



# SB Series

## Vertical Self-Contained Units



# Installation, Operation & Maintenance



### WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

### WARNING

#### QUALIFIED INSTALLER

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Startup and service must be performed by a Factory Trained Service Technician. A copy of this IOM should be kept with the unit.

### WARNING

#### FOR YOUR SAFETY

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.



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(ACP 31227)

## AAON SB Series Features and Options Introduction

### Energy Efficiency

- Direct Drive Backward Curved Plenum Supply Fans
- 10-100% Variable Capacity Scroll Compressors
- Double Wall Rigid Polyurethane Foam Injected Panel Construction
- Airside and Waterside Economizers
- Modulating SCR Electric Heat
- Modulating Head Pressure Control
- High Efficiency Electronically Commutated Motors
- Coaxial Refrigerant-to-Water Heat Exchanger
- Water-Source and Geothermal Heat Pumps
- Single Zone Variable Air Volume
- Energy Recovery Wheels

### Indoor Air Quality

- Up to 100% Outside Air with Optional Electric Pre-Heat
- Multiple High Efficiency Unit and Mixing Box Filters
- Double Wall Construction with No Exposed Insulation
- Stainless Steel Drain Pans

### Humidity Control

- 10-100% Variable Capacity Scroll Compressors
- Modulating Hot Gas Reheat

### Safety

- Freeze Stats
- Phase and Brown Out Protection

### Installation and Maintenance

- Direct Drive Backward Curved Plenum Supply Fans
- Clogged Filter Switch and Magnehelic Gauge
- Color Coded Wiring Diagram
- Isolated Compressor and Controls Compartment
- Compressor Isolation Valves
- Hinged Access Doors with Lockable Handles
- Liquid Line Sight Glass
- Split Configuration for Retrofit or Space Limited Applications

### System Integration

- Customer Provided Controls
- Electric, Steam, or Hot Water Heating
- Refrigerant-to-Water Heat Exchangers
- Condensing Unit Only Options
- Split System Configurations

### Environmentally Friendly

- R-410A Refrigerant
- Geothermal Heat Pump Configurations

### Extended Life

- Standard 5 Year Compressor Warranty
- Double Wall Rigid Polyurethane Foam Injected Cabinet Construction
- 2,500 Hour Salt Spray Tested Interior and Exterior Corrosion Protection
- Polymer E-Coated Coils - 5 Year Coating Warranty
- Stainless Steel Drain Pans
- Custom Color Paint Options

## Safety

Attention should be paid to the following statements:

**NOTE** - Notes are intended to clarify the unit installation, operation and maintenance.

**⚠ CAUTION** - Caution statements are given to prevent actions that may result in equipment damage, property damage, or personal injury.

**⚠ WARNING** - Warning statements are given to prevent actions that could result in equipment damage, property damage, personal injury or death.

**⚠ DANGER** - Danger statements are given to prevent actions that will result in equipment damage, property damage, severe personal injury or death.

### **⚠ WARNING**

#### **ELECTRIC SHOCK, FIRE OR EXPLOSION HAZARD**

Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death or property damage.

Improper servicing could result in dangerous operation, serious injury, death or property damage.

- Before servicing, disconnect all electrical power to the unit. More than one disconnect may be provided.
- When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.
- Verify proper operation after servicing. Secure all doors with key-lock or nut and bolt.

### **⚠ WARNING**

Electric shock hazard. Before servicing, disconnect all electrical power to the unit, including remote disconnects, to avoid shock hazard or injury from rotating parts. Follow proper Lockout-Tagout procedures.

### **⚠ WARNING**

#### **FIRE, EXPLOSION OR CARBON MONOXIDE POISONING HAZARD**

Failure to replace proper controls could result in fire, explosion or carbon monoxide poisoning. Failure to follow safety warnings exactly could result in serious injury, death or property damage. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this appliance.

**! WARNING**

During installation, testing, servicing and troubleshooting of the equipment it may be necessary to work with live electrical components. Only a qualified licensed electrician or individual properly trained in handling live electrical components shall perform these tasks.

Standard NFPA-70E, an OSHA regulation requiring an Arc Flash Boundary to be field established and marked for identification of where appropriate Personal Protective Equipment (PPE) be worn, should be followed.

**! WARNING**

**GROUNDING REQUIRED**

All field installed wiring must be completed by qualified personnel. Field installed wiring must comply with NEC/CEC, local and state electrical code requirements. Failure to follow code requirements could result in serious injury or death. Provide proper unit ground in accordance with these code requirements.

**! WARNING**

**UNIT HANDLING**

To prevent injury or death lifting equipment capacity shall exceed unit weight by an adequate safety factor. Always test-lift unit not more than 24 inches high to verify proper center of gravity lift point to avoid unit damage, injury or death.

**! WARNING**

**ROTATING COMPONENTS**

Unit contains fans with moving parts that can cause serious injury. Do not open door containing fans until the power to the unit has been disconnected and fan wheel has stopped rotating.

**! CAUTION**

Failure to properly drain and vent coils when not in use during freezing temperature may result in coil and equipment damage.

**! CAUTION**

Rotation must be checked on all MOTORS AND COMPRESSORS of 3 phase units at startup by a qualified service technician. Scroll compressors are directional and can be damaged if rotated in the wrong direction. Compressor rotation must be checked using suction and discharge gauges. Fan motor rotation should be checked for proper operation. Alterations should only be made at the unit power connection

**! WARNING**

**WATER PRESSURE**

Prior to connection of condensing water supply, verify water pressure is less than maximum pressure shown on unit nameplate. To prevent injury or death due to instantaneous release of high pressure water, relief valves should be field supplied on system water piping.

**! WARNING**

Do not use oxygen, acetylene or air in place of refrigerant and dry nitrogen for leak testing. A violent explosion may result causing injury or death.

**! WARNING**

Always use a pressure regulator, valves and gauges to control incoming pressures when pressure testing a system. Excessive pressure may cause line ruptures, equipment damage or an explosion which may result in injury or death.

**! WARNING**

Do not work in a closed area where refrigerant or nitrogen gases may be leaking. A sufficient quantity of vapors may be present and cause injury or death.

**! CAUTION**

Do not clean DX refrigerant coils with hot water or steam. The use of hot water or steam on refrigerant coils will cause high pressure inside the coil tubing and damage to the coil.

**! CAUTION**

To prevent damage to the unit, do not use acidic chemical coil cleaners. Do not use alkaline chemical coil cleaners with a pH value greater than 8.5, after mixing, without first using an aluminum corrosion inhibitor in the cleaning solution.

**! WARNING**

Some chemical coil cleaning compounds are caustic or toxic. Use these substances only in accordance with the manufacturer's usage instructions. Failure to follow instructions may result in equipment damage, injury or death.

**! WARNING**

**OPEN LOOP APPLICATIONS**

Failure of the condenser as a result of chemical corrosion is excluded from coverage under AAON Inc. warranties and the heat exchanger manufacturer's warranties.

**! CAUTION**

Door compartments containing hazardous voltage or rotating parts are equipped with door latches to allow locks. Door latch are shipped with nut and bolts requiring tooled access. If you do not replace the shipping hardware with a pad lock always re-install the nut & bolt after closing the door.

**! WARNING**

**WATER FREEZING**

Failure of the condenser due to freezing will allow water to enter the refrigerant circuit and will cause extensive damage to the refrigerant circuit components. Any damage to the equipment as a result of water freezing in the condenser is excluded from coverage under AAON warranties and the heat exchanger manufacturer warranties.

**! CAUTION**

Cleaning the cooling tower or the condenser water loop with harsh chemicals, such as hydrochloric acid (muriatic acid) or chlorine, can damage the water-cooled condenser. Care should be taken to avoid allowing chemicals to enter the water-cooled condenser. See Appendix A - Heat Exchanger Corrosion Resistance for more information.

**! CAUTION**

PVC (Polyvinyl Chloride) and CPVC (Chlorinated Polyvinyl Chloride) are vulnerable to attack by certain chemicals. Polyolester (POE) oils used with R-410A and other refrigerants, even in trace amounts, in a PVC or CPVC piping system will result in stress cracking of the piping and fittings and complete piping system failure.

 **WARNING**

**COMPRESSOR CYCLING**

**2 MINUTE MINIMUM OFF TIME**

To prevent motor overheating compressors must cycle off for a minimum of 2 minutes.

**2 MINUTE MINIMUM ON TIME**

To maintain the proper oil level compressors must cycle on for a minimum of 2 minutes.

The cycle rate must not exceed 6 starts per hour.

1. Startup and service must be performed by a Factory Trained Service Technician.
2. The unit is for indoor use only. See General Information section for more unit information.
3. Every unit has a unique equipment nameplate with electrical, operational, and unit clearance specifications. Always refer to the unit nameplate for specific ratings unique to the model you have purchased.
4. READ THE ENTIRE INSTALLATION, OPERATION AND MAINTENANCE MANUAL. OTHER IMPORTANT SAFETY PRECAUTIONS ARE PROVIDED THROUGHOUT THIS MANUAL.
5. Keep this manual and all literature safeguarded near or on the unit.

# SB Series Feature String Nomenclature

| Model Options |       |     |        |     |    |    |    |     |    | Unit Feature Options |    |    |    |    |   |   |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |   |   |   |   |   |   |  |  |
|---------------|-------|-----|--------|-----|----|----|----|-----|----|----------------------|----|----|----|----|---|---|---|----|----|----|----|----|----|---|---|---|----|----|----|----|-----|-----|---|---|---|---|---|---|--|--|
| GEN           | SIZE  | VLT | CONFIG | A1  | A2 | A3 | A4 | B1  | B2 | B3                   | 1A | 1B | 1C | 1D | 2 | 3 | 4 | 5A | 5B | 5C | 6A | 6B | 6C | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14A | 14B |   |   |   |   |   |   |  |  |
| SB            | - 007 | - 3 | - 0    | - E | 7  | 0  | A  | - 0 | 0  | 0                    | :  | 0  | 0  | 0  | 0 | - | 0 | 0  | 0  | -  | A  | B  | C  | - | 0 | A | 0  | -  | 0  | 0  | 0   | 0   | 0 | 0 | Y | - | E | 0 |  |  |
|               |       |     |        |     |    |    |    |     |    |                      |    |    |    |    |   |   |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |   |   |   |   |   |   |  |  |
|               |       |     |        |     |    |    |    |     |    |                      |    |    |    |    |   |   |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |   |   |   |   |   |   |  |  |
|               |       |     |        |     |    |    |    |     |    |                      |    |    |    |    |   |   |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |   |   |   |   |   |   |  |  |
|               |       |     |        |     |    |    |    |     |    |                      |    |    |    |    |   |   |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |   |   |   |   |   |   |  |  |

## MODEL OPTIONS

### Series and Generation

SB

### Unit Size

003 = 3 ton Capacity  
 004 = 4 ton Capacity  
 005 = 5 ton Capacity  
 006 = 6 ton Capacity  
 007 = 7 ton Capacity  
 009 = 9 ton Capacity  
 010 = 10 ton Capacity  
 014 = 14 ton Capacity  
 016 = 16 ton Capacity  
 018 = 18 ton Capacity

### Voltage

1 = 230V/1Φ/60Hz  
 2 = 230V/3Φ/60Hz  
 3 = 460V/3Φ/60Hz  
 4 = 575V/3Φ/60Hz  
 8 = 208V/3Φ/60Hz  
 9 = 208V/1Φ/60Hz

### Configuration

0 = Right Hand Unit + Top Vertical Discharge  
 A = Left Hand Unit + Top Vertical Discharge

### A1: Refrigerant Style

E = R-410A Variable Capacity Scroll Compressor

### A2: Unit Configuration

0 = Water-Cooled Condenser - Condensing Unit Only  
 7 = Water-Source/Geothermal Heat Pump + Std Evap. Coil - Coaxial Heat Exchanger  
 8 = Water-Source/Geothermal Heat Pump + 6 Row Evap. Coil - Coaxial Heat Exchanger  
 9 = Water-Source/Geothermal Heat Pump - Condensing Unit Only

### A3: Coil Coating

0 = Standard - None  
 1 = Polymer E-coated Cooling and Reheat Coils  
 5 = Copper Finned Coils + Stainless Steel Coil Casing

### A4: Cooling / Heat Pump Staging

A = Modulating - Variable Capacity Compressor

### B1: Heating Type

0 = No Heating  
 3 = Electric Heat  
 C = Steam Distributing Standard Coil  
 D = Steam Distributing Polymer E-Coated Coil  
 E = Hot Water Standard Coil  
 F = Hot Water Polymer E-Coated Coil

### B2: Heating Designation

0 = No Heating  
 1 = 1 Row Coil  
 2 = 2 Row Coil  
 A = 7 kW (5.3 kW @ 208V)  
 B = 14 kW (10.5 kW @ 208V)  
 C = 21 kW (15.8 kW @ 208V)  
 D = 28 kW (21.0 kW @ 208V)  
 E = 35 kW (26.3 kW @ 208V)  
 F = 42 kW (31.5 kW @ 208V)  
 G = 49 kW (37.0 kW @ 208V)  
 H = 56 kW (42.0 kW @ 208V)  
 J = 63 kW (47.3 kW @ 208V)  
 K = 70 kW (52.5 kW @ 208V)

### B3: Heating Staging

0 = No Heating  
 1 = 1 Stage  
 2 = 2 Stage  
 3 = 3 Stage  
 4 = 4 Stage  
 9 = Modulating/SCR Electric - Potentiometer Control  
 A = Modulating/SCR Electric - 0-10VDC Control Signal  
 H = Single Serpentine 8 fpi  
 J = Half Serpentine 8 fpi  
 K = Single Serpentine 10 fpi  
 L = Half Serpentine 10 fpi  
 M = Single Serpentine 12 fpi  
 N = Half Serpentine 12 fpi

# SB Series Feature String Nomenclature

| Model Options |       |     |        |     |    |    |    |     |    | :  | Unit Feature Options |              |              |             |   |     |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |  |  |  |  |
|---------------|-------|-----|--------|-----|----|----|----|-----|----|----|----------------------|--------------|--------------|-------------|---|-----|---|----|----|----|----|----|----|---|---|---|----|----|----|----|-----|-----|--|--|--|--|
| GEN           | SIZE  | VLT | CONFIG | A1  | A2 | A3 | A4 | B1  | B2 | B3 | 1A                   | 1B           | 1C           | 1D          | 2 | 3   | 4 | 5A | 5B | 5C | 6A | 6B | 6C | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14A | 14B |  |  |  |  |
| SB            | - 007 | - 3 | - 0    | - E | 7  | 0  | A  | - 0 | 0  | 0  | <b>: 0000</b>        | <b>- 000</b> | <b>- ABC</b> | <b>- 0A</b> | 0 | - 0 | 0 | 0  | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0  | 0  | 0  | Y  | - E | 0   |  |  |  |  |
|               |       |     |        |     |    |    |    |     |    |    |                      |              |              |             |   |     |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |  |  |  |  |
|               |       |     |        |     |    |    |    |     |    |    |                      |              |              |             |   |     |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |  |  |  |  |
|               |       |     |        |     |    |    |    |     |    |    |                      |              |              |             |   |     |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |  |  |  |  |
|               |       |     |        |     |    |    |    |     |    |    |                      |              |              |             |   |     |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |  |  |  |  |
|               |       |     |        |     |    |    |    |     |    |    |                      |              |              |             |   |     |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |  |  |  |  |
|               |       |     |        |     |    |    |    |     |    |    |                      |              |              |             |   |     |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |  |  |  |  |
|               |       |     |        |     |    |    |    |     |    |    |                      |              |              |             |   |     |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |  |  |  |  |
|               |       |     |        |     |    |    |    |     |    |    |                      |              |              |             |   |     |   |    |    |    |    |    |    |   |   |   |    |    |    |    |     |     |  |  |  |  |

