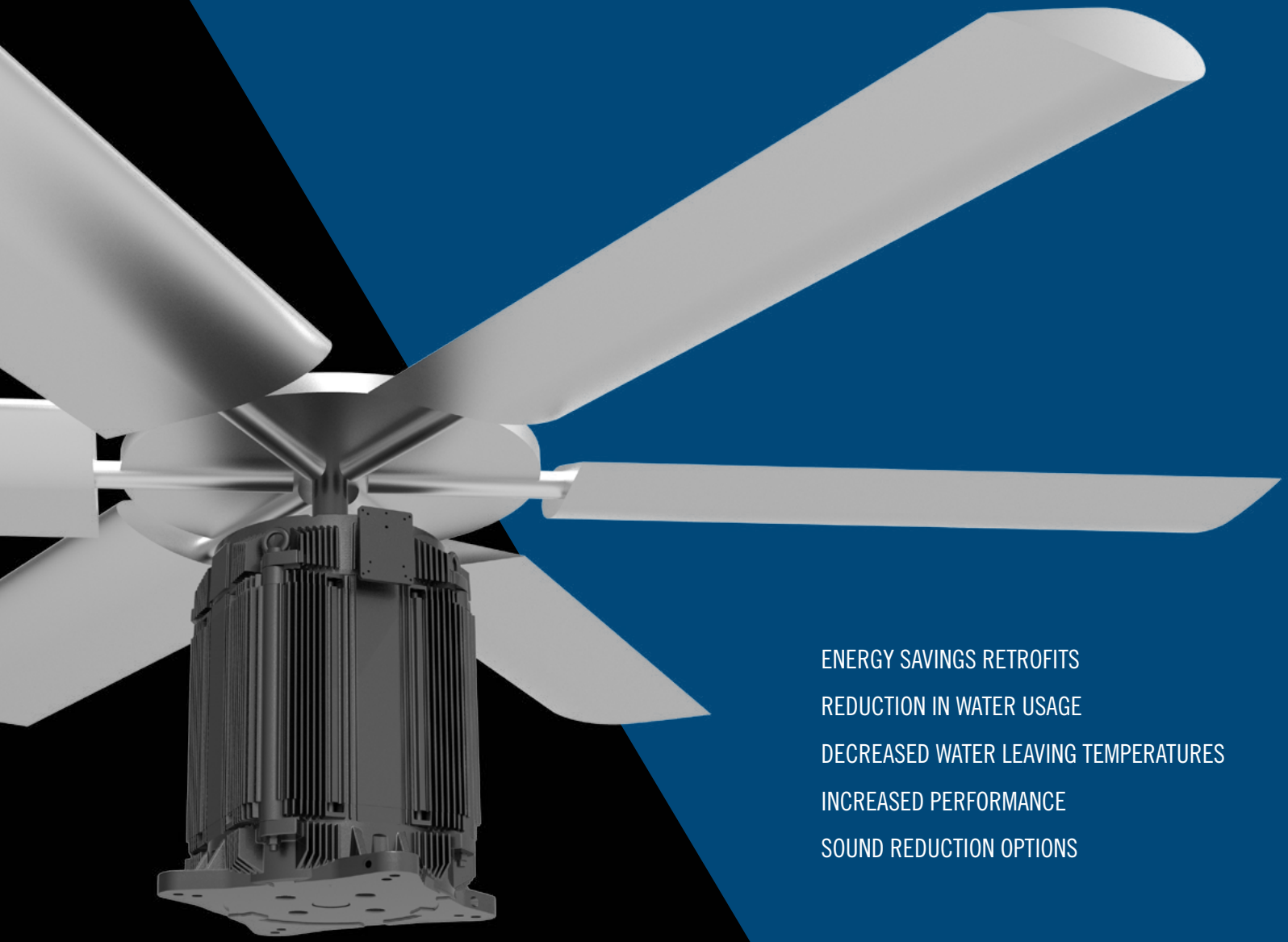




PARTS & MAINTENANCE GUIDE



ENERGY SAVINGS RETROFITS
REDUCTION IN WATER USAGE
DECREASED WATER LEAVING TEMPERATURES
INCREASED PERFORMANCE
SOUND REDUCTION OPTIONS



BALTIMORE AIRCOIL COMPANY

Welcome to the BAC Parts & Maintenance Guide. We are pleased to provide you with a combination of parts, maintenance reference materials, and technical information for use on all your evaporative cooling products. We are committed to keeping all of your equipment running at peak performance through the life of the unit by providing you with energy efficient solutions and the most reliable parts in the industry.

this guide contains:

COMPLETE PART DESCRIPTIONS

LARGE PRODUCT PHOTOS

MAINTENANCE TIPS

TECH TIPS

CAUTION TIPS

PRODUCT RETROFIT OPPORTUNITIES

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MAINTENANCE



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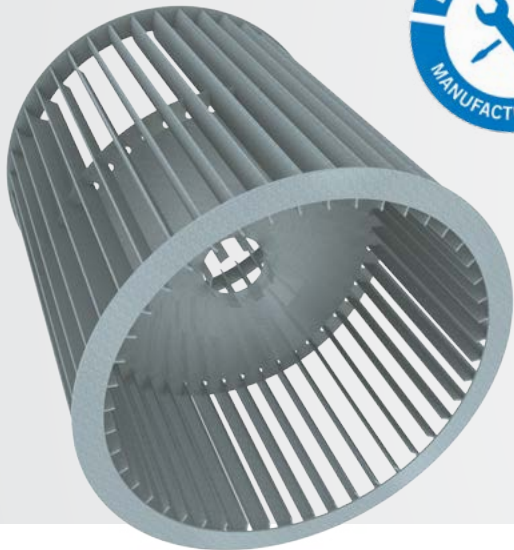
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BAC OFFERS A FULL RANGE OF BAC PARTS FOR ALL EVAPORATIVE COOLING
MANUFACTURERS EQUIPMENT. LOOK FOR THIS SYMBOL THROUGHOUT THE GUIDE.

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FANS & DRIVES



Centrifugal Fans

- › Centrifugal fans have inherently low sound characteristics
- › Available in multiple materials of construction to meet various operating conditions
- › Engineered and rated by BAC for optimum performance
- › Maintain thermal performance as originally certified by CTI
- › Complete installation kit includes hardware, adhesive, and clamps

AVAILABILITY: Available in 15", 18", 22", and 30" diameters for shafts 1-3/16" to 5" in diameter. Fits BAC and other manufacturers' products.



Axial Fans

- › Standard fan is high-efficiency and low sound
- › Rugged, aluminum construction for corrosion resistance and extended life
- › For further reduced sound levels, Low Sound Fans, Whisper Quiet Fans, and sound attenuation are available
- › Factory balanced for easy installation and vibration-free operation
- › Maintain thermal performance as originally certified by CTI
- › Most fan kits include bushing and special length bolts

AVAILABILITY: Available in sizes from 24" to 156" diameter, 4 blades to 12 blades for economical and quiet operation.



BAC MAINTENANCE TIP:

When installing centrifugal fan wheels on hollow shafts, remember to apply the adhesive under the fan tabs to prevent the fan wheel from slipping on the shaft.

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Whisper Quiet Fans

- › Ultimate low sound solution
- › Available for Series 3000, 1500, PT2, FXV, and CXVB units
- › Reduces sound levels generated from the unit with minimal impact on thermal performance



Shafts

- › Specially selected tubing materials ensure strength and durability
- › BAC shafts are precision manufactured for vibration-free operation
- › Epoxy-coated for corrosion resistance
- › Journals are ground and polished for an accurate fit and easy bearing and drive component installation
- › Long keyways for multiple drive combinations
- › Grooved flats for positive, secure set-screw installation

AVAILABILITY: Sizes from 1" to 2-15/16" diameter and 18" to 148" long. Many available with nickel plating or in stainless steel for added corrosion resistance.



BAC CAUTION TIP:

Hub clamp bolts should be tightened gradually to a torque of 30 ft/lbs. Tighten bolts evenly around the clamp so that gaps are equal.

FANS & DRIVES



Automatic Bearing Greaser

- › Compatible with all BAC bearings and other non BAC bearings
- › Lithium batteries are standard
- › Positive displacement pump allows installations up to 20 feet away from bearings when using single and multiple greaser kits
- › Variable output and user-settable based on number of bearings, size and type of service
- › Significant labor savings through less maintenance
- › Multi-Point Automatic Bearing Greasers are now available in 250cc and 500cc
- › Replacement grease packs and batteries are available from stock

**Don't forget
to order
bearing greaser
refill packs!**

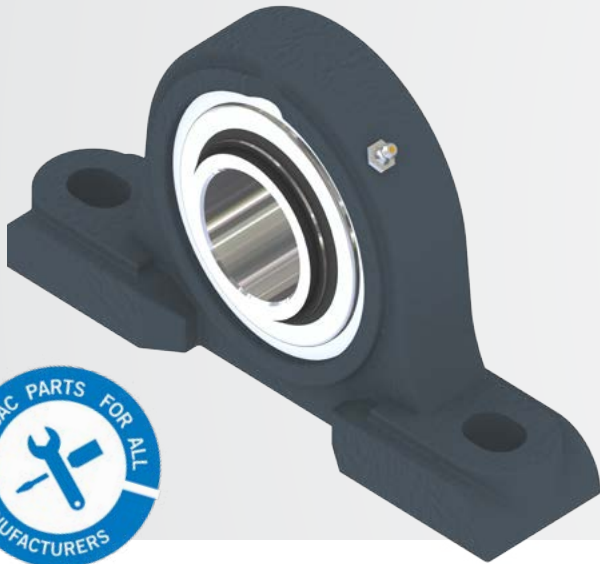


Single Automatic Bearing Greaser			
Forced Draft – One Greaser per Bearing			
Bearing Quantity	Size of Bearings	Bearing Greaser	Setting
1	1-11/16" or smaller	125cc	1 Year
1	Larger than 1-11/16"	125cc 250cc	6 Month 1 Year
Induced Draft – One Greaser per Bearing			
1	1-11/16" or smaller	125 cc	1 Year
1	Larger than 1-11/16"	125cc	6 month
	Smaller than 2-15/16"	250cc	1 Year
1	2-15/16"	250cc	3 Month



Multi-Point Automatic Bearing Greaser			
Forced Draft – Multiple Bearings per Greaser			
Bearing Quantity	Size of Bearings	Multi-Point Greaser	Setting
2	1-11/16" or smaller	250cc Multi-point kit	1 Year
4	1-11/16" or smaller	500cc Multi-point kit	6 Month
2	Larger than 1-11/16"	250cc Multi-point kit	6 Month
		500cc Multi-point kit	1 Year
Induced Draft – Multiple Bearings per Greaser			
2	1-11/16" or smaller	250cc Multi-point kit	1 Year
4	1-11/16" or smaller	500cc Multi-point kit	6 Month
2	Larger than 1-11/16" Smaller than 2-15/16"	250cc Multi-point kit	6 Month
		500cc Multi-point kit	1 Year
4	Larger than 1-11/16" Smaller than 2-15/16"	250cc Multi-point	3 Month
		500cc Multi-point	6 Month
2	2-15/16"	500cc Multi-point	3 Month

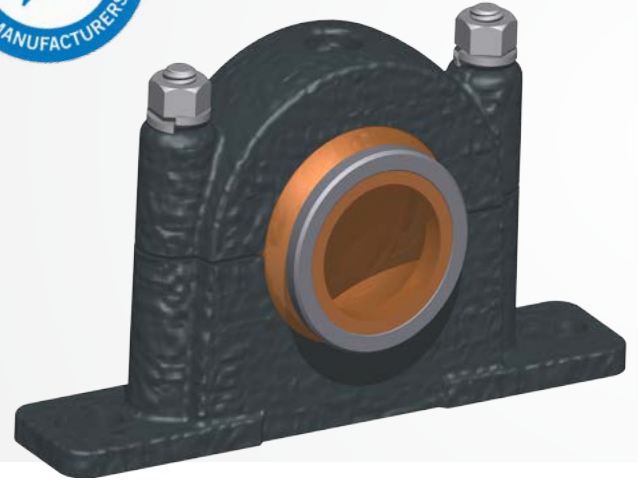
FANS & DRIVES



Induced Draft Bearings

- › Rated with a minimum L_{10} of 80,000 or more operating hours
- › Industrial grade pillow block castings for extended life
- › Exclusive BAC slinger/locking collar keeps water off the bearing seals
- › Double-lip seal to keep moisture from contaminating the grease
- › Complete installation kit includes all hardware, shims, and instructions

AVAILABILITY: Sizes from 1 7/16" to 2 15/16" for all vertical shaft cooling tower applications.



Forced Draft Bearings

- › Rated for an average life of 200,000 operating hours
- › Pre-packed with water resistant grease for easy maintenance
- › Split sleeve design bearings are available for easy replacement

AVAILABILITY: Sizes from 1" to 2 3/16" in flange mount, sleeve, split sleeve, and pillow block ball bearing configurations.



BAC MAINTENANCE TIP:

If replacing only the top fan shaft bearing on vertical shafts, the locking collar on the bottom fan shaft bearing must be loosened and then retightened after the installation of the new top bearing. **This is critical because, by design, the top bearing is intended to handle the thrust load.**

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Cast Iron Bushings and Sheaves

- > Minimum 2.0 service factor
- > Fine-grain, high-strength cast iron
- > Factory balanced for smooth operation
- > Bushing design minimizes fretting corrosion on the shaft, which greatly eases removal when required

AVAILABILITY: Bushing styles for all standard drive components from 1" to 2 15/16" diameter. Cast iron sheaves for all drive combinations, 1 to 8 grooves.



Aluminum Sheaves

- > Designed for use with all induced draft cooling towers
- > Corrosion resistant aluminum alloy for operation in the moist cooling tower environment
- > Less corrosion means less wear on sheave grooves and extended belt life
- > Available for both driver and driven shafts

AVAILABILITY: From 2 groove to 8 groove, 3 3/5" to 50" diameter for all induced draft applications.

Always replace bushings and bearings together to reduce downtime!



BAC MAINTENANCE TIP:

See bushing torque requirements for Cast Iron and Aluminum Sheaves in the reference section on page 43.

FANS & DRIVES



Belts and Powerbands

- > Engineered for evaporative cooling operations
- > Rated for 150% of unit horsepower
- > Neoprene, backed with reinforced polyester, specifically designed for extended life

AVAILABILITY: Up to 8 grooves and 195" long in A groove, B groove, and cogged configurations.



