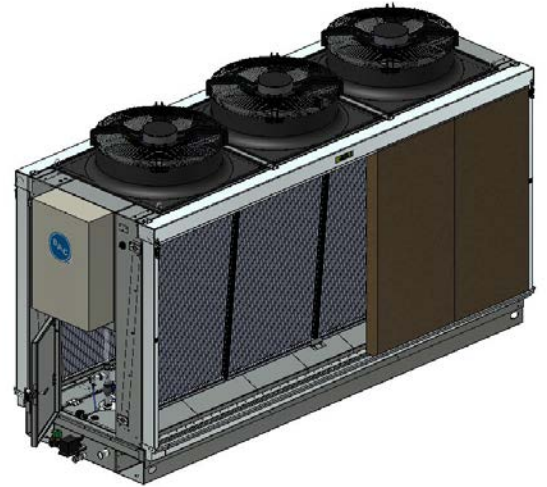




**BALTIMORE
AIRCOIL COMPANY**



TrilliumSeries™ Condenser

RIGGING, OPERATION & MAINTENANCE MANUAL





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RIGGING, OPERATION & MAINTENANCE » TRILLIUMSERIES™ CONDENSER

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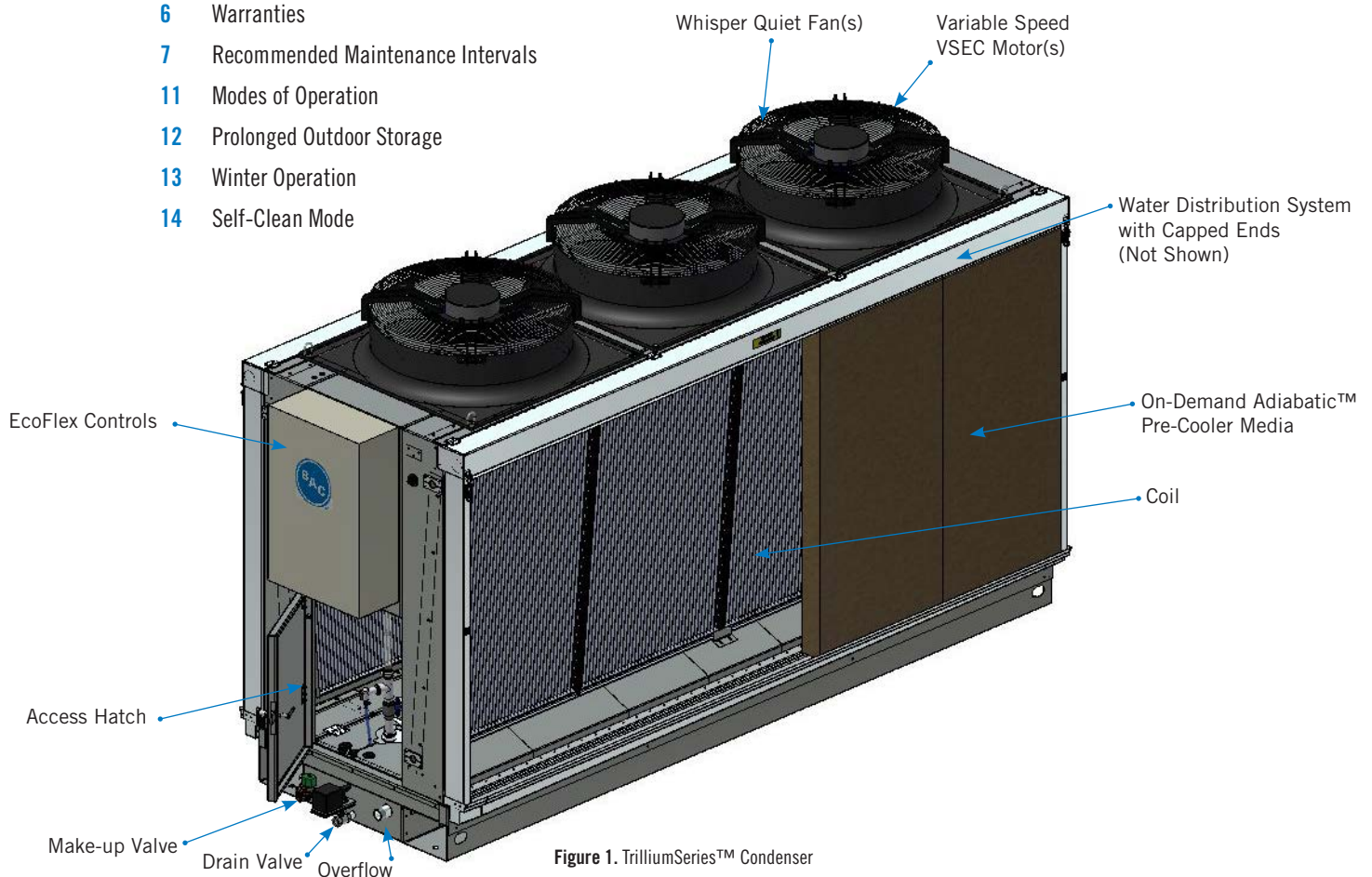


Figure 1. TrilliumSeries™ Condenser

Rigging

Safety

Adequate precautions appropriate for the installation and location of these products should be taken to safeguard the equipment and the premises from damage, and the public from possible injury. **The procedures listed in this manual must be thoroughly reviewed prior to rigging. Read all dangers, warnings, attentions, and notes detailed in the margins.**

Pre-Rigging Checks

When the unit is delivered to the jobsite, it should be checked thoroughly to ensure all required items have been received and are free of any shipping damage prior to signing the bill of lading.

The following parts should be inspected:

- | | |
|--|--|
| <input type="checkbox"/> Fan Motor(s) | <input type="checkbox"/> Sump and Drain Pans |
| <input type="checkbox"/> Fan Guard(s) | <input type="checkbox"/> Exterior Surfaces |
| <input type="checkbox"/> Fan(s) | <input type="checkbox"/> On-Demand Adiabatic™ Pre-Cooler Media |
| <input type="checkbox"/> Drain Valve | <input type="checkbox"/> EcoFlex Control Panel |
| <input type="checkbox"/> Make-up Valve | <input type="checkbox"/> Coil |
| <input type="checkbox"/> Water Distribution System | |
| <input type="checkbox"/> Pump | |

The TrilliumSeries™ Condenser coil is shipped charged with Nitrogen at 15 psi. Prior to installation, verify that the coil has maintained pressure by pressure gage to Shrader valve.



WARNING: Failure to use designated lifting points can result in a dropped load causing severe injury, death, and/or property damage. Lifts must be performed by qualified riggers following BAC published Rigging Instructions and generally accepted lifting practices. The use of supplemental safety slings may also be required if the lift circumstances warrant its use, as determined by the rigging contractor.



WARNING: Only personnel qualified to do so should undertake the installation, operation, maintenance and repair of this equipment. Proper care, procedures, and tools must be used in handling, lifting, installing, operating, maintaining, and repairing this equipment to prevent personal injury and/or property damage.

ATTENTION: Before an actual lift is undertaken, open the access hatch and check to ensure no water, snow, ice, or debris has collected in the sump or elsewhere in the unit. Such accumulations will substantially add to the equipment's lifting weight.



Unit Weights

Before rigging any unit, the weight should be verified from the unit submittal drawing.

Anchoring

Seven-eighths inch (7/8") diameter holes are provided in the bottom flange of the unit for bolting the unit to the support beams. Refer to the suggested support drawing included in the submittal for location and quantity of the mounting holes. **The unit must be level in both length and width directions for proper operation.** Anchor bolts must be provided by others.

Layout Guidelines

The TrilliumSeries™ Condenser must be located to ensure an adequate supply of fresh air to the coils. The axial fan(s) are not equipped to overcome external static pressure. When units are located adjacent to walls or in enclosures, care must be taken to ensure the discharge air is not deflected and recirculated back to the air intakes.

Each unit must be located and positioned to prevent the introduction of discharge air into the ventilation systems of the building on which the unit is located and of adjacent buildings. For detailed recommendations, see **Figure 2** and **Table 1**.

