PARTS & MAINTENANCE GUIDE

ENERGY SAVING RETROFITS
REDUCTION IN WATER USAGE
LOWER LEAVING WATER TEMPERATURES
INCREASED PERFORMANCE
SOUND REDUCTION OPTIONS
Welcome to the BAC Parts and 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
- Maintenance Reference Materials
- Picture Index of Parts
Centrifugal Fans

- Centrifugal fans have inherently low sound characteristics
- Available in multiple materials of construction to meet various operating conditions
- Engineered, manufactured, 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.
**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.

**Whisper Quiet Fans**
- Ultimate low sound solution
- Available for Series 3000, 1500, PT2, Single Air Inlet 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.

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**Find Your Representative:**
BaltimoreAircoil.com/repfinder
Or Call: 800.896.8497
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

<table>
<thead>
<tr>
<th>Bearing Quantity</th>
<th>Size of Bearings</th>
<th>Multi-Point Greaser</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-11/16” or smaller</td>
<td>125cc</td>
<td>1 Year</td>
</tr>
<tr>
<td>1</td>
<td>Larger than 1-11/16”</td>
<td>125cc</td>
<td>6 Month</td>
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<td></td>
<td></td>
<td>250cc</td>
<td>1 Year</td>
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#### Induced Draft – One Greaser per Bearing

<table>
<thead>
<tr>
<th>Bearing Quantity</th>
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<td>6 month</td>
</tr>
<tr>
<td></td>
<td>Smaller than 2-15/16”</td>
<td>250cc</td>
<td>1 Year</td>
</tr>
<tr>
<td>1</td>
<td>2-15/16”</td>
<td>250cc</td>
<td>3 Month</td>
</tr>
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</table>

### Multi-Point Automatic Bearing Greaser

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<tbody>
<tr>
<td>2</td>
<td>1-11/16” or smaller</td>
<td>250cc Multi-point kit</td>
<td>1 Year</td>
</tr>
<tr>
<td>4</td>
<td>1-11/16” or smaller</td>
<td>500cc Multi-point kit</td>
<td>6 Month</td>
</tr>
<tr>
<td>2</td>
<td>Larger than 1-11/16”</td>
<td>250cc Multi-point kit</td>
<td>6 Month</td>
</tr>
<tr>
<td></td>
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<td>2-15/16”</td>
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<td>3 Month</td>
</tr>
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</table>
**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.

**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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**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.
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.

**BAC MAINTENANCE TIP:**
See bushing torque requirements for Cast Iron and Aluminum Sheaves in the reference section on page 43.

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 grove to 8 groove, 3 3/5” to 50” diameter for all induced draft applications.

**Always replace bushings and bearings together to reduce downtime!**
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.

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

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.

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

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Or Call: 800.896.8497
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 5-year warranty
- IP55 rating for greater protection from water and particulate contaminants

BAC CAUTION TIP:
What does IP mean? IP is an ingress protection rating that states the level of protection from solids and liquids for your motor. The higher the number after the IP identifier, the higher the protection from potential water damage. If your motor is lower than an IP55 rating, you are purchasing a motor that was not properly protected from water seeping into the motor and your motor may prematurely fail in evaporative cooling equipment applications.
Cooling Tower Duty Motors
BAC has worked with motor manufacturers to develop rigorous standards for cooling tower duty motors. While supply companies and our competition might offer replacement motors that will initially function in a cooling tower, BAC offers top quality motors that will reliably continue to operate in the harsh cooling tower environment, resulting in less motor failures, downtime, and replacements. Here at BAC, we believe in our motors so much that we stand by them with a 5-year warranty, compared to the 1-3 year industry standard.

Industry Rated Performance and Durability:
✓ Built according to inverter duty NEMA Standard MG1, Section IV, Part 31 and designed for operation in 100% humidity
✓ IEEE 112, Method B, tested ensuring performance and survivability
✓ IP55 rating for superior protection against pressurized water jets from all directions

Energy Efficient with Flexible Installation:
✓ Meets or exceeds all NEMA Premium and Consortium for Energy Efficiency energy requirements with efficiency values certified by UL (CSA C390)
✓ Meet Design B torques, maintaining exceedingly high breakdown and locked rotor torque while providing the highest rated efficiency levels
✓ Designed to operate in either horizontal, shaft up, or shaft down positions
✓ Multiple end shield drain plugs for all position mounting
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.

