



LANDMARK KITS AND ACCESSORIES

P28A-47LDW

January 8, 2010

50(R/P)2847xM/H ENERGY RECOVERY SYSTEM

INSTALLATION INSTRUCTIONS FOR ENERGY RECOVERY SYSTEMS USED WITH LANDMARK 090-150 UNITS

Patent# 5,548,970



Energy recovery COMPONENT certified to the AHRI Air-to-Air Energy Recovery Ventilation Equipment Certification Program in accordance with AHRI Standard 1060-2000. Actual performance in packaged equipment may vary.



ETL Certified per UL 1995 and CSA 22.2

SHIPPING AND PACKING LIST

Package 1 of 1 contains: **See Illustration 1 and 2.**

- 1 - Energy Recovery System Assembly
- 1 - Outdoor Fresh Air Hood with Filter
- 1 - Outdoor Exhaust Air Hood with Barometric Damper
- 1 - ERS Support Rail
- 1 - -Balancing Damper Assembly (**Fixed Only**)
- 1 - Hardware Bag:
 - 14' - Gasket $\frac{3}{4}$ " x $1\frac{1}{4}$ "
 - 7' - Gasket $\frac{1}{8}$ " x $\frac{1}{2}$ "
 - 1 - Field Harness
 - 1 - Jumper Harness
 - 4 - Wire Ties
 - 6 - Mounting Screw(s) #14-16 x $\frac{3}{4}$ "
 - 15 - Self-Tapping Screw(s) 10-16 x $\frac{1}{2}$ "
 - 8 - Gold Screw(s) 10-16 x $\frac{1}{2}$ "
 - 1 - Installation Instruction
 - 2 - Wiring Stickers

PRINCIPLE OF OPERATION

The ERS enthalpy wheel contains parallel layers of a polymeric material that are impregnated with silica gel (desiccant). The wheel is located in the entering (intake) air and exhaust air streams of the ventilation equipment. As the wheel rotates through each air stream, the wheel surface adsorbs sensible and latent energy. In the heating mode, the wheel rotates to provide a constant transfer of heat from the exhaust air stream to the colder intake air stream. During the cooling season, the process is reversed. **For pivoting applications** the wheel pivots out of the air stream to allow economizer to operate normally for "free cooling" when outdoor temperature and humidity is acceptable. During economizer operation, the ERS exhaust blower continues to run, providing power exhaust for the system. The intake blower is de-energized during economizer operation.

! WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer or service agency.

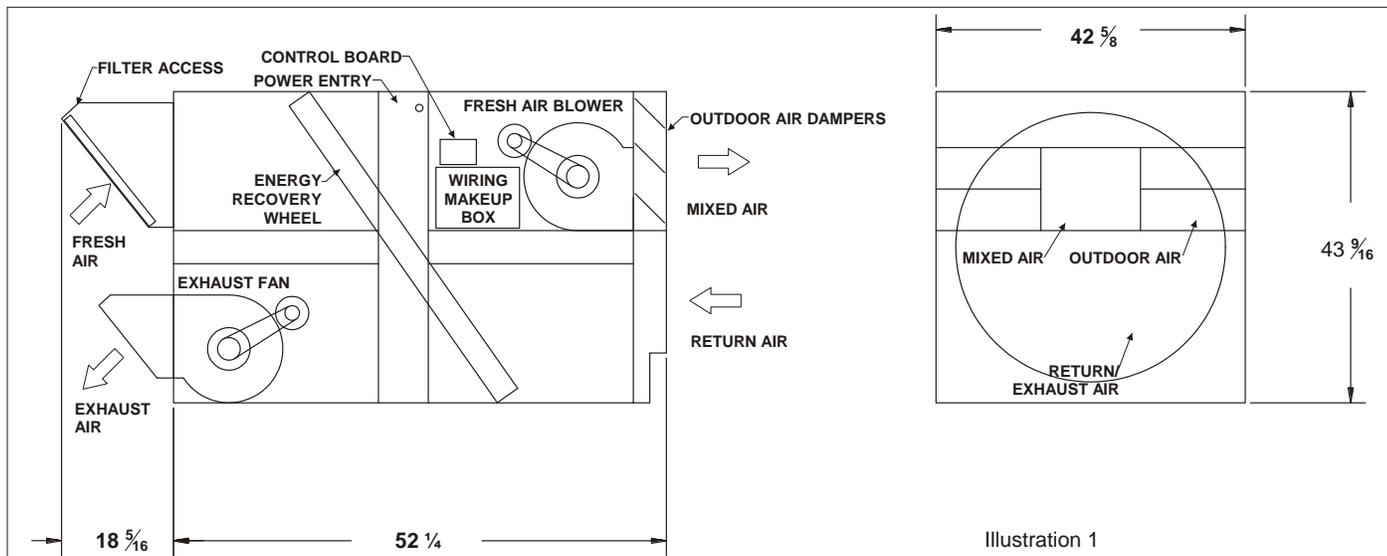


Illustration 1

CAUTION



Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

GENERAL

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

REQUIREMENTS

When installed, the unit must be electrically wired and grounded in accordance with local codes or, in the absence of local codes, with the current National Electric Code, ANSI/NFPA No. 70.

SHIPPING DAMAGE

Check unit for shipping damage. Receiving party should contact last carrier immediately if shipping damage is found.

RIGGING UNIT FOR LIFTING

1. Maximum weight of unit is — 800 Lbs (crated).
2. Remove crating and retrieve hardware bag that is inside of ERS.
3. All ERS door panels must be in place for rigging.
4. Use straps to lift unit.