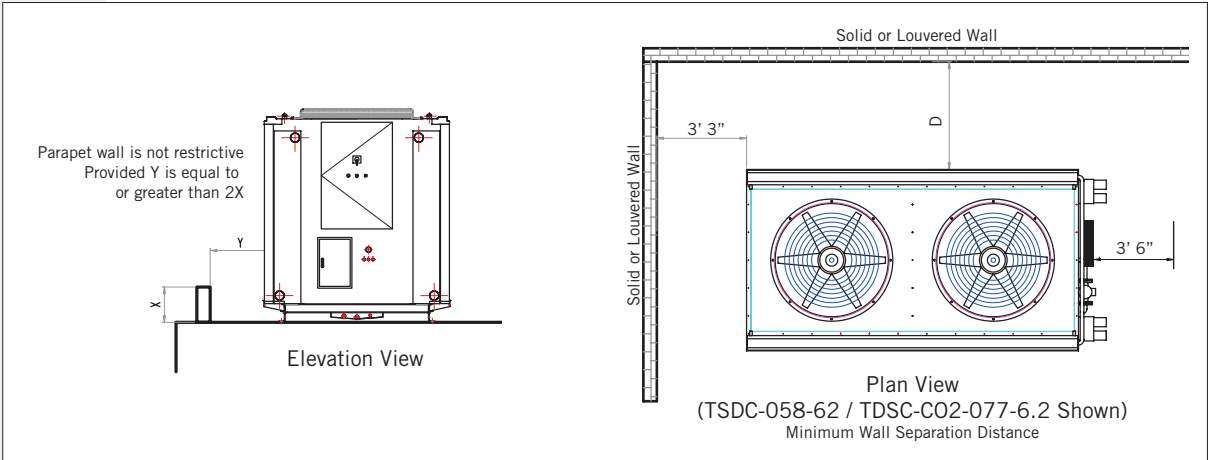


Figure 2. TrilliumSeries™ Condenser Location

Model Number	CO ₂ Model Number	D
TSDC-033-3	TSDC-C02-044-3	3'-6"
TSDC-058-6.2	TSDC-C02-077-6.2	4'-2"
TSDC-085-9.6	TSDC-C02-112-9.6	5'-0"
TSDC-116-12.4	TSDC-C02-152-12.4	5'-9"

Table 1. Minimum Wall Separation Distance

Rigging



Rigging

Pre-Rigging Checks

Unit Weights

Anchoring

Location

Rigging

Refer to **Table 2** and **Figure 3** for each unit's required minimum spreader bar length "W1" and the recommended minimum vertical dimension "H". Dimension "H" is the distance from the lift point to the lifting device.

Model Number	CO ₂ Model Number	Number of Fans	H	W1	W2
TSDC-033-3	TSDC-C02-044-3	1	2'-0"	3'-4"	1'-8"
TSDC-058-6.2	TSDC-C02-077-6.2	2	3'-1"	3'-4"	1'-8"
TSDC-085-9.6	TSDC-C02-112-9.6	3	5'-5"	3'-4"	1'-8"
TSDC-116-12.4	TSDC-C02-152-12.4	4	6'-6"	3'-4"	1'-8"

Table 2. Recommended Vertical Dimension

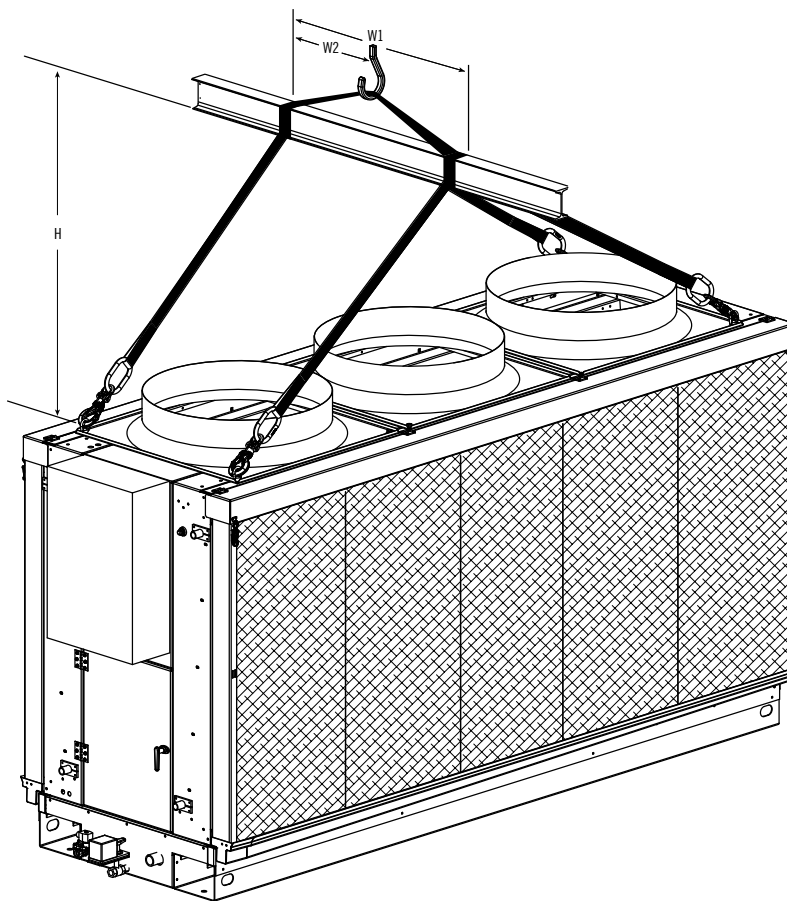


Figure 3. TrilliumSeries™ Condenser Lift (TSDC-085-9.6 / TSDC-C02-112-9.6 Shown)



NOTE: For weight information, refer to the submittal drawing package.



WARNING: Failure to use designated lifting points can result in a dropped load causing severe injury, death, and/or property damage. Lifts must be performed by qualified riggers following BAC published Rigging Instructions and generally accepted lifting practices. The use of supplemental safety slings may also be required if the lift circumstances warrant its use, as determined by the rigging contractor.

Wiring and Electrical Information

Below is the diagram showing customer power and control signal input connections.

NOTES:

1. Optional features.
2. Dashed line indicates customer field wiring.
3. For voltage information, refer to the submittal in the Customer Information Packet.
4. The unit should be wired according to local and national electric codes.
5. For a detailed wiring diagram, refer to the Customer Information Packet supplied with the unit.
6. For units purchased prior to April 2014, contact BAC for the previous generation manual.

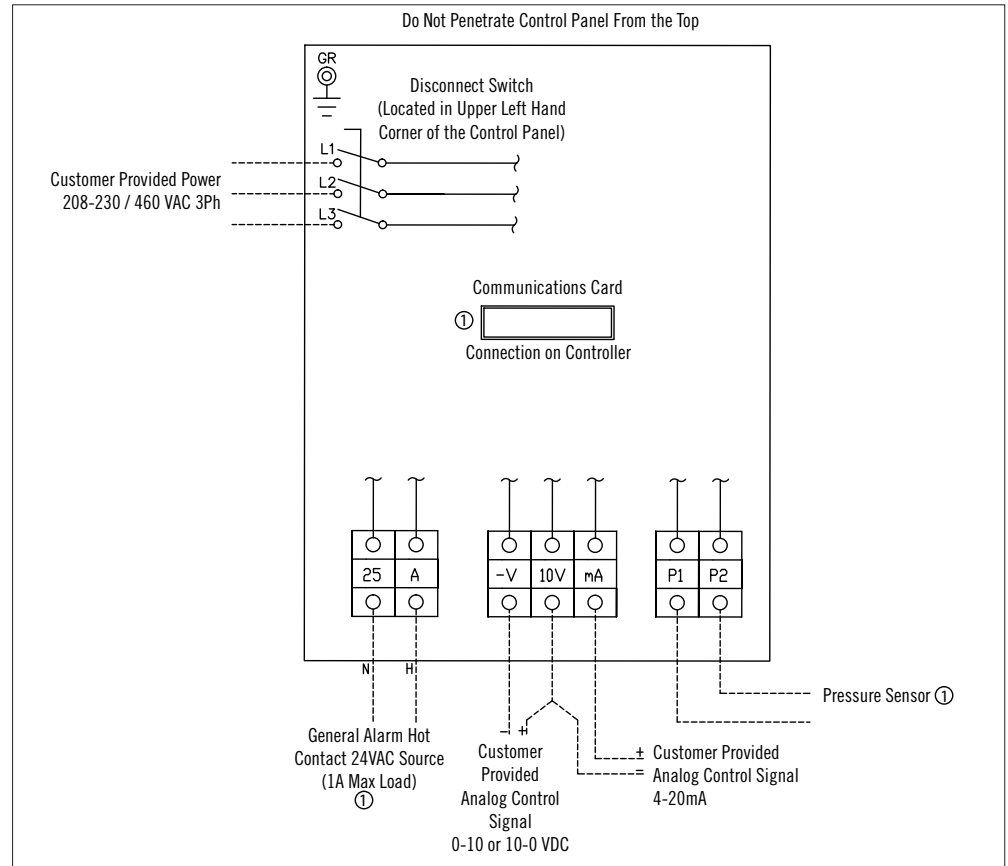


Figure 4. Control Panel - Wiring Connections (Dashed Lines Indicate Field Wiring)