BAC Maintenance Tip:
Always check spray nozzles when inspecting evaporative cooling equipment as poor spray patterns will negatively affect unit performance.

Spray Branches

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

**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.

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.

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Or Call: 800.896.8497
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.
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.

BAC Tech Tip:


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.
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.
**Combined Inlet Shields**

- Available for the Series 3000, Series 1500, PT2, PF2, PC2, FXV 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
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
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

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.
BAC offers the following for all units:

› Enclosed controls
› Variable frequency drives (VFD)
› Safety disconnect switches
› Combined Drive Enclosure

Benefits of BAC Equipment Controls:

› Water and energy savings
› NEMA-rated enclosures for indoor/outdoor applications
› Industrial grade components
› UL listed and CSA/CUL certified
› Single-source solution
› Easy installation

BAC CAUTION TIP:
When starting up a variable frequency drive, run the tower through the entire speed range to find and lock out any frequencies that cause unwanted vibrations.

Always select a premium efficiency motor for inverter duty use. All BAC premium efficiency motors are fully compliant with NEMA MG-1 Section-1, Part-9 Inverter Duty Ratings.

Contact your local rep to upgrade your Marley or Evapco Units with BAC Controls!

Save operating costs and energy with BAC Equipment Controls!
All equipment controls are custom-engineered to operate your new or existing evaporative cooling equipment.
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
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

<table>
<thead>
<tr>
<th>Cooling Tower Leaving Water Temperature Decrease</th>
<th>Annual Cooling Tower Efficiency Savings²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1°F</td>
<td>$5,306</td>
</tr>
<tr>
<td>2°F</td>
<td>$10,612</td>
</tr>
<tr>
<td>3°F</td>
<td>$15,918</td>
</tr>
</tbody>
</table>

¹ Note 1: U.S. Energy Information Administration (EIA)
² 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.
Replace Nozzles

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

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.**

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.**

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.**

<table>
<thead>
<tr>
<th><strong>#</strong></th>
<th><strong>Action</strong></th>
<th><strong>Energy Savings</strong></th>
<th><strong>Temperature Impact</strong></th>
<th><strong>Pay Back Period</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Replace Nozzles</td>
<td>2% to 3%</td>
<td>1°F Decrease in Leaving Water Temperature</td>
<td>Less Than 1 Year</td>
</tr>
<tr>
<td>2</td>
<td>Upgrade or Replace Drive Components</td>
<td>3% to 7%</td>
<td>1-2°F Decrease in Leaving Water Temperature</td>
<td>Less Than 1 Year</td>
</tr>
<tr>
<td>3</td>
<td>Install New Fill</td>
<td>7% to 10%</td>
<td>2°F Decrease in Leaving Water Temperature</td>
<td>2-3 Years</td>
</tr>
<tr>
<td>4</td>
<td>Install a VFD</td>
<td>30% to 40%</td>
<td></td>
<td>Less Than 1 Year</td>
</tr>
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Contact your local BAC Representative for a free unit inspection and consultation on Energy Saving Retrofits.
BACross® Replacement Fill Kits
For FXT, Series 1500, Series 3000, FXV, and CXV Single and Dual Air Intake Products
› 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 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
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.
Pre-assembled Platforms

- OSHA compliant
- Increases the ease of maintenance
- Available on Series 3000, Series 1500, PC2, PT2, FXV, PF2, CXVB, 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.
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.
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.
Large Orifice Spray Distribution Retrofits

- Large orifice grommeted nozzles can easily be retrofitted in BAC’s older designed products and in other manufacturers’ units
- Grommeted 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.
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
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
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
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.