ROOFTOP UNIT PREPARATION

1. Disconnect all power to rooftop unit.
2. Open rooftop unit filter access door. If installing pivoting wheel verify and/or install modulating economizer.
3. Remove the rooftop unit return air access panels. Also remove any hoods and/or power exhaust equipment. Discard hoods, power exhaust equipment, and horizontal return air panels. **See Figure 1.**
4. Drill $\frac{7}{8}$ " hole in divider panel. **See Figures 2 and 3.**

If installing fixed wheel skip to step 8

5. The economizer may use an A7 enthalpy sensor located on the divider panel between the economizer outdoor air and return air dampers. If present, the sensor must be moved to the intake air section of the ERS. Disconnect sensor A7 wires from logic module, remove screws securing the sensor, and retain sensor assembly and screws. **See Figure 4.**
6. Install the provided ERS field harness between J4 and P3 by plugging P27 into J4, plugging J27 into P4 harness by routing through $\frac{7}{8}$ " hole drilled in **Step 4.**
7. Plug purple and blue wires from ERS field harness into logic module at SO+ (purple) and SO (blue)

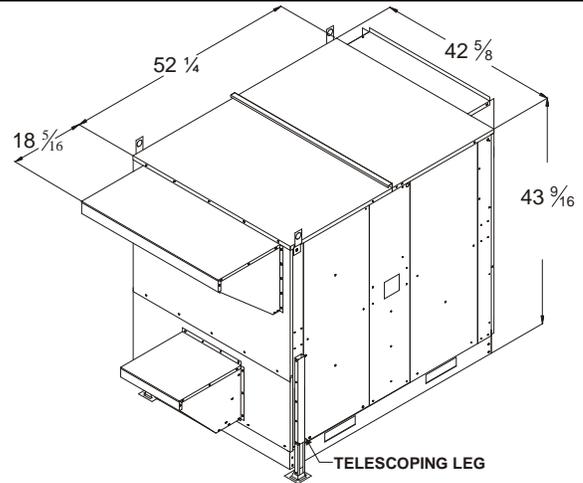


Illustration 2



Figure 1



Figure 2

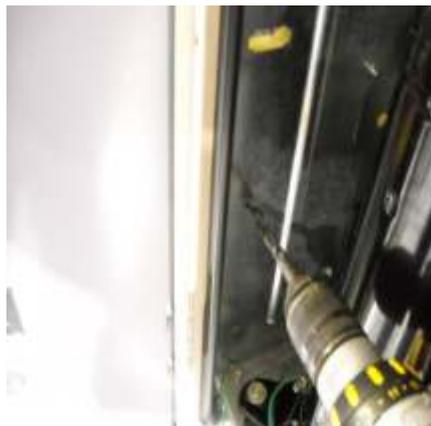


Figure 3

If installing pivoting wheel skip to step 9

8. Install balancing damper in return air section. Loosen top of RTU by removing screws around return end of RTU. Remove screws from bottom of corner panel and pull out until the damper will slide in over duct opening. Once damper is installed replace all panels and screw in place. Put balancing damper in place with the damper blade at the bottom. Balancing damper mounts in place of the economizer as shown in **Figure 5**. Loosen nut on linkage to set blades to 50% open and retighten nut.
9. Plug field harness P27 into economizer plug J4. **See page 9** for field wiring.
10. Using wire ties neatly route the wires to clear any moving parts.
11. Route the 6-pin (pivoting) / 3-pin (fixed) connector P153 and wiring harness under the economizer and out the return air. Coil excess wire and route into return air of the rooftop unit. **See Figure 6**.
12. Apply $\frac{3}{4}$ " x $1\frac{1}{4}$ " gasket to top and bottom decks of ERS as shown in the figure. **See Figure 7**.
13. Attach bottom filler panel with platform support rail to bottom opening of rooftop unit aligning with screw holes used by removed door panel. Secure in place as shown in **Figure 8**.
14. Remove all screws holding the top panel of rooftop unit around the horizontal exhaust air opening. Ensure that the top and upper most return air opening panel will move upward at least 2".

INSTALL ENERGY RECOVERY SYSTEM

1. Lift ERS at least three feet (3'). Remove four screws holding telescoping leg to guide and pull out leg. Reinsert the leg from the bottom with the flat foot under the unit and reinsert one of the screws to hold leg into place. The leg will need to be adjusted later when unit is in position.
2. Position ERS in front of horizontal exhaust air opening. Line up the ERS to the rooftop unit. Ensure that there are not any screws on the rooftop unit that will interfere with the mounting flanges of the ERS and if so remove them.

Note: *Equipment support kit or equivalent should be used under feet of standoff legs to prevent roof penetration.*

3. Lower ERS onto ERS support rail catching the front edge of the ERS bottom into the ERS support rail. Tuck the top flange of the ERS under the top of the rooftop unit. Slide the ERS so that it is tight against the side and flush against filter access corner post of rooftop unit. Secure with the existing rooftop unit screws and the provided 10-16 x $\frac{1}{2}$ " self-tapping screws.
4. Remove the screws placed in the telescoping legs and adjust the legs on the ERS until it is level. Then replace all four screws in each leg to secure the ERS in the leveled position. **See Figure 9**.
5. Use provided 10-16 x $\frac{1}{2}$ " self-tapping screws to secure the side mounting flanges of the ERS to the rooftop unit. Also, secure the back panel of ERS to rooftop unit through the inside of ERS with provided 10-16 x $\frac{1}{2}$ " self tapping screws. **See Figure 10**.



