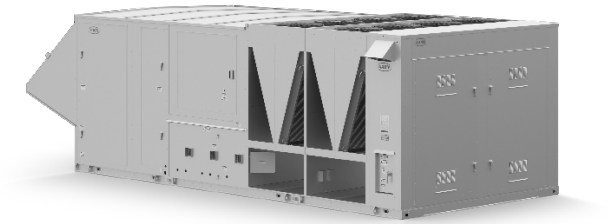
RN Series
E Cabinet
(75-140 tons)

Packaged Rooftop Units
& Outdoor Air Handling Units



Installation, Operation, & Maintenance

UL-1995

⚠ WARNING

FIRE OR EXPLOSION HAZARD

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

Be sure to read and understand the installation, operation, and service instructions in this manual.

Improper installation, adjustment, alteration, service, or maintenance can cause serious injury, death, or property damage.

A copy of this IOM must be kept with the unit.

⚠ WARNING

- Do not store gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance
- WHAT TO DO IF YOU SMELL GAS
  - Do not try to light any appliance.
  - Do not touch any electrical switch; do not use any phone in your building.
  - Leave the building immediately.
  - Immediately call your gas supplier from a phone remote from the building. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
- Startup and service must be performed by a Factory Trained Service Technician.

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AAON® RN Series E Cabinet Features and Options Introduction

Energy Efficiency
- Direct Drive Backward Curved Plenum Supply Fans
- Variable Speed Scroll Compressors
- Airside Economizers
- Factory Installed AAONAIRE® Energy Recovery Wheels
- Double Wall Rigid Polyurethane Foam Panel Construction, R-13 Insulation
- Modulating Natural Gas Heaters
- Modulating/SCR Electric Heaters
- Premium Efficiency Motors
- Variable Speed Supply/Return/Exhaust Fans

Indoor Air Quality
- 100% Outside Air
- Outside Airflow Monitoring
- Constant Volume Outside Air Control
- Economizer CO_2 Override
- High Efficiency Filtration
- UV Lights for Single Pass 90% Air Disinfection
- Double Wall Rigid Polyurethane Foam Panel Construction, R-13 Insulation
- Interior Corrosion Protection

Humidity Control
- High Capacity Cooling Coils
- Variable Speed Compressors
- Factory Installed AAONAIRE Total Energy Recovery Wheels
- Mixed/Return Air Bypass
- Modulating Hot Gas Reheat

Safety
- Burglar Bars
- Freeze Stats
- Hot Water/Steam Preheat Coils
- Electric Preheat
- Phase and Brown Out Protection
- Supply/Return Smoke Detectors

Safety Continued
- Supply/Return Firestats

Installation and Maintenance
- Clogged Filter Switch
- Color Coded Wiring Diagram
- Compressors in Isolated Compartment
- Compressor Isolation Valves
- Convenience Outlet
- Direct Drive Supply Fans
- Hinged Access Doors with Lockable Handles
- Magnehelic Gauge
- Service Lights
- Sight Glass

System Integration
- Chilled Water Cooling Coils
- Third-party Controls
- Electric/Natural Gas/LP Heating
- Hot Water/Steam Heating Coil
- Non-Compressorized DX Coils

Environmentally Friendly
- Airside Economizers
- Factory Installed AAONAIRE Energy Recovery Wheels
- Mixed/Return Air Bypass
- R-410A Refrigerant

Extended Life
- 2, 5, or 10 Year Parts Warranty Options
- 5 Year Compressor Warranty
- 15 Year Aluminized Steel Heat Exchanger Warranty
- 25 Year Stainless Steel Heat Exchanger Warranty
- Condenser Coil Guards
- Interior Corrosion Protection
- Coil Polymer E-Coating - 5 Year Coating Warranty
- Stainless Steel Coil Casing
- Stainless Steel Drain Pans

Safety

Attention must be paid to the following statements:

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

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

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

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

⚠ WARNING

ELECTRIC SHOCK, FIRE OR EXPLOSION HAZARD

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

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

- Before servicing, disconnect all electrical power to the furnace. 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.

⚠ CAUTION

WHAT TO DO IF YOU SMELL GAS

- Do not try to turn on unit.
- Shut off main gas supply.
- Do not touch any electric switch.
- Do not use any phone in the building.
- Never test for gas leaks with an open flame.
- Use a gas detection soap solution and check all gas connections and shut off valves.

⚠ WARNING

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

⚠ WARNING

FIRE, EXPLOSION OR CARBON MONOXIDE POISONING HAZARD

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

⚠ WARNING

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.

⚠ 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.

⚠ CAUTION

Unit power supply wire must be only copper or aluminum.

⚠ 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.

⚠ WARNING

GROUNDING REQUIRED

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

⚠ WARNING

VARIABLE FREQUENCY DRIVES

Do not leave VFDs unattended in hand mode or manual bypass. Damage to personnel or equipment can occur if left unattended. When in hand mode or manual bypass mode VFDs will not respond to controls or alarms.

⚠ CAUTION

Electric motor over-current protection and overload protection may be a function of the Variable Frequency Drive to which the motors are wired. Never defeat the VFD motor overload feature. The overload ampere setting must not exceed 115% of the electric motor's FLA rating as shown on the motor nameplate.

⚠ 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 61 cm (24 inches) high to verify proper center of gravity lift point to avoid unit damage, injury or death.

⚠ CAUTION

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

⚠ CAUTION

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

⚠ WARNING

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

⚠ WARNING

WATER PRESSURE

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

⚠ 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.

⚠ CAUTION

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

⚠ 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.

⚠ WARNING

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ WARNING

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.

⚠ 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.

⚠ 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.

⚠ 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.

⚠ 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.

⚠ 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.

⚠ 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.

⚠ WARNING

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

WARNING

Connected ductwork must be free of potential ignition sources, such as hot surfaces above 700 ºC (1292 ºF) 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.

CAUTION

Disconnect power to the unit before servicing UV-C lamps

CAUTION

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

WARNING

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

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.

1. Startup and service must be performed by a Factory Trained Service Technician.

2. Use only with type of the gas approved for the furnace. Refer to the furnace rating plate.

3. The unit is for outdoor use only. See General Information section for more information.

4. Provide adequate combustion ventilation air to the furnace. See the Locating Units and Gas Heating sections of the Installation section of the manual.

5. Always install and operate furnace within the intended temperature rise range and duct system external static pressure (ESP) as specified on the unit nameplate.

6. The supply and return air ducts must be derived from the same space. It is recommended ducts be provided with access panels to allow inspection for duct tightness. When a down flow duct is used with electric heat, the exhaust duct must be an L shaped duct.

7. Clean furnace, duct and components upon completion of the construction setup. Verify furnace operating conditions including input rate, temperature rise and ESP.

8. 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.

9. READ THE ENTIRE INSTALLATION, OPERATION AND MAINTENANCE MANUAL. OTHER IMPORTANT SAFETY PRECAUTIONS ARE PROVIDED THROUGHOUT THIS MANUAL.

10. Keep this manual and all literature safeguarded near or on the unit.

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	1	2	3A	3B	3C	3D	3E	4A	4B	4C	5A	5B	5C	5D	5E	6A	6B	6C	6D	6E	7	8	9A	9B	9C	9D
RN	**A**	**-105**	**-E**	**-0**	**-3**	**-C**	**A**	**A**	**0**	**A**	-	0	0	0	0	0	:	A	0	-	A	A	M	0	L	-	B	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	A	-	0	0	0	0
						-	0	0	-	0	0	-	B	-	0	0	0	-	0	0	-	B	A	0	B	-	0	0	-	0	0	0	-	A	0	0	0	0	0	-	E	0	0	0	0	0	-	0	0	0	0	0	0	B

10A	10B	11A	11B	12	13A	13B	13C	14	15	16A	16B	16C	16D	17A	17B	18A	18B	18C	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37

MODEL OPTIONS

SERIES AND GENERATION
RN

MAJOR REVISION
A

UNIT SIZE
075 = 75 ton Capacity
090 = 90 ton Capacity
105 = 105 ton Capacity
120 = 120 ton Capacity
130 = 130 ton Capacity
140 = 140 ton Capacity

SERIES
E = 75-140 ton units

MINOR REVISION
0

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

Model Option A: COOLING/HEAT PUMP

A1: COMPRESSOR STYLE
0 = No Compressor
C = R-410A Variable Speed Scroll Compressor
H = R-454B Variable Speed Scroll Compressor

A2: CONDENSER STYLE
0 = No Condenser
A = Microchannel Air-Cooled Condenser
N = DX Air Handling Unit

A3: INdOOR COIL CONFIGURATION
0 = No Cooling Coil
A = 4 Row Standard Evaporator
B = 6 Row Evaporator
E = 4 Row Chilled Water Coil
F = 6 Row Chilled Water Coil

A4: COOLING HEAT EXCHANGER CONSTRUCTION
0 = Standard
A = Polymer E-Coated Cooling Coil
B = Stainless Steel Cooling Coil Casing
D = Stainless Steel Cooling Coil Casing + Polymer E-Coated Cooling Coil
E = Polymer E-Coated Cond. Coil
J = Polymer E-Coated Evap. And Cond. Coil
T = Stainless Steel Cooling Coil Casing + Polymer E-Coated Evap. And Cond. Coil

A5: COOLING STAGING
0 = No Cooling
A = Full Face Variable Capacity + Tandem On/Off Refrigeration Systems
F = Single Serpentine 8 FPI
G = Half Serpentine 8 FPI
H = Single Serpentine 10 FPI
J = Half Serpentine 10 FPI
K = Single Serpentine 12 FPI
L = Half Serpentine 12 FPI
N = DX Air Handling Unit with 2 Refrigeration Circuits

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	**B1**	**B2**	**B3**	**B4**	**B5**	**1**	**2**	**3A**	3B	3C	3D	3E	4A	4B	4C	5A	5B	5C	5D	5E	6A	6B	6C	6D	6E	7	8	9A	9B	9C	9D
RN	A	- 105 -	E	- 0	- 3	- C	A	A	0	A	**- 0**	**0**	**0**	**0**	**0 : A**	**0 - A**			A	M	0	L	- B	0	0	- 0	0	0	0	0	- 0	0	0	0	0	0	- 0	A	- 0	0	0	0
				- 0	0 -	0	0 -	B	- 0	0	0	- 0	0 -	B	A	0	B	- 0	0 -	0	0	0	- A	0	0	0	0	0	- E	0	0	0	0	0	- 0	0	0	0	0	0	B
						10A	10B		11A	11B	12		13A	13B	13C	14	15		16A	16B	16C	16D		17A	17B		18A	18B	18C	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37

Model Option B: HEATING

B1: HEAT TYPE

0 = No Heat
A = Electric Heat
C = Natural Gas
F = LP Gas
J = Hot Water Coil
L = Steam Distributing Coil

B2: HEAT CONSTRUCTION

0 = Standard
B = Stainless Steel Heat Exchanger
D = High Altitude Stainless Steel Heat Exchanger
G = Polymer E-Coated Heating Coil

B3: HEAT DESIGNATION

0 = No Heat
1 = Heat 1
2 = Heat 2
3 = Heat 3
4 = Heat 4
5 = Heat 5
6 = Heat 6
7 = Heat 7
A = 1 Row
E = 2 Row

B4: HEAT STAGING

0 = No Heat
B = 2 Stage
C = 3 Stage
D = 4 Stage
E = 5 Stage
F = 6 Stage
K = Modulating Gas Heat Temp Control
L = High Turndown Modulating Gas Heat – Temperature Control
M = Modulating SCR with Temperature Control
N = Modulating SCR with External 0-10 VDC
P = Single Serpentine 8 FPI
Q = Half Serpentine 8 FPI

B4: HEAT STAGING (Continued)

R = Single Serpentine 10 FPI
S = Half Serpentine 10 FPI
T = Single Serpentine 12 FPI
U = Half Serpentine 12 FPI

B5: HEAT PUMP AUX HEATING

0 = No Heat Pump

1: UNIT ORIENTATION

A = Draw Through Compact Supply Fan, End Compressor Compartment, Both Side Access
D = Draw Through Compact Supply Fan, Non-Compressorized, End Control Panel, Both Side Access

2: SUPPLY & RETURN LOCATIONS

0 = Bottom Supply--Bottom Return
A = Bottom Supply--No Return
B = Bottom Supply--Left Return
C = Bottom Supply--Right Return
D = Bottom Supply--End Return
F = Left Supply--Bottom Return
G = Left Supply--Left Return
H = Left Supply--Right Return
J = Left Supply--End Return
L = Right Supply--Bottom Return
M = Right Supply--Left Return
N = Right Supply--Right Return
P = Right Supply--End Return
R = Top Supply--Bottom Return
S = Top Supply--Left Return
T = Top Supply--Right Return
U = Top Supply--End Return

Feature 3: SUPPLY FAN OPTIONS

3A: SUPPLY FAN QUANTITY

0 = 1 Fan
A = 2 Fans

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	1	2	3A	**3B**	**3C**	**3D**	**3E**	**4A**	4B	4C	5A	5B	5C	5D	5E	6A	6B	6C	6D	6E	7	8	9A	9B	9C	9D
RN	A	- 105 -	E	- 0	- 3	- C	A	A	0	A	- 0	0	0	0	0	: A	0	- A	**A**	**M**	**0**	**L**	- **B**	0	0	- 0	0	0	0	- 0	0	0	0	0	- 0	A	- 0	0	0	0
				- 0	0 -	0	0 -	B	- 0	0	0 -	0	0 -	B	A	0	B -	0	0 -	0	0	0 -	A	0	0	0	0	0 -	E	0	0	0	0	0 -	0	0	0	0	0	0	B
						10A	10B		11A	11B	12		13A	13B	13C	14	15	16A	16B	16C	16D	17A	17B	18A	18B	18C	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37

3B: SUPPLY FAN CONFIGURATION

0 = No VFDs + Full Width Fan
A = 1 Fan per VFD + Full Width Fan
B = 2 Fans per VFD + Full Width Fan
E = No VFDs + Narrow Width Fan
F = 1 Fan per VFD + Narrow Width Fan
G = 2 Fans per VFD + Narrow Width Fan
K = Option 0 + Inlet Backdraft Dampers
L = Option A + Inlet Backdraft Dampers
M = Option B + Inlet Backdraft Dampers
Q = Option E + Inlet Backdraft Dampers
R = Option F + Inlet Backdraft Dampers
S = Option G + Inlet Backdraft Dampers

3C: SUPPLY FAN SIZE

0 = 13.5" Direct Drive Backward Curved Plenum Aluminum
F = 24" Direct Drive Backward Curved Plenum Aluminum
G = 27" Direct Drive Backward Curved Plenum Aluminum
H = 30" Direct Drive Backward Curved Plenum Aluminum
J = 30" Direct Drive Backward Curved Plenum Steel
K = 33" Direct Drive Backward Curved Plenum Steel
L = 36.5" Direct Drive Backward Curved Plenum Aluminum
M = 42.5" Direct Drive Backward Curved Plenum Aluminum

3D: SUPPLY FAN MOTOR TYPE

0 = High Efficiency Open Motor (1200 nominal rpm)
A = High Efficiency Open Motor (1800 nominal rpm)
B = High Efficiency Open Motor (3600 nominal rpm)
C = Perm Magnet AC Open Motor (1200 nominal rpm)
D = Perm Magnet AC Open Motor (1800 nominal rpm)
E = Perm Magnet AC Open Motor (3600 nominal rpm)

3D: SUPPLY FAN MOTOR TYPE (continued)

F = ECM Motor (1200 nominal rpm)
G = ECM Motor (1800 nominal rpm)
H = ECM Motor (3600 nominal rpm)
J = ECM Motor Packaged with Fan
K = High Efficiency Totally Enclosed Motor (1200 nominal rpm)
L = High Efficiency Totally Enclosed Motor (1800 nominal rpm)
M = High Efficiency Totally Enclosed Motor (3600 nominal rpm)
N = Perm Magnet AC Totally Enclosed Motor (1200 nominal rpm)
P = Perm Magnet AC Totally Enclosed Motor (1800 nominal rpm)
Q = Perm Magnet AC Totally Enclosed Motor (3600 nominal rpm)

3E: SUPPLY FAN MOTOR SIZE

D = 1 hp
F = 2 hp
G = 3 hp
H = 5 hp
J = 7.5 hp
K = 10 hp
L = 15 hp
M = 20 hp
N = 25 hp
P = 30 hp
Q = 40 hp
R = 50 hp

Feature 4: RETURN/OUTSIDE AIR OPTIONS

4A: OUTSIDE AIR SECTION

0 = 100% Outside Air
A = 100% Outside Air with Motorized Dampers
B = Manual Outside Air + Return Air Opening
C = Motorized Outside Air Dampers + Return Air Opening
D = 100% Return Air
E = Economizer
G = Econ + Power Exhaust (Plenum Fans)

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	1	2	3A	3B	3C	3D	3E	**4A**	**4B**	**4C**	**5A**	**5B**	**5C**	**5D**	5E	6A	6B	6C	6D	6E	7	8	9A	9B	9C	9D
RN	A	- 105	- E	- 0	- 3	- C	A	A	0	A	- 0	0	0	0	0	: A	0	- A	A	M	0	L	- **B**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	0	- 0	0	0	0	0	- 0	A	- 0	0	0	0
				- 0	0 -	0	0 -	B	- 0	0	0 -	0	0 -	B	A	0	B	- 0	0 -	0	0	0 -	A	0	0	0	0	0 -	E	0	0	0	0	0 -	0	0	0	0	0	0	B
						10A	10B		11A	11B	12		13A	13B	13C	14	15	16A	16B	16C	16D	17A	17B	18A	18B	18C	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37

4A: OUTSIDE AIR SECTION (continued)
J = Econ + Power Return (Plenum Fans)
Q = Econ + Energy Recovery + Bypass Damper

4B: ENERGY RECOVERY TYPE
0 = No Energy Recovery
A = Polymer Energy Recovery Wheel
B = Polymer Energy Recovery Wheel + 1% Purge
C = Aluminum Energy Recovery Wheel
D = Aluminum Energy Recovery Wheel + 1% Purge

4C: ENERGY RECOVERY SIZE
0 = No Energy Recovery
A = Low CFM Enthalpy
B = High CFM Enthalpy
E = Low CFM Sensible
F = High CFM Sensible
J = Low CFM Enthalpy + Exhaust Filters
K = High CFM Enthalpy + Exhaust Filters
N = Low CFM Sensible + Exhaust Filters
P = High CFM Sensible + Exhaust Filters

Feature 5: RETURN FAN OPTIONS

5A: RETURN FAN QUANTITY
0 = No Return Fan
A = 1 Fan
B = 2 Fans

5B: RETURN FAN CONFIGURATION
0 = No Return Fan
A = No VFDs + Full Width Fan
B = 1 Fan per VFD + Full Width Fan
C = 2 Fans per VFD + Full Width Fan
F = No VFDs + Narrow Width Fan
G = 1 Fan per VFD + Narrow Width Fan
H = 2 Fans per VFD + Narrow Width Fan
L = Option A + Inlet Backdraft Dampers
M = Option B + Inlet Backdraft Dampers
N = Option C + Inlet Backdraft Dampers
R = Option F + Inlet Backdraft Dampers
S = Option G + Inlet Backdraft Dampers
T = Option H + Inlet Backdraft Dampers

5C: RETURN FAN SIZE
0 = No Return Fan
M = 24" Direct Drive Backward Curved Plenum Aluminum
N = 27" Direct Drive Backward Curved Plenum Aluminum
P = 30" Direct Drive Backward Curved Plenum Aluminum
Q = 30" Direct Drive Backward Curved Plenum Steel
R = 33" Direct Drive Backward Curved Plenum Steel
S = 36.5" Direct Drive Backward Curved Plenum Aluminum

5D: RETURN FAN MOTOR TYPE
0 = No Return Fan
A = High Efficiency Open Motor (1170 nominal rpm)
B = High Efficiency Open Motor (1760 nominal rpm)
L = High Efficiency Totally Enclosed Motor (1170 nominal rpm)
M = High Efficiency Totally Enclosed Motor (1760 nominal rpm)
A = High Efficiency Open Motor (1200 nominal rpm)
B = High Efficiency Open Motor (1800 nominal rpm)
C = High Efficiency Open Motor (3600 nominal rpm)
D = Perm Magnet AC Open Motor (1200 nominal rpm)
E = Perm Magnet AC Open Motor (1800 nominal rpm)
F = Perm Magnet AC Open Motor (3600 nominal rpm)
G = ECM Motor (1200 nominal rpm)
H = ECM Motor (1800 nominal rpm)
J = ECM Motor (3600 nominal rpm)
K = ECM Motor Packaged with Fan
L = High Efficiency Totally Enclosed Motor (1200 nominal rpm)
M = High Efficiency Totally Enclosed Motor (1800 nominal rpm)

