



LANDMARK KITS AND ACCESSORIES

P28A-48LDW

January 6, 2010

50(R/P)2848xM/H ENERGY RECOVERY SYSTEM

INSTALLATION INSTRUCTIONS FOR ENERGY RECOVERY SYSTEMS USED WITH LANDMARK 156-300 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 Wheel Assembly
- 1 - Intake Air Hood with Filter
- 1 - Exhaust Hood with Barometric Damper
- 1 - ERS Support Rail
- 2 - Door Filler Panels
- 1 - Top Filler Panel
- 1 - Balancing Damper Assembly (**Fixed Only**)
- 1 - LD Shield (**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 Wire Harness
 - 4 - Wire Ties
 - 10- Self-tapping Screw(s) #10-16 x $\frac{1}{2}$ "
 - 8 - Gold Screw(s) #10-16 x $\frac{1}{2}$ "
 - 5 - Mounting Screw(s) #14-16 x $\frac{3}{4}$ "
 - 1 - Installation Instruction
 - 2 - Wiring Sticker(s)

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.

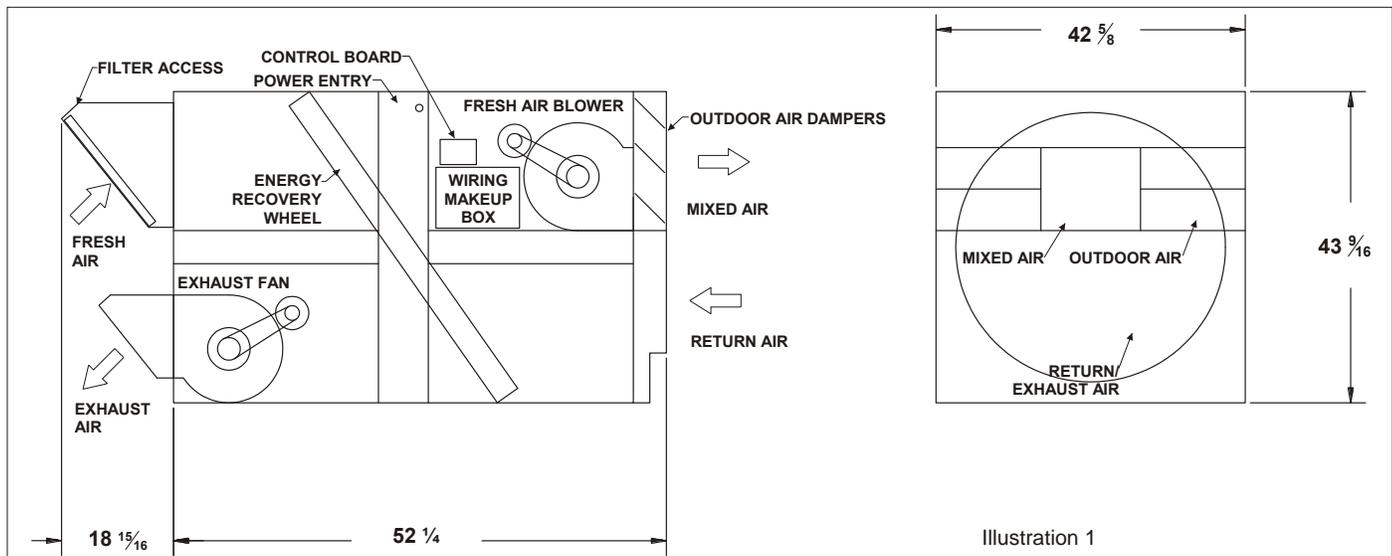


Illustration 1

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 — 1000 Lbs.
2. Remove crating and retrieve hardware bag that is attached to back of control box inside ERS. Also retrieve ERS support rail, (2) door filler panels and top filler panel.
3. All ERS door panels must be in place for rigging.
4. Lifting lugs are supplied with the unit. Loosen machine bolts and rotate lifting lug. Retighten bolt before lifting.

ROOFTOP UNIT PREPARATION

Note: The ERS unit is equipped with a support block that must be removed to allow the unit to change operating modes. This block may cause damage to system if not removed. See Figure 14.

1. Disconnect all power to rooftop unit.
2. Open filter access door. If installing a pivoting wheel verify and/or install an internal modulating economizer. See Figure 1.
3. Remove the rooftop unit horizontal supply air and return air access panels. Also remove any hoods and/or power exhaust equipment. Discard hoods, power exhaust equipment, and horizontal supply and return air access panels. See Figure 1.

If installing fixed wheel skip to step 8

4. The economizer may use an A7 enthalpy sensor located on the division 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 2.
5. Disconnect plug P4 from connector J4. See Figure 3.

