

ClimaCool IOM ***FLEX SERIES***

Water-Cooled Modular Chillers



Installation, Operation &
Maintenance Manual

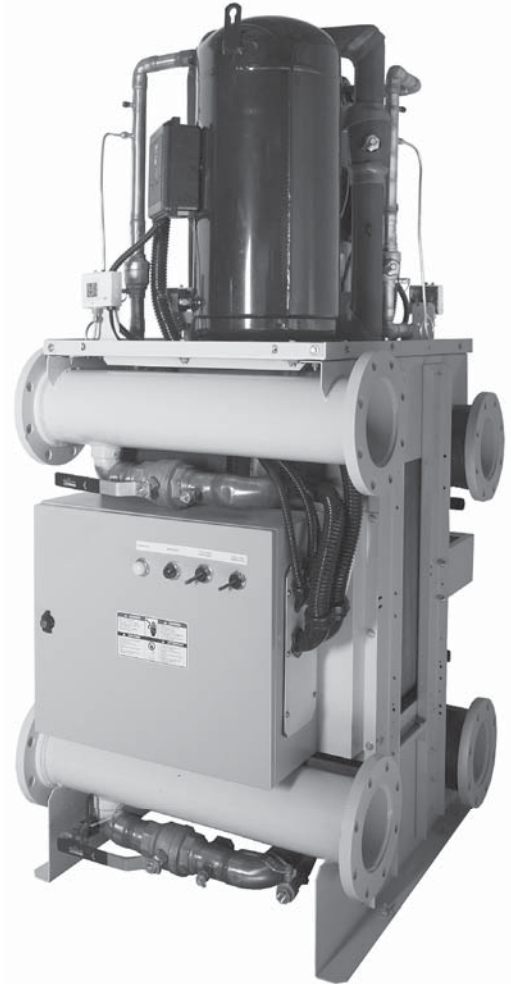
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Refer to www.climacoolcorp.com for complete warranty details.

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MODEL NUMBERS AND SPECIFICATIONS

Model No.	Dimensions L x W x H (in.)	Voltage	Refrigerant Circuits	No. Of Compressors	Nominal Tons
FLEX 30	41-7/8" x 29-1/2" x 77"*	208/230/3/60	2	2	30
FLEX 30	41-7/8" x 29-1/2" x 77"*	460/3/60	2	2	30
FLEX 30	41-7/8" x 29-1/2" x 77"*	575/3/60	2	2	30
FLEX 50	41-7/8" x 33-1/2" x 78 3/8"*	208/230/3/60	2	2	50
FLEX 50	41-7/8" x 33-1/2" x 78 3/8"*	460/3/60	2	2	50
FLEX 50	41-7/8" x 33-1/2" x 78 3/8"*	575/3/60	2	2	50
FLEX 65	43-5/8" x 33-1/2" x 78 3/8"*	208/230/3/60	2	2	65
FLEX 65	43-5/8" x 33-1/2" x 78 3/8"*	460/3/60	2	2	65
FLEX 65	43-5/8" x 33-1/2" x 78 3/8"*	575/3/60	2	2	65

* Dimensions with covers.

⚠ SAFETY WARNING ⚠

High voltage is used to operate this equipment. Failure to observe standard electrical safety procedures may result in serious injury. Only persons qualified and / or properly trained should attempt to install, operate and maintain this equipment. These chillers come fully charged with refrigerant. Installation, and start – up should be accomplished by technicians who are fully certified to handle refrigerants, as required by 40 CFR Part 82, subpart F of the Recycling and Emissions Reduction Act. Scroll compressors are used in this equipment. Phase verification is required for proper rotation direction. Incorrect rotation will result in elevated sound and internal overload trip failure.

Inspection

INSPECTION

Allow a sufficient amount of time to carefully follow these instructions to assure warranty coverage.

During inspection of the equipment remove the top doors to check the equipment for any damage during shipment. Inspect wiring connections, lines from expansion devices, thermostats, and pressure switches for damage.

General

During any correspondence concerning this machine, always reference the full model and serial numbers of your modules.

Receipt of the ClimaCool Modules

Upon receipt of the equipment, carefully check the shipment against the bill of lading. Make sure all modules ordered have been received. Inspect the carton or crating of each module, and inspect each module for damage. ***You must make proper notation of any shortages or damage on all copies of the freight bill for your records. Make sure the carrier completes a common carrier inspection report listing any shortages or damage.***

Note: It is the responsibility of the recipient of the modules to file all necessary claims with the carrier. In addition, please notify the ClimaCool Customer Service Department of all damage immediately. Refer to the back cover for the Customer Service Department phone number.

Storage

Equipment should be stored as shipped in a clean, dry area. Store modules in an upright position at all times. Plastic wrap should be left on until the module is ready to be installed.

Handling of Modules

The packaging allows for handling by fork lift or pallet jack (only lift the module from the side). See Lifting and Transporting Modules (Fig. 3) on page 5. **Caution: modules ARE TOP HEAVY. Please use caution when rigging or moving.**

Rigging for Lifting

Each module should be lifted by using lift straps threaded through each top header tube. See page 5 - Rigging and Lifting Procedures.

⚠ WARNING ⚠

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 statutes for the recovery and disposal of refrigerants.

If a compressor is removed from this 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.

Preparing for Installation.

Prepare the modules for installation by carefully removing the module's packaging, unbolt the module from the skid, and lift the module with a crane or hoist into its final position.

Hardware kits are shipped in separate packaging along with the modules. Make sure the hardware kits are on site when connecting the modules.

SITE PREPARATION

Base Requirements

The minimum base requirement for the ClimaCool chiller is a level surface which has been checked to ensure that it is capable of bearing the combined operating weight of the modules (see page 4).

Anti-Vibration Mountings

Although the compressors are installed on anti-vibration mountings, further isolation of the chiller from the structure can be achieved by installing vibration-eliminating springs or pads under the base rails on which the chiller will rest. (see page 7 - Vibration Isolation).

Service Access

The minimum space required for electrical panel service is 36" in the front of each module. Allow 24" service clearance in the back of the module for refrigeration access. Allow a minimum of 18" of clearance above the module for service. Allow 12" side clearance of any ClimaCool modular chiller system (see Service Clearances page 6). Local building or electrical codes may require additional clearance.

Draining

When performing standard maintenance procedures such as flushing heat exchanger, it will be necessary to close off a section of a module. ClimaCool modular chillers come equipped with isolation valves for this purpose. Access to a floor drain is helpful when performing standard maintenance procedures.

INSTALLATION

Assembling Modules

Use of (2) 4" rails (minimum size) is required for ease of installation. One of the end modules should be chosen as the reference module and carefully located.

A factory supplied fastener kit is provided for the adjoining of each module. Each kit contains (4) gaskets, (32) $\frac{3}{4}$ " fully threaded studs, (64) heavy duty hex nuts, (64) lock washers, and (64) flat washers.

A $\frac{3}{4}$ "-10 tap should be run through each weld nut located at the bottom rear chiller header flange of each module. Screw the fully threaded studs into these four weld nut locations. At all other flange hole locations, insert fully threaded studs, attach washers, lock washers, and nuts from the fastener kit.

The gasket should be placed between the first reference module and the next module. Slide the next module into position while guiding the fully threaded studs into the flange holes of the next module. Finally, the washers, lock washers, and nuts are applied to the other end of the fully threaded studs to securely fasten the module flanges.

Tighten the flange bolts in a diametrically opposite pattern, in such a way as to pull the modules together evenly. It will be necessary to use a $\frac{3}{4}$ " (12 point) box-end wrench when tightening. As each module is added, the alignment of the whole package should be confirmed.

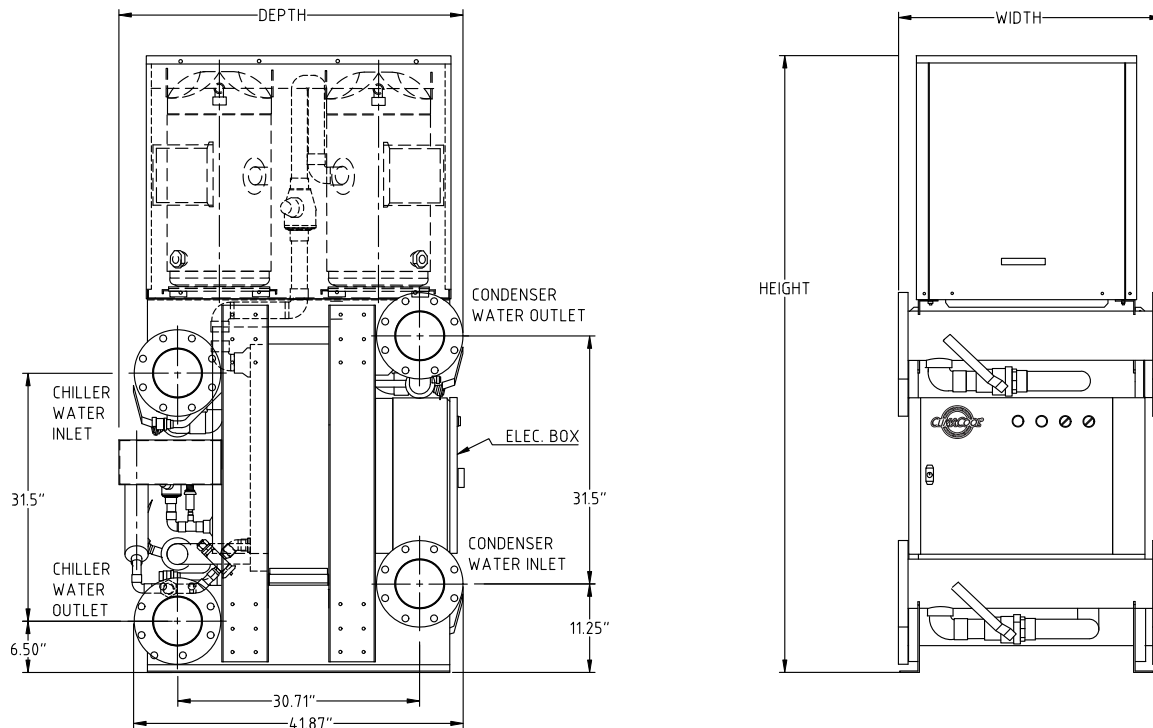


Header and Flange Insulation

Chilled water piping is pre-insulated on each module at the factory with $\frac{3}{4}$ " closed cell foam rubber. After the bolting the modules together, the installer must apply insulation on site over the chilled water header connection flanges.

ClimaCool Dimensional Data

The ClimaCool® Modular Chiller - Module Dimensional Data - Models 30, 50 & 65 - FLEX Series



Model FLEX	Voltage	Depth (inches)	Width (inches)	Height (inches)	Height (w/covers) (inches)	Weight ¹ (lbs.)	Oper. Weight ² (lbs.)
30	208/230/3/60	41-7/8	29-1/2	72-7/8	77	1,669	1,825
30	460/3/60	41-7/8	29-1/2	72-7/8	77	1,669	1,825
30	575/3/60	41-7/8	29-1/2	72-7/8	77	1,669	1,825
50	208/230/3/60	41-7/8	33-1/2	76-5/8	78-3/8	1,873	2,163
50	460/3/60	41-7/8	33-1/2	76-5/8	78-3/8	1,873	2,163
50	575/3/60	41-7/8	33-1/2	76-5/8	78-3/8	1,873	2,163
65	208/230/3/60	43-5/8	33-1/2	76-5/8	78-3/8	1,990	2,280
65	460/3/60	43-5/8	33-1/2	76-5/8	78-3/8	1,990	2,280
65	575/3/60	43-5/8	33-1/2	76-5/8	78-3/8	1,990	2,280

NOTES:

- Unit shipping weight includes refrigerant charge, compressor oil, and shipping base skid. Add two inches to base dimensions for shipping skid.
- Operational weight includes refrigerant charge, compressor oil and water.



• ISO-9001 Certified
• Meets NYC Fire Code

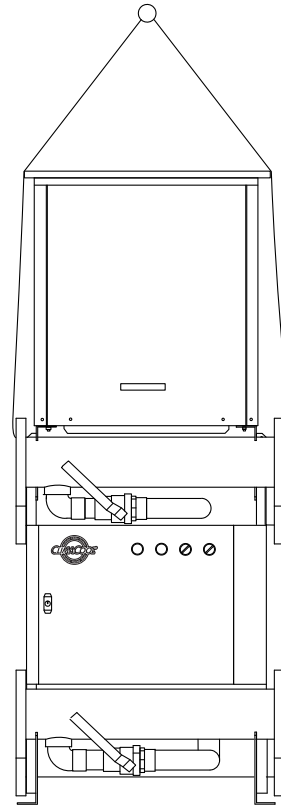
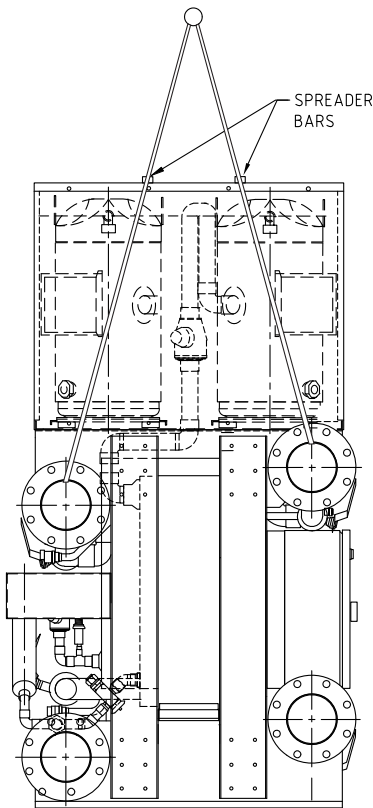


The ClimaCool® Modular Chiller - Rigging and Lifting Procedures

Rigging (Figures 1 and 2)

Each module should be lifted by using lift straps threaded through each top header tube.

A spreader bar should be utilized when rigging with covers in place.

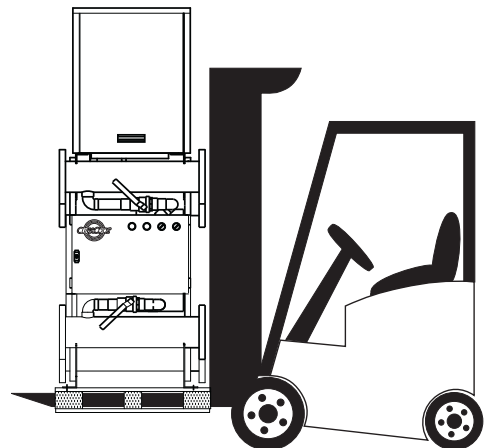


Lifting and Transporting Modules (Figure 3)

When lifting and transporting the module, it is very important to proceed as shown at right. Use of any other means for lifting and transporting may damage the module and void the warranty.