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	1	2	3A	3B	3C	3D	3E	4A	4B	4C	5A	5B	5C	**5D**	**5E**	**6A**	**6B**	**6C**	**6D**	6E	7	8	9A	9B	9C	9D
RN	A	-	105	-	E	-	0	-	3	-	C	A	A	0	A	-	0	0	0	0	0	:	A	0	-	A	A	M	0	L	-	B	0	0	-	0	0	0	**0**	**0**	-	**0**	**0**	**0**	**0**	0	-	0	A	-	0	0	0	0
				-	0	0	-	0	0	-	B	-	0	0	0	-	0	0	-	B	A	0	B	-	0	0	-	0	0	0	-	A	0	0	0	0	0	-	E	0	0	0	0	0	-	0	0	0	0	0	0	B
						10A	10B		11A	11B		12			13A	13B	13C		14	15		16A	16B	16C	16D		17A	17B		18A	18B	18C		19	20	21	22	23	24		25	26	27	28	29	30		31	32	33	34	35	36	37

5D: RETURN FAN MOTOR TYPE (continued)
N = High Efficiency Totally Enclosed Motor (3600 nominal rpm)
P = Perm Magnet AC Totally Enclosed Motor (1200 nominal rpm)
Q = Perm Magnet AC Totally Enclosed Motor (1800 nominal rpm)
R = Perm Magnet AC Totally Enclosed Motor (3600 nominal rpm)

5E: RETURN MOTOR SIZE
0 = No Return Fan
E = 1 hp
F = 1.5 hp
G = 2 ph
H = 3 hp
J = 5 hp
K = 7.5 hp
L = 10 hp
M = 15 hp
N = 20 hp
P = 25 hp
Q = 30 hp
R = 40 hp
S = 50 hp

Feature 6: EXHAUST FAN OPTIONS

6A: EXHAUST FAN QUANTITY
0 = No Exhaust Fan
A = 1 Fan
B = 2 Fans

6B: EXHAUST FAN CONFIGURATION
0 = No Exhaust Fan
A = No VFDs + Full Width Fan
B = 1 Fan per VFD + Full Width Fan
C = 2 Fans per VFD + Full Width Fan
F = No VFDs + Narrow Width Fan
G = 1 Fan per VFD + Narrow Width Fan
H = 2 Fans per VFD + Narrow Width Fan
L = Option A + Inlet Backdraft Dampers
M = Option B + Inlet Backdraft Dampers
N = Option C + Inlet Backdraft Dampers

6B: EXHAUST FAN CONFIGURATION (cont)
R = Option F + Inlet Backdraft Dampers
S = Option G + Inlet Backdraft Dampers
T = Option H + Inlet Backdraft Dampers

6C: EXHAUST FAN SIZE
0 = No Exhaust Fan
M = 24" Direct Drive Backward Curved Plenum Aluminum
N = 27" Direct Drive Backward Curved Plenum Aluminum
P = 30" Direct Drive Backward Curved Plenum Aluminum
Q = 30" Direct Drive Backward Curved Plenum Steel
R = 33" Direct Drive Backward Curved Plenum Steel
S = 36.5" Direct Drive Backward Curved Plenum Aluminum
T = 42.5" Direct Drive Backward Curved Plenum Aluminum

6D: EXHAUST FAN MOTOR TYPE
0 = No Exhaust Fan
A = High Efficiency Open Motor (1200 nominal rpm)
B = High Efficiency Open Motor (1800 nominal rpm)
C = High Efficiency Open Motor (3600 nominal rpm)
D = Perm Magnet AC Open Motor (1200 nominal rpm)
E = Perm Magnet AC Open Motor (1800 nominal rpm)
F = Perm Magnet AC Open Motor (3600 nominal rpm)
G = ECM Motor (1200 nominal rpm)
H = ECM Motor (1800 nominal rpm)
J = ECM Motor (3600 nominal rpm)
K = ECM Motor Packaged with Fan
L = High Efficiency Totally Enclosed Motor (1200 nominal rpm)
M = High Efficiency Totally Enclosed Motor (1800 nominal rpm)
N = High Efficiency Totally Enclosed Motor (3600 nominal rpm

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	1	2	3A	3B	3C	3D	3E	4A	4B	4C	5A	5B	5C	5D	5E	6A	6B	6C	**6D**	**6E**	**7**	**8**	**9A**	**9B**	**9C**	**9D**
RN	A	- 105	- E	- 0	- 3	- C	A	A	0	A	- 0	0	0	0	0	: A	0	- A	A	M	0	L	- B	0	0	- 0	0	0	0	0	- 0	0	0	**0**	**0**	**- 0**	**A -**	**0**	**0**	**0**	**0**
				- 0	**0 -**	0	0	- B	- 0	0	0	- 0	0	- B	A	0	B	- 0	0	- 0	0	0	- A	0	0	0	0	0	- E	0	0	0	0	0	- 0	0	0	0	0	0	0	B
				10A	**10B**	11A	11B	12	13A	13B	13C	14	15	16A	16B	16C	16D	17A	17B	18A	18B	18C	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37

6D: EXHAUST FAN MOTOR TYPE (continued)

P = Perm Magnet AC Totally Enclosed Motor (1200 nominal rpm)
Q = Perm Magnet AC Totally Enclosed Motor (1800 nominal rpm)
R = Perm Magnet AC Totally Enclosed Motor (3600 nominal rpm)

6E: EXHAUST MOTOR SIZE

0 = No Return Fan
E = 1 hp
G = 2 ph
H = 3 hp
J = 5 hp
K = 7.5 hp
L = 10 hp
M = 15 hp
N = 20 hp
P = 25 hp
Q = 30 hp
R = 40 hp
S = 50 hp

7: O/A CONTROL

0 = Standard (No Actuator)
C = Fully Modulating Actuator - Sensible Limit
D = Fully Modulating Actuator - Enthalpy Limit
E = DDC Actuator
P = Option C + CO2 Override
Q = Option D + CO2 Override
R = Option E + CO2 Override
U = 2 Position Actuator
V = Fault Detection and Diagnostics Controller (FDD) Sensible Limit
W = FDD Enthalpy Limit
Y = Option V + CO2 Override
Z = Option W + CO2 Override

8: RETURN & EXHAUST OPTIONS

0 = No Return Opening
A = Standard Return Opening without EA Dampers
C = Standard Return Opening + Barometric Relief Dampers

8: RETURN & EXHAUST OPTIONS (continued)

E = Standard Return Opening + Motorized EA Dampers

Feature 9: FILTER OPTIONS

9A: UNIT FILTER TYPE

0 = 2" Pleated MERV 8
A = 4" Pleated MERV 8
B = 2" Pleated MERV 8 + 4" Pleated MERV 11
C = 2" Pleated MERV 8 + 4" Pleated MERV 13
D = 2" Pleated MERV 8 + 4" Pleated MERV 14

9B: UNIT FILTER BOX SIZE/LOCATION

0 = Standard Filters in Standard Position
B = High Eff Filters in Standard Position

9C: FINAL FILTER TYPE

0 = No Final Filters
A = 12” Cartridge MERV 13
D = 12” Cartridge MERV 14
U = 4” Pleated MERV 13
Y = 4” Pleated MERV 14

9D: FILTER OPTIONS

0 = None
A = Clogged Filter Switch - Unit Filters
E = Magnehelic Gauge - Unit Filters
J = CFS + Magnehelic Gauge - Unit Filters

Feature 10: REFRIGERATION CONTROL

10A: REFRIGERATION CONTROL

0 = None
E = Freeze Stats (each circuit)

10B: BLANK

0 = None

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	1	2	3A	3B	3C	3D	3E	4A	4B	4C	5A	5B	5C	5D	5E	6A	6B	6C	6D	6E	7	8	9A	9B	9C	9D
RN	A	- 105 -	E	- 0	- 3	- C	A	A	0	A	- 0	0	0	0	0	: A	0	- A	A	M	0	L	- B	0	0	- 0	0	0	0	0	- 0	0	0	0	0	- 0	A	- 0	0	0	0
				- 0	0	**- 0**	**0 -**	**B -**	**0**	**0**	0	- 0	0	**-**	B	A	0	B	-	0	0	-	0	0	0	-	A	0	0	0	0	0	-	E	0	0	0	0	0	-	0	0	0	0	0	0	B
						10A	10B	**11A**	**11B**	**12**	**13A**	**13B**	13C	14	15	16A	16B	16C	16D	17A	17B	18A	18B	18C	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37

Feature 11: REFRIGERATION OPTIONS

11A: REFRIGERATION OPTIONS

0 = None
D = Hot Gas Bypass Non-Variable Compressor Circuits (HGBNV)
M = HGBNV + Parallel Modulating Hot Gas Reheat -Lag Circuit
W = HGBNV + Parallel Modulating Hot Gas Reheat -Lag Circuit - Polymer E-Coated

11B: BLANK

0 = None

12: REFRIGERATION ACCESSORIES

0 = None
B = Compressor Isolation Valves
C = Sight Glass + Option B
F = Option B +Variable Circuits -20°F Low Ambient
G = Sight Glass + Option F
K = Option B + Tandem Circuit -20°F Low Ambient
L = Sight Glass + Option K
P = Option B + All Circuits -20°F Low Ambient
Q = Sight Glass + Option P

Feature 13: POWER OPTIONS

13A: UNIT DISCONNECT TYPE

0 = Single Point Power - Standard Power Block
A = Single Point Power - Non-fused Disconnect Power Switch
B = Single Point Power - Circuit Breaker
C = Dual Point Power - Standard Power Block – Method #1
D = Dual Point Power - Non-fused Disconnect Power Switch – Method #1
E = Dual Point Power – Circuit Breaker – Method #1
F = Dual Point Power - Standard Power Block – Method #2
G = Dual Point Power - Non-fused Disconnect Power Switch – Method #2
H = Dual Point Power – Circuit Breaker – Method #2
J = Dual Point Power - Standard Power Block – Method #3

13A: UNIT DISCONNECT TYPE (continued)

K = Dual Point Power - Non-fused Disconnect Power Switch – Method #3
L = Dual Point Power – Circuit Breaker – Method #3
M = Dual Point Power - Standard Power Block – Method #4
N = Dual Point Power - Non-fused Disconnect Power Switch – Method #4
P = Dual Point Power – Circuit Breaker – Method #4

13B: DISCONNECT 1 SIZE

0 = Power Block
A = 15 amps
B = 20 amps
C = 25 amps
D = 30 amps
E = 35 amps
F = 40 amps
G = 45 amps
H = 50 amps
J = 60 amps
K = 70 amps
L = 80 amps
M = 90 amps
N = 100 amps
P = 110 amps
Q = 125 amps
R = 150 amps
S = 175 amps
T = 200 amps
U = 225 amps
V = 250 amps
W = 300 amps
Y = 350 amps
Z = 400 amps
1 = 450 amps
2 = 500 amps
3 = 600 amps
4 = 700 amps
5 = 800 amps
6 = 1000 amps
7 = 1200 amps

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	1	2	3A	3B	3C	3D	3E	4A	4B	4C	5A	5B	5C	5D	5E	6A	6B	6C	6D	6E	7	8	9A	9B	9C	9D
RN	A	- 105 -	E	- 0	- 3	- C	A	A	0	A	- 0	0	0	0	0	: A	0	- A	A	M	0	L	- B	0	0	- 0	0	0	0	0	- 0	0	0	0	0	0	- 0	A	- 0	0	0	0
				- 0	0 -	0	0 -	B	-	0	0	**0**	**-**	**0**	**0**	- B	A	0	B	-	0	0	-	0	0	0	- A	0	0	0	0	0	- E	0	0	0	0	0	-	0	0	0	0	0	0	B
				10A	10B		11A	11B		12		13A	13B	**13C**		**14**	**15**	16A	16B	16C	16D		17A	17B		18A	18B	18C		19	20	21	22	23	24		25	26	27	28	29	30		31	32	33	34	35	36	37

13C: Disconnect 2 Size

0 = None
A = 15 amps
B = 20 amps
C = 25 amps
D = 30 amps
E = 35 amps
F = 40 amps
G = 45 amps
H = 50 amps
J = 60 amps
K = 70 amps
L = 80 amps
M = 90 amps
N = 100 amps
P = 110 amps
Q = 125 amps
R = 150 amps
S = 175 amps
T = 200 amps
U = 225 amps
V = 250 amps
W = 300 amps
Y = 350 amps
Z = 400 amps
1 = 450 amps
2 = 500 amps
3 = 600 amps
4 = 700 amps
5 = 800 amps
6 = 1000 amps
7 = 1200 amps

14: SAFETY OPTIONS

0 = None
A = RA & SA Firestat
B = RA Smoke Detector
C = SA Smoke Detector
D = High Supply Air Static Pressure Switch
E = Remote Safety Shutdown Terminals
F = Option A + B
G = Option A + C
H = Option A + D

14: SAFETY OPTIONS (continued)

J = Option A + E
K = Option B + C
L = Option B + D
M = Option B + E
N = Option C + D
P = Option C + E
Q = Option D + E
R = Option A + B + C
S = Option A + B + D
T = Option A + B + E
U = Option A + C + D
V = Option A + C + E
W = Option A + D + E
Y = Option B + C + D
Z = Option B + C + E
1 = Option B + D + E
2 = Option C + D + E
3 = Option A + B + C + D
4 = Option A + B + C + E
5 = Option A + B + D + E
6 = Option A + C + D + E
7 = Option B + C + D + E
8 = Option A + B + C + D + E

15: ACCESSORIES

0 = None
A = Low Limit Control
B = Phase & Brown Out Protection
C = Air Disinfection UV Lights
E = Compressor Sound Blankets
F = Option A + B
G = Option A + C
J = Option A + E
K = Option B + C
M = Option B + E
P = Option C + E
R = Option A + B + C
T = Option A + B + E
V = Option A + C + E
Z = Option B + C + E
4 = Option A + B + C + E

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	1	2	3A	3B	3C	3D	3E	4A	4B	4C	5A	5B	5C	5D	5E	6A	6B	6C	6D	6E	7	8	9A	9B	9C	9D
RN	A	-	105	-	E	-	0	-	3	-	C	A	A	0	A	-	0	0	0	0	0	:	A	0	-	A	A	M	0	L	-	B	0	0	-	0	0	0	0	0	0	-	0	0	0	0	0	0	-	0	A	-	0	0	0	0
				-	0	0	-	0	0	-	B	-	0	0	0	-	0	0	-	**B**	**A**	**0**	**B**	**-**	**0**	**0**	**-**	**0**	**0**	**0**	**-**	**A**	**0**	**0**	**0**	0	0	-	E	0	0	0	0	0	-	0	0	0	0	0	0	B
						10A	10B		11A	11B	12		13A	13B	13C	14	15	**16A**	**16B**	**16C**	**16D**	**17A**	**17B**	**18A**	**18B**	**18C**	**19**	**20**	**21**	**22**	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37							

Feature 16: UNIT CONTROLS

16A: CONTROL SEQUENCE

0 = Standard Terminal Block for Thermostat
A = Terminal Block for Thermostat + Isolation Relays
B = Single Zone VAV Unit Controller - VAV Cool + CAV Heat
D = VAV Unit Controller - VAV Cool + CAV Heat
E = Constant Air Volume Unit Controller - CAV Cool + CAV Heat
F = Makeup Air Unit Controller
M = Field Installed DDC Controls by Others
N = Field Installed DDC Controls + Isolation Relays
P = Factory Installed DDC Controls by Others + Isolation Relays

16B: CONTROL SUPPLIER

0 = None
A = AAON Controls
C = AAON Controls Supervisory

16C: CONTROL SUPPLIER OPTIONS

0 = None

16D: BMS CONNECTION & DIAGNOSTICS

0 = None
B = BACnet MSTP
K = BACnet MSTP with Diagnostics

Feature 17: PREHEAT OPTIONS

17A: PREHEAT CONFIGURATION

0 = Standard - None

17B: PREHEAT SIZING

0 = Standard - None

Feature 18: OPTION BOXES

18A: BOX LOCATION

0 = None
A = 20” Cabinet Extension After Return
B = 20” Cabinet Extension After Pre-Filter
C = 20” Cabinet Extension After Cooling

18B: BOX SIZE

0 = None
A = 20” Cabinet Extension

18C: BOX ACCESSORIES

0 = None
A = 20” Drain Pan in First Box

19: OUTSIDE AIR ACCESSORIES

0 = No Outside Air Hood - 100% Return Air
A = Outside Air Hood
B = Outside Air Hood with Metal Mesh Filters
C = Option A + Air Flow Measuring Station Size A
D = Option A + Air Flow Measuring Station Size B
E = Option A + Air Flow Measuring Station Size C
G = Option B + Air Flow Measuring Station Size A
H = Option B + Air Flow Measuring Station Size B
J = Option B + Air Flow Measuring Station Size C

20: CABINET OPTIONS

0 = None
B = SA & RA Burglar Bars

21: ACCESSORIES

0 = None
C = Supply Fan Air Flow Measuring
D = Return Fan Air Flow Measuring
N = Option C + D

22: MAINTENANCE ACCESSORIES

0 = None
A = Factory Wired 115V Convenience Outlet
B = Field Wired 115V Convenience Outlet
C = Control Panel LED Service Lights and Marine Lights
D = Remote Start/Stop Contacts
E = Supply Fan Auxiliary Contacts
F = Option A + C
G = Option A + D
H = Option A + E
J = Option B + C
K = Option B + D
L = Option B + E

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	1	2	3A	3B	3C	3D	3E	4A	4B	4C	5A	5B	5C	5D	5E	6A	6B	6C	6D	6E	7	8	9A	9B	9C	9D
RN	A	- 105 -	E	- 0	- 3	- C	A	A	0	A	- 0	0	0	0	0	: A	0	- A	A	M	0	L	- B	0	0	- 0	0	0	0	0	- 0	0	0	0	0	0	- 0	A	- 0	0	0	0
				- 0	0 -	0	0 -	B	- 0	0	0	- 0	0	- B	A	0	B	- 0	0	- 0	0	0	- A	0	0	**0**	**0**	**0**	**-**	**E**	**0**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	B
				10A	10B		11A	11B		12		13A	13B	13C		14	15		16A	16B	16C	16D		17A	17B		18A	18B	18C		19	20	21	**22**	**23**	**24**		**25**	**26**	**27**	**28**	**29**	**30**		**31**	**32**	**33**	**34**	**35**	**36**	37

22: MAINTENANCE ACCESSORIES (cont.)
M = Option C + D
N = Option C + E
P = Option D + E
Q = Option A + C + D
R = Option A + C + E
S = Option A + D + E
T = Option B + C + D
U = Option B + C + E
V = Option B + D + E
W = Option C + D + E
Y = Option A + C+ D + E
Z = Option B + C + D + E

23: CODE OPTIONS
0 = Standard - ETL U.S.A. Listing
A = Chicago Code
B = ETL U.S.A. + Canada Listing

24: SHIPPING SPLITS
0 = Standard

25: AIR COOLED CONDENSER ACESSORIES
0 = Standard
E = VFD Condenser Fan Head Pressure Control
K = Low Sound Condenser Fan Head Pressure Control

26: Evap-Cooled Condenser Accessories
0 = None

27: WATER - COOLED CONDENSER ACCESSORIES
0 = None (No Water Condenser)

28: ENERGY RECOVERY WHEEL ACCESSORIES
0 = None
A = Energy Recovery Wheel Defrost - Start/Stop
B = Energy Recovery Wheel Rotation Detection

28: ENERGY RECOVERY WHEEL ACCESSORIES (continued)
E = VFD for Heat Wheel Motor (Field Control)
F = Option A + B
M = Option B + E

29: VFD Options
0 = None
A = Shaft Grounding kit on all SA, RA, EA motors
C = BACNet VFD on all Motors
G = Option A + C

30: Miscellaneous Options
0 = Standard
A = High Condensate Level Switch

31: BLANK
0 = Standard
A = Removable Doors (Pin Hinges)

32: BLANK
0 = Standard

33: BLANK
0 = Standard

34: BLANK
0 = Standard

35: WARRANTY
0 = Standard Warranty
A = 2 Year Parts Warranty
B = 5 Year Parts Warranty
C = 10 Year Parts Warranty

36: CABINET MATERIAL
0 = Galvanized Cabinet - Double Wall + R-13 Foam Insulation

RN Series E Cabinet Feature String Nomenclature

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	1	2	3A	3B	3C	3D	3E	4A	4B	4C	5A	5B	5C	5D	5E	6A	6B	6C	6D	6E	7	8	9A	9B	9C	9D
RN	A	- 105	- E	- 0	- 3	- C	A	A	0	A	- 0	0	0	0	0	: A	0	- A	A	M	0	L	- B	0	0	- 0	0	0	0	0	- 0	0	0	0	0	- 0	A	- 0	0	0	0
				- 0	0 -	0	0	- B	-	0	0	0	-	0	0	- B	A	0	B	-	0	0	-	0	0	0	- A	0	0	0	0	0	- E	0	0	0	0	0	- 0	0	0	0	0	0	**B**
				10A	10B		11A	11B		12			13A	13B	13C		14	15		16A	16B	16C	16D		17A	17B		18A	18B	18C		19	20	21	22	23	24		25	26	27	28	29	30		31	32	33	34	35	36	**37**

37: SPECIALS & PAINT

B = Premium AAON Gray Paint Exterior
C = Premium AAON Gray Paint Exterior Paint + Interior Corrosion Protection
F = Premium Gray Paint Exterior Paint + Interior Corrosion Protection + Shrink Wrap
X = SPA + Premium AAON Gray Paint Exterior
Y = SPA + Premium AAON Gray Paint Exterior Paint + Interior Corrosion Protection
2 = SPA + Premium AAON Gray Paint Exterior Paint + Interior Corrosion Protection + Shrink Wrap
4 = SPA + Special Exterior Paint Color
5 = SPA + Special Exterior Paint Color + Interior Corrosion Protection
8 = SPA + Special Exterior Paint Color + Interior Corrosion Protection + Shrink Wrap

General Information

RN Series E Cabinet packaged rooftop and outdoor air handling units are for outdoor installation only. A minimum of 12" high curb is required for installation on combustible roofs.