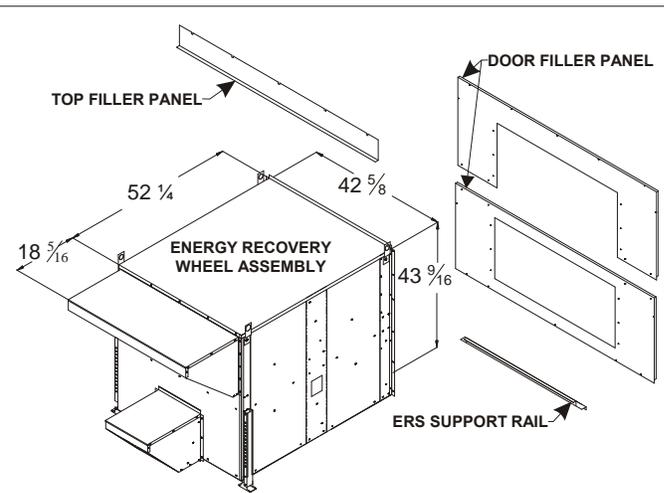


Illustration 2

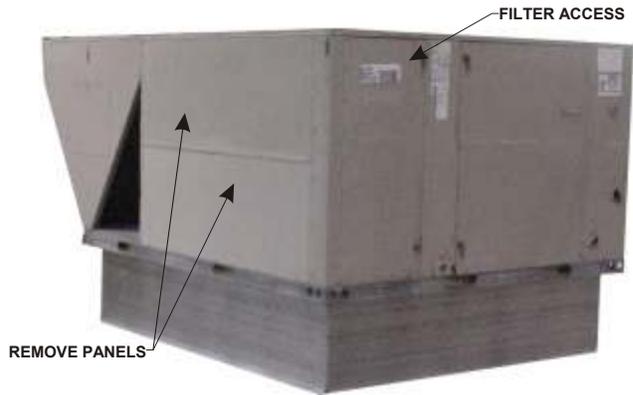


Figure 1

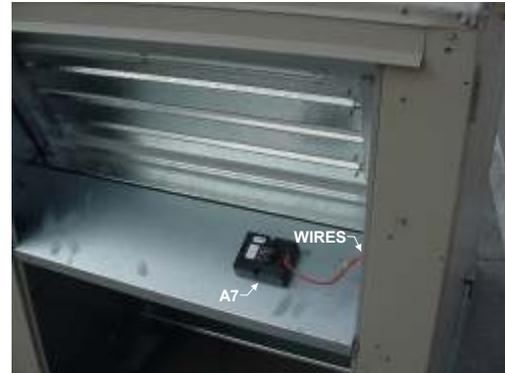


Figure 2

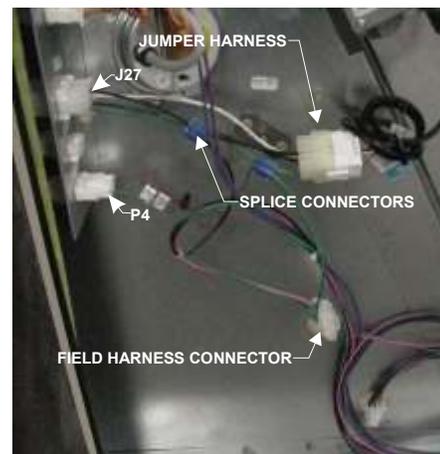


Figure 3

6. Install the provided ERS field harness between J4 and P4 by plugging P27 into J4, plugging J27 into P4 harness. **See Figure 3.**
7. Plug purple and blue wires from ERS field harness into logic module at SO+ (purple) and SO (blue)

If installing pivoting wheel skip to step 9

8. Slide in balancing damper on economizer rails. Put balancing damper in place with the damper blade at the bottom. Balancing damper mounts in place of the economizer shown in **Figure 5**. Loosen wing nut on adjustable quadrant, rotate arm to set blades to 50% open and retighten wing nut. **See Figure 5.**
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. Install door filler panels (provided) with panel having rectangular hole at the bottom and panel with "U" shaped opening at the top. **See Figure 8.**
14. Position ERS support rail with notched flange pointing away from rooftop unit. Center ERS support rail by using the center hole in the base of rail and aligning it with the center hole in the base pan of the return opening. Use (5) of the 14-16 x $\frac{3}{4}$ " screws provided to secure rail to base of unit. Apply $\frac{3}{4}$ " x $1\frac{1}{4}$ " gasket along face of the ERS support rail. **See Figure 9.**

INSTALL ENERGY RECOVERY SYSTEM

1. Lift and move ERS unit into position in front of horizontal exhaust air opening. **See Figure 12.**
2. Using lifting lugs, raise ERS unit approximately three (3') feet. Remove nut and bolt assembly to slide telescoping part of leg out of guide from the top and reinsert into bottom of guide having attached flat foot under unit. Do not fasten tightly, adjustment will need to be made when ERS is put into position on unit. **See Figure 10.**

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

3. Lower ERS into ERS support rail catching the front edge of the ERS bottom into the $\frac{1}{2}$ " flange. Slide the ERS so that it is tight against the door filler panel.
4. With the ERS in place, adjust the telescoping legs to level and support ERS against rooftop unit. Tighten securely. Rotate lifting lug to original position and tighten machine bolts.
5. Secure ERS to RTU with provided 10-16 x $\frac{1}{2}$ " gold screws through ERS side flanges to door filler panels installed earlier. **See Figure 12.**

