READ AND SAVE THESE INSTRUCTIONS

PART #468151

GREENHECK
Building Value in Air.

ENERGY RECOVERY UNIT WITH PACKAGED DX

without DDC Controls

Model ERCH-20, 45, 55 & 90

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

RECEIVING AND HANDLING

The ERCH is thoroughly inspected and test run at the factory. However, damage may occur during shipping and handling. Upon delivery, inspect the unit for both obvious and hidden damage. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier. In addition, ensure all accessory items are present. Some accessory items are stored inside the unit during shipping.

SAFETY WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read this installation, operation, and maintenance manual thoroughly before installing or servicing this equipment. Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

INSTALLATION SUPPLEMENTS

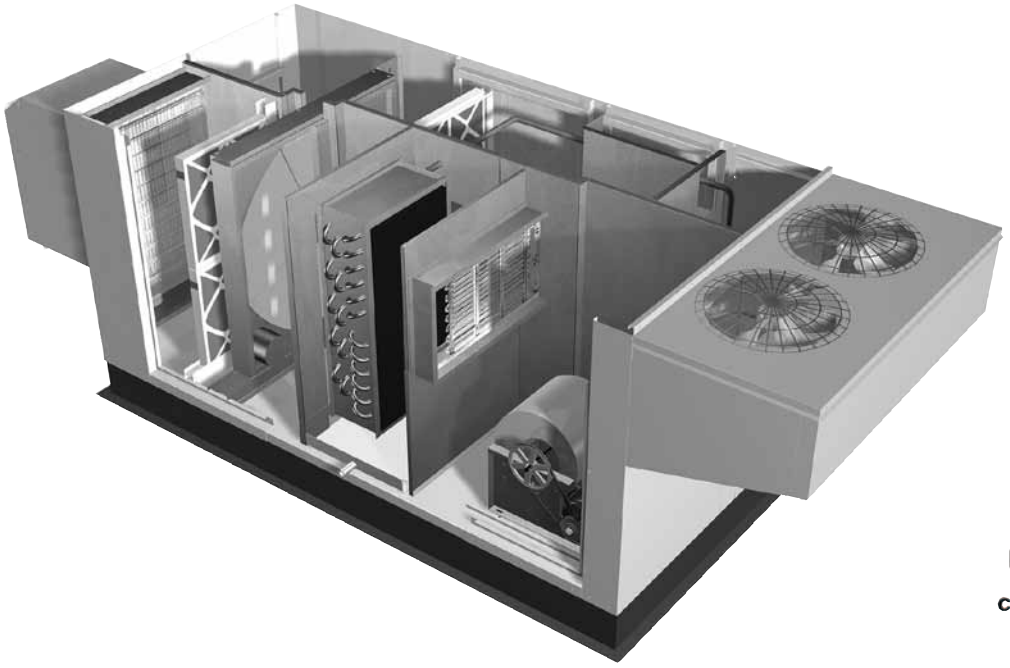
Refer to the following installation supplements

ERCH supplied with Indirect Gas (IG) heating: Model PVF, Indirect Gas Fired Furnaces for Energy Recovery Units, Part #461006

ERCH Curb Assembly Instruction, Part #468280

SAVE THIS MANUAL

This manual is the property of the owner, and is required for future maintenance. This manual should remain with each ERCH unit when the job is complete.



ETL LISTED c US

TABLE OF CONTENTS

STORAGE

When a unit is not going to be in service for an extended amount of time, certain procedures should be followed to keep the fans in proper operating condition.

- Rotate fan wheel monthly and purge grease from bearings once every three months
- Cover unit with tarp to protect from dirt and moisture
  (Note: do not use a black tarp as this will promote condensation)
- Energize fan motor once every three months
- Store belts flat to keep them from warping and stretching
- Store unit in location which does not have vibration
- After storage period, purge grease from fan bearings before putting fan into service

If storage of unit is in a humid, dusty or corrosive atmosphere, rotate the fan and purge the bearings once a month. Improper storage which results in damage to the unit or components will void the warranty.

OWNER'S INFORMATION

The following summary highlights some important notes to help avoid premature failure and possible voidance of warranty.

Product Overview

Greenheck ERCH Models integrated with a complete refrigerant system are designed with the purpose of being a self-contained source for heating and cooling in both commercial and institutional applications. This is done in a highly efficient manner through the use of a total enthalpy recovery wheel. The wheel allows the compressors and cooling equipment to be downsized in the unit, therefore being more cost effective to operate. The DX system comes fully charged from the factory with refrigerant and is ready for installation upon arrival.

The smaller tonnage units (4-9 tons) contain a single compressor, allowing for one stage of cooling. Larger units (10-30 tons) come standard with two compressors. This allows for staging of compressors to meet a wider range of outdoor air loads while reducing the amount of cycles per compressor.

Integral Components

All units are provided with an expansion valve, hermetic scroll compressor(s), liquid line filter drier, high pressure manual reset cutout, low pressure auto-reset cutout, time delays for compressor protection, service/ charging valves, moisture indicating sight glass, and hot gas bypass. The compressors also come standard with a crankcase heater for additional protection.

Shutdown Operation
The scroll compressors in this unit are designed to compress gas refrigerant only. To prevent liquid refrigerant from migrating into and damaging the compressors, each compressor is supplied with a crankcase heater. Prior to starting the compressors, the heaters must have power to them for 24 hours. Power should never be cut to these units unless the complete shutdown procedure is followed.

Proper shutdown procedure:

1) Turn off main power supply to the unit
2) Turn thermostat controls to “off” position
3) Restore main power supply to the unit
4) Wait 24 hours prior to turning the thermostat control to the “on” position

Low Ambient Operation
Low ambient operation can cause damage to the refrigerant system. A factory-installed temperature sensor in the outdoor air intake prevents refrigerant system operation at ambient conditions below 55ºF. Crankcase heaters will still be engaged provided the main power has not been disconnected. If cooling is desired at ambient temperatures below 55ºF, economizer operation (wheel start/stop or wheel modulation) should be employed.

Reduced Airflow – Pumping oil and liquid refrigerant
Lack of maintenance will lead to filters, condensing coils, and evaporator coils building up with dirt and debris. As this occurs, the airflow through the unit will decrease. Cooling coils are sized to handle a particular airflow volume. A reduction in airflow can cause the cooling coils to get too cold and may result in excessive liquid refrigerant return to the compressors. The liquid refrigerant buildup in the compressors will displace the necessary oil required for proper lubrication. The combination of these two events will significantly reduce the life of the compressors.

To maintain the proper airflow and system efficiency, follow all procedures in the Maintenance section.

Safety Listing
The ERCH units are listed per ANSI/UL 1995, Heating and Cooling Equipment, and bear the ETL logo.

Environmental Concerns
This equipment contains R22 or R-410a refrigerant. Refer to label on access door identifying the type of refrigerant in the unit.

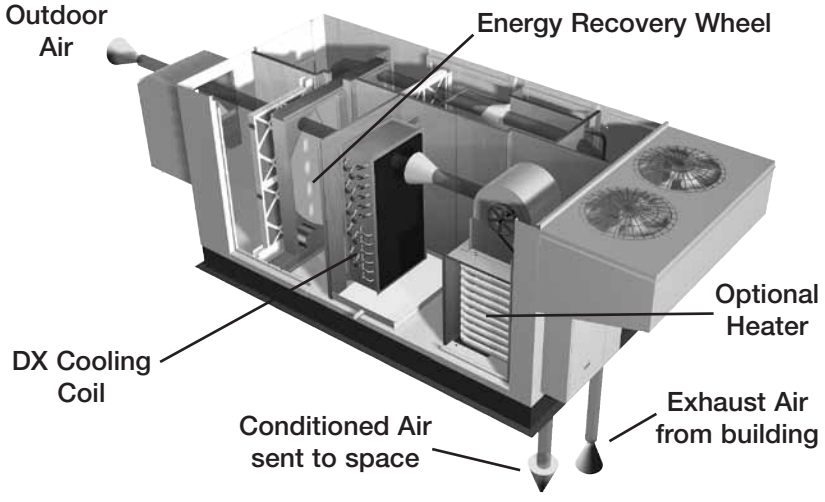
R22 is a class II refrigerant that contains HCFC’s. If released, HCFC’s may reduce the amount of ozone in the atmosphere. This ozone depletion will result in less protection from the sun and therefore it is critical to use every precaution necessary to minimize the amount admitted to our environment.

When working with Greenheck’s fully charged refrigerant system, it is strongly recommended that caution is undertaken during installation, operation, and routine maintenance. This caution will help ensure that minimal amounts of refrigerant are leaked into the atmosphere. To comply to the U.S. Clean Air Act, anytime there is residual refrigerant, the proper equipment shall be used and methods should be followed to reclaim the refrigerant so that it can be recycled, reprocessed, or destroyed.

IMPORTANT!
Do not release refrigerant to the atmosphere! If required service procedures include the adding or removing of refrigerant, the service technician must comply with all federal, state and local laws. The procedures discussed in this manual should only be performed by a qualified EPA Certified Technician.

BASIC OPERATION

The ERCH with Packaged DX units bring in fresh, outdoor air and remove stale, exhaust air. Prior to discharging the exhaust air, the energy recovery wheel transfers energy from the exhaust air to the outdoor air at an efficiency of 70-80%. Simply put, this unit preconditions the outdoor air to save money on heating and cooling costs. These particular units also have packaged DX cooling and heating options available after the recovery wheel to further condition the fresh air.



CAUTION!
Unit is designed for Outdoor installation only. Follow all guidelines in this manual for proper installation.

INSTALLATION

The system design and installation should follow accepted industry practice, such as described in the ASHRAE Handbook.

Adequate space should be left around the unit for piping coils and drains, filter replacement, and maintenance. Sufficient space should be provided on the side of the unit for routine service and component removal should that become necessary.

See Service Clearances/Access Panel Locations section for more details.

SAFETY WARNING
All factory provided lifting lugs must be used when lifting the units. Failure to comply with this safety precaution could result in property damage, serious injury, or death.

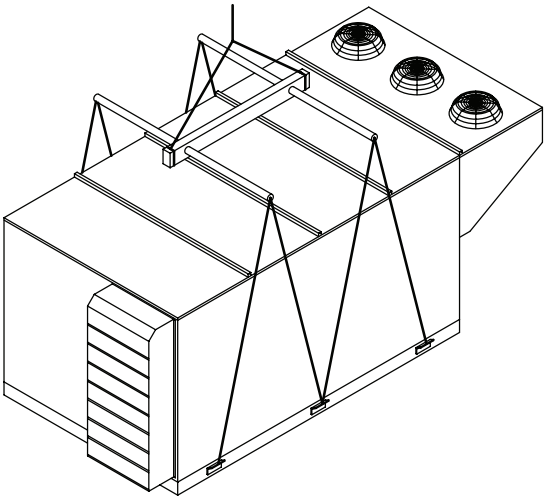
HANDLING

While this unit was constructed with quality and dependability in mind, damage still may occur during handling of the unit for installation. Exercise extreme caution to prevent any damage from occurring to the refrigerant system. This unit contains a system pressurized with refrigerant that if damaged, could leak into the atmosphere or cause bodily harm due to the extreme cold nature of expanding refrigerant. Use protective equipment such as gloves and safety glasses to minimize or prevent injury in case of a system leak during installation.

LIFTING

1) Before lifting, be sure that all shipping material has been removed from unit.
2) To assist in determining rigging requirements, weights are shown below.
3) Unit must be lifted by all lifting lugs provided on base structure.
4) Rigger to use suitable mating hardware to attach to unit lifting lugs.
5) Spreader bar(s) must span the unit to prevent damage to the cabinet by the lift cables.
6) Always test-lift the unit to check for proper balance and rigging before hoisting to desired location.
7) Never lift units by weatherhoods.
8) Never lift units in windy conditions.
9) Preparation of curb and roof openings should be completed prior to lifting unit to the roof.
10) Check to be sure that gasketing (supplied by others) has been applied to the curb prior to lifting the unit and setting on curb.
11) Do not use fork lifts for handling unit.

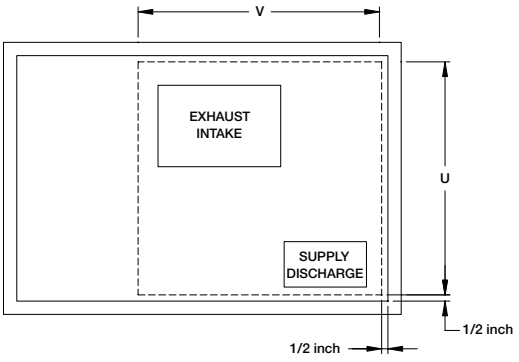
Lift using lifting lugs and spreader bar



UNIT WEIGHTS & RECOMMENDED ROOF OPENING

Unit Size	Approximate Weight (lbs)	U (inches)	V (inches)
ERCH-20	2150	46	46
ERCH-45	3500	54	48
ERCH-55	4450	65	58
ERCH-90	6200	85	63

Unit weights assume rooftop configuration with weatherhoods, filters, outdoor air damper, six row DX coil, integral condensing section and an indirect gas fired furnace.



Position the unit roof opening such that the supply discharge and exhaust inlet of the unit will line up with the corresponding ductwork. Be sure to allow for the recommended service clearances when positioning opening (see Service Clearances). Do not face the outdoor air intake of the unit into prevailing wind and keep the intake away from any other exhaust fans. Likewise, position the exhaust discharge opening away from outdoor air intakes of any other equipment.

INSTALLATION CONCERNS

Unobstructed airflow to the condensing section must be maintained at all times to ensure proper operating efficiency and capacity of the cooling system. Unit placement should allow proper airflow over the condensing section. The unit may not operate properly and damage may occur to the system if there is coil starvation (lack of air over condenser) or warm air recirculating back through the condensing coil. Recirculating air is caused when the unit is placed near obstacles that can redirect exhaust air from the condensing fans, back around to the coil inlet. Overhangs or walls near the condensing section are two examples.

Another consideration when placing the unit is prevailing wind direction. The condensing coil operation can be significantly affected when winds are blowing continuously and directly at the condensing coil. On hot days, the wind will help the system by providing extra flow over the coil. But on cooler days, that same wind may overcool the refrigerant, and cause hot gas bypass to operate more frequently, causing higher operating costs. Therefore, avoiding direct winds will provide a more stable operation of the system throughout the cooling season.

Lack of air over the coil can reduce efficiencies and affect system operation. Do not allow debris (such as leaves and trash), to accumulate on or near the unit. Keeping debris clear of the unit will ensure minimal obstruction to the coils, keeping efficiencies and operation closer to design. The unit typically should not operate when snow is present. In the event this is possible, make sure all snow is clear of the coil and condensing fans prior to operating the unit.

If more than one unit is being installed, make provisions so discharge air from either the condensing fans or exhaust fan of the unit do not discharge towards another unit's intake. Also, OA intake and condensing sections should be spaced as too allow proper airflow to each unit helping ensure the units operate as intended.

When cutting only duct openings, cut opening 1 inch (25mm) larger than duct size to allow clearance for installation. Area enclosed by roof curb must comply with clearance to combustible materials. If the roof is constructed of combustible materials, area within the roof curb must be ventilated, left open, or covered with non-combustible material which has an "R" value of at least 5. If area within curb is open, higher radiated sound levels may result.

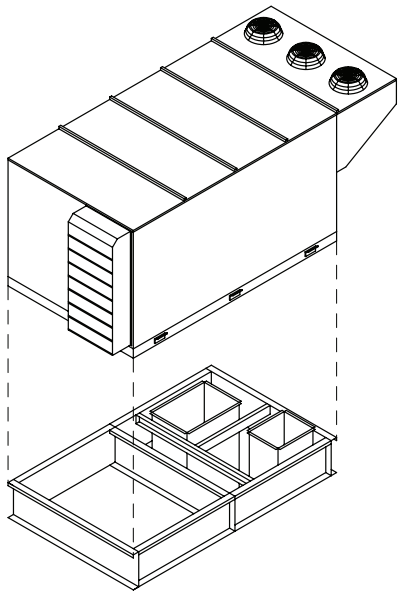
Where the supply or warm air duct passes thru a combustible roof, a clearance of one inch must be maintained between the outside edges of the duct and combustible material in accordance with NFPA Standard 90A.

ROOF CURB MOUNTING

Rooftop units require curbs to be mounted first. The duct connections must be located so they will be clear of structural members of the building.

Roof curb details, including duct location dimensions, are available on ERCH roof curb assembly instructions, Part #468280.

1. **Factory Supplied Roof Curbs**
   Roof curbs are Model GKD, which are shipped in a knockdown kit (includes duct adapter) and require field assembly (by others). Assembly instructions are included with the curb.
2. **Install Curb**
   Locate curb over roof opening and fasten in place. (Refer to Recommended Roof Openings). Check that the diagonal dimensions are within ±1/8 inch of each other and adjust as necessary. For proper coil drainage and unit operation, it is important that the installation be level. Shim as required to level.
3. **Install Ductwork**
   Installation of all ducts should be done in accordance with SMACNA and AMCA guidelines. Duct adapter provided to support ducts prior to setting the unit.
4. **Set the Unit**
   Lift unit to a point directly above the curb and duct openings. Guide unit while lowering to align with duct openings. Roof curbs fit inside the unit base. Make sure the unit is properly seated on the curb and is level.

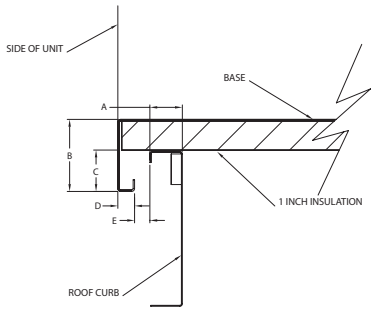


Curb Outside Dimensions

Curb Outside Dimensions and Curb Weights (lbs)			
Model	**L**	**W**	**Weight**
ERCH-20	104.88	51	310
ERCH-45	115.75	60.63	400
ERCH-55	129.88	71.5	510
ERCH-90	148.13	90.75	720

All dimensions shown are in inches. Weights are for 12 inch high curbs.

ROOF CURB MOUNTING - CONTINUED



Curb Cap Details for Factory Supplied Roof Curbs

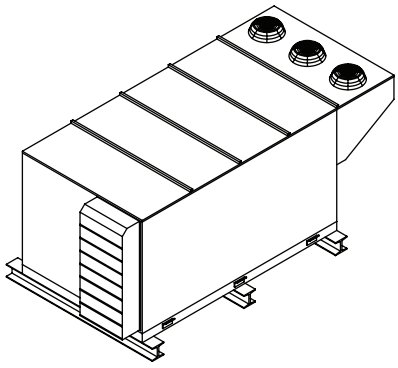
Model	Curb Cap Dimensions				
	A	B	C	D	E
ERCH-20	2.00	2.00	1.00	0.88	0.75
ERCH-45	2.00	4.25	2.00	1.31	0.50
ERCH-55	2.00	4.25	2.00	1.31	0.50
ERCH-90	2.00	4.25	2.00	1.31	0.50

All dimensions shown are in inches.

