

# **SB** Series

### Vertical Self-Contained Units





# Installation, Operation & Maintenance



# **A** 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 competent in working with flammable refrigerants. A copy of this IOM must be kept with the unit.

### **A** 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.

### **A** 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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### **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-454B 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 must be paid to the following statements:

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

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

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

# **A** 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.

### **A** 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.

### **A** 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.

# **A** WARNING

# CARBON MONOXIDE POISONING HAZARD

Failure to follow instructions could result in severe personal injury or death due to carbon-monoxide poisoning, if combustion products infiltrate into the building.

Check that all openings in the outside wall around the vent (and air intake) pipe(s) are sealed to prevent infiltration of combustion products into the building.

Check that furnance vent (and air intake) terminal(s) are not obstructed in any way during all seasons.

# **A** 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, must be followed.

### **A** 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.

# **A** 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.

### **A** 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.

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

# **A** 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 must be checked for proper operation. Alterations must only be made at the unit power connection

### **A** WARNING

### WATER PRESSURE

Prior to connection of condensing water supply, verify water pressure is less than maximum pressure of 2068.4 kpa (300psi). To prevent injury or death due to instantaneous release of high pressure water, relief valves must be field supplied on system water piping.

### **A** WARNING

Do not use torch or other potential ignition source to detect refrigerant leaks. Use only electronic detector suitable for the refrigerant, or bubble method with chlorine free detergent.

### **A** 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.

# **A** 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.

### **A** 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.

### A 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.

### **A** WARNING

If refrigerant leak is detected, remove/extinguish all sources of open flame. If repairing refrigerant leak requires brazing, remove all refrigerant before beginning brazing.

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.

# **A** WARNING

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

# **A** 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.

# **A** CAUTION

Unit power supply wire must be only copper or aluminum.

# **A** 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 must be taken to avoid allowing chemicals to enter the water-cooled condenser. See Appendix A - Heat Exchanger Corrosion Resistance for more information.

### **A** 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.

### **A** 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.

PVC (Polyvinyl Chloride) and CPVC (Chlorinated Polyvinyl Chloride) are vulnerable to attack by certain chemicals. Polyolester (POE) oils used with R-454B 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.

# **A** WARNING

This appliance is not intended for use by persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children must be supervised around this appliance.

# **A** WARNING

Ensure that sufficient dampers will be open to provide air path before fan is allowed to run.

### **A** WARNING

Do not weld or cut foam panel with plasma cutters or a cutting torch – When burnt the foam produces dangerous fumes.

# **A** WARNING

#### **COMPRESSOR CYCLING**

3 MINUTE MINIMUM OFF TIME To prevent motor overheating compressors must cycle off for a minimum of 3 minutes.

5 MINUTE MINIMUM ON TIME To maintain the proper oil level compressors must cycle on for a minimum of 5 minutes.

The cycle rate must not exceed 7 starts per hour.

# **A** CAUTION

In order to avoid a hazard due to inadvertent resetting of the THERMAL CUT-OUT, this appliance must not be supplied through an external switching device, such as a timer, or connected to a circuit that is regularly switched on and off by the utility.

### **A** WARNING

Units with VFD driven motors/compressors have adjustable overload settings. These are set by the AAON factory for the protection of these motors/compressors and must not be adjusted over this factory setpoint or bypassed.

# **A** WARNING

Only auxiliary devices approved by manufacturer or declared suitable with the refrigerant may be installed in ductwork.

### **A** WARNING

Connected ductwork must be free of potential ignition sources, such as hot surfaces above 700 °C (1292 °F) or electrical devices prone to arcing or sparking. Potential ignition sources within the ductwork may only be allowed if the minimum air velocity across these components is above 1 m/s (200 ft/min) during any point which the component can function.

### **A** WARNING

This appliance contains a flammable refrigerant. Minimum floor area on nameplate is based on factory charge at a ceiling/release height of 2.2 m (7.2 ft) in accordance with UL 60335-2-40. Refer to Table 16 for different allowable room areas based on other charges and ceiling/release heights. Apply altitude adjustment factor to table values as required by local codes.

# **A** WARNING

If this appliance is installed to serve a conditioned area less than the minimum area as indicated in Table 17, the served space must be free of continuously operating open flames or other sources of ignition. Additional ventilation is required in accordance with ASHRAE 15.

# **A** WARNING

If any damage or fault to electrical equipment exists, do not provide power to unit. If the issue can not be resolved immediately, report issue to equipment owner to ensure power is not supplied before issue is resolved.

# **A** WARNING

Refrigerant Detection System activated circulation airflow. In the event of refrigerant leak within airstream, indoor blower is activated to provide circulation airflow. Mitigation board provided with alarm output. Wire all zone dampers and VAV boxes to alarm output to open in the event of a refrigerant leak alarm.

### **A** WARNING

Ensure that there are no live electrical components or wiring exposed when adjusting charge, recovering charge, or purging the system. Ensure that earthing continuity is unbroken.

### **A** WARNING

Minimum circulation airflow is required to prevent stagnation of refrigerant in the event of a refrigerant leak. Zone dampers and VAV boxes must be operated to allow for minimum circulation airflow in the event of a refrigerant leak.

# **A** WARNING

Do not use means to accelerate the defrosting process or to clean, other than those recommended in this manual.

# **A** WARNING

The appliance shall be stored in a room without continuously operating ignition sources (i.e. open flames, an operating gas appliances or operating electric heater).

# **A** WARNING

Flammable refrigerant. Do not pierce or burn tubing or refrigerant containing components.



### **A** CAUTION

Disconnect power to the unit before servicing UV-C lamps



# **A** CAUTION

Doors and panels with access to UV-C lamps, with possible spectral irradiance exceeding 1.7  $\mu$ W/cm2 are provided with an interlock switch. Do not over-ride.



### **A** WARNING

Units containing UV-C Germicidal lamps should not be operated with damage to the cabinet of the unit. UV-C radiation may, even in small doses, cause harm to the eyes and skin.



# **A** WARNING

Do not operate UV-C lamps outside of the unit.

# **A** WARNING

Flammable refrigerant. Be aware that refrigerant does not contain an odor.

- 1. Startup and service must be performed by a Factory Trained Service Technician competent with working with flammable refrigerants.
- 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. For ducted applications, supply and return must be ducted directly to the space served by the unit. If plenum return is to be utilized, the return plenum must be provided with a refrigerant detection system or ventilation in accordance with ASHRAE 15 requirements.
- 5. READ THE ENTIRE INSTALLATION, OPERATION AND MAINTENANCE MANUAL. OTHER IMPORTANT SAFETY PRECAUTIONS ARE PROVIDED THROUGHOUT THIS MANUAL.
- 6. Keep this manual and all literature safeguarded near or on the unit.

### **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

L = R-454B Variable Capacity Scroll Compressor (VCC)

#### **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

7 = 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

Model Options : Unit Feature Options

### **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

M = Option A + Piezo Ring

N = Option B + Piezo Ring

P = Option C + Piezo Ring

Q = Option D + Piezo Ring

R = Option E + Piezo Ring

S = Option F + Piezo Ring

T = Option G + Piezo Rings

U = Option H + Piezo Rings

V = Option J + Piezo Rings

W = Option K + Piezo Rings

Y = Option L + Piezo Rings

#### 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

D = Fully Modulating Actuator - Enthalpy Limit

E = Fully Modulating Actuator - Sensible Limit

### 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

J = Energy Recovery Wheel - Total + High CFM, Aluminum

L = Energy Recovery Wheel - Total + High CFM, 1% Purge, Aluminum

#### 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

C = Option A + Piezo Ring

D = Option B + Piezo Rings

E = 1 Blower + Perm Magnet AC TEFC Motor + VFD

F = 2 Blowers + 2 Perm Magnet AC TEFC Motors + 2 VFDs

Model Options : Unit Feature Options

#### **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 = 250 mm (12") Direct Drive Backward Curved Plenum Fan
- F = 13.5" Backward Curved Plenum Fan, 70% Width
- G = 15" Backward Curved Plenum Fan, 70% Width
- 1 = 15" Backward Curved Plenum Fan
- 4 = 18.5" Backward Curved Plenum Fan, 70% Width

#### 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)
- 1 = 1 hp
- 2 = 2 hp
- 3 = 3 hp
- 4 = 5 hp

#### 6A: Pre-Filter Type

- 0 =No Pre Filter
- A = 2" Pleated MERV 8

#### **6B:** Unit Filter Type

- 0 = No Unit Filter
- A = 2" Pleated MERV 8
- B = 4" Pleated MERV 8
- C = 4" Pleated MERV 11
- D = 4" Pleated MERV 13
- E = 4" Pleated MERV 14

#### **6C: Filter Options**

- 0 = Standard
- A = Clogged Filter Switch
- B = Magnehelic Gauge
- C = Options A + B

#### 7: Refrigeration Control

- 0 = Standard
- C = Freeze Stat Each Circuit

#### **8: Refrigeration Options**

- 0 = Standard
- D = Modulating Hot Gas Reheat

#### 9: Refrigeration Accessories

- 0 = Standard
- A = Sight Glass
- B = Compressor Isolation Valves
- C = Options A + B

#### 10: Power Options

0 = Standard Power Block

#### 11: Safety Options

- 0 = Standard
- C = Supply Air Smoke Detector
- H = Remote Safety Shutoff Terminals
- L = Options C + H

#### 12: Controls

- 0 = Standard
- A = Low Limit Controls
- B = Phase and Brown Out Protection
- C = Options A + B
- D = Energy Recovery Wheel Rotation Detection
- E = Options A + D
- F = Options B+D
- G = Options A+B+D

#### 13: Special Controls

- D = VAV Unit Controller VAV Cool + CV Heat
- Y = Single Zone VAV Heat Pump Unit Controller -VAV Cool + VAV Heat
- Z = Constant Volume Heat Pump Unit Controller -CV Cool + CV Heat
- 1 = Make Up Air Heat Pump Unit Controller CV Cool + CV Heat
- 5 = Field Installed DDC Controls by Others with Isolation Relays
- 6 = Factory Installed DDC Controls Furnished by Others with Isolation Relays

Model Options : Unit Feature Options

#### 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
- L= Balancing Valves + Option H
- 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 = No Paint
- 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

- $\overline{0}$  = 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 (SPA Required)

#### 22: Control Vendors

- 0 = Standard
- A = VCB-X Controls
- H = AAON Touchscreen Controller
- V = VCCX Controls

#### **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. SB Series units are intended for installation up to 3500 meters (11,500 ft)

# **A** 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 must be kept with the unit.

### A 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-454B coils.

#### **Codes and Ordinances**

SB Series units have been tested and certified, by ETL, in accordance with CSA C22.2 No. 236 and UL-60335-2-40 and Z21.47-2016.