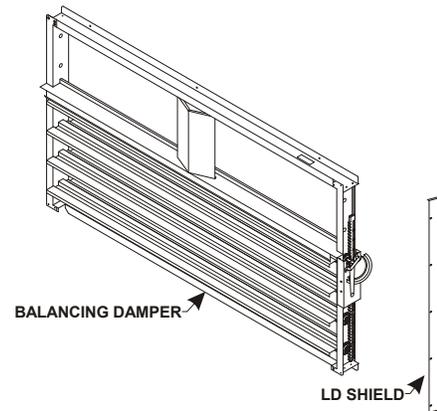


Figure 4



Figure 5

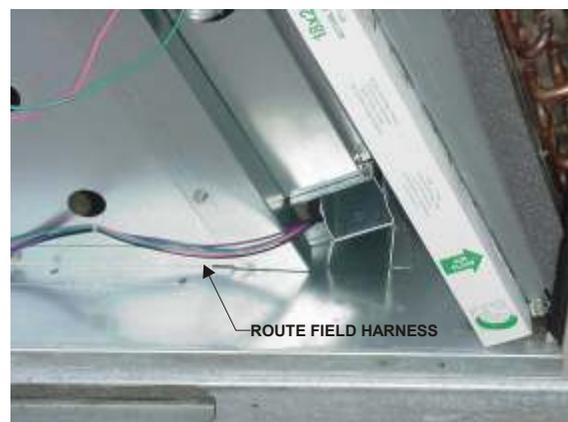


Figure 6

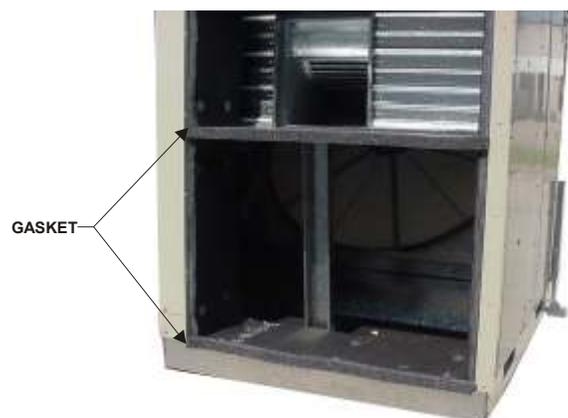


Figure 7

6. Insert remaining top filler panel with the notches upward under the top of the RTU to cover the top flange of ERS. **See Figure 13.**
7. 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 14.**
8. 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.

If installing fixed wheel skip to step 13

9. Locate the A7 enthalpy control sensor (if removed earlier from the rooftop unit.) **See Figure 2.**
10. 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 15.**
11. 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 P104 to J193. Secure excess wiring. **See Page 9** for field wiring diagram.
12. Remove ERS support block to allow wheel rotation when unit is placed in operation. **See Figure 16.**
13. 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.
14. Connect line voltage power to ERS unit from rooftop unit disconnect switch through the knock out near the exhaust air hood. Connect the line voltage to the ERS control box per the wiring diagram. **See Figure 17.**
15. 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.

16. 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.

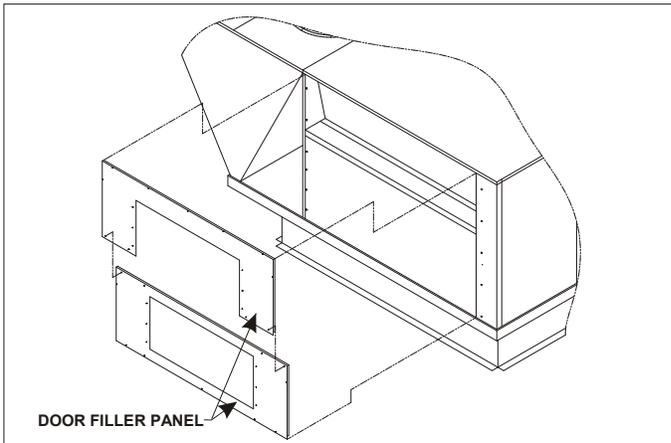


Figure 8

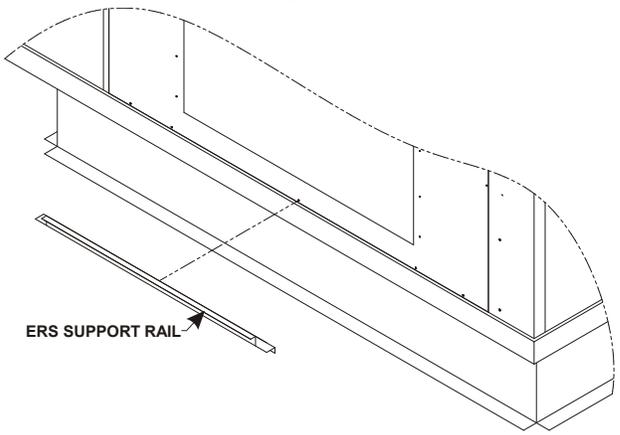


Figure 9

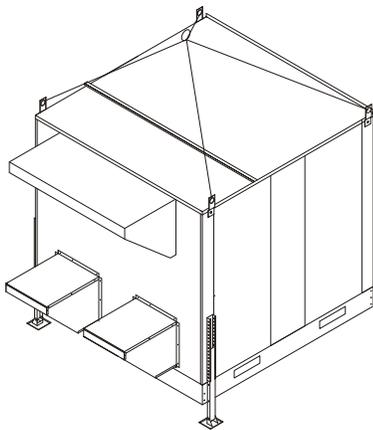


Figure 10



Figure 11

- Once ERS is working properly, caulk any open joints, holes, or seams to make the units completely air and water tight.
- Leave this instruction manual with owner or in an envelope to be kept near unit.

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.

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 10F. 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(es) setting on the internal economizer damper assembly are 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 changing the sheave setting on both fresh air and exhaust air blowers. All blowers are factory set at "closed" 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 20**.