### UNIT FEATURE OPTIONS

#### 1A: Return / Outside Air Section

- 0 = Standard
- 2 = Mixing Box - Top and Front Openings

#### 1B: Exhaust Fan

- 0 = Standard
- A = 250 mm Exhaust Fan, 800 W EC Motor
- B = 310 mm Exhaust Fan, 1.0 kW EC Motor
- C = 310 mm Exhaust Fan, 1.7 kW EC Motor
- D = 355 mm Exhaust Fan, 1.7 kW EC Motor
- E = 450 mm Exhaust Fan, 3.0 kW EC Motor
- F = 450 mm Exhaust Fan, 6.0 kW EC Motor
- G = Dual 310 mm Exhaust Fan, 1.0 kW EC Motor
- H = Dual 310 mm Exhaust Fan, 1.7 kW EC Motor
- J = Dual 355 mm Exhaust Fan, 1.7 kW EC Motor
- K = Dual 450 mm Exhaust Fan, 3.0 kW EC Motor
- L = Dual 450 mm Exhaust Fan, 6.0 kW EC Motor

#### 1C: Filter Location

- 0 = Standard

#### 1D: Mixing Box Damper Control

- 0 = Standard - None
- A = 2 Position Actuators (24V)
- B = Fully Modulating Actuators (DDC)
- C = Fixed Position Dampers

#### 2: Waterside Economizer

- 0 = Standard - None

#### 3: Energy Recovery Type

- 0 = Standard
- A = Energy Recovery Wheel – Total + High CFM, Polymer
- C = Energy Recovery Wheel – Total + High CFM, 1% Purge, Polymer
- E = Energy Recovery Wheel – Sensible + High CFM, Polymer
- G = Energy Recovery Wheel – Sensible + High CFM, 1% Purge, Polymer

#### 4: Maintenance Options

- 0 = Standard
- A = Blower Aux. Contact - Low Voltage Terminal Block
- B = Remote Start/Stop Terminals - Low Voltage Terminal Block
- C = Options A + B

#### 5A: Supply Air Blower Configuration

- 0 = No Airside - Condensing Unit Only
- A = 1 Blower + High Efficiency EC Motor
- B = 2 Blowers + High Efficiency EC Motors

#### 5B: Supply Air Blower

- 0 = No Airside - Condensing Unit Only
- A = 310 mm (14") Direct Drive Backward Curved Plenum Fan
- B = 355 mm (16") Direct Drive Backward Curved Plenum Fan
- C = 450 mm (18") Direct Drive Backward Curved Plenum Fan
- D = 250MM (12") Direct Drive Backward Curved Plenum

#### 5C: Supply Air Blower Motor

- 0 = No Airside - Condensing Unit Only
- B = 1.0 kW (1.34 HP)
- C = 1.7 kW (2.3 hp)
- D = 3.0 kW (4.0 hp)
- E = 6.0 kW (8.0 hp)
- F = 800 W (1.1 HP)

#### 6A: Pre-Filter Type

- 0 = No Pre Filter
- A = 2" Pleated - 30% Eff. - MERV 10

#### 6B: Unit Filter Type

- 0 = No Unit Filter
- A = 2" Pleated - 30% Eff. - MERV 10
- B = 4" Pleated - 30% Eff. - MERV 10
- C = 4" Pleated - 65% Eff. - MERV 11
- D = 4" Pleated - 85% Eff. - MERV 13
- E = 4" Pleated - 95% Eff. - MERV 14



# SB Series Feature String Nomenclature

| Model Options |       |     |        |     |    |    |    |     |    | :  | Unit Feature Options |    |    |    |   |   |   |       |      |    |     |    |    |   |   |   |    |    |    |    |     |     |  |  |
|---------------|-------|-----|--------|-----|----|----|----|-----|----|----|----------------------|----|----|----|---|---|---|-------|------|----|-----|----|----|---|---|---|----|----|----|----|-----|-----|--|--|
| GEN           | SIZE  | VLT | CONFIG | A1  | A2 | A3 | A4 | B1  | B2 | B3 | 1A                   | 1B | 1C | 1D | 2 | 3 | 4 | 5A    | 5B   | 5C | 6A  | 6B | 6C | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14A | 14B |  |  |
| SB            | - 007 | - 3 | - 0    | - E | 7  | 0  | A  | - 0 | 0  | 0  | :                    | 0  | 0  | 0  | 0 | 0 | 0 | - ABC | - 0A | 0  | - 0 | 0  | 0  | 0 | 0 | 0 | 0  | 0  | 0  | Y  | - E | 0   |  |  |
|               |       |     |        |     |    |    |    |     |    |    |                      |    |    |    |   |   |   |       |      |    |     |    |    |   |   |   |    |    |    |    |     |     |  |  |
|               |       |     |        |     |    |    |    |     |    |    |                      |    |    |    |   |   |   |       |      |    |     |    |    |   |   |   |    |    |    |    |     |     |  |  |
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**14A: Water-Cooled Condenser**

- B = Water Flow Switch
- E = Balancing Valves + Option B
- H = Motorized Shut-Off Valve + Option B
- J = Two Way Head Pressure Control + Option B
- M = Balancing Valves + Option J
- T = CuNi Corrosion Resistant Coaxial Heat Exchanger + Option B
- W = CuNi Corrosion Resistant Coaxial Heat Exchanger + Option E
- 1 = CuNi Corrosion Resistant Coaxial Heat Exchanger + Option H
- 2 = CuNi Corrosion Resistant Coaxial Heat Exchanger + Option J
- 4 = CuNi Corrosion Resistant Coaxial Heat Exchanger + Option L
- 5 = CuNi Corrosion Resistant Coaxial Heat Exchanger + Option M

**14B: Waterside Economizer Piping**

- 0 = Standard - None

**15: Glycol Percentage**

- 0 = Standard - None
- A = Minimum 20% Propylene Glycol
- B = Minimum 40% Propylene Glycol

**16: Interior Cabinet Options**

- 0 = Standard - Double Wall Construction + R-6.5 Foam Insulation + Stainless Steel Drain Pan
- A = Overflow Switch
- B = Compressor Sound Blanket
- C = Options A + B

**17: Exterior Cabinet Options**

- 0 = Standard
- A = AAON Gray Exterior Paint
- B = Special Paint
- C = Interior Corrosion Protection
- D = Options A + C

**18: Energy Recovery Cabinet**

- 0 = Standard - None
- A = Top RA + Back EA + Back OA Connections
- G = OA + EA Dampers - Top RA + Back EA + Back OA Connections
- N = OA + Economizer Dampers - Top RA + Back EA + Back Connections
- U = OA + EA + Economizer Dampers - Top RA + Back EA + Back OA Connections

**19: Code Options**

- 0 = Standard - ETL U.S.A. Listing
- H = ETL U.S.A. + Canada Listing

**20: Crating**

- 0 = Standard
- A = Export Crating
- B = Forkliftable Base - 5" Base
- D = Options A + B
- E = Shipping Shrink Wrap
- F = Options B + E
- G = Options A + B + E

**21: Unit Splits**

- 0 = Standard - One Piece Unit
- A = 1 Shipping Split (2 pallets)
- B = 2 Shipping Splits (3 pallets)
- C = 3 Shipping Splits (4 pallets)
- D = 4 Shipping Splits (5 pallets)
- H = Special Shipping Split

**22: Control Vendors**

- 0 = Standard
- A = WattMaster Orion Controls System

**23: Type**

- B = Standard
- X = Special Pricing Authorization

## General Information

SB Series self contained units have been designed for indoor installation only. Units are assembled, wired, charged and run-tested at the factory.

### **WARNING**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Startup and service must be performed by a Factory Trained Service Technician. A copy of this IOM should be kept with the unit.

### **CAUTION**

These units must not be used as a "construction heater" at anytime during any phase of construction. Very low return air temperatures, harmful vapors, and misplacement of the filters will damage the unit and its efficiency.

### Certification of Steam or Hot Water Heat Models

- a. Certified as a forced air heating system with cooling.
- b. Certified for indoor installation only.

### Certification of Electric Heat Models

- a. Certified as an electric warm air furnace with cooling.
- b. Certified for indoor installation only.

### Certification of Cooling Models

- a. Certified as a commercial central air conditioner with electrically operated compressors.
- b. Certified for indoor installation only.
- c. Certified with refrigerant R-410A coils.

### Codes and Ordinances

SB Series units have been tested and certified, by ETL, in accordance with UL Safety Standard 1995/CSA C22.2 No. 236.

System should be sized in accordance with the American Society of Heating, Refrigeration and Air Conditioning Engineers Handbook.

Installation of units must conform to the ICC standards of the International Mechanical Code, the International Building Code, Installation of Air Conditioning and Ventilating Systems Standard, NFPA 90A, and local building, plumbing and waste water codes. All appliances must be electrically grounded in accordance with local codes, or in the absence of local codes, the current National Electric Code, ANSI/NFPA 70 or the current Canadian Electrical Code CSA C22.1.

### **CAUTION**

The Clean Air Act of 1990 bans the intentional venting of refrigerant as of July 1, 1992. Approved methods of recovery, recycling, or reclaiming must be followed.

### **WARNING**

Coils and sheet metal surfaces present sharp edges and care must be taken when working with equipment.

**! WARNING**

Failure to observe the following instructions will result in premature failure of your system and possible voiding of the warranty.

**Receiving Unit**

When received, the unit should be checked for damage that might have occurred in transit. If damage is found it should be noted on the carrier's Freight Bill. A request for inspection by carrier's agent should be made in writing at once.

Nameplate should be checked to ensure the correct model sizes and voltages have been received to match the job requirements.

If repairs must be made to damaged goods, then the factory should be notified before any repair action is taken in order to protect the warranty. Certain equipment alteration, repair, and manipulation of equipment without the manufacturer's consent may void the product warranty. Contact the AAON Warranty Department for assistance with handling damaged goods, repairs, and freight claims: (903) 236-4403.

**Note:** Upon receipt check shipment for items that ship loose such as filters and remote sensors. Consult order and shipment documentation to identify potential loose-shipped items. Loose-shipped items may have been placed inside unit cabinet for security. Installers and owners should secure all doors with locks or nuts and bolts to prevent unauthorized access.

The warranty card must be completed in full and returned to AAON not more than 3 months after unit is delivered.



Figure 1 - Lockable Handle

**Storage**

If installation will not occur immediately following delivery, store equipment in a dry protected area away from construction traffic and in the proper orientation as marked on the packaging with all internal packaging in place. Secure all loose-shipped items.

**Direct Expansion (DX) Systems**

**! WARNING**

**COMPRESSOR CYCLING**

**2 MINUTE MINIMUM OFF TIME**

To prevent motor overheating compressors must cycle off for a minimum of 2 minutes.

**2 MINUTE MINIMUM ON TIME**

To maintain the proper oil level compressors must cycle on for a minimum of 2 minutes.

The cycle rate must not exceed 6 starts per hour.

All water-cooled condenser DX systems are factory assembled, leak tested, charged with R-410A refrigerant, and run tested.

All DX systems include evaporator coils, liquid line filter dryers, thermal expansion valves (TXV), and scroll compressors.

 **CAUTION**

**CRANKCASE HEATER**

Some units are equipped with compressor crankcase heaters, which should be energized at least 24 hours prior to condenser operation, to clear any liquid refrigerant from the compressors.

Never turn off the main power supply to the unit, except for servicing, emergency, or complete shutdown of the unit. When power is cut off from the unit crankcase heaters cannot prevent refrigerant migration into the compressors. This means the compressor may cool down and liquid refrigerant may accumulate in the compressor. The compressor is designed to pump refrigerant gas and damage may occur when power is restored.

If power to the unit must be off for more than an hour, turn the thermostat system switch to "OFF", or turn the unit off at the control panel, and leave the unit off until the main power switch has been turned on again for at least 24 hours for units with compressor crankcase heaters. This will give the crankcase heater time to clear any liquid accumulation out of the compressor before it is started.

Always control the unit from the thermostat, or control panel, never at the main power

supply, except for emergency or complete shutdown of the unit.

During the cooling season, if the air flow is reduced due to dirty air filters or any other reason, the cooling coils can get too cold which will cause excessive liquid to return to the compressor. As the liquid concentration builds up, oil is washed out of the compressor, leaving it starved for lubrication.

The compressor life will be seriously shortened by reduced lubrication and the pumping of excessive amounts of liquid oil and refrigerant.

### **Wiring Diagrams**

Unit specific wiring diagrams are laminated and affixed inside the controls compartment door.

### **Condensate Drain Pans**

Units require drain p-traps and lines to be connected to the condensate drain pans of the unit. The lines should be the same pipe size or larger than the drain connection, include a p-trap, and pitch downward toward drain. An air break should be used with long runs of condensate lines.

Waterside economizer coil units include a separate condensate drain pan which drains into the evaporator coil drain pan.

 **CAUTION**

Unit should not be operated without a p-trap. Failure to install a p-trap may result in overflow of condensate water.

## Installation

AAON equipment has been designed for quick and easy installation.

### Locating the Unit

Placement of the unit relative to ductwork, electrical and plumbing must be carefully considered. Return air plenum or duct can be mounted directly to the return air flanges. Use flexible gasket material to seal the duct to the unit.

Verify floor or foundation can support the total unit weight, including accessory weights. Unit must be level in both horizontal axes to support the unit and reduce noise and vibration from the unit.

Allow adequate service clearances as shown on the unit nameplate and unit drawing. Consult your local building codes for additional service clearance requirements.

Allow adequate space for piping access and panel removal. Condenser water piping and condensate drain connections are located on either side of the unit.



Figure 2 - SB Series

Table 1 - SB Series Clearances

| Location          | Minimum Clearance Required |
|-------------------|----------------------------|
| Access Door Sides | 36 inches                  |
| All Other Sides   | 6 inches                   |

**! CAUTION**

Emergency drain pan is recommended for all applications where a risk of water damage to surrounding structure or furnishings. Refer to local codes.

### *Floor Mounted Units*

Make sure the unit is level and mounted on a field supplied platform with a minimum height to allow for proper depth of the condensate line p-trap. Other installation provisions may be necessary according to job specifications. SB Series vertical air handling units are designed for up flow applications only.