Figure 4



Figure 5

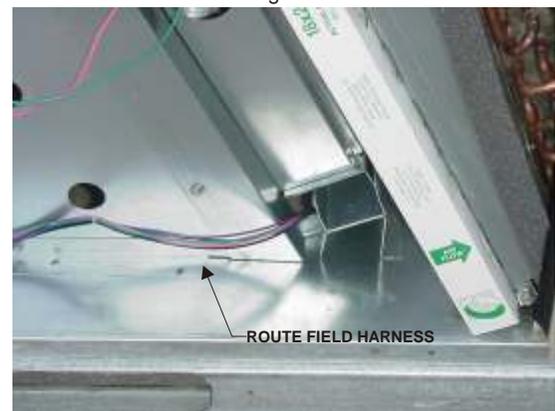


Figure 6



Figure 7

6. Check and seal, if necessary, along the edges where the ERS meets the rooftop unit to ensure there is no air leakage. Final assembly should resemble **Figure 11**.
7. Remove the control access panel and locate the 6-pin (pivoting) / 3-pin (fixed) connector P153 wiring harness that was previously routed into the return air of the rooftop unit. Plug the harness connector P153 into the connector J153 located at the bottom of the access door inside the ERS. **See Figure 12**.

If installing fixed wheel skip to step 12

8. Locate the A7 enthalpy control sensor (if removed earlier from the rooftop unit.) **See Figure 2**.
 9. Installations using an A7 enthalpy sensor - Remove the screws to the filter access panel of the fresh air hood on the ERS and remove the air filter. Reinstall the A7 enthalpy control sensor with retained screws removed on the bottom panel of the fresh air intake hood. **See Figure 13**.
 10. If the A7 enthalpy sensor was retained, locate the blue and purple wire harness on the top deck. Remove the intake air access panel and route blue and purple harness to the A7 enthalpy sensor harness and connect purple to SO+ and blue to SO. Secure excess wiring. **See Figure 14** and **Page 9** for field wiring diagram.
 11. All electrical connections must conform to any local codes and the current National Electric Codes (NEC) and Canadian Electric Code (CEC). Refer closely to wiring diagram in unit and/or in these instructions for proper connections. Refer to the unit nameplate for the minimum circuit ampacity and maximum over current protection size. Electrical data is listed on unit rating plate and motor nameplates.
 12. Connect line voltage power to ERS unit from ERS field provided or rooftop unit disconnect switch(disconnect must be properly sized). Then connect line voltage from disconnect switch through ERS knockout on middle post to control box per the wiring diagram. **See Figure 15** and **16**.
 13. Ground unit with a suitable ground connection either through unit supply wiring or earth ground.
- Note: Unit voltage entries must be sealed weather tight after wiring is complete.**
14. Replace access panels onto the ERS unit and secure.

**ROOFTOP UNIT WIRING
(See Field Wiring Diagram)**

1. Open access panel to rooftop unit controls.
2. The minimum damper blade position must be adjusted on the economizer control board to the correct amount of outside air specified by the customer. Refer to Lennox rooftop unit manual for setting.
3. Close access panels on the rooftop unit and secure.
4. Restore power to unit.
5. Once ERS is working properly, caulk any open joints, holes, or seams to make the units completely air and water tight.
6. Leave this instruction manual with owner or in an envelope to be kept near unit.

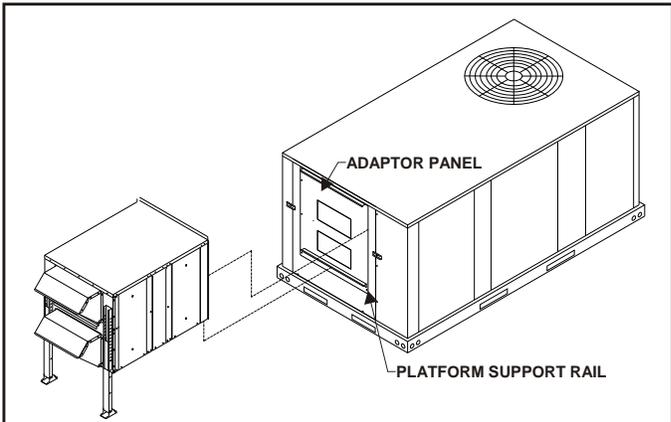


Figure 8



Figure 9



Figure 10

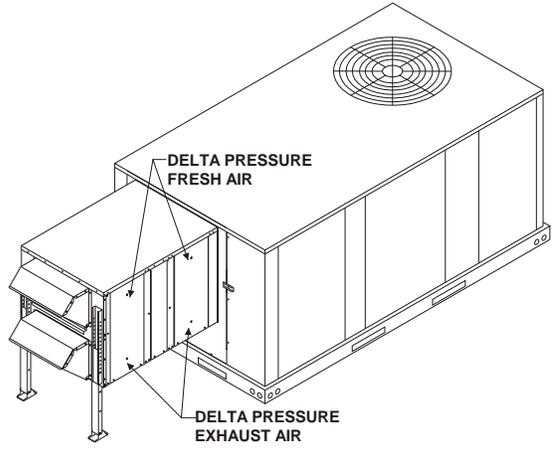


Figure 11

OPTIONAL KITS (Factory Installed)

Motorized Intake Air Damper

Damper mounts behind the outdoor air intake hood. It opens when the ERS is energized and closes when de-energized. Powered by B30 damper motor.

Pressure Sensor

Measurement device on the ERS to determine airflow across the Enthalpy Wheel.

Low Ambient Control Kit (S26)

Prevents frost formation on energy wheel heat transfer surfaces by terminating the intake blower operation when discharge air temperature falls below a field selectable temperature setting. Intake blower operation resumes operation after temperature rises above the adjustable temperature differential.

The frost threshold is the outdoor temperature at which frost will begin to form on the ERS wheel. For energy recovery ventilators, the frost threshold is typically below 10°F. Frost threshold is dependent on indoor temperature and humidity. The table shows how the frost threshold temperatures vary depending on indoor conditions.

FROST THRESHOLD TEMPERATURE	
INDOOR RH AT 70°F	FROST THRESHOLD TEMPERATURE
20%	0°F
30%	5°F
40%	10°F

Because Energy Recovery Systems have a low frost threshold, frost control options are not necessary in many climates. Where outdoor temperatures may drop below the frost threshold during the ERS operational hours, exhaust only frost control option is available.

