COLMAC COIL

Installation, Operation, and Maintenance
ENG00018655

Aircoils™

Aircoil™ Evaporators are designed to deliver long, trouble-free service when properly installed, operated and maintained. To obtain optimum performance and maximum service life, it is important that a program of regular inspection and maintenance be developed and carried out. This manual is published as a guide to establish such a program.

Included in the manual are the recommended procedures for rigging, storage, installation, start-up, operation, and shutdown. There are also minimum recommendations for maintenance. These recommendations are minimums and should be adjusted to cope with the severity of the operating environment. While reviewing these instructions or installing, operating or maintaining the equipment, a copy of the certified unit drawing(s) should be available for reference. If you need additional information about the operation or maintenance of this equipment, please obtain the unit serial number and contact your Colmac Representative.

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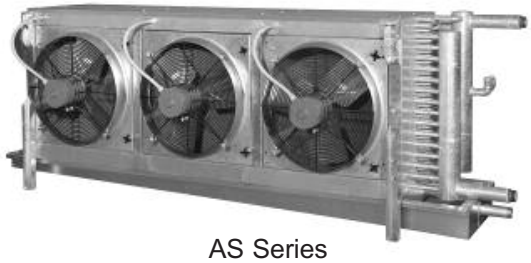
General

Read the following instructions carefully before handling or installing Colmac Coil Aircoil™ Evaporators. These instructions contain important safety information along with recommendations for the installation, operation, and maintenance of the equipment. Failure to comply could result in bodily harm and damage to property and may void the equipment warranty. Refer to the Limitation of Warranties applicable to and in effect at the time of the sale/purchase of these products.

Product Lines

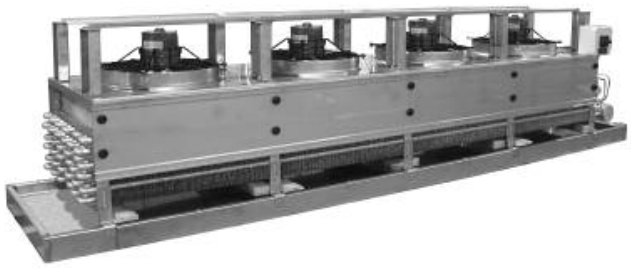
The following product lines are addressed in this manual.



AS Series

AM Series

AL Series



AR Series

NOTE: For models not shown, contact your local Colmac Representative for rigging instructions.

Refrigerant Warning

Aircoil™ Evaporators may contain liquid refrigerant such as ammonia, R-22, R-507, etc. For this reason, Aircoil™ Evaporators should be installed, operated and serviced by qualified refrigeration technicians only.

Liquid refrigerant causes burns, which may be fatal, if it leaks and comes in contact with a person.

Refrigerant vapor can cause asphyxiation and or tissue burns if released to the atmosphere in the vicinity of people.

Liquid refrigerant, that is isolated in a pipe or equipment without an adequate means of pressure relief can rupture pipe or equipment if it is allowed to warm.

Hot refrigerant vapor, when injected into an evaporator containing cold refrigerant, will rapidly condense. This rapid condensation can accelerate liquid slugs to dangerously high energy levels that can rupture pipes, valves and other components.

Please refer to various manuals from organizations such as IIAR, ASHRAE, and RETA for more information concerning the safe operation of refrigeration equipment.

Installation Instructions

Receiving

Inspection

Carefully inspect all equipment upon arrival to detect any shipping damage and to verify receipt of all equipment listed on the bill of lading. Specifically look for loose items listed on the bill of lading such as fan guards, long throw adaptors, mating flanges and thermal expansion valves (TXVs). If there is damage or a shortage, note it on the delivery receipt prior to signing for the shipment and subsequently file a claim with the freight carrier. While Colmac will gladly provide information to assist with the process, the responsibility for filing such a claim is that of the purchaser or the purchaser's consignee.

Holding Charge

Each Colmac Aircoil™ Evaporator coil is shipped with a low-pressure nitrogen charge. Slightly open the Schrader valve located on the coil connection cap to detect the presence of the charge by listening for the nitrogen escaping through the valve. After this brief test, close the valve to maintain the nitrogen charge until the unit is ready to be connected to the system piping.

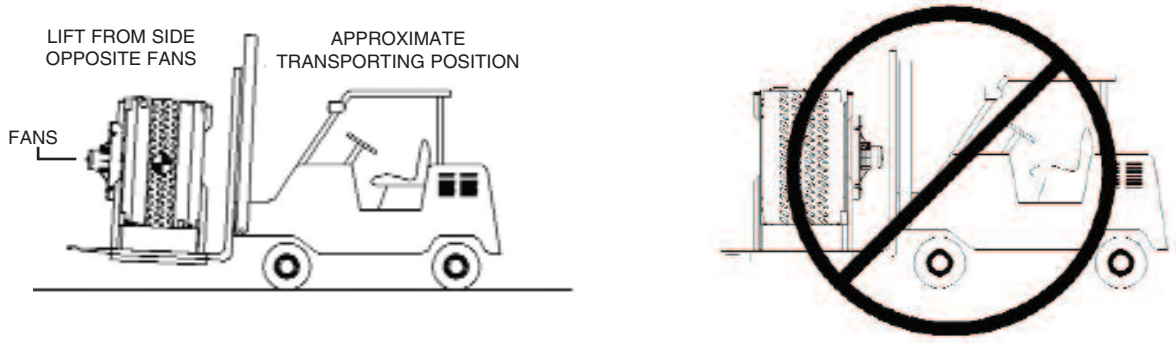
If the unit has lost its nitrogen charge, it may have been compromised during shipment. Before installation, pressure test the coil with dry nitrogen to ensure there is not a coil leak and report the loss of the shipping charge to Colmac. If the unit will not hold pressure, please obtain the unit's serial number, then contact your local Colmac Representative for a resolution.