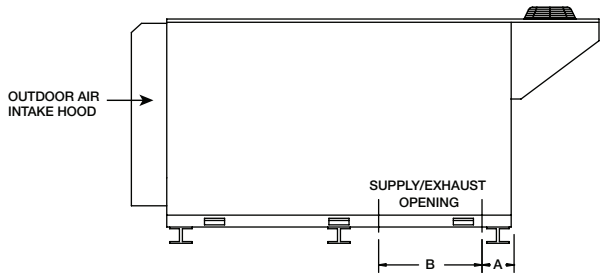
RAIL MOUNTING

Rail Layout

- Rails designed to handle the weight of the ERCH should be positioned as shown on the diagram (rails by others).
- Make sure that rail positioning does not interfere with the supply air discharge opening or the exhaust air intake opening on the ERCH unit. (Avoid area dimensioned “B” below).
- Rails should run the width of the unit and extend beyond the unit a minimum of 12 inches on each side.
- Set unit on rails.



Isometric view of unit on rails



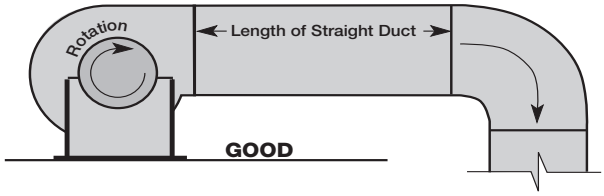
Side view of unit on rails

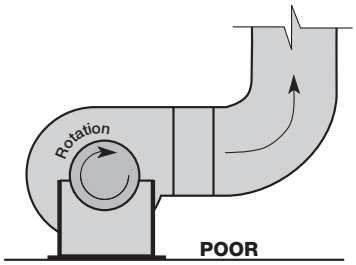
Model	Rail Mounting	
	A	B
ERCH-20	5.00	41.00
ERCH-45	7.00	41.90
ERCH-55	5.50	53.00
ERCH-90	6.00	59.00

All dimensions shown are in inches.

DUCTWORK CONNECTIONS

Examples of good and poor fan-to-duct connections are shown below. Airflow out of the fan should be directed straight or curve the same direction as the fan wheel rotates. Poor duct installation will result in low airflow and other system effects.





Recommended Discharge Duct Size and Length			
Model	Blower Size	Duct Size	Straight Duct Length
ERCH-20	9	14 x 14	36
ERCH-45	12	20 x 20	48
ERCH-55	15	28 x 28	60
ERCH-90	18	32 x 32	60

All dimensions shown are in inches.

- Recommended duct sizes are based on velocities across the cfm range of each model at approximately 800 feet per minute (FPM) at minimum airflow and up to 1600 fpm at maximum airflow. Recommended duct sizes are only intended to be a guide and may not satisfy the requirements of the project. Refer to plans for appropriate job specific duct size and/or velocity limitations.
- Straight duct lengths were calculated based on 100% effective duct length requirements as prescribed in AMCA Publication 201. Calculated values have been rounded up to nearest foot.

OUTDOOR AIR WEATHERHOOD

Outdoor air weatherhood will be factory mounted.

EXHAUST WEATHERHOOD

The exhaust weatherhood is shipped separately as a kit with its own instructions.

DAMPERS

Backdraft dampers are always included as an integral part of the exhaust hood assemblies. Motorized outdoor air and exhaust air dampers are optional and are factory mounted (and wired) at the intake.

ELECTRICAL INFORMATION

The unit must be electrically grounded in accordance with the current National Electrical Code, ANSI/NFPA 70. In Canada, use current CSA Standard C22.1, Canadian Electrical Code, Part 1. In addition, the installer should be aware of any local ordinances or electrical company requirements that might apply. System power wiring must be properly fused and conform to the local and national electrical codes. System power wiring is to the unit main disconnect (door interlocking disconnect switch standard on most units) or distribution block and must be compatible with the ratings on the nameplate: supply power voltage, phase, and amperage (Minimum Circuit Amps - MCA, Maximum Overcurrent Protection - MOP). All wiring beyond this point has been done by the manufacturer and cannot be modified without affecting the unit's agency / safety certification.

If field installing an additional disconnect switch, it is recommended that there is at least four feet of service room between the switch and system access panels. When providing or replacing fuses in a fusible disconnect, use dual element time delay fuses and size according to the rating plate.

Field Power Connection: Electronic wiring is run through the roof of the unit. All power and control connections should be run through the floor or side panel.

If power supply is desired through bottom of unit, run the wiring through the curb, cut a hole in the cabinet bottom, and wire to the disconnect switch. Seal penetration in cabinet bottom to prevent leakage.

The electric supply to the unit must meet stringent requirements for the system to operate properly. Voltage supply and voltage imbalance between phases should be within the following tolerances. If the power is not within these voltage tolerances, contact the power company prior to operating the system.

Voltage Supply - See voltage use range on the rating plate. Measure and record each supply leg voltage at all line disconnect switches. Readings must fall within the allowable range on the rating plate.

Voltage Imbalance - In a 3-phase system, excessive voltage imbalance between phases will cause motors to overheat and eventually fail. Maximum allowable imbalance is 2%. To determine voltage imbalance, use recorded voltage measurements in this formula.

Key: V1, V2, V3 = line voltages as measured

VA (average) = (V1 + V2 + V3) / 3

VD = Line voltage (V1, V2 or V3) that deviates farthest from average (VA)

Formula: % Voltage Imbalance = [100 x (VA-VD)] / VA

CAUTION

If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105ºC.

WARNING

To prevent injury or death due to electrocution or contact with moving parts, lock disconnect switch open.

WARNING

For units with a gas furnace, if you turn off the power supply, turn off the gas.

Most factory supplied electrical components are pre-wired. To determine what electrical accessories require additional field wiring, refer to the unit specific wiring diagram located on the inside of the unit control center access door. The low voltage control circuit is 24 Vac and control wiring should not exceed 0.75 ohms. Refer to Field Control Wiring Length/Gauge table for wire length maximums for a given wire gauge. Control wires should not be run inside the same conduit as that carrying the supply power. Make sure that field supplied conduit does not interfere with access panel operation.

Field Control Wiring Length/Gauge	
Total Wire Length	Minimum Wire Gauge
125 ft.	18
200 ft.	16
300 ft.	14
450 ft.	12

If wire resistance exceeds 0.75 ohms, an industrial-style, plug-in relay should be added to the unit control center and wired in place of the remote switch (typically between terminal blocks R and G on the terminal strip (refer to Typical Control Center Components). The relay must be rated for at least 5 amps and have a 24 Vac coil. Failure to comply with these guidelines may cause motor starters to "chatter" or not pull in which can cause contactor failures and/or motor failures.

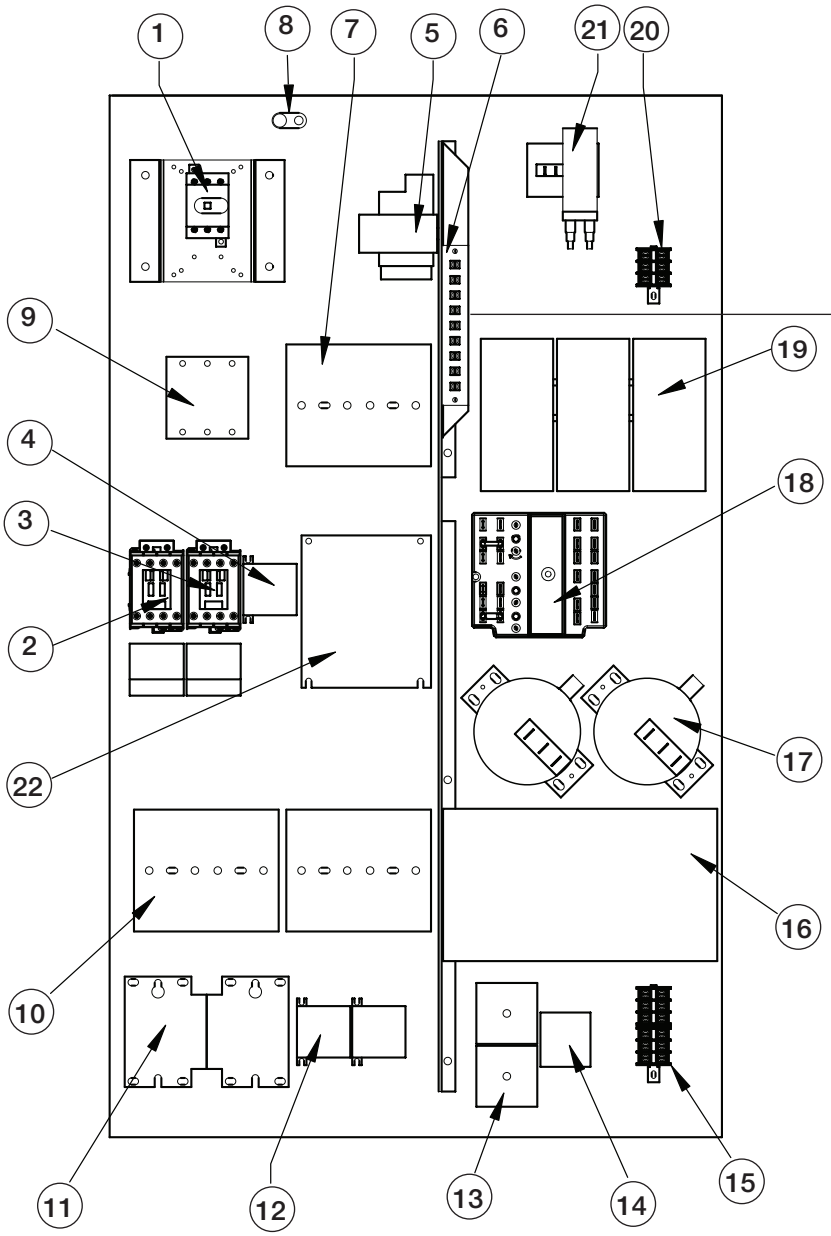
Note: Standard factory installed electric post-heaters have their own disconnect separate from the unit disconnect. Thus, each electric post-heater requires its own separate power connection.

CONTROL CENTER COMPONENTS

1. Main Disconnect (non-fusible, lockable)
2. Motor Starter - Exhaust Air Fan
3. Motor Starter - Outdoor Air Fan
4. Motor Contactor - Energy Wheel
5. 24 Vac Control Transformer
6. 24 Vac Terminal strip
7. Fuses for blower motors
8. Grounding lug
9. Distributor block
10. Compressor fuse blocks
11. Compressor contactors
12. Condensing fan contactors
13. Compressor cycle timers
14. Compressor relay
15. Terminal block

Optional Control Center Components

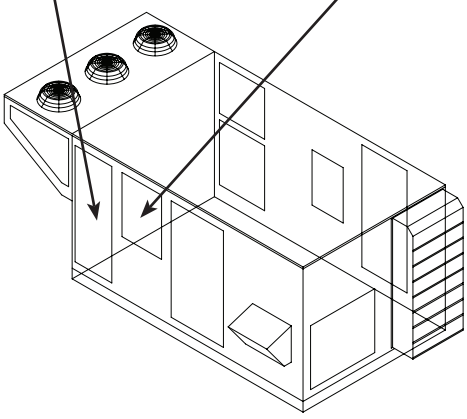
16. DDC controller
17. Dirty filter pressure switches
18. Economizer module
19. Thermostats for:
    - Economizer module
    - Energy Recovery wheel frost control
    - Compressor lock out
20. Terminal block
21. Frost control pressure switch
22. Energy recovery wheel VFD



Component #6 Exploded Detail of Terminal Strip

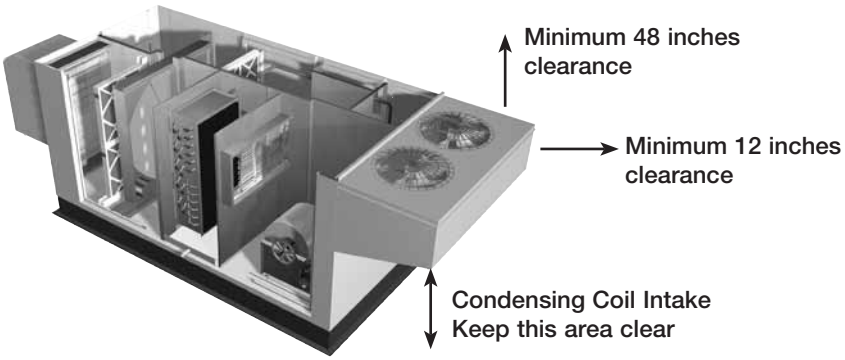
Refer to "Refrigeration System" section for components in compressor compartment

Access to Control Center Components is gained through the access panel indicated.



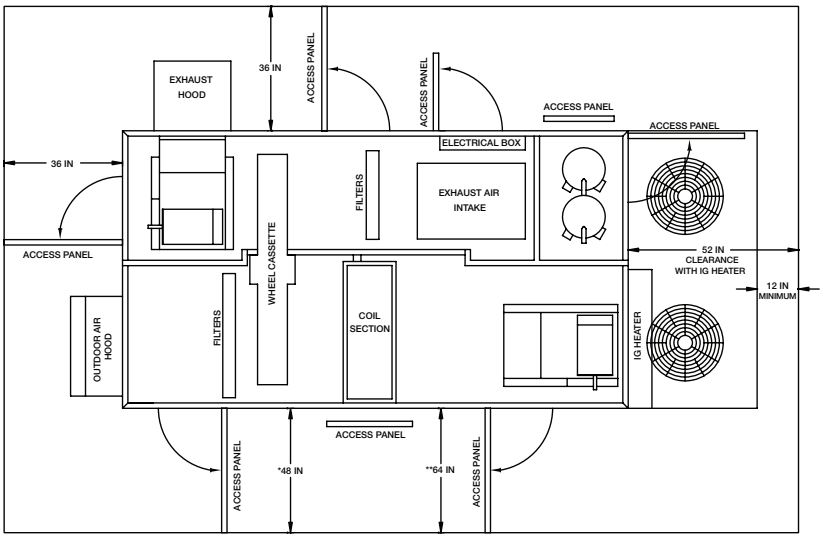
SERVICE CLEARANCES / ACCESS PANEL LOCATIONS FOR MODEL ERCH

Clearances must be maintained on all sides of this unit. This especially is true with the top of this unit. Hot air is being discharged through the condensing fans during operation, and the more clearance available, the better the chance of avoiding recirculation or coil starvation. This unit should never be placed under an overhang or inside a building. A minimum of 48 inches over the condensing fans is recommended.



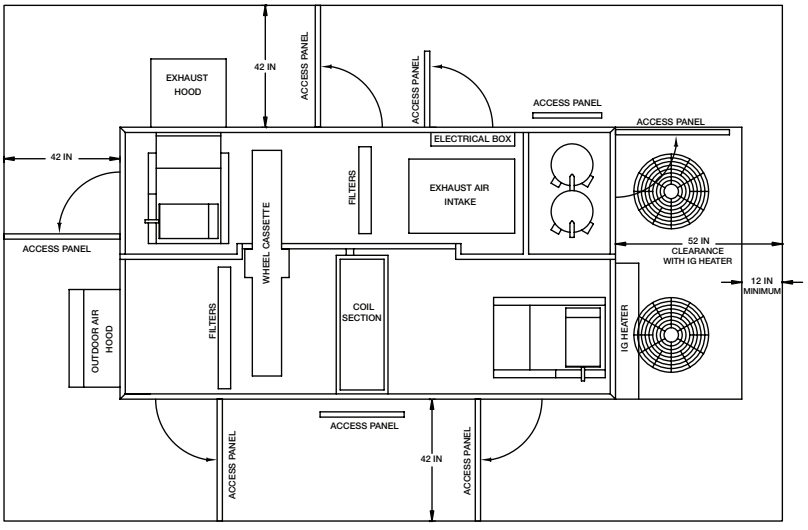
ERCH-20, 45, 55, and 90 units require minimum clearances for access on all sides for routine maintenance. Filter replacement, drain pan inspection and cleaning, energy wheel cassette inspection, fan bearing lubrication and belt adjustment are examples of routine maintenance that must be performed. Blower and motor assemblies, energy recovery wheel cassette, coil and filter sections are always provided with a service door or panel for proper component access. Clearances for component removal may be greater than the service clearances, refer to drawings for these dimensions.

ERCH-20
ERCH-45



Clearances for service and component removal on ERCH-20 and ERCH-45
* Clearance for energy wheel removal on ERCH-20
** Clearance for energy wheel removal on ERCH-45

ERCH-55
ERCH-90



Clearances for service and component removal on ERCH-55 and ERCH-90

DIMENSIONAL DATA / ACCESS DOOR DESCRIPTIONS AND LOCATIONS

Model	Exterior Dimensions									
	A	B	C	D	E	F	G	H	I	J
ERCH-20	108	50	56	27	28.5	17	6	14.25	18	18
ERCH-45	119	69	66	38	41	23.375	10.5	13.375	20	16
ERCH-55	133.5	70	76	39	59.5	5.875	7.125	21.25	25	16
ERCH-90	151.5	85	96	46	78	2.875	10	24.5	27	16

All dimensions shown are in inches.

Model	Overall Exterior Dimensions		
	Width (including Lifting Lugs)	Overall Width (with Exhaust Hood)	Overall Length (with Outdoor Air Hood)
ERCH-20	59.5	75	116
ERCH-45	69.5	86	122
ERCH-55	79.5	101	134
ERCH-90	99.5	123	147

All dimensions shown are in inches.

Following is a list of items accessible through the access doors shown on the diagrams. Some items are optional and may not have been provided.

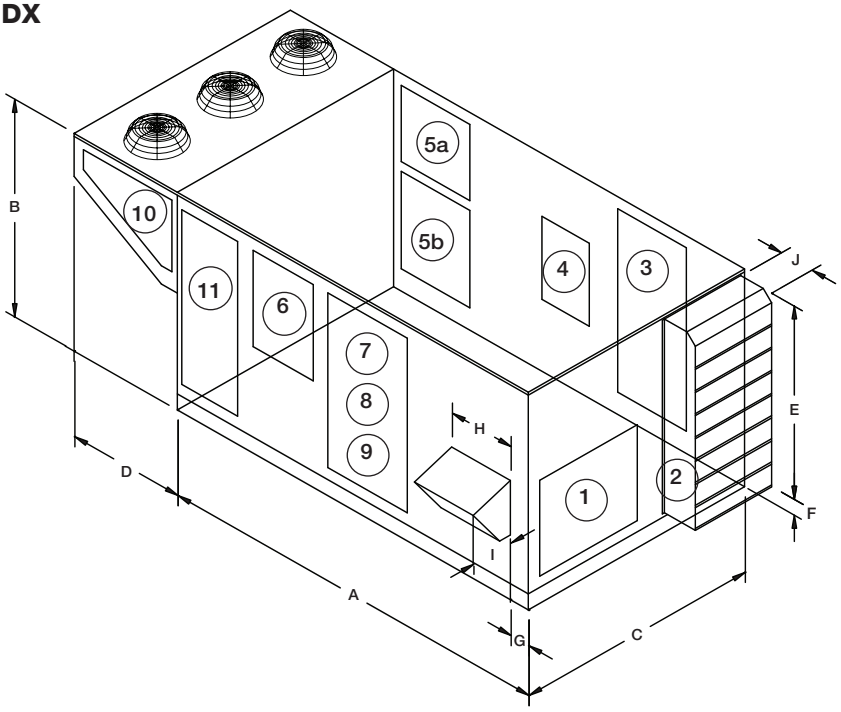
1. Exhaust blower, motor, and drives
2. Aluminum mesh filters (intake hood)
3. Energy recovery wheel, motor, belt, and seals
   Outdoor air filters
   Outdoor air intake damper (optional)
   Electric preheater (optional)
   Frost control sensors (optional)
   Economizer sensors (optional)
4. Coil access / Drain pan

5a. Outdoor air blower, motor, and drives (with indirect gas furnace)
   Drain Pan

5b. Outdoor air blower, motor, and drives (without indirect gas furnace)
   Coil access / Drain pan (w/o Electric Heat)

6. Control center
   All electrical controls
   VFD for energy recovery wheel (optional)
7. Exhaust air filters
   Exhaust air intake damper (optional)
8. Electric post-heater control center (optional)
9. Bypass damper (optional)
10. Condensing fan motors
11. Compressor(s) - refer to Refrigeration System section for components in compressor compartment

Model ERCH with Packaged DX

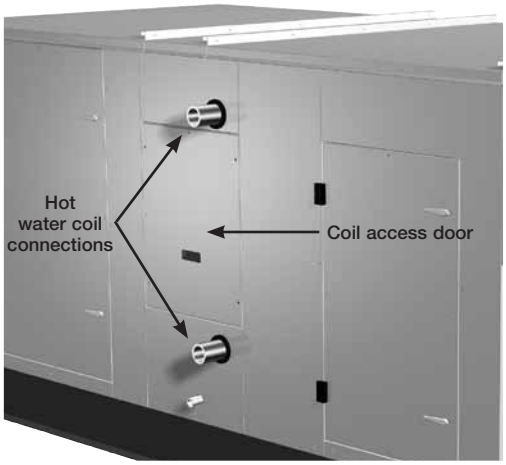


COIL APPLICATION RECOMMENDATIONS

Factory installed cooling and heating components are mounted in the coil section of the unit. The coil section is downstream of the energy wheel on the supply air side of the unit.