Stop-Start-Jog (Fixed only)

Control option that allows intermittent operation of the enthalpy wheel during mild outdoor conditions to provide cycling and cleaning of the wheel.

ECONOMIZER SETTINGS (Pivoting Only)

Refer to economizer instructions for minimum air flow requirement. The damper end switch setting on the internal economizer damper assembly is field adjustable to any position above minimum air flow for fresh air requirements at the customers specified conditions.

BLOWER SPEED ADJUSTMENT

Blower speed selection is accomplished by adjusting the motor sheave on both fresh air and exhaust air blowers. All blowers are factory set in closed position for maximum airflow. To determine air flow setting, external static pressure readings will need to be read across the ERS. **Reference Table 1.** For location to take pressure readings. **See Figure 11.**

OPERATION

Recovery Wheel Mode

On a thermostat call for blower operation in heating, cooling or continuous blower, the ERS media will rotate between fresh air and exhaust air streams. Both the fresh air blower and exhaust air blower will be operating.



Figure 12



Figure 13



Figure 14



Figure 15

Economizer/Power Exhaust Mode (Pivoting Only)

On the activation of the economizer mode (closure of EH and EH1 of logic module), the ERS unit will shutdown for approximately 60 seconds to allow the ERS media to pivot out of the air stream. After this delay timer has been satisfied, the exhaust air blower will operate. The ERS unit will act as a power exhaust unit.

This mode will continue until economizer has been deactivated. The exhaust air blower will shut down and the delay timer will be activated. During this time period the ERS media will pivot back into the air stream. When timing is complete the unit will operate in the Recovery Wheel Mode.

Then if economizer continues to close the ERS will shutdown when the "N" terminal is deactivated, thus allowing rooftop unit to run in night set back mode.

SYSTEM CHECK

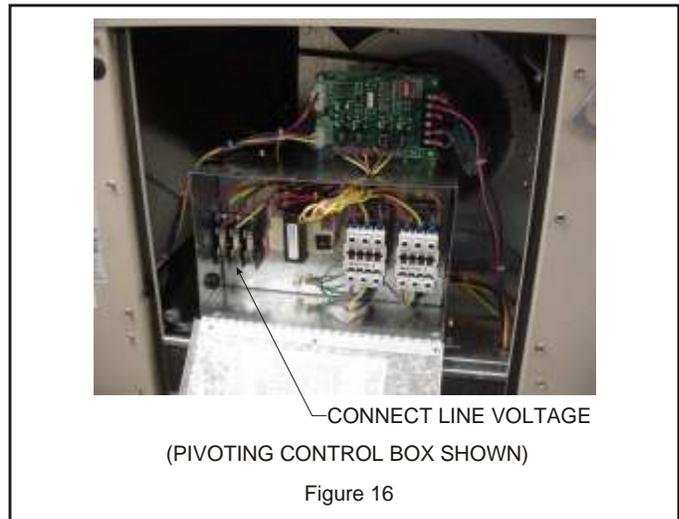
1. Disconnect ERS main power.

Note: If Low ambient kit S26 is used the jumper between TB37-5 and TB37-6 should be removed. Also if system check out is being conducted at low ambient temperatures, jumper low ambient switch.

2. Open rooftop unit blower access panel and locate TB1. Jumper terminals 6 (24v) and 3 (G) to energize rooftop unit blower. Refer to manufacturers instructions when an electronic thermostat or other energy management system is used.

If installing fixed wheel skip to step 6

3. Remove ERS control access panel and install jumper at low voltage terminal strip between TB37-1 and TB37-2.
4. Restore power to ERS unit. The recovery wheel will pivot out of the air stream, fresh air dampers will open, and after a delay, the exhaust blower will operate.
5. Remove jumper from ERS control board TB37-1 and TB37-2. The recovery wheel will pivot into the air stream, the fresh air dampers will close, and after a delay, the fresh air blower and exhaust air blower will operate.
6. Verify that the ERS (3) three phase blower motors are phased sequentially ensuring correct rotation and operation.
 - a. Disconnect power.
 - b. Reverse any two field power leads to the ERS.
 - c. Reapply power.
7. Disconnect main power to unit before making adjustment to economizer and/or ERS unit.
8. Remove all jumpers and replace ERS control access cover.
9. Set thermostat to normal operating position.
10. Restore power to unit.



MAINTENANCE

Motor Maintenance

All motors use prelubricated sealed bearings; no further lubrication is necessary.

Mechanical Inspection

Make visual inspection of dampers, linkage assemblies and ERS rotating bearings during routine maintenance. Filters should be checked periodically and cleaned when necessary. Filter is located in fresh air hoods. **DO NOT** replace permanent filters with throwaway type filters.

Belt Alignment

Proper alignment is essential to maintain long V-Belt life. Belt alignment should be checked every time belt maintenance is performed, each time the belt is replaced, and whenever sheaves are removed or installed.

Belt Installation

Always move the drive unit forward so the belt can be easily slipped into the groove without forcing them. Never force the belt into a sheave with a screw driver or wedge. You will damage the fabric and break the cords. It is recommended that the pulley center distances be offset by $\frac{3}{4}$ " for proper length. This will allow the motor assembly to slide forward to remove belt and backward for belt tension.

Belt Tension

Measure the span length (center distance between pulleys when belt is snug). Mark center of span, then apply a force (6 to 9 Lbs on new belts) perpendicular to the span large enough to deflect the belt $\frac{1}{64}$ " for every inch in span length.