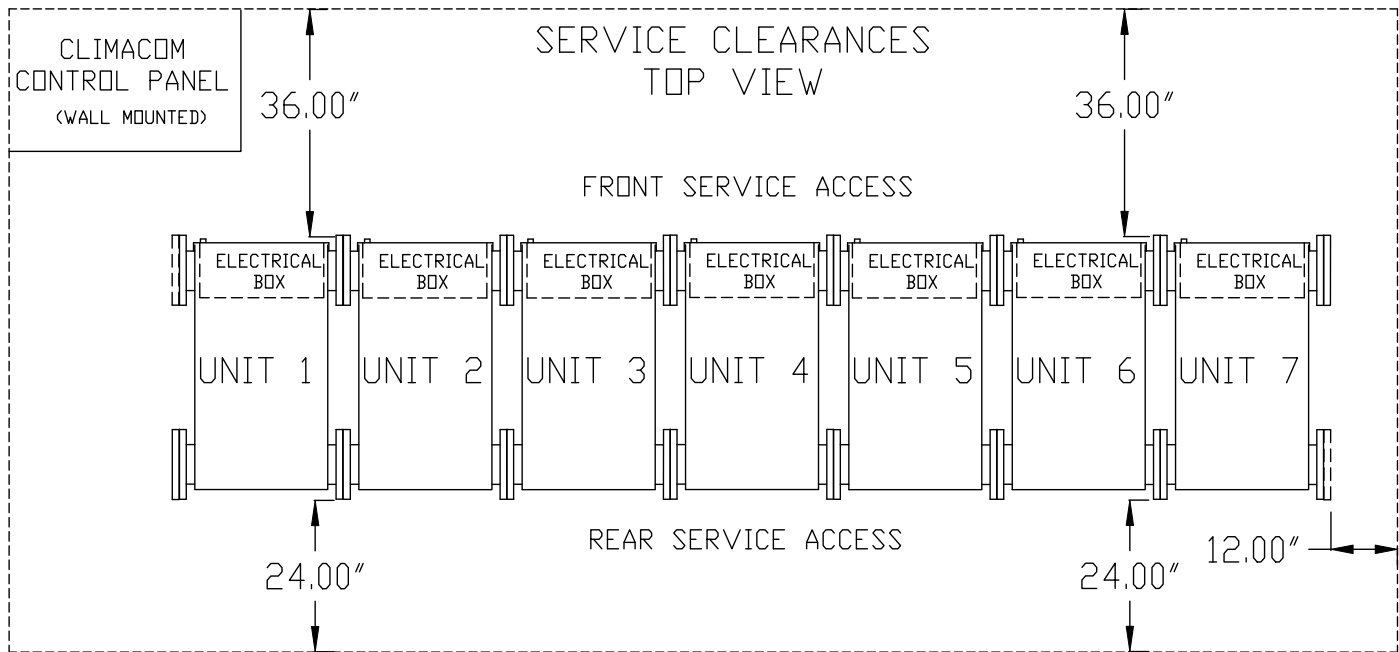
⚠ CAUTION

TOP HEAVY  TIP HAZARD	⚠ WARNING TOP HEAVY TIP HAZARD <ul style="list-style-type: none"> ● Use extreme CAUTION when moving or transporting this object! ● Improper handling may cause this object to tip over and may result in property damage, serious bodily injury or death! ● Transporting this object at unsafe speeds or without adequately securing the object for transportation may cause this object to tip over and may result in property damage, serious bodily injury or death!
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ClimaCool Service Clearances

The ClimaCool® Modular Chiller - Service Clearances



Recommended Clearances

1. Allow 36" clearance for electrical panels and 24" clearance for rear service access to modules.
2. Allow a minimum of 18" height clearance for service and 12" for side clearances.
3. Local building or electrical codes may require additional clearance. Consult applicable codes.

Modular Chiller Bank Dimensions - w/Connection Flange Gaskets and Blank Off Plates

Model FLEX	Dimensions											
	Width (ft./inches)			Depth			Height (w/o panels)			Height (w/ panels)		
	30	50	65	30	50	65	30	50	65	30	50	65
1 module	2' 7-1/8"	2' 11-1/8"	2' 11-1/8"	41-7/8"	41-7/8"	43-5/8"	72-7/8"	76-3/4"	76-3/4"	77"	78-3/8"	78-3/8"
2 modules	5' 3/4"	5' 8-3/4"	5' 8-3/4"	41-7/8"	41-7/8"	43-5/8"	72-7/8"	76-3/4"	76-3/4"	77"	78-3/8"	78-3/8"
3 modules	7' 6-3/8"	8' 6-3/8"	8' 6-3/8"	41-7/8"	41-7/8"	43-5/8"	72-7/8"	76-3/4"	76-3/4"	77"	78-3/8"	78-3/8"
4 modules	10' 0"	11' 4"	11' 4"	41-7/8"	41-7/8"	43-5/8"	72-7/8"	76-3/4"	76-3/4"	77"	78-3/8"	78-3/8"
5 modules	12' 5-5/8"	14' 1-5/8"	14' 1-5/8"	41-7/8"	41-7/8"	43-5/8"	72-7/8"	76-3/4"	76-3/4"	77"	78-3/8"	78-3/8"
6 modules	15' 7/8"	17' 7/8"	17' 7/8"	41-7/8"	41-7/8"	43-5/8"	72-7/8"	76-3/4"	76-3/4"	77"	78-3/8"	78-3/8"
7 modules	17' 6-1/2"	19' 10-1/2"	19' 10-1/2"	41-7/8"	41-7/8"	43-5/8"	72-7/8"	76-3/4"	76-3/4"	77"	78-3/8"	78-3/8"

NOTES:

1. Modular chiller bank width dimensions above include (1/8") between modules, plus (1-1/2") for required blank off plate flanges when piping for a direct return (Refer to Water Piping Configuration - Figure 1). Example: (5) FLEX 65 modules 167-1/2" width + 1-1/2" (Blank off plates) + 5 x 1/8" (flange connection gaskets) = 169-5/8" (14' 1-5/8").
2. When piping 1 to 5 or more than 5 modules, use reverse return (Refer to Water Piping Configuration - Figure 2). Example: (7) FLEX 30 modules 206-1/2" width + 1-1/2" (Blank off plates left) + 1-1/2" (Blank off plates right) + 8 x 1/8" (flange connection gaskets) = 210-1/2" (17' 6-1/2").

The ClimaCool® Modular Chiller - Mounting Rail and Vibration Isolation Configuration Options

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 Figs. 1 and 2.

Figure 1 - Spring Vibration Isolators Option

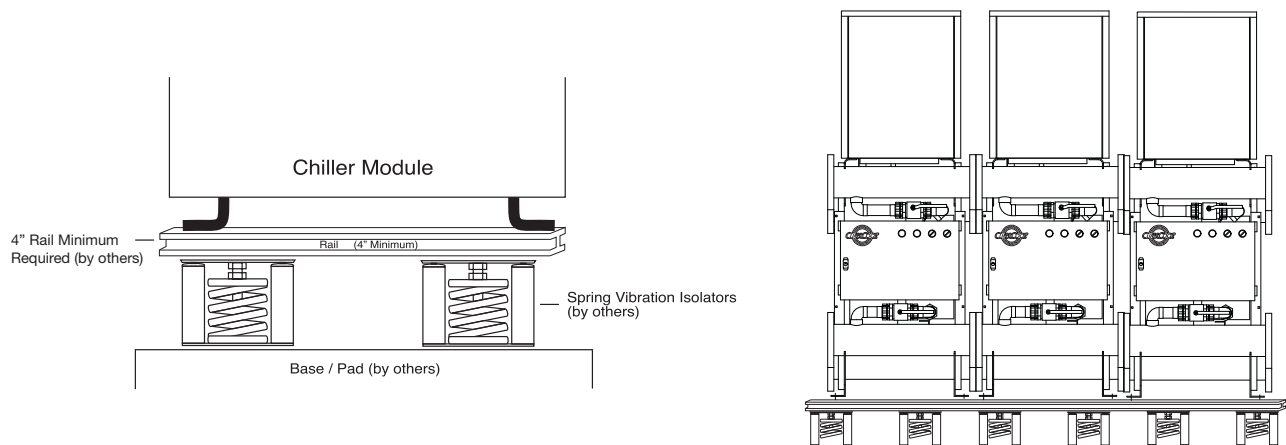
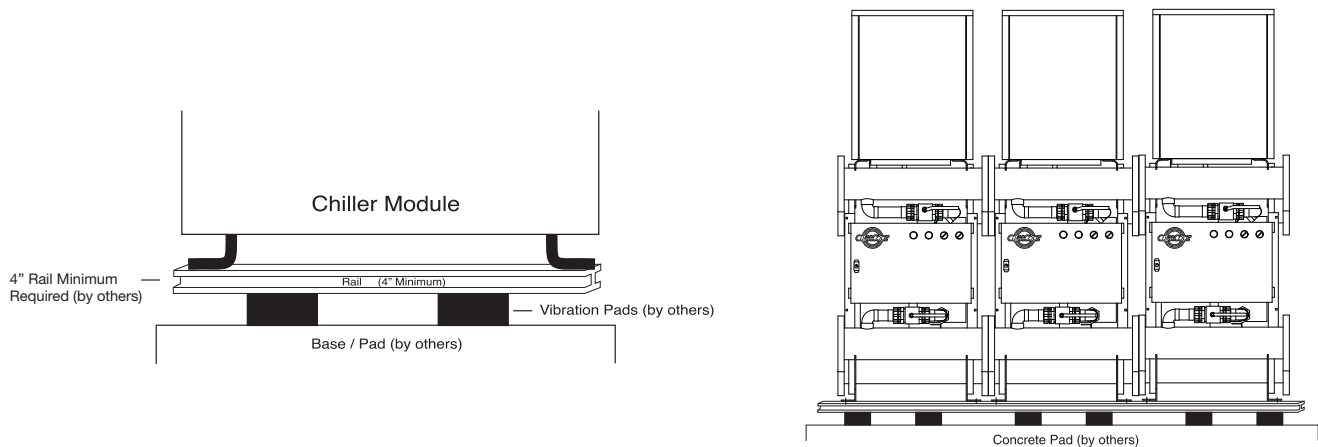


Figure 2 - Vibration Isolation Pads Option



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

Electrical Connection

Connecting the Water Piping to Modules

Water piping must be installed in accordance with applicable codes and standards. Flexible connections and supports should be installed to prevent load or stress on the module's flange connections (see page 10 - Water Piping Configurations).

ELECTRICAL CONNECTION

The compliance of the installation to relevant codes is the responsibility of the installer. Before carrying out any electrical work, confirm that the main supply is isolated. The installer must ensure that the correct electrical drawing is available.

Inter-Module Power Wiring

The power for all modules is taken from a fused supply within the main panel. A typical power wiring is located on page 43 - Power Distribution.

Inter-Module Control Wiring

After the power wiring has been run, the control wires can then be connected. The wires should be carefully marked and installed in the terminals shown on the wiring diagram. External control wires should be connected to the relevant terminals and devices. Wiring to the sensors should not be run with the power wiring.

Control Wiring Sizes and Lengths

When running control wires, proper gauged wires should be used. With 14 AWG the maximum distance allowed is 250 feet. With 16 AWG, 100 feet is acceptable. You should not exceed 50 feet when using 18 AWG. These lengths and gauges are for the use of 24 volt control circuits.

Incoming Power Wiring

Incoming power should be supplied from a suitable disconnect switch. Proper grounding of the module is mandatory.

Electrical Phase Sequencing

Proper clockwise rotation for scroll compressor motors is important to prevent damaging the compressors. If you have access to a phase sequence indicating instrument it is recommended to use this following the manufactures directions. If not, you may “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. You can quickly reverse compressor rotation 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 than 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 one = 226v Line two = 230v Line three = 228v

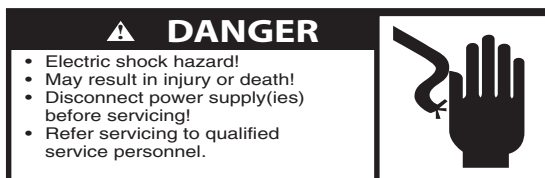
The average is: $\frac{226+230+228}{3} = 228v$

Next, $\frac{100(228-226)}{228} = 0.9\%$

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

Checking

Before power is applied to the system, the wiring should be visually inspected for loose connections or frayed terminal connections. All control wiring should follow wiring instructions supplied in the project submittal package.



WATER PIPING SYSTEM

As with any water system, it is important that the system is clean. Care should be taken to maintain a clean system. The installing contractor should remove weld scale, rust and contamination during the fabrication of the piping system. We recommend the use of an alkaline flush of the piping system prior to start-up.

Necessary Components

All items depicted in figure 1 and 2 on page 10, other than the modules themselves, are provided by others as optional accessories and must be installed with the hydronics system. Several of these key components for both condenser and chilled water systems are: water pump, strainer, isolation valve, flow switch, temperature sensor wells, and pressure taps.

Pressure Taps

The installer must provide access ports for connecting flow switches (differential pressure or paddle style) for both the condenser and chilled water systems (see page 10 - Water Piping Configurations).

Temperature Sensor Wells

Four temperature sensors and wells are provided with each ClimaCool chiller system (chilled water inlet, chilled water outlet, condenser water inlet, condenser water outlet). The installing contractor must install these temperature sensor wells as shown in figures 1 and 2 on page 10.

Strainers - (Minimum 60 Mesh Screen Required)

ClimaCool chillers employ 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 Water Piping Configurations (see page 10).**

Isolation Valves

It is recommended to provide water isolation valves for proper isolation and maintenance of the chiller, pump, and strainer (see page 10 - Water Piping Configurations).

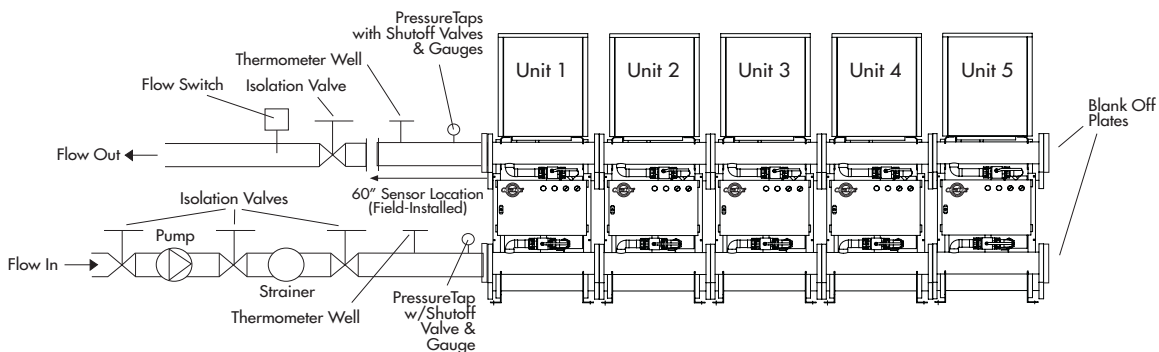
Flow Switch - Required

It is mandatory that differential pressure flow switches are installed in both the chilled and condenser water circuits. These flow switches are shown on page 10 - Water Piping Configurations.