Note the coil connection locations on the picture. Coil connections are located external to the unit as shown. Coil connections that are not external have been ordered from the factory with interior or exhaust airstream coil connections.

Note: DX coil liquid connection is internal to units.



WATER COILS

1. Piping should be in accordance with accepted industry standards. Pipework should be supported independently of the coils. Water connections are male NPT iron pipe. When installing couplings, do not apply undue stress to the connection extending through the unit. Use a backup pipe wrench to avoid breaking the weld between coil connection and header.
2. Connect the WATER SUPPLY TO THE BOTTOM CONNECTION on the air leaving side and the WATER RETURN TO THE TOP CONNECTION on the air entering side. To insure proper venting, an external air vent in the piping is recommended. Connecting the supply and/or return in any other manner will result in very poor performance. Be sure to replace factory installed grommets around coil connections if removed for piping. Failure to replace grommets will result in water leakage into the unit and altered performance.
3. The air vent at the uppermost point should be temporarily opened during system start-up to release all of the air from the coil. To maintain heat transfer capacity, periodically vent any air in coil.
4. Water coils are not normally recommended for use with entering air temperatures below 40ºF; however, the energy recovery wheel maintains a pre-coil temperature higher than 40ºF. No control system can be depended on to be 100% safe against freeze-up with water coils. Glycol solutions or brines are the only safe media for operation of water coils with low entering air conditions.

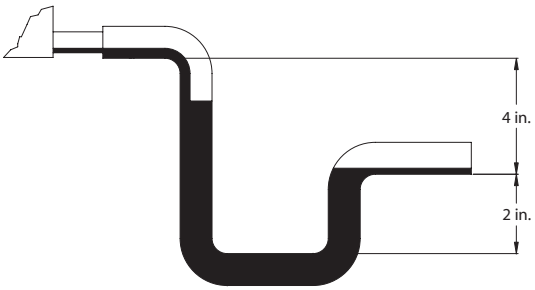
   CONTINUOUS WATER CIRCULATION THROUGH THE COIL AT ALL TIMES IS HIGHLY RECOMMENDED.
5. Pipe sizes for the system must be selected on the basis of the head (pressure) available from the circulation pump. The velocity should not exceed 6 feet per second and the friction loss should be approximately 3 feet of water column per 100 feet of pipe.

DIRECT EXPANSION (DX) COILS WITH INTEGRAL CONDENSING SECTION

1. The condensate drain pipe should be sized adequately to ensure the condensate drains properly. Refer to Drain Trap section.

DRAIN TRAP

Cooling coils are provided with a stainless steel drain pan with 1-inch male NPT drain connection. A drain trap must be connected to the drain connection to allow excess water to flow out of the drain pan. More importantly, though, due to the negative internal static of the cooling coil compartment, installing the drain trap prevents outdoor air from being pulled into the drain pan and consequently forcing water out of the pan and into the unit.



To ensure the drain trap works properly, the trap height must account for the difference in static pressure between ambient conditions outside the unit and the internal negative pressure of the cooling coil compartment. For energy recovery units, an assumption of 3.0 in. wg differential will be sufficient. This would require a trap design as shown. If the internal static is believed to be higher, consult factory.

Refer to local codes to determine drainage requirements. If draining onto to roof, place a drip pad below drain to protect roof. If draining onto roof is not acceptable, a drain line must be attached to the trap. The drain line must be pitched away from the unit at least 1/8-in. per foot. On longer runs, an air break should be used to ensure proper drainage. Local codes may require drainage into a waste water system.

Drainage problems not only occur from improper drain trap design, but also from lack of maintenance of the cooling coil compartment. Algae can form in the drain pan and trap and cause reduced water flow, which can in turn result in backup into the system. Regular maintenance will prevent this from occurring. If the drains have a cleanout opening, be sure to close the opening after cleaning.

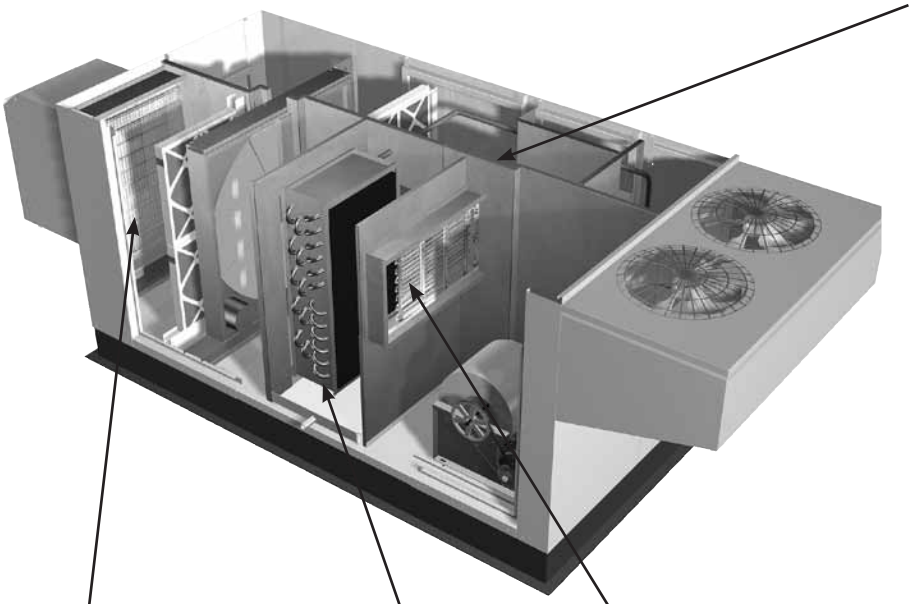
OPTIONAL ACCESSORIES

Electric Heater Application/Operation

Factory installed electric heaters can be provided for preheat and/or post-heat. An electric preheater warms the outdoor air prior to the energy recovery wheel to prevent frosting on the wheel. An electric post-heater warms the air leaving the energy recovery wheel to a user specified discharge temperature. Electric heaters are available in 208, 230, or 460 Vac (refer to heater nameplate for voltage).

Preheaters: Preheaters are standard as 2-stage, step control. Step control heaters are designed with multiple stages made up of equal increments of heating capability. For example, a 10 kW heater with two stages will be composed of two 5-kW stages. Preheaters are single point wired at the factory. A temperature sensor (with field adjustable set point) is mounted in the outdoor airstream after the preheater to turn the preheater on. See Frost Control Application /Operation for typical set points. If the temperature falls below the set point and the wheel pressure drop sensor is triggered, the first stage of the preheater will turn on. If the first stage does not satisfy the set point, the second stage will also turn on.

Post-heaters: Post-heaters are standard as SCR control. Post-heaters are not single point wired (see Electrical Connections). A temperature sensor (with field adjustable set point) is mounted in the outdoor airstream after the post-heater to turn the post-heater on. A SCR heater provides an infinitely modulating control of the heat to provide an accurate discharge temperature. A call for heat is required.



Electric Preheater
The pre-heater is single point wired to the ERCH control center. Access to the preheater control panel is through the supply filter door.

DX Cooling Coil

Electric Post-Heater

Post-Heater Control Panel
The post-heater is not single point wired to the ERCH control center. Separate power must be supplied to the post-heater disconnect (located in unit control center).

See 'Access Door Descriptions and Locations' for access to post-heater control panel. For Model ERCH, the exhaust filters must be removed from the unit to access.

OPTIONAL ACCESSORIES

Frost Control Application/Operation

Extremely cold outdoor air temperatures can cause moisture condensation and frosting on the energy recovery wheel. Frost control is an optional feature that will prevent/control wheel frosting. Three options are available:

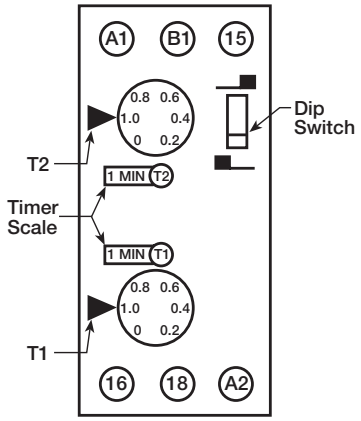
1) Timed Exhaust frost control
2) Electric preheat frost control
3) Modulating wheel frost control

Indoor RH @ 70°F	Frost Threshold Temp
20%	-10° F
30%	-5° F
40%	0° F

Frost Threshold Temperatures

All of these options are provided with a thermostat (with probe) mounted in the outdoor air intake compartment and a pressure sensor to monitor pressure drop across the wheel. The typical temperature setting corresponds to the indoor air relative humidity as shown in the Frost Threshold Temperatures Table and represents when frost can occur. An increase in pressure drop would indicate that frost is occurring. Both the pressure sensor **AND** the outdoor air temperature sensor must trigger in order to initiate frost control. The two sensors together ensure that frost control is only initiated during a real frost condition. Field wiring of a light (or other alarm) between 6 & C in the control center will notify personnel when unit is in frost control mode (refer to Remote Panel Wiring schematics section for wiring details). The following explains the three options in more detail.

Timed exhaust frost control includes a timer in addition to the thermostat and wheel pressure sensor. When timed exhaust frost control is initiated, the timer will turn the supply blower on and off to allow the warm exhaust air to defrost the energy recovery wheel. Default factory settings are 5 minutes off and 30 minutes on. Use the following test procedure for troubleshooting.



Timer

Testing (refer to diagram at right)

- Jumper the wheel pressure switch in the unit control center. Set the Timer Scale for T1 and T2 to 1 minute. Set the Timer Settings for T1 and T2 to 1.0. Set the dip switch to the down position. (normal position)
- Turn the temperature sensor up as high as possible. The supply blower should cycle on for one minute, then turn off for one minute.
- After testing, set the ***Timer Scale*** as follows: T1 = 10 minutes, T2 = 1 hour
- Set the **Timer Settings** as follows: T1 = 0.5, T2 = 0.5. The timer is now set for 5 minutes off and 30 minutes on. *Remember to remove the jumper.*

Electric preheat frost control includes an electric heater (at outdoor air intake) and an airflow pressure switch (located at the preheater) in addition to the thermostat and pressure sensor on wheel. (Refer to Electric Heater Application/Operation for electric preheater location). When electric preheat frost control is initiated, the electric preheater will turn on and warm the air entering the energy wheel to avoid frosting. Use the following test procedure for troubleshooting.

Testing

- Turn the thermostat as high as it will go and jumper the wheel pressure sensor. The heater should turn on.
- If it doesn't, either put the outdoor air side doors on or temporarily jumper the airflow pressure switch in the preheater control center to avoid nuisance tripping of the pressure switch. Also check the airflow switch pressure tap located at the supply discharge blower to ensure the tubing is connected and the tap is not blocked. *Remember to remove the jumpers.*

Modulating wheel frost control includes a variable frequency drive in addition to the thermostat and pressure sensor. When modulating wheel frost control is initiated, the variable frequency drive will reduce the speed of the wheel. Reducing the speed of the energy wheel reduces its effectiveness, which keeps the exhaust air condition from reaching saturation, thus, eliminating condensation and frosting. If the outdoor air temperature is greater than the frost threshold temperature OR the pressure differential is less than the set point, the wheel will run at full speed. If the outdoor air temperature is less than the frost threshold temperature AND the pressure differential is greater than the set point, the wheel will run at reduced speed until the pressure differential falls below the set point. The temperature and pressure differential set points are set at the factory, but are field-adjustable (refer to VFD section for more information). The variable frequency drive will be fully programmed at the factory.

OPTIONAL ACCESSORIES

Economizer Application/Operation

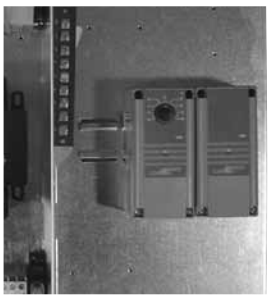
The energy recovery wheel operation can be altered to take advantage of economizer operation (free cooling). Two modes are available: 1) De-energizing the wheel or 2) Modulating the wheel. A field supplied call for cool (Y1) is required.

De-energizing the wheel is accomplished with a signal from a Temperature or Enthalpy sensor mounted in the air intake compartment. This Primary sensor will de-energize the energy wheel when the outdoor air temperature (factory default is 65ºF) or enthalpy (factory default is the 'D' setting) is below the field adjustable set point. An Override temperature sensor is also furnished in the outdoor air intake compartment to deactivate economizer mode. The Override (with field adjustable set point) is set at some temperature lower than the Primary sensor (factory default is 50ºF). Effectively, the two sensors create a deadband where the energy recovery wheel will not operate and free cooling from outside can be brought into the building unconditioned.

Testing

Temperature Sensor with Override

- Turn both Temperature and Override thermostats down as low as they go. The wheel should be rotating.
- Turn the Temperature sensor up as high as it goes, and keep the Override sensor as low as it will go. The wheel should stop rotating.
- Turn both sensors as high as they will go. The wheel should start rotating.
- Set the Temperature sensor at desired point for economizer operation to begin. Set the Override sensor at desired point for economizer operation to end (factory default is 65ºF and 50ºF, respectively).

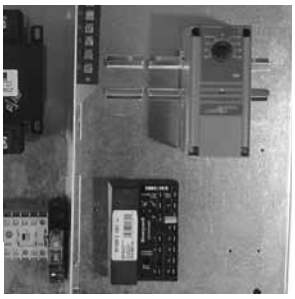


Temperature Sensor with Override

Enthalpy Sensor with Override

- Turn unit power off. Disconnect C7400 solid state enthalpy sensor from terminal So on the enthalpy controller. Also, disconnect the 620 ohm resistor from terminal Sr on the enthalpy controller. Turn unit power on. The LED on the enthalpy controller should light and the energy recovery wheel should not rotate.
- Turn unit power off. Reconnect 620 ohm resistor to terminal Sr on the enthalpy controller. Turn unit power on. The LED on the enthalpy controller should not light and the energy recovery wheel should energize and rotate.

  If the steps above provide the results described, the enthalpy economizer is working properly.
- Turn unit power off. Reconnect C7400 solid state enthalpy sensor to terminal So.



Enthalpy Sensor with Override

Enthalpy Controller

Modulating the Wheel

In applications in which an internal heat gain is present in the space, the rotational speed of the energy wheel may be modulated (via variable frequency drive) to avoid overheating the space during the winter. The speed of the energy wheel will be controlled in response to the discharge temperature set point.

Sequence of Operation: The variable frequency drive is fully programmed at the factory (refer to VFD section for more information). A "call for cool" must be field wired to the unit (terminals provided in unit - refer to wiring diagram in unit control center) to allow for initiation of economizer mode. When the space calls for cooling, factory supplied controls will drive the following wheel operations:

$T_{OA} > T_{RA}$: Wheel runs at full speed (maximum energy recovery)

$T_{OA} < T_{RA}$ and $T_{OA} > T_{SA}$: Wheel is stopped (no energy recovery)

$T_{OA} < T_{RA}$ and $T_{OA} < T_{SA}$: Wheel will modulate to maintain discharge temperature

where (T_{OA}) is the outdoor air temperature set point, (T_{RA}) is the return air temperature set point, and (T_{SA}) is the supply air discharge thermostat set point.

OPTIONAL ACCESSORIES

Variable Frequency Drives for Energy Recovery Wheel

Factory installed VFD for the energy recovery wheel are programmed at the factory per the settings shown below. Refer to the instruction manual that ships with the unit when making adjustments. A copy of the manual can be found online at www.drives.com. For technical support, contact Yaskawa direct at 1-800-927-5292.

