



Fan-Air[®]

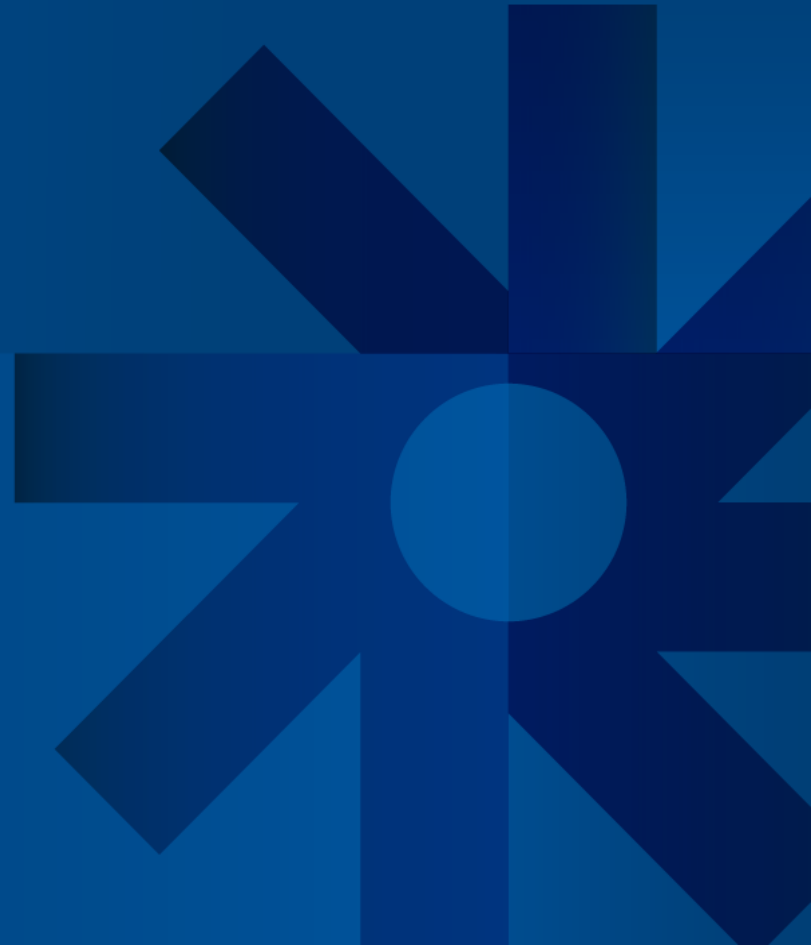
Operation and Maintenance Training

For

Models CF-2100, HD730D and UMP-730D-HD

Note: Always use trained, licensed HVAC Contractors
for installation and service of this equipment

- Safe environmentally
- Lowest operating cost





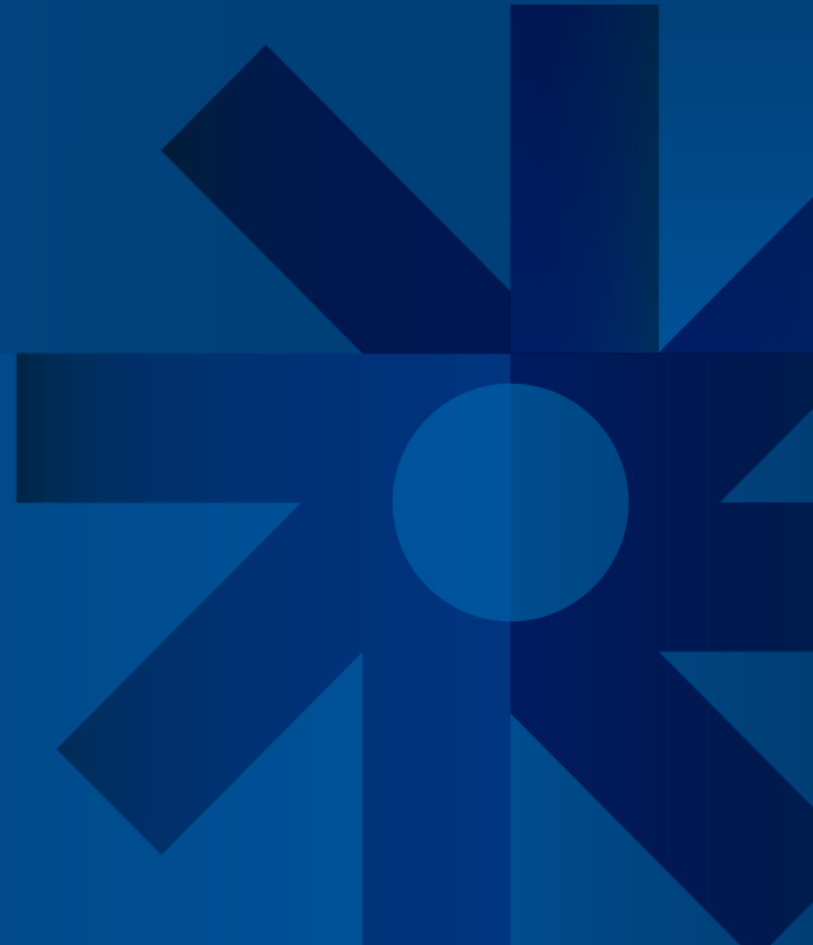
United Metal Products, Inc.

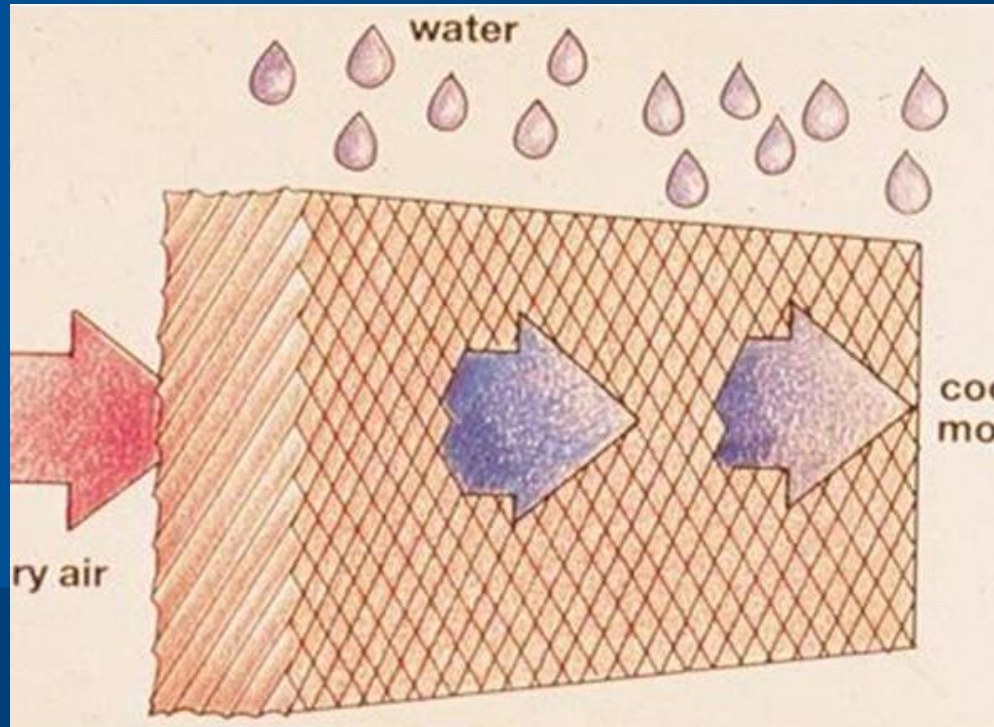


In
Partnership
With

Home Depot Maintenance Team

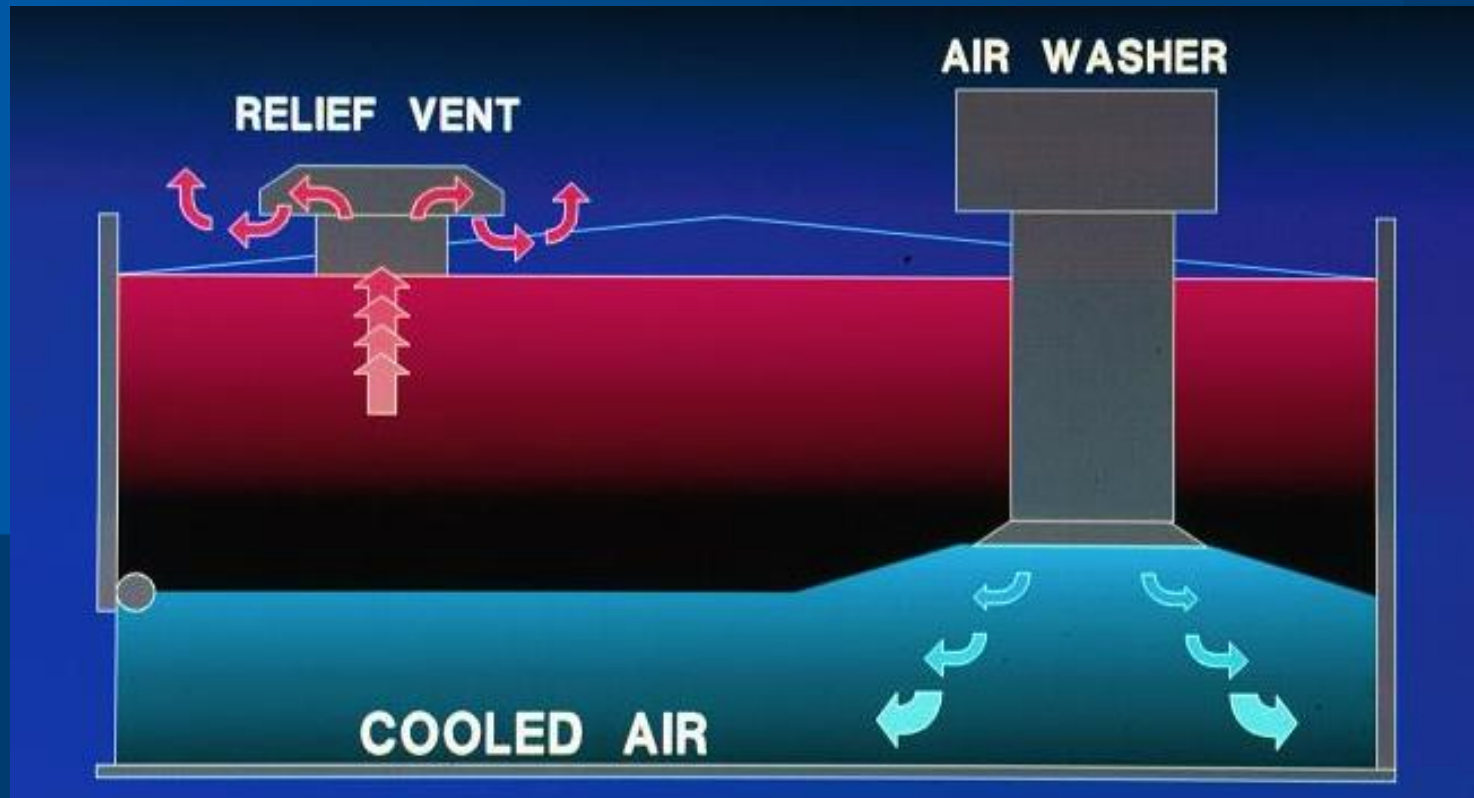
- How it works
- How it is applied
- How it is maintained