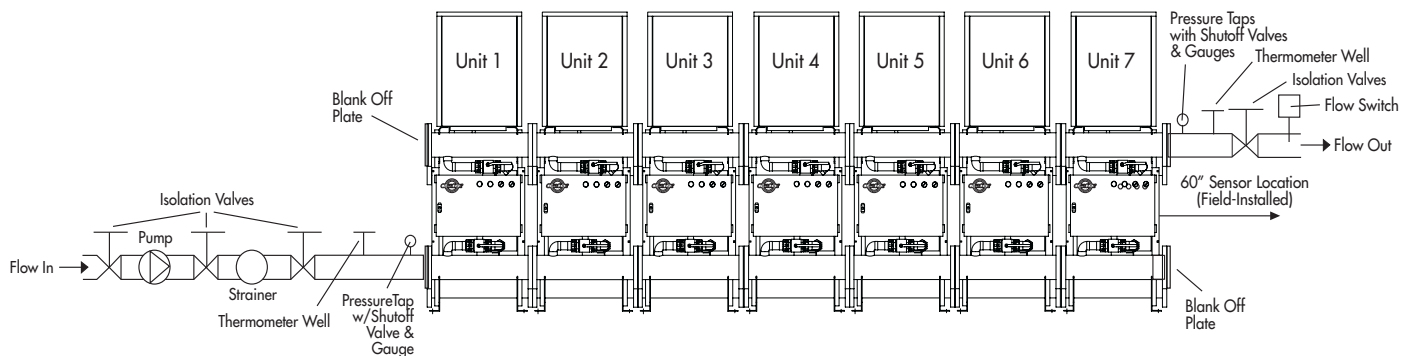
ClimaCool Water Piping Configurations

The ClimaCool® Modular Chiller - Water Piping Configurations

Field Piping Direct Return - 1 to 5 Modules (Figure 1)



Field Piping Reverse Return - (Preferred 1 to 5 modules) Required for 6 to 7 Modules (Figure 2)



NOTES:

- Figures 1 and 2 are required piping for proper water regulation and distribution through ClimaCool® modular chillers.
- Module order and incoming/outgoing water flow as shown in both Figure 1 and 2 can be set up as either a left-to-right or right-to-left configuration.
- Condenser Hydronic Circuit shown. Piping configurations are similar for the chilled water hydronic circuit.
- For condenser and chilled water (evaporator) inlet/outlet location dimensions, refer to Module Dimensional Data.
- A flow switch (supplied by others) is a required safety device for ClimaCool® modular chillers on the chilled and condenser water circuits.
- Maximum water flow rates for both evaporator and condenser water header systems in one bank of modules is 1000 GPM.
- The chilled water piping on each module is pre-insulated at the factory with 3/4" closed cell foam rubber. Insulation (3/4") on the chilled water header connection flanges is to be applied in the field by the installer, after the modules are bolted together on site.

The ClimaCool® Modular Chiller - Hydronic Configuration

Figure 1 - Condenser Hydronic Circuit

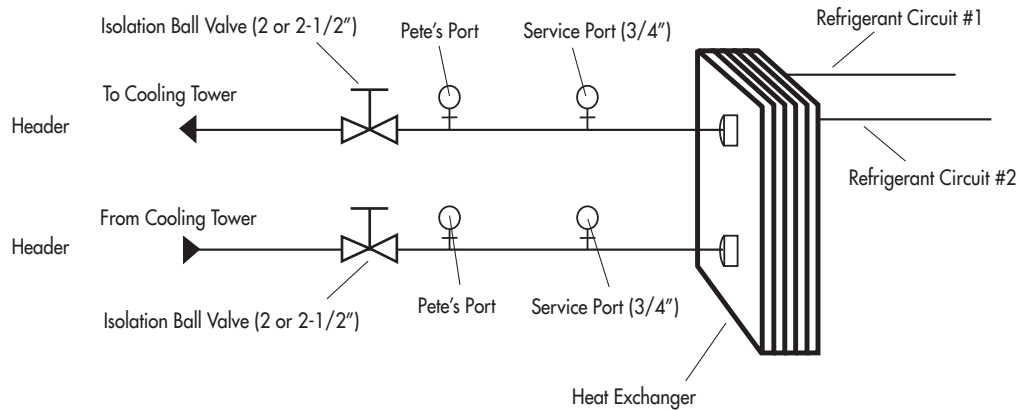
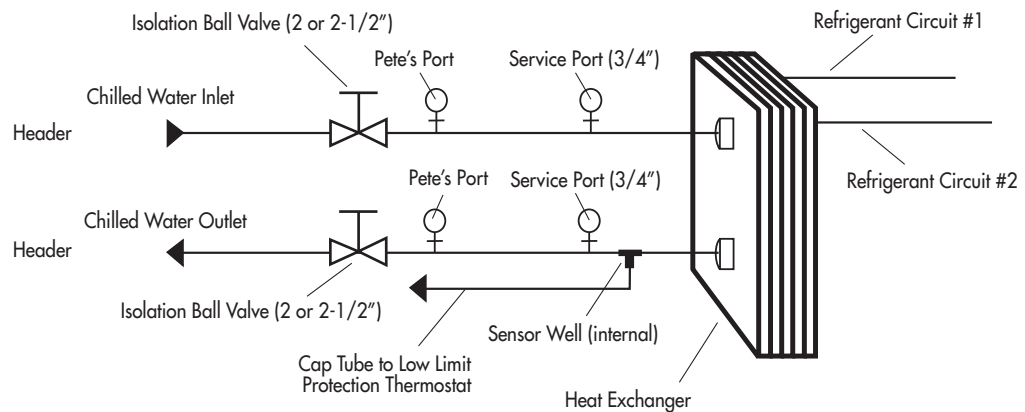


Figure 2 - Chilled Water Circuit



NOTE: Figures 1 and 2 depict hydronic piping in each ClimaCool® chiller module.

Filling the Water System

FILLING THE WATER SYSTEMS

It is imperative that the water systems are free from debris prior to initial operation. See the page 15 - Water Treatment section for a comprehensive list of precautions.

Filling, Purging and Leak Testing the System

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

We recommend the following sequence to fill and leak check the water systems:

1. Close all isolation valves inside each modular chiller.
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 send through a strainer and the system checked for leaks.
4. Once the main water lines and the chiller headers are filled with clean water, purge and repeat the filling process several times.
5. Open the isolation valves inside each modular chiller and repeat the filling process, this time also checking for leaks inside each module.
6. Following the final filling and leak checking procedure, air should be purged from the system.

Cleaning the System

We recommend the following sequence to properly clean the water systems:

1. If possible, install a temporary bypass line between the supply and return water lines of both water systems prior to cleaning the system.
2. Close all isolation valves inside each modular chiller before engaging the main water pumps.
3. The pumps should be run with the strainer in place (see the Starting the Pumps section for proper pump startup). All external hydronic branches should be open to all devices in the system.

4. After several hours of operation, the strainer should be isolated and cleaned.
5. Step 4 should be repeated until there is no more debris being collected by the strainer.
6. Finally, open all isolation valves inside each modular chiller and repeat step 4 and 5.

If it is not possible to install the bypass line in step 1 above, it is recommended to drain out the initial fill of water to help flush out debris. The chiller isolating valves should be closed to prevent debris from being washed into the chiller as the water drains out. Before refilling and purging the system again, the strainers should be removed and cleaned. This action should be repeated until there is no more debris being collected by the strainer.

Starting the Pumps

Follow 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 page 34). 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

Proper water treatment is a specialized industry. We recommend consulting an expert in this field to analyze the water for compliance with the water quality parameters listed in Table 1 below. The material used in the ClimaCool chiller exposed to the water are type 316 stainless steel, pure copper, and carbon steel. Other materials may exist external to the ClimaCool chiller. It is the users responsibility to ensure these materials are compatible with the treated water. Failure to provide proper water quality will void the ClimaCool module's warranty.

It is further recommended to seek an experts advice to specify the appropriate water treatment required. Typical additives to hydronic systems include rust inhibitors, scaling preventative, antimicrobial growth agents, and algae preventatives. Anti-freeze solutions may also be used to lower the freezing point.

Heavily-Contaminated Water

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

Other Considerations

The following considerations are listed to help achieve system longevity.

Cooling Tower

The cooling tower should be located away from sources of external contaminants 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 contaminants removed as required.

Table 1 - Water Quality Parameters

WATER CONTAINING	CONCENTRATION
Sulphate	Less Than 200 ppm
pH	7.0 – 9.0
Chlorides	Less Than 200 ppm
Nitrate	Less Than 100 ppm
Iron	Less Than 4.5 mg/l
Ammonia	Less Than 2.0 mg/l
Manganese	Less Than 0.1 mg/l
Dissolved Solids	Less Than 1000 mg/l
CaCO ₃ Hardness	30 – 500 ppm
CaCO ₃ Alkalinity	30 – 500 ppm

CAUTION

- **Excessive Chlorine, Undissolved Solids and other improper water quality conditions WILL DAMAGE the internal heat exchanger and WILL VOID YOUR WARRANTY!**

Condenser Water Temp. Requirements

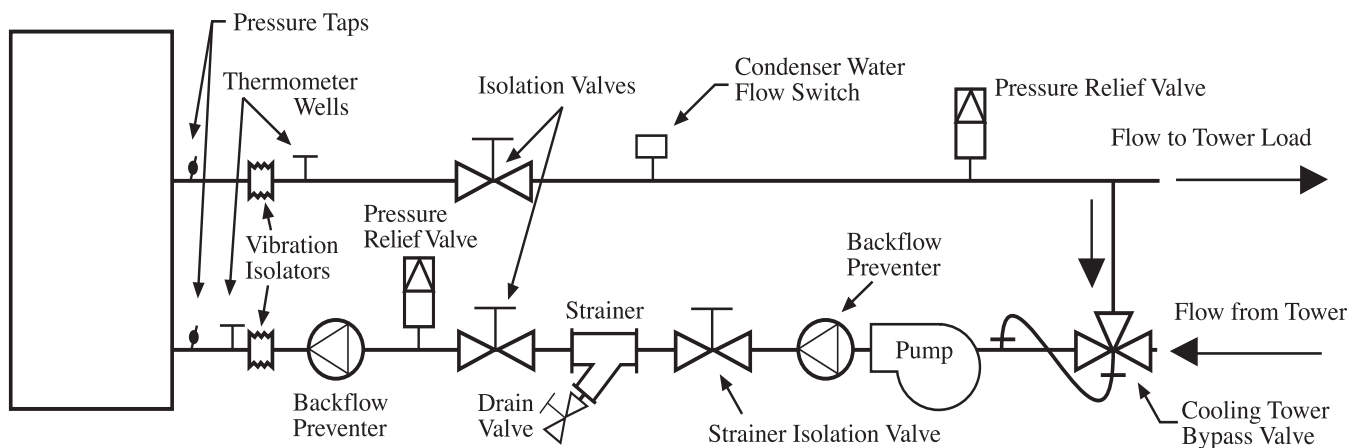
CONDENSER WATER TEMPERATURE REQUIREMENTS

Requirements

As a general rule the efficiency of the chiller increases as the condenser water temperature is lowered. 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). 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 65°F.

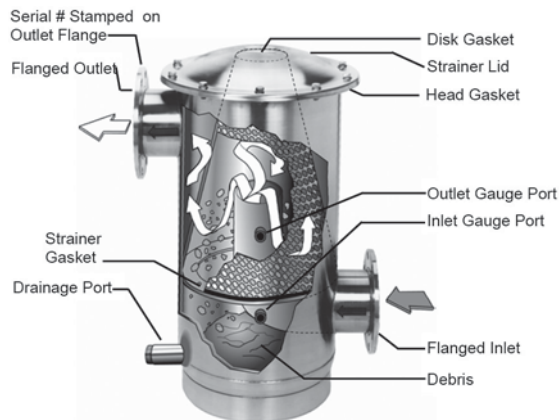
An alternate method to maintain the minimum entering condenser water temperature above 65°F is to employ a bypass arrangement as show in Fig. 1 below. This valve is an automatic 3-way bypass valve, which senses the temperature of the mixed water entering the condenser. If this mixed water temperate falls below 65°F the valve will recirculate the leaving condenser water and mix it into the entering condenser water stream (bypassing the cooling tower).

Fig. 1 - Condenser Water System



CLIMACOOL CS STRAINER (OPTIONAL)

Fig. 1



Safety Considerations

Read this manual carefully. 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 our customer service representatives for 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 installation, contact Climacool customer service.
3. The strainer lid or pressure gauges should not, be removed under ANY circumstance 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: At No Time Should The Internal Pressure Exceed The Maximum Rated Pressure For Your Strainer

Strainer Installation Recommendations

We recommend following the guidelines below when installing your strainer:

1. The Climacool Strainer should be placed on a firm, supporting surface. Failure to do so can cause stress on the weld joints. The weight of the Climacool Strainer should not be supported by the main water line's connecting it.
2. The inlet and outlet connections should be securely fastened. The arrows clearly depict flow direction (see fig. 1).
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 Climacool 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: Climacool Strainer models CS-2, CS-3, and CS-4C 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.

Stainless Steel Strainer Option

Table 1

STRAINER	BOLT SIZE	RECOMMENDED TORQUE
CS-2 (Clamp)	5/16 - 18	40 - 50 in. lbs.
CS-3 (Clamp)	5/16 - 18	60 - 80 in. lbs.
CS-4C (Clamp)	5/16 - 18	75 - 85 in. lbs.
CS-4B	3/8 - 16	15 - 25 ft. lbs.
CS-6	1/2 - 13	45 - 55 ft. lbs.
CS-8	1/2 - 13	45 - 55 ft. lbs.
CS-10	5/8 - 11	80 - 100 ft. lbs.

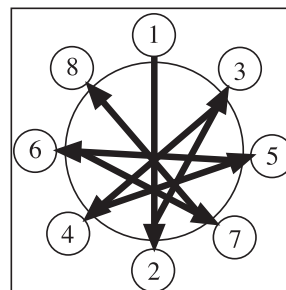
BOLTED LID MODELS: ClimaCool Strainer models CS-4B, CS-6, CS-8, and CS-10 have "bolted" lid designs. Grade 5 zinc-plated bolts, nuts, and washers are used to attach the lids to these strainers. See Table 1 for the proper lid bolt size and torque rating for each strainer. (Exercise care when tightening 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 Fig. 2). The strainer lid may not be seated down completely after the first torque sequence (this is especially evident on the larger strainers such as the CS-8 and larger). A second torque sequence should be adequate to seat the lid securely to the body.