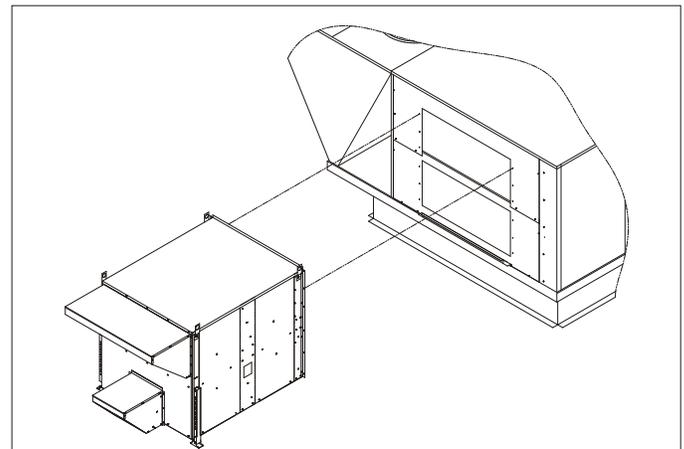


Figure 12

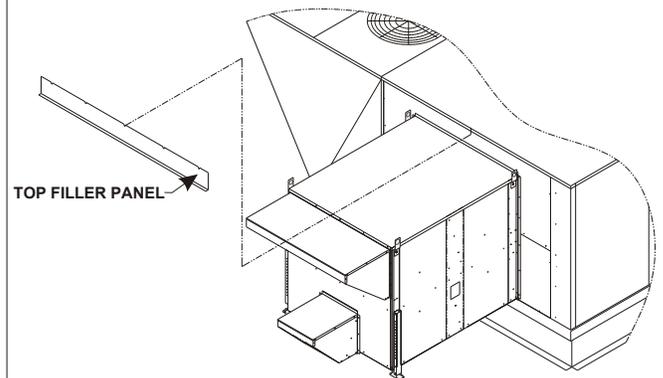


Figure 13

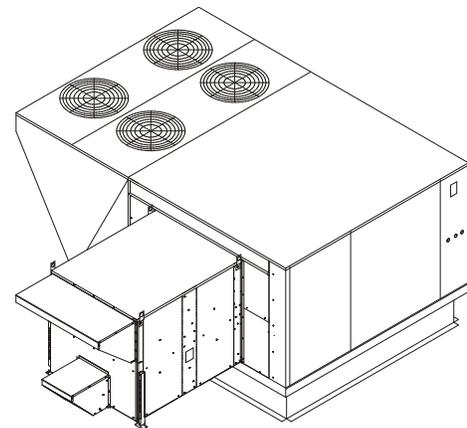


Figure 14

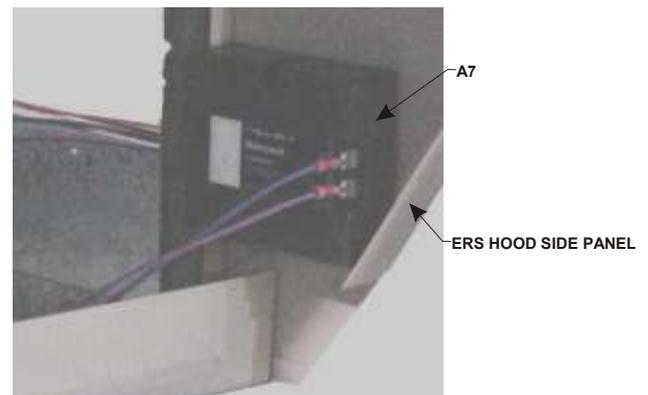


Figure 15

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.

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. **See Figure 18.**

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. **See Figure 19.**

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.

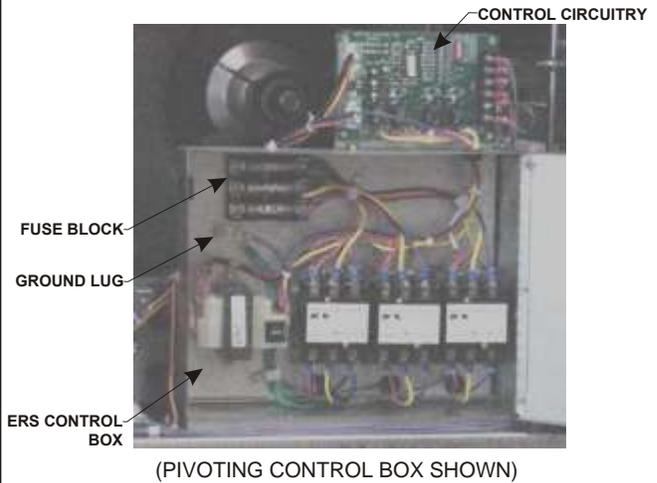
2. Open rooftop unit blower access panel and locate TB1. Jumper terminals 6 (24v) and 3 (G) to energize rooftop unit blower. Refer to manufacturers instructions when an electronic thermostat or other energy management system is used.

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(s) from low voltage terminal block TB37. View pivoting of media back into air stream and closing of fresh air dampers. After delay timer has cycled then both fresh air blower and one 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.



Figure 16



(PIVOTING CONTROL BOX SHOWN)

Figure 17

RECOVERY MODE

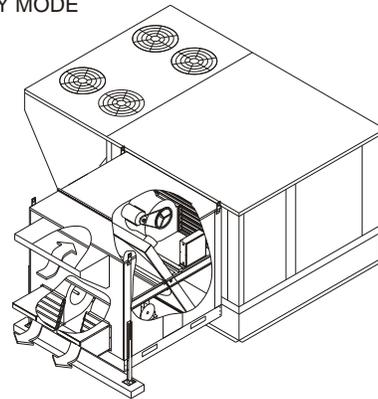


Figure 18

ECONOMIZER MODE

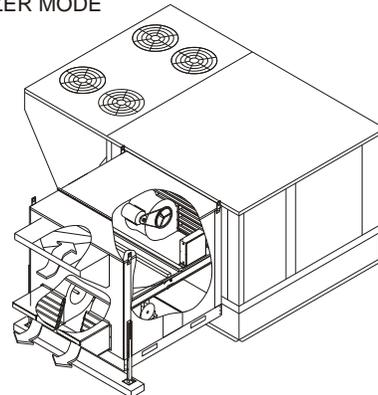


Figure 19

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 21.** 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.

