incurred during shipment. Thoroughly check for any visible damage of control panels and electrical and/or refrigeration components or broken copper lines. The carrier must make proper notation of any damages or shortages on all copies of the bill of lading and complete a common carrier inspection report prior to your final acceptance of the shipment. **Note: It is the responsibility of the purchaser to file all necessary claims with the carrier. In addition, please notify the ClimaCool Customer Service Department at 405.815.3000 or customerservice@climacoolcorp.com of all damage immediately.**

Storage

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

Handling of Modules

Carefully remove the module's packaging. The chiller's steel base cutouts provide maneuverability by forklift or pallet jack into its final position (See Rigging and Lifting Procedures on page 7). Verify that all header grooved couplings and mounting hardware kits are on site prior to connecting the modules. **Note: Consult factory for handling other than in the upright position.**

Rigging and Lifting

Each module should be lifted using a pallet jack or fork lift. If it is necessary to utilize a crane for rigging or lifting, each module shall be lifted using lifting straps and spreader bars using rigging points identified on Rigging and Lifting Procedures on page 7.

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. Regular treatment of the water will increase longevity of your system. **Failure to provide adequate filtration or treatment of evaporator and condenser water will void the ClimaCool module's warranty.** A factory authorized technician is required to perform the startup of your ClimaCool chiller. Please contact the ClimaCool Customer Service Department at 405-815-3000 or customerservice@climacoolcorp.com to schedule. **There is a minimum of three (3) weeks' notice required to schedule your factory startup.**

Unit Placement

ClimaCool modular chillers must be installed in a conditioned and dehumidified space. The minimum foundation requirement for the chiller is a level surface capable of bearing the combined operating weight of the modules (See Physical Data on page 5).

Service Access

The recommended service clearances for modules with standard brazed plate heat exchangers are 36" for front service access, 36" height clearance for service and 30" for rear service access as identified in the Recommended Service Clearances and Bank Dimensions on page 9. For the optional shell and tube condenser design, allow 60" for front clearance. Local building or electrical codes may require additional clearance – please consult applicable codes.

Draining

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

Assembling Modules

ClimaCool recommends locking down the chiller to a concrete base or to three (3) 4" base mounting rails using the six (6) bolt holes provided in each base pan. Although the compressors are installed on anti-vibration mountings, further isolation of the chiller from the structure is recommended by installing vibration-eliminating springs or pads under the base rails on which the chiller will rest (See page 8 – Mounting Rail and Vibration Isolation). One module should be chosen as the reference module and carefully located.

Field installed mounting accessories are provided for adjoining each module.

- Header grooved coupling kits containing four (4) grooved couplings with gaskets
- Mounting hardware kit containing necessary bolts, spacers, nuts and washers
- Header bank end cap kit containing four (4) grooved couplings with gaskets and four (4) end caps

Field installing the mounting hardware kit will assist with alignment of the modules in a bank and eliminate offset inconsistencies. The 1/2" mounting holes are provided on sides of the unit base pan. First module should be set, set adjacent unit on mounting surface roughly aligned 1 ½ inches away from the first unit. While holding spacer in place work through first modules front base cutout to place a washer and insert bolt through front mounting hole and spacer. Repeat the process for the rear mounting hole. Line up mounting hole of adjacent module with bolt from previous module and working through adjacent modules front base cutout place a washer, split lock washer and nut. Using the appropriate tools tighten hardware assembly until seated.

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 as well as 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 to avoid damage in the next step.** 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. Ensure 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 ¼ to ½ turn to make sure the nuts and bolts are snug and secure; the use of a torque wrench is usually not required. **Uneven tightening of bolts may cause the gasket to be pinched resulting in immediate or delayed leaks.**

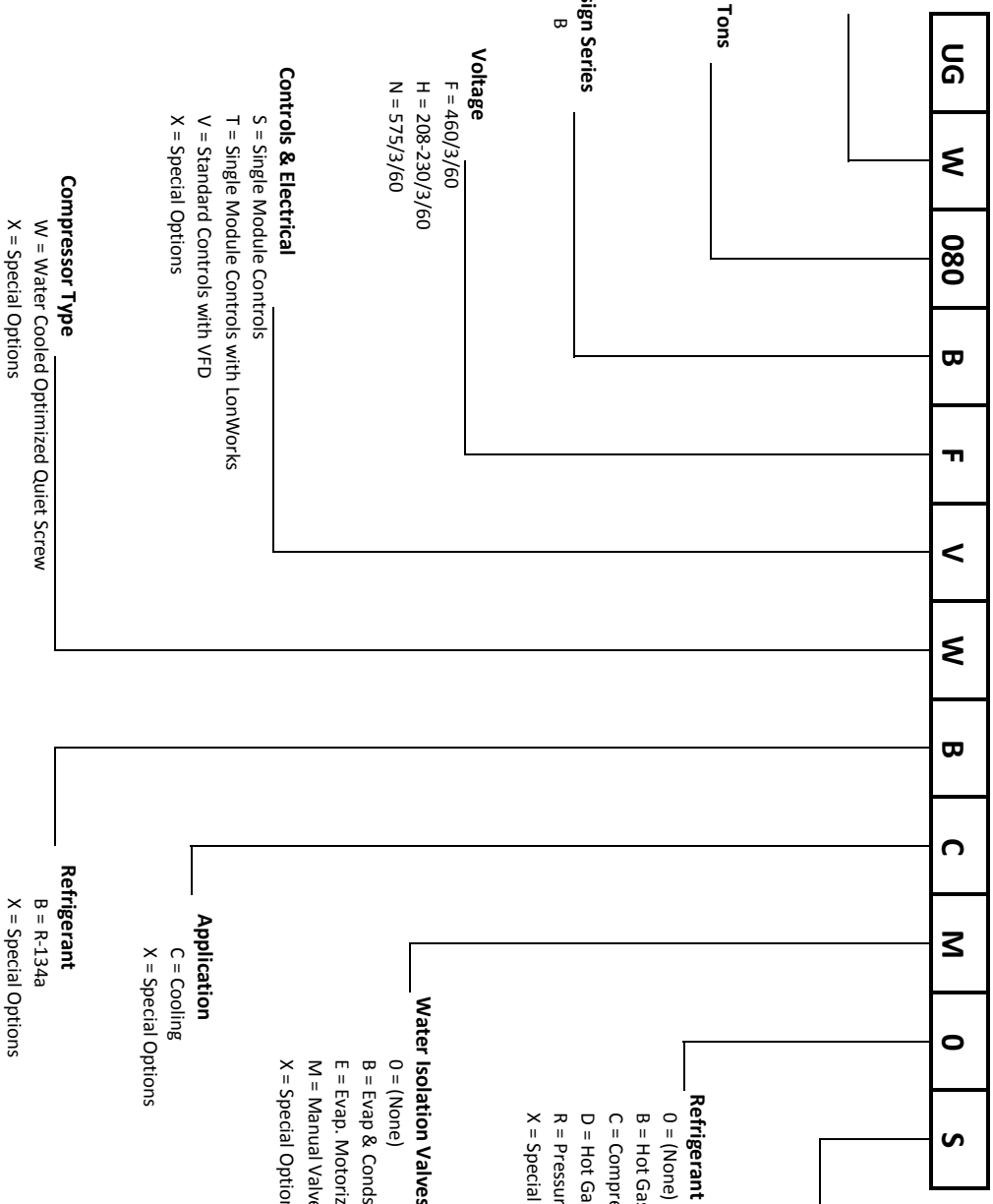
Header Insulation

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

Sound Attenuation Panels and Gasket

Attenuation panels are enclosures made of 18 gauge galvanized steel with powder coat paint finish and fiberglass insulation. Panel package includes one (1) upper panel and one (1) lower panel for each side of bank (field installed), four (4) panels for each module in the bank (factory installed) and gasket sealant tape for installation between modules. Install panels by setting in place and locking down with the half turn latches or self tapping screws. **Note: Panel package includes a compressed 1" x 1" gasket sealant tape for installation between modules. Install the tape on the outer frame on the side of one module prior to installing the adjacent modules.**

Ultra Green Solution Model Key



Physical Data

Model UGW Module and Compressor		80
Capacity (Tons)[1]		77
Refrigerant Type		R-134a
Compressor kWi		53.75
kW/Ton @ Full Load		0.698
Compressor Type		Optimized Quiet Screw
Compressor Quantity		1
Compressor Nominal HP		80
Refrigerant Charge (lbs)		119
Oil Circulation Rate		<0.5%
Module Operating Weight w/Water (lbs)[2]		3,390
Module Shipping Weight (lbs)[3]		2,995
Model UGW Condenser		
Heat Exchanger (Type)		Brazed Plate
Refrigerant Circuits (quantity)		1
Water Storage Volume HX Only (gals.)		11.2
Water Storage Volume HX Plus 8" Main Headers (gals.)		26.4
Flow Rate (GPM)[4]	Min	90
	Max	330
Maximum Working Design Pressure - Water Side (PSI)		300
Header Water Connections - Inlet/Outlet (inches)[5]		8
Model UGW Evaporator		
Heat Exchanger (Type)		Brazed Plate
Refrigerant Circuits (quantity)		1
Water Storage Volume HX Only (gals.)		14.9
Water Storage Volume HX Plus 8" Main Headers (gals.)		30.1
Flow Rate (GPM)[4]	Min	90
	Max	330
Maximum Working Design Pressure - Water Side (PSI)		300
Header Water Connections - Inlet/Outlet (inches)[5]		8

Notes:

1. Tonnage ratings conditions: 44°F leaving chilled water temperature, 85°F entering condenser water temperature, flow rates are 3 GPM per ton through the condenser with a fouling factor of .00025 and 2.4 GPM per ton through the evaporator with a .0001 fouling factor.
2. Module operational weight includes water, compressor oil, and refrigerant charge. Multiply times the number of modules for a total sytem operational weight.
3. Module shipping weight includes refrigerant charge, compressor oil and packaging.
4. The minimum/maximum flow rates are based on an approximate temperature differential of 5.9°F to 20°F through the evaporator. The minimum/maximum flow rates are based on an approximate temperature differential of 7.2°F to 30°F through the condenser.
5. Main header water/fluid connections are 8" grooved coupling.
6. Utilize Selection Program for performance based on glycol solution.

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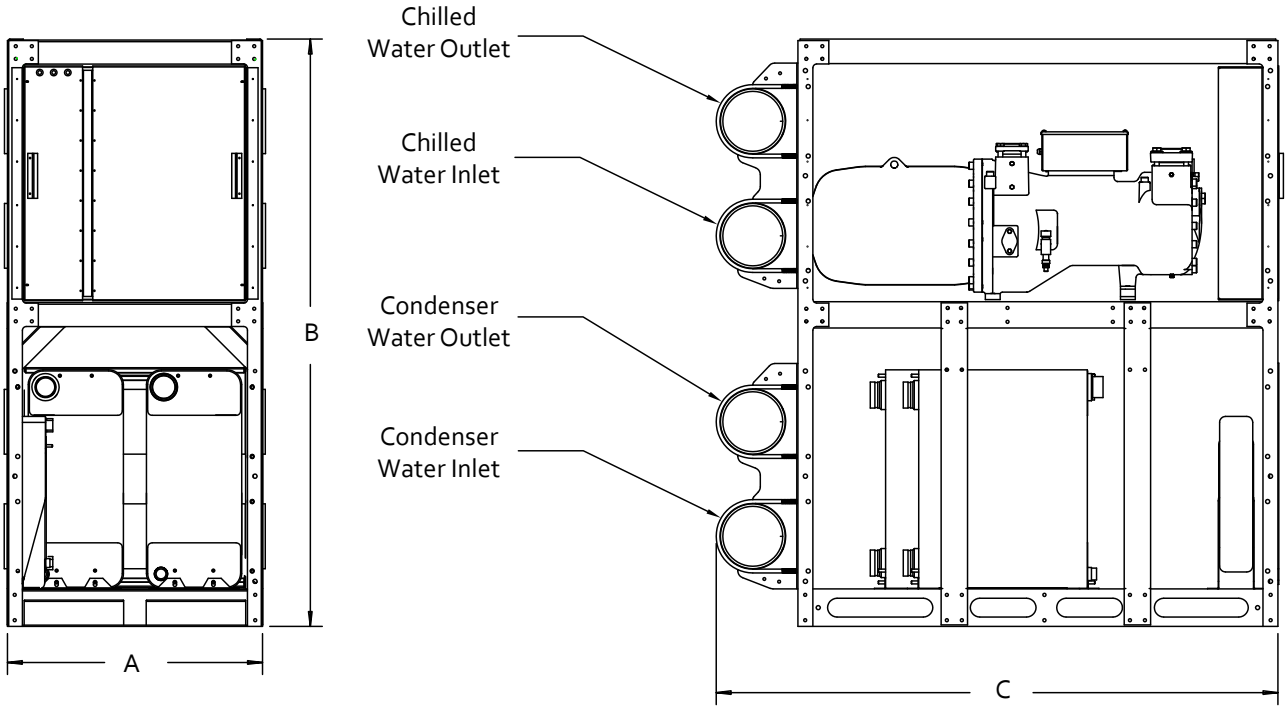
Dimensional Data and Drawings



Model UGW	Voltage	A Unit Width[3] (in.)	B Unit Height[3] (in.)	C Unit Depth[3] (in.)	Unit Weight [1] (lb.)	Operational Weight[2] (lb.)	Header Connection (in.)
80	208/230/460/575/3/60	34 ¾	78	75	3,685	4,080	8

Notes:
1. Shipping weight includes refrigerant charge, compressor oil and packaging.
2. Operational weight includes refrigerant charge, compressor oil and water.
3. 208/230v module has external variable frequency drive which will add to module dimensions.