Energy Wheel Maintenance

Eight pie-shaped ERS segments, are seated on stops between the segment retainer which pivots on the wheel rim and secured to the hub and rim of wheel. Annual inspection of the self cleaning wheel is recommended. With power disconnected, remove ERS access panels (rear) and unplug [J150 and P150] (**Refer to wiring diagrams in this instruction manual**). Remove segment and wash with water and/or mild detergent.

To install wheel segments follow steps A through E. **See Figure 17.** Reverse procedure for segment removal.

- A. Unlock two segment retainers (one on each side of the selected segment opening).
- B. With the embedded stiffener facing the motor side, insert the nose of the segment between the hub plates.
- C. Holding segment by the two outer corners, press the segment towards the center of the wheel and inwards against the spoke flanges. If hand pressure does not fully seat the segment, insert the flat tip of a screw driver between the wheel rim and outer corners of the segment and apply downward force while guiding the segment into place.
- D. Close and latch each segment retainer under segment retaining catch.
- E. Slowly rotate the wheel 180°. Install the second segment opposite the first for counterbalance. Rotate the two installed segment 90° to balance the wheel while the third segment is installed. Rotate the wheel 180° again to install the fourth segment. Repeat this sequence with the remaining four segments.

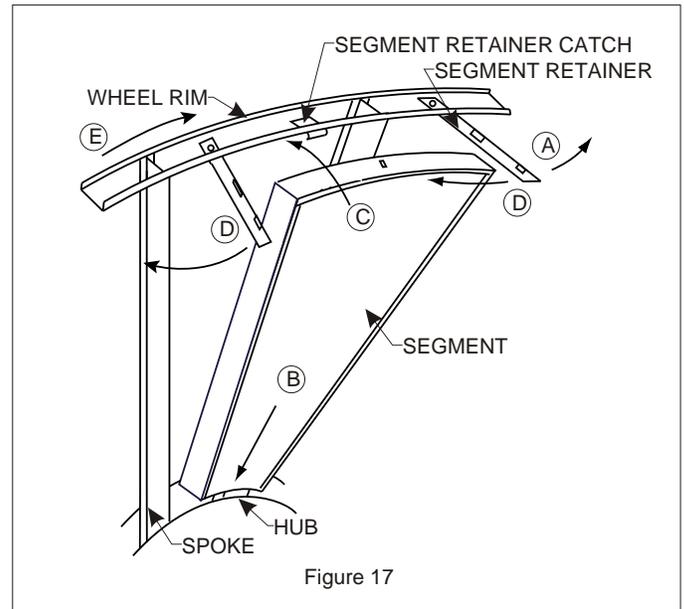
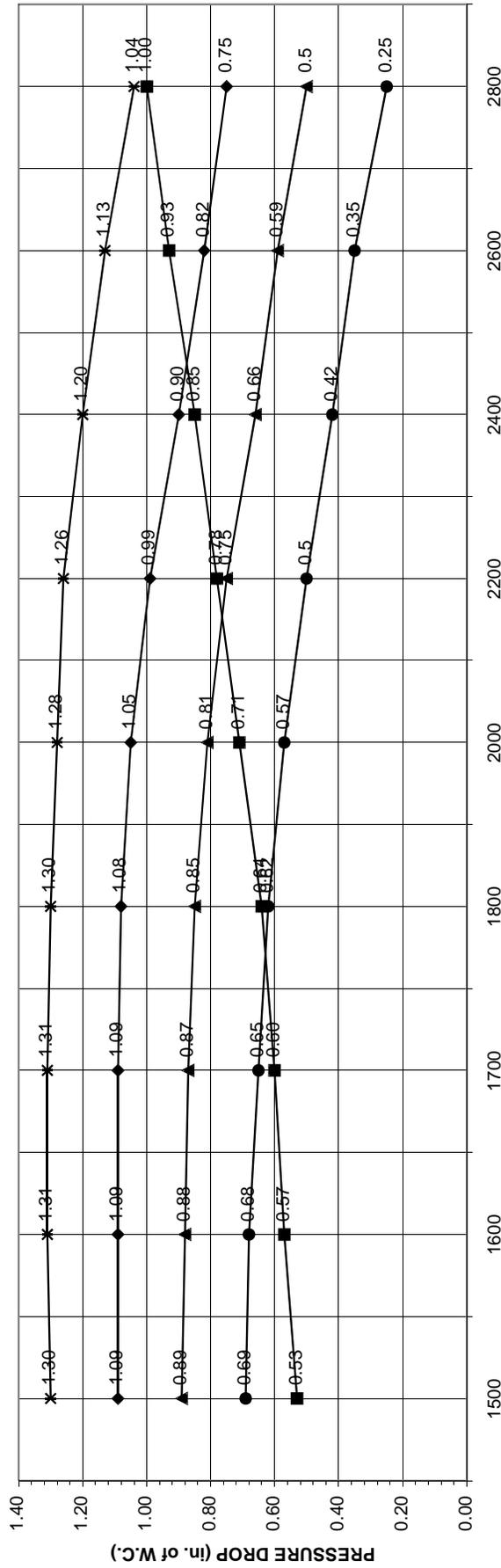