ENDURADRITE™ Fan System Retrofit Kit

- > Complete kit with matching motor, VFD, fan, bushing and upgraded 2 beam mechanical support
- > 90% reduction in maintenance costs
- > Up to 10% energy reduction vs standard gear drive system
- > 100% reliability with the elimination of a power transmission system
- > Industry best 7 year motor warranty and 5 year limited VFD warranty

AVAILABILITY: Horsepower ratings from 20 to 125 horsepower with mounting and shaft dimensions to fit the Series 3000 Cooling Tower.

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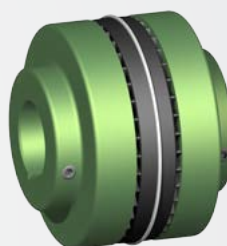
Or Call: 800.896.8497



BAC Gear Systems

- > Meet AGMA and CTI standards to ensure reliability
- > Constructed of high-strength cast iron for low sound, vibration-free operation
- > Gear drives are available for both BAC and other manufacturers' equipment (exact dimensional fit, no modification required)

AVAILABILITY: Horsepower ratings from 7.5 to 100 horsepower with mounting and shaft dimensions to fit virtually any make of cooling tower.



Gear Couplings

- > No need for maintenance or lubrication
- > Installation is quick and easy, and no special tools are needed
- > Couplings absorb all types of misalignment caused by shock or vibration
- > Not affected by dirt or moisture

Composite Drive Shafts

- > Composite shaft ships with 316 SST gear and motor couplings and hardware
- > Made from high-strength composite material that allows for higher misalignment tolerance
- > Corrosion resistant
- > Lightweight, which reduces vibration and extends the life of the shaft



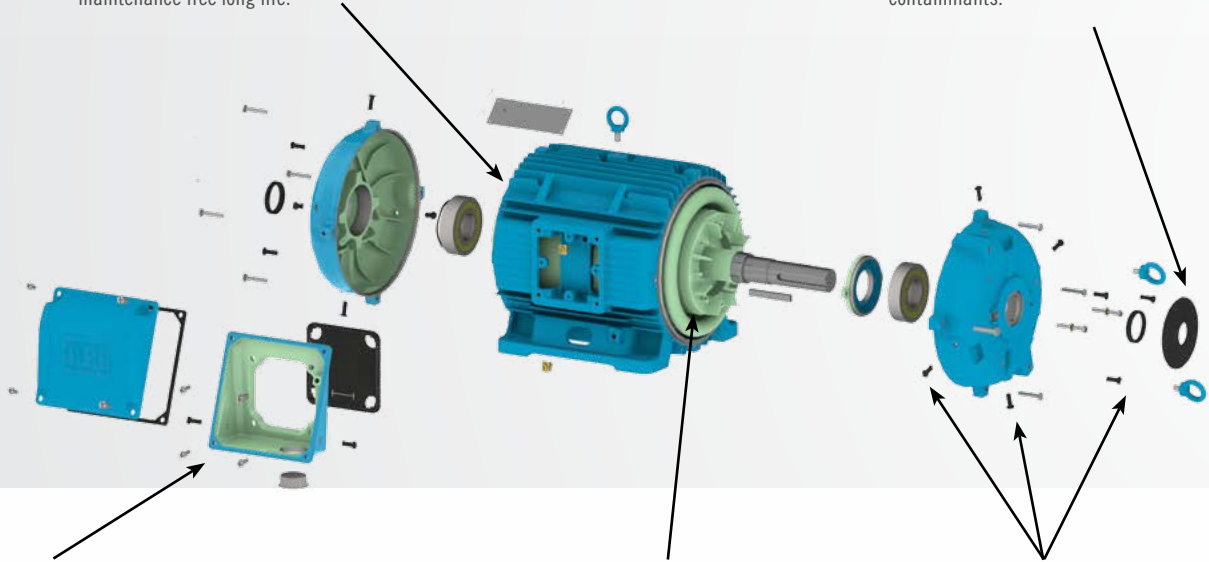
BAC TECH TIP:

Prior to installing the couplings, it is important to clean the shaft of any lubricants or protective coatings, as well as remove any existing burrs that may damage the coupling.

FANS & DRIVES

Bearings – Permanently sealed and lubricated bearings provide maintenance free long life.

Umbrella Seal – Fits over V-ring slinger to provide protection from water and other contaminants.



Conduit Box – Fully gasketed, cast iron conduit box includes drain plugs, lead separator gasket, and internal epoxy coating.

Internal Epoxy Coating – Entire interior of the motor is coated with epoxy for maximum moisture/corrosion resistance.

Drain Plugs – Located every 90 degrees and on the face of each endshield. They are easy to open and accommodate all mounting configurations.

Premium Efficient Motors

- › Motors are engineered specifically for the rigors of cooling tower applications
- › Made of high-grade FC-200 cast iron for maximum cooling and includes additional grounding plug
- › Permanently sealed bearings never require lubrication and eliminate water contamination to the bearing grease
- › BAC Premium Efficiency Cooling Tower Duty Motors are covered by a 7 year warranty when the motor space heater is wired according to the motor wiring diagram.
- › IP55 rating for greater protection from water and particulate contaminants



THE ENDURADRIVE™ FAN SYSTEM RETROFIT KIT

Includes Factory Authorized Start Up

ENDURA DRIVE™ Fan System



BAC's new **ENDURADRIVE™** Fan System retrofit kit gives you:

- ✓ 100% reliability on transmission components versus a traditional gear drive system
- ✓ 90% reduction in maintenance costs
- ✓ All while providing you the opportunity to increase your energy savings by 10%

Please contact your local Representative for more information at www.BaltimoreAircoil.com/repfinder or by calling 410.799.6200.

This system is available for retrofit on Series 3000 units manufactured between 1991 through today!



Baltimore Aircoil Company's **ENDURADRIVE™** Fan System is the most durable engineered solution for your Series 3000 Cooling Tower!

WATER DISTRIBUTION

BAC 360™ Spray Nozzle used on closed circuit cooling towers and evaporative condensers

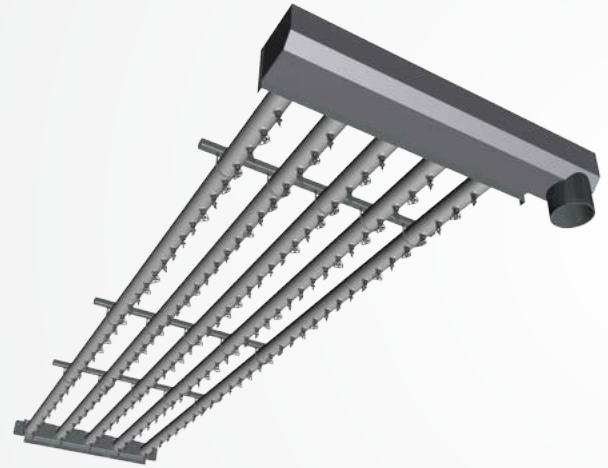


A or AA Counterflow Nozzle used on open cooling towers

XF Crossflow Nozzle used on open cooling towers



BAC's Pyramid nozzles are used in IPC, IMT, and other manufacturers' field erected units



Water Distribution Nozzles

- › BAC 360™ Spray Nozzle, A, AA, and Pyramid Nozzles are grommeted for easy inspection and removal
- › XF nozzles are gravity flow and can easily be inspected and replaced while unit is in operation
- › Kits are available to install 360™ Spray Nozzles in other manufacturers coil products
- › Patented design for pressurized or gravity-feed systems guarantees optimum thermal performance
- › Large orifice means non-clogging performance for effective wetting of the heat-transfer surface
- › Multiple sizes are available to accommodate all system flow rates

AVAILABILITY: 1/4" through 1 1/8" orifice for properly metered flow.

Spray Branches

- › Constructed of corrosion resistant PVC
- › Grommeted construction allows spray branches and nozzles to be easily removed



BAC MAINTENANCE TIP:

Always check spray nozzles when inspecting evaporative cooling equipment as poor spray patterns will negatively effect unit performance.

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Spray Pumps

- > Cast iron, bronze-fitted construction with mechanical seal means pumps are industrial quality for a long, trouble-free life
- > Impeller and trims have been selected for difficult high-flow, low-head requirements, assuring complete coil wetting to reduce scale and provide maximum thermal capacity
- > Supplied with vented seal housing to prevent air binding and to provide a sump bleed connection
- > Mechanical seal is constructed with a carbon rotating element and a ceramic stationary element with stainless steel hardware for a long, leak-free life

AVAILABILITY: High efficiency, high flow/low head pumps 1/3 through 10 horsepower and 1 1/2" through 4" discharge.



Pump Seal Kits

- > Replacement TEFC pump motors are designed for outdoor application
- > Complete seal kits available from stock
- > Shaft sleeves are available for pumps 1.5 hp and larger

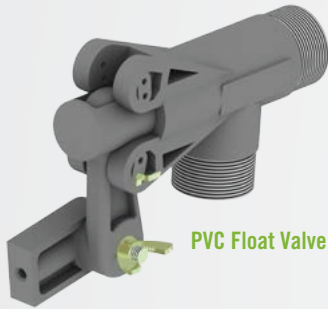


BAC TECH TIP:

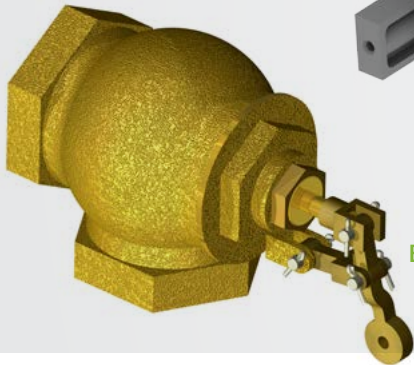
The pump is supplied with a bleed line and valve connected to the seal vent. This valve can be set to provide the proper bleed rate to minimize impurities in the basin water.

Even if the basin bleed is accomplished by other methods, always leave the valve slightly cracked to prevent air binding in the pump.

WATER DISTRIBUTION



PVC Float Valve



Brass Float Valve



Float Valves

- > Rubber seal disc assures a positive shut-off to prevent water waste
- > Reliable stainless steel linkage in all kits

AVAILABILITY: 1/2" to 2" valves for all applications.

Float Balls

- > Heavy-duty polypropylene construction resists cracking
- > Foam-filled for structural rigidity and additional buoyancy
- > Available in many sizes and configurations to ensure positive shutoff

AVAILABILITY: 4 1/2" to 8" diameter and 10" pancake style for all applications.



BAC CAUTION TIP:

Many commercially available float balls are hollow with no foam filling and are not suitable for the rigors of evaporative cooling equipment. While operating, the inside of your equipment can resemble a hurricane with high winds and extreme temperature swings. Without the added structural rigidity from the foam filling, the float ball may easily crack, allowing the float to fill with water, which will cause the system to run improperly. Do not exceed 50 psi inlet water pressure to the float valve.



BAC TECH TIP:

Upon start-up, fill the tower to approximately 1/2" below the overflow level before starting the unit. This will provide enough water to fill the rest of the system without draining the tower on start-up. After the system is running, adjust the water level as shown in your Operation and Maintenance Manual. Monitor the operating level for the first 24 hours of operation to make sure it is set properly.

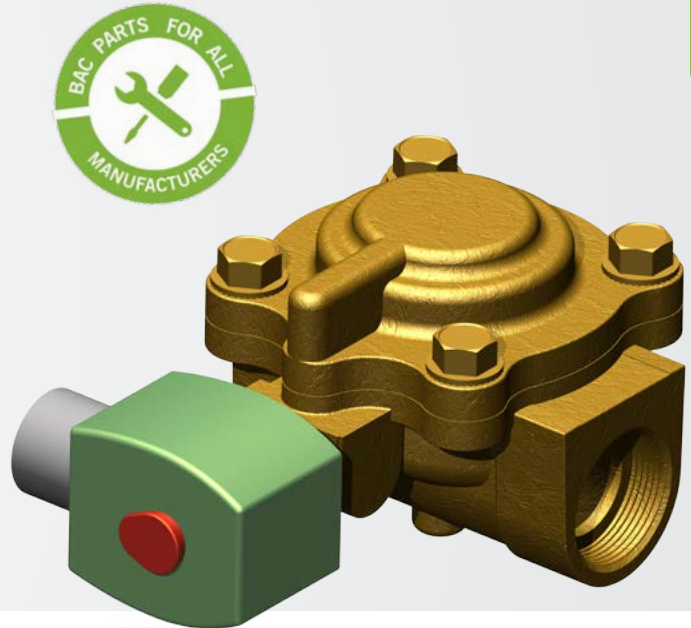
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Electric Water Level Control

- > Universal mounting system fits any tower
- > Completely sealed and waterproof
- > Located inside the tower so no heat tracing is required
- > 6 second time delay prevents short-cycling
- > Plastic sheath on probes and stilling chamber prevents false-cycling
- > Requires 110 volt solenoid valve for operation
- > Equipped with trouble shooting LED to diagnose water and probe conditions

AVAILABILITY: 3-probe through 6-probe models for on/off, low water cut-out, low water alarm, high water cut-out, and/or high water alarm.



Solenoid Valves

- > Forged brass body for durability and high-pressure applications
- > Watertight electrical enclosure for outdoor use
- > Slow-closing feature minimizes water-hammer on shut-off
- > Valves are sized for a water pressure between 15 and 50 psig at the valve inlet

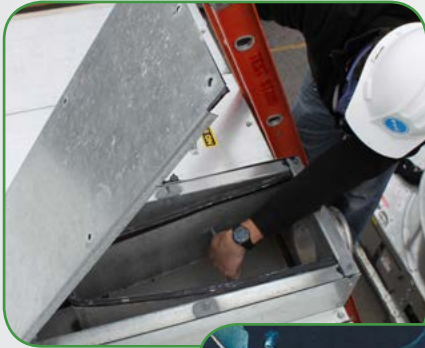
AVAILABILITY: 3/8" to 2" with 110 volt normally closed holding coil.



BAC TECH TIP:

LED error codes can be found in the Universal Electric Water Level Control Installation, Operation & Maintenance Manual on BAC's website, www.BaltimoreAircoil.com.