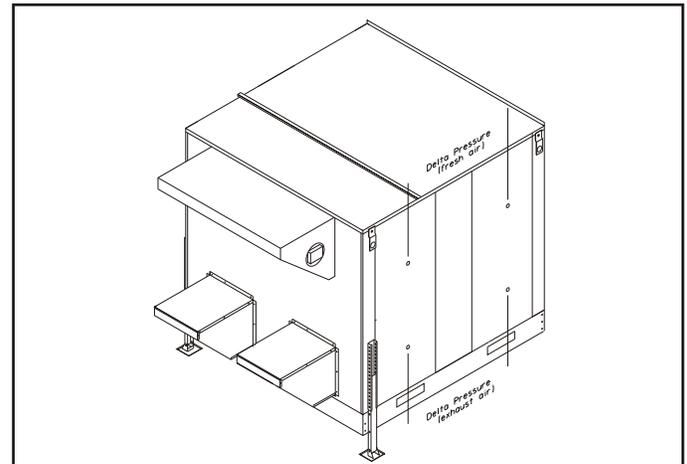


FIGURE 20

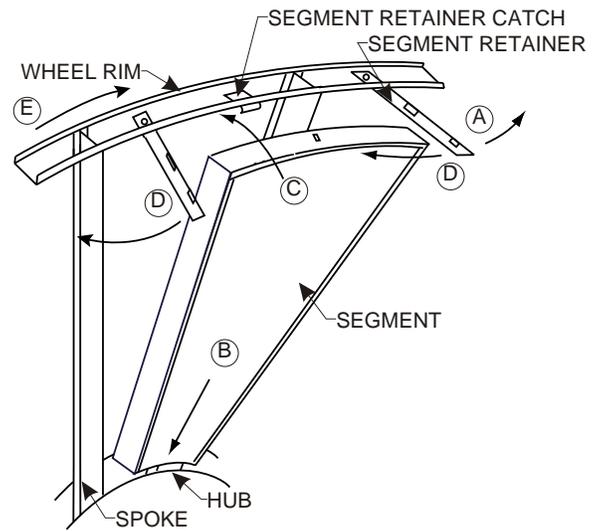
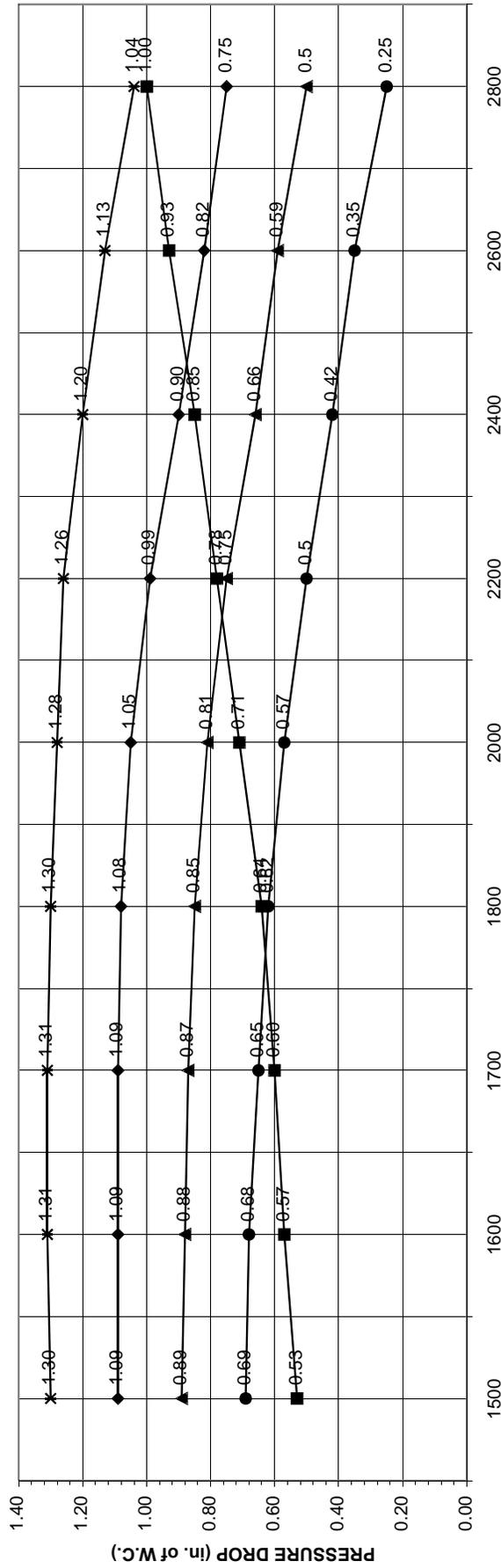