Figure 17

50(R/P)2847xM/H* Series

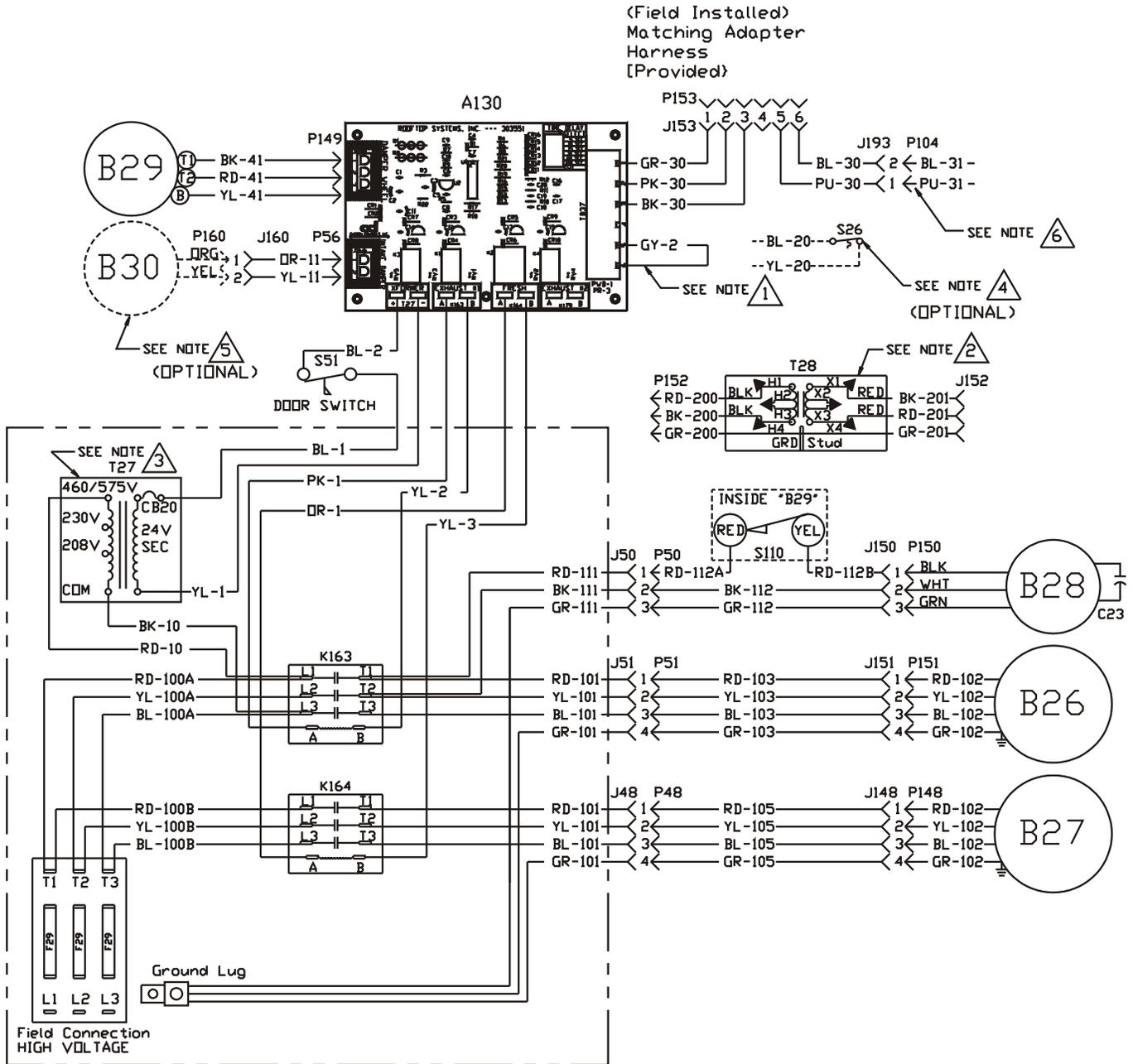
ENERGY RECOVERY SYSTEMS

SCFM vs. PRESSURE DROP



Equation fl ine: S CFM=(PD+0.01)/0.00036
TABLE#1

ERS UNIT WIRING DIAGRAM



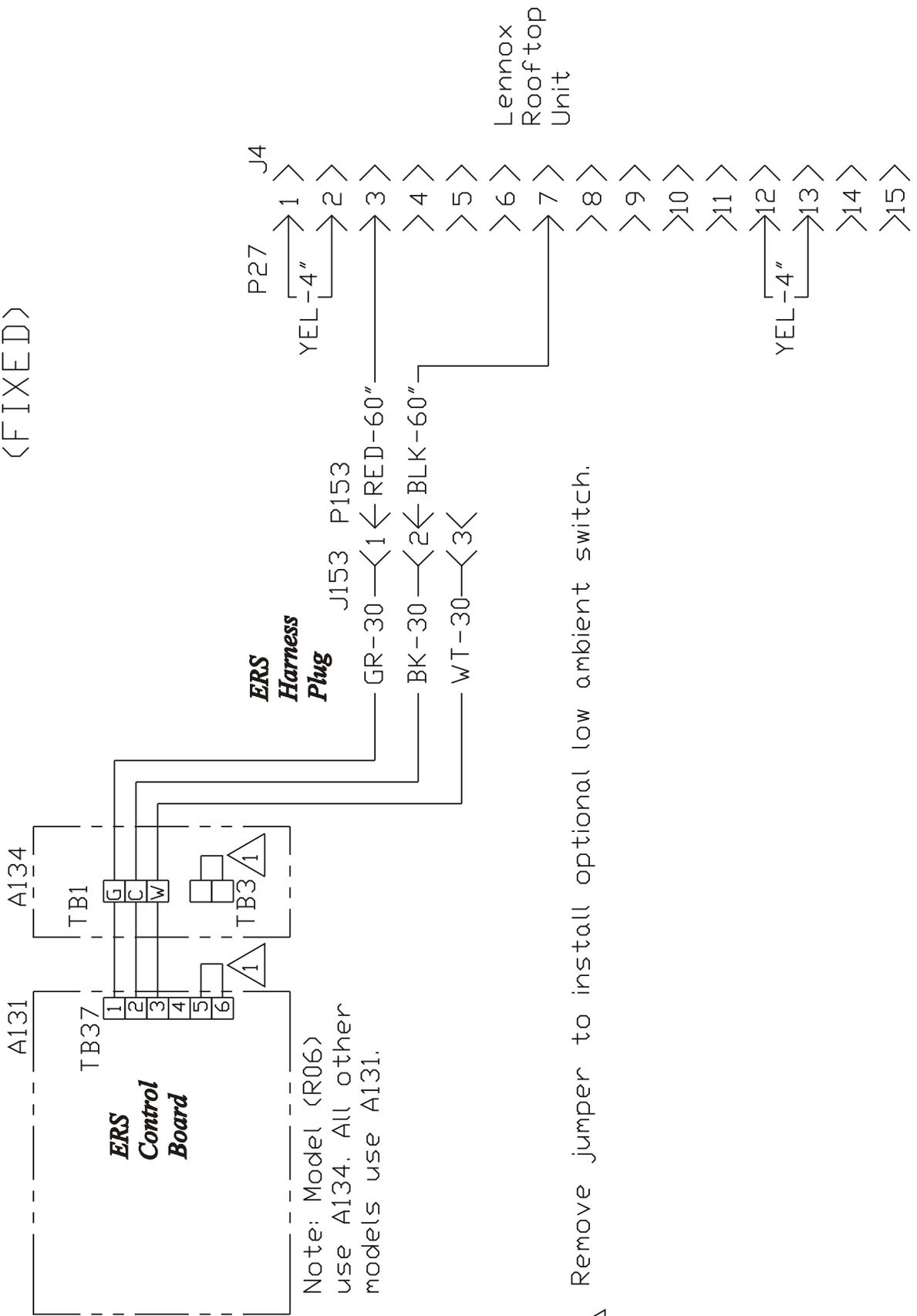
Notes:

1. Remove jumper to install field optional low ambient switch.
2. Step-down transformer assembly for 460/575 volt units (only) connect between J50 and P50.
3. Move wire for different input voltage.
4. Optional low ambient switch.
5. Optional motorized intake damper.
6. Reposition enthalpy control into intake hood of ERS from rooftop unit.

Desiccant Wheel for Rooftop Unit 208-230/460V/575V (3 PH)
Unit#: 01-P28-01XX-23/-33/-43

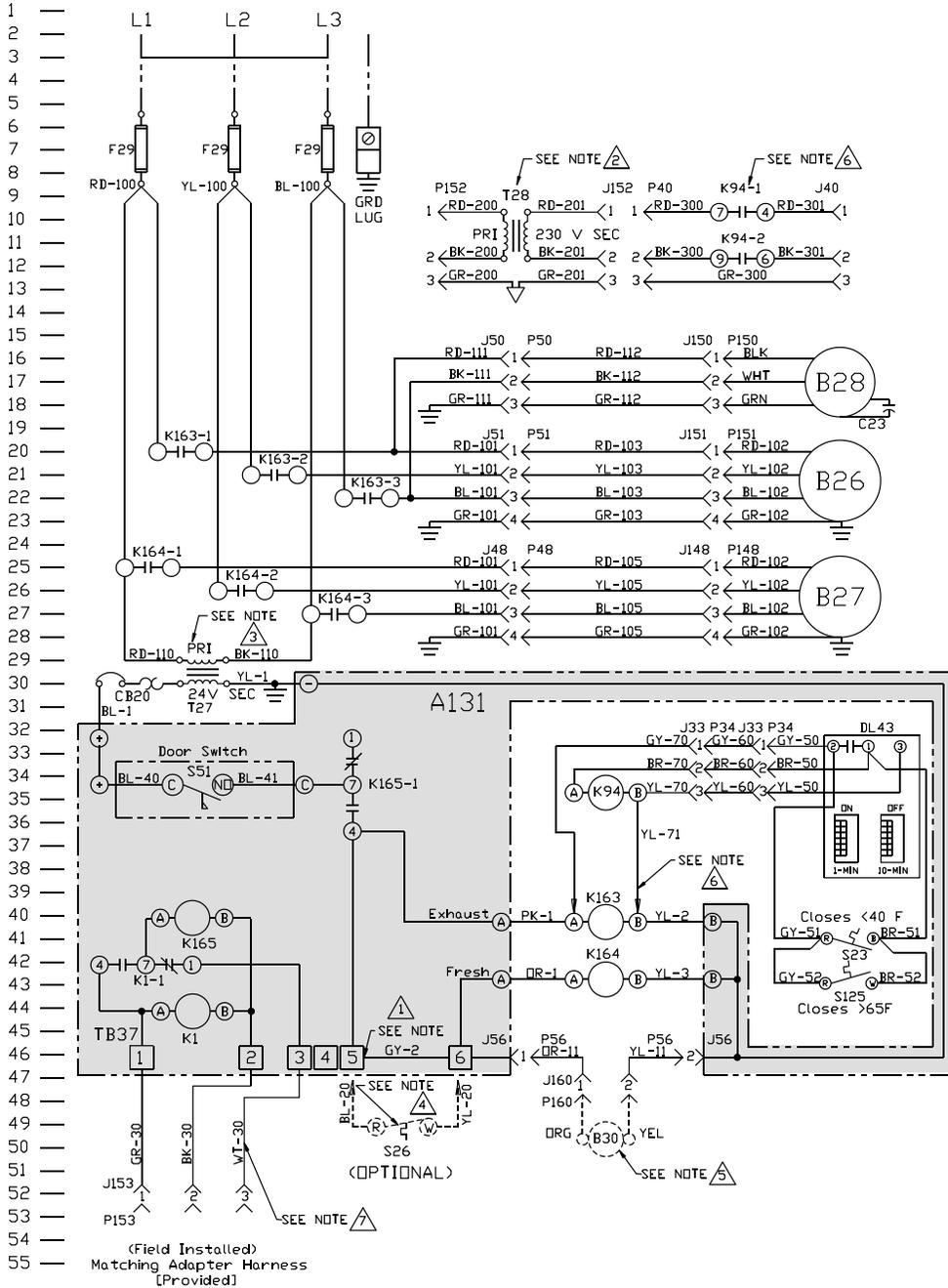
Field Wiring Harness

LANDMARK
<FIXED>



ERS UNIT SCHEMATIC DIAGRAM

POWER SUPPLY
208/230-3-60
460-3-60
575-3-60



COMPONENT CODE	
A131	Fixed Relay Board
B26	Motor, Exhaust Air
B27	Motor, Fresh Air
B28	Motor, Desiccant Wheel
B30	Motor, Damper (Optional)
C23	Capacitor, Wheel Motor
DL43	Delay, Cycle Timer (Optional)
F29	Fuse
J33	Jack, Cycle Control (Optional)
J34	Jack, Cycle Control Harness (Optional)
J40	Jack, Cycle (Optional)
J48	Jack, Control Box (Fresh Air)
J50	Jack, Control Box (Wheel)
J51	Jack, Control Box (Exhaust Air)
J56	Jack, Control Box (Damper)
J148	Jack, Fresh Air Motor Harness
J150	Jack, Wheel Motor Harness
J151	Jack, Exhaust Air Motor Harness
J152	Jack, Transformer (High Voltage)
J153	Jack, Field Harness
J160	Jack, Damper Motor Harness
K94	Relay, On/Off (Optional)
K163	Contactors, Exhaust Air Motor
K164	Contactors, Fresh Air Motor
P33	Plug, Cycle Control (Optional)
P34	Plug, Cycle Control Harness (Optional)
P40	Plug, Wheel Cycle (Optional)
P48	Plug, Fresh Air Motor Harness
P50	Plug, Wheel Motor Harness
P51	Plug, Exhaust Air Motor Harness
P56	Plug, Damper Motor Harness
P148	Plug, Fresh Air Motor
P150	Plug, Wheel Motor
P151	Plug, Exhaust Air Motor
P152	Plug, Transformer (High Voltage)
P153	Plug, Field Harness
P160	Plug, Damper Motor
S23	Thermostat - Low Ambient (Optional)
S26	Switch, Low Ambient (Optional)
S51	Switch, Door
S125	Switch, Ambient Override (Optional)
T27	Transformer, Control
T28	Transformer, Step-down (Optional)

WIRE COLOR	
BK	Black
BL	Blue
GR	Green
GY	Gray
OR	Orange
PK	Pink
RD	Red
WH	White
YL	Yellow

- Notes:
- Remove jumper to install field optional low ambient switch.
 - Step-down transformer assembly for 460 volt units.
 - Selective voltage terminal for proper unit voltage
 - Optional low ambient switch.
 - Optional motorized intake damper.
 - Optional stop, start and jog control.
 - Matching adapter harness (provided) to connect with rooftop unit. For energy management systems connect +24v to green and common 24v to black.

Lennox Model No.	Req'd Curb Height	CFM Range	Voltage	Phase
