RRS ROOFTOP SYSTEMS
A Ruskin Company

INSTALLATION INSTRUCTIONS

P28A-10GDW
APRIL 24, 2015

ENERGY RECOVERY VENTILATOR

INSTALLATION INSTRUCTIONS FOR ENERGY RECOVERY VENTILATOR (PIVOTING) USED WITH GOODMAN ROOFTOP UNIT MODELS 7 ½ TO 12 ½ TON UNITS

AHRI CERTIFIED www.ahridirectory.org

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.

C ETL US LISTED Intertek

Patent# 5,548,970

ETL Certified per UL 1995 and CSA 22.2

I - SHIPPING AND PACKING LIST

Package 1 of 1 contains:

1 - Energy Recovery Wheel Assembly
  1 - Transition (Installed)
1 - Box Assembly
  1 - Roll of ¾" x 1 ¼" gasket
  1 - 160" of ⅛" x ½" gasket
  1 - Wiring Harness
  - Hardware for Attachment

II - SHIPPING DAMAGE

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

III - 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.

IV - 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.

V - APPLICATION

Energy Recovery Ventilators **(ERV)** are used with 7 ½ to 12 ½ ton rooftop units **with field installed RRS economizer (ordered separately).** These wheels conserve energy by mixing warmer air with cooler air in the following manner:

Recovery Ventilator Mode

The Recovery Mode is accomplished by two blowers providing continuous exhaust of stale indoor air and replacement by equal amount of outdoor air. Energy recovery is achieved by slowly rotating the Energy Recovery Wheel (ERW) within the cassette frame work. In winter, the ERW adsorbs heat and moisture from the exhaust air stream during one half of a complete rotation and gives them back to the cold, drier intake air supply during the other half rotation. In summer, the process is automatically reversed. Heat and moisture are absorbed from incoming fresh air supply and transferred to the exhaust air stream. This process allows outdoor air ventilation rates to be increased by factors of three or more without additional energy penalty or increase in size of heating or air conditioning systems.

VI - RIGGING UNIT FOR LIFTING

1. Maximum weight of unit is - 900 Lbs (crated).
2. Remove crating and retrieve box assembly that is inside of ERV.
3. All panels must be in place for rigging.
4. Lifting straps are needed to lift the unit.

VII - INSTALLATION

1. Disconnect all power to unit.
2. Remove the rooftop return air access panels. Also remove any hoods and/or power exhaust equipment. Discard hoods, power exhaust equipment, and return air access panels.

⚠ WARNING

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.

⚠ CAUTION

Danger of sharp metallic edges. Can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.

3. Remove the rooftop return air access panels. Also remove any hoods and/or power exhaust equipment. Discard hoods, power exhaust equipment, and return air access panels.

4. Verify and/or install an economizer. The ERV will ONLY work with RRS part# (1036610) economizer.

5. Remove the enthalpy control sensor from the economizer. Keep enthalpy control sensor. It will be reinstalled in the UERV.

6. Locate the provided low voltage field wiring harness. Wire the field harness to the economizer controls per the field wiring harness diagram provided in the installation instructions. The economizer wiring should be plugged into the factory installed RTU plug. **See Figure 1. Refer to System Wiring on page 5.**

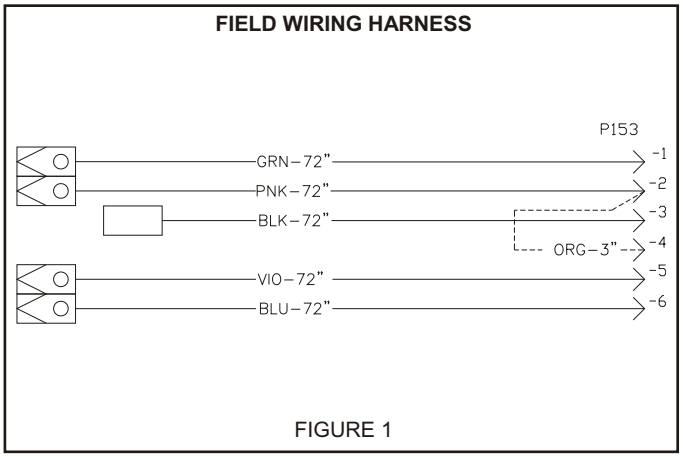


FIGURE 1

7. Use the two provided connectors to connect the field wiring harness to economizer logic module and use provided splice connector to tap on blue wire ("C" common-24V).