Startup and service must be performed by a Factory Trained Service Technician.

⚠ 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.

⚠ CAUTION

These units must not be used for heating or cooling at any time 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 Gas Heat Models

a. The RN Series E Cabinet gas heat exchangers have been certified as a Category III forced air furnace for use with or without cooling, located downstream of the indoor coil.
b. AAON gas heat exchangers operate for a minimum of 10,000 cycles.
c. Individual RN Series E Cabinet gas heat exchangers are designed for 400 MBH input rates and can be configured for up to a 2400 MBH total gas input rating (maximum input rates vary by selected heating feature).
d. Modulating gas heat exchangers are designed for 3:1 turndown of the 320 MBH input rate available on the first stage of heating.

Certification of Steam or Hot Water Heat Models

a. Certified as a forced air heating system with or without cooling.
b. RN Series E Cabinet hot water coils are designed for operation with no more than 82.2°C (180°F) water at a 1034.2 kpa (150 psig) working pressure.
c. RN Series E Cabinet steam coils are designed for 1034.2 kpa (150 psig) working pressure.

Certification of Electric Heat Models

a. RN Series E Cabinet electric warm air furnaces have been certified for use with or without cooling, located downstream of the indoor coil.
b. RN Series E Cabinet electric warm air furnaces are designed with individual 40 KW electric heating elements that can be configured for up to 320 KW of electric heat (maximum output varies by selected heating features).
c. Modulating electric heat exchangers are equipped with Silicon Control Rectifiers (SCR) on the first stage of heating.

Certification of Cooling Models

a. RN Series E Cabinet R-410A refrigerant systems have been certified as commercial central air conditioners with or without electrically operated compressors.

b. RN Series E Cabinet chilled water coils are designed for 1034.2 kpa (150 psig) working pressure.

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

If repairs must be made to damaged goods, notify the factory 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

Codes and Ordinances

The RN Series E Cabinet has been tested and certified by Intertek (ETL) to the following safety standards:

ANSI Z21.47-2016/CSA 2.3-2016
Gas-Fired Central Furnaces

ANSI Z83.8-2016/CSA 2.6-2016
Gas unit heaters, gas packaged heaters, gas utility heaters and gas-fired duct furnaces

UL 1995 5th Edition
Safety standard for Heating and Cooling Equipment

System must be sized in accordance with practices described in the American Society of Heating, Refrigeration, and Air Conditioning Engineers Handbooks.

AAON equipment must be installed in accordance with this manual and the International Code Council (ICC) requirements.

Installation of RN Series E Cabinet units must conform to the International Code Council (ICC) standards of the International Mechanical Code, the International Building Code, and local building, plumbing, and waste water codes. In the absence of local codes installation must conform to current National Fuel Code ANSI Z223.1/NFPA 54 or the National Gas & Propane Installation Code CSA B149.1, and CSA B52 Mechanical Refrigeration Code. All appliances must be electrically grounded in accordance with local codes, or in the absence of local codes, the National Electric Code, ANSI/NFPA 70, and/or the Canadian Electrical Code CSA C22.1.

⚠ CAUTION

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

⚠ WARNING

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

⚠ WARNING

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

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.

Wiring Diagrams

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

Installation

AAON equipment has been designed for quick and easy installation.

Locating Units

The curb must be mounted first and must be located so that duct connections will be clear of structural members of the building.

Verify rooftop or foundation can support the total unit weight, including accessory weights. 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.

⚠ WARNING

When locating gas fired units, it is recommended the unit be installed so that the flue discharge vents are located at least 305 cm (120 inches) away from any opening through which combustion products could enter the building.

⚠ WARNING

Distances from adjacent public walkways, adjacent buildings, operable windows and building openings, shall conform to local codes and/or the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or the National Gas & Propane Code, CSA B149.1

Do not position flue opening to discharge into a fresh air intake of any other piece of equipment. Unit must also be installed so that the flow of combustion intake air is not obstructed from reaching the furnace.

Vent opening must not be blocked by snow. A minimum 30.5 cm (12”) curb must be used or the vent outlet shall be greater than 30.5 cm (12”) off the ground/roof.

Flue gas is dangerously hot and contains containments. The user is responsible for determining if vent gases may degrade building materials.

The National Gas and Propane Installation Code, B149.1 specifies a 1.8m (6ft). horizontal vent terminal clearance to gas and electric meters and relief devices.

Local codes may supersede or further place restrictions on vent termination locations.

Table 1 - RN Series E Cabinet Unit Clearances

Location	Unit Size
	75-140 tons
Discharge - (Controls Side)	152cm (60”)
Intake - (Outside Air)	254cm (100”) from end of the unit
Left Side	254cm (100”)
Right Side	254cm (100”)
Top	Unobstructed

Figure 2 - RN Series E Cabinet, 75-140 tons

Setting the Curb

Make openings in roof decking large enough to allow for duct penetration and workspace only. Do not make openings larger than necessary. Set the curb to coincide with the openings. Make sure the curb is level. Unit must be level in both horizontal axes to support the unit and reduce noise and vibration.

⚠ CAUTION

All roofing work must be performed by competent roofing contractors to avoid any possible leakage.

⚠ CAUTION

Where the supply or warm air duct passes through a combustible roof, a clearance of 2.54cm (1 inch) must be maintained between the outside edges of the duct and combustible material in accordance with National Fire Protection Association Standard No. 90A. Provide flashings or enclosure between structure and roof and all joints must be sealed with mastic roofing to ensure a watertight seal.

Be careful to install the provided neoprene isolator according to the following figure prior to setting the unit on the curb.

⚠ CAUTION

Neoprene isolator for unit vibration isolation is provided in the cabinet and must be installed according to installation manual.

⚠ CAUTION

Incorrect lifting can cause damage to the unit.

Lifting the Unit

If cables or chains are used to hoist the unit they must be the same length. Minimum cable length is 488 cm (192") and spreader bars are required for 75-140 ton units. Care must be taken to prevent damage to the cabinet, coils, and condenser fans.

It is recommended to lift the unit with the outside air hood in the downward shipping position. However, the unit may be lifted with the outside air hood in the open position.

Before lifting unit, be sure that all shipping material has been removed from unit. Secure hooks and cables at all lifting points / lugs provided on the unit.

Hoist unit to a point directly above the curb and duct openings. Be sure that the gasket material has been applied to curb.

Carefully lower and align the unit with utility and duct openings. Lower the unit until the unit skirt fits around the curb. Some units are designed to overhang the curb. Take care that any recessed base rails fit around the curb. Make sure the unit is properly seated on the curb and is level.

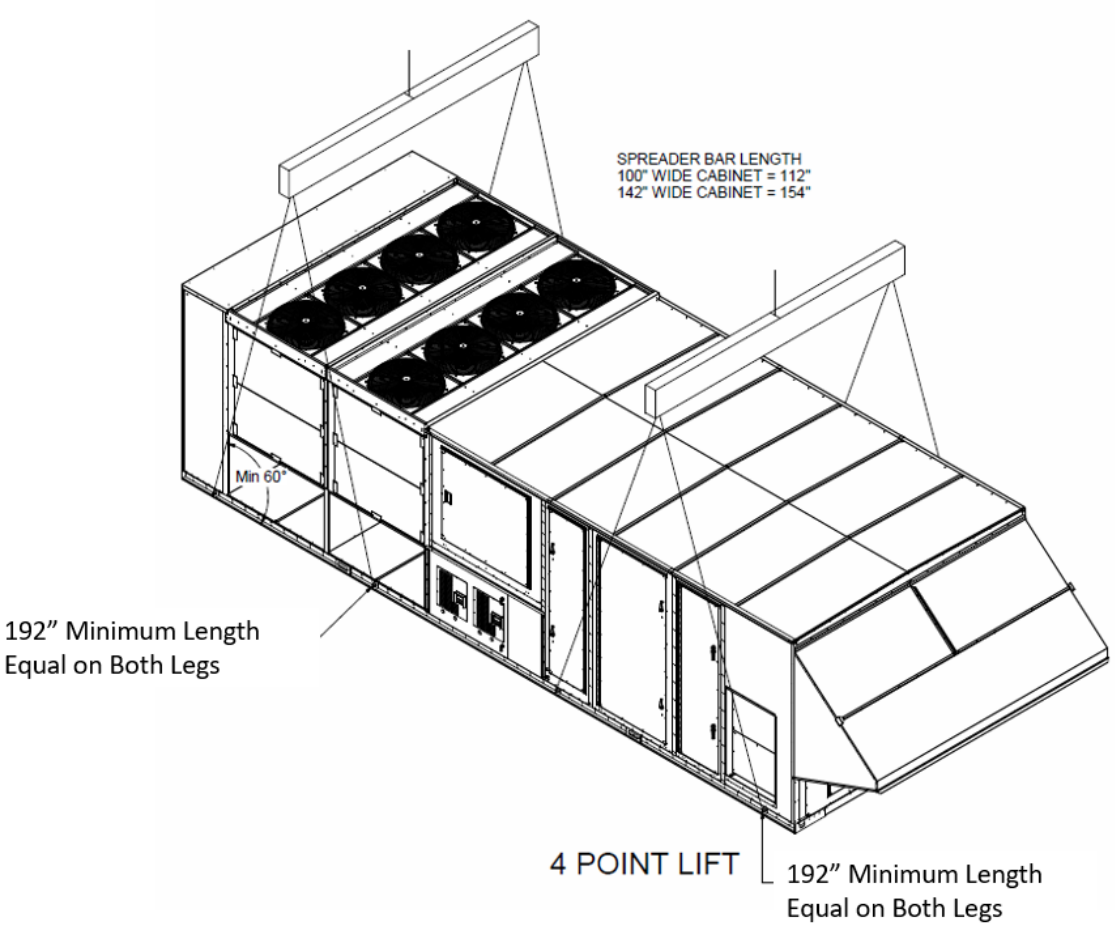


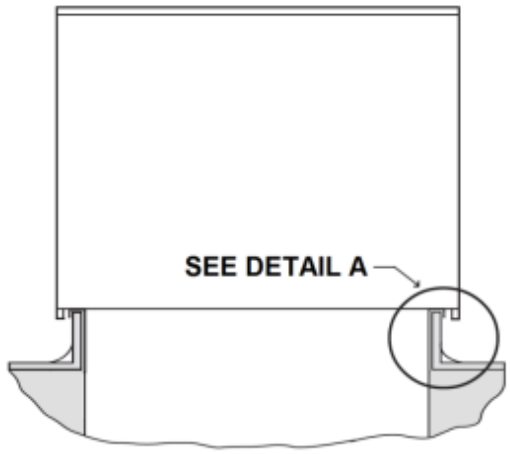
Figure 3 - Lifting Details of a 75-140 ton Unit

Duct Connection

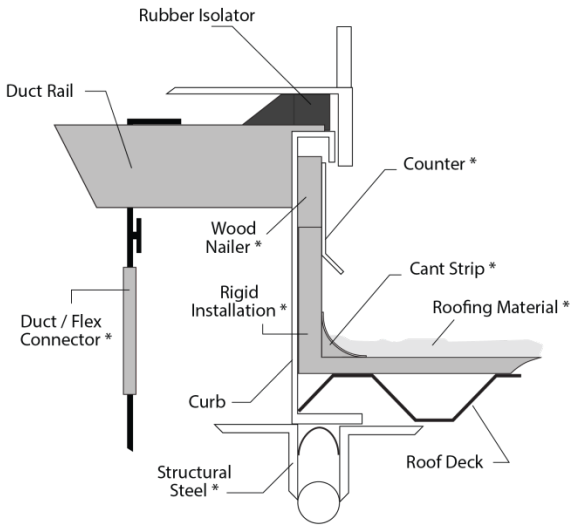
Note: RN Series E cabinet (75-140 tons) units include base insulation standard.

⚠ CAUTION

Do not drill or punch holes in the base of the unit, from inside the unit or from below the unit to attach ductwork. Leaking may occur if unit base is punctured.

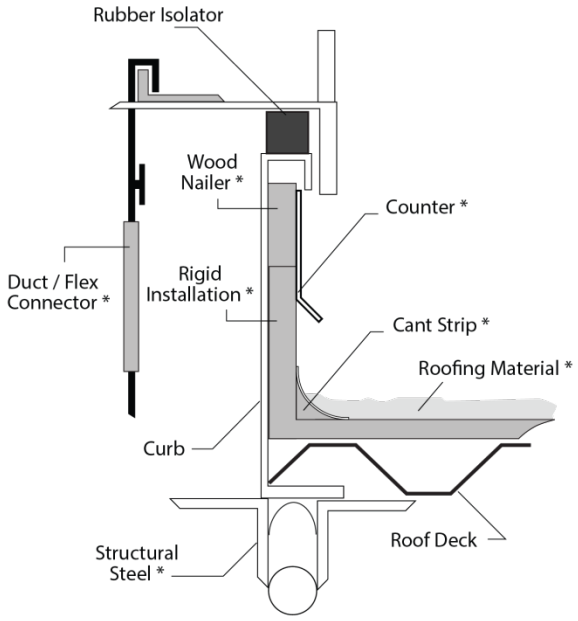


SECTIONAL VIEW OF UNIT ON ROOF CURB



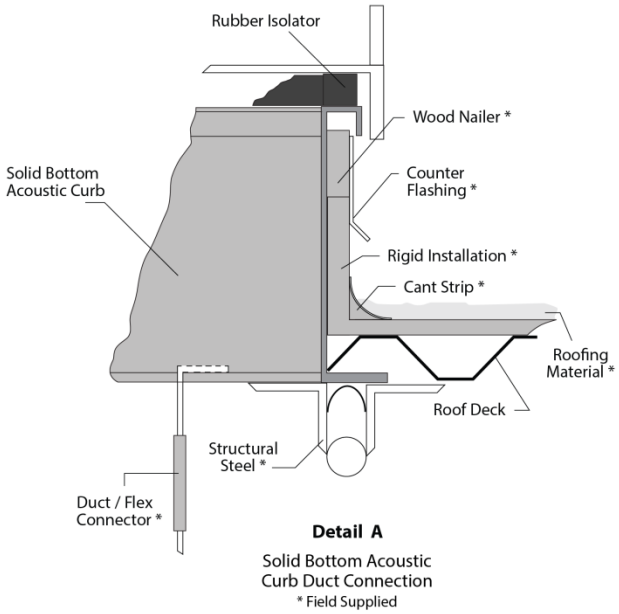
Detail A

Knock Down Curb
Duct Support Rail Connection
* Field Supplied



Detail A

Unit Base Connection
* Field Supplied



Detail A

Solid Bottom Acoustic
Curb Duct Connection
* Field Supplied

Figure 4 - Duct Connection

Outside Air Rain Hood
Rain hood must be opened before startup of the unit. Fresh air intake adjustments must be made according to building ventilation of local code requirements.

75-140 ton Units
Remove the shipping screws from each side of the closed hood.

Lift hood outward and attach the sides of the hood to the side of the unit.

Apply butyl caulking along the top and both sides of the rain hood. Take care to seal the top corners where the rain hood attaches to the unit.

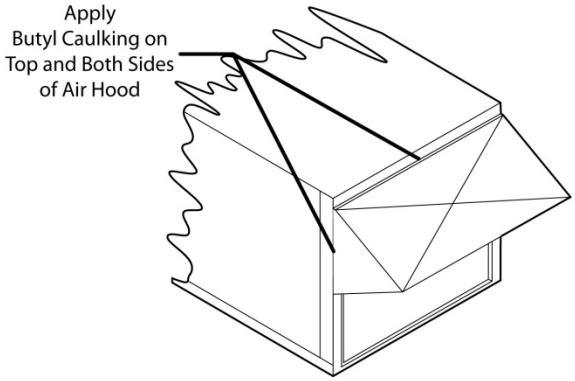


Figure 5 - 55-140 ton Open Rain Hood

End Flashing Installation
RN Series E cabinet units are 360.7 cm (142”) wide and the cabinet width will overhang the shipping trailer on each side.

In order to secure and protect the unit during transit the sheet metal end flashings have been removed from the unit. The slot created at the base of each end of the unit allows the unit to set firmly on the trailer deck.

Sheet metal flashings are shipped loose with the unit and once the unit is set into place the flashings must be installed on each end of the unit to complete the finished seal at the base. The flashings are unit specific and designed to cover the slot at each end of the unit to prevent water run-off into the curb.

Failure to attach and seal the end of unit with the flashings may result in water leakage into the curb.

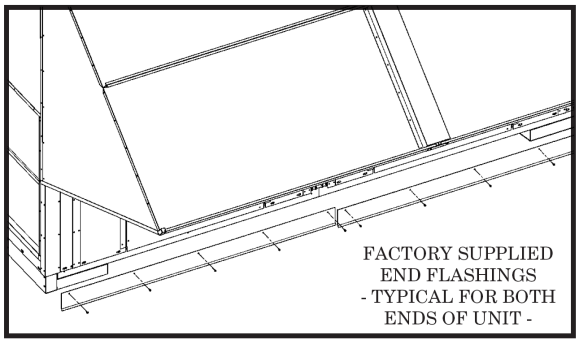


Figure 6 - Factory Supplied End Flashings

⚠ CAUTION

In order to prevent water leakage into the roof curb, the factory provided sheet metal flashings MUST BE attached to the unit base to cover the shipping slots at both ends of the unit.

Motorized Exhaust & Rain Hood

The RNE unit will arrive with the motorized exhaust already in place. The rain hood ships inside of the return air section and must be field installed. After screwing the rain hood over the motorized exhaust with sheet metal screws, apply a sealant of butyl caulking.

Figure 7 - Motorized Exhaust

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. Verify the unit nameplate agrees with power supply. Connect power and control wiring to the unit as shown in Figure 8, and in the unit specific wiring diagram, which shows factory and field wiring and is attached to the inside of the door of the controls compartment. Route power and control wiring, separately, through the utility entry in the base of the unit. Do not run power and signal wires in the same conduit.

Table 2 - Nameplate Voltage Markings & Tolerances

Hz	Nameplate Voltage	Nominal System Voltage	Operating Voltage Range [1]		Acceptable Performance Range[2]	
			Min	Max	Min	Max
60	115	120	104	127	108	126
	208/230	208/240	187	254	187	252
	208	208	187	228	187	228
	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
	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.

Table 3 - RN Series E Cabinet 75-145 ton Dual Point Power Methods

Feature 13A	Disconnect #	Component Power Allocation by Dual Point Power Method (Feature 13A)												
		Compressors	Condenser Fans	Condenser Pumps	Supply Fans	Exhaust Fans	Return Fans	Combustion Motor	Electric Heat	Electric Preheat	Control Circuit	Sump Heater	Vestibule Heater	Heat Wheel Motor
C-E	**1**	X	X	X		X	X							X
	2				X			X	X	X	X	X	X	
F-H	**1**	X	X	X										
	2				X	X	X	X	X	X	X	X	X	X
J-L	**1**	X	X	X		X	X	X	X	X		X	X	X
	2				X						X			
M-P	**1**	X	X	X	X			X	X	X		X	X	X
	2					X	X				X			

⚠ WARNING

Electric shock hazard. Before attempting to perform any installation, service, or maintenance, shut off all electrical power to the unit at the disconnect switches. Unit may have multiple power supplies. Failure to disconnect power could result in dangerous operation, serious injury, death, or property damage.