FIND YOUR REPRESENTATIVE:
BaltimoreAircoil.com/repfinder
Or Call: 800.896.8497
## Maintenance Checklist for:
Cooling Towers, Closed Circuit Cooling Towers, and Evaporative Condensers

### Mechanical equipment system:

<table>
<thead>
<tr>
<th>Task</th>
<th>Start-Up</th>
<th>Monthly</th>
<th>Quarterly</th>
<th>Annually</th>
<th>Shutdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check belt condition</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjust belt tension[^3]</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubricate fan shaft bearings</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Lubricate motor base adjusting screw</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check and lubricate optional gear drive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Check drive alignment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Check motor voltage and current</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean fan motor exterior</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check fan motor for proper rotation</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check general condition of the fan</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check and unplug fan drain holes (hollow blade fans)</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check fan for uniform pitch</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check fan for rotation without obstruction</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check and recoat steel shafts with RUST VETO®</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

### Inspect and clean as necessary:

<table>
<thead>
<tr>
<th>Task</th>
<th>Start-Up</th>
<th>Monthly</th>
<th>Quarterly</th>
<th>Annually</th>
<th>Shutdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect general condition of the unit[^2] and check unit for unusual noise or vibration</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect cold water basin</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flush water distribution system/inspect spray nozzles</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain basin and piping</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Inspect air inlet louvers/combinated inlet shields</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check and adjust water level in basins</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check operation of make-up valve</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check and adjust bleed rate</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect unit finish</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

### 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.

[^1]: Maintenance Checklist for: Cooling Towers, Closed Circuit Cooling Towers, and Evaporative Condensers[^1]
[^2]: Inspect general condition of the unit[^2] and check unit for unusual noise or vibration
[^3]: Adjust belt tension[^3]
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)

a. The vibration setpoint adjustment is accessible externally. Turning the setpoint adjustment clockwise (CW) increases the vibration setpoint.

b. 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).

c. 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.

d. 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 set point.

e. 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.
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 #S82628P1, normal temperature range
- -25°F to 30°F - BAC #S82627P1, 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.
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.

<table>
<thead>
<tr>
<th>Fan Type</th>
<th>Product Type</th>
<th>Bushing Type</th>
<th>Bolt Torque (FT-LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>FXT</td>
<td>H</td>
<td>8</td>
</tr>
<tr>
<td>A</td>
<td>VCA</td>
<td>P</td>
<td>16</td>
</tr>
<tr>
<td>A</td>
<td>VCA</td>
<td>Q</td>
<td>29</td>
</tr>
<tr>
<td>B</td>
<td>FXV and CXV</td>
<td>Q</td>
<td>29</td>
</tr>
<tr>
<td>C</td>
<td>PT2, Series 3000, Series 1500, FXV and CXV Dual Air Intakes, PC2</td>
<td>Q</td>
<td>29</td>
</tr>
<tr>
<td>C</td>
<td>Series 3000</td>
<td>R</td>
<td>29</td>
</tr>
<tr>
<td>C</td>
<td>Series 3000</td>
<td>E</td>
<td>22</td>
</tr>
</tbody>
</table>