Handling

Colmac Aircoil™ Evaporators are designed to facilitate safe handling with fork trucks or cranes. Use caution when handling to prevent damage to exposed components. **The shipping skid should remain affixed to the unit to enable handling and to prevent damage to the pan and other components.** The coil/air inlet side of the unit has most of the unit weight. **When rigging with a fork truck, lift from the coil side.**

Fork Trucks

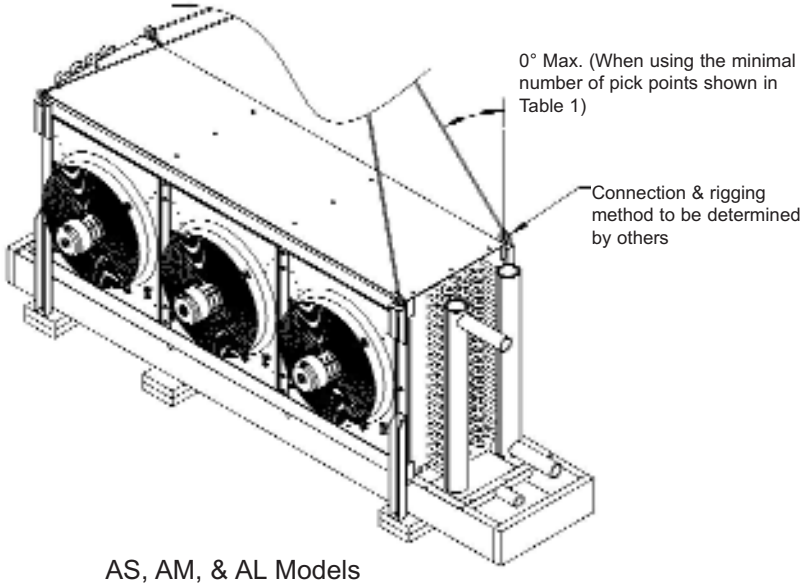
Lifting forks should be placed under appropriate areas of the wooden shipping skid for proper handling; **damage may result if the forks come in direct contact with the equipment.** The lifting skid may be used to lift the unit into place for either ceiling-hung or foot-mounted applications.



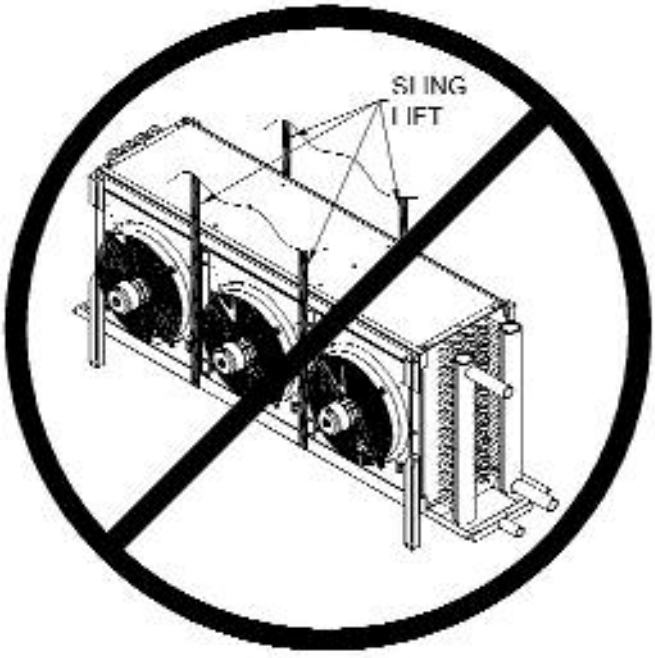
Lift from the Face Opposite Fans to Prevent Damage

Cranes

When lifting AS, AM, and AL models with a crane, attach appropriate lifting devices to the recommended hanger points and lift in a level and balanced manner to avoid concentrating stresses on any point. **Do not apply load or lifting stresses to the headers, connections, or tubes.**



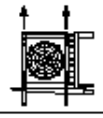
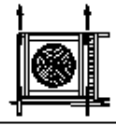
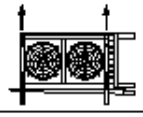
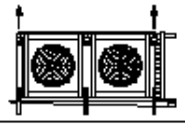
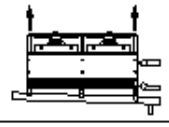
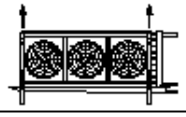
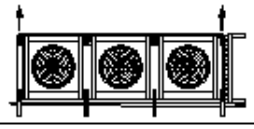
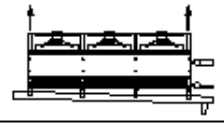
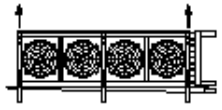
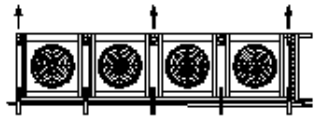
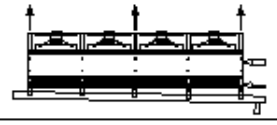
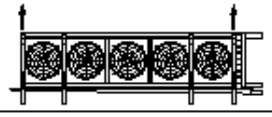
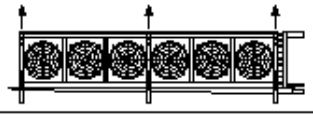
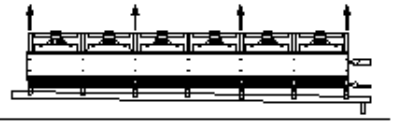
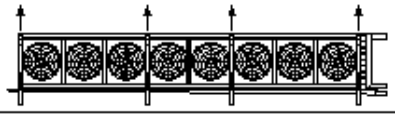
AS, AM, & AL Models