WATER DISTRIBUTION



Inlet strainer inspection for Series 1500

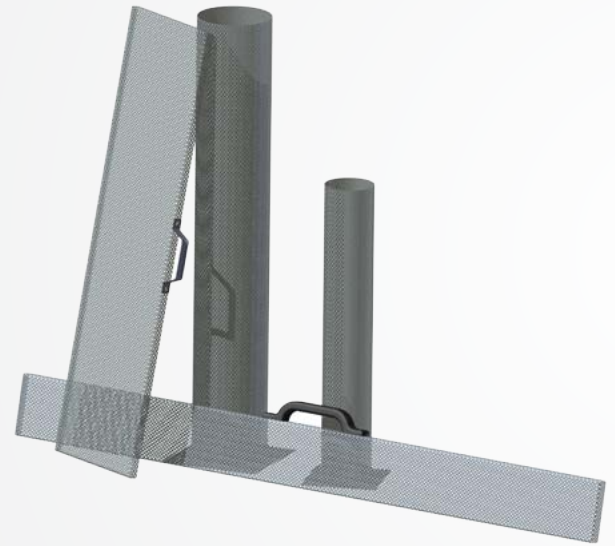


Inlet strainer inspection for Series 3000

Inlet Strainers

- > Single point inlet provides automatic flow-balancing to both hot water basins
- > Inlet strainer protects water distribution nozzles from debris, eliminating the need for a separate system strainer
- > Large free-area inlet strainer minimizes pumping head
- > Inlet strainer is easy to remove and clean

Series 3000 Cooling Towers built in 1991 through 2007 were equipped with inlet strainers located in the BALANCE CLEAN® Chamber. The BALANCE CLEAN® Chamber provides a single-point piping connection and automatically balances the flow to both hot water basins. Contact your local BAC Representative for replacement inlet strainers and options, such as winter operation bleed down valves, that prevent freeze-up when the tower is shut down.

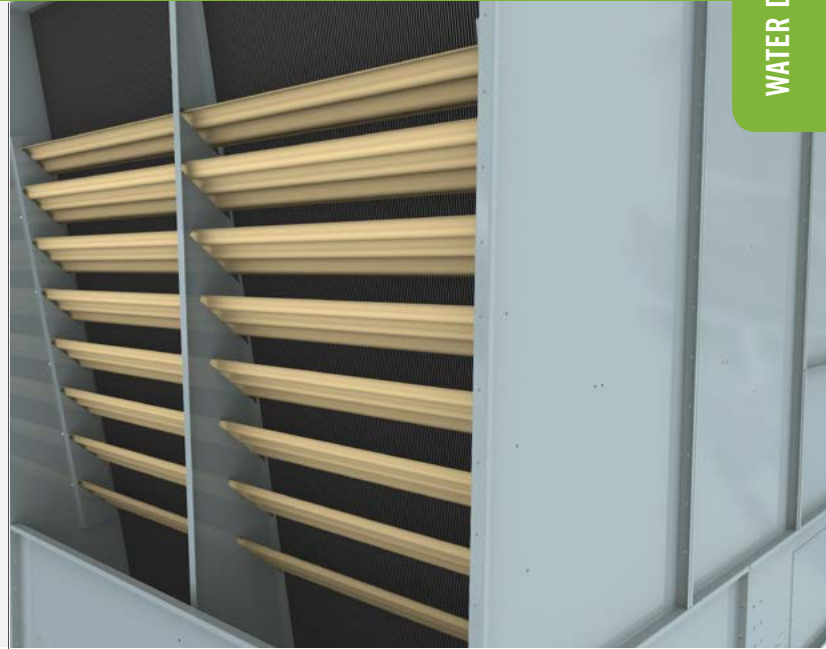
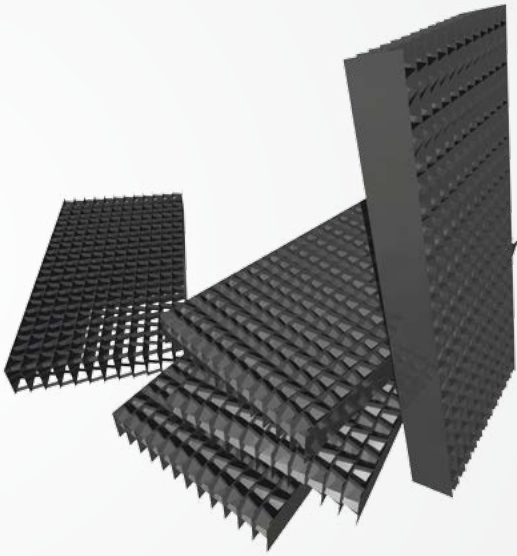


Suction Strainers

- > 3/16" strainer perforations help keep the system clean
- > Strainer perforations are spaced to provide maximum strainer free area for low pump suction losses
- > Anti-cavitation design prevents air from reaching the system pump

BAC offers many styles of suction strainers and suction hoods for just about any application. Proper strainer design is critical to the total system operation. It provides protection for the pump and keeps debris out of the condenser water loop. BAC strainers are designed to offer optimum system protection while still providing a full 50% free area to allow efficient system pump operation. Also important, the anti-cavitation design is built into all BAC strainers. This keeps air from entering the piping that would cause pump cavitation.

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Combined Inlet Shields

- › Available for the Series 3000E, Series 1500E, PT2, PF2, PFi, PC2, PCC, FXV, FXV3, CXVT and CXVB units
- › Prevent algae growth in the cold water basin
- › Eliminate water splash out
- › Prevent debris from entering the cold water basin
- › Inlet shield is easy to remove and clean
- › Separate from the fill and removable to allow easy access for inspection of the air/water interface at the air inlet side of the equipment
- › Also available on the FXV and CXVB for installation above the spray distribution system

Air Intake Louvers

- › Wide spaced louvers reduce the potential for scale build-up and damaging ice formations at the air/water interface by providing an easy visual inspection from the outside of the unit into the fill
- › Standard air intake louvers are constructed of corrosion and UV-resistant fiberglass reinforced polyester (FRP)
- › Galvanized and stainless steel are available

CONTROLS

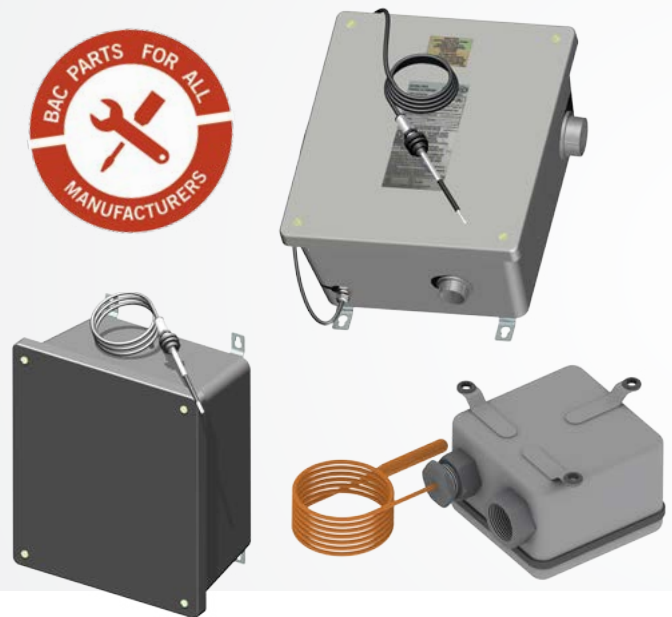


Basin Heaters

- > UL and CSA rated
- > Durable copper heating elements for long life
- > 2" MPT connection is easy to retrofit into any cooling tower

AVAILABILITY: 2 – 24 kW ratings, 50 watts/in² watt density
200, 230, 460, and 575 volt.

BAC stocks a complete line of immersion heaters to prevent cold water basin freeze-up during winter weather. These heaters are selected for cooling tower duty and are constructed with copper heating elements rated at 50 watt/in² with a 2" MPT brass connection and conduit box rated NEMA 4. Heaters are suitable for use in all makes of evaporative cooling equipment.



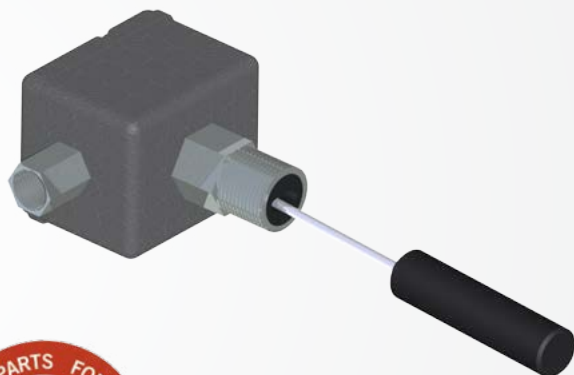
Basin Heater Controls

- > UL and CSA rated
- > BAC thermostats and low water cutouts are designed to ensure long life and proper operation
- > Individual components or complete kits available
- > Standard heater control panel consists of:
 - Single probe to sense both water temperature and water level
 - Contactor(s)
 - 24 Volt control circuit transformer
 - NEMA 4 Enclosure
 - UL Listed

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Float Switch

- › Single-pole, double throw, liquid level float switch
- › Designed to maintain a liquid level in the cold water basin
- › When liquid level rises above or falls below a certain point, the switch will close one circuit and open a second



Electronic
Vibration
Cutout Switch



Mechanical
Vibration
Cutout Switch



Vibration Cutout Switches

- › Protect your tower from damage resulting from excessive vibration
- › Mechanical or electronic switches are available with multiple options for alarms and reset
- › Electronic switches are compatible with building management systems



BAC MAINTENANCE TIP:

Test vibration switches during seasonal start-ups to ensure proper operation.

See pages 38 & 39 in the Reference Section for Basic Operation and Troubleshooting of the Vibration Cutout Switches or contact your local BAC Representative for more information.

CONTROLS

BAC Refrigeration Controls



- > **VFD Only:** Includes a single VFD in a weather-resistant enclosure sized to control all fan motors on the unit
- > **Total Controls Package:** Includes the VFD Only PLUS sequencing and accessory contactors

Benefits of BAC Refrigeration Controls:

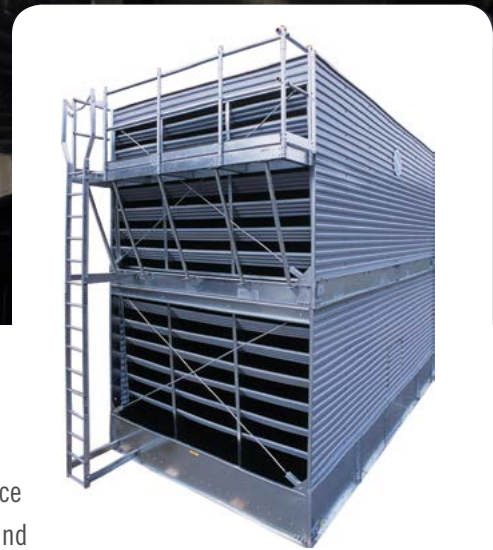
- > Controls specifically designed for industrial refrigeration applications
- > Single point wiring (optional)
- > UL/cUL listed
- > All panel enclosures are NEMA 3R as standard
- > Easy installation
- > Total controls package

- Fan Starter(s)
- Spray Pump Starter
- Basin Heater(s)
- Vibration Cutout Switch Interface(s)
- Electric Water Level Control Contactor(s)
- Communication Card^[1]
- Sequencing Logic
- Weather-Resistant Enclosure
- Start-Up (Option)
- Pressure Controller

	VFD ONLY	TOTAL CONTROLS PACKAGE
Fan Starter(s)	VFD	VFD
Spray Pump Starter		✓
Basin Heater(s)		✓
Vibration Cutout Switch Interface(s)		✓
Electric Water Level Control Contactor(s)		✓
Communication Card ^[1]	✓ Modbus-standard	✓ Modbus-standard
Sequencing Logic		✓
Weather-Resistant Enclosure	✓	✓
Start-Up (Option)	✓	✓
Pressure Controller	OPTIONAL	OPTIONAL

^[1]Communication Protocols limited to Modbus, Lonworks, Johnson N2, BACNet, and Siemens APOGEE.

RETROFITS



Retrofit and Rejuvenate Your Equipment

BAC offers a variety of retrofit kits and accessories to rejuvenate or maximize the performance of your evaporative cooling equipment. Whether your unit appears to be on its last leg or brand new, BAC parts and retrofit kits are available to bring it back to life or add features to meet the needs of your projects.

Performance

- › Increase performance and efficiency
- › Restore lost performance

Ease of Maintenance

- › Safety and access items
- › Serviceability upgrades

Operational Items

- › Capacity control and redundancy
- › Controls

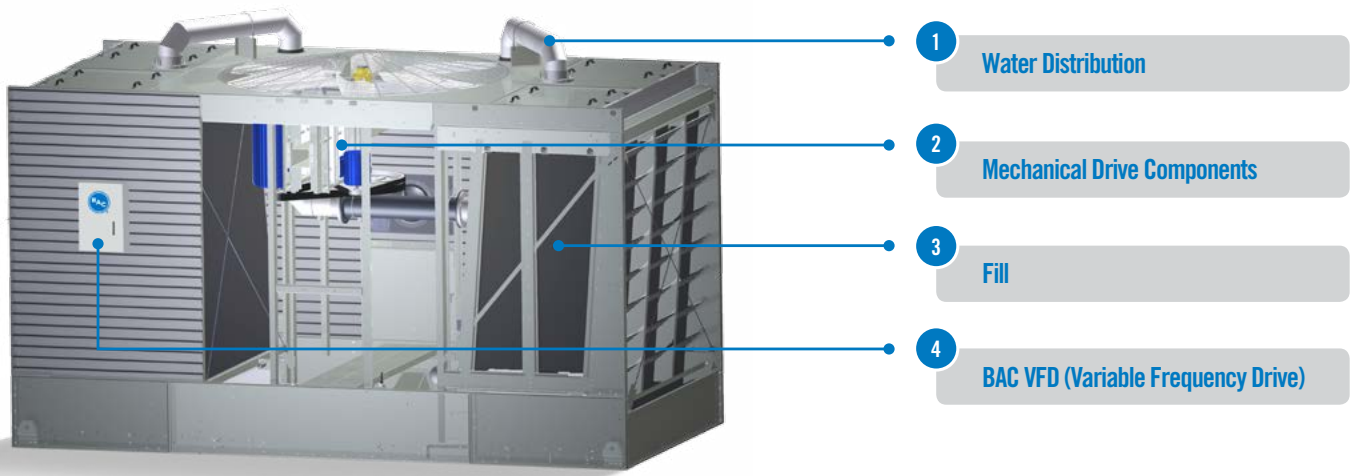
Sound

- › Reduced sound levels



ENERGY SAVING RETROFITS

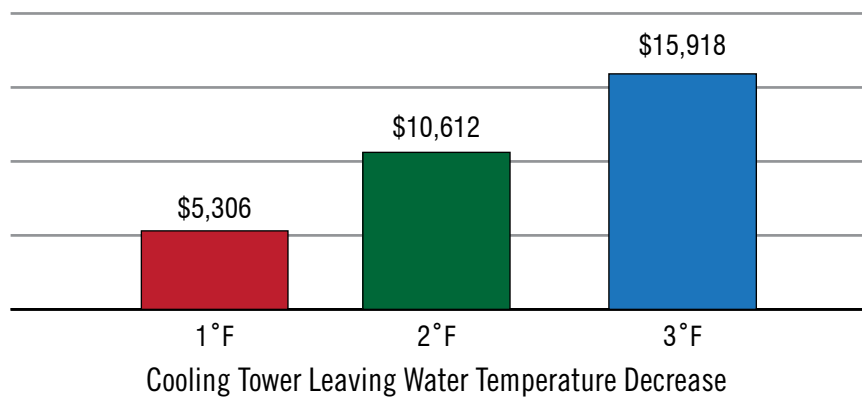
Retrofit Opportunities



A 2°F Decrease in Leaving Water Temperature Saves 6% in Electricity Costs



On average the HVAC system uses 25% of a building's electricity. The slightest increase in cooling tower leaving water temperature will result in significantly higher energy costs.¹



Annual Cooling Tower Efficiency Savings²






› Note 1: U.S. Energy Information Administration (EIA)

› Note 2: Savings are based on the energy costs for a 500 ton centrifugal chiller, 0.68 kW/ton chiller efficiency at full load, \$0.12/kWh energy cost, \$25/kW per month, 80% ratchet demand charge, and 2,000 equivalent full load hours of operation.