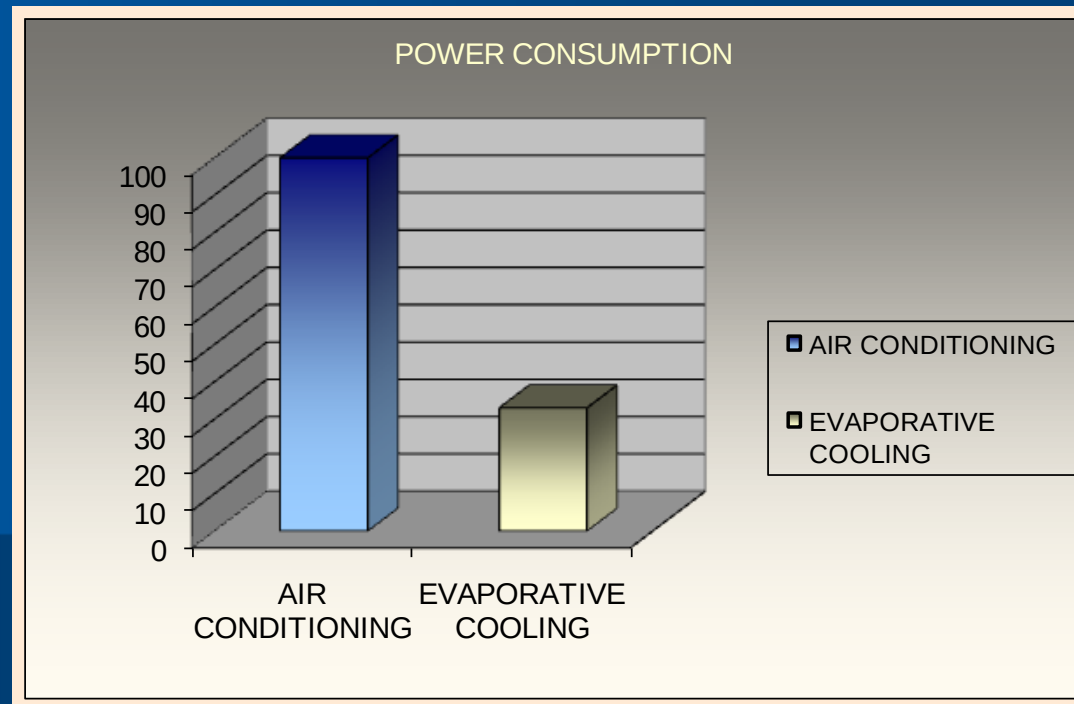


Hot, dry air passes through a wet cellulose media

As the water evaporates, the air is cooled
and humidified



Efficient cooling design



Fan-Air Evaporative coolers operate at a fraction of a cost of an air conditioning system

Poor Maintenance Affects Performance

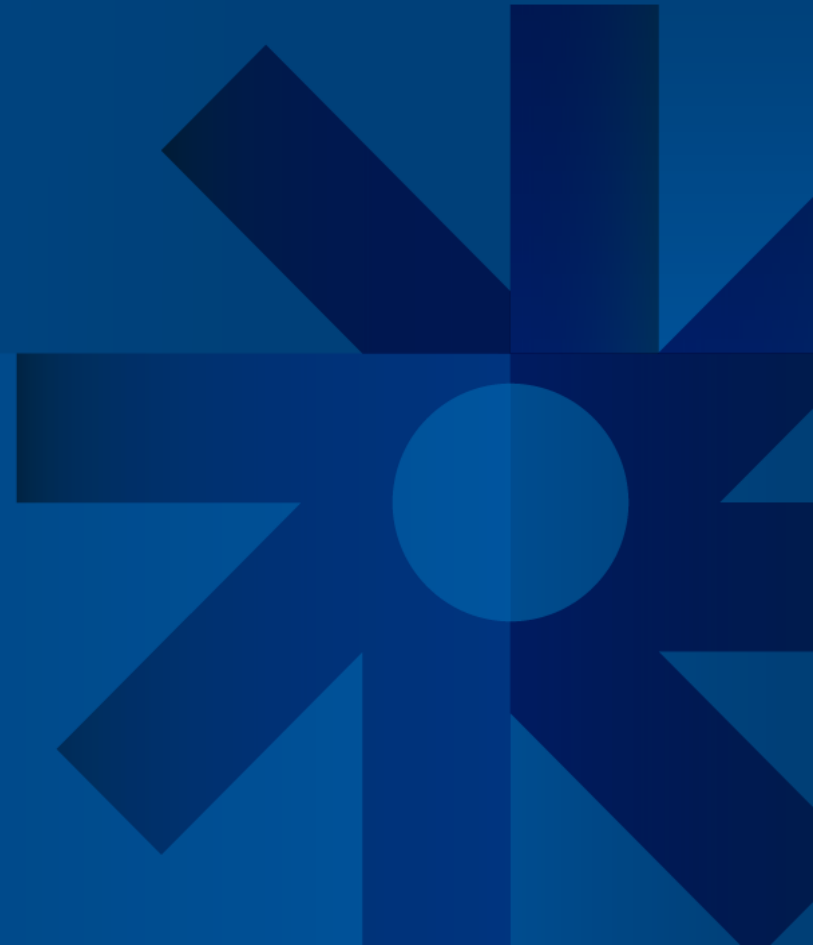


- Insufficient Cooling
- Shortened Life
- Unsafe Equipment
- Higher Operational Cost



- Cooler air
- Safer equipment
- Extended Life
- Lower Operational Cost

- Safety
- Annual Maintenance
- Regular Maintenance
- Parts Replacement
- Troubleshooting
- Additional Information



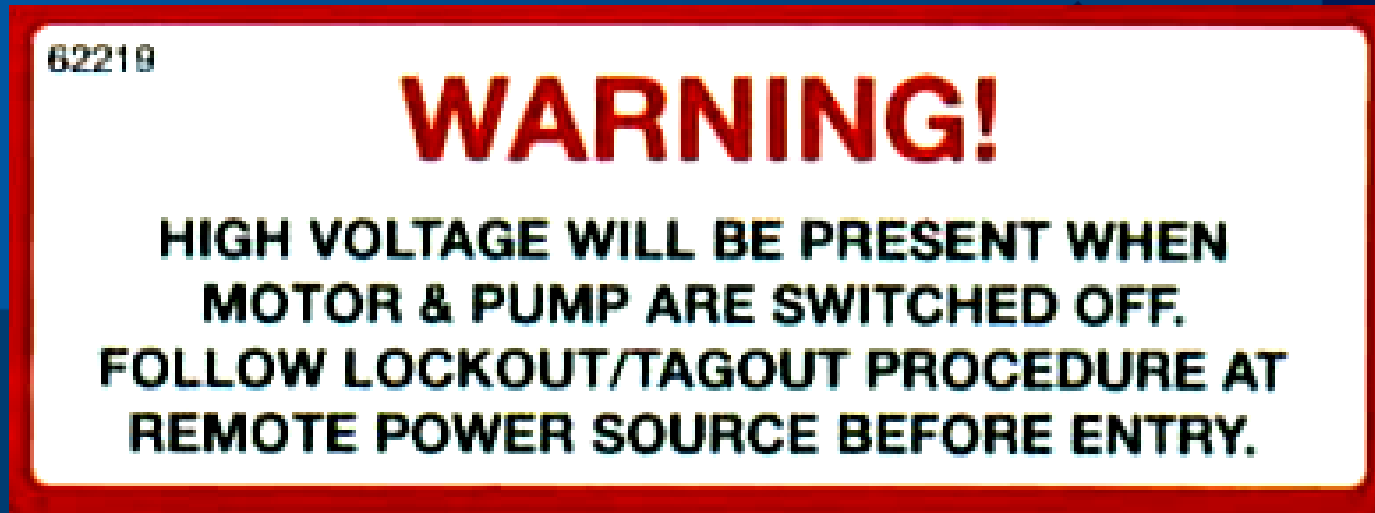


CAUTION



- Disconnect all electrical power to the unit before attempting to install, open, or service the unit
- If the unit is thermostatically controlled, the thermostat is not to be used as a disconnect as it may reset and start the unit unexpectedly
- Always use proper lock out / tag out procedure

Before opening electrical enclosure follow the warning sticker instructions



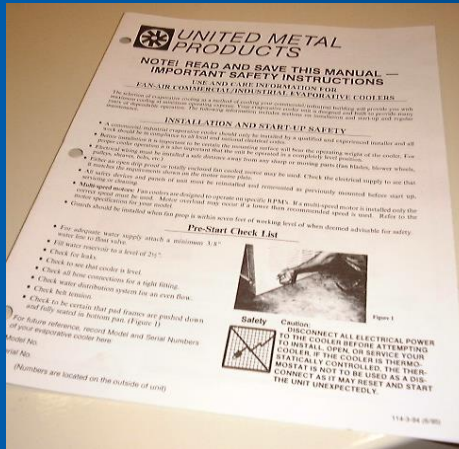
Note: The sticker may not be present on all units

Call United Metal Products for a supply of replacement warning stickers – at no charge



Safety Instructions Con't

All safety instructions can be found in the Operation and Maintenance Manual



...located in a clear plastic packet inside each unit



Maintenance Tools Required

- Nut drivers – 1/4, 5/16, 3/8
- Combination wrenches or sockets - 7/16, 1/2, 9/16
- Adjustable wrench, 10"
- Phillips and slot blade screwdrivers
- Soft head hammer
- Ring nose and slip joint pliers
- Hex key – 5/32
- Grease gun
- Wet / dry vacuum, water hose
- Flexible pipe brush
- Amp / Volt meter

