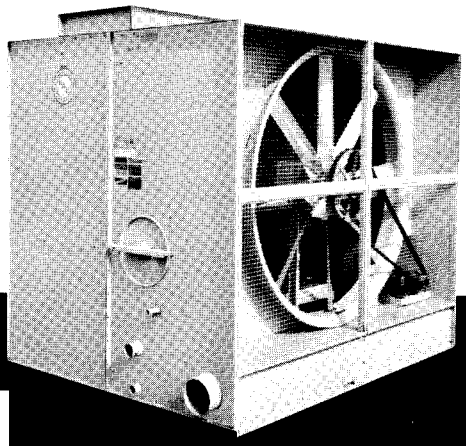
FXT

COOLING TOWERS



Operating and Maintenance Instructions

Baltimore Aircoil Company FXT equipment has been designed to give long, trouble-free service when properly installed, operated, and maintained. To obtain optimum performance and maximum service life, it is important that a program of regular inspection and maintenance be developed and carried out. This bulletin is published as a guide to establishing such a program.

Included in the bulletin are the recommended services for start-up, operation, and shutdown and the approximate frequency for each. *Note that the recommendations on frequency of service are minimums and where operating conditions are severe, the services should be performed more often.* For each required service, follow the procedures outlined under the "Maintenance Procedures" section of this bulletin. The FXT is illustrated in a cutaway form on page 3 with the major points of inspection and service identified. A copy of the unit certified drawing should also be available for reference. If you need additional information about operation or maintenance not covered in this bulletin, contact the local B.A.C. representative. The name and phone number are on a label at the connection end of the unit.

Table of Contents Page

Baltimore Aircoil

BULLETIN M270/1-OJA

General Maintenance Information

The services required to maintain a cooling tower are primarily a function of the quality of the air and water in the locality of the installation:

AIR:
The most harmful atmospheric conditions are those with unusual quantities of industrial smoke, chemical fumes, salt or heavy dust. Such airborne impurities are carried into the cooling tower and absorbed by the recirculating water to form a corrosive solution.

WATER:
The most harmful conditions develop as water evaporates from the cooling tower leaving behind the dissolved solids originally contained in the make-up water. These dissolved solids may be either alkaline or acidic and, as they are concentrated in the circulating water, can produce scaling or accelerated corrosion.

The extent of impurities in the air and water determines the frequency of most maintenance services and also governs the extent of water treatment which can vary from a simple continuous bleed to a sophisticated treatment system. (See "Water Treatment".)

SAFETY *The operation, maintenance, and repair of this equipment should be undertaken only by personnel qualified to do so. All such personnel should be thoroughly familiar with the equipment, the associated system and controls, and the procedures set forth in this manual. Proper care, procedures, and tools must be used in handling, lifting, installing, operating, maintaining and repairing this equipment to prevent personal injury and/or property damage.*

For the protection of authorized service and maintenance personnel, each fan and pump motor associated with this equipment should be installed with a lockable disconnect switch located within sight of the cooling tower. No service work should be performed on or near the fans, motors, and drives or inside the unit without first ensuring the fan and pump motors have been disconnected and locked out.

All electrical, mechanical, and rotating machinery constitute a potential hazard, particularly for those not familiar with its design, construction, and operation. Accordingly, adequate safeguards (including use of protective enclosures where necessary) should be taken with this equipment both to safeguard the public (including minors) from injury and to prevent damage to the equipment, its associated system, and the premises.

Depending upon site conditions, it also may be necessary to install ladders, safety cages, stairways, access platforms, and handrails and toeboards for the safety and convenience of authorized service and maintenance personnel.

At no time should this equipment be operated without all fan screens, access panels, and access doors in place.

The recirculating water system may contain chemicals or biological contaminants including Legionella, which could be harmful if inhaled or ingested. Accordingly, personnel who may be exposed directly to the discharge airstream and the associated drift, mists generated during operation of the water distribution system and/or fans, or mists produced by high pressure water jets or compressed air should these be used to clean portions or components of the recirculating water system, should wear respiratory protection equipment approved for such use by OSHA and/or local occupational safety and health authorities.

WARRANTIES — *Please refer to the Limitation of Warranties applicable to and in effect at the time of the sale/purchase of these products.*

FREEZE PROTECTION — *These products must be protected by mechanical and operational methods against damage and/or reduced effectiveness due to possible freeze-up. Please refer to the Winter Operation guidelines (page 11) or contact the local B.A.C. Representative for recommended protection alternatives.*