	2% to 3% Energy Savings
	1°F Decrease in Leaving Water Temperature
Pay Back Period: Less Than 1 Year	

	3% to 7% Energy Savings
	1-2°F Decrease in Leaving Water Temperature
Pay Back Period: Less Than 1 Year	

	7% to 10% Energy Savings
	2°F Decrease in Leaving Water Temperature
Pay Back Period: 2-3 Years	

	30% to 40% Energy Savings
Pay Back Period: Less Than 1 Year	

1 Replace Nozzles

- ✓ Broken or clogged nozzles cause uneven water distribution over the fill, scale build-up, and decreased capacity.

2 Upgrade or Replace Drive Components

- ✓ For increased building heat loads, BAC's drive upgrade kits will increase the capacity of your cooling tower.
- ✓ To maintain the peak performance of your cooling tower, replace your motors, drive sheaves, drive bushings and belts with BAC Factory Authorized Parts.

3 Install New Fill

- ✓ Replace scaled or clogged fill with BAC's replacement fill kits that are designed with state-of-the-art fill technology to restore or increase the capacity of your cooling tower.

4 Install a VFD

- ✓ Adding a Variable Frequency Drive will provide a more efficient method of operating your cooling tower while extending the life of the motor and mechanical drive system.

Contact your local BAC Representative for a free unit inspection and consultation on Energy Saving Retrofits.

RETROFITS



BACross® Replacement Fill Kits

For FXT, Series 1500, Series 3000, FXV, FXV3, CXV and CXVB

- › Maintains thermal performance as originally certified by CTI
- › Available in standard PVC for normal temperature applications or CPVC for high temperature applications

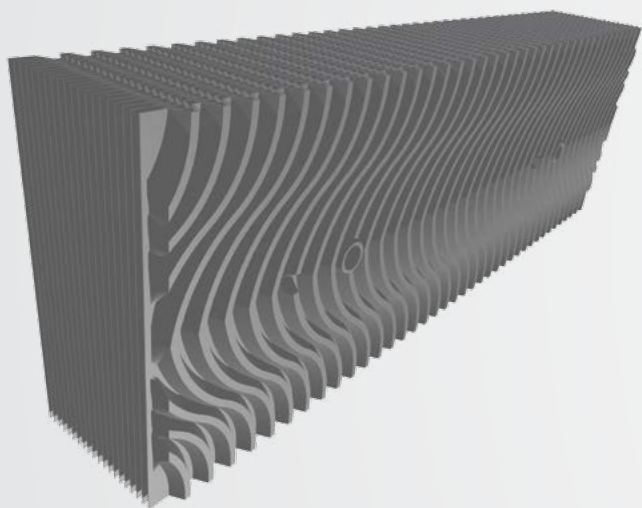
VersaCross® Replacement Fill Kits

- › Outstanding thermal performance will meet or exceed the performance of any OEM fill
- › Fits most crossflow towers
- › Quick and easy field installation saves labor
- › Nested shipment requires smallest fill staging area and low shipping costs
- › Model-specific kits contain everything needed for an efficient installation, including detailed instructions, supports, hardware, and fill
- › 2-week standard lead time



BAC TECH TIP:

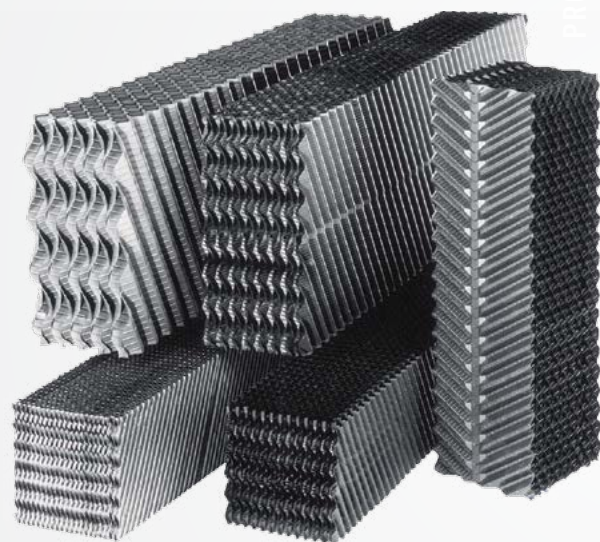
Block fill is not recommended for use in BAC's crossflow cooling products and may decrease the thermal capacity of the unit by 10%.



BACount® Replacement Fill Kits

For Series V Counterflow products

- › Maintains the thermal performance as originally certified by CTI
- › Single-source responsibility, providing quality materials and a guaranteed fit
- › Available in standard PVC or CPVC for high temperature applications
- › Maintains 3/4" spacing to minimize fouling



BAC Pak™ Replacement Fill Kits

For PT2 Counterflow products

- › For use in counterflow and induced draft counterflow cooling towers
- › Pre-engineered kits to fit specific counterflow, and induced draft counterflow cooling towers
- › Easy to install
- › All hardware and supports included
- › Available in standard PVC or HPVC for high temperature applications



BAC MAINTENANCE TIP:

Maintain or increase thermal capacity in all BAC counterflow cooling towers with BACount® Fill Kits. They offer the same efficient heat transfer surface as currently supplied in new BAC towers, in an easy-to-install bundled configuration.



VERSACROSS® REPLACEMENT FILL



VersaCross® Replacement Fill improves thermal performance of the original fill by an average of 7.3% and 10% on other Manufacturers' block fill.

Customer Benefits

- › Only replacement hanging fill on the market
- › Designed to meet or exceed original performance specifications
- › Lower shipping costs versus block fill
- › Nested shipments require smaller staging areas
- › Fill fits in most Class A freight elevators
- › Shorter lead time than block fill

Integrated Custom Features

- › Includes integral louvers and drift eliminators to eliminate splashout and drift
- › Formed from 15 mil self-extinguishing PVC
- › Fits most BAC crossflow towers
- › Suitable for maximum entering water temperature of 130°F

Custom Installation Kit

- Hanging PVC VersaCross® Fill
- Fill hangers and supports
- Detailed instructions
- Complete Hardware

FIND YOUR REPRESENTATIVE:

BaltimoreAircoil.com/repfinder
Or Call: 800.896.8497



Internal and External Service Platforms, Catwalks, and Walkways

- > OSHA compliant
- > Simplify maintenance
- > Available in complete engineered kits
- > Keep feet dry
- > External service platforms allow for easy access to hot water basins or spray distribution systems
- > Internal walkways and internal platforms and ladders provide easy access to drive components



BAC MAINTENANCE TIP:

Newer unit designs do not require routine maintenance on the fan deck. Louver face platforms allow easy access and inspection of the water distribution area while the unit is in operation.

RETROFITS



Pre-assembled Platforms

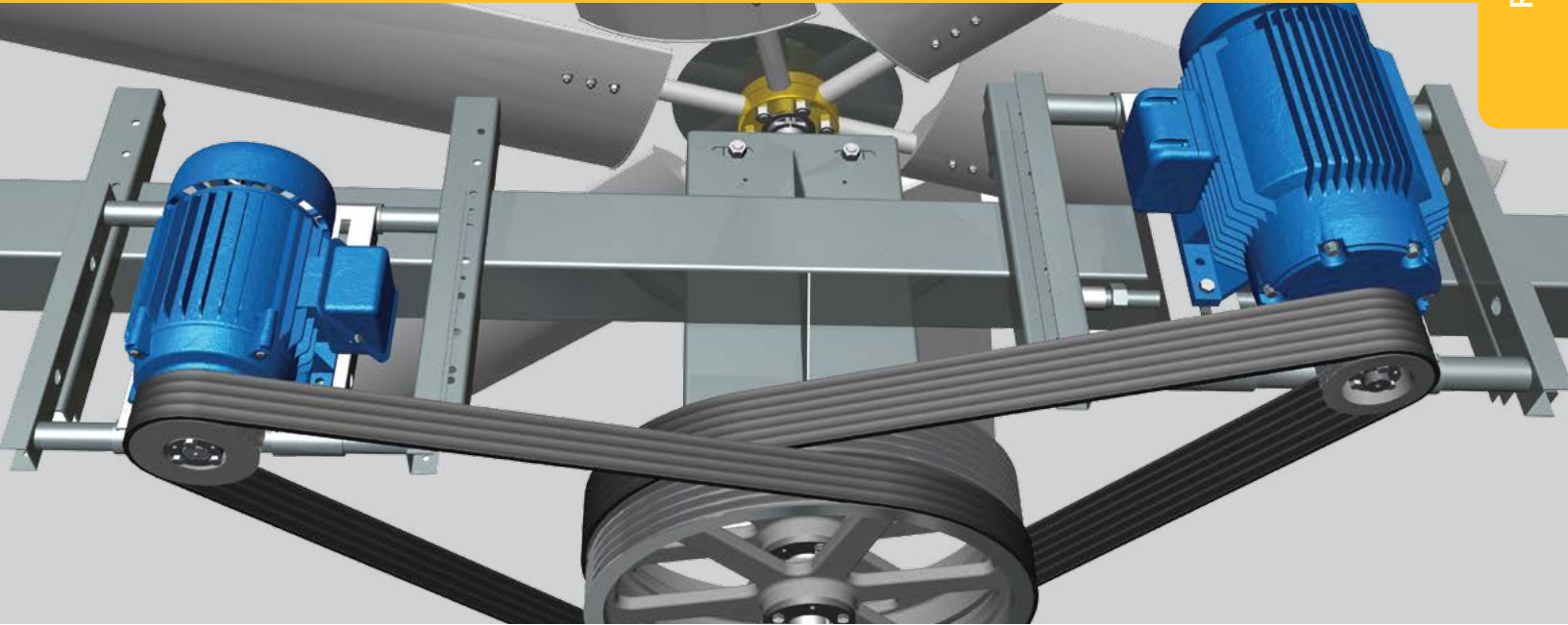
- > OSHA compliant
- > Increases the ease of maintenance
- > Available on Series 3000, Series 1500, PC2, PT2, FXV, FXV3, PF2, CXVB, CXVT and VCA models
- > Ships in modules for quick and easy installation
- > Three configurations available for the VCA (flush, offset, and full perimeter)



BAC MAINTENANCE TIP:

Ladders and handrails are available for access to the top of the equipment. If the end-user elects to use this alternative, the addition to the installation will make routine maintenance easier, and improve overall performance and unit life expectancy. All BAC safety and access retrofit packages meet OSHA requirements.

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BaltimoreAircoil.com/repfinder
Or Call: 800.896.8497



Add Redundancy and Capacity Control

- › ENERGY-MISER®/BALTIGUARD™ Fan System maximizes up-time
- › Saves energy
- › Maintains required performance for approximately 85% of the year, using only 1/3 of the full-load HP
- › Utilizes standard, cooling tower duty motors for easy replacement: no need for two-speed or special motors required

Redundancy – A simple solution to add redundancy is the ENERGY-MISER®/BALTIGUARD™ Fan System. This option adds a second fan motor to the drive system. This second motor is usually sized at approximately 1/3 of the main motor horsepower. This allows the smaller motor to operate around 85% of the year, while the larger main motor is only required on the hottest of days. Unlike a two-speed motor, this causes less wear and tear on the fan motors and provides redundancy in case of a motor failure. In addition, the single-speed motors are available “off the shelf” from BAC.

Capacity Control – The ENERGY-MISER®/BALTIGUARD™ Fan System also provides capacity control similar to a two-speed motor. Another capacity control option is adding a VFD to control the motor speed. If you are thinking of converting to a VFD system, BAC can supply the VFD and a fan motor built for that application; see [page 20](#).



BAC TECH TIP:

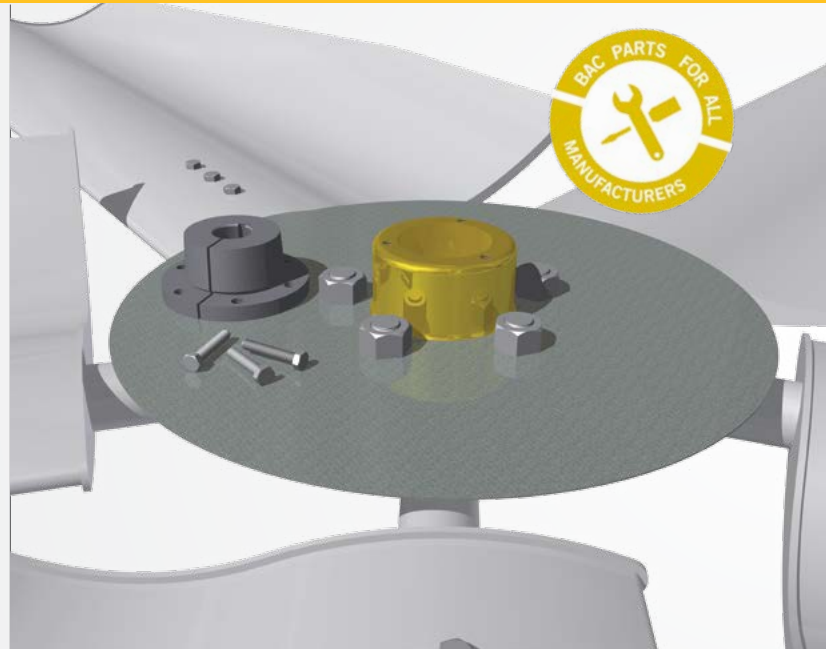
The ENERGY-MISER®/BALTIGUARD™ Fan System utilizes the control and switch-gear of a two-speed, two-winding motor while providing the security and economy of a redundant motor. You always have a motor, even if one motor fails.