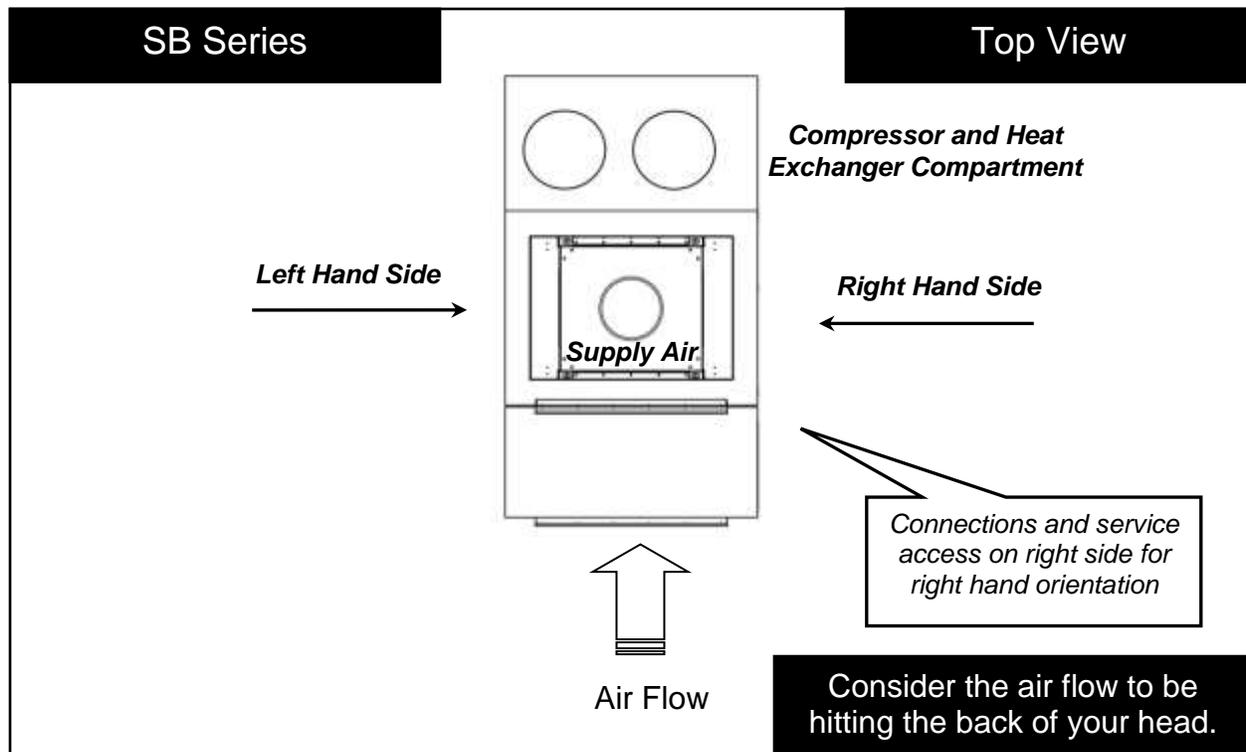


Figure 3 - SB Series Unit Orientation

### Lifting and Handling the Unit

Before lifting unit, be sure that all shipping material has been removed from unit.

#### **! WARNING**

#### UNIT HANDLING

Incorrect lifting can cause damage to the unit, injury or death. Lifting equipment capacity should exceed unit weight by an adequate safety factor. Always test lift unit not more than 24 inches high to verify proper center of gravity lift point.

Care should be taken if using spreader bars, blocking or other lifting devices to prevent damage to the cabinet, coil or fans.

### Unit Assembly

Although SB Series units are shipped factory assembled as standard, the unit may be ordered as shipping splits for certain applications such as for assembly in existing structures where modules must be manipulated separately. If the unit was ordered as shipping splits, then they must be assembled in the field.

Locate the schematic in the equipment's literature packet.

#### 1. Identify and Situate Splits

a. SB Units can have the following ship split sections:

1. Exhaust Fan
2. Energy Recovery
3. Air Handler
4. Electric Heat
5. Pre filter
6. Mixing box
7. Water-Cooled Condenser

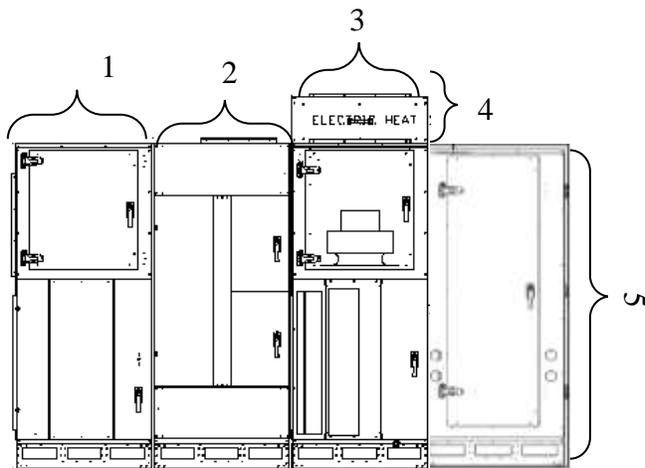


Figure 4 - SB Schematic with (1) Exhaust Fan, (2) Energy Recovery, (3) Air Handler, and (4) Electric Heat (5) Compressor Section

## 2. Connect Sections

Using the SB Schematic as an example, section 1 will have a duct flange, and it will connect to section 2 on the side that does not have a flange. First make sure gasket is on the panel around the edges of the exposed duct flanges. Push section 1 and 2 together so that the flange from section 1 is inside of section 2.

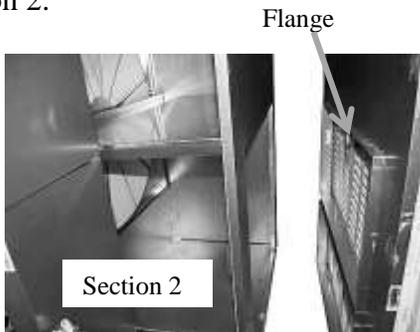


Figure 5 - Connect Sections

Use bar clamps or other non-destructive winching device to pull the tops of the modules together tightly.



Figure 6 - Bar Clamp

At each of the pre-drilled holes in the flange, drill 5/16 hex head self-tapping screws to secure the two sections together.



Figure 7 - Flange Overlap

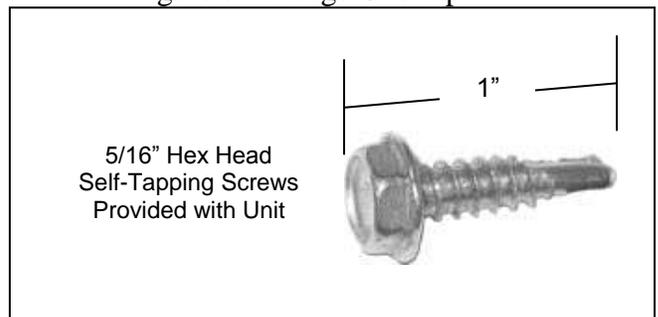


Figure 8 - Self-Tapping Screw

All connection hardware is shipped with the unit.

## 3. Secure Module Joints

The metal straps are to be used to secure module joints. Straps are provided with pre-drilled holes. Self-tapping sheet metal screws are provided to attach the straps to the unit cabinet.

Leave bar clamps in place until strap is secure.

Place the strap over a module joint, ensure the strap completely covers the joint, and that it is square with the unit casing.

Insert self-tapping screws through pre-drilled holes in strap and secure screws into unit casing using a power drill. For best results, use the lowest effective power drill torque setting. Be careful not to over tighten the screws.

Remove bar clamps and repeat for all remaining module joints.

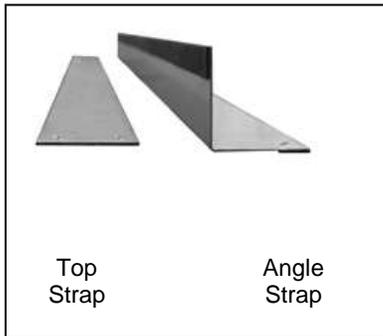


Figure 9 - Strap Types

#### 4. Connect Power and Control Wiring

SB Series units are equipped with low and high voltage quick connects to connect wiring from one section to the next. Wire from the unit to external controls and power sources must be provided in the field.



Figure 10 - Low Voltage Quick Connect

A color-coded wiring diagram is laminated and affixed to the inside of the control compartment access door. SB Series units are equipped with a single point power connection.

#### 5. Final Sealing

It is very important to keep air from infiltrating the unit cabinet. Seal all piping penetrations with Armaflex, Permagum or other suitable sealant. Also seal around drain connections, electrical connections and all other inlets where air may enter the cabinet. This is especially important when the unit is installed in an unconditioned area.

 **CAUTION**

Installing Contractor is responsible for proper sealing of the electrical and piping entries into the unit. Failure to seal the entries may result in damage to the unit and property.

#### Refrigerant-to-Water Heat Exchanger Water Piping

Condenser water pump, condenser water piping, cooling tower, pressure gauges, strainers, piping insulation and all components of the waterside piping must be field installed.

### *Open Loop Applications*

This product contains one or more refrigerant-to-water heat exchangers made of cupronickel or copper and is subject to severe corrosion and failure when exposed to chlorides.

|   |
|---|
|  <b>WARNING</b>  |
| <b>OPEN LOOP APPLICATIONS</b>   |
| Failure of the condenser as a result of chemical corrosion is excluded from coverage under AAON Inc. warranties and the heat exchanger manufacturer's warranties. |

Do not allow water containing any form of chlorides to enter this heat exchanger.

Common forms of chlorides include:

1. Sea water mist entering an open cooling tower system.
2. Contaminated make-up water containing salt water.
3. Water loops disinfected with solutions containing sodium hypochlorite.

Chlorides will result in a premature failure of the condenser.

Failure of the condenser as a result of chemical corrosion is excluded from coverage under AAON warranties and the heat exchanger manufacturer warranties.

Failure of the condenser will allow water to enter the refrigerant circuit and will cause extensive damage to the refrigerant circuit components. Any damage to the equipment as a result of condenser failure from chemical corrosion due the fluid in the condenser is excluded from coverage under

AAON warranties and the heat exchanger manufacturer warranties.

|  |
|--|
|  <b>WARNING</b>   |
| <b>OPEN LOOP APPLICATIONS</b>  |
| Cupronickel refrigerant-to-water heat exchangers are recommended with all open loop applications. Failure to use a Cupronickel heat exchanger may result in premature failure of your system and possible voiding of the warranty. |

|   |
|---|
|  <b>CAUTION</b>  |
| Cleaning the cooling tower or condenser water loop with harsh chemicals such as hydrochloric acid (muriatic acid), chlorine or other chlorides, can damage the refrigerant-to-water heat exchanger. Care should be taken to avoid allowing chemicals to enter the refrigerant-to-water heat exchanger. See Appendix A - Heat Exchanger Corrosion Resistance for more information. |

### *Freezing Water in the Heat Exchanger*

This product contains one or more refrigerant-to-water heat exchangers. A refrigerant-to-water heat exchanger contains refrigerant in one passage and water in another passage. Water is subject to freezing at 32°F. When water freezes in a heat exchanger significant forces are exerted on the components of the heat exchanger where the water is confined.

Failure of the condenser due to freezing will allow water to enter the refrigerant circuit and will cause extensive damage to the refrigerant circuit components. Any damage to the equipment as a result of water freezing in the condenser is excluded from coverage under AAON warranties and the heat exchanger manufacturer warranties.

 **WARNING**

**WATER FREEZING**

Failure of the condenser due to freezing will allow water to enter the refrigerant circuit and will cause extensive damage to the refrigerant circuit components. Any damage to the equipment as a result of water freezing in the condenser is excluded from coverage under AAON warranties and the heat exchanger manufacturer warranties.

Unit is capable of operating with Entering Water Temperatures (EWT) as low as 57°F during cooling mode without the need for head pressure control. If the EWT is expected to be lower than 57°F or more stable operation is desired, a factory provided head pressure control water valve option is available.

Glycol solution should be used if ambient temperatures are expected to fall below freezing or if the loop water temperature is below 50°F while operating in the heating mode (heat pump units only). Adding glycol to condenser water causes an increase in pressure drop resulting in a decrease in unit performance. A minimum concentration of 20% glycol solution is recommended.

Table 2 - Glycol Freezing Points

| % Glycol | Ethylene Glycol | Propylene Glycol |
|----------|-----------------|------------------|
| 20       | 18°F            | 19°F             |
| 30       | 7°F             | 9°F              |
| 40       | -7°F            | -6°F             |
| 50       | -28°F           | -27°F            |

Water loop piping runs through unheated areas or outside the building should be insulated.

*Water Piping*

Installing contractor must ensure a differential pressure switch or water flow switch is installed between the condenser water supply and return connections. This sensor provides a signal to the unit controller that water flow is present in the heat exchanger and the unit can operate without damaging unit components.

 **WARNING**

**WATER PRESSURE**

Prior to connection of condensing water supply, verify water pressure is less than maximum pressure shown on unit nameplate. To prevent injury or death due to instantaneous release of high pressure water, relief valves should be field supplied on water piping. Supply water connection may require a backflow preventer to prevent supply makeup water from backing up into the public water system.

**! CAUTION**

PVC (Polyvinyl Chloride) and CPVC (Chlorinated Polyvinyl Chloride) are vulnerable to attack by certain chemicals. Polyolester (POE) oils used with R-410A and other refrigerants, even in trace amounts, in a PVC or CPVC piping system will result in stress cracking of the piping and fittings and complete piping system failure.

Only use approved water pipe material. Avoid using galvanized material for water lines/fittings as the material is corrosive and may cause fouling of the water system.

Table 3 - Condenser Water Connections

| Model (SB-)   | Supply and Return Connection Size (in. FPT) |
|---------------|---|
| 003, 004, 005 | 1   |
| 006, 007      | 1 1/4                                       |
| 009, 010      | 1 1/2                                       |
| 014, 016, 018 | 2   |

Condenser water pump must be field sized and installed between the cooling tower or geothermal wellfield and self contained unit. System should be sized in accordance with the ASHRAE Handbook. Use engineering guidelines to maintain equal distances for supply and return piping and limit bend radiuses to maintain balance in the system. Balancing valves, permanent thermometers and gauges may be required.



Figure 11- Water Connections

**! CAUTION**

Installing contractor is responsible for properly sizing and installing water system components. Improper fluid flow due to valves, piping, or improper pump operation may result in unacceptable unit operation and void warranty.

**! CAUTION**

**WATER PIPING**

Follow national and local codes when installing water piping. Connections to the unit should incorporate vibration eliminators to reduce noise and vibration and shutoff valves to facilitate servicing. Supply and return water piping must be at least as large as the unit connections and larger depending on length of runs, rise and bends.

Before connection to the unit, the condenser water system should be flushed to remove foreign material that could cause condenser fouling. Install a screen strainer with a minimum of 20 Mesh ahead of the condenser inlet to prevent condenser fouling and internal tube damage. Mineral content of the condenser water must be controlled. All make-up water has minerals in it and as the water is evaporated in the cooling tower, these minerals remain. As the mineral content of the water increases, the conductivity of the water increases.

Field provided and installed water treatment program must be compatible with stainless steel, copper, aluminum, ABS plastic, and PVC. Batch feed processes should never be used as concentrated chemicals can cause corrosion. Never use hydrochloric acid (muriatic acid) or chlorine as it will corrode stainless steel.

Water loop piping runs through unheated areas or outside the building should be insulated.

**NOTE:** For unit isolation and water flow balancing, characterized ball valves should be factory or field installed in the condenser water supply and return. All manual flow valves in the condenser water system should be of the characterized ball valve design. Globe or gate valves are not recommended.

Pressure and temperature ports are recommended in condenser water supply and return lines for system balancing. These openings should be 5 to 10 pipe diameters from the unit water connections. To allow for mixing and temperature stabilization, wells in the water piping should extend at least ½ pipe diameter into the pipe.

Piping systems should not exceed 10 ft/sec fluid velocity to ensure tube wall integrity and reduce noise.

### Electrical

Verify the unit nameplate agrees with power supply. SB Series units are provided with single point power wiring connections. Connection terminations are made to the main terminal block. A complete set of unit specific wiring diagrams, showing factory and field wiring are laminated in plastic and located inside the controls compartment door.