8. Remove the wires that were connecting the enthalpy control to the economizer and replace them with the connector having purple and blue wires of the field wiring harness. Then attach the connector with green and pink to AUX1-0 and EXH1 on Honeywell W7220 (JADE) economizer logic module control.

9. Adjust the minimum position control on logic module to position blades at 20% open or greater.

10. Clean up wiring around the economizer and neatly route the wires to clear any moving parts.

11. Route the excess wire of the field wiring harness out the return air. Coil the excess wire inside the rooftop unit to clear installation of the ERV.

12. Locate roll of provided ¾" and ⅛" gasket material. Apply ¾" gasket to the middle and bottom decks of the ERV.

13. Lift ERV 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.

14. Lift and move ERV unit into position with open end in-line with horizontal openings. Apply ⅛" gasket material to perimeter of ERV.

15. Position ERV in front of the economizer. Line up the ERV to the economizer assembly in the rooftop unit.

Note - A treated 2" x 6" x 48" piece of wood or equivalent equipment support should be used to under feet of standoff legs to prevent roof penetration.

16. Secure the ERV to the RTU with the provided screws.

17. Remove the screw placed in the standoff legs and adjust the legs on the ERV until it is level. Then replace all four screws in each leg to secure the ERV in the leveled position.

18. Check and seal, if necessary, along the edges where the ERV meets the adapter panel assembly and where the adapter panel assembly meets the rooftop unit to ensure there is no air leakage.

19. Remove the right front access panel and locate the field wiring harness that was previously tucked into the return air of the rooftop unit. Plug the field wiring harness into the connector located at the bottom of the access door inside the ERV.

20. 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.

21. Connect line voltage power to ERV unit from rooftop unit disconnect switch through the knock out. Connect the line voltage to the ERV control box per the wiring diagram.

22. 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.

23. Replace access panels onto the ERV unit and secure.

24. **Restore power to unit**

25. Cleanup once ERV is operating properly. Caulk any open joints, holes or seams to make the unit completely air and water tight.

26. Leave this instruction manual with owner or in an envelope to be kept near the unit.

VIII - OPERATION

How It Works

The unit contains an Energy Recovery Wheel (ERW) that is a new concept in rotary air-to-air heat exchanger. Designed as a packaged unit for ease of installation and maintenance, only matching up to rooftop unit with an internal economizer and connection of electrical power is required to make the system operational. The concept consists of a unique rotary energy recovery wheel that rotates in and out of fresh air streams within a heavy duty, permanently installed blower cabinet that provides ready access to all internal components. The media is polymeric material that is coated and permanently bonded with a dry desiccant for total enthalpy recovery. The wheel is belt driven by PSC motor and drive belt.

When slowly rotating through counter flowing exhaust and fresh air streams the ERV adsorbs sensible heat and latent heat from the warmer air stream and transfer this total energy to the cooler air stream during the second half of its rotating cycle. Rotating at 60 revolutions per minute, the wheel provides constant flow of energy from warmer to cooler air stream. The large energy transfer surface and laminar flow through the wheel causes this constant flow of recovered energy to represent up to 85% of the difference in total energy contained within the two air streams.

Sensible and latent heat are the two components of total heat. Sensible heat is energy contained in dry air and latent heat is the energy contained within the moisture of the air. The latent heat load from the outdoor fresh air on an air conditioning system can often be two to three times that of the sensible heat load and in the winter it is a significant part of a humidification heat load.