RETROFITS



Aluminum Sheave and Bushing Kits

- › Complete with bushing and special bushing bolts
- › Special torque requirements and installation techniques included with kit instructions
- › Corrosion resistant aluminum allows for operation in the moist cooling tower environment
- › Available exclusively from BAC
- › Designed for the specific power transmission required by the motor and fan application



Aluminum Fan and Bushing Kits

- › Complete with bushing and special bushing bolts
- › Special torque requirements and installation techniques included with kit instructions
- › Corrosion resistant aluminum allows for operation in the moist cooling tower environment
- › Available exclusively from BAC
- › Designed for the specific airflow requirements of the cooling tower



BAC MAINTENANCE TIP:

Proper installation of aluminum sheaves also requires the bolts to be tightened to the specific torque values as shown on **page 43**. The chart also indicates the proper bushing type for each sheave.

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Or Call: 800.896.8497



Large Orifice Spray Distribution Retrofits

- › Large orifice grommeted nozzles can easily be retrofitted in BAC's older designed products and in other manufacturers' units
- › Grommetted installation makes spray branches and nozzles easy to remove, clean, and replace
- › Non-clogging, large-orifice nozzles
- › Available in pre-engineered kits for your equipment



Low Sound Alternatives

- › Intake and discharge attenuation packages are available
- › Fully factory-tested and rated
- › Can be used in conjunction with low sound fan options
- › Available on both counterflow and crossflow products



BAC TECH TIPS:

Proper spray water distribution is important to the long-term efficiency of your cooling tower. A fully wetted coil or fill surface will resist scaling and dirt build-up while maintaining peak thermal efficiencies.

Many replacement towers utilize axial fans instead of centrifugal fans. Axial fans produce higher sound levels than centrifugal fans. Contact your local BAC Representative for sound ratings and sound solutions. Consult the BAC website, www.BaltimoreAircoil.com, for more information on sound.

RETROFITS



Drift Eliminators

- › Engineered for maximum performance and corrosion resistance
- › Available in PVC, thermosetting hybrid polymer, galvanized or stainless steel construction
- › Complete kits available
- › Helps conserve water



Replacement Coils

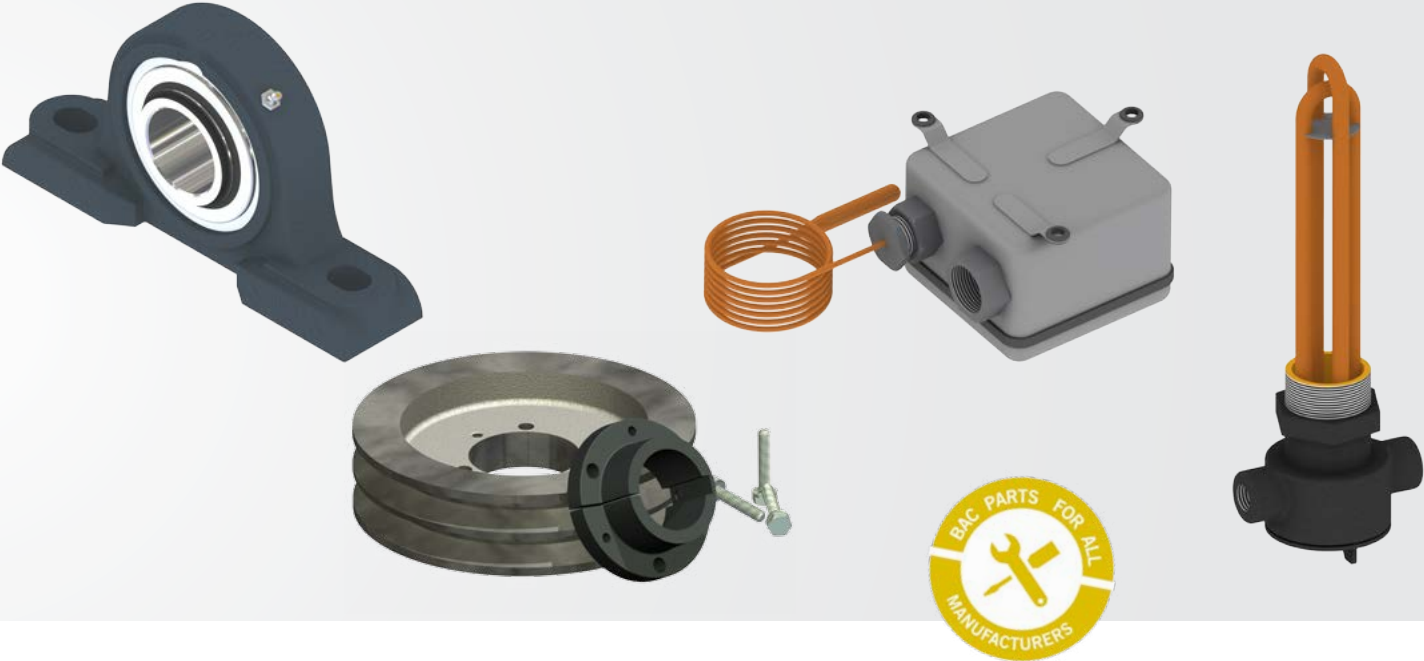
BAC offers a large selection of coil configuration options to fulfill any thermal and pressure drop requirements for both BAC and other manufacturers' evaporative cooling equipment.

- › Industrial grade construction, ASME B31.5 compliant
- › Standard patented serpentine coils are 16 gauge and HDGAF, minimizing scale and fouling potential
- › Materials of construction provide compatibility with virtually any refrigeration, air conditioning, or process fluid system
- › Construction options include:
 - ASME "U" construction when conditions require pressure vessel compliance
 - Extended surface finned coils for plume reduction and water savings
 - Cleanable tubes or cleanable headers for dirty fluid application
 - Stainless Steel coils
 - 14 gauge coils are also available
- › CRN coils available for Canadian installations

FIND YOUR REPRESENTATIVE:

BaltimoreAircoil.com/repfinder

Or Call: 800.896.8497



Parts for all Evaporative Cooling Equipment

- > BAC offers a full range of replacement products for other manufacturers units such as:
 - Replacement coil and casing sections
 - Motors
 - Automatic Bearing Greasers
 - Drive components including fans, shafts, bearings, sheaves, and belts
 - Fill and eliminators
 - Spray distribution retrofit kits
 - BAC Controls
 - Heaters and heater controls
 - Electric water level and make-up controls
 - Vibration cutout switches
 - Composite drive shafts
 - Gears for all factory assembled cooling towers

- > All BAC Parts are designed and manufactured to meet BAC's original quality standards and are backed by a 1-year warranty
- > Motors have a 5-year warranty, 7-year when installed with space heater



RETROFITS



Velocity Recovery Stacks

- › Available on most Series 3000 Cooling Towers
- › Increase thermal performance
- › Maintain tower footprint
- › Maintain existing CTI certification on Series 3000A and 3000C Cooling Towers



Drive System Upgrade

- › Comprehensive option for upgrading cooling capacity
- › Larger motor
- › New sheave and belt configuration
- › New fan and fan shafts available

Remember to specify
the ENDURADRIVE™
Fan System retrofit kit.
Details on page 8.

FIND YOUR REPRESENTATIVE:

BaltimoreAircoil.com/repfinder
Or Call: 800.896.8497



Davit Systems

- > Facilitates motor replacement
- > Removal system includes davit arm(s) and access panels on the side opposite of the air inlet face on FXV and CVXB only
- > Series 3000, PT2, and PC2 davit allows for quick and easy motor removal
- > Davit on Series 3000 can be easily moved from cell to cell as it simply slides and locks into socket



BAC Cooling Tower Service Kits

- > Psychrometer
- > Infrared thermometer
- > Conductivity meter
- > A/C current clamp
- > pH meter
- > Heavy-duty, waterproof flashlight
- > Handheld digital anemometer
- > Megger® brand insulation tester
- > Tool bag

AVAILABILITY: This kit contains measuring instruments to cover a full range of service needs, including temperature, air flow, electrical parameters, and water quality measurements.

Maintenance Checklist for:

Cooling Towers, Closed Circuit Cooling Towers, and Evaporative Condensers^[1]



WARNING: 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.

Inspect and clean as necessary:	Start-Up	Monthly	Quarterly	Annually	Shutdown
Inspect general condition of the unit ^[2] and check unit for unusual noise or vibration	✓	✓			
Inspect cold water basin	✓		✓		
Flush water distribution system/inspect spray nozzles	✓		✓		
Drain basin and piping			✓		✓
Inspect air inlet louvers/combined inlet shields	✓	✓			
Check and adjust water level in basins	✓	✓			
Check operation of make-up valve	✓	✓			
Check and adjust bleed rate	✓	✓			
Inspect unit finish				✓	
Mechanical equipment system:	Start-Up	Monthly	Quarterly	Annually	Shutdown
Check belt condition	✓	✓			
Adjust belt tension ^[3]	✓		✓		
Lubricate fan shaft bearings	✓		✓		✓
Lubricate motor base adjusting screw	✓		✓		✓
Check and lubricate optional gear drive	See product specific O&M Manual for detailed instructions and schedule				
Check drive alignment				✓	
Check motor voltage and current	✓		✓		
Clean fan motor exterior	✓		✓		
Check fan motor for proper rotation	✓				
Check general condition of the fan	✓		✓		
Check and unplug fan drain holes (hollow blade fans)	✓		✓		
Check fan for uniform pitch			✓		
Check fan for rotation without obstruction	✓		✓		
Check and recoat steel shafts with RUST VETO®	✓		✓		✓

NOTES:

1. **Consult your product specific O&M Manual before conducting maintenance on the unit.** Recommended service intervals are the minimum for typical installations. Different environmental conditions may dictate more frequent servicing.
2. When operating in ambient temperatures below freezing, the unit should be inspected more frequently. Refer to the “Cold Weather Operation” section of the Operation and Maintenance Manual for more details.
3. Tension on new belts must be readjusted after the first 24 hours of operation and quarterly, thereafter.



Recommended Spare Parts

BAC Factory Authorized Parts are manufactured to meet rigorous cooling tower duty specifications and are guaranteed to fit your unit and perform as original equipment.

BAC Factory Authorized Parts can be ordered through your local BAC Representative or online at www.CoolingTowerWorld.com. Most BAC Representatives maintain a local inventory of commonly used parts. For a free unit inspection, call your local BAC Representative today.

Even with BAC's fast delivery capability, it is still recommended that certain essential, emergency repair parts be maintained in your inventory to minimize any potential downtime.

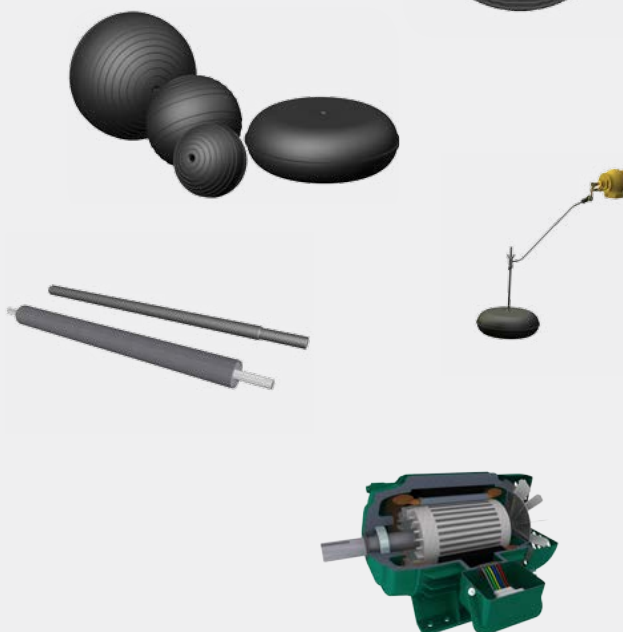
Basic Recommended Spare Parts

- Bearing set
- Float valve
- Float ball
- Solenoid valve (if unit is equipped with electric water level control)
- Powerband or set of belts
- Spray nozzle kit with grommets
- Basin heater and low water cut out
- Door gasket
- Strainer (inlet and suction)
- Fan and sheave bushings
- Pump seal and gasket kit for coil products
- Automatic bearing greaser refill kit



Parts to Consider if Extended Downtime is a Concern

- Spray pump for coil products
- Axial or centrifugal fans
- Fan shaft
- Sheave set
- Fan motor
- Electric water level control



Basic Operation and Troubleshooting of BAC Electronic Vibration Cutout Switches (VCOS)

A. Checking the Installation

The electronic VCOS is the standard switch used by BAC. This switch is rated for **5 amps continuous duty and for in-rush of 25 amps for 1 sec or 50 amps for 16 msec.** This is ideal when wiring the switch to a motor starter system, since the bigger the motor, the higher the current on the starter.

A computerized Building Management System (BMS) works on a very low current draw. Therefore, some additional measures must be taken when wiring the VCOS to a BMS. For the VCOS to turn on and stay on, it needs to be connected to a load that draws a minimum of 50mA. Without this current draw, the switch may not stay closed or “pulled in”. In this case, a 2000-ohm, 10-watt resistor can be wired in parallel with the BMS input. An interposing relay (SPDT, class C) can also be installed to draw the 50mA.

B. Reset and Lockout Circuits

BAC supplies the switch prewired with 7' of 20 Ga., UV resistant shielded cable. When this cable is removed and other wiring supplied to the switch by the customer, make sure that the reset and lockout terminals (terminals 5, 6, and 7) are shielded from the rest of the wires.

The switch comes from the factory with terminals 5 and 6 connected together with a wire nut, which enables the local reset circuit. This means that when the switch trips, the pushbutton on the side of the switch must be used to reset it. If this wire nut is removed, and nothing is connected to terminals 5 and 6, the switch is not latched. This means that when the switch trips due to excessive vibration, the switch will automatically reset itself once the vibration level drops. This will cause the fans to restart automatically.

When a remote reset is desired, terminals 5 and 6 are wired to a pushbutton at the desired remote location. Be sure to use shielded cable.

C. Mounting

The vibration switch must be mounted rigidly to the unit, ensuring that the mounting brackets are stiffened to avoid any resonant builds that could cause nuisance trips. Contact your local BAC Representative with any questions regarding the installation of the VCOS for your specific equipment model.

D. Testing Basic Operation

The switch can be bench-tested or tested after it is mounted on the unit. For safety reasons, the cooling system must be off during testing. Follow these easy steps to test the proper operation of the vibration switch.

Testing time delay

The time delay is field adjustable from 1 to 15 seconds. It is set at the factory to approximately 3 seconds.