⚠ 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.

Route power and control wiring, separately, through the utility entry in the base of the unit. Do not run power and control signal wires in the same conduit. The utility entry on 75-140 ton units is located in the controls and compressor section of the unit. See unit drawing for specific location.

⚠ CAUTION

Proper sealing of the electrical and gas entries into the unit must be performed. Failure to seal the entries may result in damage to the unit and property

Size supply conductors based on the unit 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.

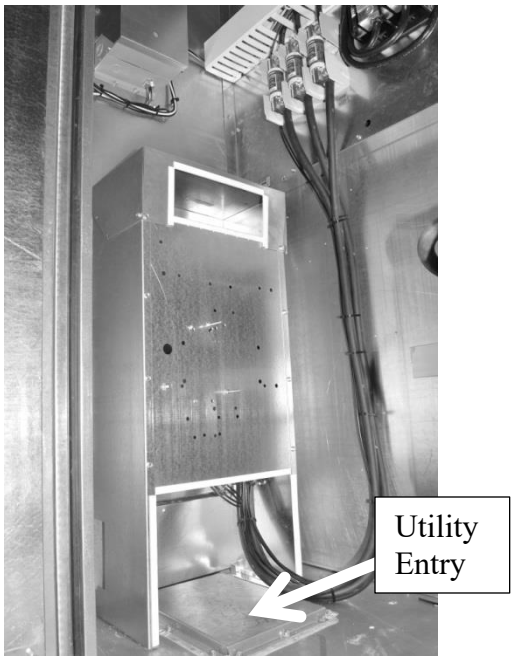


Figure 8 - Back View of Utility Entry and Power Switch from Control Compartment (75-140 ton Units)

Note: All units are factory wired for 208V, 230V, 380V, 460V, or 575V. The transformer configuration must be checked by a qualified technician prior to service, especially if unit is to be connected to a 208V or 230V supply. For 208V service interchange the yellow and red conductor on the low voltage control transformer.

Red-Black for 208V
Yellow-Black for 230V

Wire power leads to the unit's terminal block or main disconnect. All wiring beyond this point has been completed by the manufacturer 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.

⚠ 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.

Installing contractor must check for proper motor rotation and check blower motor amperage listed on the motor nameplate is not exceeded. Motor overload protection may be a function of the variable frequency drive and must not be bypassed.

⚠ CAUTION

Rotation must be checked on all MOTORS AND COMPRESSORS of three phase units. Supply fan, exhaust fan, return fan, and condenser 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.

⚠ 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.

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

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 4 – 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 4 – 35 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

Variable Speed Compressors

Variable speed compressors with VFD speed control are available on all RN Series E Cabinet units. Variable speed compressors must not be operated outside the factory determined turndown ratio or frequency range. The factory determined compressor VFD ranges are given in the following tables.

Table 5 - RN Series E Cabinet Variable Speed Compressor VFD Frequency Range

Model (RNA-)	*Compressor VFD Range (Hz)*
75	25-94 Hz
90	25-85 Hz
105	25-100 Hz
120	25-100 Hz
130	25-88 Hz
140	25-100 Hz

⚠ CAUTION

No variable speed compressor shall operate below 35 Hz. Operating variable speed compressors outside the frequency range specified in this manual voids all warranties and may result in compressor failure.

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 6 - Control Wiring

Wire Size (Stranded) - Copper Conductors Only	Total Wire Distance Allowable	
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 quantity 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 6, 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.

⚠ CAUTION

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

Condensate Drain Piping

RN Series E Cabinet units are equipped with two condensate drain connections, one on the left side of the unit and one on the right side of the unit. P-traps must be field provided and installed.

All drain connections must be used and individually trapped to ensure a minimum amount of condensate accumulation in the drain pans. Use ABS type cement to join the drain pipe connections.

Note: The drain pan connections are 38 mm (1.5") MPT fitting.

Drainage of condensate directly onto the roof may be acceptable in certain areas, refer to local codes. If condensate is to drain directly onto the roof, place a small drip pad below the drain to protect the roof from possible damage.

If condensate is piped into the building drainage system, the drain pipe must penetrate the roof external to the unit itself. The drain line must be pitched away from the unit at least 3.2mm (1/8 inch) per foot. On longer runs an air break must be used to ensure proper drainage.

⚠ CAUTION

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

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.

Draw-Through Coils

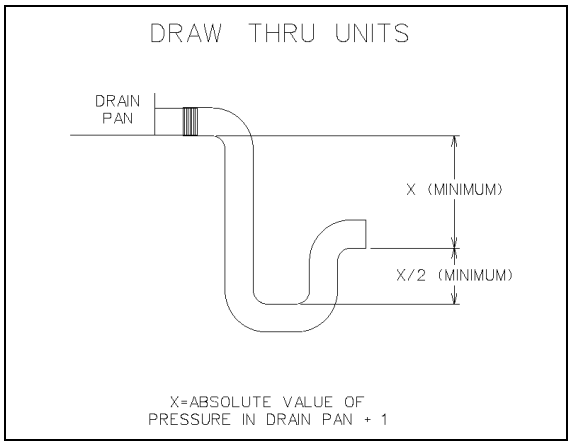


Figure 9 - Draw-Through Drain Trap

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 7 - Draw-Through Drain Trap Dimensions (Metric)

Draw-Through		
Drain Pan Pressure	Trap Dimensions	
Negative Static	X	X/2
(mmHg)	(millimeters)	(millimeters)
-0.93	38.1	19.1
-1.87	50.8	25.4
-2.80	63.5	31.8
-3.74	76.2	38.1
-4.67	88.9	44.5
-5.60	101.6	50.8
-6.54	114.3	57.2
-7.47	127	63.5
-8.41	139.7	69.9
-9.34	152.4	76.2
-10.28	165.1	82.6
-11.21	177.8	88.9
-12.14	190.5	95.3
-13.08	203.2	101.6
-14.01	215.9	108.0
-14.95	228.6	114.3

Note: 1 mm = 0.1 cm

Table 8 - Draw-Through 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
-3.50	4.50	2.25
-4.00	5.00	2.50
-4.50	5.50	2.75
-5.00	6.00	3.00
-5.50	6.50	3.25
-6.00	7.00	3.50
-6.50	7.50	3.75
-7.00	8.00	4.00
-7.50	8.50	4.25
-8.00	9.00	4.50

⚠ CAUTION

All condensate drains must be trapped individually before they are connected to a common line.

⚠ CAUTION

All condensate drain connections must be used. Drain pans are sloped towards connections.

Startup

(See back of the manual for startup form.)

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Startup and service must be performed by a Factory Trained Service Technician.

⚠ 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 the air flow, air filters, condenser water flow, dampers, heaters, and refrigerant charge.

Filters

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

Metal Mesh Filters

Metal mesh filters are washable expanded aluminum mesh filters that are mounted over the outside air intake. These filters are normally located on the outside air hood. These filters are commonly used to prevent moisture carryover from the outside. An access panel is provided to slide out the filters for cleaning.

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.

Air Flow Monitoring

Some units include an air flow monitoring device. Air flow can be measured either at the outside air opening, supply fans and/or return fans. Outside air uses a measuring grid and the fans use a piezo ring on their inlets to collect this information. A singular processor located in the vestibule handles all of these different readings.

Supply Fans

RN Series E Cabinet units are equipped with direct drive backward curved plenum fan assemblies that are selected to deliver the air volume specified according to unit size and job requirements. This is done with variable

frequency drives. Field airflow adjustment may be required at startup.

Air Flow Adjustment
For single set screw applications, tighten the set screw to the required torque setting (Table 9) using a calibrated torque wrench. For double set screw applications, tighten one set screw to half of the required torque setting (Table 9) 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 9 - 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 10. 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.

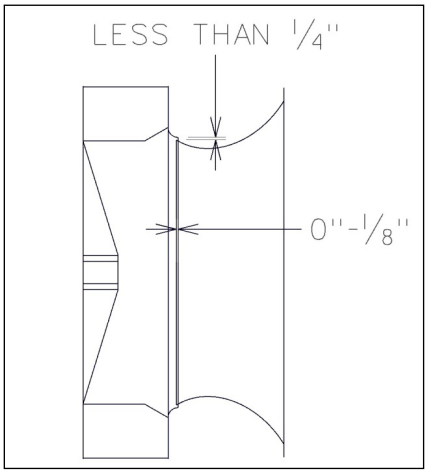


Figure 10 - Plenum Fan Gap Tolerances

⚠ 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 sub-cooling and evaporator superheat. On a system with an expansion valve liquid sub-cooling is more representative of the charge than evaporator superheat but both measurements must be taken.

⚠ CAUTION

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

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

Units equipped with heat pump options must be charged in heating mode to get the proper charge. After charging, operate the unit in cooling mode to check for correct charge. Charge may need to be adjusted for cooling mode. If adjustments are made in the cooling mode heating mode must be rerun to verify proper 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 table below when determining the proper sub-cooling.

Checking Liquid Sub-Cooling
Measure the temperature of the liquid line as it leaves the condenser coil.

Read the gauge pressure at the liquid line close to the point where the temperature was taken. You must use liquid line pressure as it will vary from discharge pressure due to condenser coil 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 tables below for the appropriate coil and system 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 tables below for the appropriate coil and system type and options.

⚠ CAUTION

Expansion valve must be adjusted to approximately 4.4-8.3°C (8-15°F) of suction superheat. Failure to have sufficient superheat will damage the compressor and void the warranty.

Table 10 - Acceptable Fin & Tube Air-Cooled Condenser Coil Refrigeration Circuit Values (Metric)

Air-Cooled Cond./Air-Source Heat Pump In Cooling Mode	
Sub-Cooling	4.4-8.3°C
Sub-Cooling with Hot Gas Reheat	4.4-8.3°C
Superheat	4.4-8.3°C

Table 11 - Acceptable Fin & Tube Air-Cooled Condenser Coil Refrigeration Circuit Values (Imperial)

Air-Cooled Cond. In Cooling Mode	
Sub-Cooling	8-15°F
Sub-Cooling with Hot Gas Reheat	8-15°F
Superheat	8-15°F

Table 12 - Acceptable Microchannel Air-Cooled Condenser Coil Liquid Sub-Cooling Values (Metric)

	Cooling Mode Liquid Sub-Cooling Values(°C)				
Ambient (°C)	Evaporator Coil Saturation Temperature (°C)				
	4.4	7.2	8.9	10.0	12.8
19.4	5.0 - 7.8	4.4 - 7.2	4.4 - 7.2	3.9 - 6.7	2.8 - 5.6
22.2	5.6 - 8.3	5.0 - 7.8	5.0 - 7.8	4.4 - 7.2	3.9 - 6.7
27.8	5.6 - 8.3	5.6 - 8.3	5.6 - 8.3	5.0 - 7.8	3.9 - 6.7
35.0	5.6 - 8.3	5.6 - 8.3	5.6 - 8.3	5.0 - 7.8	4.4 - 7.2
40.6	6.1 - 8.9	6.1 - 8.9	5.6 - 8.3	5.6 - 8.3	4.4 - 7.2
46.1	5.6 - 8.3	6.1 - 8.9	6.1 - 8.9	6.1 - 8.9	5.0 - 7.8

Table 13 - Acceptable Microchannel Air-Cooled Condenser Coil Liquid Sub-Cooling Values (Imperial)

	Cooling Mode Liquid Sub-Cooling Values(°F)				
Ambient (°F)	Evaporator Coil Saturation Temperature (°F)				
	40	45	48	50	55
67	9 - 14	8 - 13	8 - 13	7 - 12	5 - 10
72	10 - 15	9 - 14	9 - 14	8 - 13	7 - 12
82	10 - 15	10 - 15	10 - 15	9 - 14	7 - 12
95	10 - 15	10 - 15	10 - 15	9 - 14	8 - 13
105	11 - 16	11 - 16	10 - 15	10 - 15	8 - 13
115	10 - 15	11 - 16	11 - 16	11 - 16	9 - 14

Notes:

1. Microchannel condenser coils are more sensitive to charge. The system must be running in cooling mode with compressor, supply airflow & condenser fan speed at full load. The sub-cooling value changes depending on the ambient temperature reading and the microchannel evaporator coil saturation temperature. To find the correct sub-cooling value, find the ambient temperature on the first column and follow that across to the SST (4.4-12.8°C [40-55°F]).
2. Superheat for Microchannel condenser coils must be between 4.4 and 8.3°C (8 - 15°F)

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 Table 12 and Table 13 above (high superheat results in increased sub-cooling).

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

⚠ CAUTION

DO NOT OVERCHARGE!

Refrigerant overcharging leads to excess refrigerant in the condenser coils resulting in elevated compressor discharge pressure. Maximum allowable charge of any single circuit is 133 kg (4700 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 expansion valve may need adjustment to correct the superheat.

Freeze Stat Startup

Freeze Stat is an adjustable temperature sensor (-23.3°C to 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°C to 1.7°C (32° F to 35º F)

Table 14 – R-410A Refrigerant Temperature-Pressure Chart (Metric)

°C	KPA	°C	KPA	°C	KPA	°C	KPA	°C	KPA
-6.7	539.9	**8.3**	928.8	**23.3**	1473.5	**38.3**	2213.3	**53.3**	3193.8
-6.1	551.6	**8.9**	946.0	**23.9**	1496.9	**38.9**	2245.0	**53.9**	3235.8
-5.6	564.0	**9.4**	963.2	**24.4**	1521.0	**39.4**	2276.7	**54.4**	3277.9
-5.0	576.4	**10.0**	980.5	**25.0**	1545.2	**40.0**	2309.1	**55.0**	3320.6
-4.4	588.8	**10.6**	998.4	**25.6**	1570.0	**40.6**	2341.5	**55.6**	3363.4
-3.9	601.2	**11.1**	1016.3	**26.1**	1594.8	**41.1**	2374.6	**56.1**	3406.8
-3.3	614.3	**11.7**	1034.9	**26.7**	1619.6	**41.7**	2408.4	**56.7**	3450.9
-2.8	627.4	**12.2**	1053.6	**27.2**	1645.1	**42.2**	2442.2	**57.2**	3495.1
-2.2	640.5	**12.8**	1072.2	**27.8**	1670.7	**42.8**	2476.0	**57.8**	3539.9
-1.7	654.3	**13.3**	1090.8	**28.3**	1696.2	**43.3**	2510.5	**58.3**	3585.4
-1.1	667.4	**13.9**	1110.1	**28.9**	1722.4	**43.9**	2544.9	**58.9**	3630.9
-0.6	681.2	**14.4**	1129.4	**29.4**	1749.3	**44.4**	2580.1	**59.4**	3677.1
0.0	695.7	**15.0**	1149.4	**30.0**	1775.5	**45.0**	2616.0	**60.0**	3724.0
0.6	709.5	**15.6**	1169.4	**30.6**	1802.4	**45.6**	2651.8	**60.6**	3771.6
1.1	724.0	**16.1**	1189.4	**31.1**	1829.9	**46.1**	2688.4	**61.1**	3819.1
1.7	738.5	**16.7**	1209.4	**31.7**	1857.5	**46.7**	2724.9	**61.7**	3867.4
2.2	752.9	**17.2**	1230.1	**32.2**	1885.8	**47.2**	2761.4	**62.2**	3915.7
2.8	768.1	**17.8**	1251.4	**32.8**	1914.1	**47.8**	2798.7	**62.8**	3965.3
3.3	783.3	**18.3**	1272.1	**33.3**	1942.3	**48.3**	2836.6	**63.3**	4015.0
3.9	798.4	**18.9**	1293.5	**33.9**	1971.3	**48.9**	2874.5	**63.9**	4065.3
4.4	814.3	**19.4**	1314.9	**34.4**	2000.2	**49.4**	2913.1	**64.4**	4115.6
5.0	829.5	**20.0**	1336.9	**35.0**	2029.9	**50.0**	2952.4	**65.0**	4167.3
5.6	846.0	**20.6**	1359.0	**35.6**	2059.5	**50.6**	2991.7	**65.6**	4219.1
6.1	861.9	**21.1**	1381.8	**36.1**	2089.2	**51.1**	3031.0		
6.7	878.4	**21.7**	1403.8	**36.7**	2120.2	**51.7**	3071.0		
7.2	895.0	**22.2**	1427.3	**37.2**	2150.6	**52.2**	3111.7		
7.8	911.5	**22.8**	1450.0	**37.8**	2181.6	**52.8**	3153.1		

Table 15 - R-410A Refrigerant Temperature-Pressure Chart (Imperial)

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

Condenser Fan Electronically Commutated Motor (ECM) Startup

With Customer Provided Unit Controls AAON Condenser Head Pressure Module is used for variable speed control of the motor to maintain a head pressure. The motor is factory wired to the PWM outputs of the AAON Condenser Head Pressure Module.

See AAON literature for further information. (https://www.aaon.com/Controls)

Note

High voltage wires out of the motor:
Black & Brown - 1 Phase Line Voltage
Green - Ground

Low control voltage wires out of the motor:
Blue - Common
Yellow - Variable Speed Control

Table 16 - ECM Condenser Fan Cycling Options

Color	Terminal	Customer Connection	Option 1	Option 2	Option 3	Option 4	Option 5
Black	0.50 BWS	L1	208-230 VAC	208-230 VAC	208-230 VAC	208-230 VAC	208-230 VAC
Brown	0.50 BWS	L2	208-230 VAC	208-230 VAC	208-230 VAC	208-230 VAC	208-230 VAC
Green	#10 EYELET	Ground	GND	GND	GND	GND	GND
Blue	0.50 BWS	Common	Common	24 VAC	24 VAC	24 VAC	24 VAC
Yellow	0.50 BWS	Signal	PWM		24 VAC		24 VAC
White	0.50 BWS	Signal				24 VAC	24 VAC
Orange	0.50 BWS	Signal		24 VAC		24 VAC	
		RPM	300-1100	300	500	850	1100
		Rotation	CCW	CCW	CCW	CCW	CCW
		ECM Toolbox ID	Variable	Speed 4	Speed 3	Speed 2	Speed 1
		20% PWM RPM	300				
		100% PWM RPM	1100				

VFD Controlled Condenser Fan Startup

With Customer Provided Unit Controls the VFD's are factory provided and factory programmed. VFD's receives input from pressure transducers on each refrigerant circuit and vary the fan speed based on the pressure inputs to maintain a discharge (head) pressure. Standard pressure setpoint is 2.38 MPa (340 psi) for standard air-cooled systems and 2.76 MPa (400 psi) for modulating hot gas reheat air-cooled systems.

With the AAON Condenser Head Pressure Module is used to maintain a discharge pressure. The VFD is factory wired to the outputs of the AAON Condenser Head Pressure Module. See AAON literature for additional information. (https://www.aaon.com/products/controls).

Operation

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

Thermostat Operation

Heating

Thermostat system switch - "Heat"
Thermostat fan switch - "Auto" or "On"
Thermostat temperature set to desired point.

Cooling

Thermostat system switch - "Cool"
Thermostat fan switch - "Auto" or "On"
Thermostat temperature set to desired point.

Air Circulation

Thermostat system switch - "Off"
Thermostat fan switch - "Auto" or "On"
No change of the thermostat temperature.
With these settings, the supply blower will run continuously but the supply air will not be heated, cooled, or dehumidified.

System Off

Thermostat system switch - "Off"
Thermostat fan switch - "Auto"
No change of the thermostat temperature.
With these settings the system is shut down, with the exception of control system power.

Night and Weekend Unoccupied Operation

To reduce the operating time of the unit when the space is unoccupied, such as nights and weekends, it is recommended that the temperature setting be raised about 5°F while unoccupied during the cooling season and lowered about -12.2°C (10°F) during the heating season.

⚠ 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.

Packaged DX Cooling Operation and Control

When a call for cooling (G and Y1, Y2, etc.) is made the supply blower motors and compressors will energize.

Note: When using field controls any variable capacity compressors must run at 100% for 1 minute when starting.

Gas Heater Operation

When heat (G and W1, W2, etc.) is called for the combustion motor starts and the ignition control is energized. The control sends 24 VAC to the main gas valve and high voltage to the igniter. If a burner flame has been detected within 10 seconds, the spark is extinguished and the flame continues. If a flame has not been detected after 10 seconds, the gas valve closes, the spark ceases and the induced draft blower continues to purge the heat exchanger. After 45 seconds of purge, the ignition system will attempt to light the burners again. Should no flame be detected after 3 tries, the ignition control will lock out the system. Power to the ignition control must be cycled to reset the heater control.

On a fault the gas train is shut down by a main limit located in the heat exchanger area or by

an auxiliary limit mounted in the supply fan compartment.