Rigging

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

Figure 1

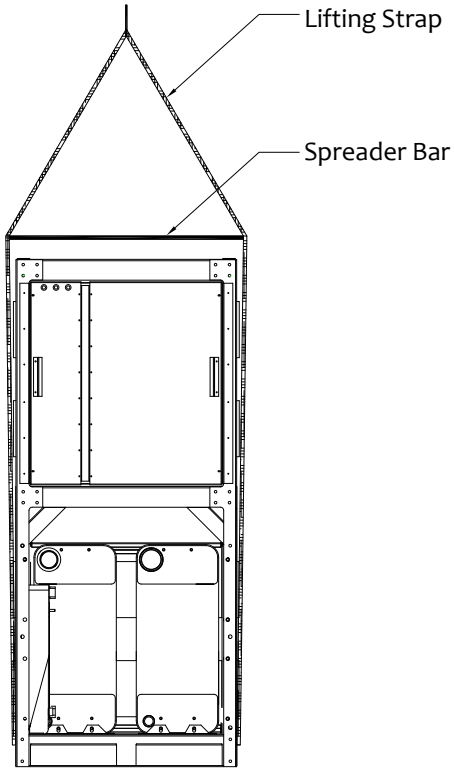
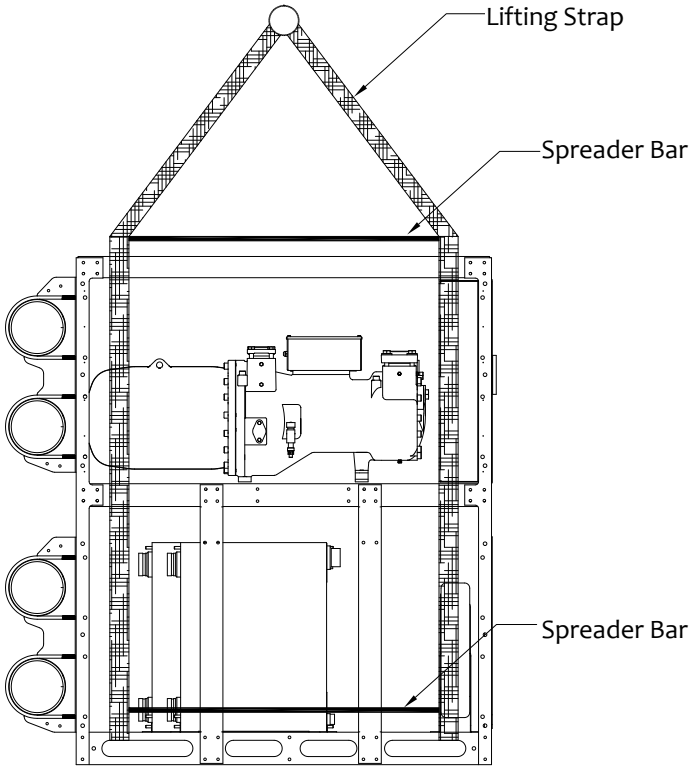


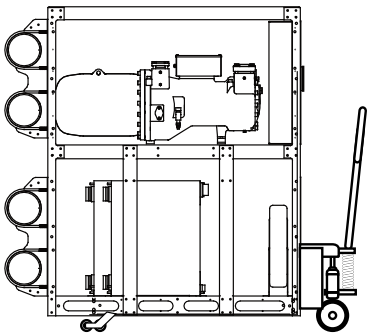
Figure 2

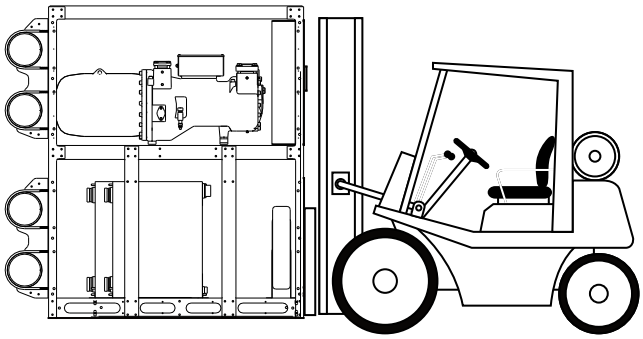


Lifting and Transporting Modules

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

Figure 3

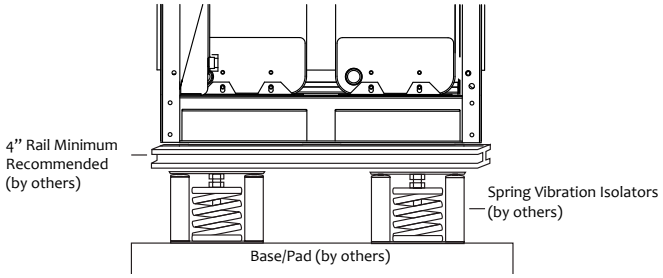




Mounting Rail and Vibration Isolation

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

Figure 4- Spring Vibration Isolators Option



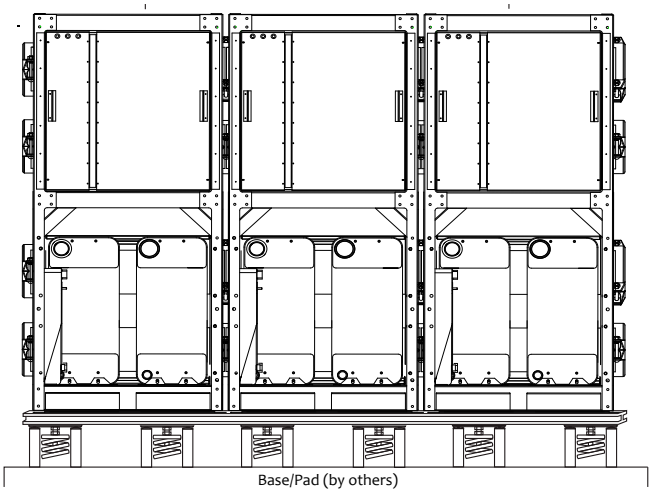
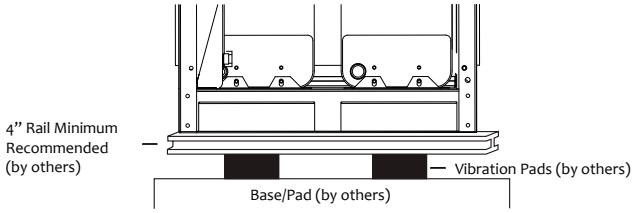
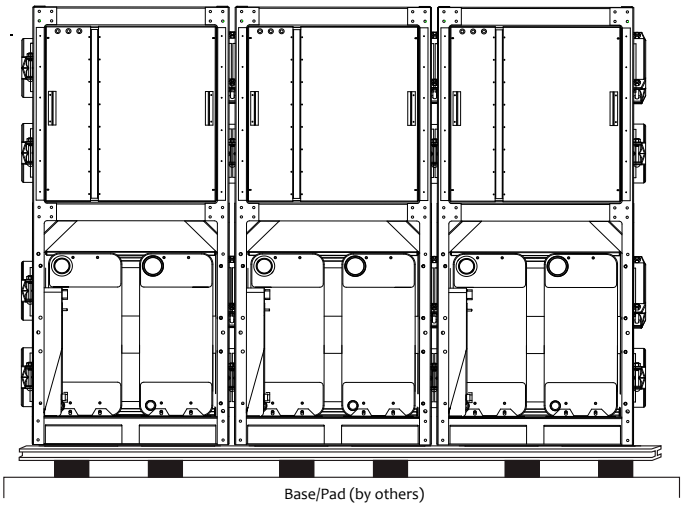


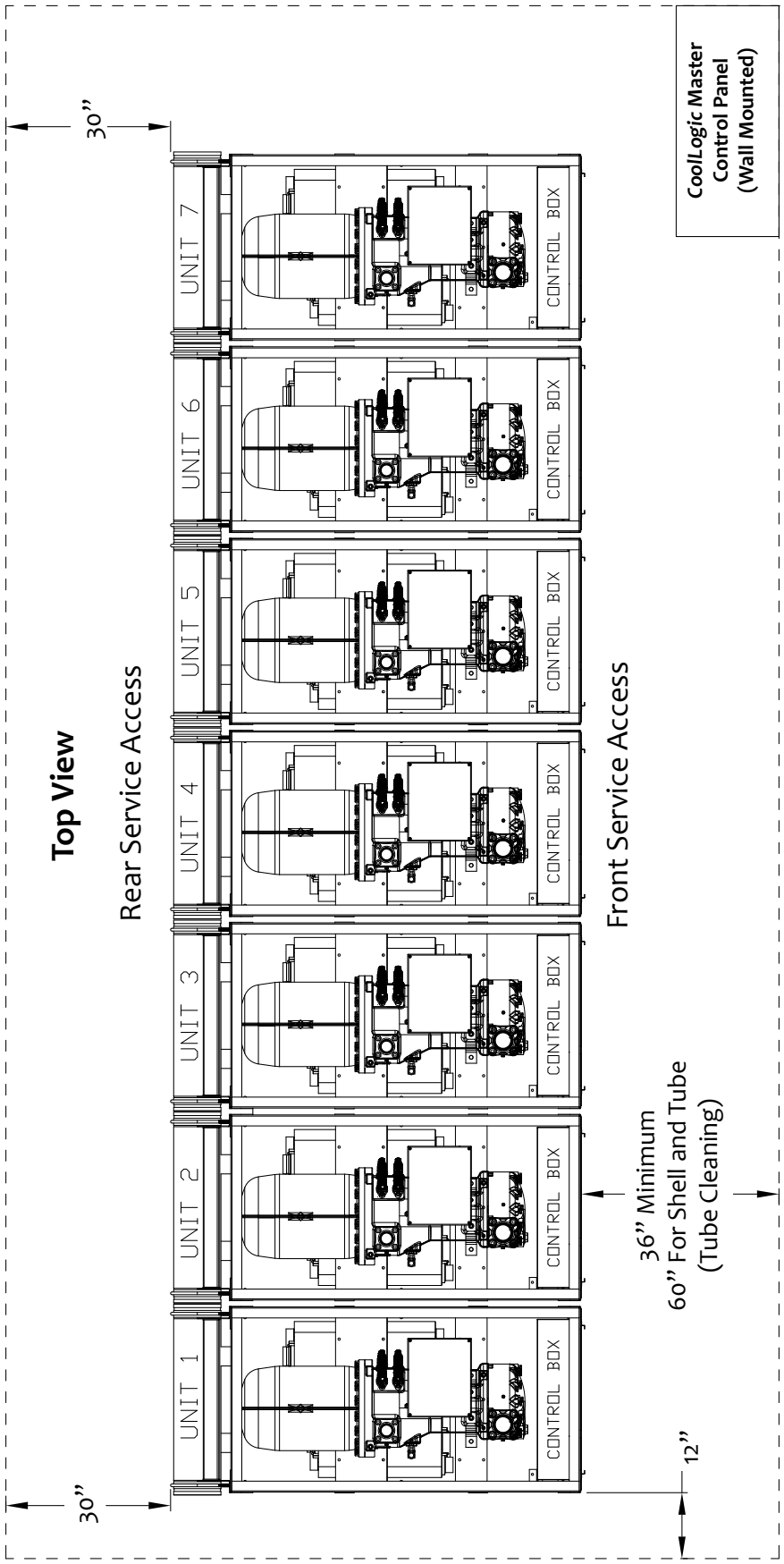
Figure 5 – Vibration Isolation Pads Option





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

Recommended Service Clearances



Notes:
1. For brazed plate, allow 36” clearance for electrical panels and 30” clearance for rear access to modules.
2. For shell and tube, allow 60” clearance for electrical panels and 30” clearance for rear access to modules.
3. Allow a minimum of 36” height clearance for service.
4. Local building or electrical codes may require additional clearance. Consult applicable codes.

As with any water system, it is important that the system be clean. The pipe work installer must remove weld scale, rust and contamination during pipe work fabrication. The system water piping must be flushed thoroughly with recommended alkaline flush or other chemicals that are compatible with 316 stainless steel, prior to making connections to the ClimaCool chiller. There are certain necessary components that should always be installed in both the chilled water and condenser water systems. (See Water Piping Configuration Figures 9 and 10 on page 12). Piping configurations on multiple modules may also be found on page 11. All water piping must be installed in accordance with applicable codes and standards.

Temperature Sensor and Wells

ClimaCool provides four (4) temperature sensors and wells with each chiller system configured by the *CoolLogic* Control System. They must be field installed 36" - 60" away from the bank and before the strainer on the chilled water inlet, chilled water outlet, condenser water inlet and condenser water outlet (See Water Piping Configurations – page 12). **Note: Sensors must be fully inserted into the well to obtain proper readings.**

Pressure Differential Flow Sensor

It is imperative that minimum and maximum water flow rates, as defined in the Physical Data tables on page 5, are not exceeded. To prevent operation of the chiller without sufficient water flow to the evaporator and condenser, it is required to install pressure differential flow sensors in both the chilled and condenser water circuits. Place one on each side, downstream of the strainers on the inlet and outlet of a straight pipe, as close to the module as possible. **Do not put in an elbow on the outlet.** (See Water Piping Configurations – page 12). **Note: Evaporator and condenser sides both require sensors of equal pressure ranges.**

Pressure Taps

The installing contractor must provide access ports for connecting both the pressure differential flow sensor and pressure gauges for both the condenser and chilled water systems. A ¼" pressure tap is required on the inlet and the outlet of both water systems for a total of eight (8) taps. If a port is shared by the pressure differential flow sensor and the pressure gauge, it will require four (4) ½" taps. (See Water Piping Configurations – page 12).

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 12).

Strainers – Minimum 60 Mesh Screen Required

ClimaCool chillers utilize brazed plate heat exchangers which are extremely sensitive to debris. **Therefore, it is mandatory that all condenser and chilled water systems include a strainer with a minimum of 60 mesh screen for proper filtration.** The strainers must be installed as shown in the Water Piping Configurations on page 12 and be in place at all times when the chiller(s) is/are in operation. **ClimaCool's warranty does not cover and does not apply to products which have defects or damages due to freezing of the water supply, an inadequate or interrupted water supply, corrosives or abrasives in the water supply, or improper or inadequate filtration or treatment of the water supply.**

Chiller/Heater System Water Header Bypass

A bypass is required for any chilled water/evaporator, hot water/condenser (heating load) and source water side (geothermal, cooling tower or closed circuit cooler) with variable pumping. The bypass must be piped in such a way that the temperature and differential pressure sensors are still sensing active flow. See Water Piping Configuration Figures 9 and 10 on page 12. The purpose of the chiller/heater system bypass is to prevent deadheading of the pumps when all of the internal unit valves go closed as well as allow temperature and differential pressure sensors to sense active flow. The bypass should be sized for an absolute minimum of one module's worth of design flow. (Please refer to selection submittals for design flow rates).