During both the summer and winter, the ERV transfers moisture entirely in the vapor phase. This eliminates wet surfaces that retain dust and promote fungal growth as well as the need for a condensate pan and drain to carry water.

Because it is constantly rotating when in the air stream, the ERV is always being cleared by air, first in one direction then the other. Because it is always dry, dust or other particles impinging on the surface during one half cycle, are readily removed during the next half cycle.

Low Ambient Kit is appropriate for climates with limited HVAC system operation when outdoor temperatures are below 15°F.

The frost threshold is the outdoor temperature at which frost will begin to form on the ERV wheel. For energy recovery ventilators, the frost threshold is typically below 15°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 Ventilators 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 ERV operational hours, exhaust only frost control option is available.

Low Ambient Kit

Low Ambient Kit turns off the supply blower when outdoor temperatures fall below the frost threshold. Exhaust Only set points are field adjustable with a factory supplied thermostat. Supply fan operation is automatically restored when the exhaust air temperature rises above the thermostat set point. Provisions for introducing make-up air into the building when the supply blower is off to avoid depressurization should be considered.

Recovery Wheel Mode

On a thermostat call for blower operation in heating, cooling or continuous blower, the ERV media will rotate between fresh air and exhaust air streams. Both the fresh air blower and exhaust air blower will be operating to overcome the air resistance of the ERV media. The ERV unit will operate in this mode until economizer mode is activated.

Economizer/Power Exhaust Mode

On the activation of the economizer mode [closure of damper switch], the ERV unit will shutdown for approximately 60 seconds to allow the ERV media to pivot out of the air stream. After the delay timer has been satisfied, the exhaust air blower will operate. The ERV 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 ERV media will pivot back into the air stream. When timing is complete the unit will operate in the Recovery Wheel Mode.

IX - SYSTEM CHECK

1. Disconnect ERV main power.
2. Remove ERV control access panel and install jumper at low voltage terminal strip between "TB37-1 and TB37-2". Wheel should pivot out of air stream.

Note - If optional Low ambient kit is used the jumper between TB37-5 & TB37-6 should be removed. Also if system check out is being conducted at low ambient temperatures, technician should be aware that this kit can cause system not to operate.

3. Turn thermostat to "Cont" for blower operation.
4. Restore power to unit. Observe ERV drive motors (damper motor) for wheel and dampers, it should pivot wheel out of air stream, opening fresh air dampers and a delayed 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. Disconnect main power to unit before making adjustment to economizer and/or ERV unit.
7. Replace ERV control access cover.
8. Set thermostat to normal operating position.
9. Restore power to unit.

A - Economizer Settings

Refer to economizer instructions for minimum air flow requirement. The damper 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.

B - Blower Speed Adjustment

Blower speed selection is accomplished by changing the sheave setting on both fresh air and exhaust air blowers. Both 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 ERV.

1. Disconnect main power to unit before making adjustment to economizer and/or ERV unit.
2. Replace ERV control access cover.
3. Set thermostat to normal operating position.
4. Restore power to unit.

C - Air Balancing Adjustment

1. Remove plastic plugs in door panels (4 total).
2. With a manometer measure pressure drop [inches of water column] across top half of ERV (top holes in door panel). Unit CFM is determined then by referring to **Table #1**. If CFM values are not per design, adjust damper in fresh air hood and repeat measure method.
3. Repeat the same process for the bottom half of ERV. If CFM values are not per design, adjust internal dampers inside the ERV. This is accomplished by removing door panel at the return air opening, loosing screw in center of damper, then slide damper rod up or down in the return airstream and re-tighten screw. Replace door panel and repeat measurement method.
4. Place plastic plugs back in to door panels.