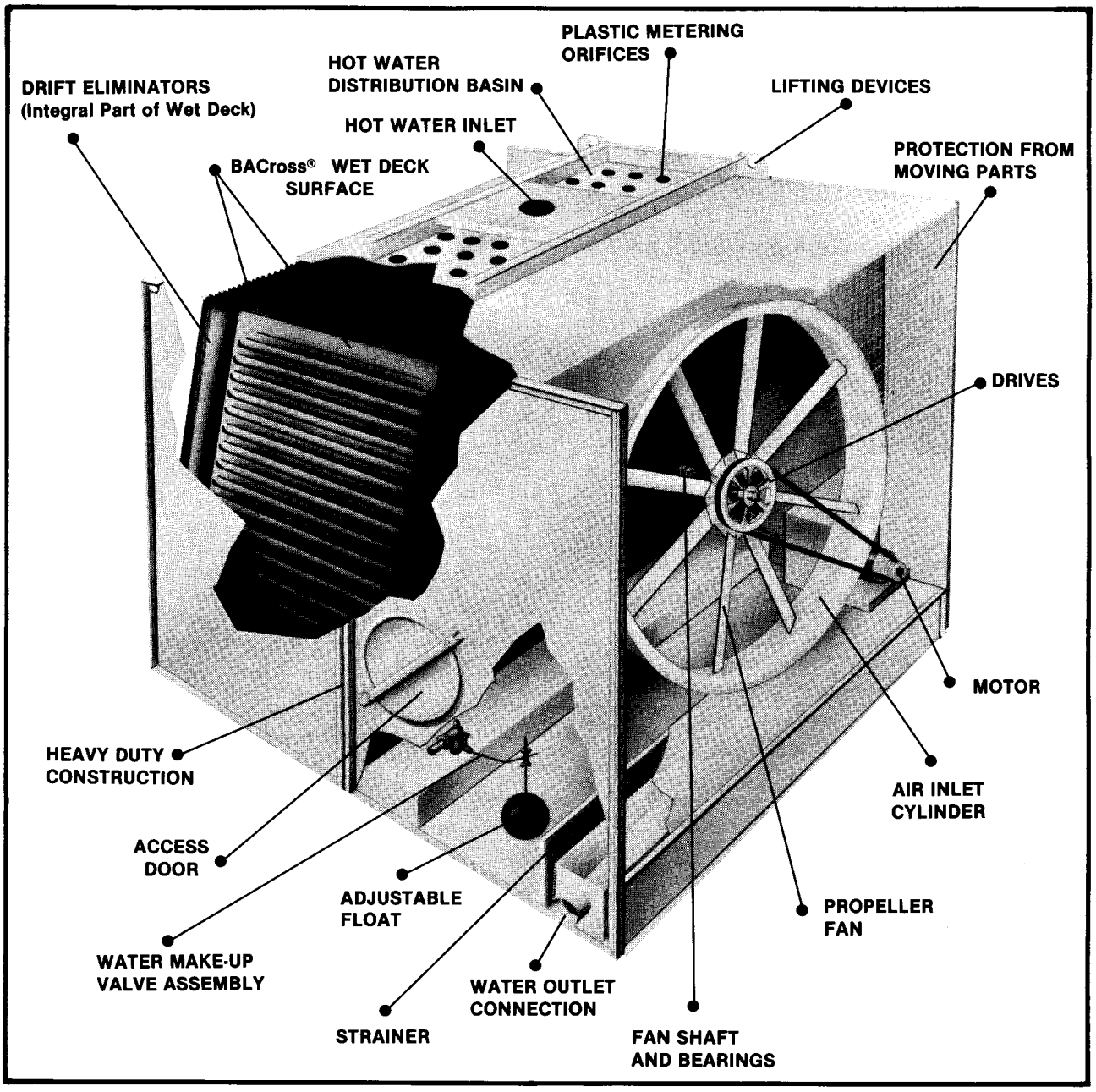


FIGURE 1 — Cutaway View of FXT Cooling Tower

Operation and Maintenance Schedule

TABLE 1. Recommended Maintenance Services for FXT Equipment[1]

TYPE SERVICE	Start-Up	Monthly	Every Six Months	Shutdown	Ref. Page
Inspect General Condition of Unit[2]	X	X			5
Clean Debris from Unit	X	X		X	5
Clean Sump Strainer	X	X		X	6
Inspect and Clean as Necessary:					
A) Hot Water Basins[3]	X	X			6
B) Cold Water Sump	X	X			6
Check and Adjust Water Levels in:					
A) Hot Water Basins	X	X			6
B) Cold Water Sump	X	X			6
Inspect Spray Nozzles	X	X			6
Check and Adjust Fan Belt Tension	X	X			8
Check and Adjust Bleed Rate	X	X			10
Check Operation of Make-Up Valve	X	X			6
Check Unit for Unusual Noise or Vibration	X	X			5
Check Fan Bearing Locking Collars	X		X		7
Check Motor Voltage and Current	X		X		5
Lubricate Fan Shaft Bearings	X		X	X	7
Lubricate Fan Motor Bearings	X				7
Lubricate Motor Base Adjusting Screw	X		X	X	8
Check Fan for Rotation Without Obstruction	X				5
Check Fan Motor for Proper Rotation	X				5
Drain Sump and Piping			X		5
Inspect Protective Finish			X	X	9

Before performing any maintenance or inspection, make certain that all power has been disconnected and locked in the off position.