NOTE:

FLA = Full Load Amps
MCA = Minimum Circuit Ampacity
MOP = Maximum Overcurrent Protection



Model Number	CO ₂ Model Number	FLA		MCA		MOP	
		200V	460V	200V	460V	200V	460V
TSDC-033-3	TSDC-C02-044-3	12.2	9.11	14	9	20	15
TSDC-058-6.2	TSDC-C02-077-6.2	21.9	15.7	23	16	30	20
TSDC-085-9.6	TSDC-C02-112-9.6	31.6	22.3	33	23	40	25
TSDC-116-12.4	TSDC-C02-152-12.4	41.3	28.9	43	29	50	35

Table 3. MCA and MOP Ratings (amps)

Power Connections

The TrilliumSeries™ Condenser requires a 3 phase 60Hz (50Hz also available) power source. The voltages available are 208V, 230V and 460V (380V and 415V also available). Please ensure that the correct voltage is supplied to the unit. If unsure check your unit's submittal to verify that the provided power matches your unit. BAC recommends penetrating the control panel on the left side using the proper sealing methods to comply with NEMA standards. This will maintain the panel's NEMA 4 rating and prevent water ingress to the unit.

Controls Connections

The controls wiring should be provided in a separate conduit from any power wiring. BAC recommends penetrating the control panel from the bottom or side panel observing NEMA standards. It is also recommended to use of shielded wire to avoid interference.

BAC offers the following options to control the TrilliumSeries™ Condenser:

- **Control signal (0-10VDC, 10-0VDC or 4-20mA):** The voltage signals should be wired to terminals -V (negative) and 10V (positive). The 4-20mA should be wired to terminals 10V and mA.
- **Communications via ModBus or BACnet:** BAC offers both protocols over RS485 and BAC NET over IP. For RS485 connection, BAC recommends the use of twisted shielded paired wire. The communications card will be located at the controller in port J8.
- **Head Pressure Control:** For units with this option BAC has already preset the controller to operate with the specified refrigerant. A pressure sensor will be furnished with the unit. This sensor must be installed in the inlet header of the coil on either side of the unit using a Schrader 7/16" 20 UNF valve (provided by others). The sensor must be wired to the controller directly to terminals P1 and P2. To program the temperature set point into the controller, scroll down on the screen until the refrigerant temp set point is shown, press enter and using the up/down arrows select the desired temperature and press enter.



Rigging

Wiring and Electrical Information

Power Connections

Controls Connections

Refrigerant Connection

The On-Demand Adiabatic™ Pre-Cooler Media represents the only potential flammable component of the TrilliumSeries™ Condenser. Remove the first two On-Demand Adiabatic™ Pre-Cooler Media shown in **Figure 1** on each side prior to brazing or welding the refrigerant piping.

ATTENTION:

1. Weld/braze the pipes with care, noting that the coil itself is aluminum.
2. When piping the refrigerant connections, take care not to block the door opening of the access hatch or control panel.

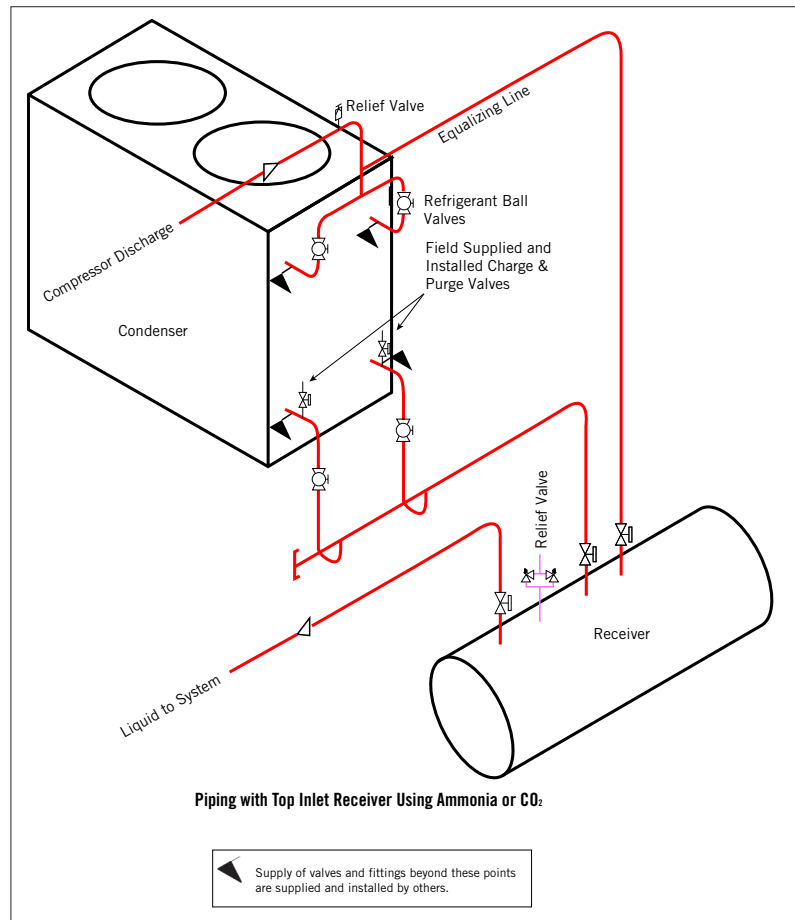


Figure 5. Refrigerant Connection

Ammonia Installation Instructions

If using ammonia, the following additions are recommended to ensure integrity and cleanliness of the microchannel coil:

- Discharge strainer (provided by others) on the discharge line from the compressor to the TrilliumSeries™, Condenser as close to the unit as possible. The strainer will catch weld slag and other system impurities during start-up. Suggested strainers are Danfoss FIA 50 with a 100 mesh strainer or finer.
- Filter dryer for the ammonia in the exiting liquid line, such as Parker C-40016-P replaceable core filter dryers or similar. This eliminates any moisture in the ammonia.
- Autopurger installed to eliminate any non-condensables.

Water Piping

The TrilliumSeries™ Condenser requires a water supply of no less than 35 psi in a ¾" pipe at the unit's inlet. This is critical for proper operation of the unit. Failure to meet these requirements will result in poor performance, lower capacity and possible damage to the pump. For units with the water monitoring option, a water regulator will be provided with the unit which will be shipped loose inside the basin. The regulator must be installed before the make up valve and must have a minimum of 2 feet of straight pipe before its inlet to avoid turbulence.

Customers in climates that reach below freezing temperatures should refer to **Page 13** for winter operation.

Discrete Spray Connection

The discrete spray connection offers a water by-pass connection in case of pump failure. The connection is made for a standard garden hose and is not designed to hold weight, such as attached piping. In case of pump failure, turn the pump valve to the horizontal (closed) position in order to isolate the pump and divert water flow.