All Models - Do Not Lift with Sling

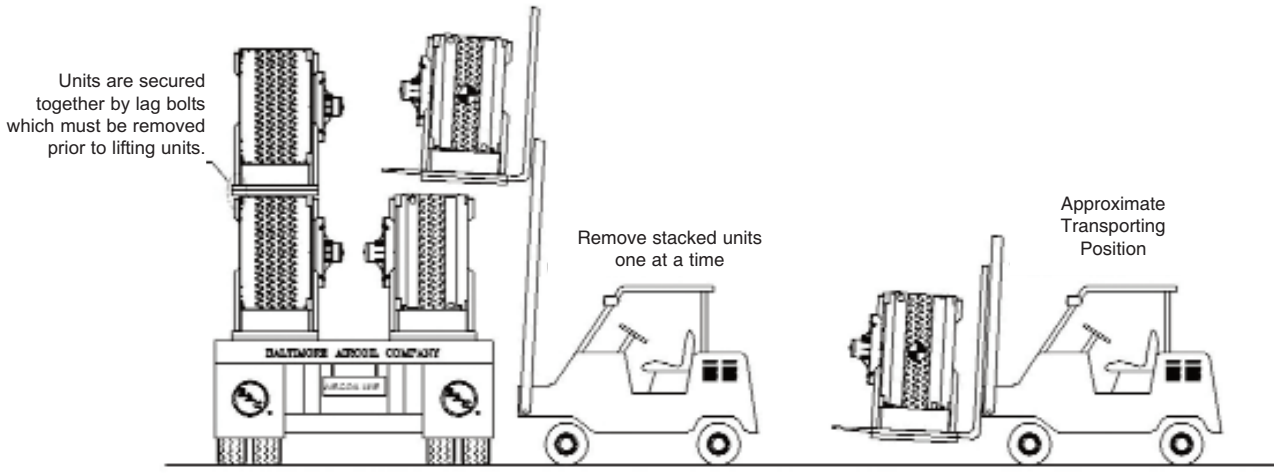
Table 1 illustrates the minimum number and location of rigging points. Contact your local Colmac Representative for information on models not shown.

Table 1: Lifting Requirements

NUMBER OF FANS	LIFTING REQUIREMENTS		
	AS & AM UNITS	AL UNITS	AR UNITS
1 FAN			
2 FAN			
3 FAN			
4 FAN			
5 FAN			
6 FAN			
8 FAN			

Units Stacked for Shipment

Some units may be stacked “two high” to minimize shipping costs. **Do not lift such units in tandem. Units must be removed from the truck one at a time** by first disconnecting the fasteners that bind them together, then removing the top unit first. Either a fork truck or a crane may be used to remove the units one at a time.

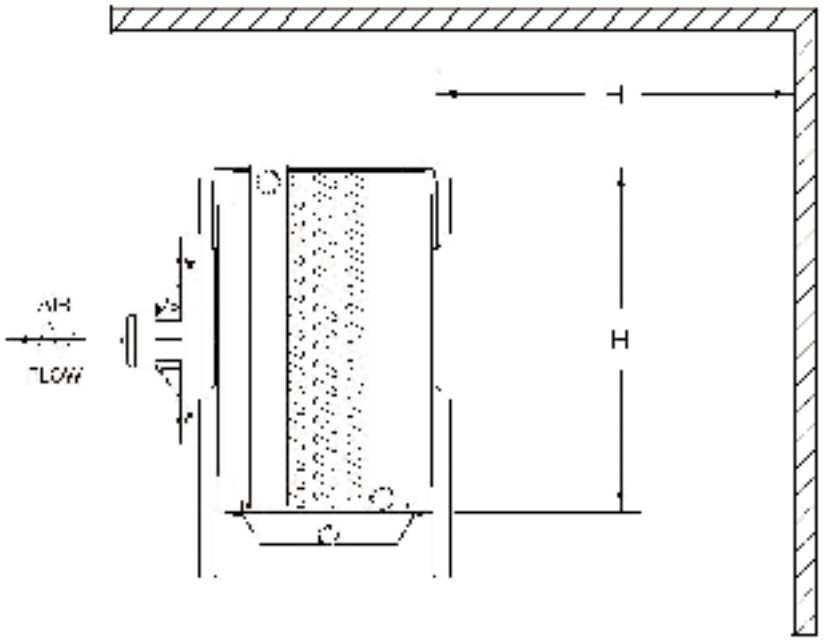


Storage

If the units are not to be hung or mounted upon receipt, they should be stored in a clean dry place, under roof or tarp.

Location

Unit(s) should be located to permit unobstructed airflow both to and from the unit. The intake face of the unit should be located at least one unit height away from any wall or other significant obstruction. The discharge area should be adequately free and clear of obstructions, such as building structures, racks, or product, to permit the desired air throw.



Units should be located away from areas of high infiltration such as doorways. If located near an open door, the entry of warm, moist air will increase the defrost requirements and “falsely load” the unit.

Units with hinged fan faces require a completely unencumbered area approximately 3-feet wide, along the fan face extending the length and height of the unit. In general, it is good practice to provide approximately 3-feet clearance on all sides of the unit to permit inspection, service, and maintenance.
If the unit is water defrosted, allow for 2-feet of clearance above the unit to clean the water distribution pan.

If the unit has electric defrost heaters, allow for the necessary heater pull area at the end(s) of the unit, as noted on the unit drawings.

Mounting

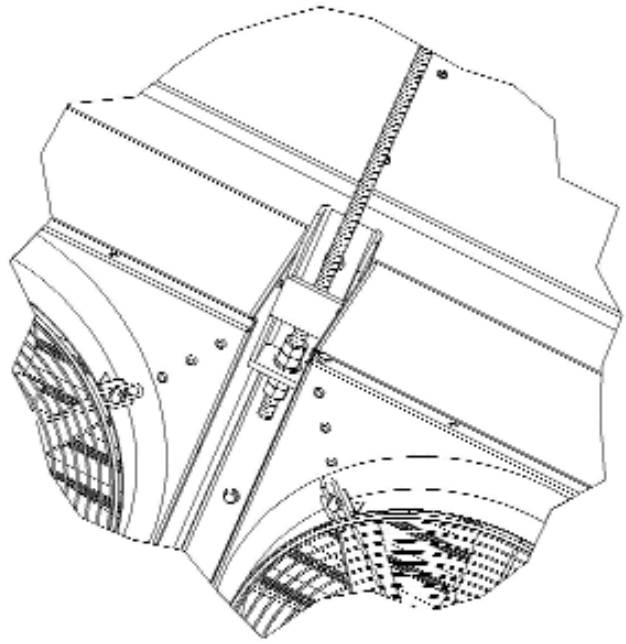
All units must be installed such that the top of the unit is level to ensure quick and thorough pan drainage. Units are equipped for ceiling-hung or leg-mounted applications.