- Clean water pump
- Check belt tension
- Fan speed adjustment
- Lubricate bearings
- Clean water distributor
- Check flush valve
- Fill reservoir and adjust float





Clean Water Pump HD730D

CAUTION Always disconnect power before servicing pump





Clean Water Pump CF-2100 / CF-2400

CAUTION Always disconnect power before servicing pump



Remove the plastic grid strainer from the bottom of the pump and clean thoroughly



Also check that the pump cooler is operating



Check Belt Tension

CAUTION Always disconnect power before servicing pump



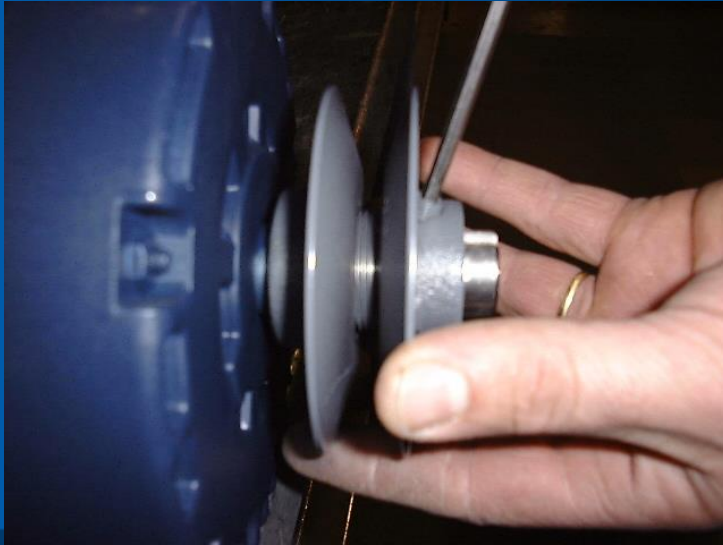
Proper belt tension is approximately $\frac{1}{2}$ " movement of the belt when pressed at mid-span under normal thumb pressure

To tighten the belt, loosen the motor mount bolts and tap the motor mount with a soft head hammer

Belt should be checked for wear and any signs of cracking



Fan Speed Adjustment



If there is an insufficient air delivery it is possible to increase air volume by increasing the fan speed

Motor pulley is an adjustable, variable pitch pulley split into two halves



NOTE: Do not exceed name plate AMPS with service factor



Fan Speed Adjustment Con't

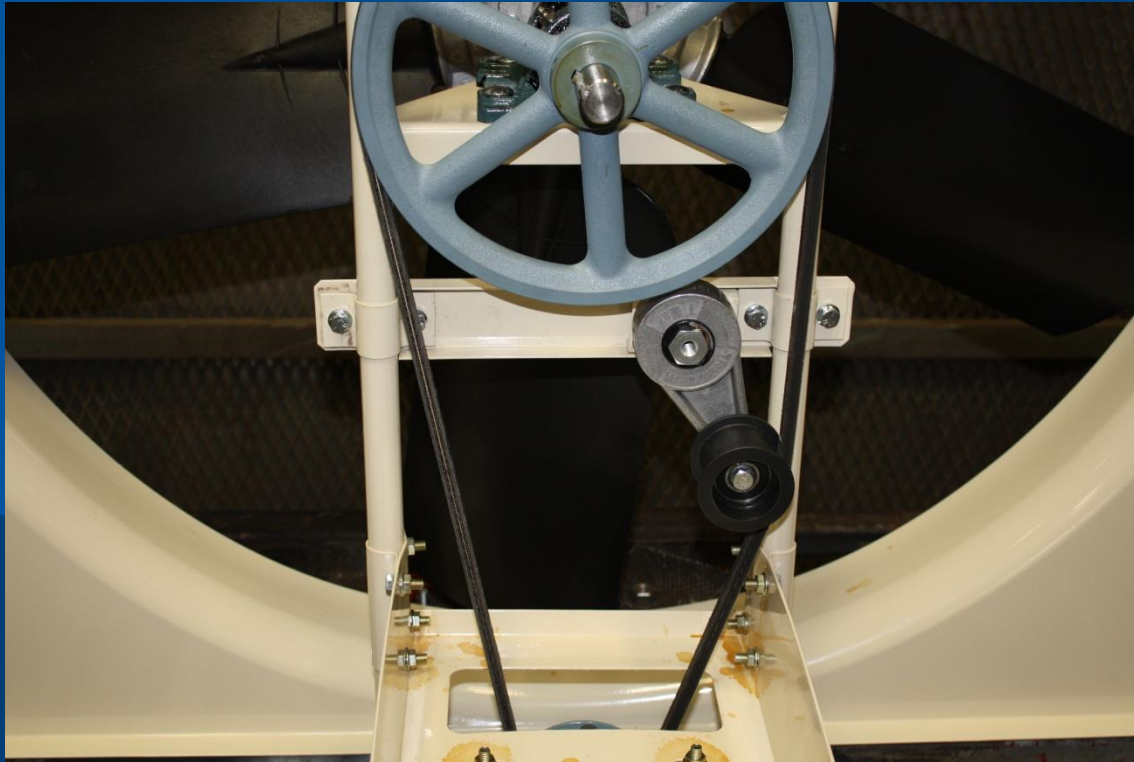


To adjust, it is necessary to loosen the inner half of the pulley (closest to motor) with a 5/32" hex key

Looking down the shaft, turn clockwise to increase the speed of fan, and counter-clockwise to decrease the speed of fan



After adjustment re-tighten the hex screws



Belt Tensioner #BT100
Installation and Service

Lubricate Bearings



Motor and blower shaft bearings on the CF units require re-lubrication with a #2 consistency Lithium Base grease.

Re-lubrication every month during months of operation with no more than 1/10 oz. of a lubricant.

(EXAMPLES: Shell Alvania #2, Mobil Mobilux #2, Texaco Multifax #2)



NOTE: Do not over-grease.
Excessive lubrication can cause premature bearing failure.

Do not use machine oil.



Clean Water Distributor CF-2100 / CF-2400



Water distribution pipe should be cleaned to prevent clogging



Remove the flush hose, twist off the elbow connector and clean the pipe with a flexible pipe brush



Turn the pump on to flush out the pipe with water



Water distribution pipe
should be cleaned to prevent
clogging

Remove the flush hose, twist
off the elbow connector and
clean the pipe with a flexible
pipe brush



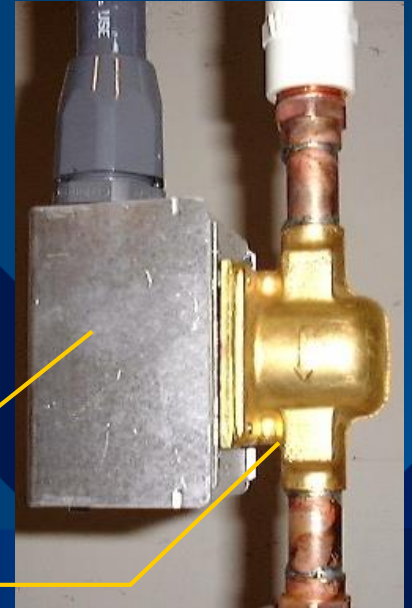
Turn the pump on to flush out the pipe with water

Units are equipped with an automatic flush kit

This flush kit will help prevent excessive salts and corrosion build-up and will prolong the life of the unit

Flush valve
actuator

Flush valve



Make sure that the metal flush
retainer clip is properly inserted into
the PVC overflow pipe

To remove the Actuator
remove screw



Make sure that the metal
flush retainer clip is
properly inserted into the
PVC overflow pipe



If unit is not supplied with a flush kit, a bleed-off kit will be provided

It is important to insert ¼" black tubing into overflow pipe





Fill Reservoir and Adjust Float



After the reservoir has been cleaned, fill it with water up to 2 ½"

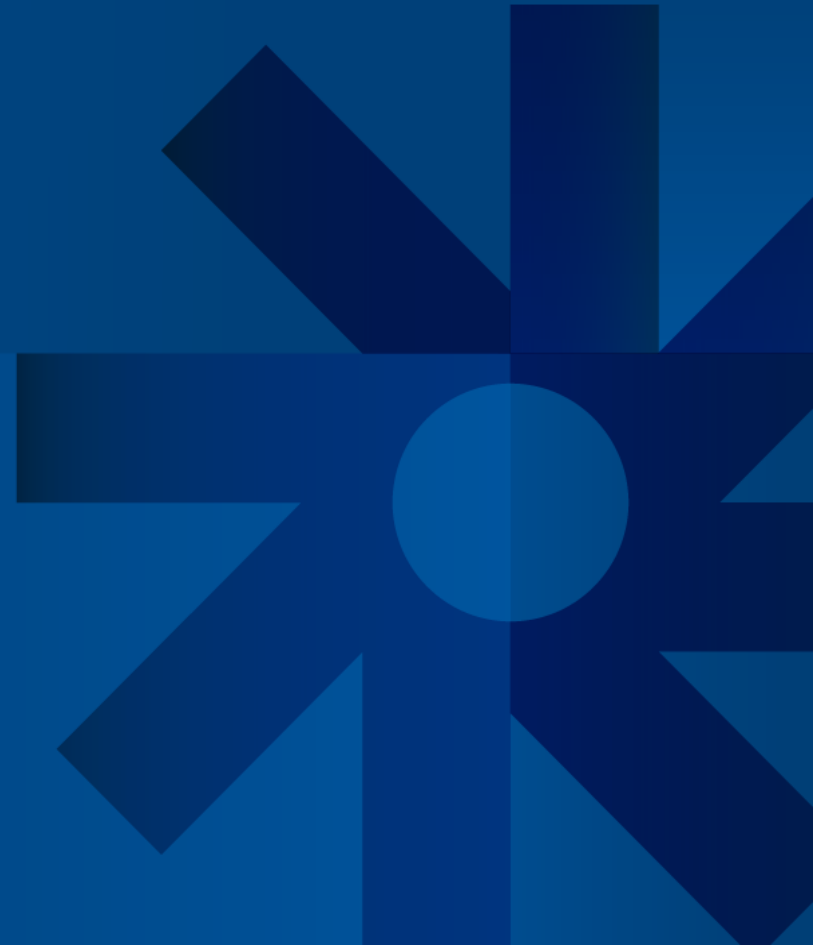
Adjust the float accordingly

Do not adjust by bending the float rod

Please use the screw provided



- Wash cooling media
- Drain and clean reservoir
- Clean cooler area



Check Cooling Media



Inspect entering air side of media for scale build-up

If excessive scale is present
increase flush cycle frequency

Rinsing the media surface with
a water hose will help remove
scale build-up





Drain and Clean Reservoir



Drain the reservoir by removing the PVC overflow pipe

After draining, remove any debris or dirt from the unit by scrubbing and vacuuming the reservoir

Sub-sealer may be applied after 2nd year of operation for prolonged life

You can use either of the following: submarine sealer, dial cooler coat, or marine coat





Clean, Clean, Clean



After each unit has been properly maintained, secure the panels in their places

Before leaving the unit make sure that there are no screws or any other objects lying around

Keep the roof clean!