NOTES:

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

2. When operating in ambient temperatures below freezing, the cooling tower should be inspected more frequently (see Winter Operation, page 11).

3. Not required if hot water basin covers are installed.

Operation and Maintenance

(continued)

INITIAL AND SEASONAL START-UP

Prior to initial start-up or after a shutdown period, the FXT Cooling Tower should be thoroughly inspected and cleaned:

1. Clean all debris, such as leaves and dirt, from the inside of the tower and the hot water basins.
2. Drain the cold water sump (with sump strainers in place) and flush to remove accumulated dirt.
3. Remove the sump strainers and clean.
4. Turn the fan by hand to insure rotation without obstruction.
5. Check and, if necessary, adjust the fan belt tension.
6. Check float operated make-up valve to be sure it is operating freely.
7. Prior to seasonal start-up, lubricate the fan shaft and motor bearings. The ball bearings are factory lubricated but should be relubricated if the unit has been sitting on site for more than a year before start-up.
8. Fill the cold water sump with fresh water to the overflow level.

   a. At *initial start-up* or before restart-up where the sump was completely drained: the initial biocide treatment should be applied at this time (see Water Treatment section).

   b. *Following* a *shut-down period*, where the sump was *not* completely drained: it is recommended that an initial shock treatment of appropriate biocides be administered at restart-up to eliminate accumulated biological contaminants.
9. Set the float on the make-up valve to shut off the valve when the float is approximately ½" below the overflow level. This is an initial setting. Further adjustment may be necessary to maintain the desired level.
10. Prime and start the water circulating pump(s) and adjust system flow rate to design.
11. Start the fan and check for the proper rotation as indicated by the arrow on the fan housing.
12. Inspect hot water distribution orifices and heat transfer section.
13. Check the voltage and current of all three legs of the fan motor. The current should not exceed the nameplate rating. After prolonged shutdowns, the motor insulation should be checked with a megger insulation tester prior to restarting the motor. **To prevent motor overload, do not operate fan motor without design water flow over unit.**

    NOTE: Rapid on-off cycling can cause the fan motor to overheat. It is recommended that controls be set to allow a maximum of 6 on-off cycles per hour.
14. Open the valve in the tower bleed line (by others) and adjust bleed to the recommended rate. (See "Water Treatment".)

AFTER 24 HOURS

After 24 hours of operation under load the following services should be performed:

1. Check the tower for any unusual noise or vibration.
2. Check the operating water levels in the hot water distribution basins and the cold water sump. Adjust if necessary.
3. Readjust the tension of the fan belts.

OPERATION

During operation, the tower should be inspected, cleaned, and lubricated on a regular basis. The required services and recommended frequency for each are summarized in Table 1 on page 4 of this bulletin.

SEASONAL SHUTDOWN

The following services should be performed whenever the FXT Cooling Tower is to be shutdown for a prolonged period:

1. Drain the cold water sump and all piping that will be exposed to freezing temperatures.
2. Clean and flush the hot water and cold water basins with the sump strainers in place. Leave the cold water sump drain open so rain and melting snow will drain from the tower.
3. Clean the sump strainers and reinstall.
4. Cover the hot water basins to keep out dirt and debris.
5. Lubricate the fan shaft bearings and motor base adjusting screw.
6. Close the shutoff valve in the make-up water line (by others) and drain all exposed make-up water piping.
7. Inspect the protective finish on the steel portions of the tower. Clean and refinish as required.

Maintenance Procedures

HOT WATER BASIN

The hot water basin receives the inlet water and distributes it evenly over the wet deck surface through plastic metering orifices. For optimum tower performance, the basins and orifices must be kept clean and, at design flow, the operating water level in the basins should be not less than two inches or greater than six inches deep.

The hot water basins and metering orifices should be inspected regularly. Remove any dirt or debris which may clog the orifices. Unless supplied with the optional sliding hot water basin covers, the basins should be thoroughly cleaned and flushed with fresh water quarterly to remove any accumulated dirt and debris.

COLD WATER SUMP

As the water circulating through the tower is cooled, it collects in the cold water sump and passes through the strainers into the system. The operating water level is controlled by the make-up valve and should be maintained at the operating water level shown in **Table 2**.

The operating water level in the cold water sump will vary with system thermal load (evaporation rate), the bleed rate employed and the make-up water supply pressure. Because the typical winter load is less than the summer load, the winter evaporation rate is frequently less than the summer evaporation rate. With this reduced evaporation rate in winter, the water level in the cold water sump will increase unless the float is re-adjusted. The operating water level shoud be checked monthly and the float re-adjusted as necessary to maintain the recommended operating level.