Electric Heating Operation
When a call for heating (G and W1, W2, etc.) is made the supply blower 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 and Heating Operation
Valve control for steam and hot water heating coils are by others. Heating is accomplished by passing steam or hot water through the steam or hot water coil assembly.

Chilled Water or Non-Compressorized DX Cooling Operation
Controls for chilled water cooling coils and non-compressorized DX coil are by others.

Maintenance
(See back of the manual for maintenance log)

At least once each year, a trained, qualified service technician must check out the unit. Fans, evaporator coils, and filters must be inspected at least monthly.

Supply Fans

⚠ WARNING

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

⚠ CAUTION

Blower wheels and bands 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.

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

Re-lubricate bearings 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 RB

DX Cooling
Set unit controls to cooling mode of operation with supply fans on. Check the fan 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 service technician.

Brazed Plate Heat Exchanger Cleaning
Because of a normally high degree of turbulence in brazed plate heat exchangers, for many applications the heat exchanger channels are self cleaning. For applications that are not self cleaning (i.e. hard water at high temperatures, etc.) or applications where additional cleaning is desired, it is possible to clean the brazed plate heat exchanger by circulating a cleaning liquid.

Use a tank with weak acid, 5% phosphoric acid (H_3PO_4) or, if the exchanger is frequently cleaned, 5% oxalic acid ($H_2C_2O_4$). Pump the cleaning liquid through the exchanger. For optimum cleaning, the cleaning solution flow rate must be a minimum of 1.5 times the normal flow rate, preferably in a back-flush mode. After cleaning, the heat exchanger must be rinsed with clean water. A solution of 1-2% sodium hydroxide (NaOH) or sodium bicarbonate (NaHCO) before the last rinse ensures that all acid is neutralized.

E-Coated Coil Cleaning
Documented routine cleaning of e-coated coils is required to maintain coating warranty coverage for fin and tube and microchannel coils. See the AAON E-Coated Coil Maintenance Record sheet.

⚠ WARNING

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

Surface loaded fibers or dirt must be removed prior to water rinse to prevent restriction of airflow. If unable to back wash the side of the coil opposite of the coils entering air side, then surface loaded fibers or dirt must be removed with a vacuum cleaner. If a vacuum cleaner is not available, a ***soft non-metallic*** bristle brush may be used. In either case, the tool 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 and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

A monthly clean water rinse is recommended for coils that are applied in coastal or industrial environments to help to remove chlorides, dirt, and debris. It is very important when rinsing, that water temperature is less than 54.4°C (130°F) and pressure is less than 689.5 kpa (100 psig) to avoid damaging the fin edges. An elevated water temperature (not to exceed 54.4°C [130°F]) will reduce surface tension, increasing the ability to remove chlorides and dirt.

⚠ 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 shall be part of the unit's regularly scheduled maintenance procedures. Failure to clean an e-coated coil will void the warranty and may result in reduced efficiency and durability.

⚠ CAUTION

Harsh chemicals, household bleach, or acid cleaners 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™ 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 ™ 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 ™ 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 ™ Salt Reducer. When finished replace all panels and tops that were removed.

Microchannel Coil Cleaning

Cleaning microchannel coils is necessary in all locations. In some locations it may be necessary to clean the coils more or less often than recommended. Condenser coil must be cleaned at a minimum of once a year. In locations where there is commonly debris or

a condition that causes dirt/grease build up it may be necessary to clean the coils more often. Proper procedure must be followed at every cleaning interval. Using improper cleaning technique or incorrect chemicals will result in coil damage, system performance fall off, and potentially leaks requiring coil replacement.

Documented routine cleaning of microchannel coils with factory provided e-coating is required to maintain coating warranty coverage. Use the E-Coated Coil Cleaning section for details on cleaning e-coated coils.

Field applied coil coatings are not recommended with microchannel coils.

Allowed Chemical Cleaners and Procedures
AAON recommends certain chemicals that can be used to remove buildup of grime and debris on the surface of microchannel coils. These chemicals have been tested for performance and safety and are the only chemicals that AAON will warrant as correct for cleaning microchannel coils.

There are two procedures that are outlined below that will clean the coils effectively without damage to the coils. Use of any other procedure or chemical may void the warranty to the unit where the coil is installed. **With all procedures make sure the unit is off before starting.**

⚠ WARNING ⚠

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

The water pressure used to clean must not exceed 100 psi, from no closer than 6 inches from the coils, and with the water aimed perpendicular to the coils.

#1 Simple Green
Simple Green is available from AAON Parts and Supply (Part# T10701) and is biodegradable with a neutral 6.5 pH A 4 to 1 solution is recommended. Use the following procedure.

1. Rinse the coil completely with water. Use a hard spray but be careful not to bend or damage the fins. A spray that is too hard will bend the fins. Spray from the fan side of the coil.
2. With a pump sprayer filled with a mix of 4 parts water to one part Simple Green spray the air inlet face of the coil. Be sure to cover all areas of the face of the coil.
3. Allow the coil to soak for 10-15 minutes.
4. Rinse the coil with water as in step one.
5. Repeat as necessary.

#2 Water Flush
This procedure can be used when the only material to cause the coil to need cleaning is debris from plant material that has impinged the coil face.

1. Rinse the coil completely with water. Use a hard spray but be careful not to bend or damage the fins. A spray that is too hard will bend the fins. Spray from the fan side of the coil.
2. Spray and rinse the coil from the face.

⚠ CAUTION

Use pressurized clean water, with pressure not to exceed 689.5 kpa (100 psi). Nozzle must be 15.25 centimeters (6”) and perpendicular to the coil face. Failure to do so could result in coil damage.

Application Examples
The two procedures can be used to clean microchannel coils. They will fit with the application depending on the area. In some areas where the spring/summer has a large cottonwood bloom #2 might work fine if the unit is installed on an office building and no other environmental factors apply.

Generally the best and broadest based procedure is #1. The grease cutting effect of the Simple Green is good for restaurant applications.

Other Coil Cleaners
There are many cleaners on the market for condenser coils. Before using any cleaner that is not covered in this section you must get written approval from the AAON warranty and service department. Use of unapproved chemicals will void the warranty.

AAON testing has determined that unless a chemical has a neutral pH (6-8) it must not be used.

Beware of any product that claims to be a foaming cleaner. The foam that is generated is caused by a chemical reaction to the aluminum fin material on tube and fin coils and with the fin, tube, and coating material on microchannel coils.

Microchannel coils are robust in many ways, but like any component they must be treated correctly. This includes cleaning the coils correctly to give optimal performance over many years.

Roofing
The cleaning procedures outlined here use relatively benign ingredients. When working with a rooftop unit care must be taken to make sure the chemicals will not adversely affect the roof coating. Checking with the roofing supplier/manufacturer is the best way to proceed. If the roofing supplier/manufacturer is not available testing of the chemicals on the roof coating is recommended.

Commercial roofing material manufacturers using PVC and EPDM have been contacted and indicate that there should be no problem with any of the procedures outlined above.

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.

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.

Options

(See back of the manual for maintenance log)

Heating Coils

One or two row hot water and steam heating and preheating coils can be factory installed. All valve controls for heating operation are field supplied and field installed. Hot water and steam coil connections are spun copper tube.

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.

⚠ WARNING

Piping, pressure limiting devices, backflow preventers and all other safety requirements shall be in accordance with national and local codes.

⚠ CAUTION

The unit shall have proper sealing of the water piping entries into the unit. Failure to seal the entries may result in damage to the unit and property.

Table 17 - Hot Water Coil & Steam Coil Connection Sizes

Model (RNA-)	Hot Water Coil Connection Size	Steam Coil Connection Size	Coil Connection Quantity*
075, 090, 105, 120, 130, 140	2-1/8”	2-1/8”	2/2

Note: 2 1/8” = 54 mm

* In/Out Connections

Table 18 - Preheat Hot Water Coil Connection Sizes

Model (RNA-)	Preheat Hot Water Coil Connection Size	Coil Connection Quantity*
075	1-3/8”	2/2
090, 105, 120, 130, 140	1-3/8”	4/4

Note: 1 3/8” = 35 mm

* In/Out Connections

Table 19 - Preheat Steam Coil Connection Sizes

Model (RNA-)	Preheat Steam Coil Connection Size	Coil Connection Quantity*
075	2-1/8”	4/4
090, 105, 120, 130, 140	2-1/8”	4/4

* In/Out Connections

Note: 2 1/8” = 54 mm

Chilled Water Coil

Four or six row chilled water cooling coils can be factory installed. All valve controls for cooling operation are field supplied and field installed. Chilled water coil connections are spun copper tube.

Table 20 - Chilled Water Coil Connection Sizes

Model (RNA-)	Chilled Water Coil Connection Size	Coil Connection Quantity*
055, 065, 075	2 1/8”	2/2
090, 105, 120, 130, 140	2 1/8”	4/4

* In/Out Connections

Note: 2 1/8” = 54 mm

Table 21 - Min and Max Water Pressures and Temps

	Chilled Water	Hot Water
Min. Entering Air	15.6°C (60°F)	4.4 °C (40°F)
Max Entering Air	37.8°C (100°F)	26.7°C (80°F)
Min. Entering Water	1.7°C (35°F)	60°C (140°F)
Max Entering Water	18.3°C (65°F)	93.3°C (200°F)
Min. Water Pressure	0 kpa (15 psig)	
Max Water Pressure	2068kpa (300 psig)	

Packaged Direct Expansion (DX) Units

⚠ 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.

All DX refrigeration systems are factory assembled, leak tested, charged with refrigerant, and run tested.

All refrigerant systems include an evaporator, condenser, liquid line filter driers, expansion valves and scroll compressors.

⚠ CAUTION

CRANKCASE HEATER OPERATION

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

Never cut 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 will 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 servicing, 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.

Note: Low Ambient Operation
Air-cooled DX units without a low ambient option, such as condenser fan cycling or the -17.8°C (0°F) low ambient option, will not operate in the cooling mode of operation properly when the outdoor temperature is below 12.8°C (55°F). Low ambient and/or economizer options are recommended if cooling operation below 12.8°C (55°F) is expected.

⚠ CAUTION

Polyester (POE) and Polyvinyl ether (PVE) oils are two types of lubricants used in hydrofluorocarbon (HFC) refrigeration systems. Refer to the compressor label for the proper compressor lubricant type.

Note: Multiple Units with Multiple Thermostats

When several heating and cooling units are used to condition a space all unit thermostat switches must be set in either heating mode, cooling mode or off. Do not leave part of the units switched to the opposite mode. Cooling only units must be switched off at the thermostat during the heating season.

Evaporator Coil

⚠ WARNING

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

Removal

Isolate the evaporator section and recover the refrigerant in that section. Make sure to weigh the amount of refrigerant recovered.

Remove the expansion valve bulbs and/or the valve controller from the suction lines.

Disconnect the suction and liquid line copper connections to the evaporator coil.

Depending on the configuration, remove additional components such as filters, reheat coils or UV lights to allow the coil to be removed.

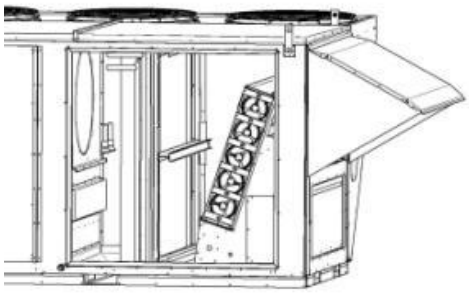


Figure 11 - Evaporator Coil Access

Remove the screws attaching the filter rack to the evaporator coil blank-off panels at the door opening and along the top of the coil.

Remove the screws attaching the filter rack to the back wall. Angle filter rack away from coil so it fits through the door opening. It may be necessary to remove economizer damper assembly.

Remove screws attaching access side, back, and top blank-off panels to the evaporator coil and the unit.

Angle the coil so that it fits through the door opening.

Remove the evaporator coil.

Reinstallation

Install the coil in the unit drain pan. There should be about a 6.4 mm (1/4”) gap between the upstream side of the coil and the back of the drain pan.

Secure the coil to the back wall of the unit with the blank-off panel. Attach the top and access side blank-off panels to the coil.

Attach the filter rack to the back, top, and access side coil blank-off panels upstream of the coil. Reinstall economizer damper assembly if necessary.

Connect the suction and liquid copper connections to the evaporator coil. Reinstall the expansion valve bulbs on the suction lines.

Depending on the configuration, additional components might need to be reinstalled.

Evacuate the refrigerant systems. Weigh in the nameplate refrigerant charge.

See Adjusting Refrigerant Charge section to check for proper sub-cooling and superheat of the refrigerant systems.

Condenser Fans
Condenser fans and motors can be removed and reinstalled as individual assemblies.

⚠ WARNING

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

⚠ 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.

Removal
Take off the fan grill by removing the screws that attach it to the orifice.

The condenser fan motor wires can then be accessed and disconnected.

Remove the screws that attach the orifice to the condenser assembly. The screws are located on the top of the orifice around the perimeter, and in some cases, through the side of the condenser assembly into the orifice.

With the wires disconnected and the screws removed, the fan, motor and orifice assembly can be lifted off the unit.

Figure 12 - Removal of a Condenser Fan Assembly

Reinstallation
Set the condenser fan, motor and orifice assembly back into the condenser assembly with the motor wires on the side closest to the control panel.

Attach the orifice to the condenser assembly using all of the points where screws were removed.

Reconnect the fan motor wires.

Attach the fan grill at all of the points where screws were removed.

Suction Filter
In an effort to help protect the compressors from contaminants during testing and startup, AAON is now factory installing pleated

replaceable core suction line filters on the RN Series E Cabinet products (75-140 tons)

Figure 13 - RPE-48-BD filter element

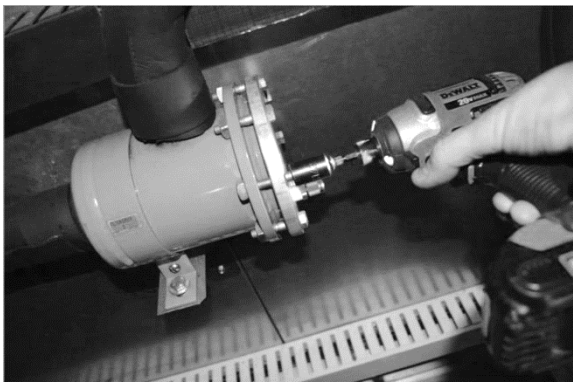
One month after startup, remove the RPE-48-BD filter element for the lowest possible pressure drop. Removing the suction line filter will improve the efficiency and capacity of the unit. AAON installs isolation ball valves on both sides of the suction line filter so the complete system will not have to be reclaimed/evacuated.

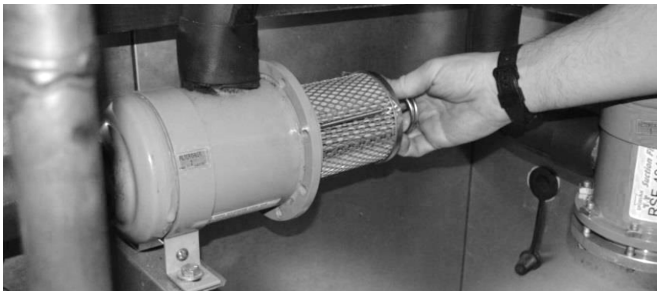
Suction Filter Removal Instructions

1. Shut down operation of the unit
2. Close both shut-off valves to isolate the suction filter
3. Reclaim the refrigerant from the suction filter section

4. Remove the bolts from the suction filter end plate

5. Remove the pleated filter assembly





6. Replace the suction filter end plate and bolts
7. Evacuate the suction filter assembly to 300 microns
8. Open both shut-off valves

Energy Recovery Units

Some RN Series E Cabinet units have been equipped with an energy recovery wheel. AAON provides options for either an aluminum energy recovery wheel or a polymer energy recovery wheel. Follow the instructions for the specific type of energy recovery wheel in your installed equipment.

⚠ 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.

Initial Mechanical Check and Setup

Outdoor units equipped with outside air intake will have an outside air hood. The outside air hood must be opened prior to unit operation.

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. Apply power and observe that the wheel rotates. If the wheel does not rotate when power is applied, it may be necessary to readjust the "diameter air seals".

Controls

A variety of controls and electrical accessories may be provided with the equipment. Identify the controls on each unit by consulting appropriate submittal, or order documents, and operate according to the control manufacturer's instructions. If you cannot locate installation, operation, or maintenance information for the specific controls, then contact your sales representative, or the control manufacturer for assistance.

⚠ WARNING

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

Aluminum Energy Recovery Wheel

This section is provided to assure the energy recovery feature will be properly setup to perform in accordance with the job specifications for your particular application.

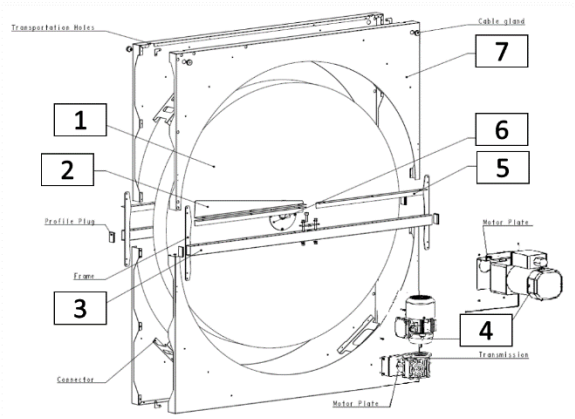
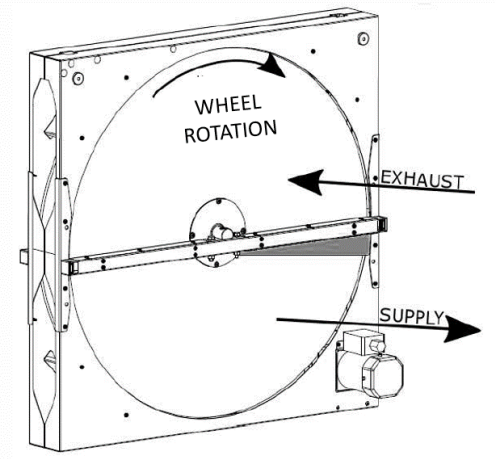


Figure 14 - Aluminum Energy Recovery Wheel

1. Monolith energy recovery wheel
2. Purge Sector
3. Profile
4. Motor
5. Brush Plate
6. Rotor Hub
7. Casing

Aluminum Wheel Check Purge Location

The purge sector is an optional element so it may not be installed on some units. Ensure the purge sector is mounted in the correct location. Purge sector must be located on the fresh supply air side. Based on the airflow and the wheel rotation in the following illustrations, notice the correct locations for the purge sector.



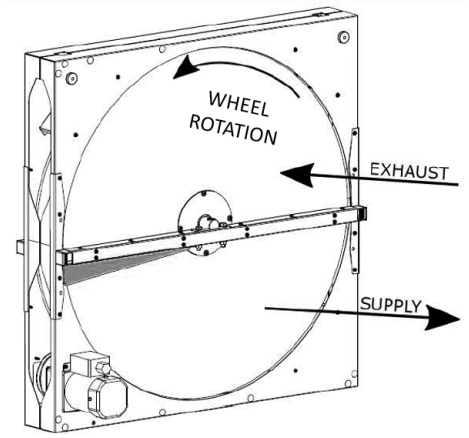
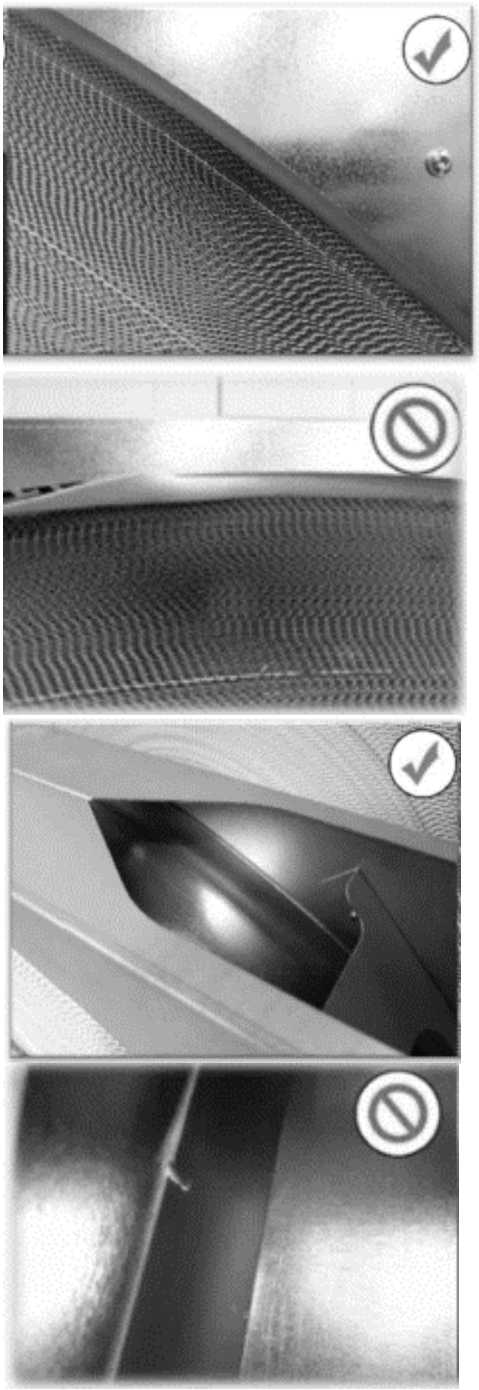


Figure 15 - Aluminum ERW Purge Sector Location

Aluminum Wheel Air Seals

Both non-contact sealing on wheel peripheries and brush sealing middle beam are maintenance-free but their condition must be checked every year. During the inspection, check their tightness and overall visual condition. Non-contact seals must not be flipped, rolled or pierced at any place

If seals are damaged, please contact our technical support immediately. A damaged seal may cause efficiency deterioration, mixing of an air flows and unwanted leakages in the system, especially in environments with hygienic requirements.