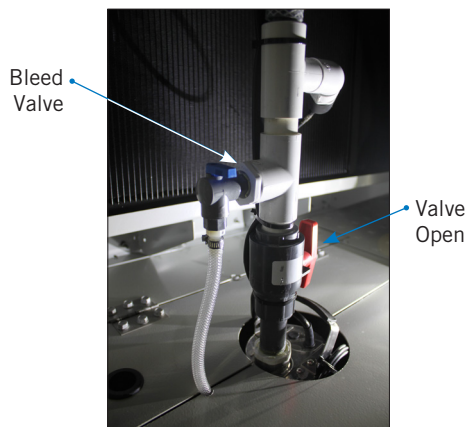


Figure 6a. Water Connection - Valve Open

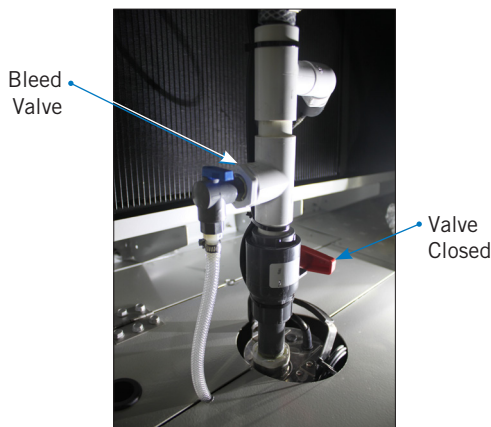


Figure 6a. Water Connection - Valve Closed

Start-Up

DANGER: Do not perform any service on or near the fans, motors, and drives, or inside the unit without first ensuring that the fans are disconnected, locked out, and tagged out.



General

- If the unit is mounted on vibration isolators or isolation rails (supplied by others), refer to the vibration isolation manufacturer's guidelines before loading/unloading weight from the unit.
- Verify fan and unit pump motor breakers are off, locked out, and tagged out.
- The unit must be level in both length and width directions for proper operation.

Cleaning

- Remove all dirt and debris from the fan guard(s).
- Inspect and clean the distribution system.
- Clean all of the mechanical components, such as the fan and motor.
- Flush the sump to remove any accumulated dirt and debris.
- Remove, clean, and replace the pump strainer.
- Clean the coil.
- Clean the On-Demand Adiabatic™ Pre-Cooler media.
- After installation, remove any steel shavings from inside the unit. This will prevent shavings from rusting onto the surface of the thermosetting hybrid polymer, which may affect the coating's integrity over extended time.

Inspection

- Conduct external inspection of the equipment. Check for leaks, corrosion, and any structural damage.
- Conduct internal inspection of the equipment. Check for anything unusual such as structural or mechanical component damage.
- Inspect the piping from the pump to the non-clogging distribution system and the make-up valve and drain valves.
- Thoroughly inspect the fan(s) for any mechanical or physical damage.
- Check that the float switch moves freely.
- Inspect the distribution system as described in "Water Distribution System" on **Page 15**.

Start-Up

- Before power has been provided to the unit, proceed to flip all the breakers to the ON position inside the control panel.
- Close the control panel and ensure that both locks have been fully engaged by rotating 90 degrees on each bolt.
- Remove any materials from the sump.
- Turn on breaker or other power supply that supplies power to the unit.
- Close the pump access door firmly.
- Flip the main disconnect switch to the ON position and press "fan reset" button.
- The TrilliumSeries™ Condenser will start momentarily.

NOTE: It is imperative that both bolts are fully engaged to maintain the control panel's NEMA 4 rating.



Unit Operation and Storage

2



Danger

- **DANGER:** Do not perform any service on or near the fans, motors, or inside the unit without first ensuring that the fans are disconnected, locked out, and tagged out.



Warning

- **WARNING:** The top horizontal surface of the unit is not intended to be used as a walking surface or working platform. If access to the top of the unit is desired, the purchaser/end-user is cautioned to use appropriate means complying with applicable safety standards of governmental authorities.
- **WARNING:** All electrical, mechanical, and rotating machinery are potential hazards, particularly for those not familiar with their design, construction, and operation. Accordingly, use appropriate lockout procedures. Adequate safeguards (including the use of protective enclosures where necessary) should be taken with this equipment both to safeguard the public from injury and to prevent damage to the equipment, its associated system, and the premises.
- **WARNING:** Incoming power lines to the disconnect switch remain energized. Take proper electrical precautions when working near energized equipment.



Attention

- Do not use steam or high pressure water to clean any component.
- Do not attempt to remove the On-Demand Adiabatic™ Pre-Cooler Media while wet to prevent excessive degradation.
- BAC units are typically installed immediately after shipment and many operate year round. However, if the unit is to be stored for a prolonged period of time either before or after installation, certain precautions should be observed.

Warranties

Please refer to the Limitation of Warranties in the submittal packet applicable to and in effect at the time of the sale/purchase of these products. Described in this manual are the recommended services for start-up, operation, and shutdown, and the approximate frequency of each. For generic terms and conditions, refer to www.baltimoreaircoil.com/terms.

✓ Recommended Maintenance Intervals^[1]

Inspect and clean as necessary:	Start-Up	Monthly	Quarterly	Semi Annually	Annually
Inspect general condition of the unit and check unit for unusual noises or vibrations	✓	✓			
Inspect sump	✓		✓		
Flush water distribution system	✓		✓		
Clean pump strainer	✓		✓		
Inspect On-Demand Adiabatic™ Pre-Cooler media	✓	✓			
Check operation of make-up valve and drain valve	✓		✓		
Inspect the optional pressure regulating valve				✓	
Check operation of pump	✓		✓		
Inspect coil	✓		✓		
Run Fan Reversal Start Self-Clean Mode			✓		
Inspect unit finish					✓
Inspect the optional conductivity sensor				✓	
Mechanical equipment system:	Start-Up	Monthly	Quarterly	Semi Annually	Annually
Check motor voltage and current	✓		✓		
Check general condition of the fan	✓		✓		



DANGER: Do not perform any service on or near the fans, motors, or inside the unit without first ensuring that the fans are disconnected, locked out, and tagged out.



NOTE:

1. Recommended service intervals are the minimum for typical installations. Different environmental conditions may dictate more frequent servicing.

Modes of Operation

Dry Mode

On Demand Adiabatic™
Pre-Cooler Mode

Dry Mode

When the ambient air is below the set point, the unit runs as a dry cooler to save water and energy. The ambient air condenses the refrigerant in the coils which is then returned to the system.

On-Demand Adiabatic™ Pre-Cooler Mode

When the unit is in On-Demand Adiabatic™ Pre-Cooler mode, water is evenly sprayed over the highly efficient On-Demand Adiabatic™ Pre-Cooler media. As the air passes through the media, water is evaporated in to the air, and the air is humidified, cooling temperatures down to 2-3°F above wet-bulb temperature. Such substantial depression of the dry bulb temperature results in a major increase in dry cooling capacity.

The cooler air passes over the coil and condenses the refrigerant in the coil which is then returned to the system. In the sump there is an industrial duty pump that recirculates the water. Part of the distributed water is evaporated, while the excess water assists in rinsing the On-Demand Adiabatic™ Pre-Cooler media. The EcoFlex Controls determine when the water is purged from the sump.



NOTE FOR FIGURES 7 AND 8:

1. For transcritical CO₂ operation, the coil operates with vapor in and vapor out. For subcritical CO₂ operation, the coil operates with liquid in and liquid out.