Size system 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.

### **A** 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.

# **A** WARNING

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

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

Check nameplate 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 must 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: (918) 382-6450.

**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 must secure

all doors with locks or nuts and bolts to prevent unauthorized access.



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. Unit must be stored in accordance with ASHRAE 15 requirements for machine rooms

**Direct Expansion (DX) Systems** 



### COMPRESSOR CYCLING

3 MINUTE MINIMUM OFF TIME To prevent motor overheating compressors must cycle off for a minimum of 3 minutes.

5 MINUTE MINIMUM ON TIME To maintain the proper oil level compressors must cycle on for a minimum of 5 minutes.

The cycle rate must not exceed 7 starts per hour.

All water-cooled condenser DX systems are factory assembled, leak tested, charged with R-454B refrigerant, and run tested.

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

# **A** CAUTION

#### **CRANKCASE HEATER**

Some units are equipped with compressor crankcase heaters, which must 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 shorted 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 must be the same pipe size or larger than the drain connection, include a p-trap, and pitch downward toward drain. An air break must 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.



Unit must not be operated without a ptrap. 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. If unit is to be installed indoors, or in areas without sufficient ventilation, provide venting from all pressure relief outlets to outdoors in accordance with ASHRAE 15 requirements.

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
Access	Clearance Required 91.4 cm (36 inches) <sup>1</sup>
Door Sides	71.4 cm (30 menes)
All Other	15.2 cm (6 inches) <sup>2</sup>
Sides	

- 1. Additional clearance may be required to allow for coil removal. See Table 2
- 2. May be installed flush depending upon local codes.

Table 2 - Clearances for Coil Pull

Unit Size	Access Side		
SB 3-5 tons	81.3 cm (32 inches)		
SB 6-10 tons	111.8 cm (44 inches)		
SB 14-18 tons	147.3 cm (58 inches)		

### **A** 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.

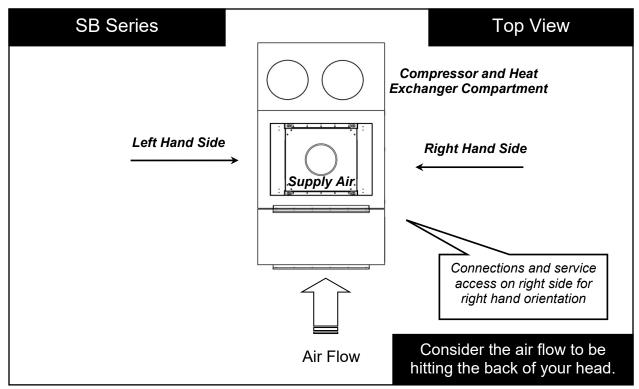


Figure 3 - SB Series Unit Orientation

### Lifting and Handling the Unit

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



#### **UNIT HANDLING**

Incorrect lifting can cause damage to the unit, injury or death. Lifting equipment capacity must exceed unit weight by an adequate safety factor. Always test lift unit not more than 61 cm (24 inches) high to verify proper center of gravity lift point.

Care must 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.

If the Air Handler section and the Compressor section ship split, the refrigerant piping must be field installed to connect these two sections.

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. Water-Cooled Condenser
  - 5. Electric Heat
  - 6. Pre filter
  - 7. Mixing box

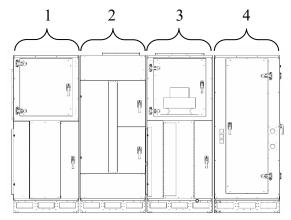


Figure 4 - SB Schematic with (1) Exhaust Fan, (2) Energy Recovery, (3) Air Handler, and (4) Compressor Section

#### 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.

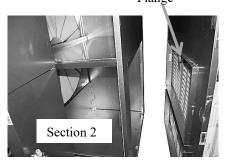


Figure 5 - Connect Sections

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

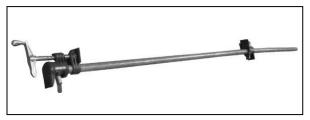


Figure 6 - Bar Clamp

At each of the pre-drilled holes in the flange, drill 8 mm (5/16") hex head self-tapping screws to secure the two sections together.



Figure 7 - Flange Overlap

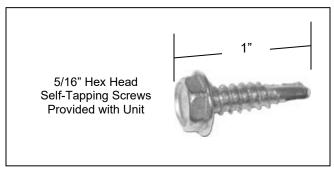


Figure 8 - Self-Tapping Screw

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 predrilled 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.

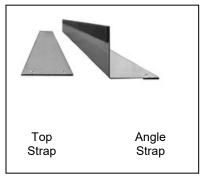


Figure 9 - Strap Types

#### 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.



Proper sealing of the electrical and piping entries into the unit must be verified by a qualified technican. Failure to seal the entries may result in damage to the unit and property.

### 6. Refrigerant Piping

If the Air Handler section and the Compressor section ship split, the refrigerant piping must be field installed to connect these two sections.



Figure 11 - Ship Split sections

# 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.

# **A** CAUTION

installed Field pipework protected from physical damage in operation and service. All joints must be accessible for inspection prior to being covered. Install in accordance with applicable local codes. In the absence of local codes, install in accordance with ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code. ICC International Mechanical Code, or CSA B52. Do no install any field made joints within conditioned airstream.

### **A** WARNING

#### **OPEN LOOP APPLICATIONS**

Failure of the refrigerant-to-water heat exchanger 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 refrigerant-to-water heat exchanger.

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

Failure of the refrigerant-to-water heat exchanger 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 refrigerant-to-water heat exchanger failure from chemical corrosion due the fluid in the refrigerant-to-water heat exchanger is excluded from coverage under AAON warranties and the heat exchanger manufacturer warranties.

# **A** WARNING

#### **OPEN LOOP APPLICATIONS**

Cupronickel refrigerant-to-water heat exchangers must be used 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.

### **A** CAUTION

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 must 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 0°C (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.

### **A** 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 13.9°C (57°F) during cooling mode without the need for head pressure control. If the EWT is expected to be lower than 13.9°C (57°F) or more stable operation is desired, a factory provided head pressure control water valve option is available.

Glycol solutions are required if ambient temperatures are expected to fall below freezing or if the loop water temperature is below 10°C (50°F) while operating in the heating mode with the design minimum flow rate (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 required.

Table 3 - Glycol Concentration Freezing Points (Metric)

% Glycol	Ethylene	Propylene
	Glycol	Glycol
20	-7.8°C	-7.2°C
30	-13.9°C	-12.8°C
40	-21.7°C	-21.1°C
50	-33.3°C	-32.8°C

Table 4 - Glycol Concentration Freezing Points (Imperial)

1 011105 (1111)					
% Glycol	Ethylene	Propylene			
	Glycol	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 must be insulated.

Never operate the unit in heat pump mode with a saturated suction temperature below 1.7°C (35°F) for pure water systems or below the freezing point + (-16.1°C [3°F]) of the aqueous solution of water and glyclol.

### Water Piping

A water flow switch is factory 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.

# **A** WARNING

#### WATER PRESSURE

Prior to connection of condensing water supply, verify water pressure is less than maximum pressure of 2068.4 kpa (300 psi). To prevent injury or death due to instantaneous release of high pressure water, relief valves must 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.

# **A** CAUTION

PVC (Polyvinyl Chloride) and CPVC (Chlorinated Polyvinyl Chloride) are vulnerable to attack by certain Polyolester (POE) oils chemicals. R-454B used with 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 5 - Condenser Water Connections

	Supply and Return
Model (SB-)	Connection Size
	(FPT)
003, 004, 005	25 mm (1")
006, 007	32 mm (1 1/4")
009, 010	38 mm (1 1/2")
014, 016, 018	51 mm (2")

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



Figure 12- Water Connections for Water-Source Heat Pumps

Table 6 - Water Connection Locations

Unit Configuration	Locations
Water-Source Heat	Water In - Top
Pump	Water Out - Bottom
Water-Cooled	Water In - Bottom
Condenser	Water Out - Top

### A CAUTION

Water system components must be properly sized and correctly installed by a qualified technician. Improper fluid flow due to valves, piping, or improper pump operation may result in unacceptable unit operation and void warranty.

# **A** CAUTION

#### WATER PIPING

Follow national and local codes when installing water piping. Connections to the unit must 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, flush the condenser water system 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 must 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 must be insulated.

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

pressure drops and poor throttling characterisics.

Pressure and temperature ports are recommended in condenser water supply and return lines for system balancing. These openings must be 5 to 10 pipe diameters from the unit water connections. To allow for mixing and temperature stabilization, wells in the water piping must extend at least 1/2 pipe diameter into the pipe.

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

#### **Electrical**

For units not equipped with incoming power disconnect, means for all pole disconnection must be provided in the fixed wiring in accordance with local or national electrical codes The single point electrical power connections are made in the electrical control compartment.

Verify the unit nameplate agrees with the power supply. Connect power and control field wiring as shown on the unit wiring diagram provided with the unit.

Table 7 - Nameplate Voltage Markings & Tolerances

Table / Traineplate			Voltage Warkings & Folerances			
1 H7 1 *	Nameplate	Nominal System	Operating Voltage Range <sup>1</sup>		Acceptable Performance Range <sup>2</sup>	
	Voltage	Voltage	Min	Max	Min	Max
	115	120	104	127	108	126
	208/230	208/240	187	254	187	252
	208	208	187	228	187	228
60	230	240	208	254	216	252
	265	277	240	293	249	291
	460	480	416	508	432	504
	575	600	520	635	540	630
50	230	230	198	254	208	254
50	400	400	344	440	360	440

#### Notes:

- 1. Operating voltage is the min and max voltage for which the unit can function. Never operate outside of this min and max voltage.
- 2. The Acceptable Performance Range is the min and max voltage for which the unit performance is designed and rated to give acceptable performance.