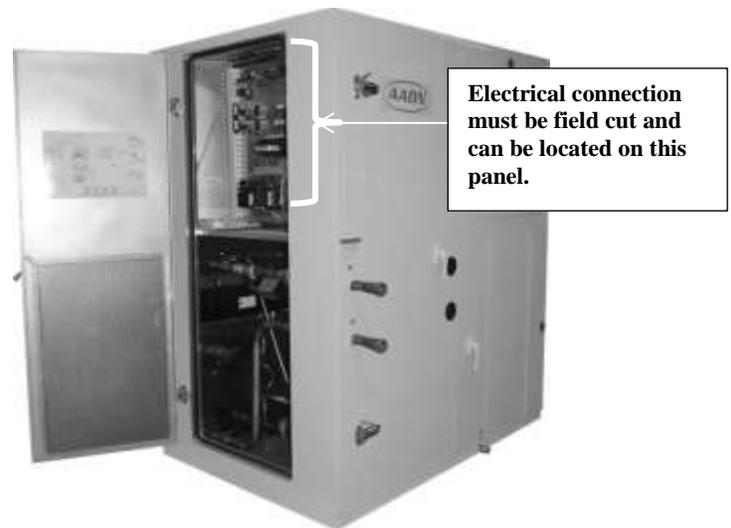


Figure 12 - Electrical Connection

|  |
|--|
|  <b>WARNING</b>   |
| Disconnect all electrical power sources before servicing the unit. More than one power source may be provided. Failure to do so may result in injury or death from electrical shock or entanglement in moving parts. |

All units require field supplied electrical overcurrent and short circuit protection.

Device must not be sized larger than the Maximum Overcurrent Protection (MOP) shown on the unit nameplate.

Codes may require a disconnect switch be within sight of the unit.

It is recommended that the field installed overcurrent protection or disconnect switch not be installed on the unit.

Electrical supply can enter through the bottom or side of the controls compartment. Entry must be field cut into panels of the unit.

A single point connection to a terminal block is provided. Split units may require connection between the units. High voltage conductors should enter the control panel in a separate opening and separate conduit than 24V low voltage conductors.

|   |
|---|
|  <b>WARNING</b>  |
| The foam insulation releases dangerous fumes when it is burnt. Do not cut a foam part with a cutting torch or plasma cutter. Do not weld to a foam filled part. |

**Note:** Locations for field cut electrical entries are marked on the unit. Field cut openings must be a minimum of 6 inches away from all components and wiring to prevent damage due to drilling or cutting.

To pass wires through the wall or roof of the unit, a hole should be cut and conduit passed through it. Use the following procedure to cut a round hole in a foam panel.

#### *Cutting Electrical Openings*

1. Locate the placement of the hole. Be sure that the conduit will not interfere with the

operation of any component or prevent access of any door or removable panel.

2. Drill a pilot hole all the way through the foam panel.

3. Using a hole saw cut the hole through the metal on both sides of the foam part.

4. With a knife cut the foam out of the hole.

5. After the conduit is installed in the hole caulk the entire perimeter of the hole on both sides with an industrial grade silicone sealant or a duct seal compound.

|   |
|---|
|  <b>CAUTION</b>  |
| Installing Contractor is responsible for proper sealing of the electrical and gas entries into the unit. Failure to seal the entries may result in damage to the unit and property. |

If a larger cut-out is needed for additional duct connections not provided by the factory, or for any other reason, it is very important that the foam be completely sealed. Insulation covers should be fabricated from sheet metal to cover the foam at the cut. The edges and corners that are not covered should then be sealed using silicone caulking or a duct seal compound.

If a reciprocating saw is used to make the cut-out take care that the metal skins of the foam part do not separate from the foam, this would result in reduced structural integrity of the part.

Size supply conductors based on the unit Minimum Current Ampacity (MCA) rating. Supply conductors must be rated a minimum of 75°C.

Protect the branch circuit in accordance with code requirements. The unit must be electrically grounded in accordance with local codes, or in the absence of local codes, the current National Electric Code, ANSI/NFPA 70 or the current Canadian Electrical Code CSA C22.1.

**Note:** Units are factory wired for 208V, 230V, 460V, or 575V. In some units, the 208V and 230V options may also be provided in single or three phase configurations. The transformer configuration must be checked by a qualified technician prior to startup.

Wire power leads to the unit's terminal block or main disconnect. All wiring beyond this point has been completed by AAON and cannot be modified without effecting the unit's agency/safety certification.

Supply voltage must be within the min/max range shown on the unit nameplate. Available short circuit current should not exceed the short circuit current rating (SCCR) shown on the unit nameplate.

|  |
|--|
|  <b>CAUTION</b> |
| Three phase voltage imbalance will cause motor overheating and premature failure.                  |

Three phase voltage imbalance will cause motor overheating and premature failure. The maximum allowable imbalance is 5.0%.

Voltage imbalance is defined as 100 times the maximum deviation from the average voltage divided by the average voltage.

Example:  
 $(218V+237V+235V)/3 = 230V$ , then  
 $100*(230V-218V)/230V = 5.2\%$ , which exceeds the allowable imbalance.

Check voltage imbalance at the unit disconnect switch and at the compressor terminal. Contact your local power company for line voltage corrections.

Installing contractor must check for proper motor rotation and check blower motor amperage listed on the motor nameplate is not exceeded.

|   |
|---|
|  <b>CAUTION</b>  |
| Rotation must be checked on all MOTORS AND COMPRESSORS of three phase units. Supply fan motors should all be checked by a qualified service technician at startup and any wiring alteration should only be made at the unit power connection. |

Wire control signals to the unit's low voltage terminal block located in the controls compartment.

If any factory installed wiring must be replaced, use a minimum 105°C type AWM insulated conductors.

|  |
|--|
|  <b>CAUTION</b>   |
| Scroll compressors are directional and will be damaged by operation in the wrong direction. Low pressure switches on compressors have been disconnected after factory testing. Rotation should be checked by a qualified service technician at startup using suction and discharge pressure gauges and any wiring alteration should only be made at the unit power connection. |

### Thermostat Control Wiring

If a thermostat is used for unit control, thermostat should be located on an inside wall 4-5 feet above the floor where it will not be subjected to drafts, sun exposure, or heat from electrical fixtures of appliances. Control wiring must deliver adequate voltage to components to assure proper operation. Control voltage returning from controller circuit must be a minimum of 21 VAC. To assure proper wiring use the following chart to determine the allowable wiring distances.

Table 4 - Control Wiring

| Wire Size (Stranded)<br>- Copper Conductors<br>Only | Total Wire Distance<br>Allowable |
|---|----------------------------------|
| 20 AWG  | 200 ft                           |
| 18 AWG  | 350 ft                           |
| 16 AWG  | 500 ft                           |
| 14 AWG  | 750 ft                           |
| 12 AWG  | 1250 ft                          |

Total Wire Distance Allowable =  
(Quantity of Control Wires) x  
(Control Wire Distance)

Take the total wire distance allowable and divide by the number of wires to be connected. This indicates the distance allowable for that size wire. The wiring to the unit must not exceed the total wire distance allowable. If the voltage at the connectors is less than 21 VAC, isolation relays must be installed. If under external control 21 VAC must be field verified.

All external devices must be powered via a separate external power supply.

Example:

A total of 8 wires must be pulled 75ft to a control the unit. What size wire should be used?

According to the Table 2, 16 AWG allows for 63ft (500 ft/8 wires) and 14 AWG allows for 94ft (750 ft/8 wires). Thus, 14 AWG should be used.

### Duct Connection

Remove shipping covers and attach duct to flanges provided on the unit. The installer is responsible for sealing ducts to the flanges to prevent water leaks.

Intake air enters the back of the SB Series unit, where the air filters are located. Ductwork should be sized in accordance with the ASHRAE Handbook. Ductwork should be installed in accordance with NFPA Standard 90A.

When attaching duct to the unit, use a flexible/compressible material rated for duct connections. A three inch flexible connector for both return and supply duct connections is recommended.

### Condensate Drain Piping

Unit is equipped with one condensate drain pan connection. A p-trap and drain line must be installed on at least one section's drain connection, with the p-trap not to exceed 6" from the drain connection. The lines should be the same pipe size or larger than the drain connection, include a p-trap, and pitch downward toward drain. An air break should be used with long runs of condensate lines.

 **CAUTION**

Unit should not be operated without p-traps. Failure to install a p-trap may result in overflow of condensate water.

Draw-through cooling coils will have a negative static pressure in the drain pan area. This will cause an un-trapped drain to back

up due to air being pulled up through the condensate drain piping.

Condensate drain trapping and piping should conform to all applicable governing codes.

**Note:** The drain pan connection(s) is a 1" MPT fitting.

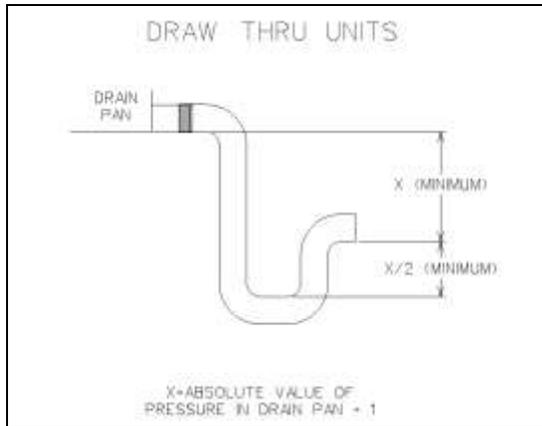


Figure 13 - Drain Trap

The X dimension on the draw-through trap should be at least equal to the absolute value of the negative static pressure in the drain pan plus one inch. To calculate the static pressure at the drain pan add the pressure drops of all components upstream of the drain pan, including the cooling coil, and add the return duct static pressure. Include the dirt allowance pressure drop for the filters to account for the worst-case scenario. The height from top of the bottom bend of the trap to the bottom of the leaving pipe must be at least equal to one half of the X dimension. This ensures that enough water is stored in the trap to prevent losing the drain seal during unit startup

**Note:** The absolute value of the fan inlet pressure will always be greater than or equal to the absolute value of the static pressure in the drain pan on draw-through units, so the fan inlet pressure is a safe value to use for the drain pan static pressure.

Table 5 - Drain Trap Dimensions

| Draw-Through       |                 |        |
|--------------------|-----------------|--------|
| Drain Pan Pressure | Trap Dimensions |        |
| Negative Static    | X               | X/2    |
| (inches of water)  | (inch)          | (inch) |
| -0.50              | 1.50            | 0.75   |
| -1.00              | 2.00            | 1.00   |
| -1.50              | 2.50            | 1.25   |
| -2.00              | 3.00            | 1.50   |
| -2.50              | 3.50            | 1.75   |
| -3.00              | 4.00            | 2.00   |

### Waterside Economizer

Cooling and pre-cooling waterside economizer coil is factory installed upstream of the evaporator coil. Factory tested and field installed water piping kit includes fully modulating waterside economizer valve and fully modulating waterside economizer bypass valve.

The waterside economizer circuit can operate in three modes: waterside economizer only, waterside economizer with mechanical cooling, and mechanical cooling only.

During waterside economizer only mode of operation condenser water flows through the waterside economizer coil with modulating valves maintaining supply air temperature setpoint. The condenser water completely bypasses the water-cooled condenser.

During waterside economizer with mechanical cooling mode of operation condenser water flows through the waterside economizer coil with the waterside economizer modulating valve fully open. The condenser water then passes through water-cooled condenser.

During mechanical cooling only mode of operation condenser water flows around the

waterside economizer coil with the waterside economizer bypass valve fully open. The condenser water then passes through water-cooled condenser.

Waterside economizer coil condensate drain outlet drains into evaporator coil drain pan. See the previous section on evaporator coil condensate drain piping.

Mineral content of the condenser water must be controlled. All make-up water has minerals in it and as the water is evaporated in the cooling tower, these minerals remain. As the mineral content of the water increases, the conductivity of the water increases.

Field provided and installed water treatment program must be compatible with stainless steel, copper, aluminum, ABS plastic, and PVC. Batch feed processes should never be used as concentrated chemicals can cause corrosion. Never use hydrochloric acid (muriatic acid) or chlorine as it will corrode stainless steel.

### **Heating Coils**

Factory installed one or two row hot water and steam heating coils can be factory mounted. These coils are supplied from a source through separate piping from the condenser water source. All controls for heating operation are field supplied and field installed.

Always connect the supply to the top of the coil and the return to the bottom. Water coils should not be subjected to entering air temperatures below 38°F to prevent coil freeze-up. If air temperature across the coil is going to be below this value, use a glycol solution to match the coldest air expected.

## **WARNING**

Piping shall be in accordance with national and local codes. Pressure limiting devices, backflow preventers and all other safety requirements are the sole responsibility of the installing contractor.

## **CAUTION**

Installing Contractor is responsible for proper sealing of the water piping entries into the unit. Failure to seal the entries may result in damage to the unit and property.

### **Electric Preheat**

The modulating electric preheat option is designed to temper the incoming outside air to the unit based on an enable control signal and the outside air conditions.

A 24VAC enable signal must be provided to the [PHE] terminal to enable the operation of the electric preheat. Once the preheat controller is enabled it will monitor the outside air temperature to determine if any capacity of preheat is needed. If the outside air temperature falls below the outside air temperature setpoint the electric preheat will be started up and maintain the leaving air temperature setpoint with both SCR controlled and staged electric preheat. Both setpoints are set with push button LCD interface on the preheat controller. Outside air temperature sensors and preheat discharge supply air temperature sensors are factory installed and wired to the preheat controller. Electric preheat has maximum operating outside air temperature of 60°F and a maximum preheat discharge air temperature of 80°F.

[COM], [PHO] & [PHC] feedback terminals are provided to communicate if the electric preheat is in operation. PHO is a normally open contact, PHC is a normally closed contact, and COM is the common. These terminals are not required to be connected.

[PHE] is the electric preheat operation enable. [PH+] and [PH-] are the preheat set point reset terminals.

## Energy Recovery Units

Some SB units have been equipped with an energy recovery wheel. This section is provided to assure the energy recovery feature will be properly setup to perform in accordance with the job specifications for your particular application.

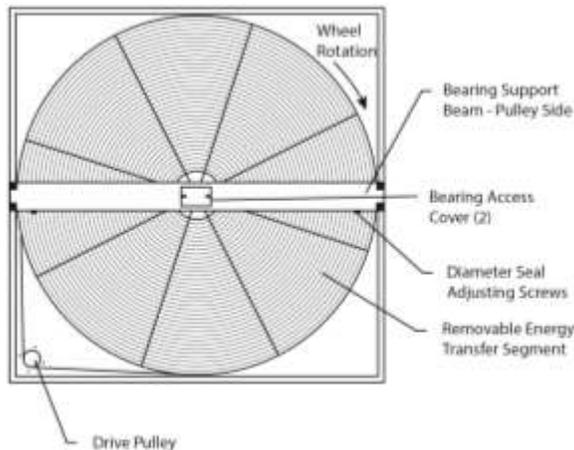


Figure 14 - Energy Recovery Wheel

The Energy Recovery Cassette consists of a frame wheel, wheel drive system, and energy transfer segments. Segments are removable for cleaning or replacement. The segments rotate through counter flowing exhaust and outdoor air supply streams where they transfer heat and/or water vapor from the warm, moist air stream to the cooler and/or drier air stream.

The initial setup and servicing of the energy recovery wheel is very important to maintain proper operation efficiency and building occupant comfort.

Normal maintenance requires periodic inspection of filters, the cassette wheel, drive belts, air seals, wheel drive motor, and its electrical connections.

Wiring diagrams are provided with each motor. When wired according to wiring diagram, motor rotates clockwise when viewed from the shaft/pulley side.

By carefully reviewing the information within this section and following the instructions, the risk of improper operation and/or component damage will be minimized.

It is important that periodic maintenance be performed to help assure trouble free operation.

### *Initial Mechanical Check and Setup*

Outdoor air intake adjustments should be made according to building ventilation, or local code requirements.