Aluminum Wheel Brush Plate

Brushes are located on both upper sides of the profiles. Inspect their condition and whether they adhere to the surface of the wheel matrix. Over time, the brushes may lose their cleaning properties and it will be necessary to replace them or simply change their position

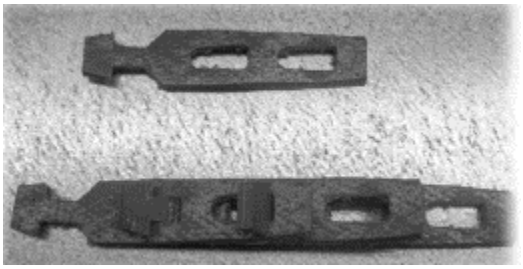
on the profile. In order to adjust their position unscrew them and place properly.

Aluminum Wheel Purge Sector
Purge sectors are maintenance-free but their condition, rigidness and cleanliness must be checked every year. Pay attention to the distance of the sector against the recovery wheel matrix. Use compressed air to clean, if required.

Aluminum Wheel Drive Components
Drive belt requires periodic inspections. Due to material property, belt may stretch, therefore it may require user to increase the tension, upon inspection.

Belt tension must be checked after the first 24 hours of operation and at least once per year.

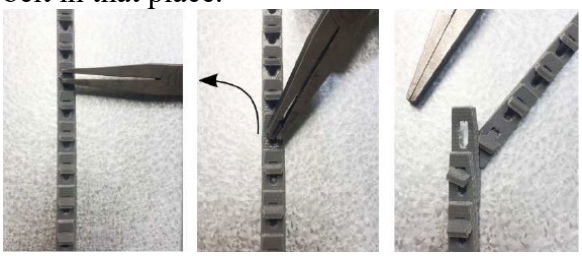
If segmented drive belt becomes too loose it is necessary to pull out few segment modules (Fig. 10) of the belt and shorten the overall length to desired amount in order to achieve optimal tension.



Correct tension should prevent ability to insert anything underneath the belt on the entire length between the belt and the wheel. Belt must not slip.

Annually inspect the visual condition of the belt all along the wheel. Be sure that belt does not show signs of mechanical damage. Check the convergence on the wheel pulley. The belt must pass freely without encountering any obstacles inside the housing. Due to the segmented design of the belt, replacing individual segments is enough to restore functionality. Please follow the instructions below, presenting proper way of replacing segments or increasing belt tension.

1. Unclip the belt using pliers. Grab the protruding tongue of the segment to remove and twist it to release the segment from the chain. Disconnect the belt in that place.



2. Remove the necessary amount of segments to increase the belt tension.
3. Connect the shortened belt ends by inserting the protruding tongue through the hole of the other half of the belt.
4. Grab the second tongue and similarly insert it through the second hole – this time use the pliers to drag the segment tongue easier and twist it back to the starting position.
5. Your belt is now shortened and the tension of the belt is increased.

Polymer Energy Recovery Wheel
This section is provided to assure the polymer energy recovery feature will be properly setup to perform in accordance with the job specifications for your particular application.

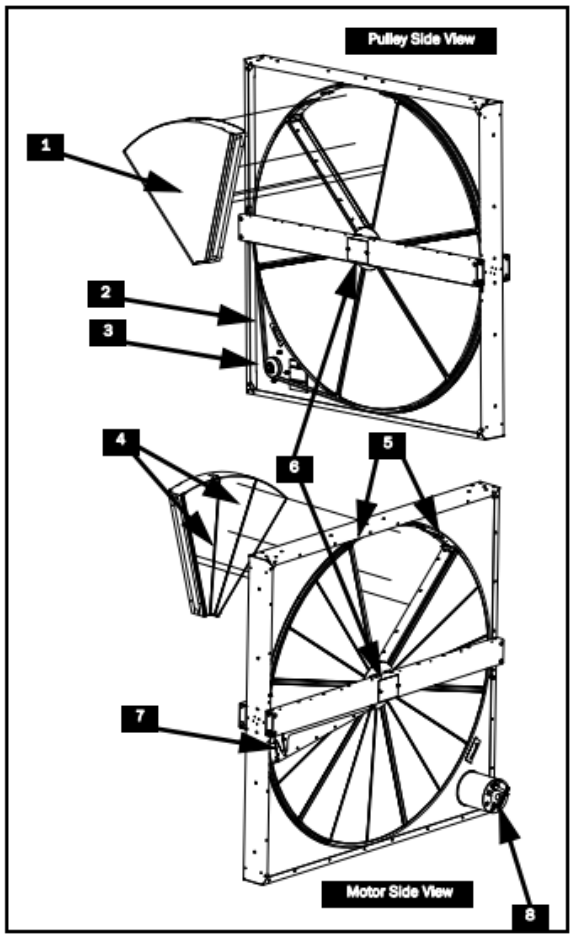


Figure 16 - Polymer Energy Recovery Wheel

1. Removable Segment
2. Permanent Tension Belt
3. Pulley
4. Embedded Segment Stiffeners
5. Segment Retaining Latches
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.

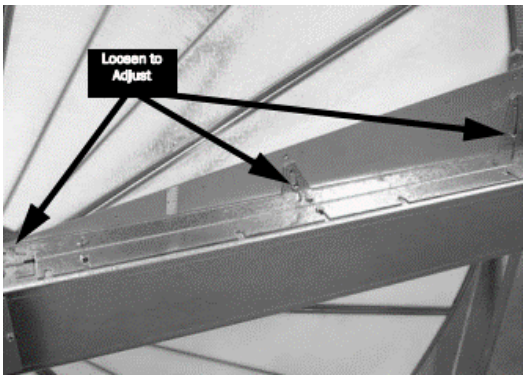
The initial setup and servicing of the energy recovery wheel is very important to maintain proper operation efficiency and building occupant comfort.

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

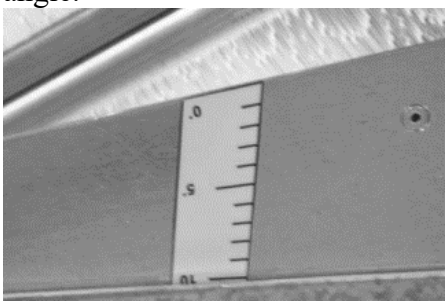
Wiring diagrams are provided with each motor. When wired according to wiring diagram, motor rotates clockwise when viewed from the shaft/pulley side.
By carefully reviewing the information within this section and following the instructions, the risk of improper operation and/or component damage will be minimized.

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

Polymer Wheel Set Purge Angle
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:



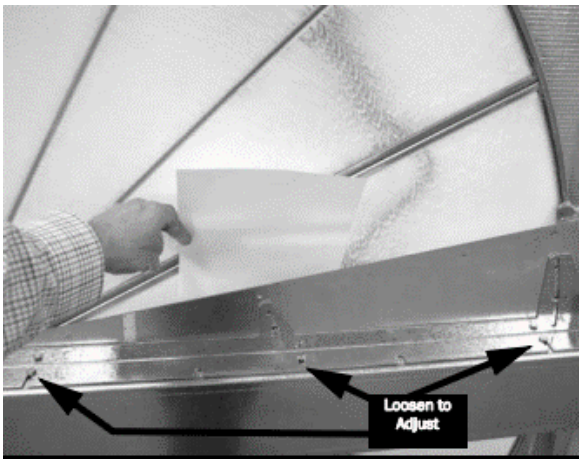
1. Loosen the three purge adjusting screws.
2. Adjust purge sector to the specified angle.



3. Tighten the purge adjusting screws.
4. Turn the wheel by hand clockwise (when viewed from pulley side) to check for interference.

Polymer Wheel Check Purge Seal

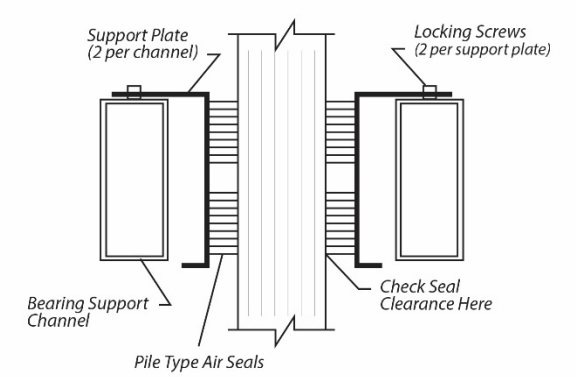
If a purge is installed, check for a slight interference fit between the seal and the face of the wheel by sliding a piece of paper ("feeler gauge") between the seal and the media a multiple locations along the purge seal as you rotate the wheel slowly by hand (clockwise when viewed from the pulley side).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

Polymer Wheel Air Seal Adjustments

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



Cross Section of Air Seal Structure

Polymer 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 feller gauge, (typically each .004" thick) by placing it between the face of the wheel and pile seal.

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

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

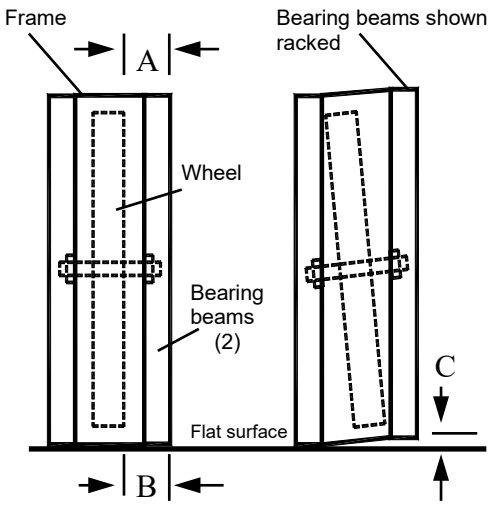
to provide slip fit clearance when the wheel is rotated by hand.

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

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

Polymer Wheel 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. Where cassettes are permanently installed in a cabinet, access to both sides of the cassette must be provided.

Polymer Wheel 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.



Avoid Racking of Cassette Frame

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 .64 centimeters (1/4 of an inch) (dimension A & B). This amount of racking can be compensated for by adjusting the diameter seals.

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

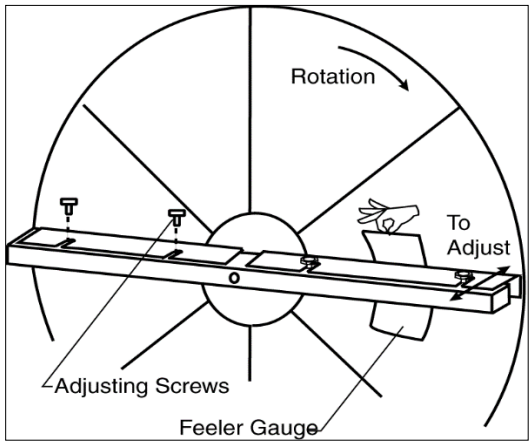
Polymer Wheel Startup Procedure

⚠ CAUTION

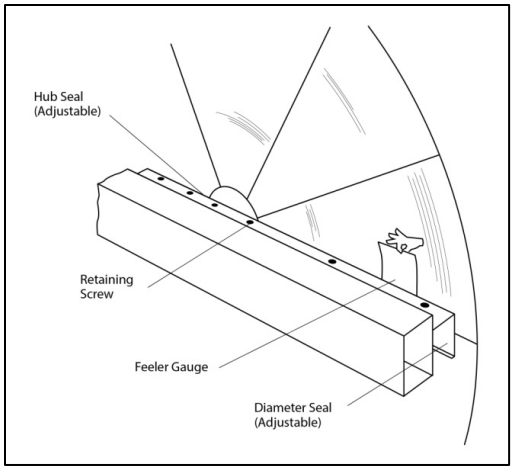
Keep hands away from rotating wheel! Contact with rotating wheel can cause physical injury.

1. By hand, turn wheel clockwise (as viewed from the pulley side), to verify wheel turns freely through 360º 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 .64 cm (1/4") from outer edge of rim).



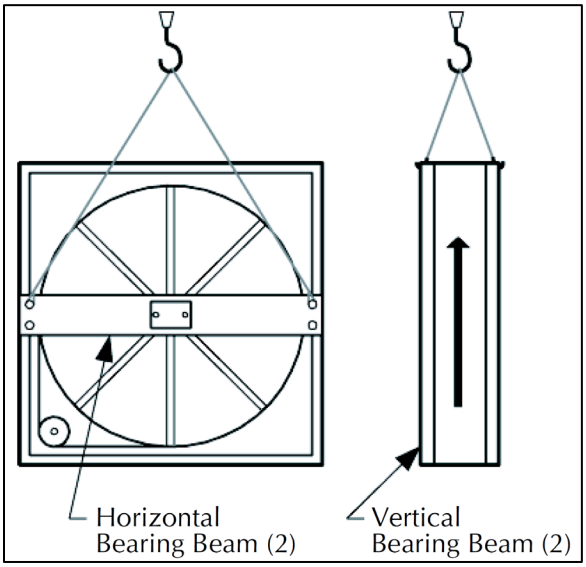
Diameter Seal Adjustment



Hub Seal Adjustment

Polymer Wheel Routine Maintenance and Handling

Handle cassettes with care. Lift all cassettes 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.



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:

Polymer 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.

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

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

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

Polymer Wheel Service

⚠ CAUTION

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

Polymer Wheel Segment Installation & Replacement
An uneven number of segments in the wheel will cause the wheel to accelerate in rotation. Minimize wheel imbalance and unwanted rotation during service by installing or removing opposing segments for even weight distribution. Failure to maintain control of the wheel rotation while removing or installing all segments could cause severe injury to fingers or hands. Always close and secure segment retaining latches before rotating wheel.

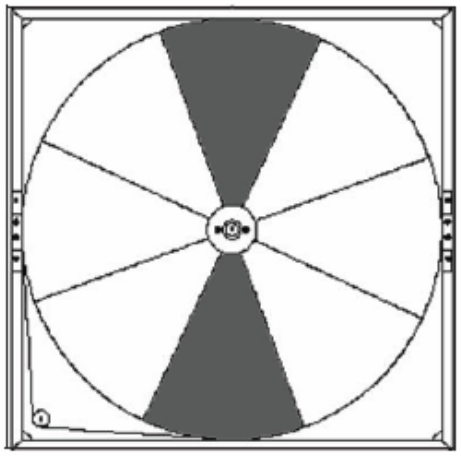
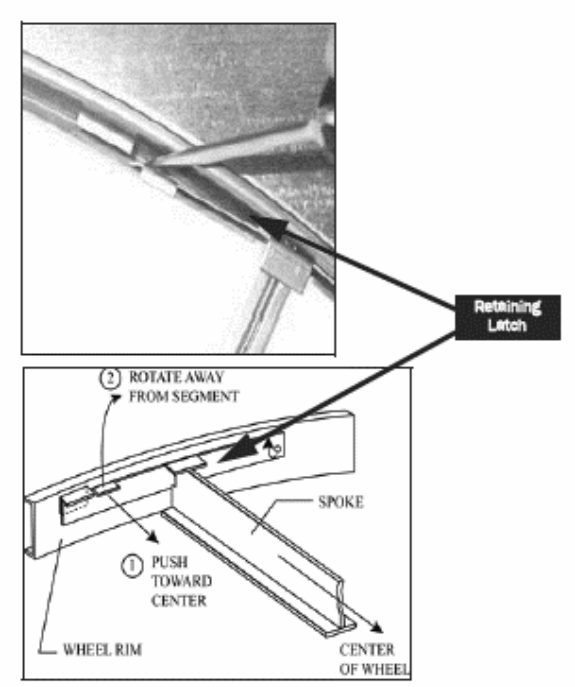


Figure 17 - Wheel Segment Removal Pattern

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 Latches.



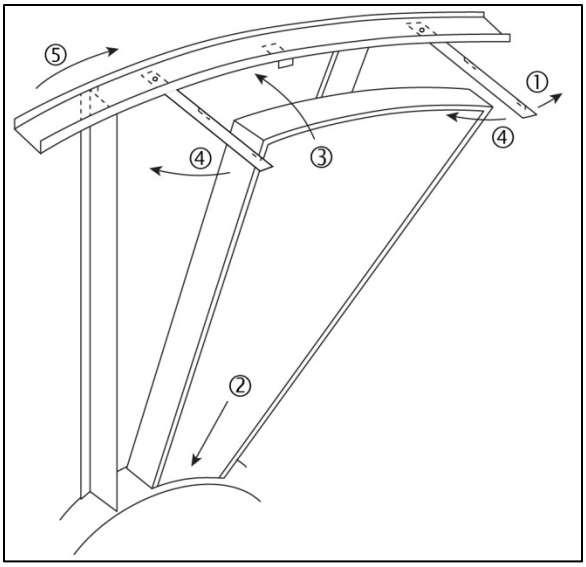
Segment Retainer

To install wheel segments follow the steps below. Reverse procedure for segment removal.

Disconnect power from the wheel.

Gain access to the wheel and slide wheel frame out of cabinet.

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.



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 180º. Install the second segment opposite the first for counterbalance. Rotate the two installed segments 90º to balance the wheel while the third segment is installed. Rotate the wheel 180º again to install the fourth segment opposite the third. Repeat this sequence with the remaining four segments.

Polymer 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.

Polymer Wheel Belt Replacement

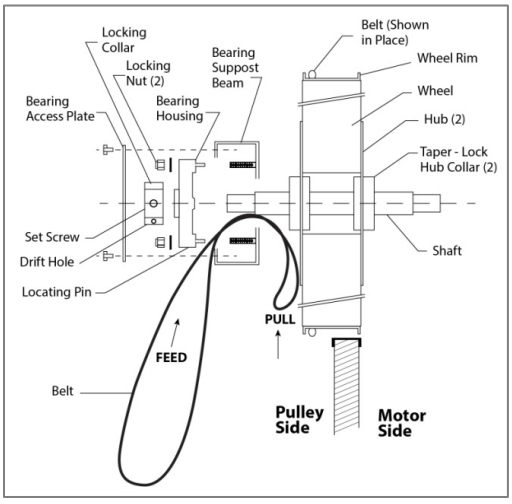
1. Obtain access to the pulley side bearing access plate if bearing access plates are provided. Remove two bearing access plate retaining screws and the access plate.
2. Using hexagonal wrench, loosen set screw in bearing locking collar. Using light hammer and drift (in drift pin hole) tap collar in 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.

⚠ 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.



Belt Replacement

Energy Recovery Wheel General Cleaning

Routine maintenance of the Energy Recovery Wheel includes periodic cleaning of the Energy Recovery Wheel as well as inspection

of the Air Seals and Wheel Drive Components.

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.

⚠ CAUTION

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

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.

Table 22 - Energy Recovery Wheel Cleaning Frequency

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

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

The energy recovery wheel is "self-cleaning" with respect to dry particles due to its laminar flow characteristics. Smaller particles pass through; larger particles land on the surface and are blown clear as the flow direction is reversed. Any material that builds up on the face of the wheel can be removed with a brush or vacuum. The primary need for cleaning is to remove oil based aerosols that have condensed on energy transfer surfaces. A characteristic of all dry desiccants, such films can close off micron sized pores at the surface of the desiccant material, reducing the efficiency by which the desiccant can adsorb and desorb moisture and also build up so as to reduce airflow.

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

Aluminum Wheel Cleaning

See general energy recovering cleaning section for how often to clean.