Modules can be designated for fixed bypass for heating, cooling and source flow, however, this limits the number of modules remaining for that duty. Also, with a module acting as a bypass increased wear of heat exchangers may be caused by abrasion from bypass flow.

Figure 6 - Direct Return

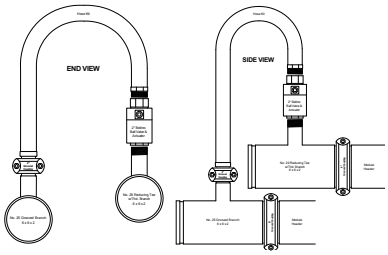
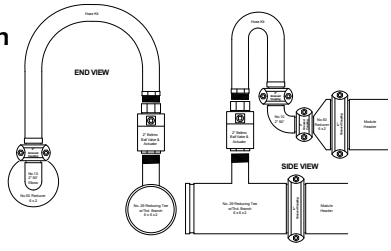


Figure 7 - Reverse Return



ClimaCool offers two types of water header bypass kits, direct return (Figure 6) and reverse return (Figure 7) as shown on page 10. The bypass kits must be installed on each water source loop and controls are integrated with the *CoolLogic* software. Installation location can be found on page 12 – Water Piping Configuration.

This bypass can also be created with field supplied piping. The design piping must accommodate one module's worth of design flow, and be positioned so that the temperature and differential flow sensors sense active flow in the bypass mode. See Figures 9 and 10 on page 12 - Water Piping Configuration. T**he field supplied piped chiller/ heater system bypass must be controlled by others.** There are system communication delays, polling and network conflicts that strictly prohibit the use of ClimaCool sensors and controls for control of field supplied bypasses or other field supplied items. Recommended method is to control via differential pressure or gpm flow meters across the chilled water/evaporator, hot water/condenser water systems.

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

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

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

Please refer to Figure 8 for a typical load bypass valve arrangement. The load side system bypass should be sized for an absolute minimum of one module's worth of design flow. (Please refer to selection submittals for design flow rates). A minimum of (6) six gallons per nominal system ton are also required to maintain proper system thermal inertia. This is to avoid short cycling of compressors in the chiller/heater system as well as prevent nuisance alarms.

Figure 8 - Typical Load Bypass Valve Arrangement

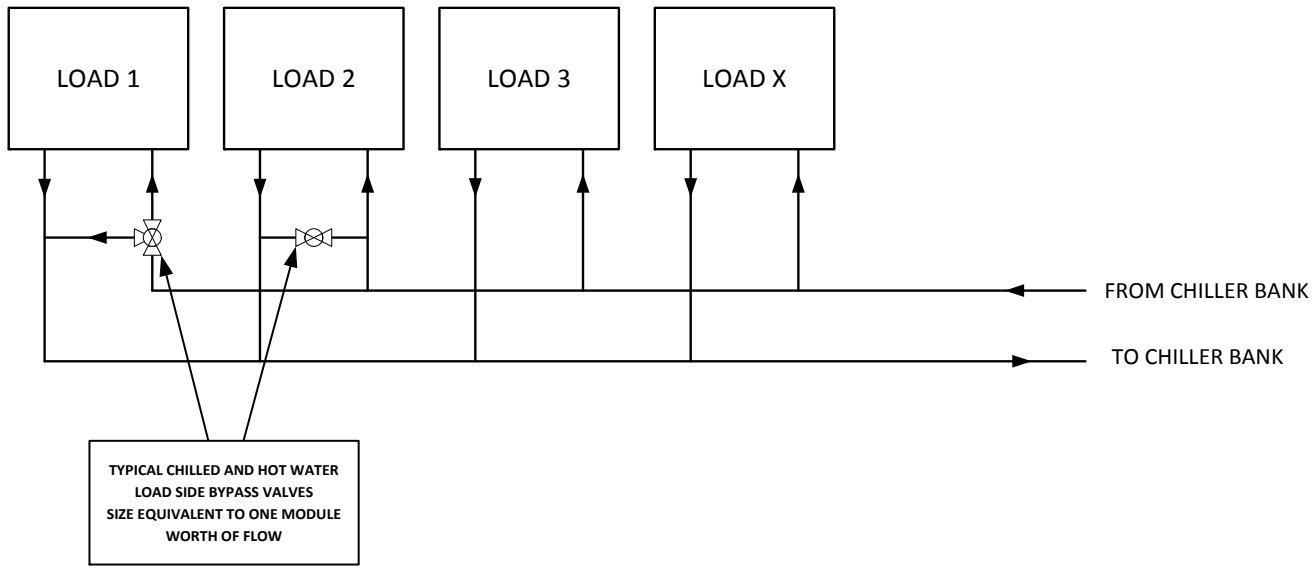


Figure 9 - Field Piping Direct Return – 1 to 5 modules

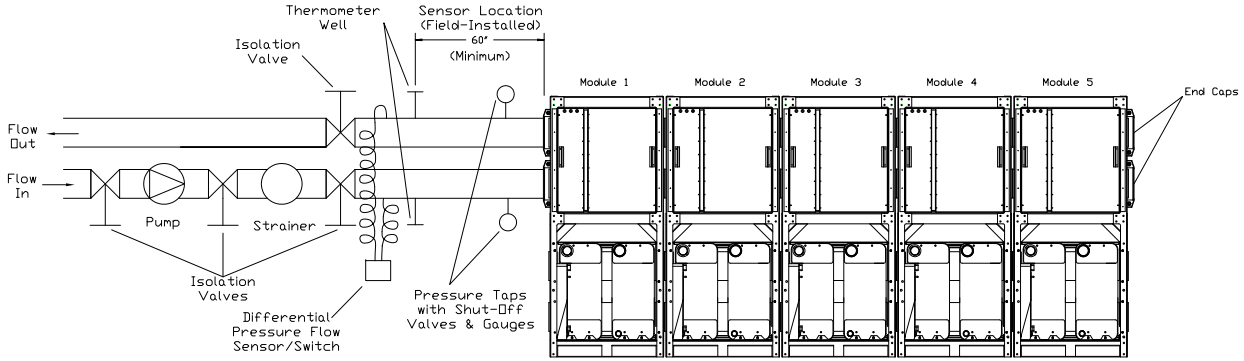
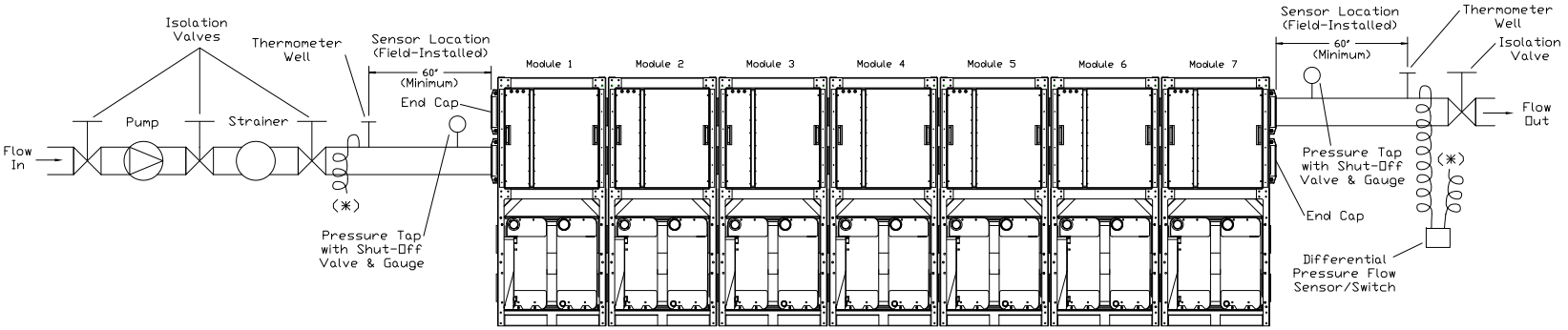


Figure 10 - Field Piping Reverse Return – (Preferred 1 to 5 modules) Required for 6 to 8 Modules



Notes:

1. Figures 9 and 10 are required piping for proper water regulation and distribution through ClimaCool modular chillers.
2. Module order and incoming/outgoing water flow as shown in both Figure 9 and 10 can be set up as either a left-to-right or right-to-left configuration.
3. Evaporator Hydronic Circuit shown. Piping configurations are similar for the condeneser water hydronic circuit.
4. For condenser and chilled water (evaporator) inlet/outlet location dimensions, refer to page 6 Module Dimension Data.
5. A pressure differential flow sensor is a required safety device for ClimaCool modular chillers on the chilled and condenser water circuits.
6. A strainer with a minimum of 60 mesh stainless steel screen is a required safety to protect the brazed plate heat exchangers on both chilled and condenser water sides of the system.
7. Maximum water flow rates for both evaporator and condenser water header systems in one bank of modules is 2400 gpm.

Figure 11 - Condenser Hydronic Circuit

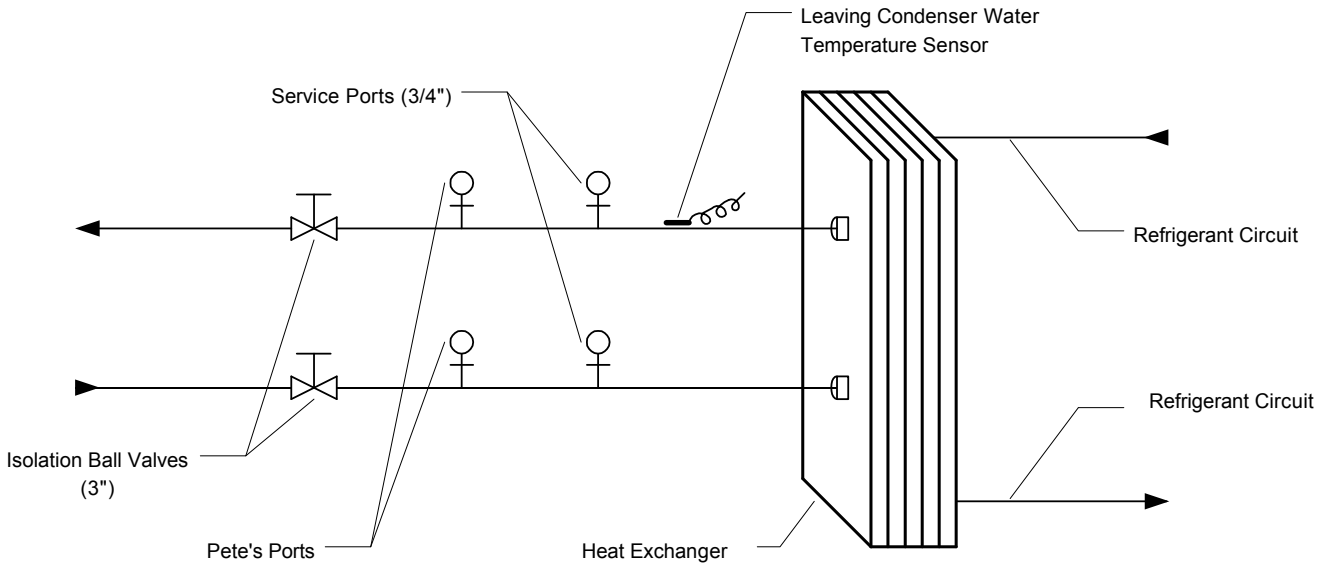
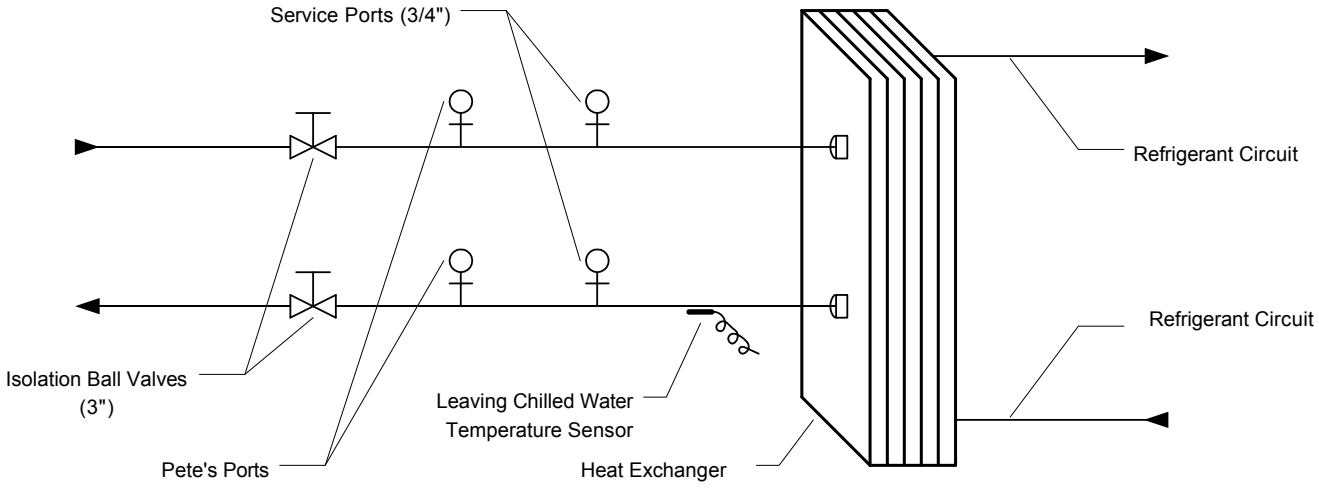


Figure 12 - Chilled Water Circuit



Note: Figure 11 and 12 depict hydronic piping in each ClimaCool chiller module and are shown with water isolation valves.

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 15.