Yaskawa GPD-305 Drive

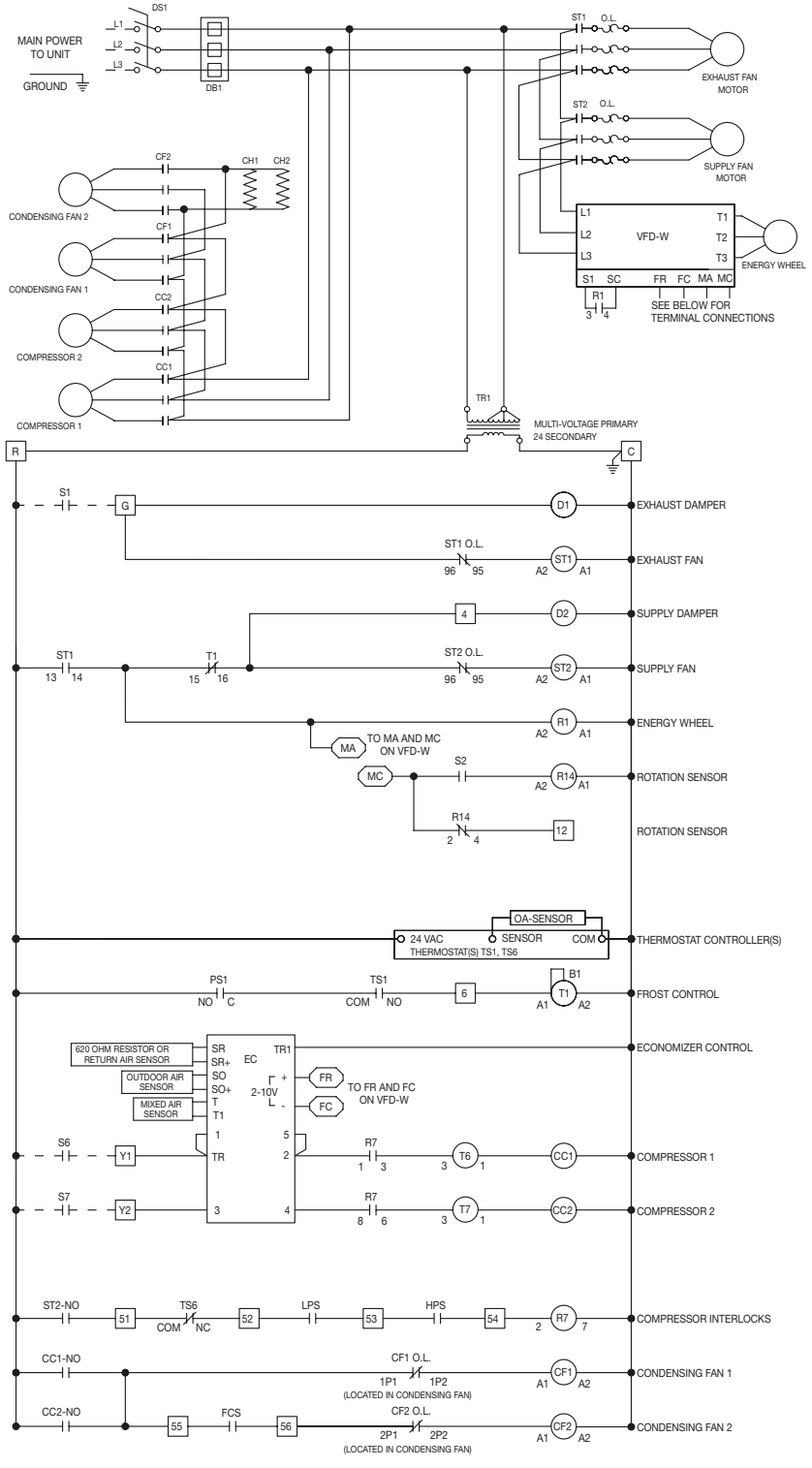
Parameter		Setting
n01	Access Level	1
n30	Ref Upper Limit	100% or 66%*
n32	Motor Rated FLA	Motor FLA
n33	Elect Thermal Overload	1
n36	Multi-Function input (terminal S2)	10
n40	Multi-Function output (MA,MB,MC)	4
n41	Analog Freq. Reference Gain	0
n42	Analog Freq. Reference Bias	99
n46	Carrier Frequency	2
n58	Frequency Detection Level	20
n01	Access Level	0

*36 inch wheel is 66% (40Hz). All other wheels are 100% (60Hz).

OPTIONAL ACCESSORIES

Wiring Diagram

Following is an example of a typical wiring diagram located in the unit control center. This wiring diagram includes a legend highlighting which accessories were provided with the unit. Factory wiring and field wiring are also indicated. This particular example includes 1) variable frequency drives on the blowers requiring a modulating input, 2) modulating energy recovery wheel with factory controls for economizer, 3) energy recovery wheel rotation sensor, 4) outdoor air and exhaust air dirty filter switches, 5) motorized outdoor air and exhaust air intake dampers, and 6) timed exhaust frost control. Many other factory installed and wired accessories are available.



LEGEND

	C1	COOLING STAGE 1 RELAY
	C2	COOLING STAGE 2 RELAY
*	CC	COMPRESSOR CONTACTOR
*	CF	CONDENSING FAN CONTACTOR
*	CH	COMPRESSOR SUMP HEATER
*	D	DAMPER
*	DB	POWER DISTRIBUTION BLOCK
	DL	DAMPER LIMIT SWITCH
*	DS	DISCONNECT SWITCH
*	EC	ECONOMIZER CONTROLLER
*	FCS	CONDENSOR FAN CYCLE SWITCH
	FU	FUSES
	FU5	CONTROL TRANSFORMER FUSES (NOT ON CLASS II)
	FZ1	FREEZE PROTECTION
	HG	HOT GAS REHEAT VALVE
*	HPS	HIGH PRESSURE SWITCH (MANUAL RESET)
*	LPS	LOW PRESSURE SWITCH
*	PS1	WHEEL FROST PRESSURE SWITCH
*	PS2	SUPPLY DIRTY FILTER PRESSURE SWITCH
*	PS3	EXHAUST DIRTY FILTER PRESSURE SWITCH
*	R1	ENERGY WHEEL RELAY/CONTACTOR
	R2	OCCUPIED/UNOCCUPIED RELAY
	R3	EXHAUST BLOWER VFD RELAY
	R4	SUPPLY BLOWER VFD RELAY
	R5	MODULATING WHEEL FROST CONTROL RELAY
	R6	ECONOMIZER RELAY
*	R7	COMPRESSOR INTERLOCK RELAY
	R8	EVAP RELAY (INDIRECT)
	R9	EVAP RELAY (DIRECT)
	R10	UNIT RELAY
	R11	POST HEAT RELAY
	R12	DEHUMIDIFICATION RELAY
	R13	ROOM CALL FOR HEAT RELAY
*	R14	ROTATION SENSOR RELAY
	R15	ROTATION SENSOR RELAY
o	S1	FAN SWITCH
*	S2	ROTATION SENSOR (LOCATED BY WHEEL)
	S3	ROTATION SENSOR (LOCATED BY WHEEL)
	S4	CALL FOR HEAT SWITCH
	S5	OCC/UNOCC SWITCH - CLOSED=OCCUPIED/OPEN=UNOCCUPIED
o	S6	CALL FOR COOL SWITCH (FIRST STAGE)
o	S7	CALL FOR COOL SWITCH (SECOND STAGE)
	S8	CALL FOR DEHUMIDIFICATION SWITCH
*	ST	MOTOR STARTER
*	T1	FROST CONTROL TIMER TYPICAL SETTINGS t1(OFF) = 5 MIN., t2(ON) = 30 MIN.
	T4	ECONOMIZER WHEEL JOG TIMER TYPICAL SETTINGS t1(OFF) = 3 HRS., t2(ON) = 10 SEC.
	T5	EVAP DELAY OFF TIMER
*	T6	COMPRESSOR MINIMUM OFF TIMER (TYP. 3 MIN.)
*	T7	COMPRESSOR MINIMUM OFF TIMER (TYP. 3 MIN.)
*	TR	TRANSFORMER
*	TS1	FROST CONTROL THERMOSTAT (JUMPER - HEAT) CLOSES ON TEMP. DECREASE TYPICAL SETTING 5° F.
	TS2	ECONOMIZER LOW LIMIT THERMOSTAT (JUMPER - HEAT) OPENS ON TEMP. DECREASE TYP. SETTING 20° OFFSET OR 50°F.
	TS3	ECONOMIZER UPPER LIMIT THERMOSTAT (JUMPER - HEAT) CLOSES ON TEMP. DECREASE TYP. SETTING 65° F./2° DIFF.
	TS4	ROOM OVERRIDE SENSOR
	TS5	INLET AIR POST HEATER LOCKOUT THERMOSTAT (AFTER WHEEL) CLOSES ON TEMP. DECREASE TYPICAL SETTING 65° F.
*	TS6	INLET AIR COMPRESSOR LOCKOUT THERMOSTAT (JUMPER-HEAT) OPENS ON TEMP. DECREASE TYPICAL SETTING 60° F./2° DIFF.

* FACTORY SUPPLIED AND WIRED

o FIELD WIRED

FIELD CONTROL WIRING RESISTANCE SHOULD NOT EXCEED 0.75 OHM.
IF RESISTANCE EXCEEDS 0.75 OHM THEN CONSULT FACTORY.
USE 14 GAUGE MINIMUM WIRE THICKNESS FOR CONTROL WIRING.

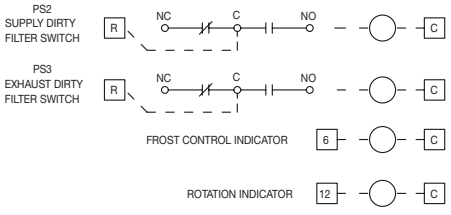
REPLACEMENT FUSES: MUST HAVE A MINIMUM I.R. RATING OF 5 KA

CAUTION:
UNIT SHALL BE GROUND IN ACCORDANCE WITH N.E.C.
POWER MUST BE OFF WHILE SERVICING.

USER INTERFACE CONNECTIONS:

USER TO VERIFY THAT TR1 CAN HANDLE THE VA LOAD OF INDICATOR DEVICES.

DIRTY FILTER INDICATOR SHOWN AS 24V POWER FROM UNIT.



OPTIONAL ACCESSORIES

Rotation Sensor

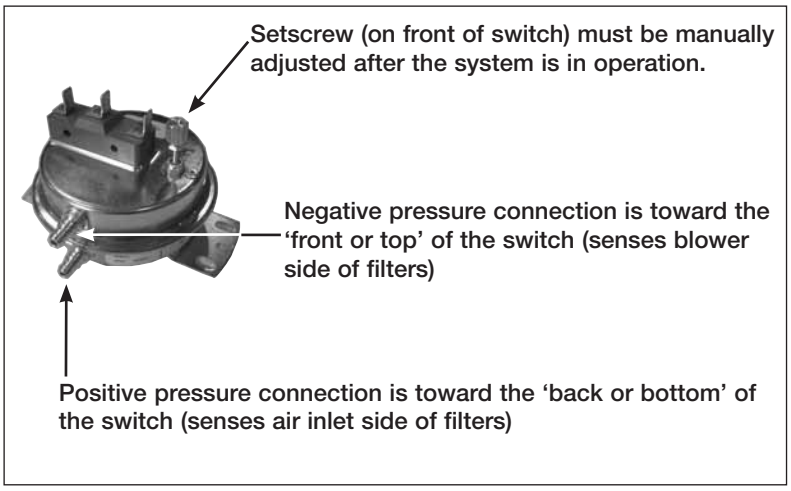
The rotation sensor monitors energy recovery wheel rotation. If the wheel should stop rotating, the sensor will close a set of contacts in the unit control center. Field wiring of a light (or other alarm) between terminals R & 12 in the unit control center will notify maintenance personnel when a failure has occurred (refer to Remote Panel Wiring Schematics section for wiring details).

Dirty Filter Sensor

Dirty filter sensors monitor pressure drop across the outdoor air filters, exhaust air filters, or both. If the pressure drop across the filters exceeds the set point, the sensor will close a set of contacts in the unit control center. Field wiring of a light (or other alarm) to these contacts will notify maintenance personnel when filters need to be replaced.

The switch has not been set at the factory due to external system losses that will affect the switch. This switch will need **minor field adjustments** after the unit has been installed with all ductwork complete. The dirty filter switch is mounted in the exhaust inlet compartment next to the unit control center or in unit control center.

To adjust the switch, the unit must be running with all of the access doors in place, except for the compartment where the switch is located (exhaust intake compartment). The adjusting screw is located on the top of the switch. Open the filter compartment and place a sheet of plastic or cardboard over 50% of the filter media. Replace the filter compartment door. Check to see if there is power at the alert signal leads (refer to electrical diagram). Whether there is power or not, turn the adjustment screw on the dirty filter gauge (clockwise if you did not have power, counterclockwise if you did have power) until the power comes on or just before the power goes off. Open the filter compartment and remove the obstructing material. Replace the door and check to make sure that you do not have power at the alert signal leads. The unit is now ready for operation.



DDC Temperature Control Package

Temperature control package allows for stand-alone operation of energy recovery units provided with supplemental cooling and heating. Controller can be ordered for discharge or room control. Room control would require a room thermostat (or other call for heat or cool) be wired to the controller. A remote panel option is also available to allow set points and other controller parameters to be adjusted from a remote location. For additional information, refer to the controls catalog and Installation, Operation and Maintenance Manual.

OPTIONAL ACCESSORIES

CO_2 Sensor

This accessory is often used to provide a modulating control signal to a variable frequency drive to raise and lower airflow in relationship to the CO_2 levels in the space. This strategy is often referred to as Demand Control Ventilation and provides further energy savings to the system. Follow instructions supplied with sensor for installation and wiring details.

Service Outlet

120 Vac GFCI service outlet ships loose for field installation. Requires separate power source so power is available when unit main disconnect is turned off for servicing.

Vapor Tight Lights

Vapor tight lights provide light to each of the compartments in the energy recovery unit. The lights are wired to a junction box mounted on the outside of the unit. The switch to turn the lights on is located in the unit control center. The switch requires a separate power source to allow for power to the lights when the unit main disconnect is off for servicing.

OPTIONAL ACCESSORIES

Remote Control Panel and Wiring Schematics

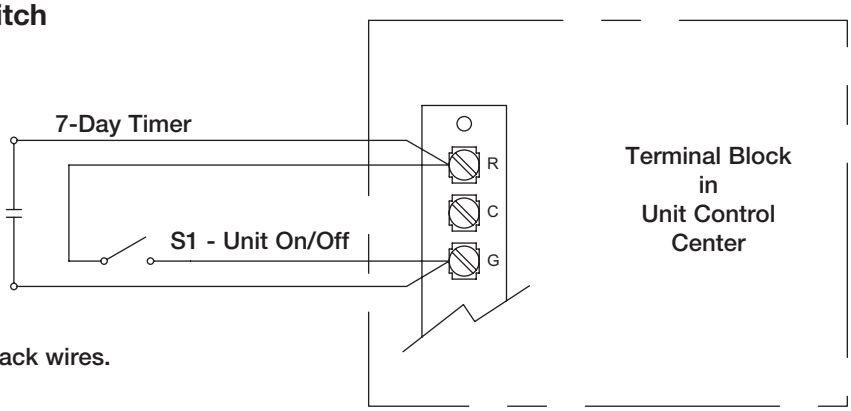
The remote panel is available with a number of different alarm lights and switches to control the unit. The remote panel ships loose and requires mounting and wiring in the field.

The remote panel is available with the following options:

- Unit on/off switch
- Unit on/off light
- 7-day time clock
- Hand/off/auto switch
- Dirty filter light
- Economizer light
- Frost control light
- Wheel rotation sensor light

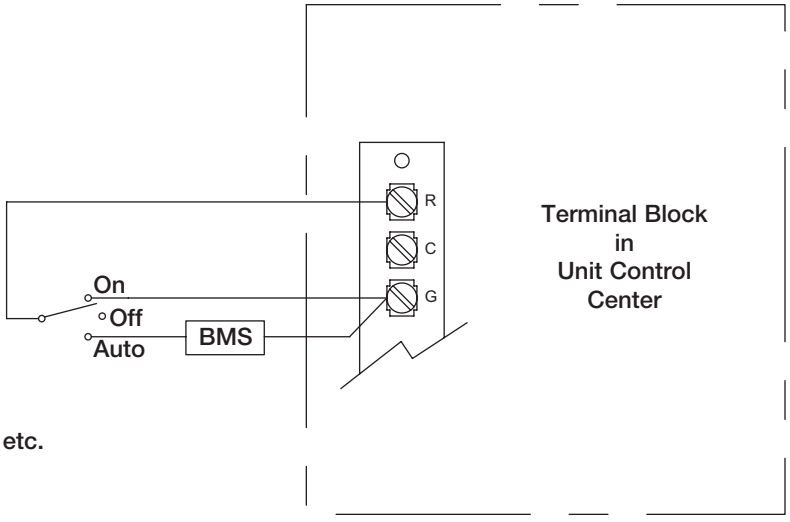
Refer to Electrical Connections section for Field Control Wiring recommendations.

7-Day Timer or On/Off Switch



For 7-Day Timer, use blue and black wires.
Red wires should be capped off.

Hand/Off/Auto Switch



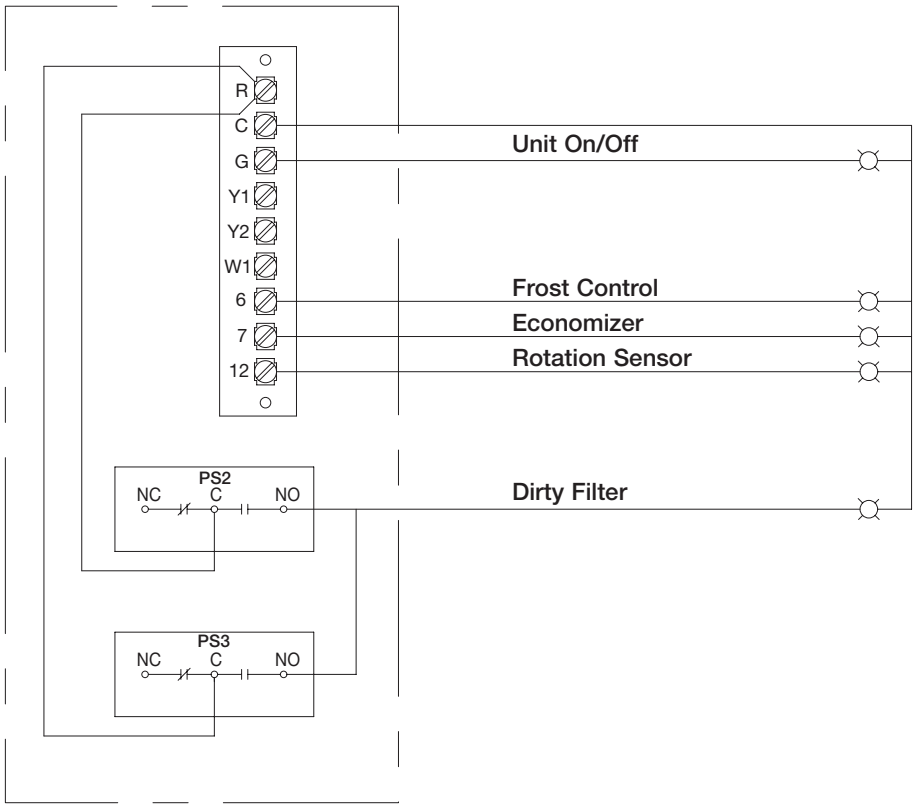
Hand/Off/Auto Switch allows the unit to
"Off" - off
"On" - Manual Operation
"Auto" - Unit is controlled by BMS, RTU, etc.

NOTE: RTU controllers are by others.