After the unit installation is complete, open the cassette access door and determine that the energy wheel rotates freely when turned by hand. Apply power and observe that the wheel rotates at approximately 30 RPM. If the wheel does not rotate when power is applied, it may be necessary to readjust the “diameter air seals”.

### *Air Seal Adjustments*

Pile type air seals across both sides of the energy wheel diameter are factory adjusted to provide close clearance between the air seal and wheel. Racking of the unit or cassette during installation, and/or mounting of the unit on a non-level support or in other than the factory orientation can change seal clearances. Tight seals will prevent rotation.

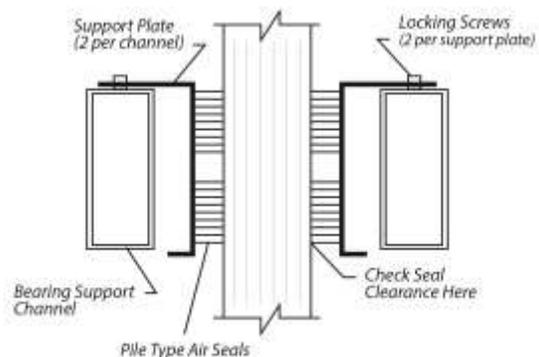


Figure 15 - Cross Section of Air Seal Structure

### *Wheel to Air Seal Clearance*

To check wheel to seal clearance; first disconnect power to the unit, in some units the energy recovery wheel assembly can be pulled out from the cabinet to view the air seals. On larger units, the energy recovery wheel may be accessible inside the walk-in cabinet.

A business card or two pieces of paper can be used as a feeler gauge, (typically each .004" thick) by placing it between the face of the wheel and pile seal.

Using the paper, determine if a loose slip fit exist between the pile seal and wheel when the wheel is rotated by hand.

To adjust air seal clearance, loosen all seal plate retaining screws holding the separate seal retaining plates to the bearing support channels and slide the seals plates away from the wheel. Using the paper feeler gauge, readjust and retighten one seal plate at a time to provide slip fit clearance when the wheel is rotated by hand.

Confirm that the wheel rotates freely. Apply power to the unit and confirm rotation.

### *Airflow Balancing and Checking*

High performance systems commonly have complex air distribution and fan systems. Unqualified personnel should not attempt to adjust fan operation, or air circulation, as all systems have unique operations characteristics. Professional air balance specialists should be employed to establish actual operating conditions, and to configure the air delivery system for optimal performance.

### *Controls*

A variety of controls and electrical accessories may be provided with the equipment. Identify the controls on each unit

by consulting appropriate submittal, or order documents, and operate according to the control manufacturer's instructions. If you cannot locate installation, operation, or maintenance information for the specific controls, then contact your sales representative, or the control manufacturer for assistance.

**⚠ WARNING**

Do not alter factory wiring. Deviation from the supplied wiring diagram will void all warranties, and may result in equipment damage or personal injury. Contact the factory with wiring discrepancies.

### *Routine Maintenance and Handling*

Handle cassettes with care. All cassettes should be lifted by the bearing support beam. Holes are provided on both sides of the bearing support beams to facilitate rigging as shown in the following illustration.

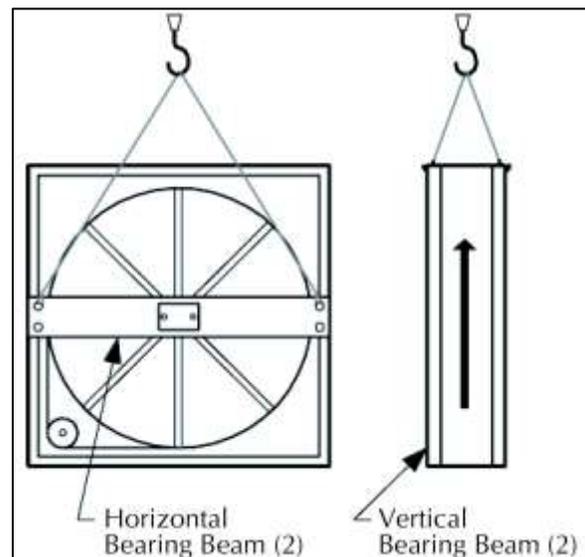


Figure 16 - Lifting Hole Locations

Routine maintenance of the Energy Recovery Cassettes includes periodic

cleaning of the Energy Recovery Wheel as well as inspection of the Air Seals and Wheel Drive Components as follows:

### *Cleaning*

The need for periodic cleaning of the energy recovery wheel will be a function of operating schedule, climate and contaminants in the indoor air being exhausted and the outdoor air being supplied to the building.

The energy recovery wheel is “self-cleaning” with respect to dry particles due to its laminar flow characteristics. Smaller particles pass through; larger particles land on the surface and are blown clear as the flow direction is reversed. Any material that builds up on the face of the wheel can be removed with a brush or vacuum. The primary need for cleaning is to remove oil based aerosols that have condensed on energy transfer surfaces.

A characteristic of all dry desiccants, such films can close off micron sized pores at the surface of the desiccant material, reducing the efficiency by which the desiccant can adsorb and desorb moisture and also build up so as to reduce airflow.

In a reasonably clean indoor environment such as a school or office building, measurable reductions of airflow or loss of sensible (temperature) effectiveness may not occur for several years. Measurable changes in latent energy (water vapor) transfer can occur in shorter periods of time in applications such as moderate occupant smoking or cooking facilities. In applications experiencing unusually high levels of occupant smoking or oil based aerosols such as industrial applications involving the ventilation of machine shop areas for example, annual washing of energy transfer may be necessary to maintain latent transfer efficiency. Proper cleaning of the

energy recovery wheel will restore latent effectiveness to near original performance.

To clean, gain access to the energy recovery wheel and remove segments. Brush foreign material from the face of the wheel. Wash the segments or small wheels in a 5% solution of non-acid based coil cleaner or alkaline detergent and warm water.

Soak in the solution until grease and tar deposits are loosened (Note: some staining of the desiccant may remain and is not harmful to performance). Before removing, rapidly run finger across surface of segment to separate polymer strips for better cleaning action. Rinse dirty solution from segment and remove excess water before reinstalling in wheel.



### *Air Seals*

Four adjustable diameter seals are provided on each cassette to minimize transfer of air between the counter flowing airstreams.

To adjust diameter seals, loosen diameter seal adjusting screws and back seals away from wheel surface. Rotate wheel clockwise until two opposing spokes are hidden behind the bearing support beam. Using a folded piece of paper as a feeler gauge, position paper between the wheel surface and diameter seals.

Adjust seals towards wheel surface until a slight friction on the feeler gauge (paper) is detected when gauge is moved along the length of the spoke. Retighten adjusting

screws and recheck clearance with “feeler” gauge.

### Wheel Drive Components

The wheel drive motor bearings are pre-lubricated and no further lubrication is necessary.

The wheel drive pulley is secured to the drive motor shaft by a combination of either a key or D slot and set screw.

The set screw is secured with removable locktite to prevent loosening. Annually confirm set screw is secure. The wheel drive belt is a urethane stretch belt designed to provide constant tension through the life of the belt. No adjustment is required. Inspect the drive belt annually for proper tracking and tension. A properly tensioned belt will turn the wheel immediately after power is applied with no visible slippage during start-up.

### Installation Considerations

Energy recovery cassettes are incorporated within the design of packaged units, packaged air handlers and energy recovery ventilators. In each case, it is recommended that the following considerations be addressed:

#### Accessibility

The cassette and all its operative parts; i.e.: motor, belt, pulley, bearings, seals and energy transfer segments must be accessible for service and maintenance. This design requires that adequate clearance be provided outside the enclosure.

#### Orientation & Support

The Energy Recovery Cassette may be mounted in any orientation. However, Care must be taken to make certain that the cassette frame remains flat and the bearing beams are not racked.

To verify, make certain that the distance between wheel rim and bearing beam is the same at each end of the bearing beam, to within 1/4 of an inch (dimension A & B). This amount of racking can be compensated for by adjusting the diameter seals.

If greater than 1/4 inch (dimension C), racking must be corrected to ensure that drive belt will not disengage from wheel.

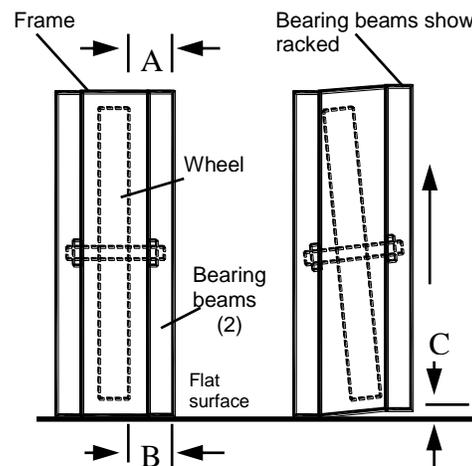


Figure 17 - Avoid Racking of Cassette Frame

### Operation

**⚠ CAUTION**

Keep hands away from rotating wheel! Contact with rotating wheel can cause physical injury.

#### Startup Procedure

1. By hand, turn wheel clockwise (as viewed from the pulley side), to verify wheel turns freely through 360° rotation.
2. Before applying power to drive motor, confirm wheel segments are fully engaged in wheel frame and segment retainers are completely fastened. (See Segment Installation Diagram).

3. With hands and objects away from moving parts, activate unit and confirm wheel rotation. Wheel rotates clockwise (as viewed from the pulley side).

4. If wheel has difficulty starting, turn power off and inspect for excessive interference between the wheel surface and each of the four (4) diameter seals. To correct, loosen diameter seal adjusting screws and back adjustable diameter seals away from surface of wheel, apply power to confirm wheel is free to rotate, then re-adjust and tighten hub and diameter seals, as shown in hub seal adjustment diagram.

5. Start and stop wheel several times to confirm seal adjustment and to confirm belt is tracking properly on wheel rim (approximately 1/4" from outer edge of rim).

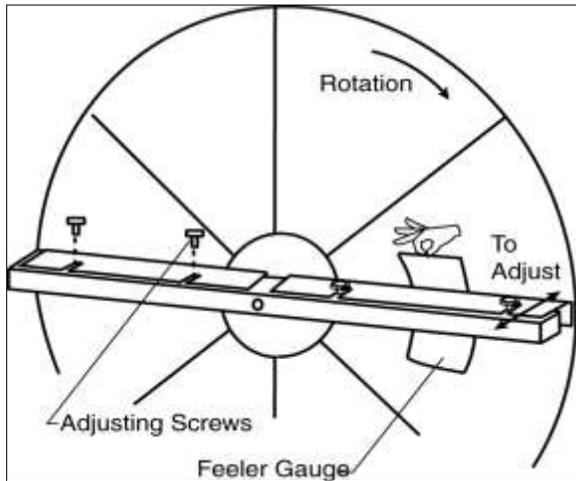


Figure 18 - Diameter Seal Adjustment

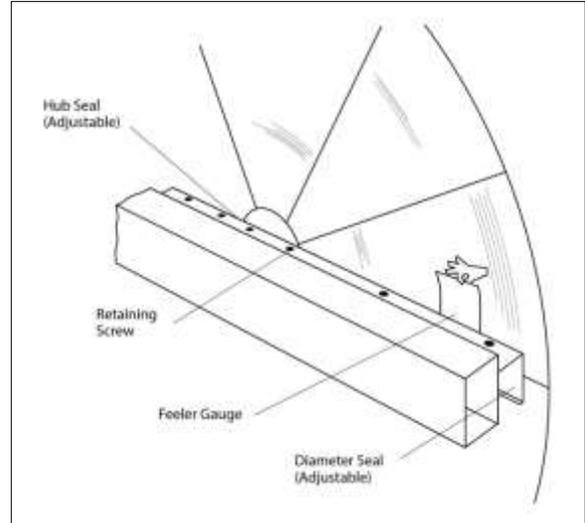


Figure 19 - Hub Seal Adjustment

#### Service

### CAUTION

Disconnect electrical power before servicing energy recovery cassette. Always keep hands away from bearing support beam when installing or removing segments. Failure to do so could result in severe injury to fingers or hand.

#### *Segment Installation & Replacement*

Wheel segments are secured to the wheel frame by a Segment Retainer which pivots on the wheel rim and is held in place by a Segment Retaining Catch.

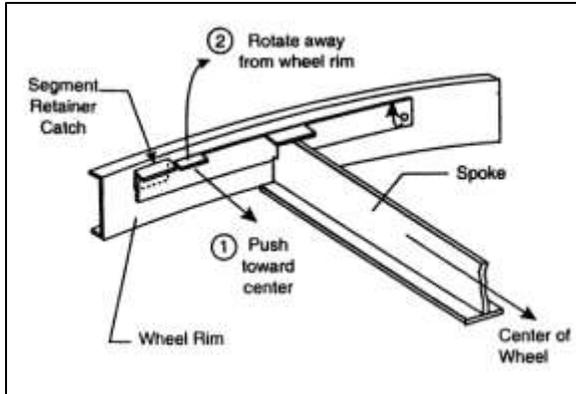


Figure 20 - Segment Retainer

To install wheel segments follow steps one through five below. Reverse procedure for segment removal.

1. Unlock two segment retainers (one on each side of the selected segment opening).
2. With the embedded stiffener facing the motor side, insert the nose of the segment between the hub plates.

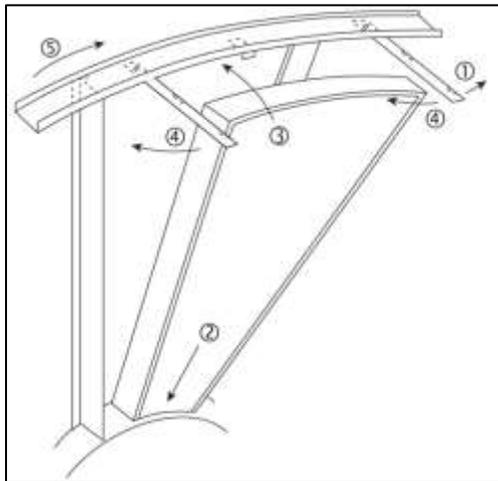


Figure 21 - Segment Installation

3. Holding segment by the two outer corners, press the segment towards the center of the wheel and inwards against the spoke flanges. If hand pressure does not fully seat the segment, insert the flat tip of a screw driver between the wheel rim and outer corners of the segment and apply

downward force while guiding the segment into place.

4. Close and latch each Segment Retainer under Segment Retaining Catch.
5. Slowly rotate the wheel 180°. Install the second segment opposite the first for counterbalance. Rotate the two installed segments 90° to balance the wheel while the third segment is installed. Rotate the wheel 180° again to install the fourth segment opposite the third. Repeat this sequence with the remaining four segments.

#### *Wheel Drive Motor and Pulley Replacement*

1. Disconnect power to wheel drive motor.
2. Remove belt from pulley and position temporarily around wheel rim.
3. Loosen set screw in wheel drive pulley using a hex head wrench and remove pulley from motor drive shaft.
4. While supporting weight of drive motor in one hand, loosen and remove (4) mounting bolts.
5. Install replacement motor with hardware kit supplied.
6. Install pulley to dimension as shown and secure set screw to drive shaft.
7. Stretch belt over pulley and engage in groove.
8. Follow start-up procedure.

#### *Belt Replacement*

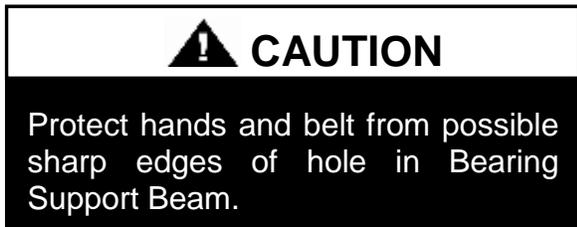
1. Obtain access to the pulley side bearing access plate if bearing access plates are provided. Remove two bearing access plate retaining screws and the access plate.

