User Guide

E Series Cooling Towers

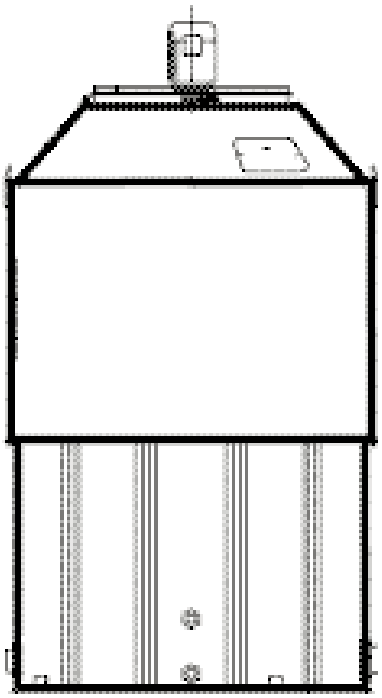
E2 Models

Installation

Maintenance

Operation

Troubleshooting



Instant Access
Parts and Service
(800) 458-1960
(814) 437-6861

www.conairnet.com

The Conair Group, Inc.
One Conair Drive
Pittsburgh, PA 15202
Phone: (412) 312-6000
Fax: (412)-312-6320

UGH012/0201

It is a good idea to record the model and serial number(s) of your equipment and the date you received it in the User Guide. Our service department uses this information, along with the manual number, to provide help for the specific equipment you installed.

Please keep this User Guide and all manuals, engineering prints and parts lists together for documentation of your equipment.

Date:

Manual Number: UG

Serial number(s):

Model number(s):

COOLING TOWERS

E2 Series Induced Draft Models
55 to 250 tons

Model E2-150
(with optional access ladder)

EFFICIENT COOLING WITH MINIMUM MAINTENANCE

Conair's E2 series induced draft, counterflow cooling towers offer more cooling, but require less space and less maintenance.

From the rust-proof molded polyethylene tower shell to the corrosion-resistant direct drive fan assembly, E2 towers contain fewer components that could fail and hamper performance.

All water connections, the water distribution system and the wet decking are made of PVC to resist rot, decay and biological attack.

Reduce water and sewer usage to save money

Conair cooling towers recirculate process cooling water, paying for themselves in reduced water costs and sewer taxes.

A rotating, multi-armed PVC sprinkler with integral drift eliminator sprays hot water over a continuous coil of angled-baffle PVC decking. The spiral decking design extends the water's travel path and exposure to air, increasing the heat transfer area for efficient cooling.

The fan draws air through inlet louver panels at the base, and then upward through the decking. Heat is removed when water evaporates from the multiple surfaces of the decking.

Options include: two-speed fan motors to closely control temperature and save energy; an aluminum access ladder with safety cage; and basin heaters.

EASY INLET/OUTLET CONNECTIONS

Single-point inlet water connection. Choose the optional side outlet with make-up float valve, or the standard bottom outlet for use with remote tanks and sumps.

SEAMLESS, RUST-FREE DESIGN

Our one-piece MDPE tower shell will not rust, corrode, chip, crack or require protective coating or painting. There are no seams, panels or rivets to fail or compromise performance. All fasteners are 304 stainless steel.

COSTS LESS TO INSTALL

Lightweight design reduces rigging and structural roof support requirements. Everything is factory assembled for easy installation. Simply attach the fan assembly and sprinkler arms to the tower, and hook up the water and electricity.

15-YEAR WARRANTY

We're so confident our molded polyethylene shell will not rust, chip or crack, we back it with a 15-year warranty. We also warrant the totally enclosed, direct drive fan motor for five years and provide a one-year parts and labor warranty on the entire tower.

One Conair Drive ● Pittsburgh, PA 15202 ● 412-312-6000 ● FAX 412-312-6227 ● www.conairnet.com

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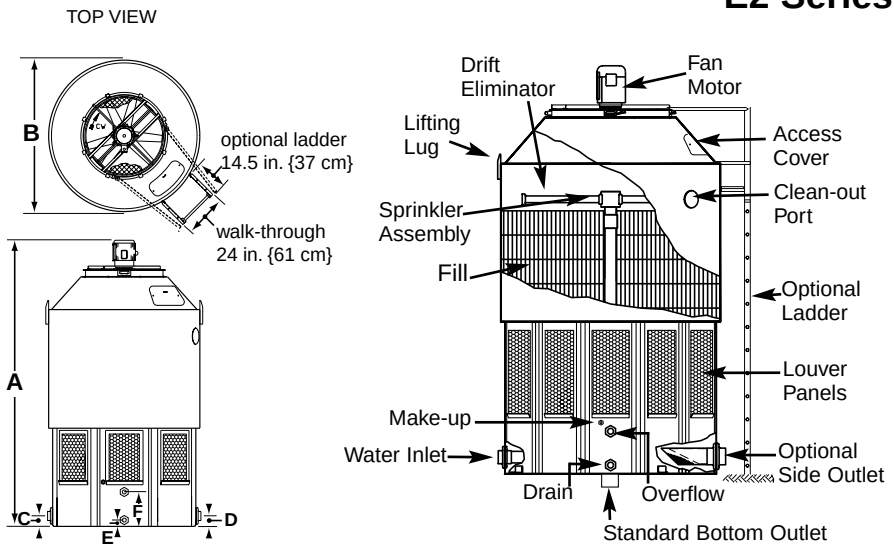
SPECIFICATIONS

COOLING TOWERS

E2 Series Induced Draft Models 55 to 250 tons



SPECIFICATION NOTES

* Based on 95° F {35° C} inlet water and 85° F {29° C} outlet water. 1 tower ton = 15,000 Btu/hr. Consult factory for other conditions.

† For the standard bottom outlet, the maximum opening in the support should be: E2-55 to E2-175, 14 x 14 inches; E2-200 to E2-250, 19 x 19 inches

‡ Operating weights are based on the following water levels: E2-55 to E2-125, 14 inches; E2-150 to E2-175, 15 inches; E2-200 to E2-250, 16 inches.

§ Due to the interchangeable nozzle design of E2 cooling towers, customer specifications must include design flow requirements.

Specifications may change without notice. Contact your Conair representative for the latest information.

MODEL	E2-55	E2-70	E2-85	E2-100	E2-125	E2-150	E2-175	E2-200	E2-250
Performance characteristics									
Tower capacity Tons	55	70	85	100	125	150	175	200	250
Sump capacity Gallons {liters}	330 {1249}	330 {1249}	330 {1249}	330 {1249}	330 {1249}	468 {1772}	468 {1772}	718 {2718}	718 {2718}
Fan motor Hp {kW}	2 {1.49}	3 {2.24}	5 {3.73}	5 {3.73}	7.5 {5.59}	7.5 {5.59}	10 {7.45}	10 {7.45}	15 {11.18}
Wet bulb temperature / Output tower tons {GPM}*									
70° F {21° C}	82 {246}	104 {313}	111 {335}	149 {447}	186 {559}	223 {671}	261 {783}	298 {895}	373 {1119}
72° F {22° C}	76 {229}	97 {291}	104 {312}	138 {416}	173 {520}	208 {624}	243 {729}	277 {833}	347 {1041}
75° F {24° C}	65 {197}	83 {251}	89 {269}	119 {359}	149 {449}	179 {538}	209 {628}	239 {718}	299 {898}
78° F {26° C}	55 {165}	70 {210}	75 {225}	100 {300}	125 {375}	150 {450}	175 {525}	200 {600}	250 {750}
80° F {27° C}	46 {138}	58 {176}	63 {189}	84 {252}	105 {315}	126 {378}	147 {441}	168 {504}	210 {630}
Dimensions inches {cm}									
A - Total height	146 {371}	146 {371}	146 {371}	159 {403}	159 {403}	178 {452}	178 {452}	210 {533}	210 {533}
B - Diameter	84 {213}	84 {213}	84 {213}	84 {213}	84 {213}	95 {241}	95 {241}	114 {290}	114 {290}
C - Height to center of inlet	5.75 {14.6}	5.75 {14.6}	5.75 {14.6}	5.75 {14.6}	5.75 {14.6}	9.0 {22.9}	9.0 {22.9}	8.63 {21.9}	8.63 {21.9}
D - Height to center of outlet†	5.75 {14.6}	5.75 {14.6}	5.75 {14.6}	5.75 {14.6}	5.75 {14.6}	10.5 {26.7}	10.5 {26.7}	9.0 {22.9}	9.0 {22.9}
E - Height to center of drain	3.5 {8.9}	3.5 {8.9}	3.5 {8.9}	4.5 {11.4}	4.5 {11.4}	4.0 {10.2}	4.0 {10.2}	4.5 {11.4}	4.5 {11.4}
F - Height to center of overflow	19 {48.3}	19 {48.3}	19 {48.3}	19.5 {49.5}	19.5 {49.5}	20.5 {52.1}	20.5 {52.1}	22.0 {55.9}	22.0 {55.9}
G - Height to center of make-up	24.5 {62.2}	24.5 {62.2}	24.5 {62.2}	24.5 {62.2}	24.5 {62.2}	25 {63.5}	25 {63.5}	26.5 {67.3}	26.5 {67.3}
Weight lb {kg}									
Shipping (dry)	1180 {535}	1250 {567}	1270 {576}	1510 {684}	1585 {719}	1785 {810}	1925 {873}	3170 {1438}	3365 {1526}
Operating ‡	3980 {1805}	4050 {1837}	4070 {1846}	4235 {1921}	4310 {1955}	5570 {2527}	5810 {2635}	8440 {3838}	8640 {3919}
Operating with remote sump/tank	1385 {628}	1455 {660}	1475 {669}	1715 {778}	1790 {812}	2020 {916}	2260 {1025}	2945 {1336}	3090 {1402}
Voltage Total amps									
208v/3 phase/60 Hz	7.5	10.6	16.8	16.8	24.3	24.3	31.0	31.0	46.4
230v/3 phase/60 Hz	6.8	9.6	15.2	15.2	22.0	22.0	28.0	28.0	42.0
400v/3 phase/50 Hz	3.9	5.5	8.7	8.5	11.3	11.3	15.2	15.2	21.7
460v/3 phase/60 Hz	3.4	4.8	7.6	7.6	11.0	11.0	14.0	14.0	21.0
575v/3 phase/60 Hz	2.7	3.8	6.1	6.1	8.8	8.8	11.2	11.2	16.8
Connections inches									
Water inlet / outlet - Socket style	4.0	4.0	4.0	4.0	4.0	6.0	6.0	6.0 / 8.0	6.0 / 8.0
Make-up water - NPT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Overflow and drain - NPT	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0
Water requirements §									
Inlet pressure / temperature	7-10 psi {0.48-0.69 bars} / 140° F {60° C} maximum								