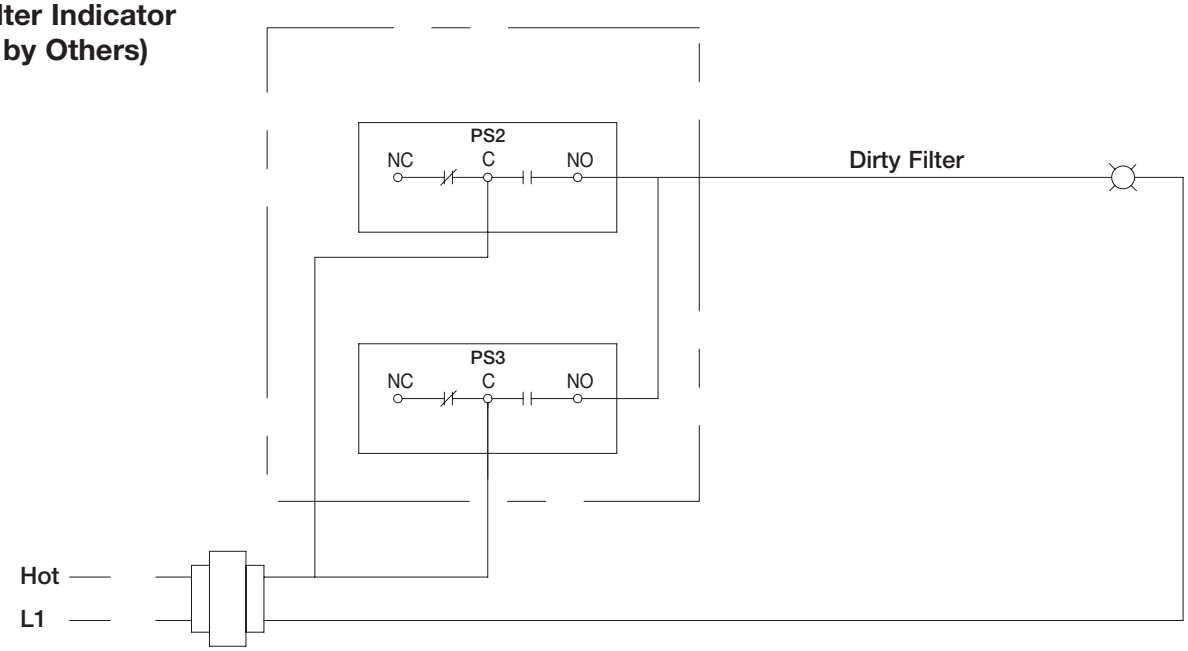
OPTIONAL ACCESSORIES

Remote Panel Wiring Schematics

Indicator Lights powered by the ER Unit



Dirty Filter Indicator (Power by Others)

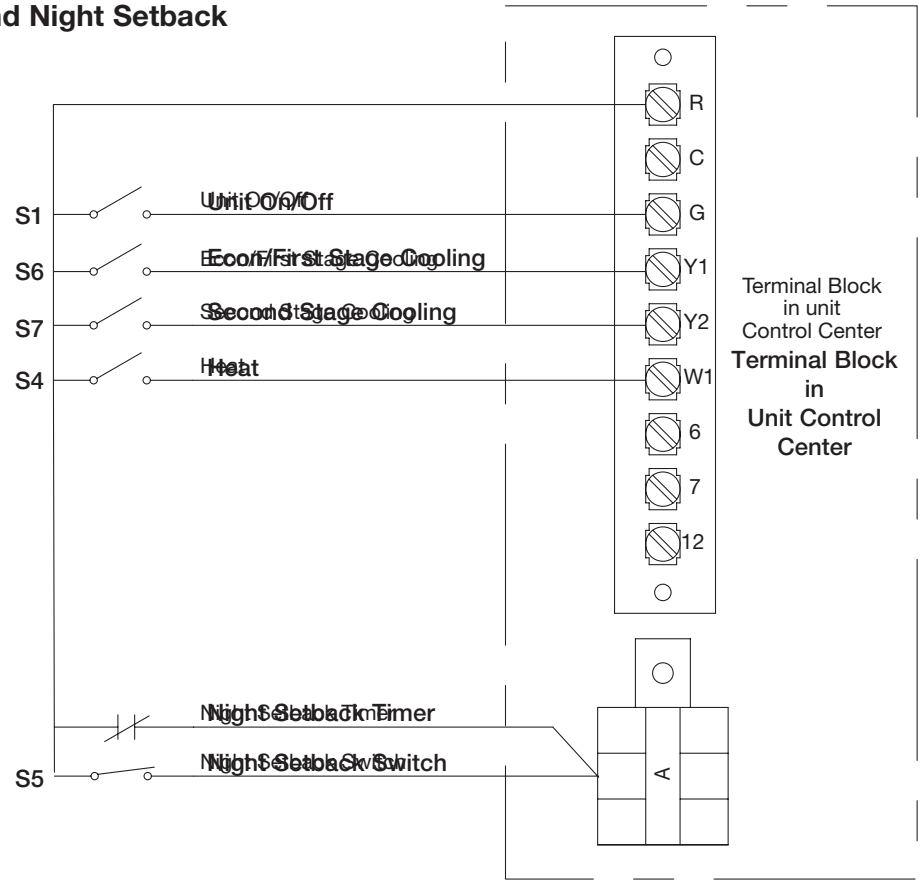


Refer to Pressure Switch for voltage and load ratings.

OPTIONAL ACCESSORIES

Remote Panel Wiring Schematics

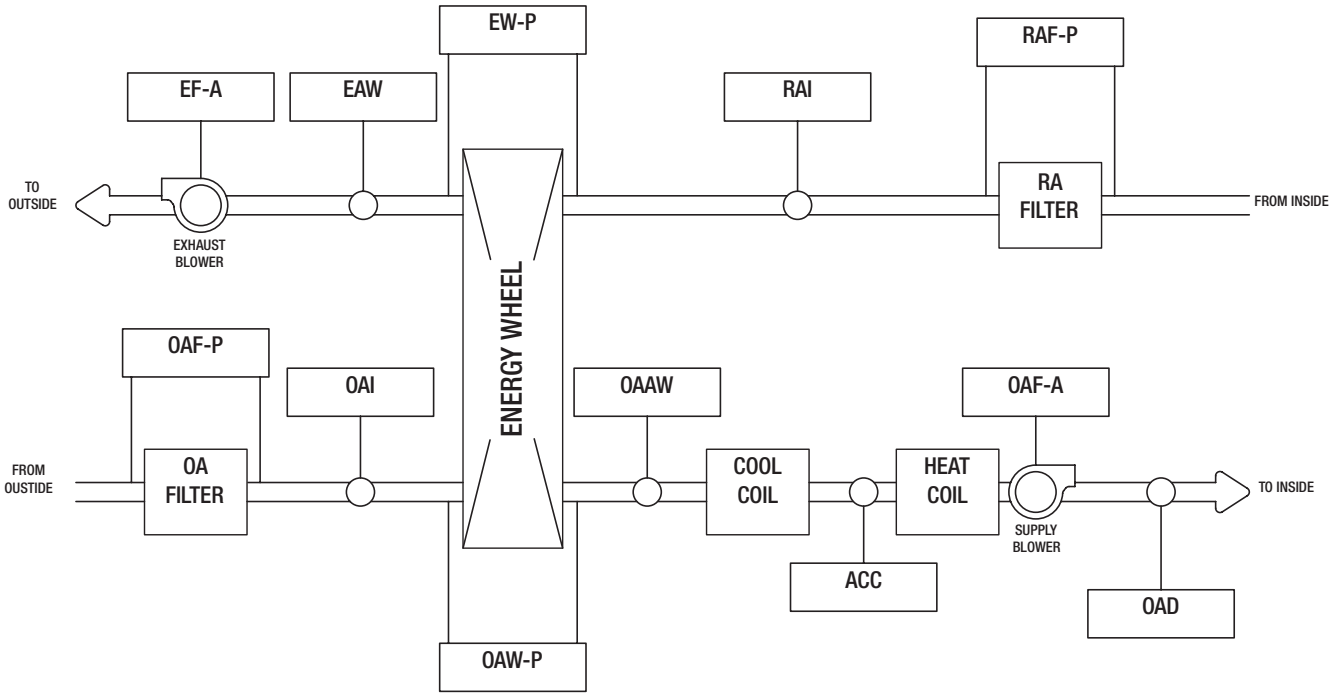
Heating/Cooling Switches and Night Setback Switch/Timer



OPTIONAL ACCESSORIES

Sensors Mounted by Factory

Factory mounted temperature, pressure, and current sensors are available in the locations indicated on the unit diagram below. A list of available sensors is shown below. The specific sensors provided on a given unit are labeled in the unit control center on the terminal strip. Sensors are wired to the terminal strip to make it easy for the controls contractor to connect the Building Management System for monitoring purposes.



Temperature Sensors - 1K Ohm RTD	
Drawing Labels	Terminal Strip Labels
OAI	OA/Supply Inlet Temp
OAAW	OA After Wheel
ACC	After Cooling Coil Temp
OAD	Supply Discharge Temp
EAW	Exhaust After Wheel Temp
RAI	RA/Exhaust Inlet Temp

Pressure Sensors (analog or digital)	
Drawing Labels	Terminal Strip Labels
OAF-P	OA/Supply Filter Pressure
OAW-P	Outdoor Air Wheel Pressure
RAF-P	RA/Exhaust Filter Pressure
EW-P	Exhaust Wheel Pressure

Amp - Current Sensors (analog or digital)	
Drawing Labels	Terminal Strip Labels
OAF-A	Supply Fan Amps
EF-A	Exhaust Fan Amps

START-UP CHECKLIST FOR UNIT

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

SAFETY CAUTION!
Use caution when removing access panels or other unit components, especially while standing on a ladder or other potentially unsteady base. Access panels and unit components can be heavy and serious injury may occur.

SAFETY CAUTION!
Do not operate energy recovery ventilator without the filters and birdscreens installed. They prevent the entry of foreign objects such as leaves, birds, etc.

CAUTION!
Do not run unit during construction phase. Damage to internal components may result and void warranty.

CAUTION! WARNINGS!

- Unit was factory tested. All blowers, fans, and compressors are set-up to run correct when supplied power. If any one fan is running backwards or the compressor is making loud noises, immediately turn off the power. Switch two leads on the incoming power to the disconnect. This will ensure proper operation of the unit. Failure to comply may damage the compressors and void the warranty.
- Do not jumper any safety devices when operating the unit. This may damage components within or cause serious injury or death.
- Do not operate compressor when the outdoor temperature is below 40ºF.
- Do not short-cycle the compressor. Allow 5 minutes between “on” cycles to prevent compressor damage.
- Prior to starting up the unit, power must be energized for 24 hours without a call for cool to allow the compressor crankcase heaters time to boil off any liquid refrigerant present in the compressor.
- DX system is charged with refrigerant. Start-up must be performed by EPA Certified Technician.

Every installation requires a comprehensive start-up to ensure proper operation of the unit. As part of that process, the following checklist must be completed and information recorded. Starting up the unit in accordance with this checklist will not only ensure proper operation, but will also provide valuable information to personnel performing future maintenance. Should an issue arise which requires factory assistance, this completed document will allow unit experts to provide quicker resolve. Qualified personnel should perform start-up to ensure safe and proper practices are followed.

Unit Model Number	_____	(e.g. ERCH-55)
Unit Serial Number	_____	(e.g. 04C99999 or 10111000)
Energy Wheel Date Code	_____	(e.g. 0450)
Compressor 1 Model Number	_____	(e.g. ZR36-XXXX)
Compressor 2 Model Number	_____	(e.g. ZR36-XXXX)
Start-Up Date	_____	(MM/DD/YYYY)
Start-Up Personnel Name	_____	
Start-Up Company	_____	
Phone Number	_____	

START-UP CHECKLIST FOR UNIT

Pre-Start Up Checklist - check boxes as items are completed

- ☐ Disconnect and lock-out all power switches
- ☐ Remove any foreign objects that are located in the energy recovery unit.
- ☐ Check all fasteners, set-screws, and locking collars on the fans, bearings, drives, motor bases and accessories for tightness.
- ☐ Rotate the fan wheels and energy recovery wheels by hand and ensure no parts are rubbing. If rubbing occurs, refer to Start-Up section for more information.
- ☐ Check the fan belt drives for proper alignment and tension (refer to Start-Up section for more information).
- ☐ Filters can load up with dirt during building construction. Replace any dirty pleated filters and clean the aluminum mesh filters in the intake hood (refer to Routine Maintenance section).
- ☐ Verify that non-motorized dampers open and close properly.
- ☐ Check the tightness of all factory wiring connections.
- ☐ Verify control wire gauge (refer to the Electrical Connections section).
- ☐ Verify diameter seal settings on the energy recovery wheel (refer to Start-Up section for more information).
- ☐ Verify proper drain trap installation (refer to Drain Trap section).
- ☐ Check condensing fans for any damage or misalignment. Spin the blades and make sure they don't contact any parts and are free turning without any resistance.
- ☐ Look over the piping system. Inspect for oil at all tubing connections. Oil typically highlights a leak in the system. If a leak is present, refer to the Maintenance section in this manual.
- ☐ Inspect all coils within the unit. Fins may get damaged in transit or during construction. Carefully straighten fins with a fin comb.
- ☐ If there is an indirect gas-fired furnace in this unit, refer to the PVF IOM provided with this unit for __ Pre-Start-Up information.
- ☐ This unit contains a crankcase heater for each compressor which needs power supplied to it 24 hours prior to start-up. If start-up is scheduled in 24 hours, unlock the disconnect power and energize unit.

Special Tools Required

- Voltage Meter (with wire probes)
- Amperage Meter
- Incline manometer or equivalent
- Tachometer
- Thermometer
- Pressure Gauges
- Temperature Gauges capable of measuring pipe temperature

Start-Up Checklist

The unit will be in operational mode during start-up. Use necessary precautions to avoid injury. All data must be collected while the unit is running. In order to measure volts & amps, the control center door must be open, and the unit energized using a crescent wrench to turn the disconnect handle.

Start-Up Procedure

- Make sure Pre-Start-Up checklist is complete.
- Jumper R to G, R to Y1, and R to Y2 (if applicable) on the control board.
- Turn the disconnect on. After 3 minutes compressors will come on. Make sure all fans and compressors are rotating the correct direction.

WARNING!

All motor(s) / compressor(s) have been checked for rotation. If blower rotation is incorrect, wiring must be changed at the disconnect to ensure all motor(s) / compressors are corrected.

Operation of scroll compressor(s) in this unit are directional and will be damaged if run with the wrong direction.

- Allow the unit to run until the refrigerant system stabilizes. Approximately 1-2 minutes.
- Take the following measurements while the unit is running to ensure proper operation.

START-UP CHECKLIST FOR UNIT

Line Voltage - check at unit disconnect

L1-L2 _____ Volts L2-L3 _____ Volts L1-L3 _____ Volts

Motor Amp Draw:

Supply Motor Amps	L1	_____	Amps	L2	_____	Amps	L3	_____ Amps
Exhaust Motor Amps	L1	_____	Amps	L2	_____	Amps	L3	_____ Amps

Fan RPM: Supply Fan RPM _____

Exhaust Fan RPM _____

Correct fan rotation direction: Supply Fan Yes / No

Exhaust Fan Yes / No

Energy Wheel Motor:	L1	_____	Amps	L2	_____	Amps	L3	_____ Amps
Compressor 1:	L1	_____	Amps	L2	_____	Amps	L3	_____ Amps
Crankcase Heater		_____	Amps					
Compressor 2:	L1	_____	Amps	L2	_____	Amps	L3	_____ Amps
Crankcase Heater		_____	Amps					
Condensing Fan 1:	L1	_____	Amps	L2	_____	Amps	L3	_____ Amps
Condensing Fan 2:	L1	_____	Amps	L2	_____	Amps	L3	_____ Amps
Condensing Fan 3:	L1	_____	Amps	L2	_____	Amps	L3	_____ Amps

Outdoor Air Temperature	_____	Deg F	
Return Air Temperature	_____	Deg F	
Outdoor Air Relative Humidity	_____	% RH	
Return Air Relative Humidity	_____	% RH	
Superheat	_____	Deg F	Should be between 8º and 12ºF
Subcooling	_____	Deg F	Should be between 12º and 17ºF
Discharge Pressure		PSIG	Should be between 200 and 280 PSIG for R22 or 300 and 500 PSIG for R410a
Suction Line Pressure		PSIG	Should be between 60 and 80 PSIG for R22 or 100 and 135 PSIG for R410a
Liquid Line Temp	_____	Deg F	
Suction Line Temp	_____	Deg F	

Moisture Indicating Sight Glass Liquid Visible Yes / No Color of Center Dot Green / Yellow

Hot Gas Bypass Operational Yes / No

OPTIONAL ACCESSORIES CHECKLIST

Refer to the respective sections in this Installation, Operation and Maintenance Manual for detailed information.

Refer to wiring diagram in unit control center to determine what electrical accessories were provided.

Provided with Unit?		Frost Control Application / Operation section:	Setting	Factory Default
Yes	No	Frost Control set point		5ºF
		Differential		2ºF
		Timer		Refer to IOM
Yes	No	Frost Control Modulating		Refer to IOM

Economizer Application / Operation section:

Yes	No	Economizer (temperature)		
		Set point		65ºF
		Offset		20ºF
		Differential		2ºF
Yes	No	Economizer (enthalpy)		
		Set point		B
Yes	No	Economizer (modulating)		Refer to IOM

Optional Accessories section:			Operational		
Yes	No	Wheel Rotation Sensor	Yes	No	N/A
Yes	No	OA Dirty Filter Sensor	Yes	No	N/A
Yes	No	EA Dirty Filter Sensor	Yes	No	N/A
Yes	No	CO_2 Sensor	Yes	No	N/A
Yes	No	Service Outlet	Yes	No	N/A
Yes	No	Vapor Tight Lights	Yes	No	N/A
Yes	No	Remote Control Panel	Yes	No	N/A

Variable Frequency Drives section:			Operational		
Yes	No	Blower VFDs	Yes	No	N/A
Yes	No	Wheel VFD	Yes	No	N/A

Damper section:			Operational		
Yes	No	Outdoor Air Damper	Yes	No	N/A
Yes	No	Exhaust Air Damper	Yes	No	N/A
Yes	No	Night Setback Damper	Yes	No	N/A

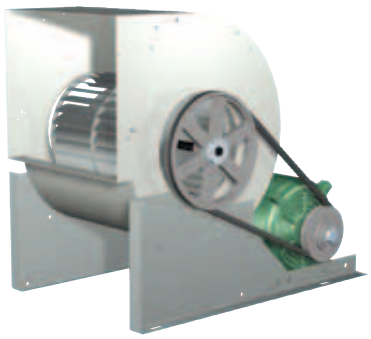
Yes	No	**Indirect Gas Furnace** (refer to the PVF IOM, Part #461006 for start-up information)

UNIT START-UP

Refer to Parts List section for component locations.

Fans

The ERCH models contain a forward curved supply fan and a forward curved exhaust fan. These forward curved fans should be checked for free rotation. If any binding occurs, check for concealed damage and foreign objects in the fan housing. Be sure to check the belt drives per the start-up recommendations in the following section.



Forward Curved Fan

SAFETY CAUTION!

When operating conditions of the fan are to be changed (speed, pressure, temperature, etc.), consult Greenheck to determine if the unit can operate safely at the new conditions.

Fan Performance Modifications

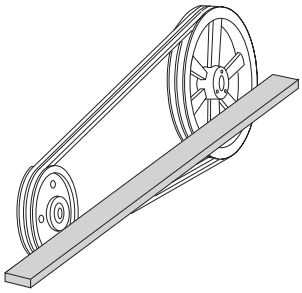
Due to job specification revisions, it may be necessary to adjust or change the sheave or pulley to obtain the desired airflow at the time of installation. Start-up technician must check blower amperage to ensure that the amperage listed on the motor nameplate is not exceeded. Amperage to be tested with access doors closed and ductwork installed.