**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.
### 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.

#### Aluminum Sheave Size

<table>
<thead>
<tr>
<th>Bushing Size</th>
<th>Bushing Type</th>
<th>Bolt Torque (FT-LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B3.6 to 2B4.4</td>
<td>SH</td>
<td>6</td>
</tr>
<tr>
<td>2B4.6 to 2B6.8</td>
<td>SDS</td>
<td>6</td>
</tr>
<tr>
<td>2B7.0, 2B16.0</td>
<td>SK</td>
<td>13</td>
</tr>
<tr>
<td>2B20.0</td>
<td>SF</td>
<td>22</td>
</tr>
<tr>
<td>4B4.2 to 4B6.6</td>
<td>SD</td>
<td>6</td>
</tr>
<tr>
<td>4B6.8 to 4B9.4</td>
<td>SK</td>
<td>13</td>
</tr>
<tr>
<td>4B16.0, 4B20.0</td>
<td>SF</td>
<td>19</td>
</tr>
<tr>
<td>4B25.0, 5B25.0</td>
<td>E</td>
<td>35</td>
</tr>
<tr>
<td>6B5.0 to 6B5.4</td>
<td>SD</td>
<td>6</td>
</tr>
<tr>
<td>6B5.6 to 6B6.8</td>
<td>SK</td>
<td>13</td>
</tr>
<tr>
<td>6B7.0, 6B7.4, 6B9.4</td>
<td>SF</td>
<td>22</td>
</tr>
<tr>
<td>6B30.0, 6B38.0</td>
<td>E</td>
<td>35</td>
</tr>
<tr>
<td>8B5.6</td>
<td>SK</td>
<td>13</td>
</tr>
<tr>
<td>8B7.4 to 8B8.2</td>
<td>SF</td>
<td>22</td>
</tr>
<tr>
<td>8B8.8 to 8B9.4</td>
<td>E</td>
<td>35</td>
</tr>
<tr>
<td>8B38.0, 8B50.0</td>
<td>F</td>
<td>55</td>
</tr>
</tbody>
</table>

#### Cast Iron Sheave Size

<table>
<thead>
<tr>
<th>Bushing Size</th>
<th>Bushing Type</th>
<th>Bolt Torque (FT-LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3B38, 4B25 to 4B38, 5B20 to 5B38, 6B20 to 6B38</td>
<td>E</td>
<td>60</td>
</tr>
<tr>
<td>2B25 to 2B38, 3B20 to 3B30, 4B15.4 to 4B20, 5B7.0 to 5B18.4, 6B7.0 to 6B18.4</td>
<td>SF</td>
<td>30</td>
</tr>
<tr>
<td>3B4.6 to 3B6.8, 4B3.4 to 4B6.8, 5B3.4 to 5B5.2, 6B3.4 to 6B5.2</td>
<td>SD</td>
<td>9</td>
</tr>
<tr>
<td>1B3.4 to 1B4.4, 2B3.4 to 2B4.4, 3B3.4 to 3B4.4</td>
<td>SH</td>
<td>9</td>
</tr>
<tr>
<td>1B4.6 to 1B13.6, 2B4.6 to 2B6.8</td>
<td>SDS</td>
<td>9</td>
</tr>
<tr>
<td>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</td>
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</tbody>
</table>

**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
Centrifugal Fan Assembly
Vertical Axial Fan Assembly
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.

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

**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.

<table>
<thead>
<tr>
<th>Product Line</th>
<th>Box Size</th>
<th>HP</th>
<th>RPM</th>
<th>Pump P/N</th>
<th>Pump Seal Kits</th>
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<tbody>
<tr>
<td>PC2</td>
<td>4 x 6</td>
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<td>300656</td>
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<td>10 x 12</td>
<td>5</td>
<td>1750</td>
<td>300526</td>
<td>300656</td>
</tr>
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<td></td>
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<td>5</td>
<td>1750</td>
<td>300563</td>
<td>300656</td>
</tr>
<tr>
<td></td>
<td>12 x 18</td>
<td>7 1/2</td>
<td>1175</td>
<td>301203</td>
<td>301382</td>
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<tr>
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<td>8.5 x 6</td>
<td>2</td>
<td>1750</td>
<td>301308</td>
<td>300656</td>
</tr>
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<td>5</td>
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<td>301309</td>
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</tr>
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<td>12 x 12</td>
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<td>301311</td>
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<td>Dual Intake FXV/CXV-T</td>
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<td>Low Profile VFL/VCL</td>
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<td>300590</td>
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<td>8 x 12</td>
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<td>1750</td>
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</tbody>
</table>

⚠️ **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.
<table>
<thead>
<tr>
<th>Product Line</th>
<th>Box Size</th>
<th>HP</th>
<th>RPM</th>
<th>Pump P/N</th>
<th>Pump Seal Kits</th>
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<td>301381</td>
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<td>301326</td>
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<td>10 x 12 (12 &amp; 14 Row Single Cell)</td>
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<td>10 x 12 (8 &amp; 10 Row Dual Cell)</td>
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<td>8 x 12</td>
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<td>10 x 12</td>
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<td>300526</td>
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<tr>
<td></td>
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<td>12 x 18</td>
<td>7 1/2</td>
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</tr>
</tbody>
</table>

**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 this water evaporates, the dissolved solids originally present in the water remain behind and, if not controlled, their concentration will increase rapidly. This can lead to corrosion, scale or biological fouling which may negatively affect heat transfer as well as the longevity of the unit and other system components.