It is critical that proper regular maintenance be performed on FAN-AIR equipment

The following items must be maintained during the cooling season for optimal operation

- Wash cooling media
- Clean water pump
- Check belt tension
- Clean water distributor
- Check flush valve
- Adjust float



If there is an excessive scale build-up on the cooling media it is advisable to increase the flush cycle



24hr flush cycle timer
is located in the
electrical enclosure



Adjust Flush Cycle HD730D

If there is an excessive scale build-up on the cooling media it is advisable to increase the flush cycle



24hr flush cycle timer is located in the electrical enclosure

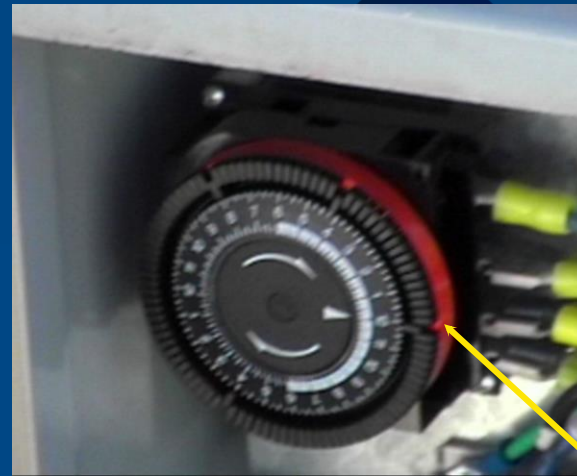


Before opening the enclosure, following the warning sticker instructions



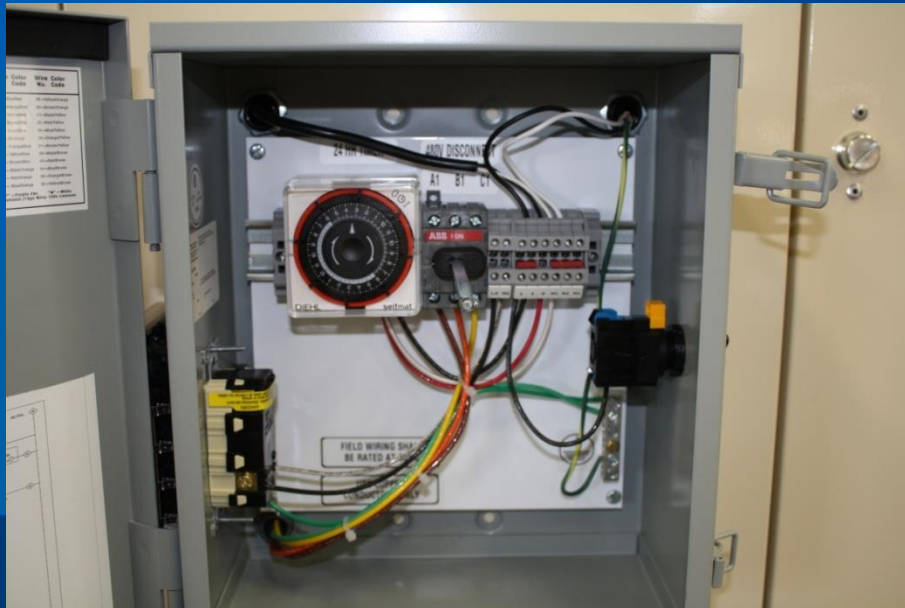
Note: The sticker may not be present on all units
Call United Metal Products for a supply of replacement warning stickers – at no charge

After making sure that there is no power present, open the enclosure, and increase the timer settings



To increase the number of flushes, push in the timer tabs at desired intervals

Adjust Flush Cycle Con't *HD730D*



To increase the number of flushes, push in the timer tabs at desired intervals

After making sure that there is no power present, open the enclosure, and increase the timer settings





Adjust Flush Cycle Con't *UMP-730D-HD*



The factory setting is three 15 minute flush cycles or events in 24 hour period of pump run time. This can and should be adjusted based on the job specific needs.

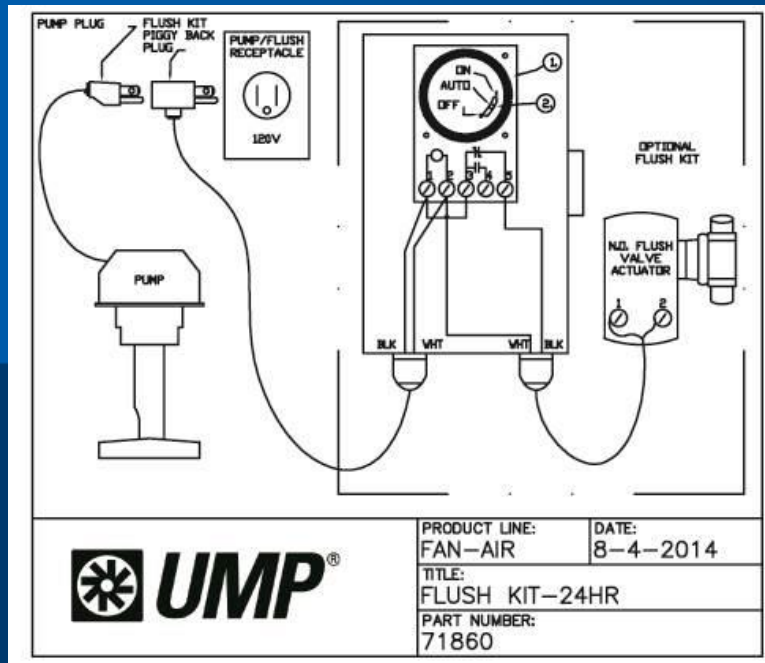
If excessive sediment scaling is experienced on the air inlet of the evaporative media after just a short period of time, the frequency of flush events should be increased.





Adjust Flush Cycle Con't **UMP-730D-HD**

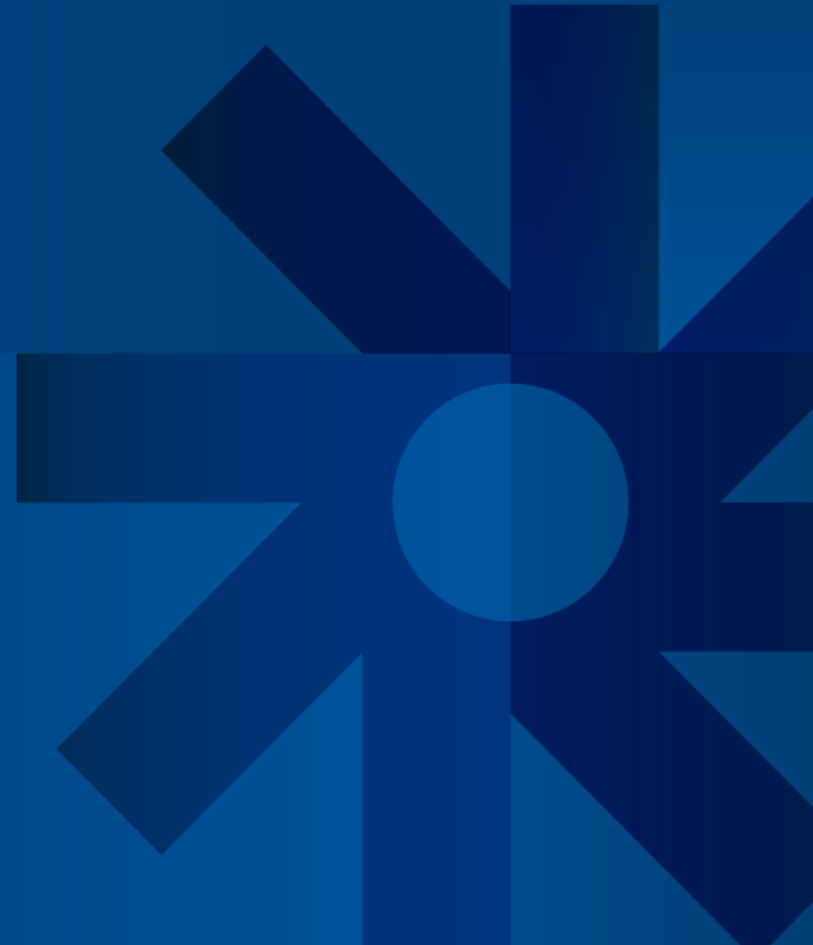
SETTING THE TIME: TO SET THE CURRENT TIME (AND DAY OF WEEK ON 7 DAY UNITS), TURN THE MINUTE HAND CLOCKWISE. DO NOT SET THE TIME BY ROTATING "OUTER" DIAL.



Programming: The 24 hour model has trippers of 15 minute increments, and a AM/PM indication on the outer dial. Push the captive trippers outward for the time period(s) that the load is to be on (normally open contacts closed).

Manual Override: With the manual switch in the middle position, the time switch is in automatic mode and will switch at the programmed times. In the upper position "I", the load is permanently ON. In the lower position, "O", the load is permanently OFF.

- Media replacement
- Fan replacement
- Motor replacement





Proper Part Replacement Procedures



CAUTION



Before removing any component from the unit, the store manager and area sales personnel must be notified and area must be secured from the traffic. Use extreme caution when replacing any parts to the unit. Bear in mind that it is a straight duct drop application, with only a wire grille separating you from the store space.

Do not drop any tools, screws, bolts, or other loose parts!