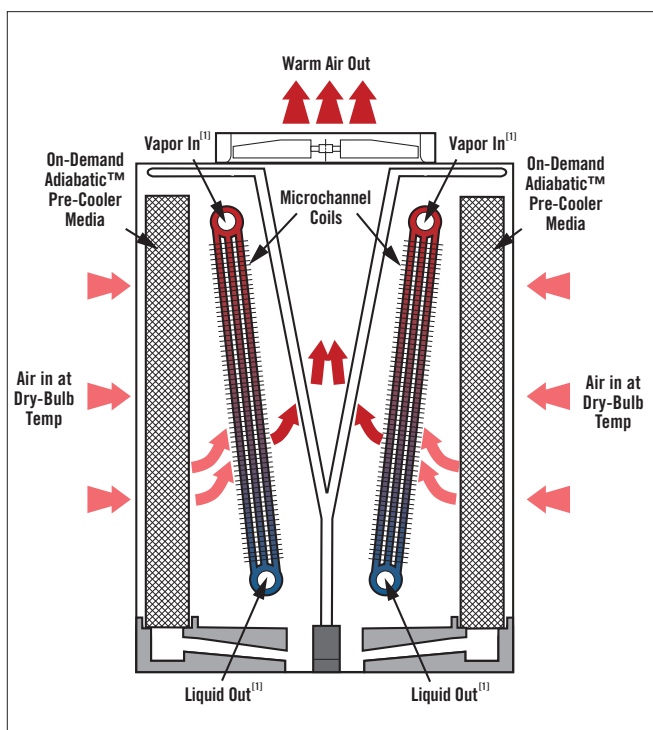


Figure 7. Dry Mode Operation

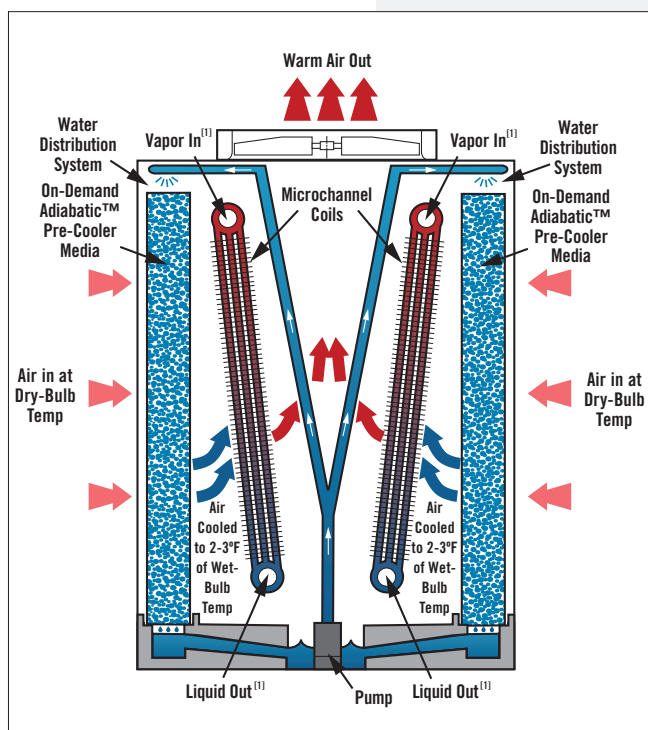


Figure 8. On-Demand Adiabatic™ Pre-Cooler Mode

On-Demand Adiabatic™ Pre-Cooler Operation Modes

There are three different ways to optimize unit operation. The unit's mode is part of the default controls menu. Once the menu is shown, press enter and select the desired mode of operation.

- **Standard Logic (Default):** The controller will start the Pre-Cooler Mode at a preset outside air temperature to increase the unit's capacity and efficiency.
- **Water Saver Logic:** The controller will optimize the unit's dry efficiency and only use water when the conditions require the extra cooling capacity. Pre-Cooler Mode will be initiated only when the outside air temperature is above the switch point **and** the fans are running at 90% or above for over 60 seconds. This mode will recheck conditions every two hours.
- **Energy Saver Logic:** The controller will optimize its sequence so that the least amount of energy is consumed to meet the present load of the unit. Pre-Cooler Mode will be initiated at 10°F below the switch point **and** if the fan speed is above 35%.

Prolonged Outdoor Storage

ATTENTION: BAC units are typically installed immediately after shipment and many operate year round. However, if the unit is to be stored for a prolonged period of time either before or after installation, certain precautions should be observed.



The TrilliumSeries™ Condenser is shipped fully shrink-wrapped. If the unit is going to remain in outdoor storage in excess of 3 months prior to installation, remove shrink-wrap and follow the storage recommendations below.

Storage Preparation

- Ensure the sump is fully drained.
- For extended shutdown periods after start-up, coils should be charged with nitrogen at 15 psig in the field and capped by adding a threaded connection or a welded cap. Upon start-up, the coil connections will require cutting.
- Insert desiccant bags into the EcoFlex Control panel to absorb moisture. Seal the control panel for storage.
- Inspect the protective finish on the unit. Clean as required.

Motor Recommendations

BAC standard motors are designed for storage at ambient temperatures of -20°F to 104°F (-28.9°C to 40°C). Prolonged periods of exposure above or below these specified conditions could degrade components of the motor and cause malfunction or premature failure.

- Care must also be taken to protect the motor from flooding or from harmful chemical vapors.
- The storage area should be free from ambient vibration. Excessive vibration can cause damage.
- Motors should be stored in a controlled environment.

Maintenance Requirements

- Rotate all fans by hand.
- Inspect the sump monthly to ensure that the drain valve is open and remove any leaves or debris that may have accumulated in the sump and drain pans.
- Inspect axial fans prior to start-up and at least once annually to ensure that the blades are tight and that there is no obvious corrosion between the hub and the fan blade. Do not energize the fans if there is obvious corrosion of fan components. Loose fan blades could result in fan failure and possible injury or damage.

Start-Up Preparation After Prolonged Storage

Keep in mind that start-up procedures after long periods of storage are just as important as pre-shutdown procedures.

- For units stored prior to installation, conduct rigging procedures as directed in the unit's "Rigging" instructions on **Page 3**.
- Perform an insulation test of motor windings to ensure satisfactory insulation resistance.
- Conduct full start-up procedure as stated in "Start-Up" on **Page 8**. Be especially thorough for cleaning and inspection prior to start-up.

Winter Operation

When the unit is in dry mode, the unit completely drains with no standing water. During winter operation, the EcoFlex Controls automatically disables Pre-Cool Mode when ambient temperature is below 40°F (4.4°C). Turn off the water to the unit and drain all exposed external piping, including pump piping, when below freezing temperatures are expected.

- Customers in climates that reach below freezing temperatures should take necessary precaution to protect the water pipes from freezing. This may include heat tracing all exposed make-up water lines and/or installing a valve to prevent standing water in the pipes, provided by others.

Self-Clean Mode

The Self Clean menu is part of the default controls menu. To access it, scroll down using the arrows on the screen. Once the menu is shown, press enter and turn on/off each feature as needed.

- **Auto Clean:** To help eliminate excessive springtime debris buildup, enable the Auto Clean mode in the control panel. This mode will force the unit into Precool Mode for once a day for 1 hour at 4 am between the months of February to April providing the outside air temperature is above 40°F. If the unit is already in Pre-Cool Mode, then nothing changes.
- **Fan Reversal Start:** After removing the On-Demand Adiabatic™ Pre-Cooler media, start the fan reverse flow sequence. This feature will allow the fans to spin in reverse for 5 minutes. This will push air to the outside to eliminate surface debris, such as pollen or dust.



Unit Operation and Storage

Modes of Operation

On Demand Adiabatic™
Pre-Cooler Mode

Prolonged Outdoor Storage

Storage Preparation
Motor Recommendations
Maintenance Requirements
Start-Up Preparation After
Prolonged Storage

Winter Operation

Self-Clean Mode



DANGER: Do not perform any service on or near the fans, motors and drives, or inside the unit without first ensuring that the fans and pumps are disconnected, locked out and tagged out.

Detailed Maintenance Procedures

Fan and Motor

The TrilliumSeries™ Condenser uses axial fan(s) with variable speed electronically commutated motors. Thoroughly inspect the fan(s) for damaged or deteriorated fan blades and replace the fan(s) as required.

DANGER: Do not perform any service on or near the fans, motors or inside the unit without first ensuring that the fans are disconnected, locked out, and tagged out.



Inspection & Maintenance

- If the unit is already in operation, while the fan is running, check for any unusual noises or vibrations.
- With the fan off and the control panel disconnect switch turned off, the power disconnected, locked out, and tagged out, check the general condition of the fan:
 - Check the fan blades for looseness, first by twisting the blade by hand, and then by moving the blade tip up and down. There should be no play or slippage.
 - Check each blade in the area of the shank for any signs of cracking. If cracking is found, the fan motor should be locked out immediately. Contact your local BAC Representative for assistance.
- **Lubrication:** The fans are provided with sealed bearings. Lubrication is not required.