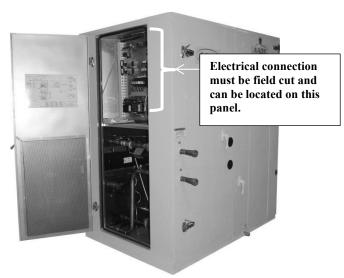


Figure 13 - Electrical Connection

# **A** WARNING

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 must enter the control panel in a separate opening and separate conduit than 24V low voltage conductors.

### **A** WARNING

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 15.2 cm (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, cut a hole and pass conduit 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.

A qualified technician must ensure 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 must be fabricated from sheet metal to cover the foam at the cut. The edges and corners that are not covered must then be sealed using silicone caulking or a duct seal compound.

If a reciprocating saw is used to make the cutout 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 (167°F).

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 must not exceed the short circuit current rating (SCCR) shown on the unit nameplate.

# **A** CAUTION

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 2%.

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

#### Example:

(221V+230V+227V)/3 = 226V, then 100\*(226V-221V)/226V = 2.2%, 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.

### A CAUTION

Ensure that wires are protected from damage and wear caused by normal operation of unit and environmental factors.

A qualified technician must check for proper motor rotation and check blower motor amperage listed on the motor nameplate is not exceeded.



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

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

# **A** CAUTION

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 must be checked by a qualified service technician at startup using suction and discharge pressure gauges and any wiring alteration must only be made at the unit power connection.

#### Thermostat Control Wiring

If a thermostat is used for unit control, locate the thermostat on an inside wall 1.2-1.5 meters (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 8 - Control Wiring

Wire Size (Stranded)	Total Wir	e Distance	
- Copper Conductors	Allowable		
Only			
20 AWG	60.96 m	200 ft	
18 AWG	106.7 m	350 ft	
16 AWG	152.4 m	500 ft	
14 AWG	228.6 m	750 ft	
12 AWG	381.0 m	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 must be used?

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

#### Fuses and Circuit Breakers

The interrupting rating of fuses and circuit breakers is to be determined based on the KAIC rating of the unit. Refer to the wiring diagram for fuse sizing.

Table 9 – 35 KAIC Fuse Sizing

35 KAIC Construction				
Component	Description	Interrupting Rating (kA)		
Fuse	Class CC, 600V, 0.5A - 30A	200		
Fuse	Class J, 600V, 35A - 600A	200		
Disconnect	3P, 600V, 15A - 600A	35		

Table 10 – 65 KAIC Fuse Sizing

65 KAIC Construction				
Component	Description	Interrupting Rating (kA)		
Fuse	Class CC, 600V, 0.5A - 30A	200		
Fuse	Class J, 600V, 35A - 600A	200		
Disconnect	3P, 600V, 15A - 600A	65		

#### **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. Size ductwork in accordance with the ASHRAE Handbook. Ductwork must 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 15.2 cm (6") from the drain connection. The

lines must be the same pipe size or larger than the drain connection, include a p-trap, and pitch downward toward drain. An air break must be used with long runs of condensate lines.

### **A** CAUTION

Unit must not be operated without ptraps. 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 must conform to all applicable governing codes.

**Note:** The drain pan connection(s) is a 2.5 cm (1") MPT fitting.

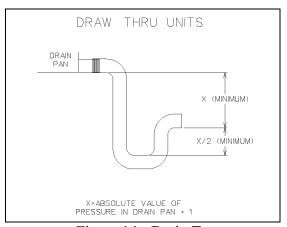


Figure 14 - Drain Trap

The X dimension on the draw-through trap must 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 11 - Drain Trap Dimensions (Metric)

Draw-Through				
Drain Pan Pressure	Trap Dimensions			
Negative Static	X	X/2		
(mm of mercury)	(mm)	(mm)		
-0.93	12.70	6.4		
-1.87	25.40	12.7		
-2.80	38.10	19.1		
-3.74	50.80	25.4		
-4.67	63.50	31.8		
-5.60	76.20	38.1		

Table 12 - Drain Trap Dimensions (Imperial)

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 must 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 must not be subjected to entering air temperatures below 3.3°C (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.

Table 13 -Min and Max Water Pressure and Temps

	Hot Water	
Min. Entering Air	4.4 °C (40°F)	
Max Entering Air	26.7°C (80°F)	
Min. Entering Water	60°C (140°F)	
Max Entering Water	93.3°C (200°F)	
Min. Water Pressure	0 kpa (15 psig)	
Max Water	2068kpa (300	
Pressure	psig)	

### A WARNING

Piping shall be in accordance with national and local codes. Pressure limiting devices, backflow preventers and all other safety requirements must be verified by a qualified technician.

# **A** CAUTION

Proper sealing of the water piping entries into the unit must be verified by a qualified technican. Failure to seal the entries may result in damage to the unit and property.

### **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.

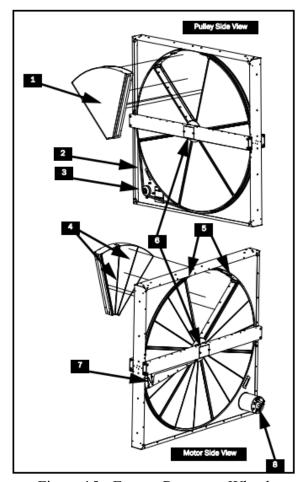


Figure 15 - Energy Recovery Wheel

- 1. Removable Segment (NA for monolith)
- 2. Permanent Tension Belt
- 3. Pulley
- 4. Embedded Segment Stiffeners (NA for monolith)
- 5. Segment Retaining Latches (NA for monolith)
- 6. Bearing Beam and Bearing Access Cover Plate (Diameter Seals are behind Bearing Beam on both sides)
- 7. Adjustable Purge
- 8. Motor

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 must 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 with no interference noise. Apply power and observe that the wheel rotates at approximately 45-50 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.

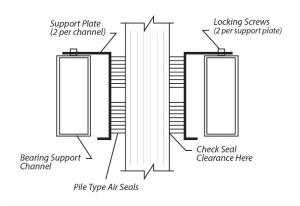


Figure 16 - Cross Section of Air Seal Structure

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.

#### 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 0.1 mm (.004") thick) by placing it between the face of the wheel and pile seal.

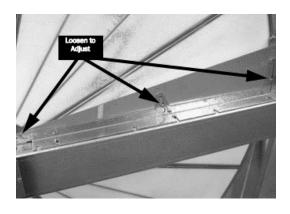
Using the paper, determine if a loose slip fit exist between the pile seal and wheel when the wheel is rotated by hand.

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.

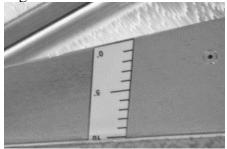
Confirm that the wheel rotates freely. Apply power to the unit and confirm rotation. Visually inspect the belt and ensure the belt is tracking near the center of the rim. Verify the wheel speed is approximately 45-50 RPM. Confirm there is no excessive noise such as scraping, brushing, or banging.

#### **Set Purge Angle (if included)**

When installed, the purge angle is factory set to 5 degrees. If a different angle is required, complete the following steps to adjust the purge:



- 1. Loosen the three purge adjusting screws.
- 2. Adjust purge sector to the specified angle.



3. Tighten the purge adjusting screws.

4. Turn the wheel by hand clockwise (when viewed from pulley side) to check for interference.

#### **Check Purge Seal**

If a purge is installed, check for a slight interference fit between the seal and the face of the wheel by sliding a piece of paper ("feeler gauge") between the seal and the media a multiple locations along the purge seal as you rotate the wheel slowly by hand (clockwise when viewed from the pulley side). Verify that the media slightly grabs the paper during rotation.



If it is necessary to adjust a purge seal to the face of the wheel, loosen the two or three screws along the bearing beam and adjust to the proper distance from the media surface. Tighten the screws and retest the seal.

#### **Airflow Balancing and Checking**

High performance systems commonly have complex air distribution and fan systems. Unqualified personnel must not attempt to adjust fan operation, or air circulation, as all systems have unique operations characteristics. Professional air balance specialists must 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.



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 must 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.

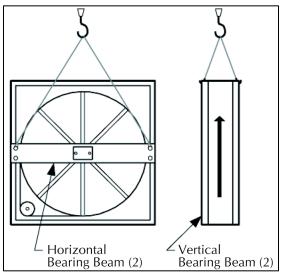


Figure 17 - Lifting Hole Locations

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

Cleaning the energy transfer media will help maintain optimal performance. The frequency of cleaning is largely dependent on the application and air quality. Use ASHRAE's Classes of Air categories, to create a routine cleaning schedule. Class 1 air has low contaminant concentration with inoffensive odor and sensory irritation intensity.

Class 2 air has moderate contaminant concentration, with mildly offensive odors or sensory-irritation intensity.

Class 3 air has significant contaminant concentration and significant offensive odor or sensory-irritation intensity.

Class 4 air has highly objectionable fumes or gases and potentially contains dangerous particles, bio-aerosols, or gases at a concentration high enough to be considered harmful, not suitable for recirculation or transfer to any other space.

Class of Air	Examples	Cleaning Frequency
Class 1 Clean Air	<ul><li>Offices</li><li>Classrooms</li><li>Assembly rooms</li><li>Churches</li></ul>	Every 8-10 years
Class 2 Moderately Clean Air	<ul> <li>Restrooms</li> <li>Swimming pools</li> <li>Dining rooms</li> <li>Locker rooms</li> <li>Warehouse</li> <li>Dorms</li> </ul>	Every 4-6 years
Class 3 Dirty Air	<ul> <li>Kitchens</li> <li>Dry cleaners</li> <li>Beauty salons</li> <li>Laboratories</li> <li>Pet shops</li> </ul>	Every 1-2 years
Class 4 Contaminated Air	<ul><li>Paint spray booths</li><li>Laboratory fume exhaust</li><li>Kitchen grease exhaust</li></ul>	Do not use in this application

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 wheel recovery 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.

# **A** CAUTION

Do Not use acid based cleaners, aromatic solvents, steam or temperatures in excess of 76.7°C (170°F); damage to the wheel may occur!

WARNING: Monolithic wheels with internal bearings must not be soaked to avoid corroding bearing.

(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.

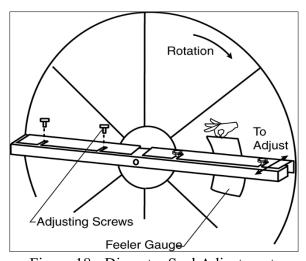


Figure 18 - Diameter Seal Adjustment

#### **Wheel Drive Components**

The wheel drive motor bearings are prelubricated 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 startup.