X - MAINTENANCE

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

Mechanical Inspection
Make visual inspection of dampers, linkage assemblies and ERV 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 ¾" 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 Recovery Wheel Maintenance
Eight pie-shaped ERW 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 ERV 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 2.** 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.

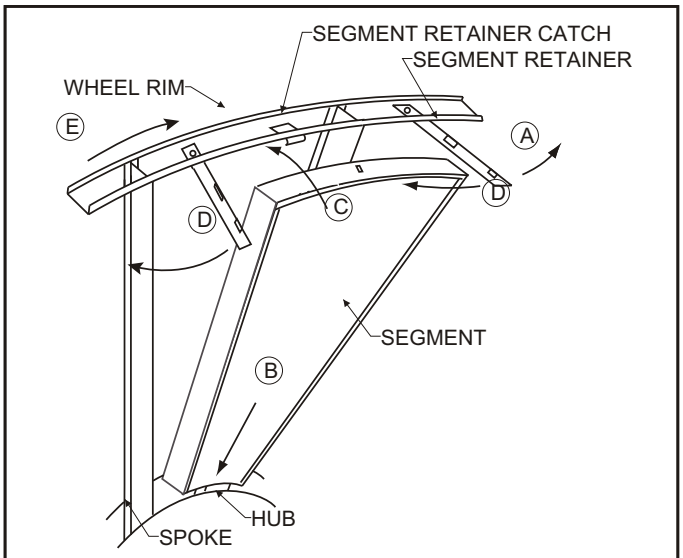
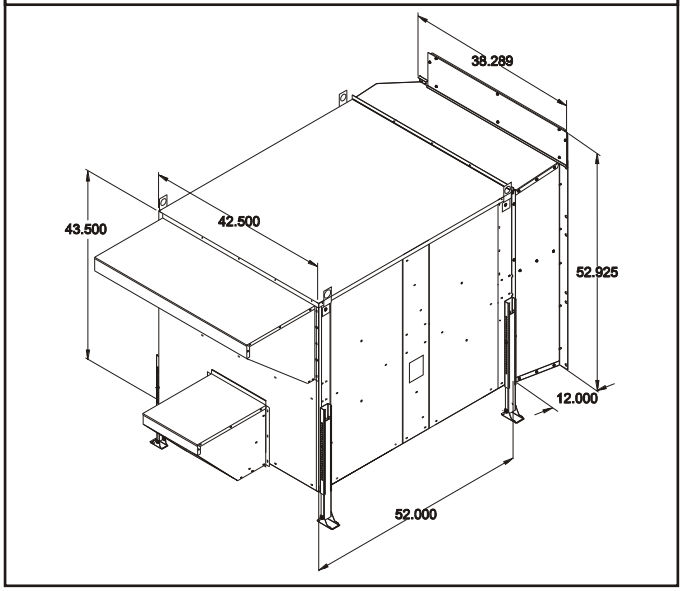
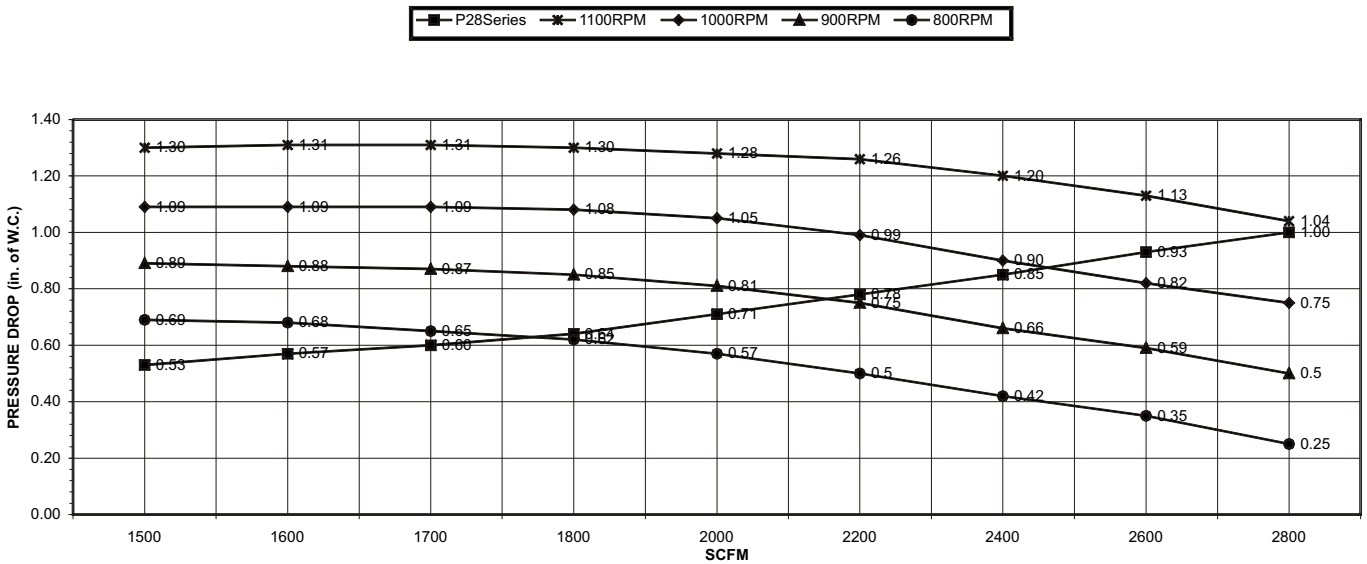