With proper maintenance, the cooling media should provide optimal cooling for up to 5 years

Thereafter, it may be necessary to replace the media

To replace media refer to the following steps

1. Unbolt and remove the side panel



2. Unbolt and remove the cover plate



3. Remove old media



With proper maintenance, the cooling media should provide optimal cooling for up to 5 years. Thereafter, it may be necessary to replace the media

To replace media refer to the following steps

1. Unbolt and remove the side panel



2. Unbolt and remove the cover plate

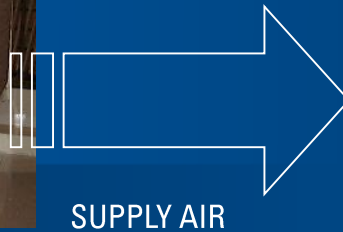


3. Remove old media

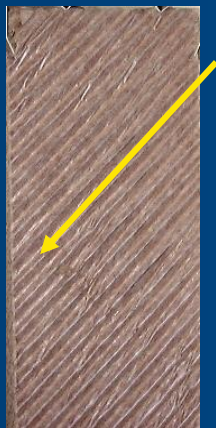
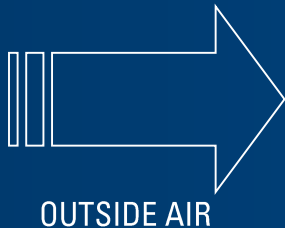




When putting in new media, be sure that 15° flutes are slanted downward toward the leaving air stream...



...while 60° flutes are slanted downward toward the entering air stream



After replacing media, reverse the steps and secure panels in their places

1. Unbolt and remove the side panels



2. Unbolt and remove the center posts



3. Remove the water supply hose



Fan Replacement Con't

4. Unscrew and remove the shroud walls



5. Unscrew the fan assembly around the perimeter

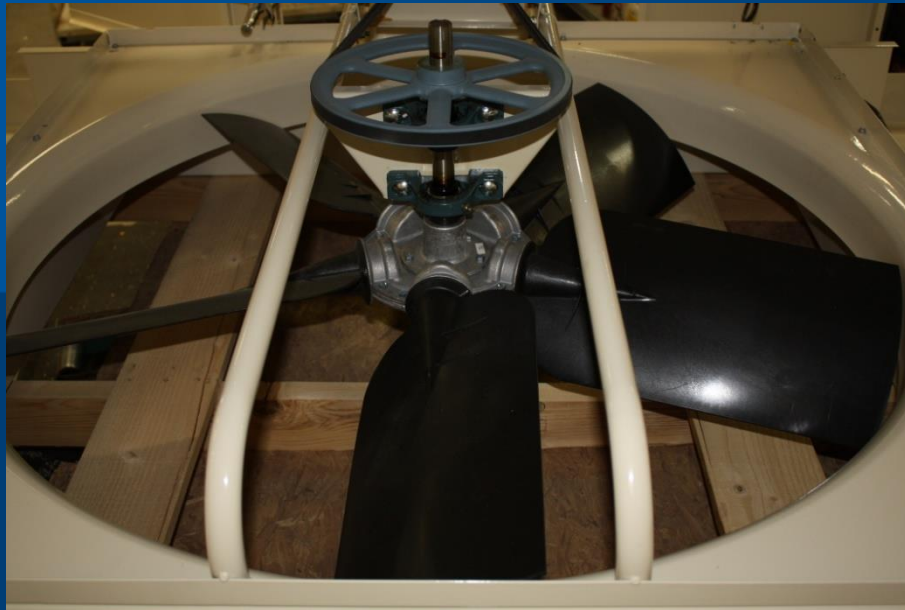


6. Pull the entire assembly out of the unit.



Use extreme caution as the assembly is heavy!

6. Pull the entire assembly out of the unit.



Use extreme caution as the assembly is heavy!

7. Remove the 4 bolts holding the bearings and remove the fan assembly



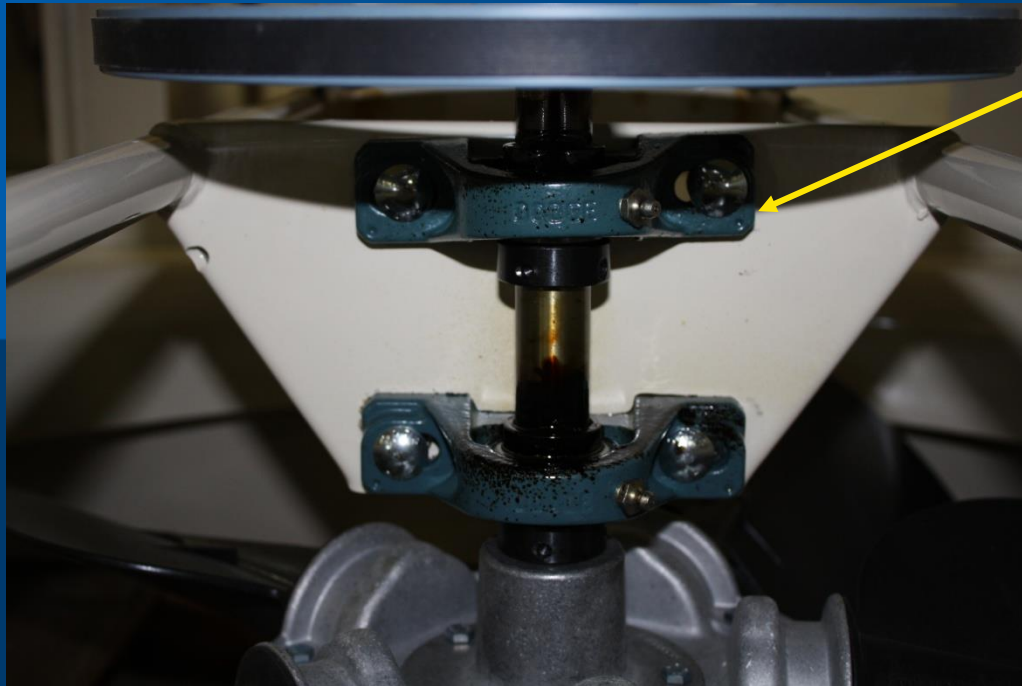
When replacing a fan it is advisable to replace the entire fan-shaft-bearing assembly

This can be ordered as a unit from the factory

Refer to the parts list provided

After replacing assembly, reverse the steps and secure everything tightly together

7. Remove the 4 bolts holding the bearings and remove the fan assembly

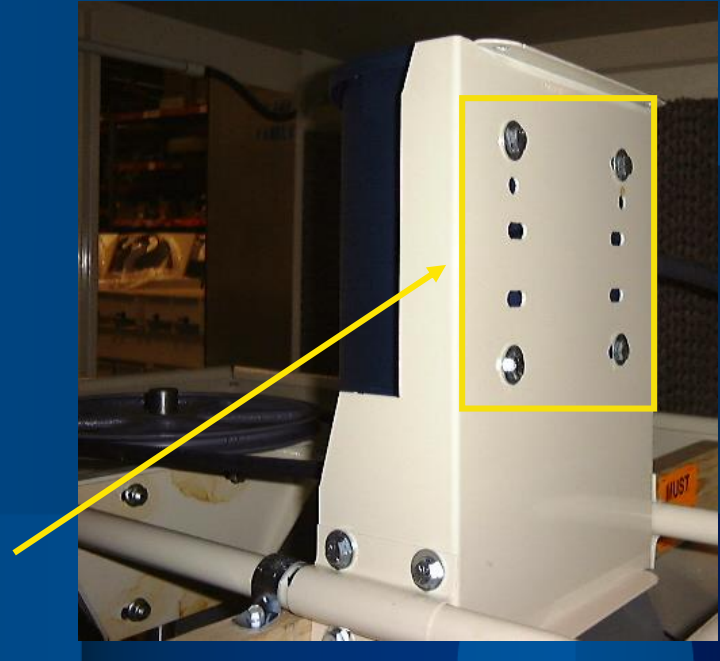


When replacing a fan it is advisable to replace the entire fan-shaft-bearing assembly

This can be ordered as a unit from the factory

Refer to the parts list provided

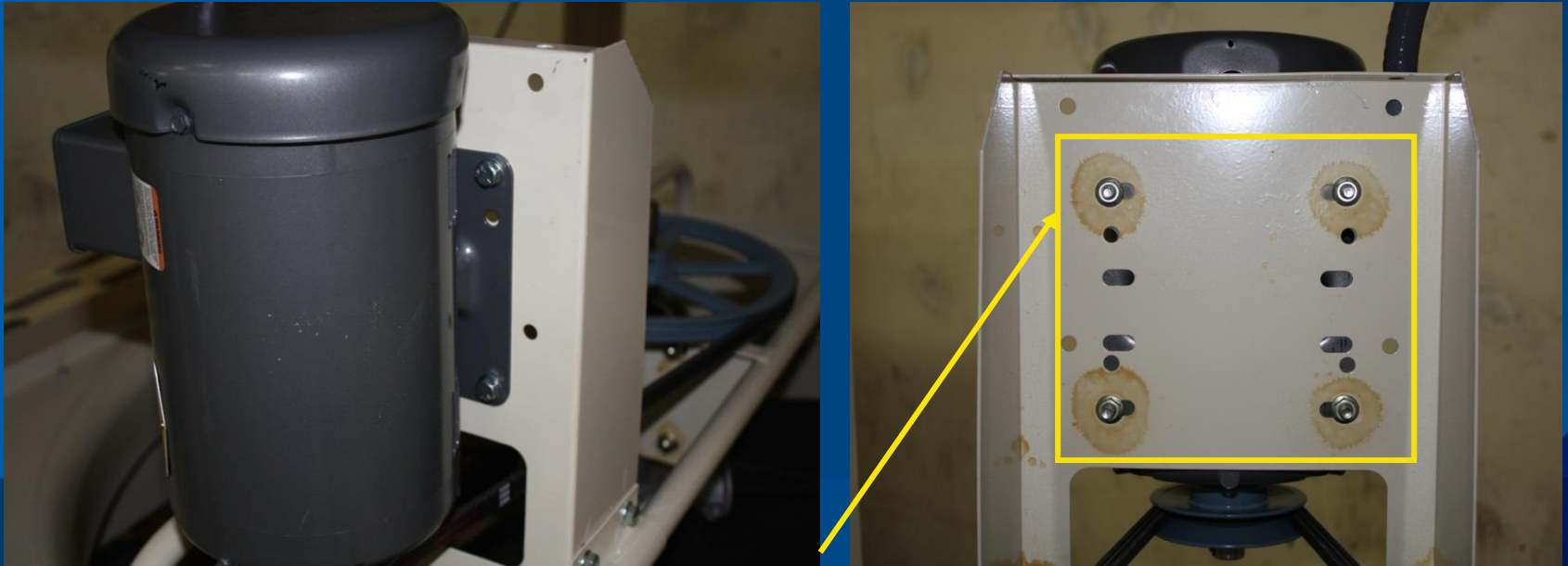
After replacing assembly, reverse the steps and secure everything tightly together



Remove the 4 bolts holding the motor

Use extreme caution as the motor is heavy!

Do not drop it through the unit!



Remove the 4 bolts holding the motor

Use extreme caution as the motor is heavy!
Do not drop it through the unit!