Filling, Purging and Leak Testing the System

After the water systems have been properly installed, visually inspect all joints for tightness. If the chiller is to be installed in an existing system, the cleanliness of the existing system can be judged from the operating conditions of the present machines. The cooling tower in particular, should be inspected and cleaned, if required. It is 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 teed into the inlet and outlet connections into and out of each heat exchanger. Ensure these ¾" valves are **CLOSED**.
6. Open the water isolation valves inside each modular chiller and repeat the filling process, this time also checking for leaks inside each module.
7. Following the final filling and leak checking procedure, air should be purged from the system.

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 teed 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 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. 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 Condenser and Evaporator Water Pressure Drop Charts on page 17). 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 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.**

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

Heavy-Contaminated Water

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

Cooling Tower

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

Table 1 - Water Quality Parameters

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

Water Temperature Requirements

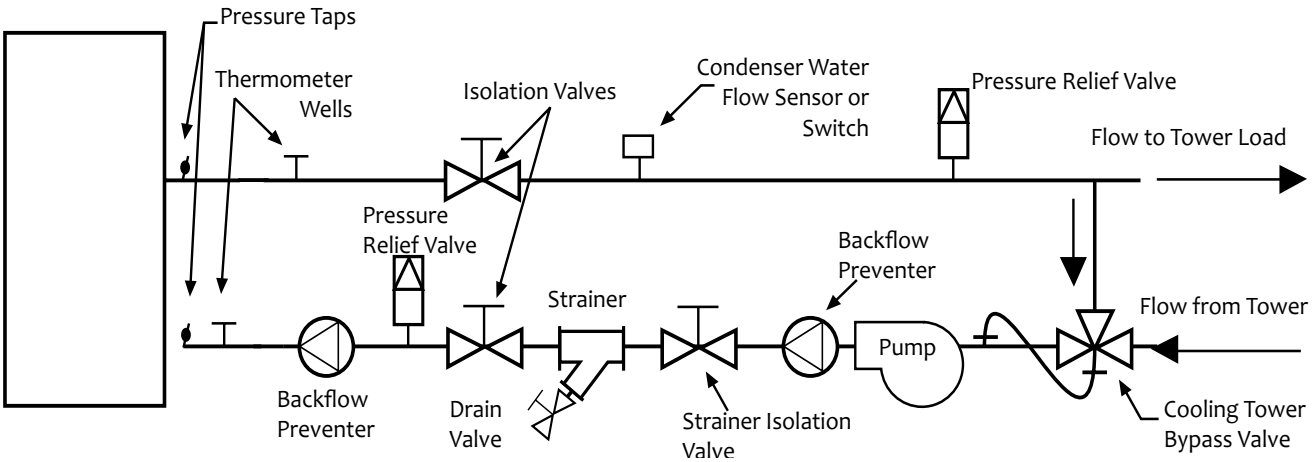
Condenser Water Temperature

The condensers are designed to operate most efficiently at lower entering water temperatures for lower power consumption. The expansion valve, however, relies on the pressure difference across the valve to drive the liquid refrigerant through. It is necessary to maintain a minimum pressure differential across the thermal expansion valve (equivalent to a 30°F difference between saturated liquid temperature in the condenser and saturated vapor temperature in the evaporator) to avoid loss of efficiency and system performance. This pressure differential is most commonly ensured by cycling the fans on the cooling tower to maintain the entering condenser water temperature above the minimum temperature of 60°F. An alternate method to maintain the minimum entering condenser water temperature above 60°F is to employ a bypass arrangement as shown in Figure 13 below. This valve is an automatic 3-way bypass valve, which senses the temperature of the mixed water entering the condenser. If this mixed water temperature falls below 60°F the valve will re-circulate the leaving condenser water and mix it into the entering condenser water stream (bypassing the cooling tower). The full range of entering condenser water is 60°F to 95°F for standard applications and maximum leaving hot water temperature of 135°F for high temperature applications. For entering water less than 60°F refer to Options and Accessories (page 27) - Motorized Water Isolation Valves.
Note: Contact factory for applications outside of the standard temperature range.

Chilled Water Temperature

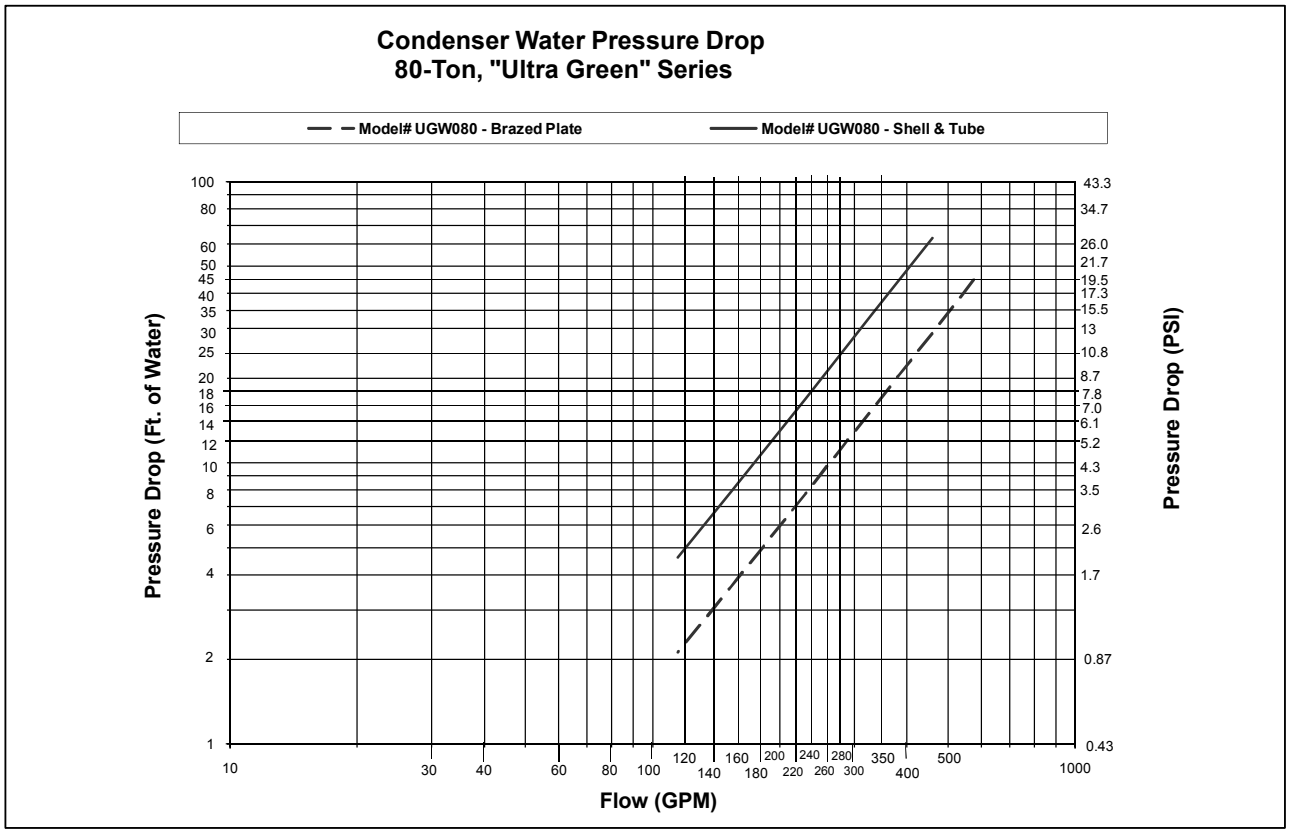
Modules are designed for a leaving water temperature range from 40°F to 62°F. All cataloged modules can operate safely in this range without the need of special controls or glycol additives. Leaving water temperatures below 40°F can result in evaporator suction temperatures below the freezing point of water. Therefore, a glycol solution additive is required that will protect the evaporator from freeze ups at lower operating suction temperatures. The full range of leaving chiller fluid using glycol is 20°F to 62°F.

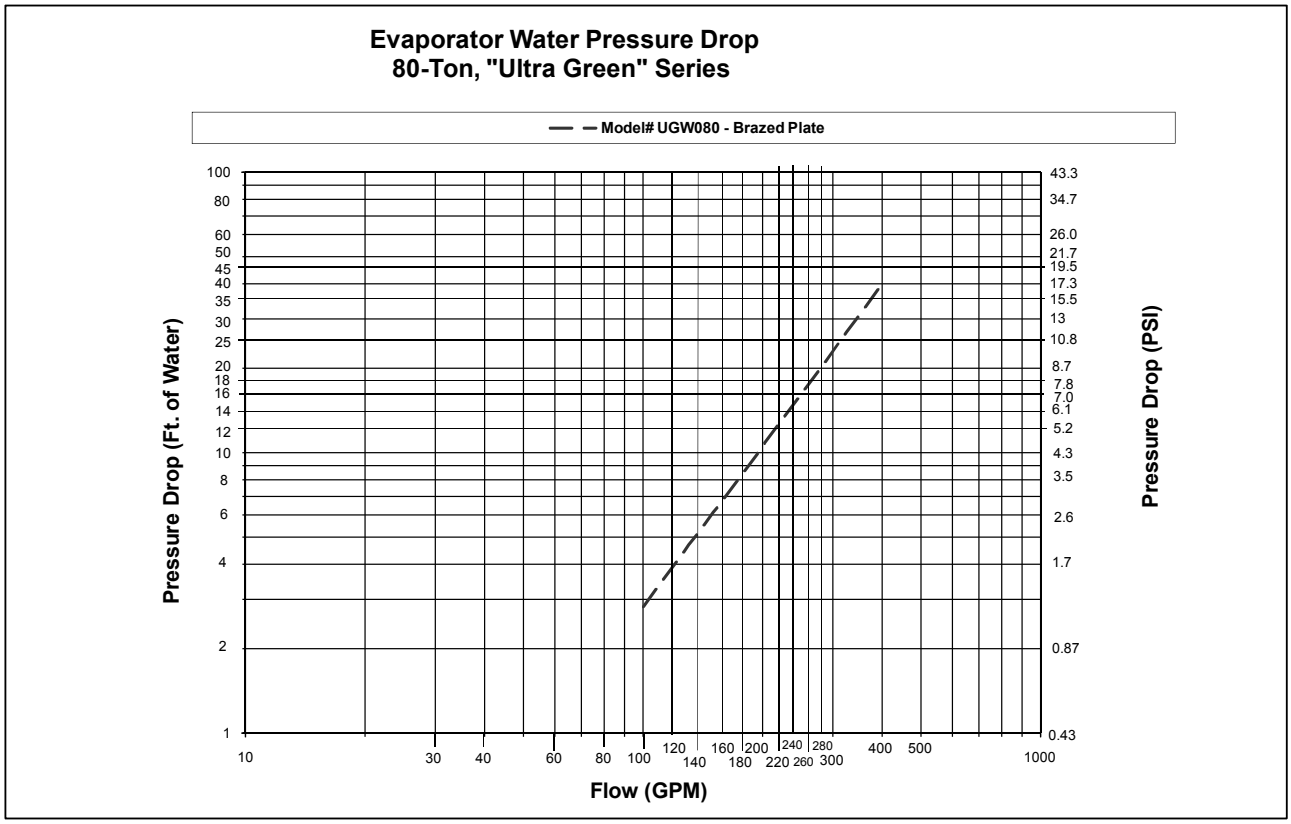
Figure 13 – Condenser Water System



Note: Only required for equipment without motorized condenser valves.

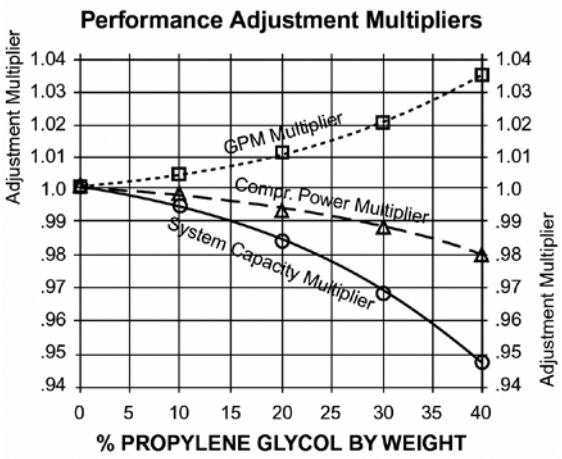
Condenser and Evaporator Water Pressure Drop Charts





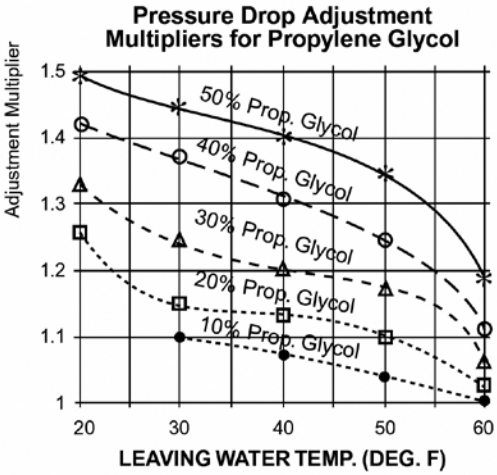
Glycol Performance Adjustment Factors Charts

Fig. AM-1



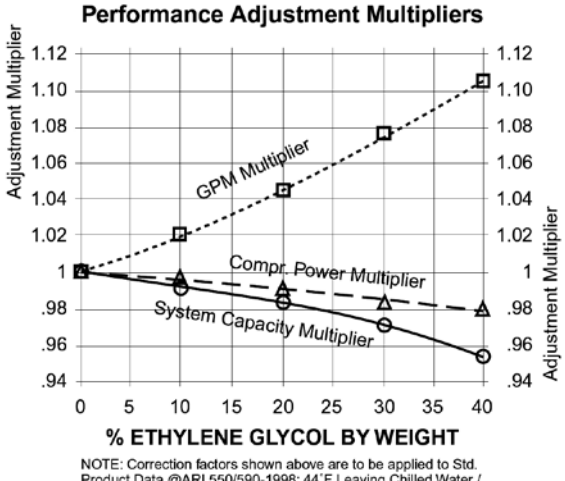
NOTE: Correction factors shown above are to be applied to Std. Product Data @ARI 550/590-1998; 44˚F Leaving Chilled Water / 85˚F Entering / 95˚F Leaving Conditioned Water.