Coil

The standard coil is a coated aluminum microchannel coil with either copper or black steel connections. The CO₂ coil is copper-aluminum tube and fin for high pressure operation.

- To inspect the coil, the On-Demand Adiabatic™ Pre-Cooler media must be removed and the unit must be operating in dry mode. It is recommended to perform coil maintenance when the media is dried, as they are easier to remove than when they are wet. The coil should be inspected quarterly.
- Inspect the coil surface. Any corrosion, damage, or obstructions must be corrected.
- Run Fan Reversal Start Self-Clean Mode quarterly. This allows the fans to run in reverse for 5 minutes to push air to the outside to eliminate surface debris, such as pollen or dust. To enable Self-Clean Mode, refer to **Page 13**.

- To manually clean the coils, use a standard garden hose. Never use a brush or high-pressure water hose. First, rinse the outside surface dust and dirt into the drain pans and the basin. Continue to rinse until the water easily flows to the inside of the unit and into the sump basin. The sump and drain pans should be cleaned immediately after cleaning the coil to avoid clogging the pump and drain valves.



Detailed Maintenance Procedures

Fan and Motor

Coil

Sump and Drain Pan

Water Distribution System

Sump and Drain Pan

The sump and drain pan are constructed from welded Type 304 stainless steel and require the following maintenance.

- Check the operating water level annually.

Inspection & Maintenance

- Inspect the sump and drain pans regularly. Remove trash or debris that may have accumulated in the sump or on the strainer.
- Quarterly, or more often if necessary, drain, clean, and flush the sump and drain pans with fresh water using a standard garden hose. This will remove the sediment, which can collect in the sump and drain pans during operation. If not removed, sediment can become corrosive and cause deterioration of the protective finish of metallic basins.
 - Remove the strainer and pump when flushing the sump. Clean the basin strainer and strainer on the outside of the pump.

Water Distribution System

To inspect the water distribution system, unlatch the quick release clasps and lift spray branch covers.

Water is distributed through a corrosion resistant polyvinyl chloride (PVC) spray distribution system.

The inspection procedure is as follows:

- Make sure the unit is operating in On-Demand Adiabatic™ Pre-Cooler mode. If the unit is operating in dry mode, force the unit into the correct mode by placing a hand over the temperature sensor at the bottom of the control panel or temporarily lower the switchpoint until the make-up valve opens.
- Check to see if the distribution is spraying consistently.
- Clean any holes which are clogged. If additional cleaning is necessary both ends of the distribution header can be removed for cleaning by carefully unscrewing the ends.
- Open the access hatch and verify there are no leaks in the water distribution system.
- If leaks are found, disconnect, lock-out and tag-out the unit before entering the unit to correct the issue.
- After closing the access hatch, reset the fans by pushing the fan safety reset button on the control panel door.



DANGER: Do not perform any service on or near the fans, motors, and drives, or inside the unit without first ensuring that the fans are disconnected, locked out, and tagged out.



ATTENTION: Do not use steam or high pressure water to clean any component.

On-Demand Adiabatic™ Pre-Cooler

Airborne debris is caught on the On-Demand Adiabatic™ Pre-Cooler media which acts as an air filter and as such protects the coil from fouling, An inspection is recommended monthly and should focus on:

- Signs of excessive fouling and scaling of the On-Demand Adiabatic™ Pre-Cooler media
- Full and even wetting of the face area (when in On-Demand Adiabatic™ Pre-Cooler mode)

Scaling and Fouling

If excessive dust, debris, scale, etc has accumulated on the On-Demand Adiabatic™ Pre-Cooler media, it is recommended to rinse the media by removing them from the unit and using a standard garden hose at a downward angle. Continue rinsing until water flows freely to the other side. Never use a brush or a high-pressure hose for cleaning off the media.

Scale may deposit when the On-Demand Adiabatic™ Pre-Cooler media dries at the end of each adiabatic cycle. The rate of scaling will depend on:

- The number of adiabatic starts and stops
- The water quality
 - If poor water quality causes excessive scaling, Also, increase the bleed time at the controller. If that does not solve the issue, throttle open the bleed line valve at the discharge of the pump to reduce accumulation on the On-Demand Adiabatic™ Pre-Cooler media.
- The air quality

ATTENTION: Do not attempt to remove the On-Demand Adiabatic™ Pre-Cooler Media while wet to prevent excessive degradation.



Water Treatment



Detailed Maintenance Procedures

The automatic draining of the On-Demand Adiabatic™ Pre-Cooler, sump and drain pans every 24 hours ensures that the possible risks of significant microbiological contamination within the system are reduced to a negligible level.

Because the TrilliumSeries™ does not require water treatment, the unit sewer water may be used for non-potable water use, such as irrigation. Refer to local rules and regulations for further information on allowed water sources.

The On-Demand Adiabatic™ Pre-Cooler media has been treated with an algacide to minimize the potential for algae growth. In cases where excessive fouling is observed and is suspected to be interfering with the airflow, the media should be cleaned and/or changed more frequently.

In areas where hard water exists utilizing a good quality water softener could significantly extend the life of the On-Demand Adiabatic™ Pre-Cooler media.

To further optimize water use, consider ordering the Water Package from your BAC Representative or enabling Water Saver Logic.

On-Demand Adiabatic™ Pre-Cooler

Scaling and Fouling

Water Treatment

Materials of Construction

Materials of Construction

BAC products are constructed of corrosion-resistant materials. Other materials listed below are used in the equipment construction:

- **Thermosetting Hybrid Polymer Components:** Galvanized steel components protected with the thermosetting hybrid polymer can be scratched, scraped, or blemished. To touch up these areas use a repair kit (BAC Part # 16-133P) available from your local BAC Representative.
- **Stainless Steel Components:** Inspect stainless steel components for signs of blemishes or corrosion. It is fairly simple to clean most contaminants off the surface of stainless steel. Most dirt and soil can be cleaned with a clean cloth, warm water and a mild detergent.
- **Coated Microchannel:** Inspect coil coating. To touch up blemished areas, use a Red Epoxy Repair Kit. Do not use sharp or pointed objects, including screwdrivers and similar, near the coil or to realign microchannel fins.

EcoFlex Controls

NOTE: For units purchased prior to April 2014, contact BAC for the previous generation manual..



The TrilliumSeries™ Condenser is furnished standard with state of the art controls that provide efficient year round performance. Each unit is shipped with custom controls logic that reduces energy consumption and optimizes water usage. With preset controls, the system is programmed and ready to operate upon arrival from the factory.

Below are optional controls packages available at time of ordering.

- **General Alarm:** The TrilliumSeries™ Condenser provides a normally open, digital output contact that notifies of any trouble with the unit by closing its contact. These contacts will alarm when any moving part of the unit fails or when the access hatch is open. This alarm provides a 24VAC output with a maximum capacity of 1 Amp for both resistive and inductive loads.
- **Water Package:** The TrilliumSeries™ Condenser can be ordered with a sensor that monitors the water quality so that water is bled out only when needed. This package also comes with a water consumption meter that can be set at defined intervals of time (up to 2 months).
- **Energy Package:** The TrilliumSeries™ Condenser can be ordered with a sensor that monitors the amount of power consumed by the unit in Watts. The information will be displayed in the main screen and will be broken down per fan. Also, other information will be provided regarding the fans including motor temperature, RPM, and current drawn. The last screen will provide a total power consumption value of the whole unit.
- **Communications Package:** The TrilliumSeries™ Condenser can be ordered with a communications card, either BACnet or ModBus over BACnetIP or RS485. This option allows full control of the unit and the ability to monitor alarms.
- **Head Pressure Control Package:** The TrilliumSeries™ Condenser will be capable of regulating the fan speed by monitoring the refrigerant inlet pressure. This option will use a pressure sensor that will be furnished by BAC but installed by others in the field.

For information on On-Demand Adiabatic™ Pre-Cooler Operation Modes, refer to **Page 12**.

Customer Electrical Connections

- Customer connection of 3 phase power and earth/ground is within the isolator/disconnect. Ensure correct voltage is supplied to the unit. Refer the submittal in the Customer Information Packet for this information.
- The connection of the above items will allow the TrilliumSeries™ Condenser to operate as specified. Please see the following sections for further details and see “Wiring and Electrical Information” on **Page 4**.