Common Replacement Parts

When replacing any parts to the FAN-AIR equipment,
it is imperative that you use identical,
factory replacement parts

Following is a list of the most common replacement parts,
compiled for your convenience and ease of ordering.

You can place an order by sending an e-mail to
parts@unitedmetal.com, by calling the parts department at
480-968-9550, or by faxing to 480-968-9555



Common Replacement Parts for CF2100

PART NUMBER	DESCRIPTION
52007	8 x 12 x 30 CELdek (10 PIECES PER UNIT)
52008	8 x 12 x 30 GLASdek (10 PIECES PER UNIT)
52113 / NEW 61315	42" FAN BLADE
52621	AK114 @ 1" FAN PULLEY
53106	1VL40L @ 7/8" MOTOR PULLEY
55242	AP48 BELT
80130 / NEW 80102	BEARING AND SHAFT KIT
53259	RM-153-P 10BK 3/8" FLOAT
54188	5MSPR PUMP (115V)
56352	CP 15,000 PUMP (115V)
55897	46" VENTURI FRAME
80037	46" COMPLETE VENTURI (Venturi, Fan Blade, Bearings & Shaft)



Common Replacement Parts for HD730D

PARTS	DESCRIPTION
52007	8 x 12 x 30 CELdek (10 PIECES PER UNIT)
52009	9 x 12 x 39 CELdek (10 PIECES PER UNIT)
53259	RM-153-P 10BK 3/8" FLOAT
56470	Float Shield
80211	Bearing and Shaft Kit
50498	2hp Motor
54188	5MSPR PUMP (115V)
58607	Pump Basket
68200	Toe Nipple / Overflow
65470	Hartell Pump - 1C w/plug
65471	Hartell Pump - n/lug
75000	42" Fan Blade
53106	MVL40 @ 7/8" Motor Pulley
52621	MA113 @ 1" FAN PULLEY
70572	EBFK-5 Black Handles
51154	5hp 460V 3Phase Motor
70574	ABB 16A Disconnect
57769	1/2" ID Black PVC Tube
54655	SS Door Hinge

PARTS	DESCRIPTION
71315	28 x 56 Aspen Pad
10948	Flex Tube Anchor
53405	90 Degree Elbow
71557	1" Pump Tube
73194	Stand Pipe Assembly
71713	Flush Valve Assembly
	No Brackets or Fittings
81272	Flush Valve Bracket Assembly
71860	Flush Timer w/Pig Plug
	No Brackets or Fittings
55484	24hr Timer
66293	5MSP Pump Assembly
10010	Louvered Panel
69162	A63 Belt Outboard
55242	A48 Belt Inboard
80037	46" Venturi Painted
80212	46" Venturi Drive Assembly
70744	2-POS Switch for EBFK-5
78117	Transformer 480/120
	120V for EBFK-5 & G1



Common Replacement Parts for HD730D

Distribution Tubes			
UMP730 & UMP739			UMP700 & UMP900
Parts	Description		Parts
80266	½" Distribution Tube-L		81599
80226	½" Distribution Tube-R		81600
80332	½" Distribution Model UMP-554D		

73482	Contactor (WEG)	Units made through May 2006
73481	Overload (WEG)	Units made through May 2006
67837	Contactor (Seimens)	Units made after May 2006
73695	Overload (Siemens)	Units made after May 2006

SYMPTOMS

- Excessive noise and / or vibration

POSSIBLE CAUSES

- Defective bearing
- Locking collar loose on shaft
- Foreign material inside sealed bearing
- Sheave not tightened on shaft: (motor or fan)
- Loose fan
- Loose belt
- Worn, oily, or dirty belts
- Improper drive selection
- Misaligned sheaves
- Fan out of balance
- Loose motor or motor base
- Bent fan shaft
- Dry bearings
- Wheel rubbing blower housing

CORRECTIVE ACTION

- Replace
- Tighten set screw
- Replace
- Tighten set screw and check alignment
- Tighten set screw
- Adjust tension
- Clean or replace
- See Model Characteristics for correct drive selection
- Realign
- Straighten or replace
- Secure properly
- Replace
- Lubricate fan bearings
- Inspect blower shaft collars, belt, pulley alignment and motor mounting

SYMPTOMS

- Fan not operating

POSSIBLE CAUSES

- Blown fuse or open circuit breaker
- Broken belt
- Loose sheaves
- Electricity turned off
- Defective motor

CORRECTIVE ACTION

- Replace fuse or reset circuit breaker
- Replace
- Tighten and check alignment
- Contact local power company
- Repair or replace

- Insufficient air flow

- Lack of sufficient air exhaust
- Fan speed too slow
- Loose belt
- Media pads plugged with scale
- Inlet louver panel plugged

- Open window or doors to increase ventilation
- See slide 19 details
- Adjust belt tension
- Rinse or replace pads
- Clean or replace louver panel
- Install Belt Tensioner

SYMPTOMS

- Inadequate cooling

POSSIBLE CAUSES

- Insufficient water flow to pads, i.e. pads are dry
- Media pads plugged with scale
- Dry pads
- Pump not working
- Media pads turned backwards
- Distributor plugged
- Water level in reservoir too low
- No water supply
- Low water pressure

CORRECTIVE ACTION

- Check water distribution system
- Rinse or replace pads
- Open restrictor clamp hose to allow more flow
- Unplug pump. Clean impeller housing
- Position so that side with dark faces exterior of unit, 60° angled slant increase flush cycles
- Clean pipe or replace distributor
- Adjust float for 2" – 2 ½" level
- Turn on water valve
- Increase to a minimum of 50 psi

SYMPTOMS

- Motor cycles on and off
- Water dripping from overflow pipe or from corner of unit

POSSIBLE CAUSES

- Excessive belt tension
- Fan shaft tight or frozen
- Motor overloaded
- Improper drive selection
- Float not properly adjusted
- Float valve leaking
- Unit not leveled when mounted

CORRECTIVE ACTION

- Adjust belt tension
- Lubricate fan bearings
- Adjust motor to name plate amps
- Refer to individual model characteristics for correct drive selection
- Adjust float
- Replace float valve
- Level the unit on the stand or roof curb
- Adjust motor to name plate amps

SYMPTOMS

- Disagreeable odor

POSSIBLE CAUSES

- Media pads not completely saturated
- Stagnant or stale water in reservoir
- Media pads mildewed or clogged
- Flush valve clogged

CORRECTIVE ACTION

- Saturate evaporative media before starting unit
- Drain, flush and clean reservoir
- Check bleed-off setting
- Remove, clean, and/or replace
- Replace evaporative media
- Clean or replace louver panel
- Increase flush cycle

- Pulsing Water

- Improper venting
- Improper amount of fall on drain line

- Vent pipes
- Correct fall to 1/8" per foot

- Unit specifications
- Performance data
- Wiring diagrams and details
- Drawing details
- Formulas



Unit Specifications

■ General

- Furnish and install complete, ready-to-operate, factory assembled Fan-Air® evaporative coolers, manufactured by United Metal Products of Tempe, Arizona
- Note: All units must be certified according to UL Standard 1995. Listed and labeled by an independent testing lab such as UL, ETL, or CSA

■ Performance and Certification

- All air deliveries are based on delivery against the external static pressure specified with evaporative media and filters in place. Such capability shall have been established for this unit by actual air performance tests conducted by the Air Movement and Control Association (AMCA)

■ Cabinets and Construction

- Cabinet shall be constructed of hot dip galvanized steel. Entire cabinet shall be coated inside and out with epoxy powder base paint baked on at 375°F. Water reservoir shall be of 16 gauge steel with welded seams



Unit Specifications Con't

■ **Fan, Drives and Motor**

- The air handling unit shall be a six-bladed steel fan rigidly and statically balanced. The shaft will be seated to the fan pulley by mean of the key-seat and key-way. The fan shall have two bearings with eccentric locking collar and re-lubrication port. The motor shall be adjustable and mounted on a rigid base. The blower pulley shall be connected to the motor sheave by means of a V-belt

■ **Evaporative Media**

- The evaporative media shall be GLASdek, made from large glass fibers bound together by inorganic, non-crystalline filters and shall be UL approved with a UL 900, Class 2 rating up to 8" depth

■ **Damper – Diffuser Model #A4545**

- A combination diffuser-damper shall be provided to allow automatic change over from heating to cooling season

■ **Water Distribution**

- Water shall be distributed to pads via large diameter polyvinyl chloride plastic conduit providing total saturation of media pumps shall be re-circulating type with centrifugal impeller. Make-up water shall be provided through a metering float valve



Performance Data

AIR DELIVERY IN CUBIC FEET PER MINUTE (CFM) CERTIFIED RATINGS AUTHORIZED BY AMCA							ELECTRICAL SPECIFICATIONS					
		Inches Static Pressure					Fan Motor				Pump	
Model (Low Profile)	Industry Standard Rating	0	.1	.2	.3	.4	Max BHP	HP	Volt/Phase 115/230 1 Phase Amps	Volt/Phase 208/230/460 3 Phase Amps	GPH	Amps 115/230V 1 Phase
CF2100 Down	14,000	1158	8917	6031	1734	-	.82	3/4	1.8 / 5.4	3.0 / 1.5	600	5 / 2.5
	16,000	12693	10175	7705	3974	-	1.20	1	2.8 / 6.4	5.4 / 2.7	600	5 / 2.5
	18,000	15590	13583	11681	9507	6845	1.72	1.5	17.2 / 8.6	6.2 / 3.1	600	5 / 2.5
	21,000	17173	15480	13510	11933	9723	2.29	2	21 / 10.5	6.2 / 3.1	600	5 / 2.5
CF2400 Down	24,000	18716	16467	13413	10663	7848	2.3	2	21 / 10.5	6.2 / 3.1	600	5 / 2.5
	36,000	21647	19810	17239	14709	12360	3.44	3	37.8 / 18.9	9.2 / 4.6	600	5 / 2.5