INSTALLATION NOTES

The tower should be located no less than 5 feet from a single solid wall, or not less than the diameter of the tower from two intersecting walls. The tower must be mounted on a flat rigid surface that is properly supported. All external piping must be independently supported. The fan ring, where air is discharged, should be level or higher than the wall or roof line.

One Conair Drive ● Pittsburgh, PA 15202 ● 412-312-6000 ● FAX 412-312-6227 ● www.conairnet.com

CONAIR™

ATTENTION: Read this so no one gets hurt

Questions regarding the installation, operation or maintenance of this equipment should be directed to Conair (1-800-458-1960).

Step-by-step instructions contained in this brochure are based on normal installation conditions only. Abnormal or unusual combinations of field conditions should be brought to the attention of Conair or its representative prior to installation of the equipment. The information contained herein is subject to change without notice in the interest of product improvement.

We design equipment with the user's safety in mind. You can avoid the potential hazards identified on this machine by following the procedures outlined below and elsewhere in the User Guide.

WARNING: Improper installation, operation or servicing may result in equipment damage or personal injury.

This equipment should be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation and potential hazards of this type of machine.

All wiring, disconnects and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

WARNING: Precautions need to be taken to minimize contact with health hazards.

Health hazards, such as chemicals or biological contaminants may be present in the cooling water. These contaminants can include Legionella bacteria which can cause serious sickness or death. Appropriate personal respiratory and skin protection should be worn by personnel who are exposed to the discharge air stream, mists generated by the operation of the tower equipment or are exposed to the water or air streams that are used to clean the tower and its components. Consult MSDS sheets concerning exposure to the chemicals added to the water system.

CONAIR COOLING TOWERS

PRINCIPLE OF COOLING TOWERS

All cooling towers operate on the principle of removing heat from water by evaporating a small portion of the water that is recirculated through the unit.

The heat that is removed is called the latent heat of vaporization.

Each one pound of water that is evaporated removes approximately 1,000 BTU's in the form of latent heat.

COOLING TOWER TERMS AND DEFINITIONS

BTU - A BTU is the heat energy required to raise the temperature of one pound of water one degree Fahrenheit in the range from 32° F. to 212° F.

Cooling Range - The difference in temperature between the hot water entering the tower and the cold water leaving the tower is the cooling range.

Approach - The difference between the temperature of the cold water leaving the tower and the wet-bulb temperature of the air is known as the approach. Establishment of the approach fixes the operating temperature of the tower and is a most important parameter in determining both tower size and cost.

Heat Load - The amount of heat to be removed from the circulating water within the tower. Heat load is equal to water circulation rate (gpm) times the cooling range times 500 and is expressed in BTU/hr. Heat load is also an important parameter in determining tower size and cost.

Ton - An evaporative cooling ton is 15,000 BTU's per hour.

Wet-Bulb Temperature - The lowest temperature that water theoretically can reach by evaporation. Wet-Bulb Temperature is an extremely important parameter in tower selection and design and should be measured by a psychrometer.

Pumping Head - The pressure required to pump the water from the suction side of the pump, through the entire system and return to the top of the tower.

Drift - The water entrained in the airflow and discharged to the atmosphere. Drift loss does not include water lost by evaporation. Proper tower design and operation can minimize drift loss.

Total Dissolved Solids – The amount of minerals in solution with the water which can not be removed by filtration. Usually measured in parts per million (PPM) and includes chlorides, sulfates, or carbonates which can cause corrosion or scaling in the system.

Cycles of Concentration – Ratio of the dissolved solids in recirculating water to the dissolved solids in make-up water.

Make-Up - The amount of water required to replace normal losses caused by bleed-off, drift, and evaporation.

Bleed Off (Blowdown) - The circulating water in the tower which is discharged to waste to help keep the dissolved solids concentrating of the water below a maximum allowable limit. As a result of evaporation, dissolved solids concentration will continually increase unless reduced by bleed off.

WATER TREATMENT

* The Conair Cooling Tower shell is fabricated of corrosion-resistant plastics which are resistant to water treatment chemicals including common fungicides and bactericides.
* Follow appropriate water treatment practices as required and take frequent sample tests to avoid possible water contamination. We also recommend water treatment maintenance as a measure of protection for the environment in the vicinity of any cooling tower or other equipment open to atmosphere.
* To determine the appropriate water treatment practices for your particular application, it is suggested that you contact a water treatment firm for their recommendation. A list of water treatment firms is available for your reference. It is not necessarily complete nor do we recommend a specific firm. The list will be mailed to you on request or consult your local yellow pages.
* Bleed-off is also important to water quality. Evaporation of the recirculated water does not remove the dissolved solids that are present in the water. Without bleed-off, the continual buildup of these solids will impair the proper functioning of the piping and other equipment in the system.
* A bleed line can be connected in any part of the system with routing to the sewer. Normally, it is most desirable to make this connection in the hot water line at the cooling tower. A petcock type valve, installed in the bleed line is recommended. Normally, bleed-off of 1% to 2% of the recirculation water flow is satisfactory. The required amount of bleed-off water must be substituted with properly controlled amounts of make-up water.

* If biocides or corrosion inhibitors are used, then consult local authorities before introducing bleed-off water to a sanitary sewer.

GENERAL INFORMATION

APPROXIMATE WEIGHTS

The induced draft cooling towers are manufactured in two basic sections; a polyethylene tower body and a fan assembly section. Both of these sections are shipped separately and need to be field assembled.

MODEL #	**Shipping** Approximate Weights (lbs.)	**Operating** Approximate Weights (lbs.)	**Overall Dimensions W x H**
E2-55	1180	3980	79.2”x146”
E2-70	1250	4050	79.2”x146”
E2-85	1270	4070	79.2”x146”
E2-100	1510	4235	84”x159”
E2-125	1585	4310	84”x159”
E2-150	1785	5570	95”x179”
E2-175	1925	5810	95”x179”
E2-200	3170	8355	114”x218”
E2-250	3365	8500	114”x218”

DIMENSIONS AND OTHER PHYSICAL DATA

For cooling tower dimensions, design for foundations, assembly and layout, refer to the following drawings which are a part of these instructions:

Model #	**Title**	**Drawing No.**
E2-55, E2-70, E2-85	Assembly	DT-D-88-902
	Layout	DT-D-81-755
E2-100, E2-125	Assembly	DT-D-81-754
	Layout	DT-D-81-755
E2-150, E2-175	Assembly	DT-D-83-754
	Layout	DT-D-83-755
E2-200, E2-250	Assembly	DT-D-80-754
	Layout	DT-D-80-755

HANDLING AND INSTALLATION OF YOUR COOLING TOWER

SAFETY

When handling, lifting, installing or operating the cooling tower, always employ safe working procedures, according to the best practices of the trade and according to applicable construction, electrical and safety standards, regulations and codes.