To clean, gain access to the aluminum energy recovery wheel then use the following methods:

- Use a brush or vacuum cleaner to remove small foreign materials.
- Use compressed air at a distance of at least .08 m (2 ft) from the wheel. Too much pressure can easily damage the aluminum media.
- First remove the energy recovery wheel from the unit. Then use water at a distance of at least .08 m (2 ft) from the wheel. Do not use detergents. Keep temperature below 25°C (77°F). Tightly cover all electric parts and bearings while used pressurized water. Remove excess water before reinstalling the wheel.

Polymer Wheel Cleaning

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.

⚠ 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!

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

Energy Recovery Wheel Defrost Timer Setting
Set Mode to D

T1 is the on time

- Set T1 range to 10m (10 minutes)
- The scale should show 0-6 on the dial
- Set T1 dial to 3 which equals 30 minutes of run time

T2 is the off time

- Set T2 range to 1m (1 minute)
- The scale should show 0-6 on the dial
- Set T2 dial to 2 which equals 2 minutes of off time

Adjust temperature dial to set the point at which any temperature below will activate the defrost timer. Recommended setting is 1.7°C (35°F).

Once the OA Temperature goes below the setpoint, the wheel timer will stop for 2 minutes and run for 30 minutes and will continue to cycle at this rate as long as OA Temperature is below setpoint. If more off time is required to defrost the wheel, increase the T2 Knob time to a greater off time than 2 minutes.

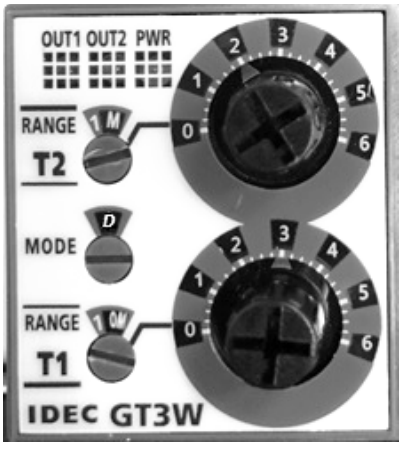


Figure 18 - Defrost Timer

Figure 19 - Temperature Dial

Gas or Electric Heating
The unit is designed to heat a given amount of air while operating. If this amount of air is greatly reduced, approximately 1/3 during the heating season, the gas heat exchanger or electric heating coil may overheat, and may cut the burner or heater off entirely by action of the safety high temperature limit devices which are factory mounted at the heat exchanger and supply fan areas.

Adjust airflow after installation to obtain an air temperature rise within the range specified on the unit rating plate at the required external static pressure.

Should overheating occur with a gas heat exchanger, or the gas supply fail to shut off, shut off the manual gas valve to the furnace before shutting off the electrical supply.

Prolonged overheating of the heat exchanger will shorten its life.

If unit has not been selected as a 100% outside air unit (makeup air unit) the return air duct must be sealed to the unit and the return air temperature must be maintained between 12.8°C (55°F) and 26.7°C (80°F).

Table 23 - Electric and Gas Heating Capacities

Model Option B3	Gas Heat Input Capacity	Gas Heat Output Capacity	Electric Heat Capacity	
	MBH	MBH	kW (208V)	kW (230V, 380V 460V, 575V)
1 = *Heat 1*	800.0	640.0	60.1	80
2 = *Heat 2*	1200.0	960.0	90.2	120
3 = *Heat 3*	1600.0	1280.0	120.3	160
4 = *Heat 4*	2000.0	1600.0	150.4	200
5 = *Heat 5*	2400.0	1920.0	180.5	240
6 = *Heat 6*			210.5	280
7 = *Heat 7*			240.6	320

Gas Heating

Verify the unit nameplate agrees with the proper gas supply type and amount.

Gas piping shall be installed in accordance with local codes, or in the absence of local codes, installation shall conform to the current (United States) National Fuel Gas Code ANSI-Z223.1/NFPA 54 or the current (Canada) National Fuel & Propane Installation Code CSA B149.1 or B149.2.

⚠ WARNING

FOR YOUR SAFETY

Read the entire gas heating installation section of this manual before beginning installation of the gas heating section.

If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

Table 24 - 75-140 ton Gas Connections

Model Option B3	Input MBH	Connections	
		Quantity	Size
1	800	2	1” NPT
2	1200		1-1/2” NPT
3	1600		
4	2000		
5	2400		

Note: 1” = 25 mm, 1 1/2” = 38 mm

After verifying gas inlet pressure and manifold pressure the service technician shall time the gas flow rate through the gas meter with a stopwatch to verify the gas input rate.

Unit nameplate input rate value has been calculated at the altitude where the unit was shipped. Above 609.6 m (2,000 ft) the input rate is adjusted 4% for every 304.8 m (1,000 ft.)

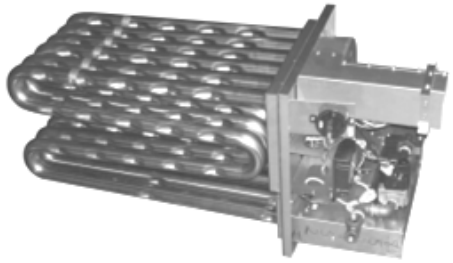


Figure 20 - RN Series E Cabinet Gas Heat Exchanger

Table 25- (**Metric**) Natural Gas Maximum Piping Capacities (m^3/hr)
- Specific Gravity = 0.6, Supply Pressure ≤ 3.5 kpa, Pressure Drop = 0.93 mmHg

	Length of Pipe				
Pipe Size (mm)	6.1 m	15.2 m	30.4 m	45.6 m	60.8 m
12.7	3.4	2	1.4	1.1	1
19	7	4.2	2.9	2.4	2
25.4	13	8	5.5	4.5	3.8
31.75	26.9	16.4	11.3	9.2	7.9
38.10	41.3	25.5	17.6	14.2	12.2
50.80	77.9	47.6	32.6	26.9	22.7
63.50	123.2	75.0	52.4	42.5	36.2

Table 26 - **(Imperial)** Natural Gas (ft^3/hr) Maximum Piping Capacities
Specific Gravity = 0.6, Supply Pressure ≤ 0.5 psi, Pressure Drop = 0.5" w.c.

	Length of Pipe				
Pipe Size	20 ft	50 ft.	100 ft.	150 ft.	200 ft.
1/2"	120	73	50	40	35
3/4"	250	151	103	84	72
1"	465	285	195	160	135
1-1/4"	950	580	400	325	280
1-1/2"	1460	900	620	500	430
2"	2750	1680	1150	950	800
2-1/2"	4350	2650	1850	1500	1280

Table 27 **(Metric)** Propane (kW) Maximum Piping Capacities
Specific Gravity = 1.52, Supply Pressure = 2.34 kpa., Pressure Drop, 0.93 mmHg

	Length of Pipe				
Pipe Size (mm)	6.1 m	15.2 m	30.4 m	45.6 m	60.8 m
12.7	0.6	0.4	0.3	0.2	0.2
19	1.3	0.8	0.6	0.5	0.4
25.4	2.5	1.5	1.0	0.9	0.7
31.75	438.1	266.7	184.6	149.5	127.5
38.10	672.6	414.7	285.7	230.1	194.9
50.80	1269.0	775.2	530.5	438.1	375.1

Table 28 – **(Imperial)** Propane (kBtu/hr) Maximum Piping Capacities
Specific Gravity = 1.52, Supply Pressure = 11" w.c., Pressure Drop, 0.5" w.c.

Pipe Size	Length of Pipe				
	20 ft	50 ft.	100 ft.	150 ft.	200 ft.
1/2"	189	114	78	63	55
3/4"	393	237	162	132	112
1"	732	448	307	252	213
1-1/4"	1496	913	630	511	440
1-1/2"	2299	1417	976	787	675
2"	4331	2646	1811	1496	1260

Do not use gas piping smaller than unit gas connections. Natural gas pipe that runs longer than 6.1 meters (20 feet) and propane gas pipe that runs longer than 15.2 meters (50 feet) may require a larger supply pipe than the unit connection size. Some utility companies may also require pipe sizes larger than the minimum sizes listed.

Piping Sizing Examples
A 100 ft pipe run is needed for a 1080 MBH natural gas heater. The natural gas has a rating of 1000 Btu/ft^3 and a specific gravity of 0.6 (Obtain these values from the local gas supplier.)

$$1080\,MBH \times \frac{ft^3}{1000\,BTU} = 1080 \text{ ft}^3\text{/hr}$$

From the natural gas maximum capacities table, at 100 ft and 1080 ft^3/hr the required minimum pipe size is 2".

A 100 ft pipe run is needed for a 270 MBH propane gas heater.

270 *MBH* = 270 kBtu/hr

From the propane gas maximum capacities table, at 100 ft and 270 kBtu/hr the required minimum pipe size is 1".

Inlet and Manifold Pressures
For natural gas units, the minimum inlet gas pressure to the unit is 11.2 mmHg (6" w.c.) and maximum inlet gas pressure to the unit is 19.6 mmHg (10.5" w.c.). For propane units, the minimum inlet gas pressure to the unit is 20.6 mmHg (11" w.c.) and the maximum inlet gas pressure to the unit is 24.3 mmHg (13" w.c.) A field provided 3.2 mm (1/8") NPT pressure tap is required to be installed in the piping just upstream of the shutoff valve for test gage connection to allow checking of the gas supply pressure at the unit.

A factory installed pressure tap on the outlet end of the gas valve can be used to verify a manifold pressure of 6.5 mmHg (3.5" w.c.) for natural gas, or 19.6 mmHg (10.5" w.c.) for propane.

⚠ CAUTION

Heater must be disconnected from the gas supply piping during pressure testing of the supply piping system with pressures in excess of 3.45 kpa (½ psi). Gas valves can be damaged if subjected to more than 3.45 kpa (½ psi).

Gas Pressure Regulator & Overpressure Protection Device
A gas pressure regulator shall be installed if natural gas supply pressure to the unit is greater than 10.5" w.c. and less than 2 psi (55.4" w.c.) and if propane gas supply pressure is greater than 13" w.c. and less than 2 psi (55.4" w.c.). Regulators shall comply

with the latest edition of the Standard for Line Pressure Regulators, ANSI Z21.80/CSA 6.22.

Both a gas pressure regulator and overpressure protection device (OPD) shall be installed if gas supply pressure to the unit is greater than 2 psi (55.4" w.c.) and less than 5 psi (138.4" w.c.), in compliance with ANSI Z21.80/CSA 6.22. For proper heater operation, pressure to the regulator SHALL NOT be greater than 5 psi (138.4" w.c.).

Piping Supports
Gas supply piping shall be supported directly at the connection to the unit and at intervals listed in the following table with metal straps, blocks, or hooks. Piping shall not be strained or bent.

Table 29 - Gas Piping Supports (Metric)

Pipe Size (mm)	Support Intervals
12.7 to 19.1	Every 1.8 m
19.1 to 25.4	Every 2.4 m
44.5 or Larger (Horizontal)	Every 3 m
31.8 or Larger	Every Floor

Table 30 – Gas Piping Supports (Imperial)

Pipe Size	Support Intervals
1/2" to 3/4"	Every 6 ft
3/4" to 1"	Every 8 ft
1-3/4" or Larger (Horizontal)	Every 10 ft
1-1/4" or Larger (Vertical)	Every Floor

Additional Gas Piping Considerations
Local codes will usually require a field provided and installed manual main shutoff valve and union external to the unit. Main shutoff valve shall be labeled. Install a drip leg near the unit connection to trap sediment and condensate. Pipe joint compounds used on all gas piping connections shall be resistant to liquid petroleum gases. If flexible gas piping to the unit, or in the unit, must be replaced connectors cannot be reused, only new connectors may be used.

Heat exchanger comes equipped with a condensate drain which shall be plumbed to the appropriate drain according to the (United States) National Fuel Gas Code ANSI-Z223.1/NFPA 54 or the current (Canada) National Fuel & Propane Installation Code CSA B149.1 or B149.2, the International Building Code, and any applicable local and regional codes and regulations.

For 75-140 ton units, the heat exchanger condensate drain connection from the unit is a 19mm (3/4") PVC connection. The heat exchanger condensate drain can be tied into the evaporator condensate drain, if code allows.

AAON gas fired heat exchangers are designed to be non-condensing. These heat exchangers are mounted downstream of the cooling coils. During the cooling season the ambient air inside the heat exchanger tubes can condense due to cold air being blown over the outside of the tubes. The amount of condensation will vary depending on the ambient air temperature and humidity as well as air temperature over the tubes. This condensation can be drained onto the roof or into any waste drain.

Typically during the heating season the heat exchanger will not make any condensation. However, short-cycling of the heater can prevent the flue gases from reaching temperatures above dew point (about 54.4°C [130^0F]) which can cause condensation in the heat exchanger.

Staged or modulated heat exchangers may produce condensate depending on the firing rate, ambient air temperature and humidity as well as the percentage and temperature of

outside air being introduced to the unit. This condensate is generally between a 2.9 and 4 pH level.

Condensation made in the heat exchanger during the heating mode may need to be managed and not just drained onto the roof depending on national and local code requirements and the application of the final user. This condensate can stain the roof and it can cause rust in some cases on metal roofs. It is the responsibility of the end user or contractor to determine if the condensate will damage the roofing material.

Below freezing ambient air temperatures during the heating mode can freeze any condensation made in the drain lines. Smaller amounts of condensation may not cause any issues but for larger amounts of condensate and low ambient air temperatures (below freezing for multiple consecutive days) the internal and external drain lines for the unit will need to be heat traced to prevent freezing. Heat traced internal drain lines are required and a factory provided standard feature on the condensate drain with the high turndown modulating gas option.

A condensate neutralizer vessel and connecting tubing can be added to the equipment if required. For below freezing ambient temperature applications the neutralizer, connecting tubing and drain lines will require heat tracing to prevent condensate freezing. These components are the responsibility of the installer.

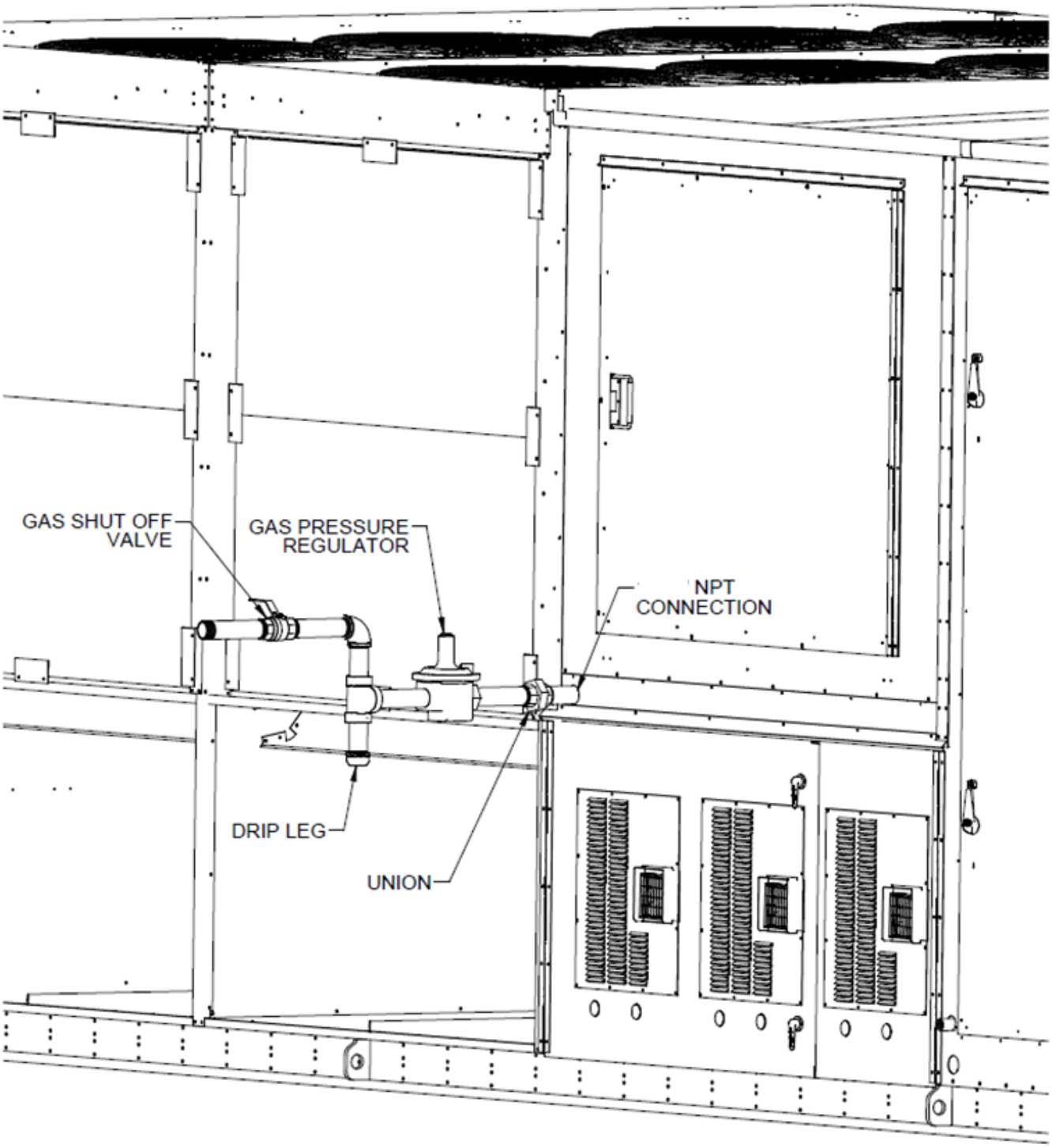


Figure 21 - Example and 75-140 ton for across the Roof Gas Piping
Note: There will be two gas connections, one on each side of the unit

Leak Testing

All components of gas supply system, including manual shut off valves and the piping in the interior of the unit, shall be leak tested with a soap solution before operating the appliance and at least on an annual basis thereafter.

⚠ DANGER

LEAK CHECK GAS PIPE

The gas pipe in the unit shall be checked for leaks before operation and startup. Unit must not be placed in operation until a leak check has been conducted for all gas piping connections. All connections shall be checked for leaks annually after installation. Gas leaks could result in fire, explosion, or other hazardous situations.

⚠ DANGER

Do not use open flame or other source of ignition for leak testing. Fire or explosion could result causing property damage, personal injury, or death.

⚠ CAUTION

Some soaps used for leak detection can be corrosive to certain metals. Rinse piping thoroughly after leak test has been completed.

All gas fired heat exchangers are completely tested at the factory before shipment. This will remove nearly all of the oils that have been used in the manufacturing process. However, trace amounts may remain. When performing the initial startup at the jobsite, it is highly recommended that people or any other living animals, which may be sensitive to the residual odors or gases, NOT be present in the conditioned space during the startup. In all cases, including the initial factory firing and testing, any of the gases will be under the acceptable level of concentration for human occupancy.

⚠ WARNING

Those sensitive to odors or gases from trace amounts of residual oils must NOT be present in the conditioned space during the startup of a gas fired installation.

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: IF YOU DO NOT FOLLOW THESE INSTRUCTIONS EXACTLY, A FIRE OR EXPLOSION MAY RESULT CAUSING PROPERTY DAMAGE, PERSONAL INJURY OR LOSS OF LIFE.

A. This appliance does not have a pilot. It is equipped with a ignition device which automatically lights the burner. Do not try to light the burner by hand.

B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

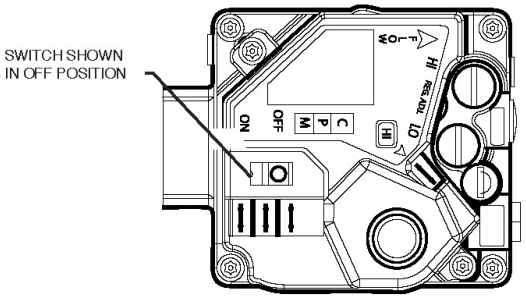
- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to move the on/off switch.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.



5. Remove control access panel.
6. Move the on/off switch to the "OFF" position.
7. WAIT five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to the next step.
8. Move the on/off switch to the "ON" position.
9. Replace control access panel.
10. Turn on all electric power to the appliance.
11. Set thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas to Appliance" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be preformed.
3. Remove control access panel.
4. Move the on/off switch to the "OFF" position.
5. Replace control access panel.

Direct Ignition • P72570

Figure 22 - Gas Heater Instructions

Gas Heating Maintenance

⚠ WARNING

Once a year, before the unit is in operation for the heating season, a qualified service technician must inspect all flue product carrying areas of the furnace and main burners for continued safe operation.

⚠ DANGER

LEAK CHECK GAS PIPE

The gas pipe in the unit shall be checked for leaks before operation and startup. Unit must not be placed in operation until a leak check has been conducted for all gas piping connections. All connections shall be checked for leaks annually after installation. Gas leaks could result in fire, explosion, or other hazardous situations.