FIGURE 21

50(R/P)2848xM/H* Series

ENERGY RECOVERY SYSTEMS

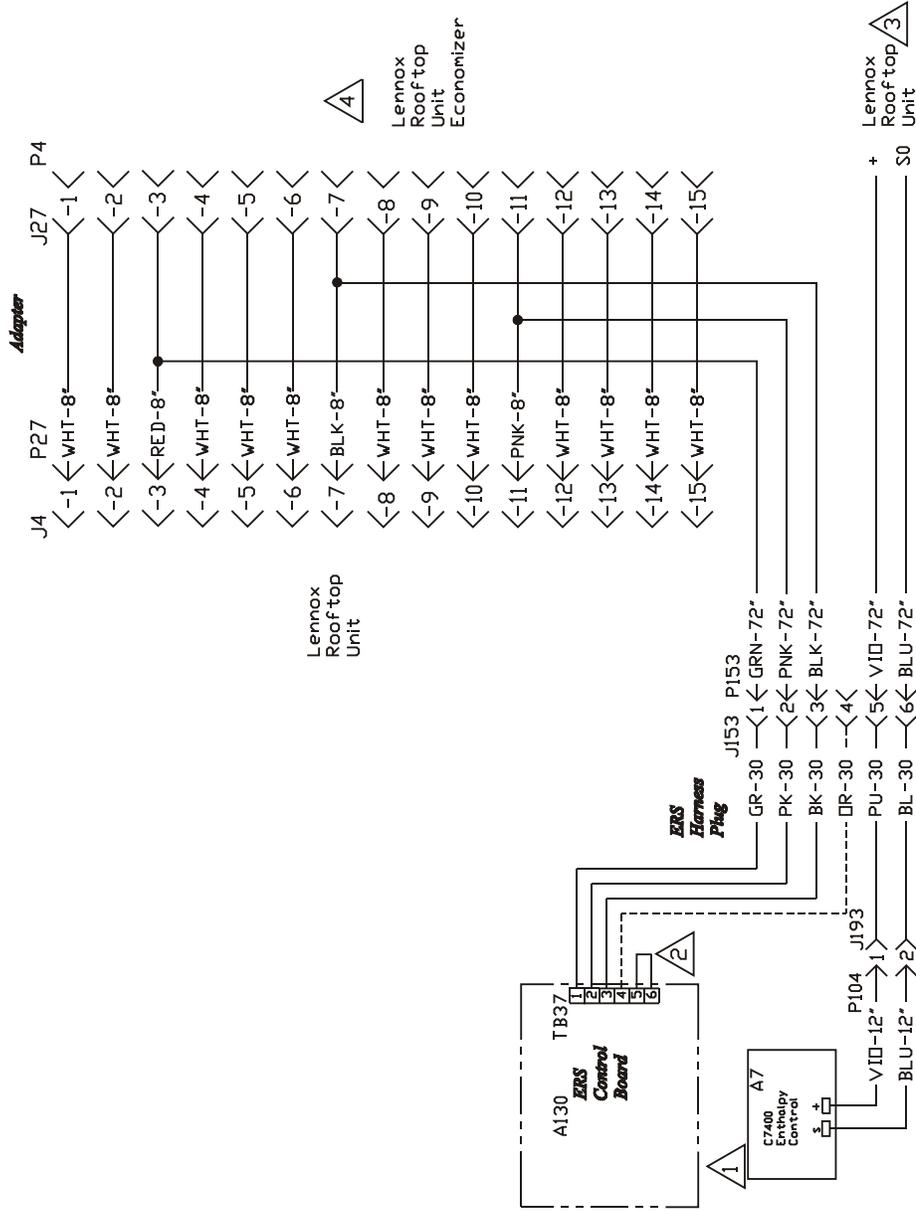
SCFM vs. PRESSURE DROP



Equation of line: SCFM = (PD + 0.01) / 0.00036
TABLE#1

Field Wiring Harness

LANDMARK
(PIVOTING)