Strainer Operation

Periodically, it will be necessary to flush out the debris that is collected and settles to the bottom of the strainer reservoir. The larger ClimaCool strainers (CS-4, CS-6, CS-8, and CS-10) 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 CS-4 model can be flushed with inlet water pressures as low as 15 PSI, while the CS-6 can be flushed with 30 PSI. The CS-8 and CS-10 models should be flushed with inlet water pressures greater than 40 PSI.

Fig. 2 - Recommended Torquing Sequence



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. Under a normal "clean" strainer operation this pressure difference should be slightly under 1 PSI. 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 these steps when cleaning the ClimaCool Strainer element:

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

Step 1 (Band-Clamp Lid Models): Remove the top of the ClimaCool 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 STEEL BRUSH**

Step 4: Wash the strainer element off with clean water. It

Stainless Steel Strainer Option

is preferable to use a hose with a significant amount of water pressure. **DO NOT USE A PRESSURE WASHER**

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

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

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

- For band-clamp 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 module 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 ClimaCool Strainer is rated to an absolute maximum pressure of 150 PSI for bolted lid models, and 125 PSI for band clamp lid models. A water hammer pressure spike that raises the pressure higher than the maximum rated pressure may result in strainer damage, voiding the manufacturer's warranty.

What Can I Do To Prevent Water Hammer?

There are certain precautions that can be taken to prevent or decrease the effect of water hammer. The addition of a surge tank or accumulator fitted with a suitable pressure relief valve 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.

Automatic Timer Flush (ATF) Package (Optional)

The ATF-EA-1.5 flush valve package provides an automatic method for flushing away the debris collected in the strainer's

Automatic Timer Flush Package Option

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:

- A. Timer Based Valve Controller (see Fig. 1) sets the flush duration (length of the flush) and the flush interval (time between flushes).
- B. Electric Ball Valve: designed for dirty water use (see Fig. 1 & 2).

Fig. 1

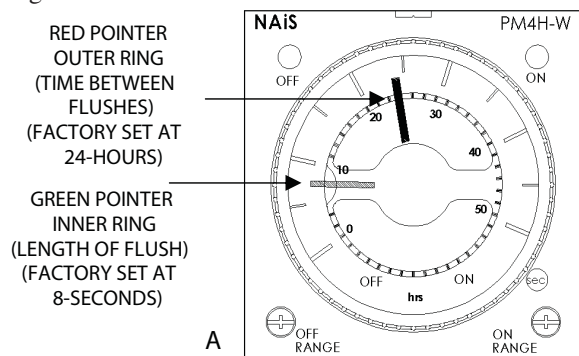
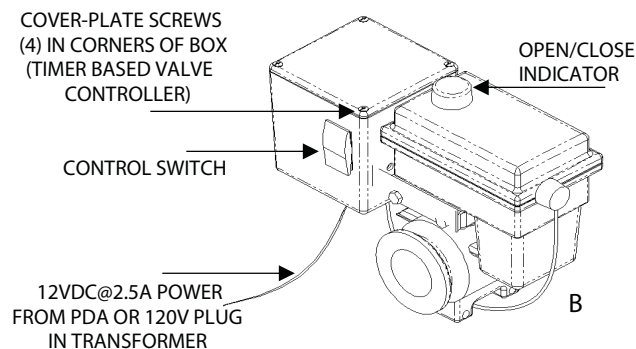


Fig. 2



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:

Plug the transformer into a 120-VAC outlet.

Insert the 12-VDC plug coming from the transformer into the jack on the underside of the ATF box.

Test for power by pressing the manual flush side of the control switch (lower switch light should come on and the valve will start to open).

Adjust the "ON-TIME" (Valve Open) by turning the inner timer ring with the GREEN POINTER clockwise to increase duration. ("ON-TIME" RANGE, See Fig. 1)

Adjust the "OFF-TIME" (Valve Close) by turning the outer ring with the RED POINTER clockwise to increase duration. ("OFF-TIME" RANGE, See Fig. 1)

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: (see illustration)

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

SAFETY FIRST!

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

Automatic Timer Flush Package Option

when handling.

Automatic Timer Flush ATF-EA-1.5 (optional)

Valve Specifications

- A. Water-resistant Polypropylene Motor Case
- B. High Torque Motors with Perma-lube Gears
- C. Open & Close Indicator
- D. Stainless Steel Ball Valve & Hardware
- E. Auto Reset Circuit Breaker
- F. 90 Degree Bidirectional Rotation
- G. Controller Case

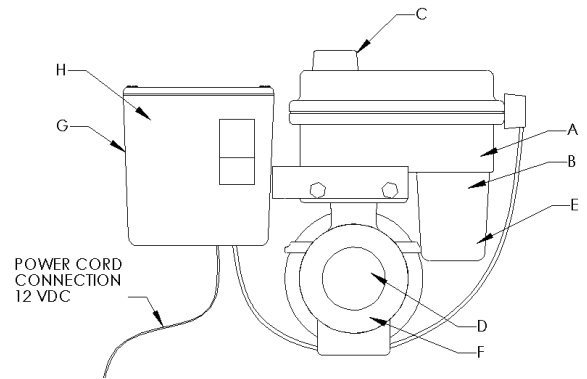


Fig. 3

TROUBLESHOOTING: If you require further assistance, please call us at (405) 745-3185.

PROBLEM	POSSIBLE CAUSE	SOLUTION
<ul style="list-style-type: none"> Valve is leaking past ball 	<ul style="list-style-type: none"> Seals damaged or worn out Valve is not stopping at proper closed position 	<ul style="list-style-type: none"> Install repair kit Adjust limit switches
<ul style="list-style-type: none"> Valve stem leaks 	<ul style="list-style-type: none"> Worn stem seals 	<ul style="list-style-type: none"> 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.
<ul style="list-style-type: none"> Valve body leaks 	<ul style="list-style-type: none"> Loose body bolts or excessive operating pressure Defective seals 	<ul style="list-style-type: none"> Check bolts and observe recommended ratings Install repair kits or new valve
<ul style="list-style-type: none"> Valve hard to turn 	<ul style="list-style-type: none"> Swollen seals or product buildup in valve chamber Valve bolts too tight Stem nut too tight 	<ul style="list-style-type: none"> Check valve for compatibility with product, may require valve cleaning or new valve Loosen bolts slightly Loosen stem nut slightly

Automatic Timer Flush Package Option

General Information

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 module during normal operation.

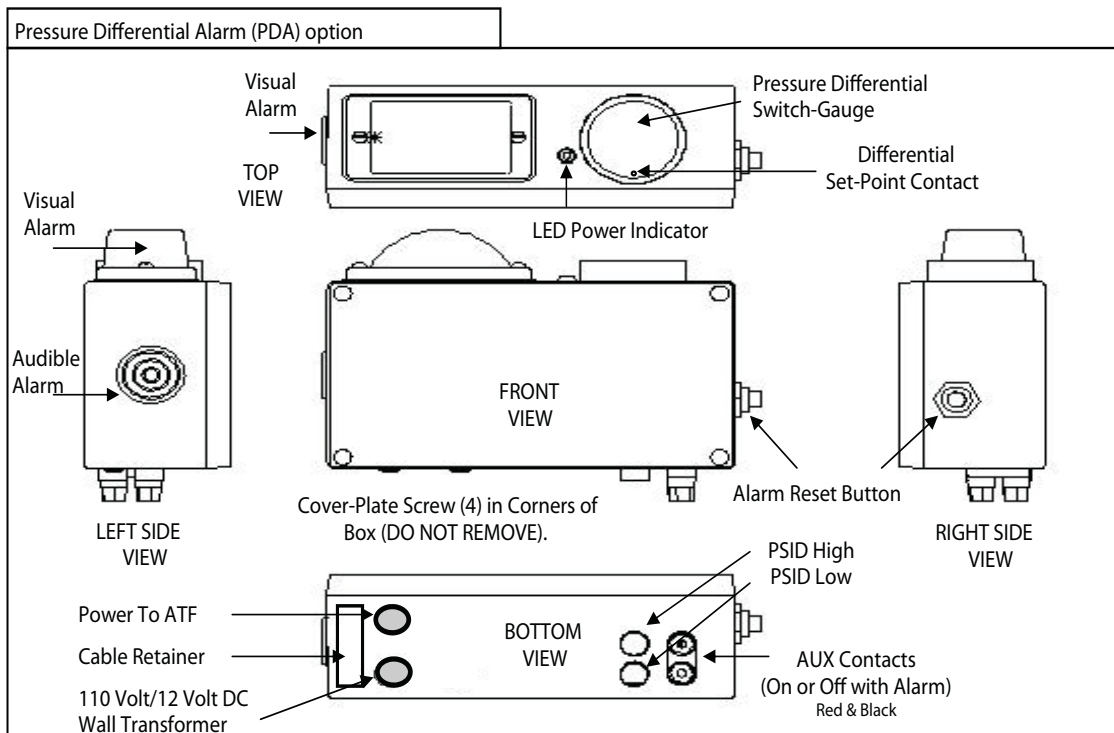
ClimaCool Corp. Return Policy:

New units or units less than 90 days old needing repair under warranty conditions must be returned to ClimaCool and must be accompanied by a Return Material Authorization (RMA) Number. To request a RMA Number, call (405) 745-3185, then enter this number on the RMA form (available from the ClimaCool web site).

Please Follow Environmental Note:

All ATF valves sent to ClimaCool for repair must be cleaned and the valve rinsed and dried from all foreign residue or the shipment will be returned "as is" to the customer. We cannot expose our technicians to the vast variety of chemicals used with the valve. Thank you for your cooperation.

Pressure Differential Alarm Option



Description:

The pressure differential alarm option continually monitors and displays the strainer's inlet and outlet differential pressure. When the strainer element (conical strainer basket) becomes significantly clogged, the pressure differential switch-gauge will trigger an audible siren and a visual flashing alarm light. These alarms are intended to alert maintenance personnel that the strainer element must be removed and cleaned (see page 18 for complete strainer element cleaning instructions).

Operation Instructions:

Remove the power supply and insert the connector end into the socket on the bottom of the PDA housing, as indicated in the drawing above. 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 ClimaCool Strainer operates at a pressure differential slightly less than 1 PSI during maximum flow when the strainer screen is clean. By the time this 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 Fig. 1).

Note: We do not recommend setting the differential switch-gauge higher than 10 PSI. Disabling the alarm or increasing the alarm set point could result in damage to the strainer element and allow debris to pass into the system.

Pressure Differential Alarm Option

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. If you have any questions about the Pressure Differential Alarm option, please call our technical product specialists at (405) 745-3185.

General Information

Auxiliary Contacts:

The PDA option is equipped with a remote alarm feature. The remote alarm contacts are located at the two Black & Red Banana Clip Posts (see illustration). 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. (See auxiliary Contact Schematic inside PDA Box). Remove the (4) screws on the cover plate and to access the schematic located inside the cover plate.) If you have any additional questions please contact a ClimaCool technical representative at (405) 745-3185.

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.

ClimaCool Corp. Return Policy:

Units in need of warranty repair, and less than 90 days old, must be returned to ClimaCool accompanied by a Return Material Authorization (RMA) number. To request a RMA, number call (405) 745-3185, then enter this number on the RMA form (available from the ClimaCool web site).

Please Follow Environmental Note:

All PDA Controllers sent to ClimaCool for repair must be cleaned and dried from all foreign residue or the shipment will be returned "as is" to the customer. We cannot expose our technicians to the vast variety of chemicals used around our systems. Thank you for your cooperation.

Maintenance:

The alarm functions of the PDA alarm package should be checked twice a year. Manually trip the differential set-point (see illustration) to engage the audible and visual alarms. Reset the differential setting and depress the alarm-reset button to verify the alarms are deactivated.

ClimaCool Y Type & Basket Type Strainers

Strainer Installation Instructions:

- A. Ensure all machined surfaces are free of defects and that the inside of the strainer is free of foreign objects.
- B. The strainer should be installed so that the drain connection is pointed downwards.
- C. For flanged end strainers, the flange bolting should be tightened gradually in a back and forth clockwise motion. Threaded end strainers should use an appropriate sealant.
- D. Once installed, increase line pressure gradually and check for leakage around joints.
- E. If the strainer is supplied with a start-up screen, monitor pressure drop carefully.

IMPORTANT! Ultimate responsibility for strainer and material selection rests with the end-user or facility manager, as only the end-user or facility manager knows the particular application and operating parameters to which the strainer will be subjected.

CAUTION: PRIOR TO DISMANTLING THE STRAINER FOR CLEANING, IT IS IMPERATIVE THAT THE STRAINER ASSEMBLY IS ISOLATED AND COMPLETELY DE-PRESSURIZED.

Strainer Removal Instructions

- A. Drain piping.
- B. Vent line to relieve pressure.
- C. Loosen flange bolts (flanged ends).
- D. Secure necessary lifting equipment to strainer assembly.
- E. Remove inlet/outlet flange bolts (flanged end), or unthread (threaded ends) and carefully remove strainer.
- F. Tighten cover. The strainer is ready for line start-up.

For Basket Strainers, Follow Steps G through L.

- G. Drain piping.
- H. Vent line to relieve pressure.
 - 1. Loosen cover and open to access basket.
- J. Remove, clean and replace basket in original position.
(Note: In some instances, a high pressure water jet or steam may be required for effective cleaning).
- K. Inspect cover gasket for damage. If necessary, replace.
(Note: If spiral wound gaskets have been used, they must be replaced and can be used again).
- L. Tighten cover. The strainer is ready for line start-up.

CAUTION SHOULD BE TAKEN DUE TO POSSIBLE EMISSION OF PROCESS MATERIAL FROM PIPING. ALWAYS ENSURE NO LINE PRESSURE EXISTS WHEN OPENING COVER.

Maintenance Instructions

For maximum efficiency, determine the length of time it takes for the pressure drop to double that in the clean condition. Once the pressure drop reaches an unacceptable value, shut down line and follow the "Strainer Removal Instructions" above.

A pressure gauge installed before and after the strainer in-line will indicate pressure loss due to clogging and may be used to determine when cleaning is required.

Trouble Shooting Guides and Diagnostic Techniques

- A. After pressurizing, inspect cover and other joints for leakage. Gasket replacement or cover tightening is necessary if leakage occurs.
- B. If the required filtration is not taking place, ensure the screen is installed in the correct position, and that the screen is mounted flush to the upper and lower seating surfaces.

Pre-Start Up

Pre-Start Up

Prior to chiller start up, there are certain essential checks which must be carried out. Failure to carry out these checks could result in damage to the chiller voiding the warranty.