Fig. AM-2



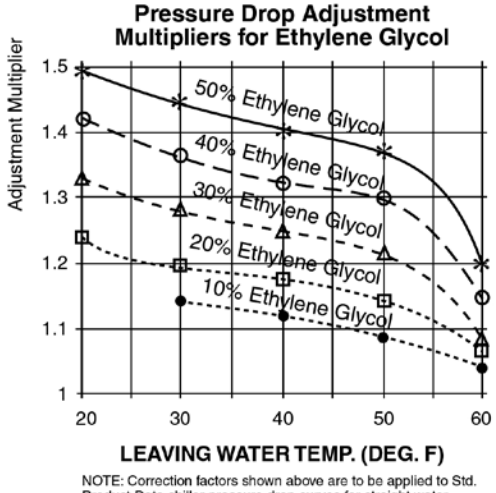
NOTE: Correction factors shown above are to be applied to Std. Product Data chiller pressure drop curves for straight water.

Fig. AM-3



NOTE: Correction factors shown above are to be applied to Std. Product Data @ARI 550/590-1998; 44˚F Leaving Chilled Water / 85˚F Entering / 95˚F Leaving Conditioned Water

Fig. AM-4



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

Fig. AM-5

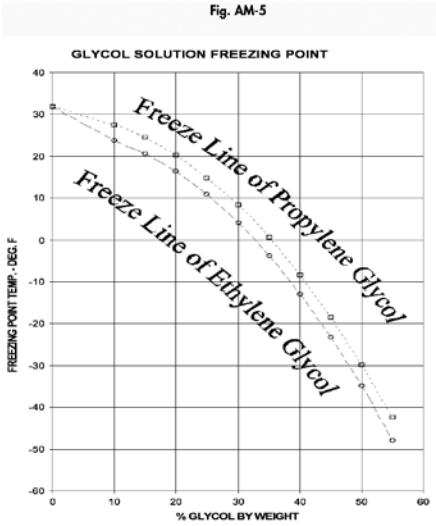
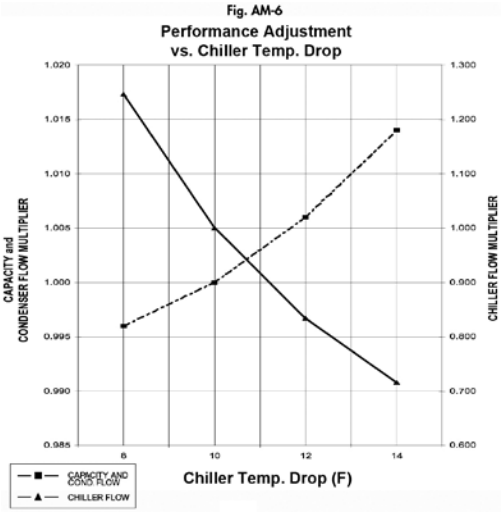


Fig. AM-6



Electrical Connection

The power for all modules is taken from a suitable circuit breaker/fused disconnect power supply within the main panel. The electrical service enters the individual modules through the top into the module's control panel enclosure. Proper grounding of the module is mandatory. **Before carrying out any electrical work, confirm that the main supply is isolated.** A typical power wiring is located on page 35 – Power Distribution Drawing. Knockout drawings are provided. **Do not drill into cabinet;** shavings can damage electronic components. The power for all individual modules shall be in compliance with all local and national codes.

CoolLogic Control System Wiring

A separate 115 volt power supply is required to power the *CoolLogic* Master Control Panel. Communication between the Master Control Panel and chiller modules requires a simple two-conductor 18 AWG shielded cable rated at 60°C minimum, daisy chain connection. **Control wiring cannot be installed in the same conduit as line voltage wiring or with wires that switch highly inductive loads such as contactor and relay coils.** Refer to the Power Distribution schematic on page 35 of this manual for more information. All wiring shall be in compliance with all local and national codes.

Electrical Phase Sequencing

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

Proper Voltage Balance

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

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

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

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

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

Voltage/Phase Monitor

Voltage/phase monitors are factory supplied for field installation with the *CoolLogic* Master Control Panel. The voltage/phase monitor helps guard the chiller bank against voltage fluctuations, phase failure or phase reversal conditions which could void your warranty. The voltage/phase monitor has three wires that connect to the main three phase power chiller bank input. Two low voltage control wires are connected to the *CoolLogic* Master Control Panel. Do not install control wiring in the same conduit as line voltage wiring or with wires that switch highly inductive loads such as contactor and relay coils. **Note: It is mandatory to install one (1) monitor per bank at main power distribution panel to monitor voltage and phasing of power to the modules. See Wiring Diagram on page 20.**

CAUTION/ATTENTION

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

⚠ WARNING/AVERTISSEMENT

To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.	Pour éviter les blessures ou la mort par électrocution, ouvrir la interrupteur de sécurité et fixez-le en position ouverte lors de l'installation.

⚠ CAUTION/ATTENTION

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

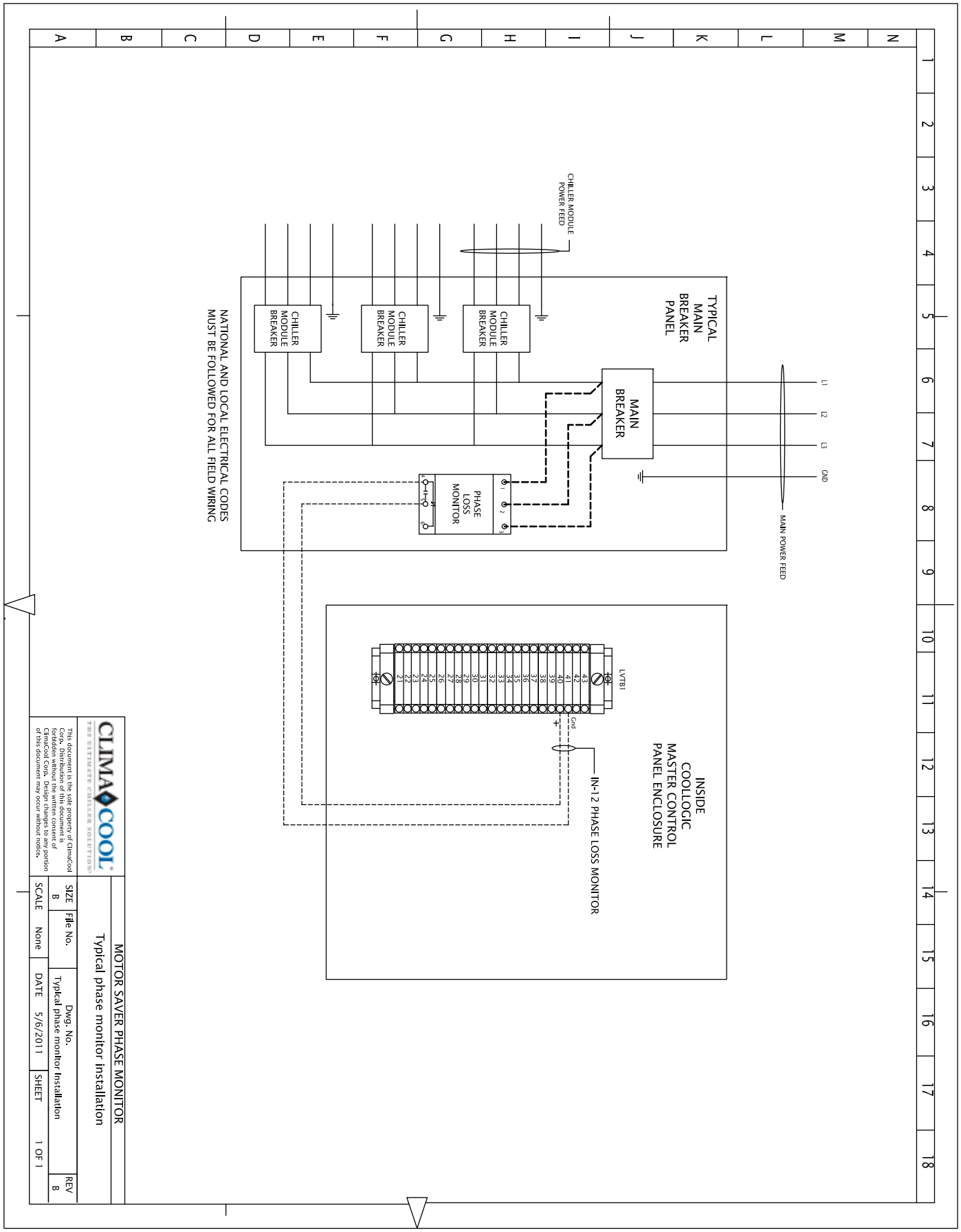
⚠ WARNING/AVERTISSEMENT

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

⚠ CAUTION/ATTENTION

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

Voltage/Phase Monitor Wiring



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 confirm correct operation of the chiller.

Maintaining a Daily Log

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

Daily

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

Weekly

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

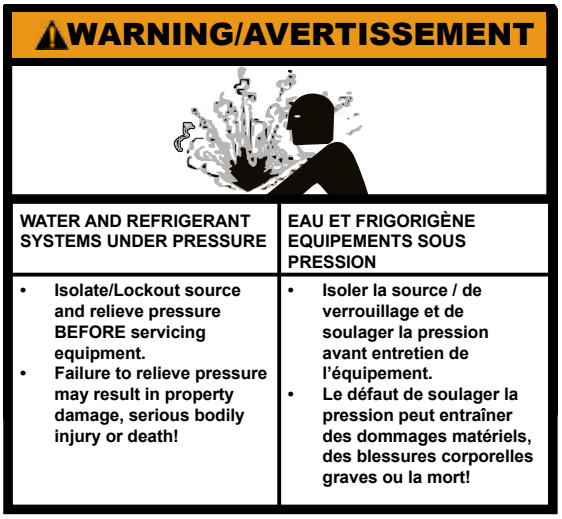
Quarterly

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

* The temperature drop/rise on a fully loaded (both compressors) heat exchanger is generally 10°F. If only one compressor is running the temperature drop/rise will be approximately 5°F. Some projects are designed to have a higher or lower temperature drop on either the evaporator or the condenser depending on application. Consult 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.

Annual

- Back flush all heat exchangers. If fouling is suspected use only ClimaCool recommended de-scalers (see page 22 – 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 set points, sensors and general control configuration.
- Properly document all data taken.



Draining

When performing standard maintenance procedures such as flushing a heat exchanger, it will be necessary to 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 depend 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 14 – City Water Cleaning Arrangement on Page 23). The back washing procedure is accomplished by isolating each individual heat exchanger and introducing the city water using a connection hose to the ¾" service port to flow in an opposite direction from the normal heat exchanger flow direction. On the opposite ¾" service port, connect a drain hose to run to a suitable floor drain. Continue the 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 15 - In Place Cleaning Arrangement (page 23). The flow of the cleaning is arranged in the opposite flow to the normal operational direction. Connection points are provided using the ¾" service ports at each heat exchanger. The cleaning solution used can be either a detergent or hot water to remove particles and simple cleaning. If correct water treatment has been implemented, this should provide adequate cleaning for most situations. The solution can be pumped through the heat exchangers and allowed to "soak" for a time and then pumped again. Upon successful cleaning of a module, proceed to isolate a second module separately from the bank to 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 module at a time. The rest of the chiller modules can continue to operate to satisfy the required cooling load. The cleaning tank, pump and pump strainer should be arranged in the manner shown in Figure 15 - In Place Cleaning Arrangement (page 23). The flow of the cleaning is arranged in the opposite flow to the normal operational direction. Connection points are provided using the ¾" service ports at each heat exchanger. The cleaning solution used can be either a detergent or hot water to remove particles and simple cleaning. If correct water treatment has been implemented, this should provide adequate cleaning for most situations. The solution can be pumped through the heat exchangers and allowed to soak for a time and then pumped again.

If it is required to remove carbonates, then an acidic wash should be used. A 2% solution of phosphoric or sulfamic acids in pure water are generally acceptable. These acid solutions should only be allowed to circulate within the heat exchanger for 10 to 15 minutes, followed by a thorough pure water flush for 10 to 15 minutes. **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 exposed to the wash are stated on page 15 – Water Treatment.