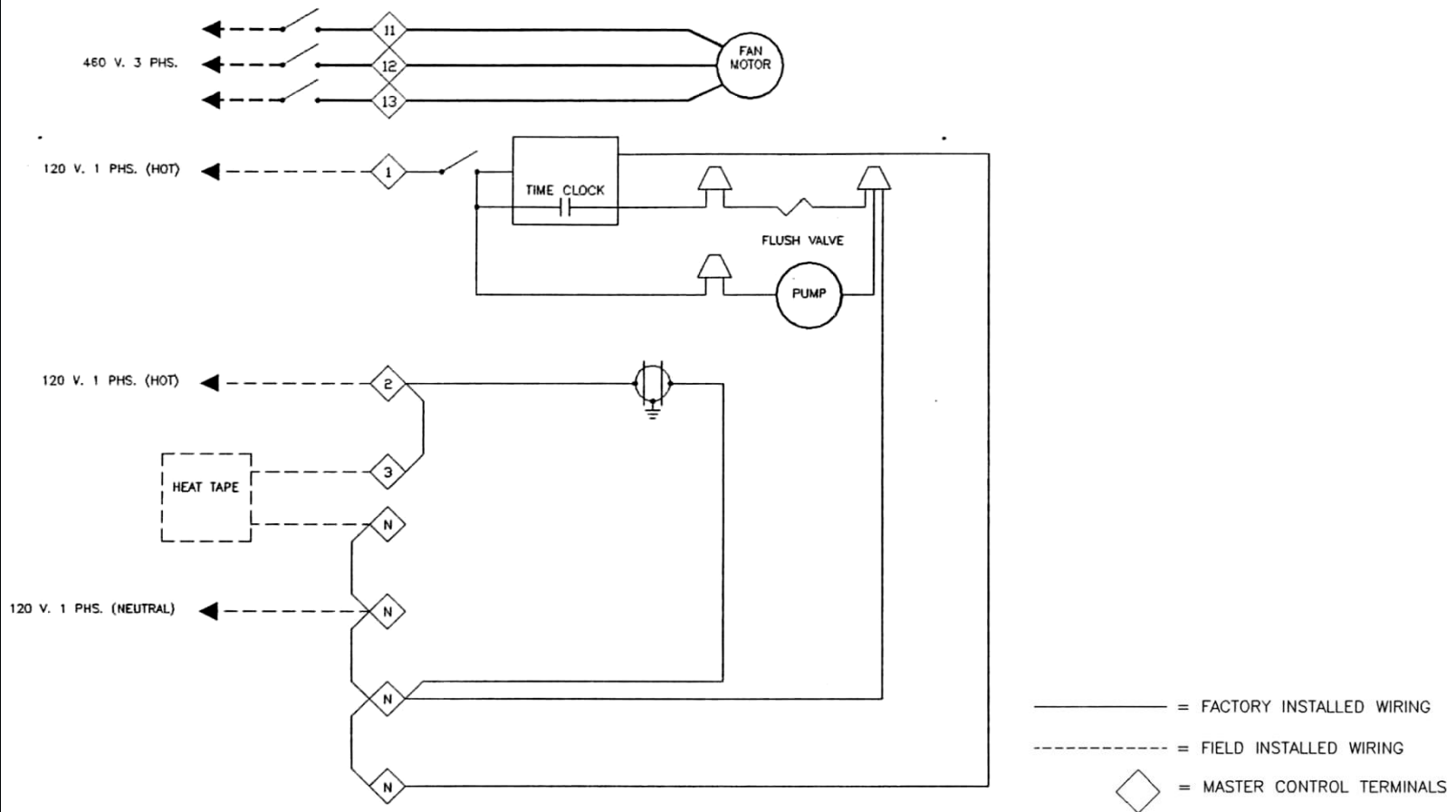
Performance Data

	Fan Unit 2						Evaporative Pads	Weights 3	
Model (Low Profile)	Fan		Drive 5						
	Dia.	Max RPM	4 MP	4 FP	Belt	Shaft	Pad Sizes	Shipping	Operating
CF2100 Down	42	388	VL40	11	A48	1"	(10) 12"x8"x30"	760	1160
	42	425	VL40	11	A48	1"	(10) 12"x8"x30"	765	1165
	42	522	VL40	11	A48	1"	(10) 12"x8"x30"	770	1170
	42	575	VL40	11	A48	1"	(10) 12"x8"x30"	770	1170
CF2400 Down	42	447	VM50	14	A60	1"	(10) 12"x8"x39"	770	1170
	42	517	VM50	14	A60	1"	(10) 12"x8"x39"	784	1184

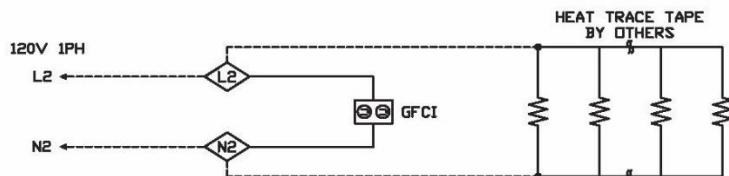
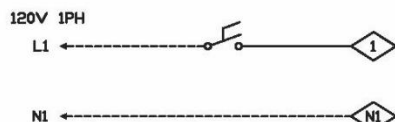
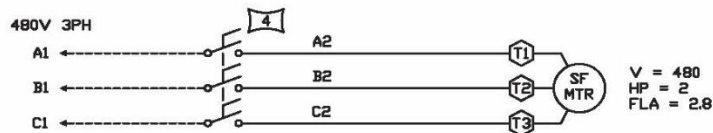
1. Power Rating (BHP) does not include drive losses.
2. Performance shown is for installation Type B - Free Inlet, Ducted Outlet.
3. Weights are in pounds and include motor and pump. Minimum duct sizing should equal discharge dimension. Consult factory for special applications.

4. Motor Pulley and Fan Pulley measurements are O.D. inches.
5. Performance Ratings include the effects of motor and drives in the air system

NOTE: ETL labeling is available upon request.

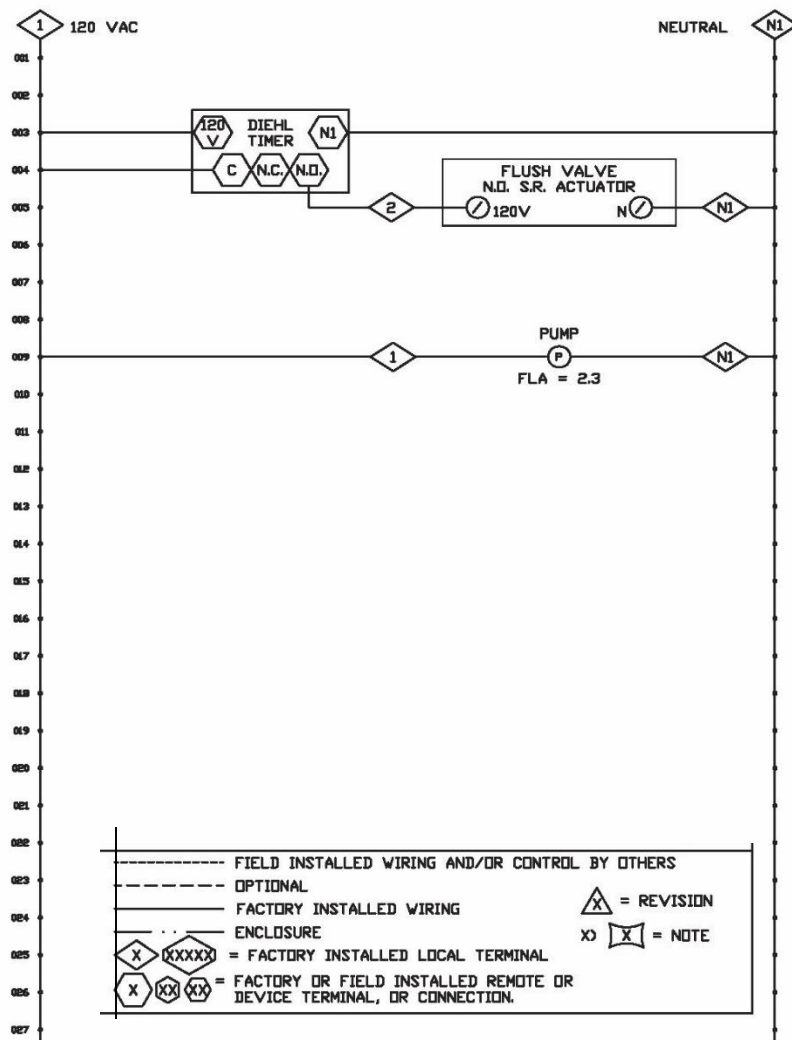


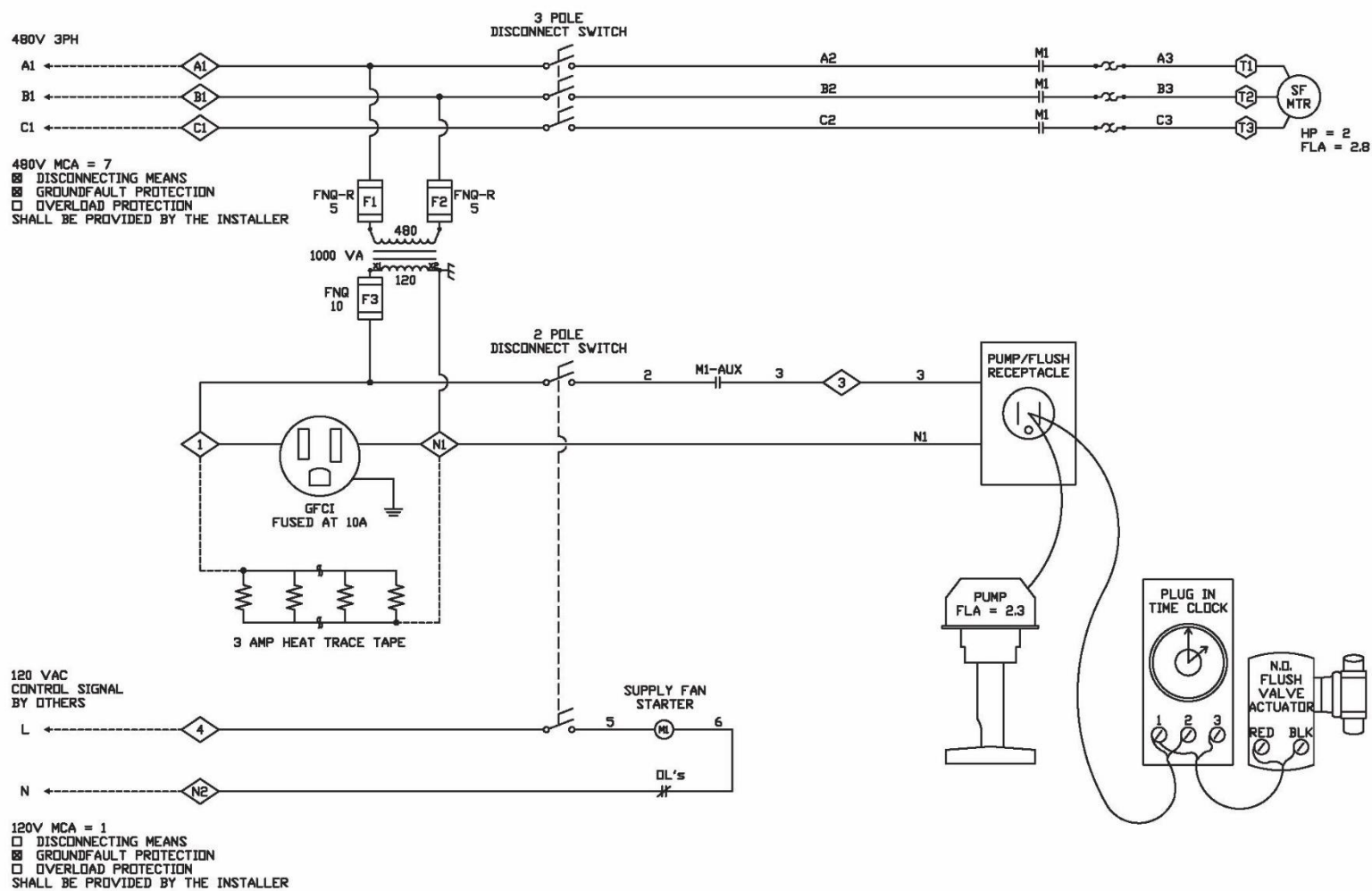
Wiring Diagrams and Details Without Starter HD730D