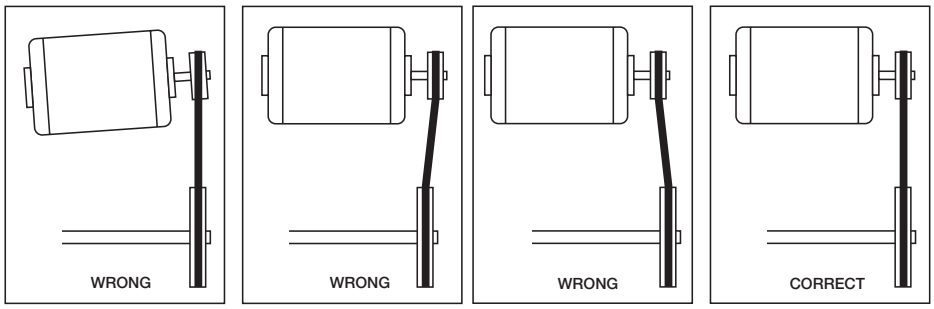
Fan Belt Drives

The fan belt drive components, when supplied by Greenheck, have been carefully selected for the unit's specific operating condition. Caution: utilizing different components than those supplied could result in unsafe operating conditions which may cause personal injury or failure of the following components: 1) Fan Shaft, 2) Fan Wheel, 3) Bearings, 4) Belt, 5) Motor. Tighten all fasteners and set screws securely and realign drive pulleys after adjustment. Check pulleys and belts for proper alignment to avoid unnecessary belt wear, noise, vibration and power loss. Motor and drive shafts must be parallel and pulleys in line (see below).

Belt Drive Installation

1. Remove the protective coating from the end of the fan shaft and assure that it is free of nicks and burrs.
2. Check fan and motor shafts for parallel and angular alignment.
3. Slide sheaves on shafts. Do not drive sheaves on as this may result in bearing damage.
4. Align fan and motor sheaves with a straight-edge or string and tighten.
5. Place belts over sheaves. Do not pry or force belts, as this could result in damage to the cords in the belts.
6. With the fan off, adjust the belt tension by moving the motor base. (See belt tensioning procedures in the Routine Maintenance section of this manual). When in operation, the tight side of the belts should be in a straight line from sheave to sheave with a slight bow on the slack side.



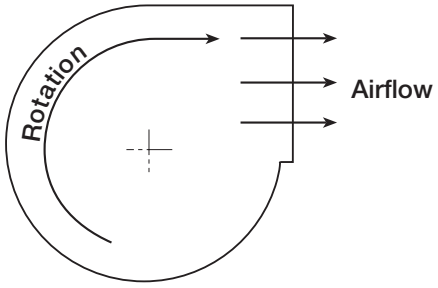


Proper alignment of motor and drive shaft.

UNIT START-UP

Direction of Fan Wheel Rotation

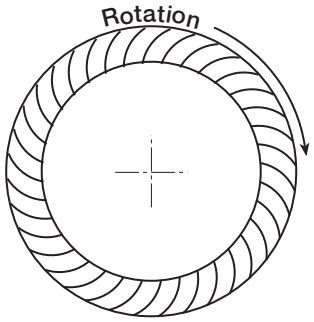
Blower access is labeled on unit. Check for proper wheel rotation by momentarily energizing the fan. Rotation is determined by viewing the wheel from the drive side and should match the rotation decal affixed to the fan housing (see Rotation Direction figures). If the wheel is rotating the wrong way, direction can be reversed by interchanging any two of the three electrical leads. Check for unusual noise, vibration, or overheating of bearings. Refer to the Troubleshooting section of this manual if a problem develops.



Fan RPM

Supply fan and exhaust fan will have an adjustable motor pulley (on 15 HP and below) preset at the factory to the customer specified RPM. Fan speed can be increased or decreased by adjusting the pitch diameter of the motor pulley. Multi-groove variable pitch pulleys must be adjusted an equal number of turns open or closed. Any increase in fan speed represents a substantial increase in load on the motor. Always check the motor amperage reading and compare it to the amperage rating shown on the motor nameplate when changing fan RPM. All access doors must be installed except the control center door. *Do not operate units with access doors open or without proper ductwork in place as the fan motors will overload.*

Forward Curved



Vibration

Excessive vibration may be experienced during initial start-up. Left unchecked, excessive vibration can cause a multitude of problems, including structural and/or component failure. The most common sources of vibration are listed below.

1. Wheel Unbalance
2. Drive Pulley Misalignment
3. Incorrect Belt Tension
4. Bearing Misalignment
5. Mechanical Looseness
6. Faulty Belts
7. Drive Component Unbalance
8. Poor Inlet/Outlet Conditions
9. Foundation Stiffness

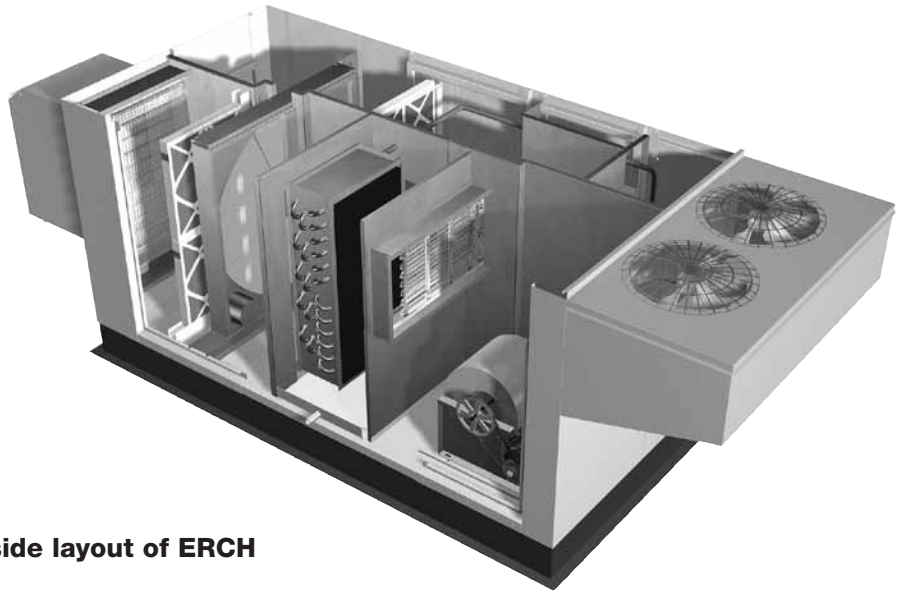
Many of these conditions can be discovered by careful observation. Refer to the Troubleshooting section of this manual for corrective actions. If observation cannot locate the source of vibration, a qualified technician using vibration analysis equipment should be consulted. If the problem is wheel unbalance, in-place balancing can be done.

Generally, fan vibration and noise is transmitted to other parts of the building by the ductwork. To eliminate this undesirable effect, the use of heavy canvas connectors is recommended.

Coils

Leak test thermal system to insure tight connections. Check for properly trapped condensate drain.

UNIT START-UP



Inside layout of ERCH

Energy Recovery Wheel

The ERCH models contain a total energy recovery wheel. The wheels are inspected for proper mechanical operation at the factory. However, during shipping and handling, shifting can occur that may affect wheel operation. The wheel is accessible through the access door marked “Energy Wheel Cassette Access”. For the ERCH-20 and ERCH-45 models, the wheel cassette slides out. Due to the size and weight of the ERCH-55 and ERCH-90 wheels, they remain stationary and all maintenance is performed in place. There is room inside the unit to perform energy recovery wheel servicing.

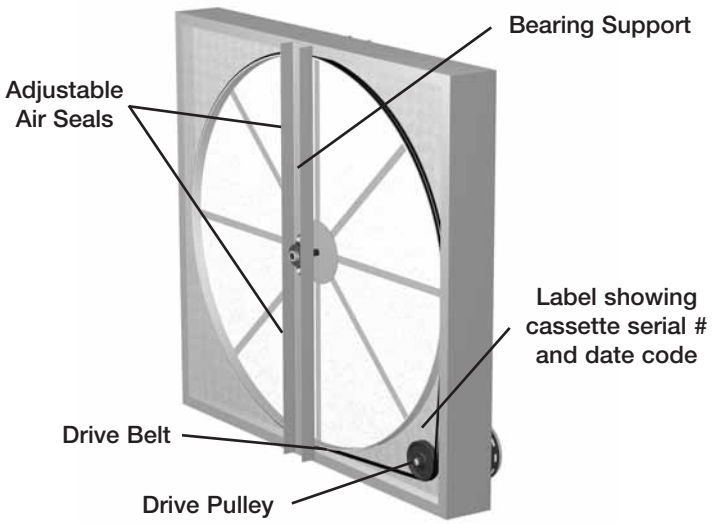
Turn the energy recovery wheels by hand to verify free operation. The wheel should rotate smoothly and should not wobble.

Drive Belt

Inspect the drive belt. Make sure the belt rides smoothly through the pulley and over the wheel rim.

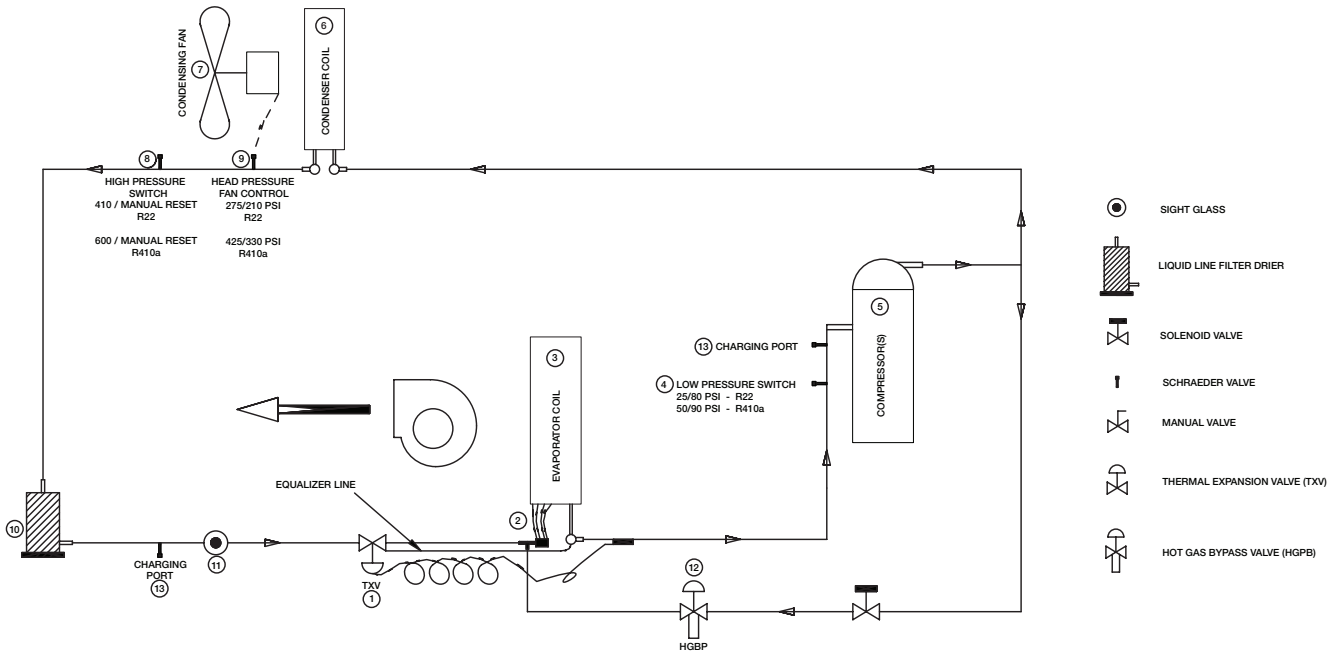
Air Seals

Check that the air seals located around the outside of the wheel and across the center (both sides of wheel) are secure and in good condition. Air seal clearance is determined by placing a sheet of paper, to act as a feeler gauge, against the wheel face. To access seals, enter unit for ERCH-55 and ERCH-90 or pull out the cassette for ERCH-20 and ERCH-45 following the instructions in Energy Recovery Wheel Maintenance section. To adjust the air seals, loosen all eight seal retaining screws. These screws are located on the bearing support that spans the length of the cassette through the wheel center. Tighten the screws so the air seals tug slightly on the sheet of paper.



Replace cassette into unit, plug in wheel drive, replace access door and apply power. Observe by opening door slightly (remove filters if necessary to view wheel) that the wheel rotates freely at about 50-60 rpm.

REFRIGERATION SYSTEM



Factory Installed Refrigeration System Components

1. **Thermostatic Expansion Valve (TXV)** - each unit is equipped with a thermal expansion valve. The valve controls the flow of liquid refrigerant entering the evaporator coil by maintaining a constant, factory set superheat of 10ºF. The valve is located on the side of the evaporator coil and can be accessed through the exhaust airstream, through the coil panel access door.

2. **Refrigerant Distributor** - attached to the TXV is a refrigerant distributor. The refrigerant distributor evenly distributes the refrigerant to each circuit of the evaporator coil to provide optimum performance.

3. **Evaporator Coil** - each unit contains a single circuit evaporator coil. The coil is located in the outdoor airstream, directly after the energy wheel. In the DX system, the liquid refrigerant is expanded in the TXV, and then flows through the evaporator coil. The refrigerant enters the coil as low temp liquid/gas where it eventually boils into a low temp, low pressure gas prior to going to the compressor. To ensure proper operation, the coil surface must be cleaned so that air movement over the coil provides the necessary heat transfer.

4. **Low Limit Pressure Switch** - the unit includes a low limit pressure switch (located in the compressor compartment). The switch is installed in the suction line and shuts off the DX system when the suction pressure drops to 25 psi for R22 or 50 psi for R410a. The switch has a built in auto-reset, which will close the circuit and allow the system to run when the pressure increases back to 80 psi for R22 or 90 psi for R410a.

5. **Compressors** - each unit includes 1 or 2 high efficiency scroll type compressors depending on needed capacity. Scroll type compressors are essentially maintenance free since they are a self-contained, self-cooling design. The scroll compresses the refrigerant in the gaseous state to a high temperature, high pressure gas.

   Compressor protective devices:

   Thermal Overload - each compressor is equipped with an auto reset thermal overload

   High Temp Protection - internal devices within the compressor protect it against excessively high discharge gas temperatures (only on compressors above 6 hp)

   Crankcase Heater - Liquid refrigerant is incompressible. Therefore, a crankcase heater is installed around each compressor in the unit to boil any liquid refrigerant that may be absorbed into the oil during idle periods. System power energizes the heater; it is recommended the heater is allowed to run 24 hours prior to compressors being started.

REFRIGERATION SYSTEM

Factory Installed Refrigeration System Components

(6) **Condensing Coil** - each unit contains a condensing coil mounted on the exterior of the unit. High temperature, high pressure gas from the compressor enters the coil and is eventually cooled into a high temperature, high pressure liquid. The condensing fans move air over the coil which pulls the heat out of the refrigerant. To ensure proper operation, the coil must be cleaned so that air movement over the coil provides the necessary heat transfer.

(7) **Condenser Fans** - depending on capacity, the unit is equipped with either 2 or 3 direct-drive condensing fans. The fans provide the necessary airflow to cool the refrigerant in the condensing coil. Depending on head pressure, one fan may not be running, which is normal operation for this unit and does not highlight a problem. The motors are equipped with sling protection to guard against water penetration, and are thermally protected. The thermal overloads shut down the condensing fans.

(8) **High Limit Pressure Switch** - to safely shutdown the DX system, in case of an increase in refrigerant pressure, a high limit pressure switch is included (located in compressor compartment). The switch is located in the compressor compartment. It trips when refrigerant pressure increase to 410 psi for the R22 (600 psi for R410a) in the liquid line, and can only be manually reset when the pressure drops below 290 psi. Typically if the high limit switch trips, a failure in the system has occurred and more investigation is needed to determine the underlying problem.

(9) **Head Pressure Cycle Switch** - to maintain proper refrigerant pressures, a Fan-Cycle switch that operates on head pressure is installed in the liquid line. When liquid line refrigerant pressure increases to 275 psi for R22 (425 psi for R410a), the switch closes and turns on an additional condensing fan to aid in cooling the refrigerant. After turning on, the fan will run until liquid line pressure drops down to 210 psi for R22 (330 psi for R410a) where it cycles off. The switch is located in the compressor compartment.

(10) **Liquid Line Filter Drier** - the liquid line filter drier prevents moisture and foreign matter from entering the thermal expansion valve. It is mounted in the compressor compartment.

(11) **Moisture Indicating Sight Glass** - moisture in a DX system can cause great harm and break down the refrigerant. Located in the compressor compartment is a moisture indicating sight glass. During normal operating conditions, the sight glass should typically be liquid. Some gas is acceptable, but excessive bubbles may indicate improper charge or a leak in the system. A green dot means moisture is below a safe operation level in the refrigerant, while a yellow dot indicates moisture has been introduced into the system and needs to be addressed.

(12) **Hot Gas Bypass Valve** - on units equipped with hot bypass, hot gas from the compressor is injected into the liquid line of the evaporator coil after the TXV. This process starts to occur when suction gas temperatures drop below 28ºF, which is 32º–34ºF coil surface temperature. Hot gas helps prevent the evaporator coil from freezing up and the compressor from cycling. The valve is factory set, but can be adjusted to exact specifications once installed in the field.

> **Valve Adjustment** - to adjust the valve, connect a pressure gauge to the suction line and block the entering air to the evaporator coil. The Valve should begin to open when the suction pressure drops to approximately 58 PSIG for R22 and 115 PSIG for R410a (the valve will feel warm to the touch). Adjustments are made by first removing the cap on the valve and then turning the adjusting stem clockwise to increase the setting pressure and counterclockwise to decrease the setting pressure. Allow several minutes between adjustments for system to stabilize. When adjustment is complete, replace the cap on the valve.

(13) **Access Ports -** For easy measurement and charging access, several ports are provided throughout the system. These can be used to measure system pressures, and also charge or evacuate the system. Most ports are located in the compressor compartment for easy access.

ROUTINE MAINTENANCE

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

SAFETY CAUTION!
Use caution when removing access panels or other unit components, especially while standing on a ladder or other potentially unsteady base. Access panels and unit components can be heavy and serious injury may occur.

This unit requires minimal maintenance to operate properly. To ensure proper operation and longevity, the following items should be completed. The items in this list assume a relatively clean air environment, and may require attention more frequently in a dirty or dusty area. If this unit contains an Indirect Gas Heater, refer to the Installation, Operation and Maintenance Manual provided with the unit for maintenance purposes. A Certified Technician should complete all refrigerant systems checks.

Monthly

External Filter	Check for cleanliness – clean if required
Internal Filter	Check for cleanliness – replace if required
Condensate Drain	Inspect and clean – refill with water

Semi-Annually

Fan Belts	Check for wear, tension, alignment
Energy Recovery Wheel	Check for cleanliness – clean if required Check for belt wear Check pulley, bearings, and motor

Annually

It is recommended that the annual inspection and maintenance occur at the start of the cooling season. After completing the checklist, follow the unit start-up checklist provided in the manual to ensure the refrigeration system operates in the intended matter.

Lubrication	Apply lubrication where required
Dampers	Check for unobstructed operation
Motors	Check for cleanliness
Fan Belts	Check for wear, tension, alignment
Motors	Check for cleanliness
Blower Wheel & Fasteners	Check for cleanliness Check all fasteners for tightness Check for fatigue, corrosion, wear
Bearings	Check for cleanliness Check set screws for tightness
Energy Recovery Wheel	Check for cleanliness – clean if required Check belt for wear Check pulley, bearings, and motor
Door Seal	Check if intact and pliable
Evaporator Coil Maintenance	Check for cleanliness – clean if required
Condenser Coil Maintenance	Check for cleanliness – clean if required
Condensate Drain	Inspect and clean – refill with water
Condensing Fan Blades and Motor	Check for cleanliness Check all fasteners for tightness Check for fatigue, corrosion, and wear
Wiring Connections	Check all connections for tightness

ROUTINE MAINTENANCE

Lubrication

Check all moving components for proper lubrication. Apply lubrication where required. Any components showing excessive wear should be replaced to maintain the integrity of the unit and ensure proper operation.