Follow all safety practices described in these instructions.

ON-SITE INSPECTION

Upon arrival at the job site, carefully inspect the shipment for any damage. If shipping damage has occurred, notify the driver or the carrier immediately in writing of all damage. Check that all items listed on the Shipping Bill of Lading have been received.

LOCATION OF THE CONAIR COOLING TOWER

Proper location of the cooling tower is essential to its satisfactory operation. The following are recommendations for the selection of a cooling tower site. Consult the factory or our representatives for additional assistance in selecting equipment and equipment locations.

* Select an open site having an unobstructed air supply and free air motion.
☛ If the site is adjacent to a wall or other structure that blocks prevailing winds, install the cooling tower so that top discharge is slightly higher than the structure. Locate the blower at farthest point from the structure, facing the direction of the prevailing winds.
☛ Gravity drain to indoor storage sump requires proper head differential and pipe design considerations. Allowance must be given based on flow, pipe size, piping layout and the distance the cooling tower is located from the indoor storage pump.
☛ Should it be necessary to locate cooling tower near walls or within enclosures, choose a location that will not restrict air flow. Do not install cooling tower in a well or below the level of an obstruction that might impede air discharge, cause short circuit of air flow, or result in recirculation of the discharge air back into the blowers.

☛ Do not locate cooling tower near heat–generating equipment, which could interfere with temperature of inlet air or ambient wet-bulb temperature to the cooling tower.
☛ Do not install a canopy or roof of any kind over the cooling tower which would deflect discharge air back down around the cooling tower and cause recirculation of the discharge air back into the blowers.

OFFLOADING

The E-200 and E-250 cooling towers are normally delivered to the site on a “low boy” or “drop deck” trailer. The tower assembly is shipped with the steel-mounting frame strapped down to the truck bed. Unload the tower assembly complete with the mounting frame. (See Figure 1) The fan assembly with motor is crated separately. The E2 – 55, 70, 85, 100, 125, 150 & 175 are normally shipped in a closed van, and can be loaded by fork truck. Unload the tower body together with shipping skid.

Lifting with crane:

* Before lifting, inspect the mounting frame to tower connection making certain that the tower is secure, adjust or tighten if necessary.
* Use fabric slings of sufficient strength for better load distribution and protection of the plastic tower body. Attach slings to lifting holes provided on the mounting frame.
* Use spreader bars to minimize the crushing effect of slings on the tower or use adequate length straps in order to maintain an angle of 60 degrees or less between slings.

Offloading with fork truck: (see figure 1 on page 12)

* A fork truck of sufficient capacity may be used for offloading. The forks should pass under the skid along the width of the mounting frame with the tips of the fork extensions passing under the mid supports of the mounting frame. A strap should be placed around the tower body and forks to secure the load.
* Fork extensions (about 10 ft. long) are necessary to offload tower skids.

Store tower assembly in an upright position until the time of installation in a secure location at the job site.

CAUTION: For extended lifts use duplicate rigging as an additional safety precaution.

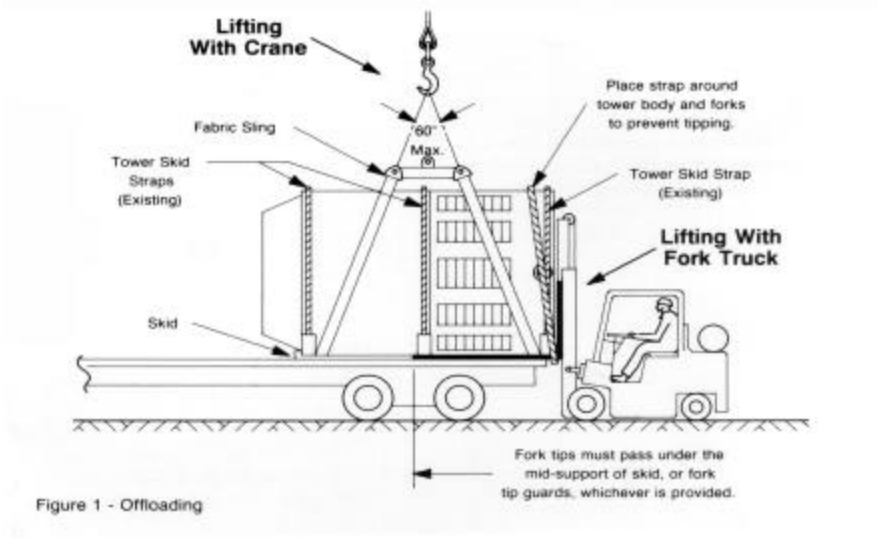


Figure 1 - Offloading

UPRIGHTING AND LIFTING OF COOLING TOWER

*All four (4) sprinkler lateral arms, (see fig 2.) are normally shipped detached and are packaged and secured inside the tower. Remove these lateral arms before up-righting and lifting cooling tower.
*Remove shipping skid straps.
*Hooks and cables of sufficient strength should be used for lifting.
*Two (2) aluminum lifting lugs secured to the top of the cylindrical section of the cooling tower are provided for uprighting and lifting purposes. Install adequate hooks and cable to each of these lifting lugs, lift the cooling tower upright and set it on a smooth, flat, and rigid surface. Use guidelines as necessary, to prevent damage to the cooling tower, and as a safety measure to control and avoid sudden shifts or movements of the load.
***IMPORTANT**: For extended lifts over 25 feet in height, use fabric slings underneath the cooling tower and secure them at the lifting lug location, as an additional safety precaution. Remove air inlet louvers, as necessary, to prevent their damage during handling.
* After re-checking the rigging, lift the tower body and set in place on the previously prepared foundation. Use guidelines, as necessary, to stabilize the load.

* Remove the strut supports attached to the top of the tower and all padding or packaging inside the tower. The shipping supports on top of the fill media, as well as other packaging, may be removed through the inspection port in the side of the cooling tower.
*Replace previously removed louvers.

CAUTION: When working inside the cooling tower where the sprinkler system is located, DO NOT step directly on the fill. Use two (2) pieces of a 3/8" minimum thickness plywood each at least 12" x 18" to distribute the worker's weight in order to prevent damage to the fill.

Anchoring

The foundation must be flat, smooth and rigid enough to be capable of dependent support of the cooling tower assembly and water load in the sump at it's maximum level. The tower assembly can also be mounted on I-beams or columns per installation drawings.

* Four hold-down anchors are provided at the base of the tower with predrilled holes for anchor bolts.
* Attachment hardware to tower mounting frame is by others.
* Use ¾" anchor bolts sized for a minimum of 1,500 lbs. pull-out load for wind loading.
* Final location of anchor bolts should be matched with hold down lug holes at installation.
* Do not shim under the base of the tower to level. If shimming of the anchor lug is required, the shim should extend from the bolt to the outside edge of anchor lug. Do not over-tighten anchor nuts.
* Check that all the hexagonal bolts on each lug are tight to prevent nuisance leaks. Access can be made by removing a set of the inlet PVC louvers.

WATER DISTRIBUTION SYSTEM / TOWER INTERNALS PRECHECK

Before installing the fan ring assembly:
* Check to be sure that all shipping material has been removed from the equipment.
* Install the sprinkler arms which were packaged separately. Position the center of the angle adjustment bolt at the center of the slot on the sprinkler port. Care should be taken not to overtighten the bolts that lock the sprinkler lateral arms in place.
* The drift eliminator blades are pre-assembled and do not require any adjustment. Check to be sure that the hose clamps on each end of the lateral arms are tight.

With the lateral arms installed, the drift eliminator blades should be parallel with the top of the fill. (See Figure 2)
* The towers are fully assembled at the factory; but it is recommended that all joints and attachments be checked over. Tighten or adjust as necessary.
* Check the packing support to ensure that it did not shift during shipping or lifting.
* Rotate the sprinkler system by hand to be sure it rotates freely.
* Clean-out caps at the end of each lateral arm are in place and are secured with a fastener.
* The manway on the tower and the inspection port on the side of the tower are provided for access to these checkpoints.

CAUTION: When stepping on top of fill, distribute body weight by means of two plywood plates.