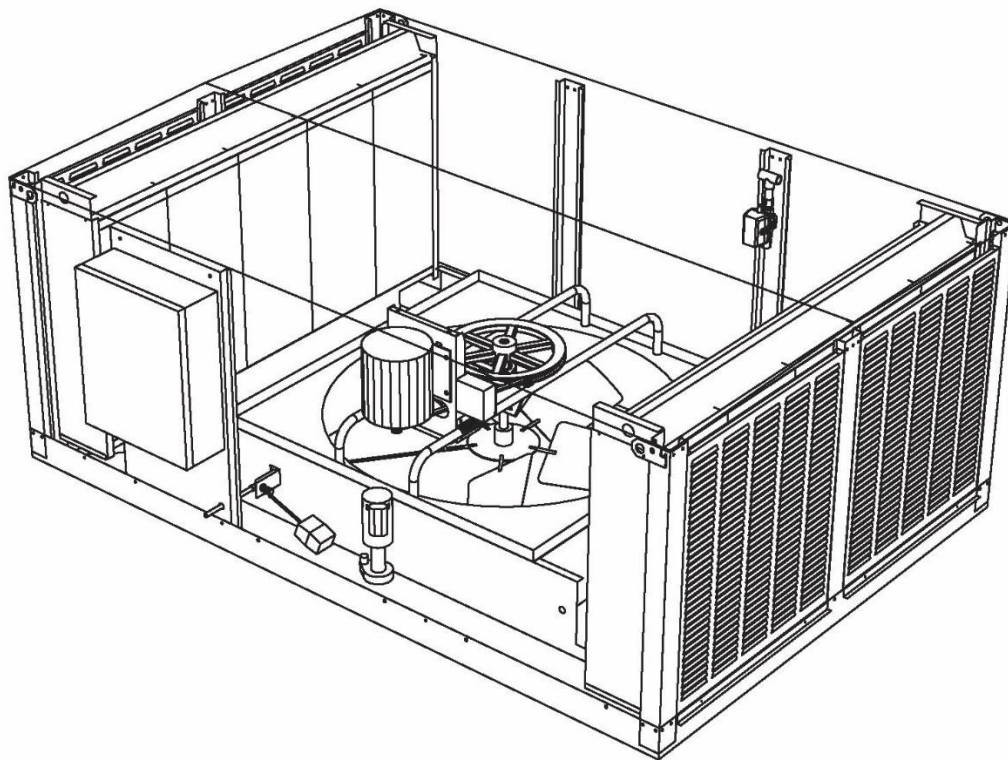


NOTES:

- 1 480V MDP = 6.25A FUSE, MCA = 5
☐ DISCONNECTING MEANS
☒ GROUNDFAULT PROTECTION
☒ OVERLOAD PROTECTION
 SHALL BE PROVIDED BY THE INSTALLER
- 2 120V MDP = 10A, MCA = 3
☐ DISCONNECTING MEANS
☒ GROUNDFAULT PROTECTION
☒ OVERLOAD PROTECTION
 SHALL BE PROVIDED BY THE INSTALLER
- 3 120V MDP = 20A, MCA = 15
☒ DISCONNECTING MEANS
☒ GROUNDFAULT PROTECTION
☒ OVERLOAD PROTECTION
 SHALL BE PROVIDED BY THE INSTALLER
- 4 HP RATED DISCONNECT SWITCH







©DUPLICATION PROHIBITED



**UNITED METAL[®]
PRODUCTS**

WWW.UNITEDMETAL.COM

UMP-730-HD 3D

REVISIONS

TAG NO.

DATE

DWG No. UMP-730Ddi-HD

INT.

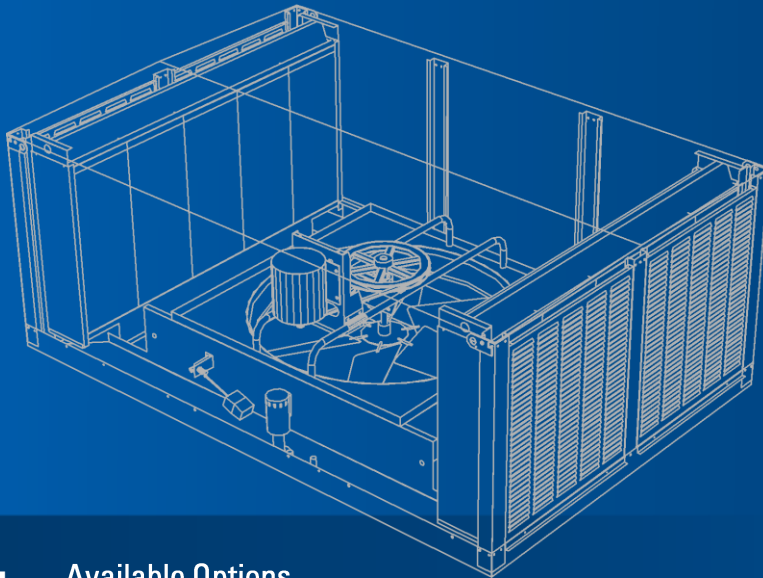
JOB NO.

DATE DRAWN: 09/26/05 SH



700 Series – “Low Profile”

UMP730 – Down Discharge



Available Options

- Class II, U.L. 900 media
- Prewired control packages
- Distribution flush system
- Freeze protection
- Self-tensioning belt
- Installation accessories
- Fused and non-fused disconnects

Resources Available for This Product

- Catalog by mail
- Catalog Online

Features

- “Low profile” (only 38.25” high)
- Factory tested and shipped ready to operate, including factory wired components
- ETL Listed and labeled in accordance with U.L. standards
- Copper-wound, heavy duty ball bearing motors
- One high capacity pump provides complete media saturation
- Self-aligning, heavy duty, greaseable, pillow block, ball type fan bearings
- Fan performance is factory set to job specific specifications
- Premium 8” thick cross fluted 80% efficient media
- Lifting sky hooks
- The most up-to-date propeller type axial fan affords maximum air delivery while minimizing horsepower
- Heavy gauge, hot dipped galvanized steel construction
- Epoxy powder base paint finish baked on at 375°
- Rugged cabinet assembly with double thick steel corners
- “Rain Tight” pitched top construction (1/4” /12”)
- Easily accessible external distributor clean-outs
- Side access media removal
- Adjustable motor sheave for air flow adjustment

- **Temperature of Evaporative Cooled Air**
 - To determine the temperature of air leaving a cooler, three facts must be known
 - The temperature of the Outdoor Air “Dry Bulb” (abbreviated DB)
 - The Wet Bulb temperature of the Outdoor Air (WB is the temperature to which a standard DB thermometer is cooled by wrapping the bulb in a wetted wicking, and passing an air stream over it; abbreviated WB)
 - The evaporation efficiency of the equipment. (This means how close to WB an evaporative cooler lowers Outdoor Air. Coolers are designed to achieve approximately an 80% evaporation efficiency).

- Temperature of Evaporative Cooled Air

- The formula for determining the amount of cooling

$$DT = DB - .80 (DB - WB)$$

- Cooler discharge temperature = Outdoor DB – 80%
(Outdoor DB – Outdoor WB)

(Note: The difference between outdoor DB and WB is also known as wet bulb depression, abbreviated WBD)

EXAMPLE:

If outdoor air is 95F DB, 75F WB

$$\begin{aligned} \text{Delivery temperature} &= 95 - .8 (95 - 75) \\ &= 95 - 16 \\ &= 79F \end{aligned}$$

- Exhaust of Cooled Spaces

- Relief from pressure build-up is a MUST in cooler applications. Three common methods are used:

- Power exhaust
 - Damper which opens automatically upon pressurization
 - Gravity vent to outside

- Sizing Exhaust

- Power Exhaust
 - Equals total CFM of cooler delivery (in some cases slightly negative or positive pressure be desired)
 - Gravity vent

- Exhaust of Cooled Spaces

- Use the formula

$$A = Q \text{ divided by } V$$

Where

A = Vent Area

Q = CFM Delivery of coolers in the space

V = The permissible air velocity through the vent

- Openings (Vents, Doors, etc.)

2 Square feet of openings per 1,000 CFM of delivery required

EXAMPLE: 60,000 CFM requires

2 sq. ft. x 60,000 CFM divided by 1,000 CFM = 120 sq. ft. opening

■ Water Consumption

- A formula for this is derived from the fact that 9,000 BTU's are required to evaporate a gallon of water
- The formula of an 80% efficient cooler is that approximately 1 gallon/hour is evaporated for each 1,000 CFM of capacity the unit, for each 10 degrees WBD, or

$$\frac{\text{CFM}}{1,000} \times \frac{(\text{DB} - \text{WB})}{10} = \text{G}$$

$$\frac{\text{CFM}}{10^3} \times \frac{(\text{Outdoor DB} - \text{Outdoor WB})}{10} = \text{Gallons per hour Evaporated}$$

EXAMPLE:

If outdoor conditions are 95 DB and 75 WB, determine how many gallons a 6,000 CFM evaporative cooler will evaporate per hour

$$\frac{60,000}{1,000} \times \frac{(95 - 75)}{10} = 6 \times 2 = 120 \text{ Gallons per hour}$$