CARNES®

INSTALLATION, OPERATION AND MAINTENANCE MANUAL
ENERGY RECOVERY VENTILATOR

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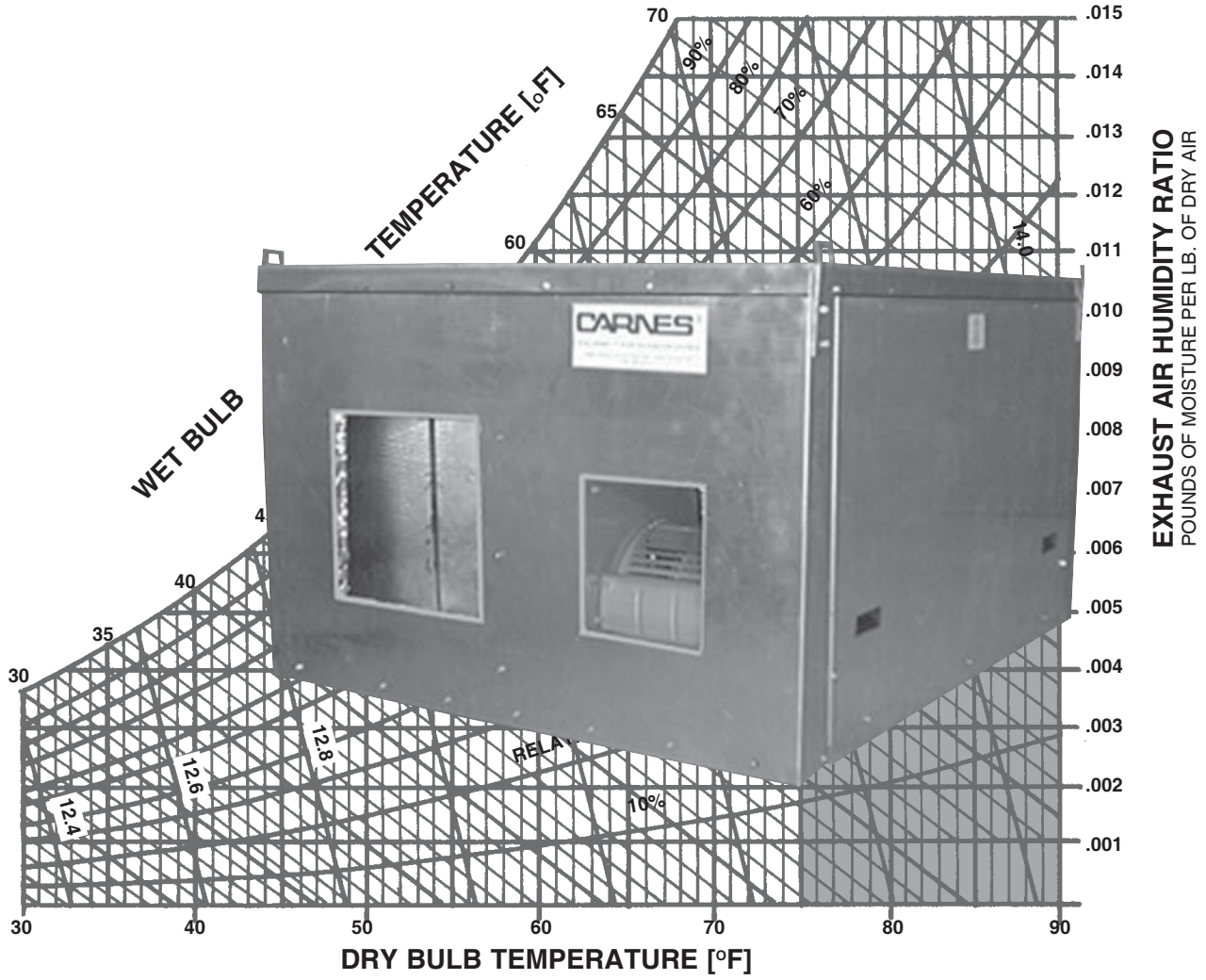
Model WEHC



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GENERAL SAFETY INFORMATION

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC), the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electric Code (CEC) in Canada.
2. Only qualified personnel should install this system.
3. All moving parts must be free to rotate.
4. Unit must be securely and adequately grounded.
5. Adjustments to fan speed significantly effect motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.
6. Never open access doors to the unit while it is running.
7. Verify that the power source is compatible with the equipment.

DANGER

Always disconnect power before working on or near this equipment. Lock and tag the disconnect switch or breaker to prevent accidental power up.

CAUTION

When servicing the unit, the internal components may be hot enough to cause pain or injury. Allow time for cooling before servicing.

The Carnes WEHC Energy Recovery Ventilator is shipped as a factory assembled factory-wired and run-tested unit. This includes an air-to-air rotary exchanger, supply and exhaust fans, supply and exhaust filters, electrical control panel, and external disconnect. The ventilator is housed in a weathertight galvanized steel cabinet. Optional dampers, controls and safety devices may be included.

This manual describes basic installation, operation and maintenance requirements for the cataloged features. Non cataloged features may be covered by the Equipment Submittal or separate Carnes Instructions.

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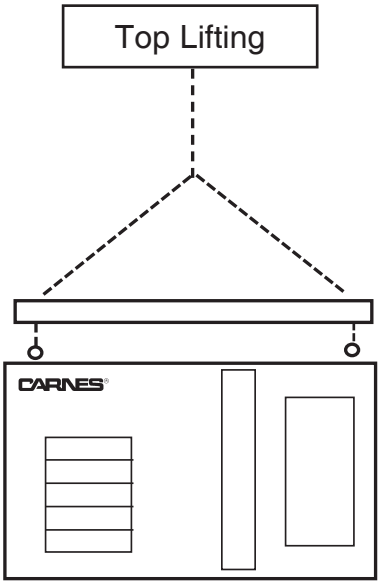
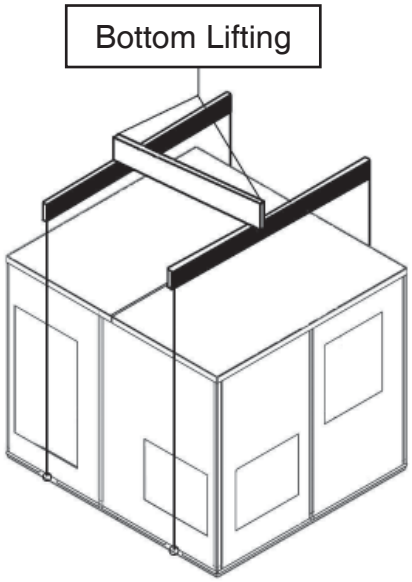
RECEIPT and STORAGE

1) The unit must be thoroughly inspected before accepting delivery from the carrier. Inspect for:
   a) Impact damage or serious scratches to the exterior.
   b) Damage to the interior components such as energy recovery wheel, fan and motor mountings or wiring.
2) Any discrepancies in equipment or condition as received must be reported in writing to the carrier and Carnes Company immediately. In particular note: the optional roof curb is shipped in advance for installation as part of the building roof.
3) The system is weather tight. However, if extended storage without operation is expected:
   a) Any special unit roof penetration not connected to operating ductwork should be covered with rainproof coverings.
   b) All access panels should be tightly closed.
   c) Store the unit indoors, under roof. Moisture and high and low temperature extremes may harm the unit. If stored more than 3 months, rotate the rotor, and fans, at least 3 turns by hand. Repeat every 3 months.