Figure 2



ENERGYRECOVERYVENTILATOR

SCFMvs.PRESSUREDROP



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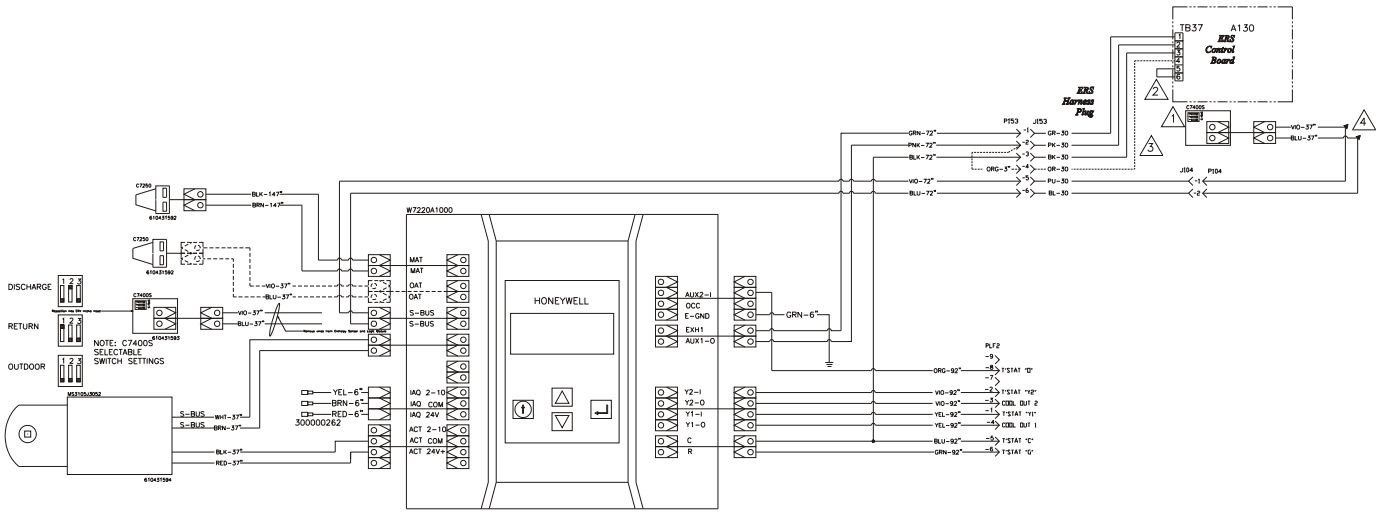
TABLE#1