Make sure all gas supply lines have been purged of air before turning on the electrical power switch. Turn the gas valve to the on position (see startup instructions). Turn the main electrical power on and set the controls to the heating mode of operation.

The combustion ventilation motor will enable. The control will automatically supply energy to the igniter and the gas valve after the heating call is made.

The flame sensing probe detects the presence of the flame. Should no flame be detected in 10 seconds, the ignition system will recycle. If no flame is detected after 3 tries, ignition system will lockout.

Remove the call for heating. The main gas valves shall be extinguished.

The supply fans are controlled by the ignition system. In the fan "Auto" mode the fan comes on 45 seconds after the flame is proved and goes off 120 seconds after the heating call is removed.

Furnace combustion ventilation air and flue openings shall be checked annually for debris and obstructions. If vent extensions are used they shall meet category III requirements.

This appliance contains a wire screen at the vent outlet. Each heating season, prior to placing the appliance in heat mode maintenance check that no debris or foreign matter has accumulated in the vent outlet. A good practice is to check for debris each time the air filters are changed.

In the event the vent outlet becomes blocked do not attempt to start the appliance in heat mode until the entire vent opening is cleared.

In the event the unit shut down because the vent was blocked a qualified technician or service agency shall monitor the unit prior to re-starting.

The gas burner and heat exchanger should never require cleaning. If cleaning is necessary, this indicates faulty operation of the unit. Cleaning shall only be done by a qualified service agency and only after consultation with an AAON service representative.

If induced draft blower/motor assembly has to be replaced, care must be taken to provide an airtight seal between the blower housing and the burner box.

Gas Heat Exchanger Removal

⚠ WARNING

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

⚠ DANGER

LEAK CHECK GAS PIPE

The gas pipe in the unit shall be checked for leaks before operation and startup. Unit must not be placed in operation until a leak check has been conducted for all gas piping connections. All connections shall be checked for leaks annually after installation. Gas leaks could result in fire, explosion, or other hazardous situations.

Removal

Verify that the unit power has been switched off.

Disconnect all wiring on the heat exchanger.

Disconnect flex gas lines and pull out of the way.

Remove screws around the perimeter of the heat exchanger face plate that connect it to the unit. Remove only the outermost screws.

Pull the heat exchanger straight back and out of the unit. It may be necessary to remove some of the control door jambs.

Reinstallation

Ensure that the neoprene isolator is installed around the perimeter of the heat exchanger. Insert heat exchanger into opening so that the back of the main plate is against the unit bulkhead.

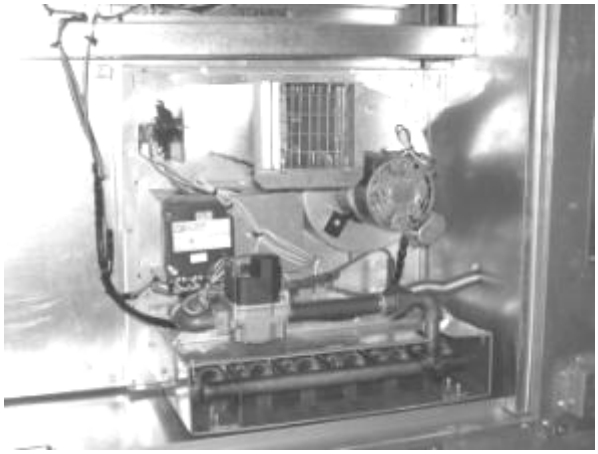


Figure 23 - Gas Heat Exchanger

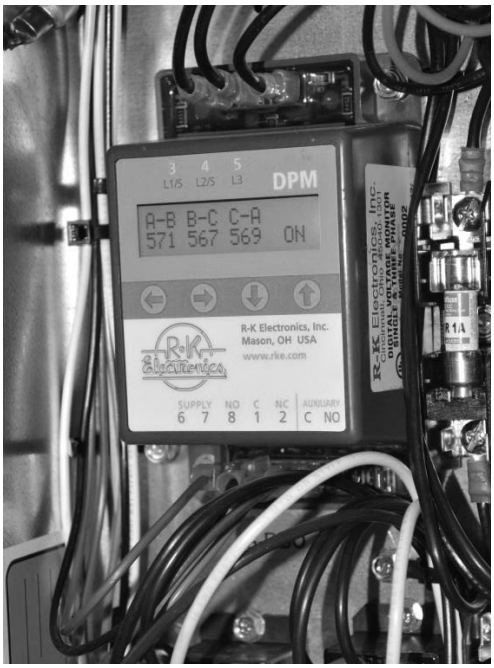
Attach the heat exchanger to the bulkhead using the holes around the perimeter.

Connect flex gas lines to the piping on the heat exchanger. If flexible gas piping in the unit must be replaced connectors cannot be reused, only new connectors may be used.

Connect wiring per the wiring diagram on the controls compartment door.

Purge gas lines to the gas valves at the unit.

Phase and Brownout Protection Module



The DPM is a Digital Phase Monitor that monitors line voltages from 200VAC to 240VAC 1ϕ and 200VAC to 600VAC 3ϕ. 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%

Phase and brownout module may be this type on some products (as seen in the above picture). No setup is needed with this module version, other than checking that the voltage jumper voltage matches the unit voltage

Screens

Manufacturer's Screen
R-K Electronics
DPM v0.0.00

Average Voltage Screen

VAvg	Imb	Hz	
460	0	60	off

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

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

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

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

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

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

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

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

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

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

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

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

Fault Screen (Vertical Format)

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

Fault Words:

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

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.

⚠ 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.

Table 31 - Air Disinfection UV Information

RNA-E Cabinet Size	CFM Max	Lamp Watt/SqFt Coil	Residence Time (Seconds)	Dose µJ/cm2*	Estimated Inactivation Rate (Coronavirus)
(75 tons)	29,300	14.50	0.287	667	91.90%
D (90-140 tons)	38,000	14.39	0.297	692	92.70%

* All dosage and estimated inactivation rates are at bulb end of life, have a wind chill degradation for 12.8°C (55°F) factored in, and factor in velocity on the coil. Warmer temperatures or lower airflows will increase the UV effectiveness.

Filter Replacement

Monthly air filter inspection is required to maintain optimum unit efficiency.

⚠ WARNING

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

It is strongly recommended that filter media be replaced monthly. Filters are located upstream of the evaporator coil in the filter and economizer section. Open access door and pull filters straight out to inspect all of the filters. Replace filters with the size indicated on each filter or as shown in the tables below. Arrow on the replacement filters must point towards the blower. (RAB = Return Air Bypass, PE = Power Exhaust and PR = Power Return)

Table 32 - 75 ton Pre Filters

Feature	Option	Quantity / Size	Type
9A	0,A	No Pre Filters	
9A	B,C,D	15 / 20” x 24” x 2” & 5 / 16” x 20” x 2”	Pleated, MERV 8
19	B,G,H,J	28 / 20” x 20” x 1”	Metal Mesh, Outside Air

Table 33 - 90-140 ton Pre Filters

Feature	Option	Quantity / Size	Type
9A	0,A	No Pre Filters	
9A	B,C,D	21 / 20” x 24” x 2” & 7 / 16” x 20” x 2”	Pleated, MERV 8
19	B,G,H,J	28 / 20” x 20” x 1”	Metal Mesh, Outside Air

Table 34 - 75 ton Unit Filters

Feature 9A	Quantity / Size	Type
0	25 / 18” x 20” x 2”	Pleated, MERV 8
A	15 / 24” x 20” x 4” & 5 / 16” x 20” x 4”	Pleated, MERV 8
B	15 / 24” x 20” x 4” & 5 / 16” x 20” x 4”	Pleated, MERV 11
C		Pleated, MERV 13
D		Pleated, MERV 14

Table 35 - 90-140 ton Unit Filters

Feature 9A	Quantity / Size	Type
0	35 / 18” x 20” x 2”	Pleated, MERV 8
A	21 / 24” x 20” x 4” & 7 / 16” x 20” x 4”	Pleated, MERV 8
B	21 / 24” x 20” x 4” & 7 / 16” x 20” x 4”	Pleated, MERV 11
C		Pleated, MERV 13
D		Pleated, MERV 14

Table 36 - 75-140 ton Exhaust Filters

Feature 4C	Quantity / Size	Type
A,E	10 / 24” x 24” x 2”	Pleated, MERV 8
J,N	OA - 10 / 24” x 24” x 2” EA - 14 / 25” x 16” x 2”	
B,F	14 / 24” x 20” x 2”	
K,P	OA - 14 / 20” x 24” x 2” EA - 14 / 25” x 16” x 2”	

18x20	18x20	18x20	18x20	18x20
18x20	18x20	18x20	18x20	18x20
18x20	18x20	18x20	18x20	18x20
18x20	18x20	18x20	18x20	18x20
18x20	18x20	18x20	18x20	18x20

75 ton Units, 2" Filters

16x20	16x20	16x20	16x20	16x20
24x20	24x20	24x20	24x20	24x20
24x20	24x20	24x20	24x20	24x20
24x20	24x20	24x20	24x20	24x20

75 ton Units, 4" Filters

18x20	18x20	18x20	18x20	18x20	18x20	18x20
18x20	18x20	18x20	18x20	18x20	18x20	18x20
18x20	18x20	18x20	18x20	18x20	18x20	18x20
18x20	18x20	18x20	18x20	18x20	18x20	18x20
18x20	18x20	18x20	18x20	18x20	18x20	18x20

90-140 ton Units, 2" Filters

16x20	16x20	16x20	16x20	16x20	16x20	16x20
24x20	24x20	24x20	24x20	24x20	24x20	24x20
24x20	24x20	24x20	24x20	24x20	24x20	24x20
24x20	24x20	24x20	24x20	24x20	24x20	24x20

90-140 ton Units, 4" Filters

Figure 24 - RN Series E Cabinet Standard Filter Layouts

All dimensions are in inches and are height x length.
Layouts are viewed from the upstream side of the cooling coil.

Filter Conversion 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 20 x 2]	[45.7 x 50.8 x 5.1]
[20 x 20 x 1]	[50.8 x 50.8 x 2.5]
[20 x 24 x 2]	[50.8 x 61 x 5.1]
[24 x 20 x 4]	[61 x 50.8 x 10.2]
[24 x 24 x 2]	[61 x 61 x 5.1]
[25 x 16 x 2]	[63.5 x 40.6 x 5.1]

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
2425 S. Yukon Ave.
Tulsa, OK 74107
Ph: 918-382-6450
techsupport@aaon.com
www.aaon.com

Note: Before calling, technician must 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.

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, transporting, 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 RQ 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 RQ 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 only**.

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 FULFILLMENT 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 INFORMATION (REQUIRED)

Job Name: Click or tap here to

Sales Order Number: Click or tap here to enter text.

Unit Tag: Click or tap here to enter text

Date of Shipment: Click or tap here to enter text.

Serial Number: Click or tap here to enter text.

Unit Model Number: Click or tap here to enter text.

SAMPLE

Appendix A - Heat Exchanger Corrosion Resistance

Corrosion Resistance of Copper and Stainless Steel in Brazed Plate Heat Exchangers - Points to Measure and Check in a Water Analysis

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

Explanations: + Good resistance under normal conditions
0 Corrosion problems may occur especially when more factors are valued 0
- Use is not recommended

Water Containing	Concentration (mg/l or ppm)	Time Limits - Analyze Before	AISI 316	SMO 254	Copper Alloy	Nickel Alloy
Alkalinity (HCO_3^-)	< 70	Within 24 Hours	+	+	0	+
	70-300		+	+	+	+
	> 300		+	+	0/+	+
Sulfate (SO_4^{2-})	< 70	No Limit	+	+	+	+
	70-300		+	+	0/-	+
	> 300		0	0	-	+
HCO_3^-/ SO_4^{2-}	> 1.0	No Limit	+	+	+	+
	< 1.0		+	+	0/-	+
Electrical Conductivity	< 10µS/cm	No Limit	+	+	0	+
	10-500 µS/cm		+	+	+	+
	> 500 µS/cm		+	+	0	+
pH	< 6.0	Within 24 Hours	0	0	0	+
	6.0-7.5		0/+	+	0	+
	7.5-9.0		+	+	+	+
	> 9.0		+	+	0	+
Ammonium (NH_4^+)	< 2	Within 24 Hours	+	+	+	+
	2-20		+	+	0	+
	> 20		+	+	-	+
Chlorides (Cl^-)*	< 300	No Limit	+	+	+	+
	> 300		0	+	0/+	+
Free Chlorine (Cl_2)	< 1	Within 5 Hours	+	+	+	+
	1-5		+	+	0	+
	> 5		0/+	+	0/-	+
Hydrogen Sulfide (H_2S)	< 0.05	No Limit	+	+	+	+
	> 0.05		+	+	0/-	+
Free (aggressive) Carbon Dioxide (CO_2)	< 5	No Limit	+	+	+	+
	5-20		+	+	0	+
	> 20		+	+	-	+

*See Chloride Content Table

Water Containing	Concentration (mg/l or ppm)	Time Limits - Analyze Before	AISI 316	SMO 254	Copper Alloy	Nickel Alloy
Total Hardness (°dH)	4.0-8.5	No Limit	+	+	+	+
Nitrate (NO_3)	< 100	No Limit	+	+	+	+
	> 100		+	+	0	+
Iron (Fe)	< 0.2	No Limit	+	+	+	+
	> 0.2		+	+	0	+
Aluminum (Al)	< 0.2	No Limit	+	+	+	+
	> 0.2		+	+	0	+
Manganese (Mn)	< 0.1	No Limit	+	+	+	+
	> 0.1		+	+	0	+

Chloride Content

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

Appendix B - Thermistor Temperature vs. Resistance Values

Deg C	Deg F	Resistance (kOhms)
-40	-40	2889.6
-35	-31	2087.22
-30	-22	1522.20
-25	-13	1121.44
-20	-4	834.72
-15	5	627.28
-10	14	475.74
-5	23	363.99
0	32	280.82
5	41	218.41
10	50	171.17
15	59	135.14
20	68	107.44
25	77	86.00
30	86	69.28
35	95	56.16
40	104	45.81
45	113	37.58
50	122	30.99
55	131	25.68
60	140	21.40
65	149	17.91

Deg C	Deg F	Resistance (kOhms)
70	158	15.07
75	167	12.73
80	176	10.79
85	185	9.20
90	194	7.87
95	203	6.77
100	212	5.85
105	221	5.09
110	230	4.45
115	239	3.87
120	248	3.35
125	257	2.92
130	266	2.58
135	275	2.28
140	284	2.02
145	293	1.80
150	302	1.59
155	311	1.39
160	320	1.25
165	329	1.12
170	338	1.01
175	347	0.92
180	356	0.83

RN Series E Cabinet Startup Form

Date:_____
Job Name:_____
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. Is all copper tubing isolated so that it does not rub?	Yes ☐	No ☐
13. Has outside air rain hood been opened?	Yes ☐	No ☐
14. Have the damper assemblies been inspected?	Yes ☐	No ☐
15. Are the air filters installed with proper orientation?	Yes ☐	No ☐
16. Have condensate drain and p-trap been connected?	Yes ☐	No ☐
18. Are ventilation and exhaust openings unobstructed?	Yes ☐	No ☐
19. Are markings, decals, and warnings on unit clearly visible?	Yes ☐	No ☐
20. Are all damaged or illegible markings and warnings replaced?	Yes ☐	No ☐

Supply Fan Assembly

Alignment ☐ Check Rotation ☐ Nameplate Amps_____

Number	hp	L1	L2	L3
1				
2				

Band Size_____ VAV Controls_____

VFD Frequency_____

Energy Recovery Wheel Assembly

Wheel(s) Spin Freely ☐ Check Rotation ☐ FLA_____

Number	hp	L1	L2	L3
1				
2				

Power Return/Exhaust Assembly

Alignment ☐ Check Rotation ☐ Nameplate Amps_____

Number	hp	L1	L2	L3
1				
2				

Outside Air/Economizer Dampers

Operation Check ☐

Damper Actuator Type:

Economizer Changeover Type and Operations:

Damper Wiring Check ☐

Gears Check ☐

Ambient Temperature

Ambient Dry Bulb Temperature _____°C/°F Ambient Wet Bulb Temperature _____°C/°F

Unit Configuration

Water-Cooled Condenser ☐ Air-Cooled Condenser ☐

No Water Leaks ☐

Condenser Safety Check ☐

Water Flow _____GPM

Water Inlet Temperature _____°C/°F

Water Outlet Temperature _____°C/°F

Compressors / DX Cooling						
Number/stage	L1	L2	L3	Head Pressure KPA/PSIG	Suction Pressure KPA/PSIG	Crankcase Heater Amps
1						
2						
3						
4						

Refrigeration System 1 – Cooling Mode					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A
Refrigeration System 2 – Cooling Mode					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A
Refrigeration System 3 – Cooling Mode					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A
Refrigeration System 4 – Cooling Mode					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A
Refrigeration System 1 – Heating Mode (Heat Pump only)					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A
Refrigeration System 2 – Heating Mode (Heat Pump only)					

	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A
Refrigeration System 3 – Heating Mode (Heat Pump only)					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Refrigeration System 4 – Heating Mode (Heat Pump only)					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Air-Cooled Condenser				
Alignment ☐		Check Rotation ☐		Nameplate Amps_____
Number	hp	L1	L2	L3
1				
2				
3				
4				
5				
6				

Water/Glycol System		
1. Has the entire system been flushed and pressure checked?	Yes ☐	No ☐
2. Has the entire system been filled with fluid?	Yes ☐	No ☐
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)?	Yes ☐	No ☐
5. Is there a minimum load of 50% of the design load?	Yes ☐	No ☐
6. Has the water piping been insulated?	Yes ☐	No ☐
7. What is the freeze point of the glycol (N/A if water)? _____		

Gas Heating

Natural Gas ☐	Propane ☐	Purge Air from Lines ☐	Verify Pilot Spark ☐
Stage	Manifold Pressure (w.c.)	Stage	Manifold Pressure (w.c.)
1		3	
2		4	

Electric Heating			
Stages_____			
Limit Lockout ☐		Aux. Limit Lockout ☐	
Stage	Amps	Stage	Amps
1		5	
2		6	
3		7	
4		8	

Electric Preheating			
Limit Lockout ☐		Aux. Limit Lockout ☐	
Outside Air Temperature Setpoint _____°F			
Preheat Leaving Air Temperature Setpoint _____°F			
Stage	Amps	Stage	Amps
1		5	
2		6	
3		7	
4		8	

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 start-up, maintenance and servicing of the equipment falls to the owner and qualified licensed technician.

Entry Date	**Action Taken**	**Name/Tel.**

AAON E-COATED COIL MAINTENANCE RECORD

Installation Site _____ Installation Date _____
Unit Model # _____ Unit Location _____
Unit Serial # _____ Customer _____

Year 20____	Ambient Temp (°F)	Surface Debris Removed	Coil Cleaned	Approved Cleaner Used	Potable Water Backwash Rinse	Potable Water Frontwash Rinse	Chlorides Removed	Comments
Jan								
Feb								
Mar								
Apr								
May								
Jun								
Jul								
Aug								
Sep								
Oct								
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.

CLEANING AGENT	RESELLER	PART NUMBER
GulfClean ™ Coil Cleaner or Enviro-Coil Cleaner	Rectorseal 2601 Spenwick Drive, Houston, Texas 77055 (P): 713-263-8001	G074480 / 80406 or V82540
GulfClean Salt Reducer™	" "	G074490 / 80408

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

Literature Change History

April 2021
Original RN Series E Cabinet IOM.

May 2021
Updated the feature options in the feature string nomenclature.

January 2022
Updated the unit clearances picture and table. Added sections on UV air disinfection and airflow monitoring. Changed the LEAK CHECK GAS PIPE Danger wording from must to shall.

November 2023
Start of new UL 60335 version of RN E series IOM. 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 Duel Point power as an option as well as included a table about the options. Added metric conversions to all units in the IOM. Removed 55 ton and 65 ton information since those tonnages are no longer selectable options in E cat.

December 2023
Added Marine Lights to Option C for Feature 22.

January 2024
Added statement about working with flammable refrigerants. Added Additional warnings. Added tables listing the max allowable charges for a circuit. Added warning about being cautious of expose live wire. Added caution to ensure wires are protected from damage and wear. Added to charging warning, “Maximum allowable charge of any single circuit is 133 kg (4700 oz).”

March 2024
Additional warnings added. Text added to installation section about proper ventilation requirements. Additional checklist items added to Startup form. Sentence added to storage section in regards to ASHRAE 15 requirements.

AAON
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Tulsa, OK 74107-2728
www.AAON.com

RN Series E Cabinet Installation, Operation & Maintenance

G147580 · Rev. A · 240422

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.