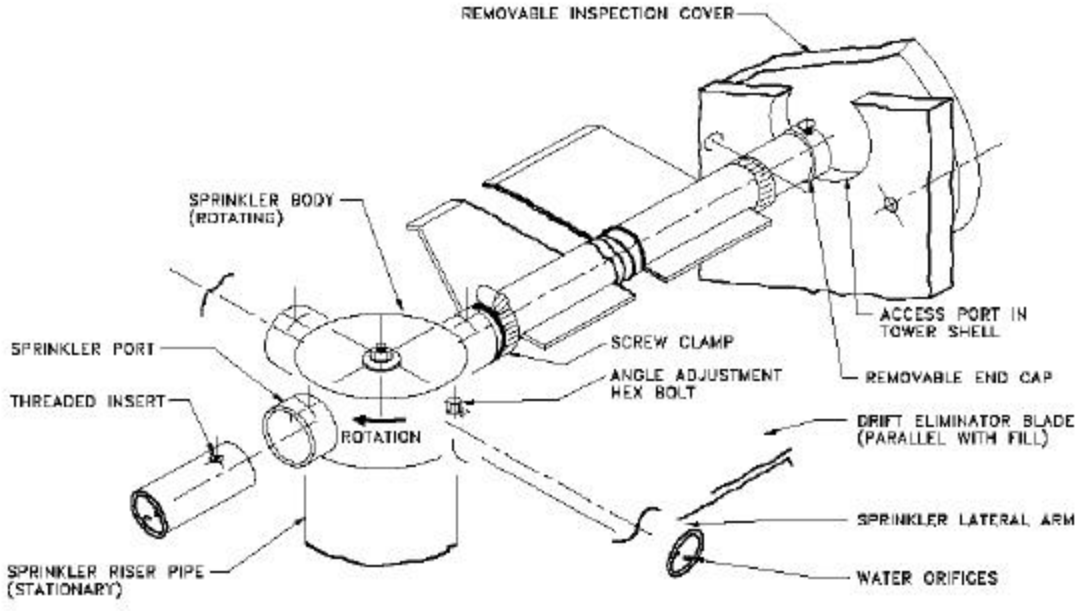


FIGURE 2 – WATER DISTRIBUTION SPRINKLER SYSTEM

LIFTING AND INSTALLATION OF THE FAN ASSEMBLY

* Stand fan crate on its side with fan shaft horizontal to the ground so the motor is above the motor mounting plate.
* Break down the fan crate, tip the fan assembly, and set the fan ring on the ground before lifting.
* It is recommended that sealant caulking be placed all around the joint between the fan ring flange and tower shell.

* Lift the fan assembly using the lifting lugs located on the fan ring.(Refer to Figure 3)
* Align the yellow match mark on the fan assembly with the yellow match mark on the tower body. (The standard ladder location is at the air inlet opening **immediately to the right** of the panel with short air inlet opening).
NOTE: If field piping or equipment location dictates some other orientation, consult Conair. Conair cannot be responsible for orientation other than standard if variations were not known prior to shipment. Costs for field corrections will be the responsibilities of others and may void equipment warranty if Conair approval is not obtained prior to any field changes.
*Align and install eight (8) sets of fan assembly mounting hardware shipped loose with the tower. Use wide washers on the oversize holes in the tower flange. Do not tighten the self-locking nuts until all the bolts are in place. Some out-of-round distortion of the fan mounting flange at the top of the tower may be encountered. To match bolt holes, apply a radial force to the flexible tower body flange. A tapered alignment drift pin may be used.
*Recheck the mounting hardware and tighten securely. Recommended torque value is 35 ft.-lbs.

WIRING OF FAN MOTOR AND ACCESSORIES

* Installation of a vibration cutout switch is recommended. (Refer to tower accessories available)
* All electrical work should be performed only by qualified personnel and in accordance to prevailing electrical codes, practices and safety standards.
* The motor starter should be sized on voltage, nominal horsepower, and maximum full load current. This current value can be found on the nameplate. If the starter cannot accept the maximum full load motor current the next size should be used.
* Motor heaters should be selected on the basics of maximum full load current and service factors based on the motor nameplate.
* Standard "Cooling Tower Service" motors are supplied with a minimum of a 1.15 Service Factor.
* Optional two speed motors are single winding variable torque.
* Run flexible conduit with some slack from the motor conduit box to terminal box outside the tower where rigid conduit can be used.
* Conduit holding clip screws can be tapped directly into the tower wall. Use maximum 3/8" screws.
* For the typical wiring schematic of fan motor and tower accessories, see the electrical schematic included with these instructions.

Piping and Tower Connections

Refer to the following drawings included with these instructions for recommended layout and pipe connection information.

Model #	**Drawing No.**
E2-55, E2-70, E2-85	DT-D-81-773
E2-100, 125	DT-D-81-754/ DT-D-81-755
E2-150, 175	DT-D-83-754/ DT-D-83-755
E2-200, 250	DT-D-80-754/ DT-D-80-755

* Piping should be adequately sized in accordance with accepted standard practices.
* An inlet gauge should be installed immediately before the cooling tower inlet connection.
* An indoor storage sump is the preferred method for a system installation. The indoor sump tank should be large enough to fill the entire recirculation system without danger of pump cavitation. As a general rule, the tank should be sized to hold three times the rate of circulation in gallons per minute (gpm). The tank should be provided with properly sized overflow, make-up, drain and suction connections. When a separate sump is ordered with a cooling tower, the water make-up valve assembly and the overflow and drain connections are installed in the indoor sump only. The cooling tower should be located high enough above it to allow free cold water gravity drain. A bottom outlet is provided for gravity drain to indoor sump tank installations. A provision must be made to make sure that the outdoor piping to the tower does not freeze. Insulation and heat tracing can help prevent freezing. Providing a bleed line on the outdoor piping that will allow the piping to drain back to the sump when the pump is not running can do this. It is only necessary to drain the exposed piping.
* Reverse siphoning is a back flow of non-potable, recirculating water into a potable water system, which can occur through the make-up float valve assembly located in the water reservoir. Should the valve malfunction, blockage of the overflow or outlet lines will cause water level to rise in the reservoir, and the make-up water pressure could drop below the atmospheric pressure creating a vacuum at the make-up inlet. Although precautions to prevent reverse siphoning are incorporated in the cooling tower design, we also recommend installing a backflow preventer valve in the water make-up supply line, as a backup precaution. Consult local water authority for type of backflow preventer required.
* Gravity drain to indoor storage sump requires proper head differential and piping design considerations. Allowance must be made for flow, pipe size, piping layout, and distance of cooling tower from the indoor storage sump.
* On multiple tower installations, valves and/or pipe sizing should balance pressure drops to provide equal inlet pressures. Equalizing lines can be installed between cooling tower sumps and are available as an option from the factory. Each tower should be valved separately to allow for flow balancing or isolation from service.
* Prior to start-up check that the PVC locknuts on all bulkhead fittings are properly tightened to prevent nuisance leaks. A chain wrench can be used to check and tighten the locknuts.

* Check that the SS hexagonal nuts on the inlet and outlet PVC socket flanges are properly tightened to prevent nuisance leaks. While tightening the nuts, do not allow the bolt to rotate. This could damage the rubber seal under the flat washer on the bolt head located inside the cooling tower.
* All supply and return piping must be independently supported.

PVC SOLVENT CEMENTING INSTRUCTIONS

The following procedure is recommended for the preparation and cementing of internal and external piping for Conair Cooling Towers:

* Cut ends of pipe square using a handsaw and miter box. Tube cutters with wheels designed for use with PVC are acceptable, providing they do not leave a raised bead on the outside diameter of the pipe.
* Use a chamfering tool or file to put a 10° to 15° chamfer on the end of the pipe. Lightly sand the area to be cemented to remove gloss. Using a clean rag, wipe pipe surface and fitting socket to remove dirt, moisture and grease. Acetone or similar solvent is recommended for cleaning.
* Check "dry fit" of pipe and fitting by inserting pipe at least 1/3 of the way into the fitting. Position pipe and fitting to assure alignment. Pipe and fitting should be at the same temperature condition.
* Using a clean, natural bristle brush about 1/2 the size of the pipe diameter, apply a primer to the fitting socket. Apply primer with a scrubbing motion until the surface is penetrated. Primer should never be applied with a rag. Repeated applications may be necessary to achieve the desired dissolving action. In the same manner, apply primer to the pipe surface equal to the depth of the fitting socket, making sure the surface is well penetrated. Reapply primer to the fitting socket to make sure it is still wet.
* While both surfaces are still wet with primer, use a clean brush to apply a liberal coat of solvent cement to the male end of the pipe. The amount should be more than sufficient to fill any gap. Next apply a light coat of solvent cement to the inside of the socket, using straight outward strokes to keep excess cement out of the socket.
* While both surfaces are still wet with solvent cement, insert the pipe into the socket with a quarter-turn twisting motion. The pipe must be inserted the full length of the socket. The application of solvent cement to pipe and fitting, and the insertion of the pipe into the fitting, should be completed in less than one minute. If necessary, two people should apply solvent cement to the pipe and fitting simultaneously.
* Hold the joint together for approximately 30 seconds until both surfaces are firmly joined. After assembly, a properly made joint will usually show a bead of cement around its entire perimeter. This bead should be brushed off. It is recommended that the joint be allowed to cure for 24 hours before pressure testing or operation.