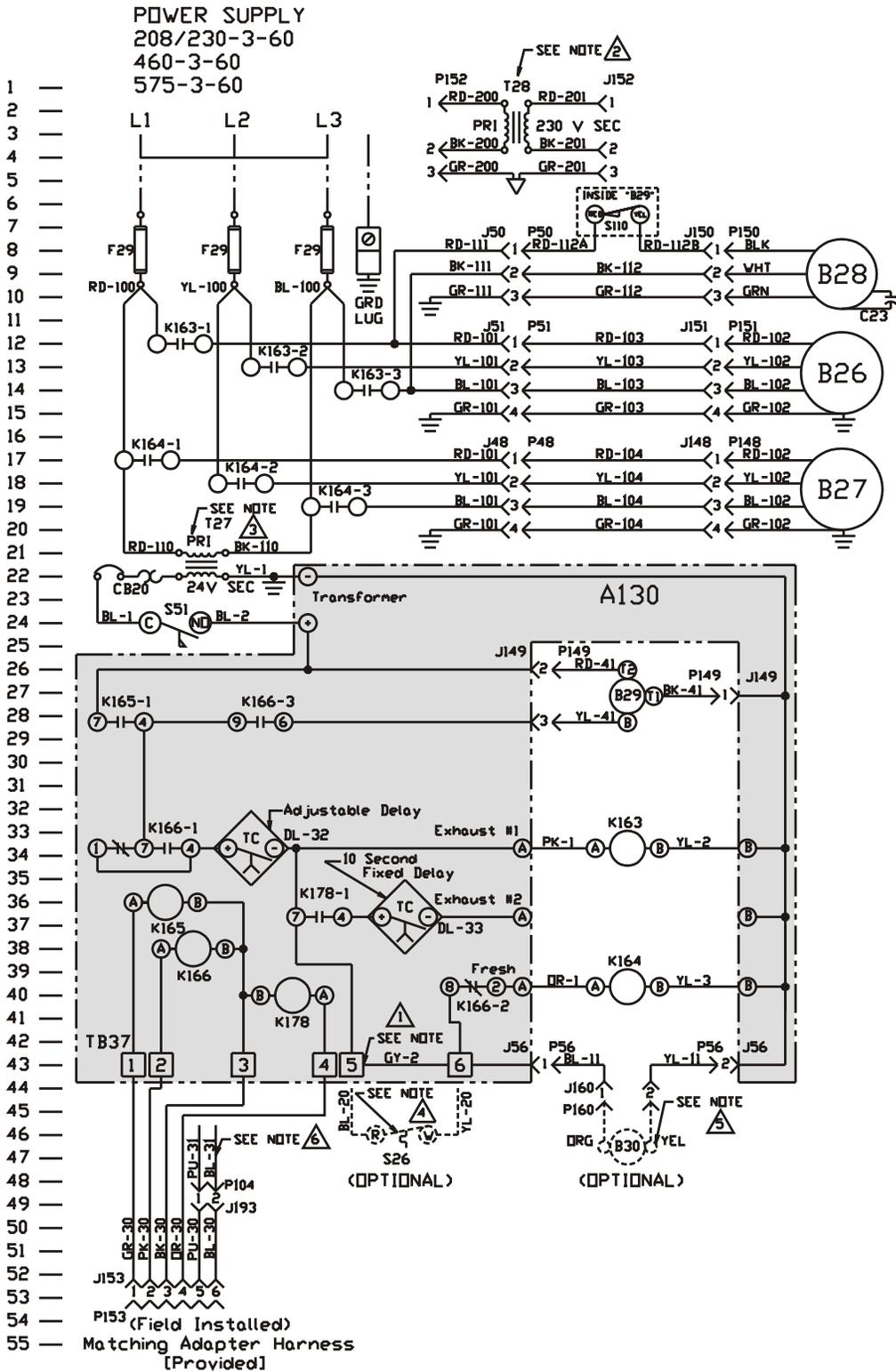


- 1 Reposition enthalpy control (A7) into intake hood of ERS from rooftop unit economizer.
- 2 Remove jumper to install optional low ambient switch.
- 3 Connects at logic module on economizer.
- 4 Setting of power exhaust pot. on logic module will activate pivoting of wheel after internal delay.

ERS UNIT SCHEMATIC DIAGRAM

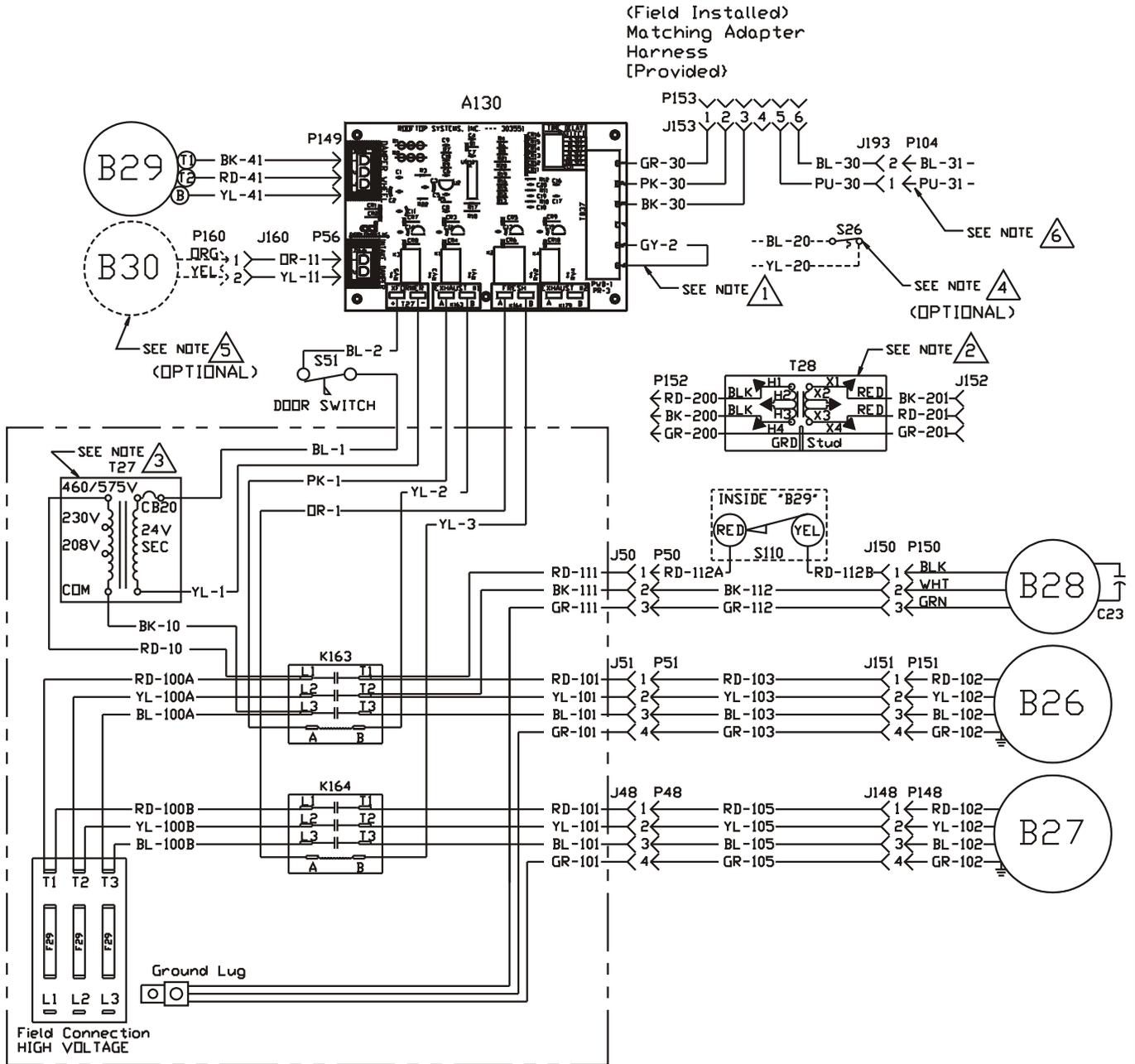
COMPONENT CODE	
A130	Pivot Wheel Board
B26	Motor, Exhaust Air
B27	Motor, Fresh Air
B28	Desiccant Wheel
B29	Motor, Wheel & Damper
B30	Motor, Damper (Optional)
C23	Capacitor, Wheel Motor
F29	Fuse
J48	Jack, Control Box (Fresh Air)
J50	Jack, Control Box (Wheel)
J51	Jack, Control Box (Exhaust Air)
J56	Jack, 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
J193	Jack, Enthalpy Sensor
K163	Contactora, Exhaust Air Motor
K164	Contactora, Fresh Air Motor
P48	Plug, Fresh Air Motor Harness
P50	Plug, Wheel Motor Harness
P51	Plug, Exhaust Air Motor Harness
P56	Plug, Damper Motor Harness
P104	Plug, Outdoor Enthalpy Sensor
P148	Plug, Fresh Air Motor
P149	Plug, Wheel & Damper Motor
P150	Plug, Wheel Motor
P151	Plug, Exhaust Air Motor
P152	Plug, Transformer (High Voltage)
P153	Plug, Field Harness
P160	Plug, Damper Motor
S26	Switch, Low Ambient (Optional)
S51	Switch, Door
S110	Switch, Tip
T27	Transformer Control
T28	Transformer, Step-down (Optional)
TB37	Terminal Block (Low Voltage)