#### **Installation Considerations**

Energy recovery cassettes are incorporated within the design of packaged units, packaged air handlers and energy recovery ventilators. In each case, the following considerations must 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 .64cm (1/4 of an inch) (dimension A & B). This amount of racking can be compensated for by adjusting the diameter seals.

If greater than .64cm (1/4 of an inch) (dimension C), racking must be corrected to ensure that drive belt will not disengage from wheel.

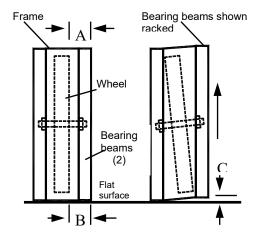


Figure 19 - Avoid Racking of Cassette Frame

#### **Operation**



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 .64cm [1/4 of an inch] from outer edge of rim).

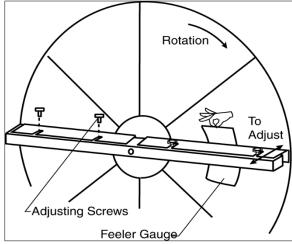


Figure 20 - Diameter Seal Adjustment

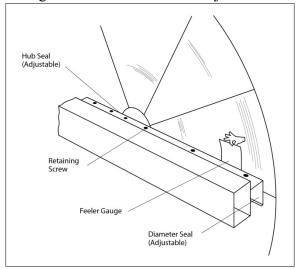


Figure 21 - Hub Seal Adjustment

#### Service



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.

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.

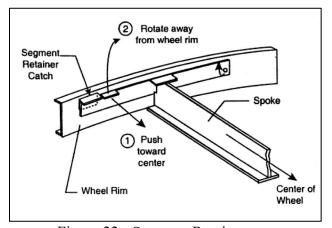


Figure 22 - Segment Retainer

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.

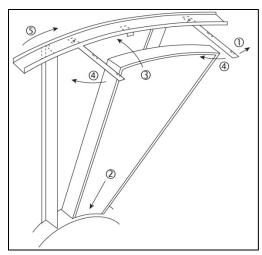


Figure 23 - Segment Installation

- 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.

# **A** CAUTION

Protect hands and belt from possible sharp edges of hole in Bearing Support Beam.

- 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.

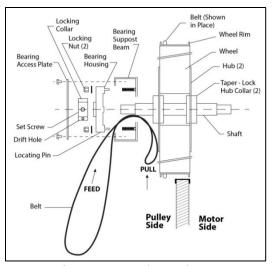


Figure 24 - Belt Replacement

#### Startup

(See back of the manual for startup form)



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 must be kept with the unit.

# **A** 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.

#### Fan Set Screw Adjustment

For single set screw applications, tighten the set screw to the required torque setting (Table 14) using a calibrated torque wrench. For double set screw applications, tighten one set screw to half of the required torque setting (Table 14) using a calibrated torque wrench. Tighten the second set screw to the full required torque setting then tighten the first set screw to the full required torque setting.

Table 14 - Plenum Fan Set Screw Specifications

SET SCREW DIAMETER	TORQUE (Nm [IN-LBS])
6.4 mm (1/4")	9 [80]
7.9 mm (5/16")	14.2 [126]
9.5 mm (3/8")	27.12 [240]

The gap tolerances that are allowed between the blower and the inlet cone for the plenum fan blowers are shown in Figure 25. The inlet cone can be moved as necessary to center the cone in relation to the blower. The blower can be moved on the motor shaft to set the correct overlap. These tolerances are critical to the performance of the blower.

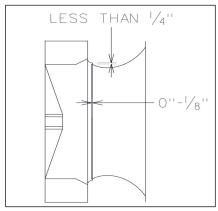


Figure 25- Plenum Fan Gap Tolerances

#### 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

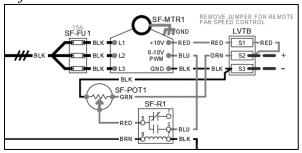


Figure 26 - Typical wiring diagram with EC motor

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).

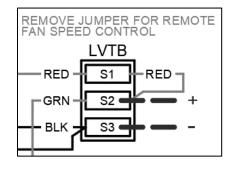


Figure 27 - Shows the jumper that is to be removed (jumped between S1 and S2).

Note, the potentiometer is still active in the electrical loop. Refer to Figure 26.

Set the potentiometer dial 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 must then be determined by adjustment.

#### **Filters**

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

# **A** CAUTION

Before completing startup and leaving the unit a complete operating cycle must 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 subcooling 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.

# **A** 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, operate unit 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.

# **A** CAUTION

#### DO NOT OVERCHARGE!

Refrigerant overcharging leads to excess refrigerant in the condenser coils resulting in elevated compressor discharge pressure. Maximum allowable charge of any single circuit is 28.1 kg (992 oz).

Table 15 - Acceptable Water-Cooled Refrigeration Circuit Values (Metric)

Water-Cooled Condenser/ Water					
Source Heat Pump (°C)					
Sub-Cooling	3.3-5.6				
Sub-Cooling with	4.4-6.7				
Hot Gas Reheat	4.4-0.7				
Superheat	4.4-8.3				

Table 16 - Acceptable Water-Cooled Refrigeration Circuit Values (Imperial)

Water-Cooled Condenser/ Water					
Source Heat Pump (°F)					
Sub-Cooling	6-10				
Sub-Cooling with	8-12				
Hot Gas Reheat	0-12				
Superheat	8-15				



Thermal expansion valve must be adjusted to approximately 4.4-8.3 (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.

# **A** CAUTION

#### DO NOT OVERCHARGE!

Refrigerant overcharging leads to excess refrigerant in the condenser coils resulting in elevated compressor discharge pressure. The maximum charge for any circuit is 19.8 kg (700 oz)

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 (-23.3 – 21.1°C [-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*: 0 to 1.7°C (32 to 35°F).

Table 17 – Minimum Airflow and Room Areas

		Minimum Room Area in m <sup>2</sup> (ft <sup>2</sup> )									
Charge		Min Circ						1			rea for
Largest Ci		Airflo			n (6 ft)		10 ft)		(12 ft)		tilated
kg (o	z)	m³/hr (	(CFM)		/release		release	ceiling/		stor	age
1.4	50	144	300		ight 		ght	1	ght	1	1 -
1.9	66	190	300	5 7	57 76	3	34 45	3	28 37	2	15 26
2.3	82	236	300	9	94	5	56	4	46	4	40
2.8	98	282	300	10	112	6	67	5	55	5	58
3.2	114	328	300	12	131	7	78	6	64	7	
3.7	130	374	300	14	149	8	89	7	72	9	101
4.1	146	419	300	16	167	9	100	8	81	12	128
4.6	162	465	300	17	186	10	111	8	90	15	157
5.0	178	511	301	19	204	11	122	9	99	18	190
5.5	194	557	328	21	222	12	133	10	108	21	226
6.0	210	603	355	22	241	13	144	11	117	25	265
6.4	226	649	382	24	259	14	155	12	126	28	306
6.9	242	695	409	26	277	15	166	13	135	33	351
7.3	258	741	436	27	296	16	177	13	144	37	399
7.8	274	787	463	29	314	17	188	14	153	42	450
8.2	290	833	490	31	332	19	199	15	162	47	505
8.7	306	879	517	33	351	20	210	16	171	52	562
9.1	322	925	545	34	369	21	221	17	179	58	622
9.6	338	971	572	36	387	22	232	17	188	64	685
10.0	354	1017	599	38	405	23	243	18	197	70	752
10.5	370	1063	626	39	424	24	254	19	206	76	821
10.9	386	1109	653	41	442	25	265	20	215	83	894
11.4	402	1155	680	43	460	26	276	21	224	90	970
11.9	418	1201	707	44	479	27	287	22	233	97	1048
12.3	434	1247	734	46	497	28	298	22	242	105	1130
12.8	450	1293	761	48	515	29	309	23	251	113	1215
13.2	466	1339	788	50	534	30	320	24	260	121	1303
13.7	482	1385	815	51	552	31	331	25	269	129	1394
14.1	498	1431	842	53	570						
14.6	514	1477	869	55	589	32 33	342 353	26 27	278 286	138 147	1488 1585
15.0	530	1523	896	56	607	34	364	27	295	157	1685
15.5	546	1569	923	58	625	35	375	28	304	166	1789
15.9	562	1615	950	60	644	36	386	29	313	176	1895
16.4	578	1661	977	62	662	37	397	30	322	186	2004

Table 18 – Minimum Airflow and Room Areas (continued)

Char	ge of	Min Circ	rulation		Minimum Room Area in m² (			<sup>2</sup> (ft <sup>2</sup> )	(ft <sup>2</sup> )		Floor area for	
Largest	Circuit g (oz)	Airflo m³/hr	w in	ceiling	n (6 ft) /release ight	ceiling,	(10 ft) /release ight	3.7 m ceiling/ hei	release	unventi stora	lated	
16.8	594	1707	1005	63	680	38	408	31	331	197	2117	
17.3	610	1753	1032	65	699	39	419	32	340	207	2232	
17.7	626	1799	1059	67	717	40	430	32	349	218	2351	
18.2	642	1845	1086	68	735	41	441	33	358	230	2473	
18.7	658	1891	1113	70	754	42	452	34	367	241	2598	
19.1	674	1937	1140	72	772	43	463	35	376	253	2725	
19.6	690	1983	1167	73	790	44	474	36	385	265	2856	
19.8	700	2011	1184	74	802	45	481	36	390	273	2940	

Min and Max Charge per Cabinet Size

with and wax charge per caemer size						
SB Cabinet Size	Minimum Charge	Maximum Charge				
В	50	275				
С	110	500				
D		700				

Table 19 - R-454BA Refrigerant Temperature-Pressure Chart (Metric)