PLACEMENT and INSTALLATION

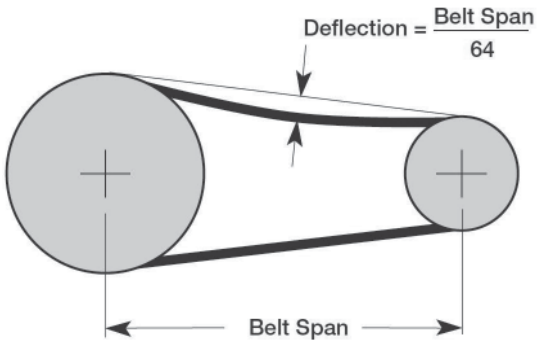
1) Hoist the ventilator only with the lifting brackets provided. Attach a suitable chain or strap and a spreader bar. Access panels must be in place during lifting to prevent damage.
2) Before lifting for final placement, confirm the duct locations are correctly oriented to the building connections. Install the foam gasket provided with the optional curb on the top flange of the curb to seal against the under side of the system. The lifting brackets ARE NOT to be used for hanging the unit. Support the unit from below if it is installed in a hanging position.
3) After all items have been completed, lift the system into position on the curb. Carnes optional curb allows a tolerance of 1" (25mm) to 2" (51mm) on each axis when positioning the system, so care must be taken accurate placement to match with ductwork and utility connections through the curb.
4) After removing shipping covers from airflow openings, fasten and seal the connecting ductwork. No specific provisions are made for fastening the unit base to the curb. If this is required, use caution to maintain the weather tightness of the unit, curb and roof.
5) The electrical diagram for the energy recovery system is found inside the exhaust access panel. Verify that the available power matches the unit. Then, incorporating applicable **NEC** and local code requirements, run the power supply to the main disconnect switch.
6) Damper motor and safety controls are wired by Carnes. Verify from the project plans and specifications, or Carnes electrical diagram which controls or equipment within the system are to be "field wired" or "provided and wired in the field."
7) In specific instances, other building controls (i.e., master time clocks or fire protection systems) may interface with the Carnes energy recovery system. Verify that building controls are compatible with the controls on the Carnes electrical diagram.

MOUNTING WEATHER HOODS

1) This only applies if the unit was shipped with the weather hoods not attached. The unassembled exhaust weather hood may be located in the inlet air compartment with assembly instructions.
2) If the intake and exhaust openings are covered for shipment, remove the covers before installing the weather hoods. The weather hoods will be labeled for either exhaust or intake. The assembled weather hoods come with gaskets already installed.
3) If the unit is supplied with electric preheat, install the preheater over the outside air intake. The intake air weather hood is then installed to the electric preheater.
4) For weather hoods with gravity back draft dampers, center the weather hood over the appropriate exhaust or intake hole. Then mount the weather hood onto the cabinet with sheet metal screws using the premade holes in the weather hood flanges. If self drilling sheet metal screws are not used it may be necessary to mark and pre-drill holes in the cabinet for the sheet metal screws.
5) For weather hoods with motorized dampers there are a few more steps. The motorized damper will be pre-wired with an appropriate length of conduit and wire to be wired into the junction box mounted inside the cabinet. Located on the side of the cabinet will be a pre-made hole to feed the conduit through and then a qualified electrician can wire up the motorized damper in the junction box mounted inside the cabinet. Center the weather hood over the appropriate exhaust or intake hole. Then mount the weather hood onto the cabinet with sheet metal screws using the premade holes in the weather hood flanges. If self drilling sheet metal screws are not used it may be necessary to mark and pre-drill holes in the cabinet for the sheet metal screws.

START-UP and OPERATION

1) Verify that all Placement and Installation tasks have been completed, including the removal of all airflow opening/damper shipment covers.
2) Verify that the tensions on all fan belts (adjusted by motor location) is proper. “A” belts when properly adjusted on typical fan drives, require 8-1/4 pounds (3.75 Kg) [+10%] to deflect the midpoint on the belt 1/64 of the distance between sheave centers. The belts should be tight enough not to “squeal” audibly on start-up. If they are allowed to squeal on start-up, accelerated belt and sheave wear will result.



3) Verify fan rotation is correct. This can be viewed with access panels removed, or looking through the discharge duct openings.
4) Forward-curved fans used with this unit will overload severely if operated without all access panels in place. Therefore, any run inspections made with an access panel removed **MUST** be brief (less than 2 minutes) to avoid tripping motor starter thermal overloads and/or damaging the motor and wiring.

> **CAUTION:** *Avoid operating the fans for extended periods unless the wheel is also operating. During rotation the wheel is self-cleaning, but when stopped debris can accumulate on the wheel surface over an extended period of time. This accumulation increases the static pressure drop across the wheel, and can result in damage to the wheel surface whenever wheel rotation is resumed.*

5) If unable to start the unit above, check for -
   a) Proper electrical power supplies, control power and supplemental utility supplies.
   b) All fuses and circuit breakers within the unit and on power supply to unit are in good condition and properly sized.
   c) Reset of thermal overload(s) on the fan motors. The reset button is part of the motor starter(s) typically located in the main electrical panel. Verify that an overload condition or ambient temperature above motor nameplate is not causing recurring tripping of the overload device.
   d) All disconnect switches and circuit breakers within the unit are on the power supplied to the unit when power is switched on.
   e) All “field wired” and/or “provided and wired in the field” controls are properly installed and compatible with unit equipment and controls. DDC controls may require jumpers between terminals or providing a proper control signal to operate system components. See Carnes electrical diagram.
6) After balancing the ductwork and control system served by the unit--including any unit fan speed changes made with the variable pitch sheaves provided--verify acceptable wheel brush adjustment, wheel start following shutdown and fan motor currents.

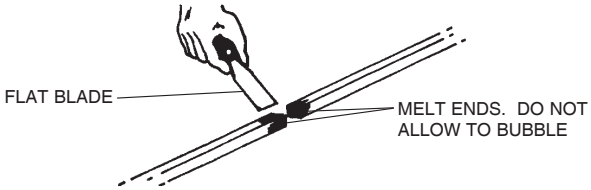
MAINTENANCE and TROUBLESHOOTING

1) Inspect filter conditions quarterly and replace with equivalent panel filters.
2) ***The wheel reduction drive is a permanently sealed unit and requires no maintenance.***
3) Inspect and, if necessary, adjust the fan belt tension as discussed under Start-Up and Operation. If the belts are frayed, slip after tension adjustment or require frequent adjustment to maintain tension, replace with equivalent belts. After years of operation (particularly if belt tension has not been properly maintained) the contact surfaces of the drive or driven sheaves may exhibit “cutting” from the belts wear. If this happens, replace the sheave(s) with equivalent unit.
4) The very “stretchy” urethane wheel drive belt should ***not*** require belt tension adjustment. If cracks appear or belt breakage occurs, it may be repaired or replaced by the following fusing procedure:
   a) *Tools Required* -
      1. Razor blade (or sharp knife).
      2. Propane torch or spade-tipped soldering gun.
      3. Flat blade tool (such as putty knife).
   b) *Preparation* -
      1. Route the belt so the closed loop will be properly located with no twists.