Ceiling-Hung

Hangers for ceiling-hung installations are located on the unit framework on each face of the unit. Table 2, below, provides hanger quantities, hole diameter, and maximum support rod diameter. Hanger rod and hardware selection and size are to be provided by the design engineer using sound engineering practices. For proper support, all hangers must be used. **The unit must be lifted to the secured hanger rods and secured in place such that the top of the unit is level and each hanger provides equal support. Securely tightened double nuts with washers, or equivalent, must be used above and below the hanger hole to minimize the chances of loosening due to vibration.** After the unit is secure, the shipping/handling skid and legs should be removed and discarded.

Table 2: Hanger Hole Data for Ceiling Hung Installations

Model Number	Number of Hangers	Hole Diameter (in.)	Maximum Rod Diameter (in.)
AS1, AS2, AS3	4	13/16”	3/4”
AS4, AS6	6		
AS5, AS8	8		
AM1, AM2, AM3	4		
AM4, AM6	6		
AM5, AM8	8		
AL1	4		
AL2	6		
AL3	8		
AL4	10		
AR2	6	5/8”	1/2”
AR3	8		
AR4	10		
AR5	12		
AR6	14		



“Double-Nut” Hanger

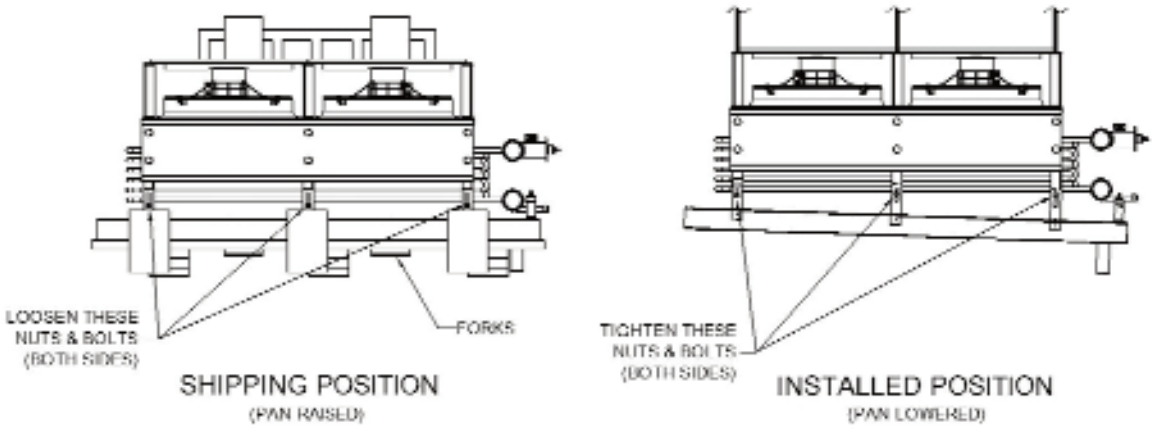
Leg-Mounted (optional)

Adjustable legs may be provided for floor-mounted or steel-mounted installations. **For proper support, all legs must be supported on a level structural member and must be securely positioned such that the top of the unit will be level.** Depending on the location and installer preference, the shipping/handling skid may be removed before or after the unit is set in its final position. Once set in position, all legs should be bolted or welded to the supporting structure to prevent movement.

Field Assembly

AR Model Pan Positioning

On AR models, the drain pans ship attached to the unit, in a raised position. **The pan must be lowered to permit adequate airflow and sloped for drainage.** This should be accomplished just after securing the unit in place and prior to removing the unit lifting device (fork truck). Loosen the hardware on the adjustable pan hanger, carefully lower the pan to the bottom position on the drain end using the fork truck, then re-secure the pan hanger hardware. At this point, the skid should be removed and discarded.



Interconnecting Hot Gas Piping on AR Models

Field assembly is required for the interconnecting piping on units with hot gas defrost of the coil and pan for AR Models, only. On other models, the piping can ship installed since the pans are in a fixed, final position. For AR Models, fix the pan in its final position, as described above, then measure, cut to length, and weld the interconnecting piping components provided by Colmac. **Piping must be performed in accordance with applicable codes and as described in the piping section of this instruction manual.**

Piping

Refrigerant Piping

The refrigerant piping design and installation must be performed by qualified personnel in accordance with applicable national and local codes and standards. Piping is to be designed and supported independent of the evaporator to minimize the transmission of vibration, to permit expansion and contraction, and to impose no load on the evaporator connections. Pipe sizes are to be established according to good engineering design practices, taking into account all applicable facets of the system: the connection size provided by Colmac should not be used to determine the system piping. **Prior to charging the system with refrigerant, the entire system must be pressure tested to ensure there are no leaks and evacuated to remove moisture.** Documents concerning the engineering and installation of refrigerant piping are available from organizations such as IIAR, ASME and ASHRAE.

Refrigeration Connections

The nitrogen holding charge should be permitted to remain intact as long as possible. When ready to connect the refrigerant piping, slowly vent the nitrogen charge to the atmosphere, then remove the connection caps.

Galvanized steel, stainless steel, and aluminum coils terminate with carbon steel pipe connections, which should be trimmed, cleaned of slag and fines, and prepared for welding at a point that removes any temporary capping provisions such as threads or welded endplates. **Note that these temporary capping provisions are not intended for refrigeration service and must be removed prior to placing the coil in service.** Carbon steel connections will be Schedule 80 pipe for connections less than or equal to 1-1/2” in diameter or Schedule 40 for connections 2” in diameter and greater.

Thermal Expansion Valve Installation

Perform the following tasks when installing a thermal expansion valve (TXV) on a direct expansion system:

- Confirm that the distributor orifice and retainer wire is in place and was not dislodged during shipping and handling. Note that some hot gas defrost systems will have a side port for hot gas located between the distributor orifice and the distributor.
- For ammonia systems, confirm that the discharge tube is removed from the outlet of the TXV.
- **Install the expansion valve immediately adjacent to the distributor with no elbows, valves, or fittings in between.** If a side port must be provided, the orifice will be removed to the upstream side of the port, adjacent to the TXV.
- Connect the equalizer tube.
- Secure the expansion valve bulb directly on a horizontal length of pipe as close to the suction header as possible, but not at a trap nor downstream from a trap. The preferred location on the pipe is in the 3, 4, 8, or 9 o'clock position. Do not place the bulb at the 6 or 12 o'clock positions.