SYSTEM WIRING



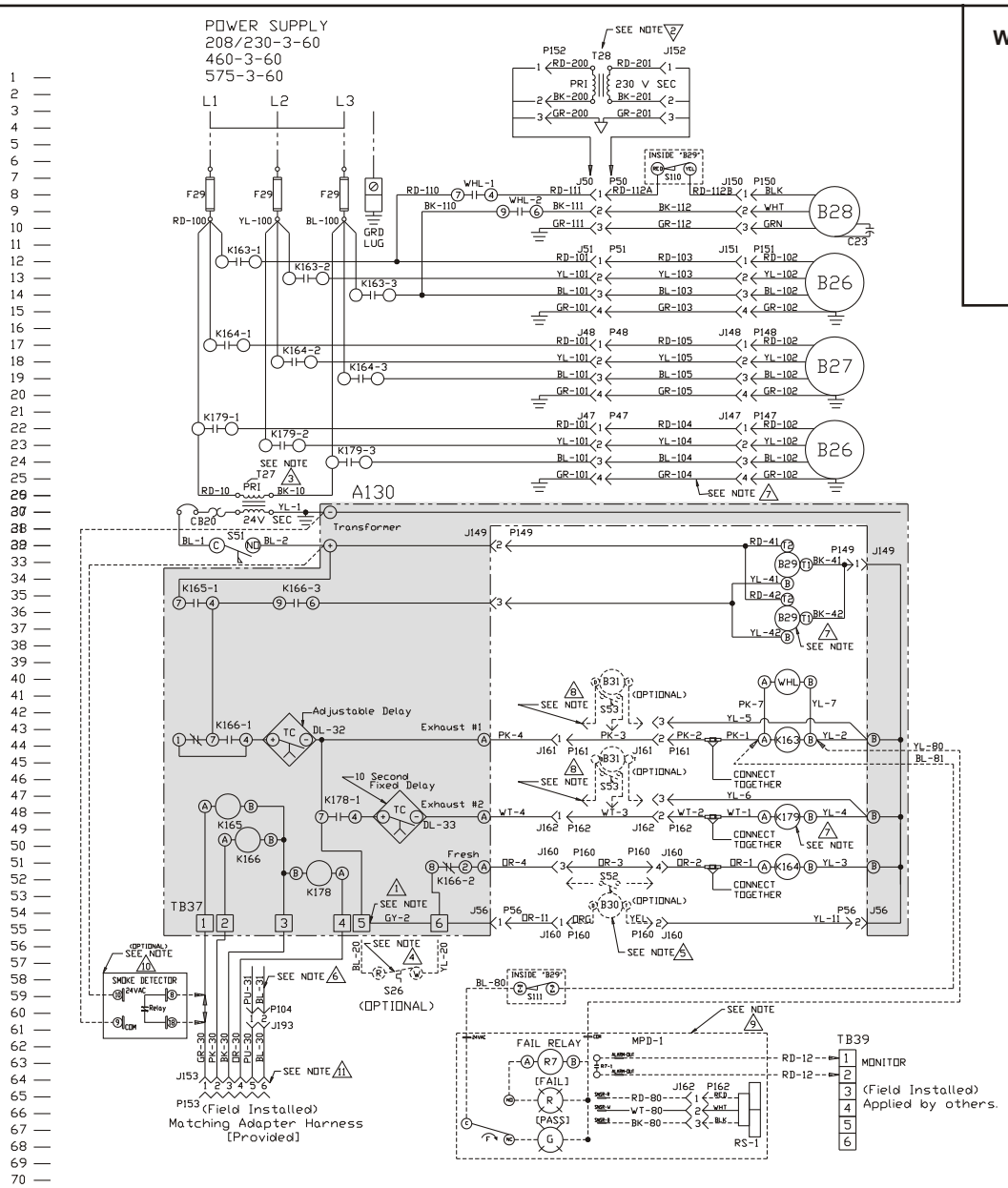
1. Reposition enthalpy control (A7) into intake hood of ERV from rooftop unit economizer.
2. Remove jumper to install optional low ambient switch.
3. This wire is used only on 5600 CFM units or higher.
4. Splice wires together using provide wire nuts.