OPERATION AND MAINTENANCE

SAFETY IN OPERATION OF THE FAN

NEVER operate the fan when the access panel or the entire fan guard is removed.

NEVER remove access manhole cover while fan is in operation.

NEVER operate fan when any work, access, maintenance, trouble-shooting, etc. is being performed on the inside of the fan ring assembly or inside the tower plenum.

* Normally, electrical codes dictate a disconnect box at the cooling tower.
* The handle of the disconnect box must be locked in the off position and an OSHA DANGER tag (DO NOT OPERATE) must be attached to handle securely.

Note: Removing fuses from the disconnect box may provide further assurance, but only when done by qualified personnel.

The foregoing precautions apply when any type of internal access to the tower is required, including the following examples:

* Checking, maintenance or replacement of any fan assembly component.
* Checking, maintenance or replacement of the water distribution system inside the tower.
* Cleaning of the fill.
* Any work that necessitates removal of any access door, the fan guard or the manhole cover.

WATER DISTRIBUTION SYSTEM

Water distribution is accomplished by a low pressure, rotating, self-propelled sprinkler system designed to accommodate the specified flow rate.

The following points are important:
* Substantial deviations from specified water flow will inhibit proper sprinkler and drift eliminator functions and may necessitate replacement of lateral arms, calibrated for a new range of water flow.
* Normal sprinkler rotational speed is approximately 5 to 6 RPM, with both the pump and the fan operating.
* Rotation can be observed through the inspection port in the side of the tower.
* Sprinkler RPM can be adjusted by a slight rotation of the lateral arms at the sprinkler head. Counter clockwise rotation of the laterals will increase RPM. The

standard position is set by aligning the center of the hexagonal bolt with the first notch of the slot on the sprinkler head. This angle was preset at the factory and should not require adjustment unless there is a genuine necessity to do so.

IMPORTANT:

Following any adjustment of lateral arm angles, eliminator blades must be re-adjusted into horizontal position.

* The maximum operating inlet water temperature should not exceed 140^{o} F.
* The operating inlet pressure should be 10 psi.
* Do not over-tighten the hexagonal bolts used for sprinkler lateral arm adjustment.
* Before start-up, check for free rotation of the sprinkler system.
* Periodically during operation, check for proper RPM at design water flow.
* Clean out of the sprinkler lateral arms is accomplished by removing the end cap of each lateral.
* Installation of a tower outlet strainer (optional accessory) is recommended as an effective and economical means of preventing clogging of sprinkler orifices.

CAUTION:

When stepping on top of the fill, distribute the body weight by means of two plywood plates as described earlier in these instructions.

SPRINKLER HEAD MAINTENANCE

If the sprinkler revolution slows down or stops despite normal and proper water flow, the sprinkler head may require removal for inspection and cleaning.

Note: Check the troubleshooting guide first for other corrective action.

* To remove the sprinkler head, first remove the sprinkler lateral arm and drift eliminator blade assemblies. Then remove the three (3) riser pipe screws.
* To dismantle, the sprinkler head should be removed from the tower. The order of dismantling is:

1. Match mark riser pipe assembly and coupling. Remove the three (3) riser pipe screws and remove the entire sprinkler head assembly from the coupling.
Note: It may be necessary to shift the upper split layer of fill to gain access to the riser pipe screws, in some models.
2. The self-tapping screws and the PVC ring must be removed from the E2-100 and 125 models prior to removal of the head body assembly. For convenience of reassembly, match mark to PVC ring and the lip of the sprinkler head. This procedure is not necessary for disassembly of the sprinkler head for any other model.

3. Remove the top locknut and lift the sprinkler head body assembly to separate it from the internal rise pipe.

* Inspect the general condition of all components, including the shaft seal, for wear, mechanical interference, and check for foreign matter on the frictional surfaces.
* Clean or order replacement components as necessary. Consult Factory prior to authorizing any field repairs. Work by others without Conair authorization may void warranty.
* Assemble in reverse order per the above instructions.
* After assembly, check that the sprinkler head rotates freely.
* The sprinkler head should be inspected and cleaned every 2 to 3 years or more frequently depending on operating environment.

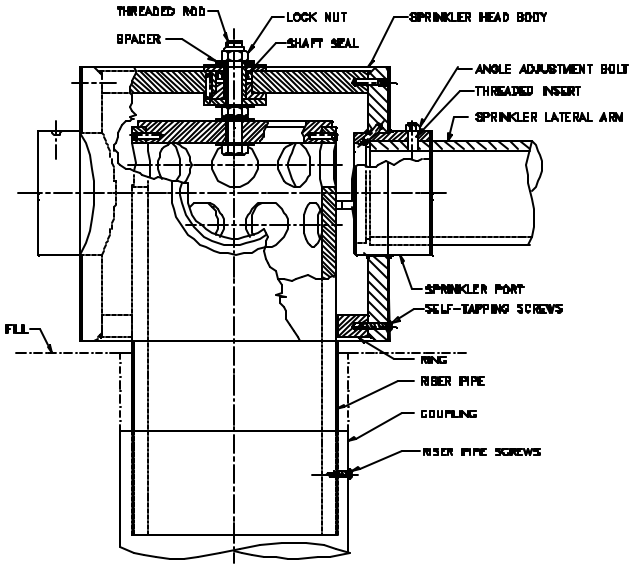


FIGURE 3 - 6" SPRINKLER HEAD ASSEMBLY

FAN MOTOR AND ITS MAINTENANCE

Safety
Follow all safety instructions previously discussed.

Motor:

* The standard motor is a totally enclosed motor with extra moisture protection on the windings, Class F insulation, 1.15 minimum service factor, epoxy coating on

outside frame, and is specifically designed for cooling tower duty to the exclusive specifications of Conair Cooling Towers.
* Should there be a problem with the motor, which may be covered under our standard warranty, the motor must only be inspected and serviced by an authorized agent of Conair Cooling Towers, otherwise the warranty is void.
* If the motor bearings have grease fittings, follow the lubrication recommendations as outlined in instructions from motor manufacturer. The majority of motors do not require greasing.

START-UP INSTRUCTIONS

Complete all start-up instructions before applying heat load.

* Clean any accumulated debris or packaging material from inside tower sump.
* Check to be sure that the fan motor is properly wired for correct rotation as viewed from the top of the fan. Reverse leads will cause incorrect rotation and reverse direction of airflow.

Note: Fan rotation should always agree with rotation labels. Standard fan rotation is clockwise, (C.W.) however non-standard fans may be designed to rotate counter clockwise (C.C.W.).

* Check for free rotation of the fan and fan blade tip clearance.
* Check that all PVC louvers are properly installed with the emboss on the louver in the slot of the inlet window on the tower. For unusual conditions of operation, the louvers can be adjusted in or out.
* Check for free rotation of the sprinkler system. This can be accomplished by removing the inspection cover and moving the lateral arms by hand.
* Fill the cooling tower sump or the cold water storage reservoir on gravity drain applications.
* Water recirculation pump should be primed and all piping below the tower sump filled with water. Check pump for proper shaft rotation.
* Start the water recirculation pump and adjust flow to design. A flow metering device installed in the inlet is recommended but if not available, use the pressure differential across the pump in conjunction with the pump curve.
* Check flow pattern from sprinkler lateral arms to be sure there is no clogging of orifices. If necessary, clean out lateral arms by removing the end caps.
* Start up fan motor and check amperage and voltage against motor nameplate data.
* For side outlet models, the standard make-up valve assembly is shipped with the plastic float ball strapped against the tower side to prevent damage. To set the ball for proper operation, loosen the screw in the fulcrum arm, lift or depress the arm with the plunger pressed against the valve seat and tighten. Repeat until the proper

operating level is obtained (Refer to operating level table below). It is recommended that a shut-off valve be installed in the make-up line.

* After 24 hours of operation:
- Check lateral arms for clogging.
- Check tower sump water level.

WATER LEVEL IN TOWER SUMP

* When the cooling tower is being operated with pump-suction, the make-up valve assembly with float ball should be adjusted to set the water operating level as follows:

Model	Operating Level
E2-55-85	10 - 12 inches
E2-100/125	13 - 15 inches
E2-150/175	14 - 16 inches
E2-200/250	15 - 17 inches

Access the make-up valve through the window louvers.

* A lower water level than recommended may cause air to be drawn into the tower outlet piping and cause pump air binding or cavitation.
* A water level higher than recommended will cause continuous overflow and waste of water as a result of potential siphoning from the piping when the system is shut down.
* The overflow should NEVER be capped, or its elevation altered by raising external piping.