Electrical

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

1. The installation must be inspected and approved by the respective agent and be in compliance with all local and national electrical codes.
2. Check and tighten as required all electrical terminal connections on each module. Utilize lock-out/tag-out procedures for this operation. A systematic tightening of all terminals inside the electrical control panel on each module should be carried out. This will include the compressor motor terminals, which would require removal of the compressor terminal cover. Check connections at each safety and every termination in the panel.
3. There are approx. (12) control wires which must be field connected from each module's electrical panel back to the "Master Control Panel". These control wires should be routed using a series of twisted pair conductors having #18 AWG minimum up to 50 ft., #16 AWG minimum up to 100 ft., and #14 AWG min. up to 250 ft. All field wiring must be identified (tagged).
4. All field connections should be checked for tightness.
5. Check all fuses for proper sizing as indicated on the chiller data plate and/or the electrical diagram on the inside door of the electrical panel.

Refrigeration

1. Remove the front and rear access covers from the top compressor sound enclosure of each module.
2. Refrigerant piping and components should be inspected for damage.
3. Check all refrigeration and water valves for proper positioning; once completed mark refrigerant valves with permanent marker. Make sure all refrigerant valves are fully opened and there are no visible signs of refrigerant leaks.

4. Place refrigerant gauges on the discharge and suction access ports of each refrigerant circuit to ensure a refrigerant charge is present. Leave the gauges on for compressor rotation check.
5. Confirm the settings on all pressure switches and thermostats.

Water System

1. Confirm that leak testing has been carried out.
2. Confirm that the system is clean.
3. Confirm that necessary water treatment systems are in place with both the evaporator and condenser water systems.
4. Confirm that appropriate water analysis has been conducted by the end-user or facility manager.
5. Confirm that the results of this water analysis does not conflict with the acceptable constituent ppm levels as indicated in Table 1, page 15.
6. **Extract a water sample from both the evaporator and condenser.** Confirm that the sample bottles are filled to the top leaving no air in the bottles. Both sample bottles must have labels filled out per instructions included with bottles. Mail bottles immediately to the appropriate water testing laboratory as per instructions included with bottles.
7. Confirm that both the chilled water and condenser water circulating pumps are operational and water is flowing through both exchangers.
8. Shut entering water valve and blow out some water to check for particles or coloration from suspended particles. Record the differential pressures across the chiller and condenser, measured at the "Pete's ports at each module.
9. Confirm correct water flow rates through the condenser and evaporator. Acquire the "predicted" flow rates from the building's "hydronics system balancer". Compare the measured differential pressures from step 6 above with the predicted flow rates to ensure proper correlation to the flow results.

Chiller Pre-Start-Up Procedures

1. Turn selector switches on module front panel to off position. Fill in circuit number and power panel identification inside each module cover panel.
2. Ensure the correct fuses are installed in the control transformer fuse blocks inside each ClimaCool Module. Turn on the power to each module. The "Power" light should be on.
3. Override output with DX commissioning program or place a jumper between compressor 1 start terminals on

the "field wiring" terminal strip (terminals 8 & 9). With jumper in place, turn on the selector switch marked "compressor #1" to bump the compressor and check for proper rotation. Use pressure gauges to verify proper rotation. Once this is complete and correct rotation is verified, override output with DX commissioning program or place a jumper between compressor 2 start terminals on the control terminal strip (terminals 10 & 11). Turn on the switch marked "compressor #2" to bump the compressor and verify that circuit #2 compressor has correct rotation. Use pressure gauges to verify proper rotation. Always use proper electrical safety precautions.

4. Slowly close the chiller water inlet isolating valve and note that the flow switch stops the machine. Note the flow rate at which this occurs. If too much flow is lost before chiller is stopped, reset switch setting. The flow switch should be set so the chiller shuts down when the flow rate to each evaporator and condenser water circuits drops below 60% of rated ARI full load conditions (indicating a 10°F temperature change through both the evaporator and condenser heat exchangers).
5. Repeat the tests of all other safety interlocks which may be connected.
6. The anti-freeze thermostat for each module should be set to trip when the leaving chilled water temperature drops below 38°F.

Start Up

An anti-short cycle timer protects the chiller and there will be a delay before the controller will allow the compressors to start.

1. If the chilled water temperature is above the normal operating level, all load should be removed from the chilled water system and the suction temperature should be monitored to prevent high current draw.
2. If the condenser water temperature is below the normal operating level, ensure that the condenser water temperature control is in the correct position.
3. Re-install all fuses and set the controller.
4. When all temperatures are within operating limits, all

high and low pressure safety switches should be tested for each refrigeration system.

5. The condenser temperature controller should be checked. Once stable conditions have been achieved, the refrigeration system's high and low pressures, compressor amp draw, voltage input level, and water system temperatures and pressures should be logged for each chiller module separately.
6. Check that oil level is between 1/3 and 1/2 of the sight glass. See page 35 - Oil Levels.
7. The action of the controller should be checked for correct operation and control.

Mechanical and General

All covers, panels and doors should be in place and secured.

Start Up Documentation

All start-up paperwork and documentation must be submitted to ClimaCool. Future warranty claims cannot be processed without the Start up documentation on file.

Supervision and Training

ClimaCool provides factory supervision and training as an extra cost option per installation of one or multiple chiller modules. This training is to provide general information about the installation and operating characteristics to the start-up contractor. Cost for the start-up service contractor is not ClimaCool's responsibility. Supervision and training for new service contractors is also available, contact ClimaCool for a quotation.

ClimaCool's supervision and training is not intended to take the place of the installation and start-up contractor. The start-up contractor is responsible for complete mechanical and electrical installation and adherence to all local and federal codes or regulations. Consult an authorized ClimaCool representative for a list of authorized start-up service contractors in your area.

Pre Start Up Check List



Pre Start-Up Check List* (Water-Cooled)

E-mail vdoyle@climacoolcorp.com or Fax 405-745-2072

Project Name: _____	Date: _____
Address: _____	

- | | <u>YES</u> | <u>NO</u> |
|--|------------|-----------|
| 1. Are modules connected properly "per Codes and Installation Manual"?
(Installation, Operation & Maintenance Manual is available at www.climacoolcorp.com) | _____ | _____ |
| 2. Is there a 60-80 mesh strainer on condenser & evaporator inlet water?
(Fill water to Chiller through upstream 60-80 mesh strainer.) | _____ | _____ |
| 3. Is Condenser water system filled & flushed?
(See "Filling the Water System" in ClimaCool IO&M.) | _____ | _____ |
| 4. Is Chilled water system filled, flushed & all air purged from system?
(All air must be purged from system prior to startup. See "Filling the Water System" in ClimaCool IO&M.) | _____ | _____ |
| 5. Are all pumps tested & operational? | _____ | _____ |
| 6. Are required GPM's being provided to Chiller?
(See project selection and performance sheets available from ClimaCool Sales Rep.) | _____ | _____ |
| 7. Is required Differential Pressure being provided to Chiller?
(See project selection and performance sheets available from ClimaCool Sales Rep.) | _____ | _____ |
| 8. Flow & differential switches set to trip on drop below required flows?
(Set to trip on low flow (less than 75% flow), not pump on/off .) | _____ | _____ |
| 9. Have all Chiller flange connections been leak tested? | _____ | _____ |
| 10. Is there water presently circulating through chiller? | _____ | _____ |
| 11. Is power and control wiring complete to each module?
(Note: <u>All Chiller covers are removable DO NOT Attach Wiring Etc.</u>) | _____ | _____ |
| 12. Do wiring & devices meet with approved control submittal drawings? | _____ | _____ |
| 13. Is required load available to run multiple compressors at start-up? | _____ | _____ |
| 14. Is control functional to maintain condenser water temperature?
(This includes maintaining "minimum" inlet temperature. See "Operational Limitations" in ClimaCool IO&M.) | _____ | _____ |
| 15. Are water quality parameters tested and in compliance with ClimaCool IO&M?
(See "Water Treatment" in ClimaCool IO&M for required Water Quality Parameters.) | _____ | _____ |

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

*This form must be completed and submitted to ClimaCool Corp. a minimum of two (2) weeks prior to final scheduling of any Start-up.

Note: If any of the above items are not complete at time of start-up, backcharges will be assessed for additional costs.

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

Start Up & Warranty Form



Start-Up and Warranty Registration Form (Water-Cooled)

Sign & date and fax: (405) 745-2072 Attn.: Vivian Doyle / Dennis Megaro
Or E-mail: customerservice@climacoolcorp.com

Project Name: _____	Start-Up Date: _____
Address: _____	
Module #: _____	Model #: _____ Serial Number: _____

Chiller # _____ Bank # _____ On-Site Location: _____
 Evaporator entering pressure _____ Evaporator leaving pressure _____ ΔP _____
 Condenser entering pressure _____ Condenser leaving pressure _____ ΔP _____
 Evaporator & condenser "flow devices" shut off chiller below aprox. 25% loss of flow _____

Water Samples taken (Mark "X") Evaporator _____ Condenser _____
Water sample bottles are provided. Follow instructions on label and mail same day sample is taken.

All wiring terminations in module panel, safeties and compressors tightened _____

Voltage / Ground L1 _____ L2 _____ L3 _____
 Phase / Phase L1/ L2 _____ L2/ L3 _____ L1/ L3 _____

Circuit # 1

Amperage	L1 _____	L2 _____	L3 _____
Sight Glass Oil Level	_____	Comments: _____	
Suction Pressure	_____	_____	
Suction Temperature	_____	_____	
Discharge Pressure	_____	_____	
Compressor Superheat	_____	_____	
Evaporator Entering Water Temperature	_____	_____	
Evaporator Leaving Water Temperature	_____	_____	
Condenser Entering Water Temperature	_____	_____	
Condenser Leaving Water Temperature	_____	_____	
Evaporator Pressure Differential	_____	_____	
Condenser Pressure Differential	_____	_____	

Circuit # 2

Amperage	L1 _____	L2 _____	L3 _____
Sight Glass Oil Level	_____	Comments: _____	
Suction Pressure	_____	_____	
Suction Temperature	_____	_____	
Discharge Pressure	_____	_____	
Compressor Superheat	_____	_____	
Evaporator Entering Water Temperature	_____	_____	
Evaporator Leaving Water Temperature	_____	_____	
Condenser Entering Water Temperature	_____	_____	
Condenser Leaving Water Temperature	_____	_____	
Evaporator Pressure Differential	_____	_____	
Condenser Pressure Differential	_____	_____	

Verify Safety Settings: Low Limit _____ High Pressure Limit _____ Low Pressure Limit _____

NOTE: Correct rotation of scroll compressors is extremely critical. Incorrect rotation could damage the compressor.

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

Chiller Operation and Maintenance

CHILLER OPERATION AND MAINTENANCE

Pressure and Temperature Log

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

Maintaining a Daily Log

Date _____	Data Log _____						
Chiller No. _____	Technician _____						
	Sun.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
Chilled Water Entering Temp.							
Chilled Water Leaving Temp.							
Condenser Water Entering Temp.							
Condenser Water Leaving Temp.							
Chilled Water Pressure Drop							
Condenser Water Pressure Drop							
Faults: Note By Module Number							

Daily

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

Weekly

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

Quarterly

- Check controller operating parameters and set points
- Check refrigerant pressures and temperatures
- Check compressor amps
- Check compressor oil level
- Check and test all safeties
- Check water flow rates and pressure drops across evaporator and condenser
- Properly document all data taken

Annual

- Isolate chiller, drain all water circuits
- Back flush all heat exchangers (use only ClimaCool recommended de-scalers)
- Remove and clean all waterside strainers
- Perform leak test on all refrigerant circuits
- Check all interconnecting flanges for proper tightness
- Perform oil analysis on each compressor
- Check and test all refrigerant safeties for proper operation
- Check all electrical terminal connections for tightness
- Manually operate all waterside isolation valves on each module
- Check all peripheral systems for proper operation
- Check and test main controller
- Verify set points, sensors and general configuration
- Properly document all data taken

HEAT EXCHANGERS

Back Washing

It may become evident from the recorded daily 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

Heat Exchangers

higher than the normal flow, and, in the opposite direction. The difficulties and practicality of this method depends on the back wash pumping system itself. Another method would be to back flush each heat exchanger using city water as opposed to system water (see Fig. 1, City Water Cleaning Arrangement). The back washing procedure is accomplished by isolating each individual heat exchanger, and introducing the city water using a connection hose to the 3/4" service port to flow in an opposite direction from the "normal" heat exchanger flow direction. On the opposite 3/4" service port, connect a drain hose to run to a suitable floor drain. Continue back flow until all debris is removed.

Chemical in Place Washing

"Chemical Clean In-Place Washing" will typically provide the best debris removal, even from severely clogged heat exchangers. It is only necessary to mechanically and electrically isolate one chiller module at a time which undergoes the "Clean In-Place Washing". The rest of the chiller modules can continue to operate to satisfy the cooling load required. The cleaning tank, pump and pump strainer should be arranged in the manner shown in Fig. 2, In Place Cleaning Arrangement. The flow of the cleaning is arranged in the opposite flow to the normal operational direction. Connection points are provided using the 3/4" service ports at each heat exchanger. The cleaning solution used can be

either a detergent or hot water to remove particles and simple cleaning. If correct water treatment has been implemented this should provide adequate cleaning for most situations. The solution can be pumped through the heat exchangers and allowed to "soak" for a time and then pumped again.

If it is required to remove carbonates, then an acidic wash 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, which will be 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.

If you have questions related to the suitability of a solution, please contact ClimaCool for more information.

Fig. 1
City Water
Cleaning Arrangement.

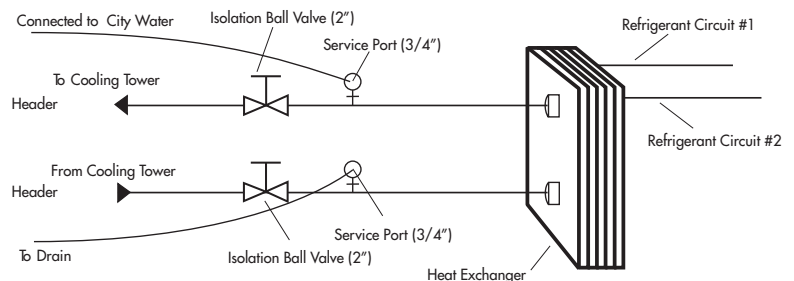
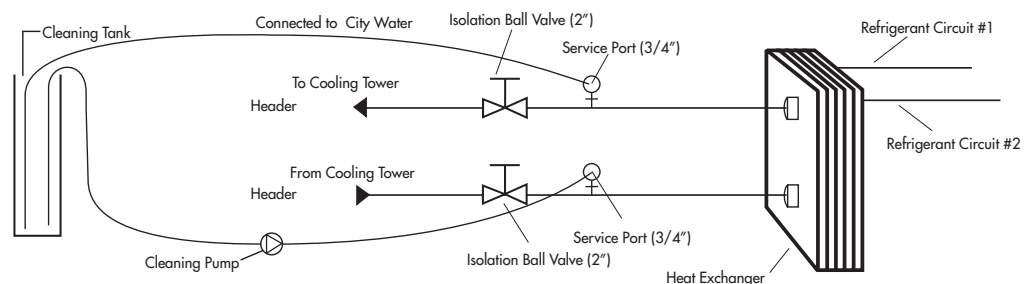


Fig. 2
In Place
Cleaning Arrangement.