COMPONENT CODE

A130	Pivot Relay Board	J153	Jack, Field Harness	P151	Plug, Exhaust Air Motor
B26	Motor, Exhaust Air	J160	Jack, Damper Intake Motor Harness	P152	Plug, Transformer (High Voltage)
B27	Motor, Intake Air	J161	Jack, Damper Exhaust Motor Harness	P153	Plug, Field Harness
B28	Motor, Desiccant Wheel	J162	Jack, Damper Exhaust Motor #2 Harness	P160	Plug, Damper Intake Motor Harness
B29	Motor, Wheel & Damper	K163	Contactor, Exhaust Air Motor	P161	Plug, Damper Exhaust Motor Harness
B30	Motor, Damper Intake (Optional)	K164	Contactor, Intake Air Motor	P162	Plug, Damper Exhaust Motor #2 Harness
B31	Motor, Damper Exhaust (Optional)	K179	Contactor, Exhaust Air Motor #2	RS-1	Rotation Sensor (Optional)
C23	Capacitor, Wheel Motor	MPD-1	Missing Pulse Detector Board (Optional)	S26	Switch, Low Ambient (Optional)
F29	Fuse	P47	Plug, Exhaust Air Motor #2 Harness	S51	Switch, Door
J47	Jack, Control Box (Exhaust Air # 2)	P48	Plug, Intake Air Motor Harness	S52	Switch, Damper Intake
J48	Jack, Control Box (Intake Air)	P50	Plug, Wheel Motor Harness	S53	Switch, Damper Exhaust
J50	Jack, Control Box (Wheel)	P51	Plug, Exhaust Air Motor Harness	S111	Switch, Rotation
J51	Jack, Control Box (Exhaust Air)	P56	Plug, Damper Motor Harness	S11D	Switch, Tip
J56	Jack, Control Box (Damper)	P104	Plug, Outdoor Enthalpy Sensor	T27	Transformer, Control
J147	Jack, Exhaust Air Motor #2 Harness	P147	Plug, Exhaust Air Motor #2 Harness	T28	Transformer, Step-down (Optional)
J148	Jack, Intake Air Motor Harness	P148	Plug, Intake Air Motor	TB37	Terminal Block (Low Voltage)
J150	Jack, Wheel Motor Harness	P149	Plug, Motor Wheel & Damper Harness	TB38	Terminal Block (Monitoring)
J151	Jack, Exhaust Air Motor Harness	P150	Plug, Wheel Motor	WHL	Relay, Wheel Motor
J152	Jack, Transformer (High Voltage)				

WIRE COLOR CODE

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



Notes:
1. Remove jumper to install field optional low ambient switch.
2. Step-down transformer assembly for 460/575 volt units.
3. Selective voltage terminal for proper unit voltage
4. Optional low ambient switch.
5. Optional motorized intake damper.
6. Reposition enthalpy control into intake hood of ERV from rooftop unit economizer
7. Used on higher CFM models
8. Optional motoirzed exhaust damper.
9. Optional wheel rotation sensor.
10. Optional smoke detector.
11. Matching adapter harness (provided) to connect with rooftop unit.