On-Demand Adiabatic™ Pre-Cooler Mode Activation

- During dry mode, the drain valve remains open, while the makeup valve remains closed. During On-Demand Adiabatic™ Pre-Cooler mode, the drain closes, while the makeup valve opens and closes to maintain water level. Both valves operate on 24 VAC.
- The sump mounted float switch controls the water level in the sump.
- The pump is energized by the controller once the water level has reached normal operating level.
- The On-Demand Adiabatic™ Pre-Cooler mode is turned off if the ambient temperature drops below the set point.

On-Demand Adiabatic™ Pre-Cooler Mode Operation

- The EcoFlex Control panel is pre-wired to control all On-Demand Adiabatic™ Pre-Cooler mode components (pump, make-up, drain valves, and the float switch).
- EcoFlex Controls eliminates the need for water treatment and maintains a clean sump by periodically opening the drain and makeup valves simultaneously.
- The controller time clock is pre-set to stop On-Demand Adiabatic™ Pre-Cooler mode between 5-5:15 am to drain the water distribution system and clean-out the sump.
- To further optimize water use, consider ordering the Water Package from your BAC Representative or enabling Water Saver Logic.

EcoFlex Control Features

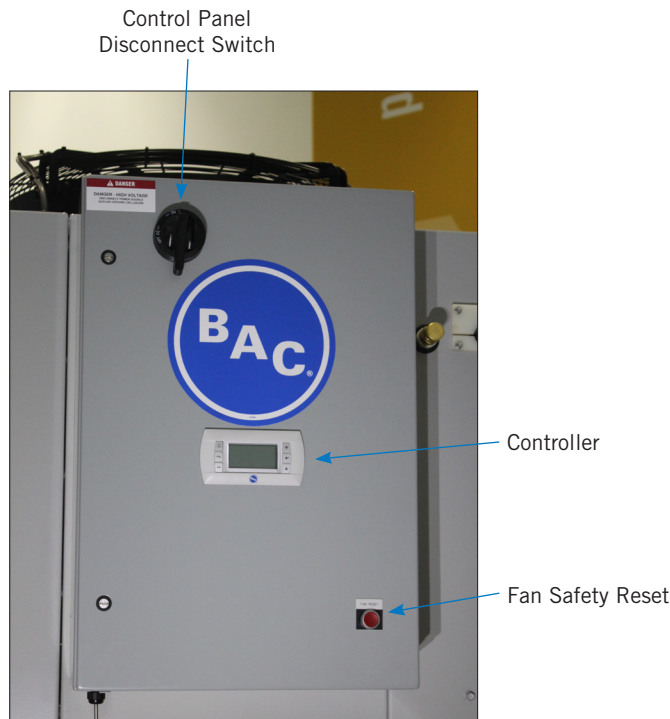


Figure 9. EcoFlex Controls Panel

- **Control Panel Disconnect Switch:** De-energizes the entire unit and control panel and unlocks the control panel door. Note power still enters the control panel, even if the disconnect switch has been turned.
- **Fan Speed Control**
 - **Customer Signal Control:** Fan speed control provided by 0 – 10V, 10 – 0V, or 4 – 20mA control signal. The fan speed control is supplied by others.
 - **Communication Control:** Fan speed control provided by either BACnet or ModBus over Ethernet or RS485 and requires the Communication Package be ordered. The fan speed control is supplied by others.
 - **Head Pressure Control:** Fan speed control provided by monitoring the inlet refrigerant pressure and requires the Head Pressure Control Package be ordered.
- **Fan Safety Reset:** When the unit's access hatch is opened, a safety door switch trips and the fans are de-energized. To restart the fans the hatch must be closed and the reset button must be pressed.



Detailed Maintenance Procedures

EcoFlex Controls

Customer Electrical Connections

On-Demand Adiabatic™ Pre-Cooler Mode Activation

On-Demand Adiabatic™ Pre-Cooler Mode Operation

EcoFlex Controls Features



WARNING: Incoming power lines to the disconnect switch remain energized. Take proper electrical precautions when working near energized equipment.

Setting Date and Time

The date and time are preset from the factory and don't need modification during the initial startup and operation of the unit. However, if the unit is in storage for an extended time the date and time may need to be updated. To update these parameters, follow these steps from the control panel screen:

- Press Prg.
- Scroll up/down and select Technician, then press enter.
- Scroll up/down and select Clock, then press enter.
- While in the Clock menu press enter to begin making changes, use the up/down arrow to set the correct time and date, then press enter to accept the changes.

Commandable Values

The commandable values menu is part of the default customer menu. To access it, scroll down using the arrows on the screen. Once the menu is shown, press enter and begin adjusting.

- **OA Temp Setpt:** Is the temperature at which the Precool Mode is initiated. The Setting range is from 40°F (4.4°C) up to 120°F (48.9°C). BAC presets all the units according to weather data for each region and it's optimized for your location.
- **Force Precool:** This function allows the customer to force the unit into Precool mode. BAC recommends using this feature only if the temperature sensor has failed or for testing purposes.
- **Daily Drain:** This function allows the customer to change the time of the longer daily drain of the unit. BAC has it preset at 6am. On systems with multiple TrilliumSeries™ Condensers, it is advisable to adjust the time so all the units do not drain at the same time.
- **Conductivity:** On units equipped with this option, the customer has the ability to turn on/off the sensor.

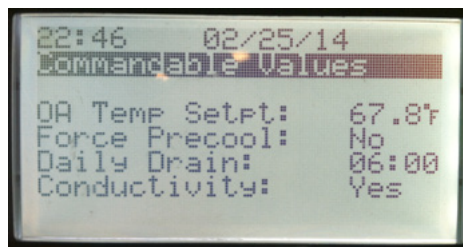


Figure 10. Pressure Regulating Valve

Software Verification for a pCO Controller

If a BAC Factory Technician is troubleshooting the controller/program over the phone, they may ask for the software version. To provide them with the information, follow these steps from the control panel screen:

- Press Prg.
- Scroll up/down and select Technician, then press enter.
- Scroll up/down and select Information, then press enter.
- The Version of the software will be displayed along with other information, the current Version of the software is **Ver: 1.00BA**.

Setting the Parameters for the Water Monitoring Option

The TrilliumSeries™ Condenser can be ordered with a sensor that monitors the water quality so that water is bled out only when needed. This package also comes with a water consumption meter that can be set defined intervals of time. Please use the following procedure to set those intervals. This option monitors the amount of purged from the Condenser given the following conditions:

- The pressure regulating valve provided by BAC is properly field installed and set to 20 psi.
- The pressure of the incoming water is 35 psi or greater on a ¾" pipe.
- There are no interruptions of water delivery when the unit is on Precool Mode.
- The controller is properly set up .
- The Pressure Regulating valve is properly maintained and tested biyearly.

This water meter will automatically measure the amount of water that passes through the makeup valve in Gallons and monitor it during specified periods of time. The meter has an accuracy of +/- 5%.

Installation of the Pressure Regulating Valve

The valve must be installed on straight rigid pipe 15" (38cm) from the makeup valve, refer to the diagram below for more information.

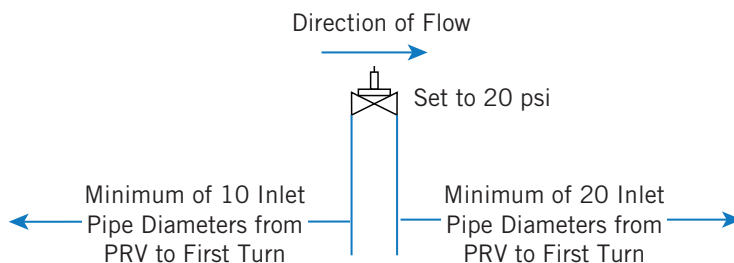


Figure 11. Pressure Regulating Valve

Water Meter Set Up

When the unit is started up for the first time, the start and finish dates will be 00/00 and 0:00.