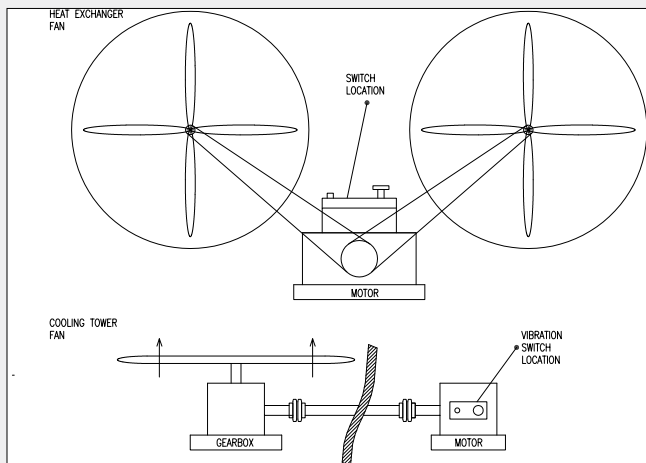
- a. Connect 110 or 220 volts to terminals 1 and 2 as per the appropriate wiring diagram. Contact your local BAC Representative if you do not have this diagram.
- b. Jumper terminals 1 and 3 together.
- c. Connect a 25-watt light bulb to terminals 2 and 4.
- d. Since the switch comes from the factory with the slide switch in the N/C position (see wiring diagram for the slide switch location), the light bulb should turn on immediately. Set slide switch to the N/O position. The light bulb should turn off. This assures that the triac relay is operating properly.
- e. Return the slide switch to the N/C position.
- f. Turn the set point control knob counterclockwise to the test position. The LED above the knob should turn on immediately. After approximately 3 seconds, the triac changes state and the light bulb should turn off.
- g. Return the set point control knob to the normal setting (0.45 in/sec).
- h. If the switch is wired for local reset (5 and 6 wired together), depress the pushbutton on the side of the vibration switch to return it to the non-alarm condition.
- i. If there is no connection across terminals 5 and 6, the switch will automatically reset to the non-alarm condition.
- j. To increase or decrease the time delay, turn the adjustment screw that is located directly below the set point control knob. One full clockwise turn increases the time delay by approximately 1/2 a second. One full counterclockwise turn decreases the time delay by approximately 1/2 a second.

If the vibration switch fails in any of the above steps, the switch should be returned to the factory for repair or replacement. Contact the local BAC Representative for more information.



BAC Mechanical Vibration Cutout Switches (VCOS)

- The vibration setpoint adjustment is accessible externally. Turning the setpoint adjustment clockwise (CW) increases the vibration setpoint.
- When the switch is shipped from the factory, the setpoint adjustment is set to 2g when installed in the vertical position and 1g when installed in the horizontal position (with reference to the setpoint adjustment shaft).
- To check factory calibration, place the unmounted unit in your hand and rotate per **Diagram D**. The switch(es) should activate at dead bottom position. If necessary, adjust setpoint using setpoint adjustment screw.
- To preset switch at other than factory setpoint, start with step three (3) and then rotate adjustment screw 1/8 turn per g until you reach the required setpoint.
- To adjust setpoint when installed on the machine, mount and wire the unit. Reset the switch by depressing the reset plunger and start the machine. When the machine has reached full speed, slowly turn the vibration setpoint adjustment counter clockwise until the switch tips. Then turn the adjustment clockwise a small amount (approx. 1/8 turn). Try to reset the switch; if the switch does not reset, turn another 1/8 turn clockwise and repeat in increments of 1/8 turn until you are able to reset the switch. Reset the switch and restart the machine to determine whether the machine starting roughness will cause the switch to trip, in which case it may be necessary to increase the setpoint.



Typical Installation Diagram

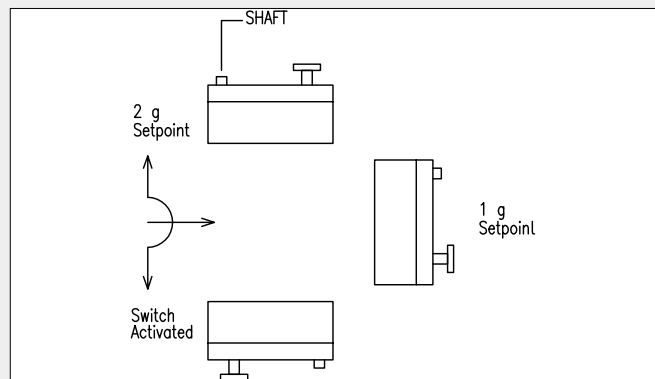


Diagram D

Fan Shaft Bearing Maintenance

Ball Bearings:

Seasonal shutdown and start-up:

When shutting your unit down for an extended period and before starting up after an extended shutdown, always purge the fan shaft bearings with new grease.

Lubrication Schedule:

- **Induced draft products** – Lubricate the bearings at least every three months.
- **Forced draft products** – Lubricate the bearings every 2000 hours of operation or every six months, whichever occurs first.

Greasing:

Bearings should only be lubricated with a hand grease gun or the automatic bearing greaser. When lubricating, purge the old grease from the bearing by gradually adding grease until a bead of new grease appears at the bearing seal.

Type of Grease:

Only use one of the following greases, as they are compatible with the grease installed at the factory:

- Citgo Polyurea MP2™
- Conoco Polyurea 2™
- Exxon Polyurex® EM
- Exxon Unirex N™
- Mobilgrease® AW2
- Shell Alvania RL3™
- SKF LGHP2™
- Unocal 76 Unolife Grease™

Sleeve Bearings:

Start-up:

Prior to start-up and during the first week of operation, the bearing oil cup must be refilled with an industrial-type mineral oil to saturate the wick in the bearing reservoir. After the initial start-up, fill the bearing oil cup every 1000 operating hours or every six months.

Type of Oil:

- 0°F to 110°F - BAC #582628P1, normal temperature range
- -25°F to 30°F - BAC #582627P1, low temperature range

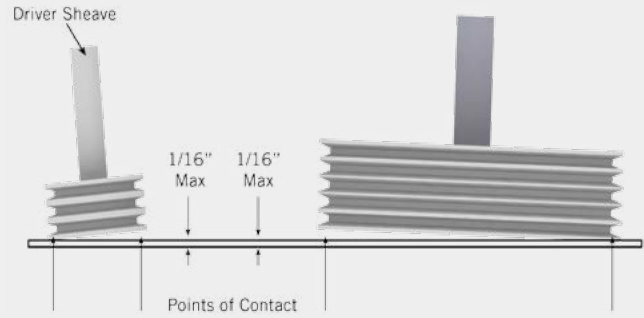
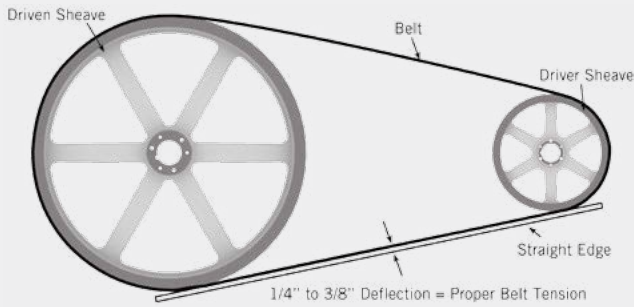


BAC CAUTION TIP:

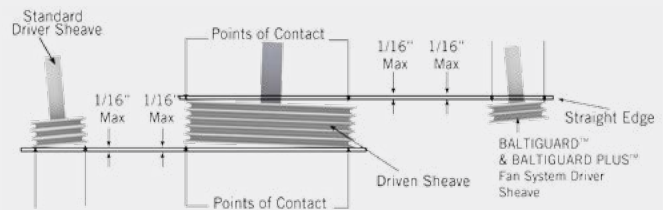
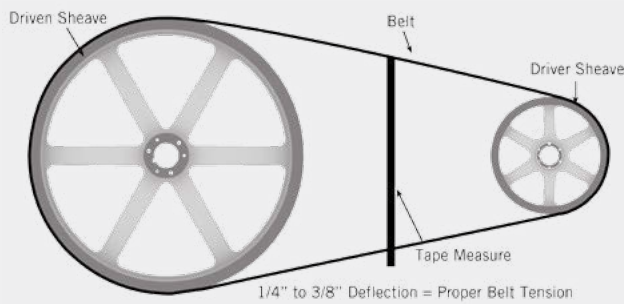
Sleeve Bearings: Do not use oils containing detergents. Detergent oils will remove the graphite in the bearing sleeve and cause bearing failure.

Ball Bearings: Do not use high pressure grease guns, as they may rupture the bearing seals.

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 Or Call: 800.896.8497



Standard Drives



BALTIguard™/BALTIguard PLUS™ Fan System

Belt Tensioning

After initial tower start-up or the installation of a new belt, the belt tension must be readjusted after the first 24 hours of operation. The condition of the belt and belt tension should then be checked and adjusted quarterly.

To check the belt tension, place a straight edge along the belt from sheave to sheave or, alternatively, use a tape measure as shown.

Apply a moderate force by hand (approximately 40 lbs) evenly across the width of the belt in the center of the span between the two sheaves. If the belt deflects between 1/4" and 3/8" as shown, the belt is adequately tensioned.

Sheave Alignment

As with proper belt tensioning, good sheave alignment will result in both maximum performance and maximum belt life. Therefore sheave alignment should be checked annually.

To check alignment, place a straight edge across the driver and driven sheaves as shown in the figure for standard drive systems or the figure for the Energy-Miser®/BALTIguard™ Fan System.

When the drives are properly aligned, the straight edge will contact all points as indicated. There should be no more than 1/16" deviation from four-point contact.

If realignment is necessary, loosen the motor sheave and align it with the fan sheave and be sure to allow approximately 1/4" for draw-up as the bushing screws are retightened.

Aluminum Fan & Bushing Installation Instructions

 **CAUTION: READ COMPLETE INSTRUCTIONS BEFORE PROCEEDING:**

BAC aluminum fans are installed using a standard cast iron bushing with special length bolts. The proper bolts are provided with each bushing kit. Proper installation also requires the bolts to be tightened to the specific torque values for each fan and bushing type, as shown on the chart below.

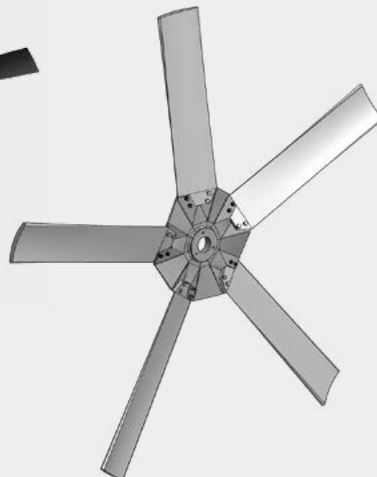
Fan Type	Product Type	Bushing Type	Bolt Torque (FT-LBS)
A	FXT	H	8
A	VCA	P	16
A	VCA	Q	29
B	FXV and CXV	Q	29
C	PT2, Series 3000, Series 1500, FXV3 and CXVB, PC2	Q	29
C	Series 3000	R	29
C	Series 3000	E	22

Bushing Installation Instructions:

1. Failure to follow these instructions may result in a cracked hub.
2. Do not use “Never Seize” or any lubricants on the bolts, bushings or shaft.
3. Do not attempt to bottom out the bushing in the aluminum fan hub. After proper bolt torque is applied, there should be a gap between the bushing flange and fan hub.
4. Use the longest bolts provided with the bushing kit.
5. Wipe the shaft, bushing bore, bushing taper, and fan hub bore with a cleaning solvent to remove any dirt and oil.
6. Tighten each bolt a little at a time so that the bushing draws evenly into the fan hub without cocking to one side or the other. Torque the bolts as specified on the chart above. Rotate the shaft to verify that it does not wobble.



Fan Type B
CXV and FXV



Fan Type A
Series 1500, VC2, VCA, and FXT



Fan Type C
Series 3000, PT2, PC2, FXV3 and CXVB



Aluminum and Cast Iron Sheave Bushing Installation Instructions

Read complete instructions before proceeding:

1. Wipe the shaft, bushing bore, bushing taper, and sheave bore with a cleaning solvent to remove any dirt or oil.
2. Tighten each bolt a little at a time so that the bushing draws evenly into the sheave hub without cocking to one side or the other. Torque the bolts as specified on the chart below. Rotate the sheave to verify that it does not wobble.
3. **Do not attempt to bottom-out the bushing in the sheave. After proper bolt torque is applied, there should still be a gap between the bushing flange and the sheave hub.**