°C	KPA	°C	KPA	°C	KPA	°C	KPA	°C	KPA
-6.7	484.5	8.3	843.3	23.3	1348.0	38.3	2034.6	53.3	2946.9
-6.1	495.6	8.9	859.3	23.9	1370.0	38.9	2064.1	53.9	2985.7
-5.6	506.9	9.4	875.3	24.4	1392.2	39.4	2093.9	54.4	3024.9
-5.0	518.2	10.0	891.6	25.0	1414.6	40.0	2123.9	55.0	3064.5
-4.4	529.7	10.6	908.1	25.6	1437.3	40.6	2154.3	55.6	3104.5
-3.9	541.5	11.1	924.8	26.1	1460.3	41.1	2185.0	56.1	3144.9
-3.3	553.3	11.7	941.7	26.7	1483.5	41.7	2216.1	56.7	3185.8
-2.8	565.4	12.2	958.8	27.2	1507.0	42.2	2247.4	57.2	3227.0
-2.2	577.6	12.8	976.2	27.8	1530.8	42.8	2279.1	57.8	3268.6
-1.7	589.9	13.3	993.7	28.3	1554.8	43.3	2311.1	58.3	3310.7
-1.1	602.5	13.9	1011.5	28.9	1579.0	43.9	2343.5	58.9	3353.2
-0.6	615.2	14.4	1029.4	29.4	1603.6	44.4	2376.2	59.4	3396.1
0.0	628.1	15.0	1047.6	30.0	1628.4	45.0	2409.2	60.0	3439.5
0.6	641.2	15.6	1066.0	30.6	1653.5	45.6	2442.6	60.6	3483.3
1.1	654.4	16.1	1084.7	31.1	1678.8	46.1	2476.2	61.1	3527.6
1.7	667.8	16.7	1103.5	31.7	1704.4	46.7	2510.3	61.7	3572.3
2.2	681.4	17.2	1122.6	32.2	1730.4	47.2	2544.7	62.2	3617.4
2.8	695.2	17.8	1141.9	32.8	1756.6	47.8	2579.4	62.8	3663.0
3.3	709.2	18.3	1161.5	33.3	1783.0	48.3	2614.5	63.3	3709.2
3.9	723.3	18.9	1181.3	33.9	1809.9	48.9	2650.0	63.9	3755.7
4.4	737.6	19.4	1201.3	34.4	1836.9	49.4	2685.7	64.4	3802.7
5.0	752.2	20.0	1221.5	35.0	1864.3	50.0	2721.9	65.0	3850.3
5.6	766.9	20.6	1242.0	35.6	1891.9	50.6	2758.5	65.6	3898.4
6.1	781.8	21.1	1262.8	36.1	1919.8	51.1	2795.4		
6.7	796.9	21.7	1283.7	36.7	1948.1	51.7	2832.7		
7.2	812.2	22.2	1304.9	37.2	1976.7	52.2	2870.4		
7.8	827.7	22.8	1326.3	37.8	2005.5	52.8	2908.4		

Table 20 - R-454B Refrigerant Temperature-Pressure Chart (Imperial)

۰F	PSIG	°F	PSIG	۰F	PSIG	°F	PSIG	°F	PSIG
20	70.3	47	122.3	74	195.5	101	295.1	128	427.4
21	71.9	48	124.6	75	198.7	102	299.4	129	433.0
22	73.5	49	127.0	76	201.9	103	303.7	130	438.7
23	75.2	50	129.3	77	205.2	104	308.0	131	444.5
24	76.8	51	131.7	78	208.5	105	312.5	132	450.3
25	78.5	52	134.1	79	211.8	106	316.9	133	456.1
26	80.3	53	136.6	80	215.2	107	321.4	134	462.0
27	82.0	54	139.1	81	218.6	108	326.0	135	468.0
28	83.8	55	141.6	82	222.0	109	330.6	136	474.1
29	85.6	56	144.1	83	225.5	110	335.2	137	480.2
30	87.4	57	146.7	84	229.0	111	339.9	138	486.3
31	89.2	58	149.3	85	232.6	112	344.6	139	492.6
32	91.1	59	151.9	86	236.2	113	349.4	140	498.8
33	93.0	60	154.6	87	239.8	114	354.3	141	505.2
34	94.9	61	157.3	88	243.5	115	359.1	142	511.6
35	96.9	62	160.1	89	247.2	116	364.1	143	518.1
36	98.8	63	162.8	90	251.0	117	369.1	144	524.6
37	100.8	64	165.6	91	254.8	118	374.1	145	531.3
38	102.9	65	168.5	92	258.6	119	379.2	146	538.0
39	104.9	66	171.3	93	262.5	120	384.3	147	544.7
40	107.0	67	174.2	94	266.4	121	389.5	148	551.5
41	109.1	68	177.2	95	270.4	122	394.8	149	558.4
42	111.2	69	180.1	96	274.4	123	400.1	150	565.4
43	113.4	70	183.1	97	278.4	124	405.4		
44	115.6	71	186.2	98	282.5	125	410.8		
45	117.8	72	189.3	99	286.7	126	416.3		
46	120.0	73	192.4	100	290.9	127	421.8		

### **Operation**

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

#### **Refrigerant Detection System**

Each unit is equipped with a Refrigerant Detection System (RDS) to detect leaked refrigerant within the conditioned airstream and in the cabinet. The RDS system consists of refrigerant detection sensors in the conditioned airstream and cabinet connected to a corresponding mitigation board. In the event of a refrigerant leak, the RDS sensors will send an alarm to the mitigation board. Each A2L mitigation board is equipped with alarm output in the form of a NO/NC relay.

Applications using AAON VCC-X controls: In the event of an airstream RDS alarm, the compressor operation is disabled and the indoor blower is enabled to provide circulation airflow in accordance with UL 60335-2-40. In the event of a Cabinet or Gas Heat RDS alarm, compressor operation and gas heat operation is disabled. The indoor blower, and any form of heat other than gas, will resume normal operation. RDS alarm available outputs are via **BACNet** communication through the VCC-X controller.

For applications not using AAON VCC-X controls, mitigation board outputs will be wired to the low voltage terminal block.

In all cases, the mitigation board and VCCX-X board will remain in alarm state for five minutes after the RDS sensor has cleared the alarm below the concentration setpoint.

For VAV applications and applications utilizing zone dampers, the VAV boxes and zone dampers must be wired to the mitigation board output to open all VAV boxes and zone dampers to allow for the required circulation

airflow to prevent stagnation of leaked refrigerant. Other applications requiring additional refrigerant leak mitigation measures as required by local code and ASHRAE 15 may be notified of detected refrigerant by this alarm output.

Verify functionality of RDS by removing sensor connection at the mitigation board and ensuring that all sequences above take place, including the opening of VAV boxes and zone dampers and additional mitigation procedures, if applicable. Refer to the *A2L Mitigation Board Technical Guide* for sensor location.

Smoke control procedures may override the RDS alarm functions.

# **A** CAUTION

Certain applications may allow the unit to bring in unconditioned air. Freeze protection needs to be considered in the final application.

# **A** CAUTION

Certain applications may allow the unit to bring in unconditioned air. Freeze protection needs to be considered in the final application.

# **A** CAUTION

Additional mitigation procedures or fault conditions initiated outside of AAON controls are the responsibility of the Building Engineer and must give appropriate priority in accordance with local codes.

# Packaged DX Cooling Operation and Control

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



#### **COMPRESSOR CYCLING**

3 MINUTE MINIMUM OFF TIME To prevent motor overheating compressors must cycle off for a minimum of 3 minutes.

5 MINUTE MINIMUM ON TIME To maintain the proper oil level compressors must cycle on for a minimum of 5 minutes.

The cycle rate must not exceed 7 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





Prior to performing work that can result in release of a flammable refrigerant, inspect area to ensure it is free of any potential ignition sources. "No Smoking" signs are to be displayed while performing work.

by passing steam or hot water through the steam or hot water coil assembly.

#### Maintenance

(See back of the manual for maintenance log.)

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

# **A** 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 technician. A copy of this IOM must 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.

#### **Refrigerant Removal and Evacuation**

If removal of refrigerant is required for any maintenance or servicing, conventional procedures must be used and removal of refrigerant must be in accordance with local and national regulations.

Safety precautions must be taken prior to beginning work to ensure that the risk of fire due to flammable refrigerants is minimized. Work is to be undertaken under a controlled procedure to reduce the amount of refrigerant vapor present while work is being performed. All maintenance staff and others working in

the area are to be instructed on the nature of work being performed. Care should be taken to ensure that working in a confined space is avoided.

Check area with a refrigerant detector suitable for use with the refrigerant prior to and during work in order to be aware of potential flammable environment. Keep a dry powder or CO2 fire extinguisher nearby if any hot work is being performed.

Ensure that work area is sufficiently ventilated before breaking into the system. Ventilation must continue throughout all of the work. Ensure that ventilation safely removes flammable refrigerant to an area that will adequately disperse refrigerant to avoid concentration above flammable levels.

Refrigerant must be recovered into the correct recovery cylinders in accordance with local and national regulations. Recovery cylinders must be labeled properly. Ensure that the correct number of cylinders are available for holding the entire charge of the system. Cylinders must have pressure relief and shut-off valves that are in proper working order. Fully evacuate a recovery cylinder before use.

The recovery equipment must be in good working order with a set of instructions concerning the equipment that is at hand. Ensure that equipment is suitable for the recovery of flammable refrigerant used. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales must be available and in good working order. Ensure hoses are complete with leak-free disconnect couplings and in good condition.

When removing refrigerant to open the system, evacuate the system and flush or purge the system continuously with an inert gas when using a flame to open the circuit.

The system must be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerant. Compressed air or oxygen must not be used. When pulling a vacuum, ensure that the outlet of the vacuum pump is not near any potential ignition source and in a well ventilated area.

The recovered refrigerant is to be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. Do not heat the compressor body by using an open flame or other ignition sources to accelerate this process. Remove any drained oil safely.

#### **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 must be done only by qualified personnel.

#### **E-Coated Coil Cleaning**

Documented routine cleaning of e-coated coils is required to maintain coating warranty coverage for condenser coils. E-Coated Coil

Maintenance Record sheet is provided in this document.

# **A** WARNING

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

Remove surface loaded fibers or dirt 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 remove surface loaded fibers or dirt 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 must 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, dirt and salts 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 less 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.

# **A** CAUTION

High velocity water from a pressure washer or compressed air must 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 must 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.

# **A** CAUTION

Harsh chemicals, household bleach, or acid cleaners must 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, when 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 Cleaner: AAON PN: V82540

GulfClean ™ Coil Cleaner: AAON PN: G074480

#### **Recommended Chloride Remover**

GulfClean Salt Reducer™: AAON PN: G074490

GulfClean Salt Reducer<sup>TM</sup> is used to remove soluble salts from the e-coated coil, follow the manufacturer's instructions. This product is not intended for use as a degreaser. Any grease or oil film must first be removed with GulfClean <sup>TM</sup> Coil Cleaner.