The water level in the sump of equipment designed for remote sump operation is a function of the circulating water flow rate, water outlet connection size, quantity and location, and outlet piping size and configuration. The remote sump unit is supplied without a water make-up assembly and the sump operating level during remote sump operation is not adjustable.

The cold water sump should be inspected regularly. Any trash or debris which may have accumulated in the sump or on the strainers should be removed and, if necessary, the float adjusted to maintain the design operating level. (See **Figure 2**)

Quarterly, or more often if necessary, the entire cold water sump should be drained, cleaned, and flushed with fresh water to remove the silt and sediment which normally collects in the sump and under the wet deck surface during operation. If not removed periodically, this sediment can become corrosive and cause deterioration of the protective finish. When flushing the sump, the strainers should be left in place to prevent the sediment from re-entering the tower system. After the sump has been flushed, the strainers should be removed, cleaned, and replaced before refilling the sump with fresh water.

MAKE-UP VALVE

A float operated water make-up assembly is furnished as standard equipment on all FXT cooling towers unless the unit has been ordered with the optional electric water level control package or for remote sump application. It is located inside the unit sump within easy reach from the access door at the connection end of each unit.

The standard make-up assembly (see **Figure 2**) consists of a bronze make-up valve connected to a float arm assembly and actuated by a large diameter polystyrene filled plastic float. The float is mounted on an all-thread rod which is held in place by wing nuts. The operating water level in the cold water sump can be adjusted to maintain the recommended operating level by repositioning the float and all-thread rod using the wing nuts provided.

The make-up assembly should be inspected monthly and adjusted as necessary. The valve itself should be inspected annually for leakage and the valve seat replaced if necessary.

The make-up water supply pressure should be maintained between 15 and 50 psig for proper operation of the valve.

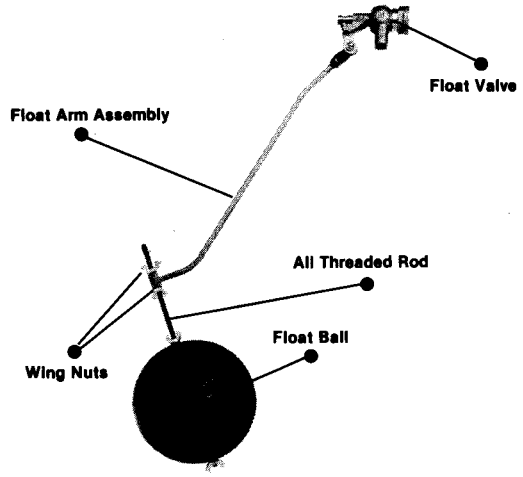


Figure 2—Water Make-Up Valve Assembly.

To make the initial sump water level setting, adjust the wing nuts so that the make-up valve is completely closed when the water level in the cold water sump is ½" below the overflow level. Under design thermal load and with average city water pressure (15 to 50 psig) at the valve, this setting should produce the operating water levels stated in **Table 2.** It should be noted that if the thermal load is less than the design load at the time of unit start-up, this procedure may produce operating levels greater than that shown. It may be necessary to re-adjust the float in order to attain the recommended operating level. The unit sump should be closely monitored and water level adjusted as necessary during the first 24 hours of operation.

TABLE 2

Model No.	Cold Water Basin Operating Height (inches)	
	Pan Bottom	Unit Base
FXT 6, 7.5, 11	4½	8⅝
FXT 16, 20	5	9½
FXT 26, 30, 33	5	8⅝
FXT 38 thru 536	6	9⅝

As an option, an electric water level control package is available in lieu of the previously described mechanical make-up assembly. The package consists of a probe-type liquid level control assembly and a slow closing solenoid valve. Stainless steel electrodes, factory set at predetermined lengths, extend from a NEMA 4 electrode holder into the cold water sump. These electrodes should be periodically cleaned to prevent accumulations of scale, corrosion, sludge or biological growth from interfering with the electrical circuit. With the electric water level control package, the water level is maintained at the recommended operating level regardless of the system thermal load. Therefore, it is not necessary, nor is it recommended that the operating level be adjusted.

During the startup of units equipped with the electric water level control package, the control unit should be bypassed in order to fill the unit to ½" below the overflow level.

Unit operation at the recommended water level will ensure that the unit sump contains sufficient water volume to prevent air entrainment in the circulating pump during system start-up and to provide sufficient excess sump capacity to accept the total system pull-down volume. The total system pull-down volume is the quantity of water suspended in the tower during pump operation plus that contained in the water distribution system, external piping, and any heat exchangers which could drain to the tower sump when the circulating pump is shut down.