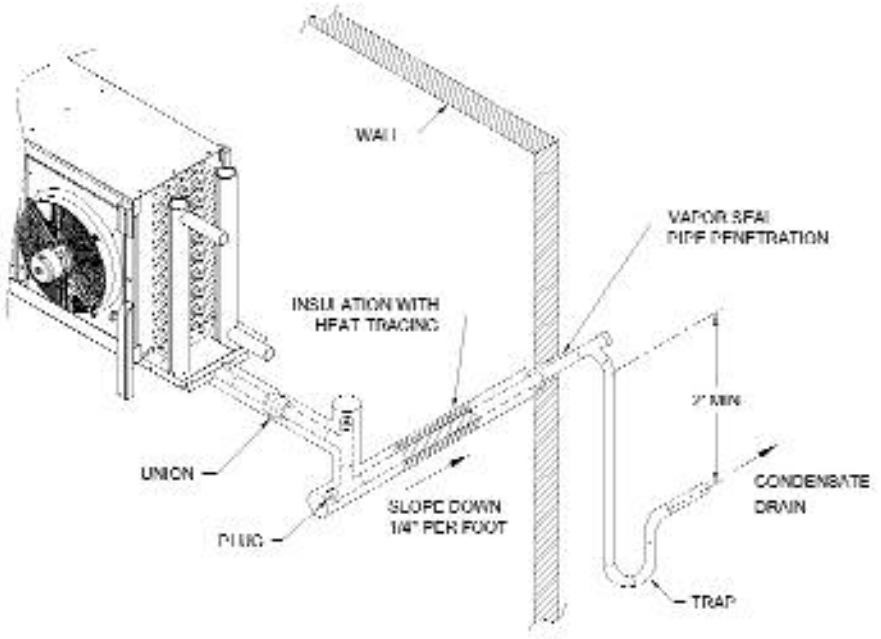
Caution: It is recommended that a suction trap, or suction accumulator, be used on all direct expansion systems for compressor protection.

Defrost Water Drain Piping

Defrost water drain lines should be as short as possible within the refrigerated space and should be pitched at least 1/4" to 1/2" per foot. T**he drain line for each unit must be piped to an independent trap to prevent the migration of warm air through the drain lines. Only units that are defrosted in tandem may share a trap. Drain pan connections and any drain lines and traps that are located in freezing temperatures must be heat traced and insulated to prevent freezing. Heating elements should be continuously energized.**

The trap requires static head to overcome the resistance to flow. For this reason, it should be located in the vertical piping at least 2' below the unit (preferably outside of the refrigerated space). The trap should not be heated if it is located in a space in which the temperature is continuously above freezing. This avoids the possibility of boiling the trap dry. The piping should include a cross or tee to facilitate cleanout. **All piping should be adequately supported independent of the unit so no load is imposed on the pan connection.** In some cases, consideration should be given to using a union at/near the pan connection to enable disconnecting the drain line for maintenance.

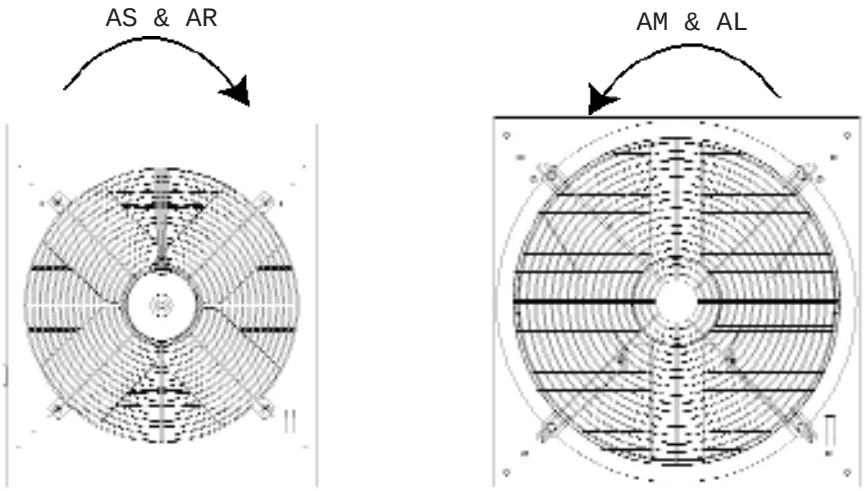
Caution: Do not apply torque to the drain pan connection; use two wrenches to secure the pipe union.



Electrical

Field Wiring

All wiring must be performed by qualified personnel, in compliance with national and local codes and standards. Refer to the unit nameplate and the specific certified wiring drawings for details. The nameplate contains the required electrical power characteristics and the serial number, which can be cross-referenced to the certified prints. The cast aluminum fans on an AM or AL unit should rotate CCW when looking into the airflow. The paddle wheel style of fans on an AS or AR unit should rotate CW when looking into the airflow. Connect the leads in the order that provides proper rotation.



Direction of Fan Rotation

Review the certified prints and wiring diagrams to determine what, if any, electrical components have been provided by Colmac. For example, factory wiring options range from no wiring through pre-wired and mounted combination starters with fused disconnects. Standard motors on AS, AM and AR units are inherently protected with auto-resetting thermal overloads (ATOs). Motors on AL units do not feature this inherent protection due to the size of the motors. Refer to certified prints for specific details.

Review the following data to adequately size supply wiring, motor protection, and other necessary electrical components that are supplied by other than Colmac. As the room air gets colder, the increasing air density causes an increase in the amp draw of the motors. There is a corresponding increase in the ability of the motor to dissipate heat. To size the electrical components (switchgear, wires, overloads, etc.) to accommodate this increased amp draw, use the service factor full load amps multiplied by the air density correction factor.

Table 3: Air Density Correction Factors

Room Temp.	50˚F	40˚F	30˚F	20˚F	10˚F	0˚F	-10˚F	-20˚F	-30˚F	-40˚F	-50˚F
Factor	1.04	1.06	1.08	1.11	1.13	1.15	1.18	1.21	1.26	1.29	1.33

Electrical Data

Tables 4 through 7 provide approximate amperage data for sizing electrical components, based on common single-speed, standard efficiency, 1200 RPM (nominal) motors. Refer to certified unit prints to confirm specific electrical and motor data.