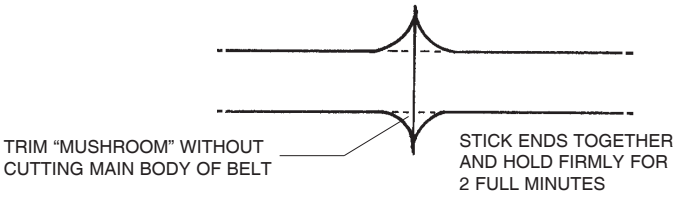
2. Arrange the belt so it is not under tension while welding. The finished belt should stretch 6-8 percent [about 7/8" (22mm) per foot] beyond its relaxed length when in operation. Note the relaxed length of a new rotor belt is nearly tight to the outer rim of the rotor itself.
3. Cut both ends of the belt squarely using the razor blade.
4. Weld the belt in an open or ventilated area to minimize inhalation of the fumes.

c) *Welding -*

1. Heat the putty knife or flat tool to approximately 300°F (149°C). **DO NOT OVER HEAT**. Hold both ends of the belt against the tool until belt material starts to flow out of the point. The urethane belt melts at 200°F (93°C).



2. Remove the tool and immediately push the belt ends together. The softened material should flow slightly out of the joint, but do not squeeze all of the melted material out. Hold together for 3 minutes. If the material bubbles, it is too hot and will not maintain the bond. Re-trim and re-weld at a lower temperature.
3. Allow the belt to cool for a minimum of 30 minutes prior to installing, tensioning or straining the belt weld.



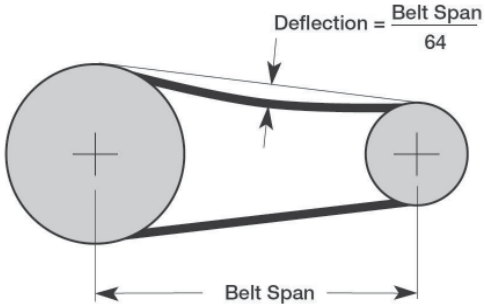
d) *Verify that -*

1. Wheel face is free of dirt and debris.
2. Access doors and seals close tightly. All access panels are secured tightly and sealed.

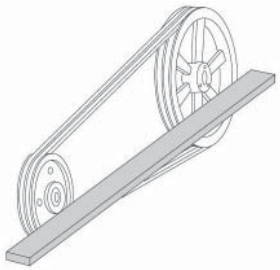
5) Fan belt maintenance:

a) Fan belts must be checked on a regular basis for wear, tension, alignment and dirt accumulation.

b) Both loose and tight belts can cause fan vibration and fan failure. The proper tension for belt setting is the lowest tension at which the belt will not slip under peak load. For initial tensioning, set the belt deflection at moderate thumb pressure to 1/64-inch for each inch of belt span. Check the tension twice in teh first 24 hours and periodically after that.



c) When replacing belts do not pry belts on or off the sheave. Loosen belt tension until belts can be removed easily. On multiple groove drives, all belts should be replaced at the same time to provide uniform drive loading. Do not install new blets on worn sheaves. Replace the worn sheaves with new ones before new belts are installed.



d) Check fan and motor shafts for parallel and angular alignment. Make sure motor and fan sheaves are aligned properly and if needed use a straight edge to align the sheaves properly.

6) If trouble occurs and the energy recovery ventilator operation is suspected, check the following items as well -

a) Confirm that all interlocks (i e., motor starter, auxiliary contacts or damper motor end switches) are operating.

b) Confirm that all field-provided safety devices (i.e., fire stat, freeze stat or smoke detector) are operating.

c) Verify that all fuses, circuit breakers, switches and motor starter overloads within and serving the unit, are in running condition.

d) Verify that all dampers and linkages operate properly.

e) Measure static pressures to and from the unit and verify agreement with original operation and values for which the unit was designed.

ROTOR REMOVAL PROCEDURE

Under normal operating conditions the rotor should never have to be removed unless for replacement of rotor or rotor bearings.

1) Step #1 (see photo below)
   a) Make sure power to the unit is turned off before servicing.
   b) On the supply side of the wheel, remove the middle side plate on the recovery wheel frame.
   c) Suppport under the rotor with a piece of wood or equivalent.
2) Step #2 (see photo below)
   a) On the exhaust side of the wheel remove the shaft mounting Allen bolts from both sides of the wheel.

Step #1

Step #2

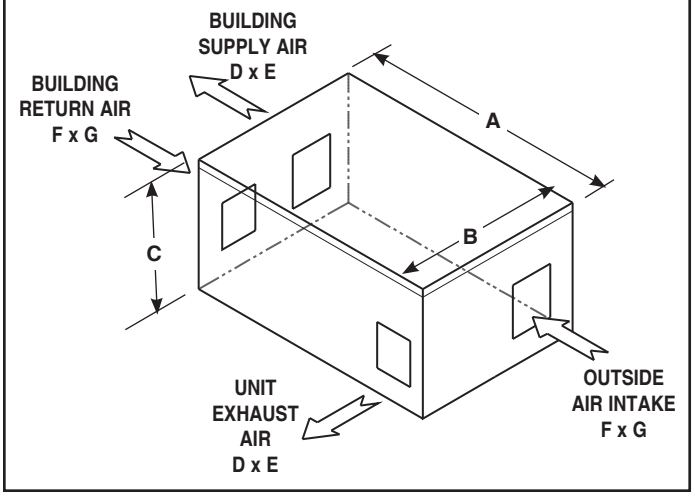
3) Step #3 (see photo below)
   a) Roll wheel a few inches out of the frame on the exhaust side. The motor should not get in the way but if needed remove the wheel motor from the frame.
   b) Remove the snap ring from one side of the rotor shaft as seen below.
   c) Remove the shaft from the rotor.
   d) Roll the rotor out the supply side of the frame.