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

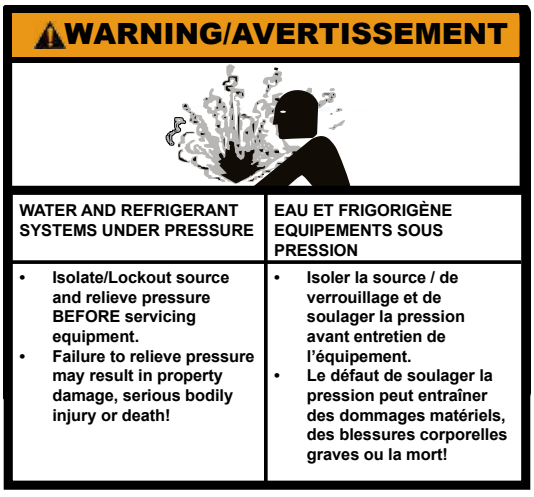


Figure 14 - City Water Cleaning Arrangement

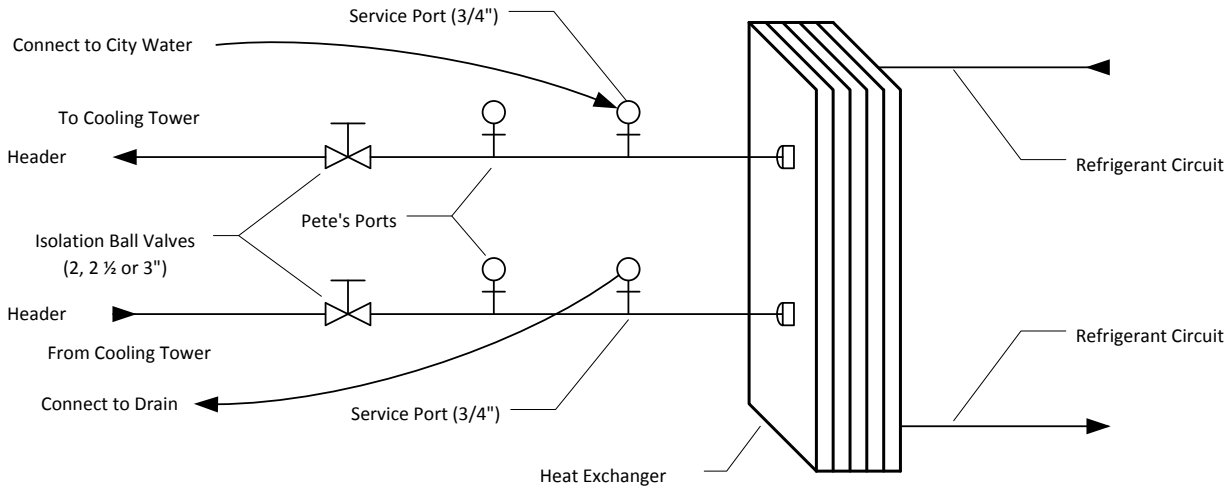
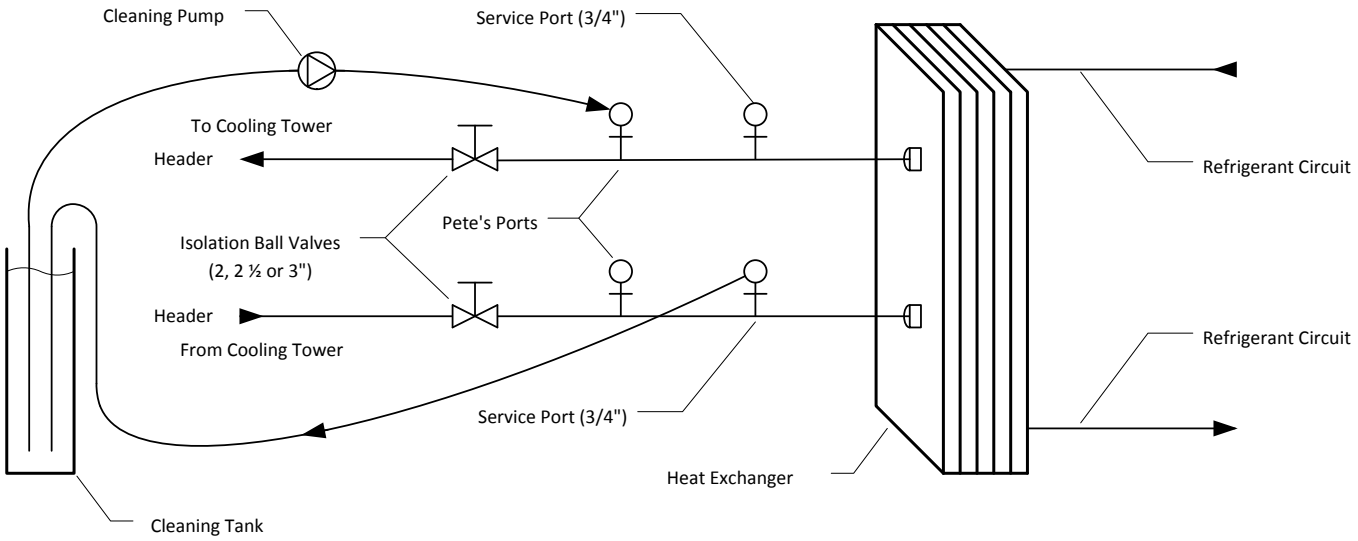


Figure 15 - In Place Cleaning Arrangement



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.

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

Water Flow Data	UGW080
Minimum Evaporator Water Flow (gpm)	79
Maximum Evaporator Water Flow (gpm)	360
Minimum Condenser Water Flow (gpm)	72
Maximum Condenser Water Flow (gpm)	400
Minimum Leaving Evaporator Water Temperature (No Glycol)(°F)	40
Minimum Leaving Evaporator Water Temperature (with Glycol)(°F)	20
Maximum Leaving Evaporator Water Temperature (°F)	62
Minimum Evaporator Water Differential Temperature (°F)	7
Maximum Evaporator Water Differential Temperature (°F)	20
Minimum Entering Condenser Water Temperature (°F)	60
Minimum Condenser Water Differential Temperature (°F)	37
Maximum Condenser Water Differential Temperature (°F)	7
Maximum Leaving Condenser Water Temperature (^{0}F)	115
Equipment Room Data	
Minimum Equipment Room Ambient Temperature (^{0}F)	55
Maximum Equipment Room Ambient Temperature (^{o}F)	105
Compressor Operating Limitations	
Maximum Compression Ratio	6.25:1
Minimum Operating Pressure Differential (psi)	30
Maximum Operating Pressure Differential (psi)	156
Minimum Discharge Pressure (psig)	79
Maximum Discharge Pressure (psig)	171
Minimum Suction Pressure (psig)	25
Maximum Suction Pressure (No Glycol)(psig)	51
Minimum Suction Pressure (With Glycol)(psig)	15
Maximum Discharge Temperature (°F)	170
Minimum Subcooling (°F)	8
Maximum Subcooling (°F)	16
Minimum Superheat at Compressor (°F)	4
Maximum Superheat at Compressor (°F)	15
Maximum Oil Temperature (Max) (°F)	160
Maximum Saturation Discharge Temperature (°F)	120

Compressor Information

Model UGW utilizes a screw compressor. They are highly efficient and extremely reliable. The information contained in this manual will be useful for their care.

Compressor Rotation

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

Compressor Lubrication

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

Oil Type

The oil in all screw compressors used in Model UGW is polyol-ester type oil, (PVE), and is intended for R-134a refrigerant use. All PVE 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 PVE 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 minimum and maximum levels 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. The compressor should not be allowed to operate below the minimum level of the sight glass.

Adding Oil

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

ATTENTION

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

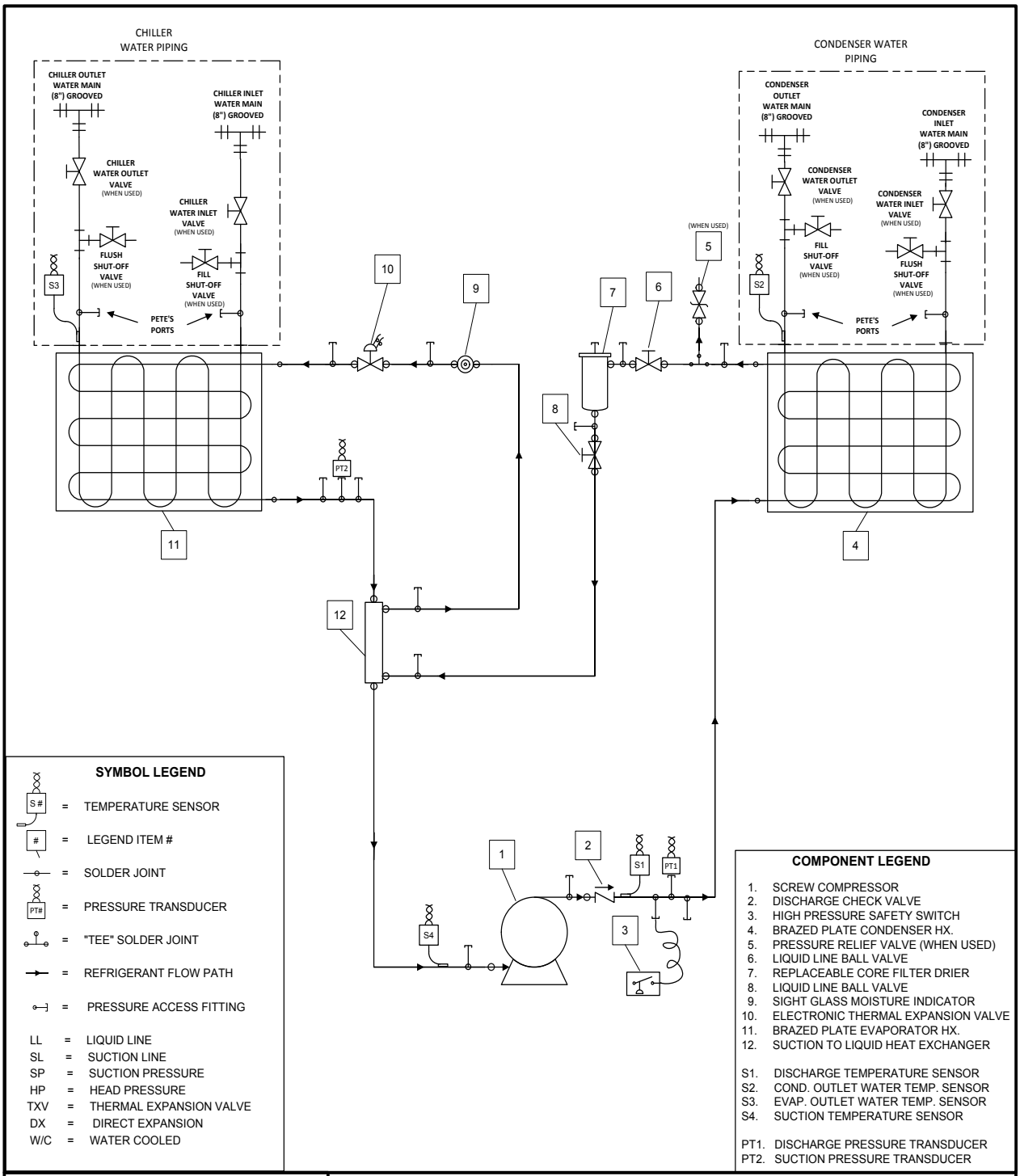
All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state and federal statues for the recovery and disposal of refrigerants.

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

⚠ CAUTION/ATTENTION

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

Refrigeration Circuit Diagram



Shell and Tube Condenser

Factory installed cleanable shell and tube condenser with enhanced copper tube geometry. Provides removable, epoxy coated, water plates to facilitate cleaning. Contact factory for application parameters.

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 and condenser heat exchangers while adjacent modules continue normal operation. Both motorized and manual valves include standard ¾" fill and flush valves.

Motorized condenser water valves provide head pressure regulation for low entering condenser water temperature applications (less than 60°F).

Available choices include:

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

Hot Gas Bypass

For normal leaving chilled water temperature setpoint of 44° F, verify that the cut-in pressure is set at 31.5 psig. For water and glycol systems operating at lower leaving design temperatures, cut-in pressure must be field adjusted at approximately 4 psig above the equivalent water/glycol temperature solution freeze point.

Pressure Differential Flow Sensor/Switch

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

Manual Strainers

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

Automatic CS Series Strainer Package

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

Water Header Bypass

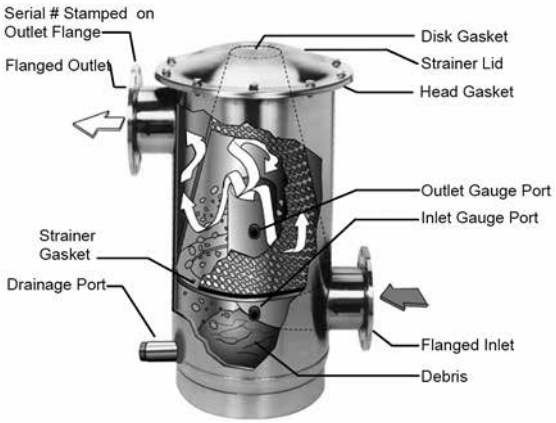
To prevent deadheading the pump, a water header bypass may be utilized and is mandatory when using motorized valves.

Options available for following:

- Direct Return:
  - Motorized evaporator/condenser water isolation valves
  - Motorized evaporator/manual condenser water isolation valves
- Reverse Return:
  - Motorized evaporator/condenser water isolation valves
  - Motorized evaporator/manual condenser water isolation valves

Stainless Steel Strainer Option

Figure 16



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 your 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 id 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

We recommend following the guidelines below when installing the strainer:

1. The CS strainer should be placed on a firm, supporting surface. Failure to do so can cause stress on the weld joints. It is recommended a concrete pad be poured under the base of the strainer. The weight of the CS strainer should not be supported by the main water lines connecting it.
2. The inlet and outlet connections should be securely fastened. The arrows depict flow direction (see Figure 16).
3. The back-mount pressure gauges should be installed in the gauge ports located on the front of the strainer body. These gauges will allow you to monitor the pressure differential across the strainer screen providing an indication when the strainer element is clogged and requires cleaning.
4. The CS strainer lid must be securely fastened according to the following torque specifications to ensure product safety and an adequate seal.

Torque Specifications

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

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

Bolted Lid Models: CS strainer models 6CS, 8CS and 10CS have "bolted" lid designs. Grade 5 zinc-plated bolts, nuts and washers are used to attach the lids to these strainers. See Table 2 for proper lid bolt size and torque rating for each strainer (page 29). (Exercise care when tightening the lid bolts so as not to damage the strainer lid or housing).

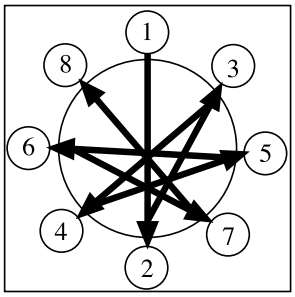
It is important to follow the torque specifications as over-tightening may result in premature failure of the bolts. It is equally important to follow a star wheel torque pattern when tightening the lid bolts (see Figure 17). The strainer lid may not be seated down completely after the first torque sequence. A second torque sequence should be adequate to seat the lid securely to the body.

Table 2

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

Note: The 3CS strainer torque is in lbs (not ft. lbs).

Figure 17 - Recommended Torquing Sequence



Strainer Operation

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

Strainer Element Cleaning

If 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.

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 1/10th of a second can generate a water hammer.

What Can Water Hammer Do?

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

What Can I Do to Prevent Water Hammer?

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

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 18) 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 18 and 19).