Note: On gravity drain cooling tower(s), make-up valve assembly, overflow, drain and vortex breaker are not provided.

COLD WEATHER OPERATION

Cold Weather Protection
The cooling tower may require protection against freezing at light heat loads when the wet-bulb temperature is below 32°F or during shutdown when the temperature drops below 32°F.

The following methods are recommended for use in Conair Cooling towers for protection during cold weather conditions. Recommended equipment is optional

and may be ordered from the factory. Consult the factory for further information on which equipment to choose for your specific application.

Separate Indoor Sump
This method is virtually a foolproof antifreeze protection system with the added advantage of minimum maintenance. The gravity drain to the sump insures that the basin will drain when the pump is turned off.

Electric Immersion Heater
Cooling towers ordered with antifreeze systems are shipped with a protective seat secured under the immersion heater probe, which must remain in place during operation to protect the polyethylene shell from the heater element.

Note: This seat is not a shipping brace and must not be removed.

Thermostatic On/Off Control

A fan controlled by a thermostat for on/off operation should be considered as an energy saving feature for capacity control during winter operation. The thermostatic control can be field set to insure automatic fan shutdown when cold water drops below design temperatures as well as fan start-up when cold water rises to design temperature.

A thermostatic control provides excellent cooling tower anti-freeze protection while reducing operating costs throughout cold weather operation.

PVC Distribution System
To prevent damage to the PVC distribution system during cold weather shut-down, install an automatic or manual drain line from the hot water inlet piping as close to the cooling tower inlet as possible. The entire inlet and distribution system must be drained for shutdown in sub-freezing weather.

Piping
When the cooling tower is located outdoors, adequate measures including the use of heating tapes and insulation should be considered to protect water lines from freezing.

Operation at Sub-freezing Ambient Temperatures
See Thermostatic On/Off control
To prevent ice formation, insure that tower operates at maximum possible heat load.

If tower is equipped with two speed motors, operate at low speed to increase leaving water temperature.

On multi-cell installations, it may also be necessary to cycle fan(s) periodically to prevent ice formation on the intake louvers and the wet decking. If fan(s) are operated in reverse, **DO NOT** operate in reverse any longer than is necessary. Extended reverse operation can cause ice to form on the fan blades causing an out-of-balance condition. **A vibration cutout switch is always recommended.**

The importance of frequent visual inspections and routine maintenance during sub-freezing operation is very important and should not be overlooked.

Trouble-Shooting

Trouble-Shooting Guide For E2 Series Induced Draft Cooling Towers

Problem	Possible Causes	Corrective Actions
Increase in the leaving water temperature	1. Excess water flow; over pumping. 2. Recirculation of hot discharge air, back into the cooling tower air intakes. Obstructed air intakes 3. Proximity of other heat source or discharge of moist air. 4. Improper operation of sprinkler system. A. Orifices clogged. B. RPM too slow or sprinkler stops. a. Preset angle of orifices was changed. b. Actual water flow is lower than design sprinkler rating. c. Mechanical causes. 5. Clogged fill. 6. Damaged fill. 7. Additional heat load on system. 8. Wet-bulb temperature higher than design. 9. Dirty fan. 10. Defective fan cycling switch or improper setting. 11. Motor not functioning.	1. Adjust to the design flow. 2. Eliminate obstructions which impede air discharge. For proper location of cooling tower(s), see Conair dwgs. Baffle air discharge, if necessary. 3. Remove source or relocate tower. 4. See water distribution system instructions. A. Flush lateral arms, clean orifices, clean system, install outlet strainer. B. a. Reset properly or increase angle of lateral arms. b. Install properly rated sprinkler lateral arms or increase to design flow. c. Check for clearance between lateral arms & walls. Check sprinkler head. See sprinkler head maintenance. 5. Clean the fill. 6. Replace the fill. 7. Contact Conair for possible upgrade or addition of another cooling tower selected for additional load. 8. None required if condition is temporary. Otherwise consult Factory for upgrade. 9. Check fan for debris on fan or screen and clean. 10. Check operation of switch by raising and lowering set point. Clean sensing element. Set proper set point. Replace if defective. Check wiring to control panel. 11. Check fusing or circuit protection for motor. Check for faulty motor starter/contactor. Check wiring for proper voltage supply and continuity to motor. Replace or repair if defective motor.
Drop in the water flow rate. Low water flow rate	1. Blockage of sprinkler lateral arm orifices. 2. Low water level in sump causing air to be drawn into pump and piping.	1. Flush lateral arms. Clean whole system. Install outlet strainer. 2. Adjust float valves. Be sure the system is flooded and balanced.

Problem	**Possible Causes**	**Corrective Actions**
	3. Improper selection of water circulating pump.	3. Replace with proper size pump designed for flow and head requirements. Check pump "Net positive suction head."
	4. Blockage of strainers.	4. Backwash or clean.
	5. Pump malfunction.	5. Consult pump specialist.
Noise and vibration	1. Loose bolts.	1. Recheck and tighten all bolts to specified torque.
	2. Mechanical interference of rotating parts.	2. Inspect propeller for free rotation. Check propeller for mechanical interference. Adjust, repair or replace, as necessary.
	3. Fan propeller damaged or out of balance.	3. Replace components, as necessary and check balance. Install vibration cut-out switch.
	4. Air intake at pump.	4. Check basin water level and irregular piping design.
	5. Pump cavitation.	5. Match pump NPSH with system hydraulics.
	6. Damaged motor bearings.	6. Check and replace motor.
Sudden or short term irregularities of cold water level in basin	1. Peculiarities of specific system and its operation.	1. Inspect system and review operation procedures. Correct, as applicable valve settings, loss of water in system, fill system to flooded capacity.
Excessively high water level in sump on gravity drain installation	1. Gravity flow restrictions due to insufficient head differential.	1. A. Outlet piping should terminate below sump tank water level. B. Increase discharge pipe size. C. Increase head by mean other than A.
	2. Airlock.	2. Install an air bleed valve at highest point of piping, usually at a vertical angle.
	3. Unnecessary obstruction of waterflow (i.e., partially closed valve).	3. Remove obstruction.
	4. Undersized piping.	4. Increase pipe size.
	5. Horizontal pipe run too long.	5. Shorten, if possible.
	6. Improper hydraulic pipe design.	6. Correct design.
	7. Outlet vortex breaker provided.	7. Remove vortex breaker.
Excessively high water level in tower basin on closed loop system installations	1. Make-up valve float set too high.	1. Readjust float arm.
	2. Valve or float damaged or malfunctioning.	2. Repair or replace.
	3. Make-up water pressure too high.	3. Reduce pressure or contact Conair for alternate solutions.
Uneven water level in tower basins of multi-cell installations (For Side Outlet Models)	1. Unbalanced system hydraulics.	1. A. Install equalizer line with isolation valves between modules. B. Adjust inlet water flow to insure equal distribution to each cooling tower module. C. Review outlet header hydraulics and correct piping design, if applicable. D. Contact Conair for assistance.
	2. More than one make-up valve operating, and set for different water levels.	A. Adjust float level settings relative to one another. B. Shut-off and or/throttle flow to one or more valves. C. C. Installation of equalizers is highly

Problem	Possible Causes	Corrective Actions
		recommended.
Excessive water carry over (drift)	1. Surfaces of top layer of fill damaged causing "pooling" of water. 2. Eliminator(s) not horizontal. 3. Damaged eliminator. 4. Excess water flow causing high sprinkler RPM. 5. Improper angle of sprinkler lateral arms causing high RPM. 6. Orifices in lateral arms clogged causing improper water dispersion and high RPM. 7. Blockage of fill.	1. Replace top layer. Protect fill when working inside tower. 2. Adjust to horizontal position. 3. Replace. 4. Reduce water flow or install lateral arms designed for the actual operating flow. 5. Reduced the angle of the lateral arms. (Rotate arms CW slightly). 6. Install outlet strainer. Clean whole system and lateral arms. 7. Clean fill.
Premature or excessive **corrosion** of fan drive components	1. Excessive drift. 2. Presence of corrosive chemicals in air or water that was not known at time of supply.	1. See " Excessive water Carry Over (Drift)" above. 2. Remove source of corrosion or contact Conair for alternative materials, premium coatings or other precautions.