2. Using hexagonal wrench, loosen set screw in bearing locking collar. Using light hammer and drift (in drift pin hole) tap collar in the direction of wheel rotation to unlock collar. Remove collar.

3. Using socket wrench with extension, remove two nuts which secure bearing housing to the bearing support beam. Slide bearing from shaft. If not removable by hand, use bearing puller.

4. Form a small loop of belt and pass it through the hole in the bearing support beam. Grasp the belt at the wheel hub and pull the entire belt down.

**Note:** Slight hand pressure against wheel rim will lift weight of wheel from inner race of bearing to assist bearing removal and installation.



5. Loop the trailing end of the belt over the shaft (belt is partially through the opening).

6. Reinstall the bearing onto the wheel shaft, being careful to engage the two locating pins into the holes in the bearing support beam. Secure the bearing with two self-locking nuts.

7. Install the belts around the wheel and pulley according to the instructions provided with the belt.

8. Reinstall diameter seals or hub seal and tighten retaining screws. Rotate wheel in

clockwise direction to determine that wheel rotates freely with slight drag on seals.

9. Reinstall bearing locking collar. Rotate collar by hand in the direction the wheel rotates (see label provided on each cassette for wheel rotation).

10. Lock in position by tapping drift pin hole with hammer and drift. Secure in position by tightening set screw.

11. Reinstall Bearing Access Cover.

12. Apply power to wheel and ensure that the wheel rotates freely without interference.

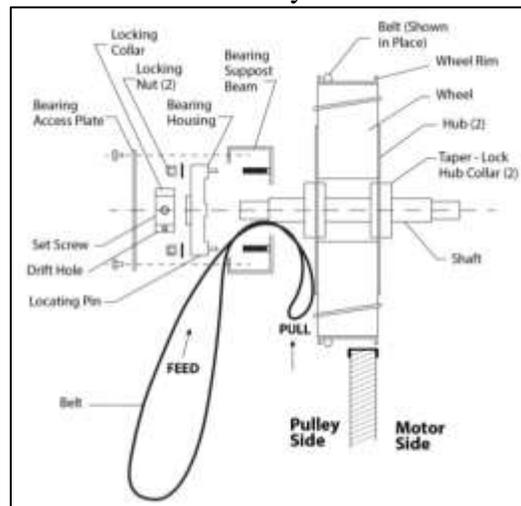


Figure 22 - Belt Replacement

## Startup

(See back of the manual for startup form)

### WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Startup and service must be performed by a Factory Trained Service Technician. A copy of this IOM should be kept with the unit.

### WARNING

Electric shock hazard. Shut off all electrical power to the unit to avoid shock hazard or injury from rotating parts.

During startup, it is necessary to perform routine checks on the performance of the unit. This includes checking of the air flow, the air filters, condenser water flow and refrigerant charge.

## Supply Fans

SB Series units are equipped with direct drive backward curved plenum supply fan assemblies that deliver the air volume specified according to unit size and job requirements.



Figure 23 - SB Series Supply Fan

## Fan Air Flow Adjustment

A specific air volume is delivered by the fans with air volume bands in the blower wheels, Electronically Commutated Motors (ECM), or Variable Frequency Drives (VFD). Field air flow adjustment may be required at startup.

Air volume bands for the wheels are sized according to the unit's air delivery specifications and can also be ordered from the factory for field installation.

### *Electrically Commutated Motor Airflow Adjustment*

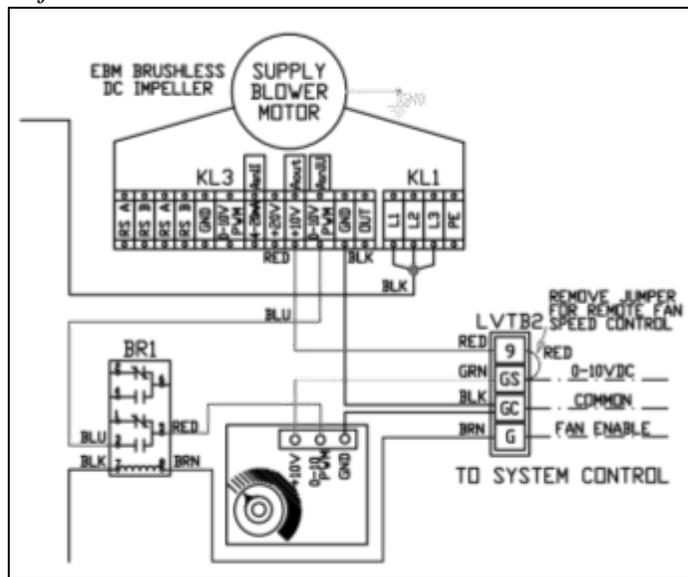


Figure 24- Typical wiring diagram with EC motor

If the application is for the motor to run at a constant speed, the potentiometer can be utilized without any change. If the application is to vary the motor speed for changing conditions, remove the jumper indicated on the terminal strip (red wire).

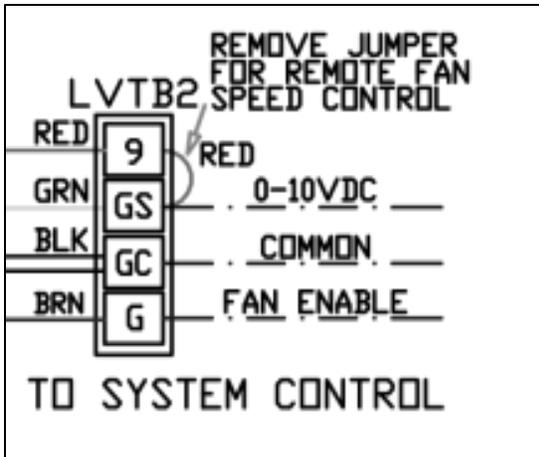


Figure 25 - Shows the jumper that is to be removed (jumped between 9 and GS).

Note, the potentiometer is still active in the electrical loop. Refer to Figure 24.

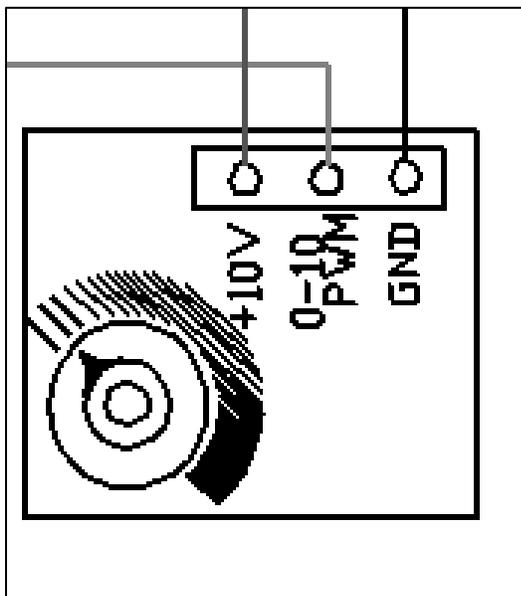


Figure 26 - Potentiometer

The potentiometer dial should be set for the maximum fan speed for a particular application. Maximum fan speed is determined by the ECat submittal. Typically, this max speed will be the rpm set at the factory.

The fan speed can be modulated using the 0-10 VDC input signal.

To check fan output from the factory, the potentiometer can be dialed to 100%. By sending a 5V signal\*, for instance, the rpm can be measured and this reading can be converted to cubic feet of air moved by the fan.

It is advised that a medium range signal\* be utilized for this procedure. The highest signal sent by the controller should then be determined by adjustment.

### Filters

Do not operate the unit without filters in place. Unit should be checked for correct filter placement during startup. Operation of the equipment without filters will result in a clogged evaporator coil.

**⚠ CAUTION**

Before completing startup and leaving the unit a complete operating cycle should be observed to verify that all components are functioning properly.

### Adjusting Refrigerant Charge

Adjusting the charge of a system in the field must be based on determination of liquid sub-cooling and evaporator superheat. On a system with a TXV liquid sub-cooling is more representative of the charge than evaporator superheat but both measurements must be taken.

 **CAUTION**

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance.

*Before Charging*

Unit being charged must be at or near full load conditions before adjusting the charge. Units equipped with hot gas reheat must be charged with the hot gas reheat valves closed while the unit is in cooling mode to get the proper charge. After charging, unit should be operated in reheat (dehumidification) mode to check for correct operation.

After adding or removing charge the system must be allowed to stabilize, typically 10-15 minutes, before making any other adjustments.

The type of unit and options determine the ranges for liquid sub-cooling and evaporator superheat. Refer to the tables below when determining the proper sub-cooling.

*Checking Liquid Sub-Cooling*

Measure the temperature of the liquid line as it leaves the condenser.

Read the gauge pressure at the liquid line close to the point where the temperature was taken. Use liquid line pressure as it will vary from discharge pressure due to condenser pressure drop.

Convert the pressure obtained to a saturated temperature using the appropriate refrigerant temperature-pressure chart.

Subtract the measured liquid line temperature from the saturated temperature to determine the liquid sub-cooling. Compare calculated sub-cooling to the table below for the appropriate unit type and options.

*Checking Evaporator Superheat*

Measure the temperature of the suction line close to the compressor.

Read gauge pressure at the suction line close to the compressor.

Convert the pressure obtained to a saturated temperature using the appropriate refrigerant temperature-pressure chart.

Subtract the saturated temperature from the measured suction line temperature to determine the evaporator superheat.

Compare calculated superheat to the table below for the appropriate unit type and options.

 **CAUTION**

**DO NOT OVERCHARGE!**

Refrigerant overcharging leads to excess refrigerant in the condenser coils resulting in elevated compressor discharge pressure.

Table 6 - Acceptable Water-Cooled Refrigeration Circuit Values

|                                 | Water-Cooled Condenser |
|---------------------------------|------------------------|
| Sub-Cooling                     | 6-10°F                 |
| Sub-Cooling with Hot Gas Reheat | 8-12°F                 |
| Superheat                       | 8-15°F                 |

 **CAUTION**

Thermal expansion valve must be adjusted to approximately 8-15°F of suction superheat. Failure to have sufficient superheat will damage the compressor and void the warranty.

*Adjusting Sub-Cooling and Superheat Temperatures*

The system is overcharged if the sub-cooling temperature is too high and the evaporator is fully loaded (low loads on the evaporator result in increased sub-cooling) and the evaporator superheat is within the temperature range as shown in the table above (high superheat results in increased sub-cooling).

Correct an overcharged system by reducing the amount of refrigerant in the system to lower the sub-cooling.

 **CAUTION**

**DO NOT OVERCHARGE!**

Refrigerant overcharging leads to excess refrigerant in the condenser coils resulting in elevated compressor discharge pressure.

The system is undercharged if the superheat is too high and the sub-cooling is too low

Correct an undercharged system by adding refrigerant to the system to reduce superheat and raise sub-cooling.

If the sub-cooling is correct and the superheat is too high, the TXV may need adjustment to correct the superheat.

**Freeze Stat Startup**

Freeze Stat is an adjustable temperature sensor (-10 to 70°F) mounted on the tubing of the first cooling circuit and wired to de-energize all cooling circuits if tubing temperature falls below setpoint. Option is used to prevent freezing of evaporator coil.

*Recommended Setting: 32° F to 35°*

Table 7 - R-410A Refrigerant Temperature-Pressure Chart

| °F        | PSIG  | °F        | PSIG  | °F         | PSIG  | °F         | PSIG  | °F         | PSIG  |
|-----------|-------|-----------|-------|------------|-------|------------|-------|------------|-------|
| <b>20</b> | 78.3  | <b>47</b> | 134.7 | <b>74</b>  | 213.7 | <b>101</b> | 321.0 | <b>128</b> | 463.2 |
| <b>21</b> | 80.0  | <b>48</b> | 137.2 | <b>75</b>  | 217.1 | <b>102</b> | 325.6 | <b>129</b> | 469.3 |
| <b>22</b> | 81.8  | <b>49</b> | 139.7 | <b>76</b>  | 220.6 | <b>103</b> | 330.2 | <b>130</b> | 475.4 |
| <b>23</b> | 83.6  | <b>50</b> | 142.2 | <b>77</b>  | 224.1 | <b>104</b> | 334.9 | <b>131</b> | 481.6 |
| <b>24</b> | 85.4  | <b>51</b> | 144.8 | <b>78</b>  | 227.7 | <b>105</b> | 339.6 | <b>132</b> | 487.8 |
| <b>25</b> | 87.2  | <b>52</b> | 147.4 | <b>79</b>  | 231.3 | <b>106</b> | 344.4 | <b>133</b> | 494.1 |
| <b>26</b> | 89.1  | <b>53</b> | 150.1 | <b>80</b>  | 234.9 | <b>107</b> | 349.3 | <b>134</b> | 500.5 |
| <b>27</b> | 91.0  | <b>54</b> | 152.8 | <b>81</b>  | 238.6 | <b>108</b> | 354.2 | <b>135</b> | 506.9 |
| <b>28</b> | 92.9  | <b>55</b> | 155.5 | <b>82</b>  | 242.3 | <b>109</b> | 359.1 | <b>136</b> | 513.4 |
| <b>29</b> | 94.9  | <b>56</b> | 158.2 | <b>83</b>  | 246.0 | <b>110</b> | 364.1 | <b>137</b> | 520.0 |
| <b>30</b> | 96.8  | <b>57</b> | 161.0 | <b>84</b>  | 249.8 | <b>111</b> | 369.1 | <b>138</b> | 526.6 |
| <b>31</b> | 98.8  | <b>58</b> | 163.8 | <b>85</b>  | 253.7 | <b>112</b> | 374.2 | <b>139</b> | 533.3 |
| <b>32</b> | 100.9 | <b>59</b> | 166.7 | <b>86</b>  | 257.5 | <b>113</b> | 379.4 | <b>140</b> | 540.1 |
| <b>33</b> | 102.9 | <b>60</b> | 169.6 | <b>87</b>  | 261.4 | <b>114</b> | 384.6 | <b>141</b> | 547.0 |
| <b>34</b> | 105.0 | <b>61</b> | 172.5 | <b>88</b>  | 265.4 | <b>115</b> | 389.9 | <b>142</b> | 553.9 |
| <b>35</b> | 107.1 | <b>62</b> | 175.4 | <b>89</b>  | 269.4 | <b>116</b> | 395.2 | <b>143</b> | 560.9 |
| <b>36</b> | 109.2 | <b>63</b> | 178.4 | <b>90</b>  | 273.5 | <b>117</b> | 400.5 | <b>144</b> | 567.9 |
| <b>37</b> | 111.4 | <b>64</b> | 181.5 | <b>91</b>  | 277.6 | <b>118</b> | 405.9 | <b>145</b> | 575.1 |
| <b>38</b> | 113.6 | <b>65</b> | 184.5 | <b>92</b>  | 281.7 | <b>119</b> | 411.4 | <b>146</b> | 582.3 |
| <b>39</b> | 115.8 | <b>66</b> | 187.6 | <b>93</b>  | 285.9 | <b>120</b> | 416.9 | <b>147</b> | 589.6 |
| <b>40</b> | 118.1 | <b>67</b> | 190.7 | <b>94</b>  | 290.1 | <b>121</b> | 422.5 | <b>148</b> | 596.9 |
| <b>41</b> | 120.3 | <b>68</b> | 193.9 | <b>95</b>  | 294.4 | <b>122</b> | 428.2 | <b>149</b> | 604.4 |
| <b>42</b> | 122.7 | <b>69</b> | 197.1 | <b>96</b>  | 298.7 | <b>123</b> | 433.9 | <b>150</b> | 611.9 |
| <b>43</b> | 125.0 | <b>70</b> | 200.4 | <b>97</b>  | 303.0 | <b>124</b> | 439.6 |            |       |
| <b>44</b> | 127.4 | <b>71</b> | 203.6 | <b>98</b>  | 307.5 | <b>125</b> | 445.4 |            |       |
| <b>45</b> | 129.8 | <b>72</b> | 207.0 | <b>99</b>  | 311.9 | <b>126</b> | 451.3 |            |       |
| <b>46</b> | 132.2 | <b>73</b> | 210.3 | <b>100</b> | 316.4 | <b>127</b> | 457.3 |            |       |

## Operation

Unit operations should be controlled with thermostat or unit controller, never at the main power supply, except for emergency or complete shutdown of the unit.