SPRAY NOZZLES AND HEAT TRANSFER SECTION

The spray nozzles and heat transfer section should be inspected and cleaned each month. The inspection procedure is as follows:

1. Shut off the fan.
2. Remove hot water basin cover (if present) and clean any nozzles which are clogged.
3. Inspect the wet deck surface. Any damage or obstructions must be corrected.

Note: Do not use steam or high pressure water to clean cooling tower wet deck surface.

FAN SHAFT BEARINGS

The fan shaft is supported by ball bearings (See Figure 3). Each bearing is equipped with a lubrication fitting and locking collar.

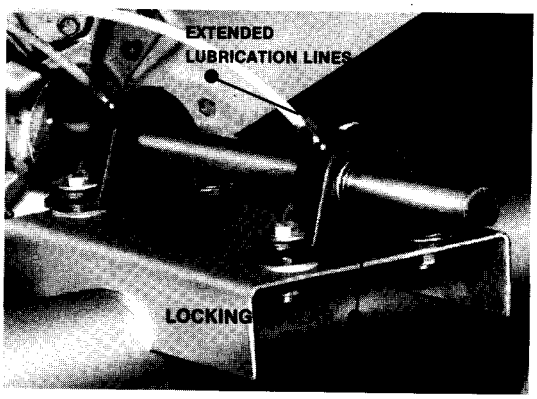


Figure 3 — Ball Bearing

Under normal operating conditions, the bearings should be greased every 2,000 operating hours or at least every six months. The bearings should also be greased at seasonal start-up and shutdown. Lubricate the bearings only with one of the following water resistant inhibited greases which are good for ambient temperatures ranging from −65 °F to 250 °F.

American	—Rycon Premium #3
Exxon	—Beacon #325
Shell	—Aeroshell #7
Mobil	—Mobilgrease #28
Chevron	—SRI #3
Keystone	—84 EP Light

The bearings should be lubricated only with a hand grease gun. Do not use high pressure grease guns since they may rupture the bearing seals. When lubricating, purge the old grease from the bearing by gradually adding grease until a bead of new grease appears at the seal. FXT units have extended lube lines which extend from the bearing to the fan cylinder.

FAN MOTOR BEARINGS

All ODP and TEFC Fan Motors have regreasable bearings. The motor bearings should be lubricated as recommended in the motor manufacturer's Operating Instructions which are attached to the motor when the equipment ships from the factory.

LOCKING COLLARS

Each eccentric locking collar should be checked every six months to ensure that the inner bearing race is secured to the fan shaft. The locking collar can be set using the following procedure. (See Figure 4).

1. Loosen the set screw.
2. Using a drift pin or centerpunch, tap the collar (in the hole provided) tangentially in the direction of rotation while holding the shaft.
3. Retighten the set screw.

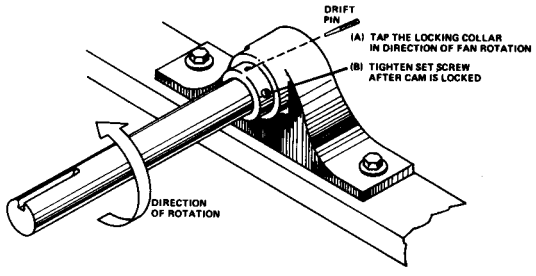


Figure 4 — Locking Collar Assembly

Maintenance Procedures

(continued)

ADJUSTABLE MOTOR BASE

The motor base slides and adjusting screws (see figures 5A, 5B, and 5C) should be coated twice a year using a good quality corrosion inhibiting grease such as one of those recommended for lubricating the fan shaft bearings.