Motor Trouble Shooting Guide (General)

Problem	Possible Causes	Corrective Actions
High current draw (all 3 phases)	1. Low line voltage (5 to 10% lower than nameplate). 2. 200V motor on 230/240V system. 3. 230V motor on 208V system. 4. Incorrect propeller. 5. Incorrect pitch if adjustable 6. Water not circulating through the cooling tower. 7. Faulty contactor or motor starter	1. Consult power company. 2. Change to 230V motor. 3. Change to 200V or 280V motor. 4. Consult factory. 5. Reduce pitch / consult factory 6. Circulate water while running fans. 7. Check for voltage across the contactor or starter terminals. If more than 5 volt drop, replace it.
Low motor current draw	1. Incorrect propeller. 2. Incorrect pitch if adjustable.	1. Consult factory 2. Increase pitch / consult factory
Unbalanced current (5% from average)	1. Unbalanced line voltage due to: A. Power supply. B. Unbalance system loading. C. High resistance connection. D. Undersized supply lines. 2. Defective Motor.	1. Consult power company and/or electrician. 2. Replace motor.
Excessive voltage drop (2 or 3% of supply voltage)	1. Inadequate power supply. 2. Undersized supply lines. 3. High resistance connections.	1. Consult power company. 2. Increase line sizes. 3. Check motor leads and other connections.
Overload relays tripping	1. Overload. 2. Unbalanced input current. 3. Single phasing. 4. Excessive voltage drop. 5. Frequent starting or intermittent overloading. 6. High ambient starter temperature. 7. Wrong size relays.	1. Reduce load on motor or increase motor size. 2. Balance supply voltage. 3. Eliminate. 4. Eliminate (see above). 5. Reduce frequency of starting and overloading or increase motor size. 6. Reduce ambient temperature. 7. Correct size per nameplate current and service factor.

	8. Improper overload settings of adjustable relays.	8. Readjust to motor FL Amps x S.F.
Motor runs very hot	1. Overloaded. 2. Blocked ventilation. 3. High ambient temperature. 4. Unbalanced input current. 5. Single phased.	1. Reduce overload. 2. Fouled fill or air restriction. 3. Reduce ambient temperature. 4. Balanced supply voltage. 5. Eliminate.
Motor will not start	1. Single phased. 2. Rotor or bearings locked.	1. Shut power off – eliminate. 2. Shut power off – check shaft rotation.
Excessive vibration (Mechanical)	Out of balance 1. Motor mounting. 2. Motor.	 1. Check to be sure motor mounting hardware is tight. 2. Replace motor.

Note: Consult Warranty page prior to replacing or repairing any cooling tower components. Conair recommendation and consent to remedy material and workmanship defects are necessary to avoid breach of Warranty.

We're Here to Help

Conair has made the largest investment in customer support in the plastics industry. Our service experts are available to help with any problem you might have installing and operating your equipment. Your Conair sales representative also can help analyze the nature of your problem, assuring that it did not result from misapplication or improper use.

How to Contact Customer Service

To contact Customer Service personnel, call:

From outside the United States, call: 814-437-6861

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department. Standard rates include an on-site hourly rate, with a one-day minimum plus expenses.

Before You Call ...

If you do have a problem, please complete the following checklist before calling Conair:

- ❒ Make sure you have all model, serial and parts list numbers for your particular equipment. Service personnel will need this information to assist you.
- ❒ Make sure power is supplied to the equipment.
- ❒ Make sure that all connectors and wires within and between control systems and related components have been installed correctly.
- ❒ Check the troubleshooting guide of this manual for a solution.
- ❒ Thoroughly examine the instruction manual(s) for associated equipment, especially controls. Each manual may have its own troubleshooting guide to help you.
- ❒ Check that the equipment has been operated as described in this manual.
- ❒ Check accompanying schematic drawings for information on special considerations.

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Departments for a nominal fee.

EQUIPMENT GUARANTEE

Conair guarantees the machinery and equipment on this order, for a period as defined in the quotation from date of shipment, against defects in material and workmanship under the normal use and service for which it was recommended (except for parts that are typically replaced after normal usage, such as filters, liner plates, etc.). Conair's guarantee is limited to replacing, at our option, the part or parts determined by us to be defective after examination. The customer assumes the cost of transportation of the part or parts to and from the factory.

PERFORMANCE WARRANTY

Conair warrants that this equipment will perform at or above the ratings stated in specific quotations covering the equipment or as detailed in engineering specifications, provided the equipment is applied, installed, operated and maintained in the recommended manner as outlined in our quotation or specifications.

Should performance not meet warranted levels, Conair at its discretion will exercise one of the following options:

- Inspect the equipment and perform alterations or adjustments to satisfy performance claims. (Charges for such inspections and corrections will be waived unless failure to meet warranty is due to misapplication, improper installation, poor maintenance practices or improper operation.)
- Replace the original equipment with other Conair equipment that will meet original performance claims at no extra cost to the customer.
- Refund the invoiced cost to the customer. Credit is subject to prior notice by the customer at which time a Return Goods Authorization Number (RGA) will be issued by Conair's Service Department. Returned equipment must be well crated and in proper operating condition, including all parts. Returns must be prepaid.

Purchaser must notify Conair in writing of any claim and provide a customer receipt and other evidence that a claim is being made.

WARRANTY LIMITATIONS

Except for the Equipment Guarantee and Performance Warranty stated above, Conair disclaims all other warranties with respect to the equipment, express or implied, arising by operation of law, course of dealing, usage of trade or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

CONAIR OPTIONAL ACCESSORIES

Conair Optional Accessories Available:

- Installation Platform
- Aluminum Ladder with a step platform and railing at the fan elevation custom designed for the cooling tower.
- Safety cage.
- Two-speed motor(s) designed for cooling tower duty to the exclusive specifications of Conair Cooling Towers.
- Thermostat on/off control of fan operation through sensing the temperature of water leaving the tower.
- Vibration cutout switch provides for fan motor circuit disconnect for shutdown protection should abnormal fan vibration develop during service. Installation of vibration cutout switches is recommended as good design practice.
- Basin anti-freeze system for cold weather operation.
- Plastic equalizer fittings.
- Standard Fan Assembly Coating.
- Motor space heaters are recommended for unusually high relative humidity conditions where extreme day to night temperatures can cause excessive condensation in the motor, when in operation during this period.
- Plastic outlet sump strainer.
- High sump level switch
- Automatic drain valve
- Elevated mounting frame structures.
- Variable frequency drive on fan motors, controlled by temperature controller.

Consult factory or a Conair representative for further information and an updated list of accessories.

ACCESSORIES DESCRIPTION

Installation Platform – The platform is a desirable option when a flat smooth uniform surface is not available for mounting Conair's cooling towers.

The platform must be mounted and supported in accordance with Conair's recommendations. This option includes a steel mounting platform finished in a black semi-gloss alkyd paint. See table below for the appropriate drawing for each model.

Model	Drawing Number
E2-55, E2-70, E2-85	DT-B-81-763
E2-100, E2-125	DT-B-81-763
E2-150, E2-175	DT-B-83-763
E2-200, E2-250	DT-B-80-763-1/ DT-B-80-763-2

Ladder (see dwg. no. DT-A-80-520 sh1 and dwg. no. DT-A-80-520 sh2**)–** The ladder facilitates access to the upper section of the cooling tower for inspection and maintenance of the water distribution system and fan assembly as required.

The assembly is fabricated of aluminum for lightweight installation and has skid resistant rungs and landing platform. The landing platform is specifically placed to maximize accessibility to the man-way located in the conical section of the tower for easy access and servicing of the components.

The ladder conforms to all OSHA requirements. In some cases, the cage assembly may be required.

The unit is attached to the tower via (4) bolted connections and two base mounting bolts.

NOTE: Do not tighten the self-locking nuts until all the bolts are in place.

Safety Cage – Complementary to the ladder option, and attached to the ladder at the factory.

This assembly is attached directly to the cooling tower shell during installation.

The safety cage may or may not be required depending on OSHA specifications.

The cage assembly is manufactured of the same type of aluminum as the ladder.

Two Speed Fan Motor – Two speed fan motors provide cold water temperature control by means of airflow modulation, allowing for design cold water temperature at minimum operating cost.

When provided with a two stage thermostat, the motor can be reduced to half speed when cold water sump temperature approaches design. The motor will shut off when the cold water temperature falls below design.

Two-speed TEAO motors are provided for single voltage, 3-phase operation only. Single phase, dual-voltage motors are not available.

Please refer to the Blower thermostat option data below.

Single Stage and Two-Stage Fan Thermostats – The fan thermostat is important to minimize operating costs. The thermostat senses water temperature and controls fan operation during cold weather service. When cold water temperature drops below design, the fan will shut off, saving motor hp operating costs.

A single-stage thermostat controls the fan on and off and is provided with standard single speed motors.

A two-stage thermostat is required for two-speed motor operation and controls the fan from "on" to "half speed" and then to "off". Two-stage thermostats must be wired to Conair specifications (see dwg. No. DT-B-78-005).