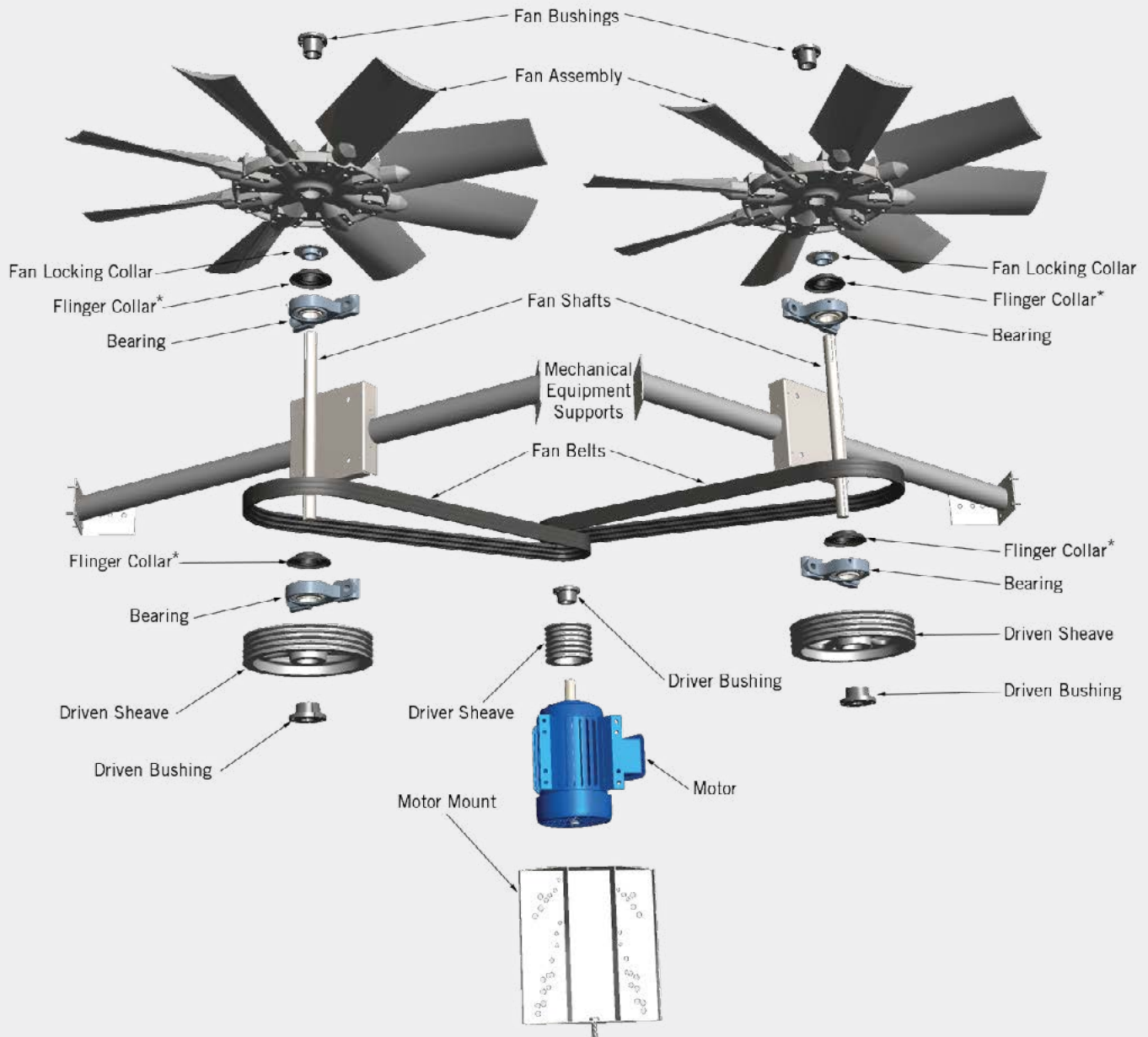
Aluminium Sheave Size	Bushing Type	Bolt Torque (FT-LBS)
2B3.6 to 2B4.4	SH	6
2B4.6 to 2B6.8	SDS	6
2B7.0, 2B16.0	SK	13
2B20.0	SF	22
4B4.2 to 4B6.6	SD	6
4B6.8 to 4B9.4	SK	13
4B16.0, 4B20.0	SF	19
4B25.0, 5B25.0	E	35
6B5.0 to 6B5.4	SD	6
6B5.6 to 6B6.8	SK	13
6B7.0, 6B7.4, 6B9.4	SF	22
6B30.0, 6B38.0	E	35
8B5.6	SK	13
8B7.4 to 8B8.2	SF	22
8B8.8 to 8B9.4	E	35
8B38.0, 8B50.0	F	55
Cast Iron Sheave Size	Bushing Type	Bolt Torque (FT-LBS)
3B38, 4B25 to 4B38, 5B20 to 5B38, 6B20 to 6B38	E	60
2B25 to 2B38, 3B20 to 3B30, 4B15.4 to 4B20, 5B7.0 to 5B18.4, 6B7.0 to 6B18.4	SF	30
3B4.6 to 3B6.8, 4B3.4 to 4B6.8, 5B3.4 to 5B5.2, 6B3.4 to 6B5.2	SD	9
1B3.4 to 1B4.4, 2B3.4 to 2B4.4, 3B3.4 to 3B4.4	SH	9
1B4.6 to 1B13.6, 2B4.6 to 2B6.8	SDS	9
1B15.4 to 1B20, 2B7.0 to 2B18.4, 3B7.0 to 3B18.4, 4B7.0 to 4B13.6, 5B5.4 to 5B6.8, 6B5.4 to 6B6.8	SK	15



BAC CAUTION TIP:

Failure to follow these instructions may result in a cracked sheave! Do not use “Never Seize” or any lubricants on the bolts!

Horizontal Axial Fan Assembly

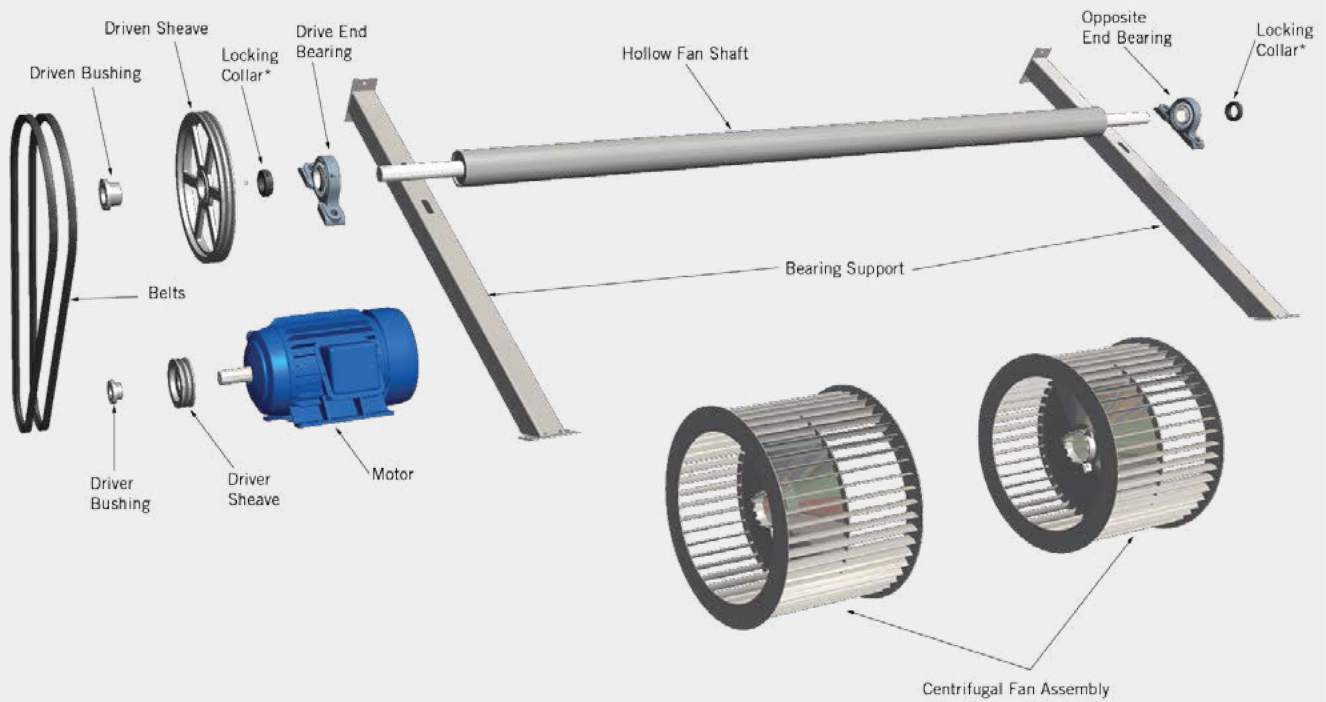


* Included in bearing kit

FIND YOUR REPRESENTATIVE:
BaltimoreAircoil.com/repfinder
Or Call: 800.896.8497

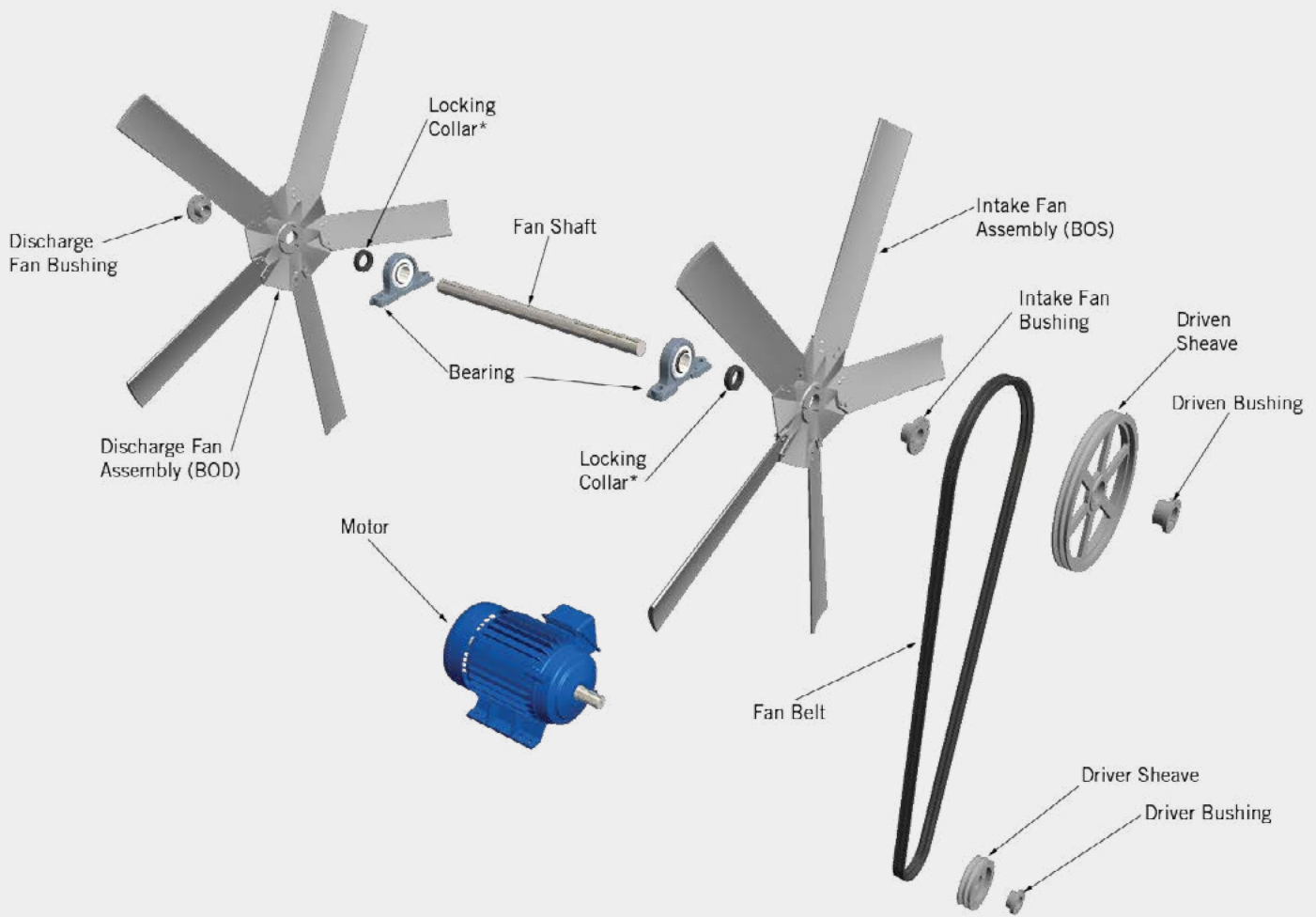


Centrifugal Fan Assembly



*Included in bearing kit

Vertical Axial Fan Assembly



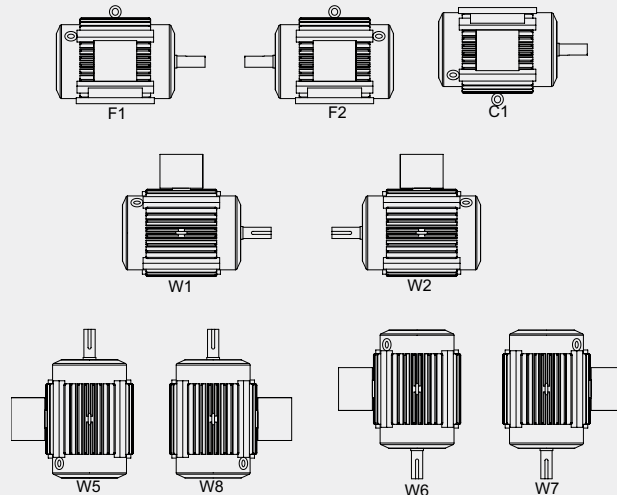
* Included in bearing kit



Motor Orientation

BAC motors come in a variety of orientations as shown in the table below. Use this table to determine the standard motor configuration in your unit and use the chart below to confirm this is what has been supplied.

Model	Motor Type	Motor Orientation, Right-hand Configuration	Motor Orientation, Left-hand Configuration
Series V	TEFC	F2-Standard, F1-Pony	F1-Standard, F2-Pony
VTL, VFL, VCL	TEFC	F2-Standard, F1-Pony	F1-Standard, F2-Pony
VC2	TEFC	C1-Standard W1 & W2 Independent Fans	C1-Standard W2 & W1 Independent Fans
FXT	TEFC	Contact your local BAC Representative	
CFT	TEAO	W7	
1500, FXV (single), CXVB	TEAO	W8-Standard, W5-Pony or Independent Fans	
3000, FXV3, CXVT	TEAO (TEFC with ext. motor)	W6-Belt Drive F1-Gear Drive	N/A
PT2, PC2	TEAO (TEFC with ext. motor)	W8-Internal Direct Drive and External W6-Internal Belt Drive	
VCA	TEFC	F2	F2
VCA (End Blow Units)	TEFC	C1	C1



BAC TECH TIP:

TEAO: Totally Enclosed, Air Over. These motors are mounted in, and cooled by, the air stream of the unit.

TEFC: Totally Enclosed, Fan Cooled. These motors are outside the air stream of the unit; therefore, a cooling fan is required on the motor to prevent overheating.

Pump Selection – Common Pumps

All part #'s are for 230/460 volt pumps.

Contact your local BAC Representative for other voltages.

Product Line	Box Size	HP	RPM	Pump P/N	Pump Seal Kits
PC2 DISCONTINUED	4 x 6	1	3500	300211	300472
	4 x 12	1 1/2	1750	301204	300655
	7.4 x 9	2	1750	300517	300655
	7.4 x 18	5	1750	300526	300656
	10 x 12	5	1750	300526	300656
	12 x 12	5	1750	300563	300656
	12 x 18	7 1/2	1175	301203	301382
FXV/CXVB (2011 - Present)	8.5 x 6	2	1750	301308	300655
	8.5 x 9	5	1750	301309	300656
	8.5 x 12	5	1750	301310	300656
	8.5 x 12	7 1/2	1750	301311	300656
	10 x 12	7 1/2	1750	301311	300656
	10 x 18	10	1175	301312	301382
	12 x 12	7 1/2	1750	301311	300656
	12 x 18	10	1175	301312	300656
FXV/CXV (1995-2011)	8.5 x 6	1 1/2	3500	300605	300472
	8.5 x 9	2	1750	300517	300655
	8.5 x 12	3	1750	300916	300656
	12 x 12	5	1750	300563	300656
	12 x 18	7 1/2	1750	300931	300656
	12 x 24	(2) 5	1750	300563	300656
FXV3 and CXVB	12 x 24	(2) 7 1/2	1750	300931	300656
	14 x 26	(2) 7 1/2	1750	300931	300656
Low Profile VFL/VCL	4 x 3	1/3	3500	300586	300472
	4 x 6	1/2	3500	300587	300472
	4 x 9	1	3500	300588	300472
	4 x 12	1 1/2	3500	300605	300472
	8 x 9	1 1/2	1750	300590	300655
	8 x 12	2	1750	300591	300655



BAC CAUTION TIP:

Shaft sleeve part number 300388 will need to be ordered with all seal kits for pumps 1 1/2 Hp and larger.