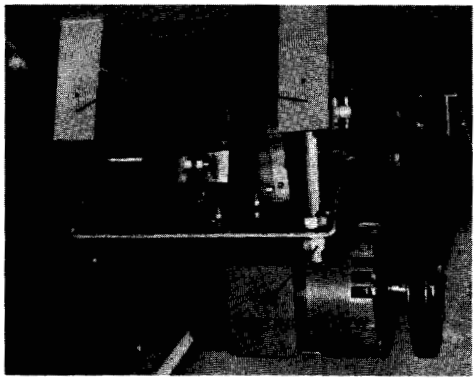


Figure 5A—Adjustable Motor Base
Models 26 thru 68

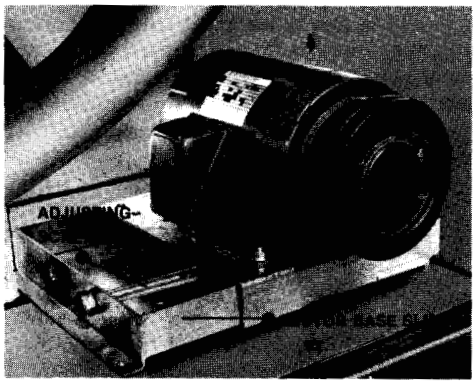


Figure 5B—Adjustable Motor Base
Models 74 thru 142 and 230 thru 284

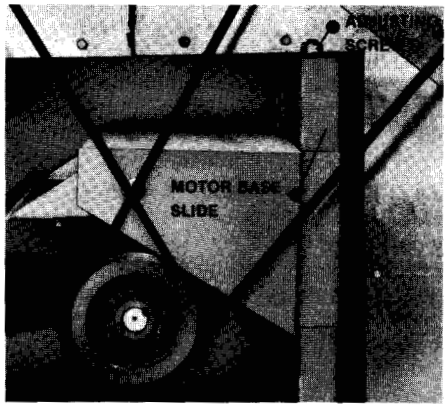


Figure 5C—Adjustable Motor Base
Models 160 thru 268 and 320 thru 536

FAN BELT ADJUSTMENT

Models FXT-26 thru FXT-536 use V-belts. Belt tension should be checked and adjusted (as needed) every month. To properly adjust the belt tension, position the fan motor so that the belt will deflect ½" when moderate pressure (approximately 15 lbs.) is applied midway between the sheaves.

Note: There should be no "chirp" or "squeal" when the fan motor is started.

The position of the fan motor can easily be changed by adjusting the rod which extends from the frame to the motor base. Loosen the locknut on top of the frame and rotate the nut under the frame with a wrench as necessary. **Then, retighten the locknut** (see **Fig. 5A, 5B, 5C** and **6**). The motor base adjusting nut and lock nut requires a 15/16" box-end wrench on Models FXT-26 through FXT-68, and a 1⅛" box-end wrench on Models FXT-74 through FXT-536.

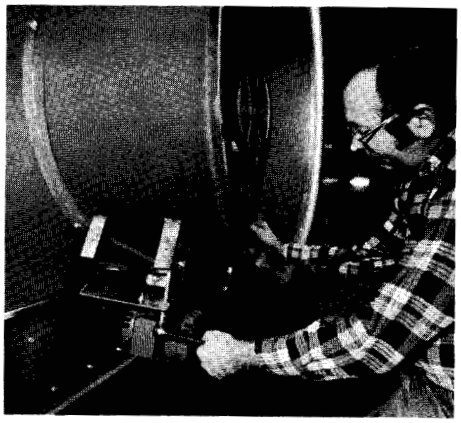


Figure 6 — Fan Belt Adjustment

Maintenance Procedures

(continued)

FAN DRIVES

The drive alignment should be checked annually to ensure maximum belt life. This can be done by placing a straightedge across both sheaves as shown in Figure 7.

When the drive is properly aligned, the straightedge will contact all four points as indicated. If realignment is necessary, loosen the motor sheave and align it with the fan sheave. Allow approximately ¼ " for draw-up as the motor sheave is pulled tight on the bushing; then retighten the bushing screw.

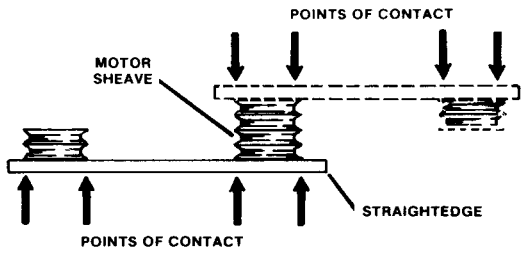


Figure 7 — Checking Sheave Alignment

NOTE:

Direct drive units (Models FXT-6 thru FXT-20) do not employ fan shaft bearings, adjustable motor bases, fan drives, or fan belts. The fans are driven directly by the motor and there is never a need for any adjustment.

CORROSION PROTECTION

The FXT is constructed entirely of corrosion resistant materials. The wet deck surface is made of an inert synthetic material which requires no protection against rot, decay, rust or biological attack. As standard, the FXT is constructed of heavy gauge galvanized steel. As an option, the FXT is available with all principal steel components protected with the BALTIBOND Corrosion System† utilizing heavy gauge galvanized steel as the substrate.

STANDARD:

GALVANIZED STEEL CONSTRUCTION

The principal steel components of the FXT are constructed of galvanized steel. The steel components of the FXT should be inspected annually.

Inspect the tower for blemishes or corrosion on the galvanized steel. Affected areas should be thoroughly wire brushed and recoated with ZRC (Zinc-Rich Compound).

OPTIONAL:

BALTIBOND CORROSION PROTECTION SYSTEM†

FXT Cooling Towers provided with the optional BALTIBOND Corrosion Protection System† are identified by the letter "R" at the end of the model number shown on the unit nameplate (e.g. FXT-250R). Scratches and scrapes on parts which do not require extraordinary corrosion protection can be touched up with a repair kit (B.A.C. Part No. 16-133P). In the unlikely event that damage is more extensive than simple scratches or dents, contact your local B.A.C. Representative.

†Patented or Patent Pending in the U.S.A. and certain other nations.