As the cold water temperature rises and approaches the design temperature, the thermostat signals the fan to start in order to maintain the cold water design temperature. The thermostat has a 5^{o} differential in its operating range of 30°F to 130°F. The contacts are SPDT and have a 15 Amp UL rating. Thermostat operating range must be set in the field. Recommended setting is approximately 70° to 72° F, but will vary depending on the application and the installation location. They are complete with NEMA 4 enclosures suitable for outdoor mounting.

The thermostat can be provided loose, installed in the cooling tower sump, or in an indoor storage tank.

When the thermostat is supplied with a cooling tower provided by Conair, the package includes installation with a ¾" schedule 80 PVC bulkhead fitting and a ¾" x ½" schedule 40 PVC reducer bushing.

Vibration Cut-Out Switch (see dwg. no. DT-A-80-517**) –** The vibration cut-out switch option is utilized to shut down the rotating mechanical fans in the event of

excessive vibration. Excessive vibration can be caused by worn or failed bearings, a bent shaft, or propeller imbalance.

This device helps prevent further potential damage by shutting the motor off. It is wired in series with the motor starter coil and has a dry contact rating of 10-ampere capacity at 120 VAC.

Conair provides the vibration cut-out switch installed on the fan when ordered as a component of a new cooling tower or on a replacement fan assembly.

Antifreeze Package – Resistance Heating Option (see dwg. no. DT-B-78-010) **–** The antifreeze package is supplied to provide protection against freezing of standing water in the cooling tower sump due to shutdown during winter operation.

This option is provided when draining the system during periods of prolonged shutdown is not feasible, such as during weekends, or when a separate gravity feed indoor storage tank is not part of the recirculation system.

Protection is provided by resistance heating of the sump water. This package includes the following components:

Immersion heater – Capacity sized for service. NEMA 4 enclosure.

E2/100-E175:	6000 watt – 2.5” thread
E2/200-E250:	9000 watt – 2.5” thread

Thermostat Assembly – NEMA 4 enclosure with SPDT switch. 30-130°F temperature range. 120/277 Volt with ¾” Sch 80 bulkhead fitting and a ¾” x ½” Sch 40 reducer. Thermostat is to be set in the field. Recommended setting is approximately 38°F.

Liquid Level Switch Assembly – NEMA 7 and 9 enclosure is standard on this SPDT level switch. This insures that the heating element is submerged prior to energizing to prevent immersion heater burn-out in case of low water level.

Heater Contactor – NEMA 1 enclosure is standard. Open style for control panel mounting is available. This contactor is mounted in the control panel when the panel is purchased from Conair.

See dwg. no. DT-B-78-001 for wiring schematic.

PVC bulkhead fittings, for local installation, are included in component prices.

Protection of external piping by heat tracing and insulation is recommended but not included.

Equalizer Fittings – This option is desirable for multiple module installations to provide equal liquid levels in the sumps of the individual modules and allows for the installation of only one water make-up line.

Conair provides the bulkhead fittings installed in the cooling towers to provide for gravity flow from one tower sump to another. The equalizer connection is not for full flow transfer, ie; pumping from one unit to another.

The connecting piping should be field installed and is the responsibility of others.

Flanged Adapters – Standard inlet and outlet fittings are PVC socket connections.

This option provides 125 lb. Schedule 80 PVC flanged connection at approximately 6" projection minimum from the cooling tower.

Gasket and hardware are not provided by Conair and should be provided by others with the piping companion flange.

Standard Fan Assembly Coating – The Standard fan coating provided for the cooling tower fan ring and guards is a cross linked epoxy-phenolic with an alkaline curing agent and formulated to withstand a wide range of chemicals and for ease of handling.

This coating provides excellent chemical resistance to a wide range of acids, alkalies, solvent and water solutions. When dry, the coating can withstand up to 400°F temperature.

The fan ring and guard steel surfaces are sand blasted and primer is applied prior to final application.

Motor Space Heater – Fan motor space heaters are recommended for installations where temperature variations can cause excessive condensation within the motor. The space heater controls can be incorporated in our control panel and would be designed for automatic and manual operation. While the motor is operating, the heater remains off. When the motor shuts down, the heater is automatically energized during the off cycle. The control panel would be designed with manual on/off control for intermittent cycles of operation. Heaters are available for 115, 230, 460 or 550 volts, 3 phase, 60 Hertz operation.

Outlet Strainer Basket – This option is desirable to prevent debris that may have entered the cooling tower sump from getting into the pump, or the rest of the cooling water system. This option is recommended to minimize particle size which could foul chillers, heat exchangers, compressors or the cooling tower distribution laterals.

A vortex breaker pipe, which provides as standard on pump suction applications, is included to maximize the inlet area and prevent cavitation. The strainer is made from a vortex breaker pipe surrounded by 3/16" #2 PVC coated mesh screen.

Finer mesh screens can be overlaid to minimize particle size. Consult Conair to for prices and availability.

High Sump Level Switch (see dwg. no. DT-B-80-545 and dwg. no. DT-B-78-009 for wiring schematic)– The high sump level switch option is utilized when a potential overflow condition must be avoided.

Switch elevation is set below the point when the water in the sump will overflow onto the ground.

The switch can be used to illuminate a light, shut off the influent feed pump or initiate some other device or alarm.

This package consists of NEMA 7 & 9 liquid level switch mounted in a PVC bulkhead fitting assembly with 2" x 1" reduced bushing.

Antifreeze Package Solenoid Drain Valve Option (see dwg. no. DT-B-86-043 and dwg. no. DT-B-78-008 for wiring schematic)– This option is utilized when freezing of standing water in the cooling tower sump could occur due to system shutdown during winter operation.

An electrically actuated valve will open when the pumps are not operating and temperatures approach freezing. The valve can be installed in the sump drain fitting of the tower at the factory or remotely at the piping low point by others in the field.

Components provided are:

A) Electrically actuated to close, spring to open, 2-way valve, 1" line size, with NEMA 4 enclosure.

When power is removed the valve automatically reverts to the open position. This feature ensures freeze protection even during a power outage.

B) 1" PVC tee
C) 1" PVC plug
D) Temperature switch with bulkhead fitting.

CONAIR RECOMMENDED REPLACEMENT PARTS

To avoid costly cooling tower downtime, the following replacement parts should be carried in inventory at the installation site:

- Make-up float or complete make-up valve assembly.
- Cartridge of recommended moisture resistant lubricant.
- Fan Motor.
- Complete spare sprinkler head.

When ordering, include model number and serial number of the cooling tower as it appears on the tower nameplate. Under normal conditions, shipment of factory replacement parts is made within one day after the order is received. Spare pumps and pump parts, as well as control panel components, such as fuses and heaters for magnetic starters, are also available.

APPENDICES/ REFERENCE DOCUMENTS

Conair Drawings

❑ DT-B-78-005	Two stage thermostat wiring schematic
❑ DT-B-78-008	Anti-freeze solenoid valve wiring schematic
❑ DT-B-78-009	High level switch wiring schematic
❑ DT-B-78-010	Resistance heater installation instructions
❑ DT-D-81-754	100/125 Assembly
❑ DT-D-81-755	100/125 single and multi-cell layout
❑ DT-D-83-754	150/175 assembly
❑ DT-D-83-755	150/175 single and multi-cell layout
❑ DT-D-80-754	200/250 I assembly
❑ DT-D-80-755	200/250 I single and multi-cell layout
❑ DT-B-78-001	Typical wiring schematic for controlling cooling tower
❑ DT-A-80-517	Vibration cut-out switch installation
❑ DT-A-80-520	Ladder installation instructions, Sheets 1 and 2
❑ DT-B-80-525	Anti-freeze protection instructions
❑ DT-B-78-007	Fan control thermostat installation instructions

PREVENTATIVE MAINTENANCE CHECKLIST

MONTHLY:

- Inspect General Condition of cooling tower.
- Check Water Level in cold water basin. Adjust if needed.
- Check float ball & Make-up Valve for proper operation.
- Check Line Voltage, Motor Amperage, Water Sprinkler RPM and Drift Eliminator, for proper horizontal position.
- Clean Sump Strainers, if installed.

EVERY 3 MONTHS:

- Lubricate Motor Bearing, (if motor has fittings for greasing. The majority of motors require no external greasing). Use Proper Lubricants. Increase frequency, as necessary depending on conditions of service.
- Check for obstructed Water Flow through Orifices. Clean and flush sprinkler lateral arms, as required.
- Check All Bolts which can cause unbalance and vibration and tighten specified torque.
- Check Condition of Water for proper treatment to prevent build-up of algae and solids concentration.

EVERY 6 MONTHS:

- Clean and flush Cold Water Sump