Step #3

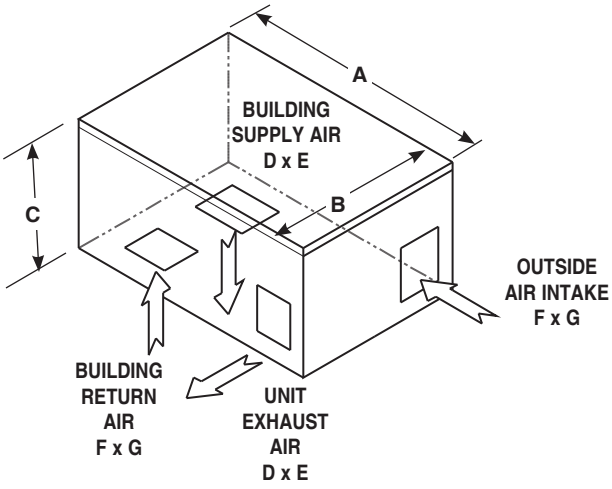
DIMENSIONS and WEIGHTS

SIZE	DIMENSIONS LISTED IN INCHES (In Millimeters)									HOOD LENGTH		WGT
	A	B	C	D	E	F	G	H	J	INTAKE	EXH.	Lbs. (Kg.)
01	49	32	32	7-1/8	8-1/2	8	10	8	10	12-1/2	14-1/4	350
02	58	46	38	9-3/8	10-1/2	14	14	14	14	18-1/4	18-1/4	525
03	70	54	49	12-1/2	13-3/4	18	18	18	18	21	20-/14	775
04	72	54	55-1/2	18	18	18	18	18	24	28-1/2	20-1/4	1400
06	80	72	67-1/2	24	20	24	20	22	26	34-/12	24-3/4	1900
08	87-1/2	78	72-1/2	24	24	24	24	28	34	34-1/2	24-3/4	2400

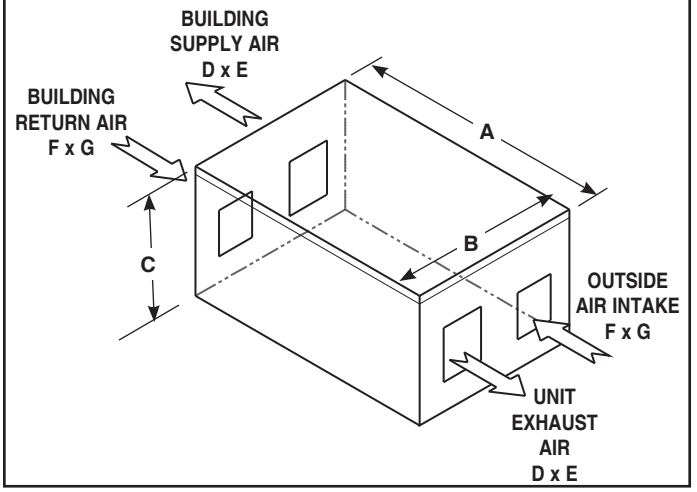
UNIT ARRANGEMENT # 1



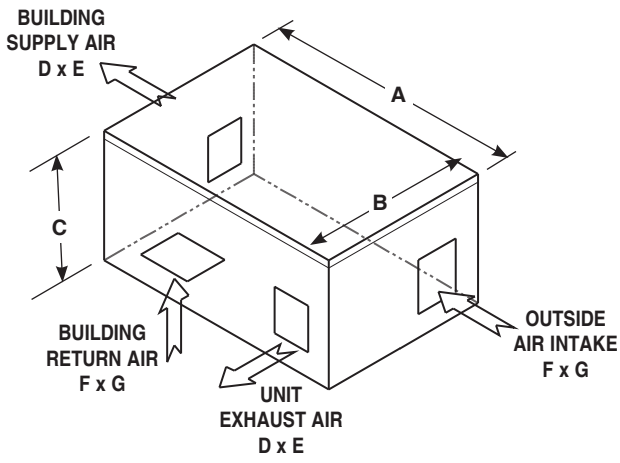
UNIT ARRANGEMENT # 2



UNIT ARRANGEMENT # 6



UNIT ARRANGEMENT # 7



SERVICE ACCESS

Allow sufficient clearance on sides of unit for filter maintenance and service access.

SIZE	Supply Side Service Clearance	Exhaust
01	32 Inches (813mm)	30 In.
02	46 Inches (1168mm)	32 In.
03	54 Inches (1372mm)	42 In.
04	54 Inches (1372mm)	42 In.
06	72 Inches (1829mm)	42 In.
08	78 Inches (1981mm)	42 In.

EXHAUST FAN ONLY DEFROST

1) Operation
   a) When frost forms on the wheel media (normally at an outside air temperature less than 0°F), the wheel supply leaving air temperature leaving the wheel will typically drop from the predicted supply air temperature as shown on the wheel submittal performance (typically 45°F to 55°F) to a temperature approaching freezing. The supply air thermostat will then trigger a defrost cycle, shutting off the supply fan for a length of time determined by the setting of the “OFF” knob of the timing relay, while the energy recovery wheel and exhaust fan continue to operate. This time should be long enough to allow the warm exhaust air to defrost the wheel media, but as short as possible to avoid creating a significant negative pressure within the building. The building should have pressure relief dampers or other means to prevent excessive negative pressure. Carnes recommends an initial “OFF” time of 30 to 60 seconds, with adjustments made from observed performance. The “ON” knob setting prevents the defrost cycle from being initiated again for the length of the setting. Carnes recommends the maximum setting of 10 minutes to minimize start-stop cycles for the supply fan.
2) Checkout and setting
   a) Turn main unit disconnect off. Turn supply fan and exhaust fan disconnects off.
   b) Locate supply air thermostat in supply fan compartment.

   c) Set supply air thermostat set point to the maximum temperature setting, which must be above ambient temperature. Adjust the timing relay “ON” knob clockwise to the maximum setting, then increase to approximately the 2nd or 3rd mark from minimum. The settings should look like this.

   d) Turn main unit disconnect on, and if required, enable unit to operate.
   e) The energy recovery wheel should start to operate, and the exhaust fan motor starter should pull the contactor in. Time the interval until the supply fan motor contactor pulls in. This time should be 30 to 60 seconds. Shut the unit off, adjust the “OFF” knob appropriately, and continue trying until the “OFF” cycle time is between 30 to 60 seconds.
   f) Initiate the defrost cycle, wait for the “OFF” cycle to end, then time the “ON” cycle until the “OFF” cycle initiates again. This should be approximately 10 minutes.
   g) Turn the unit off. Reset the fan disconnects. Set the supply air thermostat set point to approximately 36°F (2.2°C). Restore power to the unit.

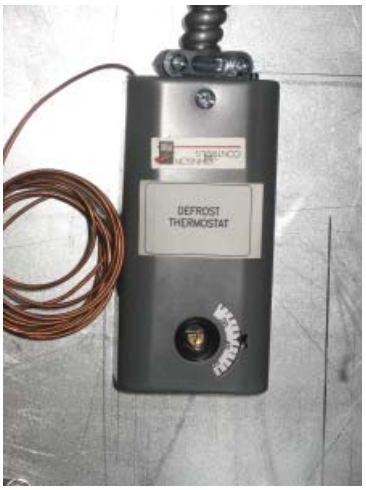
VARIABLE SPEED WHEEL DEFROST

1) Operation
   a) When frost forms on the wheel media, the supply air temperature leaving the wheel will drop from the predicted supply air temperature as shown on the wheel submittal performance (typically 45°F to 55°F) to a temperature approaching freezing. The defrost thermostat will then trigger a defrost cycle, slowing the energy recovery wheel to approximately 25% of full speed for a length of time determined by the setting of the "OFF" knob of the timing relay while the supply fan and exhaust fan continue to operate. This will reduce the energy recovery effectiveness, reduce the supply air temperature and allow a warmer exhaust air temperature to exit the wheel, thus defrosting the wheel media. Defrost cycle time should be long enough to allow the warm exhaust air to defrost the wheel media, but short as possible to minimize the amount of colder supply air entering the building. The recommended initial Defrost Cycle time is 30 to 60 seconds, with adjustments made as desired from observed operating performance.