Remove Barrier - First ensure the power to the unit is off and locked out. Clean the area around the unit if needed to ensure leaves, grass or loose debris will not be blown into the coil. 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.

Application- Apply GulfClean TM Coil Cleaner 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. Apply the cleaner to unit interior air exiting side coil surfaces first. Work in sections/panels moving side to side and from top to bottom. Allow the cleaning solution to soak for 5 to 10 minutes. Then move on to the exterior using the same method.

Rinse - Using pressurized potable water such as a garden hose, (< 689.5 kpa [100 psi]), rinse the coils and continue to always work in sections/panels.

Continue until all coil areas on the inside of the unit have been rinsed. *Note: Coils must* always be cleaned / back flushed, opposite of airflow to prevent impacting the dirt into the coil.

Repeat these steps with GulfClean <sup>TM</sup> Salt Reducer. When finished replace all panels and tops that were removed.

#### **Supply Fans**

# **A** 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.

### **A** 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 relubricated periodically. The schedule will depend on the operating duty, temperature variations or other severe atmospheric conditions.

Bearings must 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

#### Filter Replacement

Monthly filter inspection is required to maintain optimum unit efficiency.



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

Filter media must 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.

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



The DPM is a Digital Phase Monitor that monitors line voltages from 200VAC to 240VAC 1¢ and 200VAC to 600VAC 3¢. The DPM is 50/60 Hz self-sensing. DPM must 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, 3Ø
Over & Undervoltage ±10%
Trip Time Delay 5 Seconds
Re-Start Time Delay 2 Minutes
Phase Imbalance 5%

#### **UV** Lights

Some units include UV lights for airstream disinfection. The UV fixture is installed directly downstream of cooling coil. Door interlock switches are provided with this option. UV lamps ship loose in the vestibule and require installation during startup.

Useful lamp life shall be 9000 hours (minimum) with no more than a 15% output loss at the end of the lamps life. Use AAON Part # R68850 for lamp replacement.

## **A** WARNING

#### **UV LIGHTS**

Never expose eyes or skin to UVC light from any source, as personal injury may result. Wear gloves, face shield/glasses (per ANSI Z87.1) and cover all exposed skin.

#### **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

1Ø; 200, 1Ø; 208, 220. 10; 230, 10; 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)

60

# **Filter Information**

Table 21 - 3-5 ton (B Cabinet) Pre and Unit Filters

Feature 6A	Quantity/Size	Type
0	No Pre Filters	
A	(1) 24" x 24" x 2"	Pleated, MERV 8
Feature 6B	Quantity/Size	Type
0	No Standard Filters	
A	(1) 24" x 24" x 2"	Pleated, MERV 8
В		Pleated, MERV 8
C		Pleated, MERV 11
D	(1) 24" x 24" x 4"	Pleated, MERV 13
Е		Pleated, MERV 14
F		Carbon

Table 22 - 6-10 ton (C Cabinet) Pre and Unit Filters

Feature 6A	Quantity/Size	Type
0	No Pre Filters	
A	(4) 16" x 20" x 2"	Pleated, MERV 8
Feature 6B	Quantity/Size	Type
0	No Standard Filters	
A	(4) 16" x 20" x 2"	Pleated, MERV 8
В		Pleated, MERV 8
C		Pleated, MERV 11
D	(4) 16" x 20" x 4"	Pleated, MERV 13
Е		Pleated, MERV 14
F		Carbon

Table 23 - 14-18 ton (D Cabinet) Pre and Unit Filters

Feature 6A	Quantity/Size	Type
0	No Pre Filters	
A	(4) 18" x 24" x 2"	Pleated, MERV 8
Feature 6B	Quantity/Size	Type
0	No Standard Filters	
A	(4) 18" x 24" x 2"	Pleated, MERV 8
В		Pleated, MERV 8
С		Pleated, MERV 11
D	(4) 18" x 24" x 4"	Pleated, MERV 13
E		Pleated, MERV 14
F		Carbon

Table 24 - 3-5 ton (B Cabinet) Mixing Box Filters

Feature 6A	Quantity/Size	Туре
A	(1) 24" x 24" x 2" (located in the mixing box)	2" Pleated, MERV 8 Pre- Filters
Feature 6B	<b>Quantity/Size</b>	Type
G		Pleated, MERV 11 and Carbon
Н	(1) 24" x 24" x 4" (located in the mixing box)	Pleated, MERV 13 and Carbon
Ј	and (1) 24" x 24" x 4" (located in the unit)	Pleated, MERV 14 and Carbon
K	(located in the unit)	Pleated, MERV 11 and Pleated, MERV 13
L		Pleated, MERV 11 and Pleated, MERV 14

Table 25 - 6-10 ton (C Cabinet) Mixing Box Filters

Feature 6A	Quantity/Size	Туре
A	(4) 16" x 20" x 2" (located in the mixing box)	2" Pleated, MERV 8 Pre- Filters
Feature 6B	Quantity/Size	Type
G	(0.16) 200 40	Pleated, MERV 11 and Carbon
Н	(4) 16" x 20" x 4" (located in the mixing box)	Pleated, MERV 13 and Carbon
J	and (4) 16" x 20" x 4" (located in the unit)	Pleated, MERV 14 and Carbon
K	(iocated in the unit)	Pleated, MERV 11 and Pleated, MERV 13
L		Pleated, MERV 11 and Pleated, MERV 14

Table 26 - 14-18 ton (D Cabinet) Mixing Box Filters

Feature 6A	Quantity/Size	Туре		
A	(4) 18" x 24" x 2"	2" Pleated, MERV 8 Pre-		
A	(located in the mixing box)	Filters		
Feature 6B	Quantity/Size	Type		
G		Pleated, MERV 11 and		
d		Carbon		
Н	(4) 18" x 24" x 4"	Pleated, MERV 13 and Carbon		
11				
Ţ	(located in the mixing box) and	Pleated, MERV 14 and		
3	(4) 18" x 24" x 4"	Carbon		
K	(located in the unit)	Pleated, MERV 11 and		
K	(located in the unit)	Pleated, MERV 13		
T		Pleated, MERV 11 and		
L		Pleated, MERV 14		

#### **Replacement Parts**

Parts for AAON equipment may be obtained from your local AAON representative. Reference the unit serial number and part number when ordering parts.

# **AAON** Warranty, Service, and Parts Department

2424 S. Yukon Ave. Tulsa, OK 74107

Ph: 918-382-6450 Fax: 918-382-6364 www.aaon.com

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

Warranty: Refer to the Limited Warranty Certificate for the unit warranty details. Contact your AAON representative for a unit specific copy of the certificate for your serial number

#### **Filter Converstion Table**

Inches	Centimeters
[16 x 20 x 2]	[40.6 x 50.8 x 5.1]
[16 x 20 x 4]	[40.6 x 50.8 x 10.2]
[18 x 24 x 2]	[45.7 x 61 x 5.1]
[18 x 24 x 4]	[45.7 x 61 x 10.2]
[20 x 24 x 2]	[50.8 x 61 x 5.1]
[20 x 24 x 4]	[50.8 x 61 x 10.2]

#### **Decommissioning**

Before decommissioning unit, ensure you are familiar with the unit and its operation. Only individuals qualified for handling refrigerant may remove charge from the unit. Unit must be isolated electrically before beginning any decommissioning work. Proper PPE is required.

Ensure any equipment that may be needed for handling refrigerant cylinders safely is available. Equipment and cylinders used for recovery must be in good working order and comply with appropriate standards.

Operate recovery machine in accordance with the instructions. Remove refrigerant from all parts of the refrigeration system. On heat pumps, refrigerant must be recovered from discharge, suction and common liquid lines. Weigh out refrigerant when removing to ensure that all refrigerant is removed and cylinders are not overfilled. Place refrigerant cylinder on scales before beginning recovery process. Do not exceed maximum pressure of cylinder.

When recovery is completed, remove all cylinders containing recovered refrigerant from the site. Ensure all isolation valves on equipment are closed and all warning decals are still visible on unit.

Label the unit as having been decommissioned and date and sign label.



### **Limited Warranty Certificate**

#### GENERAL CONDITIONS

AAON, Inc. (hereinafter referred to as "AAON") warrants this AAON equipment, as identified hereon, to be free of defects in material and workmanship under normal use, service, and maintenance. Our obligations under this warranty must be limited to repairing or replacing the defective part, or parts, which in our judgment show evidence of such defects. AAON is not liable for labor charges and other costs incurred for removing, shipping, handling or transporting defective part, or parts, or for shipping, handling, transporting, or installing repaired or replacement part, or parts.

The limited warranty is effective one (1) year from date of **original installation**, or eighteen (18) months from date of original shipment from the factory, whichever occurs first and covers all parts and components in this AAON equipment excluding air filters, belts, refrigerant moisture driers, and lost refrigerant, which are not included in any part of this limited warranty. The replacement part, or parts, assume only the unused portion of the original limited warranty and are shipped f.o.b. from the factory and freight prepaid by the factory.

The limited warranty is effective for products manufactured at the Tulsa, Oklahoma or Longview, Texas facility.

THIS LIMITED WARRANTY ONLY APPLIES WHEN THE **ORIGINAL MODEL NUMBER AND SERIAL NUMBER** OF THE AAON UNIT ARE GIVEN AT TIME OF REQUEST FOR REPLACEMENT PART, OR PARTS. DEFECTIVE PART, OR PARTS, MUST BE RETURNED **PREPAID**, WITH ITS ASSIGNED RETURN MATERIAL TAG, WITHIN FOURTEEN (14) DAYS OF RECEIPT OF THE REPLACEMENT PART, OR PARTS.