### Packaged DX Cooling Operation and Control

When a call for cooling is made the supply fan motors and compressors will energize.

 **WARNING**

**COMPRESSOR CYCLING**

**2 MINUTE MINIMUM OFF TIME**  
To prevent motor overheating compressors must cycle off for a minimum of 2 minutes.

**2 MINUTE MINIMUM ON TIME**  
To maintain the proper oil level compressors must cycle on for a minimum of 2 minutes.

The cycle rate must not exceed 6 starts per hour.

### Electric Heating Operation

When a call for heating (G and W1, W2, etc.) is made the supply fan motors and electric resistance heaters will energize. Heating is accomplished by passing electrical current through a specified amount of resistance heaters which will produce the required heat.

On a fault condition the main limit located in the supply air or the auxiliary limit located downstream the supply blower will remove power from all contactors.

### Steam or Hot Water Preheating Operation

Valve control for steam and hot water heating coils are by others. Heating is accomplished by passing steam or hot water

through the steam or hot water coil assembly.

### Modulating Electric Preheat

Electric preheat is used to temper the incoming outside air to the unit based on an enable control signal and outside air conditions. Electric preheat has a maximum operation outside air temperature of 60°F and a maximum preheat discharge air temperature of 80°F.

## Maintenance

(See back of the manual for maintenance log.)

At least once each year, a qualified service technician should check out the unit. Supply fans, evaporator coils and air filters should be inspected monthly.

 **WARNING**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer. A copy of this IOM should be kept with the unit.

Periodically during operation, it is necessary to perform routine service checks on the performance of the unit. This includes checking of the air flow, the air filters, condenser water flow and refrigerant charge.

See Startup section for information on air flow adjustment and refrigerant charge adjustment.

### DX Cooling

Set unit controls to cooling mode of operation with supply fans on. Check the fans for correct operating direction, amperage and voltage. Check compressor operation, rotation, amperage and voltage to the unit nameplate (check the amperage on the load side of the compressor contactor).

### Condensate Drain Pans

Drain pans will have moisture present and require periodic cleaning to prevent microbial growth. Cleaning of the drain pans will also prevent any possible plugging of the drain lines and overflow of the pan itself. Cleaning of the drain pans and inside of the unit should be done only by qualified personnel.

### E-Coated Coil Cleaning

Documented routine cleaning of e-coated coils is required to maintain coating warranty coverage.

|   |
|---|
|  <b>WARNING</b>                    |
| Electric shock hazard. Shut off all electrical power to the unit to avoid shock hazard or injury from rotating parts. |

Surface loaded fibers or dirt should be removed prior to water rinse to prevent restriction of airflow. If unable to back wash the side of the coil opposite of the coils entering air side, then surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a *soft non-metallic* bristle brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges bent over) if the tool is applied across the fins.

Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse. A *monthly* clean water rinse is recommended for coils that are applied in coastal or industrial environments to help to remove chlorides, dirt, and debris. It is very important when rinsing, that water temperature is less than 130°F and pressure is than 100 psig to avoid damaging the fin edges. An elevated water temperature (not to exceed 130°F) will reduce surface tension, increasing the ability to remove chlorides and dirt.

|   |
|---|
|  <b>CAUTION</b>  |
| High velocity water from a pressure washer or compressed air should only be used at a very low pressure to prevent fin and/or coil damages. The force of the water or air jet may bend the fin edges and increase airside pressure drop. Reduced unit performance or nuisance unit shutdowns may occur. |

*Quarterly cleaning is essential to extend the life of an e-coated coil and is required to maintain coating warranty coverage.* Coil cleaning shall be part of the unit's regularly scheduled maintenance procedures. Failure to clean an e-coated coil will void the warranty and may result in reduced efficiency and durability.

 **CAUTION**

Harsh chemicals, household bleach, or acid cleaners should not be used to clean outdoor or indoor e-coated coils. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion and attack the e-coating. If there is dirt below the surface of the coil, use the recommended coil cleaners.

For routine quarterly cleaning, first clean the coil with the below approved coil cleaner. After cleaning the coils with the approved cleaning agent, use the approved chloride remover to remove soluble salts and revitalize the unit.

*Recommended Coil Cleaner*

The following cleaning agent, assuming it is used in accordance with the manufacturer's directions on the container for proper mixing and cleaning, has been approved for use on e-coated coils to remove mold, mildew, dust, soot, greasy residue, lint and other particulate:

Enviro-Coil Concentrate, Part Number H-EC01.

*Recommended Chloride Remover*

CHLOR\*RID DTS™ should be used to remove soluble salts from the e-coated coil, but the directions must be followed closely. This product is not intended for use as a degreaser. Any grease or oil film should first be removed with the approved cleaning agent.

Remove Barrier - Soluble salts adhere themselves to the substrate. For the effective use of this product, the product must be able to come in contact with the salts. These salts may be beneath any soils, grease or dirt; therefore, these barriers must be removed prior to application of this product. As in all

surface preparation, the best work yields the best results.

Apply CHLOR\*RID DTS - Apply directly onto the substrate. Sufficient product must be applied uniformly across the substrate to thoroughly wet out surface, with no areas missed. This may be accomplished by use of a pump-up sprayer or conventional spray gun. The method does not matter, as long as the entire area to be cleaned is wetted. After the substrate has been thoroughly wetted, the salts will be soluble and is now only necessary to rinse them off.

Rinse - It is highly recommended that a hose be used, as a pressure washer will damage the fins. The water to be used for the rinse is recommended to be of potable quality, though a lesser quality of water may be used if a small amount of CHLOR\*RID DTS is added. Check with CHLOR\*RID International, Inc. for recommendations on lesser quality rinse water.

**Supply Fans**

 **CAUTION**

Blower wheels must be inspected for excessive dust build up periodically and cleaned if required. Excessive dust build up on blower wheels may cause an unbalanced state; leading to vibration and/or component failure. Damages due to excessive dust build up will not be covered under factory warranty.

 **WARNING**

Electric shock hazard. Shut off all electrical power to the unit to avoid shock hazard or injury from rotating parts.

### *Supply Fan Lubrication*

All original blower motors and bearings are furnished with factory lubrication. Some applications will require that bearings be re-lubricated periodically. The schedule will depend on the operating duty, temperature variations or other severe atmospheric conditions.

Bearings should be re-lubricated when at normal operating temperatures, but not running. Rotate the fan shaft by hand and add only enough grease to purge the seals. **DO NOT OVERLUBRICATE.**

Recommended greases are:  
SHELL OIL - DOLIUM R  
CHEVRON OIL - SRI No. 2  
TEXACO INC. - PREMIUM R

### **Phase and Brownout Protection Module**



The DPM is a Digital Phase Monitor that monitors line voltages from 200VAC to 240VAC 1 $\phi$  and 200VAC to 600VAC 3 $\phi$ . The DPM is 50/60 Hz self-sensing. DPM should be wired according to unit specific

wiring diagram include in the control compartment

When the DPM is connected to the line voltage, it will monitor the line and if everything is within the setup parameters, the output contacts will be activated. If the line voltages fall outside the setup parameters, the output relay will be de-energized after the trip delay.

Once the line voltages recover, the DPM will re-energize the output relay after the restart time delay. All settings and the last 4 faults are retained, even if there is a complete loss of power.

### **DPM Setup Procedure**

With the supply voltage active to the module, you can setup all of the DPM's settings without the line voltage connected.

To change the setpoint parameters use the right arrow key to advance forward through the setpoint parameters and the left arrow to backup if needed. When each parameter is displayed use the up/down keys to change and set the parameter.

After adjustments are made or if no adjustments are made it will take 2 to 4 minutes before the DPM energizes the output relay unless there is an out of tolerance issue with the incoming line voltage.

### **Recommended Default Set-up**

|                     |                  |
|---------------------|------------------|
| Line Voltage        | 460VAC, 3 $\phi$ |
| Over & Undervoltage | $\pm$ 10%        |
| Trip Time Delay     | 5 Seconds        |
| Re-Start Time Delay | 2 Minutes        |
| Phase Imbalance     | 5%               |

## Screens

### Manufacturer's Screen

R-K Electronics  
DPM v0.0.00

### Average Voltage Screen

| VAvg | Imb | Hz |     |
|------|-----|----|-----|
| 460  | 0   | 60 | off |

**Default – the default screen shows the real time voltage detected in each of the 3 phases:**

| A-B | B-C | C-A |    |
|-----|-----|-----|----|
| 460 | 459 | 461 | ON |

### Voltage Selection Screen (Vertical Format) Default = 460V, 3Ø

200, 1Ø; 208, 1Ø; 220, 1Ø; 230, 1Ø; 240, 1Ø;  
200, 3Ø; 208, 3Ø; 220, 3Ø; 230, 3Ø; 240, 3Ø; 380, 3Ø; 415, 3Ø; 440, 3Ø;  
460, 3Ø; 480 3Ø; 575, 3Ø; 600, 3Ø;

### Over/Under voltage Percentage Screen (Vertical Format) Default = 10%

7% 8% 9% 10% 11% 12% 13% 14% & 15%

### Trip Time Delay Screen (Vertical Format) Default = 5 sec

2S, 3S, 4S, 5S, 6S, 27S, 8S, 9S & 10S

### Re-Start Time Delay Screen (Vertical Format) Default = 2 sec

Manual, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 30S, 1M, 2M, 3M & 4M

### Phase Imbalance Percentage Screen (Vertical Format) Default = 5%

3% 4% 5% 6% 7% 8% 9% & 10%

### Fault Screen (Vertical Format)

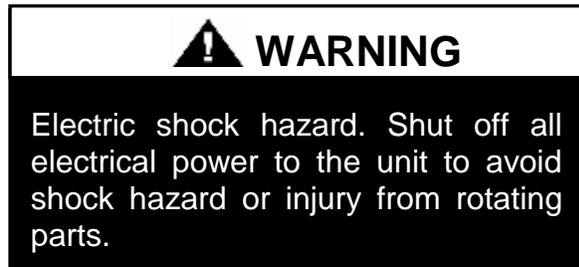
“0” most recent faults, “1” previous fault “2” third oldest fault & “3” fourth oldest fault.

### Fault Words:

|                |   |
|----------------|---|
| “Phase a Loss” | (There is no voltage sensed on 3-L1/S)  |
| “Voltage Low”  | (Average line voltage is less than selected Undervoltage Percentage)                |
| “Voltage High” | (Average line voltage is more than selected Overvoltage Percentage)                 |
| “Imbalance”    | (One phase is lower than the average voltage by more than the Imbalance percentage) |
| “Phase Loss    | (One phase is more than 30% below the Line Voltage selection)                       |
| “Bad Rotation” | (The phase rotation sequence is reversed)   |
| “Bad Freq”     | (Line frequency out of allowable range of 45 to 65 Hz)                              |

## **Filter Replacement**

Monthly filter inspection is required to maintain optimum unit efficiency.



It is strongly recommended that filter media be replaced monthly. Filters are located upstream of the evaporator coil. Open access panel and pull filters straight out to inspect all of the filters. Replace filters with the size indicated on each filter. Arrow on the replacement filters must point towards the blower.

## **Replacement Parts**

Parts for AAON equipment may be obtained by contacting your local AAON representative. When ordering parts, reference the unit serial number and part number located on the external or internal nameplate of the unit.

## **AAON Longview Product Support**

203 Gum Springs Road  
Longview, TX 75602  
Ph: 903-247-9894  
Fax: 903-236-4463  
[www.aaon.com](http://www.aaon.com)

**Note:** Before calling, technician should have model and serial number of the unit available to help answer questions regarding the unit.

## Filter Information

Table 8 - 3-5 ton (B Cabinet) Pre and Unit Filters

| <b>Feature 6A</b> | <b>Quantity/Size</b> | <b>Type</b>               |
|-------------------|----------------------|---------------------------|
| 0                 | No Pre Filters       |                           |
| A                 | (1) 24" x 24" x 2"   | Pleated, 30% Eff, MERV 10 |
| <b>Feature 6B</b> | <b>Quantity/Size</b> | <b>Type</b>               |
| 0                 | No Standard Filters  |                           |
| A                 | (1) 24" x 24" x 2"   | Pleated, 30% Eff, MERV 10 |
| B                 | (1) 24" x 24" x 4"   | Pleated, 30% Eff, MERV 10 |
| C                 |                      | Pleated, 65% Eff, MERV 11 |
| D                 |                      | Pleated, 85% Eff, MERV 13 |
| E                 |                      | Pleated, 95% Eff, MERV 14 |
| F                 |                      | Carbon                    |

Table 9 - 6-10 ton (C Cabinet) Pre and Unit Filters

| <b>Feature 6A</b> | <b>Quantity/Size</b> | <b>Type</b>               |
|-------------------|----------------------|---------------------------|
| 0                 | No Pre Filters       |                           |
| A                 | (4) 16" x 20" x 2"   | Pleated, 30% Eff, MERV 10 |
| <b>Feature 6B</b> | <b>Quantity/Size</b> | <b>Type</b>               |
| 0                 | No Standard Filters  |                           |
| A                 | (4) 16" x 20" x 2"   | Pleated, 30% Eff, MERV 10 |
| B                 | (4) 16" x 20" x 4"   | Pleated, 30% Eff, MERV 10 |
| C                 |                      | Pleated, 65% Eff, MERV 11 |
| D                 |                      | Pleated, 85% Eff, MERV 13 |
| E                 |                      | Pleated, 95% Eff, MERV 14 |
| F                 |                      | Carbon                    |

Table 10 - 14-18 ton (D Cabinet) Pre and Unit Filters

| <b>Feature 6A</b> | <b>Quantity/Size</b> | <b>Type</b>               |
|-------------------|----------------------|---------------------------|
| 0                 | No Pre Filters       |                           |
| A                 | (4) 18" x 24" x 2"   | Pleated, 30% Eff, MERV 10 |
| <b>Feature 6B</b> | <b>Quantity/Size</b> | <b>Type</b>               |
| 0                 | No Standard Filters  |                           |
| A                 | (4) 18" x 24" x 2"   | Pleated, 30% Eff, MERV 10 |
| B                 | (4) 18" x 24" x 4"   | Pleated, 30% Eff, MERV 10 |
| C                 |                      | Pleated, 65% Eff, MERV 11 |
| D                 |                      | Pleated, 85% Eff, MERV 13 |
| E                 |                      | Pleated, 95% Eff, MERV 14 |
| F                 |                      | Carbon                    |