      The "ON" knob setting prevents the defrost cycle from being initiated again for the length of the time setting. Carnes recommends the maximum setting of 10 minutes to minimize the amount of time the recovery effectiveness is reduced.
2) Checkout and setting

   The adjustments for this unit were set and checked before shipment. To check for proper operation:

   a) Turn main unit disconnect off. Manually trip off the supply fan and exhaust fan overloads so that the fans do not operate. Locate the defrost thermostat in the supply fan compartment. Locate the defrost thermostate in the supply fan compartment.



   b) Set defrost air thermostat set point to a setting below ambient temperature.
   c) If necessary, adjust the timing relay "ON" knob clockwise to the maximum setting (10 minutes). Adjust the timing relay "OFF" knob counter-clockwise to the minimum setting, then increase to approximately the 2nd or 3rd mark from minimum. The settings should look as follows:

1. For models WEHC01, -02, -03: Ensure that the wheel speed control knob is set to 25% on the 0-100% dial.

2. On models WEHC04, -06, -08: check that when the energy recovery wheel is operating normally, the speed readout on the VFD display is 100 Hz. When the defrost cycle is activated, the speed readout should be 25 Hz. If speed changes are required, consult the VFD manual.

d) Turn the units main disconnect on and, if required, enable the time clock for the unit to operate. The energy recovery wheel should start to operate at a normal speed of approximately 15 to 20 RPM.
e) Initiate the defrost cycle by adjusting the Defrost Thermostat to a setting well above ambient temperature.
f) After a short delay, the wheel speed should slow down to approximately 3 to 4 RPM for 30 seconds to 1 minute to allow the wheel to defrost.
g) The wheel should then return to its normal speed of 15 to 20 RPM for approximately 10 minutes.
h) The wheel should slow down for another defrost cycle of 30 seconds to 1 minute.
i) Shut the unit off. If modifications to the operating cycle are desired, adjust the timing and wheel speed settings. Then restart the unit and check that the operating cycle works as desired.
j) **When the wheel speed and defrost cycle time settings are as desired, turn the unit off. Reset the fan overloads. Set the Supply Air Defrost Thermostat set point to approximately 32°F (0°C) to 36°F (2.2°C). Restore power ot the unit and check for normal operation**.

ON-OFF FROST CONTROL

1) Operation and settings
   a) When frost forms on the wheel media the outside temperature is typically between -5°F and 5°F. When this occurs the outdoor air thermostat, will trigger a defrost cycle. The defrost cycle will shut down the unit until the air in the intake plenum rises above the outdoor air temperature setting. Carnes recommends setting the outdoor air thermostat to the predicted frost temperature found on the wheel performance submittal, typically between -5°F and 5°F. Outdoor air thermostat is located in the intake compartment.
   b) This is the simplest way to control frost on the energy recovery wheel but it has its drawbacks. The building will go without the fresh air while the frost control is activated until the temperature in the outdoor air stream rises above the thermostat setting. In some cases it is not acceptable to shut down the supply air to the building. The other consideration is that on-off frost control is not the best solution when the unit is located indoors. When the unit shuts off due to the incoming outdoor air below the thermostat setting, the air that is not moving will slowly rise above the thermostat setting because the unit is in a warm indoor environment. The unit will turn back on and when the cold air from outside reaches the thermostat again the unit will shut off. This cycle will cause excessive on-off cycle of the unit and may cause damage to the fan motor.

TEMPERATURE ECONOMIZER

1) Operation and settings
   a) When the outside air falls within a set rancge of temperatures between the high limit and low limit thermostats the energy recovery wheel is shut down while the exhaust and supply fans remain running. This means that no energy is being transferred from the exhaust and supply air stream which allows free cooling of the building to occur. The high limit thermostat is typically set to the return air temperature found on the wheel submittal (~75°F). The low limit thermostat is typically set to 45°F. Both the high and low limit thermostate can be found in the intake plenum.
2) Checkout
   To check for proper operation:
   a) Turn the main unit disconnect off. Set the high limit thermostat to above ambient temperature. Set the low limit thermostat well below ambient temperature.
   b) Turn the main unit disconnect on, run the unit for a few seconds, and then turn the main unit disconnect off. Do no operate the unit with access panesl removed for more than a few seconds or damage to fan motors may occur.
   c) Verify that the energy recovery wheel DID NOT rotate while both the supply and exhaust fan were operating. If so the high limit is working correctly.
   d) Set the high limit thermostat well above ambient temperature.
   e) Set the low limit thermostat above ambient temperature, but below the high limit setting.
   f) Turn the main unit disconnect on, run the unit for a few seconds, and then turn the main unit disconnect off. Do not operate the unit with access panels removed for more than a few seconds or damage to fan motors may occur.
   g) Verify that the energy recovery wheel WAS rotating while both the supply and exhaust fan were operating. If so the low limit is working correctly.
   h) Return the high limit thermostat back to its original setting, typically the return air temperature found on the wheel submittal (~75°F).
   i) Return the low limit thermostat back to its original setting, typically 45°F.
   j) Replace all access panels/close the doors. Turn the unit disconnect on.