Dampers

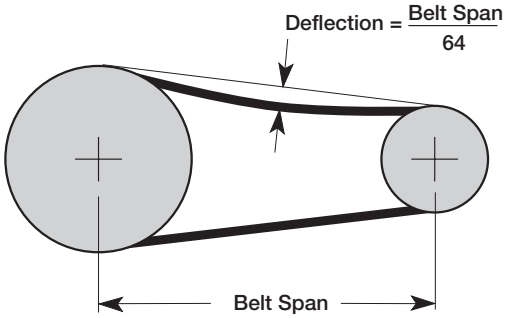
Check all dampers to ensure they open and close properly and without binding. Backdraft dampers can be checked by hand to determine if blades open and close freely. Apply power to motorized dampers to ensure the actuator opens and closes the damper as designed.

Fan Belts

Belts must be checked on a regular basis for wear, tension, alignment, and dirt accumulation. Premature or frequent belt failures can be caused by improper belt tension (either too loose or too tight) or misaligned sheaves. Abnormally high belt tension or drive misalignment will cause excessive bearing loads and may result in failure of the fan and/or motor bearings. Conversely, loose belts will cause squealing on start-up, excessive belt flutter, slippage, and overheated sheaves. Both loose and tight belts can cause fan vibration.

When replacing belts on multiple groove drives, all belts should be changed to provide uniform drive loading. Do not pry belts on or off the sheave. Loosen belt tension until belts can be removed by simply lifting the belts off the sheaves. After replacing belts, insure that slack in each belt is on the same side of the drive. Belt dressing should never be used.

Do not install new belts on worn sheaves. If the sheaves have grooves worn in them, they must be replaced before new belts are installed.



Proper fan belt settings

The proper belt setting is the lowest tension at which the belts will not slip under peak load operation. For initial tensioning, set the belt deflection at 1/64-inch for each inch of belt span (measured half-way between sheave centers). For example, if the belt span is 64 inches, the belt deflection should be 1 inch (using moderate thumb pressure at mid-point of the drive). Check belt tension two times during the first 24 hours of operation and periodically thereafter.

Fan Motors

Motor maintenance is generally limited to cleaning and lubrication. Cleaning should be limited to exterior surfaces only. Removing dust and grease buildup on the motor housing assists proper motor cooling. Never wash-down motor with high pressure spray. Greasing of motors is only intended when fittings are provided. Many fractional motors are permanently lubricated for life and require no further lubrication.

Fan Wheel & Fasteners

Wheels require very little attention when moving clean air. Occasionally oil and dust may accumulate on the wheel causing imbalance. When this occurs the wheel and housing should be cleaned to assure smooth and safe operation. Inspect fan impeller and housing for fatigue, corrosion or wear.

Routinely check all fasteners, set screws and locking collars on the fan, bearings, drive, motor base and accessories for tightness. A proper maintenance program will help preserve the performance and reliability designed into the fan.

ROUTINE MAINTENANCE

Internal Filter Maintenance

The ERCH units will typically be provided with 2-inch, pleated filters in the outdoor air and exhaust airstream. These filters should be checked per a routine maintenance schedule and replaced as necessary to ensure proper airflow through the unit. See table at right for pleated filter size and quantity for each unit. Replacement filters shall be of same performance and quality as factory installed filters. Filter type must be pleated design with integral metal grid. Two acceptable filter replacements are Aerostat Series 400 or Farr 30/30®.

Filter Size and Quantities			
Model	**Internal Filter Size**	**Quantity Supply**	**Quantity Exhaust**
ERCH-20	20 in. x 20 in.	2	2
ERCH-45	20 in. x 25 in.	3	3
ERCH-55	16 in. x 20 in.	6	6
ERCH-90	20 in. x 20 in.	8	8

Outdoor Air Filters: Access to the outdoor air filters is through the door labeled as “Filter Access” on the outdoor air side of the unit.

Exhaust Air Filters: Access to the exhaust air filters is through the door labeled as “Filter Access” on the exhaust air side of the unit.

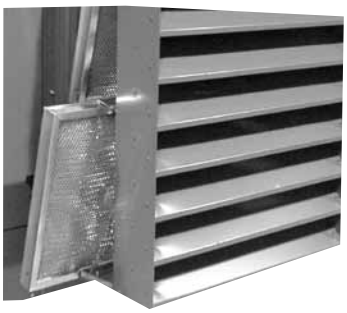
Refer to Access Door Descriptions section for additional information on filter locations.

External Filter Maintenance

Aluminum mesh, 2-inch deep filters are located in the supply weatherhood (if the weatherhood option was purchased). Filters should be checked and cleaned on a regular basis for best efficiency. The frequency of cleaning depends upon the cleanliness of the incoming air. These filters should be cleaned prior to start-up.

To access these filters, remove bottom bolt in the access door on the side of the weatherhood. Slide the access door up and then pull bottom out to remove door. Then, slide the filters out (see figure at right).

Clean filters by rinsing with a mild detergent in warm water.



Outdoor air intake hood mesh filter access

ROUTINE MAINTENANCE

Coil Maintenance

****WARNING****

REFER TO SAFETY WARNING ON COVER

DO NOT OPERATE ENERGY RECOVERY VENTILATOR WITHOUT THE FILTERS AND BIRDSCREENS INSTALLED. THEY PREVENT THE ENTRY OF FOREIGN OBJECTS SUCH AS LEAVES, BIRDS, ETC.

DO NOT REMOVE ACCESS PANELS OR OTHER UNIT COMPONENTS WHILE STANDING ON A LADDER OR OTHER UNSTEADY BASE. ACCESS PANELS AND UNIT COMPONENTS ARE HEAVY AND SERIOUS INJURY MAY OCCUR.

Filters

Filters upstream of the coil should be checked regularly. If the filters are dirty, they should be cleaned or replaced. It is important that the coils stay clean to maintain desired airflow. See Filter Maintenance section for additional information.

Coil Maintenance

1. Coils must be cleaned to obtain maximum performance. Check once a year under normal operating conditions and if dirty, brush or vacuum clean. Soiled fins reduce the capacity of the coil, demand more energy from the fan, and create an environment for odor and bacteria to grow and spread through the conditioned zone. High pressure water (700 psi or less) may be used to clean coils with fin thickness over 0.0095 inches thick. TEST THE SPRAY PRESSURE over a small corner of the coil to determine if the fins will withstand the spray pressure.

   For coils with fragile fins or high fin density, foaming chemical sprays and washes are available. Many coil cleaners contain harsh chemicals, so they must be used with caution by qualified personnel only. Care must be taken not to damage the coils, including the fins, while cleaning.

   CAUTION: Fin edges are sharp.

****WARNING****

BIOLOGICAL HAZARD. MAY CAUSE DISEASE. CLEANING SHOULD BE PERFORMED BY QUALIFIED PERSONNEL.

2. Drain pans in any air conditioning unit will have some moisture in them, therefore, algae and other organisms will grow due to airborne spores and bacteria. Periodic cleaning is necessary to prevent this buildup from plugging the drain and causing the drain pan to overflow. Inspect twice a year to avoid the possibility of overflow. Also, drain pans should be kept clean to prevent the spread of disease. Cleaning should be performed by qualified personnel.

ROUTINE MAINTENANCE

Energy Recovery Wheel Maintenance

Annual inspection of the energy recovery wheel is recommended. Units ventilating smoking lounges and other non-clean air spaces should have energy recovery wheel inspections more often based upon need. Inspections for smoke ventilation applications are recommended bimonthly to quarterly until a regular schedule can be established.

ACCESSING ENERGY RECOVERY WHEEL

The ERCH units have one energy recovery wheel. Open the outdoor air filter door to access the wheel. For the ERCH-20 and ERCH-45 models, the wheel cassette slides out. Due to the size and weight of the ERCH-55 and ERCH-90 wheels, they remain stationary and all maintenance is performed in place. There is room inside the unit to perform energy recovery wheel servicing. Filters must be removed to access stationary wheels.

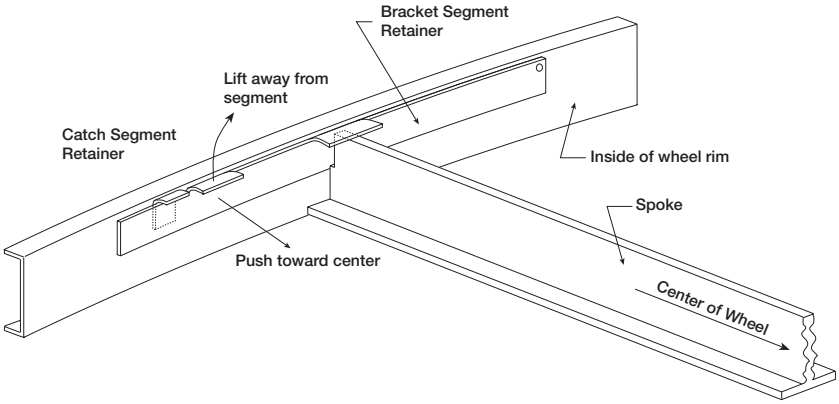
****WARNING: Disconnect power to the unit before performing any type of service.**

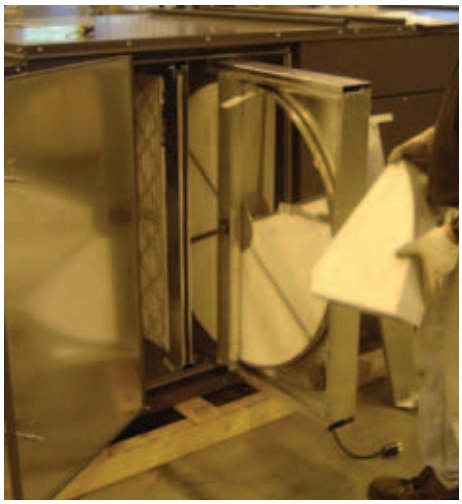
Access to wheel through outdoor air filter door

REMOVING THE ENERGY RECOVERY WHEEL SEGMENTS

Models ERCH-20, 45, 55 & 90

Steel retainers are located on the inside of the wheel rim (see diagram at right). Push the retainer toward center of wheel, then lift up and away to release segments (see below).





Wheel segment removed

IMPORTANT! *PLACE RETAINERS BACK IN THE ORIGINAL POSITION BEFORE ROTATING THE ENERGY RECOVERY WHEEL. OTHERWISE DAMAGE TO RETAINER WILL OCCUR.*

ROUTINE MAINTENANCE

CLEANING THE ENERGY RECOVERY WHEEL

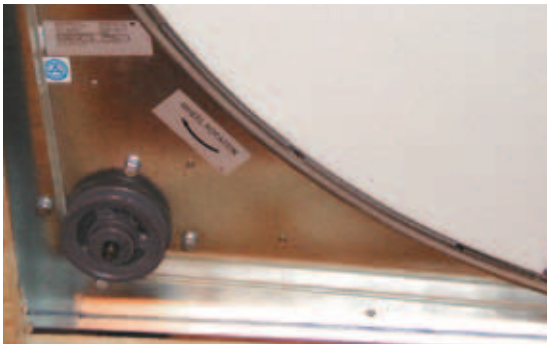
If the wheel appears excessively dirty, it should be cleaned to ensure maximum operating efficiency. Only excessive buildup of foreign material needs to be removed. *DISCOLORATION AND STAINING OF ENERGY RECOVERY WHEEL DOES NOT AFFECT ITS PERFORMANCE.*

Thoroughly spray wheel matrix with household cleaner such as Fantastic® or equivalent. Gently rinse with warm water and using a soft brush remove any heavier accumulation. A detergent/water solution can also be used. Avoid aggressive organic solvents, such as acetone. The energy recovery wheel segments can be soaked in the above solution overnight for stubborn dirt or accumulation.

After cleaning is complete, shake the excess water from the wheel or segments. Dry wheel or segments before placing them back into the cassette. Place wheel or segments back into cassette by reversing removal procedures.

**** DO NOT CLEAN ENERGY RECOVERY WHEEL SEGMENTS WITH WATER IN EXCESS OF 140ºF.***
**** DO NOT DRY ENERGY RECOVERY WHEEL SEGMENTS IN AIR IN EXCESS OF 140ºF.***
**** THE USE OF A PRESSURE WASHER TO CLEAN SEGMENTS IS NOT RECOMMENDED. DAMAGE COULD RESULT.***

Energy Recovery Wheel Belt
Inspect belts each time filters are replaced. Belts that look chewed up or are leaving belt dust near the motor pulley may indicate a problem with the wheel. Be sure to inspect wheel for smooth and unrestricted rotation. If a belt requires replacement, contact the local Greenheck representative. Instructions for replacement will ship with the new belt.

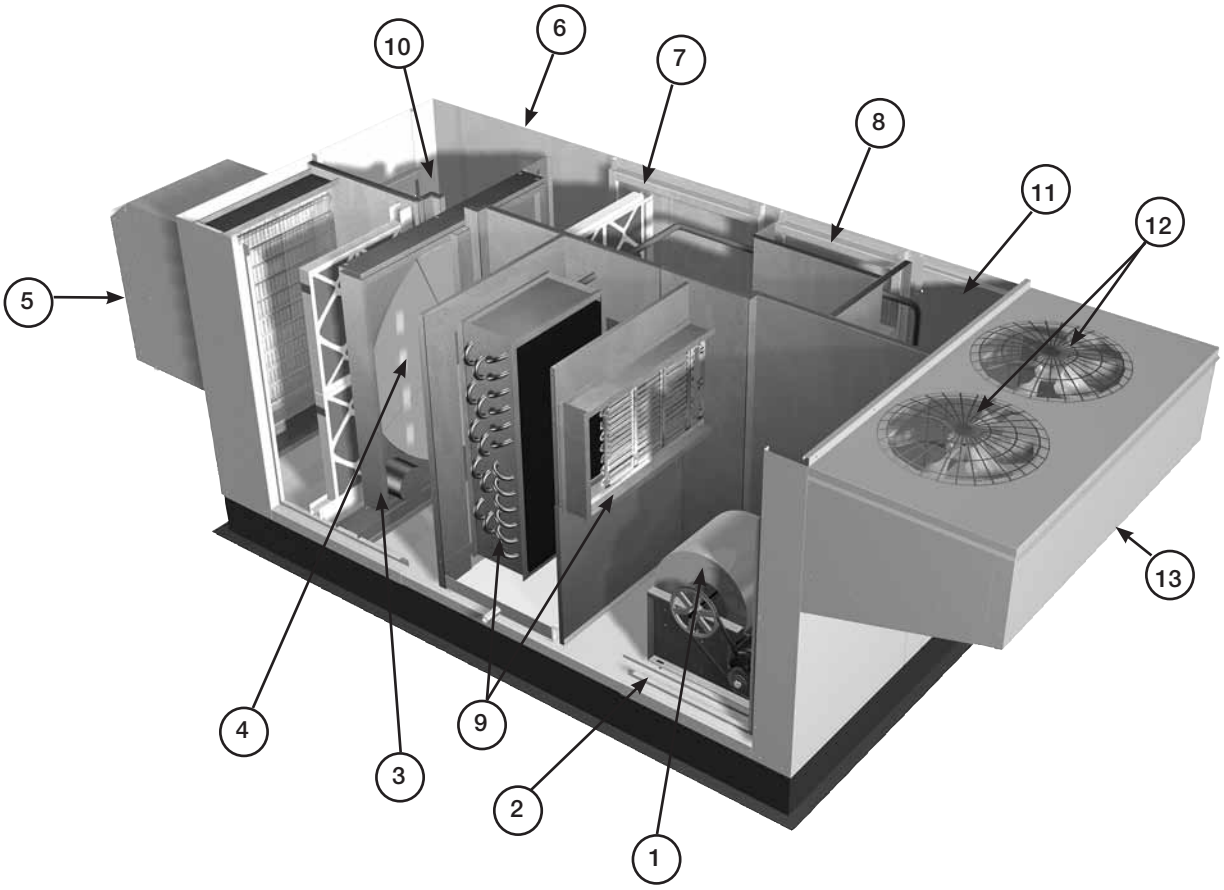


Wheel Belt & Pulley

Energy Recovery Wheel Bearings
In the unlikely event that a wheel bearing fails, access is available through the outdoor air filter door and through a removable plate in the divider in the unit (accessed through the exhaust air filter door). Contact the local Greenheck representative for detailed instructions on how to replace the bearing.

Wheel Bearing

PARTS LIST



Model ERCH

(shown with standard integral condensing section and optional electric heater)

1. Supply blower
   - Forward curved fan
   - Adjustable motor mount for belt tensioning
   - Adjustable sheaves for speed control

2. Vibrations isolators (quantity 4 per blower)
   - Neoprene

3. Energy recovery wheel cassette

4. Removable energy recovery wheel segments

5. Optional supply weatherhood with 2 in. aluminum mesh filter

6. Optional exhaust weatherhood with bird screen

7. Optional supply and exhaust air filter racks for 2 in. pleated, 30% efficient filters

8. Electrical control box (standard features)
   - Single point power
   - Disconnect interlocked with access door
   - Motor starters for the supply blower, exhaust blower and energy wheel motors.
   - 24 Vac, control circuit with terminal strip

9. Coil section houses supply air tempering options
   - Packaged DX for cooling
   - Electric or hot water heat
   - Indirect gas heat

10. Exhaust blower

11. Compressor(s)

12. Condensing fans

13. Condensing coil

SEQUENCE OF OPERATION

Basic Unit

The ERCH units are pre-wired such that when a call for outside air is made (via field supplied 24 Vac control signal wired to unit control center), the supply fan, exhaust fan and energy wheel are energized and optional motorized dampers open. The ERCH units can be supplied with or without heating coils. Controls can be supplied by Greenheck or by the controls contractor. If supplied by the controls contractor, they would provide, mount, and wire any temperature controllers and temperature or relative humidity sensors required for the unit to discharge air at the desired conditions. However, temperature, pressure, and current sensors can be provided by Greenheck for purposes of monitoring via the Building Management System (see Optional Accessories section).

Summer Operation:

Outdoor air is preconditioned (temperature and moisture levels are decreased) by the transfer of energy from the cooler, drier exhaust air via the energy recovery wheel. Units supplied with cooling coils can further cool the air coming off the wheel and strip out moisture to levels at or below room design. A heating coil downstream of the cooling coil can reheat the air to a more comfortable discharge temperature to the space.

Standard DX Sequence of Operation:

Unit without economizer
Ambient temperatures above 55ºF

- First call for cool, the unit will turn on the first compressor.
- On the second call for cool, the unit will turn on the second compressor if available. (10 or larger tonnage system).

Unit without economizer
Ambient temperatures below 55ºF

- DX system locked out and will not operate.

Unit with economizer
With economizer conditions available and ambient temperature above 55ºF

- First call for cool - the unit will check if it can use economizer air. If it can, the wheel will shut off or modulate and the cooling coil will be de-energized.
- Second call for cool - the unit will turn on a compressor to provide the space with further cooling.