Table 4: Amperage for 460-Volt, 3-Phase, 60-Hertz Power

Motor HP	FLA (at 70˚F)	Amps at 1.15 SF	Room Air Temperature										
			50˚F	40˚F	30˚F	20˚F	10˚F	0˚F	-10˚F	-20˚F	-30˚F	-40˚F	-50˚F
1/3	0.9	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.3
1/2	1.1	1.3	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.6
3/4	1.5	1.7	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2
1	1.9	2.2	2.3	2.3	2.4	2.4	2.5	2.5	2.6	2.6	2.7	2.8	2.8
1-1/2	2.3	2.6	2.7	2.8	2.9	2.9	3.0	3.1	3.1	3.2	3.3	3.3	3.4
2	3.4	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.1
3	4.5	5.2	5.3	5.5	5.6	5.7	5.8	6.0	6.1	6.2	6.4	6.5	6.7
5	7.3	8.4	8.6	8.9	9.1	9.3	9.5	9.7	9.9	10.1	10.4	10.6	10.9
7-1/2	9.4	10.8	11.1	11.4	11.7	11.9	12.2	12.5	12.8	13.1	13.4	13.7	14.0

Table 5: Amperage for 230-Volt, 3-Phase, 60-Hertz Power

Motor HP	FLA (at 70˚F)	Amps at 1.15 SF	Room Air Temperature										
			50˚F	40˚F	30˚F	20˚F	10˚F	0˚F	-10˚F	-20˚F	-30˚F	-40˚F	-50˚F
1/3	1.8	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7
1/2	2.2	2.5	2.6	2.7	2.7	2.8	2.9	2.9	3.0	3.1	3.1	3.2	3.3
3/4	3.1	3.6	3.7	3.8	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6
1	3.7	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.3	5.4	5.5
1-1/2	4.6	5.3	5.4	5.6	5.7	5.8	6.0	6.1	6.2	6.4	6.5	6.7	6.9
2	6.8	7.8	8.1	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.7	9.9	10.1
3	9.1	10.5	10.8	11.0	11.3	11.5	11.8	12.1	12.3	12.6	12.9	13.2	13.6
5	14.5	16.7	17.2	17.6	18.0	18.4	18.8	19.2	19.7	20.1	20.6	21.1	21.6
7-1/2	18.9	21.7	22.4	22.9	23.4	24.0	24.5	25.1	25.6	26.2	26.9	27.5	28.2

Table 6: Amperage for 200-Volt, 3-Phase, 60-Hertz Power

Motor HP	FLA (at 70˚F)	Amps at 1.15 SF	Room Air Temperature										
			50˚F	40˚F	30˚F	20˚F	10˚F	0˚F	-10˚F	-20˚F	-30˚F	-40˚F	-50˚F
1/3	2.1	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.1	3.1
1/2	2.5	2.9	3.0	3.0	3.1	3.2	3.2	3.3	3.4	3.5	3.6	3.6	3.7
3/4	3.5	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.9	5.0	5.1	5.2
1	4.3	4.9	5.1	5.2	5.3	5.5	5.6	5.7	5.8	6.0	6.1	6.3	6.4
1-1/2	5.3	6.1	6.3	6.4	6.6	6.7	6.9	7.0	7.2	7.4	7.5	7.7	7.9
2	7.0	8.1	8.3	8.5	8.7	8.9	9.1	9.3	9.5	9.7	9.9	10.2	10.4
3	10.4	12.0	12.3	12.6	12.9	13.2	13.5	13.8	14.1	14.4	14.8	15.1	15.5
5	16.4	18.9	19.4	19.9	20.3	20.8	21.3	21.8	22.3	22.8	23.3	23.9	24.4
7-1/2	21.5	24.7	25.5	26.1	26.7	27.3	27.9	28.5	29.2	29.8	30.5	31.3	32.0

Table 7: Amperage for 575-Volt, 3-Phase, 60-Hertz Power

Motor HP	FLA (at 70˚F)	Amps at 1.15 SF	Room Air Temperature										
			50˚F	40˚F	30˚F	20˚F	10˚F	0˚F	-10˚F	-20˚F	-30˚F	-40˚F	-50˚F
1/3	0.7	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.1
1/2	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3
3/4	1.2	1.4	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.7	1.7	1.8	1.8
1	1.5	1.7	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.3
1-1/2	1.8	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8
2	2.7	3.1	3.2	3.3	3.4	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1
3	3.6	4.1	4.3	4.3	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.3	5.4
5	5.8	6.7	6.9	7.1	7.3	7.4	7.6	7.7	7.9	8.1	8.3	8.5	8.7
7-1/2	7.5	8.6	8.9	9.1	9.3	9.5	9.8	9.9	10.2	10.5	10.7	11.0	11.2

Variable Frequency Drives

Variable frequency drives require suitable optional motors. Designers should consider such operating parameters as air throw, minimum/maximum fan RPM and coil charge fluctuations when applying variable frequency drives.

Electric Defrost

Electric defrost requires sufficient power supply as shown on the drawings.

Operation Instructions

Pre-Start-Up Checklist

Following is a representative checklist of items to be checked prior to startup. It is not, nor is it intended to be, a comprehensive checklist for the many varying industrial refrigeration systems. **Consult with a qualified system start-up expert for assistance.**

- Confirm the unit is level and secure.
- Confirm hanger rod nuts are securely tightened with double nuts or legs securely are bolted or welded down.
- Confirm piping is complete and conforms to good practice.
- Confirm the condensate drain line is piped properly, including proper pitch, trap, and functioning heat tracing.
- Confirm there are no leaks in the unit or surrounding piping.
- Confirm the supply voltage is within 10% of design and the phase-to-phase imbalance is within 2%.
- Confirm electrical connections are correct and secure.
- Confirm fan set screws and/or bushings are tight.
- Check fan direction and amperage.
- Dry run control valves through defrost and control sequence to verify proper operation.
- Check time settings.
- Open suction, discharge and receiver service valves.
- (Optional) Confirm the thermal expansion bulb is mounted properly and insulated.
- (Optional) “Jumper” the electric defrost termination thermostat.