Operational Limitations

VOLTAGE LIMITATIONS			COMPRESSOR OPERATING LIMITATIONS
The following voltage limitations are absolute and operation beyond these limitations may cause serious damage to the compressor.			Maximum Compression Ratio 7.0:1
			Maximum Operating Pressure Differential (PSI) 240
			Minimum Operating Pressure Differential (PSI).....56
			Maximum Suction Pressure (PSIG) 80
			Maximum Discharge Temp. (°F) 225
NOMINAL VOLTAGE	MIN VOLTAGE	MAX VOLTAGE	Minimum Superheat At Compressor (°F) 10
208/230-3-60	187	253	Maximum Superheat At Compressor (°F) 25
460-3-60	414	506	Oil Temperature (Max.) (°F) 160
575-3-60	518	632	Maximum Sat. Discharge Temp. (°F) 120

WATER FLOW DATA	FLEX 30	FLEX 50	FLEX 65
Min. Evaporator Water Flow (GPM)	50	80	90
Max. Evaporator Water Flow (GPM)	100	180	210
Min. Condenser Water Flow (GPM)	60	100	120
Max. Condenser Water Flow (GPM)	130	210	210
Min. Lvg. Evap. Water Temp. (No Glycol; R-407C) (°F)	42	42	42
Min. Lvg. Evap. Water Temp. (No Glycol; R-22) (°F)	40	40	40
Min. Lvg. Evap. Water Temp. (With Glycol) (°F)	20	20	20
Max. Lvg. Evap. Water Temp. (°F)	55	55	55
Max. Lvg. Evap. Water Temp. (UniFlow) (°F)	55	55	55
Max. Evaporator Water Differential Temp. (°F)	15	15	15
Min. Evaporator Water Differential Temp. (°F)	7	7	8
Min. Entering Condenser Water Temp. (°F)	65	65	65
Max. Entering Condenser Water Temp. (°F)	105	105	105
Max. Condenser Water Differential Temp. (°F)	15	15	15
Min. Condenser Water Differential Temp. (°F)	7	7	9.5

NOTES: 1. All temperatures stated are for counterflow HX flow configuration unless “UniFlow” is specified.

EQUIPMENT ROOM DATA	FLEX 30	FLEX 50	FLEX 65
Maximum Equipment Room Ambient Temp. (°F)	105	105	105
Minimum Equipment Room Ambient Temp. (°F)	55	55	55

The ClimaCool® Modular Chiller - Physical Data Models 30, 50 & 65 - FLEX Series

Module and Compressors

Model FLEX	30	50	65
Capacity (Tons) ¹	32.1	51.4	65.2
Module Type	FLEX	FLEX	FLEX
Refrigerant Circuits (Quantity)	2	2	2
Compressor Type	Scroll	Scroll	Scroll
Compressor Quantity	2	2	2
Compressor Nominal Hp (Per Circuit)	15	25	32
Minimum Unloading ² (Tons / % Per Module)	15 / 50%	25 / 50%	32 / 50%
Refrigerant Charge (Per Circuit) R-22 (Lbs.)	17	24	29.5
Oil Charge (Per Circuit) (Oz.)	140	224	224
Module Overall Dimensions (Inches)	Length	41-7/8"	43-5/8"
	Width	29-1/2"	33-1/2"
	Height*	77"	78 3/8"
	Height	72-7/8"	76-5/8"
* Denotes unit with covers			
Module Operating Weight w/Water (Lbs.) ³	1825	2163	2280
Module Shipping Weight (Lbs.) ⁴	1669	1873	1990

Condenser

Model FLEX	30	50	65
Heat Exchanger (Type)	Brazed Plate	Brazed Plate	Brazed Plate
Independent Refrigerant Circuits (Quantity)	2	2	2
Water Storage Volume HX Only (Gals.)	3.42	6.65	7.92
Water Storage Volume HX Plus 6" Main Headers (Gals.)	11.27	16.12	17.41
Flow Rate (GPM) ⁵	Min.	60	100
	Max.	130	210
Pressure Drop (PSI. / Ft H ₂ O)	4.6 / 10.6	4.9 / 11.3	5.8 / 13.4
Maximum Design Working Pressure - Water Side (PSI.)	285	285	285
Condenser Water Connections Inlet/Outlet (Inches)	2"	2-1/2"	2-1/2"
Header Water Connections - Inlet/Outlet (Inches) ⁶	6"	6"	6"
Test Pressure Rating - Water/Fluid Header (PSI.)	450	450	450

Evaporator

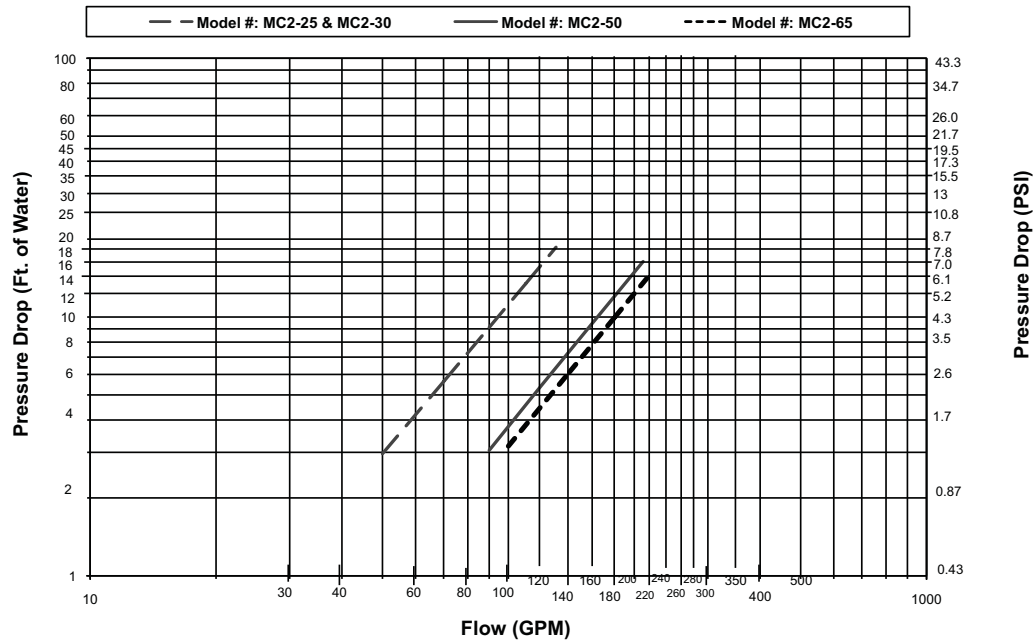
Model FLEX	30	50	65
Heat Exchanger (Type)	Brazed Plate	Brazed Plate	Brazed Plate
Independent Refrigerant Circuits (Quantity)	2	2	2
Water Storage Volume HX Only (Gals.)	3.42	6.65	7.92
Water Storage Volume HX Plus 6" Main Headers (Gals.)	11.27	16.12	17.41
Flow Rate (GPM) ⁵	Min.	50	80
	Max.	100	180
Pressure Drop (PSI. / Ft H ₂ O)	3.4 / 7.8	4.2 / 9.7	4.6 / 10.6
Maximum Design Working Pressure - Water Side (PSI.)	285	285	285
Evaporator Water Connections Inlet/Outlet (Inches)	2"	2-1/2"	2-1/2"
Evaporator Insulation Thickness (Inches)	3/4"	3/4"	3/4"
Header Water Connections - Inlet/Outlet (Inches) ⁶	6"	6"	6"
Test Pressure Rating - Water/Fluid Header (PSI.)	450	450	450
Insulation Thickness - Header (Inches)	3/4"	3/4"	3/4"

NOTES:

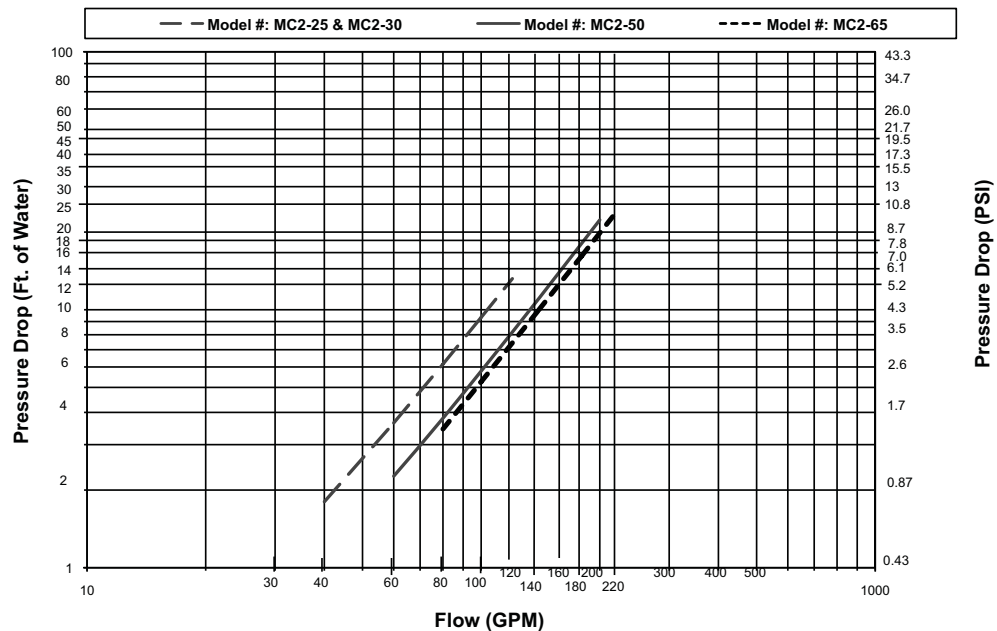
- Tonnage ratings conditions: 44°F leaving chilled water temperature, 85°F entering condenser water temperature, flow rates are 3 GPM per ton through the condenser with a fouling factor of .00025 and 2.4 GPM per ton through the evaporator with a .0001 fouling factor.
- Minimum chiller unloading percentage can be as low as 4.7% of total system. Calculate system unloading by dividing 1/2 of smallest module by total system tons.
- Module operational weight includes water, compressor oil, and refrigerant charge. Multiply times the number of modules for a total system operational weight.
- Unit shipping weight includes refrigerant charge, compressor oil, and shipping base skid.
- The minimum/maximum flow rates are based on a temperature differential of 7°F to 15°F through the evaporator and the condenser. The minimum allowable temperature differential for the FLEX 65 condenser is 9.5°F.
- Main header water / fluid connections are ASME, 6" full face flange, Class 150, eight bolt pattern.

Application Parameters

**Condenser Water Pressure Drop
30, 50 & 65-Ton, "FLEX" Series**



**Evaporator Water Pressure Drop
25, 30, 50 & 65-Ton, "FLEX" Series**



COMPRESSOR INFORMATION

The compressors used on the ClimaCool chiller are scroll compressors. They are highly efficient and extremely reliable. However, the information contained in this document will be useful for their care.

Compressor Rotation

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

Compressor Lubrication

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

Oil Type

The oil in ALL scroll compressors used in ClimaCool chillers is polyester type oil, (POE), and is intended for the dual usage of either refrigerant R22 or R407C selected for use. All (POE) 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 POE oils from sealed metal cans. Suitable POE oils are:

- * Copeland Ultra 22 CC
- * Mobil EAL Arctic 22 CC
- * ICI Emkarate RL 32 CF

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 start-up. The normal operating compressor oil level should be between 1/3 and 1/2 of the sight glass. During operation, a certain amount of oil is carried out into the refrigeration system. The system has been designed to bring the oil back to the compressor. If the level in the sight glass falls, it may be due to the operating conditions and enough time should be given to allow the oil to return before more oil is added. This could take up to 6 hours of operation. The compressor should not be allowed to operate with less than 1/8" oil sight glass for an extended period of time (longer than 4-6 hours).

Adding Oil

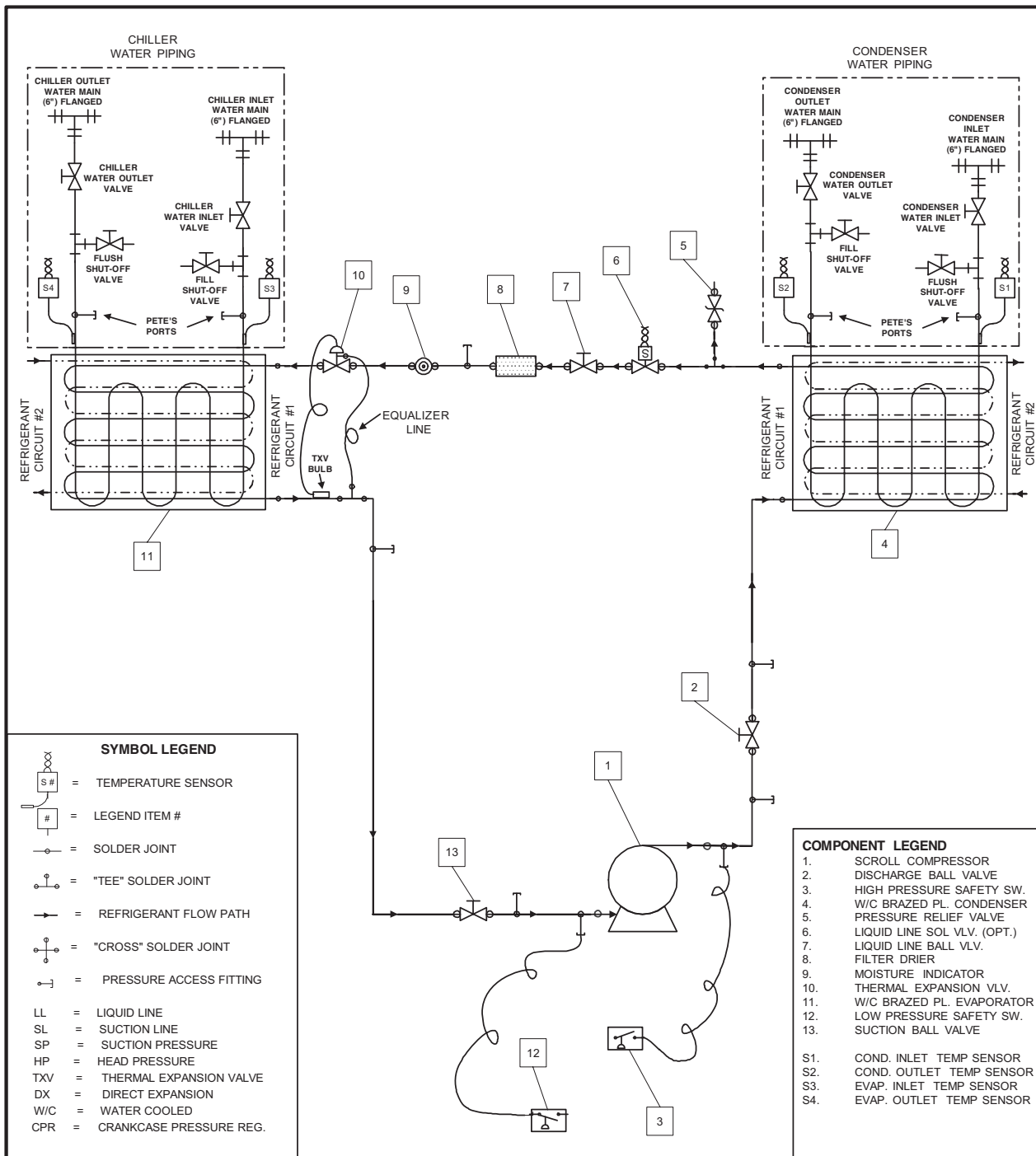
The compressor must never be run in a vacuum. A suitable hydraulic pump should be used to add oil and reserved for this process. Oil should only be added to a compressor while it is operating to observe valid oil sight glass levels. Oil is pressure-injected either into a gauge connection on the suction 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 1/3 sight glass point.