ENTHALPY ECONOMIZER

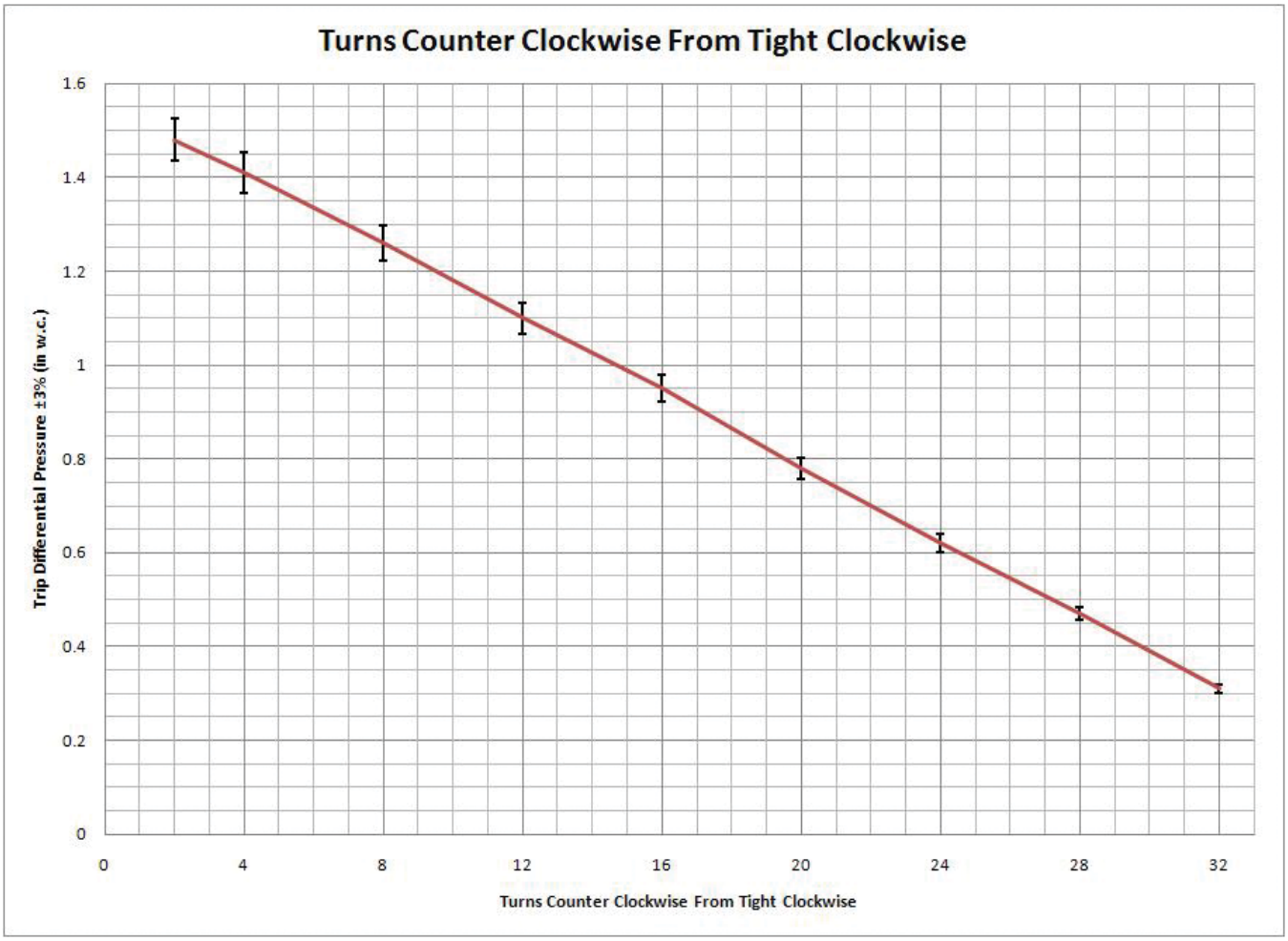
1) Operation
   a) When the outside air falls within a set enthalpy (temp & humidity) band the energy recovery wheel will shut down while the exhaust and supply fans remain running. This means that no energy is being transferred from the exhaust and supply air stream which allows free cooling of the building to occur.
   b) See additional instruction manual included with the unit for settings and operational instructions.

ROTATION DETECTOR

1) Operation and settings
   a) When the energy recovery wheel is rotating the rotation detector will sense the reflection of reflective tape placed at several spots around the wheel. As long as the rotation detector senses a reflection from the rotating wheel within the specified time period it will NOT generate a wheel rotation fail signal. The time period should be adjusted to maximum setting of 90 seconds by turning the pot fully clockwise. The time adjustment pot is located on a small circuit card plugged into the main circuit board.
   b) This device yields strictly an alarm signal (alarm device provided by others) not an interlock of the wheel motor. See additional instructions included with unit for further information.
2) Checkout
   a) To operate properly the lenses on the detector and reflector must be clean. The mounting of the detector and reflector must be properly aligned using the following procedure: Turn the sensitivity control (pot located inside detector) fully clockwise to maximum and align until the red LED indicated glows brightest. Decrease the sensitivity and align for brightest glow at the low sensitivity setting. Upon completion of the alignment securely mount the contorl and increase the sensitivity to maximum.

FILTER SWITCHES

1) Operation and setting
   a) As the filters become clogged with dust and debris over time the differential pressure across the filters will increase. When the pressure difference reaches the set limit on the filter switch the filter switch will trip. The filter switch can either be normally open or normally closed. The switch can be used to turn on or off a signal device provided by others to indicate dirty filters.
   b) To properly calibrate the switch trip pressure a monometer and a “T” tubing setup are needed as described in the Dwyer series 1900 IOM provided with the unit. To adjust the trip pressure, remove the snap cover to expose the adjustment screw at the top of the switch. Below is a graph that can be used to approximate the trip pressure based on the number of counter clockwise turns of the adjustment screw from tight clockwise. THis is not a guaranteed value but may get close to the trip pressure desired. Turn the adjustment screw clockwise until it is tight. Then use the graph below to find the number of counter clockwise turns needed to get the approximate desired trip pressure for dirty filters.



2) Checkout
   a) To properly calibrate the switch trip pressure a monometer and a “T” tubing setup are needed as described in the Dwyer series 1900 IOm provided with the unit.

ADDITIONAL INFORMATION

For more details on the installation or the operation of your unit, contact your dealer. We will be glad to help you.