Post-Start-Up Checklist

- Reconfirm there are no leaks in the unit or surrounding piping.
- Reconfirm voltage is within 10% of design and the phase-phase imbalance is within 2%.
- Confirm the room thermostat and/or control system are functioning properly.
- Look and listen for any excessive vibration, severe valve chatter, water hammer, or moving pipes, and correct as necessary.

General Comments

- The compressor may overload during the time it takes to "pull-down" the temperature in the room.
- Ensure that there is sufficient refrigerant in the system to properly feed all of the units.
- Severe frost buildup during pull-down may necessitate frequent, manual defrost.

Field Adjustments

Perform the following functions when commissioning aircoils, based on the refrigerant feed system and defrost technique being employed on the particular unit. These instructions are not, nor are they intended to be, a comprehensive list of tasks required to successfully commission all aircoils. **Consult with a qualified system start-up expert for assistance.**

Recirculated & Controlled Pressure Receiver Feed

Open hand expansion valves (HEVs) slowly and observe frost/condensate formation on all return bends, top and bottom alike. The proper setting may be achieved by observing the frost or condensate on all return bends and opening the HEV until all return bends are evenly wetted or frosted. Alternatively, if the defrost relief regulator is connected to the liquid line and is equipped with a gauge, set the HEV to achieve a 5 PSI rise in pressure when the liquid solenoid valve is energized.

Flooded Feed

Verify that the liquid level is at the design level in the surge drum. Open and adjust the liquid feed HEV to allow for the solenoid to be energized approximately 70% of the time at design temperature difference (TD).

Direct Expansion Feed

After room temperature has been achieved, check the superheat, and adjust the thermal expansion valve. If the coil is being starved, resulting in too much superheat at the desired room temperature, reduce the superheat setting of the valve by turning the adjusting stem counter-clockwise. If there is not enough superheat, increase the setting by turning the adjusting stem clockwise. After waiting approximately 30 minutes, re-check the superheat and re-adjust the thermal expansion valve. Repeat until the unit operation is stable.

NOTE: Thermal expansion valves require a minimum of 10°F superheat to fully open the valve. It is recommended that the evaporator suction temperature be at least 11°F or 12°F lower than the room return air temperature. For direct expansion application that use electronic expansion valves different operational parameters may be acceptable. Refer to the electronic expansion valve manufacturer guidelines for more details.

Brine, Glycol or Water Feed

Vent the system, bleed off all air, and check for water hammer. Verify the feed solenoid valve or mixing valve function.

Hot Gas Defrost:

- Allow the unit to frost, then initiate the defrost cycle.
- Monitor the leaving air temperature. It should increase if the pump-out time is sufficient.
- Monitor the condensate flow. It should diminish to a trickle prior to hot gas termination. Check the bottom of the coil for residual ice or frost. Do not allow long hot gas times that cause coil steaming. If more than 15 minutes of hot gas is required, there may be system design problems.
- Monitor the bleed time. The pressure of the coil should be within 25 PSIG of suction pressure by the end of the bleed cycle.
- Monitor the fan delay. The free water on the coil should be frozen prior to the fans starting.
- Adjust the various function times as necessary.

Electric Defrost:

- Allow the unit to frost, then initiate the defrost cycle.
- Monitor the leaving air temperature. It should increase if the pump-out time is sufficient.
- Monitor the condensate flow. It should diminish to a trickle prior to heater termination. Check the bottom of the coil for residual ice or frost. Do not allow long heater on times that cause coil steaming.
- Verify the operation of the defrost termination thermostat and remove the start-up jumper, if used.
- Verify that all of the heaters are working by checking the amp draw.
- Monitor the fan delay. The free water on the coil should be frozen prior to the fans starting.
- Adjust the various function times as necessary.

Water Defrost:

- Allow the unit to frost, then initiate the defrost cycle.
- Monitor the leaving air temperature. It should increase if the pump-out time is sufficient.
- Monitor the water flow and check for even flow coverage, overflows or excessive splashing.
- Check the coil for any residual frost or ice.
- Monitor the fan delay. The free water on the coil should be frozen prior to the fans starting if the unit is in a freezer.
- Adjust the various function times as necessary.

Typical Operational Sequences

The following sequences of operation for various defrost methods are general in nature and are considered typical. They are published here for general reference They are not intended for use in all circumstances. **Refer to the certified submittals to determine the defrost method for a specific unit. Consult with a qualified refrigeration engineer to determine what sequence of operation is appropriate for your specific needs**.

No Defrost

Evaporators may be used with no defrost only where suction temperatures are at or above freezing. The following is the sequence of operation, beginning just as the room temperature rises to a temperature where cooling is required:

1. The thermostat opens the feed valve to allow refrigerant to flow to the coil.
2. After a prescribed delay, the fan motor energizes.
3. The room cools to a preset temperature where no cooling is required, so the thermostat stops flow to the coil.
4. The fans should continue to run for a prescribed time to clear liquid from the coil. Then the fans may or may not be de-energized, depending upon the chosen control scheme.

Air Defrost

Air defrost can be used where room temperatures are above 36°F while the suction temperature may be below 32°F. The following is the sequence of operation, beginning just prior to initiation of defrost:

1. Unit is in the cooling mode -- the thermostat has energized the liquid solenoid and the fan motors.
2. At a prescribed time of day, the timer closes the liquid solenoid and energizes the suction pressure regulator to a higher pressure corresponding to 47°F, if so equipped.
3. The fans continue to run, allowing the room air to defrost the coil.
4. After a prescribed time delay, the timer opens the liquid solenoid, resets the suction pressure regulator and cooling continues.

Hot Gas Defrost

Hot gas defrost connections are identified and located on the submittal drawings. In the case of hot gas defrost for the coil and the pan, a pan defrost coil and an insulated cover are affixed to the bottom of the drain pan.