Product Line	Box Size	HP	RPM	Pump P/N	Pump Seal Kits
Series V	3 x 3	1/3	3500	300214	300472
	3 x 6	1/2	3500	300213	300472
	3 x 9	3/4	3500	300212	300472
	3 x 12	1	3500	300211	300472
	4 x 12	1 1/2	3500	300210	300472
	6 x 12	2	1750	300517	300655
	8 x 12	3	1750	300520	300655
	8 x 18	5	1750	300523	300656
	8 x 18	5	1750	300526	300656
	10x12	5	1750	300901	300655
	10x18	5	1750	300678	300656
	12 x 12	5	1750	300526	300656
	12 x 18	5	1750	300563	300656
	12 x 18	7 1/2	1750	300931	300656
PF2	4 x 6	3/4	3500	301316	300472
	4 x 12	1	3500	300588	300472
	4 x 12 (12 Row)	1	3500	301318	300472
	7.4 x 9	1 1/2	3500	300605	300472
	7.4 x 18	3	1750	301325	300656
	10 x 12 (8 & 10 Row Single Cell)	2	1750	301326	300655
	10 x 12 (12 & 14 Row Single Cell)	2	1750	301308	300655
	10 x 12 (8 & 10 Row Dual Cell)	2	1750	301308	300655
	10 x 12 (12 & 14 Row Dual Cell)	2	1750	300591	300655
	12 x 12 (Single Cell)	5	1750	300523	300656
	12 x 12 (Dual Cell)	5	1750	300526	300656
	12 x 12 (Quad Cell)	5	1750	300563	300656
	12 x 18 (Single & Dual Cell)	5	1175	301331	300474
	12 x 18 (Quad Cell)	5	1175	301335	300474
VCA	5 x 12	1 1/2	3500	300210	300472
	6 x 12	2	1750	300561	300655
	8 x 12	3	1750	300916	300656
	8 x 18	5	1750	300526	300656
	10 x 12	5	1750	300526	300656
	10 x 18	7 1/2	1750	300931	300656
	12 x 12	5	1750	300526	300656
	12 x 18	7 1/2	1750	300931	300656

**BAC CAUTION TIP:**

Shaft sleeve part number 300388 will need to be ordered with all seal kits for pumps 1 1/2 Hp and larger.

Water Quality Guidelines

A proper water treatment program, administered under the supervision of a competent water treatment specialist, is an essential part of routine maintenance to ensure the safe operation and longevity of evaporative cooling equipment, as well as other system components.

In evaporative cooling products, cooling is accomplished by evaporating a small portion of the recirculating water as it flows through the unit. As the water evaporates, the dissolved solids originally present in the water remain behind and if not controlled, the concentration of dissolved solids will increase rapidly. This can lead to corrosion, scale or biological fouling which may negatively affect heat transfer as well as the longevity of system components.

- **Corrosion** – Red rust on steel components and white rust on galvanized surfaces may affect the longevity of system components.
- **Scale formation** – Scale, typically a calcium or magnesium based build-up, not only reduces heat transfer and system efficiency, but may also lead to under deposit corrosion. If scale is not controlled, it may continue building on critical components such as the fill, and severely impact thermal performance.
- **Biological Fouling** – Slime and algae formations may reduce heat transfer, promote corrosion, and harbor pathogens such as *Legionella*.

Each of these aspects of water quality is discussed in greater detail below. Since the quality of the ambient air and make-up water varies significantly from job site to job site, BAC strongly recommends obtaining the services of a competent water treatment agency prior to the initial start-up of the evaporative cooling equipment. Additionally, to protect against the risk of *Legionella* contamination, the cooling equipment should never be operated without adequate biological control.

Corrosion and Scale Control

To control corrosion and scale, maintain the water chemistry of the recirculating water within the parameters listed in **Table 1** on the following page. The specific measures required vary from system to system and are dependent on the chemistry of the make-up water, the metallurgy of the piping and heat transfer devices exposed to the recirculating water, and the temperatures at which the system will be operating. Bleed/blowdown, the continuous flow of a small portion of the recirculating water to a drain, is used to control the concentration of dissolved solids. On rare occasions, this may be adequate to control scale and corrosion. More often, chemical scale and corrosion inhibitors are necessary, which raise the allowable level of dissolved solids without the risk of scale and corrosion. Keep the chemically treated water within the guidelines given in **Table 1**. In cases where bleed/blowdown alone is being employed for corrosion and scale control without chemical treatment your water treatment specialist may recommend more conservative limits than those shown in **Table 1**.



NOTE:

Since the quality of the ambient air and make-up water varies significantly from job site to job site, BAC strongly recommends obtaining the services of a competent water treatment specialist prior to the initial start-up of the evaporative cooling equipment. Additionally, to protect against the risk of *Legionella* contamination, never operate the cooling equipment without adequate biological control.

Chemical Treatment Requirements

Chemical treatment programs must meet these requirements:

- ✓ The chemicals must be compatible with the unit materials of construction as well as other materials used in the system (pipe, heat exchanger, etc.).
- ✓ BAC discourages acid dosing as means of scale control except for open circuit cooling towers with remote sump applications or towers constructed from stainless steel. This should be done at a point in the system where total mixing and dilution occur before reaching the evaporative cooling equipment. The preferred injection point for chemical scale and corrosion inhibitors is on the discharge side of the system circulating pump(s). These chemicals should not be batch fed directly into the unit's cold water basin or water distribution system, as this can severely damage areas directly contacted.
- ✓ When chlorine is added to the system, free residual chlorine should not exceed 1 ppm, except as noted in start-up and shutdown section. Exceeding this limit may accelerate corrosion.

Passivation

When new systems are first commissioned, special measures should be taken to ensure that galvanized steel surfaces are properly passivated to provide maximum protection from corrosion. Passivation is the formation of a protective, passive, oxide layer on galvanized steel surfaces. To ensure the galvanized steel surfaces are passivated, the pH of circulating water should be kept between 6.5 and 8.2 and calcium hardness between 50 and 600 ppm (as CaCO₃) for four to eight weeks after start-up, or until new zinc surfaces turn dull gray in color. If white deposits form on galvanized steel surfaces after the pH is returned to normal service levels, it may be necessary to repeat the passivation process. In case the pH can't be kept below 8.2, a secondary approach is to conduct a chemical passivation using inorganic phosphate or film-forming passivation agents. Consult your water treatment specialist for specific recommendation.



NOTE: Stainless steel cold water basins and basins protected by the TriArmor® Corrosion Protection System or thermosetting hybrid polymer do not require passivation. However, if the upper structure is galvanized steel, passivation is required. Closed circuit cooling towers and evaporative condensers with galvanized coil require passivation.

Biological Control

The warm, oxygen and nutrient rich environment inside evaporative cooling equipment provides an ideal environment conducive to the growth of algae, slime, and other micro-organisms. Uncontrolled, this can reduce heat transfer, promote corrosion, and promote the growth of potentially harmful organisms such as *Legionella*. To avoid biological contamination and minimize the risk of *Legionella*, initiate the biocide treatment program at start-up and continue on a regular basis thereafter in accordance with the treatment supplier's instructions. Bleed/blowdown or chemical treatment used for corrosion and scale control alone is not adequate for control of biological contamination. Introduce solid or granular biocides through a chemical "pot" feeder installed in parallel with the system circulating pump. Diluted liquid biocides may be added directly to the cold water basin.

Property of Water	Recommended Levels for Various Materials of Construction			
	Galvanized Steel	Thermosetting Hybrid Polymer	Type 304 Stainless Steel	TriArmor® Corrosion Protection System or Type 316 Stainless Steel
pH	6.5 to 9.0 ^[1]	6.5 to 9.2 ^[1]	6.5 to 9.2 ^[1]	6.5 to 9.5 ^[1]
Total Suspended Solids	25 ppm	25 ppm	25 ppm	25 ppm
Total Dissolved Solids (TDS)	1,500 ppm	2,050 ppm	2,050 ppm	2,500 ppm
Conductivity	2,400 (micromhos/cm)	3,300 (micromhos/cm)	3,300 (micromhos/cm)	4,000 (micromhos/cm)
Alkalinity as CaCO ₃	500 ppm ^[2]	600 ppm ^[2]	600 ppm ^[2]	600 ppm ^[2]
Calcium Hardness as CaCO ₃	50 to 600 ppm ^[2]	50 to 750 ppm ^[2]	50 to 750 ppm ^[2]	50 to 750 ppm ^[2]
Chlorides (CL)	250 ppm	300 ppm	300 ppm	750 ppm
Sulfates	250 ppm	350 ppm	350 ppm	750 ppm
Silica	150 ppm	150 ppm	150 ppm	150 ppm

Table 1. Quality Guidelines for Treated Circulating Water



NOTES:

- Galvanized steel units require passivation in order to prevent white rust (refer to “Passivation”).
- Hardness and alkalinity limits may be exceeded under certain circumstances. Consult your water treatment specialist for recommendations.
- The conversion factor used to determine conductivity is 0.625 (TDS = 0.625 x Conductivity).
- EVERTOUGH™ Construction units have a TriArmor® Corrosion Protection System basin.
- The guidelines above refer to the materials used in construction. Different combinations of materials may be used on the same unit.
- Water chemistry will change with operating temperatures. The recommended guidelines listed in Table 1 refers to water temperature at 95°F.

Initial Start-up & Start-up Following a Shutdown Period

To minimize the risk of biological contamination during a shut-down period of three days or more, it is recommended that the entire system (evaporative cooling equipment, system piping, heat exchangers, etc.) be drained. To resume operation of a drained system and at initial start-up, clean all debris from the cold water basin and fill the system with fresh water. Then execute one of the following biocide treatment programs while operating the circulating pump and prior to operating the unit fans:

- ✓ Resume treatment with the biocide that was used prior to shut-down. Operate the pump only while maintaining the maximum recommended biocide residual for a sufficient duration (residual and time will vary with the biocide) as recommended by the water treatment supplier. Start the fan only after this treatment period is completed.
- ✓ Check the pH of the circulating water and, if necessary, adjust it to 7.0 - 7.6 pH. Then, running the pump only, treat the system with sodium hypochlorite to maintain a level of 4 to 5 mg/l (ppm) free chlorine (as Cl₂) over a six hour period. Test kits for measuring the free residual of chlorine are commercially available. Start the fan only after this treatment period is completed.

When it is not practical to drain the system during shut-down periods, install a by-pass line with shut-off valves to permit the recirculating water to circulate throughout the system, including the unit basin, while bypassing the fill section of the evaporative cooling equipment (fans should remain off). Treat the system as per one of the above-described methods prior to restarting the unit.

System Cleaning for Coil Products

This section is applicable to BAC Closed Circuit Cooling Towers and Evaporative Condensers only. The outside of the heat exchange coil may require occasional cleaning. The chemicals used must be compatible with the materials being treated.

For example, the standard coil is galvanized steel on the outside. The inside of the coil is black carbon steel. For finned coils, the coil cleaning must be careful not to damage the fins (outside of the coils) and the coils themselves. For specific recommendations on coil cleaning, contact a qualified consultant.

Closed Circuit Cooling Towers

With proper precautions, prior to start-up circulate an alkaline solution which can be used to clean condenser water systems through a closed circuit cooling tower. The necessary precautions include:

- Limit the duration of the cleaning to one day or at the most two days.
- The temperature of the solution should never exceed 100°F (37.8°C).
- The maximum concentration of chemicals in the circulation solution should not exceed any of the following:
 - 5% Sodium Hydroxide
 - 5% Sodium Metasilicate
 - 2% Sodium Carbonate
 - 2% Tetra Sodium Pyrophosphate
 - 0.5% Trisodium Phosphate
 - 0.5% Sodium Nitrate
 - 5-10% Butyl Cellosolve

while bypassing the fill section of the evaporative cooling equipment (fans should remain off). Treat the system as per one of the above-described methods prior to restarting the unit.

Evaporative Condensers

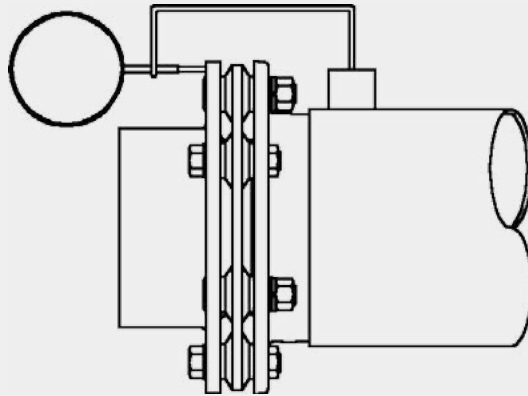
The installation and manufacturing processes commonly used for field assembly of steel-piped systems may leave weld byproducts inside coils and connecting piping (especially in refrigeration systems). It is common practice to install filters and/or strainers that remove contaminants during initial system operation. Shortly after system startup, the filters and/or strainers should be cleaned or replaced.

Alignment Instructions for Gear Drive Composite Shafts

NOTE: Both angular and axial alignment must be checked to properly align a gear coupling.

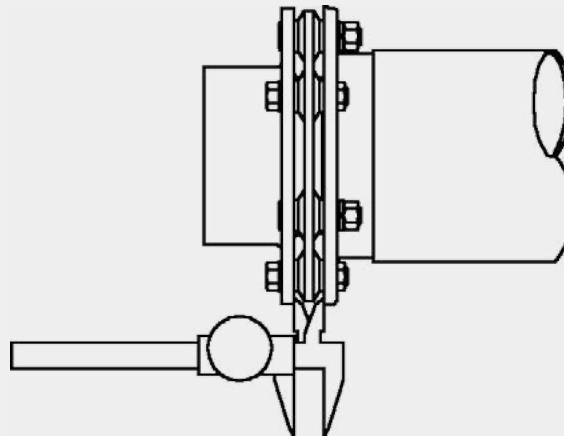
ANGULAR ALIGNMENT

Angular alignment requires the use of a dial indicator position as indicated in figure below. With the dial indicator set to zero, check the shaft alignment by rotating the shaft and recording the maximum and minimum reading on the dial indicator.



AXIAL ALIGNMENT

The axial misalignment must also be checked. Use a caliper as shown in the figure below and take four readings around the perimeter at 90° intervals. Do this without rotating the coupling.



For complete alignment instructions and tolerances, please contact your local BAC Representative.



BAC CAUTION TIP: All couplings must be covered with a guard per OSHA requirements.

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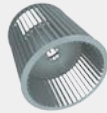
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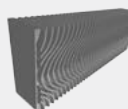
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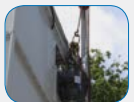
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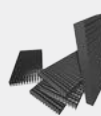
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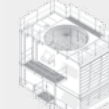
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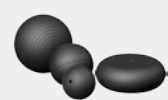
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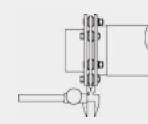
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