Carnes
448 S. Main Street
P.O. Box 930040
Verona, WI 53593-0040

Phone: 608/845-6411
Fax: 608/845-6504

PRODUCT INFORMATION

Date of purchase_____

Serial Number _____

Maintenance Sheet (Description of Work Done)	Date

Maintenance Sheet (Description of Work Done)	Date

REPLACEMENT PARTS

Description	Size 01	Size 02	Size 03	Size 04	Size 06	Size 08
AHRI Certified Wheel & Frame	998-2030	998-2031	998-2032	998-2033	998-2034	998-2035
Rotor Replacement Bearing	999-8575	999-8575	999-8575	999-8575	999-8575	999-8575
Intake Damper (Backdraft)	999-6833	999-6834	999-6835	999-6907	999-6908	999-6909
Intake Damper (Motorized) **	999-6833	999-6834	999-6835	999-6889	999-6891	999-6892
Exhaust Damper (Backdraft)	999-6833	999-6834	999-6835	999-6901	999-6813	999-6902
Exhaust Damper (Motorized) **	999-6833	999-6834	999-6835	999-6895	999-6896	999-6897
Damper Motor	999-9295	999-9295	999-9295	999-9341	999-9341	999-9341
Wheel Motor (CS) *	999-8438	999-8438	999-8439	999-0380	999-0380	999-0380
Wheel Motor Sheave (CS) *	999-8277	999-8278	999-8279	999-7803	999-7666	999-7797
Wheel Motor (VS)	SPECIAL	SPECIAL	SPECIAL	SPECIAL	SPECIAL	SPECIAL
Wheel Motor Sheave (VS)	SPECIAL	SPECIAL	SPECIAL	SPECIAL	SPECIAL	SPECIAL
Wheel Drive Belt	391-1851	391-1852	391-1853	391-1854	391-1855	389-2032
Belt Weld Kit	999-8364	999-8364	999-8364	999-8364	999-8364	999-8364
Blower	999-2590	999-2592	999-2598	999-2598	999-2575	999-2576
Blower Isolator (4/Blower)	---	998-6126	998-6126	999-9748	999-9748	999-9748
Wheel Motor Relay	999-2675	999-2675	999-2675	999-2675	999-2675	999-2675
Wire Harness	998-7015	998-7015	998-7015	998-7015	998-7015	998-7015
Main Transformers 208V-277V-380V	999-9280	999-9280	999-9280	999-9275	999-9275	999-9275
230V-460V-575V	999-9279	999-9279	999-9279	999-9274	999-9274	999-9274
120-24VAC Transformer, 75VA	999-9268	999-9268	999-9268	999-9268	999-9268	999-9268
120-24 VAC Transformer, 100VA	999-9265	999-9265	999-9265	999-9265	999-9265	999-9265
Enthalpy Controller	999-7245	999-7248	999-7245	999-7245	999-7245	999-7245
Rotation Detector	999-2896	999-2896	999-2896	999-2896	999-2896	999-2896
Thermostat	999-7422	999-7422	999-7422	999-7422	999-7422	999-7422
Control Relay (Frost Cont.)	999-2647	999-2647	999-2647	999-2647	999-2647	999-2647
Filter Switch	999-7300	999-7300	999-7300	999-7300	999-7300	999-7300
Filter Switch Tube Kit	999-7360	999-7360	999-7360	999-7360	999-7360	999-7360
Wheel Motor Thermal Unit	---	---	---	999-9531	999-9531	999-9531
Air Filter Part Number (Qty)	999-8991 (2)	999-8872 (4)	998-8892 (6)	999-8911 (4)	999-8872 (12)	999-8872 (8)
Air Filter Size (Inches)	12x24x2	16x20x2	14x20x2	24x24x2	16x20x2	16x20x2
Air Filter Part Number (Qty)	---	---	---	---		999-8891 (4)
Air Filter Size (Inches)						16x25x2
Intake Hood Aluminum	999-8863	999-8873	999-8864	999-8864 (2)	999-8881 (3)	999-8873 (6)
Moisture Eliminators	12x12x2	16x20x2	24x24x2	24x24x2	20x25x2	16x20x2

* Size 04, 06, 08 require both wheel motor and motor sheave. All parts prefaced with “W” (ie W998-2030).
** Does not include damper motor.

WE_C & WM_A — FAN DRIVE COMPONENTS

VOLTAGE	HP			CONTACTOR	OVERLOAD		FUSE		MOTOR ODP	MOTOR TEFC	MOTOR HI-EFF ODP	MOTOR HI-EFF TEFC
	PID		FLA			AMP RANGE		AMP				
(A) 115 VOLT, 1 PHASE	L	1/4	5.4	999-2656	999-2606	4-6	999-2719	12	993-1264	993-5255	N/A	N/A
	M	1/3	6.2	999-2656	999-2607	5-8	999-2721	17-1/2	993-1355	993-5351	N/A	N/A
	P	1/2	7.2	999-2656	999-2608	7-11	999-2706	20	993-1362	993-5354	N/A	N/A
	R	3/4	10.8	999-2657	999-2609	9-13	999-2723	25	993-1366	993-5360	N/A	N/A
	S	1	12.8	999-2657	999-2609	9-13	999-2724	30	993-1368	993-5364	N/A	N/A
	T	1-1/2	18	999-2659	999-2614	16-22	999-2724	30	993-1370	993-5367	N/A	N/A
	V	2		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	W	3		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	X	5		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	Y	7-1/2		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	C	10		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
(B) 208 VOLT, 1 PHASE	L	1/4	3	999-2656	999-2605	2.8-4.2	999-2716	8	993-1264	993-5255	N/A	N/A
	M	1/3	3.4	999-2656	999-2605	2.8-4.2	999-2718	10	993-1355	993-5351	N/A	N/A
	P	1/2	3.6	999-2656	999-2605	2.8-4.2	999-2719	12	993-1362	993-5354	N/A	N/A
	R	3/4	5.3	999-2656	999-2607	5-8	999-2720	15	993-1366	993-5360	N/A	N/A
	S	1	6.4	999-2656	999-2607	5-8	999-2721	17-1/2	993-1368	993-1364	N/A	N/A
	T	1-1/2	10.2	999-2656	999-2608	7-11	999-2723	25	993-1370	993-5367	N/A	N/A
	V	2	13.6	999-2657	999-2611	12-18	999-2724	30	993-1371	N/A	N/A	N/A
	W	3		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	X	5		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	Y	7-1/2		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	C	10		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
(C) 208 VOLT, 3 PHASE	L	1/4	1.1	999-2656	999-2602	.95-1.45	999-2709	3	993-1201	993-5201	N/A	N/A
	M	1/3	1.6	999-2656	999-2603	1.4-2.2	999-2713	5	993-1305	993-5303	N/A	N/A
	P	1/2	2.4	999-2656	999-2604	1.7-2.6	999-2714	6	993-1309	993-5307	993-8301	N/A
	R	3/4	3.3	999-2656	999-2605	2.8-4.2	999-2716	8	993-1313	993-5311	993-8302	N/A
	S	1	3.6	999-2656	999-2605	2.8-4.2	999-2718	10	993-1314	993-5313	993-8408	993-9302
	T	1-1/2	5	999-2656	999-2606	4-6	999-2720	15	993-1317	993-5405	993-8409	993-9303
	V	2	6.8	999-2656	999-2607	5-8	999-2721	17-1/2	993-8410	993-5408	993-8410	993-9304
	W	3	8.5	999-2656	999-2608	7-11	999-2722	20	993-8502	993-5504	993-8502	993-9507
	X	5	13.4	999-2657	999-2611	12-18	999-2724	30	993-8504	993-5508	993-8504	993-5508
	Y	7-1/2	24	999-2659	999-2612	21-26	999-2727	45	993-8601	993-5602	993-8601	993-5602
	C	10	28.6	999-2659	999-2613	24-36	999-2729	60	993-8603	993-5605	993-8603	993-5605
(D) 230 VOLT, 1 PHASE	L	1/4	3	999-2656	999-2605	2.8-4.2	999-2716	8	993-1264	993-5255	N/A	N/A
	M	1/3	3.2	999-2656	999-2605	2.8-4.2	999-2716	8	993-1355	993-5351	N/A	N/A
	P	1/2	3.6	999-2656	999-2605	2.8-4.2	999-2718	10	993-1362	993-5354	N/A	N/A
	R	3/4	5.3	999-2656	999-2607	5-8	999-2719	12	993-1366	993-5360	N/A	N/A
	S	1	6.4	999-2656	999-2607	5-8	999-2721	17-1/2	993-1368	993-5364	N/A	N/A
	T	1-1/2	9.2	999-2656	999-2608	7-11	999-2723	25	993-1370	993-5367	N/A	N/A
	V	2	12.3	999-2657	999-2609	9-13	999-2723	25	993-1371	N/A	N/A	N/A
	W	3		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	X	5		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	Y	7-1/2		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	C	10		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A