For series-flow, or “three-pipe”, hot gas defrost of the coil and pan, the hot gas flows through the pan coil, then via Colmac-supplied interconnecting piping and check valve, into the cooling coil. For parallel-flow, or “two-pipe”, hot gas defrost of the coil and pan, Colmac interconnecting piping transports a portion of the defrost flow through the pan then back to join the coil defrost relief.

The following is the sequence of operation, beginning just prior to initiation of defrost:

1. Unit is in the cooling mode – the thermostat has energized the liquid solenoid and the fan motors.
2. At a prescribed time of day, the timer overrides the room thermostat and closes (de-energizes) the liquid solenoid valve, stopping refrigerant flow to the coil.
3. The fans continue to run for a prescribed time to clear liquid refrigerant from the coil, then the fans are de-energized.
4. The hot gas supply solenoid is energized to introduce hot gas to the unit, and, at the same time, the suction solenoid is de-energized. (Larger coils operating at low temperatures, may have a smaller pre-pressurization solenoid with a time delay prior to opening the main hot gas solenoid).
5. After a prescribed time delay of approximately 10-12 minutes, the hot gas supply solenoid is de-energized.
6. The bleed solenoid or defrost relief regulator is energized and given a prescribed length of time to bleed the coil pressure colmac k down to the suction pressure.
7. After a prescribed time, the room thermostat is again allowed to control the liquid solenoid and the fan motors, as cooling is required.

NOTE: Settings for time of day and time delays are set by the operator to suit specific unit requirements.

Electric Defrost

Electric defrost consists of a series of resistance heating elements that are inserted through the fin bank to heat the fins during the defrost mode. Units may also have an electric defrost pan which includes heating elements and an insulated pan cover to allow the defrost water to drain from the pan in freezing room temperatures. The following is the sequence of operation beginning just prior to initiation of defrost:

1. Unit is in the cooling mode - the room thermostat has energized the liquid solenoid and the fan motors.
2. At a prescribed time of day, the timer overrides the room thermostat and closes (de-energizes) the liquid solenoid valve, stopping refrigerant flow to the coil.
3. The fans continue to run for a prescribed time to clear liquid refrigerant from the coil, then the fans are de-energized.
4. The heaters are energized as the fans are stopped to defrost the coil.
5. Once the defrost thermostat senses a prescribed temperature, the heaters are de-energized.
6. The timer then energizes the liquid solenoid to introduce refrigerant and freeze water droplets that remain on the coil.
7. After a prescribed delay, the room thermostat is again allowed to control the liquid solenoid and the fan motors, as cooling is required.

NOTE: Settings for time of day and delays are set by the operator to suit specific site requirements.

Water Defrost

Water defrost systems heat the coil by introducing warm water to the coil through a series of distribution pans with flow orifices or through a low pressure spray system. Valves must be provided (by others) to limit the water supply pressure and balance the flow to prevent overflowing and splash-out. The following is a sequence of operation beginning just prior to initiation of defrost:

1. Unit is in the cooling mode - the room thermostat has energized the liquid solenoid and the fan motors.
2. At a prescribed time of day, the timer overrides the room thermostat and closes (de-energizes) the liquid solenoid valve, stopping the refrigerant flow to the coil.
3. The fans continue to run for a prescribed time to clear liquid refrigerant from the coil, then the fans are de-energized.
4. The water defrost supply solenoid is energized to defrost the coil for a prescribed period of time.
5. After the water supply solenoid is closed, there is a prescribed delay to allow water to drip from the coil.
6. The timer then energizes the liquid solenoid to introduce refrigerant and freeze water droplets that remain on the coil.
7. After a prescribed delay, the room thermostat is again allowed to control the liquid solenoid and the fan motors, as cooling is required.

NOTE: Settings for time of day and delays are set by the operator to suit specific unit requirements.

Maintenance Instructions

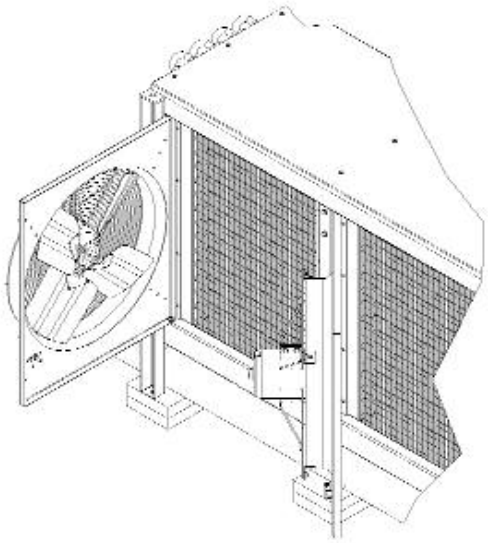
Routine Maintenance

Although there is limited routine maintenance required for Aircoil™ Evaporators, the units should be inspected periodically to ensure proper and efficient operation. Visually inspect the units and listen for any signs of mechanical wear. Note that the motors are totally enclosed, with sealed bearings that do not require re-greasing. Inspect the unit for debris or deposits, particularly on the air inlet face of the fins and the pan drain area, and clean using water with a suitably mild cleaning agent, as required. Check the frequency and duration of frost events and inspect the unit for ice-build-up at least monthly.

Cleaning

Note that equipment may be damaged by incompatible cleaning agents or water condensate from defrost that is contaminated by airborne impurities. **It is the responsibility of the owner/operator to be familiar with these chemicals and the room environment and to select compatible agents and materials of construction. Refer to the certified submittals for a listing of the materials used in the specific evaporator in question. Consult with a qualified chemical/corrosion expert to ensure compatibility and to develop a plan to address any special circumstances, such as airborne impurities.**

Hinged Fans
Facilitate Maintenance



Parts

Aircoil™ Evaporators have few parts subject to wear: primarily the motors, fans, and defrost heaters if so equipped. These parts have been selected to provide a service life of many years. Contact your local Colmac Representative to order any replacement parts that may be required. Please have the serial number of the unit in question available when ordering.

Long Term Shutdown

If an Aircoil™ Evaporator is to be shutdown for a period longer than one week, it should have the liquid refrigerant removed from the unit. **The isolation service valves should all be closed and tagged with technicians name, date and reason for unit shutdown. The electrical disconnect(s) for that unit's fan motors (and heaters) should be locked out and similarly tagged.**