ATTENTION INSTALLER

3 Phase Scroll Compressor Units

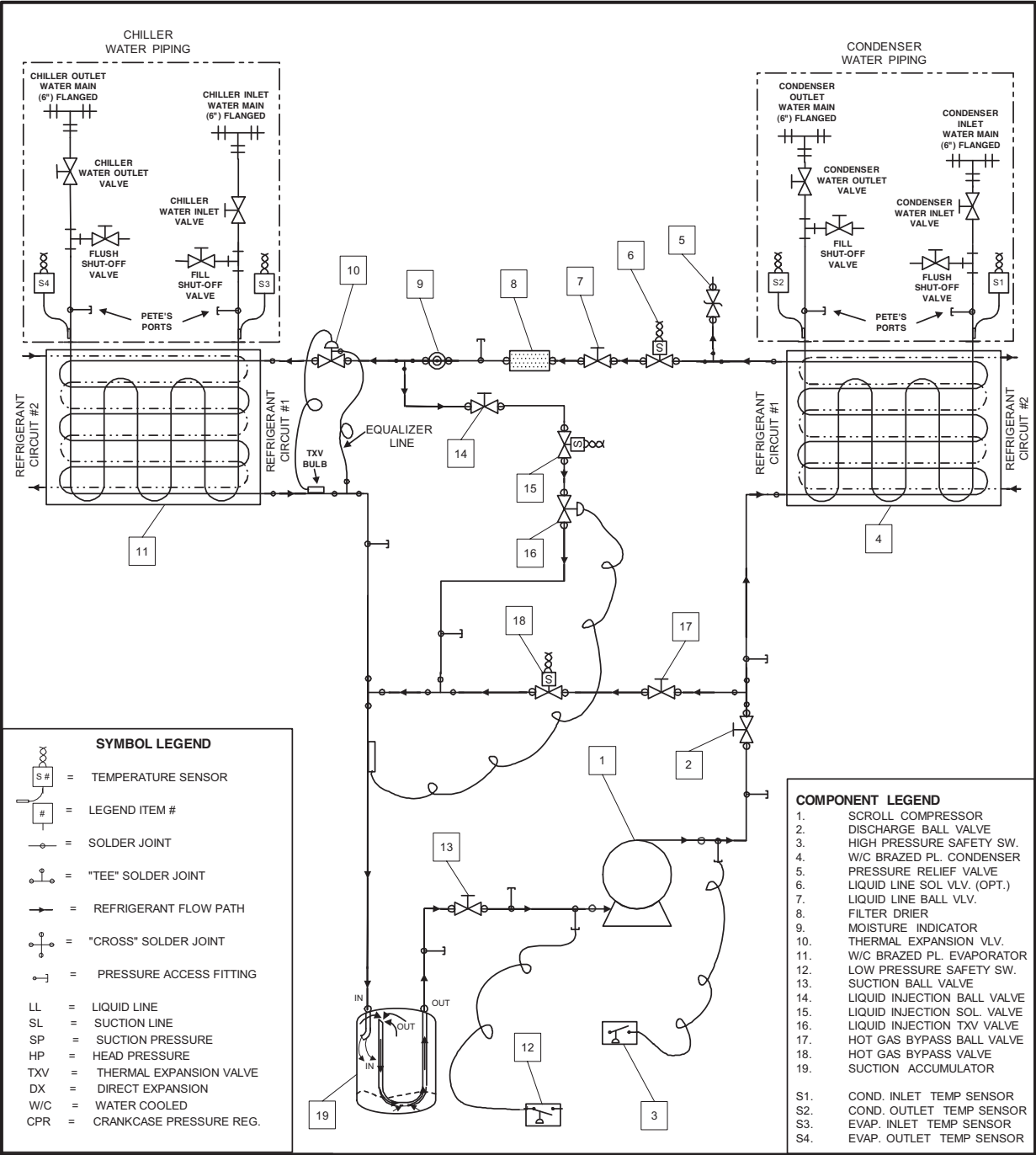
- If this unit uses a 3 Phase Scroll Compressor, the following instructions ***MUST BE*** followed:
 - Unit power supply ***MUST BE*** wired in the proper sequence to avoid damage to the 3 Phase Scroll Compressor;
 - Scroll Compressors with ***INCORRECT*** rotation show the following characteristics:
 - 1.) High sound level;
 - 2.) High suction pressure and low discharge pressure;
 - 3.) 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.

Refrigeration Circuit Diagram



CLIMACOOL® THE ULTIMATE CHILLER SOLUTION®			TITLE REFRIGERATION CIRCUIT DIAGRAM			
DESCRIPTION			W/C SCROLL CHILLER STD. REFRIG. (REFRIGERANT CIRCUIT #1 OF 2 SHOWN)			
APPROVED	DATE	FILENAME CCE-06011-2.vsd	SIZE A	ClimaCool Corp. CCE-06011-2.VSD	DWG NO CCE-06011-2.VSD	REV A
SCALE NONE		DRAWN BY M. Kujak	DATE 02/11/2006	SHEET 1 OF 1		

Refrigeration Circuit Diagram



CLIMACOOL® THE ULTIMATE CHILLER SOLUTION®			TITLE REFRIGERATION CIRCUIT DIAGRAM			
DESCRIPTION			W/C SCROLL CHILLER W/HGB + LIQ. INJ. (REFRIGERANT CIRCUIT #1 OF 2 SHOWN)			
APPROVED	DATE	FILENAME CCE-06011-1.vsd	SIZE A	ClimaCool Corp. CCE-06011-1.VSD	DWG NO CCE-06011-1.VSD	REV A
SCALE NONE		DRAWN BY M. Kujak		DATE 02/11/2006	SHEET 1 OF 1	

Refrigeration System Re-Processing

REFRIGERATION SYSTEM RE-PROCESSING

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

ASHRAE Standard Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1978.

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

Factory Tested

ClimaCool modular chillers have been leak tested, fully charged and factory run-tested before shipment. In the unlikely event that a refrigerant leak is detected at start-up, the following guidelines should be consulted before reprocessing the refrigeration systems.

Refrigerant System Reprocessing

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

After all of the repairs have been made to the refrigeration system, a pressure test using refrigerant and dry nitrogen should be taken. Connect the refrigerant cylinder to the charging port of the condenser liquid stop valve and bleed in enough gas to raise the system pressure up to 25 PSI. If no obvious leaks are present you may proceed. Using a dry nitrogen supply tank equipped with a pressure regulator set at 150 PSI, continue to raise the pressure up to 150 PSI. Using a leak detector, carefully check the system for any remaining leaks. If the system is leak free you may release the pressure.

Evacuating the System

The compressors should never be run while the system is in a vacuum. This could cause immediate failure to the compressors. After the system has been leak tested and sealed, any moisture that entered the system should be dehydrated and removed. While the pressure is reduced under a vacuum, the boiling point of moisture trapped inside the lines is reduced also. A pressure of .0095 PSIA, or 500 microns absolute pressure or better must be reached

and sustained for several hours in order for the system to be considered free from moisture. It is necessary to use a micron meter equipped with an absolute pressure gauge (or transducer) to take this reading. ClimaCool recommends the double evacuation process to ensure the proper removal of moisture and contaminants from the refrigeration system. After the initial vacuum is reached and held on the system, allow dry nitrogen back into the system until the pressure reaches zero PSIG or slightly higher. Then, repeat the entire evacuation process described above.

Recharging the System

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

Refrigerant (per circuit)

Model FLEX	R-22 Quantity (lbs.)	
	Circuit #1	Circuit #2
30	17	17
50	24	24
65	33.5	33.5

Refrigerant (per circuit)

Model FLEX	R-407C Quantity (lbs.)	
	Circuit #1	Circuit #2
30	16.5	16.5
50	23	23
65	32.5	32.5

NOTES: Modules are all pre-charged at factory and ready for field connections. FLEX Modules are refrigerant flexible.

SEQUENCE OF OPERATION GENERIC INTERFACE - MANUAL ISOLATION VALVES

Sequence of Operations

Chiller shall be enabled locally or remotely from enable/disable contact by BAS via selector switch on face of the "Master Control Panel". Pumps for chilled water supply and condenser water supply shall be started by others. When proof of flow is established in both the chilled water and condenser water lines, the ClimaCool chiller shall start. The "Chilled Water Supply" (CHWS) temp. sensor (TS1), located in the discharge line of respective chiller shall be used to cycle compressor stages sequentially to maintain set point of 45°F (adjustable from the LCD Display on the Face of the "Master Control Panel", or Remotely via 4-20 ma signal.)

Chillers will be disabled until "Chilled Water Return" (CHWR) temperature sensor is below 90°F and "Condenser Water Supply" (CWS) temperature sensor is above 65°F.

Each module of the chiller has 2 compressors. Stage 1 compressors shall be started first on lead week and stage 2 compressors shall be started first on lag weeks to equalize run hours between compressors 1 and 2 of the modules automatically. Compressors shall be staged with a single compressor per module as required, until all available

modules of the chiller have one compressor running. The remaining compressors will stage per module, as load requires. Compressors shall be energized and de-energized by the program, in an order which will maintain equal run time.

The compressor with most run time will de-energize as the set point is satisfied, and compressor with least run time will energize, as additional cooling capacity is required.

If a fault is detected the compressor will be disabled and displayed on the "Master Control Panel" LCD Screen. (Faults must be manually reset at the chiller).

The Chiller Status and Run Time in hours for each Compressor shall be shown on the LCD Display on the "Master Control Panel". Common Alarm contact and Chiller Status contact is provided at the panel.

Electrical Data - 60 Hz

The ClimaCool® Modular Chiller - Electrical Data - Models 30, 50 & 65 - FLEX Series

Model FLEX	Voltage	Power Wiring - per Module				Internal Wiring - per Compressor			
		RLA ¹	MCA ²	MOP ^{3,8}	Rec. Fuse ^{4,8}	RLA ¹	MCA ²	LRA ⁵	Fuse Size ⁴
30	208-230/3/60	92	103	125	125	46	58	425	70
30	460/3/60	42	47	60	60	21	26	187	35
30	575/3/60	33	37	50	45	17	21	148	30
50	208-230/3/60	142	160	225	200	71	89	500	110
50	460/3/60	64	72	100	90	32	40	250	50
50	575/3/60	51	58	80	70	26	32	198	40
65	208-230/3/60	183	206	250	250	92	115	600	150
65	460/3/60	83	93	125	110	41	52	310	70
65	575/3/60	66	75	100	90	33	41	255	60

NOTES:

1. RLA. Rated Load Amps are calculated as per UL1995.
2. MCA. Minimum Circuit Ampacity: 125% of the RLA of the largest compressor motor plus 100% of the RLA (or FLA) of all other concurrent motors and/or electrical loads.
3. MOP. Maximum Overcurrent Protection or Max.Fuse Sizing: Rounded down from 225% of the RLA of the largest compressor motor plus 100% of the RLA (or FLA) 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 (or FLA) of all other concurrent electrical loads.
5. Locked Rotor Amps are instantaneous starting amperage per compressor.
6. Module internal wiring is per NEC.
7. Voltage Tolerance Range:
208-230V / 60Hz: Min. 187V Max. 253V
460V / 60Hz: Min. 414V Max. 506V
575V / 60Hz: 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.