- **Corrosion** – Red rust on steel components and “white rust” on galvanized surfaces will affect the longevity of the unit.
- **Scale formation** – Scale not only reduces heat transfer and system efficiency, but may lead to under deposit corrosion.
- **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, the water chemistry of the recirculating water must be maintained within certain parameters. 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, however, chemical scale and corrosion inhibitors are necessary, which raise the allowable level of dissolved solids without the risk of scale and corrosion.

Chemically treated water should be kept within the guidelines given in Table 1, or within the limits provided by your water treatment specialist. 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.

**Chemical treatment programs must meet the following requirements:**

1. The chemicals must be compatible with the unit materials of construction as well as other materials used in the system (pipe, heat exchanger, etc.)
2. Chemical scale and corrosion inhibitors, and particularly acid (if used) should be introduced into the circulating water through automatic feeders 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.
3. When chlorine is added to the system, free residual should not exceed 1ppm. Exceeding this limit may accelerate corrosion.
4. Closed Circuit Cooling Towers and Condensers only: Unless a common remote sump is utilized, each cell of a multi-cell coil product must be treated as a separate entity, even if the cold water basins are flumed together or equalized.
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 7.0 and 8.2 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.

Note: Stainless steel units and units protected by the BALTIBOND® Corrosion Protection System/thermosetting hybrid polymer do not 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, a biocide treatment program should be initiated at start-up, and administered 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.

Solid or granular biocides should be introduced through a chemical “pot” feeder installed in parallel with the system circulating pump(s). Dilute liquid biocides may be added directly to the cold water basin. If ozone water treatment is used, ozone concentrations should not exceed 0.5 ppm.

Start-up, Initial and Following a Shut-down 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(s) and prior to operating the unit fans:

1. Resume treatment with the biocide that was used prior to shut-down. Then run the pump only while maintaining the maximum recommended biocide residual for a sufficient period of time (residual and time will vary with the biocide) as recommended by the water treatment supplier. Only after this treatment period is completed should the fan(s) be started.

2. Check the pH of the circulating water and, if necessary, adjust it to between 7.0 to 7.6. 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 that can be used to measure the free residual of chlorine are commercially available. Only after this treatment period is completed should the fan(s) be started.

When it is not practical to drain the system during shutdown periods, a bypass line with shut-off valves should be installed to permit the recirculating water to be circulated throughout the system, including the unit basin, while bypassing the fill section of the evaporative cooling equipment (fans should remain off). The system should be treated per one of the two methods described above prior to restarting the unit.

Table 1 - Circulating water quality guidelines for chemically treated water

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<thead>
<tr>
<th>Property of Water</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.5 to 9.0*</td>
</tr>
<tr>
<td>Hardness as CaCO₃</td>
<td>30 to 750 ppm</td>
</tr>
<tr>
<td>Alkalinity as CaCO₃</td>
<td>500 ppm maximum</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>1500 ppm maximum</td>
</tr>
<tr>
<td>Conductivity</td>
<td>2400 micromhos</td>
</tr>
<tr>
<td>Chlorides</td>
<td>250 ppm maximum as Cl₂</td>
</tr>
<tr>
<td></td>
<td>410 ppm maximum as NaCl</td>
</tr>
<tr>
<td>Sulfates</td>
<td>250 ppm maximum</td>
</tr>
<tr>
<td>Silica</td>
<td>150 ppm maximum</td>
</tr>
</tbody>
</table>

* Galvanized steel surfaces must be passivated before operating at pH levels of 8.3 and higher. See “Passivation” for details.
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 the 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.

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