# EXTENDED LIMITED WARRANTY ON COMPRESSORS INCLUDED IN SINGLE PACKAGE EQUIPMENT (NOT INCLUDING CHILLERS OR WH/WV); OPTIONAL ON OTHER EQUIPMENT

For the second through the fifth year from date of **shipment**, we further agree to repair or replace the fully hermetic compressor, at our option, for the **original purchase-user only**. The repaired or replacement fully hermetic compressor will be supplied f.o.b. the factory, freight **prepaid and add**, providing the defective fully hermetic compressor is returned **prepaid by the customer**, and is proven to be inoperative due to defects in materials or workmanship. This extended limited warranty covers **only** the fully hermetic compressor and **does not include** any labor charges, or other additional costs incurred for removing, shipping, handling, ransporting, or replacing the defective fully hermetic compressor. It also **does not include** additional costs incurred for shipping, handling, or transporting of electric controls such as relays, capacitors, pressure controls, or fan-motor assemblies, condensers, receivers, etc, which carry the standard **one-year limited warranty**.

#### EXTENDED LIMITED WARRANTY OF WH/WV PRODUCTS

The WH/WV limited warranty is effective five (5) years from date of original installation. If installation date cannot be verified, limited warranty is effective five (5) years from date of equipment manufacture at the factory. Warranty covers all parts and components, including compressors, in this AAON equipment except those excluded in the general conditions.

#### **EXTENDED LIMITED WARRANTY OF RQ PRODUCTS**

The RQ limited warranty is effective two (2) years from date of original **shipment** from the factory and covers all parts and components in this AAON equipment except those excluded in the general conditions.

# FOR OPTIONAL TWO YEAR EXTENDED LIMITED WARRANTY OF RN PRODUCTS

The limited warranty is effective two (2) years from date of original **shipment** from the factory and covers all parts and components in this AAON equipment except those excluded in the general conditions.

#### FOR OPTIONAL FIVE YEAR EXTENDED LIMITED WARRANTY OF RN or RO PRODUCTS

The limited warranty is effective five (5) years from date of original shipment from the factory and covers all parts and components in this AAON equipment except those excluded in the general conditions.

#### FOR OPTIONAL TEN YEAR EXTENDED LIMITED WARRANTY OF RN or RO PRODUCTS

The limited warranty is effective ten (10) years from date of original shipment from the factory and covers all parts and components in this AAON equipment except those excluded in the general conditions.

### FOR OPTIONAL FIVE YEAR EXTENDED LIMITED WARRANTY OF RN OR RQ ECONOMIZER WITH FAULT DETECTION AND DIAGNOSTICS

For the second through fifth year from date of shipment, we further warrant the economizer damper assembly against failure due to defects in materials and workmanship for the original purchaser-user only.

### EXTENDED LIMITED WARRANTY OF GAS FIRED HEAT EXCHANGERS

#### FOR RQ OR RN ALUMINIZED STEEL HEAT EXCHANGERS

For the second through the fifteenth year from date of **shipment**, we further warrant the steel heat exchanger against failure due to defects in materials and workmanship for the **original purchaser-user only**.

#### FOR RQ, RN, OR RZ STAINLESS STEEL HEAT EXCHANGERS

For the second through the twenty-fifth year from date of **shipment**, we further warrant the stainless steel heat exchanger against failure due to defects in materials and workmanship for the **original purchaser-user** 

#### FOR RL SERIES HEAT EXHANGERS

For the second through the tenth year from date of original installation, we further warrant the steel heat exchanger against failure due to defects in materials and workmanship for the original purchaser-user only, in accordance with the following: For the first five (5) years from date of shipment, we agree to repair or replace the heat exchanger, at our option, for the original purchaser-user only; during the sixth year, we will charge 50% of the current trade price for repaired or replacement steel heat exchanger, as the case may be, during the seventh year, 60%, during the eighth year, 70% during the ninth year, 80% and during the tenth year, 90%.

In all cases, the repaired or replacement heat exchanger will be supplied f.o.b. our factory, freight prepaid, providing the defective heat exchanger is returned prepaid, and if it is proved to be inoperative due to defects in materials and workmanship. This extended limited warranty covers only the heat exchanger and does not include labor charges, or other costs incurred for removing, shipping, handling, transporting, or installing repaired replacement heat exchanger. This extend limited warranty does not apply where the furnace has been operated in an atmosphere contaminated by chlorine, fluorine, or any other damaging chemical compounds.

### FOR OPTIONAL FIVE YEAR EXTENDED LIMITED WARRANTY OF COIL COATING

For the second through fifth year from date of shipment, we further warrant the coating of e-coated coils on the equipment against failure due to defects in materials and workmanship for the original purchaser-user only. Coil cleaning, maintenance, and record keeping must be followed according to the unit Installation, Operation and Maintenance Manual to maintain warranty.



### Limited Warranty Certificate

#### OTHER CONDITIONS

This warranty does not cover any AAON unit or part thereof which has been subject to accident, negligence, damages in transit, misuse or abuse, or which has been tampered with or altered in any way, or which has not been installed operated serviced and maintained in accordance with our instructions, or which has been installed outside of the Continental United States or Canada, or on which the serial number or identification number has been altered defaced, or removed. AAON will not be responsible for failure of the unit to start due to voltage conditions, blown fuses, open circuit breakers, or other damages due to the inadequacy or interruption of electric service.

This warranty **does not cover** equipment containing a water-to-refrigerant heat exchanger for any damage resulting from freezing, fouling, corrosion or clogging.

AAON must not be liable for any default or delay in performance hereunder, caused by a contingency beyond its control, including governmental restrictions or restraint, strikes, short or reduced supply of raw materials or parts, floods, winds, fire, lightning strikes, or any other acts of God.

#### **DISCLAIMERS OF WARRANTIES**

THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHER WARRANTY OF QUALITY, WHETHER EXPRESS OR IMPLIED, EXCEPT OF TITLE AND AGAINST PATENT INFRINGEMENT, CORRECTION OF NON-CONFORMITIES ARE LIMITED TO REPAIR OR REPLACEMENT OF THE DEFECTIVE PART OR PARTS, AT SELLER'S OPTION, WHICH MUST CONSTITUTE FULFILLIMENT OF ALL TORT OR OTHERWISE IT IS EXPRESSLY UNDERSTOOD THAT AAON MUST NOT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES. AAON MUST NOT UNDER ANY CIRCUMSTANCES BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, SUCH AS, BUT NOT LIMITED TO DAMAGES OR LOSS OF OTHER PROPERTY OR EQUIPMENT, LOSS OF PROFITS OR REVENUE, COST OF CAPITAL, COST OF PURCHASED OR REPLACEMENT GOODS, OR CLAIMS OF BUYER OR USER FOR SERVICE INTERRUPTIONS. THE REMEDIES OF THE BUYER SET FORTH HEREIN ARE EXCLUSIVE, AND THE LIABILITY OF AAON WITH RESPECT TO ANY CONTRACT, OR ANYTHING DONE IN CONNECTION THEREWITH SUCH AS THE PERFORMANCE OR BREACH THEREFORE, OR FROM THE MANUFACTURE, SALE, DELIVERY, RESALE, INSTALLATION, OR USE OF ANY GOODS COVERED BY OR FURNISHED UNDER THIS CONTRACT WHETHER ARISING OUT OF CONTRACT, NEGLIGENCE, STRICT TORT, OR UNDER ANY WARRANTY, OR OTHERWISE, MUST NOT EXCEPT AS EXPRESSLY PROVIDED HEREIN, EXCEED THE PRICE OF THE GOODS UPON WHICH SUCH LIABILITY IS BASED.

WITH RESPECT TO THE GOODS SOLD, THE BUYER HEREBY WAIVES ALL LIABILITY ARISING FROM STATUTE, LAW, STRICT LIABILITY IN TORT, OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY OBLIGATION OF AAON WITH RESPECT TO CONSEQUENTIAL OR INCIDENTAL DAMAGES AND WHETHER OR NOT OCCASIONED BY AAON NEGLIGENCE. TIME LIMIT ON COMMENCING LEGAL ACTIONS: AN ACTION FOR BREACH OF THIS CONTRACT FOR GOOD SOLD OR ANY OTHER ACTION OTHERWISE ARISING OUT OF THIS CONTRACT, MUST BE COMMENCED WITHIN ONE (1) YEAR FROM THE DATE, THE RIGHT, CLAIM, DEMAND OR CAUSE OF ACTION MUST FIRST OCCUR, OR BE BARRED FOREVER.

#### SEVERABILITY

IF ANY PROVISION OR CAUSE OF THIS CONTRACT OR APPLICATION THEREOF TO ANY PERSON OR CIRCUMSTANCES IS HELD INVALID OR UNCONSCIONABLE SUCH INVALIDITY OR UNCONSCIONABILITY MUST NOT AFFECT OTHER PROVISIONS OR APPLICATIONS OF THE CONTRACT WHICH CAN BE GIVEN EFFECT WITHOUT THE INVALID OR UNCONSCIONABLE PROVISIONS OF THE CONTRACT ARE DECLARED BE SEVERABLE

EQUIPMENT IN	NFORMATION (REQUIRED)					
Job Name:	Click or tap here to	Sales Order Number:	Click or tap here to enter Tag: text.	Click or tap here to enter text	Date of Shipment:	Click or tap here to enter text.
Seria Number		Unit Model Number: Click or	tap here to enter text.			