WE_C & WM_A — FAN DRIVE COMPONENTS

VOLTAGE	HP			CONTACTOR	OVERLOAD		FUSE		MOTOR ODP	MOTOR TEFC	MOTOR HI-EFF ODP	MOTOR HI-EFF TEFC
	PID		FLA			AMP RANGE		AMP				
(E) 230 VOLT, 3 PHASE	L	1/4	1	999-2656	999-2602	.95-1.45	999-2709	3	993-1201	993-5201	N/A	N/A
	M	1/3	1.5	999-2656	999-2603	1.4-2.2	999-2713	5	993-1305	993-5303	N/A	N/A
	P	1/2	2.3	999-2656	999-2604	1.7-2.6	999-2714	6	993-1309	993-5307	993-8301	N/A
	R	3/4	3.2	999-2656	999-2605	2.8-4.2	999-2716	8	993-1313	993-5311	993-8302	N/A
	S	1	3.5	999-2656	999-2605	2.8-4.2	999-2716	8	993-1314	993-5313	993-8408	993-9302
	T	1-1/2	4.8	999-2656	999-2606	4-6	999-2719	12	993-1317	993-5405	993-8409	993-9303
	V	2	6.4	999-2656	999-2607	5-8	999-2720	15	993-8410	993-5408	993-8410	993-9304
	W	3	8.6	999-2656	999-2608	7-11	999-2722	20	993-8502	993-5504	993-8502	993-9507
	X	5	13.4	999-2657	999-2611	12-18	999-2724	30	993-8504	993-5508	993-8504	993-5508
	Y	7-1/2	24	999-2658	999-2612	21-26	999-2727	45	993-8601	993-5602	993-8601	993-5602
	C	10	28.6	999-2659	999-2613	24-36	999-2728	50	993-8603	993-5605	993-8603	993-5605
(G) 460 VOLT, 3 PHASE	L	1/4	0.5	999-2656	999-2601	.64-.96	999-2705	1-8/10	993-1201	993-5201	N/A	N/A
	M	1/3	0.8	999-2656	999-2601	.64-.96	999-2708	2-1/2	993-1305	993-5303	N/A	N/A
	P	1/2	1.2	999-2656	999-2602	.95-1.45	999-2709	3	993-1309	993-5307	993-8301	N/A
	R	3/4	1.7	999-2656	999-2603	1.4-2.2	999-2711	4	993-1313	993-5311	993-8302	N/A
	S	1	1.8	999-2656	999-2603	1.4-2.2	999-2711	4	993-1314	993-5313	993-8408	993-9302
	T	1-1/2	2.4	999-2656	999-2604	1.7-2.6	999-2714	6	993-1317	993-5405	993-8409	993-9303
	V	2	3.2	999-2656	999-2605	2.8-4.2	999-2716	8	993-8410	993-5408	993-8410	993-9304
	W	3	4.3	999-2656	999-2606	4-6	999-2718	10	993-8502	993-5504	993-8502	993-9507
	X	5	6.7	999-2656	999-2607	5-8	999-2721	17-1/2	993-8504	993-5508	993-8504	993-5508
	Y	7-1/2	10.8	999-2657	999-2609	9-13	999-2723	25	993-8601	993-5602	993-8601	993-5602
	C	10	13.2	999-2657	999-2611	12-18	999-2724	30	993-8603	993-5605	993-8603	993-5605
(H) 600 VOLT, 3 PHASE	L	1/4		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A
	M	1/3	0.6	999-2656	999-2601	.64-.96	999-2706	2	N/A	993-5305	N/A	N/A
	P	1/2	0.9	999-2656	999-2601	.64-.96	999-2708	2-1/2	993-1310	993-5308	N/A	N/A
	R	3/4	1.2	999-2656	999-2602	.95-1.45	999-2709	3	993-1312	993-5312	N/A	N/A
	S	1	1.4	999-2656	999-2602	.95-1.45	999-2709	3	993-1405	993-5403	SPECIAL	993-5403
	T	1-1/2	1.8	999-2656	999-2604	1.7-2.6	999-2713	5	993-1409	993-5406	SPECIAL	993-5406
	V	2	2.4	999-2656	999-2604	1.7-2.6	999-2714	6	993-1410	993-5409	SPECIAL	993-5409
	W	3	3.3	999-2656	999-2605	2.8-4.2	999-2716	8	993-1504	993-5505	SPECIAL	993-5505
	X	5	5	999-2656	999-2606	4-6	999-2720	15	993-1506	993-5509	993-1506	993-5509
	Y	7-1/2	7.7	999-2656	999-2608	7-11	999-2722	20	993-1602	993-5603	SPECIAL	993-5603
	C	10	9.5	999-2657	999-2609	9-13	999-2723	25	993-1606	993-5606	993-1606	993-5606

START-UP PROCEDURE

☐ **VERIFY THAT ALL PLACEMENT AND INSTALLATION TASKS HAVE BEEN COMPLETED, INCLUDING THE REMOVAL OF ALL AIRFLOW OPENING DAMPER SHIPMENT COVERS.**

☐ **INSTALL FILTERS OBSERVING THE AIRFLOW DISCHARGE ARROWS.**

☐ **VERIFY TENSION ON FAN BELT IS PROPER. THE BELTS SHOULD BE TIGHT ENOUGH NOT TO "SQUEAL" AUDIBLY ON START-UP.**

☐ **CHECK UNIT ELECTRICAL DIAGRAM FOR SETTINGS ON OPTIONAL THERMOSTATS, TIMERS AND MOTOR CONTROLS THAT ARE INCLUDED.**

☐ **VERIFY FAN ROTATION. REMOVE ACCESS PANELS TO VIEW THIS PROCEDURE. THIS MAY ALSO BE ACCOMPLISHED BY LOOKING THROUGH THE EXHAUST DISCHARGE DAMPER.**

☐ **DO NOT OBSERVE RUN INSPECTIONS WITH THE ACCESS PANEL REMOVED FOR MORE THAN 2 MINUTES. FORWARD-CURVED FANS WILL OVERLOAD SEVERELY IF OPERATED WITHOUT ALL ACCESS PANELS IN PLACE. IF LONGER THAN 2 MINUTES, TRIPPING MOTOR STARTER, THERMAL OVERLOADS AND/OR DAMAGE TO THE MOTOR COULD OCCUR.**

☐ **IF YOU ARE UNABLE TO START THE UNIT, CHECK FOR:**

- ☐ Proper electrical power supplies, control power and supplemental utility supplies.
- ☐ Reset the thermal overload(s) on the fan motors.
- ☐ All disconnect switch(es) within the unit are on the power supplied to the unit when power is switched on.
- ☐ All "Field Wired" and/or "Provided" controls are properly installed, compatible with unit equipment and controls, and set to the proper settings for unit operation.

CAUTION: ***Avoid operating the fans for extended periods unless the wheel is also operating. During rotation the wheel is self-cleaning, but when stopped, debris can increase the static pressure drop across the wheel, and can result in damage to the wheel surface whenever wheel rotation is resumed.***