50P2847xM23	24"	1500-2200	208-230	3
50P2847xM33	24"	1500-2200	460	3
50P2847xM43	24"	1500-2200	575	3
50P2847xH23	24"	2200-2800	208-230	3
50P2847xH33	24"	2200-2800	460	3
50P2847xH43	24"	2200-2800	575	3
50R2847xM23	24"	1500-2200	208-230	3
50R2847xM33	24"	1500-2200	460	3
50R2847xM43	24"	1500-2200	575	3
50R2847xH23	24"	2200-2800	208-230	3
50R2847xH33	24"	2200-2800	460	3
50R2847xH43	24"	2200-2800	575	3

START UP INFORMATION SHEET

VOLTAGE - ERS UNIT

Incoming Voltage L1-L2 _____ L1-L3 _____ L2-L3 _____
Running Voltage L1-L2 _____ L 1-L3 _____ L2-L3 _____
Secondary Voltage _____ C (black) to G (green) Volts* _____
C (black) to W (white) Volts* _____

* With thermostat calling.

AMPERAGE - ERS MOTORS

Intake Motor: Nominal HP _____ Rated Amps _____ Running Amps _____
Exhaust Motor: Nominal HP _____ Rated Amps _____ Running Amps _____
Wheel Motor: Nominal HP _____ Rated Amps _____ Running Amps _____

AIRFLOW

Intake Design CFM _____ Pressure Drop _____ Calculated CFM _____
Exhaust Design CFM _____ Pressure Drop _____ Calculated CFM _____
Amb. db Temp _____ Return Air db Temp* _____ Tempered Air db Temp* _____
Amb. wb Temp _____ Return Air wb Temp* _____ Tempered Air wbTemp* _____

* Measure after 15 minutes of run time

INSTALLATION CHECK LIST

Model # _____ Serial # _____
Owner _____ Owner Phone # _____
Owner Address _____
Installing Contractor _____ Start Up Mechanic _____

- Inspect the unit for transit damage and report any damage on the carrier's freight bill.
- Check model number to insure it matches the job requirements.
- Install field accessories and unit adapter panels as required. Follow accessory and unit installation manuals.
- Verify field wiring, including the wiring to any accessories.
- Check all multi-tap transformers, to insure they are set to the proper incoming voltage.
- Verify correct belt tension, as well as the belt/pulley alignment. Tighten if needed.
- Prior to energizing the unit, inspect all the electrical connections.
- Power the unit. Bump the motor contactor to check rotation. Three phase motors are synchronized at the factory. If blower motor fans are running backwards, de-energize power to the unit, then swap two of the three incoming electrical lines to obtain proper phasing. Re-check.
- Perform all start up procedures outlined in the installation manual shipped with the unit.
- Fill in the Start Up Information as outlined on the opposite side of this sheet.
- Provide owner with information packet. Explain the thermostat and unit operation.