Figure 18

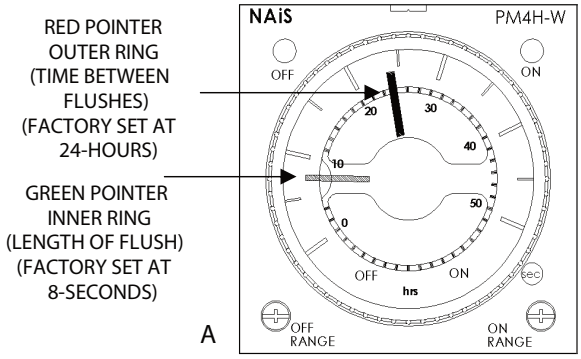


Figure 19

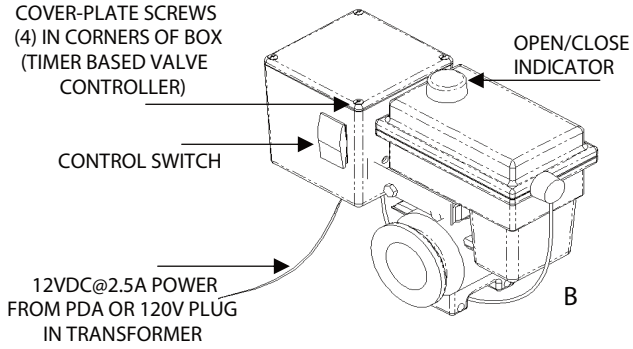
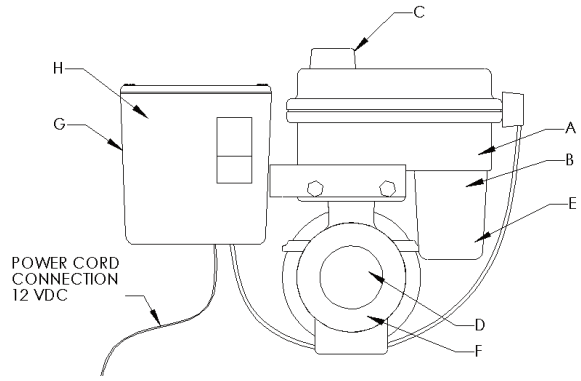


Figure 20



Valve Specifications (See Figure 17)

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° bidirectional rotation

G. Controller case

Operation Instructions

Flush valve line must be piped to atmospheric pressure such as an open floor drain. The flush line should not undergo any changes in elevation and should be sloped downward in the direction of drainage. **Do not pipe the flush or drain line into a pressurized line.**

Note: The Automatic Timer Flush Package needs to be programmed when it is received by the end-user. The programming is simple and takes only a few moments. However, because every application has different parameters that affect the required frequency between flushes and the duration of the flush, the end-user must choose the controller's settings (refer to your specific strainer manual).

To Program the ATF Controller

1. Plug the transformer into a 120-VAC outlet.
2. Insert the 12-VDC plug coming from the transformer into the jack on the underside of the ATF box.
3. Test for power by pressing the manual flush side of the control switch (lower switch light should come on 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 18).
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 18).
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 19). 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 supplied a sufficient amount of power to cause personal injury. Take precaution when handling.

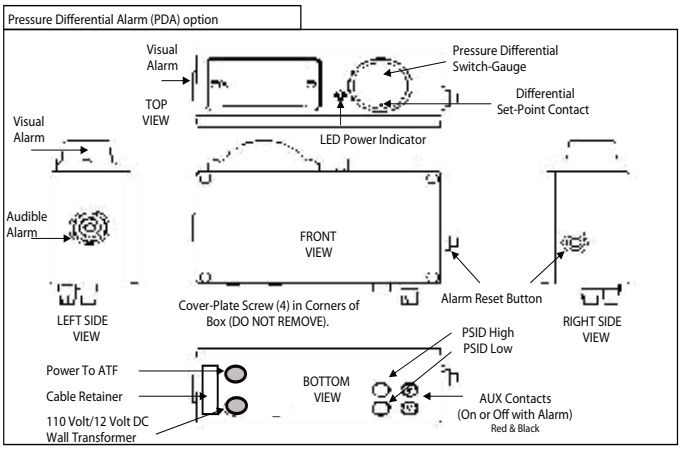
Water Resistance

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

Pressure Differential Alarm Package Option

The pressure differential alarm (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 29).

Figure 21



Operation Instructions

Remove the power supply and insert the connector end into the socket on the bottom of the PDA housing (See Figure 21 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 21). **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 21). The alarm can be set up in one of two ways:

1. A remote alarm signal of 12 VDC can be sent to a central monitoring station or
2. A set of auxiliary contacts will indicate a "closed" condition when the alarm activates. (Locate the Auxiliary Contact Schematic inside the PDA box by removing the four screws on the cover plate).

Water Resistance

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

Table 3

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

"Y" Strainer

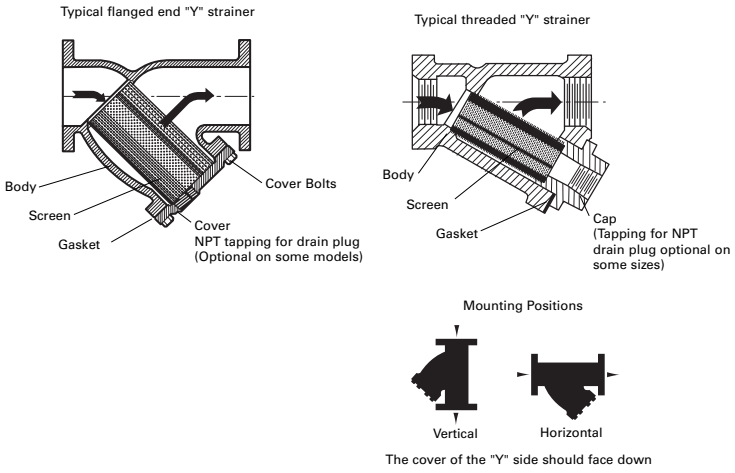
Before installing the "Y" strainer, be sure its pressure rating is correct for the system. If the end connections are threaded or designed for soldering or brazing, be sure the piping is straight and not at an angle or offset. If the strainer has flanged ends, be sure the flanges of the connecting piping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

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

Keeping a spare, clean screen will minimize shut down time.

Warning

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



CALIFORNIA PROPOSITION 65 WARNING

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

For more information: www.watts.com/prop65

Basket Strainer

Installation

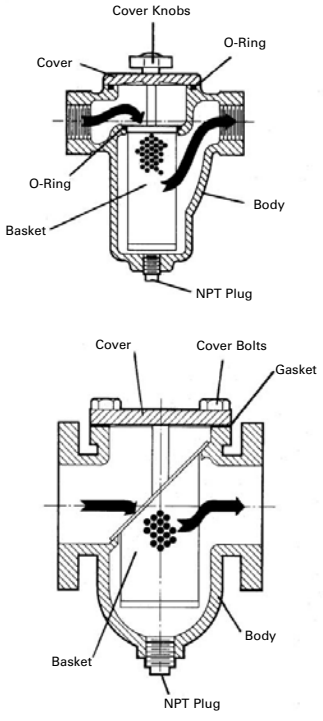
Before installing the simplex basket strainer, be sure its pressure rating is correct for the system. If the end connections are threaded, be sure the piping is straight and not at an angle or offset. If the strainer has flanged ends, be sure the flanges of the connecting piping are square with the pipe so that no undue stresses are put on the strainer or piping when tightening flange bolts. Tighten bolts in sequence crossing to opposites.

Maintenance

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

Warning

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



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

Ultimate Green Model Type	Voltage	Power Wiring - per Module					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]	Locked Rotor (LRA)[5]	MaxFuse Size (MOP)[3]	Rec. Fuse[4] Size
UGW080	208-230/3/60	204.5	255	350	350	400	202.1	253	780	350	350
UGW080	460/3/60	92.6	116	200	150	200	91.5	114	350	200	150
UGW080	575/3/60	74.1	92	150	125	150	73.1	91.4	300	150	125

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 Device Amp Size is rounded down from: [225% of the RLA of the largest compressor motor plus 100% of the RLA of all other concurrent electrical loads].
4. 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.

Power Distribution Drawing

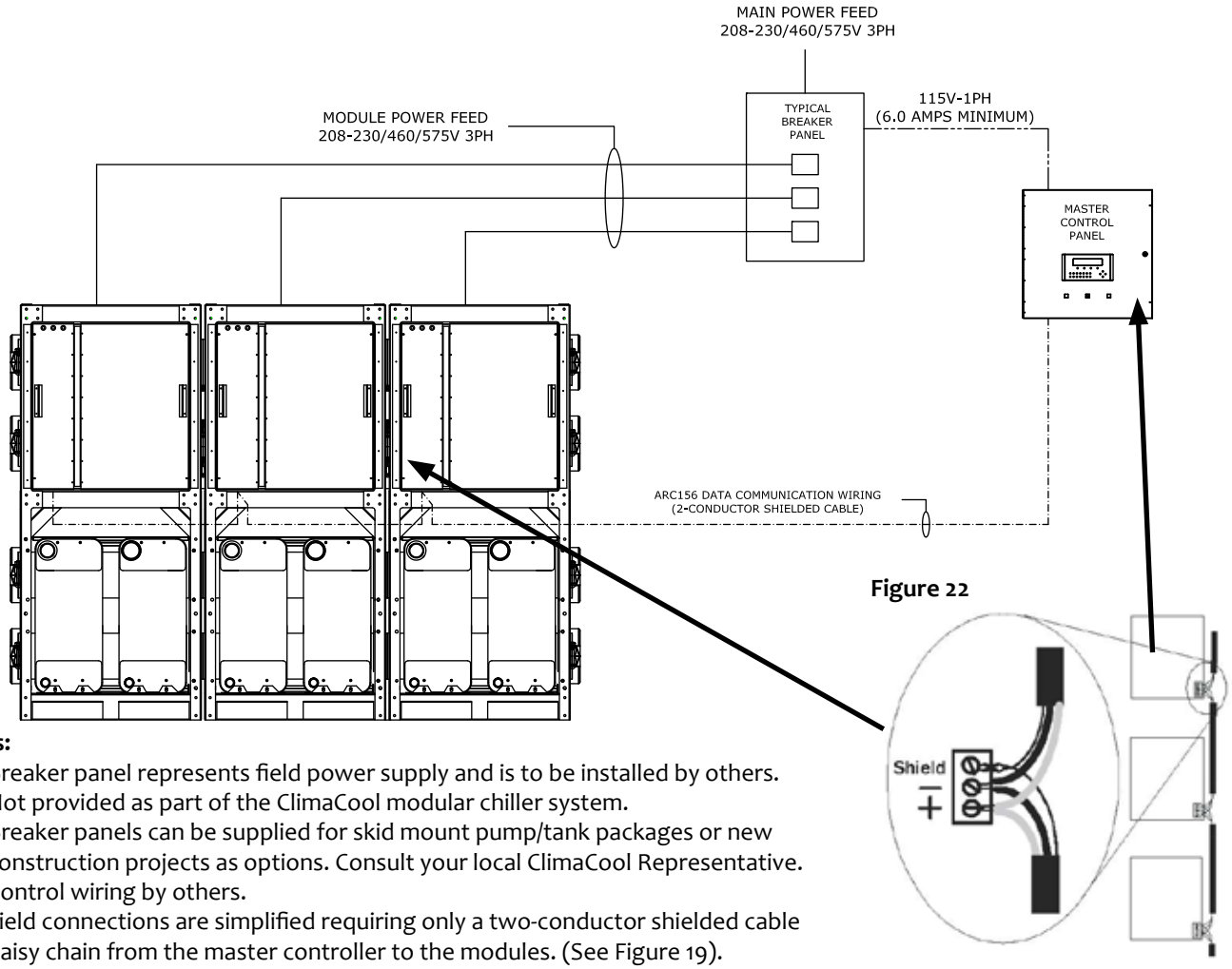


Figure 22

Notes:

1. Breaker panel represents field power supply and is to be installed by others. Not provided as part of the ClimaCool modular chiller system.
2. Breaker panels can be supplied for skid mount pump/tank packages or new construction projects as options. Consult your local ClimaCool Representative.
3. Control wiring by others.
4. Field connections are simplified requiring only a two-conductor shielded cable daisy chain from the master controller to the modules. (See Figure 19).