- The first two numbers are the Month/Day, if for instance the counter wanted to be used from April 19th until May 7th the start should read 04/19 and the finish date should read 05/07.
- The timer is start/finish in hours and minutes in 24hr format, so for instance the counter starts at 6:00 AM and finishes at 4:30 PM, the monitor is set to Start 6:00 and Finish 16:30.

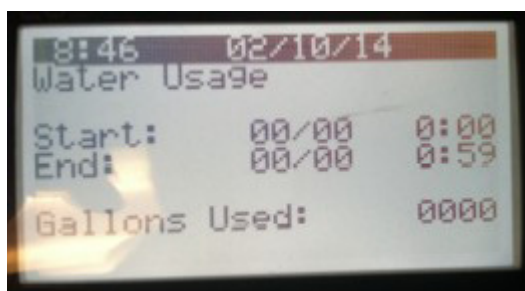


Figure 12. Water Meter Set Up



Detailed Maintenance Procedures

EcoFlex Controls

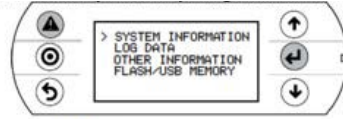
- Setting Date and Time
- Software Verification for a pCO Controller
- Setting the Parameters for the Water Monitoring Option
- Installation of the Pressure Regulating Valve
- Water Meter Set Up
- Retrieval of Logged Data

Retrieval of Logged Data

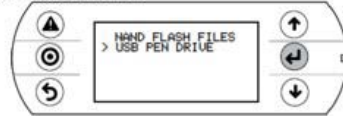
When ordered, the energy usage can be retrieved from the Datalog files using the following procedure. A USB flash drive is provided in the Customer Information Packet when this option is ordered.

1. Plug the USB flash drive into the pCO controller and follow the steps shown below.
2. When the download is finished remove the USB flash drive and connect to a PC.

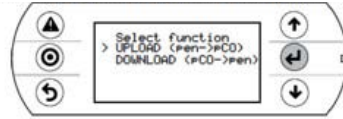
a. Enter in the system masks pressing Alarm+Enter for a few seconds.



b. Select USB Pen drive.



c. Select Flash/USB Memory then download (pCP -> pen).



d. Select download logs.

3. A folder was created CPY00_01 the LOGS.DWL file is the log file that needs to be converted by pCO Manager software.
4. Install the pCO Manager software in the computer to be used for the data conversion. This software is included with the USB flashdrive. It can also be downloaded from www.baltimoreaircoil.com.
5. Start the pCO Manager software and click on the LogEditor module icon.

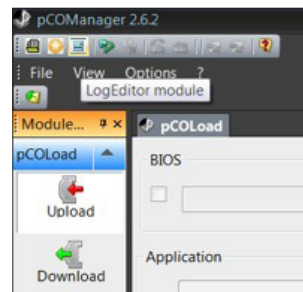


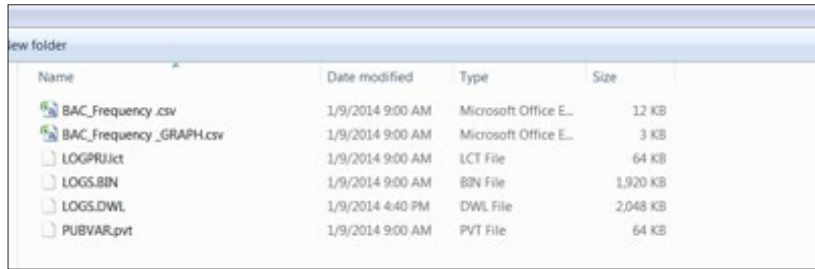
Figure 13. LogEditor Module

6. Click on USB log.
7. Using the browse button select the file LOGS.DWL contained in the USB flash drive.



Figure 14. USB Log

- After the data is successfully converted, go to the USB flash drive's directory and open the LOG00_01 folder, the datalog information will be contained in the BAC_Frequency.csv file.



Name	Date modified	Type	Size
BAC_Frequency.csv	1/9/2014 9:00 AM	Microsoft Office E...	12 KB
BAC_Frequency_GRAPH.csv	1/9/2014 9:00 AM	Microsoft Office E...	3 KB
LOGPRU.ict	1/9/2014 9:00 AM	ICT File	64 KB
LOGS.BIN	1/9/2014 9:00 AM	BIN File	1,920 KB
LOGS.DWL	1/9/2014 4:40 PM	DWL File	2,048 KB
PUBVAR.pvt	1/9/2014 9:00 AM	PVT File	64 KB

Figure 15. Datalog Information in BAC_Frequency.csv File



Detailed Maintenance Procedures

EcoFlex Controls

Retrieval of Logged Data

4

TRILLIUMSERIES™ CONDENSER

Troubleshooting Guide

Problem	Possible Cause	Solution
Fan Does Not Run	No Power to the Fans	Cycle power on/off the unit.
		Confirm that power is applied to the unit at the main disconnect.
		Confirm that power is applied to each fan by checking terminals xT1, xT2, xT3 & xT4.
		Check all terminals for tightness.
		Check power wires at fan's housing.
		Check all terminals at Modbus module for tightness.
		Ensure that Pump Access door is shut and fan reset button is not lit. If lit press reset button.
	Fan Internal Fault	Check the LED light on top of the fan for fault codes, refer to section 7.2 of Assembly Instructions ECblue Basic Version UL at www.ziehl-abegg.com for more details..
Fan Spins Backwards	Fan is Off/Faulty	Check with a meter the control voltage at terminals -V, 10V or mA depending on control signal.
		Ensure a fan speed control signal is being sent to the unit.
		Turn the unit off. Allow all fans to stop completely. Check all breakers and power connections. Restart the unit and ensure all fans are operational.
Fan Does Not Respond to the Control Signal	Communications Fault	Ensure the communications cable is connected to the controller on port J8.
		Ensure the communications cable is not cut or damaged.
		Ensure the communications cable is properly connected at the fan's motors.
No Water Spray or Pump Does Not Run or Precool Mode Doesn't Work	Incorrect Setpoint	Check the precool setpoint on the controller, see Page 20 . The pump will not run if the outside air temperature is below 40°F (4.4°C). Precool Mode will be initiated only when outside air temperatures are above the set point.
	No Water Supply	Ensure water is being supplied to the make up valve (green valve on the left).
		If there is a faulty make up valve, contact your local BAC Representative for a replacement.
		To check for a faulty sump float, manually raise and lower the float to ensure functionality.
	Faulty Pump	Ensure the pump is receiving 120V by checking terminals 2&3 at the bottom left corner of the control panel. For the pump to be energized, the sump needs to be filled with water and the unit must be in Precool mode.
		To check for a faulty drain valve, ensure the valve closes completely when unit is in precool mode.
	Clogged Pump Strainer	Clean the pump strainer quarterly.
	Spray System Fault	Ensure that the pump's isolation valve is on the open position.
		Check for kinks or damage to the internal hoses.

Problem	Possible Causes	Checks/Solutions
Uneven Spray or Dry Sections on On-Demand Adiabatic™ Pre-Cooler Media	Water Distribution System Clogged	Clean the spray branches by opening both ends of the distribution header. Then clean the water distribution system. See Page 15 for more details.
		If the water spray system does not work, connect a garden hose to the discrete spray system and close the pump isolation valve. See Page 7 for more details.
Low Performance	Lack of Maintenance	Inspect the On-Demand Adiabatic™ Pre-Cooler media monthly and replace as needed. The coils should be inspected quarterly and cleaned as needed. See Page 13 for more details on “Self Clean Mode”.
	Precool Mode Not Working	Refer to troubleshooting for Precool Mode on Page 24 .
Scale Formation on On-Demand Adiabatic™ Pre-Cooler Media	Hard Water	Increase the duration of the daily drain time. See Page 20 for more details.
	Faulty Drain Valve	Ensure the drain valve opens and closes 100%. Otherwise, contact your local BAC Representative for a replacement.
Excessive Wear on On-Demand Adiabatic™ Pre-Cooler Media	After Few Years, Media Needs to be Replaced	On-Demand Adiabatic™ Pre-Cooler media should be replaced. Contact your local BAC Representative.

COOLING TOWERS

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