LEGEND:

- RLA - Rated Load Amps
- LRA - Locked Rotor Amps
- MCA - Minimum Circuit Amps
- MOPD - Maximum Overcurrent Protection Device

DANGER

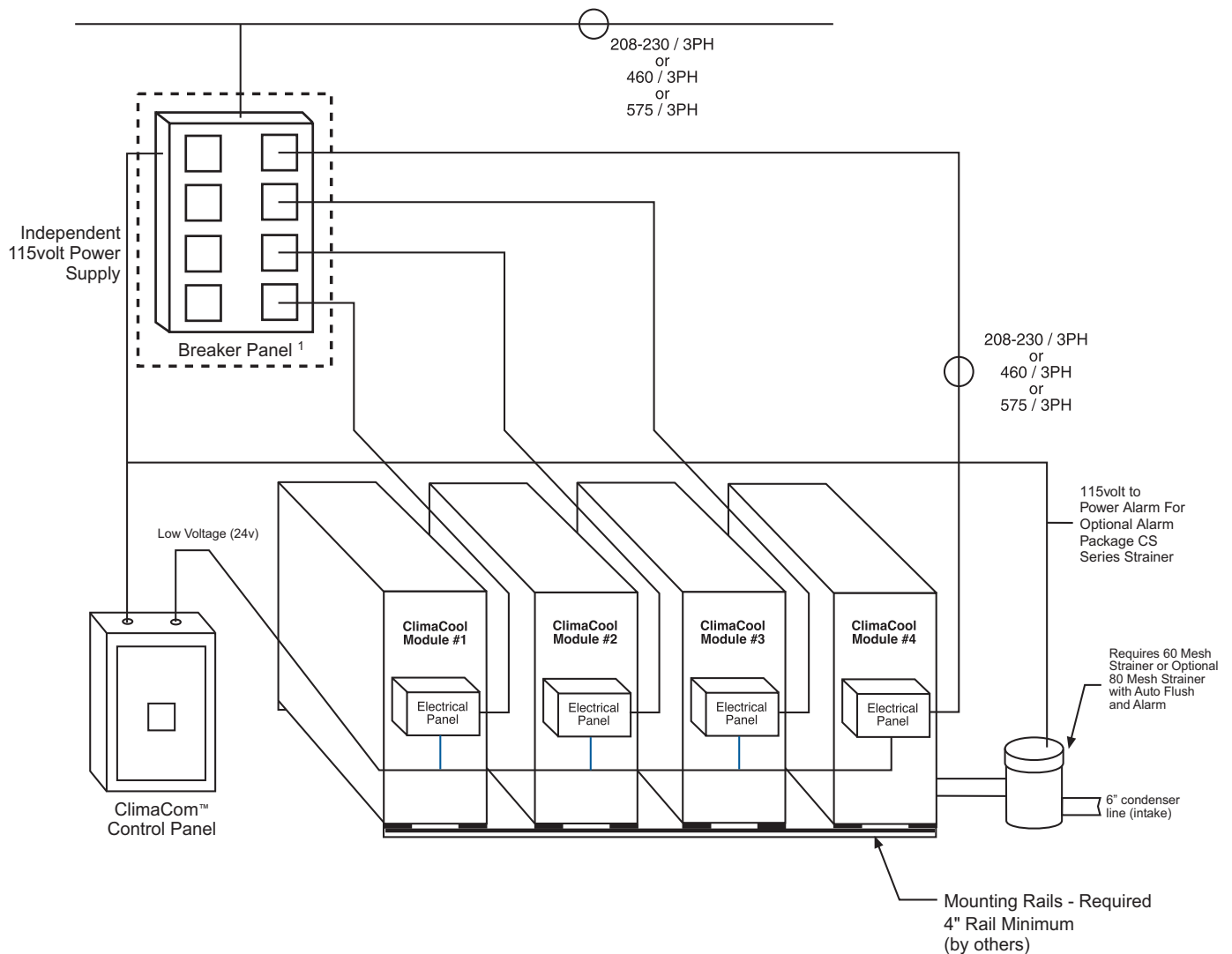
- Electric shock hazard!
- May result in injury or death!
- Disconnect power supply(ies) before servicing!
- Refer servicing to qualified service personnel.



DANGER

- Risque de choc électrique!
- Résultat de mai dans dommages ou la mort!
- Debrancher avant d'entreprendre le dépannage de l'appareil!
- Consulter un réparateur qualifié pour le dépannage.

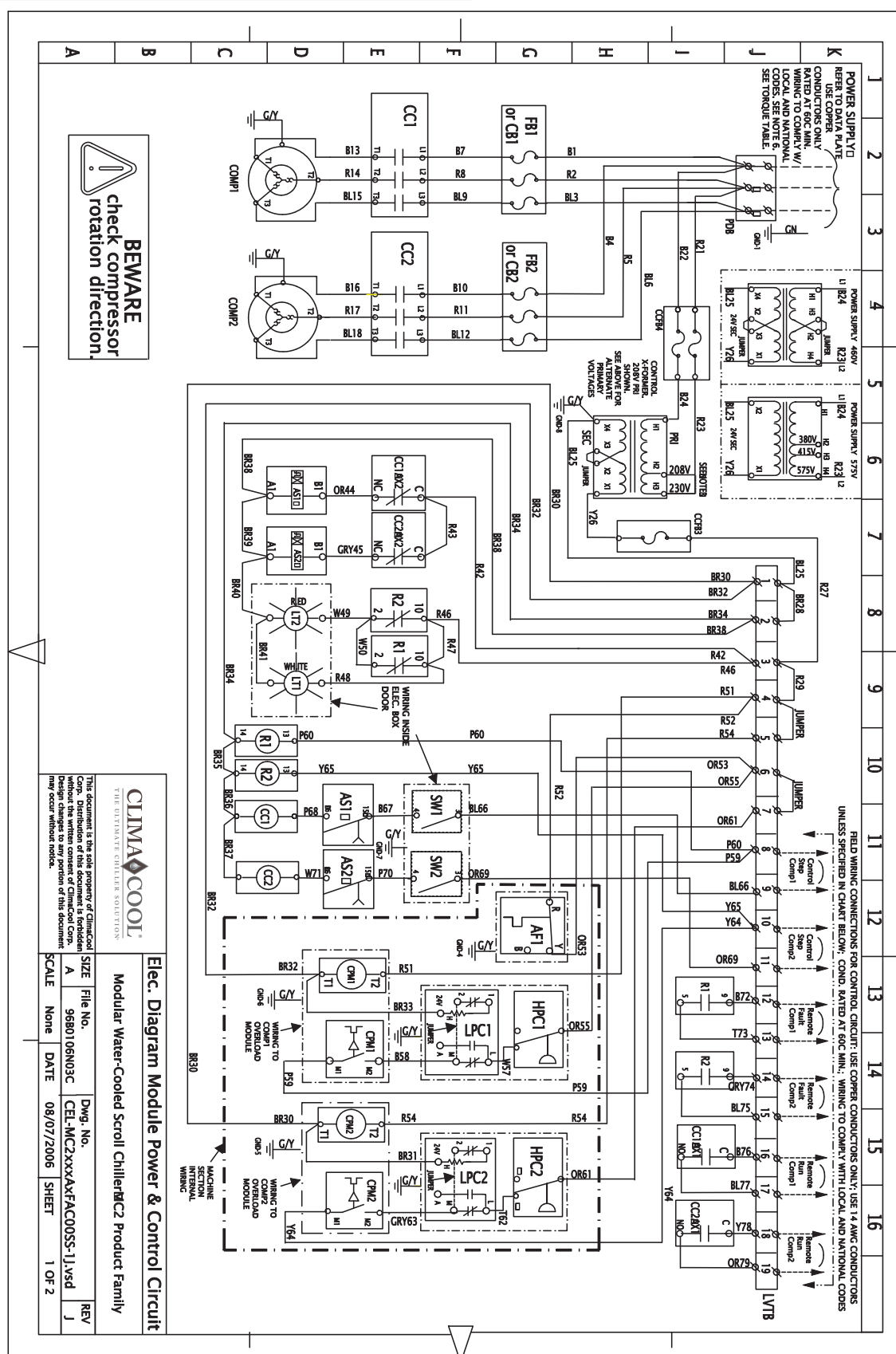
The ClimaCool® Modular Chiller - Multi-Source Power Typical Installation



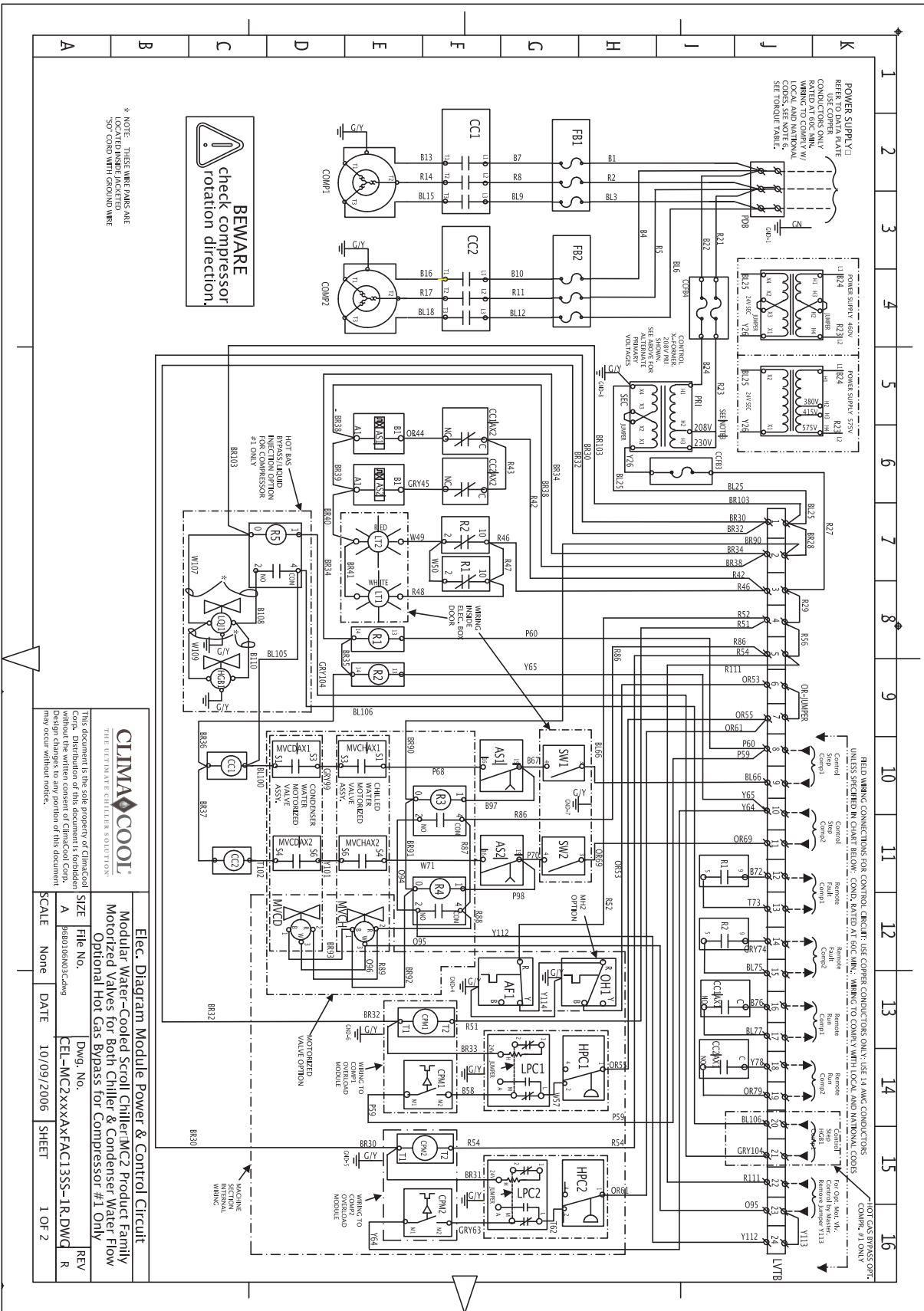
NOTES:

1. Breaker panel represents field power supply and is to be installed by others. Not provided as part of 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 is by others.

Module Power & Control Circuit



Module Power & Control Circuit



Module Power & Control Circuit

[illegible]

WARNING!

The troubleshooting guidelines recommended in this section could result in exposure to electrical safety hazards. 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 UNIT WILL NOT START

Possible Cause

1. Power off
2. Main line open
3. Incorrect wiring
4. Loose terminals/connections
5. Control circuit open
6. Improper phasing of main power

Remedy

1. Check main disconnect switch
2. Check main fuses
3. Check the wiring diagram
4. Tighten the terminal connections
5. Check interlocks with auxiliary equipment, pressure and temperature controls
6. Change any 2 of 3 phases of main power

COMPRESSOR HUMS BUT DOES NOT START

Possible Cause

1. Low voltage

Remedy

1. Check at main power entry and power entry at unit (consult power company if low)

COMPRESSOR RUNS BUT DOES NOT COOL

Possible Cause

1. Improper phasing of main power
2. Refrigeration service valves closed

Remedy

1. Change any 2 of 3 phases of main power
2. Open all refrigeration system service ball valves

COMPRESSOR CUTS OUT ON LOW PRESSURE SAFETY CONTROL

Possible Cause

1. Refrigerant shortage
2. No load on water chiller
3. Restriction in liquid line
4. Suction valve partially closed
5. Expansion valve clogged or inoperative
6. Low discharge pressure
7. Low water flow through the cooler
8. Chilled water temp. too cold
9. Fouled evaporator brazed plate HX
10. Defective low pressure switch

Remedy

1. Check for leaks - add refrigerant
2. Check water pump operation
3. Plugged liquid line drier - replace liquid line drier
4. Open valves fully
5. Repair / Replace the expansion valve
6. Raise and control discharge pressure within design limits
7. Check water flow through the cooler
8. Raise water temperature
9. Clean-in-place HX as described in previous section
10. Replace low pressure switch

Troubleshooting Guide

COMPRESSOR CYCLES ON HIGH PRESSURE CONTROL

Possible Cause

1. Main condenser water valve closed
2. Water reg. valve incorrectly set or defective
3. Compressor discharge valve partially closed
4. Non-condensable gases in hydronic system
5. Overcharge of refrigerant (R-22 or R-407C)
6. Condenser water temperature high
7. Improper condenser water circulation
8. Insufficient water flow through the condenser
9. Fouled condenser brazed plate heat exchanger
10. Defective high pressure switch

Remedy

1. Open water valve
2. Reset or replace
3. Open valve to full open position
4. Purge non-condensable gases from bleed valve on condenser or at bleed valve of the building condenser water system
5. Purge refrigerant from system while in operation until the first sign of bubbles are shown in sight glass. Add back refrigerant just until bubbles clear
6. Check water supply temperature against requirements; if cooling tower is used check spray nozzles on cooling tower
7. Use an ample sized cleanable strainer in the condenser water circuit. Make certain in the strainer is clean to insure full flow of condenser water (strainer screen must be 60 mesh minimum)
8. Check water flow thru condenser against design requirements
9. Clean-in-place heat exchanger as described in previous section
10. Replace high pressure switch

CAUSES AND PREVENTION OF FREEZE-UP

Possible Cause

1. Improper charging
2. Improperly set low pressure freeze control
3. Operating with low pressure control bypassed
4. Improper chilled water circulation
5. Not draining for winter shutdown
6. Improper setting of low water temperature control

Prevention

1. Charge per ClimaCool®'s data plate information located on the unit
2. Check the safety time delay low pressure control for proper setting at the beginning of each season
3. The safety time delay low pressure control is wired in series with the compressor motor contactors (**do not bypass**)
4. Use an ample sized cleanable strainer in the chilled water circuit. Make certain in the strainer is clean to insure full flow and velocity of chilled water. It may sometimes be necessary to treat the water to prevent formation of deposits
5. When the system is shut down for the winter, remove the drain plugs and drain the cooler. Blow out remaining water with air
6. Check setting of (freeze-stat) temperature control

Warranty Certificate

For complete warranty details refer to ClimaCool's web site at www.climacoolcorp.com or contact customer service at (405) 745-3185.



THE ULTIMATE CHILLER SOLUTION®

CLIMACOOOL 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 of 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 manufacturer'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) 745-3185 • e-mail: Claims@climacoolcorp.com

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



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405-745-2072 (Fax)
www.climacoolcorp.com

ClimaCool works continually to improve its products. As a result, the design and specifications of each product at the time for order may be changed without notice and may not be as described herein. Please contact ClimaCool's Customer Service Department at (405) 745-3185 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimaCool's opinion or commendation of its products. For the most current version of this document please visit www.climacoolcorp.com.

The management system governing the manufacture of ClimaCool's products is ISO 9001:2000 certified.