Specifications for ARC156 Wiring

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

Cable Shields

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

Noise Avoidance

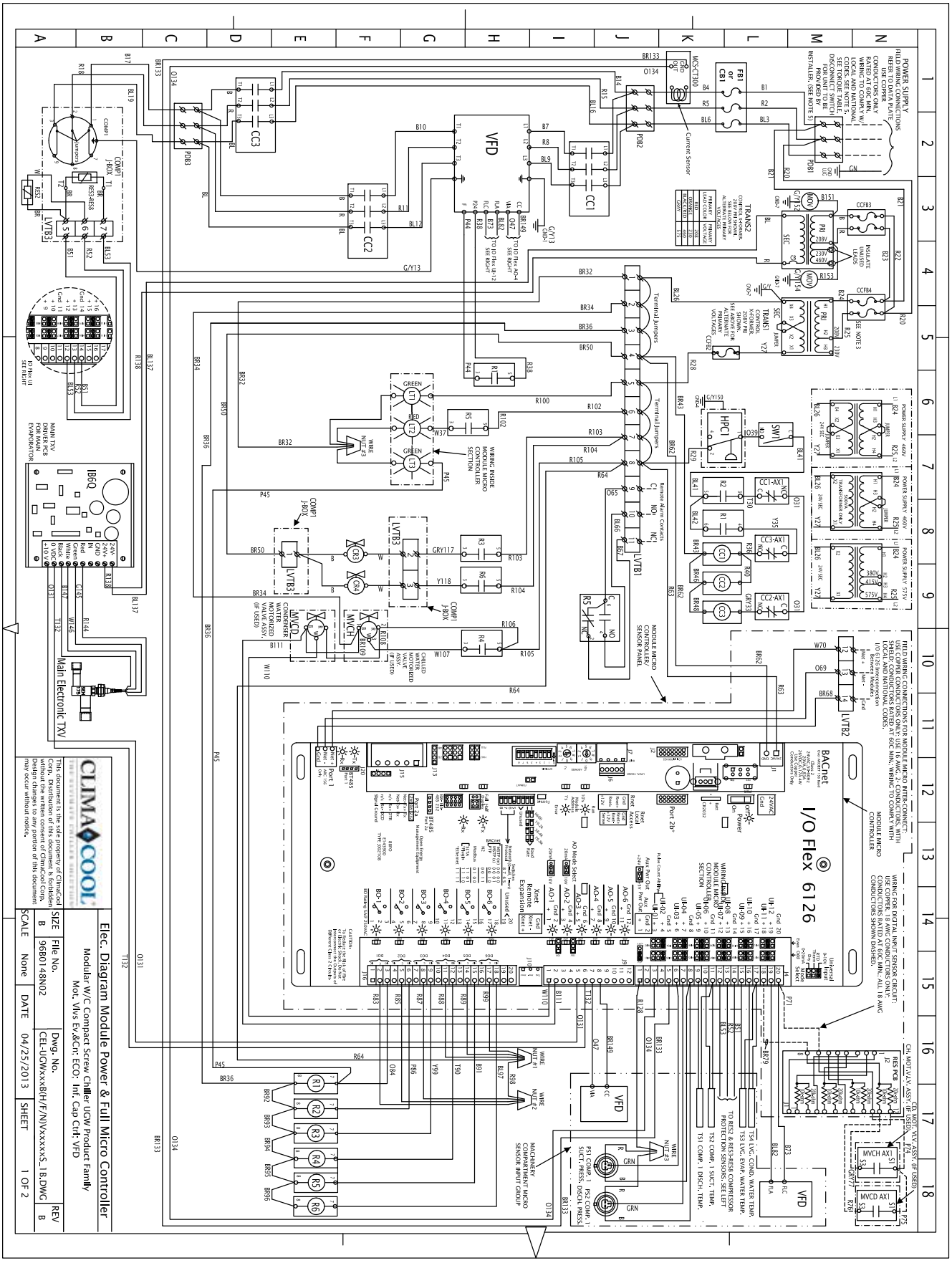
Avoid running communication wires or sensor input wires next to AC power wires or the control module's relay output wires. These can be a source of noise that can affect signal quality.

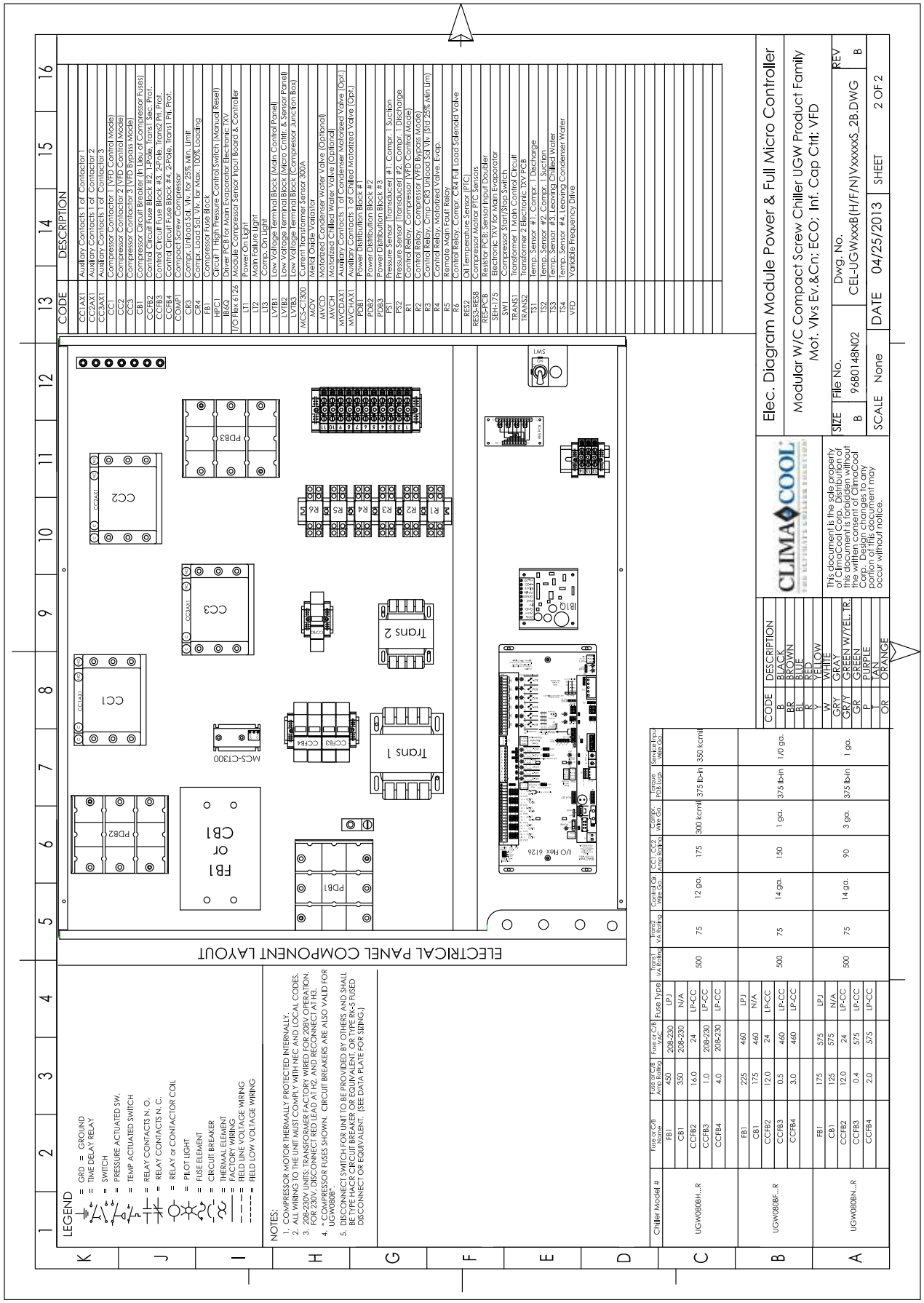
Common sources of noise are:

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

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

Wiring Diagram





	Chiller Model #	Fuse or C/B Name	Fuse or C/B Amp Rating	Fuse or C/B VAC	Fuse Type	Trans1 VA Rating	Trans2 VA Rating	Control Ckt Wire Ga.	CC1, CC2, CC3 Amp Rating	Compr. Wire Ga.	Torque PDB Lugs	Service Input Wire Ga.
C	UGW0808H...R	FB1	450	208-230	LPJ	500	75	12 ga.	175	300 kcmil	375 lb-in	350 kcmil
		CB1	350	208-230	N/A							
		CCFB2	16.0	24	LP-CC							
		CCFB3	1.0	208-230	LP-CC							
		CCFB4	4.0	208-230	LP-CC							
B	UGW0808F...R	FB1	225	460	LPJ	500	75	14 ga.	150	1 ga.	375 lb-in	1/0 ga.
		CB1	175	460	N/A							
		CCFB2	12.0	24	LP-CC							
		CCFB3	0.5	460	LP-CC							
		CCFB4	3.0	460	LP-CC							
A	UGW0808N...R	FB1	175	575	LPJ	500	75	14 ga.	90	3 ga.	375 lb-in	1 ga.
		CB1	125	575	N/A							
		CCFB2	12.0	24	LP-CC							
		CCFB3	0.4	575	LP-CC							
		CCFB4	2.0	575	LP-CC							

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 only be allowed to work with energized electrical components.

Chiller Will Not Start	
Possible Cause	**Remedy**
Power off	Check main disconnect switch.
Main line open	Check main fuses.
Incorrect wiring	Check the wiring diagram.
Loose terminals/connections	Tighten the terminal connections.
Control circuit open	Check interlocks with auxiliary equipment, pressure and temperature controls.
Improper phasing of main power	Change any two of three phases of main power.
Compressor Hums But Does Not Start	
Possible Cause	**Remedy**
Low voltage	Check at main power entry and unit power entry (consult power company if low).
Phase loss	Check power wiring and fuses.
Compressor Runs But Does Not Cool	
Possible Cause	**Remedy**
Improper phasing of main power	Switch any two of three phases of main power.
Compressor Cuts Out On Low Pressure Safety Control	
Possible Cause	**Remedy**
Main chilled water valve closed or restricted	Open valve to full open position.
Module chilled water isolation valves, if provided, closed or restricted	Open valves to full open position.
Refrigerant storage	Check for leaks – add refrigerant.
No load on water chiller	Check water pump operation.
Restriction in liquid line	Plugged liquid line drier – replace liquid line drier.
Expansion valve clogged or inoperative	Repair/replace the expansion valve.
Low discharge pressure	Raise and control discharge pressure within design limits.
Low water flow through the cooler	Check water flow through the cooler.
Chilled water temperature too cold	Raise water temperature setpoint.
Fouled evaporator brazed plate heat exchanger	Clean-in-place heat exchanger as described on page 22.
Improper chilled water circulation	Use an ample sized cleanable strainer in the chilled water circuit; make certain the strainer is clean to insure full flow of chilled water (strainer screen must be 60 mesh minimum).
Faulty suction pressure transducer	Verify transducer calibration using a calibrated manifold gauge and replace if defective.
Wrong suction pressure cutout setpoint	Verify suction pressure cutout setpoint to be set equal to the corresponding leaving chilled solution freeze temperature equivalent pressure on a PT chart. (i.e. If the solution freeze point is 32°F, the equivalent pressure setpoint will be 101 psig).

Compressor Cycle On High Pressure Control	
Possible Cause	**Remedy**
Main condenser water valve closed or restricted	Open valve to full open position.
Module condenser water isolation valves, if provided, closed or restricted	Open valves to full open position.
Water regulating valve incorrectly set or defective	Reset or replace.
Compressor discharge valve partially closed	Open valve to full open position.
Non-condensable gases in hydronic system	Recover non-condensable gases from bleed valve on condenser or at bleed valve of the building condenser water system.
Overcharge of refrigeration	Recover refrigerant from system while in operation until the first sign of bubbles are shown in the sight glass. Add back refrigerant just until bubbles clear.
Condenser water temperature high	Check water supply temperature against requirements; if cooling tower is used check spray nozzles on cooling tower.
Improper condenser water circulation	Use an ample sized cleanable strainer in the condenser water circuit; make certain the strainer is clean to insure full flow of condenser water (strainer must be 60 mesh minimum). It may sometimes be necessary to treat water to prevent formation of deposits.
Insufficient water flow through the condenser	Check water flow through condenser against design requirements.
Fouled condenser brazed plate heat exchanger	Clean-in-place heat exchanger as described on page 22.
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.
Improper chilled water circulation	Use an ample sized cleanable strainer in the chilled water circuit; make certain the strainer is clean to insure full flow and velocity of chilled water (strainer screen must be 60 mesh minimum). It may sometimes be necessary to treat water to prevent formation of deposits.
Not draining for winter shutdown	When the system is shut down for the winter, remove the drain plugs from the flush ports and drain the cooler. Blow out remaining water with air.
Faulty leaving chilled solution temperature	Verify sensor calibration using a calibrated thermometer and replace if defective.
Wrong freeze-up protection temperature setpoint	Verify leaving chilled solution freeze protection temperature setpoint to be set at 8°F above solution freeze point.

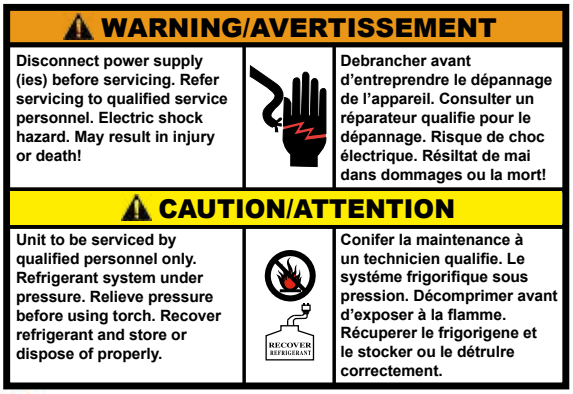
Note: See page 32 for Troubleshooting for Stainless Steel Strainer ATF Package.

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.



CLIMACOOL CORPORATION

LIMITED EXPRESS WARRANTY/LIMITATION OF REMEDIES AND LIABILITY

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: (a) All modular chillers built or sold by CC for twelve (12) months from date of unit start-up or eighteen (18) months from date of shipment (from CC's warehouse), whichever comes first; and (b) Repair and replacement parts, which are not supplied under warranty, for ninety (90) days from date of shipment (from CC's warehouse). All parts must be returned to CC's warehouse in Oklahoma City, Oklahoma, freight prepaid, no later than sixty (60) days after the date of the failure of the part. If CC determines the part to be defective and within CC's Limited Express Warranty, CC shall, when such part has been either replaced or repaired, return such to a CC recognized dealer, contractor or service organization, F.O.B. CC's warehouse, Oklahoma City, Oklahoma, freight prepaid. The warranty on any part repaired or replaced under warranty expires at the end of the original warranty period.

This warranty does not cover and does not apply to : (1) Fuses, refrigerant, fluids, oil; (2) Products relocated after initial installation; (3) Any portion or component of the system that is not supplied by CC, regardless of the cause of the failure of such portion or component; (4) Products on which the module 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; (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; or, (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.

CC is not responsible for: (1) The costs of any fluids, refrigerant or other system components, or 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 of 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 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 the 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 OF THE BUYER AGAINST CC FOR THE 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, shortage 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 OF IMPLIED WARRANTY, OR IN TORT, WHETHER FOR CC'S OWN NEGLIGENCE OR AS STRICT LIABILITY**.

OBTAINING WARRANTY PERFORMANCE

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

ClimaCool Corp. • P.O. Box 2055 • Oklahoma City, Oklahoma 73102 • (405) 815-3000 • e-mail: Claims@climacoolcorp.com

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

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

CLIMACOOL®
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COOLLOGIC™
DIGITAL CONTROLLER

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