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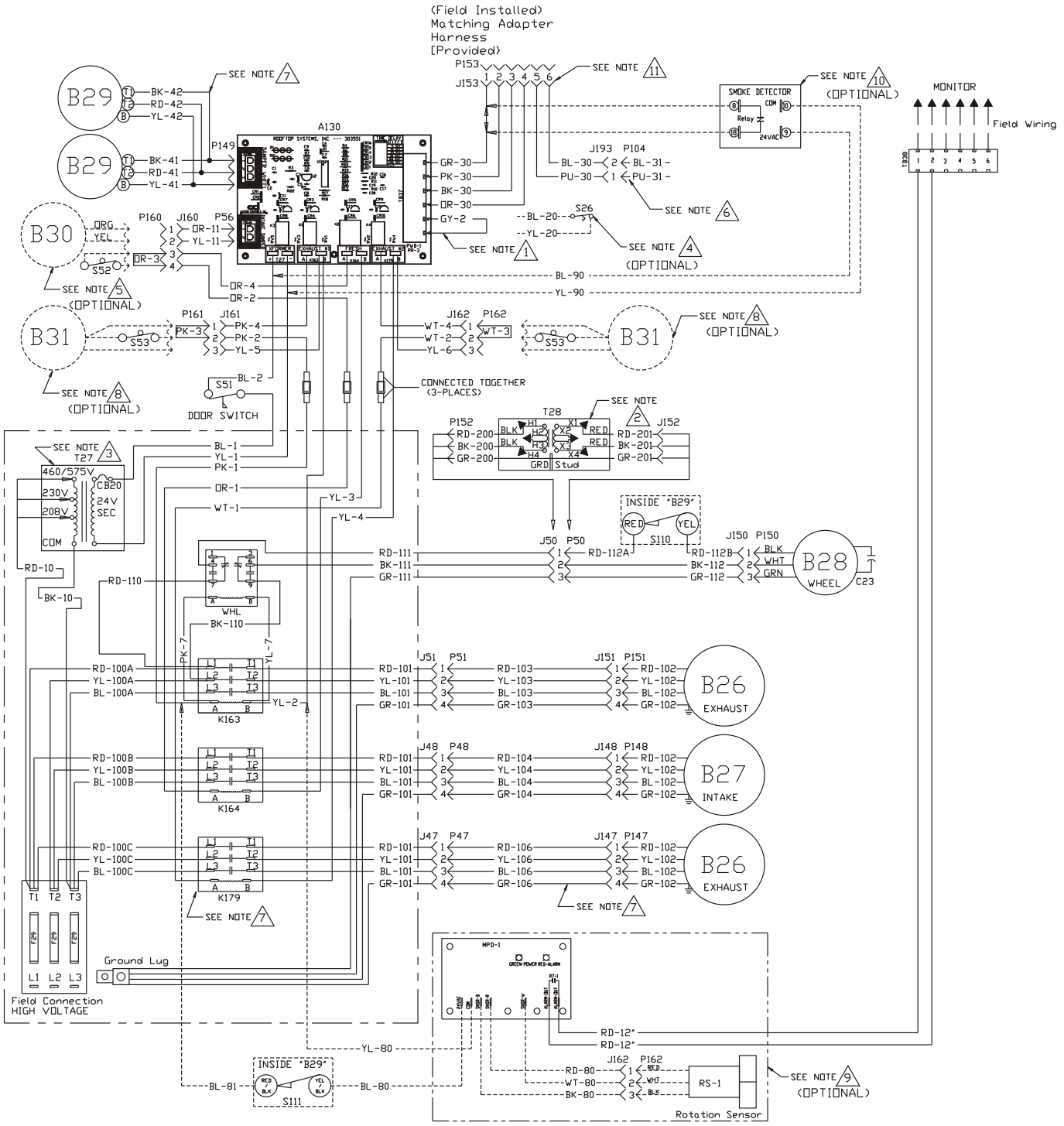
ERV UNIT WIRING DIAGRAM



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Desiccant Wheel for Rooftop Unit
208-230/460V/575V (3 PH)

Unit#: 01-P20-P62-01XX-23/-33/-43

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.