# **Apendix 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	Concentration	Time Limits -	AISI	SMO	Copper	Nickel
Containing	(mg/l or ppm)	Analyze Before	316	254	Alloy	Alloy
A 11 11 14	< 70	W/41.1 24	+	+	0	+
Alkalinity	70-300	Within 24	+	+	+	+
(HCO <sub>3</sub> -)	> 300	Hours	+	+	0/+	+
	< 70		+	+	+	+
Sulfate (SO <sub>4</sub> <sup>2</sup> -)	70-300	No Limit	+	+	0/-	+
	> 300		0	0	-	+
HCO <sub>3</sub> <sup>-</sup> / SO <sub>4</sub> <sup>2-</sup>	> 1.0	No Limit	+	+	+	+
ПСО3 / 3О4	< 1.0	NO LIIIII	+	+	0/-	+
Electrical	< 10µS/cm		+	+	0	+
Electrical Conductivity	10-500 μS/cm	No Limit	+	+	+	+
Conductivity	$> 500 \mu S/cm$		+	+	0	+
	< 6.0		0	0	0	+
	6.0-7.5	Within 24	0/+	+	0	+
рН	7.5-9.0	Hours	+	+	+	+
	> 9.0		+	+	0	+
Ammonium	< 2	Within 24	+	+	+	+
(NH <sub>4</sub> <sup>+</sup> )	2-20	Hours	+	+	0	+
(1NП4 )	> 20	nours	+	+	-	+
Cl-1 - mi d - m (Cl-)*	< 300		+	+	+	+
Chlorides (Cl <sup>-</sup> )*	> 300	No Limit	0	+	0/+	+
Free Chlorine	< 1		+	+	+	+
	1-5	Within 5 Hours	+	+	0	+
$(Cl_2)$	> 5		0/+	+	0/-	+
Hydrogen	< 0.05	No Limit	+	+	+	+
Sulfide (H <sub>2</sub> S)	> 0.05	NO LIIIII	+	+	0/-	+
Free	< 5		+	+	+	+
(aggressive)	5-20	No Limit	+	+	0	+
Carbon Dioxide (CO <sub>2)</sub>	> 20	NO LIIIII	+	+	-	+

<sup>\*</sup>See Also Chloride Content Table

Water	Concentration	Time Limits -	AISI	SMO	Copper	Nickel
Containing	(mg/l or ppm)	Analyze Before	316	254	Alloy	Alloy
Total Hardness (°dH)	4.0-8.5	No Limit	+	+	+	+
Nitrata (NO.)	< 100	No Limit	+	+	+	+
Nitrate (NO <sub>3</sub> )	> 100	NO LIIIII	+	+	0	+
Iron (Fo)	< 0.2	No Limit	+	+	+	+
Iron (Fe)	> 0.2	NO LIIIII	+	+	0	+
Aluminum (A1)	< 0.2	No Limit	+	+	+	+
Aluminum (Al)	> 0.2	NO LIIIII	+	+	0	+
Manganese	< 0.1	No Limit	+	+	+	+
(Mn)	> 0.1	NO LIMIL	+	+	0	+

### Chloride Content

Chloride	Maximum Temperature						
Content	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 must verify the following items.				
1. Is there any visible shipping damage?	Yes No			
2. Is the unit level?	Yes No			
3. Are the unit clearances adequate for service and operation?	Yes No			
4. Do all access doors open freely and are the handles operational?	Yes No			
5. Have all shipping braces been removed?	Yes No			
6. Have all electrical connections been tested for tightness?	Yes No			
7. Does the electrical service correspond to the unit nameplate?	Yes No			
8. On 208/230V units, has transformer tap been checked?	Yes No			
9. Has overcurrent protection been installed to match the unit nameplate requirement?	Yes No			
10. Have all set screws on the fans been tightened?	☐ Yes ☐ No			
11. Do all fans rotate freely?	☐ Yes ☐ No			
12. Does the field water piping to the unit appear to be correct per design parameters?	Yes No			
13. Is all copper tubing isolated so that it does not rub?	☐ Yes ☐ No			
14. Are air filters installed with proper orientation?	Yes No			
15. Have condensate drain and p-trap been connected?	Yes No			
16. Is the actual refrigerant charge of largest circuit in accordance with the required conditioned floor area according to Table 16?	☐ Yes ☐ No			
17. Are ventilation and exhaust openings unobstructed?	☐ Yes ☐ No			
18. Are markings, decals, and warnings on unit clearly visible?	Yes No			
19. Are all damaged or illegible markings and warnings replaced?	Yes No			
20. Has the functionality of the Refrigerant Detection System been verified?	Yes No			

Ambient Tempo	erature						
Ambient Dry B	ulb Temper	atur	e°C/°F	Ambient Wet	Bulb Tem	peratur	re°C/°F
Voltage							
L1-L2			L2-L3	L1-L3			
L1-Groun	d	L	2-Ground	L3-Ground			
Supply Fan Ass	embly						
Alignment			Check Rotation	n 🗌	Namep	ate Am	ips
Number	hp	-	L1 Volts/Amps	L2 Volts/A	Amps	L3	Volts/Amps
1							
2							
				VAV Controls			
Compressors/D	X Cooling						
Check Rotation							
Number	L1 Volts/Amp	os	L2 Volts/Amps	L3 Volts/Amps	Hea Press PSI	ure	Suction Pressure PSIG
1							
Refrigeration S	ystem 1 - C	ooli	ng Mode				
	Pressure		Saturated Temperature	Line Temperature	Sub-co	oling	Superheat
Discharge			•	•	N/A	4	N/A
Suction					N/A	4	
Liquid							N/A
Refrigeration S	ystem 1 - H	eati	ng Mode (Heat	Pump Only)	_		
	Pressure		Saturated Temperature	Line Temperature	Sub-co	oling	Superheat
Discharge			<u> </u>	1	N/A	4	N/A
Suction					N/A		
Liquid							N/A

Water-Cooled Condenser ☐  No Water Leaks ☐  Condenser Safety Check ☐						
No Water Leaks  Condenser Safety Check						
Water Flow gpm						
Water Inlet Temperature°C/°F Water Outlet Temperature°C/°F						
Water/Glycol System						
1. Has the entire system been flushed and pressure checked?						
2. Has the entire system been filled with fluid?						
3. Has air been bled from the heat exchangers and piping? ☐ Yes ☐ No						
4. Is the glycol the proper type and concentration (N/A if water)?						
5. Is there a minimum load of 50% of the design load?						
5. Is there a minimum load of 50% of the design load?    Yes   No						
6. Has the water piping been insulated?						
6. Has the water piping been insulated?  7. What is the freeze point of the glycol (N/A if water)?						
6. Has the water piping been insulated?						
6. Has the water piping been insulated?  7. What is the freeze point of the glycol (N/A if water)?						
6. Has the water piping been insulated?  7. What is the freeze point of the glycol (N/A if water)?  Mixing Box Dampers  Operation Check  Damper Wiring Check  Gears Check						
6. Has the water piping been insulated?  7. What is the freeze point of the glycol (N/A if water)?  Mixing Box Dampers  Operation Check Damper Wiring Check Gears Check Damper Actuator Type:						
6. Has the water piping been insulated?  7. What is the freeze point of the glycol (N/A if water)?  Mixing Box Dampers  Operation Check  Damper Wiring Check  Gears Check						
6. Has the water piping been insulated?						
6. Has the water piping been insulated?  7. What is the freeze point of the glycol (N/A if water)?  Mixing Box Dampers  Operation Check Damper Wiring Check Gears Check Damper Actuator Type:  Economizer Changeover Type and Operations:						
6. Has the water piping been insulated?  7. What is the freeze point of the glycol (N/A if water)?  Mixing Box Dampers  Operation Check Damper Wiring Check Gears Check Damper Actuator Type:						
6. Has the water piping been insulated?						
6. Has the water piping been insulated?						
6. Has the water piping been insulated?						

### **A2L Mitigation Board**

1.	Does each port (sensor 1-3) have a male connector plugged in on	Yes No
	both the Cabinet and Airstream board?	
2.	Do the compressor(s) and gas heat operation shut off when the	Yes No
	Cabinet Board is in the alarm state?	
3.	Does the unit operate normally except compressor and gas heat	Yes No
	operation when the Cabinet Board is in the alarm state?	
4.	Do the compressor(s) shut off and fan(s) stay on when the Airstream	Yes No
	Board is in the alarm state?	
5.	Does non-compressor or gas heating/cooling stay on when both A2L	Yes No
	Mitigation boards are in the alarm state?	

#### **Maintenance Log**

This log must be kept with the unit. It is the responsibility of the owner and/or maintenance/service contractor to document any service, repair or adjustments. AAON Service and Warranty Departments are available to advise and provide phone help for proper operation and replacement parts. The responsibility for proper startup, maintenance, and servicing of the equipment falls to the owner and qualified licensed technician.

Entry Date	Action Taken	Name/Tel.

# **Maintenance Log (E-Coated Coil)**

AAON E-COATED COIL MAINTENANCE RECORD

Installation Date		Customer	Comments												
			Chlorides Removed												
			Potable Water Frontwash Rinse												
	Unit Location		Potable Water Backwash Rinse												
			Approved Cleaner Used												
			Coil												
			Surface Debris Removed												
Site	#		Ambient Temp (°F)												
Installation Site Unit Model # Unit Serial #		Unit Serial #	Year 20	Jan	Feb	Mar	Apr	May	unſ	Int	Aug	dəs	0ct	Nov	Dec

The following cleaning agents have been approved for use on AAON E-Coated Coils to remove mold, mildew, dust, soot, greasy residue, lint and similar particulate without harming the coated surfaces.

RECOMMENDED CHLORIDE REMOVER
Rectorseal
2601 Spenwick Drive, Houston, Texas 77055
(P): 713-263-8001

#### October 2022

Added E=No Paint option to Feature 17, while removing 0=No Paint option so the SA Series and SB Series will have consistent feature options. Leaving 0 = No Paint in this document for older units. Added E = 1 Blower + Perm Magnet AC TEFC Motor + VFD option to Feature 5A.

#### November 2023

Start of new UL 60335 version of SB series IOM Rev. A. Added New UL 60335 tables and standard. Added 35 and 65 KAIC tables. Add Min and Max Water temps and pressures table. Added 454B Pressure Temperature charts as well as metric and imperial versions of 410A and 454B. Add new warning labels. Updated Feature string. Added metric conversions to all units in the IOM.

#### March 2024

Additional warnings added. Text added to installation section about proper ventilation requirements. Minimum Floor Area for charge table added. Added "Refrigerant Detection System" for new mitigation board for A2L refrigerant. Additional checklist items added to Startup form. Sentence added to storage section in regards to ASHRAE 15 requirements. Added section about proper Refrigerant removal and Evacuation.

#### May 2024

Added statement to general item numbered list about ducted applications in a space.

#### **July 2024**

Added statement about UV lights and lamp replacement.

#### August 2024

Added process of Decommissioning the unit. Added text to General Information stating the maximum installation elevation is 11,500 ft.

#### September 2024

Added detailed text to the RDS mitigation board section for the sequence of operations for the A2L sensors.

#### October 2024

Updated part number. Added text in supply fan section about adjusting the set screw and a figure of what the gap of the plenum looks like.

#### January 2025

Updated decommissioning section. Updated RDS section, updated startup form. Updated Warnings and caution section.



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

SB Series
Installation, Operation &
Maintenance
G164880 · Rev. B · 250108

**Factory Technical Support:** 918-382-6450

**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.

It is the intent of AAON to provide accurate and current product information. However, in the interest of product improvement, AAON reserves the right to change pricing, specifications, and/or design of its product without notice, obligation, or liability.