Water Treatment

CORROSION AND SCALE CONTROL

In cooling towers, cooling is accomplished by evaporation of a portion of the process water as it flows through the tower. As this water evaporates, the impurities originally present remain in the recirculating water. The concentration of the dissolved solids increases rapidly and can reach unacceptable levels. In addition, airborne impurities are often introduced into the recirculating water, intensifying the problem. If these impurities and contaminates are not effectively controlled, they can cause scaling, corrosion, and sludge accumulations which reduce heat transfer efficiency and increase system operating costs.

The degree to which dissolved solids and other impurities build up in the recirculating water may be defined as the cycles of concentration. Specifically, cycles of concentration is the ratio of dissolved solids (for example; TDS, chlorides, sulfates) in the recirculating water to dissolved solids in the make-up water. For optimal heat transfer efficiency and maximum equipment life, the cycles of concentration should be controlled such that the recirculating water is maintained within the guidelines listed below:

Recirculated Water Quality Guidelines

	BALTIBOND® Corrosion Protection System	Galvanized Steel
pH	6.5 to 9.0	7.0 to 9.0 †
Hardness as $CaCO_3$	30 to 500 ppm	30 to 500 ppm
Alkalinity as $CaCO_3$	500 ppm max.	500 ppm max.
Total Dissolved Solids	1200 ppm max.	1000 ppm max.
Chlorides	250 ppm max.	125 ppm max.
Sulfates	250 ppm max.	125 ppm max.

In order to control the cycles of concentration such that the above guidelines are maintained, it will be necessary to "bleed" or "blowdown" a small amount of recirculating water from the system. This "bleed" water is replenished with fresh make-up water, thereby limiting the build-up of impurities.

Typically the bleed is accomplished automatically through a solenoid valve controlled by a conductivity meter. The conductivity meter set point is the water conductivity at the desired cycles of concentration and should be determined by a competent water treatment expert. (Note: the solenoid valve and conductivity meter must be supplied by others.) Alternatively a bleed line with a valve can be used to continuously bleed from the system. (Note: the bleed line and valve must be supplied by others.) In this arrangement, the rate of bleed can be adjusted using the valve in the bleed line and measured by filling a container of known volume while noting the time period. The bleed rate and water quality should be periodically checked to ensure that adequate control of the water quality is being maintained.

The required continuous bleed rate may be calculated by the formula,

$$\text{Bleed Rate} = \frac{\text{Evaporation Rate}}{\text{Number of Cycles of Concentration} - 1}$$

The evaporation rate can be determined by one of the following:

1. The evaporation rate is approximately 2 GPM per 1 million BTU/HR of heat rejection.
2. The evaporation rate is approximately 3 GPM per 100 tons of refrigeration.
3. Evaporation Rate = Water Flow Rate × Range × .001.

Example: At a flow rate of 900 GPM and a cooling range of 10°F, the evaporation rate is 9 GPM (900 GPM × 10°F × .001 = 9 GPM).

In many localities, this constant bleed and replacement with fresh make-up water will keep the concentration of impurities in the recirculating water at an acceptable level. If the site conditions are such that constant bleed-off will not control scale or corrosion and maintain the water quality within the guidelines, chemical treatment may be necessary. If a chemical water treatment program is used, it must meet the following requirements:

1. The chemicals must be compatible with galvanized (zinc coated) steel as well as all other materials used in the system (pipe, heat exchanger, etc.)
2. Chemicals to inhibit scale and corrosion should be added to the recirculating water by an automatic feed system on a continuously metered basis. This will prevent localized high concentrations of chemicals which may cause corrosion. It is recommended that the chemicals be fed into the system at the discharge of the recirculating pump. They should *not* be batch fed directly into the cold water sump.
3. Acid water treatment is *not* recommended unless the unit(s) have been furnished with the BALTIBOND® Corrosion Protection System or is constructed of stainless steel — in which cases acid treatment can be used provided the requirements of paragraph 1 and 2 above are maintained.

BIOLOGICAL CONTROL

Bleed-off with or without chemical treatment for scale and corrosion control is *not* adequate for control of biological contamination. The growth of algaes, slimes and other micro-organisms, if unchecked, will reduce system efficiency and may contribute to the growth of potentially harmful micro-organisms, including Legionella, in the recirculating water system.

Accordingly, a biocide treatment program specifically designed to address biological control should be initiated when the system is first filled with water and administered on a regular basis thereafter in accordance with the supplier's instructions. Liquid biocides may be added to the sump of the cooling tower in dilute form. If a solid form of biocide is used, it should be added to the system via a pot feeder. If ozone water treatment is used, ozone concentrations should not exceed 0.1-0.5 ppm in order to ensure maximum equipment life.

BAC offers a simple, easily applied, low maintenance form of biological control, the IOBIO® Bacteria, Slime and Algae Control. The control is easy to use and requires little maintenance. By delivering low concentrations of iodine through the make-up water line, the IOBIO® Control automatically controls unwanted microbiological contaminants in the open water system. Contact your local BAC Representative for more information.