With economizer conditions available and ambient temperature below 55ºF

- First call for cool - the unit will engage economizer allowing free cooling down to minimum set point, factory set at 50ºF.
- Second call for cool - the DX system is locked out, not allowing compressors to run below 55ºF. First stage of cooling will still operate unless ambient temperature drops below economizer set point.

Without economizer conditions available and ambient temperature above 55ºF

- First call for cool - the unit will turn on compressor one.
- Second call for cool - the unit will turn on the second compressor if available. (10 or larger tonnage system).

Economizer Operation: See Economizer Application/Operation section.

Winter Operation:

Outdoor air is preconditioned (temperature and moisture levels are increased) by the transfer of energy from the warmer, more humid exhaust air via the energy recovery wheel. Units supplied with heating coils can further heat the air coming off the wheel to levels at or above room design.

Frost Control Operation: See Frost Control Application/Operation section.

SEQUENCE OF OPERATION

Other Accessories:

Rotation Sensor	See Optional Accessories section
Dirty Filter Sensor	See Optional Accessories section
CO2 Sensor	See Optional Accessories section
Night Setback	On a call for night setback (unoccupied mode), the outdoor air damper will close and the energy wheel and exhaust fan will be de-energized. The night setback dampers will open and the supply fan will remain on, providing 100% recirculation. Units supplied with heating and cooling coils will temper air as required by the controls to maintain desired conditions in the space.

DX Safety and General Control Sequence

To prevent damage to the system, there is a safety loop incorporated into the controls. This loop includes a check to make sure the supply fan starter is pulled in, ambient temperature is above 55ºF, and the low- and high-pressure switches are not tripped out. After this loop is verified, a relay then pulls in to start the anti-cycle timer. (Typical setting is 3 minutes). Once the timer has counted down, only then can the compressor contact pull in. Once the compressor contact pulls in, the first stage of condensing fans turns on. If pressure in the condensing coil increases to a point at which more heat needs to be removed from the system, the fan cycle switch will close and the second stage of condensing fans turns on.

Troubleshooting – Airflow

Test and Balance Report

The Test and Balance Report (TAB) is utilized to determine whether the appropriate amount of outdoor air and exhaust air is being supplied and removed from a building, respectively. There are no set rules on what information must be included in a TAB report. As such, if a TAB report indicates that the airflow on a unit is low, prior to contacting the factory, please determine the following information:

	Unit #1	Unit #2	Unit #3	Unit #4
Model Number				
Serial Number				
Name Plate Information				
Voltage				
Hertz				
Phase				
Outdoor Air Fan Amps				
Exhaust Fan Amps				
Outdoor Air Fan Horsepower				
Exhaust Fan Horsepower				
Design Airflow				
Outdoor Air				
Exhaust				
Measured Airflow				
Outdoor Air				
Exhaust				
Measured Data				
Blower Rotation				
Outdoor Air Fan RPM				
Exhaust Fan RPM				
Outdoor Air Fan Amp Draw				
Exhaust Fan Amp Draw				
Pressure Drop Across Energy Recovery Wheel				
Outdoor Air Side				
Exhaust Side				

Airflow problems can often be tied back to improper ductwork installation. Be sure to install ductwork in accordance with SMACNA and AMCA guidelines.

Troubleshooting – General Unit

Symptom	Possible Cause	Corrective Action
Blower fails to operate	Blown fuse or open circuit breaker.	Replace fuse or reset circuit breaker and check amps.
	Defective motor or capacitor.	Replace.
	Motor starter overloaded.	Reset starter and check amps.
	Electrical.	Check for On/Off switches. Check for correct supply voltage.
	Drive.	Check for broken or loose belts. Tighten loose pulleys.
Motor starters "chatter" or do not pull in	Control power (24 Vac) wiring run is too long (resistance should not exceed 0.75 ohms).	Shorten wiring run to mechanical room or install a relay which will turn unit on/off (C/F for relay information). Increase wire gauge size so that resistance is .075 ohms or less.
	Incoming supply power is less than anticipated. Voltage supplied to starter coil must be within +10% / -15% of nominal voltage stated on the coil.	Need to increase supply power or use a special control transformer which is sized for the actual supply power.
Motor over amps	CFM too high.	Check cfm and adjust drives if needed.
	Static pressures are higher or lower than design.	If higher, ductwork should be improved. If lower, fan rpm should be lower.
	Blower rotation is incorrect.	Check rotation and reverse if necessary.
	Motor voltage incorrect.	Check motor nameplate versus supplied voltage.
	Motor horsepower too low.	See specifications and catalog for fan curves to determine if horsepower is sufficient.
	Shorted windings in motor.	Replace motor.
Low airflow (cfm)	Unit damper not fully open.	Adjust damper linkage or replace damper motor.
	System static pressure too high.	Improve ductwork to eliminate losses using good duct practices.
	Blower speed too low.	Check for correct drives and rpm with catalog data.
	Fan wheels are operating backwards.	For 3-phase, see Direction of Fan Wheel Rotation under Unit Start-Up section.
	Dirty filter or energy wheel.	Follow cleaning procedures in Routine Maintenance section.
	Leaks in ductwork.	Repair.
	Elbows or other obstructions may be obstructing fan outlet.	Correct or improve ductwork.
	Belt slippage.	Adjust belt tension.
High airflow (cfm)	Blower fan speed too high.	Check for correct fan rpm. Decrease fan speed if necessary.
	Filter(s) not in place.	Install filters.
	Insufficient static pressure (Ps) (airflow resistance).	Induce Ps into system ductwork. Make sure grilles and access doors are installed. Decrease fan speed if necessary.

Always have a completed Pre-Start-Up Checklist, unit Start-Up Checklist, and Optional Accessories Checklist prior to requesting parts or service information.

Troubleshooting – General Unit

Symptom	Possible Cause	Corrective Action
One or both blowers turn off intermittently and back on after about 2 minutes	Exhaust Only frost control sensors are tripping.	Adjust frost temperature sensor set point as needed.
Energy wheel does NOT turn	Air seals are too tight.	See Energy Recovery Wheel under Unit Start-Up section.
	"Economizer" sensors are operating.	Adjust temperature or enthalpy set points as needed.
	No power to wheel motor.	Make sure wheel drive is plugged in. Verify power is available.
	Wheel drive belt.	Check for loose or broken belts. Replace belts (consult factory).
	VFD overload. (OL1 on readout)	Refer to VFD section. Compare motor amp rating to setting in VFD. Adjust accordingly.
Energy wheel runs intermittently	Wheel motor overloads are tripping, due to rubbing between wheel and air seals.	Recheck air seals, make sure they are not too tight. See Energy Recovery Wheel under Unit Start-Up Section.
Excessive noise or vibration	Fan wheel rubbing on inlet.	Adjust wheel and/or inlet cone. Tighten wheel hub or bearing collars on shaft.
	Bearings.	Replace defective bearings (s). Lubricate bearings. Tighten collars and fasteners.
	Wheel out of balance.	Replace or rebalance.
	Loose wheel on shaft.	Tighten wheel setscrew.
	Loose motor or blower sheave.	Tighten sheave setscrew.
	Belts too loose.	Adjust belt tension after 24 hours of operation.
	Belts too tight.	Loosen to maintain a 3/8 inch deflection per foot of span between sheaves.
	Worn belt.	Replace.
	Motor base or blower loose.	Tighten mounting bolts.
	Buildup of material on wheel.	Clean wheel and housing.
	Bearing and drive misaligned.	Realign.
	Noise being transmitted by duct.	Make sure ductwork is supported properly. Make sure ductwork metal thickness is sized for proper stiffness. Check duct size at discharge to ensure that air velocities are not too high.

Always have a completed Pre-Start-Up Checklist, unit Start-Up Checklist, and Optional Accessories Checklist prior to requesting parts or service information.

Troubleshooting – General Refrigeration Circuit

IMPORTANT TROUBLESHOOTING NOTE!
Before any components are changed on the refrigeration system, the cause of the failure must be identified. Further problems will exist unless the true cause or problem is identified and corrected.

IMPORTANT!
Do not release refrigerant to the atmosphere! If required service procedures include the adding or removing of refrigerant, the service technician must comply with all federal, state and local laws. The procedures discussed in this manual should only be performed by a qualified HVAC Technician.

NOTE: Unit is equipped with a phase loss/phase reversal control. If system does not start, check phase of electrical supply.

Symptom	Possible Cause	Corrective Action
Compressor will not run or does not try to start	Open disconnect switch or circuit breaker.	Close switch and / or breaker.
	Compressor contactor not closing.	Check voltage to contactor coil, transformer, slave relay, system. Replace parts as necessary.
	Blown fuse or tripped breaker.	Check for reason and repair. Replace fuse after correcting problem.
	Low line voltage.	Check line voltage. If more than 10% from compressor marking, correcting is necessary.
	Compressor motor protector open.	Motor thermal protector automatically resets. Allow time (2 hrs.) for compressor to cool down so protector will reset. Restart and check for reason overheat occurred.
	Compressor defective.	Check motor for open circuit, short circuit, grounded windings or burn out. Compressor may be seized; check refrigerant. If necessary, replace compressor.
	High or low pressure switch open or defective.	If manual reset (high pressure), reset switch. (Switch opens at 400 psi and will not reset above 250 psi for R22 or 600/420 respectively for R410a). If auto reset (low pressure) does not reset and everything else is OK, replace switch.
	Open room thermostat or control (no cooling required).	Check room temperature. If temperature is proper, wait for thermostat to close.
	Loose wiring.	Check all wire terminals and tighten as necessary.
Compressor starts but cuts out on low pressure	Low refrigerant charge.	Check refrigerant pressures.
	Airflow restricted.	Check for dirty evaporator coil, dirty filters, dampers closed, iced evaporator coil, improper belt, check motor amps, check duct design.
Low pressure switch activates at 25 psig for R22, 50 psig for R410a	Restriction in refrigerant line.	Check refrigerant pressure, check and adjust thermal expansion valve. If not functioning properly, check for pressure drop across the filter drier.
	Defective low pressure switch.	Replace.

Always have a completed Pre-Start-Up Checklist, unit Start-Up Checklist, and Optional Accessories Checklist prior to requesting parts or service information.

Troubleshooting - General Refrigeration Circuit

Symptom	Possible Cause	Corrective Action
Compressor starts but cuts out on high pressure switch High pressure activates at 410 psig for R22, 600 psig for R410a	Refrigerant overcharge.	Check pressures, charge by subcooling.
	Condenser fan motor defective.	Check fan motor.
	Condenser coil inlet obstructed or dirty.	Check coil and inlet clearances.
	Air or non-condensables in system.	Check high side equalized pressure reading with equivalent outdoor temperature.
	Defective high pressure switch.	Replace.
	Restriction in discharge or liquid line.	Check refrigerant line pressures, check thermal expansion valves.
	Condensing fan relay not pulling in.	Replace.
Compressor cuts out on thermal overload	Low voltage.	Check voltage.
	Sustained high discharge pressure.	Check running amperage and conditions described under 'Low suction pressure' symptoms.
	High suction and discharge pressures.	Check thermal expansion valve setting, check for air in system.
	Defective compressor overload.	If compressor is hot, allow compressor to cool for two hours. Recheck for open circuit.
	Improper refrigerant charge.	Check subcooling.
	Improperly wired.	Review wiring schematics.
	Loose wiring.	Check all connections and wires.
	Defective start relay.	Replace relay.
	Motor windings damaged.	Verify amp draw.
Compressor hums, but will not start	Improperly wired.	Review wiring schematics.
	Low line voltage.	Check voltage.
	Loose wiring.	Check all connections.
	Defective start or run capacitor.	Check run capacitor for compressor and fan motor.
	Defective relay start.	Replace relay.
	Motor winding damaged.	Verify amp draws.
	Internal compressor mechanical damage.	Replace.

Always have a completed Pre-Start-Up Checklist, unit Start-Up Checklist, and Optional Accessories Checklist prior to requesting parts or service information.

Troubleshooting - General Refrigeration Circuit

Symptom	Possible Cause	Corrective Action
Compressor noisy or vibrating	Refrigerant overcharge.	Check pressures and subcooling.
	Liquid floodback.	Check thermal expansion valve setting. Check for refrigerant overcharge.
	Tubing rattle.	Dampen tubing vibration by taping or clamping. Carefully bend tubing away from contact where possible.
	Scroll compressor rotating in reverse (3 phase).	Rewire for opposite rotation.
	Worn or damaged compressor.	Replace the compressor.
	Improper mounting on unit base.	Check that compressor is properly isolated.
High suction pressure	Excessive load on evaporator coil.	Check for high entering wet bulb temperature. Check for excessive air.
	Compressor is unloaded.	Check head pressure, check thermal expansion valve if not functioning properly, check pressure drop across filter drier.
	Expansion valve not secured to suction line.	Check the thermal expansion valve, ensure bulb is insulated. Check superheat. If superheat is high, then valve is out of control and pegged wide open. • Check bulb for contact. • Adjust valve for superheat. • Replace valve powerhead or valve.
	Thermostatic expansion valve pressure limit feature incorrect or inoperative. Overfeeding.	Check bulb location and clamping. Adjust superheat. Replace expansion valve power head.
	Room load too large.	Reduce the load or add more equipment.
	Overcharged.	Check pressures and subcooling.
High discharge pressure	Thermal expansion valve setting.	Check thermal expansion setting and calibrate superheat.
	Air inlet to condenser dirty or obstructed.	Check for proper clearances and possible air recirculating.
	Condenser fan motor defective.	Check condenser fan motor and capacitor.
	Too much refrigerant.	Remove excess refrigerant.
	Non-condensable in system.	Remove non-condensable from system.
	Dirty condenser coil.	Clean condenser coil.
	Condenser fan not running or running backwards.	Check electrical circuit and fuse. Check fan cycling controls.
	Discharge service valve partially closed.	Open valve.
	High load conditions.	Add more equipment or reduce load.

Always have a completed Pre-Start-Up Checklist, unit Start-Up Checklist, and Optional Accessories Checklist prior to requesting parts or service information.

Troubleshooting - General Refrigeration Circuit

Symptom	Possible Cause	Corrective Action
Low suction pressure	Refrigerant undercharge.	Check pressures and subcooling.
	Blower running backward.	Interchange any two wires from 3 phase disconnect.
	Loose blower, pulley or belts.	Check drive pulley alignment, belt tension.
	Low entering air temperature (low load condition).	Check entering air wet bulb conditions.
	Refrigerant leak.	Check system for leaks. Repair leaks and add refrigerant.
	Evaporator dirty or iced up or airflow restricted.	Check defrost system. Clean the coil. Check fan operation. Check airflow.
	Plugged liquid line filter-drier.	Replace filter-drier.
	Improper suction pressure regulator setting.	Check setting and correct as required.
	Expansion valve defective, superheat too high, or valve too small.	Adjust valve for proper superheat or replace the expansion valve if too small or defective.
	Moisture in system.	Reclaim refrigerant, check for leaks, recharge.
Low discharge pressure	Insufficient refrigerant charge.	Check subcooling, check for leak. Repair leak and add refrigerant.
	Defective or improperly adjusted expansion valve.	Check superheating and adjust thermal expansion valve.
	Low suction pressure.	See “Low suction pressure”.
	Faulty condenser temperature controls.	Check condenser controls and reset to obtain desired condensing temperature.
Compressor short cycles	Thermostat location or malfunction.	Check thermostat, check heat anticipator setting.
	Improper refrigerant charge.	Check subcooling, verify superheat.
	Defective high or low pressure control.	Check high or low pressure switch.
	Liquid floodback.	Possible tight bearings, see above.
	Defective expansion valve.	Check thermal expansion valve and superheat.
	Poor air distribution.	Check ductwork for recirculating.
	High discharge pressure.	See “High discharge pressure”.
	Leaking discharge valves in compressor.	See “High suction pressure”.
	Low airflow at evaporator(s).	Check blower operation and airstream restrictions.
	Incorrect unit selection (oversized).	Contact factory.

Always have a completed Pre-Start-Up Checklist, unit Start-Up Checklist, and Optional Accessories Checklist prior to requesting parts or service information.

Troubleshooting - General Refrigeration Circuit

Symptom	Possible Cause	Corrective Action
Low or no oil pressure	Low oil level (trapped oil in evaporator or suction line).	Thoroughly defrost evaporator. After defrost, observe level, add oil. Check for leaks. Check lines for proper slope and traps.
	Excessive liquid refrigerant in the crankcase.	Adjust expansion valve for higher superheat. Check crankcase heater.
	Worn oil pump.	Replace the oil pump.
	Worn compressor bearings.	Replace the compressor.
	Loose fitting on oil line or pump housing gasket leaking. (R22 only)	Check and tighten system. Check bottom plate or compressor.
	Compressor short cycling.	Check low pressure control setting.
Compressor loses oil	Refrigerant leak.	Check system for leaks. Repair leaks and add refrigerant.
	Short cycling.	Check low pressure control settings.
	Refrigerant flood back.	Check thermal expansion valve setting. Check for refrigerant overcharge.
	Improper piping or traps.	Verify proper piping slopes.
Running cycle is too long or unit operates continuously	Refrigeration undercharged.	Check subcooling.
	Dirty filter or evaporator coil.	Check filter, coil and airflow.
	Dirty or clogged condenser coil.	Check coil and airflow.
	Air or other non-condensables in system.	Check equalized high side pressure with equivalent outdoor temperature.
	Defective compressor.	See “High suction pressure”.
	Restriction in suction and liquid line.	Check for restrictions in refrigerant circuit.
	Control contacts stuck.	Check wiring.
	Excessive load.	Add more equipment or reduce room load.
	Too low of a system thermostat setting or defective thermostat.	Adjust or replace thermostat.

Always have a completed Pre-Start-Up Checklist, unit Start-Up Checklist, and Optional Accessories Checklist prior to requesting parts or service information.

Troubleshooting - General Refrigeration Circuit

Symptom	Possible Cause	Corrective Action
Liquid line is too hot	Refrigerant undercharge.	Adjust the charge by subcooling.
	High discharge pressure.	See “High discharge pressure”.
Liquid line is frosted or wet	Restriction in liquid line.	Clear restriction upstream of point of frosting.
Suction line is frosting	Insufficient evaporator airflow.	Check airflow, check filters, check drive for loose parts or belts.
	Restriction in suction or liquid line.	Restriction upstream of point of frosting.
	Malfunctioning or defective expansion valve.	Check bulb of thermal expansion valve.
Frost on evap coil	Hot gas bypass valve not functioning properly.	Check valve. If defective, replace.
	Manual hot gas bypass valve closed.	Open valve.

Always have a completed Pre-Start-Up Checklist, unit Start-Up Checklist, and Optional Accessories Checklist prior to requesting parts or service information.

Notes:

Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year from the shipment date. The energy recovery wheel is warranted to be free from defects in material and workmanship for a period of five years from the shipment date. Any units or parts which prove defective during the warranty period will be replaced at our option when returned to our factory, transportation prepaid.

Motors are warranted by the motor manufacturer for a period of one year. Should motors furnished by Greenheck prove defective during this period, they should be returned to the nearest authorized motor service station. Greenheck will not be responsible for any removal or installation costs.

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

GREENHECK

P.O. Box 410 • Schofield, WI 54476-0410 • 715.359.6171 • greenheck.com

#468151 IOM ERCH w/Packaged DX
Rev. 3, April 2012