Table 11- 3-5 ton (B Cabinet) Mixing Box Filters

| <b>Feature 6A</b> | <b>Quantity/Size</b>  | <b>Type</b>   |
|-------------------|---|---|
| A                 | (1) 24" x 24" x 2"<br>(located in the mixing box)   | 2" Pleated, 30% Eff, MERV<br>10 Pre-Filters                   |
| <b>Feature 6B</b> | <b>Quantity/Size</b>  | <b>Type</b>   |
| G                 | (1) 24" x 24" x 4"<br>(located in the mixing box)<br>and<br>(1) 24" x 24" x 4"<br>(located in the unit) | Pleated, 65% Eff, MERV 11<br>and<br>Carbon                    |
| H                 |   | Pleated, 85% Eff, MERV 13<br>and<br>Carbon                    |
| J                 |   | Pleated, 95% Eff, MERV 14<br>and<br>Carbon                    |
| K                 |   | Pleated, 65% Eff, MERV 11<br>and<br>Pleated, 85% Eff, MERV 13 |
| L                 |   | Pleated, 65% Eff, MERV 11<br>and<br>Pleated, 95% Eff, MERV 14 |

Table 12 - 6-10 ton (C Cabinet) Mixing Box Filters

| <b>Feature 6A</b> | <b>Quantity/Size</b>  | <b>Type</b>   |
|-------------------|---|---|
| A                 | (4) 16" x 20" x 2"<br>(located in the mixing box)   | 2" Pleated, 30% Eff, MERV<br>10 Pre-Filters                   |
| <b>Feature 6B</b> | <b>Quantity/Size</b>  | <b>Type</b>   |
| G                 | (4) 16" x 20" x 4"<br>(located in the mixing box)<br>and<br>(4) 16" x 20" x 4"<br>(located in the unit) | Pleated, 65% Eff, MERV 11<br>and<br>Carbon                    |
| H                 |   | Pleated, 85% Eff, MERV 13<br>and<br>Carbon                    |
| J                 |   | Pleated, 95% Eff, MERV 14<br>and<br>Carbon                    |
| K                 |   | Pleated, 65% Eff, MERV 11<br>and<br>Pleated, 85% Eff, MERV 13 |
| L                 |   | Pleated, 65% Eff, MERV 11<br>and<br>Pleated, 95% Eff, MERV 14 |

Table 13 - 14-18 ton (D Cabinet) Mixing Box Filters

| <b>Feature 6A</b> | <b>Quantity/Size</b>  | <b>Type</b>   |
|-------------------|---|---|
| A                 | (4) 18" x 24" x 2"<br>(located in the mixing box)   | 2" Pleated, 30% Eff, MERV<br>10 Pre-Filters                   |
| <b>Feature 6B</b> | <b>Quantity/Size</b>  | <b>Type</b>   |
| G                 | (4) 18" x 24" x 4"<br>(located in the mixing box)<br>and<br>(4) 18" x 24" x 4"<br>(located in the unit) | Pleated, 65% Eff, MERV 11<br>and<br>Carbon                    |
| H                 |   | Pleated, 85% Eff, MERV 13<br>and<br>Carbon                    |
| J                 |   | Pleated, 95% Eff, MERV 14<br>and<br>Carbon                    |
| K                 |   | Pleated, 65% Eff, MERV 11<br>and<br>Pleated, 85% Eff, MERV 13 |
| L                 |   | Pleated, 65% Eff, MERV 11<br>and<br>Pleated, 95% Eff, MERV 14 |

## Appendix A - Heat Exchanger Corrosion Resistance

The resistance guide below provides the corrosion resistance of stainless steel type AISI 316 and pure Copper (99.9%) in water, to a number of important chemical factors. The actual corrosion is a very complex process influenced by many different factors in combination.

Explanations: + Good resistance under normal conditions

0 Corrosion problems may occur especially when more factors are valued 0

- Use is not recommended

| Water Containing  | Concentration (mg/l or ppm) | Time Limits - Analyze Before | AISI 316 | SMO 254 | Copper Alloy | Nickel Alloy |
|---|-----------------------------|------------------------------|----------|---------|--------------|--------------|
| Alkalinity (HCO <sub>3</sub> <sup>-</sup> )                   | < 70                        | Within 24 Hours              | +        | +       | 0            | +            |
|   | 70-300                      |                              | +        | +       | +            | +            |
|   | > 300                       |                              | +        | +       | 0/+          | +            |
| Sulfate (SO <sub>4</sub> <sup>2-</sup> )                      | < 70                        | No Limit                     | +        | +       | +            | +            |
|   | 70-300                      |                              | +        | +       | 0/-          | +            |
|   | > 300                       |                              | 0        | 0       | -            | +            |
| HCO <sub>3</sub> <sup>-</sup> / SO <sub>4</sub> <sup>2-</sup> | > 1.0                       | No Limit                     | +        | +       | +            | +            |
|   | < 1.0                       |                              | +        | +       | 0/-          | +            |
| Electrical Conductivity                                       | < 10µS/cm                   | No Limit                     | +        | +       | 0            | +            |
|   | 10-500 µS/cm                |                              | +        | +       | +            | +            |
|   | > 500 µS/cm                 |                              | +        | +       | 0            | +            |
| pH  | < 6.0                       | Within 24 Hours              | 0        | 0       | 0            | +            |
|   | 6.0-7.5                     |                              | 0/+      | +       | 0            | +            |
|   | 7.5-9.0                     |                              | +        | +       | +            | +            |
|   | > 9.0                       |                              | +        | +       | 0            | +            |
| Ammonium (NH <sub>4</sub> <sup>+</sup> )                      | < 2                         | Within 24 Hours              | +        | +       | +            | +            |
|   | 2-20                        |                              | +        | +       | 0            | +            |
|   | > 20                        |                              | +        | +       | -            | +            |
| Chlorides (Cl <sup>-</sup> )*                                 | < 300                       | No Limit                     | +        | +       | +            | +            |
|   | > 300                       |                              | 0        | +       | 0/+          | +            |
| Free Chlorine (Cl <sub>2</sub> )                              | < 1                         | Within 5 Hours               | +        | +       | +            | +            |
|   | 1-5                         |                              | +        | +       | 0            | +            |
|   | > 5                         |                              | 0/+      | +       | 0/-          | +            |
| Hydrogen Sulfide (H <sub>2</sub> S)                           | < 0.05                      | No Limit                     | +        | +       | +            | +            |
|   | > 0.05                      |                              | +        | +       | 0/-          | +            |
| Free (aggressive) Carbon Dioxide (CO <sub>2</sub> )           | < 5                         | No Limit                     | +        | +       | +            | +            |
|   | 5-20                        |                              | +        | +       | 0            | +            |
|   | > 20                        |                              | +        | +       | -            | +            |

\*See Also Chloride Content Table

| Water Containing           | Concentration (mg/l or ppm) | Time Limits - Analyze Before | AISI 316 | SMO 254 | Copper Alloy | Nickel Alloy |
|----------------------------|-----------------------------|------------------------------|----------|---------|--------------|--------------|
| Total Hardness (°dH)       | 4.0-8.5                     | No Limit                     | +        | +       | +            | +            |
| Nitrate (NO <sub>3</sub> ) | < 100                       | No Limit                     | +        | +       | +            | +            |
|                            | > 100                       |                              | +        | +       | 0            | +            |
| Iron (Fe)                  | < 0.2                       | No Limit                     | +        | +       | +            | +            |
|                            | > 0.2                       |                              | +        | +       | 0            | +            |
| Aluminum (Al)              | < 0.2                       | No Limit                     | +        | +       | +            | +            |
|                            | > 0.2                       |                              | +        | +       | 0            | +            |
| Manganese (Mn)             | < 0.1                       | No Limit                     | +        | +       | +            | +            |
|                            | > 0.1                       |                              | +        | +       | 0            | +            |

#### Chloride Content

| Chloride Content | Maximum Temperature |              |               |               |
|------------------|---------------------|--------------|---------------|---------------|
|                  | 60°C (140°F)        | 80°C (176°F) | 120°C (248°F) | 130°C (266°F) |
| = 10 ppm         | SS 304              | SS 304       | SS 304        | SS 316        |
| = 25 ppm         | SS 304              | SS 304       | SS 316        | SS 316        |
| = 50 ppm         | SS 304              | SS 316       | SS 316        | Ti / SMO 254  |
| = 80 ppm         | SS 316              | SS 316       | SS 316        | Ti / SMO 254  |
| = 150 ppm        | SS 316              | SS 316       | Ti / SMO 254  | Ti / SMO 254  |
| = 300 ppm        | SS 316              | Ti / SMO 254 | Ti / SMO 254  | Ti / SMO 254  |
| > 300 ppm        | Ti / SMO 254        | Ti / SMO 254 | Ti / SMO 254  | Ti / SMO 254  |

## SB Series Startup Form

|                           |             |
|---------------------------|-------------|
| Job Name: _____           | Date: _____ |
| Address: _____            |             |
|                           |             |
| Model Number: _____       |             |
| Serial Number: _____      | Tag: _____  |
| Startup Contractor: _____ |             |
| Address: _____            |             |
|                           |             |
| Phone: _____              |             |

### Pre Startup Checklist

|   |  |
|---|--|
| Installing contractor should verify the following items.                                |  |
| 1. Is there any visible shipping damage?  | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 2. Is the unit level?   | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 3. Are the unit clearances adequate for service and operation?                          | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 4. Do all access doors open freely and are the handles operational?                     | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 5. Have all shipping braces been removed?   | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 6. Have all electrical connections been tested for tightness?                           | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 7. Does the electrical service correspond to the unit nameplate?                        | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 8. On 208/230V units, has transformer tap been checked?                                 | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 9. Has overcurrent protection been installed to match the unit nameplate requirement?   | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 10. Have all set screws on the fans been tightened?                                     | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 11. Do all fans rotate freely?  | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 12. Does the field water piping to the unit appear to be correct per design parameters? | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 13. Is all copper tubing isolated so that it does not rub?                              | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 14. Are air filters installed with proper orientation?                                  | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 15. Have condensate drain and p-trap been connected?                                    | <input type="checkbox"/> Yes <input type="checkbox"/> No |

### Ambient Temperature

|                                      |                                      |
|--------------------------------------|--------------------------------------|
| Ambient Dry Bulb Temperature _____°F | Ambient Wet Bulb Temperature _____°F |
|--------------------------------------|--------------------------------------|

**Supply Fan Assembly**

|                                    |    |   |    |                      |  |
|------------------------------------|----|---|----|----------------------|--|
| Alignment <input type="checkbox"/> |    | Check Rotation <input type="checkbox"/> |    | Nameplate Amps _____ |  |
| Number                             | hp | L1                                      | L2 | L3                   |  |
| 1                                  |    |   |    |                      |  |
| 2                                  |    |   |    |                      |  |
| VAV Controls _____                 |    |   |    |                      |  |

**Compressors/DX Cooling**

|   |    |    |    |                    |                       |
|---|----|----|----|--------------------|-----------------------|
| Check Rotation <input type="checkbox"/> |    |    |    |                    |                       |
| Number                                  | L1 | L2 | L3 | Head Pressure PSIG | Suction Pressure PSIG |
| 1                                       |    |    |    |                    |                       |

**Refrigeration System 1 - Cooling Mode**

|           | Pressure | Saturated Temperature | Line Temperature | Sub-cooling | Superheat |
|-----------|----------|-----------------------|------------------|-------------|-----------|
| Discharge |          |                       |                  | N/A         | N/A       |
| Suction   |          |                       |                  | N/A         |           |
| Liquid    |          |                       |                  |             | N/A       |

**Refrigeration System 1 - Heating Mode (Heat Pump Only)**

|           | Pressure | Saturated Temperature | Line Temperature | Sub-cooling | Superheat |
|-----------|----------|-----------------------|------------------|-------------|-----------|
| Discharge |          |                       |                  | N/A         | N/A       |
| Suction   |          |                       |                  | N/A         |           |
| Liquid    |          |                       |                  |             | N/A       |

**Unit Configuration**

|   |   |                                   |  |
|---|---|-----------------------------------|--|
| Water-Cooled Condenser <input type="checkbox"/> |   |                                   |  |
| No Water Leaks <input type="checkbox"/>         | Condenser Safety Check <input type="checkbox"/> |                                   |  |
| Water Flow _____ gpm                            |   |                                   |  |
| Water Inlet Temperature _____ °F                |   | Water Outlet Temperature _____ °F |  |

**Water/Glycol System**

|  |  |
|--|--|
| 1. Has the entire system been flushed and pressure checked?        | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 2. Has the entire system been filled with fluid?                   | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 3. Has air been bled from the heat exchangers and piping?          | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 4. Is the glycol the proper type and concentration (N/A if water)? | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 5. Is there a minimum load of 50% of the design load?              | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 6. Has the water piping been insulated?                            | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 7. What is the freeze point of the glycol (N/A if water)? _____    |  |

**Mixing Box Dampers**

|  |  |                                      |
|--|--|--------------------------------------|
| Operation Check <input type="checkbox"/>         | Damper Wiring Check <input type="checkbox"/> | Gears Check <input type="checkbox"/> |
| Damper Actuator Type: _____                      |  |                                      |
| Economizer Changeover Type and Operations: _____ |  |                                      |

**Electric Heating**

| Stages _____ |      | Limit Lockout <input type="checkbox"/> | Aux. Limit Lockout <input type="checkbox"/> |
|--------------|------|--|---|
| Stage        | Amps | Stage                                  | Amps  |
| 1            |      | 5                                      |   |
| 2            |      | 6                                      |   |
| 3            |      | 7                                      |   |
| 4            |      | 8                                      |   |

**Electric Preheating**

| Limit Lockout <input type="checkbox"/>            | Aux. Limit Lockout <input type="checkbox"/> |       |      |
|---|---|-------|------|
| Outside Air Temperature Setpoint _____ °F         |   |       |      |
| Preheat Leaving Air Temperature Setpoint _____ °F |   |       |      |
| Stage   | Amps  | Stage | Amps |
| 1   |   | 3     |      |
| 2   |   | 4     |      |



## **Literature Change History**

### **November 2012**

First Revision, Rev. A, of the SB Series IOM.

### **December 2012**

Manual updated with the voltage options corrected, option 1 = 230V/1Φ/60Hz and option 9 = 208V/1Φ/60Hz. Condensing unit only options and ECM driven fan airflow adjustment information added.

### **January 2013**

Updated with additional mixing box filter details.

### **April 2014**

Updated configurator options and added modulating electric preheat sections.

### **July 2015**

Added Features and Options section and removed carbon filters as a selectable option.

### **January 2016**

Updated *Phase and Brownout Protection Module* section.

### **March 2016**

Updated Feature 14A - *Water-Cooled Condenser* in the Feature String Nomenclature.

### **June 2016**

Waterside Economizer section was updated. *Fan Airflow Adjustment* section was added.

### **July 2016**

Updated *E-Coated Cleaning* section.

### **October 2016**

Added **Feature 3** – *Energy Recovery Type*.

### **November 2016**

Added *Unit Assembly* section. Updated *Feature String Nomenclature* to reflect new features and options.

### **June 2017**

Table 14 - *Condenser Water Connections* updated.

### **September 2017**

Updated Feature 14A - *Water-Cooled Condenser*. Added *ETL U.S.A. + Canada Listing* option; Feature 19. Updated Feature 5B - *Supply Air Blower*. Updated Feature 5C – *Supply Air Blower Motor*. Removed *Terminal Block* option; Feature 13.









**AAON**  
**203 Gum Springs Rd.**  
**Longview, TX 75602-1721**  
**www.aaon.com**

**SB Series**  
**Installation, Operation &**  
**Maintenance**  
**V14190 · Rev. B · 170908**  
**(ACP 31227)**

**Factory Technical Support: 903-247-9894**

**Note:** Before calling Technical Support, please have the model and serial number of the unit available.

**Parts:** For replacement parts please contact your local AAON Representative.

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