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



- 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 economizer.

ERS UNIT WIRING DIAGRAM



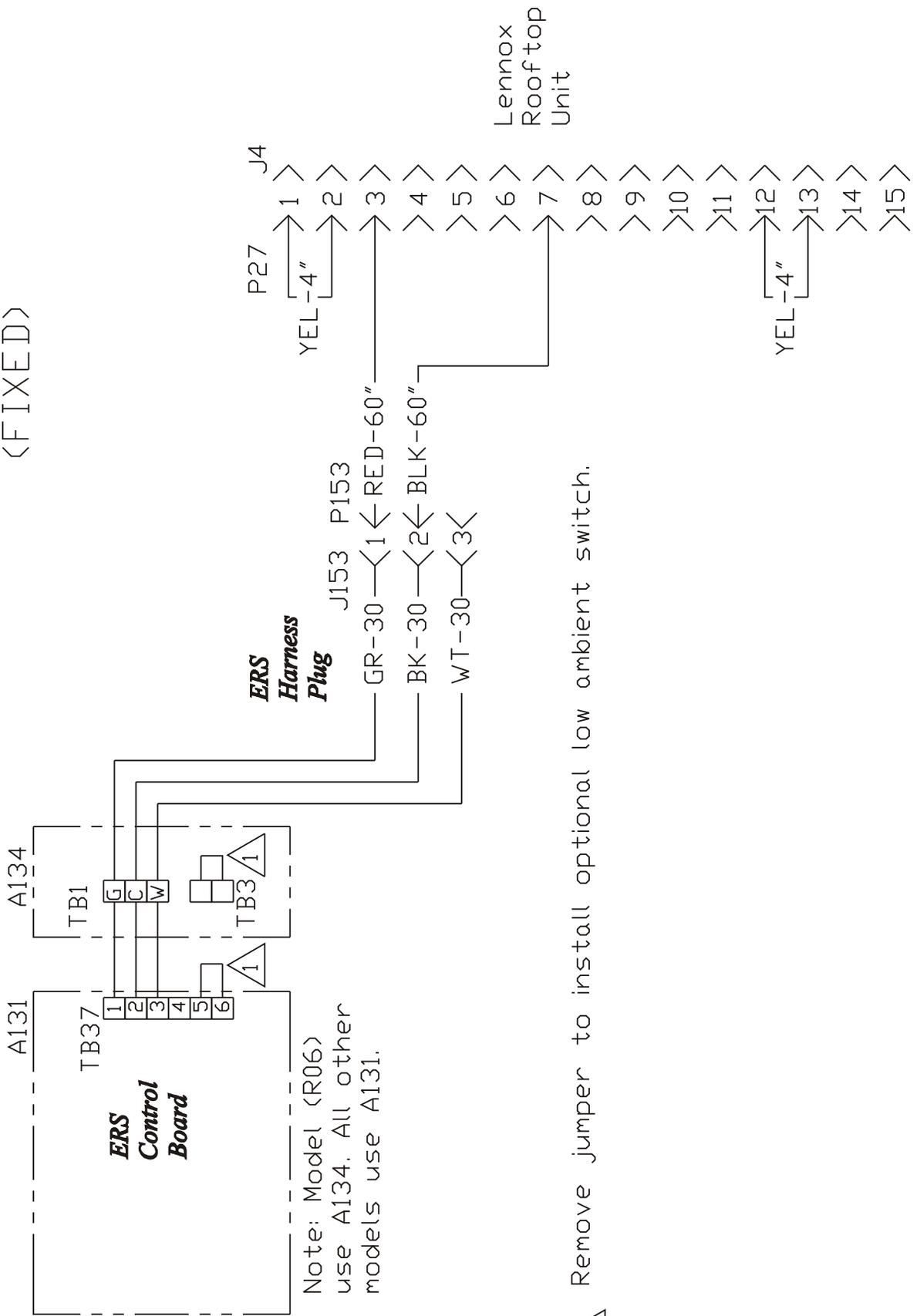
Notes:

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>



Remove jumper to install optional low ambient switch.

Lennox Model No.	Req'd Curb Height	CFM Range	Voltage	Phase
50P2848xM23	24"	1500-2200	208-230	3
50P2848xM33	24"	1500-2200	460	3
50P2848xM43	24"	1500-2200	575	3
50P2848xH23	24"	2200-2800	208-230	3
50P2848xH33	24"	2200-2800	460	3
50P2848xH43	24"	2200-2800	575	3
50R2848xM23	24"	1500-2200	208-230	3
50R2848xM33	24"	1500-2200	460	3
50R2848xM43	24"	1500-2200	575	3
50R2848xH23	24"	2200-2800	208-230	3
50R2848xH33	24"	2200-2800	460	3
50R2848xH43	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.