† *Units having galvanized steel construction and a circulating water pH of 8.3 or higher will require periodic passivization of the galvanized steel to prevent "white rust," the accumulation of white, waxy, non-protective zinc corrosion products on galvanized steel surfaces.*

Start-Up Following a Shut-Down Period

To minimize the risk from biological contamination following a shutdown period, it is recommended that the entire system (cooling tower, system piping, heat exchangers, etc.) be drained when the system is to be shut down for more than 3 days. To resume operation of a drained system, clean all debris, such as leaves and dirt from the cooling tower and re-fill the system with fresh water. While operating the circulating pump(s) ***and prior to operating the cooling tower fans,*** execute one of the following two alternative biocidal treatment programs:

1. Resume treatment with the biocide which had been used prior to shutdown. Maintain the maximum recommended biocide residual (for the specific biocide) for a sufficient period of time (residual and time will vary with the biocide) as recommended by the water treatment supplier to bring the system under good biological control.
2. Check the pH of the circulating water, and if necessary, adjust it to 7.0 to 7.6. Then treat the system with sodium hypochlorite to maintain the level of 4 to 5 mg/l (ppm) FREE chlorine over a six (6) hour period. Test kits that can be used to measure the free residual of chlorine are commercially available.

When it is not practical to drain the system during shutdown periods, a by-pass line with shut-off valves should be installed to permit the cooling water to be circulated throughout the system, including the tower basin, while by-passing the tower fill. Then, after each shut-down of three (3) days or more, the system should be treated prior to restarting the tower using one of the two methods described above. **However, while circulating the treated cooling tower water through the entire system, the cooling tower fill should be by-passed and the tower fans kept inoperative.** After the biocide residual has been maintained at the required level for at least six (6) hours, the water can be directed over the fill and the tower returned to service. The standard water treatment program (including the biological treatment) should be resumed at this time.

For specific recommendations on treatment for scale, corrosion, or biological control, consult a qualified water treatment consultant.

Factory Authorized Parts

Baltimore Aircoil maintains a stock of replacement parts at each of its manufacturing facilities. Shipment of these parts is normally within four days after receipt of an order. In emergency situations, shipment can usually be made within twenty-four hours. To order factory authorized parts, contact your local Baltimore Aircoil Company Representative. Be sure to include the unit serial number when ordering any parts.

To facilitate servicing the unit, it is suggested that the following parts be carried on hand.

Make-Up Float Ball

Valve Seat for Make-Up Valve

Fan Shaft Bearings

Fan Belts

Spray Nozzles

Access Door Gasket

Winter Operation

The FXT Cooling Tower can be operated at ambient temperatures below freezing provided proper operating methods are established and diligently followed. Precautions that must be taken to insure satisfactory operation include:

1. Freeze protection of the water in the cold water sump when tower is idle.
2. Control of ice formation during tower operation.

Freeze protection must be provided for the cold water sump during shutdown since ice formation in the sump can severely damage the cooling tower. A remote sump located indoors in a heated space is an ideal method since the water in the tower and connecting piping will drain by gravity whenever the circulating pump is stopped. Where this arrangement is impractical, a form of sump heat must be provided in the tower itself. Electric immersion heaters controlled by a thermostat in the cold water sump may be used. Consult your B.A.C. Representative for details. Additionally, where a remote sump is not used, all exposed make-up lines and water piping that does not drain at shutdown should be traced with electric heater tape and insulated.

Ice formation can be minimized by maintaining the leaving water temperature at the highest possible level while still satisfying system cooling requirements. This capacity control should be achieved through fan cycling and the use of two-speed motors.

NOTE: Rapid on-off cycling can cause the fan motor to overheat. It is recommended that controls be set to allow a maximum of 6 on-off cycles per hour.

If two-speed motors are employed, the motor starter should include a time delay of 15 seconds when switching from high to low speed.

The importance of performing frequent visual inspections and routine maintenance services during operation in subfreezing weather cannot be overemphasized. These must be carried out on a routine basis to:

1. Insure all controls for capacity and freeze protection are set properly and functioning normally.
2. Prevent excessively high water levels and possible overflow of the hot or cold water basins due to unbalanced flows, clogged orifices or strainers, or make-up valve malfunction.
3. Discover any icing conditions that may develop before they reach the point where the tower or supports are damaged or system performance is impaired.

For more detailed information on winter operation and for recommended operating procedures on specific installations, contact your local B.A.C. Representative.

Baltimore Aircoil

P.O. Box 7322, Baltimore, Maryland 21227
410-799-6200 Fax 410-799-6416

ONE OF THE Amsted INDUSTRIES

Printed in the U.S.A. Printed on Recycled Paper

PP-5M-08/00